

## Description

The AZ78LXX series are three terminal positive regulators with several fixed output voltages. These regulators can provide local on card regulation, eliminating the distribution problems associated with single point regulation. The AZ78LXX can be used in logic systems, instrumentation, HiFi, and other solid state electronic equipment. When used as a Zener diode/resistor combination replacement, the AZ78LXX usually results in an effective output impedance improvement of two orders of magnitude, and lower quiescent current.

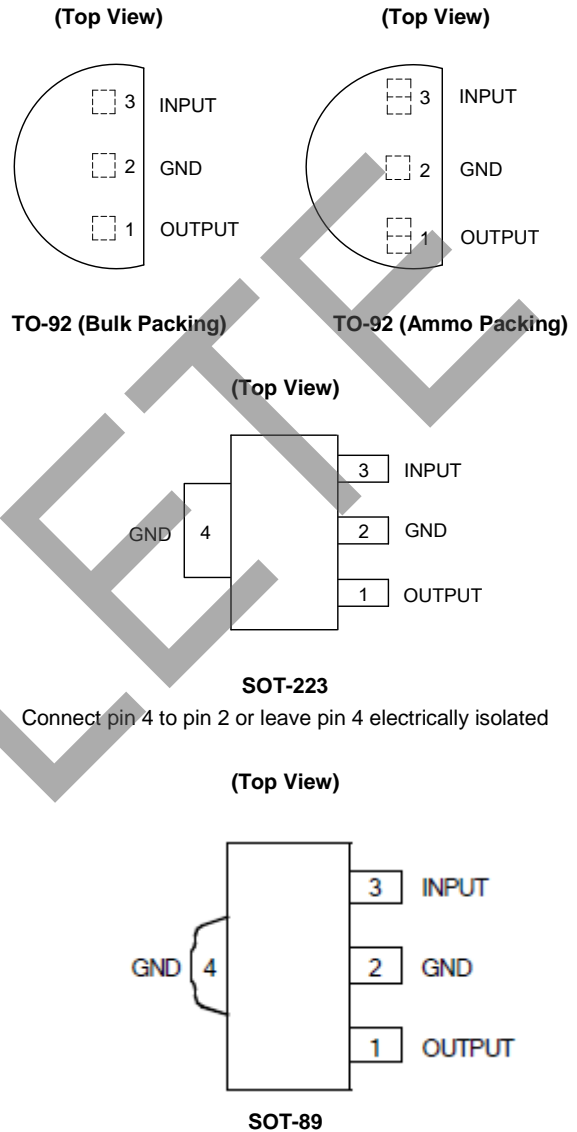
With adequate heat sinking, the AZ78LXX can deliver 100mA output current. Current limiting is included to limit the peak output current to a safe value. Thermal protection is also provided. If internal power dissipation becomes too high for the heat sinking provided, the thermal shutdown circuit takes over, preventing the IC from overheating.

The AZ78LXX are available in the plastic TO-92 (bulk or ammo packing), SOT-223 and SOT-89 packages.

## Features

- Output Current up to 100mA
- Fixed Output Voltages of 5V and 9V
- Output Voltage Tolerances of  $\pm 5\%$  over the Full Temperature Range
- Internal Short Circuit Current-limiting
- Internal Thermal Overload Protection
- No External Components
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](#) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

