

**5A LOW DROPOUT LINEAR REGULATOR****AZ1084****General Description**

The AZ1084 is a series of low dropout positive voltage regulators with a maximum dropout of 1.5V at 5A of load current.

The series features on-chip thermal limiting which provides protection against any combination of overload and ambient temperatures that would create excessive junction temperatures. It also includes a trimmed band-gap reference and a current limiting circuit.

The AZ1084 is available in 1.5V, 1.8V, 2.5V, 2.85V, 3.3V and 5.0V versions. 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 AZ1084 series is available in standard packages of TO-263-2, TO-263-3, TO-220-3 and TO-252-2 (1).

Features

- Low Dropout Voltage: 1.3V Typical at 5A
- Current Limiting and Thermal Protection
- Output Current: 5A
- Current Limit: 6.5A
- Operating Junction Temperature Range: 0 to 125°C
- Line Regulation (Adj Version): 0.015% (Typical)
- Load Regulation (Adj Version): 0.1% (Typical)

Applications

- High Efficiency Linear Regulators
- Battery Chargers
- Post Regulation for Switching Supply
- Microprocessor Supply
- Desktop PCs, RISC and Embedded Processors' Supply

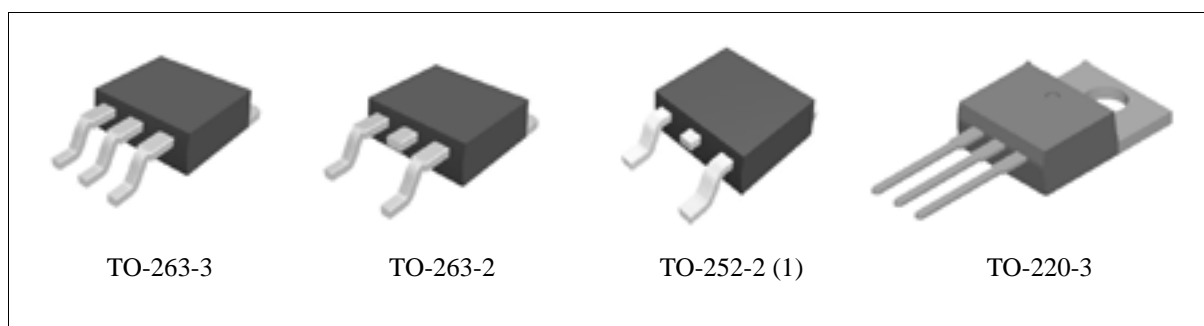


Figure 1. Package Types of AZ1084

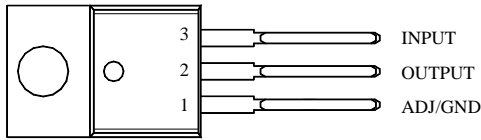


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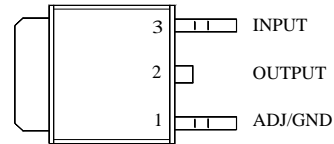
AZ1084

Pin Configuration

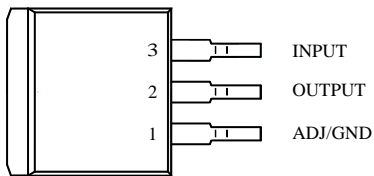
T Package
(TO-220-3)



D Package
(TO-252-2(1))



S Package
(TO-263-3)



S2 Package
(TO-263-2)

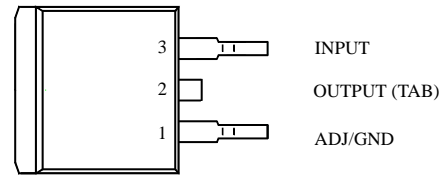


Figure 2. Pin Configuration of AZ1084 (Top View)

