

Features

- Operation Voltage: 5V~72V
- 0.22V Constant Current Sense Voltage
- Directly drive 1~14 Series LED
- Current Sense Voltage Accuracy $\pm 3\%$
- Fixed 150KHz Switching Frequency
- 1.5A Constant Output Current Capability
- Internal Optimize Power MOSFET
- High efficiency up to 93%
- Max. Output power up to 15W
- Excellent line and load regulation
- Built in thermal shutdown function
- Built in current limit protection function
- Temperature Grade 1: -40°C to 125°C
Ambient Operating Temperature Range
- Device HBM ESD Classification Level Class3B
- Available in TO252-5L package

General Description

The XL9612 is a 150KHz fixed frequency PWM synchronous buck LED constant current driver, capable of driving a 1.5A load with high efficiency, low ripple and excellent line and load regulation. XL9612 supports wide input operating voltage range of 5V ~ 72V and a maximum duty cycle of 100% output. A built-in loop compensation module reduces components in the system, lowering power system cost and reducing printed circuit board space.

The XL9612 has built-in thermal shutdown, current limit protection and output short protection function and so on.

Applications

- Buck constant current driver
- Monitor LED Backlighting
- General purpose LED lighting

Typical application schematic

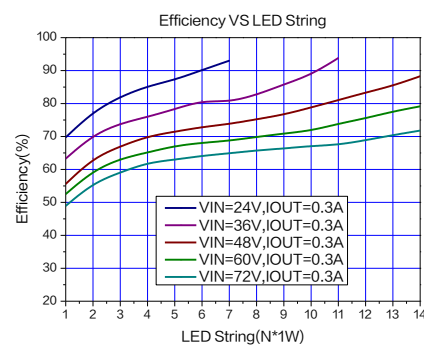
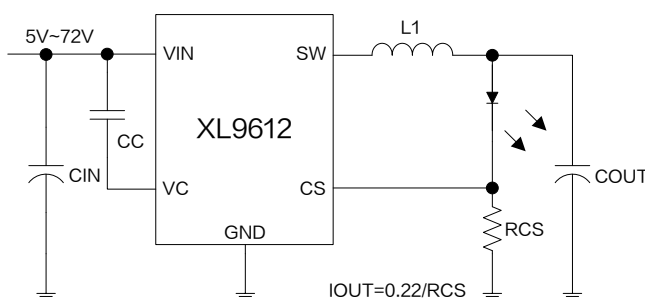


Figure1. XL9612 Typical application schematic and efficiency curve

Pin Configurations

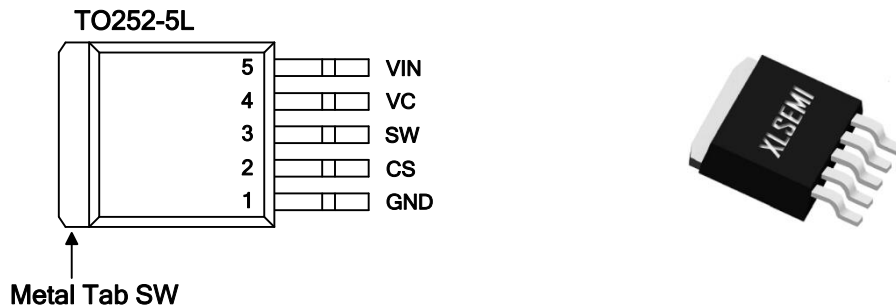


Figure2. Pin Configuration of XL9612

Table 1 Pin Description

| Pin Number | Pin Name | Description |
|------------|----------|---|
| 1 | GND | Ground Pin. |
| 2 | CS | Output constant current sense Pin (CS). The CS reference voltage is 0.22V. |
| 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. XL9612 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 |
|-------------------|------------|--------------|-----------|--------------------------|
| XL9612 | XL9612 | TO252-5L | RoHS & HF | 2500 Units on Reel |

