

LM140L/LM340L Series 3-Terminal Positive Regulators

Check for Samples: [LM140L](#), [LM340L](#)

FEATURES

- **Line Regulation of 0.04%/V**
- **Load Regulation of 0.01%/mA**
- **Output Voltage Tolerances of**
 - **$\pm 2\%$ at $T_j = 25^\circ\text{C}$ and $\pm 4\%$ Over the Temperature Range (LM140LA)**
 - **$\pm 3\%$ Over the Temperature Range (LM340LA)**
- **Output Current of 100 mA**
- **Internal Thermal Overload Protection**
- **Output Transistor Safe Area Protection**
- **Internal Short Circuit Current Limit**
- **Available in**
 - **Metal TO Low Profile Package (LM140LA/LM340LA)**
 - **Plastic TO-92 (LM340LA)**

DESCRIPTION

The LM140L series of three terminal positive regulators is available with several fixed output voltages making them useful in a wide range of applications. The LM140LA is an improved version of the LM78LXX series with a tighter output voltage tolerance (specified over the full military temperature range), higher ripple rejection, better regulation and lower quiescent current. The LM140LA regulators have $\pm 2\% V_{OUT}$ specification, 0.04%/V line regulation, and 0.01%/mA load regulation. When used as a zener diode/resistor combination replacement, the LM140LA usually results in an effective output impedance improvement of two orders of magnitude, and lower quiescent current. These regulators can provide local on card regulation, eliminating the distribution problems associated with single point regulation. The voltages available allow the LM140LA to be used in logic systems, instrumentation, Hi-Fi, and other solid state electronic equipment. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

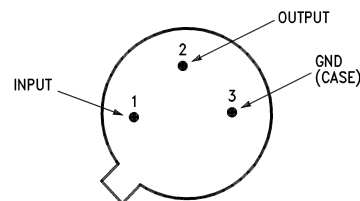
The LM140LA/LM340LA are available in the low profile metal three lead TO (NDT) and the LM340LA are also available in the plastic TO-92 (LP). With adequate heat sinking the regulator can deliver 100 mA output current. Current limiting is included to limit the peak output current to a safe value. Safe area protection for the output transistor is provided to limit internal power dissipation. If internal power dissipation becomes too high for the heat sinking provided, the thermal shut-down circuit takes over, preventing the IC from overheating.

For applications requiring other voltages, see LM117L Data Sheet.

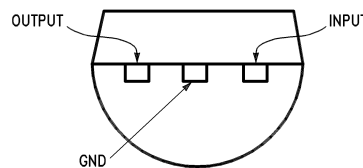
Output Voltage Options

LM140LA-5.0	5V	LM340LA-5.0	5V
LM140LA-12	12V	LM340LA-12	12V
LM140LA-15	15V	LM340LA-15	15V

Connection Diagrams



**Figure 1. TO Metal Can Package (NDT)
(Bottom View)**



**Figure 2. TO-92 Plastic Package (LP)
(Bottom View)**



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

Copyright © 1998–2013, Texas Instruments Incorporated



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.

Absolute Maximum Ratings⁽¹⁾⁽²⁾⁽³⁾

Input Voltage		35V
Internal Power Dissipation ⁽⁴⁾		Internally Limited
Operating Temperature Range	LM140LA	-55°C to +125°C
	LM340LA	0°C to +70°C
Maximum Junction Temperature		+150°C
Storage Temperature Range	Metal Can (NDT package)	-65°C to +150°C
	Molded TO-92	-55°C to +150°C
Lead Temperature (Soldering, 10 sec.)	Metal Can	+300°C
	Plastic TO-92	+230°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, but do not ensure specific performance limits.
- (2) A military RETS specification is available upon request. At the time of printing, the LM140LA-5.0, -12, and -15 RETS specifications complied with the Min and Max limits in this table. The LM140LAH-5.0, LM140LAH-12, and LM140LAH-15 may also be procured as Standard Military Drawings.
- (3) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/ Distributors for availability and specifications.
- (4) Thermal resistance of NDT-package is typically 26°C/W θ_{JC} , 250°C/W θ_{JA} still air, and 94°C/W θ_{JA} 400 lf/min of air. For the LP-package is 60°C/W θ_{JC} , 232°C/W θ_{JA} still air, and 88°C/W θ_{JA} at 400 lf/min of air. The maximum junction temperature shall not exceed 125°C on electrical parameters.

Electrical Characteristics

Test conditions unless otherwise specified. $T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$ (LM140LA), $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$ (LM340LA), $I_O = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_O = 0.01\text{ }\mu\text{F}$.

