

LTC4360 Overvoltage Protection Controller

DESCRIPTION

Demonstration circuit DC1505A features the LTC[®]4360 an overvoltage protection controller that safeguards 2.5V to 5.5V systems from input supply overvoltage. The LTC4360 is designed for portable devices with multiple power supply options including wall adapters, car battery adapters and USB ports.

The LTC4360 controls an external N-channel MOSFET in series with the input power supply. During overvoltage transients, the LTC4360 turns off the MOSFET within 1 μ s, isolating downstream components from the input supply. Inductive cable transients are absorbed by the MOSFET and load capacitance. In most applications, the LTC4360 provides protection from transients up to 80V without requiring transient voltage suppressors or other external components.

The LTC4360 has a delayed start-up and adjustable dV/dt ramp-up for inrush current limiting. A $\overline{\text{PWRGD}}$ pin

provides power good monitoring for V_{IN} . The LTC4360-1 features a soft shutdown controlled by the $\overline{\text{ON}}$ pin. The LTC4360-2 has a GATEP pin that drives an optional external P-channel MOSFET for negative voltage protection. Following an overvoltage condition, the LTC4360 automatically restarts with a start-up delay.

DC1505A demonstrates three protection schemes selected with a jumper: (A) overvoltage protection, (B) overvoltage and negative voltage protection, and (C) overvoltage, negative voltage, and reverse current protection. Each option has an output LED and can be applied to a USB protected output. Protection (A) features the LTC4360-1 with ON control. Protection (B) and (C) feature the LTC4360-2 and a P-channel MOSFET driven by GATEP.

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

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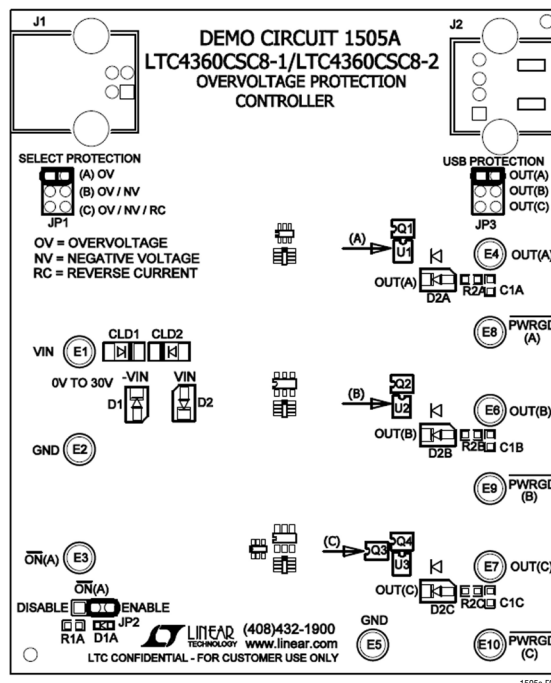


Figure 1. Demonstration Circuit 1505A

PERFORMANCE SUMMARY

Table 1. Typical DC1505A Performance Summary ($T_A = 25^\circ\text{C}$)

| PARAMETER | CONDITION | VALUE |
|----------------------------|----------------------------------------------------------------------|---------------------------------------------------------------|
| Input Voltage | Protection (A) OV Protection (B) OV/NV Protection (C) OV/NV/RC | 0V to 30V -30V to 30V -30V to 30V |
| Output Voltage | Input Range for Gate Turn-On | 2.1V to 5.8V |
| Device Used and Difference | Protection (A) OV Protection (B) OV/NV Protection (C) OV/NV/RC | LTC4360-1, ON Control LTC4360-2, GATEP LTC4360-2, GATEP |

QUICK START PROCEDURE

Demonstration circuit description 1505A is easy to set up to evaluate the performance of the LTC4360. Refer to Figure 2 and Figure 3 for proper measurement equipment setup and follow the procedure below.

1. Connect a power supply across V_{IN} and GND.
2. Select protection type at JP1 and connect a voltmeter across the corresponding output and GND:
 - a. For overvoltage protection select (A) OV and connect to OUT(A). Figure 2a.
 - b. For overvoltage and negative voltage protection select (B) OV/NV and connect to OUT(B). Figure 2b.
 - c. For overvoltage, negative voltage, and reverse current protection select (C) OV/NV/RC, connect to OUT(C). Figure 2c.
3. Select ENABLE at JP2 for protection (A) to enable.
4. For USB protection, connect a USB cable from J2 to the USB device (Figure 3). Select the protection type at JP1 and match JP3 to JP1. Connect a second USB cable from a computer to J1.

