

3A LOW DROPOUT LINEAR REGULATOR

AZ1085

General Description

The AZ1085 is a series of low dropout positive voltage regulators with a maximum dropout of 1.5V at 3A of load current.

The series features on-chip thermal shutdown. It also includes a bandgap reference and a current limiting circuit.

The AZ1085 is available in 1.5V, 1.8V, 2.5V, 3.3V, 5.0V and adjustable versions. The fixed versions integrate the adjust resistors. The adjustable version can set the output voltage with two external resistors.

The AZ1085 series is available in standard packages of TO-263-2, TO-263-3, TO-220-3, TO-252-2 (1), TO-252-2 (2), TO-252-2 (3) and TO-252-2 (4).

Features

- Low Dropout Voltage: Typical 1.3V at 3A
- Current Limiting and Thermal Protection
- Output Current: 3A
- Current Limit: 4.5A
- Operating Junction Temperature: 0 to 125°C
- Line Regulation: 0.015% (Typical)
- Load Regulation: 0.1% (Typical)

Applications

- High Efficiency Linear Regulators
- Battery Charger
- Post Regulation for Switching Supplies
- Microprocessor Supply
- Mother Board Power Supplies
- DVD-Video Player
- Telecom Equipment
- Set Top boxes and Web Boxes Modules' Supply

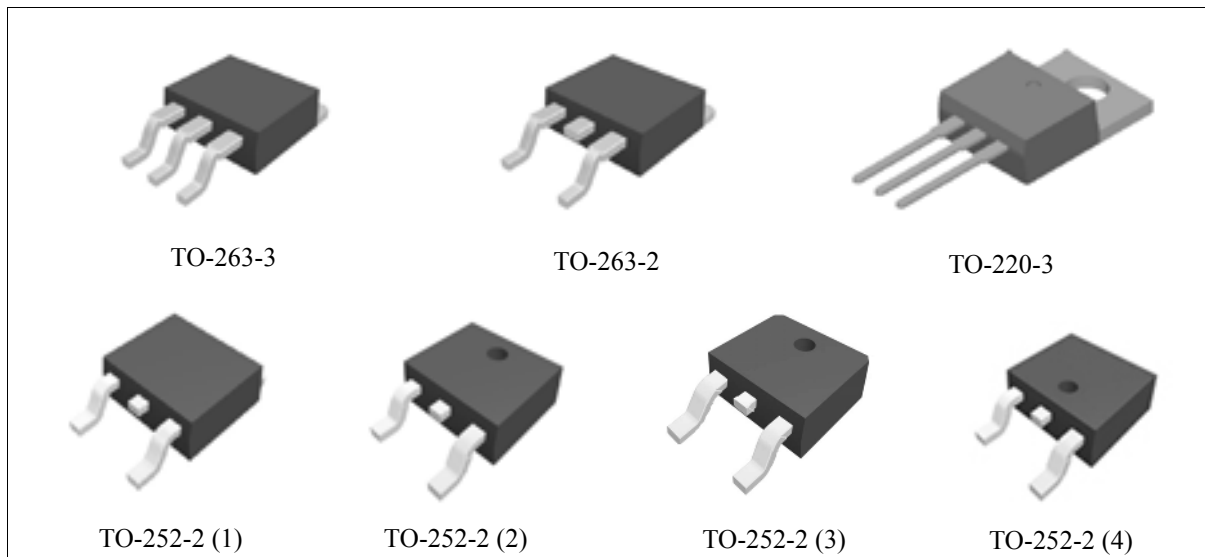


Figure 1. Package Types of AZ1085

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Pin Configuration

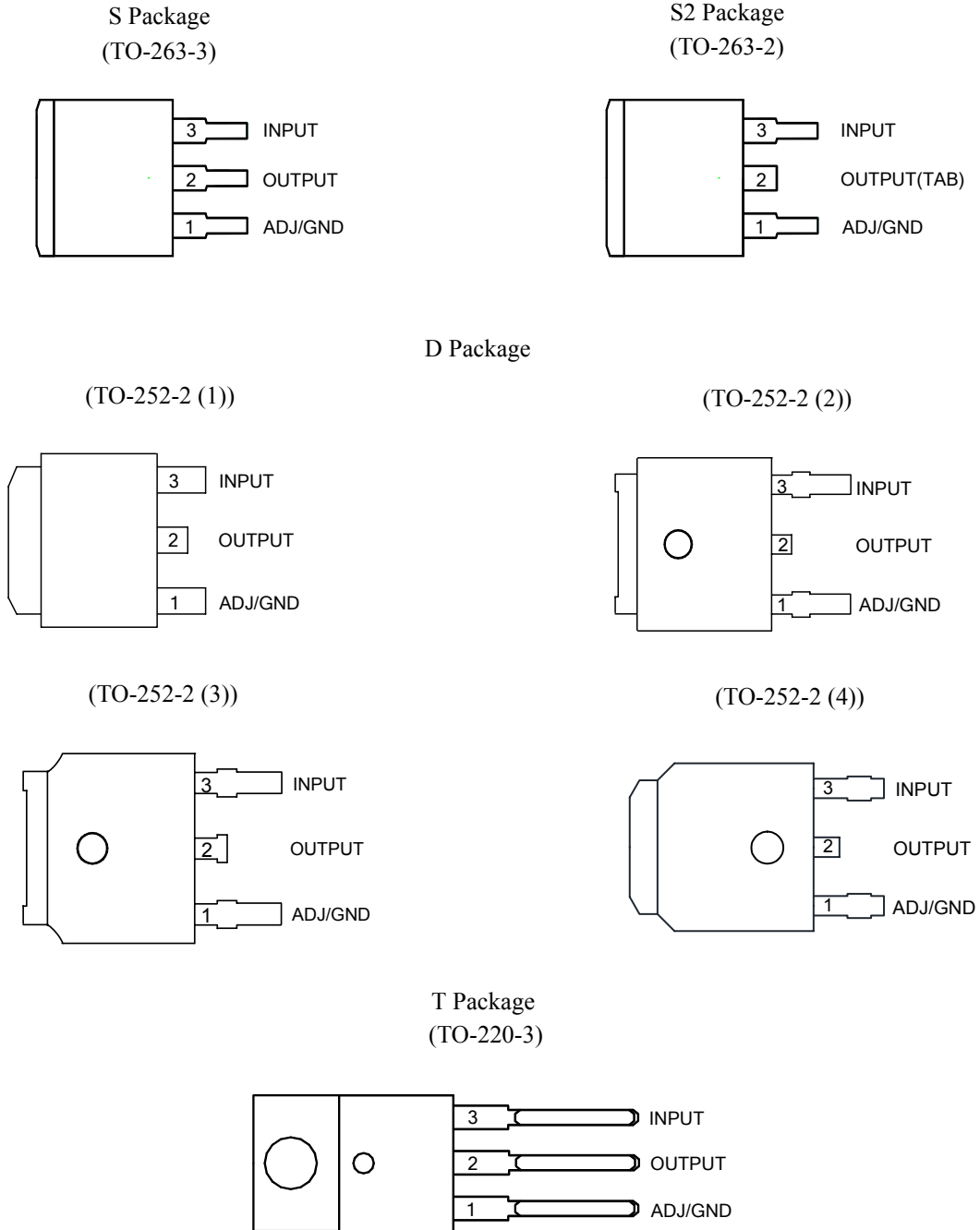


Figure 2. Pin Configuration of AZ1085 (Top View)

