TS79L00 Series

3-Terminal Negative Output Voltage Regulators

The TS79L00 Series of negative voltage regulators are inexpensive, easy-to-use devices suitable for a multitude of applications that require up to 100 mA. Like their higher powered TS7900 Series negative regulators, this series features thermal shutdown and current limiting, making them remarkably rugged. In most applications, no external components are required for operation.

The TS79L00 devices are useful for on-card regulation or any other application where a regulated negative voltage at a modest current level is needed. These regulators offer substantial advantage over the common resistor/zener diode approach.

FEATURES

- No External Components Required
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- Complementary Positive Regulators Offered (TS78L00 Series)
- Wide Range of Available, Fixed Output Voltages
- Available in ±2% Voltage Tolerance.

SOT-89

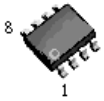
Pin 1. Ground
2. Input
3. Output

(Heatsink surface connected to Pin 2)

TO-92

Pin 1. Ground
2. Input
3. Output

SOP-8



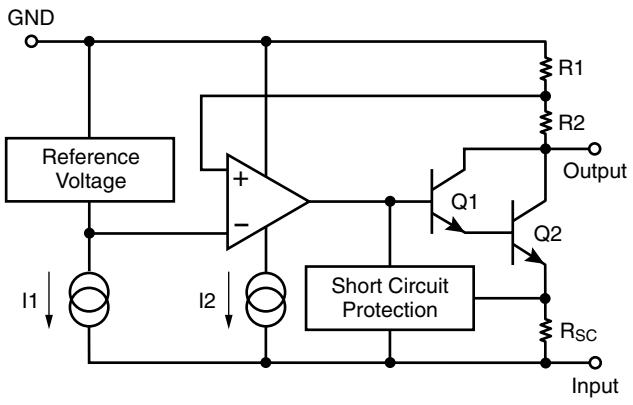
Pin 1. Vout 5. Gnd
2. Vin 6. Vin
3. Vin 7. Vin
4. Nc 8. Nc

ORDERING INFORMATION

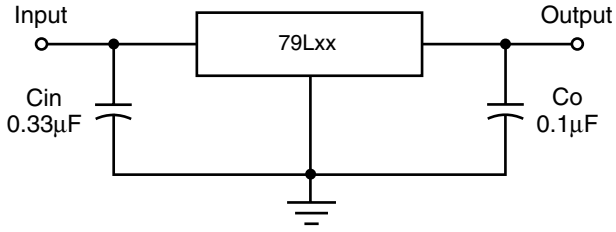
Device	Operating Temperature (Ambient)	Package
TS79LxxCT	-20 to +85	TO-92
TS79LxxCS		SOP-8
TS79LxxCY		SOT-89

CIRCUIT SCHEMATIC

REPRESENTATIVE CIRCUIT SCHEMATIC



TYPICAL CONNECTING CIRCUIT



Notes:

A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0V more negative even during the high point on the input ripple voltage.

xx = these two digits of the part number indicate output voltage.

Cin is required if regulator is located an appreciable distance from power supply filter.

Co improves stability and transient response.

TS79L00 Series

3-Terminal Negative Output Voltage Regulators

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

RATING	SYMBOL	TS79L00 SERIES	UNIT
Input Voltage	Vin *1	- 35	V
Input Voltage	Vin *2 *3	- 40	V
Storage Temperature	Tstg	- 25 to +150	°C
Operating Ambient Temperature	T_{opr}	-20 to +85	°C
Operating Junction Temperature	T_J	0 to +125	°C

