

## 1.0A 120KHz 80V Synchronous Buck DC to DC Converter

XL9712

### Features

- Operation Voltage: 5V~72V
- Minimum Drop Out: 1.5V
- Feedback Voltage Accuracy  $\pm 2\%$
- Fixed 120KHz Switching Frequency
- 1A Constant Output Current Capability
- Internal Optimize Power MOSFET
- High efficiency up to 94%
- Max. Output power up to 15W
- Excellent line and load regulation
- Built in thermal shutdown function
- Built in current limit protection function
- Built in output short protection function
- Device HBM ESD Classification Level Class3B
- Available in TO252-5L package

### General Description

The XL9712 is a 120KHz fixed frequency PWM synchronous buck DC/DC converter, capable of driving a 1A load with high voltage, high efficiency, low ripple and excellent line and load regulation. XL9712 supports wide input operating voltage range of 5V ~ 72V 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 XL9712 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 120KHz to 30KHz.

### Applications

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

### Typical application schematic

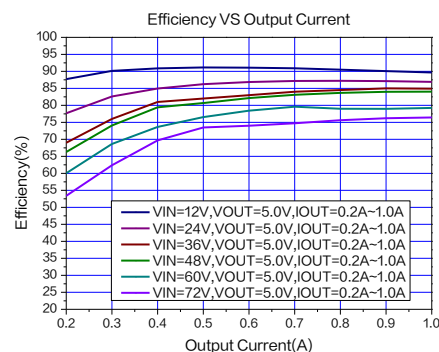
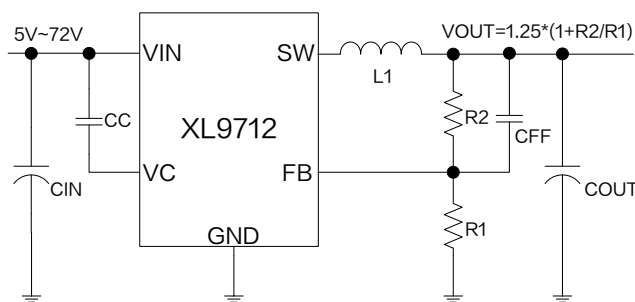


Figure1. XL9712 Typical application schematic and efficiency curve

### Pin Configurations

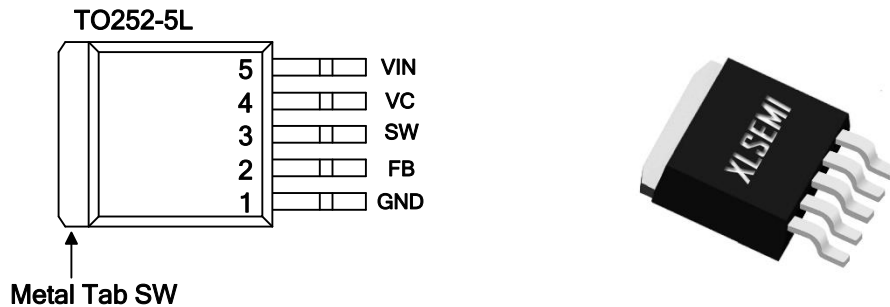


Figure2. Pin Configuration of XL9712

Table 1 Pin Description

Pin Number	Pin Name	Description
1	GND	Ground Pin.
2	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.
3	SW	Power Switch Output Pin (SW). Output is the switch node that supplies power to the output.
4	VC	Internal Voltage Regulator Bypass Capacity. In typical system application, The VC pin connect a 1uF capacitor to VIN.
5	VIN	Supply Voltage Input Pin. XL9712 operates from 5V to 72V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.

### Ordering Information

Order Information	Marking ID	Package Type	Eco Plan	Packing Type Supplied As
XL9712	XL9712	TO252-5L	RoHS & HF	2500 Units on Reel

