

1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR

AS78XX

General Description

The AS78XX series are three terminal positive regulators designed for a wide variety of applications including local, on-card regulation.

The AS78XX 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 1A.

The AS78XX are available in TO-220-3 and TO-252-2 (1) packages.

Features

- Output Current up to 1A
- Fixed Output Voltages of 5V, 8V, 9V, 12V and 15V
- Output Voltage Accuracy of $\pm 4\%$ over the Full Temperature Range
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- Output Transistor Safe-area Protection

Applications

- High Efficiency Linear Regulator
- Post Regulation for Switching Supply
- Microprocessor Power Supply
- Mother Board

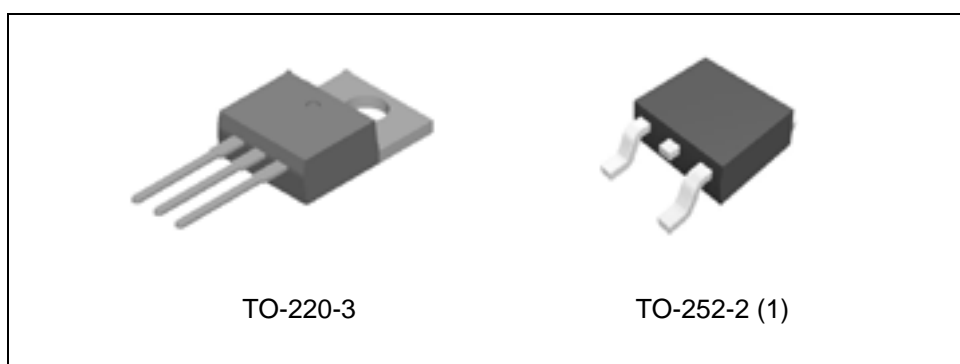


Figure 1. Package Types of AS78XX

1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR

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Pin Configuration

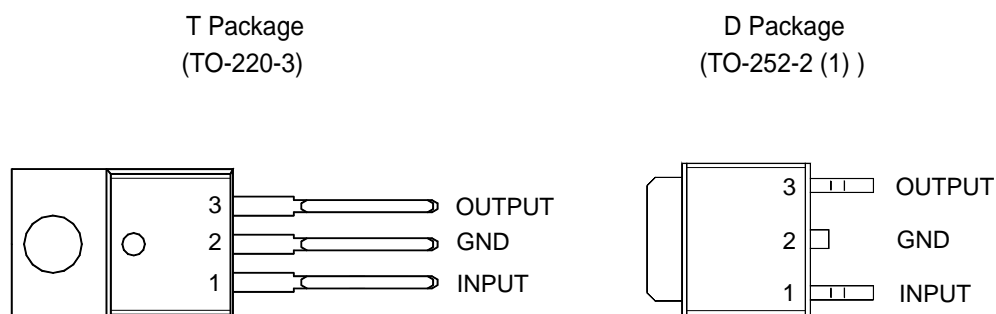


Figure 2. Pin Configuration of AS78XX (Top View)

