

## 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  $0.01\% V_O/mA$ .

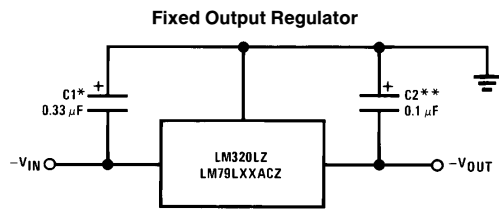
The LM320L/LM79LXXAC series also includes, as self-protection circuitry: safe operating area circuitry for output transistor power dissipation limiting, a temperature independent short circuit current limit for peak output current limiting, and a thermal shutdown circuit to prevent excessive junction 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  $0.01\% V_{OUT}/mA$

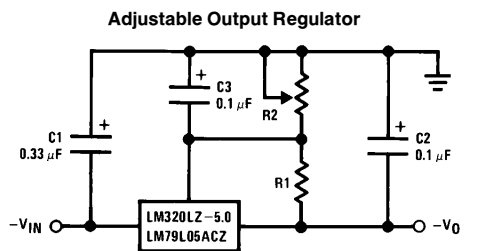
### Typical Applications



TL/H/7748-1

\*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.



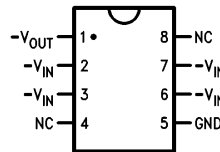
TL/H/7748-3

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

$$5V/R1 > 3 I_Q$$

### Connection Diagrams

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

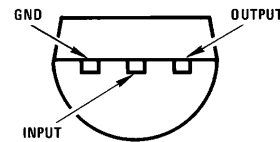


TL/H/7748-4

#### Top View

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

#### TO-92 Plastic Package (Z)



TL/H/7748-2

#### 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°C to +70°C

Maximum Junction Temperature

+125°C

Storage Temperature Range

-55°C to +150°C

Lead Temperature (Soldering, 10 sec.)

260°C

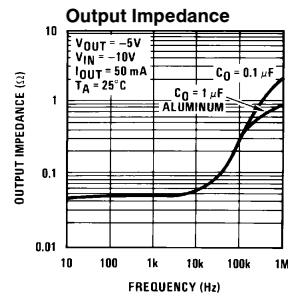
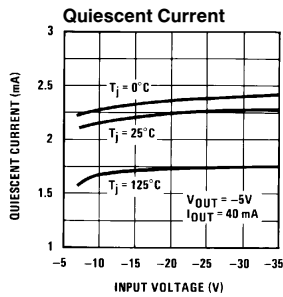
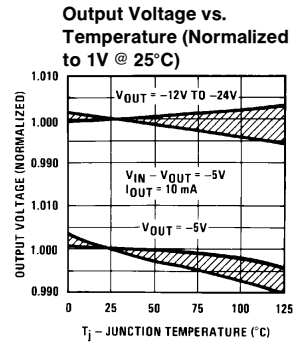
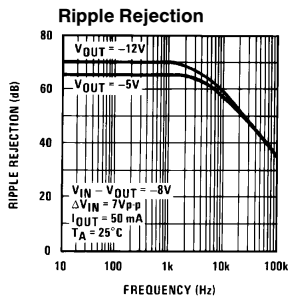
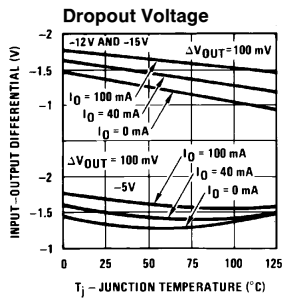
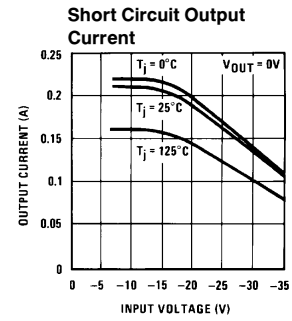
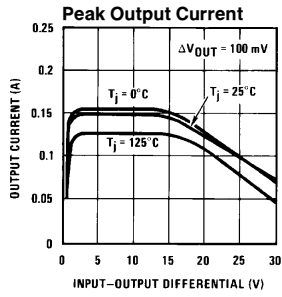
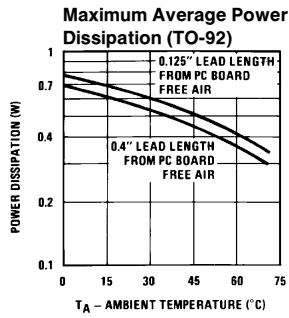
## Electrical Characteristics (Note 2) $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$ unless otherwise noted.

