5A 220KHz 36V Buck LED Constant Current Driver XL3005

Features

- Wide 8V to 36V Input Voltage Range
- Output Current Sense Voltage is 0.21V
- Maximum Duty Cycle 100%
- Minimum Drop Out 0.3V
- Fixed 220KHz Switching Frequency
- 5A Constant Output Current Capability
- Internal Optimize Power MOSFET
- High efficiency
- Excellent line and load regulation
- Built in thermal shutdown function
- Built in current limit function
- Built in output short protection function
- Available in TO-263 package

Applications

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

General Description

The XL3005 is a 220 KHz fixed frequency PWM buck (step-down) LED constant current driver, capable of driving a 5A load with high efficiency, low ripple and excellent line and load regulation. Requiring a minimum number of external components, the regulator is simple to use and include internal frequency compensation and a fixed-frequency oscillator.

The PWM control circuit is able to adjust the duty ratio linearly from 0 to 100%. An over current protection function is built inside. When short protection function happens, the operation frequency will be reduced from 220KHz to 60KHz. An internal compensation block is built in to minimize external component count.



Figure1. Package Type of XL3005

Pin Configurations

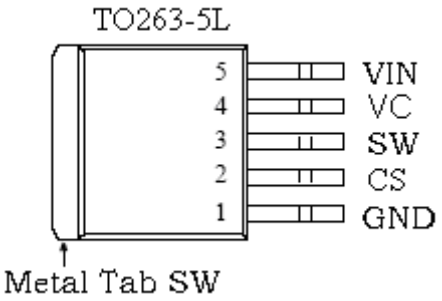


Figure2. Pin Configuration of XL3005 (Top View)

Table 1 Pin Description

Pin Number	Pin Name	Description
1	GND	Ground Pin. Care must be taken in layout. This pin should be placed outside of the Schottky Diode to output capacitor ground path to prevent switching current spikes from inducing voltage noise into XL3005.
2	CS	Output constant current sense Pin (CS). The CS reference voltage is 0.21V.
3	SW	Power Switch Output Pin (SW). SW 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 capacity to VIN.
5	VIN	Supply Voltage Input Pin. XL3005 operates from a 8V to 36V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.

