

## General Description

The VS3030 is an inductor-based DC/DC converter designed to drive up to eight white LEDs in series or 2 rows of LEDs with 5 for each in parallel for backlight. Only one feedback resistor is needed to control the LED current and obtain satisfied brightness.

A constant frequency 1.2MHz PWM control scheme is employed in this IC, which means tiny external components can be used. Specifically, 1mm tall inductor and 0.22  $\mu$ F output capacitor for the typical application are sufficient. Additionally, the schottky diode in boost circuit is integrated in this chip. VS3030 also provides a disable port to ease its use for different systems.

The output over-voltage protection is implemented in VS3030. When any LED is broken or in other abnormal conditions, the output voltage will be clamped to 30V.

The VS3030 is available in standard SOT-23-6 and TSOT-23-6 packages.

## Features

- Inherently Uniform LED Current
- High Efficiency up to 84%
- No Need for Extra Schottky Diode
- Output Over-Voltage Protection (OVP)
- Drives up to 8 LEDs in Series or 2 Rows of LEDs with 5 for Each in Parallel
- Fixed 1.2MHz Switching Frequency
- Uses Tiny 1mm Tall Inductor
- Requires Only 0.22  $\mu$ F Output Capacitor

## Applications

- Cellular Phones
- Digital Cameras
- LCD modules
- GPS Receivers
- PDAs, Handheld Computers

## Pin Configuration

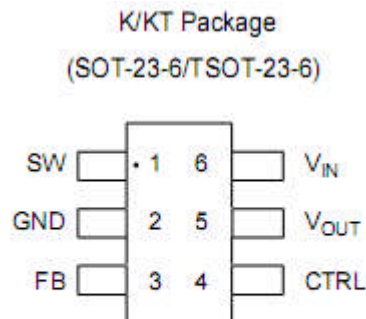
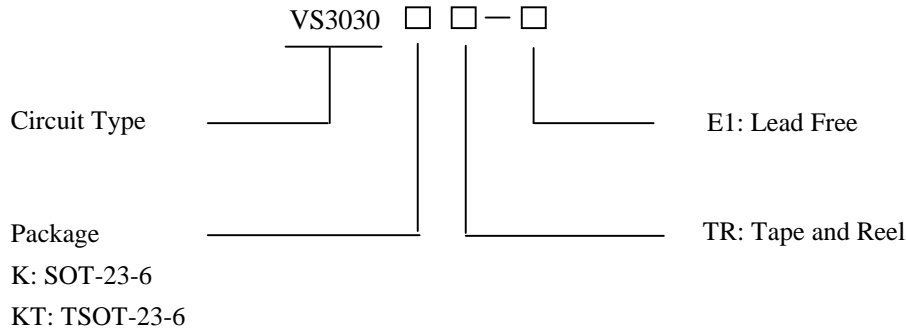


Figure 2. Pin Configuration of VS3030 (Top View)



### Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-23-6	-40 to 85°C	VS3030KTR-E1	EEB	Tape & Reel
TSOT-23-6	-40 to 85°C	VS3030KTTR-E1	S9G	Tape & Reel

### Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Input Voltage	V <sub>IN</sub>	20	V
SW Voltage	V <sub>SW</sub>	30	V
FB Voltage	V <sub>FB</sub>	20	V
CTRL Voltage	V <sub>CTRL</sub>	20	V
Thermal Resistance (Junction to Atmosphere, no Heat sink)	R <sub>θJA</sub>	265	°C/W
Operating Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-60-150	°C
Lead Temperature (Soldering, 10sec)	T <sub>LEAD</sub>	260	°C
ESD (Machine Model)		250	V
ESD (Human Body Model)		2000	V

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

### Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Input Voltage	V <sub>IN</sub>	2.6	16	V
Operating Temperature	T <sub>OP</sub>	-40	85	°C
CTRL Voltage	V <sub>CTRL</sub>		16	V

