



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

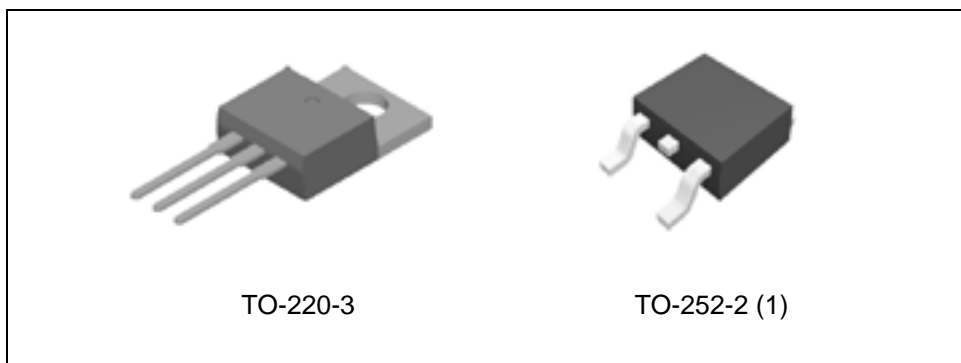


Figure 1. Package Types of AS78XX



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Pin Configuration

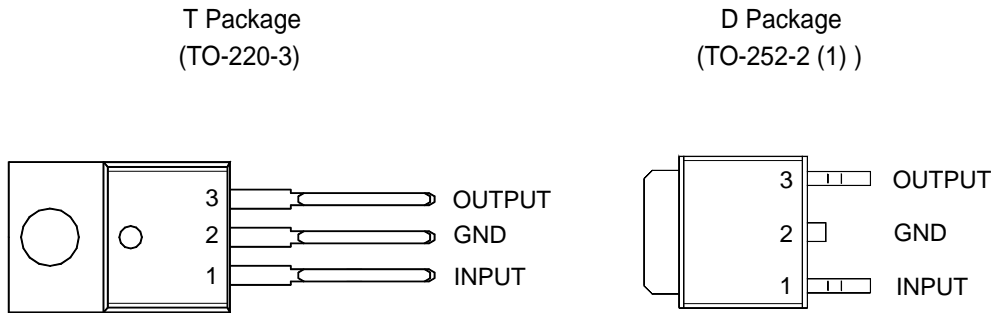


Figure 2. Pin Configuration of AS78XX (Top View)

