



International Rectifier Corp.

R5 MOSFET

Proton Test Results

Background

International Rectifier Corp., in conjunction with Orbital Sciences and Raytheon TI Systems, has tested a sample of the new R5 MOSFET technology devices. The devices tested include the following: IRH57064 (60V), IRH57160 (100V) and the IRH57260 (200V). The test was performed at the Indiana University Cyclotron Facility (IUCF) in May of 1999. Devices were tested with 3 different levels of beam energy – 40, 75 and 200 MeV. The test was conducted using IR's turnkey SEE test system, modified for proton testing.

Purpose

The purpose of the test was to characterize the new R5 devices for the proton environment. The investigation was primarily aimed at discovering potential differences between the customary Cobalt-60 test results and the proton test results. Differences due to displacement damage and ionizing damage, if any, were to be investigated.

Methodology

The test samples, each mounted in lidded TO3 packages, were placed in the beam line, approximately equally spaced from the center of the beam using a socketed board. Between the beam exit and the test samples, copper blocks were placed to degrade the beam energy to the required levels. Four test samples could be irradiated during each test run. For each test run, two samples were biased with 12V applied to the gate and 0V applied to the drain (VGS Bias). The other two samples were biased with 80% of the rated BVDS applied to the drain and 0V applied to the gates (VDS Bias). The bias was applied via coaxial cable from two Keithley Source Meters located outside the test cave. A laptop computer, through an IEEE-488 communications bus controlled the source meters. The test samples were static tested at each interim point using a Scientific Test Model 5300 ATE.

Results

The parametric data for the samples has been averaged and is shown graphically in Figures 1 through 5. Each figure shows a graph of BVDS, VGSTH and RDS(on) Vs Total Ionizing Dose (TID). The part numbers and different proton beam energies are indicated in the header for each figure. Figures 6 through 11 are comparative graphs of the parametric response due to Cobalt-60 irradiation.

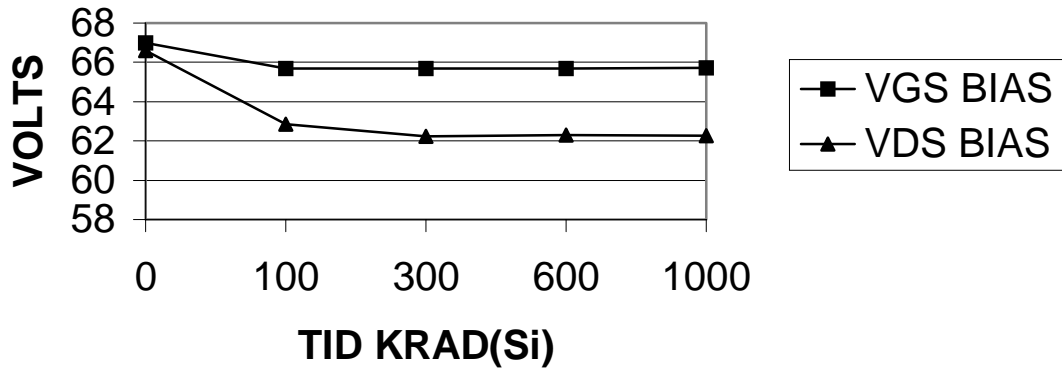
Summary

A review of the figures indicates the proton response of the R5 devices is significantly similar to the Cobalt-60 response. Effects due to displacement damage are not readily noted, as would be expected in a majority carrier device. This data will be reviewed in detail and a final test report shall be distributed.

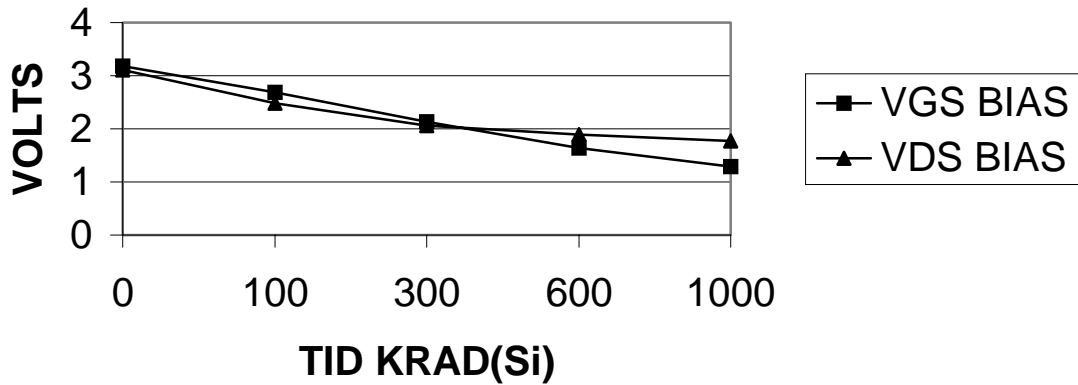
Acknowledgments

IR wishes to thank Barry Posey and Daniel Ketchum of Orbital Sciences, Gary Smith of Raytheon TI Systems and Chuck Foster and all the staff at IUCF, for enabling this test to be conducted.

