

February 1974

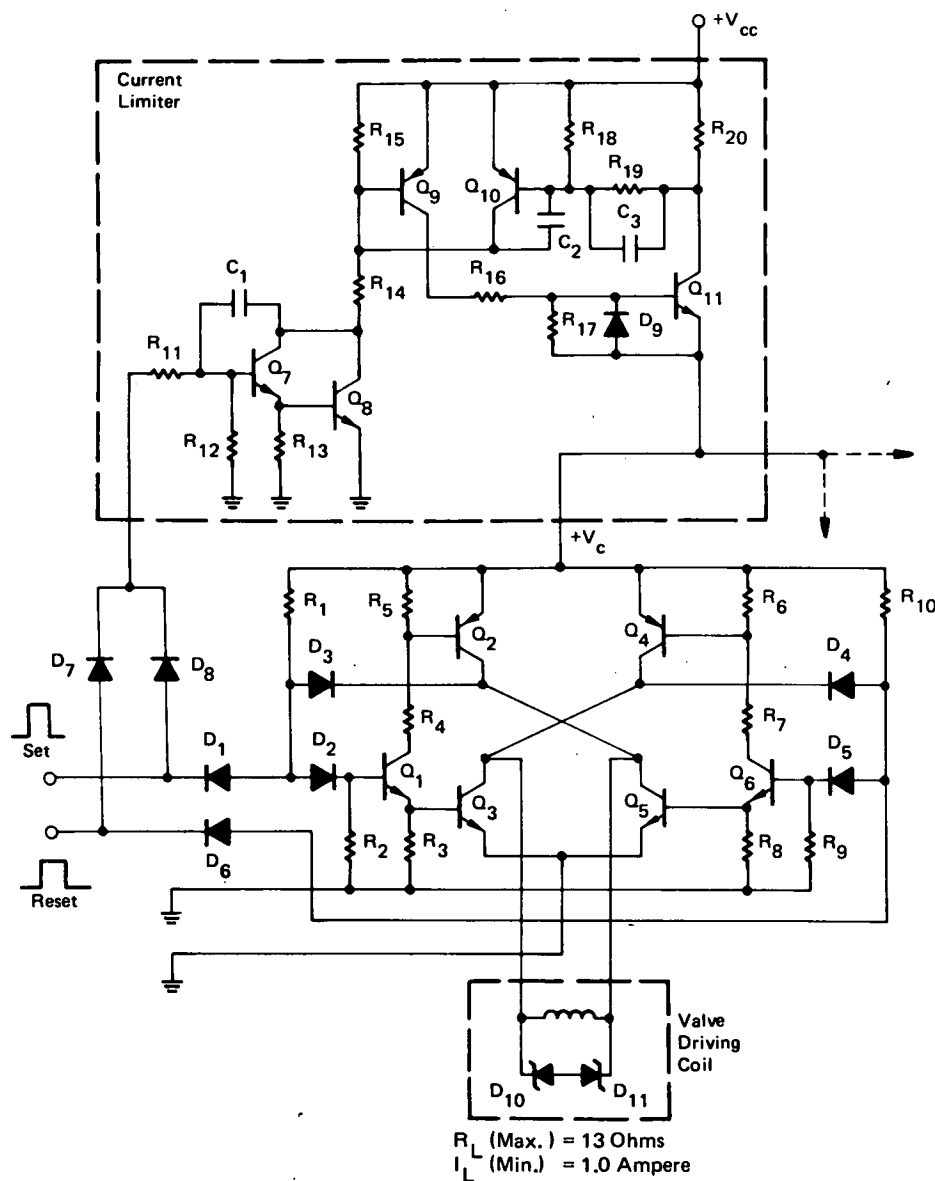
NASA TECH BRIEF

NASA Pasadena Office



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

Fail-Safe Bidirectional Valve Driver



Bidirectional Valve Driver

(continued overleaf)

The problem:

Bidirectional valve driver circuits which operate from a single power supply are subject to damage when the load is shorted or shorted to ground.

The solution:

Cross-coupled diodes are added to a commonly used bidirectional valve driver circuit to protect the circuit and power supply.

How it's done:

When the set/reset command [+2.7 volts (peak), 20-millisecond duration] is received, the current limiter is turned on and applies power ($+V_c$) to the valve driver. The current limit is set to 1.3 amperes and protects the power supply ($+V_{cc}$) in the event of a short circuit (see figure). The cross-coupled diodes D_3 and D_4 prevent simultaneous execution of the set and reset commands.

Valve actuation is prevented in the event the actuator coil is shorted to ground; under normal operation, the coil is isolated from ground. Should the coil become grounded, cross-coupling diode D_2 prevents valve actuation by clamping point A. In addition, when the coil is shorted, transistors Q_2 and Q_3 are protected by holding Q_2 off. However, with R_5 properly adjusted,

Q_3 will be turned on just enough to drive D_3 and R_1 (Q_3 collector current) while maintaining Q_2 in an off state.

Notes:

1. This circuit may be used in systems requiring fail-safe bidirectional valve operation, particularly in chemical- and petroleum-processing control systems and computer-controlled hydraulic or pneumatic systems.
2. Requests for further information may be directed to:
Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: TSP73-10450

Patent status:

NASA has decided not to apply for a patent.

Source: Hisashi Fujimoto of
Caltech/JPL
under contract to
NASA Pasadena Office
(NPO-11958)