National Semiconductor

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 μF, 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.

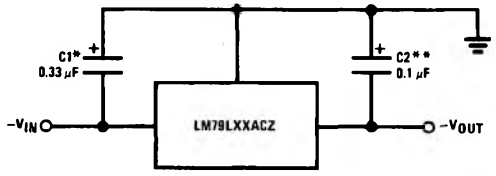
For output voltage other than −5V, −12V and −15V the LM137L series provides an output voltage range from 1.2V to 47V.

Features

- Preset output voltage error is less than ±5% overload, line and temperature
- Specified at an output current of 100 mA
- Easily compensated with a small 0.1 μF 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



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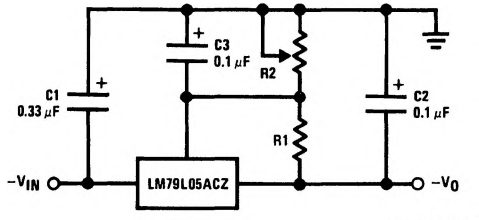
*Required if the regulator is located far from the power supply filter. A 1 μF aluminum electrolytic may be substituted.

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

Adjustable Output Regulator



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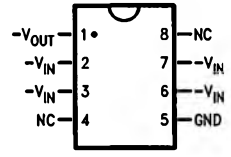
$-V_O = -5V - (5V/R1 + I_Q) \bullet R2$,
$5V/R1 > 3\,I_Q$

Connection Diagrams

SO-8 Plastic (Narrow Body)



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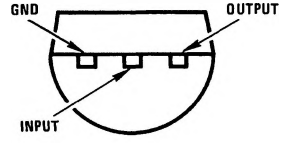
Top View

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

TO-92 Plastic Package (Z)



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Bottom View

Order Number LM79L05ACZ, LM79L12ACZ 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°C to +70°C unless otherwise noted.

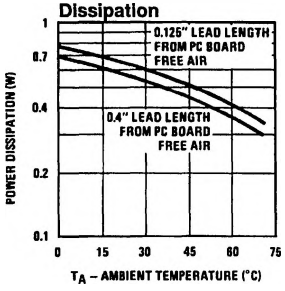
Output Voltage			−5V			−12V			−15V			Units
Input Voltage (unless otherwise noted)			−10V			−17V			−20V			
Symbol	Parameter	Conditions	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V_O	Output Voltage	T_j = 25°C, I_O = 100 mA	−5.2	−5	−4.8	−12.5	−12	−11.5	−15.6	−15	−14.4	
		1 mA ≤ I_O ≤ 100 mA V_{MIN} ≤ V_{IN} ≤ V_{MAX}	−5.25 (−20 ≤ V_{IN} ≤ −7.5)		−4.75	−12.6 (−27 ≤ V_{IN} ≤ −14.8)		−11.4	−15.75 (−30 ≤ V_{IN} ≤ −18)		−14.25	V
		1 mA ≤ I_O ≤ 40 mA V_{MIN} ≤ V_{IN} ≤ V_{MAX}	−5.25 (−20 ≤ V_{IN} ≤ −7)		−4.75	−12.6 (−27 ≤ V_{IN} ≤ −14.5)		−11.4	−15.75 (−30 ≤ V_{IN} ≤ −17.5)		−14.25	
ΔV_O	Line Regulation	T_j = 25°C, I_O = 100 mA			60			45			45	mV
		V_{MIN} ≤ V_{IN} ≤ V_{MAX}	(−20 ≤ V_{IN} ≤ −7.3)			(−27 ≤ V_{IN} ≤ −14.6)			(−30 ≤ V_{IN} ≤ −17.7)			V
		T_j = 25°C, I_O = 40 mA			60			45			45	mV
		V_{MIN} ≤ V_{IN} ≤ V_{MAX}	(−20 ≤ V_{IN} ≤ −7)			(−27 ≤ V_{IN} ≤ −14.5)			(−30 ≤ V_{IN} ≤ −17.5)			V
ΔV_O	Load Regulation	T_j = 25°C 1 mA ≤ I_O ≤ 100 mA			50			100			125	mV
ΔV_O	Long Term Stability	I_O = 100 mA		20			48			60		mV/khrs
I_Q	Quiescent Current	I_O = 100 mA		2	6		2	6		2	6	mA
ΔI_Q	Quiescent Current Change	1 mA ≤ I_O ≤ 100 mA			0.3			0.3			0.3	mA
		1 mA ≤ I_O ≤ 40 mA			0.1			0.1			0.1	
		I_O = 100 mA			0.25			0.25			0.25	mA
		V_{MIN} ≤ V_{IN} ≤ V_{MAX}	(−20 ≤ V_{IN} ≤ −7.5)			(−27 ≤ V_{IN} ≤ −14.8)			(−30 ≤ V_{IN} ≤ −18)			V
V_n	Output Noise Voltage	T_j = 25°C, I_O = 100 mA f = 10 Hz − 10 kHz		40			96			120		μV
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	T_j = 25°C, I_O = 100 mA f = 120 Hz	50			52			50			dB
	Input Voltage Required to Maintain Line Regulation	T_j = 25°C, I_O = 100 mA			−7.3			−14.6			−17.7	V
		I_O = 40 mA			−7.0			−14.5			−17.5	V

