800mA Synchronous Buck DC/DC Converter

Description

The SC11A08 is high efficiency synchronous, PWM step-down DC/DC converters working under an input voltage range from 2.5V to 5.5V. This feature makes the SC11A08 suitable for single Li-Lon battery-powered applications. 100% duty cycle capability extends battery life in portable devices, while the quiescent current is 200μA with no load, and drops to < 1μA in shutdown.

The internal synchronous switch is desired to ncrease efficiency without an external Schottky diode. The 1.0 MHz fixed switching frequency allows the using of tiny, low profile inductors and ceramic capacitors, which minimized overall solution footprint.

The SC11A08 converters are available in the industry standard SOT-23-5 power packages (or upon request).

Features

- **Up to 95% Efficiency**
- **Current Mode Operation for Excellent Line and Load Transient Response**
- **Low Quiescent Current: 200μA**
- **Low Switch on Resistance RDS(ON), Internal Switch:0.35Ω**
- **Output Voltage: 5.5V ~ 0.6V**
- **Automatic PWM/PFM Mode Switching**
- **No Schottky Diode Required**
- **1.2MHz Fixed Frequency Switching**
- **Short-Circuit Protection**
- **Shutdown Quiescent Current: < 1μA**
- **Low Profile SOT-23-5 Package (lead-free packaging is now available)**

Applications

- **Digital cameras and MP3**
- **Palmtop computers / PDAs**
- **Portable media players**
- **Wireless handsets and DSL modems**
- **Cellular phones**
- **PC cards**

Typical Application Circuit

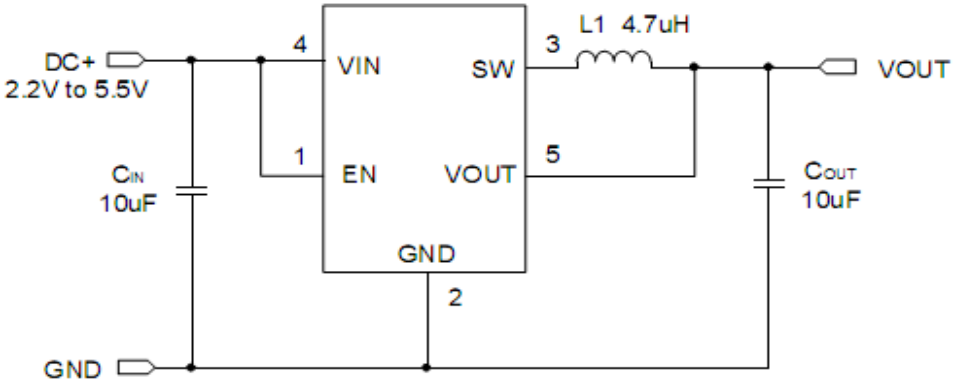


Figure 1: Fixed Output Voltage

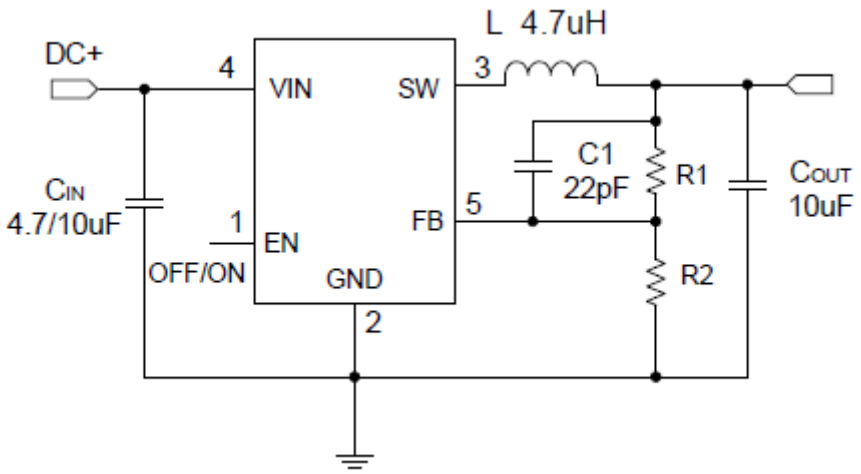
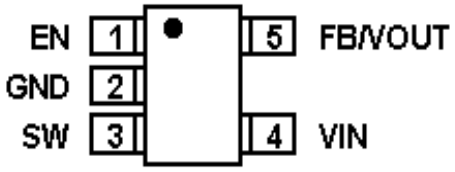


Figure2: Adjustable Output Voltage: V_{OUT} = 0.6V • [1 + (R1/R2)].

