

LM320L/LM79LXXAC/LM13121 Series 3-Terminal Negative Regulators

General Description

The LM320L/LM79LXXAC/LM13121 dual marked series of 3-terminal negative voltage regulators features fixed output voltages of $-5V$, $-12V$, and $-15V$ with output current capabilities in excess of 100mA. 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/LM13121 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 volt-

ages 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.

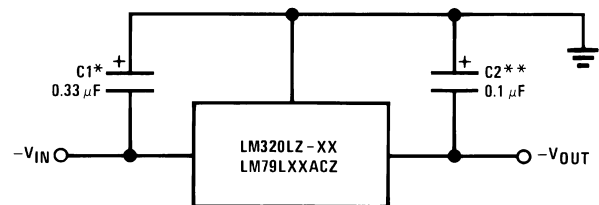
For output voltage other than $-5V$, $-12V$ and $-15V$, the LM137L series provides an output voltage range from 1.2V to 47V.

Features

- Preset output voltage error is less than $\pm 5\%$ overload, line and temperature
- Specified at an output current of 100mA
- 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

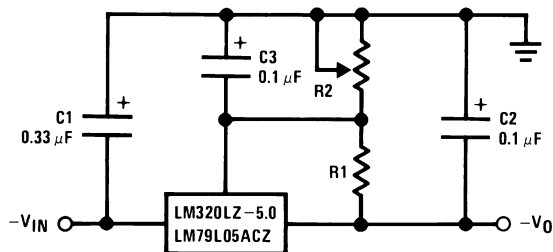


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*Required if the regulator is located far from the power supply filter. A $1\mu F$ aluminum electrolytic may be substituted.

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

Adjustable Output Regulator



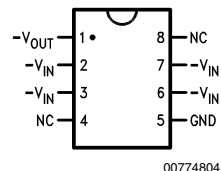
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$$-V_0 = -5V - (5V/R_1 + I_Q) \cdot R_2,$$

$$5V/R_1 > 3 I_Q$$

Connection Diagrams

SO-8 Plastic (Narrow Body)

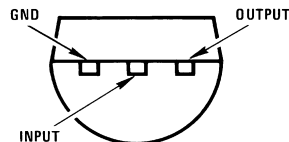


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Top View

Order Number LM79L05ACM, LM79L12ACM
LM79L15ACM, LM79L05ACMX,
LM79L12ACMX or LM79L15ACMX
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, LM13121Z-12, LM13121Z-15,
LM13121Z-5.0

See NS Package Number Z03A

Absolute Maximum Ratings (Note 1)

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 2)

Internally Limited

Operating Temperature Range

0°C to +70°C

Maximum Junction Temperature

+125°C

Storage Temperature Range

-55°C to +150°C

Lead Temperature

(Soldering, 10 sec.)

260°C

Electrical Characteristics (Note 3)
 $T_A = 0^\circ\text{C to } +70^\circ\text{C}$ 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 = 100mA	-5.2	-5	-4.8	-12.5	-12	-11.5	-15.6	-15	-14.4	V
		1mA ≤ I _O ≤ 100mA	-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)			
		1mA ≤ I _O ≤ 40mA	-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 = 100mA	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 = 40mA	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										mV
		1mA ≤ I _O ≤ 100mA	50			100			125			
ΔV _O	Long Term Stability	I _O = 100mA	20			48			60			mV/khrs
I _Q	Quiescent Current	I _O = 100mA	2			2			2			mA
ΔI _Q	Quiescent Current Change	1mA ≤ I _O ≤ 100mA	0.3			0.3			0.3			
		1mA ≤ I _O ≤ 40mA	0.1			0.1			0.1			mA
		I _O = 100mA	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 = 100mA	40			96			120			μV
		f = 10Hz – 10kHz										
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	T _J = 25°C, I _O = 100mA f = 120Hz	50			52			50			dB
	Input Voltage Required to Maintain Line Regulation	T _J = 25°C, I _O = 100mA	-7.3			-14.6			-17.7			V
		I _O = 40mA	-7.0			-14.5			-17.5			V

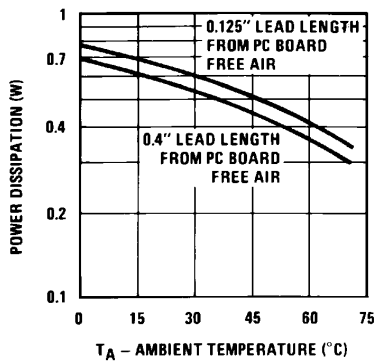
Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits.

Note 2: Thermal resistance of Z package is 60°C/W θ_{JC} , 232°C/W θ_{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 3: To ensure constant junction temperature, low duty cycle pulse testing is used.

