■ Introduction

The CE9908/9 is a CMOS step-up switching DC/DC converter that mainly consists of a reference voltage source, an oscillator, and a comparator. The CE9908 allows the duty ratio to be automatically switched according to the load (light load: 50%, high output current: 75%), enabling products with a low ripple over a wide range, high efficiency, and high output current. With the CE9908/9, a step-up switching DC/DC converter can be configured by using an external coil, capacitor, diode and NMOS or NPN. The built-in MOSFET is turned off by a protection circuit when the voltage at the LX pin exceeds the limit to prevent it from being damaged. This feature, along with the mini package and low current consumption, makes the CE9908 ideal for applications such as the power supply unit of portable equipment.

■ Features

- Low voltage operation: Startup at 0.9 V min. (I_{OUT} = 1 mA) guaranteed
- Duty ratio: 66/78%, builtin auto switching
- External parts: Coil, capacitor, diode, NMOS
- High efficiency：±85%（typ.）
- Output voltage Adjustable
- Providing Flexibility for Using Internal and ExternalPower Switches
- Zero Shutdown Mode Supply Current
- 6μA Quiescent (Switch-off) Supply Current
- Small SOT23-5,SOT89-5 Package & SOT-26(customer order）

■ Applications

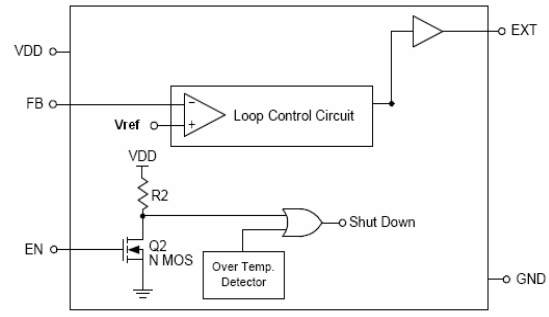
- PDA
- DSC
- LCD Panel
- RF-Tags
- MP3
- Portable Instrument
- Wireless Equipment

■ Ordering Information

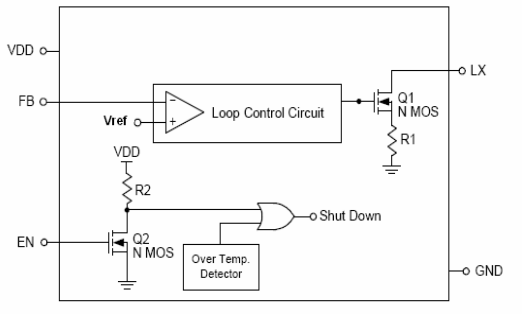
CE990①②③

DESIGNATOR	SYMBOL	DESCRIPTION
①②	8A	Output voltage Adjustable, EXT
	8B	Output voltage Adjustable, EXT,EN
	9A	Output voltage Adjustable, LX
	9B	Output voltage Adjustable, LX ,EN
③	M	Package：SOT23-5
	P	Package：SOT89-5

■ Block Diagrams

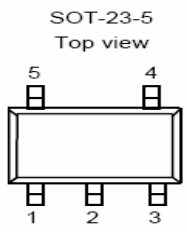


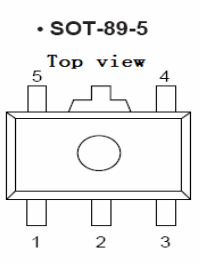
CE9908



CE9909

■ Pin Assignment





Pin No.（SOT23-5）				Pin Name	Functions
CE9908A	CE9908B	CE9909A	CE9909B		
1	1	1	1	FB	Feedback Input Pin
2	2	2	2	V_{DD}	IC power supply pin
-	3	-	3	EN	Chip Enable (Active High)
3	-	3	-	NC	No Connection
4	4	4	4	V_{SS}	GND pin
5	5	-	-	EXT	External transistor connection pin
-	-	5	5	LX	Pin for Switching

Pin No.（SOT89-5）				Pin Name	Functions
CE9908A	CE9908B	CE9909A	CE9909B		
-	1	-	1	EN	Chip Enable (Active High)
1	-	1	-	NC	No Connection
2	2	2	2	V_{DD}	IC power supply pin
3	3	3	3	FB	Feedback Input Pin
-	-	4	4	LX	Pin for Switching
4	4	-	-	EXT	External transistor connection pin
5	5	5	5	V_{SS}	GND pin

■ Absolute Maximum Ratings

(Unless otherwise specified, Ta=25℃)

Parameter		Symbol	Ratings	Unit
V_{OUT} pin voltage		V_{OUT}	V_{SS}－0.3 ~ V_{SS}＋10	V
EN pin voltage		EN	V_{SS}－0.3 ~ V_{SS}＋10	V
LX pin voltage		V_{LX}	V_{SS}－0.3 ~ V_{SS}＋10	V
LX pin current		I_{LX}	1000	mA
Power dissipation	SOT-23-5	PD	250	mW
	SOT-23-6		250	mW
	SOT-89-3		500	mW
Operating temperature		Topr	－40 ~＋85	℃
Storage temperature		Tstg	－40 ~＋125	℃

