

**Features**

- Wide 5V to 40V Input Voltage Range
- 0.22V FB adjustable LED drive current
- Directly drive 2~10 Series 1W LED
- Fixed 400KHz Switching Frequency
- Max. 2A Switching Current Capability
- SW PIN Built in Over Voltage Protection
- Up to 93% efficiency
- Excellent line and load regulation
- EN PIN TTL shutdown capability
- Internal Optimize Power MOSFET
- Built in Soft-Start Function
- Built in Frequency Compensation
- Built in Thermal Shutdown Function
- Built in Current Limit Function
- Available in SOP8 package

**Applications**

- LED Lighting
- Boost constant current driver
- Monitor LED Backlighting
- 7' to 15' LCD Panels

**General Description**

The XL6013 regulator is fixed frequency PWM Boost (step-up) LED constant current driver, capable of driving Series 1W LED units with excellent line and load regulation. The regulator is simple to use because it includes internal frequency compensation and a fixed-frequency oscillator so that it requires a minimum number of external components to work.

The XL6013 could directly drive 5~10 Series 1W LED units at  $V_{IN} \geq 12V$ .

The PWM control circuit is able to adjust the duty ratio linearly from 0 to 90%. An enable function, an over current protection function is built inside. An internal compensation block is built in to minimize external component count.

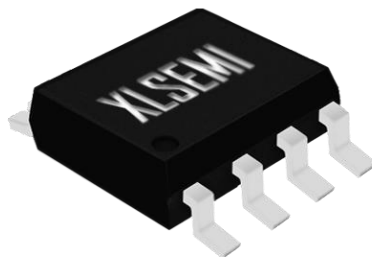


Figure1. Package Type of XL6013

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400KHz 60V 2A Switching Current Boost LED Constant Current Driver      XL6013

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## Pin Configurations

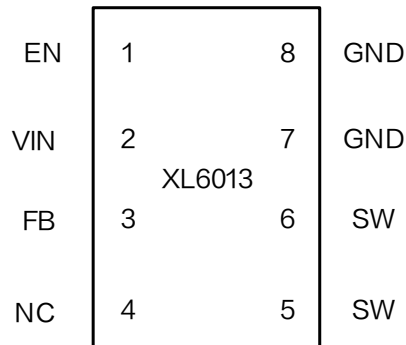


Figure2. Pin Configuration of XL6013 (Top View)

Table 1 Pin Description

Pin Number	Pin Name	Description
1	EN	Enable Pin. Drive EN pin low to turn off the device, drive it high to turn it on. Floating is default high.
2	VIN	Supply Voltage Input Pin. XL6013 operates from a 5V to 40V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.
3	FB	Feedback Pin (FB). The feedback threshold voltage is 0.22V.
4	NC	No Connected.
5,6	SW	Power Switch Output Pin (SW). Output is the switch node that supplies power to the output.
7,8	GND	Ground Pin.

