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 ±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

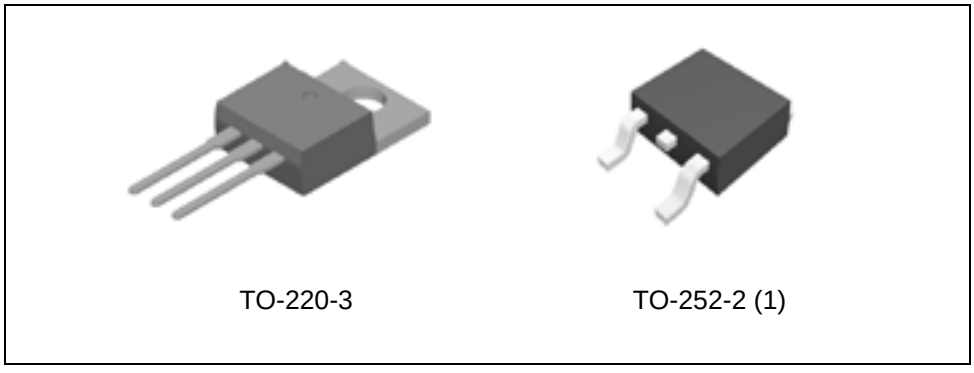

Figure 1. Package Types of AS78XX

Pin Configuration

T Package
(TO-220-3)

D Package
(TO-252-2 (1))

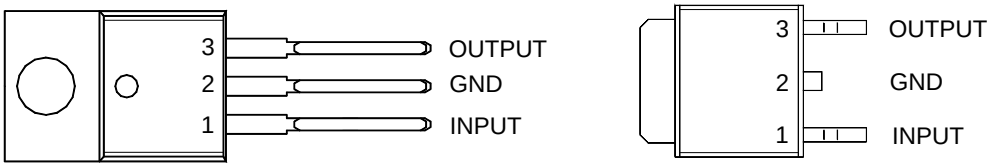

Figure 2. Pin Configuration of AS78XX (Top View)

