

## Features

- Operation Voltage: 2.5V~20V
- Directly Drive 1~10 Series LED
- Shutdown Current: 3uA
- Fixed 1.2MHz Switching Frequency
- 500mA Constant Output Current Capability
- Built in High Frequency Power Transistor
- Built in Schottky Diode
- High Efficiency up to 85%
- Excellent line and load regulation
- EN PIN TTL ON/OFF capability
- Dimming Control Using a PWM Signal in EN PIN
- Built in LED open circuit protection function
- Built in thermal shutdown function
- Device HBM ESD Classification Level Class3A
- Available in SOT23-6 package

## General Description

XL6101 is a built in high frequency power transistor and Schottky diode Boost LED constant current driver, fixed 1.2MHz frequency PWM, can support input operating voltage range of 2.5V~20V. XL6101 has high precision constant current output to drive the LED, and built in frequency compensation circuitry allows the use of small external components at a price suitable for lowering the cost of the entire power supply system and reduce the printed circuit board space. The low feedback voltage of 200mV reduces the power consumption of the external sampling resistor, and the EN pin supports both TTL ON/OFF and PWM dimming from 0 to 100%. Suitable for very low quiescent current and ultra-small size applications.

## Applications

- Screen Backlight LED Driver
- Wearable Portable Electronic Devices
- Digital Cameras
- PDAs and Other Handheld Devices
- Auxiliary Displays

## Typical application schematic

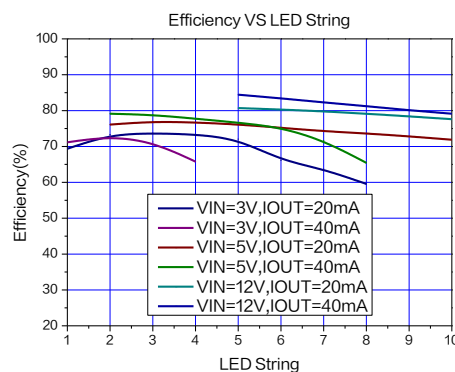
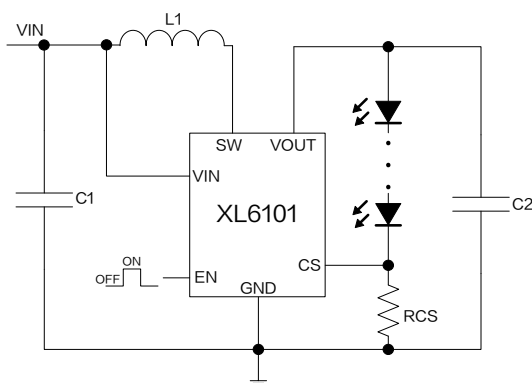


Figure1. XL6101 Typical application schematic and efficiency curve

## Pin Configurations

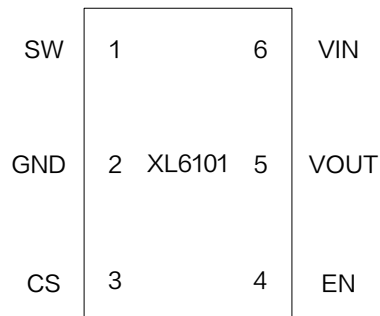


Figure2. Pin Configuration of XL6101

Table 1. Pin Description

| Pin Number | Pin Name | Description   |
|------------|----------|---|
| 1          | SW       | Power Switch Pin.   |
| 2          | GND      | Ground Pin.   |
| 3          | CS       | Output constant current sense Pin. The CS reference voltage is 200mV.   |
| 4          | EN       | Enable Pin. Drive EN pin high to turn on the device, drive it low to turn it off. Floating is default high. Connect to a PWM signal to achieve LEDs brightness dimming. |
| 5          | VOUT     | Output Pin.   |
| 6          | VIN      | Supply Voltage Input Pin. XL6101 operates from 2.5V to 20V 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 |
|-------------------|------------|--------------|-----------|--------------------------|
| XL6101            | 6101       | SOT23-6      | RoHS & HF | 3000 Units on Reel       |

