LTC4362-2: Monolithic Overvoltage/ Overcurrent Protector

DESCRIPTION

Demonstration circuit 1575B features the LTC®4362, a monolithic overvoltage/overcurrent protector that safeguards 2.5V to 5.5V systems from power supply overvoltage. It is designed for portable devices with multiple power supply options including wall adaptors, car battery adaptors and USB ports.

The LTC4362 controls an internal 40mΩ N-channel MOSFET in series with the input power supply. During overvoltage transients, the LTC4362 turns off the MOSFET within 1µs, isolating downstream components from the input supply. In most applications, the LTC4362 rides through inductive cable transients without requiring transient voltage suppressors or other external components. An internal current sense resistor is used to implement overcurrent protection.

The LTC4362 has a delayed start-up at plug-in and controlled dV/dt ramp-up for inrush current limiting. A $\overline{\text{PWRGD}}$ pin provides power good monitoring for V_{IN}. The LTC4362 features a soft-shutdown controlled by the ON pin and drives an optional external P-channel MOSFET for negative voltage protection. Following an overvoltage condition, the LTC4362 automatically restarts with a 130ms delay. After an overcurrent fault, the LTC4362-1 remains off while the LTC4362-2 (featured on the DC1575B) automatically restarts after a 130ms delay.

DC1575B demonstrates two protection schemes selected with a jumper. The first selection is overvoltage and overcurrent protection. The second selection is overvoltage, overcurrent, and negative voltage protection. Also on the DC1575B is ON control with another jumper, input LEDs indicating positive or negative input voltage, output LED and connection for USB protected output.

Design files for this circuit board are available at http://www.linear.com/demo/DC1575B

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PERFORMANCE SUMMARY (T$_A$ = 25°C)

PARAMETER	CONDITION	VALUE
Input Voltage	JP2: OV/OC JP2: OV/OC/NV	0V to 28V –30V to 28V
Output Voltage	Input Range for Gate Turn-On	2.1V to 5.8V
Overcurrent Threshold	Internal Sense Resistor	1.5A
Overcurrent Retry	LTC4362-2	Auto-Retry

QUICK START PROCEDURE

Demonstration circuit 1575B is easy to set up to evaluate the performance of the LTC4362. Refer to Figures 1 and 2 for proper measurement equipment setup and follow the procedure below:

1) Connect the load and measurement across the OUT and GND (Figure 1).

2) Select protection type at JP2:

   a) For overvoltage and overcurrent protection select OV/OC.

   b) For overvoltage, overcurrent and negative voltage protection select OV/OC/NV.

3) Select ENABLE at JP1 to enable the protection.

4) Connect a power supply across V_{IN} and GND.

5) For USB protection, connect a USB cable from J2 to the USB device (Figure 2). Select the protection type at JP2. Connect a second USB cable from a computer to J1.

