

**500mA 3-TERMINAL POSITIVE VOLTAGE REGULATOR****AZ78MXX****General Description**

The AZ78MXX series are monolithic integrated circuits designed as fixed-voltage regulators for a wide variety of applications including local, on-card regulation.

This series of regulators are complete with internal current limiting, thermal shutdown protection, and safe-area compensation which make them virtually immune from output overload. If adequate heat sinking are provided, these regulators can deliver output currents up to 0.5A.

The AZ78MXX series are available in two standard plastic packages: TO-220-3 and TO-252-2 (1).

Features

- Output Current up to 0.5A
- Fixed Output Voltages of 5V, 6V, 8V, 9V and 12V
- Output Voltage Tolerances of $\pm 5\%$ over the Full Temperature Range
- Internal Short Circuit Current-limiting
- Internal Thermal Overload Protection

Applications

- Consumer Electronics
- Microprocessor Power Supply
- Mother Board I/O Power Supply

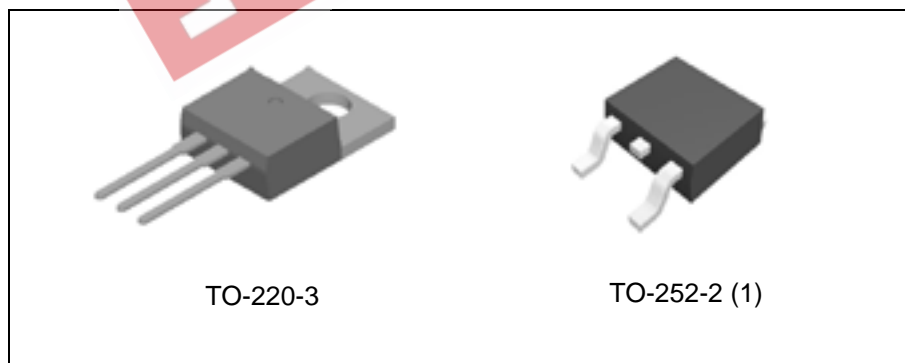


Figure 1. Package Types of AZ78MXX



500mA 3-TERMINAL POSITIVE VOLTAGE REGULATOR

AZ78MXX

Pin Configuration

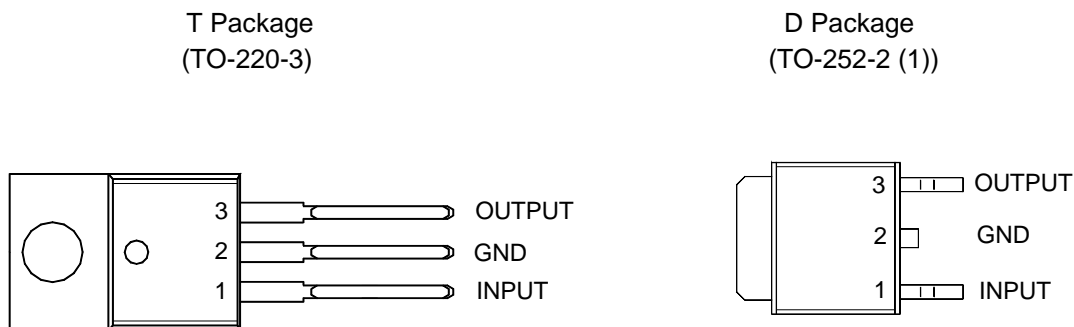


Figure 2. Pin Configuration of AZ78MXX (Top View)

Pin Description

| Pin Number | Pin Name | Function |
|------------|----------|----------------|
| 1 | INPUT | Voltage Input |
| 2 | GND | Ground |
| 3 | OUTPUT | Voltage Output |