Function Block

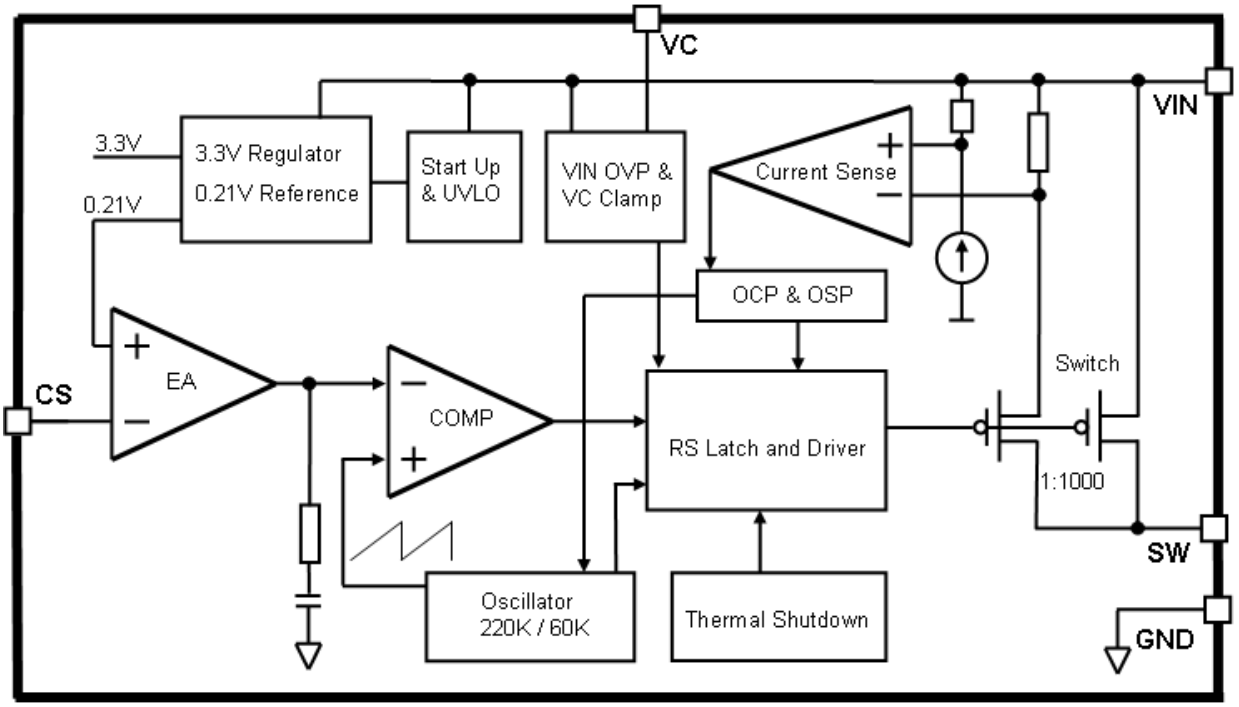


Figure3. Function Block Diagram of XL3005

Typical Application Circuit

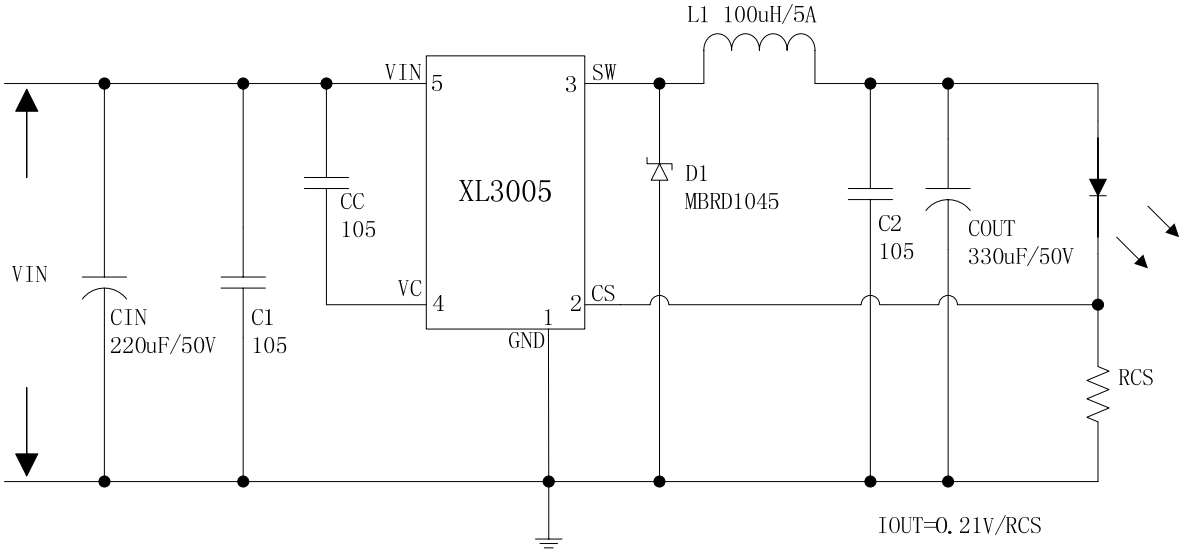


Figure4. XL3005 Typical Application Circuit

Ordering Information

Order Information	Marking ID	Package Type	Packing Type Supplied As
XL3005E1	XL3005E1	TO263-5L	800 Units on Tape & Reel

XLSEMI Pb-free products, as designated with "E1" suffix in the par number, are RoHS compliant.

Absolute Maximum Ratings（Note1）

Parameter	Symbol	Value	Unit
Input Voltage	Vin	-0.3 to 40	V
CS Pin Voltage	V_{CS}	-0.3 to Vin	V
Output Switch Pin Voltage	V_{Output}	-0.3 to Vin	V
Power Dissipation	P_D	Internally limited	mW
Thermal Resistance (TO263-5L) (Junction to Ambient, No Heatsink, Free Air)	R_{JA}	30	ºC/W
Maximum Junction Temperature	T_J	-40 to 150	ºC
Operating Junction Temperature	T_J	-40 to 125	ºC
Storage Temperature	T_{STG}	-65 to 150	ºC
Lead Temperature (Soldering, 10 sec)	T_{LEAD}	260	ºC
ESD (HBM)		>2000	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.

XL3005 Electrical Characteristics

T_a = 25℃;unless otherwise specified.

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
System parameters test circuit figure4						
VCS	Current Sense Voltage	Vin = 8V to 36V, Vout=6.4V Iload=0.1A to 4A	203.7	210	216.3	mV
ŋ	Efficiency	Vin=12V ,Vout=10V Iout=0.3A	-	95	-	%
ŋ	Efficiency	Vin=24V ,Vout=16V Iout=1A	-	96	-	%
ŋ	Efficiency	Vin=36V ,Vout=19V Iout=1A	-	95	-	%

Electrical Characteristics (DC Parameters)

Vin = 12V, GND=0V, Vin & GND parallel connect a 100uf/50V capacitor; Iout=500mA, T_a = 25℃; the others floating unless otherwise specified.

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input operation voltage	Vin		8		36	V
VIN UVLO	Vin_uvlo			5		V
Quiescent Supply Current	I_q	V_{CS}=2V		2.1	5	mA
Oscillator Frequency	Fosc		176	220	264	KHz
Output Short Frequency	Fosp		48	60	72	KHz
Switch Current Limit	I_L	V_{CS}=0		7		A
Max. Duty Cycle	D_{MAX}	V_{CS}=0V		100		%
Output Power PMOS	Rdson	V_{CS}=0V, Vin=12V, I_{SW}=5A		60	80	mohm

Typical System Application (Recommend output voltage safe work range)

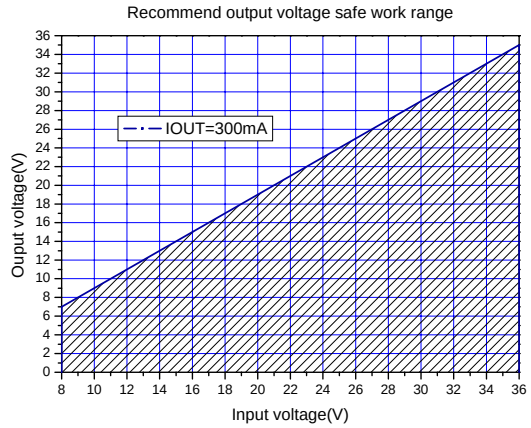


Figure5.Max output voltage(IOUT=300mA)

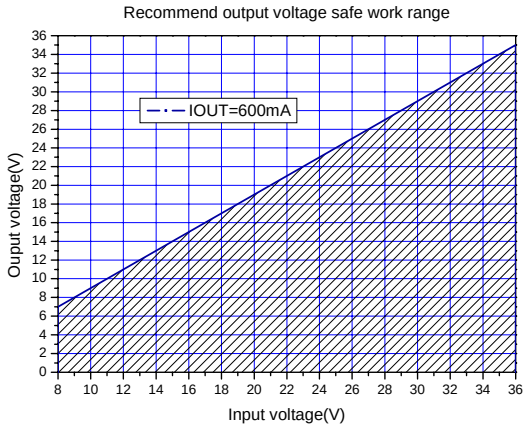


Figure6.Max output voltage(IOUT=600mA)

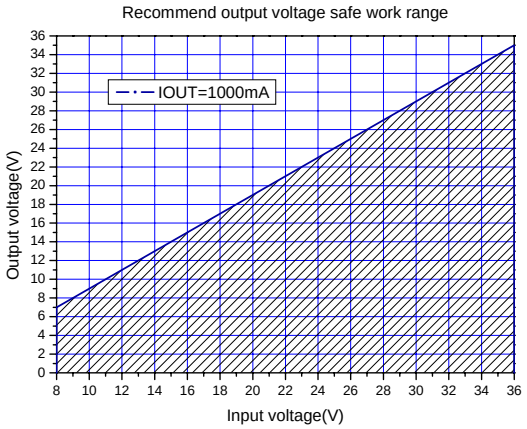


Figure7.Max output voltage(IOUT=1000mA)