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Functional Block Diagram

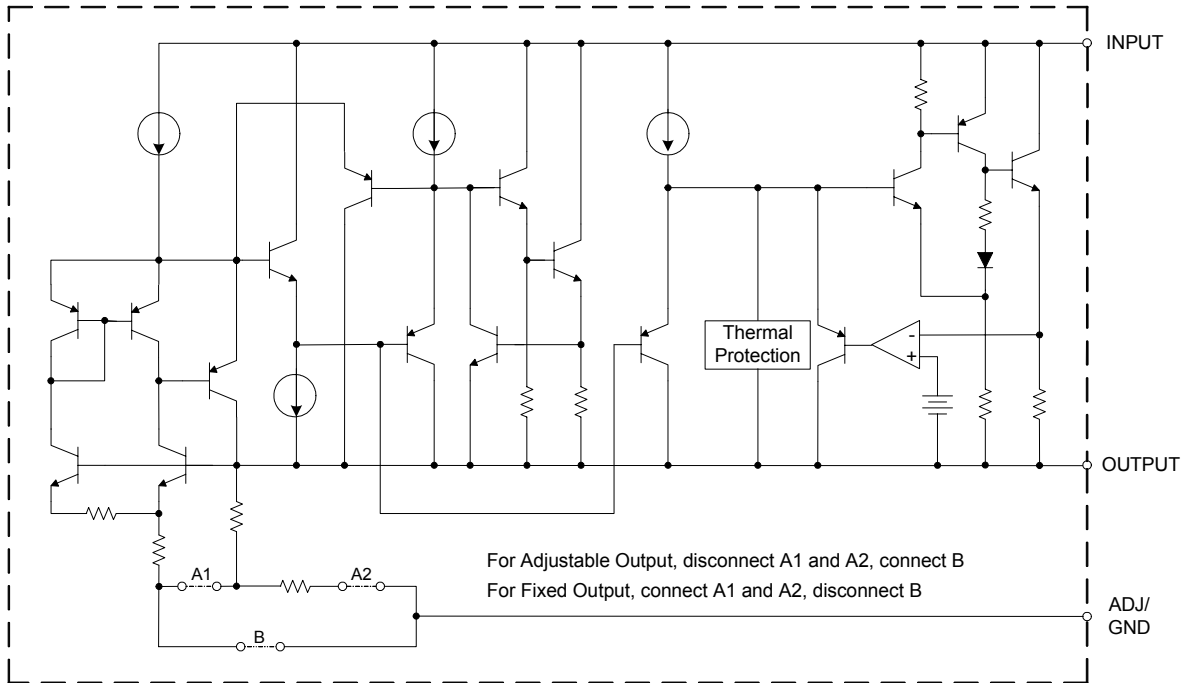


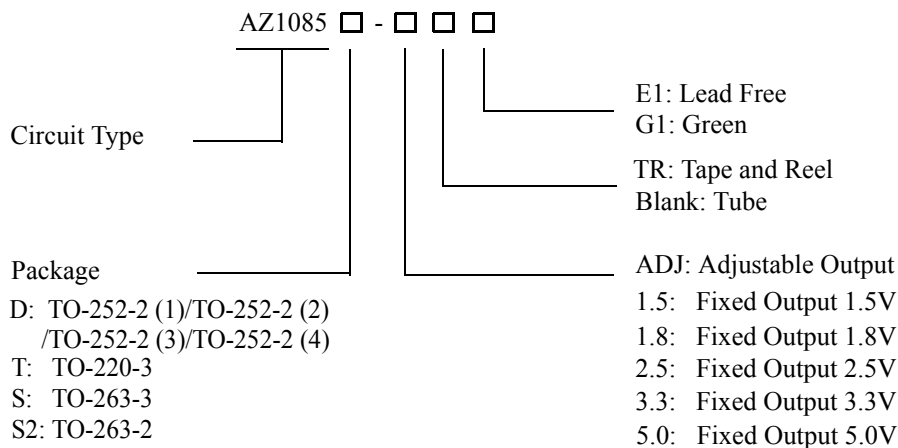
Figure 3. Functional Block Diagram of AZ1085



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Ordering Information



| Package | Temperature Range | Part Number | | Marking ID | | Packing Type |
|--|-------------------|-----------------|-----------------|---------------|---------------|--------------|
| | | Lead Free | Green | Lead Free | Green | |
| TO-252-2 (1) TO-252-2 (2) TO-252-2 (3) TO-252-2 (4) | 0 to 125°C | AZ1085D-ADJE1 | AZ1085D-ADJG1 | AZ1085D-ADJE1 | AZ1085D-ADJG1 | Tube |
| | | AZ1085D-ADJTRE1 | AZ1085D-ADJTRG1 | AZ1085D-ADJE1 | AZ1085D-ADJG1 | Tape & Reel |
| | | AZ1085D-1.5E1 | AZ1085D-1.5G1 | AZ1085D-1.5E1 | AZ1085D-1.5G1 | Tube |
| | | AZ1085D-1.5TRE1 | AZ1085D-1.5TRG1 | AZ1085D-1.5E1 | AZ1085D-1.5G1 | Tape & Reel |
| | | AZ1085D-1.8E1 | AZ1085D-1.8G1 | AZ1085D-1.8E1 | AZ1085D-1.8G1 | Tube |
| | | AZ1085D-1.8TRE1 | AZ1085D-1.8TRG1 | AZ1085D-1.8E1 | AZ1085D-1.8G1 | Tape & Reel |
| | | AZ1085D-2.5E1 | AZ1085D-2.5G1 | AZ1085D-2.5E1 | AZ1085D-2.5G1 | Tube |
| | | AZ1085D-2.5TRE1 | AZ1085D-2.5TRG1 | AZ1085D-2.5E1 | AZ1085D-2.5G1 | Tape & Reel |
| | | AZ1085D-3.3E1 | AZ1085D-3.3G1 | AZ1085D-3.3E1 | AZ1085D-3.3G1 | Tube |
| | | AZ1085D-3.3TRE1 | AZ1085D-3.3TRG1 | AZ1085D-3.3E1 | AZ1085D-3.3G1 | Tape & Reel |
| | | AZ1085D-5.0E1 | AZ1085D-5.0G1 | AZ1085D-5.0E1 | AZ1085D-5.0G1 | Tube |
| | | AZ1085D-5.0TRE1 | AZ1085D-5.0TRG1 | AZ1085D-5.0E1 | AZ1085D-5.0G1 | Tape & Reel |
| TO-220-3 | 0 to 125°C | AZ1085T-ADJE1 | AZ1085T-ADJG1 | AZ1085T-ADJE1 | AZ1085T-ADJG1 | Tube |
| | | AZ1085T-1.5E1 | AZ1085T-1.5G1 | AZ1085T-1.5E1 | AZ1085T-1.5G1 | Tube |
| | | AZ1085T-1.8E1 | AZ1085T-1.8G1 | AZ1085T-1.8E1 | AZ1085T-1.8G1 | Tube |
| | | AZ1085T-2.5E1 | AZ1085T-2.5G1 | AZ1085T-2.5E1 | AZ1085T-2.5G1 | Tube |
| | | AZ1085T-3.3E1 | AZ1085T-3.3G1 | AZ1085T-3.3E1 | AZ1085T-3.3G1 | Tube |
| | | AZ1085T-5.0E1 | AZ1085T-5.0G1 | AZ1085T-5.0E1 | AZ1085T-5.0G1 | Tube |



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Ordering Information (Continued)

