Application Report

Neutron Displacement Damage Characterization

ABSTRACT

This appendix contains the detailed test results.

Table of Contents

1 Trademarks....................1
2 Overview....................2
3 Test Procedures....................3
4 Facility....................4
5 Results....................5

1 Trademarks

All trademarks are the property of their respective owners.

2 Overview

The ISOS141-SEP is a high-speed, quad-channel digital isolator. The devices uses single-ended CMOS logic switching technology. The voltage range is from 2.25 V to 5.5 V for both supplies, V_{CC1} and V_{CC2}. ISOS141-SEP does not conform to any specific interface standard and is only intended for isolating single-ended CMOS or TTL digital signal lines. Each isolation channel has a logic input and output buffer separated by a double capacitive silicon dioxide (SiO_2) insulation barrier. This device comes with enable pins which sets the default output to low if the input power or signal is lost. General device information and testing conditions are listed in Table 2-1.

Table 2-1. Overview Information

TI Part Number	ISOS141-SEP
VID Number	V62/21610
Device Function	Radiation Tolerant High-Speed Quad-Channel Digital Isolator
Technology	LBC8LVISO
A/T Lot Number / Date Code	0852193/OBAT7YT
Unbiased Quantity Tested	12
Exposure Facility	VPT Rad
Neutron Fluence (1-MeV Equivalent)	1.0×10^{12}, 5.0×10^{12}, 1.0×10^{13} n/cm^2
Irradiation Temperature	25°C
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3 Test Procedures

The ISOS141-SEP was electrically pre-tested using the production automated test equipment program. General test procedures were IAW MIL-STD-883, Method 1017 for Neutron Irradiation of ISOS141-SEP as modified in Table 3-1.

Table 3-1. Neutron Irradiation Conditions

Group	Sample Qty	Neutron Fluence (n/cm^2)	Bias
A	3	0	Unbiased
B	3	1.0×10^{12}	Unbiased
C	3	5.0×10^{12}	Unbiased
D	3	1.0×10^{13}	Unbiased