Pin Description

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

Functional Block Diagram

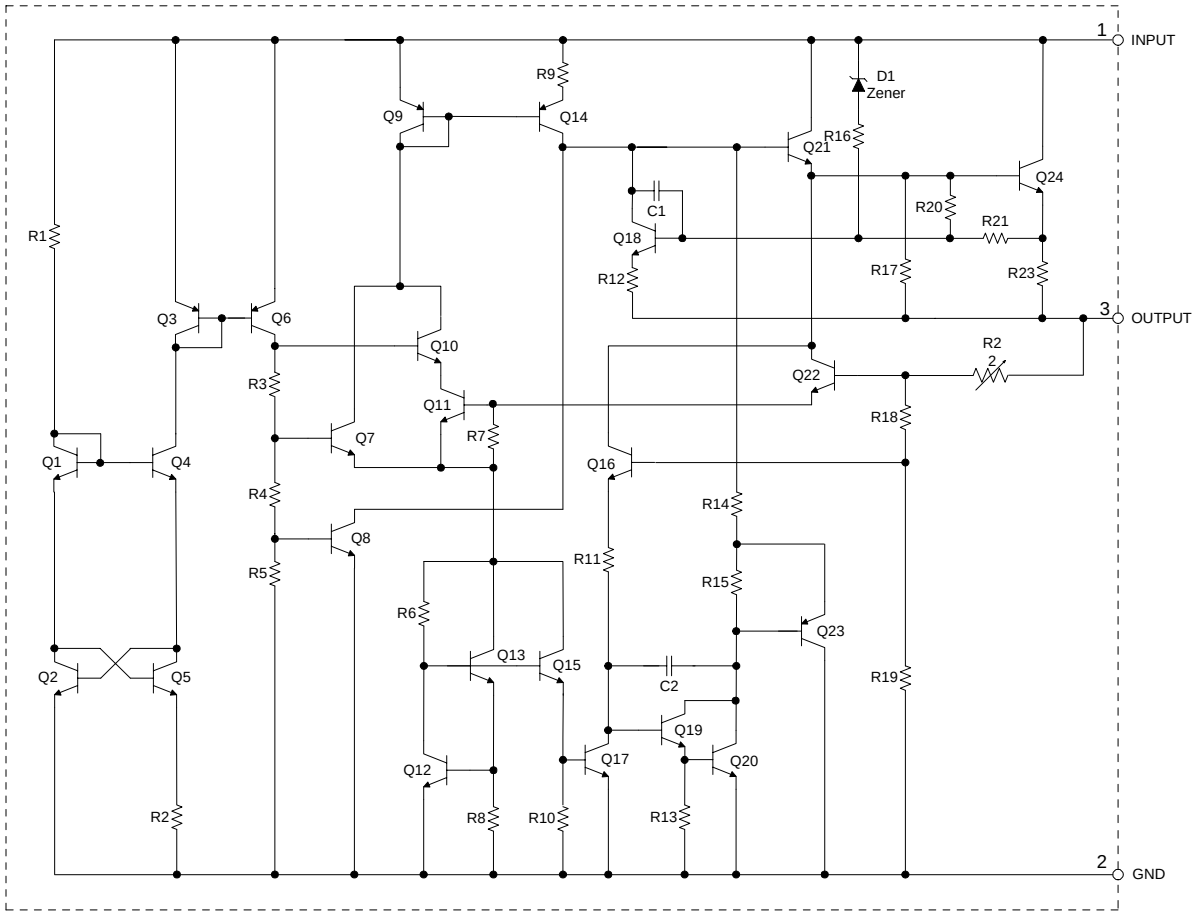

Figure 3. Functional Block Diagram of AS78XX

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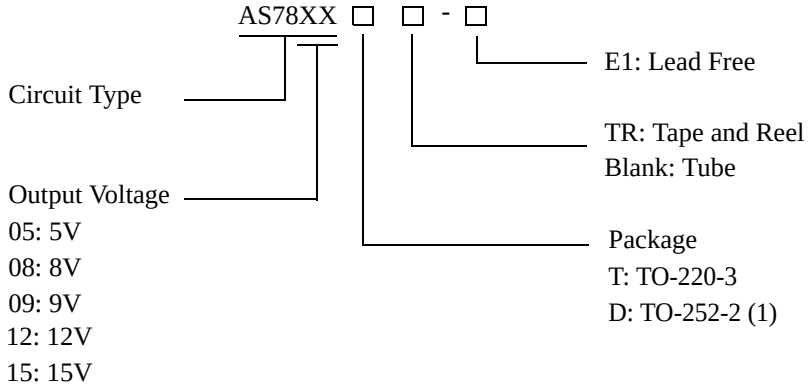
Ordering Information



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.

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

Electrical Characteristics

AS7805 (V_{IN}=10V, I_{OUT}=1A, T_J=-40 to 125°C, unless otherwise specified.)

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

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}	T_J=25°C	7.84	8	8.16	V
		I_{OUT}=5mA to 1A, V_{IN}=10.6V to 23V, P_D≤15W	7.7		8.3	
Line Regulation	V_{RLINE}	V_{IN}=10.6V to 23V, I_{OUT}=1A, T_J=25°C		12	80	mV
Load Regulation	V_{RLOAD}	V_{IN}=14V, I_{OUT}=5mA to 1A, T_J=25°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°C		0.08	0.4	mA
		I_{OUT}=5mA to 1A, T_J=25°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}	ΔV_{OUT}=1%, I_{OUT}=1A, T_J=25°C		2		V
Output Noise Voltage	N_O	f=10Hz to 100kHz, T_A=25°C		10		$\mu V/V_O$
Output Resistance	R_O	f=1kHz		10		mΩ
Short Circuit Current	I_{SC}	V_{IN}=35V, T_A=25°C		0.2		A
Peak Output Current	I_{PK}	V_{IN}=14V, T_J=25°C		2.2		A
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$			0.64		mV/°C
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			80		ppm/°C