Pin Configurations

PIN SOT-23-5L	NAME	DESCRIPTION
1.	EN	En Control Input. Forcing this pin above 1.5V enables the part. Forcing this pin below 0.3V can shuts down the device. In shutdown, all functions are disabled drawing<1mA supply current. Do not leave EN floating.
2.	GND	Ground.
3.	SW	Switch Node Connection to Inductor. This pin connects to the drains of the internal main and synchronous power MOSFET switches.
4.	VIN	Main Supply Pin. It must be closely decoupled to GND, Pin 2, with a 10μF or greater ceramic capacitor.

Package Type	Pin Configurations
SC11A08 SOT-23-5L	

SC11A08 - ○○ ○○

F: Pb-Free

Package Type
S: SOT-23-5L

Denotes Output voltage:
12: 1.2V
15: 1.5V
18: 1.8V
30: 3.0V
33: 3.3V
A : Adjustable

5.	FB/VOUT	* Output feedback. Receives thefeedback voltage from an external resistive divider across the output. In the adjustable version, the output voltage is set by a resistive divider according to the following formula:V_{OUT} = 0.6V • [1 + (R1/R2)]. * Output Pin. In the nonadjustable version, the output voltage is fixed.

Pin Description

Absolute Maximum Ratings

- Input Supply Voltage ---------- 2.5V to 5.5V
- V_{EN}、V_{SW} ---------- – 0.3V to V_{IN} + 0.3V
- V_{IN}、V_{OUT} ---------- –0.3V to 6V
- I_{SW}---------- 1.3A
- Maximum Junction Temperature ---------- 125℃
- Operating Ambient Temperature Range ---------- –40℃ to 85℃
- Storage Temperature Range ---------- –65℃ to 125℃
- Lead Temperature (Soldering, 10 sec) ---------- 300℃

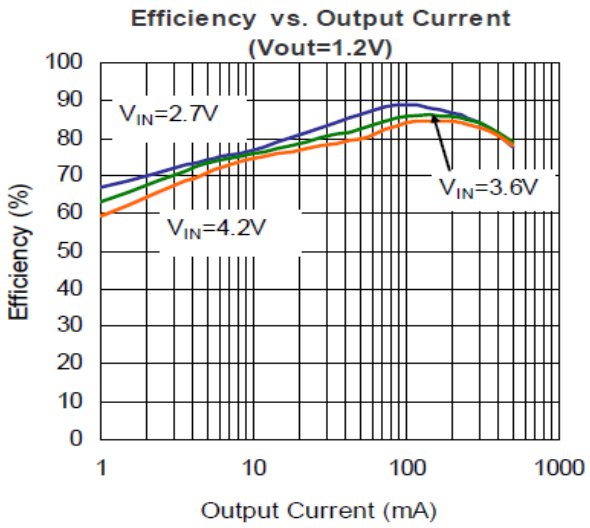
Electrical Characteristics

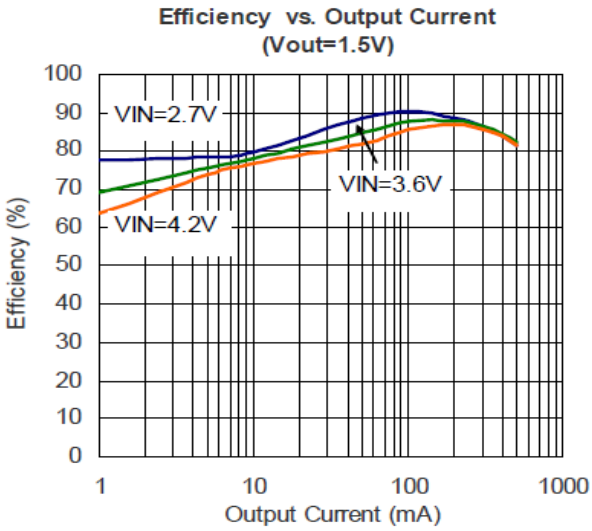
(Operating Conditions: T_A=25 ℃,V_{IN}=3.6V unless otherwise specified.)

