# LTC4362-2: Monolithic Overvoltage/ Overcurrent Protector

## DESCRIPTION

Demonstration circuit DC1575A 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 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 DC1575A) automatically restarts after a 130ms delay.

DC1575A 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 DC1575A 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**



## PERFORMANCE SUMMARY ($T_A$ = 25°C)

| PARAMETER | CONDITION | VALUE |
|---|---|---|
| Input Voltage | JP2: OV/OC<br>JP2: OV/OC/NV | 0V to 28V<br>–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 1575A 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.

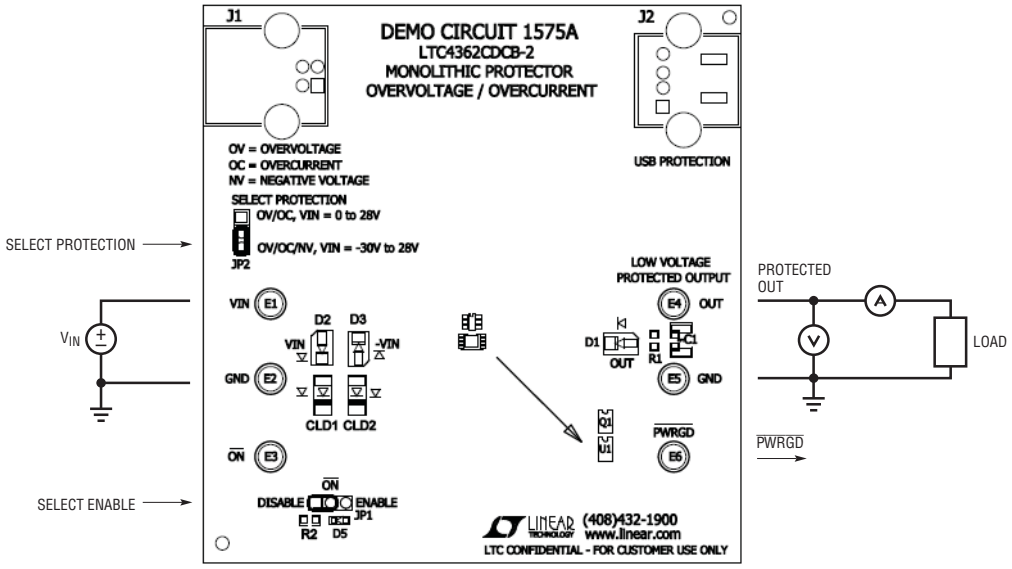



**Figure 1. DC1575A Basic Setup**

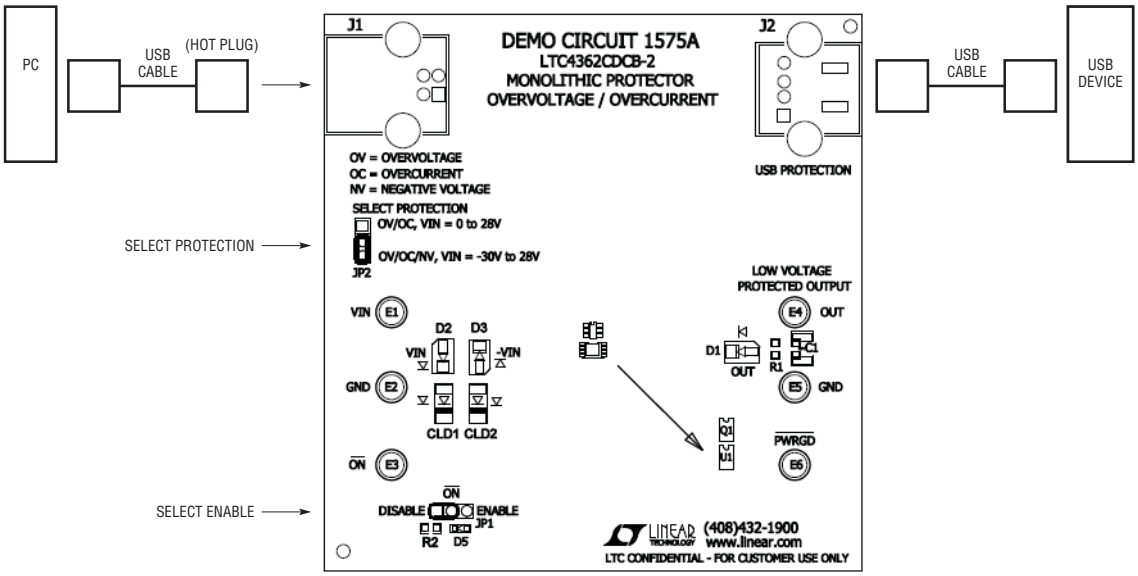



**Figure 2. DC1506A USB Protection Setup**

## OPERATION

The DC1575A 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 DC1575A automatically tries to turn the internal MOSFET back on. An amber 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 DC1575A automatically retries to turn the internal MOSFET back on. The amber $V_{IN}$ LED indicates if the input supply is on while a green OUT(B) 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.

