

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.

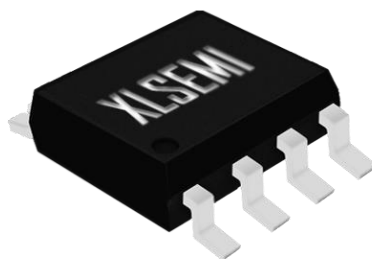


Figure1. Package Type of XL6013

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

Pin Configurations

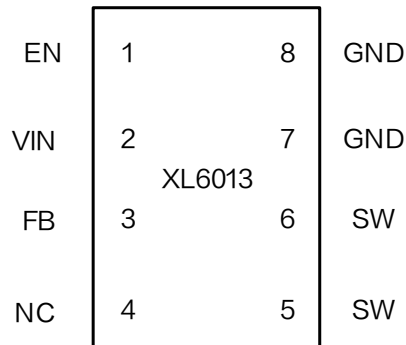


Figure2. Pin Configuration of XL6013 (Top View)

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

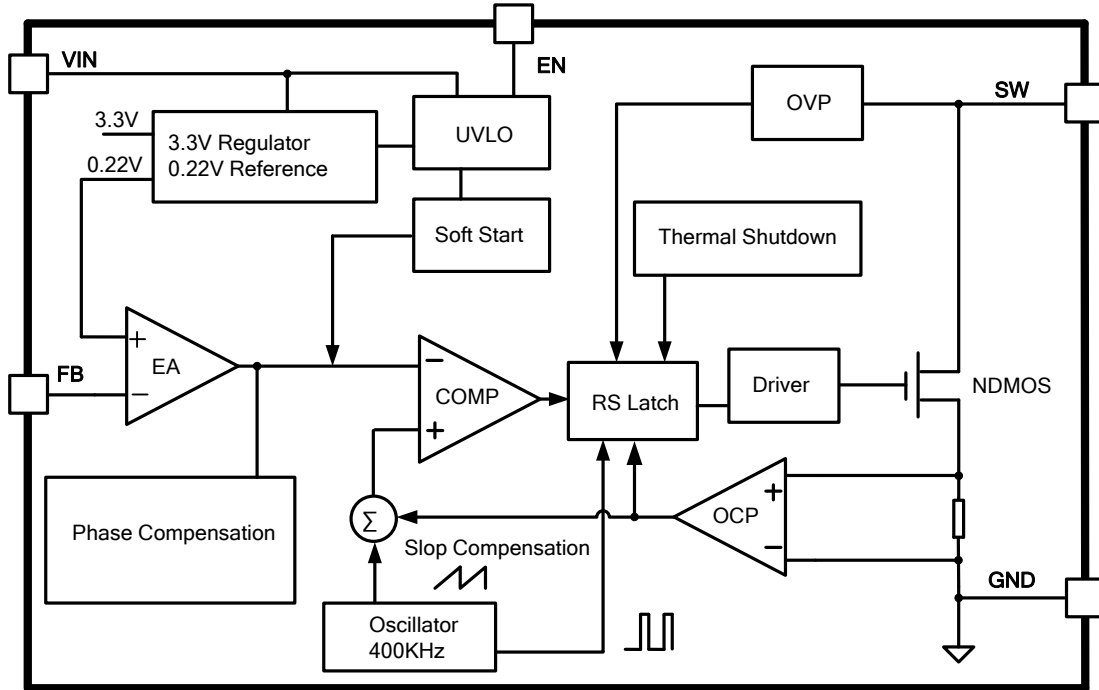


Figure3. Function Block Diagram of XL6013

Typical Application Circuit

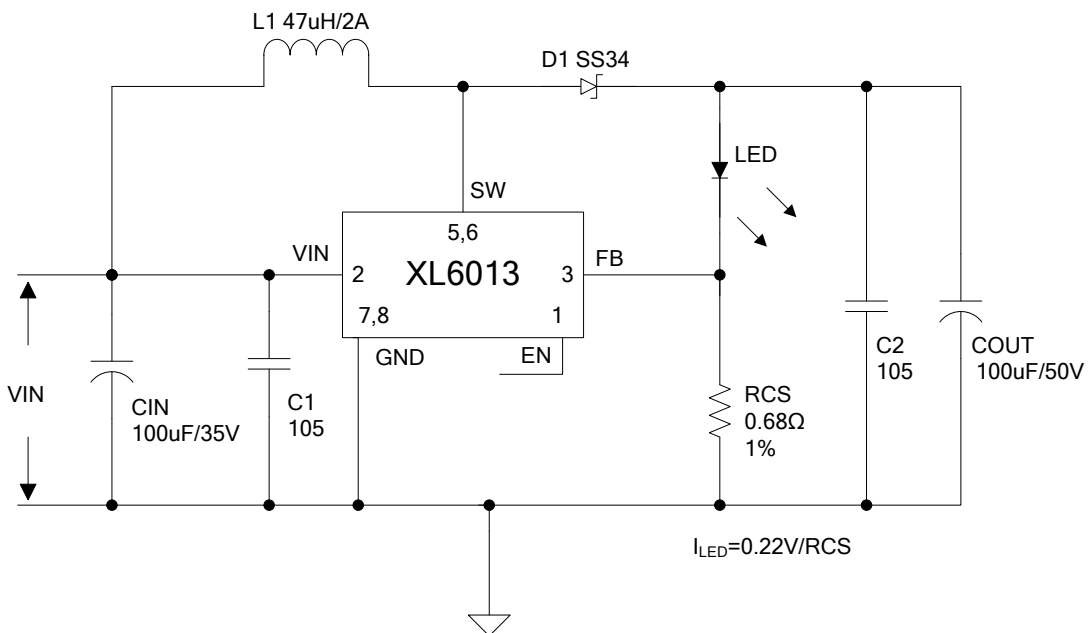


Figure4. XL6013 Typical Application Circuit

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

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 |
|---|--------|

XL6013 Electrical Characteristics

$T_a = 25^\circ\text{C}$; unless otherwise specified.

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|------------------|--|-------|------|-------|------|
| System parameters test circuit figure4 | | | | | | |
| VFB | Feedback Voltage | $V_{in} = 5\text{V to } 12\text{V}, V_{out}=24\text{V}$ $I_{load}=100\text{mA}$ | 213.4 | 220 | 226.6 | mV |
| η | Efficiency | $V_{in}=12\text{V}, V_{out}=24\text{V}$ $I_{out}=0.3\text{A}$ | - | 93 | - | % |

Electrical Characteristics (DC Parameters)

