

# LM320L/LM79LXXAC Series

## 3-Terminal Negative Regulators

### General Description

The LM320L/LM79LXXAC 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 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.

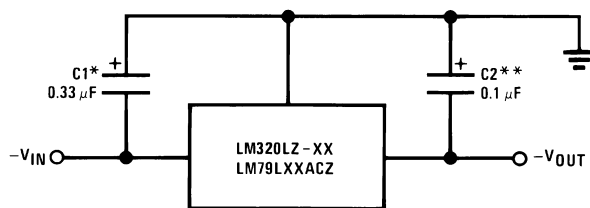
For output voltage other than  $-5V$ ,  $-12V$  and  $-15V$ , the LM137L series provides an output voltage range from 1.2V to 47V.

### 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

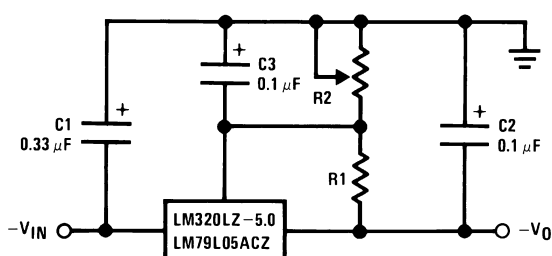


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\*Required if the regulator is located far from the power supply filter. A  $1\mu F$  aluminum electrolytic may be substituted.

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

#### Adjustable Output Regulator



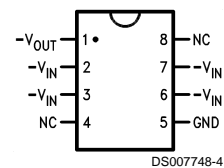
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$$-V_0 = -5V - (5V/R1 + I_Q) \cdot R2,$$

$$5V/R1 > 3 I_Q$$

### Connection Diagrams

#### SO-8 Plastic (Narrow Body)

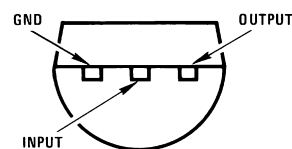


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#### Top View

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  
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

 $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  $+125^{\circ}\text{C}$  $-55^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$  $260^{\circ}\text{C}$ **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	$T_J = 25^{\circ}\text{C}, I_O = 100\text{mA}$	-5.2	-5	-4.8	-12.5	-12	-11.5	-15.6	-15	-14.4	V
		$1\text{mA} \leq I_O \leq 100\text{mA}$	-5.25		-4.75	-12.6		-11.4	-15.75		-14.25	
		$V_{\text{MIN}} \leq V_{\text{IN}} \leq V_{\text{MAX}}$	$(-20 \leq V_{\text{IN}} \leq -7.5)$			$(-27 \leq V_{\text{IN}} \leq -14.8)$			$(-30 \leq V_{\text{IN}} \leq -18)$			
		$1\text{mA} \leq I_O \leq 40\text{mA}$	-5.25		-4.75	-12.6		-11.4	-15.75		-14.25	
		$V_{\text{MIN}} \leq V_{\text{IN}} \leq V_{\text{MAX}}$	$(-20 \leq V_{\text{IN}} \leq -7)$			$(-27 \leq V_{\text{IN}} \leq -14.5)$			$(-30 \leq V_{\text{IN}} \leq -17.5)$			
$\Delta V_O$	Line Regulation	$T_J = 25^{\circ}\text{C}, I_O = 100\text{mA}$			60			45			45	mV
		$V_{\text{MIN}} \leq V_{\text{IN}} \leq V_{\text{MAX}}$	$(-20 \leq V_{\text{IN}} \leq -7.3)$			$(-27 \leq V_{\text{IN}} \leq -14.6)$			$(-30 \leq V_{\text{IN}} \leq -17.7)$			V
		$T_J = 25^{\circ}\text{C}, I_O = 40\text{mA}$			60			45			45	mV
		$V_{\text{MIN}} \leq V_{\text{IN}} \leq V_{\text{MAX}}$	$(-20 \leq V_{\text{IN}} \leq -7)$			$(-27 \leq V_{\text{IN}} \leq -14.5)$			$(-30 \leq V_{\text{IN}} \leq -17.5)$			V
$\Delta V_O$	Load Regulation	$T_J = 25^{\circ}\text{C}$			50			100			125	mV
		$1\text{mA} \leq I_O \leq 100\text{mA}$										
$\Delta V_O$	Long Term Stability	$I_O = 100\text{mA}$		20			48			60		mV/khrs
$I_Q$	Quiescent Current	$I_O = 100\text{mA}$		2	6			2	6			mA
$\Delta I_Q$	Quiescent Current Change	$1\text{mA} \leq I_O \leq 100\text{mA}$			0.3			0.3			0.3	mA
		$1\text{mA} \leq I_O \leq 40\text{mA}$			0.1			0.1		0.1		
		$I_O = 100\text{mA}$			0.25			0.25		0.25		
		$V_{\text{MIN}} \leq V_{\text{IN}} \leq V_{\text{MAX}}$	$(-20 \leq V_{\text{IN}} \leq -7.5)$			$(-27 \leq V_{\text{IN}} \leq -14.8)$			$(-30 \leq V_{\text{IN}} \leq -18)$			
$V_n$	Output Noise Voltage	$T_J = 25^{\circ}\text{C}, I_O = 100\text{mA}$ $f = 10\text{Hz} - 10\text{kHz}$		40			96			120		$\mu\text{V}$
$\frac{\Delta V_{\text{IN}}}{\Delta V_O}$	Ripple Rejection	$T_J = 25^{\circ}\text{C}, I_O = 100\text{mA}$ $f = 120\text{Hz}$		50			52			50		dB
	Input Voltage Required to Maintain Line Regulation	$T_J = 25^{\circ}\text{C}, I_O = 100\text{mA}$			-7.3			-14.6			-17.7	V
		$I_O = 40\text{mA}$			-7.0			-14.5			-17.5	V

