# RESEARCH TO DETERMINE FAILURE MODES FOR TRANSISTORS

CONTRACT #NAS 8-11059

5TH QUARTERLY REPORT
SEPTEMBER - DECEMBER 1964



General Electric Company
Semiconductor Products Department
Syracuse, New York

Research to Determine Failure Modes for Transistors
Contract #NAS 8-11059 5th Quarterly Report
October - December 1964

## Object

The object of this research is to study the effectiveness of screening transistors by stress and by non-destructive tests when applied to transistors manufactured to the same specification by three different processes.

The previous reports covered details of an initial step-stress experiment. A preliminary study of the effectiveness of using noise as a method of screening and a preliminary report covering partial details of the first 1,500 hours of a 3,000 hour life test.

This report shows the bulk of the data from a 3,000 hour life test of three separate processes to manufacture a transistor to the 2N718A specification.

Data in the form of computer calculated distributions for the complete test matrix consisting of:

3 - manufacturing processes
4 - stress screen conditions
10 - parameters
8 - test times
5 - Life test levels.

Engineering analysis of failures in the high stress screen on one process has been completed.

## Abstract

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A detailed analysis of failure modes has shown that planar transistors are subject to failures due to transient spikes. This failure mode causes serious damage if the transistor is not limited against thermal runaway.

This mode of failure is most prevalent among transistors which are considered least likely to have channeling modes of failure.

Preliminary computer readout of distribution of values is included with this report. This readout is not corrected for the combined effect of computor, data processing and automatic reading error.

The 250 readings on each transistor cause indicated failures to be several times actual.

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# 1.0 STATUS OF THE CONTRACT

## 1.1 Overall Status

The overall status of the contract as of 1 January 1965 is that all life tests have been completed on all lots. Final Phase II measurements are being made on all 800mw life tests.

Analysis is underway and has been completed for Process "A" on the high stress and moderate stress levels.

## 1.2 Work Remaining on the Contract

1.2.1 Analysis of PhaseIII life test data for centrifuge only lots and for the control lots in Process "A".

1.2.2 Analysis of PhaseIII for all lots in Process "B".

1.2.3 Analysis of PhaseIII for all lots in Process "C".

1.2.4 Centrifuge Phase IV in its entirety.

1.2.5 Analysis of Phase IV

1.2.6 Final analysis and report preparation

## 1.3 Extension Plans for the Contract

1.3.1 Design computer program to analyze all data to determine relation between noise tests and reliability.

1.3.2 Run and [illegible] noise in relation to failures of the different major cl[illegible]ations and determine the screening effectiveness of noise as a means of screening without life tests.

1.3.3 Use the computer program developed for noise readings to determine if application of screening to initial parameters other than noise will provide similar screening effectiveness.

1.3.4 Determine if noise tests made after the other screens for initial parameters will make a further improvement in reliability.

# 2.0 MAJOR PROBLEM AREAS IN PRESENT CONTRACT

## 2.1 Line Transients Plus Thermal Runaway

## 2.2 Failure Mode Description

One of the new failure mode problems facing the semiconductor industry is the effect of transient spikes which occur on power lines and are generated in other ways.

2.2 Failure Mode Description - Cont'd

Such transient spikes consist of very high peak voltages which appear on power lines due to the operation of various electrical equipment.

Transient spikes of much higher values also occur in every conductor during thrunderstorm activities. The actual spike voltage is unknown but it is not unusual to observe arc over across several inches of space from an ungrounded conductor to a grounded conductor during thunderstorms.

Such arc over problems are of serious concern in Industrial Control Standards in N.E.M.A. activities. In this case semiconductor insulator spacing is much too small to meet the requirements for arc over protection.

The project engineer is serving at present on the task force to consider this problem.

In use most transistors must be protected from such high transient voltage spikes in a manner which limits the flow of current through the device to values which will not destroy the device.

Life test racks at General Electric were originally designed to permit thermal runaway when a momentary breakdown did occur. The philosophy was reasonable and though somewhat overcautious when applied to Germanium devices and to Alloy devices, it did guarantee a higher reliability.

The original argument was that a momentary breakdown indicates a defective transistor which should be eliminated.

During the change from alloy to planar construction the problem has developed due to the high impedance of the planar surfaces.

About the time of the start of this Life test, new test cards were introduced having a diode in the base as a protection against high reverse current in the base on a momentary overload.

Such cards were available in sufficient quantities to use at the higher levels with a delay of four weeks in getting the life test started.

The 500mw level was not expected to show problems without the diodes.

The analysis of data in relation to failure effects at the 500mw level failures compared to the failures at other power levels was conducted on Process "A" and covered in Section 3.0.

It is expected that the level of failures due to transient spikes is comparable in Process "B" and Process "C", but the level of miscellaneous failures at the 500mw level and the other levels is sufficiently higher and would be more likely to cancel the most valuable information.

## 2.3 Data Handling Problems

The data handling problem is very severe in this contract.

There are more than 250 readings, key punching or computer operations involved for each transistor on the test.

The 58 test lots show data assembled by the computer on approximately 10,000 separate sheets.

The percentage of error is reasonable, but the need for data handling reliability percentage is beyond the capability of either human operator or data processing equipment.

With the 250 operations per transistor an error rate of .008% would be required to hold to 2% errors in classification of a device as a failure.

A careful review of the data is required for a cross-check on each indicated failure. Computer system errors tend to show 2 to 5 times the number of failures which are unexplained.

There are only a few of the computer failures which can be identified and the ratio above probably is too low for a true picture of failures.

# 3.0 LIFE TEST RESULTS

## 3.1 High Stress Screen

### 3.1.1 Process "A"

Five lots were tested on the 3,000 hour life test from Process "A". The five lots were subjected to the power and temperature shown in the table.

Conditions for all lots were similar except that the 500mw had no reverse current protection in the base circuit, as explained in Section 2.

It was also found during the high stress experiment as reported in Quarterly Report #3, that a substantial number of units showed a shift in $I_{CBO}$ after the temperature plus reverse voltage.

The units which did show this shift were divided with all units having a ("B" Class) shift of 1 micro-ampere or more sent to failure analysis. The units of the ("C" Class) 100nA to 100 micro-ampere, were divided and some included in the life test and some sent to failure analysis.

Units of the ("E" Class) 10nA to 100nA were included in the life test.

This division did provide the means of understanding the effect of decreasing the limits of leakage allowable.

This distinction was made only in the Process "A" units which shifted and completely recovered.

Some units which were shown to exceed initial limits on the beginning of the life test, were allowed to continue through the test.

Either type of unit is designated as screened out unit in the analysis.

3.1.1.1 Test Conditions High Stress Screen Life Test

| Lot No. | 419-201 | 419-202 | 419-203 | 419-204 | 419-205 |
|---|---|---|---|---|---|
| No. in Lot | 14 | 28 | 75 | 14 | 28 |
| Acceptable | 12 | 23 | 58 | 12 | 21 |
| Screened Out | 2 | 5 | 17 | 2 | 7 |
| % Screened Out | 14 | 18 | 23 | 14 | 25 |
| Power in MW | 800 | 700 | *500 | 200 | 400 |
| Temperature °C | 25 | 25 | 25 | 150 | 150 |

*500mw test level was not protected by diode from transient triggered thermal runaway.

Test Limits Used to Define Failure

Test limits used for the classes of failure agree with the limits used in Quarterly Report #3, Page 11 reproduced here:

| | G | E | C | B |
|---|---|---|---|---|
| $I_{CBO}$ | 10nA | 10-100nA | 100-1000nA | 1 uA |
| $I_{EBO}$ | 10nA | 10-100nA | 100-1000nA | 1 uA |
| *$BV_{CEO}$ | 40v | 30-40v | 20-30v | 20v |
| $BV_{CEO}$ % Shift | 15% | 25% | 50% | 50% |
| $h_{FE}$ | 40-120 | 35-40 & 120-150 | 28-35 150-180 | 28 or 180 |
| $h_{FE}$ % Shift | 15% | 15-25% | 25-50% | 50% |
| $V_{CE(SAT)}$ | Not Used | | | |
| $V_{CE(SAT)}$ %Shift | 15% | 15-25% | 25-50% | 50% |
| $V_{BE(SAT)}$ | Not Used | | | |
| $V_{BE(SAT)}$ %Shift | 15% | 15-25% | 25-50% | 50% |

*The specification rates $V_{CEO}$ as 32v maximum in the absolute limit. Test limits of $BV_{CEO}$ are not given and the limit of 40 volts was chosen as representative of the entire distribution at the current chosen for the test.

3.1.1.2 Failures in Units Screened Out

This lot was tested as part of the full lot as reported on the distribution graphs (Figures 3.1.1.1 through 3.1.1.5).

| Lot | | 419-201 | 202 | 203 | 204 | 205 | Total |
|---|---|---|---|---|---|---|---|
| Good at End of Test | (G) | (1) | (2) | (11) | (1) | (4) | (18) |
| Passes "E" Limit | (E) | (0) | (2) | (2) | (0) | (0) | (4) |
| Passes "C" Limit | (C) | 1 | 0 | 1 | 0 | 0 | 2 |
| Fails (Bad) | (B) | 0 | 1 | 0 | 1 | 1 | 3 |
| Failures (B & C) | | 1 | 1 | 1 | 1 | 1 | 5 |

Numbers in () do not count as failures in (B+C)

3.1.1.3 Shifters in Units Screened Out

This table shows the units which shifted on any parameters in the units which were screened out.

| | | 419-201 | 202 | 203 | 204 | 205 | Total |
|---|---|---|---|---|---|---|---|
| 15-25% Shift | (E) | 0 | 0 | (2) | 0 | 0 | (2) |
| 25-50% Shift | (C) | 0 | 0 | 0 | 0 | 0 | 0 |
| Over 50% Shift | (B) | 0 | 0 | 0 | 0 | 2 | 0 |
| Shifters B+C | | 0 | 0 | 0 | 0 | 2 | 0 |

3.1.1.4 Screened Out Units which Responded to Life Test (Shifters & Failures to "E", "C", & "B" Limits)

| Lot Number | 419-201 | 202 | 203 | 204 | 205 | Total |
|---|---|---|---|---|---|---|
| No. Screened Out | 2 | 5 | 16 | 2 | 7 | 32 |
| No. Responding | 1 | 1 | 5 | 1 | 1 | 7 |
| Failure Rate % Per "K" hours for 3,000 hour test | | | 10.4 | | | 7.3 |

This shows the percent of units which responded in some way to the life test to be 10:4%/K hours for the 500mw units but this is above the 7.3 %/K hours.

If we count only failures at the 500mw (C+B) level the percent is very low with one failure in each lot.

3.1.1.5 Failures in the Life Test Lot Which Were Accepted by the Screen

| Lot Number | 419-201 | 202 | 203 | 204 | 205 | Total |
|---|---|---|---|---|---|---|
| Number in Lot | 12 | 23 | 58 | 12 | 21 | 126 |
| Failure "C" | 0 | 0 | 0 | 2 | 1 | 3 |
| Failure "B" | 2 | 2 | 7 | 0 | 0 | 11 |
| Number Failed | 2 | 2 | 7 | 2 | 1 | 14 |
| Percent Failed | 16.7 | 8.7 | 12 | 16.7 | 4.8 | 11.1 |
| %/K Hours | 5.6 | 2.9 | 4 | 5.6 | 1.6 | |

3.1.1.6 Shifted in Life Test

| | 419-201 | 202 | 203 | 204 | 205 | Total |
|---|---|---|---|---|---|---|
| Shifted 15 to 25% | 0 | 0 | (6) | (2) | (2) | (10) |
| Shift 25-50% "C" | 0 | 0 | 9 | 3 | 3 | 15 |
| Shift Over 50% "B" | 0 | 0 | 3 | 0 | 3 | 6 |
| C&B Limits | | | | | | |
| Percent to C&B | 0 | 0 | 20.6 | 25 | 29 | 8 |
| Rate %/K Hours | 0 | 0 | 6.9 | 8.3 | 9.7 | 2.7 |

3.1.1.7 Total Number of Units Which Showed Some Response to Life Test "E", "C", & "B" Limit Failures Plus "E", "C", & "B" Limit Shifters

| | 419-201 | 202 | 203 | 204 | 205 | Total |
|---|---|---|---|---|---|---|
| Failed E | 0 | 0 | 2 | 1 | 1 | 4 |
| C | 0 | 0 | 0 | 2 | 1 | 3 |
| B | 2 | 2 | 7 | 0 | 0 | 11 |
| Shift E | 0 | 0 | 6 | 2 | 3 | 11 |
| C | 0 | 0 | 9 | 3 | 3 | 15 |
| B | 0 | 0 | 3 | 0 | 6 | 9 |
| Number Responded | 2/12 | 2/23 | 27/58 | 8/12 | 14/21 | 53/126 |
| Percent Responded | 16.7 | 8.7 | 46.5 | 66.7 | 66.7 | 42.1 |
| Rate in %/K Hours | 5.6 | 2.9 | 15.5 | 33.3 | 33.3 | 14.0 |

3.1.1.8 Characteristics of the Devices Screened From the 500mw Lot

This table shows the failure items in the life test history of the lot each item is listed in accordance with the method used in Report #3 and #4. See Quarterly Report #3, Page 10, reproduced below.

Failure Tabulation Code for Correlation Tables -

Failures shown in the correlation tables are indicated by a three part code which consists of the 3 number groups shown below.

| First Group | | Second Group | Third Group |
|---|---|---|---|
| 1 | $I_{CBO}$ | 1 Initial Value | G - Good |
| 2 | $I_{EBO}$ | 2 After 1st Step | E - End of Life |
| 9 | $BV_{CEO}$ | 2S Shift on 1st Step | C - Catastrophic |
| 13 | $h_{FE}$ | 3 After 3rd Step | B - Bad |
| 15 | $V_{CE(SAT)}$ | 3S 3rd Step Shift | (limit passed) |
| 16 | $V_{VE(SAT)}$ | 4 After 4th Step | |
| 660 | Noise 100 $\Omega$1MA | 4S 4th Step Shift | |
| 661 | Noise 1000 $\Omega$1MA | | |
| 662 | Noise 1000 $\Omega$30MA | | |
| 663 | Noise 100KC 30MA | | |

In addition the second group is extended to include Steps 5 through 16 using 5S, 6S, etc. as the shift items for each step. Second group is extended as follows.

5 = 00 hours Phase III
6 = 170 hours
7 = 340 hours
8 = 680 hours
9 = 1,000 hours
10 = 1,500 hours
11 = 2,000 hours
12 = 3,000 hours
13 = 30KG Centrifuge Phase IV
14 = 50Kg Centrifuge Phase IV
15 = 90Kg Centrifuge Phase IV
16 = 150KG Centrifuge Phase IV

3.1.1.9 Characteristics of the Transistor Screened from the 500mw Lot

Units Which Passed 500mw Tests

| Unit No. | 203 | 101 | | | | |
|---|---|---|---|---|---|---|
| A444 | 3 | 48 | (1-2-E) | | | |
| A119 | 9 | 54 | (1-2-E) | (9-3-E) | (9-4-E) | |
| A364 | 31 | 78 | (13-4S+E) | | | |
| A450 | 33 | 80 | (13-4S+C) | | | |
| A122 | 35 | 83 | (9-4-E) | (9-4S-E) | (13-2S+C) | (13-3S+C) (13-4S+C) |
| A170 | 36 | 84 | (9-3S-E) | | | |
| A261 | 53 | 102 | (1-2-C) | | | |
| A430 | 57 | 106 | (1-2-C) | | | |
| A438 | 58 | 107 | (1-2-C) | | | |
| A542 | 61 | 110 | (1-2-C) | | | |
| A344 | 66 | 115 | (13-3S+E) | (13-4S+E) | | |

Units Which Showed "E" Limits on Life Test

| | | | | | |
|---|---|---|---|---|---|
| A113 | 19 | 65 | (13-4S+C) | (13-11-E) | (13-12-E) |
| A543 | 51 | 100 | (1-2-C) | (9-2-E) | (9-4-E) (9-12-E) |

Units Which Shifted "E" Limit on Life Test 15-25%

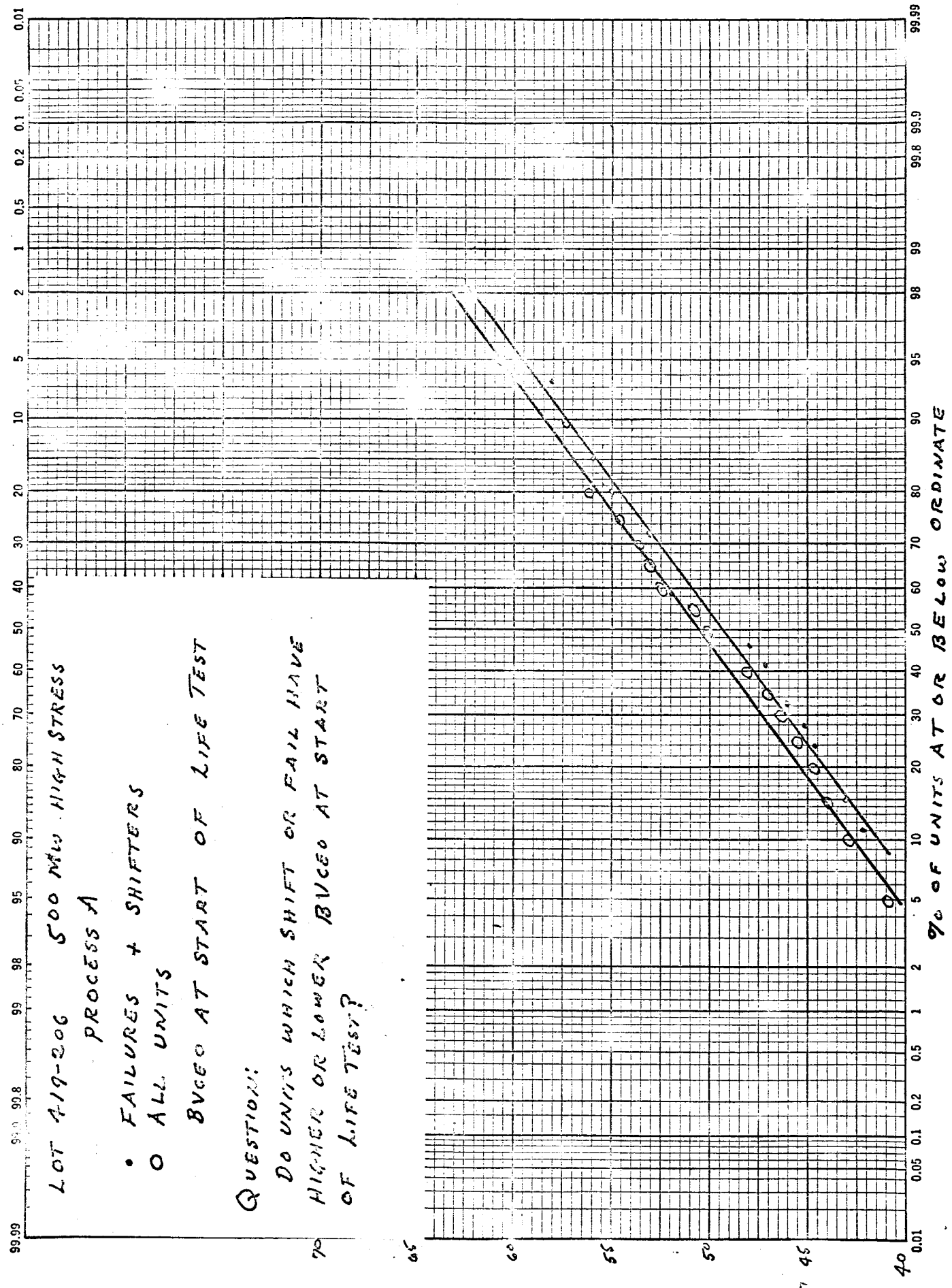
| | | | | |
|---|---|---|---|---|
| A149 | 27 | 73 | (13-3S-E) | (15-9S+C) |
| A236 | 37 | 85 | (9-3S-E) | (15-10S +E) |

Units Which Failed Life Test

| | | | | | | |
|---|---|---|---|---|---|---|
| A-6 | 34 | 81 | (1-2-E) | (13-4S-E) | (9-11S-E) | (9-12S-E) (13-11S+C) |
| | | | (13-12S+C) | | | |

From the above table we can see that units which shifted in $I_{CBO}$ after temperature pulse reverse voltage (1-2-E) or 1-2-C) did not fail life test or shift on life test unless some other shift occurred, also No. A543 and No. A-6.

FIGURE 3.1.1.10.1



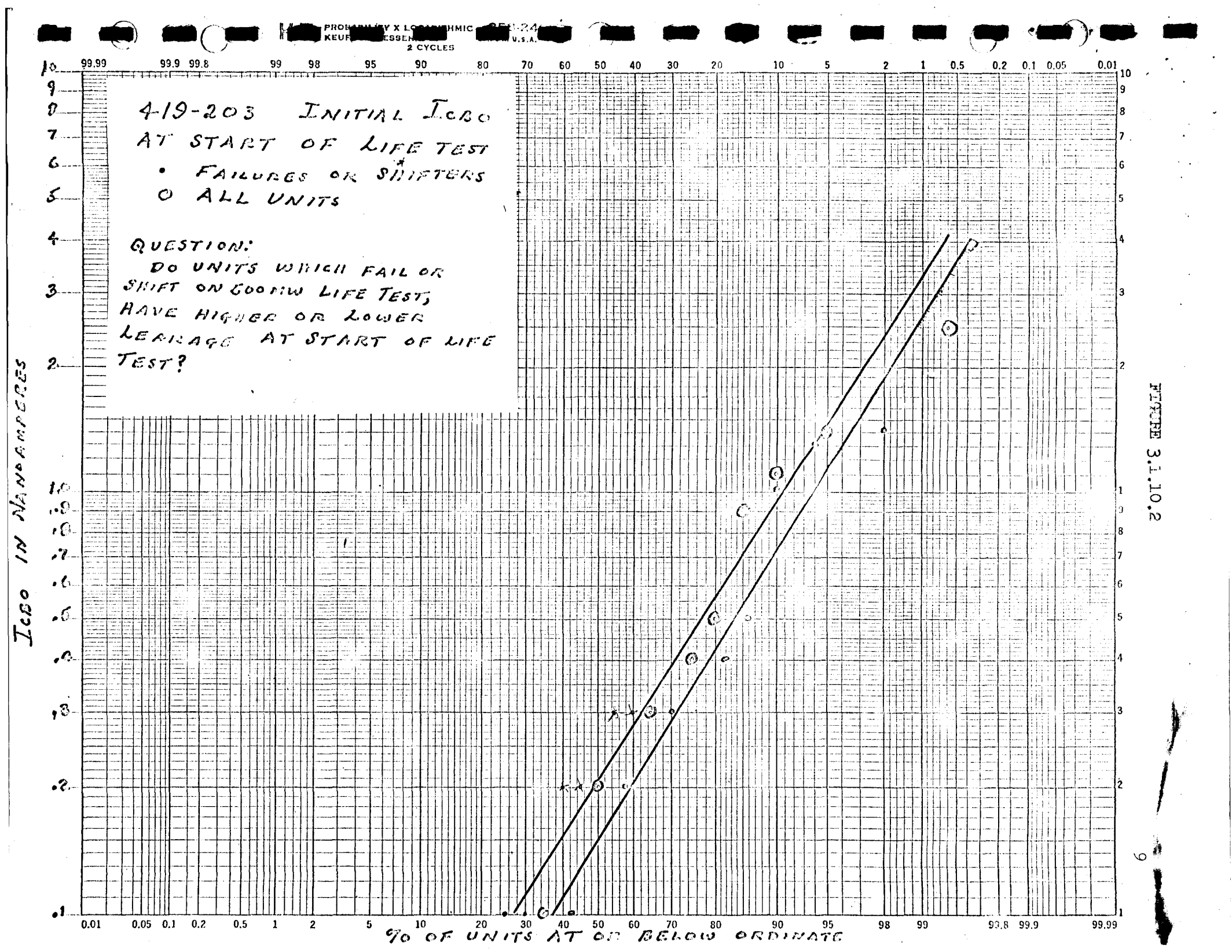



FIGURE 3.1.10.2

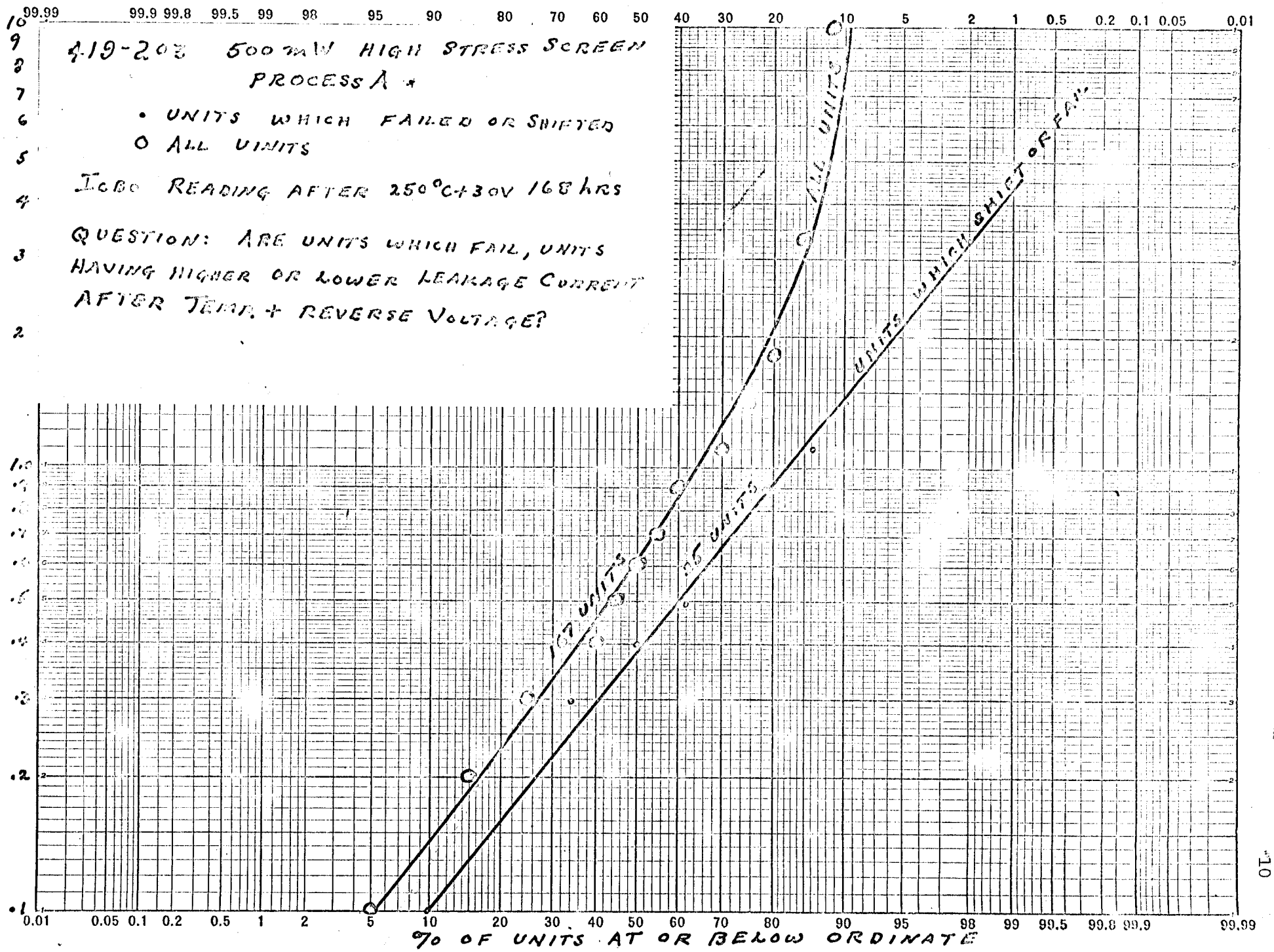



FIGURE 3.1.10.3

3.1.1.10 Failure Mechanisms

The above suggests that a different failue mechanism is involved in the 500mw failures than that which is expected in $I_{CBO}$ shift.

Figure 3.1.1.10.1 shows a comparative distribution of the $BV_{CEO}$ for all units in the lot and for the units which failed at 500mw. This shows a suggestion that the expected $BV_{CEO}$ is a cause when units are selected on an initial test. The results of the graph could be obtained by chance alone and a relation is not clear. Figure 3.1.1.10.2 shows the relation between $I_{CBO}$ measured initially and the distribution of units. The percentage accuracy of $I_{CBO}$ is apparent in this and also there is a slight indication that $I_{CBO}$ does enter into the problem but there is no clear evidence. Figure 3.1.1.10.3 shows the comparison when $I_{CBO}$ is measured after the temperature plus reverse voltage.

This distribution chart shows that the units which failed had a substantially lower $I_{CBO}$ after temperature plus reverse voltage.

This is a reversal of the results that commonly would be expected and justifies further exploration.

The lot investigated in this distribution includes both the units which would be screened out by temperature plus reverse voltage as well as those which would be accepted by the screen.

The shape of the distribution curve for the units which failed indicate that less than 0.1% of the units which failed would have a leakage above 10nA after temperature plus reverse voltage.

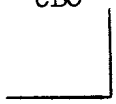
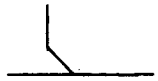
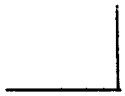
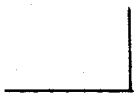
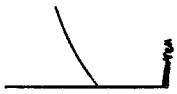
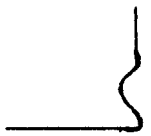
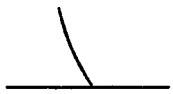
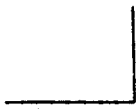
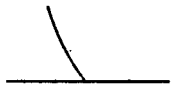
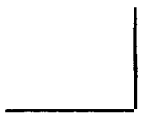
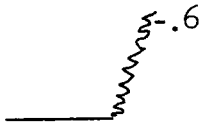
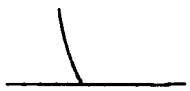
This indicates that the mechanism of failure by the 500mw test is directly opposite to failures by channeling.

The possibilities of this problem are further explored in Section 4.

3.1.1.11 Characteristics of the Devices Which were Screened Out of Life Test and Not Subjected to Life Test.

The following units were removed from the lot on Phase II and not subjected to Phase III.

| Unit No | Phase III | Phase II 101 | |
|---|---|---|---|
| A240 | None | 15 | (1-2-B) |
| A285 | None | 45 | (1-2-C) |
| A110 | None | 64 | (1-2-B) (9-2S-C) (9-2S-E) |
| A186 | None | 74 | (1-2-B) (9-2S-C) |
| A40 | None | 82 | (2-3-13) (13-3-13) (13-3S-13) (16-3S-E) |
| A294 | None | 87 | (2-1-C) (2-2-C) (2-3-B) |
| A192 | None | 135 | (1-2-B) (9-2-B) |

| Unit | $I_{EBO}$ | $I_{CBO}$ | $I_{CEO}$ | Notes |
|---|---|---|---|---|
| A240 |  9V |  100V |  35 40 100 | Base Ring Melted in one spot |
| A285 |  9V | Unit Blasted by Test  95-150 | | Gold alloyed into silicon from base |
| A110 |  9V |  110 |  45 60 110 | Gold alloyed into silicon at base |
| A186 | -1.0MA  8.59 |  100 |  40 70 100 | Spot broken off AL base ring silicon |
| A192 |  9.5 |  110 |  40 50 70 110 | Aluminum base ring melted in one spot |
| A40 | Bad  110 | Same as $I_{CBO}$ | | Out of alignment E-B junction too close to base aluminum ring |
| A294 |  -.6 8.1 |  110 |  40 50 70 90 | Nothing visible |

3.1.1.12 Truncation Screening

The theory of truncation screening as used in Quarterly Report #2, #3, and #4 is also shown in Technical Documentary Report RADC TDR-64-311 Rome Air Development Command.

Truncation screening is advanced as a means of detecting any condition which is out of normal.

3.1.1.12 Truncation Screening Cont'd

The theory as advanced in RADC or as used in the Quarterly Reports #2, #3, and #4 is that any out of normal condition within a device will cause one or more of the parameters to have a bi-model distribution. If such is true, eliminating the upper or lower percentiles of the distribution of same parameter should improve reliability.

Paragraph 3.1.1.10 shows the difference in distribution of units which went through the high stress screen. In effect the percentage difference between failures and all units is very small when applied to $I_{CBO}$ except $I_{CBO}$ after temperature plus reverse voltage.

There may be an unjustified assumption in this reasoning because Lot 419-203 had the 7 units removed as bad prior to life test.

Figure 3.1.1.12.1 shows a comparison of units which either failed on the 500mW life tests or shifted more than 50%. The "B" level of failure and shifter is used for selection.

This shows that there is little difference between units which failed and all units.

The units which change in $I_{CBO}$ due to temperature plus reverse voltage are clearly not the units which will fail.

The lot used in 3.1.1.12.1 includes all 500mw on the 4 lots for:

| | |
|---|---|
| High Stress Screen | Lot 419-203 |
| Moderate Stress Screen | 419-208 |
| Centrifuge Only | 419-213 |
| Control Lot | 419-218 |

The above data indicates that the failure mode associated with 500mw failures is most likely to occur to the best units when judged by the high stress temperature plus reverse voltage.

Units which are most likely to form a channel are much less likely to fail due to the failure mode which is associated with the lack of diode protection against thermal runaway.

Truncation Screening to Other Parameters

Table 3.1.1.2 shows the effect of truncation screening when applied to the control lot, which showed 11 failures to the "C" and "B" levels during the 3,000 hours.

If screened to remove the upper limit of $I_{CBO}$ equal to the upper 15th percentile of the entire distribution, there would be no significant improvement in reliability.

Similarly upper 15th percent are removed on other parameters produces no results lower limits also produce no significant results.

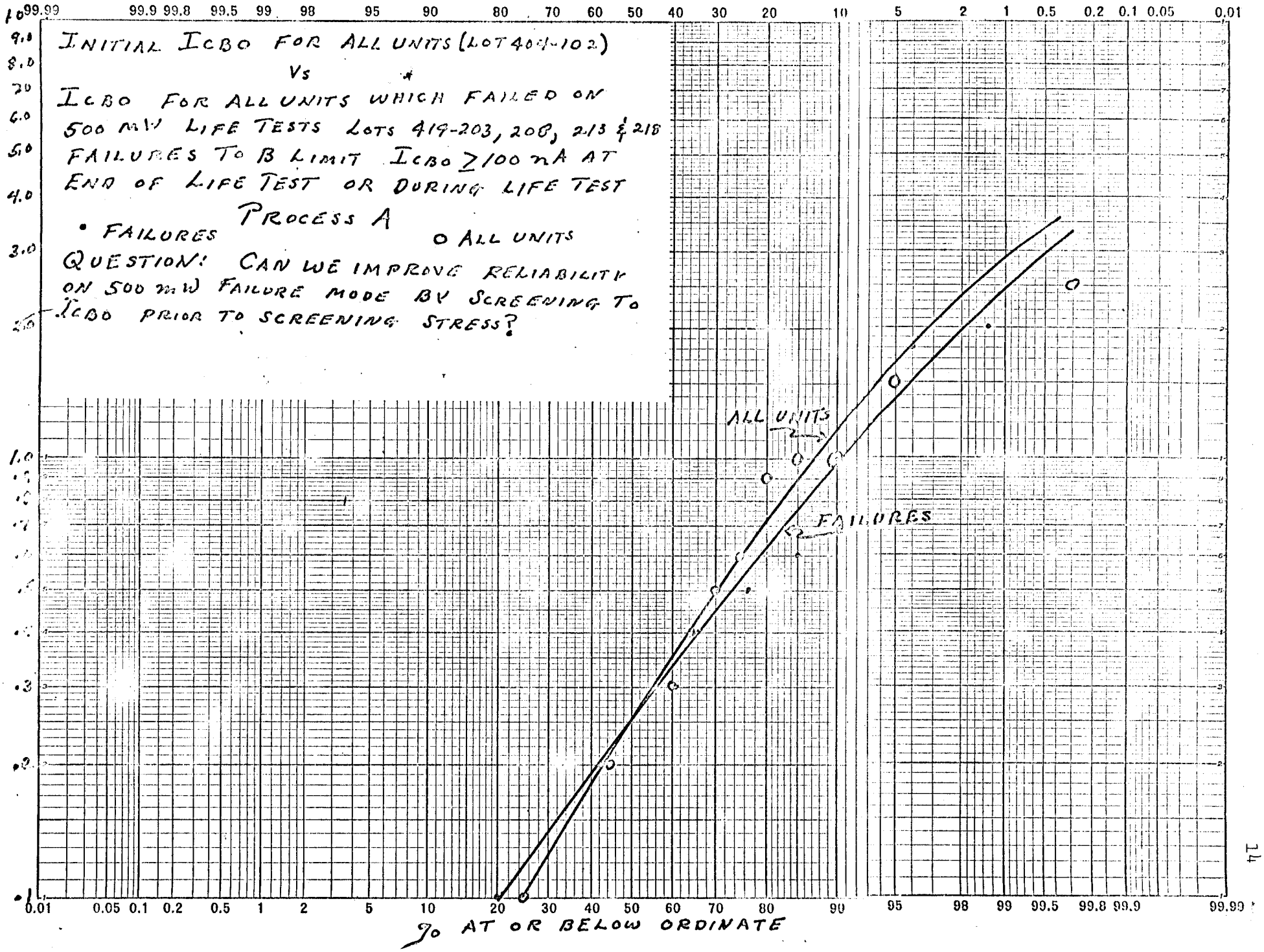



FIGURE 3.1.12.1

FIGURE 3.1.1.12.2
EFFECT OF SCREENING LOT 419-218 TO 15TH PERCENT POINTS
MEASURED AT START OF LIFE TEST

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UNIT NO. | CLASS | $I_{CBO}$ | $I_{EBO}$ | $BV_{CEO}$ | $h_{FE}$ HIGH | $h_{FE}$ LOW | $V_{CE(SAT)}$ HIGH | $V_{CE(SAT)}$ LOW | $V_{BE(SAT)}$ HIGH | $V_{BE(SAT)}$ LOW | REDUNDANT TRUNCATION SCREENING | |
| 1 | | | | | G | | | | | | | |
| 2 | B | | B | | | | (B) | | (B) | | 2-6-8 | B |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | G | | | | |
| 5 | | | G | | | | | | | | | |
| 6 | | | | G | | | | | | (G) | 3-9 | G |
| 7 | | G | | | | | (G) | | | (G) | 1-6-9 | G |
| 8 | | | | G | | | | | | | | |
| 9 | | | | | | | | G | | (G) | 7-9 | G |
| 10 | | | | | | | | | | | | |
| 11 | | | G | | | | (G) | | (G) | | 2-6-8 | G |
| 12 | B | | | | | | | | | | | |
| 13 | C | | | | C | | | | | | | |
| 14 | C | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | G | | | (G) | | | (G) | | (G) | 1-4-7-9 | G |
| 19 | | | | | | | | | | | | |
| 20 | C | | | | | | | | | | | |
| 21 | B | | | | B | | | | | | | |
| 22 | | G | | G | | | | | | | | |
| 23 | | | G | | | (G) | | | | | | |
| 24 | C | | | C | | | | (C) | | | | |
| 25 | | | | | G | | (G) | | (G) | | 4-6-8 | G |
| 26 | E | | | | | | | | | | | |
| 27 | | | | | | | G | | | | | |
| 28 | C | C | (C) | | | (C) | | | (C) | | 1-2-5-8 | G |
| 29 | | | | | | | | G | (G) | | 7-8 | G |
| 30 | | | | | | | | | | | | |
| 31 | E | | | | | | | | | | | |
| 32 | B | | | | | B | | | | | | |
| 33 | B | B | | | | | | | | (B) | 1-9 | B |
| 34 | | | | | | | | | | | | |
| 35 | | | | | | G | | | | | | |
| 36 | E | E | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | B | | | (B) | | (B) | | | | | 3-5 | B |
| Total | 38 | 32 | 33 | 33 | 34 | 33 | 32 | 33 | 33 | 32 | | 28 |
| B | 6 | 5 | 5 | 5 | 5 | 4 | 5 | 6 | 5 | 5 | | 3 |
| C | 5 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | | 4 |
| E | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 |
| G | 24 | 21 | 21 | 21 | 22 | 22 | 19 | 20 | 21 | 20 | | 17 |
| % E+G | 71 | 72 | 73 | 73 | 73.5 | 76 | 69 | 70 | 72 | 71.8 | | 71 |

Table 3.1.1.12.2

The effect of truncation screening at the 15% point when truncation is applied to initial parameters. Measured at beginning of Life test Step 5.

This shows no correlation between initial parameters and failure when truncation is applied to either a single parameter or to two or more parameters.

FIGURE 3.1.1.12.3

SCREENING AFTER FIRST STEP (6) 419-218

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UNIT NO. | CLASS | $I_{CBO}$ | $I_{EBO}$ | $BV_{CEO}$ | $h_{FE}$ HIGH | $h_{FE}$ LOW | $V_{CE(SAT)}$ HIGH | $V_{CE(SAT)}$ LOW | $V_{BE(SAT)}$ HIGH | $V_{BE(SAT)}$ LOW | REDUNDANT TRUNCATION SCREENING | |
| 1 | | | | | | | | | | | | |
| 2 | B | | | | | | B | | (B) | | 6-9 | B |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | G | | G | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | G | | | | | | | | |
| 7 | | | | | | | G | | | | | |
| 8 | | | | G | | | | | | | | |
| 9 | | G | | | | | | G | | | 1-7 | G |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | B | | | | B | | | | | | | |
| 13 | C | C | (C) | | (C) | | | | | | 1-2-4 | C |
| 14 | C | | | | | | | | | C | | |
| 15 | | G | (G) | | | | | | (G) | | 1-2-8 | G |
| 16 | | | | | | G | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | G | | | (G) | | | (G) | | (G) | 4-7-9 | G |
| 19 | | | | | | | | | | | | |
| 20 | C | | | | | | | | | | | |
| 21 | B | | | | | | | | | | | |
| 22 | | | | G | | | | | | (G) | 3-9 | G |
| 23 | | | | | | G | | | | | | |
| 24 | C | | | C | | | | (C) | | | 3-7 | C |
| 25 | | | | | G | | (G) | | (G) | | 4-6-8 | G |
| 26 | E | | | | | | | | | | | |
| 27 | | | G | | (G) | | (G) | | | | 2-4-6 | G |
| 28 | C | C | | | | | | | (C) | | 1-8 | C |
| 29 | | | | | | | | G | (G) | | 7-8 | G |
| 30 | | | | | | | G | | | | | |
| 31 | E | | | | | | | | | | | |
| 32 | B | | | | | B | | | | | | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |
| 35 | | | | | | G | | | | | | |
| 36 | E | | | | | | | | | | | |
| 37 | | | G | | | | | | | | | |
| 38 | B | | | B | | (B) | | | | | 3-5 | B |
| No. | 38 | 33 | 34 | 33 | 33 | 33 | 33 | 33 | 33 | 34 | | 26 |
| B | 6 | 6 | 6 | 5 | 5 | 4 | 5 | 6 | 5 | 6 | | 4 |
| C | 5 | 3 | 4 | 4 | 4 | 5 | 5 | 4 | 4 | 4 | | 2 |
| E | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 |
| G | 24 | 21 | 21 | 21 | 21 | 21 | 20 | 20 | 21 | 21 | | 17 |
| %E+G | 71 | 73 | 71 | 73 | 73 | 73 | 70 | 70 | 73 | 71 | | 77 |

When the units are studied on the basis of removing devices which are out of limits on 2 or more 15th percent points there is also no improvement

Figure 3.1.1.12.3 shows the same comparison when tests are taken after the first 168 hours of operation.

This table shows no effect of truncation screening. A 7% improvement does show in use of inclusion in 2 or more fringes as a screening limit. There is no common pattern for the improvement and no conclusions are possible.

Table 3.1.1.12.2 The effect of truncation screening at the 15% point when applied after the first life test.

This shows no significant improvement in screening to an individual parameter but some improvement when screening is done to redundant truncation.

The fact that truncation screening has little or no effect on reliability tends to confirm that these failures are not related to degradation processes but due to the transient spike condition.

3.1.1.13 Characteristics of Failures at 800mw 419-201

| Unit No. | III 201- | II 101- | No. in Lot =14<br>Screened out failure |
|---|---|---|---|
| A528 | 8 | 9 | (2-3-C) did not recover (2-12-C) |
| | | | Life Test Failure Not Screened Out |
| A492 | 7 | 8 | (9-11+B) (13-11-B) (16-11+B) Open on 12 |
| A74 | 1 | 2 | (13-7-B) (15-7-B) Recovered after 7 |
| | | | Screened Out Good on Life Test |
| A286 | 14 | 16 | (9-2S-E) Recovered and no further change |

A74 may be an intermittent condition

3.1.1.14 Characteristics of Failures at 700mw 419-202

| | | | No. in Lot = 28<br>Screened Out Units Good on Life Test |
|---|---|---|---|
| A417 | 18 | 2 | (1-2-c) (1-10-E) (9-2S-E) |
| A583 | 2- | 4 | (1-2-E) |
| A355 | 27 | 11 | (9-3-E) (9-4-E) (9-5-E) |
| A51 | 41 | 25 | (13-2S-E) |
| | | | Failures |
| A479 | 29 | 13 | Opened @ 1,000 hours |
| A388 | 26 | 20 | Opened @ 1,500 hours |
| | | | Screened Out Failure |
| A412 | 28 | 12 | (13-2S+C) (Opened at 8) |
| | | | All 3 Failures are definite failures |

3.1.1.15 Characteristics of Failures at 200mw +150°C 419-204

| | | | No. in Lot =14 |
|---|---|---|---|
| | | | Screened out Good |
| Unit | 204 | 10A | |
| A508 | 13 | 138 | (13-2S-B) (13-3S-B) (13-4S-B) |

Screened Out Failure

| | | | |
|---|---|---|---|
| A589 | 14 | 139 | (13-4S+E) (1-12-C) (9-12-B) (9-12S-B)(13-12S-B) In this case a shift in $h_{FE}$ on centrifuge of 15 to 25% signaled a filure at 3,000 hours. |

Life Test Failures

| | | | |
|---|---|---|---|
| A529 | 5 | 129 | (9-11+E) (9-12+E) This would not be counted as a failure on normal end of life limits |
| A353 | 3 | 127 | (13-12-C) (13-11S-C) (15-10S-B) |
| A419 | 4 | 128 | (1-9-#) (1-10-E) (1-11-C) (1-12-C) |

Unit A419 is the only unit found in this lot which fails on the leakage mode of failure that was expected in the development of this screen.

Life Test Shifters

| | | | |
|---|---|---|---|
| A252 | 2 | 126 | (13-11S-E) (13-12S-E) |
| A201 | 11 | 136 | (13-11S-E) (13-12S-E) |
| A419 | 1 | 125 | (1-10-E) (1-11-E) (1-12-E) (15-10S-C) |
| A170 | 10 | 134 | (1-11S-C) (1-12S+C) |
| A472 | 12 | 137 | (13-12-C) |

3.1.1.16 Characteristics of Failures at 400mw + 150°C

Lot 419-205 Units in Test 22 Units Screened Out but good on Life Test

| | | | |
|---|---|---|---|
| Unit | 205 | 101 | |
| A108 | 3 | 142 | (13-4S+E) |
| A88 | 13 | 152 | (13-4S+E) |
| A160 | 16 | 155 | (13-3S+E) (13-4S+C) |
| A171 | 26 | 165 | (1-2-B) (9-2-B) (9-2S-B) |

Screened Out Failures

| | | | |
|---|---|---|---|
| A154 | 27 | 166 | (1-6-C) (1-7-C) (13-3S+E) (13-4S+C) (1-12+B) |

This unit shows results of the screen as a means of removing leakage type failures

Screened Out Shifter

| | | | |
|---|---|---|---|
| A382 | 9 | 148 | (1-2-C) (13-11S-B) |
| A123 | 25 | 164 | (13-5-E) (Through 13-9-E) (15-9S-B) |

Life Test Failure

| | | | |
|---|---|---|---|
| A423 | 11 | 150 | (1-8-E) |

| | | | Life Test Shifter |
|---|---|---|---|
| A412 | 10 | 149 | (15-8S-E) |
| A169 | 17 | 156 | (15-8S-E) |
| A597 | 1 | 140 | (15-8S+C) |
| A181 | 5 | 144 | (15-8S-C) |
| A131 | 14 | 153 | (15-8S+C) |
| A269 | 6 | 145 | (13-11S+B) |
| A158 | 15 | 154 | (15-8S+B) |
| A216 | 19 | 158 | (16-9S-B) |

The shifting which occurs on the 8th readout to $V_{CE(SAT)}$ only is a shift which tended to both higher and lower levels. This is not understood at present. The occurance of so many shifters at one step only must have some significance.

It is possible that instrument trouble may be an explanation though problem is not observed in the other readings made at the same time.

Other possibilities are changes in period between oven and test and in the way the unit was cooled on removal from 150°C.

Casual examination of failures at all four 500mw life test conditions show that failure mode is similar percentage of failures and that shifting in characteristics is much more pronounced in the 500mw life tests than in other life tests which had diode protection.

Casual examination of the data shows that this condition is present in process "B" units though somewhat complicated by a larger number of failure modes which are active in the lots.

A more detailed study of these failures will be completed in later quarterly reports.

3.1.1.17 Conclusions Relating to Process "A"

Failures in Process "A" units were mainly due to a failure mode which is probably associated with a better surface.

Evidence in this experiment tends to confirm the hypothesis that: Transient spikes on power lines or connections can cause minute thermal runaway conditions which cause shifting of the device characteristics and also cause destruction in a large number.

The problem is expected to become more serious as surfaces are improved because the voltage drop across a high impedance is much greater than across low impedances.

## 4.0 COMPUTER ANALYSIS FOR PARAMETER DISTRIBUTION

The working copies of the computer analyzed data is attached for advance information. This data is subject to the usual types of computer - automation errors as follows and is being corrected as part of the engineering analysis now underway.

## 4.1 Computer Errors

The program written for the computer cannot recognize the differences between an empty test socket and an open transistor.

If a transistor opens during a test it will be recognized by the computer for $I_{CBO}$ or $I_{EBO}$ as a unit having very low leakage. The distribution is then calculated on the basis of the full number of units and the opened units as being very good. In practice the transistor may have progressively degraded in leakage, runaway and become open.

This makes the noticable changes in improvement of the high end of the distribition. Correction for this error is difficult and requires manual computations.

A second form of error is due to mis-registration of cards and other normal types of trouble. These normally show up in groups of four numbers out of line. The computer accepts the error and includes this in the computed data.

## 4.2 Other Errors

Each transistor requires a total of 250 readings, mechanical or manual and key punch operations. The combined error rate then necessary to provide a 1% indicated failure rate is .004%. This is much too low for human operators or present automatic equipment.

## 4.3 Correction Procedure

Many of the computer errors can be eliminated by examination because a typical computer error is large and frequently occurs in groups of four or more times. Other cross checks are made as part of determining failure mode for each failure.

4.4 Examination in detail of the data has been completed through lot 419-228. Failures due to computer error are approximately five times as frequent as actual device failures. This only proves that computer error rate is somewhat less than 250 times as good as the probably failure rate.

PROCESS: A PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 800 mw, 30 V, 25°C. MIN 3.67. MAX 96.47. CELL NO.: 41920 NO. OF UNITS: 24

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 0.2 | 0.5 | <.1 | <.1 | 0.1 | <.1 | <0.1 | |
| 5% | 0.2 | 0.6 | <.1 | <.1 | 0.1 | <.1 | <0.1 | |
| 10% | 0.2 | 0.6 | <.1 | <.1 | 0.1 | <.1 | <0.1 | |
| 25% | 0.3 | 0.7 | 0.2 | 0.1 | 0.2 | 0.1 | <0.1 | |
| 50% | 0.4 | 1.1 | 0.5 | 0.5 | 0.5 | 0.2 | 0.3 | |
| 75% | 0.7 | 1.5 | 0.8 | 0.9 | 0.9 | 0.6 | 0.5 | |
| 90% | 1.3 | 2.0 | 1.4 | 1.3 | 1.3 | 1.0 | 0.9 | |
| 95% | 1.5 | 2.3 | 1.7 | 1.5 | 1.5 | 1.2 | 1.0 | |
| Max | 1.5 | 2.3 | 1.7 | 1.5 | 1.5 | 1.2 | 1.0 | |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | |
| <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | |
| <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | |
| <0.1 | 0.4 | <0.1 | <0.1 | 0.1 | 0.2 | <0.1 | <0.1 | |
| 0.1 | 0.5 | 0.2 | 0.2 | 0.2 | 0.4 | 0.2 | 0.1 | |
| 0.4 | 0.6 | 0.3 | 0.3 | 0.2 | 0.5 | 0.3 | 0.3 | |
| 270.5 | 259.3 | 255.3 | 249.6 | 242.7 | 248.1 | 236.4 | 248.3 | |
| 539.5 | 516.5 | 509.2 | 483.9 | 483.9 | 495.0 | 471.5 | 495.1 | |
| 539.5 | 516.5 | 509.2 | 483.9 | 483.9 | 495.0 | 471.5 | 495.1 | |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| 41 | 41 | 41 | 41 | 41 | 41 | 39 | 40 | |
| 41 | 41 | 41 | 41 | 41 | 41 | 39 | 40 | |
| 41 | 41 | 41 | 41 | 41 | 41 | 40 | 41 | |
| 43 | 43 | 43 | 43 | 43 | 43 | 43 | 44 | |
| 47 | 47 | 47 | 47 | 47 | 47 | 47 | 48 | |
| 50 | 49 | 50 | 50 | 49 | 49 | 52 | 51 | |
| 57 | 56 | 57 | 57 | 57 | 57 | 5388 | 589 | |
| 58 | 58 | 58 | 58 | 58 | 58 | ∞ | ∞ | |
| 58 | 58 | 58 | 58 | 58 | 58 | ∞ | ∞ | |

| | $BV_{CEO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | -3 | -4 | -3 | -4 | -5 | -10 | -12 | |
| — | -3 | -4 | -3 | -4 | -5 | -10 | -12 | |
| — | -3 | -3 | -3 | -3 | -4 | -8 | -8 | |
| — | -1 | -1 | -1 | -1 | -1 | -2 | -1 | |
| — | 0 | 0 | 0 | 0 | 0 | 0 | +1 | |
| — | 0 | 0 | +1 | 0 | 0 | +1 | +2 | |
| — | +1 | +1 | +1 | +1 | +1 | 1057 | 1057 | |
| — | +1 | +1 | +1 | +1 | +1 | 2112 | 2112 | |
| — | +1 | +1 | +1 | +1 | +1 | 2112 | 2112 | |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 147 | 149 | 34 | 152 | 150 | 154 | 150 | 150 |
| 5% | 147 | 149 | 34 | 152 | 150 | 154 | 150 | 150 |
| 10% | 163 | 170 | 92 | 171 | 172 | 173 | 170 | 172 |
| 25% | 204 | 203 | 197 | 204 | 204 | 204 | 199 | 199 |
| 50% | 228 | 234 | 231 | 234 | 234 | 234 | 227 | 239 |
| 75% | 275 | 280 | 283 | 284 | 283 | 285 | 291 | 294 |
| 90% | 331 | 341 | 340 | 342 | 346 | 345 | 5184 | 5188 |
| 95% | 375 | 379 | 326 | 380 | 380 | 379 | ∞ | ∞ |
| Max | 375 | 379 | 326 | 380 | 380 | 379 | ∞ | ∞ |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | -1 | -84 | -1 | -1 | -1 | -4 | -5 | |
| — | -1 | -84 | -1 | -1 | -1 | -4 | -5 | |
| — | -1 | -42 | -1 | 0 | 0 | -3 | -3 | |
| — | +1 | 0 | +1 | +2 | +1 | 0 | +1 | |
| — | +2 | +2 | +2 | +2 | +3 | +1 | +2 | |
| — | +2 | +2 | +3 | +3 | +4 | +2 | +7 | |
| — | +6 | +5 | +6 | +7 | +7 | 1914 | 1916 | |
| — | +6 | +6 | +6 | +9 | +8 | 3821 | 3821 | |
| — | +6 | +6 | +6 | +9 | +8 | 3821 | 3821 | |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| 785 | 784 | 705 | 787 | 780 | 785 | 785 | 794 | |
| 785 | 784 | 705 | 787 | 780 | 785 | 785 | 794 | |
| 785 | 785 | 744 | 789 | 783 | 785 | 786 | 795 | |
| 790 | 788 | 789 | 790 | 789 | 787 | 790 | 797 | |
| 794 | 791 | 792 | 794 | 790 | 790 | 792 | 802 | |
| 796 | 795 | 796 | 798 | 796 | 796 | 797 | 808 | |
| 807 | 811 | 815 | 811 | 813 | 810 | 5403 | 5406 | |
| 817 | 817 | 826 | 812 | 822 | 820 | ∞ | ∞ | |
| 817 | 817 | 826 | 812 | 822 | 820 | ∞ | ∞ | |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | -2 | -12 | -1 | -2 | -2 | -3 | -1 | |
| — | -2 | -12 | -1 | -2 | -2 | -3 | -1 | |
| — | -2 | -7 | -1 | -2 | -2 | -2 | -1 | |
| — | 0 | 0 | 0 | -1 | -1 | -1 | 0 | |
| — | 0 | 0 | 0 | 0 | 0 | 0 | +1 | |
| — | 0 | 0 | +1 | 0 | 0 | +1 | +2 | |
| — | +2 | +3 | +2 | +2 | +2 | 583 | 584 | |
| — | +3 | +4 | +2 | +3 | +3 | 1164 | 1164 | |
| — | +3 | +4 | +2 | +3 | +3 | 1164 | 1164 | |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 60 | 57 | 20 | 57 | 58 | 58 | 20 | |
| 5% | 60 | 57 | 20 | 57 | 58 | 58 | 20 | |
| 10% | 64 | 63 | 28 | 63 | 64 | 64 | 38 | |
| 25% | 78 | 80 | 74 | 80 | 81 | 81 | 81 | |
| 50% | 82 | 86 | 82 | 84 | 85 | 86 | 85 | |
| 75% | 91 | 93 | 93 | 92 | 93 | 95 | 98 | |
| 90% | 102 | 103 | 98 | 101 | 102 | 103 | 104 | |
| 95% | 105 | 106 | 99 | 104 | 105 | 108 | 105 | |
| Max | 105 | 106 | 99 | 104 | 105 | 108 | 105 | |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | -3 | -72 | -4 | -1 | 0 | -71 | | |
| — | -3 | -72 | -4 | -1 | 0 | -71 | | |
| — | -2 | -42 | -4 | -1 | 0 | -37 | | |
| — | +1 | -3 | -2 | +1 | +1 | -2 | | |
| — | +2 | +1 | 0 | +2 | +2 | 0 | | |
| — | +3 | +2 | +3 | +4 | +5 | +7 | | |
| — | +6 | +5 | +9 | +12 | +15 | +23 | | |
| — | +8 | +6 | +11 | +14 | +21 | +30 | | |
| — | +8 | +6 | +11 | +14 | +21 | +30 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |

PROCESS: A PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 700 mw, 30 V, 25°C. MIN 1.8% MAX 98.2% CELL NO.: 419202 NO. OF UNITS: 28

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.4 | <.1 | <.1 | <.1 | <.1 | <0.1 | 0.3 |
| 5% | <0.1 | 0.4 | <.1 | <.1 | <.1 | <.1 | <0.1 | 0.3 |
| 10% | <0.1 | 0.4 | <.1 | <.1 | <.1 | <.1 | <0.1 | 0.5 |
| 25% | 0.1 | 0.7 | 0.1 | 0.1 | 0.2 | <.1 | 0.2 | 0.5 |
| 50% | 0.3 | 1.0 | 0.4 | 0.3 | 0.4 | 0.3 | 0.6 | 0.7 |
| 75% | 1.0 | 1.9 | 1.3 | 1.2 | 1.3 | 0.9 | 2.4 | 1.4 |
| 90% | 1.4 | 2.7 | 2.6 | 2.1 | 2.6 | 1.8 | 7.9 | 2.6 |
| 95% | 2.1 | 3.0 | 4.0 | 4.5 | 6.7 | 25.3 | 20.8 | 22.0 |
| Max | 2.3 | 3.2 | 4.6 | 6.4 | 8.9 | 44.4 | 31.0 | 36.9 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | 0.1 | <0.1 | 0.2 | <0.1 | 0.2 |
| <0.1 | 0.5 | <0.1 | 0.2 | 0.1 | 0.4 | 0.2 | 0.3 |
| 0.2 | 0.6 | 0.2 | 0.3 | 0.2 | 0.5 | 0.7 | 0.4 |
| 0.8 | 1.2 | 0.6 | 0.4 | 0.4 | 0.6 | 3.3 | 1.0 |
| 2.3 | 1.6 | 1.2 | 0.8 | 1.0 | 0.7 | 4.8 | 1.3 |
| 3.3 | 1.8 | 1.3 | 1.2 | 1.3 | 0.7 | 5.0 | 1.3 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 39 | 39 | 40 | 39 | 40 | 38 | 37 | 35 |
| 40 | 40 | 40 | 40 | 40 | 39 | 38 | 37 |
| 42 | 42 | 43 | 42 | 42 | 41 | 41 | 41 |
| 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| 47 | 47 | 46 | 47 | 47 | 47 | 47 | 47 |
| 52 | 52 | 52 | 52 | 53 | 53 | 55 | 55 |
| 57 | 56 | 56 | 57 | 1541 | 1543 | ∞ | ∞ |
| 59 | 58 | 58 | 5768 | ∞ | ∞ | ∞ | ∞ |
| 60 | 60 | 60 | ∞ | ∞ | ∞ | ∞ | ∞ |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -3 | -2 | -2 | -5 | -7 | -10 |
| — | -2 | -3 | -2 | -2 | -5 | -7 | -8 |
| — | -2 | -2 | -2 | -2 | -3 | -3 | -3 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | +1 | 203 | 203 | 1843 | 1843 |
| — | +2 | +1 | 1201 | 2109 | 2109 | 2109 | 2109 |
| — | +3 | +1 | 2183 | 2183 | 2183 | 2183 | 2183 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 145 | 148 | 146 | 149 | 149 | 149 | 148 | 018 |
| 5% | 155 | 159 | 158 | 159 | 161 | 161 | 159 | 076 |
| 10% | 171 | 172 | 173 | 177 | 179 | 176 | 173 | 169 |
| 25% | 177 | 181 | 179 | 192 | 198 | 200 | 198 | 188 |
| 50% | 207 | 210 | 211 | 219 | 223 | 213 | 220 | 222 |
| 75% | 232 | 236 | 230 | 239 | 245 | 240 | 239 | 251 |
| 90% | 263 | 265 | 264 | 272 | 1279 | 1274 | ∞ | ∞ |
| 95% | 269 | 287 | 289 | 5635 | ∞ | ∞ | ∞ | ∞ |
| Max | 273 | 304 | 305 | ∞ | ∞ | ∞ | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | 0 | 0 | 0 | 0 | -1 | -93 |
| — | -1 | 0 | 0 | 0 | 0 | -1 | -51 |
| — | 0 | 0 | 0 | +1 | +1 | -1 | 0 |
| — | +1 | +1 | +2 | +2 | +2 | 0 | 0 |
| — | +2 | +1 | +3 | +3 | +3 | +1 | +1 |
| — | +3 | +3 | +4 | +5 | +4 | +3 | +4 |
| — | +5 | +4 | +10 | 587 | 585 | 378 | 14962 |
| — | +10 | +10 | 3166 | 5805 | 5805 | 5805 | 5805 |
| — | +11 | +12 | 5747 | 5852 | 5852 | 5852 | 5852 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 775 | 775 | 777 | 777 | 775 | 775 | 775 | 003 |
| 779 | 779 | 780 | 781 | 779 | 777 | 779 | 276 |
| 784 | 784 | 785 | 788 | 784 | 784 | 785 | 259 |
| 787 | 787 | 787 | 790 | 789 | 787 | 787 | 285 |
| 790 | 792 | 789 | 795 | 790 | 790 | 792 | 289 |
| 794 | 795 | 792 | 798 | 797 | 795 | 797 | 295 |
| 799 | 800 | 799 | 814 | 1733 | 1733 | ∞ | ∞ |
| 813 | 816 | 811 | 5866 | ∞ | ∞ | ∞ | ∞ |
| 816 | 819 | 812 | ∞ | ∞ | ∞ | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -1 | 0 | -1 | -1 | -1 | -100 |
| — | -1 | -1 | 0 | -1 | -1 | -1 | -65 |
| — | 0 | -1 | 0 | -1 | -1 | -1 | -3 |
| — | 0 | -1 | 0 | 0 | -1 | 0 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | +1 | 0 | +1 | +1 | +1 |
| — | +1 | 0 | +1 | 119 | 119 | 1140 | 1130 |
| — | +2 | +1 | 648 | 1176 | 1176 | 1176 | 1176 |
| — | +2 | +1 | 1177 | 1177 | 1177 | 1177 | 1177 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 67 | 69 | 65 | 20 | 69 | 20 | 20 | 20 |
| 5% | 68 | 69 | 65 | 41 | 70 | 20 | 20 | 10 |
| 10% | 69 | 70 | 70 | 68 | 73 | 64 | 20 | 20 |
| 25% | 74 | 74 | 73 | 72 | 76 | 73 | 71 | 70 |
| 50% | 82 | 83 | 79 | 82 | 86 | 83 | 80 | 78 |
| 75% | 89 | 89 | 87 | 88 | 102 | 91 | 90 | 90 |
| 90% | 99 | 98 | 98 | 101 | 904 | 106 | 105 | 104 |
| 95% | 105 | 104 | 106 | 104 | 978 | 113 | 116 | 121 |
| Max | 106 | 106 | 107 | 106 | ∞ | 118 | 125 | 134 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -9 | -11 | -76 | -1 | -77 | -77 | -77 |
| — | -7 | -10 | -43 | -1 | -77 | -77 | -77 |
| — | -4 | -9 | -2 | 0 | -9 | -25 | -75 |
| — | 0 | -5 | -2 | 0 | +1 | -1 | -1 |
| — | +1 | +1 | -1 | +2 | +2 | 0 | 0 |
| — | +2 | +4 | +2 | +23 | +6 | -2 | +3 |
| — | +4 | +6 | +4 | 922 | +10 | +10 | +8 |
| — | +6 | +8 | +6 | 981 | +16 | +19 | +19 |
| — | +6 | +8 | +7 | 999 | +20 | +19 | +27 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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PROCESS: A PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 500 mw, 30 V, 25°C.

