DEMO CIRCUIT 548
QUICK START GUIDE

LTC1921
Dual –48V Supply and Fuse Monitor

DESCRIPTION

Demonstration circuit 548 is a Dual –48V Supply and Fuse Monitor featuring the LTC1921. The LTC®1921 monitors two independent –48V supplies, including their fuses, and drives up to three opto-isolators or LEDs to indicate status, in accordance with standard backplane specifications.

The LTC1921 replaces multiple voltage comparators, a voltage reference and several precision resistors—and requires only three non-critical resistors and opto-isolators or LEDs for status indicators. The monitor features dual supply over-voltage and under-voltage detection circuits. The preset trip thresholds include over-voltage and under-voltage recovery that is guaranteed over temperature and meets or exceeds common backplane specifications. Additional built-in circuitry detects the condition of two supply fuses. Over-voltage and under-voltage detectors ignore fast supply transients, thus eliminating false detection.

The DC548 demonstration circuit is configured with an LTC1921 with inputs for two high voltage power supplies with LEDs and opto-isolators as output status indicators. The status indicators are: FUSE OK, POWER A OK and POWER B OK. An on-board switch (SW1) selects three LED or opto-isolator outputs (the SW1 positions are LED and OPTO).

If SW1 is set for LED status the DC548 provides all the functions of a dual –48V supply and fuse monitor.

If SW1 is set for opto-isolator status then with an external logic power supply (3V to 5V) and pull-up resistors, the DC548 functions as a dual –48V supply and fuse monitor with isolated logic status indicators.

The LTC1921 operates from –10V to –80V with a typical power dissipation of less than 10mW and is available in 8-pin MSOP and SOIC packages.

OPERATING PRINCIPLES

SUPPLY MONITORING

The LTC1921 is designed to monitor dual –48V power supplies. This is accomplished with precision window comparators and an accurate bandgap reference, as well as internal level shifting circuitry. The comparators are preset to standard voltage thresholds in order to accurately verify the status of each supply. These comparators also include precision hysteresis, which allows accurate determination of voltage recovery. The two supplies status is indicated by the OUT A and OUT B pins.

The supply window comparison works in a straightforward way (Figure 1). As long as each supply magnitude remains in the valid supply window (38.5V to 70V), the outputs indicate a valid supply condition by exhibiting high internal impedance. If a supply magnitude falls below the undervoltage threshold (38.5V), then its respective output shorts internally (OUT A to OUT F or OUT B to OUT A) until that supply reaches the undervoltage recovery threshold, which is pre-set to –43V (a telecom industry standard). At this time, the output returns to a high impedance state. If a supply magnitude rises above the overvoltage threshold (70V), then its respective output shorts internally, just as with an undervoltage condition. The output returns to its nominal state when the supply overcomes the overvoltage hysteresis.

UNDERVOLTAGE LOCKOUT

If both supplies are active and their magnitudes fall below 13V, or if only one supply is active and its magnitude falls below 19V, the LTC1921 locks all outputs into a fault condition by closing all three output switches. This state is held until one supply magnitude is driven above 19V or both are driven above 13V.

FUSE MONITORING

In addition to monitoring two supplies, the LTC1921 can monitor the condition of two supply fuses via the FUSE A (Pin 2) and FUSE B (Pin 7) inputs. Fuse monitoring is accomplished by comparing the potential at FUSE A to the potential at supply VA and comparing the potential at FUSE B to the potential at supply VB. If VFUSEA is within the specified voltage window around VA and VFUSEB is within the specified voltage window around VB, the OUT F pin indicates that the fuses are intact by exhibiting high internal impedance to the return (RTN) pin.

The DC548 board is designed to be installed as a daughter board onto a typical motherboard used for monitoring a telecommunications power generating and distribution system. Typically a telecommunications system power motherboard generates power using DC/DC converters, has fuses in series with two high voltage power supply inputs, diodes for combining the power supply outputs and pull-up resistors for opto-isolator outputs and a micro-controller for monitoring the isolated logic. A DC548 installed in a telecommunications power motherboard (with SW1 set to OPTO) provides all the circuits for a dual –48V supply and fuse monitor with isolated logic status indicators (Figure 2).

