

**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

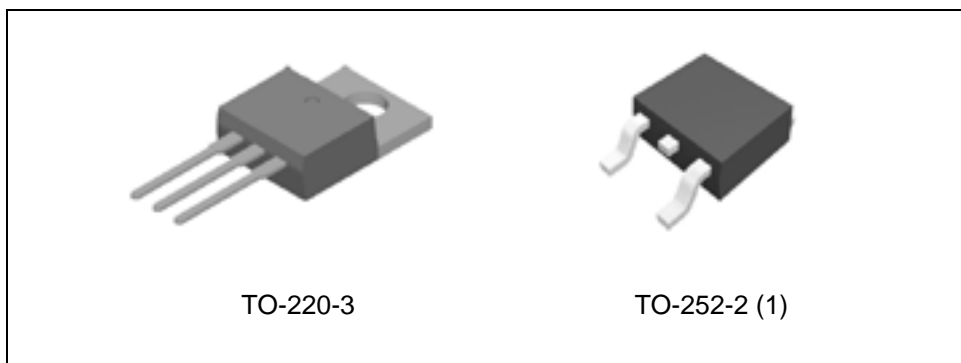


Figure 1. Package Types of AS78XX



**1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR**

**AS78XX**

**Pin Configuration**

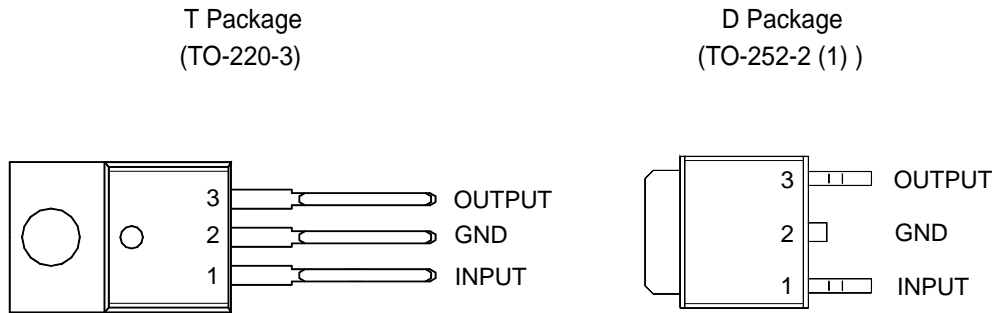


Figure 2. Pin Configuration of AS78XX (Top View)