CELL NO.: 419203 NO. OF UNITS: 75

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | <0.1 | 0.2 | 0.6 | <0.1 | <0.1 | <0.1 | <0.1 |
| 5% | <0.1 | <0.1 | 0.5 | 0.8 | <0.1 | <0.1 | <0.1 | <0.1 |
| 10% | <0.1 | <0.1 | 0.5 | 1.0 | <0.1 | 0.2 | <0.1 | <0.1 |
| 25% | 0.1 | <0.1 | 0.6 | 1.0 | 0.1 | 0.3 | 0.1 | <0.1 |
| 50% | 0.2 | 0.4 | 0.8 | 1.2 | 0.3 | 0.5 | 0.2 | 0.2 |
| 75% | 0.4 | 0.6 | 1.0 | 1.7 | 0.7 | 0.7 | 0.7 | 0.6 |
| 90% | 1.1 | 0.7 | 2.0 | 2.4 | 1.6 | 1.7 | 1.6 | 1.9 |
| 95% | 1.4 | 1.1 | 2.5 | 3.3 | 2.8 | 2.1 | 2.7 | 5.7 |
| Max | 2.5 | 1o1.2 | 329 | 10.2 | >1ma | 7.8 | 9.3 | 35.0 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | <0.1 | 0.2 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.1 | 0.2 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.5 | 0.3 | 0.3 | 0.1 | 0.1 | 0.1 | 0.1 |
| <0.1 | 0.7 | 0.4 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 |
| 0.2 | 0.7 | 0.6 | 0.5 | 0.5 | 0.4 | 0.4 | 0.7 |
| 0.3 | 0.8 | 0.9 | 0.9 | 1.1 | 0.8 | 0.8 | 1.1 |
| 0.6 | 0.9 | 1.1 | 1.1 | 2.4 | 1.2 | 1.1 | 1.5 |
| 2.0 | 1.5 | 2.6 | 2.1 | >1ma | 2.7 | 2.9 | 2.8 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 39 | 40 | 39 | 40 | 47 | 40 | 40 | 39 |
| 41 | 41 | 41 | 41 | 42 | 42 | 42 | 42 |
| 42 | 43 | 43 | 43 | 43 | 44 | 43 | 43 |
| 45 | 45 | 46 | 46 | 46 | 47 | 47 | 46 |
| 51 | 50 | 50 | 51 | 52 | 52 | 52 | 52 |
| 54 | 54 | 54 | 54 | 58 | 59 | 58 | 58 |
| 57 | 57 | 57 | 57 | 65 | 65 | 65 | 64 |
| 61 | 60 | 60 | 61 | 80 | OPEN | ∞ | 3259 |
| OPEN | 64 | 64 | OPEN | OPEN | OPEN | ∞ | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -96 | -96 | -96 | -95 | -95 | -95 | -96 |
| — | -1 | -1 | -1 | -3 | -2 | -3 | -4 |
| — | -1 | -1 | -1 | 0 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | +1 | +1 | +1 | 0 |
| — | 0 | 0 | +1 | +10 | +10 | +10 | +7 |
| — | +1 | +1 | +1 | +20 | +20 | +18 | +17 |
| — | +2 | +1 | +2 | +44 | +46 | +46 | +46 |
| — | +8 | +8 | 2209 | 2333 | 2333 | 2333 | 2333 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 140 | 142 | 146 | 144 | 147 | 148 | 000 | 147 |
| 5% | 157 | 160 | 157 | 159 | 159 | 160 | 157 | 159 |
| 10% | 172 | 175 | 174 | 172 | 173 | 170 | 165 | 168 |
| 25% | 196 | 202 | 203 | 200 | 204 | 203 | 204 | 203 |
| 50% | 227 | 229 | 231 | 227 | 237 | 239 | 233 | 238 |
| 75% | 265 | 269 | 270 | 270 | 288 | 292 | 290 | 286 |
| 90% | 296 | 310 | 310 | 312 | 367 | 385 | 367 | 366 |
| 95% | 353 | 356 | 350 | 359 | ∞ | ∞ | ∞ | 2839 |
| Max | 400 | 403 | 406 | 499 | ∞ | ∞ | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -2 | -2 | -13 | -11 | -160 | -13 |
| — | -1 | -2 | -1 | -1 | 0 | -2 | -1 |
| — | 0 | -1 | -1 | 0 | +1 | -1 | 0 |
| — | +1 | +1 | 0 | +1 | +1 | +1 | +1 |
| — | +2 | +2 | +1 | +3 | +3 | +2 | +2 |
| — | +3 | +3 | +2 | +4 | +5 | +5 | +4 |
| — | +5 | +5 | +5 | +20 | +32 | +33 | +30 |
| — | +6 | +9 | +14 | +358 | 3587 | 3587 | 2783 |
| — | +9 | +11 | +103 | +4771 | 4778 | 4778 | 4778 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 003 | 779 | 782 | 025 | 023 | 780 | 780 | 780 |
| 783 | 784 | 785 | 786 | 783 | 784 | 785 | 782 |
| 785 | 784 | 786 | 788 | 782 | 786 | 786 | 785 |
| 788 | 788 | 789 | 790 | 790 | 790 | 790 | 787 |
| 790 | 791 | 793 | 795 | 794 | 794 | 793 | 791 |
| 793 | 797 | 798 | 799 | 800 | 804 | 803 | 800 |
| 795 | 808 | 807 | 808 | 817 | 832 | 828 | 826 |
| 800 | 823 | 824 | 819 | 854 | ∞ | ∞ | 6879 |
| 848 | 831 | 829 | 833 | ∞ | ∞ | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -3 | -3 | -97 | -97 | -3 | -3 | -3 |
| — | -1 | -1 | 0 | -1 | 0 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | +1 | 0 | 0 | 0 | 0 |
| — | 0 | +1 | +1 | +1 | +1 | +1 | +1 |
| — | +2 | +2 | +2 | +3 | +7 | +4 | +5 |
| — | +4 | +4 | +4 | +240 | 1166 | 1166 | 1161 |
| — | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 51 | 48 | 20 | 20 | 20 | 20 | 20 | 20 |
| 5% | 62 | 61 | 41 | 61 | 20 | 20 | 20 | 20 |
| 10% | 69 | 65 | 64 | 65 | 51 | 53 | 53 | 53 |
| 25% | 77 | 75 | 74 | 73 | 65 | 69 | 70 | 69 |
| 50% | 86 | 83 | 84 | 82 | 76 | 78 | 79 | 80 |
| 75% | 92 | 86 | 90 | 89 | 84 | 90 | 91 | 90 |
| 90% | 99 | 97 | 97 | 99 | 99 | 99 | 101 | 100 |
| 95% | 104 | 101 | 101 | 103 | 102 | 106 | 108 | 108 |
| Max | 119 | 116 | 116 | ∞ | 118 | 119 | 121 | 120 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -19 | -77 | -61 | -78 | -78 | -78 | -78 |
| — | -10 | -33 | -15 | -73 | -73 | -73 | -73 | -73 |
| — | -9 | -9 | -9 | -28 | -27 | -26 | -27 |
| — | -6 | -4 | -6 | -20 | -17 | -16 | -13 |
| — | -3 | -1 | -3 | -9 | -1 | 0 | -1 |
| — | 0 | 0 | -2 | -1 | 0 | +2 | 0 |
| — | 0 | +1 | 0 | +1 | +2 | +3 | +3 |
| — | +1 | +2 | +2 | +4 | +5 | +9 | +9 |
| — | +2 | +7 | +98 | +24 | +35 | +42 | +45 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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PROCESS: A PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 400 mw, 30 V, 150°C. CELL NO.: 419204 NO. OF UNITS: 14

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | <0.1 | 0.4 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.4 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 10% | <0.1 | 0.5 | 0.1 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 |
| 25% | <0.1 | 0.7 | 0.3 | 0.2 | 0.2 | 0.1 | <0.1 | 0.1 |
| 50% | 0.2 | 0.8 | 0.4 | 0.6 | 0.6 | 0.3 | 0.4 | 0.5 |
| 75% | 0.4 | 1.3 | 0.7 | 1.0 | 3.4 | 1.0 | 1.4 | 22.4 |
| 90% | 0.8 | 3.0 | 3.2 | 5.1 | 14.6 | 42.3 | 152.9 | 627.7 |
| 95% | 0.9 | 4.2 | 5.3 | 6.3 | 22.9 | 83.5 | 274.4 | ∞ |
| Max | 0.9 | 4.2 | 5.3 | 6.3 | 22.9 | 83.5 | 274.4 | ∞ |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| | <0.1 | 0.4 | <0.1 | 0.1 | 0.1 | 0.2 | 0.2 | <0.1 |
| | <0.1 | 0.4 | <0.1 | 0.1 | 0.3 | 0.3 | 0.4 | 0.2 |
| | 0.1 | 0.5 | 0.1 | 0.2 | 0.4 | 0.4 | 0.4 | 0.5 |
| | 0.2 | 1.9 | 0.7 | 0.6 | 0.5 | 1.2 | 2.9 | 3.2 |
| | 0.2 | 2.0 | 1.1 | 0.9 | 0.5 | 1.7 | 5.3 | 5.3 |
| | 0.2 | 2.0 | 1.1 | 0.9 | 0.5 | 1.7 | 5.3 | 5.3 |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | 41 | 41 | 31 | 40 | 40 | 40 | 39 | 01 |
| | 41 | 41 | 31 | 40 | 40 | 40 | 39 | 01 |
| | 43 | 43 | 35 | 41 | 41 | 41 | 40 | 20 |
| | 47 | 46 | 43 | 46 | 45 | 45 | 47 | 44 |
| | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 48 |
| | 54 | 55 | 55 | 53 | 52 | 52 | 52 | 51 |
| | 58 | 58 | 59 | 57 | 56 | 55 | 55 | 54 |
| | 59 | 60 | 60 | 59 | 58 | 57 | 57 | 57 |
| | 59 | 60 | 60 | 59 | 58 | 57 | 57 | 57 |

| | $BV_{CEO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | — | -4 | -26 | -6 | -7 | -8 | -9 | -99 |
| | — | -4 | -26 | -6 | -7 | -8 | -9 | -99 |
| | — | -4 | -24 | -6 | -7 | -8 | -9 | -56 |
| | — | -2 | -8 | -4 | -6 | -6 | -7 | -9 |
| | — | 0 | 0 | -2 | -3 | -3 | -3 | -4 |
| | — | +1 | +2 | 0 | 0 | 0 | +1 | 0 |
| | — | +9 | +10 | +6 | +5 | +5 | +10 | +9 |
| | — | +15 | +13 | +10 | +9 | +9 | +10 | +9 |
| | — | +15 | +13 | +10 | +9 | +9 | +10 | +9 |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 173 | 172 | 171 | 175 | | 175 | 170 | 175 |
| 5% | 173 | 172 | 171 | 175 | | 175 | 170 | 175 |
| 10% | 175 | 178 | 178 | 180 | | 180 | 178 | 178 |
| 25% | 190 | 194 | 192 | 190 | | 193 | 188 | 187 |
| 50% | 206 | 211 | 208 | 210 | | 212 | 208 | 213 |
| 75% | 245 | 247 | 252 | 248 | | 294 | 354 | 418 |
| 90% | 376 | 390 | 397 | 399 | | 465 | 513 | 1030 |
| 95% | 396 | 405 | 408 | 410 | | 577 | 616 | 1547 |
| Max | 396 | 405 | 408 | 410 | | 577 | 616 | 1547 |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | — | -1 | -1 | 0 | -4 | -2 | -3 | -4 |
| | — | -1 | -1 | 0 | -4 | -2 | -3 | -4 |
| | — | -1 | -1 | 0 | -3 | -1 | -3 | -4 |
| | — | +1 | +1 | +1 | -1 | +2 | -1 | +1 |
| | — | +2 | +2 | +2 | +1 | +4 | +3 | +4 |
| | — | +3 | +4 | +4 | +4 | +7 | +17 | +33 |
| | — | +5 | +6 | +10 | +11 | +80 | +111 | +344 |
| | — | +5 | +8 | +10 | +13 | +135 | +150 | +529 |
| | — | +5 | +8 | +10 | +13 | +135 | +150 | +529 |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | 784 | 782 | 781 | 715 | 786 | 785 | 779 | 777 |
| | 784 | 782 | 781 | 715 | 786 | 785 | 779 | 777 |
| | 784 | 784 | 763 | 750 | 786 | 787 | 781 | 779 |
| | 789 | 791 | 789 | 791 | 791 | 792 | 786 | 790 |
| | 791 | 795 | 791 | 795 | 796 | 796 | 790 | 794 |
| | 794 | 798 | 795 | 800 | 799 | 808 | 797 | 796 |
| | 795 | 806 | 797 | 815 | 804 | 810 | 801 | 804 |
| | 796 | 812 | 797 | 815 | 807 | 810 | 802 | 805 |
| | 796 | 812 | 797 | 815 | 807 | 810 | 802 | 805 |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | — | 0 | -1 | -10 | 0 | 0 | -1 | -1 |
| | — | 0 | -1 | -10 | 0 | 0 | -1 | -1 |
| | — | 0 | -1 | -5 | 0 | 0 | -1 | -1 |
| | — | 0 | 0 | 0 | 0 | 0 | -1 | -1 |
| | — | +1 | 0 | +1 | +1 | +1 | 0 | +1 |
| | — | +1 | 0 | +1 | +1 | +1 | 0 | +1 |
| | — | +2 | +1 | +3 | +1 | +3 | +1 | +2 |
| | — | +2 | +1 | +3 | +1 | +3 | +1 | +2 |
| | — | +2 | +1 | +3 | +1 | +3 | +1 | +2 |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 64 | 58 | 64 | 53 | 63 | 64 | 64 | 20 |
| 5% | 64 | 58 | 64 | 53 | 63 | 64 | 64 | 20 |
| 10% | 73 | 60 | 65 | 60 | 67 | 67 | 68 | 42 |
| 25% | 84 | 81 | 86 | 81 | 87 | 88 | 89 | 83 |
| 50% | 89 | 89 | 88 | 84 | 93 | 96 | 98 | 102 |
| 75% | 100 | 94 | 98 | 90 | 104 | 108 | 107 | 110 |
| 90% | 106 | 97 | 103 | 100 | 109 | 112 | 115 | 119 |
| 95% | 107 | 97 | 104 | 104 | 109 | 115 | 118 | 119 |
| Max | 107 | 97 | 104 | 104 | 109 | 115 | 118 | 119 |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | — | -26 | -21 | -21 | -16 | -16 | -16 | -80 |
| | — | -26 | -21 | -21 | -16 | -16 | -16 | -80 |
| | — | -20 | -17 | -19 | -12 | -11 | -10 | -48 |
| | — | -8 | -4 | -14 | -2 | -1 | -1 | 0 |
| | — | -6 | 0 | -8 | +2 | +5 | +4 | +5 |
| | — | -1 | +3 | -1 | +10 | +13 | +15 | +22 |
| | — | +6 | +6 | +5 | +16 | +22 | +28 | +38 |
| | — | +6 | +7 | +9 | +16 | +23 | +31 | +42 |
| | — | +6 | +7 | +9 | +16 | +23 | +31 | +42 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | | | | | | | | |
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PROCESS: A PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 200 mw, 30 V, 150°C. MIN. 1.8% MAX 98.2%. CELL NO.: 419205 NO. OF UNITS: 28

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.6 | <.1 | <.1 | <.1 | <.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.6 | <.1 | <.1 | <.1 | <.1 | <0.1 | <0.1 |
| 10% | <0.1 | 0.6 | 0.1 | <.1 | 0.1 | 0.1 | <0.1 | 0.1 |
| 25% | <0.1 | 0.8 | 0.2 | 0.2 | 0.3 | 0.1 | 0.1 | 0.1 |
| 50% | 0.2 | 0.9 | 0.5 | 0.4 | 0.4 | 0.3 | 0.3 | 0.4 |
| 75% | 0.4 | 1.4 | 1.0 | 1.0 | 1.2 | 0.8 | 1.1 | 1.2 |
| 90% | 0.9 | 13.5 | 2.0 | 1.9 | 1.8 | 1.5 | 1.9 | 1.9 |
| 95% | 1.5 | 127.7 | 109.1 | 11.1 | 6.4 | 4.8 | 2.4 | 1962 |
| Max | 2.0 | 142.4 | 196.6 | 18.6 | 10.1 | 7.3 | 2.6 | 154.1 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 83 | <0.1 | <0.1 | <0.1 | <0.1 | | |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | | |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | | |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | 0.2 | | |
| <0.1 | 0.5 | 0.1 | <0.1 | 0.2 | 0.2 | | |
| 0.1 | 0.6 | 0.2 | 0.2 | 0.3 | 0.3 | | |
| 0.2 | 0.7 | 0.4 | 0.3 | 0.4 | 0.4 | | |
| 0.4 | 0.9 | 0.5 | 0.6 | 0.4 | 0.4 | | |
| 0.5 | 1.0 | 0.5 | 0.6 | 0.4 | 0.4 | | |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 |
| 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 |
| 44 | 44 | 44 | 44 | 44 | 44 | 44 | 43 |
| 47 | 47 | 47 | 47 | 47 | 47 | 47 | 46 |
| 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 |
| 54 | 54 | 54 | 54 | 54 | 54 | 54 | 55 |
| 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 |
| 62 | 62 | 62 | 62 | 63 | 62 | 62 | 62 |
| 64 | 64 | 64 | 64 | 65 | 64 | 64 | 64 |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -1 | -18 | -2 | -2 | -3 | -4 |
| — | -1 | -1 | -18 | -2 | -2 | -3 | -4 |
| — | -1 | -1 | -10 | -1 | -1 | -1 | -3 |
| — | 0 | 0 | -5 | 0 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | +5 | +1 | 0 | 0 | 0 |
| — | 0 | +1 | +11 | +1 | +1 | 0 | +1 |
| — | 0 | +1 | +24 | +1 | +1 | +3 | +1 |
| — | 0 | +1 | +24 | +1 | +1 | +5 | +1 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 150 | | 152 | 155 | 70 | 154 | 160 | 157 |
| 5% | 153 | | 156 | 157 | 108 | 157 | 160 | 159 |
| 10% | 171 | | 174 | 175 | 159 | 174 | 178 | 172 |
| 25% | 207 | | 209 | 212 | 202 | 205 | 210 | 209 |
| 50% | 230 | | 241 | 245 | 233 | 246 | 246 | 245 |
| 75% | 284 | | 299 | 303 | 296 | 302 | 298 | 290 |
| 90% | 406 | | 423 | 431 | 418 | 430 | 417 | 425 |
| 95% | 432 | | 448 | 449 | 440 | 450 | 452 | 451 |
| Max | 437 | | 451 | 453 | 442 | 453 | 453 | 455 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | 0 | -46 | -72 | -2 | -1 | -2 |
| — | -1 | 0 | -35 | -41 | -2 | -1 | -2 |
| — | 0 | 0 | -17 | -1 | 0 | 0 | 0 |
| — | +1 | +1 | -3 | 0 | 0 | +1 | +1 |
| — | +3 | +2 | +1 | +1 | +3 | +3 | +2 |
| — | +4 | +4 | +13 | +3 | +5 | +5 | +5 |
| — | +5 | +5 | +36 | +6 | +7 | +7 | +9 |
| — | +5 | +7 | +74 | +8 | +10 | +11 | +14 |
| — | +5 | +7 | +104 | +8 | +11 | +11 | +14 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 779 | 775 | 784 | 774 | 757 | 776 | 705 | 007 |
| 781 | 779 | 785 | 779 | 459 | 780 | 735 | 354 |
| 783 | 784 | 788 | 785 | 779 | 785 | 778 | 784 |
| 787 | 788 | 789 | 788 | 791 | 788 | 784 | 789 |
| 793 | 793 | 796 | 794 | 797 | 793 | 790 | 794 |
| 798 | 801 | 803 | 803 | 804 | 800 | 797 | 800 |
| 800 | 808 | 810 | 809 | 806 | 805 | 805 | 809 |
| 803 | 810 | 819 | 814 | 810 | 810 | 806 | 814 |
| 805 | 810 | 819 | 814 | 811 | 812 | 807 | 817 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -1 | -2 | -67 | -1 | -10 | -99 |
| — | -1 | -1 | -2 | -41 | -1 | -6 | -55 |
| — | 0 | 0 | -2 | -1 | -1 | -1 | 0 |
| — | 0 | 0 | -1 | 0 | 0 | -1 | 0 |
| — | 0 | 0 | +1 | +1 | 0 | 0 | 0 |
| — | +1 | +1 | +1 | +1 | +1 | 0 | +1 |
| — | +1 | +2 | +3 | +1 | +1 | +1 | +1 |
| — | +2 | +4 | +4 | +2 | +2 | +1 | +2 |
| — | +2 | +5 | +4 | +2 | +2 | +1 | +2 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 54 | 54 | 54 | 53 | 52 | 53 | 58 | 59 |
| 5% | 56 | 56 | 56 | 56 | 55 | 55 | 59 | 56 |
| 10% | 60 | 60 | 59 | 60 | 58 | 59 | 60 | 59 |
| 25% | 74 | 75 | 72 | 74 | 74 | 71 | 81 | 74 |
| 50% | 83 | 83 | 82 | 82 | 82 | 83 | 84 | 84 |
| 75% | 90 | 90 | 88 | 89 | 87 | 88 | 96 | 89 |
| 90% | 104 | 99 | 98 | 104 | 102 | 104 | 1687 | 1055 |
| 95% | 118 | 115 | 114 | 120 | 119 | 117 | 6221 | 1878 |
| Max | 122 | 123 | 134 | 125 | 123 | 117 | 7044 | 1949 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -11 | -11 | -35 | -4 | -78 | -3 | -2 |
| — | -9 | -11 | -34 | -4 | -19 | -3 | -2 |
| — | -5 | -9 | -31 | -4 | -6 | -2 | -2 |
| — | -2 | -5 | -10 | -3 | -3 | -2 | -1 |
| — | +1 | -1 | 0 | -3 | -1 | -1 | 0 |
| — | +2 | 0 | +9 | 0 | +1 | +2 | +2 |
| — | +4 | +2 | +42 | +3 | +3 | +92 | +5 |
| — | +6 | +5 | +48 | +7 | +5 | +890 | +9 |
| — | +6 | +5 | +51 | +7 | +5 | +917 | +11 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

PROCESS: A PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C. Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 800 mw, 30 V, 25°C. MIN. 3.6% MAX. 96.4%. CELL NO.: 419206 NO. OF UNITS: 14

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | <.1 | 0.1 | <.1 | 0.2 | <.1 | <0.1 | <0.1 |
| 5% | <0.1 | <.1 | 0.1 | <.1 | 0.2 | <.1 | <0.1 | <0.1 |
| 10% | 0.1 | 0.3 | 0.2 | 0.1 | 0.2 | <.1 | <0.1 | <0.1 |
| 25% | 0.1 | 0.5 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.1 |
| 50% | 0.3 | 0.9 | 0.4 | 0.4 | 0.4 | 0.5 | 0.3 | 0.4 |
| 75% | 0.5 | 1.9 | 1.7 | 1.5 | 1.6 | 1.2 | 2.7 | 3.2 |
| 90% | 1.5 | 4.9 | 4.9 | 3.0 | 2.5 | 1.9 | 7.5 | 6.5 |
| 95% | 2.0 | 6.9 | 6.9 | 3.7 | 2.5 | 2.0 | 9.3 | 6.8 |
| Max | 2.0 | 6.9 | 6.9 | 3.7 | 2.5 | 2.0 | 9.3 | 6.8 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.2 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | 0.1 | <0.1 | 0.2 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | 0.2 | 0.1 | 0.4 | 0.2 | <0.1 |
| 0.1 | 0.5 | 0.1 | 0.3 | 0.2 | 0.5 | 0.4 | 0.3 |
| 0.2 | 0.7 | 0.3 | 0.4 | 0.7 | 0.6 | 3.1 | 0.8 |
| 0.3 | 0.7 | 0.4 | 0.5 | 1.0 | 0.6 | 5.7 | 0.8 |
| 0.3 | 0.7 | 0.4 | 0.5 | 1.0 | 0.6 | 5.7 | 0.8 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 42 | 42 | 42 | 42 | 42 | 42 | 42 | 43 |
| 42 | 42 | 42 | 42 | 42 | 42 | 42 | 43 |
| 42 | 42 | 42 | 42 | 42 | 42 | 44 | 44 |
| 45 | 44 | 44 | 45 | 45 | 47 | 47 | 47 |
| 48 | 48 | 48 | 50 | 50 | 50 | 51 | 52 |
| 51 | 52 | 52 | 53 | 53 | 55 | 293 | 293 |
| 55 | 55 | 55 | 5285 | 5285 | ∞ | ∞ | ∞ |
| 57 | 57 | 57 | ∞ | ∞ | ∞ | ∞ | ∞ |
| 57 | 57 | 57 | ∞ | ∞ | ∞ | ∞ | ∞ |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -1 | -1 | -2 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -2 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -2 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | +1 |
| — | 0 | 0 | 0 | 0 | 0 | +1 | +2 |
| — | 0 | 0 | +1 | +1 | +1 | +523 | +523 |
| — | 0 | +1 | 1062 | 1062 | 2179 | 2236 | 2236 |
| — | 0 | +1 | 2122 | 2122 | 2236 | 2236 | 2236 |
| — | 0 | +1 | 2122 | 2122 | 2236 | 2236 | 2236 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 038 | 151 | 158 | 153 | 153 | 152 | 150 | 010 |
| 5% | 038 | 151 | 152 | 153 | 153 | 152 | 150 | 010 |
| 10% | 082 | 158 | 158 | 159 | 160 | 160 | 156 | 081 |
| 25% | 162 | 167 | 168 | 167 | 169 | 168 | 166 | 167 |
| 50% | 198 | 216 | 217 | 234 | 230 | 231 | 236 | 217 |
| 75% | 247 | 248 | 249 | 253 | 256 | 267 | 3214 | 264 |
| 90% | 266 | 269 | 270 | 352 | 5145 | ∞ | ∞ | ∞ |
| 95% | 281 | 284 | 287 | 419 | ∞ | ∞ | ∞ | ∞ |
| Max | 281 | 284 | 287 | 419 | ∞ | ∞ | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | 0 | -1 | +1 | 0 | 0 | -1 | -74 |
| — | 0 | -1 | +1 | 0 | 0 | -1 | -74 |
| — | 0 | -1 | +1 | +1 | +1 | -1 | -37 |
| — | +1 | +1 | +1 | +2 | +2 | 0 | +2 |
| — | +2 | +2 | +2 | +3 | +3 | +2 | +3 |
| — | +3 | +3 | +4 | +4 | +133 | 1037 | +3 |
| — | +260 | +263 | +329 | 2722 | 4583 | 7514 | 4583 |
| — | +516 | +521 | +542 | 5028 | 5028 | ∞ | 5028 |
| — | +516 | +521 | +542 | 5028 | 5028 | ∞ | 5028 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 696 | 784 | 783 | 783 | 782 | 596 | 783 | 788 |
| 696 | 784 | 783 | 783 | 782 | 596 | 783 | 788 |
| 739 | 785 | 783 | 785 | 783 | 688 | 784 | 790 |
| 783 | 787 | 785 | 787 | 785 | 785 | 785 | 792 |
| 785 | 789 | 787 | 790 | 787 | 787 | 789 | 798 |
| 788 | 792 | 790 | 793 | 790 | 791 | 3095 | 1092 |
| 792 | 794 | 793 | 963 | 5397 | ∞ | ∞ | ∞ |
| 792 | 794 | 795 | 1130 | ∞ | ∞ | ∞ | ∞ |
| 792 | 794 | 795 | 1130 | ∞ | ∞ | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | 0 | 0 | 0 | 0 | -25 | 0 | +1 |
| — | 0 | 0 | 0 | 0 | -25 | 0 | +1 |
| — | 0 | 0 | 0 | 0 | -13 | 0 | +1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | +1 |
| — | 0 | 0 | +1 | 0 | 0 | 0 | +1 |
| — | +1 | +1 | +1 | +1 | +4 | +294 | +40 |
| — | +8 | +8 | +29 | +586 | 1174 | 1257 | 1174 |
| — | +14 | +14 | +44 | 1177 | 1177 | 1337 | 1177 |
| — | +14 | +14 | +44 | 1177 | 1177 | 1337 | 1177 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 67 | 68 | 64 | 20 | 20 | 20 | 20 | 20 |
| 5% | 67 | 68 | 64 | 20 | 20 | 20 | 20 | 20 |
| 10% | 68 | 68 | 64 | 44 | 44 | 20 | 20 | 20 |
| 25% | 73 | 74 | 75 | 70 | 71 | 66 | 55 | 66 |
| 50% | 88 | 89 | 91 | 87 | 90 | 87 | 79 | 85 |
| 75% | 92 | 92 | 94 | 90 | 92 | 91 | 90 | 90 |
| 90% | 98 | 97 | 100 | 97 | 99 | 98 | 99 | 101 |
| 95% | 100 | 98 | 102 | 99 | 101 | 99 | 102 | 105 |
| Max | 100 | 98 | 102 | 99 | 101 | 99 | 102 | 105 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -11 | -79 | -79 | -79 | -79 | -79 |
| — | -2 | -11 | -79 | -79 | -79 | -79 | -79 |
| — | -2 | -10 | -42 | -40 | -78 | -78 | -78 |
| — | -1 | -5 | -2 | 0 | -3 | -32 | -7 |
| — | -1 | +1 | -1 | +2 | -1 | -1 | -2 |
| — | +2 | +3 | +2 | +3 | +2 | +1 | +2 |
| — | +4 | +6 | +4 | +5 | +6 | +3 | +5 |
| — | +5 | +7 | +5 | +6 | +6 | +3 | +5 |
| — | +5 | +7 | +5 | +6 | +6 | +3 | +5 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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PROCESS: A. PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 700 mw, 30 V, 25°C. MIN: 1.7% MAX: 98.3% CELL NO.: 419207 NO. OF UNITS: 29

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | <0.1 | 0.5 | <.1 | <.1 | <.1 | <.1 | <0.1 | 0.3 |
| 5% | <0.1 | 0.5 | <.1 | <.1 | <.1 | <.1 | <0.1 | 0.4 |
| 10% | <0.1 | 0.6 | <.1 | <.1 | <.1 | <.1 | <0.1 | 0.5 |
| 25% | 0.1 | 0.7 | 0.1 | 0.1 | 0.1 | 0.1 | <0.1 | 0.5 |
| 50% | 0.2 | 0.9 | 0.4 | 0.3 | 0.1 | 0.2 | 0.3 | 0.7 |
| 75% | 0.9 | 1.7 | 1.1 | 1.1 | 0.3 | 0.7 | 1.0 | 1.5 |
| 90% | 1.0 | 2.0 | 1.3 | 1.3 | 1.3 | 1.1 | 1.3 | 1.9 |
| 95% | 1.9 | 2.9 | 2.3 | 2.2 | 2.2 | 1.9 | 2.1 | 3.2 |
| Max | 2.7 | 3.7 | 3.1 | 3.0 | 3.0 | 2.4 | 2.7 | 3.4 |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | 0.3 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | 0.4 | <0.1 | 0.1 |
| <0.1 | 0.5 | <0.1 | 0.2 | 0.1 | 0.4 | <0.1 | 0.3 |
| 0.1 | 0.6 | <0.1 | 0.2 | 0.2 | 0.5 | 0.2 | 0.3 |
| 0.3 | 0.9 | 0.3 | 0.3 | 0.3 | 0.5 | 0.3 | 0.5 |
| 0.5 | 1.1 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 1.1 |
| 0.6 | 1.2 | 0.6 | 0.5 | 0.6 | 0.5 | 0.5 | 1.1 |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 41 | 41 | 41 | 41 | 45 | 42 | 42 | 41 |
| 42 | 42 | 41 | 42 | 17 | 42 | 42 | 42 |
| 44 | 44 | 44 | 44 | 42 | 44 | 44 | 44 |
| 45 | 45 | 46 | 45 | 45 | 46 | 46 | 46 |
| 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 |
| 55 | 55 | 55 | 55 | 56 | 56 | 55 | 55 |
| 59 | 59 | 59 | 59 | 59 | 58 | 58 | 58 |
| 60 | 60 | 60 | 60 | 60 | 60 | 60 | 59 |
| 61 | 61 | 61 | 61 | 61 | 61 | 61 | 61 |

| | $BV_{CEO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | 0 | -2 | -3 | -90 | -3 | -4 | -4 |
| — | 0 | -2 | -2 | -60 | -2 | -2 | -3 |
| — | 0 | -1 | 0 | -2 | 0 | 0 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | +1 | +1 | +1 |
| — | 0 | +1 | +1 | +1 | +1 | +1 | +1 |
| — | +4 | +4 | +4 | +4 | +4 | +4 | +5 |
| — | +5 | +6 | +6 | +6 | +6 | +7 | +8 |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 169 | 170 | 173 | 173 | 173 | 175 | 173 | 173 |
| 5% | 170 | 171 | 174 | 173 | 174 | 175 | 174 | 174 |
| 10% | 174 | 175 | 175 | 175 | 176 | 176 | 175 | 175 |
| 25% | 190 | 194 | 193 | 199 | 199 | 196 | 194 | 196 |
| 50% | 219 | 223 | 223 | 224 | 227 | 220 | 218 | 219 |
| 75% | 255 | 257 | 254 | 257 | 258 | 258 | 256 | 257 |
| 90% | 316 | 326 | 324 | 325 | 328 | 327 | 320 | 321 |
| 95% | 334 | 341 | 339 | 343 | 343 | 343 | 340 | 342 |
| Max | 339 | 346 | 343 | 347 | 350 | 344 | 343 | 343 |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -2 | -2 | 0 | -1 | -1 | -2 | -1 |
| — | -2 | -2 | +1 | -1 | -1 | -2 | -1 |
| — | -1 | 0 | +1 | 0 | 0 | 0 | 0 |
| — | 0 | +1 | +2 | +1 | +1 | +1 | +1 |
| — | -1 | +1 | +3 | +3 | +2 | +1 | +2 |
| — | +2 | +2 | +4 | +4 | +4 | +3 | +4 |
| — | +3 | +3 | +5 | +5 | +4 | +4 | +4 |
| — | +4 | +5 | +6 | +6 | +6 | +4 | +5 |
| — | +4 | +5 | +6 | +6 | +6 | +4 | +5 |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 783 | 779 | 780 | 779 | 777 | 778 | 780 | 780 |
| 783 | 781 | 781 | 781 | 778 | 779 | 781 | 781 |
| 783 | 782 | 783 | 784 | 780 | 783 | 783 | 783 |
| 785 | 785 | 785 | 786 | 785 | 786 | 788 | 786 |
| 786 | 787 | 787 | 790 | 786 | 787 | 790 | 789 |
| 790 | 791 | 790 | 791 | 790 | 790 | 793 | 793 |
| 794 | 795 | 797 | 797 | 794 | 797 | 798 | 797 |
| 797 | 796 | 800 | 798 | 796 | 798 | 801 | 801 |
| 798 | 796 | 803 | 799 | 796 | 798 | 802 | 801 |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | -1 | -1 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | +1 | +1 |
| — | 0 | +1 | +1 | 0 | +1 | +1 | +1 |
| — | +1 | +1 | +2 | +1 | +1 | +1 | +1 |
| — | +1 | +1 | +2 | +1 | +1 | +1 | +1 |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 62 | 60 | 63 | 63 | 63 | 62 | 60 | 20 |
| 5% | 63 | 63 | 64 | 64 | 64 | 64 | 61 | 40 |
| 10% | 67 | 66 | 67 | 66 | 66 | 67 | 66 | 63 |
| 25% | 77 | 77 | 77 | 77 | 77 | 77 | 74 | 73 |
| 50% | 84 | 83 | 84 | 84 | 85 | 85 | 83 | 83 |
| 75% | 90 | 90 | 89 | 90 | 92 | 91 | 90 | 88 |
| 90% | 98 | 94 | 92 | 99 | 99 | 100 | 98 | 99 |
| 95% | 102 | 100 | 97 | 103 | 103 | 103 | 103 | 102 |
| Max | 105 | 105 | 99 | 106 | 106 | 105 | 104 | 103 |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -8 | -23 | -7 | -7 | -2 | -5 | -23 |
| — | -8 | -19 | -4 | -4 | -2 | -5 | -41 |
| — | -6 | -7 | -1 | -1 | -1 | -4 | -5 |
| — | -1 | 0 | 0 | 0 | 0 | -3 | -4 |
| — | 0 | +1 | +1 | +1 | +1 | -1 | -1 |
| — | +1 | +2 | +2 | +2 | +2 | 0 | 0 |
| — | +1 | +2 | +2 | +2 | +4 | +2 | +2 |
| — | +5 | +5 | +6 | +6 | +12 | +11 | +10 |
| — | +6 | +7 | +7 | +8 | +18 | +18 | +17 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |

PROCESS: A PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 500 mw, 30 V, 25°C. MIN 0.6% MAX 99.4%

CELL NO.: 419208 NO. OF UNITS: 78

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| ERS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | <0.1 | 0.4 | 0.8 | <.1 | <.1 | <0.1 | <0.1 |
| 5% | 0.1 | <0.1 | 0.4 | 0.9 | <.1 | 0.1 | <0.1 | <0.1 |
| 10% | 0.1 | <0.1 | 0.5 | 1.0 | 0.1 | 0.2 | <0.1 | <0.1 |
| 25% | 0.2 | 0.1 | 0.7 | 1.1 | 0.3 | 0.3 | 0.1 | 0.1 |
| 50% | 0.3 | 0.4 | 0.9 | 1.3 | 0.6 | 0.5 | 0.3 | 0.4 |
| 75% | 0.9 | 0.6 | 1.5 | 1.8 | 1.2 | 1.3 | 1.0 | 1.0 |
| 90% | 1.3 | 1.2 | 2.1 | 2.5 | 2.0 | 1.7 | 1.4 | 1.7 |
| 95% | 2.4 | 2.3 | 3.4 | 3.4 | 3.8 | 2.7 | 2.1 | 2.6 |
| Max | 26.5 | 7.4 | 3.5 | 4.5 | 71MA | 3.7 | 3.5 | 6.8 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | <0.1 | 0.2 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | <0.1 | 0.2 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | <0.1 | 0.3 | 0.2 | <0.1 | <0.1 | <0.1 | 0.1 |
| <0.1 | 0.3 | 0.4 | 0.3 | 0.1 | <0.1 | 0.1 | 0.2 |
| <0.1 | 0.5 | 0.5 | 0.4 | 0.3 | 0.2 | 0.2 | 0.5 |
| 0.2 | 0.7 | 0.7 | 0.5 | 0.6 | 0.5 | 0.4 | 0.8 |
| 0.4 | 0.8 | 1.0 | 0.8 | 1.5 | 1.0 | 0.8 | 1.4 |
| 0.6 | 0.8 | 1.6 | 1.3 | 61.2 | 2.2 | 1.8 | 2.3 |
| 2.2 | 1.4 | 3.7 | 3.0 | ∞ | ∞ | 9465 | 9229 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 40 | 40 | 40 | 40 | 01 | 40 | 40 | 40 |
| 42 | 41 | 42 | 42 | 41 | 42 | 42 | 42 |
| 43 | 43 | 41 | 43 | 43 | 44 | 44 | 44 |
| 45 | 45 | 45 | 45 | 46 | 47 | 47 | 47 |
| 49 | 49 | 49 | 49 | 51 | 51 | 51 | 51 |
| 53 | 53 | 53 | 53 | 57 | 58 | 58 | 57 |
| 56 | 56 | 56 | 56 | 62 | 63 | 63 | 62 |
| 57 | 58 | 58 | 58 | 65 | 127 | 125 | ∞ |
| 65 | 65 | 65 | 65 | 110 | ∞ | ∞ | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -1 | -7 | -99 | +2 | -1 | -1 |
| — | 0 | 0 | 0 | -1 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | +1 | +1 | +1 | +1 |
| — | 0 | 0 | +1 | +7 | +10 | +10 | +7 |
| — | +1 | +1 | +1 | +16 | +22 | +21 | +21 |
| — | +1 | +1 | +1 | +37 | +144 | +142 | 1773 |
| — | +7 | +22 | +21 | +130 | 2147 | 2147 | 2147 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| ERS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 009 | 145 | 146 | 145 | 143 | 149 | 147 | 147 |
| 5% | 152 | 157 | 156 | 157 | 160 | 158 | 160 | 157 |
| 10% | 167 | 168 | 169 | 169 | 169 | 169 | 169 | 167 |
| 25% | 188 | 192 | 192 | 191 | 195 | 197 | 195 | 193 |
| 50% | 218 | 220 | 220 | 219 | 224 | 233 | 231 | 227 |
| 75% | 260 | 263 | 262 | 260 | 267 | 271 | 269 | 265 |
| 90% | 286 | 287 | 287 | 284 | 305 | 309 | 307 | 305 |
| 95% | 304 | 310 | 307 | 303 | 353 | 1183 | 1696 | ∞ |
| Max | 329 | 332 | 330 | 327 | ∞ | ∞ | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -3 | -2 | -5 | -3 | -2 | -19 |
| — | -1 | -1 | -1 | -1 | 0 | -1 | -1 |
| — | 0 | 0 | -1 | 0 | +1 | 0 | -1 |
| — | 0 | 0 | 0 | +1 | +2 | +1 | 0 |
| — | +1 | +1 | 0 | +2 | +3 | +2 | +1 |
| — | +2 | +2 | +1 | +3 | +4 | +3 | +2 |
| — | +3 | +3 | +2 | +6 | +6 | +6 | +5 |
| — | +3 | +4 | +3 | 361 | 1789 | 1810 | 4341 |
| — | | 1633 | 1622 | 466 | 5647 | 5647 | 5647 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 001 | 774 | 774 | 100 | 010 | 600 | 598 | 330 |
| 776 | 776 | 779 | 780 | 779 | 775 | 779 | 774 |
| 780 | 779 | 781 | 780 | 780 | 780 | 780 | 778 |
| 783 | 783 | 786 | 787 | 786 | 785 | 785 | 783 |
| 787 | 787 | 788 | 790 | 790 | 787 | 787 | 786 |
| 790 | 788 | 792 | 793 | 793 | 790 | 791 | 789 |
| 792 | 790 | 795 | 794 | 798 | 800 | 797 | 798 |
| 793 | 794 | 798 | 799 | 807 | 1281 | 806 | ∞ |
| 807 | 802 | 809 | 809 | 827 | ∞ | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -1 | -87 | -99 | -23 | -24 | -58 |
| — | -1 | 0 | 0 | 0 | -1 | -1 | -1 |
| — | -1 | 0 | 0 | 0 | 0 | 0 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | +1 | 0 | 0 | 0 | 0 |
| — | 0 | +1 | +1 | +1 | 0 | +1 | 0 |
| — | +1 | +1 | +1 | +1 | +1 | +1 | +1 |
| — | +1 | +1 | +1 | +4 | 1164 | 409 | 1167 |
| — | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| ERS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 53 | 54 | 52 | 52 | 20 | 20 | 20 | 20 |
| 5% | 64 | 64 | 62 | 62 | 20 | 52 | 20 | 20 |
| 10% | 68 | 65 | 64 | 64 | 54 | 57 | 54 | 54 |
| 25% | 77 | 75 | 74 | 72 | 64 | 66 | 64 | 64 |
| 50% | 87 | 82 | 83 | 80 | 77 | 80 | 79 | 79 |
| 75% | 92 | 90 | 91 | 87 | 89 | 91 | 89 | 89 |
| 90% | 97 | 96 | 96 | 91 | 95 | 97 | 95 | 95 |
| 95% | 99 | 98 | 97 | 94 | 97 | 98 | 97 | 96 |
| Max | 103 | 103 | 102 | 96 | 186 | 101 | 99 | 98 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -19 | -39 | -38 | -78 | -79 | -79 | -80 |
| — | -9 | -8 | -15 | -74 | -39 | -68 | -78 |
| — | -7 | -7 | -13 | -35 | -26 | -28 | -32 |
| — | -5 | -3 | -9 | -14 | -11 | -13 | -11 |
| — | -2 | -1 | -3 | -6 | -1 | -4 | -2 |
| — | 0 | -1 | -2 | -1 | +1 | -1 | -1 |
| — | +1 | 0 | -1 | 0 | +1 | 0 | 0 |
| — | +1 | 0 | -1 | 0 | +2 | +1 | +1 |
| — | +3 | +3 | +2 | +14 | +4 | +2 | +2 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: A PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 400 mw, 30 V, 150°C. MIN. 3.6% MAX. 96.4

CELL NO.: 419209 NO. OF UNITS: 14

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.6 | <.1 | <.1 | 0.1 | <.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.6 | <.1 | <.1 | 0.1 | <.1 | <0.1 | <0.1 |
| 10% | <0.1 | 0.6 | <.1 | 0.1 | 0.2 | 0.1 | <0.1 | 0.1 |
| 25% | 0.1 | 0.7 | 0.3 | 0.3 | 0.4 | 0.2 | 0.2 | 0.3 |
| 50% | 0.3 | 0.9 | 0.5 | 0.4 | 0.6 | 0.3 | 0.4 | 0.6 |
| 75% | 0.5 | 1.1 | 0.7 | 0.6 | 3.0 | 0.5 | 0.6 | 1.2 |
| 90% | 1.3 | 17.1 | 16.7 | 14.8 | 14.3 | 5.7 | 4.7 | 1.9 |
| 95% | 1.3 | 32.1 | 31.7 | 27.8 | 16.3 | 10.0 | 7.7 | 2.3 |
| Max | 1.3 | 32.1 | 31.7 | 27.8 | 16.3 | 10.0 | 7.7 | 2.3 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | 0.1 | 0.1 | <0.1 |
| <0.1 | 0.5 | <0.1 | 0.2 | 0.1 | 0.2 | 0.2 | 0.1 |
| <0.1 | 0.6 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 |
| 0.2 | 0.7 | 0.2 | 0.4 | 0.5 | 0.4 | 0.4 | 500.3 |
| 0.3 | 0.7 | 0.2 | 0.4 | 0.6 | 0.4 | 0.4 | ∞ |
| 0.3 | 0.7 | 0.2 | 0.4 | 0.6 | 0.4 | 0.4 | ∞ |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 |
| 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 |
| 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 |
| 46 | 46 | 46 | 46 | 46 | 46 | 46 | 47 |
| 50 | 50 | 45 | 50 | 50 | 50 | 50 | 50 |
| 53 | 53 | 53 | 52 | 53 | 53 | 53 | 53 |
| 56 | 56 | 56 | 57 | 57 | 57 | 56 | 94 |
| 59 | 59 | 59 | 59 | 59 | 59 | 59 | 128.8 |
| 59 | 59 | 59 | 59 | 59 | 59 | 59 | 128.8 |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -24 | -3 | -2 | -2 | -2 | 0 |
| — | -1 | -24 | -3 | -2 | -2 | -2 | 0 |
| — | -1 | -24 | -3 | -2 | -2 | -2 | 0 |
| — | 0 | -22 | -1 | 0 | 0 | 0 | 0 |
| — | 0 | -10 | 0 | 0 | 0 | 0 | +1 |
| — | 0 | 0 | 0 | 0 | +1 | 0 | +3 |
| — | +1 | 0 | +1 | +1 | +1 | +1 | +72 |
| — | +1 | 0 | +1 | +1 | +1 | +1 | +139 |
| — | +1 | 0 | +1 | +1 | +1 | +1 | +139 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 175 | 174 | 178 | 179 | 176 | 179 | 179 | 177 |
| 5% | 175 | 174 | 178 | 179 | 176 | 179 | 179 | 177 |
| 10% | 184 | 184 | 186 | 187 | 185 | 188 | 189 | 185 |
| 25% | 204 | 207 | 204 | 203 | 205 | 208 | 208 | 206 |
| 50% | 216 | 221 | 221 | 224 | 218 | 224 | 222 | 224 |
| 75% | 265 | 269 | 266 | 268 | 262 | 269 | 270 | 311 |
| 90% | 346 | 349 | 349 | 349 | 344 | 352 | 351 | 5125 |
| 95% | 350 | 349 | 352 | 350 | 344 | 354 | 352 | ∞ |
| Max | 350 | 349 | 352 | 350 | 344 | 354 | 352 | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | 0 | -4 | -2 | 0 | 0 | -2 |
| — | -1 | 0 | -4 | -2 | 0 | 0 | -2 |
| — | -1 | 0 | -2 | -2 | +1 | +1 | -1 |
| — | 0 | 0 | +1 | 0 | +2 | +1 | +1 |
| — | +2 | +1 | +2 | 0 | +2 | +2 | +2 |
| — | +2 | +2 | +3 | +1 | +3 | +3 | +3 |
| — | +3 | +3 | +5 | +6 | +5 | +4 | 2257 |
| — | +3 | +4 | +5 | +8 | +6 | +4 | 4568 |
| — | +3 | +4 | +5 | +8 | +6 | +4 | 4568 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 781 | 781 | 784 | 781 | 787 | 785 | 780 | 809 |
| 781 | 781 | 784 | 781 | 787 | 785 | 780 | 809 |
| 782 | 783 | 785 | 783 | 787 | 785 | 780 | 396 |
| 784 | 786 | 786 | 787 | 788 | 788 | 782 | 784 |
| 787 | 788 | 788 | 790 | 791 | 790 | 787 | 786 |
| 790 | 794 | 792 | 795 | 795 | 794 | 789 | 790 |
| 794 | 799 | 799 | 799 | 799 | 800 | 796 | 798 |
| 797 | 801 | 802 | 803 | 803 | 803 | 800 | 803 |
| 797 | 801 | 802 | 803 | 803 | 803 | 800 | 813 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | 0 | 0 | -1 | 0 | 0 | -1 | -99 |
| — | 0 | 0 | -1 | 0 | 0 | -1 | -99 |
| — | 0 | 0 | -1 | 0 | 0 | -1 | -50 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | +1 | +1 | +1 | 0 | 0 |
| — | +1 | +1 | +1 | +1 | +1 | 0 | 0 |
| — | +1 | +1 | +1 | +1 | +1 | 0 | +1 |
| — | +1 | +1 | +1 | +1 | +1 | 0 | +1 |
| — | +1 | +1 | +1 | +1 | +1 | 0 | +1 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 57 | 57 | 59 | 19 | 55 | 56 | 56 | 20 |
| 5% | 57 | 57 | 59 | 19 | 55 | 56 | 56 | 20 |
| 10% | 62 | 60 | 62 | 37 | 60 | 60 | 60 | 38 |
| 25% | 67 | 66 | 66 | 59 | 65 | 66 | 66 | 66 |
| 50% | 87 | 86 | 86 | 72 | 82 | 84 | 83 | 82 |
| 75% | 91 | 91 | 92 | 85 | 88 | 90 | 91 | 90 |
| 90% | 97 | 98 | 99 | 92 | 96 | 97 | 98 | 95 |
| 95% | 98 | 98 | 100 | 93 | 97 | 98 | 100 | 97 |
| Max | 98 | 98 | 100 | 93 | 97 | 98 | 100 | 97 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -4 | -2 | -79 | -5 | -3 | -7 | -80 |
| — | -4 | -2 | -79 | -5 | -3 | -7 | -80 |
| — | -3 | -2 | -46 | -5 | -3 | -7 | -42 |
| — | -1 | -1 | -12 | -4 | -3 | -2 | -2 |
| — | -1 | 0 | -5 | -4 | -2 | -2 | -1 |
| — | 0 | +1 | -4 | -3 | -1 | 0 | 0 |
| — | +1 | +5 | -4 | -1 | 0 | +2 | +1 |
| — | +1 | +7 | -4 | 0 | +1 | +3 | +2 |
| — | +1 | +7 | -4 | 0 | +1 | +3 | +2 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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PROCESS: A PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 200 mw, 30 V, 150°C.

CELL NO.: 419210 NO. OF UNITS: 29

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | <0.1 | 0.4 | 0.1 | <.1 | <.1 | <.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.5 | 0.2 | <.1 | <.1 | <.1 | <0.1 | <0.1 |
| 10% | 0.1 | 0.5 | 0.2 | <.1 | 0.1 | <.1 | <0.1 | <0.1 |
| 25% | 0.2 | 0.7 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 |
| 50% | 0.3 | 0.8 | 0.4 | 0.4 | 0.3 | 0.3 | 0.2 | 0.3 |
| 75% | 0.6 | 1.2 | 0.7 | 0.6 | 0.8 | 0.4 | 0.5 | 0.5 |
| 90% | 1.3 | 2.0 | 1.6 | 1.6 | 1.5 | 1.4 | 1.2 | 1.3 |
| 95% | 2.0 | 4.6 | 2.1 | 2.1 | 5.9 | 1.6 | 1.8 | 1.8 |
| Max | 2.3 | 6.3 | 2.4 | 2.5 | 9.5 | 1.8 | 2.0 | 2.2 |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | |
| 0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | |
| <0.1 | 0.6 | 0.1 | 0.2 | 0.1 | 0.1 | 0.3 | 0.1 | |
| 0.1 | 0.8 | 0.3 | 0.4 | 0.3 | 0.3 | 0.4 | 0.6 | |
| 0.3 | 1.0 | 0.5 | 0.7 | 0.4 | 0.4 | 0.5 | ∞ | |
| 0.6 | 1.2 | 0.8 | 1.0 | 0.5 | 0.4 | 0.6 | ∞ | |
| 0.7 | 1.4 | 0.9 | 1.0 | 0.5 | 0.4 | 0.6 | ∞ | |

| $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 |
| 42 | 42 | 42 | 42 | 42 | 41 | 42 | 42 |
| 48 | 49 | 49 | 48 | 49 | 49 | 48 | 48 |
| 51 | 51 | 52 | 52 | 52 | 52 | 52 | 52 |
| 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 |
| 57 | 57 | 57 | 57 | 57 | 58 | 57 | 58 |
| 58 | 59 | 59 | 60 | 60 | 60 | 60 | 60 |
| 58 | 60 | 60 | 61 | 61 | 61 | 61 | 61 |

| $BV_{CEO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | 0 | 0 | -1 | -1 | -11 | -11 | -6 |
| — | 0 | 0 | -1 | -1 | -6 | -6 | -3 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | +1 | +1 | +1 | +1 | +1 | +1 |
| — | +2 | +2 | +3 | +3 | +10 | +9 | +3 |
| — | +3 | +3 | +4 | +4 | +14 | +13 | +4 |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 168 | 002 | 168 | 170 | 168 | 171 | 170 | 170 |
| 5% | 169 | 086 | 171 | 171 | 169 | 172 | 170 | 170 |
| 10% | 171 | 120 | 173 | 172 | 172 | 173 | 173 | 172 |
| 25% | 194 | 194 | 196 | 198 | 196 | 198 | 200 | 199 |
| 50% | 219 | 221 | 220 | 220 | 221 | 220 | 220 | 221 |
| 75% | 247 | 350 | 249 | 250 | 255 | 249 | 250 | 250 |
| 90% | 278 | 226 | 278 | 275 | 278 | 279 | 277 | 279 |
| 95% | 297 | 301 | 299 | 302 | 304 | 298 | 297 | 299 |
| Max | 311 | 317 | 315 | 317 | 309 | 313 | 313 | 315 |

| $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -99 | -2 | -1 | -1 | -17 | -17 | -2 |
| — | -51 | -2 | -1 | -1 | -9 | -9 | -2 |
| — | -1 | -1 | 0 | -2 | 0 | -1 | 0 |
| — | 0 | 0 | 0 | -1 | +1 | 0 | 0 |
| — | +1 | +1 | +2 | 0 | +1 | +1 | +2 |
| — | +3 | +2 | +2 | +1 | +2 | +2 | +2 |
| — | +3 | +3 | +4 | +2 | +3 | +4 | +4 |
| — | +4 | +4 | +5 | +26 | +13 | +12 | +5 |
| — | +4 | +4 | +5 | +49 | +21 | +20 | +5 |

| $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 774 | 631 | 775 | 777 | 599 | 779 | 775 | 771 |
| 777 | 701 | 776 | 777 | 689 | 779 | 776 | 775 |
| 781 | 780 | 783 | 784 | 782 | 785 | 780 | 780 |
| 784 | 784 | 786 | 787 | 789 | 786 | 784 | 782 |
| 786 | 787 | 790 | 790 | 791 | 790 | 787 | 784 |
| 788 | 790 | 791 | 792 | 793 | 792 | 790 | 787 |
| 789 | 792 | 795 | 793 | 794 | 794 | 790 | 790 |
| 792 | 794 | 796 | 796 | 796 | 796 | 791 | 792 |
| 793 | 794 | 796 | 797 | 797 | 796 | 792 | 793 |

| $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -20 | -1 | -1 | -24 | -1 | -1 | -1 |
| — | -10 | -1 | -1 | -12 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | -1 | -1 |
| — | 0 | 0 | 0 | +1 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | +1 | +1 | 0 | 0 |
| — | 0 | +1 | +1 | +1 | +1 | +1 | 0 |
| — | +1 | +1 | +1 | +1 | +1 | +1 | 0 |
| — | +1 | +1 | +1 | +1 | +1 | +1 | 0 |
| — | +1 | +1 | +1 | +1 | +1 | +1 | 0 |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 62 | 62 | 62 | | | 62 | 61 | 62 |
| 5% | 64 | 64 | 63 | | | 63 | 63 | 63 |
| 10% | 66 | 65 | 65 | | | 65 | 65 | 66 |
| 25% | 71 | 71 | 70 | | | 70 | 69 | 71 |
| 50% | 83 | 80 | 79 | | | 80 | 81 | 82 |
| 75% | 89 | 87 | 86 | | | 87 | 87 | 88 |
| 90% | 98 | 96 | 95 | | | 97 | 95 | 97 |
| 95% | 102 | 100 | 99 | | | 99 | 101 | 102 |
| Max | 102 | 101 | 101 | | | 101 | 101 | 102 |

| $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -10 | -10 | -8 | -4 | -18 | -19 | -3 |
| — | -10 | -10 | -6 | -4 | -13 | -11 | -3 |
| — | -7 | -9 | -3 | -4 | -6 | -3 | -2 |
| — | -5 | -6 | -1 | -4 | -2 | -3 | -1 |
| — | 0 | -1 | -1 | -4 | -1 | -2 | 0 |
| — | 0 | -1 | -1 | -3 | -1 | -1 | 0 |
| — | +1 | 0 | -1 | 0 | +2 | +1 | +1 |
| — | +1 | 0 | +4 | +2 | +12 | +11 | +4 |
| — | +1 | 0 | +6 | +3 | +18 | +17 | +6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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PROCESS: A PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 800 mw, 30 V, 25°C.