Note: *1. TS79L05
*2. TS79L12, TS79L15, TS79L18
*3. TS79L24

• *TS79L05 ELECTRICAL CHARACTERISTICS*

(V_I = -10V , I_O = 40 mA, C_I = 0.33 µF, C_O = 0.1 µF, 0°C < T_J < 125°C unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (T_J = + 25°C)	V_O	- 4.9	- 5.0	- 5.1	Vdc
Line Regulation (T_J = + 25°C)	REGline				mV
-7.0 Vdc ≥ V_I ≥ -20 Vdc		--	--	150	
-8.0 Vdc ≥ V_I ≥ -20 Vdc		--	--	100	
Load Regulation	REGload				mV
T_J = + 25°C, 1.0 mA≤I_O≤ 100 mA		--	--	60	
1.0 mA≤I_O≤40 mA		--	--	30	
Output Voltage	V_O				Vdc
- 7.0 Vdc ≥ V_I ≥ -20 Vdc, 1.0mA≤I_O ≤40 mA		- 4.9	--	- 5.1	
V_I = -10 Vdc, 1.0mA≤I_O ≤70 mA		- 4.9	--	- 5.1	
Input Bias Current	I_{IB}				mA
(T_J = +25°C)		--	--	6.0	
(T_J = +125°C)		--	--	5.5	
Input Bias Current Change	ΔI_{IB}				mA
- 8.0 Vdc ≥ V_I ≥ -20 Vdc		--	--	1.5	
1.0 mA ≤ I_O ≤40 mA		--	--	0.1	
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f≤100 KH_Z)	Vn	--	40	--	µV
Ripple Rejection (- 8.0 ≥ V_I ≥ -18 Vdc, f = 120 Hz, T_J = 25°C)	RR	41	49	--	dB
Dropout Voltage I_O = 40 mA, T_J = +25°C	$\|V_I - V_O\|$	--	1.7	--	Vdc

TS79L00 Series

3-Terminal Negative Output Voltage Regulators

• *TS79L09 ELECTRICAL CHARACTERISTICS*

VI=-15V,IO=40mA,CI=0.33 μF,Co=0.1Mf,-40℃<TJ<+125℃(for TS78lxx),0℃<tj<125℃(TS78lxx)),unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (Tj=+25℃)	Vo	-8.6	-9.0	-9.4	Vdc
Line Regulation(Tj=+25℃, Io=40mA) 11.5V≤Vi≤24V , 12V≤Vi≤24V,	REGline	 -- --	 20 12	 175 125	mV
Load Regulation Tj=+25℃, 1.0mA≤Io≤100mA Tj=+25℃,1.0mA≤Io≤40mA	REGload	 -- --	 15 8.0	 90 40	mV
Output Voltage 11.5V≤Vi≤24V, 1.0mA≤Io≤40mA Vi=15V, 1.0mA≤Io≤70mA	Vo	 -8.5 -8.5	 -- --	 -9.5 -9.5	Vdc
Input Bias Current (Tj=+25℃) (Tj=+125℃)	I_{IB}	 -- --	 3.0 --	 6.0 5.5	mA
Input Bias Current Change 11V≤Vi≤23V 1.0mA≤Io≤40mA	ΔI_{IB}	 -- --	 -- --	 1.5 0.1	mA
Output Noise Voltage (Ta=+25℃, 10Hz≤f≤100KHz)	Vn	--	60	--	μV
Ripple Rejection (Io=40mA, f=120Hz, 12V≤Vi≤23V, Tj=+25℃	RR	37	57	--	dB
Dropout Voltage (Tj=+25℃)	Vi-Vo	--	1.7	--	Vdc

• *TS79L12 ELECTRICAL CHARACTERISTICS*

(V_I = -19V , I_O = 40 mA, C_I = 0.33 μF, C_O = 0.1 μF, 0°C < T_J < 125°C unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (T_J = +25°C)	V_O	- 11.76	- 12	- 12.24	Vdc
Line Regulation (T_J = +25°C) -14.5 Vdc ≥ V_I ≥ -27 Vdc -16 Vdc ≥V_I ≥ -27 Vdc	REGline	 -- --	 -- --	 250 200	mV
Load Regulation T_J = +25°C, 1.0 mA ≤ I_O ≤100 mA 1.0 mA ≤ I_O ≤ 40 mA	REGload	 -- --	 -- --	 100 50	mV
Output Voltage -14.5 Vdc ≥ V_I ≥ -27 Vdc, 1.0mA ≤ I_O ≤ 40 mA V_I = -19 Vdc, 1.0mA ≤ I_O ≤ 70 mA	V_O	 - 11.66 - 11.66	 -- --	 - 12.34 - 12.34	Vdc
Input Bias Current (T_J = + 25°C) (T_J = + 125°C)	I_{IB}	 -- --	 -- --	 6.5 6.0	mA
Input Bias Current Change - 16 Vdc ≥ V_I ≥ -27 Vdc 1.0 mA ≤ I_O ≤ 40 mA	ΔI_{IB}	 -- --	 -- --	 1.5 0.1	mA
Output Noise Voltage (T_A = + 25°C, 10 Hz ≤ f ≤ 100 KH_Z)	Vn	--	80	--	μV
Ripple Rejection (- 15 ≥ V_I ≥ -25 Vdc, f = 120 Hz, T_J = 25°C)	RR	37	42	--	dB
Dropout Voltage (I_O = 40 mA, T_J = + 25°C)	$\lvert V_I - V_O \rvert$	--	1.7	--	Vdc

