

LM79LXXAC Series 3-Terminal Negative Regulators

Check for Samples: [LM79L05](#), [LM79L12](#), [LM79L12AC](#), [LM79L15](#), [LM79L15AC](#)

FEATURES

- Preset Output Voltage Error is Less than $\pm 5\%$ Over Load, Line and Temperature
- Specified at an Output Current of 100mA
- Easily Compensated with a Small 0.1 μ 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 (SNVA009) for DSBGA Considerations

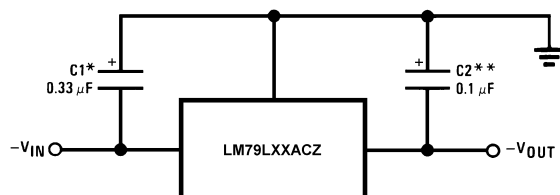
DESCRIPTION

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 μ 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 package, the 8-lead SOIC package, and the 6-Bump DSBGA package.

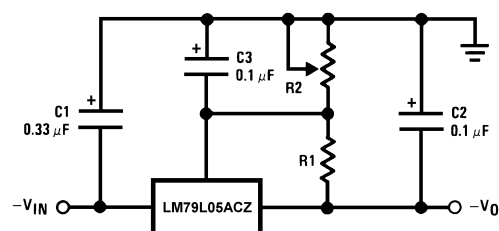
For output voltages other than the pre-set -5V, -12V and -15V, the LM137L series provides an adjustable output voltage range from -1.2V to -47V.

Typical Applications



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

Figure 1. Fixed Output Regulator



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

$$5V/R1 > 3 I_Q$$

Figure 2. Adjustable Output Regulator



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

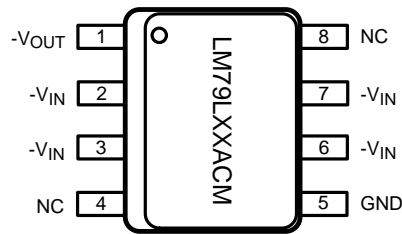
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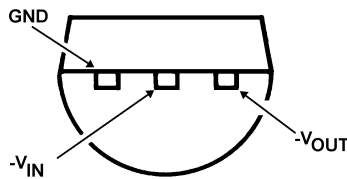
These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Connection Diagram

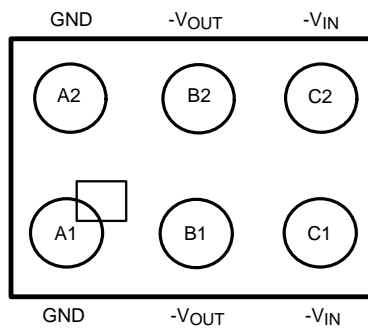


Pins labeled 'NC' on LM79LXXACM 8-Lead SOIC (pin 4 and pin 8) are Open, no internal connection.

**Figure 3. 8-Lead SOIC Narrow (D)
Top View**



**Figure 4. 3-Lead TO-226 (LP)
Bottom View**



**Figure 5. 6-Bump DSBGA
Top View (Bump Side Down)**

Absolute Maximum Ratings⁽¹⁾⁽²⁾

Input Voltage	
$V_O = -5V, -12V, -15V$	-35V
Internal Power Dissipation ⁽³⁾	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

- (1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional.
- (2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/Distributors for availability and specifications.
- (3) Thermal resistance of TO-226 (LP) 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 θ_{JA} of the LM78LXX in the 6-Bump DSBGA package is 114°C/W when mounted on a 4-Layer JEDEC test board (JESD 51-7). The θ_{JA} of the LM78LXX in the SOIC-8 (D) package is 180°C/W in still air. The maximum junction temperature shall not exceed 125°C on electrical parameters.

Electrical Characteristics⁽¹⁾

$T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$ unless otherwise noted.

