

100mA POSITIVE VOLTAGE REGULATOR

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 or ammo packing), SOT-89 and SOIC-8 packages.

Features

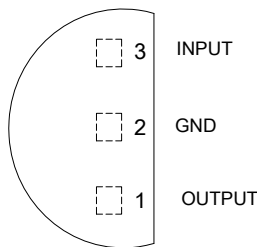
- Output Current up to 100mA
- Fixed Output Voltages of 5V, 12V and 15V
- Output Voltage Accuracy of $\pm 5\%$ over the Full Temperature Range
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- No External Components
- Output Transistor Safe-area Protection

Applications

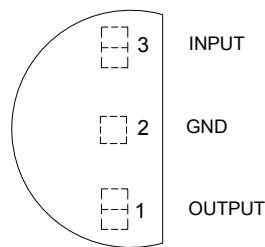
- Consumer Electronics
- Microprocessor Power Supply
- Mother Board

Pin Assignments

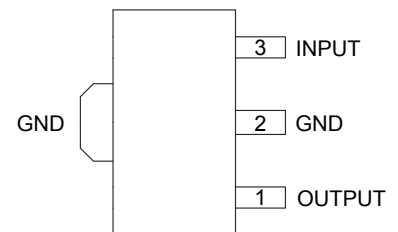
Z Package
(TO-92(Bulk Packing))



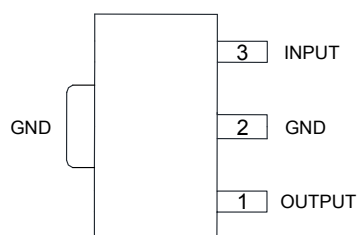
Z Package
(TO-92(Ammo Packing))



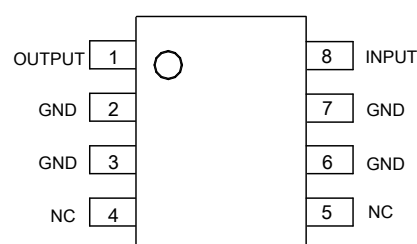
R Package
(SOT-89 Option 1)



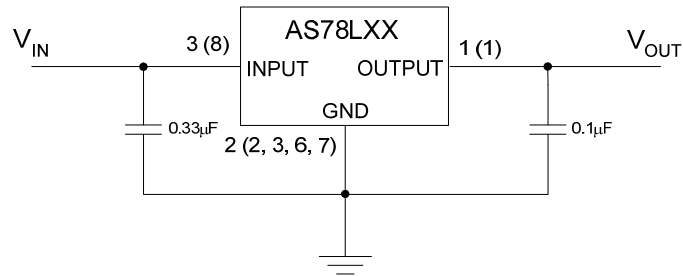
R Package
(SOT-89 Option 2)



M Package
(SOIC-8)

