5A LOW DROPOUT LINEAR REGULATOR AZ1084C

General Description

The AZ1084C 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 bandgap reference and a current limiting circuit.

The AZ1084C is available in 1.5V, 1.8V, 2.5V, 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 AZ1084C series is available in standard packages of TO-263-3, TO-263-2, TO-252-2 (3) and TO-252-2 (4).

Features

- Low Dropout Voltage: 1.35V Typical at 5A
- Current Limiting and Thermal Protection
- Output Current: 5A
- Current Limit: 6.5A
- Operating Junction Temperature Range: 0 to 125°C
- Compatible with Low ESR Ceramic Capacitor
- Line Regulation (Adj Version): 0.015% (Typ)
- Load Regulation (Adj Version): 0.1% (Typ)

Applications

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

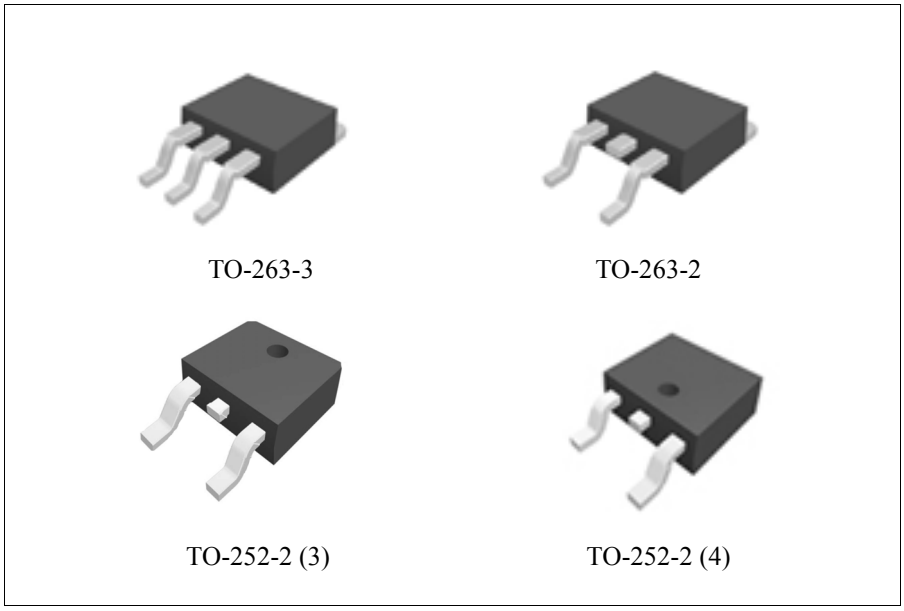
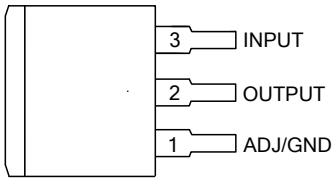


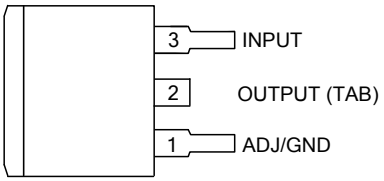
Figure 1. Package Types of AZ1084C

Pin Configuration

S Package
(TO-263-3)

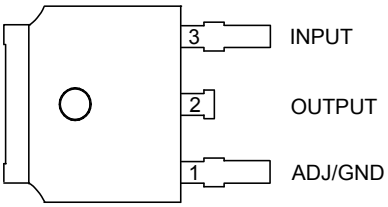


S2 Package
(TO-263-2)



D Packages

(TO-252-2 (3))



(TO-252-2 (4))

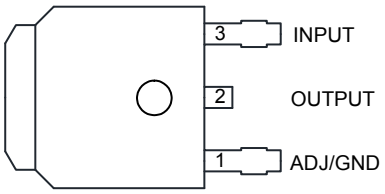


Figure 2. Pin Configuration of AZ1084C (Top View)

