High Efficiency,Step-up DC/DC Converter

Description

The SC32A10 is a compact, high efficiency, and low voltage step-up DC/DC converter including an error amplifier, ramp generator, comparator, switch pass element and driver in which providing a stable and high efficient operation over a wide range of load currents. It operates in stable waveforms without external compensation.

The low start-up input voltage is 2.5V. The high switching rate minimized the size of external components. Besides, the 50μA low quiescent (Switch-off) current together with high efficiency maintains long battery lifetime.

The output voltage is set with two external resistors.

Features

- **Output up to 24V**
- **Internal MOSFET with high switch current up to 3A**
- **20μA Quiescent (Switch-off) Supply Current**
- **87% Efficiency**
- **Up to 450KHz Switching Frequency**
- **Using Internal Power Switches**
- **SOP-8P Package**

Applications

- **Portable Instrument**
- **Portable MP3 Players**
- **LCD Panel，RF-Tags，PDA，DSC**
- **Wireless Headsets**

Typical Application Circuit

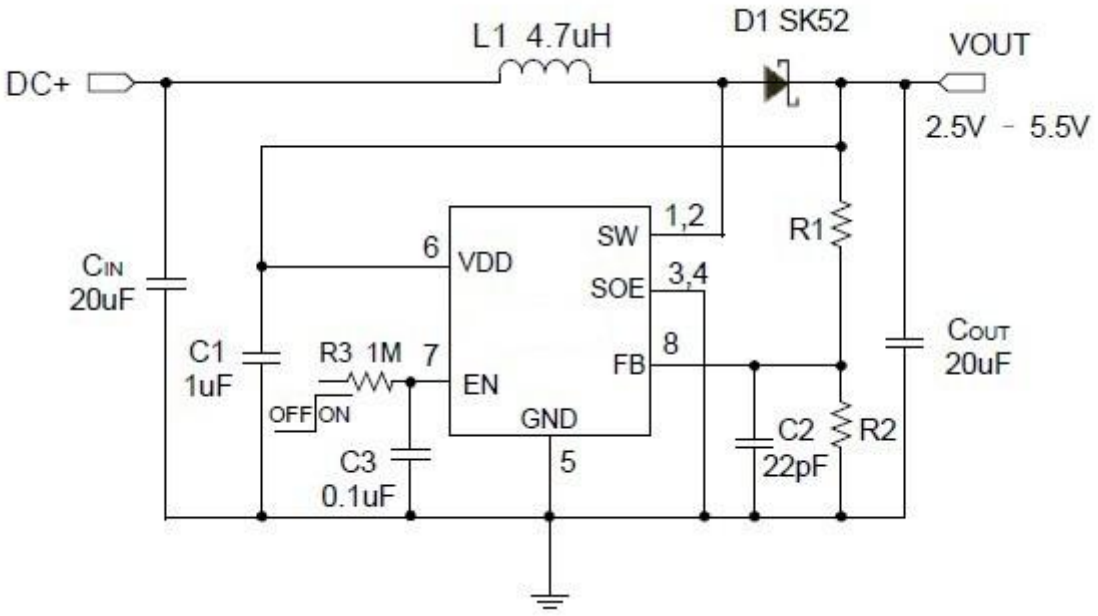


Figure 1：1.1V Stat-up input Voltage

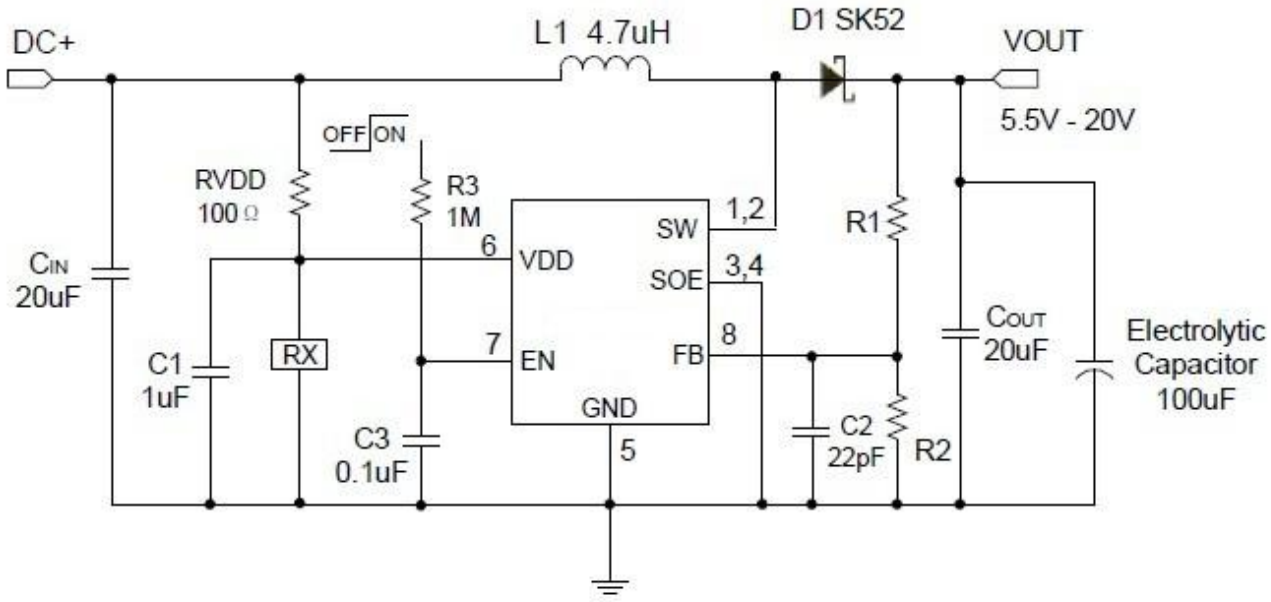
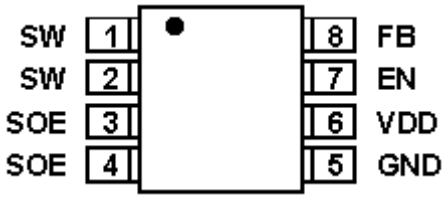


Figure.2: 2.5V Stat-up input Voltage

* **RVDD must to keep VDD voltage less than 5.5V.**