Functional Block Diagram

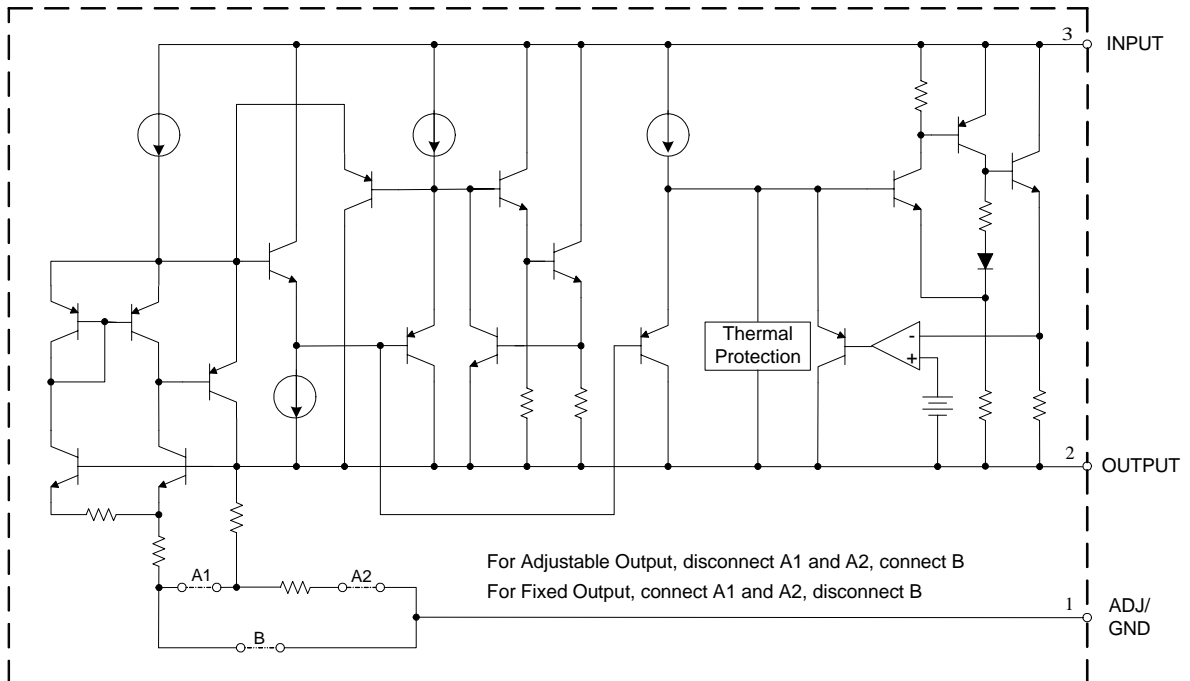


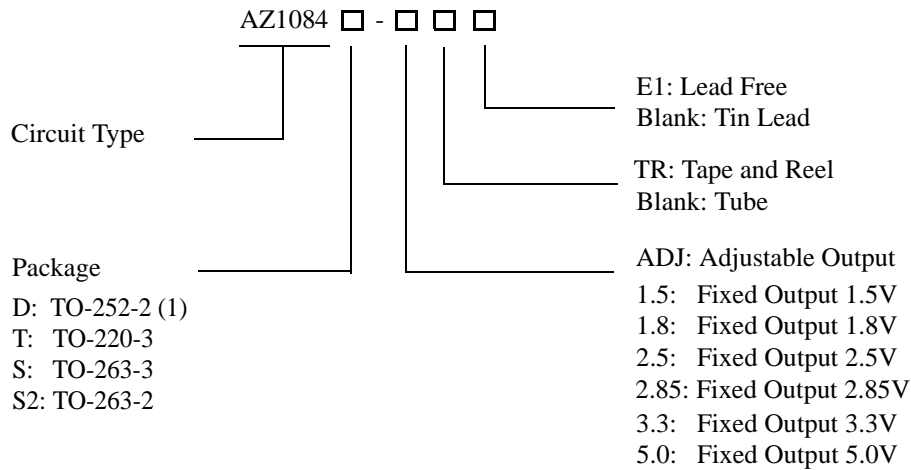
Figure 3. Functional Block Diagram of AZ1084



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Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Tin Lead	Lead Free	Tin Lead	Lead Free	
TO-252-2 (1)	0 to 125°C	AZ1084D-ADJ	AZ1084D-ADJE1	AZ1084D-ADJ	AZ1084D-ADJE1	Tube
		AZ1084D-ADJTR	AZ1084D-ADJTRE1	AZ1084D-ADJ	AZ1084D-ADJE1	Tape & Reel
		AZ1084D-1.5	AZ1084D-1.5E1	AZ1084D-1.5	AZ1084D-1.5E1	Tube
		AZ1084D-1.5TR	AZ1084D-1.5TRE1	AZ1084D-1.5	AZ1084D-1.5E1	Tape & Reel
		AZ1084D-1.8	AZ1084D-1.8E1	AZ1084D-1.8	AZ1084D-1.8E1	Tube
		AZ1084D-1.8TR	AZ1084D-1.8TRE1	AZ1084D-1.8	AZ1084D-1.8E1	Tape & Reel
		AZ1084D-2.5	AZ1084D-2.5E1	AZ1084D-2.5	AZ1084D-2.5E1	Tube
		AZ1084D-2.5TR	AZ1084D-2.5TRE1	AZ1084D-2.5	AZ1084D-2.5E1	Tape & Reel
		AZ1084D-2.85	AZ1084D-2.85E1	AZ1084D-2.85	AZ1084D-2.85E1	Tube
		AZ1084D-2.85TR	AZ1084D-2.85TRE1	AZ1084D-2.85	AZ1084D-2.85E1	Tape & Reel
		AZ1084D-3.3	AZ1084D-3.3E1	AZ1084D-3.3	AZ1084D-3.3E1	Tube
		AZ1084D-3.3TR	AZ1084D-3.3TRE1	AZ1084D-3.3	AZ1084D-3.3E1	Tape & Reel
		AZ1084D-5.0	AZ1084D-5.0E1	AZ1084D-5.0	AZ1084D-5.0E1	Tube
		AZ1084D-5.0TR	AZ1084D-5.0TRE1	AZ1084D-5.0	AZ1084D-5.0E1	Tape & Reel
TO-220-3	0 to 125°C	AZ1084T-ADJ	AZ1084T-ADJE1	AZ1084T-ADJ	AZ1084T-ADJE1	Tube
		AZ1084T-1.5	AZ1084T-1.5E1	AZ1084T-1.5	AZ1084T-1.5E1	Tube
		AZ1084T-1.8	AZ1084T-1.8E1	AZ1084T-1.8	AZ1084T-1.8E1	Tube
		AZ1084T-2.5	AZ1084T-2.5E1	AZ1084T-2.5	AZ1084T-2.5E1	Tube
		AZ1084T-2.85	AZ1084T-2.85E1	AZ1084T-2.85	AZ1084T-2.85E1	Tube
		AZ1084T-3.3	AZ1084T-3.3E1	AZ1084T-3.3	AZ1084T-3.3E1	Tube
		AZ1084T-5.0	AZ1084T-5.0E1	AZ1084T-5.0	AZ1084T-5.0E1	Tube



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Ordering Information (Continued)