Function Block

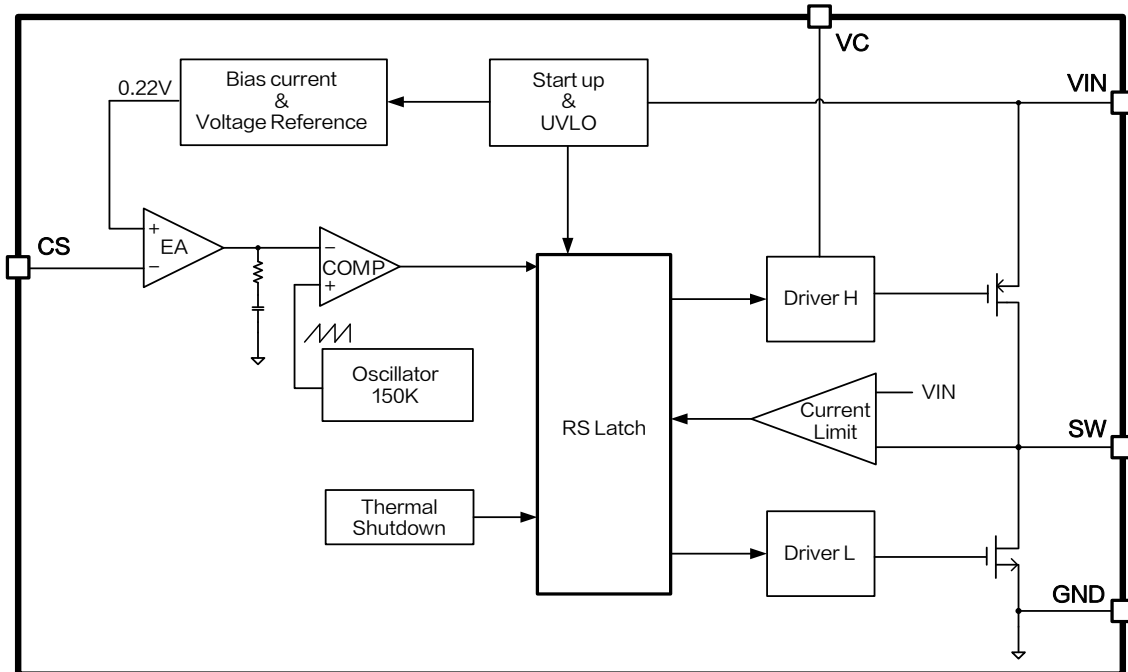


Figure3. Function Block Diagram of XL9612

Absolute Maximum Ratings (Note1)

| Parameter | Symbol | Value | Unit |
|---|------------|--------------------|------|
| Input Voltage | V_{IN} | -0.3~90 | V |
| Current Sense Pin Voltage | V_{CS} | -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 | -40~150 | °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.

1.5A 150KHz 90V Synchronous Buck LED Constant Current Driver

XL9612

XL9612 Electrical Characteristics

$T_A = 25^\circ\text{C}$; system parameters test circuit figure4, unless otherwise specified.

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|----------|-----------------------|--|-------|-------|-------|------|
| V_{CS} | Current Sense Voltage | $V_{IN} = 12\text{V}, V_{OUT} = 3.3\text{V}$ $I_{OUT} = 0.3\text{A}$ | 213.4 | 220.0 | 226.6 | mV |
| η | Efficiency | $V_{IN} = 12\text{V}, V_{OUT} = 9.9\text{V}$ $I_{OUT} = 0.3\text{A}$ | - | 90.0 | - | % |
| η | Efficiency | $V_{IN} = 24\text{V}, V_{OUT} = 19.8\text{V}$ $I_{OUT} = 0.6\text{A}$ | - | 93.2 | - | % |

Electrical Characteristics (DC Parameters)

$T_A = 25^\circ\text{C}, V_{IN} = 12\text{V}, V_{EN} = 0\text{V}$; system parameters test circuit figure4, unless otherwise specified.

| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|------------------------------|---------------|----------------------|------|------|------|------------------|
| Input operation voltage | V_{IN} | | 5 | | 72 | V |
| Quiescent Supply Current | I_Q | $V_{CS} = 2\text{V}$ | | 3.4 | 5 | mA |
| Oscillator Frequency | F_{OSC} | | 127 | 150 | 172 | KHz |
| Switch Current Limit | I_L | $V_{CS} = 0\text{V}$ | | 1.8 | | A |
| High side MOS On-resistance | $R_{DS(ON)H}$ | | | 270 | | $\text{m}\Omega$ |
| Low side MOS On-resistance | $R_{DS(ON)L}$ | | | 255 | | $\text{m}\Omega$ |
| Thermal Shutdown Temperature | T_{SD} | | | 150 | | $^\circ\text{C}$ |
| Thermal Shutdown Hysteresis | T_D | | | 30 | | $^\circ\text{C}$ |
| Max. Duty Cycle | D_{MAX} | | | 100 | | % |

1.5A 150KHz 90V Synchronous Buck LED Constant Current Driver XL9612

Typical System Application Schematic ($I_{OUT}=0.3A$)

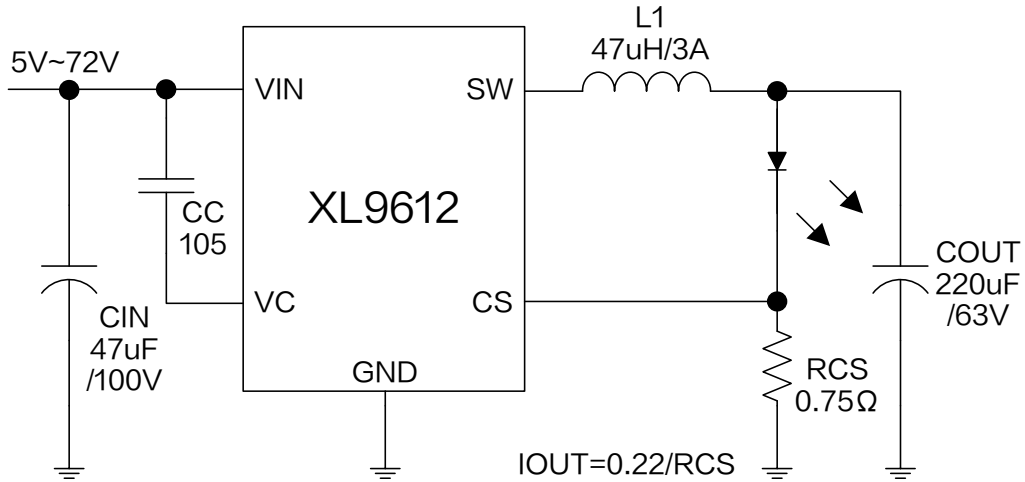


Figure4. XL9612 System Parameters Test Circuit ($I_{OUT}=0.3A$)

