2.0A 150KHz 90V Synchronous Buck LED Constant Current Driver XL9613

Features

- Operation Voltage：5V~72V
- 0.22V Constant Current Sense Voltage
- Directly drive 1~14 Series LED
- Current Sense Voltage Accuracy ±3%
- Fixed 150KHz Switching Frequency
- 2A Constant Output Current Capability
- Internal Optimize Power MOSFET
- High efficiency up to 93%
- Max. Output power up to 25W
- 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 TO263-5L package

General Description

The XL9613 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. XL9613 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 XL9613 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

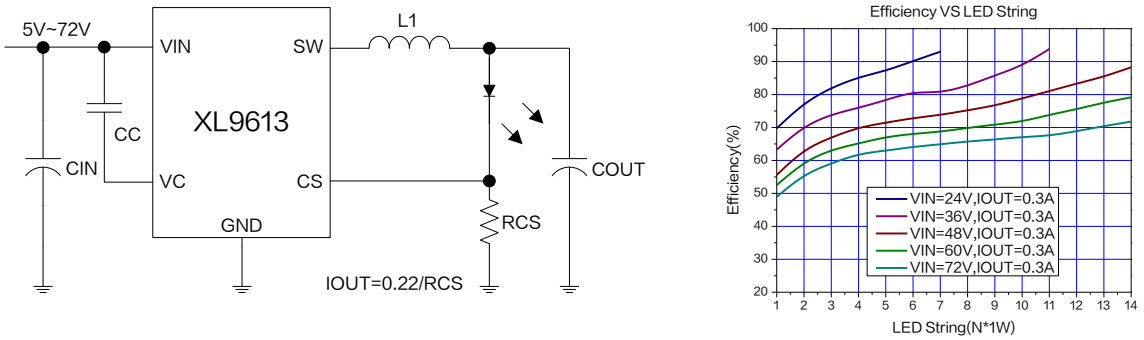


Figure1. XL9613 Typical application schematic and efficiency curve

2.0A 150KHz 90V Synchronous Buck LED Constant Current Driver XL9613

Pin Configurations

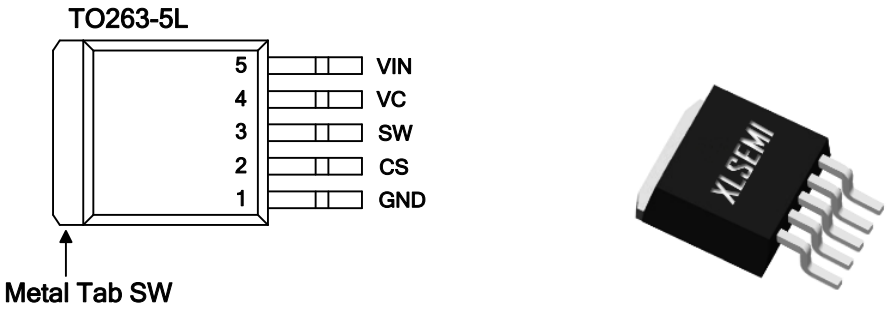


Figure2. Pin Configuration of XL9613

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. XL9613 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
XL9613	XL9613	TO263-5L	RoHS & HF	800 Units on Reel

