

Description

The 6009 is a monolithic integrated circuit that provides all of the power and control functions for step-up (boost), flyback, and forward converter switching regulators. Included on the chip is a 5A PMOSFET switch and its associated protection circuitry, consisting of current and thermal limiting, and undervoltage lockout. Other features include a 220 kHz fixed-frequency oscillator that requires no external components, a soft start mode to reduce in-rush current during start-up, and current mode control for improved rejection of input voltage and output load transients.

Features

- Wide Input Voltage Range: 3.6V to 48V
- Output Voltage Versions: 12V, 24V, and Adj
- Fixed 220KHz Switching Frequency
- Max 5A Switching Current Capability
- Up to 92% efficiency
- EN PIN TTL shutdown capability
- Excellent line and load regulation
- Internal Optimize Power MOSFET
- Built in Frequency Compensation
- Built in Soft-Start Function
- Built in Thermal Shutdown Function
- Built in Current Limit Function

Applications

- Simple boost regulator
- Fly back and forward regulators
- Multiple - output regulator

Pin Configurations

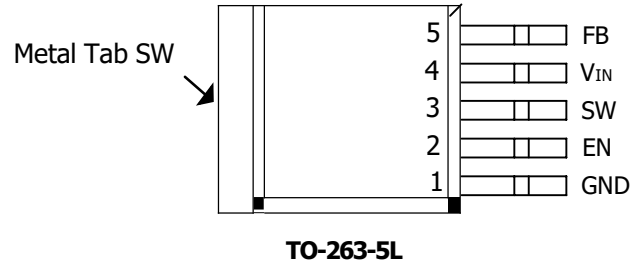


Figure 1 . Pin Configuration of 6009(Top View)

Pin Description

Pin Number	Pin Name	Description
1	GND	Ground Pin.
2	EN	Enable Pin. Drive EN pin low to turn off the device, drive it high to turn it on . Floating is default high.
3	SW	Power Switch Output Pin (SW). Output is the switch node that supplies power to the output.
4	VIN	Supply Voltage Input Pin. 6009 operates from a 3.6V to 48V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.
5	FB	Feedback Pin (FB),The feedback threshold voltage is 1.25V.
Tab	SW	Power Switch Output Pin (SW). Output is the switch node that supplies power to the output.

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	-0.3 to 60	V
Feedback Pin Voltage	V_{FB}	-0.3 to V_{IN}	V
Enable Pin Voltage	V_{EN}	-0.3 to V_{IN}	V
Switch Pin Voltage	V_{SW}	-0.3 to V_{IN}	V
Power Dissipation	P_D	Internally limited	mW
Operating Junction Temperature	T_J	-40~125	°C
Storage Temperature	T_{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10 sec)	T_{LEAD}	260	°C
ESD (HBM)		2000	V
MSL		Level3	
Thermal Resistance-Junction to Ambient	$R_{\theta JA}$	85	°C / W
Thermal Resistance-Junction to Case	$R_{\theta JC}$	45	°C / W

Typical Application Circuit

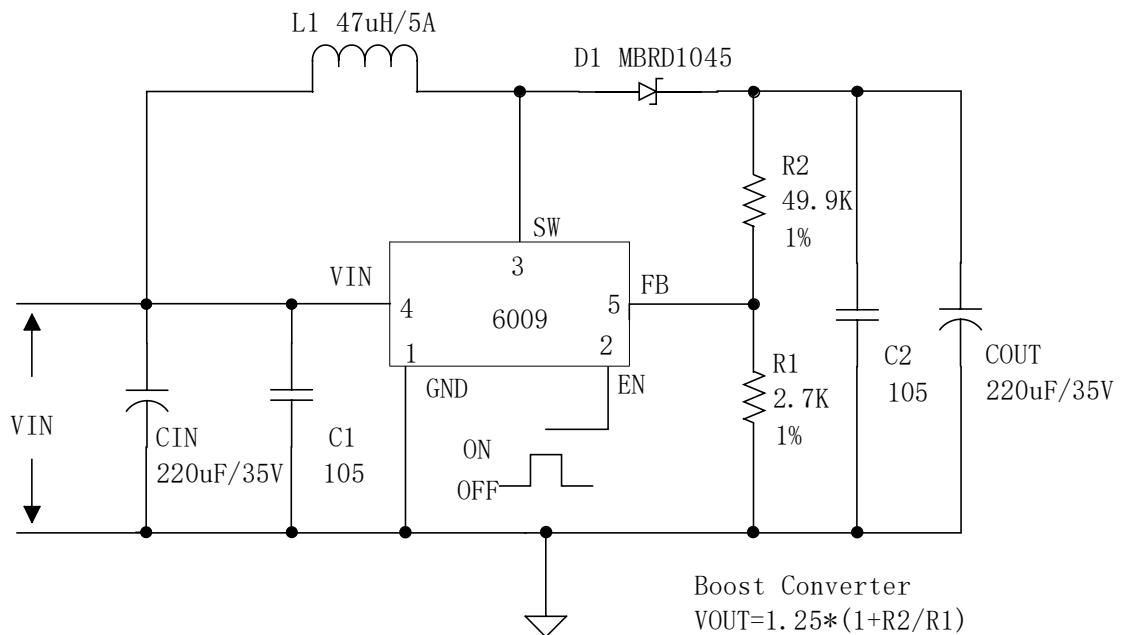


Figure 3. 6009 Typical Application Circuit ($V_{IN} = 12V \sim 22V$, $V_{OUT} = 24V/1.5A$)

Electrical Characteristics

$T_a = 25^\circ C$; unless otherwise specified, System parameters test circuit figure 3.