Output Voltage			-5V			-12V			-15V			
Input Voltage (unless otherwise noted)			-10V			-17V			-20V			
Symbol	Parameter	Conditions	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
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	-15.7		-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	-15.7		-14.25	
		$V_{\text{MIN}} \leq V_{\text{IN}} \leq V_{\text{MAX}}$	(-20 $\leq V_{\text{IN}} \leq -7$)			(-27 $\leq V_{\text{IN}} \leq -14.5$)			(-30 $\leq V_{\text{IN}} \leq -17.5$)			
ΔV_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 $\leq V_{\text{IN}} \leq -17.7$)			V
		$T_J = 25^\circ\text{C}, I_O = 40\text{mA}$			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 $\leq V_{\text{IN}} \leq -17.5$)			V
ΔV_O	Load Regulation	$T_J = 25^\circ\text{C}$			50			100			125	mV
		$1\text{mA} \leq I_O \leq 100\text{mA}$										
ΔV_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
ΔI_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
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		μV
$\Delta V_{\text{IN}}/\Delta V_O$	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

- (1) To ensure constant junction temperature, low duty cycle pulse testing is used.

Typical Performance Characteristics

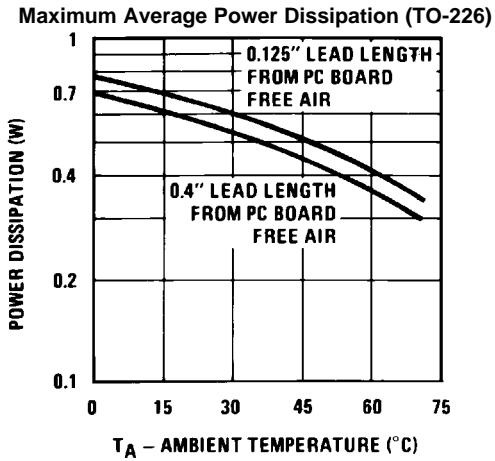


Figure 6.

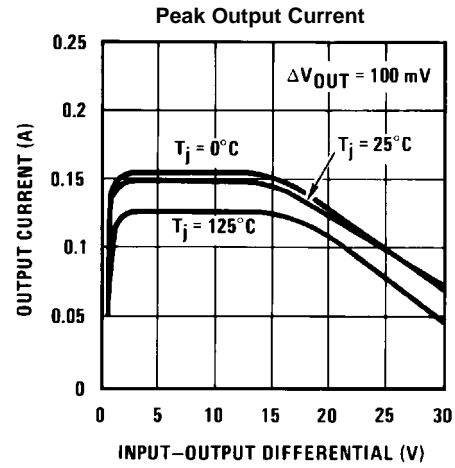


Figure 7.

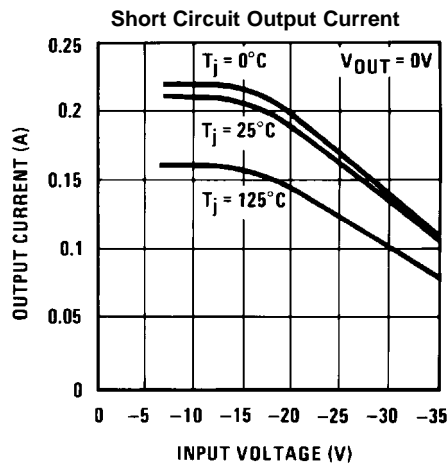


Figure 8.

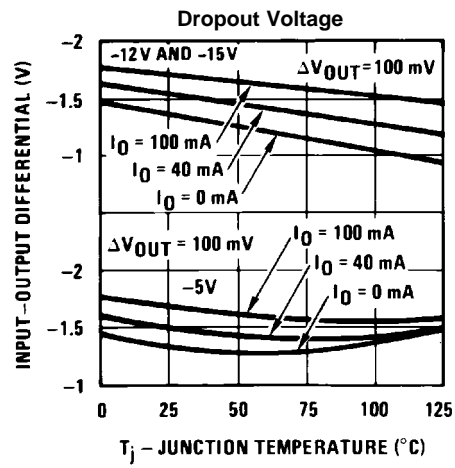


Figure 9.