Typical System Application Transfer Efficiency

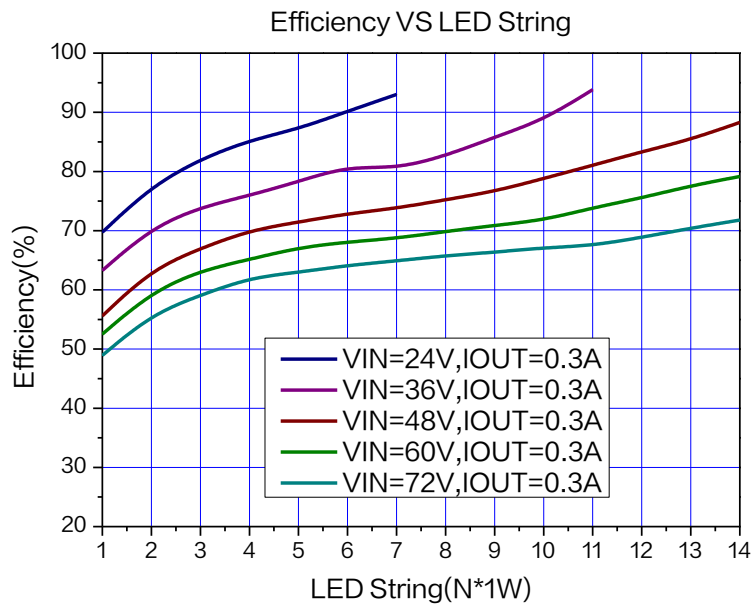


Figure5. XL9612 System Efficiency Curve ($I_{OUT}=0.3A$)

1.5A 150KHz 90V Synchronous Buck LED Constant Current Driver XL9612

Typical System Application Schematic ($I_{OUT}=0.6A$)

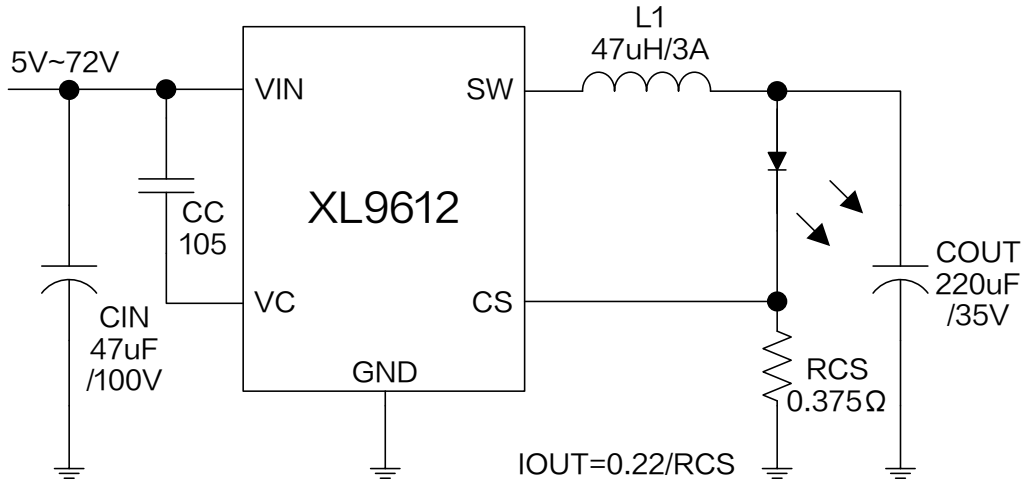


Figure6. XL9612 System Parameters Test Circuit ($I_{OUT}=0.6A$)

Typical System Application Transfer Efficiency

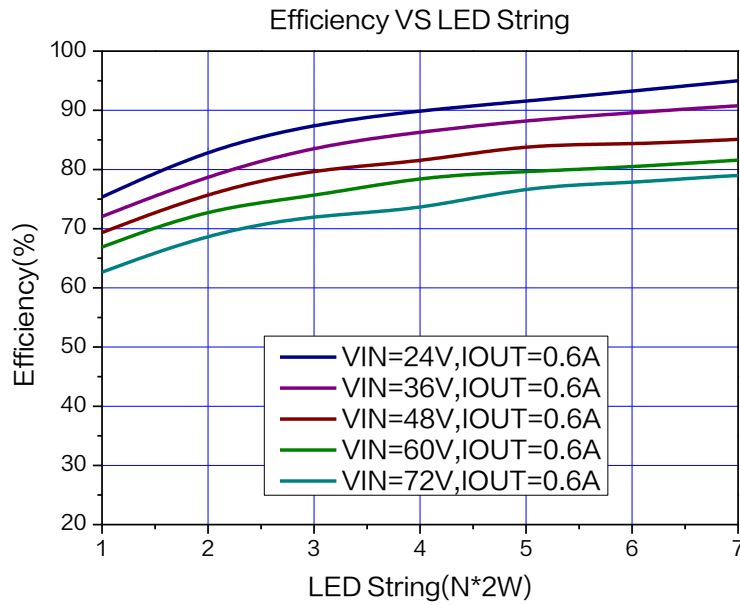


Figure7. XL9612 System Efficiency Curve ($I_{OUT}=0.6A$)