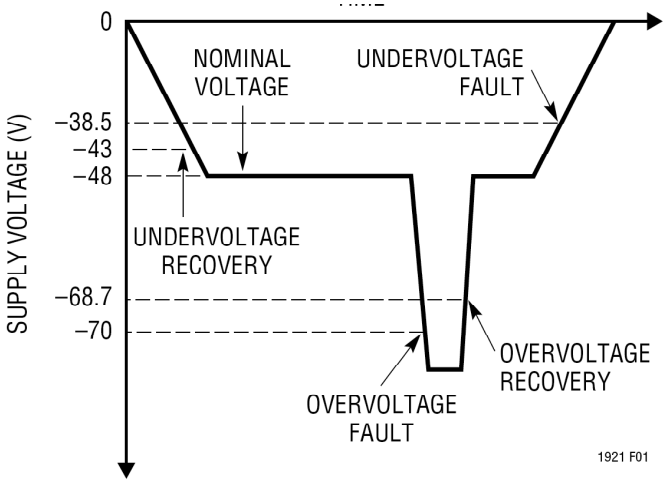


Figure 1. Supply Comparison

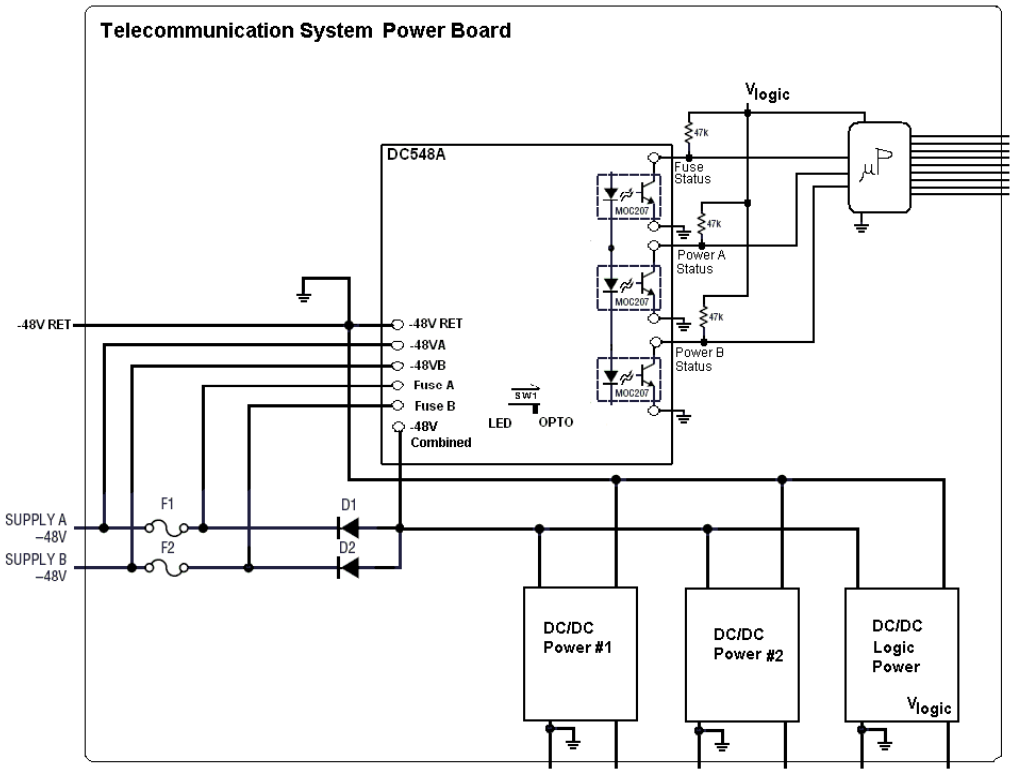


Figure 2. Typical Application

QUICK START PROCEDURE

Demonstration circuit 548 is easy to set up to evaluate the performance of the LTC1921.

