0.6A 150KHz 90V Synchronous Buck LED Constant Current Driver　　XL9611

Features

- Operation Voltage：5V~72V
- 0.22V Constant Current Sense Voltage
- Current Sense Voltage Accuracy ±3%
- Fixed 150KHz Switching Frequency
- 0.6A Constant Output Current Capability
- Internal Optimize Power MOSFET
- High efficiency up to 93%
- Max. Output power up to 5W
- Excellent line and load regulation
- Built in thermal shutdown function
- Built in current limit protection function
- Temperature Grade 1: −40℃ to 125℃ Ambient Operating Temperature Range
- Device HBM ESD Classification Level Class3B
- Available in SOP8 package

General Description

The XL9611 is a 150KHz fixed frequency PWM synchronous buck LED constant current driver, capable of driving a 0.6A load with high efficiency, low ripple and excellent line and load regulation. XL9611 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 XL9611 has built−in thermal shutdown, current limit protection and output short protection function and so on.

Applications

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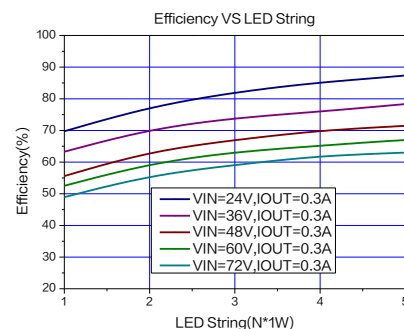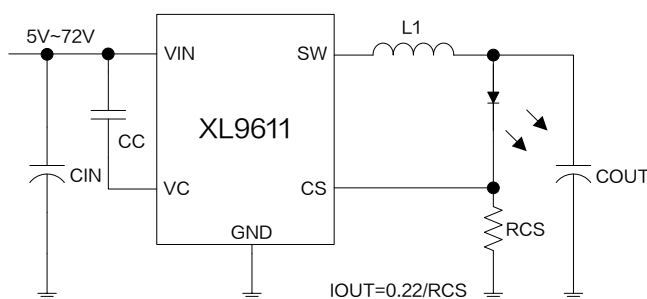- General purpose LED lighting

Typical application schematic

Figure1. XL9611 Typical application schematic and efficiency curve

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Pin Configurations

```
         ┌─────────────┐
   CS    │ 1         8 │  GND
         │             │
   NC    │ 2         7 │  GND
         │   XL9611    │
   VC    │ 3         6 │  SW
         │             │
   VIN   │ 4         5 │  SW
         └─────────────┘
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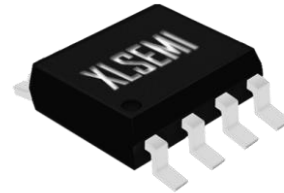
Figure2. Pin Configuration of XL9611

Table 1 Pin Description

