SINGLE EVENT LATCH-UP TEST REPORT ADUM141ES

May 2018

Radiation Test Report	
Product:	ADuM141ES
Effective LET:	86 MeV-cm^2/mg
Fluence:	1E7 Ions/cm^2
Die Type:	ADuM141_IC_AS, ADuM141_TC_AS
Facilities:	TAMU
Tested:	May 6, 2018

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Heavy Ion Test Report for the ADuM141ES – a 150 MBPS Quad Channel Digital Isolator

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Test Date: May 6th, 2018

I. Introduction

The purpose of this test is to determine the heavy ion-induced Single-Event Latch-up (SEL) susceptibility of the ADuM141ES, a 150 MBPS Quad Channel Digital Isolator.

II. Device Under Test

The ADuM141ES is a 150 MBPS Quad Channel Digital Isolator designed to provide general purpose, multi-channel isolation. The ADuM141ES operates with separate supply voltages in the range of 1.8V to 5V, providing compatibility with lower voltage systems as well as enabling voltage translation functionality across the isolation barrier. The ADuM141ES is controlled through an SPI port. Figure 1 shows a functional block diagram of the device. Table I shows the basic part and test details. Detailed device parameters and functional descriptions can be found in the datasheet.

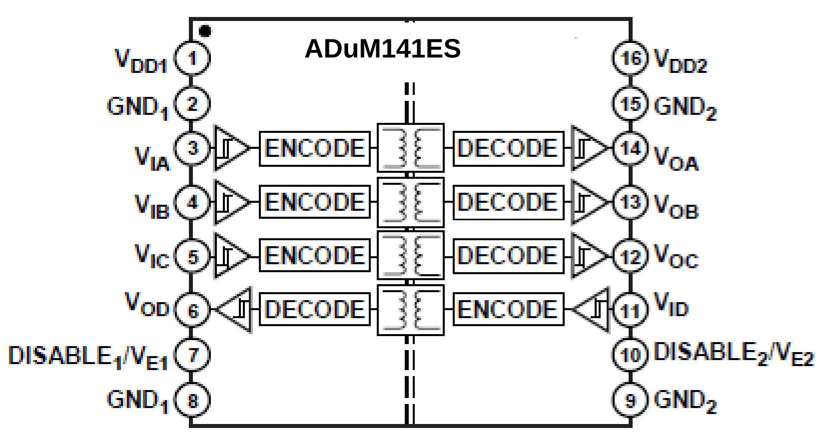


Figure 1. Functional block diagram.

Table I
Part and test information.

Generic Part Number:	ADuM141ES
Date of Test:	May 6, 2018
Manufacturer:	Analog Devices
Part Function:	150 MBPS Quad Channel Digital Isolator
Part Technology:	CMOS w/Air Core Transformer
Package Style:	16 lead – Bottom Brazed Flat Pack
Test Equipment:	Power supply, Hittite T2220, Agilent data acquisition system, heater

III. Test Facility

The heavy-ion beam testing was carried out at the Texas A&M University Cyclotron Facility. The facility utilizes the K500 cyclotron with a superconducting magnet which generates the magnetic field used to accelerate the ions. The test setup was in an air environment.

Facility: Texas A&M University Cyclotron Facility
Cocktail: 15 MeV/nuc
Flux: 1×10^3 to 1×10^5 $cm^{-2} \cdot s^{-1}$
Fluence: up to 1×10^7 cm^{-2} (per run)
Ions: Shown in Table II

Table II.
Heavy-ion specie, linear energy transfer (LET) value and range.

Ion	**Initial LET in air ($MeV \cdot cm^2/mg$)**	**Range in Si (μm)**
Ta	86	119

IV. Test Method

A. Test Setup

The devices under test (DUT) were de-lidded and soldered down to an evaluation board. All 4 channel inputs were driven with a 0-5V square wave. The outputs were connect to a 50 Ω load impedance. The VDD1 and VDD2 supplies were both set to +5.5V and a heating unit was applied to the back of the evaluation board in order to set the case temperature to +125°C. Four devices were tested for SEL susceptibility. One device was tested with VDD1 set to a maximum at +5.5V and VDD2 set to a minimum at 1.7V. The outputs of each channel were verified prior to testing.

