National Semiconductor

Voltage Regulators

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.

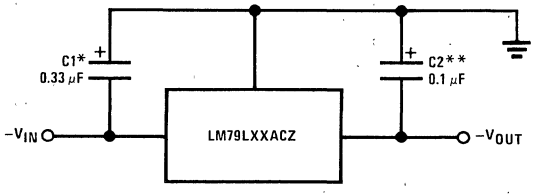
For applications requiring other voltages, see LM137 data sheet.

Features

- Preset output voltage error is less than ±5% over load, 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

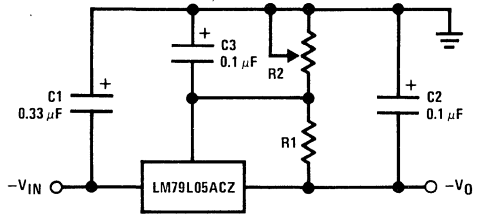
Fixed Output Regulator



*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.

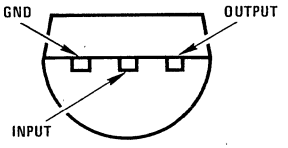
Adjustable Output Regulator



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

Connection Diagram

TO-92 Plastic Package (Z)



BOTTOM VIEW

Order Numbers

LM79L05ACZ
LM79L12ACZ
LM79L15ACZ
See NS Package Z03A

Absolute Maximum Ratings

Input Voltage	
V_o = −5V, −12V and −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 seconds)	300°C

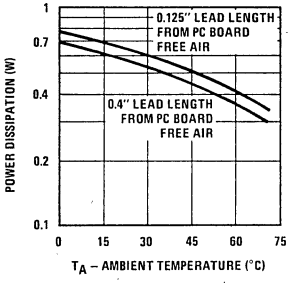
Electrical Characteristics (Note 2) T_j = 0°C to +125°C unless otherwise noted.

OUTPUT VOLTAGE			−5V			−12V			−15V			
INPUT VOLTAGE (unless otherwise noted)			−10V			−17V			−20V			UNITS
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	−5.25		−4.75	−12.6		−11.4	−15.7		−14.25	
		V_{MIN} ≤ V_{IN} ≤ V_{MAX}	(−20 ≤ V_{IN} ≤ −7.5)			(−27 ≤ V_{IN} ≤ −14.8)			(−30 ≤ V_{IN} ≤ −18)			V
		1 mA ≤ I_O ≤ 40 mA	−5.25		−4.75	−12.6		−11.4	−15.75		−14.25	
		V_{MIN} ≤ V_{IN} ≤ V_{MAX}	(−20 ≤ V_{IN} ≤ −7)			(−27 ≤ V_{IN} ≤ −14.5)			(−30 ≤ V_{IN} ≤ −17.5)			
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
		1 mA ≤ I_O ≤ 40 mA			30			50			75	mV
ΔV_O	Long Term Stability	I_O = 100 mA		20			48			60		mV/1000 hr
I_Q	Quiescent Current	I_O = 100 mA		2	6		2	6		2	6	mA
		T_J = 125°C, I_O = 40 mA			5.5			5.5			5.5	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	

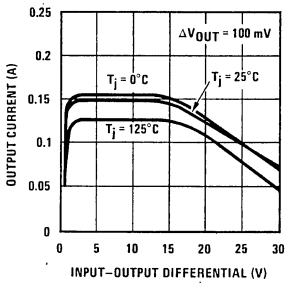
Note 1: Thermal resistance, junction to ambient, of the TO-92 (Z) package is 180°C/W when mounted with 0.40 inch leads on a PC board, and 160°C/W when mounted with 0.25 inch leads on a PC board.
Note 2: To ensure constant junction temperature, low duty cycle pulse testing is used.