Package	Temperature Range	Part Number		Marking ID		Packing Type
		Tin Lead	LeadFree	Tin Lead	LeadFree	
TO-263-3	0 to 125°C	AZ1084S-ADJ	AZ1084S-ADJE1	AZ1084S-ADJ	AZ1084S-ADJE1	Tube
		AZ1084S-ADJTR	AZ1084S-ADJTRE1	AZ1084S-ADJ	AZ1084S-ADJE1	Tape & Reel
		AZ1084S-1.5	AZ1084S-1.5E1	AZ1084S-1.5	AZ1084S-1.5E1	Tube
		AZ1084S-1.5TR	AZ1084S-1.5TRE1	AZ1084S-1.5	AZ1084S-1.5E1	Tape & Reel
		AZ1084S-1.8	AZ1084S-1.8E1	AZ1084S-1.8	AZ1084S-1.8E1	Tube
		AZ1084S-1.8TR	AZ1084S-1.8TRE1	AZ1084S-1.8	AZ1084S-1.8E1	Tape & Reel
		AZ1084S-2.5	AZ1084S-2.5E1	AZ1084S-2.5	AZ1084S-2.5E1	Tube
		AZ1084S-2.5TR	AZ1084S-2.5TRE1	AZ1084S-2.5	AZ1084S-2.5E1	Tape & Reel
		AZ1084S-2.85	AZ1084S-2.85E1	AZ1084S-2.85	AZ1084S-2.85E1	Tube
		AZ1084S-2.85TR	AZ1084S-2.85TRE1	AZ1084S-2.85	AZ1084S-2.85E1	Tape & Reel
		AZ1084S-3.3	AZ1084S-3.3E1	AZ1084S-3.3	AZ1084S-3.3E1	Tube
		AZ1084S-3.3TR	AZ1084S-3.3TRE1	AZ1084S-3.3	AZ1084S-3.3E1	Tape & Reel
		AZ1084S-5.0	AZ1084S-5.0E1	AZ1084S-5.0	AZ1084S-5.0E1	Tube
		AZ1084S-5.0TR	AZ1084S-5.0TRE1	AZ1084S-5.0	AZ1084S-5.0E1	Tape & Reel
TO-263-2	0 to 125°C	AZ1084S2-ADJ	AZ1084S2-ADJE1	AZ1084S2-ADJ	AZ1084S2-ADJE1	Tube
		AZ1084S2-ADJTR	AZ1084S2-ADJTRE1	AZ1084S2-ADJ	AZ1084S2-ADJE1	Tape & Reel
		AZ1084S2-1.5	AZ1084S2-1.5E1	AZ1084S2-1.5	AZ1084S2-1.5E1	Tube
		AZ1084S2-1.5TR	AZ1084S2-1.5TRE1	AZ1084S2-1.5	AZ1084S2-1.5E1	Tape & Reel
		AZ1084S2-1.8	AZ1084S2-1.8E1	AZ1084S2-1.8	AZ1084S2-1.8E1	Tube
		AZ1084S2-1.8TR	AZ1084S2-1.8TRE1	AZ1084S2-1.8	AZ1084S2-1.8E1	Tape & Reel
		AZ1084S2-2.5	AZ1084S2-2.5E1	AZ1084S2-2.5	AZ1084S2-2.5E1	Tube
		AZ1084S2-2.5TR	AZ1084S2-2.5TRE1	AZ1084S2-2.5	AZ1084S2-2.5E1	Tape & Reel
		AZ1084S2-2.85	AZ1084S2-2.85E1	AZ1084S2-2.85	AZ1084S2-2.85E1	Tube
		AZ1084S2-2.85TR	AZ1084S2-2.85TRE1	AZ1084S2-2.85	AZ1084S2-2.85E1	Tape & Reel
		AZ1084S2-3.3	AZ1084S2-3.3E1	AZ1084S2-3.3	AZ1084S2-3.3E1	Tube
		AZ1084S2-3.3TR	AZ1084S2-3.3TRE1	AZ1084S2-3.3	AZ1084S2-3.3E1	Tape & Reel
		AZ1084S2-5.0	AZ1084S2-5.0E1	AZ1084S2-5.0	AZ1084S2-5.0E1	Tube
		AZ1084S2-5.0TR	AZ1084S2-5.0TRE1	AZ1084S2-5.0	AZ1084S2-5.0E1	Tape & Reel

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

**5A LOW DROPOUT LINEAR REGULATOR****AZ1084****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
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)	TO-263-2	60	°C/W
	TO-263-3	60	
	TO-220-3	60	
	TO-252-2 (1)	100	
ESD (Human Body Model)	ESD	2000	V
ESD (Machine Model)	ESD	400	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	0	125	°C



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AZ1084

Electrical Characteristics

Typicals and limits appearing in normal type apply for $T_j=25^{\circ}\text{C}$. Limits appearing in **Boldface** type apply over the entire operating junction temperature range.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reference Voltage	V_{REF}	AZ1084-ADJ, $I_{OUT}=10\text{mA}$, $V_{IN}-V_{OUT}=3\text{V}$, $10\text{mA}\leq I_{OUT}\leq 5\text{A}$, $1.5\text{V}\leq V_{IN}-V_{OUT}\leq 5\text{V}$	1.238 1.225	1.250 1.250	1.262 1.270	V
Output Voltage	V_{OUT}	AZ1084-1.5, $I_{OUT}=0\text{mA}$, $V_{IN}=4.5\text{V}$, $10\text{mA}\leq I_{OUT}\leq 5\text{A}$, $3.0\text{V}\leq V_{IN}\leq 6\text{V}$	1.485 1.47	1.5 1.5	1.515 1.53	V
		AZ1084-1.8, $I_{OUT}=0\text{mA}$, $V_{IN}=4.8\text{V}$, $10\text{mA}\leq I_{OUT}\leq 5\text{A}$, $3.3\text{V}\leq V_{IN}\leq 6\text{V}$	1.782 1.764	1.8 1.8	1.818 1.836	V
		AZ1084-2.5, $I_{OUT}=0\text{mA}$, $V_{IN}=5.5\text{V}$, $10\text{mA}\leq I_{OUT}\leq 5\text{A}$, $4.0\text{V}\leq V_{IN}\leq 7\text{V}$	2.475 2.45	2.5 2.5	2.525 2.55	V
		AZ1084-2.85, $I_{OUT}=0\text{mA}$, $V_{IN}=6\text{V}$, $10\text{mA}\leq I_{OUT}\leq 5\text{A}$, $4.4\text{V}\leq V_{IN}\leq 8\text{V}$	2.822 2.793	2.85 2.85	2.879 2.907	V
		AZ1084-3.3, $I_{OUT}=0\text{mA}$, $V_{IN}=6.3\text{V}$, $10\text{mA}\leq I_{OUT}\leq 5\text{A}$, $4.8\text{V}\leq V_{IN}\leq 8\text{V}$	3.267 3.234	3.3 3.3	3.333 3.366	V
		AZ1084-5.0, $I_{OUT}=0\text{mA}$, $V_{IN}=8\text{V}$, $10\text{mA}\leq I_{OUT}\leq 5\text{A}$, $6.5\text{V}\leq V_{IN}\leq 10\text{V}$	4.95 4.9	5 5	5.05 5.1	V
Line Regulation	ΔV_{OUT}	AZ1084-ADJ, $I_{OUT}=10\text{mA}$, $2.85\text{V}\leq V_{IN}\leq 10\text{V}$		0.015 0.035	0.2 0.2	%
		AZ1084-1.5, $I_{OUT}=10\text{mA}$, $3.0\text{V}\leq V_{IN}\leq 10\text{V}$		0.5 1	6 6	mV
		AZ1084-1.8, $I_{OUT}=10\text{mA}$, $3.3\text{V}\leq V_{IN}\leq 10\text{V}$		0.5 1	6 6	mV
		AZ1084-2.5, $I_{OUT}=10\text{mA}$, $4.0\text{V}\leq V_{IN}\leq 10\text{V}$		0.5 1	6 6	mV
		AZ1084-2.85, $I_{OUT}=10\text{mA}$, $4.4\text{V}\leq V_{IN}\leq 10\text{V}$		0.5 1	6 6	mV
		AZ1084-3.3, $I_{OUT}=10\text{mA}$, $4.8\text{V}\leq V_{IN}\leq 10\text{V}$		0.5 1	6 6	mV
		AZ1084-5.0, $I_{OUT}=10\text{mA}$, $6.5\text{V}\leq V_{IN}\leq 10\text{V}$		0.5 1	10 10	mV



