

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 47 $\mu$ H to 150 $\mu$ H inductance are recommended for most applications.

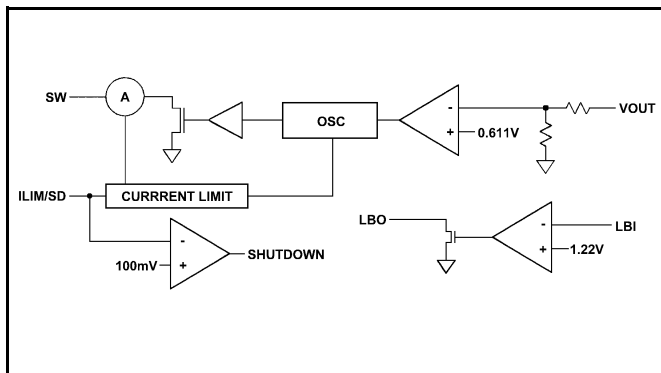
## FEATURES

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

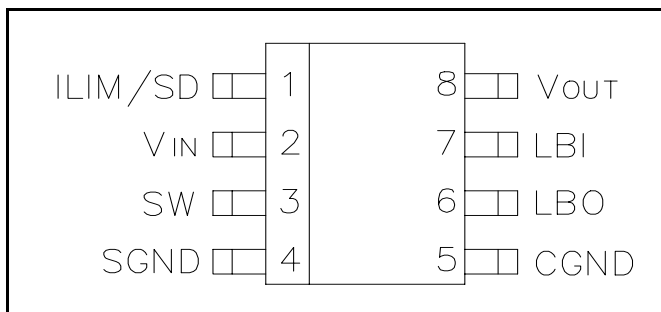
## APPLICATIONS

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

## BLOCK DIAGRAM



## PIN CONFIGURATION



## ORDERING INFORMATION

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

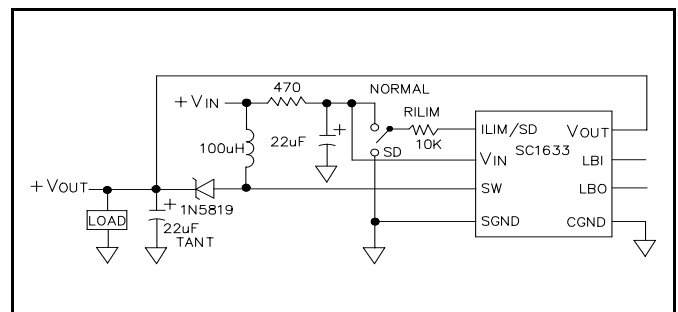
Note:

(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	$^{\circ}$ C
Storage Temperature Range	$T_{STG}$	-65 to 125	$^{\circ}$ C