Characteristic		Conditions	Min .	Typ .	Max	Unit
Feedback voltage	VFB	$V_{in} = 5V$ to $12V$, $V_{out} = 24V$ $I_{load} = 0.1 \sim 1A$	1.230	1.250	1.270	V
Efficiency	η	$V_{in} = 12V$, $V_{out} = 24V$ $I_{out} = 1A$		93		%
Fixed Voltage 12V	Vout	$V_{in} = 5V$, $I_{out} = 1A$	11.76	12	12.24	V
Fixed Voltage 24V	Vout	$V_{in} = 12V$, $I_{out} = 1A$	23.52	24	24.48	V

Electrical Characteristics (DC Parameters)

($V_{IN} = 12V$, $GND = 0V$, $I_{out} = 0.1A$, $T_a = 25^\circ C$; the others floating unless otherwise specified .)

Parameters	Symbol	Conditions	Min .	Typ .	Max	Unit
Input operation voltage	V_{in}		3.6		48	V
Shutdown supply current	I_{STBY}	$V_{EN} = 0V$		70	100	μA
Quiescent supply current	I_q	$V_{EN} = 2V$, $V_{FB} = V_{in}$		2.5	5	mA
Oscillator frequency	F_{OSC}		176	220	264	kHz
Switch current limit	I_L	$V_{FB} = 0$		5		A
Output power N MOS	R_{dson}	$V_{in} = 12V$, $I_{SW} = 5A$		110	120	m ohm
EN pin threshold	V_{EN}	High (regulator ON) Low (regulator OFF)		1.4 0.8		V
EN pin input leakage current	I_H	$V_{EN} = 2V$ (ON)		3	10	μA
	I_L	$V_{EN} = 0V$ (OFF)		3	10	μA
Max . duty cycle	D_{MAX}	$V_{FB} = 0V$		90		%

Typical System Application (Recommended safe working range for output current)

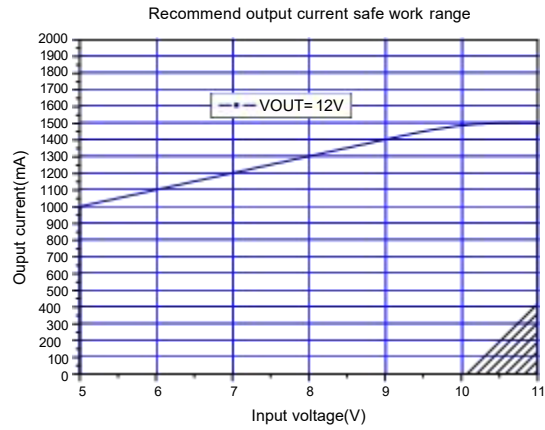


Figure 4.Maximum output current (VOUT=12V)

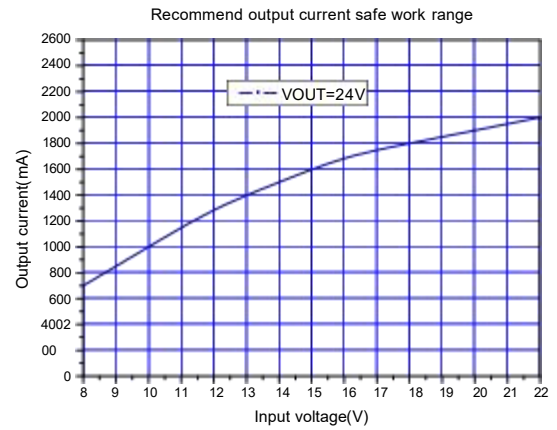


Figure 5.Maximum output current (VOUT=24V)

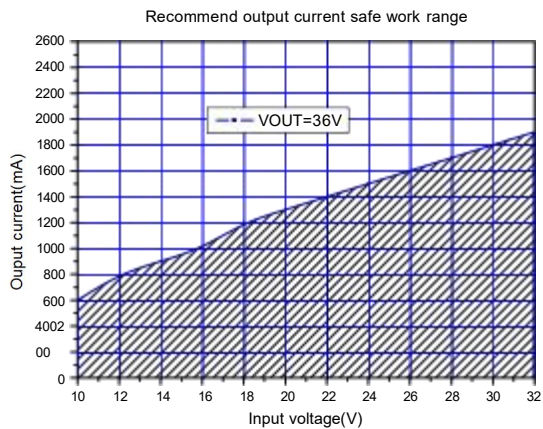


Figure 6.Maximum output current (VOUT=36V)