Pin Configurations

Package Type	Pin Configurations
SC32A10 SOP-8P	

Pin Description

PIN	NAME	DESCRIPTION
1、2	SW	Switch Pin. Connect inductor between SW and V_{IN}. Keep these PCB trace lengths as short and wide as possible to reduce EMI and voltage overshoot.
3、4	SOE	Source of the MOSFET. Connect resistor to GND.
5	GND	Signal and Power Ground. Provide a short direct PCB path between GND and the (–) side of the output capacitor(s).
6	VDD	Input positive power pin.
7	EN	En Control Input. Forcing this pin above 1.5V enables the part. Forcing this pin below 0.6V shuts down the device. In shutdown, all functions are disabled, drawing <1mA supply current. Do not leave EN floating.
8	FB	Feedback Input to the gm Error Amplifier. Connect resistor divider tap to this pin. The output voltage can be adjusted from 2.5V to 20V by: V_{OUT} = 1.212V • [1 + (R1/R2)]

Absolute Maximum Ratings

- Input Supply Voltage ---------- –0.3V to 6V
- SW Pin Switch Voltage---------- – 0.3V to 28V
- SW Pin Switch Current ---------- 3A
- Other I/O Pin Voltages ---------- –0.3V to 6V
- Maximum Junction Temperature ---------- 125℃
- Operating Ambient Temperature Range ---------- –40℃ to 85℃
- Storage Temperature Range ---------- –65℃ to 125℃
- Lead Temperature (Soldering, 10 sec) ---------- 300℃