### Function Block

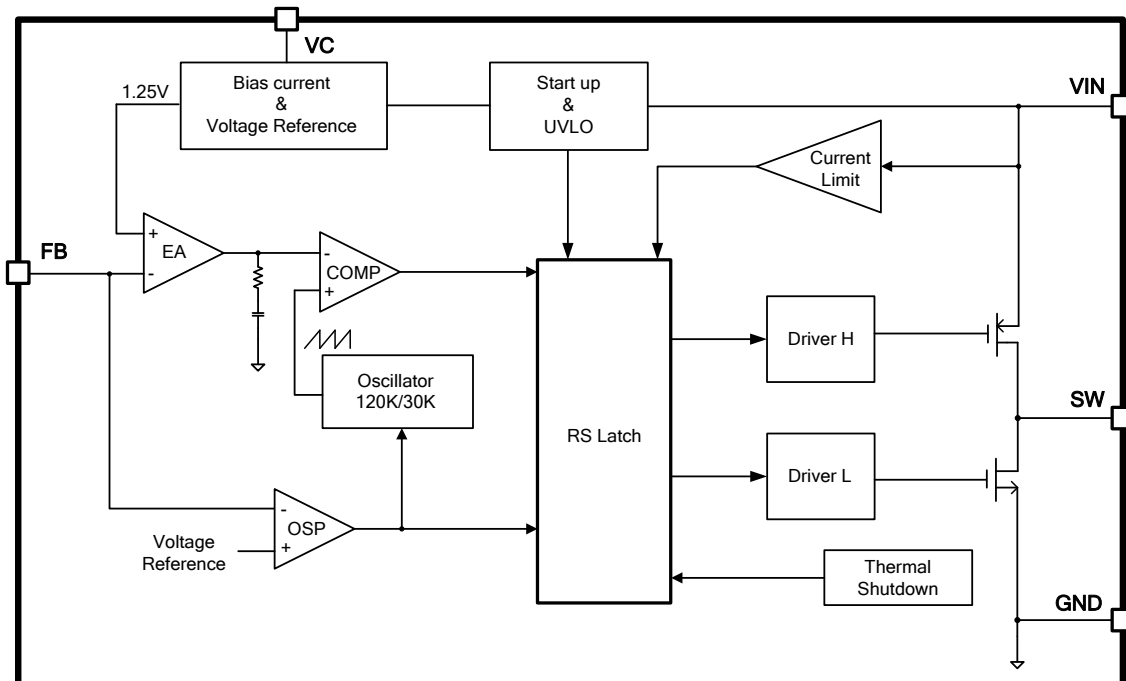


Figure3. Function Block Diagram of XL9712

### Absolute Maximum Ratings ( Note1 )

Parameter	Symbol	Value	Unit
Input Voltage	$V_{IN}$	-0.3~80	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
VC Pin Voltage	$V_C$	-0.3~ $V_{IN}$	V
Power Dissipation	$P_D$	Internally limited	mW
Thermal Resistance (TO252-5L) (Junction to Ambient, No Heatsink, Free Air)	$R_{JA}$	50	°C/W
Operating Junction Temperature	$T_J$	-40~125	°C
Storage Temperature	$T_{STG}$	-65~150	°C
Lead Temperature (Soldering, 10 sec)	$T_{LEAD}$	260	°C
ESD (HBM)		>8000	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.

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### XL9712 Electrical Characteristics

$T_A = 25^\circ\text{C}$ ; system parameters test circuit figure6, unless otherwise specified.

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{FB}$	Feedback Voltage	$V_{IN}=12\text{V}, V_{OUT}=5.0\text{V}$ $I_{OUT}=0.5\text{A}$	1.225	1.25	1.275	V
$\eta$	Efficiency	$V_{IN}=12\text{V}, V_{OUT}=5.0\text{V}$ $I_{OUT}=1.0\text{A}$	-	89.7	-	%
$\eta$	Efficiency	$V_{IN}=12\text{V}, V_{OUT}=15\text{V}$ $I_{OUT}=0.8\text{A}$	-	94.6	-	%

### Electrical Characteristics (DC Parameters)

$T_A=25^\circ\text{C}, V_{IN}=12\text{V}, V_{EN}=0\text{V}$ ; system parameters test circuit figure6, unless otherwise specified.

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input operation voltage	$V_{IN}$		5		72	V
Quiescent Supply Current	$I_Q$	$V_{FB}=2\text{V}$		3.5	5	mA
Oscillator Frequency	$F_{OSC}$		102	120	138	KHz
Switch Current Limit	$I_L$	$V_{FB}=0\text{V}$		1.4		A
High side MOS On-resistance	$R_{DS(ON)H}$			270		m $\Omega$
Low side MOS On-resistance	$R_{DS(ON)L}$			255		m $\Omega$
Thermal Shutdown Temperature	$T_{SD}$			140		$^\circ\text{C}$
Thermal Shutdown Hysteresis	$T_D$			60		$^\circ\text{C}$
Max. Duty Cycle	$D_{MAX}$	$V_{FB}=0\text{V}$		90		%