TS79L00 Series

3-Terminal Negative Output Voltage Regulators

• *TS79L15 ELECTRICAL CHARACTERISTICS*

(V_I = -23V , I_O = 40 mA, C_I = 0.33 µF, C_O = 0.1 µF, 0°C < T_J<125°C unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (T_J = + 25°C)	V_O	- 14.7	- 15	- 15.3	Vdc
Line Regulation (T_J = +25°C)	REGline				mV
-17.5 Vdc≥V_I≥ -30 Vdc		--	--	300	
-20 Vdc ≥ V_I ≥ -30 Vdc		--	--	250	
Load Regulation	REGload				mV
T_J = + 25°C, 1.0 mA ≤ I_O ≤ 100 mA		--	--	150	
1.0 mA ≤ I_O ≤ 40 mA		--	--	75	
Output Voltage	V_O				Vdc
-17.5 Vdc ≥V_I ≥ -30 Vdc, 1.0mA ≦ I_O ≦40 mA		- 14.25	--	-15.75	
V_I = -23 Vdc, 1.0 mA ≤ I_O≤70 mA		- 14.25	--	-15.75	
Input Bias Current (T_J = + 25°C)	I_{IB}	--	--	6.5	mA
(T_J = + 125°C)		--	--	6.0	
Input Bias Current Change	ΔI_{IB}				mA
-20 Vdc ≥ V_I≥ -30 Vdc		--	--	1.5	
1.0 mA ≤ I_O ≤40 mA		--	--	0.1	
Output Noise Voltage (T_A = + 25°C, 10 Hz ≤ f ≤ 100 KH_Z)	Vn	--	90	--	µV
Ripple Rejection (-18.5 Vdc ≥ V_I ≥ -28.5 Vdc, f = 120 H_Z)	RR	34	39	--	dB
Dropout Voltage (I_O = 40 mA, T_J = + 25°C)	$\lvert V_I - V_O \rvert$	--	1.7	--	Vdc

• *TS79L18 ELECTRICAL CHARACTERISTICS*

(V_I = -27V , I_O = 40 mA, C_I = 0.33 µF, C_O = 0.1 µF, 0°C < T_J < 125°C unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (T_J = +25°C)	V_O	-17.64	-18	-18.36	Vdc
Line Regulation (T_J = +25°C)	REGline				mV
-20.7 Vdc ≥ V_I ≥ -33 Vdc		--	--	325	
-21.4Vdc ≥ V_I ≥ -33 Vdc		--	--	--	
-22Vdc ≥ V_I ≥ -33 Vdc		--	--	--	
-21Vdc ≥ V_I ≥ -33 Vdc		--	--	275	
Load Regulation	REGload				mV
T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA		--	--	170	
1.0 mA ≤ I_O ≤ 40 mA		--	--	85	
Output Voltage	V_O				Vdc
-20.7 Vdc ≥ V_I ≥ -33Vdc, 1.0mA ≤ I_O ≤ 40 mA		-17.44	--	-18.56	
-21.4 Vdc ≥ V_I ≥ -33Vdc, 1.0mA ≤ I_O ≤ 40 mA		--	--	--	
V_I = -27 Vdc, 1.0mA ≤ I_O ≤ 70 mA		-17.1	--	-1.89	
Input Bias Current (T_J = + 25°C)	I_{IB}	--	--	6.5	mA
(T_J = + 125°C)		--	--	6.0	
Input Bias Current Change	ΔI_{IB}				mA
- 21 Vdc ≥ V_I ≥ -33 Vdc		--	--	1.5	
- 27 Vdc ≥ V_I ≥ -33 Vdc		--	--	--	
1.0 mA ≤I_O ≤ 40 mA		--	--	0.1	
Output Noise Voltage (T_A = + 25°C, 10 Hz ≤ f ≤ 100 KH_Z)	Vn	--	150	--	µV
Ripple Rejection (- 23 ≥ V_I ≥ -33 Vdc, f = 120 Hz, T_J = 25°C)	RR	33	48	--	dB
Dropout Voltage I_O = 40 mA, T_J = + 25°C	$\lvert V_I - V_O \rvert$	--	1.7	--	Vdc