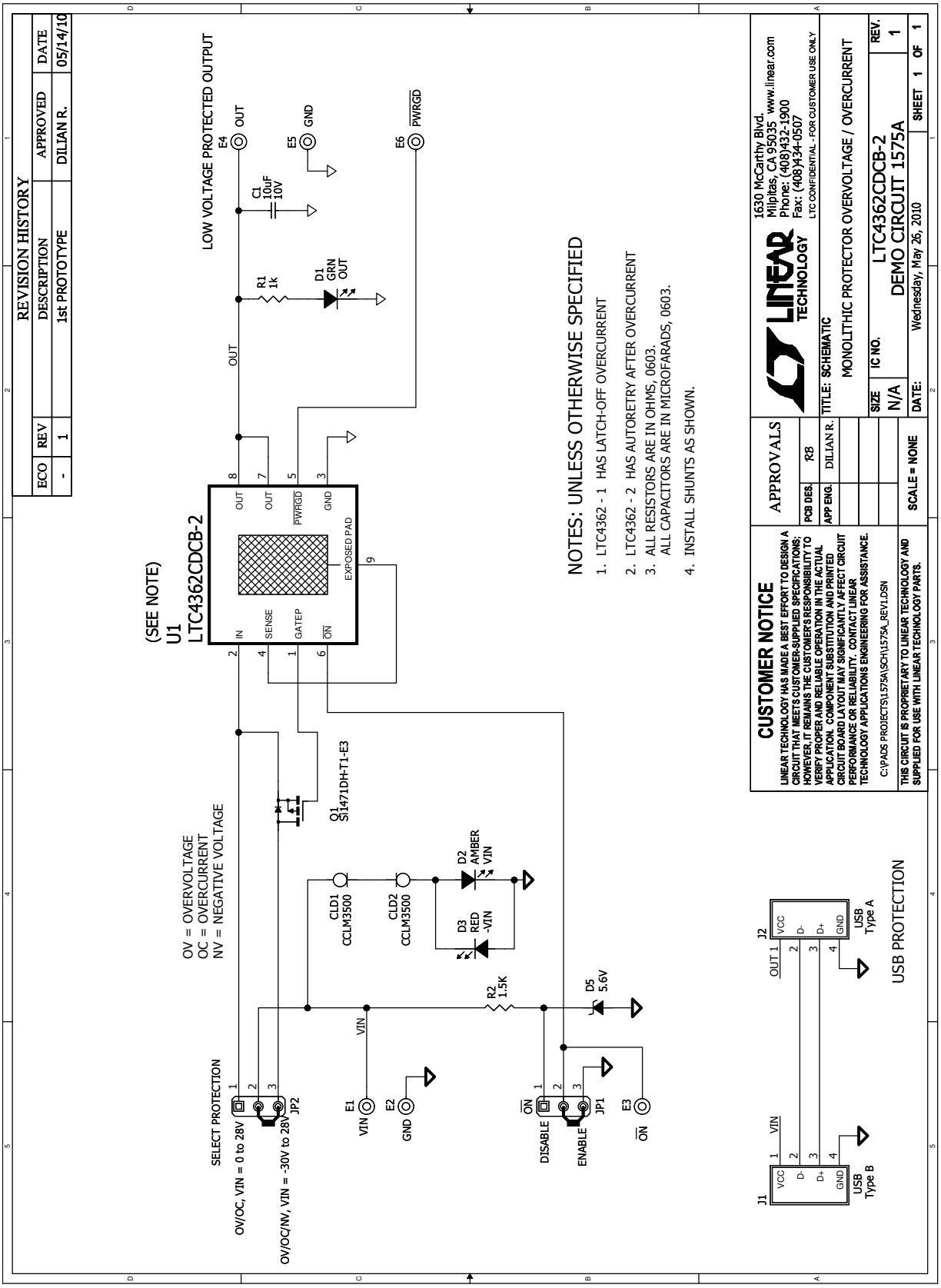
### USB Protection

DC1575A 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 CCLM3500 TR |
| 2 | 1 | C1 | Capacitor, X5R 10µF 10V 20% 0603 | Samsung CL10A106MP8NNNC |
| 3 | 1 | D1 | LED, Green | Panasonic LN1351CTR |
| 4 | 1 | D2 | LED, Amber | Panasonic LN1451CTR |
| 5 | 1 | D3 | LED, Red LN1251-C-TR | Panasonic LN1251CTR |
| 6 | 1 | D5 | Zener Diode, 5.6V SOD-523 | Diodes Inc. BZT52C5V6T |
| 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 |
| 16 | 1 | | FAB, Printed Circuit Board | Demo Circuit 1575A |
| 17 | 1 | | Stencil | Stencil 1575A |

## SCHEMATIC DIAGRAM



DEMONSTRATION BOARD IMPORTANT NOTICE

Linear Technology Corporation (LTC) provides the enclosed product(s) under the following **AS IS** conditions:

This demonstration board (DEMO BOARD) kit being sold or provided by Linear Technology is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not provided by LTC for commercial use. As such, the DEMO BOARD herein may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including but not limited to product safety measures typically found in finished commercial goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may or may not meet the technical requirements of the directive, or other regulations.

If this evaluation kit does not meet the specifications recited in the DEMO BOARD manual the kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY THE SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THIS INDEMNITY, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user releases LTC from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. Also be aware that the products herein may not be regulatory compliant or agency certified (FCC, UL, CE, etc.).

No License is granted under any patent right or other intellectual property whatsoever. **LTC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.**

LTC currently services a variety of customers for products around the world, and therefore this transaction **is not exclusive**.

**Please read the DEMO BOARD manual prior to handling the product**. Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged**.

This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

Mailing Address:

Linear Technology
1630 McCarthy Blvd.
Milpitas, CA 95035