

GS78LXX

3-Terminal Positive Voltage Regulator

DEC. 2009

Product Description

The GS78Lxx Series of positive voltage regulators are inexpensive, easy-to-use devices suitable for a multitude of applications that require a regulated supply of up to 100mA. Like their higher-powered GS78xx Series cousins, these regulators feature internal current limiting and thermal shutdown making them remarkably rugged. No external components are required with the GS78Lxx devices in many applications.

These devices offer a substantial performance advantage over the traditional zener diode-resistor combination, as output impedance and quiescent current are substantially reduced.

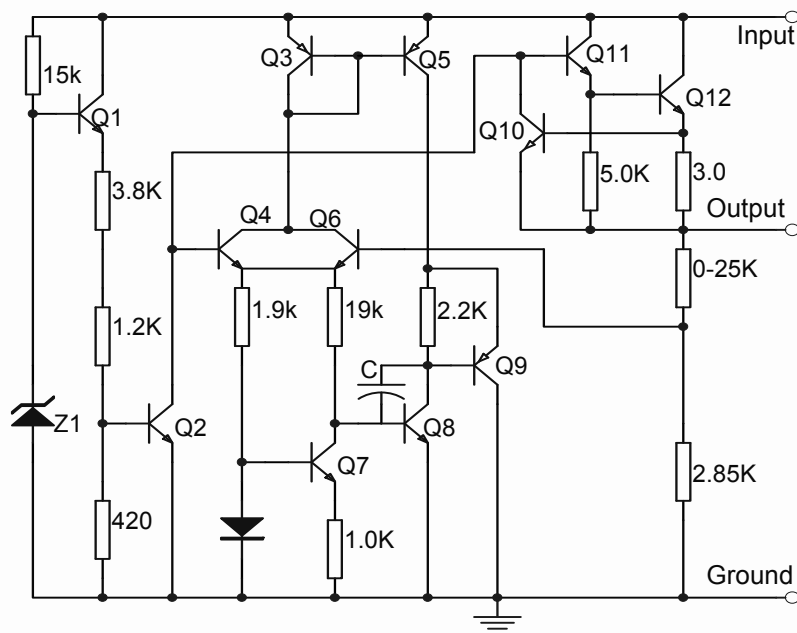
Features

- Wide Range of Available, Fixed Output Voltages
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- No External Components Required
- Complementary Negative Regulators Offered (GS79Lxx Series)
- Available in $\pm 5\%$ Accuracy
- RoHS and Halogen Free Compliant and 100% Lead(Pb)-Free

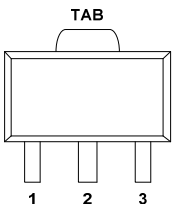
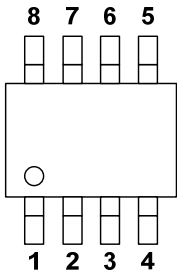
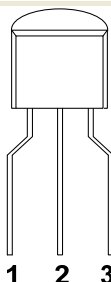
Applications

- Battery Powered Systems
- Portable Consumer Equipment
- Portable Computer
- Radio Control Systems
- Logic Systems
- Power Adapter

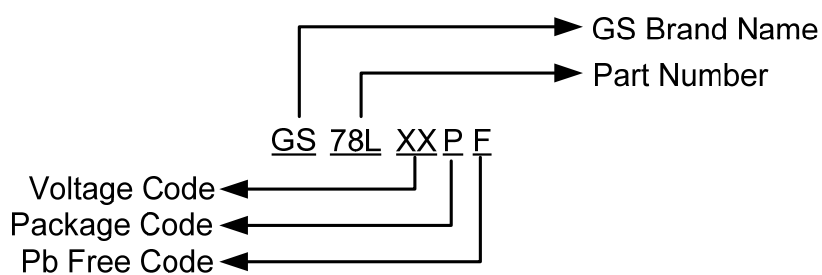
Representative Schematic Diagram



Packages & Pin Assignments

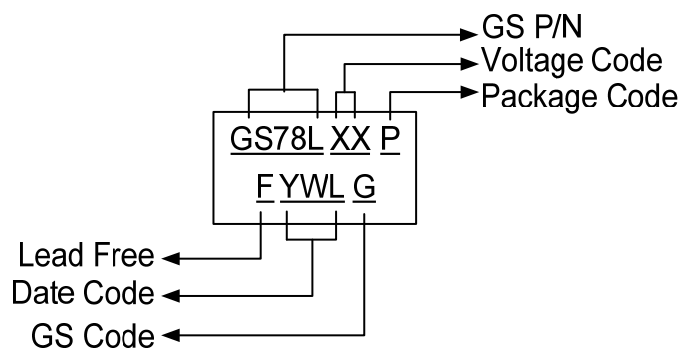
GS78LxxYF (SOT-89)			GS78LxxSF (SOP-8)			GS78LxxNF (TO-92)		
								
