2.5A 150KHz 50V Synchronous Buck DC to DC Converter XL9022

eatures

- Operation Voltage：5V~45V
- Output Adjustable from 1.25V to 40V
- Maximum Duty Cycle up to 90%
- Feedback Voltage Accuracy ±2%
- Fixed 150KHz Switching Frequency
- 2.5A Constant Output Current Capability
- Internal Optimize Power MOSFET
- High efficiency up to 95%
- Max. Output power up to 15W
- Excellent line and load regulation
- EN PIN TTL shutdown capability
- Built in thermal shutdown function
- Built in current limit protection function
- Built in output short protection function
- Temperature Grade 1: −40℃ to 125℃ Ambient Operating Temperature Range
- Device HBM ESD Classification Level Class3A
- Available in SOP8−EP package

General Description

The XL9022 is a 150KHz fixed frequency PWM synchronous buck DC/DC converter, capable of driving a 2.5A load with high efficiency, low ripple and excellent line and load regulation. XL9022 supports wide input operating voltage range of 5V ~ 45V and a maximum duty cycle of 90% output. A built−in loop compensation module reduces components in the system, lowering power system cost and reducing printed circuit board space. The XL9022 has built−in thermal shutdown, current limit protection and output short protection function and so on. When the output short protection function happens, the operation frequency will be reduced about from 150KHz to 40KHz.

Applications

- Automotive Electronics
- Industrial Control
- Networking Equipment
- Internet of Things

Typical application schematic

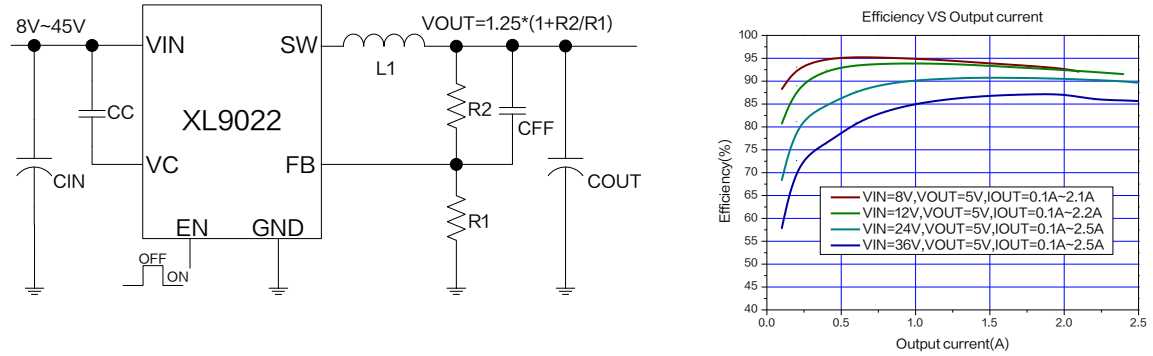


Figure1. XL9022 Typical application schematic and efficiency curve

Pin Configurations

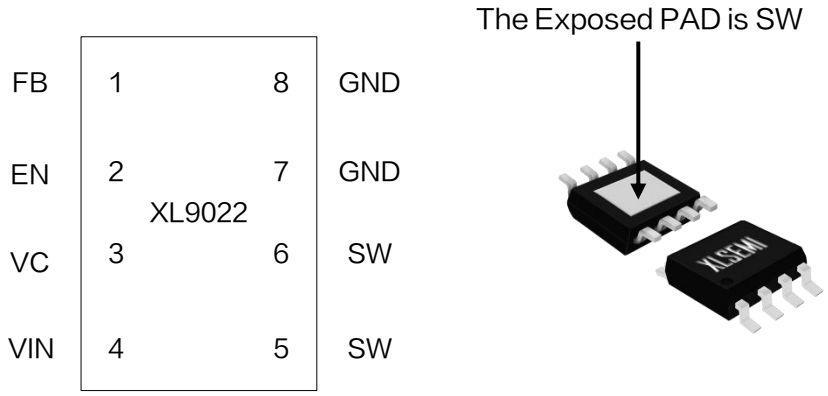


Figure2. Pin Configuration of XL9022

Table 1 Pin Description

Pin Number	Pin Name	Description
1	FB	Feedback Pin (FB). Through an external resistor divider network, Feedback senses the output voltage and regulates it. The feedback threshold voltage is 1.25V.
2	EN	Enable Pin. Drive EN pin high to turn off the device, drive it low to turn it on. Floating is default low. Connect to GND to enable the voltage regulator.
3	VC	Internal Voltage Regulator Bypass Capacity. In typical system application, The VC pin connect a 1uF capacitor to VIN.
4	VIN	Supply Voltage Input Pin. XL9022 operates from 5V to 45V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.
5,6	SW	Power Switch Output Pin (SW). Output is the switch node that supplies power to the output.
7,8	GND	Ground Pin.

Ordering Information

Order Information	Marking ID	Package Type	Eco Plan	Packing Type Supplied As
XL9022E1	XL9022E1	SOP8-EP	RoHS & HF	4000 Units on Reel

