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3000 VOLT AND 1300 AMPERE 2" DIAMETER THYRISTOR

BY

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Large diameter high quality single crystal silicon has been available during the last few years from several manufacturers. In 1971 we initiated development of 50 MM diameter high power thyristors using high resistivity, long life time n-type silicon. In a parallel program, diffusion, contacting and junction passivation techniques were developed for fabrication of these unusually large area devices. The result of these efforts is a 3000 volt 1300 ampere high power thyristor product. This device was primarily developed for the high voltage dc transmission application. It must pass additional qualification tests which are not listed in standard high power thyristor data sheets. These tests simulate HVDC operating conditions. They include:

1. Three millisecond high temperature blocking voltage.
2. Reverse recovery charge at peak current.
3. AC blocking life.

The main design features of the new device are:

1. All diffused N^+PNP^+ structure.
2. Center fired Di/Namic gate design.
3. Shorted - cathode - emitter configuration.
4. Compression bonded encapsulation.

In order to meet the HVDC requirements, the design features have to be properly optimized, to guarantee high performance of the device under both static and dynamic conditions.

In this paper, we will discuss design considerations and special fabrication techniques required for this large area device. We will also present the electrical characteristics.