### Function Block

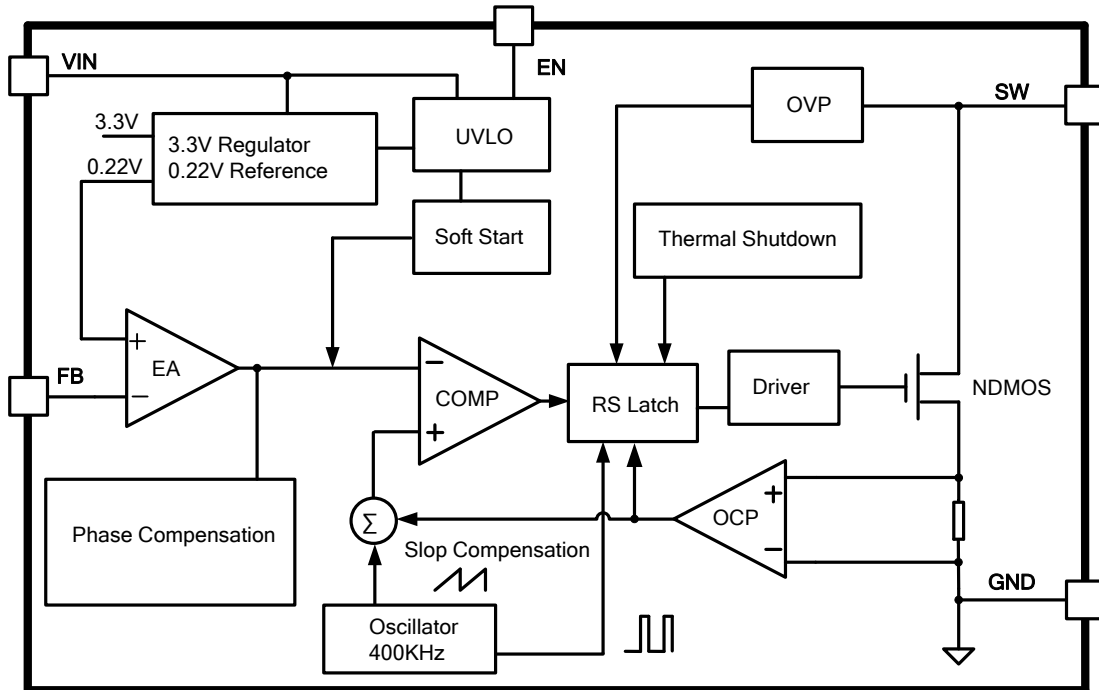


Figure3. Function Block Diagram of XL6013

### Typical Application Circuit

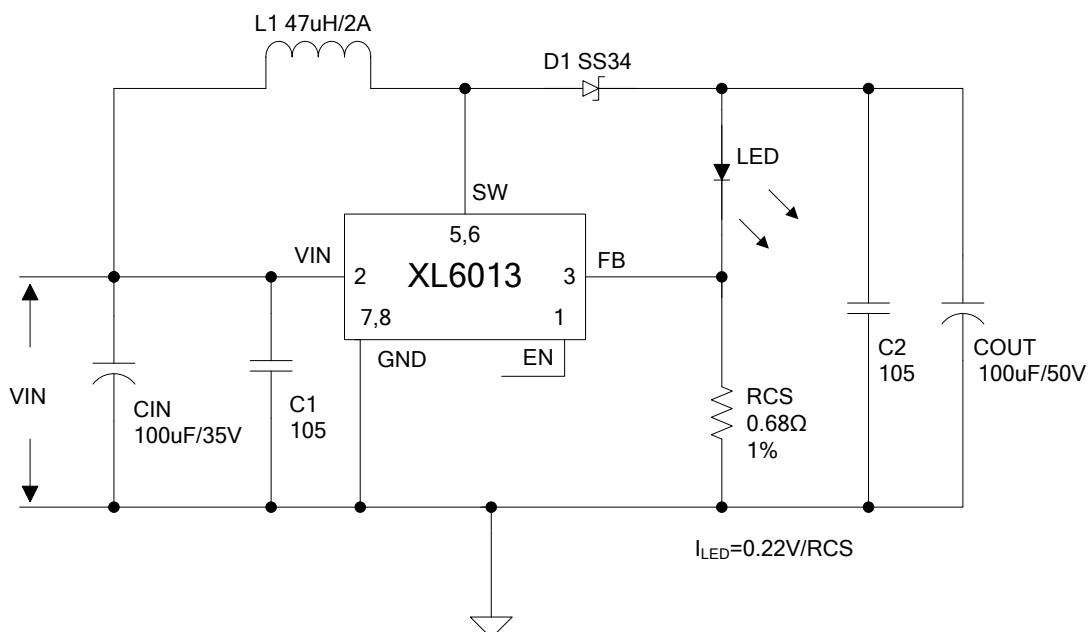


Figure4. XL6013 Typical Application Circuit

400KHz 60V 2A Switching Current Boost LED Constant Current Driver	XL6013
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## Ordering Information

