LOW VOLTAGE STEP-UP DC-DC CONVERTER

SC1633

January 29, 1998

TEL:805-498-2111 FAX:805-498-3804 WEB:http://www.semtech.com

DESCRIPTION

The SC1633 is a high efficiency step up DC-DC converter. Only four external components are required to deliver a fixed voltage of 3V, 3.3V, or 5V. Efficiency beyond 83% can be easily achieved at 70mA load with 2.2V to 3V input voltages.

A logic-controlled shutdown mode is provided for power saving. Switch current limit can be programmed with a resistor. The low battery detector can be configured as a linear regulator or a burst mode controller providing extremely low supply current operation.

A switching rate of 120kHz reduces the inductor size - inductors of 47µH to 150µH inductance are recommended for most applications.

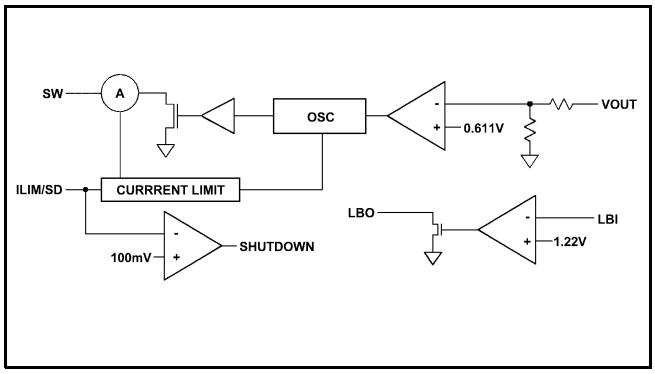
FEATURES

- High efficiency 87%
- Power-saving shutdown mode (7µA typical)
- Internal 0.8A switch
- 120kHz switching rate
- Adjustable switch current limit
- On-chip low battery detector

APPLICATIONS

- Pocket organizers
- Electronic dictionaries
- Cameras
- Pagers
- Bar code scanners
- LCD displays
- Battery backup supplies
- Portable instruments

BLOCK DIAGRAM



ORDERING INFORMATION

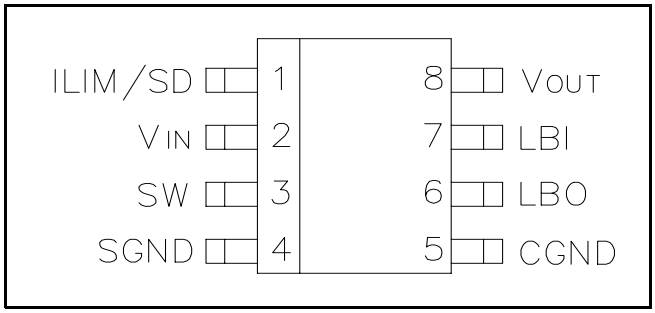
DEVICE(1)	VOLTAGE	PACKAGE
SC1633CS SC1633-3CS SC1633-5CS	3.3V 3.0V 5.0V	SO-8

Note:
(1) Add suffix 'TR' for tape and reel.

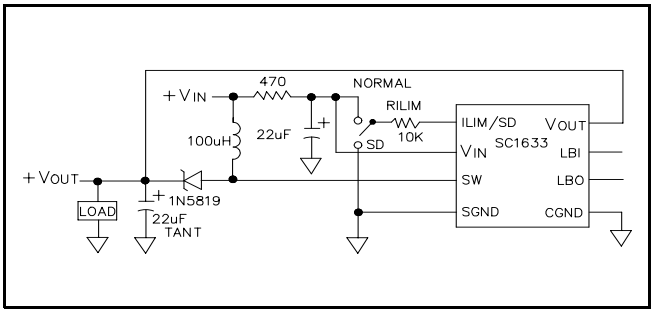
ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Maximum	Units
Supply Voltage	V_{IN}	7.0	V
Operating Temperature Range	T_A	0 to 70	°C
Storage Temperature Range	T_{STG}	-65 to 125	°C

