LTC4367

100V Overvoltage, Undervoltage and Reverse Supply Protection Controller

DESCRIPTION

Demonstration circuit 2417A is intended to demonstrate the performance of the LTC4367 100V overvoltage (OV), undervoltage (UV), and reverse supply protection controller.

This controller protects circuits from input voltages that may be too high, too low or negative. It operates by controlling the gates of two back-to-back connected N-channel MOSFETs to keep the output in a safe range. The UV and OV setpoints are configured by the resistive divider on the UV and OV inputs. Asserting the $\overline{SHDN}$ pin disables the MOSFETs and places the LTC4367 in a low current shutdown state. The $\overline{FAULT}$ pin asserts when the controller is in the shutdown mode or when the input voltage is outside of the UV/OV window. The LTC4367 can withstand DC voltages between –40V and 100V and has an operating range of 2.5V to 60V.

The DC2417A includes the LTC4367, two back-to-back connected power MOSFETs, three jumpers and three LEDs to indicate the input and output voltages and the $\overline{FAULT}$ pin signal.

The DC2417A is assembled in two options: DC2417A-A, which is populated with LTC4367, and DC2417A-B, which uses LTC4367-1.

Design files for this circuit board are available at http://www.linear.com/demo/DC2417A

PERFORMANCE SUMMARY Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Voltage Range	Operating Range Protection Range	2.5 –40		60 100	V V
$V_{IN(UVLO)}$	Input Supply Undervoltage Lockout	V_{IN} Rising	1.8	2.2	2.4	V
I_{VIN}	Input Supply Current; On Off	$\overline{SHDN}$ = 2.5V $\overline{SHDN}$ = 0V, V_{IN} = V_{OUT}		30 5	90 20	µA µA
$I_{VIN(R)}$	Reverse Input Supply Current	V_{IN} = –40V, V_{OUT} = 0V		–1.5	–2	mA
ΔV_{GATE}	Gate Drive (GATE – V_{OUT})	V_{IN} = V_{OUT} = 5.0V, I_{GATE} = 0µA, –1µA V_{IN} = V_{OUT} = 12V to 34V, I_{GATE} = –1µA	7.2 10	8.7 11	10.8 12.2	V V
$I_{GATE(UP)}$	Gate Pull-Up Current	GATE = 15V, V_{IN} = V_{OUT} = 12V	–20	–35	–50	µA
$I_{GATE(FAST)}$	Gate Fast Pull-Down Current	GATE = 20V, V_{IN} = V_{OUT} = 12V	30	60	90	mA
$I_{GATE(SLOW)}$	Gate Slow Pull-Down Current	GATE = 20V, V_{IN} = V_{OUT} = 12V	50	90	160	µA
V_{UV}	UV Input Threshold Voltage	UV Falling	492.5	500	507.5	mV
V_{OV}	OV Input Threshold Voltage	OV Rising	492.5	500	507.5	mV
$t_{GATE(FAST)}$	Gate Fast Turn-Off Delay	C_{GATE} = 2.2nF, UV or OV Fault		2	4	µs
$t_{\overline{FAULT}}$	OV, UV Fault Propagation Delay	Overdrive = 50mV, V_{IN} = V_{OUT} = 12V		1	2	µs
$V_{\overline{SHDN}}$	$\overline{SHDN}$ Input Threshold	$\overline{SHDN}$ Falling	0,4	0.75	1.2	V
V_{UV_BOARD}	Board UV Range		5.75	5.97	6.17	V
V_{OV_BOARD}	Board OV Range		14.44	14.95	15.47	V

OPERATING PRINCIPLES

The LTC4367 monitors the input voltage and disconnects downstream circuits when the input voltage is too low, too high or negative. The LTC4367 provides accurate overvoltage and undervoltage comparators to ensure that power is applied to the system only if the input supply is within the allowable voltage window. Reverse supply protection circuits automatically isolate the load from negative input voltages.

During normal operation, a high voltage charge pump enhances the gate of the external N-channel power MOSFETs.

The LTC4367 consumes 5μA during shutdown and 70μA while operating.

QUICK START PROCEDURE

DC2417A is easy to set up to evaluate the performance of the LTC4367. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below.

Reverse Voltage Tests

1 Set JP1 to EN.

2 Set JP2 and JP3 to CONNECT LED.

3 Connect a power supply across VIN and GND in negative configuration (connect positive terminal to GND and negative terminal to VIN).

4 Connect voltmeters at the input and output and an ammeter in series with the supply.

5 Ramp VIN down to –30V (referenced to GND).

6 Verify output voltage is 0V and all LEDs are off.

7 Set JP2 and JP3 to OPEN position and measure the input current. It should be ≤2.4mA.

8 Ramp VIN back to 0V and set JP2 and JP3 to CONNECT LED position.

Undervoltage/Overvoltage Test

9 Correct the polarity of the power supply connection across VIN to GND (connect positive terminal to VIN and negative terminal to GND).

10 Ramp supply up to 60V and verify that the green VIN LED and the red $\overline{\text{FAULT}}$ LED light up, but the green VOUT LED, does not light up.