Pin Description

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

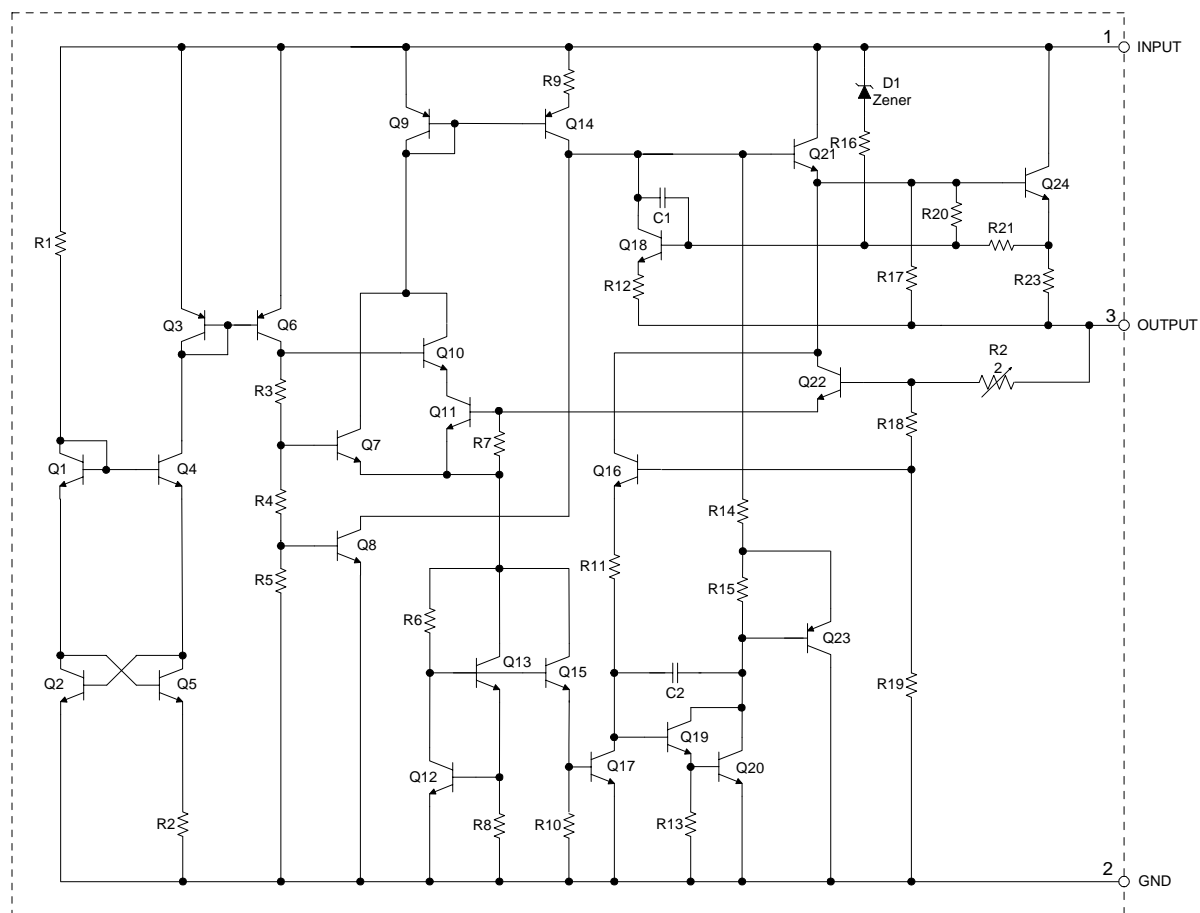
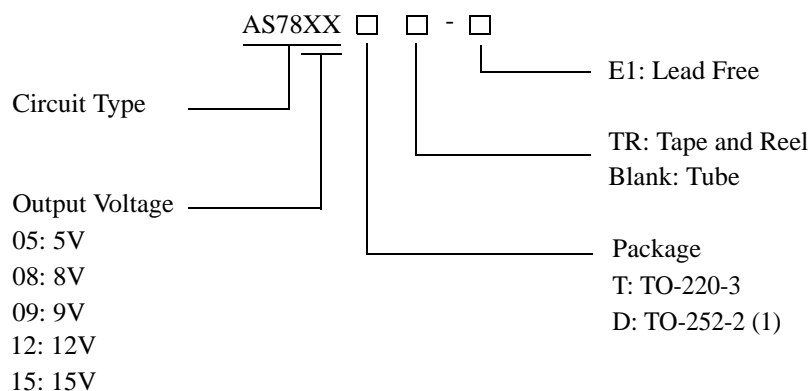
**1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR****AS78XX****Functional Block Diagram**

Figure 3. Functional Block Diagram of AS78XX

1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR

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Ordering Information



| Package | Temperature Range | Part Number | Marking ID | Packing Type |
|--------------|-------------------|--------------|------------|--------------|
| TO-220-3 | -40 to 125°C | AS7805T-E1 | AS7805T-E1 | Tube |
| | | AS7808T-E1 | AS7808T-E1 | Tube |
| | | AS7809T-E1 | AS7809T-E1 | Tube |
| | | AS7812T-E1 | AS7812T-E1 | Tube |
| | | AS7815T-E1 | AS7815T-E1 | Tube |
| TO-252-2 (1) | -40 to 125°C | AS7805D-E1 | AS7805D-E1 | Tube |
| | | AS7805DTR-E1 | AS7805D-E1 | Tape & Reel |
| | | AS7808D-E1 | AS7808D-E1 | Tube |
| | | AS7808DTR-E1 | AS7808D-E1 | Tape & Reel |
| | | AS7809D-E1 | AS7809D-E1 | Tube |
| | | AS7809DTR-E1 | AS7809D-E1 | Tape & Reel |
| | | AS7812D-E1 | AS7812D-E1 | Tube |
| | | AS7812DTR-E1 | AS7812D-E1 | Tape & Reel |
| | | AS7815D-E1 | AS7815D-E1 | Tube |
| | | AS7815DTR-E1 | AS7815D-E1 | Tape & Reel |

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

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Absolute Maximum Ratings (Note 1)

| Parameter | Symbol | Value | | Unit |
|-------------------------------------|---------------|--------------------|-----|------|
| Input Voltage | V_{IN} | 36 | | V |
| Lead Temperature (Soldering, 10sec) | T_{LEAD} | 260 | | °C |
| Power Dissipation | P_D | Internally Limited | | W |
| Operating Junction Temperature | T_J | 150 | | °C |
| 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 | 3000 | | 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.