Order Information	Marking ID	Package Type	Packing Type Supplied As
XL6013E1	XL6013E1	SOP8	2500/4000 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	$V_{in}$	-0.3 to 45	V
Feedback Pin Voltage	$V_{FB}$	-0.3 to $V_{in}$	V
EN Pin Voltage	$V_{EN}$	-0.3 to $V_{in}$	V
Output Switch Pin Voltage	$V_{SW}$	-0.3 to 60	V
Power Dissipation	$P_D$	Internally limited	mW
Thermal Resistance (SOP8) (Junction to Ambient, No Heatsink, Free Air)	$R_{JA}$	100	°C/W
Maximum Junction Temperature	$T_J$	-40 to 150	°C
Operating Junction Temperature	$T_J$	-40 to 125	°C
Storage Temperature	$T_{STG}$	-65 to 150	°C
Lead Temperature (Soldering, 10 sec)	$T_{LEAD}$	260	°C
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.

400KHz 60V 2A Switching Current Boost LED Constant Current Driver	XL6013
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### XL6013 Electrical Characteristics

T<sub>a</sub> = 25°C; unless otherwise specified.

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
<b>System parameters test circuit figure4</b>						
VFB	Feedback Voltage	V <sub>in</sub> = 5V to 12V, V <sub>out</sub> =24V I <sub>load</sub> =100mA	213.4	220	226.6	mV
η	Efficiency	V <sub>in</sub> =12V, V <sub>out</sub> =24V I <sub>out</sub> =0.3A	-	93	-	%

### Electrical Characteristics (DC Parameters)

V<sub>in</sub> = 12V, GND=0V, V<sub>in</sub> & GND parallel connect a 100uf/50V capacitor; I<sub>out</sub>=100mA, T<sub>a</sub> = 25°C; the others floating unless otherwise specified.

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input operation voltage	V <sub>in</sub>		5		40	V
Shutdown Supply Current	I <sub>s</sub>	V <sub>EN</sub> =0V		70	100	uA
Quiescent Supply Current	I <sub>q</sub>	V <sub>EN</sub> =2V, V <sub>FB</sub> =V <sub>in</sub>		2.5	5	mA
Oscillator Frequency	F <sub>osc</sub>		320	400	480	KHz
SW OVP	V <sub>sw</sub>	V <sub>FB</sub> =0V		60		V
Switch Current Limit	I <sub>L</sub>	V <sub>FB</sub> =0V		2		A
Output Power NMOS	R <sub>dson</sub>	V <sub>in</sub> =12V, I <sub>sw</sub> =2A		110	120	mohm
EN Pin Threshold	V <sub>EN</sub>	High (Regulator ON)		1.4		V
		Low(Regulator OFF)		0.8		
EN Pin Input Leakage Current	I <sub>H</sub>	V <sub>EN</sub> =2V (ON)		3	10	uA
	I <sub>L</sub>	V <sub>EN</sub> =0V (OFF)		3	10	uA
Max. Duty Cycle	D <sub>MAX</sub>	V <sub>FB</sub> =0V		90		%

Typical System Application (Recommend output voltage safe work range)

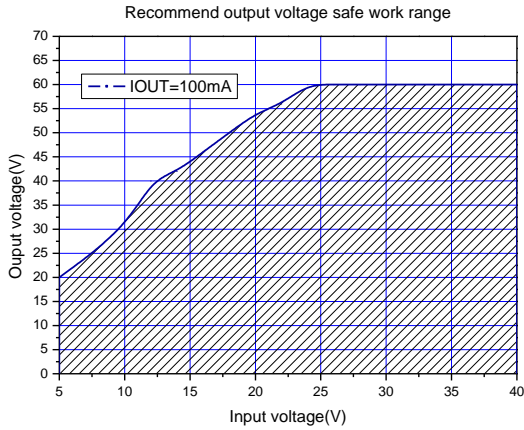


Figure5.Max output voltage(IOU=100mA)

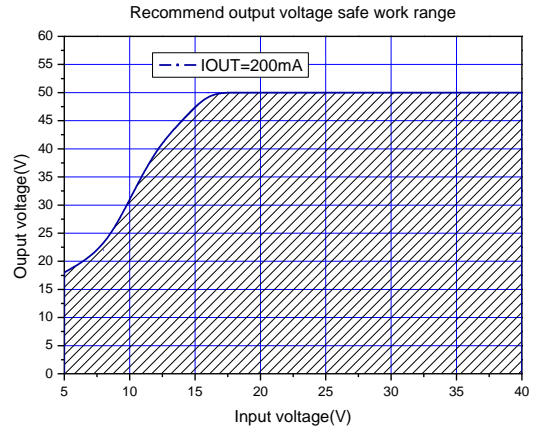


Figure6.Max output voltage(IOU=200mA)