Functional Block Diagram

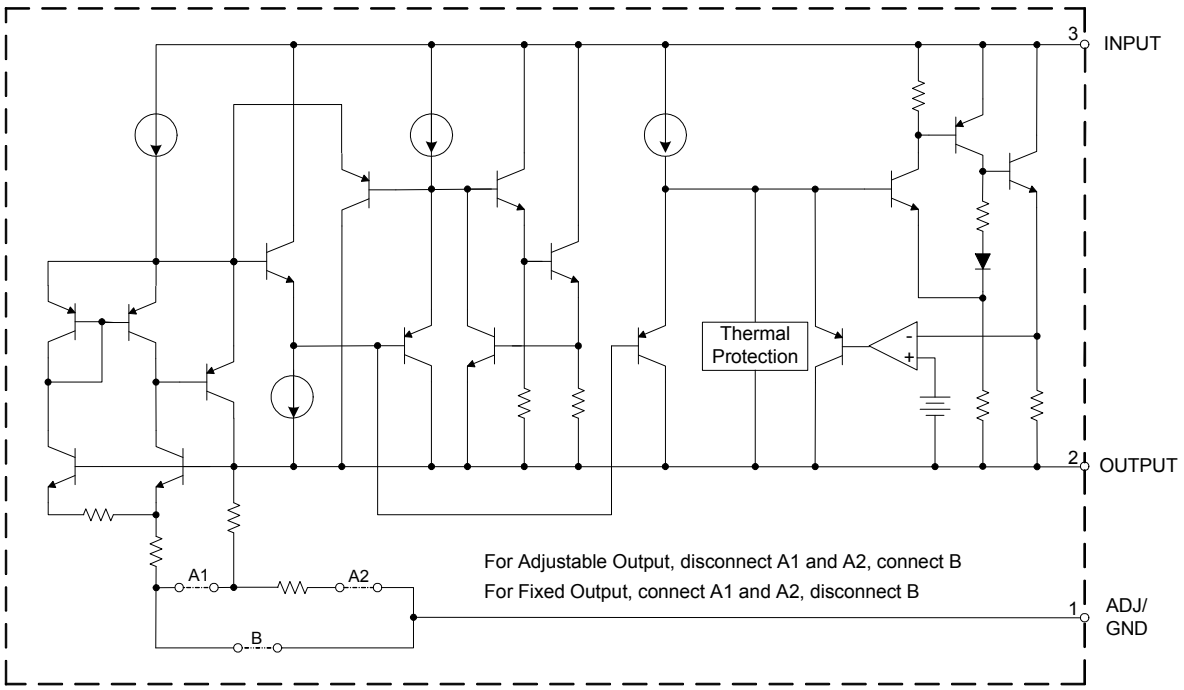
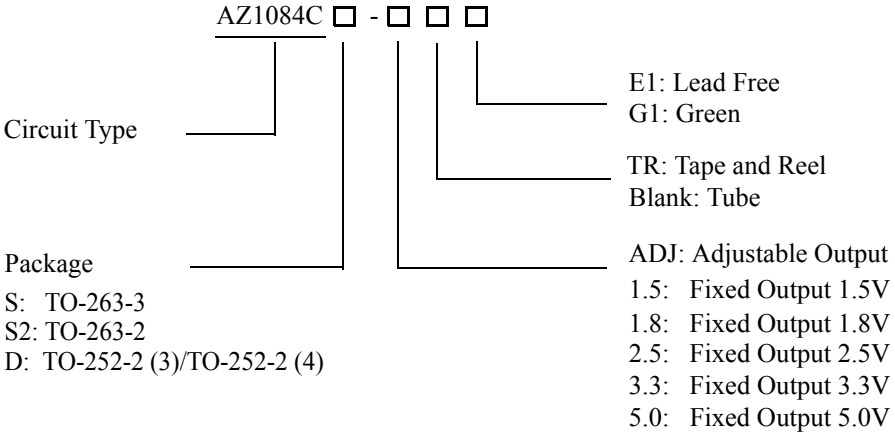


Figure 3. Functional Block Diagram of AZ1084C

Ordering Information



Package	Tempera-ture Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
TO-263-3	0 to 125°C	AZ1084CS-ADJE1	AZ1084CS-ADJG1	AZ1084CS-ADJE1	AZ1084CS-ADJG1	Tube
		AZ1084CS-ADJTRE1	AZ1084CS-ADJTRG1	AZ1084CS-ADJE1	AZ1084CS-ADJG1	Tape & Reel
		AZ1084CS-1.5E1	AZ1084CS-1.5G1	AZ1084CS-1.5E1	AZ1084CS-1.5G1	Tube
		AZ1084CS-1.5TRE1	AZ1084CS-1.5TRG1	AZ1084CS-1.5E1	AZ1084CS-1.5G1	Tape & Reel
		AZ1084CS-1.8E1	AZ1084CS-1.8G1	AZ1084CS-1.8E1	AZ1084CS-1.8G1	Tube
		AZ1084CS-1.8TRE1	AZ1084CS-1.8TRG1	AZ1084CS-1.8E1	AZ1084CS-1.8G1	Tape & Reel
		AZ1084CS-2.5E1	AZ1084CS-2.5G1	AZ1084CS-2.5E1	AZ1084CS-2.5G1	Tube
		AZ1084CS-2.5TRE1	AZ1084CS-2.5TRG1	AZ1084CS-2.5E1	AZ1084CS-2.5G1	Tape & Reel
		AZ1084CS-3.3E1	AZ1084CS-3.3G1	AZ1084CS-3.3E1	AZ1084CS-3.3G1	Tube
		AZ1084CS-3.3TRE1	AZ1084CS-3.3TRG1	AZ1084CS-3.3E1	AZ1084CS-3.3G1	Tape & Reel
		AZ1084CS-5.0E1	AZ1084CS-5.0G1	AZ1084CS-5.0E1	AZ1084CS-5.0G1	Tube
		AZ1084CS-5.0TRE1	AZ1084CS-5.0TRG1	AZ1084CS-5.0E1	AZ1084CS-5.0G1	Tape & Reel
TO-263-2	0 to 125°C	AZ1084CS2-ADJE1	AZ1084CS2-ADJG1	AZ1084CS2-ADJE1	AZ1084CS2-ADJG1	Tube
		AZ1084CS2-ADJTRE1	AZ1084CS2-ADJTRG1	AZ1084CS2-ADJE1	AZ1084CS2-ADJG1	Tape & Reel
		AZ1084CS2-1.5E1	AZ1084CS2-1.5G1	AZ1084CS2-1.5E1	AZ1084CS2-1.5G1	Tube
		AZ1084CS2-1.5TRE1	AZ1084CS2-1.5TRG1	AZ1084CS2-1.5E1	AZ1084CS2-1.5G1	Tape & Reel
		AZ1084CS2-1.8E1	AZ1084CS2-1.8G1	AZ1084CS2-1.8E1	AZ1084CS2-1.8G1	Tube
		AZ1084CS2-1.8TRE1	AZ1084CS2-1.8TRG1	AZ1084CS2-1.8E1	AZ1084CS2-1.8G1	Tape & Reel
		AZ1084CS2-2.5E1	AZ1084CS2-2.5G1	AZ1084CS2-2.5E1	AZ1084CS2-2.5G1	Tube
		AZ1084CS2-2.5TRE1	AZ1084CS2-2.5TRG1	AZ1084CS2-2.5E1	AZ1084CS2-2.5G1	Tape & Reel
		AZ1084CS2-3.3E1	AZ1084CS2-3.3G1	AZ1084CS2-3.3E1	AZ1084CS2-3.3G1	Tube
		AZ1084CS2-3.3TRE1	AZ1084CS2-3.3TRG1	AZ1084CS2-3.3E1	AZ1084CS2-3.3G1	Tape & Reel
		AZ1084CS2-5.0E1	AZ1084CS2-5.0G1	AZ1084CS2-5.0E1	AZ1084CS2-5.0G1	Tube
		AZ1084CS2-5.0TRE1	AZ1084CS2-5.0TRG1	AZ1084CS2-5.0E1	AZ1084CS2-5.0G1	Tape & Reel