1.5A 150KHz 90V Synchronous Buck LED Constant Current Driver XL9612

Typical System Application Schematic ($I_{OUT}=1.2A$)

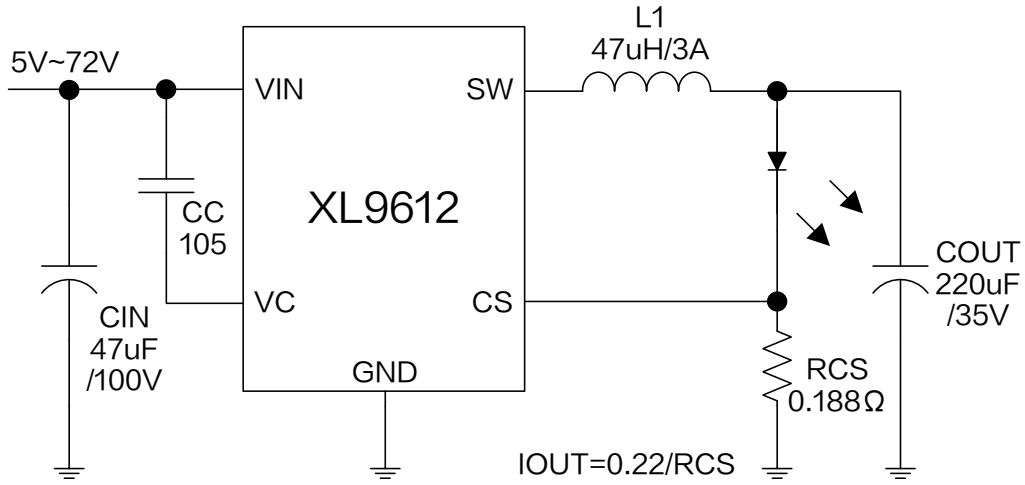


Figure8. XL9612 System Parameters Test Circuit ($I_{OUT}=1.2A$)

Typical System Application Transfer Efficiency

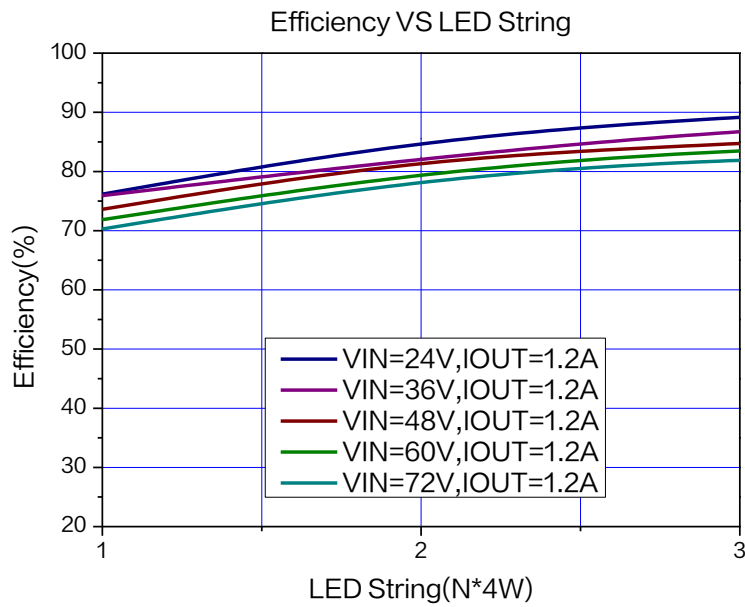


Figure9. XL9612 System Efficiency Curve ($I_{OUT}=1.2A$)

1.5A 150KHz 90V Synchronous Buck LED Constant Current Driver XL9612

Typical System Application Schematic (I_{OUT}=1.5A)

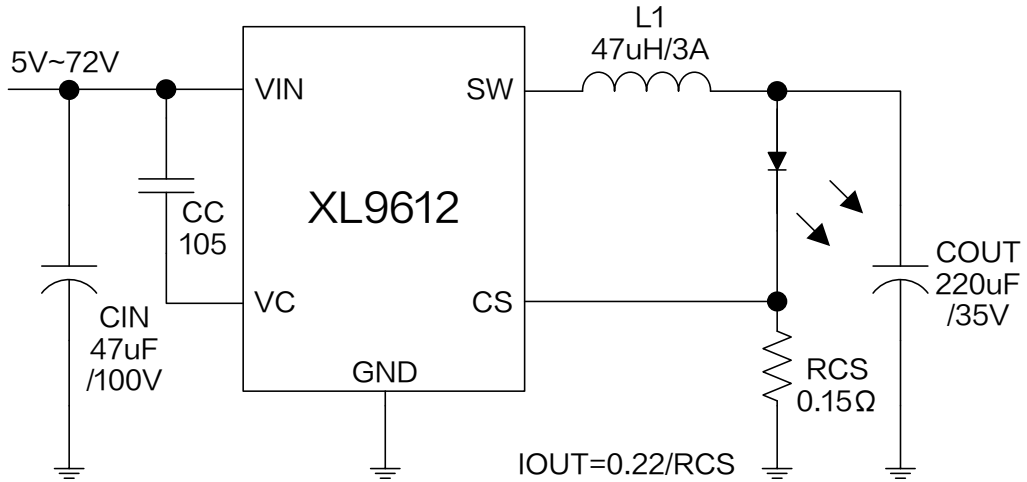


Figure10. XL9612 System Parameters Test Circuit (I_{OUT}=1.5A)