Electrical Characteristics (Continued)

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}	T_J=25°C	8.82	9	9.18	V
		I_{OUT}=5mA to 1A, V_{IN}=11.5V to 23V, P_D≤15W	8.65		9.35	
Line Regulation	V_{RLINE}	V_{IN}=11.5V to 23V, I_{OUT}=1A, T_J=25°C		12	90	mV
Load Regulation	V_{RLOAD}	V_{IN}=15V, I_{OUT}=5mA to 1A, T_J=25°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°C		0.08	0.4	mA
		I_{OUT}=5mA to 1A, T_J=25°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}	ΔV_{OUT}=1%, I_{OUT}=1A, T_J=25°C		2		V
Output Noise Voltage	N_O	f=10Hz to 100kHz, T_A=25°C		10		$\mu V/V_O$
Output Resistance	R_O	f=1kHz		10		mΩ
Short Circuit Current	I_{SC}	V_{IN}=35V, T_A=25°C		0.2		A
Peak Output Current	I_{PK}	V_{IN}=15V, T_J=25°C		2.2		A
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$			0.72		mV/°C
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			80		ppm/°C

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

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

Electrical Characteristics (Continued)

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}	T_J=25°C	14.7	15	15.3	V
		I_{OUT}=5mA to 1A, V_{IN}=17.9 to 30V, P_D≤15W	14.4		15.6	
Line Regulation	V_{RLINE}	V_{IN}=17.9V to 30V, I_{OUT}=1A, T_J=25°C		18	150	mV
Load Regulation	V_{RLOAD}	V_{IN}=23V, I_{OUT}=5mA to 1A, T_J=25°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°C		0.3	0.8	mA
		I_{OUT}=5mA to 1A, T_J=25°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}	ΔV_{OUT}=1%, I_{OUT}=1A, T_J=25°C		2		V
Output Noise Voltage	N_O	f=10Hz to 100kHz, T_A=25°C		10		$\mu V/V_O$
Output Resistance	R_O	f=1kHz		12		mΩ
Short Circuit Current	I_{SC}	V_{IN}=35V, T_A=25°C		0.2		A
Peak Output Current	I_{PK}	V_{IN}=23V, T_J=25°C		2.2		A
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$			1.2		mV/°C
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			80		ppm/°C