Function Block

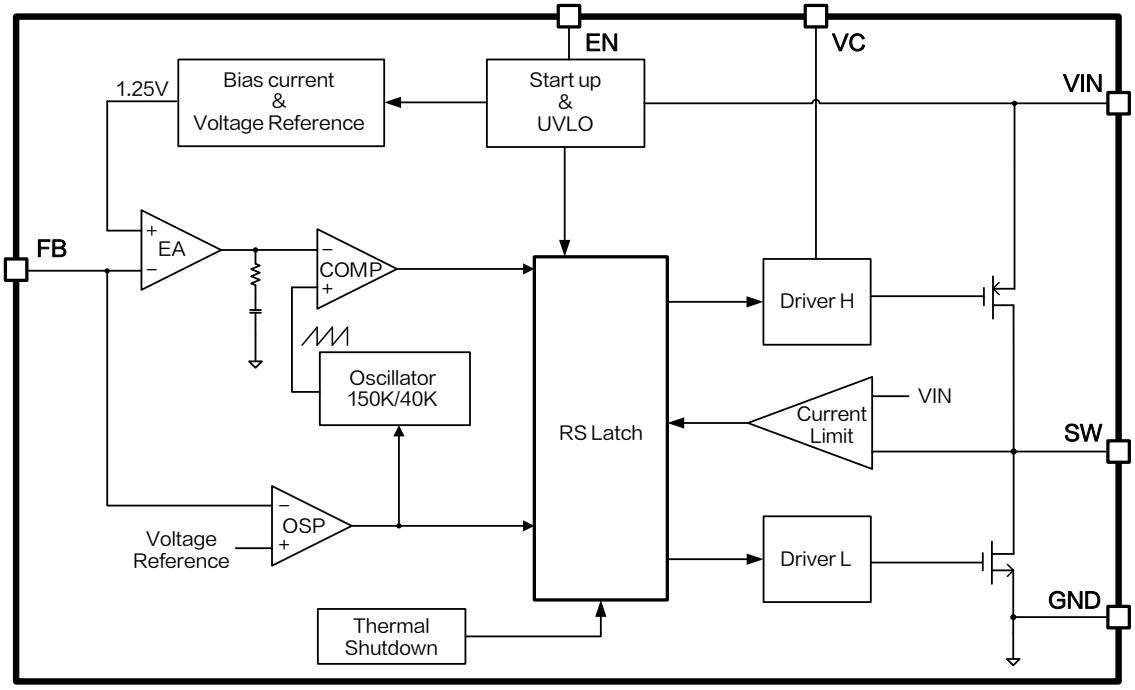


Figure3. Function Block Diagram of XL9022

Absolute Maximum Ratings（Note1）

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	−0.3~50	V
EN Pin Voltage	V_{EN}	−0.3~7	V
Feedback Pin Voltage	V_{FB}	−0.3~7	V
Output Switch Pin Voltage	V_{SW}	−0.3~V_{IN}	V
Power Dissipation	P_D	Internally limited	mW
Thermal Resistance (SOP8−EP) (Junction to Ambient, No Heatsink, Free Air)	R_{JA}	60	℃/W
Operating Junction Temperature	T_J	−40~150	℃
Storage Temperature	T_{STG}	−65~150	℃
Lead Temperature (Soldering, 10 sec)	T_{LEAD}	260	℃
ESD (HBM)		≥4000	V

Note1: Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

XL9022 Electrical Characteristics

T_A = 25℃; system parameters test circuit figure6, unless otherwise specified.

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{FB}	Feedback Voltage	V_{IN} =12V, V_{OUT}=5.0V I_{OUT}=0.5A	1.225	1.25	1.275	V
η	Efficiency	V_{IN} =12V, V_{OUT} =3.3V I_{OUT} =1.0A	–	91.1	–	%
η	Efficiency	V_{IN} =12V, V_{OUT} =5.0V I_{OUT} =1.0A	–	93.5	–	%
η	Efficiency	V_{IN} =24V, V_{OUT} =12V I_{OUT} =0.5A	–	93.4	–	%

Electrical Characteristics (DC Parameters)

T_A=25℃,V_{IN}=12V;system parameters test circuit figure6, unless otherwise specified.

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input operation voltage	V_{IN}		5		45	V
Shutdown Supply Current	I_S	V_{EN} =2V		77	200	uA
Quiescent Supply Current	I_Q	V_{EN} =0V, V_{FB} =2V		2.5	5	mA
Oscillator Frequency	F_{OSC}		127	150	172	KHz
Switch Current Limit	I_L	V_{FB}=0		2.5		A
EN Pin Threshold	V_{EN}	High(OFF)	1.4			V
		Low(ON)			0.8	V
EN Pin Current	I_{EN}	V_{EN} =2.0V		5		uA
High side MOS On-resistance	$R_{DS(ON)H}$			68		mΩ
Low side MOS On-resistance	$R_{DS(ON)L}$			50		mΩ
Thermal Shutdown Temperature	T_{SD}			160		℃
Thermal Shutdown Hysteresis	T_D			30		℃

Typical System Application Schematic (V_{OUT}=3.3V, I_{OUT}=0~2.5A)

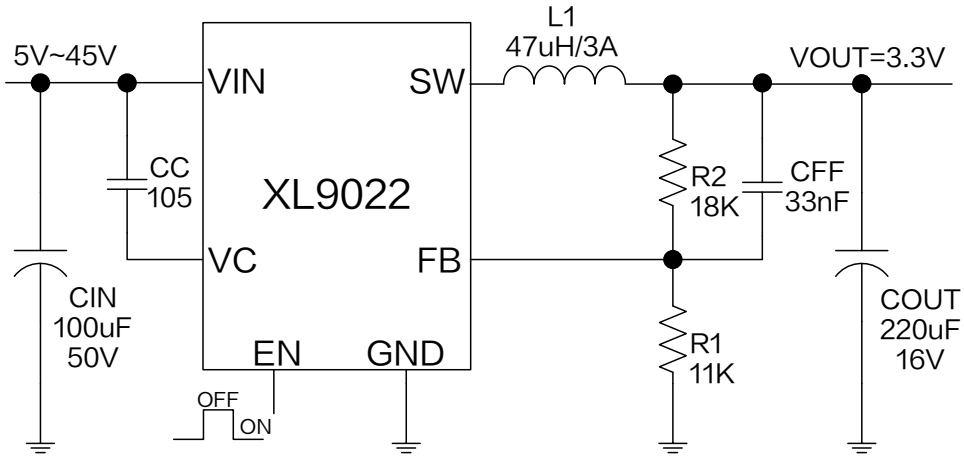


Figure4. XL9022 System Application (V_{IN}=5V~45V, V_{OUT}=3.3V, I_{OUT}=0~2.5A)

