LR9908

TINY PACKAGE HIGH EFFICIENCY STEP-UP DC/DC CONVERTER

■ Introduction

The LR9908 is a CMOS step-up switching DC/DC converter that mainly consists of a reference voltage source, an oscillator, and a comparator. The LR9908 allows the duty ratio to be automatically switched according to the load (light load: 66%, high output current: 78%), enabling products with a low ripple over a wide range, high efficiency, and high output current. With the LR9908, a step-up switching DC/DC converter can be configured by using an external coil, capacitor, diode and NMOS. This feature, along with the mini package and low current consumption, makes the LR9908 ideal for applications such as the power supply unit of portable equipment.

■ Features

- Low voltage operation: Oscillation start voltage at 0.8V
- Duty ratio: 66/78%, built-in auto switching
- External parts: Coil, capacitor, diode, NMOS
- High efficiency：±85%（typ.）
- Output voltage Adjustable
- Providing Flexibility for Using External Power Switches
- Zero Shutdown Mode Supply Current
- 6μA Quiescent (Switch-off) Supply Current
- Small SOT23-5,SOT89-5 Package

■ Applications

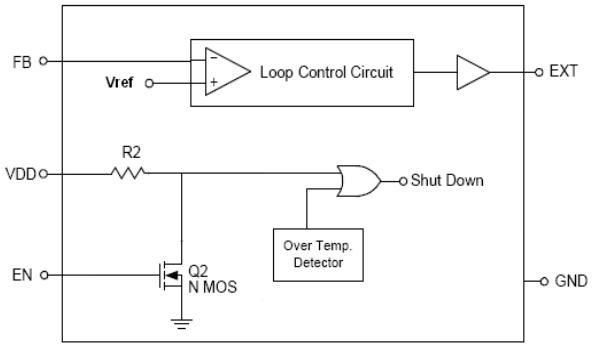
- PDA
- DSC
- LCD Panel
- RF-Tags
- MP3
- Portable Instrument
- Wireless Equipment

■ Ordering Information

LR9908 ①②③④⑤

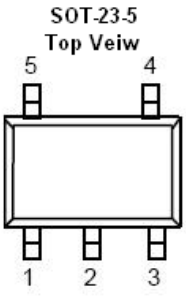
DESIGNATOR	SYMBOL	DESCRIPTION
①	A	Output Voltage adj, EXT
	B	Output Voltage adj, EXT, EN
②③④		FB, Voltage
		EXP, Vfb=1.25V, Number 125
		EXP. Vfb=3.3V, Number nothing
⑤	M	Package: SOT−23−5
	P	Package: SOT−89−5

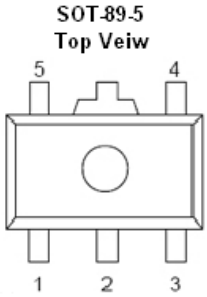
■ Block Diagrams



LR9908

■ Pin Assignment





Pin No.（SOT23-5）		Pin Name	Functions
LR9908A	LR9908B		
1	1	FB	Feedback Input Pin
2	2	V_{DD}	IC power supply pin
-	3	EN	Chip Enable (Active High)
3	-	NC	No Connection
4	4	V_{SS}	GND pin
5	5	EXT	External transistor connection pin

Pin No.（SOT89-5）		Pin Name	Functions
LR9908A	LR9908B		
-	1	EN	Chip Enable (Active High)
1	-	NC	No Connection
2	2	V_{DD}	IC power supply pin
3	3	FB	Feedback Input Pin
4	4	EXT	External transistor connection pin
5	5	V_{SS}	GND pin

■ Absolute Maximum Ratings

(Unless otherwise specified, Ta=25℃)

Parameter		Symbol	Ratings	Unit
V_{OUT} pin voltage		V_{OUT}	$V_{SS}-0.3 \sim V_{SS}+8$	V
EN pin voltage		EN	$V_{SS}-0.3 \sim V_{SS}+8$	V
Power dissipation	SOT-23-5	PD	250	mW
	SOT-89-5		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}	—	$V_{FB(s)}$ ×0.98	V_{FB}	$V_{FB(s)}$ ×1.02	V
Input voltage	V_{IN}	—	—	—	8	V
Oscillation start voltage	V_{ST}	No external parts, voltage applied to V_{OUT} LX pulled up to V_{OUT} via 300Ω resistor			0.8	V
Current consumption 1	I_{SS1}	VCC=5V, Continuously Switching	—	30	40	μA
Current consumption 2	I_{SS2}	VCC=5V, FB=2.5V, No Switching	—	5	10	μA
Shut Down Current	I_{SSS}	V_{CC}=5V,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 EXT pin	0.75	—	—	V
	V_{SL1}	V_{OUT}= 0.95×V_{OUT}， judge stop at EXT pin	—	—	0.3	V
Shutdown pin input current	I_{SH}	V_{EN}=8V	—	—	0.1	μA
	I_{SL}	V_{EN}=0V	—	—	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}