**1.0A 120KHz 80V Synchronous Buck DC to DC Converter** **XL9712**

**Typical System Application Schematic ( $V_{OUT}=3.3V, I_{OUT}=0\sim 1.0A$ )**

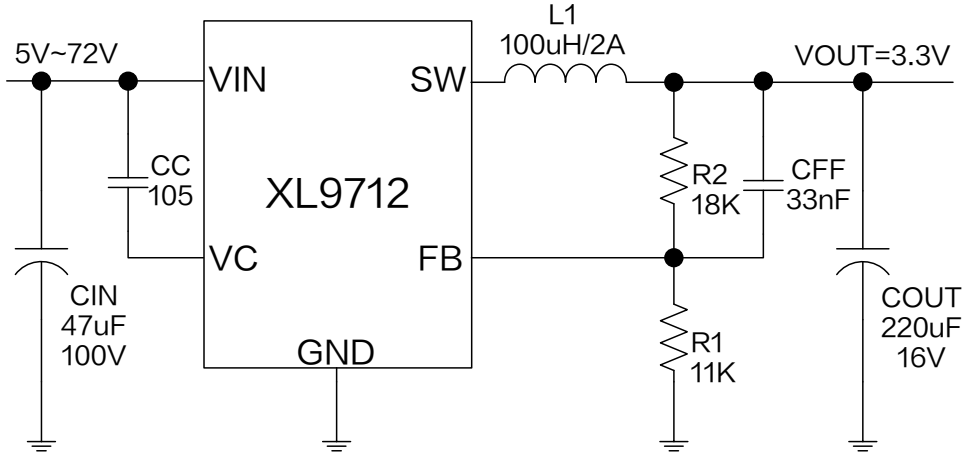


Figure4. XL9712 System Application ( $V_{IN}=5V\sim 72V, V_{OUT}=3.3V, I_{OUT}=0\sim 1.0A$ )

**Typical System Application Transfer Efficiency**

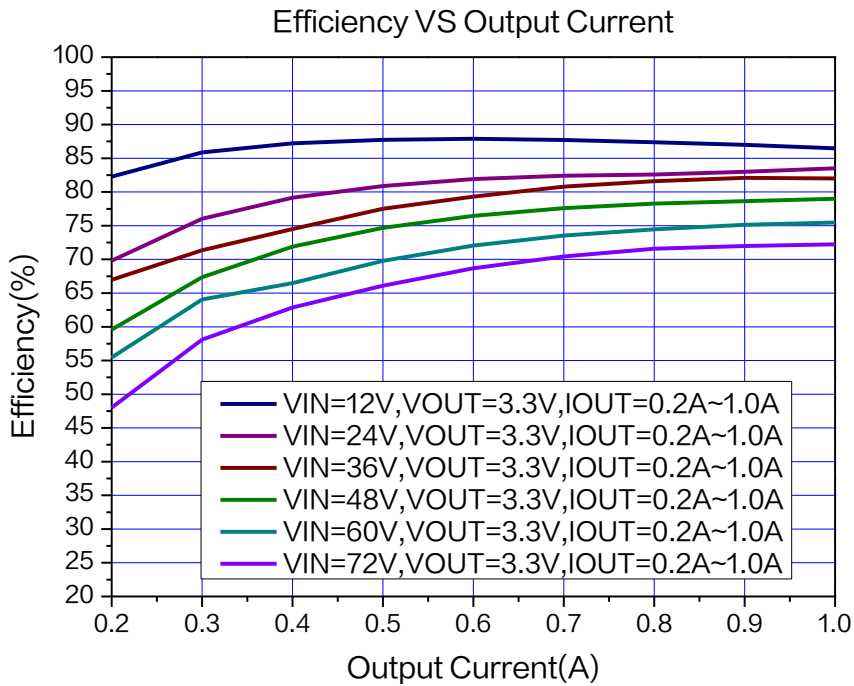


Figure5. XL9712 System Efficiency Curve ( $V_{OUT}=3.3V$ )

**1.0A 120KHz 80V Synchronous Buck DC to DC Converter** **XL9712**

**Typical System Application Schematic ( $V_{OUT}=5.0V$ ,  $I_{OUT}=0\sim 1.0A$ )**

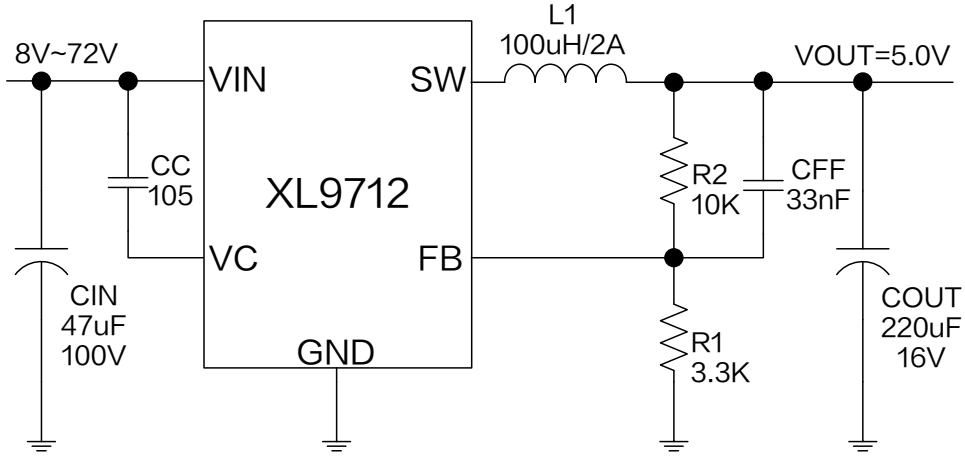


Figure6. XL9712 System Application ( $V_{IN}=8V\sim 72V$ ,  $V_{OUT}=5.0V$ ,  $I_{OUT}=0\sim 1.0A$ )