■ Electrical Characteristics

(Unless otherwise specified, Ta =25℃)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Feedback Voltage	V_{FB}	—	3.234	3.3	3.366	V
Input voltage	V_{IN}	—	—	—	10	V
Operation start voltage	V_{ST}	I_{OUT}= 1 mA	—	—	0.9	V
Current consumption 1	I_{SS1}	V_{CC}=5V, Continuously Switching	—	30	40	μA
Current consumption 2	I_{SS2}	V_{CC}=5V, FB=3.5V, No Switching	—	5	10	μA
Shut Down Current	I_{SSS}	V_{CC}=5V,V_{EN}=0 V	—	—	0.5	μA
Switching current	I_{SW}	V_{LX}= 0.4 V	100	200	—	mA
Switching transistor leakage current	I_{SWQ}	No external parts, V_{LX}＝V_{OUT} =10 V ,V_{EN} = 0 V	—	—	0.5	μA
Line regulation	ΔV_{OUT1}	V_{IN}= 0.4×V_{OUT}～0.6×V_{OUT} （V_{OUT}=5V）	—	20	50	mV
Load regulation	ΔV_{OUT2}	I_{OUT}= 10 μA ~ 50mA（V_{OUT}=5V）	—	20	50	mV
Oscillation frequency	f_{OSC}			100		kHz
Duty ratio 1	Duty1	V_{OUT}= 0.95×V_{OUT}， measure waveform at LX pin	70	78	85	%
Duty ratio 2	Duty2	Measure waveform at LX pin with light load	—	66	—	%
Efficiency	EFFI			85		%
Shutdown pin input voltage	V_{SH}	V_{OUT}=0.95×V_{OUT}， judge oscillation at LX pin	0.75	—	—	V
	V_{SL1}	V_{OUT}= 0.95×V_{OUT}， judge stop at LX pin	—	—	0.3	V
Shutdown pin input current	I_{SH}	V_{EN}＝10V	－0.1	—	0.1	μA
	I_{SL}	V_{EN}＝0V	－0.1	—	0.1	μA

Remark：1、V_{IN} =$V_{OUT(S)}$ ×0.6 applied, I_{OUT}=$V_{OUT(S)}$ / 250 Ω

2、Shutdown function built-in type: EN pin is connected to V_{OUT}

■ Standard Circuits

Component: Inductor：47uH(Sumida) Diode：IN5817、IN5819

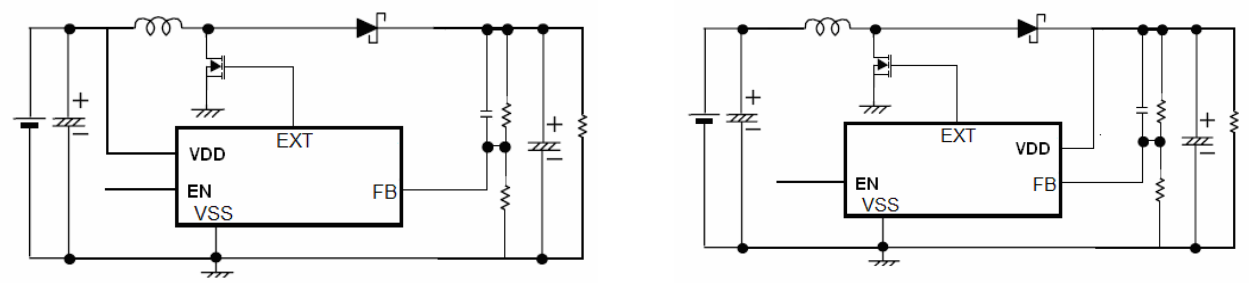
Capacitor：47uF/16V(Tantalume type) MOS：XP151、XP161

R_{FB}：Set up so that $R_{FB1}/R_{FB2}=(V_{OUT}-3.3)/3.3$ （V_{OUT}=set-up output voltage），

Please use with $R_{FB1}+R_{FB2}\leqslant 2M\ \Omega$

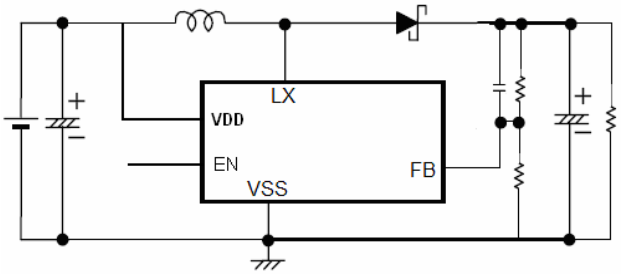
C_{FB}：Set up that $Fzfb=1/(2\times\pi\times C_{FB}\times R_{FB1})$ is within the Adjustments necessary in respect of L,C_L.

