

### 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
- 2A Constant Output Current Capability
- Internal Optimize Power MOSFET
- High efficiency up to 93%
- Max. Output power up to 30W
- Excellent line and load regulation
- Built in thermal shutdown function
- Built in current limit protection function
- Temperature Grade 1:  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$   
Ambient Operating Temperature Range
- Device HBM ESD Classification Level  
Class3B
- Available in TO220-5L package

### General Description

The XL9614 is a 150KHz fixed frequency PWM synchronous buck LED constant current driver, capable of driving a 2A load with high efficiency, low ripple and excellent line and load regulation. XL9614 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 XL9614 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

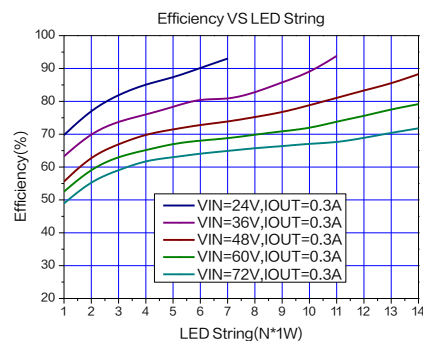
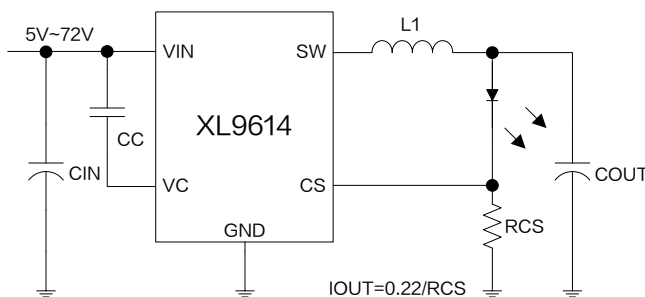


Figure1. XL9614 Typical application schematic and efficiency curve

### Pin Configurations

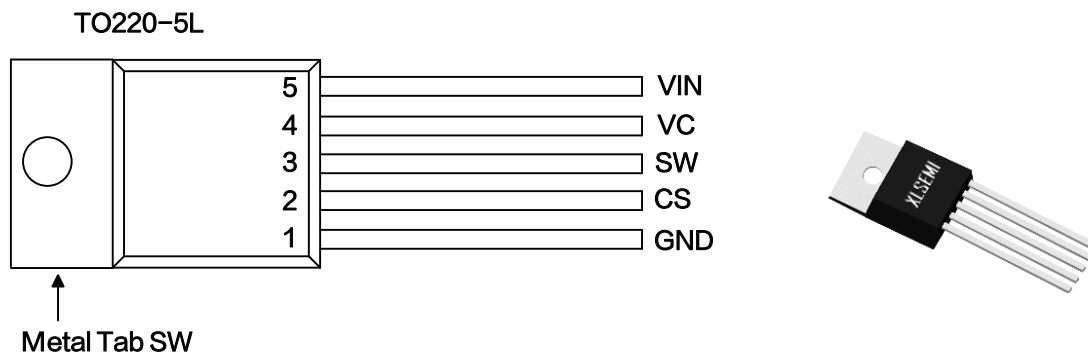


Figure2. Pin Configuration of XL9614

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. XL9614 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
XL9614	XL9614	TO220-5L	RoHS & HF	50 Units Per Tube/ 1000 Units Per Box

