

## 3-TERMINAL POSITIVE LINEAR REGULATORS

**AZ78XX**

### General Description

The AZ78XX 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 1.0A.

The AZ78XX series are available in two standard plastic packages: TO-220 and TO-252.

### Features

- Output Current up to 1.0A
- 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

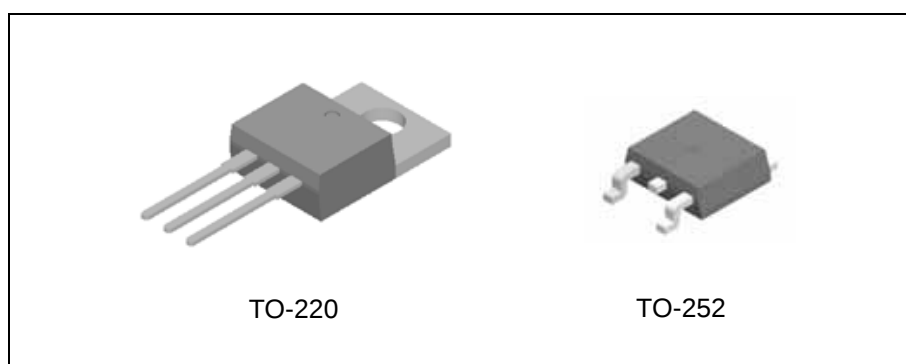


Figure 1. Package Types of AZ78XX

## 3-TERMINAL POSITIVE LINEAR REGULATORS

**AZ78XX**

### Pin Configuration

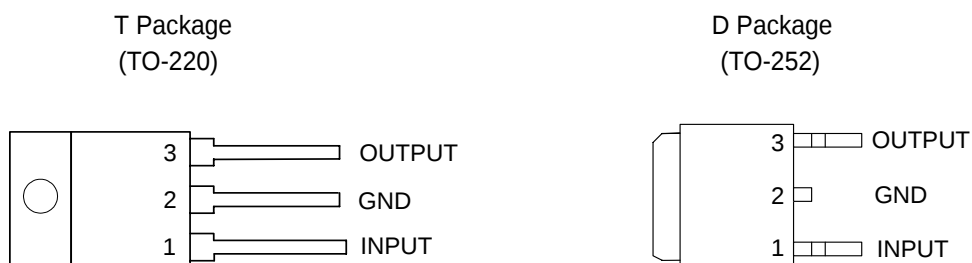


Figure 2. Pin Configuration of AZ78XX (Top View)

