

LM320L, LM79LXXAC Series 3-Terminal Negative Regulators

General Description

The LM320L/LM79LXXAC series of 3-terminal negative voltage regulators features fixed output voltages of $-5V$, $-12V$, and $-15V$ with output current capabilities in excess of 100 mA. These devices were designed using the latest computer techniques for optimizing the packaged IC thermal/electrical performance. The LM79LXXAC series, even when combined with a minimum output compensation capacitor of $0.1 \mu F$, exhibits an excellent transient response, a maximum line regulation of $0.07\% V_O/V$, and a maximum load regulation of $0.01\% V_O/mA$.

The LM320L/LM79LXXAC series also includes, as self-protection circuitry: safe operating area circuitry for output transistor power dissipation limiting, a temperature independent short circuit current limit for peak output current limiting, and a thermal shutdown circuit to prevent excessive junction temperature. Although designed primarily as fixed voltage regulators, these devices may be combined with simple external circuitry for boosted and/or adjustable voltages and currents. The LM79LXXAC series is available in the 3-lead TO-92 package, and SO-8; 8 lead package. The LM320L series is available in the 3-lead TO-92 package.

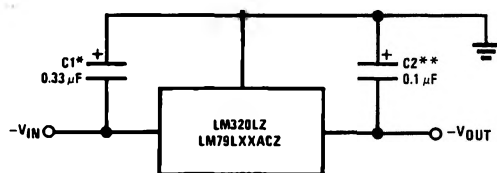
For output voltage other than $-5V$, $-12V$ and $-15V$ the LM137L series provides an output voltage range from 1.2V to 47V.

Features

- Preset output voltage error is less than $\pm 5\%$ overload, line and temperature
- Specified at an output current of 100 mA
- Easily compensated with a small $0.1 \mu F$ output capacitor
- Internal short-circuit, thermal and safe operating area protection
- Easily adjustable to higher output voltages
- Maximum line regulation less than $0.07\% V_{OUT}/V$
- Maximum load regulation less than $0.01\% V_{OUT}/mA$

Typical Applications

Fixed Output Regulator

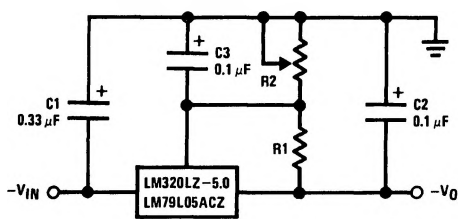


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*Required if the regulator is located far from the power supply filter. A $1 \mu F$ aluminum electrolytic may be substituted.

**Required for stability. A $1 \mu F$ aluminum electrolytic may be substituted.

Adjustable Output Regulator



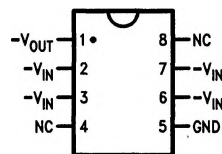
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$$-V_O = -5V - (5V/R1 + I_O) \cdot R2$$

$$5V/R1 > 3 I_O$$

Connection Diagrams

SO-8 Plastic (Narrow Body)

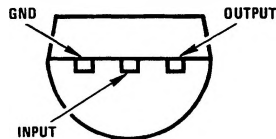


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Top View

Order Number LM79L05ACM,
LM79L12ACM or LM79L15ACM
See NS Package Number M08A

TO-92 Plastic Package (Z)



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Bottom View

Order Number LM320LZ-5.0, LM79L05ACZ,
LM320LZ-12, LM79L12ACZ, LM320LZ-15 or
LM79L15ACZ
See NS Package Number Z03A

Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Input Voltage

$V_O = -5V, -12V, -15V$

-35V

Internal Power Dissipation (Note 1)

Internally Limited

Operating Temperature Range

$0^{\circ}\text{C to } +70^{\circ}\text{C}$

Maximum Junction Temperature

$+125^{\circ}\text{C}$

Storage Temperature Range

$-55^{\circ}\text{C to } +150^{\circ}\text{C}$

Lead Temperature (Soldering, 10 sec.)

260°C

Electrical Characteristics (Note 2) $T_A = 0^{\circ}\text{C to } +70^{\circ}\text{C}$ unless otherwise noted.

