

# LTC4361 Overvoltage/ Overcurrent Protection Controller

## DESCRIPTION

Demonstration circuit DC1506A features the LTC<sup>®</sup>4361 an overvoltage/overcurrent protection controller that safeguards 2.5V to 5.5V systems from input supply overvoltage. The LTC4361 is designed for portable devices with multiple power supply options including wall adapters, car battery adapters and USB ports.

The LTC4361 controls an external N-channel MOSFET in series with the input power supply. During overvoltage transients, the LTC4361 turns off the MOSFET within 1 $\mu$ s, isolating downstream components from the input supply. Inductive cable transients are absorbed by the MOSFET and load capacitance. In most applications, the LTC4361 provides protection from transients up to 80V without requiring transient voltage suppressors or other external components.

The LTC4361 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  $V_{\text{IN}}$ . The LTC4361

features a soft shutdown controlled by the  $\overline{\text{ON}}$  pin and drives an optional external P-channel MOSFET for negative voltage protection. Following an overvoltage condition, the LTC4361 automatically restarts with a start-up delay. After an overcurrent fault, the LTC4361-1 remains off while the LTC4361-2 automatically restarts after a 130ms start-up delay.

DC1506A demonstrates three protection schemes selected with a jumper: (A) overvoltage and overcurrent protection, (B) overvoltage, overcurrent, and negative voltage protection, and (C) overvoltage, overcurrent, negative voltage, and reverse current protection. Each option has  $\overline{\text{ON}}$  control, an output LED and can be applied to a USB protected output.

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

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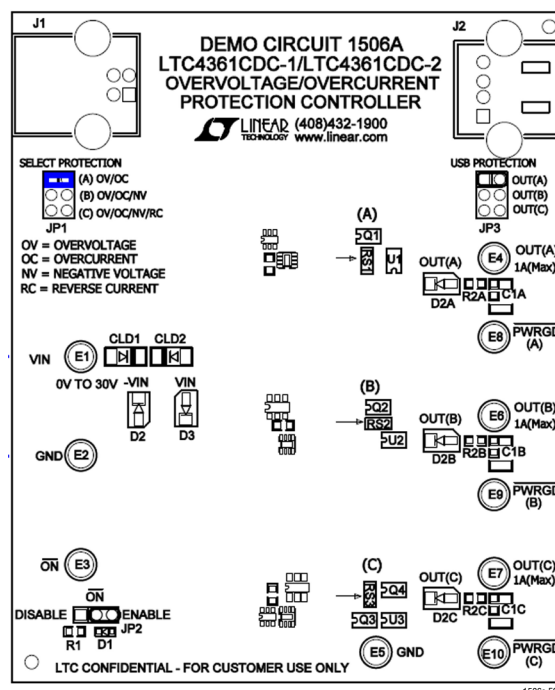


Figure 1. Demonstration Circuit 1506A

## PERFORMANCE SUMMARY

Table 1. Typical DC1506A Performance Summary ( $T_A = 25^\circ\text{C}$ )

PARAMETER	CONDITION	VALUE
Input Voltage	Protection (A) OV Protection (B) OV/OC/NV Protection (C) OV/OC/NV/RC	0V to 30V -30V to 30V -30V to 30V
Output Voltage	Input Range for Gate Turn-On	2.1V to 5.8V
Overcurrent Threshold	51m $\Omega$ Sense Resistor	980mA
Overcurrent Retry	Protection (A) OV/OC, LTC4361-1 Protection (B) OV/OC/NV, LTC4361-2 Protection (C) OV/OC/NV/RC, LTC4361-1	Latchoff Auto-Retry Latchoff

## QUICK START PROCEDURE

Demonstration circuit description 1506A is easy to set up to evaluate the performance of the LTC4361. 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 ENABLE at JP2 to enable the protection.
3. Select protection type at JP1 and connect a load and voltmeter across the corresponding output and GND:
  - a. For overvoltage and overcurrent protection select (A) OV/OC and connect to OUT(A). Figure 2a.
  - b. For overvoltage, overcurrent and negative voltage protection select (B) OV/OC/NV and connect to OUT(B). Figure 2b.
  - c. For overvoltage, overcurrent, negative voltage, and reverse current protection select (C) OV/OC/NV/RC, connect to OUT(C). Figure 2c.
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