### Pin Description

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



# 3-TERMINAL POSITIVE LINEAR REGULATORS

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## Functional Block Diagram

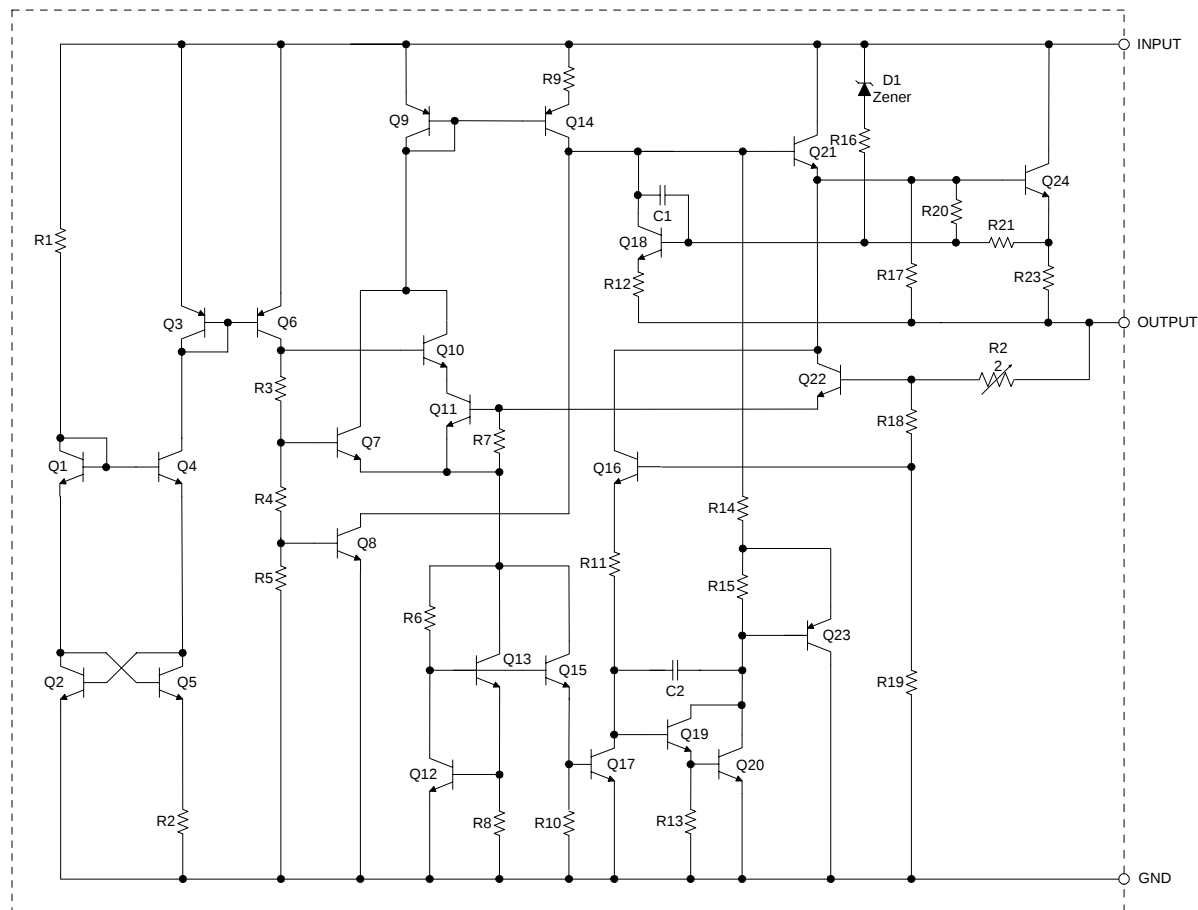
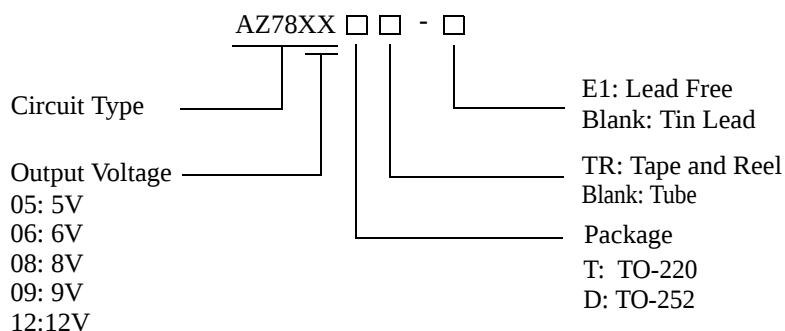


Figure 3. Functional Block Diagram of AZ78XX

# 3-TERMINAL POSITIVE LINEAR REGULATORS

**AZ78XX**

## Ordering Information



| Package | Temperature Range | Part Number |              | Marking ID |            | Packing Type |
|---------|-------------------|-------------|--------------|------------|------------|--------------|
|         |                   | Tin Lead    | Lead Free    | Tin Lead   | Lead Free  |              |
| TO-220  | -40 to 125°C      | AZ7805T     | AZ7805T-E1   | AZ7805T    | AZ7805T-E1 | Tube         |
|         |                   | AZ7806T     | AZ7806T-E1   | AZ7806T    | AZ7806T-E1 | Tube         |
|         |                   | AZ7808T     | AZ7808T-E1   | AZ7808T    | AZ7808T-E1 | Tube         |
|         |                   | AZ7809T     | AZ7809T-E1   | AZ7809T    | AZ7809T-E1 | Tube         |
|         |                   | AZ7812T     | AZ7812T-E1   | AZ7812T    | AZ7812T-E1 | Tube         |
| TO-252  | -40 to 125°C      | AZ7805D     | AZ7805D-E1   | AZ7805D    | AZ7805D-E1 | Tube         |
|         |                   | AZ7805DTR   | AZ7805DTR-E1 | AZ7805D    | AZ7805D-E1 | Tape & Reel  |
|         |                   | AZ7806D     | AZ7806D-E1   | AZ7806D    | AZ7806D-E1 | Tube         |
|         |                   | AZ7806DTR   | AZ7806DTR-E1 | AZ7806D    | AZ7806D-E1 | Tape & Reel  |
|         |                   | AZ7808D     | AZ7808D-E1   | AZ7808D    | AZ7808D-E1 | Tube         |
|         |                   | AZ7808DTR   | AZ7808DTR-E1 | AZ7808D    | AZ7808D-E1 | Tape & Reel  |
|         |                   | AZ7809D     | AZ7809D-E1   | AZ7809D    | AZ7809D-E1 | Tube         |
|         |                   | AZ7809DTR   | AZ7809DTR-E1 | AZ7809D    | AZ7809D-E1 | Tape & Reel  |
|         |                   | AZ7812D     | AZ7812D-E1   | AZ7812D    | AZ7812D-E1 | Tube         |
|         |                   | AZ7812DTR   | AZ7812DTR-E1 | AZ7812D    | AZ7812D-E1 | Tape & Reel  |