Ordering Information (Continued)

Package	Temperature Range	Part Number	Marking ID	Packing Type
TO-252-2 (3)/ TO-252-2 (4)	0 to 125°C	AZ1084CD-ADJTRG1	AZ1084CD-ADJG1	Tape & Reel
		AZ1084CD-1.5TRG1	AZ1084CD-1.5G1	Tape & Reel
		AZ1084CD-1.8TRG1	AZ1084CD-1.8G1	Tape & Reel
		AZ1084CD-2.5TRG1	AZ1084CD-2.5G1	Tape & Reel
		AZ1084CD-3.3TRG1	AZ1084CD-3.3G1	Tape & Reel
		AZ1084CD-5.0TRG1	AZ1084CD-5.0G1	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green packages.

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)	θ_{JA}	TO-263-2	60	°C/W
		TO-263-3	60	
		TO-252-2 (3)/TO-252-2 (4)	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

Electrical Characteristics

Typicals and limits appearing in normal type apply for T_J=25°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}	AZ1084C-ADJ, I_{OUT}=10mA, V_{IN}-V_{OUT}=3V, 10mA≤I_{OUT}≤5A, 1.5V≤V_{IN}-V_{OUT}≤5V	1.238 **1.225**	1.250 **1.250**	1.262 **1.270**	V
Output Voltage	V_{OUT}	AZ1084C-1.5, I_{OUT}=0mA, V_{IN}=4.5V, 10mA≤I_{OUT}≤5A, 3.0V≤V_{IN}≤6V	1.485 **1.47**	1.5 **1.5**	1.515 **1.53**	V
		AZ1084C-1.8, I_{OUT}=0mA, V_{IN}=4.8V, 10mA≤I_{OUT}≤ 5A, 3.3V≤V_{IN}≤6V	1.782 **1.764**	1.8 **1.8**	1.818 **1.836**	V
		AZ1084C-2.5, I_{OUT}=0mA, V_{IN}=5.5V 10mA≤I_{OUT}≤5A, 4.0V≤V_{IN} ≤7V	2.475 **2.45**	2.5 **2.5**	2.525 **2.55**	V
		AZ1084C-3.3, I_{OUT}=0mA, V_{IN}=6.3V, 10mA≤I_{OUT}≤5A, 4.8V≤V_{IN}≤8V	3.267 **3.234**	3.3 **3.3**	3.333 **3.366**	V
		AZ1084C-5.0, I_{OUT}=0mA, V_{IN}=8V, 10mA≤ I_{OUT}≤5A, 6.5V≤V_{IN}≤10V	4.95 **4.9**	5 **5**	5.05 **5.1**	V
Line Regulation	ΔV_{OUT}	AZ1084C-ADJ, I_{OUT}=10mA, 2.85V≤V_{IN}≤10V		0.015 **0.035**	0.2 **0.2**	%
		AZ1084C-1.5, I_{OUT}=10mA, 3.0V≤V_{IN}≤10V		0.5 **1**	6 **6**	mV
		AZ1084C-1.8, I_{OUT}=10mA, 3.3V≤V_{IN}≤10V		0.5 **1**	6 **6**	mV
		AZ1084C-2.5, I_{OUT}=10mA, 4.0V≤V_{IN}≤10V		0.5 **1**	6 **6**	mV
		AZ1084C-3.3, I_{OUT}=10mA, 4.8V≤V_{IN}≤10V		0.5 **1**	6 **6**	mV
		AZ1084C-5.0, I_{OUT}=10mA, 6.5V≤V_{IN}≤10V		0.5 **1**	10 **10**	mV

Electrical Characteristics (Continued)

Typicals and limits appearing in normal type apply for T_J=25°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}	AZ1084C-ADJ, 0mA≤I_{OUT}≤5A, V_{IN}-V_{OUT}=3V		0.1 **0.2**	0.3 **0.4**	%
		AZ1084C-1.5, 0mA≤I_{OUT}≤5A, V_{IN}-V_{OUT}=3V		3 **7**	15 **20**	mV
		AZ1084C-1.8, 0mA≤ I_{OUT}≤5A, V_{IN}-V_{OUT}=3V		3 **7**	15 **20**	mV
		AZ1084C-2.5, 0mA≤I_{OUT}≤5A, V_{IN}-V_{OUT}=3V		3 **7**	15 **20**	mV
		AZ1084C-3.3, 0mA≤I_{OUT}≤5A, V_{IN}-V_{OUT}=3V		3 **7**	15 **20**	mV
		AZ1084C-5.0, 0mA≤I_{OUT}≤5A, V_{IN}-V_{OUT}=3V		5 **10**	20 **35**	mV
Dropout Voltage	V_{DROP}	I_{OUT}=4.5A, ΔV_{REF}, ΔV_{OUT}=1%		**1.35**	**1.5**	V
Thermal Resistance (Junction to Case)	θ_{JC}	TO-263-3		4.15		°C/W
		TO-263-2		4.15		
		TO-252-2 (3)/TO-252-2 (4)		7.36		
Current Limit	I_{LIMIT}	V_{IN}-V_{OUT}=3V	5.5	6.5		A
Minimum Load Current	I_{LOAD} (MIN)	V_{IN}=10V (AZ1084C-ADJ)		**3**	**10**	mA
Quiescent Current	I_Q	V_{IN}=10V (AZ1084C)		**5**	**10**	mA
Ripple Rejection	PSRR	f_{RIPPLE}=120Hz, C_{OUT}=25μF Tantalum, I_{OUT}=5A, V_{IN}-V_{OUT}=3V	**60**	**72**		dB
Adjust Pin Current	I_{ADJ}	V_{IN}=4.25V, I_{OUT}=10mA		55	**120**	μA
Adjust Pin Current Change	ΔI_{ADJ}	10mA≤I_{OUT}≤5A, 1.5V≤(V_{IN}-V_{OUT})≤4.5V		**0.2**	**5**	μA
Temperature Stability		I_{OUT}=10mA, V_{IN}-V_{OUT}=1.5		**0.5**		%
Long Term Stability		T_A=125°C, 1000Hrs		0.5		%
RMS Noise (% of V_{OUT})		10Hz≤f≤10kHz		0.003		%