500mA 3-TERMINAL POSITIVE VOLTAGE REGULATOR

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Functional Block Diagram

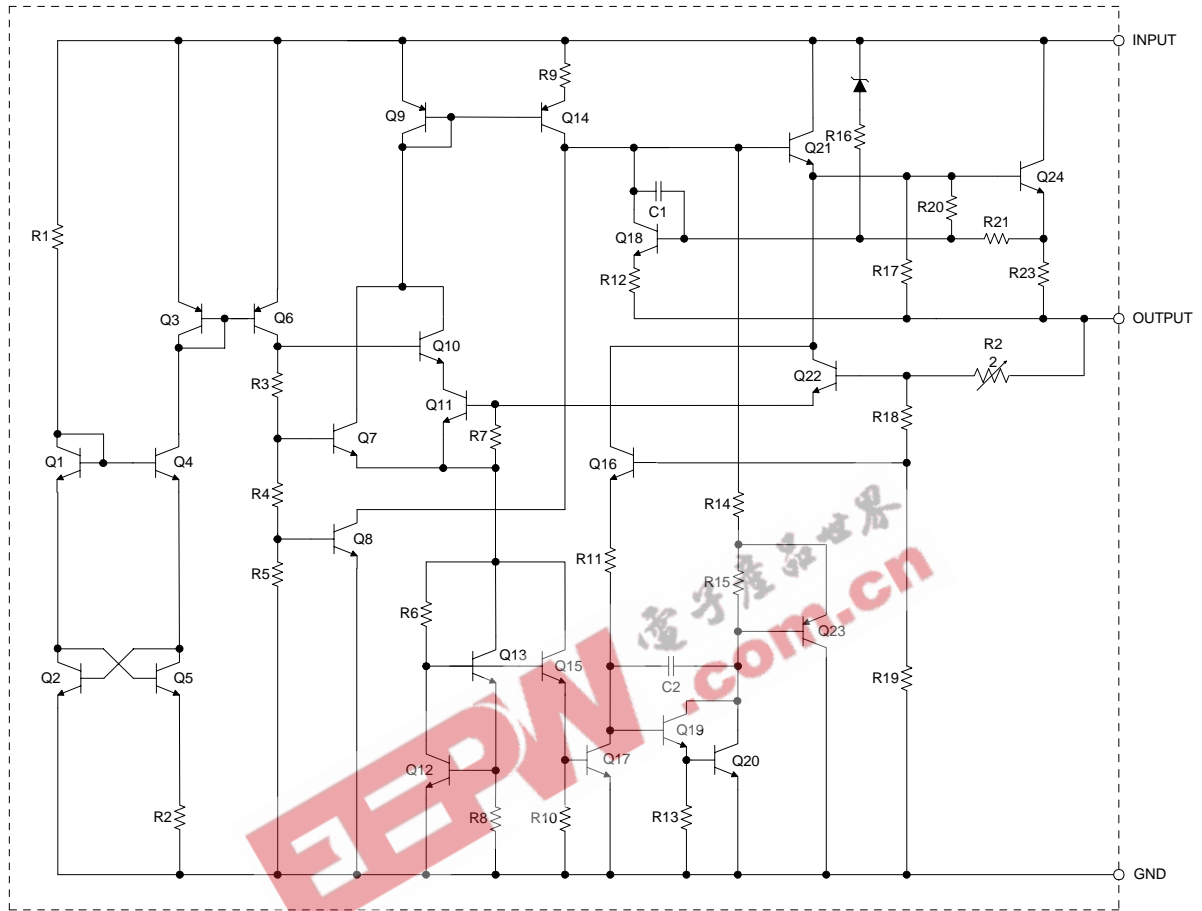
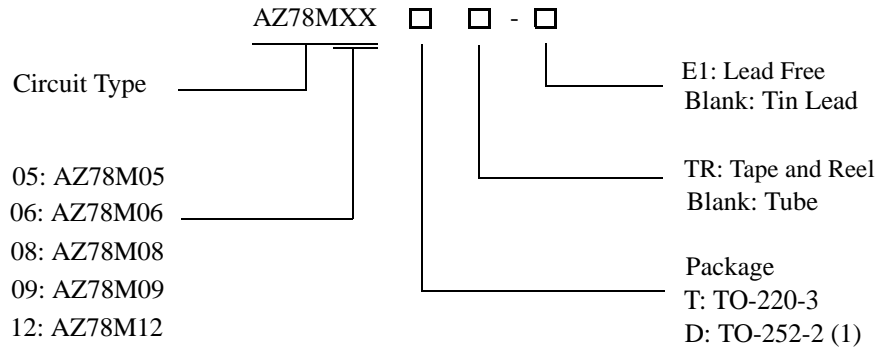