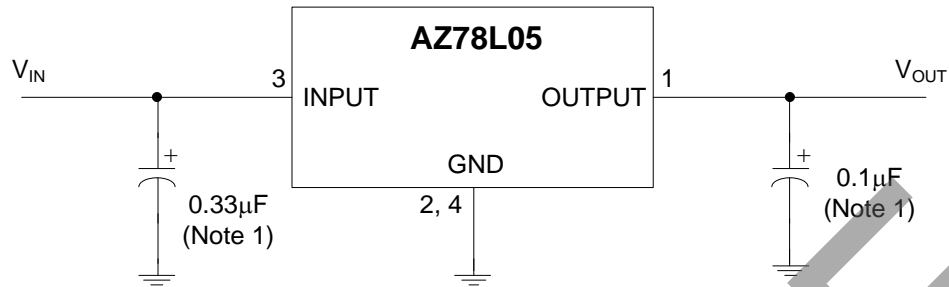
## Pin Assignments



## Applications

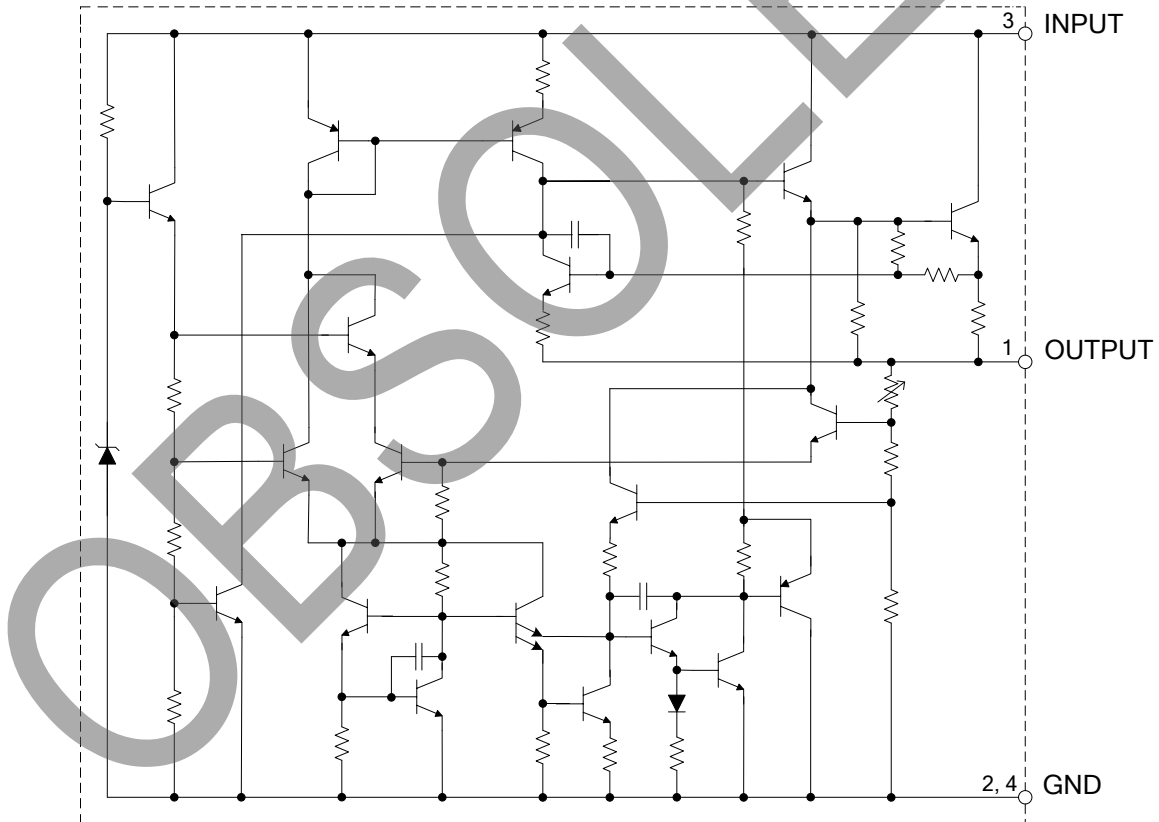
- High Efficiency Linear Regulator
- Post Regulation for Switching Supply
- Microprocessor Power Supply
- Mother Board I/O Power Supply

## Typical Applications Circuit



Note 1: Bypass capacitors are recommended for optimum stability and stability and transient response and should be located as close as possible to the regulator.

## Functional Block Diagram



**Absolute Maximum Ratings** (Note 2)

Symbol	Parameter	Rating		Unit
$V_{IN}$	Input Voltage	20		V
$T_J$	Operating Junction Temperature	+150		°C
$T_{LEAD}$	Lead Temperature (Soldering, 10sec)	+260		°C
$P_D$	Power Dissipation ( $T_A = +25^{\circ}\text{C}$ )	TO-92	0.65	W
		SOT-223	0.7	
		SOT-89	0.65	
$T_{STG}$	Storage Temperature Range	-65 to +150		°C
ESD	ESD (Human Body Model)	2000		V
ESD	ESD (Machine Model)	200		V

Note 2: 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**

Symbol	Parameter		Min	Max	Unit
$V_{IN}$	Input Voltage	AZ78L05	—	15	V
		AZ78L09	—	18	
$T_J$	Operating Junction Temperature		-40	+125	°C