Recommended Operating Conditions

| Parameter | | Symbol | Min | Max | Unit |
|--------------------------------------|--------|----------|-----|-----|------|
| Input Voltage | AS7805 | V_{IN} | | 25 | V |
| | AS7808 | | | 25 | |
| | AS7809 | | | 25 | |
| | AS7812 | | | 30 | |
| | AS7815 | | | 30 | |
| Operating Junction Temperature Range | | T_J | -40 | 125 | °C |

**1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR****AS78XX****Electrical Characteristics****AS7805** ($V_{IN}=10V$, $I_{OUT}=1A$, $T_J=-40$ to $125^{\circ}C$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|-------------------------------------|---|-----|------|-----|------------------|
| Output Voltage | V_{OUT} | $T_J=25^{\circ}C$ | 4.9 | 5 | 5.1 | V |
| | | $I_{OUT}=5mA$ to $1A$, $V_{IN}=7.5V$ to $20V$, $P_D \leq 15W$ | 4.8 | | 5.2 | |
| Line Regulation | V_{RLINE} | $V_{IN}=7.5V$ to $20V$, $I_{OUT}=1A$, $T_J=25^{\circ}C$ | | 7 | 50 | mV |
| Load Regulation | V_{RLOAD} | $V_{IN}=10V$, $I_{OUT}=5mA$ to $1A$, $T_J=25^{\circ}C$ | | 25 | 100 | mV |
| Quiescent Current | I_Q | $V_{IN}=10V$, $I_{OUT}=0$ | | 3.2 | 6 | mA |
| Quiescent Current Change | ΔI_Q | $V_{IN}=8V$ to $25V$, $I_{OUT}=500mA$, $T_J=25^{\circ}C$ | | 0.3 | 0.8 | mA |
| | | $I_{OUT}=5mA$ to $1A$, $T_J=25^{\circ}C$ | | 0.08 | 0.5 | |
| Ripple Rejection | PSRR | $V_{IN}=8V$ to $18V$, $f=120Hz$, $I_{OUT}=500mA$ | | 73 | | dB |
| Dropout Voltage | V_{DROP} | $\Delta V_{OUT}=1\%$, $I_{OUT}=1A$, $T_J=25^{\circ}C$ | | 2 | | V |
| Output Noise Voltage | N_O | $f=10Hz$ to $100kHz$, $T_A=25^{\circ}C$ | | 10 | | $\mu V/V_O$ |
| Output Resistance | R_O | $f=1kHz$ | | 10 | | $m\Omega$ |
| Short Circuit Current | I_{SC} | $V_{IN}=35V$, $T_A=25^{\circ}C$ | | 0.2 | | A |
| Peak Output Current | I_{PK} | $V_{IN}=10V$, $T_J=25^{\circ}C$ | | 2.2 | | A |
| Output Voltage Temperature Coefficient | $\Delta V_{OUT}/\Delta T$ | | | 0.4 | | $mV/^{\circ}C$ |
| | $(\Delta V_{OUT}/V_{OUT})/\Delta T$ | | | 80 | | ppm/ $^{\circ}C$ |

AS7808 ($V_{IN}=14V$, $I_{OUT}=1A$, $T_J=-40$ to $125^{\circ}C$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|-------------------------------------|--|------|------|------|------------------|
| Output Voltage | V_{OUT} | $T_J=25^{\circ}C$ | 7.84 | 8 | 8.16 | V |
| | | $I_{OUT}=5mA$ to $1A$, $V_{IN}=10.6V$ to $23V$, $P_D \leq 15W$ | 7.7 | | 8.3 | |
| Line Regulation | V_{RLINE} | $V_{IN}=10.6V$ to $23V$, $I_{OUT}=1A$, $T_J=25^{\circ}C$ | | 12 | 80 | mV |
| Load Regulation | V_{RLOAD} | $V_{IN}=14V$, $I_{OUT}=5mA$ to $1A$, $T_J=25^{\circ}C$ | | 25 | 100 | mV |
| Quiescent Current | I_Q | $V_{IN}=14V$, $I_{OUT}=0$ | | 3.2 | 6 | mA |
| Quiescent Current Change | ΔI_Q | $V_{IN}=8V$ to $25V$, $I_{OUT}=500mA$, $T_J=25^{\circ}C$ | | 0.08 | 0.4 | mA |
| | | $I_{OUT}=5mA$ to $1A$, $T_J=25^{\circ}C$ | | 0.1 | 0.5 | |
| Ripple Rejection | PSRR | $V_{IN}=11.5V$ to $21.5V$, $f=120Hz$, $I_{OUT}=500mA$ | | 62 | | dB |
| Dropout Voltage | V_{DROP} | $\Delta V_{OUT}=1\%$, $I_{OUT}=1A$, $T_J=25^{\circ}C$ | | 2 | | V |
| Output Noise Voltage | N_O | $f=10Hz$ to $100kHz$, $T_A=25^{\circ}C$ | | 10 | | $\mu V/V_O$ |
| Output Resistance | R_O | $f=1kHz$ | | 10 | | $m\Omega$ |
| Short Circuit Current | I_{SC} | $V_{IN}=35V$, $T_A=25^{\circ}C$ | | 0.2 | | A |
| Peak Output Current | I_{PK} | $V_{IN}=14V$, $T_J=25^{\circ}C$ | | 2.2 | | A |
| Output Voltage Temperature Coefficient | $\Delta V_{OUT}/\Delta T$ | | | 0.64 | | $mV/^{\circ}C$ |
| | $(\Delta V_{OUT}/V_{OUT})/\Delta T$ | | | 80 | | ppm/ $^{\circ}C$ |

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Electrical Characteristics (Continued)

