WHITE LED DRIVER AP3008

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 95 mV, 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-23-5L package.

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



SOT-23-5L

Figure 1. Package Type of AP3008

Pin Configuration

K Package
(SOT-23-5L)

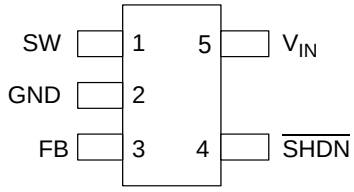


Figure 2. Pin Configuration of AP3008 (Top View)

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	$\overline{SHDN}$	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.

Functional Block Diagram

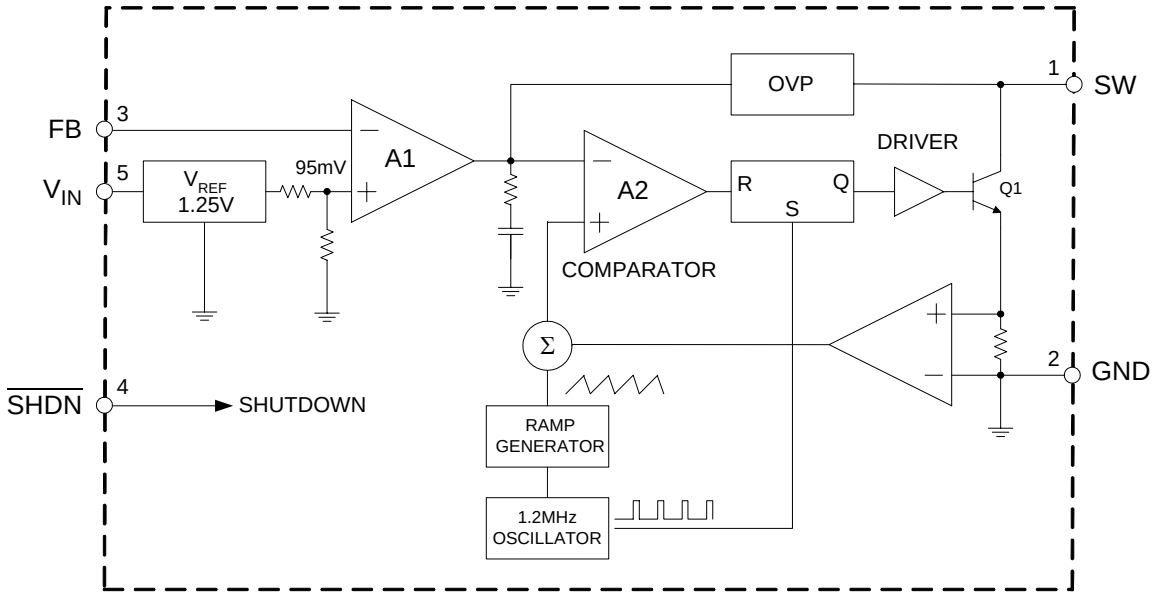
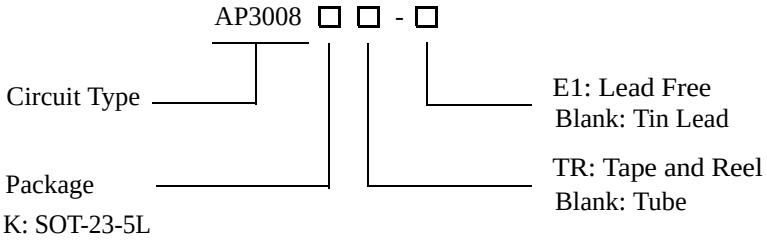


Figure 3. Functional Block Diagram of AP3008

Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Tin Lead	Lead Free	Tin Lead	Lead Free	
SOT-23-5L	-40 to 85°C	AP3008KTR	AP3008KTR-E1	K1B	E1B	Tape & Reel

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

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	15	V
SW Voltage		36	V
FB Voltage		10	V
$\overline{SHDN}$ 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

