THREE-TERMINAL NEGATIVE VOLTAGE REGULATORS

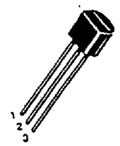
The LM79L00 Series negative voltage regulators are inexpensive, easy-to-use devices suitable for numerous applications requiring up to 100 mA. Like the higher powered LM7900 Series negative regulators, this series features thermal shutdown and current limiting, making them remarkably rugged.In most applications, no external components are required for operation.

The LM79L00 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
- Low Cost
- Complementary Positive Regulators Offered (LM78L00 Series)
- Available in ±2% Voltage Tolerance

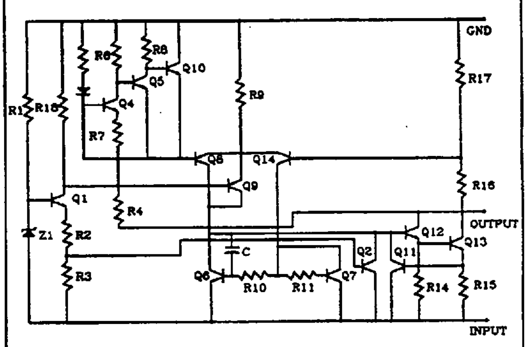
PIN ARRANGEMENT



PIN 1. GROUND
2. INPUT
3. OUTPUT

CIRCUIT SCHEMATIC

REPRESENTATIVE CIRCUIT SCHEMATIC



TYPICAL CONNECTING CIRCUIT

PIN		
	1. V_{OUT}	5. GNO
	2. V_{IN}	6. V_{IN}
	3. V_{IN}	7. V_{IN}
	4. NC	8. NC

SOP-8 is an internally modified SO-8 Package. Pins 2,3,6 and 7 are electrically common to the die attach flag. This internal lead frame modification decreases package thermal resistance and increases power dissipation capability when appropriately mounted on a printed circuit board. SOP-8 conforms to all external dimensions of the standard SO-8 Package.

ABSOLUTE MAXIMUM RATINGS (T_A = +25℃)

Rating	Symbol	LM79L00 Series	Unit
Input Voltage	Vin *1	- 30	V
Input Voltage	Vin *2	- 35	V
Input Voltage	Vin *3	- 40	V
Storage Temperature	Tstg	- 65 to 150	°C
Junction Temperature Range	T_J	0 to 150	°C

Note: *1. LM79L05
*2. LM79L12, LM79L15, LM79L18
*3. LM79L24

LM79L05 Series ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	LM79L05			Unit
		Min	Typ	Max	
Output Voltage (T_J = + 25°C)	V_O	- 4.9	- 5.0	- 5.1	Vdc
Line Regulation (T_J = + 25°C) -7.0 Vdc ≥ V_I ≥ -20 Vdc -8.0 Vdc ≥ V_I ≥ -20 Vdc	REGline	 – –	 – –	 150 100	mV
Load Regulation T_J = + 25°C, 1.0 mA ≤ I_O ≤ 100 mA 1.0 mA ≤ I_O ≤ 40 mA	REGload	 – –	 – –	 60 30	mV
Output Voltage - 7.0 Vdc ≥ V_I ≥ -20 Vdc, 1.0mA ≤ I_O ≤ 40 mA V_I = -10 Vdc, 1.0mA ≤ I_O ≤ 70 mA	V_O	 - 4.9 - 4.9	 – –	 - 5.1 - 5.1	Vdc
Input Bias Current (T_J = +25°C) (T_J = +125°C)	I_{IB}	 – –	 – –	 6.0 5.5	mA
Input Bias Current Change - 8.0 Vdc ≥ V_I ≥ -20 Vdc 1.0 mA ≤ I_O ≤ 40 mA	Δ I_{IB}	 – –	 – –	 1.5 0.1	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	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