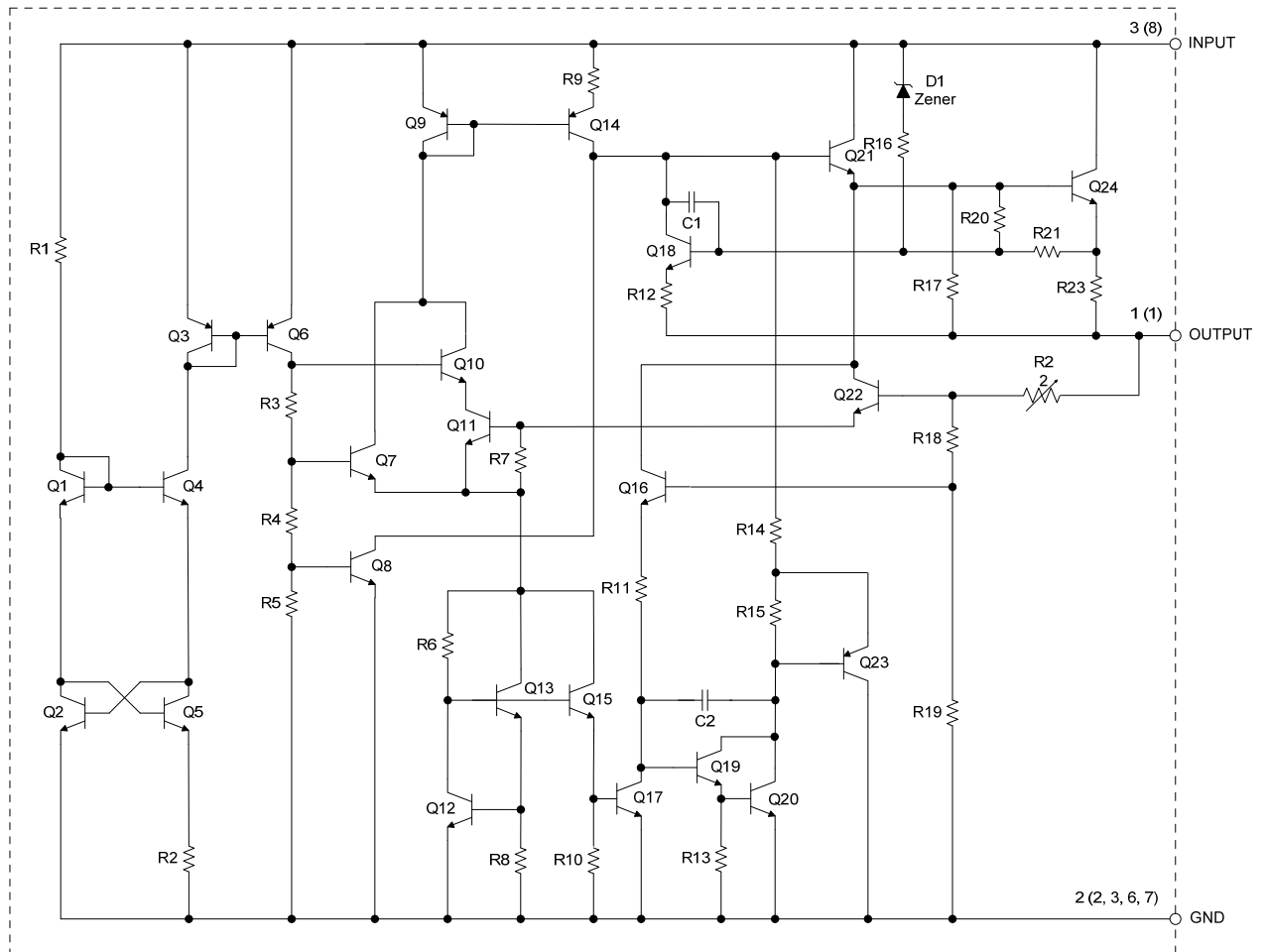


Typical Applications Circuit



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 1)

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 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

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 (@ $V_{IN}=10V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^\circ C$, **Bold** typeface applies over $-40^\circ C \leq T_J \leq 125^\circ C$, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage		4.8	5.0	5.2	V
		$7V \leq V_{IN} \leq 20V$, $1mA \leq I_{OUT} \leq 100mA$, $P_D \leq 0.75W$	4.75		5.25	
V_{RLINE}	Line Regulation	$7V \leq V_{IN} \leq 20V$		8	150	mV
V_{RLOAD}	Load Regulation	$1mA \leq I_{OUT} \leq 100mA$		10	60	mV
I_Q	Quiescent Current			3	5.5	mA
ΔI_Q	Quiescent Current Change	$8V \leq V_{IN} \leq 20V$			1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$			0.1	
PSRR	Ripple Rejection	$f=120Hz$, $8V \leq V_{IN} \leq 18V$	47	62		dB
V_{DROP}	Dropout Voltage	$I_{OUT}=40mA$		1.7		V
		$I_{OUT}=100mA$		1.8		
N_O	Output Noise Voltage	$10Hz \leq f \leq 100kHz$ (Note 2)		40		μV
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	$I_{OUT}=5mA$		0.42		$mV/^\circ C$
$(\Delta V_{OUT}/V_{OUT})/\Delta T$				84		ppm/ $^\circ C$
θ_{JC}	Thermal Resistance	TO-92		40		$^\circ C/W$
		SOT-89		28.3		
		SOIC-8		62		

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

Electrical Characteristics (Cont.)

AS78L05C (@ $V_{IN}=10V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^\circ C$, **Bold** typeface applies over $-40^\circ C \leq T_J \leq 125^\circ C$, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage		5.0		5.1	V
V_{RLINE}	Line Regulation	$7V \leq V_{IN} \leq 20V$		8	150	mV
V_{RLOAD}	Load Regulation	$1mA \leq I_{OUT} \leq 100mA$		10	60	mV
I_Q	Quiescent Current			3	5.5	mA
ΔI_Q	Quiescent Current Change	$8V \leq V_{IN} \leq 20V$			1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$			0.1	
PSRR	Ripple Rejection	$f=120Hz$, $8V \leq V_{IN} \leq 18V$	47	62		dB
V_{DROP}	Dropout Voltage	$I_{OUT}=40mA$		1.7		V
		$I_{OUT}=100mA$		1.8		
N_O	Output Noise Voltage	$10Hz \leq f \leq 100kHz$ (Note 2)		40		μV
$\frac{\Delta V_{OUT}}{\Delta T}$	Output Voltage Temperature Coefficient	$I_{OUT}=5mA$		0.42		mV/ $^\circ C$
$\frac{(\Delta V_{OUT}/V_{OUT})}{\Delta T}$				84		ppm/ $^\circ C$
θ_{JC}	Thermal Resistance	TO-92		40		$^\circ C/W$
		SOT-89		28.3		
		SOIC-8		62		

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

Electrical Characteristics (Cont.)