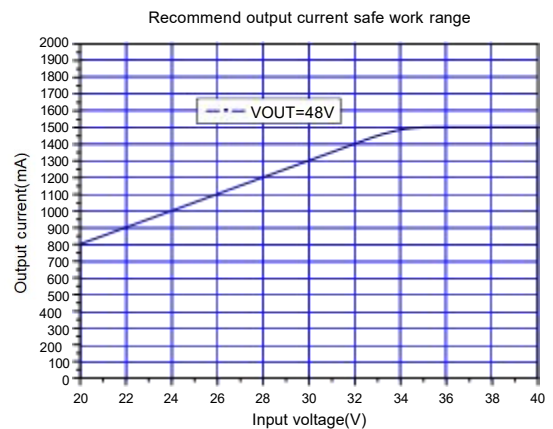


Figure 7.Maximum output current (VOUT=48V)

Typical System Application (VIN=12V, VOUT=24V)

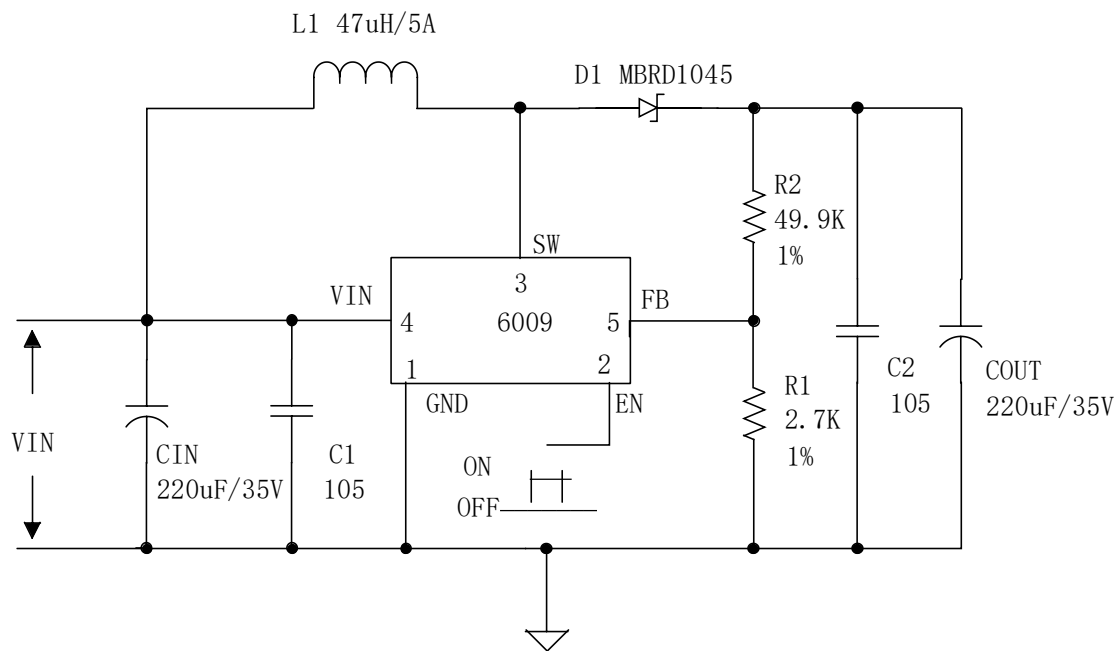


Figure 8 . 6009System Parameters Test Circuit (VIN=12V,VOUT=24V)

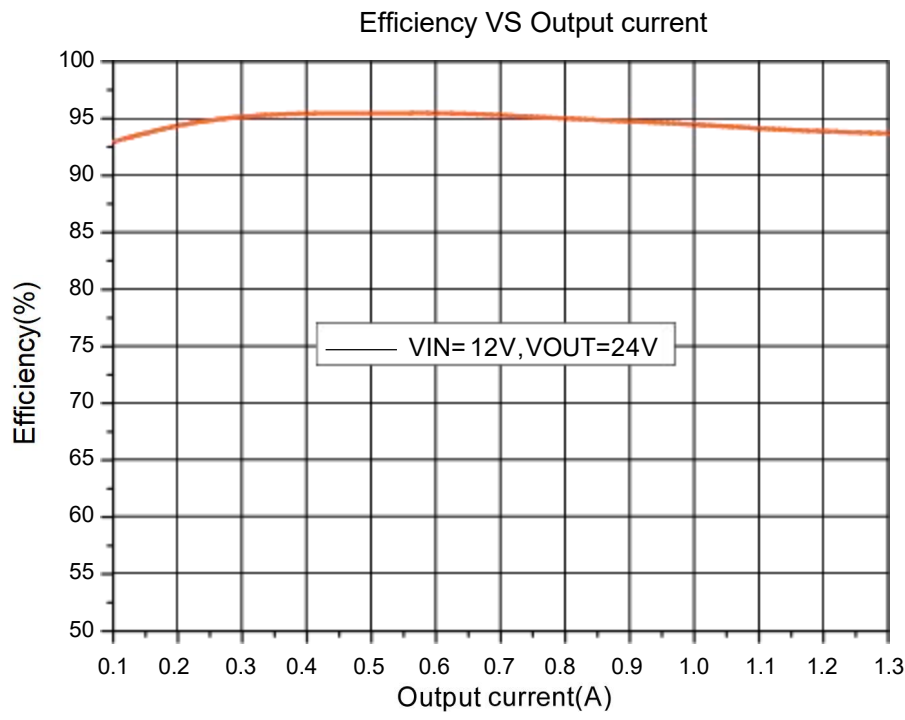


Figure 9. 6009System Efficiency Curve

Typical System Application (VIN=5V, VOUT=12V)