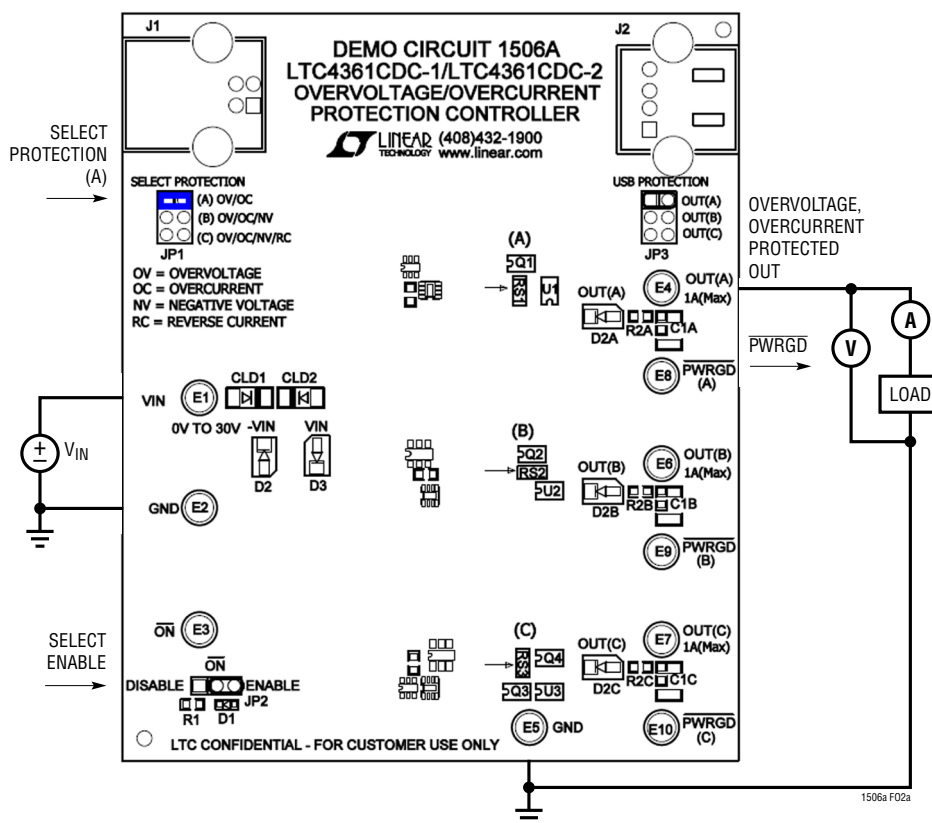


Figure 2a. DC1506A Protection (A) Setup for Overvoltage and Overcurrent

## QUICK START PROCEDURE

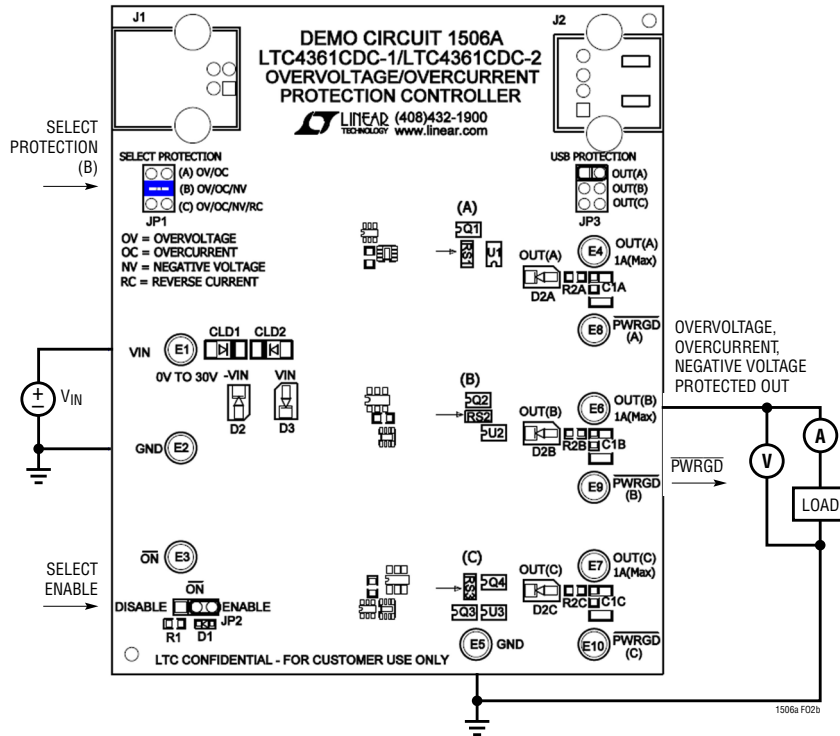