Refer to Figure 3 (Opto Output) or Figure 4 (LED Output) for proper measurement equipment setup and follow the procedure below:

1. Set power supply A and B to –48V and close the Fuse A and B simulator switches (for the Logic Output set-up, an additional Logic power supply is required).
2. Turn-On power supply A and B.
   a. Figure 3 set-up: the FUSE status and Power A and B status levels are Lo (<0.5V)

      NOTE: For a Figure 3 set-up (Opto Output), the status levels can be monitored with the minus input of a voltmeter connected to Logic ground and the plus input to the DC548A test turret corresponding to the status indicator. For example, on the DC548A schematic, the TP7 test turret is connected to the Fuse Status opto-isolator. The test turret designation is not on the DC548A silk screen.

   b. Figure 4 set-up: all three LEDs are on.
3. Open Fuse A simulator switch.
   a. Figure 3 set-up: the FUSE status level is Hi (>2.5V).
   b. Figure 4 set-up: the D1 LED (Fuse OK) turns off.
4. Set Power Supply A to less than -38.5V (-34V).
   a. Figure 3 set-up: the Power A status level is Hi (>2.5V).
   b. Figure 4 set-up: the D2 LED (Power A OK) turns off.
5. Set Power Supply A to –48V
6. Set Power Supply B to less than -38.5V (-34V).
   a. Figure 3 set-up: the Power B status level is Hi (>2.5V).
   b. Figure 4 set-up: the D3 LED (Power B OK) turns off.
7. Set Power Supply B to –48V
8. Set Power Supply A and B to –80V
   a. Figure 3 set-up: the Power A and Power B status levels is HI (>2.5V).
   b. Figure 4 set-up: the D2 and D3 LEDs (Power A and B OK) turn off.

