

## 40V, 350mA Step-Down Regulator with 2.5 $\mu$ A Quiescent Current and Integrated Diodes

### DESCRIPTION

Demonstration circuit 1566 is a monolithic step-down DC/DC switching regulator featuring the LT3970. The switching frequency is adjustable up to 2MHz. The demo circuit is designed for 5V, 350mA output from a 6V to 40V input. The wide input range of the LT3970 allows a variety of input sources including automotive batteries and 24V industrial supplies. Low ripple Burst Mode increases the efficiency at the light load while keeping the output ripple below 15mV. The part is in shutdown when the EN pin is low and active when the pin is high. The threshold of the EN pin is accurate at 1V when  $V_{IN}$  is above 4.2V. Adding a resistor divider from  $V_{IN}$  to EN can program the LT3970 to regulate the output only when  $V_{IN}$  is above a desired voltage.

The catch diode and boost diode are integrated to reduce the components count and solution size. The circuit consumes only 2 $\mu$ A of quiescent current. The current mode control scheme creates fast transient response and good loop stability. The catch diode current is limited to protect the part under short circuit and overvoltage conditions.

The LT3970 datasheet gives a complete description of the part, operation and application information. The datasheet must be read in conjunction with this quick start guide for demo circuit 1566.

**Design files for this circuit board are available. Call the LTC factory.**

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Performance Summary ( $T_A = 25^\circ\text{C}$ )

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		6V
Maximum Input Voltage		40V
Output Voltage $V_{OUT}$		5.04V $\pm 3\%$
Typical switching Frequency		600kHz
Maximum Output Current		350mA
Typical efficiency	$V_{IN}=12\text{V}$ , $I_{OUT}=350\text{mA}$	84.5%
Typical output voltage Ripple	$V_{IN}=12\text{V}$ , $I_{OUT}=350\text{mA}$	10mV

### QUICK START PROCEDURE

Demonstration circuit 1566 is easy to set up to evaluate the performance of the LT3970. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

**NOTE.** When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the  $V_{IN}$  or  $V_{OUT}$  and GND terminals. See Figure 2 for proper scope probe technique.

1. Place JP1 on the ON position.
2. With power off, connect the input power supply to VIN and GND.
3. Turn on the power at the input.
5. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

NOTE. Make sure that the input voltage does not exceed 40V.

4. Check for the proper output voltage.

NOTE. If there is no output, temporarily disconnect the load to make sure that the load is not set too high.