PIN NO.	GS78L05YF	GS78L05YUF GS78L12YUF	PIN NO.	GS78L05SF GS78L12SF	PIN NO.	GS78L05NF GS78L12NF		
1	V _{IN}	V _{OUT}	1	V _{OUT}	1	V _{OUT}		
2	GND	GND	8	V _{IN}	2	G _{ND}		
3	V _{OUT}	V _{IN}	2,3,6,7	GND	3	V _{IN}		
			4,5	NC				

Ordering Information



*Request for other voltages, please contact factory directly.

Marking Information



Absolute Maximum Ratings

$T_A=+125^{\circ}\text{C}$, unless otherwise noted.)

Symbol	Parameter	Maximum		Unit
V_{IN}	Input Voltage	25		V
P_D	Power Dissipation	SOT-89	0.5	W
		SOP-8	0.625	
		TO-92	0.5	
θ_{JA}	The Junction-To-Ambient Thermal Resistance	SOT-89	200	$^{\circ}\text{C/W}$
		SOP-8	160	
		TO-92	200	
T_J	Operating Junction Temperature Range	-20 to +120		$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-65 to +150		$^{\circ}\text{C}$

GS78L05 Electrical Characteristics

($V_{IN}=10\text{V}$, $I_{OUT}=40\text{mA}$, $C_{IN}=0.33\mu\text{F}$, $C_{OUT}=0.1\mu\text{F}$, $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, unless otherwise noted.)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	$T_J=+25^{\circ}\text{C}$	4.8	5.0	5.2	V
Reg_{LINE}	Line Regulation	$T_J=+25^{\circ}\text{C}$, $I_{OUT}=40\text{mA}$	--	55	150	mV
		$7.0\text{V} \leq V_{IN} \leq 20\text{V}$, $8.0\text{V} \leq V_{IN} \leq 20\text{V}$	--	45	100	mV
Reg_{LOAD}	Load Regulation	$T_J=+25^{\circ}\text{C}$, $1.0\text{mA} \leq I_{OUT} \leq 100\text{mA}$	--	11	60	mV
		$T_J=+25^{\circ}\text{C}$, $1.0\text{mA} \leq I_{OUT} \leq 40\text{mA}$	--	5.0	30	mV
V_{OUT}	Output Voltage	$7.0\text{V} \leq V_{IN} \leq 20\text{V}$, $1.0\text{mA} \leq I_{OUT} \leq 40\text{mA}$	4.75	--	5.25	V
		$V_{IN}=10\text{V}$, $1.0\text{mA} \leq I_{OUT} \leq 70\text{mA}$	4.75	--	5.25	
I_B	Input Bias Current	$T_J=+25^{\circ}\text{C}$	--	3.8	6.0	mA
		$T_J=+125^{\circ}\text{C}$	--	--	5.5	
ΔI_B	Input Bias Current Change	$8.0\text{V} \leq V_I \leq 20\text{V}$	--	--	1.5	mA
		$1.0\text{mA} \leq I_O \leq 40\text{mA}$	--	--	0.1	
V_N	Output Noise Voltage	$T_A=+25^{\circ}\text{C}$, $10\text{Hz} \leq f \leq 100\text{kHz}$	--	40	--	μV
RR	Ripple Rejection	$I_{OUT}=40\text{mA}$, $f=120\text{Hz}$, $8.0\text{V} \leq V_{IN} \leq 18\text{V}$, $T_J=+25^{\circ}\text{C}$	41	49	--	dB
$V_{IN}-V_{OUT}$	Dropout Voltage	$T_J=+25^{\circ}\text{C}$	--	1.7	--	V

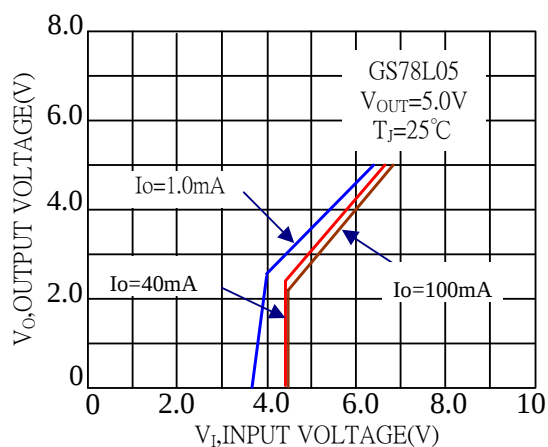
GS78L08 Electrical Characteristics

($V_{IN}=14V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $0^{\circ}C < T_J < +125^{\circ}C$, unless otherwise noted.)