BVDSS



VGSTH



RDSON @ 35A

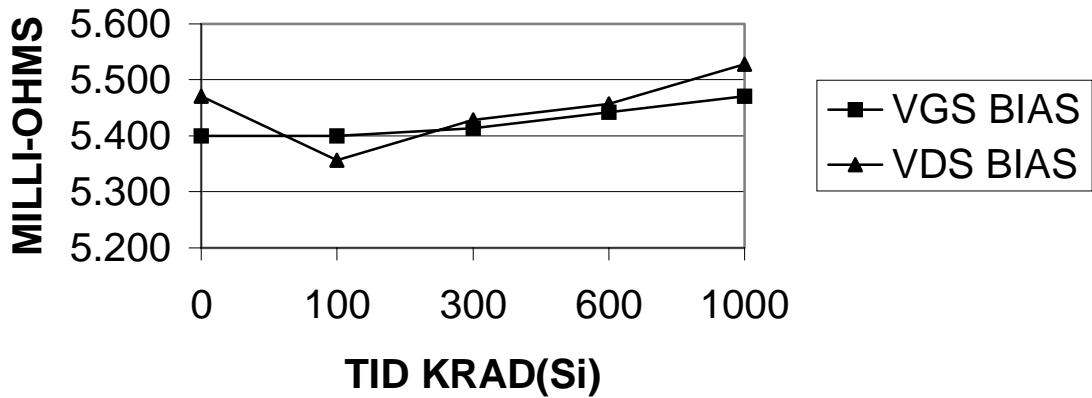
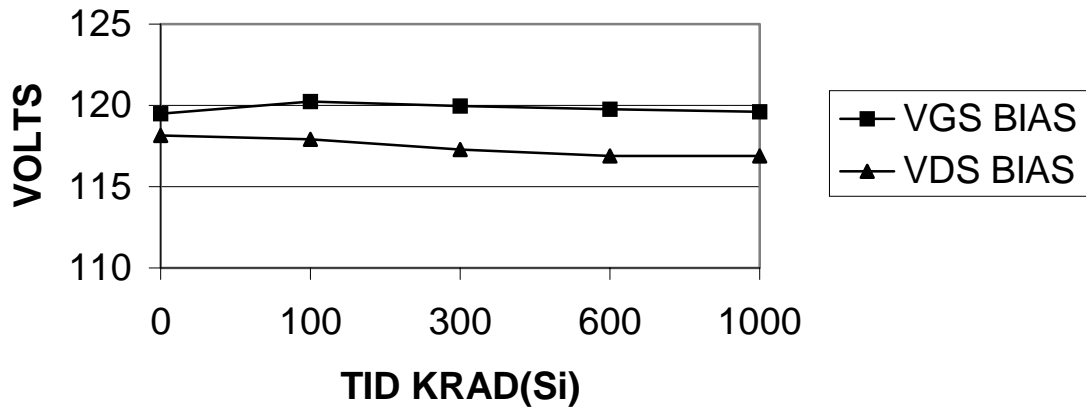
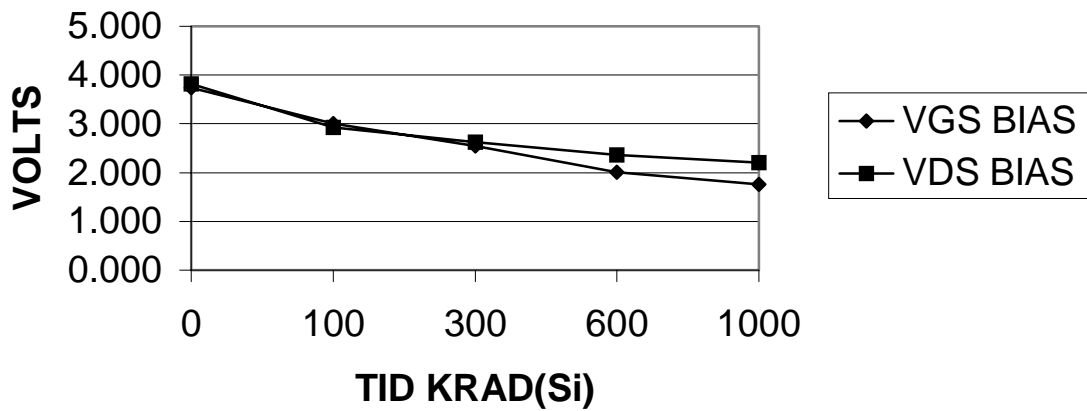


Figure 1 – IRH57064 (60V), 40MeV Proton Response

BVDSS



VGSTH



RDSON @ 35A

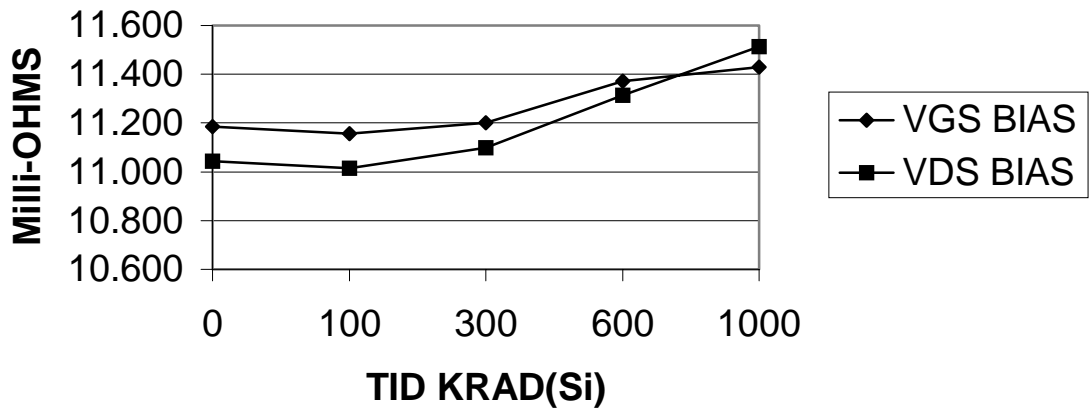
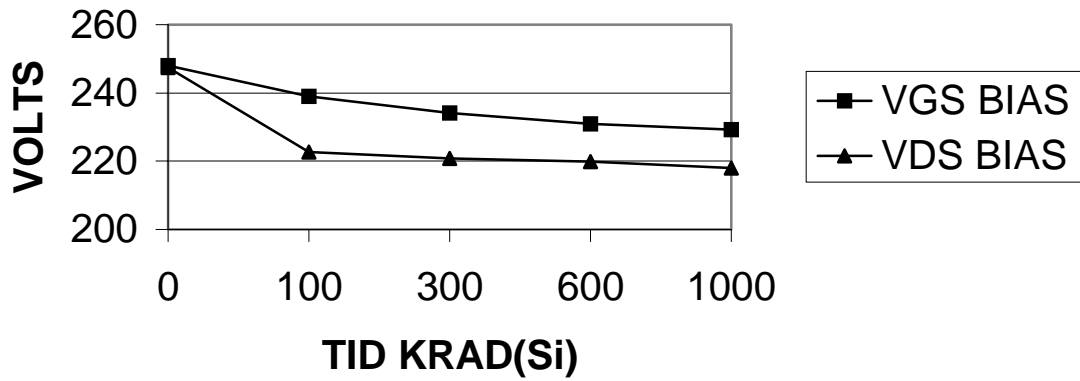
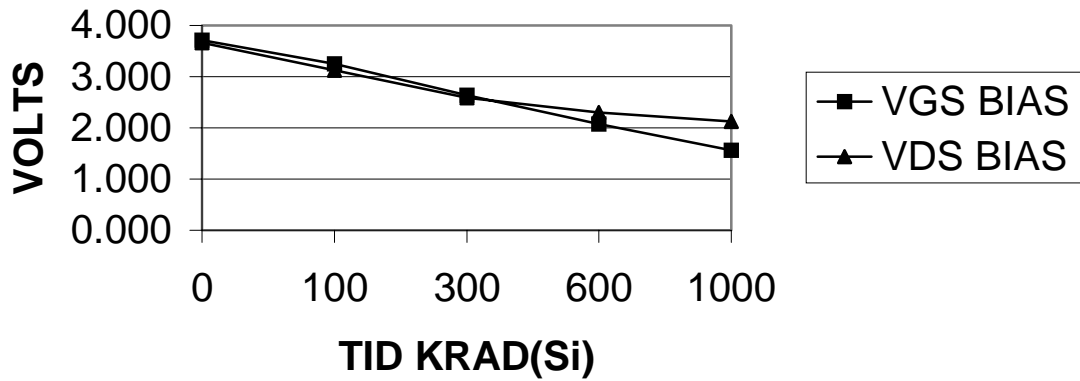