Figure 2b. DC1506A Protection (B) Setup for Overvoltage, Overcurrent and Negative Voltage

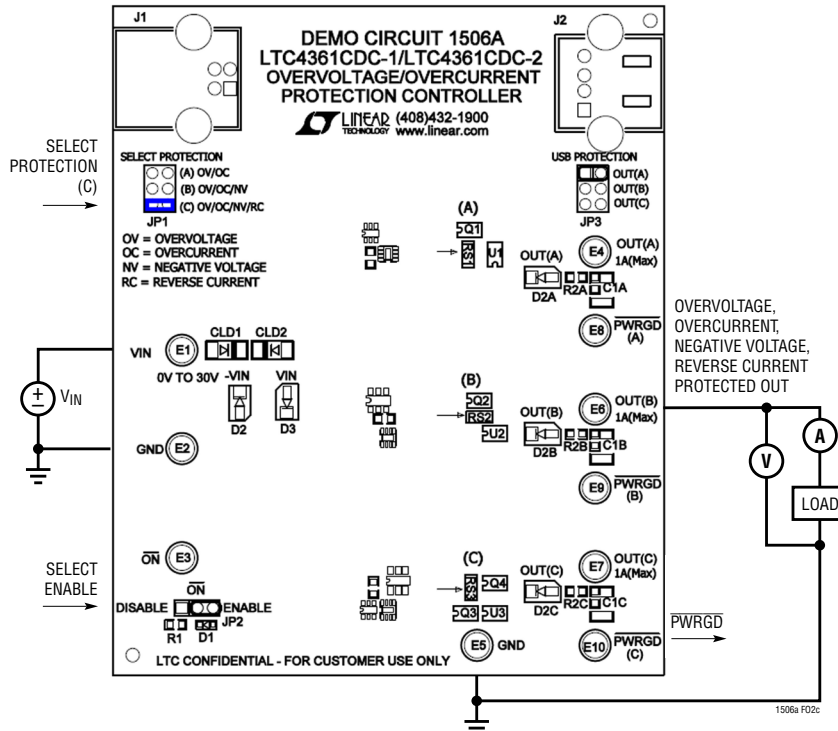


Figure 2c. DC1506A Protection (C) Setup for Overvoltage, Overcurrent, Negative Voltage, and Reverse Current