QUICK START PROCEDURE

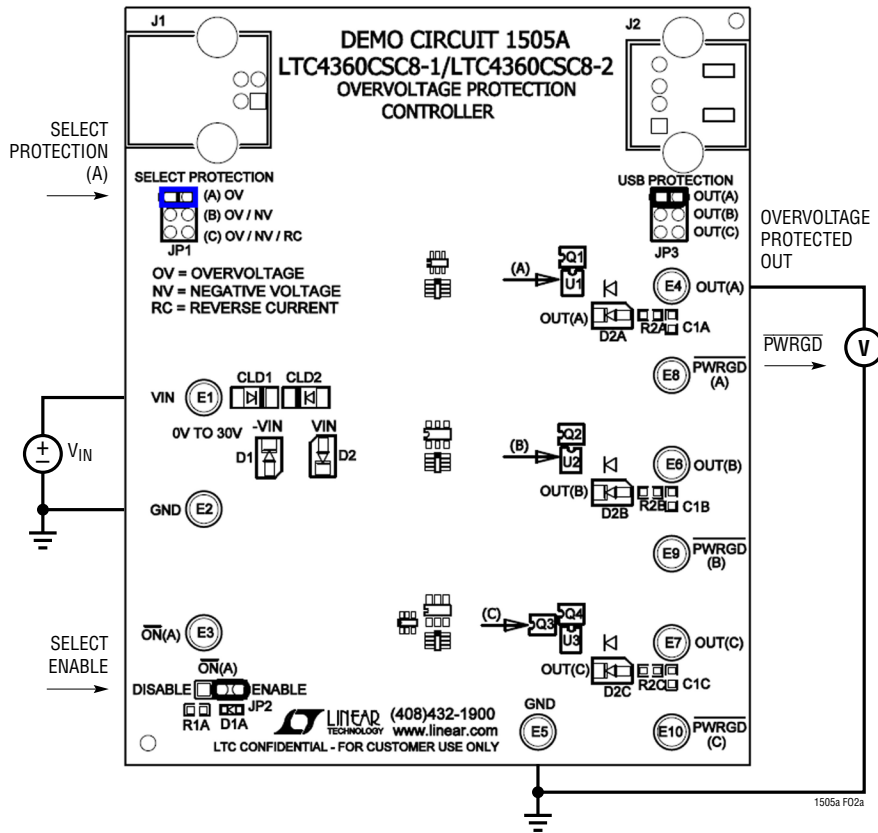


Figure 2a. DC1505A Protection (A) Setup for Overvoltage

QUICK START PROCEDURE

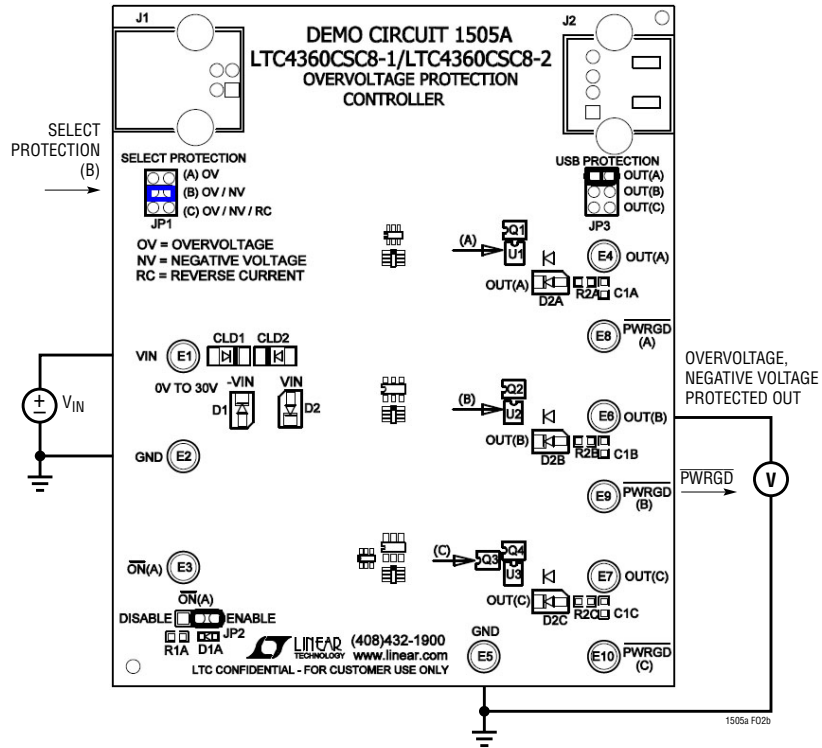


