

Description

The AP2317 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 AP2317 provides current limit and thermal shutdown. Its circuit includes a trimmed bandgap reference to assure output voltage accuracy to be within $\pm 1\%$. On-chip thermal shutdown provides protection against any combination of overload and ambient temperatures that would create excessive junction temperatures.

The AP2317 is available in 2.5V and 3.3V versions. The fixed versions integrate the corresponding resistor divider. It is also available in an adjustable version which can set the output voltage with two external resistors.

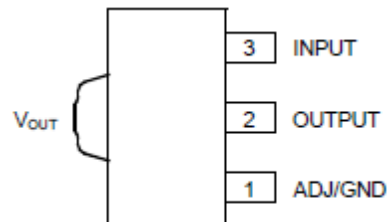
The AP2317 is available in the industry standard SOT-89, SOT-223 and TO-263-3 (for 3.3V only) power packages.

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: $\pm 1\%$
- On-chip Thermal Shutdown
- Maximum Quiescent Current: $I_{QMAX} = 5mA$
- ESD (Human Body Model): 3.5kV
- Operation Junction Temperature: -40 to $+125^{\circ}C$

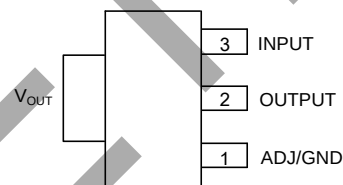
Pin Assignments

(Top View)



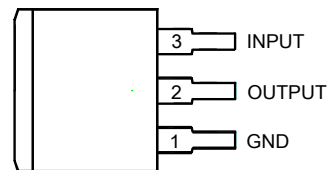
SOT-89

(Top View)



SOT-223

(Top View)