Pin Number	Pin Name	Description
1	CS	Output constant current sense Pin (CS). The CS reference voltage is 0.22V.
2	NC	No Connected.
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. XL9611 operates from 5V to 72V 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
XL9611	XL9611	SOP8	RoHS & HF	4000 Units on Reel

0.6A 150KHz 90V Synchronous Buck LED Constant Current Driver	XL9611
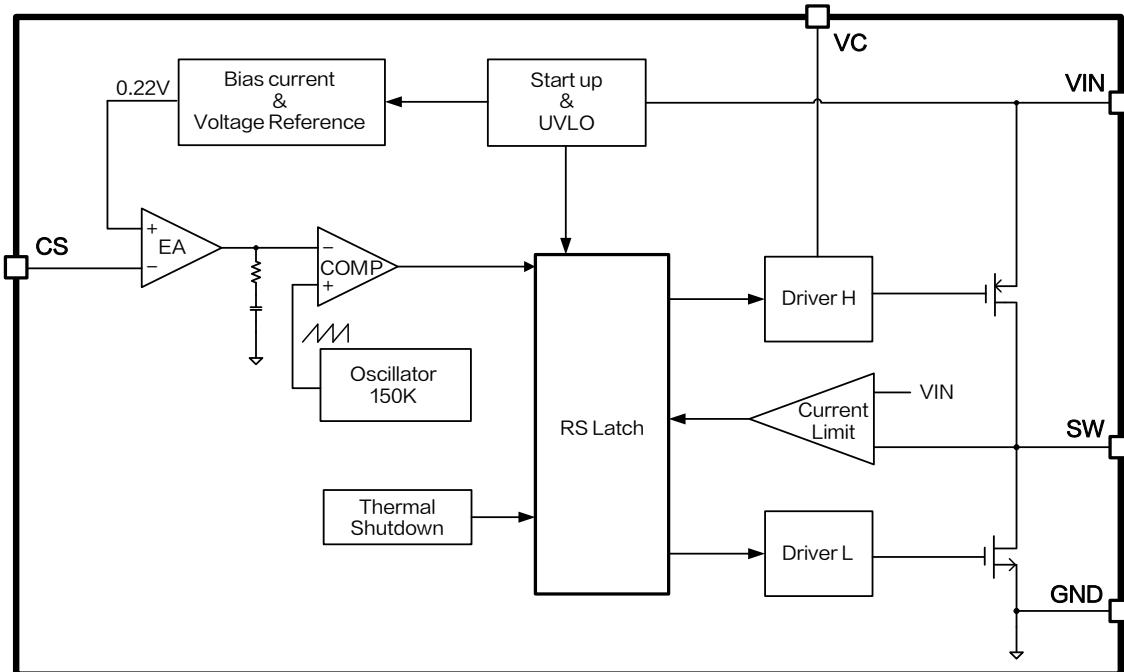
Function Block

Figure3. Function Block Diagram of XL9611

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 (SOP8) (Junction to Ambient, No Heatsink, Free Air)	R_{JA}	100	℃/W
Operating Junction Temperature	T_J	−40~150	℃
Storage Temperature	T_{STG}	−65~150	℃
