

SINGLE EVENT LATCH-UP TEST REPORT ADRF5048-CSL

September 2025



Radiation Test Report	
Product:	ADRF5048-CSL
Effective LET:	$\leq 58.0 \text{ MeV-cm}^2/\text{mg}$
Fluence:	$1\text{E}7 \text{ Ions/cm}^2$
Facilities:	LBNL, TAMU
Tested:	April 2024, May 2025

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SEL Test Report for the ADRF5048-CSL – Non-Reflective SP4T Switch

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Test Dates:

LBNL: April 9th-11th, 2024

TAMU: May 22nd-27th, 2025

I. Introduction

The purpose of this test is to determine the Single-Event Latch-up (SEL) susceptibility of the ADRF5048-CSL, a nonreflective SP4T switch rated for 100MHz to 45GHz operation. Single Event Latchup (SEL) data was verified on April 9th – 11th 2024, at the LBNL heavy ion facility and on May 22nd – 27th 2025, at the TAMU heavy ion facility.

II. Device Under Test (DUT)

The ADRF5048-CSL is a nonreflective SP4T switch operating in the range of 100MHz to 45GHz. The device contains enable and logic select controls to feature all off state and mirror port selection. Four devices were tested.

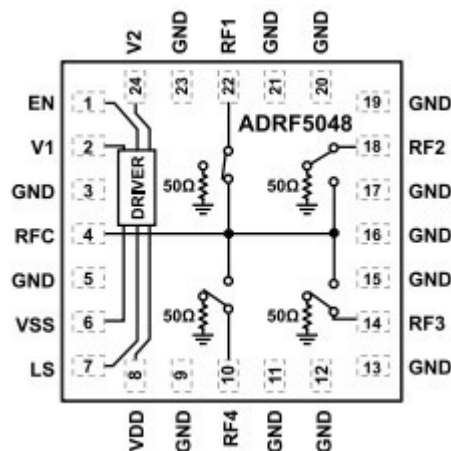


Figure 1. Functional block diagram.

Table 1
Part and test information.

Generic Part Number:	ADRF5048-CSL
Date of Test:	April 9th – 11th, 2024; May 22nd – May 27th, 2025
Manufacturer:	Analog Devices, Inc.
Die Rev:	ADRF5048_CS
Part Function:	Nonreflective SP4T Switch
Part Technology:	CMOS
Package Style:	24-terminal, 3 mm x 3 mm LGA
Interconnect:	Flip Chip
Die Thickness:	Thinned to 50 μ m

III. Test Facilities

The heavy-ion beam testing was carried out at the Lawrence Berkeley National Laboratory 88” Cyclotron Facility (LBNL) and Texas A&M University K500 (TAMU). The test setup was in an open-air environment.

Facility: LBNL, TAMU
Cocktail: 16 MeV/nuc; 24.8 MeV/nuc
Fluence: $1 \times 10^7 \text{ cm}^{-2}$ (per run)
Ions: Shown in Table 2

Table 2.
Heavy-ion species, effective linear energy transfer (LET), and location tested.

Ion	Effective LET (MeV·cm²/mg)	Location
Xe	54.0	LBNL
Ag	58.0	TAMU

IV. Test Method

A. Test Setup

The DUTs were de-processed to expose the die and thinned to 50 μ m. The ADRF5048-CSL was configured, as shown in Figure 2. The LTC5596 was attached to the output of the ADRF5048-CSL to convert to a readable DC voltage on the PXIe-5172 oscilloscope. The supply current was monitored through the PXIe-4163 SMU on the PXIe-1095 Chassis. The supply voltages ($\pm 3.3\text{V}$) were set to max rated (+10%) and the DUT was heated to high temperature (125°C).

Table 3
Test Instrumentation

Name	Configured Values	Equipment
V_{DD}	3.6 V	PXIe-4163
V_{SS}	-3.6 V	PXIe-4163
V_{CTRL}	0	PXIe-4163
V_{EN}	0	PXIe-4163
RFIN	1GHz, 2GHz; -5dBm, -10dBm	HMC-T2240
RFOUT	Measured	LTC5596 + PXIe-5172

