600mA LOW DROPOUT LINEAR REGULATOR AP2316

General Description

The AP2316 is a series of low dropout three-terminal regulators with a dropout of 1.1V at 600mA output current.

This product has been optimized for low voltage where transient response and minimum input voltage are critical. The AP2316 provides current limit and thermal shutdown. Its circuit includes a trimmed bandgap reference to assure output voltage accuracy to be within ±1%. On-chip thermal shutdown provides protection against any combination of overload and ambient temperatures that would create excessive junction temperatures.

The AP2316 is available in 2.5V and 3.3V versions. The fixed versions integrate the corresponding resistor divider.

The AP2316 is available in the industry standard SOT-89-3 power package.

Features

- Low Dropout Voltage: 1.1V at 600mA Output Current
- Output Noise from 10Hz to 10KHz: 0.003% of V_{OUT}
- PSRR at I_{OUT}=300mA and f=120Hz: 75dB
- Output Voltage Accuracy: ± 1%
- On-chip Thermal Shutdown
- Maximum Quiescent Current: I_{QMAX}=5mA
- ESD (Human Body Model): 3.5KV
- Operation Junction Temperature: -40 to 125°C

Applications

- DVD/CD-ROM
- USB Device
- Add-on Card
- DVD Player
- PC Motherboard

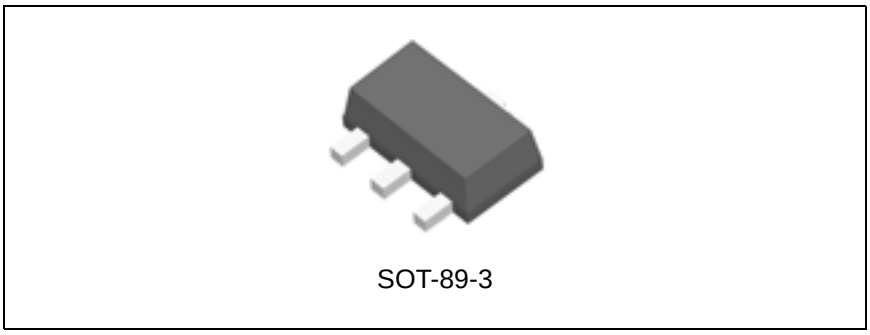


Figure 1. Package Type of AP2316

Pin Configuration

R Package
(SOT-89-3)

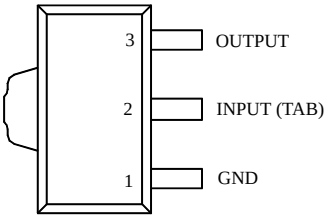


Figure 2. Pin Configuration of AP2316 (Top View)

Functional Block Diagram

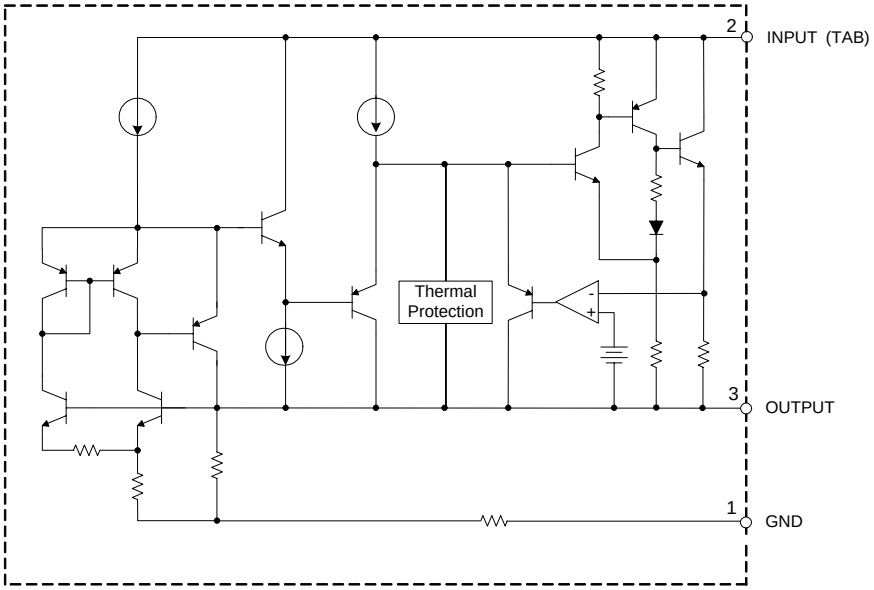
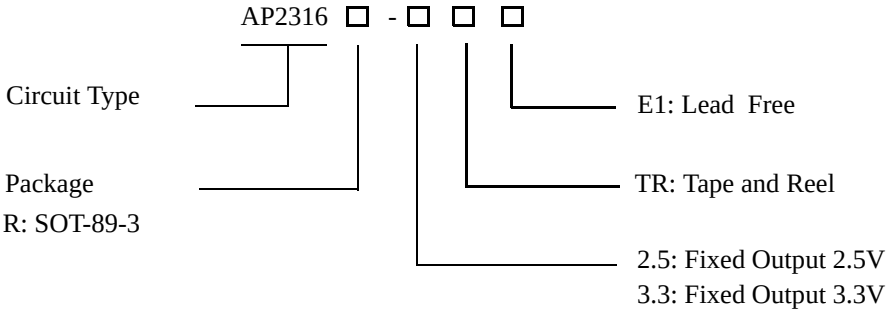


