1.5MHz STEP-UP DC-DC CONVERTER AP3012

General Description

The AP3012 is a high power, constant frequency, current mode PWM, inductor based, step-up (boost) converter. The converter operates at high frequency (1.5MHz) so that a small, low profile inductor can be used.

The AP3012 has built-in overvoltage protection (OVP) to allow the device goes into shutdown mode when the output voltage exceeds the OVP threshold of 29V.

The AP3012 is available in standard SOT-23-5 package.

Features

- High Efficiency up to 81%
- Adjustable Output Voltage up to 29V
- Shutdown Current 1μA Typical
- 1.5MHz Switching Frequency
- 36V 500mA Rugged Integrated Bipolar Switch
- Built-in Soft-start to Reduce Inrush Current During Start-up
- On-chip Overvoltage Protection
- Uses Low ESR Ceramic Output Capacitor
- Uses Small Inductor

Applications

- LCD/OLED Display Bias Supply
- White LED Driver for LCD Display Backlights
- Cellular Phones

SOT-23-5

Figure 1. Package Type of AP3012

Pin Configuration

K Package

(SOT-23-5)

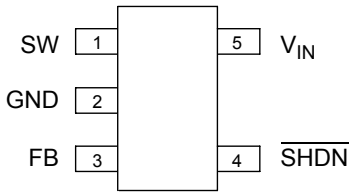


Figure 2. Pin Configuration of AP3012 (Top View)

Pin Description

Pin Number	Pin Name	Function
1	SW	Switch Pin. Connect inductor/diode here. The output voltage can go up to 29V but should not exceed this limit. If the voltage on this pin is higher than the overvoltage protection (OVP) threshold, the device can go into shutdown mode. It can be restarted by a low to high pulse on the SHDN pin, or by a power on reset on the V_{IN} supply
2	GND	Ground Pin. Connect directly to local ground plane
3	FB	Feedback Pin. Internally compares to 1.25V. Connect R1 and R2 resistor divider here. Calculate the Output Voltage according to the formula: V_{OUT}=1.25V * (1+R1/R2)
4	$\overline{SHDN}$	Shutdown Pin. Connect to 1.5V or higher to enable device (ON), 0.4V or lower to disable device (OFF)
5	V_{IN}	Input Supply Pin. Must be locally bypassed

Functional Block Diagram

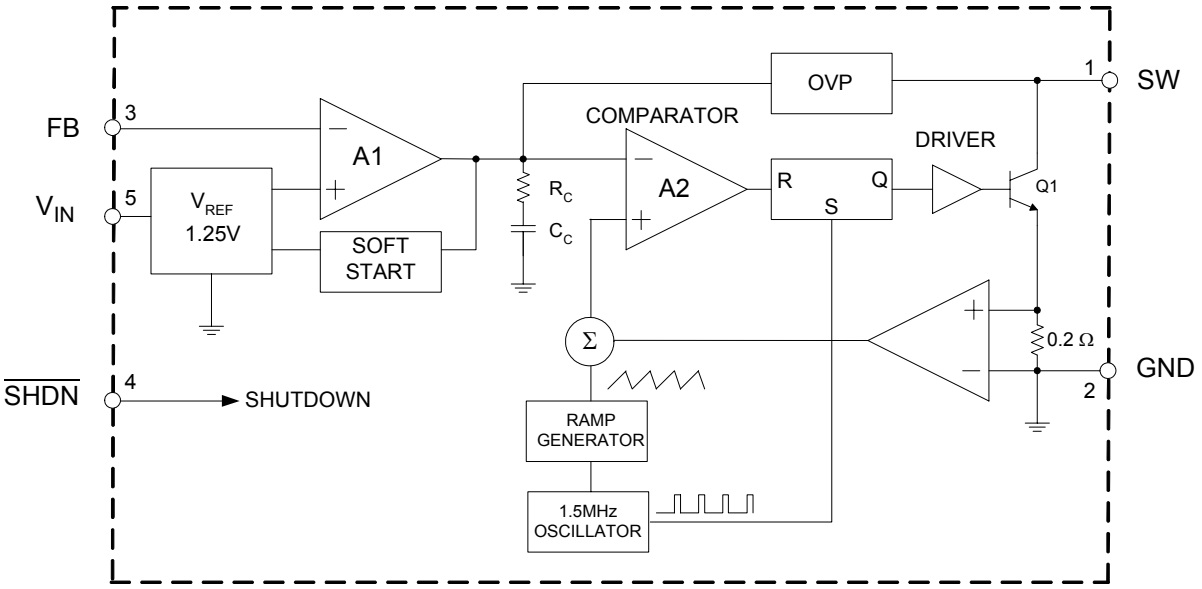
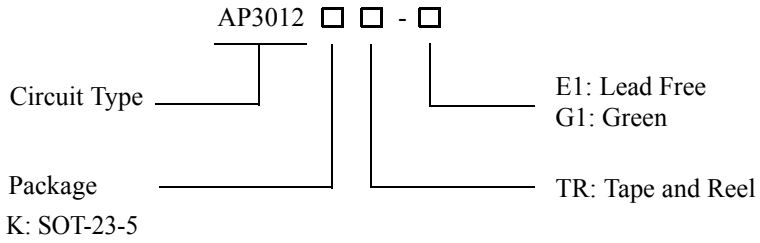


