100mA POSITIVE VOLTAGE REGULATOR AS78LXX

General Description

The AS78LXX series are three terminal positive regulators designed 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 100mA.

The AS78LXX series are available in TO-92 and SOT-89-3 packages.

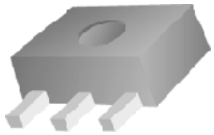
Features

- Output Current up to 100mA
- Fixed Output Voltages of 5V, 12V, 15V, 18V and 24V
- Output Voltage Accuracy of ±5% over the Full Temperature Range
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- No External Components
- Output Transistor Safe-area Protection

Applications

- Consumer Electronics
- Microprocessor Power Supply
- Mother Board

TO-92



SOT-89-3

Figure 1. Package Types of AS78LXX

Pin Configuration

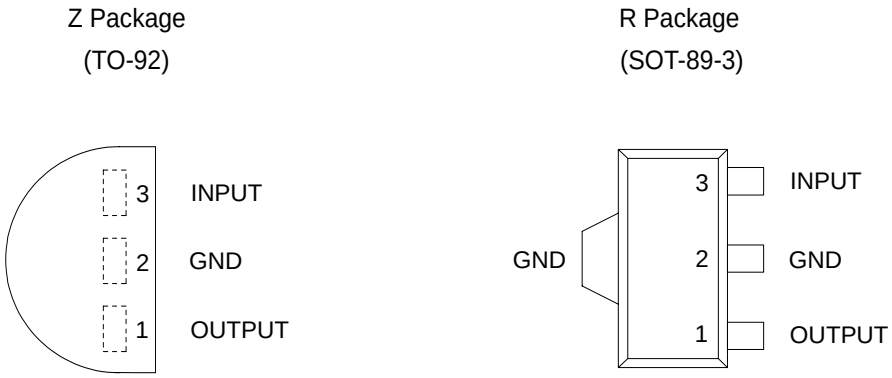


Figure 2. Pin Configuration of AS78LXX (Top View)