### Function Block

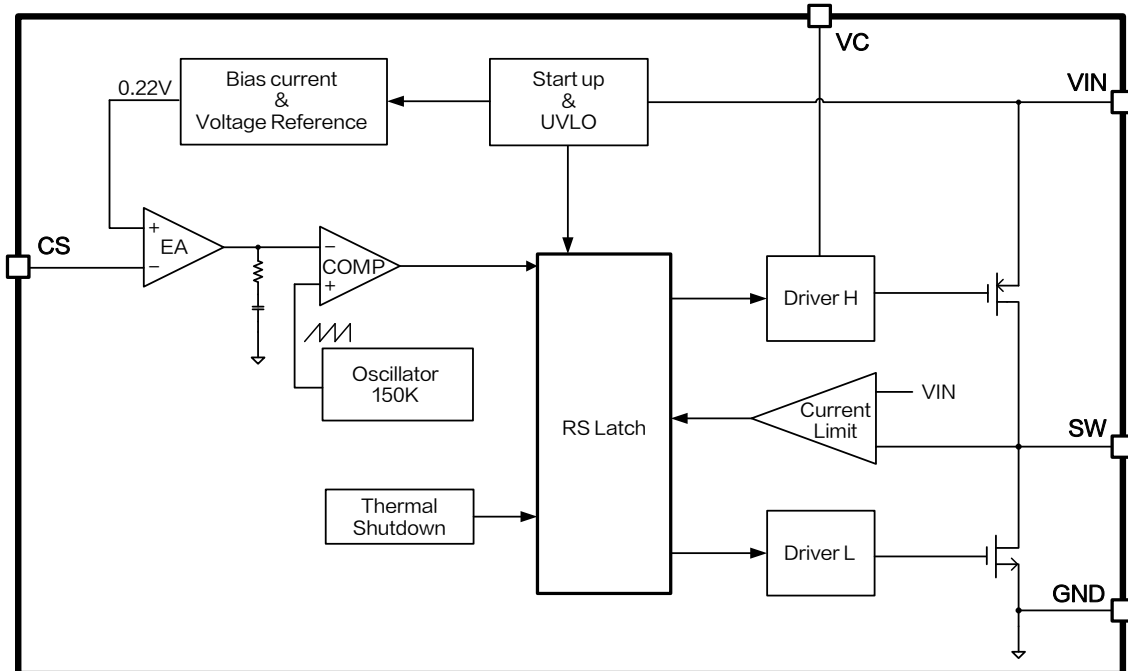


Figure3. Function Block Diagram of XL9614

### 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 (TO220-5L) (Junction to Ambient, No Heatsink, Free Air)	$R_{JA}$	30	°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.

## 2.0A 150KHz 90V Synchronous Buck LED Constant Current Driver

XL9614

### XL9614 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
$\eta$	Efficiency	$V_{IN} = 12\text{V}, V_{OUT} = 9.9\text{V}$ $I_{OUT} = 0.3\text{A}$	-	90.0	-	%
$\eta$	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	$I_L$	$V_{CS} = 0\text{V}$		2.2		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		%

**2.0A 150KHz 90V Synchronous Buck LED Constant Current Driver XL9614**

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

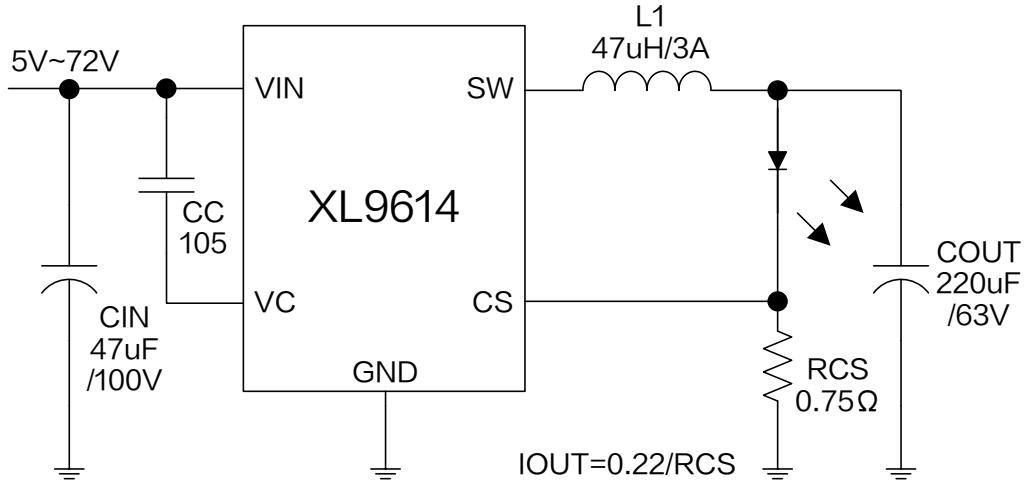


Figure4. XL9614 System Parameters Test Circuit ( $I_{OUT}=0.3A$ )

Typical System Application Transfer Efficiency

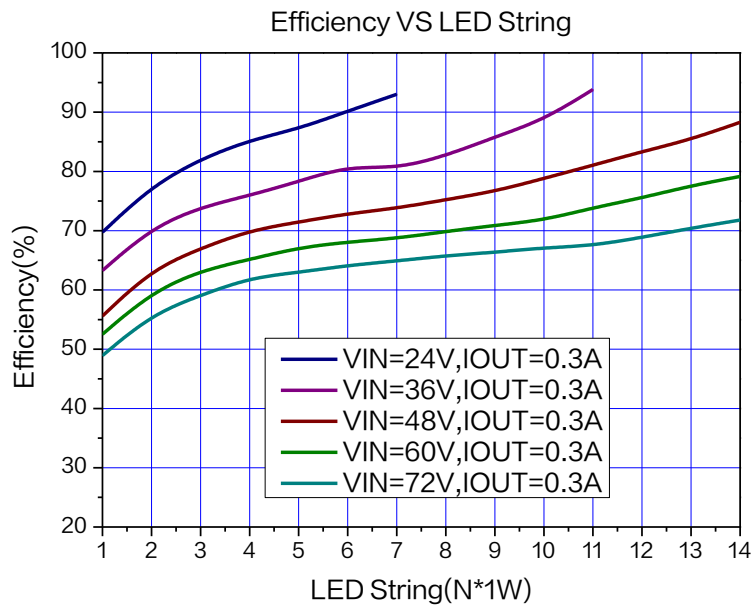


Figure5. XL9614 System Efficiency Curve ( $I_{OUT}=0.3A$ )

**2.0A 150KHz 90V Synchronous Buck LED Constant Current Driver XL9614**

Typical System Application Schematic ( $I_{OUT}=0.9A$ )

