

**LM79L05,LM79L05AC,LM79L12,LM79L12AC,  
LM79L15,LM79L15AC**

*LM79LXXAC Series 3-Terminal Negative Regulators*



Literature Number: SNOSBR8J

# 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  $100mA$ . These devices were designed using the latest computer techniques for optimizing the packaged IC thermal/electrical performance. The LM79LXXAC series, when combined with a minimum output 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,

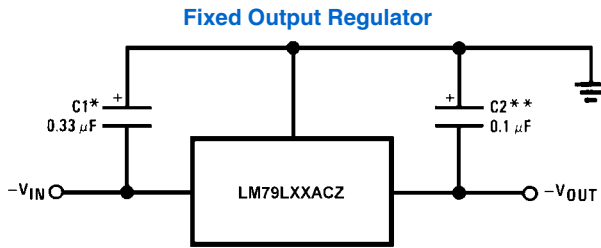
the 8-lead SOIC package, and the 6-Bump micro-SMD package.

For output voltages other than the pre-set  $-5V$ ,  $-12V$  and  $-15V$ , the LM137L series provides an adjustable 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  $0.01\% V_{OUT}/mA$
- See AN-1112 for micro-SMD considerations

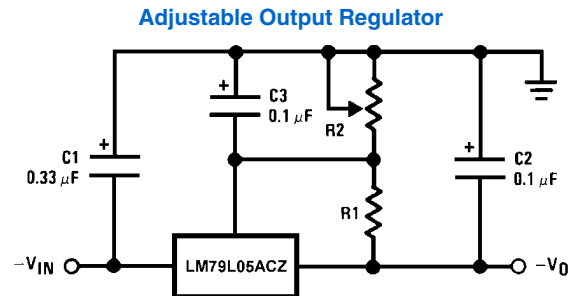
### Typical Applications



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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.

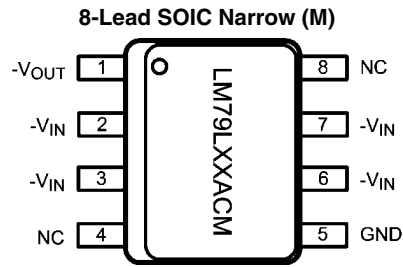


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$$-V_0 = -5V - (5V/R1 + I_O) \cdot R2,$$

$$5V/R1 > 3 I_O$$

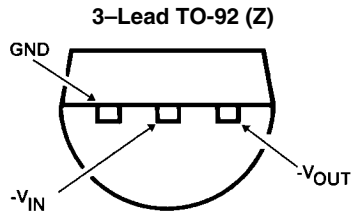
## Connection Diagrams



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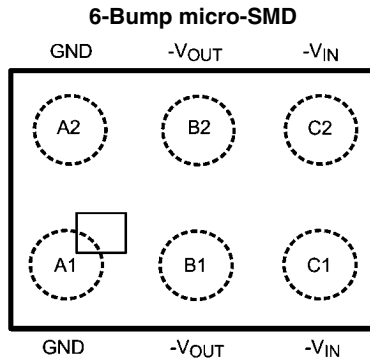
Pins labeled 'NC' on LM79LXXACM 8-Lead SOIC (pin 4 and pin 8) are Open, no internal connection.

**Top View**



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**Bottom View**



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**Top View (Bump Side Down)**

## Ordering Information

Package	Part Number	Package Marking	Transport Media	NSC Drawing
8-Lead SOIC	LM79L05ACM	LM79L	Rail of 95	M08A
	LM79L05ACMX	05ACM	Reel of 2500	
	LM79L12ACM	LM79L	Rail of 95	
	LM79L12ACMX	12ACM	Reel of 2500	
	LM79L15ACM	LM79L	Rail of 95	
	LM79L15ACMX	15ACM	Reel of 2500	
3-Pin TO-92	LM79L05ACZ	320L 79L05	Box of 1800	Z03A
	LM79L12ACZ	320L 79L12	Box of 1800	
	LM79L15ACZ	320L 79L15	Obsolete	
6-Bump micro-SMD	LM79L05ACTL	XVP	Reel of 250	TLA06AMA
	LM79L05ACTLX	IB	Reel of 3000	

