

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 $0.1\mu\text{F},$ exhibits an excellent transient response, a maximum line regulation of $0.07\%~\text{V}_{\text{O}}/\text{V},$ and a maximum load regulation of $0.01\%~\text{V}_{\text{O}}/\text{mA}.$

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

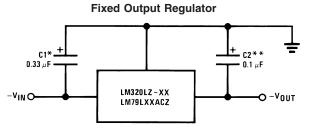
TO-92 package, 8-lead SOIC package, and the 6-Bump micro SMD package. The LM320L series is available in the 3-lead TO-92 package.

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

Features

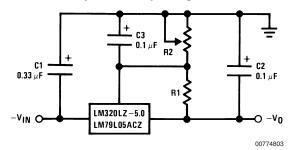
- Preset output voltage error is less than ±5% overload, line and temperature
- Specified at an output current of 100mA
- Easily compensated with a small 0.1µF output capacitor
- Internal short-circuit, thermal and safe operating area protection
- Easily adjustable to higher output voltages
- Maximum 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



 0077480 *Required if the regulator is located far from the power supply filter. A 1 μ F

Adjustable Output Regulator

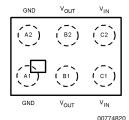


 $-V_0 = -5V - (5V/R1 + I_Q) \cdot R2,$ 5V/R1 > 3 I_Q

Connection Diagrams

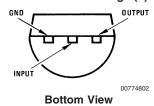
aluminum electrolytic may be substituted.

6-Bump micro SMD



Bump Side Down

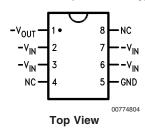
TO-92 Plastic Package (Z)



^{**}Required for stability. A 1µF aluminum electrolytic may be substituted.

Connection Diagrams (Continued)

SO-8 Plastic (Narrow Body)



Ordering Information

Package	Part Number	Package Marking	Transport Media	NSC Drawing		
8-Lead SOIC	LM79L05ACM	LM79L05ACM	95 Units/Rail	M08A		
	LM79L05ACMX		2.5k Units Tape and Reel			
	LM79L12ACM	LM79L12ACM	95 Units/Rail			
	LM79L12ACMX		2.5k Units Tape and Reel			
	LM79L15ACM	LM79L15ACM	95 Units/Rail			
	LM79L15ACMX		2.5k Units Tape and Reel			
3-Pin TO-92	LM79L05ACZ	320L79L05	1800 Units Per Box	Z03A		
	LM79L12ACZ	320L79L12	1800 Units Per Box			
	LM79L15ACZ	320L79L15	1800 Units Per Box			
6-Bump	LM79L15ACTL	XTPB	250 Units Tape and Reel	TLA06AMA		
micro SMD	LM79L05ACTLX		3k Units Tape and Reel			

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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) Internally Limited

Operating Temperature Range 0°C to $+70^{\circ}\text{C}$ Maximum Junction Temperature $+125^{\circ}\text{C}$ Storage Temperature Range -55°C to $+150^{\circ}\text{C}$ Lead Temperature (Soldering, 10 sec.) 260°C

Electrical Characteristics (Note 3)

 $T_A = 0$ °C to +70°C unless otherwise noted.