**Electrical Characteristics**

**AZ78L05 Electrical Characteristics** (Limits in standard typeface are for  $T_J = +25^\circ\text{C}$ , **Bold typeface applies over  $-40^\circ\text{C}$  to  $+125^\circ\text{C}$** ,  $I_{OUT} = 40\text{mA}$ ,  $C_{IN} = 0.33\mu\text{F}$ ,  $C_{OUT} = 0.1\mu\text{F}$ ,  $V_{IN} = 10\text{V}$ , unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OUT}$	Output Voltage	—	4.8	5	5.2	V
		$7.0\text{V} \leq V_{IN} \leq 15\text{V}$ $1.0\text{mA} \leq I_{OUT} \leq 40\text{mA}$ (Note 3)	<b>4.75</b>	—	<b>5.25</b>	
$V_{RLINE}$	Line Regulation	$7.0\text{V} \leq V_{IN} \leq 15\text{V}$	—	18	75	mV
$V_{RLOAD}$	Load Regulation	$1.0\text{mA} \leq I_{OUT} \leq 100\text{mA}$	—	20	60	mV
$V_{DROP}$	Dropout Voltage	—	—	1.6	—	V
$I_{LIMIT}$	Current Limit	$T_J = +25^\circ\text{C}$	—	150	—	mA
$I_Q$	Quiescent Current	$I_{OUT} = 0$	—	3	5	mA
$\Delta I_Q$	Quiescent Current Change	$8.0\text{V} \leq V_{IN} \leq 15\text{V}$	—	—	<b>1.0</b>	mA
		$1.0\text{mA} \leq I_{OUT} \leq 40\text{mA}$	—	—	<b>0.1</b>	
$N_o$	Output Noise Voltage	$10\text{Hz} \leq f \leq 100\text{kHz}$ (Note 4)	—	40	—	$\mu\text{V}$
PSRR	Ripple Rejection	$f = 120\text{Hz}$ , $8.0\text{V} \leq V_{IN} \leq 15\text{V}$	47	62	—	dB
$I_{PK}$	Peak Output Current	—	—	150	—	mA
$\Delta V_{OUT}/\Delta T$	Average Temperature Coefficient of Output Voltage	$I_{OUT} = 5.0\text{mA}$	—	0.65	—	$\text{mV}/^\circ\text{C}$
$V_{IN}(\text{Min})$	Minimum Value of Input Voltage Required to Maintain Line Regulation	—	—	6.7	7	V
$\theta_{JC}$	Thermal Resistance	TO-92	—	81	—	$^\circ\text{C}/\text{W}$
		SOT-89	—	29.8	—	
		SOT-223	—	71	—	

Notes: 3. Power Dissipation  $\leq 0.6\text{W}$ .  
 4. Recommended minimum load capacitance of  $0.01\mu\text{F}$  to limit high frequency noise.

**Electrical Characteristics** (continued)

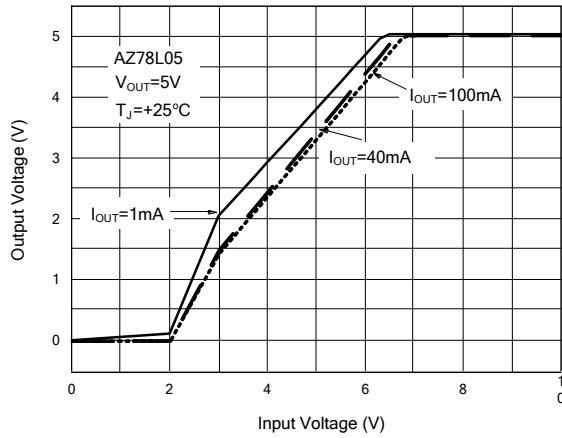
**AZ78L09 Electrical Characteristics** (Limits in standard typeface are for  $T_J = +25^\circ\text{C}$ , **Bold typeface applies over  $-40^\circ\text{C}$  to  $+125^\circ\text{C}$** ,  $I_{OUT} = 40\text{mA}$ ,  $C_{IN} = 0.33\mu\text{F}$ ,  $C_{OUT} = 0.1\mu\text{F}$ ,  $V_{IN} = 15\text{V}$ , unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OUT}$	Output Voltage	—	8.6	9	9.4	V
		$12\text{V} \leq V_{IN} \leq 18\text{V}$ $1.0\text{mA} \leq I_{OUT} \leq 40\text{mA}$ (Note 3)	<b>8.55</b>	—	<b>9.45</b>	
$V_{RLINE}$	Line Regulation	$12\text{V} \leq V_{IN} \leq 18\text{V}$	—	18	75	mV
$V_{RLOAD}$	Load Regulation	$1.0\text{mA} \leq I_{OUT} \leq 100\text{mA}$	—	20	90	mV
$V_{DROP}$	Dropout Voltage	—	—	1.6	—	V
$I_{LIMIT}$	Current Limit	$T_J = +25^\circ\text{C}$	—	150	—	mA
$I_Q$	Quiescent Current	$I_{OUT} = 0$	—	3	5	mA
$\Delta I_Q$	Quiescent Current Change	$12\text{V} \leq V_{IN} \leq 18\text{V}$	—	—	<b>1.5</b>	mA
		$1.0\text{mA} \leq I_{OUT} \leq 40\text{mA}$	—	—	<b>0.1</b>	
$N_o$	Output Noise Voltage	$10\text{Hz} \leq f \leq 100\text{kHz}$ (Note 4)	—	70	—	$\mu\text{V}$
PSRR	Ripple Rejection	$f = 120\text{Hz}$ , $12\text{V} \leq V_{IN} \leq 18\text{V}$	38	44	—	dB
$I_{PK}$	Peak Output Current	—	—	150	—	mA
$\Delta V_{OUT}/\Delta T$	Average Temperature Coefficient of Output Voltage	$I_{OUT} = 5.0\text{mA}$	—	0.9	—	$\text{mV}/^\circ\text{C}$
$V_{IN}(\text{Min})$	Minimum Value of Input Voltage Required to Maintain Line Regulation	—	—	10.7	—	V
$\theta_{JC}$	Thermal Resistance	TO-92	—	81	—	$^\circ\text{C}/\text{W}$
		SOT-89	—	84	—	
		SOT-223	—	71	—	

