

**WHITE LED STEP-UP CONVERTER****AP3031A****General Description**

The AP3031A is an inductor-based DC/DC boost converter designed to drive LED arrays. 1.2A switching current allows AP3031A to be used in series 10 LEDs application typically.

A constant frequency 1MHz PWM control scheme is employed in this IC, which means tiny external components can be used. Specifically, 1mm tall 22 μ H inductor and 0.47 μ F output capacitor for the typical application is sufficient.

The over output voltage protection is equipped in AP3031A, which protects the IC under open load condition. The AP3031A includes UVLO, soft-start, current limit and OTSD to protect the circuit.

The AP3031A is available in standard SOT-23-6 package.

Features

- Fast 1MHz Switching Frequency
- Wide Input Voltage Range: 2.7V to 16V
- Low 200mV Feedback Voltage
- Output Over Voltage Protection: 36V
- Cycle by Cycle Current Limit: 1.2A
- Built-in Soft-start
- Built-in Standby Mode to Achieve High Frequency PWM Dimming
- Built-in Thermal Shutdown Function
- Under Voltage Lockout

Applications

- Digital Photo Frame
- GPS Receiver
- EPC
- PDVD

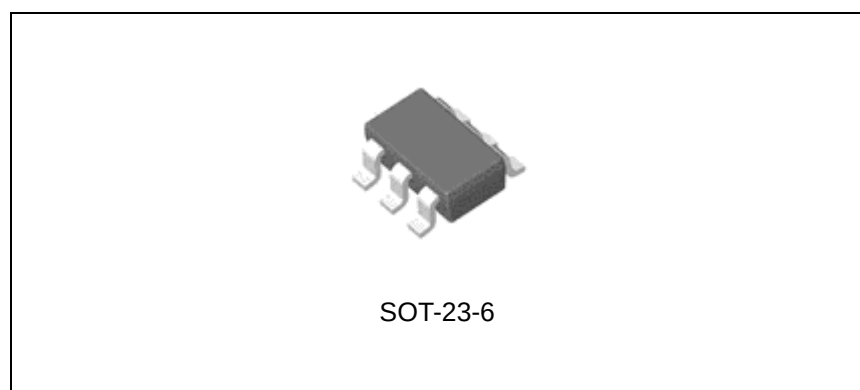


Figure 1. Package Type of AP3031A

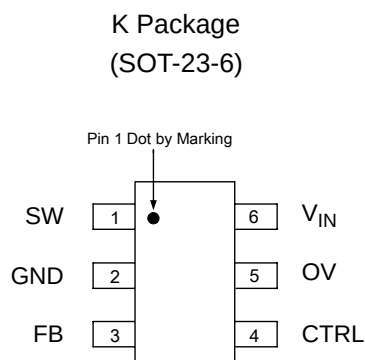
**WHITE LED STEP-UP CONVERTER****AP3031A****Pin Configuration**

Figure 2. Pin Configuration of AP3031A (Top View)

Pin Description

Pin Number	Pin Name	Function
1	SW	Switch Pin. Connect external inductor and Schottky
2	GND	Ground Pin
3	FB	Voltage Feedback Pin. Reference voltage is 200mV
4	CTRL	Enable and Dimming Control Pin. Connect to a high input to enable the IC or a low input to disable the IC. If logic low time is more than about 0.7ms and then enable the IC, the AP3031A will soft start to protect system departments. If logic low time is less than about 0.7ms and then enable the IC, the AP3031A will hold on standby mode and start directly to achieve high frequency dimming
5	OV	Over-voltage Protection Input Pin. Connect to the output directly. On OVP condition, the output voltage will be clamped
6	V _{IN}	Input Supply Pin. Must be locally bypassed