Figure 2 – IRH57160 (100V), 40MeV Proton Response

BVDSS



VGSTH



RDSON @ 35A

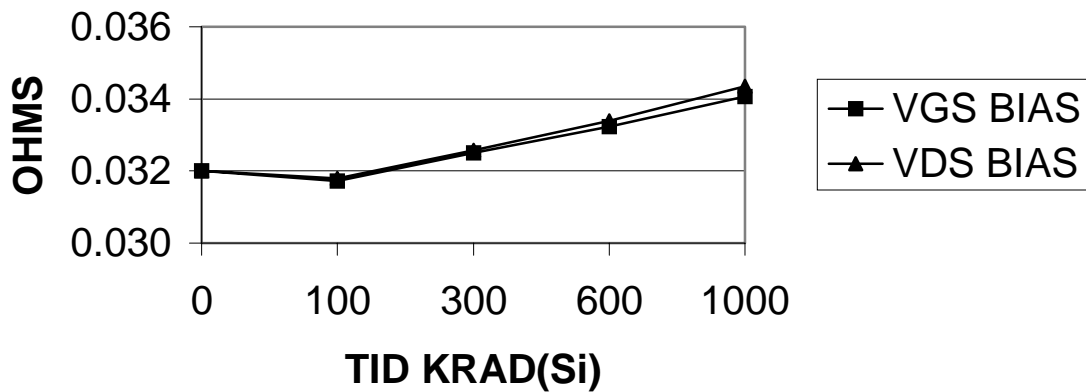
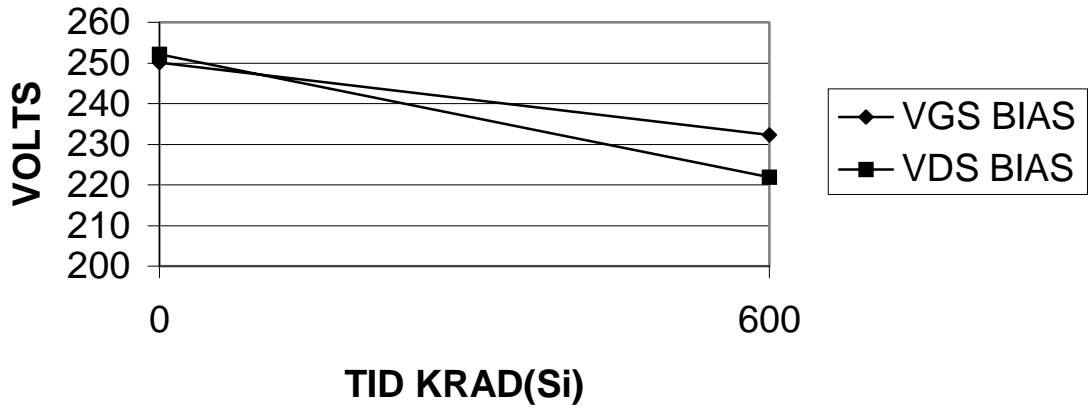
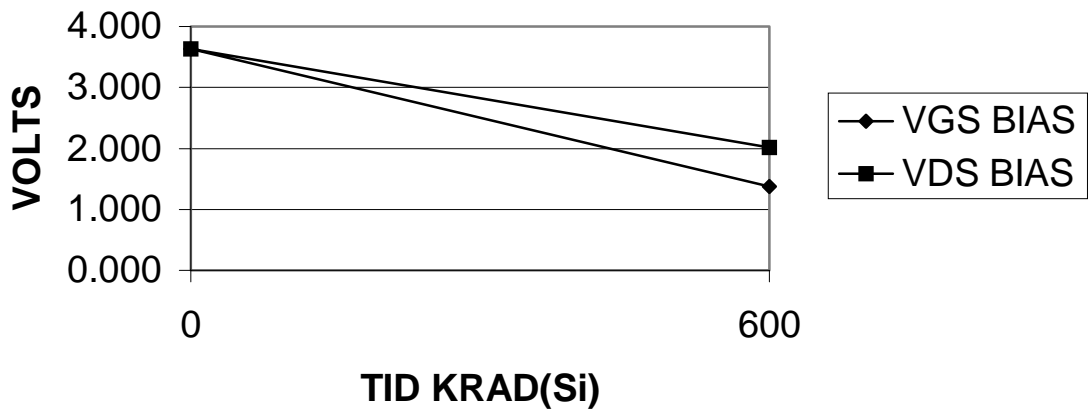