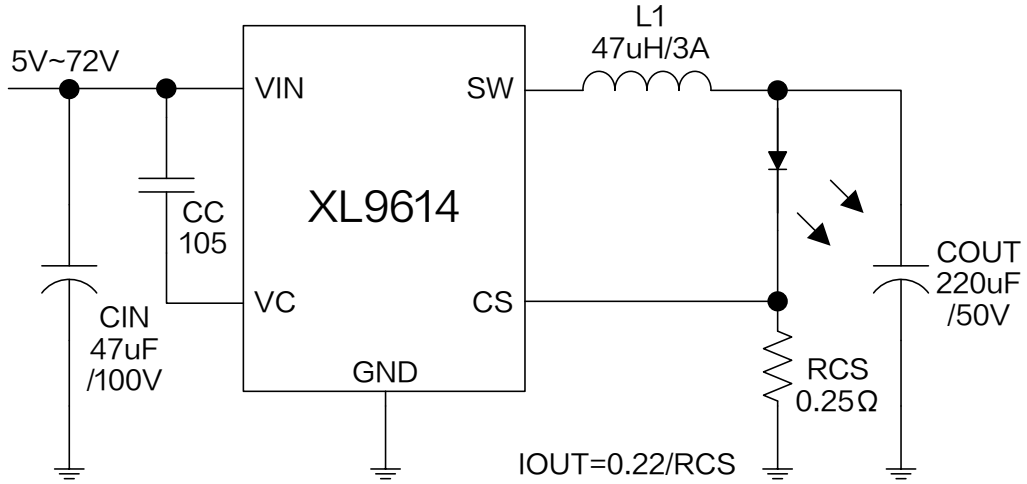


Figure6. XL9614 System Parameters Test Circuit ( $I_{OUT}=0.9A$ )

Typical System Application Transfer Efficiency

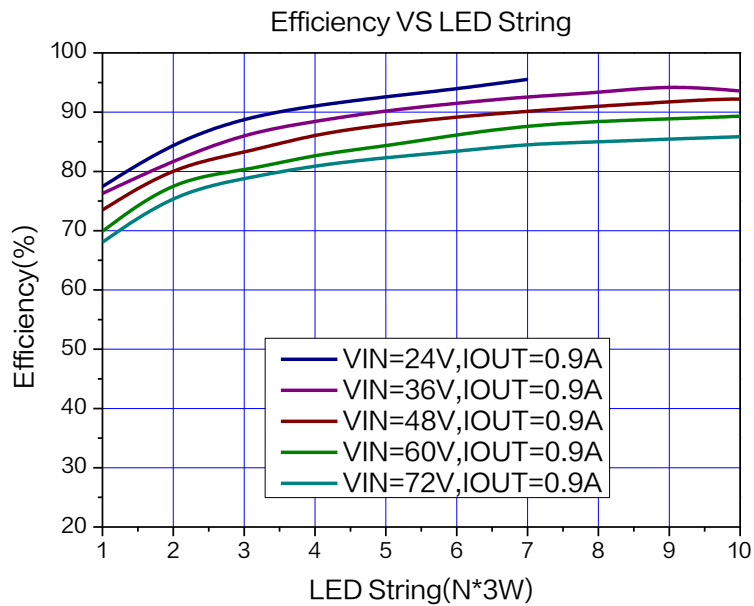


Figure7. XL9614 System Efficiency Curve ( $I_{OUT}=0.9A$ )

**2.0A 150KHz 90V Synchronous Buck LED Constant Current Driver XL9614**

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

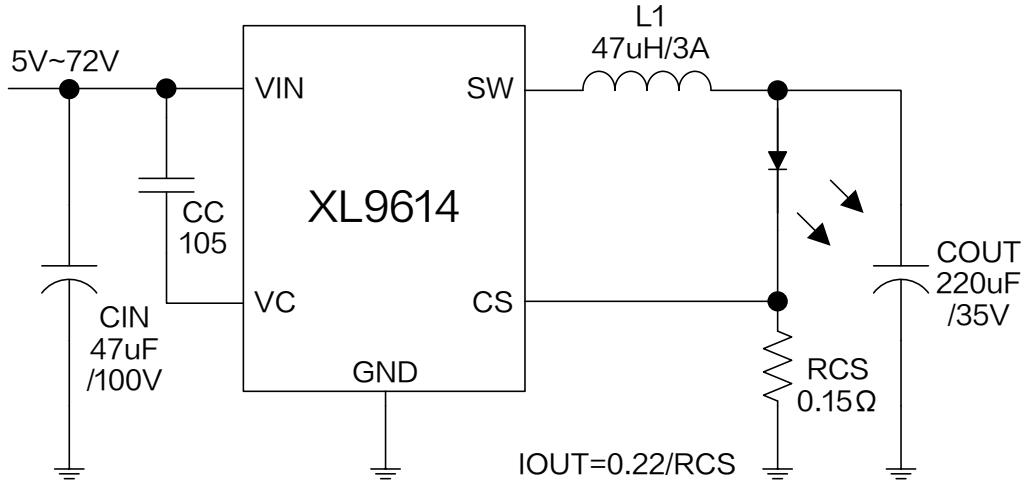


Figure8. XL9614 System Parameters Test Circuit ( $I_{OUT}=1.5A$ )