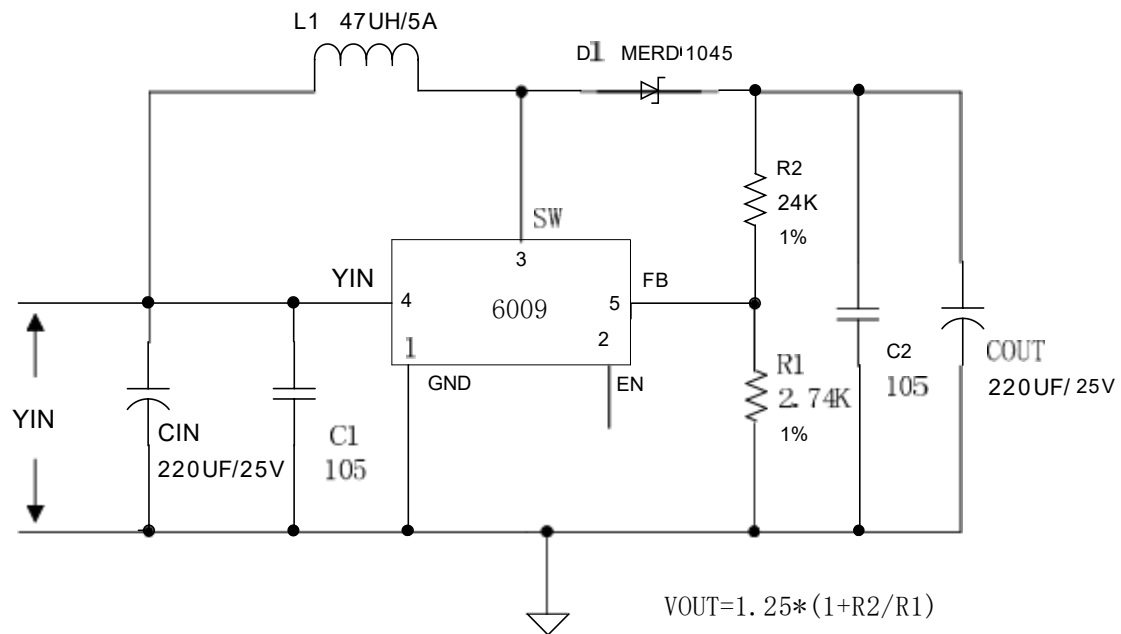


Figure 10. 6009System Parameters Test Circuit (VIN=5V,VOUT=12V)

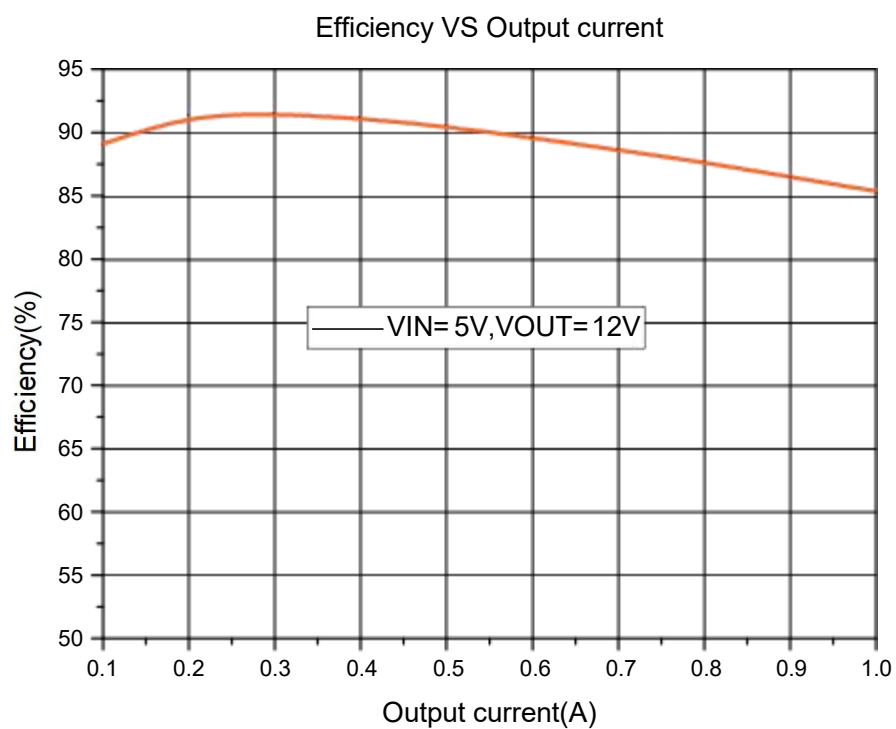


Figure 11. 6009System Efficiency Curve

Typical System Application (VIN=10~32V, VOUT=36V)

