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 (Bulk Packing)/ TO-92 (Ammo Packing), SOT-89 and SOIC-8 packages.

Features

- Output Current up to 100mA
- Fixed Output Voltages of 5V, 12V and 15V
- 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
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

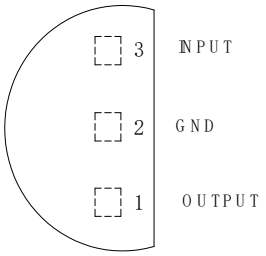
Applications

- Consumer electronics
- Microprocessor power supplies
- Mother boards

Pin Assignments

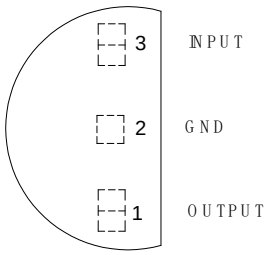
Z Package

(TO-92 (Bulk Packing))



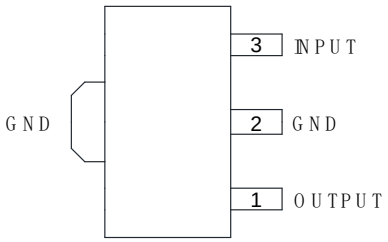
Z Package

(TO-92 (Ammo Packing))



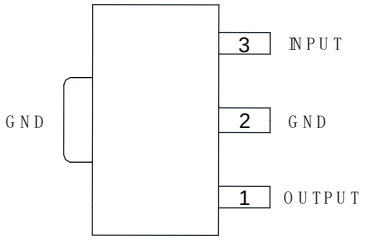
R Package

(SOT-89 Option 1)



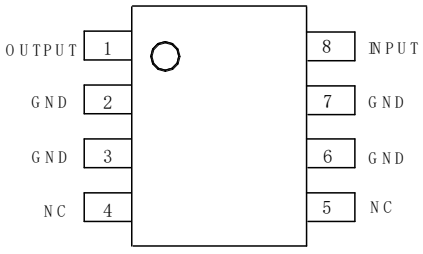
R Package

(SOT-89 Option 2)



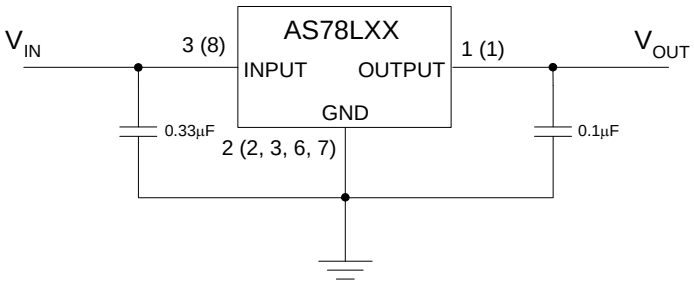
M Package

(SOIC-8)



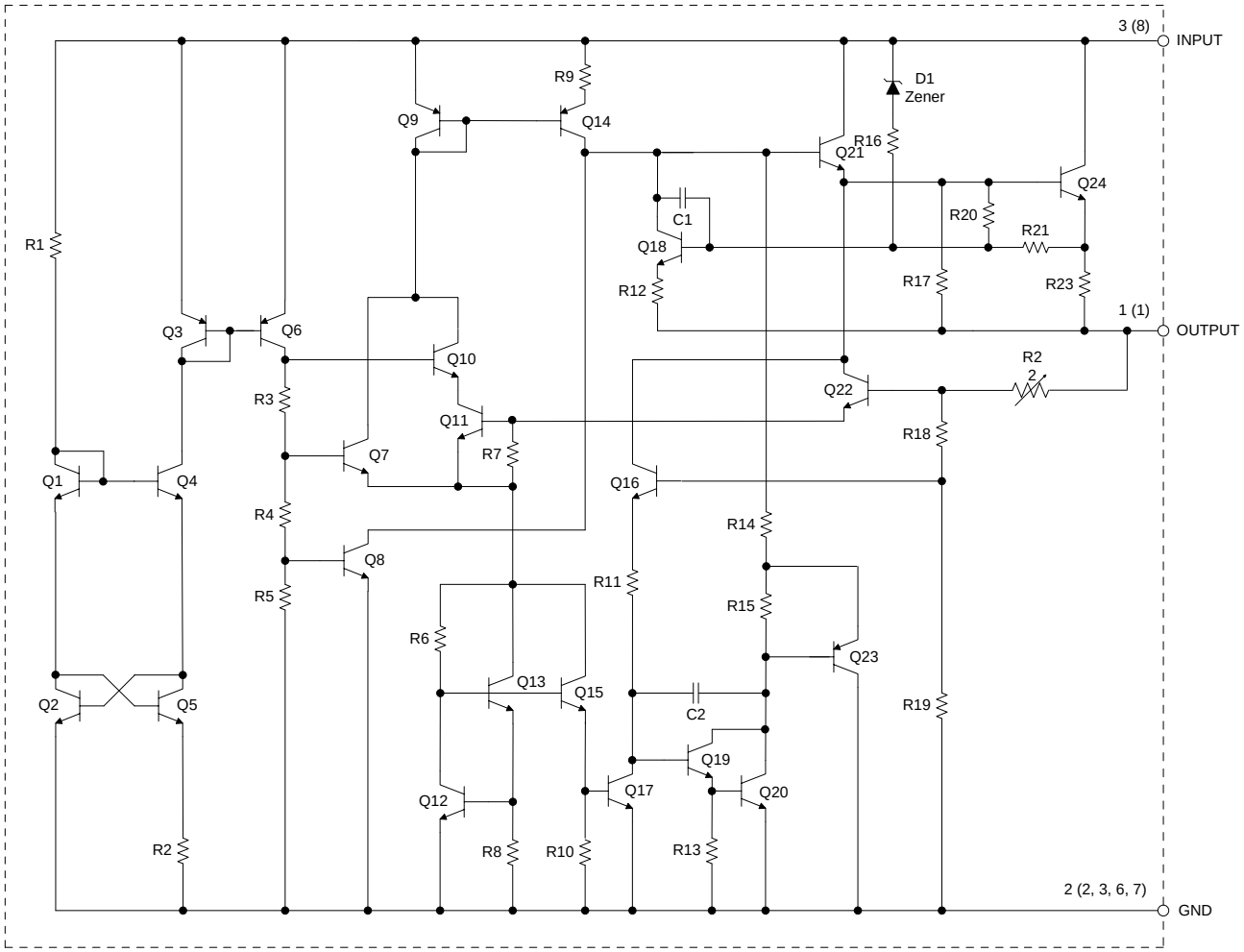
Notes: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Typical Applications Circuit