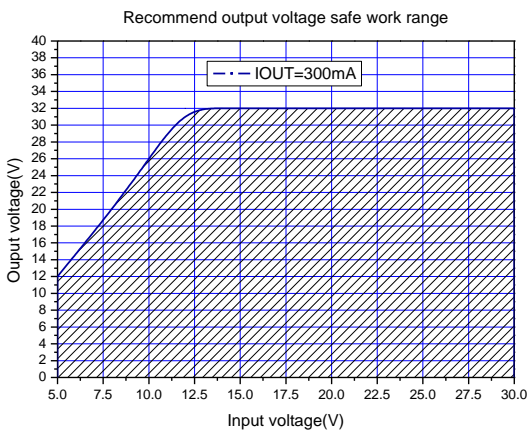


Figure7.Max output voltage(IOU=300mA)

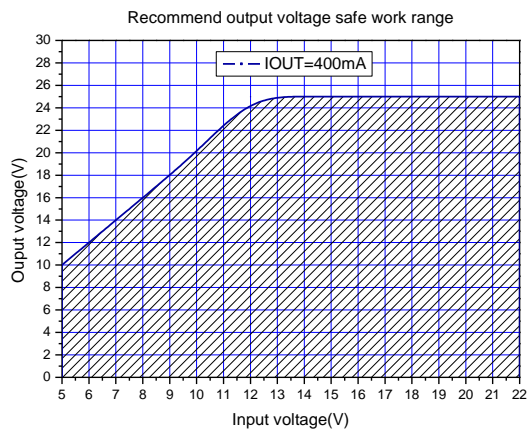


Figure8.Max output voltage(IOU=400mA)

### Typical System Application (VIN=5V~40V, IOU=150mA)

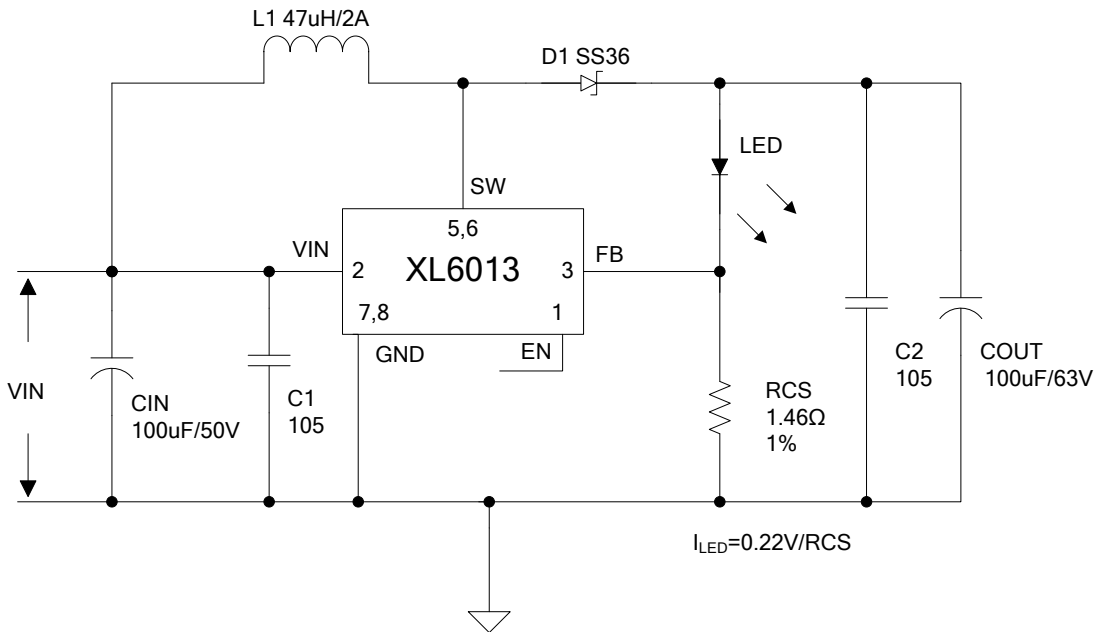


Figure9. XL6013 System Parameters Test Circuit (VIN=5V~40V, IOU=150mA)