AS7809 ($V_{IN}=15V$, $I_{OUT}=1A$, $T_J=-40$ to $125^{\circ}C$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|-------------------------------------|--|------|------|------|------------------|
| Output Voltage | V_{OUT} | $T_J=25^{\circ}C$ | 8.82 | 9 | 9.18 | V |
| | | $I_{OUT}=5mA$ to $1A$, $V_{IN}=11.5V$ to $23V$, $P_D \leq 15W$ | 8.65 | | 9.35 | |
| Line Regulation | V_{RLINE} | $V_{IN}=11.5V$ to $23V$, $I_{OUT}=1A$, $T_J=25^{\circ}C$ | | 12 | 90 | mV |
| Load Regulation | V_{RLOAD} | $V_{IN}=15V$, $I_{OUT}=5mA$ to $1A$, $T_J=25^{\circ}C$ | | 25 | 100 | mV |
| Quiescent Current | I_Q | $V_{IN}=15V$, $I_{OUT}=0$ | | 3.2 | 6 | mA |
| Quiescent Current Change | ΔI_Q | $V_{IN}=11.5V$ to $23V$, $I_{OUT}=500mA$, $T_J=25^{\circ}C$ | | 0.08 | 0.4 | mA |
| | | $I_{OUT}=5mA$ to $1A$, $T_J=25^{\circ}C$ | | 0.1 | 0.5 | |
| Ripple Rejection | PSRR | $V_{IN}=11.5V$ to $21.5V$, $f=120Hz$, $I_{OUT}=500mA$ | | 61 | | dB |
| Dropout Voltage | V_{DROP} | $\Delta V_{OUT}=1\%$, $I_{OUT}=1A$, $T_J=25^{\circ}C$ | | 2 | | V |
| Output Noise Voltage | N_O | $f=10Hz$ to $100kHz$, $T_A=25^{\circ}C$ | | 10 | | $\mu V/V_O$ |
| Output Resistance | R_O | $f=1kHz$ | | 10 | | $m\Omega$ |
| Short Circuit Current | I_{SC} | $V_{IN}=35V$, $T_A=25^{\circ}C$ | | 0.2 | | A |
| Peak Output Current | I_{PK} | $V_{IN}=15V$, $T_J=25^{\circ}C$ | | 2.2 | | A |
| Output Voltage Temperature Coefficient | $\Delta V_{OUT}/\Delta T$ | | | 0.72 | | $mV/^{\circ}C$ |
| | $(\Delta V_{OUT}/V_{OUT})/\Delta T$ | | | 80 | | ppm/ $^{\circ}C$ |

AS7812 ($V_{IN}=19V$, $I_{OUT}=1A$, $T_J=-40$ to $125^{\circ}C$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|-------------------------------------|--|-------|------|-------|------------------|
| Output Voltage | V_{OUT} | $T_J=25^{\circ}C$ | 11.75 | 12 | 12.25 | V |
| | | $I_{OUT}=5mA$ to $1A$, $V_{IN}=14.8V$ to $27V$, $P_D \leq 15W$ | 11.5 | | 12.5 | |
| Line Regulation | V_{RLINE} | $V_{IN}=14.8V$ to $27V$, $I_{OUT}=1A$, $T_J=25^{\circ}C$ | | 16 | 120 | mV |
| Load Regulation | V_{RLOAD} | $V_{IN}=19V$, $I_{OUT}=5mA$ to $1A$, $T_J=25^{\circ}C$ | | 25 | 100 | mV |
| Quiescent Current | I_Q | $V_{IN}=19V$, $I_{OUT}=0$ | | 3.4 | 6 | mA |
| Quiescent Current Change | ΔI_Q | $V_{IN}=15V$ to $30V$, $I_{OUT}=500mA$, $T_J=25^{\circ}C$ | | 0.3 | 0.8 | mA |
| | | $I_{OUT}=5mA$ to $1A$, $T_J=25^{\circ}C$ | | 0.08 | 0.5 | |
| Ripple Rejection | PSRR | $V_{IN}=15V$ to $25V$, $f=120Hz$, $I_{OUT}=500mA$ | | 60 | | dB |
| Dropout Voltage | V_{DROP} | $\Delta V_{OUT}=1\%$, $I_{OUT}=1A$, $T_J=25^{\circ}C$ | | 2 | | V |
| Output Noise Voltage | N_O | $f=10Hz$ to $100kHz$, $T_A=25^{\circ}C$ | | 10 | | $\mu V/V_O$ |
| Output Resistance | R_O | $f=1kHz$ | | 11 | | $m\Omega$ |
| Short Circuit Current | I_{SC} | $V_{IN}=35V$, $T_A=25^{\circ}C$ | | 0.2 | | A |
| Peak Output Current | I_{PK} | $V_{IN}=19V$, $T_J=25^{\circ}C$ | | 2.2 | | A |
| Output Voltage Temperature Coefficient | $\Delta V_{OUT}/\Delta T$ | | | 0.96 | | $mV/^{\circ}C$ |
| | $(\Delta V_{OUT}/V_{OUT})/\Delta T$ | | | 80 | | ppm/ $^{\circ}C$ |