Typical System Application Transfer Efficiency

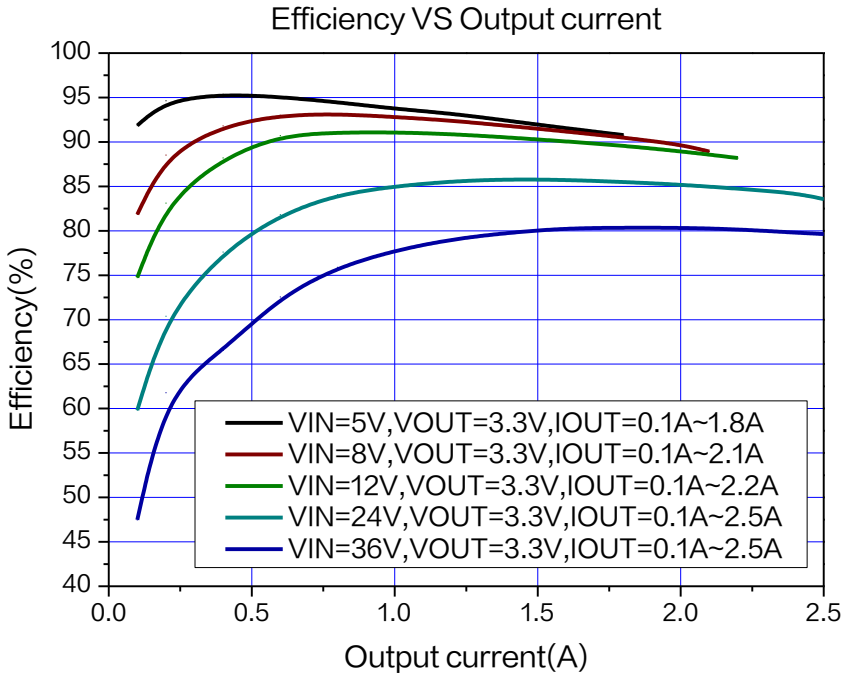


Figure5. XL9022 System Efficiency Curve(V_{OUT}=3.3V)

Typical System Application Schematic (V_{OUT}=5.0V, I_{OUT}=0~2.5A)

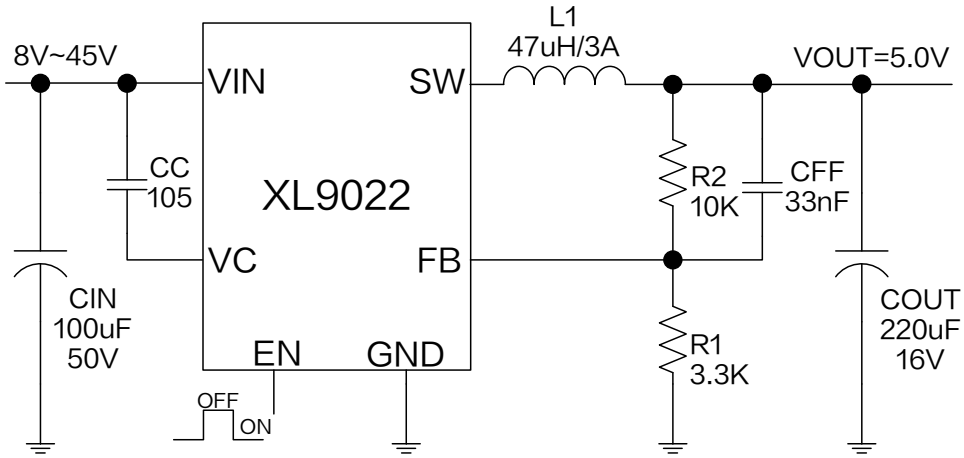


Figure6. XL9022 System Application (V_{IN}=8V~45V, V_{OUT}=5.0V, I_{OUT}=0~2.5A)

Typical System Application Transfer Efficiency

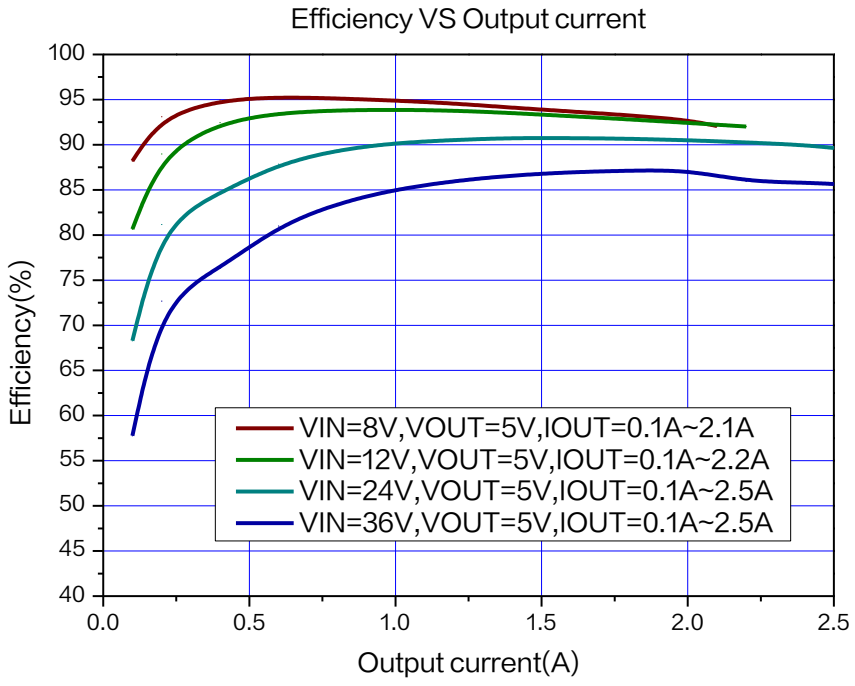


Figure7. XL9022 System Efficiency Curve(V_{OUT}=5.0V)

Typical System Application Schematic (V_{OUT}=12V, I_{OUT}=0~1.5A)