3、$V_{OUT(S)}$ specified above is the set output voltage value, and V_{OUT} is the typical value of the actual output voltage.

■ Standard Circuits

Component: Inductor：22uH(Sumida) Diode：IN5817、IN5819

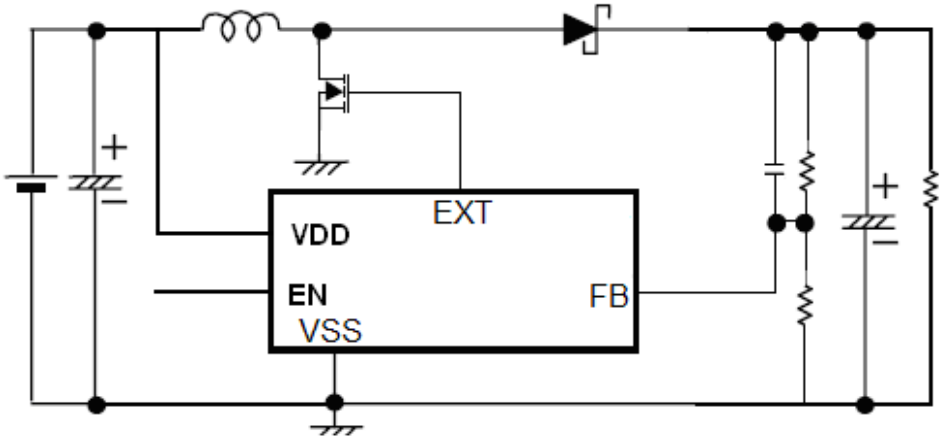
Capacitor：47uF (Tantalum type) MOS：CE2312、XP151、XP161

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

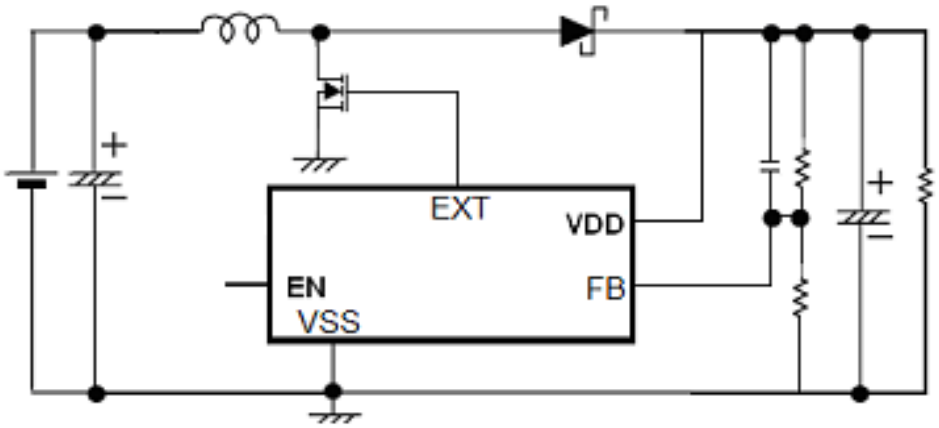
Please use with $R_{FB1}+R_{FB2}\leqslant 2M\ \Omega$

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、LR9908 Circuits 1:($V_{IN}\geqslant 3V$)