Typical System Application Transfer Efficiency

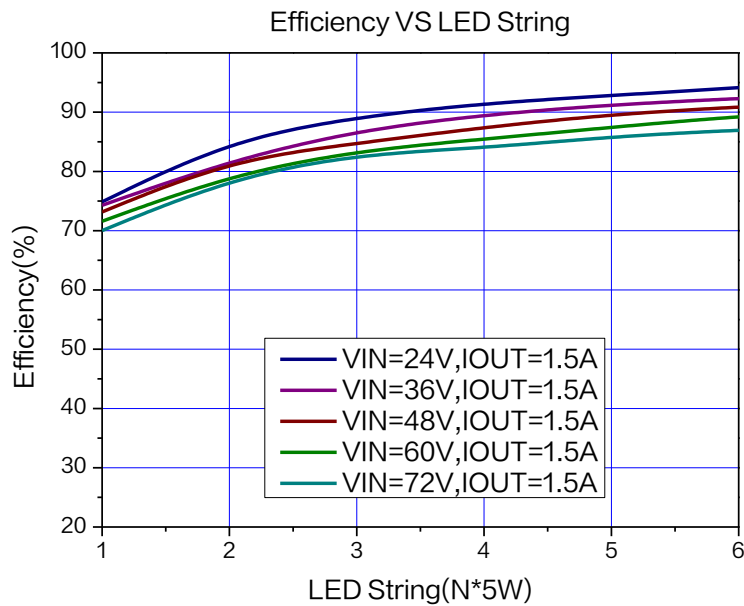


Figure9. XL9614 System Efficiency Curve ( $I_{OUT}=1.5A$ )

2.0A 150KHz 90V Synchronous Buck LED Constant Current Driver XL9614

Typical System Application Schematic ( $I_{OUT}=1.8A$ )

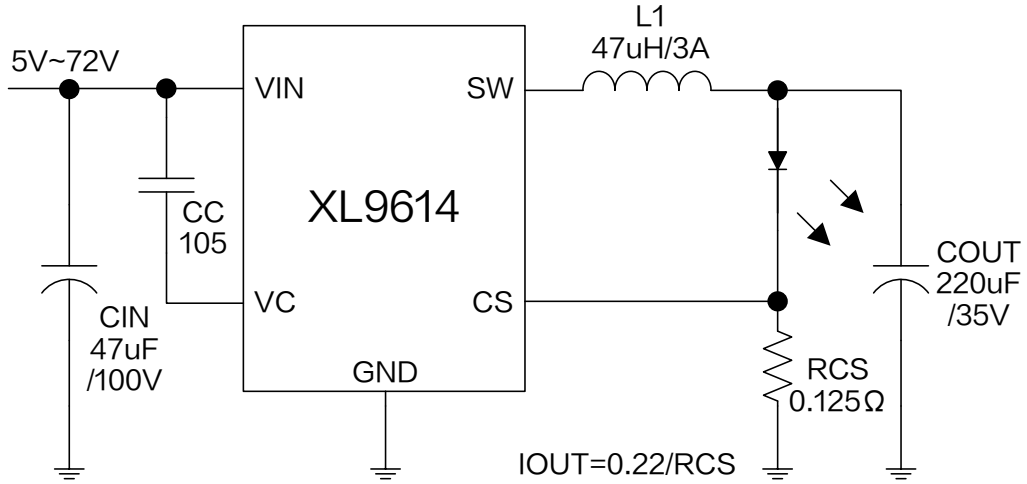


Figure10. XL9614 System Parameters Test Circuit ( $I_{OUT}=1.8A$ )

Typical System Application Transfer Efficiency

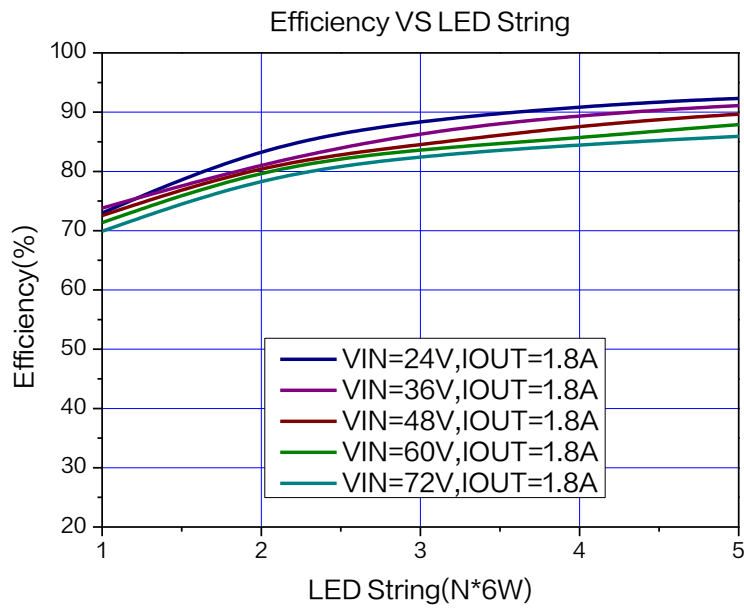


Figure11. XL9614 System Efficiency Curve ( $I_{OUT}=1.8A$ )