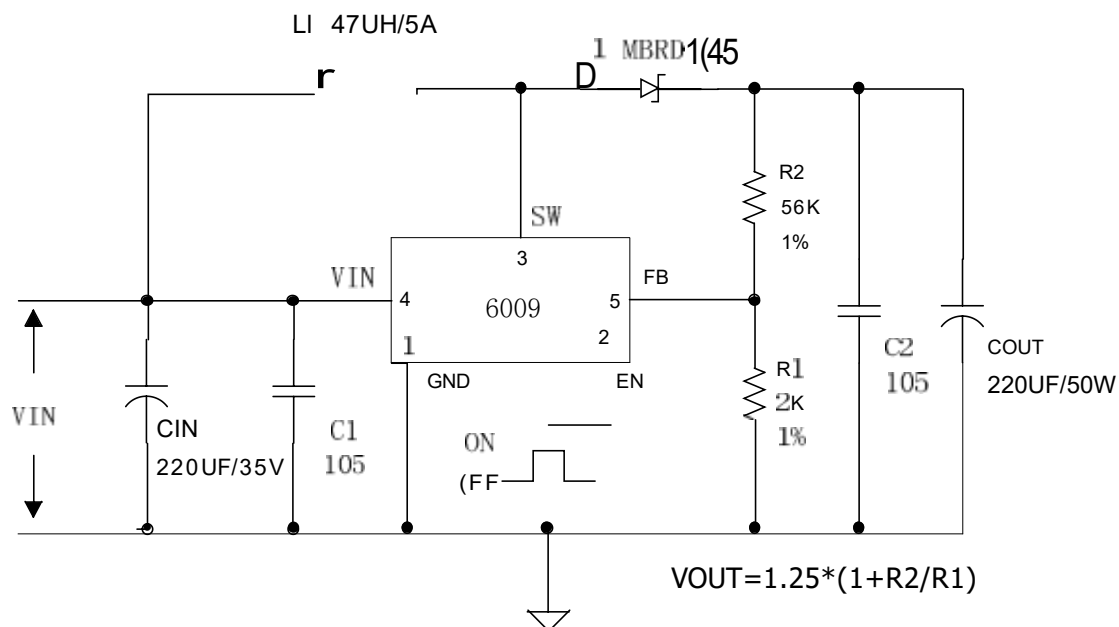


Figure 12. 6009System Parameters Test Circuit (VIN=10~32V,VOUT=36V)

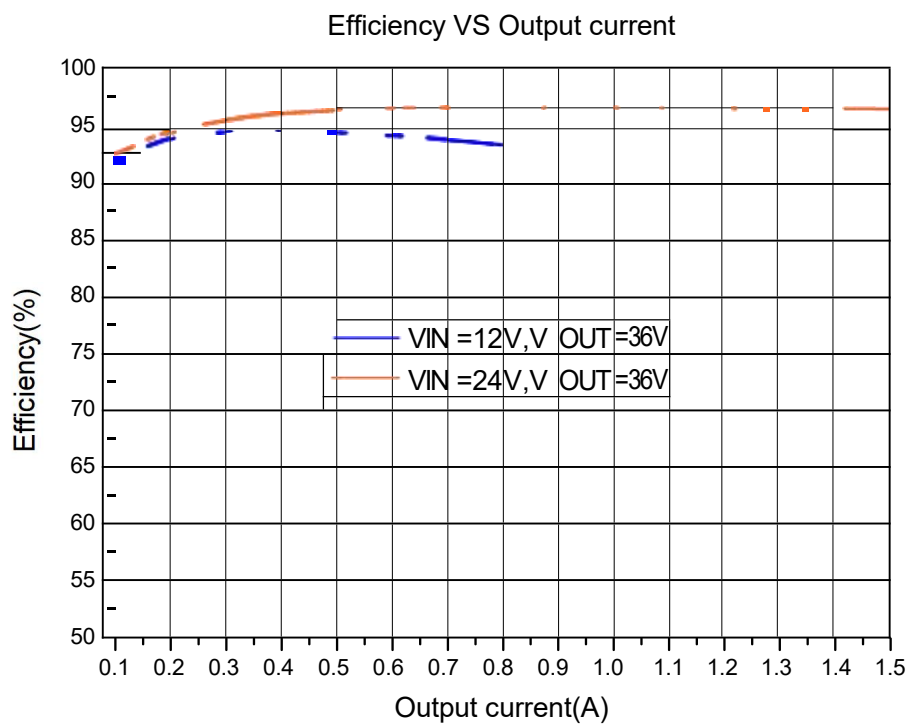


Figure 13. 6009System Efficiency Curve

Typical System Application (VIN=20~40V, VOUT=48V)