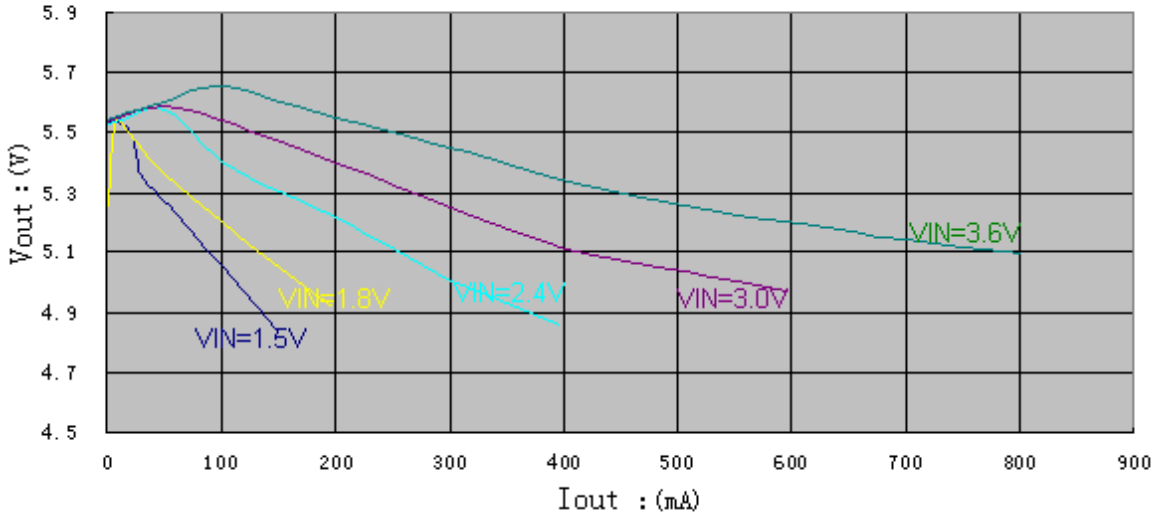


2、LR9908 Circuits 2:($V_{IN}\leqslant 3V$)