**Typical System Application Transfer Efficiency**

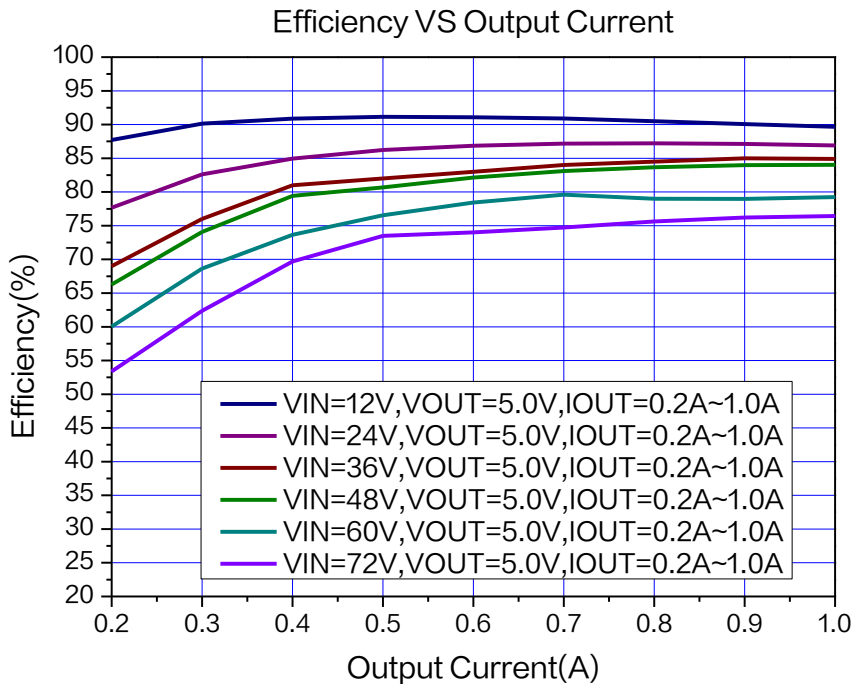


Figure7. XL9712 System Efficiency Curve( $V_{OUT}=5.0V$ )