Functional Block Diagram

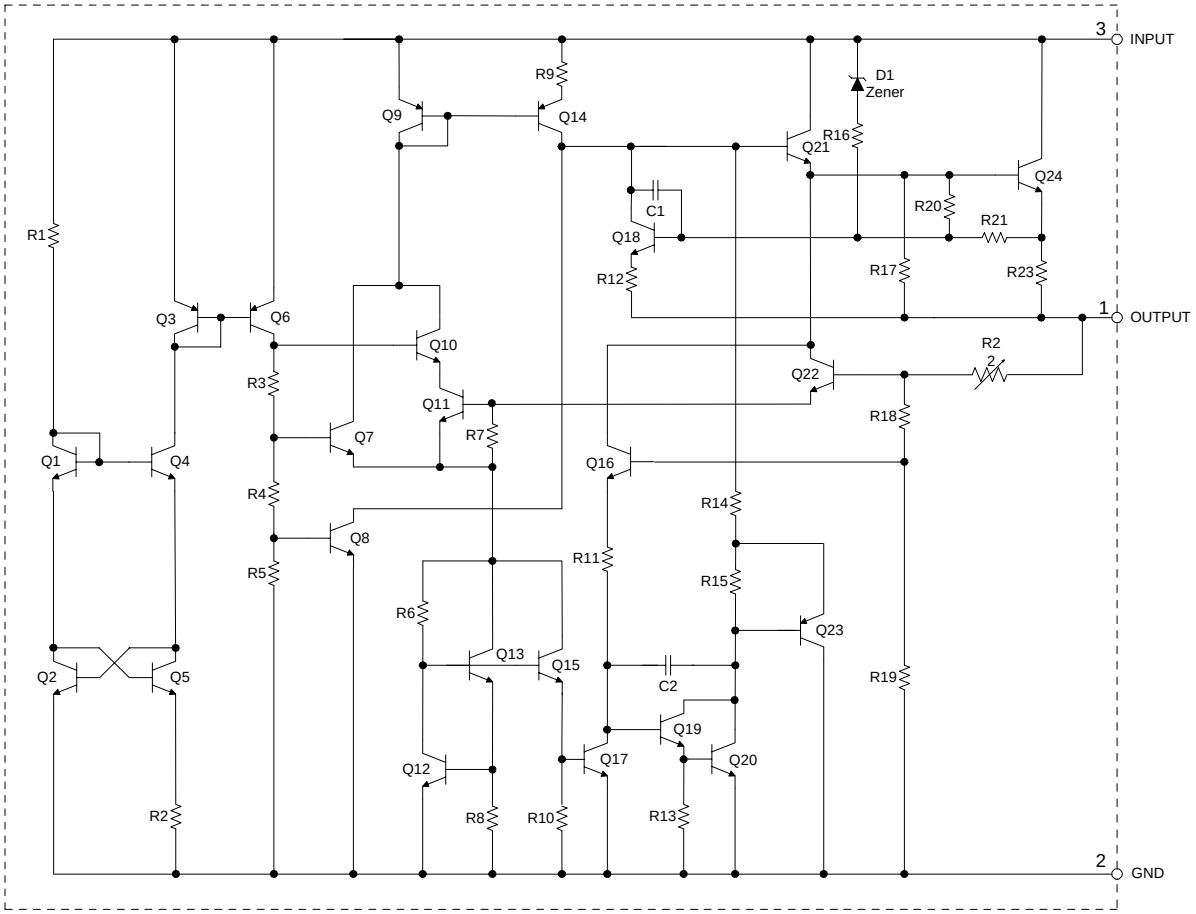
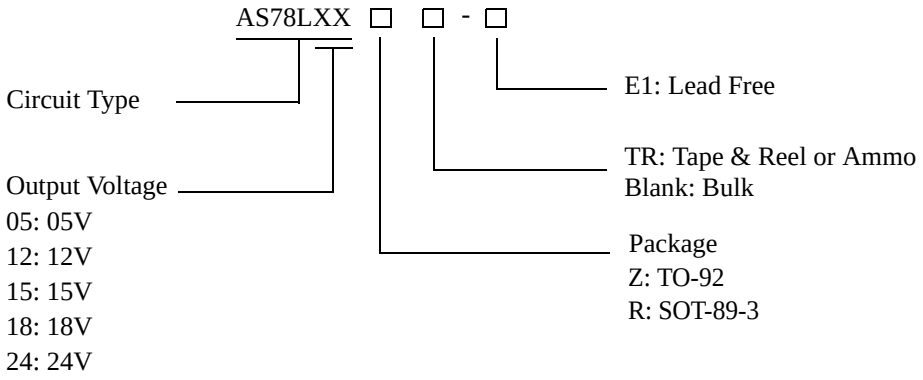


Figure 3. Functional Block Diagram of AS78LXX

100mA POSITIVE VOLTAGE REGULATOR AS78LXX

Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Tin Lead	Lead Free	Tin Lead	Lead Free	
TO-92	-40 to 125°C		AS78L05Z-E1		AS78L05Z-E1	Bulk
			AS78L05ZTR-E1		AS78L05Z-E1	Ammo
			AS78L12Z-E1		AS78L12Z-E1	Bulk
			AS78L12ZTR-E1		AS78L12Z-E1	Ammo
			AS78L15Z-E1		AS78L15Z-E1	Bulk
			AS78L15ZTR-E1		AS78L15Z-E1	Ammo
			AS78L18Z-E1		AS78L18Z-E1	Bulk
			AS78L18ZTR-E1		AS78L18Z-E1	Ammo
			AS78L24Z-E1		AS78L24Z-E1	Bulk
			AS78L24ZTR-E1		AS78L24Z-E1	Ammo
SOT-89-3	-40 to 125°C		AS78L05RTR-E1		E78E	Tape & Reel
			AS78L12RTR-E1		E78F	Tape & Reel
			AS78L15RTR-E1		E78G	Tape & Reel
			AS78L18RTR-E1		E78H	Tape & Reel
			AS78L24RTR-E1		E78I	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}	35	V
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	^oC
Power Dissipation	P_D	750	mW
Storage Temperature Range	T_{STG}	-65 to 150	^oC
ESD (Machine Model)	ESD	250	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
Operating Junction Temperature Range	T_J	-40	125	^oC