## TYPICAL APPLICATION CIRCUIT



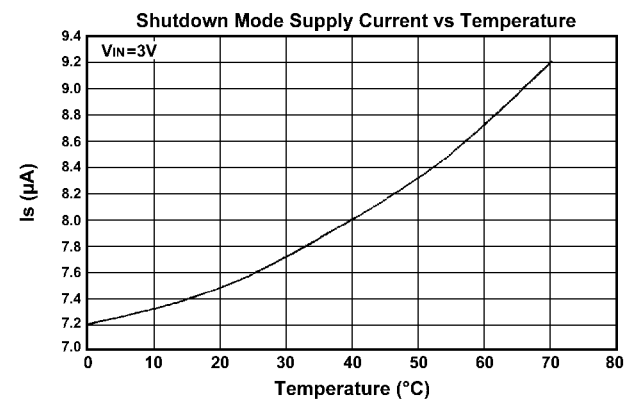
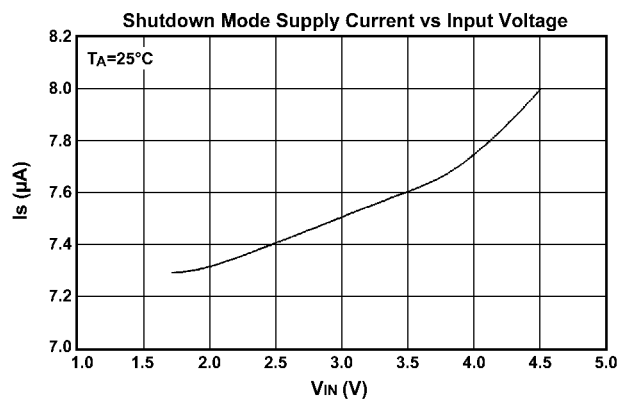
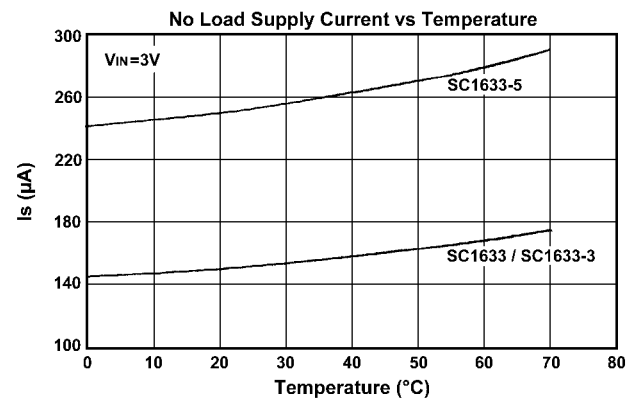
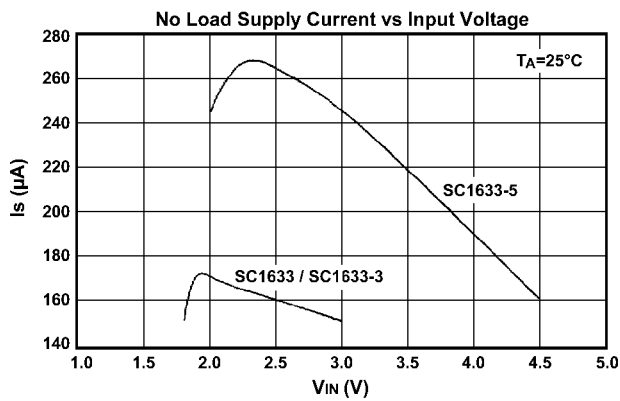
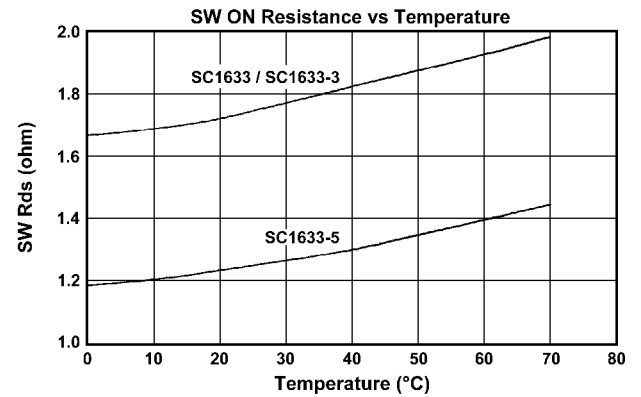
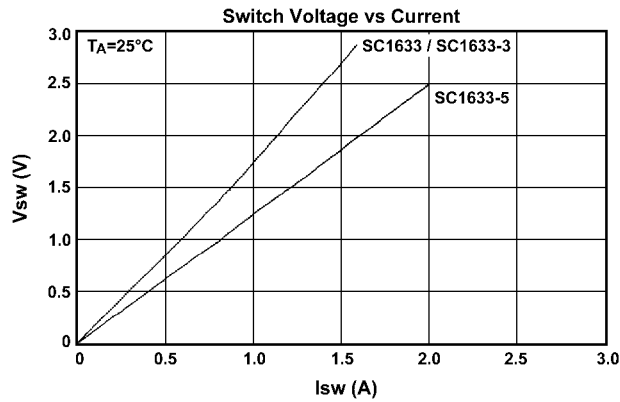
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**ELECTRICAL CHARACTERISTICS**