$V_{in} = 12\text{V}$, $GND=0\text{V}$, V_{in} & GND parallel connect a $100\mu\text{f}/50\text{V}$ capacitor; $I_{out}=100\text{mA}$, $T_a = 25^\circ\text{C}$; the others floating unless otherwise specified.

| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|------------------------------|------------|--|------|------|------|---------------|
| Input operation voltage | V_{in} | | 5 | | 40 | V |
| Shutdown Supply Current | I_s | $V_{EN}=0\text{V}$ | | 70 | 100 | μA |
| Quiescent Supply Current | I_q | $V_{EN}=2\text{V},$ $V_{FB}=V_{in}$ | | 2.5 | 5 | mA |
| Oscillator Frequency | F_{osc} | | 320 | 400 | 480 | KHz |
| SW OVP | V_{SW} | $V_{FB}=0\text{V}$ | | 60 | | V |
| Switch Current Limit | I_L | $V_{FB}=0\text{V}$ | | 2 | | A |
| Output Power NMOS | R_{dson} | $V_{in}=12\text{V},$ $I_{SW}=2\text{A}$ | | 110 | 120 | mohm |
| EN Pin Threshold | V_{EN} | High (Regulator ON) | | 1.4 | | V |
| | | Low(Regulator OFF) | | 0.8 | | |
| EN Pin Input Leakage Current | I_H | $V_{EN}=2\text{V (ON)}$ | | 3 | 10 | μA |
| | I_L | $V_{EN}=0\text{V (OFF)}$ | | 3 | 10 | μA |
| Max. Duty Cycle | D_{MAX} | $V_{FB}=0\text{V}$ | | 90 | | % |

Typical System Application (Recommend output voltage safe work range)

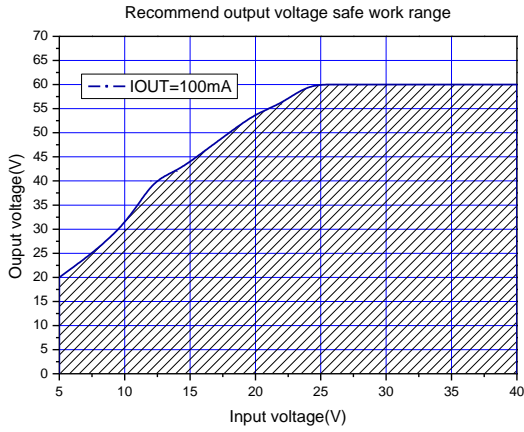


Figure5.Max output voltage(IOU=100mA)