Pin Description

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



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Functional Block Diagram

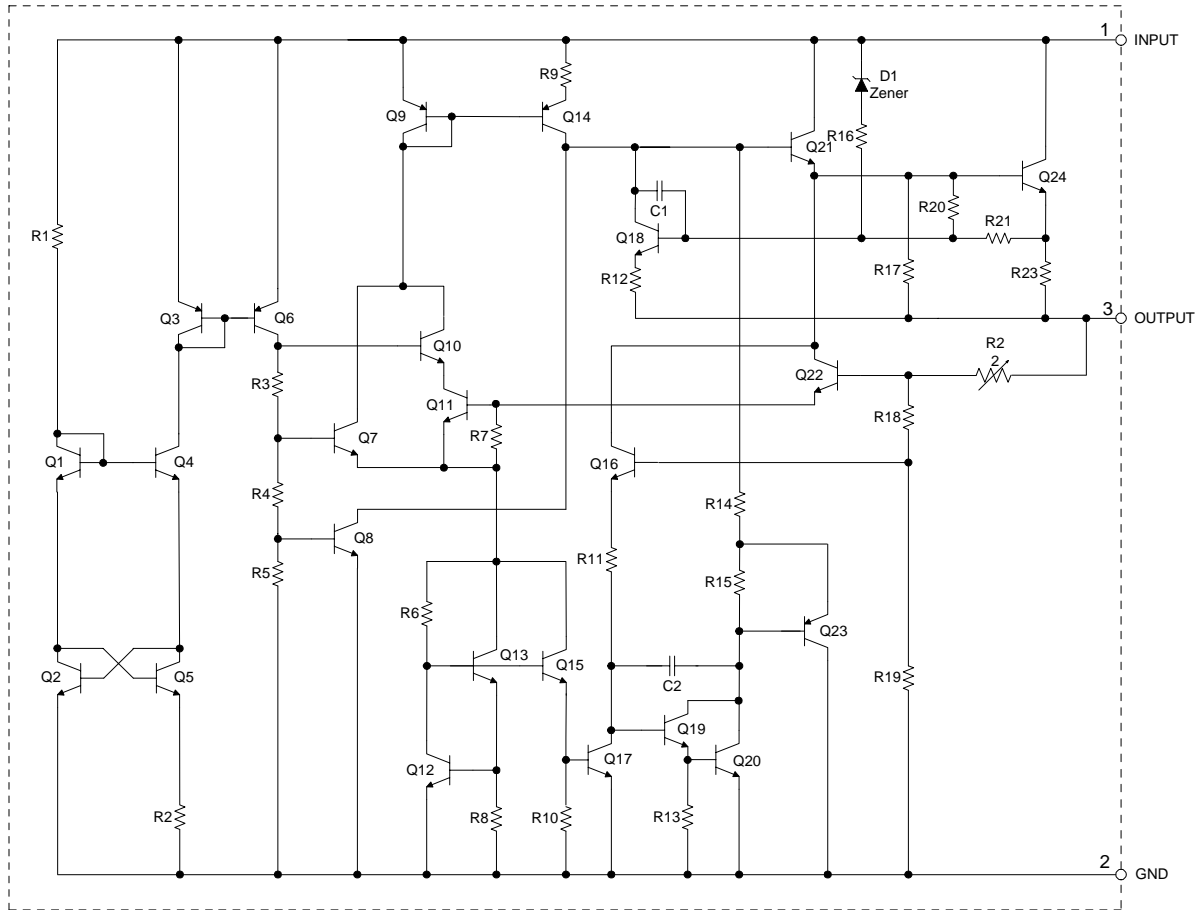
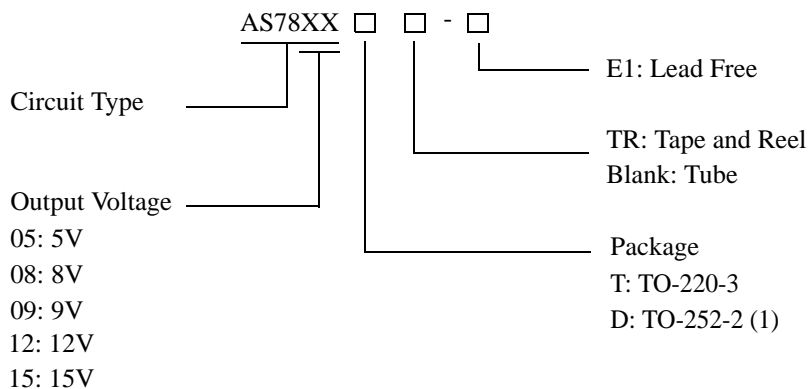


Figure 3. Functional Block Diagram of AS78XX



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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.

**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	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



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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/ $^{\circ}C$



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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/ $^{\circ}C$



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Typical Performance Characteristics