Figure 3. Functional Block Diagram of AZ78MXX



500mA 3-TERMINAL POSITIVE VOLTAGE REGULATOR **AZ78MXX**

Ordering Information



| Package | Temperature Range | Part Number | | Marking ID | | Packing Type |
|--------------|-------------------|-------------|---------------|------------|-------------|--------------|
| | | Tin Lead | Lead Free | Tin Lead | Lead Free | |
| TO-220-3 | -40 to 125°C | AZ78M05T | AZ78M05T-E1 | AZ78M05T | AZ78M05T-E1 | Tube |
| | | AZ78M06T | AZ78M06T-E1 | AZ78M06T | AZ78M06T-E1 | Tube |
| | | AZ78M08T | AZ78M08T-E1 | AZ78M08T | AZ78M08T-E1 | Tube |
| | | AZ78M09T | AZ78M09T-E1 | AZ78M09T | AZ78M09T-E1 | Tube |
| | | AZ78M12T | AZ78M12T-E1 | AZ78M12T | AZ78M12T-E1 | Tube |
| TO-252-2 (1) | -40 to 125°C | AZ78M05D | AZ78M05D-E1 | AZ78M05D | AZ78M05D-E1 | Tube |
| | | AZ78M05DTR | AZ78M05DTR-E1 | AZ78M05D | AZ78M05D-E1 | Tape & Reel |
| | | AZ78M06D | AZ78M06D-E1 | AZ78M06D | AZ78M06D-E1 | Tube |
| | | AZ78M06DTR | AZ78M06DTR-E1 | AZ78M06D | AZ78M06D-E1 | Tape & Reel |
| | | AZ78M08D | AZ78M08D-E1 | AZ78M08D | AZ78M08D-E1 | Tube |
| | | AZ78M08DTR | AZ78M08DTR-E1 | AZ78M08D | AZ78M08D-E1 | Tape & Reel |
| | | AZ78M09D | AZ78M09D-E1 | AZ78M09D | AZ78M09D-E1 | Tube |
| | | AZ78M09DTR | AZ78M09DTR-E1 | AZ78M09D | AZ78M09D-E1 | Tape & Reel |
| | | AZ78M12D | AZ78M12D-E1 | AZ78M12D | AZ78M12D-E1 | Tube |
| | | AZ78M12DTR | AZ78M12DTR-E1 | AZ78M12D | AZ78M12D-E1 | Tape & Reel |

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

**500mA 3-TERMINAL POSITIVE VOLTAGE REGULATOR****AZ78MXX****Absolute Maximum Ratings (Note 1)**

| Parameter | Symbol | Value | Unit | |
|--------------------------------------|---------------|--------------------|------|------|
| Input Voltage | V_{IN} | 20 | V | |
| Operating Junction Temperature | T_J | 150 | °C | |
| Lead Temperature (Soldering, 10sec.) | T_{LEAD} | 260 | °C | |
| Power Dissipation | P_D | Internally Limited | W | |
| Storage Temperature Range | T_{STG} | -65 to 150 | °C | |
| Thermal Resistance | θ_{JA} | TO-220-3 | 60 | °C/W |
| | | TO-252-2 (1) | 100 | |
| ESD (Human Body Model) | ESD | 2500 | V | |
| ESD (Machine Model) | ESD | 450 | 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.

Recommended Operating Conditions

| Parameter | Symbol | Min | Max | Unit |
|--------------------------------------|----------|-----|-----|------|
| Input Voltage | V_{IN} | | 18 | V |
| Operating Junction Temperature Range | T_J | -40 | 125 | °C |



500mA 3-TERMINAL POSITIVE VOLTAGE REGULATOR AZ78MXX

Electrical Characteristics

AZ78M05 ($V_{IN}=10V$, $I_{OUT}=350mA$, $T_J=-40^{\circ}C$ to $125^{\circ}C$, $P_D \leq 5W$, unless otherwise noted)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--------------------------|--------------------------------|--|------|-----|------|-----------------|
| Output Voltage | V_{OUT} | $T_J=25^{\circ}C$ | 4.8 | 5 | 5.2 | V |
| | | $V_{IN}=7V$ to $15V$, $I_{OUT}=5mA$ to $350mA$ | 4.75 | 5 | 5.25 | V |
| Line Regulation | V_{RLINE} | $T_J=25^{\circ}C$, $V_{IN}=7V$ to $15V$, $I_{OUT}=200mA$ | | 3 | 50 | mV |
| Load Regulation | V_{RLOAD} | $T_J=25^{\circ}C$, $I_{OUT}=5mA$ to $500mA$ | | 20 | 100 | mV |
| Quiescent Current | I_Q | $T_J=25^{\circ}C$, $I_{OUT}=0$ | | 3.2 | 6 | mA |
| Quiescent Current Change | ΔI_Q | $V_{IN}=8V$ to $15V$, $I_{OUT}=200mA$ | | | 0.8 | mA |
| | | $I_{OUT}=5mA$ to $350mA$ | | | 0.5 | |
| Ripple Rejection | $\Delta V_{IN}/\Delta V_{OUT}$ | $V_{IN}=8V$ to $15V$, $f=120Hz$, $I_{OUT}=200mA$ | 62 | 73 | | dB |
| Dropout Voltage | $V_{IN}-V_{OUT}$ | $\Delta V_{OUT}=1\%$, $T_J=25^{\circ}C$ | | 2 | | V |
| Output Noise Voltage | N_O | $T_A=25^{\circ}C$, $f=10Hz$ to $100KHz$ | | 40 | | μV |
| Short Circuit Current | I_{SC} | $T_J=25^{\circ}C$, $V_{IN}=15V$ | | 350 | | mA |
| Peak Output Current | I_{PK} | $T_J=25^{\circ}C$ | | 700 | | mA |
| Output Voltage Drift | $\Delta V_{OUT}/\Delta T$ | $I_{OUT}=5mA$ | | 0.2 | | mV/ $^{\circ}C$ |