AS78L12 (@ $V_{IN}=19V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^\circ C$, **Bold** typeface applies over $-40^\circ C \leq T_J \leq 125^\circ C$, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage		11.5	12.0	12.5	V
		$14.5V \leq V_{IN} \leq 27V$, $1mA \leq I_{OUT} \leq 100mA$, $P_D \leq 0.75W$	11.4		12.6	
V_{RLINE}	Line Regulation	$14.5V \leq V_{IN} \leq 27V$		20	250	mV
V_{RLOAD}	Load Regulation	$1mA \leq I_{OUT} \leq 100mA$		20	100	mV
I_Q	Quiescent Current			3	6	mA
ΔI_Q	Quiescent Current Change	$16V \leq V_{IN} \leq 27V$			1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$			0.1	
PSRR	Ripple Rejection	$f=120Hz$, $15V \leq V_{IN} \leq 25V$	37	42		dB
V_{DROP}	Dropout Voltage	$I_{OUT}=40mA$		1.7		V
		$I_{OUT}=100mA$		1.8		
N_O	Output Noise Voltage	$10Hz \leq f \leq 100kHz$ (Note 2)		80		μV
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	$I_{OUT}=5mA$		1		$mV/^\circ C$
$(\Delta V_{OUT}/V_{OUT})/\Delta T$				84		$ppm/^\circ C$
θ_{JC}	Thermal Resistance	TO-92		40		$^\circ C/W$
		SOT-89		28.3		
		SOIC-8		62		

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

Electrical Characteristics (Cont.)

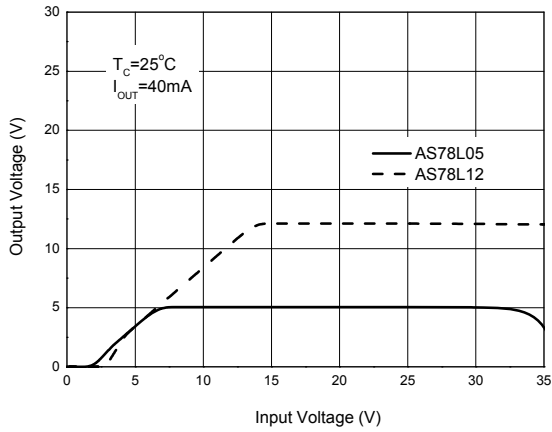
AS78L15 (@ $V_{IN}=23V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^\circ C$, **Bold** typeface applies over $-40^\circ C \leq T_J \leq 125^\circ C$, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage		14.4	15.0	15.6	V
		$17.5V \leq V_{IN} \leq 30V$, $1mA \leq I_{OUT} \leq 100mA$, $P_D \leq 0.75W$	14.25		15.75	
V_{RLINE}	Line Regulation	$17.5V \leq V_{IN} \leq 30V$		25	250	mV
V_{RLOAD}	Load Regulation	$1mA \leq I_{OUT} \leq 100mA$		25	150	mV
I_Q	Quiescent Current			3	6	mA
ΔI_Q	Quiescent Current Change	$20V \leq V_{IN} \leq 30V$			1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$			0.1	
PSRR	Ripple Rejection	$f=120Hz$, $18.5V \leq V_{IN} \leq 28.5V$	34	39		dB
V_{DROP}	Dropout Voltage	$I_{OUT}=40mA$		1.7		V
		$I_{OUT}=100mA$		1.8		
N_O	Output Noise Voltage	$10Hz \leq f \leq 100kHz$ (Note 2)		90		μV
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	$I_{OUT}=5mA$		1.25		$mV/^\circ C$
$(\Delta V_{OUT}/V_{OUT})/\Delta T$				84		ppm/ $^\circ C$
θ_{JC}	Thermal Resistance	TO-92		40		$^\circ C/W$
		SOT-89		28.3		
		SOIC-8		62		

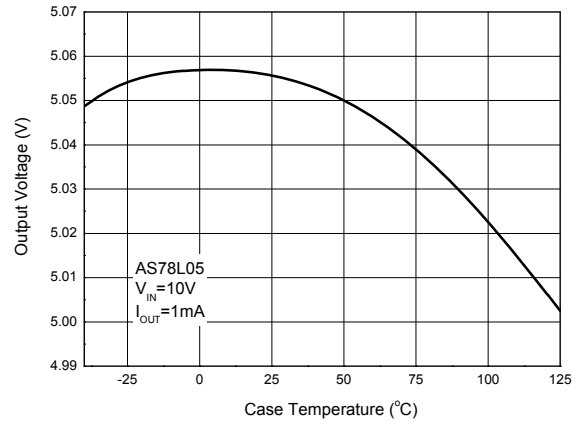
Note 2: 0.01 μF minimum load capacitance is recommended to limit high frequency noise.