Typical Performance Characteristics

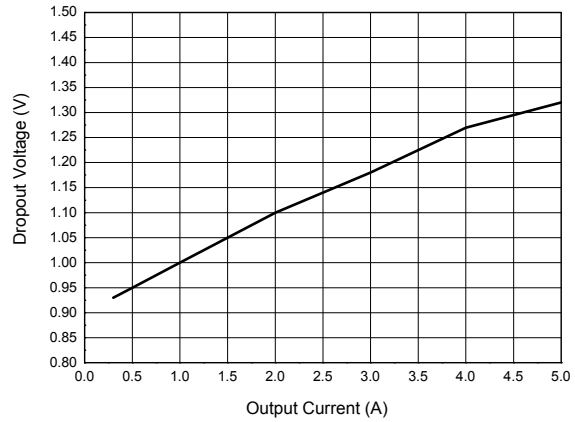


Figure 4. Dropout Voltage vs. Output Current

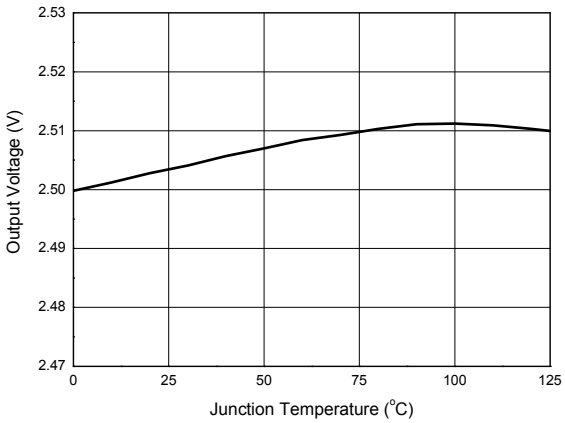


Figure 5. Output Voltage vs. Junction Temperature

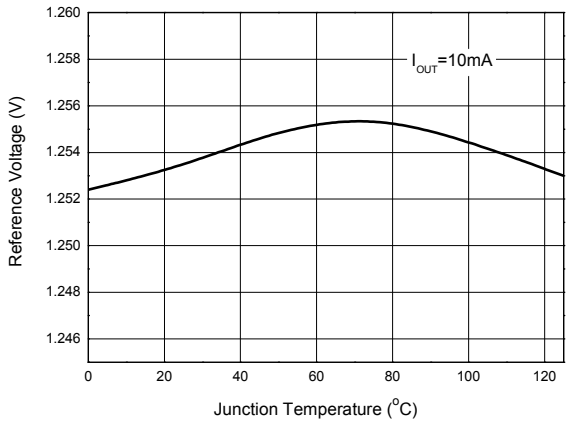


Figure 6. Reference Voltage vs. Junction Temperature

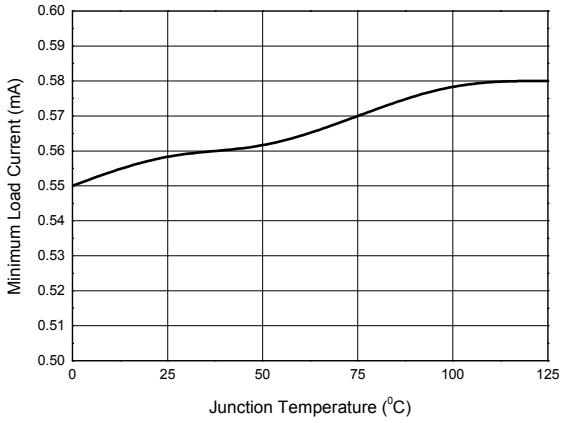


Figure 7. Minimum Load Current vs. Junction Temperature

Typical Performance Characteristics (Continued)