| Package | Temperature Range | Part Number | | Marking ID | | Packing Type |
|----------|-------------------|------------------|------------------|----------------|----------------|--------------|
| | | Lead Free | Green | Lead Free | Green | |
| TO-263-3 | 0 to 125°C | AZ1085S-ADJE1 | AZ1085S-ADJG1 | AZ1085S-ADJE1 | AZ1085S-ADJG1 | Tube |
| | | AZ1085S-ADJTRE1 | AZ1085S-ADJTRG1 | AZ1085S-ADJE1 | AZ1085S-ADJG1 | Tape & Reel |
| | | AZ1085S-1.5E1 | AZ1085S-1.5G1 | AZ1085S-1.5E1 | AZ1085S-1.5G1 | Tube |
| | | AZ1085S-1.5TRE1 | AZ1085S-1.5TRG1 | AZ1085S-1.5E1 | AZ1085S-1.5G1 | Tape & Reel |
| | | AZ1085S-1.8E1 | AZ1085S-1.8G1 | AZ1085S-1.8E1 | AZ1085S-1.8G1 | Tube |
| | | AZ1085S-1.8TRE1 | AZ1085S-1.8TRG1 | AZ1085S-1.8E1 | AZ1085S-1.8G1 | Tape & Reel |
| | | AZ1085S-2.5E1 | AZ1085S-2.5G1 | AZ1085S-2.5E1 | AZ1085S-2.5G1 | Tube |
| | | AZ1085S-2.5TRE1 | AZ1085S-2.5TRG1 | AZ1085S-2.5E1 | AZ1085S-2.5G1 | Tape & Reel |
| | | AZ1085S-3.3E1 | AZ1085S-3.3G1 | AZ1085S-3.3E1 | AZ1085S-3.3G1 | Tube |
| | | AZ1085S-3.3TRE1 | AZ1085S-3.3TRG1 | AZ1085S-3.3E1 | AZ1085S-3.3G1 | Tape & Reel |
| | | AZ1085S-5.0E1 | AZ1085S-5.0G1 | AZ1085S-5.0E1 | AZ1085S-5.0G1 | Tube |
| | | AZ1085S-5.0TRE1 | AZ1085S-5.0TRG1 | AZ1085S-5.0E1 | AZ1085S-5.0G1 | Tape & Reel |
| TO-263-2 | 0 to 125°C | AZ1085S2-ADJE1 | AZ1085S2-ADJG1 | AZ1085S2-ADJE1 | AZ1085S2-ADJG1 | Tube |
| | | AZ1085S2-ADJTRE1 | AZ1085S2-ADJTRG1 | AZ1085S2-ADJE1 | AZ1085S2-ADJG1 | Tape & Reel |
| | | AZ1085S2-1.5E1 | AZ1085S2-1.5G1 | AZ1085S2-1.5E1 | AZ1085S2-1.5G1 | Tube |
| | | AZ1085S2-1.5TRE1 | AZ1085S2-1.5TRG1 | AZ1085S2-1.5E1 | AZ1085S2-1.5G1 | Tape & Reel |
| | | AZ1085S2-1.8E1 | AZ1085S2-1.8G1 | AZ1085S2-1.8E1 | AZ1085S2-1.8G1 | Tube |
| | | AZ1085S2-1.8TRE1 | AZ1085S2-1.8TRG1 | AZ1085S2-1.8E1 | AZ1085S2-1.8G1 | Tape & Reel |
| | | AZ1085S2-2.5E1 | AZ1085S2-2.5G1 | AZ1085S2-2.5E1 | AZ1085S2-2.5G1 | Tube |
| | | AZ1085S2-2.5TRE1 | AZ1085S2-2.5TRG1 | AZ1085S2-2.5E1 | AZ1085S2-2.5G1 | Tape & Reel |
| | | AZ1085S2-3.3E1 | AZ1085S2-3.3G1 | AZ1085S2-3.3E1 | AZ1085S2-3.3G1 | Tube |
| | | AZ1085S2-3.3TRE1 | AZ1085S2-3.3TRG1 | AZ1085S2-3.3E1 | AZ1085S2-3.3G1 | Tape & Reel |
| | | AZ1085S2-5.0E1 | AZ1085S2-5.0G1 | AZ1085S2-5.0E1 | AZ1085S2-5.0G1 | Tube |
| | | AZ1085S2-5.0TRE1 | AZ1085S2-5.0TRG1 | AZ1085S2-5.0E1 | AZ1085S2-5.0G1 | 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.

**3A LOW DROPOUT LINEAR REGULATOR****AZ1085****Absolute Maximum Ratings (Note 1)**

| Parameter | Symbol | Value | | Unit |
|-------------------------------------|----------------------|---|-----|-----------------------------|
| Operating Junction Temperature | T_J | 150 | | $^{\circ}\text{C}$ |
| Storage Temperature Range | T_{STG} | -65 to 150 | | $^{\circ}\text{C}$ |
| Lead Temperature (Soldering, 10sec) | T_{LEAD} | 260 | | $^{\circ}\text{C}$ |
| Thermal Resistance(Note 2) | θ_{JA} | TO-220-3 | 60 | $^{\circ}\text{C}/\text{W}$ |
| | | TO-263-2 | 60 | |
| | | TO-263-3 | 60 | |
| | | TO-252-2 (1)/TO-252-2 (2)/ TO-252-2 (3)/TO-252-2 (4) | 100 | |
| ESD (Human Body Model) | ESD | 2000 | | 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, $T_{\text{J(max)}}$, 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: $P_{\text{D(max)}} = (T_{\text{J(max)}} - T_{\text{A}}) / \theta_{\text{JA}}$. 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 | $^{\circ}\text{C}$ |



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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 0 to 125°C .

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|-------------------|------------------|--|-----------------------|-----------------------|-----------------------|------|
| Reference Voltage | V_{REF} | AZ1085-ADJ, $I_{OUT}=10\text{mA}$, $V_{IN}-V_{OUT}=3\text{V}$, $T_J=25^\circ\text{C}$, $10\text{mA} \leq I_{OUT} \leq 3\text{A}$, $1.5\text{V} \leq V_{IN}-V_{OUT} \leq 5\text{V}$ | 1.238 1.225 | 1.250 1.250 | 1.262 1.275 | V |
| Output Voltage | V_{OUT} | AZ1085-1.5, $I_{OUT}=0\text{mA}$, $V_{IN}=4.5\text{V}$, $T_J=25^\circ\text{C}$, $10\text{mA} \leq I_{OUT} \leq 3\text{A}$, $3.0\text{V} \leq V_{IN} \leq 6\text{V}$ | 1.485 1.47 | 1.5 1.5 | 1.515 1.53 | V |
| | | AZ1085-1.8, $I_{OUT}=0\text{mA}$, $V_{IN}=4.8\text{V}$, $T_J=25^\circ\text{C}$, $10\text{mA} \leq I_{OUT} \leq 3\text{A}$, $3.3\text{V} \leq V_{IN} \leq 7\text{V}$ | 1.782 1.764 | 1.8 1.8 | 1.818 1.836 | V |
| | | AZ1085-2.5, $I_{OUT}=0\text{mA}$, $V_{IN}=5.5\text{V}$, $T_J=25^\circ\text{C}$, $10\text{mA} \leq I_{OUT} \leq 3\text{A}$, $4.0\text{V} \leq V_{IN} \leq 7\text{V}$ | 2.475 2.45 | 2.5 2.5 | 2.525 2.55 | V |
| | | AZ1085-3.3, $I_{OUT}=0\text{mA}$, $V_{IN}=6.3\text{V}$, $T_J=25^\circ\text{C}$, $10\text{mA} \leq I_{OUT} \leq 3\text{A}$, $4.8\text{V} \leq V_{IN} \leq 8\text{V}$ | 3.267 3.234 | 3.3 3.3 | 3.333 3.366 | V |
| | | AZ1085-5.0, $I_{OUT}=0\text{mA}$, $V_{IN}=8\text{V}$, $T_J=25^\circ\text{C}$, $10\text{mA} \leq I_{OUT} \leq 3\text{A}$, $6.5\text{V} \leq V_{IN} \leq 10\text{V}$ | 4.95 4.9 | 5 5 | 5.05 5.1 | V |
| Line Regulation | ΔV_{OUT} | AZ1085-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 | % |
| | | AZ1085-1.5, $I_{OUT}=10\text{mA}$, $3.0\text{V} \leq V_{IN} \leq 10\text{V}$ | | 0.5 1 | 6 6 | mV |
| | | AZ1085-1.8, $I_{OUT}=10\text{mA}$, $3.3\text{V} \leq V_{IN} \leq 10\text{V}$ | | 0.5 1 | 6 6 | mV |
| | | AZ1085-2.5, $I_{OUT}=10\text{mA}$, $4.0\text{V} \leq V_{IN} \leq 10\text{V}$ | | 0.5 1 | 6 6 | mV |
| | | AZ1085-3.3, $I_{OUT}=10\text{mA}$, $4.8\text{V} \leq V_{IN} \leq 10\text{V}$ | | 0.5 1 | 6 6 | mV |
| | | AZ1085-5.0, $I_{OUT}=10\text{mA}$, $6.5\text{V} \leq V_{IN} \leq 10\text{V}$ | | 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 0 to 125°C .