Output Voltage			-5V		-12V			-15V				
Input Voltage (unless otherwise noted)		-10V		-17V			-20V		Units			
Symbol	Parameter	Conditions	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	1
V _O	Output Voltage	$T_J = 25^{\circ}C, I_O = 100 \text{mA}$	-5.2	-5	-4.8	-12.5	-12	-11.5	-15.6	-15	-14.4	
		$1\text{mA} \le I_{O} \le 100\text{mA}$	-5.25		-4.75	-12.6		-11.4	-15.75		-14.25	
		$V_{MIN} \le V_{IN} \le V_{MAX}$	$(-20 \le V_{IN} \le -7.5)$		-7.5)	(–27	$(-27 \le V_{IN} \le -14.8)$		$(-30 \le V_{IN} \le -18)$		V	
		$1mA \le I_O \le 40mA$	-5.25		-4.75	-12.6		-11.4	-15.75		-14.25	
		$V_{MIN} \le V_{IN} \le V_{MAX}$	(–20	$\leq V_{IN} \leq$	≤ –7)	(–27	\leq $V_{IN} \leq$	-14.5)	(–30 :	≤ V _{IN} ≤	-17.5)	
ΔV_{O}	Line Regulation	$T_J = 25^{\circ}C, I_O = 100mA$			60			45			45	mV
		$V_{MIN} \le V_{IN} \le V_{MAX}$	(–20 :	≤ V _{IN} ≤	-7.3)	(–27	\leq $V_{IN} \leq$	-14.6)	(-30 :	≤ V _{IN} ≤	-17.7)	V
		$T_J = 25^{\circ}C, I_O = 40mA$			60			45			45	mV
		$V_{MIN} \le V_{IN} \le V_{MAX}$	(–20	$\leq V_{IN} \leq$	≤ –7)	(–27	\leq $V_{IN} \leq$	-14.5)	(–30 :	≤ V _{IN} ≤	-17.5)	V
ΔV_{O}	Load Regulation	$T_J = 25^{\circ}C$			50			100			125	mV
		1mA ≤ I _O ≤ 100mA										
ΔV_{O}	Long Term Stability	I _O = 100mA		20			48			60		mV/khrs
IQ	Quiescent Current	I _O = 100mA		2	6		2	6		2	6	mA
ΔI_{Q}	Quiescent Current	1mA ≤ I _O ≤ 100mA			0.3			0.3			0.3	
	Change	$1mA \le I_O \le 40mA$			0.1			0.1			0.1	mA
		I _O = 100mA			0.25			0.25			0.25	mA
		$V_{MIN} \le V_{IN} \le V_{MAX}$	(–20 :	≤ V _{IN} ≤	-7.5)	(–27	$\leq V_{IN} \leq$	-14.8)	(-30	$\leq V_{IN} \leq$	≤ –18)	V
V _n	Output Noise Voltage	$T_J = 25^{\circ}C, I_O = 100mA$		40			96			120		μV
		f = 10Hz - 10kHz										
ΔV_{IN}	Ripple	$T_J = 25^{\circ}C, I_O = 100mA$	50			52			50			dB
ΔVO	Rejection	f = 120Hz										
	Input Voltage	$T_J = 25^{\circ}C, I_O = 100mA$			-7.3			-14.6			-17.7	V
	Required to	I _O = 40mA			-7.0			-14.5			-17.5	V
	Maintain Line											
	Regulation											

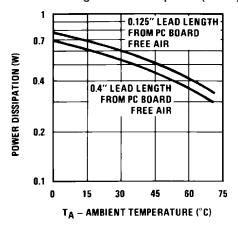
Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits.

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.

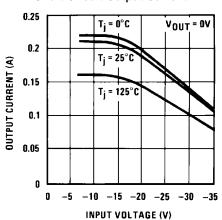
Typical Performance Characteristics

Maximum Average Power Dissipation (TO-92)



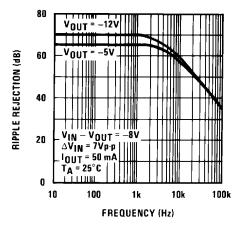
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Short Circuit Output Current



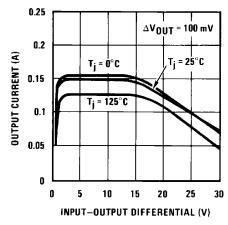
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Ripple Rejection



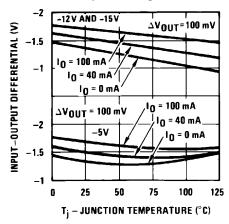
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Peak Output Current



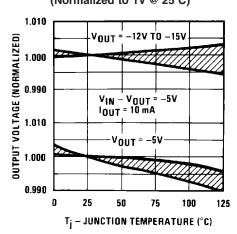
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Dropout Voltage



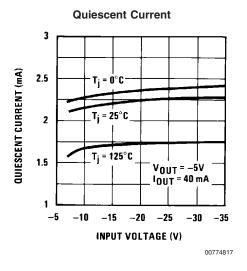
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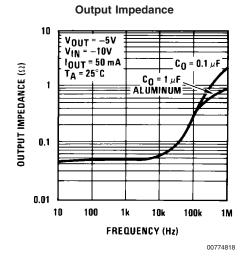
Output Voltage vs. Temperature (Normalized to 1V @ 25°C)



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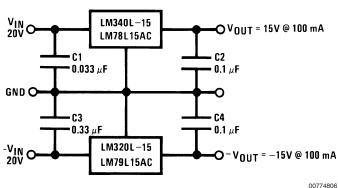
Typical Performance Characteristics (Continued)