### Typical Characteristics

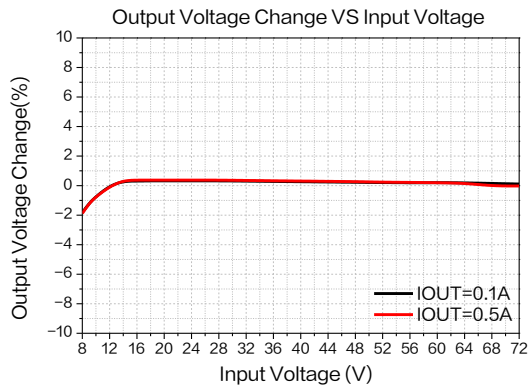


Figure 8.Line Regulation

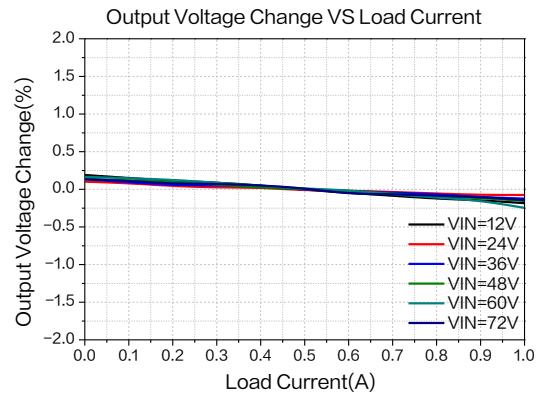


Figure 9.Load Regulation

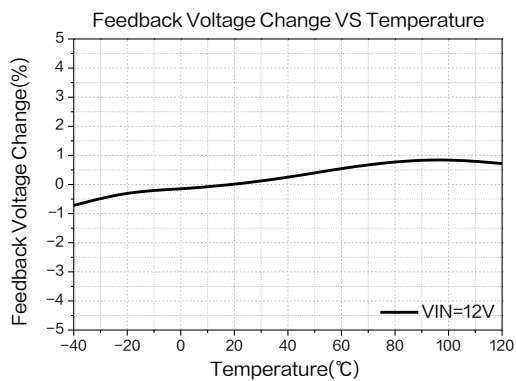


Figure 10.Feedback Voltage Regulation

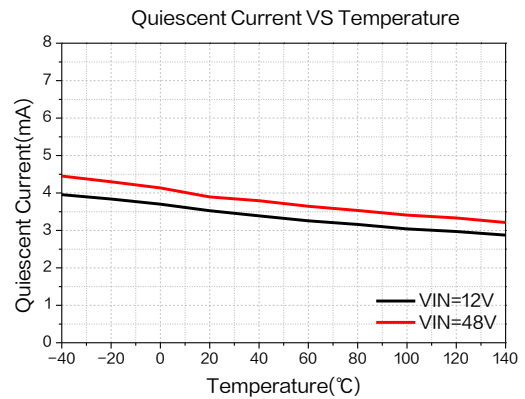


Figure 11.Quiescent Current

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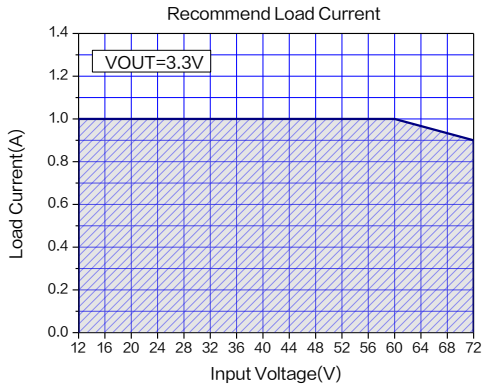


Figure 12.Max Output Current  
(V<sub>OUT</sub>=3.3V, T<sub>A</sub>=25°C)

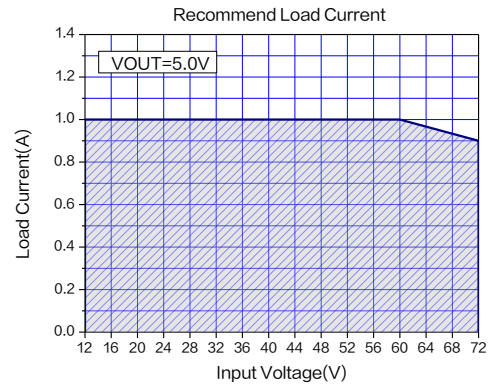


Figure 13.Max Output Current  
(V<sub>OUT</sub>=5.0V, T<sub>A</sub>=25°C)

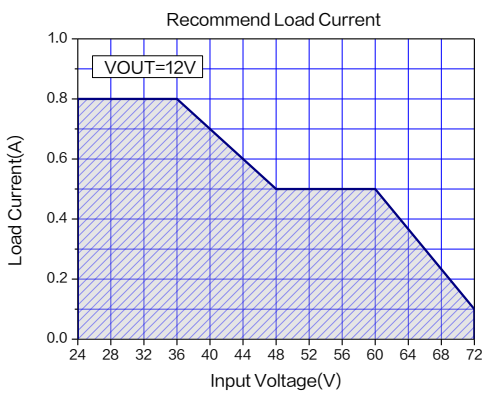


Figure 14.Max Output Current  
(V<sub>OUT</sub>=12V, T<sub>A</sub>=25°C)

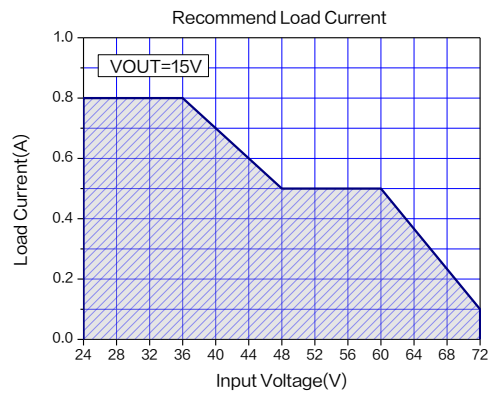


Figure 15.Max Output Current  
(V<sub>OUT</sub>=15V, T<sub>A</sub>=25°C)



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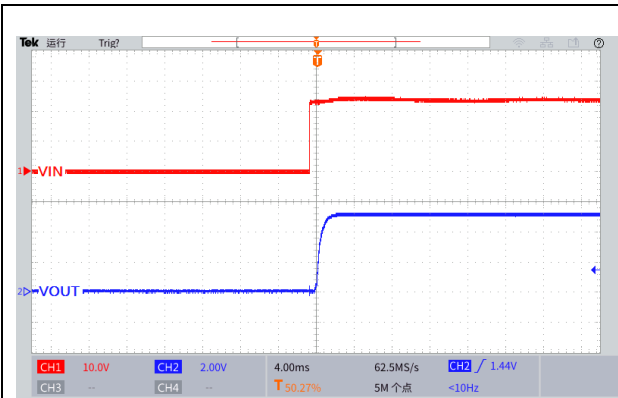


Figure 16. Start-Up Characteristic  
( $V_{IN}=24V$ ,  $V_{OUT}=5.0V$ ,  $I_{OUT}=0.1A$ )