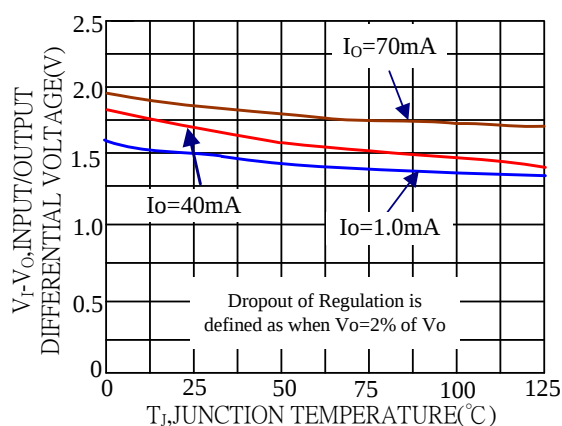
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	$T_J=+25^{\circ}C$	7.6	8.0	8.4	V
Reg_{LINE}	Line Regulation	$T_J=+25^{\circ}C$, $I_{OUT}=40mA$ $10.5V \leq V_{IN} \leq 23V$, $11V \leq V_{IN} \leq 23V$	--	10 8	175 125	mV mV
Reg_{LOAD}	Load Regulation	$T_J=+25^{\circ}C$, $1.0mA \leq I_{OUT} \leq 100mA$ $T_J=+25^{\circ}C$, $1.0mA \leq I_{OUT} \leq 40mA$	--	15 8.0	80 40	mV mV
V_{OUT}	Output Voltage	$10.5V \leq V_{IN} \leq 23V$, $1.0mA \leq I_{OUT} \leq 40mA$ $V_{IN}=14V$, $1.0mA \leq I_{OUT} \leq 70mA$	7.6 7.6	-- --	8.4 8.4	V
I_B	Input Bias Current	$T_J=+25^{\circ}C$ $T_J=+125^{\circ}C$	-- --	3.8 --	6.0 5.5	mA
ΔI_B	Input Bias Current Change	$11V \leq V_I \leq 23V$ $1.0mA \leq I_O \leq 40mA$	-- --	-- --	1.5 0.1	mA
V_N	Output Noise Voltage	$T_A=+25^{\circ}C$, $10Hz \leq f \leq 100kHz$	--	40	--	μV
RR	Ripple Rejection	$I_{OUT}=40mA$, $f=120Hz$, $8.0V \leq V_{IN} \leq 18V$, $T_J=+25^{\circ}C$	41	49	--	dB
$V_{IN}-V_{OUT}$	Dropout Voltage	$T_J=+25^{\circ}C$	--	1.7	--	V

Typical Performance Characteristics

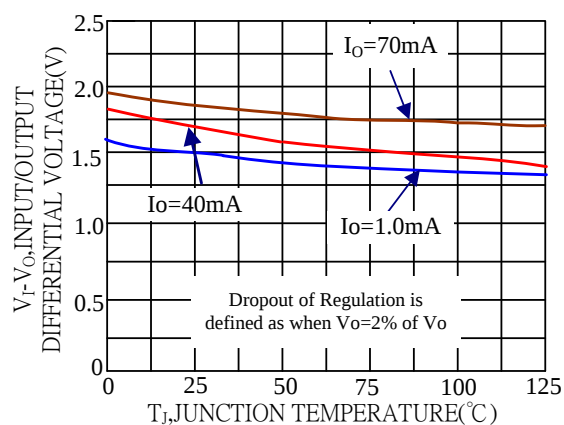
Dropout Characteristics



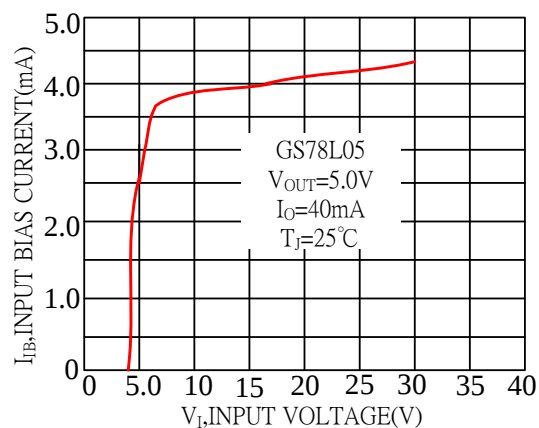
Dropout Voltage versus Junction Temperature