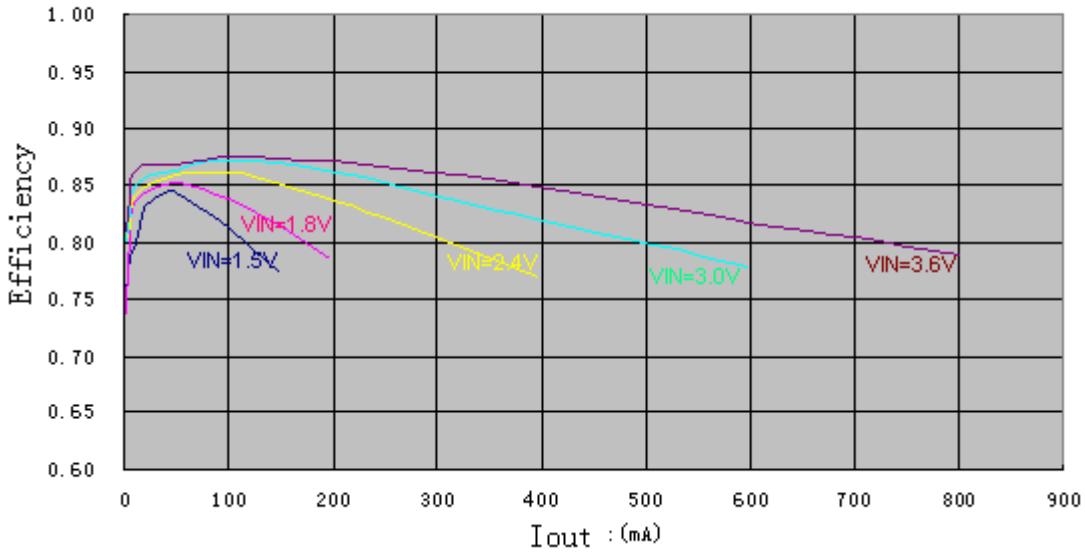


■ Characteristics

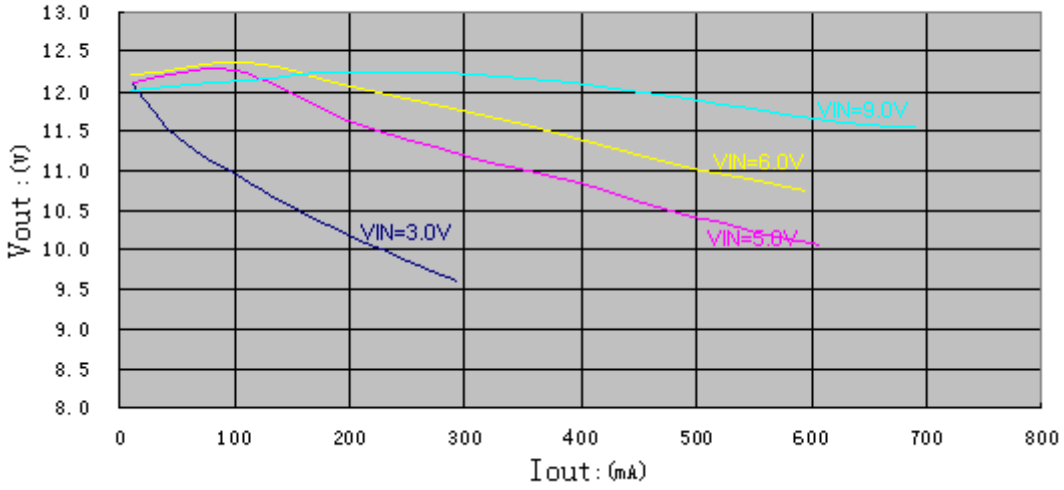
A. V_{OUT} VS I_{OUT}：（V_{OUT}=5.5V）



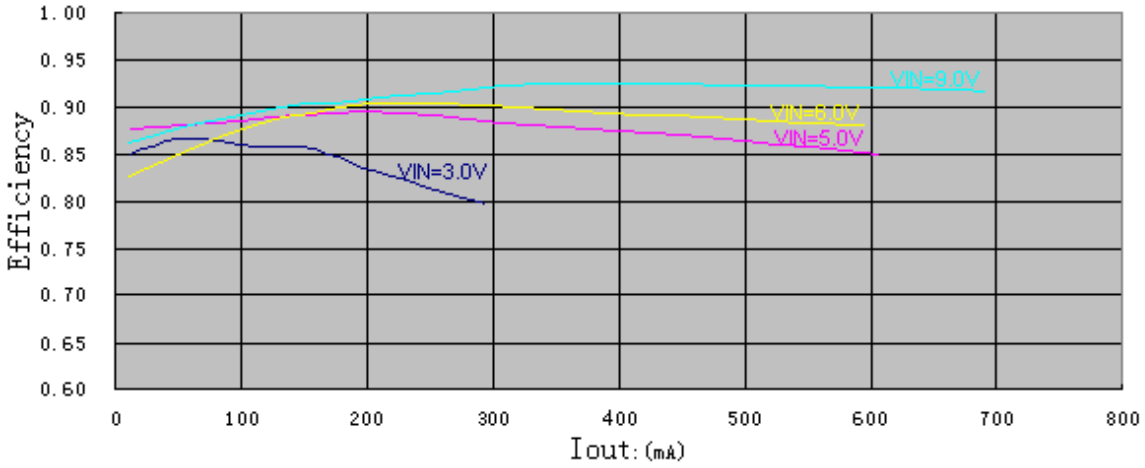
B. Efficiency VS I_{OUT}：（V_{OUT}=5.5V）



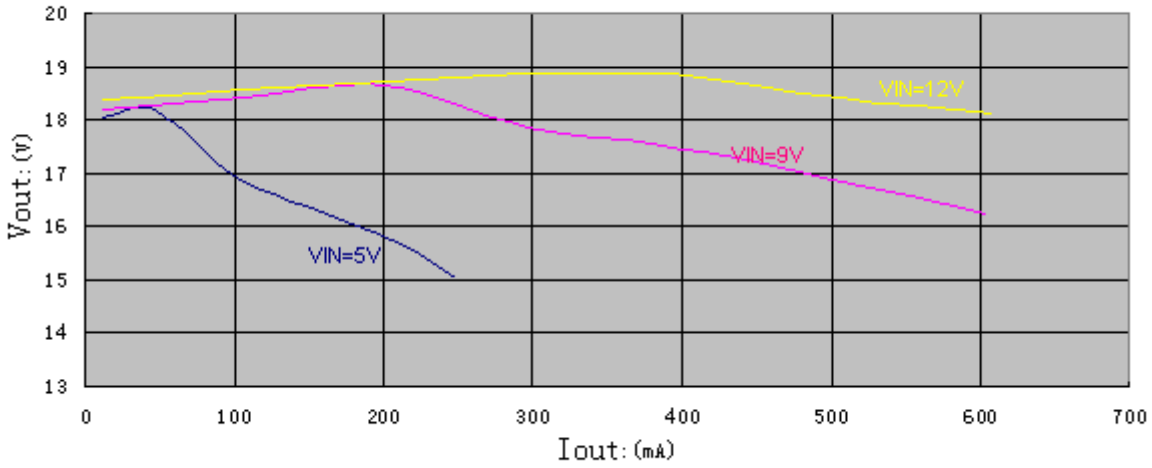
C. V_{OUT} VS I_{OUT}：（V_{OUT}＝12V）



