DESCRIPTION

Demonstration Circuit 1066 showcases the LTC4355 positive high voltage diode-OR controller and monitor in a 200W, 48V application. Included on board are two S-8 ORing MOSFETs and five LEDs to indicate a variety of fault conditions.

The 48V inputs are separated from ground and from each other with at least 60 mils spacing wherever possible. Input and output connections are made by 93 mil turrets which if removed, accommodate insertion of up to 12 gauge wire for in-situ testing.

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

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FEATURES

*Tiny Size Facilitates Grafting into Working System

*Two 5A Diode Channels Controlled by One LTC4355

*Dual Layout for S-8 or D2Pak MOSFETs

*0.093-inch Turret Holes Accommodate 12 AWG Wire

APPLICATIONS

*Servers, Routers, Switches

*Mass Storage

*Central Office Computing

*Fan Trays

*ATCA

Table 1. Typical Performance Summary (T_A = 25°C)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Operating Range		9	48	77	V
	Peak Input Voltage	Clipped by Transient Voltage Suppressor	77		100	V
I_{OUT}	Maximum Load Current	Limited by MOSFET Dissipation Limited by Fuses	5 7			A A

Board Layout

The 93-mil turrets are not swaged and may be removed for in-situ testing. The plated-through holes can accommodate up to 12 gauge wire. The FDS3672 MOSFETs handle 5A continuous load current with no air flow and a total temperature rise of about 30-40 Celsius across the board. The bottom of the board contains pads for optional D2Pak MOSFETs for applications up to 20A. Remove the top-side S-8 MOSFETs if D2Paks are installed.

Current Capability

The FDS3672 S-8 MOSFETs are capable of handling up to 7.5A for short periods, limited by the thermal characteristics of the package. A continuous load current of 5A is permissible with the board laying face-up on a lab bench and convection cooling. Thus situated and carrying 5A load current, either MOSFET experiences a junction temperature rise of approximately 50-55 Celsius.

Resistive losses total about 15 milliohms exclusive of MOSFET resistance; the fuse accounts for about

13 milliohms of this figure and is not an insignificant source of dissipation.

At 5A load, MOSFET dissipation is approximately 600mW. In contrast, the power loss of an equivalent passive Schottky diode would measure about 3W. This represents a power and thermal area savings of 5X. At 3A load current the improvement is even more dramatic.

Fault Pins

Green LEDs show the status of the five fault pins. If the LED is on there is no problem; extinguished LEDs indicate problems with a fuse, low input voltage, or excessive Vds across one or both of the MOSFETs.

The LTC4355 detects excessive Vds across one or both MOSFETs. Optional resistor R10 located on the bottom of the board allows for three choices of Vds fault threshold:

R10=0; Vds fault threshold=250mV

R10=100k; Vds fault threshold=500mV

R10=open; Vds fault threshold=1.5V

DC1066 is built with R10=open for a Vds fault threshold of 1.5V.

Note that the fault pins are limited to 8V abs/max, yet the pull-up resistors (R5-R9) are powered by the 48V output. The LEDs serve as clamps and if you remove them, the fault pins will be destroyed. If you want to interface the fault pins to logic circuits, remove BOTH the LED and the attendant pull-up resistor.

Operating Voltage Range

DC1066 is designed for 48V applications. Nevertheless, the "diode" action of the board operates down to the minimum supply voltage for the LTC4355CDE of 9V. Other functionality will be affected or lost including dim LEDs, indication of power faults on each channel (the threshold is 34.1V), and reduced gate drive.

To modify the board for a new operating range simply resize the LED resistors (R5-R9) to a value of Vinmax/5mA, and change R2 and R4 to detect under voltage at the desired point. The simple voltage divider calculations so efficiently covered in the LTC4355 data sheet need not be repeated here. For applications below 20V where minimum gate drive is guaranteed at 4.5V, use logic level MOSFETs.

Modifying for Other Current Ranges

To modify the board for other current ranges, replace the fuses and MOSFETs. A good rule of thumb for selecting MOSFETs is to select an Rds (on) which produces 100 to 200mV drop at maximum load current. This gives a substantial improvement in losses over a Schottky diode solution.

Sufficient copper is available on DC1066 to handle about 20A. Suggested devices for currents in the 5-20A range include IRFS4710, IRF3710S, IRF1310NS and FDB3632. The bottom of the board contains pads for D2Pak MOSFETs. Remove the top-side S-8 MOSFETs if D2Paks are installed.

In high current applications verify your choice of MOSFET by checking its current ratings and calculating the dissipation. For example, 200mV drop at 20A (4W) makes DC1066 fairly warm with a maximum board temperature rise of 80-90 Celsius. Above 4W, abandon DC1066 and attach the MOSFETs to a heatsink.