Figure 3 – IRH57260 (200V), 40MeV Proton Response

BVDSS



VGSTH



RDSON @ 35A

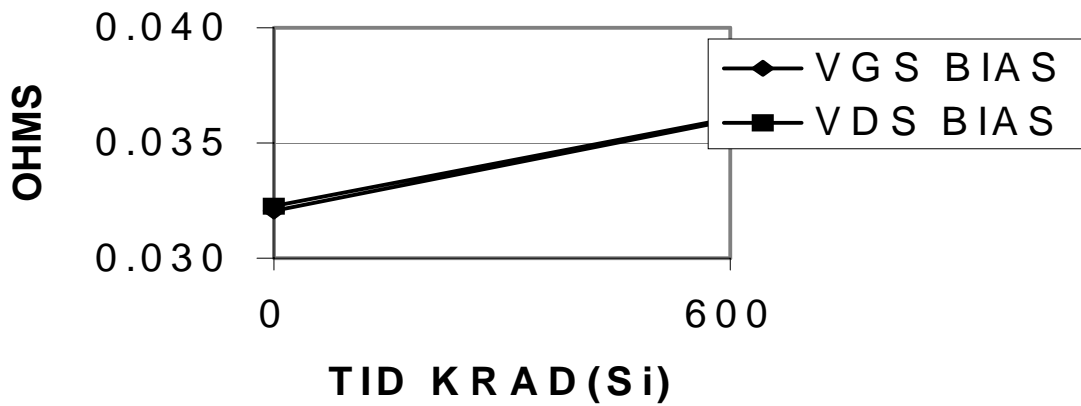
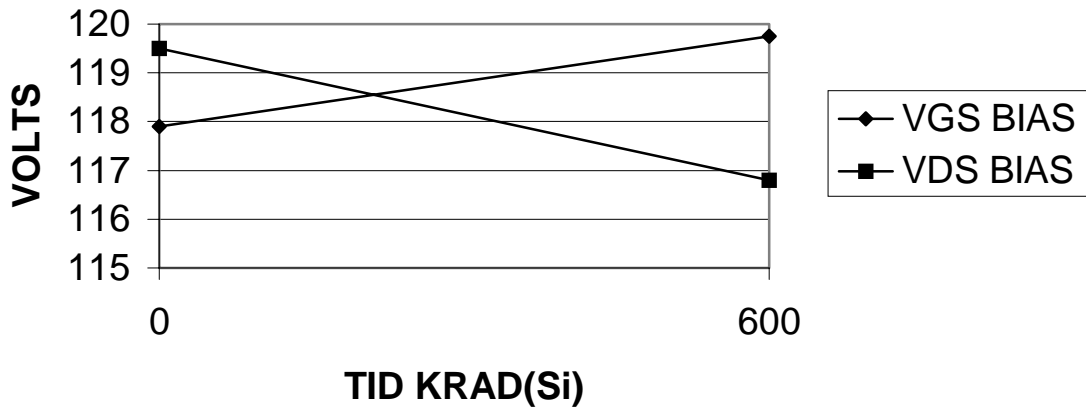
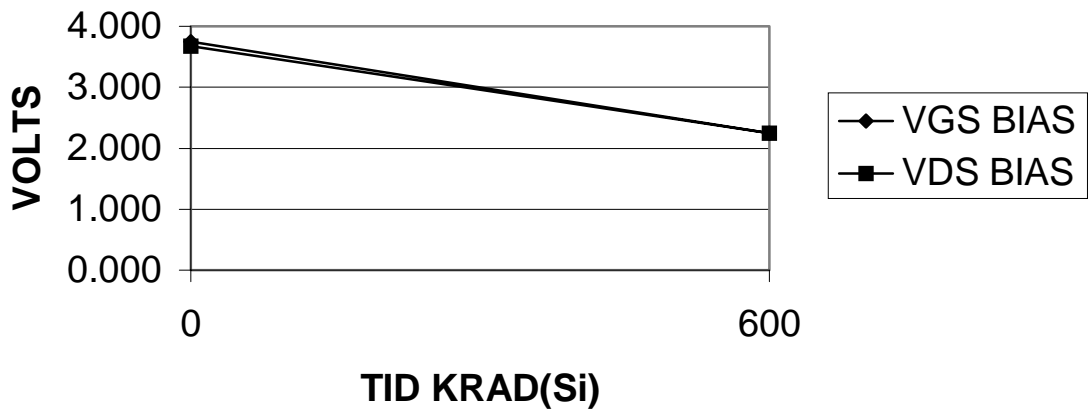


Figure 4 – IRH57260 (200V), 75MeV Proton Response
International rectifier
El Segundo, California

BVDSS



VGSTH



RDSON @ 35A

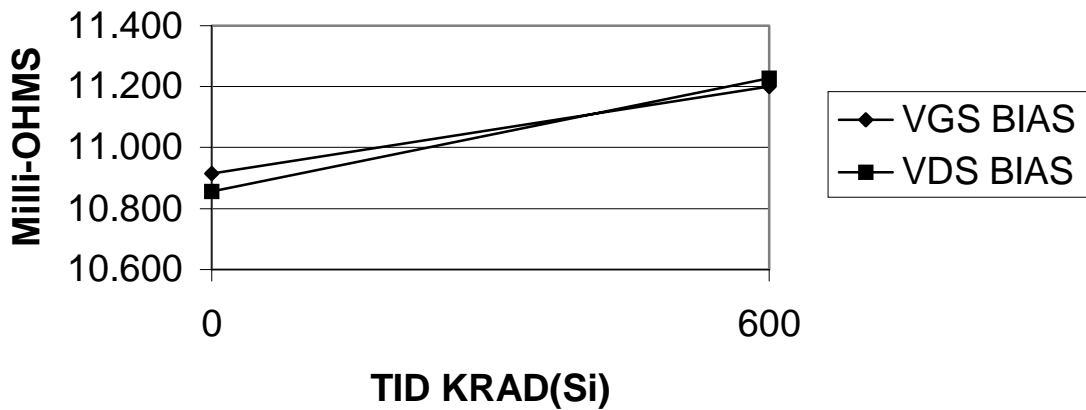


Figure 5 – IRH57160 (100V), 200MeV Proton Response
International rectifier
El Segundo, California