1. CE9908 Circuits：



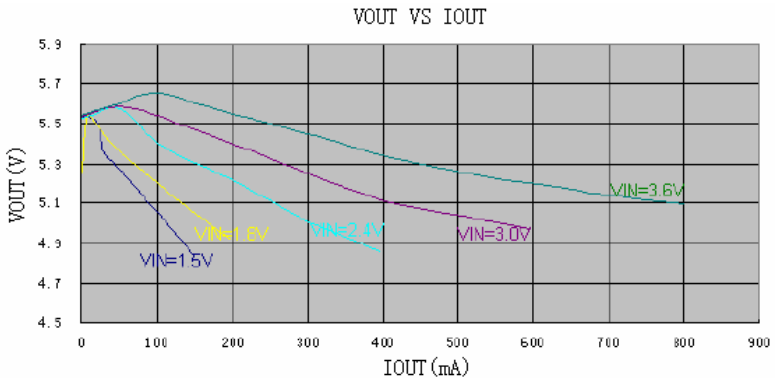
（ Note: When $V_{IN}\leqslant 2V$,V_{DD} contact to V_{OUT}； When $V_{IN}\geqslant 2V$,V_{DD} contact to V_{IN}.）

2. CE9909 Circuits:

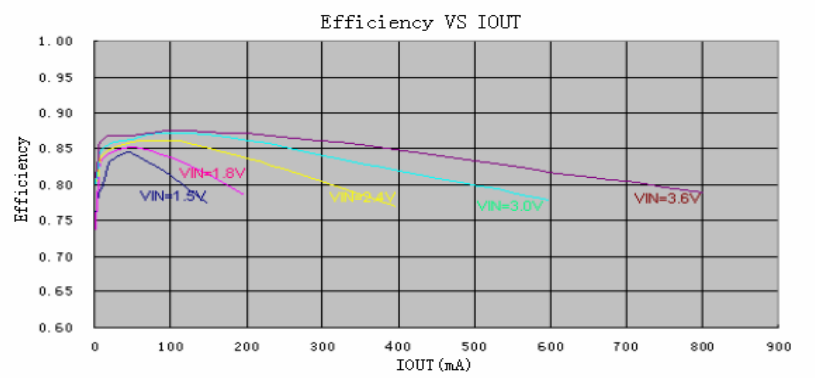


■ Characteristics

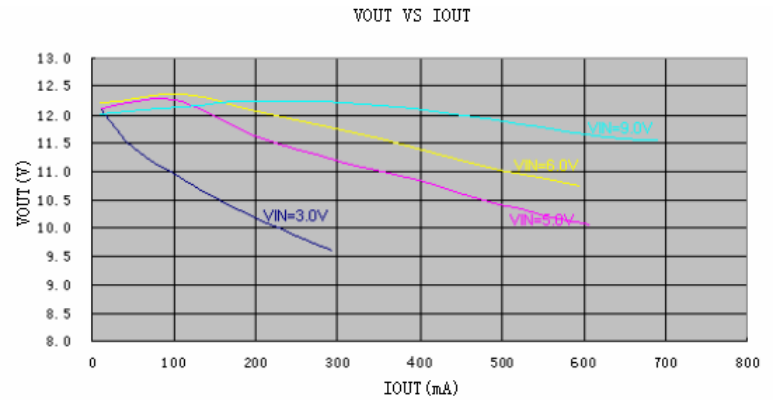
a. V_{OUT} VS I_{OUT}：（V_{OUT}=5.5V）



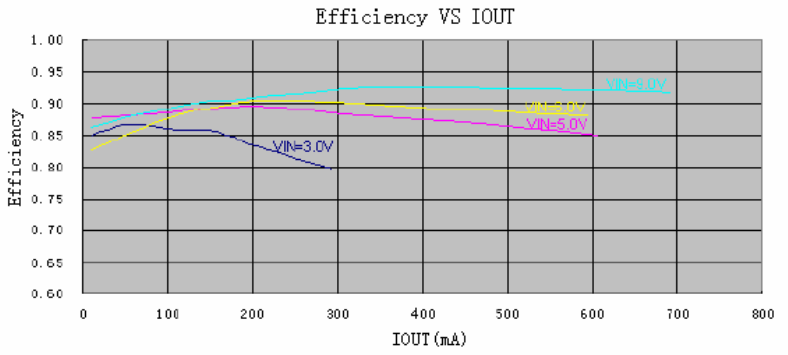
b. Efficiency VS I_{OUT}：（V_{OUT}＝5.5V）



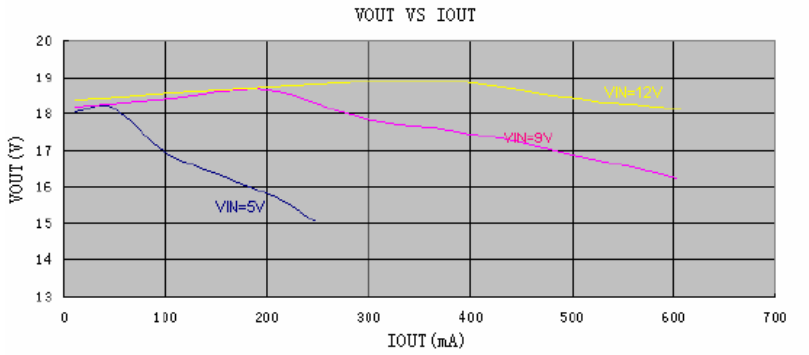
c. V_{OUT} VS I_{OUT}：（V_{OUT}＝12V）



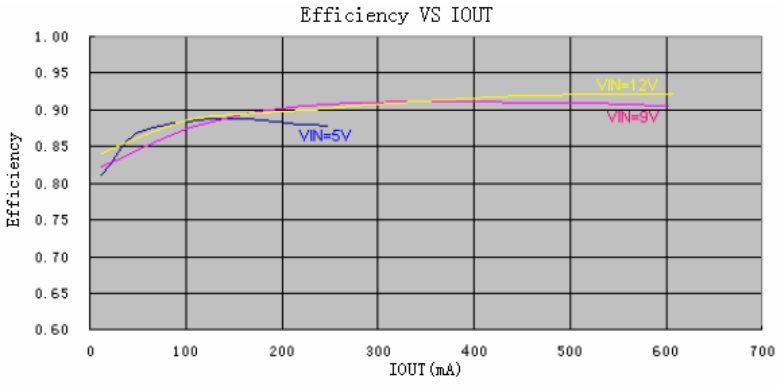
d. Efficiency VS I_{OUT}：（V_{OUT}＝12V）



e. V_{OUT} VS I_{OUT}：（V_{OUT}＝18V）

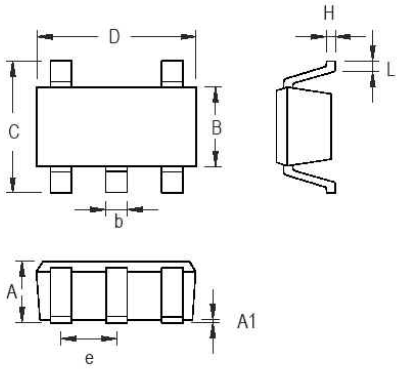