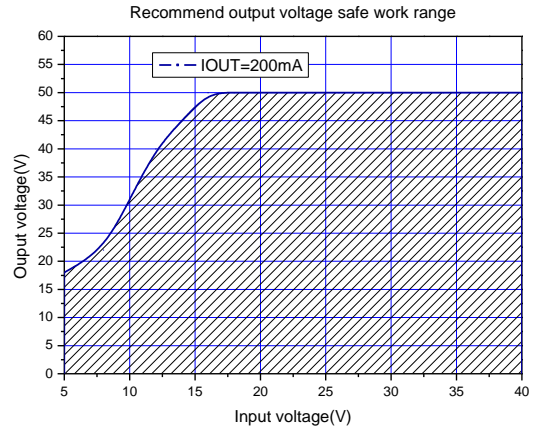


Figure6.Max output voltage(IOU=200mA)

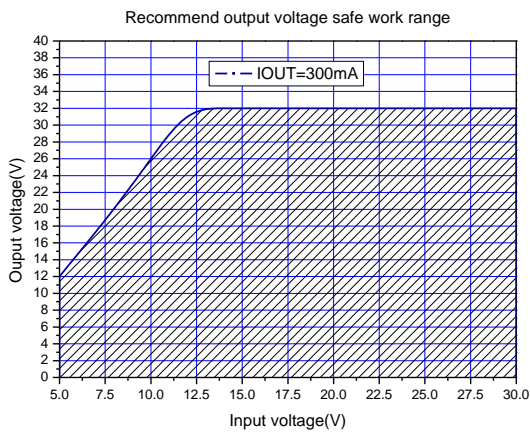


Figure7.Max output voltage(IOU=300mA)

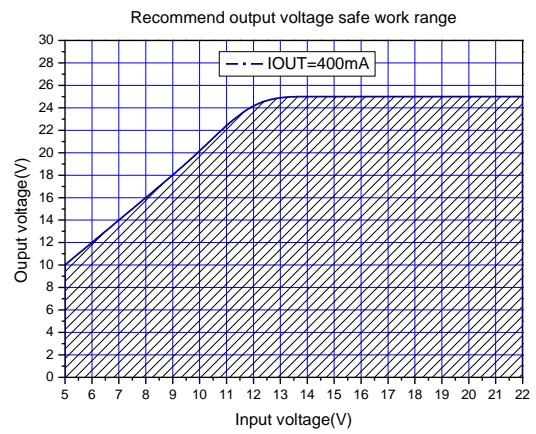


Figure8.Max output voltage(IOU=400mA)