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Electrical Characteristics (Continued)

Typicals and limits appearing in normal type apply for $T_J=25^{\circ}\text{C}$. Limits appearing in **Boldface** type apply over the entire operating junction temperature range.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Load Regulation	ΔV_{OUT}	AZ1084-ADJ, $0\text{mA} \leq I_{OUT} \leq 5\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$		0.1 0.2	0.3 0.4	%
		AZ1084-1.5, $0\text{mA} \leq I_{OUT} \leq 5\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$		3 7	15 20	mV
		AZ1084-1.8, $0\text{mA} \leq I_{OUT} \leq 5\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$		3 7	15 20	mV
		AZ1084-2.5, $0\text{mA} \leq I_{OUT} \leq 5\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$		3 7	15 20	mV
		AZ1084-2.85, $0\text{mA} \leq I_{OUT} \leq 5\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$		3 7	15 20	mV
		AZ1084-3.3, $0\text{mA} \leq I_{OUT} \leq 5\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$		3 7	15 20	mV
		AZ1084-5.0, $0\text{mA} \leq I_{OUT} \leq 5\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$		5 10	20 35	mV
Dropout Voltage	V_{DROP}	$I_{OUT} = 5\text{A}$, ΔV_{REF} , $\Delta V_{OUT} = 1\%$		1.3	1.5	V
Current Limit	I_{LIMIT}	$V_{IN} - V_{OUT} = 3\text{V}$	5.5	6.5		A
Minimum Load Current	$I_{LOAD (MIN)}$	$V_{IN} = 10\text{V}$ (AZ1084-ADJ)		3	10	mA
Quiescent Current	I_Q	$V_{IN} = 10\text{V}$ (AZ1084)		5	10	mA
Ripple Rejection	PSRR	$f_{RIPPLE} = 120\text{Hz}$, $C_{OUT} = 25\mu\text{F}$ Tantalum, $I_{OUT} = 5\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$	60	72		dB
Adjust Pin Current	I_{ADJ}	$V_{IN} = 4.25\text{V}$, $I_{OUT} = 10\text{mA}$		55	120	μA
Adjust Pin Current Change	ΔI_{ADJ}	$10\text{mA} \leq I_{OUT} \leq 5\text{A}$, $1.5\text{V} \leq (V_{IN} - V_{OUT}) \leq 4.5\text{V}$		0.2	5	μA
Temperature Stability		$I_{OUT} = 10\text{mA}$, $V_{IN} - V_{OUT} = 1.5$		0.5		%
Long Term Stability		$T_A = 125^{\circ}\text{C}$, 1000Hrs		0.5		%
RMS Noise (% of V_{OUT})		$10\text{Hz} \leq f \leq 10\text{kHz}$		0.003		%



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Typical Performance Characteristics