**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**

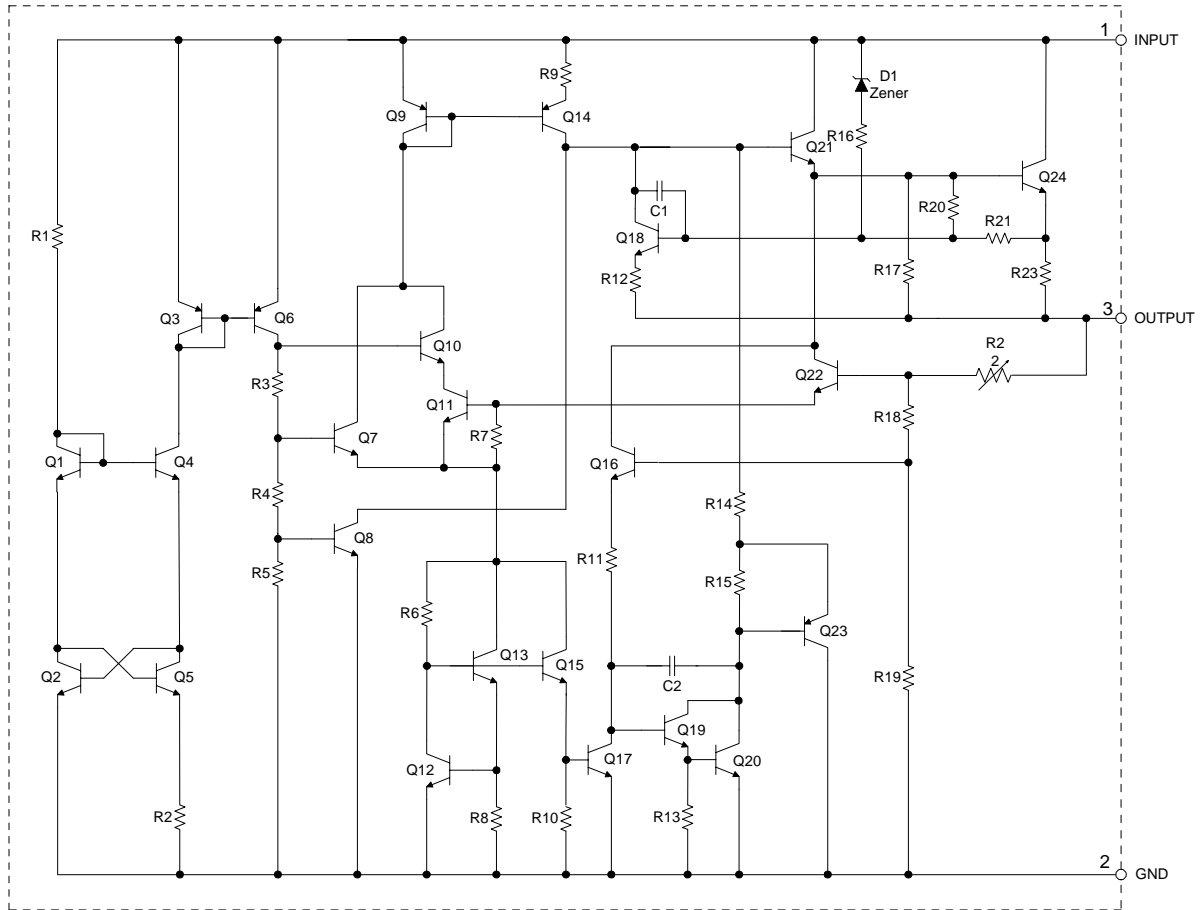
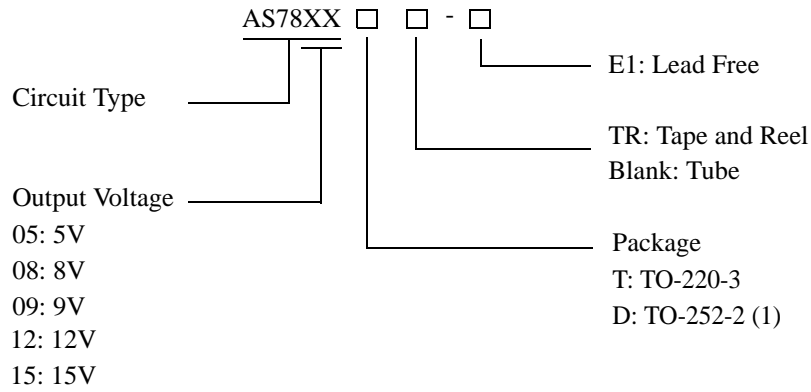


Figure 3. Functional Block Diagram of AS78XX



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

**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.

**1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR****AS78XX****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	$\theta_{JA}$	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	$\Delta I_Q$	$V_{IN}=8V$ 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	$\Delta I_Q$	$V_{IN}=8V$ 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/ $^{\circ}C$



**1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR**

**AS78XX**

**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	$\Delta I_Q$	$V_{IN}=11.5V$ 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	$\Delta I_Q$	$V_{IN}=15V$ 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**

**AS78XX**

**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	$\Delta I_Q$	$V_{IN}=17.5V$ 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**