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

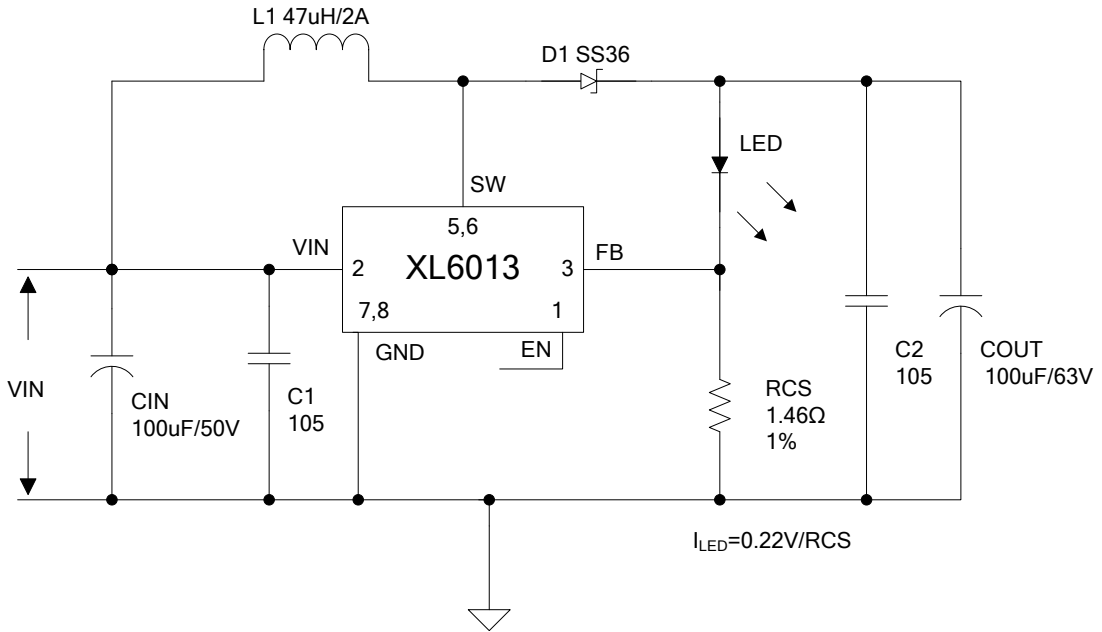


Figure9. XL6013 System Parameters Test Circuit (VIN=5V~40V, IOU=150mA)