R5 MOSFET Proton Test Report

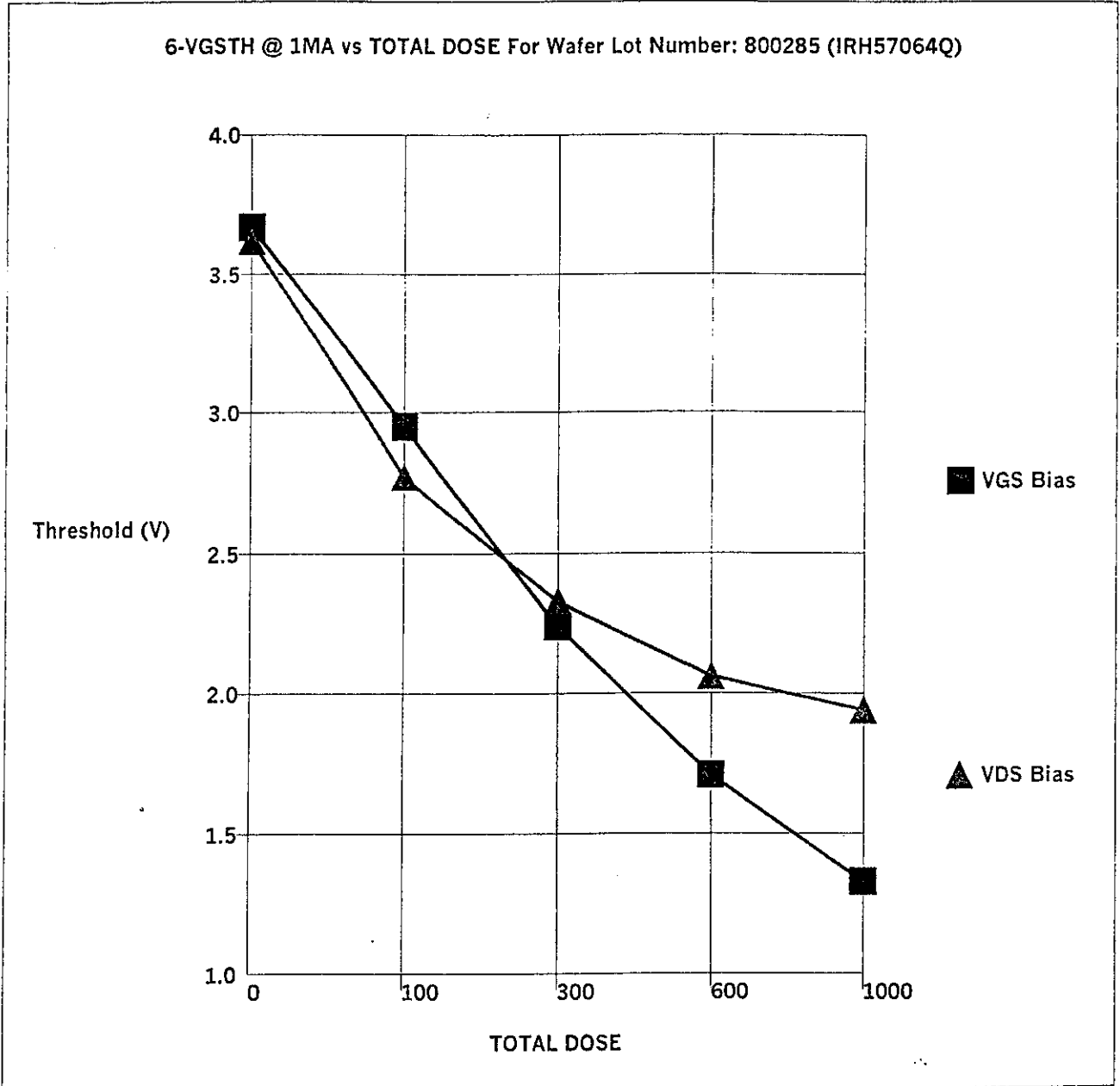


Figure 6 – IRH57064 (60V), Cobalt-60 Response

R5 MOSFET Proton Test Report