**AS78XX**

**Typical Performance Characteristics**

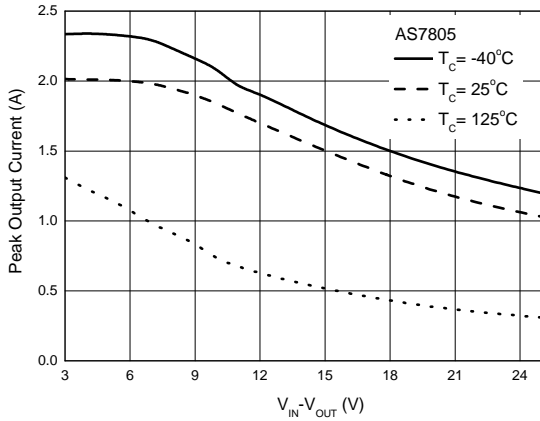


Figure 4. Peak Output Current vs. Input/Output Differential Voltage

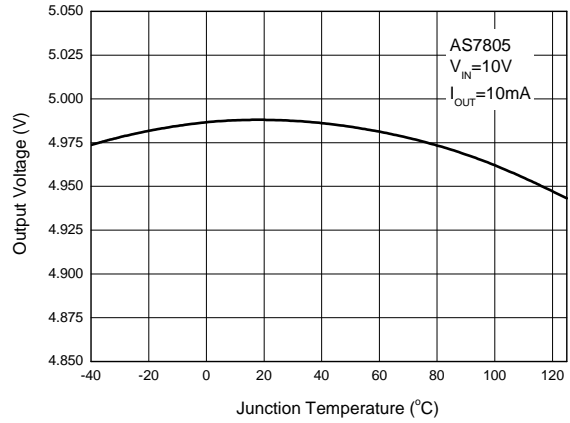


Figure 5. Output Voltage vs. Junction Temperature

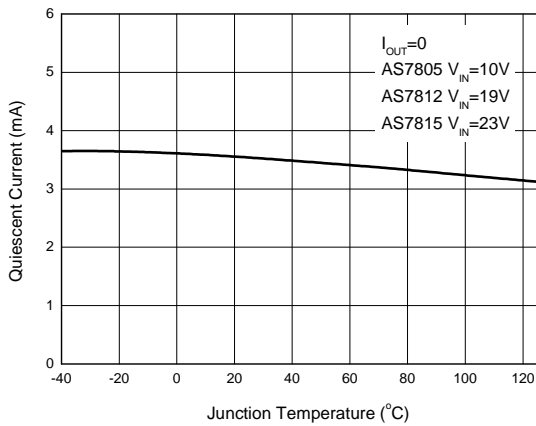


Figure 6. Quiescent Current vs. Junction Temperature

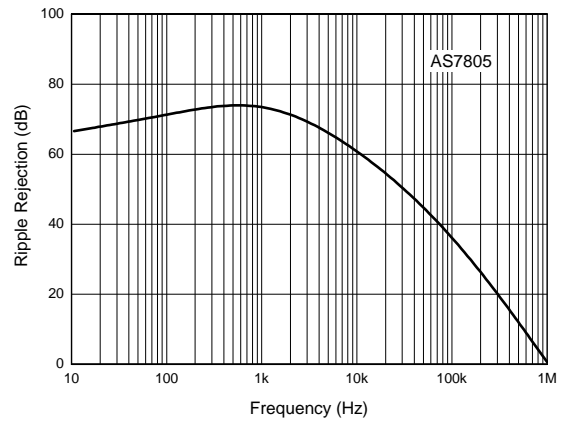


Figure 7. Ripple Rejection vs. Frequency



1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR

AS78XX

Typical Performance Characteristics (Continued)