 Unless otherwise specified,  $T_A = 25^\circ\text{C}$ ,  $V_{IN} = 3.0\text{V}$ 

Parameter	$V_{IN}$	$I_L$	Min	Typ	Max	Units
Input Voltage			1.8		7.0	V
Output Voltage SC1633 SC1633-3 SC1633-5		$I_L = 70\text{mA}$	3.16 2.88 4.80	3.30 3.00 5.00	3.44 3.12 5.20	V
Switch Off Current				105	140	$\mu\text{A}$
No Load Current SC1633/SC1633-3 SC1633-5				160 250		$\mu\text{A}$
Shutdown Mode Current				7	15	$\mu\text{A}$
Shutdown Recovery Time	$V_{IN}=2.5\text{V}$	$I_L=70\text{mA}$		1.8		msec
Efficiency SC1633/SC1633-3 SC1633-5		$I_L=70\text{mA}$		87 86		%
Line Regulation SC1633 SC1633-3 SC1633-5	$V_{IN}=2.0 - 3.3\text{V}$ $V_{IN}=2.0 - 3.0\text{V}$ $V_{IN}=2.2 - 4.5\text{V}$	$I_L=40\text{mA}$		0.6 0.6 0.5		$\%V_{OUT}$
Load Regulation SC1633/SC1633-3 SC1633-5		$I_L=1\text{mA} - 70\text{mA}$		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"	$V_{IN} = 2\text{V}$			45		$\Omega$
SW "On Resistance" SC1633/SC1633-3 SC1633-5				1.75 1.25		$\Omega$
SW Off Leakage					1	$\mu\text{A}$
Input Pin Bias Current					10	nA/Pin
Output Pin Leakage					10	nA/Pin

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**TYPICAL PERFORMANCE CHARACTERISTICS**


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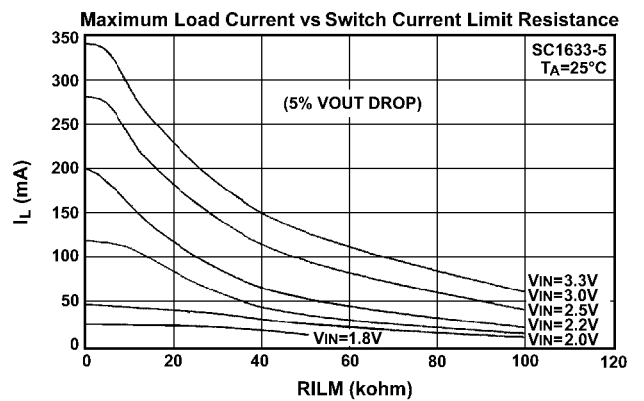
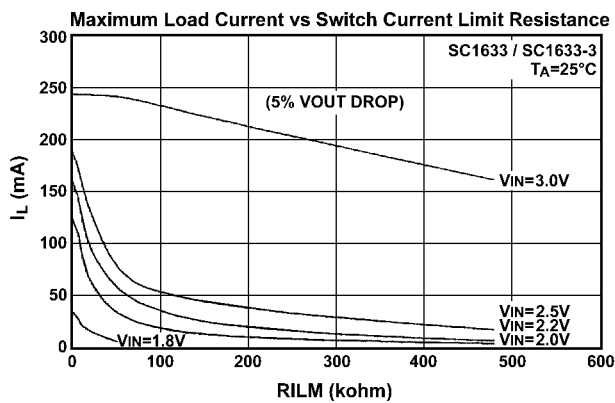
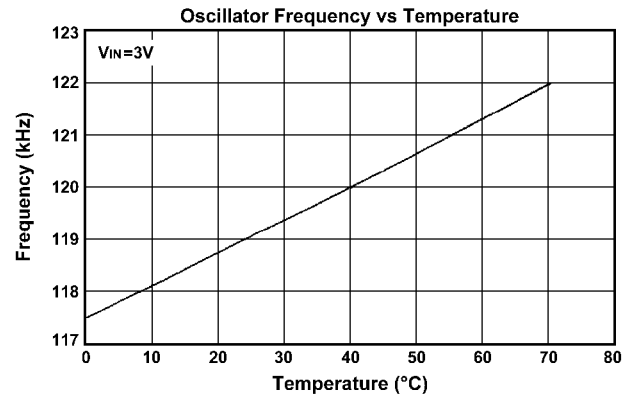
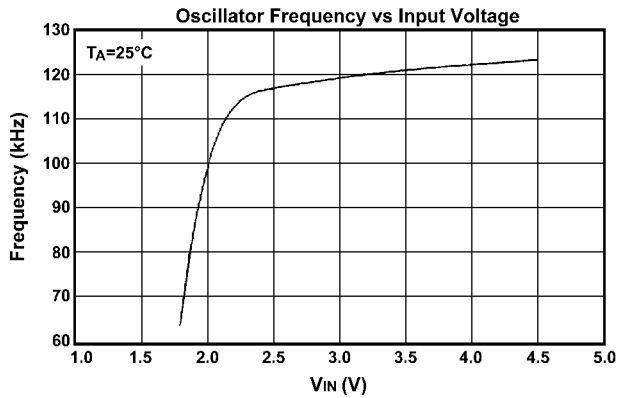
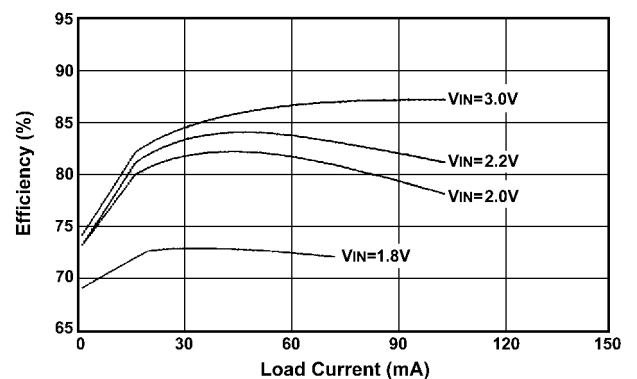
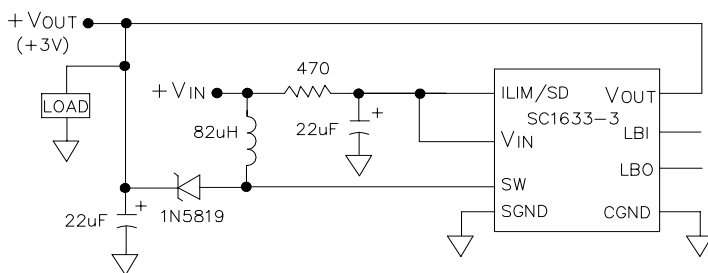
**TYPICAL PERFORMANCE CHARACTERISTICS (cont.)**