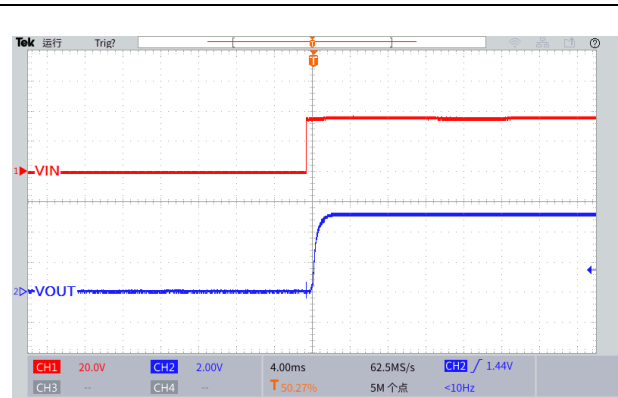


Figure 17. Start-Up Characteristic  
( $V_{IN}=36V$ ,  $V_{OUT}=5.0V$ ,  $I_{OUT}=0.1A$ )

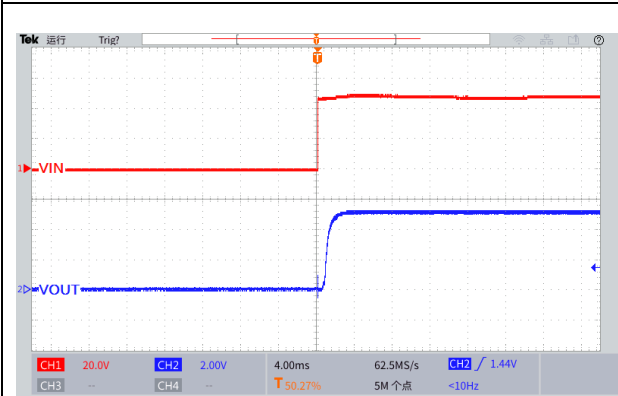


Figure 18. Start-Up Characteristic  
( $V_{IN}=48V$ ,  $V_{OUT}=5.0V$ ,  $I_{OUT}=0.1A$ )

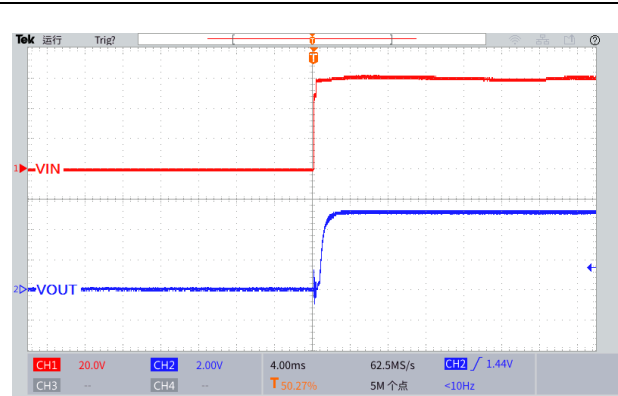


Figure 19. Start-Up Characteristic  
( $V_{IN}=60V$ ,  $V_{OUT}=5.0V$ ,  $I_{OUT}=0.1A$ )

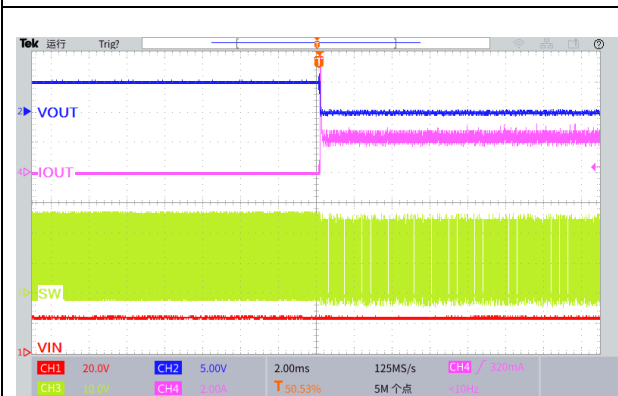


Figure 20. Output Short Circuit Waveform  
( $V_{IN}=24V$ ,  $V_{OUT}=5.0V$ )

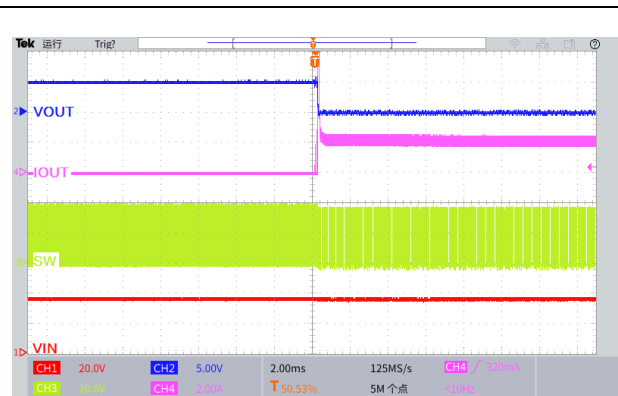


Figure 21. Output Short Circuit Waveform  
( $V_{IN}=36V$ ,  $V_{OUT}=5.0V$ )