PIN CONFIGURATION



TYPICAL APPLICATION CIRCUIT



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ELECTRICAL CHARACTERISTICS

Unless otherwise specified, T_A = 25°C, V_{IN} = 3.0V

Parameter	V_{IN}	I_L	Min	Typ	Max	Units
Input Voltage			1.8		7.0	V
Output Voltage SC1633 SC1633-3 SC1633-5		I_L = 70mA	 3.16 2.88 4.80	 3.30 3.00 5.00	 3.44 3.12 5.20	V
Switch Off Current				105	140	µA
No Load Current SC1633/SC1633-3 SC1633-5				 160 250		µA
Shutdown Mode Current				7	15	µA
Shutdown Recovery Time	V_{IN}=2.5V	I_L=70mA		1.8		msec
Efficiency SC1633/SC1633-3 SC1633-5		I_L=70mA		 87 86		%
Line Regulation SC1633 SC1633-3 SC1633-5	 V_{IN}=2.0 - 3.3V V_{IN}=2.0 - 3.0V V_{IN}=2.2 - 4.5V	I_L=40mA		 0.6 0.6 0.5		%V_{OUT}
Load Regulation SC1633/SC1633-3 SC1633-5		I_L=1mA - 70mA		 0.6 0.5		%V_{OUT}
Oscillator Frequency			90	120	150	kHz
LBI Pin Trip Point			1.17	1.22	1.27	V
LBO “On Resistance”	V_{IN} = 2V			45		Ω
SW “On Resistance” SC1633/SC1633-3 SC1633-5				 1.75 1.25		Ω
SW Off Leakage					1	µA
Input Pin Bias Current					10	nA/Pin
Output Pin Leakage					10	nA/Pin

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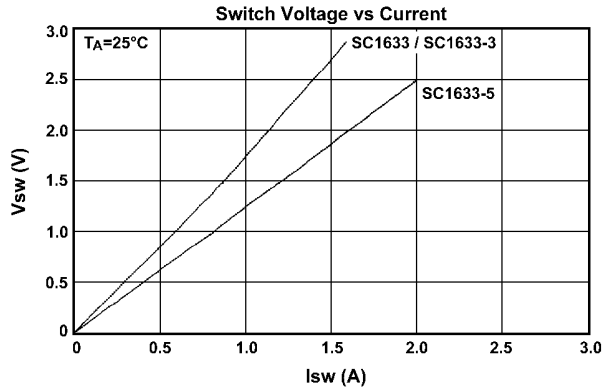
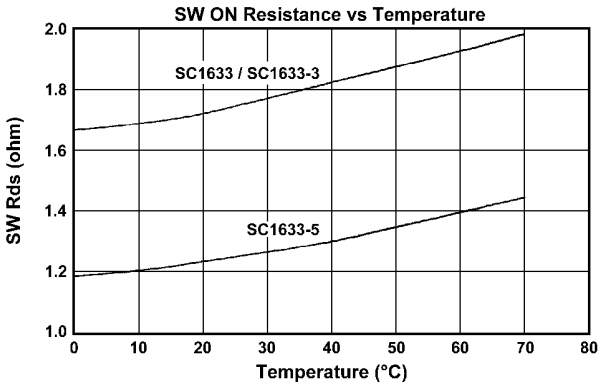
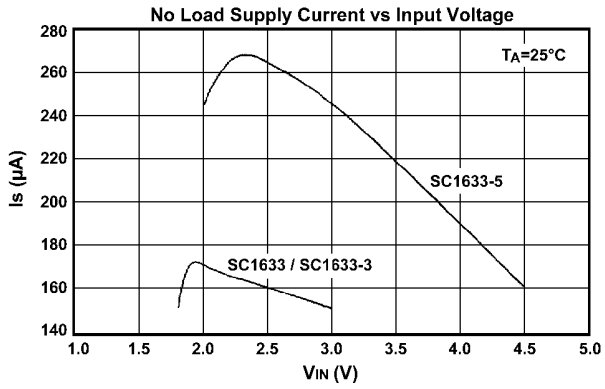
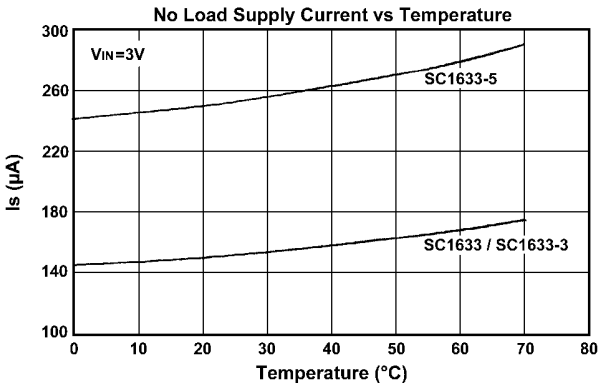
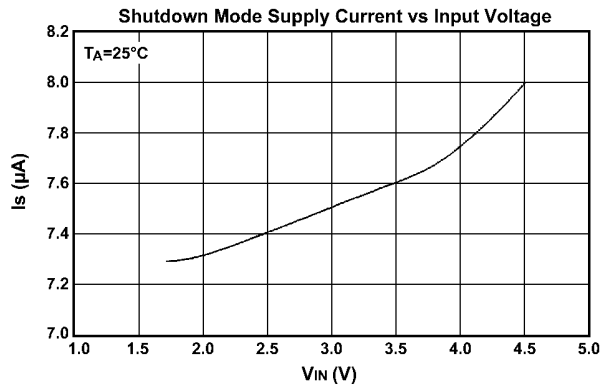
TYPICAL PERFORMANCE CHARACTERISTICS