QUICK START PROCEDURE

Connect 48V power sources to +48VA and +48VB, with the combined returns connected to GROUND. Connect the load between +48VOUT and GROUND.

A 10 ohm, 250W resistor makes a good load. The larger magnitude supply will source current as controlled by the diode action of the LTC4355.

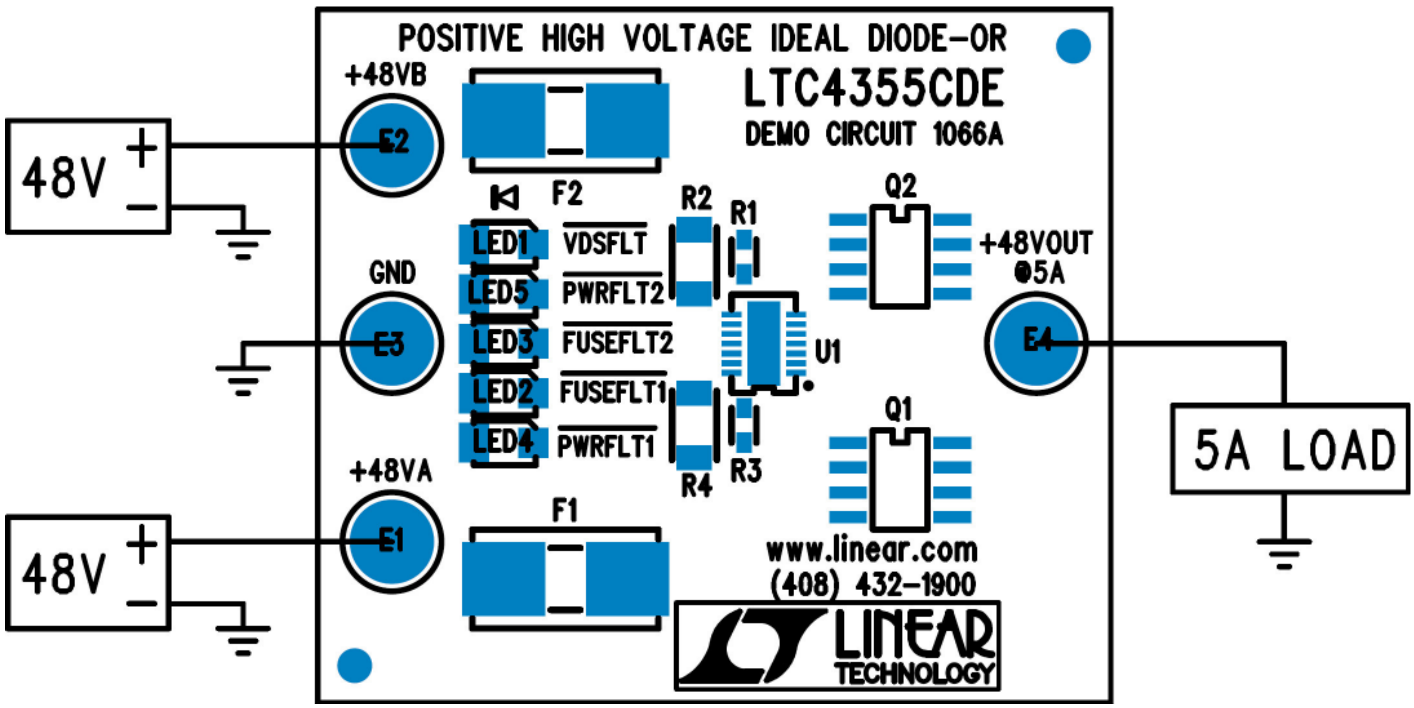
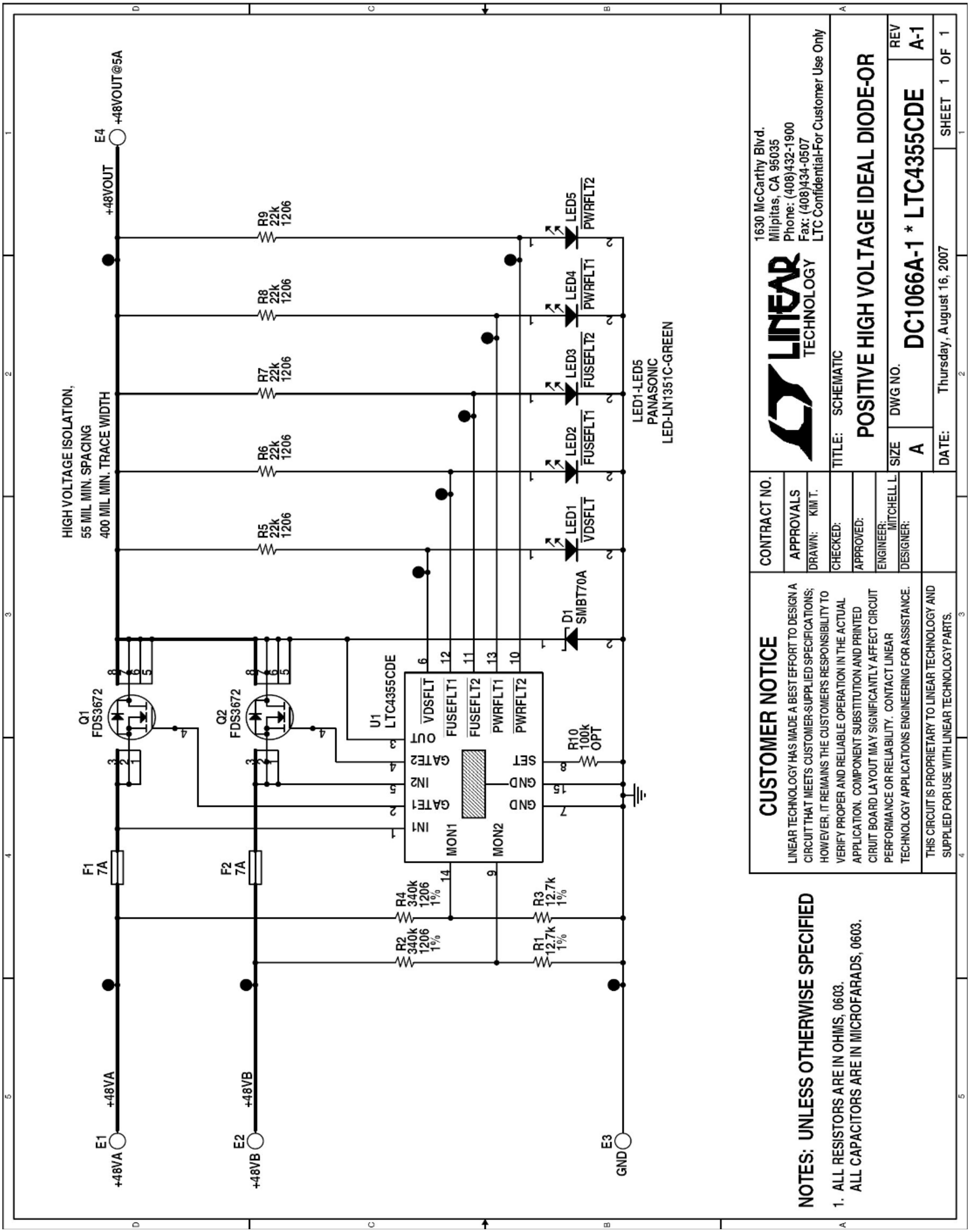