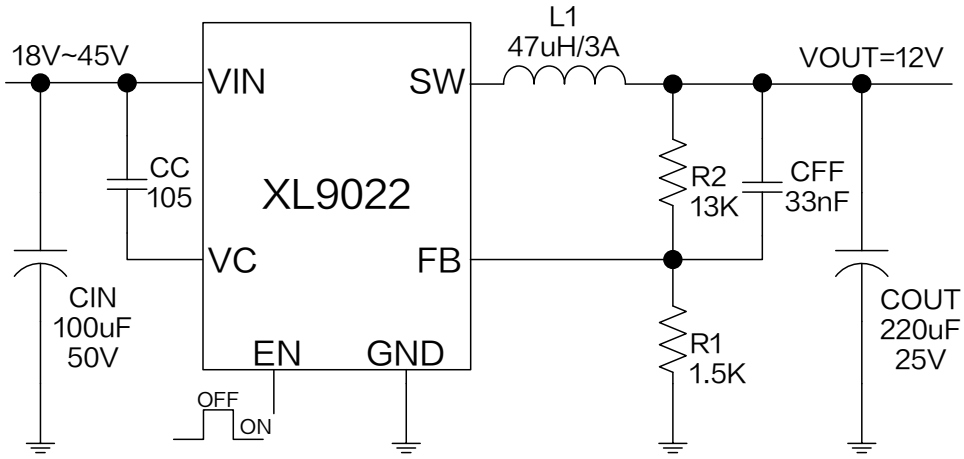


Figure8. XL9022 System Parameters Test Circuit (V_{IN}=18V~45V, V_{OUT}=12V, I_{OUT}=0~1.5A)

Typical System Application Transfer Efficiency

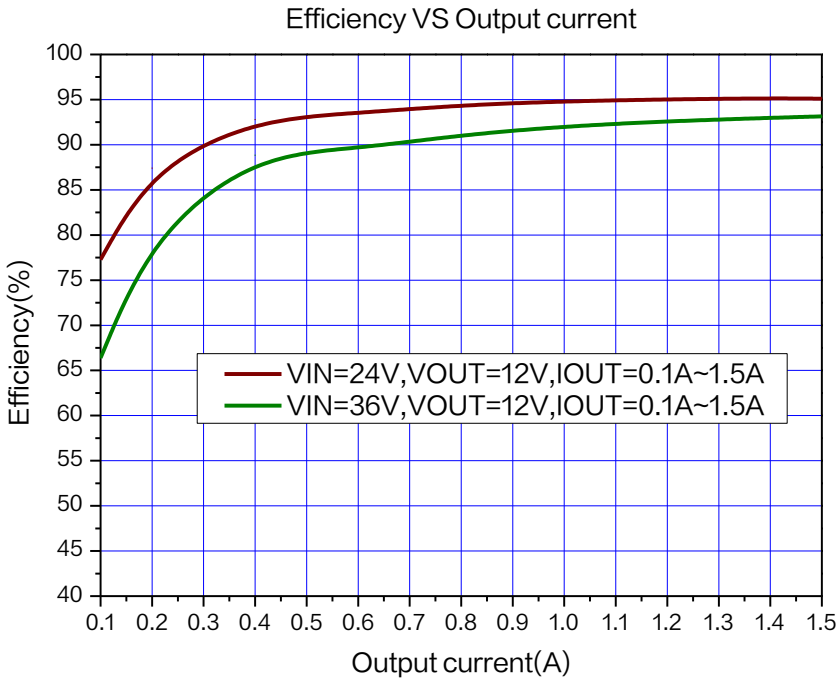


Figure9. XL9022 System Efficiency Curve(V_{OUT}=12V)

Typical System Application Schematic (V_{OUT}=15V, I_{OUT}=0~1.5A)

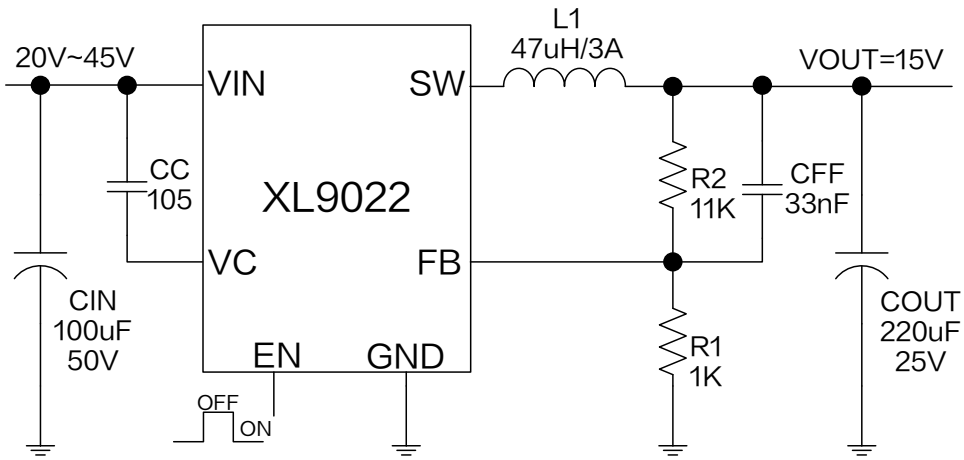


Figure10. XL9022 System Parameters Test Circuit (V_{IN}=20V~45V, V_{OUT}=15V, I_{OUT}=0~1.5A)