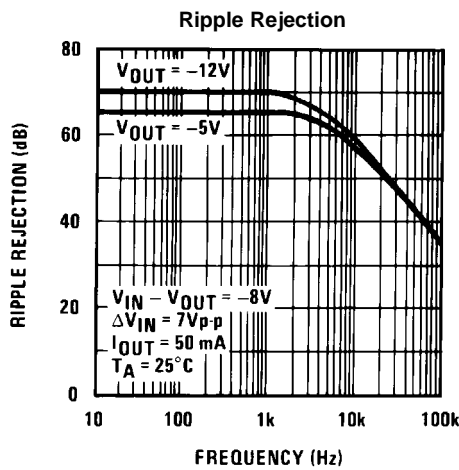


Figure 10.

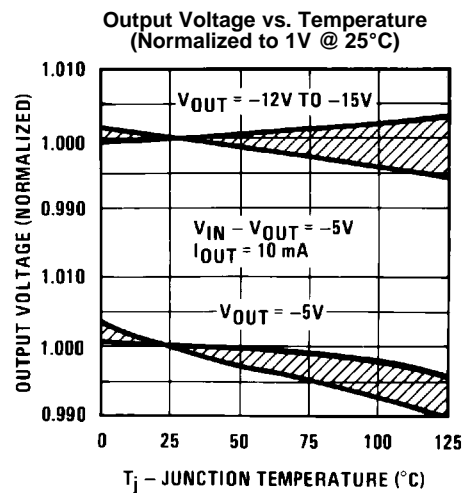
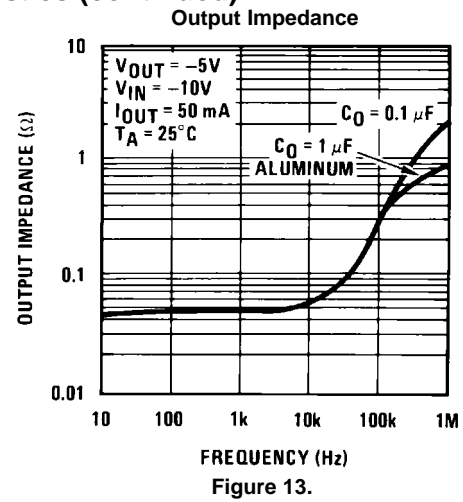
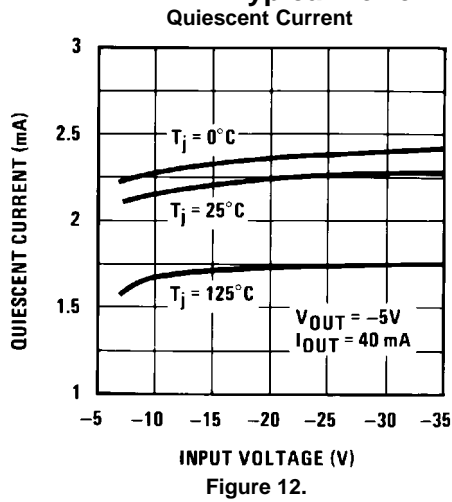


Figure 11.

Typical Performance Characteristics (continued)