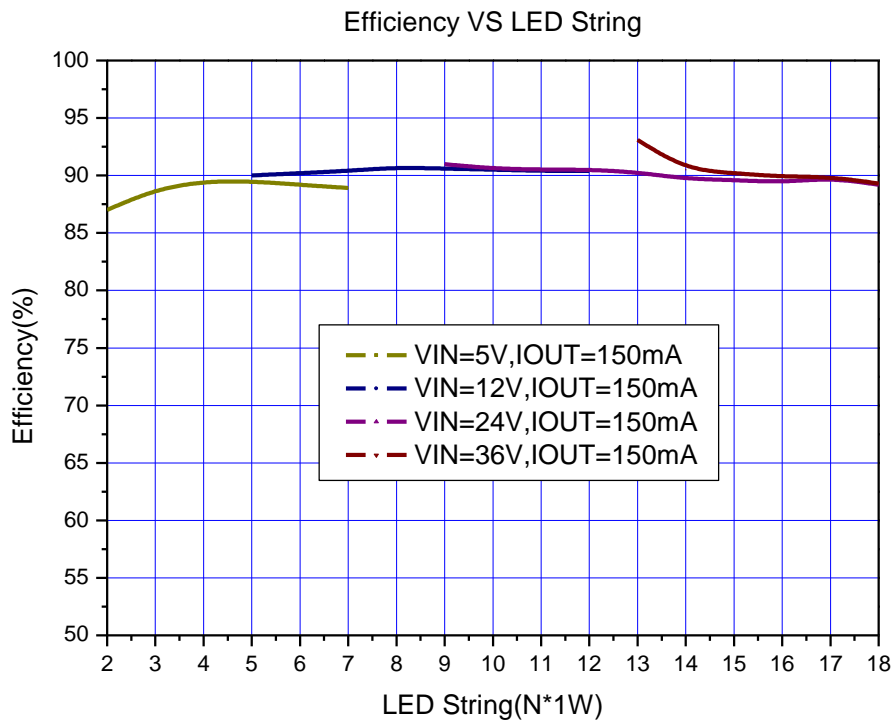


Figure10. XL6013 System Efficiency Curve

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

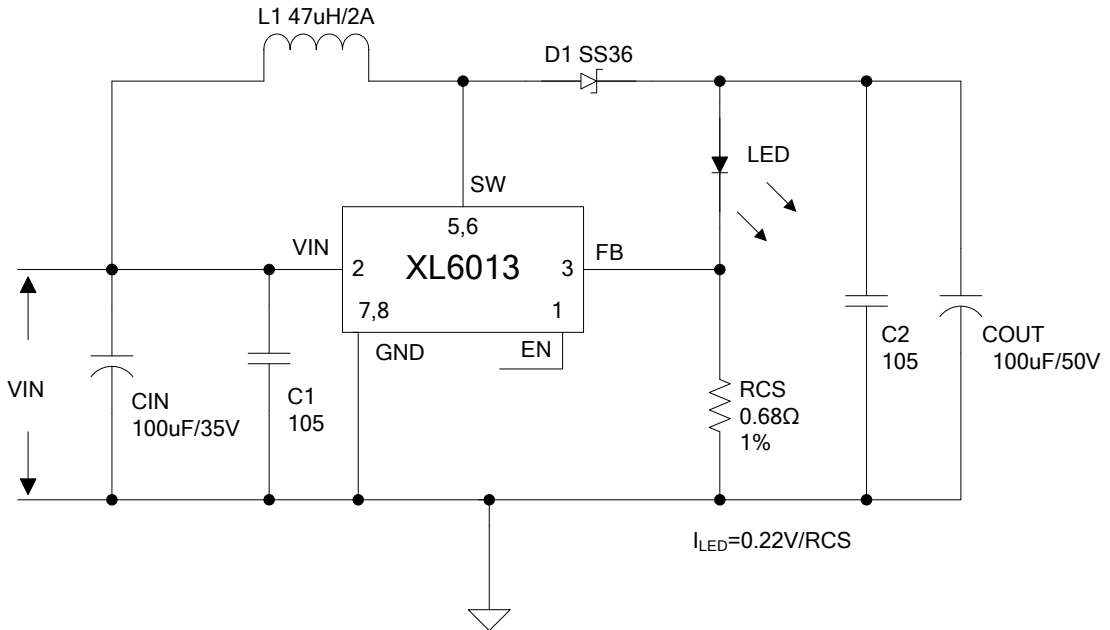


Figure11. XL6013 System Parameters Test Circuit (VIN=5V~30V, IOU=320mA)