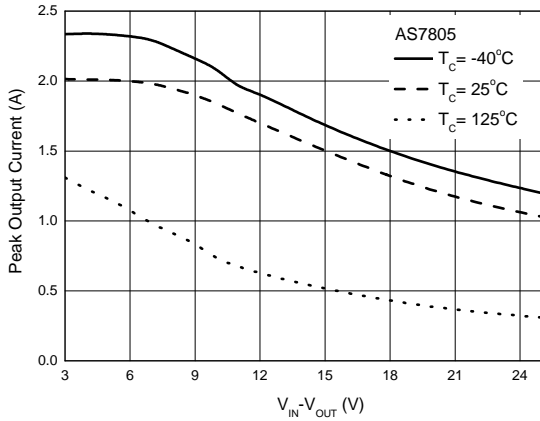


Figure 4. Peak Output Current vs. Input/Output Differential Voltage

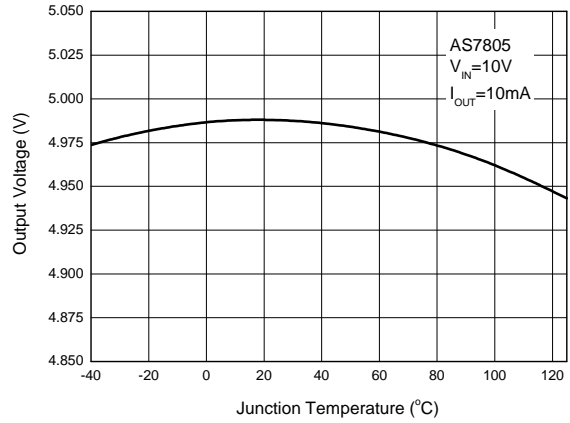


Figure 5. Output Voltage vs. Junction Temperature

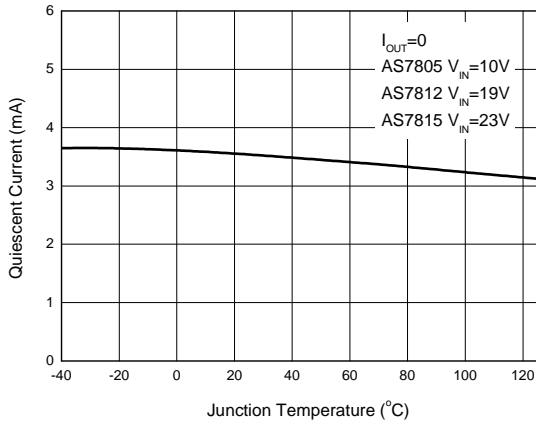


Figure 6. Quiescent Current vs. Junction Temperature

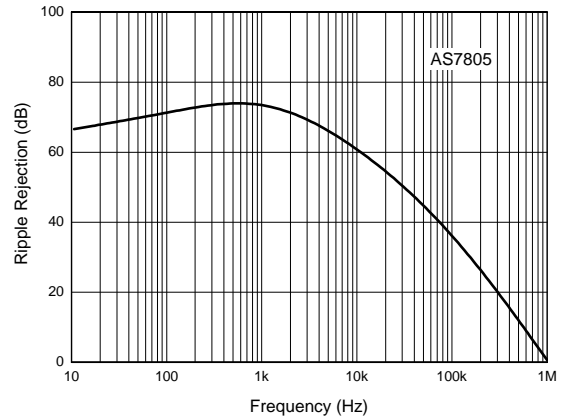


Figure 7. Ripple Rejection vs. Frequency



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Typical Performance Characteristics (Continued)