Typical Performance Characteristics

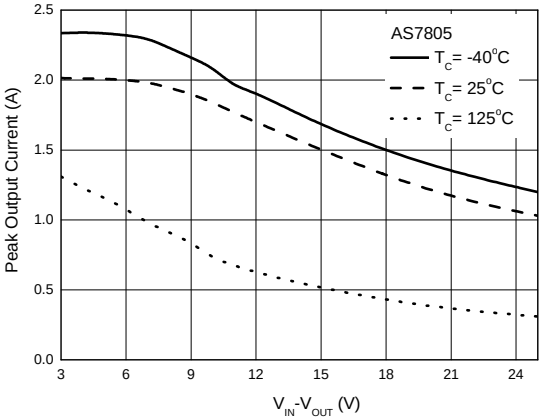


Figure 4. Peak Output Current vs. Input/Output Differential Voltage

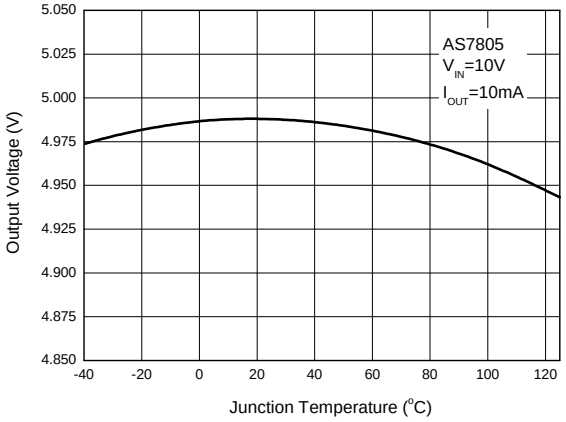


Figure 5. Output Voltage vs. Junction Temperature

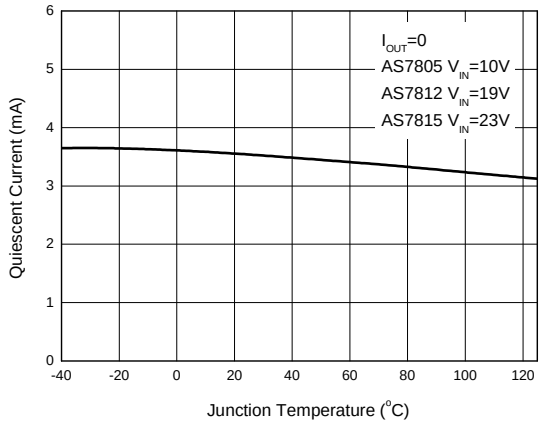


Figure 6. Quiescent Current vs. Junction Temperature

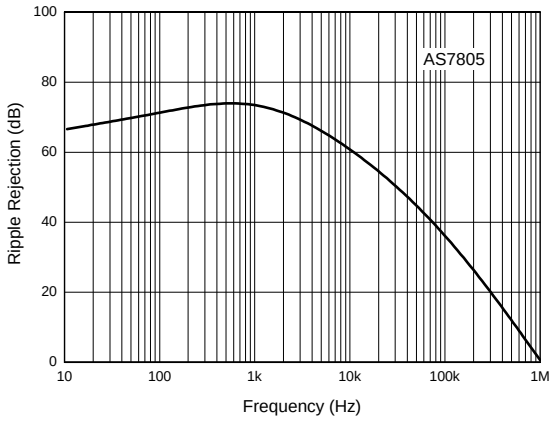


Figure 7. Ripple Rejection vs. Frequency

Typical Performance Characteristics (Continued)