WHITE LED STEP-UP CONVERTER

AP3031A

Functional Block Diagram

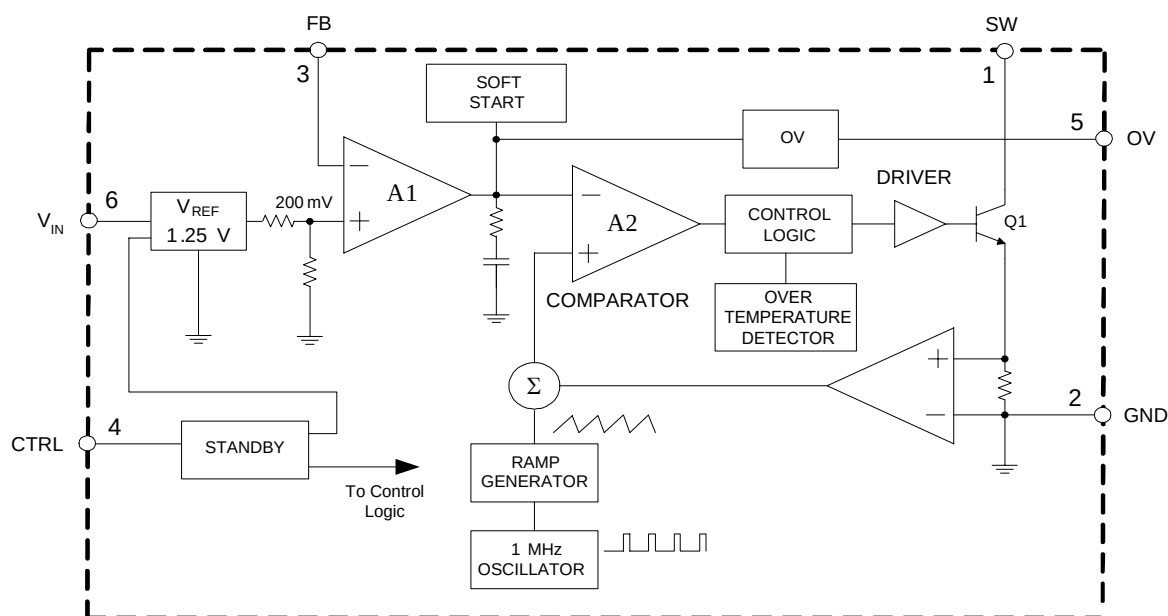


Figure 3. Functional Block Diagram of AP3031A

Ordering Information

	AP3031A	□	□	-	□
Circuit Type					G1: Green
Package					TR: Tape and Reel
K: SOT-23-6					

Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-23-6	-40 to 85°C	AP3031AKTR-G1	GDH	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "G1" suffix in the part number, are RoHS compliant and green.

**WHITE LED STEP-UP CONVERTER****AP3031A****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	-0.3 to 20	V
SW Voltage	V_{SW}	-0.3 to 38	V
FB Voltage	V_{FB}	-0.3 to 20	V
CTRL Voltage	V_{CTRL}	-0.3 to V_{IN}	V
Thermal Resistance (Junction to Ambient, No Heat Sink)	θ_{JA}	265	$^{\circ}C/W$
Junction Temperature	T_J	150	$^{\circ}C$
Storage Temperature Range	T_{STG}	-65 to 150	$^{\circ}C$
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	$^{\circ}C$
ESD (Machine Model)		600	V
ESD (Human Body Model)		4000	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
Operating Temperature Range	T_{OP}	-40	85	$^{\circ}C$
Input Voltage	V_{IN}	2.7	16	V
CTRL Voltage	V_{CTRL}		16	V

**WHITE LED STEP-UP CONVERTER****AP3031A****Electrical Characteristics**(V_{IN}=5.0V, V_{CTRL}=5.0V, T_A=25°C, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating Voltage	V _{IN}		2.7		16	V
Feedback Voltage (Note 2)	V _{FB}	I _{OUT} =20mA, T _A =-40°C to 85°C	188	200	212	mV
FB Pin Bias Current	I _{FB}			35	100	nA
Quiescent Current	I _Q	V _{FB} =V _{IN} , no switching	1.5	3.0	5.0	mA
Shutdown Quiescent Current	I _{SHDN}	V _{CTRL} =0V	20	50	80	μA
Switching Frequency	f		0.75	1	1.3	MHz
Maximum Duty Cycle	D _{MAX}		90	93		%
Switch Current Limit	I _{LIMIT}	D=60%	1.0	1.2		A
Switch V _{CE} Saturation Voltage	V _{CESAT}	I _{SW} =0.6A		300		mV
Switch Leakage Current		V _{SW} =35V		0.01	5	μA
CTRL Pin Voltage	V _{CTRL}	Active high	1.8			V
		Active low			0.5	
CTRL Pin Bias Current	I _{CTRL}		40	55	72	μA
OVP Voltage	V _{OVP}			36		V
Soft-start Time	t _{SS}			300		μs
Standby Time	t _{STB}			0.7		ms
Thermal Shutdown	T _{OTSD}			160		°C

Note 2: The bold type specifications of full temperature range are guaranteed by design (GBD).