1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR

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Electrical Characteristics (Continued)

AS7815 ($V_{IN}=23V$, $I_{OUT}=1A$, $T_J=-40$ to $125^{\circ}C$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|-------------------------------------|--|------|------|------|------------------|
| Output Voltage | V_{OUT} | $T_J=25^{\circ}C$ | 14.7 | 15 | 15.3 | V |
| | | $I_{OUT}=5mA$ to $1A$, $V_{IN}=17.9$ to $30V$, $P_D \leq 15W$ | 14.4 | | 15.6 | |
| Line Regulation | V_{RLINE} | $V_{IN}=17.9V$ to $30V$, $I_{OUT}=1A$, $T_J=25^{\circ}C$ | | 18 | 150 | mV |
| Load Regulation | V_{RLOAD} | $V_{IN}=23V$, $I_{OUT}=5mA$ to $1A$, $T_J=25^{\circ}C$ | | 25 | 100 | mV |
| Quiescent Current | I_Q | $V_{IN}=23V$, $I_{OUT}=0$ | | 3.4 | 6 | mA |
| Quiescent Current Change | ΔI_Q | $V_{IN}=17.5V$ to $30V$, $I_{OUT}=500mA$, $T_J=25^{\circ}C$ | | 0.3 | 0.8 | mA |
| | | $I_{OUT}=5mA$ to $1A$, $T_J=25^{\circ}C$ | | 0.08 | 0.5 | |
| Ripple Rejection | PSRR | $V_{IN}=18.5V$ to $28.5V$, $f=120Hz$, $I_{OUT}=500mA$ | | 58 | | dB |
| Dropout Voltage | V_{DROP} | $\Delta V_{OUT}=1\%$, $I_{OUT}=1A$, $T_J=25^{\circ}C$ | | 2 | | V |
| Output Noise Voltage | N_O | $f=10Hz$ to $100kHz$, $T_A=25^{\circ}C$ | | 10 | | $\mu V/V_O$ |
| Output Resistance | R_O | $f=1kHz$ | | 12 | | $m\Omega$ |
| Short Circuit Current | I_{SC} | $V_{IN}=35V$, $T_A=25^{\circ}C$ | | 0.2 | | A |
| Peak Output Current | I_{PK} | $V_{IN}=23V$, $T_J=25^{\circ}C$ | | 2.2 | | A |
| Output Voltage Temperature Coefficient | $\Delta V_{OUT}/\Delta T$ | | | 1.2 | | $mV/^{\circ}C$ |
| | $(\Delta V_{OUT}/V_{OUT})/\Delta T$ | | | 80 | | ppm/ $^{\circ}C$ |

1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR

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Typical Performance Characteristics