**APPLICATION EXAMPLES**


Figure 1. 3V Output Step-Up Converter

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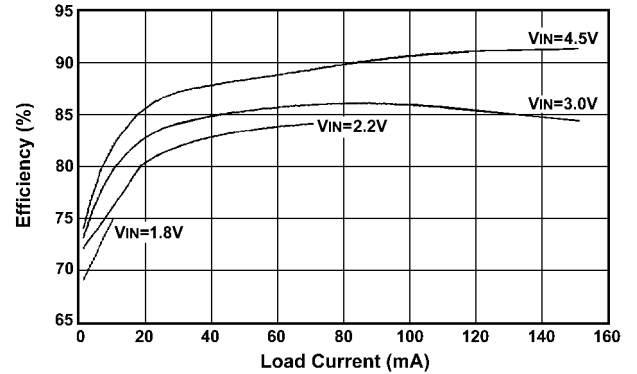
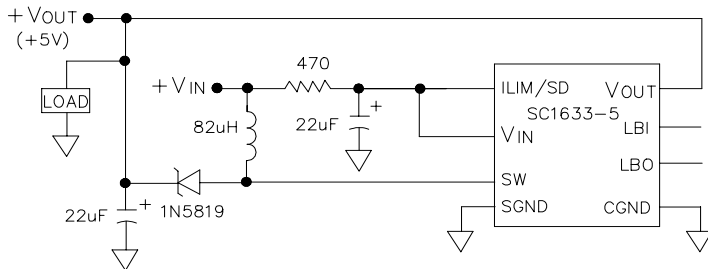
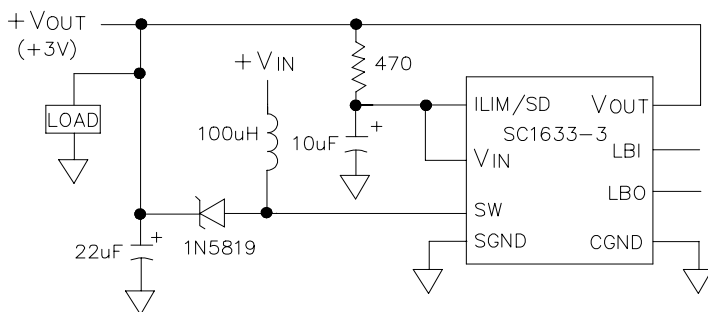
**APPLICATION EXAMPLES (cont.)**