Electrical Characteristics

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

Parameter	Symbol	Conditions	Min	Typ	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	$V_{\overline{SHDN}}$=0V		0.1	1.0	μA
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	μA
$\overline{SHDN}$ Voltage	V_{TH}	High	1.5			V
	V_{TL}	Low			0.4	
$\overline{SHDN}$ Pin Bias Current				50		μA
OVP Voltage	V_{OVP}			29		V

Typical Performance Characteristics

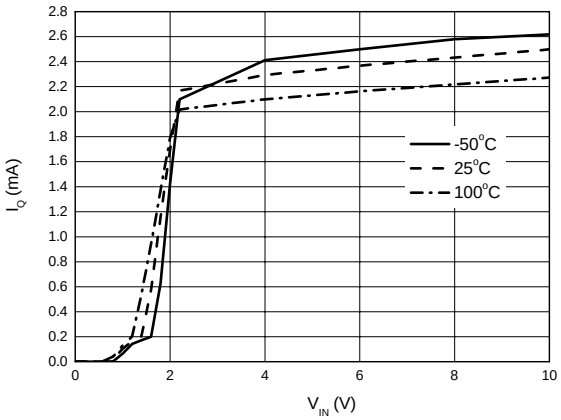


Figure 4. Quiescent Current vs. V_{IN}

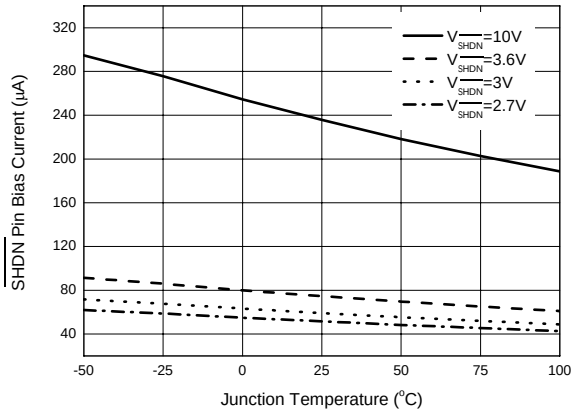


Figure 5. $\overline{SHDN}$ Pin Bias Current vs. Junction Temperature

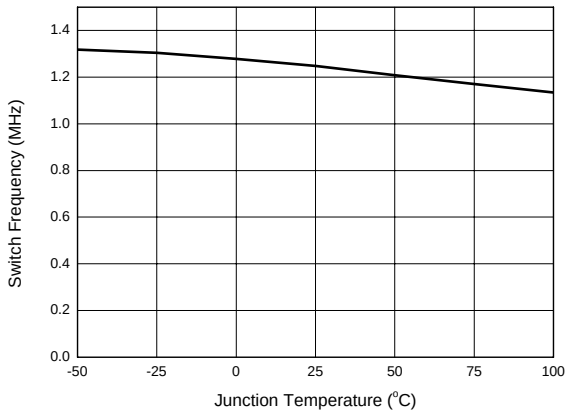


Figure 6. Switch Frequency vs. Junction Temperature

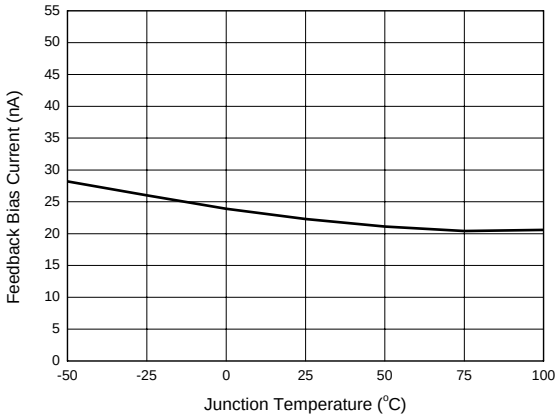


Figure 7. Feedback Bias Current vs. Junction Temperature

Typical Performance Characteristics (Continued)