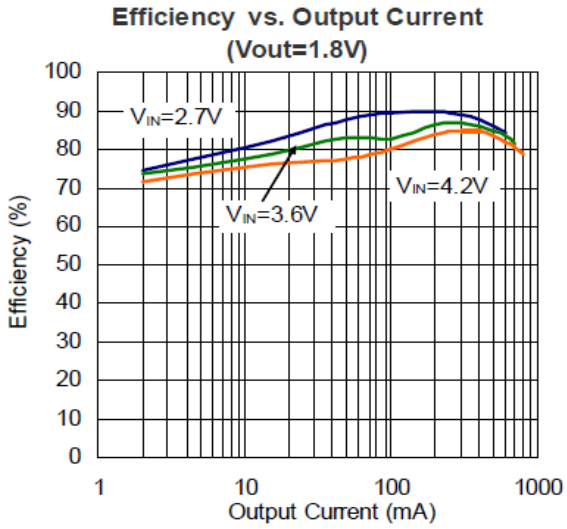
SYMBOL	PARAMETER	CONDITIONS	SC11A08			UNITS
			MIN	TYP	MAX	
V_{IN}	Input Voltage		2.5		5.5	V
V_{OUT}	Output Voltage	I_{OUT} = 100mA, R1/R2=2	1.75	1.8	1.85	V
V_{FB}	Regulated Voltage		0.588	0.6	0.612	V
I_{FB}	Feedback Current				±30	μA
ΔV_{FB}	V_{REF}	V_{IN}=2.5V~5.5V		0.03	0.4	%/V

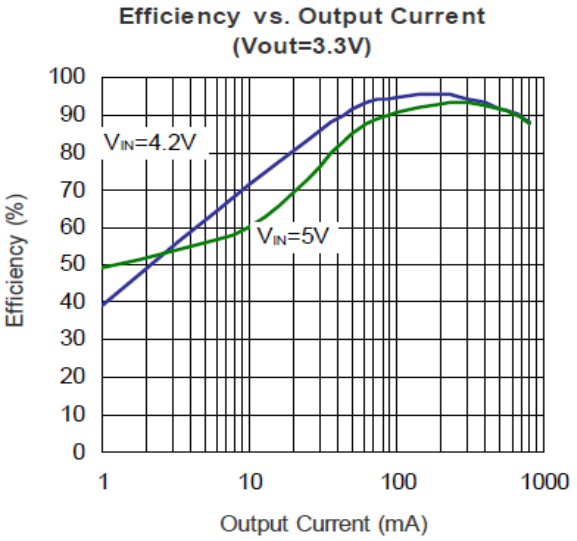
F_{OSC}	Oscillator Frequency	V_{FB} = 0.6V or V_{OUT} = 100%	0.9	1.0	1.1	MHz
I_Q	Quiescent Current	V_{FB} = 0.5V or V_{OUT} = 90%, I_{LOAD} = 0A		200	300	μA
I_S	Shutdown Current	V_{EN} = 0V, V_{IN} = 4.2V		0.1	1	μA
I_{PK}	Peak Inductor Current	V_{IN} = 3V, V_{FB} = 0.5V or V_{OUT} = 90%, Duty Cycle < 35%	0.7	0.9	1	A
R_{PFET}	RDS(ON) of P-Channel FET	I_{SW} = 100mA		0.3		Ω
R_{NFET}	RDS(ON) of N-Channel FET	I_{SW} = -100mA		0.39		Ω
EFFI	Efficiency	When connected to ext. components V_{IN}=EN=3.6 V, I_{OUT}=100mA		93		%
ΔV_{OUT}	V_{OUT} Line Regulation	V_{IN}=2.5V~5.5V		0.03	0.3	%/V
$V_{LOADREG}$	V_{OUT} Load Regulation			0.33		%

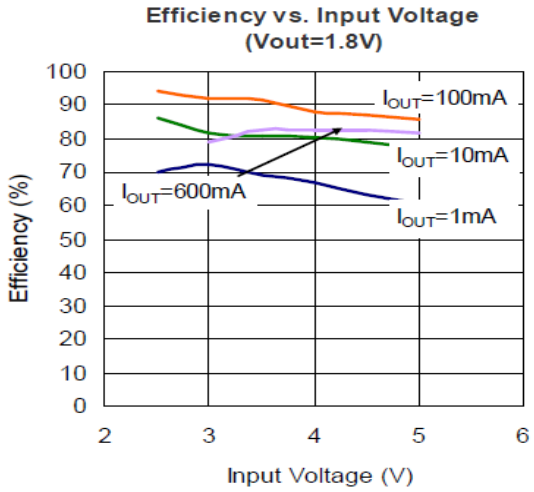
TypicalPerformance Charcterristics

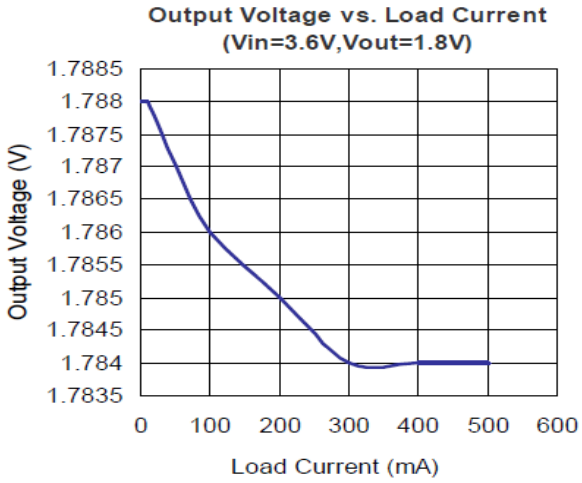

Efficiency vs. Output Current
(Vout=1.2V)
Efficiency (%)
Output Current (mA)
VIN=2.7V
VIN=3.6V
VIN=4.2V


