



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.

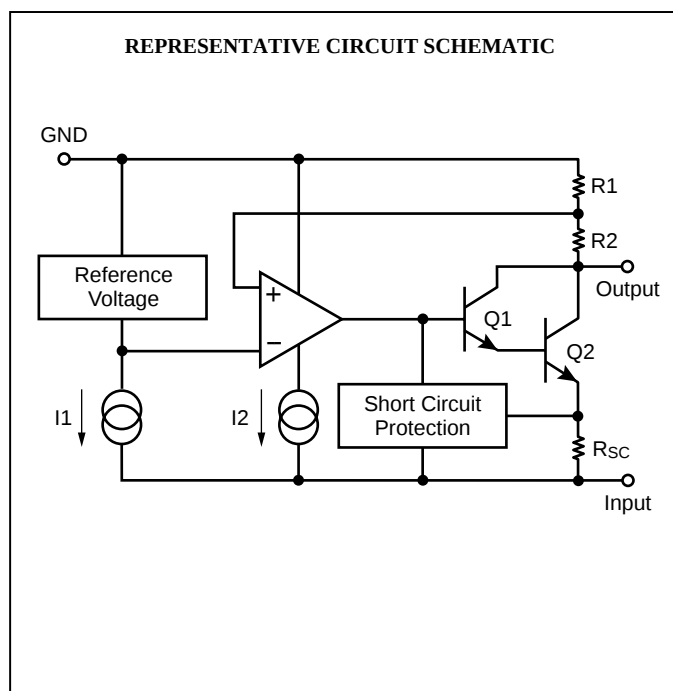
FEATURES

- 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 $\pm 2\%$ Voltage Tolerance.

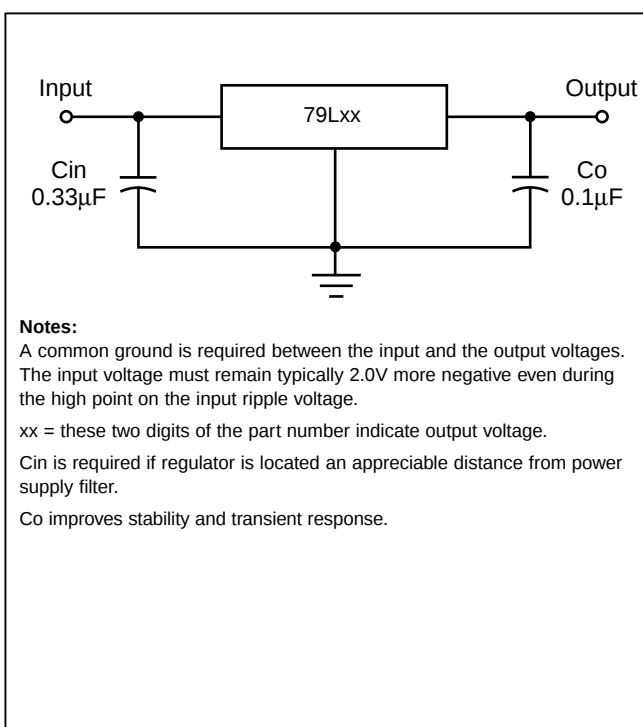
ORDERING INFORMATION

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

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.



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ABSOLUTE MAXIMUM RATINGS ($T_A = +25^\circ\text{C}$)

RATING	SYMBOL	TS79L00 SERIES	UNIT
Input Voltage	V_{in}^{*1}	- 35	V
Input Voltage	$V_{in}^{*2\ *3}$	- 40	V
Storage Temperature	T_{stg}	- 25 to +150	$^\circ\text{C}$
Operating Ambient Temperature	T_{opr}	-20 to +85	$^\circ\text{C}$
Operating Junction Temperature	T_J	0 to +125	$^\circ\text{C}$

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

• TS79L05 ELECTRICAL CHARACTERISTICS

($V_I = -10\text{V}$, $I_O = 40\text{ mA}$, $C_I = 0.33\ \mu\text{F}$, $C_O = 0.1\ \mu\text{F}$, $0^\circ\text{C} < T_J < 125^\circ\text{C}$ unless otherwise noted.)