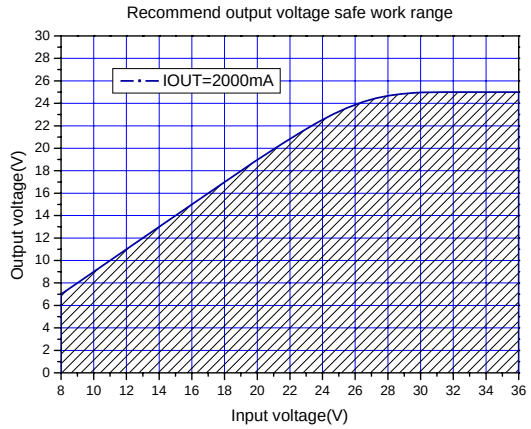


Figure8.Max output voltage(IOUT=2000mA)

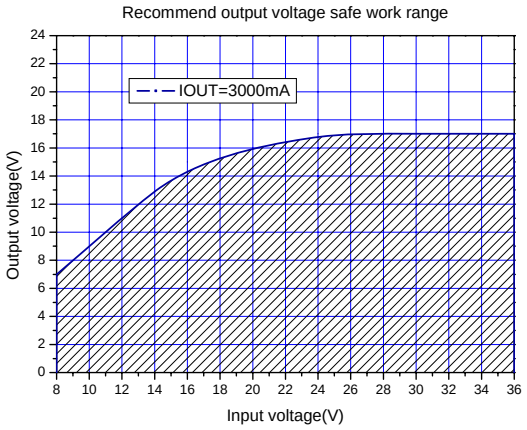


Figure9.Max output voltage(IOUT=3000mA)

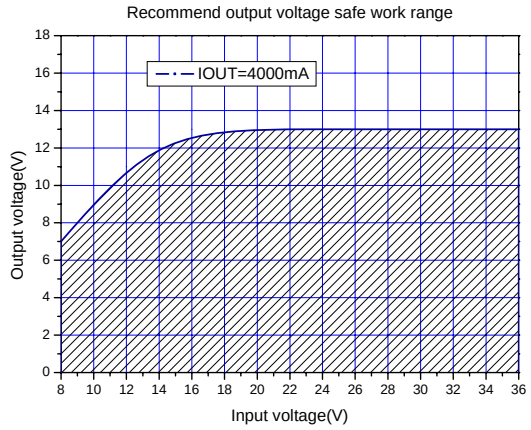


Figure10.Max output voltage(IOUT=4000mA)

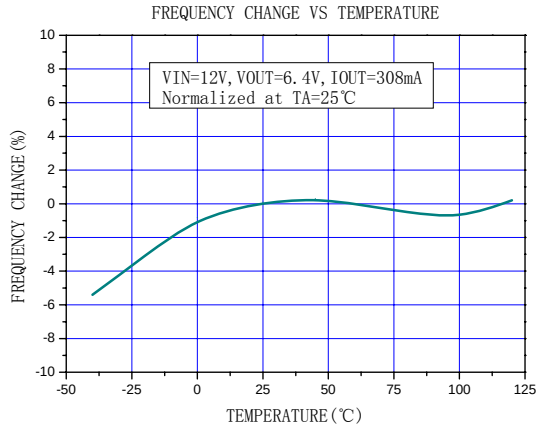


Figure11. Frequency change Curve

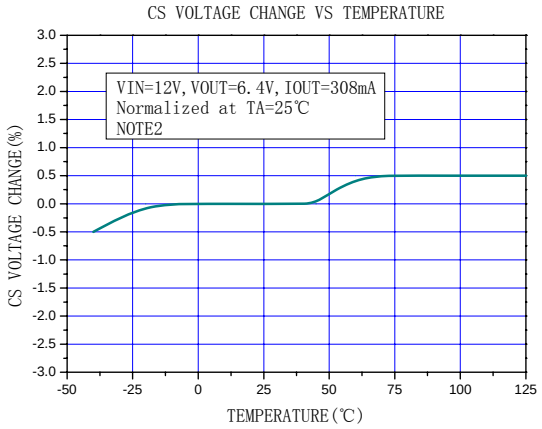


Figure12. CS Voltage change Curve

Note2: Internal temperature compensation circuitry is provided to compensation the PCB and external line loss in system application. When the junction temperature or the output power rise，the CS voltage will be compensated. This function is provided to compensation the PCB and external line loss in system application.

Typical System Application (VIN=8V~36V, IOUT=308mA)