Performance Characteristics

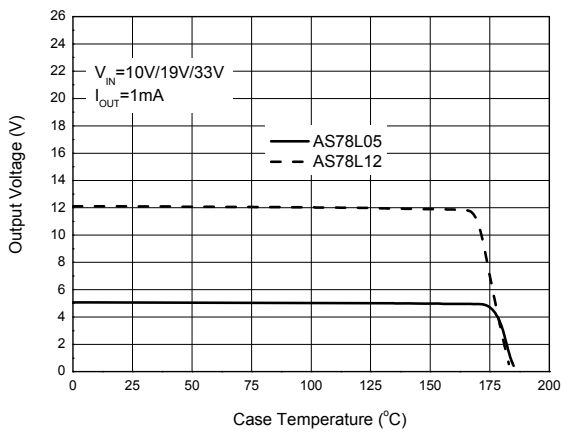
Output Voltage vs. Input Voltage



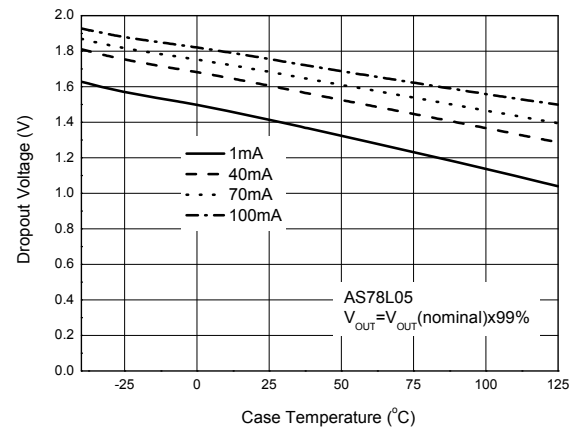
Output Voltage vs. Case Temperature



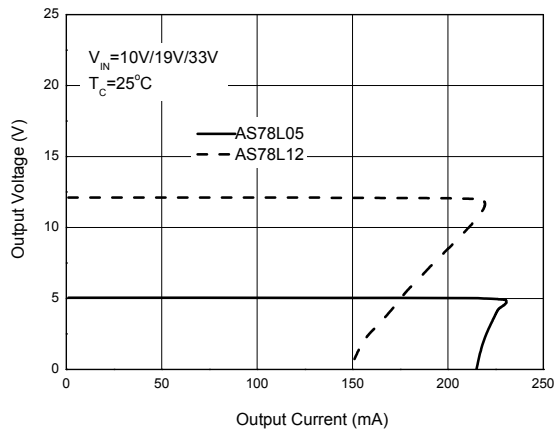
Over Temperature Protection



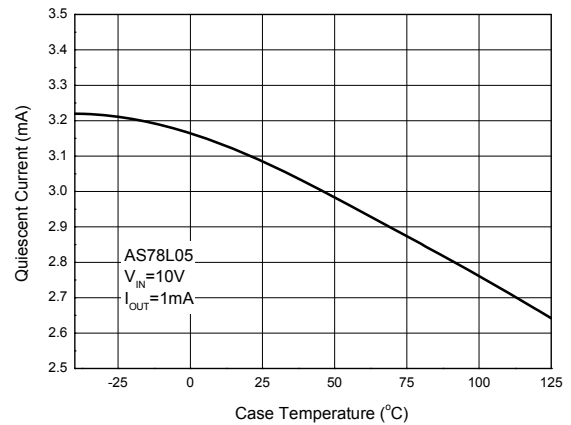
Dropout Voltage vs. Case Temperature



Output Voltage vs. Output Current

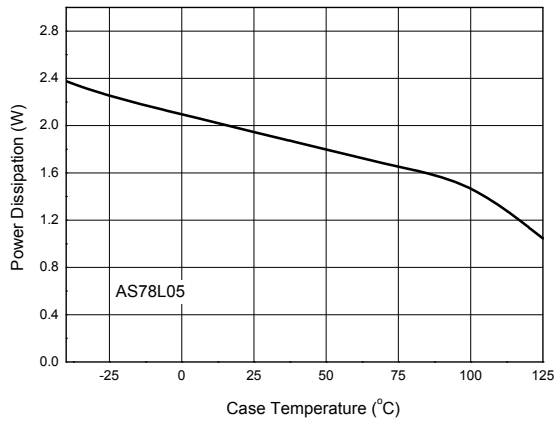


Quiescent Current vs. Case Temperature

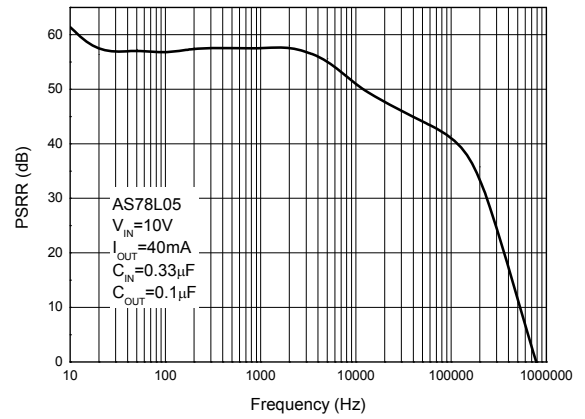


Performance Characteristics (Cont.)