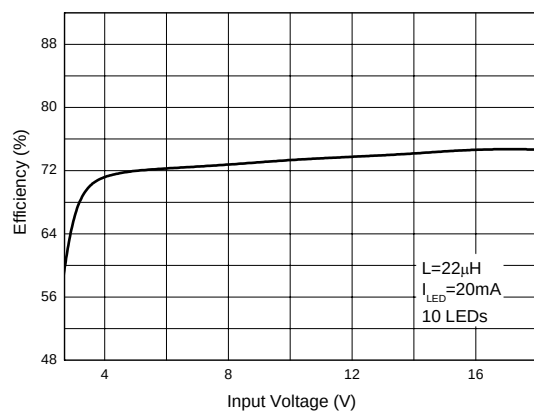
**WHITE LED STEP-UP CONVERTER****AP3031A****Typical Performance Characteristics**(WLED forward voltage (V_F)=3.2V at I_F =20mA, unless otherwise noted.)

Figure 4. Efficiency vs. Input Voltage

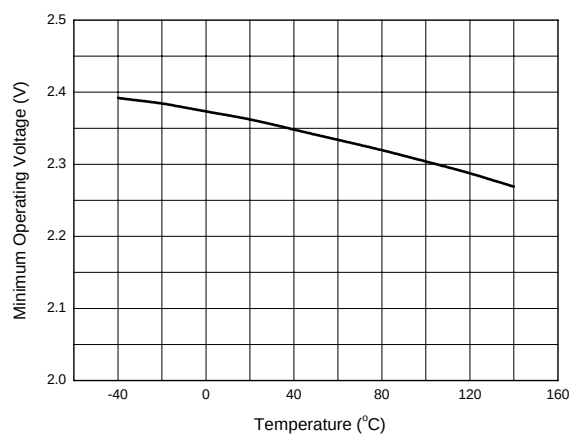


Figure 5. Minimum Operating Voltage vs. Temperature

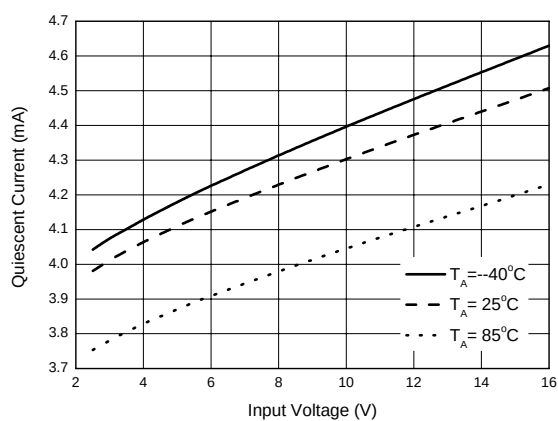


Figure 6. Quiescent Current vs. Input Voltage

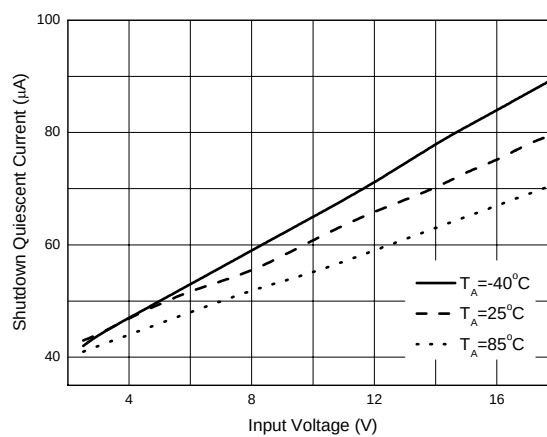


Figure 7. Shutdown Quiescent Current vs. Input Voltage

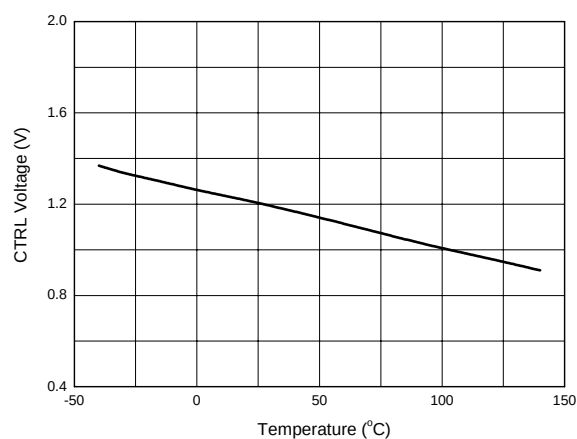