2.0A 150KHz 90V Synchronous Buck LED Constant Current Driver	XL9614
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### Typical System Application ( PWM DIMMING )

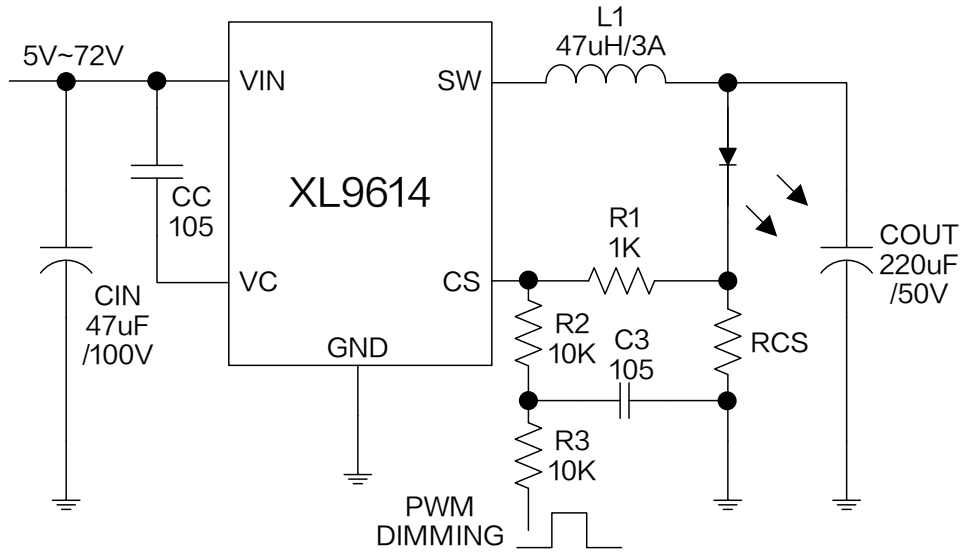


Figure12. XL9614 System Parameters Test Circuit ( PWM DIMMING )