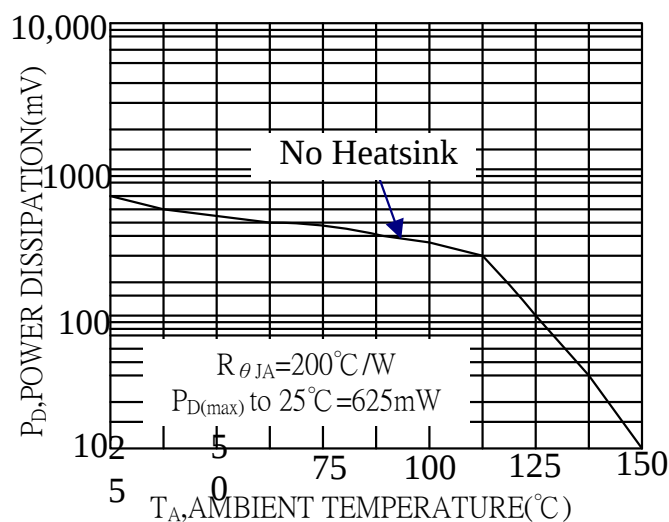
Input Bias Current versus Ambient Temperature



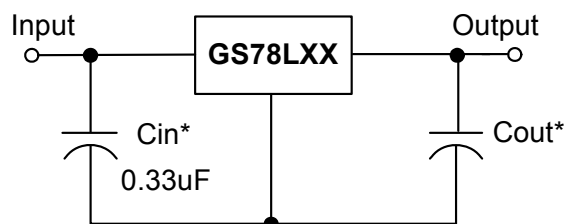
Input Bias Current versus Input Voltage



Maximum Average Power Dissipation versus Ambient Temperature TO-92 Type Package



Typical Applications



A common ground is required between the input and the output voltages.

* C_{IN} is required if regulator is located an appreciable distance from power supply filter.

** C_{OUT} is not needed for stability, however, it does improve transient response.

Design Considerations

The GS78LXX Series of fixed voltage regulators are designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition. Internal Short Circuit Protection Limits the maximum current the circuit will pass.

In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. The input bypass capacitor should be selected to provide good high-frequency characteristics to insure stable operation under all load conditions. A 0.33 μ F or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead. Bypassing the output is also recommended.

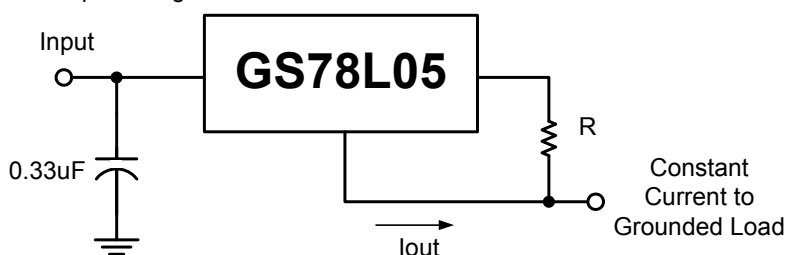
Current Regulator

The GS78LXX regulators can also be used as a current source when connected as above. In order to minimize dissipation the GS78L05 is chosen in this application. Resistor R determines the current as follows:

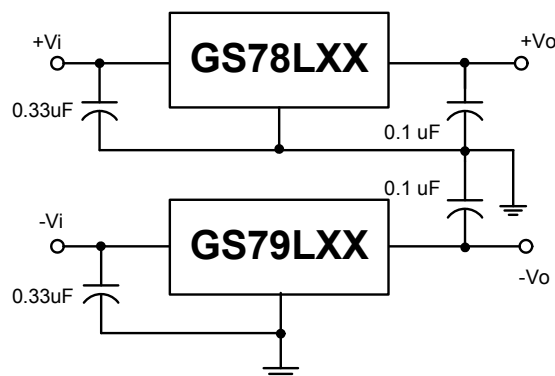
$$I_{out} = \frac{5.0V}{R} + I_B$$

$I_B = 3.8\text{mA}$ over line and load changes

For example, a 100mA current source would require R to be a 50 Ω , 1/2 W resistor and the output voltage compliance would be the input voltage less 7V.