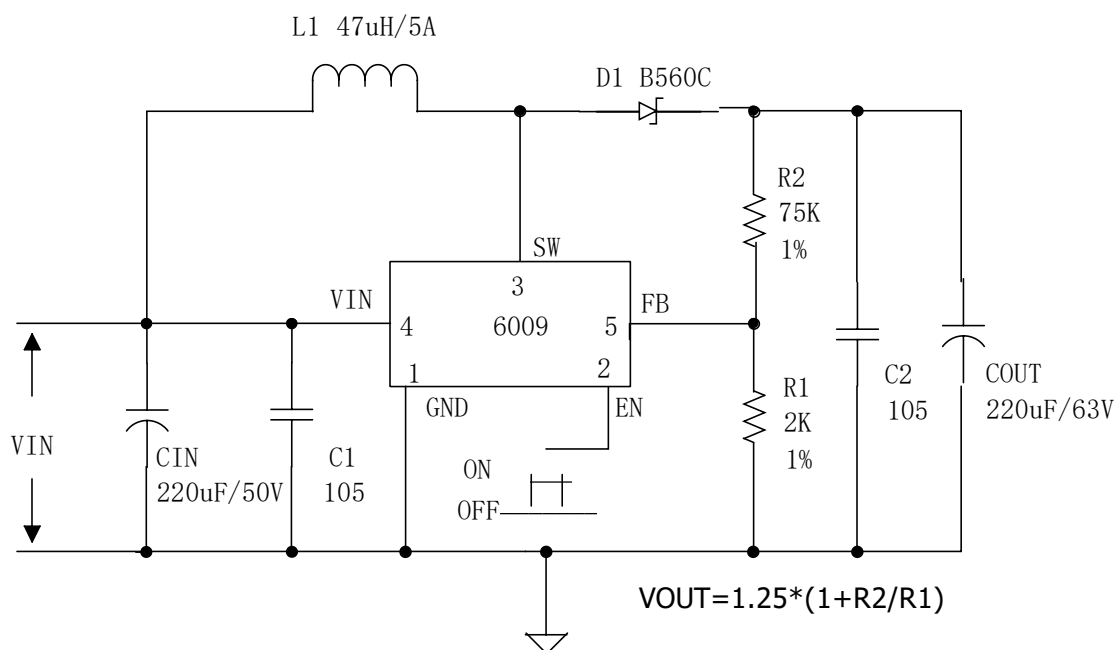


Figure 14. 6009System Parameters Test Circuit (VIN=20~40V,VOUT=48V)

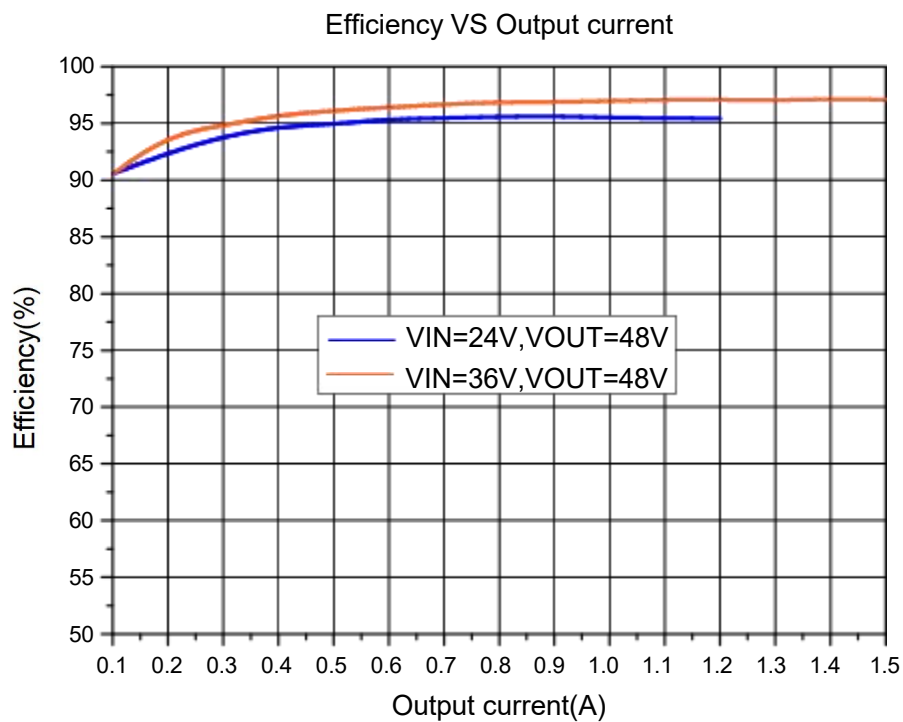


Figure 15. 6009System Efficiency Curve

Typical System Application (SEPIC Converter VIN=10~30V,VOUT=12V)