A (B)
A for 3-pin B for 8-pin

Functional Block Diagram



A (B)
A for 3-pin B for 8-pin

Absolute Maximum Ratings (Note 4)

Symbol	Parameter	Rating		Unit
V_{IN}	Input Voltage	36		V
T_J	Operating Junction Temperature	150		°C
T_{LEAD}	Lead Temperature (Soldering, 10sec)	260		°C
P_D	Power Dissipation	750		mW
T_{STG}	Storage Temperature Range	-65 to +150		°C
θ_{JA}	Thermal Resistance	TO-92	+180	°C/W
ESD	ESD (Human Body Model)	2000		V
ESD	ESD (Machine Model)	200		V

Note 4: Stresses greater than those listed under *"Absolute Maximum Ratings"* can 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 can affect device reliability.

Recommended Operating Conditions

Symbol	Parameter		Min	Max	Unit
V_{IN}	Input Voltage	AS78L05	—	30	V
		AS78L12	—	36	
		AS78L15	—	36	
T_J	Operating Junction Temperature Range		-40	+125	°C

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.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	—	4.8	5.0	5.2	V
		7V ≤ V_{IN} ≤ 20V, 1mA ≤ I_{OUT} ≤ 100mA, P_D ≤ 0.75W	4.75	—	5.25	
V_{RLINE}	Line Regulation	7V ≤ V_{IN} ≤ 20V	—	8	150	mV
V_{RLOAD}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA	—	10	60	mV
I_Q	Quiescent Current	—	—	3	5.5	mA
ΔI_Q	Quiescent Current Change	8V ≤ V_{IN} ≤ 20V	—	—	1.5	mA
		1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	
PSRR	Ripple Rejection	f = 120Hz, 8V ≤ V_{IN} ≤ 18V	47	62	—	dB
V_{DROP}	Dropout Voltage	I_{OUT} = 40mA	—	1.7	2.0	V
		I_{OUT} = 100mA	—	1.8	2.3	
N_O	Output Noise Voltage	10Hz ≤ f ≤ 100kHz (Note 5)	—	40	—	µV
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 5mA	—	0.42	—	mV/°C
$(\Delta V_{OUT}/V_{OUT})/\Delta T$			—	84	—	ppm/°C
θ_{JC}	Thermal Resistance	TO-92 (Bulk Packing)/ TO-92 (Ammo Packing)	—	40	—	°C/W
		SOT-89	—	28.3	—	
		SOIC-8	—	62	—	

Note: 5. 0.01µF minimum load capacitance is recommended to limit high frequency noise.

Electrical Characteristics (continued)

AS78L05C (@ 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.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	—	5.0		5.1	V
V_{RLINE}	Line Regulation	7V ≤ V_{IN} ≤ 20V	—	8	150	mV
V_{RLOAD}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA	—	10	60	mV
I_Q	Quiescent Current	—	—	3	5.5	mA
ΔI_Q	Quiescent Current Change	8V ≤ V_{IN} ≤ 20V	—	—	1.5	mA
		1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	
PSRR	Ripple Rejection	F = 120Hz, 8V ≤ V_{IN} ≤ 18V	47	62	—	dB
V_{DROP}	Dropout Voltage	I_{OUT} = 40mA	—	1.7	—	V
		I_{OUT} = 100mA	—	1.8	—	
N_O	Output Noise Voltage	10Hz ≤ f ≤ 100kHz (Note 5)	—	40	—	µV
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 5mA	—	0.42	—	mV/°C
$(\Delta V_{OUT}/V_{OUT})/\Delta T$			—	84	—	ppm/°C
θ_{JC}	Thermal Resistance	TO-92 (Bulk Packing)/ TO-92 (Ammo Packing)	—	40	—	°C/W
		SOT-89	—	28.3	—	
		SOIC-8	—	62	—	

Note: 5. 0.01µF minimum load capacitance is recommended to limit high frequency noise.