### Electrical Characteristics

(V<sub>IN</sub>=3V, V<sub>CTRL</sub>=3V, T<sub>A</sub>=25°C, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Type	Max	Unit
Minimum Operating Voltage	V <sub>IN(min)</sub>		2.5			V
Maximum Operating Voltage	V <sub>IN(max)</sub>				16	
Feedback Voltage	V <sub>FB</sub>	I <sub>OUT</sub> =20mA, 4 LEDs, T <sub>A</sub> =-40°C to 85°C	188	200	212	mV
FB Pin Bias Current	I <sub>FB</sub>			35	100	nA
Supply Current	I <sub>CC</sub>	V <sub>FB</sub> =V <sub>IN</sub> , Not Switching	1.5	2.5	3.2	mA
Supply Current	I <sub>Q</sub>	V <sub>CTRL</sub> =0V	2.0	3.2	5.0	μA
Switching Frequency	f		0.9	1.2	1.5	MHz
Maximum Duty Cycle	D <sub>MAX</sub>		90	93		%
Switch Current Limit (Note 2)	I <sub>LIMIT</sub>	D=40%		550		mA
		D=80%		550		
Switch V <sub>CE</sub> Saturation Voltage	V <sub>CESAT</sub>	I <sub>SW</sub> =250mA		360		mV
Switch Leakage Current		V <sub>SW</sub> =5V		0.01	5	μA
CTRL Pin Voltage	V <sub>CTRL</sub>	High	1.8			V
		Low			0.05	
CTRL Pin Bias Current	I <sub>CTRL</sub>		40	55	72	μA
		T <sub>A</sub> =85°C		50		
		T <sub>A</sub> =-40°C		75		
Schottky Forward Drop	V <sub>DROP</sub>	I <sub>D</sub> =150mA		0.7		V
Schottky Leakage Current		V <sub>R</sub> =23V		0.1	4	μA
		V <sub>R</sub> =27V			150	
Soft Start Time	t			300		μs

Note 2: The Switch Current Limit is related to Duty Cycle. Please refer to Figure 16 for detail.

Note 3: The bold type specification of full temperature range is Guaranteed By Design (GBD).

## Typical Performance Characteristics

(VF of WLED is 3.45V @ IF=20mA, unless otherwise noted )