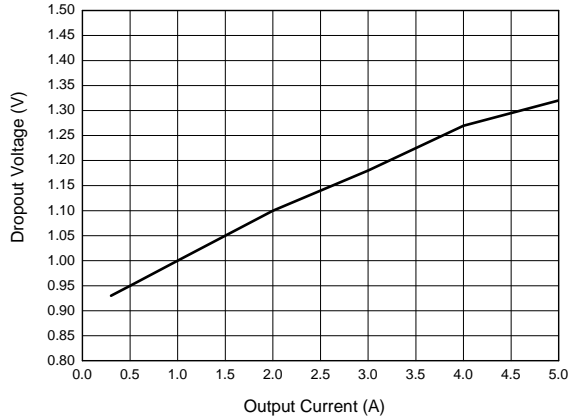


Figure 4. Dropout Voltage vs. Output Current

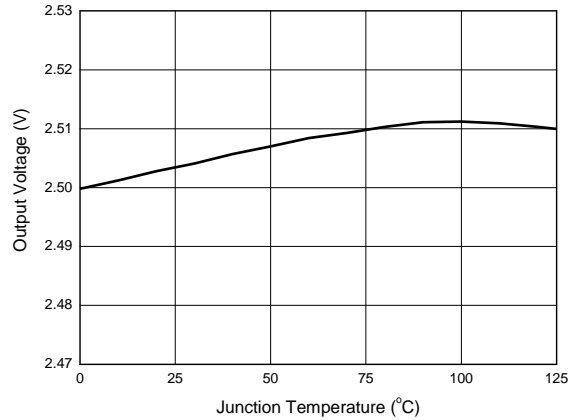


Figure 5. Output Voltage vs. Junction Temperature

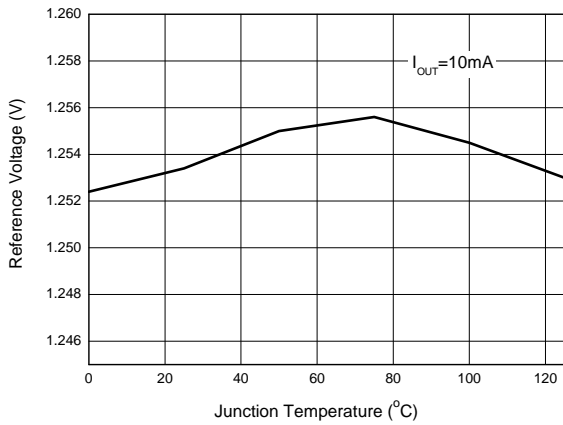


Figure 6. Reference Voltage vs. Junction Temperature

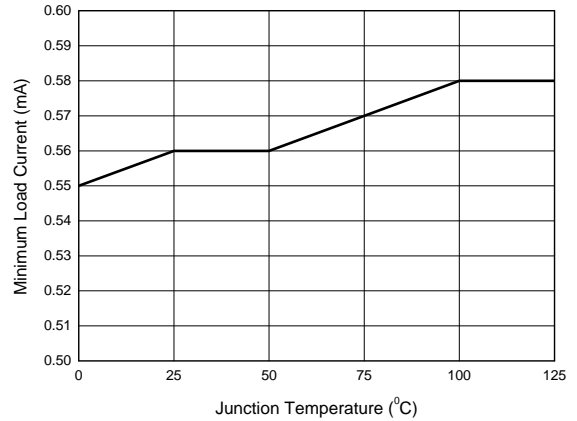


Figure 7. Minimum Load Current vs. Junction Temperature



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Typical Performance Characteristics (Continued)

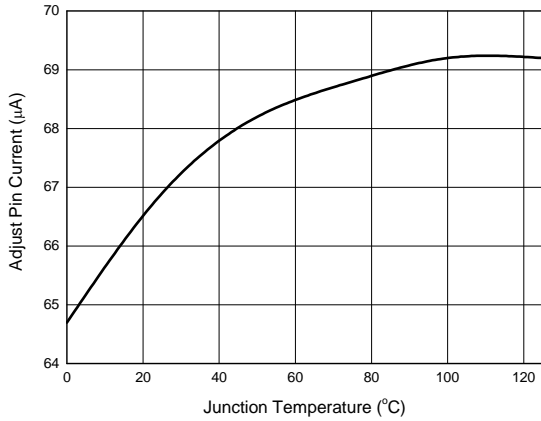


Figure 8. Adjust Pin Current vs. Junction Temperature

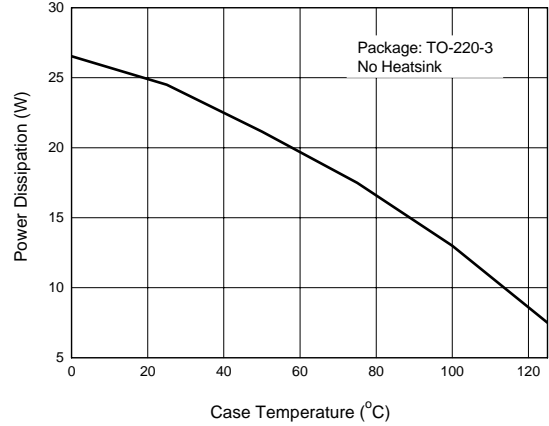


Figure 9. Power Dissipation vs. Case Temperature

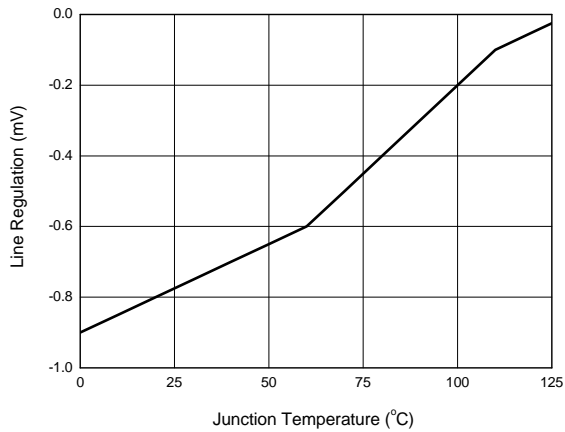


Figure 10. Line Regulation vs. Junction Temperature

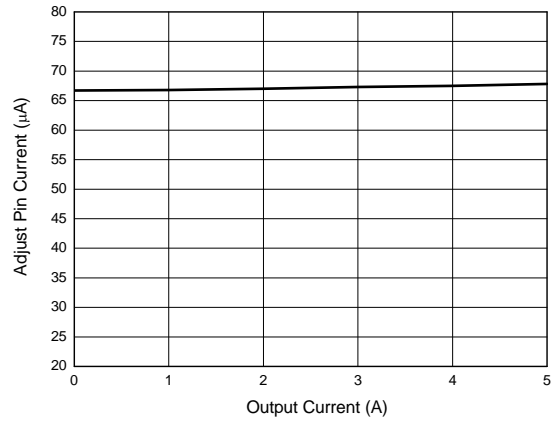


Figure 11. Adjust Pin Current vs. Output Current



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Typical Performance Characteristics (Continued)