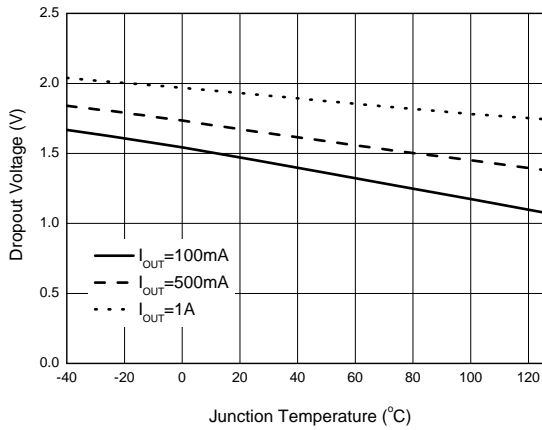


Figure 8. Dropout Voltage vs. Junction Temperature

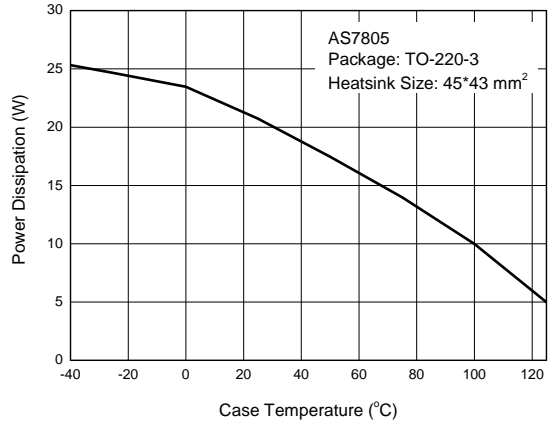


Figure 9. Power Dissipation vs. Case Temperature

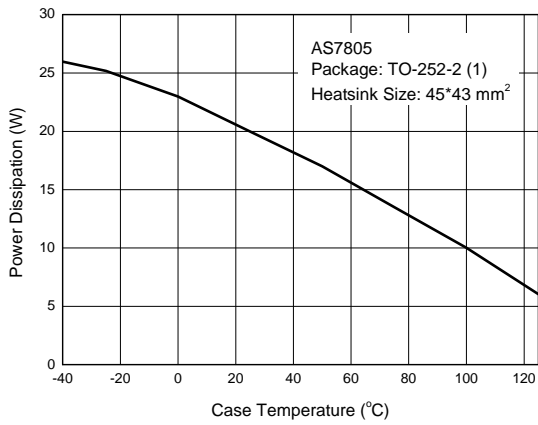


Figure 10. Power Dissipation vs. Case Temperature

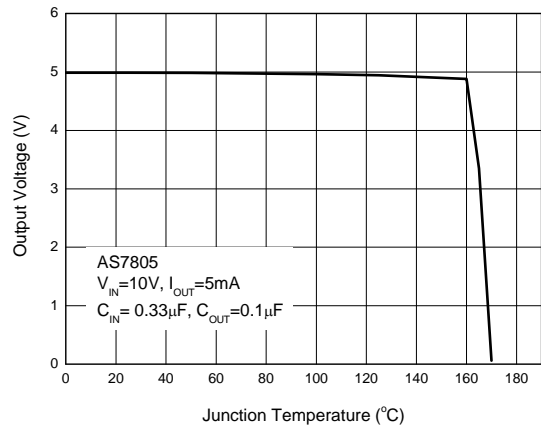


Figure 11. Thermal Shutdown Protection



1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR

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Typical Performance Characteristics (Continued)

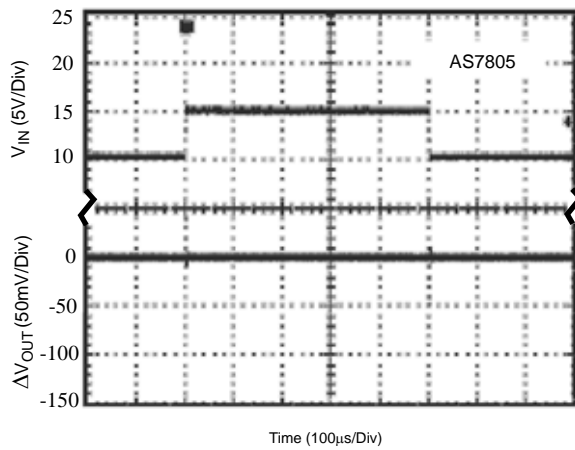


Figure 12. Line Transient
(Conditions: $I_{OUT}=500\text{mA}$, $C_{OUT}=0.1\mu\text{F}$)

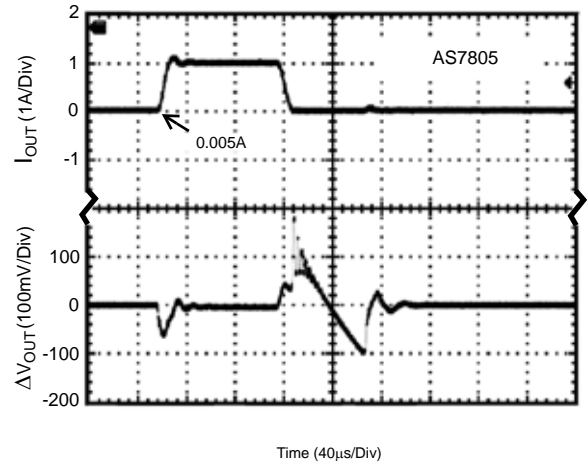


Figure 13. Load Transient
(Conditions: $V_{IN}=10\text{V}$, $C_{IN}=0.33\mu\text{F}$, $C_{OUT}=0.1\mu\text{F}$)



