

Description

The AZ1117 is a low dropout three-terminal regulator.

The AZ1117 has been optimized for low voltage where transient response and minimum input voltage are critical. It 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 a combination of high current and ambient temperature that would create excessive junction temperature.

The AZ1117 is available in 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 5.0V fixed output voltage versions and ADJ output voltage version. The fixed versions integrate the adjust resistors. It is also available in an adjustable version which can set the output voltage with two external resistors.

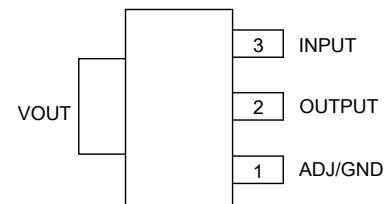
The AZ1117 is available in the industry-standard SOT-223 and SOT-89 power packages.

Features

- Current Limit: 1.0A (Typ.)
- Output Noise from 10Hz to 10KHz: 0.003% of V_{OUT}
- PSRR at $I_{OUT} = 300\text{mA}$ and $f = 120\text{Hz}$: 70dB
- Output Voltage Accuracy: $\pm 1\%$
- On-chip Thermal Shutdown
- Maximum Quiescent Current: $I_{QMAX} = 6\text{mA}$
- Operation Junction Temperature: -20 to $+125^\circ\text{C}$

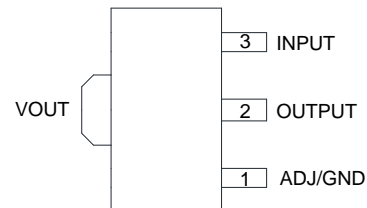
Pin Assignments

(Top View)



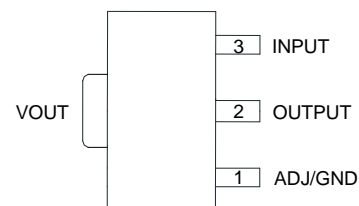
SOT-223

(Top View)



SOT-89 (Option 1)

(Top View)

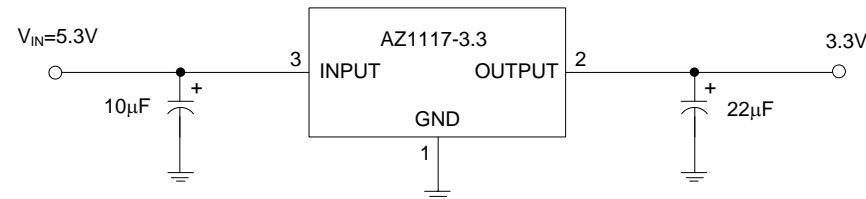
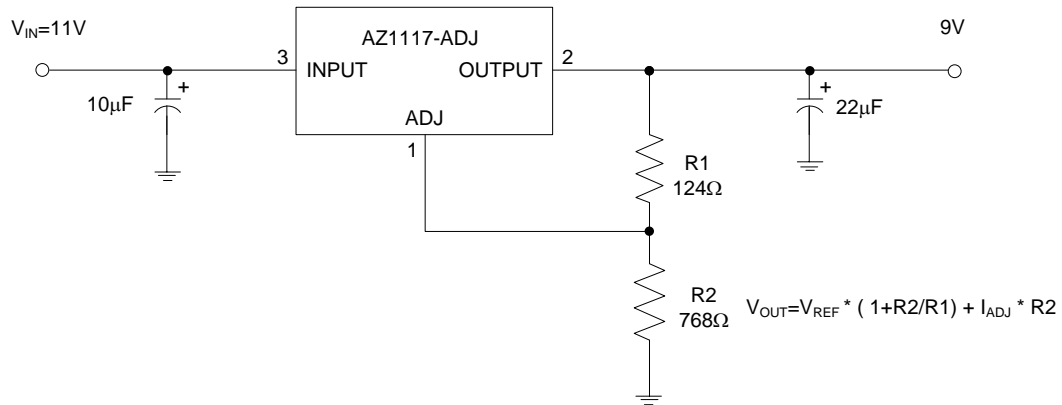


SOT-89 (Option 2)