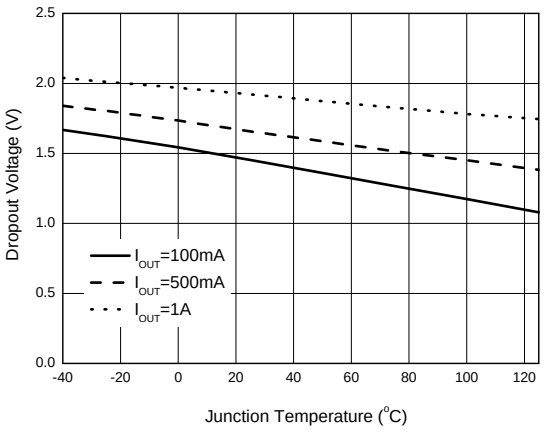


Figure 8. Dropout Voltage vs. Junction Temperature

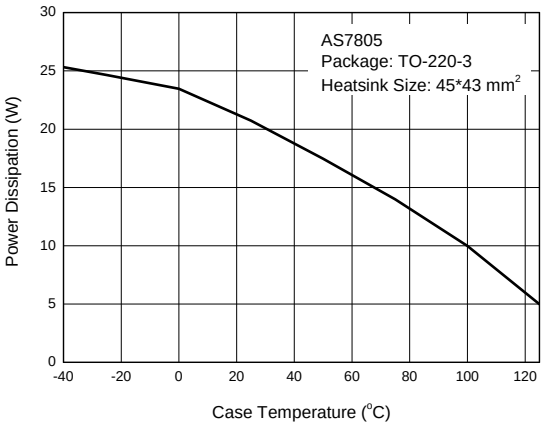


Figure 9. Power Dissipation vs. Case Temperature

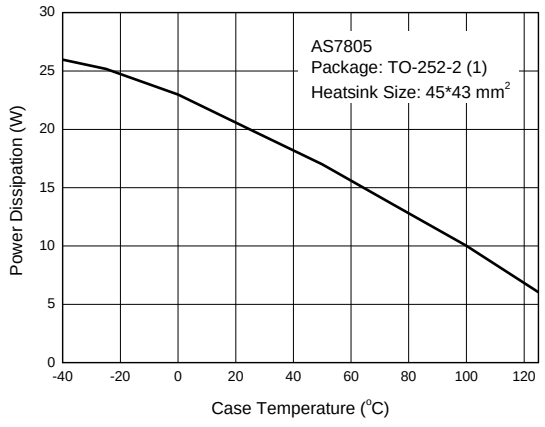


Figure 10. Power Dissipation vs. Case Temperature

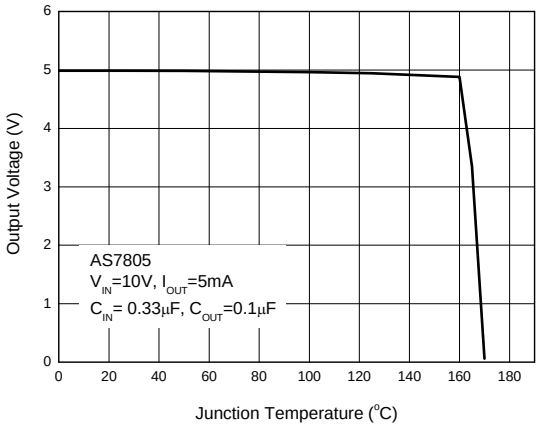


Figure 11. Thermal Shutdown Protection

Typical Performance Characteristics (Continued)

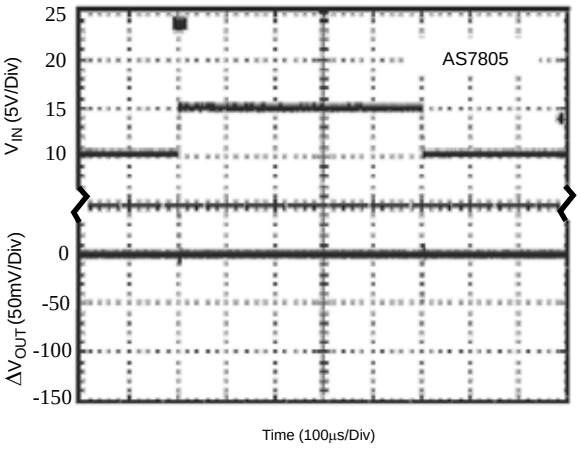


Figure 12. Line Transient
(Conditions: I_{OUT}=500mA, C_{OUT}=0.1μF)

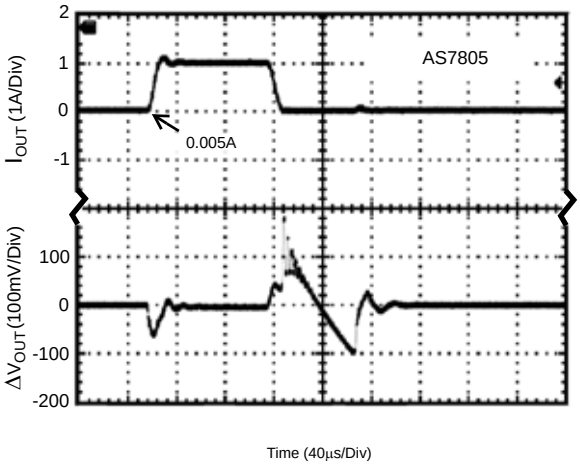


Figure 13. Load Transient
(Conditions: V_{IN}=10V, C_{IN}=0.33μF, C_{OUT}=0.1μF)

