

LOW DROPOUT LINEAR REGULATOR

AZ1117C

General Description

The AZ1117C is a low dropout three-terminal regulator.

The AZ1117C 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 AZ1117C 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 AZ1117C is available in the industry-standard TO-252-2 (3), TO-252-2 (4), SOT-89 and SOT-223 power packages.

Features

- Current Limit: 1.35A (Typ.)
- Output Noise from 10Hz to 10KHz: 0.003% of V_{OUT}
- PSRR at $I_{OUT}=300mA$ and $f=120Hz$: 70dB
- Output Voltage Accuracy: $\pm 1\%$ (Except 1.2V version)
- On-chip Thermal Shutdown
- Maximum Quiescent Current: $I_{QMAX}=6mA$
- Compatible with Low ESR Ceramic Capacitor
- Operation Junction Temperature: -20 to $125^{\circ}C$

Applications

- USB Device
- Add-on Card
- DVD Player
- PC Motherboard

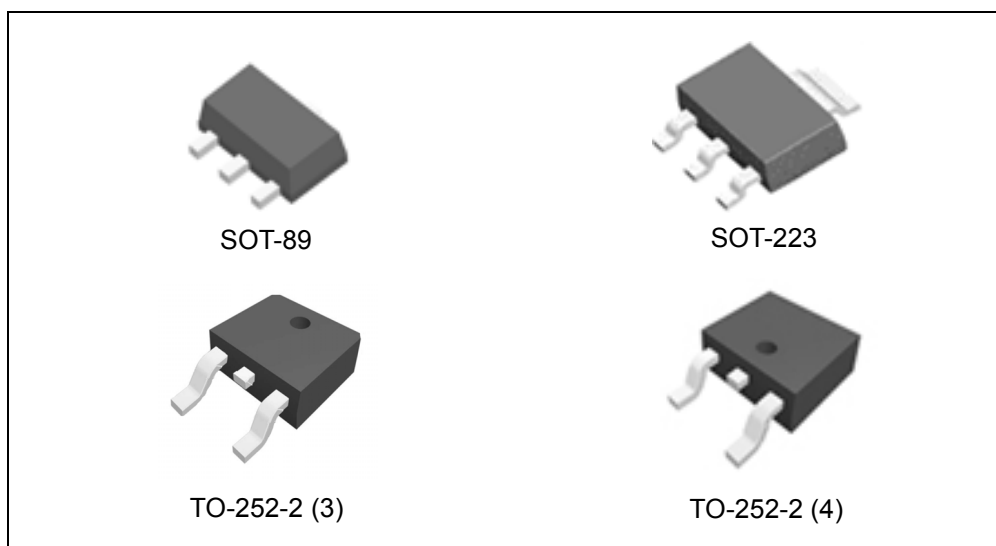


Figure 1. Package Types of AZ1117C

LOW DROPOUT LINEAR REGULATOR **AZ1117C**

Pin Configuration

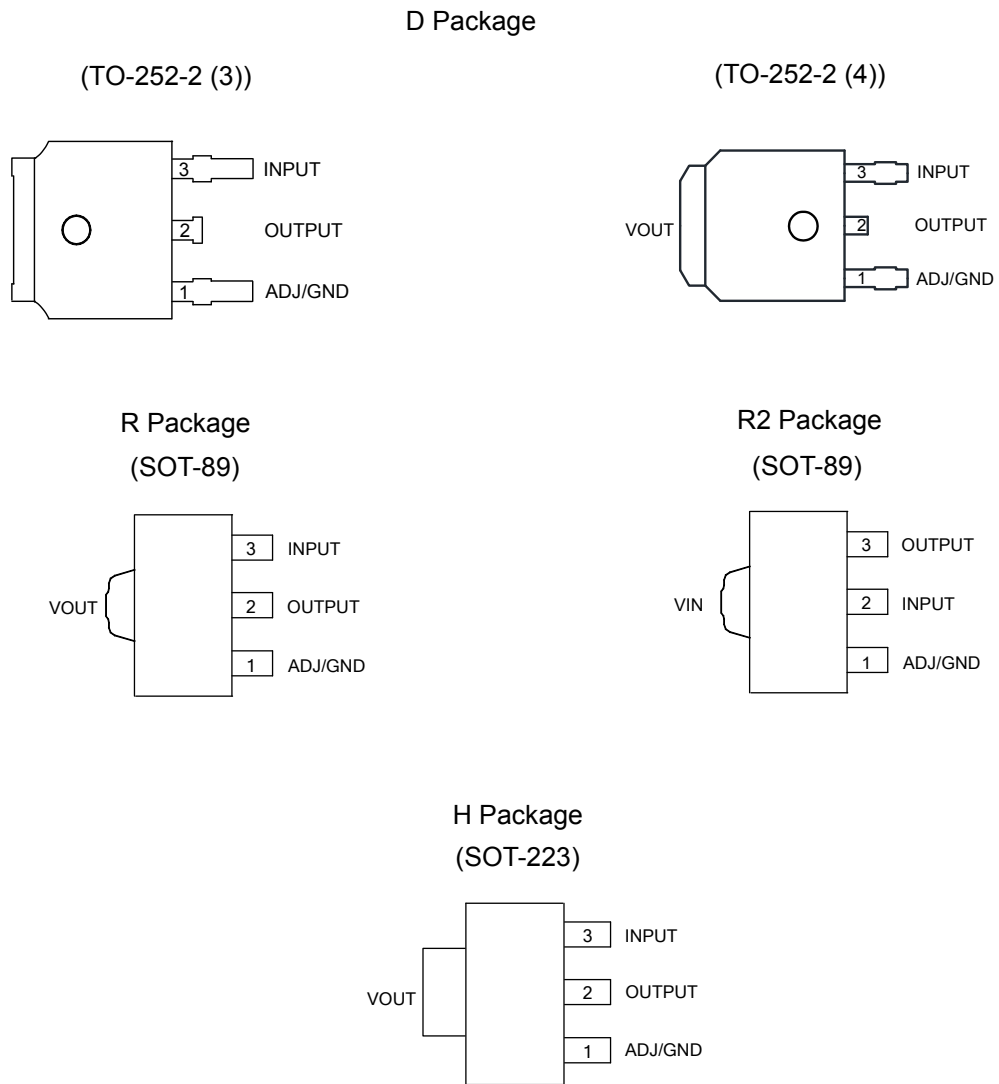
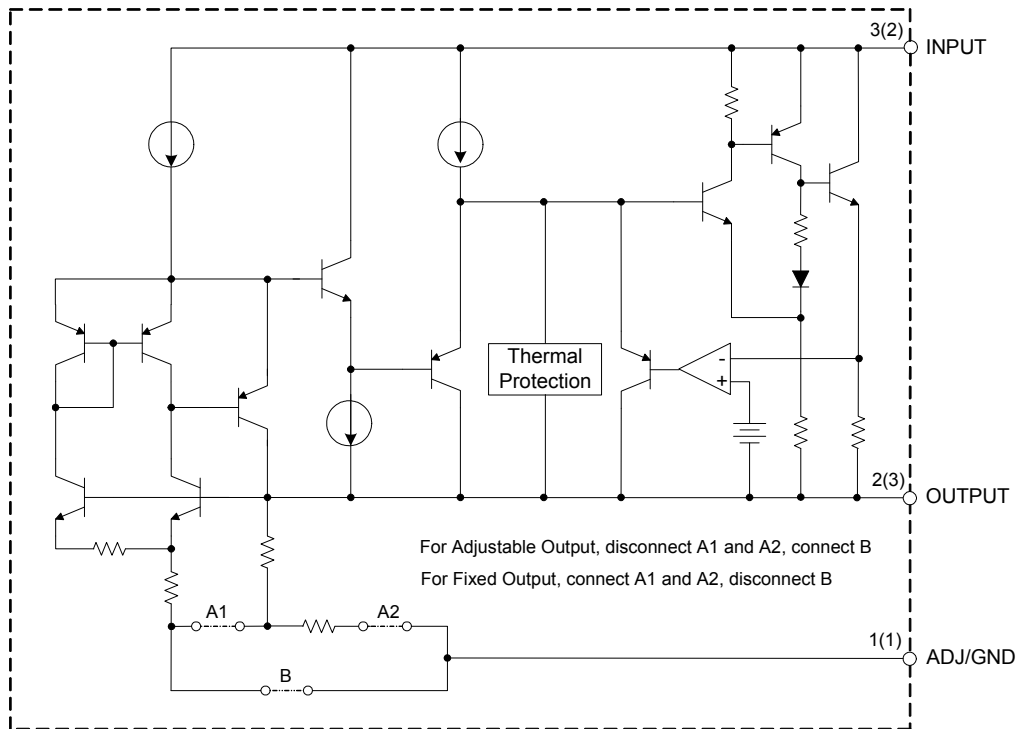


Figure 2. Pin Configuration of AZ1117C (Top View)

Functional Block Diagram



A(B)
 A for TO-252-2 (3)/TO-252-2 (4)/SOT-223/SOT-89 (R)
 B for SOT-89 (R2)

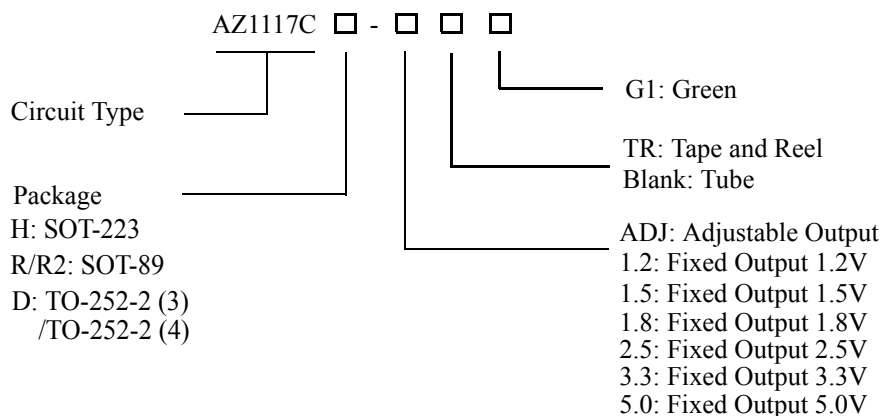
Figure 3. Functional Block Diagram of AZ1117C