Electrical Characteristics (continued)

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.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	—	11.5	12.0	12.5	V
		14.5V ≤ V_{IN} ≤ 27V, 1mA ≤ I_{OUT} ≤ 100mA, P_D ≤ 0.75W	11.4	—	12.6	
V_{RLINE}	Line Regulation	14.5V ≤ V_{IN} ≤ 27V	—	20	250	mV
V_{RLOAD}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA	—	20	100	mV
I_Q	Quiescent Current	—	—	3	6	mA
ΔI_Q	Quiescent Current Change	16V ≤ V_{IN} ≤ 27V	—	—	1.5	mA
		1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	
PSRR	Ripple Rejection	f = 120Hz, 15V ≤ V_{IN} ≤ 25V	37	42	—	dB
V_{DROP}	Dropout Voltage	I_{OUT} = 40mA	—	1.7	—	V
		I_{OUT} = 100mA	—	1.8	—	
N_O	Output Noise Voltage	10Hz ≤ f ≤ 100kHz (Note 5)	—	80	—	µV
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 5mA	—	1	—	mV/°C
$(\Delta V_{OUT}/V_{OUT})/\Delta T$			—	84	—	ppm/°C
θ_{JC}	Thermal Resistance	TO-92 (Bulk Packing)/ TO-92 (Ammo Packing)	—	40	—	°C/W
		SOT-89	—	28.3	—	
		SOIC-8	—	62	—	

Note: 5. 0.01µF minimum load capacitance is recommended to limit high frequency noise.

Electrical Characteristics (continued)

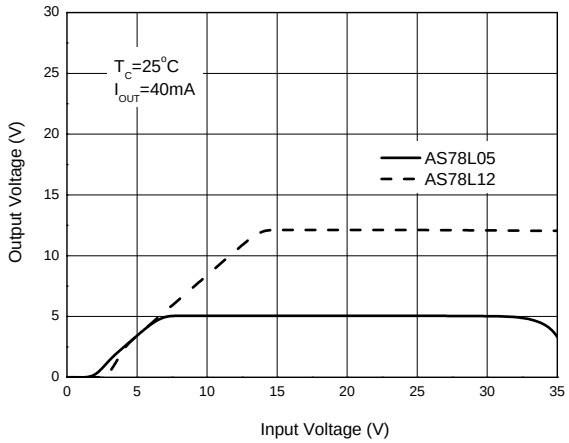
AS78L15 (@ V_{IN} = 23V, I_{OUT} = 40mA, C_{IN} = 0.33µF, C_{OUT} = 0.1µF, T_J = +25°C, **Bold** typeface applies over -40°C ≤ T_J ≤ +125°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	—	14.4	15.0	15.6	V
		17.5V ≤ V_{IN} ≤ 30V, 1mA ≤ I_{OUT} ≤ 100mA, P_D ≤ 0.75W	14.25	—	15.75	
V_{RLINE}	Line Regulation	17.5V ≤ V_{IN} ≤ 30V	—	25	250	mV
V_{RLOAD}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA	—	25	150	mV
I_Q	Quiescent Current	—	—	3	6	mA
ΔI_Q	Quiescent Current Change	20V ≤ V_{IN} ≤ 30V	—	—	1.5	mA
		1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	
PSRR	Ripple Rejection	f = 120Hz, 18.5V ≤ V_{IN} ≤ 28.5V	34	39	—	dB
V_{DROP}	Dropout Voltage	I_{OUT} = 40mA	—	1.7	—	V
		I_{OUT} = 100mA	—	1.8	—	
N_O	Output Noise Voltage	10Hz ≤ f ≤ 100kHz (Note 5)	—	90	—	µV
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 5mA	—	1.25	—	mV/°C
$(\Delta V_{OUT}/V_{OUT})/\Delta T$			—	84	—	ppm/°C
θ_{JC}	Thermal Resistance	TO-92 (Bulk Packing)/ TO-92 (Ammo Packing)	—	40	—	°C/W
		SOT-89	—	28.3	—	
		SOIC-8	—	62	—	

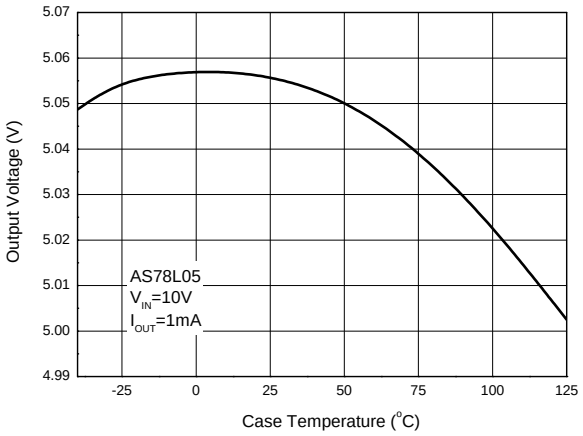
Note: 5. 0.01µF minimum load capacitance is recommended to limit high frequency noise.