AZ78M06 ($V_{IN}=11V$, $I_{OUT}=350mA$, $T_J=-40^{\circ}C$ to $125^{\circ}C$, $P_D \leq 5W$, unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|--------------------------|--------------------------------|--|------|-----|------|-----------------|
| Output Voltage | V_{OUT} | $T_J=25^{\circ}C$ | 5.75 | 6 | 6.25 | V |
| | | $V_{IN}=8V$ to $15V$, $I_{OUT}=5mA$ to $350mA$ | 5.7 | 6 | 6.3 | V |
| Line Regulation | V_{RLINE} | $T_J=25^{\circ}C$, $V_{IN}=8V$ to $15V$, $I_{OUT}=200mA$ | | 5 | 50 | mV |
| Load Regulation | V_{RLOAD} | $T_J=25^{\circ}C$, $I_{OUT}=5mA$ to $500mA$ | | 20 | 120 | mV |
| Quiescent Current | I_Q | $T_J=25^{\circ}C$, $I_{OUT}=0$ | | 3.2 | 6 | mA |
| Quiescent Current Change | ΔI_Q | $V_{IN}=9V$ to $15V$, $I_{OUT}=200mA$ | | | 0.8 | mA |
| | | $I_{OUT}=5mA$ to $350mA$ | | | 0.5 | |
| Ripple Rejection | $\Delta V_{IN}/\Delta V_{OUT}$ | $V_{IN}=9V$ to $15V$, $f=120Hz$, $I_{OUT}=200mA$ | 59 | 65 | | dB |
| Dropout Voltage | $V_{IN}-V_{OUT}$ | $\Delta V_{OUT}=1\%$, $T_J=25^{\circ}C$ | | 2 | | V |
| Output Noise Voltage | N_O | $T_A=25^{\circ}C$, $f=10Hz$ to $100KHz$ | | 45 | | μV |
| Short Circuit Current | I_{SC} | $T_J=25^{\circ}C$, $V_{IN}=15V$ | | 350 | | mA |
| Peak Output Current | I_{PK} | $T_J=25^{\circ}C$ | | 700 | | mA |
| Output Voltage Drift | $\Delta V_{OUT}/\Delta T$ | $I_{OUT}=5mA$ | | 0.2 | | mV/ $^{\circ}C$ |



500mA 3-TERMINAL POSITIVE VOLTAGE REGULATOR AZ78MXX

Electrical Characteristics (Continued)

AZ78M08 ($V_{IN}=14V$, $I_{OUT}=350mA$, $T_J=-40^{\circ}C$ to $125^{\circ}C$, $P_D \leq 5W$, unless otherwise noted)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--------------------------|--------------------------------|---|-----|-----|-----|-----------------|
| Output Voltage | V_{OUT} | $T_J=25^{\circ}C$ | 7.7 | 8 | 8.3 | V |
| | | $V_{IN}=10.5V$ to $15V$, $I_{OUT}=5mA$ to $350mA$ | 7.6 | 8 | 8.4 | V |
| Line Regulation | V_{RLINE} | $T_J=25^{\circ}C$, $V_{IN}=10.5V$ to $15V$, $I_{OUT}=200mA$ | | 6 | 50 | mV |
| Load Regulation | V_{RLOAD} | $T_J=25^{\circ}C$, $I_{OUT}=5mA$ to $500mA$ | | 25 | 160 | mV |
| Quiescent Current | I_Q | $T_J=25^{\circ}C$, $I_{OUT}=0$ | | 3.2 | 6 | mA |
| Quiescent Current Change | ΔI_Q | $V_{IN}=10.5V$ to $15V$, $I_{OUT}=200mA$ | | | 0.8 | mA |
| | | $I_{OUT}=5mA$ to $350mA$ | | | 0.5 | |
| Ripple Rejection | $\Delta V_{IN}/\Delta V_{OUT}$ | $V_{IN}=11V$ to $15V$, $f=120Hz$, $I_{OUT}=200mA$ | 56 | 62 | | dB |
| Dropout Voltage | $V_{IN}-V_{OUT}$ | $\Delta V_{OUT}=1\%$, $T_J=25^{\circ}C$ | | 2 | | V |
| Output Noise Voltage | N_O | $T_A=25^{\circ}C$, $f=10Hz$ to $100KHz$ | | 52 | | μV |
| Short Circuit Current | I_{SC} | $T_J=25^{\circ}C$, $V_{IN}=15V$ | | 350 | | mA |
| Peak Output Current | I_{PK} | $T_J=25^{\circ}C$ | | 700 | | mA |
| Output Voltage Drift | $\Delta V_{OUT}/\Delta T$ | $I_{OUT}=5mA$ | | 0.2 | | mV/ $^{\circ}C$ |