Typical Application

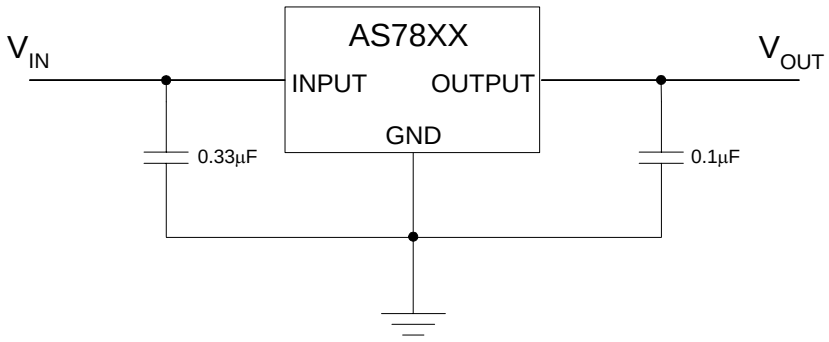
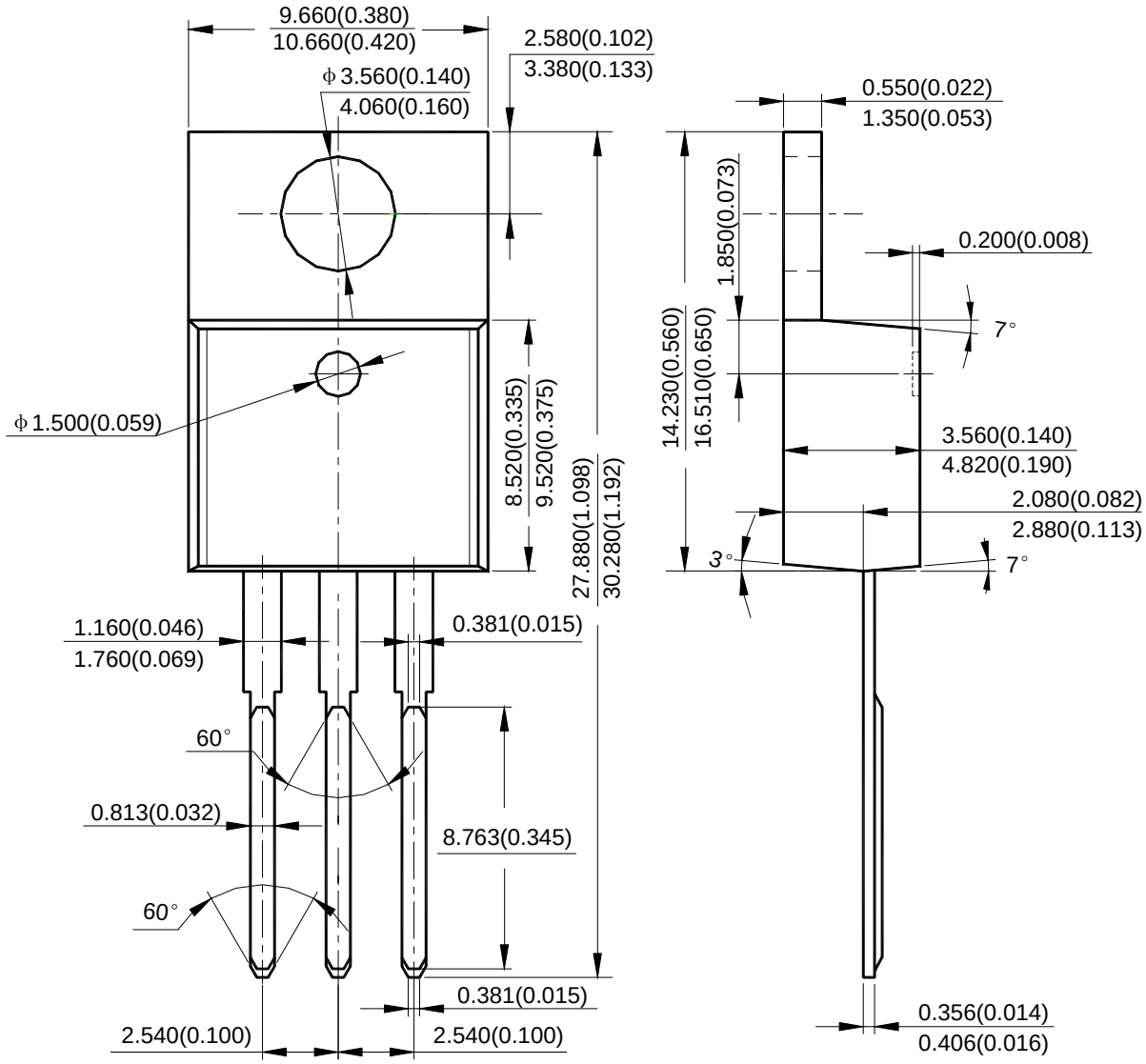