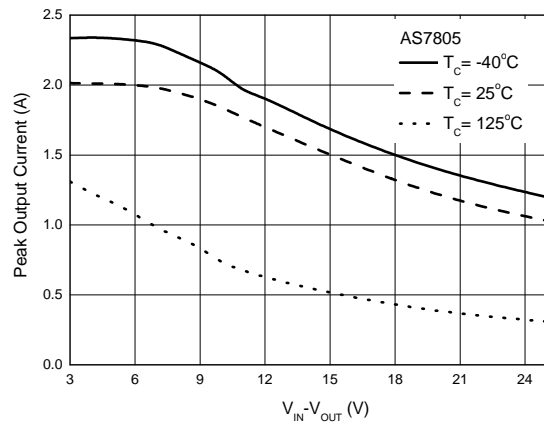


Figure 4. Peak Output Current vs. Input/Output Differential Voltage

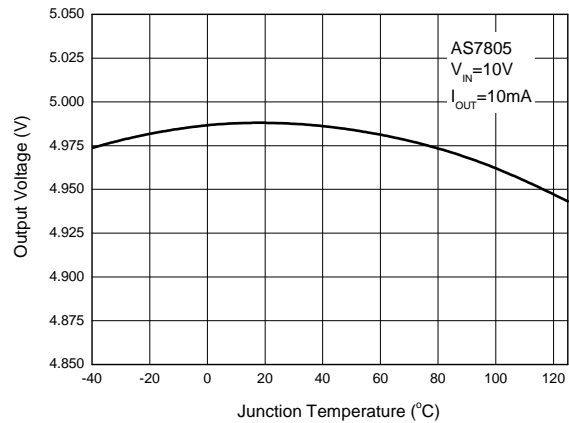


Figure 5. Output Voltage vs. Junction Temperature

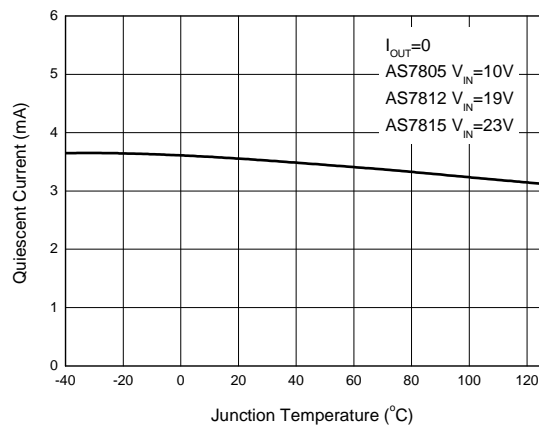


Figure 6. Quiescent Current vs. Junction Temperature

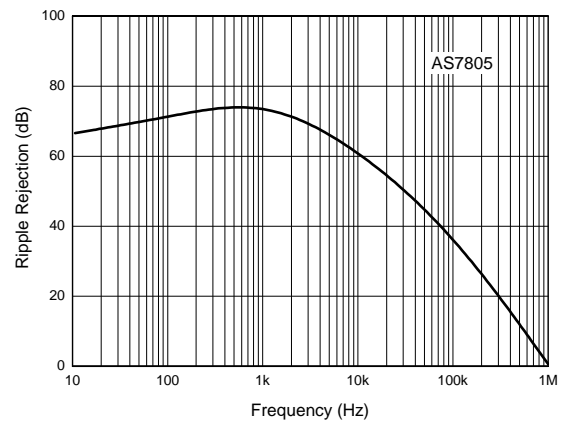


Figure 7. Ripple Rejection vs. Frequency

1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR

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Typical Performance Characteristics (Continued)

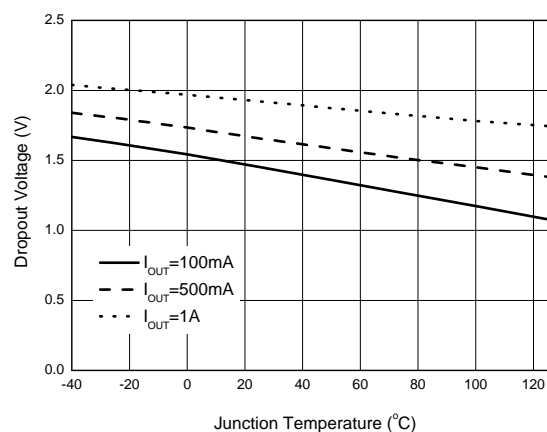


Figure 8. Dropout Voltage vs. Junction Temperature

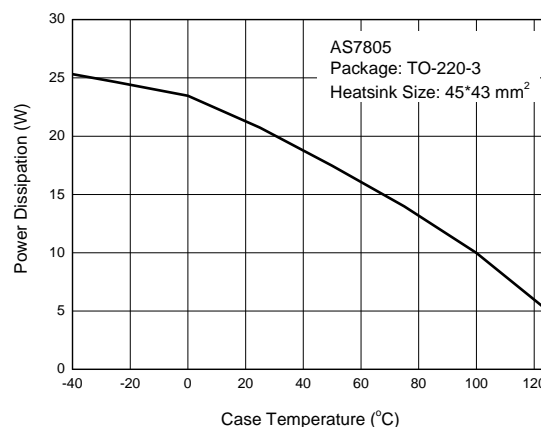


Figure 9. Power Dissipation vs. Case Temperature

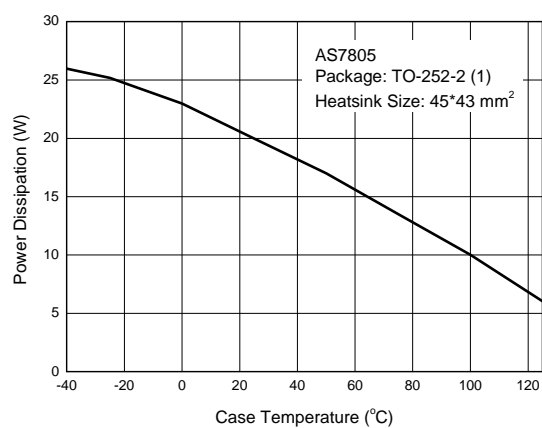


Figure 10. Power Dissipation vs. Case Temperature

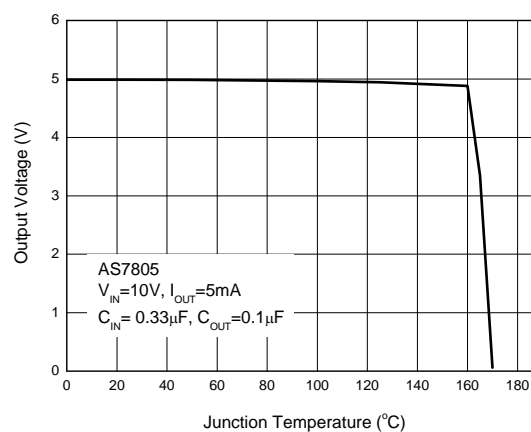


Figure 11. Thermal Shutdown Protection

1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR

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Typical Performance Characteristics (Continued)