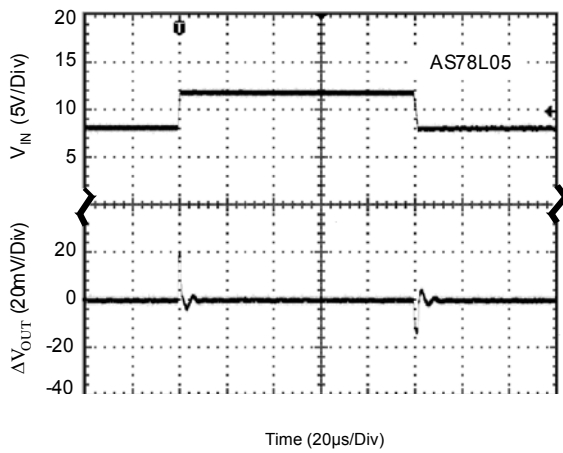
Power Dissipation vs. Case Temperature



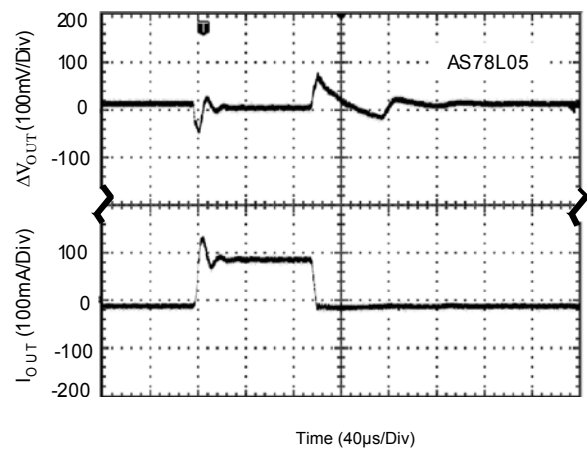
PSRR vs. Frequency



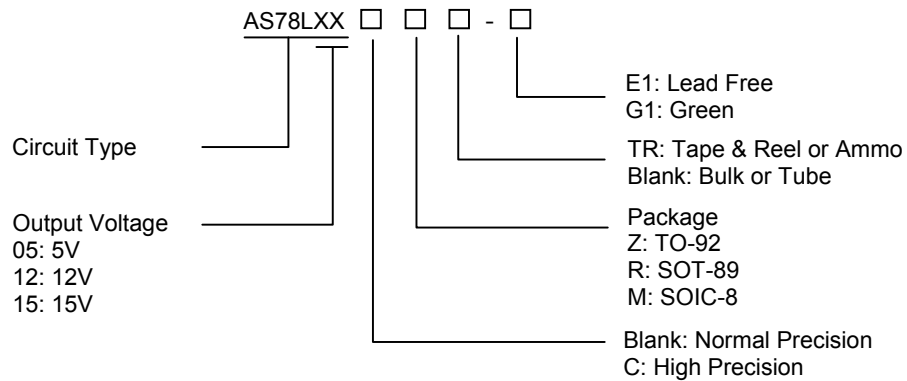
Line Transient
(Conditions: $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$)