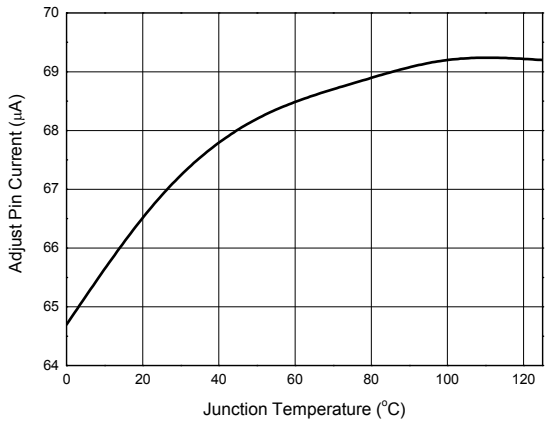


Figure 8. Adjust Pin Current vs. Junction Temperature

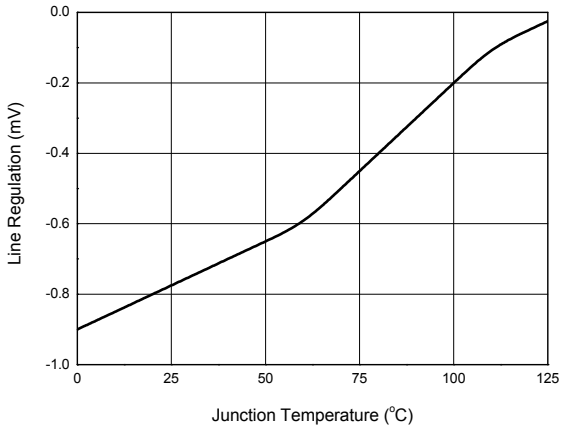


Figure 9. Line Regulation vs. Junction Temperature

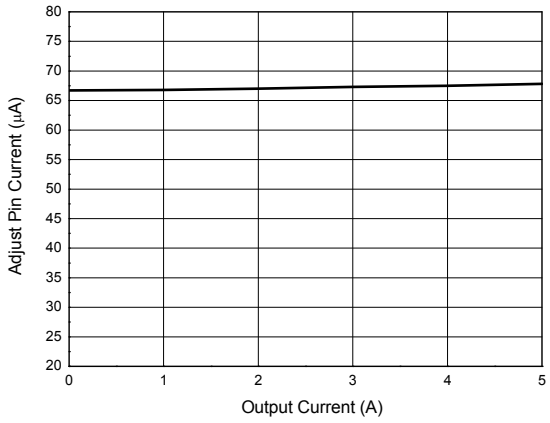


Figure 10. Adjust Pin Current vs. Output Current

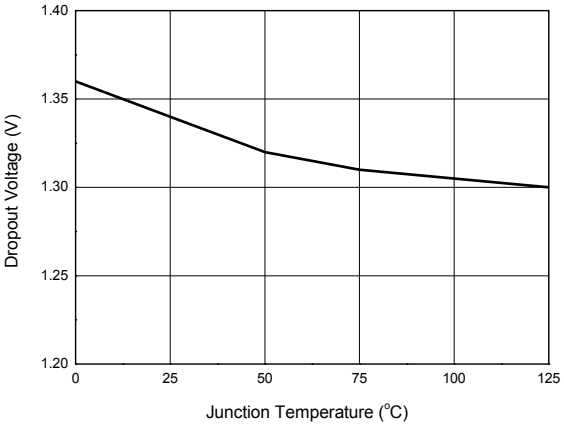


Figure 11. Dropout Voltage vs. Junction Temperature

Typical Performance Characteristics (Continued)

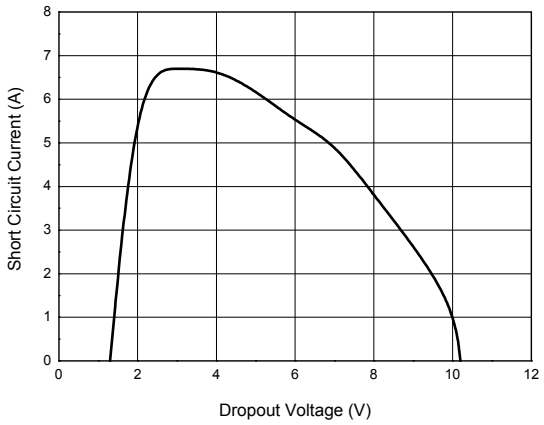


Figure 12. Short Circuit Current vs. Dropout Voltage

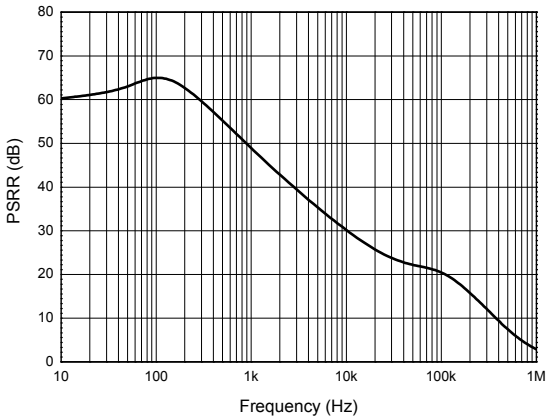


Figure 13. PSRR vs. Frequency

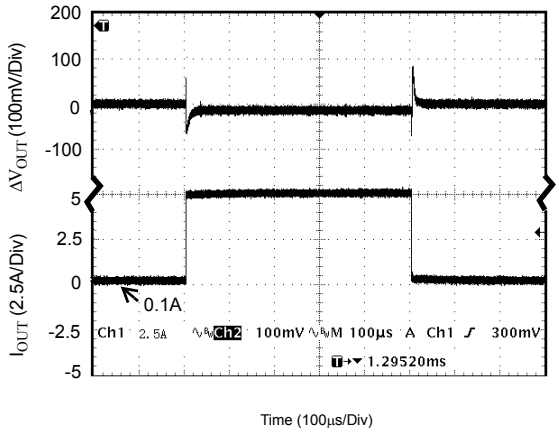


Figure 14. Load Transient Response
(Conditions: V_{IN}=5.5V, V_{OUT}=2.5V, I_{OUT}=10mA to 5A
C_{IN}=10μF, C_{OUT}=10μF)