1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR

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Typical Application

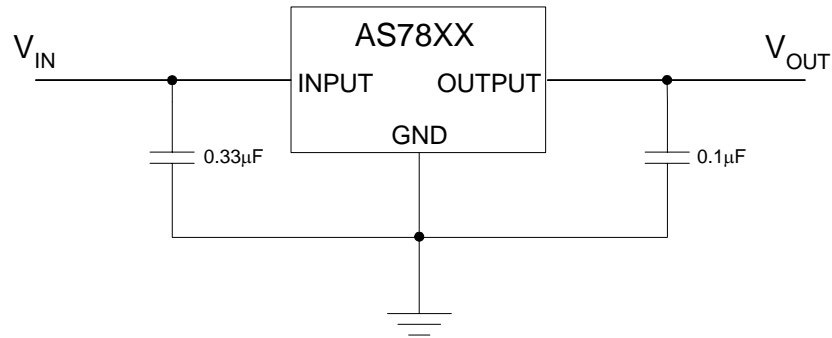


Figure 14. Typical Application of AS78XX



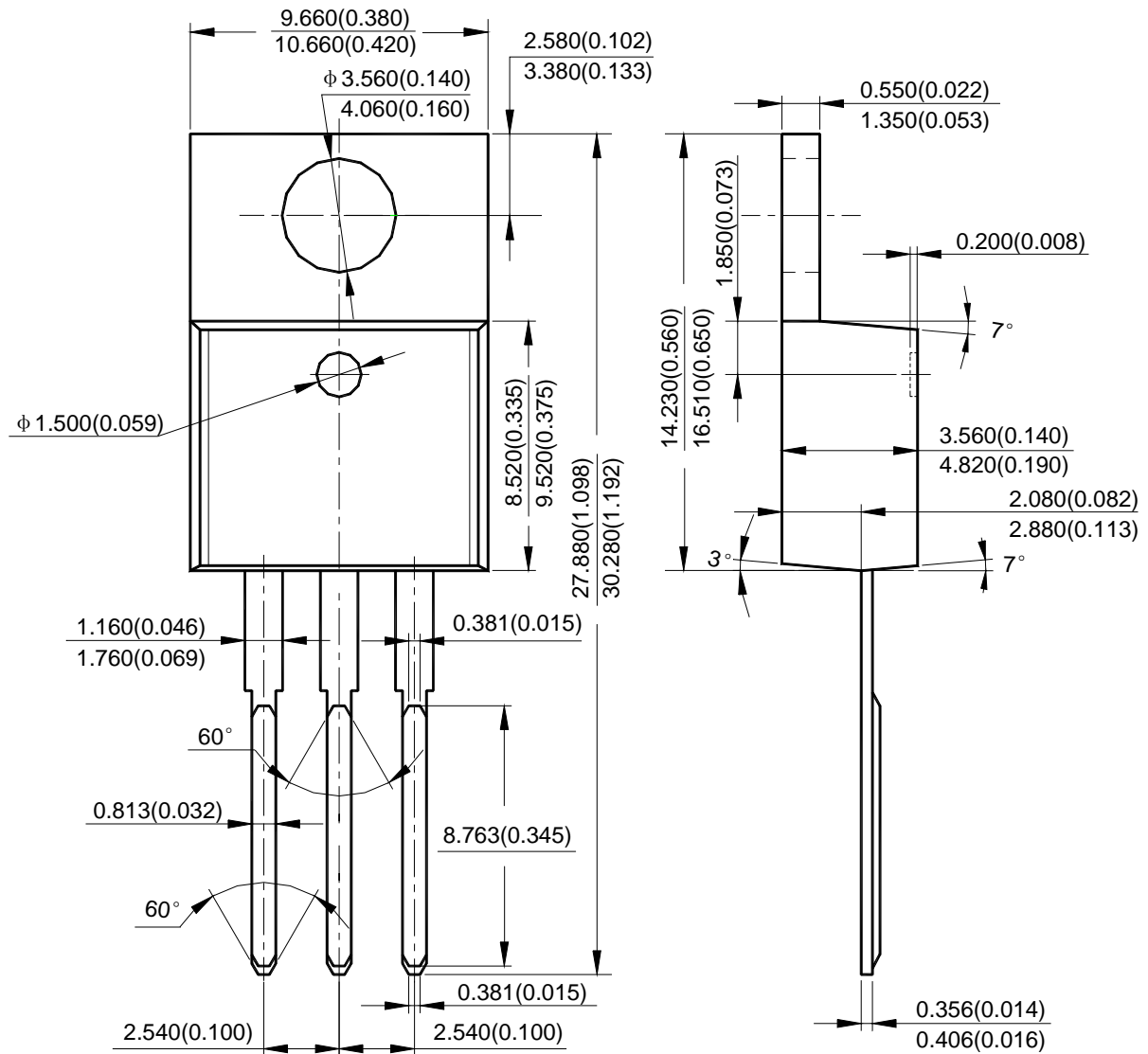
1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR