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------|---|-----------|-------------------|-------------------|----------------------|
| Load Regulation | ΔV_{OUT} | AZ1085-ADJ, $0\text{mA} \leq I_{OUT} \leq 3\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$ | | 0.1 0.2 | 0.3 0.4 | % |
| | | AZ1085-1.5, $0\text{mA} \leq I_{OUT} \leq 3\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$ | | 3 7 | 15 20 | mV |
| | | AZ1085-1.8, $0\text{mA} \leq I_{OUT} \leq 3\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$ | | 3 7 | 15 20 | mV |
| | | AZ1085-2.5, $0\text{mA} \leq I_{OUT} \leq 3\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$ | | 3 7 | 15 20 | mV |
| | | AZ1085-3.3, $0\text{mA} \leq I_{OUT} \leq 3\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$ | | 3 7 | 15 20 | mV |
| | | AZ1085-5.0, $0\text{mA} \leq I_{OUT} \leq 3\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$ | | | 5 10 | 20 35 |
| Dropout Voltage | V_{DROD} | $I_{OUT} = 3\text{A}$, ΔV_{REF} , $\Delta V_{OUT} = 1\%$ | | 1.3 | 1.5 | V |
| Thermal Resistance | θ_{JC} | TO-220-3 | | 4.15 | | $^{\circ}\text{C/W}$ |
| | | TO-252-2 (1)/TO-252-2 (2)/TO-252-2 (3)/ TO-252-2 (4) | | 7.36 | | |
| | | TO-263-3 | | 4.15 | | |
| | | TO-263-2 | | 4.15 | | |
| Current Limit | I_{LIMIT} | $V_{IN} - V_{OUT} = 3\text{V}$ | 3.2 | 4.5 | | A |
| Minimum Load Current | I_{LOAD} (MIN) | $V_{IN} = 10\text{V}$ (AZ1085-ADJ) | | 3 | 10 | mA |
| Quiescent Current | I_Q | $V_{IN} = 10\text{V}$ (AZ1085) | | 5 | 10 | mA |
| Ripple Rejection | PSRR | $f_{RIPPLE} = 120\text{Hz}$, $C_{OUT} = 25\mu\text{F}$, $I_{OUT} = 3\text{A}$, $V_{IN} - V_{OUT} = 3\text{V}$ | 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} | $10\text{mA} \leq I_{OUT} \leq 3\text{A}$, $1.5\text{V} \leq V_{IN} - V_{OUT} \leq 6\text{V}$ | | 0.2 | 5 | μA |
| Long Term Stability | | $T_A = 125^{\circ}\text{C}$, 1000Hrs | | 0.5 | | % |
| Temperature Stability | | $I_{OUT} = 10\text{mA}$, $V_{IN} - V_{OUT} = 1.5\text{V}$ | | 0.5 | | % |
| RMS Noise (% of V_{OUT}) | | $T_A = 25^{\circ}\text{C}$, $10\text{Hz} \leq f \leq 10\text{kHz}$ | | 0.003 | | % |



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Typical Performance Characteristics

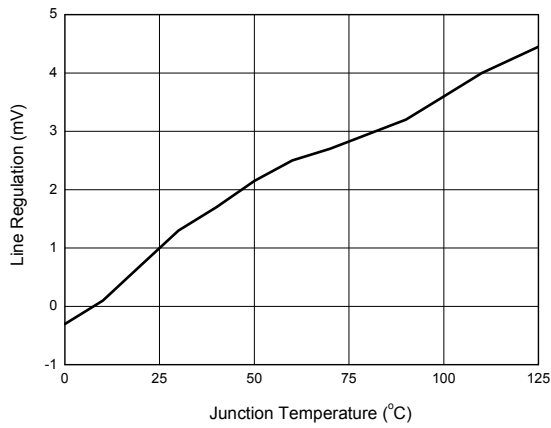


Figure 4. Line Regulation vs. Junction Temperature

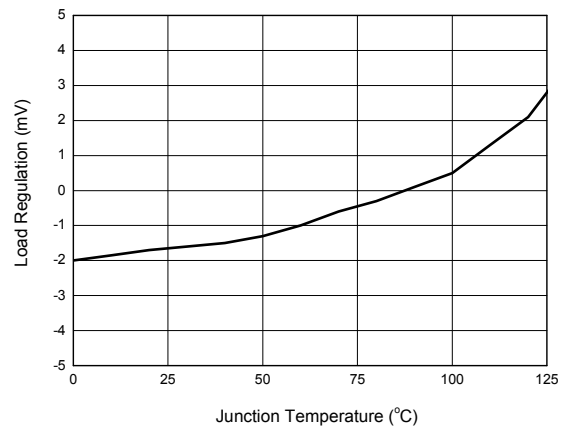


Figure 5. Load Regulation vs. Junction Temperature

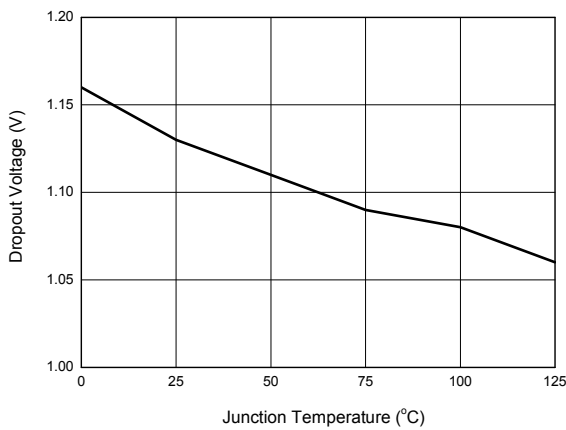


Figure 6. Dropout Voltage vs. Junction Temperature

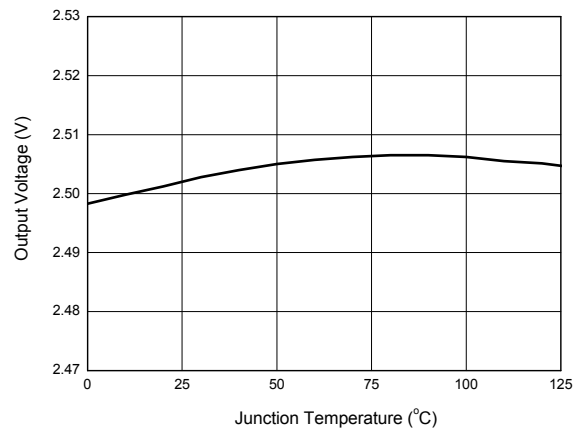


Figure 7. Output Voltage vs. Junction Temperature



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Typical Performance Characteristics (Continued)