Figure 3. Functional Block Diagram of AP3012

Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
SOT-23-5	-40 to 85°C	AP3012KTR-E1	AP3012KTR-G1	E6B	G6B	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green package.

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	20	V
SW Voltage		38	V
FB Voltage		5	V
$\overline{SHDN}$ Voltage		16	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
Input Voltage	V_{IN}	2.6	16	V
Operating Temperature	T_{OP}	-40	85	°C

Electrical Characteristics

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Minimum Operating Voltage			2.6			V
Maximum Operating Voltage					16	V
Feedback Voltage	V_{FB}	V_{IN}=5V, V_{OUT}=24V, I_{OUT}=30mA	1.17	1.25	1.33	V
FB Pin Bias Current		V_{FB}=1.25V	10	45	100	nA
Supply Current	I_{CC}	$V_{\overline{SHDN}}$ =V_{FB}=V_{IN}, No switching		2.5	3.5	mA
Supply Current	I_Q	$V_{\overline{SHDN}}$ =0V, V_{FB}=0V		0.1	1.0	μA
Switching Frequency	f		1.1	1.5	1.9	MHz
Maximum Duty Cycle	D_{MAX}		85	90		%
Switching Current Limit		Duty Cycle=80%		500		mA
Switch VCESAT	V_{CESAT}	I_{SW}=250mA		300		mV
Switch Leakage Current		V_{SW}=5V		0.01	5	μA
$\overline{SHDN}$ Voltage High (ON)	V_{TH}		1.5			V
$\overline{SHDN}$ Voltage Low (OFF)	V_{TL}				0.4	
$\overline{SHDN}$ Pin Bias Current				55		μA
OVP Voltage Threshold	V_{OVP}			29		V
Soft-Start Time				550		μS
Thermal Resistance (Junction to Case)	θ_{JC}			69.57		°C/W