Performance Characteristics

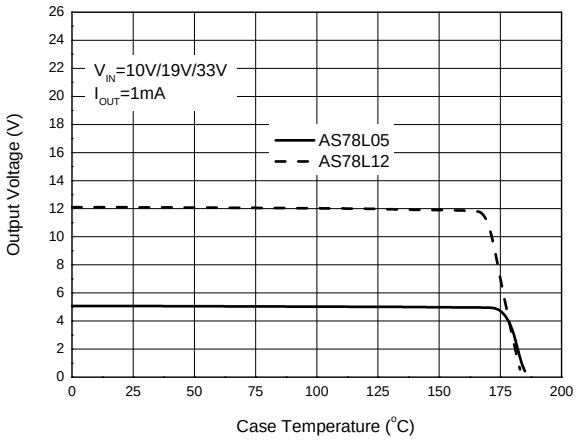
Output Voltage vs. Input Voltage



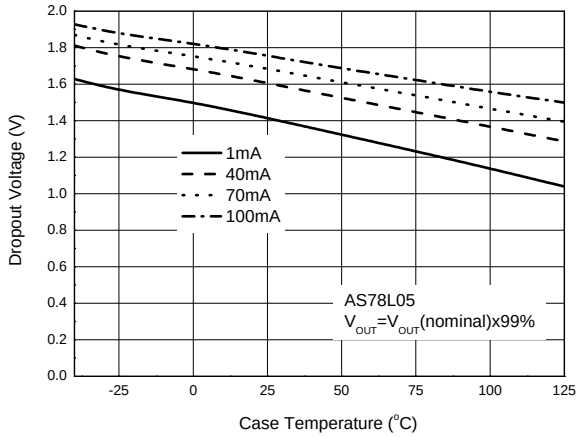
Output Voltage vs. Case Temperature



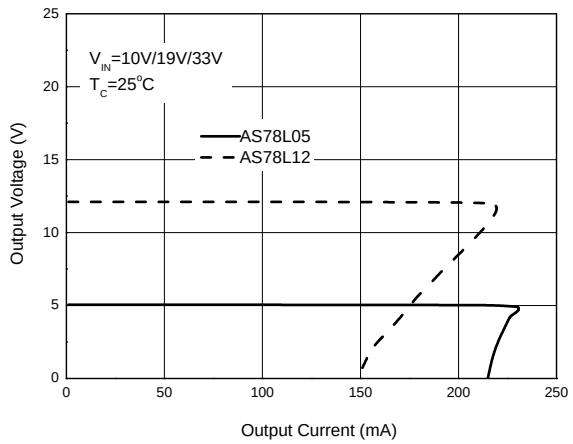
Over Temperature Protection



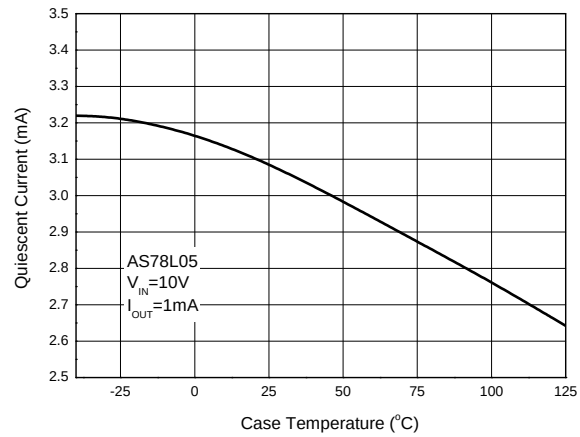
Dropout Voltage vs. Case Temperature



Output Voltage vs. Output Current

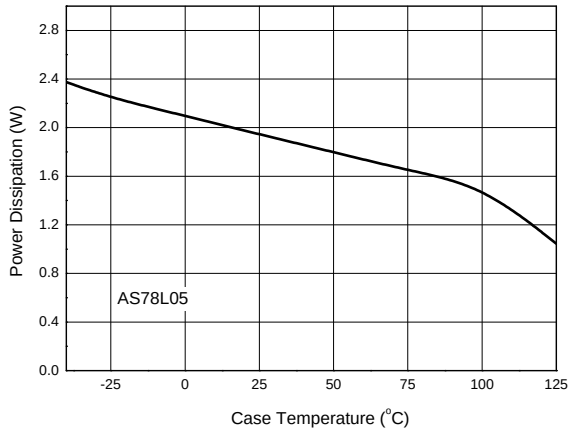


Quiescent Current vs. Case Temperature

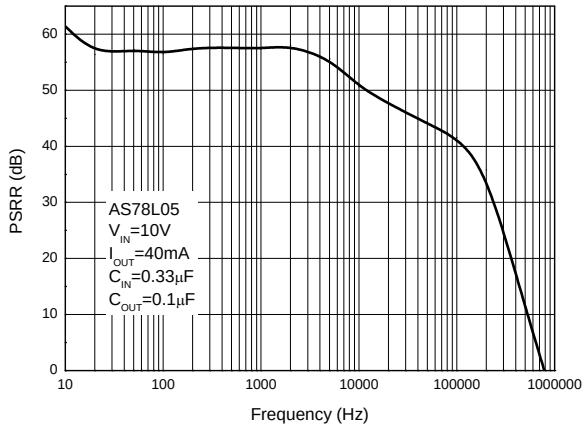


Performance Characteristics (continued)