**QUICK START PROCEDURE**

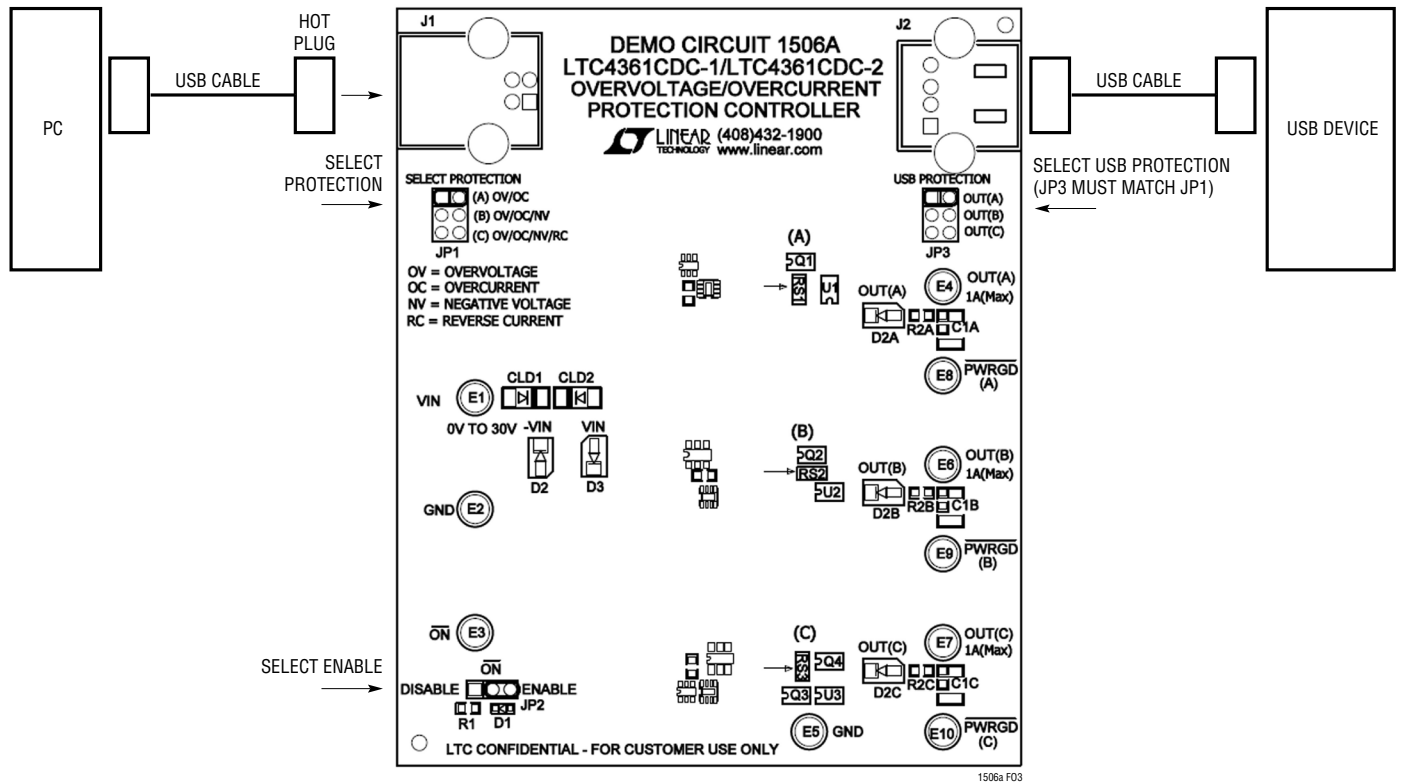


Figure 3. DC1506A USB Protection Setup

## QUICK START PROCEDURE

### OPERATION

The DC1506A is used to evaluate the LTC4361 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  $\overline{ON}$  pins on each of the three LTC4361s are tied together and controlled at JP2. Select ENABLE to enable the selected protection, or DISABLE to enter a low current sleep mode.

### Protection (A) OV/OC

The first selection at JP1 is protection (A) OV/OC which protects against overvoltage and overcurrent. The LTC4361 turns on a single N-channel MOSFET when the input voltage is below the overvoltage threshold. A Kelvin sense to the sense resistor in series with the power path provides overcurrent detection. In the case of an overcurrent, the LTC4361-1 used in protection (A) latches off and requires a power cycle to turn the MOSFET back on. 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/OC/NV

The second selection at JP1 is protection (B) OV/OC/NV which protects against overvoltage, overcurrent and negative voltage. The LTC4361 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 LTC4361 to protect the output against an inadvertent negative voltage connection at the input. A Kelvin sense to

the sense resistor in series with the power path provides overcurrent detection. In the case of an overcurrent, the LTC4361-2 used in protection (B) automatically retries to turn the 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 the input is passed over to the output. A red  $-V_{IN}$  LED indicates if a negative input voltage is present.