Typical Performance Characteristics

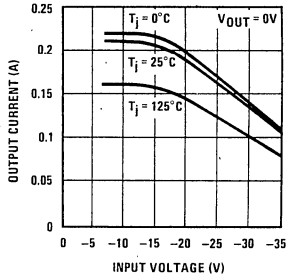
Maximum Average Power Dissipation (TO-92)



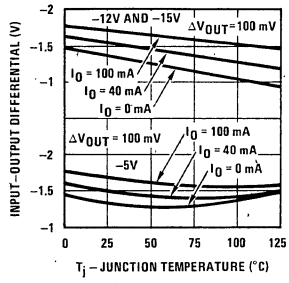
Peak Output Current



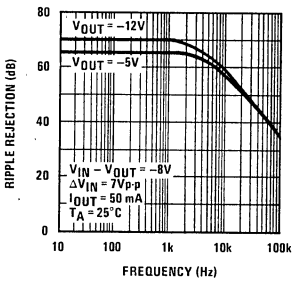
Short Circuit Output Current



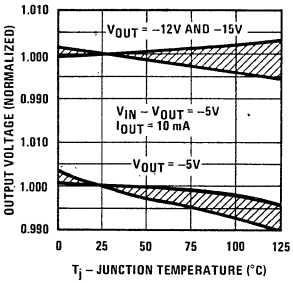
Dropout Voltage



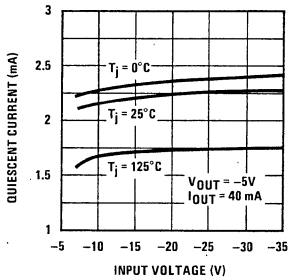
Ripple Rejection



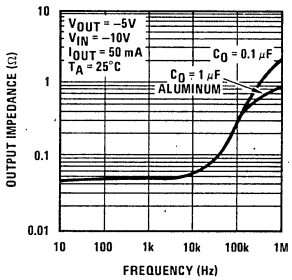
Output Voltage vs. Temperature (Normalized to 1V @ 25°C)



Quiescent Current

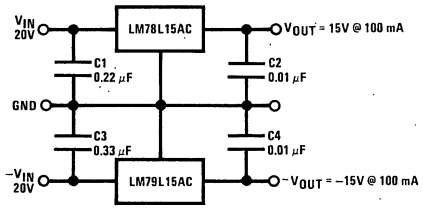


Output Impedance



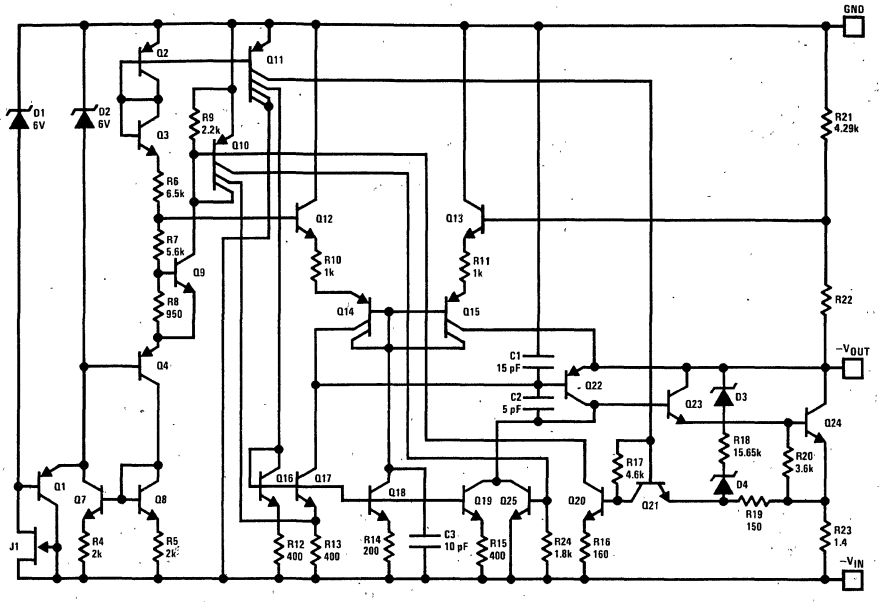
Typical Applications (Continued)

±15V, 100 mA Dual Power Supply



Schematic Diagrams

–5V



–12V and –15V