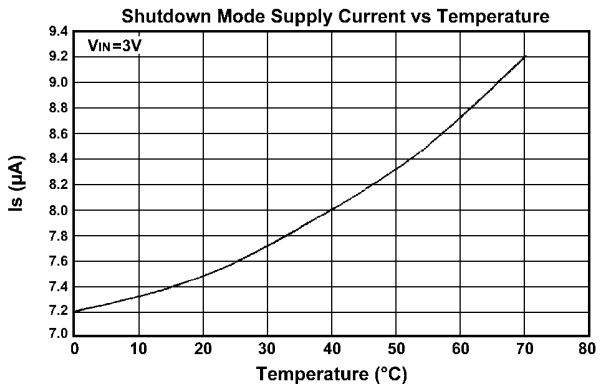












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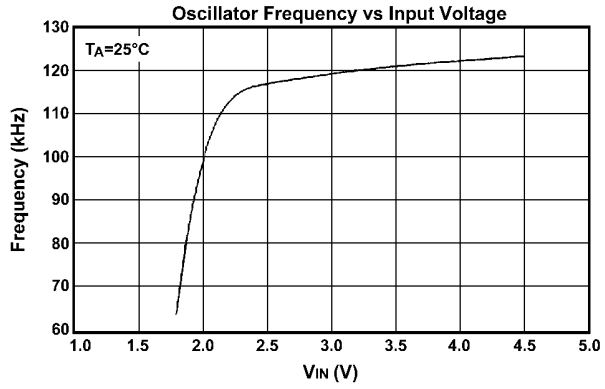
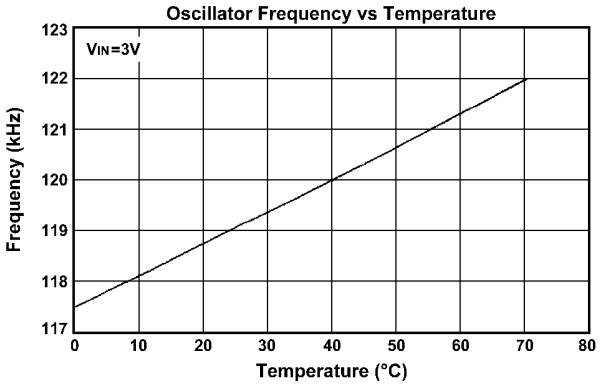
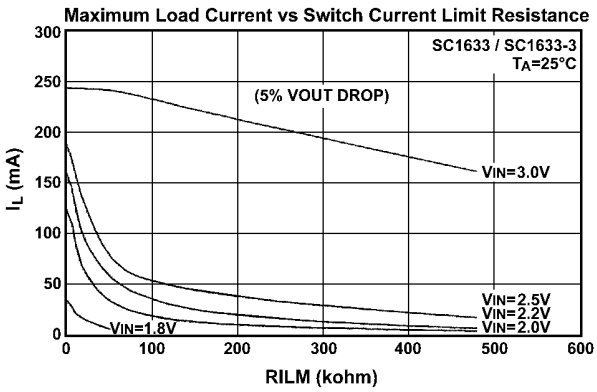
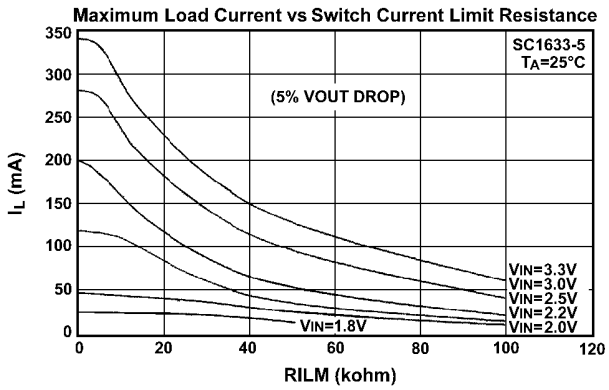
TYPICAL PERFORMANCE CHARACTERISTICS (cont.)