CELL NO.: 419211 NO. OF UNITS: 7

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 0.1 | 0.5 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 5% | 0.1 | 0.5 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 10% | 0.1 | 0.5 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 25% | 0.1 | 0.7 | 0.2 | <0.1 | 0.1 | 0.1 | 0.3 | <0.1 |
| 50% | 0.4 | 0.8 | 0.4 | 0.2 | 0.3 | 0.2 | 0.3 | 0.1 |
| 75% | 0.7 | 1.0 | 0.8 | 0.5 | 1.2 | 0.5 | 1.5 | 1.6 |
| 90% | 1.9 | 2.2 | 1.8 | 1.5 | 1.7 | 1.0 | 2.6 | 3.2 |
| 95% | 1.9 | 2.2 | 1.8 | 1.5 | 1.7 | 1.0 | 2.6 | 3.2 |
| Max | 1.9 | 2.2 | 1.8 | 1.5 | 1.7 | 1.0 | 2.6 | 3.2 |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | 0.2 | 0 | <0.1 |
| <0.1 | 0.3 | <0.1 | 0.2 | 0.1 | 0.4 | 0 | 0.2 |
| <0.1 | 0.5 | <0.1 | 0.3 | 0.2 | 0.4 | 0.1 | 0.4 |
| 0.3 | 0.6 | <0.1 | 0.3 | 0.2 | 0.5 | 0.2 | 0.5 |
| 0.3 | 0.6 | <0.1 | 0.3 | 0.2 | 0.5 | 0.2 | 0.5 |
| 0.3 | 0.6 | <0.1 | 0.3 | 0.2 | 0.5 | 0.2 | 0.5 |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 |
| 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 |
| 42 | 41 | 41 | 42 | 42 | 42 | 42 | 42 |
| 44 | 43 | 43 | 44 | 43 | 44 | 43 | 44 |
| 45 | 44 | 45 | 44 | 45 | 45 | 44 | 45 |
| 55 | 55 | 55 | 55 | 55 | 55 | 53 | 56 |
| 57 | 57 | 57 | 57 | 58 | 58 | 55 | ∞ |
| 57 | 57 | 57 | 57 | 58 | 58 | 55 | ∞ |
| 57 | 57 | 57 | 57 | 58 | 58 | 55 | ∞ |

| | $BV_{CEO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -1 | -1 | -1 | -1 | -1 | -26 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -26 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -26 | -1 |
| — | -1 | -1 | 0 | 0 | -1 | -1 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | +1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | +2 |
| — | 0 | 0 | 0 | 0 | +1 | 0 | 1642 |
| — | 0 | 0 | 0 | 0 | +1 | 0 | 1642 |
| — | 0 | 0 | 0 | 0 | +1 | 0 | 1642 |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 193 | 193 | 194 | 192 | 194 | 196 | 193 | 196 |
| 5% | 193 | 193 | 194 | 192 | 194 | 196 | 193 | 196 |
| 10% | 193 | 193 | 194 | 192 | 194 | 196 | 193 | 196 |
| 25% | 198 | 199 | 200 | 199 | 202 | 205 | 199 | 198 |
| 50% | 231 | 233 | 231 | 234 | 236 | 233 | 230 | 233 |
| 75% | 312 | 312 | 316 | 315 | 320 | 316 | 278 | 345 |
| 90% | 344 | 343 | 346 | 346 | 350 | 349 | 339 | 9744 |
| 95% | 344 | 343 | 346 | 346 | 350 | 349 | 339 | 9741 |
| Max | 344 | 343 | 346 | 346 | 350 | 349 | 339 | 9741 |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | 0 | 0 | -1 | +1 | +1 | -25 | 0 |
| — | 0 | 0 | -1 | +1 | +1 | -25 | 0 |
| — | 0 | 0 | -1 | +1 | +1 | -26 | 0 |
| — | 0 | +1 | +1 | +1 | +1 | -3 | 0 |
| — | +1 | +1 | +1 | +2 | +1 | 0 | +2 |
| — | +1 | +1 | +1 | +2 | +2 | +1 | +4 |
| — | +1 | +1 | +2 | +3 | +4 | +1 | 3022 |
| — | +1 | +1 | +2 | +3 | +4 | +1 | 3022 |
| — | +1 | +1 | +2 | +3 | +4 | +1 | 3022 |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 788 | 786 | 782 | 790 | 785 | 613 | 777 | 793 |
| 788 | 786 | 787 | 790 | 785 | 613 | 777 | 793 |
| 788 | 786 | 787 | 790 | 785 | 613 | 777 | 793 |
| 791 | 790 | 790 | 790 | 786 | 787 | 786 | 795 |
| 791 | 791 | 791 | 794 | 789 | 790 | 787 | 799 |
| 800 | 797 | 801 | 802 | 795 | 795 | 799 | 808 |
| 801 | 802 | 801 | 802 | 802 | 800 | 803 | 5330 |
| 801 | 802 | 801 | 802 | 802 | 800 | 803 | 5330 |
| 801 | 802 | 801 | 802 | 802 | 800 | 803 | 5330 |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -1 | -1 | 0 | -1 | -23 | -2 | 0 |
| — | -1 | -1 | 0 | -1 | -23 | -2 | 0 |
| — | -1 | -1 | 0 | -1 | -23 | -2 | 0 |
| — | 0 | 0 | 0 | -1 | -1 | -1 | +1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | +1 |
| — | 0 | 0 | +1 | 0 | 0 | 0 | +1 |
| — | 0 | +1 | +1 | +1 | 0 | +1 | 574 |
| — | 0 | +1 | +1 | +1 | 0 | +1 | 574 |
| — | 0 | +1 | +1 | +1 | 0 | +1 | 574 |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 62 | 63 | 57 | 62 | 63 | 63 | 80 | 20 |
| 5% | 62 | 63 | 57 | 62 | 63 | 63 | 80 | 20 |
| 10% | 62 | 63 | 57 | 62 | 63 | 63 | 80 | 20 |
| 25% | 76 | 80 | 71 | 79 | 81 | 80 | 81 | 80 |
| 50% | 90 | 91 | 77 | 87 | 91 | 91 | 91 | 89 |
| 75% | 93 | 94 | 86 | 92 | 94 | 93 | 92 | 101 |
| 90% | 101 | 101 | 101 | 99 | 101 | 101 | 99 | 855 |
| 95% | 101 | 101 | 101 | 99 | 101 | 101 | 99 | 855 |
| Max | 101 | 101 | 101 | 99 | 101 | 101 | 99 | 855 |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | 0 | -14 | -5 | 0 | -1 | -3 | -67 |
| — | 0 | -14 | -5 | 0 | -1 | -3 | -67 |
| — | 0 | -14 | -5 | 0 | -1 | -3 | -67 |
| — | 0 | -8 | -2 | +1 | 0 | -2 | -4 |
| — | +2 | -7 | -1 | +2 | +2 | +1 | +3 |
| — | +4 | -3 | +3 | +5 | +4 | +6 | +8 |
| — | +8 | 0 | +6 | +7 | +6 | +47 | +855 |
| — | +8 | 0 | +6 | +7 | +6 | +47 | +855 |
| — | +8 | 0 | +6 | +7 | +6 | +47 | +855 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: A PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 700 mw, 30 V, 25°C.

CELL NO.: 419212 NO. OF UNITS: 16

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 0.1 | 0.6 | 0.2 | <0.1 | 0.1 | <0.1 | 0.3 | <0.1 |
| 5% | 0.1 | 0.6 | 0.2 | <0.1 | 0.1 | <0.1 | 0.3 | <0.1 |
| 10% | 0.2 | 0.7 | 0.2 | <0.1 | 0.2 | <0.1 | 0.3 | 0.1 |
| 25% | 0.3 | 0.8 | 0.2 | 0.1 | 0.3 | 0.2 | 0.4 | 0.4 |
| 50% | 0.5 | 1.0 | 0.5 | 0.4 | 0.6 | 0.4 | 0.7 | 0.9 |
| 75% | 1.1 | 1.4 | 0.9 | 0.9 | 1.1 | 0.7 | 1.1 | 1.5 |
| 90% | 1.4 | 1.8 | 1.3 | 1.0 | 1.3 | 3.6 | 13.1 | 30.6 |
| 95% | 1.4 | 1.9 | 1.4 | 1.0 | 1.3 | 9.5 | 40.3 | 92.5 |
| Max | 1.4 | 1.9 | 1.4 | 1.0 | 1.3 | 9.5 | 40.3 | 92.5 |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | |
| <0.1 | 0.4 | <0.1 | 0.1 | <0.1 | 0.3 | <0.1 | | |
| 0.1 | 0.5 | <0.1 | 0.2 | 0.1 | 0.4 | 0.1 | | |
| 0.3 | 0.6 | <0.1 | 0.3 | 0.2 | 0.4 | 0.3 | | |
| 0.6 | 0.8 | 0.3 | 0.3 | 0.3 | 0.5 | 0.4 | | |
| 0.9 | 1.0 | 0.4 | 0.4 | 0.3 | 0.6 | 0.5 | | |
| 0.9 | 1.0 | 0.4 | 0.4 | 0.3 | 0.6 | 0.5 | | |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | |
| 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | |
| 43 | 43 | 43 | 43 | 43 | 43 | 43 | 44 | |
| 46 | 46 | 46 | 45 | 46 | 46 | 45 | 46 | |
| 48 | 48 | 48 | 49 | 48 | 49 | 49 | 49 | |
| 51 | 51 | 51 | 51 | 51 | 51 | 51 | 52 | |
| 54 | 53 | 53 | 53 | 53 | 54 | 54 | 340 | |
| 56 | 56 | 56 | 56 | 56 | 56 | 56 | ∞ | |
| 56 | 56 | 56 | 56 | 56 | 56 | 56 | ∞ | |

| | $BV_{CEO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | -1 | -2 | -2 | -1 | 0 | 0 | 0 | |
| — | -1 | -2 | -2 | -1 | 0 | 0 | 0 | |
| — | -1 | -1 | -1 | 0 | 0 | 0 | 0 | |
| — | -1 | -1 | 0 | 0 | 0 | 0 | 0 | |
| — | 0 | 0 | 0 | 0 | 0 | 0 | +1 | |
| — | 0 | 0 | 0 | 0 | +1 | 0 | +2 | |
| — | 0 | 0 | 0 | +1 | +1 | +1 | 594 | |
| — | 0 | 0 | +1 | +1 | +2 | +2 | 1908 | |
| — | 0 | 0 | +1 | +1 | +2 | +2 | 1908 | |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 021 | 158 | 160 | 159 | 162 | 030 | 162 | 160 |
| 5% | 021 | 158 | 160 | 159 | 162 | 030 | 162 | 160 |
| 10% | 025 | 166 | 168 | 167 | 167 | 121 | 168 | 169 |
| 25% | 173 | 202 | 205 | 209 | 207 | 202 | 204 | 211 |
| 50% | 226 | 234 | 234 | 235 | 237 | 240 | 239 | 248 |
| 75% | 257 | 260 | 260 | 262 | 261 | 261 | 261 | 272 |
| 90% | 324 | 329 | 331 | 327 | 334 | 333 | 328 | 266 |
| 95% | 360 | 365 | 367 | 366 | 369 | 369 | 363 | 700 |
| Max | 360 | 365 | 367 | 366 | 369 | 369 | 363 | 700 |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | 0 | 0 | 0 | +1 | 0 | -1 | +1 | |
| — | 0 | 0 | 0 | +1 | 0 | -1 | +1 | |
| — | 0 | 0 | 0 | +1 | 0 | 0 | +2 | |
| — | 0 | +1 | 0 | +2 | +1 | +1 | +2 | |
| — | +1 | +2 | +2 | +3 | +3 | +2 | +3 | |
| — | +2 | +4 | +3 | +3 | +5 | +5 | +7 | |
| — | +781 | +788 | +814 | +796 | +823 | +784 | 9226 | |
| — | 1043 | 1038 | 1052 | 1038 | 1043 | 1033 | ∞ | |
| — | 1043 | 1038 | 1052 | 1038 | 1043 | 1033 | ∞ | |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| 616 | 778 | 781 | 709 | 780 | 705 | 779 | | |
| 616 | 776 | 781 | 709 | 780 | 705 | 779 | | |
| 678 | 781 | 782 | 761 | 783 | 758 | 780 | | |
| 781 | 785 | 785 | 788 | 786 | 784 | 785 | | |
| 788 | 788 | 787 | 792 | 790 | 789 | 789 | | |
| 793 | 791 | 790 | 786 | 790 | 793 | 793 | | |
| 800 | 801 | 801 | 807 | 803 | 804 | 803 | | |
| 801 | 802 | 807 | 808 | 806 | 805 | 805 | | |
| 801 | 802 | 807 | 808 | 806 | 805 | 805 | | |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | -1 | 0 | 0 | 0 | 0 | 0 | | |
| — | -1 | 0 | 0 | 0 | 0 | 0 | | |
| — | 0 | 0 | 0 | 0 | 0 | 0 | | |
| — | 0 | 0 | 0 | 0 | 0 | 0 | | |
| — | 0 | 0 | +1 | 0 | 0 | 0 | | |
| — | 0 | 0 | +1 | +1 | 0 | 0 | | |
| — | +17 | +17 | +9 | +17 | +9 | +16 | | |
| — | +29 | +28 | +29 | +28 | +29 | +28 | | |
| — | +29 | +28 | +29 | +28 | +29 | +28 | | |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 49 | 51 | 52 | 51 | 52 | 50 | 20 | |
| 5% | 49 | 51 | 52 | 51 | 52 | 50 | 20 | |
| 10% | 57 | 58 | 58 | 56 | 58 | 57 | 41 | |
| 25% | 71 | 75 | 75 | 73 | 74 | 74 | 68 | |
| 50% | 77 | 83 | 83 | 81 | 84 | 84 | 83 | |
| 75% | 87 | 93 | 93 | 91 | 92 | 92 | 92 | |
| 90% | 92 | 94 | 95 | 92 | 94 | 95 | 94 | |
| 95% | 94 | 95 | 95 | 94 | 95 | 96 | 95 | |
| Max | 94 | 95 | 95 | 94 | 96 | 96 | 95 | |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | 0 | 0 | -2 | -1 | -1 | -75 | | |
| — | 0 | 0 | -2 | -1 | -1 | -75 | | |
| — | 0 | 0 | -2 | 0 | 0 | -24 | | |
| — | 0 | +1 | -1 | +1 | +1 | 0 | | |
| — | +4 | +5 | +2 | +4 | +3 | +2 | | |
| — | +8 | +8 | +5 | +7 | +9 | +7 | | |
| — | +13 | +14 | +11 | +13 | +14 | +13 | | |
| — | +15 | +15 | +12 | +15 | +17 | +16 | | |
| — | +15 | +15 | +12 | +15 | +17 | +16 | | |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: A PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 500 mw, 30 V, 25°C.

CELL NO.: 419213 NO. OF UNITS: 39

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 0.1 | <0.1 | 0.5 | 0.8 | <0.1 | <0.1 | <0.1 | <0.1 |
| 5% | 0.1 | <0.1 | 0.5 | 0.8 | <0.1 | <0.1 | <0.1 | <0.1 |
| 10% | 0.1 | <0.1 | 0.5 | 1.0 | 0.1 | 0.1 | <0.1 | <0.1 |
| 25% | 0.2 | <0.1 | 0.7 | 1.0 | 0.2 | 0.1 | 0.1 | <0.1 |
| 50% | 0.4 | 0.4 | 0.8 | 1.2 | 0.3 | 0.3 | 0.3 | 0.3 |
| 75% | 0.9 | 0.5 | 1.3 | 1.6 | 0.8 | 0.7 | 0.8 | 1.0 |
| 90% | 1.3 | 0.7 | 2.1 | 2.0 | 1.3 | 1.4 | 1.5 | 1.9 |
| 95% | 1.6 | 2.2 | 2.3 | 2.6 | 1.5 | 1.6 | 3.4 | ∞ |
| Max | 1.8 | 4.1 | 4.0 | 4.0 | 3.3 | 3.4 | ∞ | ∞ |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| <0.1 | <0.1 | 0.4 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | <0.1 | 0.4 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | <0.1 | 0.5 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.5 | 0.5 | 0.3 | <0.1 | 0.1 | 0.1 | 0.1 |
| <0.1 | 0.6 | 0.6 | 0.4 | 0.2 | 0.2 | 0.2 | 0.3 |
| 0.2 | 0.7 | 0.8 | 0.4 | 0.4 | 0.2 | 0.4 | 0.5 |
| 0.4 | 0.8 | 1.0 | 0.5 | 1.6 | 0.4 | 0.6 | 1.0 |
| 0.6 | 0.8 | 1.1 | 0.7 | ∞ | 0.6 | ∞ | ∞ |
| 0.8 | 0.9 | 1.4 | 1.1 | ∞ | 1.3 | ∞ | ∞ |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 42 | 42 | 42 | 42 | 10 | 42 | 00 | 00 |
| 42 | 42 | 42 | 42 | 33 | 42 | 42 | 42 |
| 43 | 43 | 43 | 43 | 42 | 43 | 43 | 43 |
| 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 |
| 54 | 54 | 54 | 54 | 55 | 56 | 55 | 56 |
| 57 | 57 | 57 | 57 | 62 | 63 | 119 | ∞ |
| 58 | 58 | 58 | 58 | 88 | ∞ | ∞ | ∞ |
| 64 | 63 | 63 | 63 | 107 | ∞ | ∞ | ∞ |

| | $BV_{CEO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -12 | -12 | -12 | -82 | -12 | -100 | -100 |
| — | -1 | -1 | -1 | -23 | -1 | -12 | -12 |
| — | -1 | -1 | 0 | -1 | 0 | -1 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | +2 | +2 | +2 | +1 |
| — | 0 | +1 | +1 | +9 | +13 | +86 | 1472 |
| — | +2 | +2 | +3 | +83 | 1245 | 1745 | 1785 |
| — | +2 | +3 | +3 | +97 | 1487 | 1987 | 1987 |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 010 | 160 | 162 | 160 | 168 | 165 | 159 | 162 |
| 5% | 034 | 168 | 169 | 167 | 170 | 169 | 170 | 168 |
| 10% | 166 | 184 | 184 | 180 | 185 | 187 | 183 | 181 |
| 25% | 190 | 195 | 198 | 198 | 202 | 204 | 203 | 200 |
| 50% | 228 | 234 | 234 | 233 | 233 | 237 | 238 | 235 |
| 75% | 251 | 254 | 257 | 256 | 263 | 270 | 280 | 277 |
| 90% | 288 | 314 | 313 | 310 | 319 | 368 | ∞ | ∞ |
| 95% | 313 | 324 | 325 | 320 | ∞ | ∞ | ∞ | ∞ |
| Max | 320 | 365 | 366 | 363 | ∞ | ∞ | ∞ | ∞ |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -16 | -15 | -15 | -16 | -14 | -15 | -15 |
| — | -2 | -1 | -1 | 0 | 0 | -2 | -3 |
| — | -1 | 0 | 0 | +1 | 0 | -1 | 0 |
| — | 0 | +1 | 0 | +2 | +1 | +1 | +1 |
| — | +1 | +2 | +1 | +3 | +3 | +2 | +2 |
| — | +2 | +3 | +2 | +4 | +5 | +7 | +6 |
| — | +3 | +4 | +3 | +988 | 2230 | 3125 | 3125 |
| — | +974 | +976 | +968 | 3025 | 3125 | 4801 | 4801 |
| — | 2240 | 2240 | 2230 | 3125 | 5054 | 5054 | 5054 |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 708 | 773 | 776 | 004 | 010 | 723 | 007 | 418 |
| 776 | 778 | 229 | 228 | 026 | 280 | 400 | 774 |
| 781 | 780 | 781 | 785 | 780 | 784 | 229 | 229 |
| 785 | 784 | 785 | 787 | 785 | 787 | 783 | 782 |
| 789 | 788 | 789 | 291 | 789 | 793 | 787 | 786 |
| 792 | 791 | 793 | 296 | 793 | 797 | 794 | 795 |
| 798 | 795 | 800 | 800 | 797 | 809 | 804 | ∞ |
| 808 | 803 | 803 | 806 | 802 | ∞ | ∞ | ∞ |
| 810 | 804 | 805 | 807 | 804 | ∞ | ∞ | ∞ |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -2 | -2 | -99 | -99 | -2 | -99 | -48 |
| — | -1 | -1 | -2 | -97 | -1 | -51 | -1 |
| — | -1 | -1 | 0 | -1 | 0 | -1 | -1 |
| — | -1 | 0 | 0 | 0 | 0 | 0 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | +1 | 0 | 0 |
| — | 0 | 0 | +1 | 0 | +12 | +12 | 1161 |
| — | 0 | +1 | +1 | +1 | 1163 | 1163 | 1166 |
| — | +12 | +13 | +13 | +12 | 1166 | 1166 | 1167 |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 59 | 56 | 60 | 58 | 20 | 20 | 20 | 20 |
| 5% | 63 | 59 | 60 | 63 | 20 | 20 | 20 | 20 |
| 10% | 65 | 65 | 64 | 63 | 34 | 20 | 20 | 20 |
| 25% | 70 | 71 | 72 | 70 | 69 | 68 | 70 | 68 |
| 50% | 80 | 82 | 82 | 78 | 78 | 80 | 84 | 83 |
| 75% | 85 | 86 | 86 | 87 | 88 | 89 | 91 | 92 |
| 90% | 91 | 93 | 93 | 94 | 94 | 94 | 98 | 98 |
| 95% | 95 | 100 | 100 | 98 | 99 | 99 | 101 | 105 |
| Max | 99 | 106 | 106 | 103 | 101 | 104 | 107 | 116 |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -35 | -11 | -13 | -74 | -77 | -75 | -75 |
| — | -12 | -8 | -12 | -71 | -74 | -74 | -74 |
| — | -1 | -5 | -8 | -51 | -67 | -69 | -69 |
| — | 0 | -1 | -3 | -9 | -5 | -4 | -3 |
| — | +1 | +1 | -2 | +1 | 0 | +3 | +1 |
| — | +4 | +3 | +1 | +4 | +4 | +7 | +6 |
| — | +10 | +9 | +9 | +7 | +10 | +12 | +18 |
| — | +14 | +12 | +13 | +21 | +13 | +15 | +30 |
| — | +15 | +24 | +18 | +55 | +17 | +23 | +39 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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PROCESS: A PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 400 mw, 30 V, 150°C. CELL NO.: 419214 NO. OF UNITS: 7

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.2 | 0.5 | 0.2 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 |
| 5% | 0.2 | 0.5 | 0.2 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 |
| 10% | 0.2 | 0.5 | 0.2 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 |
| 25% | 0.3 | 0.7 | 0.3 | 0.3 | 0.2 | 7.5 | <0.1 | <0.1 |
| 50% | 0.3 | 0.9 | 0.4 | 0.3 | 0.3 | 25.0 | 0.2 | 0.5 |
| 75% | 0.4 | 0.9 | 0.7 | 0.6 | 0.5 | 40.0 | 0.4 | 1.0 |
| 90% | 0.7 | 1.2 | 0.7 | 0.7 | 0.8 | 70.0 | 1.0 | 9.6 |
| 95% | 0.7 | 1.2 | 0.7 | 0.7 | 0.8 | 70.0 | 1.0 | 9.6 |
| Max | 0.7 | 1.2 | 0.7 | 0.7 | 0.8 | 70.0 | 1.0 | 9.6 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.3 | <0.1 | <0.1 | 4.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | 4.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | 4.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | 8.4 | <0.1 | 0.2 | <0.1 |
| <0.1 | 0.6 | 0.2 | 0.1 | 14.7 | 0.2 | 0.2 | 0.2 |
| 0.2 | 0.6 | 0.3 | 0.4 | 23.4 | 0.2 | 0.3 | 0.3 |
| 0.4 | 0.8 | 0.4 | 0.5 | 24.9 | 0.3 | 0.4 | 0.3 |
| 0.4 | 0.8 | 0.4 | 0.5 | 24.9 | 0.3 | 0.4 | 0.3 |
| 0.4 | 0.8 | 0.4 | 0.5 | 24.9 | 0.3 | 0.4 | 0.3 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 43 | 43 | 42 | 43 | 43 | 43 | 43 | 43 |
| 43 | 43 | 42 | 43 | 43 | 43 | 43 | 43 |
| 43 | 43 | 42 | 43 | 43 | 43 | 43 | 43 |
| 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 |
| 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 |
| 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 |
| 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 |
| 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 |
| 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | 0 | -1 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | +1 | 0 | +1 | +1 | 0 |
| — | 0 | 0 | +1 | 0 | +1 | +1 | 0 |
| — | 0 | 0 | +1 | 0 | +1 | +1 | 0 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 164 | 166 | 162 | 166 | 165 | 167 | 167 | 164 |
| 5% | 164 | 166 | 162 | 166 | 165 | 167 | 167 | 164 |
| 10% | 164 | 166 | 162 | 166 | 165 | 167 | 167 | 164 |
| 25% | 177 | 178 | 179 | 180 | 182 | 184 | 180 | 180 |
| 50% | 229 | 231 | 232 | 234 | 230 | 230 | 230 | 231 |
| 75% | 271 | 277 | 278 | 276 | 270 | 279 | 280 | 277 |
| 90% | 324 | 327 | 328 | 327 | 329 | 328 | 330 | 328 |
| 95% | 324 | 327 | 328 | 327 | 329 | 328 | 330 | 328 |
| Max | 324 | 327 | 328 | 327 | 329 | 328 | 330 | 328 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | 0 | -1 | +1 | 0 | 0 | 0 | 0 |
| — | 0 | -1 | +1 | 0 | 0 | 0 | 0 |
| — | 0 | -1 | +1 | 0 | 0 | 0 | 0 |
| — | +1 | 0 | +1 | 0 | +1 | 0 | +1 |
| — | +1 | +1 | +2 | +1 | +2 | +2 | +1 |
| — | +2 | +1 | +2 | +3 | +3 | +2 | +2 |
| — | +2 | +3 | +2 | +3 | +4 | +3 | +2 |
| — | +2 | +3 | +2 | +3 | +4 | +3 | +2 |
| — | +2 | +3 | +2 | +3 | +4 | +3 | +2 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 783 | 782 | 787 | 787 | 719 | 719 | 782 | 780 |
| 783 | 782 | 787 | 787 | 719 | 719 | 782 | 780 |
| 783 | 782 | 787 | 787 | 719 | 719 | 782 | 780 |
| 788 | 786 | 788 | 790 | 785 | 787 | 784 | 786 |
| 792 | 788 | 793 | 793 | 792 | 790 | 790 | 789 |
| 799 | 798 | 800 | 802 | 797 | 795 | 795 | 796 |
| 812 | 813 | 810 | 813 | 802 | 799 | 810 | 805 |
| 812 | 813 | 810 | 813 | 802 | 799 | 810 | 805 |
| 812 | 813 | 810 | 813 | 802 | 799 | 810 | 805 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | 0 | 0 | -11 | -11 | -1 | -1 |
| — | -1 | 0 | 0 | -11 | -11 | -1 | -1 |
| — | -1 | 0 | 0 | -11 | -11 | -1 | -1 |
| — | -1 | 0 | 0 | 0 | 0 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | +1 | 0 | +1 | +1 | 0 | 0 |
| — | 0 | +1 | +1 | +1 | +1 | 0 | 0 |
| — | 0 | +1 | +1 | +1 | +1 | 0 | 0 |
| — | 0 | +1 | +1 | +1 | +1 | 0 | 0 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 69 | 69 | 65 | 61 | 67 | 65 | 68 | 68 |
| 5% | 69 | 69 | 65 | 61 | 67 | 65 | 68 | 68 |
| 10% | 69 | 69 | 65 | 61 | 67 | 65 | 68 | 68 |
| 25% | 72 | 73 | 67 | 63 | 73 | 69 | 73 | 73 |
| 50% | 74 | 78 | 72 | 69 | 77 | 77 | 78 | 78 |
| 75% | 84 | 88 | 80 | 76 | 87 | 82 | 87 | 88 |
| 90% | 85 | 91 | 81 | 77 | 89 | 87 | 89 | 90 |
| 95% | 85 | 91 | 81 | 77 | 89 | 87 | 89 | 90 |
| Max | 85 | 91 | 81 | 77 | 89 | 87 | 89 | 90 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -12 | -15 | -3 | -7 | -3 | -1 |
| — | -1 | -12 | -15 | -3 | -7 | -3 | -2 |
| — | -1 | -12 | -15 | -3 | -7 | -3 | -2 |
| — | -1 | -10 | -14 | -3 | -6 | -2 | -1 |
| — | +4 | -5 | -10 | +2 | -3 | +3 | +4 |
| — | +6 | -3 | -8 | +5 | +4 | +5 | +6 |
| — | +9 | -3 | -3 | +7 | +4 | +7 | +8 |
| — | +9 | -3 | -3 | +7 | +4 | +7 | +8 |
| — | +9 | -3 | -3 | +7 | +4 | +7 | +8 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: A PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 200 mw, 30 V, 150°C.

CELL NO.: 419215 NO. OF UNITS: 16

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 0.1 | 0.6 | 0.3 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 |
| 5% | 0.1 | 0.6 | 0.3 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 |
| 10% | 0.1 | 0.8 | 0.3 | <0.1 | 0.1 | <0.1 | 0.1 | <0.1 |
| 25% | 0.3 | 0.9 | 0.6 | 0.3 | 0.2 | 0.2 | 0.3 | 0.1 |
| 50% | 0.4 | 1.1 | 0.8 | 0.5 | 0.4 | 0.4 | 0.5 | 0.4 |
| 75% | 1.2 | 1.7 | 1.3 | 1.2 | 1.1 | 0.8 | 1.0 | 1.1 |
| 90% | 1.4 | 1.9 | 2465 | 1.3 | 1.2 | 1.0 | 1.2 | 1.3 |
| 95% | 1.5 | 2.0 | 8149 | 1.3 | 1.2 | 1.0 | 1.3 | 1.4 |
| Max | 1.5 | 2.0 | 8149 | 1.3 | 1.2 | 1.0 | 1.3 | 1.4 |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| <0.1 | 0.6 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| 0.1 | 0.6 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| 0.2 | 0.8 | 0.4 | 0.2 | 0.3 | 0.3 | 0.2 | 0.3 |
| 0.3 | 300.6 | 3003 | 0.3 | 0.4 | 0.5 | 0.5 | 0.5 |
| 0.4 | ∞ | ∞ | 0.4 | 0.5 | 0.6 | 0.7 | 0.6 |
| 0.4 | ∞ | ∞ | 0.4 | 0.5 | 0.6 | 0.7 | 0.6 |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 38 | 38 | 38 | 37 | 38 | 37 | 38 | 37 |
| 38 | 38 | 38 | 37 | 38 | 37 | 38 | 37 |
| 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 |
| 47 | 46 | 46 | 47 | 47 | 47 | 46 | 47 |
| 51 | 49 | 49 | 49 | 51 | 52 | 51 | 52 |
| 55 | 55 | 55 | 340.9 | 340.9 | 3419 | 59 | 3420 |
| 59 | 59 | 58 | ∞ | ∞ | ∞ | 61 | ∞ |
| 59 | 59 | 58 | ∞ | ∞ | ∞ | 61 | ∞ |

| | $BV_{CEO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | — | — | -6 | — | — | — | — |
| — | — | — | -6 | — | — | — | — |
| — | — | 0 | -3 | 0 | — | 0 | — |
| — | 0 | 0 | 0 | 0 | — | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | +538 | +538 | +547 | +10 | +543 |
| — | 0 | 0 | 1759 | 1759 | 1759 | +23 | 1759 |
| — | 0 | 0 | 1759 | 1759 | 1759 | +23 | 1759 |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 167 | 173 | 171 | 175 | 172 | 173 | 170 | 172 |
| 5% | 167 | 173 | 171 | 175 | 172 | 173 | 170 | 172 |
| 10% | 175 | 177 | 178 | 182 | 178 | 177 | 178 | 180 |
| 25% | 188 | 187 | 184 | 194 | 188 | 187 | 185 | 191 |
| 50% | 237 | 238 | 238 | 243 | 237 | 240 | 240 | 243 |
| 75% | 257 | 251 | 252 | 266 | 258 | 259 | 254 | 260 |
| 90% | 272 | 275 | 271 | 3195 | 3192 | 3194 | 275 | 3194 |
| 95% | 273 | 280 | 278 | ∞ | ∞ | ∞ | 282 | ∞ |
| Max | 273 | 280 | 278 | ∞ | ∞ | ∞ | 282 | ∞ |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -2 | 0 | 0 | -1 | -1 | 0 | 0 |
| — | -2 | 0 | 0 | -1 | -2 | 0 | 0 |
| — | -1 | 0 | +1 | -1 | -1 | 0 | 0 |
| — | 0 | +1 | +2 | -1 | -1 | +1 | 0 |
| — | +1 | +1 | +3 | 0 | +1 | +2 | +2 |
| — | +2 | +2 | +4 | +1 | +2 | +3 | +3 |
| — | +3 | +2 | 1077 | 1075 | 1077 | +5 | 1077 |
| — | +4 | +3 | 3576 | 3576 | 3576 | +6 | 3576 |
| — | +4 | +3 | 3576 | 3576 | 3576 | +6 | 3576 |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 784 | 623 | 787 | 781 | 787 | 783 | 780 | 784 |
| 784 | 623 | 787 | 781 | 787 | 783 | 780 | 784 |
| 786 | 221 | 787 | 783 | 788 | 783 | 781 | 784 |
| 788 | 786 | 790 | 786 | 791 | 786 | 784 | 787 |
| 790 | 790 | 792 | 790 | 792 | 788 | 786 | 789 |
| 793 | 793 | 794 | 794 | 795 | 798 | 790 | 792 |
| 833 | 845 | 842 | 3631 | 3635 | 3638 | 837 | 3632 |
| 906 | 906 | 904 | ∞ | ∞ | ∞ | 897 | ∞ |
| 906 | 906 | 904 | ∞ | ∞ | ∞ | 897 | ∞ |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -21 | -1 | -1 | 0 | -1 | -1 | -1 |
| — | -21 | -1 | -1 | 0 | -1 | -1 | -1 |
| — | -8 | 0 | -1 | 0 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | -1 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | +1 | 349 | 350 | 350 | 0 | 349 |
| — | +1 | +1 | 1163 | 1163 | 1163 | 0 | 1163 |
| — | +1 | +1 | 1163 | 1163 | 1163 | 0 | 1163 |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 66 | 69 | 64 | 20 | 20 | 20 | 47 | 20 |
| 5% | 66 | 69 | 64 | 20 | 20 | 20 | 47 | 20 |
| 10% | 67 | 69 | 64 | 53 | 52 | 20 | 59 | 39 |
| 25% | 73 | 74 | 70 | 71 | 69 | 67 | 71 | 70 |
| 50% | 79 | 81 | 80 | 80 | 78 | 76 | 82 | 80 |
| 75% | 91 | 94 | 85 | 90 | 87 | 86 | 93 | 89 |
| 90% | 96 | 97 | 91 | 97 | 93 | 96 | 97 | 96 |
| 95% | 97 | 98 | 91 | 97 | 94 | 96 | 97 | 97 |
| Max | 97 | 98 | 91 | 97 | 94 | 96 | 97 | 97 |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -2 | -6 | -79 | -79 | -79 | -35 | -79 |
| — | -2 | -6 | -79 | -79 | -79 | -35 | -79 |
| — | -1 | -6 | -25 | -27 | -77 | -13 | -45 |
| — | +1 | -5 | -1 | -4 | -6 | +1 | -1 |
| — | +2 | -3 | 0 | -3 | -2 | +1 | 0 |
| — | +5 | 0 | +4 | +1 | +1 | +5 | +3 |
| — | +8 | +6 | +5 | +4 | +5 | +6 | +5 |
| — | +8 | +7 | +6 | +4 | +6 | +7 | +6 |
| — | +8 | +7 | +6 | +4 | +6 | +7 | +6 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: A PRE-SCREEN STRESS: None (Control).

OPERATING POWER CONDITION: 800 mw, 30 V, 25°C.

CELL NO.: 419216 NO. OF UNITS: 7

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 0.3 | 0.6 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 |
| 5% | 0.3 | 0.6 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 |
| 10% | 0.3 | 0.6 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 |
| 25% | 0.3 | 0.7 | 0.2 | 0.1 | 0.2 | <0.1 | 0.5 | 0.2 |
| 50% | 0.4 | 1.1 | 0.6 | 0.3 | 0.3 | 0.1 | 0.7 | 0.3 |
| 75% | 0.7 | 1.3 | 0.6 | 0.6 | 1.0 | 0.3 | 1.5 | 0.7 |
| 90% | 1.1 | 1.5 | 1.1 | 2.0 | 1.5 | 0.7 | 1.5 | 1.1 |
| 95% | 1.1 | 1.5 | 1.1 | 2.0 | 1.5 | 0.7 | 1.5 | 1.1 |
| Max | 1.1 | 1.5 | 1.1 | 2.0 | 1.5 | 0.7 | 1.5 | 1.1 |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 | |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 | |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 | |
| <0.1 | 0.4 | <0.1 | <0.1 | 0.1 | 0.4 | 0.1 | <0.1 | |
| <0.1 | 0.5 | <0.1 | 0.1 | 0.2 | 0.4 | 0.1 | 0.1 | |
| 0.2 | 0.6 | 0.1 | 0.3 | 0.2 | 0.4 | 0.4 | 0.4 | |
| 0.4 | 1.1 | 0.5 | 0.3 | 1.0 | 0.5 | 3.1 | 0.7 | |
| 0.4 | 1.1 | 0.5 | 0.3 | 1.0 | 0.5 | 3.1 | 0.7 | |
| 0.4 | 1.1 | 0.5 | 0.3 | 1.0 | 0.5 | 3.1 | 0.7 | |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| 45 | 45 | 44 | 45 | 10 | 45 | 44 | 45 | |
| 45 | 45 | 44 | 45 | 10 | 45 | 44 | 45 | |
| 45 | 45 | 44 | 45 | 10 | 45 | 44 | 45 | |
| 46 | 46 | 46 | 46 | 45 | 46 | 46 | 47 | |
| 52 | 52 | 52 | 52 | 49 | 52 | 53 | 54 | |
| 55 | 55 | 55 | 55 | 55 | 55 | 56 | 57 | |
| 56 | 56 | 56 | 57 | 56 | 56 | ∞ | ∞ | |
| 56 | 56 | 56 | 57 | 56 | 56 | ∞ | ∞ | |
| 56 | 56 | 56 | 57 | 56 | 56 | ∞ | ∞ | |

| | $BV_{CFO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | -1 | -1 | -1 | -80 | 0 | -1 | 0 | |
| — | -1 | -1 | -1 | -80 | 0 | -1 | 0 | |
| — | -1 | -1 | -1 | -80 | 0 | -1 | 0 | |
| — | -1 | -1 | 0 | -1 | 0 | -1 | 0 | |
| — | 0 | 0 | 0 | 0 | 0 | 0 | +1 | |
| — | 0 | 0 | 0 | 0 | 0 | +1 | +2 | |
| — | 0 | 0 | +1 | 0 | 0 | 1801 | 1801 | |
| — | 0 | 0 | +1 | 0 | 0 | 1801 | 1801 | |
| — | 0 | 0 | +1 | 0 | 0 | 1801 | 1801 | |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 031 | 183 | 186 | 184 | 033 | 188 | 186 | 188 |
| 5% | 031 | 183 | 186 | 184 | 033 | 188 | 186 | 188 |
| 10% | 031 | 183 | 186 | 184 | 033 | 188 | 186 | 188 |
| 25% | 182 | 200 | 200 | 200 | 123 | 200 | 197 | 202 |
| 50% | 209 | 224 | 225 | 227 | 207 | 226 | 230 | 233 |
| 75% | 313 | 313 | 313 | 313 | 318 | 316 | 375 | 395 |
| 90% | 320 | 320 | 319 | 327 | 327 | 327 | ∞ | 5420 |
| 95% | 320 | 320 | 319 | 327 | 327 | 327 | ∞ | 5420 |
| Max | 320 | 320 | 319 | 327 | 327 | 327 | ∞ | 5420 |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | 0 | 0 | 0 | -41 | -2 | -2 | -1 | |
| — | 0 | 0 | 0 | -41 | -2 | -2 | -1 | |
| — | 0 | 0 | 0 | -41 | -2 | -2 | -1 | |
| — | 0 | 0 | 0 | 0 | +1 | -2 | +1 | |
| — | 0 | 0 | +1 | +2 | +3 | +1 | +3 | |
| — | +1 | +2 | +2 | +4 | +4 | +20 | +26 | |
| — | +623 | +626 | +632 | +6 | +629 | ∞ | ∞ | |
| — | +623 | +626 | +632 | +6 | +629 | ∞ | ∞ | |
| — | +623 | +626 | +632 | +6 | +629 | ∞ | ∞ | |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| 704 | 785 | 787 | 786 | 710 | 780 | 786 | 791 | |
| 704 | 785 | 787 | 786 | 710 | 780 | 785 | 791 | |
| 704 | 785 | 787 | 786 | 710 | 780 | 786 | 791 | |
| 781 | 785 | 788 | 786 | 780 | 783 | 785 | 793 | |
| 787 | 789 | 792 | 793 | 787 | 790 | 789 | 796 | |
| 788 | 797 | 795 | 797 | 792 | 796 | 797 | 802 | |
| 790 | 799 | 810 | 803 | 796 | 798 | ∞ | 5389 | |
| 790 | 799 | 800 | 803 | 796 | 798 | ∞ | 5389 | |
| 790 | 799 | 800 | 803 | 795 | 798 | ∞ | 5389 | |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | 0 | +1 | 0 | 0 | 0 | 0 | +1 | |
| — | 0 | +1 | 0 | 0 | 0 | 0 | +1 | |
| — | 0 | +1 | 0 | 0 | 0 | 0 | +1 | |
| — | 0 | +1 | 0 | 0 | 0 | 0 | +1 | |
| — | +1 | +1 | +1 | 0 | 0 | +1 | +1 | |
| — | +1 | +1 | +1 | +1 | +1 | +1 | +2 | |
| — | +13 | +14 | +14 | +1 | +13 | 1320 | 665 | |
| — | +13 | +14 | +14 | +1 | +13 | 1320 | 665 | |
| — | +13 | +14 | +14 | +1 | +13 | 1320 | 665 | |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 74 | 74 | 68 | 73 | 75 | 73 | 20 | 20 |
| 5% | 74 | 74 | 68 | 73 | 75 | 73 | 20 | 20 |
| 10% | 74 | 74 | 68 | 73 | 75 | 73 | 20 | 20 |
| 25% | 74 | 74 | 68 | 74 | 75 | 75 | 72 | 72 |
| 50% | 78 | 79 | 70 | 80 | 81 | 80 | 81 | 80 |
| 75% | 84 | 87 | 78 | 86 | 87 | 83 | 87 | 86 |
| 90% | 85 | 87 | 79 | 87 | 88 | 83 | 87 | 87 |
| 95% | 85 | 87 | 79 | 87 | 88 | 83 | 87 | 87 |
| Max | 85 | 87 | 79 | 87 | 88 | 83 | 87 | 87 |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | -1 | -15 | -1 | 0 | -5 | -73 | -73 | |
| — | -1 | -15 | -1 | 0 | -5 | -73 | -73 | |
| — | -1 | -15 | -1 | 0 | -5 | -73 | -73 | |
| — | 0 | -8 | -1 | +1 | -2 | -3 | -5 | |
| — | 0 | -7 | 0 | +2 | +1 | +1 | +1 | |
| — | +2 | -6 | +1 | +4 | +1 | +2 | +4 | |
| — | +12 | 0 | +12 | +13 | +5 | +11 | +12 | |
| — | +12 | 0 | +12 | +13 | +5 | +11 | +12 | |
| — | +12 | 0 | +12 | +13 | +5 | +11 | +12 | |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: A PRE-SCREEN STRESS: None (COntrol).

OPERATING POWER CONDITION: 700 mw, 30 V, 25°C. CELL NO.: 419217 NO. OF UNITS: 14

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 0.3 | 0.6 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.5 |
| 5% | 0.3 | 0.6 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.5 |
| 10% | 0.3 | 0.7 | 0.1 | 0.1 | 0.1 | <0.1 | 0.1 | 0.5 |
| 25% | 0.3 | 0.8 | 0.3 | 0.4 | 0.2 | <0.1 | 0.3 | 0.5 |
| 50% | 0.4 | 0.9 | 0.4 | 0.5 | 0.4 | 0.2 | 0.4 | 0.7 |
| 75% | 0.6 | 1.0 | 0.7 | 0.8 | 0.6 | 0.5 | 1.0 | 1.1 |
| 90% | 1.7 | 2.6 | 2.7 | 4.4 | 4.3 | 44.0 | 45.3 | 56.6 |
| 95% | 2.1 | 3.4 | 3.5 | 5.7 | 5.9 | 85.5 | 88.2 | 110.5 |
| Max | 2.1 | 3.4 | 3.5 | 5.7 | 5.9 | 85.5 | 88.2 | 110.5 |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 |
| <0.1 | 0.4 | <0.1 | 0.1 | 0.1 | 0.2 | <0.1 | 0.3 |
| 0.1 | 0.7 | <0.1 | 0.2 | 0.1 | 0.4 | 0.2 | 0.5 |
| 0.2 | 0.8 | 0.1 | 0.3 | 0.2 | 0.4 | 0.3 | 0.6 |
| 0.4 | 0.9 | 0.4 | 0.3 | 0.4 | 0.8 | 0.4 | 1.6 |
| 0.4 | 0.9 | 0.4 | 0.3 | 0.5 | 1.1 | 0.4 | 2.1 |
| 0.4 | 0.9 | 0.4 | 0.3 | 0.5 | 1.1 | 0.4 | 2.1 |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 |
| 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 |
| 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 |
| 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 |
| 54 | 53 | 54 | 54 | 54 | 54 | 53 | 53 |
| 61 | 66 | 60 | 61 | 61 | 61 | 61 | 60 |
| 62 | 70 | 62 | 62 | 62 | 62 | 62 | 62 |
| 62 | 70 | 62 | 62 | 62 | 62 | 62 | 62 |

| | $BV_{CEO}$ (% Change from Initial) | | | | | | |
|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -2 | -2 | -2 | -2 | -1 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -1 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -1 | -2 | -2 |
| — | -1 | -1 | 0 | 0 | 0 | 0 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | +9 | 0 | +1 | +2 | +3 | +3 | +4 |
| — | +17 | 0 | +2 | +3 | +4 | +5 | +6 |
| — | +17 | 0 | +2 | +3 | +4 | +5 | +6 |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 049 | 174 | 171 | 174 | 175 | 151 | 170 | 173 |
| 5% | 049 | 174 | 171 | 174 | 175 | 151 | 170 | 173 |
| 10% | 109 | 176 | 174 | 175 | 176 | 162 | 173 | 174 |
| 25% | 184 | 195 | 196 | 197 | 194 | 189 | 194 | 193 |
| 50% | 197 | 211 | 212 | 215 | 214 | 214 | 216 | 213 |
| 75% | 232 | 241 | 242 | 244 | 243 | 241 | 243 | 244 |
| 90% | 252 | 260 | 261 | 265 | 264 | 260 | 260 | 260 |
| 95% | 266 | 272 | 273 | 278 | 277 | 270 | 270 | 271 |
| Max | 266 | 272 | 273 | 278 | 277 | 270 | 270 | 271 |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -1 | -1 | +1 | +1 | -23 | -1 | -1 |
| — | -1 | -1 | +1 | +1 | -23 | -1 | -1 |
| — | -1 | 0 | +1 | +1 | -12 | -1 | 0 |
| — | +2 | +1 | +3 | +2 | +1 | +2 | +1 |
| — | +3 | +3 | +4 | +2 | +3 | +3 | +3 |
| — | +3 | +4 | +4 | +4 | +3 | +3 | +3 |
| — | +204 | +206 | +210 | +208 | +208 | +208 | +207 |
| — | +404 | +406 | +414 | +410 | +410 | +410 | +408 |
| — | +404 | +406 | +414 | +410 | +410 | +410 | +408 |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 695 | 777 | 775 | 775 | 778 | 777 | 776 | |
| 695 | 777 | 775 | 775 | 778 | 777 | 776 | |
| 736 | 779 | 777 | 778 | 779 | 778 | 777 | |
| 784 | 784 | 781 | 780 | 782 | 780 | 780 | |
| 788 | 787 | 783 | 785 | 783 | 785 | 783 | |
| 790 | 788 | 787 | 787 | 789 | 786 | 787 | |
| 793 | 791 | 790 | 792 | 790 | 789 | 790 | |
| 795 | 791 | 791 | 793 | 790 | 790 | 790 | |
| 795 | 791 | 791 | 793 | 790 | 790 | 790 | |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | |
| — | -1 | -1 | -1 | -1 | -1 | -1 | |
| — | -1 | -1 | -1 | -1 | -1 | -1 | |
| — | -1 | -1 | -1 | -1 | -1 | -1 | |
| — | 0 | -1 | -1 | 0 | -1 | -1 | |
| — | 0 | 0 | 0 | 0 | 0 | 0 | |
| — | +7 | +7 | +7 | +7 | +7 | +7 | |
| — | +13 | +13 | +13 | +14 | +13 | +13 | |
| | +13 | +13 | +13 | +14 | +13 | +13 | |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 65 | 66 | 67 | 66 | 66 | 66 | 65 | |
| 5% | 65 | 66 | 67 | 66 | 66 | 66 | 65 | |
| 10% | 66 | 66 | 67 | 67 | 67 | 67 | 66 | |
| 25% | 67 | 69 | 69 | 69 | 68 | 68 | 67 | |
| 50% | 81 | 80 | 86 | 85 | 81 | 87 | 85 | |
| 75% | 88 | 89 | 90 | 89 | 89 | 89 | 89 | |
| 90% | 89 | 92 | 92 | 91 | 91 | 93 | 93 | |
| 95% | 90 | 92 | 93 | 92 | 92 | 93 | 93 | |
| Max | 90 | 92 | 93 | 92 | 92 | 93 | 93 | |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -8 | +1 | 0 | -20 | 0 | -2 | |
| — | -8 | +1 | 0 | -20 | 0 | -2 | |
| — | -5 | +1 | 0 | -10 | +1 | -2 | |
| — | +1 | +1 | +1 | +1 | +1 | 0 | |
| — | +2 | +2 | +2 | +1 | +2 | +1 | |
| — | +3 | +5 | +4 | +4 | +6 | +5 | |
| — | +5 | +8 | +7 | +7 | +9 | +8 | |
| — | +5 | +10 | +9 | +9 | +10 | +8 | |
| — | +5 | +10 | +9 | +9 | +10 | +8 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |

PROCESS: A PRE-SCREEN STRESS: None (Control).

OPERATING POWER CONDITION: 500 mw, 30 V, 25°C. CELL NO.: 419218 NO. OF UNITS: 38

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 0.1 | <0.1 | .5 | .8 | <.1 | <.1 | <0.1 | <0.1 |
| 5% | 0.1 | <0.1 | .6 | .9 | <.1 | <.1 | <0.1 | <0.1 |
| 10% | 0.2 | <0.1 | .6 | 1.0 | .1 | <.1 | 0.1 | <0.1 |
| 25% | 0.2 | 0.3 | .7 | 1.0 | .2 | .1 | 0.2 | 0.2 |
| 50% | 0.4 | 0.5 | .9 | 1.2 | .3 | .3 | 0.3 | 0.4 |
| 75% | 0.6 | 0.6 | 1.5 | 1.6 | 1.0 | .7 | 1.1 | 0.8 |
| 90% | 1.2 | 0.7 | 1.9 | 2.1 | 1.6 | 1.3 | 1.5 | 1.4 |
| 95% | 1.4 | 17.8 | 31.5 | 42.5 | 766. | 32.5 | 418 | 51.5 |
| Max | 1.7 | 275.2 | 589 | 809 | 7M | 22.4 | 8427 | ∞ |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| <0.1 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | 0.3 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.5 | 0.4 | 0.3 | 0.1 | 0.1 | 0.1 | <0.1 |
| <0.1 | 0.7 | 0.5 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 |
| 0.1 | 0.7 | 0.7 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 |
| 0.5 | 0.9 | 0.8 | 0.7 | 101.5 | 0.4 | 0.6 | 0.5 |
| 1.1 | 0.9 | 1.2 | 1.0 | ∞ | 0.7 | 518 | 0.7 |
| 1.5 | 0.9 | 1.8 | 1.5 | ∞ | 1.6 | ∞ | 1.6 |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 42 | 42 | 41 | 42 | 27 | 42 | 42 | 40 |
| 43 | 43 | 43 | 42 | 40 | 43 | 44 | 43 |
| 44 | 44 | 43 | 44 | 44 | 44 | 44 | 44 |
| 44 | 44 | 44 | 44 | 46 | 46 | 46 | 46 |
| 50 | 49 | 50 | 50 | 52 | 53 | 52 | 52 |
| 56 | 53 | 55 | 56 | 58 | 58 | 58 | 58 |
| 58 | 58 | 58 | 58 | 66 | 162 | 209 | ∞ |
| 58 | 57 | 59 | 59 | 99 | ∞ | ∞ | ∞ |
| 59 | 59 | 60 | 61 | 115 | ∞ | ∞ | ∞ |

| | $BV_{CEO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | - 4 | -6 | -5 | -95 | -7 | -9 | -12 |
| — | - 3 | -1 | -1 | -11 | -1 | -1 | -2 |
| — | - 1 | -1 | 0 | -1 | -1 | -1 | -1 |
| — | 0 | -1 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | +1 | 0 | 0 |
| — | 0 | 0 | 0 | +7 | +8 | +8 | +8 |
| — | 0 | 0 | +1 | +20 | +190 | +259 | 1616 |
| — | +1 | 0 | +1 | +98 | +934 | 1934 | 1934 |
| — | +1 | +3 | +5 | +125 | +1179 | 2199 | 2199 |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 145 | 147 | 148 | 147 | 150 | 148 | 147 | 148 |
| 5% | 154 | 156 | 156 | 154 | 155 | 154 | 152 | 155 |
| 10% | 164 | 169 | 170 | 169 | 172 | 172 | 171 | 167 |
| 25% | 181 | 184 | 184 | 185 | 191 | 190 | 193 | 191 |
| 50% | 201 | 202 | 204 | 206 | 213 | 215 | 215 | 211 |
| 75% | 235 | 238 | 240 | 250 | 278 | 283 | 275 | 273 |
| 90% | 291 | 289 | 294 | 298 | 1684 | 1681 | ∞ | ∞ |
| 95% | 303 | 305 | 305 | 323 | ∞ | ∞ | ∞ | ∞ |
| Max | 320 | 328 | 330 | 331 | ∞ | ∞ | ∞ | ∞ |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | - 1 | 0 | -2 | -1 | -1 | -2 | -2 |
| — | - 1 | 0 | -1 | 0 | 0 | -1 | -1 |
| — | - 1 | +1 | -1 | +1 | 0 | 0 | -1 |
| — | 0 | +1 | 0 | +1 | +1 | 0 | 0 |
| — | +1 | +2 | +1 | +2 | +2 | +2 | +1 |
| — | +2 | +3 | +2 | +4 | +4 | +4 | +3 |
| — | +3 | +3 | +3 | +609 | +607 | 3262 | 3263 |
| — | +3 | +4 | +6 | 3808 | 3868 | 5430 | 5430 |
| — | +4 | +5 | +65 | 5549 | 5549 | 5549 | 5549 |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 777 | 775 | 773 | 780 | 810 | 780 | 810 | 783 |
| 781 | 781 | 780 | 780 | 812 | 783 | 742 | 783 |
| 783 | 782 | 781 | 785 | 704 | 785 | 784 | 784 |
| 785 | 786 | 784 | 787 | 785 | 788 | 785 | 787 |
| 787 | 788 | 786 | 791 | 790 | 790 | 789 | 790 |
| 790 | 792 | 788 | 793 | 793 | 800 | 792 | 795 |
| 795 | 796 | 793 | 797 | 800 | 233 | 1342 | ∞ |
| 818 | 820 | 819 | 820 | 819 | ∞ | ∞ | ∞ |
| 828 | 826 | 823 | 828 | 830 | ∞ | ∞ | ∞ |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -1 | -1 | -1 | -99 | -1 | -99 | -1 |
| — | -1 | -1 | 0 | -98 | 0 | -6 | 0 |
| — | 0 | -1 | 0 | -11 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | +1 | 0 | 0 |
| — | 0 | 0 | 0 | +1 | +1 | 0 | +1 |
| — | +1 | 0 | +1 | +1 | +1 | +117 | 1159 |
| — | +1 | 0 | +1 | +2 | 1166 | 1166 | 1171 |
| — | +1 | +1 | +1 | +2 | 1171 | 1171 | 1174 |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 49 | 48 | 50 | 05 | 20 | 20 | 20 | 20 |
| 5% | 59 | 62 | 63 | 06 | 20 | 20 | 20 | 20 |
| 10% | 67 | 65 | 69 | 06 | 20 | 20 | 20 | 20 |
| 25% | 72 | 71 | 75 | 07 | 65 | 65 | 66 | 64 |
| 50% | 83 | 85 | 83 | 08 | 75 | 76 | 79 | 78 |
| 75% | 89 | 91 | 93 | 09 | 86 | 87 | 90 | 88 |
| 90% | 93 | 96 | 99 | 09 | 94 | 95 | 97 | 93 |
| 95% | 98 | 98 | 99 | 09 | 97 | 97 | 99 | 96 |
| Max | 100 | 101 | 102 | 10 | 101 | 100 | 105 | 100 |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -15 | -15 | -92 | -78 | -78 | -78 | -78 |
| — | -10 | -10 | -93 | -78 | -77 | -78 | -78 |
| — | -7 | -4 | -91 | -61 | -69 | -61 | -61 |
| — | -2 | -1 | -91 | -17 | -16 | -14 | -15 |
| — | 0 | +2 | -90 | -5 | -1 | +1 | -2 |
| — | +3 | +6 | -90 | 0 | +3 | +4 | +2 |
| — | +6 | +8 | -90 | +6 | +5 | +8 | +5 |
| — | +9 | +10 | -90 | +8 | +7 | +11 | +6 |
| — | +32 | +34 | -87 | +27 | +25 | +29 | +27 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | | | | | | | |
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|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | | | | | | | |
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PROCESS: A PRE-SCREEN STRESS: None (Control).