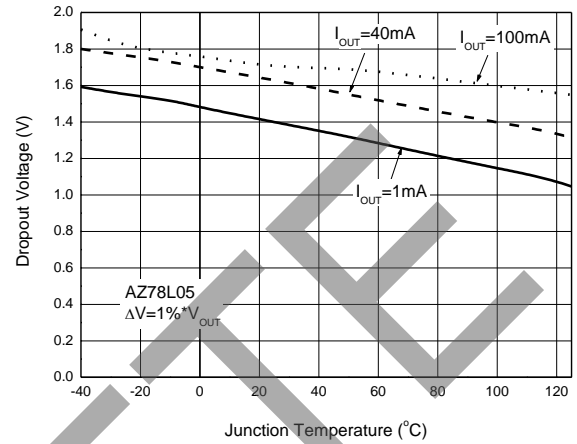
Notes: 3. Power Dissipation  $\leq 0.6\text{W}$ .  
 4. Recommended minimum load capacitance of  $0.01\mu\text{F}$  to limit high frequency noise.

## Performance Characteristics

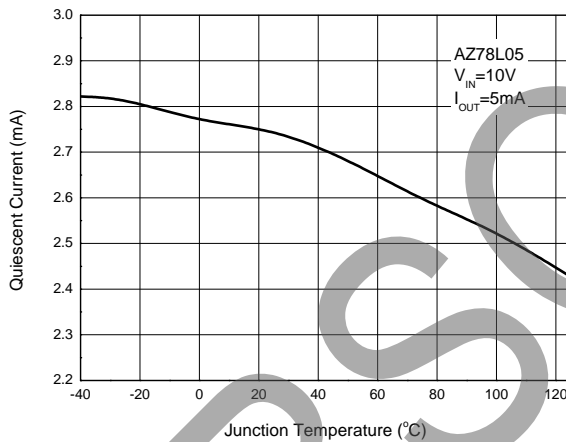
**Dropout Characteristics**



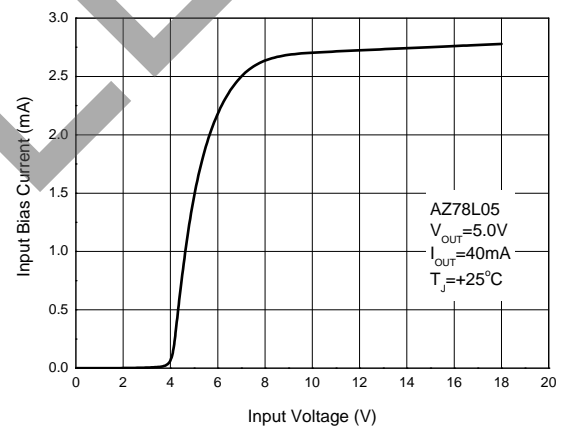
**Dropout Voltage vs. Junction Temperature**