Typical System Application Transfer Efficiency

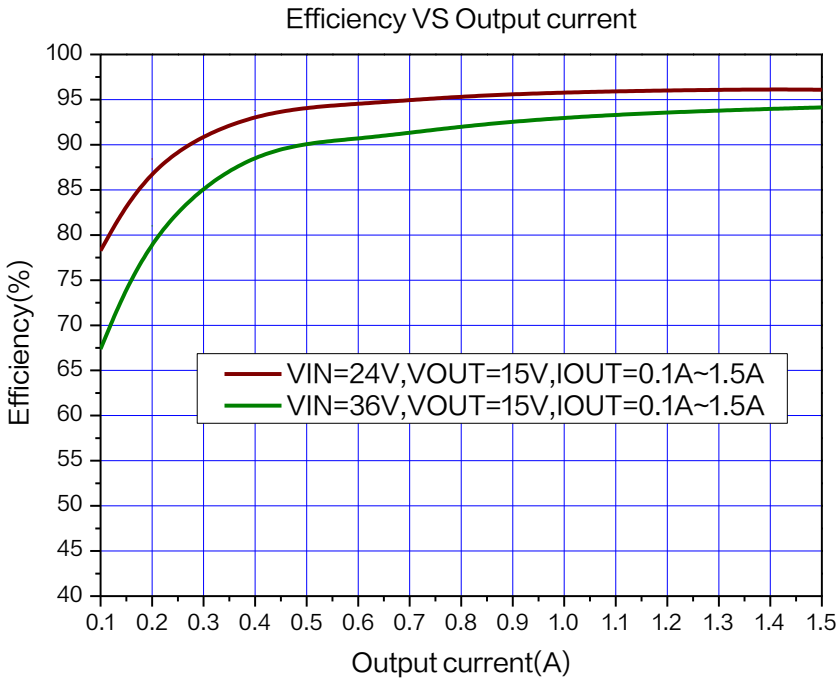


Figure11. XL9022 System Efficiency Curve(V_{OUT}=15V)

Typical Characteristics

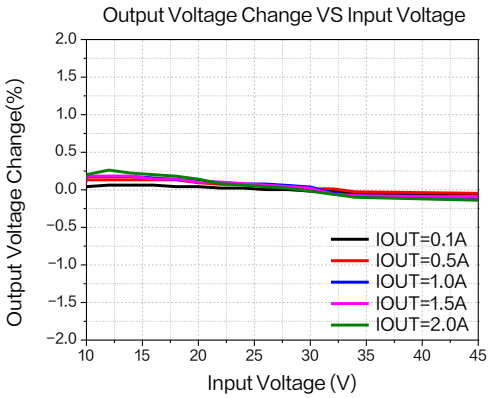


Figure12.Line Regulation

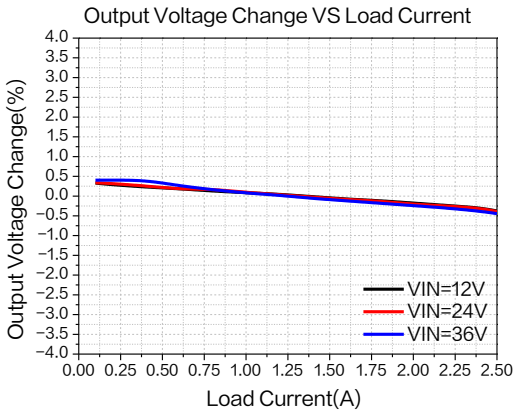


Figure13.Load Regulation

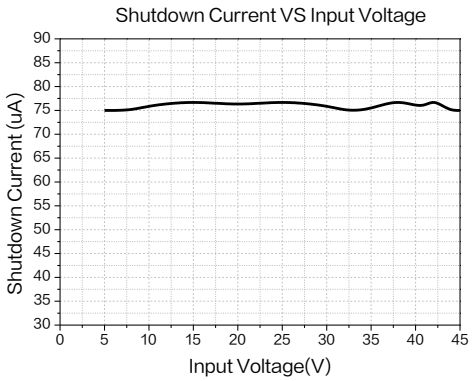


Figure14.Shutdown Current

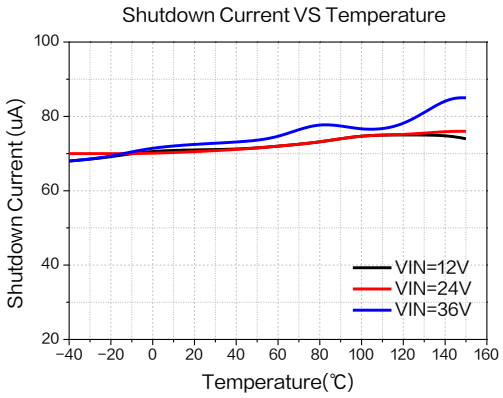


Figure15.Shutdown Current

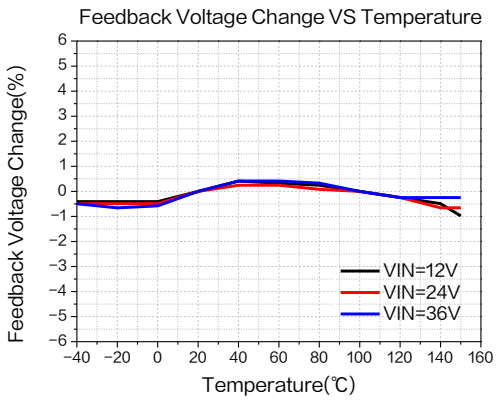


Figure16.Feedback Voltage Regulation

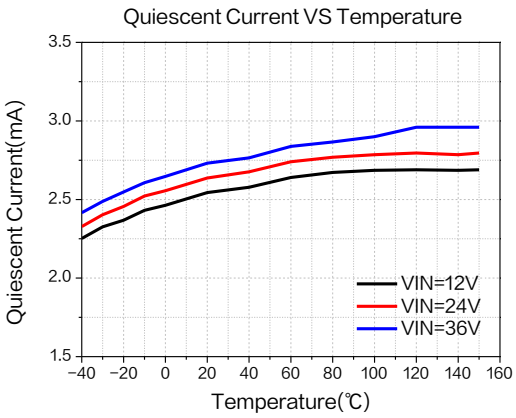


Figure17.Quiescent Current

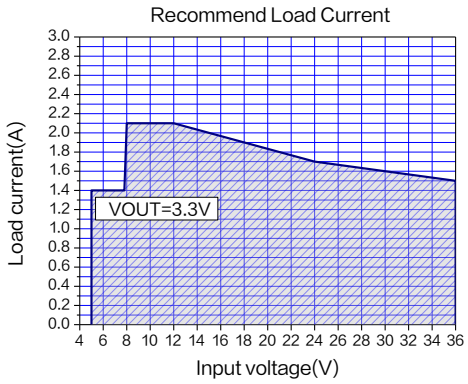


Figure 18.Max Output Current
(V_{OUT}=3.3V，T_A=25℃)