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

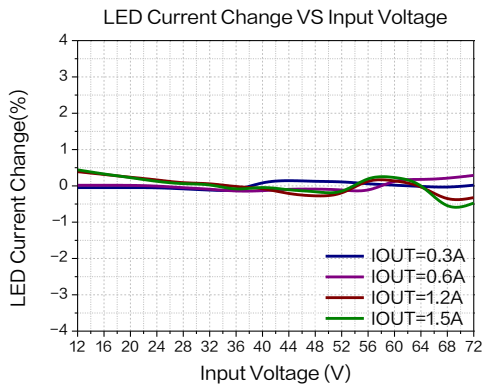


Figure13.Line Regulation

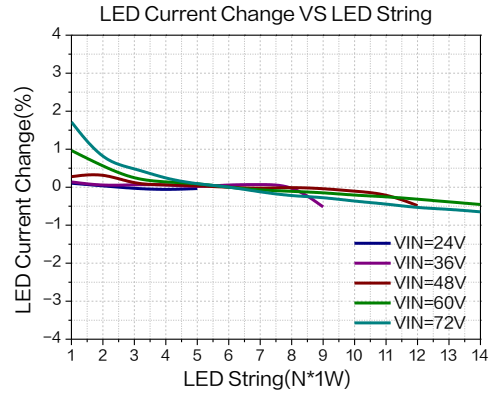


Figure14.Load Regulation

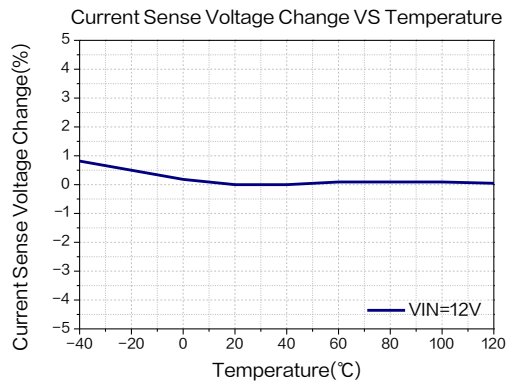


Figure15.Current Sense Voltage Regulation

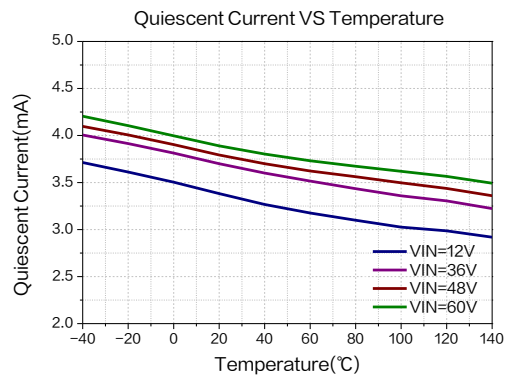


Figure16.Quiescent Current

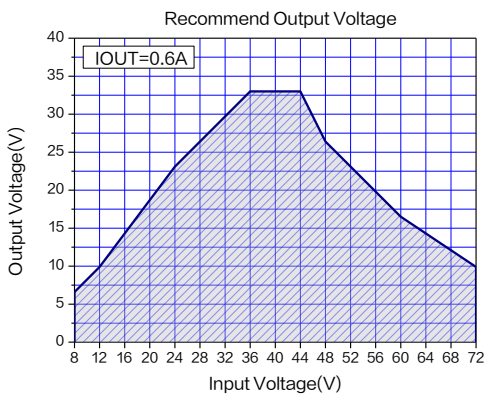


Figure17.Max Output Voltage  
( $I_{OUT}=0.6A$ ,  $T_A=25^{\circ}C$ )

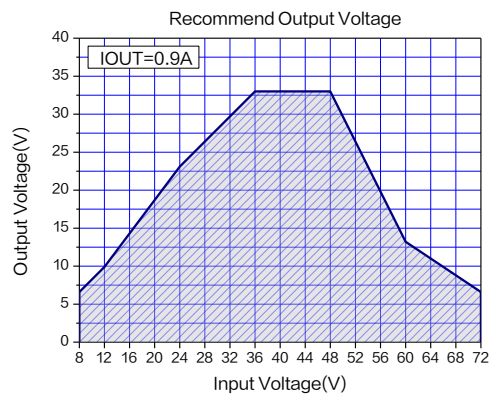


Figure18.Max Output Voltage  
( $I_{OUT}=0.9A$ ,  $T_A=25^{\circ}C$ )

## 2.0A 150KHz 90V Synchronous Buck LED Constant Current Driver

XL9614

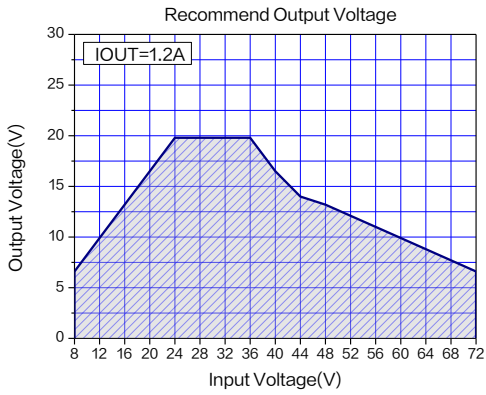


Figure19.Max Output Voltage  
(I<sub>OUT</sub>=1.2A, T<sub>A</sub>=25°C)

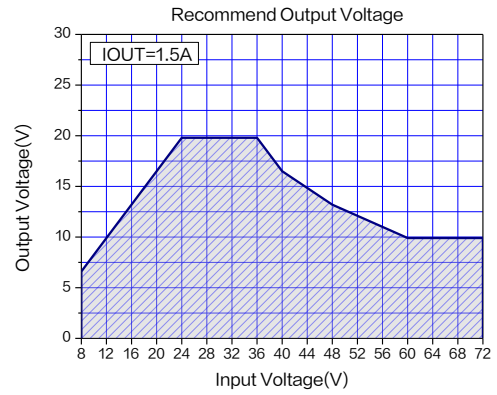


Figure20.Max Output Voltage  
(I<sub>OUT</sub>=1.5A, T<sub>A</sub>=25°C)

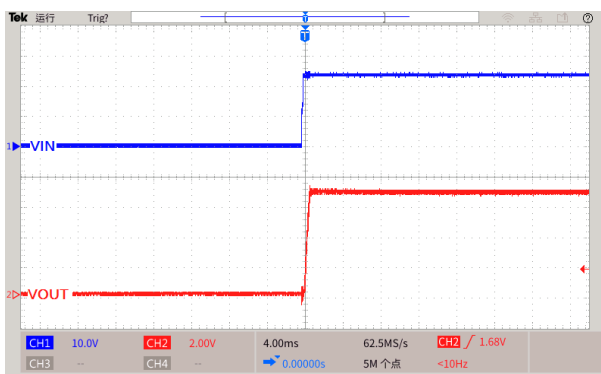


Figure21. Start-Up Characteristic  
(V<sub>IN</sub>=24V, V<sub>OUT</sub>=6.6V, I<sub>OUT</sub>=0.3A)