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	$T_J = 25^\circ\text{C}, I_O = 100\text{ mA}$	-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	$T_J = 25^\circ\text{C}$ $1\text{ mA} \leq I_O \leq 100\text{ mA}$			50			100			125	mV	
$\Delta V_O$	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	mA
		$V_{\text{MIN}} \leq V_{\text{IN}} \leq V_{\text{MAX}}$	(-20 $\leq V_{\text{IN}} \leq -7.5$ )			(-27 $\leq V_{\text{IN}} \leq -14.8$ )			(-30 $\leq V_{\text{IN}} \leq -18$ )			V	
$V_n$	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:** Thermal resistance of Z package is 60°C/W  $\theta_{\text{JC}}$ , 232°C/W  $\theta_{\text{JA}}$  at still air, and 88°C/W at 400 ft/min of air. The M package  $\theta_{\text{JA}}$  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.

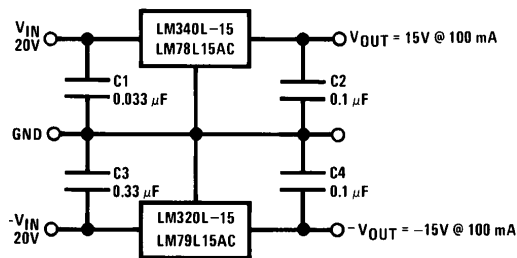