TS79L00 Series

3-Terminal Negative Output Voltage Regulators

• *TS79L24 ELECTRICAL CHARACTERISTICS*

(V_I = -33V , I_O = 40 mA, C_I = 0.33 µF, C_O = 0.1 µF, 0°C < T_J < 125°C unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (T_J = + 25°C)	V_O	- 23.52	- 24	- 24.48	Vdc
Line Regulation (T_J = +25°C)	REGline				mV
- 27 Vdc ≥V_I ≥ -38 Vdc		--	--	350	
- 27.5Vdc ≥ V_I ≥ -38 Vdc		--	--	--	
- 28 Vdc ≥ V_I ≥ -38 Vdc		--	--	300	
Load Regulation	REGload				mV
T_J = + 25°C, 1.0 mA ≤ I_O ≤ 100 mA		--	--	200	
1.0 mA ≤ I_O ≤ 40 mA		--	--	100	
Output Voltage	V_O				Vdc
-27 Vdc ≥ V_I ≥ -38 Vdc, 1.0mA ≤ I_O ≤ 40 mA		- 23.32	--	-24.68	
-28 Vdc ≥ V_I ≥ -38 Vdc, 1.0mA ≤ I_O ≤ 40 mA		--	--	--	
V_I = -33 Vdc, 1.0 mA ≤ I_O ≤ 70 mA		- 23.32	--	-24.68	
Input Bias Current	I_{IB}				mA
(T_J = + 25°C)		--	--	6.5	
(T_J = + 125°C)		--	--	6.0	
Input Bias Current Change	ΔI_{IB}				mA
-28 Vdc ≥ V_I ≥ -38 Vdc		--	--	1.5	
1.0 mA ≤ I_O ≤ 40 mA		--	--	0.1	
Output Noise Voltage (T_A = + 25°C, 10 Hz ≤f≤ 100 KH_Z)	Vn	--	200	--	µV
Ripple Rejection (- 29 ≥ V_I ≥ - 35 Vdc, f = 120 H_Z , T_J = 25°C)	RR	31	47	--	dB
Dropout Voltage , I_O = 40 mA, T_J = + 25°C	$\|V_I - V_O\|$	--	1.7	--	Vdc

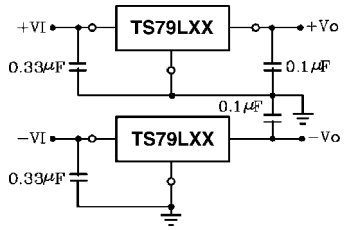
APPLICATIONS INFORMATION

Design Considerations

The TS79L00 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 that limits the maximum current the circuit will pass.

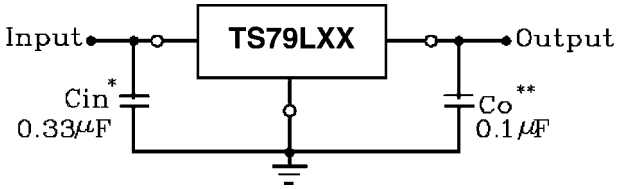
In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long

FIGURE 1 - POSITIVE AND NEGATIVE REGULATOR



wire lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high-frequency characteristics to insure stable operation under all load conditions. A 0.33 µF or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies 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.

FIGURE 2-STANDARD APPLICATION



A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

* = C_I is required if regulator is located an appreciable distance from power supply filter.