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

### 3-TERMINAL POSITIVE LINEAR REGULATORS

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#### Absolute Maximum Ratings (Note 1)

| Parameter                           | Symbol    | Value              | Unit |
|-------------------------------------|-----------|--------------------|------|
| Input Voltage                       | $V_{IN}$  | 20                 | V    |
| Lead Temperature (Soldering, 10sec) |           | 300                | °C   |
| Power Dissipation                   | $P_D$     | Internally Limited |      |
| Storage Temperature Range           | $T_{STG}$ | -65 to 150         | °C   |
| ESD (Machine Model)                 | ESD       | 500                | 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 |
|--------------------------------------|----------|-----|-----|------|
| Supply Voltage                       | $V_{CC}$ | 7.5 | 18  | V    |
| Operating Junction Temperature Range | $T_J$    | -40 | 125 | °C   |

### 3-TERMINAL POSITIVE LINEAR REGULATORS

**AZ78XX**

#### Electrical Characteristics

**AZ7805** ( $V_I=10V$ ,  $I_O=1A$ ,  $T_J=-40$  to  $125\text{ }^{\circ}C$ , unless otherwise specified.)

| Parameter                | Symbol                  | Conditions                                              | Min | Typ  | Max | Unit           |
|--------------------------|-------------------------|---------------------------------------------------------|-----|------|-----|----------------|
| Output Voltage           | $V_O$                   | $T_J=25^{\circ}C$                                       | 4.9 | 5.0  | 5.1 | V              |
|                          |                         | $I_O=5mA$ to $1A$ , $V_I=7.5$ to $15V$ , $P_D \leq 15W$ | 4.8 | 5.0  | 5.2 |                |
| Line Regulation          | $V_{RLINE}$             | $V_I=8V$ to $15V$ , $I_O=1A$ , $T_J=25^{\circ}C$        |     | 1    | 20  | mV             |
| Load Regulation          | $V_{RLOAD}$             | $V_I=10V$ , $I_O=5mA$ to $1A$ , $T_J=25^{\circ}C$       |     | 10   | 35  | mV             |
| Quiescent Current        | $I_Q$                   | $V_I=10V$                                               |     | 3.2  | 6.0 | mA             |
| Quiescent Current Change | $\Delta I_Q$            | $V_I=8V$ to $15V$ , $I_O=500mA$ , $T_J=25^{\circ}C$     |     | 0.3  | 0.8 | mA             |
|                          |                         | $I_O=5mA$ to $1A$ , $T_J=25^{\circ}C$                   |     | 0.08 | 0.5 |                |
| Ripple Rejection         | $\Delta V_I/\Delta V_O$ | $V_I=8V$ to $15V$ , $f=120Hz$ , $I_O=300mA$             | 63  | 73   |     | dB             |
| Dropout Voltage          | $V_I-V_O$               | $\Delta V_O/V_O=1\%$ , $I_O=1A$ , $T_J=25^{\circ}C$     |     | 2.0  |     | V              |
| Output Noise Voltage     | $N_O$                   | $f=10Hz$ to $100KHz$ , $T_A=25^{\circ}C$                |     | 10   |     | $\mu V/V_O$    |
| Output Resistance        | $R_O$                   | $f=1.0kHz$                                              |     | 10   |     | $m\Omega$      |
| Short Circuit Current    | $I_{PK}$                | $V_I=15V$ , $T_A=25^{\circ}C$                           |     | 0.8  |     | A              |
| Peak Output Current      | $I_{MAX}$               | $V_I=10V$ , $T_J=25^{\circ}C$                           |     | 2.2  |     | A              |
| Output Voltage Drift     | $\Delta V_O/\Delta T$   |                                                         |     | -0.3 |     | $mV/^{\circ}C$ |

