

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 volt-

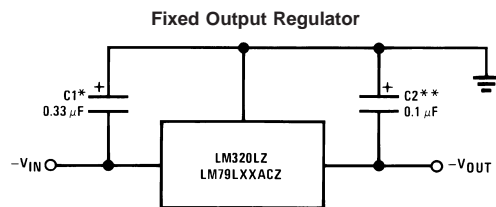
ages and currents. The LM79LXXAC series is available in the 3-lead TO-92 package, and SO-8; 8 lead package. The LM320L series is available in the 3-lead TO-92 package.

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 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 $0.01\% V_{OUT}/mA$

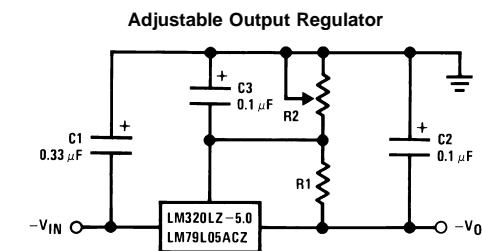
Typical Applications



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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.

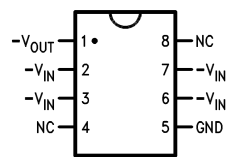


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$$-V_O = -5V - (5V/R_1 + I_Q) \cdot R_2, \\ 5V/R_1 > 3 I_Q$$

Connection Diagrams

SO-8 Plastic (Narrow Body)

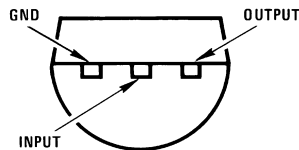


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Top View

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

TO-92 Plastic Package (Z)



DS007748-2

Bottom View

Order Number LM320LZ-5.0, LM79L05ACZ,
LM320LZ-12, LM79L12ACZ, LM320LZ-15 or
LM79L15ACZ
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)

Operating Temperature Range

Maximum Junction Temperature

Storage Temperature Range

Lead Temperature

(Soldering, 10 sec.)

Internally Limited

0°C to +70°C

+125°C

-55°C to +150°C

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 = 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	50			100			125			mV
		1 mA ≤ I _O ≤ 100 mA										
ΔV _O	Long Term Stability	I _O = 100 mA	20			48			60			mV/khrs
I _Q	Quiescent Current	I _O = 100 mA	2			2			2			mA
ΔI _Q	Quiescent Current Change	1 mA ≤ I _O ≤ 100 mA	0.3			0.3			0.3			
		1 mA ≤ I _O ≤ 40 mA	0.1			0.1			0.1			mA
		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	40			96			120			μV
		f = 10 Hz – 10 kHz										
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	T _J = 25°C, I _O = 100 mA	50			52			50			dB
		f = 120 Hz										
	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

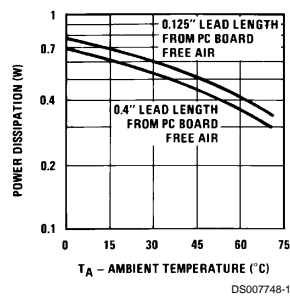
Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits.

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.

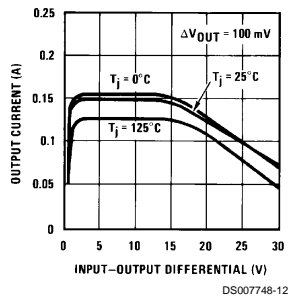
Note 3: To ensure constant junction temperature, low duty cycle pulse testing is used.

Typical Performance Characteristics

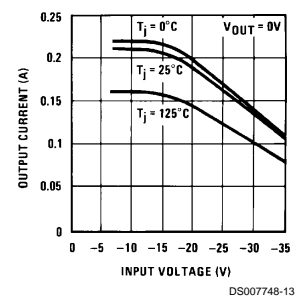
Maximum Average Power Dissipation (TO-92)