Lead Temperature (Soldering, 10 sec)	T_{LEAD}	260	℃
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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XL9611 Electrical Characteristics

T_A = 25℃; system parameters test circuit figure4, unless otherwise specified.

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

Electrical Characteristics (DC Parameters)

T_A=25℃,V_{IN}=12V,V_{EN}=0V;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} =2V		3.4	5	mA
Oscillator Frequency	F_{OSC}		127	150	172	KHz
Switch Current Limit	I_L	V_{CS}=0V		0.8		A
High side MOS On−resistance	$R_{DS(ON)H}$			270		mΩ
Low side MOS On−resistance	$R_{DS(ON)L}$			255		mΩ
Thermal Shutdown Temperature	T_{SD}			150		℃
Thermal Shutdown Hysteresis	T_D			30		℃
Max. Duty Cycle	D_{MAX}			100		%

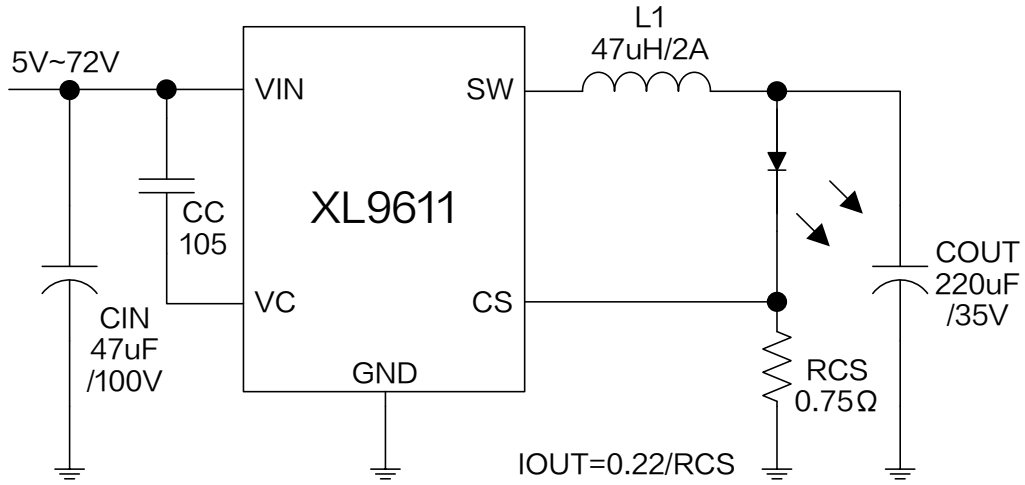## Typical System Application Schematic (I_{OUT}=0.3A)

Figure4. XL9611 System Parameters Test Circuit (I_{OUT}=0.3A)
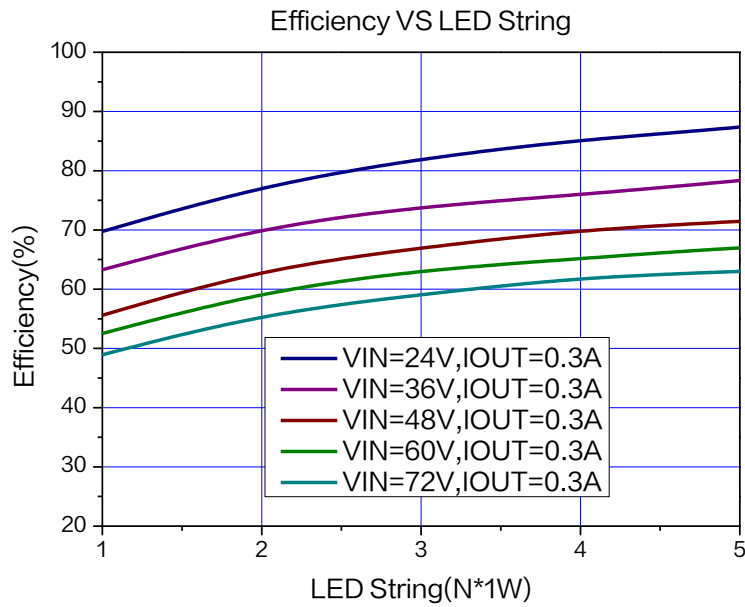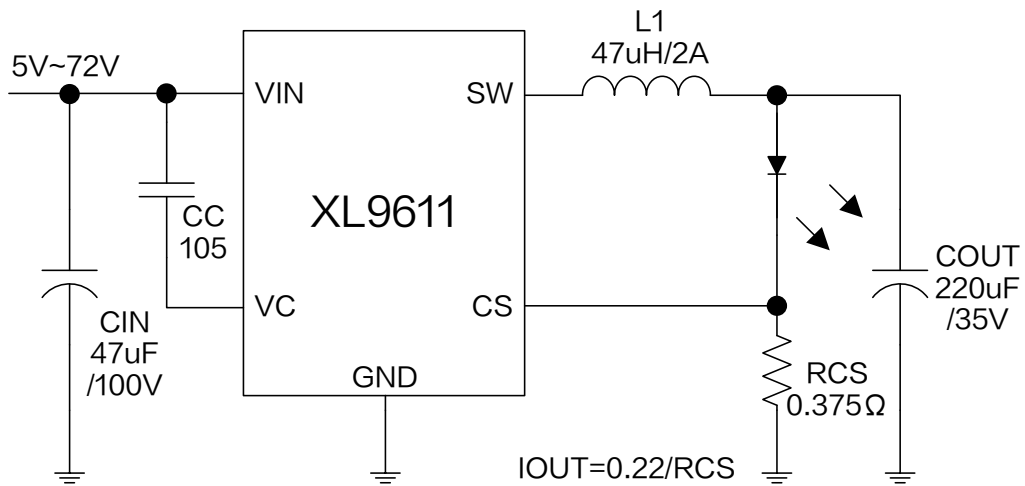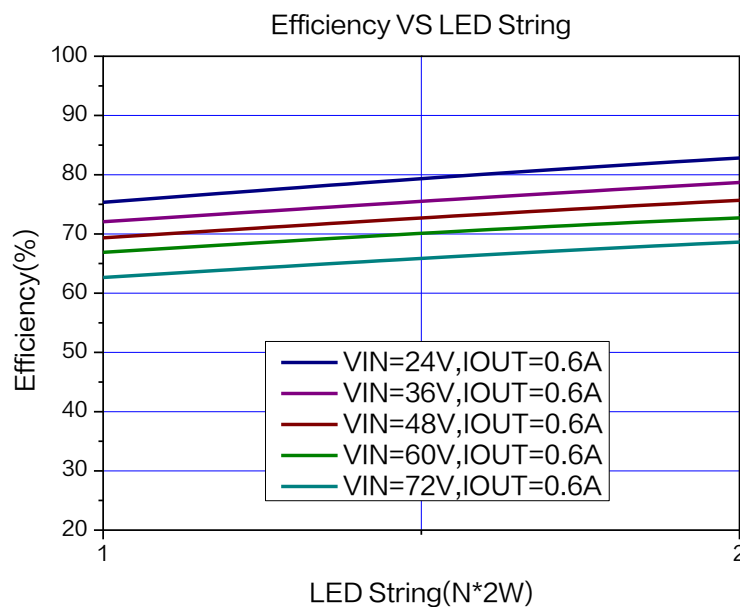
Typical System Application Transfer Efficiency

Figure5. XL9611 System Efficiency Curve(I_{OUT}=0.3A)

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

Figure6. XL9611 System Parameters Test Circuit (I_{OUT}=0.6A)

IOUT=0.22/RCS

Typical System Application Transfer Efficiency

