National Semiconductor

February 2005

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 0.1μF, 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 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.

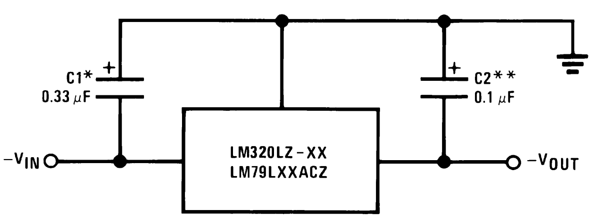
For output voltage other than −5V, −12V and −15V, the LM137L series provides an output voltage range from 1.2V to 47V.

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

Fixed Output Regulator



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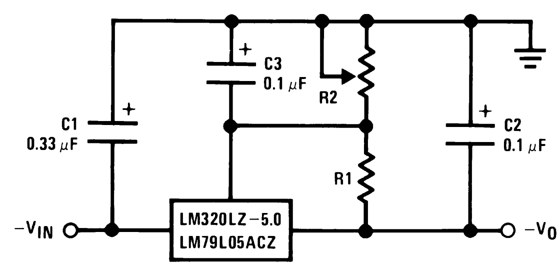
*Required if the regulator is located far from the power supply filter. A 1μF aluminum electrolytic may be substituted.

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

Adjustable Output Regulator



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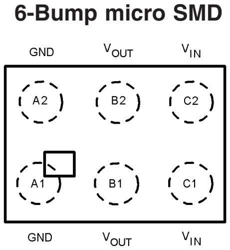
$-V_0 = -5V - (5V/R1 + I_Q) \bullet R2$,

$5V/R1 > 3\ I_Q$

Connection Diagrams

6-Bump micro SMD



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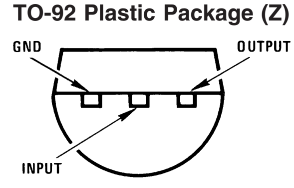
Bump Side Down

TO-92 Plastic Package (Z)



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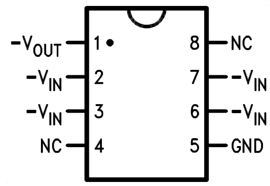
Bottom View

Connection Diagrams (Continued)

SO-8 Plastic (Narrow Body)



Top View

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	
	LM79L13ACM	LM79L12ACM	95 Units/Rail	
	LM79L13ACMX		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 micro SMD	LM79L15ACTL	XTPB	250 Units Tape and Reel	TLA06AMA
	LM79L05ACTLX		3k Units Tape and Reel	

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˚C
Maximum Junction Temperature	+125˚C
Storage Temperature Range	–55˚C to +150˚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			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 = 100mA	–5.2	–5	–4.8	–12.5	–12	–11.5	–15.6	–15	–14.4	
		1mA ≤ I_O ≤ 100mA	–5.25		–4.75	–12.6		–11.4	–15.75		–14.25	
		V_{MIN} ≤ V_{IN} ≤ V_{MAX}	(–20 ≤ V_{IN} ≤ –7.5)			(–27 ≤ V_{IN} ≤ –14.8)			(–30 ≤ V_{IN} ≤ –18)			V
		1mA ≤ I_O ≤ 40mA	–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 = 100mA			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 = 40mA			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 1mA ≤ I_O ≤ 100mA			50			100			125	mV
ΔV_O	Long Term Stability	I_O = 100mA		20			48			60		mV/khrs
I_Q	Quiescent Current	I_O = 100mA		2	6		2	6		2	6	mA
ΔI_Q	Quiescent Current Change	1mA ≤ I_O ≤ 100mA			0.3			0.3			0.3	
		1mA ≤ I_O ≤ 40mA			0.1			0.1			0.1	mA
		I_O = 100mA			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 = 100mA f = 10Hz – 10kHz		40			96			120		μV
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	T_J = 25˚C, I_O = 100mA f = 120Hz	50			52			50			dB
	Input Voltage Required to Maintain Line Regulation	T_J = 25˚C, I_O = 100mA			–7.3			–14.6			–17.7	V
		I_O = 40mA			–7.0			–14.5			–17.5	V