Function Block

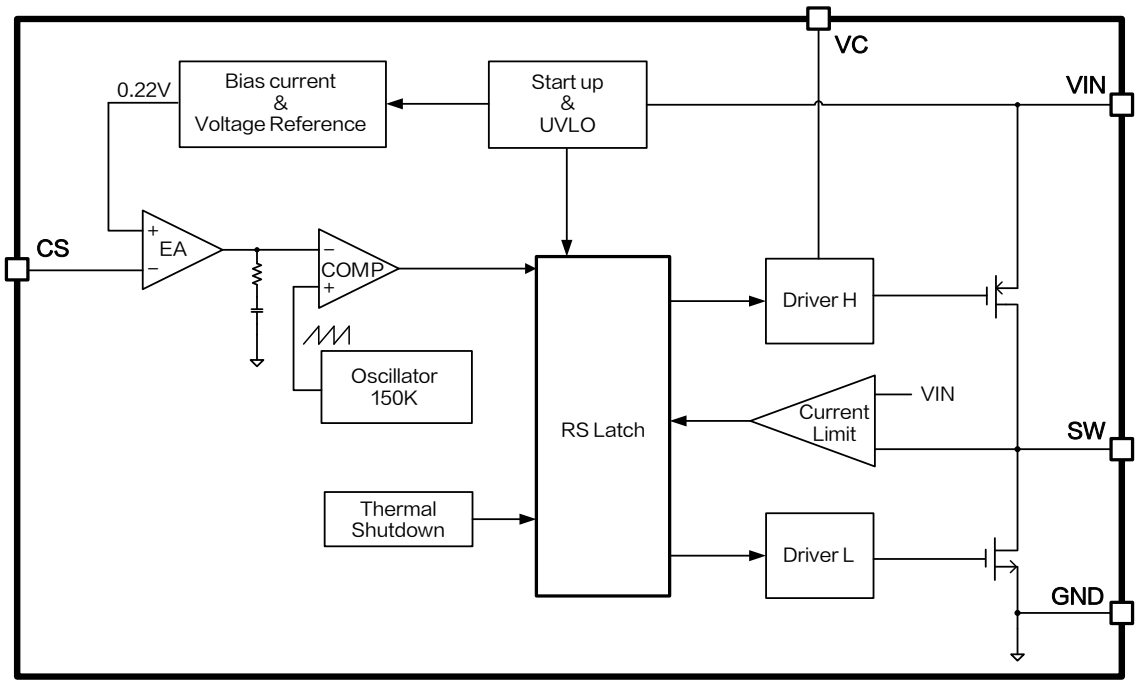


Figure3. Function Block Diagram of XL9613

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 (TO263−5L) (Junction to Ambient, No Heatsink, Free Air)	R_{JA}	30	℃/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.

XL9613 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		2.2		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)

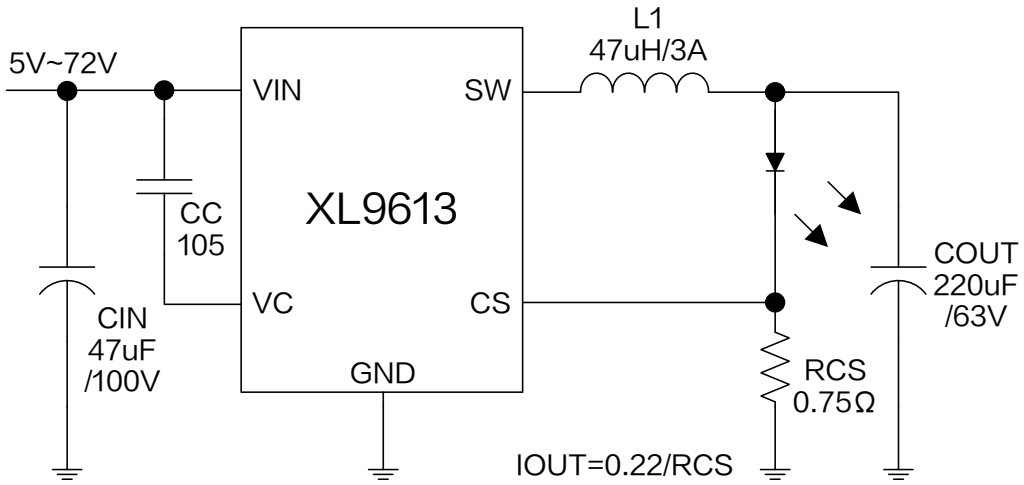


Figure4. XL9613 System Parameters Test Circuit (I_{OUT}=0.3A)

Typical System Application Transfer Efficiency

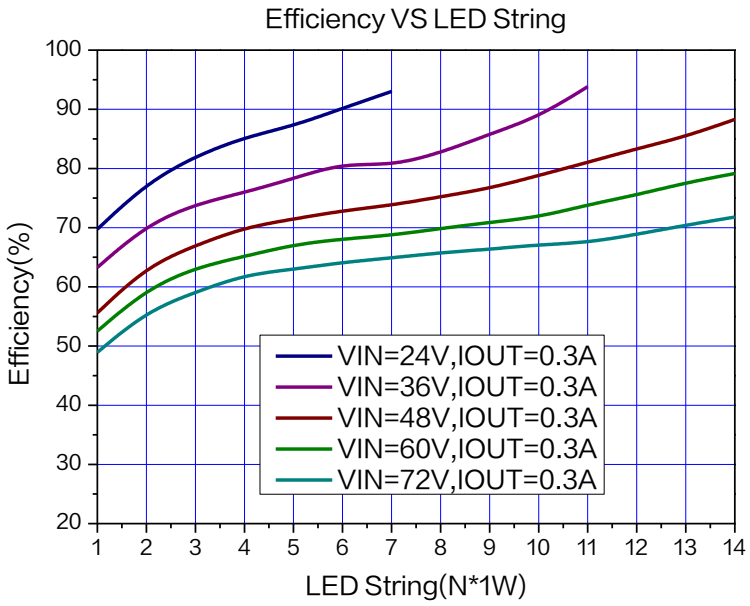


Figure5. XL9613 System Efficiency Curve(I_{OUT}=0.3A)