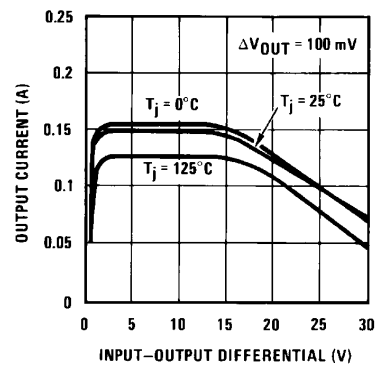
Typical Performance Characteristics

Maximum Average Power
Dissipation (TO-92)



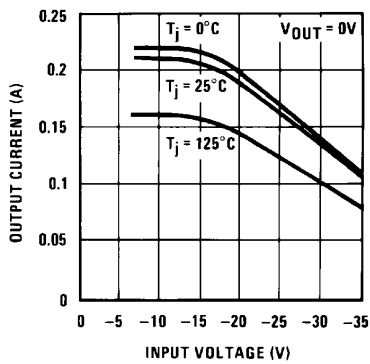
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Peak Output Current



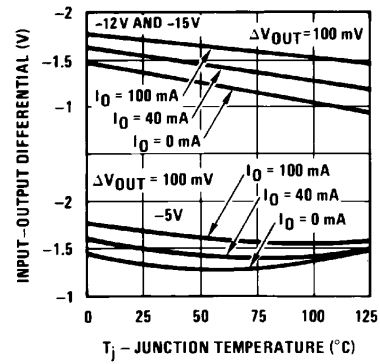
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Short Circuit Output
Current



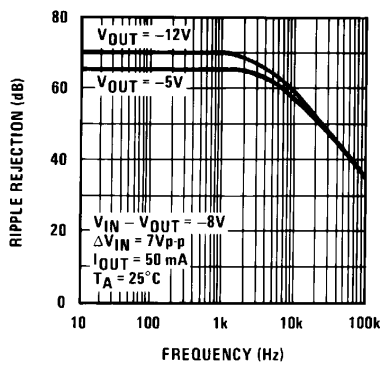
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Dropout Voltage



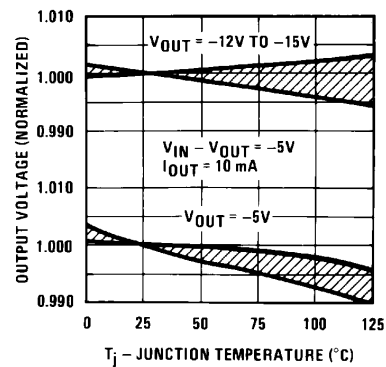
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Ripple Rejection



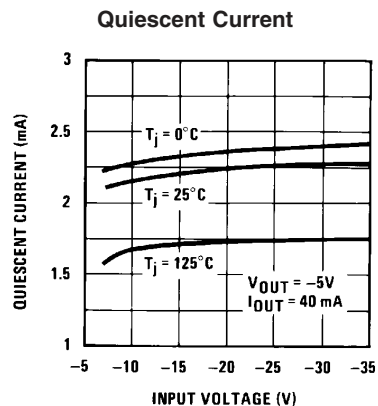
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Output Voltage vs.
Temperature (Normalized
to 1V @ 25°C)

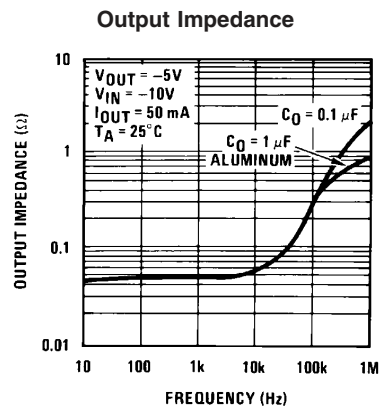


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Typical Performance Characteristics (Continued)