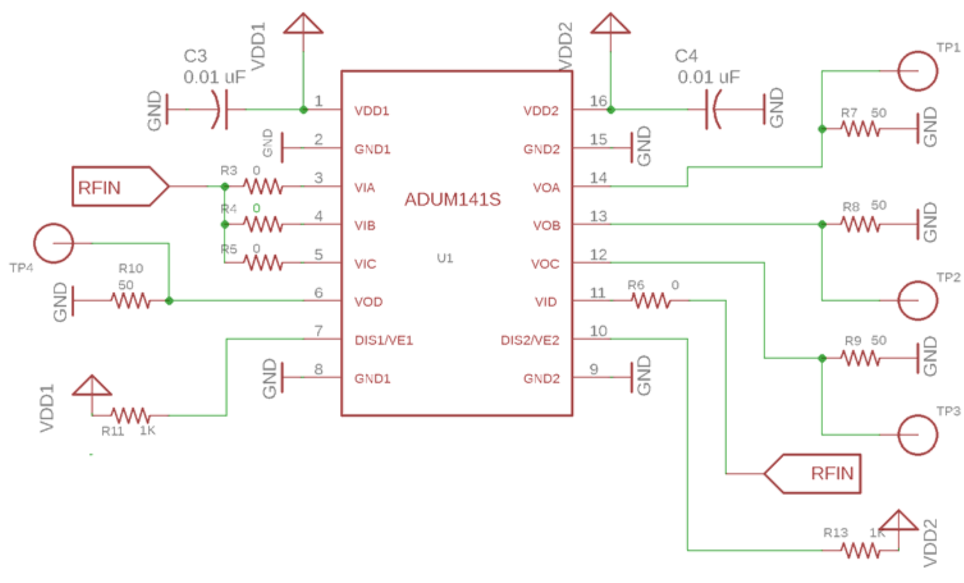


Figure 2. ADuM141ES evaluation board schematic.

B. Irradiation procedure

a. Power Device on and verify supply voltages at DUT.

b. Apply input signal to DUT.

c. Verify output signals and Supply Currents.

d. Set beam to >80MeVcm^2/mg with Average Flux = 1E5 ions/s/cm^2.

e. Monitor Supply Current until fluence = 1E7 ions/cm^2.

f. If SEL detected lower the LET and repeat steps a-e until threshold determined.

g. If no SEL, replace DUT with next DUT and repeat steps a-e.

C. Test Conditions

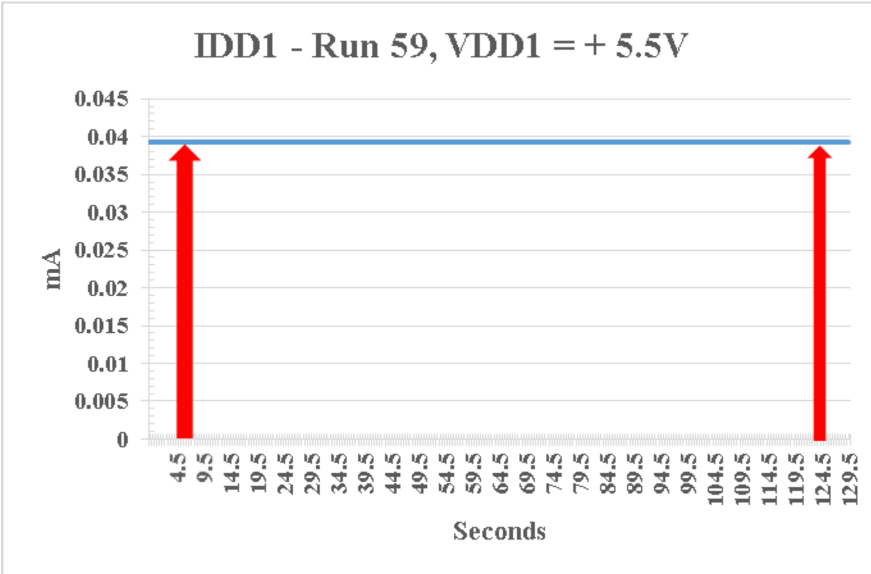
Test Temperature: +125°C
Operating Frequency: 150 MHz
Power Supply(s): 5.5V/5.5V, 5.5V, 1.7V
Angles of Incidence: 0º (normal)
Parameters: Supply Current

V. Results

SEL – No latch-up or destructive SEE events were observed on the ADuM141S to the highest effective LET tested of 86 MeV-cm^2/mg at a DUT temperature of +125°C. Four devices were tested. Power supply current plots are located below. The red arrows designate beam on and beam off. Supply current data was taken 2-3 times per second.