**AZ7806** ( $V_I=11V$ ,  $I_O=1A$ ,  $T_J=-40$  to  $125\text{ }^{\circ}C$ , unless otherwise specified.)

| Parameter                | Symbol                  | Conditions                                              | Min  | Typ  | Max  | Unit           |
|--------------------------|-------------------------|---------------------------------------------------------|------|------|------|----------------|
| Output Voltage           | $V_O$                   | $T_J=25^{\circ}C$                                       | 5.88 | 6.0  | 6.12 | V              |
|                          |                         | $I_O=5mA$ to $1A$ , $V_I=8.6$ to $15V$ , $P_D \leq 15W$ | 5.76 | 6.0  | 6.24 |                |
| Line Regulation          | $V_{RLINE}$             | $V_I=9V$ to $15V$ , $I_O=1A$ , $T_J=25^{\circ}C$        |      | 1.6  | 25   | mV             |
| Load Regulation          | $V_{RLOAD}$             | $V_I=11V$ , $I_O=5mA$ to $1A$ , $T_J=25^{\circ}C$       |      | 20   | 37   | mV             |
| Quiescent Current        | $I_Q$                   | $V_I=11V$                                               |      | 3.3  | 6.0  | mA             |
| Quiescent Current Change | $\Delta I_Q$            | $V_I=9V$ to $15V$ , $I_O=500mA$ , $T_J=25^{\circ}C$     |      | 0.3  | 0.8  | mA             |
|                          |                         | $I_O=5.0mA$ to $1A$ , $T_J=25^{\circ}C$                 |      | 0.08 | 0.5  |                |
| Ripple Rejection         | $\Delta V_I/\Delta V_O$ | $V_I=9V$ to $15V$ , $f=120Hz$ , $I_O=300mA$             | 58   | 65   |      | dB             |
| Dropout Voltage          | $V_I-V_O$               | $\Delta V_O/V_O=1\%$ , $I_O=1A$ , $T_J=25^{\circ}C$     |      | 2.0  |      | V              |
| Output Noise Voltage     | $N_O$                   | $f=10Hz$ to $100KHz$ , $T_A=25^{\circ}C$                |      | 10   |      | $\mu V/V_O$    |
| Output Resistance        | $R_O$                   | $f=1.0kHz$                                              |      | 10   |      | $m\Omega$      |
| Short Circuit Current    | $I_{PK}$                | $V_I=15V$ , $T_A=25^{\circ}C$                           |      | 0.8  |      | A              |
| Peak Output Current      | $I_{MAX}$               | $V_I=11V$ , $T_J=25^{\circ}C$                           |      | 2.2  |      | A              |
| Output Voltage Drift     | $\Delta V_O/\Delta T$   |                                                         |      | -0.3 |      | $mV/^{\circ}C$ |

### 3-TERMINAL POSITIVE LINEAR REGULATORS

**AZ78XX**

#### Electrical Characteristics (Continued)

**AZ7808** ( $V_I=14V$ ,  $I_O=1A$ ,  $T_J=-40$  to  $125\text{ }^{\circ}C$ , unless otherwise specified.)

| Parameter                | Symbol                  | Conditions                                               | Min | Typ  | Max | Unit           |
|--------------------------|-------------------------|----------------------------------------------------------|-----|------|-----|----------------|
| Output Voltage           | $V_O$                   | $T_J=25^{\circ}C$                                        | 7.8 | 8.0  | 8.2 | V              |
|                          |                         | $I_O=5mA$ to $1A$ , $V_I=10.6$ to $15V$ , $P_D \leq 15W$ | 7.7 | 8.0  | 8.3 |                |
| Line Regulation          | $V_{RLINE}$             | $V_I=11V$ to $15V$ , $I_O=1A$ , $T_J=25^{\circ}C$        |     | 2    | 26  | mV             |
| Load Regulation          | $V_{RLOAD}$             | $V_I=14V$ , $I_O=5mA$ to $1A$ , $T_J=25^{\circ}C$        |     | 15   | 37  | mV             |
| Quiescent Current        | $I_Q$                   | $V_I=14V$                                                |     | 3.3  | 6.0 | mA             |
| Quiescent Current Change | $\Delta I_Q$            | $V_I=10.6V$ to $15V$ , $I_O=500mA$ , $T_J=25^{\circ}C$   |     |      | 0.8 | mA             |
|                          |                         | $I_O=5.0mA$ to $1A$ , $T_J=25^{\circ}C$                  |     |      | 0.5 |                |
| Ripple Rejection         | $\Delta V_I/\Delta V_O$ | $V_I=11V$ to $15V$ , $f=120Hz$ , $I_O=300mA$             | 56  | 62   |     | dB             |
| Dropout Voltage          | $V_I-V_O$               | $\Delta V_O/V_O=1\%$ , $I_O=1A$ , $T_J=25^{\circ}C$      |     | 2.0  |     | V              |
| Output Noise Voltage     | $N_O$                   | $f=10Hz$ to $100KHz$ , $T_A=25^{\circ}C$                 |     | 10   |     | $\mu V/V_O$    |
| Output Resistance        | $R_O$                   | $f=1.0kHz$                                               |     | 10   |     | $m\Omega$      |
| Short Circuit Current    | $I_{PK}$                | $V_I=15V$ , $T_A=25^{\circ}C$                            |     | 0.8  |     | A              |
| Peak Output Current      | $I_{MAX}$               | $V_I=13V$ , $T_J=25^{\circ}C$                            |     | 2.2  |     | A              |
| Output Voltage Drift     | $\Delta V_O/\Delta T$   |                                                          |     | -0.4 |     | $mV/^{\circ}C$ |