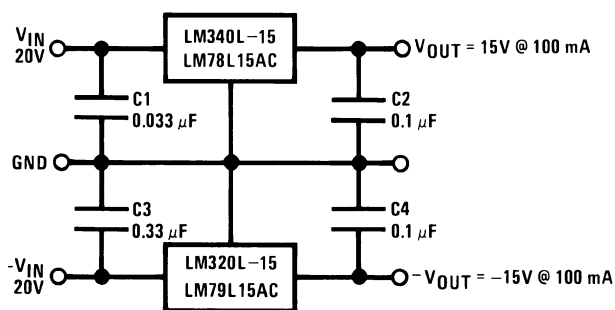
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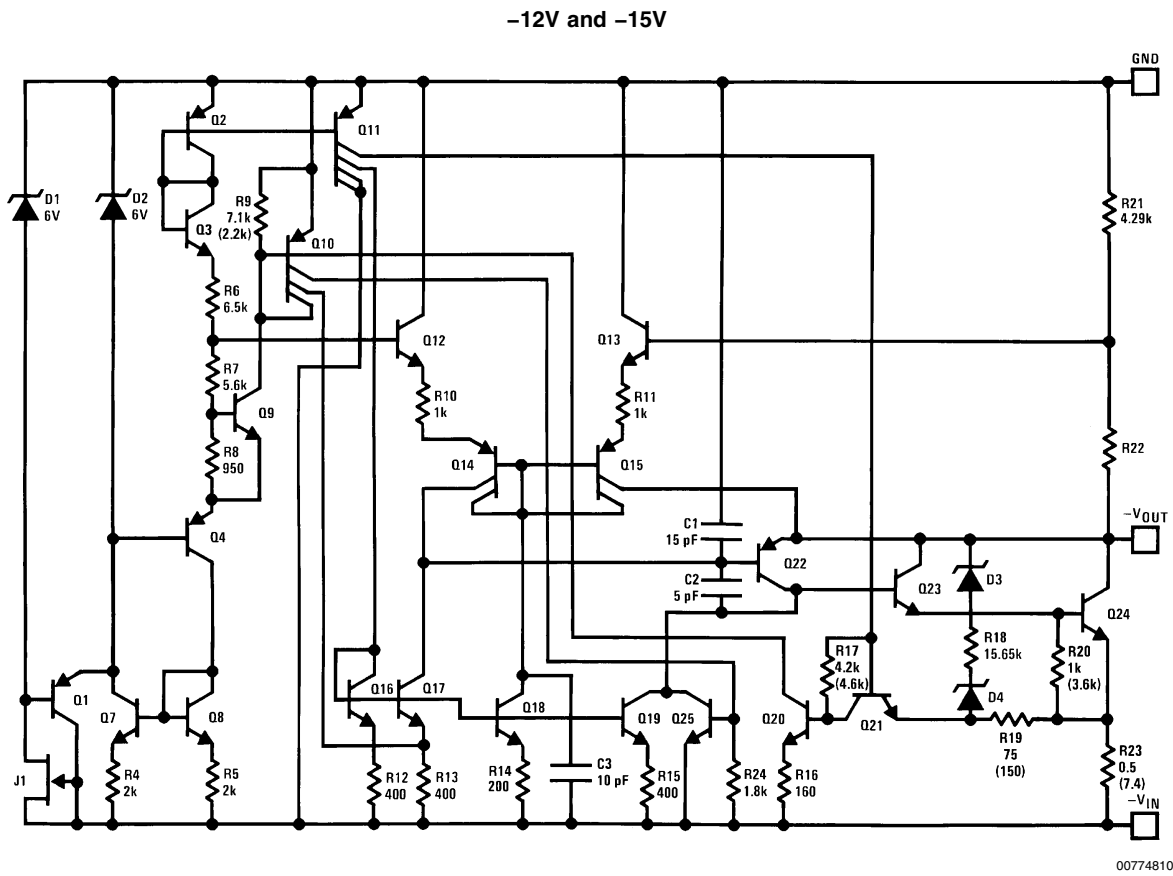
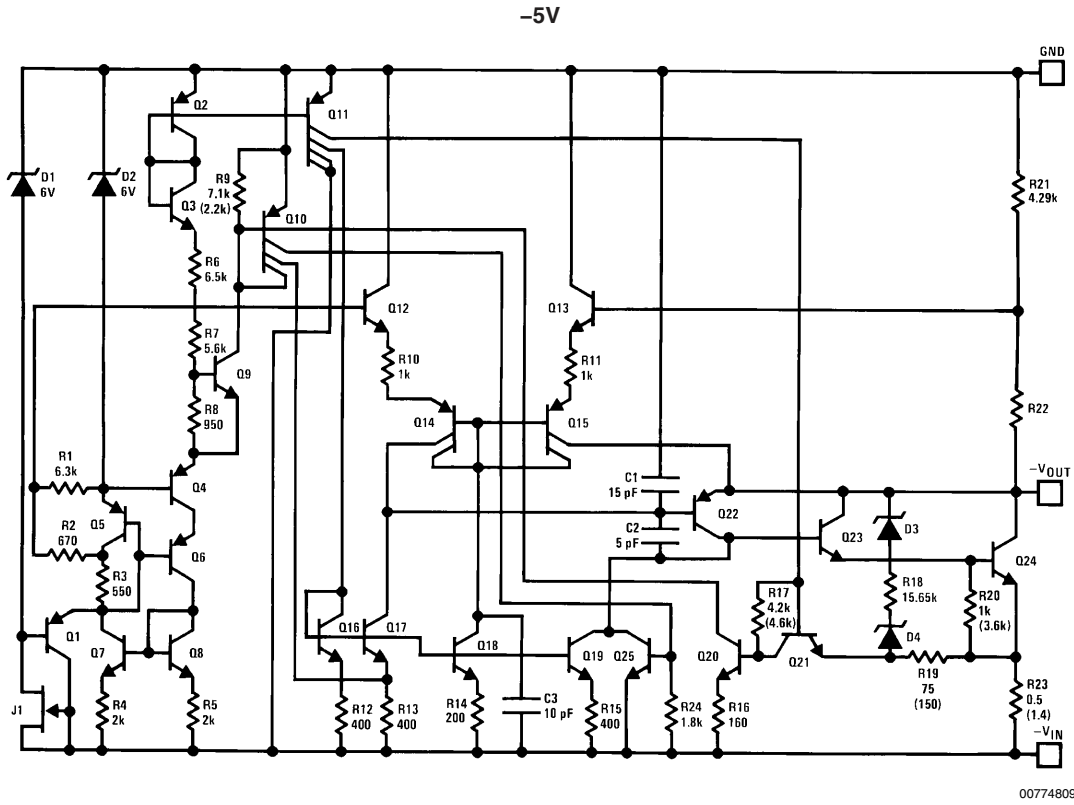
Typical Applications