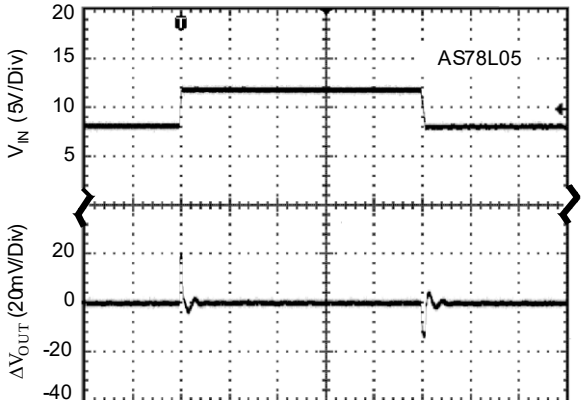
Power Dissipation vs. Case Temperature



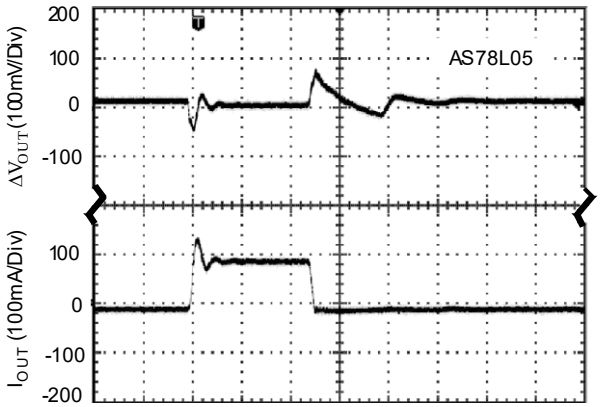
PSRR vs. Frequency



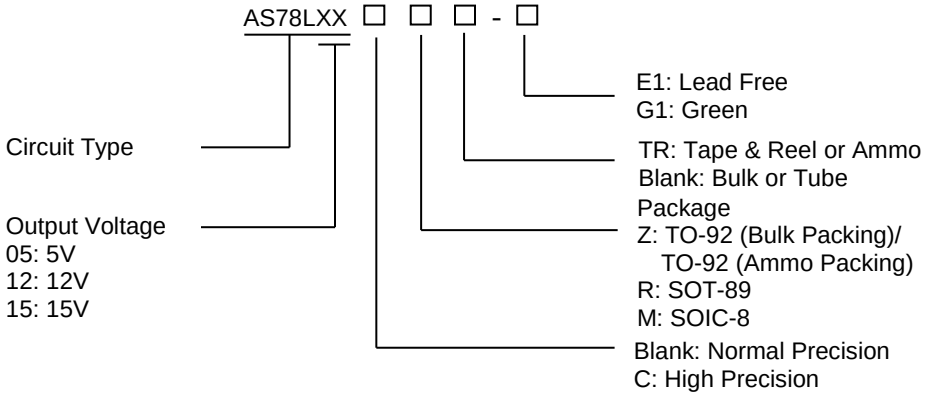
Line Transient
(Conditions: I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF)



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



Ordering Information



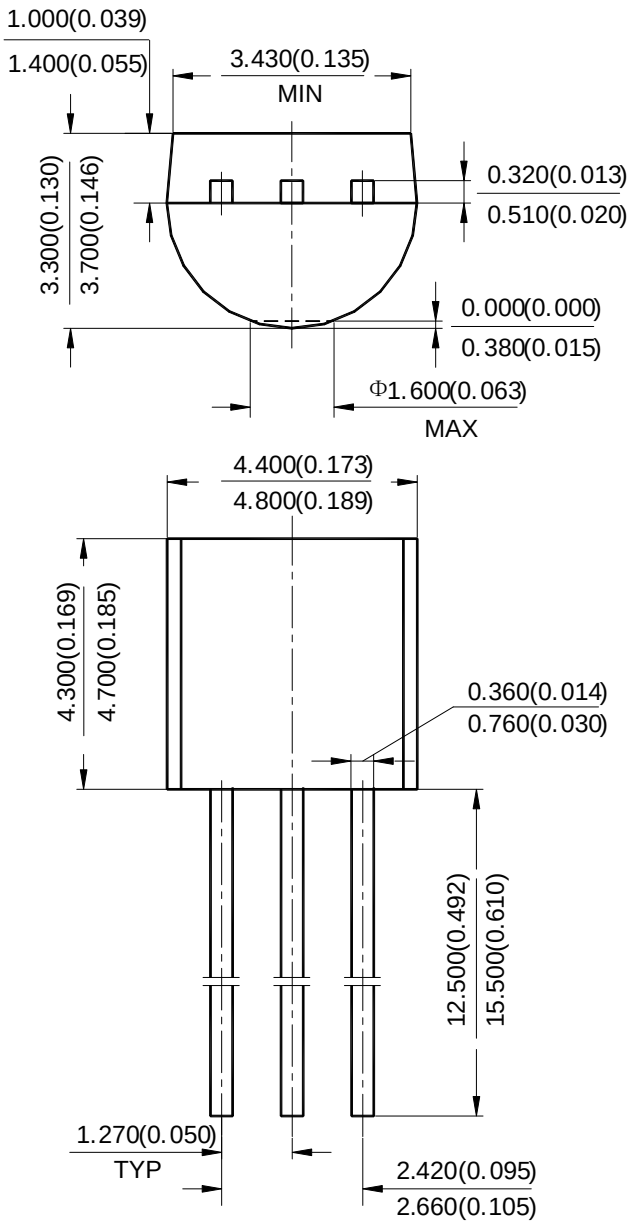
Part Number	Package	Temperature Range	Status	Marking ID	Packing	
					Qty.	Carrier
AS78L05Z-E1	TO-92 (Bulk Packing) TO-92 (Ammo Packing)	-40°C to +125°C	Production	AS78L05Z-E1	10k	Bulk
AS78L05Z-G1			EOL	AS78L05Z-G1	10k	Bulk
AS78L05ZTR-E1			Production	AS78L05Z-E1	2k	Ammo
AS78L05ZTR-G1			Production	AS78L05Z-G1	2k	Ammo
AS78L05CZTR-E1			Production	AS78L05Z-E1	2k	Ammo
AS78L12ZTR-E1			Production	AS78L12Z-E1	2k	Ammo
AS78L15ZTR-E1			Production	AS78L15Z-E1	2k	Ammo
AS78L05RTR-E1	SOT-89	-40°C to +125°C	NRND	E78E	1k	Tape & Reel
AS78L05RTR-G1			Production	G78E	1k	Tape & Reel
AS78L12RTR-G1			Production	G78F	1k	Tape & Reel
AS78L15RTR-E1			NRND	E78G	1k	Tape & Reel
AS78L15RTR-G1			Production	G78G	1k	Tape & Reel
AS78L05MTR-E1	SOIC-8	-40°C to +125°C	NRND	AS78L05M-E1	4k	Tape & Reel
AS78L05MTR-G1			Production	AS78L05M-G1	4k	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green packages.