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

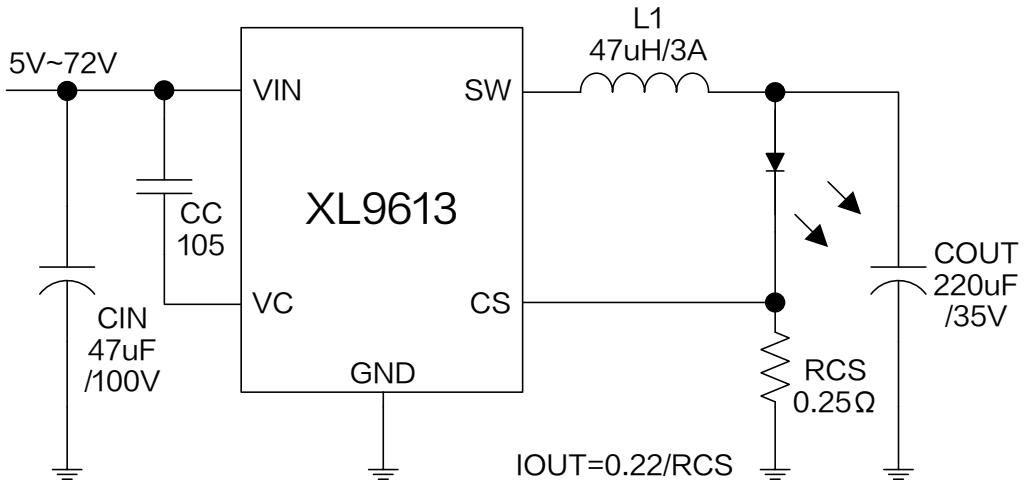


Figure6. XL9613 System Parameters Test Circuit (I_{OUT}=0.9A)

Typical System Application Transfer Efficiency

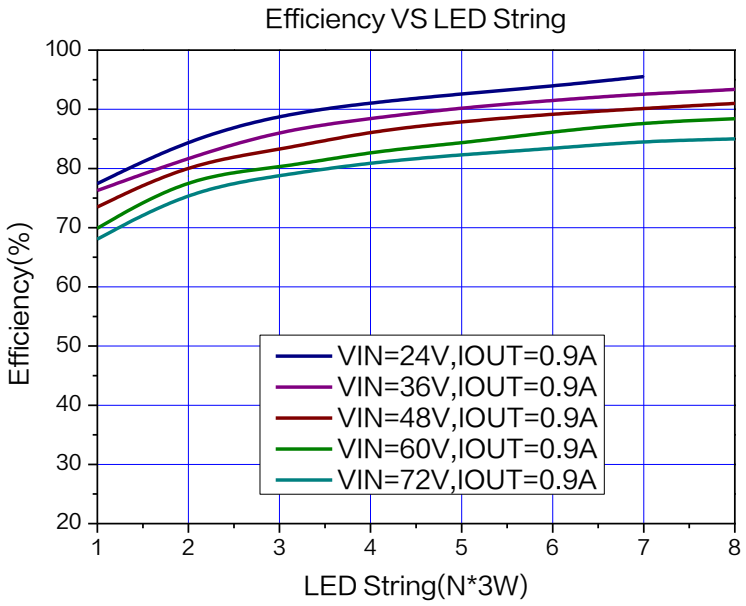


Figure7. XL9613 System Efficiency Curve(I_{OUT}=0.9A)

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

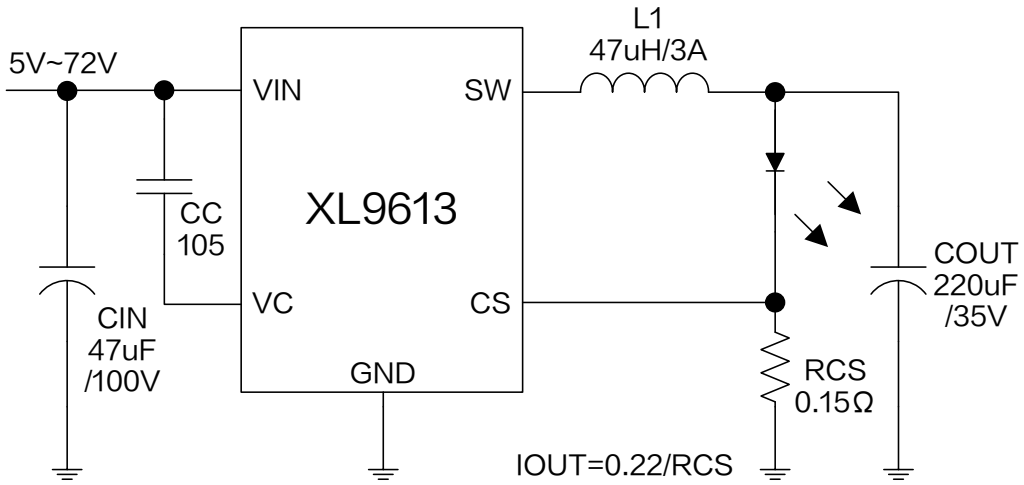


Figure8. XL9613 System Parameters Test Circuit (I_{OUT}=1.5A)