AZ78M09 ($V_{IN}=15V$, $I_{OUT}=350mA$, $T_J=-40^{\circ}C$ to $125^{\circ}C$, $P_D \leq 5W$, unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|--------------------------|--------------------------------|---|------|-----|------|-----------------|
| Output Voltage | V_{OUT} | $T_J=25^{\circ}C$ | 8.65 | 9 | 9.35 | V |
| | | $V_{IN}=11.5V$ to $15V$, $I_{OUT}=5mA$ to $350mA$ | 8.55 | 9 | 9.45 | V |
| Line Regulation | V_{RLINE} | $T_J=25^{\circ}C$, $V_{IN}=11.5V$ to $15V$, $I_{OUT}=200mA$ | | 6 | 50 | mV |
| Load Regulation | V_{RLOAD} | $T_J=25^{\circ}C$, $I_{OUT}=5mA$ to $500mA$ | | 25 | 180 | mV |
| Quiescent Current | I_Q | $T_J=25^{\circ}C$, $I_{OUT}=0$ | | 3.2 | 6 | mA |
| Quiescent Current Change | ΔI_Q | $V_{IN}=11.5V$ to $15V$, $I_{OUT}=200mA$ | | | 0.8 | mA |
| | | $I_{OUT}=5mA$ to $350mA$ | | | 0.5 | |
| Ripple Rejection | $\Delta V_{IN}/\Delta V_{OUT}$ | $V_{IN}=12V$ to $15V$, $f=120Hz$, $I_{OUT}=200mA$ | 56 | 61 | | dB |
| Dropout Voltage | $V_{IN}-V_{OUT}$ | $\Delta V_{OUT}=1\%$, $T_J=25^{\circ}C$ | | 2 | | V |
| Output Noise Voltage | N_O | $T_A=25^{\circ}C$, $f=10Hz$ to $100KHz$ | | 52 | | μV |
| Short Circuit Current | I_{SC} | $T_J=25^{\circ}C$, $V_{IN}=15V$ | | 350 | | mA |
| Peak Output Current | I_{PK} | $T_J=25^{\circ}C$ | | 700 | | mA |
| Output Voltage Drift | $\Delta V_{OUT}/\Delta T$ | $I_{OUT}=5mA$ | | 0.2 | | mV/ $^{\circ}C$ |

**500mA 3-TERMINAL POSITIVE VOLTAGE REGULATOR****AZ78MXX****Electrical Characteristics (Continued)**AZ78M12 ($V_{IN}=17V$, $I_{OUT}=350mA$, $T_J=-40^{\circ}C$ to $125^{\circ}C$, $P_D \leq 5W$, unless otherwise noted)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--------------------------|--------------------------------|---|------|-----|------|-----------------|
| Output Voltage | V_{OUT} | $T_J=25^{\circ}C$ | 11.5 | 12 | 12.5 | V |
| | | $V_{IN}=14.5V$ to $17V$, $I_{OUT}=5mA$ to $350mA$ | 11.4 | 12 | 12.6 | V |
| Line Regulation | V_{RLINE} | $T_J=25^{\circ}C$, $V_{IN}=14.5V$ to $17V$, $I_{OUT}=200mA$ | | 8 | 50 | mV |
| Load Regulation | V_{RLOAD} | $T_J=25^{\circ}C$, $I_{OUT}=5mA$ to $500mA$ | | 25 | 240 | mV |
| Quiescent Current | I_Q | $T_J=25^{\circ}C$, $I_{OUT}=0$ | | 3.2 | 6 | mA |
| Quiescent Current Change | ΔI_Q | $V_{IN}=14.5V$ to $17V$, $I_{OUT}=200mA$ | | | 0.8 | mA |
| | | $I_{OUT}=5mA$ to $350mA$ | | | 0.5 | |
| Ripple Rejection | $\Delta V_{IN}/\Delta V_{OUT}$ | $V_{IN}=15V$ to $17V$, $f=120Hz$, $I_{OUT}=200mA$ | 55 | 60 | | dB |
| Dropout Voltage | $V_{IN}-V_{OUT}$ | $\Delta V_{OUT}=1\%$, $T_J=25^{\circ}C$ | | 2 | | V |
| Output Noise Voltage | N_O | $T_A=25^{\circ}C$, $f=10Hz$ to $100KHz$ | | 75 | | μV |
| Short Circuit Current | I_{SC} | $T_J=25^{\circ}C$, $V_{IN}=17V$ | | 350 | | mA |
| Peak Output Current | I_{PK} | $T_J=25^{\circ}C$ | | 700 | | mA |
| Output Voltage Drift | $\Delta V_{OUT}/\Delta T$ | $I_{OUT}=5mA$ | | 0.3 | | mV/ $^{\circ}C$ |