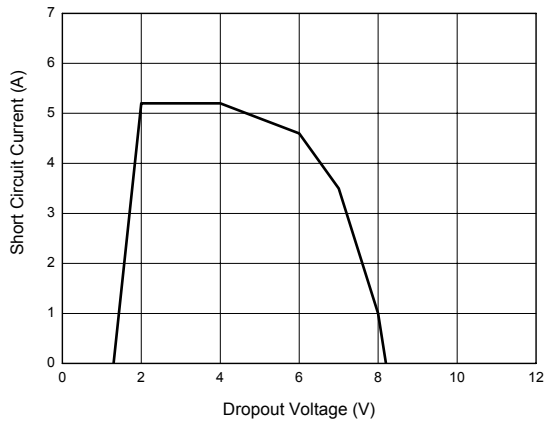


Figure 8. Short Circuit Current vs. Dropout Voltage

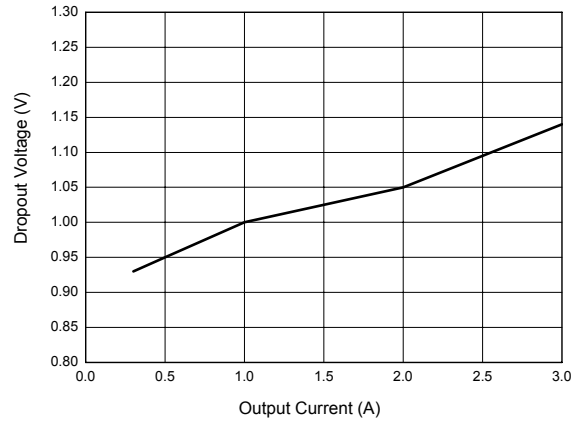


Figure 9. Dropout Voltage vs. Output Current

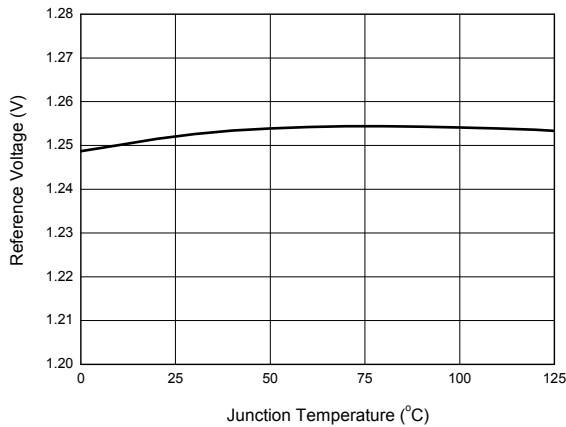


Figure 10. Reference Voltage vs. Junction Temperature

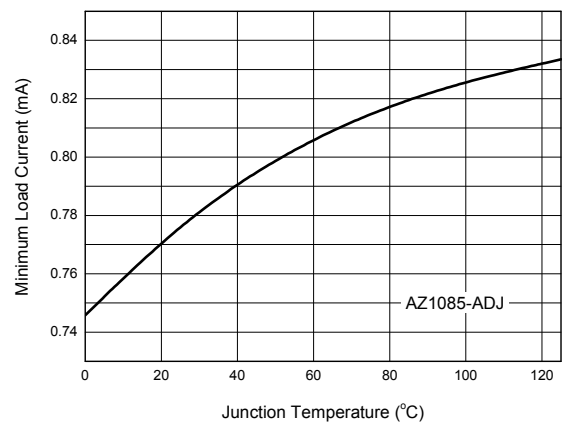


Figure 11. Minimum Load Current vs. Junction Temperature



3A LOW DROPOUT LINEAR REGULATOR

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Typical Performance Characteristics (Continued)

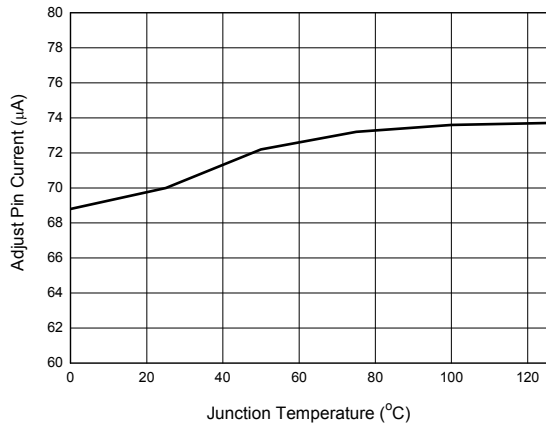


Figure12. Adjust Pin Current vs. Junction Temperature

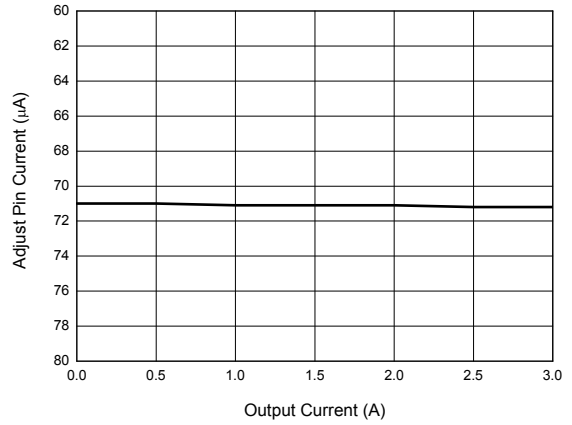


Figure13. Adjust Pin Current vs. Output Current

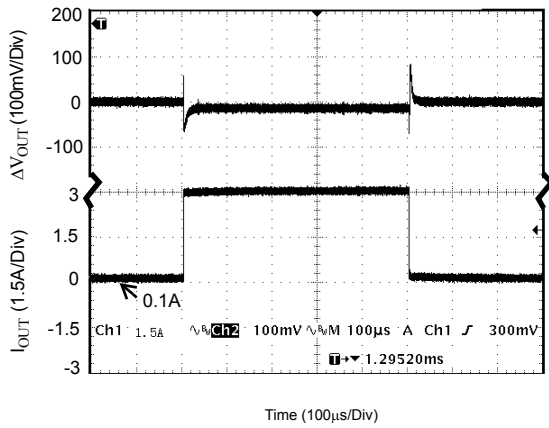


Figure 14. Load Transient Response
(Conditions: $V_{IN}=5.5V$, $V_{OUT}=2.5V$, $I_{OUT}=100mA$ to $3A$, $C_{IN}=C_{OUT}=10\mu F$)

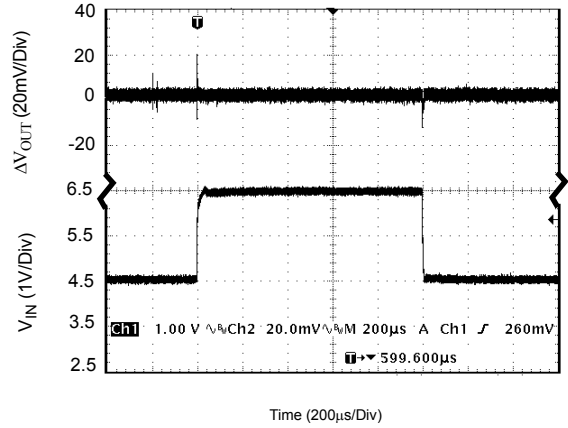


Figure 15. Line Transient Response
(Conditions: $V_{IN}=4.5V$ to $6.5V$, $V_{OUT}=2.5V$, $I_{OUT}=200mA$, $C_{IN}=1\mu F$, $C_{OUT}=10\mu F$)



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Typical Performance Characteristics (Continued)