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



TS79L00 Series

3-Terminal Negative Output Voltage Regulators

• TS79L09 ELECTRICAL CHARACTERISTICS

$V_i = -15V, I_o = 40mA, C_i = 0.33 \mu F, C_o = 0.1 \mu F, -40^\circ C < T_J < +125^\circ C$ (for TS78Lxx), $0^\circ C < t_j < 125^\circ C$ (TS78Lxx)), unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage ($T_J = +25^\circ C$)	V_o	-8.6	-9.0	-9.4	Vdc
Line Regulation ($T_J = +25^\circ C, I_o = 40mA$) $11.5V \leq V_i \leq 24V$, $12V \leq V_i \leq 24V$,	REGline	-- --	20 12	175 125	mV
Load Regulation $T_J = +25^\circ C, 1.0mA \leq I_o \leq 100mA$ $T_J = +25^\circ C, 1.0mA \leq I_o \leq 40mA$	REGload	-- --	15 8.0	90 40	mV
Output Voltage $11.5V \leq V_i \leq 24V, 1.0mA \leq I_o \leq 40mA$ $V_i = 15V, 1.0mA \leq I_o \leq 70mA$	V_o	-8.5 -8.5	-- --	-9.5 -9.5	Vdc
Input Bias Current ($T_J = +25^\circ C$) ($T_J = +125^\circ C$)	I_{IB}	-- --	3.0 --	6.0 5.5	mA
Input Bias Current Change $11V \leq V_i \leq 23V$ $1.0mA \leq I_o \leq 40mA$	ΔI_{IB}	-- --	-- --	1.5 0.1	mA
Output Noise Voltage ($T_A = +25^\circ C, 10Hz \leq f \leq 100KHz$)	V_n	--	60	--	μV
Ripple Rejection ($I_o = 40mA, f = 120Hz, 12V \leq V_i \leq 23V, T_J = +25^\circ C$)	RR	37	57	--	dB
Dropout Voltage ($T_J = +25^\circ C$)	$V_i - V_o$	--	1.7	--	Vdc

• TS79L12 ELECTRICAL CHARACTERISTICS

($V_i = -19V, I_o = 40mA, C_i = 0.33 \mu F, C_o = 0.1 \mu F, 0^\circ C < T_J < 125^\circ C$ unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage ($T_J = +25^\circ C$)	V_o	- 11.76	- 12	- 12.24	Vdc
Line Regulation ($T_J = +25^\circ C$) $-14.5 Vdc \geq V_i \geq -27 Vdc$ $-16 Vdc \geq V_i \geq -27 Vdc$	REGline	-- --	-- --	250 200	mV
Load Regulation $T_J = +25^\circ C, 1.0 mA \leq I_o \leq 100 mA$ $1.0 mA \leq I_o \leq 40 mA$	REGload	-- --	-- --	100 50	mV
Output Voltage $-14.5 Vdc \geq V_i \geq -27 Vdc, 1.0mA \leq I_o \leq 40 mA$ $V_i = -19 Vdc, 1.0mA \leq I_o \leq 70 mA$	V_o	- 11.66 - 11.66	-- --	- 12.34 - 12.34	Vdc
Input Bias Current ($T_J = +25^\circ C$) ($T_J = +125^\circ C$)	I_{IB}	-- --	-- --	6.5 6.0	mA
Input Bias Current Change $-16 Vdc \geq V_i \geq -27 Vdc$ $1.0 mA \leq I_o \leq 40 mA$	ΔI_{IB}	-- --	-- --	1.5 0.1	mA
Output Noise Voltage ($T_A = +25^\circ C, 10 Hz \leq f \leq 100 KHz$)	V_n	--	80	--	μV
Ripple Rejection ($-15 \geq V_i \geq -25 Vdc, f = 120 Hz, T_J = 25^\circ C$)	RR	37	42	--	dB
Dropout Voltage ($I_o = 40 mA, T_J = +25^\circ C$)	$ V_i - V_o $	--	1.7	--	Vdc



TS79L00 Series

3-Terminal Negative Output Voltage Regulators

• TS79L15 ELECTRICAL CHARACTERISTICS

($V_I = -23V$, $I_O = 40\text{ mA}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} < T_J < 125^\circ\text{C}$ unless otherwise noted.)

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

• TS79L18 ELECTRICAL CHARACTERISTICS

($V_I = -27V$, $I_O = 40\text{ mA}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} < T_J < 125^\circ\text{C}$ unless otherwise noted.)