**WHITE LED STEP-UP CONVERTER****AP3031A****Typical Performance Characteristics (Continued)**(WLED forward voltage (V_F)=3.2V at I_F =20mA, unless otherwise noted.)

Figure 8. CTRL Pin Voltage vs. Temperature

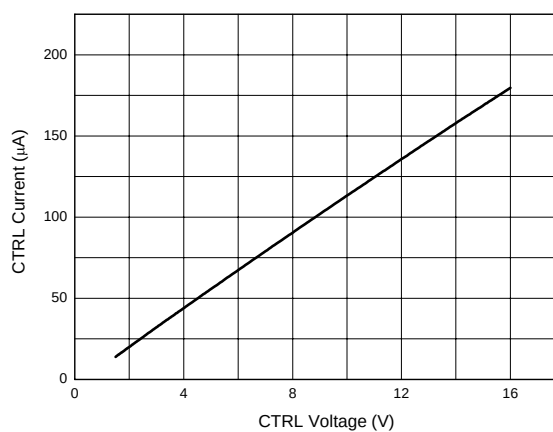


Figure 9. CTRL Current vs. CTRL Voltage

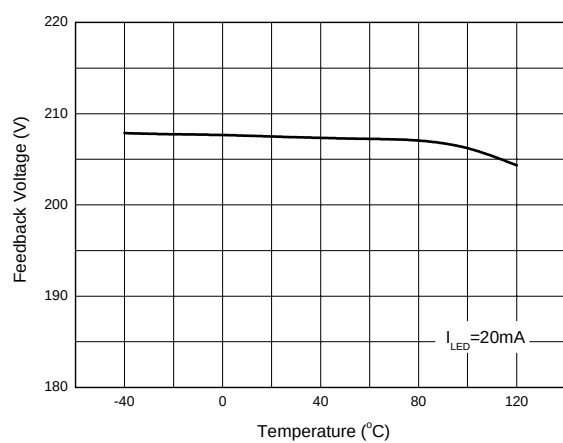


Figure 10. Feedback Voltage vs. Temperature

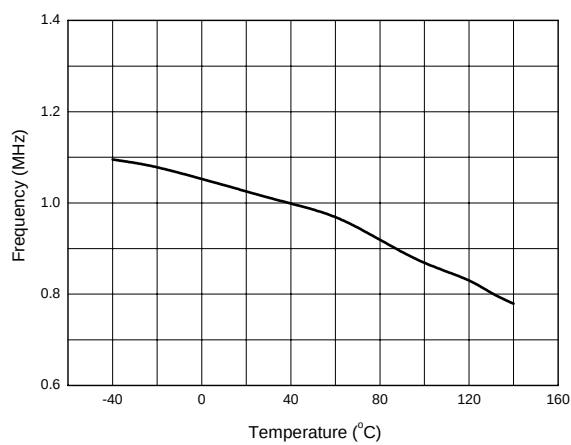


Figure 11. Frequency vs. Temperature

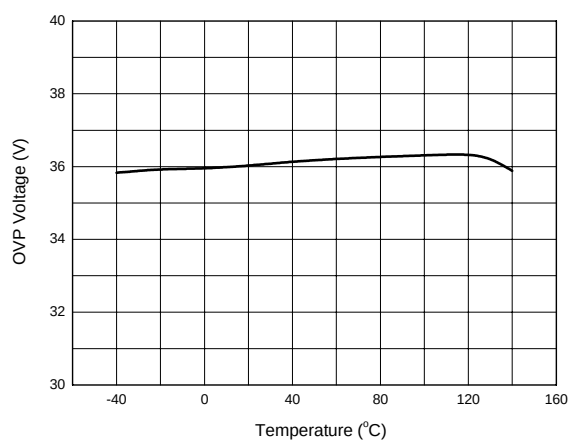
**WHITE LED STEP-UP CONVERTER****AP3031A****Typical Performance Characteristics (Continued)**(WLED forward voltage (V_F)=3.2V at I_F =20mA, unless otherwise noted.)