Figure 3. Functional Block Diagram of AP2316

Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-89-3	-40 to 125°C	AP2316R-2.5TRE1	E27H	Tape & Reel
		AP2316R-3.3TRE1	E27J	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
Operating Junction Temperature	T_J	150		°C
Storage Temperature Range	T_{STG}	-65 to 150		°C
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260		°C
Thermal Resistance (Note 2)	θ_{JA}	SOT-89-3	165	°C/W
ESD (Human Body Model)	ESD	3500		V
ESD (Machine Model)	ESD	350		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.

Note 2: Absolute maximum ratings indicate limits beyond which damage to the component may occur. Electrical specifications do not apply when operating the device outside of its operating ratings. The maximum allowable power dissipation is a function of the maximum junction temperature, $T_{J(max)}$, the junction-to-ambient thermal resistance, θ_{JA}, and the ambient temperature, T_A. The maximum allowable power dissipation at any ambient temperature is calculated using: $P_{D(max)}=(T_{J(max)} - T_A)/\theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{IN}		12	V
Operating Junction Temperature Range	T_J	-40	125	°C

Electrical Characteristics

Operating Conditions: V_{IN}≤10V, T_J=25°C, unless otherwise specified. (P≤maximum power dissipation)
Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, -40°C to 125°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}	AP2316-2.5 I_{OUT}=10mA, V_{IN}=4.5V, T_J=25°C 10mA≤I_{OUT}≤600mA, 3.9V≤ V_{IN} ≤10V	2.475 **2.450**	2.5 2.5	2.525 **2.550**	V
		AP2316-3.3 I_{OUT}=10mA, V_{IN}=5.0V, T_J=25°C 10mA≤I_{OUT}≤ 600mA, 4.75V≤V_{IN}≤10V	3.267 **3.235**	3.3 3.3	3.333 **3.365**	V
Line Regulation	ΔV_{OUT}	AP2316-2.5 I_{OUT}=10mA, 1.5V≤V_{IN}-V_{OUT}≤10V		1	**6**	mV
		AP2316-3.3 I_{OUT}=10mA, 1.5V≤V_{IN}-V_{OUT}≤10V		1	**6**	mV
Load Regulation	ΔV_{OUT}	AP2316-2.5 (V_{IN}-V_{OUT})=2V, 10mA≤I_{OUT}≤600mA		1	**10**	mV
		AP2316-3.3 (V_{IN}-V_{OUT})=2V, 10mA≤ I_{OUT}≤600mA		1	**10**	mV
Dropout Voltage	V_{DROP}	ΔV_{OUT}=1%, I_{OUT}=0.6A		1.1	**1.3**	V
Current Limit	I_{LIMIT}	(V_{IN}-V_{OUT})=2V	0.75	0.9		A
Quiescent Current	I_Q	V_{IN}=V_{OUT}+1.25V			**5**	mA
Ripple Rejection	PSRR	f=120Hz, C_{OUT}=22μF (V_{IN}-V_{OUT})=3V, I_{OUT}=300mA	**60**	75		dB
Temperature Stability				**0.5**		%
Long-Term Stability		T_A=125°C, 1000hrs.		0.3		%
RMS Output Noise (% of V_{OUT})		T_A=25°C, 10Hz≤f≤10KHz		0.003		%
Thermal Shutdown		Junction Temperature		150		°C
Thermal Shutdown Hysteresis				25		°C