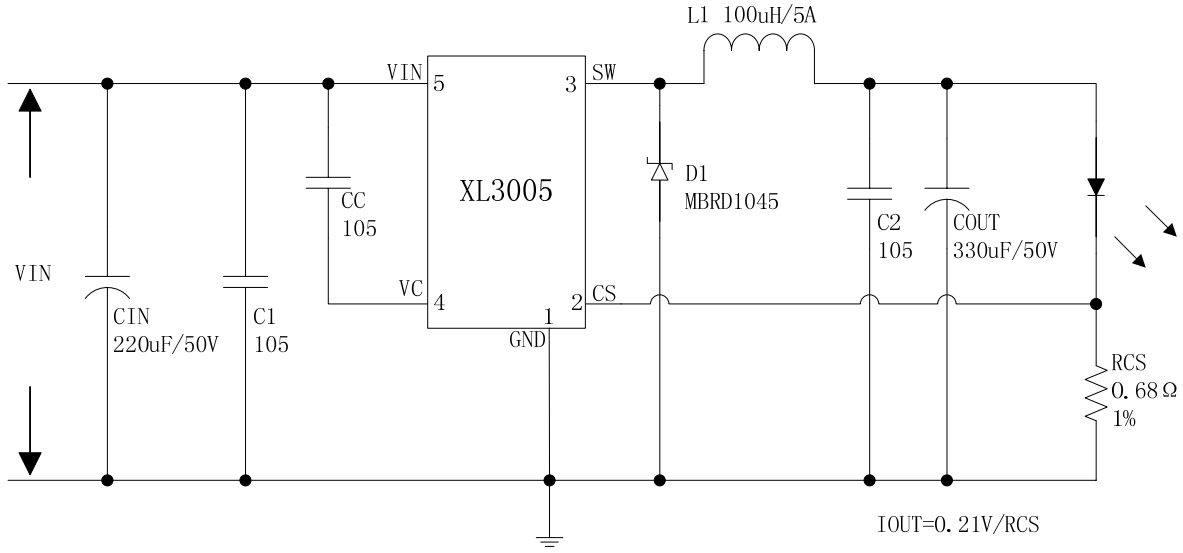


Figure13. XL3005 System Parameters Test Circuit (VIN=8V~36V, IOUT=308mA)

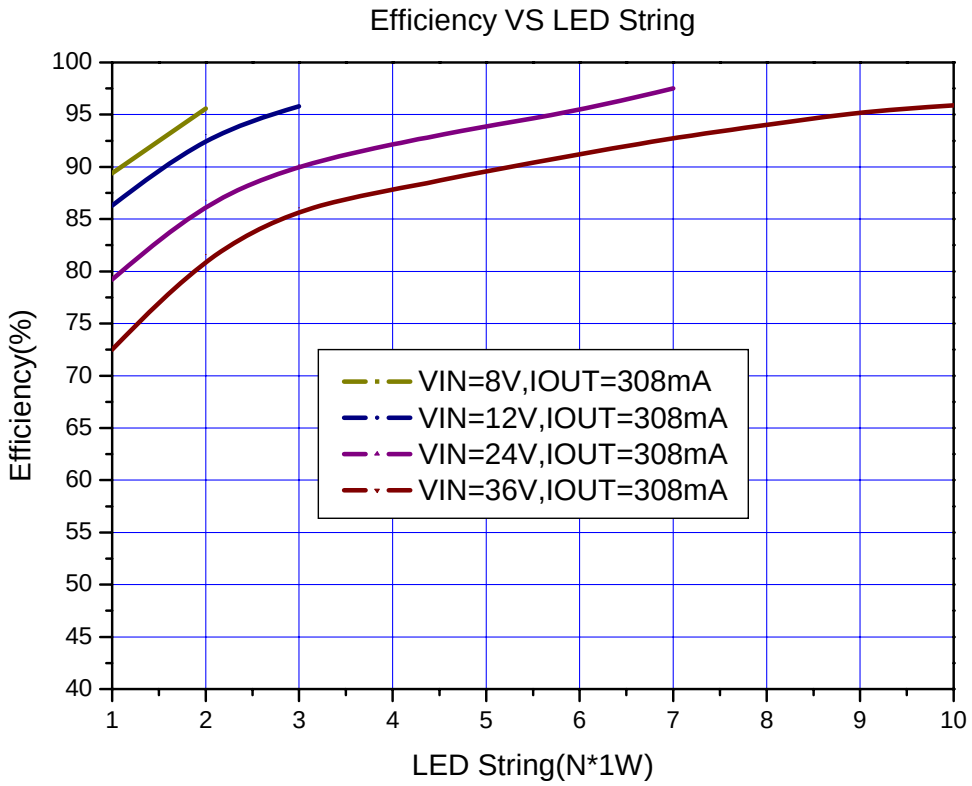


Figure14. XL3005 System Efficiency Curve

Typical System Application (VIN=8V~36V, IOUT=615mA)

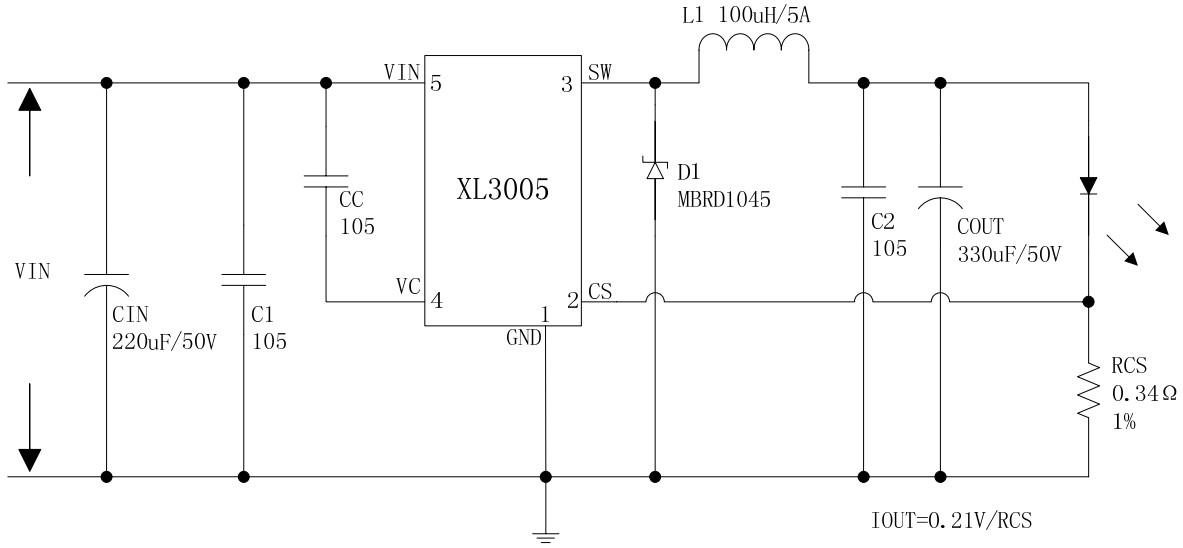


Figure15. XL3005 System Parameters Test Circuit (VIN=8V~36V, IOUT=615mA)