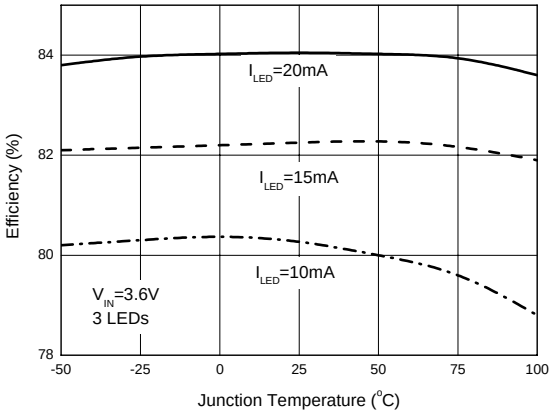


Figure 8. Efficiency vs. Junction Temperature

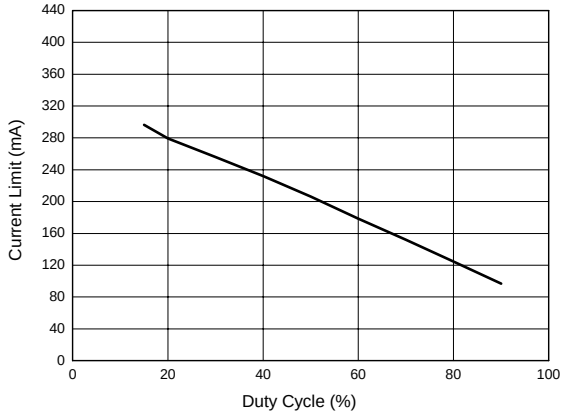


Figure 9. Switch Current vs. Duty Cycle

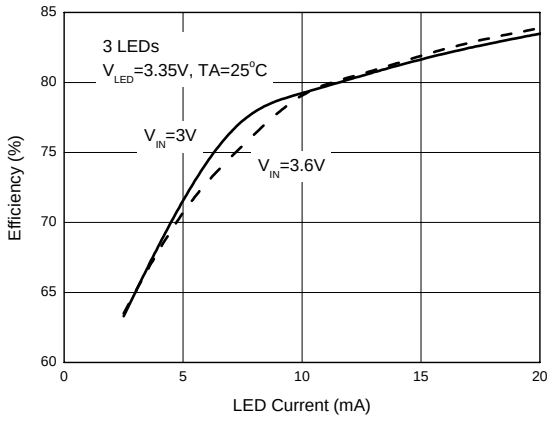


Figure 10. Efficiency vs. LED Current

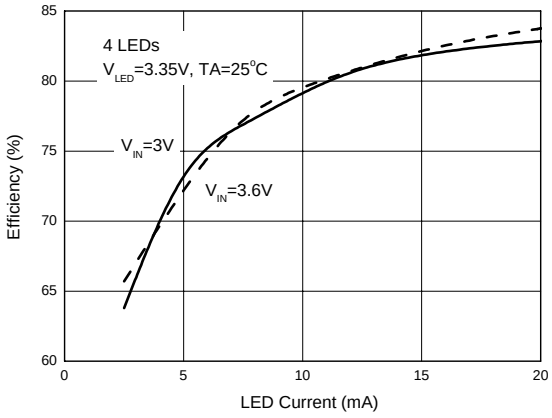
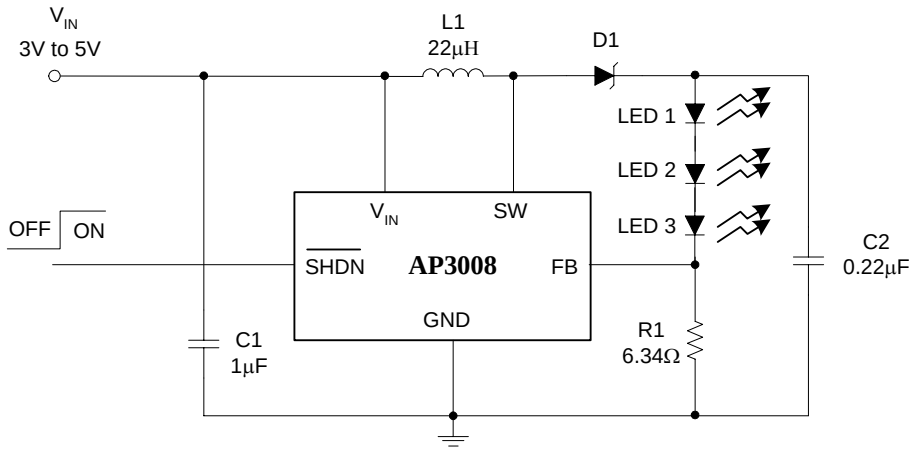