**Quiescent Current vs. Junction Temperature**

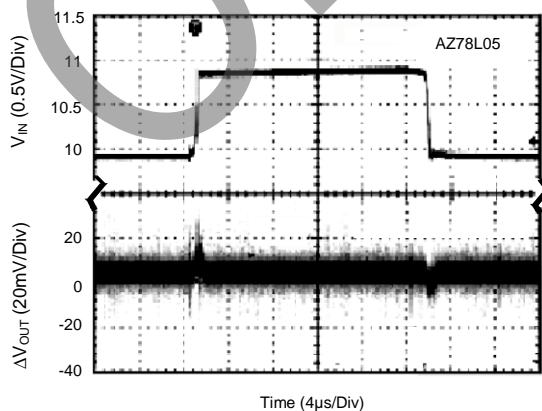


**Input Bias Current vs. Input Voltage**



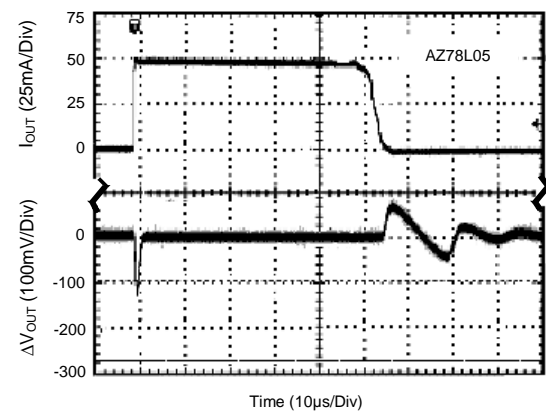
**Line Transient Response**

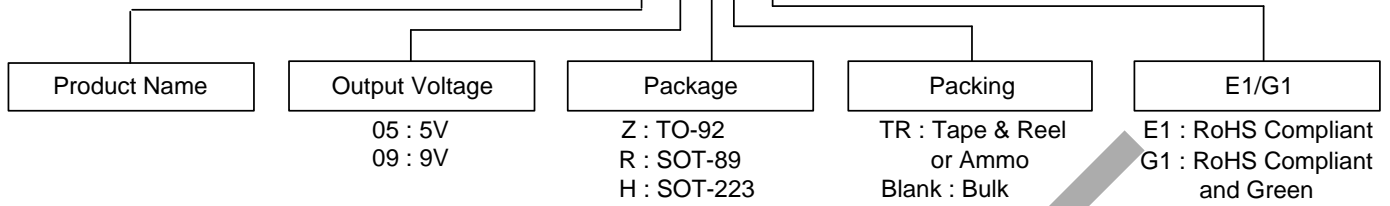
(Conditions:  $V_{IN}=10$  to  $11V$ ,  $V_{OUT}=5V$ ,  $I_{OUT}=40mA$ )



**Load Transient Response**

(Conditions:  $V_{IN}=10V$ ,  $V_{OUT}=5V$ ,  $I_{OUT}=1$  to  $50mA$ )



**Ordering Information**
**AZ78LXX X X - X**


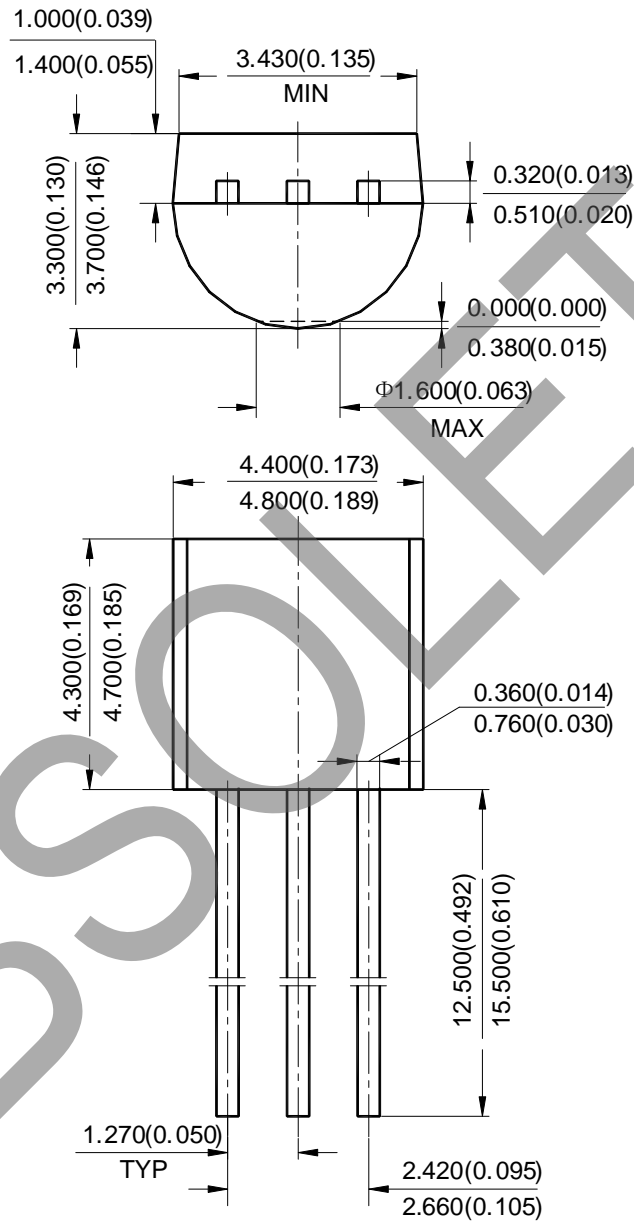
Package	Temperature Range	Part Number	Marking ID	Packing
TO-92	-40 to +125°C	AZ78L05Z-E1	AZ78L05Z-E1	Bulk
		AZ78L05Z-G1	AZ78L05Z-G1	Bulk
		AZ78L05ZTR-E1	AZ78L05Z-E1	Ammo
		AZ78L05ZTR-G1	AZ78L05Z-G1	Ammo
		AZ78L09Z-E1	AZ78L09Z-E1	Bulk
		AZ78L09Z-G1	AZ78L09Z-G1	Bulk
		AZ78L09ZTR-E1	AZ78L09Z-E1	Ammo
		AZ78L09ZTR-G1	AZ78L09Z-G1	Ammo
SOT-89	-40 to +125°C	AZ78L05RTR-E1	E78A	Tape & Reel
		AZ78L05RTR-G1	G78A	Tape & Reel
		AZ78L09RTR-E1	E78C	Tape & Reel
		AZ78L09RTR-G1	G78C	Tape & Reel
SOT-223	-40 to +125°C	AZ78L05HTR-E1	EH78A	Tape & Reel
		AZ78L05HTR-G1	GH78A	Tape & Reel
		AZ78L09HTR-E1	EH78C	Tape & Reel
		AZ78L09HTR-G1	GH78C	Tape & Reel