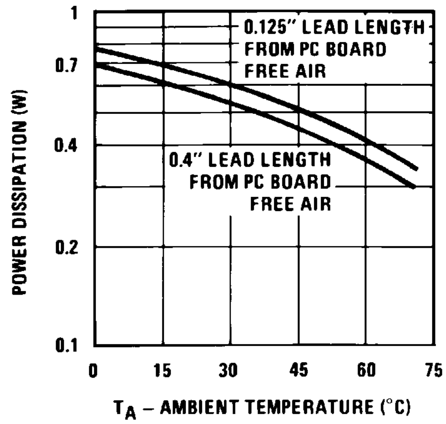
Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits.

Note 2: Thermal resistance of 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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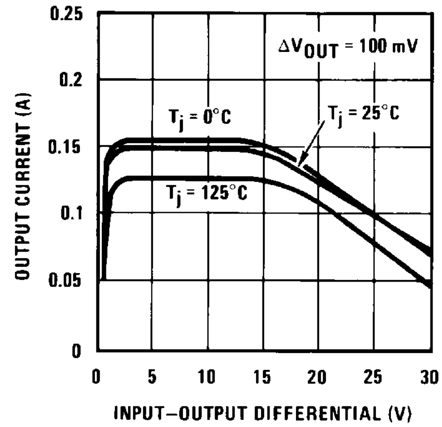
Peak Output Current



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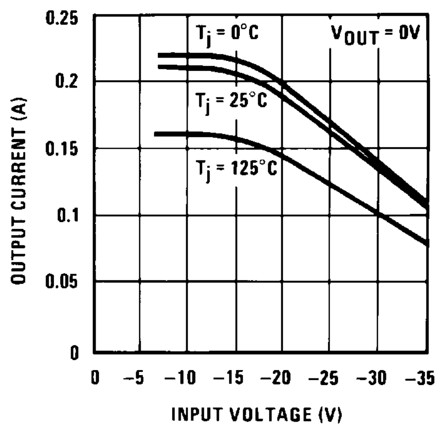
Short Circuit Output Current



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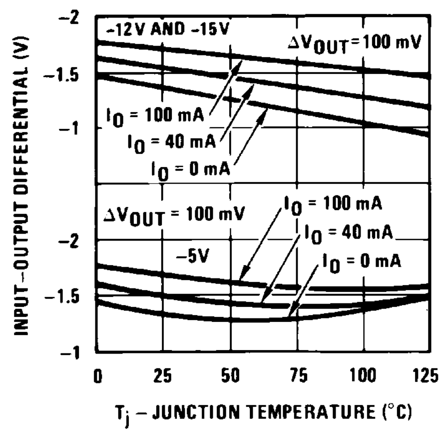
Dropout Voltage



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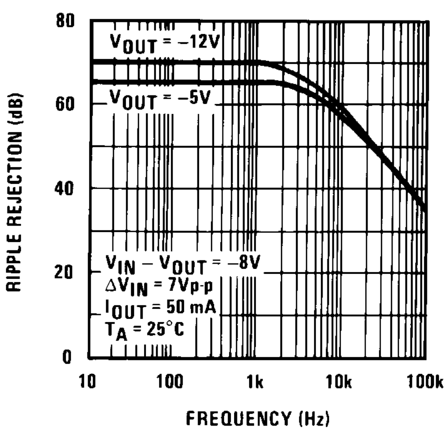
Ripple Rejection