500mA 3-TERMINAL POSITIVE VOLTAGE REGULATOR **AZ78MXX**

Typical Performance Characteristics

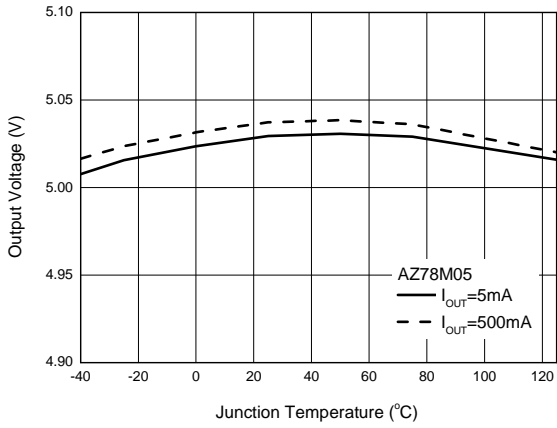


Figure 4. Output Voltage vs. Junction Temperature

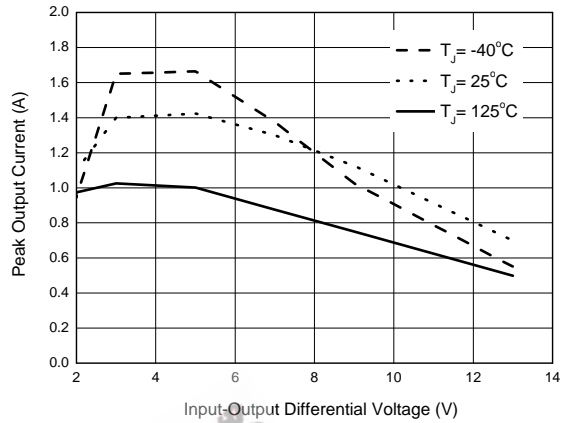


Figure 5. Peak Output Current vs. Input-Output Differential Voltage

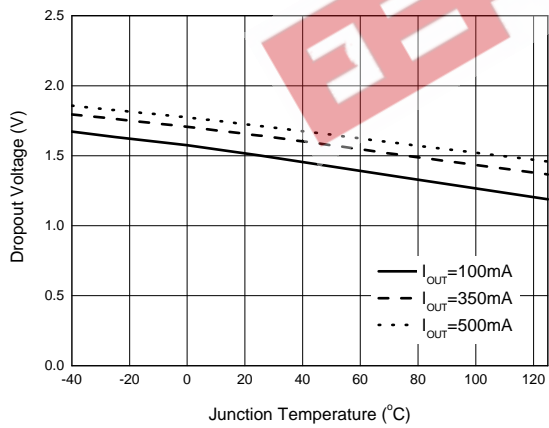


Figure 6. Dropout Voltage vs. Junction Temperature

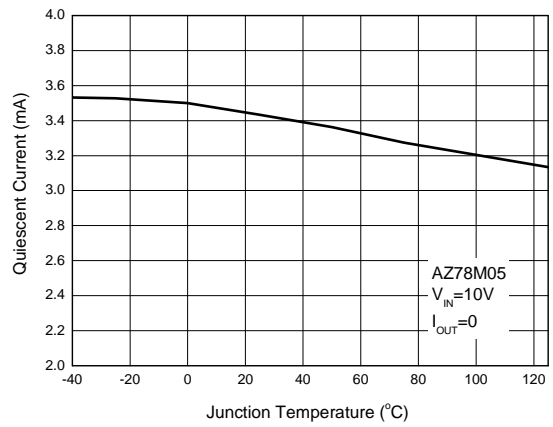


Figure 7. Quiescent Current vs. Junction Temperature



500mA 3-TERMINAL POSITIVE VOLTAGE REGULATOR **AZ78MXX**

Typical Performance Characteristics (Continued)