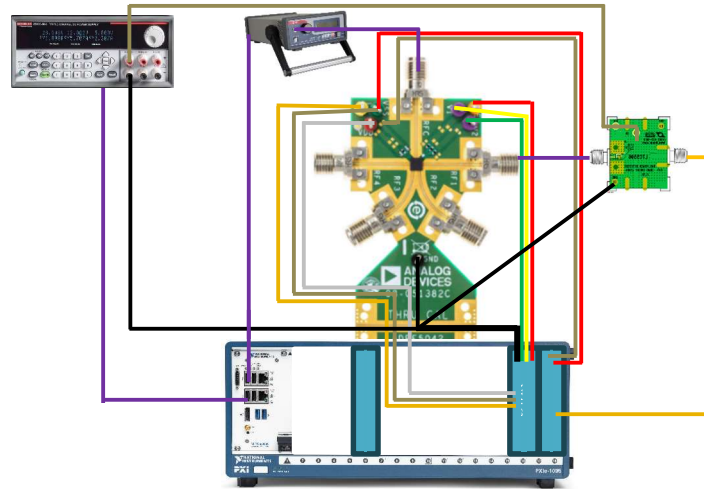


Figure 2. ADRF5048 test setup.

B. Irradiation procedure

1. The device was powered on and brought up to 125°C.
2. The software to monitor the supply voltages and currents was turned on.
3. The ion beam was turned on.
4. Once the 1e+07 fluence was reached, the beam was turned off and the software was terminated.

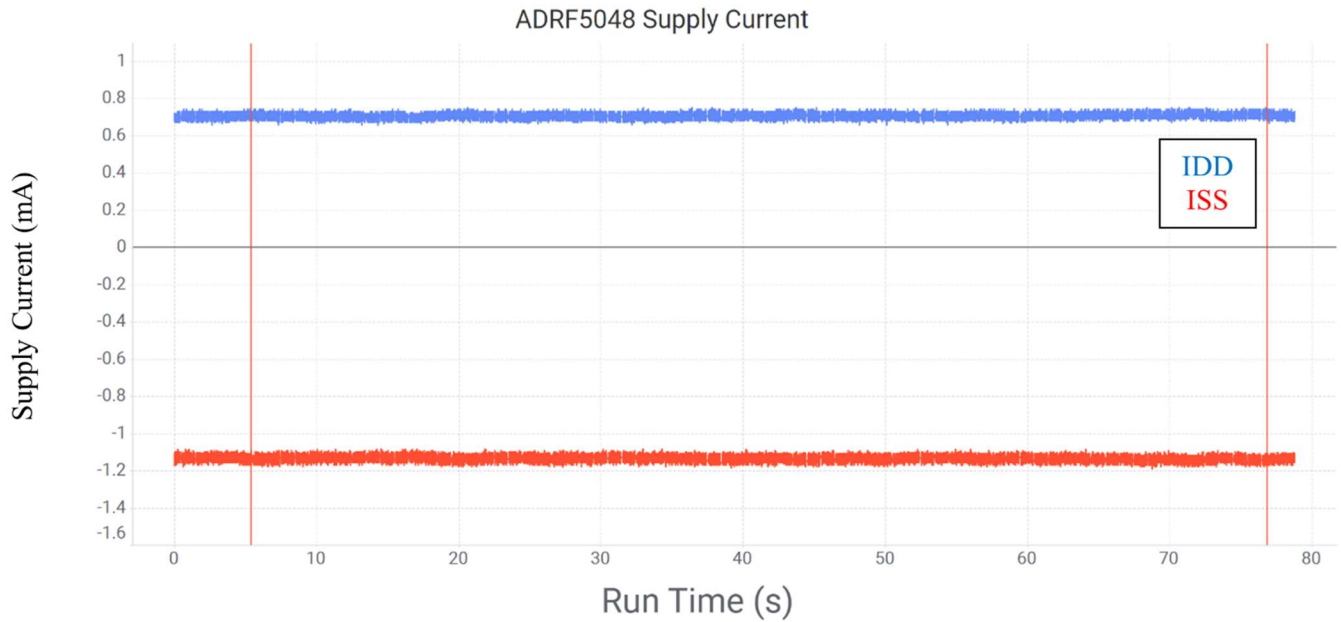
V. Results

SEL – No latch-up or destructive events were observed on the ADRF5048-CSL to the highest effective LET tested at $81.6 \text{ MeV}\cdot\text{cm}^2/\text{mg}$ at LBNL and $58.0 \text{ MeV}\cdot\text{cm}^2/\text{mg}$. Four devices were tested. The SEL plots are shown in the Appendix