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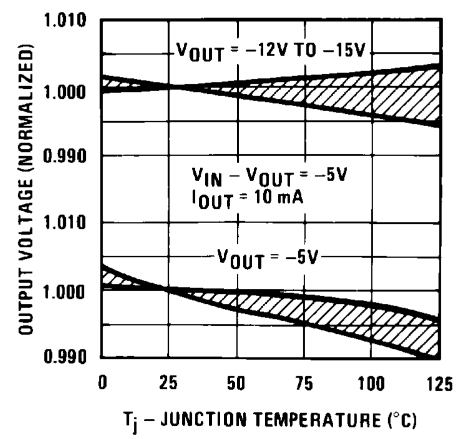
Output Voltage vs. Temperature (Normalized to 1V @ 25°C)



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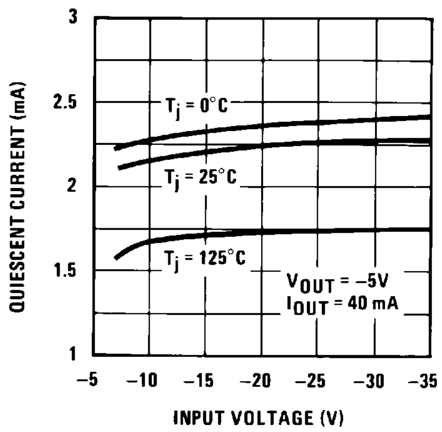
Typical Performance Characteristics (Continued)

Quiescent Current



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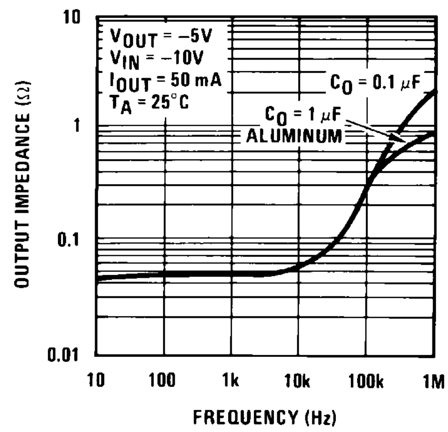
Output Impedance



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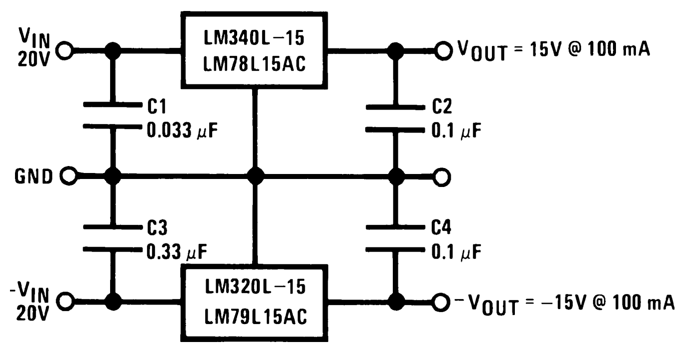
Typical Applications