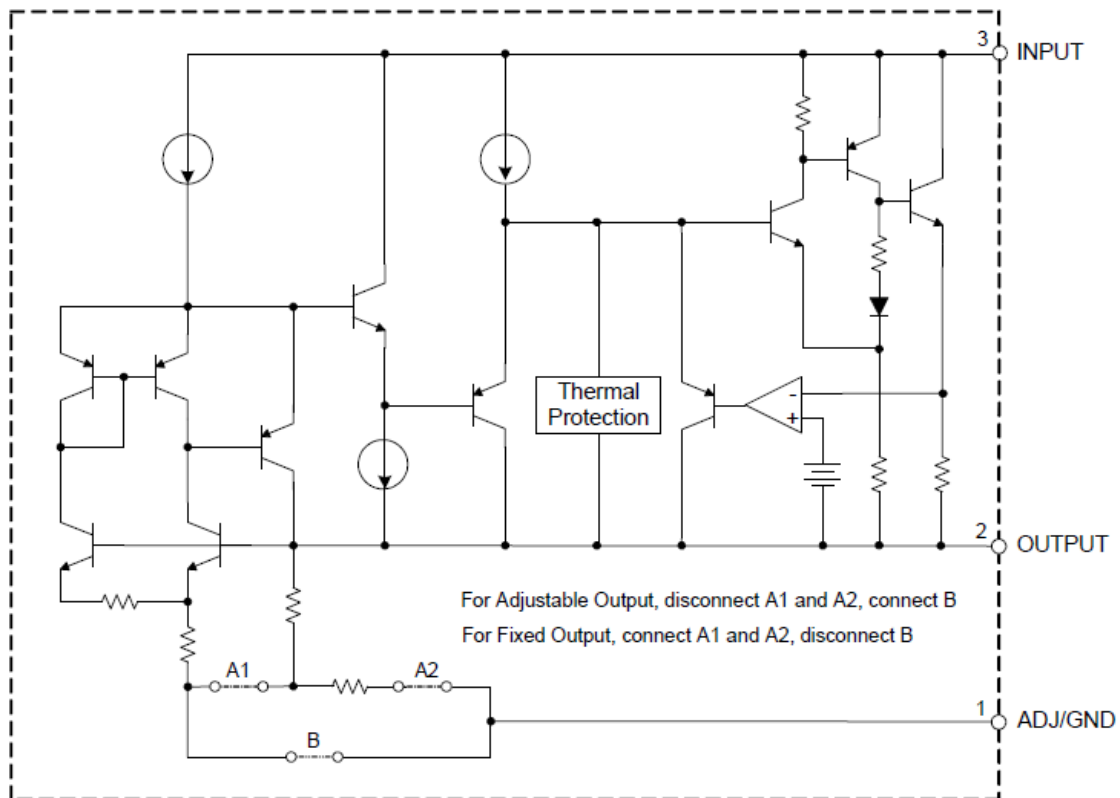
Applications

- 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	18		V
T_J	Operating Junction Temperature Range	+150		°C
T_{STG}	Storage Temperature Range	-65 to +150		°C
θ_{JA}	Thermal Resistance (No Heatsink)	SOT-223	150	°C/W
		SOT-89	210	
T_{LEAD}	Lead Temperature (Soldering, 10sec)	+260		°C

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.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{IN}	Input Voltage	–	15	V
T_J	Operating Junction Temperature Range	-20	+125	°C

Electrical Characteristics

AZ1117-ADJ Electrical Characteristics (Operating Conditions: $V_{IN} = V_{OUT} + 2V$, $I_{OUT} = 10mA$, $T_J = +25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $+125^\circ C$.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V_{REF}	Reference Voltage	–	1.238	1.250	1.262	V	
		$1.5V \leq V_{IN} - V_{OUT} \leq 10V$	1.225	1.250	1.270		
V_{RLINE}	Line Regulation	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$	–	0.001	0.1	%	
			–	–	0.2		
V_{RLOAD}	Load Regulation	–	–	0.4	1.0	%	
V_{DROP}	Dropout Voltage	$\Delta V_{REF} = 1\%$, $I_{OUT} = 0.8A$	SOT-223	–	1.2	1.3	V
			SOT-89	–	1.2	–	
I_{LIMIT}	Current Limit	–	0.85	1	1.15	A	
–	Adjust Pin Current	–	–	60	120	μA	
–	Adjust Pin Current Change	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$	–	0.2	5	μA	
–	Minimum Load Current	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$	–	1.7	5	mA	
PSRR	Ripple Rejection	$f = 120Hz$, $C_{OUT} = 22\mu F$ $V_{IN} - V_{OUT} = 3V$, $I_{OUT} = 30mA$	–	70	–	dB	
–	Temperature Stability	–	–	0.5	–	%	
–	RMS Output Noise (% of V_{OUT})	$T_A = +25^\circ C$, $10Hz \leq f \leq 10kHz$	–	0.003	–	%	
–	Thermal Shutdown	Junction Temperature	–	+160	–	$^\circ C$	
–	Thermal Shutdown Hysteresis	–	–	+16	–	$^\circ C$	
θ_{JC}	Thermal Resistance	SOT-223	–	33	–	$^\circ C/W$	
		SOT-89	–	39	–		

Electrical Characteristics (Cont.)

AZ1117-1.2 Electrical Characteristics (Operating Conditions: $V_{IN} \leq 10V$, $I_{OUT} = 10mA$, $T_J = +25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $+125^\circ C$.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V_{OUT}	Output Voltage	–	1.176	1.2	1.224	V	
		$3.2V \leq V_{IN} \leq 10V$	1.152	1.2	1.228		
V_{RLINE}	Line Regulation	$1.5V \leq V_{IN}-V_{OUT} \leq 10V$	–	0.5	6	mV	
			–	–	10		
V_{RLOAD}	Load Regulation	–	–	2	15	mV	
V_{DROP}	Dropout Voltage	$\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$	SOT-223	–	1.2	1.3	V
			SOT-89	–	1.2	–	
I_{LIMIT}	Current Limit	–	0.85	1	1.15	A	
I_Q	Quiescent Current	$I_{OUT} = 0$	–	4	6	mA	
PSRR	Ripple Rejection	$f = 120Hz$, $C_{OUT} = 22\mu F$ $V_{IN}-V_{OUT} = 3V$, $I_{OUT} = 300mA$	–	70	–	dB	
–	Temperature Stability	–	–	0.5	–	%	
–	RMS Output Noise (% of V_{OUT})	$T_A = +25^\circ C$, $10Hz \leq f \leq 10kHz$	–	0.003	–	%	
–	Thermal Shutdown	Junction Temperature	–	+160	–	$^\circ C$	
–	Thermal Shutdown Hysteresis	–	–	+16	–	$^\circ C$	
θ_{JC}	Thermal Resistance	SOT-223	–	33	–	$^\circ C/W$	
		SOT-89	–	39	–		

Electrical Characteristics (Cont.)

