



## LM79LXXAC Series 3-Terminal Negative Regulators

### General Description

The 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 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.

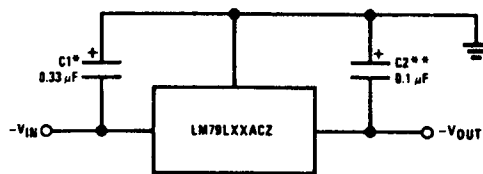
For output voltage other than  $-5V$ ,  $-12V$  and  $-15V$  the LM137L series provides an output voltage range from 1.2V to 47V.

### 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  $0.01\% V_{OUT}/mA$
- TO-92 package

### Typical Applications

#### Fixed Output Regulator

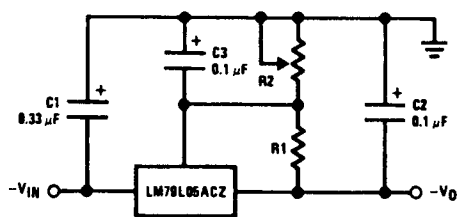


TL/H/7748-1

\*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.

#### Adjustable Output Regulator



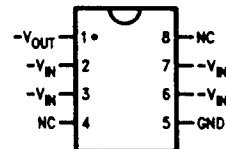
TL/H/7748-3

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

$$5V/R1 > 3 I_Q$$

### Connection Diagrams

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

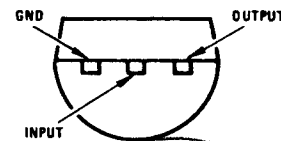


Top View

TL/H/7748-4

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

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

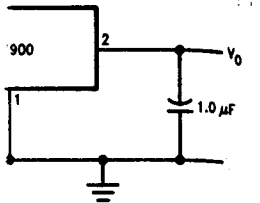


Bottom View

TL/H/7748-2

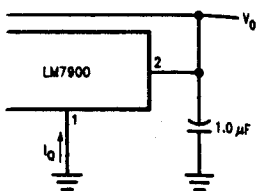
Order Number LM79L05ACZ,  
LM79L12ACZ or LM79L15ACZ  
See NS Package Number Z03A

#### Output Regulator



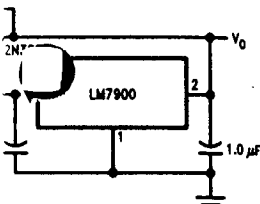
TL/H/10050-5

#### Voltage Regulator



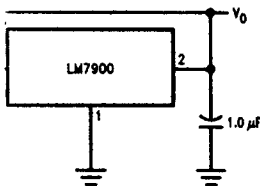
TL/H/10050-8

#### Foldback Current-Limited



TL/H/10050-7

#### Short Circuit Protected



TL/H/10050-8

### 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.)  $260^\circ\text{C}$

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

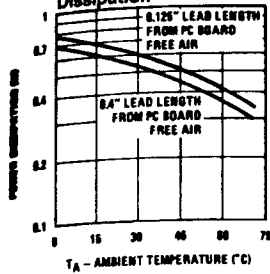
		Output Voltage			-5V			-12V			-15V			Units	
		Input Voltage (unless otherwise noted)			-10V			-17V			-20V				
Symbol	Parameter	Conditions			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
$V_O$	Output Voltage	$T_j = 25^\circ\text{C}, I_O = 100\text{ mA}$			-5.2	-5	-4.8	-12.5	-12	-11.5	-15.6	-15	-14.4	V	
		$1\text{ mA} \leq I_O \leq 100\text{ mA}$			-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	$T_j = 25^\circ\text{C}$			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	$T_j = 25^\circ\text{C}, I_O = 100\text{ mA}$			40			96			120			$\mu\text{V}$	
		$f = 10\text{ Hz} - 10\text{ kHz}$													
$\frac{\Delta V_{\text{IN}}}{\Delta V_O}$	Ripple Rejection	$T_j = 25^\circ\text{C}, I_O = 100\text{ mA}$			50			52			50			dB	
		$f = 120\text{ Hz}$													
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  $60^\circ\text{C/W}$   $\theta_{j-c}$ ,  $232^\circ\text{C/W}$   $\theta_{j-a}$  at still air, and  $88^\circ\text{C/W}$  at 400 ft/min of air. The M package  $\theta_{j-a}$  is  $180^\circ\text{C/W}$  in still air. The maximum junction temperature shall not exceed  $125^\circ\text{C}$  on electrical parameters.