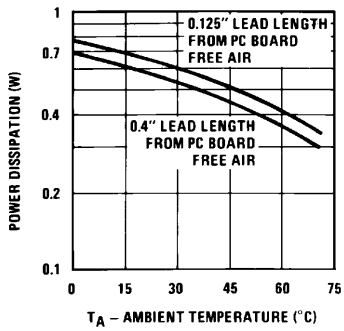
**Note 1:** Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits.

**Note 2:** Thermal resistance of Z package is  $60^{\circ}\text{C/W}$   $\theta_{\text{JC}}$ ,  $232^{\circ}\text{C/W}$   $\theta_{\text{JA}}$  at still air, and  $88^{\circ}\text{C/W}$  at 400 ft/min of air. The M package  $\theta_{\text{JA}}$  is  $180^{\circ}\text{C/W}$  in still air. The maximum junction temperature shall not exceed  $125^{\circ}\text{C}$  on electrical parameters.

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

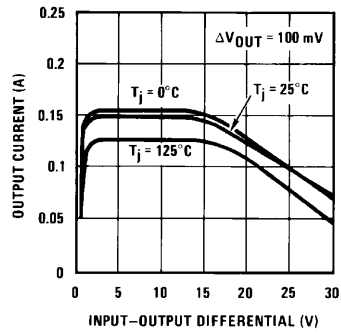
# Typical Performance Characteristics

**Maximum Average Power Dissipation (TO-92)**



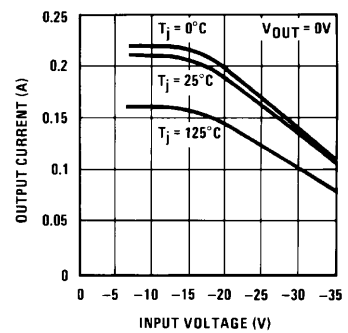
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**Peak Output Current**



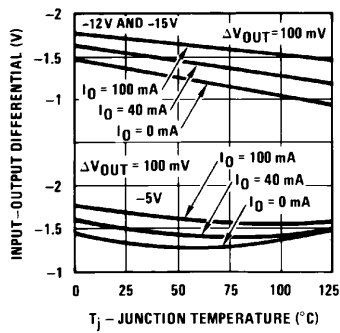
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**Short Circuit Output Current**



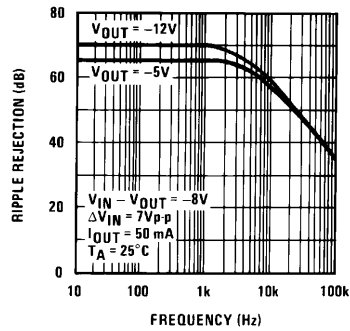
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**Dropout Voltage**



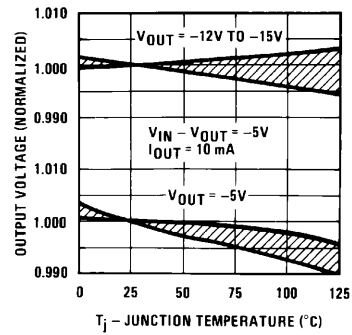
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**Ripple Rejection**



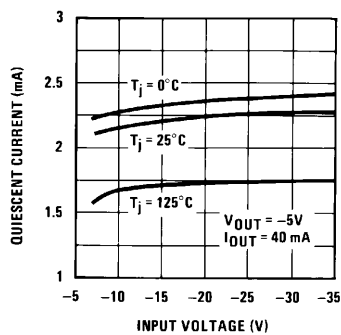
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**Output Voltage vs. Temperature (Normalized to 1V @ 25°C)**