Note 1: 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.

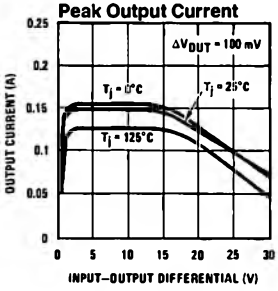
Note 2: To ensure constant junction temperature, low duty cycle pulse testing is used.

Typical Performance Characteristics

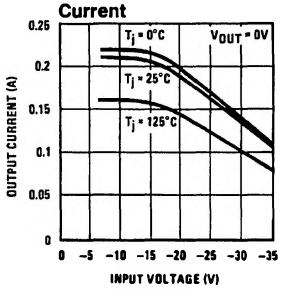
Maximum Average Power Dissipation



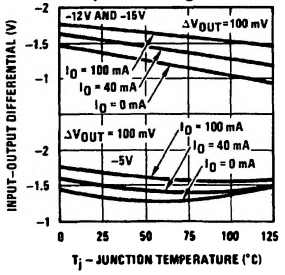
Peak Output Current



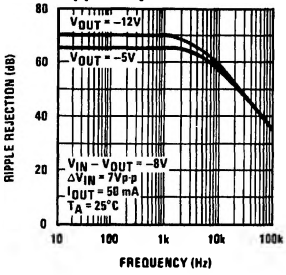
Short Circuit Output Current



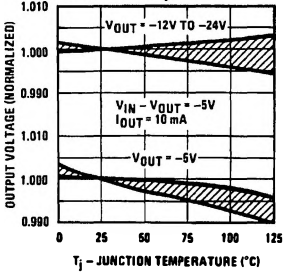
Dropout Voltage



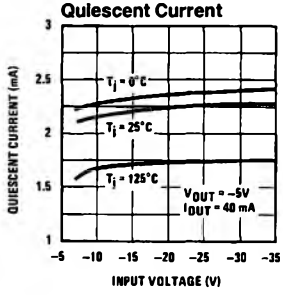
Ripple Rejection



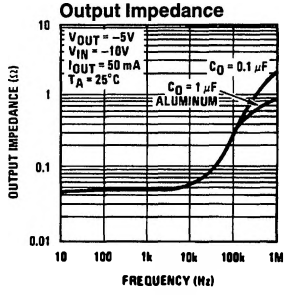
Output Voltage vs. Temperature (Normalized to 1V @ 25°C)



Quiescent Current



Output Impedance



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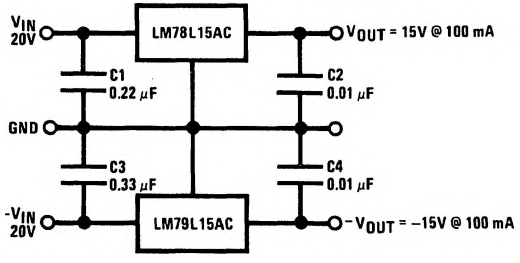
Typical Applications (Continued)

