

Synopsis V1.0  
Single Event Transient and Destructive Single Event Effects Testing of the  
Linear Technology LTC1149 Step-Down Switching Regulator

Jim Howard<sup>1</sup>, Zoran Kahric<sup>2</sup>, Hak Kim<sup>1</sup>, and Tim Irwin<sup>2</sup>  
1. Jackson and Tull Chartered Engineers, Washington DC 20018  
2. QSS, Inc., Seabrook, MD

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## I. Introduction

This study was undertaken to determine the single event destructive and transient susceptibility of the Linear Technology LTC1149 Step-Down Switching Regulator. The device was monitored for transient interruptions in the output signal and for destructive events induced by exposing it to a heavy ion beam at the Texas A&M University Cyclotron Single Event Effects Test Facility.

## II. Devices Tested

The sample size of the testing was two devices. The devices were manufactured by Linear Technology and were characterized prior to exposure. The devices tested had a Lot Date Code of 0101.

## III. Test Facility

**Facility:** Texas A&M University Cyclotron Single Event Effects Test Facility, 15 MeV/amu tune.

**Flux:**  $1 \times 10^5$  to  $1.2 \times 10^5$  particles/cm<sup>2</sup>/s.

Ion	LET (MeVcm <sup>2</sup> /mg)
Xe	53.1

## IV. Test Methods

The LTC1149 synchronous step-down switching regulator was tested with heavy ions. The basic block diagram showing the test configuration is shown in Figure 1 and the LTC1149 test circuit is shown in Figure 2. Input voltages to the device were 24, 28 and 34 volts and output voltage was set at 10.8 volts yielding operational circuit output current of 1.05 amps.

The input supply current to LTC1149 controller chip was monitored via an ammeter and the output current and voltage of entire test circuit by electronic load and oscilloscope, respectively. Typical supply current to the controller was approximately 9 mA and our latch-up threshold limit was set at 15 mA. Output voltage threshold for test circuit was set a 9.5 volts and it was never exceeded.