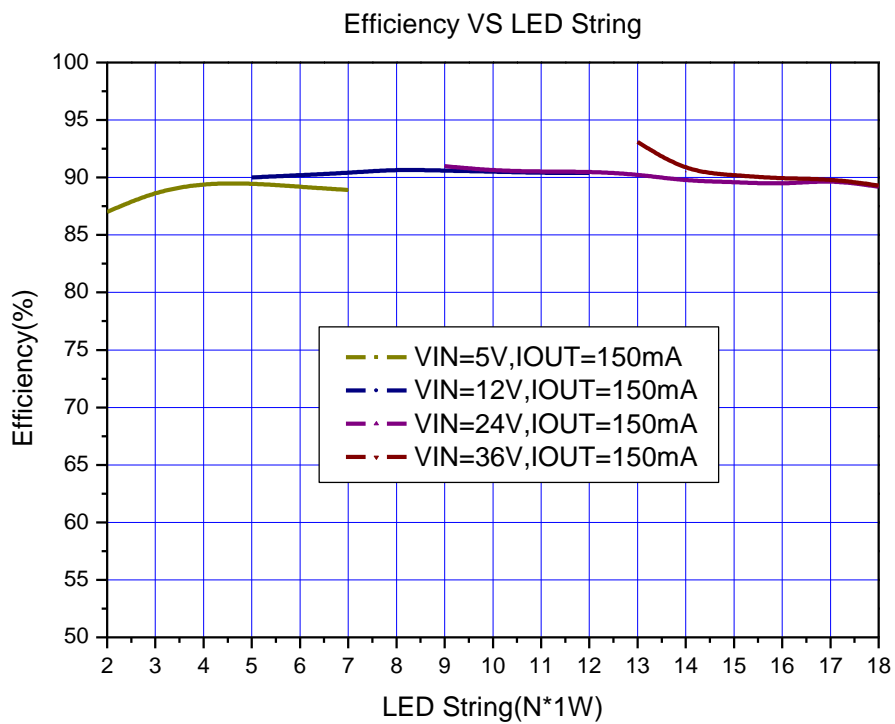


Figure10. XL6013 System Efficiency Curve

### Typical System Application (VIN=5V~30V, IOU=320mA)

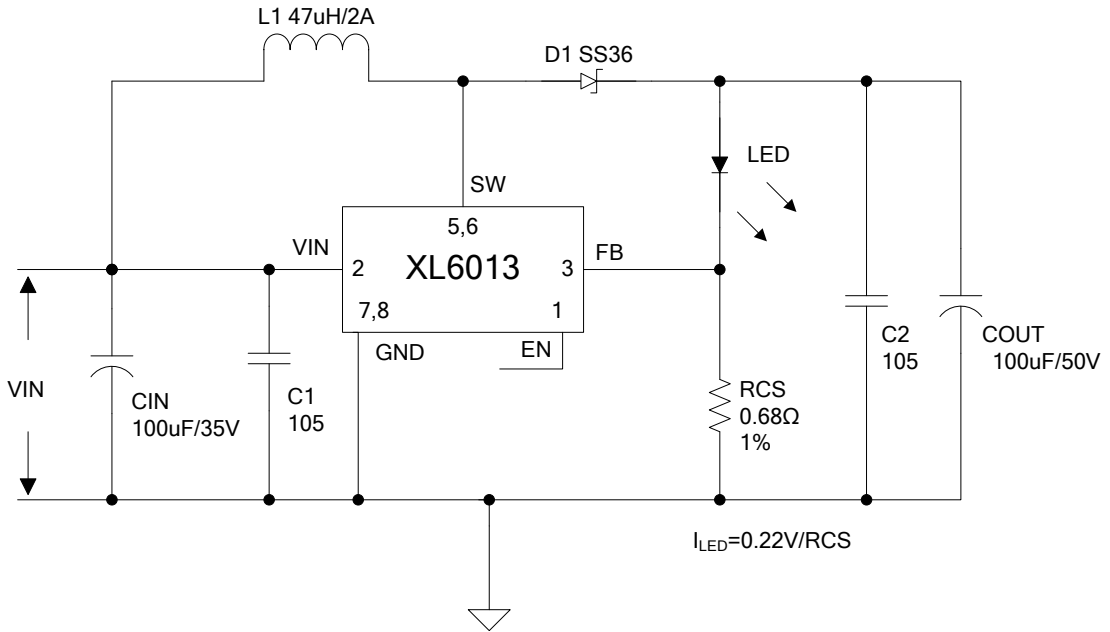


Figure11. XL6013 System Parameters Test Circuit (VIN=5V~30V, IOU=320mA)