OBSOLETE - PART DISCONTINUED

**Package Outline Dimensions** (All dimensions in mm(inch).)

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**(1) Package Type: TO-92 (Bulk Packing)**

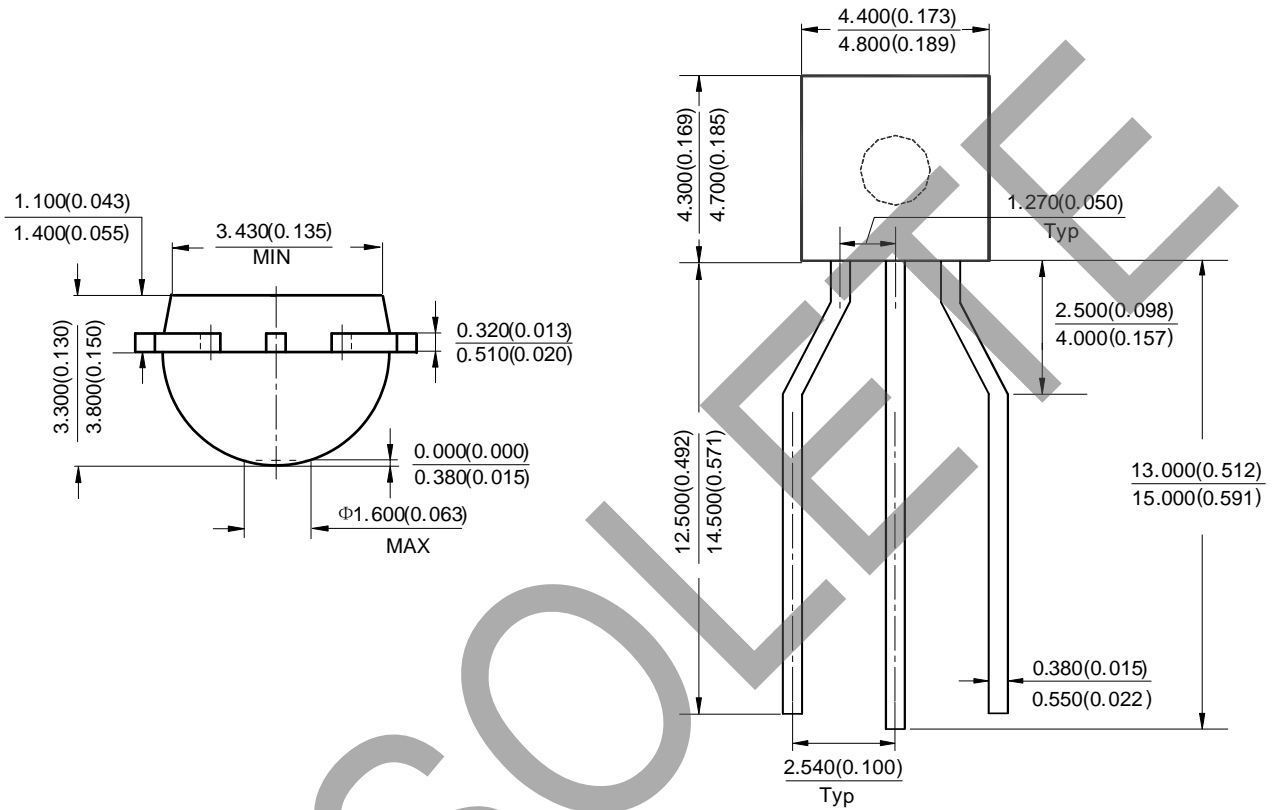