Typical Performance Characteristics

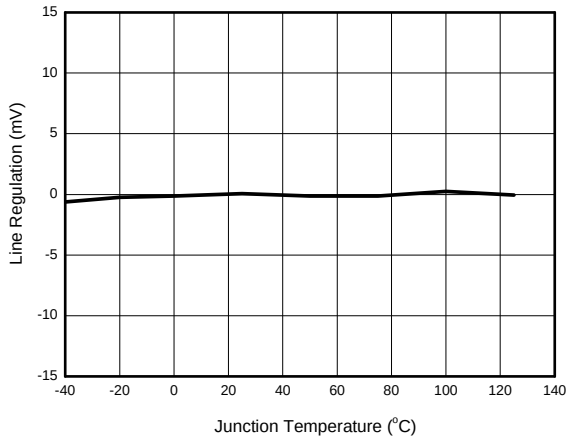


Figure 4. Line Regulation vs. Junction Temperature

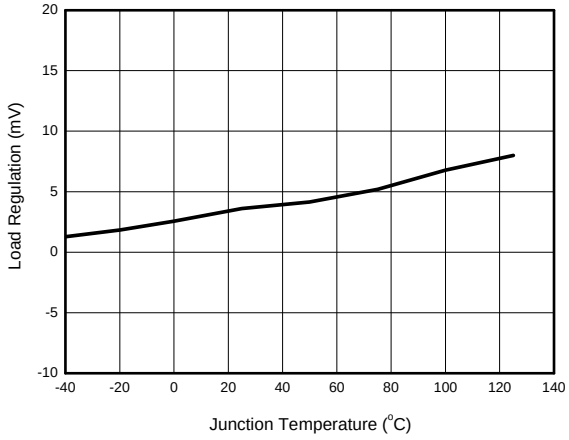


Figure 5. Load Regulation vs. Junction Temperature

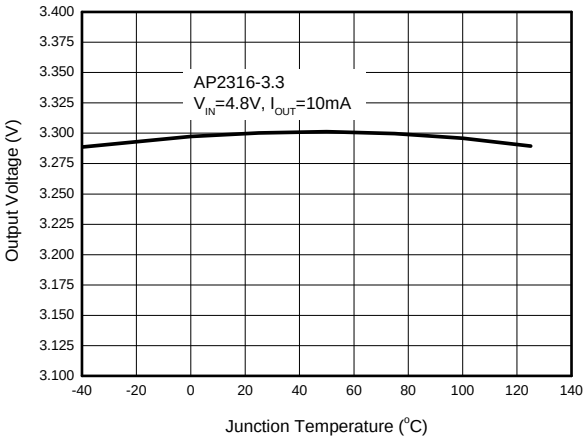


Figure 6. Output Voltage vs. Junction Temperature

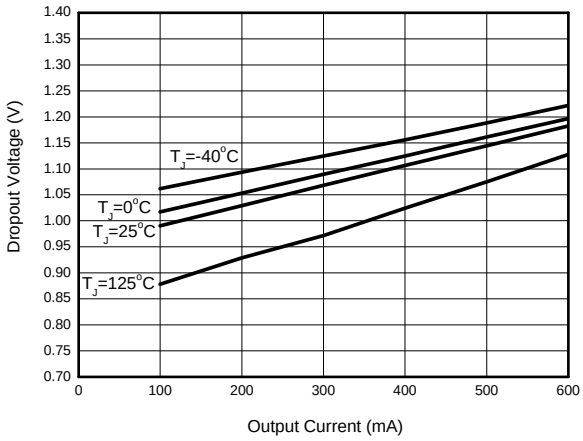


Figure 7. Dropout Voltage vs. Output Current

Typical Performance Characteristics (Continued)