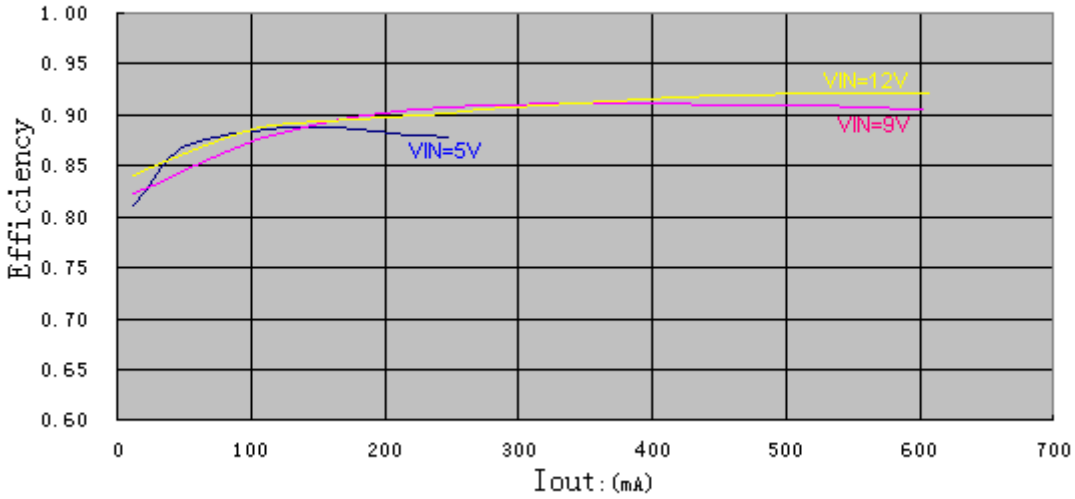
D. Efficiency VS I_{OUT}：（V_{OUT}＝12V）



E. V_{OUT} VS I_{OUT}：（V_{OUT}＝18V）

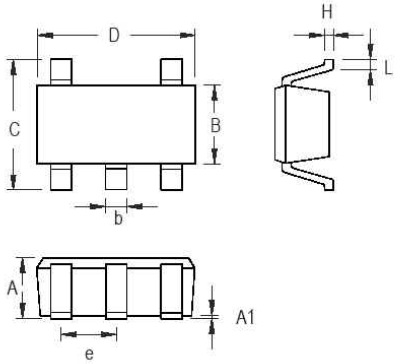


F. Efficiency VS I_{OUT}：（V_{OUT}＝18V）



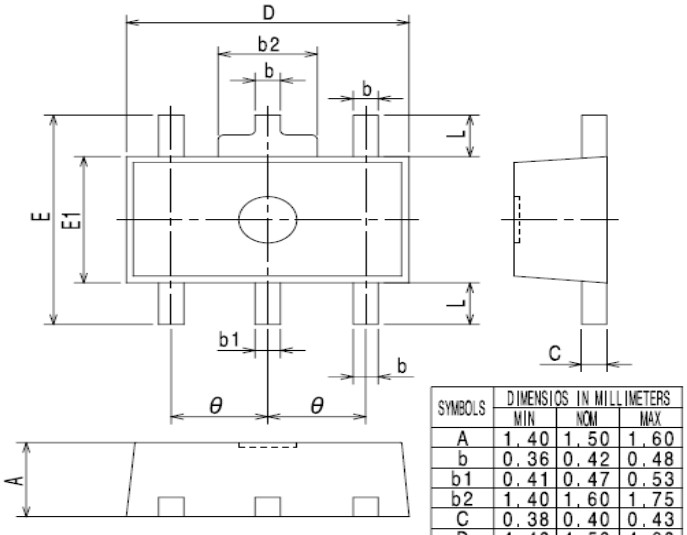
■ Package information

• **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	—	—