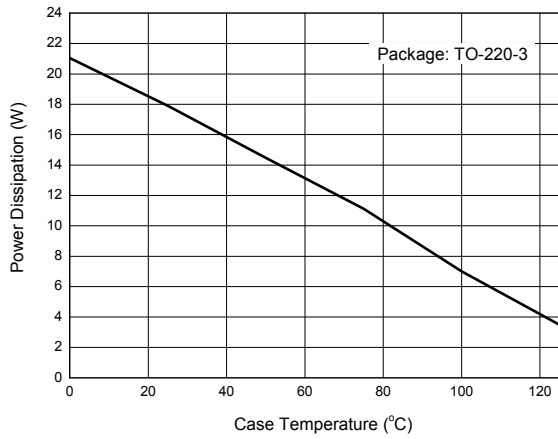


Figure16. Power Dissipation vs. Case Temperature

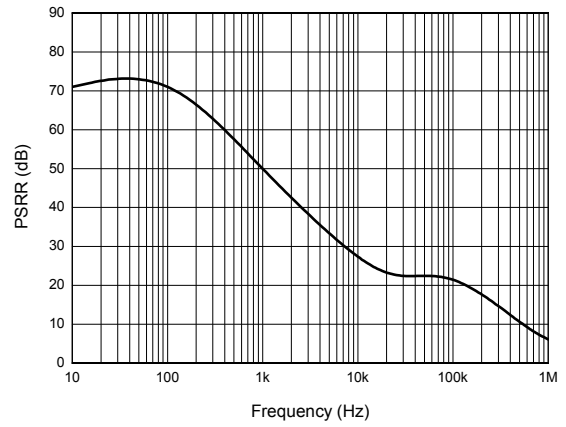


Figure17. PSRR vs. Frequency

Typical Application

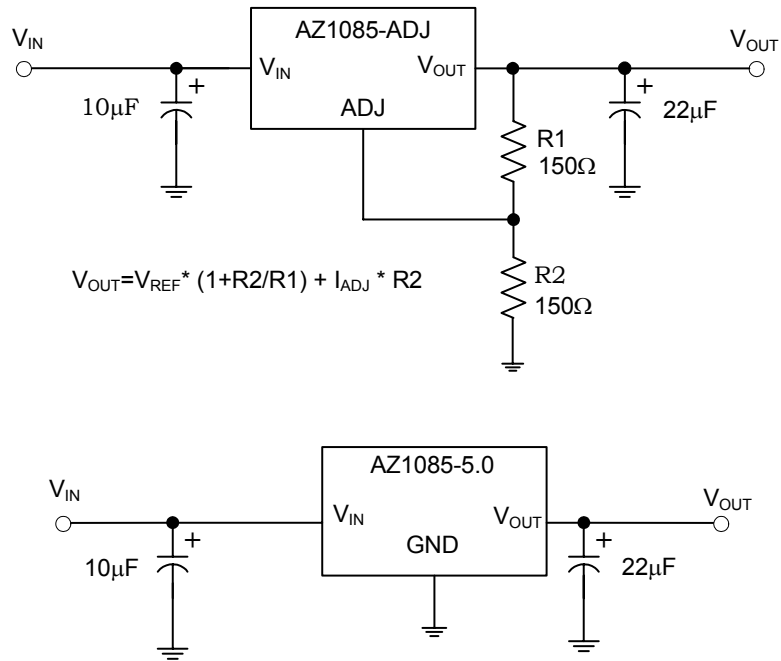


Figure 18. Typical Applications of AZ1085



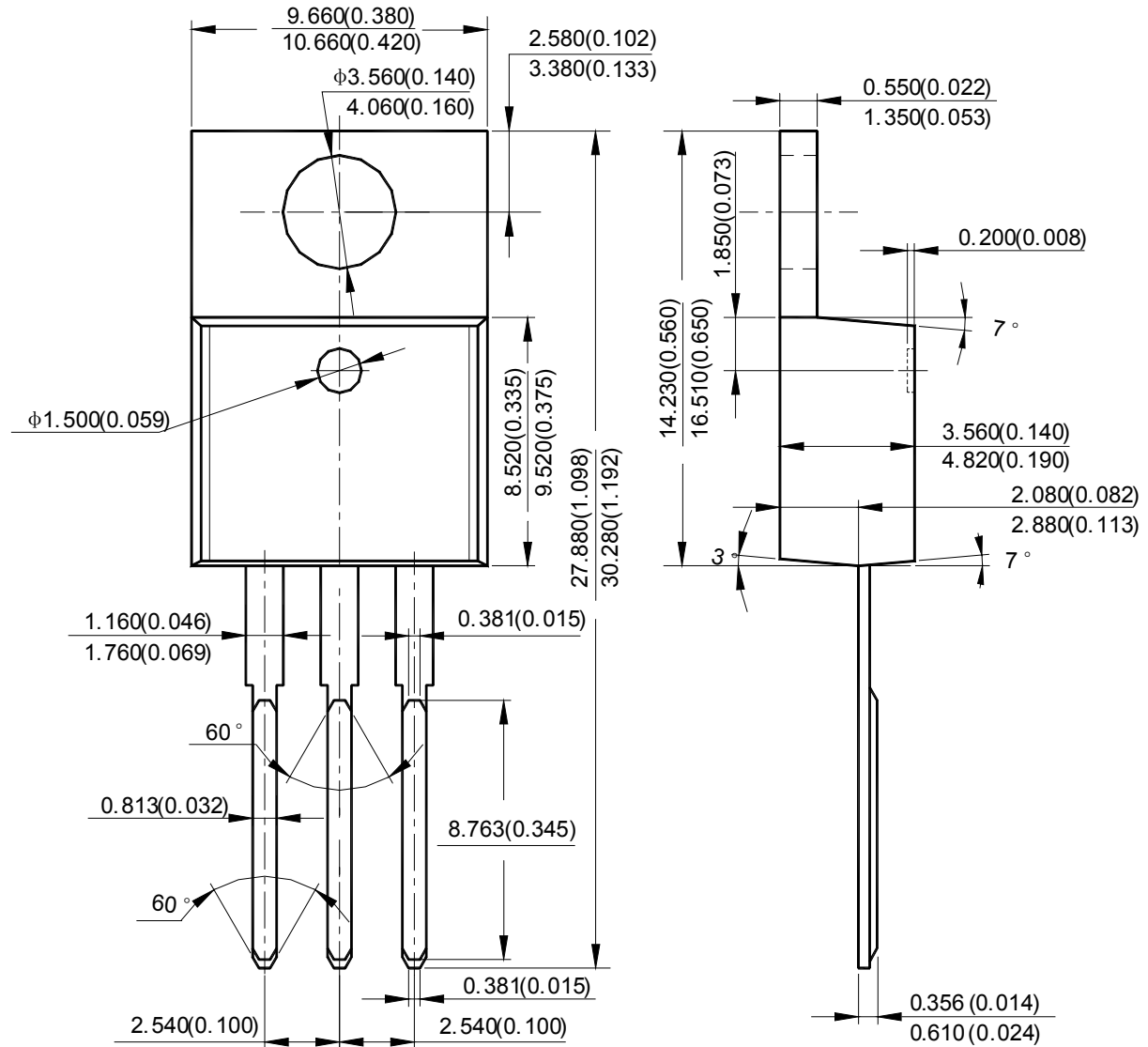
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Mechanical Dimensions

TO-220-3

Unit: mm(inch)





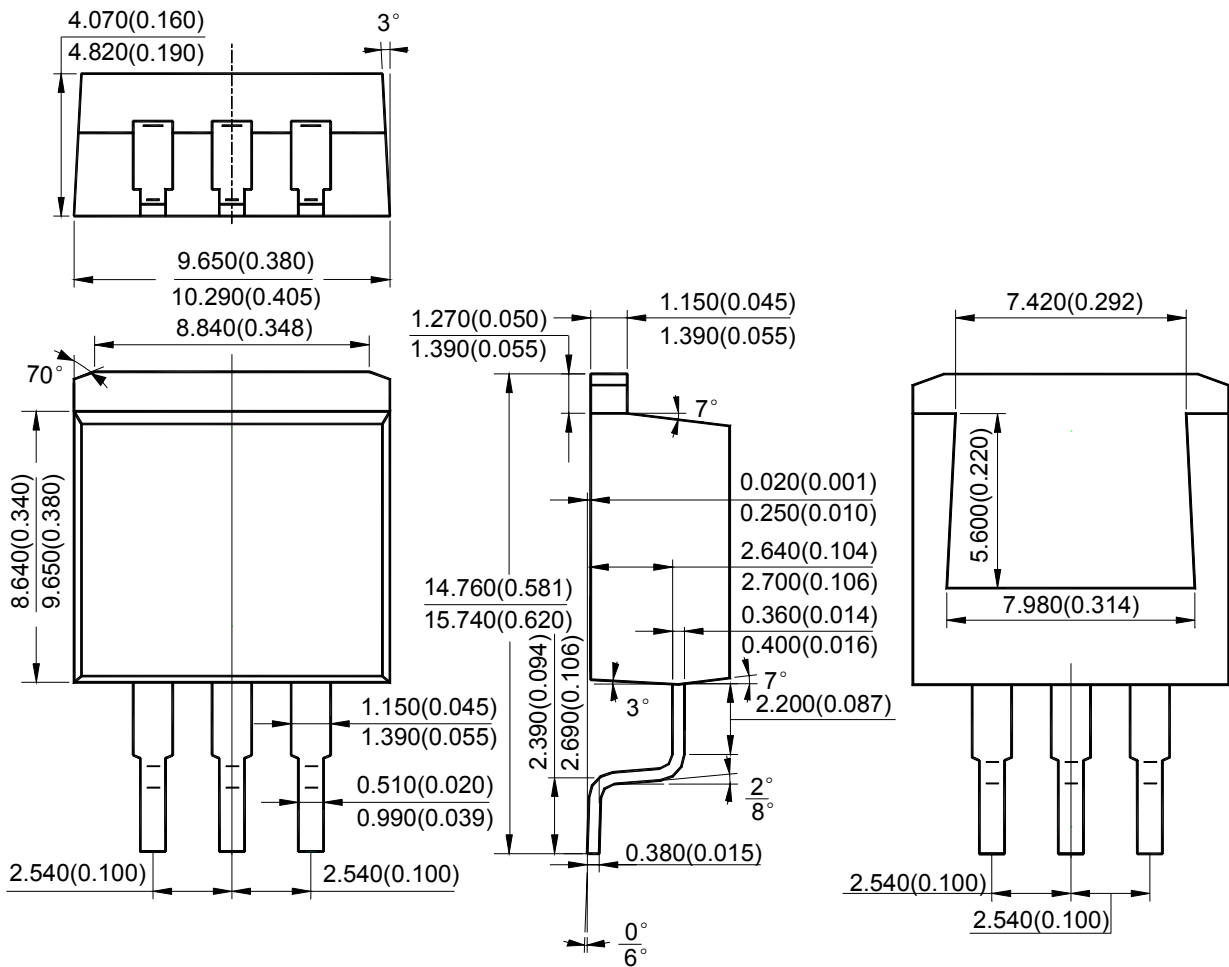
3A LOW DROPOUT LINEAR REGULATOR

AZ1085

Mechanical Dimensions (Continued)