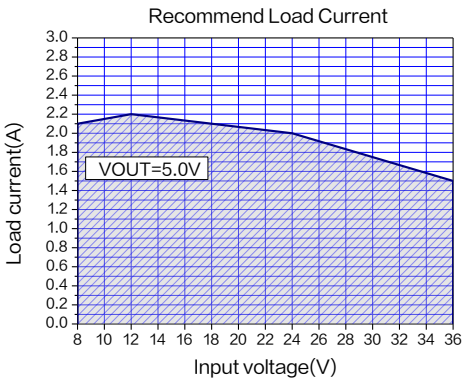


Figure 19.Max Output Current
(V_{OUT}=5.0V，T_A=25℃)

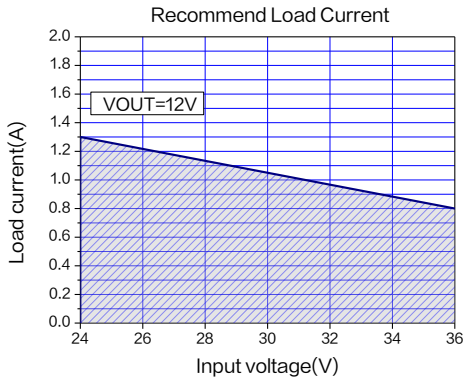


Figure 20.Max Output Current
(V_{OUT}=12V，T_A=25℃)

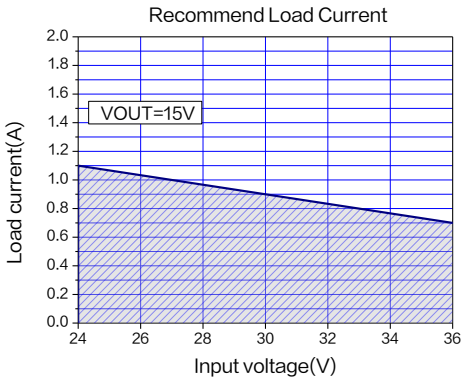


Figure 21.Max Output Current
(V_{OUT}=15V，T_A=25℃)

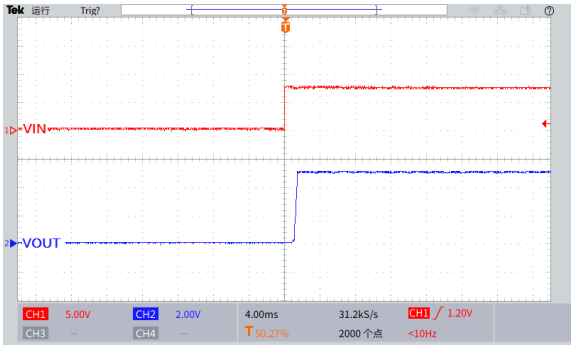


Figure 22. Start-Up Characteristic
(V_{IN}=8V，V_{OUT}=5.0V，I_{OUT}=0.1A)

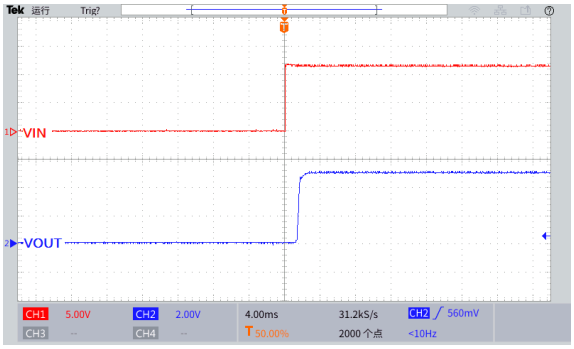


Figure 23. Start-Up Characteristic
(V_{IN}=12V，V_{OUT}=5.0V，I_{OUT}=0.1A)

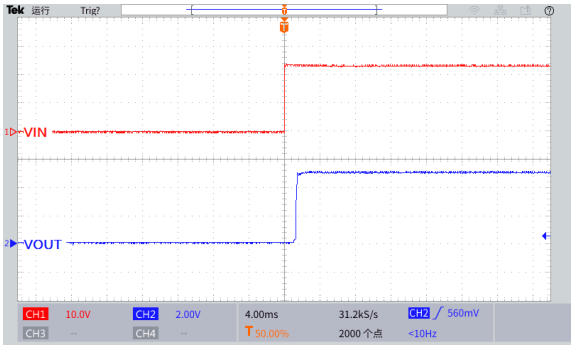


Figure 24. Start-Up Characteristic
(V_{IN}=24V，V_{OUT}=5.0V，I_{OUT}=0.1A)

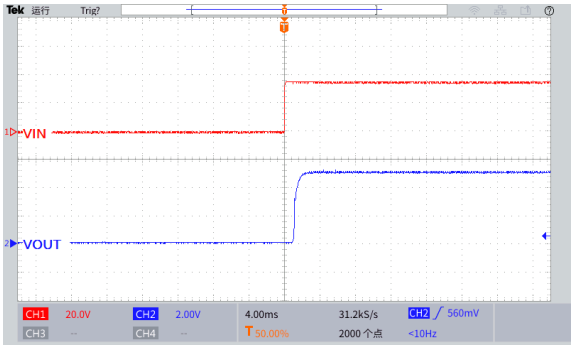


Figure 25. Start-Up Characteristic
(V_{IN}=36V，V_{OUT}=5.0V，I_{OUT}=0.1A)

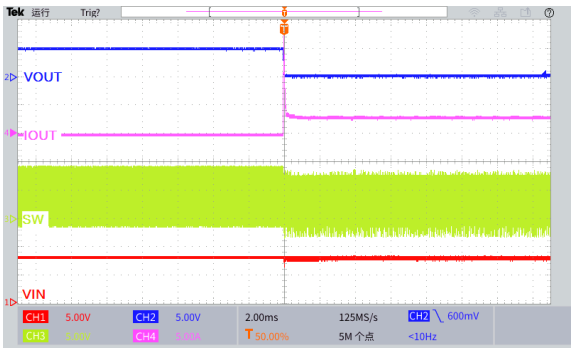


Figure 26. Output Short Circuit Waveform
(V_{IN}=8V，V_{OUT}=5.0V)