Table III
SEL Test Runs

Run	DUT	Temp (°C)	Supplies (VDD1, VDD2)	Ion	Angle	Effective LET (MeV-cm^2/mg)	Average Flux (ions/(cm^2·s)	Effective Fluence (ions/cm^2)	SEL
59	5	125	+5.5V/+5.5V	Ta	0	86	1.00E+05	9.97E+06	No SEL
61	3	125	+5.5V/+5.5V	Ta	0	86	1.00E+05	1.10E+07	No SEL
62	2	125	+5.5V/+5.5V	Ta	0	86	1.00E+05	1.10E+07	No SEL
63	1	125	+5.5V/+5.5V	Ta	0	86	1.00E+05	1.10E+07	No SEL
64	1	125	+5.5V/+1.7V	Ta	0	86	1.00E+05	1.10E+07	No SEL



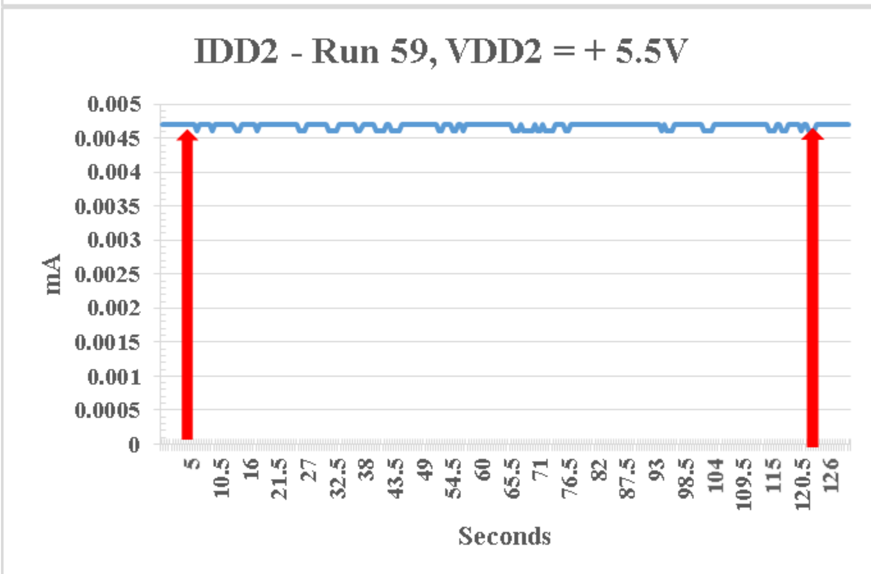