OPERATING POWER CONDITION: 400 mw, 30 V, 150°C. CELL NO.: 419219 NO. OF UNITS: 7

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 0.2 | 0.7 | <0.1 | 0.3 | 0.2 | <0.1 | <0.1 | 0.2 |
| 5% | 0.2 | 0.7 | <0.1 | 0.3 | 0.2 | <0.1 | <0.1 | 0.2 |
| 10% | 0.2 | 0.7 | <0.1 | 0.3 | 0.2 | <0.1 | <0.1 | 0.2 |
| 25% | 0.2 | 0.9 | 0.2 | 0.3 | 0.2 | 0.2 | <0.1 | 0.2 |
| 50% | 0.4 | 1.2 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.4 |
| 75% | 0.6 | 1.4 | 0.6 | 0.5 | 0.5 | 0.3 | 0.8 | 0.7 |
| 90% | 0.8 | 3.0 | 0.8 | 1.0 | 1.4 | 1.3 | 1.7 | 1.7 |
| 95% | 0.8 | 3.0 | 0.8 | 1.0 | 1.4 | 1.3 | 1.7 | 1.7 |
| Max | 0.8 | 3.0 | 0.8 | 1.0 | 1.4 | 1.3 | 1.7 | 1.7 |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 |
| 0.2 | 0.6 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 |
| 0.2 | 0.7 | 0.2 | 0.4 | 1.4 | 0.4 | 0.2 | 0.3 |
| 1.6 | 2.2 | 1.2 | 1.9 | 3.1 | 1.3 | 1.4 | 1.4 |
| 1.6 | 2.2 | 1.2 | 1.9 | 3.1 | 1.3 | 1.4 | 1.4 |
| 1.6 | 2.2 | 1.2 | 1.9 | 3.1 | 1.3 | 1.4 | 1.4 |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |
| 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |
| 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |
| 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 |
| 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| 55 | 55 | 55 | 56 | 56 | 57 | 57 | 57 |
| 58 | 57 | 58 | 58 | 57 | 57 | 57 | 56 |
| 58 | 57 | 58 | 58 | 57 | 57 | 57 | 58 |
| 58 | 57 | 58 | 58 | 57 | 57 | 57 | 58 |

| | $BV_{CEO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -1 | -22 | -1 | -1 | -1 | -1 | |
| — | -1 | -22 | -1 | -1 | -1 | -1 | |
| — | -1 | -22 | -1 | -1 | -1 | -1 | |
| — | -1 | -21 | 0 | 0 | 0 | 0 | |
| — | 0 | -20 | 0 | 0 | 0 | 0 | |
| — | 0 | 0 | 0 | +1 | +1 | +1 | |
| — | 0 | 0 | +1 | +2 | +2 | +2 | |
| — | 0 | 0 | +1 | +2 | +2 | +2 | |
| — | 0 | 0 | +1 | +2 | +2 | +2 | |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 133 | 132 | 134 | 130 | 132 | 132 | 130 | 127 |
| 5% | 133 | 132 | 134 | 130 | 132 | 132 | 130 | 127 |
| 10% | 133 | 132 | 134 | 130 | 132 | 132 | 130 | 127 |
| 25% | 153 | 156 | 155 | 157 | 152 | 154 | 156 | 128 |
| 50% | 196 | 199 | 196 | 198 | 197 | 199 | 202 | 199 |
| 75% | 216 | 219 | 218 | 218 | 215 | 217 | 220 | 219 |
| 90% | 289 | 293 | 289 | 290 | 286 | 293 | 290 | 288 |
| 95% | 289 | 293 | 289 | 290 | 286 | 293 | 290 | 288 |
| Max | 289 | 293 | 289 | 290 | 286 | 293 | 290 | 288 |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -1 | 0 | -2 | -1 | -1 | -2 | -5 |
| — | -1 | 0 | -2 | -1 | -1 | -2 | -5 |
| — | -1 | 0 | -2 | -1 | -1 | -2 | -5 |
| — | 0 | 0 | 0 | -1 | 0 | 0 | -1 |
| — | +1 | 0 | +1 | -1 | 0 | +2 | 0 |
| — | +2 | +1 | +1 | 0 | +1 | +2 | +2 |
| — | +2 | +1 | +3 | +1 | +2 | +3 | +12 |
| — | +2 | +1 | +3 | +1 | +2 | +3 | +12 |
| — | +2 | +1 | +3 | +1 | +2 | +3 | +12 |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| 778 | 779 | 782 | 780 | 780 | 499 | 774 | 776 |
| 778 | 779 | 782 | 780 | 780 | 499 | 774 | 776 |
| 778 | 779 | 781 | 780 | 780 | 499 | 774 | 776 |
| 780 | 781 | 783 | 784 | 782 | 788 | 777 | 777 |
| 786 | 788 | 790 | 788 | 787 | 792 | 785 | 784 |
| 791 | 790 | 793 | 793 | 792 | 794 | 790 | 785 |
| 793 | 796 | 794 | 796 | 794 | 795 | 792 | 791 |
| 793 | 796 | 794 | 796 | 794 | 795 | 792 | 791 |
| 793 | 796 | 794 | 796 | 794 | 795 | 792 | 791 |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | -1 | 0 | 0 | 0 | -36 | -1 | -1 |
| — | -1 | 0 | 0 | 0 | -36 | -1 | -1 |
| — | -1 | 0 | 0 | 0 | -36 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | +1 | 0 | 0 |
| — | +1 | +1 | +1 | 0 | +1 | 0 | 0 |
| — | +1 | +1 | +1 | +1 | +2 | 0 | 0 |
| — | +1 | +1 | +1 | +1 | +2 | 0 | 0 |
| — | +1 | +1 | +1 | +1 | +2 | 0 | 0 |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 56 | 57 | 56 | 54 | 55 | 56 | 57 | 22 |
| 5% | 56 | 57 | 56 | 54 | 55 | 56 | 57 | 22 |
| 10% | 56 | 57 | 56 | 54 | 55 | 56 | 57 | 22 |
| 25% | 63 | 63 | 63 | 60 | 61 | 62 | 63 | 56 |
| 50% | 77 | 82 | 84 | 78 | 79 | 81 | 82 | 73 |
| 75% | 81 | 85 | 85 | 80 | 82 | 83 | 84 | 91 |
| 90% | 91 | 92 | 91 | 87 | 89 | 91 | 91 | 541 |
| 95% | 91 | 92 | 91 | 87 | 89 | 91 | 91 | 541 |
| Max | 91 | 92 | 91 | 87 | 89 | 91 | 91 | 541 |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| — | 0 | 0 | -5 | -3 | -1 | 0 | -78 |
| — | 0 | 0 | -5 | -3 | -1 | 0 | -78 |
| — | 0 | 0 | -5 | -3 | -1 | 0 | -78 |
| — | +1 | 0 | -4 | -3 | -1 | 0 | 0 |
| — | +2 | 0 | -4 | -2 | 0 | +1 | +1 |
| — | +6 | +8 | +2 | +3 | +5 | +7 | +2 |
| — | +9 | +10 | +3 | +6 | +7 | +8 | +602 |
| — | +9 | +10 | +3 | +6 | +7 | +8 | +602 |
| — | +9 | +10 | +3 | +6 | +7 | +8 | +602 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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PROCESS: A PRE-SCREEN STRESS: None (Control).

OPERATING POWER CONDITION: 200 mw, 30 V, 150°C.

CELL NO.: 419220 NO. OF UNITS: 14

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.6 | 0.1 | 0.2 | 0.1 | <0.1 | <0.1 | 0.1 |
| 5% | <0.1 | 0.6 | 0.1 | 0.2 | 0.1 | <0.1 | <0.1 | 0.1 |
| 10% | 0.1 | 0.6 | 0.2 | 0.3 | 0.1 | <0.1 | <0.1 | 0.1 |
| 25% | 0.2 | 0.8 | 0.4 | 0.3 | 0.3 | 0.2 | 0.1 | 0.3 |
| 50% | 0.5 | 1.0 | 0.5 | 0.6 | 0.5 | 0.3 | 0.3 | 0.6 |
| 75% | 0.9 | 1.5 | 0.8 | 0.8 | 0.9 | 0.6 | 0.5 | 0.9 |
| 90% | 1.5 | 1.9 | 1.4 | 1.7 | 3.8 | 1.3 | 1.1 | 2.0 |
| 95% | 1.7 | 2.1 | 1.7 | 2.0 | 6.2 | 1.6 | 1.4 | 2.0 |
| Max | 1.7 | 2.1 | 1.7 | 2.0 | 6.3 | 1.6 | 1.4 | 2.0 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | 0.4 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | 0.4 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | 0.4 | <0.1 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.4 | <0.1 |
| 0.1 | 0.7 | 0.2 | 0.2 | 0.1 | 0.1 | 0.5 | 0.1 |
| 0.2 | 0.8 | 0.3 | 0.3 | 0.2 | 0.1 | 0.5 | 0.4 |
| 0.3 | 1.2 | 0.9 | 0.6 | 1.3 | 0.2 | 1.0 | 0.6 |
| 0.3 | 1.4 | 1.2 | 0.6 | 1.6 | 0.2 | 1.5 | 0.6 |
| 0.3 | 1.4 | 1.2 | 0.6 | 1.6 | 0.2 | 1.5 | 0.6 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 46 | 46 | 47 | 46 | 46 | 46 | | 46 |
| 46 | 46 | 47 | 46 | 46 | 46 | | 46 |
| 47 | 46 | 47 | 47 | 46 | 47 | | 46 |
| 48 | 48 | 48 | 48 | 48 | 48 | | 48 |
| 50 | 50 | 50 | 50 | 50 | 50 | | 50 |
| 56 | 55 | 56 | 56 | 56 | 56 | | 56 |
| 60 | 60 | 60 | 60 | 60 | 60 | | 60 |
| 62 | 62 | 62 | 62 | 62 | 62 | | 62 |
| 62 | 62 | 62 | 62 | 62 | 62 | | 62 |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | 0 | 0 | -1 | -1 | 0 | | 0 |
| — | 0 | 0 | -1 | -1 | 0 | | 0 |
| — | 0 | 0 | -1 | -1 | 0 | | 0 |
| — | 0 | 0 | 0 | 0 | 0 | | 0 |
| — | 0 | 0 | 0 | 0 | 0 | | 0 |
| — | 0 | 0 | 0 | 0 | 0 | | 0 |
| — | 0 | 0 | 0 | 0 | 0 | | 0 |
| — | 0 | +1 | 0 | 0 | +1 | | +1 |
| — | 0 | +2 | 0 | 0 | +1 | | +1 |
| — | 0 | +2 | 0 | 0 | +1 | | +1 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 167 | 163 | 162 | 159 | 161 | 163 | 159 | 161 |
| 5% | 167 | 163 | 162 | 159 | 161 | 163 | 159 | 161 |
| 10% | 169 | 168 | 168 | 166 | 166 | 169 | 166 | 168 |
| 25% | 180 | 183 | 183 | 183 | 181 | 184 | 183 | 182 |
| 50% | 206 | 208 | 209 | 212 | 207 | 212 | 212 | 212 |
| 75% | 290 | 294 | 293 | 296 | 289 | 293 | 290 | 294 |
| 90% | 412 | 417 | 417 | 422 | 411 | 419 | 418 | 419 |
| 95% | 414 | 419 | 420 | 424 | 414 | 421 | 420 | 421 |
| Max | 414 | 419 | 420 | 424 | 414 | 421 | 420 | 421 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -3 | -5 | -4 | -2 | -5 | -4 |
| — | -2 | -3 | -5 | -4 | -2 | -5 | -4 |
| — | -2 | -2 | -3 | -3 | -1 | +3 | -2 |
| — | 0 | 0 | +1 | -1 | 0 | 0 | 0 |
| — | +1 | +1 | +2 | 0 | +2 | +1 | +2 |
| — | +1 | +2 | +3 | 0 | +3 | +2 | +2 |
| — | +3 | +2 | +4 | +1 | +3 | +4 | +3 |
| — | +3 | +2 | +4 | +1 | +3 | +4 | +4 |
| — | +3 | +2 | +4 | +1 | +3 | +4 | +4 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 698 | 633 | 285 | 779 | 784 | 280 | 775 | 778 |
| 698 | 633 | 285 | 779 | 784 | 280 | 775 | 778 |
| 741 | 208 | 285 | 781 | 785 | 782 | 779 | 780 |
| 785 | 786 | 786 | 786 | 787 | 787 | 782 | 783 |
| 786 | 788 | 788 | 780 | 788 | 789 | 786 | 786 |
| 795 | 797 | 796 | 794 | 799 | 799 | 793 | 794 |
| 801 | 803 | 800 | 802 | 802 | 800 | 801 | 799 |
| 802 | 803 | 800 | 804 | 802 | 800 | 801 | 799 |
| 802 | 803 | 800 | 804 | 802 | 800 | 801 | 799 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -19 | 0 | 0 | 0 | 0 | -1 | -1 |
| — | -19 | 0 | 0 | 0 | 0 | -1 | -1 |
| — | -10 | 0 | 0 | 0 | 0 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | -1 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | +1 | 0 | +1 | 0 | 0 |
| — | +7 | +7 | +7 | +7 | +7 | +6 | +6 |
| — | +12 | +12 | +12 | +12 | +12 | +11 | +11 |
| — | +12 | +12 | +12 | +12 | +12 | +11 | +11 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 57 | 59 | 56 | 59 | 57 | 59 | 58 | 59 |
| 5% | 57 | 59 | 56 | 59 | 57 | 59 | 58 | 59 |
| 10% | 63 | 64 | 61 | 64 | 63 | 64 | 63 | 64 |
| 25% | 74 | 76 | 72 | 76 | 74 | 76 | 74 | 76 |
| 50% | 78 | 83 | 77 | 83 | 81 | 83 | 83 | 83 |
| 75% | 83 | 88 | 87 | 87 | 86 | 87 | 87 | 87 |
| 90% | 96 | 92 | 89 | 91 | 90 | 91 | 460 | 92 |
| 95% | 99 | 94 | 89 | 94 | 91 | 94 | 829 | 94 |
| Max | 99 | 97 | 89 | 94 | 92 | 94 | 829 | 94 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -9 | -10 | -10 | -11 | -10 | -11 | -10 |
| — | -9 | -10 | -10 | -11 | -10 | -11 | -10 |
| — | -4 | -8 | -5 | -7 | -5 | -7 | -5 |
| — | +1 | -5 | +1 | -1 | +1 | -1 | +1 |
| — | +3 | -2 | +4 | +1 | +4 | +2 | +5 |
| — | +7 | +1 | +7 | +5 | +7 | +6 | +7 |
| — | +13 | +5 | +12 | +11 | +13 | +487 | +12 |
| — | +15 | +11 | +14 | +12 | +15 | +961 | +14 |
| — | +15 | +11 | +14 | +12 | +15 | +961 | +14 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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PROCESS: B PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 800 mw, 30 V, 25°C.

CELL NO.: 419221 NO. OF UNITS: 13

$I_{CEO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.6 | 0.3 | 0.1 | 1.0 | 0.2 | 1.1 | 0.5 |
| 5% | <0.1 | 0.6 | 0.3 | 0.1 | 1.0 | 0.2 | 1.1 | 0.5 |
| 10% | >.1 | 0.6 | 0.3 | 0.1 | 1.0 | 0.2 | 1.1 | 0.5 |
| 25% | 0.4 | 1.0 | 0.6 | 0.3 | 1.2 | 0.4 | 1.1 | 0.7 |
| 50% | 0.8 | 2.9 | 1.8 | 1.0 | 3.0 | 0.5 | 1.9 | 1.2 |
| 75% | 1.7 | 14.2 | 7.8 | 3.2 | 7.7 | 2.2 | 2.9 | 2.2 |
| 90% | 3.3 | 98.2 | 47.5 | 39.1 | 54.4 | 2.8 | 3.5 | 926.1 |
| 95% | 3.4 | 132.0 | 628 | 58.3 | 54.4 | 28 | 3.5 | 926.1 |
| Max | 3.4 | 132.0 | 628 | 58.3 | 54.4 | 28 | 3.5 | 926.1 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | 0.3 | 0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | 0.3 | 0.1 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.3 | 0.1 |
| 0.1 | 0.6 | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.2 |
| 0.3 | 1.0 | 0.7 | 0.4 | 1.0 | 0.5 | 3.4 | 2.5 |
| 8.2 | 10.0 | 13.7 | 9.9 | 20.1 | 9.6 | 30.6 | 261.0 |
| 29.0 | 39.8 | 38.9 | 34.0 | 55.0 | 28.3 | ∞ | ∞ |
| 36.7 | 55.8 | 48.1 | 45.7 | 55.0 | 32.4 | ∞ | ∞ |
| 36.7 | 55.8 | 48.1 | 45.7 | 55.0 | 32.4 | ∞ | ∞ |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 61 | 60 | 60 | 60 | 63 | 62 | 63 | 64 |
| 61 | 60 | 60 | 60 | 63 | 62 | 63 | 64 |
| 62 | 61 | 61 | 61 | 63 | 63 | 63 | 64 |
| 65 | 63 | 63 | 65 | 64 | 66 | 64 | 64 |
| 67 | 66 | 66 | 67 | 67 | 70 | 66 | 87 |
| 75 | 73 | 70 | 78 | 74 | ∞ | 98 | 130 |
| 80 | 78 | 79 | ∞ | 81 | ∞ | 1350 | ∞ |
| 80 | 78 | 80 | ∞ | 81 | ∞ | 1350 | ∞ |
| 80 | 78 | 80 | ∞ | 81 | ∞ | 1350 | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -5 | -5 | -3 | -3 | -3 | -5 | -5 |
| — | -5 | -5 | -3 | -3 | -3 | -5 | -5 |
| — | -5 | -4 | -3 | -3 | -3 | -5 | -5 |
| — | -4 | -3 | -2 | -2 | -1 | -3 | -3 |
| — | -2 | -2 | -1 | -1 | -1 | -2 | +19 |
| — | -1 | -1 | 0 | -1 | 1384 | +25 | +68 |
| — | 0 | 0 | 1318 | +1 | 1522 | +69 | 1291 |
| — | 0 | 0 | 1408 | +1 | 1550 | +69 | 1291 |
| — | 0 | 0 | 1408 | +1 | 1550 | +69 | 1291 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 100 | 091 | 092 | 095 | 100 | 093 | 097 | 100 |
| 5% | 100 | 091 | 092 | 095 | 100 | 093 | 097 | 100 |
| 10% | 101 | 094 | 093 | 097 | 100 | 093 | 097 | 100 |
| 25% | 102 | 099 | 099 | 100 | 102 | 100 | 099 | 103 |
| 50% | 104 | 101 | 101 | 107 | 103 | 110 | 100 | 106 |
| 75% | 108 | 111 | 114 | 131 | 113 | ∞ | 109 | 236 |
| 90% | 121 | 6047 | 149 | ∞ | 117 | ∞ | 144 | ∞ |
| 95% | 122 | ∞ | 163 | ∞ | 117 | ∞ | 144 | ∞ |
| Max | 122 | ∞ | 163 | ∞ | 117 | ∞ | 144 | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -16 | -15 | -12 | -5 | -11 | -8 | -3 |
| — | -16 | -15 | -12 | -5 | -11 | -8 | -3 |
| — | -12 | -13 | -9 | -5 | -9 | -8 | -3 |
| — | -5 | -7 | -3 | -4 | -3 | -5 | -2 |
| — | -3 | -3 | 0 | -1 | +2 | -2 | +3 |
| — | -2 | 0 | +21 | +2 | 9246 | +6 | +101 |
| — | 5622 | +42 | 9498 | +5 | 9465 | +20 | 9423 |
| — | 9203 | +60 | 9608 | +5 | 9203 | +20 | 9423 |
| — | 9203 | +60 | 9608 | +5 | 9203 | +20 | 9423 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 786 | 785 | 780 | 780 | 783 | 777 | 007 | 786 |
| 786 | 783 | 780 | 780 | 783 | 777 | 007 | 786 |
| 786 | 786 | 781 | 782 | 783 | 778 | 024 | 786 |
| 795 | 793 | 788 | 790 | 784 | 788 | 692 | 792 |
| 802 | 799 | 799 | 799 | 797 | 796 | 800 | 804 |
| 804 | 803 | 803 | 824 | 799 | ∞ | 8279 | 919 |
| 812 | 6323 | 850 | ∞ | 809 | ∞ | ∞ | ∞ |
| 813 | ∞ | 866 | ∞ | 809 | ∞ | ∞ | ∞ |
| 813 | ∞ | 866 | ∞ | 809 | ∞ | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -2 | -2 | -2 | -2 | | |
| — | -1 | -2 | -2 | -2 | -2 | | |
| — | -1 | -2 | -2 | -2 | -2 | | |
| — | -1 | 0 | -1 | -1 | -1 | | |
| — | 0 | 0 | 0 | -1 | 0 | | |
| — | 0 | 0 | +3 | 0 | 1140 | | |
| — | +687 | +6 | 1154 | 0 | 1154 | | |
| — | 1145 | +8 | 1158 | 0 | 1158 | | |
| — | 1145 | +8 | 1158 | 0 | 1158 | | |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 67 | 20 | 67 | 20 | 68 | 20 | 34 | 20 |
| 5% | 67 | 20 | 67 | 20 | 68 | 20 | 34 | 20 |
| 10% | 68 | 40 | 68 | 20 | 68 | 20 | 34 | 20 |
| 25% | 17 | 75 | 74 | 70 | 82 | 20 | 60 | 29 |
| 50% | 92 | 96 | 92 | 96 | 99 | 86 | 98 | 75 |
| 75% | 110 | 108 | 109 | 115 | 113 | 109 | 121 | 106 |
| 90% | 151 | 119 | 158 | 159 | 122 | 124 | 129 | 131 |
| 95% | 174 | 121 | 179 | 185 | 122 | 125 | 129 | 131 |
| Max | 174 | 121 | 179 | 185 | 122 | 125 | 129 | 131 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -89 | -7 | -77 | -1 | -89 | -64 | -75 |
| — | -89 | -7 | -77 | -1 | -89 | -64 | -75 |
| — | -54 | -6 | -77 | -1 | -84 | -64 | -75 |
| — | +2 | -5 | 0 | +2 | -73 | -16 | -72 |
| — | +4 | -2 | +4 | +4 | +4 | +4 | -13 |
| — | +9 | +3 | +2 | +8 | +8 | +7 | +9 |
| — | +16 | +12 | +10 | +13 | +11 | +13 | +13 |
| — | +20 | +14 | +11 | +13 | +11 | +13 | +15 |
| — | +20 | +14 | +11 | +13 | +11 | +13 | +15 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: B PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 700 mw, 30 V, 25°C. MIN 1.89% MAX 96.4

CELL NO.: 419222 NO. OF UNITS: 28

| HRS. | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | <0.1 | 0.5 | 0.1 | <0.1 | <0.1 | 0.6 | <0.1 | <0.1 |
| 5% | <0.1 | 0.5 | 0.1 | <0.1 | <0.1 | 0.6 | <0.1 | <0.1 |
| 10% | <0.1 | 0.5 | 0.2 | 0.2 | 0.1 | 0.7 | 0.2 | <0.1 |
| 25% | 0.1 | 0.9 | 0.5 | 0.3 | 0.2 | 1.0 | 0.2 | 0.2 |
| 50% | 0.4 | 1.4 | 0.9 | 0.7 | 0.5 | 1.4 | 0.4 | 1.0 |
| 75% | 1.3 | 2.4 | 2.2 | 1.9 | 1.6 | 2.4 | 0.8 | 1.7 |
| 90% | 6.9 | 12.0 | 12.0 | 31.0 | 2.8 | 4.0 | 2.4 | 276.3 |
| 95% | 557.8 | 94.2 | 322.1 | 678.2 | 124.1 | 1446 | 46.0 | ∞ |
| Max | >1μA | 123.1 | 631.6 | ∞ | 223.1 | 1657 | 80.0 | ∞ |

| HRS. | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 |
| 10% | <0.1 | 0.3 | <0.1 | 0.1 | 0.1 | 0.4 | <0.1 | <0.1 |
| 25% | 0.1 | 0.4 | <0.1 | 0.1 | 0.1 | 0.6 | 0.1 | 0.2 |
| 50% | 0.3 | 1.0 | 0.6 | 0.6 | 0.5 | 1.1 | 0.4 | 0.5 |
| 75% | 1.5 | 2.3 | 2.1 | 2.6 | 2.7 | 3.6 | 2.2 | 3.4 |
| 90% | 11.3 | 16.1 | 18.7 | 73.5 | 22.9 | 49.1 | 40.7 | 180.8 |
| 95% | 75.0 | 198.3 | 122.1 | 638.3 | 243.0 | 858.2 | 600.1 | 6543 |
| Max | >1μA | 3129 | 199.5 | ∞ | 402.3 | ∞ | ∞ | 6543 |

| HRS. | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 38 | 56 | 56 | 56 | 56 | 56 | 56 | 01 |
| 5% | 48 | 57 | 57 | 57 | 57 | 56 | 57 | 01 |
| 10% | 60 | 59 | 59 | 59 | 59 | 58 | 59 | 46 |
| 25% | 64 | 62 | 61 | 61 | 61 | 61 | 63 | 61 |
| 50% | 73 | 73 | 73 | 74 | 74 | 73 | 78 | 73 |
| 75% | 78 | 82 | 81 | 86 | 87 | 85 | 283 | 84 |
| 90% | 85 | 89 | 89 | 217 | ∞ | 100 | ∞ | 287 |
| 95% | 86 | 116 | 115 | ∞ | ∞ | 125 | ∞ | ∞ |
| Max | 87 | 127 | 128 | ∞ | ∞ | 129 | ∞ | ∞ |

| HRS. | $BV_{CFO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | — | -21 | -21 | -21 | -21 | -20 | -21 | -99 |
| 5% | — | -18 | -18 | -17 | -18 | -19 | -17 | -99 |
| 10% | — | -12 | -12 | -12 | -11 | -13 | -11 | -35 |
| 25% | — | -3 | -4 | -5 | -4 | -6 | -5 | -10 |
| 50% | — | -1 | -2 | 0 | 0 | -1 | 0 | -2 |
| 75% | — | 0 | 0 | +2 | +2 | +1 | +951 | +1 |
| 90% | — | +13 | +12 | +264 | 1231 | +54 | 1431 | +361 |
| 95% | — | +125 | +122 | 1235 | 1288 | +139 | 1529 | 1079 |
| Max | — | +166 | +159 | 1239 | 1328 | +124 | 1561 | 1079 |

| HRS. | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 000 | 085 | 087 | 087 | 087 | 083 | 076 | 082 |
| 5% | 040 | 086 | 097 | 087 | 088 | 084 | 081 | 082 |
| 10% | 089 | 087 | 087 | 090 | 089 | 088 | 087 | 085 |
| 25% | 093 | 091 | 091 | 092 | 095 | 092 | 094 | 094 |
| 50% | 102 | 099 | 097 | 102 | 101 | 099 | 104 | 099 |
| 75% | 109 | 105 | 106 | 114 | 114 | 104 | 7531 | 103 |
| 90% | 123 | 118 | 115 | ∞ | ∞ | 116 | ∞ | 2674 |
| 95% | 134 | 139 | 139 | ∞ | ∞ | 130 | ∞ | ∞ |
| Max | 140 | 147 | 148 | ∞ | ∞ | 132 | ∞ | ∞ |

| HRS. | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | — | -14 | -13 | -10 | -9 | -13 | -14 | -14 |
| 5% | — | -13 | -12 | -10 | -9 | -13 | -14 | -14 |
| 10% | — | -10 | -10 | -8 | -8 | -11 | -10 | -10 |
| 25% | — | -5 | -5 | -4 | -3 | -6 | -6 | -7 |
| 50% | — | -2 | -2 | -1 | 0 | -3 | +1 | -3 |
| 75% | — | +1 | +1 | +4 | +5 | +1 | 7981 | +6 |
| 90% | — | +4 | +5 | ∞ | ∞ | +11 | ∞ | 1959 |
| 95% | — | 5502 | 5502 | ∞ | ∞ | 8501 | ∞ | 7042 |
| Max | — | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | 7042 |

| HRS. | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 784 | 784 | 783 | 005 | 783 | 787 | 781 | 023 |
| 5% | 784 | 784 | 784 | 356 | 783 | 782 | 783 | 023 |
| 10% | 788 | 786 | 786 | 787 | 784 | 787 | 786 | 639 |
| 25% | 793 | 788 | 790 | 790 | 790 | 789 | 790 | 794 |
| 50% | 799 | 797 | 795 | 799 | 798 | 795 | 800 | 798 |
| 75% | 802 | 800 | 801 | 805 | 803 | 810 | 7704 | 813 |
| 90% | 804 | 802 | 802 | 1231 | ∞ | 810 | ∞ | 3679 |
| 95% | 817 | 819 | 816 | ∞ | ∞ | 814 | ∞ | ∞ |
| Max | 824 | 831 | 826 | ∞ | ∞ | 815 | ∞ | ∞ |

| HRS. | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | — | -1 | -2 | -99 | -2 | -1 | -1 | -97 |
| 5% | — | -1 | -2 | -55 | -2 | -1 | -1 | -97 |
| 10% | — | -1 | -1 | -1 | -1 | -1 | -1 | -19 |
| 25% | — | 0 | -1 | -1 | -1 | -1 | -1 | 0 |
| 50% | — | 0 | 0 | 0 | 0 | 0 | 0 | +1 |
| 75% | — | 0 | 0 | +1 | 0 | 0 | +854 | +1 |
| 90% | — | 0 | +1 | +115 | 1139 | +1 | 1147 | +227 |
| 95% | — | +1 | +1 | 1155 | 1160 | +2 | 1160 | 1113 |
| Max | — | +1 | +1 | 1169 | 1169 | +2 | 1169 | 1113 |

| HRS. | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 49 | 54 | 58 | <20 | <20 | 34 | 20 | 20 |
| 5% | 50 | 56 | 59 | <20 | <20 | 38 | 20 | 20 |
| 10% | 56 | 60 | 62 | <20 | <20 | 44 | 20 | 20 |
| 25% | 86 | 83 | 84 | 86 | 86 | 89 | 23 | 86 |
| 50% | 99 | 98 | 99 | 99 | 99 | 102 | 91 | 101 |
| 75% | 109 | 106 | 112 | 118 | 117 | 134 | 116 | 145 |
| 90% | 118 | 158 | 162 | 167 | 162 | 163 | 153 | 160 |
| 95% | 128 | 175 | 180 | 634 | 178 | 193 | 168 | 179 |
| Max | 131 | 185 | 189 | ∞ | 187 | 196 | 172 | 179 |

| HRS. | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | — | -22 | -22 | -28 | -27 | -30 | -82 | -80 |
| 5% | — | -18 | -18 | -28 | -26 | -28 | -81 | -80 |
| 10% | — | -12 | -12 | -25 | -66 | -15 | -78 | -63 |
| 25% | — | -1 | 0 | -5 | -1 | 0 | -60 | -11 |
| 50% | — | +2 | +5 | +5 | +3 | +9 | +1 | +10 |
| 75% | — | +11 | +15 | +18 | +14 | +16 | +15 | +91 |
| 90% | — | +37 | +42 | +53 | +33 | +45 | +43 | +55 |
| 95% | — | +52 | +57 | +886 | +56 | +56 | +67 | +81 |
| Max | — | +55 | +61 | 1564 | +60 | +57 | +82 | +81 |

| HRS. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | | | | | | | | |
| 5% | | | | | | | | |
| 10% | | | | | | | | |
| 25% | | | | | | | | |
| 50% | | | | | | | | |
| 75% | | | | | | | | |
| 90% | | | | | | | | |
| 95% | | | | | | | | |
| Max | | | | | | | | |

| HRS. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | | | | | | | | |
| 5% | | | | | | | | |
| 10% | | | | | | | | |
| 25% | | | | | | | | |
| 50% | | | | | | | | |
| 75% | | | | | | | | |
| 90% | | | | | | | | |
| 95% | | | | | | | | |
| Max | | | | | | | | |

PROCESS: B PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 500 mw, 30 V, 25°C. CELL NO.: 419223 NO. OF UNITS: 69

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.1 | 0.6 | 0.7 | <0.1 | 0.1 | <0.1 | <0.1 | 0.2 |
| 5% | 0.2 | 0.8 | 1.1 | 0.4 | 0.2 | 0.1 | <0.1 | 0.3 |
| 10% | 0.3 | 1.1 | 1.3 | 0.5 | 0.4 | 0.2 | 0.1 | 0.4 |
| 25% | 0.7 | 1.3 | 1.6 | 0.8 | 0.7 | 0.5 | 0.5 | 0.7 |
| 50% | 1.0 | 1.9 | 2.2 | 1.6 | 1.3 | 1.1 | 1.1 | 1.4 |
| 75% | 2.5 | 3.6 | 3.4 | 3.0 | 2.7 | 2.5 | 2.4 | 3.0 |
| 90% | 3.2 | 4.6 | 6.5 | 2.8 | 7.8 | 3.3 | 3.6 | 5.8 |
| 95% | 4.4 | 9.7 | 21.3 | 32.3 | 1526 | 7.9 | 244 | 26.3 |
| Max | 13.3 | ∞ | ∞ | ∞ | ∞ | 6867 | ∞ | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.3 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.5 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.6 | 0.3 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.7 | 0.4 | 0.2 | 0.1 | 0.1 | <0.1 | 0.3 |
| 0.4 | 1.1 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.7 |
| 2.1 | 2.5 | 2.3 | 2.2 | 1.9 | 1.5 | 1.5 | 2.0 |
| 10.7 | 13.7 | 10.5 | 9.0 | 8.1 | 4.0 | 3.9 | 6.1 |
| 25.8 | 20.2 | 17.2 | 20.2 | 18.1 | 18.2 | 16.6 | 17.8 |
| 241.2 | 208.0 | 196.4 | 177.7 | 210.6 | 2029 | 2229 | 3769 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 58 | 08 | 09 | 21 | 06 | 07 | 24 | 52 |
| 63 | 61 | 61 | 60 | 58 | 22 | 59 | 60 |
| 65 | 64 | 64 | 63 | 63 | 61 | 63 | 63 |
| 69 | 66 | 66 | 66 | 66 | 66 | 66 | 66 |
| 73 | 72 | 71 | 71 | 71 | 71 | 71 | 71 |
| 79 | 78 | 78 | 78 | 78 | 80 | 79 | 80 |
| 84 | 85 | 85 | 85 | 85 | 94 | 90 | 709 |
| 86 | 89 | 98 | 89 | 96 | ∞ | ∞ | ∞ |
| 105 | 114 | ∞ | 111 | ∞ | ∞ | ∞ | ∞ |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -90 | -88 | -74 | -93 | -90 | -70 | -25 |
| — | -11 | -12 | -13 | -18 | -73 | -20 | -19 |
| — | -3 | -3 | -5 | -10 | -17 | -10 | -11 |
| — | -1 | 0 | -1 | -2 | -2 | -2 | -3 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | +1 | +1 | +1 | +2 | +5 | +4 | +33 |
| — | +3 | +30 | +3 | +4 | +967 | 1313 | 1267 |
| — | +55 | +85 | +50 | +48 | 1277 | 1420 | 1448 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 016 | 078 | 077 | 027 | 015 | 078 | 077 | 025 |
| 5% | 091 | 090 | 092 | 090 | 092 | 091 | 091 | 090 |
| 10% | 092 | 093 | 093 | 092 | 096 | 093 | 093 | 091 |
| 25% | 098 | 096 | 097 | 098 | 100 | 097 | 097 | 098 |
| 50% | 104 | 103 | 103 | 104 | 105 | 105 | 103 | 104 |
| 75% | 112 | 109 | 110 | 113 | 114 | 113 | 113 | 115 |
| 90% | 123 | 118 | 120 | 119 | 120 | 134 | ∞ | ∞ |
| 95% | 130 | 124 | 125 | 125 | 126 | ∞ | ∞ | ∞ |
| Max | 147 | 152 | ∞ | 165 | ∞ | ∞ | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -31 | -29 | -29 | -87 | -26 | -28 | -26 |
| — | -9 | -9 | -11 | -10 | -10 | -12 | -13 |
| — | -5 | -5 | -6 | -4 | -7 | -7 | -6 |
| — | -4 | -3 | -3 | -3 | -3 | -3 | -4 |
| — | -2 | -1 | 0 | +1 | 0 | -2 | -1 |
| — | +1 | +1 | +3 | +4 | +2 | 0 | +3 |
| — | +2 | +4 | +5 | +7 | +10 | 874 | 8990 |
| — | +4 | +5 | +8 | +11 | 9424 | 9561 | 9656 |
| — | +544 | ∞ | +563 | +525 | 9743 | 9743 | ∞ |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 717 | 612 | 784 | 783 | 715 | 776 | 781 | 775 |
| 786 | 781 | 785 | 783 | 780 | 780 | 784 | 781 |
| 787 | 783 | 786 | 785 | 784 | 783 | 785 | 783 |
| 790 | 787 | 789 | 788 | 789 | 786 | 789 | 787 |
| 795 | 792 | 795 | 792 | 793 | 790 | 793 | 793 |
| 800 | 796 | 799 | 797 | 798 | 797 | 799 | 799 |
| 808 | 801 | 805 | 803 | 805 | 809 | ∞ | ∞ |
| 818 | 807 | 810 | 808 | 814 | ∞ | ∞ | ∞ |
| 900 | 828 | ∞ | 843 | ∞ | ∞ | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -23 | -12 | -12 | -13 | -13 | -13 | -13 |
| — | -3 | -1 | -1 | -1 | -2 | -1 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | 0 | -1 | 0 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | +1 | +1 | 1133 | 1131 |
| — | 0 | +1 | +1 | +1 | 1168 | 1166 | 1171 |
| — | +9 | 1161 | +10 | +9 | 1178 | 1178 | 1177 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 55 | 72 | 20 | 69 | 20 | 20 | 20 | 20 |
| 5% | 70 | 74 | 23 | 75 | 71 | 20 | 20 | 20 |
| 10% | 75 | 76 | 77 | 78 | 74 | 72 | 20 | 20 |
| 25% | 86 | 86 | 83 | 85 | 85 | 84 | 83 | 82 |
| 50% | 99 | 99 | 95 | 99 | 97 | 97 | 98 | 97 |
| 75% | 109 | 111 | 106 | 111 | 111 | 113 | 112 | 113 |
| 90% | 115 | 117 | 115 | 121 | 117 | 124 | 123 | 122 |
| 95% | 121 | 130 | 126 | 140 | 142 | 143 | 141 | 143 |
| Max | 153 | 147 | 153 | 153 | 148 | 155 | 153 | 157 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -7 | -81 | -10 | -80 | -83 | -83 | -83 |
| — | -5 | -11 | -9 | -9 | -80 | -82 | -82 |
| — | -4 | -8 | -6 | -6 | -3 | -74 | -74 |
| — | -2 | -5 | -1 | -3 | 0 | -1 | 0 |
| — | 0 | -1 | 0 | 0 | +1 | +1 | +1 |
| — | +2 | +1 | +3 | +1 | +5 | +5 | +7 |
| — | +8 | +6 | +11 | +14 | +17 | +19 | +18 |
| — | +16 | +13 | +21 | +26 | +31 | +37 | +34 |
| — | +34 | +27 | +40 | +43 | +42 | +40 | +43 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

PROCESS: 8 PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 400 mw, 30 V, 150°C.

CELL NO.: 419224 NO. OF UNITS: 13

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.1 | 1.2 | 0.7 | 0.5 | 0.5 | <0.1 | 0.3 | 0.5 |
| 5% | 0.1 | 1.2 | 0.7 | 0.5 | 0.5 | <0.1 | 0.3 | 0.5 |
| 10% | 0.2 | 1.2 | 0.8 | 0.5 | 0.5 | 0.2 | 0.3 | 0.5 |
| 25% | 0.5 | 1.5 | 1.1 | 0.9 | 0.8 | 0.8 | 0.5 | 0.8 |
| 50% | 0.8 | 1.8 | 1.5 | 1.2 | 1.0 | 1.0 | 0.6 | 1.2 |
| 75% | 1.5 | 2.5 | 2.1 | 1.7 | 1.6 | 1.4 | 1.5 | 1.7 |
| 90% | 2.3 | 3.1 | 3.8 | 2.2 | 10.1 | 2.0 | 2.0 | 3.6 |
| 95% | 2.5 | 3.2 | 4.6 | 2.5 | 15.5 | 2.2 | 2.2 | 4.2 |
| Max | 2.5 | 3.2 | 4.6 | 2.5 | 15.5 | 2.2 | 2.2 | 4.2 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.9 | 0.4 | 0.3 | <0.1 | 0.1 | <0.1 | 0.1 |
| <0.1 | 0.9 | 0.4 | 0.3 | <0.1 | 0.1 | <0.1 | 0.1 |
| <0.1 | 0.9 | 0.4 | 0.3 | <0.1 | 0.1 | <0.1 | 0.1 |
| 0.3 | 1.5 | 1.0 | 0.9 | 0.6 | 0.6 | 0.5 | 1.0 |
| 1.8 | 3.1 | 2.2 | 2.1 | 1.8 | 1.7 | 1.8 | 2.3 |
| 4.1 | 5.3 | 4.7 | 4.8 | 4.9 | 5.3 | 7.1 | 7.7 |
| 5.9 | 8.4 | 7.1 | 7.1 | 7.4 | 7.8 | 8.4 | 9.7 |
| 6.0 | 9.1 | 7.9 | 7.5 | 8.0 | 8.4 | 8.7 | 10.4 |
| 6.0 | 9.1 | 7.9 | 7.5 | 8.0 | 8.4 | 8.7 | 10.4 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 62 | 62 | 63 | 63 | 62 | 62 | 61 | 61 |
| 62 | 62 | 63 | 63 | 62 | 62 | 61 | 61 |
| 63 | 63 | 63 | 63 | 63 | 62 | 62 | 62 |
| 67 | 64 | 64 | 64 | 63 | 63 | 64 | 64 |
| 72 | 73 | 73 | 73 | 73 | 73 | 73 | 73 |
| 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 |
| 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 |
| 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -8 | -7 | -9 | -9 | -13 | -14 | -14 |
| — | -8 | -7 | -9 | -9 | -13 | -14 | -14 |
| — | -5 | -7 | -9 | -8 | -11 | -12 | -12 |
| — | -1 | -1 | -1 | -2 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | +1 | 0 |
| — | 0 | 0 | +1 | +1 | +1 | +11 | +11 |
| — | 0 | 0 | +1 | +1 | +1 | +18 | +18 |
| — | 0 | 0 | +1 | +1 | +1 | +18 | +18 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 108 | 084 | 088 | 083 | 086 | 087 | 087 | 079 |
| 5% | 108 | 084 | 088 | 085 | 086 | 087 | 087 | 079 |
| 10% | 108 | 088 | 090 | 088 | 088 | 089 | 089 | 082 |
| 25% | 117 | 103 | 101 | 101 | 100 | 102 | 099 | 099 |
| 50% | 119 | 104 | 105 | 105 | 105 | 106 | 104 | 102 |
| 75% | 135 | 123 | 123 | 123 | 117 | 120 | 116 | 118 |
| 90% | 148 | 130 | 131 | 131 | 130 | 133 | 129 | 128 |
| 95% | 150 | 132 | 132 | 132 | 131 | 133 | 130 | 130 |
| Max | 150 | 132 | 132 | 132 | 131 | 133 | 130 | 130 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -23 | -19 | -22 | -21 | -21 | -23 | -27 |
| — | -23 | -19 | -22 | -21 | -21 | -23 | -27 |
| — | -20 | -18 | -20 | -20 | -21 | -22 | -27 |
| — | -15 | -14 | -15 | -17 | -14 | -17 | -19 |
| — | -13 | -12 | -13 | -15 | -11 | -15 | -16 |
| — | -9 | -10 | -9 | -12 | -9 | -11 | -10 |
| — | -6 | -9 | -7 | -9 | -7 | -9 | -8 |
| — | -6 | -9 | -7 | -9 | -7 | -8 | -8 |
| — | -6 | -9 | -7 | -9 | -7 | -8 | -8 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 792 | 781 | 778 | 784 | 786 | 785 | 782 | 780 |
| 792 | 781 | 778 | 784 | 786 | 785 | 782 | 780 |
| 795 | 781 | 781 | 786 | 787 | 786 | 784 | 781 |
| 801 | 786 | 789 | 790 | 793 | 790 | 787 | 788 |
| 810 | 798 | 795 | 799 | 799 | 797 | 795 | 796 |
| 814 | 801 | 802 | 805 | 804 | 802 | 800 | 801 |
| 830 | 815 | 818 | 821 | 814 | 816 | 807 | 808 |
| 836 | 817 | 818 | 823 | 820 | 823 | 812 | 812 |
| 836 | 817 | 818 | 823 | 820 | 823 | 812 | 812 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -3 | -2 | -2 | -2 | -3 | -3 |
| — | -2 | -3 | -2 | -2 | -2 | -3 | -3 |
| — | -2 | -3 | -2 | -2 | -2 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -1 | -1 | -2 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | -2 |
| — | -1 | 0 | 0 | 0 | 0 | -1 | 0 |
| — | -1 | 0 | 0 | 0 | 0 | -1 | 0 |
| — | -1 | 0 | 0 | 0 | 0 | -1 | 0 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 61 | 61 | 62 | 58 | 60 | 61 | 60 | 57 |
| 5% | 61 | 61 | 62 | 58 | 60 | 61 | 60 | 57 |
| | 67 | 66 | 68 | 63 | 66 | 67 | 60 | 59 |
| | 82 | 85 | 87 | 82 | 86 | 87 | 87 | 88 |
| | 99 | 94 | 100 | 89 | 97 | 98 | 98 | 100 |
| | 112 | 108 | 107 | 103 | 109 | 110 | 111 | 112 |
| 90% | 130 | 129 | 145 | 145 | 153 | 178 | 183 | 188 |
| 95% | 137 | 138 | 159 | 168 | 171 | 212 | 220 | 228 |
| Max | 137 | 138 | 159 | 168 | 171 | 212 | 220 | 228 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -10 | -5 | -14 | -3 | -2 | -21 | -25 |
| — | -10 | -5 | -14 | -3 | -2 | -21 | -25 |
| — | -9 | -4 | -14 | -3 | -2 | -13 | -16 |
| — | -5 | +1 | -9 | -2 | -2 | -1 | -1 |
| — | -1 | +1 | -5 | -2 | -1 | 0 | +1 |
| — | +2 | +3 | -1 | +3 | +5 | +5 | +7 |
| — | +4 | +13 | +14 | +19 | +31 | +42 | +46 |
| — | +4 | +16 | +23 | +35 | +55 | +61 | +67 |
| | +4 | +16 | +23 | +35 | +55 | +61 | +67 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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PROCESS: 8 PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 200 mw, 30 V, 150°C. CELL NO.: 419225 NO. OF UNITS: 28

$I_{CEO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| [illegible] | 0.3 | 0.6 | 0.5 | 0.3 | 0.2 | 0.2 | 1.0 | 0.4 |
| 5% | 0.3 | 0.7 | 0.5 | 0.4 | 0.2 | 0.2 | 1.0 | 0.4 |
| 10% | 0.4 | 0.9 | 0.7 | 0.5 | 0.3 | 0.3 | 1.0 | 0.5 |
| 25% | 1.1 | 1.5 | 1.2 | 1.1 | 0.7 | 0.5 | 1.6 | 1.3 |
| 50% | 2.0 | 2.7 | 2.4 | 2.0 | 1.8 | 1.3 | 2.3 | 2.0 |
| 75% | 3.1 | 3.6 | 3.4 | 2.7 | 2.5 | 2.7 | 3.2 | 3.0 |
| 90% | 3.7 | 25.7 | 28.3 | 6.1 | 14.5 | 4.5 | 5.2 | 4.6 |
| 95% | 18.6 | 134.5 | 211.2 | 190.3 | 135.3 | 96.5 | 68.4 | 14.6 |
| [illegible] | 50.0 | 199.9 | 359.4 | 339.7 | 231.4 | 156.7 | 109.3 | 18.9 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| <0.1 | 0.6 | 0.1 | <0.1 | <0.1 | <0.1 | 0.5 | 0.1 |
| <0.1 | 0.7 | 0.3 | 0.2 | <0.1 | <0.1 | 0.6 | 0.2 |
| 0.4 | 1.3 | 0.8 | 0.6 | 0.3 | 0.5 | 1.0 | 0.7 |
| 2.7 | 3.7 | 2.9 | 2.8 | 2.3 | 2.6 | 3.5 | 3.3 |
| 4.6 | 5.1 | 5.1 | 5.3 | 4.0 | 4.9 | 5.4 | 4.7 |
| 9.8 | 18.6 | 17.9 | 10.9 | 8.8 | 9.8 | 11.6 | 9.2 |
| 13.5 | 29.2 | 28.1 | 15.3 | 12.3 | 13.5 | 16.3 | 12.3 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 59 | 59 | 58 | 58 | 58 | 58 | 57 | 57 |
| 59 | 59 | 59 | 59 | 59 | 58 | 58 | 58 |
| 61 | 61 | 61 | 61 | 60 | 61 | 61 | 61 |
| 64 | 64 | 64 | 64 | 64 | 64 | 64 | 64 |
| 71 | 71 | 71 | 71 | 71 | 71 | 71 | 71 |
| 79 | 80 | 80 | 80 | 80 | 80 | 80 | 79 |
| 86 | 86 | 86 | 86 | 85 | 86 | 85 | 85 |
| 87 | 86 | 86 | 86 | 86 | 87 | 86 | 86 |
| 87 | 86 | 87 | 87 | 87 | 87 | 87 | 87 |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -5 | -2 | -3 | -3 | -7 | -9 |
| — | -1 | -3 | -2 | -3 | -3 | -5 | -6 |
| — | 0 | 0 | 0 | 0 | -2 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | -1 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | +2 | +1 | +1 | +1 | +1 | +1 | +2 |
| — | +6 | +6 | +5 | +6 | +5 | +5 | +4 |
| — | +7 | +7 | +6 | +7 | +6 | +6 | +6 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| [illegible] | 110 | 088 | 093 | 092 | 091 | 093 | 091 | 090 |
| 5% | 112 | 090 | 093 | 093 | 091 | 093 | 091 | 090 |
| 10% | 115 | 095 | 097 | 096 | 094 | 095 | 095 | 094 |
| 25% | 119 | 101 | 101 | 101 | 100 | 100 | 100 | 100 |
| 50% | 128 | 108 | 107 | 110 | 108 | 108 | 107 | 108 |
| 75% | 141 | 123 | 122 | 124 | 122 | 125 | 122 | 121 |
| 90% | 150 | 130 | 129 | 130 | 126 | 130 | 127 | 129 |
| 95% | 152 | 136 | 134 | 136 | 184 | 134 | 132 | 133 |
| [illegible] | 153 | 137 | 134 | 139 | 229 | 135 | 133 | 135 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -27 | -24 | -23 | -24 | -22 | -24 | -25 |
| — | -25 | -24 | -23 | -24 | -21 | -23 | -24 |
| — | -18 | -20 | -19 | -20 | -19 | -20 | -21 |
| — | -17 | -17 | -16 | -16 | -16 | -16 | -17 |
| — | -14 | -15 | -13 | -15 | -14 | -15 | -15 |
| — | -13 | -12 | -12 | -14 | -12 | -13 | -13 |
| — | -11 | -11 | -9 | -13 | -9 | -12 | -11 |
| — | -8 | -9 | -6 | +27 | -8 | -9 | -8 |
| — | -6 | -8 | -5 | +57 | -8 | -9 | -8 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 794 | 778 | 779 | 780 | 785 | 782 | 781 | 780 |
| 795 | 778 | 780 | 781 | 785 | 782 | 781 | 780 |
| 798 | 780 | 782 | 785 | 785 | 783 | 783 | 782 |
| 802 | 784 | 786 | 787 | 788 | 787 | 786 | 784 |
| 809 | 791 | 792 | 795 | 795 | 794 | 792 | 791 |
| 818 | 802 | 802 | 804 | 814 | 803 | 801 | 801 |
| 828 | 809 | 812 | 815 | 816 | 805 | 811 | 811 |
| 839 | 819 | 821 | 824 | 5893 | 818 | 818 | 820 |
| 846 | 824 | 822 | 830 | — | 822 | 824 | 826 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -4 | -4 | -3 | -3 | -4 | -4 | -4 |
| — | -4 | -4 | -3 | -3 | -4 | -4 | -4 |
| — | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| — | -3 | -2 | -2 | -2 | -3 | -3 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -1 | -1 | -1 | -2 | -2 |
| — | -2 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | +603 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | 1134 | -1 | -1 | -1 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| [illegible] | 64 | 65 | 64 | 61 | 63 | 64 | 64 | 64 |
| 5% | 65 | 65 | 64 | 61 | 64 | 65 | 65 | 65 |
| | 66 | 67 | 68 | 65 | 66 | 67 | 68 | 69 |
| | 85 | 84 | 83 | 79 | 82 | 83 | 83 | 83 |
| | 98 | 98 | 98 | 92 | 96 | 98 | 98 | 98 |
| | 112 | 108 | 107 | 100 | 110 | 110 | 111 | 111 |
| | 118 | 115 | 114 | 107 | 117 | 119 | 119 | 120 |
| | 125 | 116 | 120 | 112 | 120 | 124 | 123 | 126 |
| | 129 | 117 | 122 | 115 | 121 | 127 | 125 | 128 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -14 | -12 | -16 | -9 | -7 | -7 | -8 |
| — | -11 | -11 | -16 | -8 | -7 | -6 | -7 |
| — | -7 | -9 | -14 | -5 | -5 | -4 | -5 |
| — | -5 | -4 | -11 | -3 | -2 | -2 | -1 |
| — | -1 | -1 | -7 | -2 | -1 | -1 | 0 |
| — | 0 | 0 | -5 | -1 | 0 | 0 | 0 |
| — | +1 | 0 | -3 | +1 | +2 | +2 | +3 |
| — | +2 | +2 | -2 | +4 | +5 | +6 | +8 |
| — | +2 | +3 | -2 | +6 | +7 | +8 | +11 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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PROCESS: B PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C. Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 800 mw, 30 V, 25°C. CELL NO.: 419226 NO. OF UNITS: 14

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.2 | 0.9 | 0.3 | 0.2 | 0.3 | <0.1 | <0.1 | 0.6 |
| 5% | 0.2 | 0.9 | 0.3 | 0.2 | 0.3 | <0.1 | <0.1 | 0.6 |
| 10% | 0.3 | 0.9 | 0.3 | 0.3 | 0.4 | 0.1 | 0.2 | 0.6 |
| 25% | 0.9 | 1.6 | 0.9 | 0.7 | 0.9 | 0.3 | 0.4 | 0.7 |
| 50% | 1.5 | 1.8 | 1.2 | 1.0 | 1.2 | 1.0 | 1.0 | 1.0 |
| 75% | 3.5 | 4.1 | 3.8 | 3.2 | 3.5 | 2.3 | 1.7 | 1.3 |
| 90% | 4.6 | 4.9 | 4.4 | 5018 | 4.2 | 3.5 | 3.2 | 3.2 |
| 95% | 4.6 | 5.0 | 4.4 | ∞ | 4.2 | 3.7 | 3.7 | 3.6 |
| Max | 4.6 | 5.0 | 4.4 | ∞ | 4.2 | 3.7 | 3.7 | 3.6 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| <0.1 | 0.5 | <0.1 | 0.1 | <0.1 | 0.1 | 0.2 | <0.1 |
| <0.1 | 0.7 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 |
| 0.3 | 1.2 | 0.5 | 0.3 | 0.5 | 0.2 | 0.5 | 0.4 |
| 1.7 | 2.7 | 2.3 | 1.2 | 2.3 | 1.1 | 1.9 | 1.1 |
| 13.9 | 14.0 | 14.8 | 10.3 | 13.5 | 8.3 | 13.1 | 3.4 |
| 22.0 | 14.1 | 16.6 | 12.8 | 14.0 | 13.8 | 22.3 | 3.9 |
| 22.0 | 14.1 | 16.6 | 12.8 | 14.0 | 13.8 | 22.3 | 3.9 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 60 | 60 | 60 | 59 | 59 | | 59 | 60 |
| 60 | 60 | 60 | 59 | 59 | | 59 | 60 |
| 63 | 62 | 62 | 63 | 63 | | 61 | 61 |
| 69 | 69 | 68 | 69 | 68 | | 66 | 66 |
| 73 | 73 | 72 | 72 | 72 | | 70 | 70 |
| 81 | 85 | 84 | 84 | 83 | | 89 | 86 |
| 91 | 91 | 90 | 92 | 92 | | 546 | 787 |
| 92 | 91 | 91 | 92 | 92 | | ∞ | ∞ |
| 92 | 91 | 91 | 92 | 92 | | ∞ | ∞ |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -3 | -4 | -4 | -4 | -6 | -12 | -11 |
| — | -3 | -4 | -4 | -4 | -6 | -12 | -11 |
| — | -3 | -4 | -3 | -3 | -5 | -12 | -11 |
| — | -2 | -2 | -2 | -2 | -3 | -5 | -4 |
| — | -1 | -2 | -1 | -1 | -2 | +3 | -1 |
| — | 0 | 0 | -1 | 0 | -1 | +2 | +2 |
| — | +6 | +5 | +7 | +6 | +583 | 585 | 879 |
| — | +6 | +5 | +8 | +8 | 1163 | 1163 | 1253 |
| — | +6 | +5 | +8 | +8 | 1163 | 1163 | 1253 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 106 | 89 | 88 | 91 | 90 | 90 | 93 | 102 |
| 5% | 106 | 89 | 88 | 90 | 90 | 90 | 93 | 102 |
| 10% | 107 | 91 | 89 | 90 | 90 | 92 | 93 | 103 |
| 25% | 115 | 95 | 98 | 99 | 97 | 101 | 99 | 105 |
| 50% | 122 | 104 | 101 | 104 | 104 | 104 | 107 | 111 |
| 75% | 137 | 121 | 122 | 124 | 121 | 125 | 126 | 129 |
| 90% | 152 | 128 | 128 | 130 | 127 | 5865 | ∞ | ∞ |
| 95% | 155 | 128 | 128 | 130 | 129 | ∞ | ∞ | ∞ |
| Max | 155 | 128 | 128 | 130 | 129 | ∞ | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -19 | -19 | -19 | -20 | -19 | -19 | -17 |
| — | -19 | -19 | -19 | -20 | -19 | -19 | -17 |
| — | -18 | -19 | -18 | -19 | -19 | -19 | -17 |
| — | -16 | -17 | -16 | -17 | -16 | -16 | -13 |
| — | -15 | -16 | -14 | -14 | -14 | -14 | -7 |
| — | -12 | -13 | -10 | -13 | -11 | -10 | +6 |
| — | -10 | -11 | -7 | -10 | 3677 | 7663 | 8301 |
| — | -9 | -10 | -5 | -9 | 7362 | 7964 | 8446 |
| — | -9 | -10 | -5 | -9 | 7362 | 7964 | 8446 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 794 | 782 | 783 | 786 | 780 | 780 | 784 | 796 |
| 794 | 782 | 783 | 786 | 780 | 780 | 784 | 796 |
| 795 | 783 | 784 | 787 | 782 | 780 | 784 | 798 |
| 800 | 785 | 785 | 789 | 785 | 784 | 786 | 805 |
| 804 | 791 | 791 | 792 | 789 | 789 | 795 | 810 |
| 811 | 796 | 795 | 796 | 796 | 797 | 801 | 812 |
| 816 | 800 | 798 | 801 | 799 | 5399 | ∞ | ∞ |
| 816 | 802 | 800 | 802 | 799 | ∞ | ∞ | ∞ |
| 816 | 802 | 800 | 802 | 799 | ∞ | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -2 | -2 | -2 | -3 | -2 | -1 |
| — | -2 | -2 | -2 | -2 | -3 | -2 | -1 |
| — | -2 | -2 | -2 | -2 | -3 | -2 | -1 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | 0 |
| — | -2 | -2 | -2 | -2 | -2 | -1 | 0 |
| — | -1 | -1 | -1 | -2 | -2 | -1 | +2 |
| — | -1 | -1 | -1 | -1 | 570 | 1145 | 1155 |
| — | -1 | -1 | -1 | -1 | 1141 | 1148 | 1158 |
| — | -1 | -1 | -1 | -1 | 1141 | 1148 | 1158 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 61 | 63 | 63 | 62 | 63 | 20 | 20 | 20 |
| 5% | 61 | 63 | 63 | 62 | 63 | 20 | 20 | 20 |
| | 65 | 67 | 68 | 66 | 67 | 45 | 20 | 20 |
| | 77 | 78 | 79 | 77 | 78 | 79 | 74 | 60 |
| | 94 | 96 | 91 | 96 | 96 | 100 | 97 | 89 |
| | 98 | 101 | 103 | 100 | 103 | 108 | 112 | 114 |
| | 104 | 111 | 113 | 112 | 113 | 116 | 124 | 679 |
| | 105 | 112 | 115 | 114 | 115 | 119 | 132 | 917 |
| | 105 | 112 | 115 | 114 | 115 | 119 | 132 | 917 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -8 | -7 | -10 | -9 | -67 | -81 | -81 |
| — | -8 | -7 | -10 | -9 | -67 | -81 | -81 |
| — | -5 | -7 | -6 | -5 | -35 | -74 | -80 |
| — | +1 | +1 | 0 | +1 | +2 | -1 | -31 |
| — | +4 | +5 | +2 | +4 | +8 | +6 | -2 |
| — | +6 | +7 | +5 | +6 | +11 | +14 | +18 |
| — | +8 | +10 | +9 | +10 | +15 | +30 | +619 |
| — | +9 | +11 | +11 | +11 | +16 | +39 | +875 |
| — | +9 | +11 | +11 | +11 | +16 | +39 | +875 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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PROCESS: B PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 700 mw, 30 V, 25°C.

