CYPRESS SEMICONDUCTOR CORPORATION

FRAM Product SER/SEL Customer Reliability Report

1. Introduction

This report summarizes the Neutron Soft Error Rate (SER) and Single Event Latch-up (SEL) test results for Cypress FRAM FM25V20 2Mbit product using TI 130nm FRAM Technology. These failure rates are independent of the part density and are valid for products in the same product family.

2. Summary

The FRAM device passed the soft error (SER) spec limits set in corporate spec 25-00055. SER and SEL events have not been detected during each measurement run so it passes the corporate spec limits. The theoretical low SER FIT rate suggests a fairly small sensitive structure.

3. Data Interpretation

JESD-89 explains the procedure for the measurement and reporting of SER in semiconductor devices. Cypress follows this specification to carry out all the SER/SEL tests on our devices with memories. Since flux rate is different at different locations and also varies with altitude SER FIT rate for device would be different at different locations. To standardize the reporting and facilitate interpretation all Cypress FIT rates are scaled to New York altitude. Neutron SER rate is specified FIT/Mbit, and if applicable, total SEL rate is specified FIT/Dev. A few acronyms are also used in this report and they are listed below:

SER – Soft Error Rate
SBU - Single Bit Upset
MBU – Multiple Bit Upset
MCU – Multiple Cell Upset
SEL = Single Event latch up
SEU = Single Event Upset

4. Test Results

FRAM device FM25V20A-G serial 2Mbit units have been tested at TRIUMF, Vancouver, B.C., Canada Neutron beam facility. The Neutron soft error rate has been measured based on the TI 130nm FRAM technology.

No SEU event or SEL event have been detected during testing of the FRAM devices and the SER FIT rate presented below is a theoretical failure rate assuming the very next particle will cause an event. The theoretical FIT rate strictly depends on the time of exposed and decreases with further particle exposure and no failure events. The overall SER FIT averaged over all runs can be calculated to <0.3 FIT/Mb for the FM25V20A-G and FM28V202A FRAM devices. The 2Mbit FRAM devices are immune to soft errors from terrestrial neutrons.

Neutron Soft Error Test Results:

MODE	VT - Condition	Neutron Fluence [1/cm2]	SBU FIT Rate [FIT/Mb]	MBU FIT Rate [FIT/Mb]	SEL FIT Rate [FIT/Dev]	Theoretical SER FIT Rate [FIT/Mb]
Active Mode FM25V20A-G U3	25-125C, 2.0-3.6V, CHKBD	8.24E9	0.0	0.0	No event	<0.73
Active Mode FM25V20A-G U7	125C, 3.6V, CHKBD	4.08E9	0.0	0.0	No event	<1.47
Active Mode FM25V20A-G U8	25-125C, 2.0-3.6V, CHKBD	8.45E9	0.0	0.0	No event	<0.71

5. Coverage

Devices covered in this SER/SEL report are listed in table below.

All FRAM Device Family **TI 130nm FRAM Technology**

Document History Page

Document Title: FRAM Product SER/SEL Customer Reliability Report
Document Number: 001-99184

Rev.	ECN No.	Orig. of Change	Description of Change
**	4851249	ZIJ	New Release