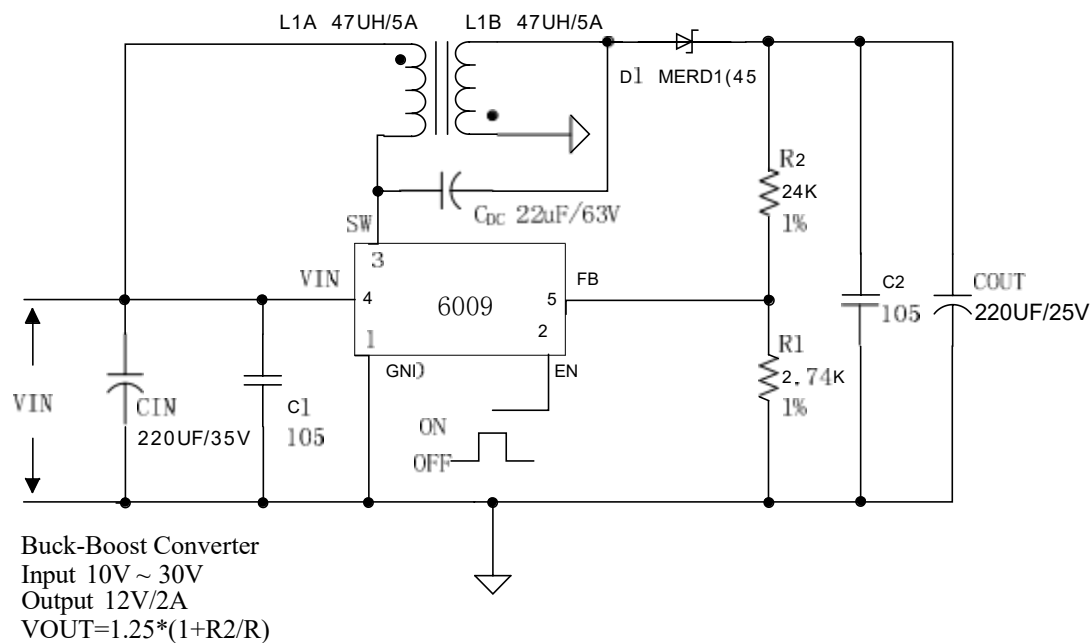


Figure 16. 6009System Parameters Test Circuit

Typical System Application (SEPIC Converter VIN=10~30V,VOUT=±12V)

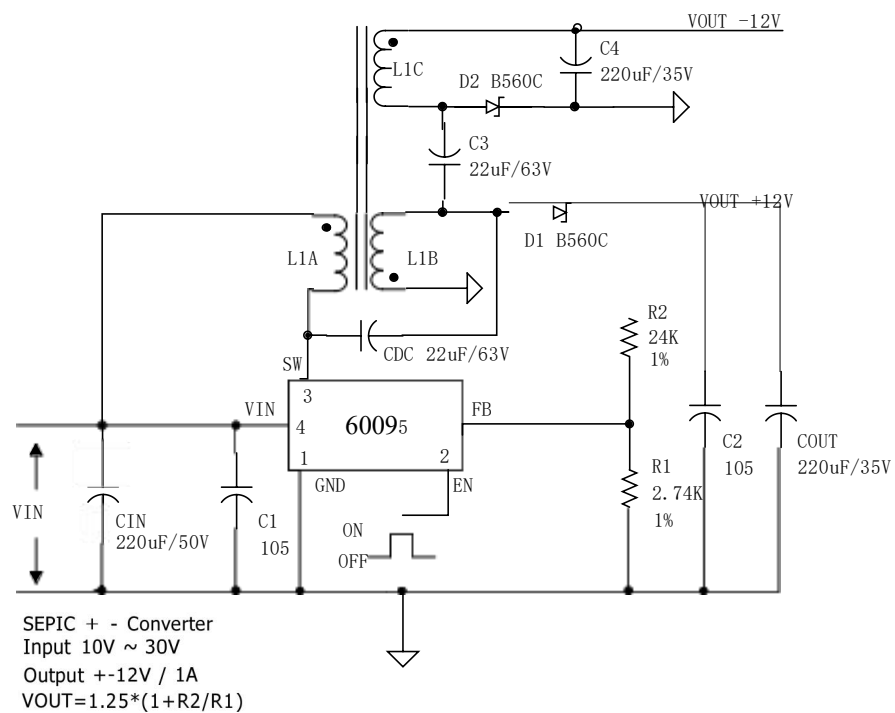


Figure 17. 6009System Parameters Test Circuit

Typical System Application (Fixed Output Voltage 12V, VIN=3.6~10V)