CELL NO.: 419227 NO. OF UNITS: 29

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.8 | 0.2 | 0.2 | 0.4 | <0.1 | 0.2 | 0.2 |
| 5% | 0.2 | 0.9 | 0.3 | 0.2 | 0.4 | <0.1 | 0.3 | 0.2 |
| 10% | 0.4 | 0.9 | 0.4 | 0.3 | 0.5 | 0.1 | 0.3 | 0.2 |
| 25% | 1.0 | 1.8 | 1.1 | 0.9 | 1.3 | 1.0 | 0.7 | 0.9 |
| 50% | 2.2 | 3.4 | 2.8 | 1.8 | 2.0 | 1.6 | 1.0 | 1.3 |
| 75% | 3.6 | 4.5 | 3.5 | 2.7 | 3.5 | 3.3 | 2.9 | 3.3 |
| 90% | 4.7 | 5.1 | 4.4 | 3.8 | 4.5 | 4.2 | 3.7 | 4.0 |
| 95% | 4.9 | 9.8 | 6.9 | 3.9 | 4.8 | 5037 | 3.9 | 4.4 |
| Max | 5.0 | 14.4 | 9.2 | 3.9 | 4.8 | ∞ | 3.9 | 4.5 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 |
| <0.1 | 0.6 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 |
| <0.1 | 0.7 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | 0.1 |
| 0.1 | 0.8 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.4 |
| 0.4 | 1.0 | 0.6 | 0.6 | 0.6 | 0.4 | 0.4 | 0.9 |
| 1.3 | 2.0 | 1.7 | 1.9 | 1.3 | 1.1 | 1.3 | 2.7 |
| 5.7 | 6.6 | 6.4 | 6.3 | 6.4 | 6.2 | 6.4 | 6.9 |
| 14.9 | 11.2 | 12.1 | 5069 | 10.0 | 5074 | 12.8 | 14.3 |
| 15.3 | 13.9 | 17.6 | ∞ | 13.5 | ∞ | 16.3 | 17.4 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 63 | 63 | 63 | 07 | 59 | 62 | 59 | 63 |
| 64 | 63 | 63 | 33 | 61 | 63 | 61 | 63 |
| 65 | 64 | 64 | 63 | 63 | 64 | 62 | 64 |
| 68 | 68 | 68 | 67 | 67 | 67 | 66 | 67 |
| 72 | 73 | 73 | 71 | 71 | 71 | 70 | 70 |
| 79 | 80 | 80 | 78 | 80 | 81 | 79 | 78 |
| 83 | 86 | 86 | 87 | 87 | 88 | 88 | 88 |
| 88 | 88 | 88 | 88 | 89 | 161 | 545 | 90 |
| 90 | 89 | 89 | 89 | 89 | 225 | ∞ | 91 |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -2 | -91 | -30 | -14 | -20 | -4 |
| — | -2 | -2 | -56 | -11 | -11 | -13 | -4 |
| — | -1 | -2 | -2 | -2 | -5 | -4 | -3 |
| — | -1 | -1 | -2 | -2 | -2 | -3 | -2 |
| — | 0 | -1 | -1 | -1 | -2 | -2 | -2 |
| — | +1 | 0 | 0 | 0 | +1 | 0 | 0 |
| — | +4 | +3 | +3 | +5 | +13 | +4 | +1 |
| — | +7 | +7 | +6 | +7 | +106 | +581 | +7 |
| — | +8 | +8 | +2 | +7 | +181 | 1153 | +9 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 098 | 002 | 084 | 088 | 086 | 083 | 086 | 082 |
| 5% | 105 | 045 | 089 | 089 | 088 | 088 | 089 | 085 |
| 10% | 112 | 092 | 095 | 093 | 085 | 095 | 093 | 093 |
| 25% | 119 | 098 | 100 | 100 | 101 | 098 | 097 | 098 |
| 50% | 126 | 105 | 106 | 106 | 108 | 106 | 106 | 104 |
| 75% | 132 | 114 | 113 | 116 | 115 | 115 | 112 | 112 |
| 90% | 139 | 119 | 119 | 129 | 127 | 123 | 122 | 119 |
| 95% | 146 | 5063 | 128 | ∞ | 5015 | ∞ | ∞ | 128 |
| Max | 151 | ∞ | 128 | ∞ | ∞ | ∞ | ∞ | 130 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -98 | -33 | -32 | -33 | -31 | -34 | -33 |
| — | -66 | -26 | -27 | -27 | -26 | -29 | -29 |
| — | -21 | -18 | -19 | -19 | -20 | -21 | -20 |
| — | -18 | -17 | -17 | -16 | -18 | -18 | -18 |
| — | -16 | -16 | -14 | -15 | -15 | -16 | -16 |
| — | -13 | -14 | -11 | -11 | -12 | -13 | -13 |
| — | -11 | -9 | -7 | -7 | -8 | -11 | -11 |
| — | 3621 | -6 | 7335 | 3633 | 7335 | 7335 | -2 |
| — | 7252 | -4 | 7418 | 7252 | 7418 | 7418 | +2 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 795 | 630 | 780 | 782 | 777 | 585 | 778 | 781 |
| 796 | 704 | 780 | 782 | 778 | 682 | 779 | 782 |
| 797 | 780 | 780 | 783 | 780 | 780 | 780 | 786 |
| 800 | 784 | 785 | 784 | 784 | 783 | 785 | 788 |
| 807 | 791 | 791 | 793 | 789 | 792 | 790 | 795 |
| 814 | 796 | 797 | 799 | 794 | 797 | 797 | 802 |
| 819 | 803 | 803 | 807 | 810 | 806 | 805 | 813 |
| 831 | 5403 | 807 | ∞ | 5412 | ∞ | ∞ | 817 |
| 835 | ∞ | 808 | ∞ | ∞ | ∞ | ∞ | 809 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -22 | -5 | -5 | -5 | -27 | -5 | -4 |
| — | -14 | -4 | -4 | -4 | -16 | -4 | -4 |
| — | -3 | -3 | -2 | -3 | -3 | -2 | -2 |
| — | -2 | -2 | -2 | -3 | -3 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | 565 | -1 | 1129 | 566 | 1129 | 1129 | 0 |
| — | 1130 | -1 | 1130 | 1130 | 1130 | 1130 | 0 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 67 | 20 | 65 | 20 | 20 | 20 | 20 | 22 |
| 5% | 69 | 44 | 69 | 20 | 44 | 20 | 20 | 25 |
| | 73 | 73 | 74 | 68 | 73 | 20 | 70 | 82 |
| | 85 | 84 | 85 | 82 | 85 | 86 | 85 | 89 |
| | 93 | 92 | 91 | 92 | 94 | 94 | 95 | 100 |
| | 102 | 99 | 101 | 103 | 103 | 107 | 104 | 110 |
| | 105 | 105 | 109 | 108 | 110 | 112 | 109 | 114 |
| | 108 | 106 | 112 | 112 | 115 | 116 | 113 | 116 |
| | 109 | 107 | 115 | 115 | 116 | 117 | 116 | 117 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -81 | -11 | -81 | -81 | -81 | -81 | -11 |
| — | -45 | -11 | -80 | -46 | -80 | -80 | -9 |
| — | -8 | -10 | -8 | -10 | -7 | -12 | -3 |
| — | -2 | -4 | -2 | -1 | +1 | -1 | +1 |
| — | 0 | +2 | +1 | +2 | +4 | +4 | +8 |
| — | +2 | +3 | +5 | +6 | +9 | +8 | +11 |
| — | +3 | +7 | +7 | +10 | +14 | +11 | +13 |
| — | +5 | +8 | +9 | +11 | +16 | +13 | +15 |
| — | +5 | +8 | +9 | +11 | +17 | +14 | +16 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: B PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 500 mw, 30 V, 25°C.

CELL NO.: 419228 NO. OF UNITS: 70

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.2 | 0.9 | 1.3 | 0.4 | 0.3 | 0.2 | 0.3 | 0.5 |
| 5% | 0.4 | 1.0 | 1.3 | 0.5 | 0.6 | 0.3 | 0.4 | 0.7 |
| 10% | 0.5 | 1.2 | 1.5 | 0.7 | 0.7 | 0.5 | 0.6 | 1.0 |
| 25% | 0.9 | 1.6 | 1.9 | 1.0 | 1.1 | 0.9 | 1.0 | 1.3 |
| 50% | 2.1 | 3.4 | 3.3 | 2.3 | 2.5 | 2.4 | 2.3 | 2.6 |
| 75% | 3.7 | 4.5 | 4.2 | 3.5 | 3.5 | 3.4 | 3.4 | 4.0 |
| 90% | 4.1 | 5.0 | 4.6 | 3.9 | 4.0 | 4.3 | 4.2 | 4.6 |
| 95% | 4.5 | 13.2 | 13.9 | 12.9 | 18.7 | 5.1 | 5.6 | 9.7 |
| Max | 4.8 | 196.4 | 121.8 | 57.6 | 29.4 | 34.2 | 38.3 | 31.1 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.5 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 |
| <0.1 | 0.6 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | 0.4 |
| <0.1 | 0.6 | 0.5 | <0.1 | 0.1 | <0.1 | 0.1 | 0.4 |
| <0.1 | 0.8 | 0.6 | 0.2 | 0.2 | 0.2 | 0.3 | 0.6 |
| 0.4 | 1.1 | 0.8 | 0.5 | 0.5 | 0.5 | 0.5 | 1.0 |
| 1.3 | 2.1 | 1.7 | 1.4 | 1.4 | 1.3 | 1.3 | 1.7 |
| 3.1 | 4.1 | 3.5 | 2.9 | 3.4 | 3.4 | 3.1 | 4.0 |
| 5.6 | 6.6 | 5.5 | 5.8 | 5.9 | 6.7 | 6.8 | 6.3 |
| 14.6 | 12.2 | 6.7 | 19.9 | 12.4 | 18.8 | 19.0 | 19.3 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 60 | 60 | 60 | 60 | 60 | 60 | 07 | 60 |
| 62 | 62 | 62 | 62 | 62 | 62 | 60 | 61 |
| 65 | 65 | 66 | 66 | 66 | 65 | 63 | 65 |
| 70 | 69 | 70 | 70 | 69 | 70 | 69 | 69 |
| 73 | 73 | 73 | 74 | 73 | 73 | 73 | 73 |
| 80 | 81 | 81 | 80 | 80 | 80 | 79 | 79 |
| 85 | 85 | 86 | 85 | 85 | 85 | 86 | 85 |
| 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 |
| 89 | 90 | 91 | 90 | 91 | 90 | ∞ | 90 |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -5 | -4 | -4 | -5 | -4 | -90 | -14 |
| — | -1 | -1 | -1 | -1 | -2 | -9 | -7 |
| — | -1 | 0 | -1 | -1 | -1 | -3 | -2 |
| — | 0 | 0 | 0 | 0 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | +1 | +1 | +1 | +1 | 0 | 0 |
| — | +3 | +4 | +3 | +4 | +2 | +2 | +3 |
| — | +6 | +7 | +6 | +7 | +6 | 1310 | +7 |

$V_{CE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | | 085 | 088 | 090 | 086 | 088 | 089 | 086 |
| 5% | | 092 | 093 | 094 | 092 | 093 | 090 | 092 |
| 10% | | 094 | 096 | 099 | 097 | 097 | 094 | 094 |
| 25% | | 100 | 100 | 102 | 100 | 102 | 100 | 100 |
| 50% | | 105 | 105 | 107 | 107 | 106 | 105 | 105 |
| 75% | | 111 | 113 | 113 | 111 | 114 | 111 | 115 |
| 90% | | 124 | 125 | 128 | 127 | 128 | 128 | 128 |
| 95% | | 136 | 138 | 137 | 138 | 138 | 139 | 142 |
| Max | | 144 | 145 | 143 | 144 | 143 | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 791 | 778 | 784 | 603 | 780 | 779 | 777 | 777 |
| 795 | 780 | 784 | 783 | 783 | 780 | 780 | 780 |
| 798 | 782 | 785 | 784 | 784 | 783 | 780 | 780 |
| 803 | 784 | 787 | 787 | 786 | 785 | 783 | 783 |
| 807 | 789 | 793 | 793 | 792 | 790 | 789 | 789 |
| 813 | 795 | 797 | 797 | 797 | 795 | 794 | 794 |
| 822 | 798 | 800 | 803 | 800 | 799 | 799 | 799 |
| 833 | 810 | 805 | 805 | 805 | 804 | 801 | 809 |
| 921 | 824 | 825 | 823 | 819 | 820 | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -15 | -15 | -25 | -15 | -15 | -15 | -7 |
| — | -4 | -3 | -5 | -3 | -3 | -4 | -3 |
| — | -3 | -2 | -2 | -3 | -3 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | 1136 | 1190 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 36 | 47 | 20 | 57 | 57 | 58 | 20 | 20 |
| 5% | 58 | 58 | 57 | 59 | 59 | 60 | 58 | 57 |
| 10% | 67 | 70 | 66 | 69 | 69 | 70 | 68 | 65 |
| 25% | 84 | 85 | 82 | 83 | 84 | 86 | 84 | 83 |
| 50% | 93 | 93 | 91 | 93 | 93 | 96 | 97 | 96 |
| 75% | 101 | 101 | 96 | 100 | 99 | 102 | 103 | 104 |
| 90% | 103 | 106 | 103 | 106 | 106 | 107 | 106 | 108 |
| 95% | 105 | 108 | 105 | 108 | 107 | 109 | 109 | 109 |
| Max | 108 | 110 | 108 | 109 | 109 | 113 | 119 | 115 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -22 | -22 | -6 | -9 | -4 | -28 | -30 |
| — | -7 | -10 | -3 | -8 | -2 | -5 | -4 |
| — | -5 | -9 | -2 | -7 | 0 | -2 | -2 |
| — | -1 | -6 | -1 | -3 | 0 | 0 | 0 |
| — | +1 | -2 | -1 | -1 | +1 | +1 | +1 |
| — | +1 | 0 | 0 | +1 | +3 | +4 | +3 |
| — | +6 | +2 | +6 | +6 | +7 | +10 | +11 |
| — | +8 | +2 | +8 | +7 | +11 | +14 | +16 |
| — | +125 | +121 | +103 | +122 | +124 | +123 | +123 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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PROCESS: 8 PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 400 mw, 30 V, 150°C. CELL NO.: 419229 NO. OF UNITS: 14

$I_{CEO}$ ($V_{CE}$ - 60V)(Nanoamps.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.2 | 0.7 | 0.5 | 0.3 | 0.1 | 0.2 | <0.1 | 0.3 |
| 5% | 0.2 | 0.7 | 0.5 | 0.3 | 0.1 | 0.2 | <0.1 | 0.3 |
| 10% | 0.2 | 0.8 | 0.5 | 0.4 | 0.1 | 0.3 | 0.1 | 0.4 |
| 25% | 0.4 | 1.1 | 0.6 | 0.5 | 0.4 | 0.4 | 0.3 | 0.6 |
| 50% | 1.9 | 2.5 | 2.2 | 1.8 | 1.3 | 1.6 | 1.6 | 0.8 |
| 75% | 4.4 | 4.6 | 4.2 | 3.9 | 3.1 | 3.6 | 4.1 | 3.6 |
| 90% | 5.1 | 5.1 | 4.6 | 4.3 | 3.5 | 4.1 | 4.4 | 4.3 |
| 95% | 5.4 | 5.3 | 4.6 | 4.5 | 3.5 | 4.2 | 4.4 | 4.6 |
| Max | 5.4 | 5.3 | 4.6 | 4.5 | 3.5 | 4.2 | 4.4 | 4.6 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.6 | 0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.6 | 0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.6 | 0.2 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.9 | 0.3 | 0.3 | <0.1 | <0.1 | <0.1 | 0.1 |
| 0.1 | 1.1 | 0.5 | 0.5 | 0.2 | 0.3 | 0.2 | 0.6 |
| 1.1 | 2.0 | 1.4 | 1.2 | 0.8 | 1.2 | 1.1 | 1.8 |
| 3.5 | 6.9 | 6.0 | 5.6 | 4.9 | 5.1 | 5.4 | 4.8 |
| 5.7 | 7.5 | 6.6 | 6.0 | 5.3 | 5.7 | 6.2 | 6.1 |
| 5.7 | 7.5 | 6.6 | 6.0 | 5.3 | 5.7 | 6.2 | 6.1 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 61 | 61 | 61 | 61 | 61 | 61 | 59 | 10 |
| 61 | 61 | 61 | 61 | 61 | 61 | 59 | 10 |
| 61 | 61 | 61 | 61 | 62 | 61 | 60 | 32 |
| 68 | 68 | 68 | 68 | 68 | 68 | 68 | 65 |
| 74 | 75 | 76 | 75 | 76 | 76 | 76 | 73 |
| 78 | 78 | 78 | 77 | 78 | 80 | 79 | 77 |
| 89 | 91 | 91 | 90 | 92 | 92 | 92 | 86 |
| 91 | 91 | 91 | 91 | 92 | 93 | 94 | 90 |
| 91 | 91 | 91 | 91 | 92 | 93 | 94 | 90 |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -15 | -12 | -15 | -9 | -2 | -8 | -84 |
| — | -15 | -12 | -15 | -9 | -2 | -8 | -84 |
| — | -8 | -7 | -9 | -6 | -2 | -6 | -48 |
| — | -1 | -1 | -2 | -1 | -1 | -2 | -4 |
| — | 0 | -1 | -1 | -1 | -1 | -1 | -2 |
| — | 0 | 0 | 0 | 0 | 0 | -1 | -1 |
| — | +18 | +19 | +18 | +21 | +21 | +21 | -1 |
| — | +36 | +37 | +35 | +39 | +41 | +41 | 0 |
| — | +36 | +37 | +35 | +39 | +41 | +41 | 0 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 107 | 093 | 010 | 090 | 091 | 059 | 090 | 083 |
| 5% | 107 | 093 | 010 | 090 | 091 | 059 | 090 | 083 |
| 10% | 110 | 096 | 051 | 095 | 094 | 080 | 094 | 085 |
| 25% | 117 | 103 | 101 | 100 | 099 | 102 | 100 | 096 |
| 50% | 123 | 105 | 106 | 105 | 105 | 106 | 106 | 105 |
| 75% | 128 | 113 | 114 | 114 | 112 | 114 | 113 | 112 |
| 90% | 138 | 117 | 116 | 118 | 115 | 115 | 118 | 119 |
| 95% | 138 | 117 | 116 | 120 | 116 | 116 | 120 | 125 |
| Max | 138 | 117 | 116 | 120 | 116 | 116 | 120 | 125 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -26 | -92 | -28 | -27 | -53 | -28 | -33 |
| — | -26 | -92 | -28 | -27 | -53 | -28 | -33 |
| — | -23 | -60 | -24 | -24 | -35 | -24 | -32 |
| — | -18 | -16 | -16 | -17 | -16 | -17 | -19 |
| — | -14 | -14 | -14 | -15 | -15 | -14 | -15 |
| — | -10 | -12 | -10 | -13 | -11 | -13 | -10 |
| — | -2 | -1 | -2 | -3 | -1 | -3 | -2 |
| — | +6 | +7 | +6 | +5 | +7 | +5 | +5 |
| — | +6 | +7 | +6 | +5 | +7 | +5 | +5 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 797 | 780 | 510 | 780 | 782 | 785 | 778 | 782 |
| 797 | 780 | 510 | 780 | 782 | 785 | 778 | 782 |
| 797 | 780 | 647 | 782 | 784 | 786 | 779 | 783 |
| 801 | 787 | 787 | 788 | 788 | 787 | 783 | 786 |
| 808 | 793 | 794 | 798 | 796 | 794 | 790 | 794 |
| 813 | 798 | 798 | 800 | 800 | 799 | 795 | 798 |
| 820 | 800 | 801 | 804 | 802 | 804 | 799 | 803 |
| 822 | 800 | 802 | 805 | 802 | 804 | 800 | 806 |
| 822 | 800 | 802 | 805 | 802 | 804 | 800 | 806 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -3 | -36 | -3 | -3 | -2 | -3 | -3 |
| — | -3 | -36 | -3 | -3 | -2 | -3 | -3 |
| — | -3 | -19 | -3 | -3 | -2 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -3 | -2 |
| — | -2 | -2 | -1 | -2 | -2 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 77 | 75 | 75 | 72 | 77 | 78 | 83 | 84 |
| 5% | 77 | 75 | 75 | 72 | 77 | 78 | 83 | 84 |
| 10% | 77 | 76 | 75 | 73 | 77 | 78 | 83 | 84 |
| 25% | 87 | 82 | 81 | 77 | 80 | 81 | 83 | 89 |
| 50% | 94 | 91 | 90 | 89 | 94 | 95 | 97 | 98 |
| 75% | 97 | 96 | 92 | 95 | 101 | 102 | 103 | 103 |
| 90% | 105 | 104 | 550 | 102 | 105 | 106 | 137 | 136 |
| 95% | 106 | 108 | ∞ | 103 | 108 | 108 | 164 | 162 |
| Max | 106 | 108 | ∞ | 103 | 108 | 108 | 164 | 162 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -15 | -16 | -21 | -21 | -19 | -12 | -7 |
| — | -15 | -16 | -21 | -21 | -19 | -12 | -7 |
| — | -11 | -12 | -15 | -14 | -12 | -11 | -4 |
| — | -6 | -7 | -7 | -2 | -1 | 0 | +2 |
| — | -1 | -1 | -5 | +1 | +2 | +6 | +7 |
| — | +2 | +3 | -2 | +3 | +4 | +10 | +10 |
| — | +5 | +444 | +1 | +5 | +6 | +33 | +32 |
| — | +5 | +843 | +1 | +5 | +7 | +55 | +52 |
| — | +5 | +843 | +1 | +5 | +7 | +55 | +52 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: 8 PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 200 mw, 30 V, 150°C.

CELL NO.: 419230 NO. OF UNITS: 29

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.4 | 0.8 | 0.6 | 0.5 | 0.5 | 0.3 | 1.1 | 0.1 |
| 5% | 0.5 | 0.9 | 0.7 | 0.5 | 0.5 | 0.4 | 1.1 | 0.3 |
| 10% | 0.6 | 1.2 | 0.8 | 0.5 | 0.6 | 0.4 | 1.2 | 0.9 |
| 25% | 0.9 | 1.5 | 1.2 | 1.0 | 0.9 | 0.9 | 1.5 | 1.2 |
| 50% | 1.4 | 2.0 | 1.7 | 1.6 | 1.3 | 1.7 | 2.1 | 1.7 |
| 75% | 3.2 | 3.7 | 3.7 | 3.4 | 2.9 | 3.3 | 3.7 | 3.7 |
| 90% | 3.8 | 4.3 | 4.6 | 5.0 | 4.0 | 4.3 | 4.5 | 4.3 |
| 95% | 4.6 | 4.8 | 5.6 | 7.0 | 6.8 | 29.3 | 7.2 | 21 |
| Max | 4.8 | 5.0 | 6.1 | 7.9 | 9.0 | 521 | 7.7 | 9.5 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Unit | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.6 | 0.1 | <0.1 | <0.1 | <0.1 | 0.5 | <0.1 |
| <0.1 | 0.7 | 0.2 | 0.1 | <0.1 | 0.1 | 0.5 | 0.1 |
| 0.1 | 0.8 | 0.3 | 0.3 | <0.1 | 0.1 | 0.7 | 0.2 |
| 0.2 | 1.0 | 0.5 | 0.5 | 0.2 | 0.3 | 0.9 | 0.5 |
| 1.3 | 1.9 | 1.5 | 1.6 | 0.9 | 1.2 | 1.9 | 1.5 |
| 3.9 | 4.0 | 3.6 | 3.5 | 3.0 | 3.1 | 4.1 | 3.4 |
| 10.0 | 13.2 | 8.6 | 8.1 | 7.3 | 7.7 | 8.5 | 8.0 |
| 24.4 | 50.6 | 17.9 | 17.2 | 15.0 | 16.3 | 18.0 | 14.4 |
| 25.6 | 78.3 | 25.2 | 24.6 | 19.9 | 21.3 | 23.5 | 17.6 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Unit | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 59 | 60 | 60 | 59 | 60 | 60 | 60 | 60 |
| 61 | 61 | 60 | 60 | 60 | 61 | 61 | 61 |
| 65 | 64 | 62 | 62 | 63 | 65 | 65 | 65 |
| 68 | 68 | 67 | 67 | 67 | 67 | 68 | 68 |
| 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 |
| 79 | 80 | 79 | 79 | 79 | 81 | 80 | 80 |
| 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| 90 | 90 | 90 | 90 | 90 | 548 | 548 | 548 |
| 94 | 95 | 95 | 95 | 95 | ∞ | ∞ | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Unit | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -19 | -19 | -19 | -13 | -22 | -2 |
| — | -1 | -10 | -10 | -11 | -13 | -12 | -2 |
| — | 0 | -1 | -1 | -1 | -10 | -2 | -1 |
| — | 0 | 0 | -1 | 0 | 0 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | +1 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | +2 | +2 | +1 | +1 | +3 | +1 | +1 |
| — | +3 | +2 | +2 | +2 | +635 | +635 | +622 |
| — | +3 | +2 | +2 | +2 | +242 | +242 | +242 |

$V_{CE(SAT)}$ ($I_C$ - 50 ma, $I_B$ - 5 ma)(Mv.)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 105 | 083 | 087 | 085 | 084 | 086 | 085 | 084 |
| 5% | 109 | 085 | 089 | 086 | 085 | 088 | 086 | 085 |
| 10% | 119 | 092 | 099 | 100 | 094 | 100 | 099 | 095 |
| 25% | 123 | 102 | 104 | 106 | 101 | 104 | 101 | 103 |
| 50% | 130 | 109 | 111 | 113 | 108 | 110 | 110 | 111 |
| 75% | 139 | 119 | 122 | 124 | 120 | 122 | 122 | 121 |
| 90% | 158 | 138 | 138 | 143 | 138 | 139 | 139 | 139 |
| 95% | 161 | 143 | 5071 | 5072 | 5069 | 5072 | 140 | 5070 |
| Max | 162 | 144 | ∞ | ∞ | ∞ | ∞ | 141 | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Unit | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -29 | -27 | -29 | -30 | -31 | -29 | -30 |
| — | -26 | -23 | -24 | -25 | -29 | -25 | -26 |
| — | -21 | -18 | -12 | -20 | -22 | -19 | -20 |
| — | -18 | -17 | -15 | -18 | -17 | -17 | -17 |
| — | -16 | -14 | -14 | -16 | -14 | -16 | -15 |
| — | -12 | -13 | -11 | -14 | -12 | -12 | -13 |
| — | -11 | -12 | -10 | -12 | -11 | -12 | -12 |
| — | -11 | 3977 | 3978 | 3976 | 3985 | -6 | 3976 |
| — | -10 | 7964 | 7964 | 7964 | 7964 | -1 | 7964 |

$V_{BE(SAT)}$ ($I_C$ - 50 ma, $I_B$ - 5 ma)(Mv.)

| Unit | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 798 | 780 | 780 | 777 | 784 | 781 | 363 | 779 |
| 799 | 781 | 782 | 780 | 786 | 784 | 551 | 780 |
| 801 | 781 | 784 | 786 | 787 | 786 | 783 | 782 |
| 805 | 786 | 787 | 790 | 790 | 790 | 785 | 786 |
| 807 | 792 | 794 | 794 | 795 | 795 | 793 | 792 |
| 815 | 797 | 798 | 800 | 800 | 800 | 797 | 795 |
| 820 | 800 | 802 | 804 | 803 | 802 | 799 | 799 |
| 827 | 809 | 5408 | 5408 | 5409 | 5409 | 809 | 5407 |
| 832 | 817 | ∞ | ∞ | ∞ | ∞ | 815 | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Unit | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -4 | -4 | -4 | -4 | -4 | -55 | -5 |
| — | -4 | -4 | -4 | -3 | -4 | -32 | -4 |
| — | -3 | -3 | -3 | -2 | -2 | -3 | -3 |
| — | -3 | -2 | -2 | -3 | -2 | -2 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -1 | -1 | -1 | -1 | -2 | -2 |
| — | -1 | -1 | 0 | -1 | -1 | -1 | -1 |
| — | -1 | +565 | 565 | 565 | 565 | -1 | 565 |
| — | -1 | 1130 | 1130 | 1130 | 1130 | -1 | 1130 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 56 | 56 | 20 | 20 | 20 | 20 | 55 | 20 |
| 5% | 57 | 58 | 38 | 38 | 37 | 38 | 57 | 38 |
| 10% | 70 | 68 | 59 | 59 | 58 | 59 | 68 | 59 |
| 25% | 75 | 76 | 77 | 76 | 75 | 77 | 78 | 77 |
| 50% | 88 | 87 | 86 | 88 | 87 | 87 | 89 | 89 |
| 75% | 97 | 97 | 95 | 97 | 96 | 98 | 98 | 98 |
| 90% | 107 | 108 | 105 | 106 | 106 | 103 | 109 | 108 |
| 95% | 108 | 109 | 107 | 110 | 108 | 107 | 112 | 113 |
| Max | 108 | 109 | 109 | 111 | 110 | 109 | 114 | 114 |

$h_{FE}$ (% Change from Initial)

| Unit | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -5 | -72 | -72 | -72 | -72 | -1 | -72 |
| — | -5 | -41 | -38 | -38 | -60 | -1 | -37 |
| — | -4 | -9 | -3 | -3 | -4 | -1 | -1 |
| — | -1 | -4 | -1 | -2 | -1 | 0 | 0 |
| — | 0 | 0 | 0 | -1 | 0 | 0 | +1 |
| — | +1 | +1 | +1 | 0 | +1 | +2 | +4 |
| — | +2 | +4 | +4 | +4 | +7 | +5 | +7 |
| — | +6 | +8 | +9 | +6 | +46 | +8 | +8 |
| — | +8 | +8 | +9 | +6 | +85 | +8 | +8 |

| Unit | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Unit | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: B PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 800 mw, 30 V, 25°C.

CELL NO.: 419231 NO. OF UNITS: 7

$I_{CEO}$ ($V_{CB}$ = 60V)(Nanoamps)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.6 | 1.3 | 0.9 | 0.8 | 0.8 | 0.4 | <0.1 | 0.1 |
| 5% | 0.6 | 1.3 | 0.9 | 0.8 | 0.8 | 0.4 | <0.1 | 0.1 |
| 10% | 0.6 | 1.3 | 0.9 | 0.8 | 0.8 | 0.4 | <0.1 | 0.1 |
| 25% | 1.6 | 1.9 | 1.7 | 0.9 | 1.3 | 1.0 | <0.1 | 0.3 |
| 50% | 3.2 | 3.3 | 3.1 | 2.6 | 3.3 | 2.5 | 1.0 | 1.5 |
| 75% | 3.6 | 3.8 | 4.2 | 3.0 | 3.7 | 3.1 | 2.7 | 2.8 |
| 90% | 5.1 | 4.5 | 20.0 | 3.7 | 4.7 | 3.5 | 3.4 | 3.5 |
| 95% | 5.1 | 4.5 | 20.0 | 3.7 | 4.7 | 3.5 | 3.4 | 3.5 |
| Max | 5.1 | 4.5 | 20.0 | 3.7 | 4.7 | 3.5 | 3.4 | 3.5 |

$I_{EBO}$ ($V_{EB}$ = 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 |
| <0.1 | 0.5 | 0.1 | <0.1 | <0.1 | 0.3 | <0.1 | 0.1 |
| 0.8 | 0.7 | 1.0 | 0.3 | 0.3 | 0.6 | 0.4 | 0.4 |
| 1.2 | 2.4 | 1.5 | 1.9 | 1.5 | 1.0 | 1.7 | 1.4 |
| 2.5 | 2.7 | 2.3 | 2.3 | 2.7 | 2.8 | 2.4 | 3.1 |
| 2.5 | 2.7 | 2.3 | 2.3 | 2.7 | 2.8 | 2.4 | 3.1 |
| 2.5 | 2.7 | 2.3 | 2.3 | 2.7 | 2.8 | 2.4 | 3.1 |

$BV_{CEO}$ ($I_C$ = 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 64 | 63 | 63 | 63 | 63 | 63 | 53 | 49 |
| 64 | 63 | 63 | 63 | 63 | 63 | 53 | 49 |
| 64 | 63 | 63 | 63 | 63 | 63 | 53 | 49 |
| 66 | 66 | 66 | 66 | 65 | 65 | 63 | 51 |
| 73 | 71 | 71 | 71 | 71 | 70 | 69 | 65 |
| 77 | 75 | 75 | 75 | 75 | 75 | 74 | 78 |
| 81 | 77 | 77 | 80 | 79 | 77 | 77 | ∞ |
| 81 | 77 | 77 | 80 | 79 | 77 | 77 | ∞ |
| 81 | 77 | 77 | 80 | 79 | 77 | 77 | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -8 | -6 | -6 | -3 | -4 | -17 | -34 |
| — | -8 | -6 | -6 | -3 | -4 | -17 | -34 |
| — | -8 | -6 | -6 | -3 | -4 | -17 | -34 |
| — | -4 | -5 | -2 | -3 | -4 | -10 | -23 |
| — | -2 | -2 | -2 | -3 | -2 | -6 | -4 |
| — | 0 | -1 | -1 | -1 | -1 | -3 | -1 |
| — | +3 | +2 | +3 | +4 | +2 | -1 | 1273 |
| — | +3 | +2 | +3 | +4 | +2 | -1 | 1273 |
| — | +3 | +2 | +3 | +4 | +2 | -1 | 1273 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 111 | 091 | 094 | 094 | 014 | 094 | 002 | 100 |
| 5% | 111 | 091 | 094 | 094 | 014 | 094 | 002 | 100 |
| 10% | 111 | 091 | 094 | 094 | 014 | 094 | 002 | 100 |
| 25% | 114 | 095 | 097 | 097 | 095 | 098 | 093 | 103 |
| 50% | 119 | 103 | 100 | 102 | 106 | 104 | 114 | 132 |
| 75% | 129 | 113 | 115 | 120 | 114 | 116 | ∞ | ∞ |
| 90% | 137 | 115 | 115 | 124 | 116 | 120 | ∞ | ∞ |
| 95% | 137 | 115 | 115 | 134 | 116 | 120 | ∞ | ∞ |
| Max | 137 | 115 | 115 | 124 | 116 | 120 | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -23 | -20 | -20 | -90 | -20 | -98 | -10 |
| — | -23 | -20 | -20 | -90 | -20 | -98 | -10 |
| — | -23 | -20 | -20 | -90 | -20 | -98 | -10 |
| — | -16 | -17 | -14 | -17 | -13 | -18 | -10 |
| — | -13 | -13 | -12 | -12 | -12 | -12 | +2 |
| — | -12 | -11 | -8 | -10 | -10 | 7199 | 8303 |
| — | -11 | -11 | -4 | -7 | -9 | 8374 | 8374 |
| — | -11 | -11 | -4 | -7 | -9 | 8374 | 8374 |
| — | -11 | -11 | -4 | -7 | -9 | 8374 | 8374 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 798 | 780 | 785 | 784 | 713 | 778 | 786 | 793 |
| 798 | 780 | 785 | 784 | 713 | 778 | 786 | 793 |
| 798 | 780 | 785 | 784 | 713 | 778 | 786 | 793 |
| 799 | 785 | 788 | 788 | 727 | 783 | 790 | 797 |
| 800 | 791 | 790 | 790 | 787 | 787 | 802 | 819 |
| 808 | 798 | 797 | 800 | 797 | 795 | ∞ | ∞ |
| 812 | 801 | 800 | 807 | 800 | 800 | ∞ | ∞ |
| 812 | 811 | 810 | 807 | 800 | 800 | ∞ | ∞ |
| 812 | 801 | 800 | 807 | 800 | 800 | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -1 | -2 | -12 | -3 | -2 | -1 |
| — | -2 | -2 | -2 | -12 | -3 | -2 | -1 |
| — | -2 | -2 | -2 | -12 | -3 | -2 | -1 |
| — | -2 | -2 | -1 | -3 | -2 | -2 | 0 |
| — | -1 | -1 | -1 | -2 | -2 | -1 | +1 |
| — | -1 | -1 | -1 | -2 | -2 | 1139 | 1150 |
| — | -1 | -1 | 0 | -1 | -1 | 1151 | 1151 |
| — | -1 | -1 | 0 | -1 | -1 | 1151 | 1151 |
| — | -1 | -1 | 0 | -1 | -1 | 1151 | 1151 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 82 | 78 | 79 | 77 | 74 | 77 | 20 | 20 |
| 5% | 82 | 78 | 79 | 77 | 74 | 77 | 20 | 20 |
| 10% | 82 | 78 | 79 | 77 | 74 | 77 | 20 | 20 |
| 25% | 82 | 87 | 86 | 88 | 89 | 92 | 20 | 20 |
| 50% | 100 | 108 | 103 | 109 | 110 | 114 | 112 | 86 |
| 75% | 106 | 117 | 112 | 115 | 116 | 118 | 119 | 118 |
| 90% | 107 | 117 | 113 | 117 | 116 | 124 | 131 | 131 |
| 95% | 107 | 117 | 113 | 117 | 116 | 124 | 131 | 131 |
| Max | 107 | 117 | 113 | 117 | 116 | 124 | 131 | 131 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -17 | -17 | -18 | -21 | -18 | -80 | -81 |
| — | -17 | -17 | -18 | -21 | -18 | -80 | -81 |
| — | -17 | -17 | -18 | -21 | -18 | -80 | -81 |
| — | +3 | -4 | +2 | +3 | +6 | -79 | -80 |
| — | +4 | +2 | +6 | +6 | +9 | +8 | +5 |
| — | +10 | +7 | +8 | +9 | +12 | +12 | +13 |
| — | +42 | +36 | +43 | +41 | +50 | +59 | +59 |
| — | +42 | +36 | +43 | +41 | +50 | +59 | +59 |
| — | +42 | +36 | +43 | +41 | +50 | +59 | +59 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: B PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 700 mw, 30 V, 25°C.

CELL NO.: 419232 NO. OF UNITS: 15

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.4 | 0.9 | 0.5 | 0.5 | 0.1 | 0.1 | <0.1 | 0.3 |
| 5% | 0.4 | 0.9 | 0.5 | 0.5 | 0.1 | 0.1 | <0.1 | 0.3 |
| 10% | 0.5 | 1.1 | 0.6 | 0.6 | 0.2 | 0.3 | 0.2 | 0.4 |
| 25% | 0.8 | 1.6 | 1.2 | 1.0 | 0.5 | 0.6 | 0.5 | 1.0 |
| 50% | 1.3 | 2.1 | 1.7 | 1.5 | 1.3 | 1.3 | 1.0 | 1.2 |
| 75% | 2.6 | 3.2 | 3.0 | 2.7 | 2.8 | 6.1 | 10.3 | 11.3 |
| 90% | 3.2 | 363.8 | 140.1 | 34.2 | 38.4 | ∞ | 4080 | ∞ |
| 95% | 3.3 | 891.6 | 140.1 | 79.7 | 90.8 | ∞ | ∞ | ∞ |
| Max | 3.3 | 891.6 | 140.1 | 79.7 | 90.8 | ∞ | ∞ | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.4 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.5 | <0.1 | <0.1 | 0.3 | 0.1 | <0.1 | 0.1 |
| 0.2 | 0.7 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.4 |
| 0.5 | 1.1 | 0.8 | 0.7 | 0.8 | 0.7 | 0.9 | 0.9 |
| 1.7 | 2.1 | 4.3 | 2.8 | 2.6 | ∞ | 24.3 | 4458 |
| 25.3 | 229 | 4186 | 4163 | ∞ | ∞ | ∞ | ∞ |
| 31.8 | 30.5 | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |
| 31.8 | 30.5 | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 62 | 62 | 62 | 62 | 08 | 20 | 61 | 15 |
| 62 | 62 | 62 | 62 | 08 | 20 | 61 | 15 |
| 64 | 63 | 63 | 63 | 40 | 41 | 63 | 33 |
| 65 | 66 | 65 | 65 | 65 | 65 | 65 | 63 |
| 68 | 72 | 72 | 72 | 91 | 83 | 79 | 67 |
| 79 | 84 | 85 | 85 | 88 | 104 | 104 | 84 |
| 88 | 95 | 95 | 96 | ∞ | 231 | ∞ | 98 |
| 90 | 103 | 104 | 105 | ∞ | 237 | ∞ | 102 |
| 90 | 103 | 104 | 105 | ∞ | 237 | ∞ | 102 |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -3 | -3 | -90 | -69 | -9 | -77 |
| — | -2 | -3 | -3 | -90 | -69 | -9 | -77 |
| — | -2 | -3 | -2 | -38 | -35 | -7 | -55 |
| — | -1 | -1 | -1 | -1 | -4 | -3 | -11 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | -2 |
| — | +1 | +2 | +2 | +35 | +45 | +60 | +1 |
| — | +32 | +29 | +33 | 1104 | +236 | 1124 | +48 |
| — | +34 | +35 | +36 | 1287 | +268 | 1287 | +57 |
| — | +34 | +35 | +36 | 1287 | +268 | 1287 | +57 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 104 | 089 | 088 | 090 | 086 | 010 | 087 | 092 |
| 5% | 104 | 089 | 088 | 090 | 086 | 010 | 087 | 092 |
| 10% | 106 | 090 | 089 | 093 | 090 | 010 | 092 | 093 |
| 25% | 114 | 099 | 100 | 101 | 100 | 100 | 099 | 100 |
| 50% | 126 | 104 | 104 | 104 | 107 | 109 | 110 | 107 |
| 75% | 132 | 109 | 113 | 113 | 117 | 120 | 114 | 123 |
| 90% | 141 | 118 | 117 | 120 | ∞ | ∞ | ∞ | 6288 |
| 95% | 143 | 118 | 120 | 122 | ∞ | ∞ | ∞ | ∞ |
| Max | 143 | 118 | 120 | 122 | ∞ | ∞ | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -25 | -22 | -21 | -24 | -92 | -19 | -18 |
| — | -25 | -22 | -21 | -24 | -92 | -19 | -18 |
| — | -24 | -21 | -19 | -22 | -91 | -19 | -18 |
| — | -19 | -19 | -17 | -18 | -18 | -17 | -17 |
| — | -17 | -17 | -15 | -14 | -14 | -11 | -15 |
| — | -14 | -13 | -11 | -11 | -2 | +50 | -1 |
| — | -10 | -11 | -8 | 7493 | 7493 | 2557 | 4724 |
| — | -9 | -11 | -7 | 7533 | 7533 | 2592 | 7592 |
| — | -9 | -11 | -7 | 7533 | 7533 | 2592 | 7592 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 721 | 787 | 786 | 786 | 785 | 785 | 790 | 791 |
| 721 | 787 | 786 | 786 | 785 | 785 | 790 | 791 |
| 767 | 787 | 786 | 788 | 786 | 786 | 790 | 793 |
| 804 | 791 | 790 | 793 | 788 | 788 | 790 | 795 |
| 808 | 795 | 792 | 795 | 792 | 792 | 795 | 799 |
| 810 | 796 | 794 | 795 | 796 | 795 | 765 | 802 |
| 816 | 798 | 795 | 799 | ∞ | ∞ | ∞ | 6588 |
| 817 | 799 | 795 | 802 | ∞ | ∞ | ∞ | ∞ |
| 817 | 799 | 795 | 802 | ∞ | ∞ | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -4 | -3 | -3 | -3 | -3 | -3 | -2 |
| — | -4 | -3 | -3 | -3 | -3 | -3 | -2 |
| — | -3 | -3 | -3 | -3 | -2 | -2 | -2 |
| — | -2 | -3 | -2 | -2 | -2 | -2 | -1 |
| — | -2 | -2 | -2 | -2 | -2 | -1 | -1 |
| — | -1 | -2 | -2 | -1 | +2 | +10 | +6 |
| — | +3 | +3 | +3 | 1131 | 1131 | 1137 | +210 |
| — | +10 | +10 | +10 | 1136 | 1136 | 1138 | 1138 |
| — | +10 | +10 | +10 | 1136 | 1136 | 1138 | 1138 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 76 | 58 | 57 | 61 | 20 | 20 | 20 | 20 |
| 5% | 76 | 58 | 57 | 61 | 20 | 20 | 20 | 20 |
| 10% | 78 | 68 | 68 | 66 | 20 | 20 | 20 | 24 |
| 25% | 86 | 80 | 80 | 78 | 67 | 23 | 20 | 61 |
| 50% | 93 | 90 | 91 | 94 | 95 | 95 | 82 | 95 |
| 75% | 100 | 98 | 99 | 101 | 99 | 101 | 101 | 105 |
| 90% | 106 | 102 | 104 | 109 | 110 | 109 | 109 | 592 |
| 95% | 110 | 104 | 106 | 112 | 114 | 114 | 114 | 909 |
| Max | 110 | 104 | 106 | 112 | 114 | 114 | 114 | 909 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -42 | -43 | -39 | -77 | -78 | -82 | -82 |
| — | -42 | -43 | -39 | -77 | -78 | -82 | -82 |
| — | -23 | -26 | -28 | -76 | -77 | -80 | -77 |
| — | -3 | -2 | -5 | -24 | -25 | -77 | -36 |
| — | -2 | 0 | 0 | +2 | +2 | 0 | +6 |
| — | +1 | +4 | +3 | +4 | +6 | +5 | +12 |
| — | +7 | +9 | +14 | +16 | +14 | +15 | +495 |
| — | +11 | +13 | +16 | +18 | +22 | +22 | +806 |
| — | +11 | +13 | +16 | +18 | +22 | +22 | +806 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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PROCESS: B PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 500 mw, 30 V, 25°C. CELL NO.: 419233 NO. OF UNITS: 40

$I_{CEO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.5 | 0.8 | 1.2 | 0.4 | 0.1 | 0.1 | <0.1 | 0.1 |
| 5% | 0.5 | 0.9 | 1.5 | 0.5 | 0.3 | 0.2 | 0.1 | 0.6 |
| 10% | 0.7 | 1.2 | 1.6 | 0.7 | 0.5 | 0.5 | 0.3 | 1.0 |
| 25% | 1.0 | 1.6 | 1.8 | 1.3 | 0.9 | 1.0 | 1.0 | 1.2 |
| 50% | 1.8 | 2.6 | 2.9 | 2.3 | 1.7 | 1.6 | 1.5 | 1.6 |
| 75% | 3.7 | 4.3 | 4.2 | 3.9 | 3.0 | 3.6 | 3.3 | 3.9 |
| 90% | 4.3 | 5.8 | 5.2 | 4.5 | 3.7 | 4.3 | 3.7 | 4.3 |
| 95% | 4.8 | 12.8 | 9.5 | 175T | 52.6 | 238 | 38.1 | 4.8 |
| Max | 4.9 | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | 7.6 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.6 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 |
| <0.1 | 0.6 | 0.3 | 0.1 | <0.1 | <0.1 | <0.1 | 0.1 |
| <0.1 | 0.7 | 0.5 | 0.2 | <0.1 | <0.1 | <0.1 | 0.3 |
| 0.1 | 0.9 | 0.6 | 0.4 | 0.1 | 0.2 | 0.3 | 0.6 |
| 0.4 | 1.2 | 0.8 | 0.6 | 0.3 | 0.4 | 0.7 | 0.7 |
| 0.8 | 1.7 | 1.4 | 1.3 | 1.0 | 1.0 | 1.1 | 1.5 |
| 4.8 | 7.0 | 8.8 | 9.7 | 2.6 | 2.1 | 2.0 | 5.4 |
| 9.1 | 12.3 | 12.7 | 13.1 | 11.6 | 11.8 | 11.7 | 10.0 |
| 12.4 | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | 12.5 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 60 | 05 | 06 | 08 | 04 | 10 | 11 | 60 |
| 61 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| 63 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 66 | 66 | 66 | 66 | 66 | 65 | 65 | 65 |
| 73 | 72 | 72 | 72 | 72 | 72 | 72 | 72 |
| 79 | 81 | 81 | 80 | 80 | 80 | 79 | 78 |
| 86 | 88 | 88 | 88 | 88 | 88 | 88 | 89 |
| 89 | 92 | 93 | 93 | 93 | 93 | 93 | 94 |
| 89 | 123 | 125 | 122 | 123 | 123 | 123 | ∞ |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -93 | -91 | -88 | -93 | -85 | -84 | -11 |
| — | -1 | -1 | -2 | -2 | -11 | -8 | -5 |
| — | -1 | -1 | -1 | -1 | -2 | -3 | -4 |
| — | 0 | 0 | 0 | 0 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | +4 | +4 | +4 | +4 | +3 | +3 | +3 |
| — | +5 | +5 | +5 | +5 | +5 | +5 | +6 |
| — | +40 | +42 | +39 | +40 | +40 | +40 | 1417 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 104 | 084 | 085 | 083 | 085 | 087 | 083 | 084 |
| 5% | 106 | 092 | 093 | 093 | 090 | 095 | 091 | 093 |
| 10% | 116 | 095 | 097 | 096 | 097 | 097 | 095 | 096 |
| 25% | 119 | 101 | 101 | 103 | 101 | 101 | 101 | 102 |
| 50% | 126 | 108 | 108 | 109 | 108 | 109 | 107 | 108 |
| 75% | 132 | 117 | 118 | 120 | 119 | 120 | 118 | 120 |
| 90% | 151 | 128 | 127 | 130 | 129 | 136 | 131 | 140 |
| 95% | 158 | 132 | 133 | 142 | 144 | 183 | 185 | ∞ |
| Max | 160 | 143 | 139 | 175 | 180 | ∞ | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -21 | -21 | -21 | -23 | -19 | -22 | -21 |
| — | -21 | -19 | -20 | -20 | -19 | -20 | -21 |
| — | -19 | -18 | -18 | -18 | -18 | -20 | -19 |
| — | -17 | -17 | -17 | -16 | -16 | -18 | -18 |
| — | -15 | -15 | -13 | -15 | -15 | -16 | -15 |
| — | -11 | -13 | -11 | -12 | -11 | -13 | -12 |
| — | -10 | -9 | -5 | -7 | -7 | -7 | +10 |
| — | -8 | -5 | +10 | +11 | +17 | +18 | 8164 |
| — | -9 | +11 | +13 | +14 | 7553 | 7533 | 8520 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 714 | 780 | 781 | 300 | 783 | 778 | 781 | 776 |
| 793 | 781 | 783 | 280 | 785 | 779 | 782 | 777 |
| 799 | 783 | 785 | 783 | 788 | 780 | 783 | 778 |
| 802 | 786 | 789 | 785 | 790 | 785 | 787 | 784 |
| 805 | 791 | 794 | 790 | 793 | 791 | 791 | 788 |
| 814 | 795 | 799 | 797 | 800 | 797 | 797 | 795 |
| 824 | 802 | 805 | 805 | 810 | 808 | 810 | 812 |
| 838 | 805 | 815 | 813 | 815 | 810 | 853 | ∞ |
| 844 | 811 | 815 | 845 | 854 | 855 | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -6 | -6 | -63 | -6 | -6 | -6 | -7 |
| — | -4 | -3 | -6 | -3 | -4 | -3 | -4 |
| — | -3 | -2 | -3 | -2 | -3 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -3 |
| — | -2 | -2 | -2 | -1 | -2 | -2 | -2 |
| — | -2 | -1 | -2 | -1 | -2 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | +11 |
| — | -1 | 0 | +1 | +2 | +2 | +11 | 1142 |
| — | +11 | +11 | +11 | +12 | +11 | 1142 | 1445 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 69 | 20 | 61 | 62 | 23 | 20 | 20 | 20 |
| 5% | 69 | 60 | 68 | 68 | 68 | 35 | 24 | 20 |
| 10% | 75 | 74 | 73 | 73 | 70 | 70 | 69 | 69 |
| 25% | 85 | 84 | 83 | 85 | 76 | 87 | 86 | 84 |
| 50% | 90 | 92 | 91 | 90 | 91 | 93 | 91 | 92 |
| 75% | 97 | 99 | 97 | 97 | 95 | 100 | 99 | 101 |
| 90% | 99 | 103 | 100 | 100 | 101 | 107 | 105 | 109 |
| 95% | 102 | 107 | 108 | 102 | 108 | 110 | 108 | 110 |
| Max | 103 | 110 | ∞ | 109 | 108 | 110 | 109 | 114 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -72 | -37 | -36 | -76 | -80 | -80 | -80 |
| — | -36 | -8 | -8 | -3 | -72 | -73 | -79 |
| — | -6 | -6 | -5 | -2 | -1 | -2 | -2 |
| — | -1 | -2 | -2 | -1 | 0 | -1 | 0 |
| — | +2 | -1 | 0 | 0 | +4 | +3 | +5 |
| — | +6 | +4 | +3 | +4 | +8 | +7 | +9 |
| — | +8 | +7 | +9 | +6 | +11 | +10 | +11 |
| — | +12 | +9 | +11 | +9 | +12 | +14 | +17 |
| — | +16 | 185 | +11 | +14 | +16 | +19 | +23 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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PROCESS: 5 PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 400 mw, 30 V; 150°C.

CELL NO.: 419234 NO. OF UNITS: 7

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.5 | 1.0 | 0.3 | 0.3 | 0.7 | 0.3 | 0.4 | 0.3 |
| 5% | 0.5 | 1.0 | 0.3 | 0.3 | 0.7 | 0.3 | 0.4 | 0.3 |
| 10% | 0.5 | 1.0 | 0.3 | 0.3 | 0.7 | 0.3 | 0.4 | 0.3 |
| 25% | 0.8 | 1.3 | 0.9 | 0.7 | 0.7 | 0.7 | 0.8 | 0.4 |
| 50% | 1.5 | 1.9 | 1.6 | 1.3 | 1.2 | 1.2 | 1.3 | 1.3 |
| 75% | 4.4 | 4.6 | 4.0 | 3.8 | 3.2 | 3.5 | 3.6 | 3.9 |
| 90% | 4.8 | 4.7 | 4.5 | 4.0 | 3.5 | 3.6 | 3.7 | 4.2 |
| 95% | 4.8 | 4.7 | 4.5 | 4.0 | 3.5 | 3.6 | 3.7 | 4.2 |
| Max | 4.8 | 4.7 | 4.5 | 4.0 | 3.5 | 3.6 | 3.7 | 4.2 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.3 | <0.1 | <0.1 | 0.4 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | 0.4 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | 0.4 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.7 | 0.1 | 0.3 | 0.5 | <0.1 | 0.2 | <0.1 |
| 0.4 | 1.0 | 0.4 | 0.5 | ∞ | 0.4 | 0.2 | 0.5 |
| 0.6 | 1.2 | 0.7 | 0.7 | ∞ | 0.8 | 0.7 | 1.1 |
| 1.5 | 1.8 | 1.7 | 1.5 | ∞ | 0.9 | 1.2 | 1.3 |
| 1.5 | 1.8 | 1.7 | 1.5 | ∞ | 0.9 | 1.2 | 1.3 |
| 1.5 | 1.8 | 1.7 | 1.5 | ∞ | 0.9 | 1.2 | 1.3 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 71 | 71 | 71 | 71 | 71 | 68 | 67 | 65 |
| 71 | 71 | 71 | 71 | 71 | 68 | 67 | 65 |
| 71 | 71 | 71 | 71 | 71 | 68 | 67 | 65 |
| 71 | 71 | 71 | 71 | 71 | 71 | 71 | 70 |
| 71 | 71 | 74 | 74 | 72 | 72 | 71 | 71 |
| 76 | 76 | 90 | 90 | 76 | 76 | 76 | 75 |
| 90 | 90 | ∞ | ∞ | 90 | 90 | 90 | 89 |
| 90 | 90 | ∞ | ∞ | 90 | 90 | 90 | 89 |
| 90 | 90 | ∞ | ∞ | 90 | 90 | 90 | 89 |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | 0 | 0 | 0 | 0 | -4 | -6 | -8 |
| — | 0 | 0 | 0 | 0 | -4 | -6 | -8 |
| — | 0 | 0 | 0 | 0 | -4 | -6 | -8 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | -2 |
| — | 0 | 0 | 0 | +1 | 0 | 0 | -1 |
| — | 0 | +1 | +2 | +1 | +1 | +1 | 0 |
| — | +1 | [illegible] | [illegible] | +2 | +2 | +2 | +1 |
| — | +1 | [illegible] | [illegible] | +2 | +2 | +2 | +1 |
| — | +1 | [illegible] | [illegible] | +2 | +2 | +2 | +1 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 108 | 088 | 001 | 001 | 092 | 092 | 090 | 088 |
| 5% | 108 | 088 | 001 | 001 | 092 | 092 | 090 | 088 |
| 10% | 108 | 088 | 001 | 001 | 092 | 092 | 090 | 088 |
| 25% | 113 | 099 | 092 | 095 | 098 | 095 | 093 | 090 |
| 50% | 120 | 100 | 099 | 099 | 102 | 103 | 100 | 102 |
| 75% | 125 | 112 | 110 | 110 | 110 | 110 | 109 | 110 |
| 90% | 128 | 114 | 113 | 113 | 111 | 111 | 110 | 110 |
| 95% | 128 | 114 | 113 | 113 | 111 | 111 | 110 | 110 |
| Max | 128 | 114 | 113 | 113 | 111 | 111 | 110 | 110 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -19 | -99 | -99 | -18 | -17 | -19 | -20 |
| — | -19 | -99 | -99 | -18 | -17 | -19 | -20 |
| — | -19 | -99 | -99 | -18 | -17 | -19 | -20 |
| — | -18 | -18 | -18 | -15 | -16 | -18 | -19 |
| — | -13 | -13 | -12 | -14 | -14 | -16 | -14 |
| — | -12 | -12 | -12 | -12 | -12 | -14 | -14 |
| — | -9 | -11 | -11 | -11 | -10 | -12 | -11 |
| — | -9 | -11 | -11 | -11 | -10 | -12 | -11 |
| — | -9 | -11 | -11 | -11 | -10 | -12 | -11 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 795 | 781 | 785 | 785 | 786 | 783 | 779 | 780 |
| 795 | 781 | 785 | 785 | 786 | 783 | 779 | 780 |
| 795 | 781 | 785 | 785 | 786 | 783 | 779 | 780 |
| 800 | 783 | 786 | 785 | 786 | 787 | 782 | 782 |
| 801 | 789 | 790 | 794 | 793 | 794 | 784 | 792 |
| 804 | 795 | 793 | 795 | 796 | 796 | 792 | 794 |
| 811 | 795 | 797 | 797 | 798 | 797 | 796 | 796 |
| 811 | 795 | 797 | 797 | 798 | 797 | 796 | 796 |
| 811 | 795 | 797 | 797 | 798 | 797 | 796 | 796 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -2 | -1 | -1 | -2 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -1 | -1 | -1 | -2 | -1 |
| — | -2 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 83 | 82 | 76 | 77 | 79 | 81 | 81 | 85 |
| 5% | 83 | 82 | 76 | 77 | 79 | 81 | 81 | 85 |
| | 83 | 82 | 76 | 77 | 79 | 81 | 81 | 85 |
| | 84 | 82 | 81 | 77 | 82 | 82 | 86 | 90 |
| | 94 | 94 | 93 | 87 | 87 | 92 | 91 | 94 |
| | 99 | 98 | 97 | 94 | 100 | 105 | 109 | 114 |
| | 103 | 101 | 98 | 100 | 105 | 105 | 113 | 128 |
| | 103 | 101 | 98 | 100 | 105 | 105 | 113 | 128 |
| | 103 | 101 | 98 | 100 | 105 | 105 | 113 | 128 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -3 | -10 | -9 | -7 | -3 | -4 | 0 |
| — | -3 | -10 | -9 | -7 | -3 | -4 | 0 |
| — | -3 | -10 | -9 | -7 | -3 | -4 | 0 |
| — | -2 | -5 | -8 | -6 | -3 | -3 | +1 |
| — | -1 | -2 | -7 | -2 | -2 | +1 | +7 |
| — | 0 | -1 | -3 | +1 | +5 | +6 | +13 |
| — | 0 | -1 | -3 | +2 | +11 | +20 | +36 |
| — | 0 | -1 | -3 | +2 | +11 | +20 | +36 |
| — | 0 | -1 | -3 | +2 | +11 | +20 | +36 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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PROCESS: B PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 200 mw, 30 V, 150°C.