**Package Outline Dimensions** (continued) (All dimensions in mm(inch).)

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

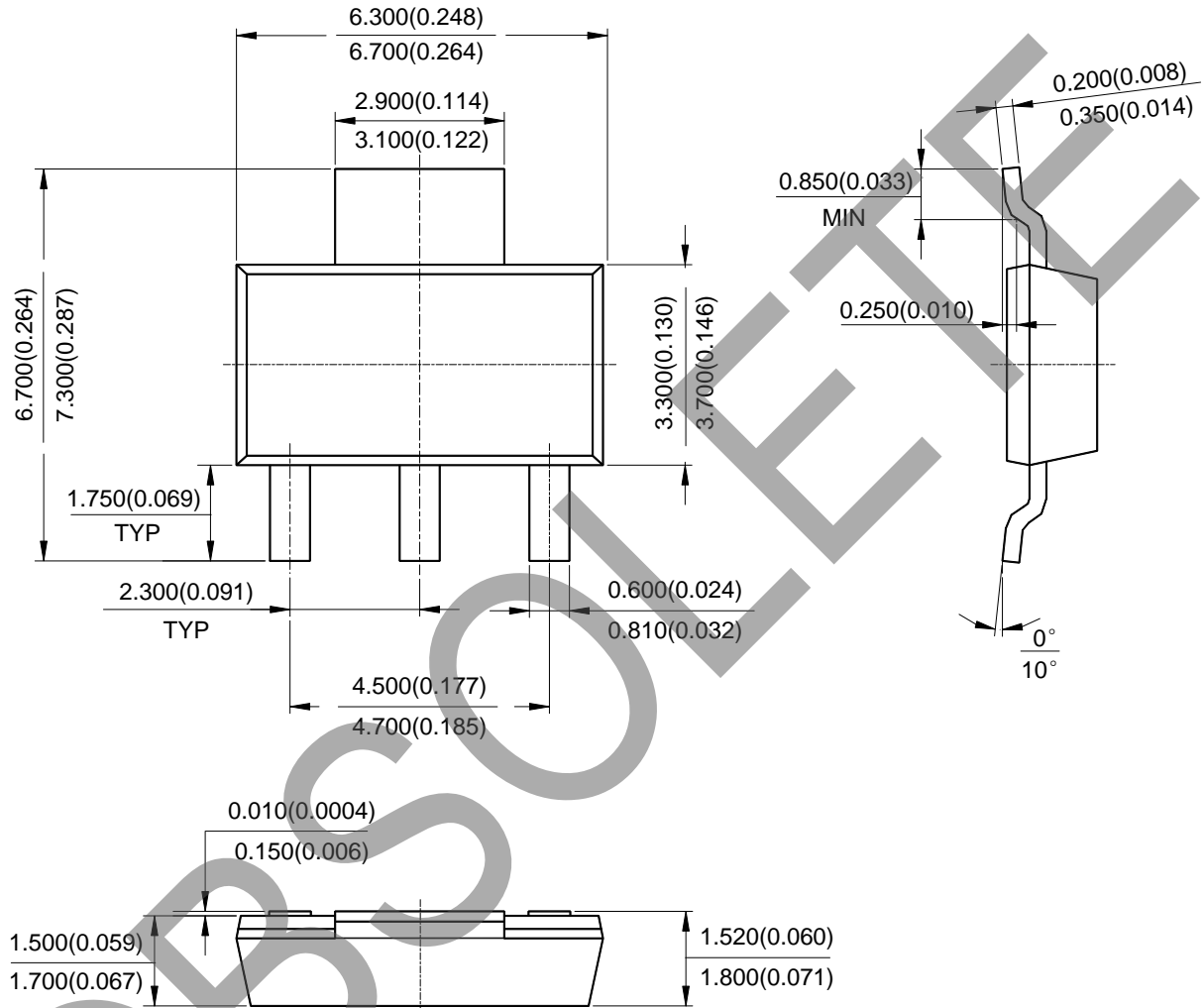
**(2) Package Type: TO-92 ( Ammo Packing)**