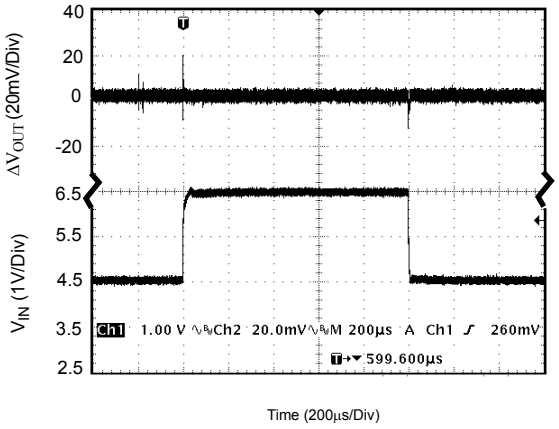


Figure 15. Line Transient Response
(Conditions: V_{IN}=4.5V to 6.5V, V_{OUT}=2.5V,
I_{OUT}=200mA, C_{OUT}=10μF)

Typical Application

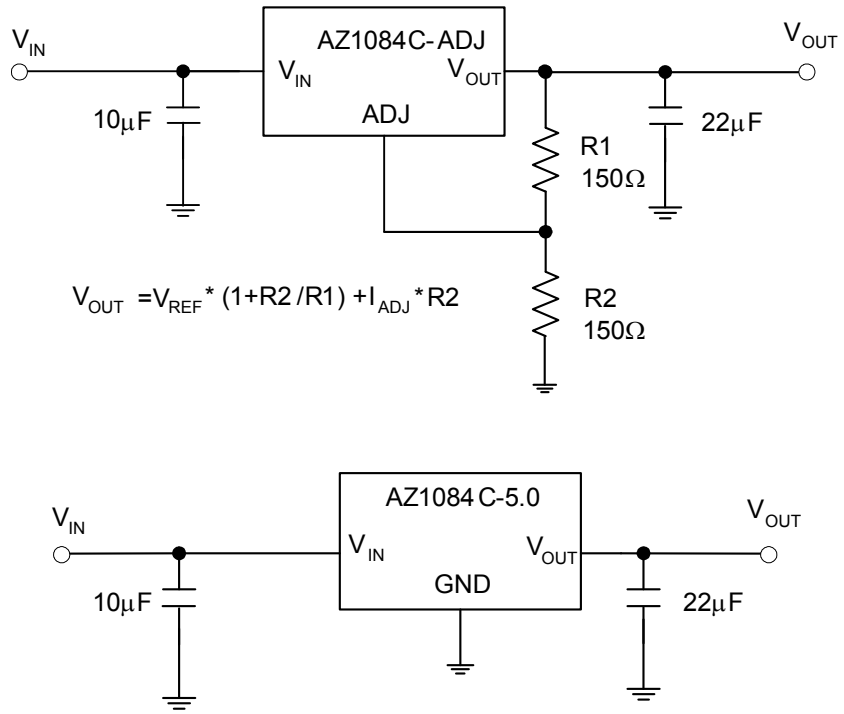
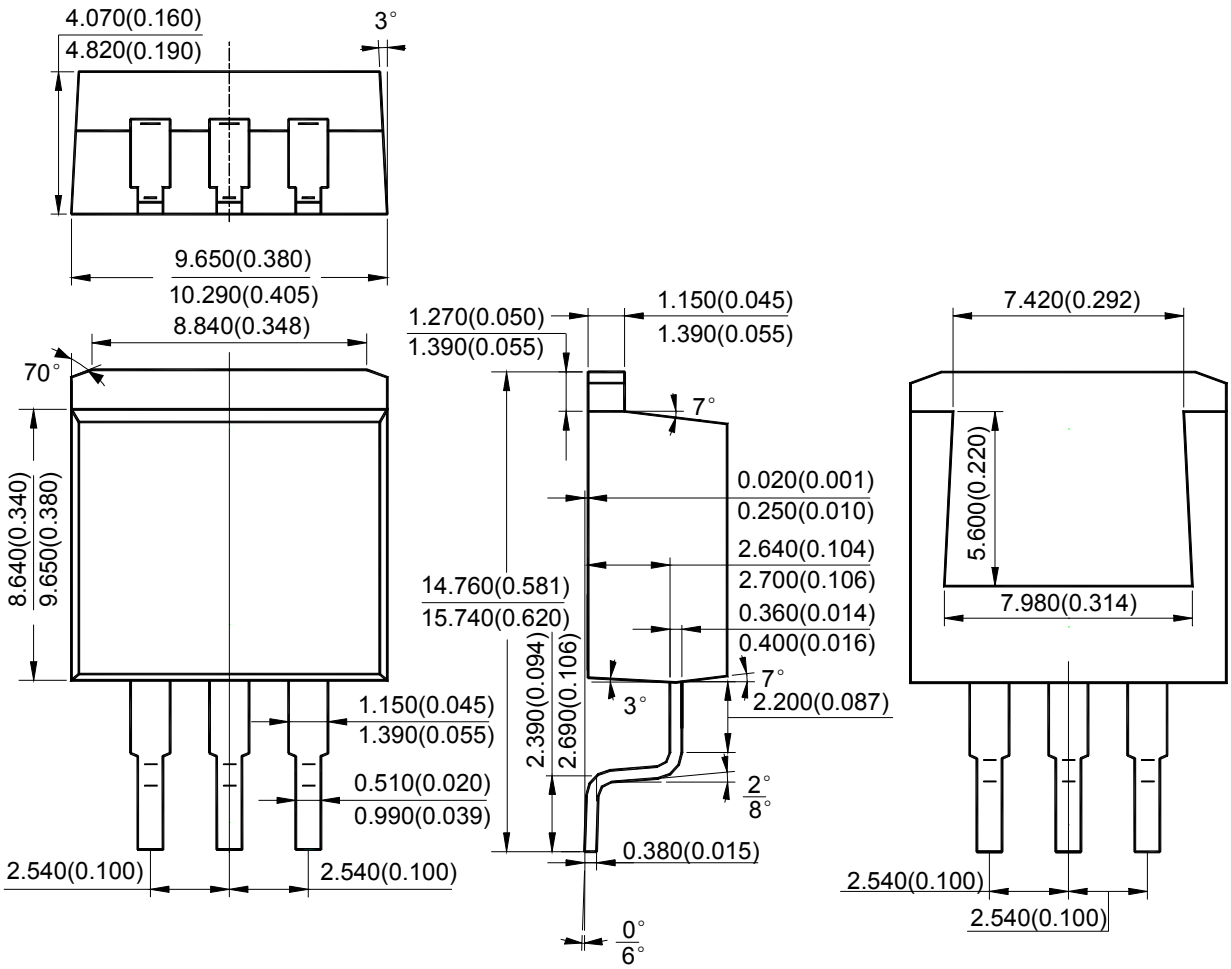