## 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	$T_J = 25^\circ\text{C}, I_O = 100\text{mA}$	-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		
$\Delta V_O$	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 $\leq V_{\text{IN}} \leq -17.7$ )				
		$T_J = 25^\circ\text{C}, I_O = 40\text{mA}$			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 $\leq V_{\text{IN}} \leq -17.5$ )				
$\Delta V_O$	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		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 $\leq V_{\text{IN}} \leq -18$ )				
$V_n$	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	

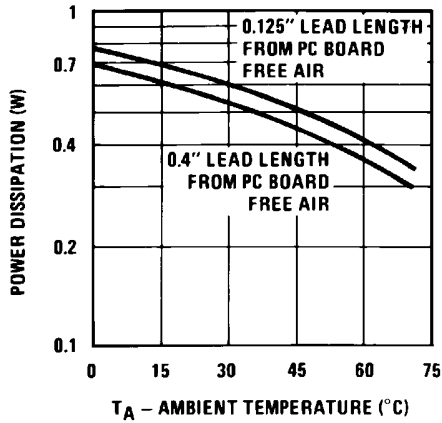
**Note 1:** Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits.

**Note 2:** Thermal resistance of TO-3 (Z) package is  $60^\circ\text{C/W}$   $\theta_{JC}$ ,  $232^\circ\text{C/W}$   $\theta_{JA}$  at still air, and  $88^\circ\text{C/W}$  at 400 ft/min of air. The  $\theta_{JA}$  of the LM78LXX in the 6-Bump micro-SMD package is  $114^\circ\text{C/W}$  when mounted on a 4-Layer JEDEC test board (JESD 51-7). The  $\theta_{JA}$  of the LM78LXX in the SOIC-8 (M) package 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.

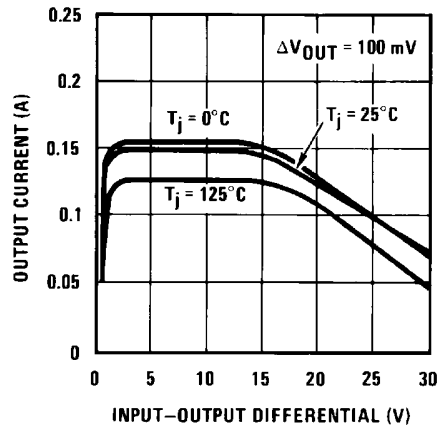
# Typical Performance Characteristics

Maximum Average Power Dissipation (TO-92)



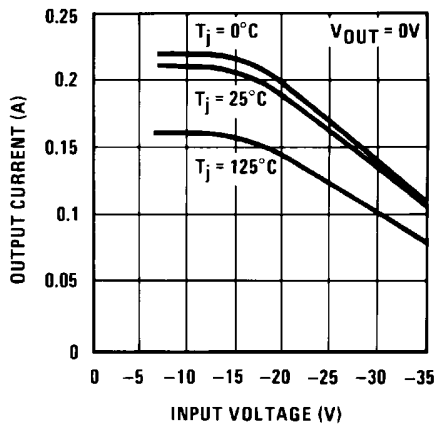
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Peak Output Current



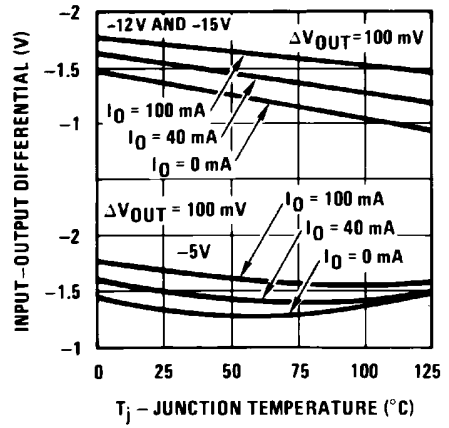
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Short Circuit Output Current



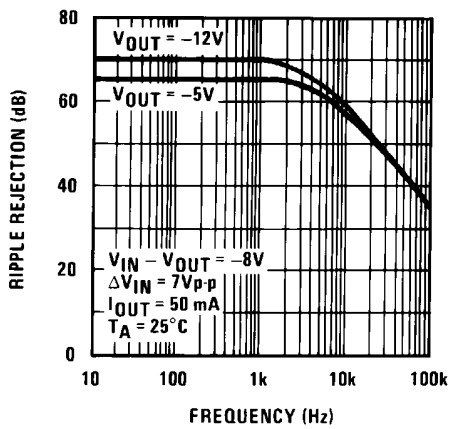
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Dropout Voltage