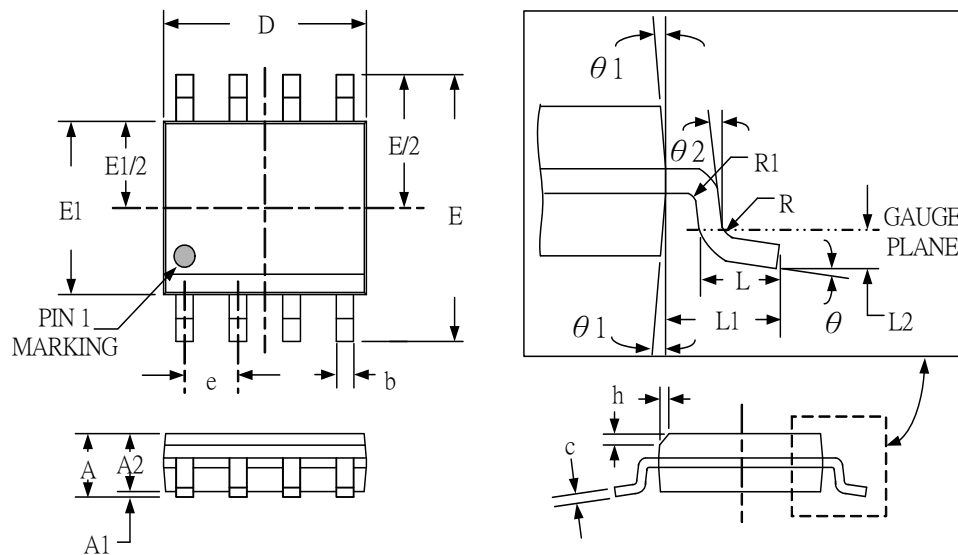


Positive and Negative Regulator



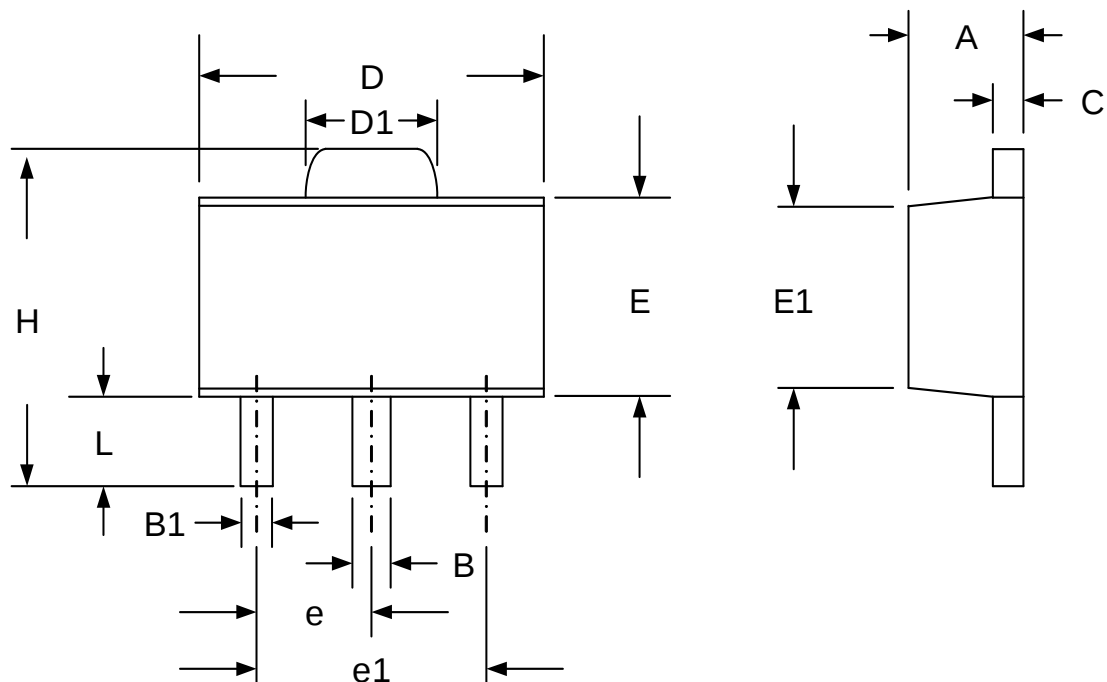
Package Dimension

SOP-8 PLASTIC PACKAGE



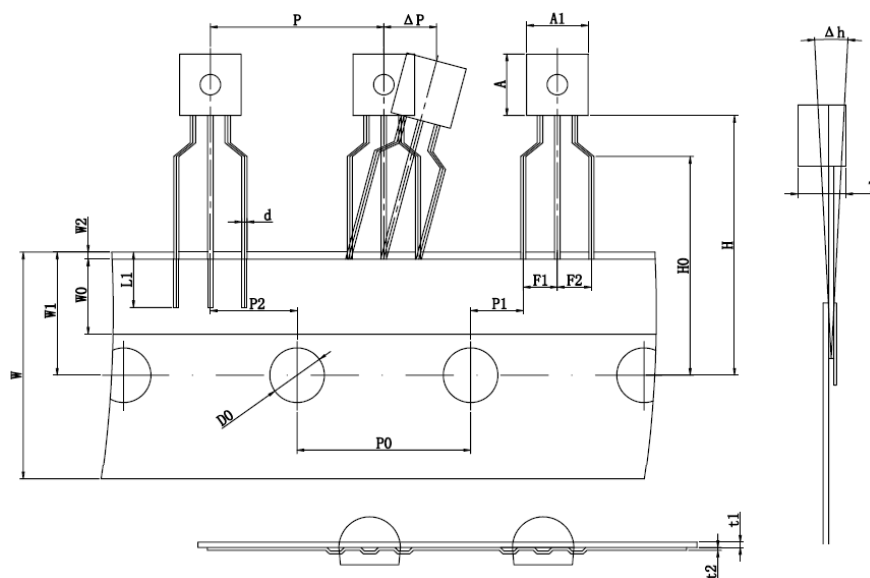
Dimensions				
SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	.053	.069
A1	0.10	0.25	.004	.010
A2	1.25	1.65	.049	.065
b	0.31	0.51	.012	.020
c	0.17	0.25	.007	.010
D	4.90 (TYP)		.193 (TYP)	
E	6.00 (TYP)		.236 (TYP)	
E1	3.90 (TYP)		.154 (TYP)	
e	1.27 (TYP)		.050 (TYP)	
L	0.40	1.27	.016	.050
L1	1.04 (TYP)		.041 (TYP)	
L2	0.25 (TYP)		.010 (TYP)	
R	0.07	-	.003	-
R1	0.07	-	.003	-
h	0.25	0.50	.010	.020
θ	0°	8°	0°	8°
θ_1	5°	15°	5°	15°
θ_2	0°	-	0°	-

SOT-89 PLASTIC PACKAGE



Dimensions				
SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	1.40	1.60	.055	.063
B	0.44	0.56	.017	.022