### Function Block

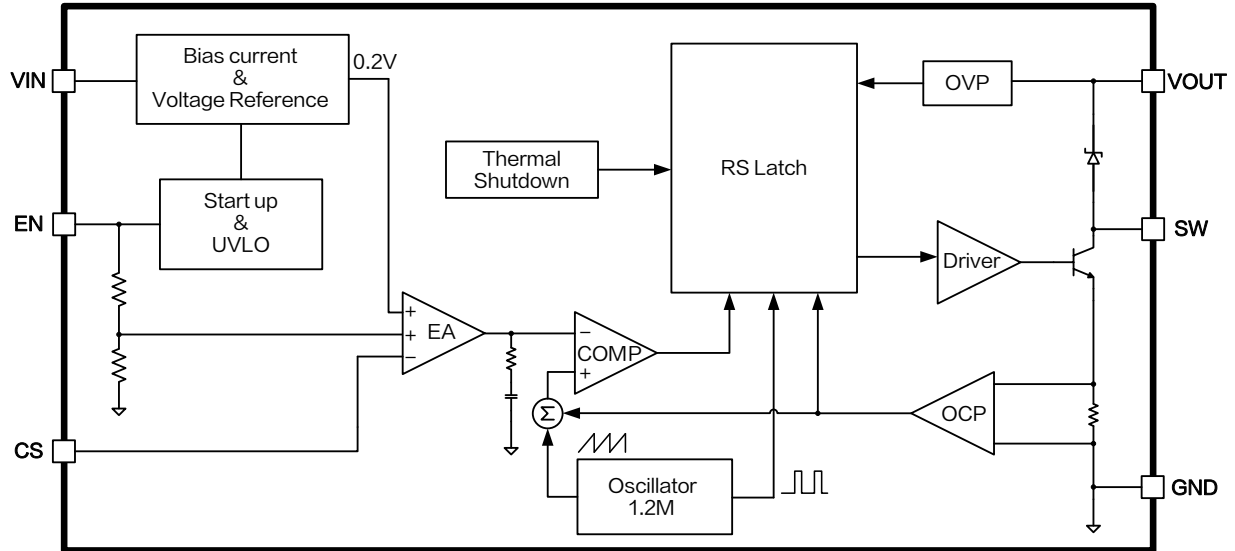


Figure3. Function Block Diagram of XL6101

### Absolute Maximum Ratings ( Note1 )

| Parameter  | Symbol     | Value          | Unit |
|--|------------|----------------|------|
| Input Voltage  | $V_{IN}$   | -0.3~25        | V    |
| EN Pin Voltage   | $V_{EN}$   | -0.3~ $V_{IN}$ | V    |
| Current Sense Pin Voltage  | $V_{CS}$   | -0.3~ $V_{IN}$ | V    |
| Switch Pin Voltage   | $V_{SW}$   | -0.3~40        | V    |
| VOUT Pin Voltage   | $V_{OUT}$  | -0.3~40        | V    |
| Power Dissipation  | $P_D$      | 250            | mW   |
| Thermal Resistance (SOT23-6)<br>(Junction to Ambient, No Heatsink, Free Air) | $R_{JA}$   | 260            | °C/W |
| Maximum Junction Temperature   | $T_J$      | -40~150        | °C   |
| Operating Junction Temperature   | $T_J$      | -40~125        | °C   |
| Storage Temperature  | $T_{STG}$  | -65~150        | °C   |
| Lead Temperature (Soldering, 10 sec)   | $T_{LEAD}$ | 260            | °C   |
| ESD (HBM)  |            | >4000          | 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.

500mA 1.2MHz 36V Built in SBD Boost LED Constant Current Driver

XL6101

## XL6101 Electrical Characteristics

$T_A = 25^\circ\text{C}$ ; system parameters test circuit figure5, unless otherwise specified.

| Symbol   | Parameter             | Test Condition                                      | Min. | Typ. | Max. | Unit |
|----------|-----------------------|---|------|------|------|------|
| $V_{CS}$ | Current Sense Voltage | $V_{IN} = 5V, V_{OUT} = 9.9V$<br>$I_{LED} = 20mA$   | 194  | 200  | 206  | mV   |
| $\eta$   | Efficiency            | $V_{IN} = 5V, V_{OUT} = 13.2V$<br>$I_{LED} = 20mA$  | -    | 82.0 | -    | %    |
| $\eta$   | Efficiency            | $V_{IN} = 12V, V_{OUT} = 23.1V$<br>$I_{LED} = 40mA$ | -    | 85.0 | -    | %    |