**AZ7809** ( $V_I=15V$ ,  $I_O=1A$ ,  $T_J=-40$  to  $125\text{ }^{\circ}C$ , unless otherwise specified. )

| Parameter                | Symbol                  | Condition                                                | Min  | Typ  | Max  | Unit           |
|--------------------------|-------------------------|----------------------------------------------------------|------|------|------|----------------|
| Output Voltage           | $V_O$                   | $T_J=25^{\circ}C$                                        | 8.65 | 9.0  | 9.35 | V              |
|                          |                         | $I_O=5mA$ to $1A$ , $V_I=11.5$ to $15V$ , $P_D \leq 15W$ | 8.55 | 9.0  | 9.45 |                |
| Line Regulation          | $V_{RLINE}$             | $V_I=11.5V$ to $15V$ , $I_O=1A$ , $T_J=25^{\circ}C$      |      | 1.8  | 24   | mV             |
| Load Regulation          | $V_{RLOAD}$             | $V_I=15V$ , $I_O=5mA$ to $1A$ , $T_J=25^{\circ}C$        |      | 14   | 36   | mV             |
| Quiescent Current        | $I_Q$                   | $V_I=15V$                                                |      | 3.4  | 8.0  | mA             |
| Quiescent Current Change | $\Delta I_Q$            | $V_I=11.5V$ to $15V$ , $I_O=500mA$ , $T_J=25^{\circ}C$   |      |      | 1.0  | mA             |
|                          |                         | $I_O=5.0mA$ to $1A$ , $T_J=25^{\circ}C$                  |      |      | 0.5  |                |
| Ripple Rejection         | $\Delta V_I/\Delta V_O$ | $V_I=12V$ to $15V$ , $f=120Hz$ , $I_O=300mA$             | 56   | 61   |      | dB             |
| Dropout Voltage          | $V_I-V_O$               | $\Delta V_O/V_O=1\%$ , $I_O=1A$                          |      | 2.0  |      | V              |
| Output Noise Voltage     | $N_O$                   | $f=10Hz$ to $100KHz$ , $T_A=25^{\circ}C$                 |      | 10   |      | $\mu V/V_O$    |
| Output Resistance        | $R_O$                   | $f=1.0KHz$                                               |      | 12   |      | $m\Omega$      |
| Short Circuit Current    | $I_{PK}$                | $V_I=15V$ , $T_A=25^{\circ}C$                            |      | 0.8  |      | A              |
| Peak Output Current      | $I_{MAX}$               | $V_I=14V$ , $T_J=25^{\circ}C$                            |      | 2.2  |      | A              |
| Output Voltage Drift     | $\Delta V_O/\Delta T$   |                                                          |      | -0.5 |      | $mV/^{\circ}C$ |