Electrical Characteristics

AS78L05 (V_{IN}=10V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_J=25°C, **Bold** typeface applies over -40°C≤T_J≤125°C, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		4.8	5.0	5.2	V
		7V≤V_{IN}≤20V, 1mA≤I_{OUT}≤100mA, P_D≤0.75W	**4.75**		**5.25**	
Line Regulation	V_{RLINE}	7V≤V_{IN}≤20V		8	150	mV
Load Regulation	V_{RLOAD}	1mA≤I_{OUT}≤100mA		10	60	mV
Quiescent Current	I_Q			3	5.5	mA
Quiescent Current Change	ΔI_Q	8V≤V_{IN}≤20V			**1.5**	mA
		1mA≤I_{OUT}≤40mA			**0.1**	
Ripple Rejection	PSRR	f=120Hz, 8V≤V_{IN}≤18V	47	62		dB
Dropout Voltage	V_{DROP}	I_{OUT}=40mA		1.7		V
		I_{OUT}=100mA		1.8		
Output Noise Voltage	N_O	10Hz≤f≤100kHz (Note 2)		40		μV
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	I_{OUT}=5mA		0.42		mV/°C
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			84		ppm/°C

Note 2: 0.01μF minimum load capacitance is recommended to limit high frequency noise.

AS78L12 (V_{IN}=19V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_J=25°C, **Bold** typeface applies over -40°C≤T_J≤125°C, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		11.5	12.0	12.5	V
		14.5V≤V_{IN}≤27V, 1mA≤I_{OUT}≤100mA, P_D≤0.75W	**11.4**		**12.6**	
Line Regulation	V_{RLINE}	14.5V≤V_{IN}≤27V		20	250	mV
Load Regulation	V_{RLOAD}	1mA≤I_{OUT}≤100mA		20	100	mV
Quiescent Current	I_Q			3	6	mA
Quiescent Current Change	ΔI_Q	16V≤V_{IN}≤27V			**1.5**	mA
		1mA≤I_{OUT}≤40mA			**0.1**	
Ripple Rejection	PSRR	f=120Hz, 15V≤V_{IN}≤25V	37	42		dB
Dropout Voltage	V_{DROP}	I_{OUT}=40mA		1.7		V
		I_{OUT}=100mA		1.8		
Output Noise Voltage	N_O	10Hz≤f≤100kHz (Note 2)		80		μV
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	I_{OUT}=5mA		1		mV/°C
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			84		ppm/°C

Note 2: 0.01μF minimum load capacitance is recommended to limit high frequency noise.

Electrical Characteristics (Continued)

AS78L15 (V_{IN}=23V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_J=25°C, **Bold** typeface applies over -40°C≤T_J≤125°C, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		14.4	15.0	15.6	V
		17.5V≤V_{IN}≤30V, 1mA≤I_{OUT}≤100mA, P_D≤0.75W	**14.25**		**15.75**	
Line Regulation	V_{RLINE}	17.5V≤V_{IN}≤30V		25	250	mV
Load Regulation	V_{RLOAD}	1mA≤I_{OUT}≤100mA		25	150	mV
Quiescent Current	I_Q			3	6	mA
Quiescent Current Change	ΔI_Q	20V≤V_{IN}≤30V			**1.5**	mA
		1mA≤I_{OUT}≤40mA			**0.1**	
Ripple Rejection	PSRR	f=120Hz, 18.5V≤V_{IN}≤28.5V	34	39		dB
Dropout Voltage	V_{DROP}	I_{OUT}=40mA		1.7		V
		I_{OUT}=100mA		1.8		
Output Noise Voltage	N_O	10Hz≤f≤100kHz (Note 2)		90		μV
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	I_{OUT}=5mA		1.25		mV/°C
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			84		ppm/°C

Note 2: 0.01μF minimum load capacitance is recommended to limit high frequency noise.