Figure 2b. DC1505A Protection (B) Setup for Overvoltage, and Negative Voltage

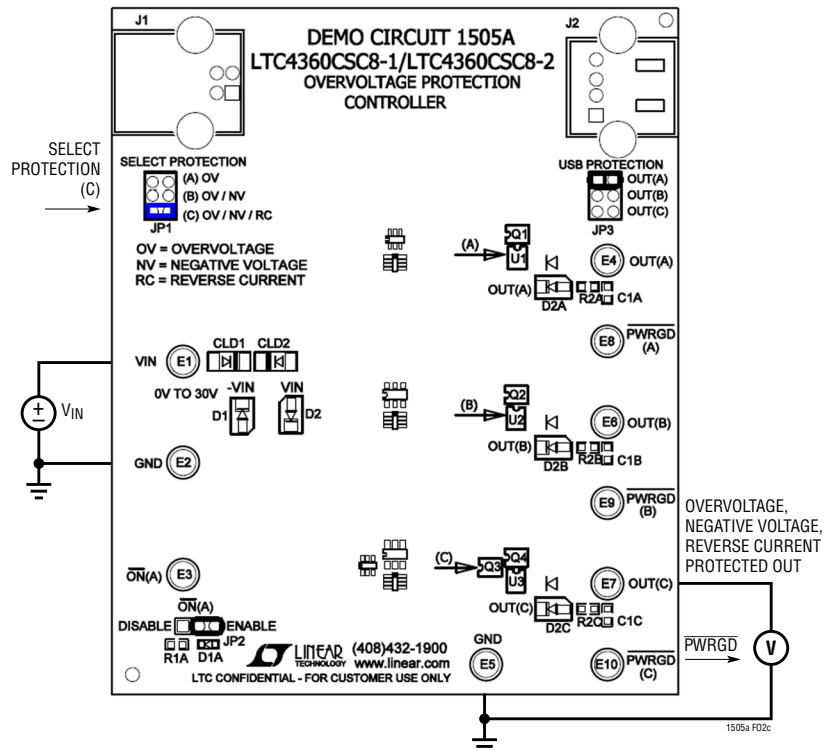


Figure 2c. DC1505A Protection (C) Setup for Overvoltage, Negative Voltage, and Reverse Current