CELL NO.: 419235 NO. OF UNITS: 15

$I_{CEO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.6 | 1.4 | 1.0 | 0.8 | 0.7 | 0.2 | 0.5 | <0.1 |
| 5% | 0.6 | 1.4 | 1.0 | 0.8 | 0.7 | 0.2 | 0.5 | <0.1 |
| 10% | 0.7 | 1.4 | 1.0 | 0.9 | 0.8 | 0.2 | 0.6 | 0.5 |
| 25% | 1.3 | 1.7 | 1.3 | 1.2 | 1.0 | 0.7 | 1.1 | 1.0 |
| 50% | 2.0 | 2.5 | 2.3 | 2.3 | 1.7 | 1.9 | 2.0 | 1.6 |
| 75% | 3.8 | 3.8 | 3.8 | 3.8 | 3.0 | 3.3 | 3.3 | 3.4 |
| 90% | 4.5 | 14.9 | 1125 | 66.4 | 19.5 | 4.9 | 149.8 | 5.8 |
| 95% | 4.9 | 30.1 | 2822 | 159.6 | 43.1 | 6.5 | 368.3 | 7.8 |
| Max | 4.9 | 30.1 | 2822 | 159.6 | 43.1 | 6.5 | 368.3 | 7.8 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.8 | 0.2 | 0.3 | <0.1 | <0.1 | <0.1 | 0.2 |
| <0.1 | 0.8 | 0.2 | 0.3 | <0.1 | <0.1 | <0.1 | 0.2 |
| 0.1 | 0.8 | 0.2 | 0.3 | <0.1 | <0.1 | <0.1 | 0.2 |
| 0.2 | 0.8 | 0.3 | 0.4 | <0.1 | 0.1 | <0.1 | 0.3 |
| 0.3 | 1.0 | 0.5 | 0.5 | <0.1 | 0.3 | 0.1 | 0.5 |
| 0.7 | 1.5 | 1.1 | 1.3 | 0.9 | 1.0 | 0.7 | 1.4 |
| 3.1 | 7.0 | 6.4 | 5.2 | 4.3 | 5.8 | 6.4 | 7.7 |
| 12.2 | 7.8 | 7.9 | 7.4 | 6.1 | 6.0 | 7.4 | 7.9 |
| 12.2 | 7.8 | 7.9 | 7.4 | 6.1 | 6.0 | 7.4 | 7.9 |

$BV_{CFO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 61 | 61 | 61 | 61 | 61 | 61 | 61 | 61 |
| 61 | 61 | 61 | 61 | 61 | 61 | 61 | 61 |
| 63 | 63 | 63 | 63 | 63 | 62 | 63 | 62 |
| 68 | 68 | 68 | 68 | 68 | 68 | 67 | 66 |
| 73 | 74 | 74 | 74 | 74 | 73 | 73 | 73 |
| 80 | 81 | 82 | 82 | 82 | 82 | 82 | 83 |
| 86 | 86 | 86 | 86 | 86 | 85 | 86 | 86 |
| 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 |
| 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -3 | -4 | -5 | -4 | -5 | -8 | -14 |
| — | -3 | -4 | -5 | -4 | -5 | -8 | -14 |
| — | -1 | -2 | -3 | -2 | -3 | -6 | -8 |
| — | 0 | 0 | 0 | 0 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | +1 | +1 | +1 | 0 | 0 | 0 |
| — | +1 | +2 | +2 | +2 | +2 | +2 | +3 |
| — | +1 | +3 | +2 | +2 | +2 | +2 | +3 |
| — | +1 | +3 | +2 | +2 | +2 | +2 | +3 |

$V_{CE}$(SAT)($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 102 | 088 | 088 | 087 | 088 | 086 | 088 | 086 |
| 5% | 102 | 088 | 088 | 087 | 088 | 086 | 088 | 086 |
| 10% | 104 | 089 | 089 | 091 | 089 | 087 | 089 | 088 |
| 25% | 109 | 096 | 092 | 094 | 094 | 093 | 095 | 093 |
| 50% | 123 | 102 | 105 | 106 | 105 | 102 | 104 | 104 |
| 75% | 126 | 109 | 108 | 110 | 108 | 107 | 110 | 110 |
| 90% | 137 | 121 | 119 | 122 | 119 | 119 | 120 | 120 |
| 95% | 104 | 134 | 133 | 133 | 133 | 133 | 135 | 133 |
| Max | 104 | 134 | 133 | 133 | 133 | 133 | 135 | 133 |

$V_{CE}$(SAT)(% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -22 | -20 | -19 | -19 | -21 | -20 | -19 |
| — | -22 | -20 | -19 | -19 | -21 | -20 | -19 |
| — | -19 | -18 | -18 | -18 | -20 | -18 | -18 |
| — | -15 | -17 | -15 | -16 | -18 | -15 | -15 |
| — | -14 | -14 | -13 | -14 | -15 | -14 | -14 |
| — | -13 | -13 | -11 | -13 | -14 | -12 | -12 |
| — | -11 | -11 | -8 | -11 | -11 | -12 | -11 |
| — | -10 | -10 | -7 | -10 | -11 | -11 | -11 |
| — | -10 | -10 | -7 | -10 | -11 | -11 | -11 |

$V_{BE}$(SAT)($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 793 | 599 | 780 | 780 | 784 | 705 | 725 | 729 |
| 793 | 599 | 780 | 780 | 784 | 705 | 725 | 729 |
| 794 | 707 | 781 | 782 | 786 | 749 | 778 | 781 |
| 795 | 783 | 782 | 784 | 787 | 780 | 782 | 782 |
| 800 | 786 | 786 | 787 | 788 | 785 | 785 | 784 |
| 803 | 793 | 790 | 793 | 795 | 793 | 791 | 792 |
| 816 | 802 | 800 | 800 | 803 | 801 | 797 | 801 |
| 823 | 807 | 806 | 805 | 807 | 808 | 802 | 803 |
| 823 | 807 | 806 | 805 | 807 | 808 | 802 | 803 |

$V_{BE}$(SAT)(% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -24 | -3 | -3 | -2 | -12 | -3 | -3 |
| — | -24 | -3 | -3 | -2 | -12 | -3 | -3 |
| — | -11 | -2 | -2 | -2 | -7 | -3 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -2 | -1 | -2 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 69 | 72 | 76 | 77 | 76 | 76 | 79 | 79 |
| 5% | 69 | 72 | 76 | 77 | 76 | 76 | 79 | 79 |
| 10% | 78 | 79 | 83 | 84 | 82 | 82 | 84 | 84 |
| 25% | 87 | 91 | 90 | 93 | 93 | 91 | 94 | 95 |
| 50% | 92 | 93 | 94 | 96 | 95 | 94 | 96 | 99 |
| 75% | 96 | 96 | 97 | 99 | 96 | 96 | 99 | 100 |
| 90% | 98 | 102 | 98 | 101 | 100 | 101 | 103 | 103 |
| 95% | 101 | 103 | 98 | 102 | 101 | 102 | 103 | 103 |
| Max | 101 | 103 | 98 | 102 | 101 | 102 | 103 | 103 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -3 | -10 | -2 | -5 | -4 | -4 | -4 |
| — | -3 | -10 | -2 | -5 | -4 | -4 | -4 |
| — | -2 | -6 | -1 | -4 | -3 | -2 | -2 |
| — | 0 | -2 | +1 | -1 | -1 | +2 | +2 |
| — | +1 | +3 | +5 | +3 | +1 | +5 | +7 |
| — | +4 | +7 | +7 | +6 | +7 | +8 | +10 |
| — | +7 | +8 | +11 | +10 | +9 | +13 | +15 |
| — | +8 | +9 | +12 | +10 | +10 | +13 | +17 |
| — | +8 | +9 | +12 | +10 | +10 | +13 | +17 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: 8 PRE-SCREEN STRESS: None (Control).

OPERATING POWER CONDITION: 800 mw, 30 V, 25°C.

CELL NO.: 419236 NO. OF UNITS: 7

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.7 | 1.0 | 1.8 | <0.1 | 0.1 | 0.3 | <0.1 | 0.7 |
| 5% | 0.7 | 1.0 | 1.8 | <0.1 | 0.1 | 0.3 | <0.1 | 0.7 |
| 10% | 0.7 | 1.0 | 1.8 | <0.1 | 0.1 | 0.3 | <0.1 | 0.7 |
| 25% | 0.9 | 1.9 | 2.7 | 0.4 | 0.7 | 0.3 | <0.1 | 0.8 |
| 50% | 2.6 | 3.3 | 3.5 | 2.4 | 1.9 | 0.8 | 1.5 | 1.3 |
| 75% | 3.9 | 3.7 | 3.9 | 2.9 | 3.4 | 3.1 | 3.0 | 8.1 |
| 90% | 4.0 | 3.8 | 4.1 | 3.0 | 3.5 | 93.5 | 550 | 10.3 |
| 95% | 4.0 | 3.8 | 4.1 | 3.0 | 3.5 | 93.5 | 550 | 10.3 |
| Max | 4.0 | 3.8 | 4.1 | 3.0 | 3.5 | 93.5 | 550 | 10.3 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.3 | 0.5 | <0.1 | 0.1 | 0.1 | <0.1 | 0.4 |
| <0.1 | 0.3 | 0.5 | <0.1 | 0.1 | 0.1 | <0.1 | 0.4 |
| <0.1 | 0.3 | 0.5 | <0.1 | 0.1 | 0.1 | <0.1 | 0.4 |
| 0.1 | 0.5 | 0.8 | 0.1 | 0.2 | 0.4 | 0.3 | 0.4 |
| 0.5 | 1.8 | 1.0 | 0.5 | 0.4 | 0.7 | 0.7 | 0.9 |
| 2.0 | 2.2 | 2.5 | 2.1 | 2.2 | 1.9 | 2.7 | 2.6 |
| 5.8 | 6.4 | 7.9 | 5.3 | 6.6 | 5.4 | 6.5 | 3.0 |
| 5.8 | 6.4 | 7.9 | 5.3 | 6.6 | 5.4 | 6.5 | 3.0 |
| 5.8 | 6.4 | 7.9 | 5.3 | 6.6 | 5.4 | 6.5 | 3.0 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 68 | 66 | 66 | 66 | 66 | 64 | 63 | 63 |
| 68 | 66 | 66 | 66 | 66 | 64 | 63 | 63 |
| 68 | 66 | 66 | 66 | 66 | 64 | 63 | 63 |
| 70 | 69 | 69 | 69 | 69 | 69 | 69 | 65 |
| 72 | 73 | 72 | 72 | 71 | 70 | 72 | 70 |
| 77 | 76 | 92 | 96 | 97 | ∞ | ∞ | 75 |
| 88 | 92 | 244 | ∞ | ∞ | ∞ | ∞ | 77 |
| 88 | 92 | 244 | ∞ | ∞ | ∞ | ∞ | 77 |
| 88 | 92 | 244 | ∞ | ∞ | ∞ | ∞ | 77 |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -3 | -4 | -4 | -4 | -6 | -7 | -7 |
| — | -3 | -4 | -4 | -4 | -6 | -7 | -7 |
| — | -3 | -4 | -4 | -4 | -6 | -7 | -7 |
| — | -2 | -1 | -1 | -2 | -4 | -2 | -6 |
| — | -1 | 0 | -1 | -1 | -1 | -1 | -1 |
| — | 0 | +4 | +8 | +10 | 1034 | 1034 | 0 |
| — | +4 | 1202 | 1221 | 1221 | 1221 | 1221 | 0 |
| — | +4 | 1222 | 1221 | 1221 | 1221 | 1221 | 0 |
| — | +4 | 1222 | 1221 | 1221 | 1221 | 1221 | 0 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 120 | 103 | 103 | 105 | 105 | 105 | 104 | 100 |
| 5% | 120 | 103 | 103 | 105 | 105 | 105 | 104 | 100 |
| 10% | 120 | 103 | 103 | 105 | 105 | 105 | 104 | 100 |
| 25% | 123 | 105 | 109 | 110 | 110 | 110 | 110 | 103 |
| 50% | 124 | 109 | 113 | 112 | 115 | 111 | 115 | 113 |
| 75% | 134 | 114 | 117 | 119 | 120 | ∞ | ∞ | 134 |
| 90% | 135 | 118 | ∞ | ∞ | ∞ | ∞ | ∞ | 140 |
| 95% | 135 | 118 | ∞ | ∞ | ∞ | ∞ | ∞ | 140 |
| Max | 135 | 118 | ∞ | ∞ | ∞ | ∞ | ∞ | 140 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -21 | -19 | -19 | -16 | -18 | -19 | -17 |
| — | -21 | -19 | -19 | -16 | -18 | -19 | -17 |
| — | -21 | -19 | -19 | -16 | -18 | -19 | -17 |
| — | -15 | -14 | -13 | -13 | -14 | -14 | -16 |
| — | -12 | -11 | -11 | -10 | -13 | -13 | -14 |
| — | -11 | -9 | -10 | -7 | 7964 | 7964 | +7 |
| — | -11 | 7964 | 7964 | 7964 | 7964 | 7964 | +14 |
| — | -11 | 7964 | 7964 | 7964 | 7964 | 7964 | +14 |
| — | -11 | 7964 | 7964 | 7964 | 7964 | 7964 | +14 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 797 | 784 | 786 | 790 | 784 | 780 | 691 | 791 |
| 797 | 784 | 786 | 790 | 784 | 780 | 691 | 791 |
| 797 | 784 | 786 | 790 | 784 | 780 | 691 | 791 |
| 800 | 790 | 790 | 790 | 785 | 786 | 784 | 793 |
| 802 | 791 | 796 | 796 | 795 | 793 | 806 | 802 |
| 806 | 799 | 803 | 803 | 799 | ∞ | ∞ | 819 |
| 821 | 804 | ∞ | ∞ | ∞ | ∞ | ∞ | 824 |
| 821 | 804 | ∞ | ∞ | ∞ | ∞ | ∞ | 824 |
| 821 | 824 | ∞ | ∞ | ∞ | ∞ | ∞ | 824 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -2 | -2 | -3 | -3 | -13 | -1 |
| — | -2 | -2 | -2 | -3 | -3 | -13 | -1 |
| — | -2 | -2 | -2 | -3 | -3 | -13 | -1 |
| — | -2 | -1 | -1 | -2 | -2 | -2 | -1 |
| — | -1 | -1 | -1 | -1 | -2 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | 1147 | 1147 | +2 |
| — | -1 | 1147 | 1147 | 1147 | 1148 | 1148 | +3 |
| — | -1 | 1147 | 1147 | 1147 | 1148 | 1148 | +3 |
| — | -1 | 1147 | 1147 | 1147 | 1148 | 1148 | +3 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 69 | 71 | 20 | 20 | 20 | 20 | 20 | 90 |
| 5% | 69 | 71 | 20 | 20 | 20 | 20 | 20 | 90 |
| 10% | 69 | 71 | 20 | 20 | 20 | 20 | 20 | 90 |
| 25% | 76 | 81 | 70 | 71 | 71 | 20 | 20 | 95 |
| 50% | 85 | 87 | 89 | 90 | 91 | 93 | 91 | 110 |
| 75% | 95 | 101 | 102 | 106 | 107 | 112 | 110 | 117 |
| 90% | 100 | 104 | 106 | 107 | 108 | 115 | 116 | 120 |
| 95% | 100 | 104 | 106 | 107 | 108 | 115 | 116 | 120 |
| Max | 100 | 104 | 106 | 107 | 108 | 115 | 116 | 120 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -4 | -74 | -74 | -74 | -77 | -77 | +8 |
| — | -4 | -74 | -74 | -74 | -77 | -77 | +8 |
| — | -4 | -74 | -74 | -74 | -77 | -77 | +8 |
| — | +3 | -2 | -8 | -10 | -74 | -74 | +9 |
| — | +4 | +3 | +7 | +07 | +10 | +8 | +13 |
| — | +6 | +7 | +12 | +12 | +14 | +10 | +29 |
| — | +12 | +17 | +14 | +19 | +27 | +29 | +33 |
| — | +12 | +17 | +14 | +19 | +27 | +29 | +33 |
| — | +12 | +17 | +14 | +19 | +27 | +29 | +33 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: 8 PRE-SCREEN STRESS: None (COntrol).

OPERATING POWER CONDITION: 700 mw, 30 V; 25°C.

CELL NO.: 419237 NO. OF UNITS: 14

$I_{CEO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.4 | 1.4 | 0.8 | 0.3 | 1.0 | 0.3 | 0.3 | 1.0 |
| 5% | 0.4 | 1.4 | 0.8 | 0.3 | 1.0 | 0.3 | 0.3 | 1.0 |
| 10% | 0.5 | 1.4 | 0.8 | 0.7 | 1.0 | 0.4 | 0.4 | 1.1 |
| 25% | 1.4 | 2.1 | 1.6 | 1.4 | 1.3 | 0.6 | 0.7 | 2.0 |
| 50% | 3.0 | 4.1 | 3.4 | 3.0 | 3.7 | 3.2 | 2.7 | 3.5 |
| 75% | 3.8 | 4.5 | 3.7 | 3.3 | 3.8 | 3.6 | 3.1 | 3.9 |
| 90% | 4.9 | 6.9 | 4.9 | 4.3 | 6.0 | 6.4 | 3.3 | 4.5 |
| 95% | 5.4 | 9.1 | 5.9 | 4.8 | 20.0 | 6.8 | 3.3 | 4.7 |
| Max | 5.4 | 9.1 | 5.9 | 4.8 | 20.0 | 6.8 | 3.3 | 4.7 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.6 | <0.1 | <0.1 | <0.1 | <0.1 | 0.2 | 0.3 |
| <0.1 | 0.6 | <0.1 | <0.1 | <0.1 | <0.1 | 0.2 | 0.3 |
| <0.1 | 0.6 | 0.1 | 0.1 | <0.1 | <0.1 | 0.2 | 0.3 |
| <0.1 | 0.7 | 0.3 | 0.1 | 0.1 | 0.2 | 0.2 | 0.6 |
| 0.6 | 1.2 | 0.7 | 0.7 | 0.7 | 0.5 | 0.4 | 1.0 |
| 2.0 | 2.8 | 2.2 | 2.1 | 1.9 | 1.5 | 1.3 | 2.2 |
| 4.2 | 4.3 | 3.8 | 4.2 | 4.3 | 4.2 | 4.3 | 11.0 |
| 5.8 | 4.9 | 4.1 | 4.4 | 5.0 | 4.8 | 5.2 | 15.3 |
| 5.8 | 4.9 | 4.1 | 4.4 | 5.0 | 4.8 | 5.2 | 15.3 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 64 | 63 | 63 | 62 | 62 | 62 | 61 | 61 |
| 64 | 63 | 63 | 62 | 62 | 62 | 61 | 61 |
| 66 | 65 | 65 | 64 | 64 | 64 | 63 | 63 |
| 68 | 67 | 68 | 67 | 69 | 68 | 67 | 66 |
| 73 | 73 | 73 | 73 | 73 | 72 | 72 | 71 |
| 80 | 82 | 83 | 84 | 85 | 85 | 88 | 89 |
| 86 | 90 | 88 | 90 | 91 | 546 | 546 | 105 |
| 86 | 93 | 90 | 91 | 93 | ∞ | ∞ | 113 |
| 86 | 93 | 90 | 91 | 93 | ∞ | ∞ | 113 |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -7 | -3 | -3 | -10 | -13 | -14 |
| — | -2 | -7 | -3 | -3 | -10 | -13 | -14 |
| — | -2 | -5 | -3 | -3 | -7 | -9 | -11 |
| — | -1 | -2 | -1 | -1 | -3 | -9 | -4 |
| — | 0 | 0 | -1 | -1 | -1 | -2 | -2 |
| — | +1 | +2 | +1 | +4 | +9 | +8 | +4 |
| — | +9 | +9 | +10 | +12 | +541 | +551 | +52 |
| — | +9 | +11 | +13 | +15 | 1163 | 1063 | +70 |
| — | +9 | +11 | +13 | +15 | 1163 | 1163 | +70 |

$V_{CE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 110 | 094 | 096 | 096 | 098 | 090 | 000 | 097 |
| 5% | 110 | 094 | 096 | 096 | 098 | 090 | 000 | 097 |
| 10% | 112 | 095 | 096 | 098 | 098 | 095 | 046 | 097 |
| 25% | 118 | 097 | 099 | 100 | 100 | 100 | 097 | 100 |
| 50% | 128 | 110 | 108 | 111 | 110 | 110 | 105 | 110 |
| 75% | 131 | 116 | 115 | 116 | 115 | 113 | 111 | 115 |
| 90% | 153 | 134 | 133 | 134 | 134 | 5059 | 117 | 121 |
| 95% | 168 | 148 | 148 | 147 | 149 | ∞ | 117 | 123 |
| Max | 168 | 148 | 148 | 147 | 149 | ∞ | 117 | 123 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -21 | -20 | -19 | -18 | -21 | -100 | -20 |
| — | -21 | -20 | -19 | -18 | -21 | -100 | -20 |
| — | -20 | -20 | -18 | -18 | -20 | -65 | -19 |
| — | -17 | -17 | -15 | -14 | -16 | -20 | -15 |
| — | -14 | -14 | -13 | -13 | -14 | -16 | -13 |
| — | -12 | -12 | -12 | -11 | -12 | -15 | -11 |
| — | -11 | -11 | -9 | -11 | 2912 | -12 | -7 |
| — | -10 | -9 | -8 | -10 | 5851 | -11 | -5 |
| — | -10 | -9 | -8 | -10 | 5852 | -11 | -5 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 788 | 775 | 775 | 780 | 777 | 136 | 706 | 785 |
| 788 | 775 | 775 | 780 | 777 | 136 | 706 | 785 |
| 788 | 778 | 778 | 781 | 779 | 456 | 742 | 786 |
| 795 | 785 | 783 | 783 | 780 | 779 | 783 | 791 |
| 805 | 789 | 786 | 790 | 787 | 784 | 789 | 795 |
| 815 | 802 | 803 | 803 | 802 | 798 | 795 | 811 |
| 826 | 812 | 812 | 813 | 813 | 5404 | 808 | 925 |
| 830 | 817 | 815 | 815 | 816 | ∞ | 810 | 995 |
| 830 | 817 | 815 | 815 | 816 | ∞ | 810 | 995 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -3 | -3 | -3 | -83 | -14 | -2 |
| — | -2 | -3 | -3 | -3 | -83 | -14 | -2 |
| — | -2 | -3 | -3 | -3 | -43 | -9 | -2 |
| — | -2 | -2 | -2 | -2 | -4 | -2 | -1 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -1 |
| — | -1 | -1 | -1 | -2 | -2 | -1 | 0 |
| — | -1 | -1 | -1 | -1 | +552 | -1 | +15 |
| — | -1 | -1 | -1 | -1 | 1105 | -1 | +25 |
| — | -1 | -1 | -1 | -1 | 1105 | -1 | +25 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 64 | 65 | 63 | 64 | 66 | 20 | 20 | 50 |
| 5% | 64 | 65 | 63 | 64 | 66 | 20 | 20 | 50 |
| 10% | 65 | 68 | 68 | 69 | 70 | 44 | 20 | 57 |
| 25% | 77 | 72 | 76 | 76 | 72 | 75 | 65 | 79 |
| 50% | 89 | 88 | 89 | 86 | 87 | 89 | 88 | 95 |
| 75% | 94 | 101 | 102 | 103 | 102 | 108 | 112 | 114 |
| 90% | 101 | 110 | 112 | 112 | 111 | 114 | 120 | 128 |
| 95% | 105 | 111 | 114 | 115 | 113 | 115 | 124 | 128 |
| Max | 105 | 111 | 114 | 115 | 113 | 115 | 124 | 128 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -6 | -15 | -8 | -8 | -78 | -78 | -36 |
| — | -6 | -15 | -8 | -8 | -78 | -78 | -36 |
| — | -4 | -11 | -7 | -6 | -42 | -77 | -21 |
| — | 0 | +0 | -1 | 0 | +1 | -9 | +5 |
| — | +3 | +4 | +4 | +3 | +6 | +6 | +10 |
| — | +8 | +11 | +8 | +9 | +14 | +17 | +20 |
| — | +14 | +18 | +17 | +16 | +21 | +27 | +36 |
| — | +14 | +18 | +19 | +16 | +25 | +27 | +38 |
| — | +14 | +18 | +19 | +16 | +25 | +27 | +38 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

PROCESS: 8 PRE-SCREEN STRESS: None (Control).

OPERATING POWER CONDITION: 500 mw, 30 V, 25°C.

CELL NO.: 419238 NO. OF UNITS: 37

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.2 | 0.4 | 1.3 | 0.2 | 0.3 | 0.1 | <0.1 | 0.1 |
| 5% | 0.4 | 0.4 | 1.4 | 0.6 | 0.5 | 0.4 | 0.1 | 0.4 |
| 10% | 0.7 | 0.5 | 1.6 | 0.8 | 0.7 | 0.5 | 0.4 | 0.5 |
| 25% | 1.0 | 1.2 | 1.8 | 1.0 | 1.0 | 0.8 | 0.7 | 1.2 |
| 50% | 1.5 | 1.8 | 2.3 | 1.6 | 1.5 | 1.3 | 1.3 | 1.6 |
| 75% | 3.1 | 4.0 | 3.9 | 3.6 | 3.6 | 3.3 | 3.4 | 3.6 |
| 90% | 4.4 | 6.1 | 6.5 | 5.0 | 4.7 | 4.0 | 4.3 | 4.4 |
| 95% | 5.0 | 110.1 | 1245 | 1153 | 108.4 | 1045 | 1042 | 5.8 |
| Max | 5.6 | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | 10.1 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.3 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.5 | 0.3 | 0.2 | 0.1 | <0.1 | 0.1 | 0.3 |
| 0.1 | 0.8 | 0.6 | 0.3 | 0.3 | 0.1 | 0.2 | 0.5 |
| 0.4 | 1.0 | 0.8 | 0.6 | 0.4 | 0.3 | 0.5 | 0.8 |
| 1.5 | 2.1 | 1.8 | 1.5 | 1.5 | 1.5 | 1.6 | 1.9 |
| 3.5 | 4.2 | 3.5 | 3.2 | 3.0 | 3.0 | 3.3 | 3.1 |
| 4.0 | 4.4 | 4.5 | 3.6 | 3.5 | 3.5 | 3.5 | 4.0 |
| 4.1 | 4.7 | 4.5 | 4.2 | 4.7 | 3.9 | 3.9 | 4.4 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 61 | 58 | 58 | 57 | 57 | 58 | 57 | 60 |
| 61 | 61 | 61 | 60 | 61 | 59 | 61 | 61 |
| 64 | 62 | 62 | 62 | 62 | 61 | 62 | 62 |
| 68 | 67 | 67 | 66 | 68 | 67 | 67 | 67 |
| 72 | 72 | 72 | 71 | 72 | 72 | 72 | 72 |
| 80 | 79 | 80 | 80 | 80 | 80 | 80 | 81 |
| 85 | 85 | 86 | 85 | 86 | 85 | 86 | 89 |
| 89 | 89 | 89 | 89 | 89 | 89 | 181 | ∞ |
| 90 | 90 | 90 | 90 | 90 | 91 | ∞ | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -24 | -23 | -24 | -25 | -23 | -24 | -10 |
| — | -20 | -10 | -18 | -5 | -19 | -9 | -8 |
| — | -2 | -1 | -1 | -1 | -3 | -2 | -4 |
| — | 0 | 0 | 0 | 0 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | +2 | +1 | +1 | +1 | +1 | +1 | +1 |
| — | +15 | +2 | +2 | +2 | +1 | +191 | 1278 |
| — | +29 | +4 | +3 | +8 | +2 | 1287 | 1287 |

$V_{CE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 099 | 083 | 073 | 079 | 080 | 077 | 079 | 077 |
| 5% | 101 | 089 | 085 | 087 | 085 | 085 | 083 | 082 |
| 10% | 110 | 094 | 093 | 092 | 092 | 091 | 090 | 090 |
| 25% | 121 | 105 | 105 | 103 | 104 | 105 | 102 | 103 |
| 50% | 129 | 111 | 113 | 113 | 113 | 113 | 110 | 113 |
| 75% | 136 | 120 | 118 | 120 | 119 | 120 | 118 | 120 |
| 90% | 141 | 130 | 128 | 127 | 126 | 130 | 129 | 2106 |
| 95% | 149 | 143 | 1126 | 131 | 132 | 1125 | 1124 | ∞ |
| Max | 161 | 172 | ∞ | 140 | 136 | ∞ | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -31 | -26 | -21 | -19 | -22 | -31 | -22 |
| — | -21 | -19 | -20 | -19 | -20 | -21 | -21 |
| — | -18 | -18 | -18 | -19 | -18 | -20 | -21 |
| — | -15 | -15 | -15 | -16 | -15 | -17 | -17 |
| — | -13 | -14 | -13 | -13 | -13 | -14 | -14 |
| — | -10 | -12 | -12 | -11 | -11 | -13 | -12 |
| — | -5 | -10 | -10 | -9 | -9 | -10 | 1490 |
| — | +12 | +790 | -7 | -8 | +790 | +788 | 2964 |
| — | +29 | 2964 | -6 | -7 | 2964 | 2964 | 8164 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 794 | 212 | 780 | 780 | 780 | 779 | 777 | 776 |
| 795 | 217 | 784 | 780 | 783 | 779 | 777 | 777 |
| 797 | 732 | 785 | 783 | 785 | 782 | 779 | 780 |
| 803 | 784 | 788 | 785 | 788 | 785 | 783 | 784 |
| 807 | 791 | 794 | 792 | 794 | 792 | 790 | 790 |
| 811 | 796 | 798 | 796 | 797 | 795 | 793 | 797 |
| 816 | 800 | 803 | 800 | 800 | 799 | 798 | 2654 |
| 822 | 804 | 1247 | 806 | 805 | 1244 | 1243 | ∞ |
| 851 | 808 | ∞ | 830 | 825 | ∞ | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -14 | -2 | -3 | -3 | -3 | -3 | -4 |
| — | -11 | -2 | -3 | -2 | -3 | -3 | -3 |
| — | -10 | -2 | -2 | -2 | -3 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -1 | -2 | -2 | -2 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | +226 |
| — | 0 | +114 | -1 | -1 | +114 | +113 | 1145 |
| — | +1 | 1144 | -1 | -1 | 1144 | 1144 | 1155 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 61 | 61 | 20 | 25 | 25 | 20 | 20 | |
| 5% | 64 | 64 | 56 | 56 | 56 | 57 | 57 | |
| | 76 | 75 | 72 | 71 | 71 | 71 | 71 | |
| | 83 | 84 | 81 | 83 | 82 | 83 | 83 | |
| | 89 | 93 | 88 | 93 | 90 | 93 | 92 | |
| | 100 | 102 | 98 | 102 | 101 | 103 | 102 | |
| | 101 | 106 | 101 | 107 | 105 | 106 | 107 | |
| | 103 | 110 | 109 | 110 | 107 | 110 | 110 | |
| | 105 | 113 | 110 | 114 | 111 | 114 | 113 | |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -7 | -29 | -75 | -75 | -29 | -29 | -29 |
| — | -6 | -15 | -12 | -12 | -12 | -12 | -77 |
| — | -4 | -6 | -3 | -4 | -3 | -4 | -19 |
| — | -1 | -3 | -1 | -2 | -1 | -1 | -2 |
| — | +1 | -1 | +3 | 0 | +3 | +1 | +2 |
| — | +4 | 0 | +5 | +4 | +5 | +6 | +7 |
| — | +7 | +4 | +7 | +6 | +8 | +8 | +9 |
| — | +10 | +6 | +10 | +9 | +10 | +11 | +12 |
| — | +12 | +8 | +12 | +10 | +12 | +15 | +19 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: B PRE-SCREEN STRESS: None (Control).

OPERATING POWER CONDITION: 400 mw, 30 V, 150°C. CELL NO.: 419239 NO. OF UNITS: 7

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.2 | 0.9 | 0.3 | 0.4 | 0.2 | <0.1 | 0.3 | 0.8 |
| 5% | 0.2 | 0.9 | 0.3 | 0.4 | 0.2 | <0.1 | 0.3 | 0.8 |
| 10% | 0.2 | 0.9 | 0.3 | 0.4 | 0.2 | <0.1 | 0.3 | 0.8 |
| 25% | 0.6 | 1.3 | 0.7 | 0.7 | 0.6 | 0.5 | 0.6 | 0.9 |
| 50% | 1.1 | 2.0 | 1.4 | 1.3 | 1.2 | 1.0 | 1.2 | 3.9 |
| 75% | 3.7 | 4.2 | 3.6 | 3.6 | 3.4 | 3.1 | 4.0 | ∞ |
| 90% | 4.3 | 5.0 | 4.2 | 4.3 | 3.6 | 3.4 | ∞ | ∞ |
| 95% | 4.3 | 5.0 | 4.2 | 4.3 | 3.6 | 3.4 | ∞ | ∞ |
| Max | 4.3 | 5.0 | 4.2 | 4.3 | 3.6 | 3.4 | ∞ | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.7 | 0.1 | 0.1 | <0.1 | <0.1 | 0.1 | 0.1 |
| <0.1 | 0.9 | 0.2 | 0.3 | 0.3 | 0.2 | 0.6 | 0.3 |
| 0.3 | 1.1 | 0.9 | 0.7 | 0.5 | 0.5 | 0.8 | 0.8 |
| 1.5 | 2.6 | 2.2 | 1.7 | 0.9 | 1.3 | 1.5 | 1.9 |
| 1.5 | 2.6 | 2.2 | 1.7 | 0.9 | 1.3 | 1.5 | 1.9 |
| 1.5 | 2.6 | 2.2 | 1.7 | 0.9 | 1.3 | 1.5 | 1.9 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 62 | 61 | 61 | 61 | 61 | 61 | 62 | 61 |
| 62 | 61 | 61 | 61 | 61 | 61 | 62 | 61 |
| 62 | 61 | 61 | 61 | 61 | 61 | 62 | 61 |
| 63 | 63 | 63 | 72 | 72 | 72 | 61 | 72 |
| 74 | 77 | 73 | 77 | 77 | 77 | 73 | 77 |
| 81 | 80 | 80 | 86 | 82 | 85 | 80 | 83 |
| 86 | 86 | 86 | ∞ | ∞ | ∞ | 85 | ∞ |
| 86 | 86 | 86 | ∞ | ∞ | ∞ | 85 | ∞ |
| 86 | 86 | 86 | ∞ | ∞ | ∞ | 85 | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -1 | -1 | -1 | -1 | -96 | -4 |
| — | -1 | -1 | -1 | -1 | -1 | -96 | -4 |
| — | -1 | -1 | -1 | -1 | -1 | -96 | -4 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -2 |
| — | -1 | 0 | -1 | 0 | 0 | -1 | -1 |
| — | 0 | 0 | +1 | +1 | +1 | 0 | +1 |
| — | +8 | +1 | 1427 | 1427 | 1427 | +1 | 1427 |
| — | +8 | +1 | 1427 | 1427 | 1427 | +1 | 1427 |
| — | +8 | +1 | 1427 | 1427 | 1427 | +1 | 1427 |

$V_{CE(SAT)}$ ($I_C$-50ma., $I_B$-5 ma)(Mv.)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 111 | 093 | 093 | 094 | 093 | 090 | 093 | 092 |
| 5% | 111 | 093 | 093 | 094 | 093 | 090 | 093 | 092 |
| 10% | 111 | 093 | 093 | 094 | 093 | 090 | 093 | 092 |
| 25% | 114 | 098 | 099 | 095 | 097 | 097 | 100 | 093 |
| 50% | 118 | 100 | 100 | 102 | 106 | 105 | 105 | 106 |
| 75% | 122 | 112 | 107 | 111 | 112 | 113 | 113 | 116 |
| 90% | 131 | 199 | 115 | ∞ | ∞ | ∞ | 115 | ∞ |
| 95% | 131 | 199 | 115 | ∞ | ∞ | ∞ | 115 | ∞ |
| Max | 131 | 199 | 115 | ∞ | ∞ | ∞ | 115 | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -16 | -16 | -17 | -16 | -19 | -16 | -20 |
| — | -16 | -16 | -17 | -16 | -19 | -16 | -20 |
| — | -16 | -16 | -17 | -16 | -19 | -16 | -20 |
| — | -15 | -15 | -16 | -16 | -16 | -15 | -16 |
| — | -15 | -13 | -15 | -15 | -14 | -14 | -12 |
| — | -12 | -12 | -12 | -12 | -9 | -11 | -11 |
| — | +64 | -12 | 8671 | 8671 | 8671 | +1 | 8671 |
| — | +64 | -12 | 8671 | 8671 | 8671 | +1 | 8671 |
| — | +64 | -12 | 8671 | 8671 | 8671 | +1 | 8671 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 800 | 779 | 785 | 784 | 786 | 786 | 780 | 781 |
| 800 | 779 | 785 | 784 | 786 | 786 | 780 | 781 |
| 800 | 779 | 785 | 784 | 786 | 786 | 780 | 781 |
| 801 | 786 | 786 | 786 | 789 | 787 | 785 | 785 |
| 802 | 791 | 789 | 795 | 797 | 798 | 788 | 794 |
| 809 | 797 | 798 | 803 | 802 | 805 | 795 | 797 |
| 813 | 1151 | 799 | ∞ | ∞ | ∞ | 797 | ∞ |
| 813 | 1151 | 799 | ∞ | ∞ | ∞ | 797 | ∞ |
| 813 | 1151 | 799 | ∞ | ∞ | ∞ | 797 | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -3 | -2 | -2 | -2 | -2 | -3 | -2 |
| — | -3 | -2 | -2 | -2 | -2 | -3 | -2 |
| — | -3 | -2 | -2 | -2 | -2 | -3 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -1 | -1 | -1 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | -1 |
| — | +44 | -1 | 1148 | 1148 | 1148 | -1 | 1148 |
| — | +44 | -1 | 1148 | 1148 | 1148 | -1 | 1148 |
| — | +44 | -1 | 1148 | 1148 | 1148 | -1 | 1148 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 61 | 60 | 61 | 19 | 20 | 20 | 20 | 20 |
| 5% | 61 | 60 | 61 | 19 | 20 | 20 | 20 | 20 |
| | 61 | 60 | 61 | 19 | 20 | 20 | 20 | 20 |
| | 92 | 90 | 89 | 39 | 60 | 61 | 162 | 62 |
| | 103 | 96 | 101 | 98 | 102 | 104 | 267 | 105 |
| | 105 | 100 | 104 | 102 | 104 | 109 | 281 | 107 |
| | 111 | 103 | 110 | 105 | 108 | ∞ | 292 | 114 |
| | 111 | 103 | 110 | 105 | 108 | ∞ | 292 | 111 |
| | 111 | 103 | 110 | 105 | 108 | ∞ | 292 | 111 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -8 | -3 | -82 | -81 | -81 | -81 | -81 |
| — | -8 | -3 | -82 | -81 | -81 | -81 | -81 |
| — | -8 | -3 | -82 | -81 | -81 | -81 | -81 |
| — | -7 | -3 | -7 | -4 | -3 | +151 | -1 |
| — | -3 | -1 | -4 | -2 | 0 | +166 | +1 |
| — | -2 | 0 | -1 | +1 | +2 | +171 | +4 |
| — | -2 | +1 | 0 | +3 | +917 | +181 | +7 |
| — | -2 | +1 | 0 | +3 | +917 | +181 | +7 |
| — | -2 | +1 | 0 | +3 | +917 | +181 | +7 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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PROCESS: B PRE-SCREEN STRESS: None (Control).

OPERATING POWER CONDITION: 200 mw, 30 V, 150°C. CELL NO.: 419240 NO. OF UNITS: 14.

$I_{CEO}$ ($V_{CE}$ - 60V)(Nanoamps)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.3 | 0.9 | 0.5 | 0.6 | 0.4 | 0.4 | 1.1 | 0.4 |
| 5% | 0.3 | 0.9 | 0.5 | 0.6 | 0.4 | 0.4 | 1.1 | 0.4 |
| 10% | 0.4 | 1.1 | 0.7 | 0.6 | 0.5 | 0.5 | 1.2 | 0.5 |
| 25% | 1.0 | 1.4 | 1.2 | 1.1 | 1.0 | 0.9 | 1.7 | 1.0 |
| 50% | 1.2 | 1.9 | 1.9 | 1.8 | 1.7 | 1.6 | 2.5 | 2.1 |
| 75% | 2.4 | 3.4 | 3.4 | 3.3 | 2.9 | 3.2 | 3.8 | 3.6 |
| 90% | 3.5 | 4.2 | 6.3 | 5.6 | 4.4 | 3.9 | 5.4 | 13.6 |
| 95% | 3.8 | 4.5 | 8.2 | 7.0 | 4.6 | 4.1 | 6.3 | 15.7 |
| Max | 3.8 | 4.5 | 8.2 | 7.0 | 4.6 | 4.1 | 6.3 | 15.7 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.5 | 0.1 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.5 | 0.1 |
| <0.1 | 0.6 | <0.1 | <0.1 | <0.1 | <0.1 | 0.5 | 0.1 |
| 0.1 | 0.8 | 0.3 | 0.4 | <0.1 | 0.1 | 0.6 | 0.3 |
| 0.7 | 1.5 | 0.8 | 0.9 | 0.3 | 0.7 | 1.2 | 0.9 |
| 2.8 | 3.5 | 2.8 | 3.4 | 2.5 | 2.6 | 3.0 | 2.6 |
| 27.9 | 22.7 | 24.5 | 28.2 | 29.8 | 23.1 | 24.3 | 25.9 |
| 48.9 | 42.1 | 40.5 | 46.9 | 52.1 | 39.4 | 42.7 | 46.3 |
| 48.9 | 42.1 | 40.5 | 46.9 | 52.1 | 39.4 | 42.7 | 46.3 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| 56 | 55 | 56 | 56 | 55 | 55 | 56 | 55 |
| 64 | 64 | 64 | 64 | 64 | 64 | 64 | 64 |
| 73 | 73 | 73 | 73 | 73 | 74 | 73 | 74 |
| 82 | 82 | 82 | 82 | 83 | 82 | 82 | 82 |
| 86 | 89 | 90 | 90 | 90 | 90 | 90 | 89 |
| 89 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |
| 89 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -1 | -1 | -1 | -1 | -1 | -3 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -3 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -2 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | -1 |
| — | 0 | +1 | 0 | +1 | +1 | 0 | 0 |
| — | +1 | +1 | +1 | +1 | +1 | +1 | +1 |
| — | +4 | +5 | +5 | +5 | +5 | +5 | +5 |
| — | +7 | +8 | +8 | +8 | +8 | +8 | +8 |
| — | +7 | +8 | +8 | +8 | +8 | +8 | +8 |

$V_{CE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 100 | 084 | 083 | 084 | 082 | 081 | 083 | 083 |
| 5% | 100 | 084 | 083 | 084 | 082 | 081 | 083 | 083 |
| 10% | 103 | 086 | 088 | 087 | 087 | 086 | 087 | 087 |
| 25% | 115 | 099 | 100 | 101 | 098 | 097 | 099 | 099 |
| 50% | 126 | 109 | 109 | 111 | 109 | 109 | 110 | 118 |
| 75% | 130 | 117 | 118 | 118 | 118 | 120 | 119 | 119 |
| 90% | 147 | 133 | 131 | 137 | 131 | 134 | 132 | 132 |
| 95% | 153 | 143 | 139 | 148 | 140 | 142 | 141 | 140 |
| Max | 153 | 143 | 139 | 148 | 140 | 142 | 141 | 140 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -17 | -17 | -16 | -18 | -19 | -17 | -17 |
| — | -17 | -17 | -16 | -18 | -19 | -17 | -17 |
| — | -17 | -17 | -16 | -17 | -19 | -17 | -17 |
| — | -16 | -15 | -15 | -15 | -14 | -14 | -15 |
| — | -12 | -11 | -12 | -13 | -13 | -12 | -13 |
| — | -10 | -9 | -9 | -11 | -9 | -11 | -9 |
| — | -8 | -9 | -5 | -9 | -7 | -8 | -8 |
| — | -7 | -8 | -3 | -8 | -7 | -8 | -8 |
| — | -7 | -8 | -3 | -8 | -7 | -8 | -8 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 787 | 637 | 781 | 783 | 785 | 785 | 781 | 780 |
| 787 | 637 | 781 | 783 | 785 | 786 | 781 | 780 |
| 791 | 711 | 782 | 784 | 786 | 786 | 782 | 782 |
| 800 | 785 | 785 | 785 | 789 | 787 | 787 | 784 |
| 805 | 790 | 793 | 792 | 794 | 791 | 790 | 788 |
| 810 | 796 | 797 | 798 | 799 | 798 | 795 | 796 |
| 828 | 815 | 815 | 814 | 817 | 816 | 815 | 817 |
| 829 | 818 | 815 | 818 | 817 | 817 | 815 | 817 |
| 829 | 818 | 815 | 818 | 817 | 817 | 815 | 817 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -20 | -3 | -2 | -2 | -2 | -3 | -3 |
| — | -20 | -3 | -2 | -2 | -2 | -3 | -3 |
| — | -11 | -3 | -2 | -2 | -2 | -3 | -3 |
| — | -2 | -2 | -2 | -1 | -2 | -2 | -2 |
| — | -2 | -1 | -2 | -1 | -1 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 57 | 56 | 55 | 55 | 54 | 54 | 55 | 54 |
| 5% | 57 | 56 | 55 | 55 | 54 | 54 | 55 | 54 |
| 10% | 60 | 58 | 59 | 59 | 58 | 58 | 59 | 58 |
| 25% | 78 | 78 | 76 | 78 | 75 | 75 | 77 | 79 |
| 50% | 92 | 90 | 89 | 90 | 88 | 88 | 90 | 91 |
| 75% | 97 | 94 | 95 | 96 | 95 | 93 | 97 | 98 |
| 90% | 106 | 102 | 104 | 105 | 104 | 104 | 105 | 107 |
| 95% | 103 | 107 | 104 | 106 | 104 | 104 | 105 | 109 |
| Max | 108 | 107 | 104 | 106 | 104 | 104 | 105 | 109 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -7 | -8 | -7 | -8 | -8 | -6 | -6 |
| — | -7 | -8 | -7 | -8 | -8 | -6 | -6 |
| — | -7 | -8 | -7 | -8 | -8 | -6 | -6 |
| — | -6 | -4 | -3 | -6 | -5 | -4 | -4 |
| — | -2 | -3 | -2 | -4 | -5 | -2 | -2 |
| — | -1 | -2 | -1 | -2 | -3 | 0 | +1 |
| — | +1 | -1 | +1 | -1 | -1 | +1 | +4 |
| — | +2 | -1 | +1 | 0 | 0 | +1 | +4 |
| — | +2 | -1 | +1 | 0 | 0 | +1 | +4 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

PROCESS: C PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 700 mw, 30 V, 25°C. CELL NO.: 419241 NO. OF UNITS: 6

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.2 | 1.1 | 0.6 | 0.6 | 0.4 | 0.4 | 0.8 | <0.1 |
| 5% | 0.2 | 1.1 | 0.6 | 0.6 | 0.4 | 0.4 | 0.8 | <0.1 |
| 10% | 0.2 | 1.1 | 0.6 | 0.6 | 0.4 | 0.4 | 0.8 | <0.1 |
| 25% | 0.2 | 9.7 | 4.3 | 39.7 | 9.0 | 0.5 | 1.3 | 1.1 |
| 50% | 504.4 | 50.0 | 9.6 | 7.5 | 6.8 | 13.2 | 3.1 | 1.7 |
| 75% | >1 μA | 607.0 | 441.6 | 331.9 | 895.8 | 293.7 | 504.6 | 394.2 |
| 90% | >1 μA | 908.9 | 808.1 | 662.8 | 640.9 | 494.0 | 918.4 | ∞ |
| 95% | >1 μA | 908.9 | 808.1 | 662.8 | 640.9 | 494.0 | 918.4 | ∞ |
| Max | >1 μA | 908.9 | 808.1 | 662.8 | 640.9 | 494.0 | 918.4 | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 0.7 | 1.0 | 0.6 | 0.6 | 0.3 | <0.1 | 0.1 | <0.1 |
| 0.7 | 1.0 | 0.6 | 0.6 | 0.3 | <0.1 | 0.1 | <0.1 |
| 0.7 | 1.0 | 0.6 | 0.6 | 0.3 | <0.1 | 0.1 | <0.1 |
| 0.9 | 1.2 | 0.7 | 0.8 | 0.7 | 0.5 | 1.0 | 0.2 |
| 2.8 | 51.4 | 9.5 | 48.6 | 134.6 | 52.5 | 2.7 | 0.6 |
| 282.5 | 349.3 | 325.3 | 346.5 | 655.7 | ∞ | 255.5 | 352.6 |
| >1 μA | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |
| >1 μA | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |
| >1 μA | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 1 | 86 | 86 | 86 | 86 | 95 | 86 | 11 |
| 1 | 86 | 86 | 86 | 86 | 95 | 86 | 11 |
| 1 | 86 | 86 | 86 | 86 | 95 | 86 | 11 |
| 58 | 99 | 102 | 103 | 103 | 107 | 104 | 67 |
| 100 | 105 | 108 | 112 | 113 | 120 | 120 | 122 |
| 108 | 113 | 113 | 118 | 119 | 160 | 343 | 347 |
| 112 | 119 | 118 | 119 | 119 | 224 | ∞ | ∞ |
| 112 | 119 | 118 | 119 | 119 | 224 | ∞ | ∞ |
| 112 | 119 | 118 | 119 | 119 | 224 | ∞ | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -1 | -1 | -1 | -1 | -2 | -91 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | -91 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | -91 |
| — | +3 | +4 | +4 | +4 | +16 | +7 | -15 |
| — | +9 | +10 | +11 | +11 | +27 | +18 | +19 |
| — | 1841 | 1917 | 2010 | 2044 | 2186 | 2862 | 2743 |
| — | 2329 | 2636 | 2929 | 8114 | 8329 | 8800 | 9121 |
| — | 2329 | 2636 | 2929 | 8114 | 8329 | 8800 | 9121 |
| — | 2329 | 2636 | 2929 | 8114 | 8329 | 8800 | 9121 |

$V_{CE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 110 | 105 | 013 | 110 | 108 | 110 | 110 | 110 |
| 5% | 110 | 105 | 013 | 110 | 108 | 110 | 110 | 110 |
| 10% | 110 | 105 | 013 | 110 | 108 | 110 | 110 | 110 |
| 25% | 118 | 107 | 086 | 112 | 108 | 112 | 110 | 115 |
| 50% | 122 | 117 | 117 | 124 | 113 | 123 | 126 | 124 |
| 75% | 142 | 126 | 131 | 131 | 128 | 2600 | 2597 | 2597 |
| 90% | 145 | 131 | 132 | 132 | 132 | ∞ | ∞ | ∞ |
| 95% | 145 | 131 | 132 | 132 | 132 | ∞ | ∞ | ∞ |
| Max | 145 | 131 | 132 | 132 | 132 | ∞ | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -12 | -89 | -13 | -11 | -13 | -13 | -13 |
| — | -12 | -89 | -13 | -11 | -13 | -13 | -13 |
| — | -12 | -89 | -13 | -11 | -13 | -13 | -13 |
| — | -12 | -32 | -11 | -11 | -11 | -12 | -11 |
| — | -9 | -9 | -8 | -6 | -3 | -5 | -3 |
| — | -3 | +3 | +10 | -2 | 2043 | 2047 | 2045 |
| — | +2 | +7 | +14 | -1 | 8164 | 8164 | 8164 |
| — | +2 | +7 | +14 | -1 | 8164 | 8164 | 8164 |
| — | +2 | +7 | +14 | -1 | 8164 | 8164 | 8164 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 791 | 776 | 700 | 777 | 776 | 772 | 780 | 777 |
| 791 | 776 | 700 | 777 | 776 | 772 | 780 | 777 |
| 791 | 776 | 700 | 777 | 776 | 772 | 780 | 777 |
| 792 | 781 | 765 | 783 | 781 | 783 | 788 | 783 |
| 794 | 789 | 795 | 798 | 785 | 792 | 795 | 804 |
| 809 | 803 | 802 | 806 | 792 | 3039 | 3105 | 3105 |
| 815 | 804 | 808 | 810 | 799 | ∞ | ∞ | ∞ |
| 815 | 804 | 808 | 810 | 799 | ∞ | ∞ | ∞ |
| 815 | 804 | 808 | 810 | 799 | ∞ | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -12 | -2 | -2 | -3 | -2 | -2 |
| — | -2 | -12 | -2 | -2 | -3 | -2 | -2 |
| — | -2 | -12 | -2 | -2 | -3 | -2 | -2 |
| — | -2 | -5 | -2 | -2 | -3 | -2 | -1 |
| — | -2 | -1 | -2 | -2 | -2 | -1 | 0 |
| — | -1 | +1 | +2 | -1 | 290 | 291 | 291 |
| — | +1 | +2 | +2 | -1 | 1156 | 1156 | 1156 |
| — | +1 | +2 | +2 | -1 | 1156 | 1156 | 1156 |
| — | +1 | +2 | +2 | -1 | 1156 | 1156 | 1156 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 51 | 46 | 46 | 45 | 46 | 20 | 20 | |
| 5% | 51 | 46 | 46 | 45 | 46 | 20 | 20 | |
| 10% | 51 | 46 | 46 | 45 | 46 | 20 | 20 | |
| 25% | 55 | 51 | 50 | 49 | 49 | 43 | 20 | |
| 50% | 69 | 68 | 63 | 67 | 68 | 68 | 58 | |
| 75% | 89 | 82 | 79 | 82 | 84 | 84 | 93 | |
| 90% | 129 | 115 | 107 | 114 | 117 | 119 | 117 | |
| 95% | 129 | 115 | 107 | 114 | 117 | 119 | 117 | |
| Max | 129 | 115 | 107 | 114 | 117 | 119 | 117 | |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -10 | -17 | -12 | -11 | -61 | -70 | |
| — | -10 | -17 | -12 | -11 | -61 | -70 | |
| — | -10 | -17 | -12 | -11 | -61 | -70 | |
| — | -9 | -12 | -11 | -10 | -24 | -63 | |
| — | -7 | -9 | -8 | -6 | -6 | -11 | |
| — | -1 | -8 | -3 | -1 | -1 | +1 | |
| — | 0 | -6 | -2 | 0 | 0 | +13 | |
| — | 0 | -6 | -2 | 0 | 0 | +13 | |
| — | 0 | -6 | -2 | 0 | 0 | +13 | |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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PROCESS: C PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 500 mw, 30 V, 25°C.

CELL NO.: 419242 NO. OF UNITS: 16

$I_{CEO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.7 | 1.0 | 0.5 | 0.5 | 0.1 | 0.1 | <0.1 |
| 5% | <0.1 | 0.7 | 1.0 | 0.5 | 0.5 | 0.1 | 0.1 | <0.1 |
| 10% | <0.1 | 0.8 | 1.0 | 0.5 | 0.5 | 0.2 | 0.2 | 0.2 |
| 25% | 0.2 | 1.0 | 1.3 | 0.6 | 0.7 | 0.7 | 0.5 | 1.0 |
| 50% | 1.5 | 5.1 | 11.7 | 6.3 | 7.5 | 5.2 | 12.6 | 9.8 |
| 75% | 533.1 | 94.9 | 57.5 | 77.9 | 116.3 | 83.4 | 125.9 | 129.0 |
| 90% | >1μA | ∞ | ∞ | ∞ | 765.9 | 544.7 | ∞ | ∞ |
| 95% | >1μA | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |
| Max | >1μA | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 0.3 | 0.4 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 0.3 | 0.4 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 0.3 | 0.4 | 0.3 | 0.1 | <0.1 | 0.1 | <0.1 | <0.1 |
| 0.5 | 0.9 | 0.7 | 0.6 | 0.3 | 0.3 | <0.1 | 0.3 |
| 1.0 | 2.1 | 1.9 | 1.7 | 1.6 | 1.4 | 0.2 | 2.0 |
| 5.1 | 6.3 | 6.4 | 5.7 | 5.2 | 5.1 | 0.3 | 5.9 |
| 32.3 | 123.0 | 122.6 | 128.0 | 123.0 | 198.3 | 2.1 | 91.2 |
| 81.9 | 363.5 | 363.9 | 379.0 | 364.0 | 389.0 | 18.7 | 264.9 |
| 81.9 | 363.5 | 363.9 | 379.0 | 364.0 | 389.0 | 18.7 | 264.4 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 45 | 61 | 61 | 61 | 61 | 61 | 33 | 05 |
| 45 | 61 | 61 | 61 | 61 | 61 | 33 | 05 |
| 56 | 62 | 63 | 63 | 66 | 67 | 36 | 48 |
| 63 | 74 | 74 | 74 | 74 | 74 | 71 | 74 |
| 90 | 93 | 90 | 90 | 92 | 89 | 84 | 90 |
| 118 | 123 | 124 | 124 | 125 | 125 | 117 | 125 |
| 140 | 163 | 163 | 164 | 155 | 163 | 149 | 168 |
| 151 | 200 | 199 | 199 | 199 | 198 | 198 | 199 |
| 151 | 200 | 199 | 199 | 199 | 198 | 198 | 199 |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -1 | -2 | -3 | -3 | -75 | -92 |
| = | -1 | -1 | -2 | -3 | -3 | -75 | -92 |
| = | 0 | 0 | -1 | -2 | -2 | -49 | -29 |
| — | 0 | 0 | 0 | 0 | 0 | • | 0 |
| — | +4 | +4 | +5 | +1 | +5 | +2 | +4 |
| — | +24 | +25 | +25 | +24 | +24 | +24 | +25 |
| — | +43 | +41 | +41 | +48 | +43 | +39 | +43 |
| — | +48 | +44 | +43 | +51 | +57 | +59 | +48 |
| — | +48 | +44 | +43 | +51 | +57 | +59 | +48 |

$V_{CE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 103 | 626 | 090 | 093 | 090 | 093 | 092 | 091 |
| 5% | 103 | 626 | 090 | 093 | 090 | 093 | 092 | 091 |
| 10% | 110 | 073 | 092 | 094 | 094 | 093 | 092 | 092 |
| 25% | 117 | 099 | 103 | 102 | 104 | 104 | 103 | 102 |
| 50% | 126 | 117 | 118 | 120 | 119 | 120 | 119 | 117 |
| 75% | 142 | 126 | 127 | 132 | 129 | 136 | 141 | 135 |
| 90% | 165 | 167 | 153 | 148 | 142 | 147 | 177 | 196 |
| 95% | 194 | 173 | 173 | 158 | 153 | 150 | 215 | 203 |
| Max | 194 | 173 | 173 | 158 | 153 | 150 | 215 | 203 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -82 | -18 | -19 | -29 | -25 | -19 | -18 |
| — | -82 | -18 | -19 | -29 | -25 | -19 | -18 |
| — | -37 | -17 | -18 | -21 | -20 | -18 | -17 |
| — | -14 | -13 | -15 | -14 | -14 | -14 | -12 |
| — | -11 | -11 | -10 | -10 | -10 | -11 | -11 |
| — | -7 | -6 | -6 | -7 | -5 | -7 | -3 |
| — | +7 | -1 | +2 | +2 | +5 | +31 | +18 |
| — | +36 | +5 | +3 | +7 | +13 | +65 | +48 |
| — | +36 | +5 | +3 | +7 | +13 | +65 | +48 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 778 | 693 | 767 | 765 | 767 | 765 | 765 | 767 |
| 778 | 693 | 767 | 765 | 767 | 765 | 765 | 767 |
| 778 | 744 | 767 | 766 | 768 | 765 | 765 | 767 |
| 786 | 769 | 775 | 774 | 775 | 776 | 772 | 774 |
| 796 | 787 | 788 | 785 | 787 | 786 | 785 | 786 |
| 802 | 792 | 799 | 797 | 792 | 805 | 795 | 801 |
| 829 | 845 | 819 | 815 | 812 | 1119 | 823 | 831 |
| 874 | 852 | 853 | 836 | 815 | 1799 | 837 | 881 |
| 874 | 852 | 853 | 836 | 815 | 1799 | 837 | 881 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -13 | -2 | -4 | -7 | -6 | -4 | -2 |
| — | -13 | -2 | -4 | -7 | -6 | -4 | -2 |
| — | -6 | -2 | -3 | -4 | -3 | -3 | -2 |
| — | -2 | -2 | -1 | -2 | -2 | -2 | -2 |
| — | -2 | -1 | -2 | -1 | -1 | -2 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | 0 |
| — | +1 | 0 | 0 | +1 | +41 | +1 | +1 |
| — | +5 | +1 | 1 | +2 | +126 | +2 | +1 |
| — | +5 | +1 | 1 | +2 | +126 | +2 | +1 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 49 | 48 | 47 | 49 | 48 | 49 | 48 | 50 |
| 5% | 49 | 48 | 47 | 49 | 48 | 49 | 48 | 50 |
| 10% | 50 | 51 | 49 | 51 | 50 | 51 | 50 | 50 |
| 25% | 55 | 54 | 53 | 54 | 54 | 54 | 54 | 53 |
| 50% | 69 | 69 | 68 | 69 | 69 | 69 | 67 | 68 |
| 75% | 102 | 101 | 100 | 101 | 101 | 101 | 101 | 101 |
| 90% | 124 | 123 | 121 | 123 | 122 | 124 | 124 | 123 |
| 95% | 131 | 130 | 128 | 131 | 129 | 131 | 130 | 129 |
| Max | 131 | 130 | 128 | 131 | 129 | 131 | 130 | 129 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -3 | -10 | -3 | -4 | -4 | -5 | -5 |
| — | -3 | -10 | -3 | -4 | -4 | -5 | -5 |
| — | -2 | -7 | -2 | -3 | -2 | -4 | -4 |
| — | -1 | -3 | -1 | -2 | -1 | -2 | -3 |
| — | -1 | -3 | -1 | -1 | -1 | -2 | -2 |
| — | 0 | -2 | 0 | -1 | 0 | -1 | -1 |
| — | +1 | -2 | 0 | -1 | +1 | -1 | +1 |
| — | +2 | -2 | +1 | 0 | +2 | 0 | +2 |
| — | +2 | -2 | +1 | 0 | +2 | 0 | +2 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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PROCESS: C PRE-SCREEN STRESS: 168 Hrs. of 250°C/30V - 300°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 200 mw, 30 V, 150°C.