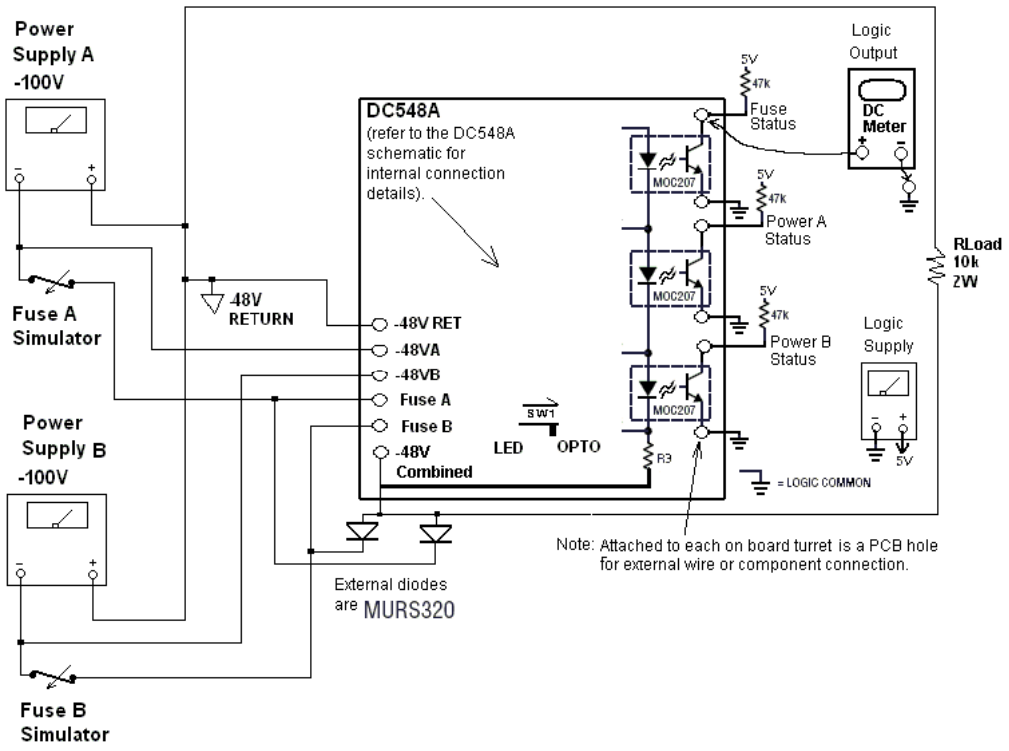


Figure 3. Setup for opto-isolator output

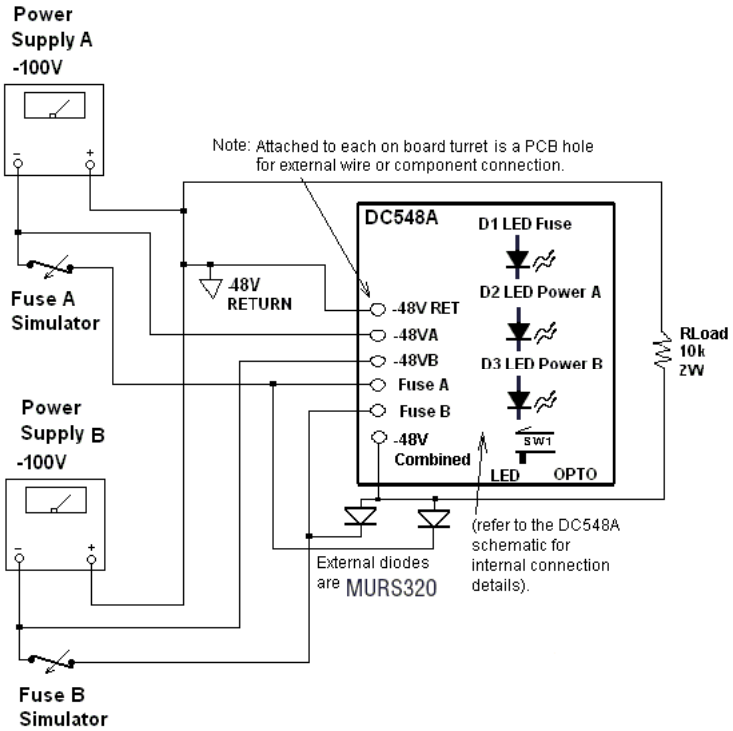
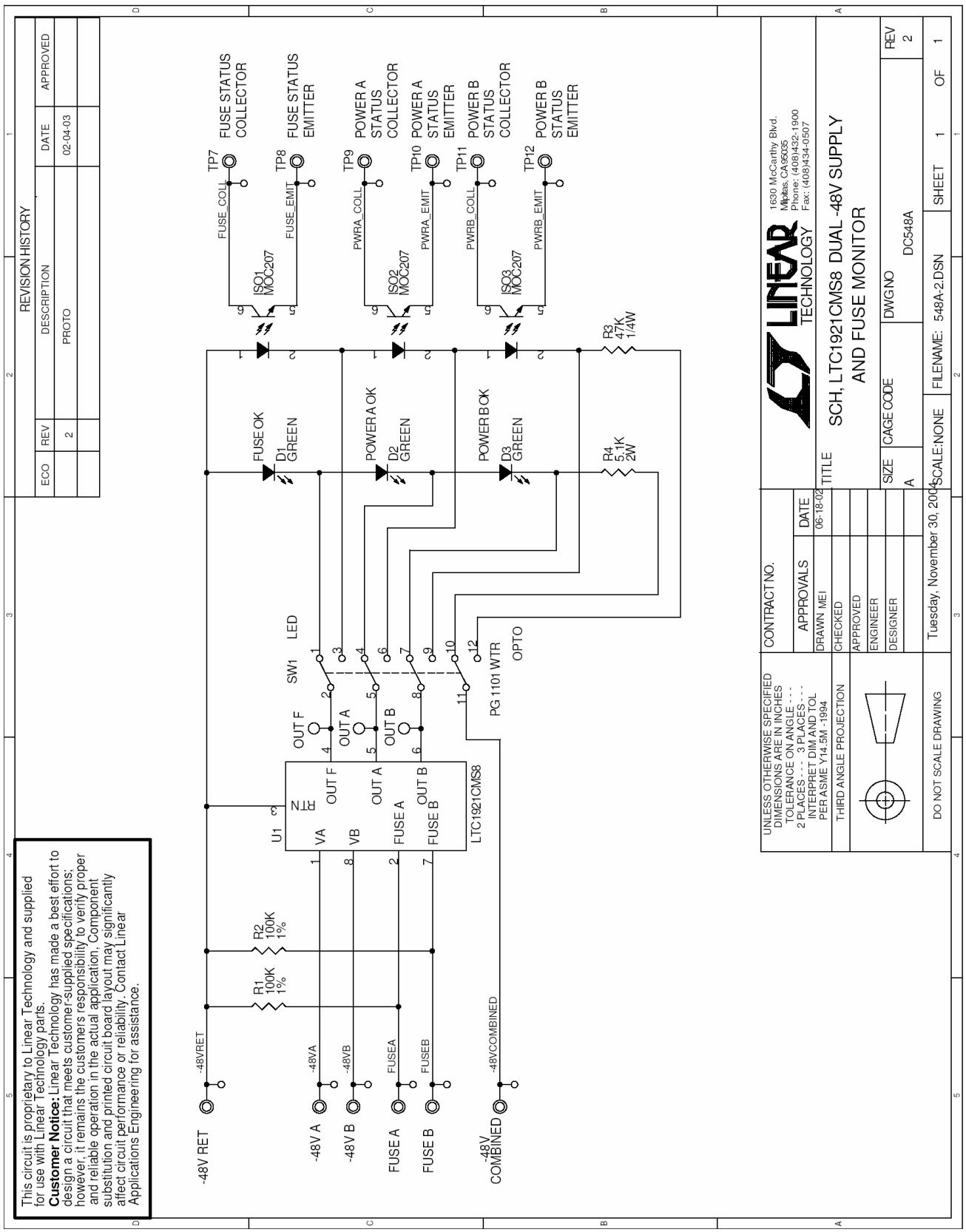