± 15V, 100 mA Dual Power Supply



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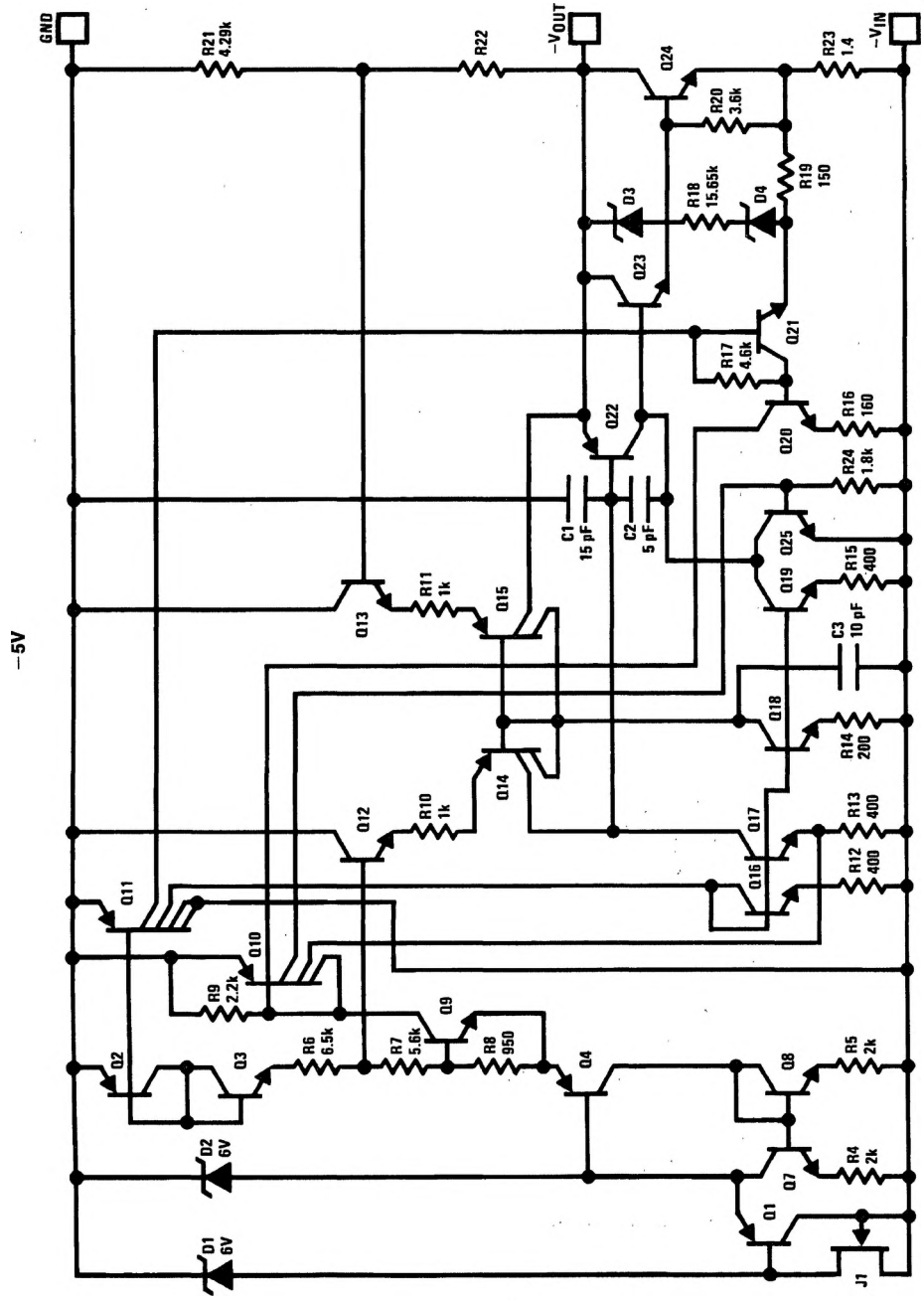
Schematic Diagrams



Schematic Diagrams (Continued)