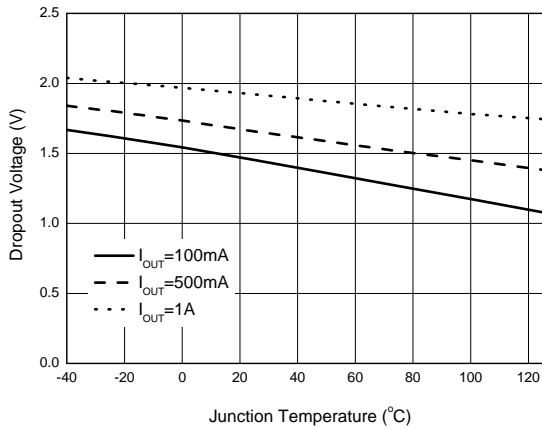


Figure 8. Dropout Voltage vs. Junction Temperature

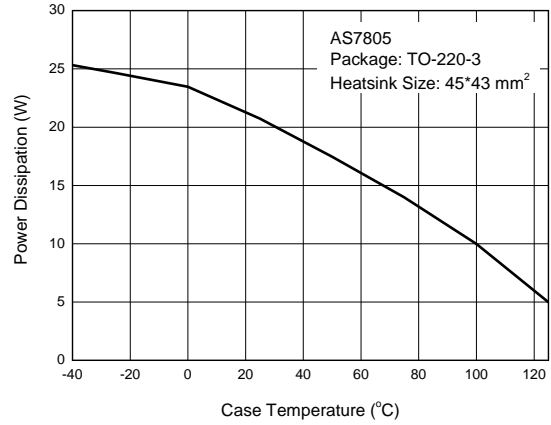


Figure 9. Power Dissipation vs. Case Temperature

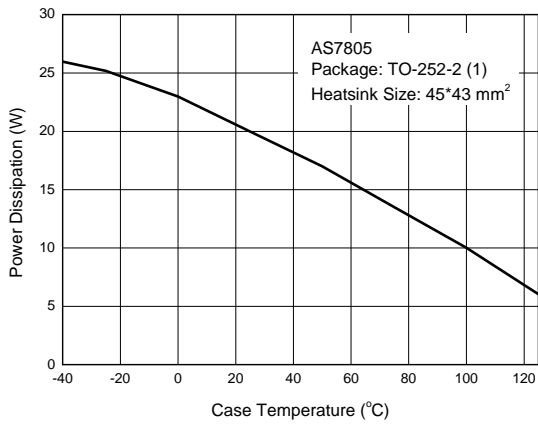


Figure 10. Power Dissipation vs. Case Temperature

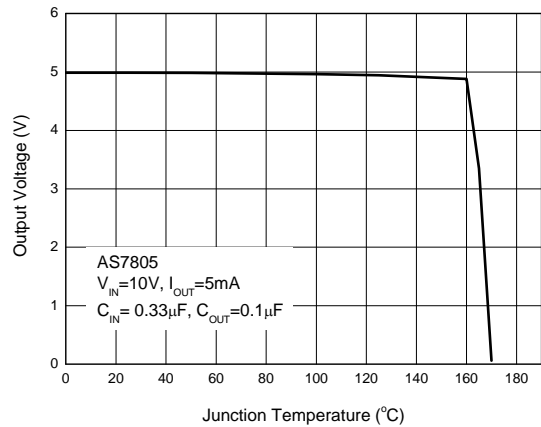


Figure 11. Thermal Shutdown Protection



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

**Typical Performance Characteristics (Continued)**

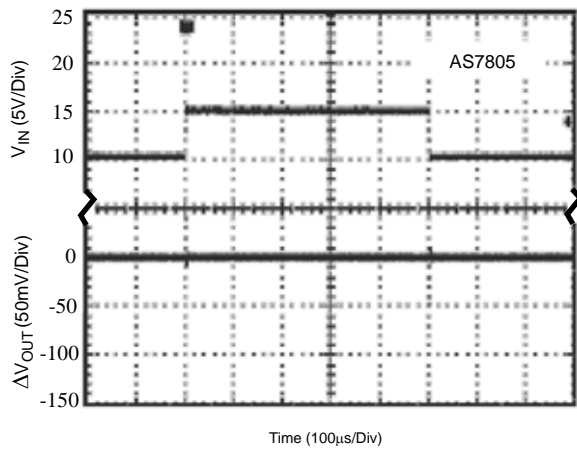


Figure 12. Line Transient  
(Conditions:  $I_{OUT}=500\text{mA}$ ,  $C_{OUT}=0.1\mu\text{F}$ )