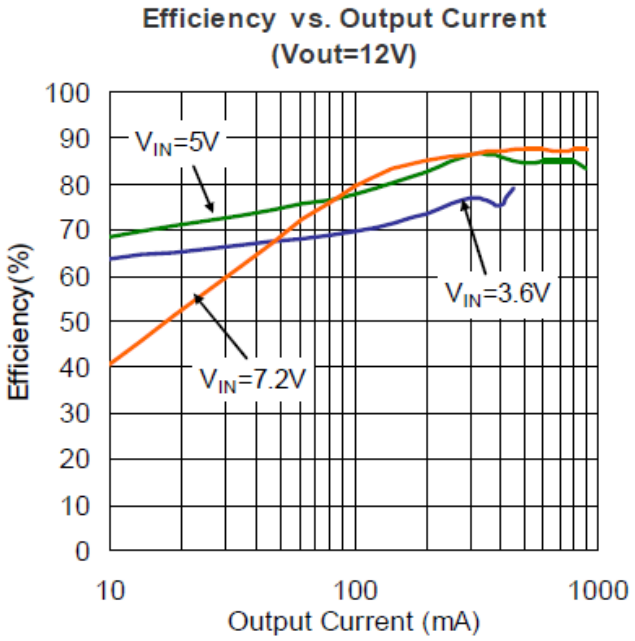
Electrical Characteristics

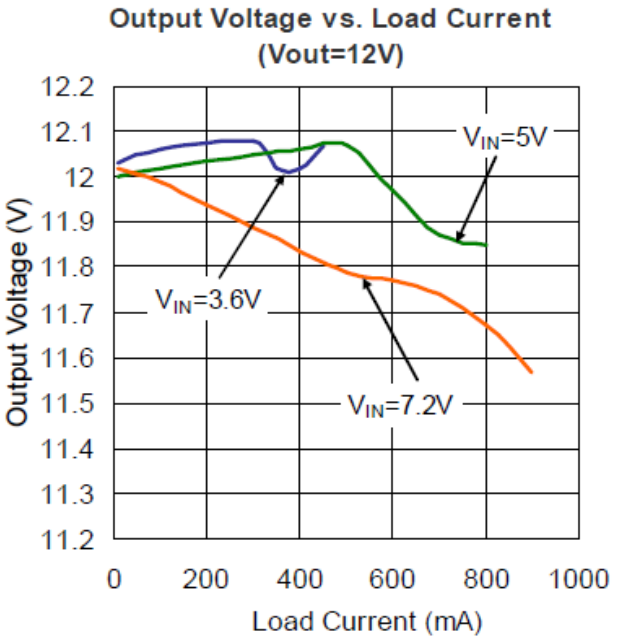
V_{IN} = 1.5V, V_{DD} set to 3.3V, Load Current = 0A, T_A = 25°C, unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	SC32A10			UNTIS
			MIN	TYP	MAX	
V_{OUT}	Output Voltage Adjust Range		2.5		20	V
Vs	Start-UP Voltage	I_L = 1mA,V_{OUT}=5V		2.5		V
Is	No Load Current I (V_{IN})	V_{IN} = 3.6V, V_{OUT} = 5V		50		μA
		V_{IN} = 3.6V, V_{OUT} = 12V		230		
FB	Feedback Reference Voltage	Close Loop, V_{DD} = 3.3V	1.182	1.212	1.242	V
f	Switching Frequency	V_{DD} = 3.3V	420	450	480	KHz
Duty	Maximum Duty	V_{DD} = 3.3V		80		%
SW_R	SW ON Resistance	V_{DD} = 3.3V		0.05		Ω
I_{SET}	Current Limit Setting	V_{DD} = 3.3V		3		A
	Line Regulation	V_{IN}=1.5~2.5V, I_L=100mA		55		mV/V
	Load Regulation	V_{IN}=2.5V, I_L=1~300mA		0.1		mV/mA
Tvout	Temperature Stability for V_{OUT}			50		ppm/℃
Tsy	Thermal Shutdown Hysterics			10		℃
Ts	Thermal Shutdown			165		℃
EN	En Input Low				0.4	V
	En Input High		1			
V_{RM}	Maximum V_{RM}			145		mV