AZ1117-1.5 Electrical Characteristics (Operating Conditions: $V_{IN} \leq 10V$, $I_{OUT} = 10mA$, $T_J = +25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $+125^\circ C$.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V_{OUT}	Output Voltage	–	1.485	1.5	1.515	V	
		$3.5V \leq V_{IN} \leq 10V$	1.470	1.5	1.530		
V_{RLINE}	Line Regulation	$1.5V \leq V_{IN}-V_{OUT} \leq 10V$	–	0.5	6	mV	
			–	–	10		
V_{RLOAD}	Load Regulation	–	–	2	15	mV	
V_{DROP}	Dropout Voltage	$\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$	SOT-223	–	1.2	1.3	V
			SOT-89	–	1.2	–	
I_{LIMIT}	Current Limit	–	0.85	1	1.15	A	
I_Q	Quiescent Current	$I_{OUT} = 0$	–	4	6	mA	
PSRR	Ripple Rejection	$f = 120Hz$, $C_{OUT} = 22\mu F$ $V_{IN}-V_{OUT} = 3V$, $I_{OUT} = 300mA$	–	70	–	dB	
–	Temperature Stability	–	–	0.5	–	%	
–	RMS Output Noise (% of V_{OUT})	$T_A = +25^\circ C$, $10Hz \leq f \leq 10kHz$	–	0.003	–	%	
–	Thermal Shutdown	Junction Temperature	–	+160	–	$^\circ C$	
–	Thermal Shutdown Hysteresis	–	–	+16	–	$^\circ C$	
θ_{JC}	Thermal Resistance	SOT-223	–	33	–	$^\circ C/W$	
		SOT-89	–	39	–		

Electrical Characteristics (Cont.)

AZ1117-1.8 Electrical Characteristics (Operating Conditions: $V_{IN} \leq 10V$, $I_{OUT} = 10mA$, $T_J = +25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $+125^\circ C$.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V_{OUT}	Output Voltage	–	1.782	1.8	1.818	V	
		$3.8V \leq V_{IN} \leq 10V$	1.764	1.8	1.836		
V_{RLINE}	Line Regulation	$1.5V \leq V_{IN}-V_{OUT} \leq 10V$	–	0.5	6	mV	
			–	–	10		
V_{RLOAD}	Load Regulation	–	–	2	15	mV	
V_{DROP}	Dropout Voltage	$\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$	SOT-223	–	1.2	1.3	V
			SOT-89	–	1.2	–	
I_{LIMIT}	Current Limit	–	0.85	1	1.15	A	
I_Q	Quiescent Current	$I_{OUT} = 0$	–	4	6	mA	
PSRR	Ripple Rejection	$f = 120Hz$, $C_{OUT} = 22\mu F$ $V_{IN}-V_{OUT} = 3V$, $I_{OUT} = 300mA$	–	70	–	dB	
–	Temperature Stability	–	–	0.5	–	%	
–	RMS Output Noise (% of V_{OUT})	$T_A = +25^\circ C$, $10Hz \leq f \leq 10kHz$	–	0.003	–	%	
–	Thermal Shutdown	Junction Temperature	–	+160	–	$^\circ C$	
–	Thermal Shutdown Hysteresis	–	–	+16	–	$^\circ C$	
θ_{JC}	Thermal Resistance	SOT-223	–	33	–	$^\circ C/W$	
		SOT-89	–	39	–		

Electrical Characteristics (Cont.)

AZ1117-2.5 Electrical Characteristics (Operating Conditions: $V_{IN} \leq 10V$, $I_{OUT} = 10mA$, $T_J = +25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $+125^\circ C$.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V_{OUT}	Output Voltage	–	2.475	2.5	2.525	V	
		$4.5V \leq V_{IN} \leq 10V$	2.455	2.5	2.545		
V_{RLINE}	Line Regulation	$1.5V \leq V_{IN}-V_{OUT} \leq 10V$	–	0.5	6	mV	
			–	–	10		
V_{RLOAD}	Load Regulation	–	–	2	15	mV	
V_{DROP}	Dropout Voltage	$\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$	SOT-223	–	1.2	1.3	V
			SOT-89	–	1.2	–	
I_{LIMIT}	Current Limit	–	0.85	1	1.15	A	
I_Q	Quiescent Current	$I_{OUT} = 0$	–	4	6	mA	
PSRR	Ripple Rejection	$f = 120Hz$, $C_{OUT} = 22\mu F$ $V_{IN}-V_{OUT} = 3V$, $I_{OUT} = 300mA$	–	70	–	dB	
–	Temperature Stability	–	–	0.5	–	%	
–	RMS Output Noise (% of V_{OUT})	$T_A = +25^\circ C$, $10Hz \leq f \leq 10kHz$	–	0.003	–	%	
–	Thermal Shutdown	Junction Temperature	–	+160	–	$^\circ C$	
–	Thermal Shutdown Hysteresis	–	–	+16	–	$^\circ C$	
θ_{JC}	Thermal Resistance	SOT-223	–	33	–	$^\circ C/W$	
		SOT-89	–	39	–		

Electrical Characteristics (Cont.)

AZ1117-3.3 Electrical Characteristics (Operating Conditions: $V_{IN} \leq 10V$, $I_{OUT} = 10mA$, $T_J = +25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $+125^\circ C$.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V_{OUT}	Output Voltage	–	3.267	3.3	3.333	V	
		$5.3V \leq V_{IN} \leq 10V$	3.235	3.3	3.365		
V_{RLINE}	Line Regulation	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$	–	0.5	6	mV	
			–	–	10		
V_{RLOAD}	Load Regulation	–	–	2	15	mV	
V_{DROP}	Dropout Voltage	$\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$	SOT-223	–	1.2	1.3	V
			SOT-89	–	1.2	–	
I_{LIMIT}	Current Limit	–	0.85	1	1.15	A	
I_Q	Quiescent Current	$I_{OUT} = 0$	–	4	6	mA	
PSRR	Ripple Rejection	$f = 120Hz$, $C_{OUT} = 22\mu F$ $V_{IN} - V_{OUT} = 3V$, $I_{OUT} = 300mA$	–	70	–	dB	
–	Temperature Stability	–	–	0.5	–	%	
–	RMS Output Noise (% of V_{OUT})	$T_A = +25^\circ C$, $10Hz \leq f \leq 10kHz$	–	0.003	–	%	
–	Thermal Shutdown	Junction Temperature	–	+160	–	$^\circ C$	
–	Thermal Shutdown Hysteresis	–	–	+16	–	$^\circ C$	
θ_{JC}	Thermal Resistance	SOT-223	–	33	–	$^\circ C/W$	
		SOT-89	–	39	–		