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Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-223	-20 to 125°C	AZ1117CH-ADJTRG1	GH15B	Tape & Reel
		AZ1117CH-1.2TRG1	GH16B	Tape & Reel
		AZ1117CH-1.5TRG1	GH15C	Tape & Reel
		AZ1117CH-1.8TRG1	GH16C	Tape & Reel
		AZ1117CH-2.5TRG1	GH15D	Tape & Reel
		AZ1117CH-3.3TRG1	GH16D	Tape & Reel
		AZ1117CH-5.0TRG1	GH15E	Tape & Reel
TO-252-2 (3) /TO-252-2 (4)		AZ1117CD-ADJG1	AZ1117CD-ADJG1	Tube
		AZ1117CD-ADJTRG1	AZ1117CD-ADJG1	Tape & Reel
		AZ1117CD-1.2G1	AZ1117CD-1.2G1	Tube
		AZ1117CD-1.2TRG1	AZ1117CD-1.2G1	Tape & Reel
		AZ1117CD-1.5G1	AZ1117CD-1.5G1	Tube
		AZ1117CD-1.5TRG1	AZ1117CD-1.5G1	Tape & Reel
		AZ1117CD-1.8G1	AZ1117CD-1.8G1	Tube
		AZ1117CD-1.8TRG1	AZ1117CD-1.8G1	Tape & Reel
		AZ1117CD-2.5G1	AZ1117CD-2.5G1	Tube
		AZ1117CD-2.5TRG1	AZ1117CD-2.5G1	Tape & Reel
		AZ1117CD-3.3G1	AZ1117CD-3.3G1	Tube
		AZ1117CD-3.3TRG1	AZ1117CD-3.3G1	Tape & Reel
		AZ1117CD-5.0G1	AZ1117CD-5.0G1	Tube
AZ1117CD-5.0TRG1	AZ1117CD-5.0G1	Tape & Reel		

**LOW DROPOUT LINEAR REGULATOR****AZ1117C****Ordering Information (Continued)**

Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-89	-20 to 125°C	AZ1117CR-ADJTRG1	G27N	Tape & Reel
		AZ1117CR-1.2TRG1	G28J	Tape & Reel
		AZ1117CR-1.5TRG1	G28K	Tape & Reel
		AZ1117CR-1.8TRG1	G28L	Tape & Reel
		AZ1117CR-2.5TRG1	G28M	Tape & Reel
		AZ1117CR-3.3TRG1	G28N	Tape & Reel
		AZ1117CR-5.0TRG1	G27M	Tape & Reel
SOT-89		AZ1117CR2-ADJTRG1	G42O	Tape & Reel
		AZ1117CR2-1.2TRG1	G43M	Tape & Reel
		AZ1117CR2-1.5TRG1	G43N	Tape & Reel
		AZ1117CR2-1.8TRG1	G43O	Tape & Reel
		AZ1117CR2-2.5TRG1	G70M	Tape & Reel
		AZ1117CR2-3.3TRG1	G70N	Tape & Reel
		AZ1117CR2-5.0TRG1	G33N	Tape & Reel

BCD Semiconductor's products, as designated with "G1" suffix in the part number, are RoHS compliant and Green.

**LOW DROPOUT LINEAR REGULATOR****AZ1117C****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value		Unit
Input Voltage	V_{IN}	18		V
Operating Junction Temperature Range	T_J	150		°C
Storage Temperature Range	T_{STG}	-65 to 150		°C
Thermal Resistance (Without Heatsink)	θ_{JA}	SOT-89	170	°C/W
		SOT-223	125	
		TO-252-2 (3)/TO-252-2 (4)	100	
Thermal Resistance (With Heatsink) (Note2)	θ_{JA}	SOT-89	150	°C/W
		SOT-223	100	
		TO-252-2 (3)/TO-252-2 (4)	70	
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260		°C

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: Chip is soldered to 100mm²(10mm*10mm) copper (top side solder mask) on 2oz.2 layers FR-4 PCB with 8*0.5mm vias.

Recommended Operating Conditions

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



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Electrical Characteristics

AZ1117C-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 $125^{\circ}C$.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Reference Voltage	V_{REF}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$	1.238	1.250	1.262	V	
			1.225	1.250	1.270		
Line Regulation	V_{RLINE}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$		0.001	0.1	%	
					0.2		
Load Regulation	V_{RLOAD}			0.4	1.0	%	
Dropout Voltage	V_{DROP}	$\Delta V_{REF}=1\%$, $I_{OUT}=0.8A$	SOT-223		1.2	1.3	V
			TO-252-2 (3)/TO-252-2 (4)		1.3	1.4	V
Current Limit	I_{LIMIT}		1	1.35		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	
Ripple Rejection	PSRR	$f=120Hz$, $C_{OUT}=22\mu F$ $(V_{IN} - V_{OUT})=3V$, $I_{OUT}=300mA$		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		$^{\circ}C$	
Thermal Resistance (Junction to Case)	θ_{JC}	SOT-89		30		$^{\circ}C/W$	
		SOT-223		15			
		TO-252-2 (3)/TO-252-2 (4)		10			



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Electrical Characteristics (Continued)

AZ1117C-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 $125^\circ C$.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Output Voltage	V_{OUT}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$	1.176	1.2	1.224	V	
			1.152	1.2	1.228		
Line Regulation	V_{RLINE}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$		0.5	6	mV	
					10		
Load Regulation	V_{RLOAD}			2	15	mV	
Dropout Voltage	V_{DROP}	$\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$	SOT-223		1.2	1.3	V
			TO-252-2 (3)/TO-252-2 (4)		1.3	1.4	V
Current Limit	I_{LIMIT}		1	1.35		A	
Quiescent Current	I_Q	$I_{OUT} = 0$		4	6	mA	
Ripple Rejection	PSRR	$f = 120Hz$, $C_{OUT} = 22\mu F$ $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 300mA$		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		$^\circ C$	
Thermal Resistance (Junction to Case)	θ_{JC}	SOT-89		30		$^\circ C/W$	
		SOT-223		15			
		TO-252-2 (3)/TO-252-2 (4)		10			