Figure 1. Proper Measurement Equipment Setup


NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE IN OHMS, 0603.
ALL CAPACITORS ARE IN MICROFARADS, 0603.
CUSTOMER NOTICE
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LTC Confidential-For Customer Use Only
TITLE: SCHEMATIC
POSITIVE HIGH VOLTAGE IDEAL DIODE-OR
SIZE A
DWG NO. DC1066A-1 * LTC4355CDE
REV A-1
DATE: Thursday, August 16, 2007
SHEET 1 OF 1
HIGH VOLTAGE ISOLATION,
55 MIL MIN. SPACING
400 MIL MIN. TRACE WIDTH
E1 +48VA
E2 +48VB
E3 GND
E4 +48VOUT@5A
+48VOUT
F1 7A
F2 7A
Q1 FDS3672
Q2 FDS3672
U1 LTC4355CDE
IN1 GATE1 IN2 GATE2 OUT
VDSFLT FUSEFLT1 FUSEFLT2 PWRFLT1 PWRFLT2
MON1 MON2 GND GND SET
R1 12.7k 1%
R2 340k 1206 1%
R3 12.7k 1%
R4 340k 1206 1%
R5 22k 1206
R6 22k 1206
R7 22k 1206
R8 22k 1206
R9 22k 1206
R10 100k OPT
D1 SMBT70A
LED1 VDSFLT
LED2 FUSEFLT1
LED3 FUSEFLT2
LED4 PWRFLT1
LED5 PWRFLT2
LED1-LED5
PANASONIC
LED-LN1351C-GREEN