### 3-TERMINAL POSITIVE LINEAR REGULATORS

**AZ78XX**

#### Electrical Characteristics (Continued)

**AZ7812** ( $V_I=17V$ ,  $I_O=1A$ ,  $T_J=-40$  to  $125^\circ C$ , unless otherwise specified.)

| Parameter                | Symbol                    | Condition                                                | Min  | Typ  | Max  | Unit            |
|--------------------------|---------------------------|----------------------------------------------------------|------|------|------|-----------------|
| Output Voltage           | $V_O$                     | $T_J=25^\circ C$                                         | 11.5 | 12   | 12.5 | V               |
|                          |                           | $I_O=5mA$ to $1A$ , $V_I=14.8$ to $17V$ , $P_D \leq 15W$ | 11.4 | 12   | 12.6 |                 |
| Line Regulation          | $V_{RLINE}$               | $V_I=14.5$ to $18V$ , $I_O=1A$ , $T_J=25^\circ C$        |      | 2.2  | 20   | mV              |
| Load Regulation          | $V_{RLOAD}$               | $V_I=17V$ , $I_O=5mA$ to $1A$ , $T_J=25^\circ C$         |      | 8.1  | 60   | mV              |
| Quiescent Current        | $I_Q$                     | $V_I=17V$                                                |      | 3.4  | 6.5  | mA              |
| Quiescent Current Change | $\Delta I_Q$              | $V_I=14.5$ to $17V$ , $I_O=1A$ , $T_J=25^\circ C$        |      |      | 0.7  | mA              |
|                          |                           | $I_O=5.0mA$ to $1A$ , $T_J=25^\circ C$                   |      |      | 0.5  |                 |
| Ripple Rejection         | $\Delta V_I / \Delta V_O$ | $V_I=15V$ to $17V$ , $f=120Hz$ , $I_O=300mA$             | 55   | 60   |      | dB              |
| Dropout Voltage          | $V_I - V_O$               | $\Delta V_O / V_O = 1\%$ , $I_O=1A$ , $T_A=25^\circ C$   |      | 2.0  |      | V               |
| Output Noise Voltage     | $N_O$                     | $f=10Hz$ to $100KHz$ , $T_A=25^\circ C$                  |      | 10   |      | $\mu V / V_O$   |
| Output Resistance        | $R_O$                     | $f=1.0KHz$                                               |      | 13   |      | $m\Omega$       |
| Short Circuit Current    | $I_{PK}$                  | $V_I=15V$ , $T_A=25^\circ C$                             |      | 0.8  |      | A               |
| Peak Output Current      | $I_{MAX}$                 | $V_I=17V$ , $T_J=25^\circ C$                             |      | 2.2  |      | A               |
| Output Voltage Drift     | $\Delta V_O / \Delta T$   |                                                          |      | -0.8 |      | $mV / ^\circ C$ |