Efficiency VS LED String

VIN=24V,IOUT=0.6A
VIN=36V,IOUT=0.6A
VIN=48V,IOUT=0.6A
VIN=60V,IOUT=0.6A
VIN=72V,IOUT=0.6A

LED String(N*2W)

Figure7. XL9611 System Efficiency Curve(I_{OUT}=0.6A)

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Typical System Application（PWM DIMMING）
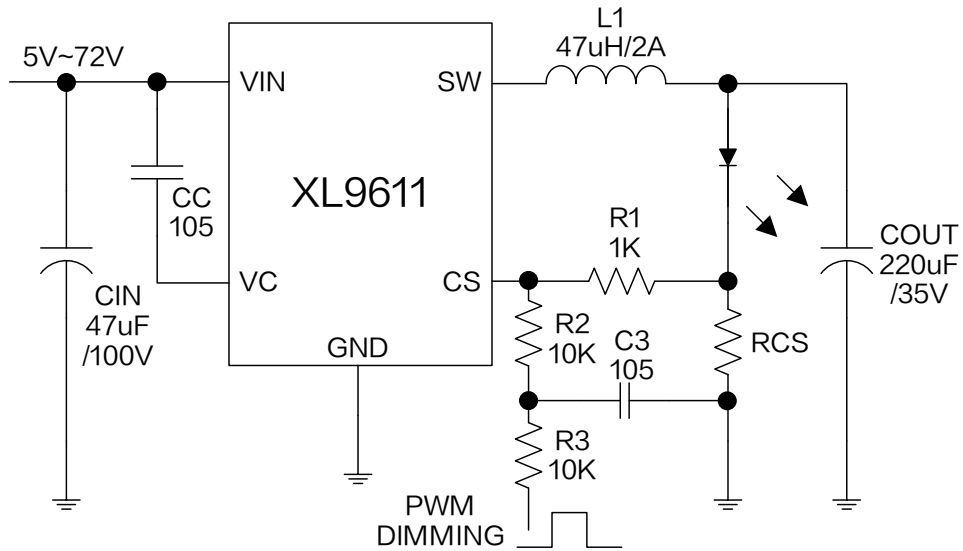
Figure8. XL9611 System Parameters Test Circuit（PWM DIMMING）

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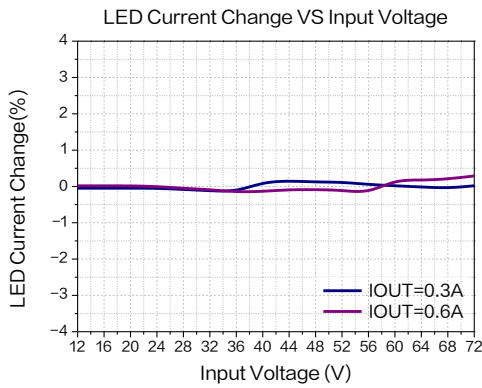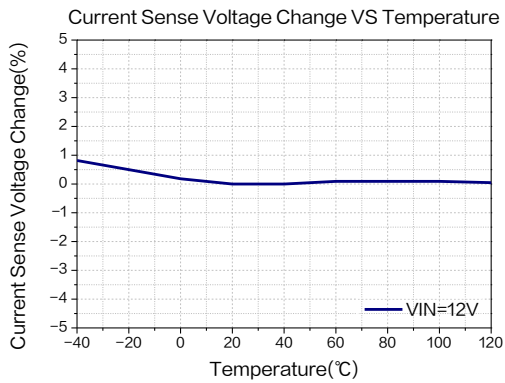

Figure9.Line Regulation
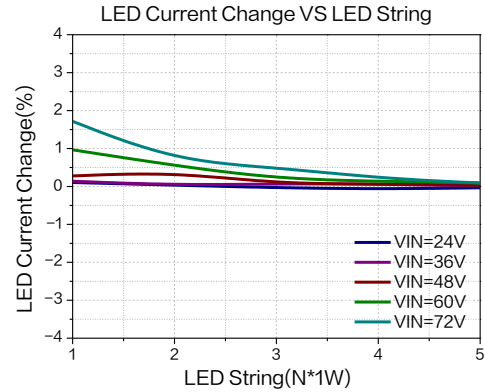
Figure10.Load Regulation

Figure11.Current Sense Voltage Regulation