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Electrical Characteristics (Continued)

AZ1117C-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 $125^\circ C$.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Output Voltage	V_{OUT}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$	1.485	1.5	1.515	V	
			1.470	1.5	1.530		
Line Regulation	V_{RLINE}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$		0.5	6	mV	
					10		
Load Regulation	V_{RLOAD}			2	15	mV	
Dropout Voltage	V_{DROP}	$\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$	SOT-223		1.2	1.3	V
			TO-252-2 (3)/TO-252-2 (4)		1.3	1.4	V
Current Limit	I_{LIMIT}		1	1.35		A	
Quiescent Current	I_Q	$I_{OUT} = 0$		4	6	mA	
Ripple Rejection	PSRR	$f = 120Hz$, $C_{OUT} = 22\mu F$ $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 300mA$		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		$^\circ C$	
Thermal Resistance (Junction to Case)	θ_{JC}	SOT-89		30		$^\circ C/W$	
		SOT-223		15			
		TO-252-2 (3)/TO-252-2 (4)		10			



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Electrical Characteristics (Continued)

AZ1117C-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 $125^\circ C$.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Output Voltage	V_{OUT}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$	1.782	1.8	1.818	V	
			1.764	1.8	1.836		
Line Regulation	V_{RLINE}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$		0.5	6	mV	
					10		
Load Regulation	V_{RLOAD}			2	15	mV	
Dropout Voltage	V_{DROP}	$\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$	SOT-223		1.2	1.3	V
			TO-252-2 (3)/TO-252-2 (4)			1.3	1.4
Current Limit	I_{LIMIT}		1	1.35		A	
Quiescent Current	I_Q	$I_{OUT} = 0$		4	6	mA	
Ripple Rejection	PSRR	$f = 120Hz$, $C_{OUT} = 22\mu F$ $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 300mA$		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		$^\circ C$	
Thermal Resistance (Junction to Case)	θ_{JC}	SOT-89		30		$^\circ C/W$	
		SOT-223		15			
		TO-252-2 (3)/TO-252-2 (4)		10			



LOW DROPOUT LINEAR REGULATOR

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Electrical Characteristics (Continued)

AZ1117C-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 $125^\circ C$.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Output Voltage	V_{OUT}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$	2.475	2.5	2.525	V	
			2.455	2.5	2.545		
Line Regulation	V_{RLINE}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$		0.5	6	mV	
					10		
Load Regulation	V_{RLOAD}			2	15	mV	
Dropout Voltage	V_{DROP}	$\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$	SOT-223		1.2	1.3	V
			TO-252-2 (3)/TO-252-2 (4)			1.3	1.4
Current Limit	I_{LIMIT}		1	1.35		A	
Quiescent Current	I_Q	$I_{OUT} = 0$		4	6	mA	
Ripple Rejection	PSRR	$f = 120Hz$, $C_{OUT} = 22\mu F$ $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 300mA$		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		$^\circ C$	
Thermal Resistance (Junction to Case)	θ_{JC}	SOT-89		30		$^\circ C/W$	
		SOT-223		15			
		TO-252-2 (3)/TO-252-2 (4)		10			



LOW DROPOUT LINEAR REGULATOR

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Electrical Characteristics (Continued)

AZ1117C-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 $125^\circ C$.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Output Voltage	V_{OUT}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$	3.267	3.3	3.333	V	
			3.235	3.3	3.365		
Line Regulation	V_{RLINE}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$		0.5	6	mV	
					10		
Load Regulation	V_{RLOAD}			2	15	mV	
Dropout Voltage	V_{DROP}	$\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$	SOT-223		1.2	1.3	V
			TO-252-2 (3)/TO-252-2 (4)		1.3	1.4	V
Current Limit	I_{LIMIT}		1	1.35		A	
Quiescent Current	I_Q	$I_{OUT} = 0$		4	6	mA	
Ripple Rejection	PSRR	$f = 120Hz$, $C_{OUT} = 22\mu F$ $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 300mA$		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		$^\circ C$	
Thermal Resistance (Junction to Case)	θ_{JC}	SOT-89		30		$^\circ C/W$	
		SOT-223		15			
		TO-252-2 (3)/TO-252-2 (4)		10			



LOW DROPOUT LINEAR REGULATOR

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Electrical Characteristics (Continued)

AZ1117C-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 $125^\circ C$.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Output Voltage	V_{OUT}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$	4.950	5.0	5.050	V	
			4.900	5.0	5.100		
Line Regulation	V_{RLINE}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$		0.5	6	mV	
					10		
Load Regulation	V_{RLOAD}			2	15	mV	
Dropout Voltage	V_{DROP}	$\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$	SOT-223		1.2	1.3	V
			TO-252-2 (3)/TO-252-2 (4)		1.3	1.4	V
Current Limit	I_{LIMIT}		1	1.35		A	
Quiescent Current	I_Q	$I_{OUT} = 0$		4	6	mA	
Ripple Rejection	PSRR	$f = 120Hz$, $C_{OUT} = 22\mu F$ $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 300mA$		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		$^\circ C$	
Thermal Resistance (Junction to Case)	θ_{JC}	SOT-89		30		$^\circ C/W$	
		SOT-223		15			
		TO-252-2 (3)/TO-252-2 (4)		10			