Typical System Application Transfer Efficiency

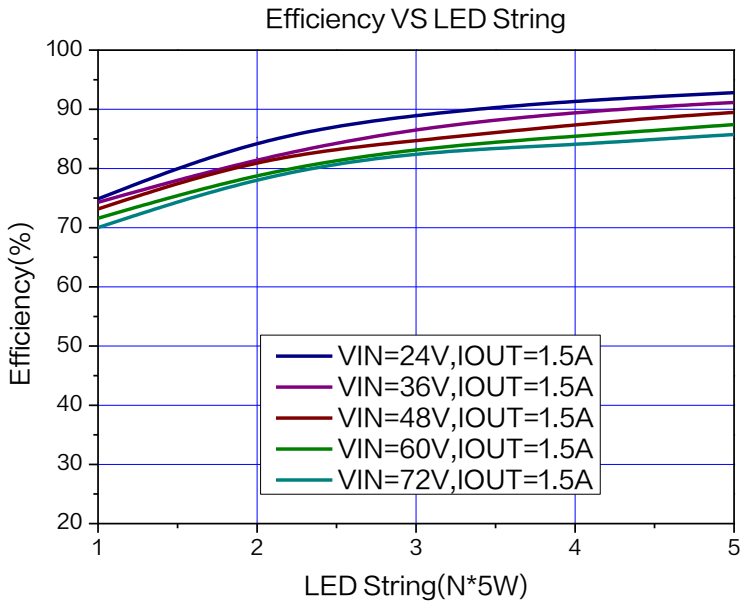


Figure9. XL9613 System Efficiency Curve(I_{OUT}=1.5A)

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

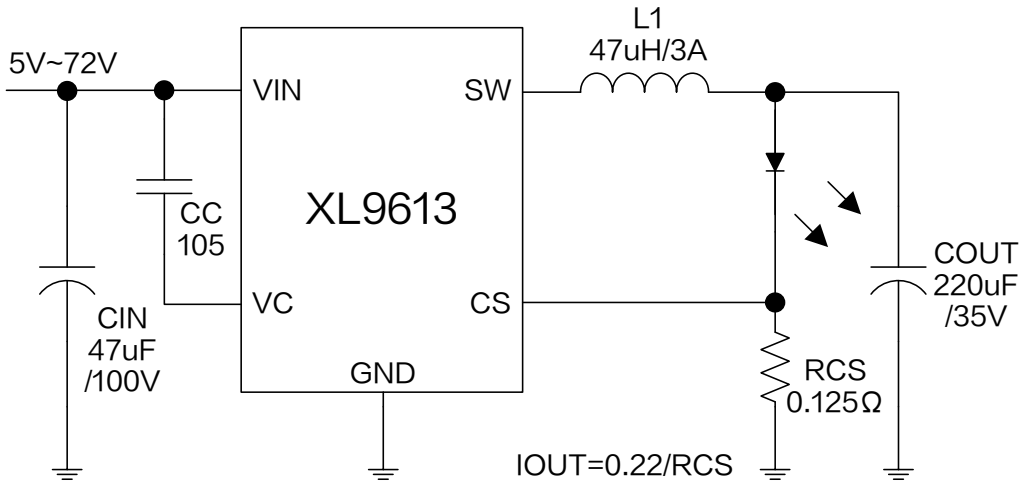


Figure10. XL9613 System Parameters Test Circuit (I_{OUT}=1.8A)

Typical System Application Transfer Efficiency

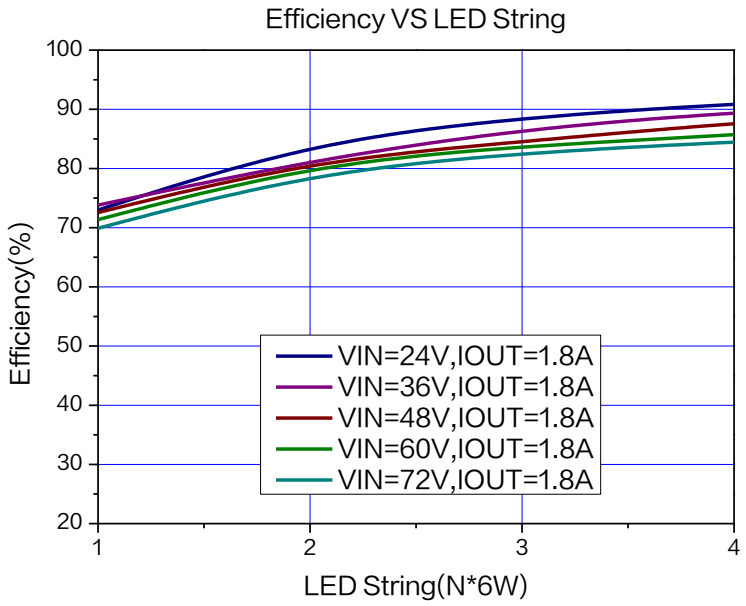


Figure11. XL9613 System Efficiency Curve(I_{OUT}=1.8A)