Efficiency vs. Output Current
(Vout=1.5V)
Efficiency (%)
Output Current (mA)
VIN=2.7V
VIN=3.6V
VIN=4.2V

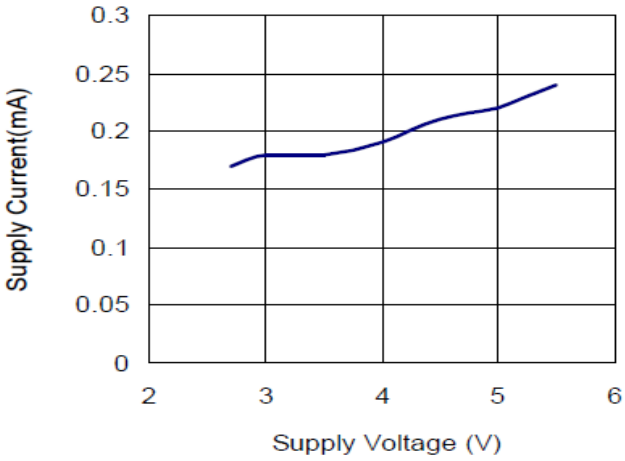

Efficiency vs. Output Current
(Vout=1.8V)
Efficiency (%)
Output Current (mA)
VIN=2.7V
VIN=3.6V
VIN=4.2V


Efficiency vs. Output Current
(Vout=3.3V)
Efficiency (%)
Output Current (mA)
VIN=4.2V
VIN=5V

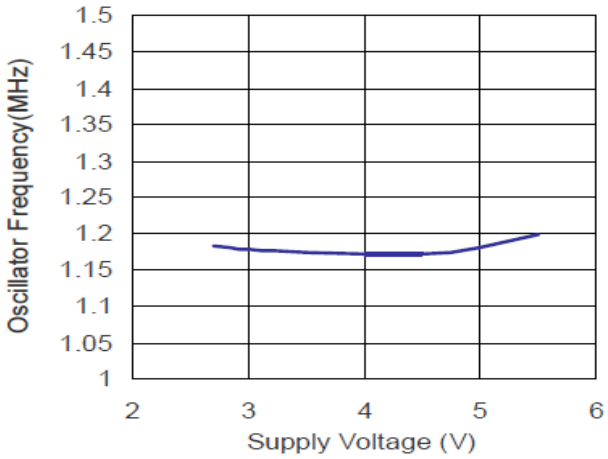

Efficiency vs. Input Voltage
(Vout=1.8V)
Efficiency (%)
Input Voltage (V)
IOUT=100mA
IOUT=10mA
IOUT=600mA
IOUT=1mA


Output Voltage vs. Load Current
(Vin=3.6V,Vout=1.8V)
Output Voltage (V)
Load Current (mA)

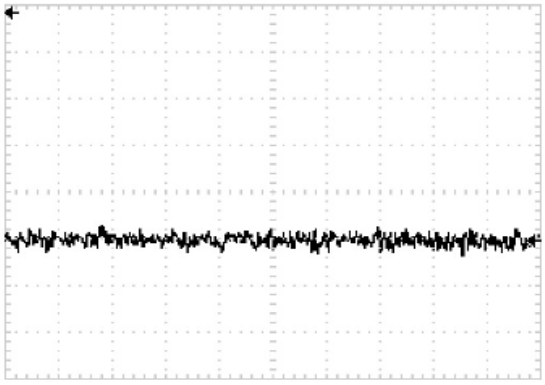
Supply Current vs. Supply Voltage
(Vout=1.8V Io=0A)



Oscillator Frequency vs.Supply
Voltage(Vout=1.8V Io=100mA)