LOW DROPOUT LINEAR REGULATOR

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Typical Performance Characteristics

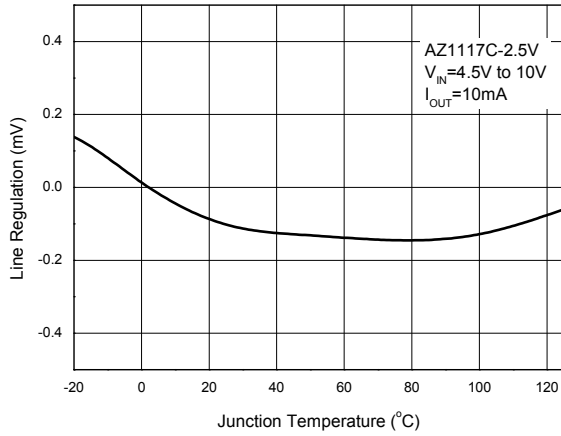


Figure 4. Line Regulation vs. Junction Temperature

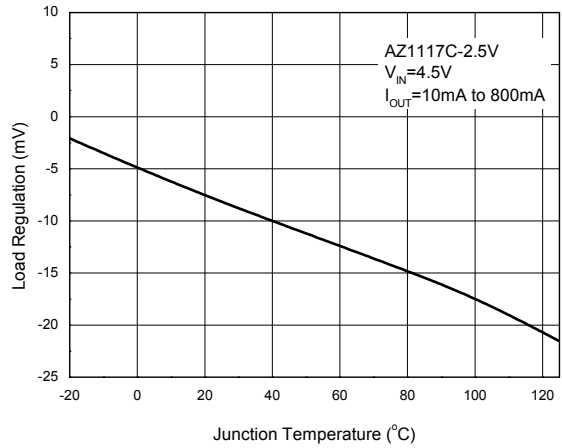


Figure 5. Load Regulation vs. Junction Temperature

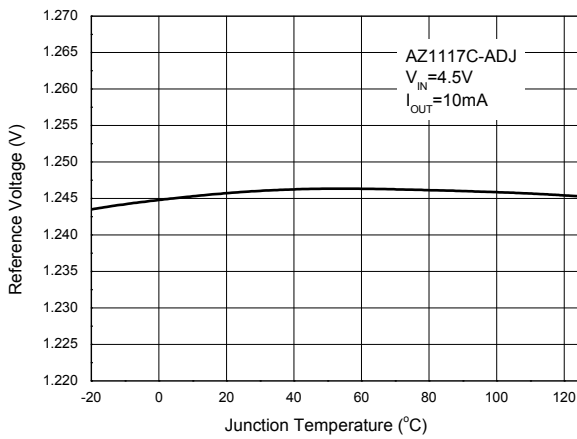


Figure 6. Reference Voltage vs. Junction Temperature

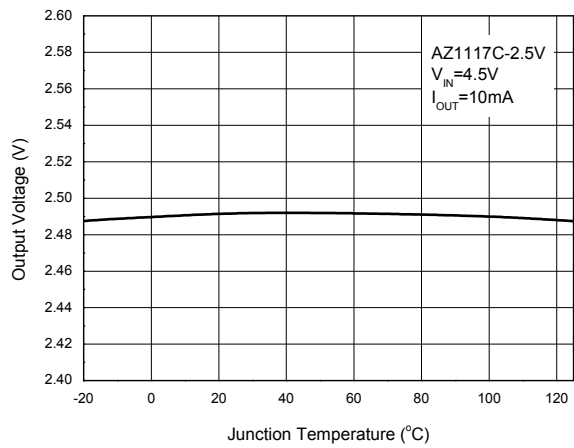


Figure 7. Output Voltage vs. Junction Temperature



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Typical Performance Characteristics (Continued)