TYPICAL APPLICATIONS

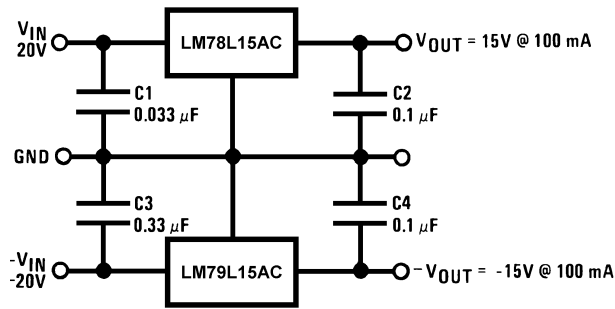


Figure 14. ±15V, 100mA Dual Power Supply

Schematic Diagrams

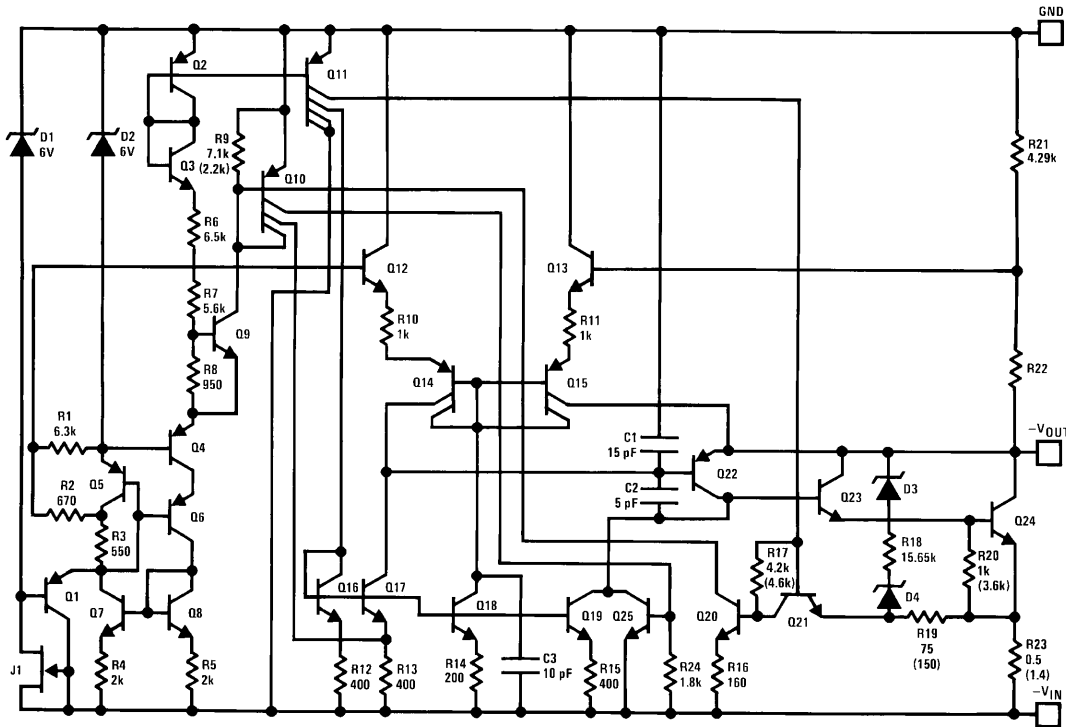


Figure 15. -5V Schematic Diagram

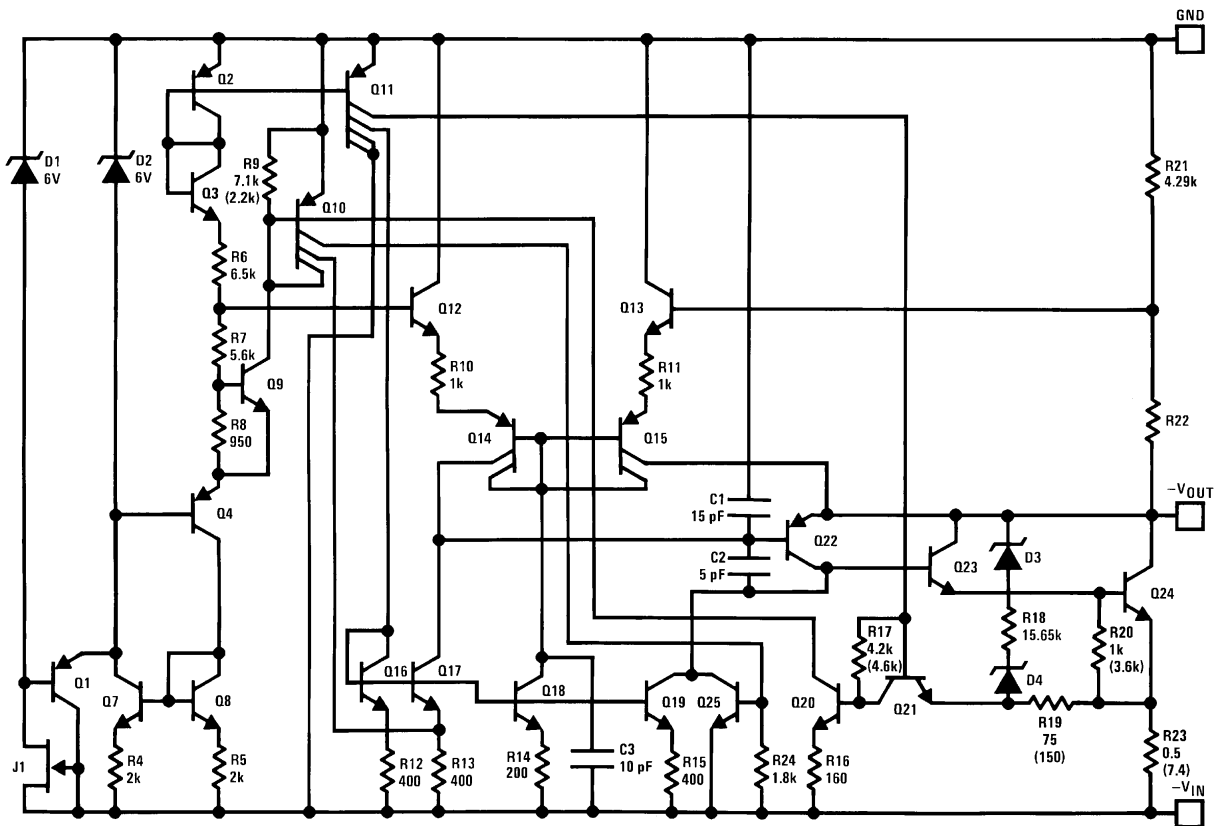


Figure 16. -12V and -15V Schematic Diagram

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

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REVISION HISTORY

Changes from Revision J (April 2013) to Revision K	Page
<ul style="list-style-type: none"> Changed layout of National Data Sheet to TI format 	7

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM79L05ACM	NRND	SOIC	D	8	95	TBD	Call TI	Call TI	0 to 70	LM79L 05ACM	
LM79L05ACM/NOPB	ACTIVE	SOIC	D	8	95	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	LM79L 05ACM	Samples
LM79L05ACMX	NRND	SOIC	D	8	2500	TBD	Call TI	Call TI	0 to 70	LM79L 05ACM	
LM79L05ACMX/NOPB	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	LM79L 05ACM	Samples
LM79L05ACTL/NOPB	ACTIVE	DSBGA	YZR	6	250	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	0 to 70	P B	Samples
LM79L05ACTLX/NOPB	ACTIVE	DSBGA	YZR	6	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	0 to 70	P B	Samples