LM79L12 Series ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	LM79L12 Min	LM79L12 Typ	LM79L12 Max	Unit
Output Voltage (T_J = +25℃)	V_O	- 11.76	- 12	- 12.24	Vdc
Line Regulation (T_J = +25℃) -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℃) (T_J = + 125℃)	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℃, 10 Hz ≤ f ≤ 100 kHz)	Vn	--	80	--	μV
Ripple Rejection (- 15 ≥ V_I ≥ -25 Vdc, f = 120 Hz, T_J = 25℃)	RR	37	42	--	dB
Dropout Voltage I_O = 40 mA, T_J = + 25℃	$\lvert V_I - V_O \rvert$	--	1.7	--	Vdc

LM79L15 Series ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	LM79L15 Min	LM79L15 Typ	LM79L15 Max	Unit
Output Voltage (T_J = + 25℃)	V_O	- 14.7	- 15	- 15.3	Vdc
Line Regulation (T_J = +25℃) -17.5 Vdc ≥ V_I ≥ -30 Vdc -20 Vdc ≥ V_I ≥ -30 Vdc	REGline	 -- --	 -- --	 300 250	mV
Load Regulation T_J = + 25℃, 1.0 mA ≤ I_O ≤ 100 mA 1.0 mA ≤ I_O ≤ 40 mA	REGload	 -- --	 -- --	 150 75	mV
Output Voltage -17.5 Vdc ≥ V_I ≥ -30 Vdc, 1.0mA ≤ I_O ≤ 40 mA V_I = -23 Vdc, 1.0 mA ≤ I_O ≤ 70 mA	V_O	 - 14.25 - 14.25	 -- --	 -15.75 -15.75	Vdc
Input Bias Current (T_J = + 25℃) (T_J = + 125℃)	I_{IB}	 -- --	 -- --	 6.5 6.0	mA
Input Bias Current Change -20 Vdc ≥ V_I ≥ -30 Vdc 1.0 mA ≤ I_O ≤ 40 mA	ΔI_{IB}	 -- --	 -- --	 1.5 0.1	mA
Output Noise Voltage (T_A = + 25℃, 10 Hz ≤ f ≤ 100 kHz)	Vn	--	90	--	μV
Ripple Rejection (-18.5 Vdc ≤ V_I ≤ -28.5 Vdc, f = 120 Hz)	RR	34	39	--	dB
Dropout Voltage I_O = 40 mA, T_J = + 25℃	$\lvert V_I - V_O \rvert$	--	1.7	--	Vdc

LM79L18 Series ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	LM79L18			Unit
		Min	Typ	Max	
Output Voltage (T_J = + 25℃)	V_O	- 17.64	- 18	- 18.36	Vdc
Line Regulation (T_J = + 25℃) -20.7 Vdc ≥ V_I ≥ -33 Vdc -21.4 Vdc ≥ V_I ≥ -33 Vdc -22 Vdc ≥ V_I ≥ -33 Vdc -21 Vdc ≥ V_I ≥ -33 Vdc	REGline	 -- -- -- --	 -- -- -- --	 325 -- -- 275	mV
Load Regulation T_J = + 25℃, 1.0 mA ≤ I_O ≤ 100 mA 1.0 mA ≤ I_O ≤ 40 mA	REGload	 -- --	 -- --	 170 85	mV
Output Voltage -20.7 Vdc ≥ V_I ≥ -33 Vdc, 1.0mA ≤ I_O ≤ 40 mA -21.4 Vdc ≥ V_I ≥ -33 Vdc, 1.0mA ≤ I_O ≤ 40 mA V_I = - 27 Vdc, 1.0mA ≤ I_O ≤ 70 mA	V_O	 - 17.44 -- - 17.1	 -- -- --	 - 18.56 -- - 1.89	Vdc
Input Bias Current (T_J = + 25℃) (T_J = + 125℃)	I_{IB}	 -- --	 -- --	 6.5 6.0	mA
Input Bias Current Change -21 Vdc ≥ V_I ≥ -33 Vdc -27 Vdc ≥ V_I ≥ -33 Vdc 1.0 mA ≤ I_O ≤ 40 mA	ΔI_{IB}	 -- -- --	 -- -- --	 1.5 -- 0.1	mA
Output Noise Voltage (T_A = + 25℃, 10 Hz ≤ f ≤ 100 kHz)	Vn	--	150	--	μV
Ripple Rejection (- 23 ≥ V_I ≥ -33 Vdc, f = 120 Hz, T_J = 25℃)	RR	33	48	--	dB
Dropout Voltage I_O = 40 mA, T_J = + 25℃	$\lvert V_I - V_O \rvert$	--	1.7	--	Vdc