±15V, 100mA Dual Power Supply



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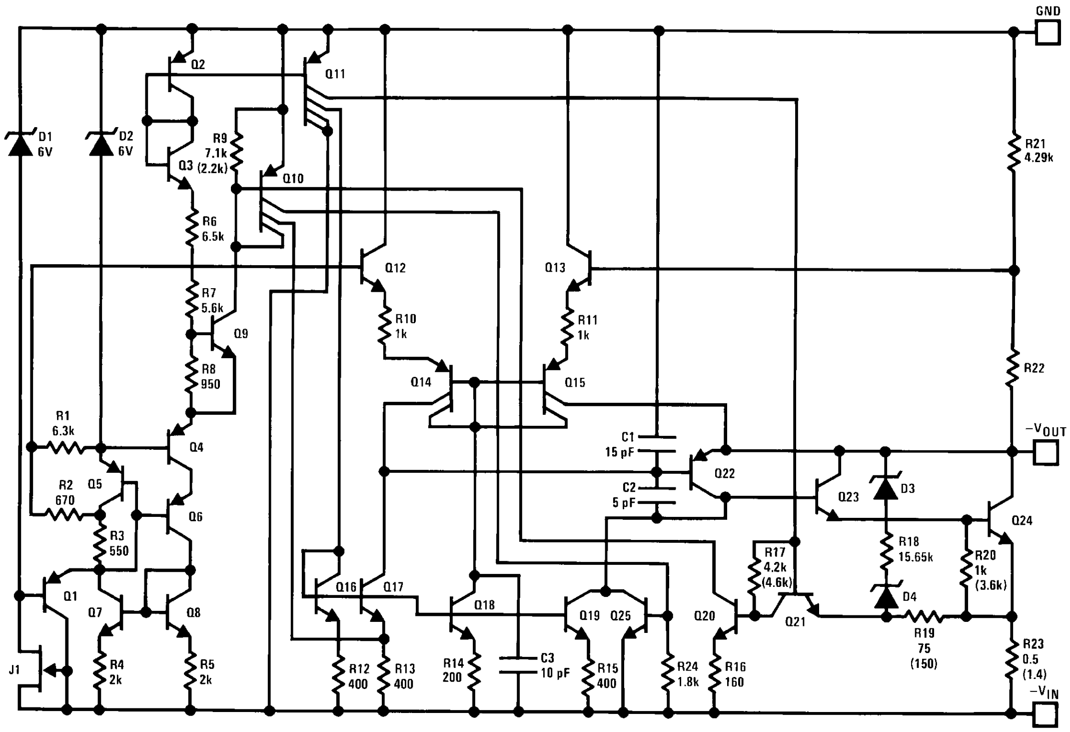
Schematic Diagrams

−5V



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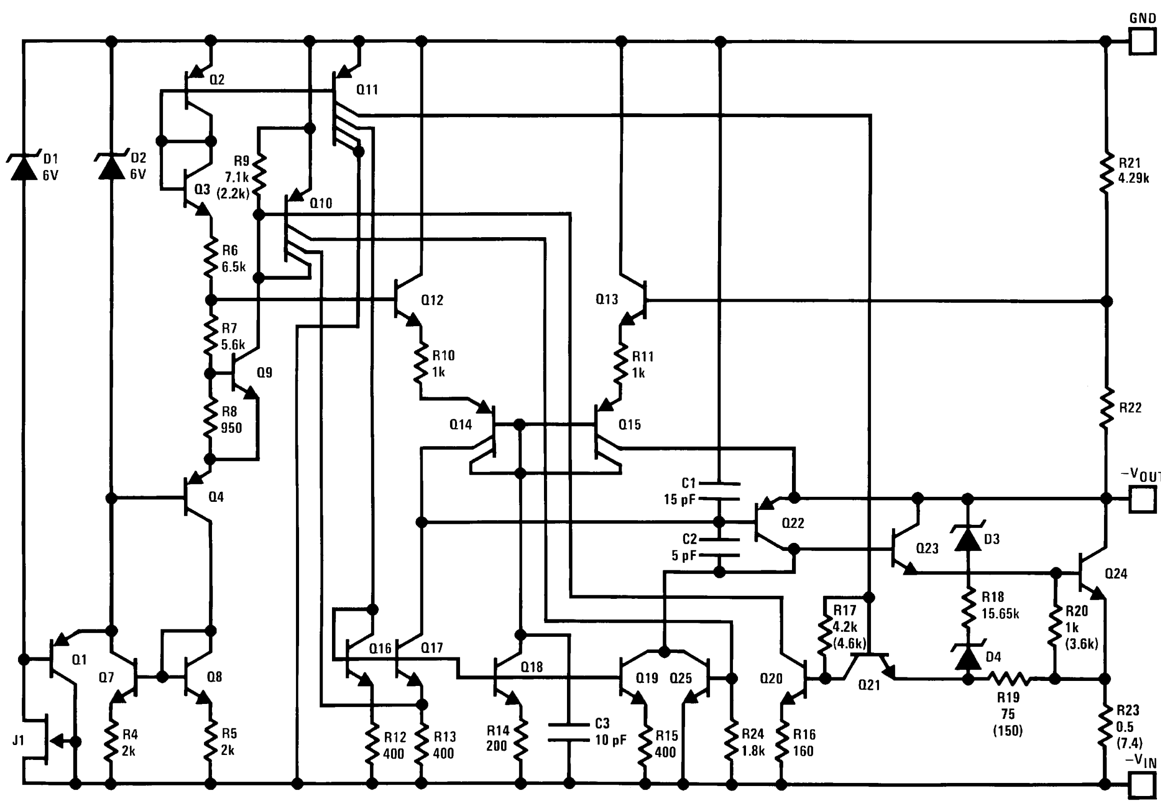
−12V and −15V