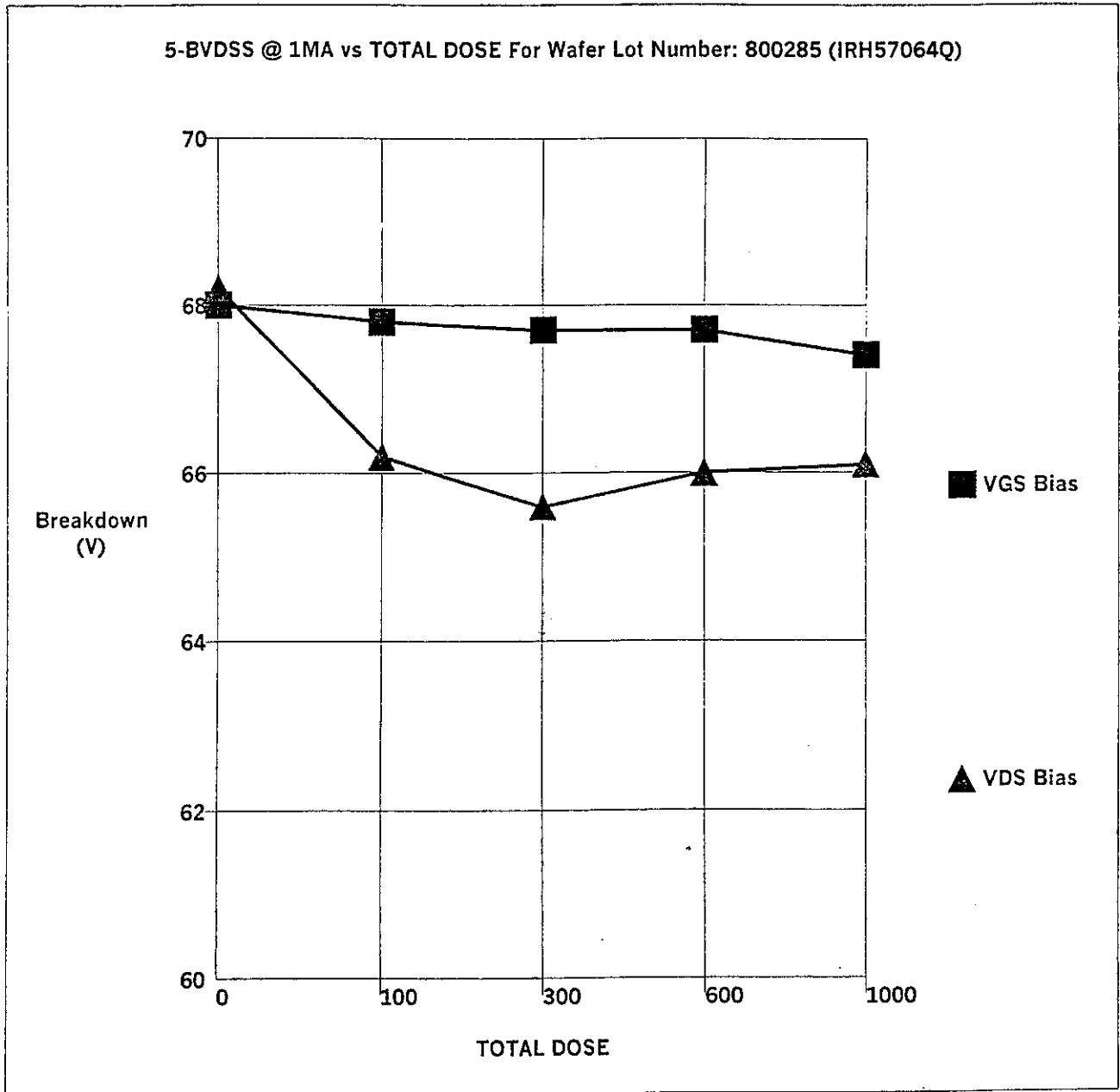


Figure 7 – IRH57064 (60V), Cobalt-60 Response

R5 MOSFET Proton Test Report

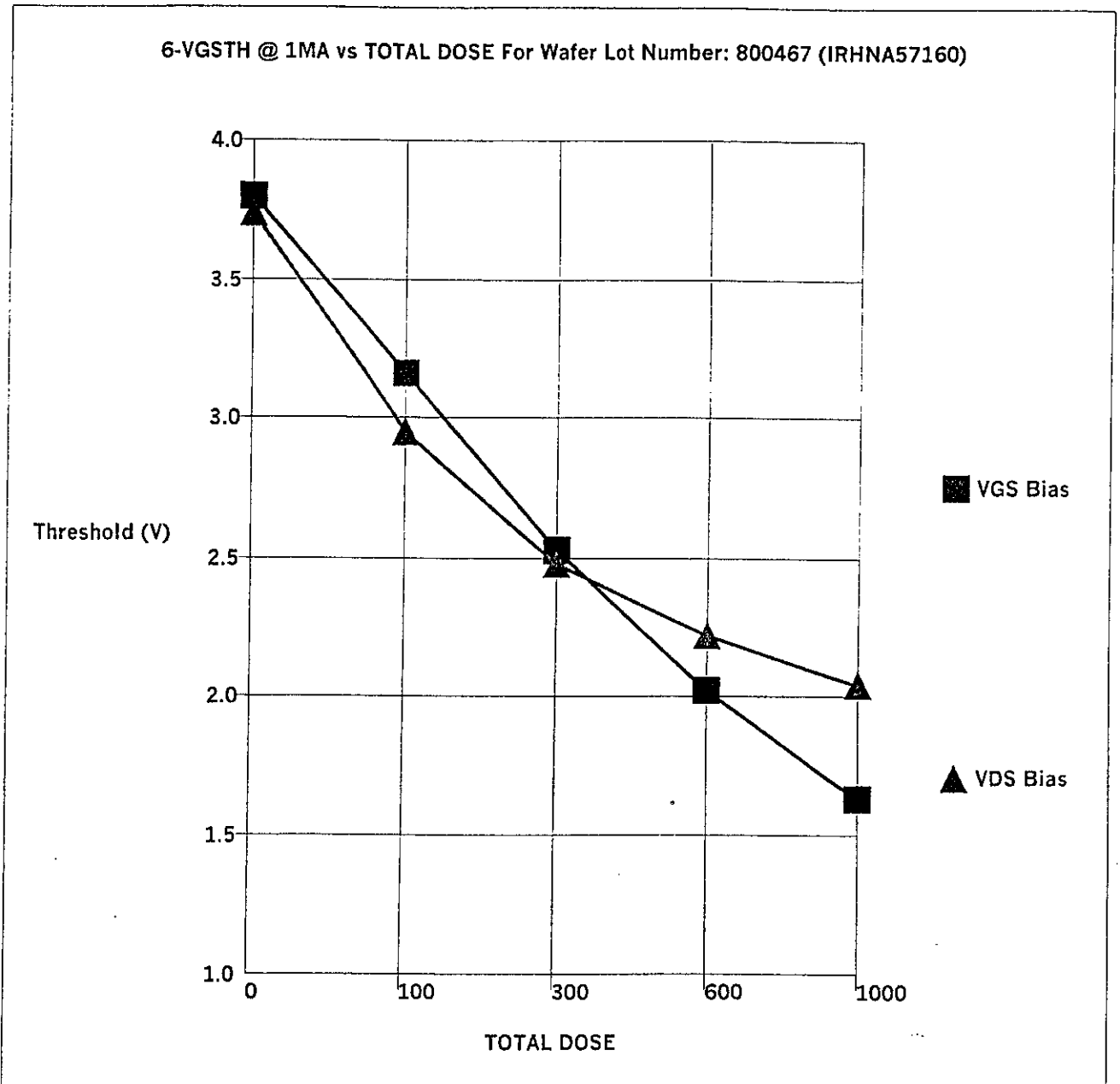