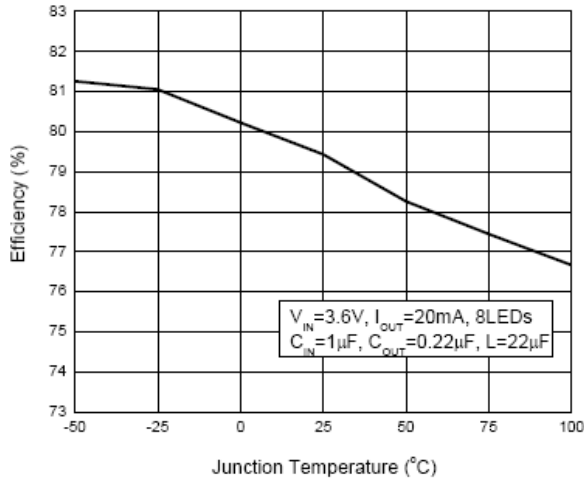


Figure 4. Efficiency vs. Junction Temperature

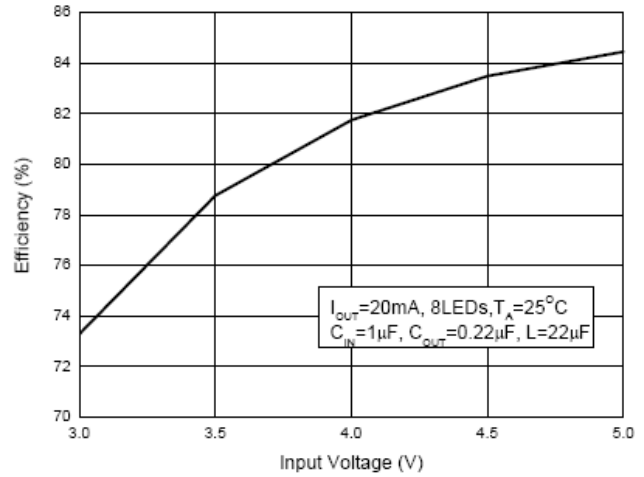


Figure 5. Efficiency vs. Input Voltage

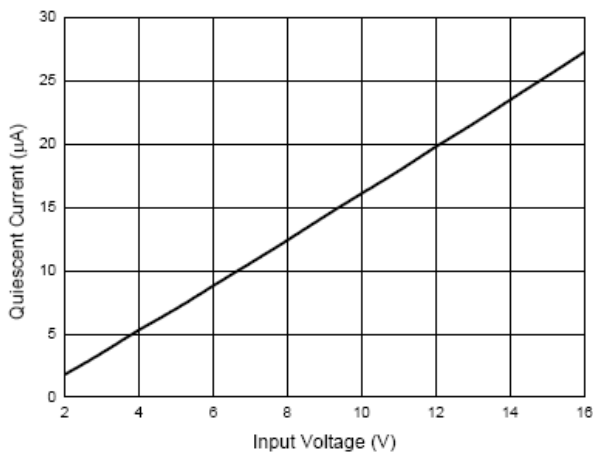


Figure 6. Shutdown Quiescent Current vs. Input Voltage

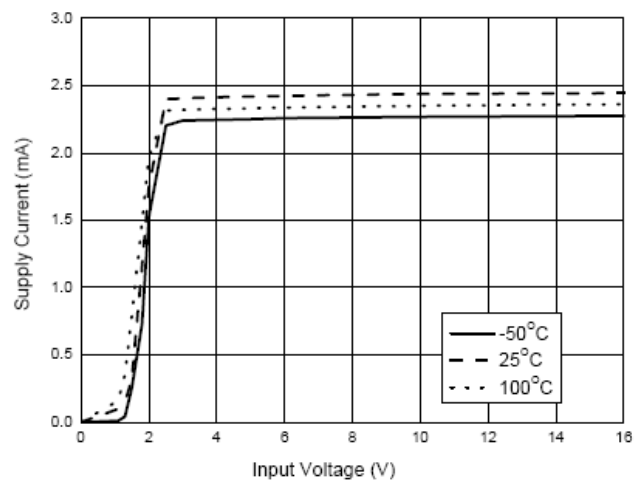


Figure 7. Supply Current vs. Input Voltage

## Typical Performance Characteristics (Continued)

(VF of WLED is 3.45V @ IF=20mA, unless otherwise noted )