Typical System Application（PWM DIMMING）

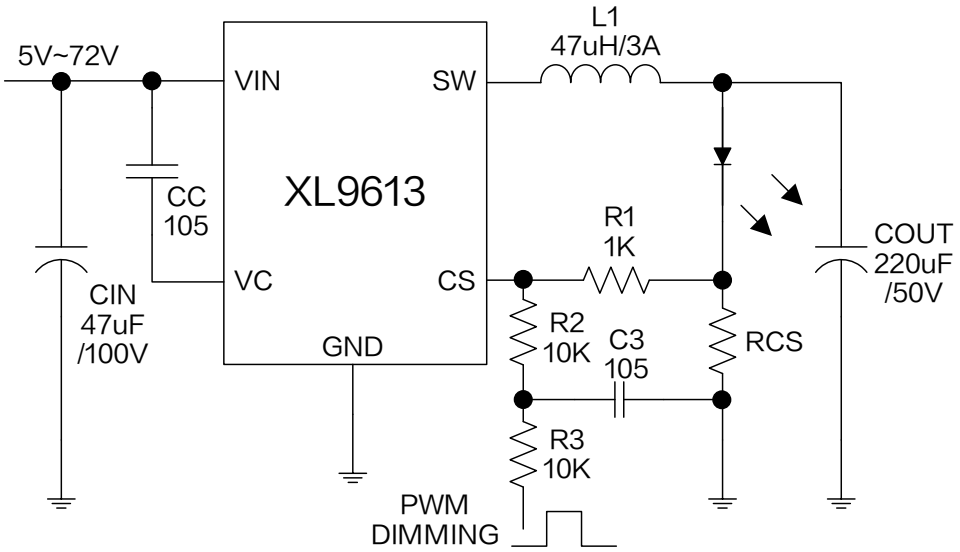


Figure12. XL9613 System Parameters Test Circuit（PWM DIMMING）

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

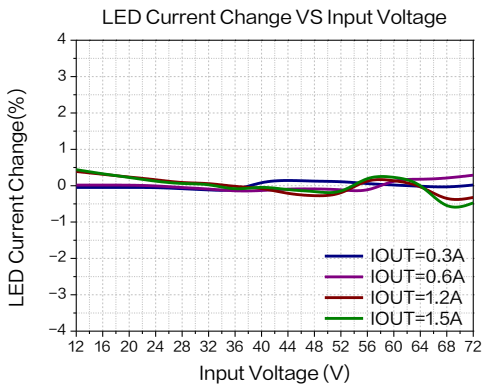


Figure13.Line Regulation

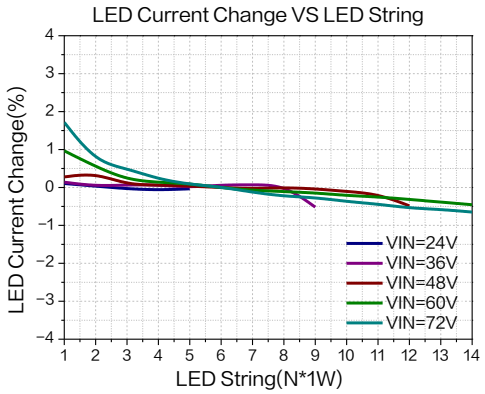


Figure14.Load Regulation

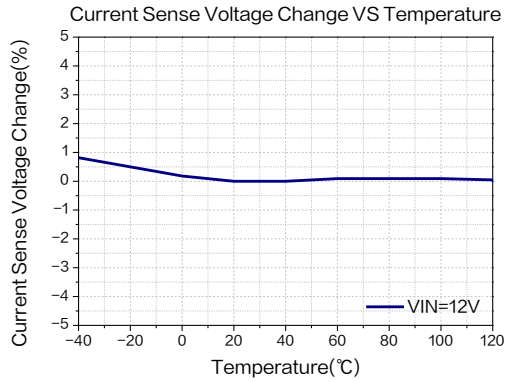


Figure15.Current Sense Voltage Regulation

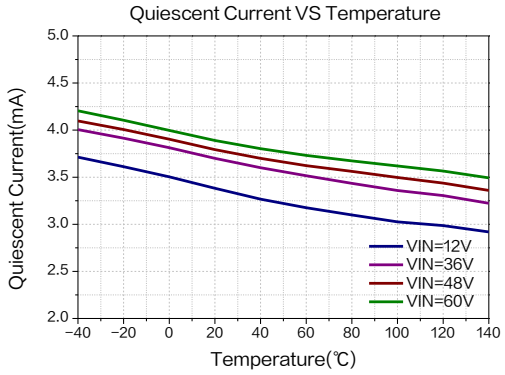


Figure16.Quiescent Current