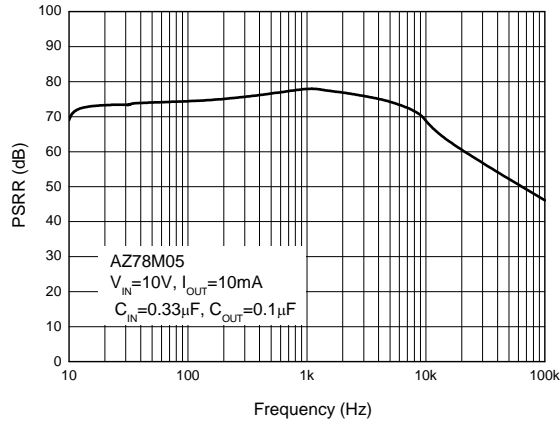


Figure 8. PSRR vs. Frequency





Typical Application

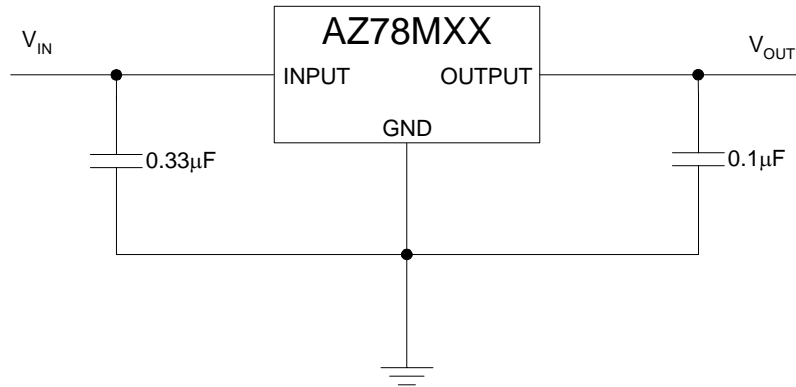


Figure 9. Typical Application of AZ78MXX



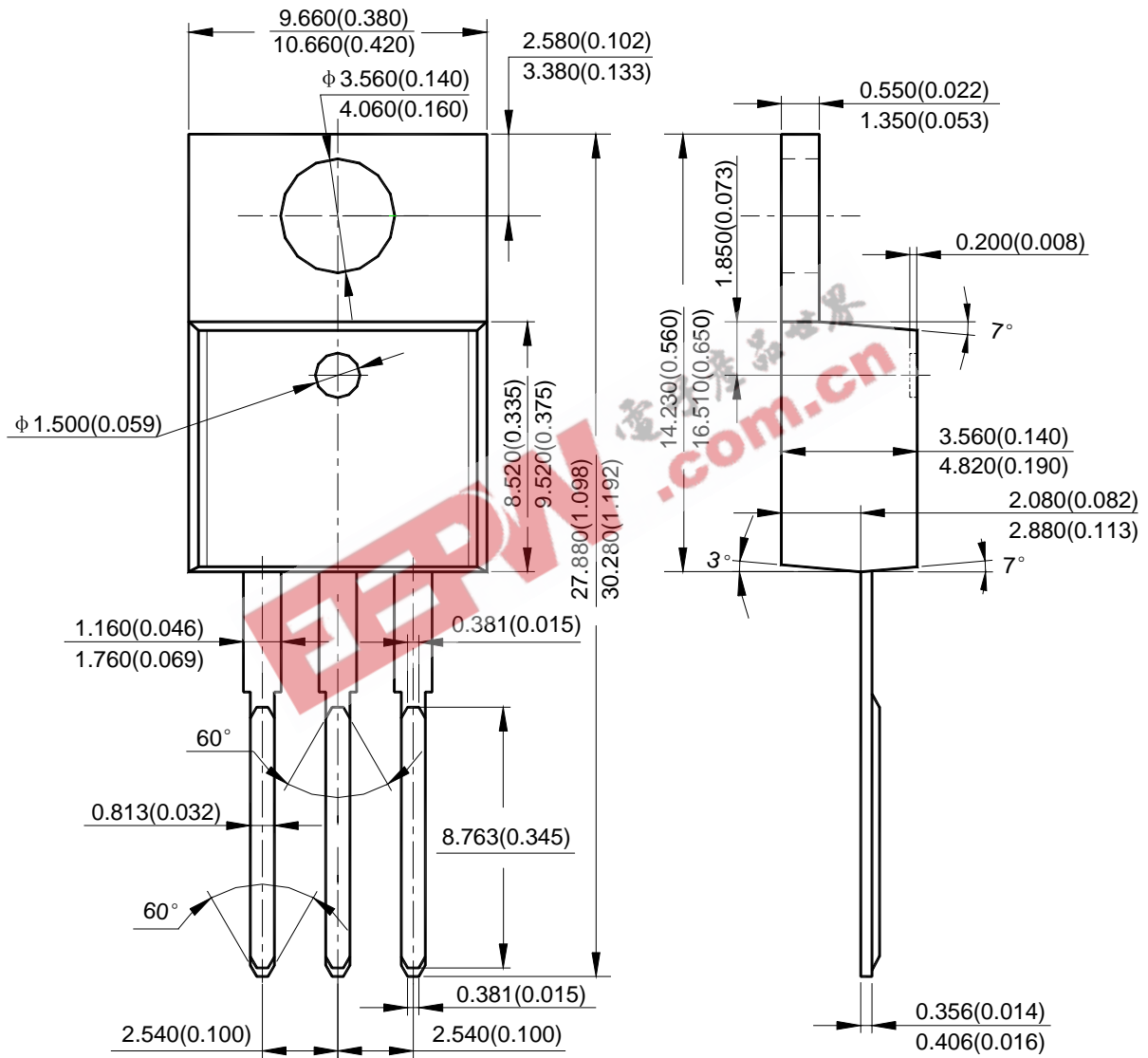


500mA 3-TERMINAL POSITIVE VOLTAGE REGULATOR **AZ78MXX**

Mechanical Dimensions