Typical System Application Transfer Efficiency

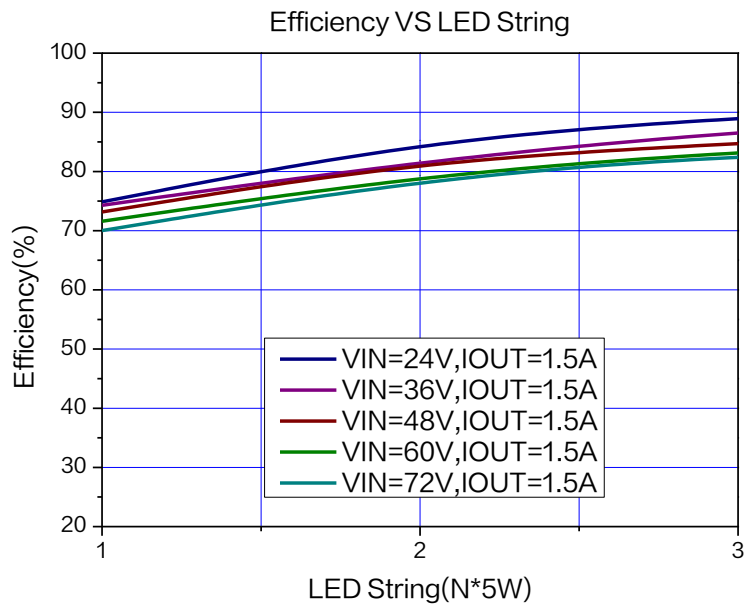


Figure11. XL9612 System Efficiency Curve (I_{OUT}=1.5A)

Typical System Application (PWM DIMMING)

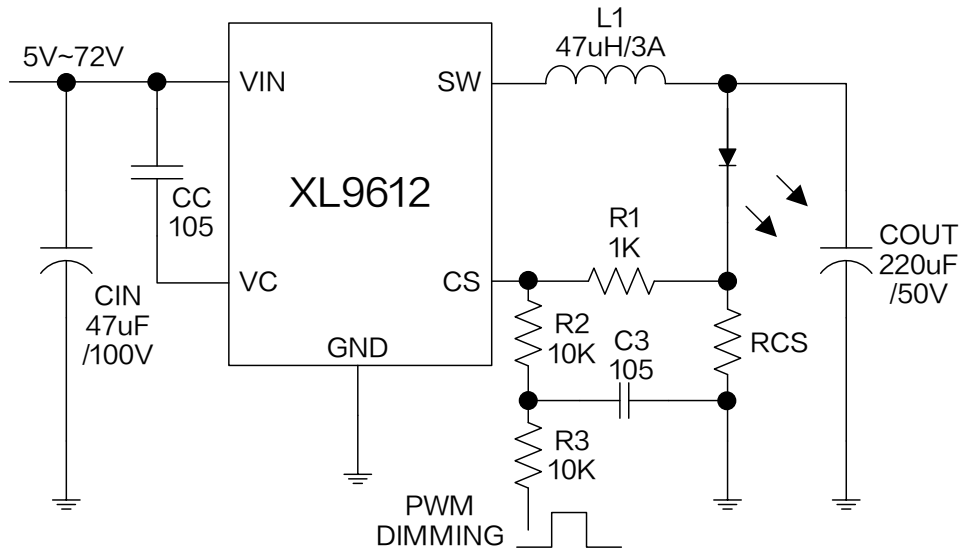


Figure12. XL9612 System Parameters Test Circuit (PWM DIMMING)

Typical Characteristics (LED forward voltage V_F is 3.3V at $I_F=0.3A$, unless otherwise noted.)