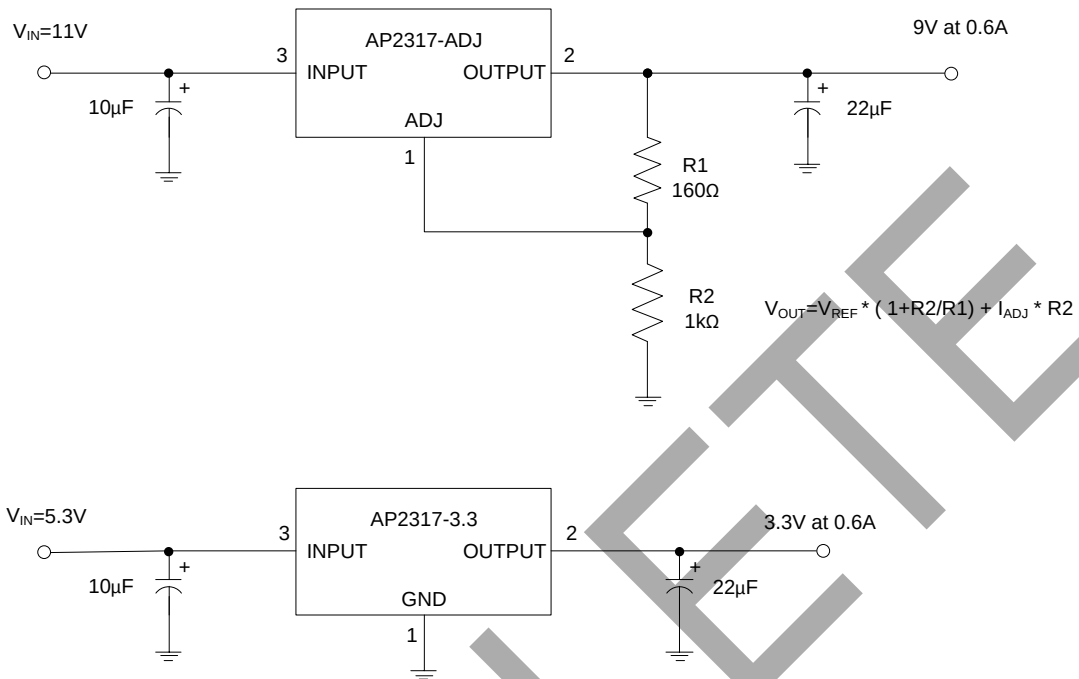


TO-263-3

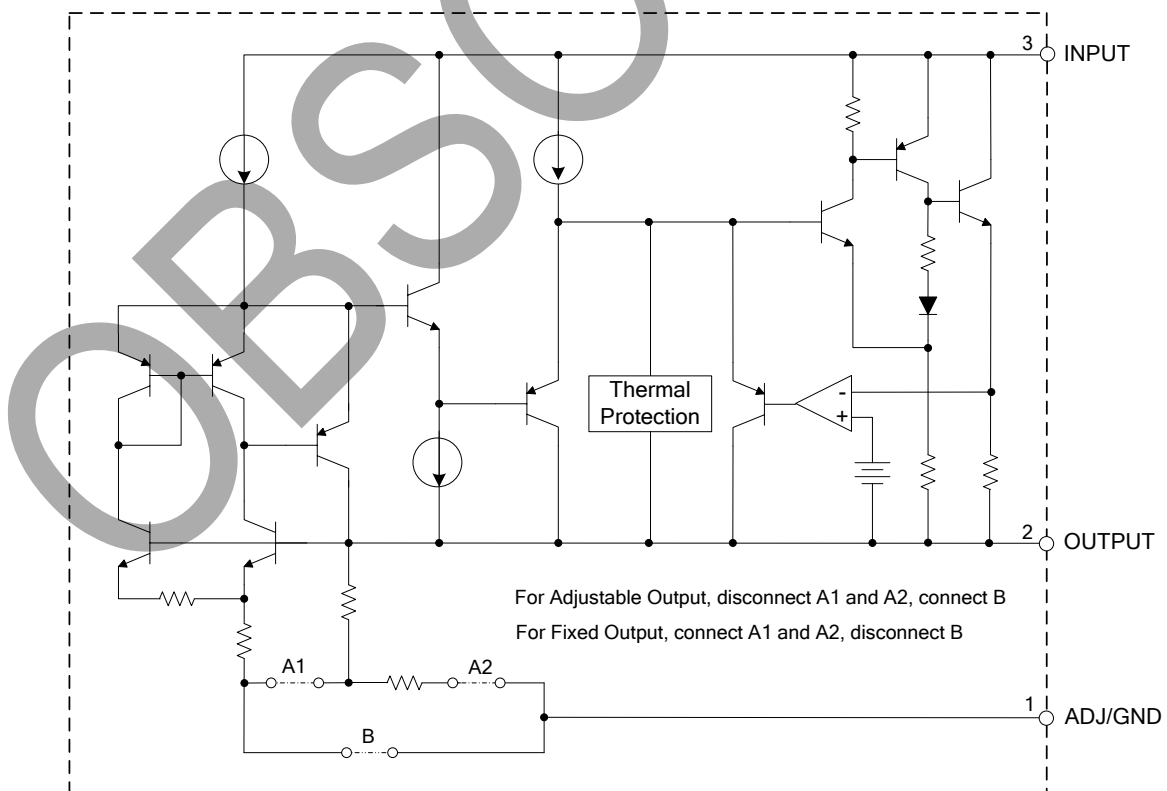
Applications

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

Typical Applications Circuit



Functional Block Diagram



Absolute Maximum Ratings (Note 1)

Symbol	Parameter	Rating		Unit
V_{IN}	Input Voltage	15		V
T_J	Operating Junction Temperature	+150		°C
T_{STG}	Storage Temperature Range	-65 to +150		°C
T_{LEAD}	Lead Temperature (Soldering, 10sec)	+260		°C
θ_{JA}	Thermal Resistance (Note 2)	SOT-223	120	°C/W
		SOT-89	165	
		TO-263-3	80	
ESD	ESD (Human Body Model)	3500		V
ESD	ESD (Machine Model)	400		V

Notes: 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.

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

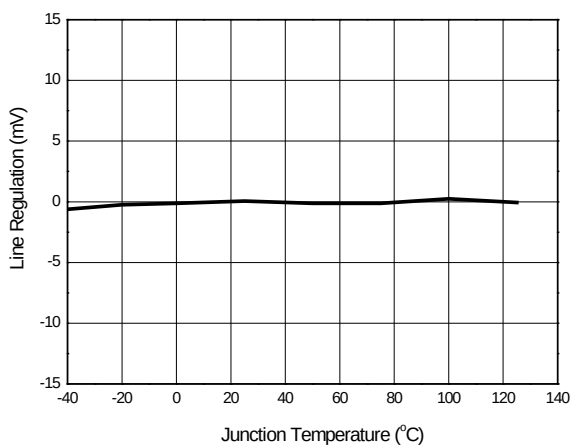
Symbol	Parameter	Min	Max	Unit
V_{IN}	Input Voltage	—	12	V
T_J	Operating Junction Temperature Range	-40	+125	°C

Electrical Characteristics (Operating Conditions: $V_{IN} \leq 10V$, $T_J = +25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation) Limits appearing in **Boldface** type apply the entire junction temperature range for operation, $-40^\circ C$ to $+125^\circ C$)