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



Ordering Information

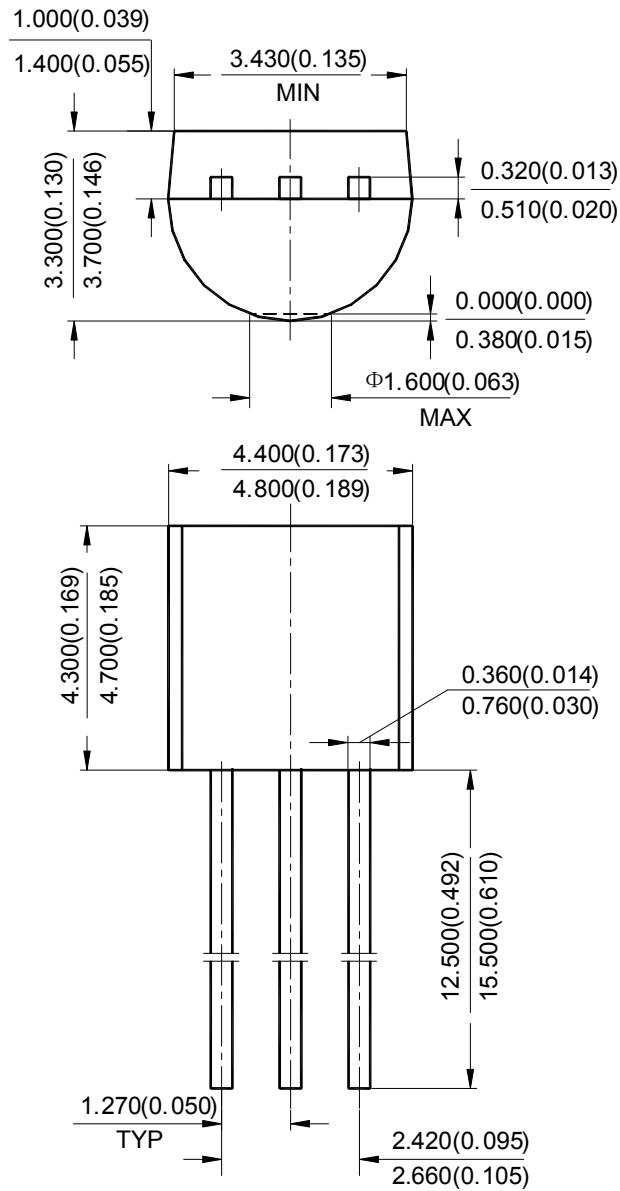


Package	Temperature Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
TO-92	-40 to 125°C	AS78L05Z-E1	AS78L05Z-G1	AS78L05Z-E1	AS78L05Z-G1	Bulk
		AS78L05ZTR-E1	AS78L05ZTR-G1	AS78L05Z-E1	AS78L05Z-G1	Ammo
		AS78L05CZTR-E1	AS78L05CZTR-G1	AS78L05Z-E1	AS78L05Z-G1	Ammo
		AS78L12Z-E1	AS78L12Z-G1	AS78L12Z-E1	AS78L12Z-G1	Bulk
		AS78L12ZTR-E1	AS78L12ZTR-G1	AS78L12Z-E1	AS78L12Z-G1	Ammo
		AS78L15Z-E1	AS78L15Z-G1	AS78L15Z-E1	AS78L15Z-G1	Bulk
		AS78L15ZTR-E1	AS78L15ZTR-G1	AS78L15Z-E1	AS78L15Z-G1	Ammo
SOT-89	-40 to 125°C	AS78L05RTR-E1	AS78L05RTR-G1	E78E	G78E	Tape & Reel
		AS78L12RTR-E1	AS78L12RTR-G1	E78F	G78F	Tape & Reel
		AS78L15RTR-E1	AS78L15RTR-G1	E78G	G78G	Tape & Reel
SOIC-8	-40 to 125°C	AS78L05M-E1	AS78L05M-G1	AS78L05M-E1	AS78L05M-G1	Tube
		AS78L05MTR-E1	AS78L05MTR-G1	AS78L05M-E1	AS78L05M-G1	Tape & Reel
		AS78L12M-E1	AS78L12M-G1	AS78L12M-E1	AS78L12M-G1	Tube
		AS78L12MTR-E1	AS78L12MTR-G1	AS78L12M-E1	AS78L12M-G1	Tape & Reel
		AS78L15M-E1	AS78L15M-G1	AS78L15M-E1	AS78L15M-G1	Tube
		AS78L15MTR-E1	AS78L15MTR-G1	AS78L15M-E1	AS78L15M-G1	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.