Figure 3: Supply Current measurements for Sample 5, VDD1=VDD2= +5.5V

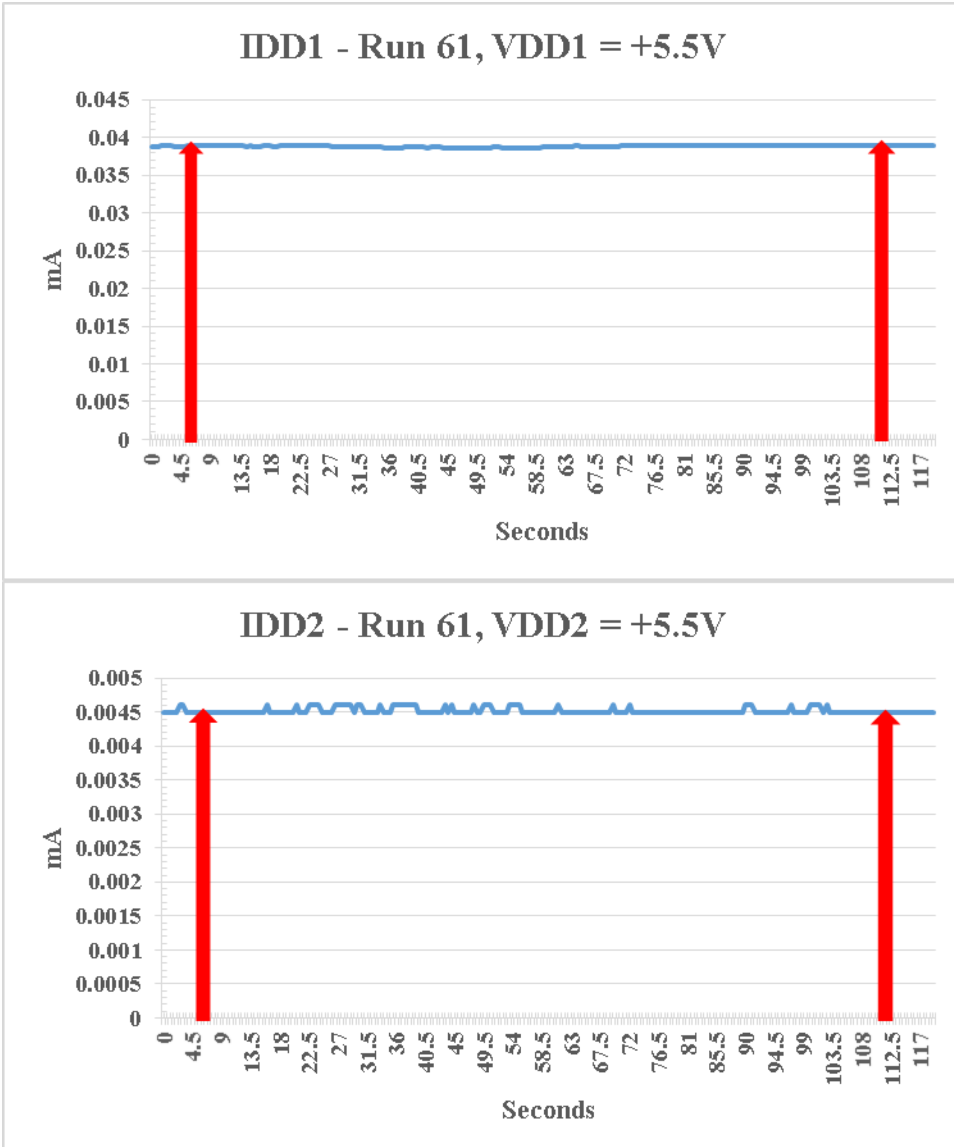


Figure 3: Supply Current measurements for Sample 3, VDD1=VDD2= +5.5V

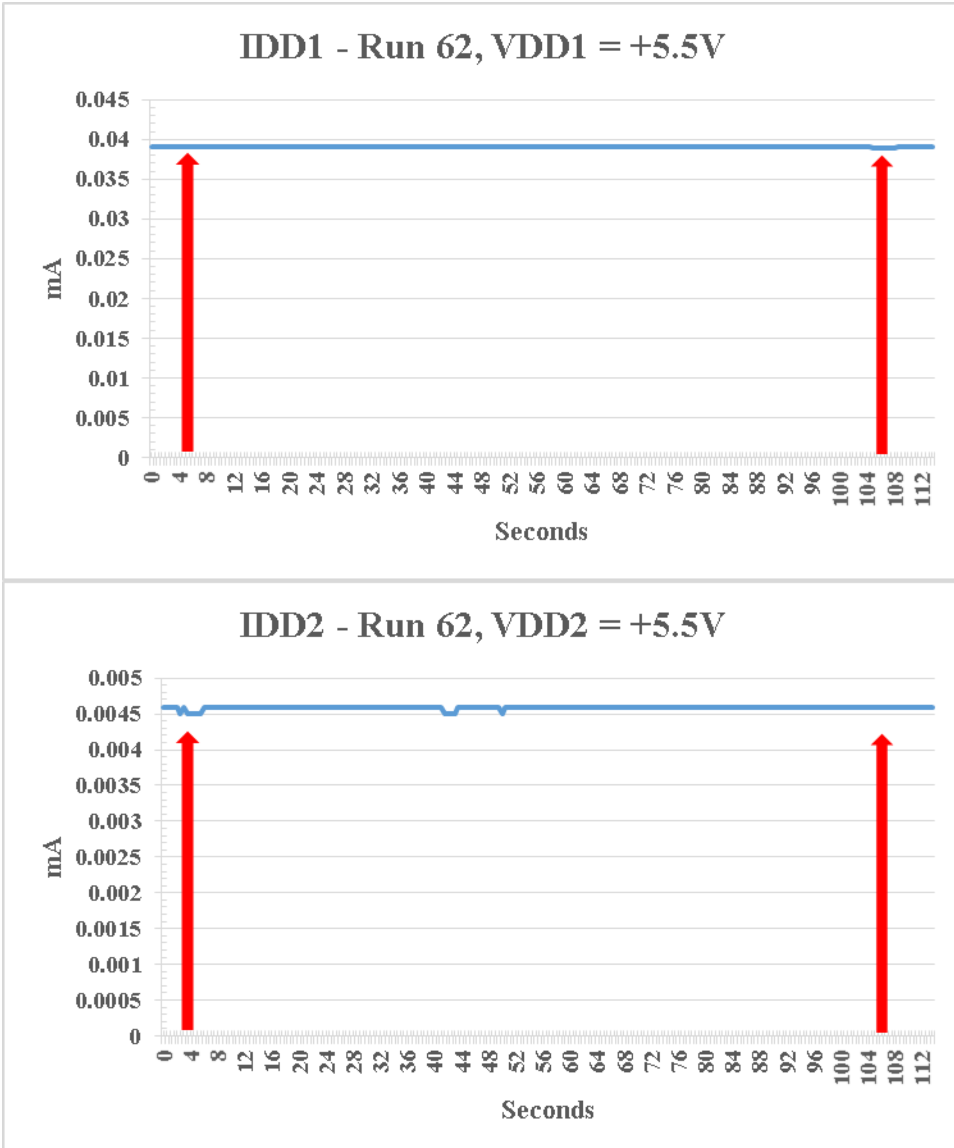


Figure 3: Supply Current measurements for Sample 2, VDD1=VDD2= +5.5V