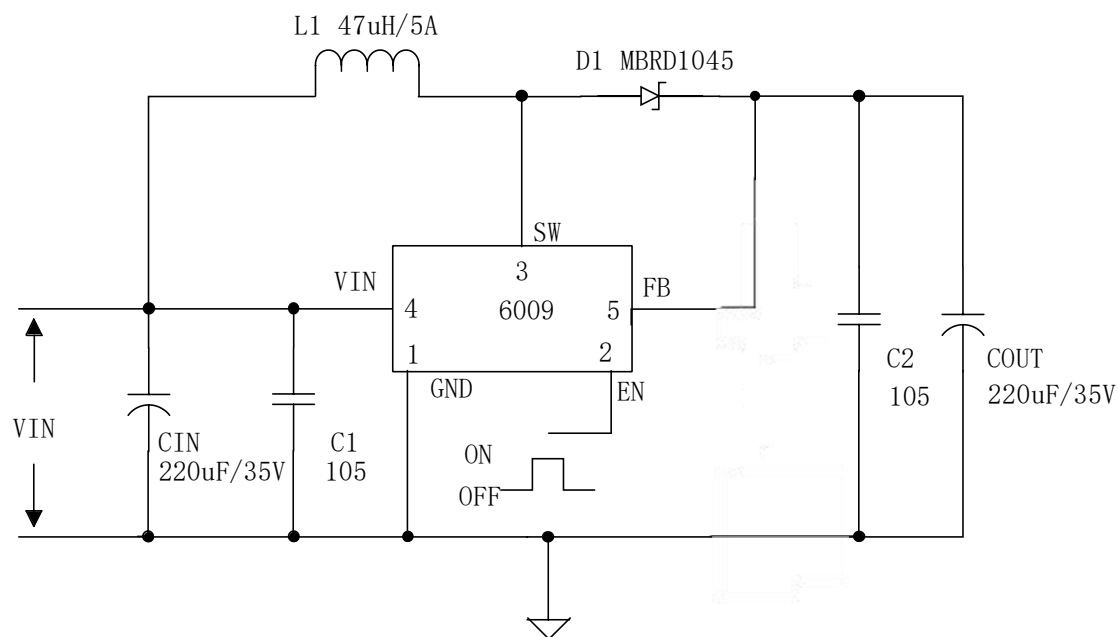


Figure 18. 6009System Parameters Test Circuit

Typical System Application (Fixed Output Voltage 24V, VIN=5~20V)

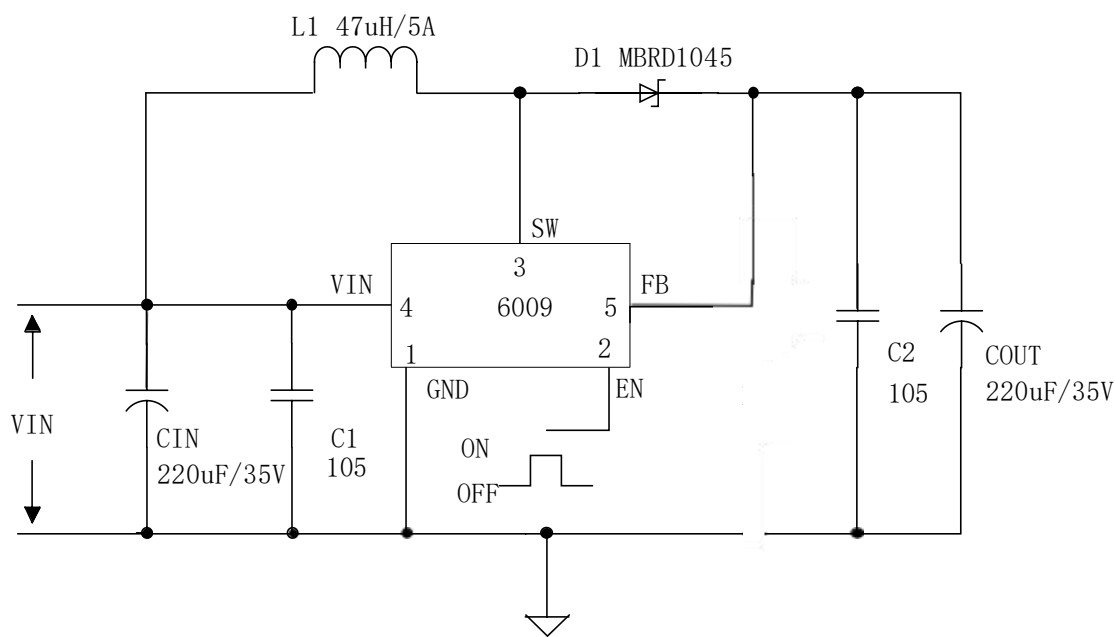


Figure 19 . 6009System Parameters Test Circuit

Package Information

·T0-263-5L

Size Symbol	Dimensions In Millimeters		Size Symbol	Dimensions In Inches	
	Min (mm)	Max (mm)		Min (in)	Max (in)
A	1.170	1.370	A	0.046	0.054
A1	4.470	4.670	A1	0.176	0.184
A2	0.310	0.530	A2	0.012	0.021
B1	2.340	2.740	B1	0.092	0.108
C	5.080 (REF)		C	0.200 (REF)	
D	1.170	1.370	D	0.046	0.054
D1	8.500	8.900	D1	0.335	0.350
D2	14.55	15.55	D2	0.572	0.612
E	0.660	0.860	E	0.025	0.034
E1	10.01	10.31	E1	0.394	0.406
e	1.700 (BSC)		e	0.067 (BSC)	