** = C_O improves stability and transient response.

FIGURE 3-DROPOUT CHARACTERISTICS

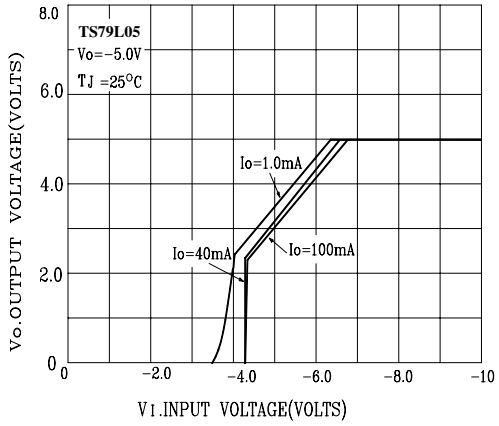


FIGURE 4-DROPOUT VOLTAGE versus JUNCTION TEMPERATURE

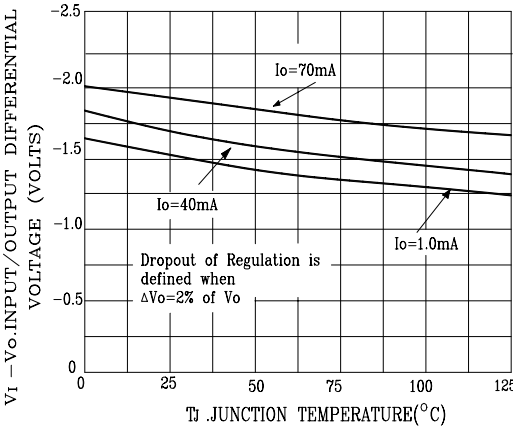


FIGURE 5-INPUT BIAS CURRENT versus AMBIENT TEMPERATURE

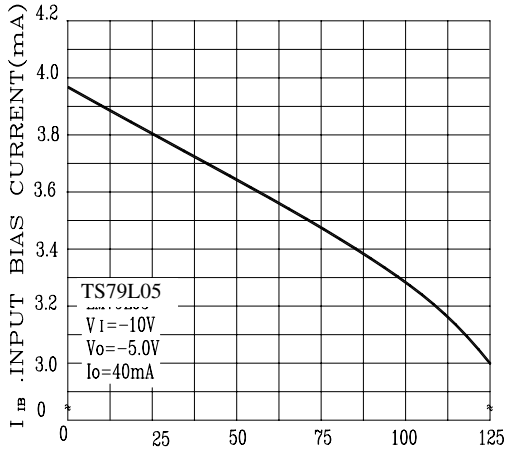


FIGURE 6-INPUT BIAS CURRENT versus INPUT VOLTAGE

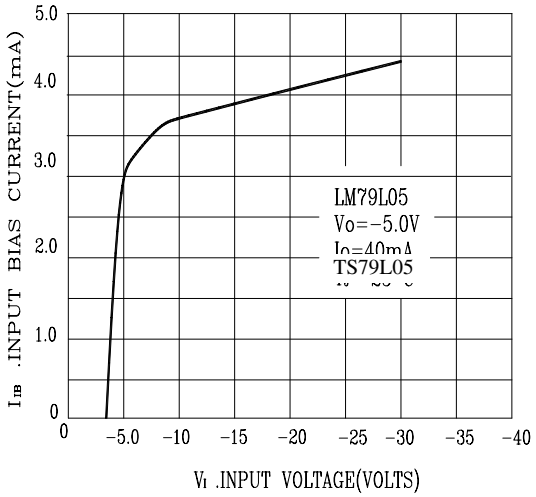
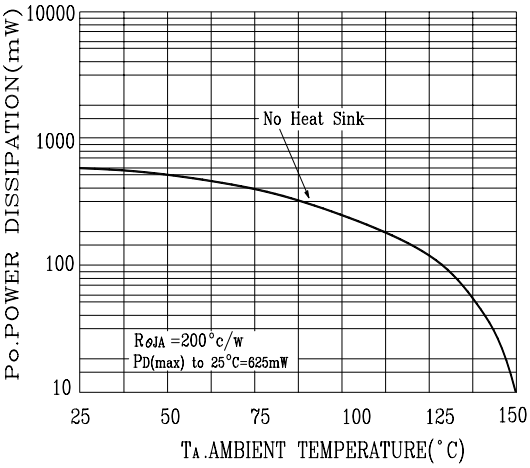