# 3-TERMINAL POSITIVE LINEAR REGULATORS

AZ78XX

## Typical Performance Characteristics

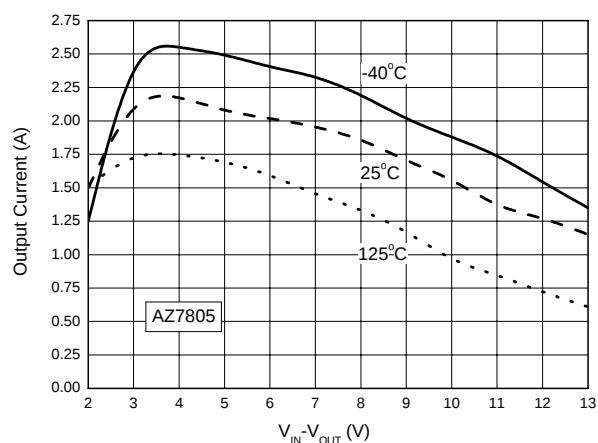


Figure 4. Peak Output Current vs. Input / Output Differential Voltage

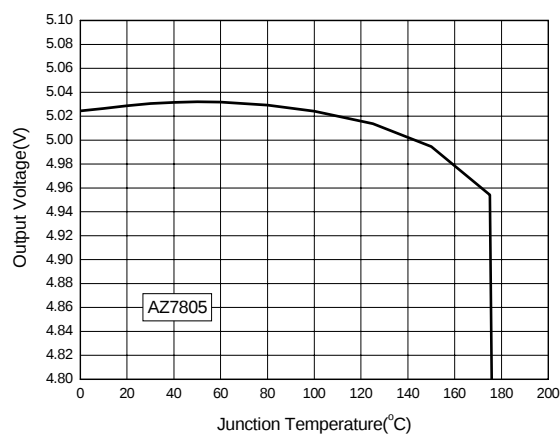


Figure 5. Output Voltage vs. Junction Temperature

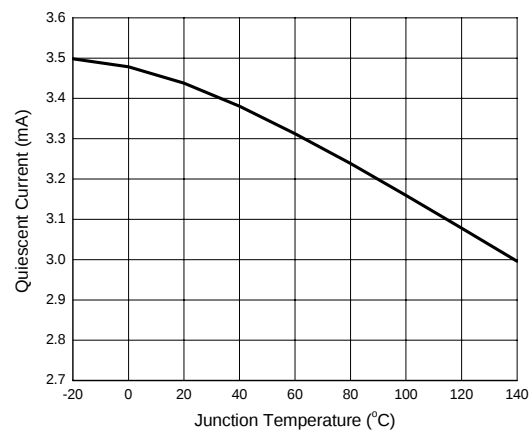


Figure 6. Quiescent Current vs. Junction Temperature

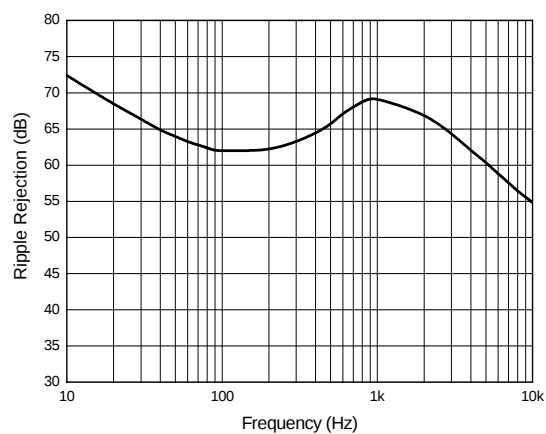


Figure 7. Ripple Rejection vs. Frequency

