

General Description

The AP3008 is a 1.2MHz PWM boost switching regulator designed for constant-current white LED driver applications.

The AP3008 can drive a string of 2 to 3 white LEDs from a 2.7V supply in series, ensuring uniform brightness and eliminating several ballast resistors. The AP3008 implements a constant frequency 1.2MHz PWM control scheme. The high frequency PWM operation also saves board space by reducing external component sizes. To improve efficiency, the feedback voltage is set to 95mV, which reduces the power dissipation in the current setting resistor.

The AP3008 is equipped with OVP protection ability, the SW pin monitors the output voltage and will turn off the device if an over-voltage condition is present to prevent damage from an open circuit condition.

The AP3008 is available in SOT-23-5 package.

AP3008

Features

- Inherently Uniform LED Current
- High Efficiency up to 84%
- Drives 2 to 3 LEDs from a 2.7V Supply
- 1.2MHz PWM Operation Frequency
- Requires Only 0.22µF Output Capacitor
- Shutdown Current: <1µA
- Built-in Output Over-Voltage Protection
- Under Voltage Lock Out (UVLO)

Applications

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

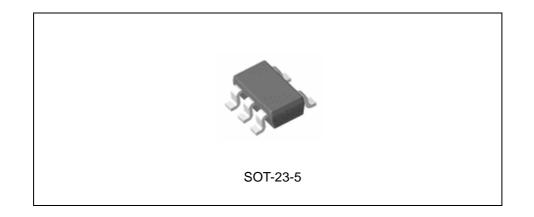


Figure 1. Package Type of AP3008



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Pin Configuration

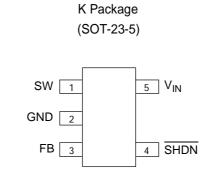


Figure 2. Pin Configuration of AP3008 (Top View)

Pin Description

Pin Number	Pin Name	Function				
1 SW		Switch Pin. Connect inductor/diode here. The output voltage can range up to 29V but not extend this limit. If the voltage on this pin is higher than the overvoltage protection threshold (OVP), the device comes back to shutdown mode. To restart the chip, one must then send a low to high sequence on shutdown pin or switch off the V_{IN} supply.				
2	GND	Ground Pin.				
3	FB	Voltage Feedback. Reference voltage is 95mV.				
4	SHDN	Shutdown Pin. Connect to 1.5V or higher to enable device; Connect to 0.4V or less to disable device.				
5	V _{IN}	Input Supply Pin. Must be locally bypassed.				



WHITE LED DRIVER

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Functional Block Diagram

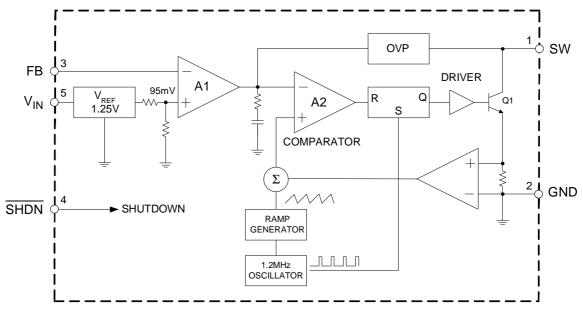
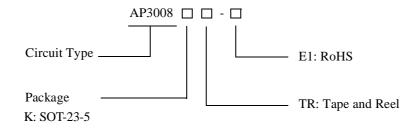


Figure 3. Functional Block Diagram of AP3008

Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type	
SOT-23-5	-40 to 85°C	AP3008KTR-E1	E1B	Tape & Reel	

BCD Semiconductor's products as designated with "E1" suffix in the part number are RoHS compliant.



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Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Input Voltage	V _{IN}	15	V
SW Voltage		38	V
FB Voltage		10	V
SHDN Voltage		15	V
Thermal Resistance (Junction to Atmosphere, no Heat sink)	$R_{\theta JA}$	265	°C/W
Operating Junction Temperature		150	°C
Storage Temperature Range	T _{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10sec)	T _{LEAD}	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	
Operating Temperature Range	T _{OP}	-40	85	°C	
Operating Voltage Range		2.5	12	V	



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Electrical Characteristics

(V_{IN} =3V, $V_{\overline{SHDN}}$ =3V, T_A =25°C, unless otherwise specified.)

Parameter	meter Symbol Conditions		Min	Тур	Max	Unit	
Feedback Voltage	V _{FB}	I _{SW} =100mA, Duty Cycle=66%	86	95	104	mV	
FB Pin Bias Current				45	100	nA	
Supply Current	I _{CC}	$V_{\overline{SHDN}} = V_{IN}, V_{FB} = V_{IN}$, No switching		1.9	2.5	mA	
Supply Current	I _Q	V _{SHDN} =0V		0.1	1.0	μΑ	
Switch Frequency	f		0.8	1.2	1.6	MHz	
Maximum Duty Cycle	D _{MAX}		85	90		%	
Switch Current Limit	I _{LIM}	Duty=15%		320		mA	
Switch VCESAT	V _{CESAT}	I _{SW} =250mA		350		mV	
Switch Leakage Current		V _{SW} =5V		0.01	5	μΑ	
	V _{TH}	High	1.5			v	
SHDN Voltage	V _{TL}	Low			0.4		
SHDN Pin Bias Current				50		μΑ	
OVP Voltage	V _{OVP}			29		V	
Thermal Resistance (Junction to Case)	θ_{JC}			86.10		°C/W	