Figure 16. Typical Applications of AZ1084C

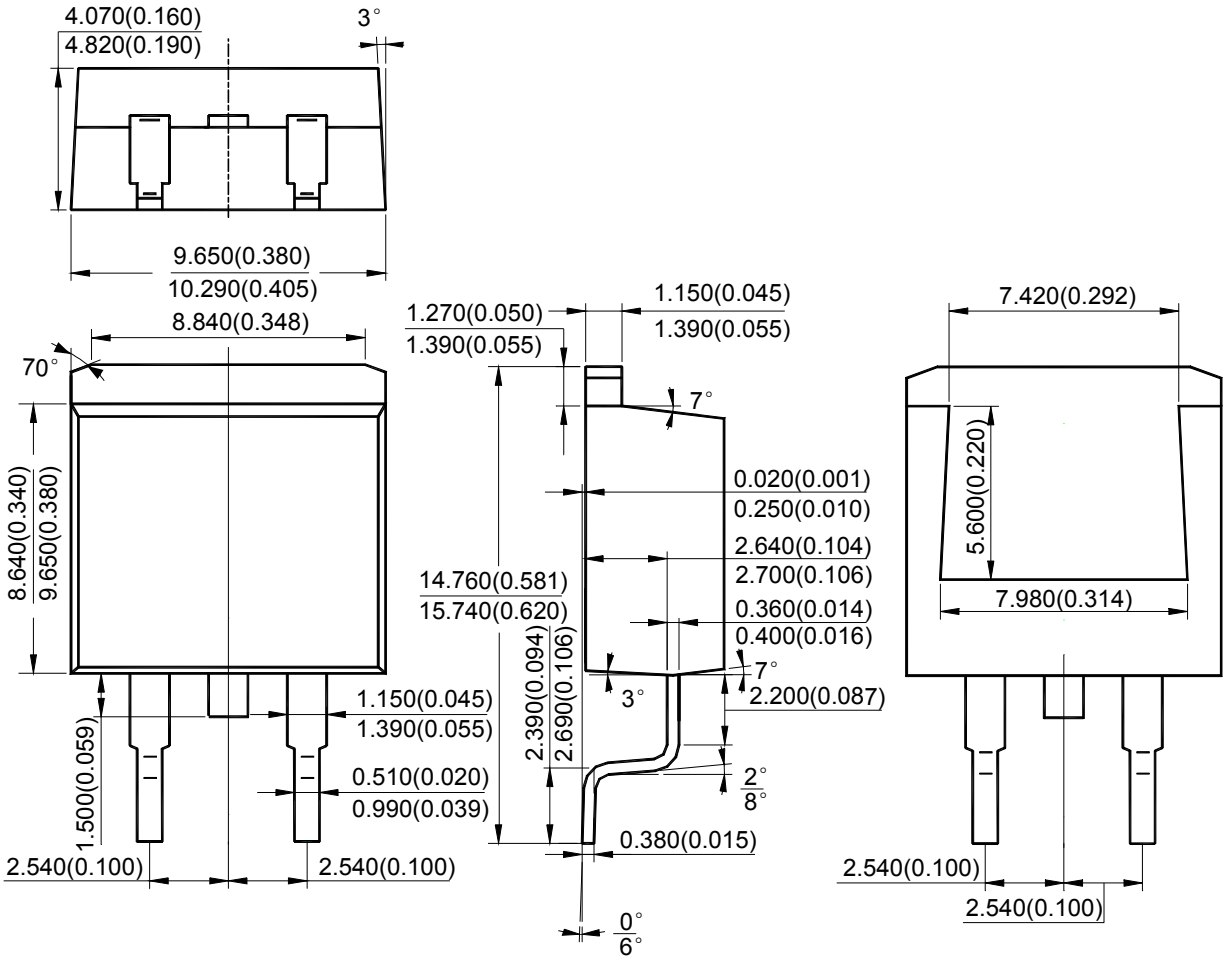
Mechanical Dimensions

TO-263-3 **Unit: mm(inch)**



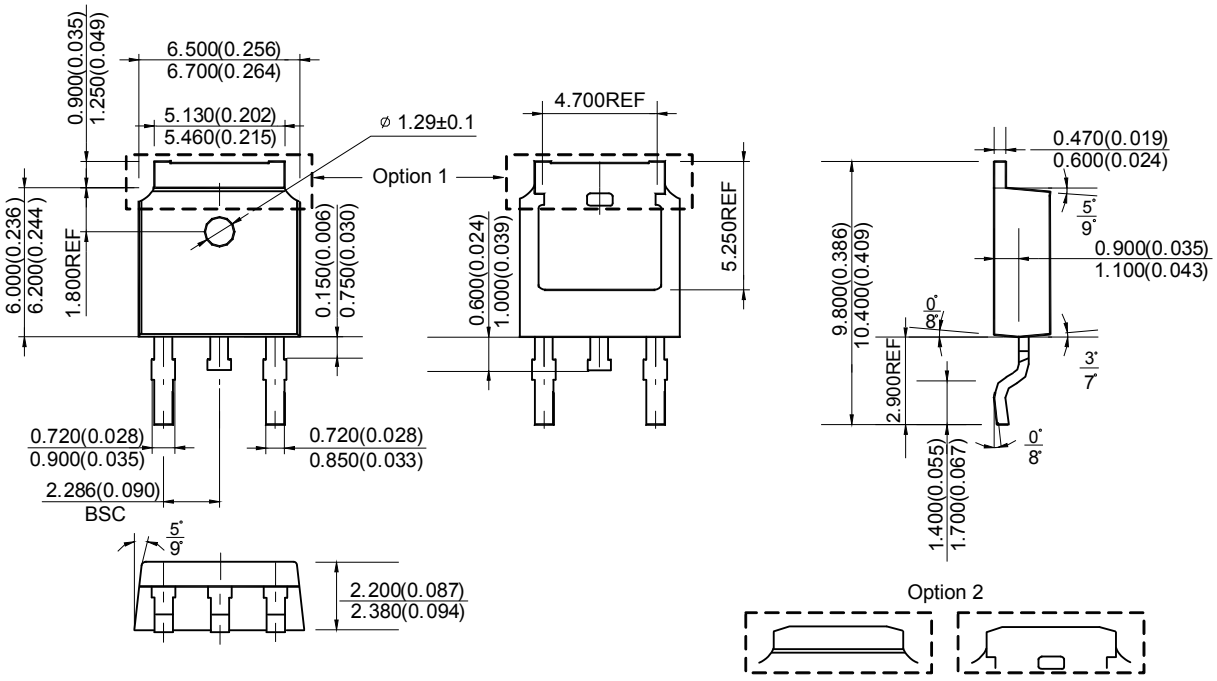
Mechanical Dimensions (Continued)

TO-263-2 **Unit: mm(inch)**