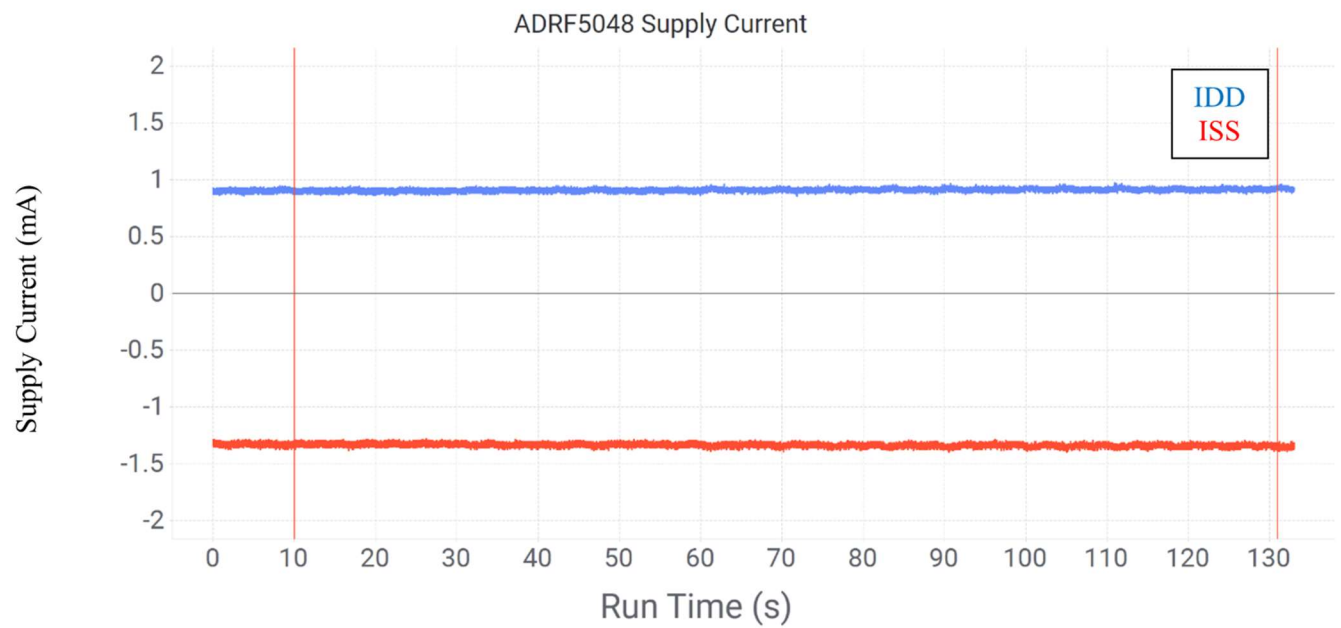
Table 4
SEL Test Runs

Run	Board Serial Number	Ion	Effective LET	Angle	Flux	Fluence
#			<i>MeV·cm²/mg</i>	<i>Degrees</i>	<i>Ions/s</i>	<i>Total Ions</i>
50	1	Xe	81.6	45	1.429E+05	1.000E+07
51	4	Xe	81.6	45	8.696E+04	1.000E+07
186	8	Ag	58.0	0	1.158E+05	1.005E+07
187	15	Ag	58.0	0	1.158E+05	9.954E+06