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Typical Performance Characteristics

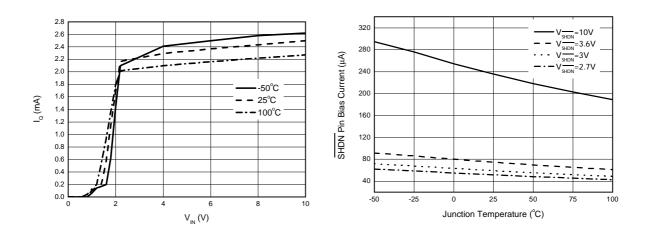
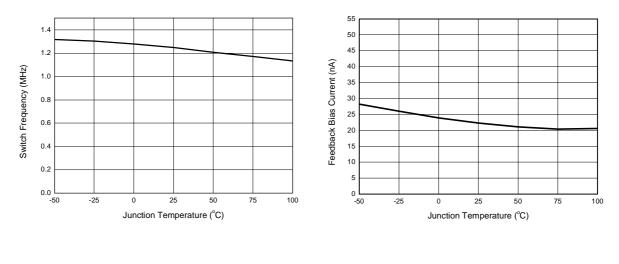


Figure 4. Quiescent Current vs. V_{IN}





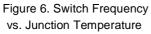


Figure 7. Feedback Bias Current vs. Junction Temperature

May 2013 Rev. 2.0

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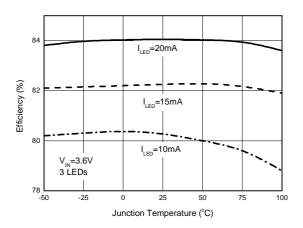




Figure 9. Switch Current vs. Duty Cycle

Duty Cycle (%)

۰ L

Current Limit (mA)

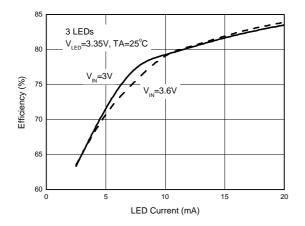
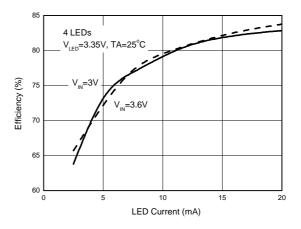
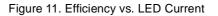


Figure 10. Efficiency vs. LED Current



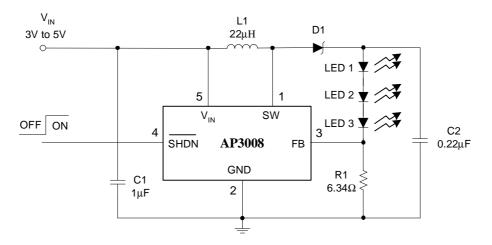




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Typical Application



C1, C2: X5R or X7R Dielectric L1: SUMIDA CDRH5D28R-220NC or Equivalent

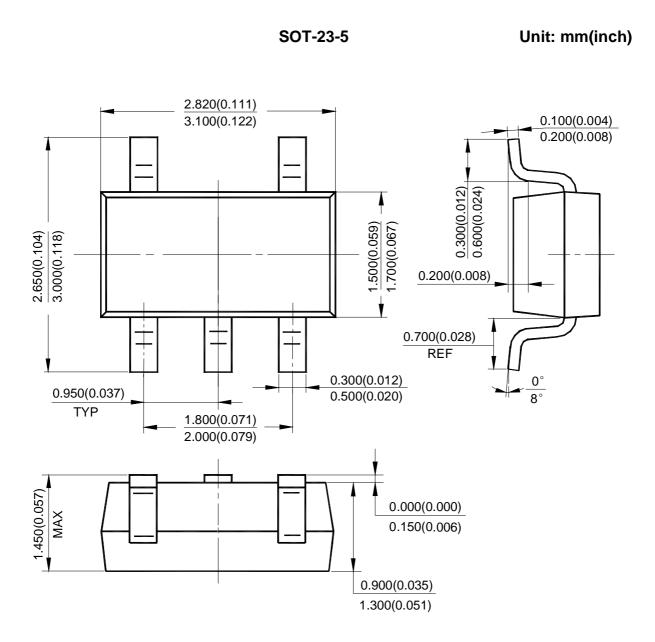
Figure 12. Three White LEDs Driver



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Mechanical Dimensions



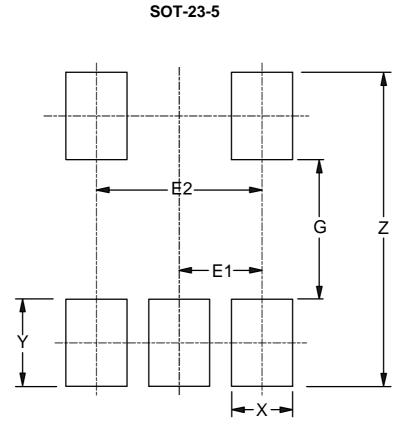
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Mounting Pad Layout



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075



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