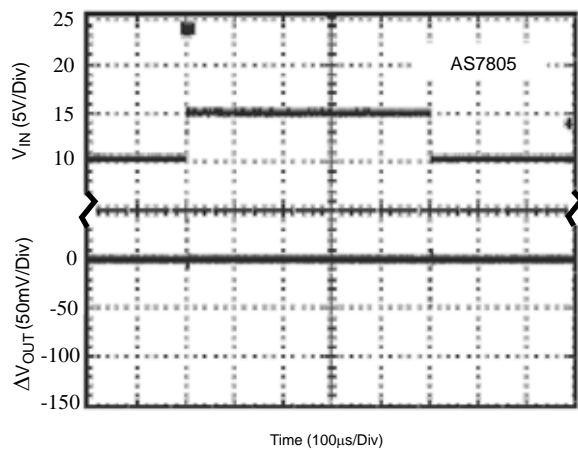


Figure 12. Line Transient
(Conditions: $I_{OUT}=500\text{mA}$, $C_{OUT}=0.1\mu\text{F}$)

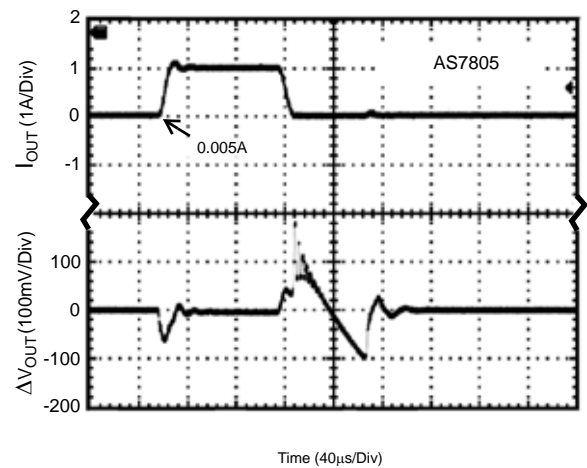


Figure 13. Load Transient
(Conditions: $V_{IN}=10\text{V}$, $C_{IN}=0.33\mu\text{F}$, $C_{OUT}=0.1\mu\text{F}$)