## 3-TERMINAL POSITIVE LINEAR REGULATORS

**AZ78XX**

### Typical Application

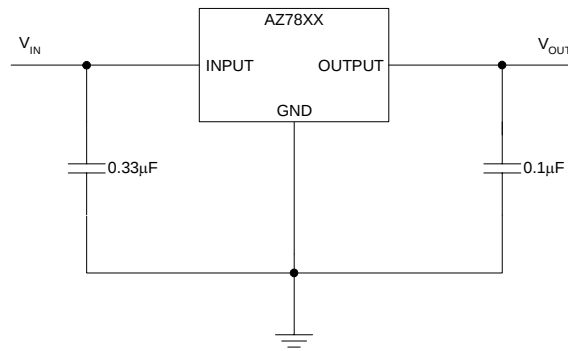
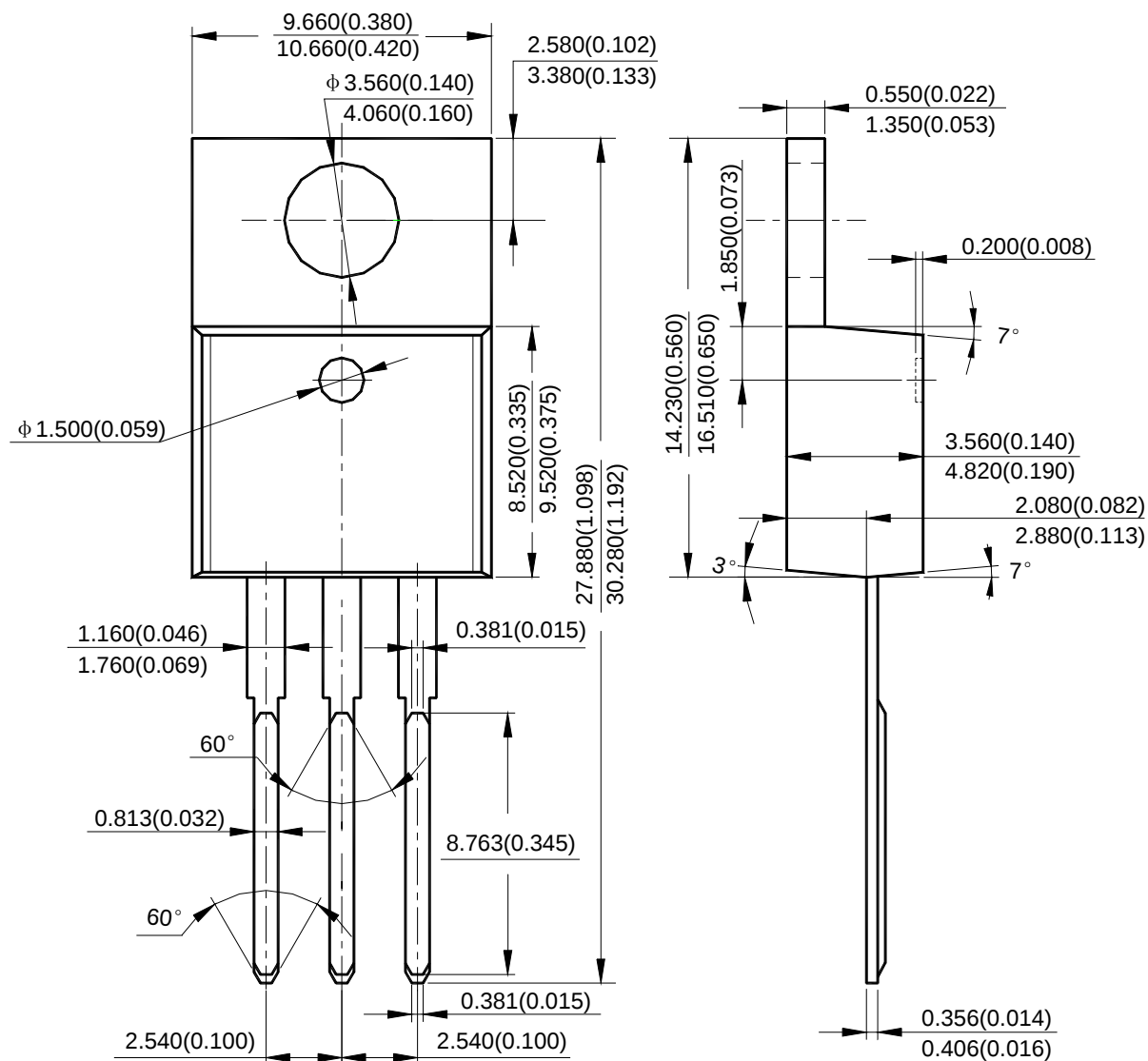
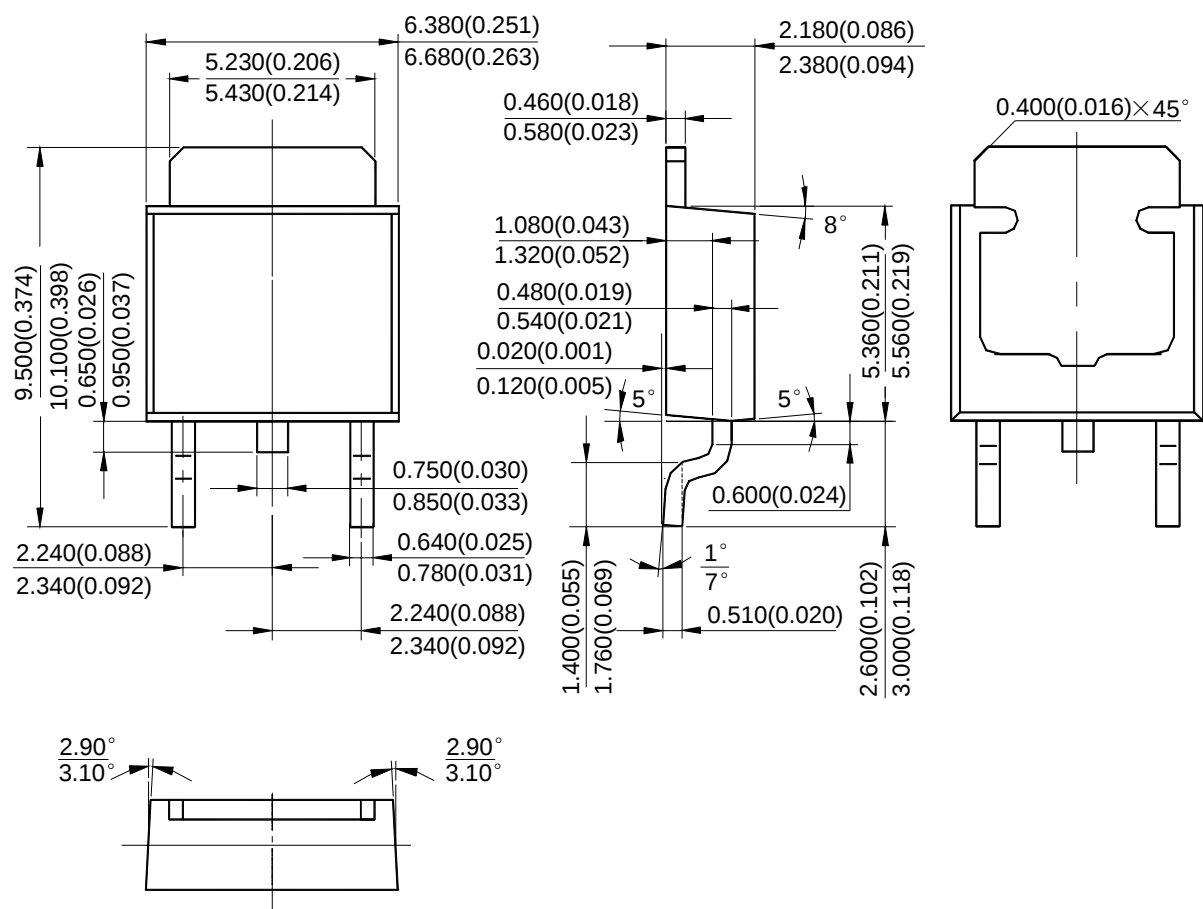


Figure 8. Fixed Output Regulator of AZ78XX

**3-TERMINAL POSITIVE LINEAR REGULATORS****AZ78XX****Mechanical Dimension****TO-220****Unit: mm(inch)**

**3-TERMINAL POSITIVE LINEAR REGULATORS****AZ78XX****Mechanical Dimension (Continued)****TO-252****Unit: mm(inch)**



BCD Semiconductor Manufacturing Limited

<http://www.bcdsemi.com>

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