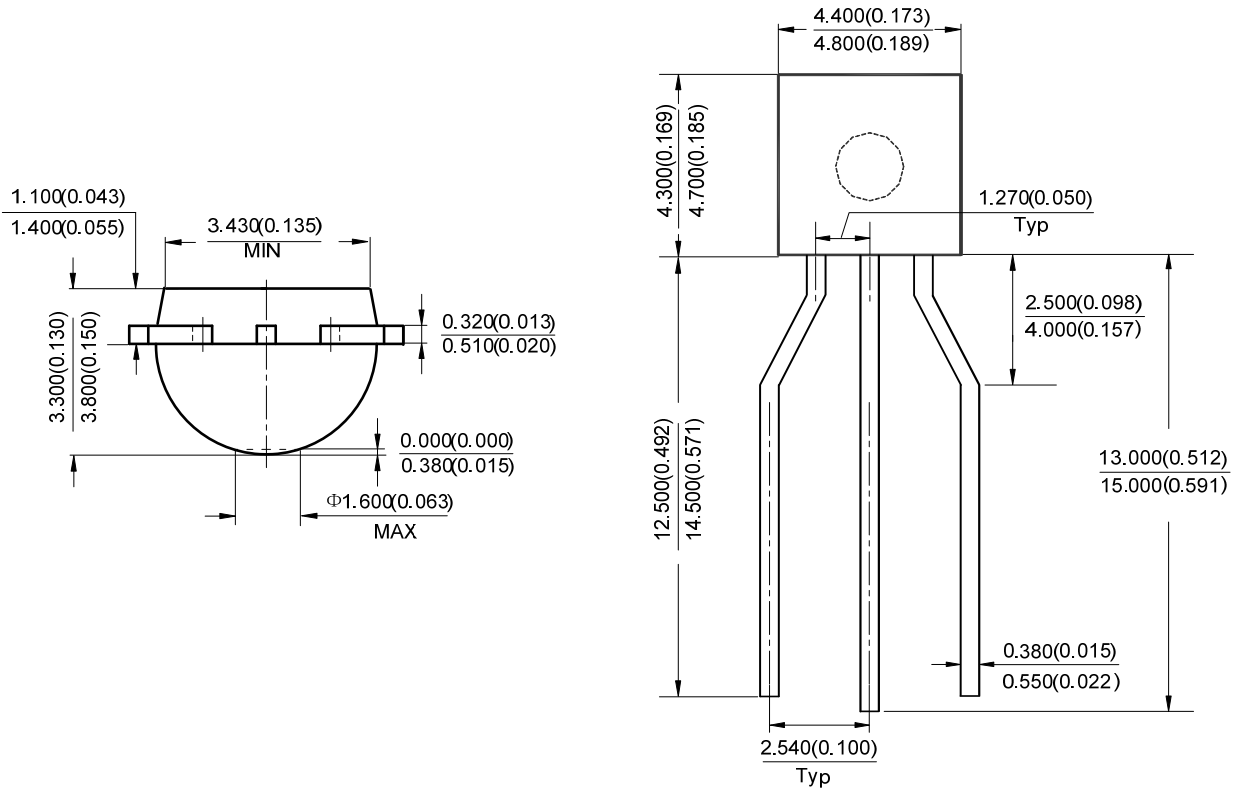
Package Outline Dimensions (All dimensions in mm(inch).)

TO-92 (Bulk Packing)



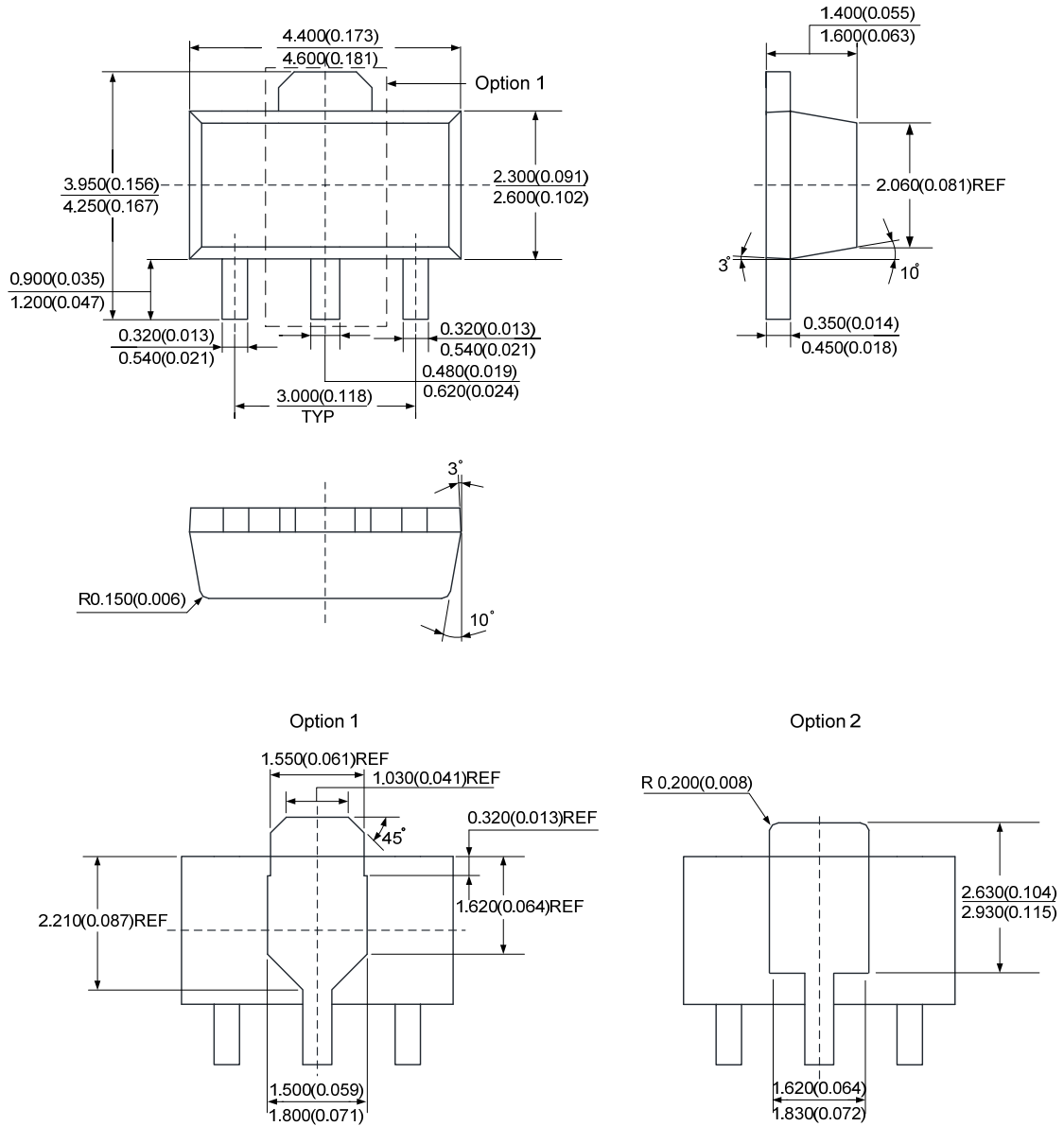
Package Outline Dimensions (Cont. All dimensions in mm(inch).)