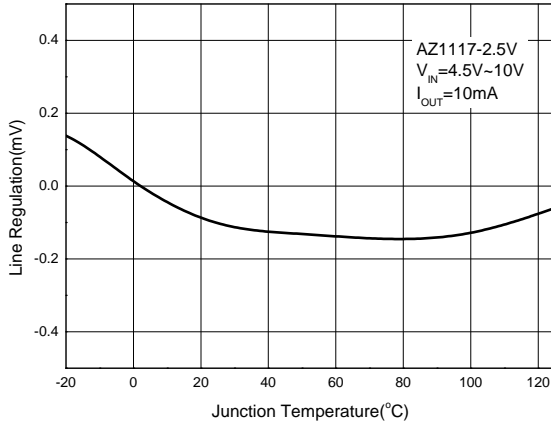
Electrical Characteristics (Cont.)

AZ1117-5.0 Electrical Characteristics (Operating Conditions: $V_{IN} \leq 10V$, $I_{OUT} = 10mA$, $T_J = +25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $+125^\circ C$.)

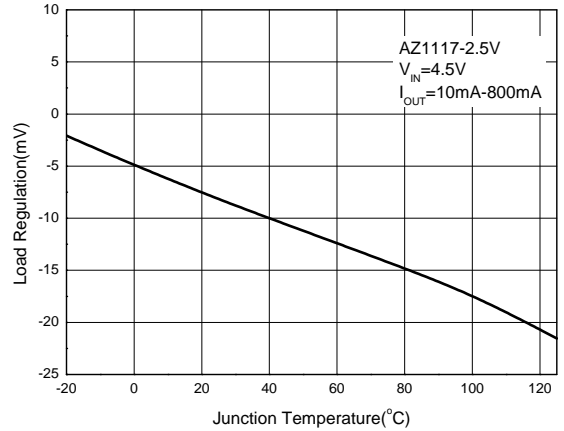
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V_{OUT}	Output Voltage	–	4.950	5.0	5.050	V	
		$6.5V \leq V_{IN} \leq 10V$	4.900	5.0	5.100		
V_{RLINE}	Line Regulation	$1.5V \leq V_{IN}-V_{OUT} \leq 10V$	–	0.5	6	mV	
			–	–	10		
V_{RLOAD}	Load Regulation	–	–	2	15	mV	
V_{DROP}	Dropout Voltage	$\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$	SOT-223	–	1.2	1.3	V
			SOT-89	–	1.2	–	
I_{LIMIT}	Current Limit	–	0.85	1	1.15	A	
I_Q	Quiescent Current	$I_{OUT} = 0$	–	4	6	mA	
PSRR	Ripple Rejection	$f = 120Hz$, $C_{OUT} = 22\mu F$ $V_{IN}-V_{OUT} = 3V$, $I_{OUT} = 300mA$	–	70	–	dB	
–	Temperature Stability	–	–	0.5	–	%	
–	RMS Output Noise (% of V_{OUT})	$T_A = +25^\circ C$, $10Hz \leq f \leq 10kHz$	–	0.003	–	%	
–	Thermal Shutdown	Junction Temperature	–	+160	–	$^\circ C$	
–	Thermal Shutdown Hysteresis	–	–	+16	–	$^\circ C$	
θ_{JC}	Thermal Resistance	SOT-223	–	33	–	$^\circ C/W$	
		SOT-89	–	39	–		

Performance Characteristics

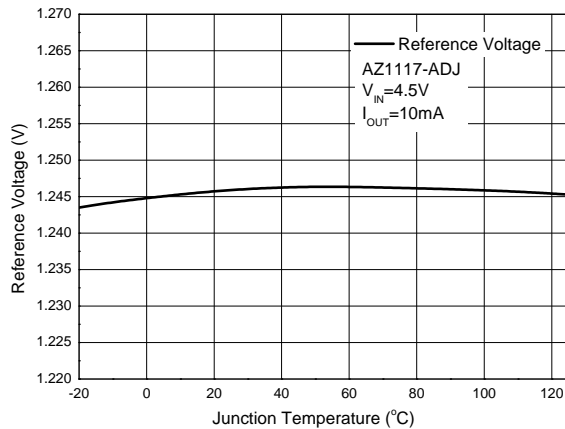
Line Regulation vs. Junction Temperature



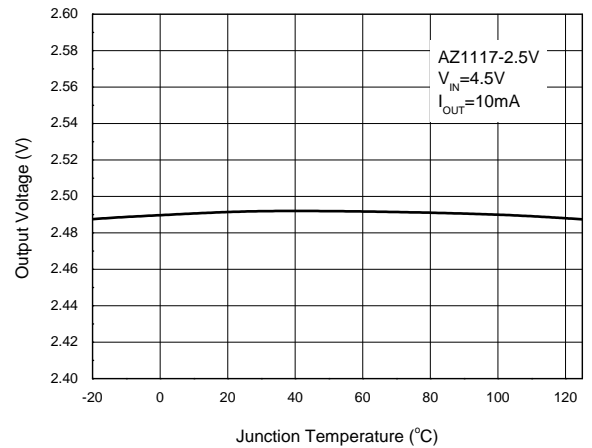
Load Regulation vs. Junction Temperature