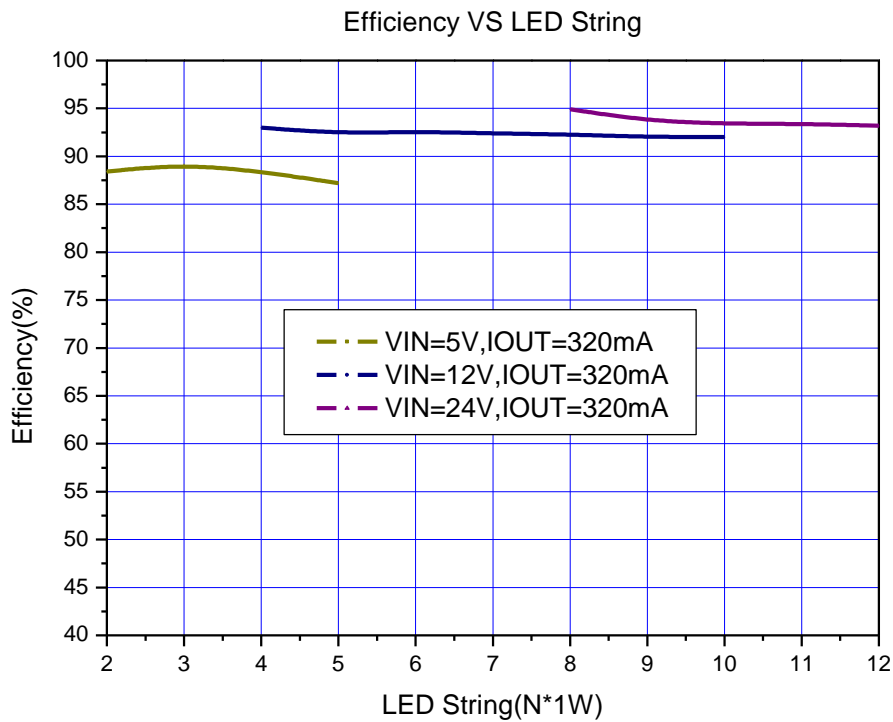


Figure12. XL6013 System Efficiency Curve



## 400KHz 60V 2A Switching Current Boost LED Constant Current Driver XL6013

### Typical System Application for SEPIC Buck-Boost LED Driver

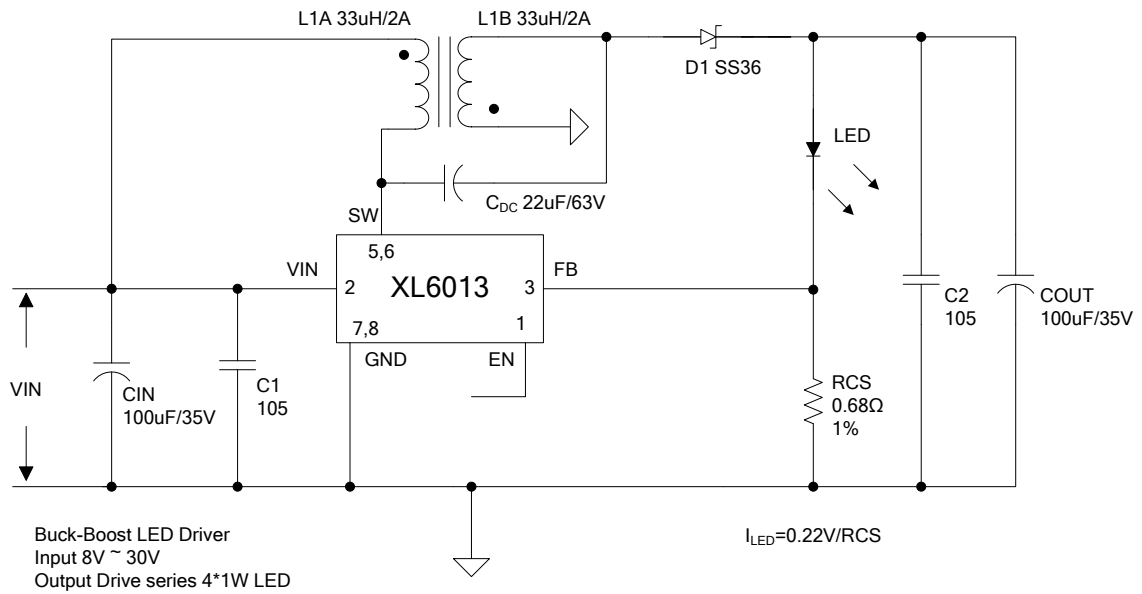