Figure 2. 5V Output Step-Up Converter



Start-up VIN Voltage = 1.4V

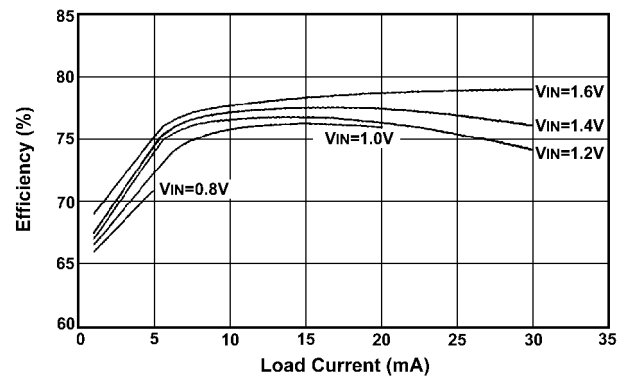


Figure 3. 1-Cell Input 3V Output Step-Up Converter

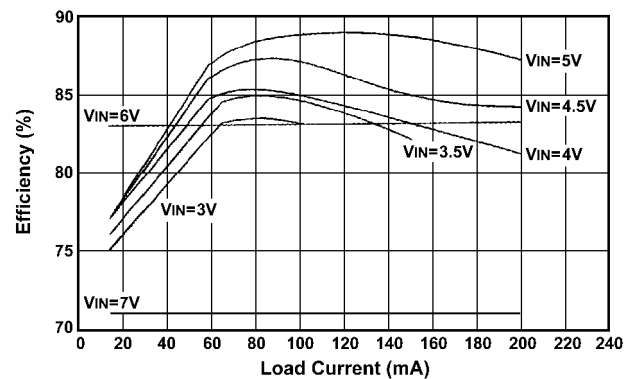
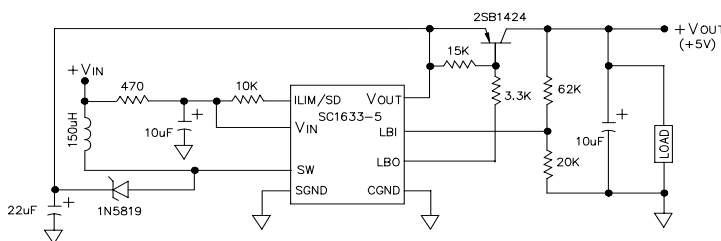


Figure 4. 4-Cell Input Step-Up/Step-Down Converter

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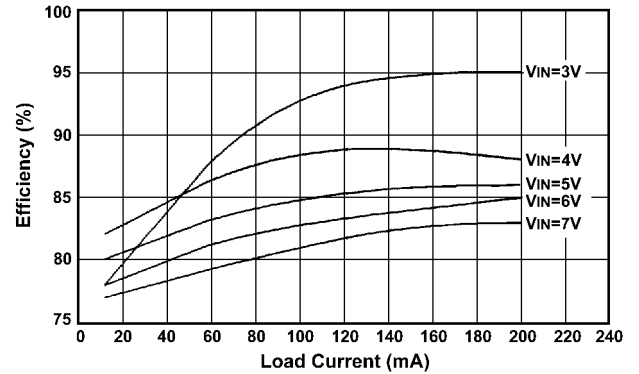
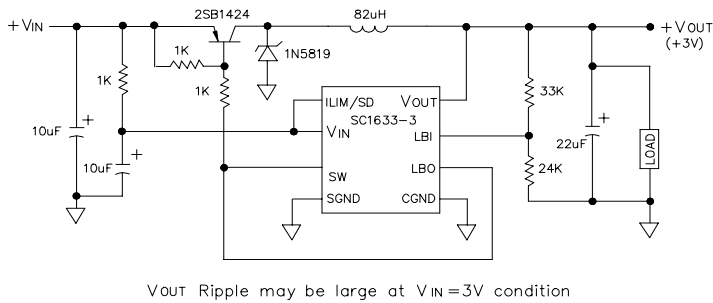
**APPLICATION EXAMPLES (cont.)**