CELL NO.: 419243 NO. OF UNITS: 6

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 0.3 | 0.3 | 0.1 | 0.5 | 10b | 0.3 | 0.2 | 0.4 |
| 5% | 0.3 | 0.3 | 0.1 | 0.5 | 10b | 0.3 | 0.2 | 0.4 |
| 10% | 0.3 | 0.3 | 0.1 | 0.5 | 10b | 0.3 | 0.2 | 0.4 |
| 25% | 0.3 | 0.5 | 2.1 | 6.7 | 24.8 | 7.2 | 5.3 | 7.8 |
| 50% | 169.0 | 9.5 | 76.1 | 47.0 | 7302 | 536 | 439 | 326 |
| 75% | >1 μA | 354.3 | 7613 | ∞ | ∞ | ∞ | ∞ | ∞ |
| 90% | >1 μA | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |
| 95% | >1 μA | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |
| Max | >1 μA | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.6 | 0.6 | 0.5 | 0.8 | 0.3 | 0.4 | 0.5 |
| <0.1 | 0.6 | 0.6 | 0.5 | 0.8 | 0.3 | 0.4 | 0.5 |
| <0.1 | 0.6 | 0.6 | 0.5 | 0.8 | 0.3 | 0.4 | 0.5 |
| 0.4 | 1.2 | 0.8 | 0.9 | 1.4 | 0.8 | 1.1 | 1.1 |
| 2.6 | 6.8 | 5.7 | 3.3 | 2.8 | 2.2 | 1.6 | 1.6 |
| 17.1 | 13.6 | 10.4 | 12.9 | 15.0 | 23.8 | 42.2 | 25.34 |
| 31.6 | 14.3 | 12.0 | 17.0 | 32.2 | 69.5 | 148.5 | ∞ |
| 31.6 | 14.3 | 12.0 | 17.0 | 32.2 | 69.5 | 148.5 | ∞ |
| 31.6 | 14.3 | 12.0 | 17.0 | 32.2 | 69.5 | 148.5 | ∞ |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 43 | 56 | 60 | 48 | 42 | 45 | 38 | 26 |
| 43 | 56 | 60 | 48 | 42 | 45 | 38 | 26 |
| 43 | 56 | 60 | 48 | 42 | 45 | 38 | 26 |
| 66 | 67 | 75 | 78 | 78 | 78 | 74 | 57 |
| 103 | 112 | 113 | 113 | 113 | 113 | 113 | 113 |
| 110 | 120 | 125 | 126 | 126 | 126 | 126 | 126 |
| 120 | 125 | 126 | 128 | 128 | 129 | 129 | 132 |
| 120 | 125 | 126 | 128 | 128 | 129 | 129 | 132 |
| 120 | 125 | 126 | 128 | 128 | 129 | 129 | 132 |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -4 | +1 | 0 | -3 | 0 | -12 | -39 |
| — | -4 | +1 | 0 | -3 | 0 | -12 | -39 |
| — | -4 | +1 | 0 | -3 | 0 | -12 | -39 |
| — | -1 | +4 | +4 | -1 | +3 | -3 | -17 |
| — | +8 | +10 | +12 | +9 | +8 | +8 | +2 |
| — | +20 | +28 | +21 | +23 | +22 | +19 | +17 |
| — | +30 | +39 | +27 | +28 | +28 | +29 | +31 |
| — | +30 | +39 | +27 | +28 | +28 | +29 | +31 |
| — | +30 | +39 | +27 | +28 | +28 | +29 | +31 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 108 | 095 | 093 | 094 | 094 | 095 | 092 | 089 |
| 5% | 108 | 095 | 093 | 094 | 094 | 095 | 092 | 089 |
| 10% | 108 | 095 | 093 | 094 | 094 | 095 | 092 | 089 |
| 25% | 117 | 103 | 104 | 104 | 102 | 105 | 102 | 101 |
| 50% | 127 | 112 | 117 | 116 | 112 | 114 | 114 | 118 |
| 75% | 135 | 122 | 119 | 124 | 121 | 122 | 121 | 120 |
| 90% | 135 | 133 | 121 | 125 | 122 | 123 | 125 | 121 |
| 95% | 135 | 133 | 121 | 125 | 122 | 123 | 125 | 121 |
| Max | 136 | 133 | 121 | 125 | 122 | 123 | 125 | 121 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -14 | -14 | -13 | -14 | -12 | -15 | -18 |
| — | -14 | -14 | -13 | -14 | -12 | -15 | -18 |
| — | -14 | -14 | -13 | -14 | -12 | -15 | -18 |
| — | -13 | -13 | -12 | -13 | -12 | -14 | -14 |
| — | -12 | -11 | -10 | -12 | -10 | -12 | -11 |
| — | -8 | -8 | -7 | -10 | -9 | -8 | -8 |
| — | -1 | -6 | -6 | -9 | -8 | -7 | -4 |
| — | -1 | -6 | -6 | -9 | -8 | -7 | -4 |
| — | -1 | -6 | -6 | -9 | -8 | -7 | -4 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 786 | 771 | 773 | 775 | 775 | 772 | 769 | 768 |
| 786 | 771 | 773 | 775 | 775 | 772 | 769 | 768 |
| 786 | 771 | 773 | 775 | 775 | 772 | 769 | 768 |
| 789 | 775 | 776 | 777 | 777 | 774 | 773 | 770 |
| 796 | 784 | 783 | 787 | 783 | 782 | 781 | 781 |
| 808 | 793 | 797 | 800 | 796 | 793 | 793 | 802 |
| 826 | 808 | 811 | 813 | 814 | 812 | 807 | 809 |
| 826 | 808 | 811 | 813 | 814 | 812 | 807 | 809 |
| 826 | 808 | 811 | 813 | 814 | 812 | 807 | 809 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -1 | -1 | -2 | -2 | -2 |
| — | -2 | -2 | -1 | -1 | -2 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | 0 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | 0 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | 0 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 43 | 43 | 37 | 32 | 31 | 31 | 29 | 28 |
| 5% | 43 | 43 | 37 | 32 | 31 | 31 | 29 | 28 |
| 10% | 43 | 43 | 37 | 32 | 31 | 31 | 29 | 28 |
| 25% | 53 | 52 | 51 | 47 | 48 | 49 | 49 | 48 |
| 50% | 64 | 66 | 67 | 64 | 67 | 68 | 70 | 71 |
| 75% | 86 | 81 | 81 | 78 | 81 | 83 | 85 | 84 |
| 90% | 111 | 108 | 108 | 103 | 105 | 108 | 114 | 109 |
| 95% | 111 | 108 | 108 | 103 | 105 | 108 | 114 | 109 |
| Max | 111 | 108 | 108 | 103 | 105 | 108 | 114 | 109 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -7 | -13 | -25 | -26 | -28 | -31 | -35 |
| — | -7 | -13 | -25 | -26 | -28 | -31 | -35 |
| — | -7 | -13 | -25 | -26 | -28 | -31 | -35 |
| — | -4 | -9 | -14 | -12 | -10 | -10 | -10 |
| — | -3 | -3 | -7 | -5 | -2 | -2 | -2 |
| — | +4 | +2 | -4 | +1 | +3 | +8 | +6 |
| — | +10 | +12 | +6 | +15 | +16 | +21 | +23 |
| — | +10 | +12 | +6 | +15 | +16 | +21 | +23 |
| — | +10 | +12 | +6 | +15 | +16 | +21 | +23 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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PROCESS: C PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C. Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 800 mw, 30 V, 25°C.

CELL NO.: 419244 NO. OF UNITS: 14

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 10% | <0.1 | 0.4 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 |
| 25% | 0.2 | 0.6 | 0.3 | 0.2 | 0.3 | 0.1 | 0.5 | 0.2 |
| 50% | 0.5 | 0.9 | 1.0 | 0.6 | 0.7 | 0.8 | 1.9 | 1.8 |
| 75% | 0.8 | 2.1 | 2.1 | 1.8 | 1.9 | 1.4 | 30.1 | 14.6 |
| 90% | 1.0 | 124.3 | 378.2 | 405 | 4482 | 5124 | 5922 | 3319 |
| 95% | 1.1 | 220.8 | 745.3 | 802.9 | 8750 | ∞ | ∞ | 3630 |
| Max | 1.1 | 220.8 | 745.3 | 802.9 | 8750 | ∞ | ∞ | 3630 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 |
| <0.1 | 0.7 | 0.2 | 0.2 | 0.1 | 0.4 | 0.4 | 0.6 |
| <0.1 | 2.0 | 1.5 | 1.6 | 1.5 | 1.3 | 1.8 | 3.2 |
| 0.2 | 3.2 | 3.2 | 2.7 | 2.9 | 2.8 | 3.2 | 7.0 |
| 0.4 | 7.1 | 7.4 | 7.4 | 7.1 | 18.9 | 5027 | 6038 |
| 0.5 | 8.0 | 8.5 | 9.0 | 8.5 | 32.4 | ∞ | ∞ |
| 0.5 | 8.0 | 8.5 | 9.0 | 8.5 | 32.4 | ∞ | ∞ |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 63 | 61 | 61 | 61 | 61 | 61 | 61 | 61 |
| 63 | 61 | 61 | 61 | 61 | 61 | 61 | 61 |
| 66 | 64 | 64 | 64 | 65 | 66 | 65 | 64 |
| 70 | 72 | 74 | 74 | 74 | 76 | 78 | 79 |
| 95 | 95 | 96 | 96 | 96 | 93 | 99 | 108 |
| 105 | 117 | 118 | 120 | 121 | 121 | 124 | 129 |
| 142 | 152 | 150 | 149 | 149 | 146 | 141 | 654 |
| 152 | 166 | 163 | 162 | 162 | 158 | 149 | ∞ |
| 152 | 166 | 163 | 163 | 162 | 158 | 149 | ∞ |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -5 | -6 | -4 | -5 | -12 | -10 | -8 |
| — | -5 | -6 | -4 | -5 | -12 | -10 | -8 |
| — | -4 | -5 | -4 | -4 | -8 | -7 | -6 |
| — | -1 | -2 | -2 | -2 | -1 | -1 | -1 |
| — | 0 | +2 | +2 | +2 | +2 | +1 | +6 |
| — | +8 | +8 | +8 | +8 | +13 | +17 | +35 |
| — | +28 | +28 | +27 | +27 | +28 | +34 | +361 |
| — | +43 | +42 | +41 | +41 | +39 | +39 | +558 |
| — | +43 | +42 | +41 | +41 | +39 | +39 | +558 |

$V_{CE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 101 | 083 | 082 | 087 | 088 | 089 | 084 | 082 |
| 5% | 101 | 083 | 082 | 087 | 088 | 089 | 084 | 082 |
| 10% | 105 | 085 | 085 | 089 | 089 | 090 | 086 | 086 |
| 25% | 113 | 096 | 098 | 097 | 099 | 100 | 096 | 098 |
| 50% | 126 | 113 | 112 | 113 | 115 | 115 | 110 | 113 |
| 75% | 140 | 126 | 129 | 130 | 131 | 129 | 127 | 132 |
| 90% | 155 | 134 | 133 | 133 | 134 | 143 | 143 | 144 |
| 95% | 160 | 134 | 135 | 134 | 135 | 150 | 150 | 148 |
| Max | 160 | 134 | 135 | 134 | 135 | 150 | 150 | 148 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -22 | -19 | -21 | -18 | -17 | -22 | -22 |
| — | -22 | -19 | -21 | -18 | -17 | -22 | -22 |
| — | -21 | -19 | -20 | -18 | -17 | -21 | -21 |
| — | -18 | -18 | -15 | -16 | -14 | -17 | -17 |
| — | -13 | -13 | -12 | -13 | -12 | -14 | -12 |
| — | -12 | -11 | -9 | -10 | -9 | -11 | -7 |
| — | -6 | -8 | -4 | -4 | -1 | -2 | -1 |
| — | -3 | -6 | -1 | -4 | +1 | +1 | -1 |
| — | -3 | -6 | -1 | -4 | +1 | +1 | -1 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 776 | 766 | 763 | 767 | 765 | 765 | 767 | 768 |
| 776 | 766 | 763 | 767 | 765 | 765 | 767 | 768 |
| 781 | 770 | 766 | 770 | 766 | 766 | 767 | 770 |
| 788 | 776 | 771 | 775 | 770 | 772 | 773 | 779 |
| 793 | 780 | 779 | 780 | 779 | 780 | 780 | 786 |
| 798 | 787 | 786 | 787 | 786 | 786 | 786 | 794 |
| 813 | 794 | 792 | 794 | 791 | 802 | 801 | 807 |
| 819 | 794 | 792 | 794 | 791 | 813 | 812 | 809 |
| 819 | 794 | 792 | 794 | 791 | 813 | 812 | 809 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -5 | -5 | -4 | -5 | -5 | -4 | -4 |
| — | -5 | -5 | -4 | -5 | -5 | -4 | -4 |
| — | -4 | -4 | -3 | -4 | -4 | -4 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | 0 |
| — | 0 | -1 | -1 | -1 | +1 | +1 | +1 |
| — | +1 | 0 | 0 | 0 | +1 | +1 | +1 |
| — | +1 | 0 | 0 | 0 | +1 | +1 | +1 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 54 | 55 | 55 | 55 | 55 | 55 | 54 | 53 |
| 5% | 54 | 55 | 55 | 55 | 55 | 55 | 54 | 53 |
| 10% | 60 | 61 | 61 | 60 | 61 | 61 | 60 | 54 |
| 25% | 66 | 67 | 68 | 67 | 68 | 68 | 67 | 59 |
| 50% | 81 | 80 | 80 | 80 | 81 | 82 | 77 | 77 |
| 75% | 107 | 107 | 105 | 105 | 107 | 108 | 107 | 107 |
| 90% | 112 | 112 | 114 | 112 | 113 | 114 | 113 | 112 |
| 95% | 114 | 115 | 116 | 115 | 115 | 116 | 115 | 113 |
| Max | 114 | 115 | 116 | 115 | 115 | 116 | 115 | 113 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -2 | -7 | -3 | -2 | -3 | -31 | -47 |
| — | -2 | -7 | -3 | -2 | -3 | -31 | -47 |
| — | -2 | -6 | -3 | -2 | -3 | -20 | -39 |
| — | -1 | -2 | -2 | 0 | -1 | -3 | -7 |
| — | 0 | 0 | -1 | +1 | +1 | 0 | -2 |
| — | +2 | +2 | +1 | +2 | +2 | +2 | +1 |
| — | +2 | +3 | +2 | +4 | +4 | +2 | +4 |
| — | +2 | +3 | +2 | +4 | +5 | +2 | +5 |
| — | +2 | +3 | +2 | +4 | +5 | +2 | +5 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
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PROCESS: C PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 700 mw, 30 V, 25°C.

CELL NO.: 419245 NO. OF UNITS: 28

$I_{CEO}$ ($V_{CE}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 |
| 5% | <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | 0.2 |
| 10% | <0.1 | 0.6 | 0.2 | <0.1 | 0.2 | <0.1 | 0.3 | 0.5 |
| 25% | <0.1 | 0.7 | 0.2 | 0.1 | 0.3 | 0.1 | 0.4 | 0.7 |
| 50% | 0.1 | 0.9 | 0.5 | 0.3 | 0.4 | 0.4 | 1.0 | 1.6 |
| 75% | 0.2 | 1.4 | 1.2 | 1.2 | 1.5 | 3.3 | 2049 | 5624 |
| 90% | 0.6 | 3.6 | 31.2 | 44.3 | 58.5 | 5810 | ∞ | ∞ |
| 95% | 8.0 | 6.5 | 622 | 1348 | 1484 | ∞ | ∞ | ∞ |
| Max | 14.0 | 7.0 | 738 | 1745 | 1820 | ∞ | ∞ | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | 0.1 | 0.1 | <0.1 | 0.1 |
| <0.1 | 0.5 | 0.1 | 0.1 | 0.2 | 0.4 | 0.1 | 0.3 |
| 0.3 | 0.7 | 0.3 | 0.3 | 0.4 | 0.5 | 0.4 | 0.6 |
| 2.2 | 2.0 | 2.3 | 3.3 | 3.3 | 2.8 | 3.3 | 3.9 |
| 6.3 | 7.0 | 2.2 | 9.4 | 9.1 | 51.9 | 44.1 | 28.3 |
| 9.2 | 9.9 | 16.1 | 26.2 | 36.3 | 131 | 5746 | 6404 |
| 9.6 | 10.3 | 22.0 | 39.0 | 54.5 | 1343 | 7485 | ∞ |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 56 | 13 | 57 | 57 | 56 | 03 | 01 | |
| 57 | 33 | 57 | 57 | 57 | 05 | 01 | |
| 58 | 57 | 58 | 58 | 58 | 51 | 42 | |
| 69 | 67 | 70 | 70 | 70 | 66 | 61 | |
| 80 | 79 | 80 | 79 | 79 | 80 | 77 | |
| 101 | 101 | 114 | 116 | 116 | 106 | 106 | |
| 148 | 148 | 149 | 142 | 147 | 147 | 149 | |
| 158 | 157 | 630 | 177 | 128 | 182 | 177 | |
| 160 | 159 | ∞ | 193 | 195 | 206 | 198 | |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -90 | -4 | -5 | -5 | -96 | -99 | |
| — | -51 | -4 | -5 | -5 | -93 | -99 | |
| — | -2 | -3 | -4 | -4 | -21 | -34 | |
| — | -1 | -2 | -2 | -2 | -3 | -5 | |
| — | -1 | -1 | -1 | -1 | -1 | -2 | |
| — | +2 | +9 | +6 | +6 | +7 | +5 | |
| — | +12 | +13 | +21 | +20 | +25 | +25 | |
| — | +28 | +312 | +25 | +26 | +31 | +27 | |
| — | +30 | +527 | +25 | +26 | +33 | +28 | |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 103 | 080 | 082 | 080 | 084 | 015 | 080 | |
| 5% | 103 | 081 | 082 | 081 | 084 | 046 | 081 | |
| 10% | 104 | 085 | 084 | 085 | 087 | 084 | 087 | |
| 25% | 114 | 095 | 094 | 096 | 094 | 094 | 094 | |
| 50% | 125 | 105 | 106 | 106 | 106 | 106 | 105 | |
| 75% | 139 | 125 | 121 | 120 | 120 | 120 | 119 | |
| 90% | 152 | 130 | 150 | 134 | 132 | 131 | 131 | |
| 95% | 167 | 153 | 893 | 150 | 154 | 153 | 153 | |
| Max | 171 | 153 | 1499 | 152 | 154 | 155 | 153 | |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -22 | -21 | -22 | -21 | -89 | -22 | |
| — | -21 | -21 | -21 | -21 | -58 | -22 | |
| — | -20 | -21 | -20 | -18 | -19 | -20 | |
| — | -18 | -19 | -17 | -17 | -17 | -19 | |
| — | -15 | -16 | -15 | -14 | -15 | -16 | |
| — | -11 | -12 | -12 | -11 | -13 | -11 | |
| — | -9 | -7 | -8 | -7 | -6 | -7 | |
| — | -6 | +523 | -6 | -5 | -5 | -6 | |
| — | -6 | 956 | -5 | -5 | -5 | -6 | |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 775 | 759 | 758 | 765 | 756 | 757 | | |
| 777 | 761 | 760 | 765 | 760 | 760 | | |
| 781 | 766 | 763 | 767 | 765 | 765 | | |
| 785 | 771 | 770 | 775 | 768 | 769 | | |
| 794 | 777 | 777 | 779 | 775 | 776 | | |
| 802 | 785 | 785 | 786 | 780 | 780 | | |
| 809 | 794 | 799 | 796 | 791 | 791 | | |
| 818 | 803 | 1241 | 805 | 801 | 810 | | |
| 823 | 807 | 1599 | 807 | 800 | 800 | | |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -3 | -3 | -3 | -4 | -3 | -388 | |
| — | -3 | -3 | -3 | -4 | -3 | -234 | |
| — | -3 | -3 | -3 | -3 | -3 | -3 | |
| — | -2 | -3 | -2 | -3 | -3 | -3 | |
| — | -2 | -2 | -2 | -3 | -2 | -2 | |
| — | -1 | -2 | -1 | -2 | -2 | -2 | |
| — | -1 | -1 | -1 | -1 | -1 | -1 | |
| — | 0 | +54 | 0 | 0 | 0 | 0 | |
| — | 0 | +98 | 0 | 0 | 0 | 0 | |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 55 | 56 | 20 | 56 | 57 | | 44 | 46 |
| 5% | 56 | 57 | 36 | 57 | 58 | | 50 | 50 |
| 10% | 59 | 60 | 57 | 60 | 61 | | 57 | 57 |
| 25% | 68 | 68 | 63 | 67 | 68 | | 63 | 64 |
| 50% | 90 | 89 | 81 | 87 | 88 | | 87 | 87 |
| 75% | 110 | 110 | 105 | 109 | 111 | | 109 | 112 |
| 90% | 132 | 134 | 120 | 133 | 136 | | 134 | 134 |
| 95% | 136 | 137 | 134 | 134 | 138 | | 136 | 136 |
| Max | 139 | 139 | 138 | 135 | 140 | | 137 | 136 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -9 | -81 | -23 | -23 | -31 | -38 | -40 |
| — | -8 | -52 | -16 | -16 | -27 | -37 | -36 |
| — | -2 | -11 | -4 | -3 | -19 | -9 | -10 |
| — | 0 | -9 | -2 | 0 | -4 | -2 | -2 |
| — | +1 | -5 | -1 | +1 | +1 | +1 | +1 |
| — | +2 | 0 | 0 | +2 | +3 | +2 | +3 |
| — | +2 | +1 | +2 | +4 | +4 | +6 | +11 |
| — | +4 | +4 | +3 | +5 | +9 | +9 | +18 |
| — | +4 | +4 | +3 | +5 | +10 | +9 | +22 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: C PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 500 mw, 30 V, 25°C.

CELL NO.: 419246 NO. OF UNITS: 79

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.3 | 0.7 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.4 | 0.8 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 |
| 10% | <0.1 | 0.4 | 1.0 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 |
| 25% | <0.1 | 0.5 | 1.0 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 |
| 50% | <0.1 | 0.7 | 1.3 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 |
| 75% | 0.2 | 1.2 | 1.9 | 1.1 | 1.4 | 0.7 | 1.6 | 1.7 |
| 90% | 0.6 | 4.0 | 5.4 | 5.9 | 130 | 6.7 | 11.6 | 19.1 |
| 95% | 2.3 | 23.7 | 22.2 | 313 | 453 | 17.9 | 24.5 | 1029 |
| Max | 7.6 | 58.1 | 171 | 9380 | ∞ | ∞ | ∞ | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.2 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.2 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | 0.3 | <0.1 | 0.1 | 0.1 | 0.1 | <0.1 |
| 0.2 | 0.4 | 0.5 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 |
| 0.5 | 1.0 | 1.0 | 0.8 | 0.7 | 0.7 | 0.7 | 1.0 |
| 2.3 | 2.9 | 2.4 | 2.6 | 2.7 | 2.3 | 2.3 | 2.9 |
| 4.0 | 5.0 | 4.6 | 4.5 | 6.6 | 5.2 | 5.5 | 6.7 |
| 6.2 | 7.4 | 7.5 | 7.5 | 9.3 | 7.4 | 7.4 | 7.5 |
| 7.5 | 11.2 | 11.1 | 12.0 | ∞ | 12.4 | 21.0 | 30.3 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 56 | 55 | 56 | 55 | 56 | 57 | 08 | 48 |
| 59 | 59 | 59 | 59 | 59 | 60 | 57 | 60 |
| 64 | 64 | 64 | 64 | 64 | 64 | 61 | 64 |
| 72 | 72 | 72 | 72 | 72 | 72 | 69 | 72 |
| 80 | 79 | 80 | 79 | 79 | 79 | 78 | 79 |
| 97 | 102 | 104 | 103 | 104 | 104 | 99 | 105 |
| 126 | 136 | 136 | 137 | 135 | 134 | 130 | 135 |
| 139 | 140 | 141 | 141 | 140 | 140 | 140 | 140 |
| 155 | 154 | ∞ | ∞ | 155 | 159 | 158 | 172 |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -13 | -14 | -14 | -20 | -23 | -90 | -44 |
| — | -2 | -2 | -3 | -5 | -9 | -26 | -11 |
| — | -1 | -1 | -2 | -2 | -2 | -3 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | +1 | +1 | +1 | +1 | +1 |
| — | +2 | +3 | +7 | +7 | +11 | +10 | +18 |
| — | +11 | +13 | +11 | +11 | +18 | +19 | +24 |
| — | +20 | +163 | +84 | +21 | +22 | +23 | +38 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 090 | 081 | 080 | 002 | 003 | 012 | 080 | 005 |
| 5% | 105 | 084 | 086 | 085 | 085 | 084 | 085 | 082 |
| 10% | 106 | 087 | 087 | 087 | 089 | 087 | 087 | 085 |
| 25% | 113 | 094 | 094 | 095 | 095 | 095 | 095 | 094 |
| 50% | 122 | 101 | 103 | 103 | 104 | 102 | 102 | 101 |
| 75% | 134 | 114 | 115 | 116 | 117 | 116 | 115 | 113 |
| 90% | 152 | 132 | 135 | 136 | 136 | 136 | 135 | 133 |
| 95% | 159 | 138 | 147 | 140 | 140 | 145 | 140 | 141 |
| Max | 320 | 145 | 207 | 150 | 150 | 1030 | 146 | 145 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -56 | -41 | -99 | -98 | -90 | -56 | -97 |
| — | -21 | -21 | -22 | -20 | -22 | -21 | -22 |
| — | -20 | -20 | -19 | -19 | -20 | -20 | -20 |
| — | -19 | -18 | -17 | -17 | -17 | -18 | -18 |
| — | -16 | -16 | -14 | -14 | -15 | -16 | -16 |
| — | -13 | -13 | -11 | -12 | -13 | -13 | -13 |
| — | -10 | -10 | -8 | -10 | -9 | -9 | -10 |
| — | -9 | -7 | -6 | -6 | -5 | -8 | -9 |
| — | -7 | +154 | -6 | -5 | +163 | -7 | -7 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 738 | 622 | 028 | 757 | 757 | 757 | 753 | 756 |
| 777 | 760 | 758 | 763 | 762 | 760 | 760 | 761 |
| 783 | 764 | 765 | 766 | 763 | 763 | 760 | 765 |
| 787 | 768 | 769 | 770 | 768 | 767 | 765 | 767 |
| 794 | 775 | 775 | 777 | 774 | 775 | 770 | 773 |
| 802 | 783 | 780 | 783 | 783 | 782 | 779 | 781 |
| 811 | 792 | 794 | 796 | 790 | 792 | 790 | 791 |
| 823 | 709 | 796 | 800 | 797 | 797 | 793 | 800 |
| 906 | 820 | 819 | 823 | 820 | 818 | 819 | 817 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -21 | -13 | -19 | -20 | -20 | -21 | -20 |
| — | -4 | -4 | -3 | -3 | -4 | -4 | -4 |
| — | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| — | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -3 | -2 |
| — | -1 | -1 | -1 | -2 | -2 | -2 | -1 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | -1 |
| — | 0 | 0 | 0 | -1 | 0 | 0 | 0 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 53 | 53 | 53 | 53 | 54 | 55 | 25 | |
| 5% | 57 | 57 | 56 | 56 | 57 | 57 | 53 | |
| 10% | 60 | 61 | 61 | 60 | 62 | 63 | 56 | |
| 25% | 74 | 72 | 71 | 23 | 75 | 76 | 70 | |
| 50% | 84 | 84 | 82 | 84 | 85 | 87 | 80 | |
| 75% | 102 | 103 | 101 | 102 | 103 | 105 | 99 | |
| 90% | 121 | 122 | 120 | 121 | 124 | 125 | 118 | |
| 95% | 133 | 132 | 130 | 128 | 134 | 138 | 129 | |
| Max | 139 | 141 | 139 | 134 | 141 | 143 | 134 | |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -10 | -13 | -11 | -7 | -14 | -67 | -29 |
| — | -7 | -9 | -9 | -2 | -1 | -12 | -8 |
| — | -4 | -7 | -8 | -1 | 0 | -7 | -2 |
| — | 0 | -3 | -2 | 0 | +1 | -5 | -1 |
| — | 0 | -1 | -1 | 0 | +2 | -4 | 0 |
| — | +1 | 0 | 0 | +2 | +3 | -3 | +1 |
| — | +2 | +1 | +1 | +3 | +5 | -2 | +3 |
| — | +3 | +1 | +3 | +4 | +6 | 0 | +4 |
| — | +16 | +4 | +9 | +11 | +17 | +7 | +21 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| | | | | | | | |

PROCESS: C PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 400 mw, 30 V, 150°C.

CELL NO.: 419247 NO. OF UNITS: 14

$I_{CEO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.4 | 0.1 | 0.1 | 0.2 | 0.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.4 | 0.1 | 0.1 | 0.2 | 0.1 | <0.1 | <0.1 |
| 10% | <0.1 | 0.5 | 0.2 | 0.2 | 0.3 | 0.2 | <0.1 | <0.1 |
| 25% | <0.1 | 0.7 | 0.6 | 0.5 | 2.6 | 0.3 | 0.2 | <0.1 |
| 50% | 0.4 | 1.3 | 2.4 | 4.6 | 729 | 39 | 0.3 | 0.4 |
| 75% | 0.4 | 4.1 | 2290 | 3752 | ∞ | ∞ | 498.2 | 1554 |
| 90% | 0.8 | 2362 | ∞ | ∞ | ∞ | ∞ | ∞ | 3467 |
| 95% | 0.9 | 4120 | ∞ | ∞ | ∞ | ∞ | ∞ | 4518 |
| Max | 0.9 | 4170 | ∞ | ∞ | ∞ | ∞ | ∞ | 4518 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| 0.2 | 0.5 | 0.1 | 0.4 | 0.1 | 0.1 | 0.3 | 0.2 |
| 0.4 | 0.9 | 0.7 | 1.3 | 0.6 | 0.7 | 0.5 | 0.4 |
| 1.2 | 2.3 | 4.0 | 4.5 | 4.7 | 5.2 | 3.7 | 4.9 |
| 5.7 | 6.6 | 8.7 | 5051 | 6019 | 8121 | 6019 | 3425 |
| 7.3 | 8.5 | 8.9 | ∞ | ∞ | ∞ | 113.0 | 6859 |
| 7.3 | 8.5 | 8.9 | ∞ | ∞ | ∞ | 113.0 | 6859 |

$BV_{CEO}$ ($I_C$ - 0.1 ma.)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 57 | 02 | 00 | 01 | 01 | 00 | 06 | 87 |
| 57 | 02 | 00 | 01 | 01 | 00 | 06 | 87 |
| 60 | 30 | 03 | 02 | 02 | 01 | 07 | 91 |
| 65 | 71 | 69 | 68 | 68 | 09 | 85 | 108 |
| 76 | 88 | 87 | 89 | 90 | 90 | 111 | 127 |
| 92 | 106 | 104 | 109 | 112 | 111 | ∞ | ∞ |
| 107 | 127 | 128 | 132 | 133 | 134 | ∞ | ∞ |
| 111 | 142 | 143 | 145 | 148 | 149 | ∞ | ∞ |
| 111 | 142 | 143 | 145 | 148 | 149 | ∞ | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -97 | -99 | -99 | -99 | -99 | -91 | +1 |
| — | -97 | -99 | -99 | -99 | -99 | -91 | +1 |
| — | -50 | -95 | -98 | -97 | -99 | -91 | +10 |
| — | -1 | -3 | -16 | -2 | -90 | 0 | +24 |
| — | +7 | +8 | +14 | +10 | +5 | +29 | +53 |
| — | +14 | +12 | +36 | +26 | +24 | 1363 | 1363 |
| — | +58 | +64 | +78 | +68 | +68 | 1526 | 1526 |
| — | +90 | +92 | +95 | +99 | +100 | 1642 | 1642 |
| — | +90 | +92 | +95 | +99 | +100 | 1642 | 1642 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma.)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 101 | 084 | 088 | 090 | 088 | 019 | 007 | 088 |
| 5% | 101 | 084 | 088 | 090 | 088 | 019 | 007 | 088 |
| 10% | 103 | 085 | 088 | 091 | 088 | 053 | 049 | 089 |
| 25% | 107 | 093 | 096 | 097 | 092 | 091 | 102 | 099 |
| 50% | 125 | 105 | 115 | 115 | 114 | 107 | 123 | 125 |
| 75% | 137 | 121 | 124 | 127 | 128 | 128 | ∞ | ∞ |
| 90% | 150 | 128 | 417 | 418 | 416 | 416 | ∞ | ∞ |
| 95% | 150 | 130 | 699 | 700 | 701 | 694 | ∞ | ∞ |
| Max | 150 | 130 | 699 | 700 | 701 | 694 | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -20 | -19 | -33 | -21 | -85 | -93 | -21 |
| — | -20 | -19 | -33 | -21 | -85 | -93 | -21 |
| — | -19 | -19 | -27 | -19 | -52 | -56 | -18 |
| — | -17 | -16 | -16 | -17 | -16 | -14 | -15 |
| — | -15 | -15 | -11 | -14 | -15 | -4 | -4 |
| — | -12 | -8 | -3 | -7 | -8 | 2580 | 2580 |
| — | -7 | +294 | +304 | +288 | +295 | 9479 | 9479 |
| — | -5 | +592 | +593 | +594 | +587 | 9800 | 9800 |
| — | -5 | +592 | +593 | +594 | +587 | 9800 | 9800 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 776 | 626 | 738 | 743 | 742 | 701 | 619 | 766 |
| 776 | 626 | 738 | 743 | 742 | 701 | 619 | 766 |
| 778 | 696 | 751 | 754 | 755 | 720 | 692 | 767 |
| 782 | 767 | 768 | 770 | 769 | 764 | 769 | 770 |
| 792 | 781 | 780 | 778 | 781 | 773 | 790 | 792 |
| 806 | 787 | 789 | 791 | 793 | 787 | ∞ | ∞ |
| 811 | 791 | 794 | 795 | 798 | 794 | ∞ | ∞ |
| 813 | 792 | 795 | 797 | 798 | 797 | ∞ | ∞ |
| 813 | 792 | 795 | 797 | 798 | 797 | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -20 | -6 | -5 | -5 | -11 | -21 | -3 |
| — | -20 | -6 | -5 | -5 | -11 | -21 | -3 |
| — | -12 | -5 | -5 | -4 | -9 | -12 | -3 |
| — | -3 | -2 | -3 | -2 | -3 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -1 | -1 |
| — | -2 | -2 | -1 | -1 | -2 | 1146 | 1146 |
| — | -1 | 0 | +1 | 0 | -2 | 1182 | 1182 |
| — | 0 | +1 | +1 | +1 | -1 | 1189 | 1189 |
| — | 0 | +1 | +1 | +1 | -1 | 1189 | 1189 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 59 | 20 | 20 | 19 | 20 | 20 | 20 | 20 |
| 5% | 59 | 20 | 20 | 19 | 20 | 20 | 20 | 20 |
| 10% | 60 | 39 | 39 | 33 | 27 | 30 | 20 | 20 |
| 25% | 63 | 60 | 60 | 56 | 54 | 60 | 20 | 20 |
| 50% | 104 | 92 | 84 | 76 | 78 | 93 | 58 | 45 |
| 75% | 118 | 115 | 112 | 101 | 105 | 114 | 126 | 84 |
| 90% | 121 | 120 | 121 | 109 | 117 | 246 | 149 | 111 |
| 95% | 122 | 121 | 122 | 111 | 119 | 374 | 156 | 116 |
| Max | 122 | 121 | 122 | 111 | 119 | 374 | 156 | 116 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -83 | -82 | -84 | -83 | -82 | -83 | -83 |
| — | -83 | -82 | -84 | -82 | -82 | -83 | -83 |
| — | -43 | -51 | -72 | -71 | -74 | -83 | -83 |
| — | -3 | -11 | -47 | -24 | -11 | -81 | -81 |
| — | -1 | -1 | -10 | -4 | -1 | -12 | -34 |
| — | +1 | 0 | +7 | -3 | +2 | +16 | -7 |
| — | +2 | 0 | +51 | +1 | +253 | +29 | -4 |
| — | +2 | 0 | +59 | +3 | +501 | +30 | -2 |
| — | +2 | 0 | +59 | +3 | +501 | +30 | -2 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: C PRE-SCREEN STRESS: 168 Hrs. of 200°C/30V - 200°C Stabilization Bake - 25 Kg Centrifuge.

OPERATING POWER CONDITION: 200 mw, 30 V, 150°C.

CELL NO.:419248 NO. OF UNITS: 28

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 10% | <0.1 | 0.5 | <0.1 | <0.1 | 0.1 | <0.1 | 0.1 | <0.1 |
| 25% | <0.1 | 0.7 | <0.1 | 0.1 | 0.2 | <0.1 | 0.2 | 0.1 |
| 50% | 0.2 | 0.9 | 0.4 | 0.5 | 0.4 | 0.2 | 0.3 | 0.5 |
| 75% | 0.4 | 1.4 | 1.6 | 7.0 | 1.5 | 4.8 | 4.4 | 259 |
| 90% | 2.0 | 22.2 | 56.3 | 45.2 | 122 | 821 | 470 | 460.7 |
| 95% | 24.3 | 39.6 | 329 | 139.1 | 755 | 2369 | 6590 | ∞ |
| Max | 34.3 | 44.1 | 1696 | 2850 | 1214 | 2605 | ∞ | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | 0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| 0.1 | 0.4 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | <0.1 |
| 0.4 | 1.1 | 0.5 | 0.7 | 0.5 | 0.5 | 0.5 | 0.5 |
| 0.8 | 3.0 | 2.7 | 2.8 | 2.1 | 2.2 | 2.3 | 2.8 |
| 3.8 | 6.2 | 5.7 | 5.6 | 5.5 | 5.6 | 5.6 | 5.9 |
| 6.5 | 2.8 | 8.8 | 10.3 | 12.5 | 12.7 | 9.5 | 10.9 |
| 7.4 | 8.1 | 9.6 | 12.4 | 16.9 | 17.0 | 11.2 | 13.1 |

$BV_{CEO}$ ($I_C$ - 0.1 ma.)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 56 | 59 | 56 | 56 | 56 | 55 | 55 | 01 |
| 57 | 60 | 57 | 57 | 57 | 57 | 57 | 25 |
| 61 | 63 | 61 | 60 | 60 | 60 | 60 | 59 |
| 67 | 69 | 68 | 67 | 67 | 67 | 67 | 66 |
| 81 | 87 | 81 | 84 | 83 | 80 | 80 | 28 |
| 101 | 110 | 101 | 101 | 101 | 101 | 101 | 101 |
| 129 | 234 | 124 | 117 | 131 | 139 | 134 | 134 |
| 132 | ∞ | 143 | 145 | 149 | 618 | 622 | 623 |
| 132 | ∞ | 153 | 156 | 160 | ∞ | ∞ | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -10 | -7 | -14 | -2 | -19 | -46 | -99 |
| — | -6 | -4 | -8 | -2 | -13 | -26 | -75 |
| — | -1 | -1 | -1 | -1 | -2 | -2 | -7 |
| — | 0 | 0 | -1 | -1 | -1 | -1 | -2 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| — | +155 | +13 | +9 | +5 | +9 | +10 | +11 |
| — | +157 | +18 | +27 | +18 | +585 | +585 | +589 |
| — | 1695 | +19 | +31 | +25 | 1049 | 1049 | 1049 |

$V_{CE}$(SAT)($I_C$-50ma, $I_B$-5 ma)(Mv.)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 091 | 000 | 084 | 083 | 083 | 076 | 085 | 086 |
| 5% | 095 | 096 | 086 | 085 | 085 | 080 | 086 | 086 |
| 10% | 103 | 089 | 088 | 090 | 089 | 087 | 089 | 090 |
| 25% | 111 | 093 | 096 | 095 | 094 | 091 | 094 | 096 |
| 50% | 123 | 106 | 105 | 105 | 104 | 100 | 103 | 108 |
| 75% | 133 | 127 | 116 | 116 | 116 | 116 | 117 | 128 |
| 90% | 156 | 370 | 134 | 134 | 133 | 133 | 134 | 180 |
| 95% | 161 | 2495 | 502 | 135 | 176 | 5559 | 5560 | 5800 |
| Max | 166 | 2499 | 800 | 136 | 210 | ∞ | ∞ | ∞ |

$V_{CE}$(SAT)(% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -100 | -25 | -22 | -22 | -24 | -21 | -22 |
| — | -65 | -23 | -21 | -22 | -24 | -21 | -21 |
| — | -21 | -20 | -19 | -20 | -22 | -20 | -20 |
| — | -17 | -17 | -16 | -17 | -20 | -17 | -17 |
| — | -14 | -14 | -14 | -14 | -16 | -14 | -13 |
| — | -12 | -12 | -12 | -12 | -14 | -12 | -9 |
| — | +218 | -8 | -9 | -9 | -11 | -7 | +48 |
| — | 2345 | 358 | -7 | +51 | 4077 | 4077 | 4303 |
| — | 2424 | 655 | -6 | +98 | 7418 | 7418 | 7418 |

$V_{BE}$(SAT)($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 764 | 400 | 761 | 764 | 765 | 761 | 762 | 745 |
| 769 | 497 | 761 | 764 | 766 | 761 | 763 | 752 |
| 778 | 728 | 764 | 767 | 768 | 762 | 765 | 762 |
| 786 | 768 | 769 | 769 | 771 | 769 | 768 | 766 |
| 797 | 777 | 779 | 779 | 780 | 774 | 776 | 776 |
| 803 | 784 | 785 | 784 | 787 | 782 | 784 | 782 |
| 810 | 792 | 813 | 792 | 795 | 809 | 812 | 809 |
| 843 | 818 | 1690 | 816 | 820 | 5868 | 5867 | 5865 |
| 860 | 823 | 2399 | 820 | 824 | ∞ | ∞ | ∞ |

$V_{BE}$(SAT)(% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -49 | -4 | -5 | -4 | -5 | -5 | -6 |
| — | -37 | -4 | -4 | -4 | -5 | -5 | -6 |
| — | -8 | -3 | -3 | -3 | -4 | -3 | -5 |
| — | -3 | -3 | -3 | -2 | -3 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -1 | -1 | -1 | -2 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -2 |
| — | 0 | 112 | 0 | 0 | 633 | 633 | 633 |
| — | 0 | 204 | 0 | +1 | 1151 | 1151 | 1151 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 53 | 20 | 52 | 19 | 50 | 20 | 20 | 20 |
| 5 | 55 | 34 | 54 | 33 | 53 | 37 | 32 | 20 |
| 10 | 60 | 56 | 60 | 57 | 59 | 60 | 59 | 56 |
| 25 | 70 | 66 | 69 | 66 | 66 | 68 | 68 | 68 |
| 50 | 89 | 85 | 87 | 83 | 88 | 89 | 88 | 87 |
| 75 | 104 | 103 | 104 | 100 | 103 | 106 | 105 | 103 |
| 90 | 116 | 117 | 115 | 111 | 113 | 117 | 115 | 118 |
| 95 | 123 | 123 | 122 | 118 | 119 | 123 | 121 | 124 |
| Max | 127 | 127 | 126 | 122 | 123 | 127 | 125 | 128 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -78 | -9 | -68 | -13 | -62 | -62 | -81 |
| — | -46 | -7 | -42 | -9 | -40 | -38 | -72 |
| — | -5 | -2 | -11 | -4 | -3 | -4 | -13 |
| — | -2 | -2 | -6 | -4 | -6 | -2 | -1 |
| — | -1 | -1 | -5 | -3 | +0 | -2 | +1 |
| — | 0 | 0 | -4 | -1 | +1 | 0 | +2 |
| — | +1 | +2 | -2 | +2 | +3 | +2 | +4 |
| — | +2 | +2 | -1 | +3 | +5 | +5 | +7 |
| — | +2 | +2 | -1 | +3 | +5 | +5 | +7 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: C PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 800 mw, 30 V, 25°C.

CELL NO.: 419249 NO. OF UNITS: 10.

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| 5% | <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| 10% | <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| 25% | 0.2 | 0.6 | 0.2 | 0.3 | 0.2 | <0.1 | 0.2 | 4.3 |
| 50% | 0.3 | 1.2 | 0.6 | 0.7 | 1.6 | 1.4 | 1.7 | 27.7 |
| 75% | 0.4 | 5.8 | 15.5 | 19.4 | 80.4 | 52.3 | 53.2 | 246.7 |
| 90% | 4.6 | 60.0 | 251.1 | 249.0 | 258.9 | 356.0 | 258.7 | 936.7 |
| 95% | 5.1 | 65.1 | 273.0 | 269.0 | 272.3 | 382.9 | 298.2 | 236 ∞ |
| Max | 5.1 | 65.1 | 273.0 | 269.0 | 272.3 | 382.9 | 298.2 | 236 ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.3 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.3 |
| <0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.3 |
| 0.2 | 0.6 | 0.2 | 0.2 | 0.1 | 0.3 | 0.8 | 2.2 |
| 0.5 | 1.2 | 0.7 | 0.6 | 0.7 | 0.8 | 3.8 | 436 |
| 2.6 | 3.1 | 2.5 | 2.0 | 2.0 | 3.7 | 2222 | ∞ |
| 11.1 | 11.8 | 9.0 | 9.0 | 11.0 | 22.8 | ∞ | ∞ |
| 12.0 | 12.8 | 9.7 | 9.8 | 11.9 | 29.9 | ∞ | ∞ |
| 12.0 | 12.8 | 9.7 | 9.8 | 11.9 | 29.9 | ∞ | ∞ |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 72 | | 71 | 71 | 71 | 71 | 71 | 76 |
| 72 | | 71 | 71 | 71 | 71 | 71 | 76 |
| 72 | | 73 | 73 | 73 | 72 | 74 | 78 |
| 84 | | 93 | 93 | 93 | 93 | 101 | 108 |
| 101 | | 103 | 104 | 104 | 104 | 114 | 122 |
| 129 | | 139 | 138 | 138 | 144 | 144 | 161 |
| 148 | | 145 | 148 | 146 | 153 | 190 | 918 |
| 148 | | 145 | 148 | 146 | 154 | 194 | ∞ |
| 148 | | 145 | 148 | 146 | 154 | 194 | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -14 | -5 | -2 | -2 | -3 | -5 | -7 |
| — | -14 | -5 | -2 | -2 | -3 | -5 | -7 |
| — | -13 | -5 | -2 | -2 | -3 | -5 | -7 |
| — | -1 | -2 | -1 | -1 | -2 | -2 | +2 |
| — | 0 | -1 | -1 | +1 | -1 | +13 | +30 |
| — | +1 | +4 | +5 | +5 | +8 | +42 | +50 |
| — | +33 | +37 | +38 | +38 | +40 | +56 | +512 |
| — | +37 | +40 | +41 | +41 | +42 | +56 | +524 |
| — | +37 | +40 | +41 | +41 | +42 | +56 | +524 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 121 | 018 | 098 | 099 | 100 | 104 | 099 | 097 |
| 5% | 121 | 018 | 098 | 099 | 100 | 104 | 099 | 097 |
| 10% | 122 | 026 | 099 | 099 | 101 | 104 | 100 | 098 |
| 25% | 125 | 103 | 107 | 108 | 109 | 109 | 110 | 115 |
| 50% | 127 | 113 | 115 | 117 | 117 | 118 | 118 | 128 |
| 75% | 135 | 118 | 122 | 122 | 124 | 124 | 123 | 153 |
| 90% | 146 | 126 | 127 | 132 | 129 | 130 | 127 | 157 |
| 95% | 146 | 126 | 127 | 133 | 129 | 130 | 127 | 157 |
| Max | 146 | 126 | 127 | 133 | 129 | 130 | 127 | 157 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -86 | -19 | -18 | -17 | -15 | -18 | -20 |
| — | -86 | -19 | -18 | -17 | -15 | -18 | -20 |
| — | -79 | -19 | -18 | -17 | -15 | -17 | -19 |
| — | -16 | -14 | -15 | -14 | -13 | -11 | -10 |
| — | -13 | -11 | -11 | -8 | -9 | -9 | -4 |
| — | -11 | -9 | -6 | -6 | -6 | -8 | +22 |
| — | -9 | -6 | -4 | -4 | -6 | -6 | +28 |
| — | -9 | -6 | -4 | -4 | -6 | -6 | +28 |
| — | -9 | -6 | -4 | -4 | -6 | -6 | +28 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 779 | 694 | 722 | 765 | 767 | 767 | 765 | 773 |
| 779 | 694 | 722 | 765 | 767 | 767 | 765 | 773 |
| 780 | 702 | 722 | 766 | 767 | 767 | 766 | 774 |
| 788 | 723 | 727 | 778 | 776 | 778 | 776 | 784 |
| 800 | 783 | 785 | 784 | 780 | 782 | 787 | 795 |
| 802 | 789 | 789 | 790 | 786 | 786 | 790 | 822 |
| 807 | 791 | 792 | 790 | 790 | 790 | 793 | 827 |
| 807 | 791 | 792 | 790 | 790 | 790 | 793 | 827 |
| 807 | 791 | 792 | 790 | 790 | 790 | 793 | 827 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -3 | -3 | -3 | -3 | -3 | -2 |
| — | -1 | -3 | -3 | -3 | -3 | -3 | -2 |
| — | -10 | -3 | -3 | -3 | -3 | -3 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -1 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -1 |
| — | -2 | -1 | -2 | -2 | -2 | -1 | +2 |
| — | -2 | 0 | 0 | 0 | 0 | 0 | +5 |
| — | -2 | 0 | 0 | 0 | 0 | 0 | +5 |
| — | -2 | 0 | 0 | 0 | 0 | 0 | +5 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 49 | 50 | 49 | 50 | 51 | 51 | 42 | 20 |
| 5% | 49 | 50 | 49 | 50 | 51 | 51 | 42 | 20 |
| 10% | 50 | 50 | 50 | 50 | 51 | 51 | 42 | 20 |
| 25% | 61 | 62 | 59 | 62 | 63 | 62 | 48 | 25 |
| 50% | 77 | 78 | 73 | 79 | 80 | 78 | 66 | 53 |
| 75% | 88 | 88 | 82 | 88 | 89 | 88 | 80 | 80 |
| 90% | 106 | 109 | 101 | 110 | 111 | 110 | 104 | 103 |
| 95% | 106 | 110 | 101 | 110 | 111 | 110 | 106 | 105 |
| Max | 106 | 110 | 101 | 110 | 111 | 110 | 106 | 105 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -4 | -10 | -1 | 0 | -4 | -61 | -75 |
| — | -4 | -10 | -1 | 0 | -4 | -61 | -75 |
| — | -4 | -10 | -1 | 0 | -4 | -59 | -75 |
| — | -1 | -7 | 0 | +1 | 0 | -24 | -72 |
| — | +1 | -6 | +1 | +3 | +2 | -1 | -14 |
| — | +3 | -2 | +3 | +4 | +3 | +2 | -1 |
| — | +6 | +1 | +8 | +10 | +5 | +7 | +5 |
| — | +6 | +1 | +8 | +10 | +5 | +7 | +6 |
| — | +6 | +1 | +8 | +10 | +5 | +7 | +6 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: C PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 700 mw, 30 V, 25°C.

CELL NO.: 419250 NO. OF UNITS: 20

$I_{CEO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.6 | <0.1 | <0.1 | 0.1 | 0.3 | <0.1 | 0.3 |
| 5% | <0.1 | 0.6 | <0.1 | <0.1 | 0.1 | 0.3 | <0.1 | 0.3 |
| 10% | <0.1 | 0.6 | <0.1 | <0.1 | 0.1 | 0.5 | <0.1 | 0.5 |
| 25% | <0.1 | 0.7 | 0.1 | <0.1 | 0.2 | 1.0 | <0.1 | 0.7 |
| 50% | <0.1 | 0.8 | 0.2 | 0.3 | 0.3 | 1.3 | 0.4 | 1.1 |
| 75% | 0.1 | 1.2 | 0.5 | 2.3 | 0.8 | 2.5 | 2.3 | 3.8 |
| 90% | 0.2 | 2.3 | 3.2 | 7.0 | 7.2 | 39.1 | 26.9 | 409.8 |
| 95% | 1.2 | 30.6 | 6.9 | 10.3 | 9.4 | 623.7 | 951.4 | 9225 |
| Max | 1.3 | 32.1 | 7.1 | 10.5 | 9.5 | 623.7 | ∞ | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | 0.1 | 0.1 | 0.3 | 0.2 | 0.1 |
| 0.1 | 0.7 | 0.2 | 0.3 | 0.2 | 0.7 | 0.3 | 0.4 |
| 0.4 | 1.4 | 0.5 | 0.5 | 0.7 | 1.3 | 0.8 | 1.3 |
| 3.3 | 4.3 | 3.0 | 3.4 | 3.3 | 3.7 | 3.2 | 3.6 |
| 6.2 | 2.0 | 5.1 | 5.3 | 5.3 | 6.8 | 6.3 | 6.6 |
| 6.4 | 2.5 | 6.3 | 6.4 | 6.3 | 7.7 | 7.4 | 7.7 |
| 6.4 | 2.5 | 6.4 | 6.5 | 6.3 | 7.7 | 7.5 | 7.7 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 62 | 61 | 61 | 61 | 60 | 62 | 01 | 02 |
| 62 | 61 | 61 | 61 | 60 | 62 | 04 | 05 |
| 63 | 64 | 63 | 63 | 63 | 62 | 61 | 61 |
| 73 | 73 | 73 | 72 | 72 | 73 | 71 | 70 |
| 88 | 87 | 86 | 86 | 87 | 86 | 87 | 88 |
| 105 | 109 | 109 | 109 | 111 | 111 | 110 | 108 |
| 137 | 134 | 135 | 135 | 158 | 135 | 156 | 155 |
| 148 | 160 | 159 | 159 | 958 | 159 | 958 | 958 |
| 148 | 161 | 161 | 160 | ∞ | 159 | ∞ | ∞ |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -17 | -30 | -34 | -34 | -36 | -98 | -98 |
| — | -16 | -29 | -32 | -32 | -36 | -95 | -95 |
| — | -2 | -3 | -3 | -3 | -3 | -33 | -35 |
| — | -2 | -2 | -3 | -3 | -3 | -4 | -4 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | -1 |
| — | +3 | +4 | +4 | +8 | +8 | +7 | +7 |
| — | +9 | +9 | +9 | +24 | +10 | +18 | +23 |
| — | +23 | +26 | +35 | 835 | +27 | 835 | 833 |
| — | +24 | +27 | +26 | 878 | +27 | 878 | 878 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 102 | 089 | 085 | 087 | 090 | 087 | 090 | 087 |
| 5% | 102 | 089 | 085 | 087 | 090 | 087 | 090 | 087 |
| 10% | 105 | 089 | 088 | 092 | 090 | 089 | 090 | 091 |
| 25% | 115 | 097 | 098 | 101 | 101 | 100 | 100 | 100 |
| 50% | 129 | 113 | 113 | 113 | 114 | 113 | 110 | 113 |
| 75% | 140 | 124 | 123 | 123 | 127 | 123 | 128 | 131 |
| 90% | 150 | 132 | 131 | 134 | 139 | 131 | 139 | 152 |
| 95% | 154 | 135 | 136 | 136 | 9506 | 137 | 9506 | 9507 |
| Max | 154 | 135 | 136 | 136 | ∞ | 137 | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -19 | -19 | -17 | -17 | -17 | -22 | -18 |
| — | -19 | -19 | -17 | -17 | -17 | -22 | -18 |
| — | -17 | -17 | -16 | -16 | -16 | -19 | -17 |
| — | -15 | -15 | -13 | -14 | -15 | -15 | -15 |
| — | -13 | -13 | -12 | -12 | -13 | -12 | -12 |
| — | -11 | -12 | -9 | -10 | -11 | -9 | -10 |
| — | -9 | -10 | -8 | -8 | -10 | -8 | +15 |
| — | -9 | -8 | -7 | 7326 | -8 | 7326 | 7327 |
| — | -9 | -8 | -7 | 7712 | -8 | 7712 | 7712 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 777 | 761 | 763 | 760 | 760 | 769 | 764 | 761 |
| 777 | 761 | 763 | 760 | 760 | 764 | 764 | 761 |
| 783 | 761 | 763 | 765 | 763 | 765 | 766 | 761 |
| 788 | 768 | 769 | 771 | 766 | 770 | 768 | 768 |
| 799 | 781 | 779 | 780 | 779 | 781 | 781 | 779 |
| 807 | 789 | 785 | 785 | 787 | 789 | 790 | 791 |
| 814 | 792 | 794 | 796 | 793 | 793 | 795 | 817 |
| 816 | 792 | 796 | 799 | 9539 | 797 | 9539 | 9540 |
| 816 | 792 | 796 | 799 | ∞ | 797 | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -4 | -3 | -3 | -4 | -3 | -4 | -4 |
| — | -4 | -3 | -3 | -4 | -3 | -4 | -4 |
| — | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| — | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| — | -3 | -2 | -2 | -2 | -2 | -2 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | +3 |
| — | -1 | -1 | -1 | 1084 | -1 | 1084 | 1084 |
| — | -1 | -1 | -1 | 1141 | -1 | 1141 | 1141 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 48 | 49 | 48 | 48 | 20 | 20 | 20 | 20 |
| 5% | 48 | 49 | 48 | 48 | 21 | 20 | 20 | 21 |
| 10% | 50 | 51 | 51 | 50 | 49 | 48 | 23 | 48 |
| 25% | 58 | 59 | 58 | 59 | 58 | 57 | 57 | 58 |
| 50% | 96 | 94 | 89 | 97 | 98 | 93 | 89 | 94 |
| 75% | 106 | 106 | 109 | 109 | 110 | 108 | 110 | 109 |
| 90% | 122 | 113 | 116 | 122 | 124 | 123 | 121 | 121 |
| 95% | 125 | 124 | 125 | 128 | 130 | 128 | 127 | 128 |
| Max | 125 | 124 | 125 | 128 | 130 | 128 | 128 | 128 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -19 | -11 | -1 | -66 | -81 | -79 | -66 |
| — | -18 | -11 | -1 | -63 | -81 | -78 | -63 |
| — | -8 | -9 | -1 | 0 | -2 | -60 | -6 |
| — | -1 | -4 | -1 | 0 | -1 | -2 | -1 |
| — | +1 | +1 | +1 | +2 | 0 | 0 | 0 |
| — | +2 | +3 | +2 | +3 | +2 | +3 | +3 |
| — | +2 | +3 | +2 | +4 | +3 | +3 | +4 |
| — | +4 | +7 | +5 | +6 | +5 | +5 | +4 |
| — | +4 | +7 | +5 | +6 | +5 | +5 | +4 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: C PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 500 mw, 30 V; 25°C.

CELL NO.: 419251 NO. OF UNITS: 52.