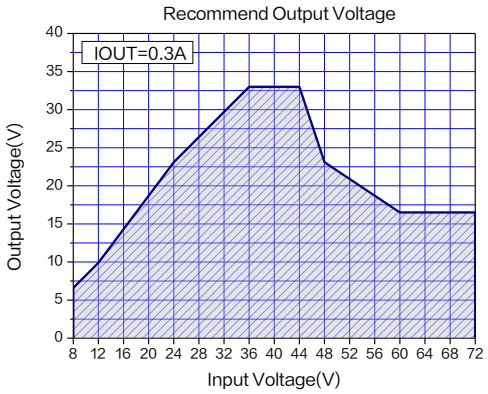


Figure17.Max Output Voltage
(I_{OUT}=0.3A，T_A=25℃)

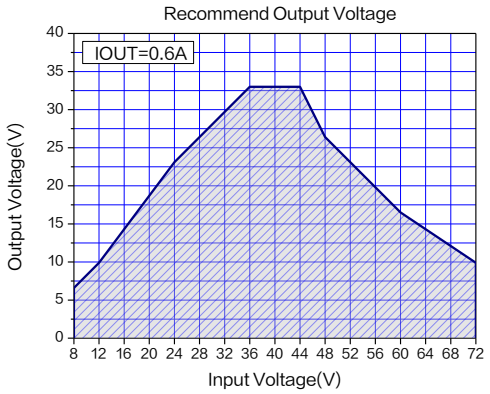


Figure18.Max Output Voltage
(I_{OUT}=0.6A，T_A=25℃)

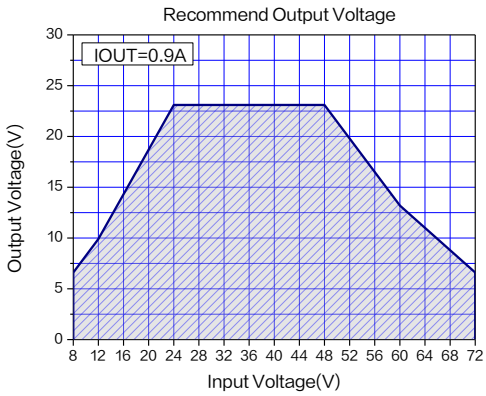


Figure19.Max Output Voltage
(I_{OUT}=0.9A，T_A=25℃)

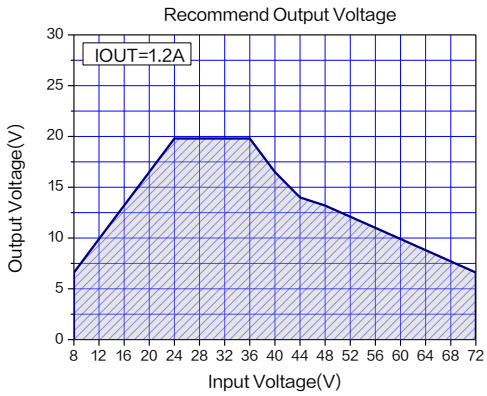


Figure20.Max Output Voltage
(I_{OUT}=1.2A，T_A=25℃)

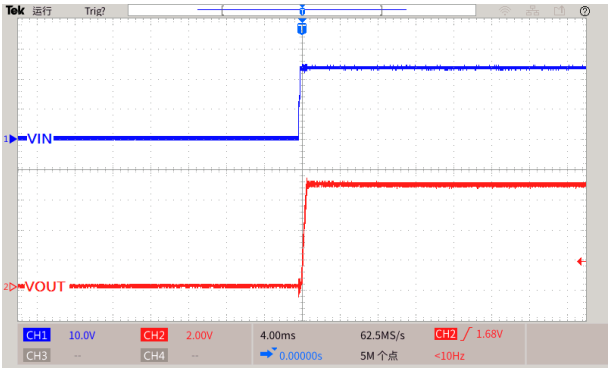


Figure21. Start-Up Characteristic
(V_{IN}=24V，V_{OUT}=6.6V，I_{OUT}=0.3A)