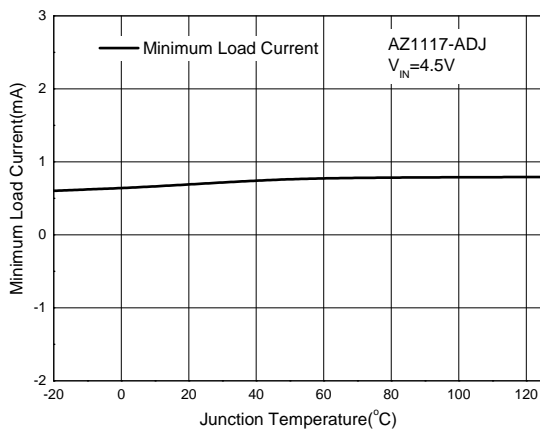
Reference Voltage vs. Junction Temperature



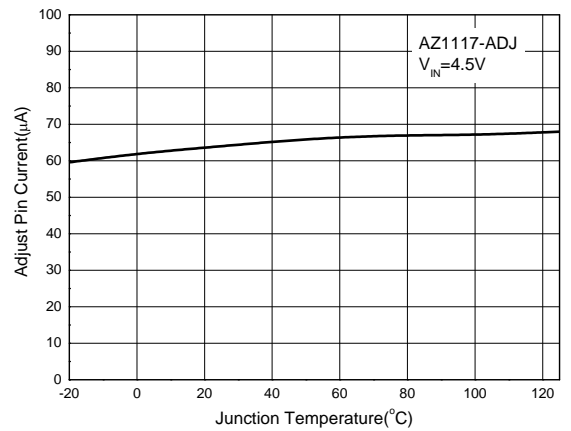
Output Voltage vs. Junction Temperature



Minimum Load Current vs. Junction Temperature

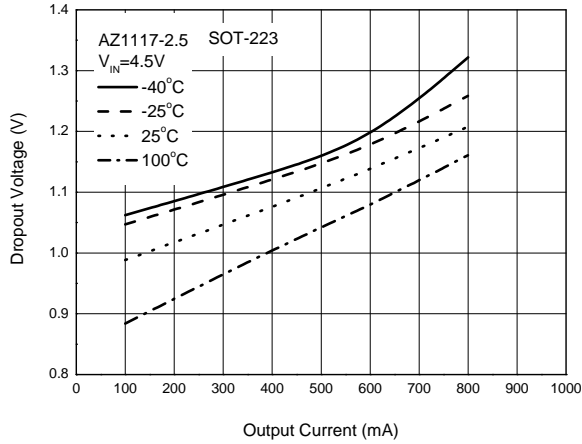


Adjust Pin Current vs. Junction Temperature

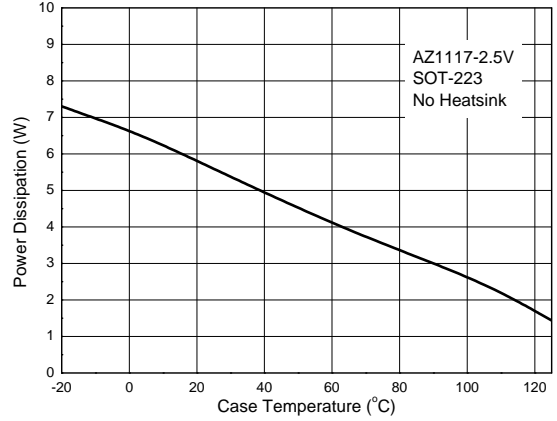


Performance Characteristics (Cont.)

