Radiation Report

LMP2012QML-SP Neutron Displacement Damage Characterization

ABSTRACT

This report presents the effect of neutron displacement damage (NDD) on the LMP2012QML-SP device. The results show that all devices were fully functional and within production test limits after having been irradiated up to 1 × 10^{12} n/cm^2 (1-MeV equivalent). A sample size of fifteen units was exposed to radiation testing per (MIL-STD-883, Method 1017 for Neutron Irradiation) and an additional two unirradiated sample devices was used for correlation. All devices used in the experiment were from lot date code B9B1044A. Electrical testing was performed at Texas Instruments before and after neutron irradiation using the production test program for LMP2012QML-SP.

Table of Contents

List of Figures

List of Tables

Trademarks

1 Overview

The LMP2012QML-SP device is a dual high precision, rail-to-rail output operational amplifier with excellent CMRR and PSRR ratings, and does not exhibit the familiar 1/f voltage and current noise increases that plague traditional amplifiers. The QMLV version of the LMP2012 has been rated to tolerate a total dose level of 50-krad(Si) radiation by Ionizing radiation (Total Dose) test method 1019.4 of MIL-STD-883.

General device information and testing conditions are listed in Table 1-1.

Table 1-1. Overview Information

TI Part Number	LMP2012QML-SP
Device Function	Rail-to-Rail Output Operational Amplifier
Technology	CS080ABI
A/T Lot Number / Date Code	B9B1044A
Unbiased Quantity Tested	15
Exposure Facility	Lowell
Neutron Fluence (1-MeV equivalent)	1.0×10^{11}, 3.2×10^{11}, 1.0×10^{12} n/cm^2
Irradiation Temperature	25°C
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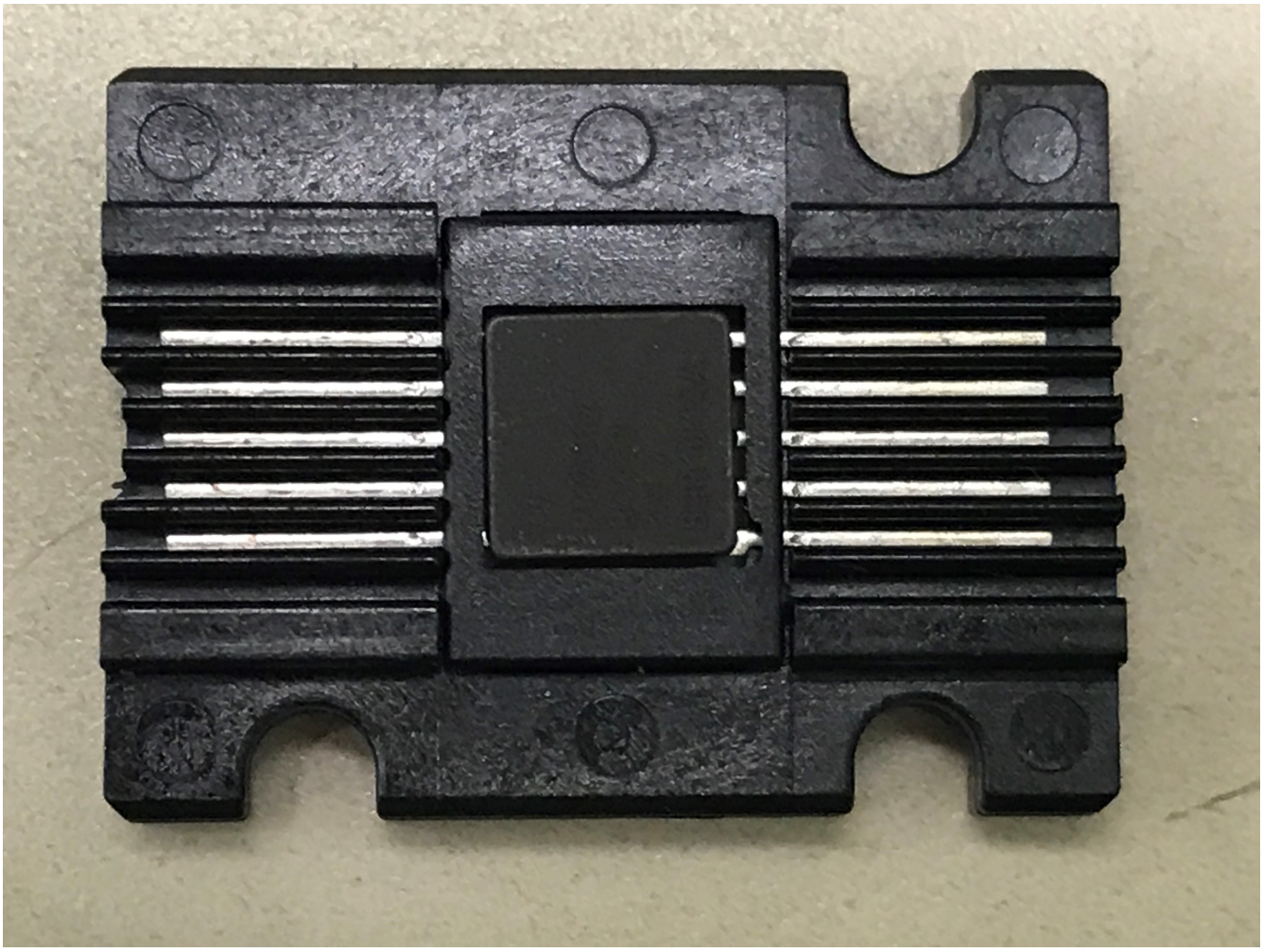

Figure 1-1. LMP2012QML-SP Device

2 Test Procedures

The LMP2012QMLV-SP 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 LMP2012QMLV-SP.

Table 2-1. Neutron Irradiation Conditions

Group	Sample Qty	Neutron Fluence (n/cm^2)	Bias
A	5	1.0×10^{11}	Unbiased
B	5	3.2×10^{11}	Unbiased
C	5	1.0×10^{12}	Unbiased

3 Facility

Devices were exposed via fast neutron irradiation (FNI) at the University of Massachusetts Lowell Research Reactor (UMLRR). The facility 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

4 Results

There were no functional failures at any irradiation level. All parametric measurements remained well within all *LMP2012QML Dual High Precision, Rail-to-Rail Output Operational Amplifier* data sheet limits for all exposure levels. All parametric measurements remained well within the production test limits which are guard-banded from the data sheet limits. The full parameter list and graphs are found in Appendix A.

A Appendix A: Test Results

This appendix contains the detailed test results.

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