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

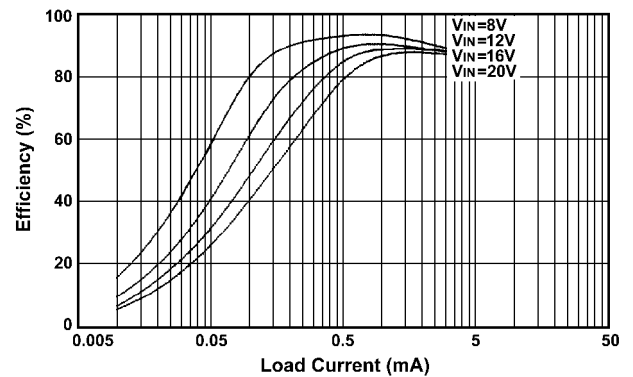
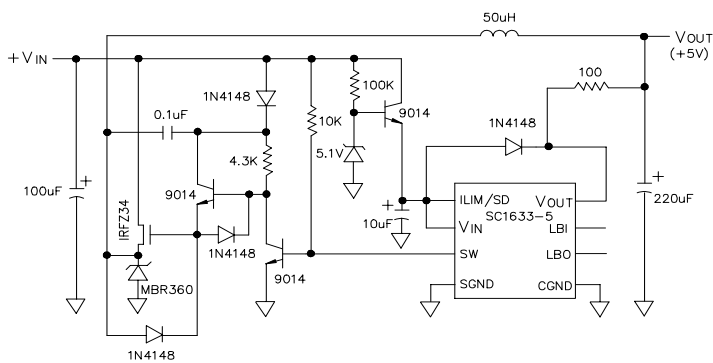
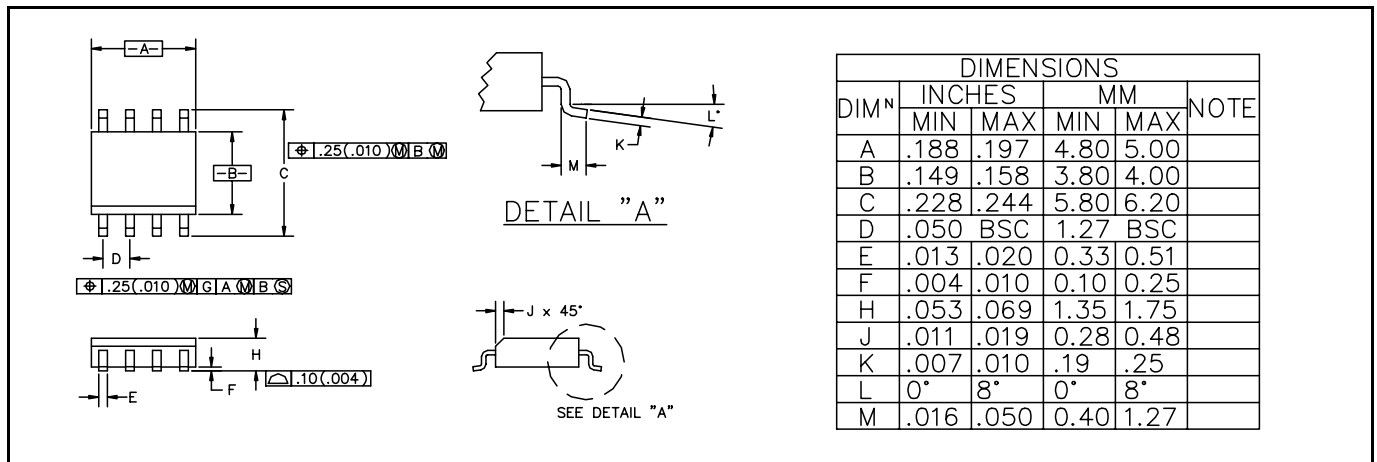


Figure 6. Boost-Drive 5V Output Step-Down Converter

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**DEVICE OUTLINE - SO-8**

**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  $10\mu A$  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**