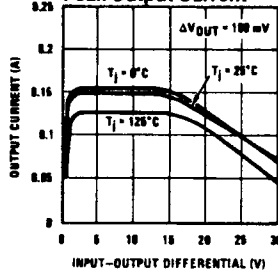
Note 2: To ensure constant junction temperature, low duty cycle pulse testing is used.

## Typical Performance Characteristics

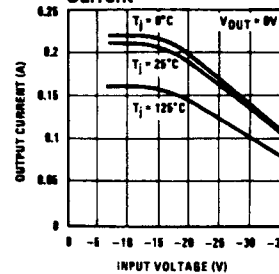
Maximum Average Power Dissipation



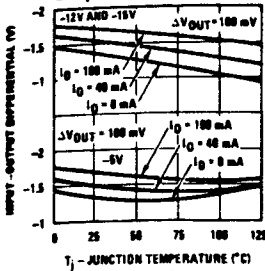
Peak Output Current



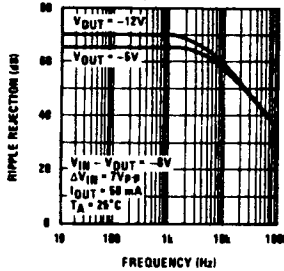
Short Circuit Output Current



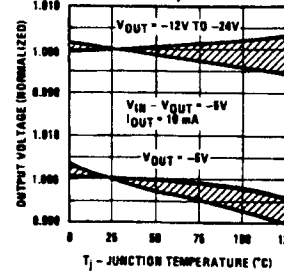
Dropout Voltage



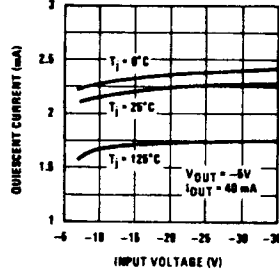
Ripple Rejection



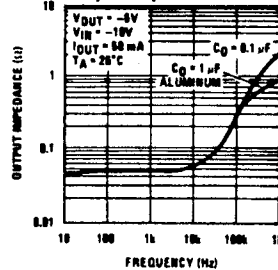
Output Voltage vs. Temperature (Normalized to 1V @ 25°C)



Quiescent Current

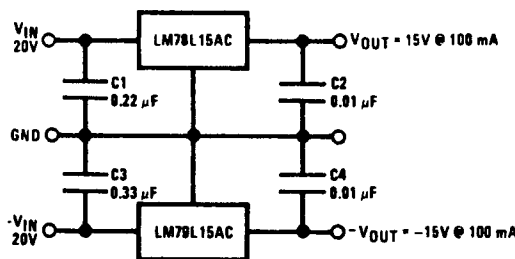


Output Impedance



## Typical Applications (Continued)

± 15V, 100 mA Dual Power Supply



TL/H/7748-6

0°C to +70°C		
+125°C		
-55°C to +150°C		
200°C		
-15V		Unreg
-20V		
Typ	Max	
-15	-14.4	
	-14.25	
V <sub>IN</sub> ≤ -18)	V	
	-14.25	
V <sub>IN</sub> ≤ -17.5)	V	
	45	mV
V <sub>IN</sub> ≤ -17.7)	V	
	45	mV
V <sub>IN</sub> ≤ -17.5)	V	
	25	mV
60		mV/100mA
2	6	mA
	0.3	
	0.1	mA
	0.25	mA
V <sub>IN</sub> ≤ -18)	V	
	120	μV
		dB
-17.7	V	
-17.5	V	

180°C/W in still air.