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

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

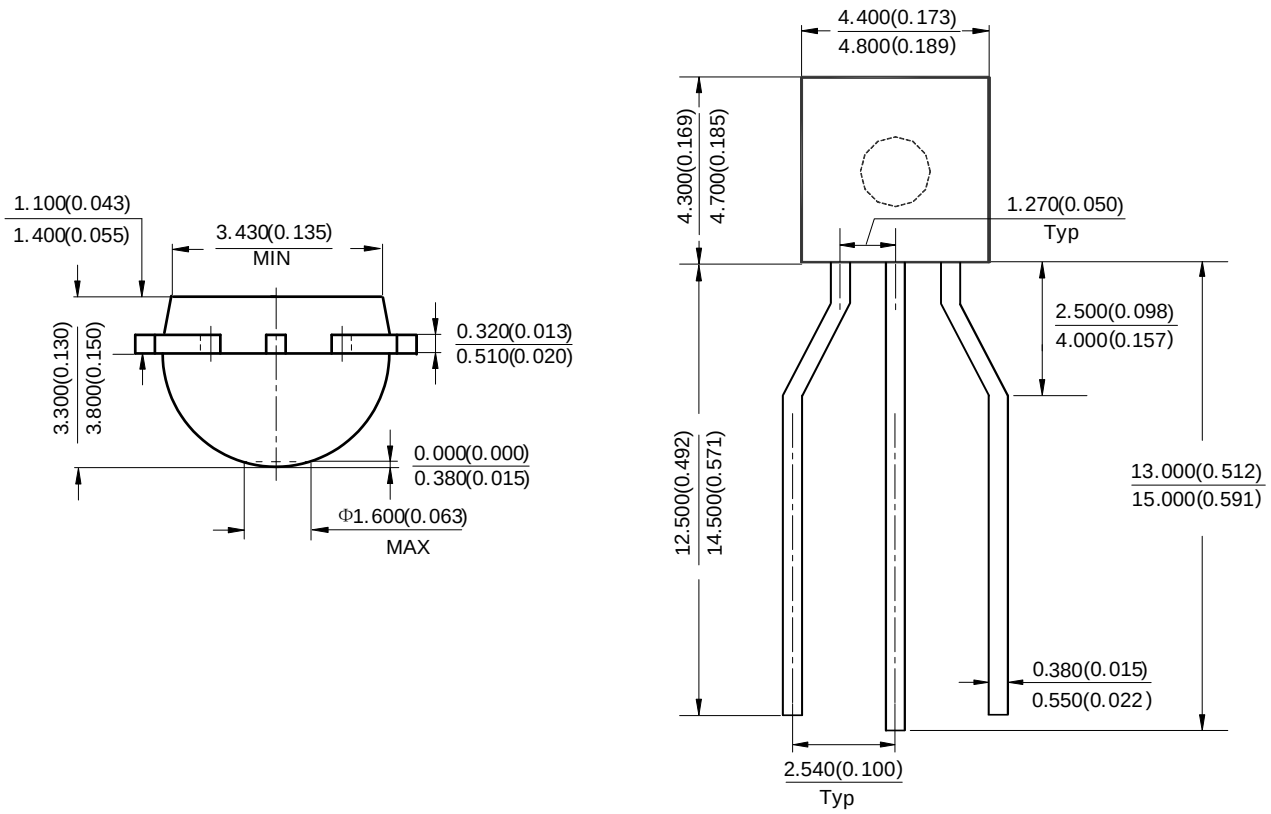
TO-92 (Bulk Packing)



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

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

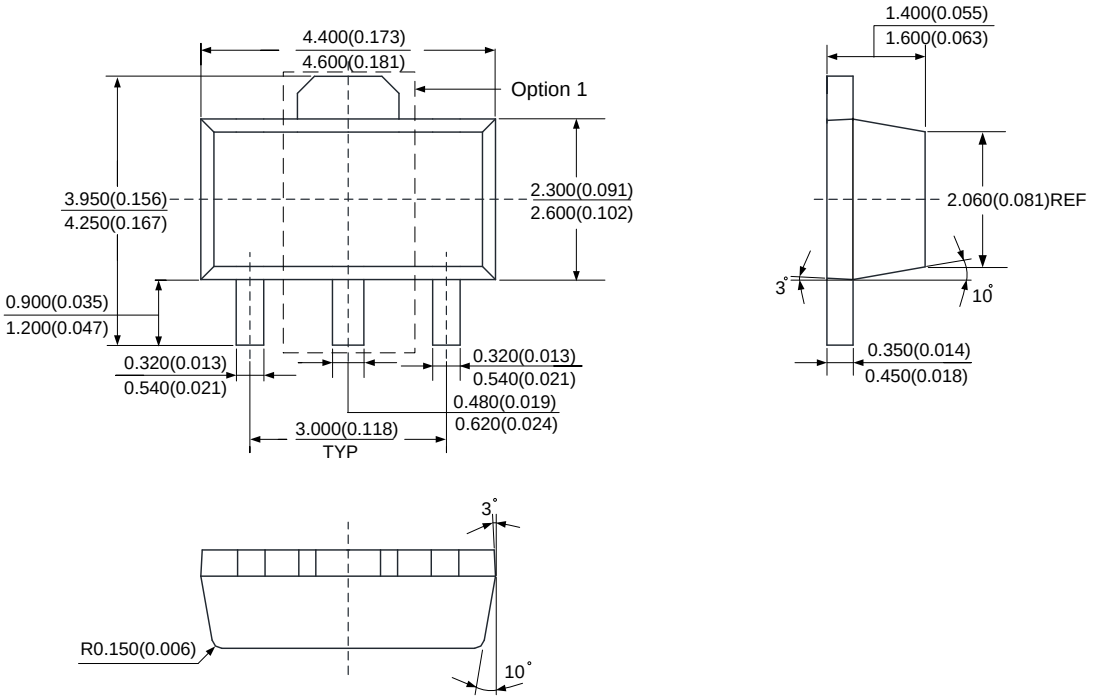
TO-92 (Ammo Packing)