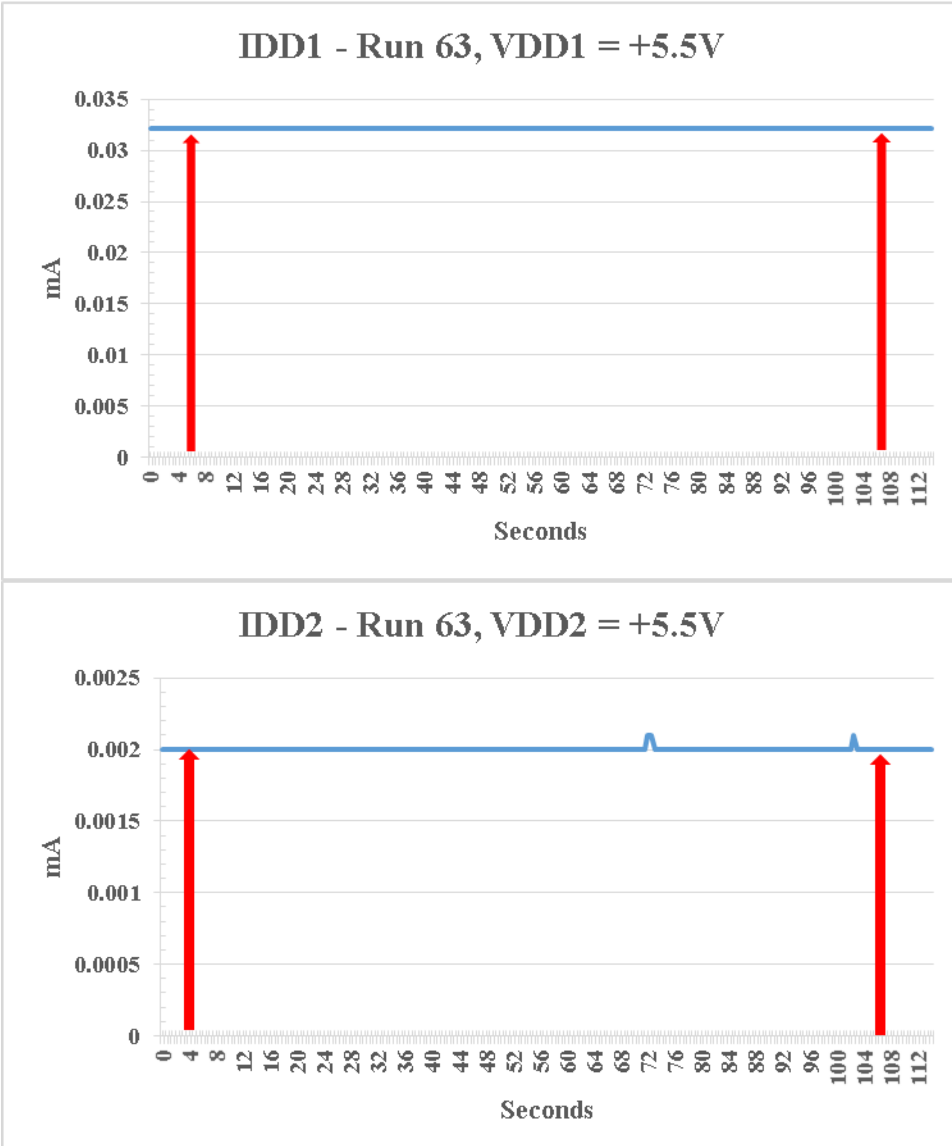


Figure 3: Supply Current measurements for Sample 1, VDD1=VDD2= +5.5V

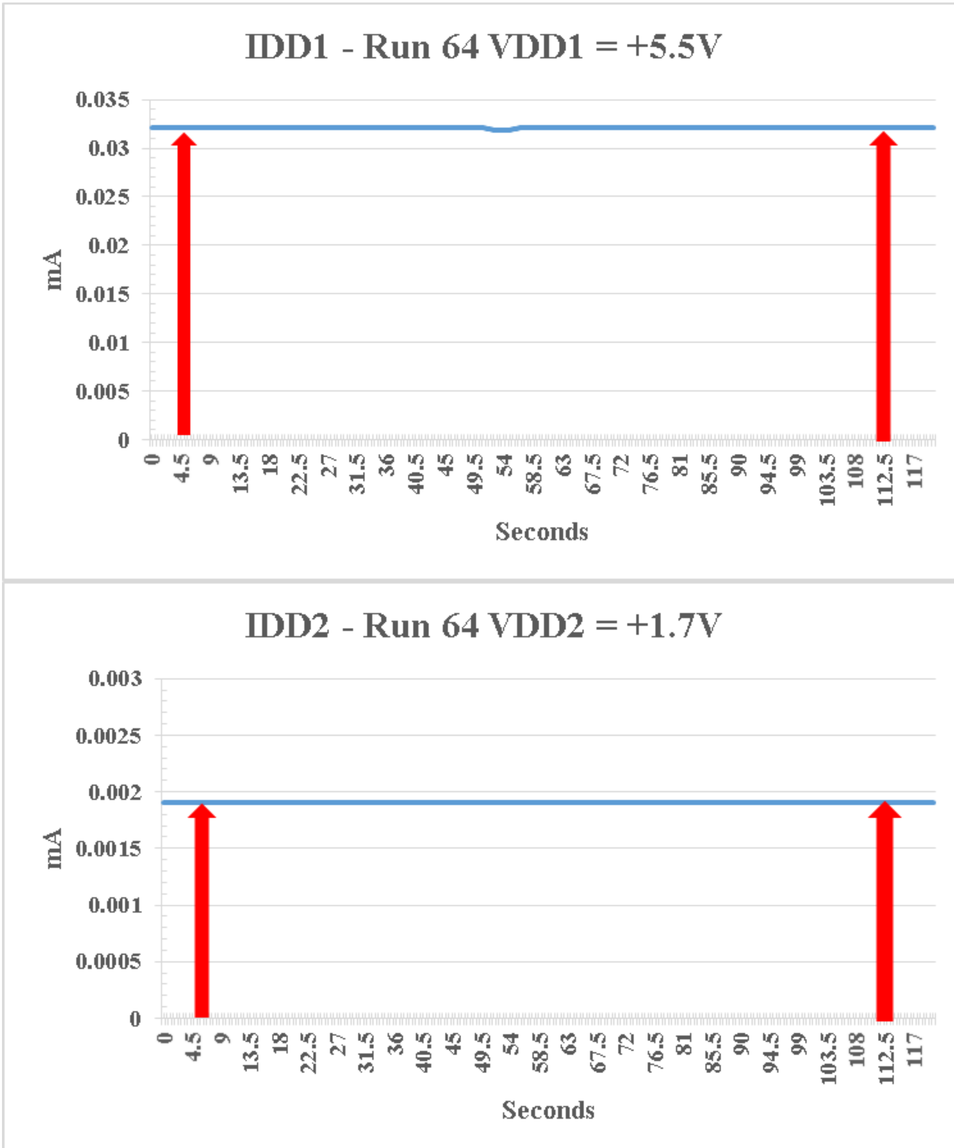


Figure 3: Supply Current measurements for Sample 1, VDD1= +5.5V, VDD2 = +1.7V