QUICK START PROCEDURE

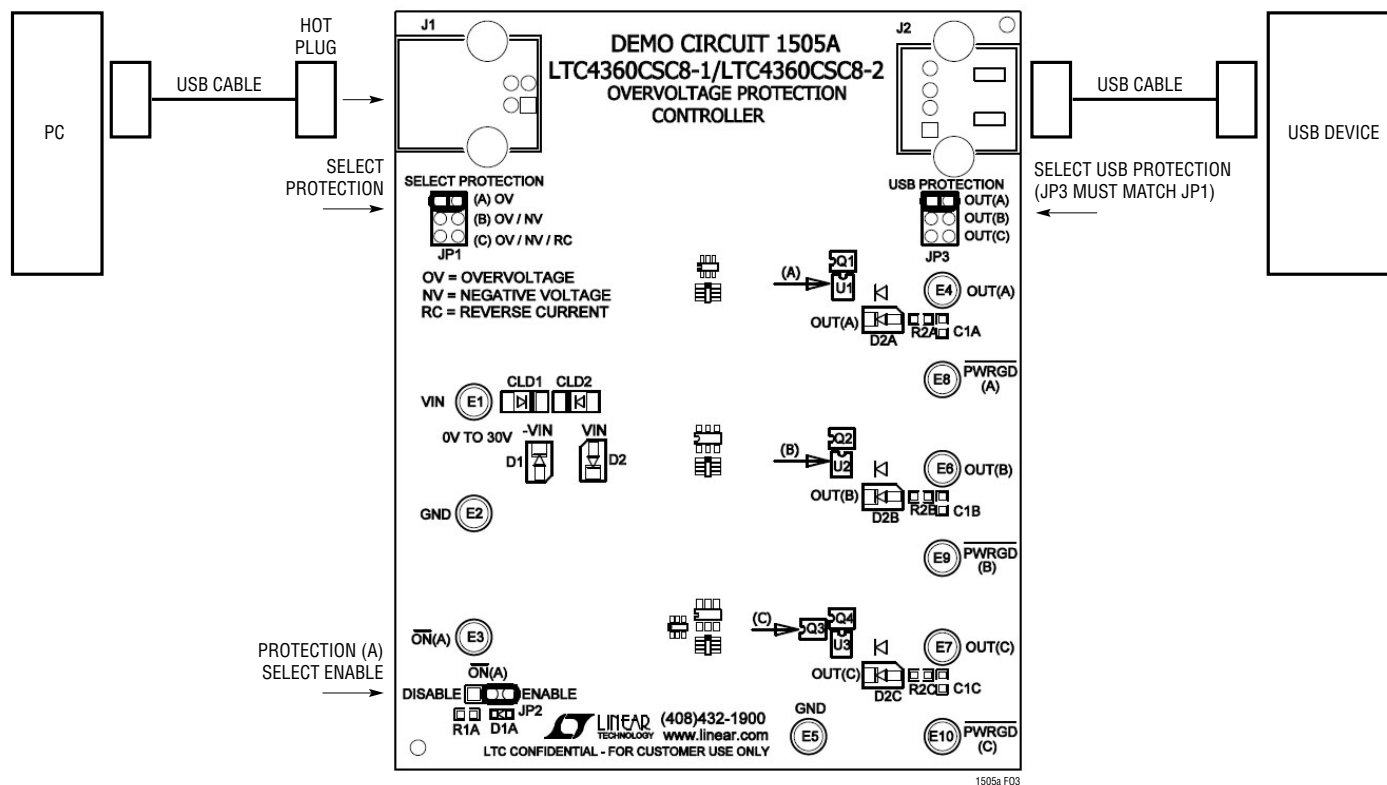


Figure 3. DC1505A USB Protection Setup

QUICK START PROCEDURE

OPERATION

The DC1505A is used to evaluate the LTC4360 in three protection configurations selected at JP1. The device in need of protection is connected to one of the three OUT test points 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 for protection (A) with the LTC4360-1 is controlled at JP2. Select ENABLE to enable the selected protection, or DISABLE to enter a low current sleep mode.

Protection (A) OV

The first selection at JP1 is protection (A) OV which protects against overvoltage. The LTC4360 turns on a single N-channel MOSFET when the input voltage is below the overvoltage threshold. An amber input LED indicates if the input supply is on while a green OUT(A) LED indicates the gate is on and the input is passed over to the output.

Protection (B) OV/NV

The second selection at JP1 is protection (B) OV/NV which protects against overvoltage and negative voltage. The LTC4360 turns on an N-channel MOSFET when the input voltage is below the overvoltage threshold. A P-channel MOSFET is driven by the GATEP pin of the LTC4360-2 to

protect the output against an inadvertent negative voltage connection at the input. The amber V_{IN} LED indicates if the input supply is on while a green OUT(B) LED indicates the gate is on and the input is passed over to the output. A red $-V_{IN}$ LED indicates if a negative input voltage is present.