Figure 11. Efficiency vs. LED Current

Typical Application

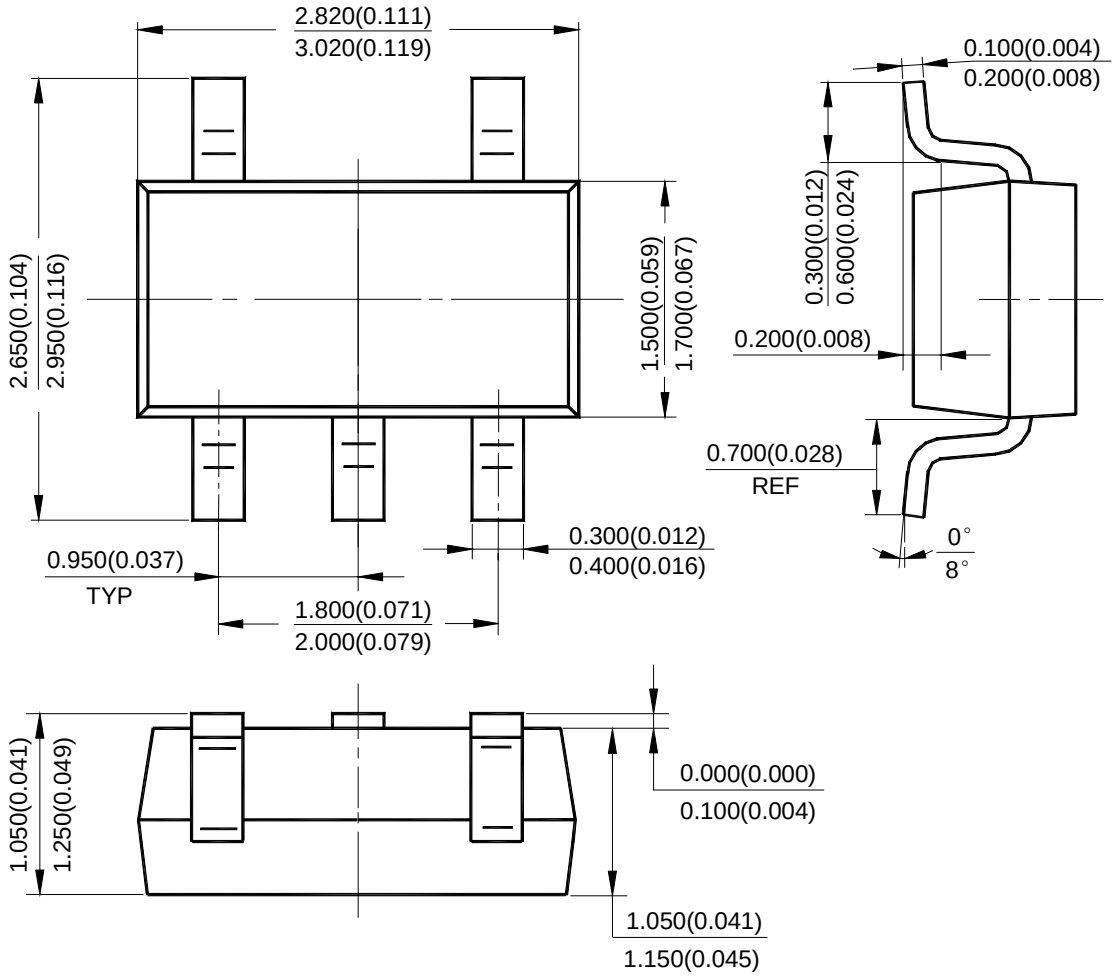


C1, C2: X5R or X7R Dielectric
L1: SUMIDA CDRH5D28R-220NC or Equivalent

Figure 12. Three White LEDs Driver

Mechanical Dimensions

SOT-23-5L **Unit: mm(inch)**





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