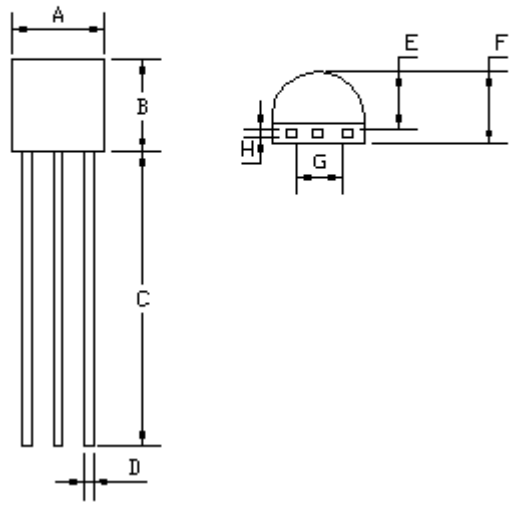
FIGURE 7-MAXIMUM AVERAGE POWER DISSIPATION versus AMBIENT TEMPERATURE - TO-92 Type Package



TS79L00 Series

3-Terminal Negative Output Voltage Regulators

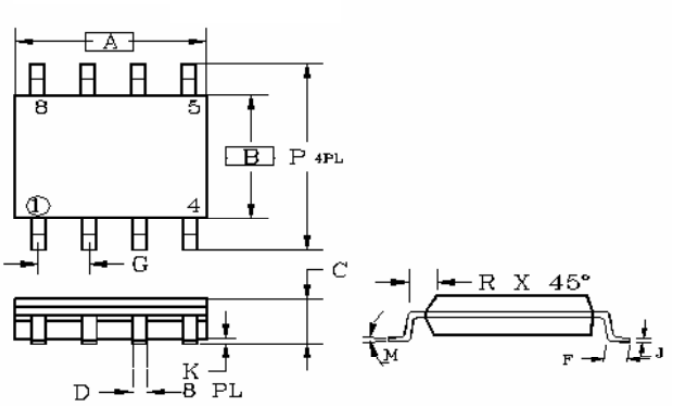
TO-92 Mechanical drawing



TO-92 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.3	4.7	0.169	0.185
B	4.3	4.7	0.169	0.185
C	14.3	14.3	0.563	0.563
D	0.435	0.485	0.017	0.019
E	2.19	2.81	0.086	0.111
F	3.3	3.7	0.130	0.146
G	2.42	2.66	0.095	0.105
H	0.375	0.425	0.015	0.107

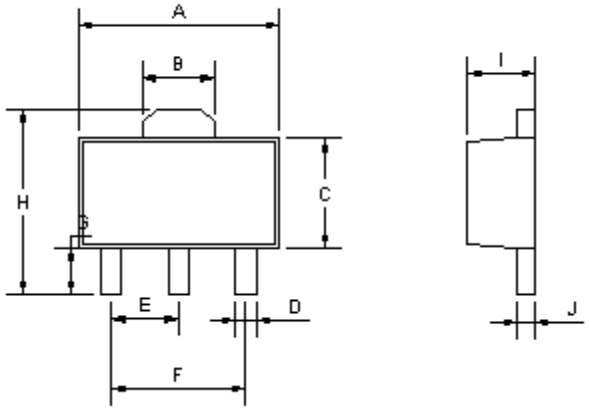
SOP-8 Mechanical drawing

SOP-8



SOP-8 DIMENSION				
	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27BSC		0.05BSC	
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

SOT-89 Mechanical drawing



SOT-89 Dimension				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.4	4.6	0.173	0.181
B	1.5	1.7	0.059	0.070
C	2.30	2.60	0.090	0.102
D	0.40	0.52	0.016	0.020
E	1.50	1.50	0.059	0.059
F	3.00	3.00	0.118	0.118
G	0.89	1.20	0.035	0.047
H	4.05	4.25	0.159	0.167
I	1.4	1.6	0.055	0.063
J	0.35	0.44	0.014	0.017