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



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3-Terminal Negative Output Voltage Regulators

• TS79L24 ELECTRICAL CHARACTERISTICS

($V_I = -33V$, $I_O = 40\text{ mA}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} < T_J < 125^\circ\text{C}$ unless otherwise noted.)

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

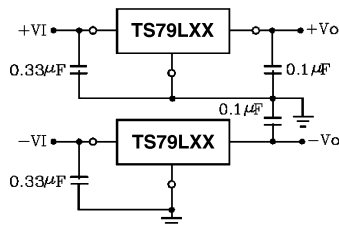
APPLICATIONS INFORMATION

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

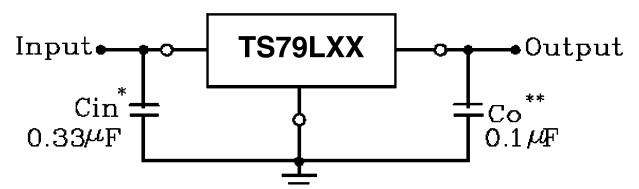
FIGURE 1 - POSITIVE AND NEGATIVE REGULATOR



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 $0.33\text{ }\mu\text{F}$ 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.



TS79L00 Series

3-Terminal Negative Output Voltage Regulators

FIGURE 3-DROPOUT CHARACTERISTICS

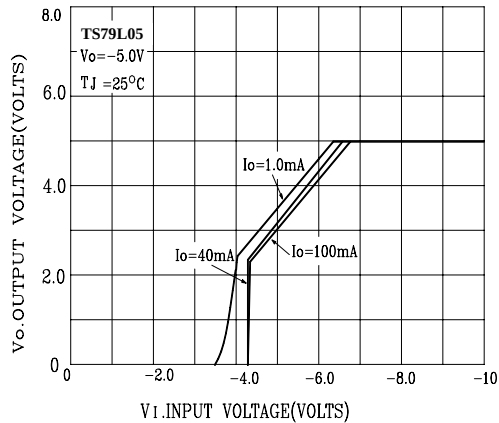


FIGURE 4-DROPOUT VOLTAGE versus JUNCTION TEMPERATURE