AS78L18 (V_{IN}=27V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_J=25°C, **Bold** typeface applies over -40°C≤T_J≤125°C, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		17.3	18.0	18.7	V
		22V≤V_{IN}≤33V, 1mA≤I_{OUT}≤100mA, P_D≤0.75W	**17.1**		**18.9**	
Line Regulation	V_{RLINE}	22V≤V_{IN}≤33V		30	300	mV
Load Regulation	V_{RLOAD}	1mA≤I_{OUT}≤100mA		30	170	mV
Quiescent Current	I_Q			3	6	mA
Quiescent Current Change	ΔI_Q	23V≤V_{IN}≤33V			**1.5**	mA
		1mA≤I_{OUT}≤40mA			**0.1**	
Ripple Rejection	PSRR	f=120Hz, 23V≤V_{IN}≤33V	33	38		dB
Dropout Voltage	V_{DROP}	I_{OUT}=40mA		1.7		V
		I_{OUT}=100mA		1.8		
Output Noise Voltage	N_O	10Hz≤f≤100kHz (Note 2)		150		μV
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	I_{OUT}=5mA		1.5		mV/°C
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			84		ppm/°C

Note 2: 0.01μF minimum load capacitance is recommended to limit high frequency noise.

Electrical Characteristics (Continued)

AS78L24 (V_{IN}=33V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_J=25°C, **Bold** typeface applies over -40°C≤T_J≤125°C, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		23	24.0	25	V
		27V≤V_{IN}≤36V, 1mA≤I_{OUT}≤100mA, P_D≤0.75W	**22.8**		**25.2**	
Line Regulation	V_{RLINE}	27V≤V_{IN}≤36V		50	300	mV
Load Regulation	V_{RLOAD}	1mA≤I_{OUT}≤100mA		40	200	mV
Quiescent Current	I_Q			3	6	mA
Quiescent Current Change	ΔI_Q	28V≤V_{IN}≤36V			**1.5**	mA
		1mA≤I_{OUT}≤40mA			**0.1**	
Ripple Rejection	PSRR	f=120Hz, 29V≤V_{IN}≤35V	31	37		dB
Dropout Voltage	V_{DROP}	I_{OUT}=40mA		1.7		V
		I_{OUT}=100mA		1.8		
Output Noise Voltage	N_O	10Hz≤f≤100kHz (Note 2)		200		μV
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	I_{OUT}=5mA		2		mV/°C
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			84		ppm/°C

Note 2: 0.01μF minimum load capacitance is recommended to limit high frequency noise.