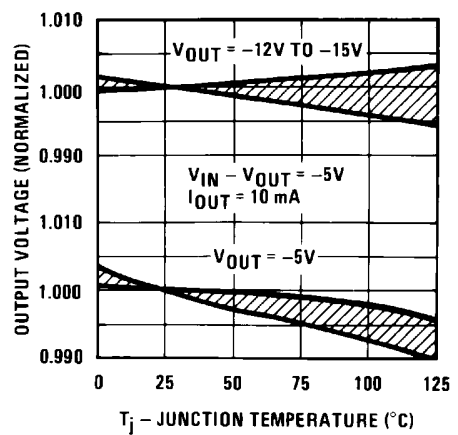
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Ripple Rejection

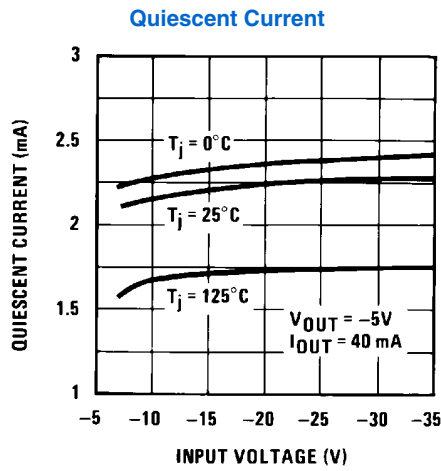


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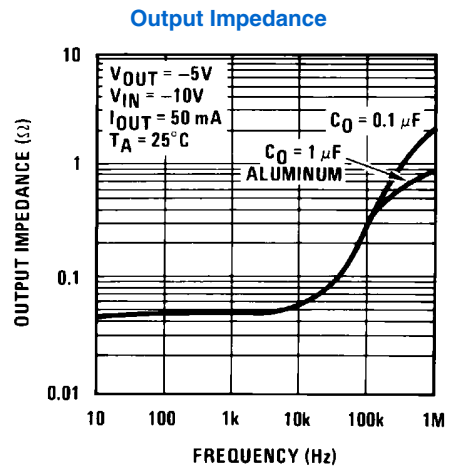
Output Voltage vs. Temperature (Normalized to 1V @ 25°C)



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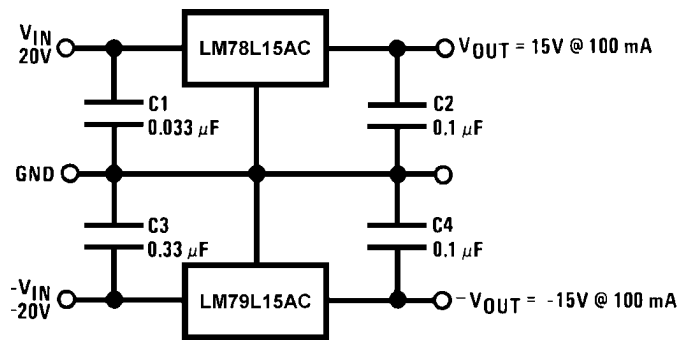
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## Typical Applications