Figure 14. Typical Application of AS78XX

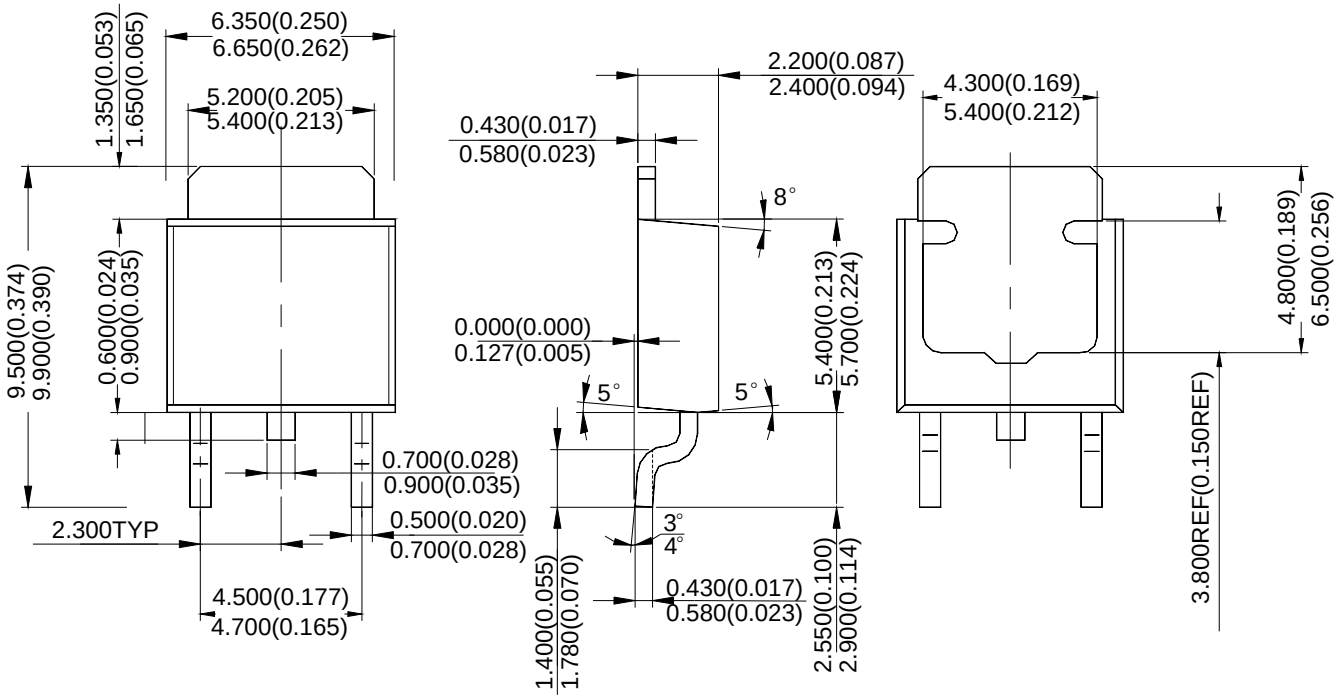
Mechanical Dimensions

TO-220-3 **Unit: mm(inch)**



Mechanical Dimensions (Continued)

TO-252-2 (1) **Unit: mm(inch)**



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