Figure 8 – IRH57160 (100V), Cobalt-60 Response

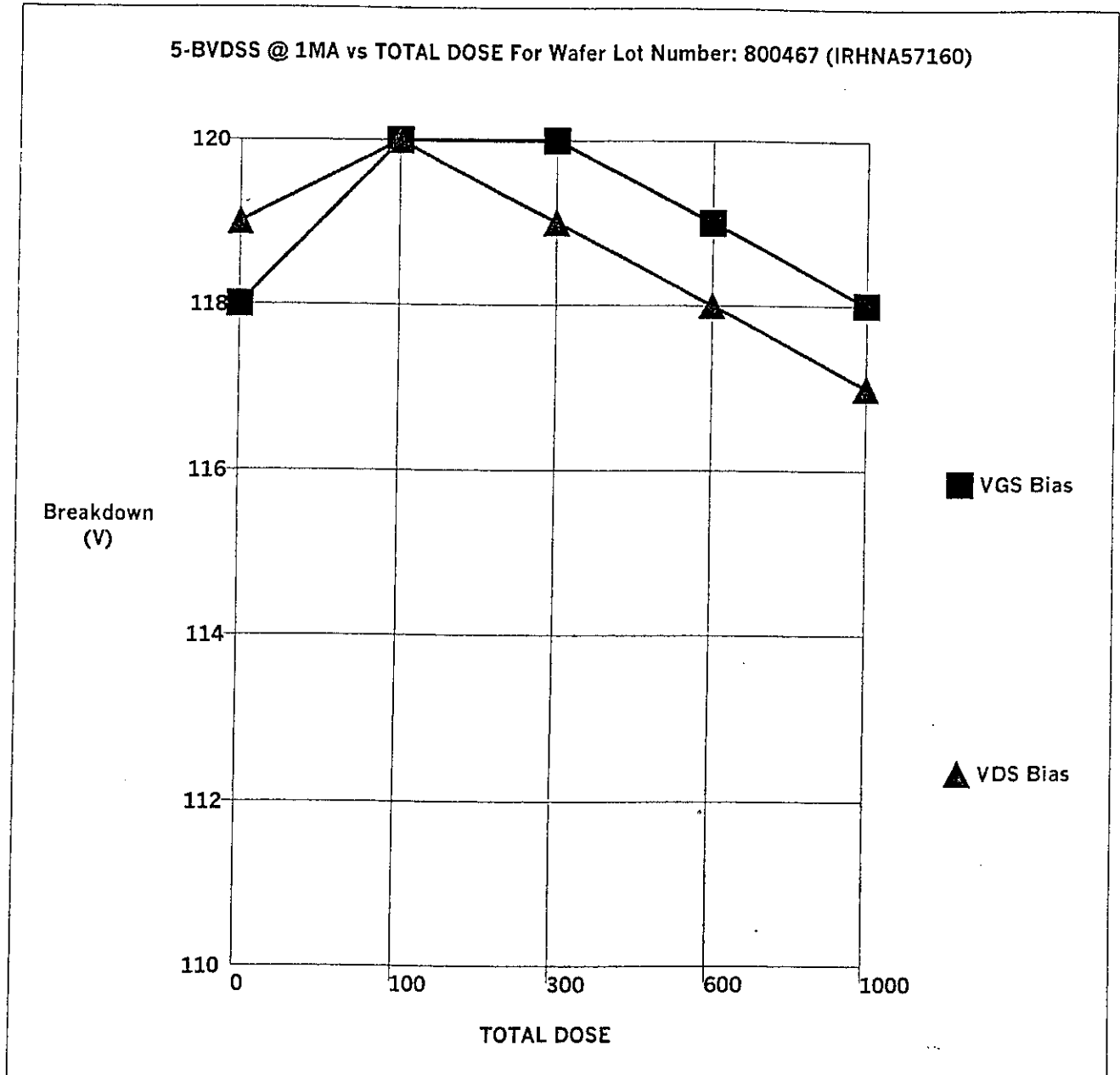


Figure 9 – IRH57160 (100V), Cobalt-60 Response

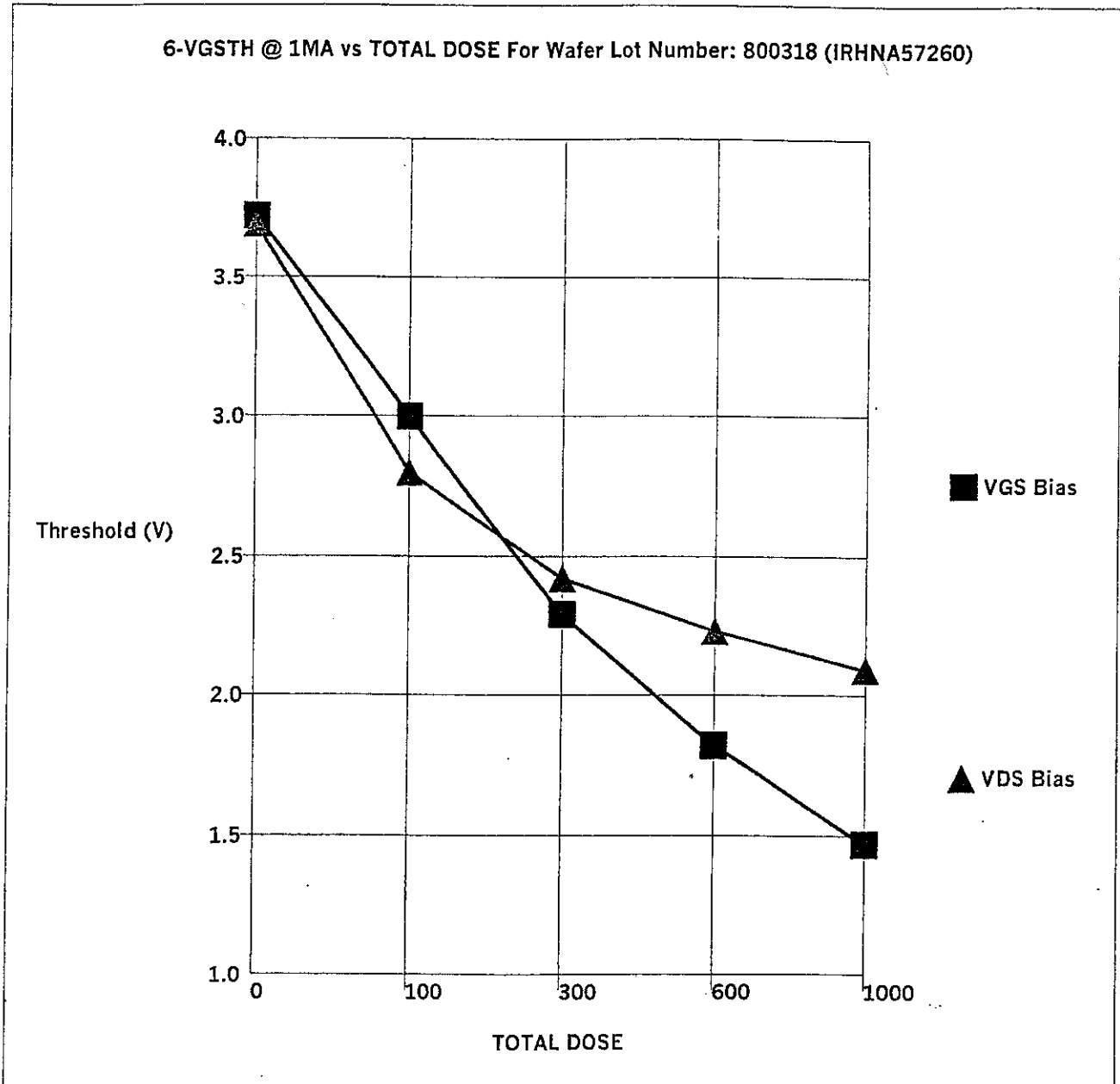