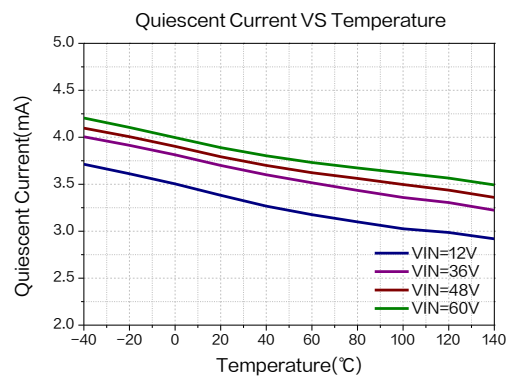
Figure12.Quiescent Current
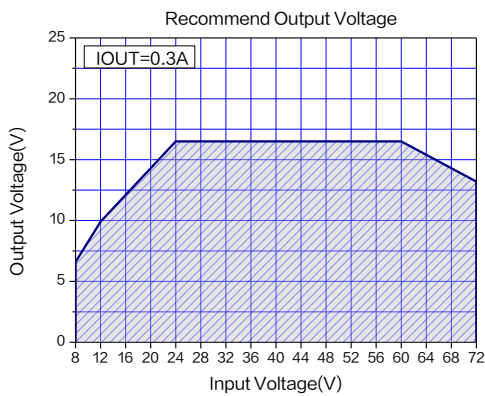
Figure13.Max Output Voltage
(I_{OUT}=0.3A, T_A=25℃)

Figure14.Max Output Voltage
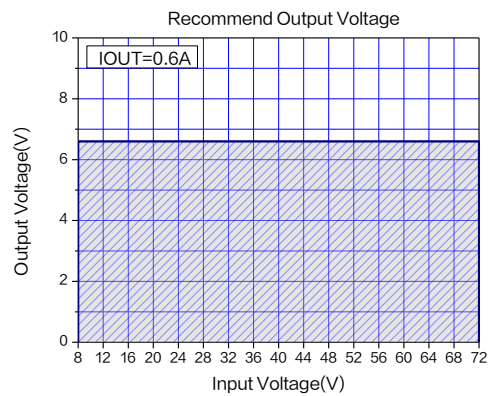(I_{OUT}=0.6A, T_A=25℃)

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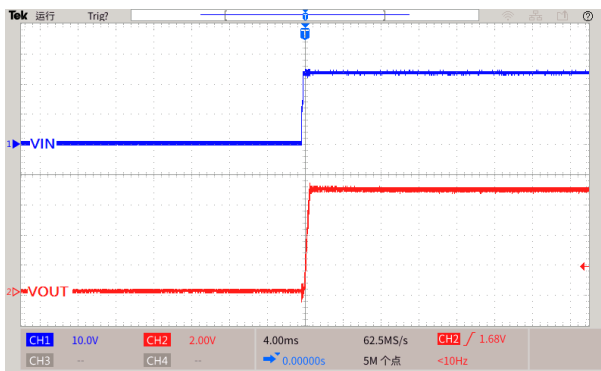

Figure15. Start–Up Characteristic
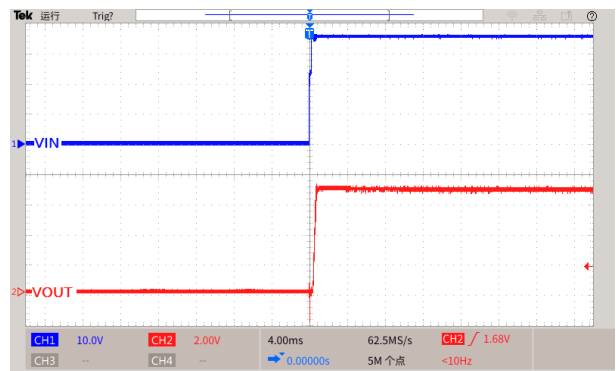(V_{IN}=24V，V_{OUT}=6.6V，I_{OUT}=0.3A)

Figure16. Start–Up Characteristic
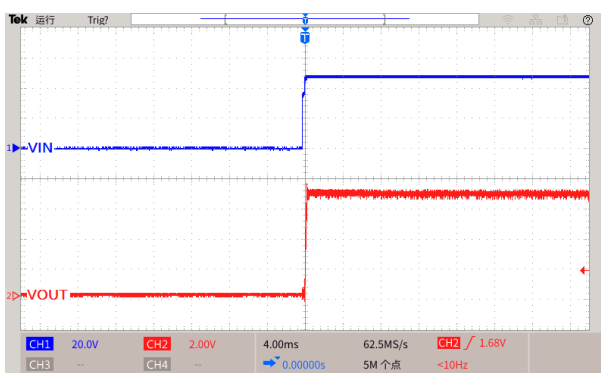(V_{IN}=36V，V_{OUT}=6.6V，I_{OUT}=0.3A)

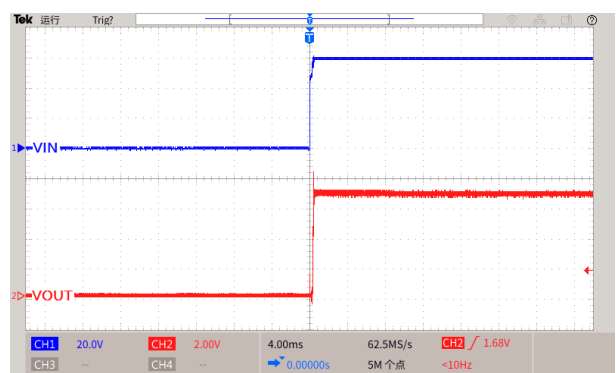Figure17. Start–Up Characteristic
(V_{IN}=48V，V_{OUT}=6.6V，I_{OUT}=0.3A)