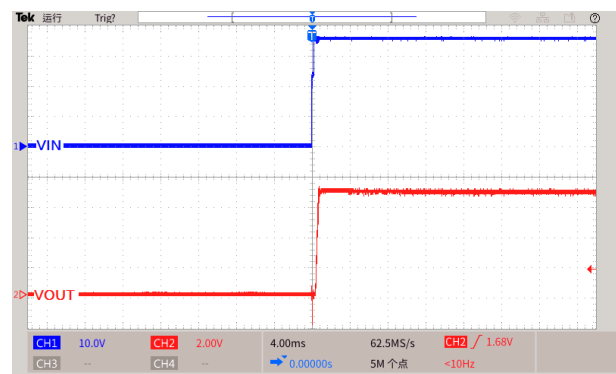


Figure22. Start-Up Characteristic  
(V<sub>IN</sub>=36V, V<sub>OUT</sub>=6.6V, I<sub>OUT</sub>=0.3A)

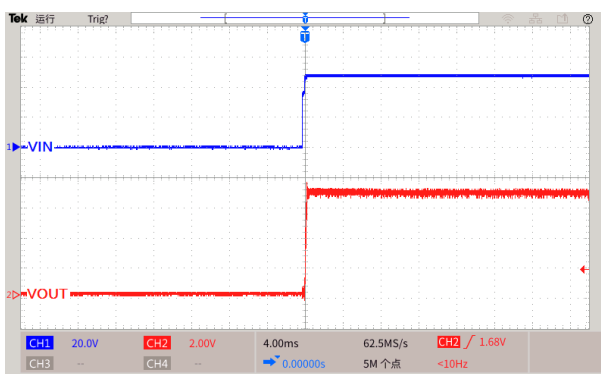


Figure23. Start-Up Characteristic  
(V<sub>IN</sub>=48V, V<sub>OUT</sub>=6.6V, I<sub>OUT</sub>=0.3A)

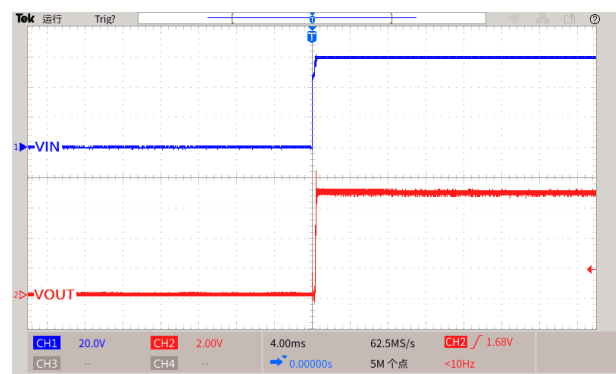


Figure24. Start-Up Characteristic  
(V<sub>IN</sub>=60V, V<sub>OUT</sub>=6.6V, I<sub>OUT</sub>=0.3A)

## 2.0A 150KHz 90V Synchronous Buck LED Constant Current Driver

XL9614

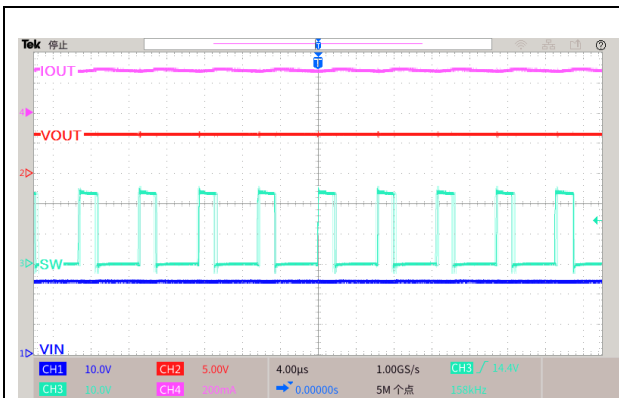


Figure25. LED Current Ripple  
( $V_{IN}=24V$ ,  $V_{OUT}=3.3V$ ,  $I_{OUT}=0.3A$ )

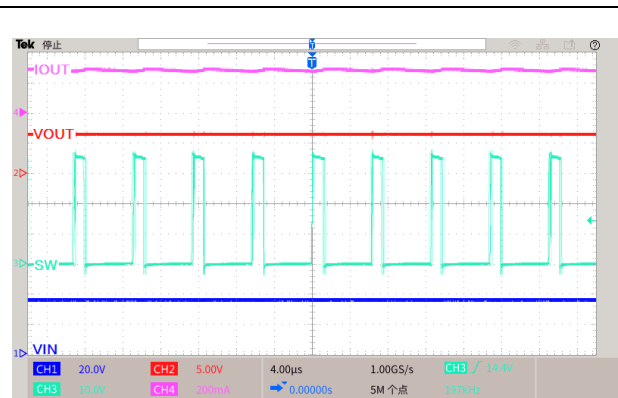


Figure26. LED Current Ripple  
( $V_{IN}=36V$ ,  $V_{OUT}=6.6V$ ,  $I_{OUT}=0.3A$ )