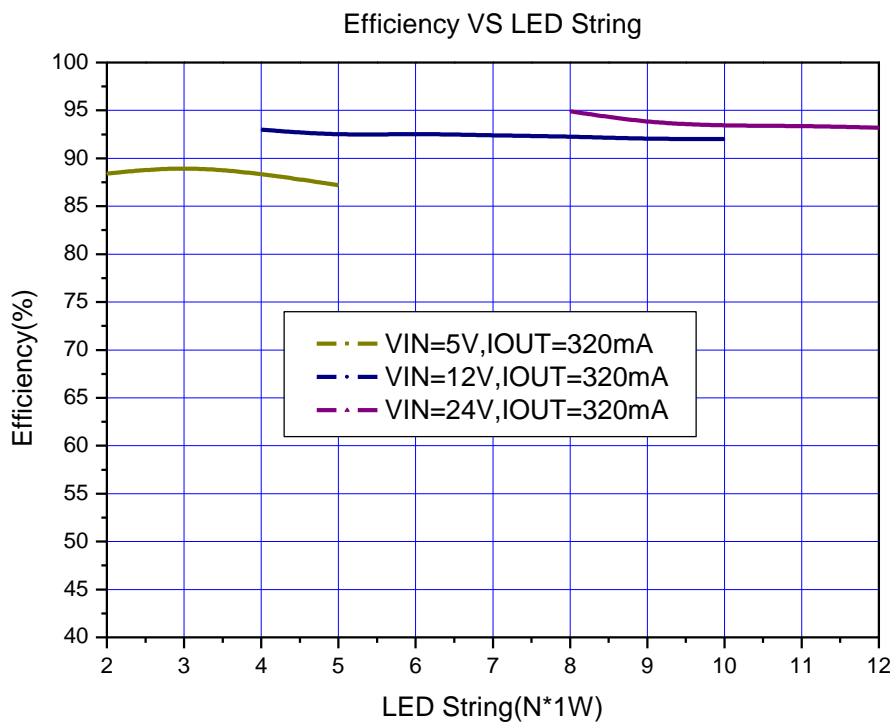


Figure12. XL6013 System Efficiency Curve

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

Typical System Application for SEPIC Buck-Boost LED Driver

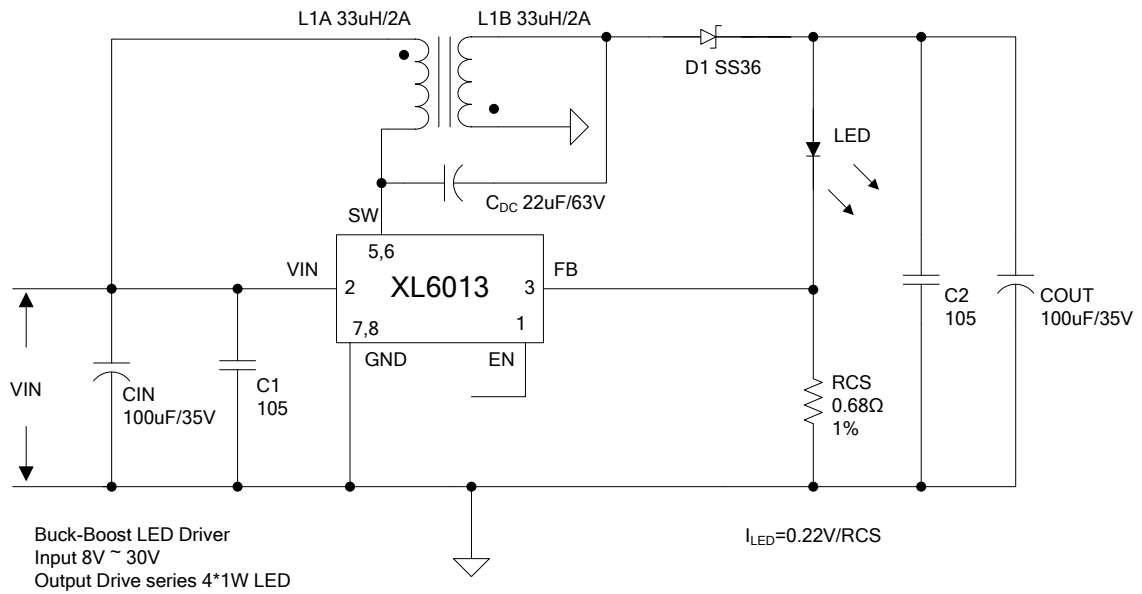


Figure13. XL6013 System Parameters Test Circuit (Buck-Boost LED Driver)

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

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.

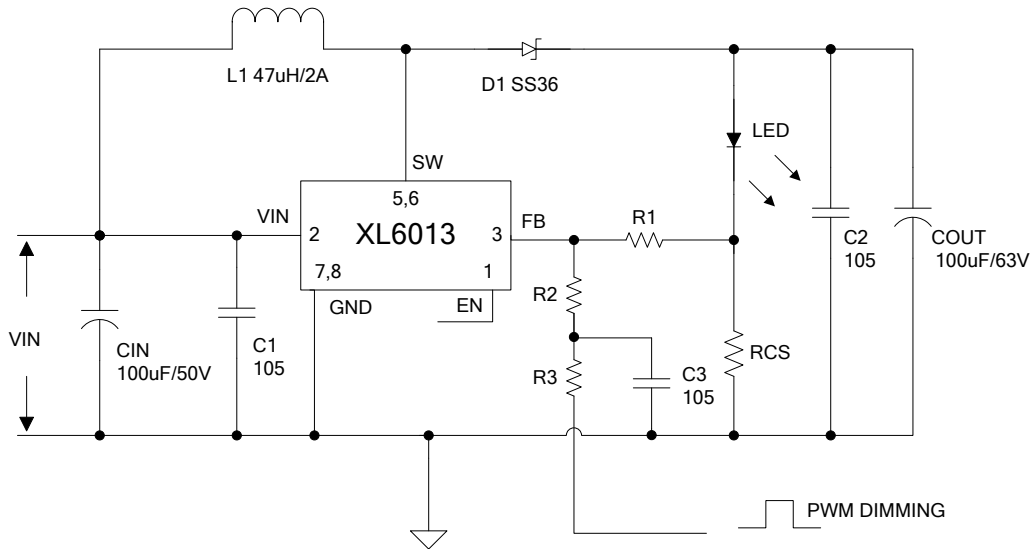


Figure14. XL6013 System Parameters Test Circuit (PWM DIMMING)

Typical System Application (LED Open Protection)