LM79L05ACZ/LFT1	ACTIVE	TO-92	LP	3	2000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type		320L 79L05	Samples
LM79L05ACZ/NOPB	ACTIVE	TO-92	LP	3	1800	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	0 to 70	320L 79L05	Samples
LM79L12ACM	NRND	SOIC	D	8	95	TBD	Call TI	Call TI	0 to 70	LM79L 12ACM	
LM79L12ACM/NOPB	ACTIVE	SOIC	D	8	95	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	LM79L 12ACM	Samples
LM79L12ACMX	NRND	SOIC	D	8	2500	TBD	Call TI	Call TI	0 to 70	LM79L 12ACM	
LM79L12ACMX/NOPB	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	LM79L 12ACM	Samples
LM79L12ACZ/LFT4	ACTIVE	TO-92	LP	3	2000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type		320L 79L12	Samples
LM79L12ACZ/NOPB	ACTIVE	TO-92	LP	3	1800	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	0 to 70	320L 79L12	Samples
LM79L15ACM	NRND	SOIC	D	8	95	TBD	Call TI	Call TI	0 to 70	LM79L 15ACM	
LM79L15ACM/NOPB	ACTIVE	SOIC	D	8	95	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	LM79L 15ACM	Samples
LM79L15ACMX/NOPB	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	LM79L 15ACM	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