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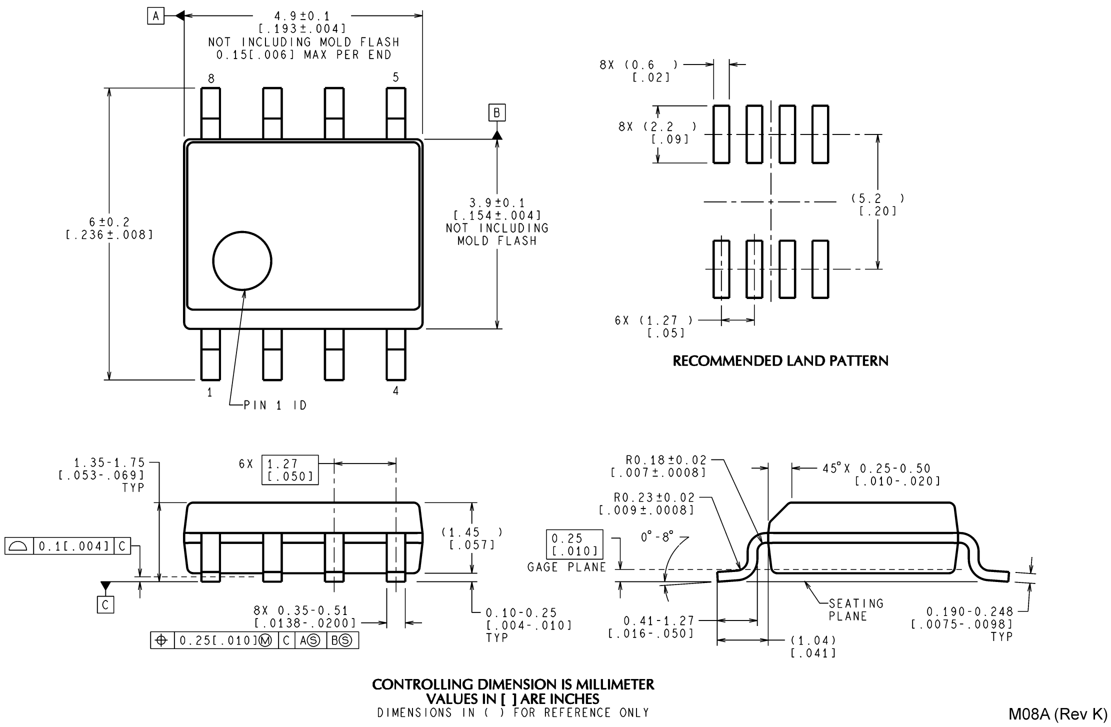
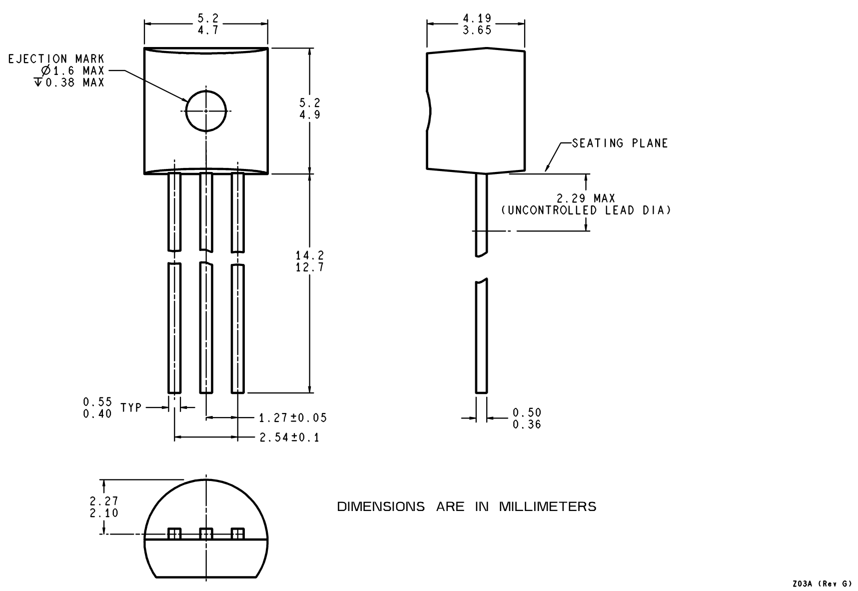
Physical Dimensions inches (millimeters) unless otherwise noted