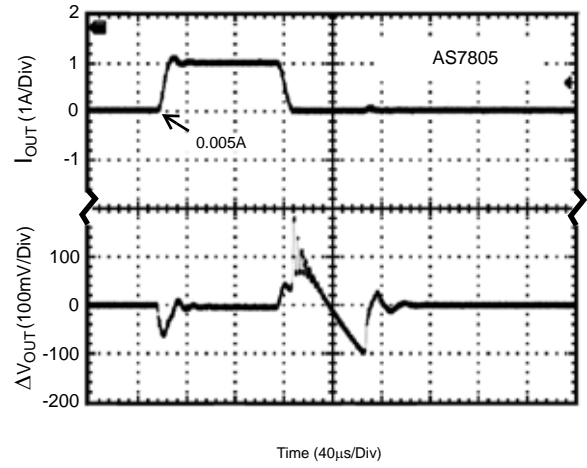


Figure 13. Load Transient  
(Conditions:  $V_{IN}=10\text{V}$ ,  $C_{IN}=0.33\mu\text{F}$ ,  $C_{OUT}=0.1\mu\text{F}$ )



**1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR**

**AS78XX**

**Typical Application**

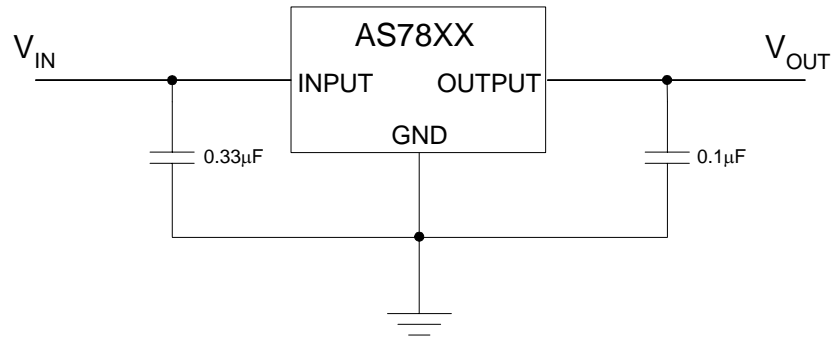


Figure 14. Typical Application of AS78XX



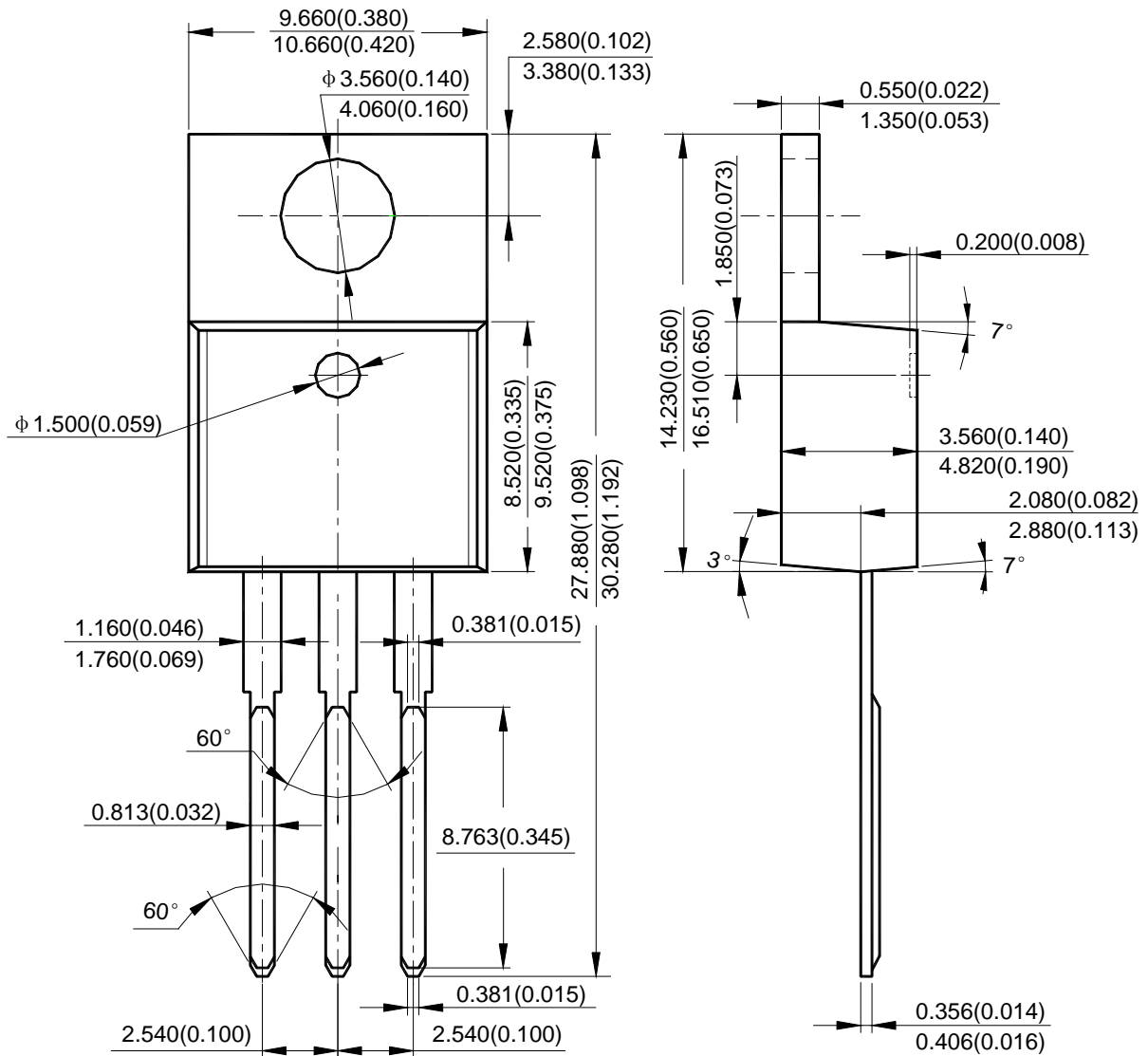
**1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR**