Output Voltage Option				5.0V			12V			15V			Units
Input Voltage (unless otherwise noted)				10V			19V			23V			
Symbol	Parameter	Conditions		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V _O	Output Voltage	T _j = 25°C		4.9	5	5.1	11.75	12	12.25	14.7	15	15.3	V
	Output Voltage Over Temp. ⁽¹⁾	LM140LA	I _O = 1 – 100 mA	4.8		5.2	11.5		12.5	14.4		15.6	
				(7.2–20)		(14.5–27)		(17.6–30)					
		LM340LA	I _O = 1 – 100 mA or I _O = 1 – 40 mA and V _{IN} = ()V	4.85		5.15	11.65		12.35	14.55		15.45	
(7–20)				(14.3–27)		(17.5–30)							
ΔV _O	Line Regulation	T _j = 25°C	I _O = 40 mA		18	30		30	65		37	70	mV
			V _{IN} = ()V	(7–25)		(14.2–30)		(17.3–30)					
			I _O = 100 mA		18	30		30	65		37	70	
			V _{IN} = ()V	(7.5–25)		(14.5–30)		(17.5–30)					
	Load Regulation	T _j = 25°C	I _O = 1 – 40 mA		5	20		10	40		12	50	
			I _O = 1 – 100 mA		20	40		30	80		35	100	
	Long Term Stability			12			24			30			mV 1000 hrs
I _O	Quiescent Current	T _j = 25°C T _j = 125°C			3	4.5		3	4.5		3.1	4.5	mA
						4.2			4.2			4.2	
ΔI _Q	Quiescent Current Change	T _j = 25°C	ΔLoad I _O = 1 – 40 mA		0.1			0.1			0.1		mA
			ΔLine V _{IN} = ()V		0.5			0.5			0.5		
				(7.5–25)		(14.3–30)		(17.5–30)					

(1) The temperature coefficient of V_{OUT} is typically within 0.01% $V_O/^\circ\text{C}$.

Electrical Characteristics (continued)

Test conditions unless otherwise specified. $T_A = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ (LM140LA), $T_A = 0^{\circ}\text{C}$ to $+70^{\circ}\text{C}$ (LM340LA), $I_O = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_O = 0.01\text{ }\mu\text{F}$.

Output Voltage Option			5.0V			12V			15V			Units
Input Voltage (unless otherwise noted)			10V			19V			23V			
Symbol	Parameter	Conditions	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V _N	Output Noise Voltage	T _j = 25°C ⁽²⁾ , f = 10 Hz–10 kHz	40			80			90			μV
$\frac{\Delta V_{IN}}{\Delta V_{out}}$	Ripple Rejection	f = 120 Hz, V _{IN} = ()V	55	62		47	54		45	52		dB
			(7.5–18)			(14.5–25)			(17.5–28.5)			
	Input Voltage Required to Maintain Line Regulation	T _j = 25°C, I _O = 40 mA	7			14.2			17.3			V

(2) It is recommended that a minimum load capacitor of $0.01\text{ }\mu\text{F}$ be used to limit the high frequency noise bandwidth.

Typical Performance Characteristics

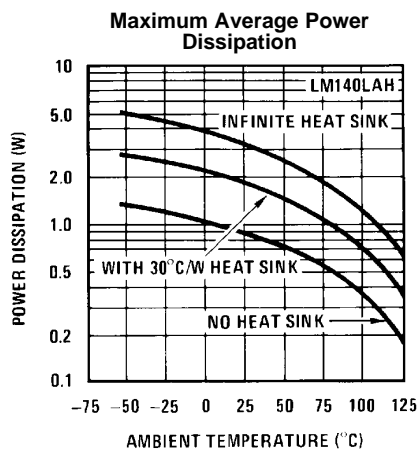


Figure 3.

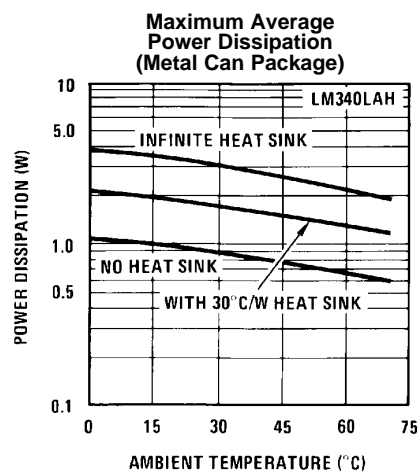


Figure 4.