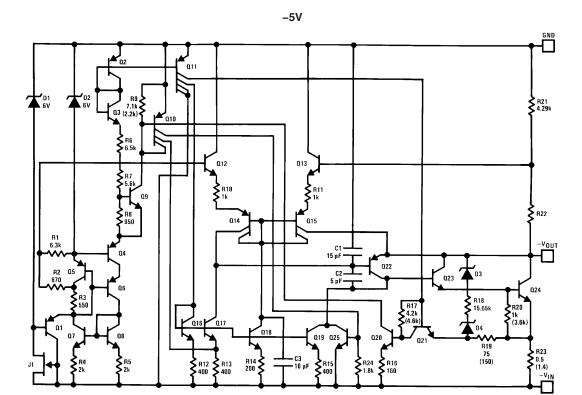
Typical Applications

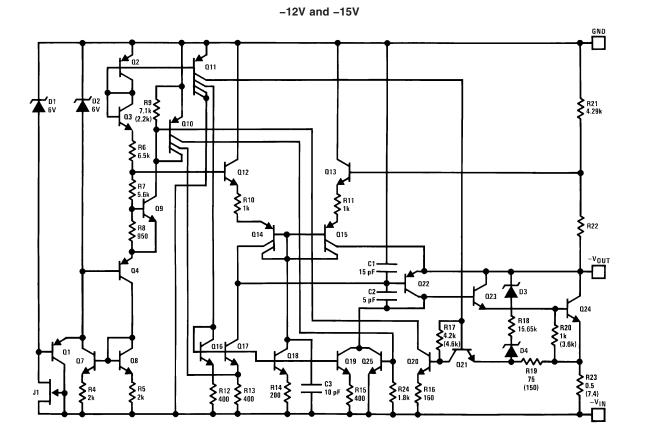
±15V, 100mA Dual Power Supply



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Schematic Diagrams



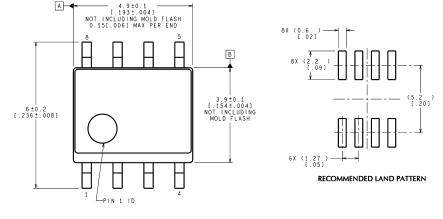


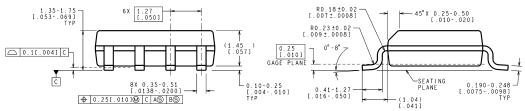
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Physical Dimensions inches (millimeters) unless otherwise noted

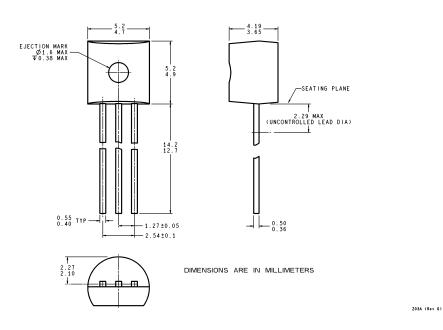




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DIMENSIONS IN () FOR REFERENCE ONLY

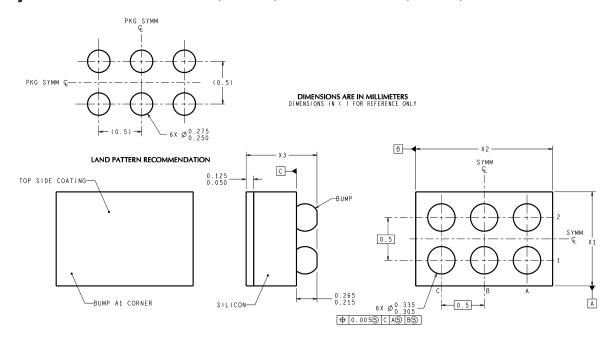
M08A (Rev K)

SOIC Package (M)
NS Package Number M08A



Molded Offset TO-92 (Z) NS Package Number Z03A

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



TLA06XXX (Rev C)

NOTES: UNI ESS 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 JEEC REGISTRATION MO-211, VARIATION BC.

6-Bump micro SMD **NS Package Number TLA06AMA** $X_1 = 1006 \mu m$ $X_2 = 1793 \mu m$ $X_3 = 600 \mu m$

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