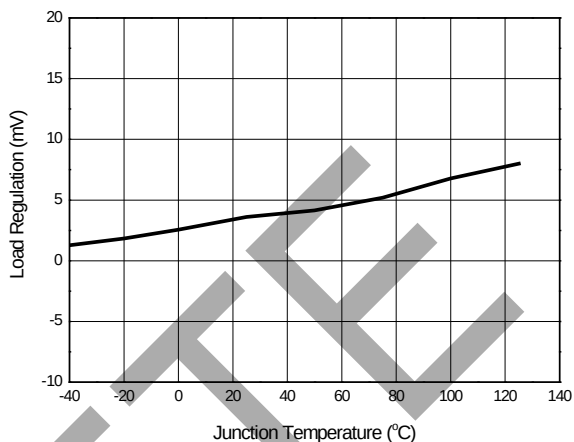
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{REF}	Reference Voltage	AP2317-ADJ $I_{OUT} = 10mA$, $V_{IN}-V_{OUT} = 2V$, $T_J = +25^\circ C$ $10mA \leq I_{OUT} \leq 600mA$, $1.4V \leq V_{IN}-V_{OUT} \leq 8V$ $P \leq$ maximum power dissipation	1.238 1.225	1.250 1.250	1.262 1.270	V
V_{OUT}	Output Voltage	AP2317-2.5 $I_{OUT} = 10mA$, $V_{IN} = 4.5V$, $T_J = +25^\circ C$ $10mA \leq I_{OUT} \leq 600mA$, $3.9V \leq V_{IN} \leq 10V$	2.475 2.450	2.5 2.5	2.525 2.550	V
		AP2317-3.3 $I_{OUT} = 10mA$, $V_{IN} = 5.0V$, $T_J = +25^\circ C$ $10mA \leq I_{OUT} \leq 600mA$, $4.75V \leq V_{IN} \leq 10V$	3.267 3.235	3.3 3.3	3.333 3.365	V
ΔV_{OUT}	Line Regulation	AP2317-ADJ $I_{OUT} = 10mA$, $1.5V \leq V_{IN}-V_{OUT} \leq 10V$	—	0.035	0.2	%
		AP2317-2.5 $I_{OUT} = 10mA$, $1.5V \leq V_{IN}-V_{OUT} \leq 10V$	—	1	6	mV
		AP2317-3.3 $I_{OUT} = 10mA$, $1.5V \leq V_{IN}-V_{OUT} \leq 10V$	—	1	6	mV
ΔV_{OUT}	Load Regulation	AP2317-ADJ ($V_{IN}-V_{OUT}$) = 2V, $10mA \leq I_{OUT} \leq 600mA$	—	0.2	0.4	%
		AP2317-2.5 ($V_{IN}-V_{OUT}$) = 2V, $10mA \leq I_{OUT} \leq 600mA$	—	1	10	mV
		AP2317-3.3 ($V_{IN}-V_{OUT}$) = 2V, $10mA \leq I_{OUT} \leq 600mA$	—	1	10	mV
V_{DROP}	Dropout Voltage	$\Delta V_{REF} = 1\%$, $I_{OUT} = 0.6A$	—	1.1	1.3	V
I_{LIMIT}	Current Limit	($V_{IN}-V_{OUT}$) = 2V	0.66	0.9	—	A
I_{ADJ}	Adjust Pin Current	—	—	60	120	μA
ΔI_{ADJ}	Adjust Pin Current Change	$1.4V \leq (V_{IN}-V_{OUT}) \leq 10$, $10mA \leq I_{OUT} \leq 600mA$	—	0.2	5	μA
I_{LOAD}	Minimum Load	$1.5V \leq (V_{IN}-V_{OUT}) \leq 10V$ (ADJ only)	—	1.7	5	mA
I_Q	Quiescent Current	$V_{IN} = V_{OUT} + 1.25V$	—	4	—	mA
PSRR	Ripple Rejection	$f = 120Hz$, $C_{OUT} = 22\mu F$ Tantalum ($V_{IN}-V_{OUT}$) = 3V, $I_{OUT} = 300mA$	60	75	—	dB
—	Temperature Stability	—	—	0.5	—	%
—	Long-Term Stability	$T_A = +125^\circ C$, 1000hrs.	—	0.3	—	%
—	RMS Output Noise	$T_A = +25^\circ C$, $10Hz \leq f \leq 10kHz$	—	0.003	—	%
—	Thermal Shutdown	Junction Temperature	—	+150	—	$^\circ C$
—	Thermal Shutdown Hysteresis	—	—	+25	—	$^\circ C$
θ_{JC}	Thermal Resistance	SOT-89	—	38.6	—	$^\circ C/W$
		SOT-223	—	32.7	—	
		TO-263-3	—	32.7	—	

Performance Characteristics

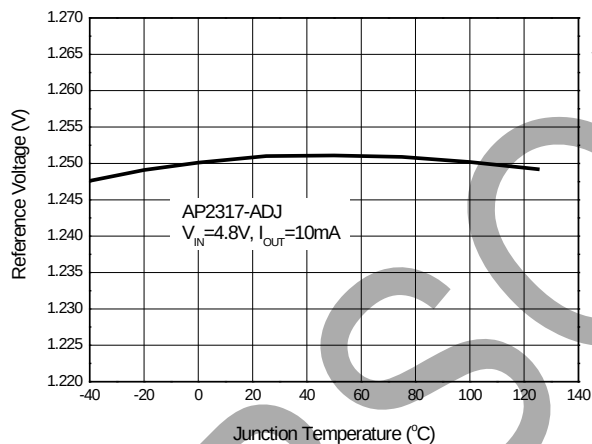
Line Regulation vs. Junction Temperature



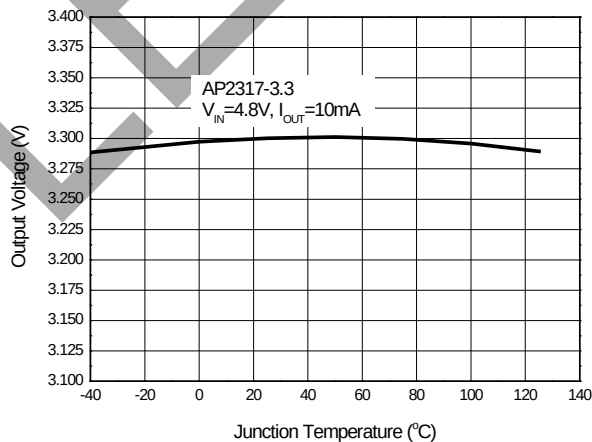
Load Regulation vs. Junction Temperature



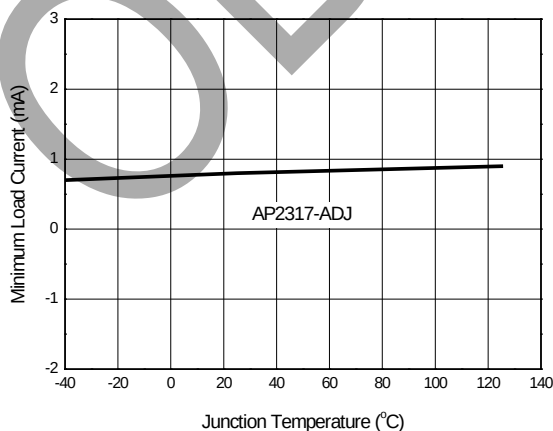
Reference Voltage vs. Junction Temperature