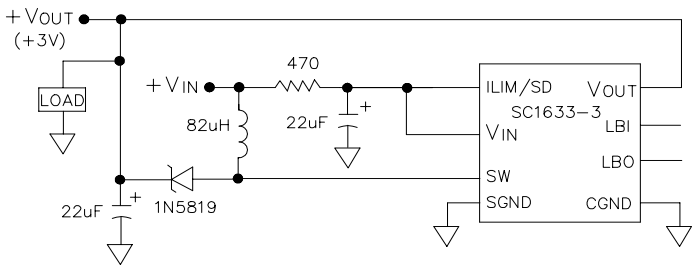








APPLICATION EXAMPLES



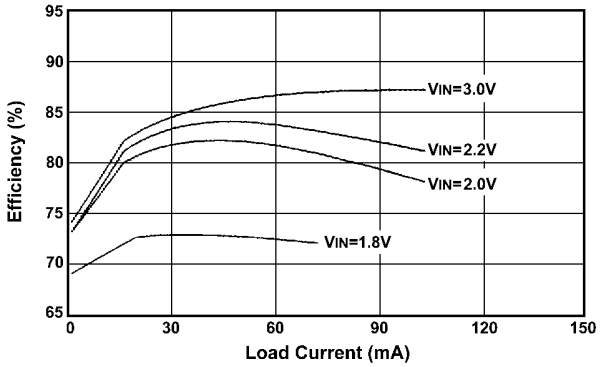


Figure 1. 3V Output Step-Up Converter

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APPLICATION EXAMPLES (cont.)