AS78XX

Mechanical Dimensions

TO-220-3

Unit: mm(inch)





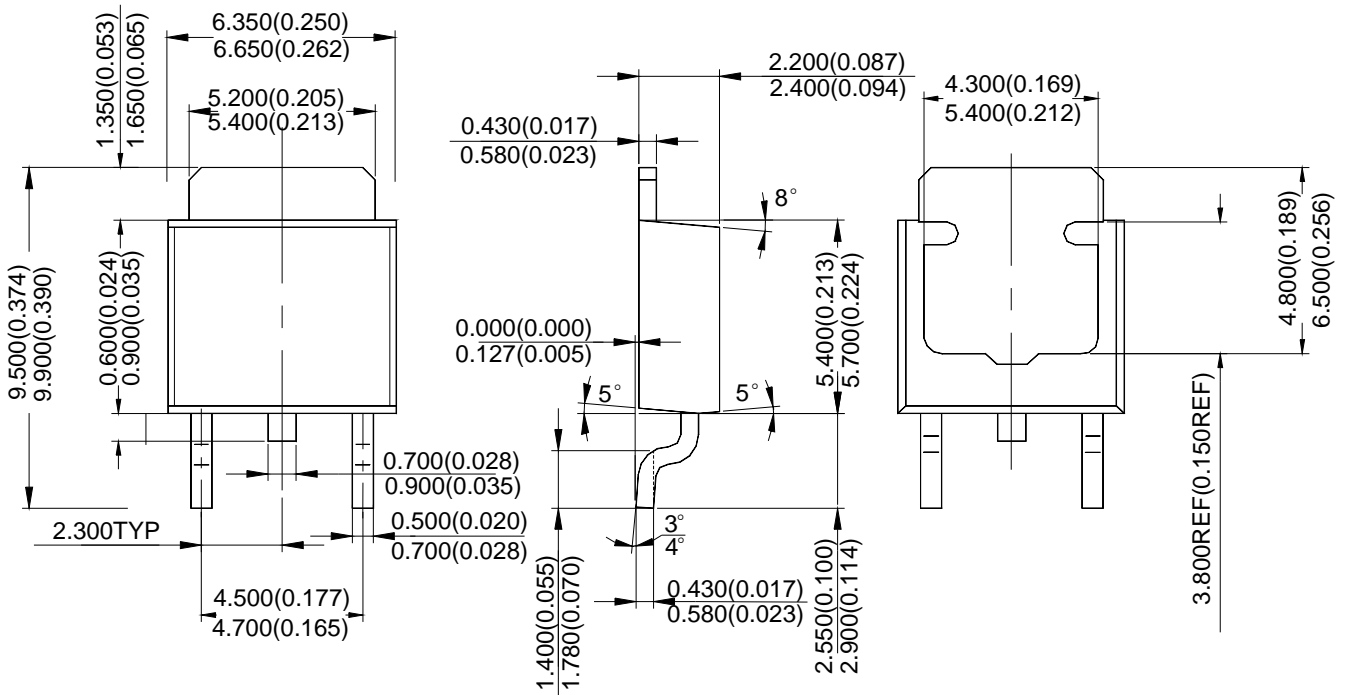
1A 3-TERMINAL POSITIVE VOLTAGE REGULATOR

AS78XX

Mechanical Dimensions (Continued)

TO-252-2 (1)

Unit: mm(inch)



OBSOLETE - PART DISCONTINUED



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