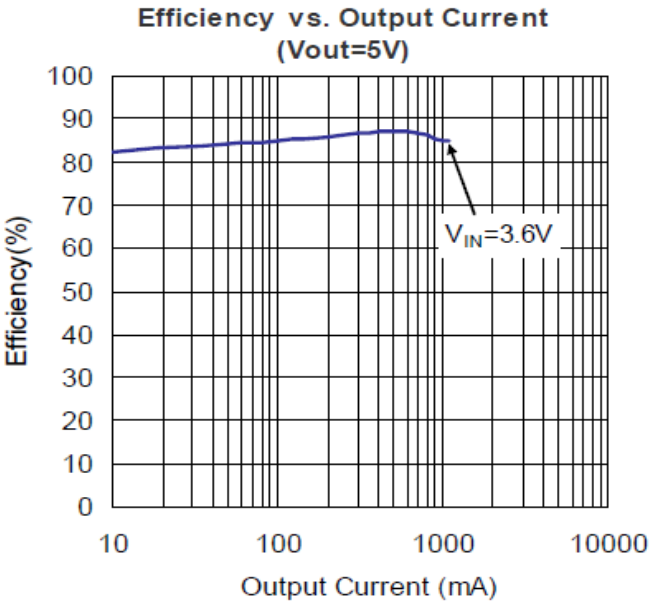
Typical Performance Charateristics

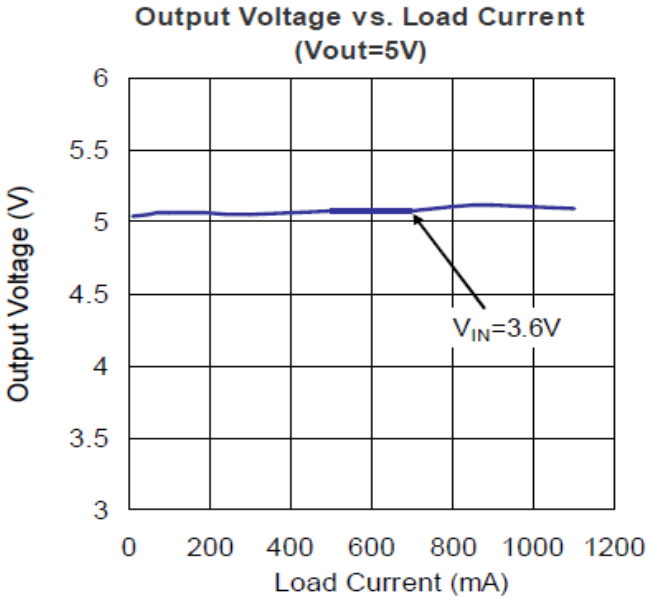
- **T_A=25℃, L_1=4.7uH，C_{IN} =20uF，C_{OUT} =20uF+100uF(Electrolytic Capacitor), C_1=1uF, C2=0.1uF, C3=22pF,R1=560k, R2=62k, R_{VDD}=1k, R_X=IN4733A, D_1=SK52,, unless otherwise noted.(Refer to Test Circuit Figure. 2)**





- **T_A=25℃, L_1=4.7uH，C_{IN} =20uF，C_{OUT} =20uF, C1=1uF, C2=0.1uF, C3=22pF, R1=300k, R2=95k, D1=SK52, unless otherwise noted.(high saturated inductor current Figure. 1)**





Application Information

Output Voltage Setting

Referring to Typical Application Circuits, the output voltage of the switching regulator (V_{OUT}) can be set with Equation (1).