## Electrical Characteristics (DC Parameters)

$T_A = 25^\circ\text{C}, V_{IN} = 3V$ ; system parameters test circuit figure4, unless otherwise specified.

| Parameters                         | Symbol      | Test Condition                      | Min. | Typ. | Max. | Unit             |
|------------------------------------|-------------|-------------------------------------|------|------|------|------------------|
| Input operation voltage            | $V_{IN}$    |                                     | 2.5  |      | 20   | V                |
| Shutdown Supply Current            | $I_S$       | $V_{EN} = 0V$<br>$V_{OUT}$ flowing  |      | 3    |      | $\mu\text{A}$    |
| Quiescent Supply Current           | $I_Q$       | $V_{CS} = 2V$                       |      | 2.3  |      | mA               |
| Oscillator Frequency               | $F_{OSC}$   |                                     | 0.96 | 1.20 | 1.44 | MHz              |
| Switch Current Limit               | $I_L$       | $V_{CS} = 0V$                       |      | 500  |      | mA               |
| Switch $V_{CE}$ Saturation Voltage | $V_{SAT}$   | $I_{SW} = 300mA$                    |      | 0.3  |      | V                |
| Schottky Forward Drop              | $V_F$       | $I_F = 300mA$                       |      | 0.8  |      | V                |
| EN Pin Threshold                   | $V_{EN\_H}$ | High(ON)                            | 2.0  |      |      | V                |
|                                    | $V_{EN\_L}$ | Low(OFF)                            |      |      | 0.5  |                  |
| Max. Duty Cycle                    | $D_{MAX}$   | $V_{CS} = 0V$                       |      | 90   |      | %                |
| Over Voltage Protection            | $V_{OUT}$   | $V_{OUT}$ OPEN<br>( $V_{CS} = 0V$ ) |      | 36   |      | V                |
| Thermal Shutdown Temperature       | $T_{SD}$    |                                     |      | 150  |      | $^\circ\text{C}$ |

### Typical System Application–Single Li Battery to Drive LED

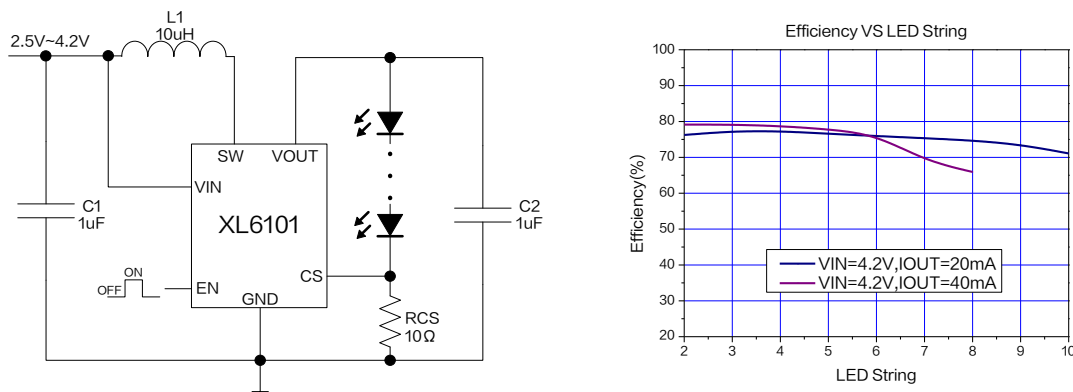


Figure4. XL6101 System Application and efficiency curve

Table 2. Figure4 Typical System Application Schematic Boom

| Qty | Ref Des | Description                 | Mfg Part Number | Mfg     |
|-----|---------|-----------------------------|-----------------|---------|
| 1   | L1      | 10uH,0.73A,Inductor,3*3     | ANR3015T100M    | APV     |
| 1   | C1      | 1uF,25V,Ceramic,X7R,0603    | 0603B105K250NT  | Fenghua |
| 1   | C2      | 1uF,50V,Ceramic,X7R,0603    | 0603B105K500NT  | Fenghua |
| 1   | RCS     | 10Ω,1%,1/8W,Thick Film,0805 | RS-05K100FT     | Fenghua |