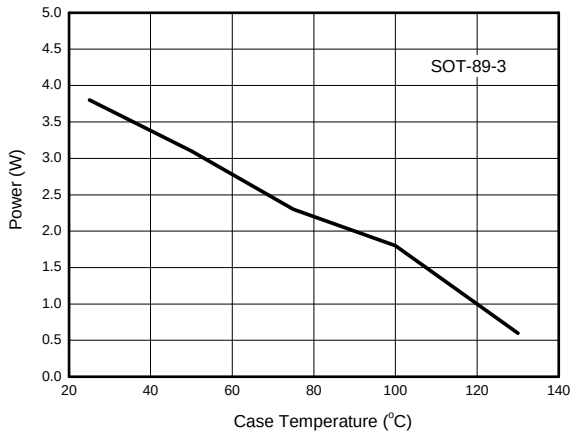


Figure 8. Maximum Power Dissipation

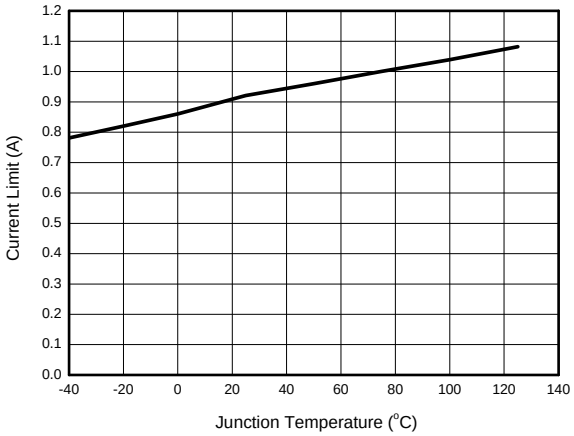


Figure 9. Current Limit vs. Junction Temperature

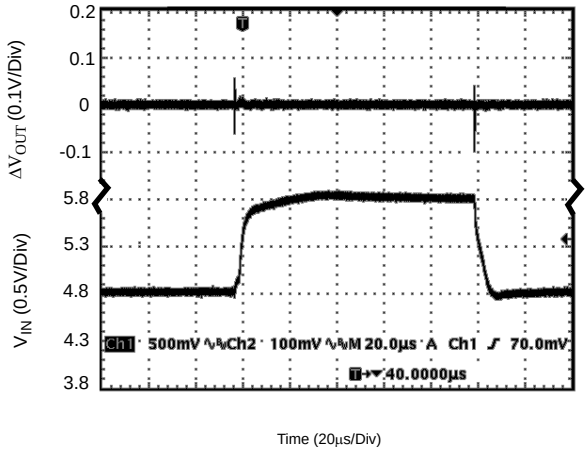


Figure 10. Line Transient Response
(Conditions: V_{IN}=4.8 to 5.8V, V_{OUT}=3.33V, I_{OUT}=0.1A, C_{IN}=1µF, C_{OUT}=10µF)

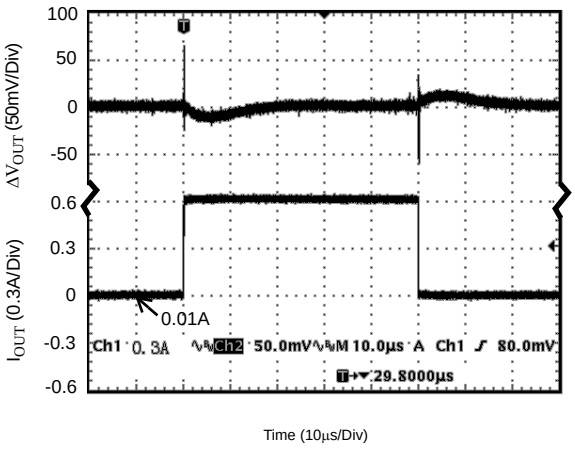


Figure 11. Load Transient Response
(Conditions: V_{IN}=4.8V, V_{OUT}=3.33V, I_{OUT}=0.01 to 0.6A, C_{IN}=C_{OUT}=10µF)

Typical Performance Characteristics (Continued)