TO-263-3

Unit: mm(inch)





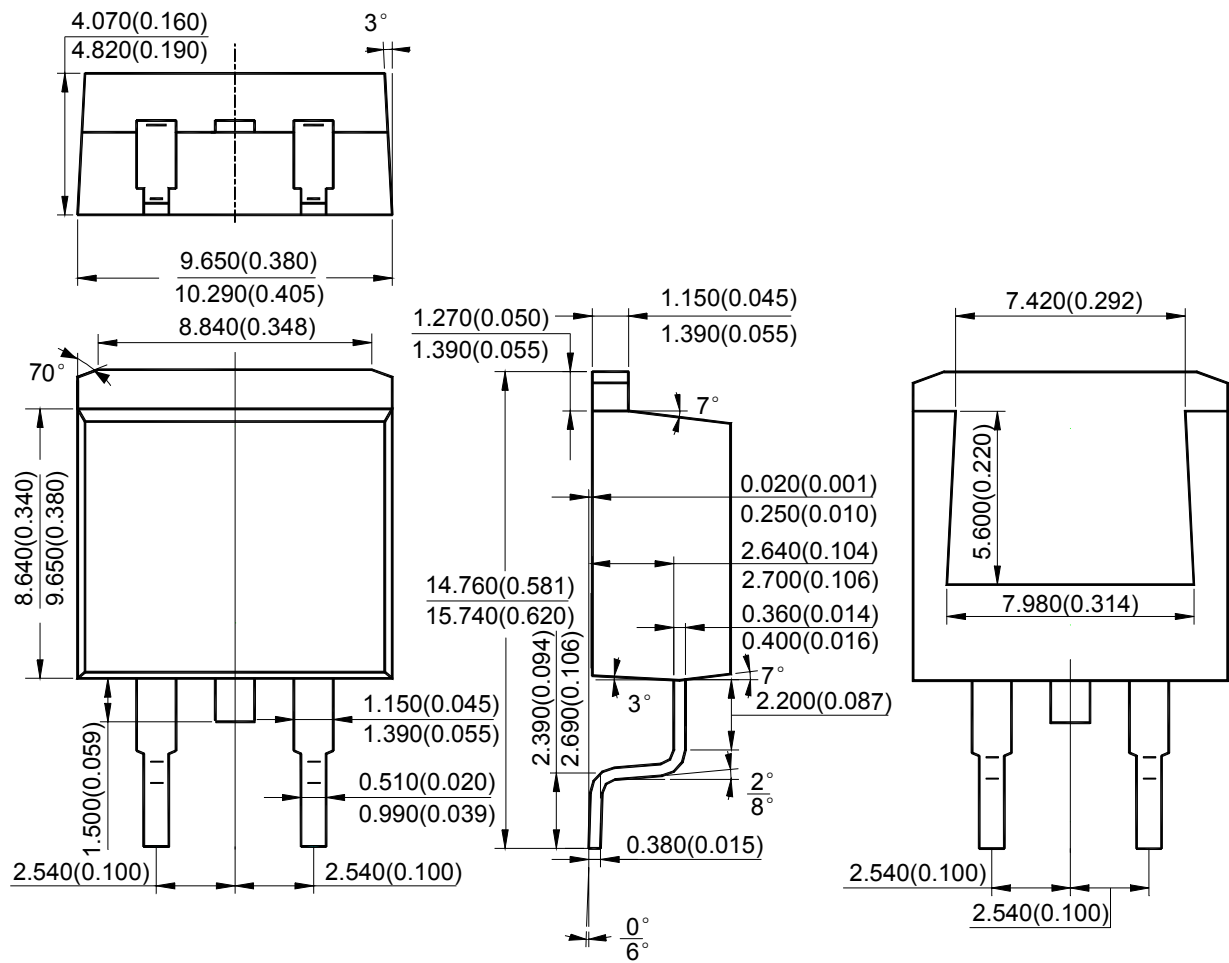
3A LOW DROPOUT LINEAR REGULATOR

AZ1085

Mechanical Dimensions (Continued)

TO-263-2

Unit: mm(inch)





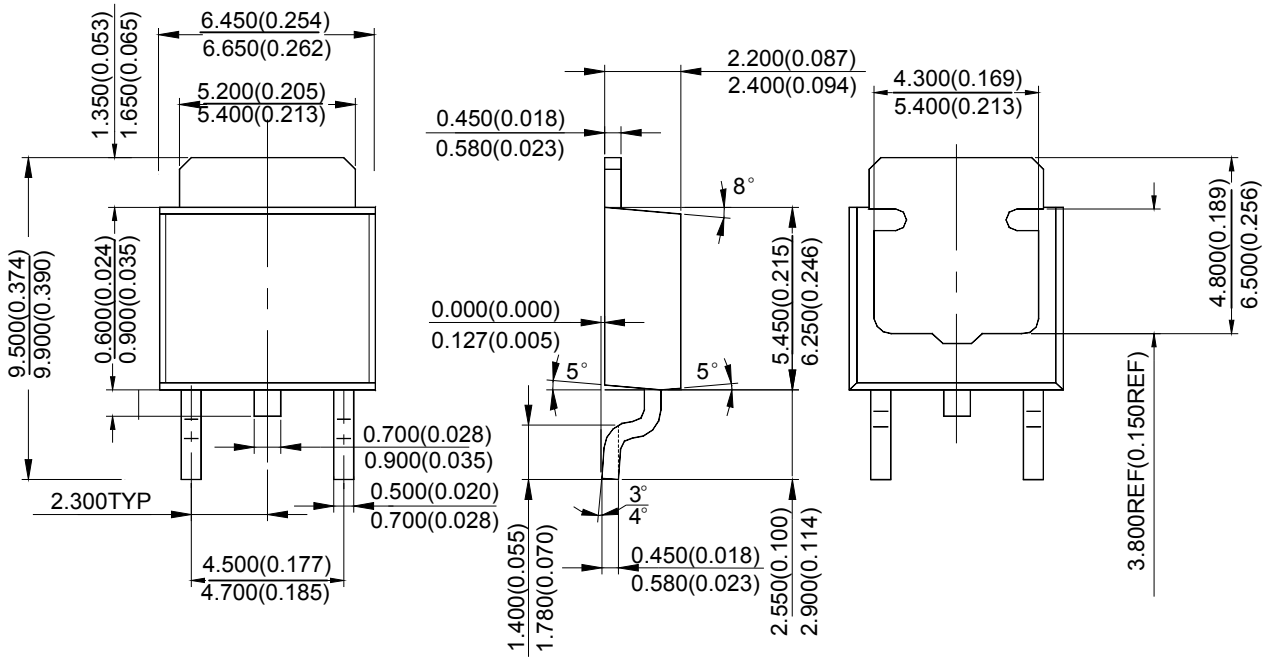
3A LOW DROPOUT LINEAR REGULATOR

AZ1085

Mechanical Dimensions (Continued)

TO-252-2 (1)

Unit: mm(inch)