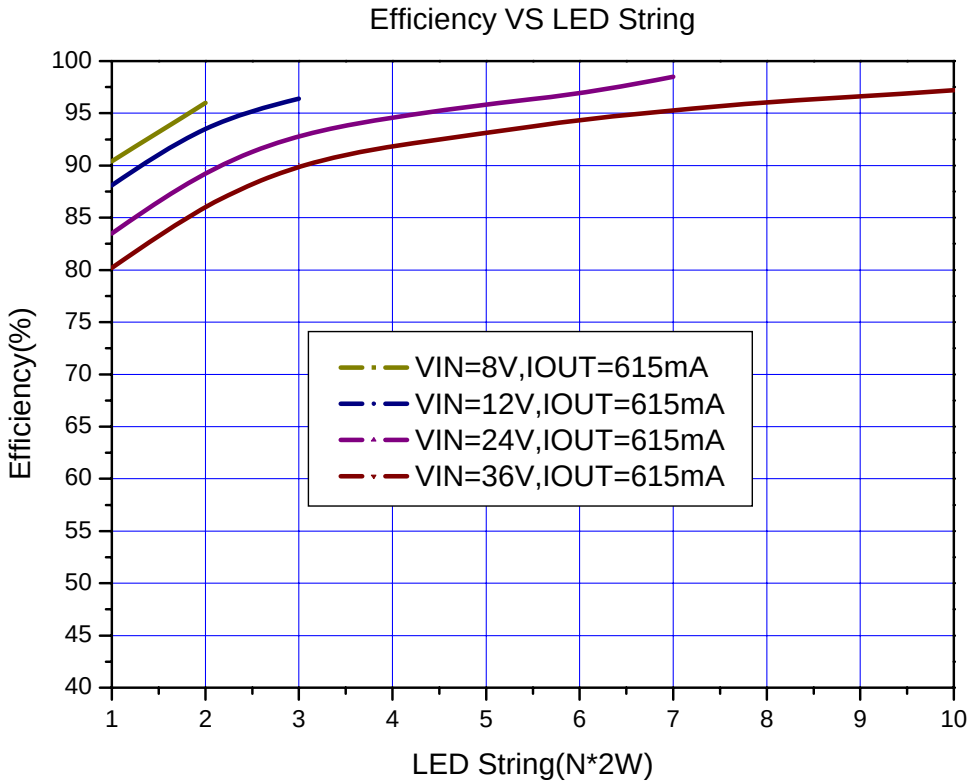


Figure16. XL3005 System Efficiency Curve

Typical System Application (VIN=8V~36V, IOUT=925mA)

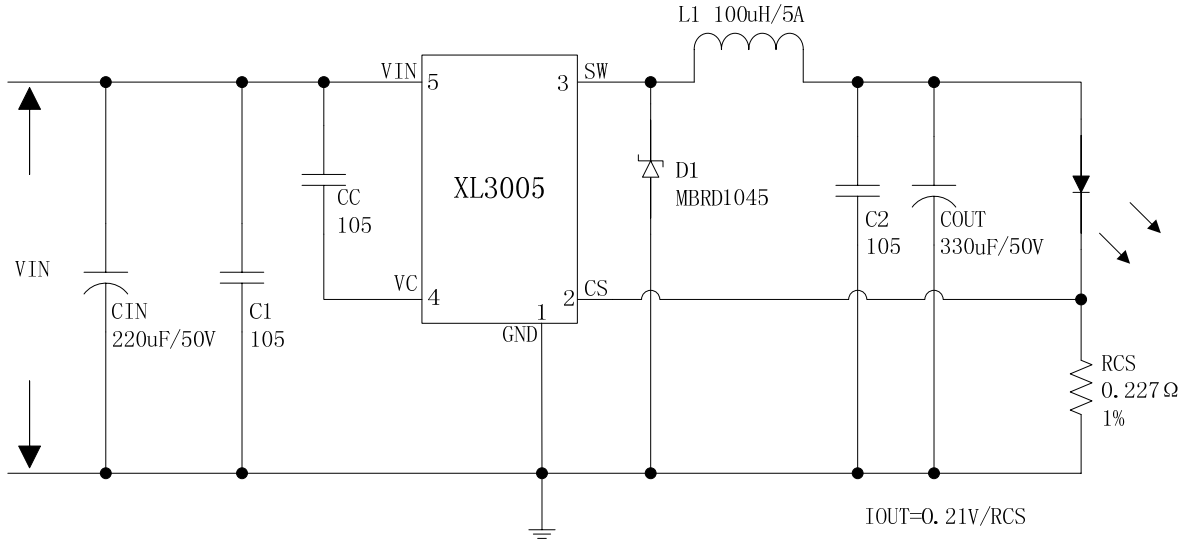


Figure17. XL3005 System Parameters Test Circuit (VIN=8V~36V, IOUT=925mA)