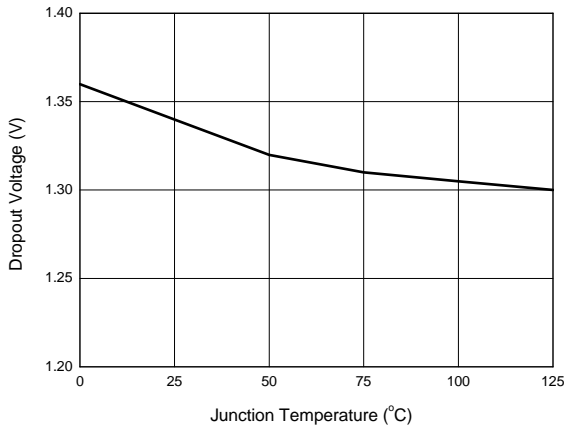


Figure 12. Dropout Voltage vs. Junction Temperature

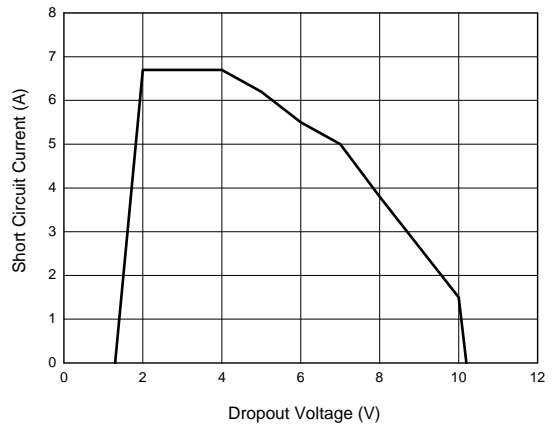


Figure 13. Short Circuit Current vs. Dropout Voltage

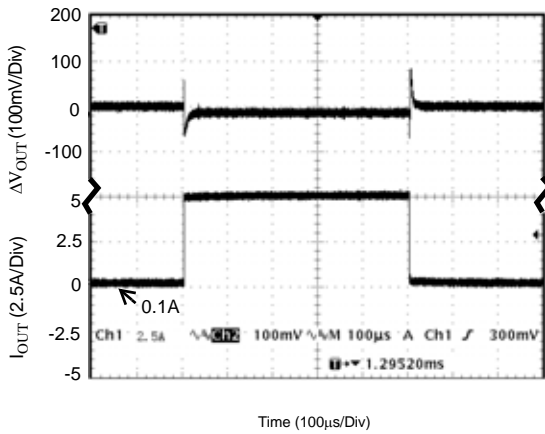


Figure 14. Load Transient Response
(Conditions: $V_{IN}=5.5V$, $V_{OUT}=2.5V$, $I_{OUT}=10mA$ to $5A$, $C_{IN}=10\mu F$, $C_{OUT}=10\mu F$)

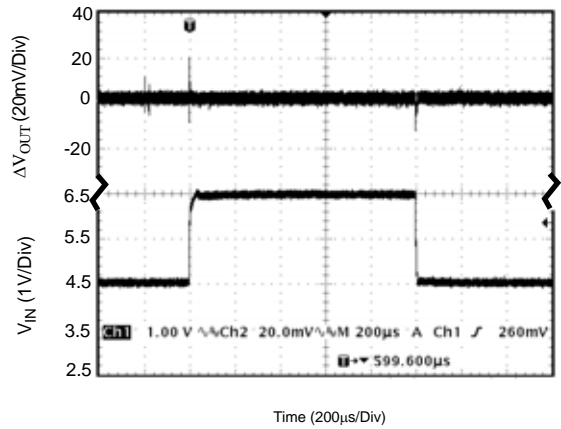


Figure 15. Line Transient Response
(Conditions: $V_{IN}=4.5V$ to $6.5V$, $V_{OUT}=2.5V$, $I_{OUT}=200mA$, $C_{OUT}=10\mu F$)



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Typical Performance Characteristics (Continued)