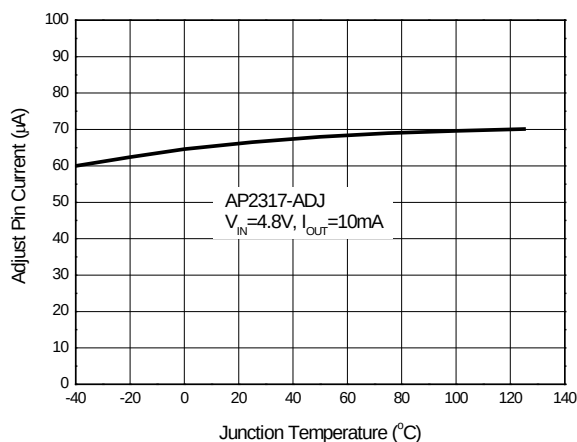
Output Voltage vs. Junction Temperature



Minimum Load Current vs. Junction Temperature

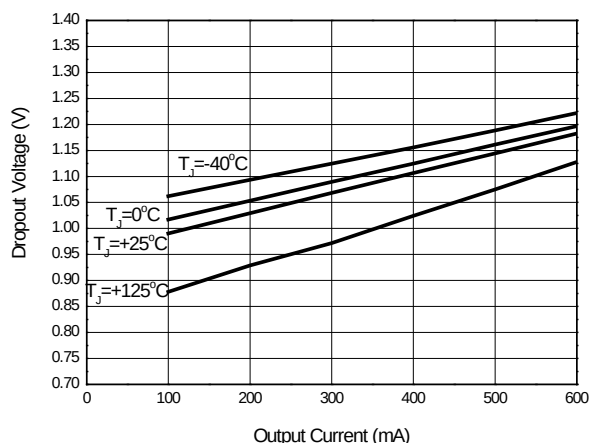


Adjust Pin Current vs. Junction Temperature

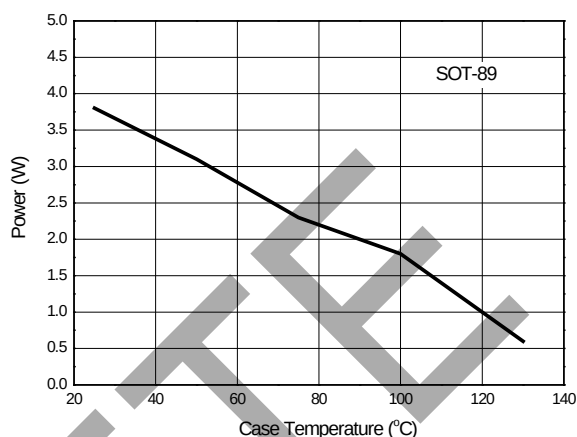


Performance Characteristics (Cont.)

Dropout Voltage vs. Output Current

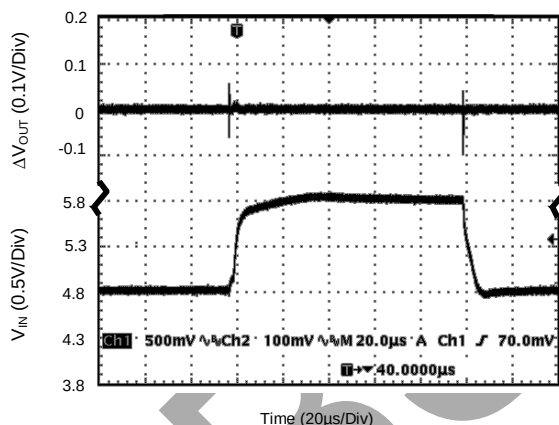


Maximum Power Dissipation



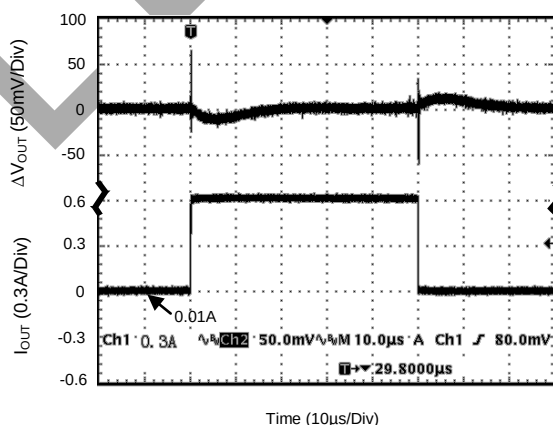
Line Transient Response

(Conditions: $V_{IN}=4.8V$ to $5.8V$, $V_{OUT}=3.33V$, $I_{OUT}=0.1A$, $C_{IN}=1\mu F$, $C_{OUT}=10\mu F$)