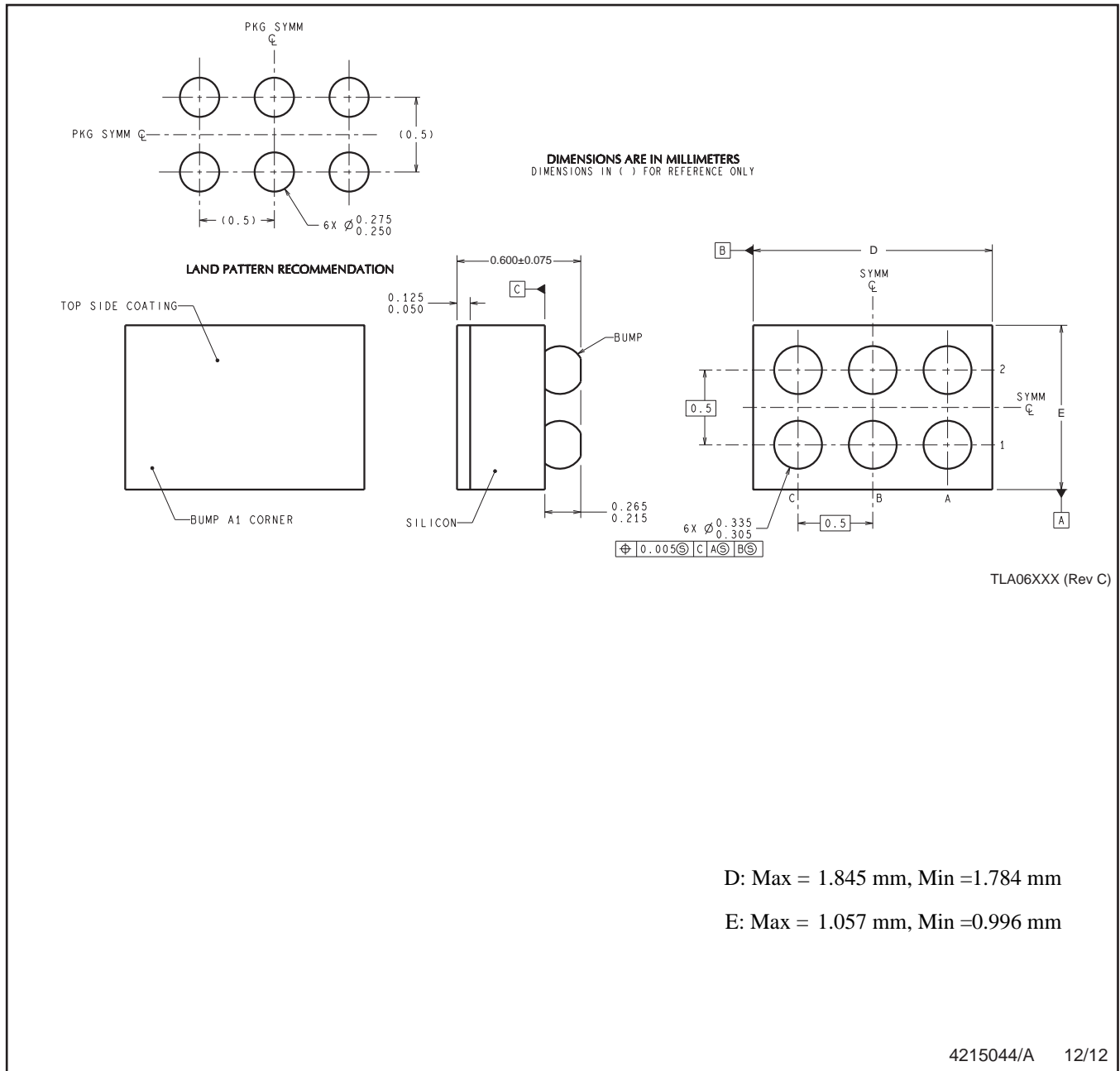
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LM79L05ACMX	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1
LM79L05ACMX/NOPB	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1
LM79L05ACTL/NOPB	DSBGA	YZR	6	250	178.0	8.4	1.09	1.88	0.76	4.0	8.0	Q1
LM79L05ACTLX/NOPB	DSBGA	YZR	6	3000	178.0	8.4	1.09	1.88	0.76	4.0	8.0	Q1
LM79L12ACMX	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1
LM79L12ACMX/NOPB	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1
LM79L15ACMX/NOPB	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM79L05ACMX	SOIC	D	8	2500	367.0	367.0	35.0
LM79L05ACMX/NOPB	SOIC	D	8	2500	367.0	367.0	35.0
LM79L05ACTL/NOPB	DSBGA	YZR	6	250	210.0	185.0	35.0
LM79L05ACTLX/NOPB	DSBGA	YZR	6	3000	210.0	185.0	35.0
LM79L12ACMX	SOIC	D	8	2500	367.0	367.0	35.0
LM79L12ACMX/NOPB	SOIC	D	8	2500	367.0	367.0	35.0
LM79L15ACMX/NOPB	SOIC	D	8	2500	367.0	367.0	35.0