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

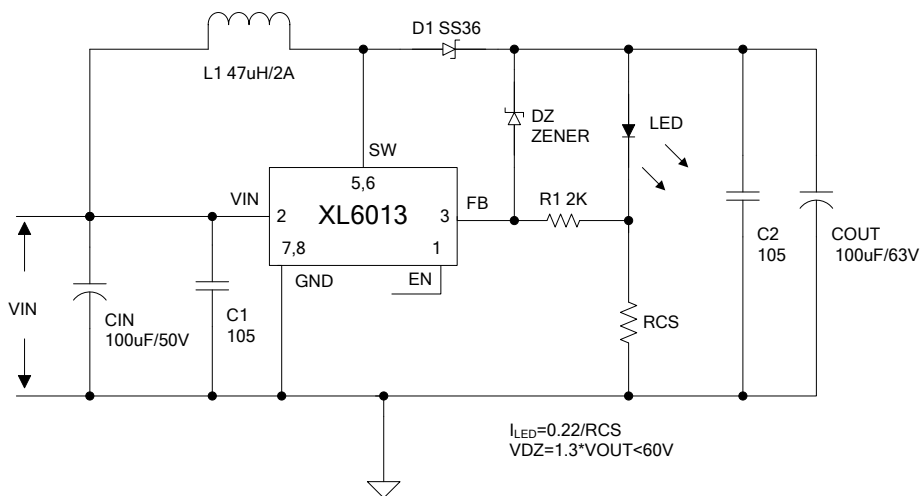
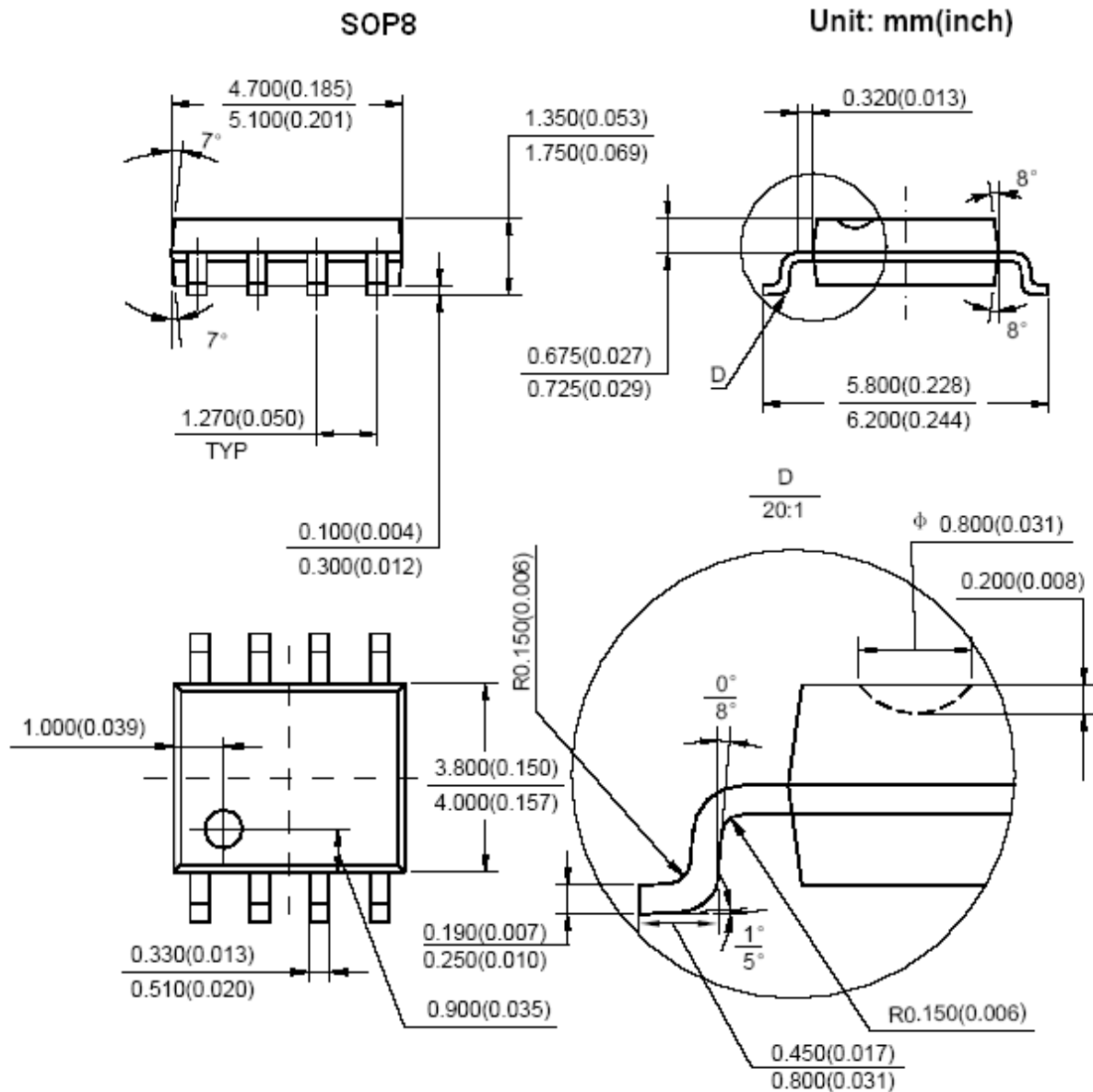


Figure15. XL6013 System Parameters Test Circuit (LED Open Protection)

Package Information

SOP8 Mechanical Dimensions



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