100 mA Buck-Boost Regulator Demonstration Board

FEATURES

- SiP1759 Demonstration Board includes the required components to evaluate the IC's performance
- Easy hook-up to demonstrate performance of the IC, stand alone or in a system
- Charge pump based IC
- 100 mA output

APPLICATIONS

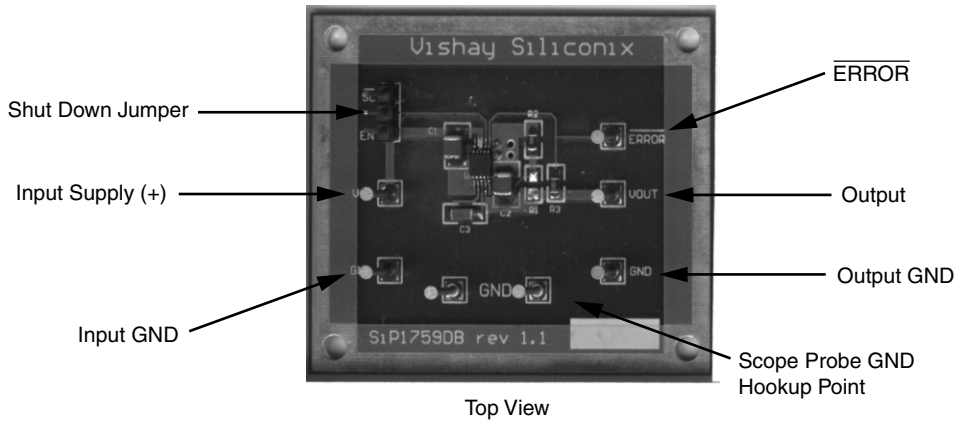
- 1-Cell Li Ion Battery Powered Equipment
- 2- to 3-Cell NiMH Battery Powered Equipment
- 2- to 3-Cell Alkaline Battery Powered Equipment
- Backup Battery Boost Converters

DESCRIPTION

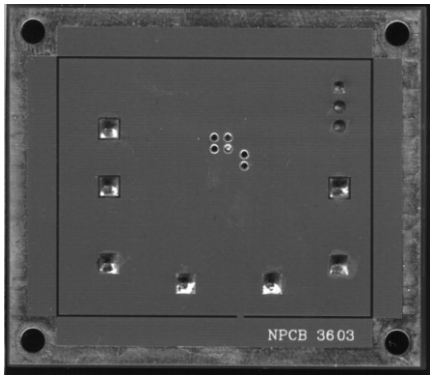
The Siliconix SiP1759DB Demonstration Board contains all the circuitry required to demonstrate the fully integrated buck-boost regulator. This demonstration board utilizes the adjustable output voltage version of the SiP1759, while the fixed output version may be preferable in an actual application.

In addition to allowing evaluation of the SiP1759's performance, the layout shows the small amount of PC board area required for implementation.

DEMONSTRATION BOARD HOOK UP

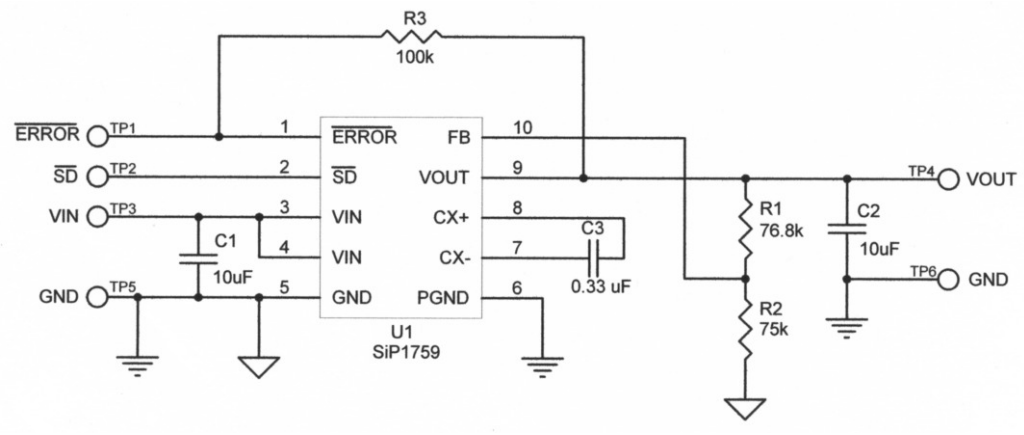


Top View



Bottom View

SCHEMATIC DIAGRAM



DEMONSTRATION BOARD OPERATION

1) To use the demo Board, connect a 1.6 to 5.5 V power supply to the Vin (TP3) & GND (TP5) pins.
2) Place a jumper between the center and EN pin to enable the regulator's operation. Connecting the center pin to the SD pin with disable or shut down the regulator.
3) A Load Resistor or Electronic Load should be connected to the V_{OUT} (TP4) & GND (TP6) pins in order to simulate typical loaded conditions for this type of circuit.