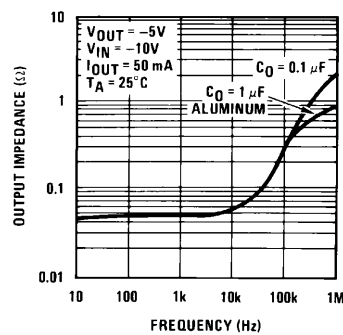
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**Quiescent Current**



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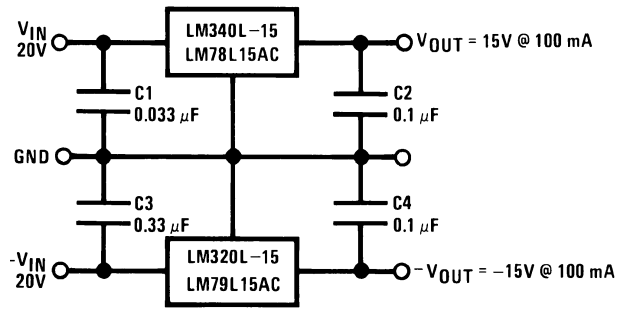
**Output Impedance**



DS007748-18

# Typical Applications

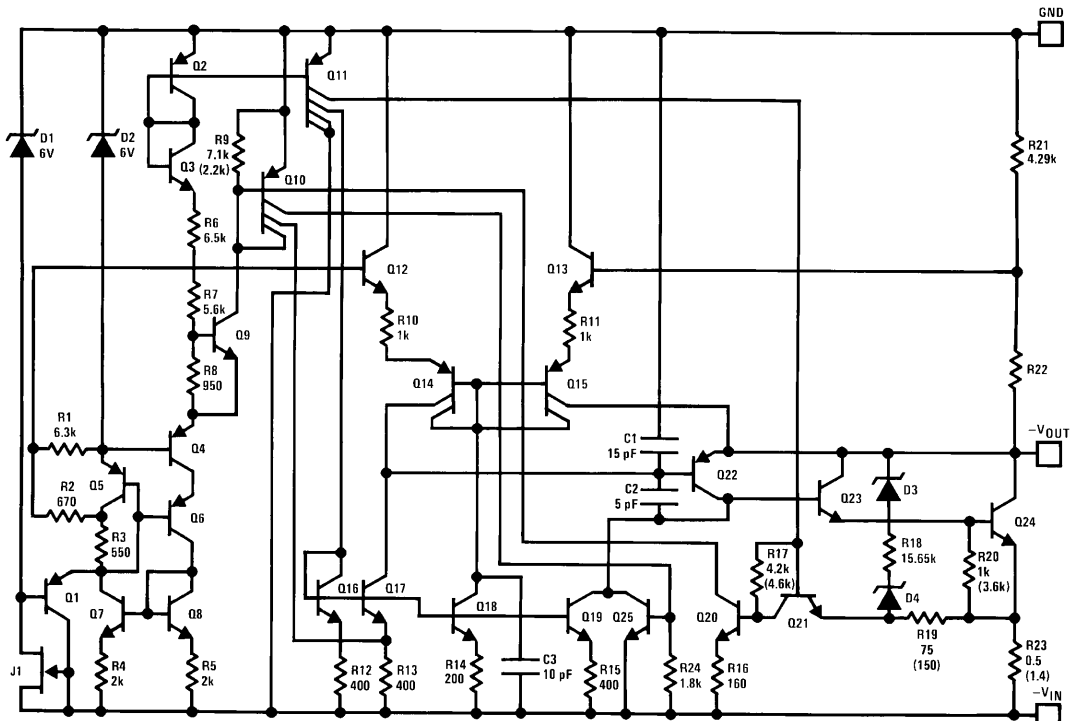
±15V, 100mA Dual Power Supply



DS007748-6

# Schematic Diagrams

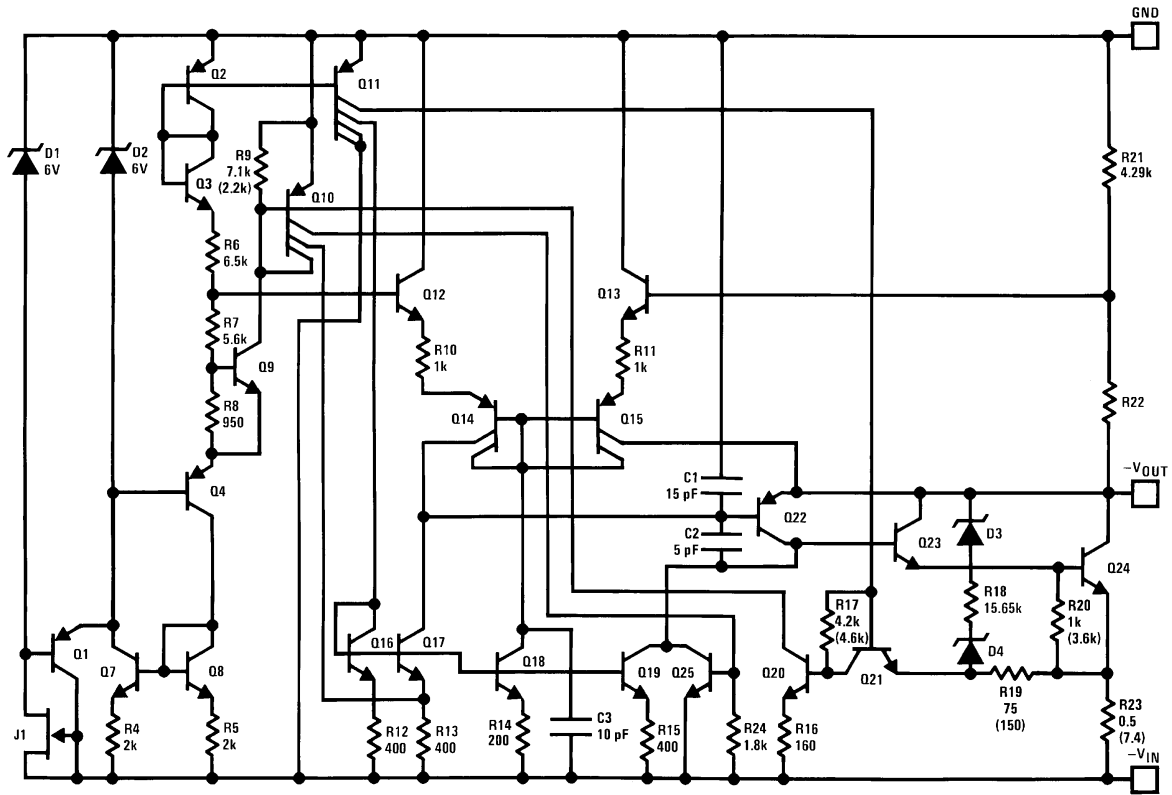
-5V



DS007748-9

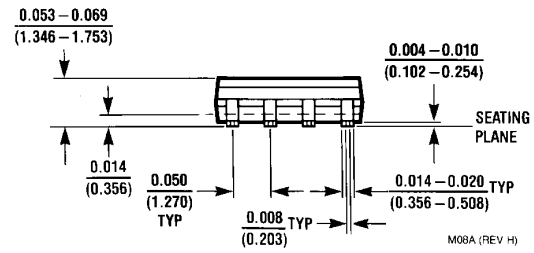
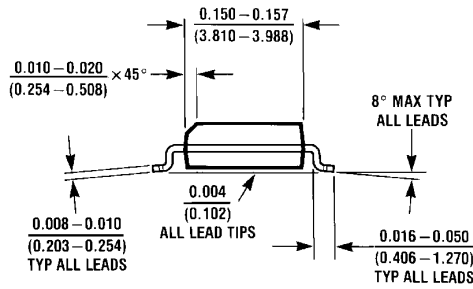