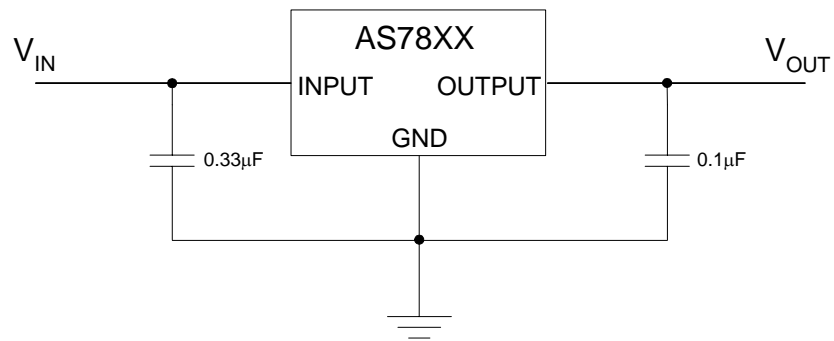
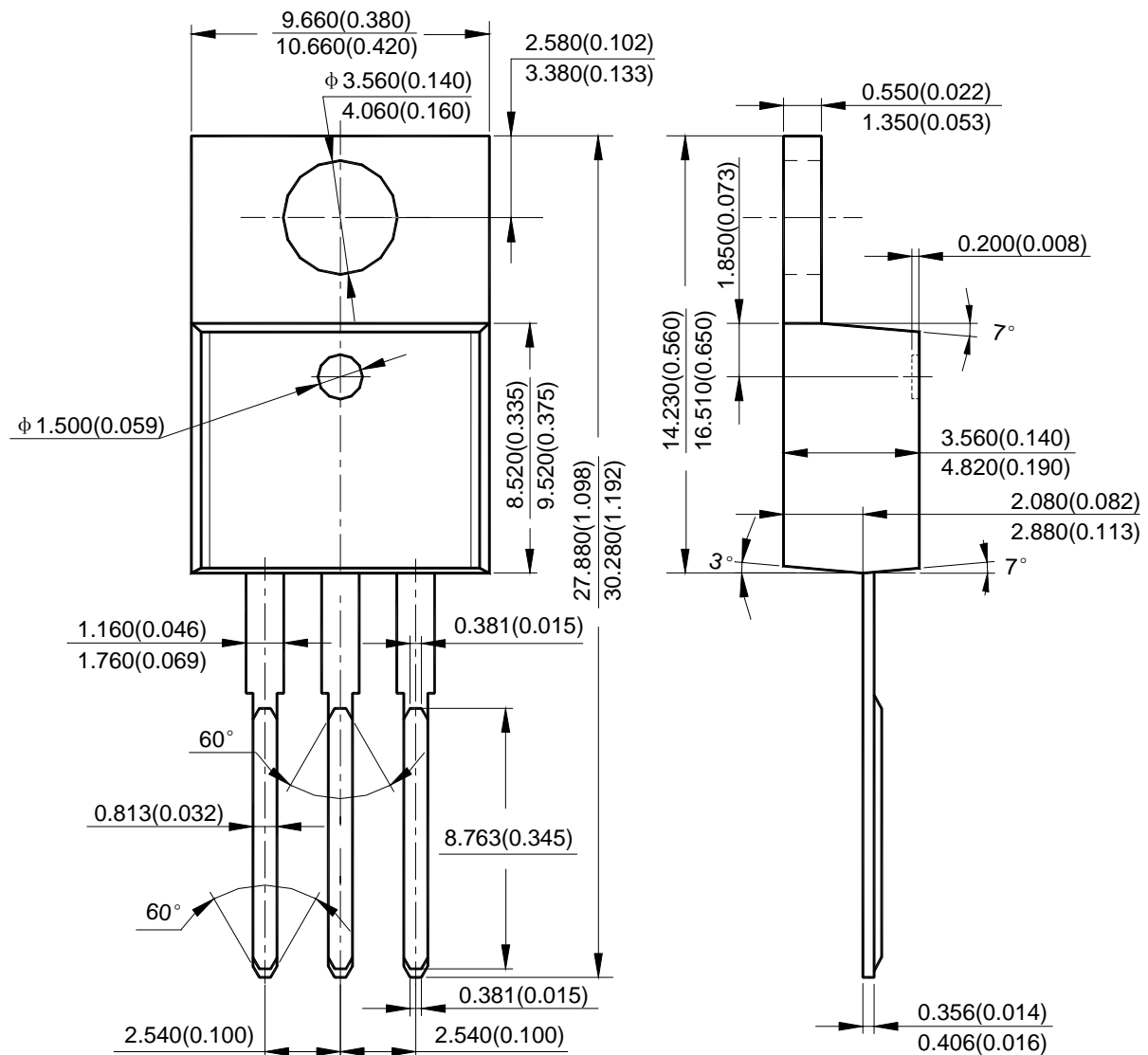
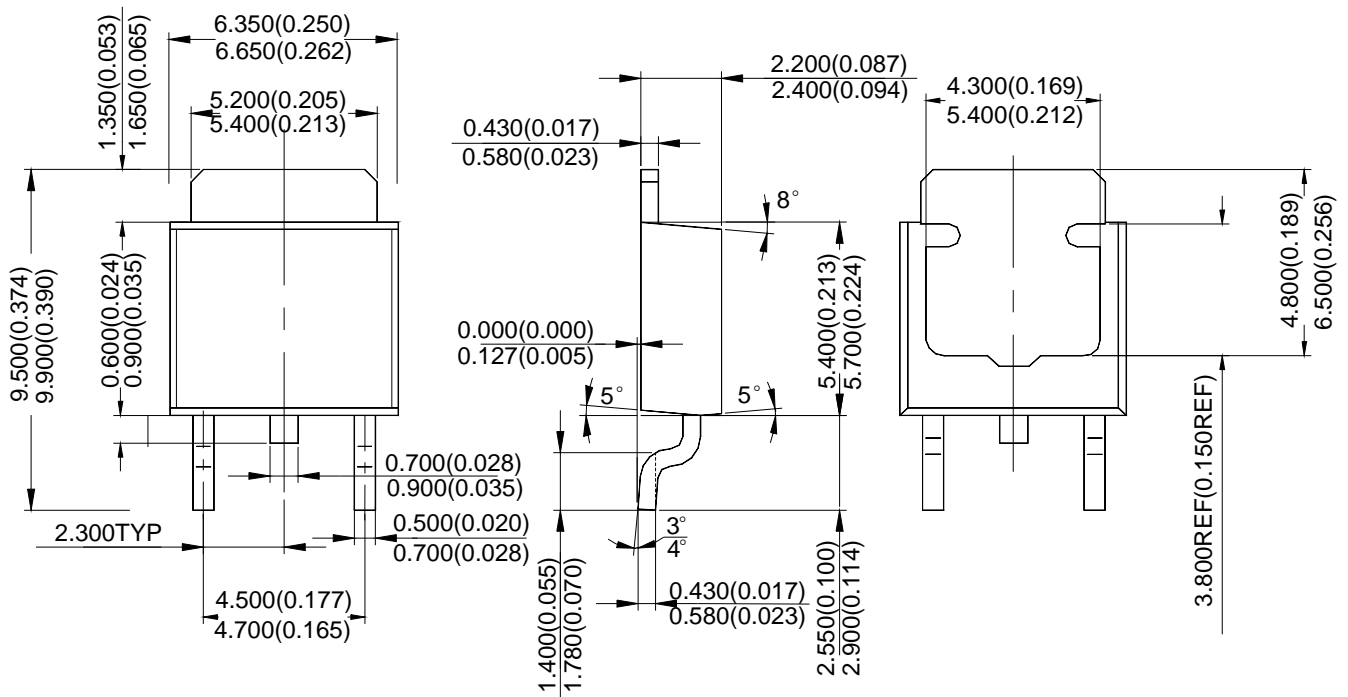
**1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR****AS78XX****Typical Application**

Figure 14. Typical Application of AS78XX

**1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR****AS78XX****Mechanical Dimensions****TO-220-3****Unit: mm(inch)**

**1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR****AS78XX****Mechanical Dimensions (Continued)****TO-252-2 (1)****Unit: mm(inch)**



BCD Semiconductor Manufacturing Limited

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