B1	0.36	0.48	.014	.019
C	0.35	0.44	.014	.017
D	4.40	4.60	.173	.181
D1	1.62	1.83	.064	.072
E	2.29	2.60	.090	.102
E1	2.13	2.29	.084	.090
e	1.50 (TYP)		.059 (TYP)	
e1	3.00 (TYP)		.118 (TYP)	
H	3.94	4.25	.155	.167
L	0.89	1.20	.035	.047

TO-92 PLASTIC PACKAGE



Dimensions

SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A1	4.4	4.6	.173	.181
A	4.4	4.6	.173	.181
T	3.4	3.6	.133	.142
d	.36	.40	.014	.016
P	12.4	13.0	.487	.512
P0	12.5	12.9	.491	.508
P2	6.05	6.65	.238	.262
F1,F2	2.2	2.8	.086	.110
Δh	-1.0	1.0	-.039	.039
W	17.5	19	.688	.748
W0	5.5	6.5	.216	.256
W1	8.5	9.5	.334	.374
W2	-	1	-	.039
H	19.	21	.747	.827
H0	15.5	16.5	.609	.650
L1	2.5	-	.098	-
D0	3.8	4.2	.149	.165
t1	.35	.45	.014	.018
t2	.15	.25	.006	.010
P1	3.55	4.15	.140	.163
ΔP	-1	1	-.039	.039

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