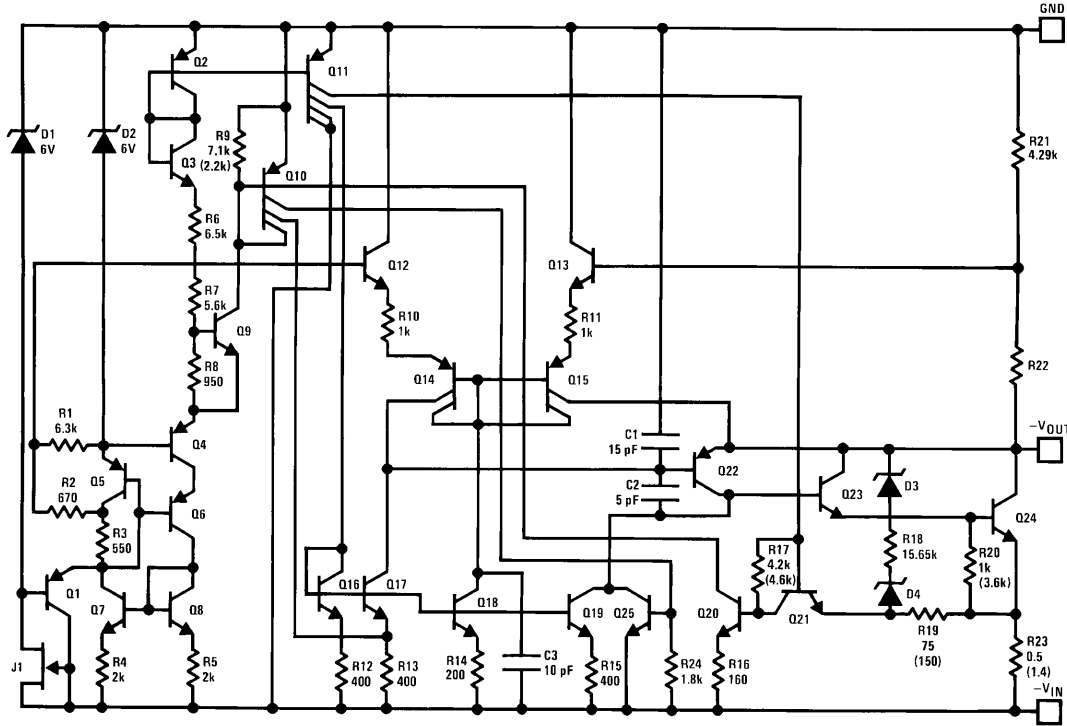
±15V, 100mA Dual Power Supply



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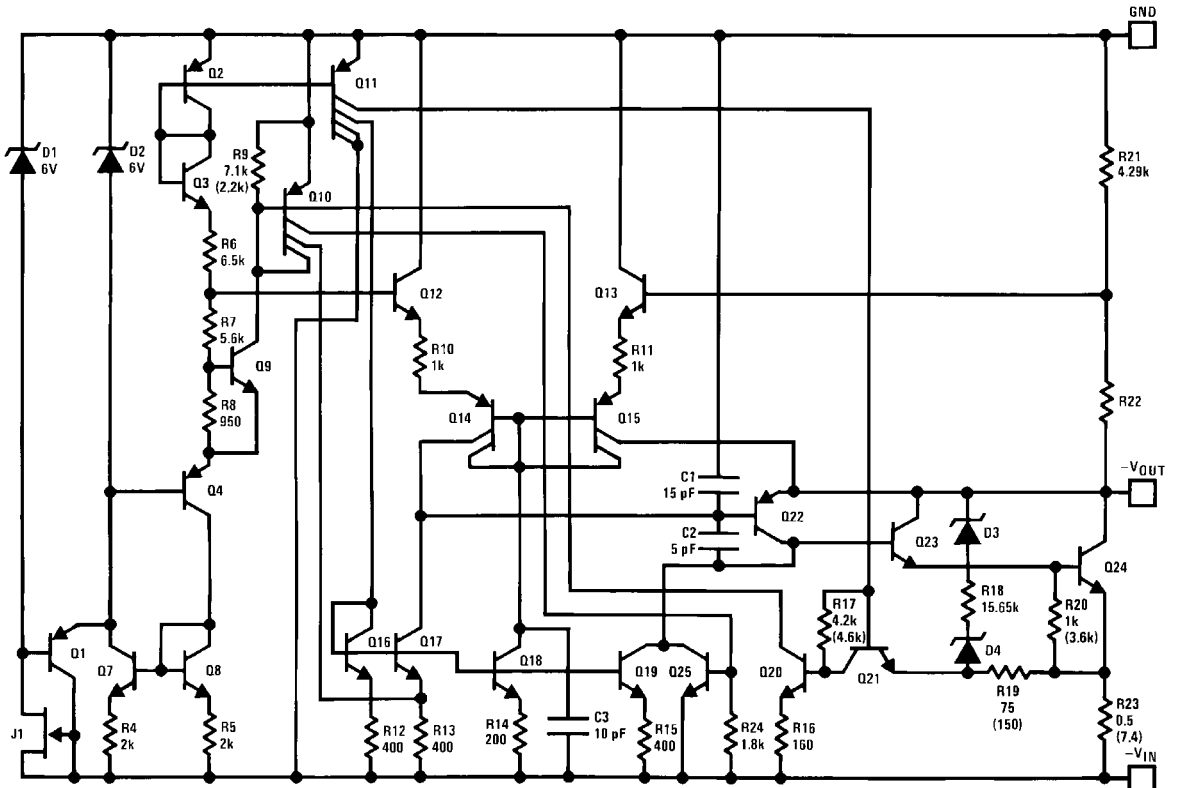
Schematic Diagrams