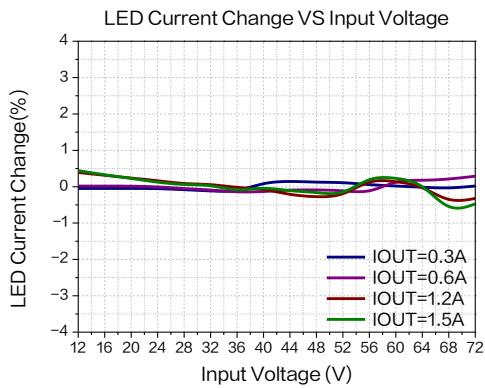


Figure13.Line Regulation

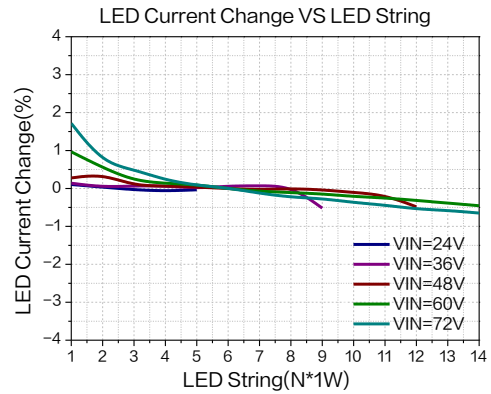


Figure14.Load Regulation

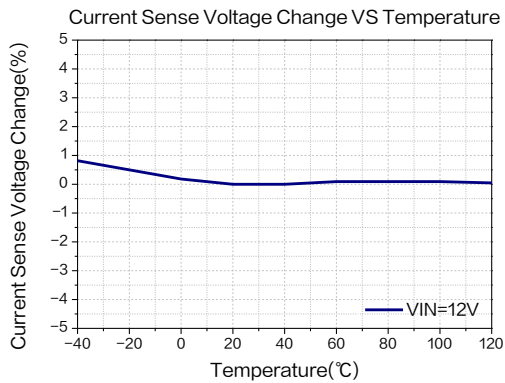


Figure15.Current Sense Voltage Regulation

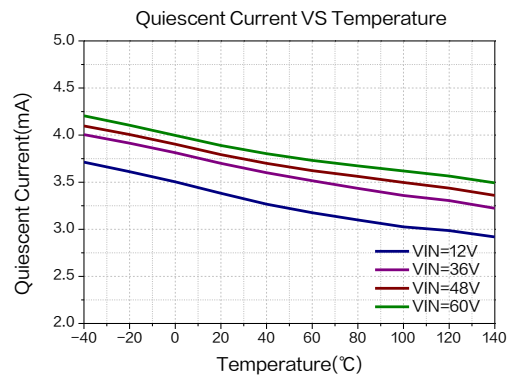


Figure16.Quiescent Current

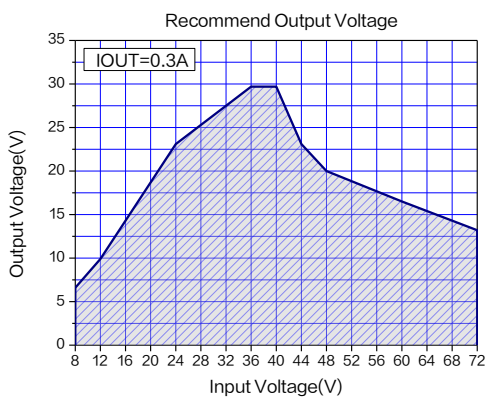


Figure17.Max Output Voltage
($I_{OUT}=0.3A$, $T_A=25^{\circ}C$)

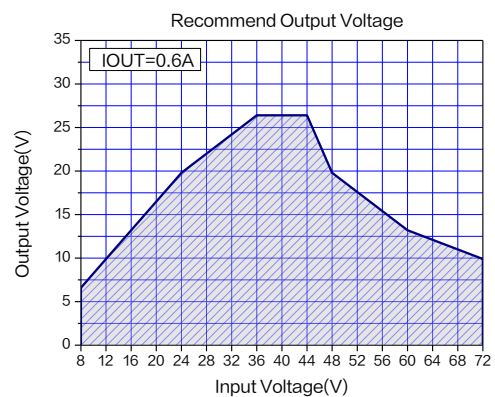


Figure18.Max Output Voltage
($I_{OUT}=0.6A$, $T_A=25^{\circ}C$)

1.5A 150KHz 90V Synchronous Buck LED Constant Current Driver

XL9612

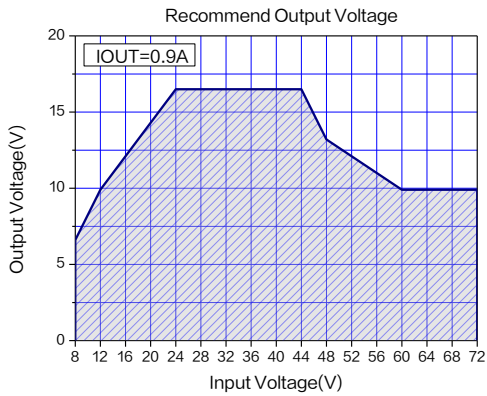


Figure19.Max Output Voltage
($I_{OUT}=0.9A$, $T_A=25^{\circ}C$)

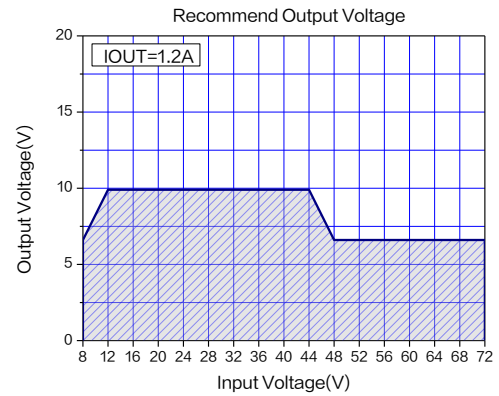


Figure20.Max Output Voltage
($I_{OUT}=1.2A$, $T_A=25^{\circ}C$)