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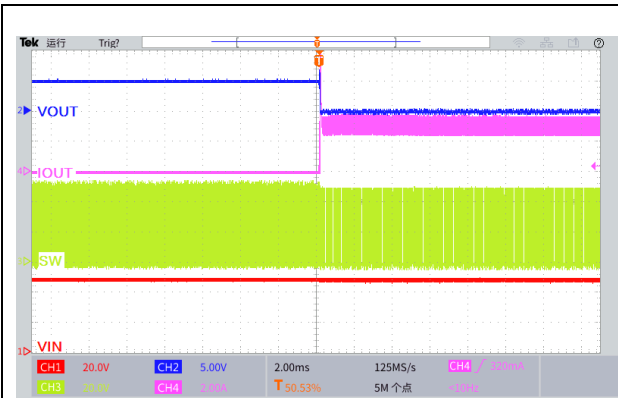


Figure 22. Output Short Circuit Waveform  
( $V_{IN}=48V$ ,  $V_{OUT}=5.0V$ )

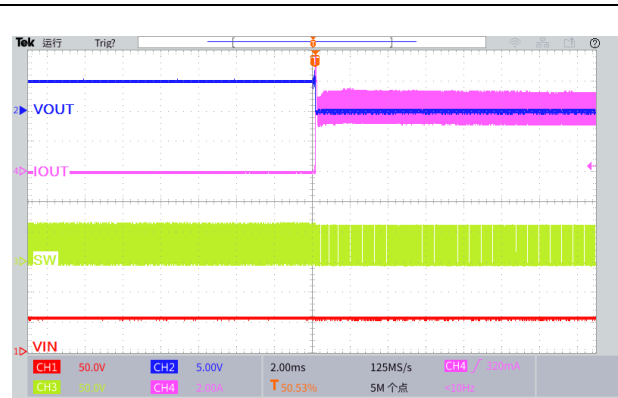


Figure 23. Output Short Circuit Waveform  
( $V_{IN}=60V$ ,  $V_{OUT}=5.0V$ )

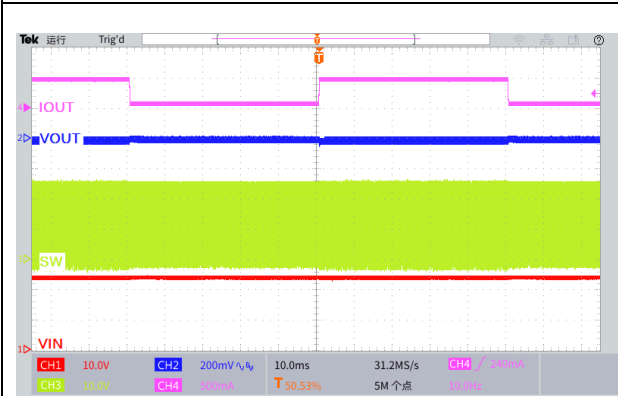


Figure 24. Load Transient Response  
( $V_{IN}=24V$ ,  $V_{OUT}=5.0V$ ,  $I_{OUT}=0.1$  to  $0.5A$ )

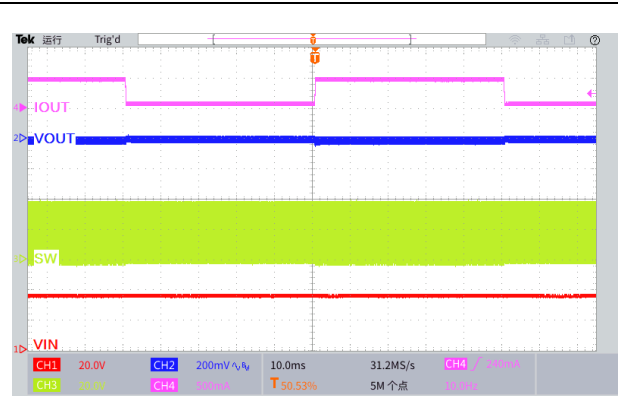


Figure 25. Load Transient Response  
( $V_{IN}=36V$ ,  $V_{OUT}=5.0V$ ,  $I_{OUT}=0.1$  to  $0.5A$ )

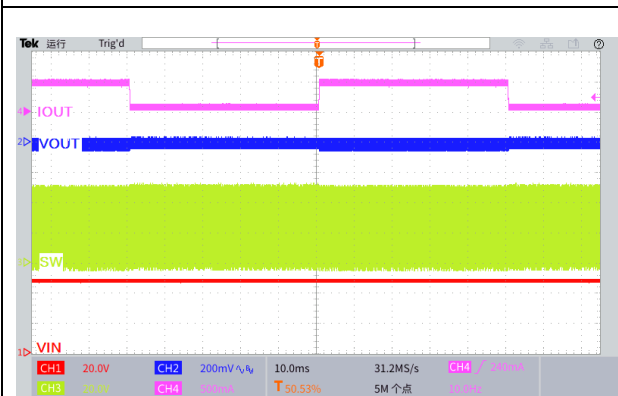


Figure 26. Load Transient Response  
( $V_{IN}=48V$ ,  $V_{OUT}=5.0V$ ,  $I_{OUT}=0.1$  to  $0.5A$ )