Figure 4. Setup for LED output


REVISION HISTORY
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DESCRIPTION
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APPROVED
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02-04-03
This circuit is proprietary to Linear Technology and supplied for use with Linear Technology parts.
Customer Notice: Linear Technology has made a best effort to design a circuit that meets customer-supplied specifications; however, it remains the customers 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 Applications Engineering for assistance.
-48V RET
-48V A
-48V B
FUSE A
FUSE B
-48V COMBINED
-48VRET
-48VA
-48VB
FUSEA
FUSEB
-48VCOMBINED
R1 100K 1%
R2 100K 1%
U1
LTC1921CMS8
RTN
VA
VB
FUSE A
FUSE B
OUT F
OUT A
OUT B
SW1
LED
OUT F
OUT A
OUT B
PG 1101 WTR
OPTO
FUSE OK
D1 GREEN
POWER A OK
D2 GREEN
POWER B OK
D3 GREEN
R4 5.1K 2W
R3 47K 1/4W
TP7
FUSE STATUS COLLECTOR
TP8
FUSE STATUS EMITTER
TP9
POWER A STATUS COLLECTOR
TP10
POWER A STATUS EMITTER
TP11
POWER B STATUS COLLECTOR
TP12
POWER B STATUS EMITTER
FUSE_COLL
FUSE_EMIT
PWRA_COLL
PWRA_EMIT
PWRB_COLL
PWRB_EMIT
ISO1 MOC207
ISO2 MOC207
ISO3 MOC207
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON ANGLE - - - 2 PLACES - - - 3 PLACES - - - INTERPRET DIM AND TOL PER ASME Y14.5M - 1994
THIRD ANGLE PROJECTION
DO NOT SCALE DRAWING
CONTRACT NO.
APPROVALS
DATE
DRAWN MEI
06-18-02
CHECKED
APPROVED
ENGINEER
DESIGNER
LINEAR TECHNOLOGY
1630 McCarthy Blvd.
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Fax: (408)434-0507
TITLE
SCH, LTC1921CMS8 DUAL -48V SUPPLY AND FUSE MONITOR
SIZE
A
CAGE CODE
DWG NO
DC548A
REV
2
SCALE:NONE
FILENAME: 548A-2.DSN
Tuesday, November 30, 2004
SHEET 1 OF 1