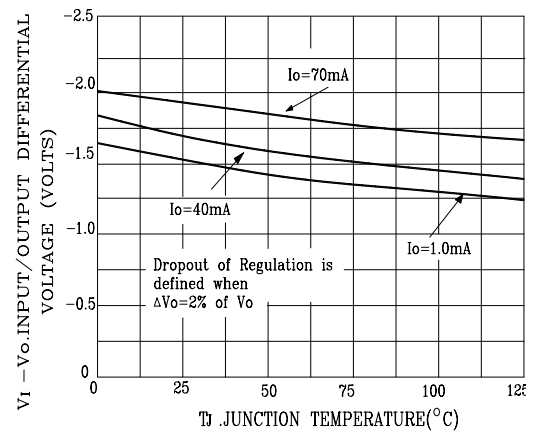


FIGURE 5-INPUT BIAS CURRENT versus AMBIENT TEMPERATURE

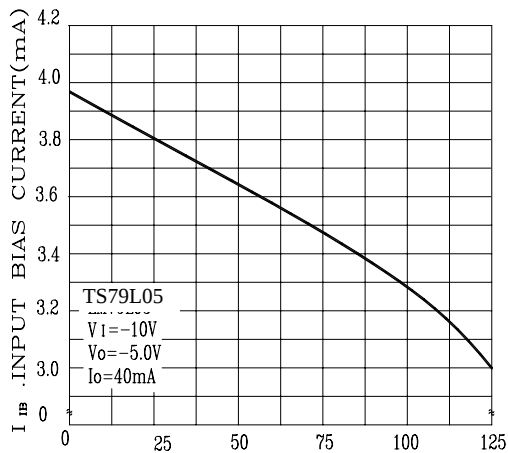


FIGURE 6-INPUT BIAS CURRENT versus INPUT VOLTAGE

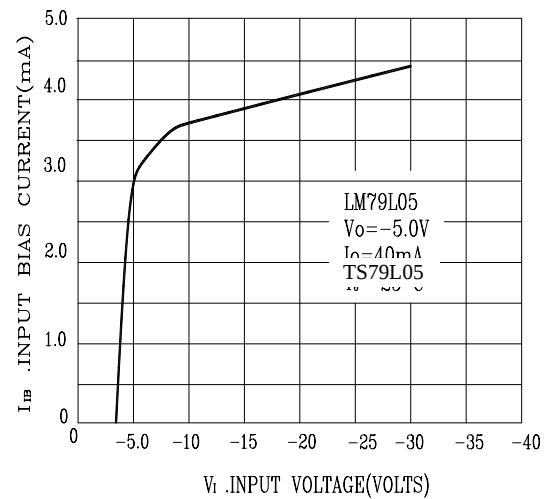
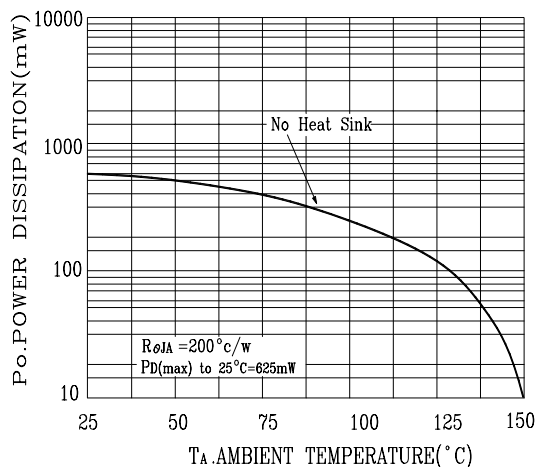


FIGURE 7-MAXIMUM AVERAGE POWER DISSIPATION versus AMBIENT TEMPERATURE - TO-92 Type Package

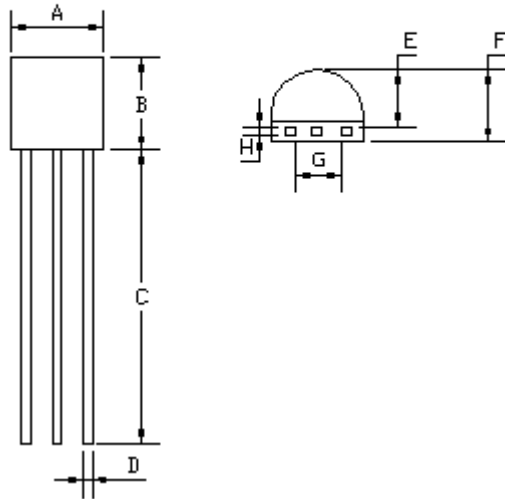




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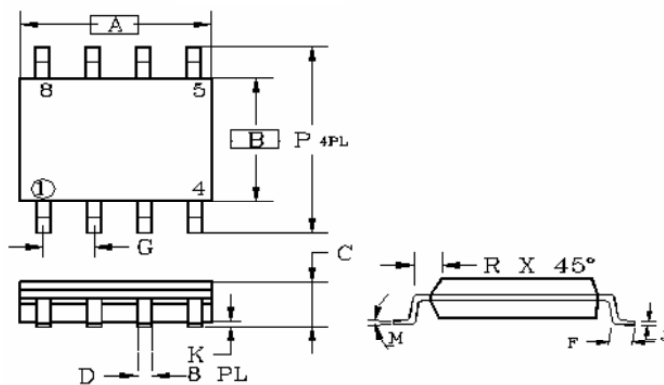
TO-92 Mechanical drawing



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



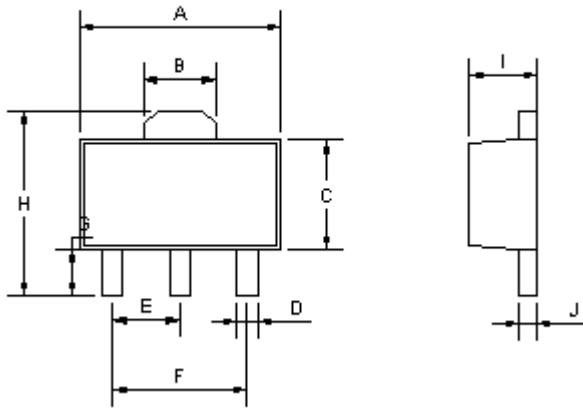
SOP-8 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27BSC		0.05BSC	
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019



TS79L00 Series

3-Terminal Negative Output Voltage Regulators

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