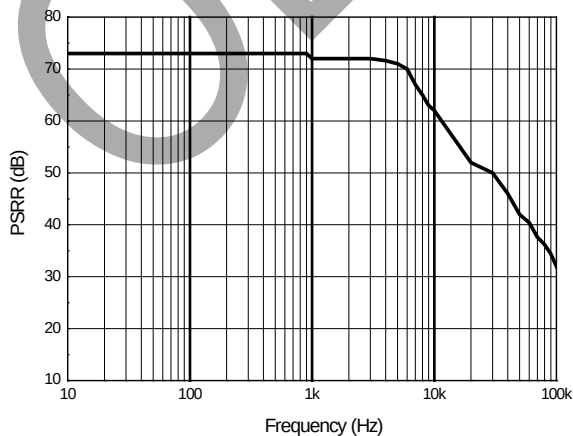


Load Transient Response

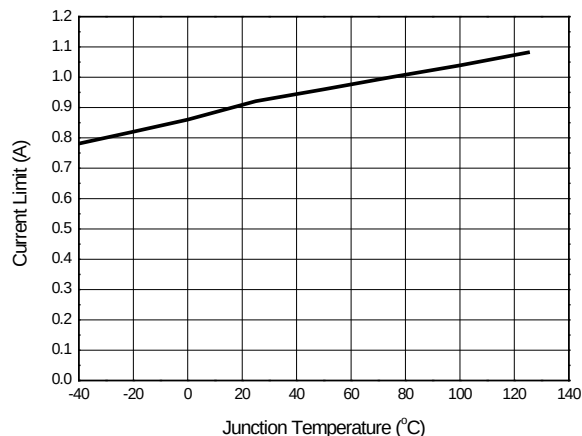
(Conditions: $V_{IN}=4.8V$, $V_{OUT}=3.33V$, $I_{OUT}=0.01$ to $0.6A$, $C_{IN}=C_{OUT}=10\mu F$)