TO-220-3

Unit: mm(inch)





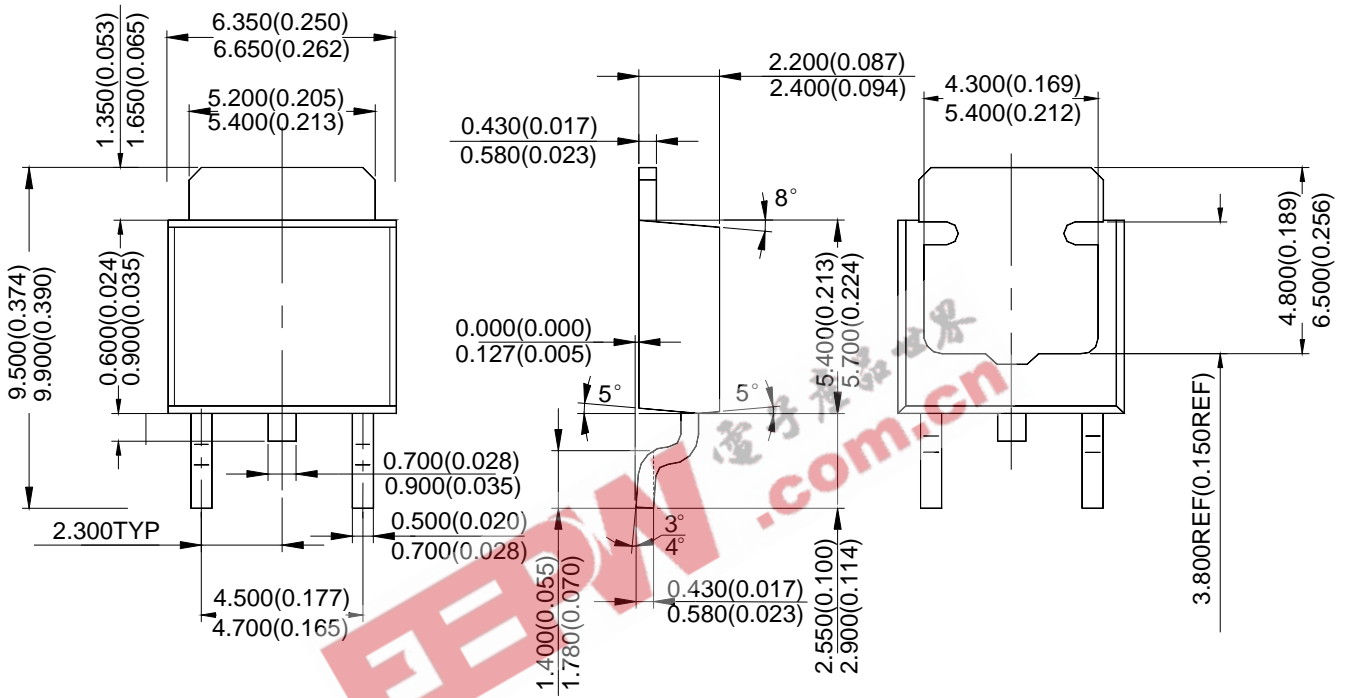
500mA 3-TERMINAL POSITIVE VOLTAGE REGULATOR

AZ78MXX

Mechanical Dimensions (Continued)

TO-252-2(1)

Unit: mm(inch)





BCD Semiconductor Manufacturing Limited

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