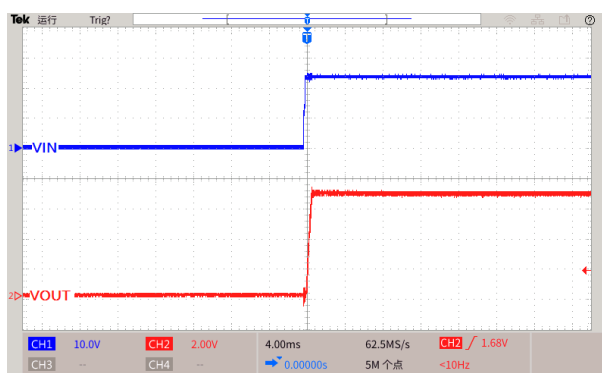


Figure21. Start-Up Characteristic
($V_{IN}=24V$, $V_{OUT}=6.6V$, $I_{OUT}=0.3A$)

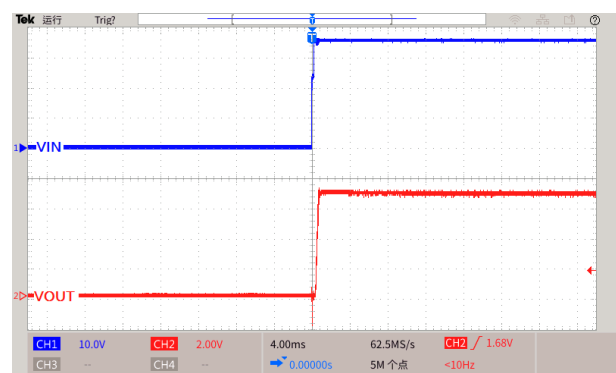


Figure22. Start-Up Characteristic
($V_{IN}=36V$, $V_{OUT}=6.6V$, $I_{OUT}=0.3A$)

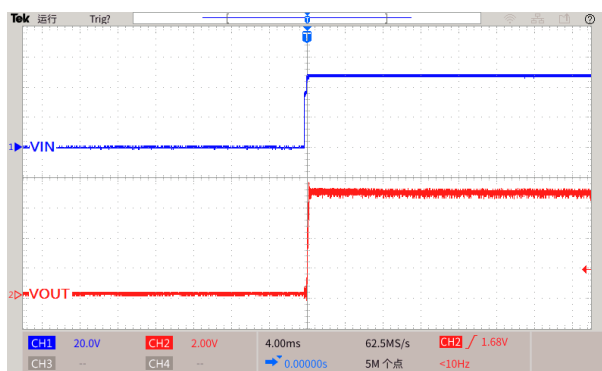


Figure23. Start-Up Characteristic
($V_{IN}=48V$, $V_{OUT}=6.6V$, $I_{OUT}=0.3A$)

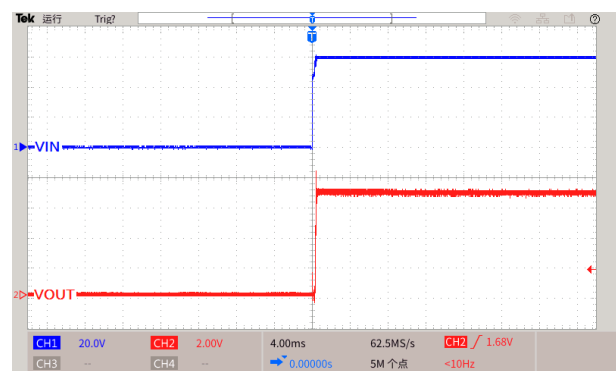


Figure24. Start-Up Characteristic
($V_{IN}=60V$, $V_{OUT}=6.6V$, $I_{OUT}=0.3A$)