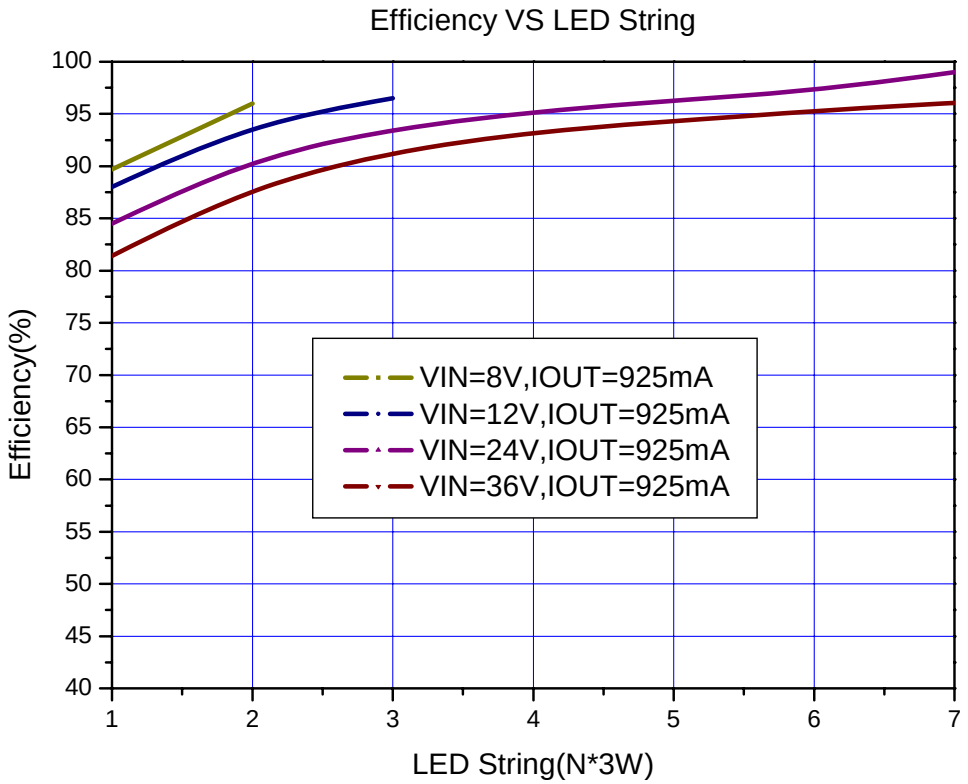


Figure18. XL3005 System Efficiency Curve

Typical System Application (VIN=8V~36V, IOUT=1540mA)

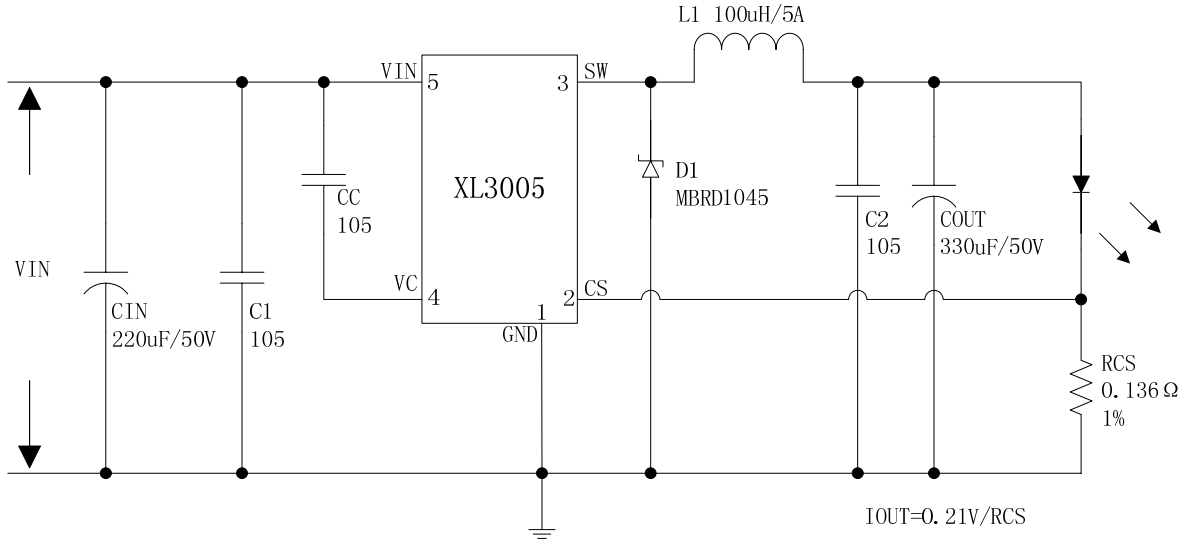


Figure19. XL3005 System Parameters Test Circuit (VIN=8V~36V, IOUT=1540mA)

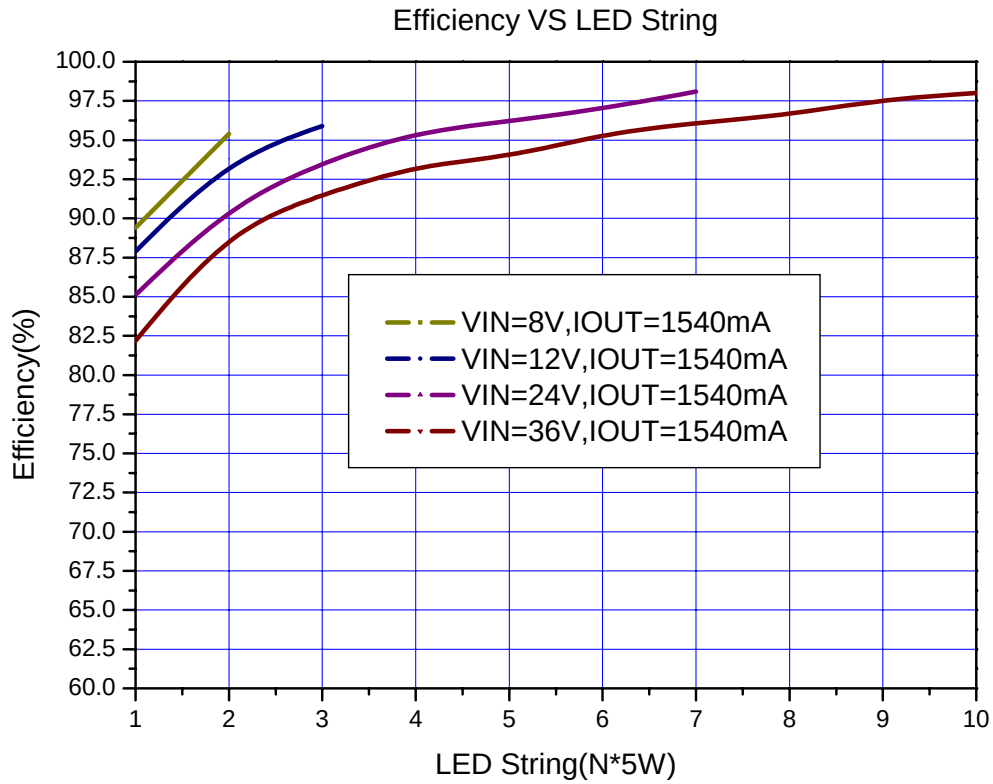


Figure20. XL3005 System Efficiency Curve

Typical System Application (VIN=8V~36V, IOUT=2140mA)