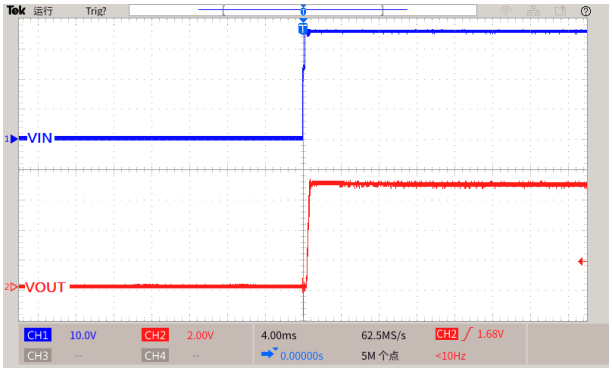


Figure22. Start-Up Characteristic
(V_{IN}=36V，V_{OUT}=6.6V，I_{OUT}=0.3A)

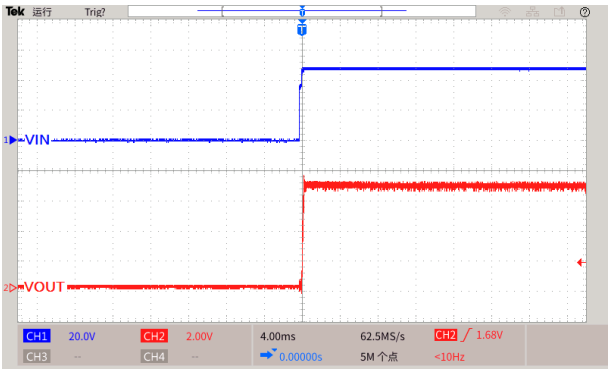


Figure23. Start-Up Characteristic
(V_{IN}=48V，V_{OUT}=6.6V，I_{OUT}=0.3A)

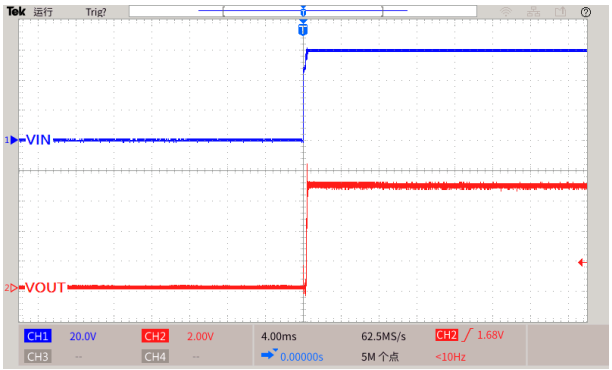


Figure24. Start-Up Characteristic
(V_{IN}=60V，V_{OUT}=6.6V，I_{OUT}=0.3A)

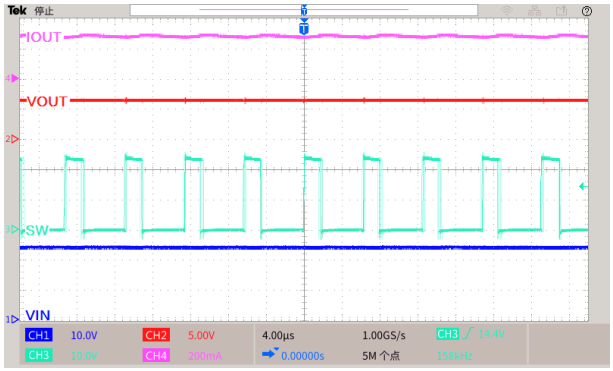


Figure25. LED Current Ripple
(V_{IN}=24V，V_{OUT}=3.3V，I_{OUT}=0.3A)

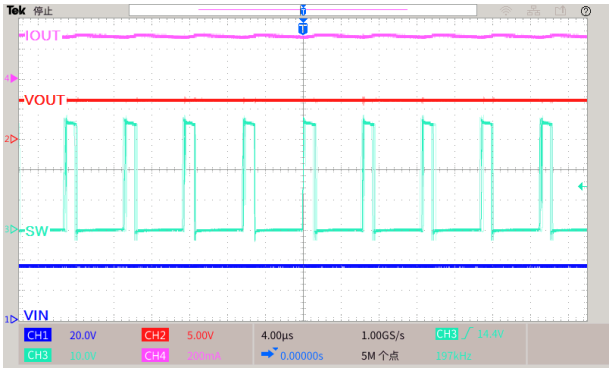


Figure26. LED Current Ripple
(V_{IN}=36V，V_{OUT}=6.6V，I_{OUT}=0.3A)