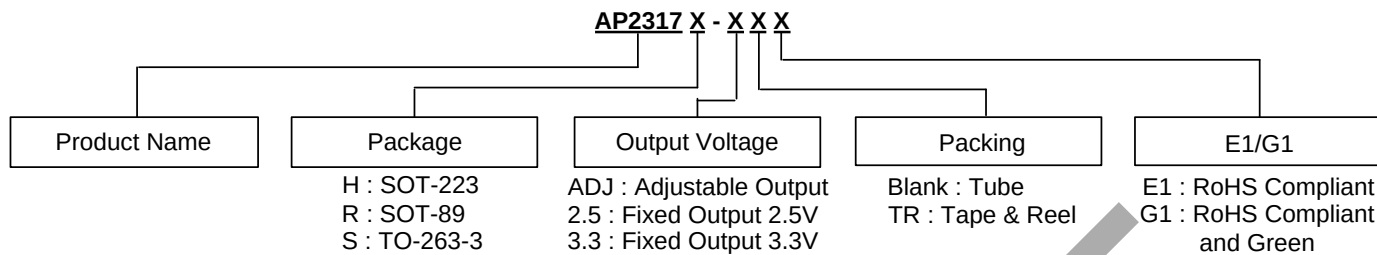
PSRR vs. Frequency



Current Limit vs. Junction Temperature



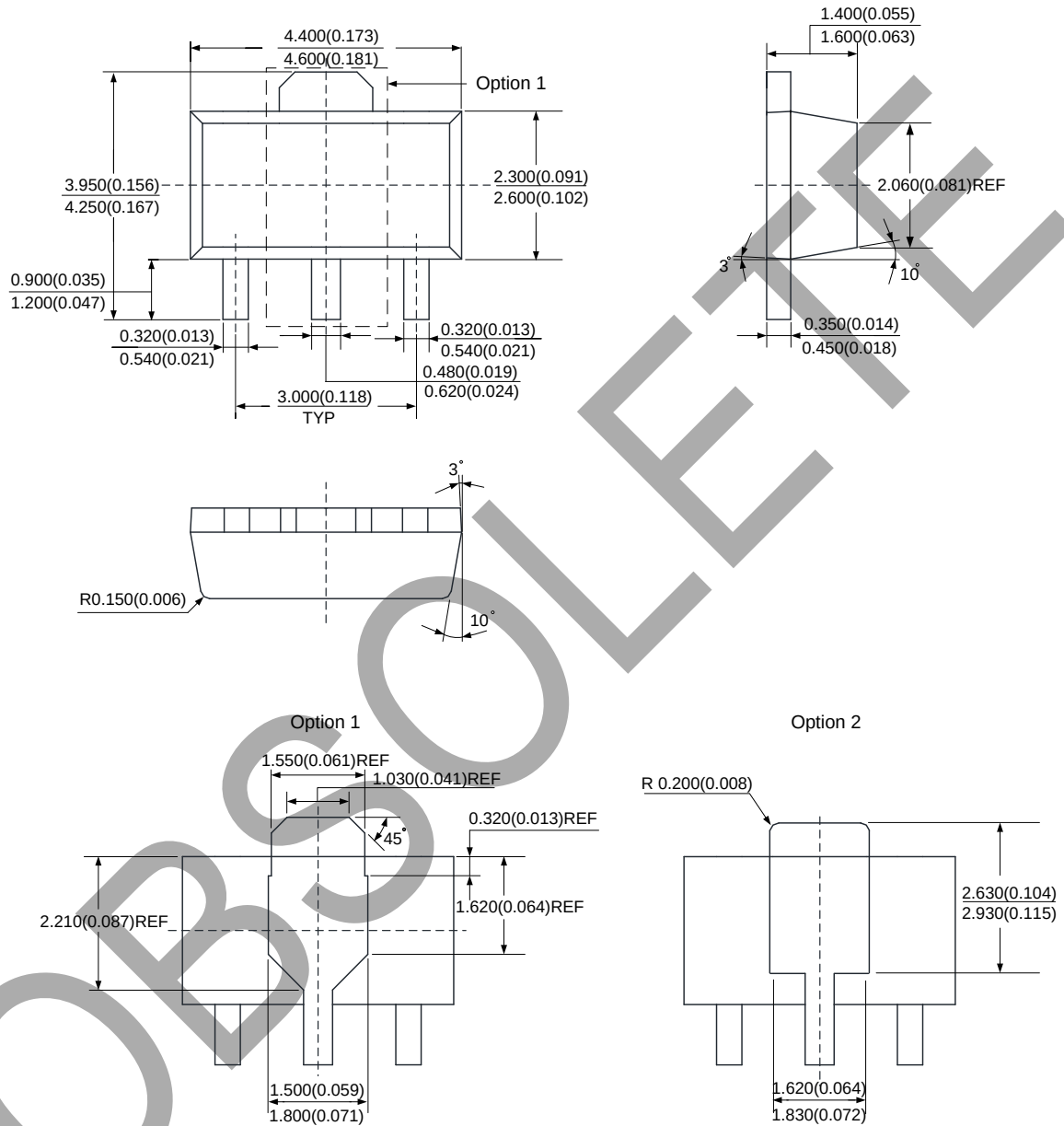
Ordering Information



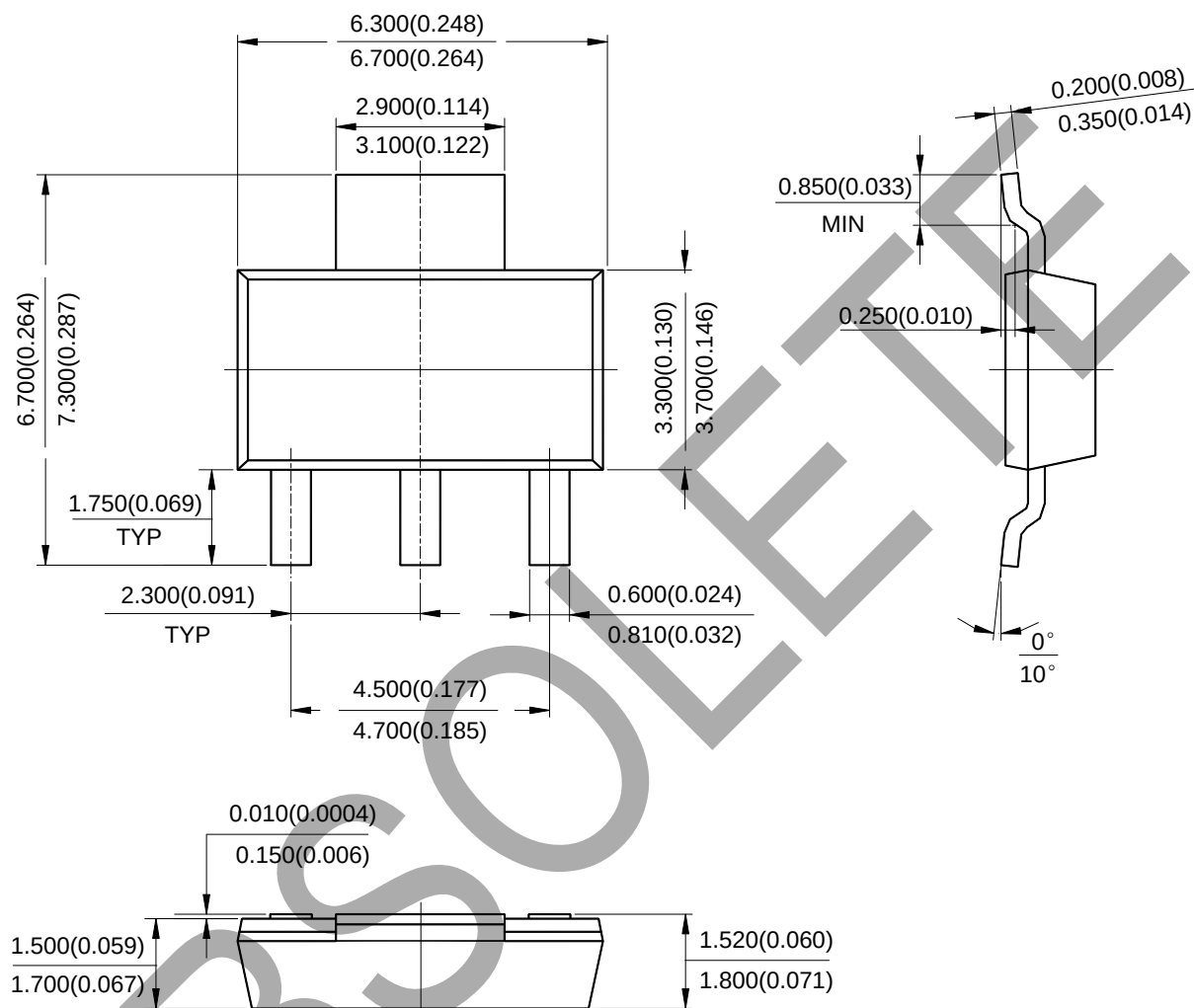
Package	Temperature Range	Part Number		Marking ID		Packing
		RoHS Compliant	RoHS Compliant and Green	RoHS Compliant	RoHS Compliant and Green	
SOT-89	-40 to +125°C	AP2317R-ADJTRE1	AP2317R-ADJTRG1	E27A	G27A	Tape & Reel
		AP2317R-2.5TRE1	AP2317R-2.5TRG1	E27B	G27B	Tape & Reel
		AP2317R-3.3TRE1	AP2317R-3.3TRG1	E27C	G27C	Tape & Reel
SOT-223	-40 to +125°C	AP2317H-ADJTRE1	AP2317H-ADJTRG1	EH27A	GH27A	Tape & Reel
		AP2317H-2.5TRE1	AP2317H-2.5TRG1	EH27B	GH27B	Tape & Reel
		AP2317H-3.3TRE1	AP2317H-3.3TRG1	EH27C	GH27C	Tape & Reel
TO-263-3	-40 to +125°C	AP2317S-3.3E1	AP2317S-3.3G1	AP2317S-3.3E1	AP2317S-3.3G1	Tube
		AP2317S-3.3TRE1	AP2317S-3.3TRG1	AP2317S-3.3E1	AP2317S-3.3G1	Tape & Reel

Package Outline Dimensions (All dimensions in mm(inch).)