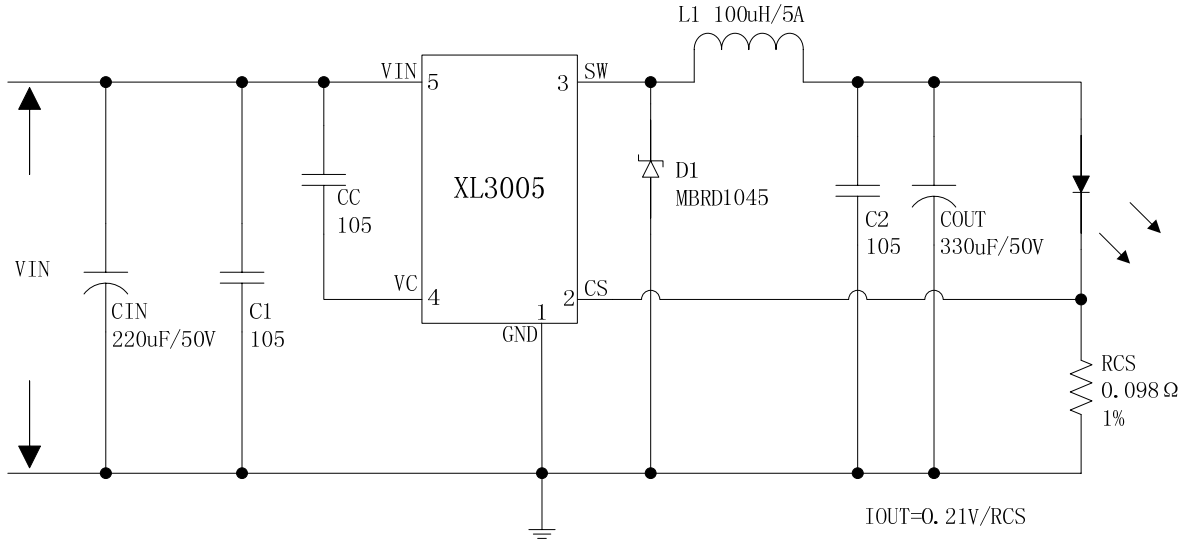


Figure21. XL3005 System Parameters Test Circuit (VIN=8V~36V, IOUT=2140mA)

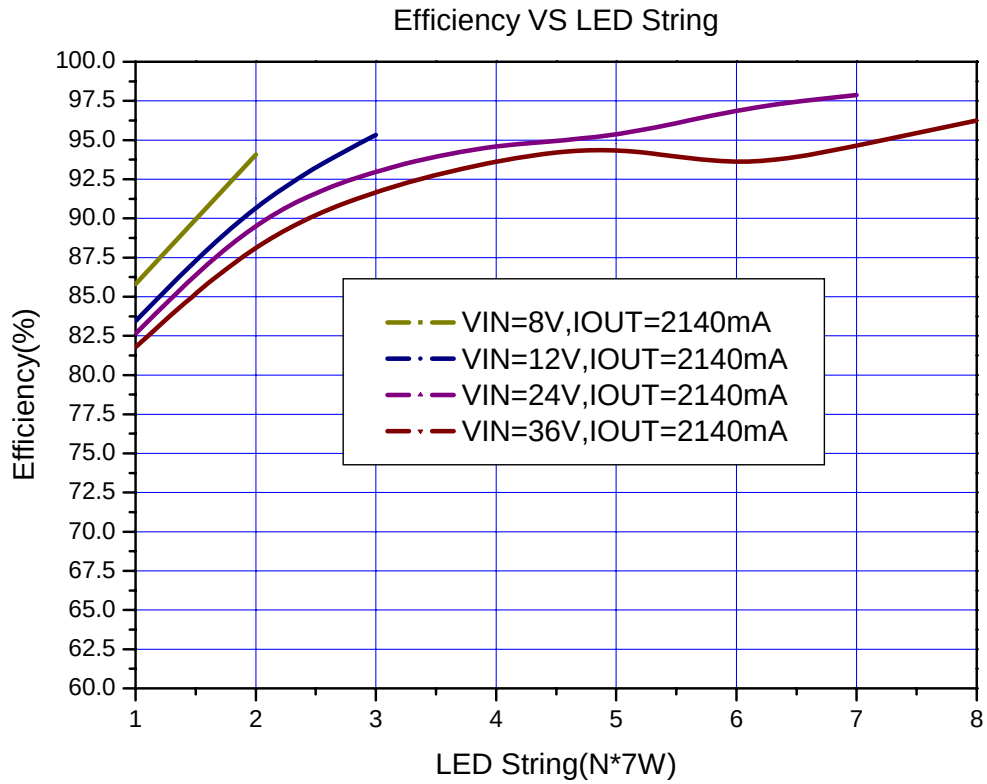


Figure22. XL3005 System Efficiency Curve

Typical System Application (PWM DIMMING)

PWM dimming function can be used in typical system application with external components. Changing the duty cycle of PWM signal can get different LED current. The PWM signal voltage is 3.3V or 5V.