Typical Performance Characteristics

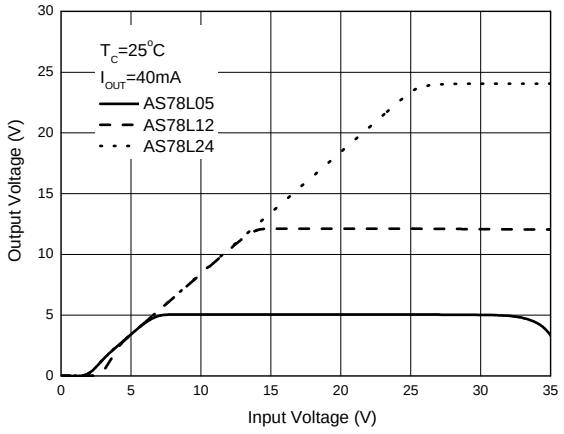


Figure 4. Output Voltage vs. Input Voltage

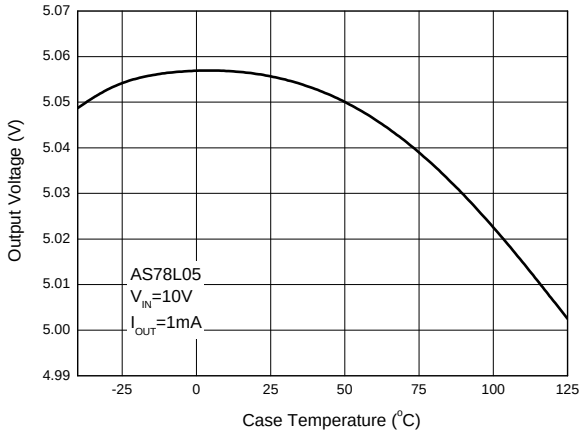


Figure 5. Output Voltage vs. Case Temperature

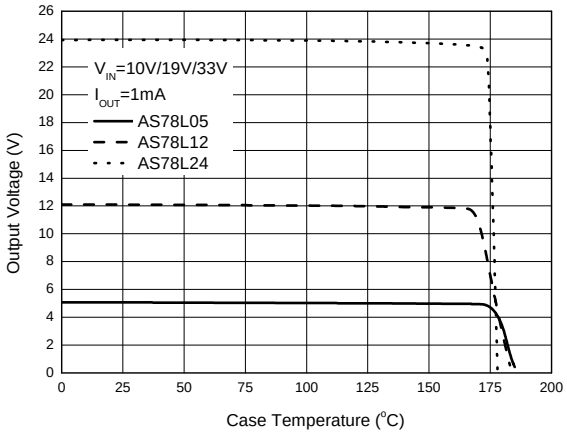


Figure 6. Over Temperature Protection

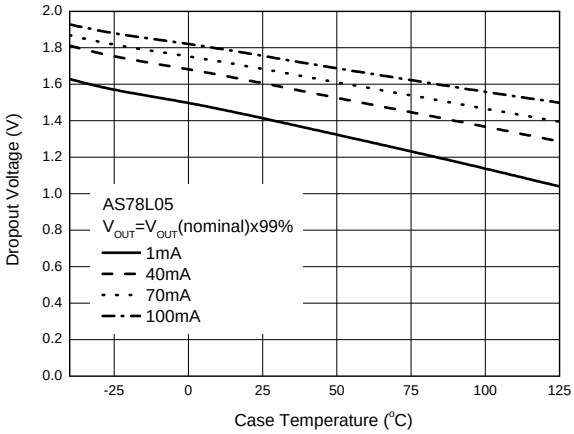


Figure 7. Dropout Voltage vs. Case Temperature

Typical Performance Characteristics (Continued)