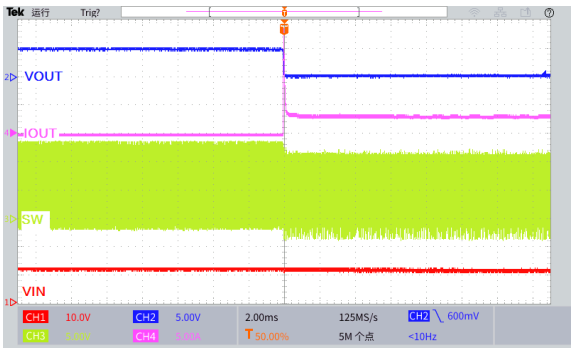


Figure 27. Output Short Circuit Waveform
(V_{IN}=12V，V_{OUT}=5.0V)

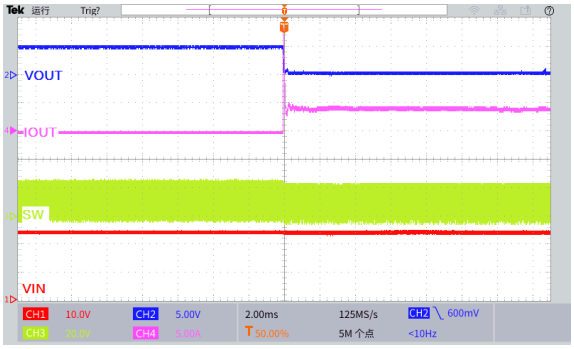


Figure 28. Output Short Circuit Waveform
(V_{IN}=24V，V_{OUT}=5.0V)

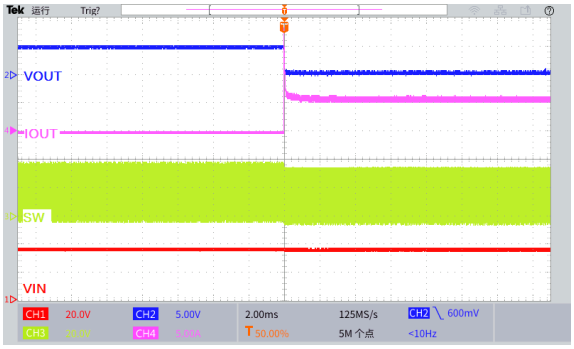


Figure 29. Output Short Circuit Waveform
(V_{IN}=36V，V_{OUT}=5.0V)

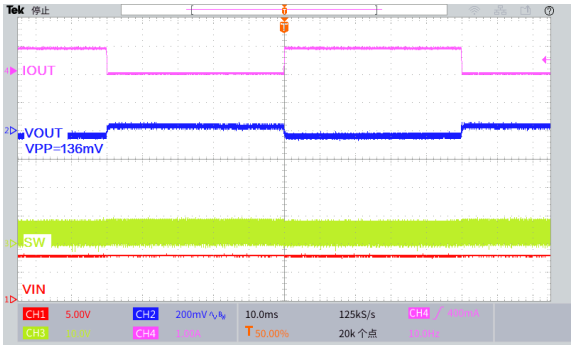


Figure30. Load Transient Response
(V_{IN}=8V，V_{OUT}=5.0V，I_{OUT}=0.1 to 1A)

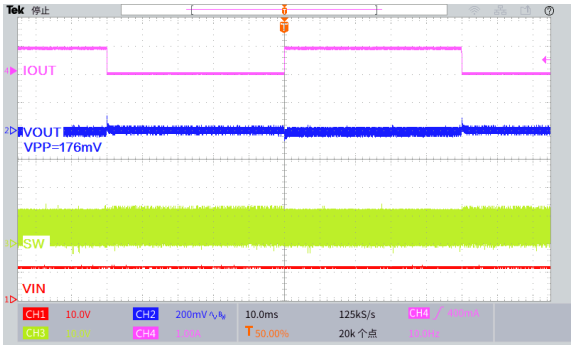


Figure31. Load Transient Response
(V_{IN}=12V，V_{OUT}=5.0V，I_{OUT}=0.1 to 1A)

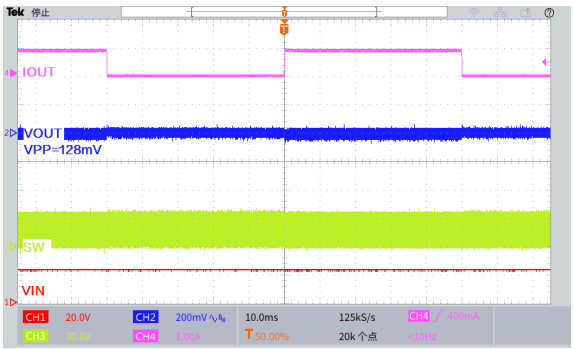


Figure32. Load Transient Response
(V_{IN}=24V，V_{OUT}=5.0V，I_{OUT}=0.1 to 1A)

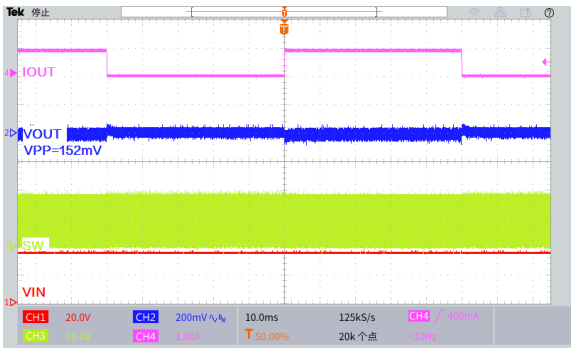


Figure33. Load Transient Response
(V_{IN}=36V，V_{OUT}=5.0V，I_{OUT}=0.1 to 1A)