11 Ramp supply down from 60V to 0V and verify the green VIN LED, red $\overline{\text{FAULT}}$ LED, green VOUT LED, and VOUT voltage according to Table 1 below.

12 Repeat steps 10 and 11 with a 3 A resistive load connected between VOUT and GND.

Table 1

VIN	VOUT	VIN LED	VOUT LED	$\overline{\text{FAULT}}$ LED
0V to 5.97V	0V	Off/Dim/On	Off	On
5.97V to 14.95V	V_{IN}	On	On	Off
14.95V to 60V	0V	On	Off	On

13 Remove load and set supply to 9V.

14 Move jumpers and verify LEDs according to Table 2 below.

Table 2

JP1	JP2/JP3	VIN LED	VOUT LED
EN	CONNECT LED	On	On
DIS	CONNECT LED	On	Off
EN	OPEN	Off	Off

QUICK START PROCEDURE

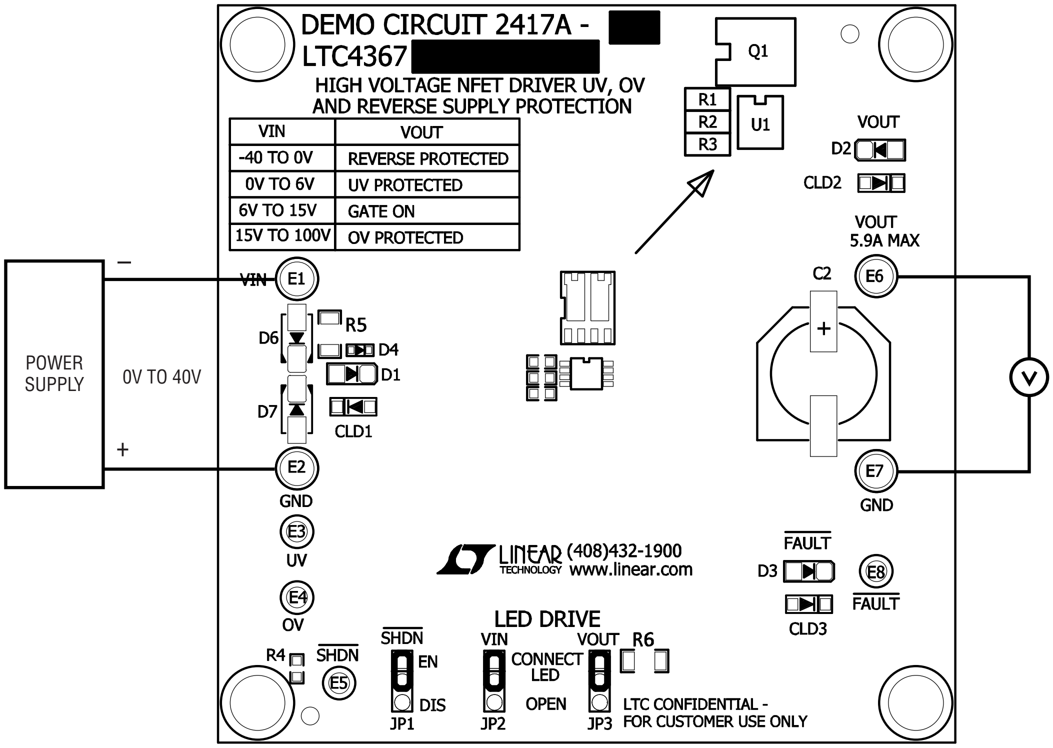


Figure 1a. Reverse Voltage Test

QUICK START PROCEDURE

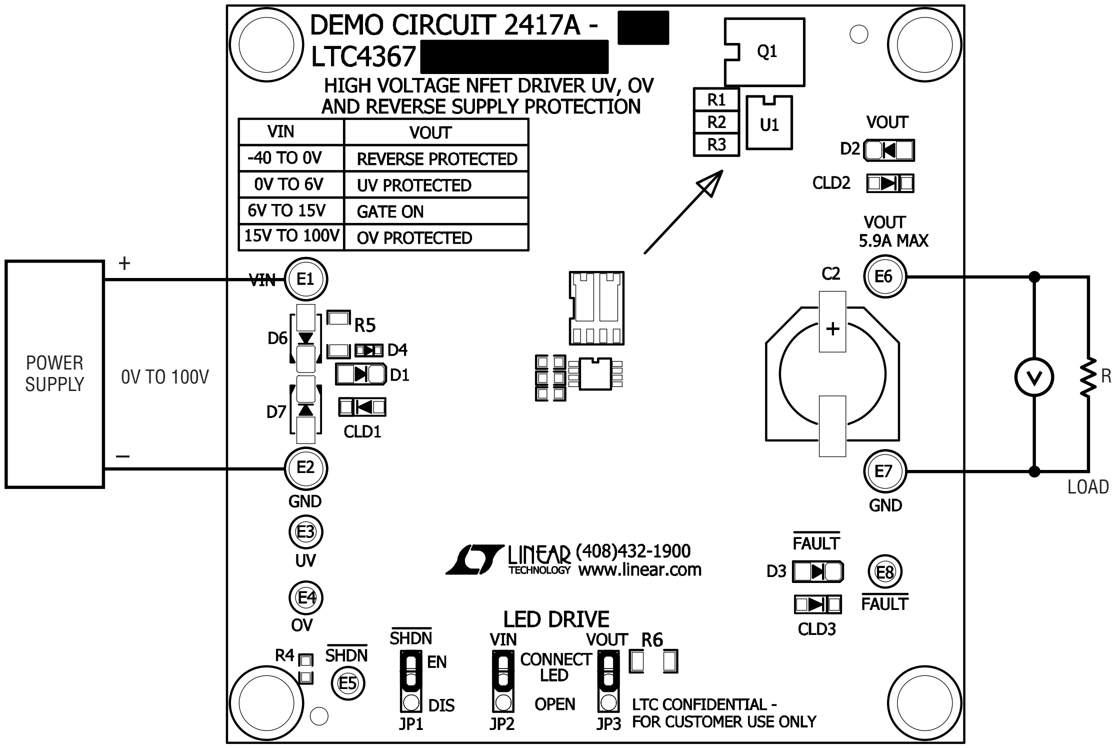
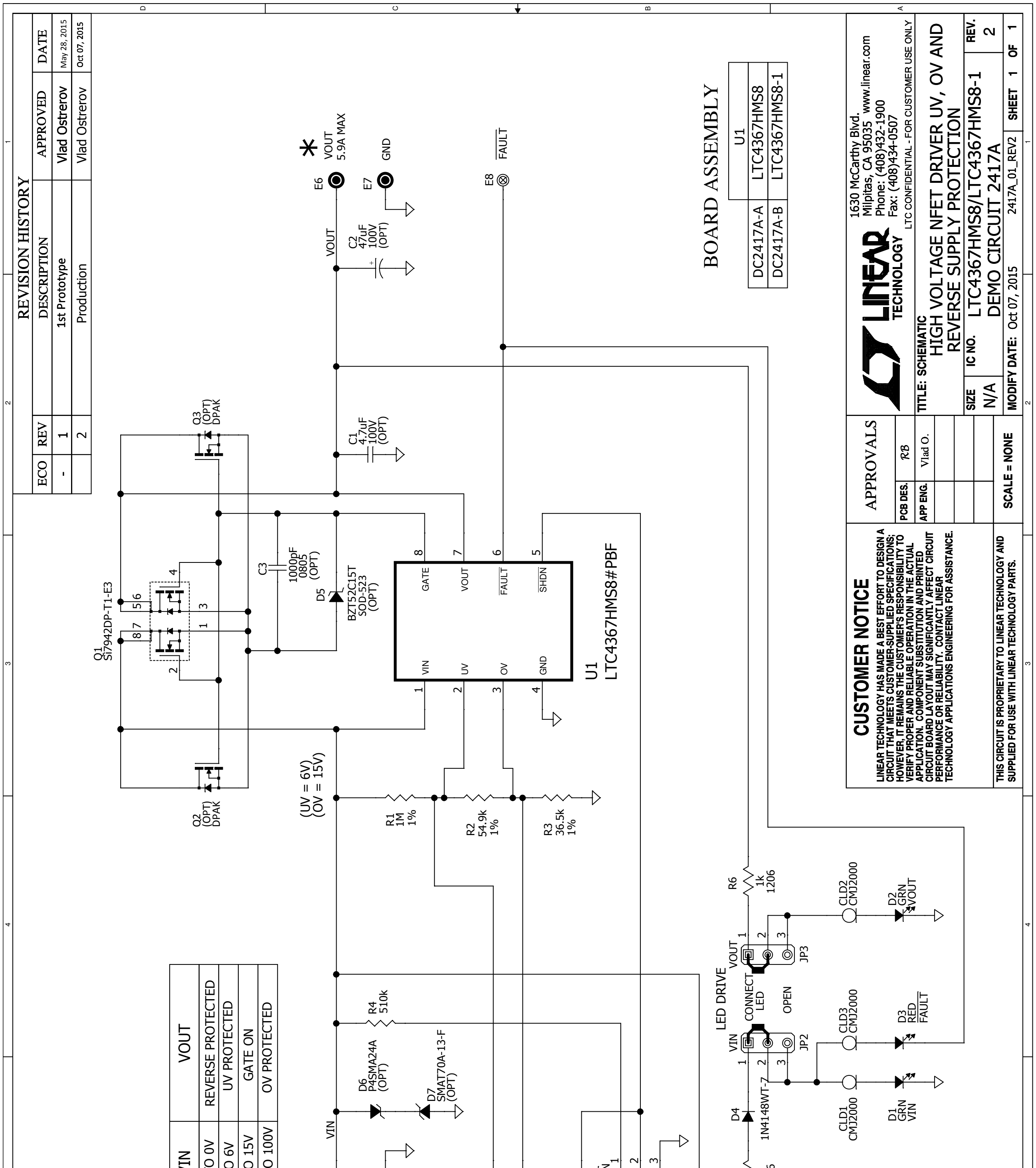


Figure 1b. Undervoltage/Overvoltage Test

SCHEMATIC DIAGRAM



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