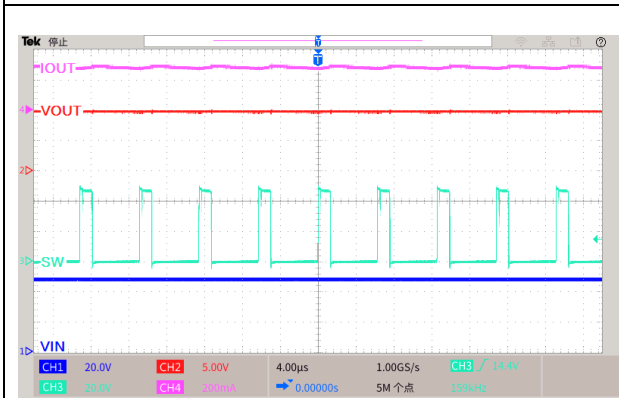


Figure27. LED Current Ripple  
( $V_{IN}=48V$ ,  $V_{OUT}=9.9V$ ,  $I_{OUT}=0.3A$ )

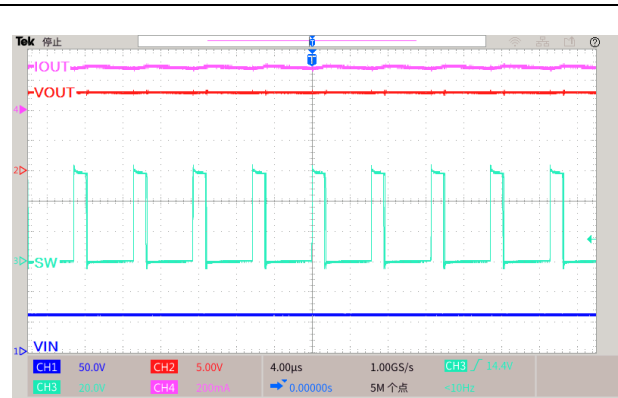
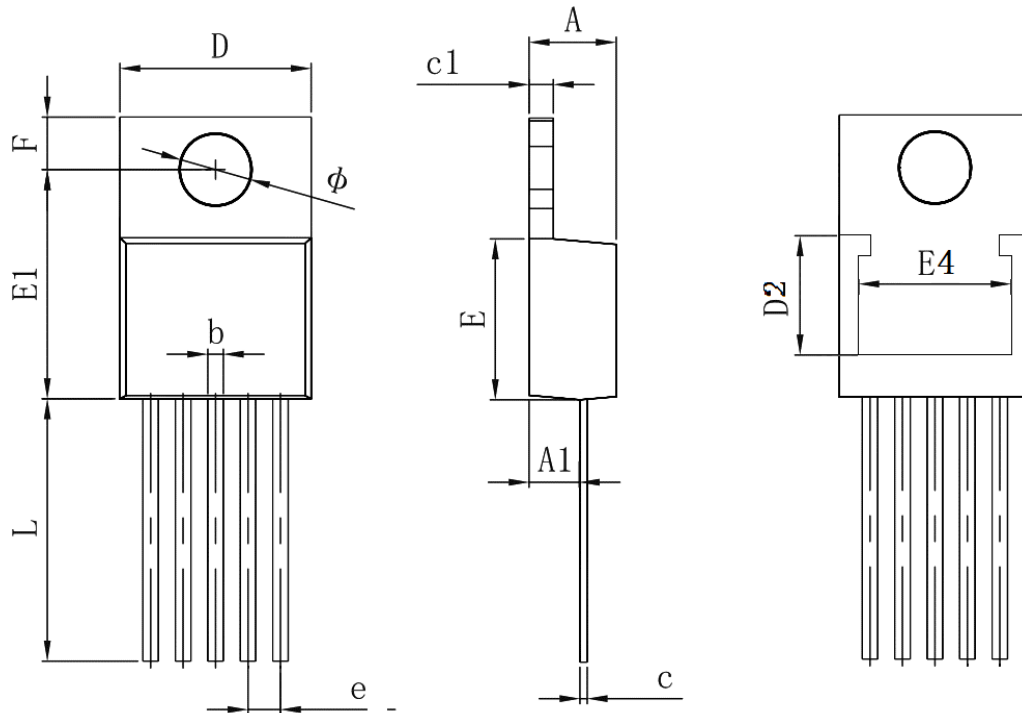


Figure28. LED Current Ripple  
( $V_{IN}=60V$ ,  $V_{OUT}=13.2V$ ,  $I_{OUT}=0.3A$ )

## Package Information

### TO220-5L



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	4.37	4.57	4.77	0.172	0.180	0.188
A1	2.52	2.67	2.82	0.099	0.105	0.111
b	0.71	0.89	1.02	0.028	0.035	0.040
c	0.31	0.38	0.64	0.012	0.015	0.025
c1	1.17	1.27	1.42	0.046	0.050	0.056
D	9.85	10.26	10.39	0.387	0.404	0.409
D2	5.50	-	-	0.216	-	-
E	8.20	8.70	9.00	0.323	0.342	0.354
E1	11.55	12.26	13.01	0.454	0.482	0.512
E4	7.30	-	-	0.287	-	-
e	1.55	1.70	1.85	0.061	0.067	0.073
F	2.54	-	3.05	0.100	-	0.120
L	13.34	13.74	14.10	0.525	0.541	0.555
Φ	3.70	-	3.95	0.146	-	0.156

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**2.0A 150KHz 90V Synchronous Buck LED Constant Current Driver****XL9614**

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