Figure 10 – IRH57260 (200V), Cobalt-60 Response

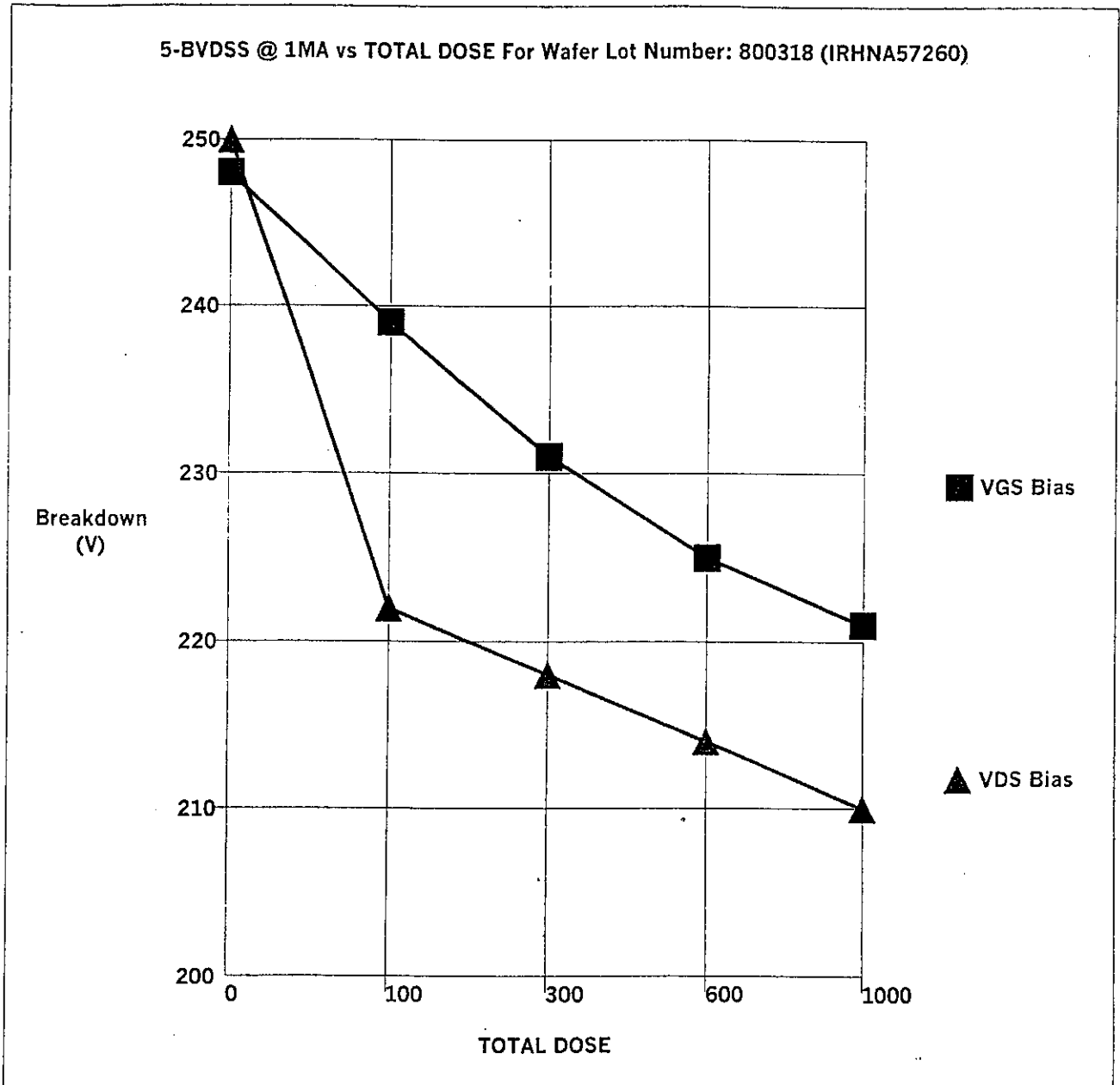


Figure 11 – IRH57260 (200V), Cobalt-60 Response