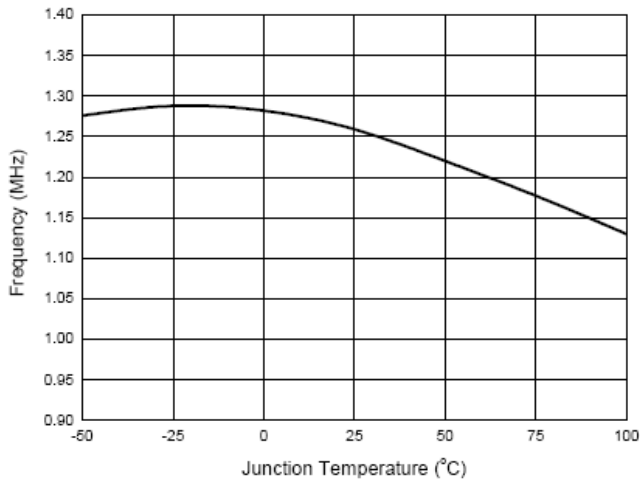


Figure 8. Switching Frequency vs. Junction Temperature

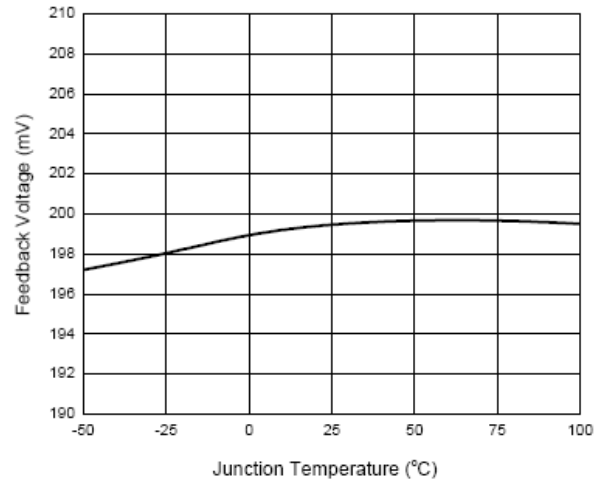


Figure 9. Feedback Voltage vs. Junction Temperature

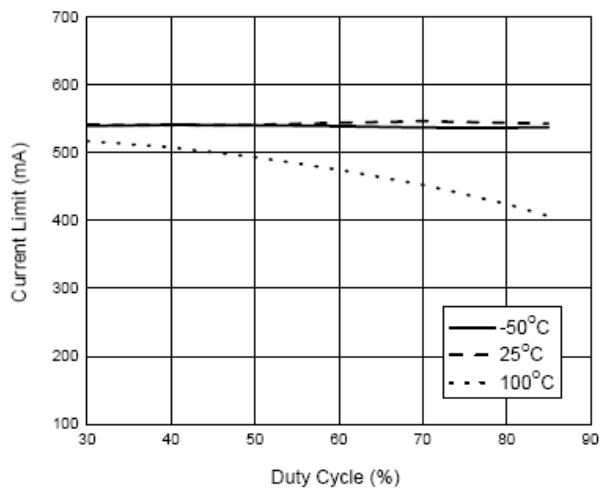


Figure 10. Switch Current Limit vs. Duty Cycle

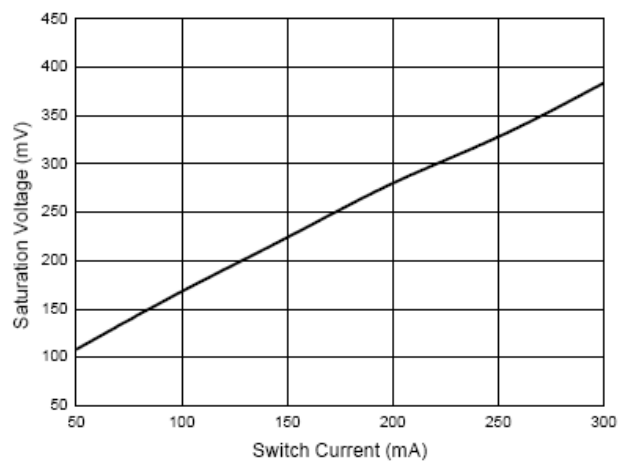


Figure 11. Switch Saturation Voltage vs. Switch Current

### Typical Performance Characteristics (Continued)

( $V_F$  of WLED is 3.45V @  $I_F=20\text{mA}$ , unless otherwise noted )