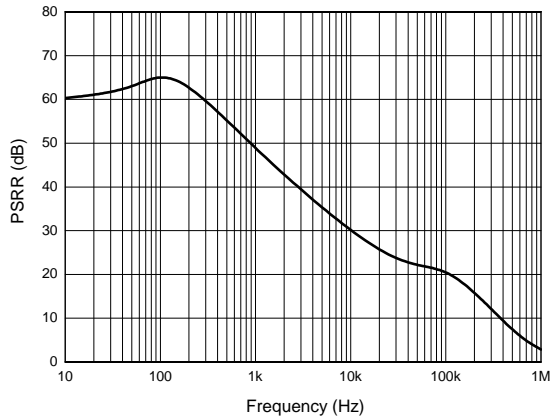


Figure 16. PSRR vs. Frequency



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Typical Application

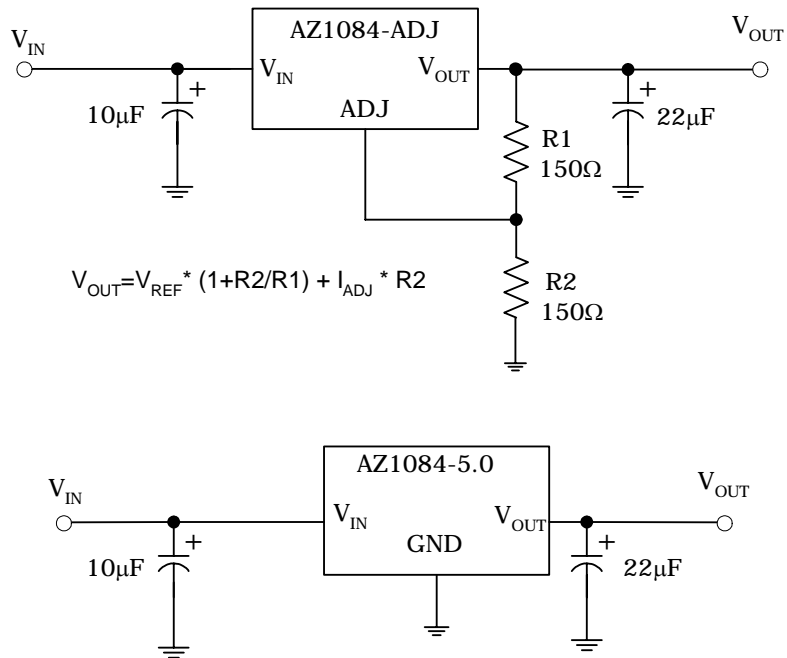


Figure 17. Typical Applications of AZ1084



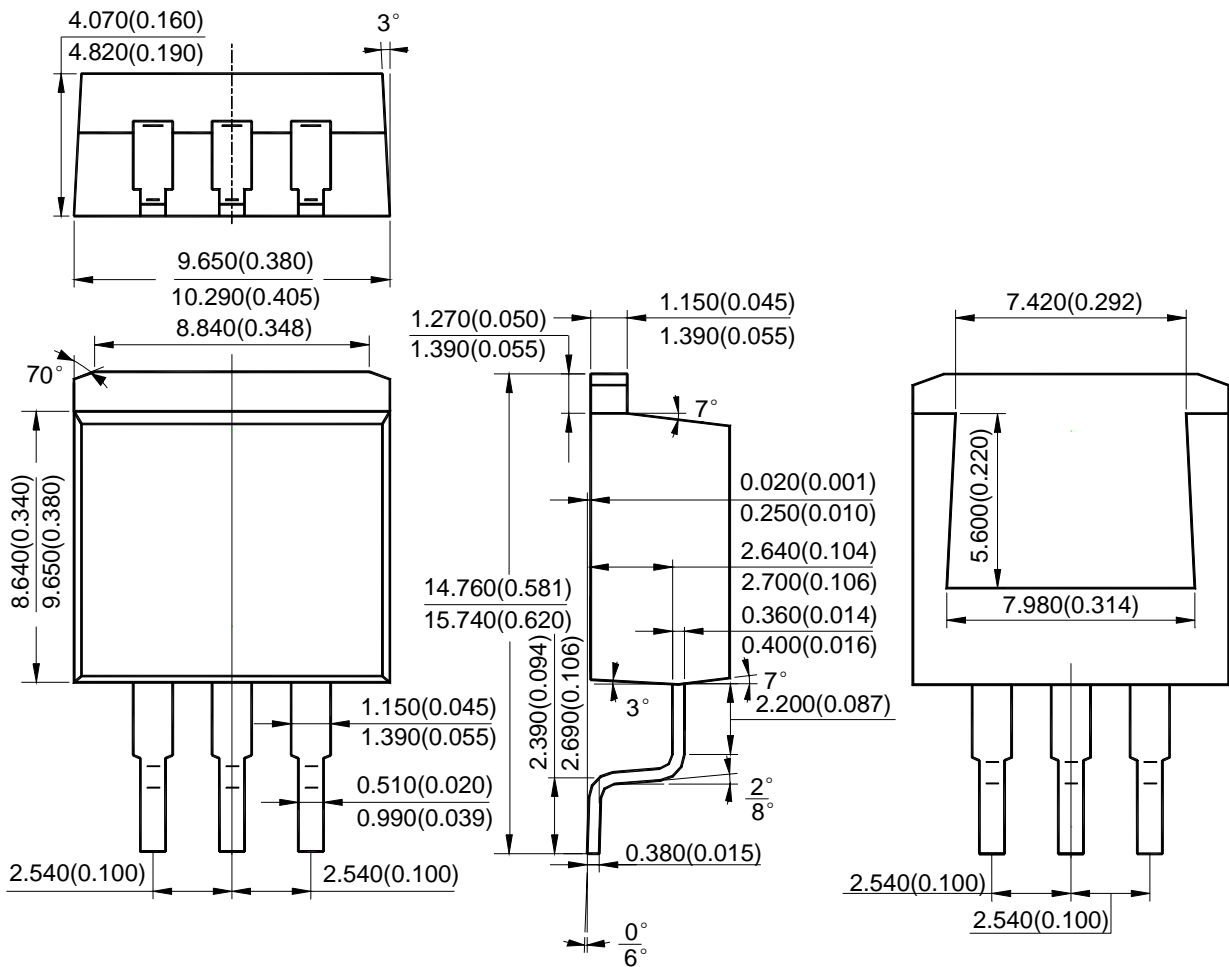
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Mechanical Dimensions

TO-263-3

Unit: mm(inch)





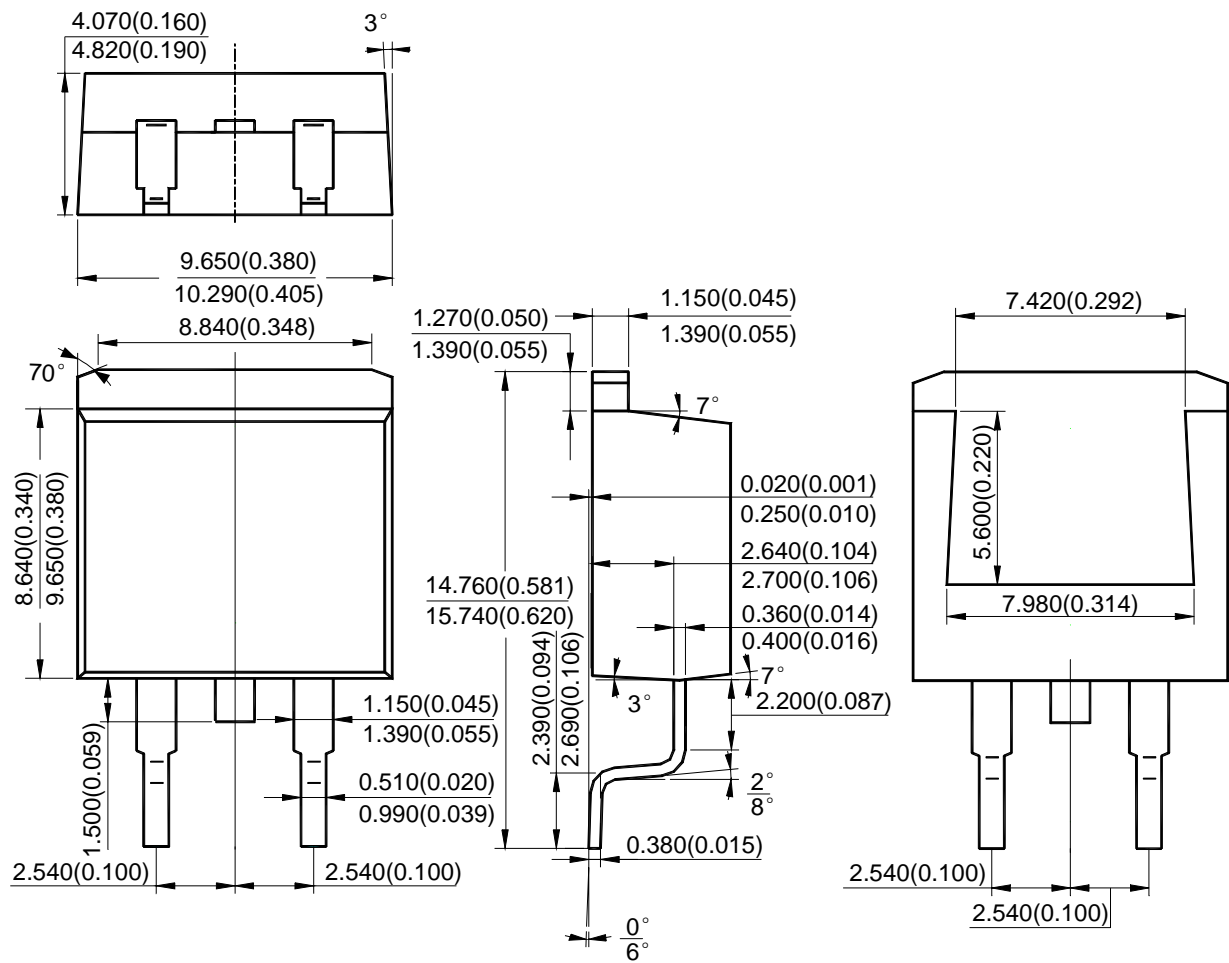
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Mechanical Dimensions (Continued)