BILL OF MATERIAL

Item	Qty	Designator	Part Type	Description	Footprint	Manufacturer
1	2	C1, C2	10 µF	Cap, Ceramic, 10 V	1206	VISHAY
2	1	C3	0.33 µF	Cap, Ceramic, 10 V	1206	VISHAY
3	1	R1	76.8 k	Res Suface Mount	1206	VISHAY/DALE
4	1	R2	75 k	Res Suface Mount	1206	VISHAY/DALE
5	1	R3	100 k	Res Suface Mount	1206	VISHAY/DALE
6	1	U1	SiP1759DH	Power IC	MSOP-10	VISHAY/SILICONIX
7	6	TP1-6	Test Point	1 Pin Header	TP1	MULTI-SOURCE

CHOICE OF COMPONENTS

Output Voltage

The SiP1759 regulated output is set at 2.5 V for shipment. It can be adjusted from 2.5 V to 5.5 V via resistor divider network from V_{OUT} to GND. R1 and R2 should be kept in the 50 kΩ to 100 kΩ range for low power consumption, while maintaining adequate noise immunity. The value R1 is calculated using the following formula:

$$R1 = R2((VOUT/VFB)-1)$$

VFB is nominally 1.235 V.

Capacitor Selection

The value for the C_{IN} and C_{OUT} capacitors is 10 µF and the value of the C_X capacitor is 0.33 µF.

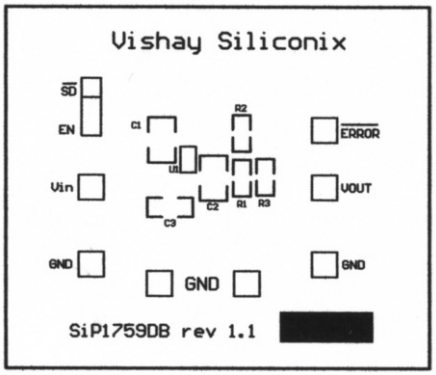
Capacitor selection for C_{IN}, C_{OUT} and CX will have an impact on the voltage output ripple, output current and overall physical size of the circuit.

Ceramic capacitors are recommenced for their low ESR, (≤ 20 mΩ), which will help keep the output voltage ripple at a minimum.

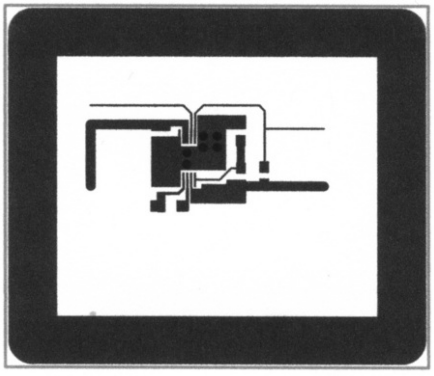
Output Voltage Ripple

The SiP1759 automatically decides whether to be in step up mode or step down mode depending on the V_{IN}, V_{OUT} and current load conditions, therefore the voltage output ripple will vary. In step-up mode the voltage output ripple is higher than step-down mode. But unless V_{IN} is significant larger than V_{OUT} ($V_{IN} \geq V_{OUT}$ + 1 V), in heavy load the IC will slip from buck mode to boost mode as necessary to charge the transfer capacitor and the ripple will increase. Reducing the C_X capacitor value will cause an increase in the swit-ching frequency and a reduction of the output ripple.