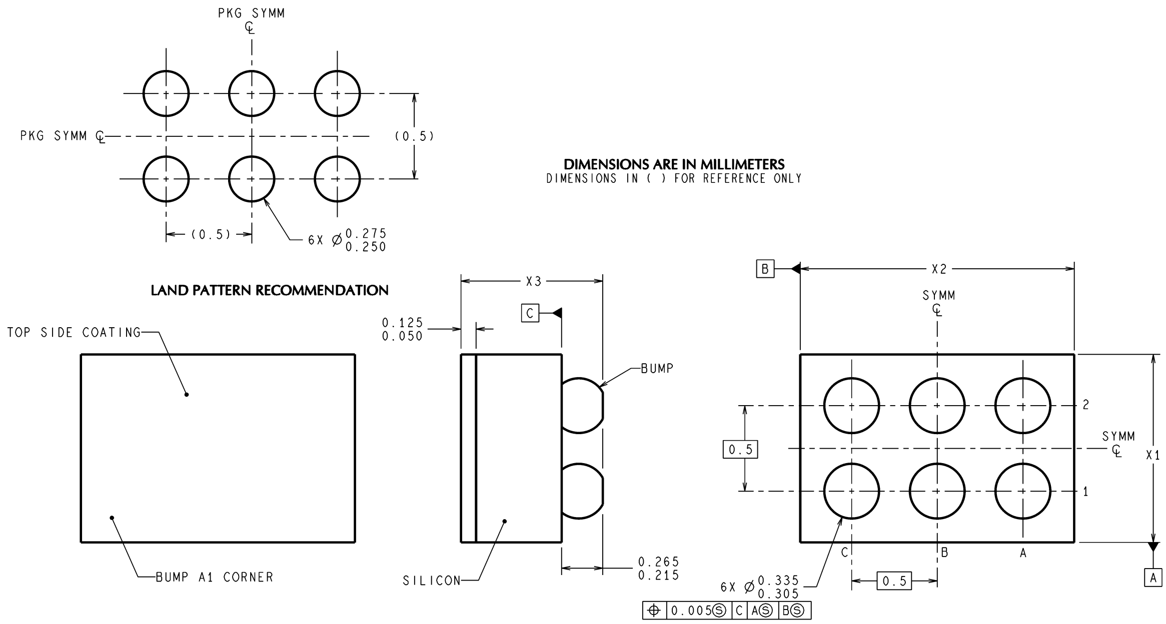


SOIC Package (M)
NS Package Number M08A



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

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



TLA06XXX (Rev C)

NOTES: 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 JEEC REGISTRATION MO-211, VARIATION BC.

6-Bump micro SMD
NS Package Number TLA06AMA
X_1 = 1006µm X_2 = 1793µm X_3 = 600µm

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