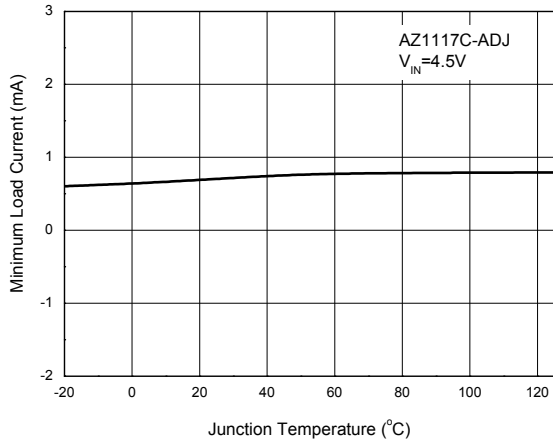


Figure 8. Minimum Load Current vs. Junction Temperature

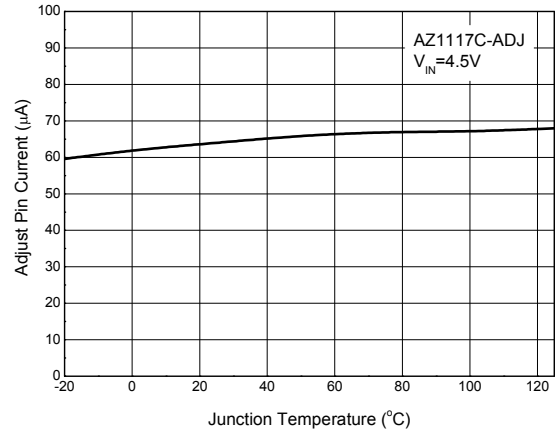


Figure 9. Adjust Pin Current vs. Junction Temperature

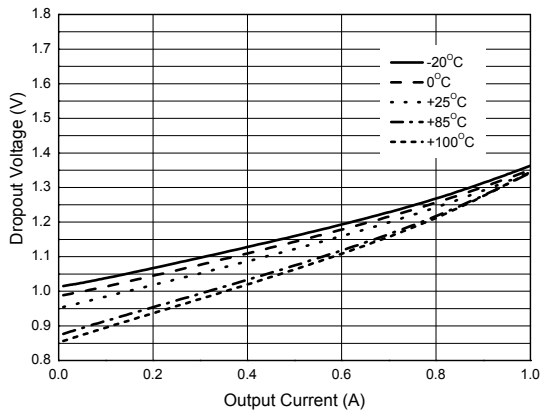


Figure 10. Dropout Voltage vs. Output Current

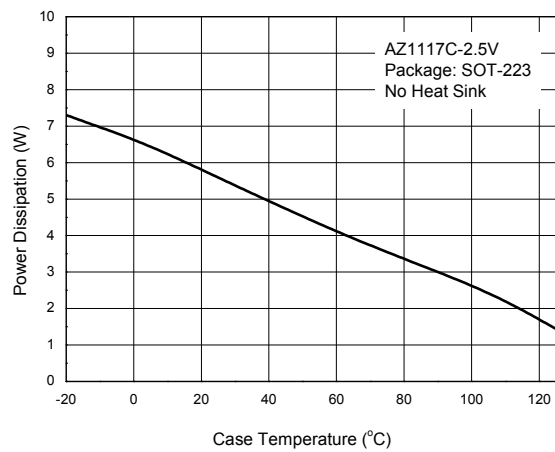


Figure 11. Power Dissipation vs. Case Temperature



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Typical Performance Characteristics (Continued)

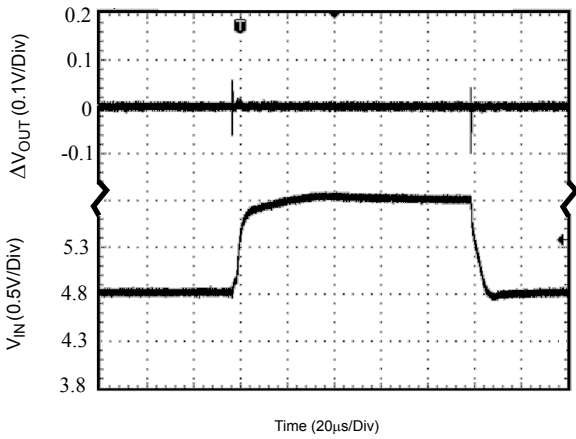


Figure 12. Line Transient Response

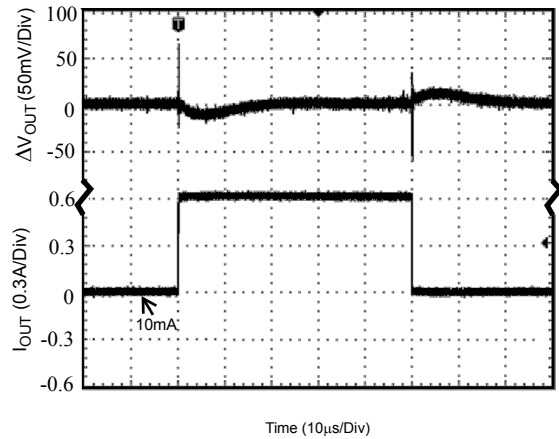


Figure 13. Load Transient Response

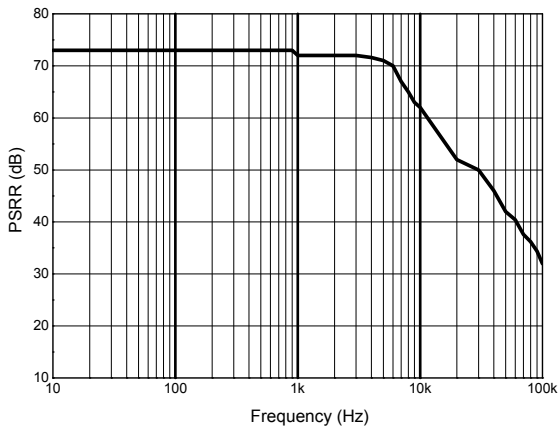


Figure 14. PSRR vs. Frequency

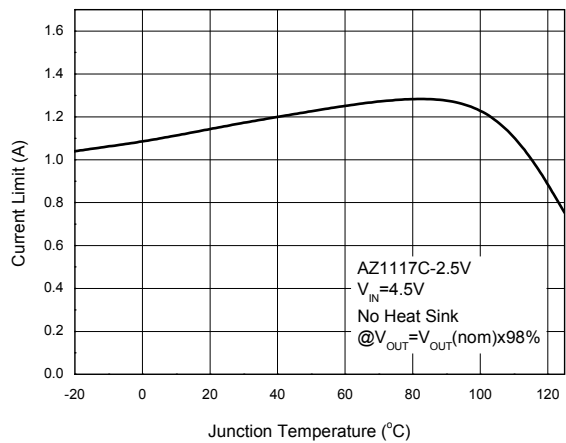


Figure 15. Current Limit vs. Junction Temperature



LOW DROPOUT LINEAR REGULATOR **AZ1117C**

Typical Performance Characteristics (Continued)