1.5A 150KHz 90V Synchronous Buck LED Constant Current Driver

XL9612

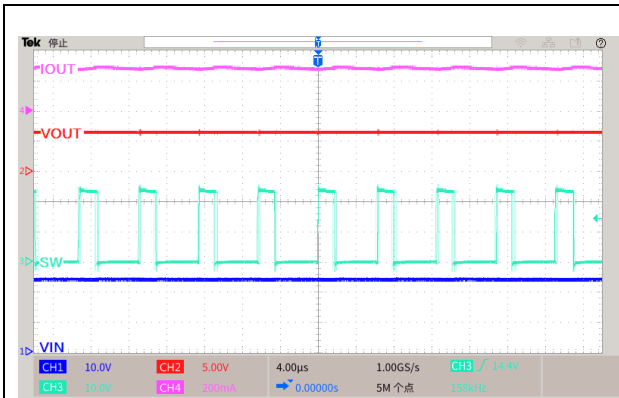


Figure25. LED Current Ripple
 $(V_{IN}=24V, V_{OUT}=3.3V, I_{OUT}=0.3A)$

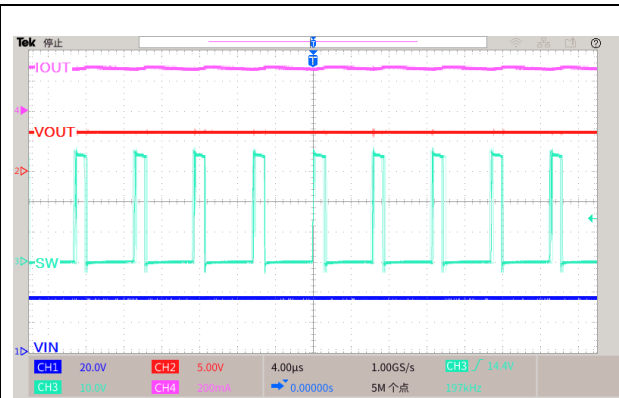


Figure26. LED Current Ripple
 $(V_{IN}=36V, V_{OUT}=6.6V, I_{OUT}=0.3A)$

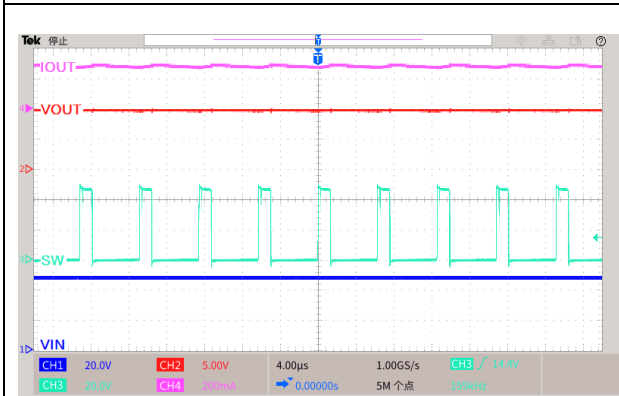


Figure27. LED Current Ripple
 $(V_{IN}=48V, V_{OUT}=9.9V, I_{OUT}=0.3A)$

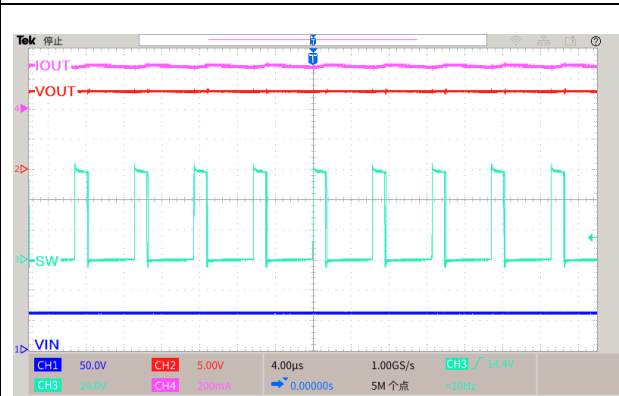
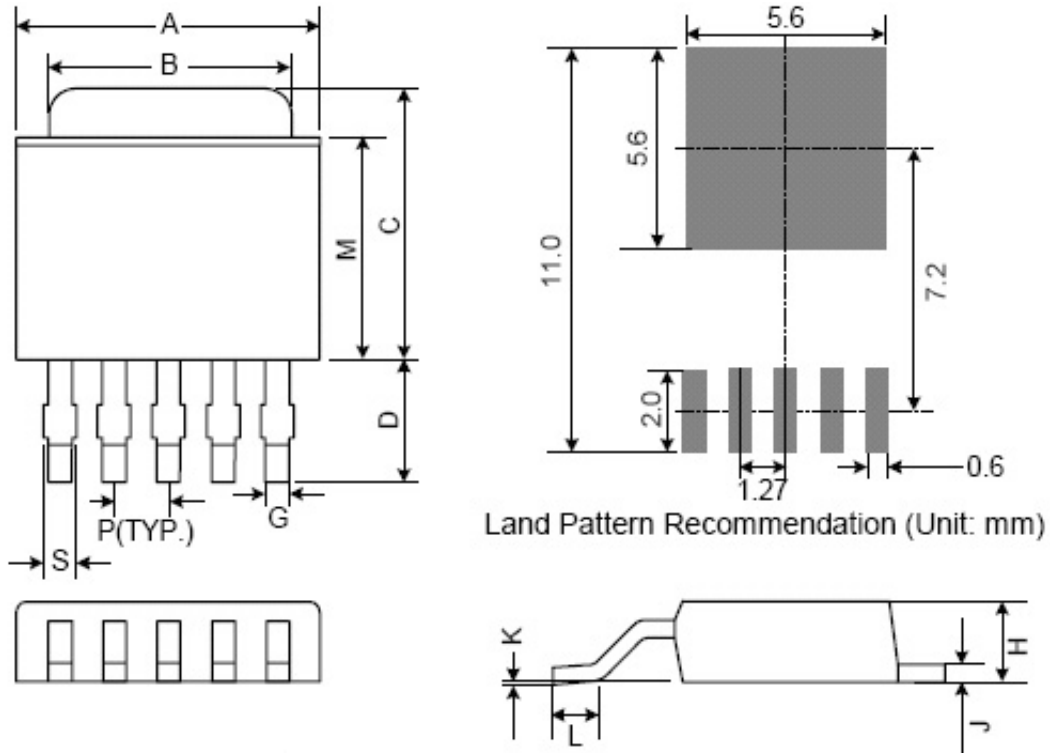


Figure28. LED Current Ripple
 $(V_{IN}=60V, V_{OUT}=13.2V, I_{OUT}=0.3A)$

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 |

1.5A 150KHz 90V Synchronous Buck LED Constant Current Driver**XL9612**

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