

## LTC4354

# 200W Negative Voltage Diode-OR Controller

### DESCRIPTION

Demonstration Circuit 852 showcases the LTC<sup>®</sup>4354 negative voltage diode-OR controller and monitor in a 200W, 36 to 72V application. Included on board are two S-8 ORing MOSFETs and an LED to indicate fault conditions. The -48V inputs are separated from RTN and from each other with at least 60 mils spacing, except for where drain sensing resistors bridge the gap. 93-mil turrets make input and output connections; if removed, these accommodate insertion of up to 12 gauge wires for in-situ testing.

The small size of this demonstration circuit facilitates grafting into a working system for evaluation purposes. On the backside of the board there are pads for D2-pak MOSFETs. The S-8 MOSFETs included on the board are avalanche rated and carry up to 5A for ATCA<sup>®</sup> applications.

**Design files for this circuit board are available. Call the LTC factory.**

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### PERFORMANCE SUMMARY

Specifications are at  $T_A = 25^\circ\text{C}$

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
L	Input Supply Range	(-48VA)-(-48VB)	-100		100	V
	Maximum Output Current		5			A
	Commutation Time			700		ns

### BOARD LAYOUT

The top of the board contains the components necessary for the application. The 93-mil turrets are not swaged and may be removed before assembly in a working system with up to 12-gauge wire. The FDS3672 MOSFETs can handle 5A continuous load current in this board.

The bottom of the board contains no components but provisions are made for installation of optional D2-pak MOSFETs. Remove the topside S-8 MOSFETs if others are installed on the bottom side. Larger MOSFETs extend the usable range of this board to in excess of 10A.

The FDS3672 S-8 MOSFETs are capable of handling up to 7.5A for short periods, limited by the thermal characteristics of the board. A continuous load current of 5A is permissible with the board laying face-up on a lab bench

with only convection cooling. Thus situated and carrying 5A load current, either MOSFET experiences a junction temperature rise of approximately 75°C.

Copper loss is equivalent to about 2 squares of 1-ounce copper, or  $\cong 1.2\text{m}\Omega$ , measured from turret to S-8 MOSFET lead.

Dissipation for the combined MOSFET and board loss is 700mW at 5A. In contrast, the power loss from an equivalent passive Schottky diode circuit would measure about 3.1W. This represents a power and thermal area savings of more than 4X.

A clear line of demarcation separates RTN, -48VA and -48VB, with a spacing of at least 60 mils to any adjacent trace. Spacing necks down in the vicinity of R1 and R2.

To increase the voltage capability of this area, use either larger resistors (1206, for example) or apply conformal coating. Since operational spacing is ultimately limited by the LTC4354's DFN package, the latter is preferred. An S-8 package (LTC4354CS8 or LTC4354IS8) with wider pad spacing is also available.

The LTC4354 detects excessive  $V_{ds}$  ( $>260\text{mV}$ ) across the MOSFETs and reports this to the FAULT pin, asserting it high and illuminating LED1. As a result the LED not only indicates faults, but also doubles as a clamp for the FAULT pin, limiting the high-state voltage to less than 2V.

At room temperature the typical resistance of the FDS3672 MOSFET is  $19\text{m}\Omega$ , requiring a current of

$13.7\text{A}$  to trip the FAULT pin. Although this exceeds the MOSFET's maximum continuous current rating, the device can handle such a current for up to 400ms. As the MOSFET heats up, its resistance increases to a point where as little as 7.5A drain current is necessary to trip the FAULT detector. Under normal operating conditions LED1 will not illuminate.

Note that the aforementioned  $V_{ds}$  detection is performed in a negative direction, asserting FAULT when  $V_d$  is 260mV or more negative with respect to  $V_s$ . This corresponds to either an open MOSFET, or current flow far in excess of the intended operating range.

## QUICK START PROCEDURE

Connect  $-48\text{V}$  power sources to  $-48\text{VA}$  and  $-48\text{VB}$ , with the combined returns connected to RTN. The 48V output is taken at  $-48\text{VOUT}$ . The larger magnitude supply will source current as controlled by the diode action of the LTC4354.

The turrets are installed without swaging in 93-mil plated through holes. They may be removed for insertion of up to 12 AWG wire for in-situ testing.