### Typical System Application–Two Li Batteries to Drive LED

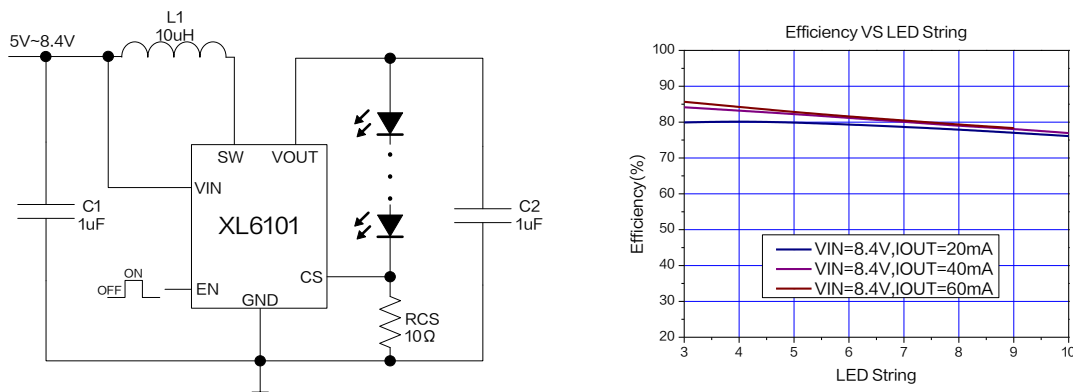


Figure5. XL6101 System Application and efficiency curve

Table 3. Figure5 Typical System Application Schematic Boom

| Qty | Ref Des | Description                 | Mfg Part Number | Mfg     |
|-----|---------|-----------------------------|-----------------|---------|
| 1   | L1      | 10uH,0.73A,Inductor,3*3     | ANR3015T100M    | APV     |
| 1   | C1      | 1uF,25V,Ceramic,X7R,0603    | 0603B105K250NT  | Fenghua |
| 1   | C2      | 1uF,50V,Ceramic,X7R,0603    | 0603B105K500NT  | Fenghua |
| 1   | RCS     | 10Ω,1%,1/8W,Thick Film,0805 | RS-05K100FT     | Fenghua |