f. Efficiency VS I_{OUT}：（V_{OUT}＝18V）



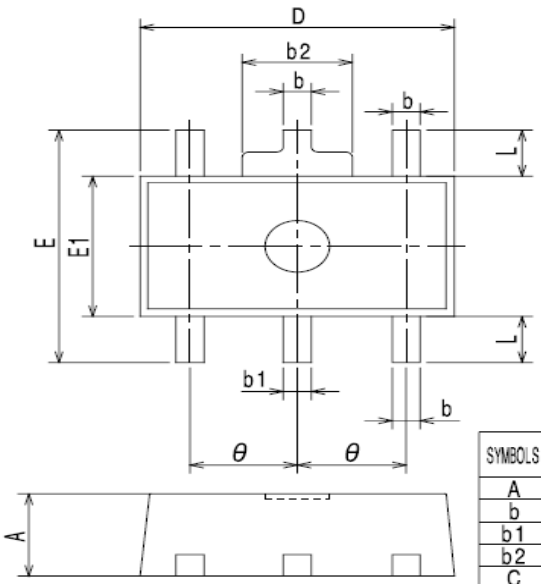
■ Package information

● SOT- 23- 5



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.889	1.295	0.035	0.051
A1	0.000	0.152	0.000	0.006
B	1.397	1.803	0.055	0.071
b	0.356	0.559	0.014	0.022
C	2.591	2.997	0.102	0.118
D	2.692	3.099	0.106	0.122
e	0.838	1.041	0.033	0.041
H	0.080	0.254	0.003	0.010
L	0.300	0.610	0.012	0.024

● **SOT- 89- 5**



SYMBOLS	DIMENSIOS IN MILLIMETERS		
	MIN	NOM	MAX
A	1.40	1.50	1.60
b	0.36	0.42	0.48
b1	0.41	0.47	0.53
b2	1.40	1.60	1.75
C	0.38	0.40	0.43
D	4.40	4.50	4.60
E	—	—	4.25
E1	2.40	2.50	2.60
e	1.40	1.50	1.60
L	0.80	—	—