Typical Performance Characteristics

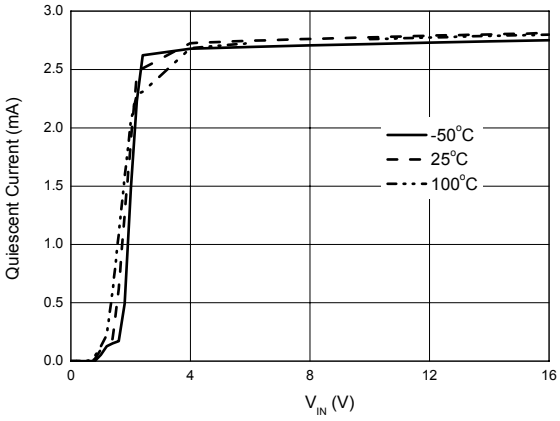


Figure 4. Quiescent Current vs. Input Voltage

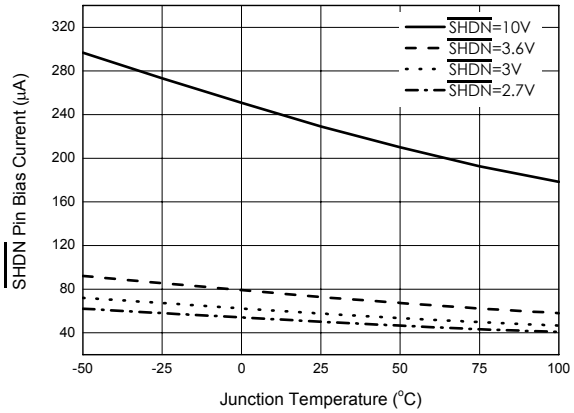


Figure 5. $\overline{SHDN}$ Pin Bias Current vs. Junction Temperature

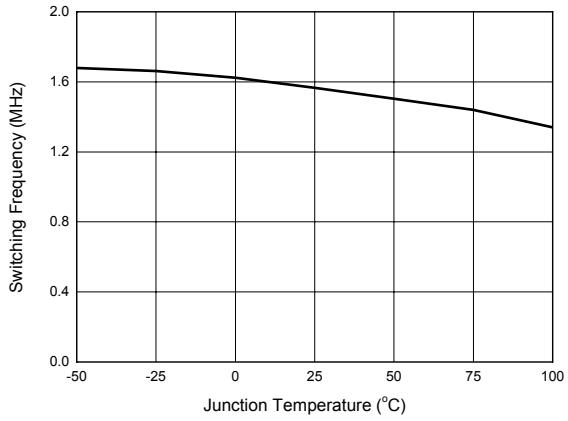


Figure 6. Switching Frequency vs. Junction Temperature

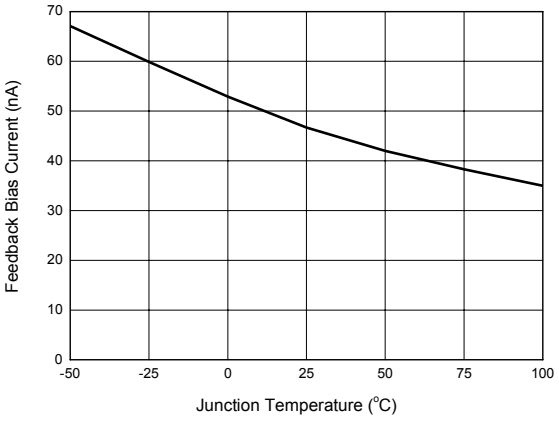


Figure 7. Feedback Bias Current vs. Junction Temperature

Typical Performance Characteristics (Continued)