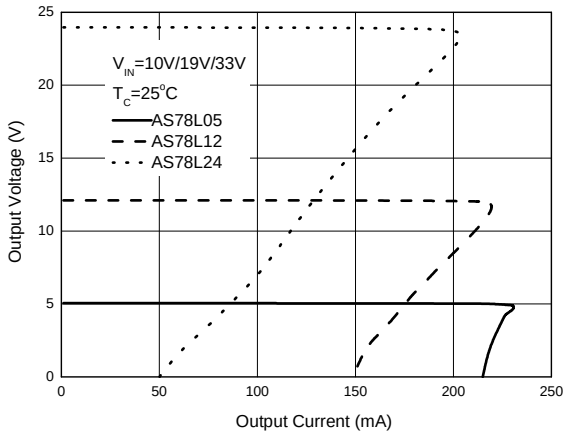


Figure 8. Output Voltage vs. Output Current

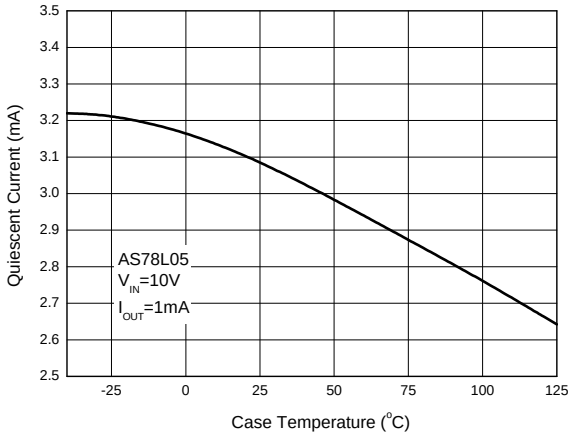


Figure 9. Quiescent Current vs. Case Temperature

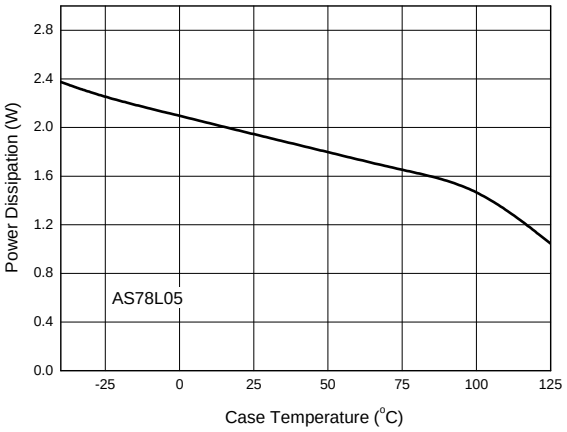


Figure 10. Power Dissipation vs. Case Temperature

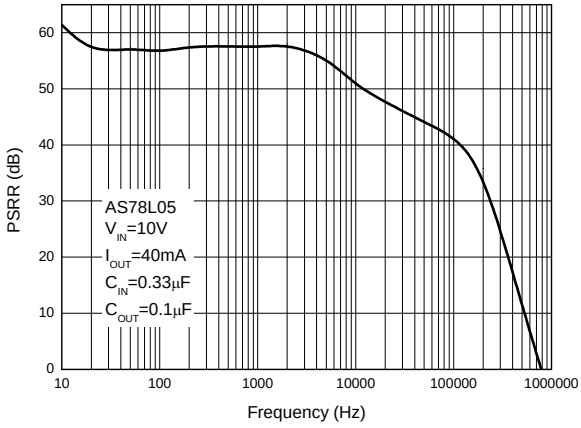


Figure 11. PSRR vs. Frequency

Typical Performance Characteristics (Continued)

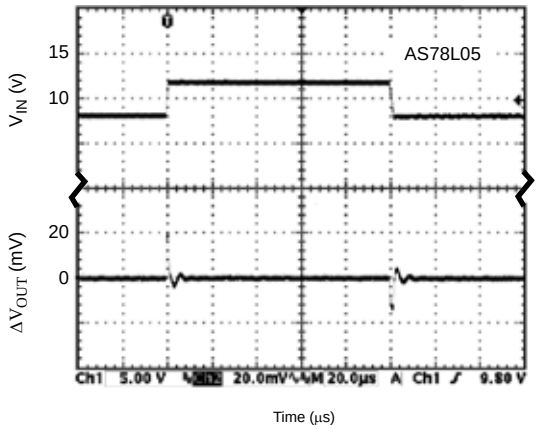


Figure 12. Line Transient
(Conditions: I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF)

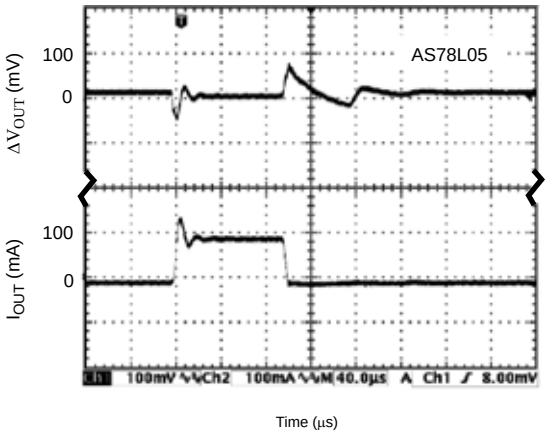


Figure 13. Load Transient
(Conditions: V_{IN}=10V, C_{IN}=0.33µF, C_{OUT}=0.1µF)