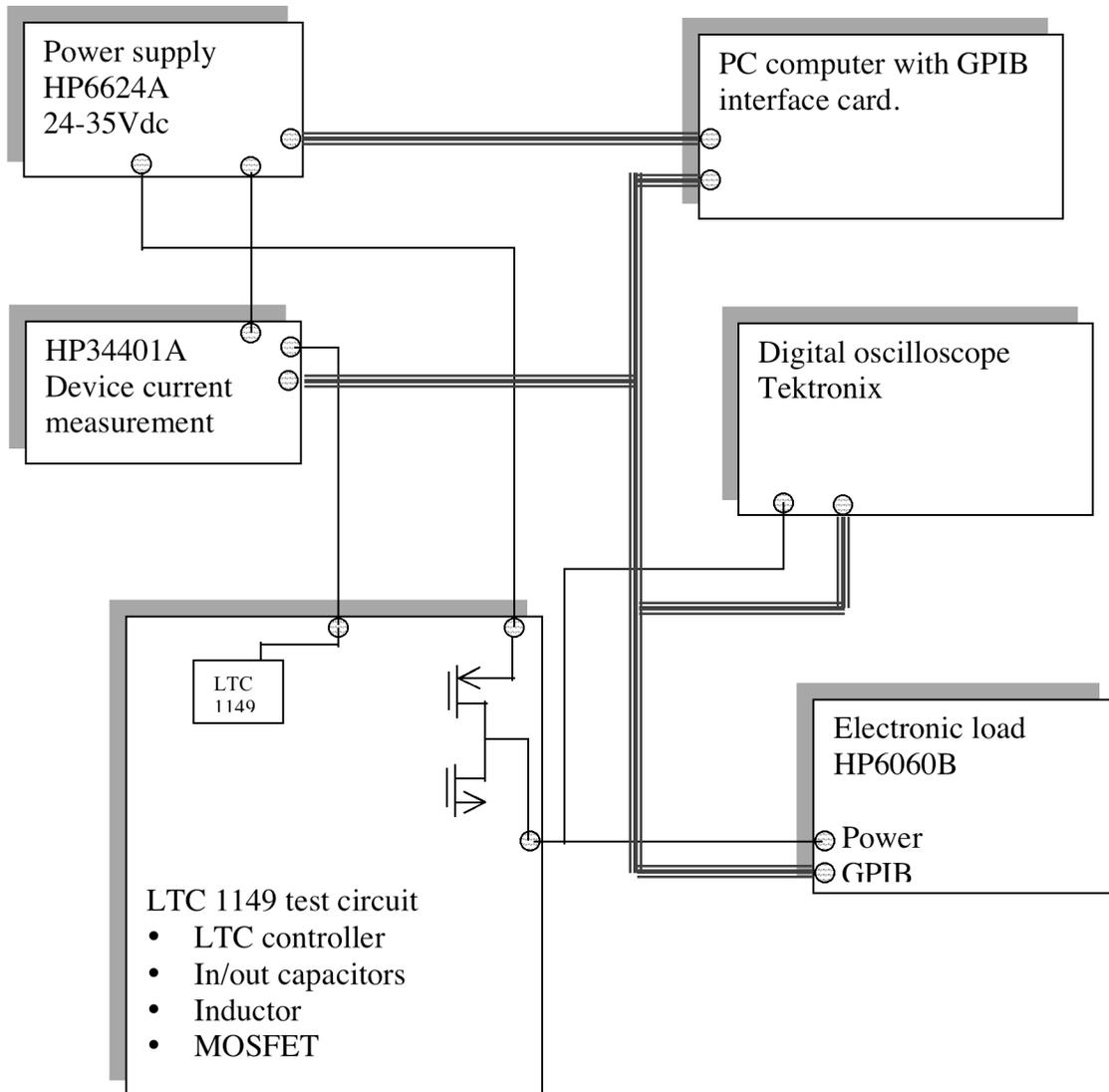
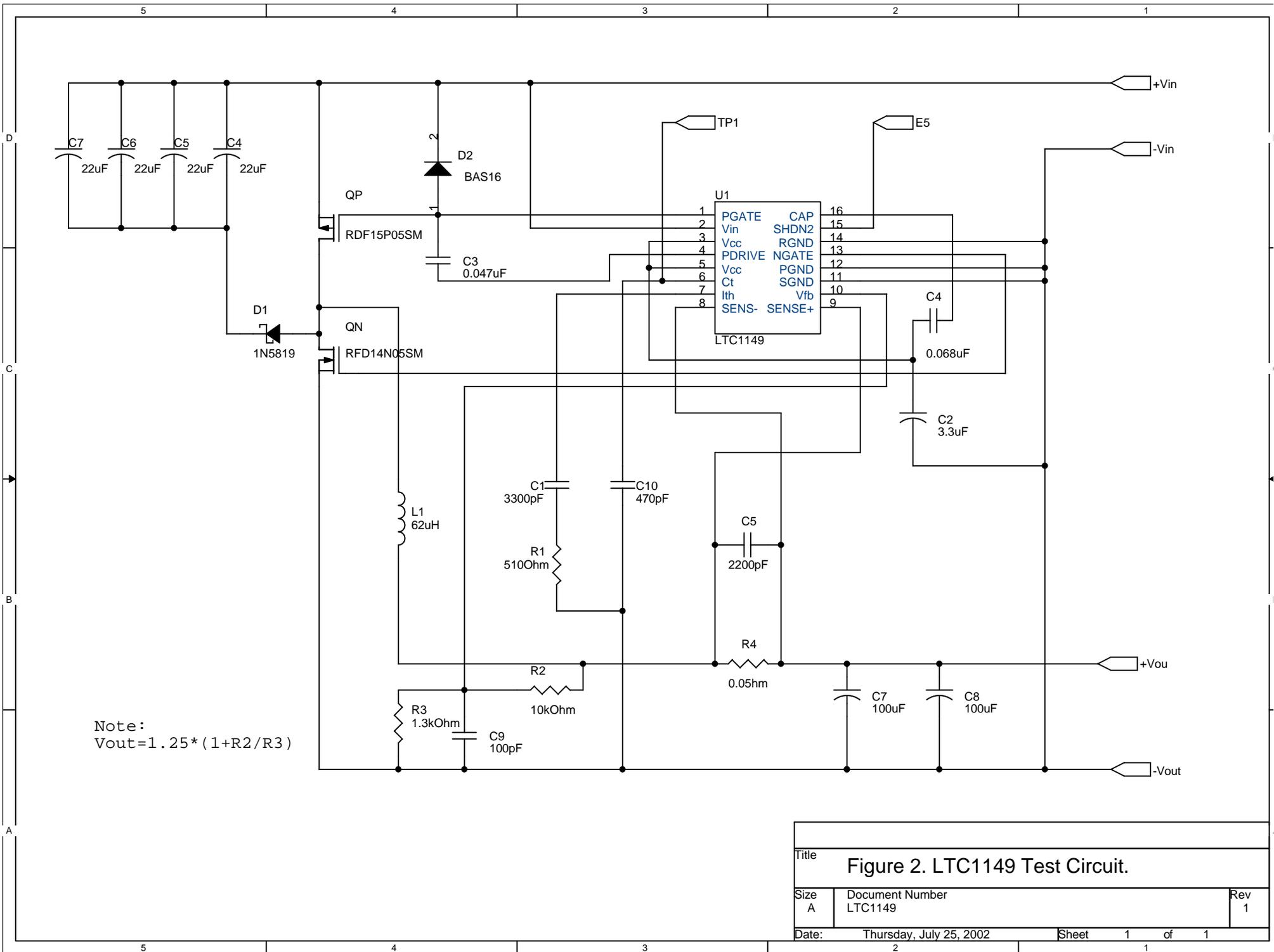


Figure 1. Block diagram for the test configuration for the LTC1149.



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Figure 2. LTC1149 Test Circuit.		
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## **V. Results**

During the testing the LTC1149 was irradiated with the Xe beam at both normal incidence and at 45 degrees (yielding an effective LET of approximately 75 MeV-cm<sup>2</sup>/mg). Testing was done for both parts with input voltages set to 24, 28 and 34 volts. Under all these conditions, no single event latchup or transients were observed. Therefore, the LET threshold for latchup and transients on the LTC1149 is greater than 75 MeV-cm<sup>2</sup>/mg.

## **VI. Recommendations**

In general, devices are categorized based on heavy ion test data into one of the four following categories:

Category 1 – Recommended for usage in all NASA/GSFC spaceflight applications.

Category 2 – Recommended for usage in NASA/GSFC spaceflight applications, but may require mitigation techniques.

Category 3 – Recommended for usage in some NASA/GSFC spaceflight applications, but requires extensive mitigation techniques or hard failure recovery mode.

Category 4 – Not recommended for usage in any NASA/GSFC spaceflight applications.

The Linear Technology LTC1149 Step-Down Switching Regulators are Category 1 devices.