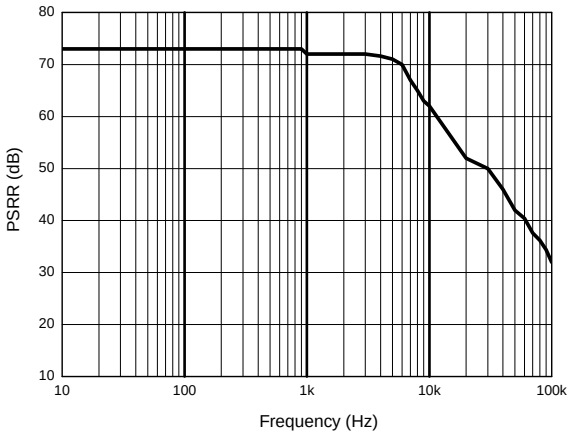


Figure 12. PSRR vs. Frequency

Typical Application

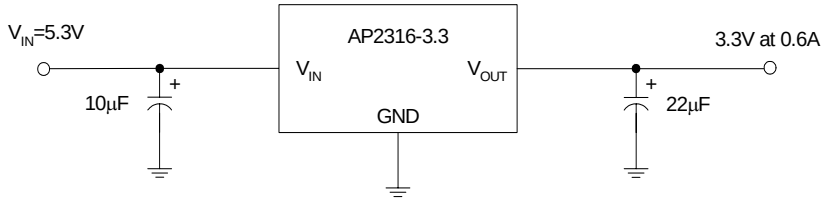
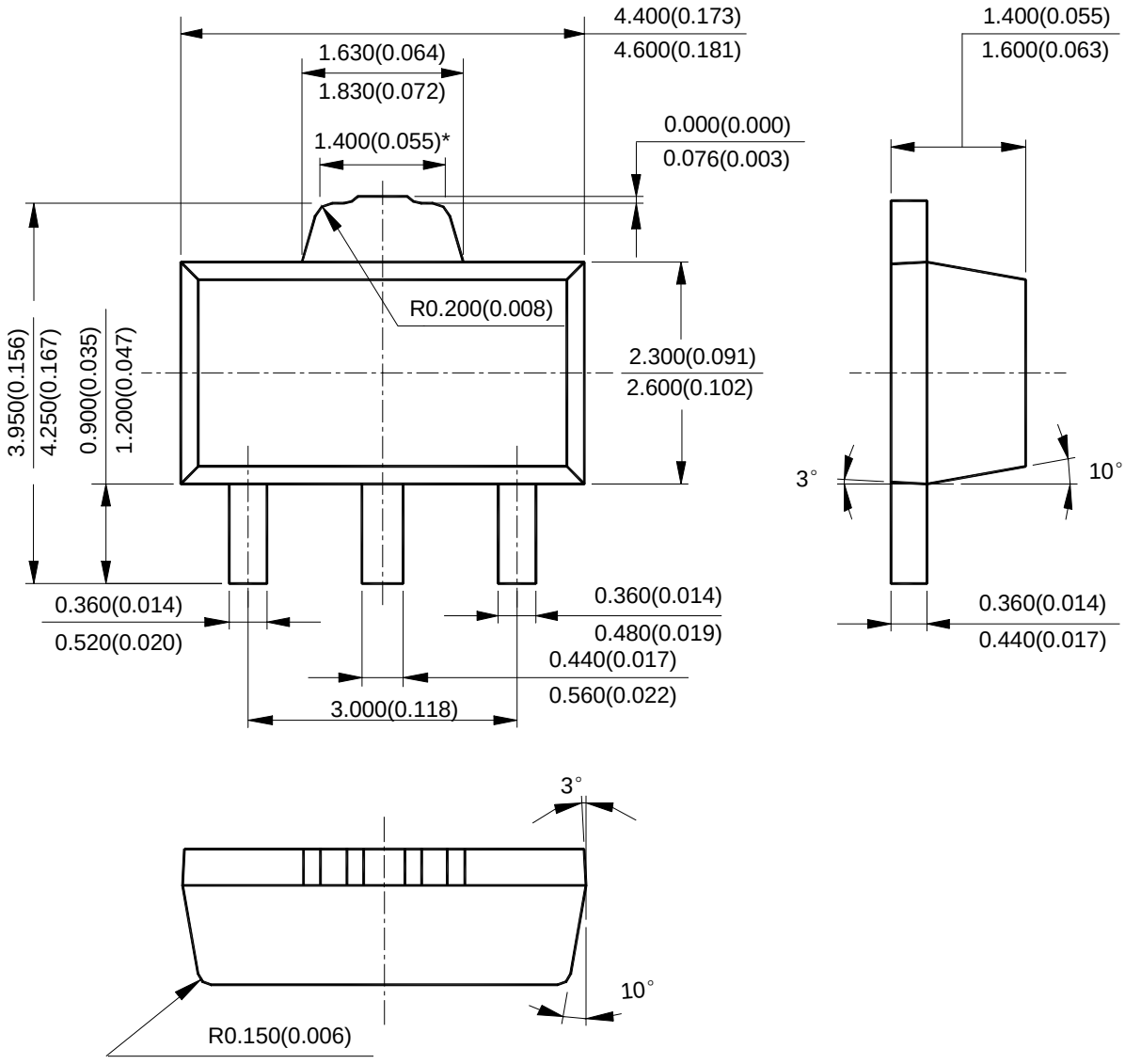


Figure 13. Typical Application of AP2316

Mechanical Dimensions

SOT-89-3 **Unit: mm(inch)**



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