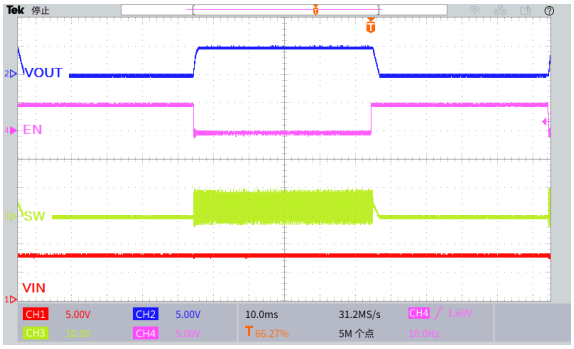


Figure34. Start or Shutdown Using EN Pin
(V_{IN}=8V，V_{OUT}=5.0V，I_{OUT}=0.5A)

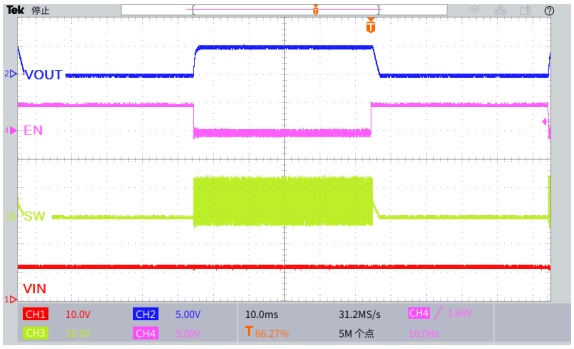


Figure35. Start or Shutdown Using EN Pin
(V_{IN}=12V，V_{OUT}=5.0V，I_{OUT}=0.5A)

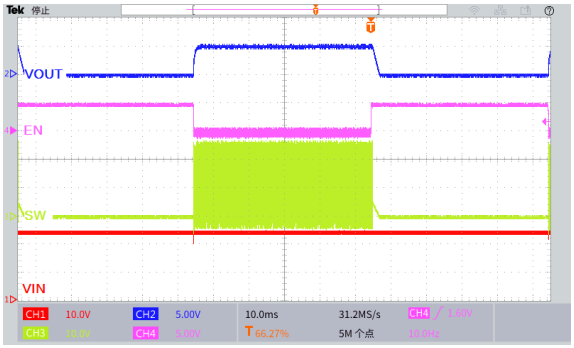


Figure36. Start or Shutdown Using EN Pin
(V_{IN}=24V，V_{OUT}=5.0V，I_{OUT}=0.5A)

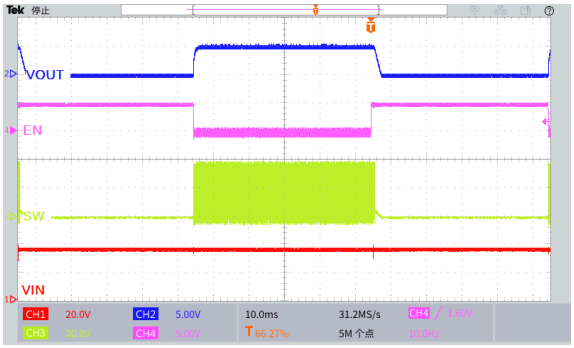
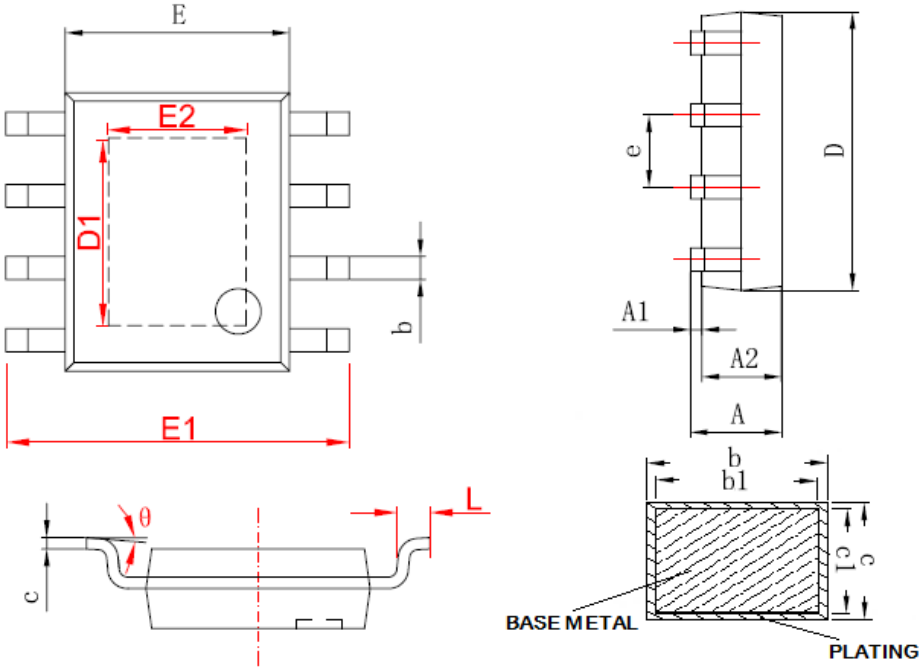


Figure37. Start or Shutdown Using EN Pin
(V_{IN}=36V，V_{OUT}=5.0V，I_{OUT}=0.5A)

Package Information

SOP8-EP



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.000	0.150	0.000	0.006
A2	1.250	1.650	0.049	0.065
b	0.306	0.510	0.012	0.020
b1	0.296	0.480	0.011	0.019
c	0.170	0.250	0.006	0.010
c1	0.170	0.230	0.006	0.009
D	4.700	5.100	0.185	0.200
D1	2.650	3.467	0.104	0.136
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	1.930	2.534	0.076	0.100
e	1.140	1.400	0.045	0.055
L	0.450	0.800	0.017	0.031
θ	0°	8°	0°	8°

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