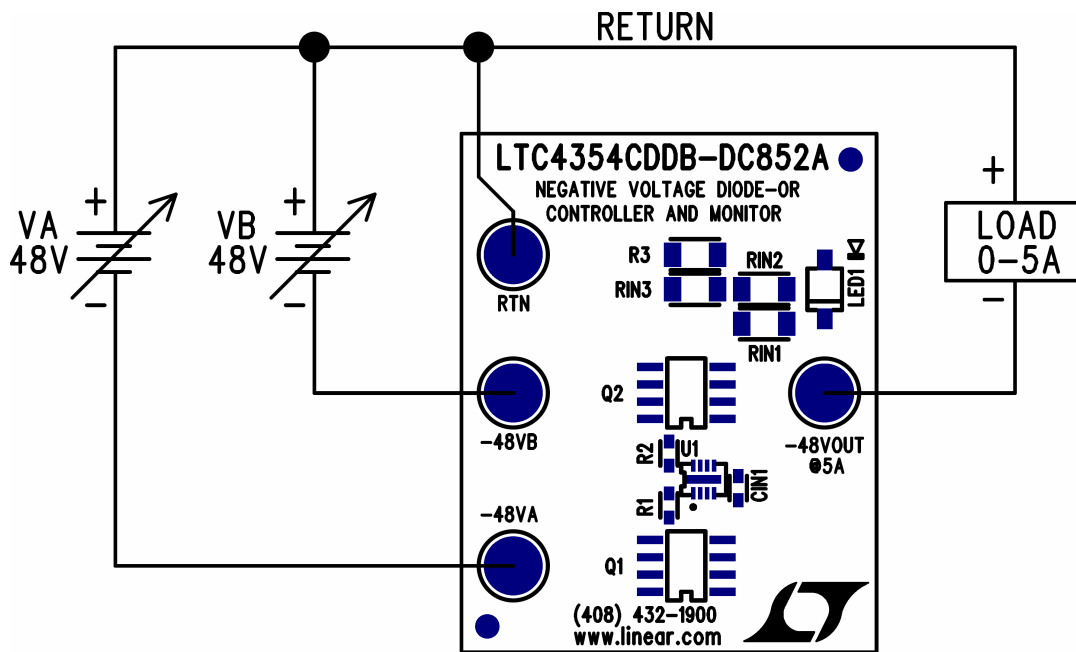
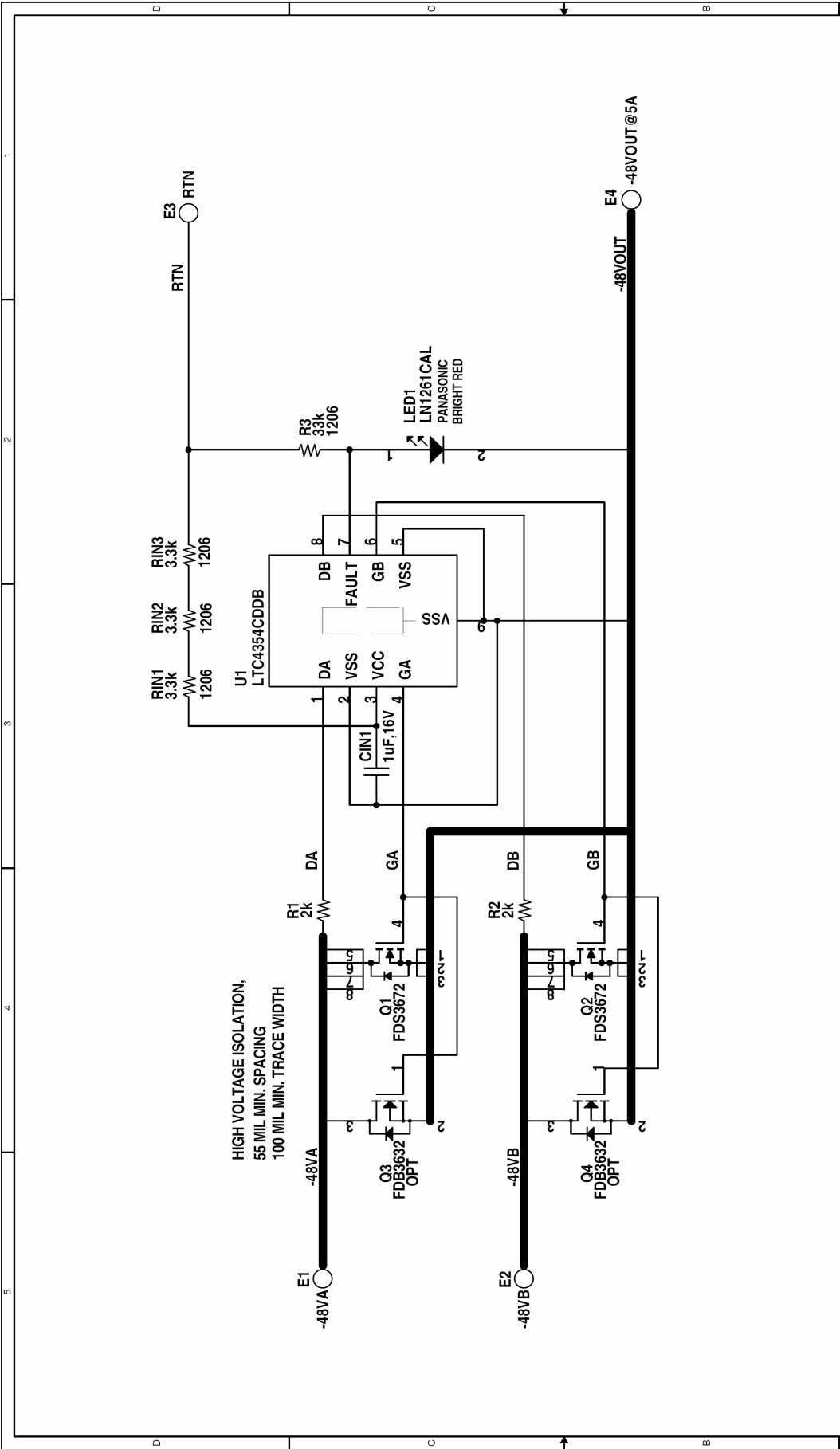


Figure 1. Proper Measurement Equipment Setup



HIGH VOLTAGE ISOLATION,  
55 MIL MIN. SPACING  
100 MIL MIN. TRACE WIDTH

**NOTES: UNLESS OTHERWISE SPECIFIED**

1. ALL RESISTORS ARE IN OHMS, 0603.  
ALL CAPACITORS ARE IN MICROFARADS, 0603.

**CUSTOMER NOTICE**

LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE. THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.

CONTRACT NO.

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TITLE: SCHEMATIC

NEGATIVE VOLTAGE DIODE-OR CONTROLLER AND MONITOR

SIZE	DWG NO.	REV
A	DC852A-LTC4354CDDB	A
DATE:	SHEET	OF
Wednesday, November 03, 2004	1	1

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