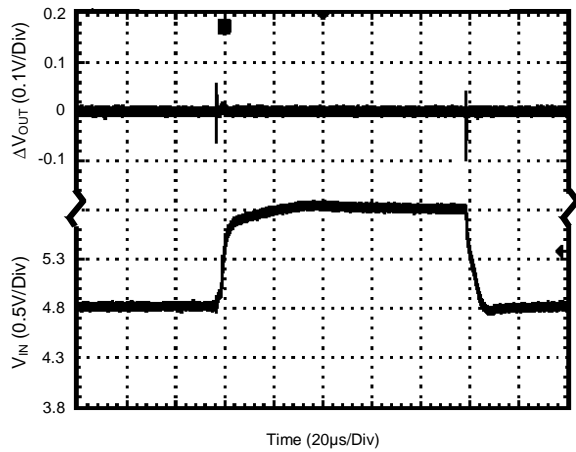
Dropout Voltage vs. Output Current



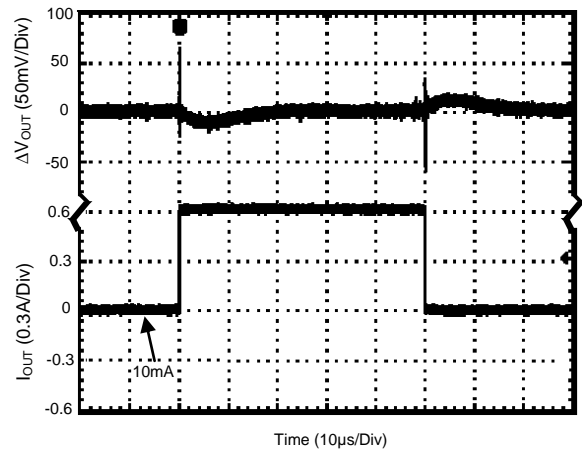
Power Dissipation vs. Case Temperature



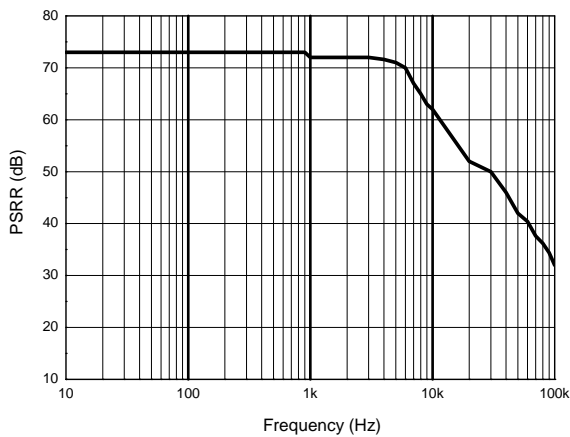
Line Transient Response



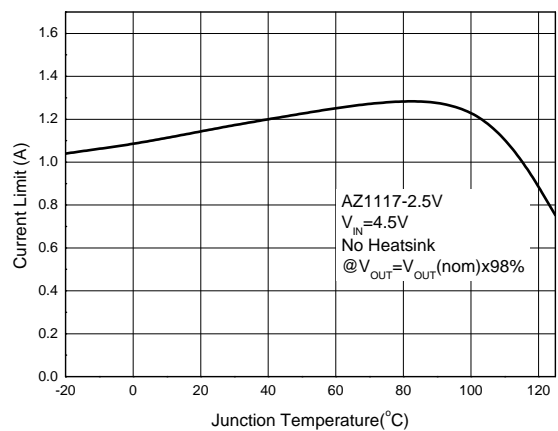
Load Transient Response



PSRR vs. Frequency

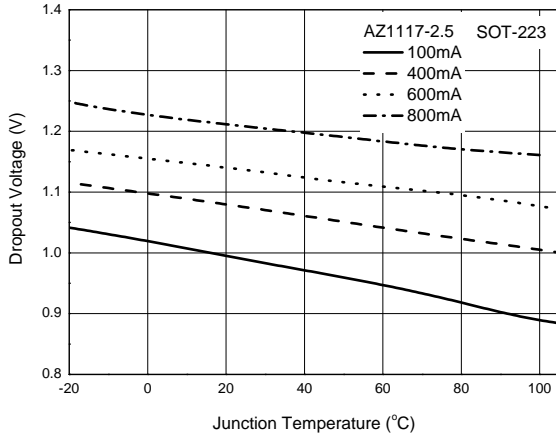


Current Limit vs. Junction Temperature

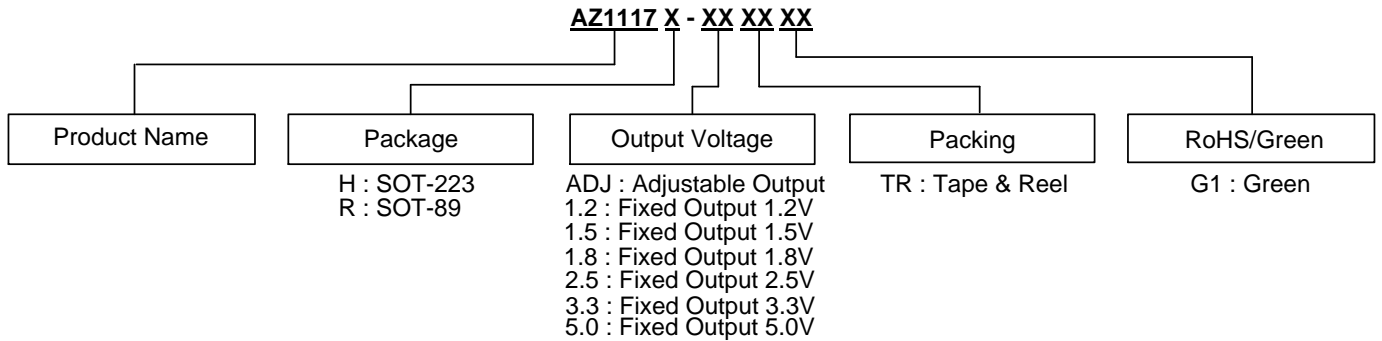


Performance Characteristics (Cont.)