(1) Package Type: SOT-89

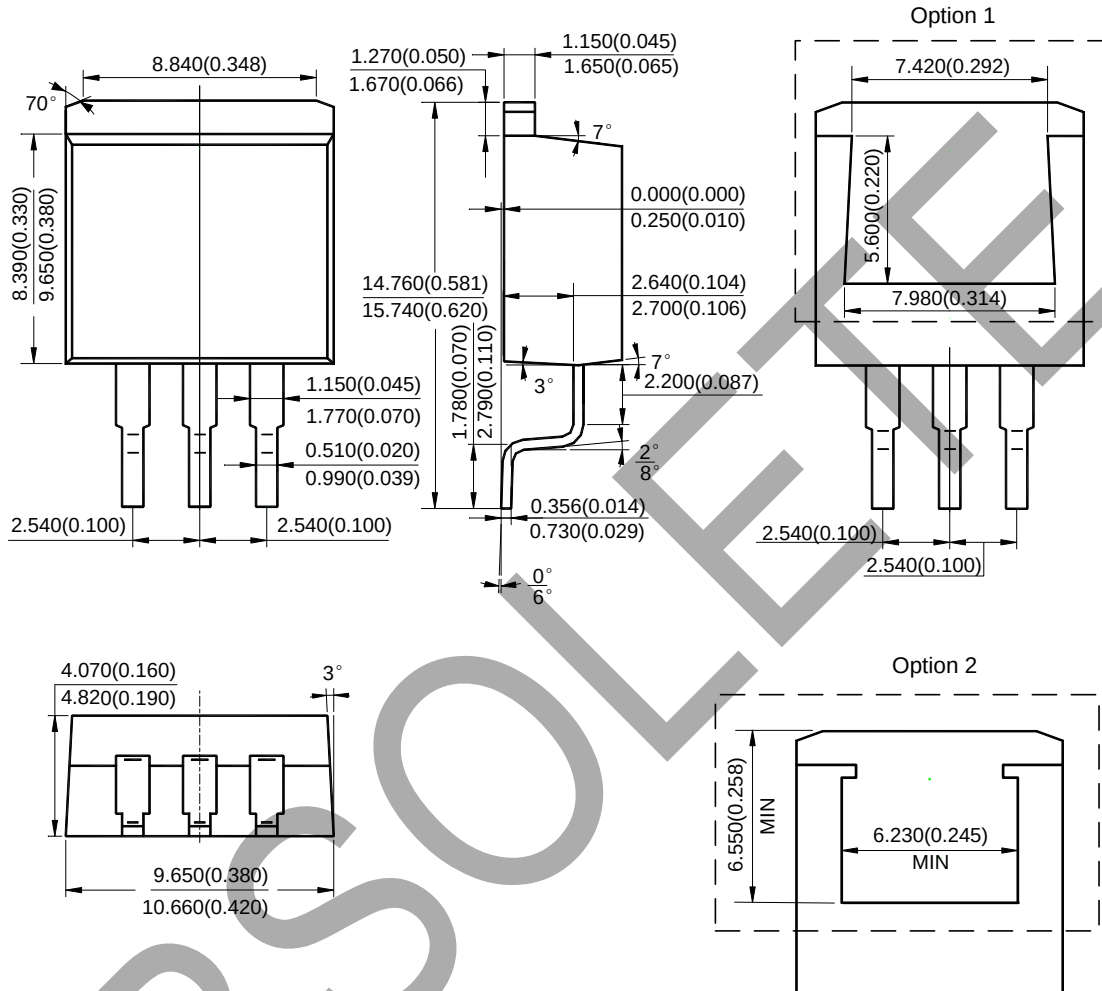


(2) **Package Type:** SOT-223



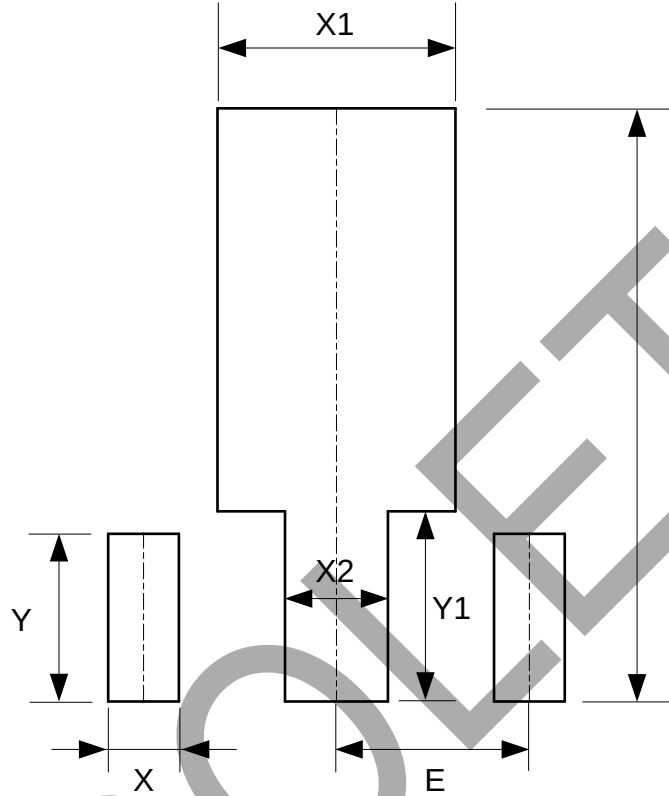
Package Outline Dimensions (Cont. All dimensions in mm(inch).)