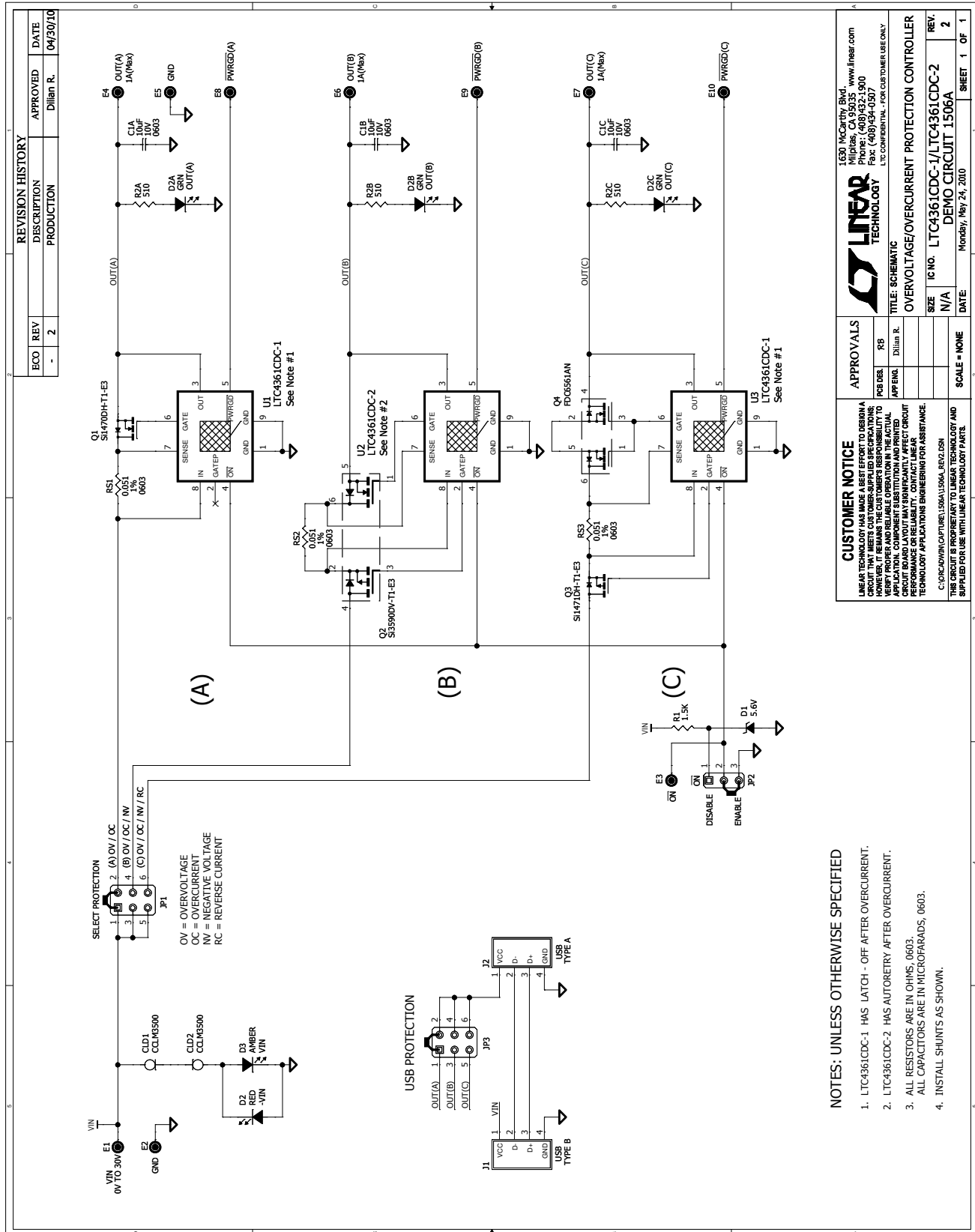
### Protection (C) OV/OC/NV/RC

The third selection at JP1 is protection (C) OV/OC/NV/RC which protects against over voltage, overcurrent, negative voltage and reverse current. The LTC4361 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 LTC4361 to protect the output against an inadvertent negative voltage connection at the input. A Kelvin sense to the sense resistor in series with the power path provides overcurrent detection. In the case of an overcurrent, the LTC4361-1 used in protection (C) latches off and requires a power cycle to turn the MOSFET back on. 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

DC1506A 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**



# DEMO MANUAL DC1506A

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