YZR0006



NOTES: A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 B. This drawing is subject to change without notice.

4215044/A 12/12

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - $\triangle D$ Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AA.

GENERIC PACKAGE VIEW

LP 3

TO-92 - 5.34 mm max height

TRANSISTOR OUTLINE



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

4040001-2/F

LP0003A



PACKAGE OUTLINE

TO-92 - 5.34 mm max height

TO-92



4215214/B 04/2017

NOTES:

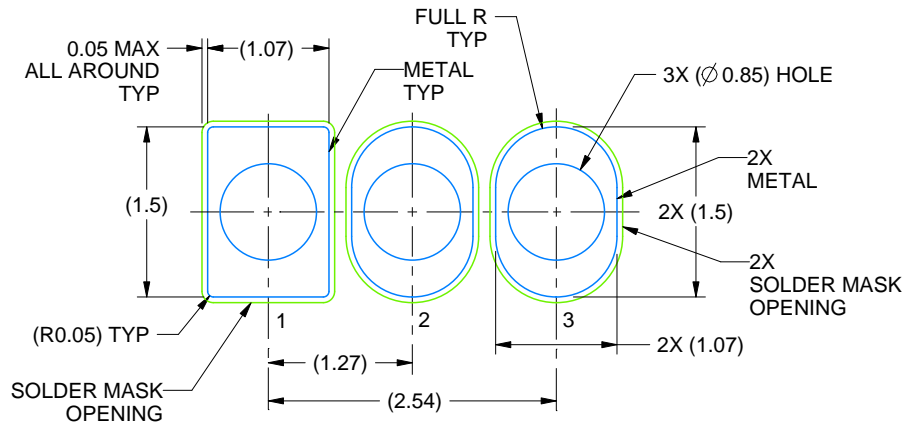
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Lead dimensions are not controlled within this area.
4. Reference JEDEC TO-226, variation AA.
5. Shipping method:
 - a. Straight lead option available in bulk pack only.
 - b. Formed lead option available in tape and reel or ammo pack.
 - c. Specific products can be offered in limited combinations of shipping medium and lead options.
 - d. Consult product folder for more information on available options.