**Package Outline Dimensions** (continued) (All dimensions in mm(inch).)

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

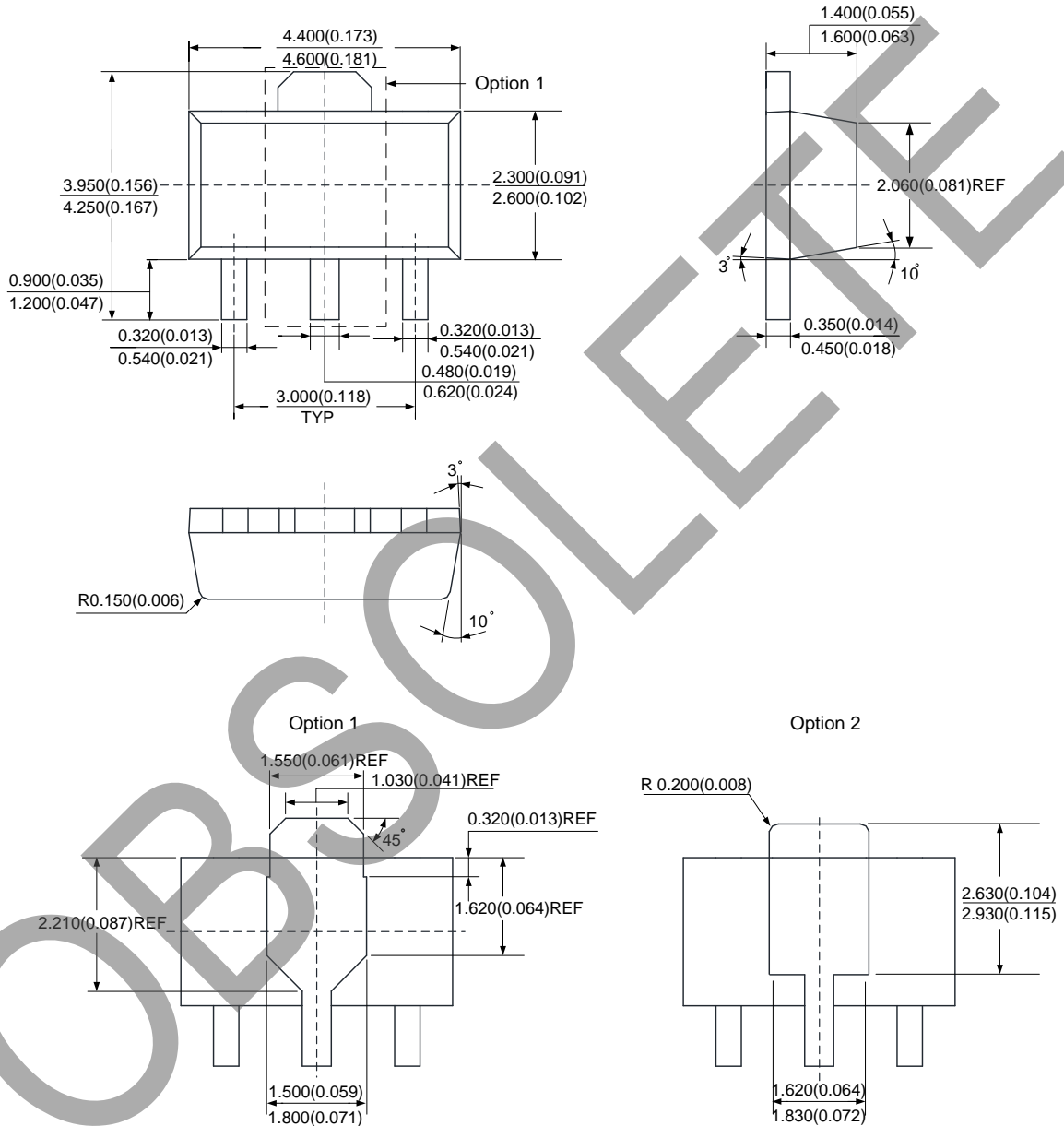
**(3) Package Type: SOT-223**



**Package Outline Dimensions** (continued) (All dimensions in mm(inch).)

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**(4) Package Type: SOT-89**



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