-5V



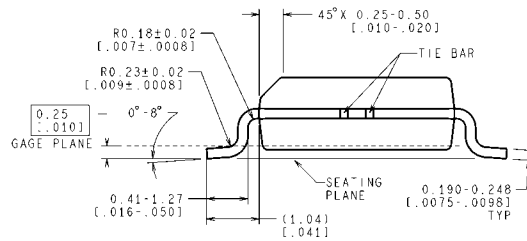
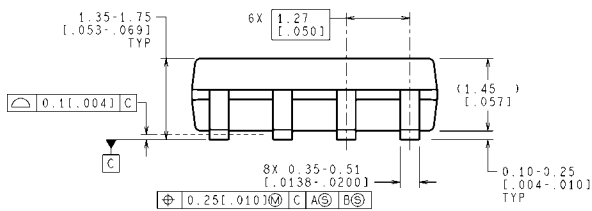
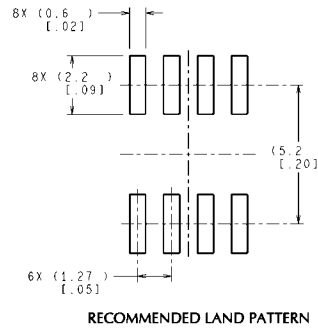
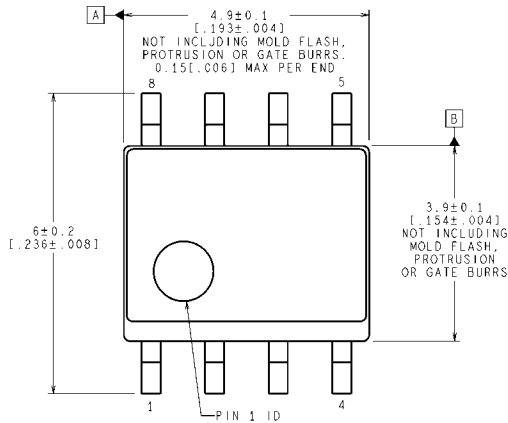
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-12V and -15V



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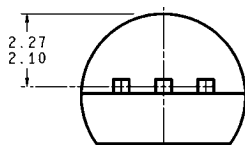
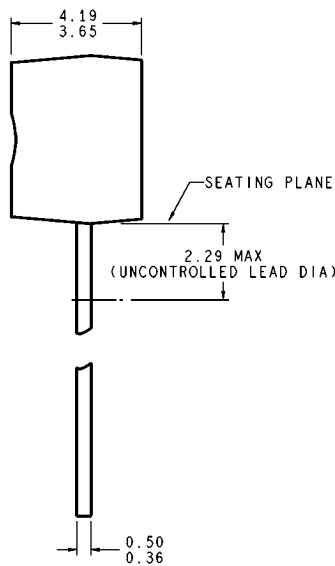
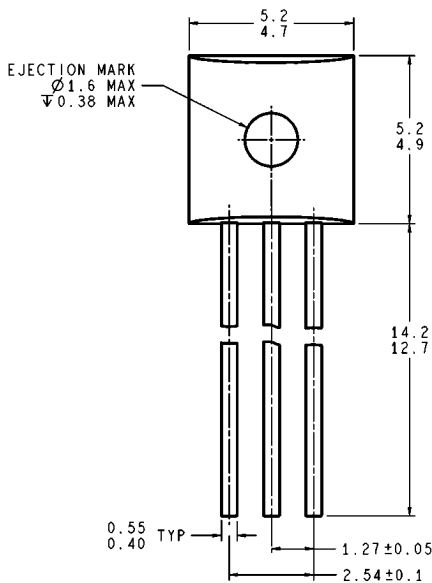
**Physical Dimensions** inches (millimeters) unless otherwise noted



CONTROLLING DIMENSION IS MILLIMETER  
VALUES IN [ ] ARE INCHES  
DIMENSIONS IN ( ) FOR REFERENCE ONLY

M08A (Rev M)