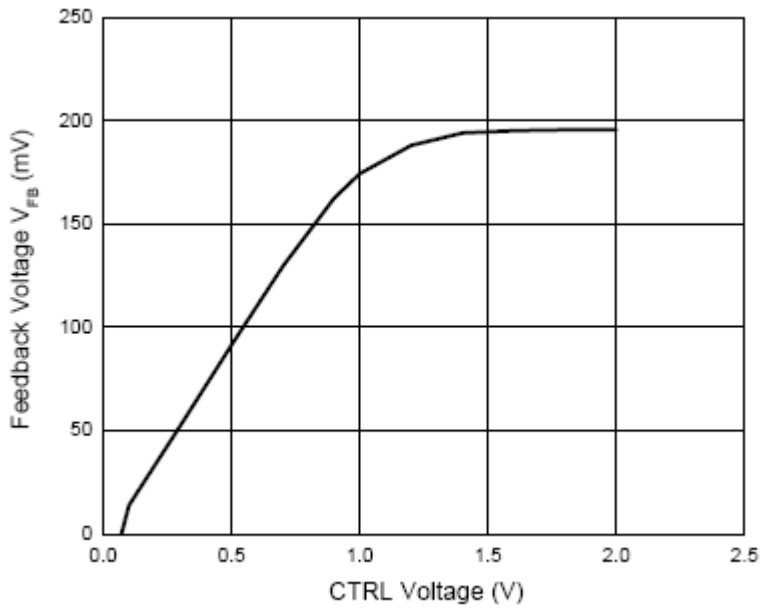


Figure 12. Feedback Voltage vs. CTRL Pin Voltage

**Typical Application**

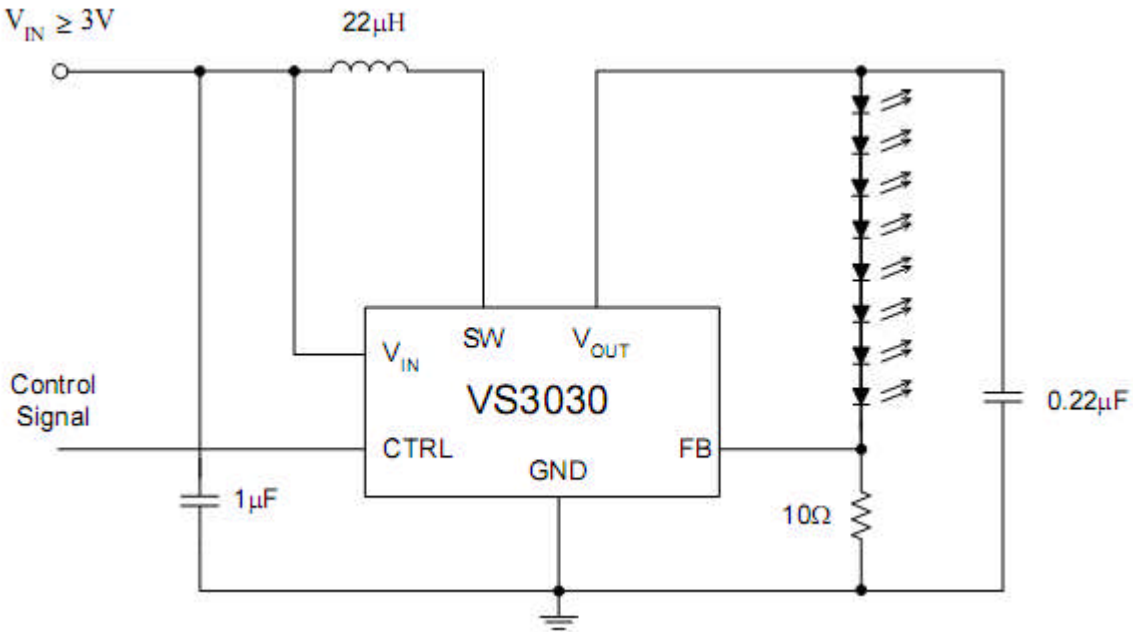


Figure 13. Typical Application of Eight LED Drivers