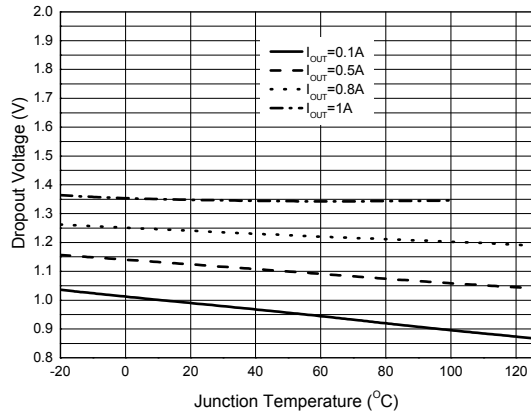


Figure 16. Dropout Voltage vs. Junction Temperature

Typical Applications

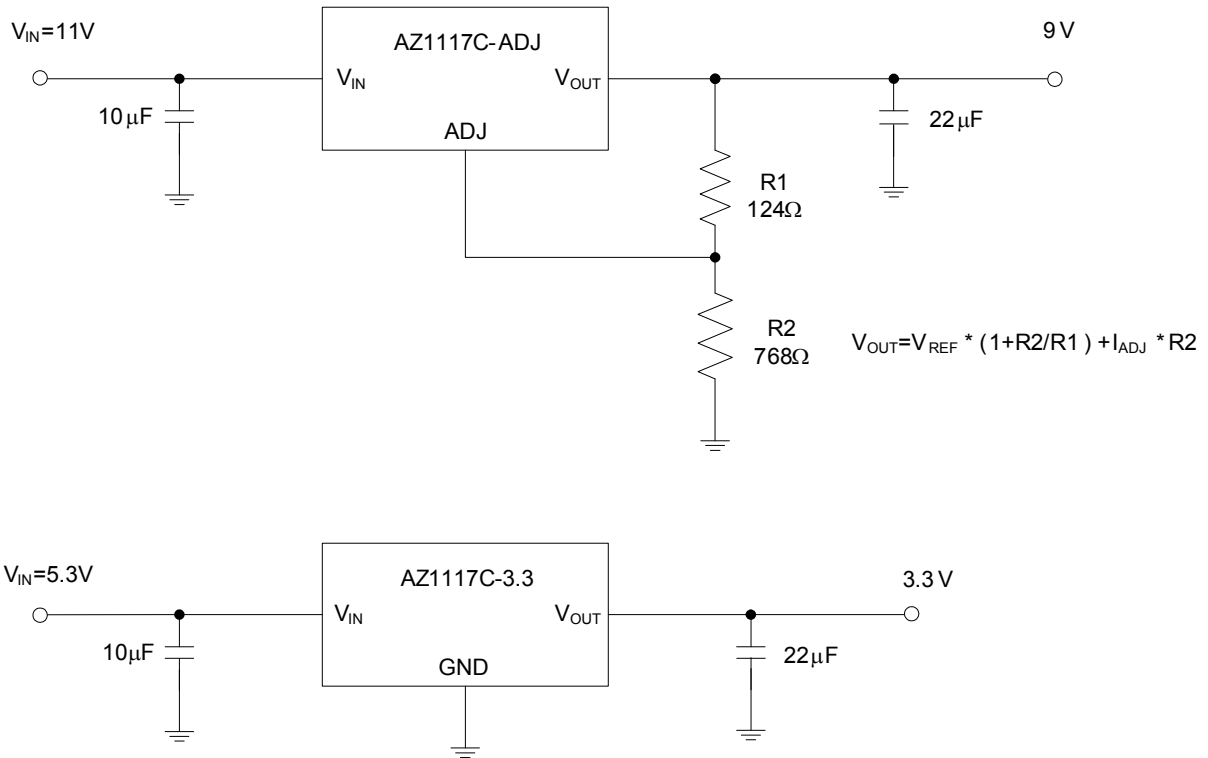


Figure 17. Typical Applications of AZ1117C



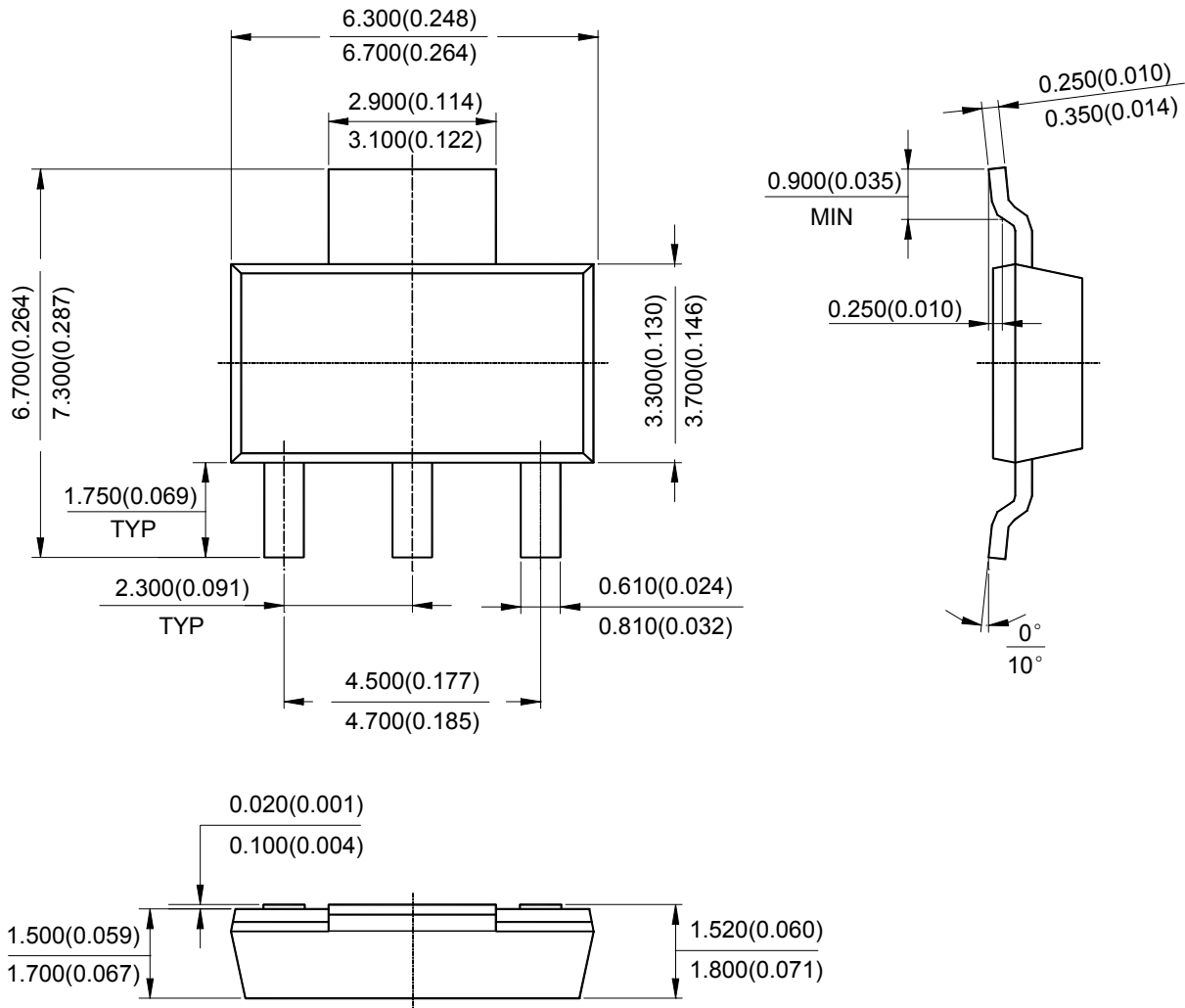
LOW DROPOUT LINEAR REGULATOR

AZ1117C