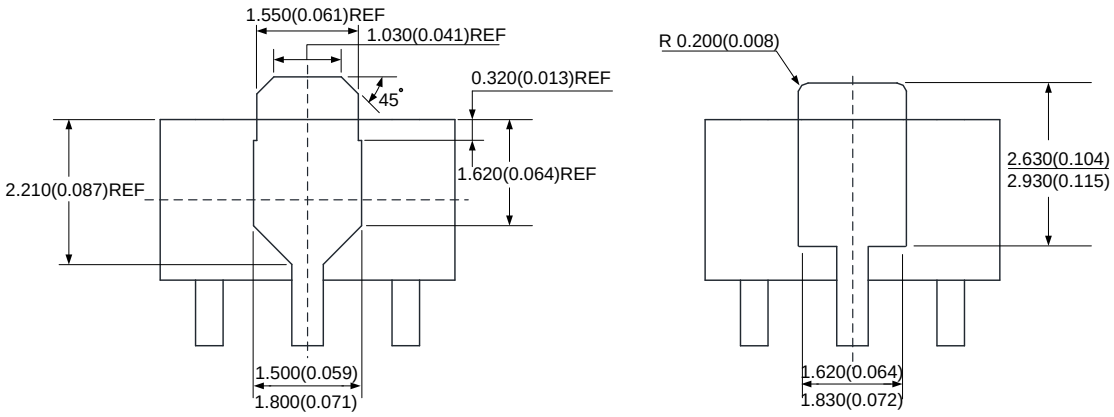


Package Outline Dimensions (continued) (All dimensions in mm (inch).)

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

SOT-89

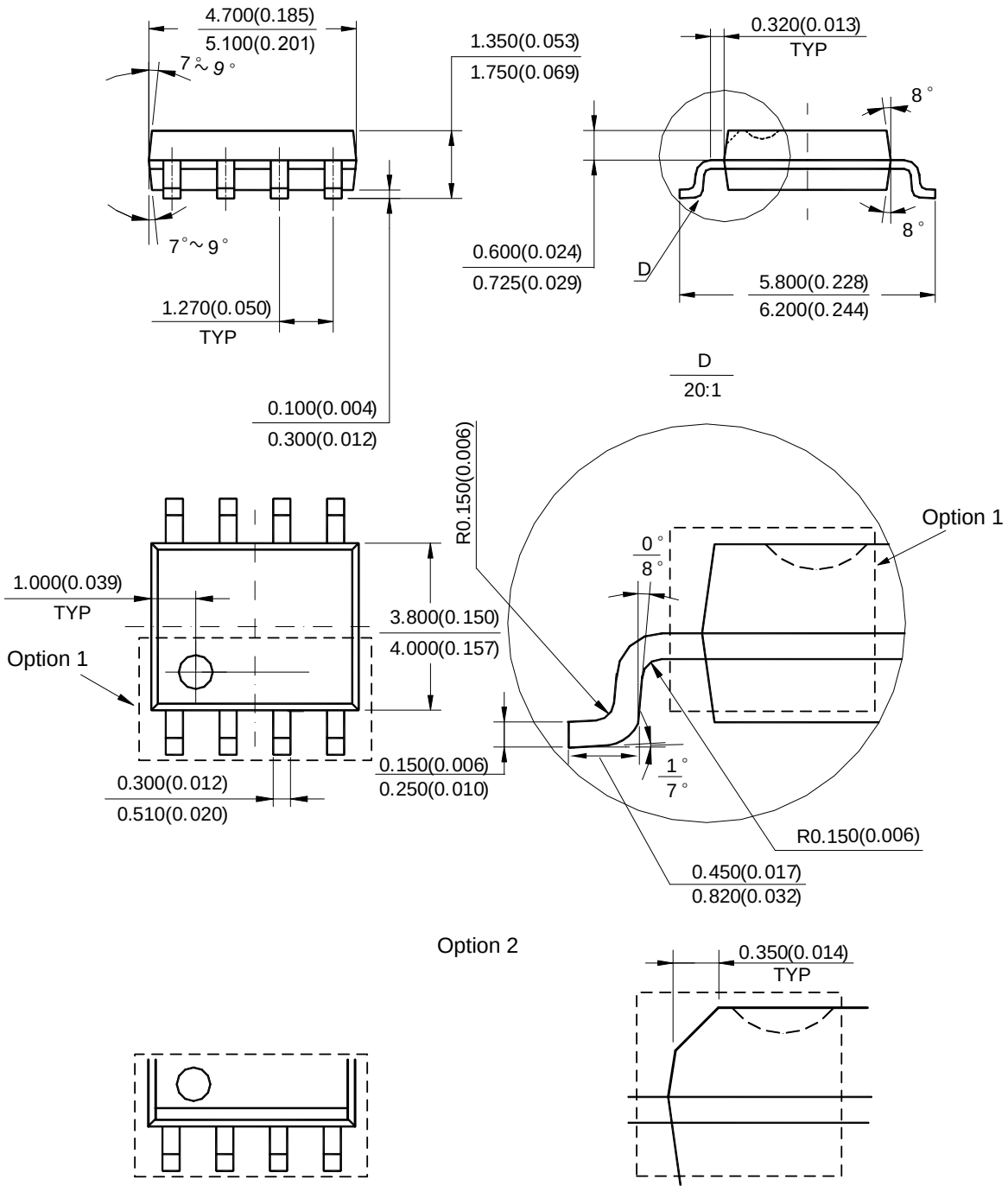




Package Outline Dimensions (continued) (All dimensions in mm (inch).)