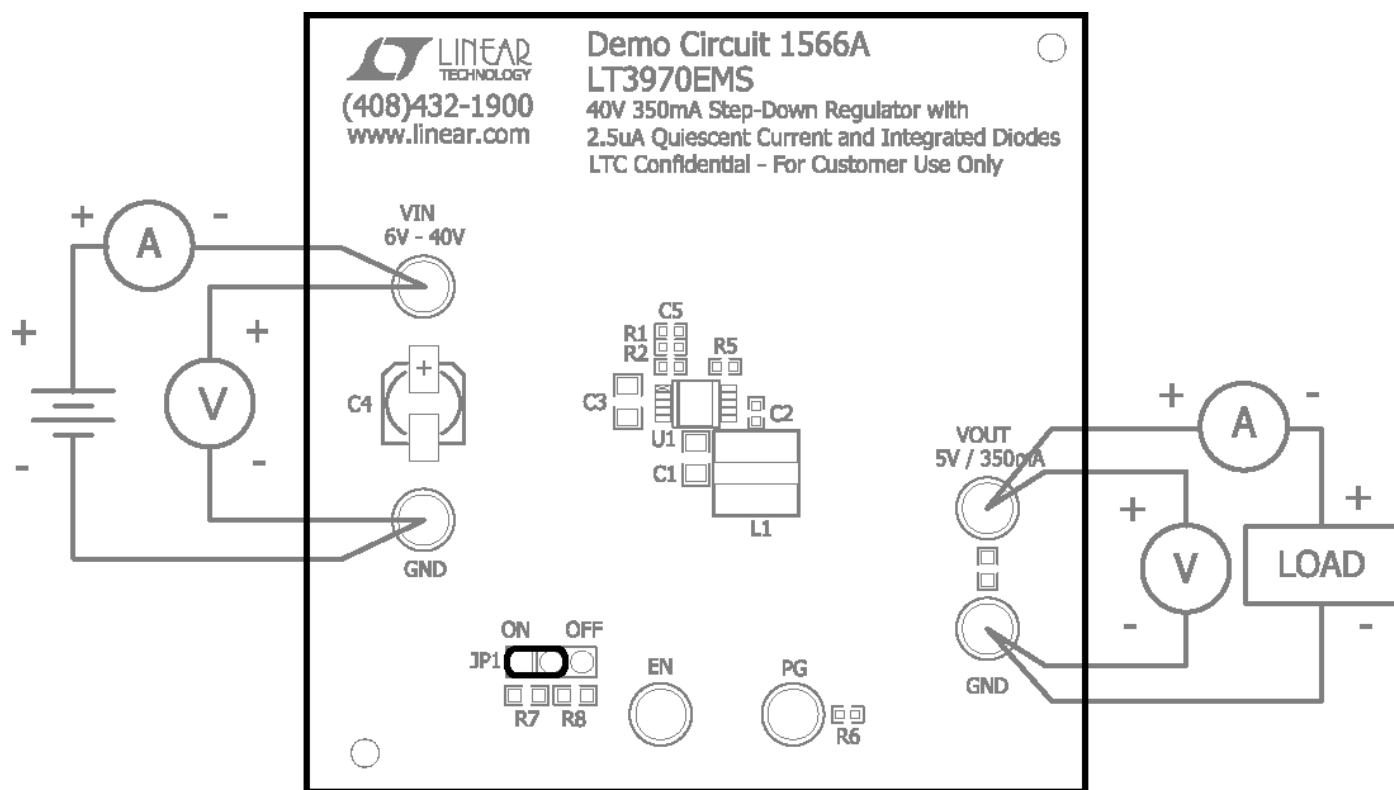
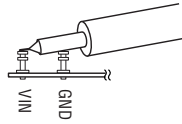
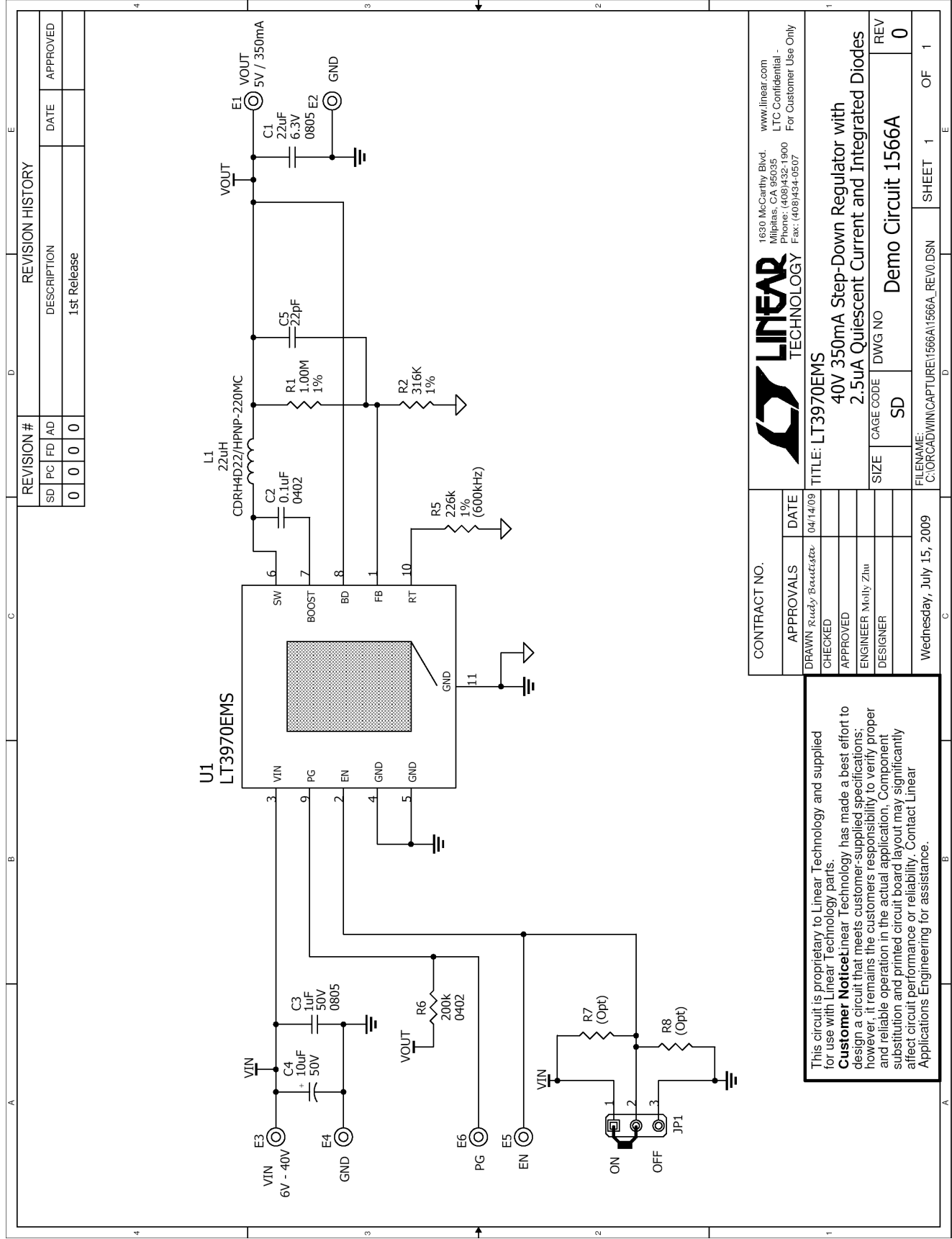


Figure 1. Proper Measurement Equipment Setup



**Figure 2. Measuring Input or Output Ripple**



REVISION HISTORY				
SD	PC	FD	AD	DATE
0	0	0	0	1st Release

CONTRACT NO.		DATE	
DRAWN: Rudy Baacksta		04/14/09	
CHECKED			
APPROVED			
ENGINEER: Muly Zhu			
DESIGNER			
Wednesday, July 15, 2009			
FILENAME: C:\ORCAD\WINCAPTURE\1566A\1566A_REV0.DSN		SHEET 1 OF 1	

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**TITLE: LT3970EMS**  
**40V 350mA Step-Down Regulator with**  
**2.5uA Quiescent Current and Integrated Diodes**  
 SIZE: SD CAGE CODE: DWG NO: REV: 0  
 Demo Circuit 1566A

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 customer's 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.