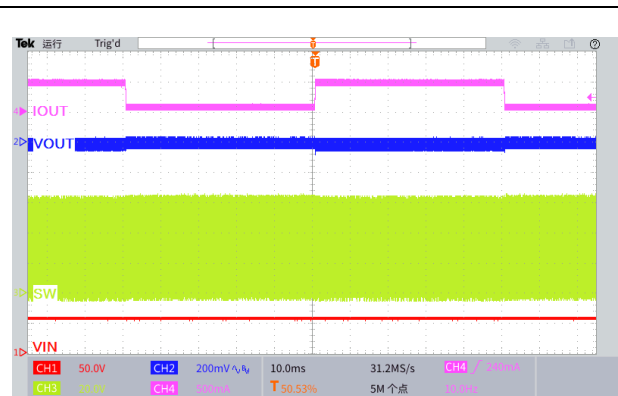
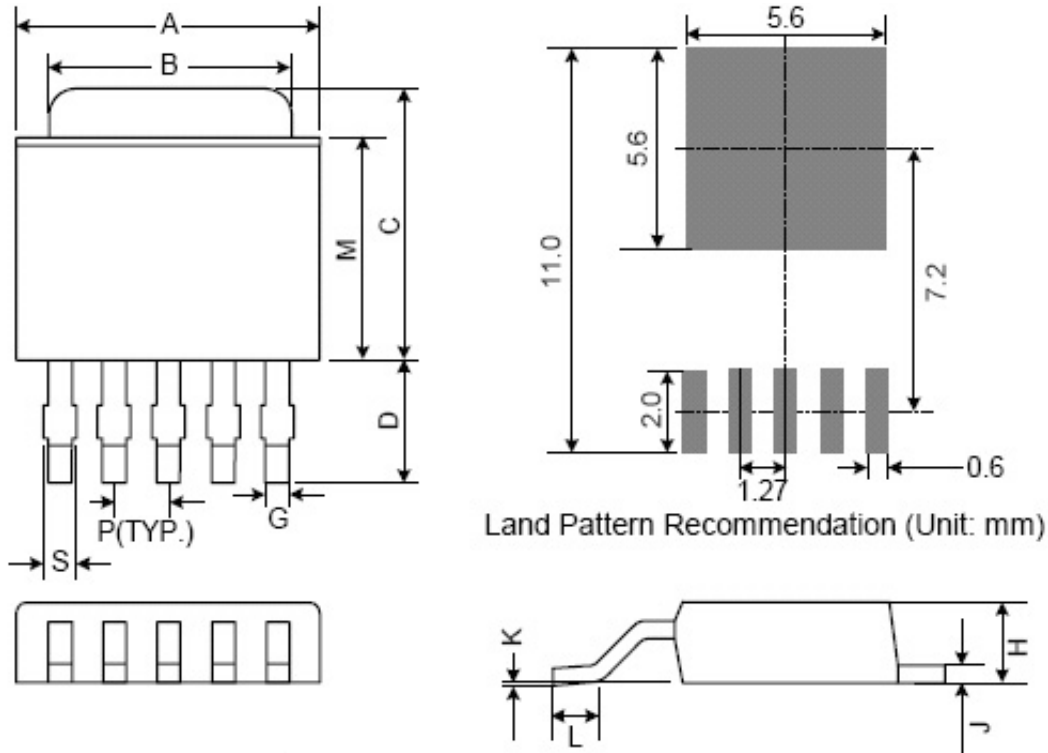


Figure 27. Load Transient Response  
( $V_{IN}=60V$ ,  $V_{OUT}=5.0V$ ,  $I_{OUT}=0.1$  to  $0.5A$ )

## Package Information

### TO252-5L



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	6.35	6.60	6.85	0.250	0.260	0.270
B	5.20	5.35	5.50	0.205	0.211	0.217
C	6.80	7.00	7.30	0.268	0.276	0.287
D	2.40	2.80	3.20	0.094	0.110	0.126
P	1.27 REF.			0.05 REF.		
S	0.50	0.65	0.80	0.020	0.026	0.031
G	0.40	0.50	0.63	0.016	0.020	0.025
H	2.20	2.30	2.40	0.087	0.091	0.094
J	0.45	0.52	0.58	0.018	0.020	0.023
K	0.00	0.08	0.15	0.000	0.003	0.006
L	0.90	1.20	1.77	0.035	0.047	0.064
M	5.40	5.80	6.20	0.213	0.228	0.244

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