### Typical System Application– PWM dimming circuit

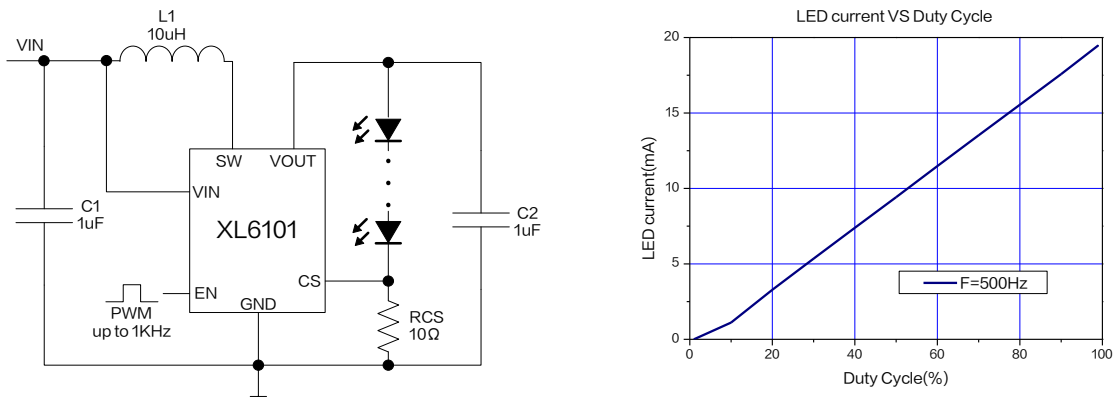
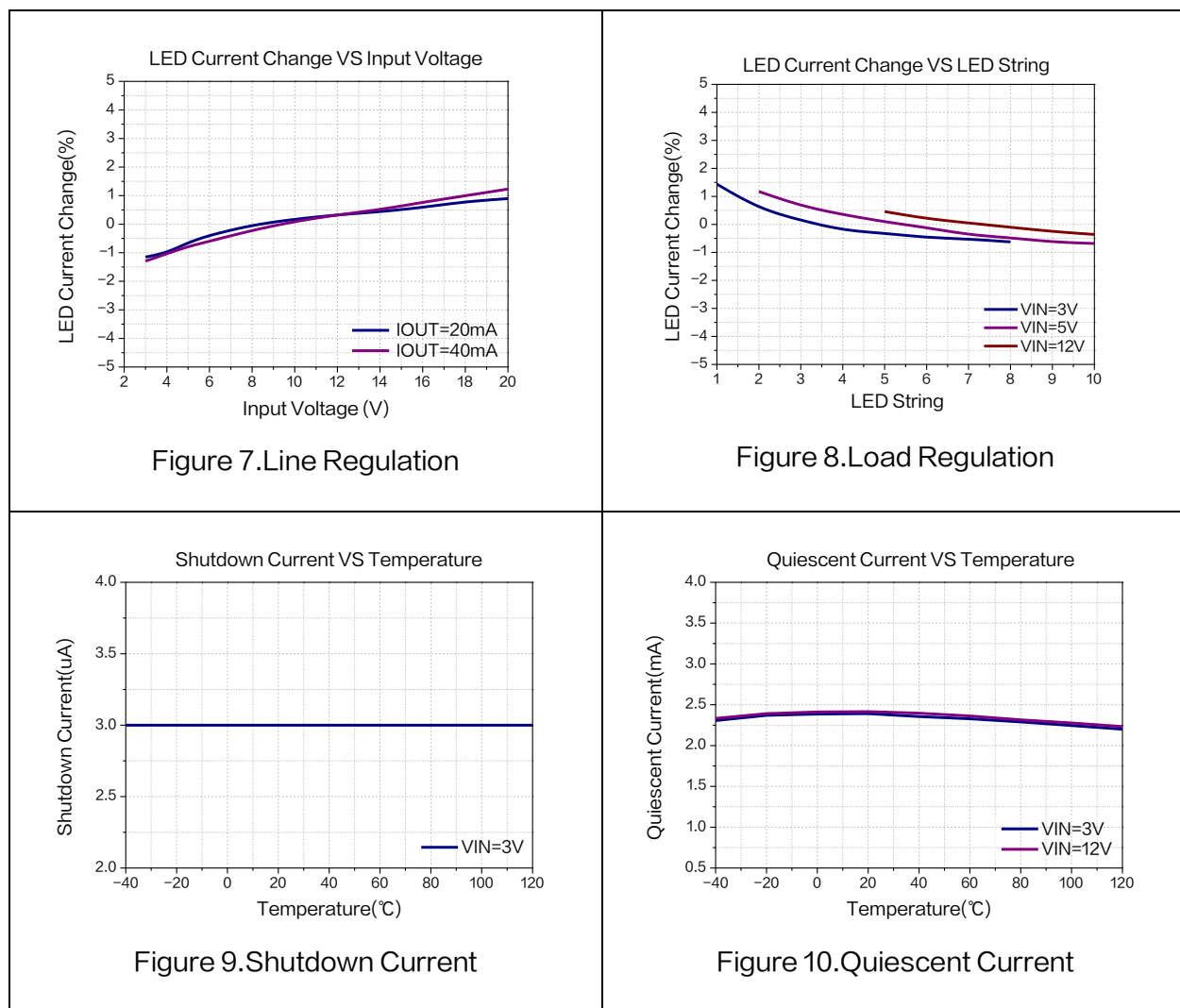


Figure6. XL6101 Dimming circuit and PWM dimming curve

### Typical Characteristics (LED forward voltage $V_F$ is 3.3V at $I_F=20mA$ , unless otherwise noted.)



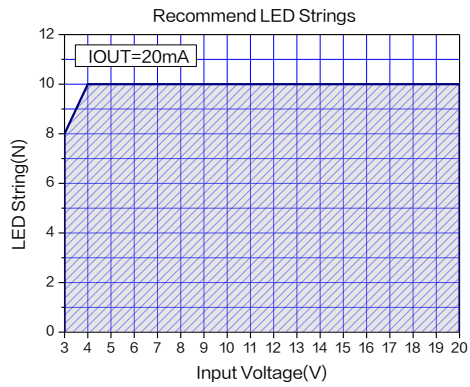


Figure 11. Max LED Strings (I<sub>OUT</sub>=20mA)

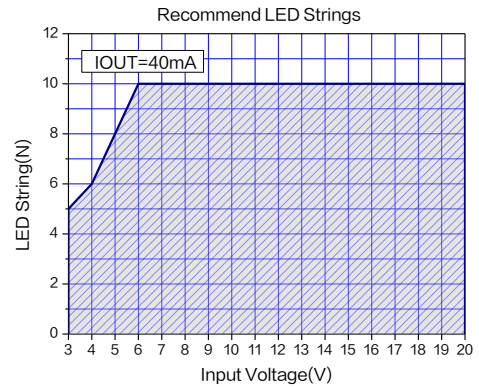


Figure 12. Max LED Strings (I<sub>OUT</sub>=40mA)