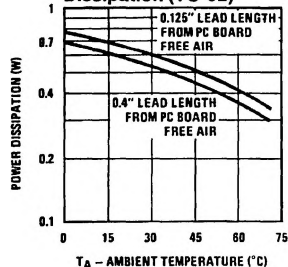
Output Voltage			-5V			-12V			-15V			Units	
Input Voltage (unless otherwise noted)			-10V			-17V			-20V				
Symbol	Parameter	Conditions	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
V _O	Output Voltage	T _J = 25°C, I _O = 100 mA	-5.2	-5	-4.8	-12.5	-12	-11.5	-15.6	-15	-14.4	V	
		1 mA ≤ I _O ≤ 100 mA	-5.25		-4.75	-12.6		-11.4	-15.75		-14.25		
		V _{MIN} ≤ V _{IN} ≤ V _{MAX}	(-20 ≤ V _{IN} ≤ -7.5)			(-27 ≤ V _{IN} ≤ -14.8)			(-30 ≤ V _{IN} ≤ -18)				
		1 mA ≤ I _O ≤ 40 mA	-5.25		-4.75		-12.6	-11.4	-15.75		-14.25		
		V _{MIN} ≤ V _{IN} ≤ V _{MAX}	(-20 ≤ V _{IN} ≤ -7)			(-27 ≤ V _{IN} ≤ -14.5)			(-30 ≤ V _{IN} ≤ -17.5)				
ΔV _O	Line Regulation	T _J = 25°C, I _O = 100 mA			60			45			45	mV	
		V _{MIN} ≤ V _{IN} ≤ V _{MAX}	(-20 ≤ V _{IN} ≤ -7.3)			(-27 ≤ V _{IN} ≤ -14.6)			(-30 ≤ V _{IN} ≤ -17.7)			V	
		T _J = 25°C, I _O = 40 mA			60			45			45	mV	
		V _{MIN} ≤ V _{IN} ≤ V _{MAX}	(-20 ≤ V _{IN} ≤ -7)			(-27 ≤ V _{IN} ≤ -14.5)			(-30 ≤ V _{IN} ≤ -17.5)			V	
ΔV _O	Load Regulation	T _J = 25°C 1 mA ≤ I _O ≤ 100 mA			50			100			125	mV	
ΔV _O	Long Term Stability	I _O = 100 mA			20			48			60	mV/khrs	
I _Q	Quiescent Current	I _O = 100 mA			2	6		2	6		2	6	mA
ΔI _Q	Quiescent Current Change	1 mA ≤ I _O ≤ 100 mA			0.3			0.3			0.3	mA	
		1 mA ≤ I _O ≤ 40 mA			0.1			0.1			0.1		
		I _O = 100 mA			0.25			0.25			0.25	mA	
		V _{MIN} ≤ V _{IN} ≤ V _{MAX}	(-20 ≤ V _{IN} ≤ -7.5)			(-27 ≤ V _{IN} ≤ -14.8)			(-30 ≤ V _{IN} ≤ -18)			V	
V _n	Output Noise Voltage	T _J = 25°C, I _O = 100 mA f = 10 Hz – 10 kHz			40			96			120	μV	
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	T _J = 25°C, I _O = 100 mA f = 120 Hz			50			52			50	dB	
	Input Voltage Required to Maintain Line Regulation	T _J = 25°C, I _O = 100 mA			-7.3			-14.6			-17.7	V	
		I _O = 40 mA			-7.0			-14.5			-17.5	V	

Note 1: Thermal resistance of Z package is $60^{\circ}\text{C/W } \theta_{JC}$, $232^{\circ}\text{C/W } \theta_{JA}$ at still air, and 88°C/W at 400 ft/min of air. The M package θ_{JA} is 180°C/W in still air. The maximum junction temperature shall not exceed 125°C on electrical parameters.

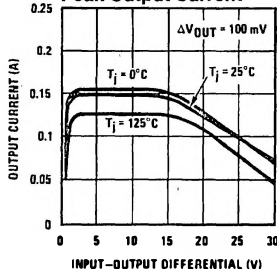
Note 2: To ensure constant junction temperature, low duty cycle pulse testing is used.

Typical Performance Characteristics

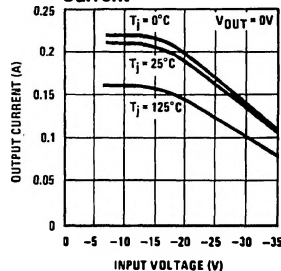
Maximum Average Power Dissipation (TO-92)



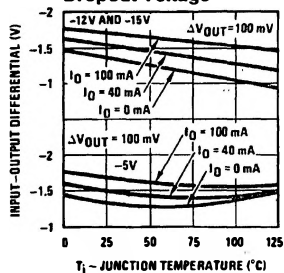
Peak Output Current



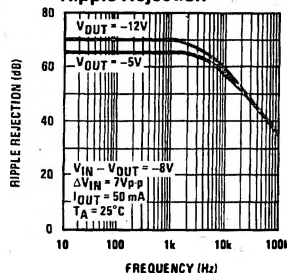
Short Circuit Output Current



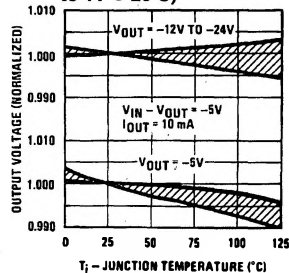
Dropout Voltage



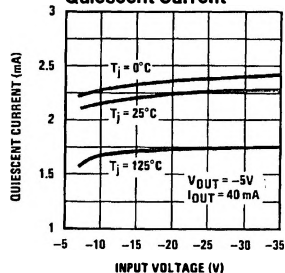
Ripple Rejection



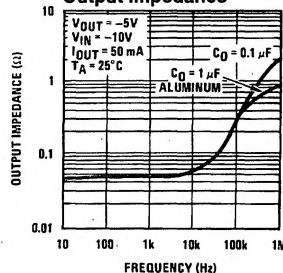
Output Voltage vs. Temperature (Normalized to 1V @ 25 $^{\circ}\text{C}$)