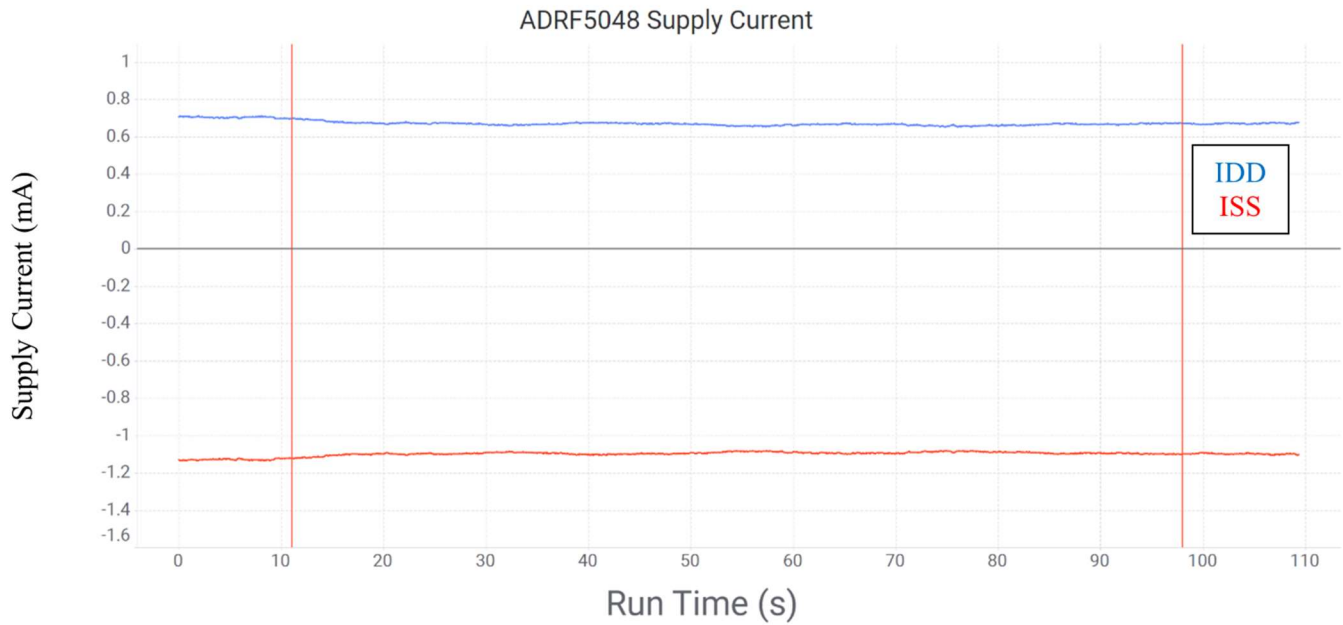
Appendix:



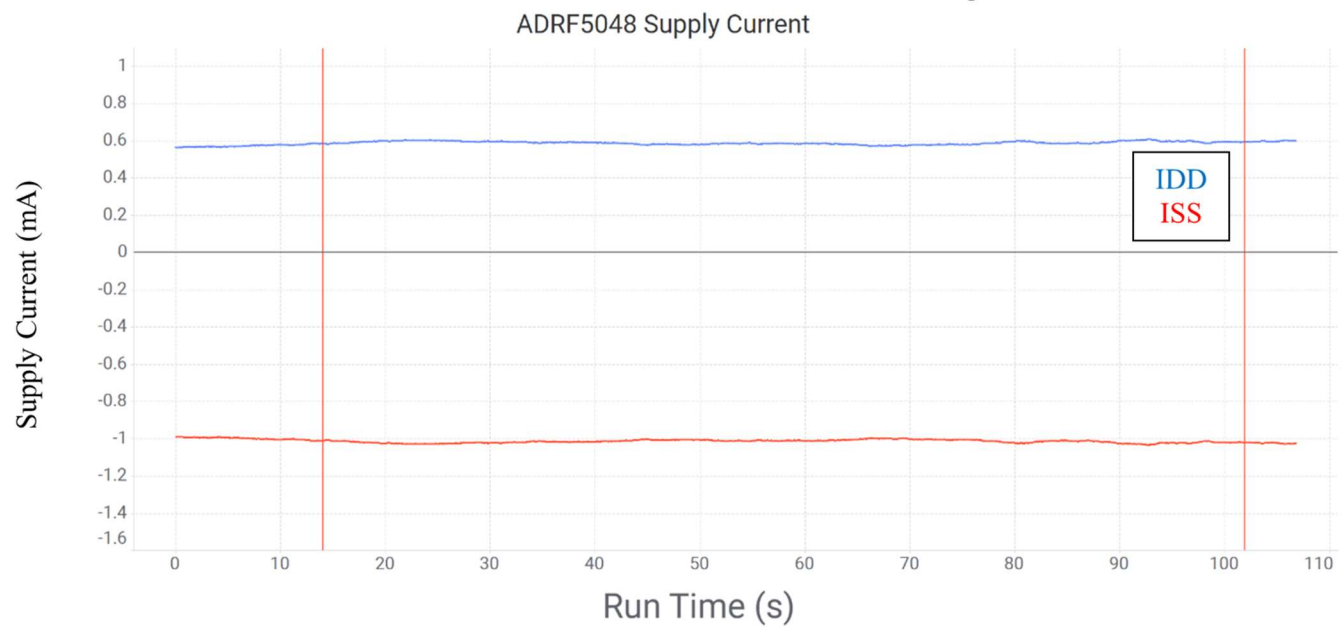
Run 50, Board 1, LET = 81.60 MeV·cm²/mg



Run 51, Board 4, LET = 81.60 MeV·cm²/mg



Run 186, Board 8, LET = 58.0 MeV·cm²/mg



Run 187, Board 15, LET = 58.0 MeV·cm²/mg