(3) Package Type: TO-263-3



Suggested Pad Layout

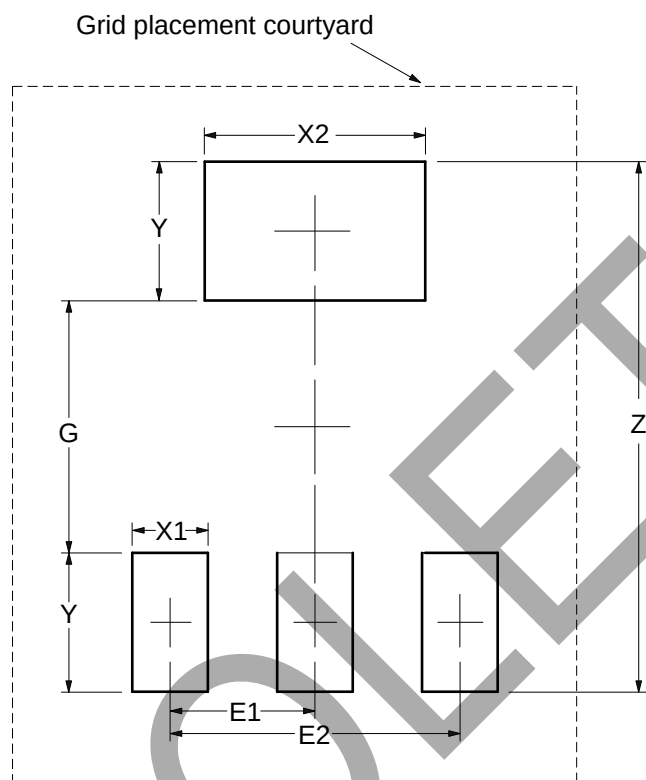
(1) Package Type: SOT-89



Dimensions	Z (mm)/(inch)	X (mm)/(inch)	X1 (mm)/(inch)	X2 (mm)/(inch)	Y (mm)/(inch)	Y1 (mm)/(inch)	E (mm)/(inch)
Value	4.600/0.181	0.550/0.022	1.850/0.073	0.800/0.031	1.300/0.051	1.475/0.058	1.500/0.059

Suggested Pad Layout (Cont.)

(2) Package Type: SOT-223

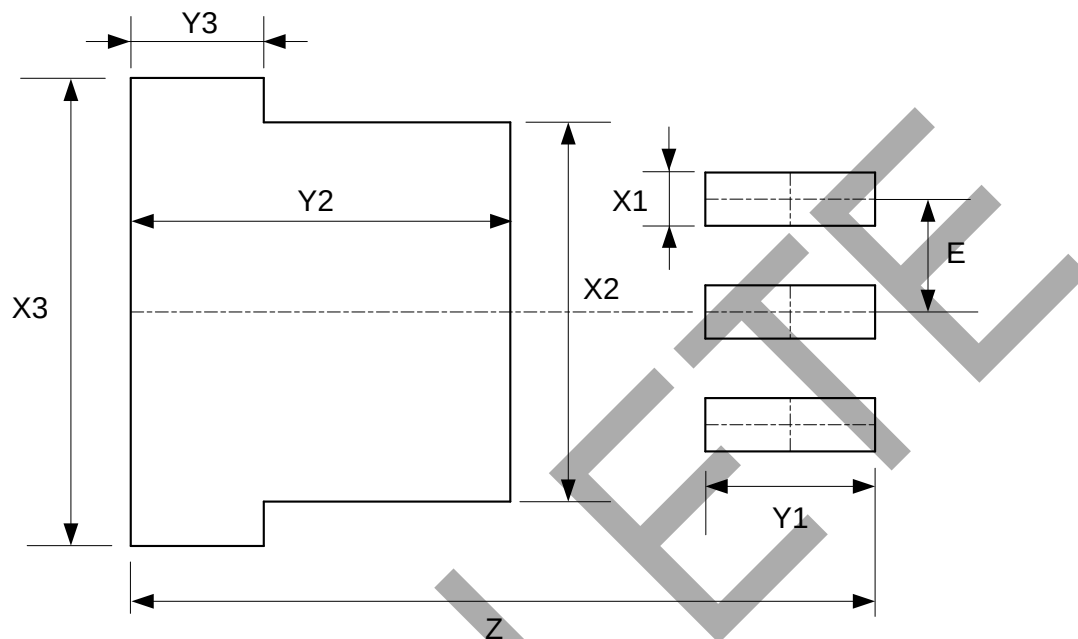


Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X1 (mm)/(inch)	X2 (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	8.400/0.331	4.000/0.157	1.200/0.047	3.500/0.138	2.200/0.087	2.300/0.091	4.600/0.181

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Suggested Pad Layout (Cont.)

(3) Package Type: TO-263-3



Dimensions	Z (mm)/(inch)	X1 (mm)/(inch)	X2 (mm)/(inch)	X3 (mm)/(inch)
Value	16.760/0.660	1.200/0.047	8.540/0.336	10.540/0.415
Dimensions	Y1 (mm)/(inch)	Y2 (mm)/(inch)	Y3 (mm)/(inch)	E (mm)/(inch)
Value	3.830/0.151	8.560/0.337	3.000/0.118	2.540/0.100

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OBSOLETE - PART DISCONTINUED

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