TO-92 (Ammo Packing)



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

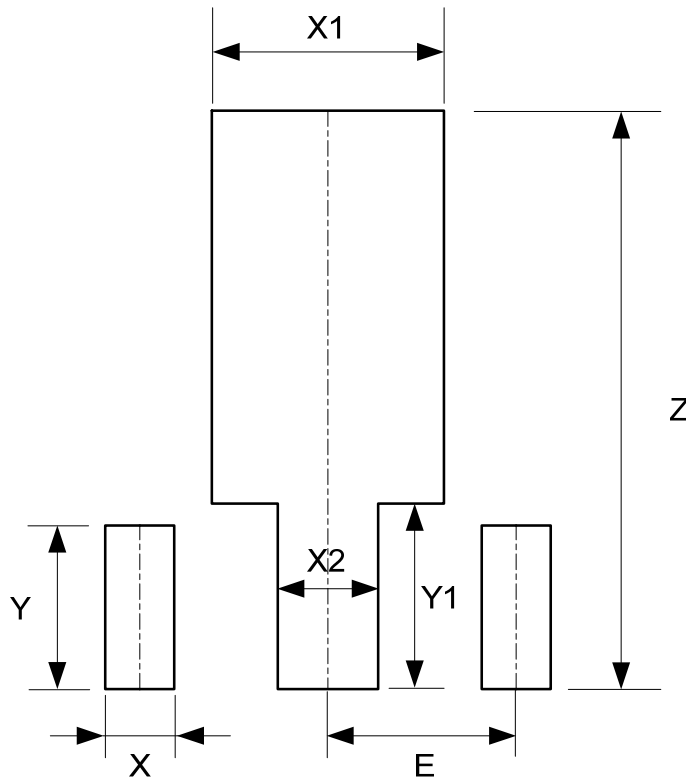
SOT-89



DATA SHEET

Suggested Pad Layout

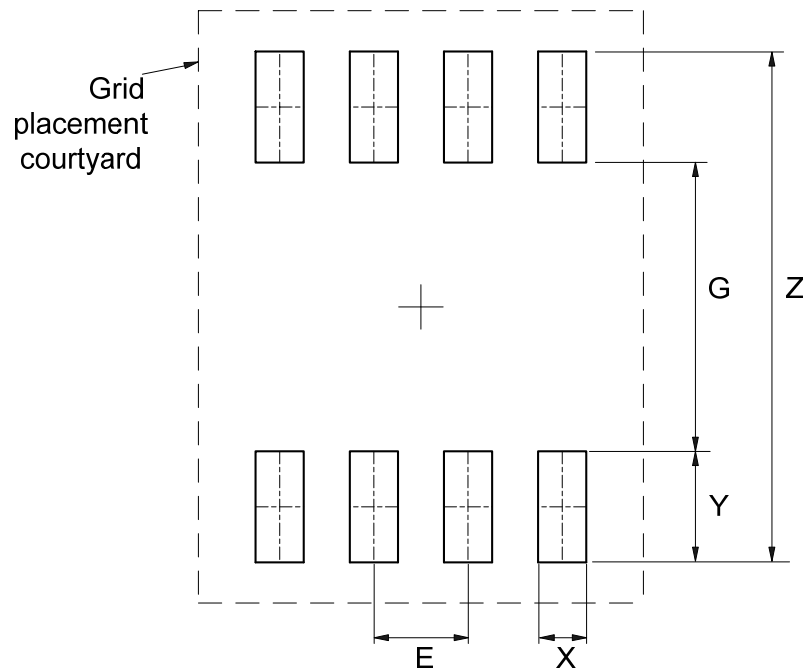
SOT-89



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 (Cont.)

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

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