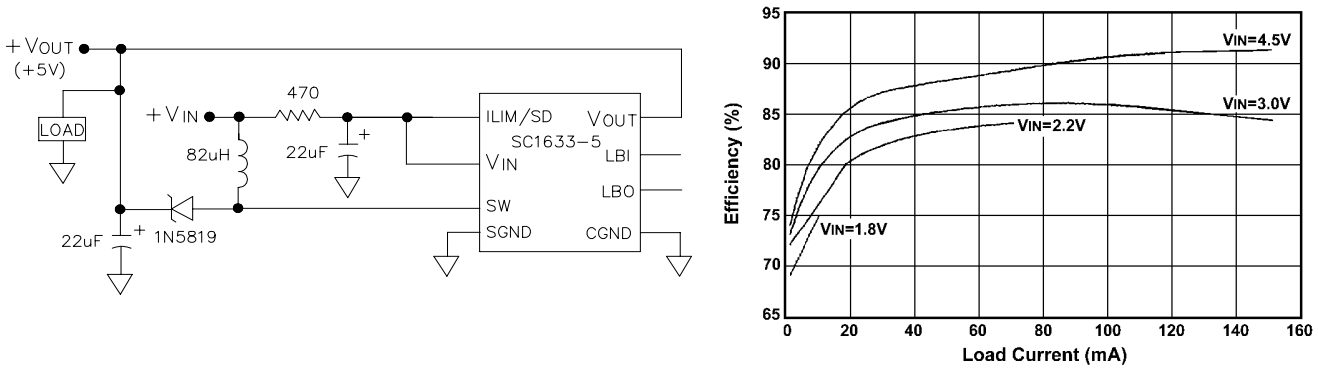

Figure 2. 5V Output Step-Up Converter

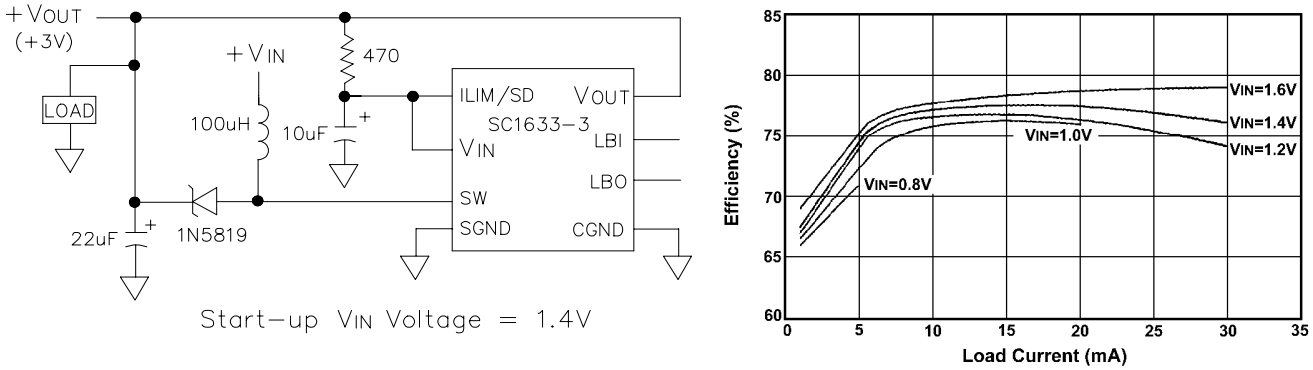

Figure 3. 1-Cell Input 3V Output Step-Up Converter

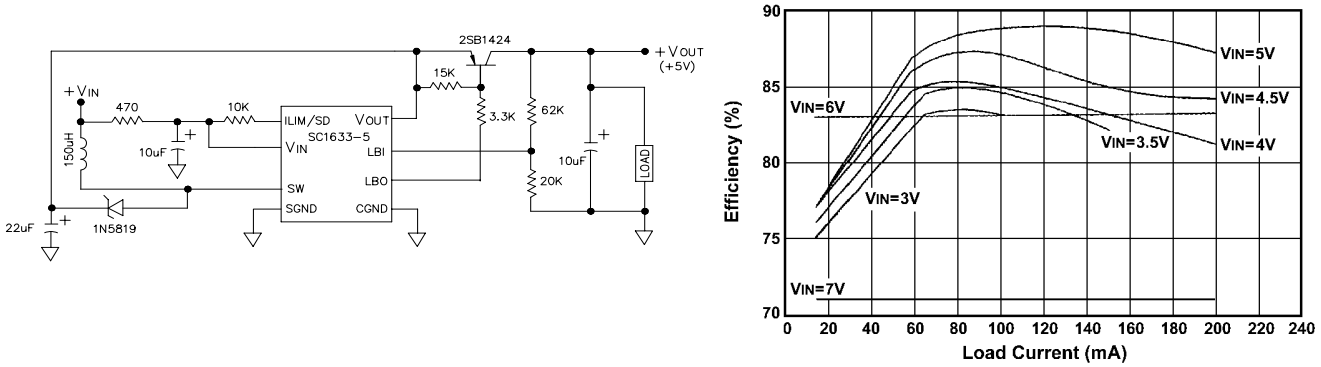

Figure 4. 4-Cell Input Step-Up/Step-Down Converter

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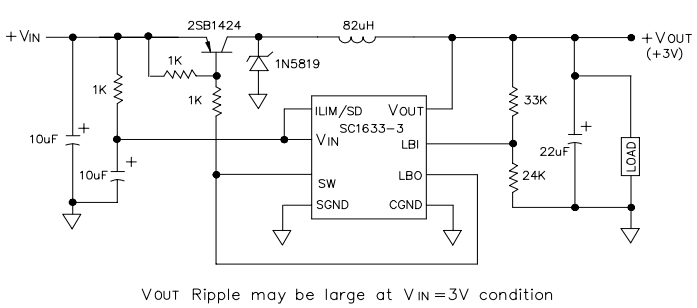
APPLICATION EXAMPLES (cont.)