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



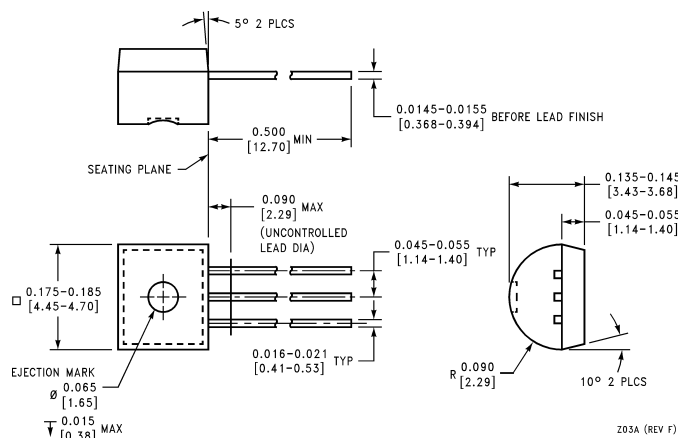
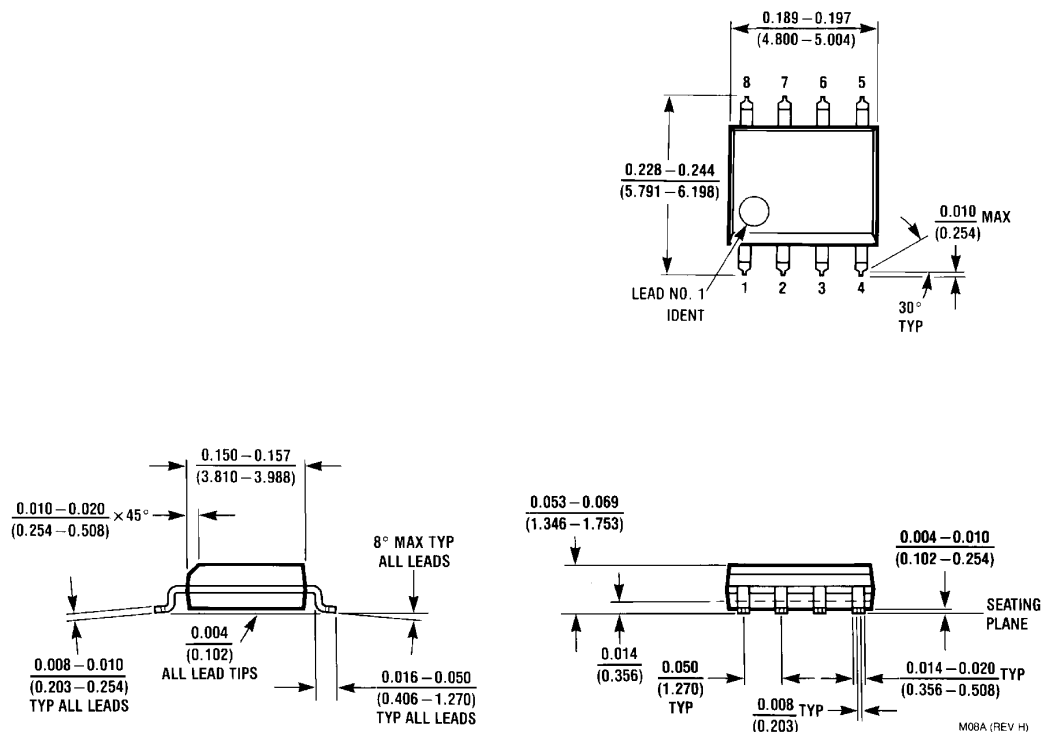
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Schematic Diagrams



Physical Dimensions inches (millimeters)

unless otherwise noted



Notes

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