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

SOIC-8

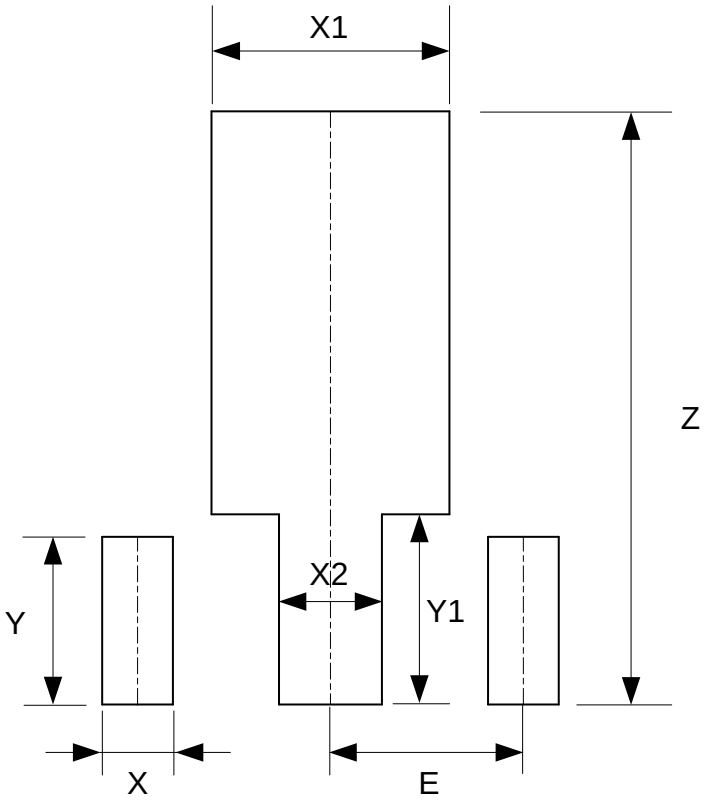


Note: Eject hole, oriented hole and mold mark is optional.

Suggested Pad Layout

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

SOT-89

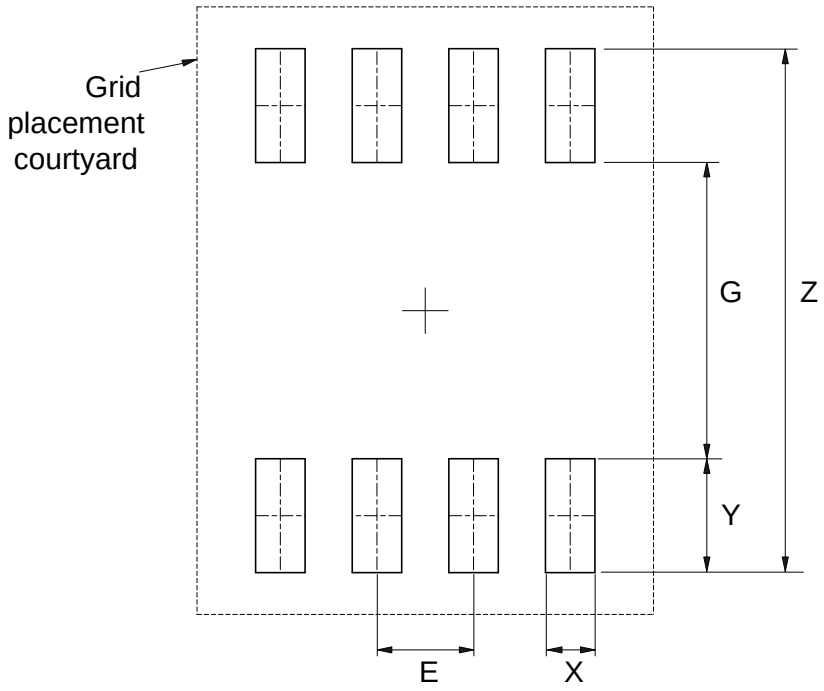


Dimensions	Z (mm)/(inch)	X (mm)/(inch)	X1 (mm)/(inch)	X2 (mm)/(inch)	Y (mm)/(inch)	Y1 (mm)/(inch)	E (mm)/(inch)
Value	4.600/0.181	0.550/0.022	1.850/0.073	0.800/0.031	1.300/0.051	1.475/0.058	1.500/0.059

Suggested Pad Layout (continued)

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

SOIC-8



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)
Value	6.900/0.272	3.900/0.154	0.650/0.026	1.500/0.059	1.270/0.050

Mechanical Data

- Moisture Sensitivity: SOT-89: Level 3 per J-STD-020
  SOIC-8: Level 1 per J-STD-020
- Terminals: Finish— Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight:
  SOIC-8: 0.076 grams (Approximate)
  SOT-89: 0.0561 grams (Approximate)
  TO-92 (Bulk Packing)/ TO-92 (Ammo Packing): 0.157 grams (Approximate)

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