Typical Application

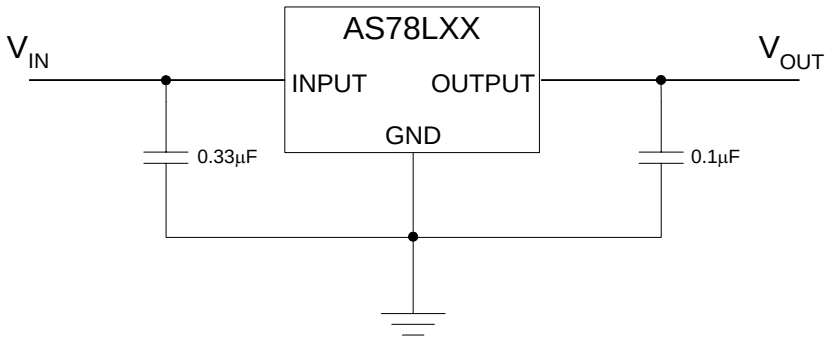
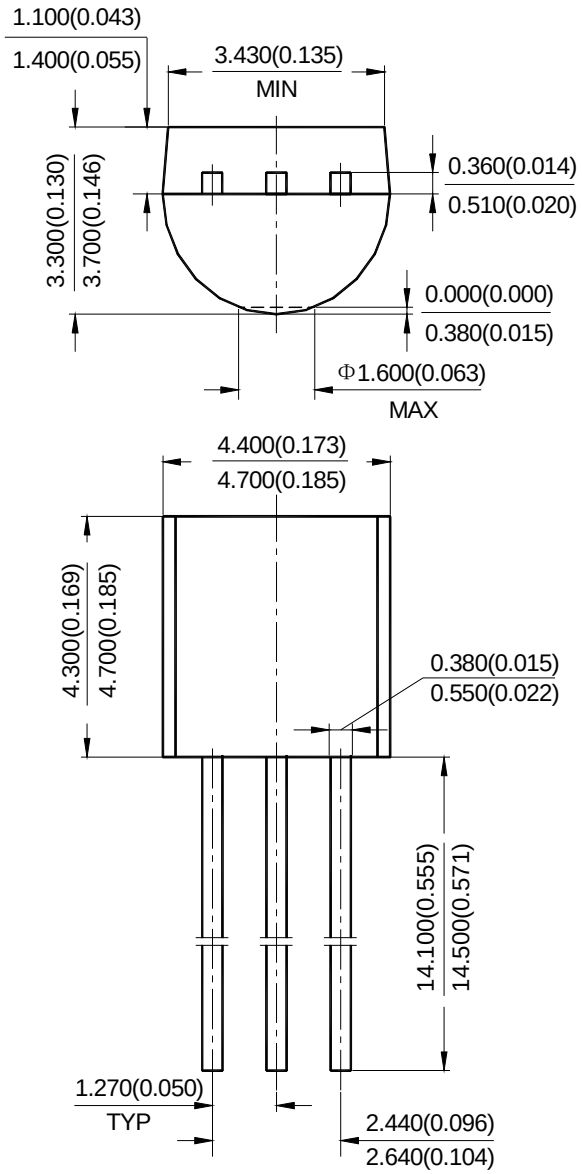