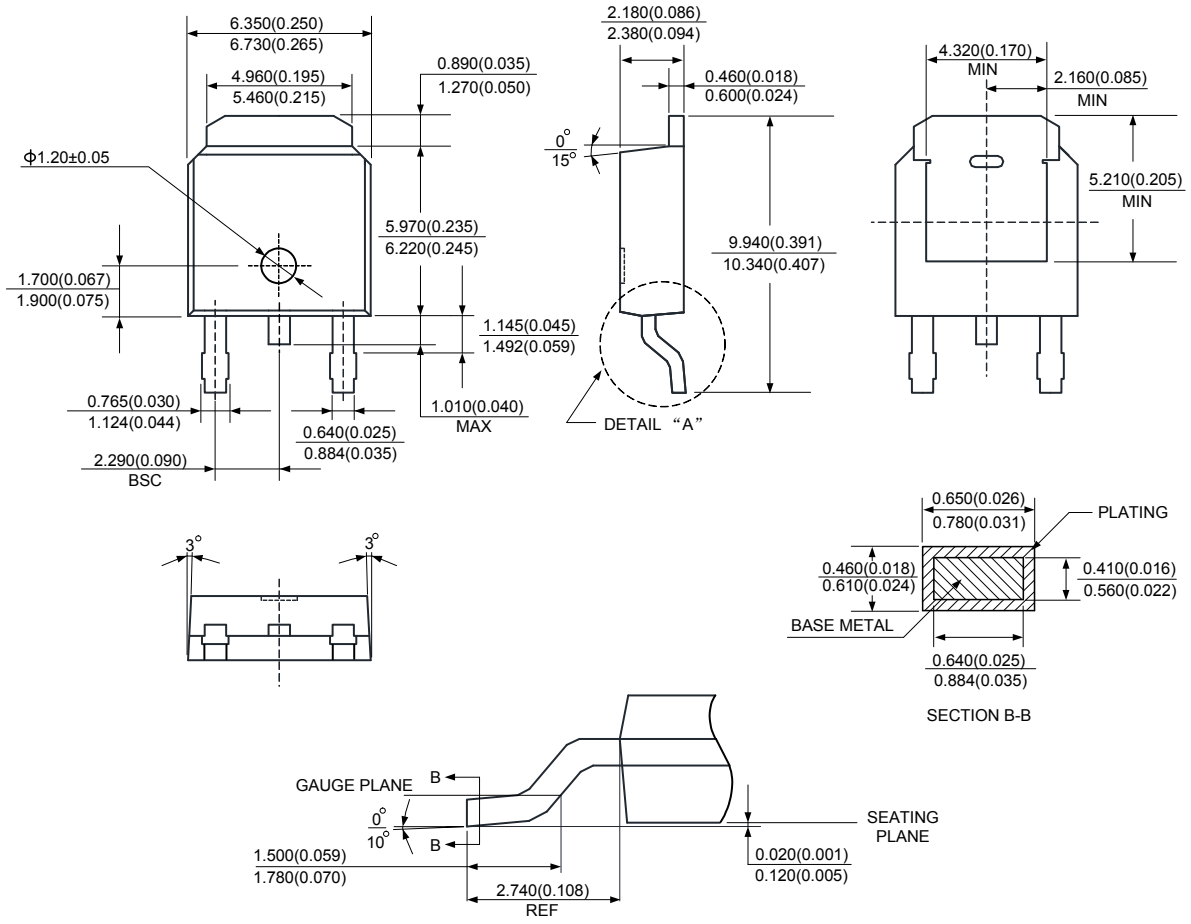
Mechanical Dimensions (Continued)

TO-252-2 (3) **Unit: mm(inch)**



Mechanical Dimensions (Continued)

TO-252-2 (4) **Unit: mm(inch)**



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