**8-Lead, SOIC NARROW  
NS Package Number M08A**

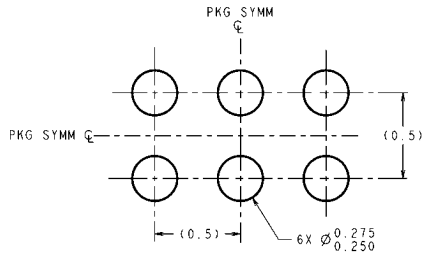


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Z03A (Rev G)

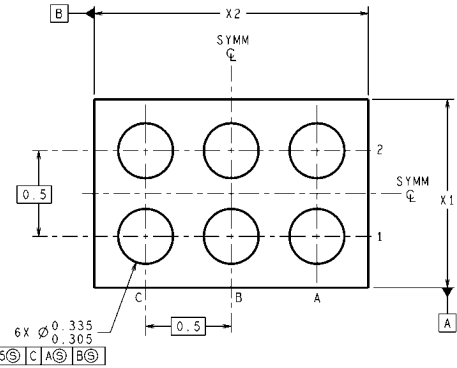
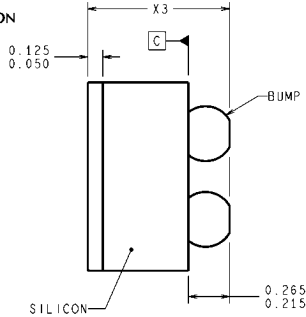
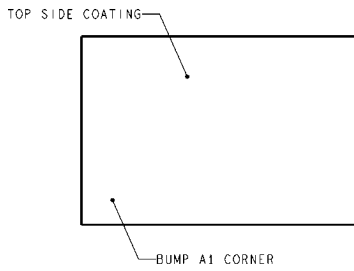
**TO-92, Molded, 3-Lead  
NS Package Number Z03A**





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LAND PATTERN RECOMMENDATION



$\pm 0.005$  C A B

TLA06XXX (Rev C)

NOTES: UNLESS OTHERWISE SPECIFIED

1. EPOXY COATING.
2. 63Sn/67Pb EUTECTIC BUMP.
3. RECOMMEND NON-SOLDER MASK DEFINED LANDING PAD.
4. PIN A1 ESTABLISHED BY LOWER LEFT CORNER WITH RESPECT TO TEXT ORIENTATION.
5. XXX IN DRAWING NUMBER REPRESENTS PACKAGE SIZE VARIATION WHERE X1 IS PACKAGE WIDTH, X2 IS PACKAGE LENGTH AND X3 IS PACKAGE HEIGHT.
6. REFERENCE JEDEC REGISTRATION MO-211, VARIATION BC.

**6-Bump micro SMD**  
**NS Package Number TLA06AMA**  
**X<sub>1</sub> = 1006μm X<sub>2</sub> = 1793μm X<sub>3</sub> = 600μm**

# Notes

LM79LXXAC

## Notes

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Interface	<a href="http://www.national.com/interface">www.national.com/interface</a>	Eval Boards	<a href="http://www.national.com/evalboards">www.national.com/evalboards</a>
LVDS	<a href="http://www.national.com/lvds">www.national.com/lvds</a>	Packaging	<a href="http://www.national.com/packaging">www.national.com/packaging</a>
Power Management	<a href="http://www.national.com/power">www.national.com/power</a>	Green Compliance	<a href="http://www.national.com/quality/green">www.national.com/quality/green</a>
Switching Regulators	<a href="http://www.national.com/switchers">www.national.com/switchers</a>	Distributors	<a href="http://www.national.com/contacts">www.national.com/contacts</a>
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Voltage References	<a href="http://www.national.com/vref">www.national.com/vref</a>	Design Made Easy	<a href="http://www.national.com/easy">www.national.com/easy</a>
PowerWise® Solutions	<a href="http://www.national.com/powerwise">www.national.com/powerwise</a>	Applications & Markets	<a href="http://www.national.com/solutions">www.national.com/solutions</a>
Serial Digital Interface (SDI)	<a href="http://www.national.com/sdi">www.national.com/sdi</a>	Mil/Aero	<a href="http://www.national.com/milaero">www.national.com/milaero</a>
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Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Mobile Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
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