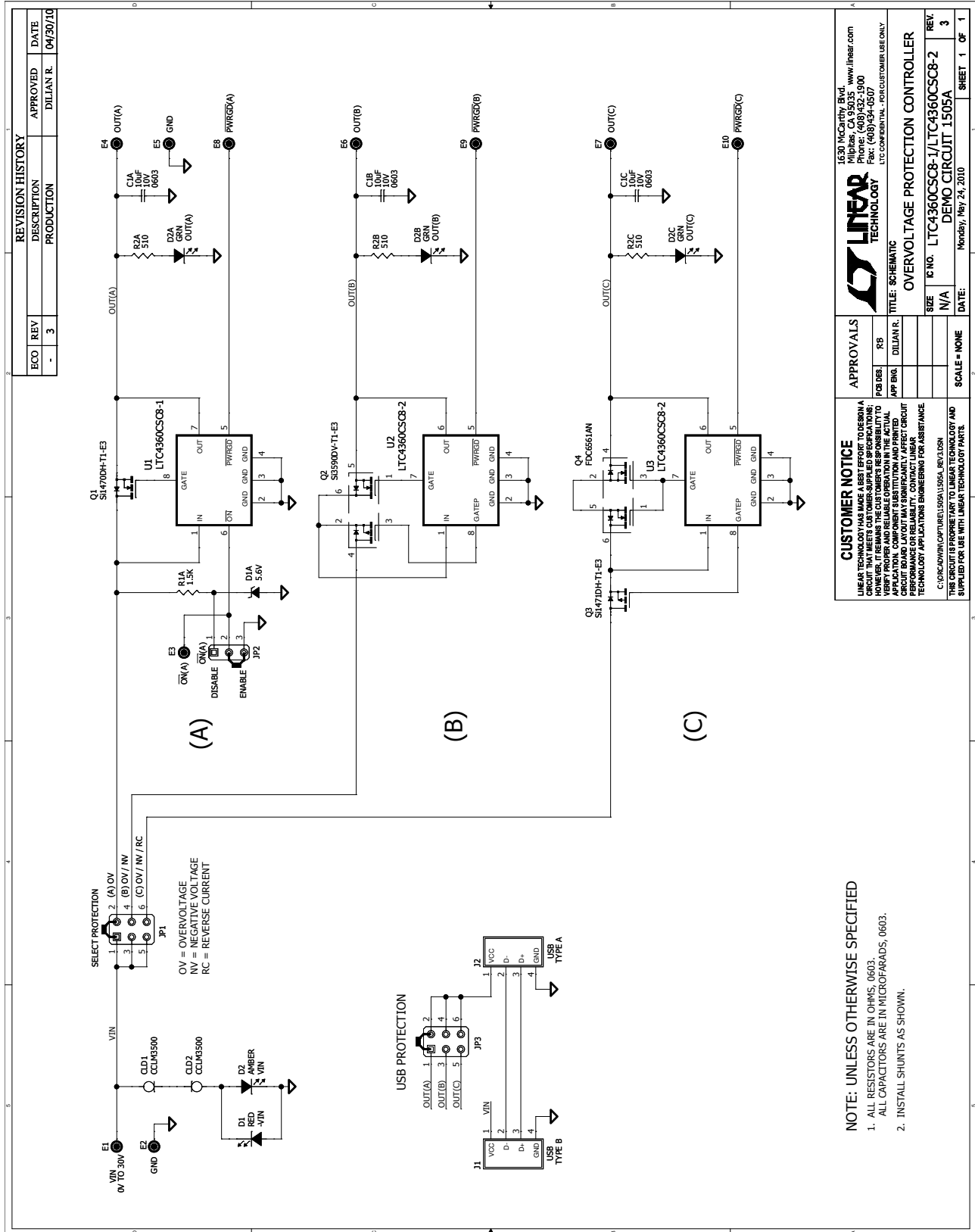
Protection (C) OV/NV/RC

The third selection at JP1 is protection (C) OV/OC/NV/RC which protects against overvoltage, overcurrent, negative voltage and reverse current. The LTC4360 turns on back-to-back N-channel MOSFETs when the input voltage is below the overvoltage threshold. The back-to-back N-channel MOSFETs blocks reverse current feeding in to the input. A P-channel MOSFET is driven by the GATEP pin of the LTC4360-2 to protect the output against an inadvertent negative voltage connection at the input. The amber V_{IN} LED indicates if the input supply is on while a green OUT(C) LED indicates the gate is on and the input is passed over to the output. The red $-V_{IN}$ LED indicates if a negative input voltage is present.

USB Protection

DC1505A also provides connection for USB protection. First connect a USB device with a USB cable at J2. Select the protection type at JP1 and match this with JP3. Select ENABLE at JP2. The USB source can then be connected at J1.

SCHEMATIC DIAGRAM



NOTE: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE IN OHMS, 0603.
2. ALL CAPACITORS ARE IN MICROFARADS, 0603.
3. INSTALL SHUNTS AS SHOWN.



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DEMO MANUAL DC1505A

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