## Typical Performance Characteristics



TL/H/7748-5

## Typical Applications (Continued)

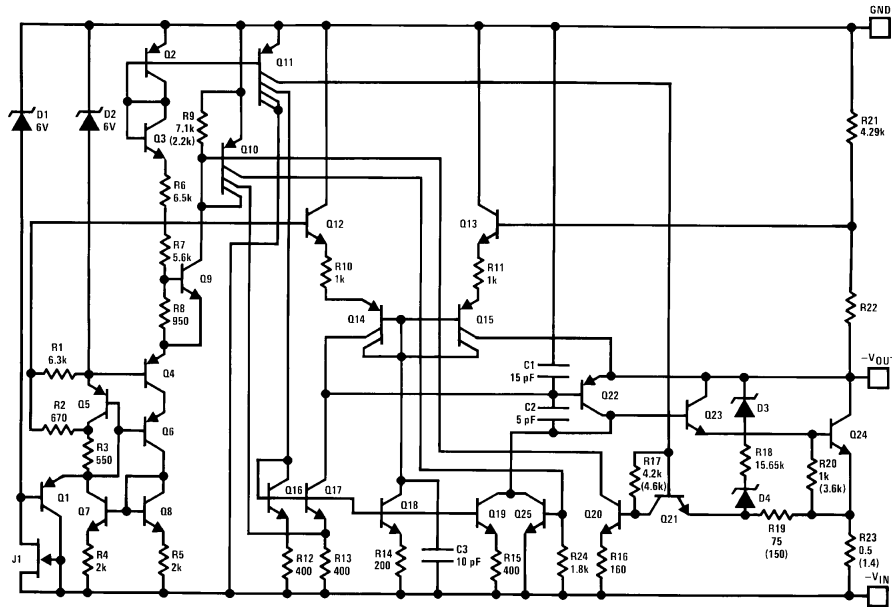
$\pm 15$ V, 100 mA Dual Power Supply



TL/H/7748-6

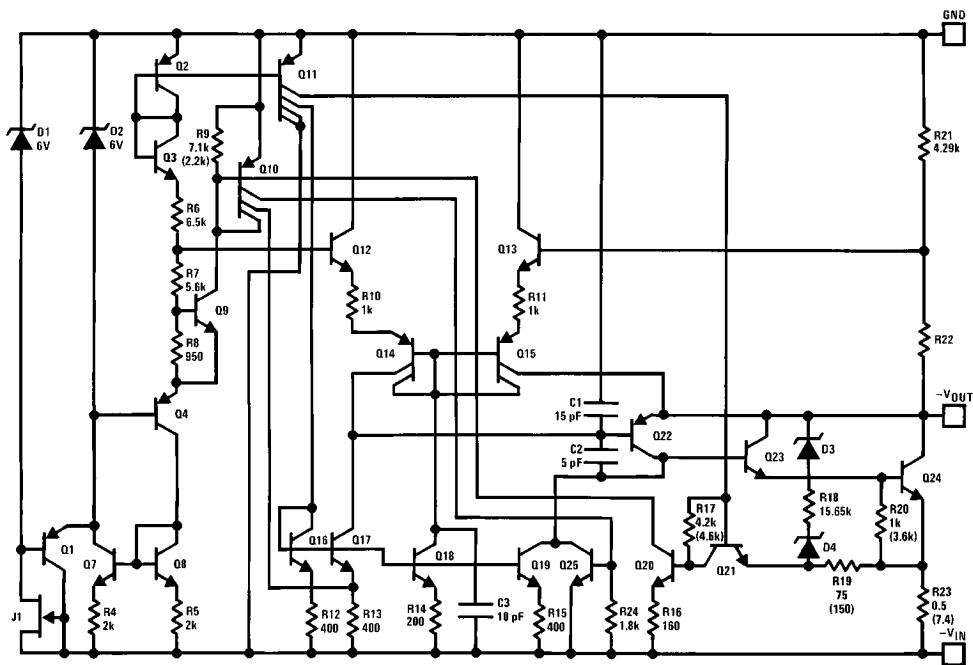
# Schematic Diagrams

-5V



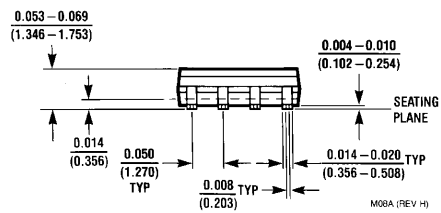
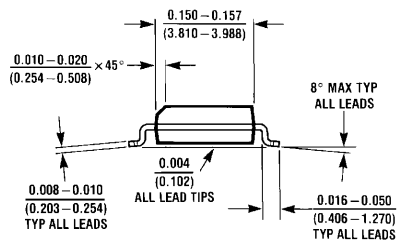
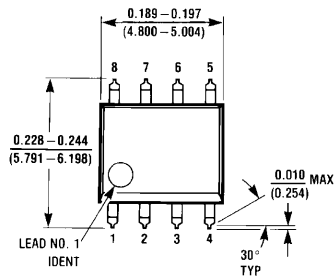
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-12V and -15V



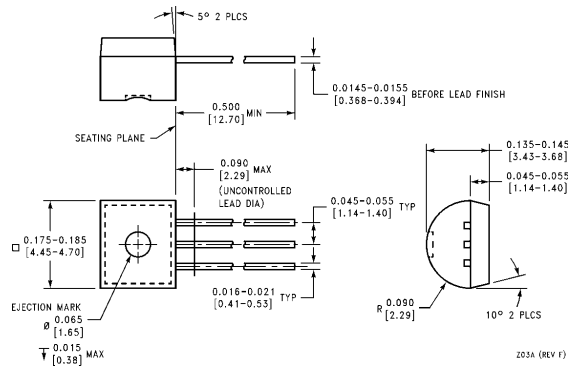
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**Physical Dimensions** inches (millimeters)



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

**Physical Dimensions** inches (millimeters) (Continued)



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

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