Dropout Voltage vs. Junction Temperature



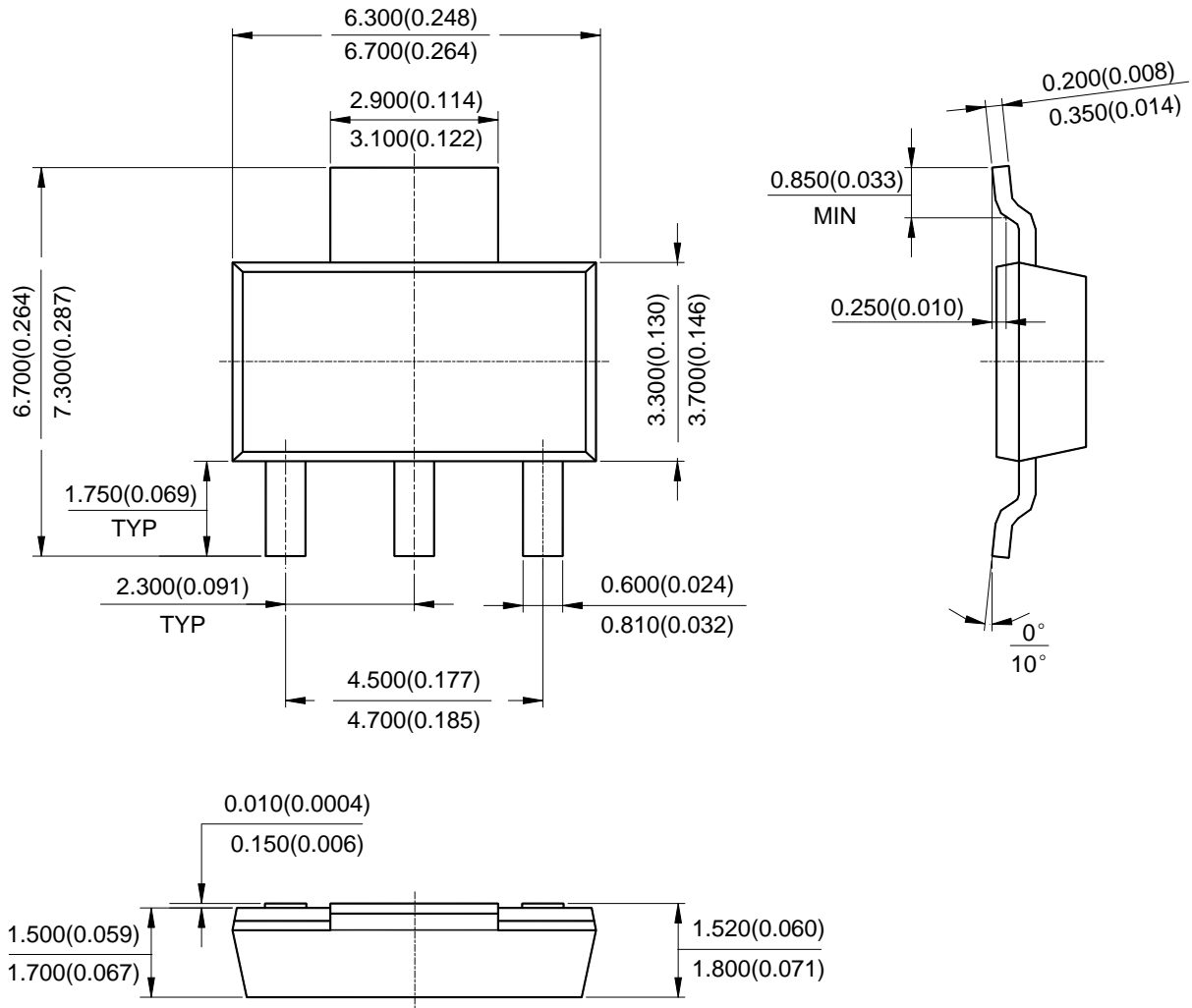
Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing
SOT-223	-20 to +125°C	AZ1117H-ADJTRG1	GH17K	Tape & Reel
		AZ1117H-1.2TRG1	GH17P	Tape & Reel
		AZ1117H-1.5TRG1	GH17Q	Tape & Reel
		AZ1117H-1.8TRG1	GH17L	Tape & Reel
		AZ1117H-2.5TRG1	GH17N	Tape & Reel
		AZ1117H-3.3TRG1	GH17M	Tape & Reel
		AZ1117H-5.0TRG1	GH17R	Tape & Reel
SOT-89	-20 to +125°C	AZ1117R-ADJTRG1	G31F	Tape & Reel
		AZ1117R-1.2TRG1	G31G	Tape & Reel
		AZ1117R-1.5TRG1	G31H	Tape & Reel
		AZ1117R-1.8TRG1	G31J	Tape & Reel
		AZ1117R-2.5TRG1	G31K	Tape & Reel
		AZ1117R-3.3TRG1	G31L	Tape & Reel
		AZ1117R-5.0TRG1	G31M	Tape & Reel

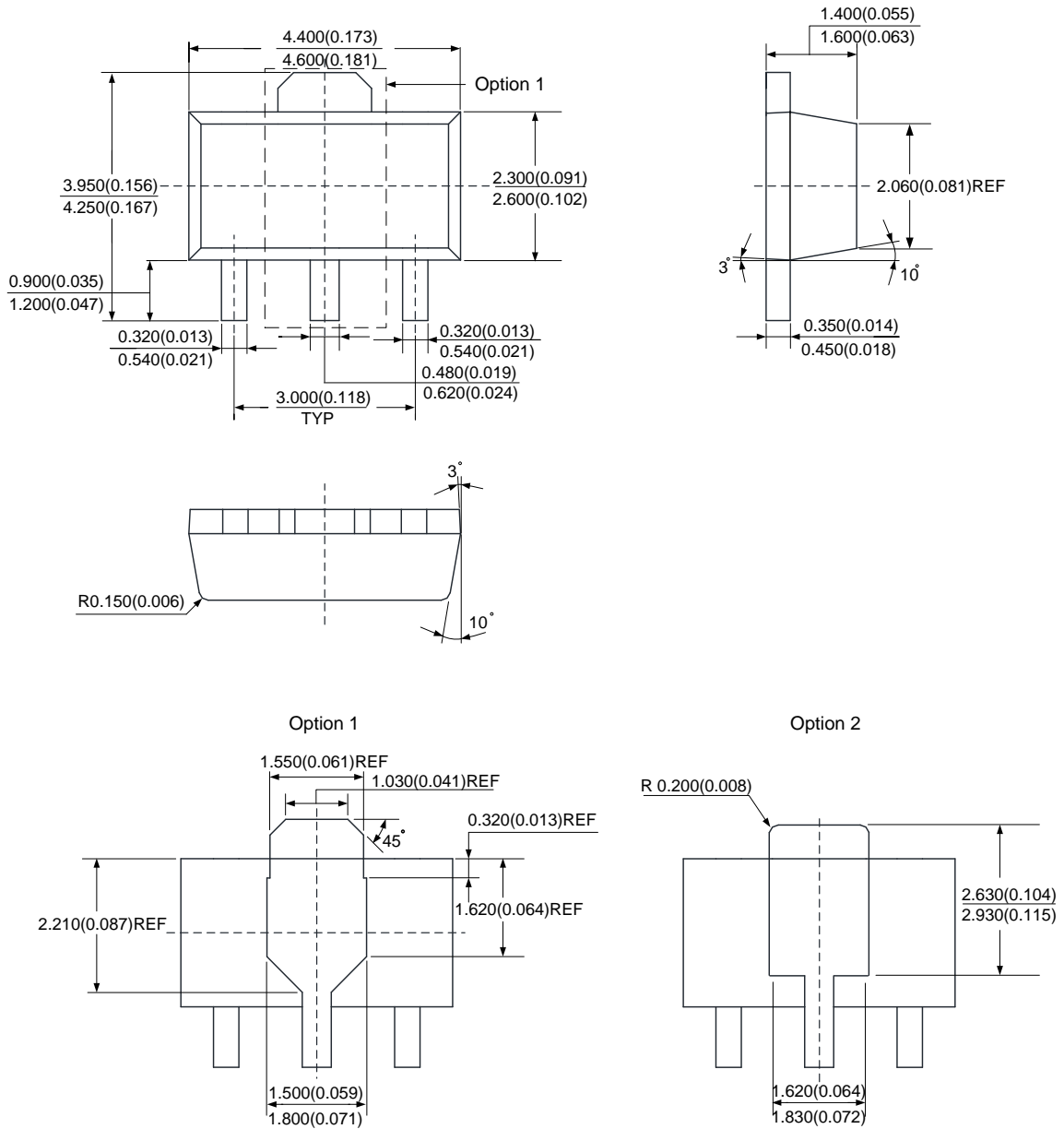
Package Outline Dimensions (All dimensions in mm(inch).)