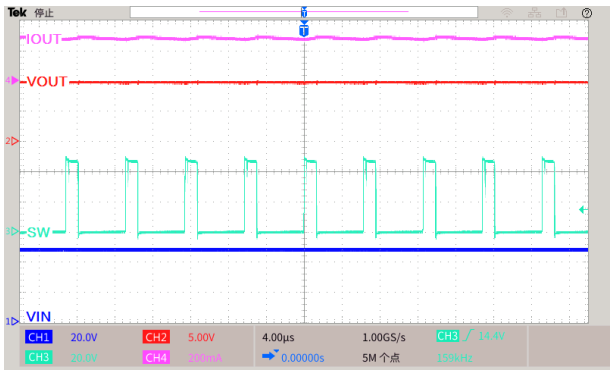


Figure27. LED Current Ripple
(V_{IN}=48V，V_{OUT}=9.9V，I_{OUT}=0.3A)

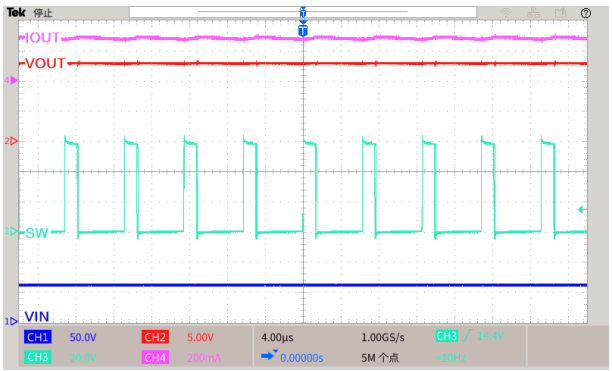
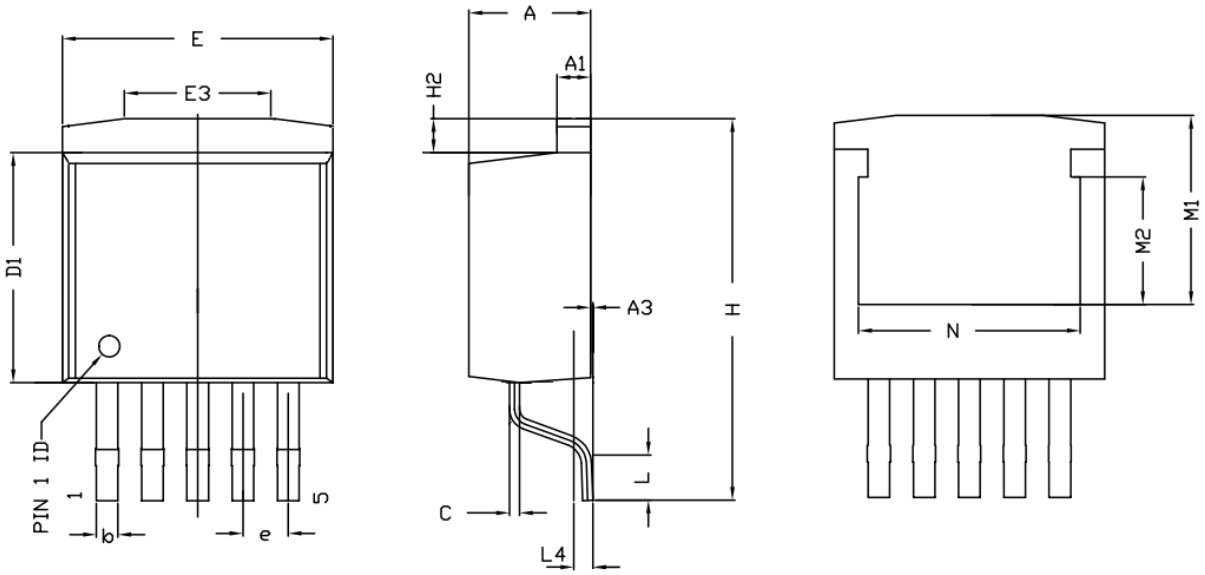


Figure28. LED Current Ripple
(V_{IN}=60V，V_{OUT}=13.2V，I_{OUT}=0.3A)

Package Information

TO263-5L



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	1.17	1.27	1.42	0.046	0.050	0.056
A3	0.00	0.13	0.25	0.000	0.005	0.010
b	0.71	0.81	0.97	0.028	0.032	0.038
c	0.33	0.38	0.76	0.013	0.015	0.030
D1	8.38	8.70	9.00	0.330	0.343	0.354
E	9.90	10.16	10.39	0.390	0.400	0.410
E3	5.00	6.50	8.00	0.197	0.256	0.315
e	1.70 REF.			0.067 REF.		
H	13.00	13.85	14.35	0.511	0.545	0.565
H2	0.90	1.27	1.42	0.035	0.050	0.056
L	1.68	1.98	2.28	0.066	0.078	0.090
L4	0.56	0.76	0.96	0.022	0.030	0.038
M1	6.00	7.11	8.00	0.236	0.280	0.315
M2	–	4.80	–	–	0.189	–
N	7.30	8.33	9.30	0.287	0.328	0.366

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