LM79L24 Series ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	LM79L24 Min	LM79L24 Typ	LM79L24 Max	Unit
Output Voltage (T_J = + 25℃)	V_O	- 23.52	- 24	- 24.48	Vdc
Line Regulation (T_J = +25℃)	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℃)		--	--	6.5	
(T_J = + 125℃)		--	--	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℃, 10 Hz ≤ f ≤ 100 kHz)	Vn	--	200	--	μV
Ripple Rejection (- 29 ≤ V_I ≤ - 35 Vdc, f = 120 Hz, T_J = 25℃)	RR	31	47	--	dB
Dropout Voltage I_O = 40 mA, T_J = + 25℃	$\|V_I-V_O\|$	--	1.7	--	Vdc

APPLICATIONS INFORMATION

Design Considerations

The LM79L00 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 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 1 - POSITIVE AND NEGATIVE REGULATOR

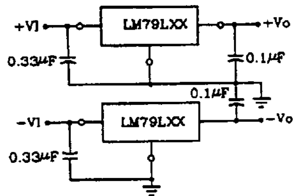
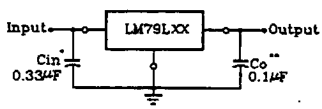


FIGURE 2-STANDARD APPLICATION



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

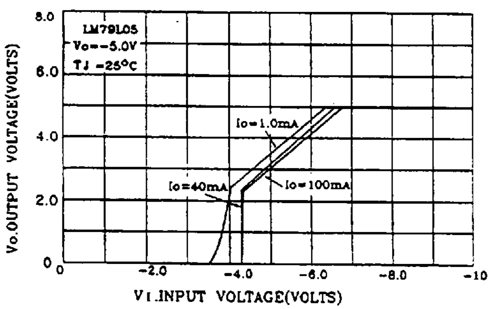


FIGURE 4-DROPOUT VOLTAGE versus JUNCTION TEMPERATURE

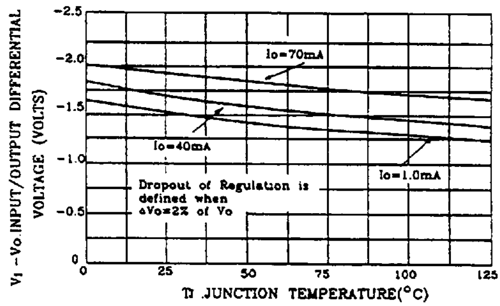


FIGURE 5-INPUT BIAS CURRENT versus AMBIENT TEMPERATURE

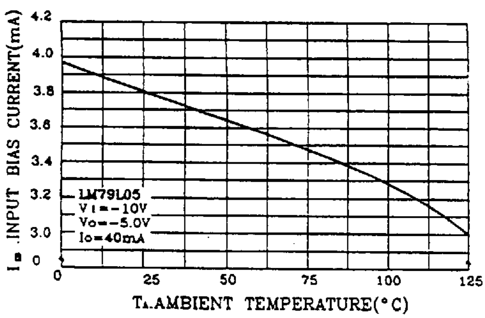


FIGURE 6-INPUT BIAS CURRENT versus INPUT VOLTAGE

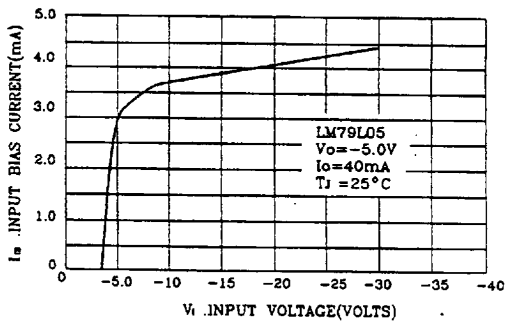


FIGURE 7-MAXIMUM AVERAGE POWER DISSIPATION versus AMBIENT TEMPERATURE -TO-92 Type Package