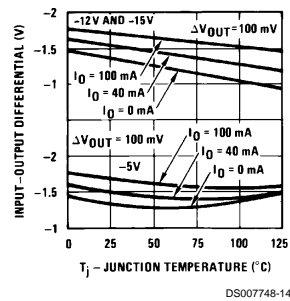
Peak Output Current



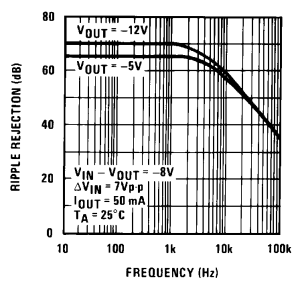
Short Circuit Output Current



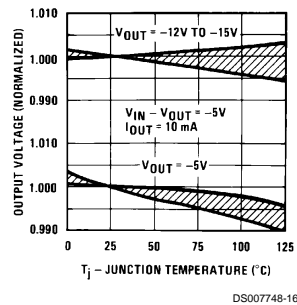
Dropout Voltage



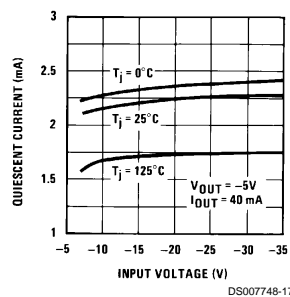
Ripple Rejection



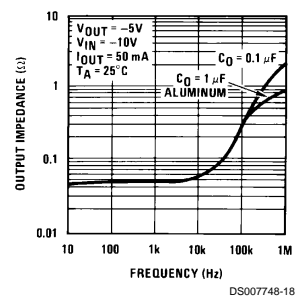
Output Voltage vs. Temperature (Normalized to 1V @ 25°C)