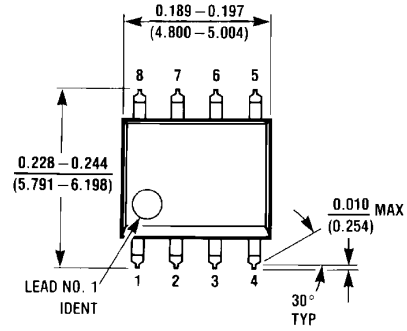
Schematic Diagrams (Continued)

-12V and -15V

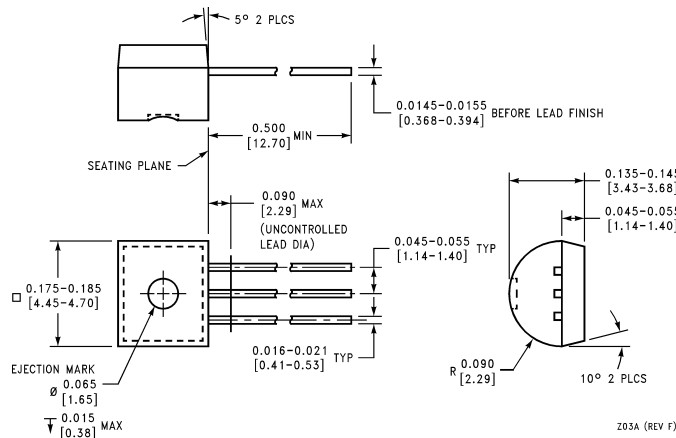


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**Physical Dimensions** inches (millimeters) unless otherwise noted



**S.O. Package (M)**  
**Order Number LM79L05ACM, LM79L12ACM, LM79L15ACM,**  
**LM79L05ACMX, LM79L12ACMX, or LM79L15ACMX**  
**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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