Figure 14. Typical Application of AS78LXX

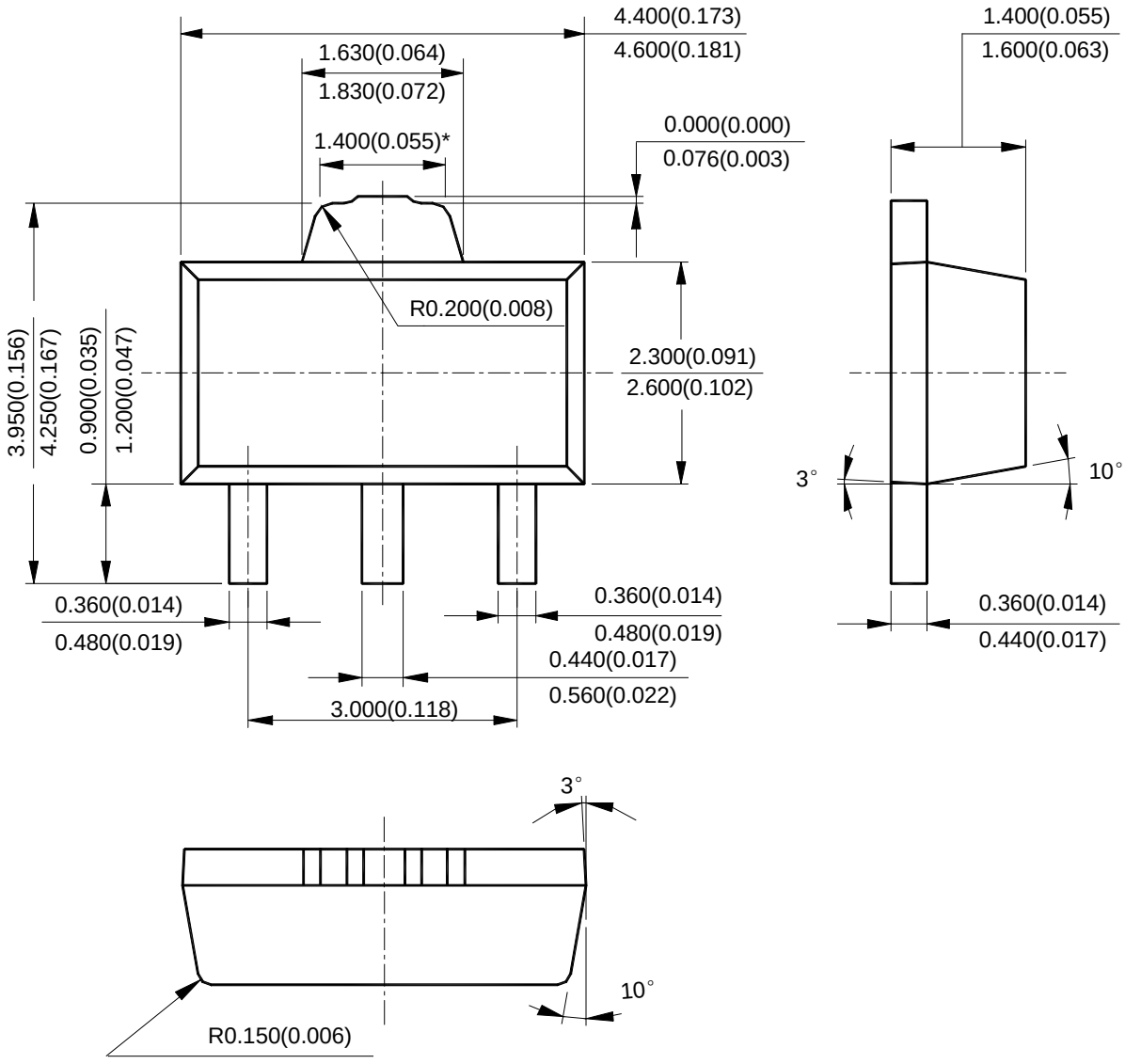
Mechanical Dimensions

TO-92 **Unit: mm(inch)**



Mechanical Dimensions (Continued)

SOT-89-3 **Unit: mm(inch)**



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