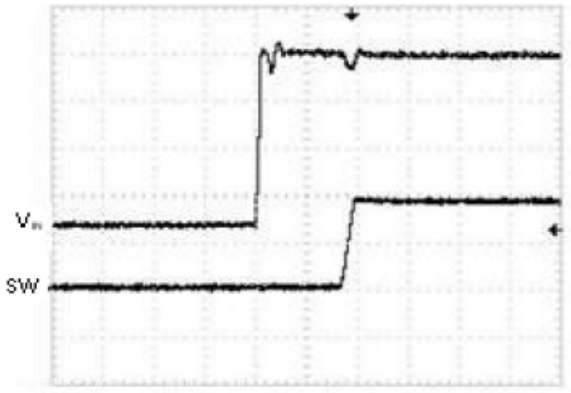


Output Noise（100mV/DIV 2ms/DIV
AC COUPLED）

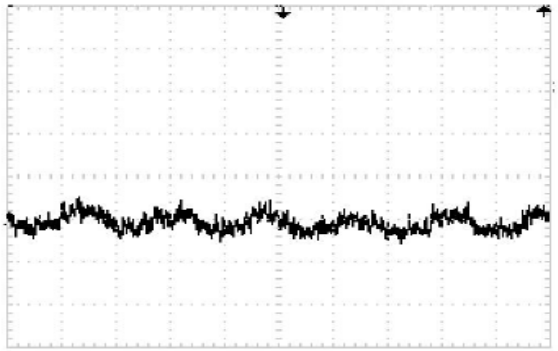


V_{IN}=3.6V V_{OUT}=1.8V I_{LOAD}=0mA

Start –up from Shutdown
（1V/DIV 100ns/DIV）



Output Noise （10mV/DIV 200ns/DIV
AC COUPLED）



V_{IN}=3.6V V_{OUT}=1.8V I_{LOAD}=200mA

PCB Layout Guidelines

When laying out the printed circuit board, the following checklist should be used to ensure proper operation of the SC11A08. These items are also illustrated graphically in Figures 2. Check the following in your layout:

1. The power traces, consisting of the GND trace, the SW trace and the VIN trace should be kept short, direct and wide.

2. Put the input capacitor as close as possible to the device pins (VIN and GND).

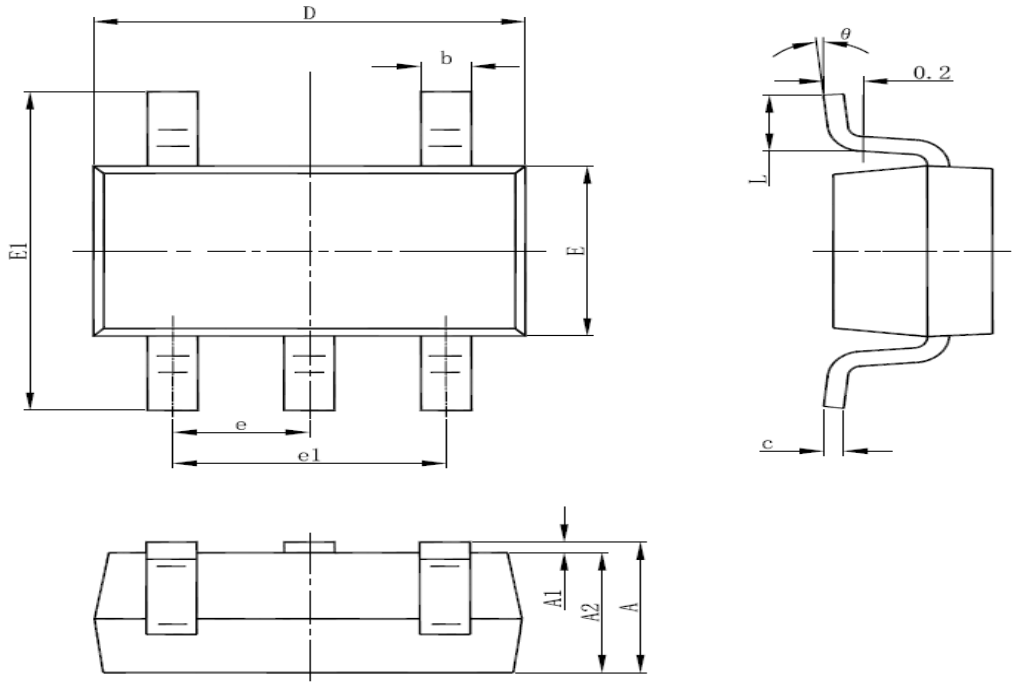
3. SW node is with high frequency voltage swing and should be kept small area. Keep analog components away from SW node to prevent stray capacitive noise pick-up.

4. Connect all analog grounds to a command node and then connect the command node to the power ground behind the output capacitors.

5. Keep the (–) plates of CIN and COUT as close as possible.

Packaging Information

SOT-23-5L Package Outline Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°