EXAMPLE BOARD LAYOUT

LP0003A

TO-92 - 5.34 mm max height

TO-92



LAND PATTERN EXAMPLE
STRAIGHT LEAD OPTION
NON-SOLDER MASK DEFINED
SCALE:15X



LAND PATTERN EXAMPLE
FORMED LEAD OPTION
NON-SOLDER MASK DEFINED
SCALE:15X

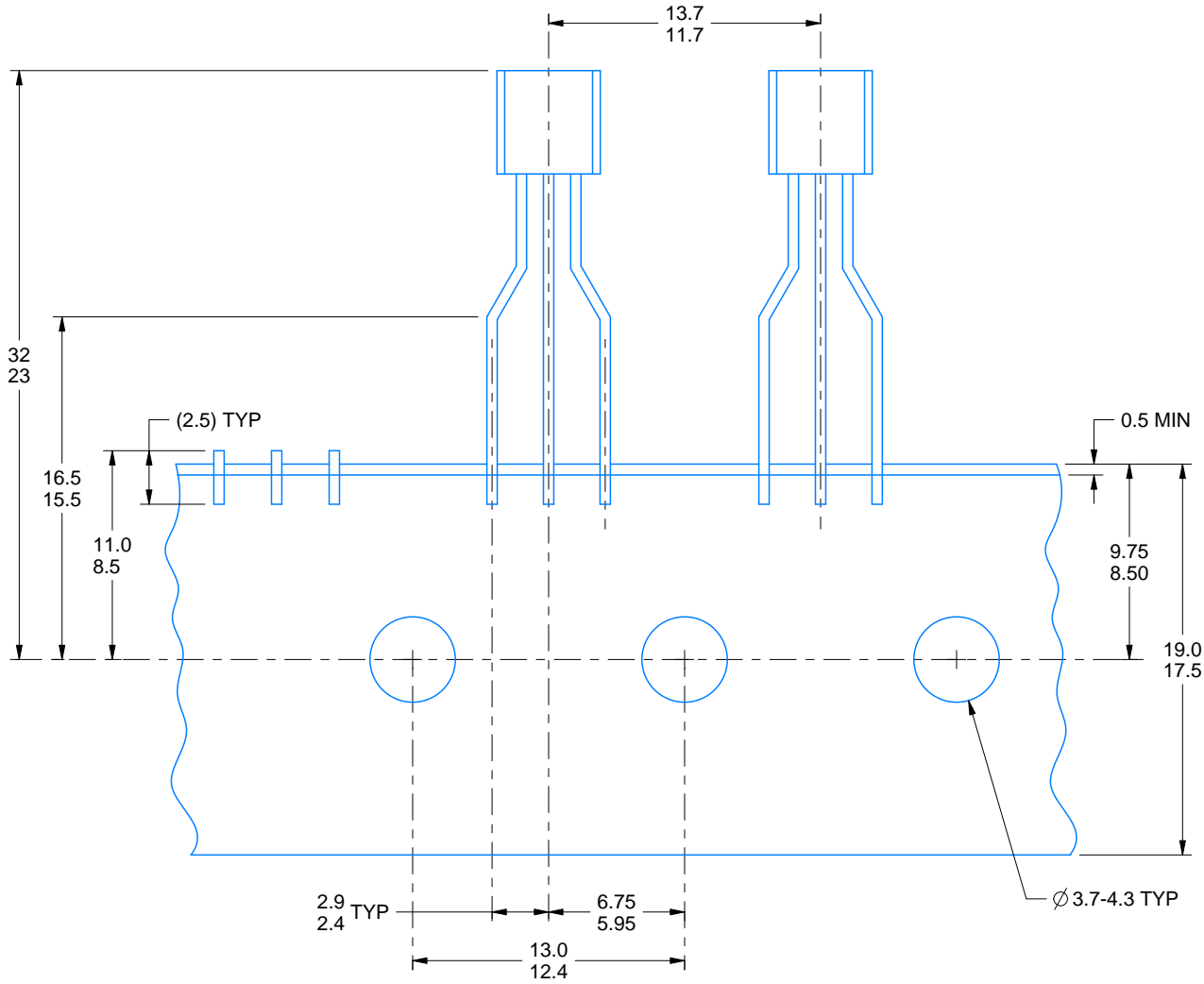
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TAPE SPECIFICATIONS

LP0003A

TO-92 - 5.34 mm max height

TO-92



FOR FORMED LEAD OPTION PACKAGE

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