TO-263-2

Unit: mm(inch)





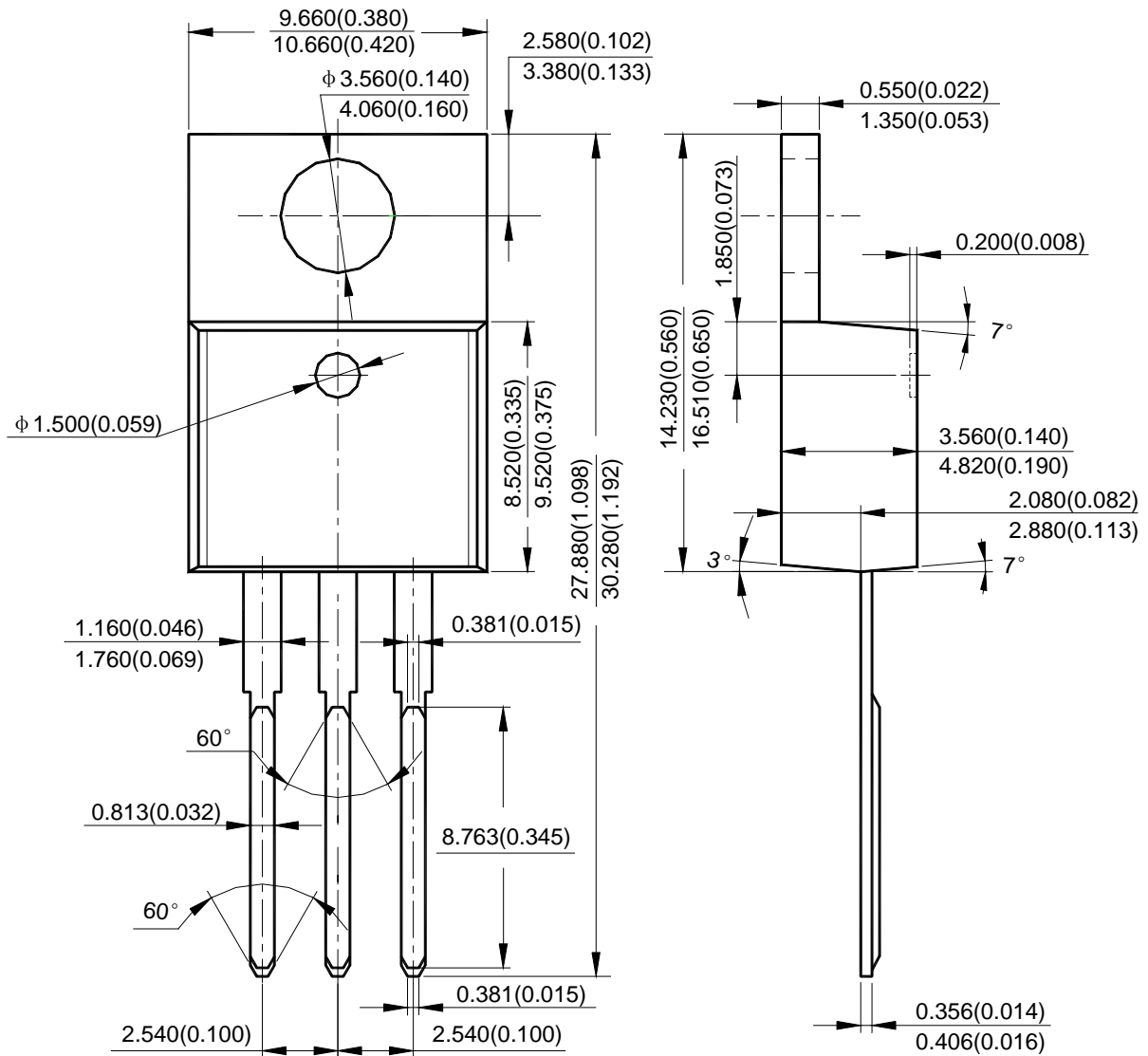
5A LOW DROPOUT LINEAR REGULATOR

AZ1084

Mechanical Dimensions (Continued)

TO-220-3

Unit: mm(inch)





BCD Semiconductor Manufacturing Limited

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