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Marshall Space Flight Center



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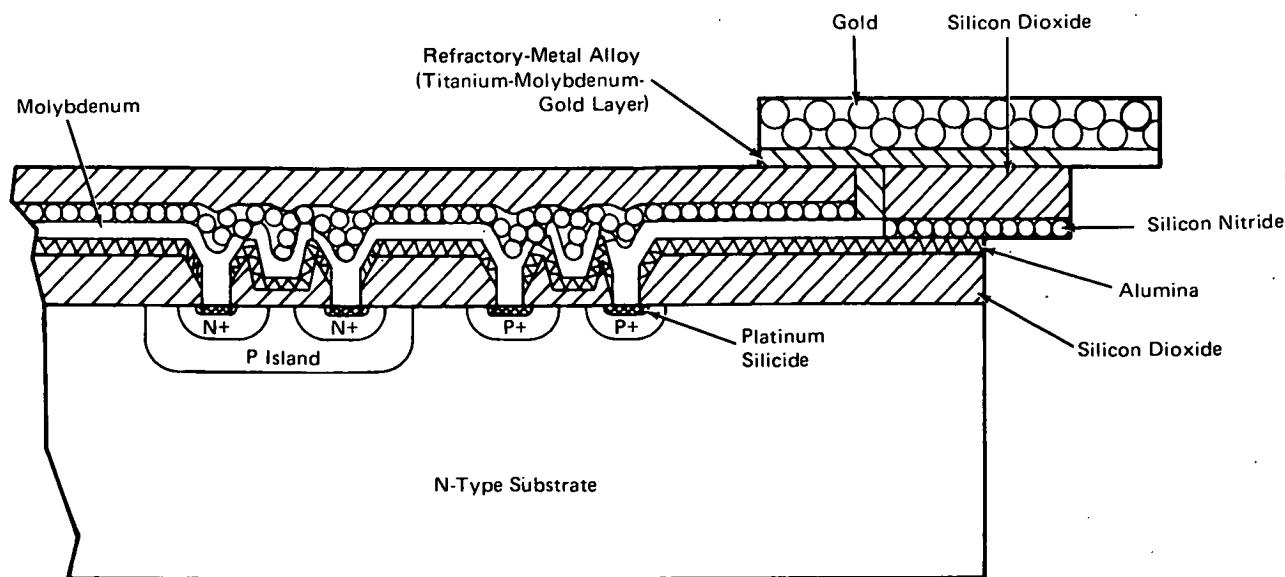
Development of Chip Passivated Monolithic Complementary MISFET Circuits with Beam Leads

The study and development of advanced materials in semiconductor technologies during recent years resulted in an efficient fabrication technique for alumina-passivated silicon monolithic complementary MISFET (metal-insulator semiconductor field-effect transistor) arrays. The technique involves a total passivation beam-lead approach and provides a completely sealed chip with a double level interconnect capability (see figure).

The contact of the p+ and n+ source/drain regions is obtained with platinum silicide. A refractory metal is used to form the interconnect system to obtain metal contacts that withstand temperatures of 873 K for short periods of time. The refractory-metal interconnect system has been chosen because it matches the expansion coefficient of silicon and silicon dioxide and provides low ductility. Low ductility prevents cracks in the

protective layer that result from mechanical forces applied to the oxide above the metal layer. The conductors, as well as all MISFET source and drain contact openings, are protected by an ion barrier layer of silicon nitride which, in conjunction with the alumina under the gate metallization, provides for a "dual" passivation of all MISFET gate structures to outside ion sources. A thick layer of silicon dioxide on top of the nitride serves as an overall mechanical protection.

The beam-interconnect contact (refractory-metal alloy) is obtained through a titanium-molybdenum-gold layer. These metals were selected because of their adhesion strength and low migration rates into each other. The etch separation process is performed with an amine etch to reduce the amount of "alkali contamination."



(Not To Scale)

(continued overleaf)

Notes:

1. Information concerning this subject may be of interest to designers and manufacturers of integrated circuits.
2. The following documentation may be obtained from:
National Technical Information Service
Springfield, Virginia 22151
Single document price \$3.00
(or microfiche \$0.95)

Reference: NASA CR-123742 (N72-28497)
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Leads

Patent status:

NASA has decided not to apply for a patent.

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