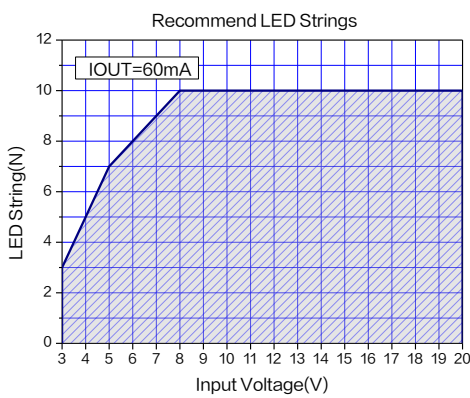


Figure 13. Max LED Strings (I<sub>OUT</sub>=60mA)

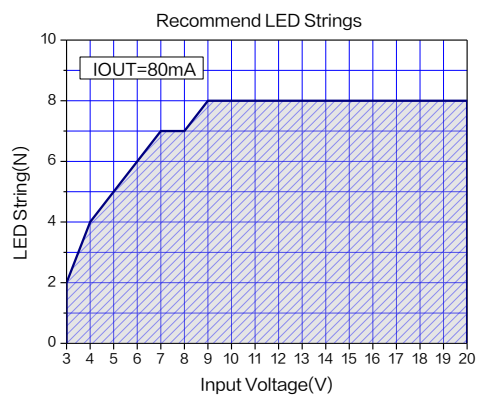
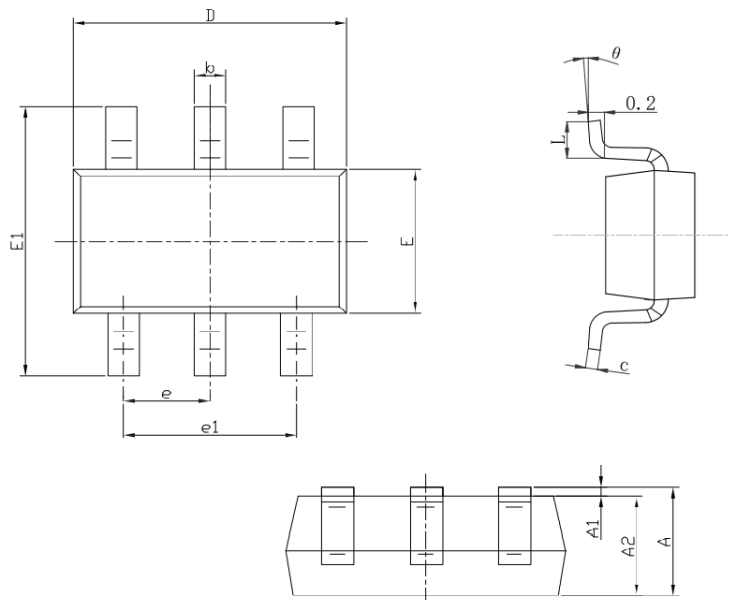


Figure 14. Max LED Strings (I<sub>OUT</sub>=80mA)

## Package Information

### SOT23-6



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 1.000                     | 1.350 | 0.039                | 0.053 |
| A1     | 0.000                     | 0.150 | 0.000                | 0.006 |
| A2     | 1.000                     | 1.200 | 0.039                | 0.047 |
| b      | 0.300                     | 0.500 | 0.012                | 0.020 |
| c      | 0.100                     | 0.200 | 0.004                | 0.008 |
| D      | 2.820                     | 3.050 | 0.111                | 0.120 |
| E      | 1.500                     | 1.726 | 0.059                | 0.068 |
| E1     | 2.600                     | 3.000 | 0.102                | 0.118 |
| e      | 0.900                     | 1.000 | 0.035                | 0.039 |
| e1     | 1.800                     | 2.000 | 0.071                | 0.079 |
| L      | 0.300                     | 0.600 | 0.012                | 0.024 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |

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| 500mA 1.2MHz 36V Built in SBD Boost LED Constant Current Driver | XL6101 |
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