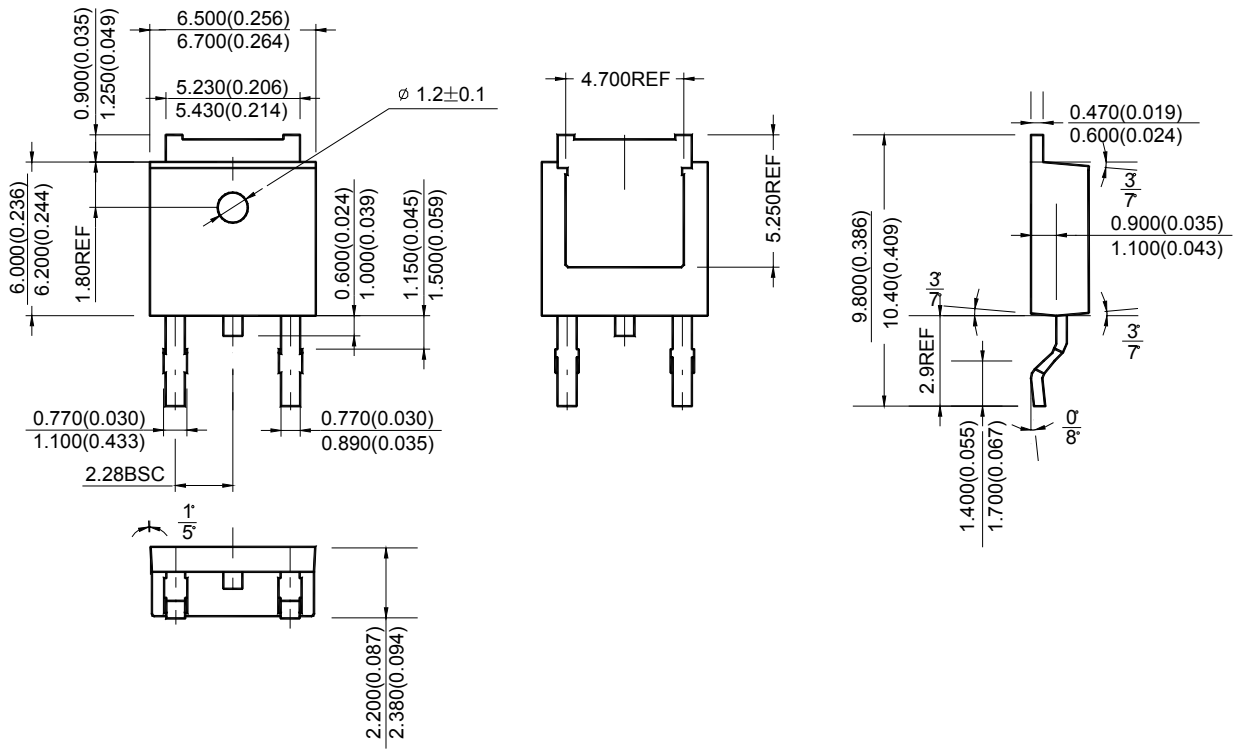
3A LOW DROPOUT LINEAR REGULATOR

AZ1085

Mechanical Dimensions (Continued)

TO-252-2 (2)

Unit: mm(inch)





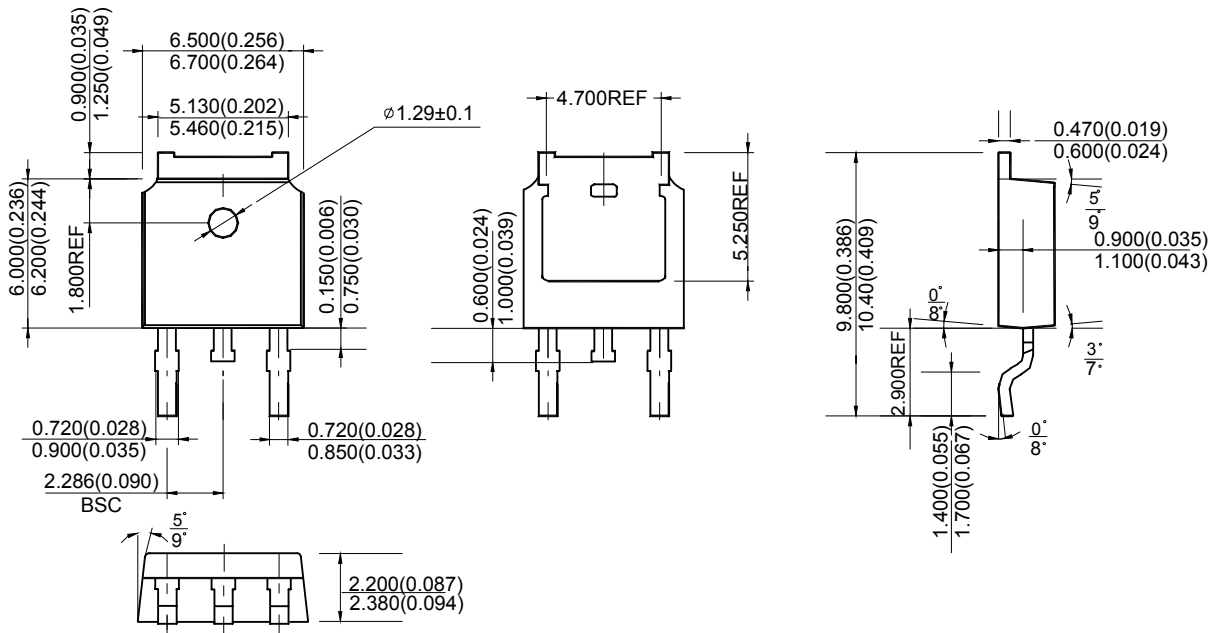
3A LOW DROPOUT LINEAR REGULATOR

AZ1085

Mechanical Dimensions (Continued)

TO-252-2 (3)

Unit: mm(inch)





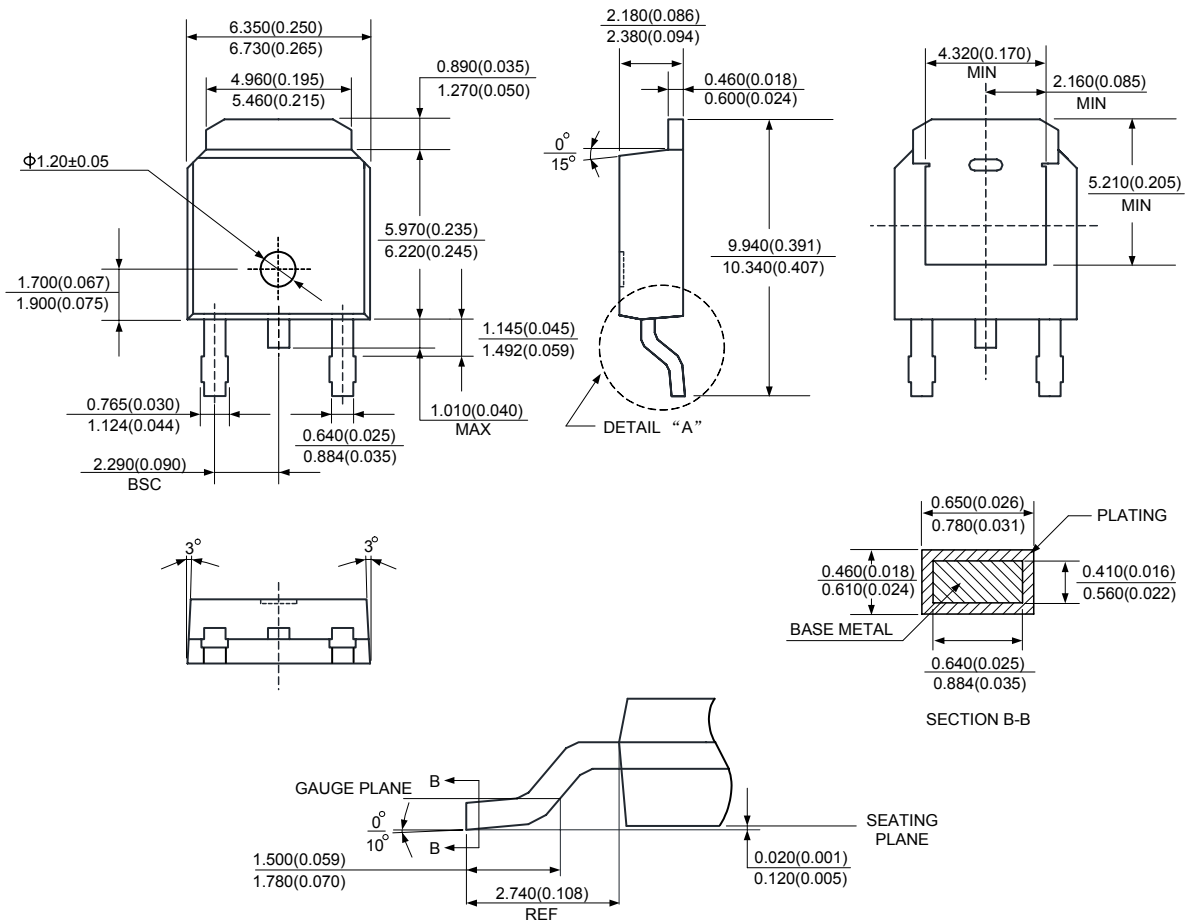
3A LOW DROPOUT LINEAR REGULATOR

AZ1085

Mechanical Dimensions (Continued)

TO-252-2 (4)

Unit: mm(inch)





BCD Semiconductor Manufacturing Limited

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