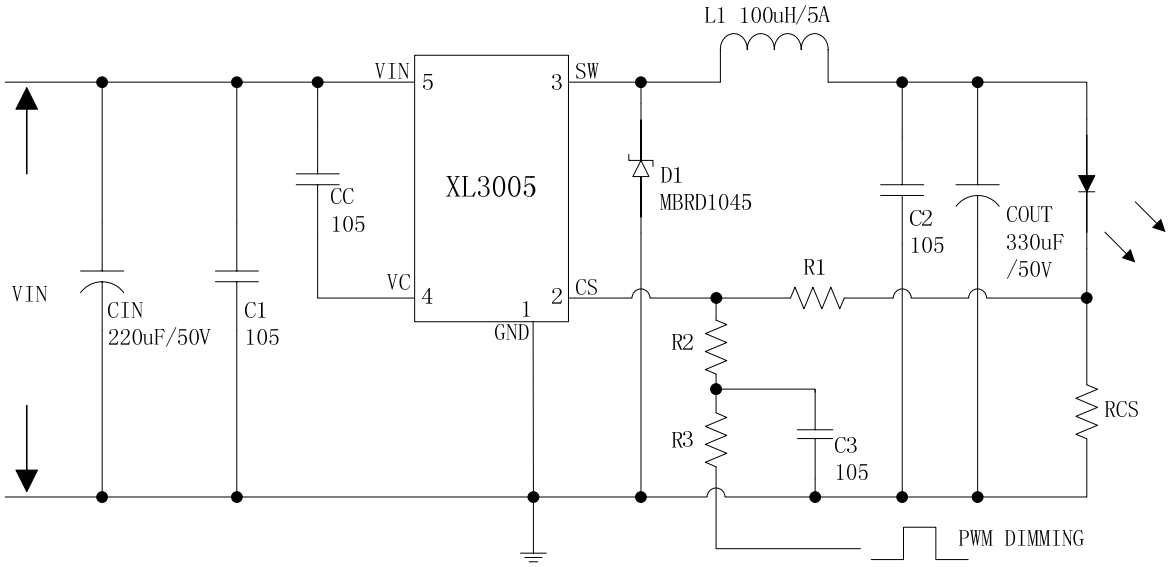


Figure23. XL3005 System Parameters Test Circuit (PWM DIMMING)

Typical System Application (LED OVP)

LED OVP function can be used in typical system application with external components. The output voltage can be limited in a suitable value by choose different zener diode when the output LED open. the zener diode voltage choosed by output led voltage's 1.3 times.

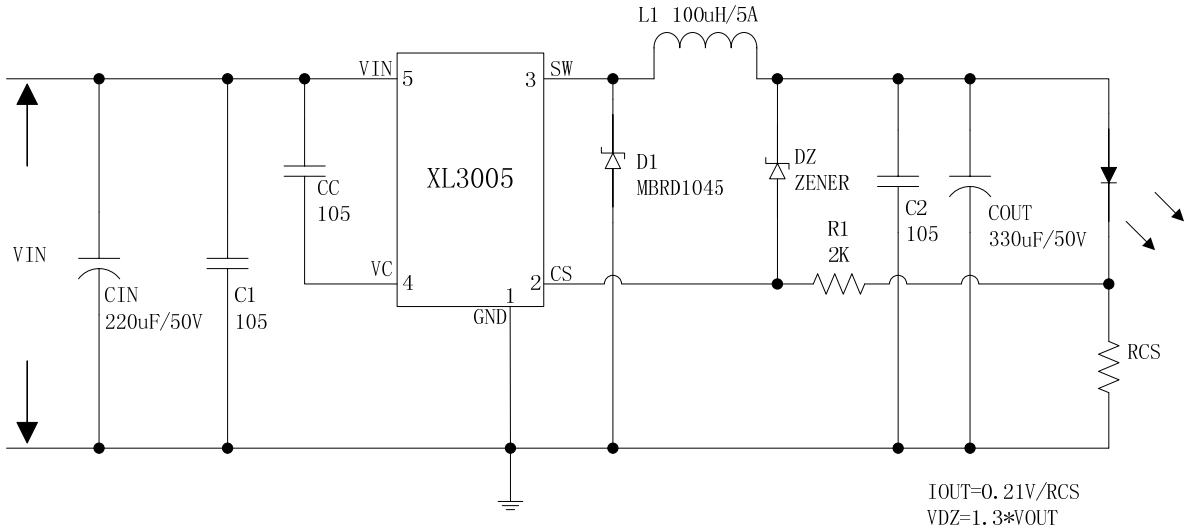
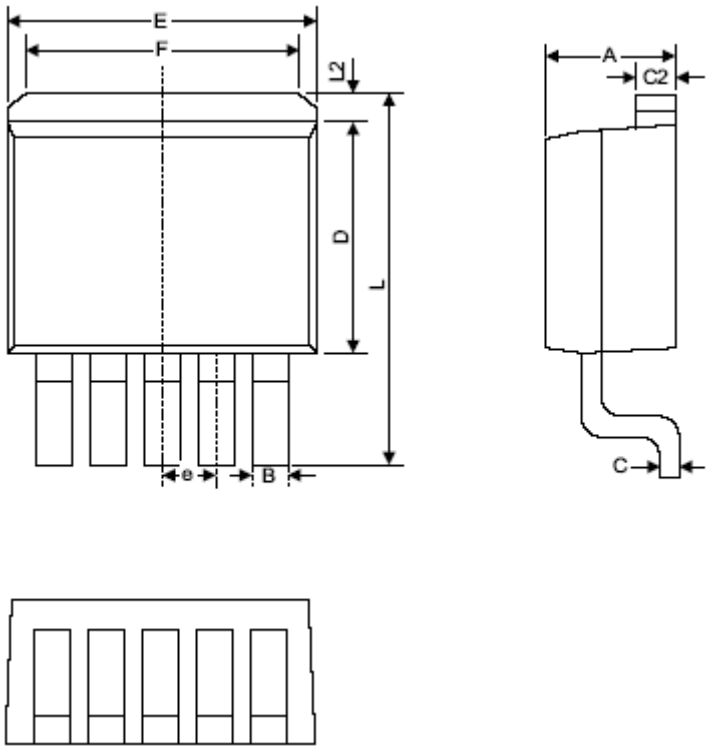


Figure24. XL3005 System Parameters Test Circuit (LED OVP)

Package Information

TO263-5L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.440	4.650	0.175	0.183
B	0.710	0.970	0.028	0.038
C	0.360	0.640	0.014	0.025
C2	1.255	1.285	0.049	0.051
D	8.390	8.890	0.330	0.350
E	9.960	10.360	0.392	0.408
e	1.550	1.850	0.061	0.073
F	6.360	7.360	0.250	0.290
L	13.950	14.750	0.549	0.581
L2	1.120	1.420	0.044	0.056

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