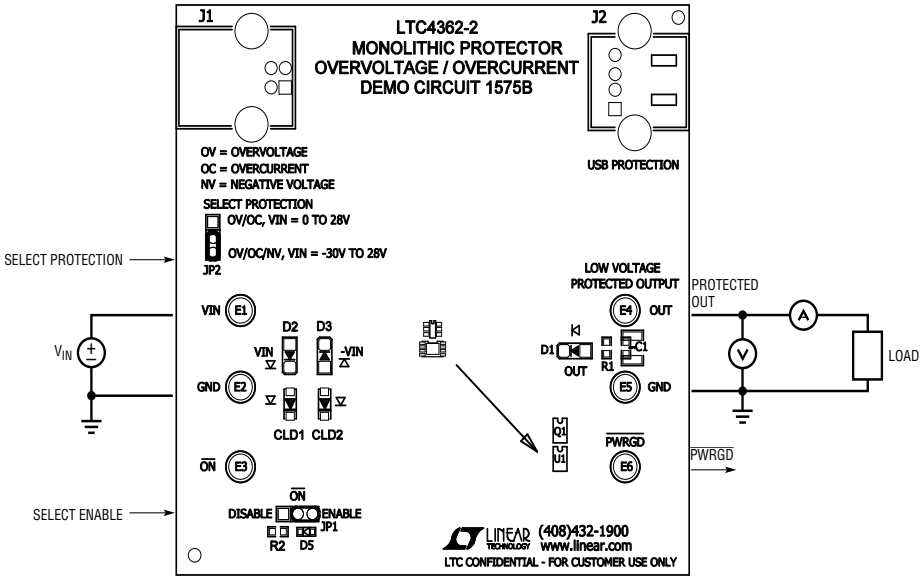


Figure 1. DC1575B Basic Setup

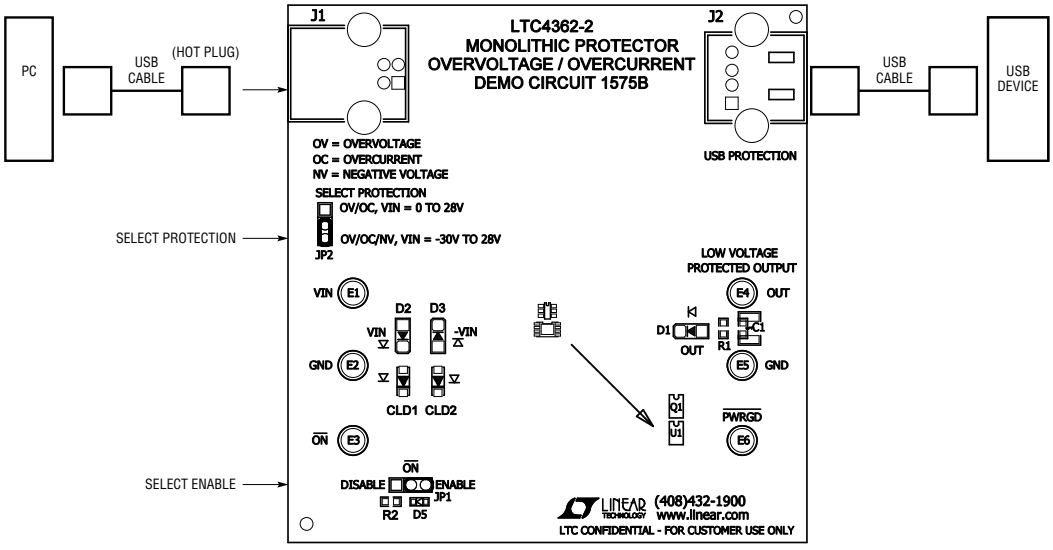


Figure 2. DC1575B USB Protection Setup

OPERATION

The DC1575B is used to evaluate the LTC®4362 in two protection configurations selected at JP2 for overvoltage and overcurrent protection, or overvoltage, overcurrent, and negative voltage protection. The device in need of protection is connected to the OUT test point or to the USB output connector J2. An input supply is connected at V_{IN} or a USB source is connected at J1.

$\overline{ON}$ Control

The $\overline{ON}$ pin on the LTC4362 is controlled at JP1. Select ENABLE to enable the LTC4362, or DISABLE to enter a low current sleep mode.

Protection OV/OC

The first selection at JP2 is OV/OC protection which protects against overvoltage and overcurrent. The LTC4362 turns on an internal N-channel MOSFET when the input voltage is below the overvoltage threshold. An internal current sense resistor provides overcurrent detection. In the case of an overcurrent, the LTC4362-2 used in the DC1575B automatically tries to turn the internal MOSFET back on. An orange input LED indicates if the input supply is on while a green OUT LED indicates the gate is on and input is connected to the output.

Protection OV/OC/NV

The second selection at JP2 is OV/OC/NV protection which protects against overvoltage, overcurrent and negative voltage. The LTC4362 turns on an internal N-channel MOSFET when the input voltage is below the overvoltage threshold. A P-channel MOSFET is driven by the GATEP pin of the LTC4362 to protect the output against an inadvertent negative voltage connection at the input. An internal current sense resistor provides overcurrent detection. In the case of an overcurrent, the LTC4362-2 used in the DC1575B automatically retries to turn the internal MOSFET back on. The orange V_{IN} LED indicates if the input supply is on while a green OUT LED indicates the gate is on and input is passed over to the output. A red $–V_{IN}$ LED indicates if a negative input voltage is present.