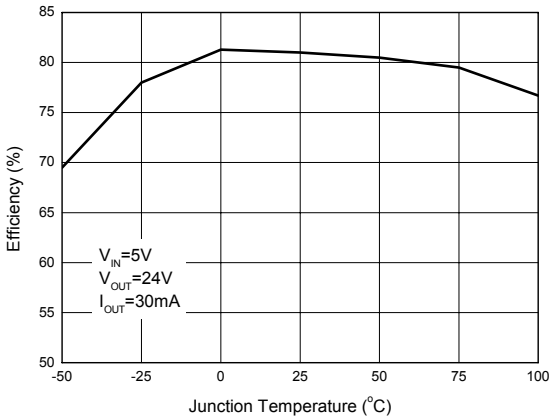


Figure 8. Efficiency vs. Junction Temperature

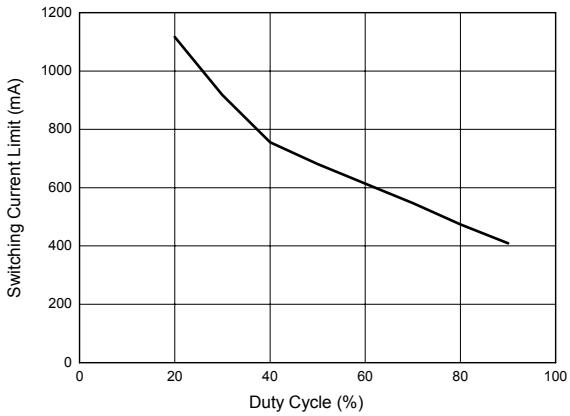


Figure 9. Switching Current Limit vs. Duty Cycle

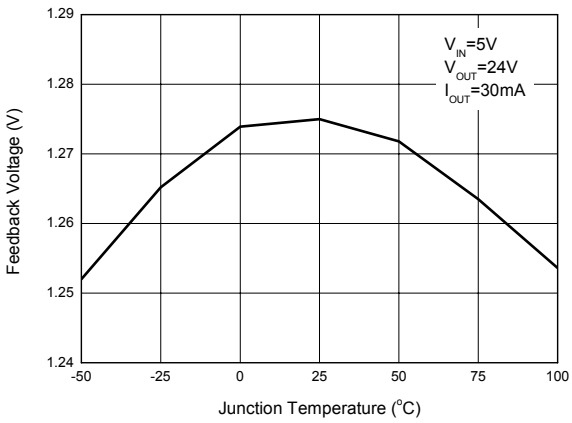


Figure 10. Feedback Voltage vs. Junction Temperature

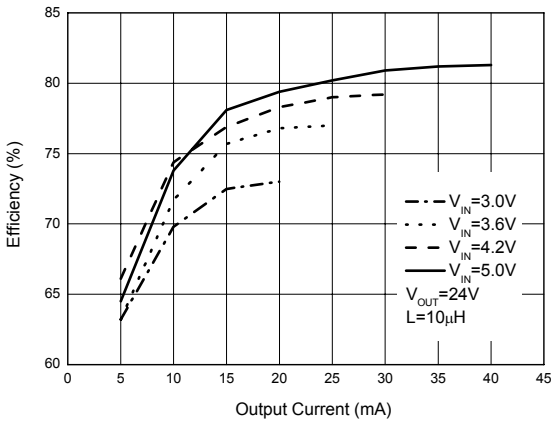
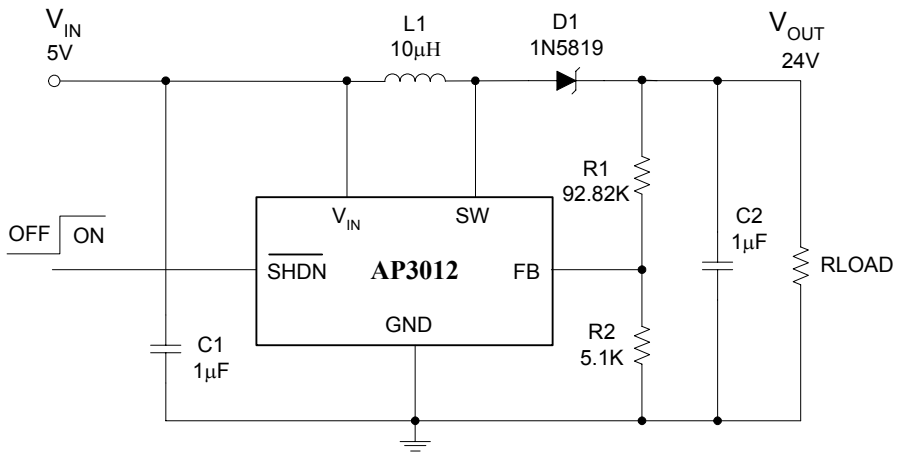


Figure 11. Efficiency vs. Output Current

Typical Application

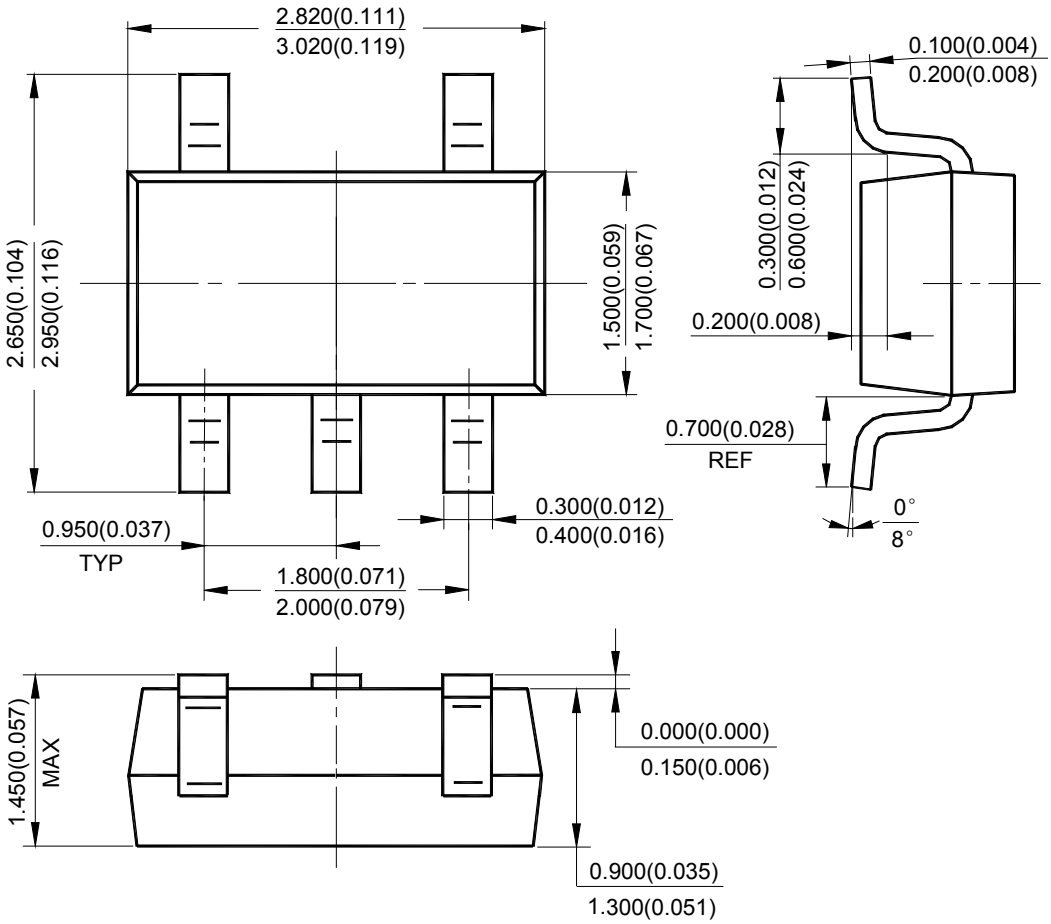


Note: V_{OUT}=1.25*(1+R1/R2)=1.25*19.2=24V
C: X5R or X7R Dielectric
L: SUMIDA CDTH3D14/HPNP-100NC or Equivalent

Figure 12. LCD/OLED Display Bias Driver Typical Circuit

Mechanical Dimensions

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



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