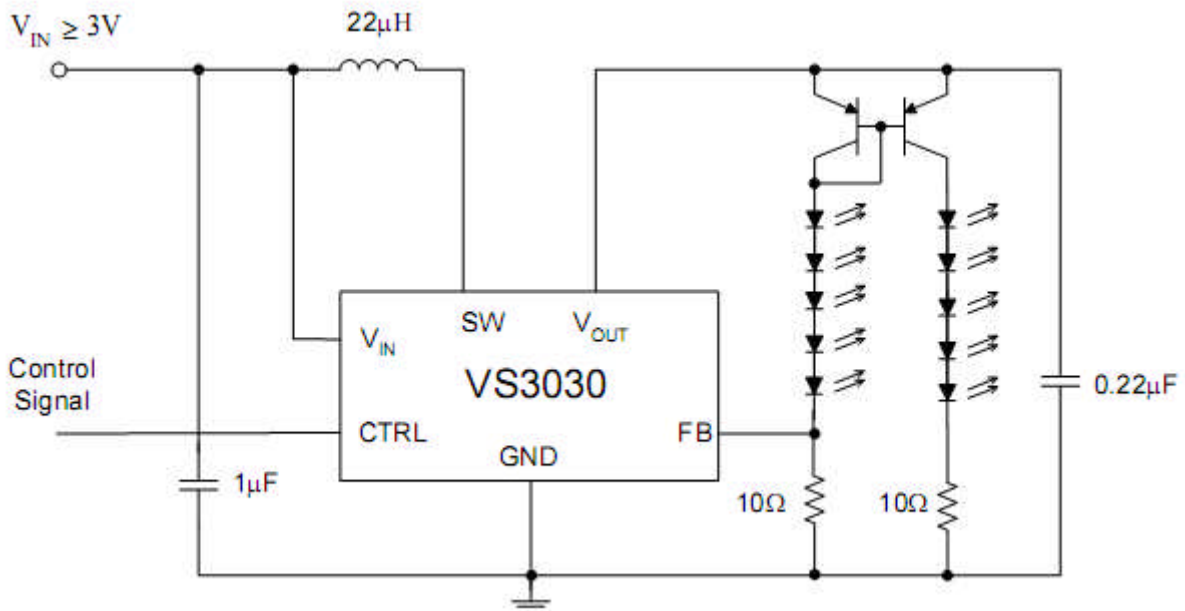


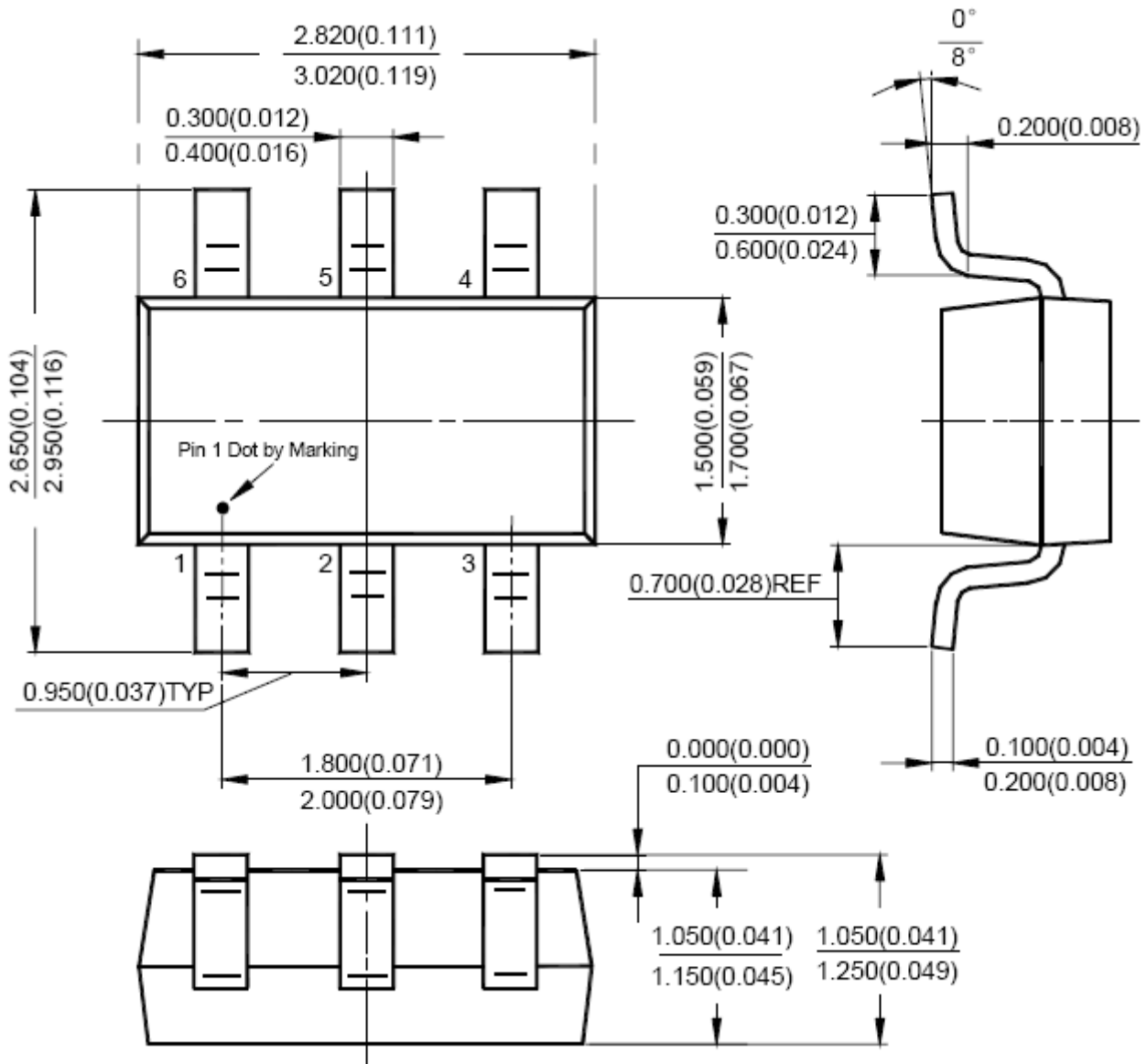
Figure 14. Typical Application of Ten LED Drivers



**Mechanical Dimensions**

SOT-23-6

Unit: mm(inch)



**Mechanical Dimensions**

SOT-23-6

Unit: mm(inch)