Quiescent Current



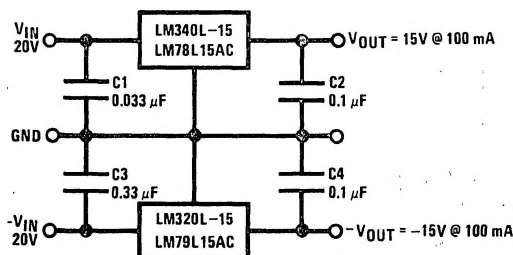
Output Impedance



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Typical Applications (Continued)

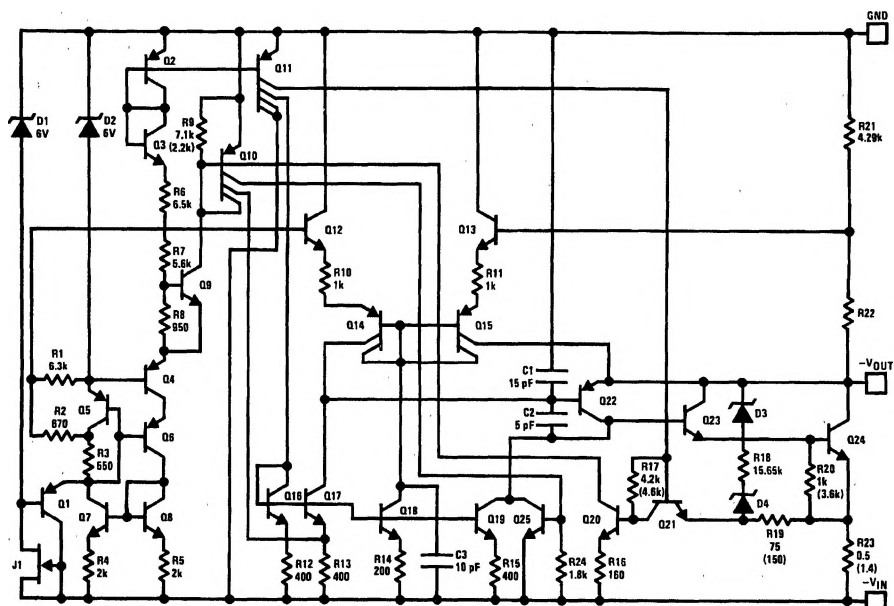
$\pm 15\text{ V}$, 100 mA Dual Power Supply



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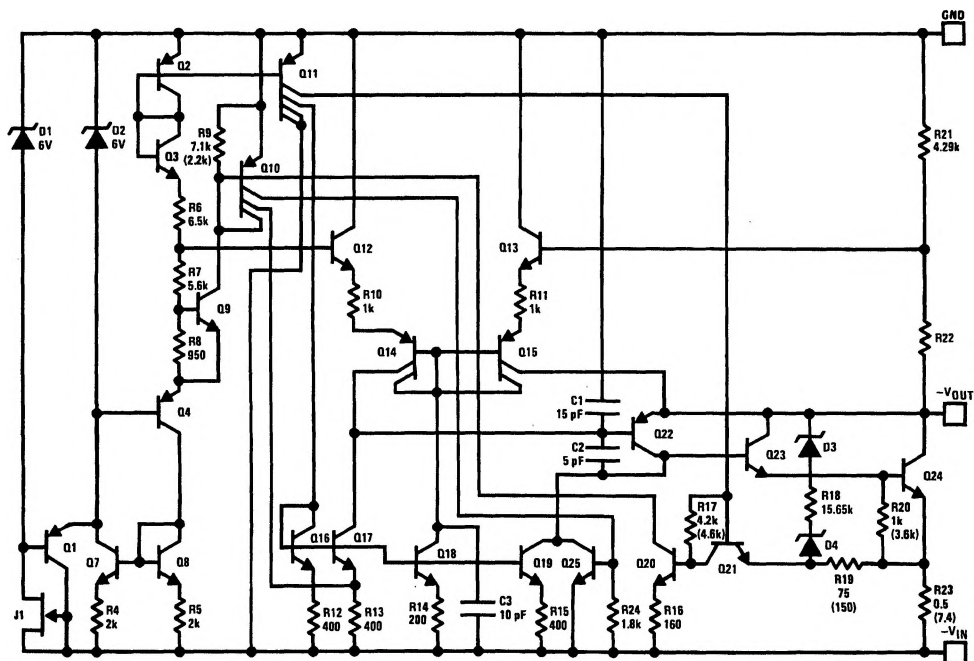
Schematic Diagrams

-5V



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-12V and -15V



TL/H/7748-10