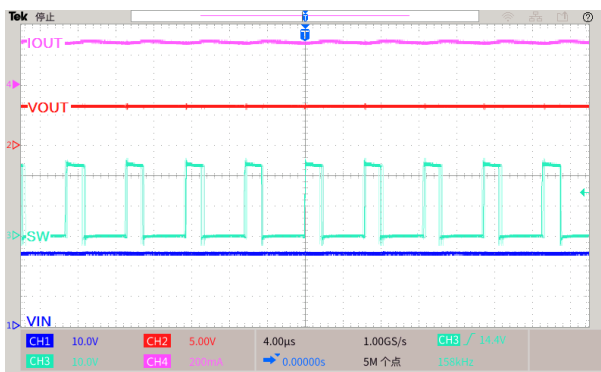Figure18. Start–Up Characteristic
(V_{IN}=60V，V_{OUT}=6.6V，I_{OUT}=0.3A)

Figure19. LED Current Ripple
(V_{IN}=24V，V_{OUT}=3.3V，I_{OUT}=0.3A)

Figure20. LED Current Ripple
(V_{IN}=36V，V_{OUT}=6.6V，I_{OUT}=0.3A)

Figure21. LED Current Ripple
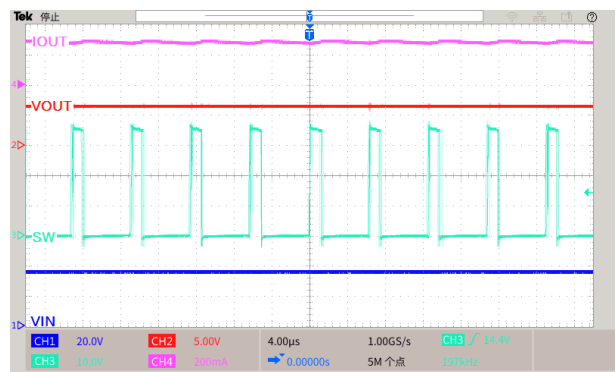
(V_{IN}=48V，V_{OUT}=9.9V，I_{OUT}=0.3A)
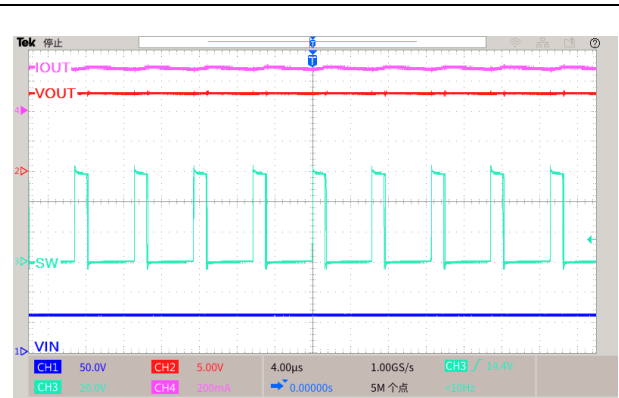
Figure22. LED Current Ripple

(V_{IN}=60V，V_{OUT}=13.2V，I_{OUT}=0.3A)

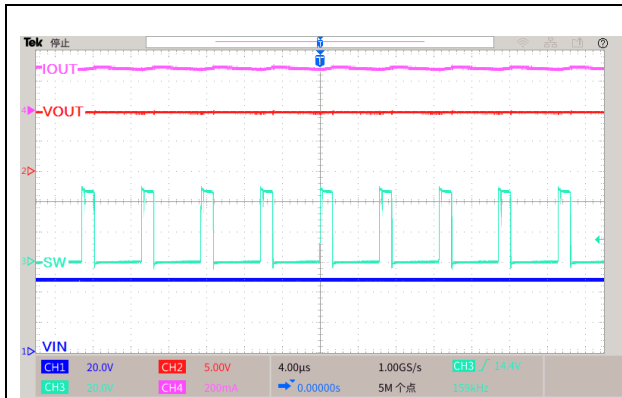| 0.6A 150KHz 90V Synchronous Buck LED Constant Current Driver	XL9611

Package Information

SOP8
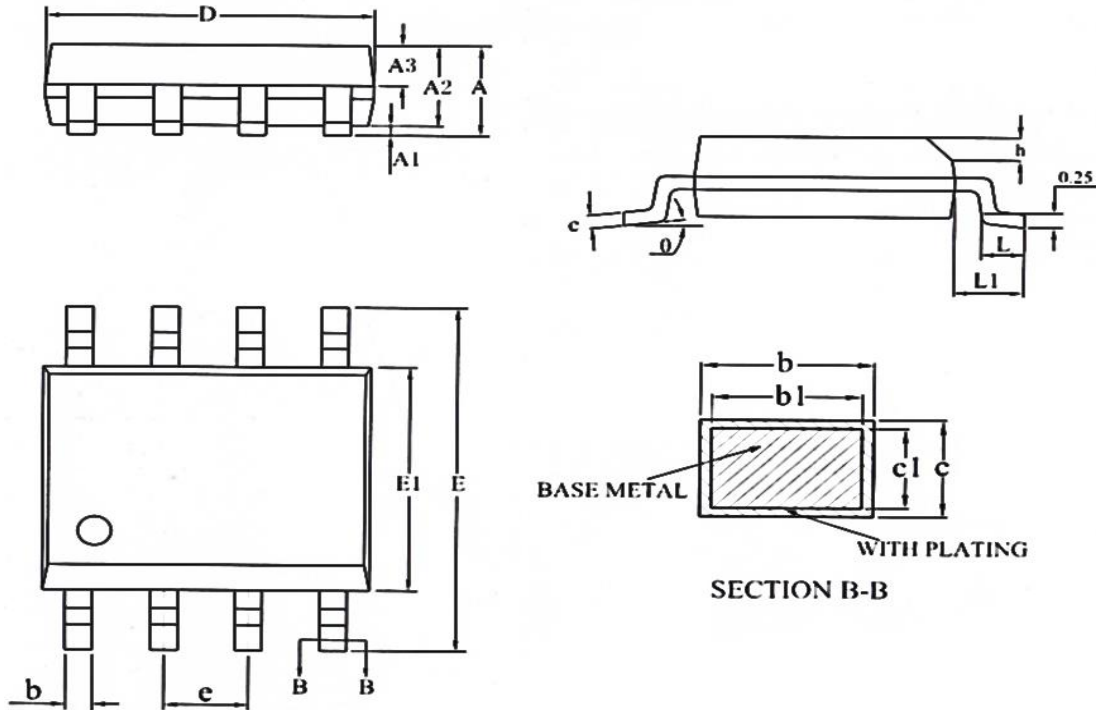
Symbol	Dimensions In Millimeters			Dimensions In Millimeters		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.35	1.55	1.75	0.053	0.061	0.069
A1	0.05	−	0.25	0.002	−	0.010
A2	1.25	1.40	1.65	0.049	0.055	0.065
A3	0.50	0.60	0.70	0.019	0.024	0.028
b	0.30	−	0.51	0.012	−	0.020
b1	0.29	0.41	0.48	0.011	0.016	0.018
c	0.17	−	0.25	0.007	−	0.010
c1	0.17	0.20	0.23	0.007	0.008	0.009
D	4.70	4.90	5.10	0.185	0.193	0.200
E	5.80	6.00	6.20	0.228	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.154	0.157
e	1.14	1.27	1.40	0.045	0.050	0.055
h	0.25	−	0.50	0.010	−	0.020
L	0.45	−	0.80	0.017	−	0.031
L1	0.82	1.03	1.23	0.032	0.040	0.048
θ	0	−	8°	0	−	8°

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