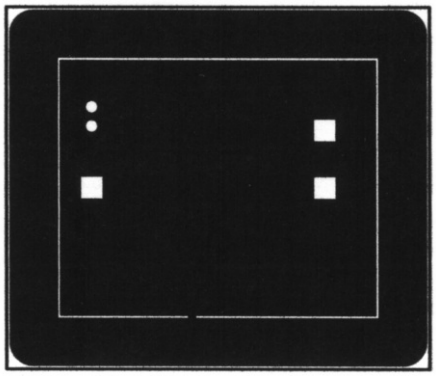
PRINTED CIRCUIT BOARD



Top Silk Screen

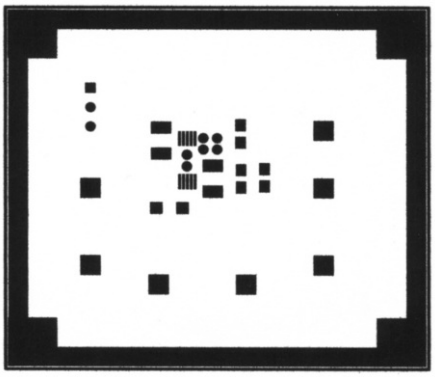


Top Layer

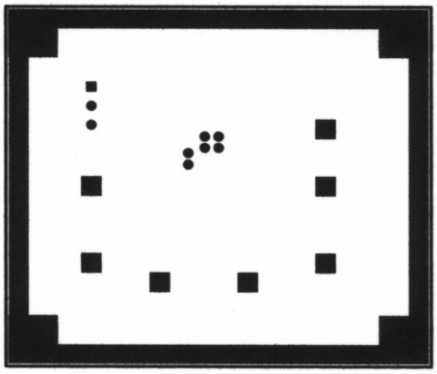


Bottom Layer

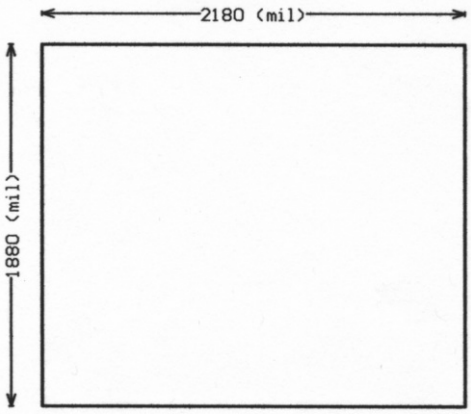
PRINTED CIRCUIT BOARD



Top Solder Mask



Bottom Solder Mask



Mechanical

TYPICAL WAVEFORMS

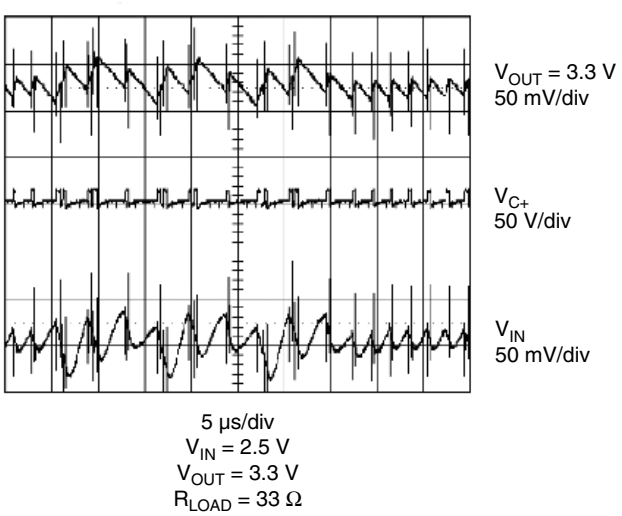


Figure 1. Typical Switching Waveform (V_{OUT} > V_{IN})

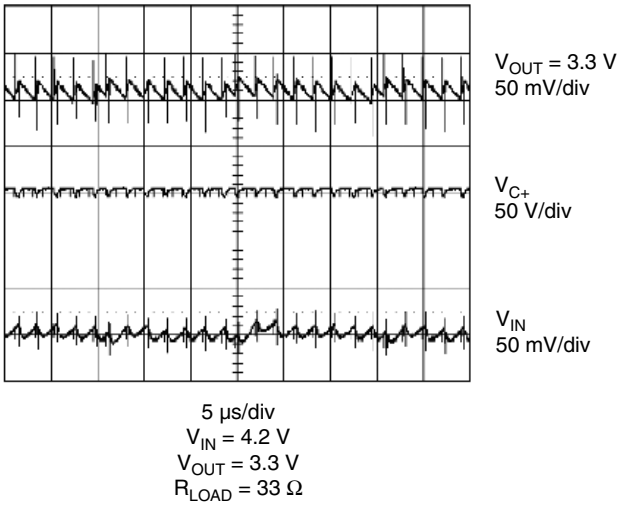


Figure 2. Typical Switching Waveform (V_{OUT} < V_{IN})

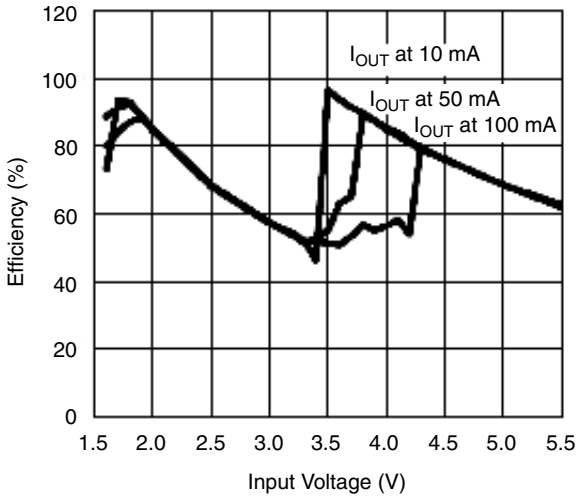


Figure 3. Efficiency vs. Input Voltage

ORDERING INFORMATION		
Part Number	**Marking**	**Temperature Range**
SiP1759DB	SiP1759DB	- 40 to 85 °C