Figure 12. OVP Voltage vs. Temperature

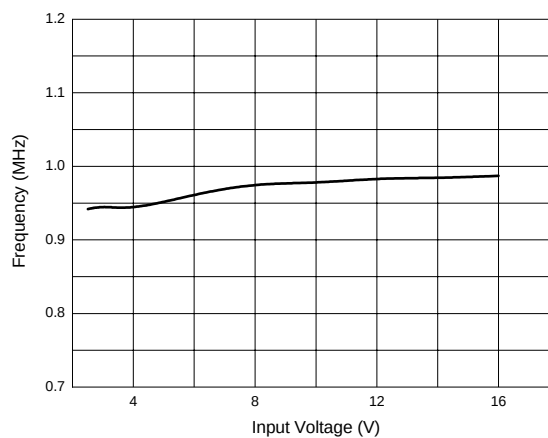


Figure 13. Frequency vs. Input Voltage

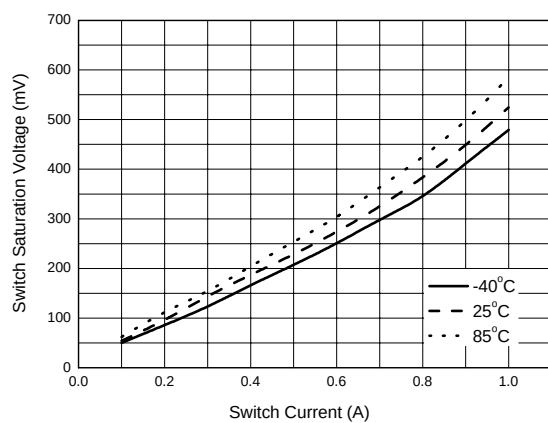


Figure 14. Switch Saturation Voltage vs. Switch Current

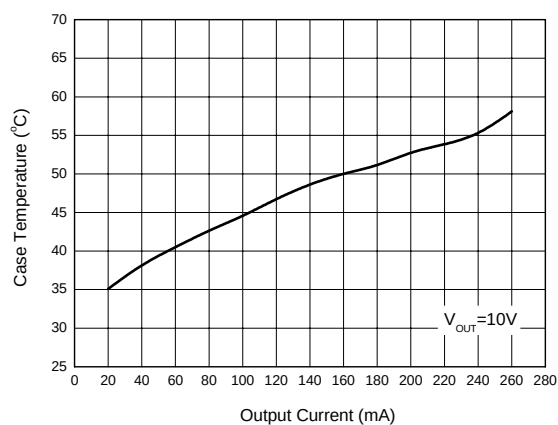


Figure 15. Case Temperature vs. Output Current

WHITE LED STEP-UP CONVERTER