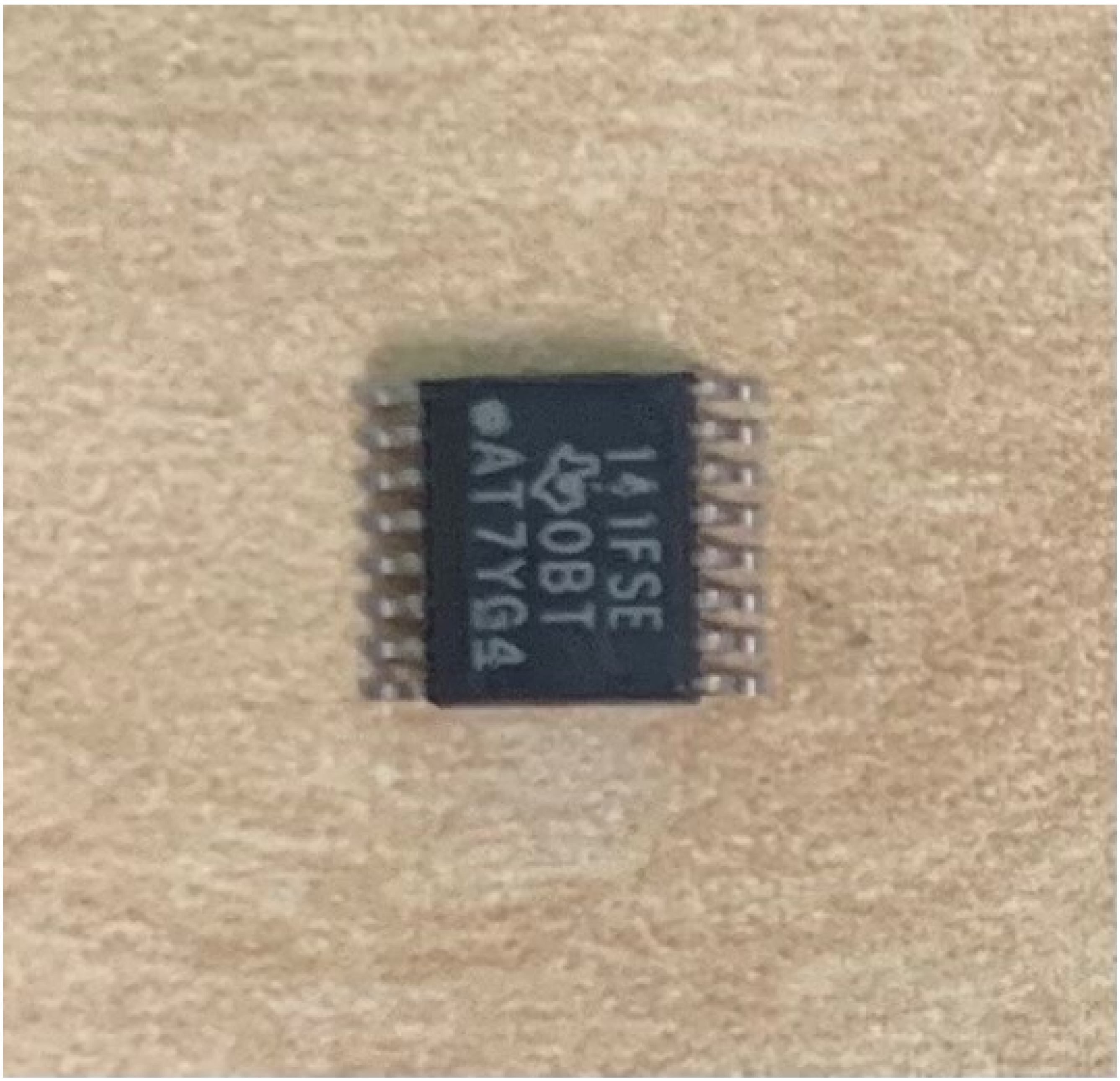

Figure 3-1. ISOS141-SEP Device

4 Facility

The University of Massachusetts's Fast Neutron Irradiation (FNI) facility is an experimental facility replaces three beam ports that originally existed on the left side of the research reactor. It is designed to give a fast flux level ≥ 1011 n/cm^2–s, with relatively low thermal fluence and gamma dose rates. Samples with a cross-sectional area as large as 30 cm (12 in) × 30 cm (12 in) and up to 15 cm (6 in) thick can be irradiated. The fast neutron flux is designed to be nearly uniform over the 30 cm (12 in) × 30 cm (12 in) area facing the core, and the fast fluence variation through the sample thickness is minimized via a single 180° rotation of the sample canister at the midpoint of the irradiation period. The FNI facility offers a significantly larger sample volume than previously available within the University of Massachusetts Lowell Research Reactor (UMLRR). The fluences are calculated based on 1-MeV equivalences.

Detailed information of the radiation facility is available at the following link: www.uml.edu/docs/FNI%20Brochure_tcm18-90375.pdf

5 Results

There were no functional failures at any irradiation level. All parametric measurements remained well within data sheet (SLLSFN1) limits and within the production test limits, which are guard-banded from the data sheet limits for all exposure levels. The following list is an overview of the largest drifts seen post-test and on critical parameters. The full parameter list and graphs are found in Appendix Test Results.

The largest shifts seen for various parameters are shown in the following list:

1. 160.1_icc1_2.75_2.75_na_FS-Dis_0_41. Pre readings are approximately 0.968 mA, Post readings are approximately 0.923 mA.

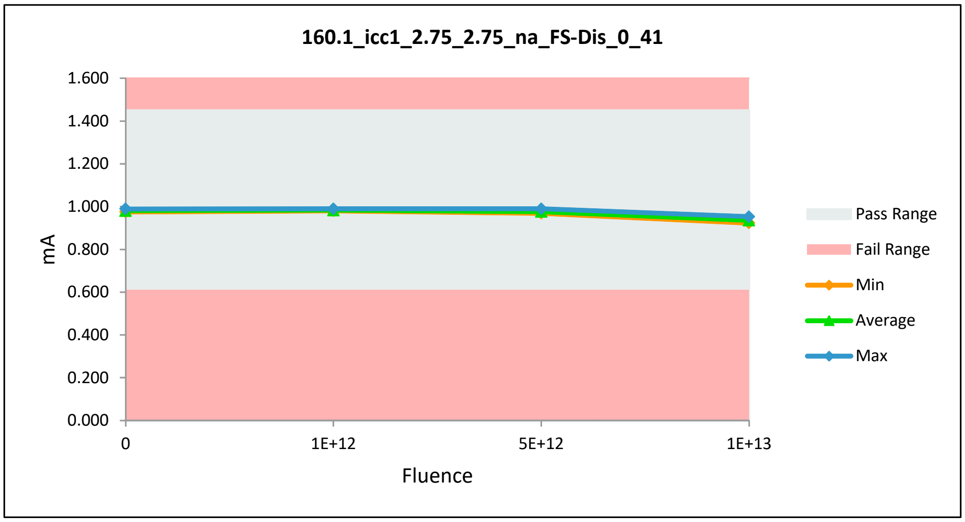

Figure 5-1. Supply Current Disable I_{CC1} NDD Graph

2. 970.1_tpwd_2.25_2.25_ch1_na_25. Pre readings are approximately -.0228 ns, Post readings are approximately -0.284 ns.

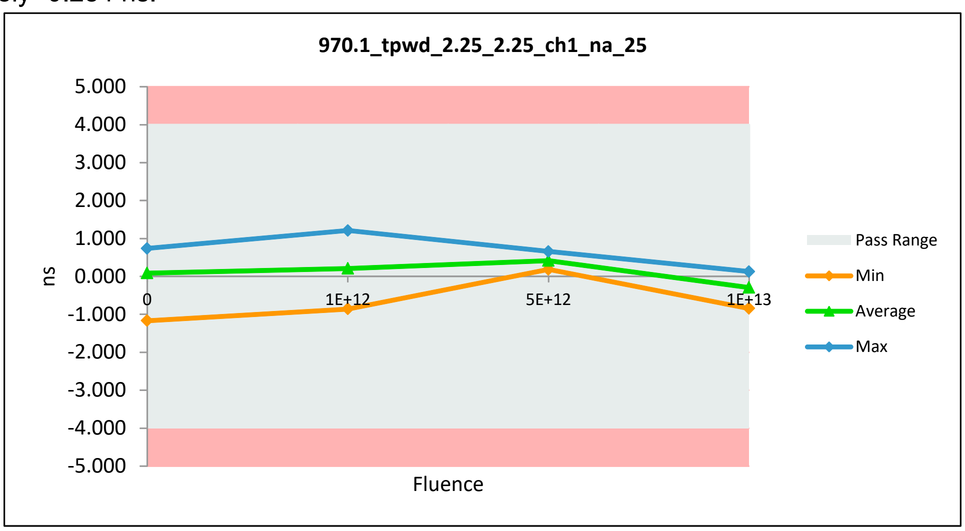

Figure 5-2. Pulse Width Distortion NDD Graph