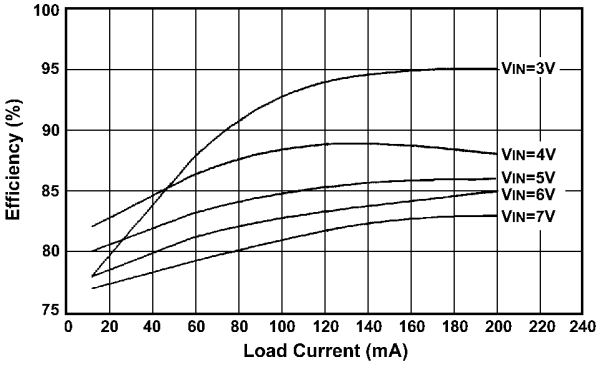
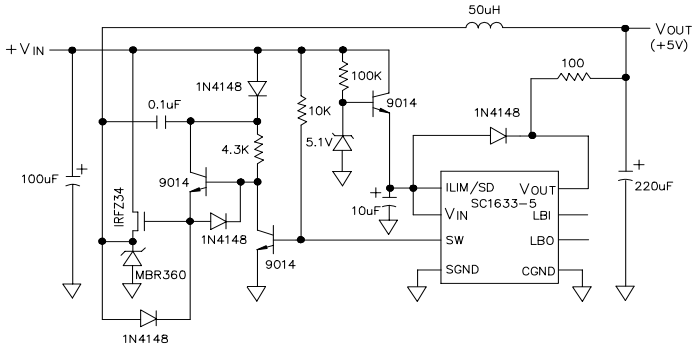


Figure 5. 3-Cell Input 3V Output Step-Down Converter



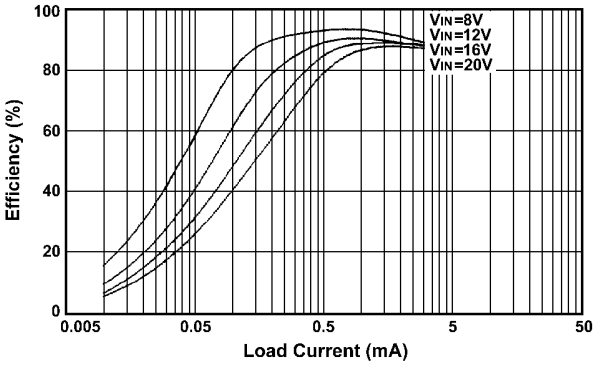


Figure 6. Boost-Drive 5V Output Step-Down Converter

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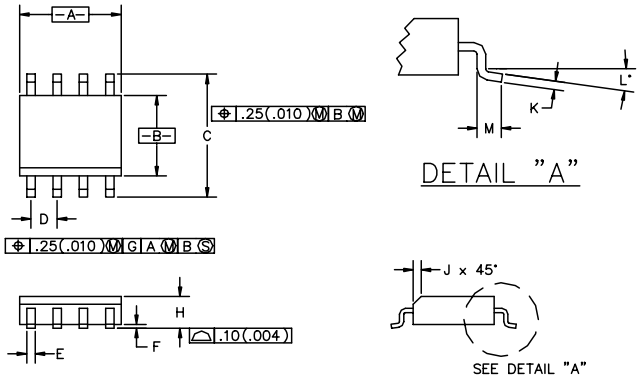
DEVICE OUTLINE - SO-8



DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	.188	.197	4.80	5.00	
B	.149	.158	3.80	4.00	
C	.228	.244	5.80	6.20	
D	.050	BSC	1.27	BSC	
E	.013	.020	0.33	0.51	
F	.004	.010	0.10	0.25	
H	.053	.069	1.35	1.75	
J	.011	.019	0.28	0.48	
K	.007	.010	.19	.25	
L	0°	8°	0°	8°	
M	.016	.050	0.40	1.27	

PIN DESCRIPTIONS

PIN 1: I_{LIM}/SD (1) Connected to V_{IN} pin through a resistor to set the switch peak current. It serves to protect the IC and inductor, as well as to improve efficiency and output ripple. However, the supply capability of the SC1633 is limited by the current limit resistor (see typical performance characteristics). The I_{LIM}/SD pin should be shorted to V_{IN} if limiting switch peak current is not required.
(2) The SC1633 goes into shutdown mode and consumes less than 10µA when the I_{LIM}/SD pin is pulled to ground.

PIN 2: V_{IN} Input supply.

PIN 3: SW Drain of the power switch, to be connected to the inductor and diode.

PIN 4: SGND Ground connected to the source of the power switch.

PIN 5: CGND Ground for control circuits of the IC. It should be separated from SGND to avoid interference.

PIN 6: LBO Open drain output of the battery low detector, with 45 Ohm "On Resistance" at V_{IN}=2V. It is pulled low when the voltage on the LBI pin is below 1.22 volts.

PIN 7: LBI The inverting input of the battery low detector, of which the non-inverting input is internally connected to the 1.22V voltage reference.

PIN 8: V_{OUT} The output voltage feeds back to the IC through this pin.

PIN CONFIGURATION