Mechanical Dimensions

SOT-223

Unit: mm(inch)





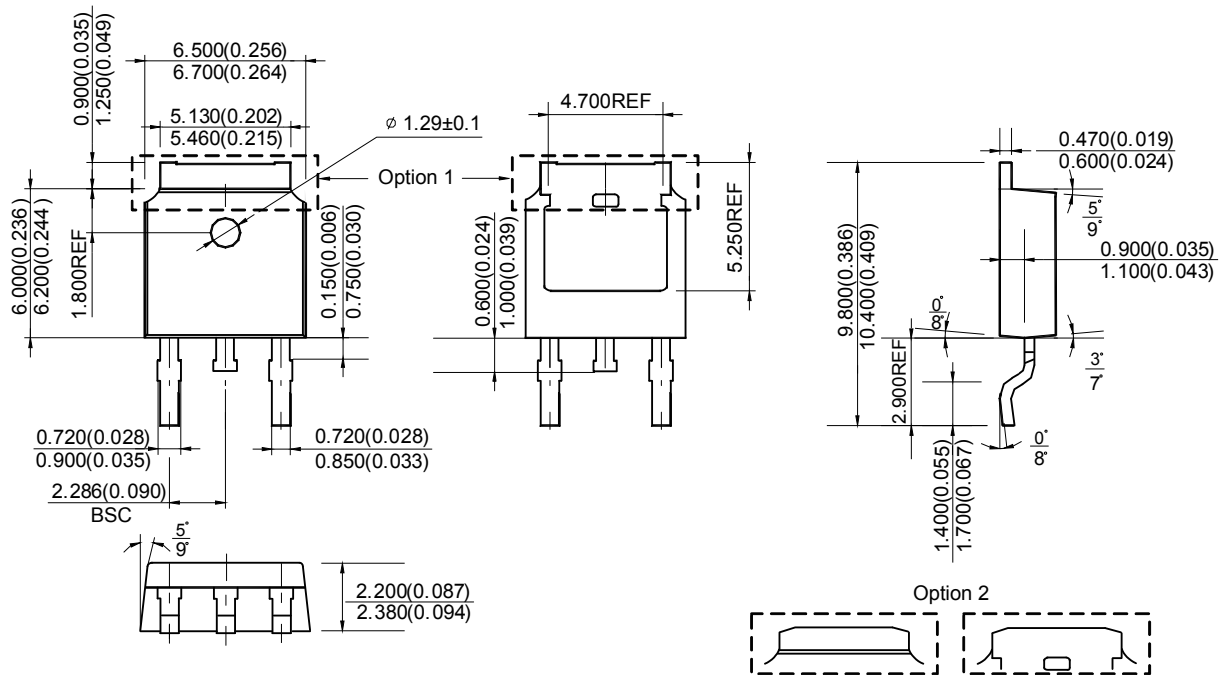
LOW DROPOUT LINEAR REGULATOR

AZ1117C

Mechanical Dimensions (Continued)

TO-252-2 (3)

Unit: mm(inch)





BCD Semiconductor Manufacturing Limited

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