$I_{CEO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.2 | 0.8 | 0.1 | <0.1 | <0.1 | <0.1 | 0.3 |
| 5% | <0.1 | 0.3 | 0.9 | 0.1 | <0.1 | <0.1 | <0.1 | 0.3 |
| 10% | <0.1 | 0.4 | 0.9 | 0.2 | 0.1 | <0.1 | 0.1 | 0.3 |
| 25% | <0.1 | 0.5 | 1.0 | 0.3 | 0.3 | 0.1 | 0.2 | 0.5 |
| 50% | <0.1 | 0.7 | 1.3 | 0.5 | 0.5 | 0.3 | 0.3 | 0.8 |
| 75% | 0.3 | 1.2 | 2.2 | 1.0 | 0.9 | 0.7 | 0.5 | 1.4 |
| 90% | 1.8 | 3.4 | 5.1 | 3.2 | 3.3 | 2.5 | 2.9 | 4.8 |
| 95% | 3.4 | 5.7 | 7.8 | 41.5 | 26.1 | 39 | 6.6 | 618 |
| Max | 6.3 | 6624 | 13.5 | 116.0 | 206.3 | 11.5 | 2927 | 2157 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | <0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.2 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 |
| <0.1 | 0.2 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | 0.2 |
| 0.1 | 0.4 | 0.3 | 0.2 | 0.1 | 0.2 | 0.1 | 0.5 |
| 0.4 | 0.9 | 0.8 | 0.8 | 0.6 | 0.6 | 0.3 | 1.1 |
| 2.2 | 2.4 | 2.3 | 2.4 | 2.3 | 1.8 | 0.5 | 2.4 |
| 5.3 | 5.8 | 5.7 | 5.7 | 5.5 | 5.4 | 0.6 | 5.8 |
| 6.7 | 7.4 | 7.2 | 7.2 | 6.4 | 6.7 | 0.6 | 7.4 |
| 6.7 | 7.5 | 8.0 | 8.2 | 7.0 | 7.0 | 2.5 | 7.5 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 55 | 53 | 53 | 53 | 53 | 53 | 53 | 55 |
| 58 | 57 | 57 | 57 | 57 | 57 | 57 | 56 |
| 60 | 59 | 59 | 59 | 59 | 59 | 59 | 59 |
| 68 | 69 | 68 | 68 | 68 | 69 | 68 | 69 |
| 83 | 83 | 83 | 83 | 84 | 85 | 85 | 85 |
| 108 | 108 | 108 | 108 | 108 | 108 | 108 | 112 |
| 139 | 140 | 139 | 140 | 140 | 141 | 141 | 141 |
| 151 | 152 | 152 | 151 | 153 | 153 | 153 | 153 |
| 167 | 173 | 172 | 171 | 170 | 170 | 170 | 169 |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -4 | -4 | -6 | -7 | -8 | -8 | -8 |
| — | -3 | -3 | -5 | -6 | -6 | -7 | -6 |
| — | -2 | -3 | -4 | -5 | -4 | -4 | -4 |
| — | -1 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | +1 | 0 | +1 |
| — | +5 | +7 | +10 | +10 | +13 | +15 | +14 |
| — | +13 | +11 | +20 | +30 | +30 | +34 | +31 |
| — | +32 | +32 | +37 | +47 | +49 | +61 | +57 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 092 | 015 | 080 | 020 | 007 | 016 | 079 | 080 |
| 5% | 102 | 082 | 085 | 082 | 084 | 083 | 086 | 087 |
| 10% | 105 | 087 | 090 | 089 | 084 | 089 | 090 | 090 |
| 25% | 114 | 094 | 095 | 096 | 098 | 097 | 096 | 094 |
| 50% | 123 | 104 | 105 | 107 | 107 | 107 | 106 | 104 |
| 75% | 135 | 116 | 115 | 117 | 119 | 118 | 119 | 115 |
| 90% | 146 | 124 | 127 | 128 | 128 | 129 | 128 | 128 |
| 95% | 170 | 137 | 138 | 137 | 138 | 137 | 136 | 135 |
| Max | 265 | 170 | 162 | 169 | 167 | 167 | 168 | 167 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -88 | -61 | -84 | -94 | -86 | -59 | -61 |
| — | -36 | -20 | -34 | -33 | -33 | -19 | -20 |
| — | -20 | -19 | -18 | -18 | -17 | -17 | -19 |
| — | -18 | -16 | -15 | -15 | -16 | -16 | -17 |
| — | -16 | -14 | -14 | -13 | -13 | -14 | -15 |
| — | -13 | -13 | -12 | -11 | -11 | -11 | -13 |
| — | -10 | -12 | -11 | -8 | -9 | -10 | -10 |
| — | -10 | -10 | -10 | -8 | -8 | -9 | -10 |
| — | -6 | -8 | -5 | -7 | -7 | -8 | -9 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 774 | 618 | 763 | 698 | 599 | 699 | 754 | 758 |
| 779 | 735 | 763 | 759 | 760 | 758 | 765 | 759 |
| 782 | 759 | 764 | 763 | 763 | 761 | 757 | 759 |
| 792 | 768 | 771 | 769 | 770 | 769 | 766 | 767 |
| 797 | 777 | 779 | 777 | 778 | 776 | 772 | 775 |
| 804 | 783 | 783 | 784 | 783 | 782 | 777 | 780 |
| 815 | 791 | 793 | 794 | 793 | 795 | 787 | 788 |
| 835 | 796 | 798 | 799 | 797 | 798 | 794 | 793 |
| 908 | 840 | 843 | 843 | 842 | 842 | 838 | 840 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -23 | -15 | -14 | -24 | -15 | -15 | -15 |
| — | -13 | -3 | -7 | -7 | -7 | -4 | -4 |
| — | -4 | -3 | -3 | -3 | -3 | -4 | -4 |
| — | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| — | -3 | -2 | -2 | -3 | -3 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -3 | -2 |
| — | -2 | -2 | -1 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -1 | -1 | -1 | 0 | -2 | -2 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 48 | 49 | 49 | 49 | 50 | 50 | 49 | 51 |
| 5% | 54 | 54 | 52 | 53 | 54 | 54 | 52 | 53 |
| | 59 | 59 | 58 | 55 | 59 | 60 | 57 | 59 |
| | 70 | 70 | 69 | 68 | 71 | 70 | 69 | 72 |
| | 86 | 85 | 82 | 85 | 86 | 87 | 84 | 86 |
| | 108 | 106 | 106 | 108 | 109 | 111 | 107 | 110 |
| | 124 | 123 | 122 | 121 | 126 | 128 | 123 | 126 |
| | 134 | 131 | 126 | 128 | 133 | 135 | 131 | 133 |
| | 140 | 141 | 138 | 137 | 139 | 140 | 135 | 139 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -16 | -12 | -13 | -3 | -19 | -6 | -4 |
| — | -7 | -10 | -9 | -2 | -3 | -4 | -4 |
| — | -4 | -9 | -7 | -1 | -2 | -4 | -2 |
| — | -1 | -5 | -4 | -1 | +1 | -3 | -1 |
| — | +1 | -1 | -2 | 0 | +1 | -1 | 0 |
| — | +1 | 0 | 0 | +1 | +3 | -1 | +2 |
| — | +3 | +2 | +3 | +5 | +6 | +2 | +5 |
| — | +6 | +4 | +4 | +6 | +7 | +3 | +6 |
| — | +13 | +5 | +5 | +6 | +8 | +4 | +7 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: C PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 400 mw, 30 V; 150°C. CELL NO.: 419252 NO. OF UNITS: 10

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.7 | 0.2 | <0.1 | 0.2 | <0.1 | 0.5 | <0.1 |
| 5% | <0.1 | 0.7 | 0.2 | <0.1 | 0.2 | <0.1 | 0.5 | <0.1 |
| 10% | <0.1 | 0.7 | 0.2 | <0.1 | 0.2 | <0.1 | 0.5 | <0.1 |
| 25% | <0.1 | 0.8 | 0.3 | 0.2 | 0.4 | 0.1 | 0.6 | 0.3 |
| 50% | 0.1 | 1.1 | 0.8 | 0.7 | 3.8 | 0.7 | 1.1 | 2.9 |
| 75% | 0.1 | 42.8 | 92.1 | 102.1 | 99.2 | 86.1 | 8.3 | 20.2 |
| 90% | 0.6 | 240.2 | 916.7 | 914.2 | 912.7 | 926.4 | 408.5 | 902.9 |
| 95% | 0.7 | 813.6 | ∞ | ∞ | ∞ | ∞ | 408.5 | ∞ |
| Max | 0.7 | 813.6 | ∞ | ∞ | ∞ | ∞ | 408.5 | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 0.2 | 0.7 | 0.2 | 0.4 | 0.2 | 0.2 | 1.0 | 0.2 |
| 1.1 | 1.6 | 2.4 | 2.4 | 1.8 | 2.2 | 3.5 | 2.4 |
| 4.9 | 4.6 | 6.1 | 5.6 | 5.3 | 5.3 | 6.4 | 5.3 |
| 7.9 | 6.6 | 15.1 | 42.4 | 1166 | 416.8 | ∞ | 916.7 |
| 8.2 | 6.6 | 16.1 | 46.5 | 1289 | 463.8 | ∞ | ∞ |
| 8.2 | 6.6 | 16.1 | 46.5 | 1289 | 463.8 | ∞ | ∞ |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 52 | 51 | 51 | 11 | 12 | 34 | 51 | 51 |
| 52 | 51 | 51 | 11 | 12 | 34 | 51 | 51 |
| 53 | 52 | 52 | 15 | 16 | 36 | 51 | 52 |
| 61 | 57 | 59 | 56 | 56 | 56 | 59 | 59 |
| 74 | 74 | 67 | 67 | 67 | 67 | 78 | 82 |
| 84 | 82 | 91 | 92 | 92 | 95 | 112 | 126 |
| 149 | 141 | 145 | 145 | 145 | 146 | 915 | 919 |
| 155 | 147 | 151 | 151 | 150 | 151 | ∞ | ∞ |
| 155 | 147 | 151 | 151 | 150 | 151 | ∞ | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -10 | -27 | -87 | -85 | -58 | -4 | -5 |
| — | -10 | -27 | -87 | -85 | -58 | -4 | -5 |
| — | -10 | -25 | -79 | -77 | -53 | -4 | -5 |
| — | -6 | -4 | -4 | -4 | -4 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | 0 | +13 | +30 |
| — | +6 | +26 | +31 | +33 | +35 | 1081 | 1022 |
| — | +6 | +29 | +34 | +36 | +38 | 1130 | 1130 |
| — | +6 | +29 | +34 | +36 | +38 | 1130 | 1130 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 102 | 086 | 089 | 088 | 087 | 090 | 087 | 087 |
| 5% | 102 | 086 | 089 | 088 | 087 | 090 | 087 | 087 |
| 10% | 102 | 086 | 089 | 088 | 087 | 090 | 087 | 087 |
| 25% | 106 | 093 | 092 | 093 | 093 | 094 | 093 | 093 |
| 50% | 107 | 099 | 097 | 100 | 098 | 101 | 105 | 103 |
| 75% | 156 | 136 | 139 | 139 | 135 | 136 | 146 | 137 |
| 90% | 173 | 165 | 162 | 159 | 152 | 156 | 9014 | 9014 |
| 95% | 174 | 167 | 163 | 160 | 153 | 157 | ∞ | ∞ |
| Max | 174 | 167 | 163 | 160 | 153 | 157 | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -18 | -15 | -18 | -18 | -16 | -16 | -19 |
| — | -18 | -15 | -18 | -18 | -16 | -16 | -19 |
| — | -18 | -15 | -17 | -18 | -16 | -16 | -19 |
| — | -14 | -13 | -11 | -14 | -12 | -14 | -16 |
| — | -10 | -12 | -10 | -12 | -10 | -13 | -14 |
| — | -7 | -8 | -8 | -10 | -8 | -9 | -9 |
| — | -3 | -6 | -2 | -5 | -3 | 8399 | 8399 |
| — | -3 | -6 | -1 | -5 | -2 | 9333 | 9333 |
| — | -3 | -6 | -1 | -5 | -2 | 9333 | 9333 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 773 | 758 | 760 | 763 | 764 | 763 | 761 | 763 |
| 773 | 758 | 760 | 763 | 764 | 763 | 761 | 763 |
| 774 | 759 | 761 | 764 | 765 | 763 | 761 | 763 |
| 781 | 770 | 770 | 770 | 773 | 767 | 770 | 768 |
| 784 | 773 | 774 | 776 | 776 | 770 | 775 | 777 |
| 813 | 796 | 798 | 800 | 801 | 797 | 799 | 804 |
| 851 | 843 | 840 | 837 | 835 | 832 | 833 | 9682 |
| 854 | 846 | 843 | 840 | 838 | 834 | 833 | ∞ |
| 854 | 846 | 843 | 840 | 838 | 834 | 833 | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -3 | -2 | -2 | -2 | -2 | -3 | -4 |
| — | -3 | -2 | -2 | -2 | -2 | -3 | -4 |
| — | -3 | -2 | -2 | -2 | -2 | -3 | -4 |
| — | -2 | -1 | -2 | -2 | -2 | -2 | -3 |
| — | -2 | -2 | -2 | -1 | -2 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -2 | -2 | -2 |
| — | 0 | 0 | 0 | +1 | -1 | 0 | 1062 |
| — | 0 | 0 | 0 | +1 | -1 | 0 | 1180 |
| — | 0 | 0 | 0 | +1 | -1 | 0 | 1180 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| PRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 54 | 54 | 54 | 52 | 53 | 53 | | 20 |
| 5% | 54 | 54 | 54 | 52 | 53 | 53 | | 20 |
| 10% | 55 | 55 | 55 | 52 | 54 | 54 | | 23 |
| 25% | 71 | 71 | 71 | 63 | 69 | 68 | | 54 |
| 50% | 96 | 98 | 95 | 83 | 84 | 85 | | 67 |
| 75% | 101 | 104 | 102 | 90 | 100 | 102 | | 98 |
| 90% | 114 | 114 | 114 | 97 | 111 | 113 | | 112 |
| 95% | 115 | 115 | 116 | 98 | 112 | 114 | | 113 |
| Max | 115 | 115 | 116 | 98 | 112 | 114 | | 113 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -1 | -11 | -24 | -29 | -34 | -39 | -79 |
| — | -1 | -11 | -24 | -29 | -34 | -39 | -79 |
| — | -1 | -10 | -23 | -27 | -31 | -39 | -76 |
| — | +1 | 0 | -13 | -3 | -1 | -2 | -42 |
| — | +1 | +1 | -10 | -2 | 0 | -1 | -1 |
| — | +3 | +3 | -8 | 0 | +3 | +2 | +1 |
| — | +4 | +4 | -4 | +2 | +5 | +5 | +6 |
| — | +4 | +4 | -4 | +2 | +5 | +5 | +6 |
| — | +4 | +4 | -4 | +2 | +5 | +5 | +6 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
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PROCESS: C PRE-SCREEN STRESS: 25 Kg Centrifuge Only.

OPERATING POWER CONDITION: 200 mw, 30 V, 150°C.

CELL NO.: 419253 NO. OF UNITS: 20

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.5 | <0.1 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.5 | <0.1 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 |
| 10% | <0.1 | 0.7 | <0.1 | 0.2 | 0.1 | <0.1 | <0.1 | <0.1 |
| 25% | <0.1 | 0.8 | 0.3 | 0.3 | 0.2 | 0.1 | 0.1 | 0.1 |
| 50% | 0.2 | 1.2 | 0.6 | 0.5 | 0.5 | 0.2 | 0.2 | 0.3 |
| 75% | 0.4 | 1.7 | 1.7 | 1.4 | 3.1 | 1.2 | 0.8 | 0.9 |
| 90% | 2.3 | 9.0 | 8.4 | 4.8 | 31.3 | 3.9 | 3.8 | 5.6 |
| 95% | 3.4 | 950.4 | 950.3 | 950.2 | 9516 | 6.2 | 647 | 3224 |
| Max | 3.4 | ∞ | ∞ | ∞ | ∞ | 6.3 | 679 | 3391 |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| 0.2 | 0.5 | <0.1 | 0.2 | 0.2 | 0.2 | 0.3 | <0.1 |
| 0.5 | 1.1 | 0.7 | 0.7 | 0.5 | 0.5 | 0.5 | 0.6 |
| 2.3 | 3.3 | 2.5 | 2.7 | 2.3 | 1.6 | 1.3 | 1.7 |
| 4.3 | 7.6 | 4.7 | 4.9 | 4.2 | 4.6 | 5.1 | 7.0 |
| 6.7 | 11.3 | 7.5 | 7.4 | 6.2 | 6.5 | 6.5 | 11.3 |
| 6.8 | 11.5 | 7.6 | 7.5 | 6.3 | 6.6 | 6.6 | 11.5 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 59 | 01 | 01 | 01 | 01 | 58 | 58 | 58 |
| 59 | 04 | 04 | 04 | 04 | 58 | 58 | 58 |
| 63 | 59 | 59 | 59 | 58 | 62 | 62 | 62 |
| 70 | 67 | 67 | 67 | 67 | 67 | 67 | 67 |
| 75 | 74 | 74 | 74 | 75 | 75 | 75 | 74 |
| 86 | 85 | 84 | 83 | 83 | 87 | 87 | 87 |
| 114 | 108 | 113 | 113 | 113 | 122 | 119 | 121 |
| 138 | 115 | 119 | 122 | 124 | 956 | 956 | 956 |
| 139 | 115 | 120 | 123 | 124 | ∞ | ∞ | ∞ |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -99 | -99 | -99 | -100 | -11 | -42 | -42 |
| — | -94 | -94 | -96 | -97 | -11 | -41 | -40 |
| — | -7 | -7 | -38 | -38 | -9 | -13 | -11 |
| — | -4 | -5 | -7 | -8 | -5 | -7 | -8 |
| — | -1 | -2 | -2 | -2 | -2 | -2 | -4 |
| — | 0 | 0 | -1 | 0 | 0 | +18 | +18 |
| — | +23 | +23 | +60 | +59 | +60 | +63 | +63 |
| — | +45 | +58 | +64 | +66 | +59 | +59 | +59 |
| — | +46 | +60 | +64 | +66 | +61 | +61 | +61 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 008 | 075 | 074 | 070 | 073 | 076 | 076 | 074 |
| 5% | 013 | 075 | 075 | 071 | 073 | 076 | 076 | 075 |
| 10% | 102 | 084 | 084 | 084 | 029 | 084 | 084 | 084 |
| 25% | 104 | 087 | 089 | 090 | 087 | 090 | 091 | 089 |
| 50% | 119 | 098 | 100 | 102 | 099 | 101 | 098 | 099 |
| 75% | 138 | 122 | 122 | 126 | 120 | 128 | 124 | 125 |
| 90% | 151 | 131 | 132 | 133 | 129 | 135 | 135 | 133 |
| 95% | 159 | 134 | 132 | 135 | 131 | 9506 | 9506 | 9506 |
| Max | 159 | 134 | 132 | 135 | 131 | ∞ | ∞ | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -30 | -26 | -23 | -31 | -26 | -26 | -26 |
| — | -30 | -26 | -23 | -31 | -26 | -26 | -26 |
| — | -21 | -22 | -20 | -25 | -19 | -19 | -20 |
| — | -18 | -18 | -16 | -19 | -17 | -17 | -18 |
| — | -16 | -14 | -13 | -14 | -13 | -14 | -14 |
| — | -11 | -11 | -9 | -11 | -9 | -11 | -11 |
| — | -9 | -9 | -6 | -10 | +764 | +764 | +742 |
| — | +796 | +783 | +736 | +722 | 6932 | 6932 | 6931 |
| — | +838 | +825 | +775 | +813 | 7252 | 7252 | 7252 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 705 | 762 | 759 | 760 | 454 | 760 | 756 | 714 |
| 709 | 762 | 759 | 760 | 470 | 760 | 756 | 716 |
| 782 | 763 | 762 | 762 | 764 | 764 | 759 | 759 |
| 784 | 766 | 764 | 766 | 768 | 766 | 762 | 766 |
| 799 | 778 | 774 | 775 | 778 | 777 | 772 | 774 |
| 810 | 788 | 789 | 786 | 790 | 790 | 788 | 788 |
| 814 | 792 | 794 | 795 | 796 | 799 | 797 | 799 |
| 818 | 801 | 795 | 799 | 800 | 9539 | 9539 | 9539 |
| 818 | 801 | 795 | 799 | 800 | ∞ | ∞ | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -5 | -5 | -4 | -42 | -4 | -5 | -9 |
| — | -5 | -5 | -4 | -40 | -4 | -5 | -9 |
| — | -3 | -4 | -4 | -4 | -3 | -4 | -5 |
| — | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -3 | -2 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -1 | -2 | -2 | -1 | +7 | +7 | +7 |
| — | +8 | +8 | +8 | +9 | 1091 | 1091 | 1091 |
| — | +8 | +8 | +8 | +9 | 1148 | 1148 | 1148 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 51 | 51 | 51 | 20 | 20 | 20 | 20 | 20 |
| 5% | 51 | 51 | 51 | 21 | 21 | 21 | 21 | 21 |
| 10% | 52 | 53 | 53 | 51 | 49 | 51 | 51 | 51 |
| 25% | 63 | 60 | 63 | 59 | 57 | 58 | 58 | 58 |
| 50% | 102 | 102 | 103 | 104 | 100 | 95 | 95 | 95 |
| 75% | 116 | 116 | 117 | 118 | 115 | 117 | 118 | 118 |
| 90% | 124 | 124 | 124 | 127 | 122 | 126 | 126 | 126 |
| 95% | 125 | 126 | 125 | 127 | 123 | 128 | 128 | 128 |
| Max | 125 | 126 | 125 | 127 | 123 | 128 | 128 | 129 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -7 | -7 | -68 | -68 | -82 | -82 | -81 |
| — | -7 | -7 | -65 | -65 | -78 | -78 | -77 |
| — | -7 | -5 | -9 | -12 | -3 | -9 | -9 |
| — | -5 | -1 | 0 | -4 | -1 | -2 | -2 |
| — | 0 | 0 | +1 | -3 | +1 | +1 | +1 |
| — | +1 | +2 | +3 | 0 | +2 | +2 | +2 |
| — | +2 | +3 | +9 | +6 | +4 | +4 | +6 |
| — | +6 | +9 | +12 | +8 | +4 | +12 | +12 |
| — | +6 | +9 | +12 | +8 | +4 | +12 | +12 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

PROCESS: C PRE-SCREEN STRESS: None (Control).

OPERATING POWER CONDITION: 800 mw, 30 V, 25°C.

CELL NO.: 419254 NO. OF UNITS: 10

| | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | <0.1 | 0.6 | 0.1 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.6 | 0.1 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 |
| 10% | <0.1 | 0.6 | 0.1 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 |
| 25% | <0.1 | 0.7 | 0.2 | 0.2 | 0.2 | <0.1 | 0.1 | 0.2 |
| 50% | 0.1 | 1.0 | 0.2 | 0.4 | 0.4 | 0.2 | 1.6 | 4.9 |
| 75% | 0.3 | 1.5 | 0.3 | 0.6 | 0.6 | 1.7 | 439 | 1421 |
| 90% | 0.4 | 3.5 | 900.0 | 1.8 | 1.8 | 3.3 | 9124 | 9264 |
| 95% | 0.4 | 3.7 | ∞ | 1.9 | 1.9 | 3.4 | ∞ | ∞ |
| Max | 0.4 | 3.7 | ∞ | 1.9 | 1.9 | 3.4 | ∞ | ∞ |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| <0.1 | 0.7 | 0.3 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | |
| <0.1 | 0.7 | 0.3 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | |
| <0.1 | 0.7 | 0.3 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | |
| 0.2 | 0.9 | 0.9 | 0.3 | 0.3 | 0.2 | 1.0 | 1.6 | |
| 1.3 | 2.4 | 1.7 | 1.4 | 1.5 | 1.1 | 4.7 | 5.0 | |
| 3.2 | 3.5 | 4.5 | 3.6 | 3.7 | 3.1 | ∞ | 3252 | |
| 5.4 | 4.4 | 8.8 | 8.3 | 8.6 | 5.4 | ∞ | ∞ | |
| 5.5 | 4.5 | 9.0 | 8.7 | 9.0 | 5.5 | ∞ | ∞ | |
| 5.5 | 4.5 | 9.0 | 8.7 | 9.0 | 5.5 | ∞ | ∞ | |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| 62 | 61 | 62 | 62 | 62 | 61 | 37 | 69 | |
| 62 | 61 | 62 | 62 | 62 | 61 | 37 | 69 | |
| 62 | 62 | 62 | 63 | 63 | 62 | 40 | 69 | |
| 68 | 68 | 72 | 71 | 70 | 70 | 67 | 79 | |
| 81 | 94 | 78 | 100 | 100 | 100 | 101 | 116 | |
| 129 | 126 | 138 | 130 | 128 | 132 | 142 | 148 | |
| 161 | 166 | 167 | 185 | 183 | 182 | 158 | 916 | |
| 162 | 169 | 168 | 188 | 186 | 186 | 159 | ∞ | |
| 162 | 169 | 168 | 188 | 186 | 186 | 159 | ∞ | |

| | $BV_{CFO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | -49 | -28 | -2 | -2 | -3 | -46 | -4 | |
| — | -49 | -28 | -2 | -2 | -3 | -46 | -4 | |
| — | -44 | -25 | -2 | -2 | -3 | -43 | -4 | |
| — | -3 | +4 | 0 | -1 | -1 | -6 | +1 | |
| — | -1 | +7 | +3 | +1 | +3 | +1 | +17 | |
| — | +6 | +10 | +17 | +17 | +17 | +28 | +54 | |
| — | +131 | +16 | +34 | +35 | +34 | +35 | +473 | |
| — | +143 | +16 | +35 | +36 | +35 | +35 | +316 | |
| — | +143 | +16 | +35 | +36 | +35 | +35 | +516 | |

| | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 102 | 083 | 085 | 084 | 018 | 087 | 083 | 085 |
| 5% | 102 | 083 | 085 | 084 | 018 | 087 | 083 | 085 |
| 10% | 103 | 084 | 086 | 085 | 025 | 088 | 084 | 087 |
| 25% | 113 | 097 | 099 | 100 | 094 | 100 | 097 | 100 |
| 50% | 126 | 113 | 111 | 116 | 115 | 117 | 113 | 118 |
| 75% | 147 | 131 | 130 | 130 | 130 | 133 | 131 | 140 |
| 90% | 154 | 137 | 137 | 137 | 135 | 137 | 148 | 177 |
| 95% | 154 | 138 | 138 | 138 | 135 | 137 | 150 | 179 |
| Max | 154 | 138 | 138 | 138 | 135 | 137 | 150 | 179 |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | -19 | -17 | -18 | -84 | -15 | -19 | -17 | |
| — | -19 | -17 | -18 | -84 | -15 | -19 | -17 | |
| — | -19 | -17 | -18 | -78 | -15 | -19 | -17 | |
| — | -17 | -16 | -14 | -18 | -12 | -14 | -13 | |
| — | -13 | -14 | -12 | -12 | -11 | -13 | -11 | |
| — | -10 | -10 | -9 | -9 | -9 | -8 | -3 | |
| — | 0 | -6 | -5 | -5 | -3 | -1 | +29 | |
| — | +1 | -5 | -5 | -5 | -2 | -1 | +32 | |
| — | +1 | -5 | -5 | -5 | -2 | -1 | +32 | |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| 783 | 764 | 763 | 765 | 699 | 765 | 763 | 771 | |
| 783 | 764 | 763 | 765 | 699 | 765 | 763 | 771 | |
| 783 | 764 | 763 | 766 | 706 | 765 | 764 | 771 | |
| 785 | 768 | 769 | 770 | 768 | 769 | 769 | 774 | |
| 799 | 784 | 779 | 780 | 775 | 780 | 779 | 790 | |
| 808 | 791 | 791 | 791 | 790 | 790 | 791 | 806 | |
| 811 | 796 | 795 | 797 | 793 | 793 | 806 | 832 | |
| 811 | 796 | 795 | 797 | 793 | 793 | 807 | 834 | |
| 811 | 796 | 795 | 797 | 793 | 793 | 807 | 834 | |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | -3 | -3 | -3 | -12 | -3 | -3 | -3 | |
| — | -3 | -3 | -3 | -12 | -3 | -3 | -3 | |
| — | -3 | -3 | -3 | -11 | -3 | -3 | -3 | |
| — | -2 | -2 | -3 | -3 | -2 | -2 | -2 | |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -1 | |
| — | -2 | -2 | -2 | -2 | -2 | -2 | +1 | |
| — | -1 | -1 | -1 | -1 | -1 | 0 | +4 | |
| — | -1 | -1 | -1 | -1 | -1 | 0 | +4 | |
| — | -1 | -1 | -1 | -1 | -1 | 0 | +4 | |

| | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| Min | 51 | 53 | 43 | 49 | 51 | 52 | 48 | 24 |
| 5% | 51 | 53 | 43 | 49 | 51 | 52 | 48 | 24 |
| 10% | 52 | 54 | 43 | 50 | 51 | 52 | 49 | 25 |
| 25% | 65 | 65 | 54 | 64 | 65 | 66 | 67 | 46 |
| 50% | 89 | 91 | 61 | 89 | 89 | 83 | 91 | 76 |
| 75% | 120 | 118 | 88 | 106 | 108 | 109 | 111 | 111 |
| 90% | 131 | 133 | 95 | 118 | 119 | 119 | 119 | 120 |
| 95% | 131 | 134 | 96 | 119 | 120 | 120 | 119 | 121 |
| Max | 131 | 134 | 96 | 119 | 120 | 120 | 119 | 121 |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |
| — | -30 | -53 | -28 | -30 | -34 | -25 | -81 | |
| — | -30 | -53 | -28 | -30 | -34 | -25 | -81 | |
| — | -28 | -51 | -26 | -28 | -32 | -23 | -77 | |
| — | -1 | -29 | -10 | -9 | -8 | -7 | -28 | |
| — | +2 | -24 | -6 | -5 | -5 | -6 | -7 | |
| — | +3 | -14 | -2 | 0 | 0 | +2 | -1 | |
| — | +33 | -9 | +16 | +15 | +4 | +6 | +10 | |
| — | +36 | -9 | +18 | +16 | +4 | +6 | +10 | |
| — | +36 | -9 | +18 | +16 | +4 | +6 | +10 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 | |

PROCESS: C PRE-SCREEN STRESS: None (COntrol).

OPERATING POWER CONDITION: 700 mw, 30 V; 25°C.

CELL NO.: 419255 NO. OF UNITS: 20

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 10% | <0.1 | 0.6 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 |
| 25% | <0.1 | 0.7 | <0.1 | <0.1 | 0.1 | <0.1 | 0.3 | 0.2 |
| 50% | <0.1 | 0.9 | 0.3 | 0.4 | 0.6 | 0.4 | 2.5 | 4.0 |
| 75% | 0.2 | 1.7 | 1.3 | 2.2 | 2.5 | 2.4 | 626 | 3450 |
| 90% | 0.5 | 20.2 | 1744 | 96.4 | 120.2 | 81.3 | 98.7 | ∞ |
| 95% | 1.2 | 950.9 | 6108 | 9552 | 956.5 | 646.1 | ∞ | ∞ |
| Max | 1.2 | ∞ | 6328 | ∞ | ∞ | 6227 | ∞ | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.3 | <0.1 | 0.1 | 0.2 | <0.1 | 0.2 | 0.1 |
| 0.3 | 0.6 | 0.2 | 0.3 | 0.3 | 0.2 | 0.4 | 0.4 |
| 1.1 | 1.7 | 1.1 | 1.1 | 1.2 | 0.5 | 1.3 | 1.2 |
| 2.5 | 2.9 | 2.3 | 2.3 | 2.5 | 2.4 | 3.1 | 2.7 |
| 3.9 | 4.9 | 4.0 | 3.9 | 3.9 | 5.8 | 4.2 | 3.8 |
| 5.4 | 6.1 | 5.6 | 5.3 | 5.5 | 6.9 | 6.6 | 4.1 |
| 5.5 | 6.2 | 5.7 | 5.4 | 5.6 | 7.0 | 6.7 | 4.1 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 61 | 61 | 61 | 60 | 60 | 62 | 01 | 01 |
| 62 | 61 | 61 | 60 | 60 | 62 | 01 | 01 |
| 63 | 63 | 63 | 63 | 63 | 62 | 13 | 09 |
| 68 | 67 | 67 | 67 | 68 | 73 | 64 | 64 |
| 78 | 77 | 76 | 76 | 76 | 86 | 72 | 70 |
| 101 | 106 | 97 | 96 | 97 | 110 | 95 | 96 |
| 119 | 911 | 110 | 110 | 109 | 157 | 107 | 108 |
| 142 | ∞ | 138 | 131 | 117 | 958 | 111 | 112 |
| 144 | ∞ | 140 | 132 | 118 | ∞ | 112 | 112 |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -24 | -10 | -11 | -18 | -47 | -99 | -100 |
| — | -23 | -10 | -11 | -18 | -47 | -99 | -100 |
| — | -9 | -8 | -8 | -11 | -37 | -82 | -89 |
| — | -5 | -4 | -7 | -7 | -11 | -8 | -8 |
| — | -1 | -1 | -2 | -2 | +10 | -3 | -5 |
| — | 0 | 0 | -1 | -1 | +38 | 0 | +1 |
| — | +282 | 0 | +1 | +6 | +108 | +13 | +14 |
| — | 1088 | +1 | +4 | +10 | 1319 | +15 | +19 |
| — | 1099 | +1 | +4 | +10 | 1323 | +15 | +19 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 096 | 020 | 087 | 087 | 089 | 088 | 085 | 086 |
| 5% | 096 | 023 | 087 | 087 | 089 | 088 | 085 | 086 |
| 10% | 103 | 084 | 088 | 090 | 090 | 092 | 087 | 088 |
| 25% | 109 | 093 | 093 | 095 | 096 | 100 | 091 | 096 |
| 50% | 122 | 101 | 102 | 103 | 105 | 114 | 103 | 104 |
| 75% | 127 | 115 | 115 | 117 | 119 | 129 | 115 | 115 |
| 90% | 142 | 146 | 119 | 124 | 123 | 137 | 123 | 125 |
| 95% | 162 | 938 | 148 | 152 | 149 | 9506 | 151 | 151 |
| Max | 163 | 980 | 150 | 153 | 150 | ∞ | 152 | 152 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -83 | -22 | -22 | -20 | -30 | -20 | -19 |
| — | -80 | -22 | -22 | -20 | -30 | -20 | -19 |
| — | -21 | -21 | -21 | -19 | -30 | -20 | -19 |
| — | -18 | -17 | -16 | -14 | -21 | -18 | -17 |
| — | -13 | -13 | -12 | -11 | -7 | -13 | -13 |
| — | -9 | -9 | -7 | -7 | +7 | -8 | -9 |
| — | -6 | -6 | -2 | -5 | +24 | -7 | -6 |
| — | +655 | -5 | -1 | -4 | 8621 | -4 | +1 |
| — | +690 | -5 | -1 | -4 | 9073 | -4 | +1 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 777 | 258 | 762 | 760 | 759 | 760 | 759 | 763 |
| 777 | 258 | 762 | 760 | 759 | 760 | 759 | 763 |
| 779 | 760 | 763 | 763 | 960 | 764 | 762 | 765 |
| 783 | 767 | 770 | 769 | 767 | 768 | 768 | 773 |
| 794 | 771 | 773 | 773 | 770 | 780 | 773 | 777 |
| 800 | 786 | 781 | 783 | 778 | 790 | 779 | 787 |
| 813 | 898 | 791 | 798 | 786 | 797 | 790 | 801 |
| 823 | 909 | 797 | 860 | 796 | 9539 | 799 | 869 |
| 823 | 909 | 797 | 860 | 796 | ∞ | 799 | 872 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -4 | -4 | -4 | -4 | -7 | -4 | -4 |
| — | -4 | -4 | -4 | -4 | -7 | -4 | -4 |
| — | -4 | -3 | -3 | -4 | -4 | -4 | -3 |
| — | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| — | -2 | -2 | -2 | -3 | -2 | -2 | -2 |
| — | -2 | -2 | -2 | -2 | 0 | -2 | -1 |
| — | +13 | -2 | -1 | -2 | +2 | -2 | -1 |
| — | +14 | -1 | 0 | -1 | 1103 | 0 | +11 |
| — | +14 | -1 | 0 | -1 | 1161 | 0 | +12 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 36 | 49 | 48 | 48 | 20 | 20 | | |
| 5% | 36 | 49 | 49 | 49 | 20 | 21 | | |
| 10% | 48 | 58 | 58 | 58 | 28 | 49 | | |
| 25% | 64 | 67 | 65 | 69 | 66 | 58 | | |
| 50% | 84 | 85 | 84 | 87 | 88 | 97 | | |
| 75% | 91 | 92 | 100 | 95 | 104 | 111 | | |
| 90% | 118 | 119 | 115 | 121 | 123 | 127 | | |
| 95% | 126 | 123 | 122 | 126 | 128 | 130 | | |
| Max | 126 | 123 | 122 | 126 | 128 | 130 | | |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -6 | -9 | -3 | -75 | -78 | -5 | -5 |
| — | -6 | -9 | -3 | -74 | -77 | -5 | -5 |
| — | -5 | -6 | 0 | -44 | -61 | -3 | -4 |
| — | -2 | -3 | 0 | +1 | -26 | -1 | 0 |
| — | +2 | +2 | +2 | +3 | +8 | +3 | +4 |
| — | +3 | +4 | +5 | +7 | +45 | +11 | +11 |
| — | +7 | +14 | +11 | +19 | +130 | +18 | +21 |
| — | +120 | +131 | +146 | +149 | +258 | +158 | +158 |
| — | +126 | +137 | +153 | +156 | +265 | +165 | +165 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

OCESS: C PRE-SCREEN STRESS: None (Control).

'ERATING POWER CONDITION: 500 mw, 30 V, 25°C.

CELL NO.: 419256 NO. OF UNITS: 55

| S. | $I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| n | <0.1 | 0.4 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | 0.2 |
| % | <0.1 | 0.5 | 0.8 | <0.1 | 0.1 | <0.1 | <0.1 | 0.3 |
| % | <0.1 | 0.5 | 1.0 | 0.1 | 0.1 | <0.1 | <0.1 | 0.3 |
| % | <0.1 | 0.7 | 1.0 | 0.3 | 0.3 | 0.1 | 0.1 | 0.5 |
| % | 0.1 | 0.9 | 1.3 | 0.5 | 0.6 | 0.2 | 0.4 | 0.8 |
| % | 0.4 | 1.7 | 1.7 | 1.2 | 1.3 | 1.0 | 1.3 | 2.0 |
| % | 0.6 | 3.4 | 4.3 | 3.2 | 3.4 | 2.5 | 2.9 | 4.1 |
| % | 1.1 | 107.4 | 208.2 | 213.7 | 219.1 | 344.4 | 252.3 | 50.9 |
| ax | 1.2 | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | 133.1 |

| | $I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | <0.1 | 0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | <0.1 | 0.2 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | 0.2 |
| | <0.1 | 0.3 | 0.3 | <0.1 | <0.1 | 0.1 | <0.1 | 0.3 |
| | 0.2 | 0.4 | 0.5 | 0.1 | 0.1 | 0.2 | 0.2 | 0.4 |
| | 0.5 | 1.2 | 0.9 | 0.6 | 0.6 | 0.4 | 0.6 | 1.1 |
| | 1.6 | 2.8 | 2.5 | 1.9 | 2.3 | 1.5 | 1.8 | 2.6 |
| | 5.1 | 6.5 | 6.0 | 5.9 | 5.7 | 5.4 | 5.7 | 5.9 |
| | 7.1 | 8.1 | 7.5 | 7.5 | 7.4 | 7.3 | 7.6 | 7.8 |
| | 7.2 | 12.8 | 14.1 | 16.5 | 8.5 | 9.0 | 9.2 | 8.5 |

| | $BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | 53 | 04 | 52 | 01 | 01 | 17 | 17 | 52 |
| | 58 | 53 | 54 | 45 | 45 | 54 | 54 | 57 |
| | 63 | 61 | 61 | 59 | 59 | 61 | 61 | 62 |
| | 71 | 70 | 71 | 71 | 71 | 71 | 71 | 71 |
| | 78 | 82 | 80 | 81 | 80 | 80 | 82 | 82 |
| | 97 | 99 | 99 | 99 | 99 | 99 | 102 | 108 |
| | 130 | 133 | 132 | 131 | 133 | 133 | 133 | 138 |
| | 149 | 141 | 142 | 141 | 140 | 144 | 144 | 148 |
| | 156 | 153 | 147 | 145 | 144 | 148 | 150 | ∞ |

| | $BV_{CEO}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | — | -94 | -45 | -99 | -99 | -77 | -78 | -8 |
| | — | -5 | -6 | -44 | -43 | -11 | -9 | -6 |
| | — | -3 | -3 | -6 | -7 | -6 | -6 | -4 |
| | — | -1 | -1 | -2 | -3 | -2 | -2 | -2 |
| | — | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| | — | 0 | 0 | 0 | 0 | 0 | 0 | +1 |
| | — | +4 | +10 | +14 | +13 | +10 | +12 | +16 |
| | — | +18 | +20 | +28 | +32 | +22 | +30 | +33 |
| | — | +26 | +23 | +51 | +47 | +28 | +36 | +936 |

| RS. | $V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| n | 103 | 83 | 085 | 085 | 084 | 010 | 083 | 085 |
| % | 105 | 87 | 087 | 090 | 087 | 059 | 087 | 087 |
| % | 107 | 89 | 090 | 090 | 090 | 089 | 090 | 090 |
| % | 112 | 94 | 096 | 098 | 096 | 095 | 097 | 096 |
| % | 122 | 104 | 105 | 107 | 106 | 105 | 104 | 103 |
| % | 136 | 116 | 117 | 117 | 120 | 117 | 119 | 115 |
| % | 148 | 132 | 133 | 133 | 134 | 133 | 135 | 132 |
| % | 157 | 135 | 141 | 144 | 144 | 141 | 152 | 144 |
| ax | 200 | 147 | 402 | 152 | 169 | 147 | 183 | 157 |

| | $V_{CE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | — | -52 | -32 | -48 | -48 | -91 | -30 | -50 |
| | — | -24 | -20 | -23 | -23 | -64 | -20 | -24 |
| | — | -19 | -17 | -18 | -18 | -19 | -18 | -18 |
| | — | -17 | -15 | -15 | -15 | -16 | -16 | -16 |
| | — | -14 | -14 | -12 | -13 | -13 | -13 | -14 |
| | — | -11 | -11 | -9 | -9 | -10 | -9 | -11 |
| | — | -9 | -9 | -9 | -8 | -7 | -8 | -8 |
| | — | -9 | -7 | -3 | -4 | -6 | -6 | -7 |
| | — | -7 | +101 | +8 | +15 | -3 | +12 | +7 |

| | $V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | 778 | 606 | 010 | 760 | 756 | 760 | 760 | 659 |
| | 782 | 759 | 760 | 762 | 760 | 764 | 760 | 758 |
| | 785 | 764 | 766 | 766 | 765 | 765 | 761 | 761 |
| | 789 | 769 | 769 | 769 | 769 | 770 | 768 | 767 |
| | 797 | 775 | 777 | 777 | 775 | 776 | 775 | 772 |
| | 803 | 785 | 785 | 783 | 784 | 783 | 784 | 780 |
| | 811 | 790 | 794 | 795 | 791 | 793 | 791 | 789 |
| | 821 | 798 | 797 | 800 | 800 | 797 | 798 | 798 |
| | 956 | 813 | 814 | 813 | 820 | 815 | 815 | 808 |

| | $V_{BE(SAT)}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | — | -25 | -99 | -19 | -19 | -19 | -19 | -19 |
| | — | -9 | -3 | -4 | -4 | -4 | -4 | -9 |
| | — | -3 | -3 | -3 | -3 | -3 | -3 | -4 |
| | — | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| | — | -2 | -2 | -2 | -3 | -2 | -3 | -3 |
| | — | -2 | -2 | -2 | -2 | -2 | -2 | -3 |
| | — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| | — | -2 | -2 | -1 | -2 | -2 | -2 | -2 |
| | — | -2 | -1 | +1 | +2 | -1 | +1 | +1 |

| RS. | $h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| n | 52 | 53 | 20 | 53 | 54 | 53 | 53 | 20 |
| % | 56 | 57 | 55 | 57 | 58 | 57 | 57 | 56 |
| % | 60 | 63 | 60 | 63 | 64 | 63 | 64 | 61 |
| % | 68 | 71 | 70 | 68 | 71 | 20 | 20 | 71 |
| % | 79 | 87 | 80 | 82 | 85 | 82 | 82 | 78 |
| % | 102 | 100 | 95 | 101 | 102 | 101 | 101 | 101 |
| % | 119 | 115 | 111 | 116 | 118 | 117 | 116 | 116 |
| % | 126 | 126 | 128 | 126 | 128 | 127 | 127 | 121 |
| ax | 140 | 141 | ∞ | 139 | 142 | 140 | 141 | 142 |

| | $h_{FE}$ (% Change from Initial) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
| | — | -31 | -84 | -48 | -36 | -35 | -36 | -79 |
| | — | -6 | -22 | -12 | -10 | -9 | -9 | -10 |
| | — | -3 | -11 | -3 | -1 | -2 | -2 | -1 |
| | — | 0 | -6 | -1 | 0 | -1 | -1 | 0 |
| | — | +1 | 0 | 0 | +2 | 0 | +1 | +2 |
| | — | +2 | +1 | +1 | +3 | +2 | +2 | +3 |
| | — | +3 | +3 | +6 | +7 | +5 | +7 | +8 |
| | — | +8 | +30 | +9 | +11 | +11 | +16 | +16 |
| | — | +114 | 1406 | +109 | +113 | +111 | +110 | +113 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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PROCESS: C PRE-SCREEN STRESS: None (Control).

OPERATING POWER CONDITION: 400 mw, 30 V, 150°C.

CELL NO.: 419257 NO. OF UNITS: 10

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.6 | 0.2 | <0.1 | 0.1 | <0.1 | 0.5 | 0.1 |
| 5% | <0.1 | 0.6 | 0.2 | <0.1 | 0.1 | <0.1 | 0.5 | 0.1 |
| 10% | <0.1 | 0.6 | 0.2 | <0.1 | 0.1 | <0.1 | 0.5 | 0.1 |
| 25% | <0.1 | 0.8 | 0.4 | 0.2 | 0.2 | 0.1 | 0.7 | 0.3 |
| 50% | 0.3 | 1.0 | 0.5 | 0.3 | 0.6 | 0.2 | 1.0 | 3.7 |
| 75% | 0.4 | 2532 | 168 | 128 | 89 | 3.1 | 1.2 | 992 |
| 90% | 1.0 | ∞ | 9063 | 9041 | 9020 | 281.1 | 128 | 9195 |
| 95% | 1.0 | ∞ | ∞ | ∞ | ∞ | 3115 | 128 | ∞ |
| Max | 1.0 | ∞ | ∞ | ∞ | ∞ | 311.5 | 128 | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.7 | 0.2 | 0.2 | <0.1 | <0.1 | 0.6 | <0.1 |
| <0.1 | 0.7 | 0.2 | 0.2 | <0.1 | <0.1 | 0.6 | <0.1 |
| <0.1 | 0.7 | 0.2 | 0.2 | <0.1 | <0.1 | 0.6 | <0.1 |
| 0.2 | 1.3 | 0.9 | 0.7 | 0.3 | 0.6 | 1.2 | 0.3 |
| 1.6 | 2.6 | 3.2 | 3.6 | 4.4 | 3.5 | 3.1 | 3.9 |
| 4.7 | 6.0 | 5.8 | 7.4 | 25.9 | 32.0 | 33.2 | 149.5 |
| 7.1 | 48.4 | 887.5 | 9087 | 9031 | 910.6 | 3569 | 1987 |
| 7.2 | 529 | 896.4 | ∞ | ∞ | ∞ | 3569 | 2069 |
| 7.2 | 529 | 896.4 | ∞ | ∞ | ∞ | 3569 | 2069 |

$BV_{CEO}$ ($I_C$ - 0.1 ma)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 71 | 07 | 07 | 07 | 22 | 67 | 67 | 99 |
| 71 | 07 | 07 | 07 | 22 | 67 | 67 | 99 |
| 72 | 10 | 13 | 13 | 27 | 68 | 67 | 80 |
| 84 | 63 | 74 | 75 | 75 | 80 | 84 | 86 |
| 91 | 84 | 88 | 87 | 88 | 96 | 93 | 125 |
| 113 | 95 | 114 | 96 | 117 | 142 | 130 | 160 |
| 147 | 112 | 160 | 153 | 176 | 176 | 128 | 918 |
| 151 | 113 | 161 | 158 | 177 | 128 | 128 | ∞ |
| 151 | 113 | 161 | 158 | 177 | 128 | 128 | ∞ |

$BV_{CFO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -96 | -95 | -95 | -85 | -12 | -12 | -5 |
| — | -96 | -95 | -95 | -85 | -12 | -12 | -5 |
| — | -92 | -87 | -87 | -76 | -12 | -12 | -5 |
| — | -23 | -7 | -12 | -8 | -6 | -5 | +3 |
| — | -3 | -2 | -5 | -2 | -2 | 0 | +28 |
| — | +1 | +14 | +1 | +16 | +22 | +37 | +69 |
| — | +8 | +44 | +37 | +67 | +66 | +69 | +315 |
| — | +8 | +44 | +41 | +69 | +69 | +69 | +364 |
| — | +8 | +44 | +41 | +69 | +69 | +69 | +364 |

$V_{CE(SAT)}$ ($I_C$-50ma, $I_B$-5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 100 | 004 | 089 | 095 | 091 | 088 | 093 | 090 |
| 5% | 100 | 004 | 089 | 095 | 091 | 088 | 093 | 090 |
| 10% | 101 | 013 | 090 | 095 | 092 | 089 | 093 | 091 |
| 25% | 110 | 092 | 096 | 099 | 098 | 095 | 098 | 100 |
| 50% | 122 | 106 | 107 | 109 | 105 | 105 | 104 | 107 |
| 75% | 133 | 116 | 120 | 121 | 119 | 116 | 116 | 120 |
| 90% | 139 | 131 | 128 | 132 | 132 | 133 | 123 | 9011 |
| 95% | 139 | 132 | 129 | 133 | 133 | 134 | 123 | ∞ |
| Max | 139 | 132 | 129 | 133 | 133 | 134 | 123 | ∞ |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -96 | -16 | -13 | -14 | -15 | -13 | -14 |
| — | -96 | -16 | -13 | -14 | -15 | -13 | -14 |
| — | -98 | -16 | -13 | -14 | -15 | -13 | -14 |
| — | -14 | -13 | -13 | -13 | -14 | -12 | -11 |
| — | -12 | -11 | -9 | -11 | -14 | -11 | -10 |
| — | -9 | -9 | -6 | -9 | -9 | -8 | -6 |
| — | -5 | -7 | -4 | -5 | -4 | -7 | +6384 |
| — | -5 | -7 | -4 | -4 | -4 | -7 | 7094 |
| — | -5 | -7 | -4 | -4 | -4 | -7 | 7094 |

$V_{BE(SAT)}$ ($I_C$-50 ma, $I_B$-5 ma)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 779 | 618 | 766 | 769 | 768 | 765 | 764 | 765 |
| 779 | 618 | 766 | 769 | 768 | 765 | 764 | 765 |
| 779 | 633 | 766 | 769 | 768 | 765 | 764 | 765 |
| 783 | 771 | 772 | 774 | 773 | 768 | 768 | 769 |
| 796 | 780 | 780 | 780 | 782 | 778 | 775 | 777 |
| 799 | 784 | 785 | 785 | 787 | 782 | 781 | 784 |
| 805 | 793 | 796 | 796 | 797 | 793 | 785 | 9078 |
| 805 | 794 | 797 | 797 | 798 | 794 | 785 | ∞ |
| 805 | 794 | 797 | 797 | 798 | 794 | 785 | ∞ |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -21 | -2 | -3 | -2 | -3 | -3 | -3 |
| — | -21 | -2 | -3 | -2 | -3 | -3 | -3 |
| — | -19 | -2 | -3 | -2 | -3 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| — | -2 | -2 | -1 | -1 | -2 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -2 | -2 | -2 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | +1628 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | 1142 |
| — | -1 | -1 | -1 | -1 | -1 | -2 | 1142 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 41 | 49 | 40 | 32 | 32 | 33 | 33 | 20 |
| 5% | 41 | 49 | 40 | 32 | 32 | 33 | 33 | 20 |
| 10% | 42 | 50 | 41 | 33 | 33 | 34 | 33 | 21 |
| 25% | 63 | 65 | 56 | 50 | 50 | 49 | 46 | 39 |
| 50% | 81 | 82 | 77 | 77 | 80 | 82 | 82 | 74 |
| 75% | 111 | 113 | 106 | 101 | 110 | 113 | 109 | 98 |
| 90% | 129 | 130 | 124 | 120 | 127 | 130 | 132 | 116 |
| 95% | 131 | 131 | 126 | 122 | 128 | 131 | 132 | 117 |
| Max | 131 | 131 | 126 | 122 | 128 | 131 | 132 | 117 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -6 | -24 | -40 | -42 | -46 | -51 | -73 |
| — | -6 | -24 | -40 | -42 | -46 | -51 | -73 |
| — | -5 | -23 | -39 | -42 | -45 | -51 | -72 |
| — | 0 | -9 | -16 | -12 | -10 | -18 | -42 |
| — | +1 | -5 | -8 | -2 | 0 | +1 | -6 |
| — | +4 | -3 | -5 | 0 | +2 | +4 | +2 |
| — | +30 | +22 | +25 | +28 | +28 | +34 | +20 |
| — | +33 | +25 | +28 | +31 | +31 | +34 | +22 |
| — | +33 | +25 | +28 | +31 | +31 | +34 | +22 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

PROCESS: C PRE-SCREEN STRESS: None (Control).

OPERATING POWER CONDITION: 200 mw, 30 V, 150°C.

CELL NO.: 419258 NO. OF UNITS: 19

$I_{CBO}$ ($V_{CB}$ - 60V)(Nanoamps)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | <0.1 | 0.4 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 5% | <0.1 | 0.4 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 10% | <0.1 | 0.5 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 25% | <0.1 | 0.6 | 0.3 | 0.2 | 0.2 | <0.1 | 0.1 | 0.1 |
| 50% | 0.2 | 0.9 | 0.5 | 0.5 | 0.5 | 0.3 | 0.5 | 0.3 |
| 75% | 0.6 | 1.5 | 1.5 | 1.8 | 16.1 | 1.0 | 1.3 | 1.4 |
| 90% | 1.9 | 23.1 | 2.9 | 4.4 | ∞ | 2.2 | 3.0 | 5.1 |
| 95% | 5.8 | 70.0 | 5%.1 | ∞ | ∞ | ∞ | ∞ | ∞ |
| Max | 5.8 | 70.0 | 5%.1 | ∞ | ∞ | ∞ | ∞ | ∞ |

$I_{EBO}$ ($V_{EB}$ - 5V)(Nanoamps)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | 0.1 | 0.1 | <0.1 |
| 0.3 | 0.6 | 0.1 | 0.1 | 0.1 | 0.2 | 0.7 | 0.3 |
| 0.9 | 1.9 | 1.3 | 1.1 | 0.8 | 0.8 | 1.1 | 1.2 |
| 4.6 | 5.1 | 4.0 | 3.5 | 2.9 | 4.7 | 4.6 | 4.4 |
| 6.9 | 7.8 | 7.1 | 7.4 | 6.9 | 7.0 | 8.3 | 7.4 |
| 7.8 | 8.0 | 7.5 | 7.6 | 7.5 | 7.7 | 9.9 | 7.7 |
| 7.8 | 8.0 | 7.5 | 7.6 | 7.5 | 7.7 | 9.9 | 7.7 |

$BV_{CEO}$ ($I_C$ - 0.1 ma.)(Volts)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 63 | 62 | 62 | 06 | 02 | 01 | 01 | 01 |
| 63 | 62 | 62 | 06 | 02 | 01 | 01 | 01 |
| 68 | 65 | 65 | 62 | 62 | 61 | 62 | 61 |
| 71 | 70 | 70 | 69 | 68 | 67 | 68 | 67 |
| 79 | 74 | 77 | 73 | 73 | 72 | 73 | 72 |
| 100 | 89 | 89 | 82 | 82 | 85 | 89 | 86 |
| 133 | 127 | 126 | 126 | 125 | 125 | 126 | 125 |
| 137 | 134 | 131 | 129 | 127 | 126 | 126 | 137 |
| 137 | 134 | 131 | 129 | 127 | 126 | 126 | 137 |

$BV_{CEO}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -42 | -40 | -94 | -98 | -100 | -99 | -99 |
| — | -42 | -40 | -94 | -98 | -100 | -99 | -99 |
| — | -6 | -7 | -40 | -42 | -36 | -31 | -36 |
| — | -3 | -4 | -6 | -6 | -7 | -7 | -7 |
| — | -1 | -2 | -2 | -2 | -3 | -2 | -2 |
| — | 0 | 0 | -1 | -1 | -1 | -1 | -1 |
| — | 0 | 0 | 0 | 0 | -1 | 0 | 0 |
| — | +1 | +1 | 0 | 0 | 0 | 0 | +7 |
| — | +1 | +1 | 0 | 0 | 0 | 0 | +7 |

$V_{CE(SAT)}$ ($I_C$ - 50ma, $I_B$ - 5 ma)(Mv.)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 107 | 814 | 091 | 093 | 092 | 090 | 093 | 088 |
| 5% | 107 | 814 | 091 | 093 | 092 | 090 | 093 | 088 |
| 10% | 109 | 091 | 093 | 093 | 093 | 092 | 094 | 092 |
| 25% | 114 | 095 | 095 | 099 | 097 | 093 | 100 | 097 |
| 50% | 119 | 103 | 103 | 104 | 101 | 100 | 103 | 103 |
| 75% | 135 | 114 | 110 | 114 | 112 | 113 | 113 | 115 |
| 90% | 144 | 128 | 125 | 125 | 123 | 125 | 130 | 125 |
| 95% | 154 | 134 | 135 | 132 | 132 | 131 | 199 | 135 |
| Max | 154 | 134 | 135 | 135 | 132 | 131 | 199 | 135 |

$V_{CE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -88 | -24 | -24 | -25 | -25 | -24 | -26 |
| — | -88 | -24 | -24 | -25 | -25 | -24 | -26 |
| — | -24 | -22 | -22 | -23 | -24 | -22 | -22 |
| — | -17 | -18 | -16 | -17 | -18 | -16 | -17 |
| — | -15 | -15 | -13 | -15 | -15 | -13 | -14 |
| — | -11 | -12 | -11 | -13 | -13 | -10 | -13 |
| — | -8 | -8 | -8 | -11 | -11 | -8 | -8 |
| — | -7 | -4 | -6 | -6 | -8 | +59 | -4 |
| — | -7 | -4 | -6 | -6 | -8 | +59 | -4 |

$V_{BE(SAT)}$ ($I_C$ - 50 ma, $I_B$ - 5 ma.)(Mv.)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| 782 | 698 | 767 | 765 | 770 | 764 | 762 | 761 |
| 782 | 698 | 767 | 765 | 770 | 764 | 762 | 761 |
| 784 | 766 | 770 | 767 | 770 | 765 | 764 | 765 |
| 787 | 770 | 773 | 770 | 775 | 767 | 770 | 768 |
| 793 | 775 | 777 | 777 | 777 | 773 | 773 | 772 |
| 799 | 783 | 784 | 784 | 784 | 781 | 779 | 778 |
| 803 | 786 | 787 | 785 | 786 | 783 | 780 | 778 |
| 811 | 786 | 787 | 785 | 787 | 784 | 879 | 779 |
| 811 | 786 | 787 | 785 | 787 | 784 | 879 | 779 |

$V_{BE(SAT)}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | +2 | -4 | -4 | -4 | -5 | -5 | -4 |
| — | +2 | -4 | -4 | -4 | -5 | -5 | -4 |
| — | -4 | -3 | -3 | -3 | -4 | -4 | -4 |
| — | -3 | -3 | -2 | -2 | -3 | -3 | -3 |
| — | -2 | -2 | -2 | -2 | -2 | -2 | -3 |
| — | -2 | -2 | -2 | -1 | -2 | -2 | -2 |
| — | -1 | -1 | -2 | -1 | -2 | -2 | -1 |
| — | 0 | 0 | 0 | 0 | -1 | +12 | -1 |
| — | 0 | 0 | 0 | 0 | -1 | +12 | -1 |

$h_{FE}$ ($I_C$ - 20 ma, $V_{CE}$ - 5V)

| HRS. | Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|---|
| Min | 35 | 54 | 54 | 52 | 53 | 55 | 54 | 55 |
| 5% | 35 | 54 | 54 | 52 | 53 | 55 | 54 | 55 |
| 10% | 54 | 54 | 55 | 52 | 54 | 55 | 55 | 56 |
| 25 | 58 | 60 | 60 | 57 | 59 | 60 | 60 | 61 |
| 50 | 80 | 80 | 79 | 76 | 77 | 74 | 78 | 79 |
| 75 | 104 | 102 | 10.4 | 104 | 107 | 110 | 111 | 113 |
| 90 | 120 | 116 | 114 | 110 | 119 | 122 | 121 | 142 |
| 95 | 120 | 121 | 120 | 114 | 126 | 132 | 135 | 159 |
| Max | 120 | 121 | 120 | 114 | 126 | 132 | 135 | 159 |

$h_{FE}$ (% Change from Initial)

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|
| — | -7 | -14 | -9 | -6 | -8 | -3 | -2 |
| — | -7 | -14 | -9 | -6 | -8 | -3 | -2 |
| — | -3 | -7 | -8 | -5 | -4 | -3 | -2 |
| — | -1 | -1 | -6 | -3 | -1 | -2 | 0 |
| — | 0 | +1 | -5 | -2 | +1 | +1 | +1 |
| — | +2 | +2 | -1 | +2 | +4 | +7 | +9 |
| — | +39 | +41 | +36 | +55 | +59 | +57 | +60 |
| — | +56 | +56 | +49 | +58 | +66 | +69 | +78 |
| — | +56 | +56 | +49 | +58 | +66 | +69 | +78 |

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|

| Init | 168 | 340 | 680 | 1000 | 1500 | 2000 | 3000 |
|---|---|---|---|---|---|---|---|