USB Protection

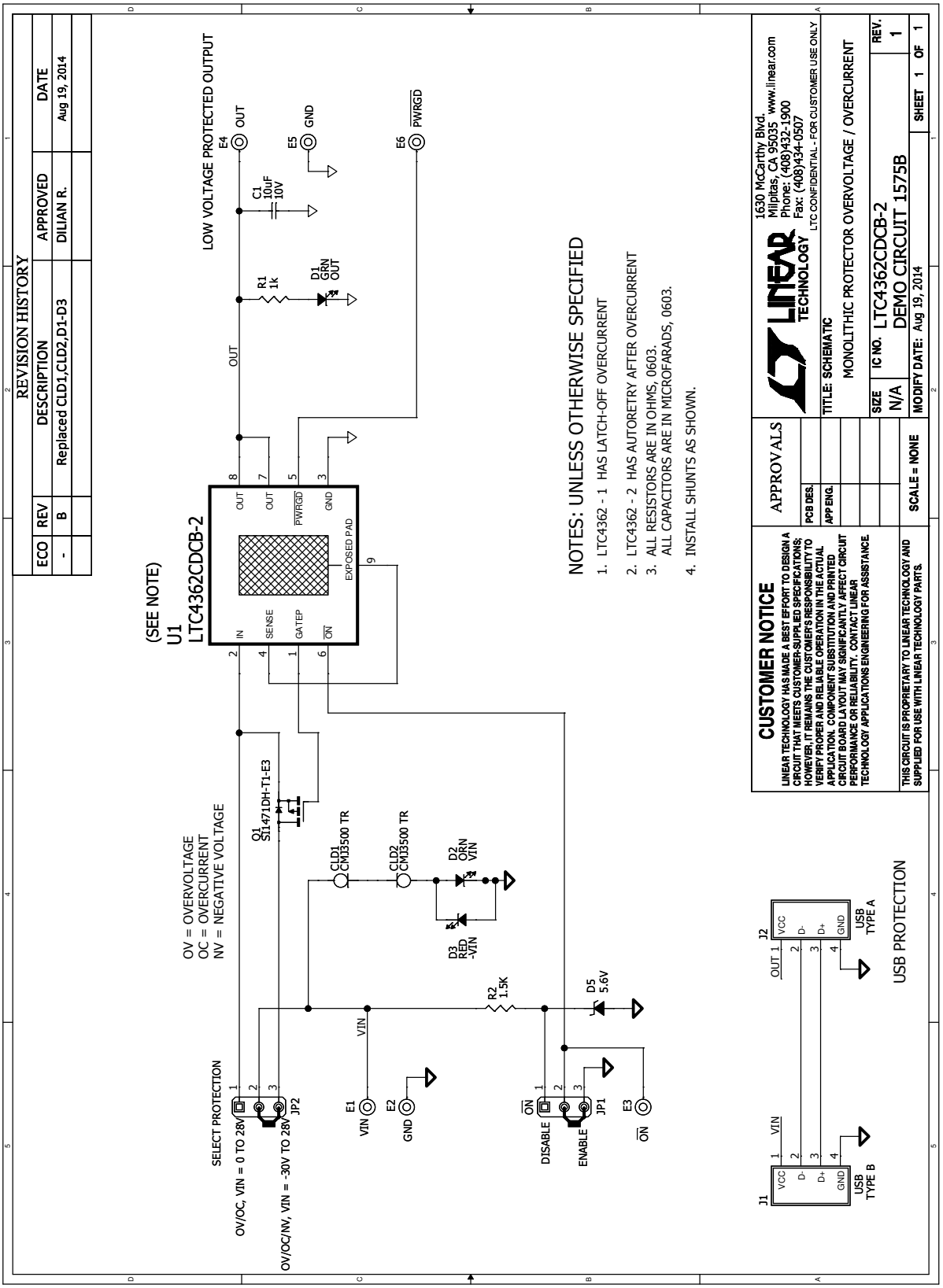
DC1575B also provides connection for USB protection. First connect a USB device with a USB cable at J2. Select the protection type at JP2 and match this with JP3. Select ENABLE at JP1. The USB source can then be connected at J1.

PARTS LIST

ITEM	QUANTITY	REFERENCE	DESCRIPTION	MANUFACTURER'S PART NUMBER
1	2	CLD1, CLD2	Current Limiting Diode, 3.2V SOD-80	Central Semiconductor Corporation CMJ3500 TR
2	1	C1	Capacitor, X5R 10µF 10V 20% 0603	Samsung CL10A106MP8NNNC
3	1	D1	LED, Green	ROHM SML-010FTT86L
4	1	D2	LED, Orange	ROHM SML-010DTT86M
5	1	D3	LED, Red	ROHM SML-010VTT86L
6	1	D5	Zener Diode, 5.6V SOD-523	Diodes Inc. BZT52C5V6T-7
7	6	E1, E2, E3, E4, E5, E6	Turret, Testpoint 0.094"	Mill Max 2501-2-00-80-00-00-07-0
8	2	JP1, JP2	Headers, Single Row 3 Pins 2mm Ctrs.	Samtec TMM-103-02-L-S
9	1	J1	USB Connection, Type B USB	Mill-Max 897-43-004-90-000000
10	1	J2	USB Connection, Type A USB	Mill-Max 896-43-004-90-000000
11	1	Q1	MOSFET P-Channel, 30V SOT-363	Vishay Si1471DH-T1-E3
12	1	R1	Res., Chip 1k 1/10W 5% 0603	NIC Components Corporation NRC06J102TRF
13	1	R2	Res., Chip 1.5k 0.06W 5% 0603	Vishay CRCW06031K50JNEA
14	1	U1	I.C., Overvoltage/Overcurrent Protector DFN(08)(DCB) 2mm × 3mm	Linear Technology Corporation LTC4362CDCB-2
15	2	XJP1, XJP2	Shunt, 2mm Ctrs.	Samtec 2SN-BK-G

Note: DC1575B replaces DC1575A due to obsoleted LEDs used in DC1575A.

SCHEMATIC DIAGRAM



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