AP3031A

Typical Application

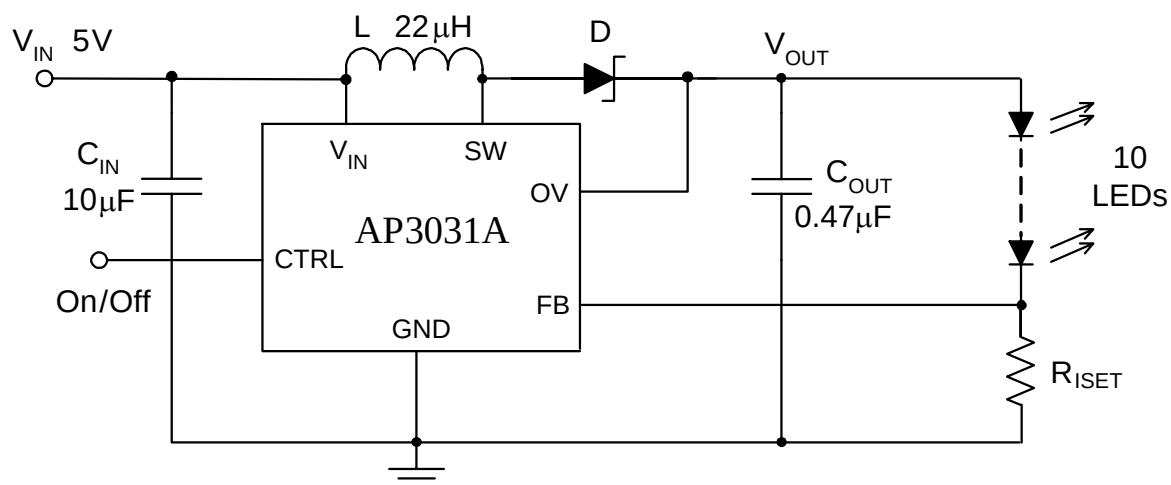
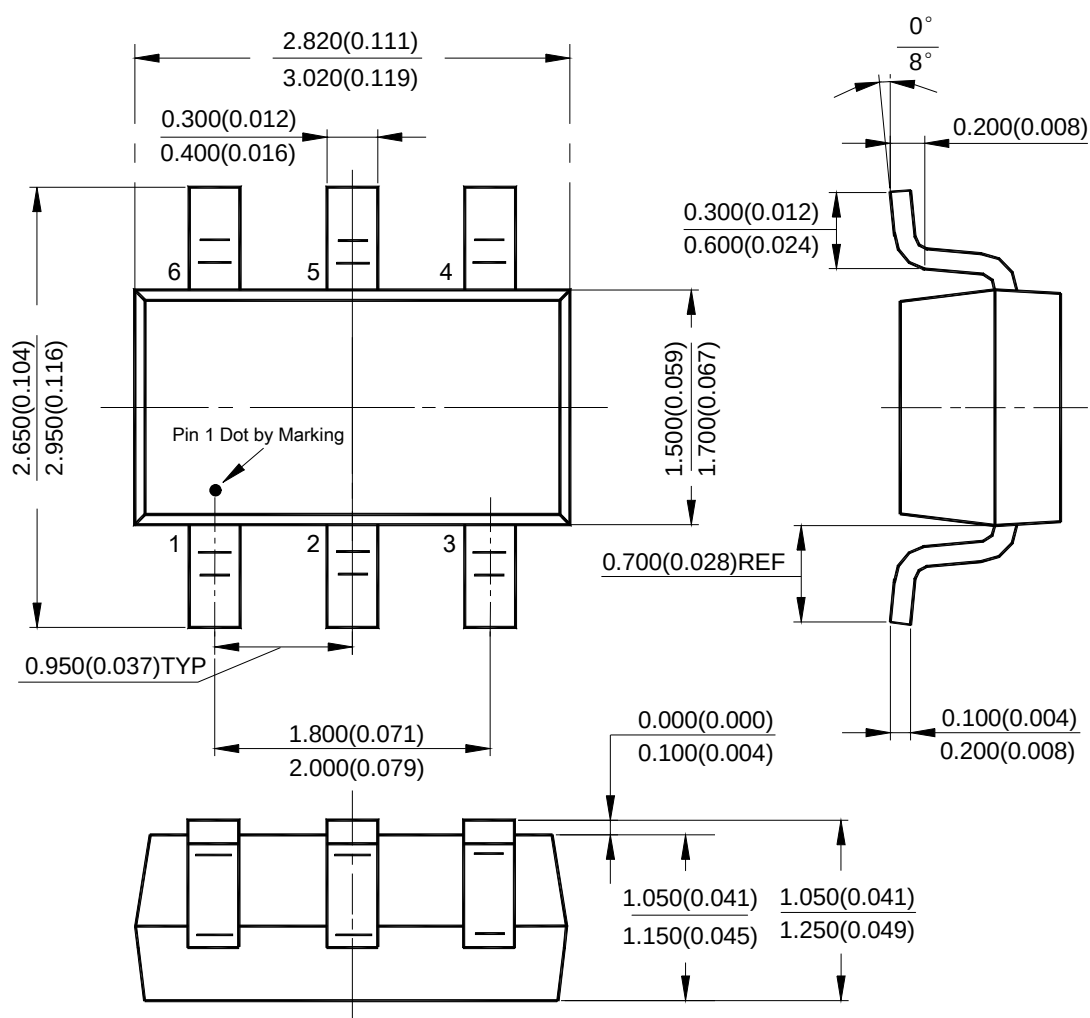


Figure 16. Typical Application of AP3031A (10 WLEDs Series)

**WHITE LED STEP-UP CONVERTER****AP3031A****Mechanical Dimensions****SOT-23-6****Unit: mm(inch)**



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