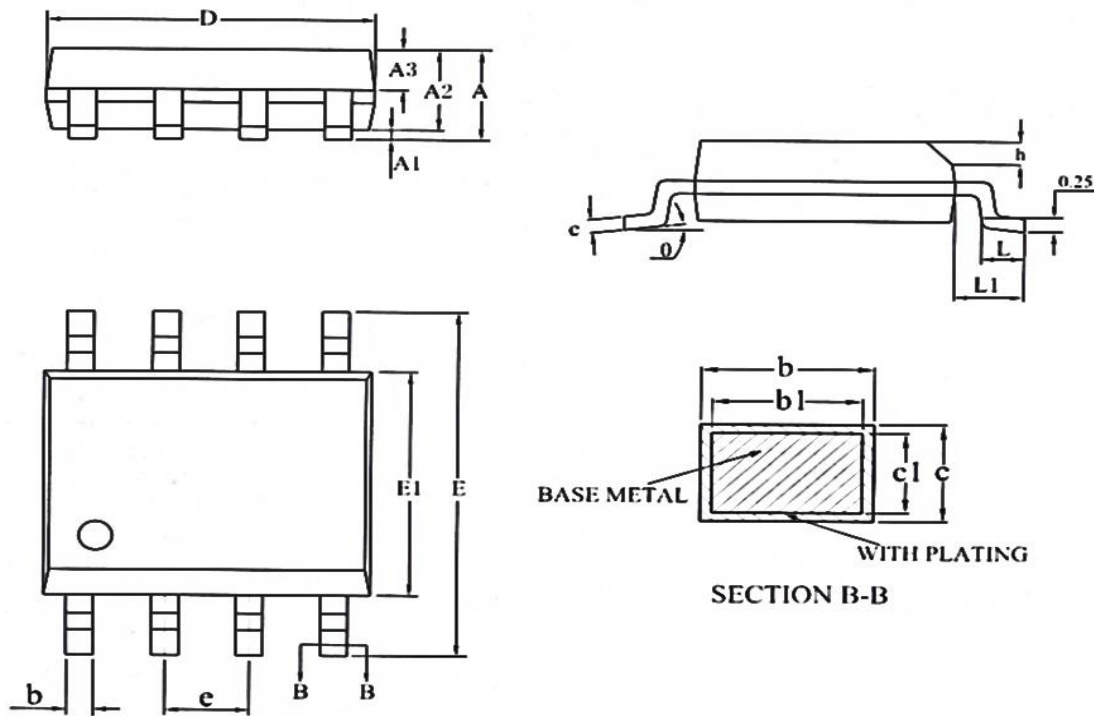


Figure13. XL6013 System Parameters Test Circuit (Buck-Boost LED Driver)



### 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
$\theta$	0	-	8°	0	-	8°

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