Quiescent Current

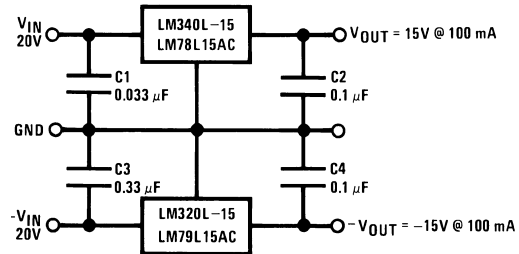


Output Impedance



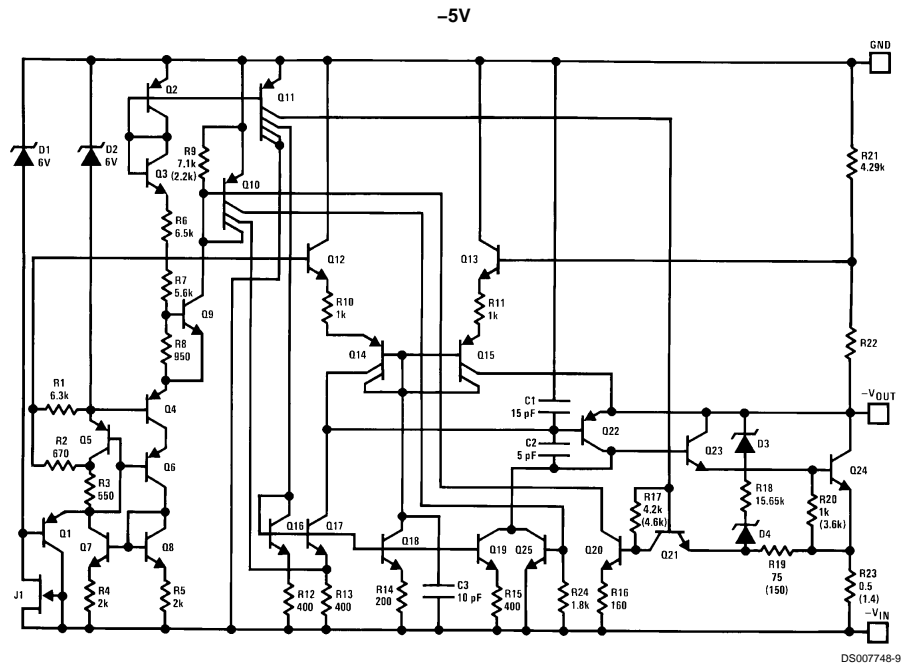
Typical Applications

±15V, 100 mA Dual Power Supply



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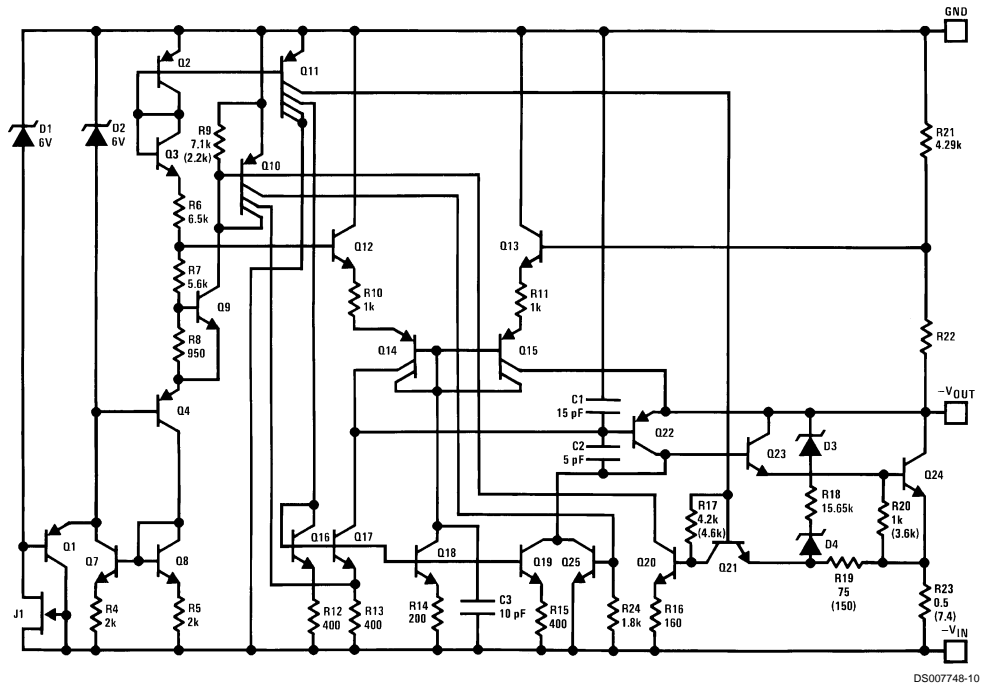
Schematic Diagrams



DS007748-9

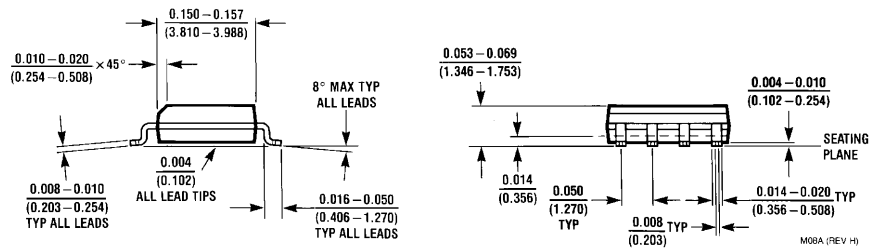
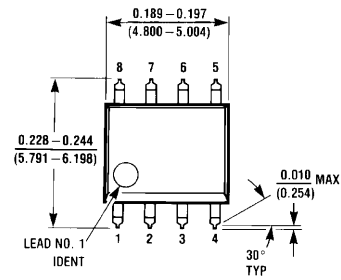
Schematic Diagrams (Continued)

-12V and -15V

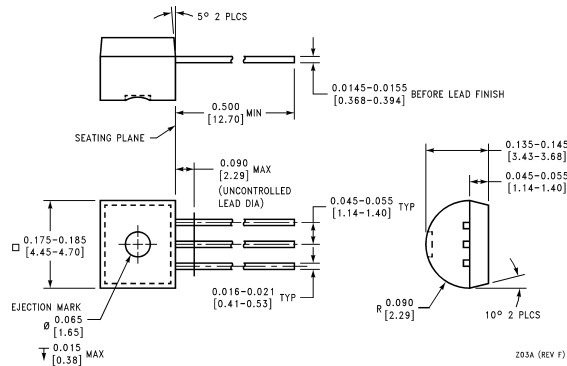


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Physical Dimensions inches (millimeters) unless otherwise noted



S.O. Package (M)
Order Number LM79L05ACM, LM79L12ACM or LM79L15ACM
NS Package Number M08A



Molded Offset TO-92 (Z)
Order Number LM320LZ-5.0, LM79L05ACZ, LM320LZ-12,
LM79L12ACZ, LM320LZ-15 or LM79L15ACZ
NS Package Number Z03A

Notes

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