$$V_{OUT}=(1+R1/R2)\times 1.212$$

Current-limiting Resistance Setting

RM= 0.145/IMAX.switch

Feedback Loop Design

Referring to the Typical Application Circuits. The selection of R1 and R2 based on the trade-off between quiescent current consumption and interference immunity is stated below:

- **l Follow Equation (1)**
- **l Higher R reduces the quiescent current (Path current = 1.212V/R2), however resistors beyond 5MW are not Recommended.**

For applications without standby or suspend modes, lower values of R1 and R2 are preferred. For applications concerning the current consumption in standby or suspend modes, the higher values of R1 and R2 are needed. Such high impedance feedback loop is sensitive to any interference, which requires careful PCB layout and avoid any interference, especially to FB pin. To improve the system stability, a proper value capacitor between FB pin and GND pin is suggested. An empirical suggestion is around 20pF.

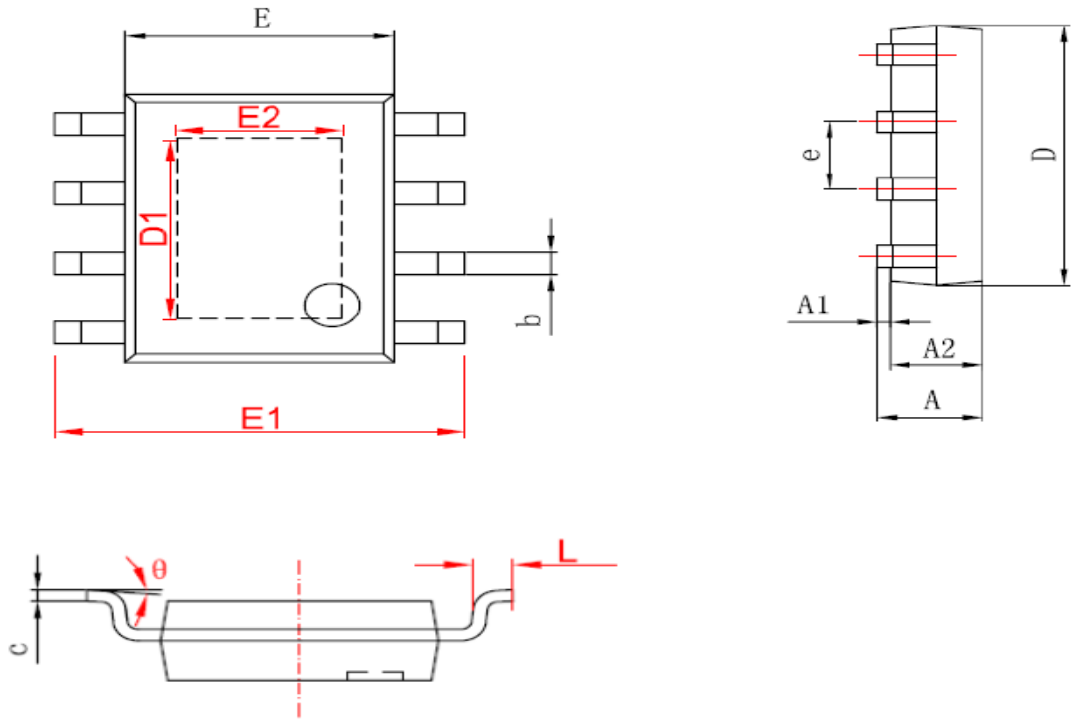
PCB Layout Guide

PCB Layout shall follow these guidelines for Better system stability:

- **A full GND plane without any gap break.**
- **VDD to GND bypass Cap – The 1μF MLCC noise bypass Cap pin 4 shall have short and wide connections.**
- **V_{IN} to GND bypass Cap – Add a Cap close to the inductor when V_{IN} is not an idea voltage source.**
- **Minimize the FB node copper area and keep it far away from noise sources.**

Packaging Information

SOP-8L Package Outline Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.050	0.150	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
D1	3.202	3.402	0.126	0.134
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.313	2.513	0.091	0.099
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°