(1) Package Type: SOT-223



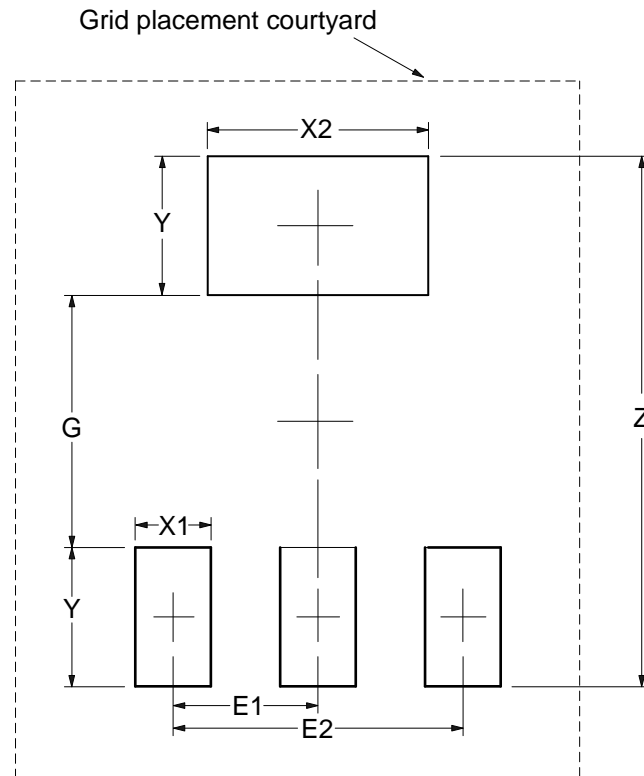
Package Outline Dimensions (Cont. All dimensions in mm(inch).)

(2) Package Type: SOT-89



Suggested Pad Layout

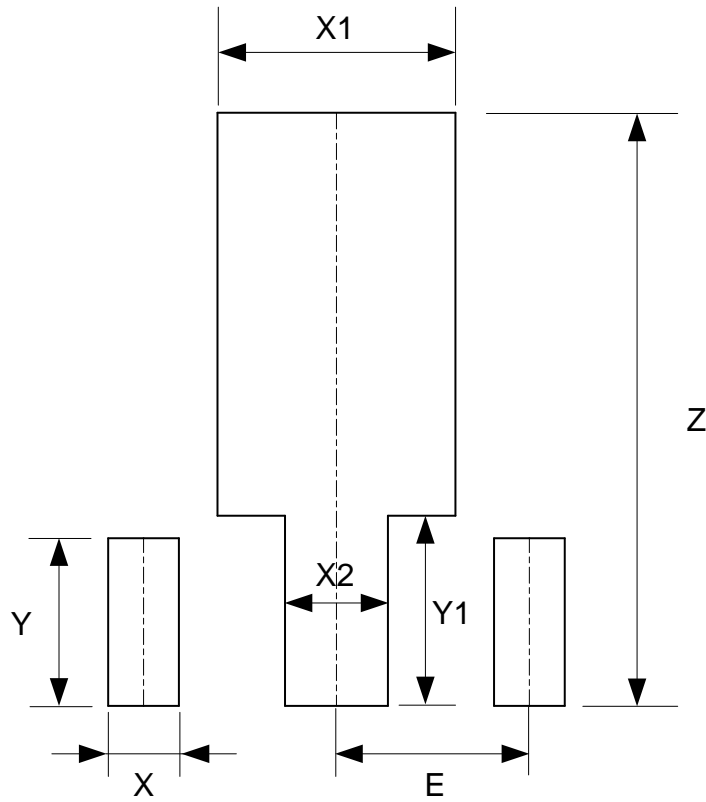
(1) Package Type: SOT-223



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

Suggested Pad Layout (Cont.)

(2) 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

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