**AS78XX**

**Mechanical Dimensions**

**TO-220-3**

**Unit: mm(inch)**





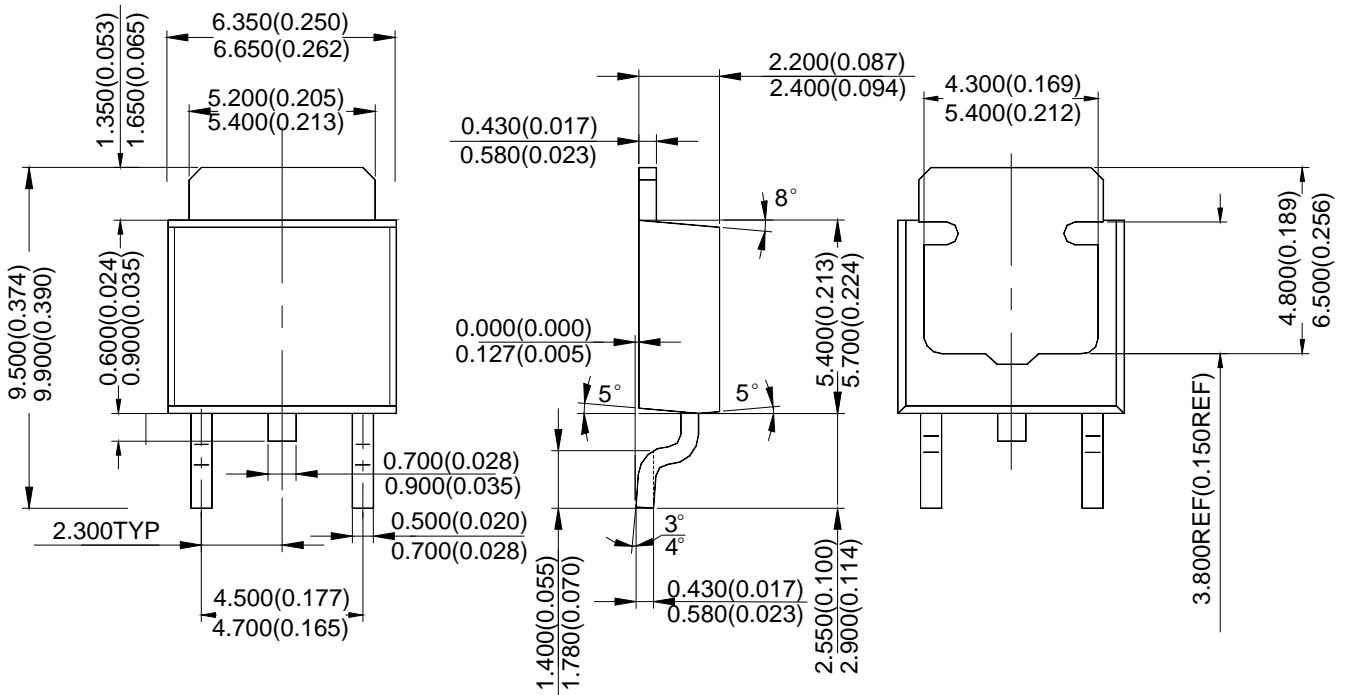
**1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR**

**AS78XX**

**Mechanical Dimensions (Continued)**

**TO-252-2 (1)**

**Unit: mm(inch)**





BCD Semiconductor Manufacturing Limited

<http://www.bcdsemi.com>

#### IMPORTANT NOTICE

BCD Semiconductor Manufacturing Limited reserves the right to make changes without further notice to any products or specifications herein. BCD Semiconductor Manufacturing Limited does not assume any responsibility for use of any its products for any particular purpose, nor does BCD Semiconductor Manufacturing Limited assume any liability arising out of the application or use of any its products or circuits. BCD Semiconductor Manufacturing Limited does not convey any license under its patent rights or other rights nor the rights of others.

---

#### MAIN SITE

**BCD Semiconductor Manufacturing Limited**  
- Wafer Fab  
Shanghai SIM-BCD Semiconductor Manufacturing Limited  
800, Yi Shan Road, Shanghai 200233, China  
Tel: +86-21-6485 1491, Fax: +86-21-5450 0008

**BCD Semiconductor Manufacturing Limited**  
- IC Design Group  
Advanced Analog Circuits (Shanghai) Corporation  
8F, Zone B, 900, Yi Shan Road, Shanghai 200233, China  
Tel: +86-21-6495 9539, Fax: +86-21-6485 9673

#### REGIONAL SALES OFFICE

**Shenzhen Office**  
Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd. Shenzhen Office  
Advanced Analog Circuits (Shanghai) Corporation Shenzhen Office  
Room E, 5F, Noble Center, No.1006, 3rd Fuzhong Road, Futian District, Shenzhen 518026, China  
Tel: +86-755-8826 7951  
Fax: +86-755-8826 7865

**Taiwan Office**  
BCD Semiconductor (Taiwan) Company Limited  
4F, 298-1, Rui Guang Road, Nei-Hu District, Taipei,  
Taiwan  
Tel: +886-2-2656 2808  
Fax: +886-2-2656 2806

**USA Office**  
BCD Semiconductor Corporation  
30920 Huntwood Ave. Hayward,  
CA 94544, U.S.A  
Tel : +1-510-324-2988  
Fax: +1-510-324-2788