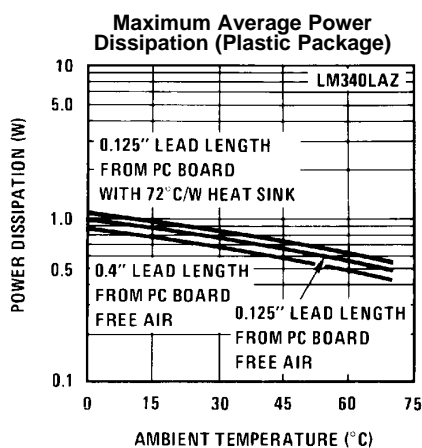


Figure 5.

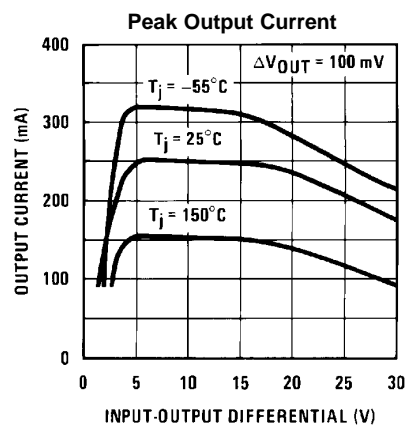


Figure 6.

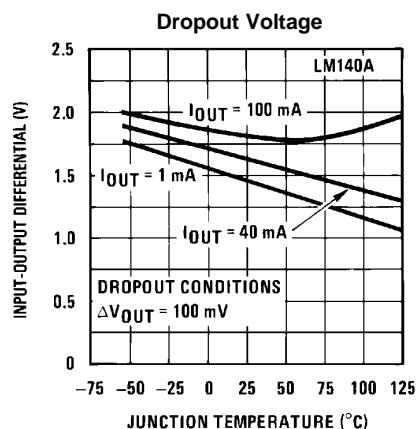


Figure 7.

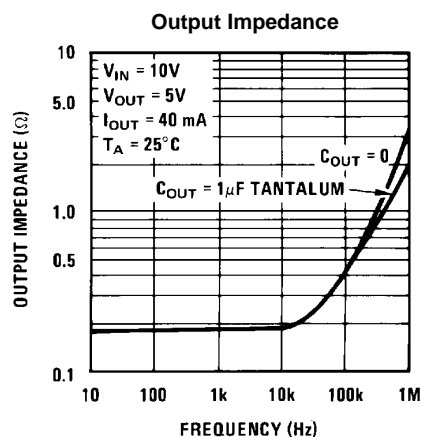


Figure 8.

Typical Performance Characteristics (continued)

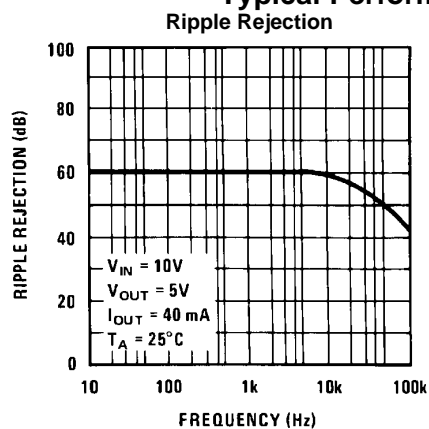


Figure 9.

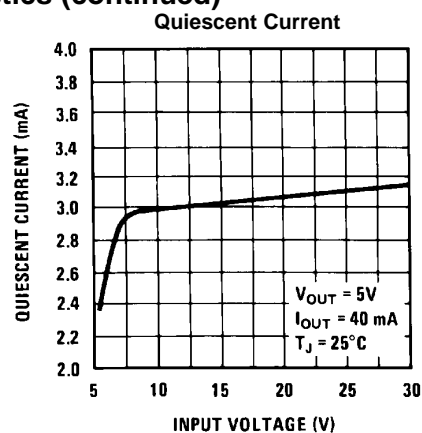


Figure 10.

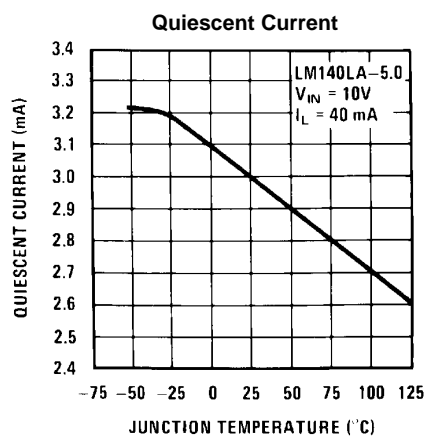
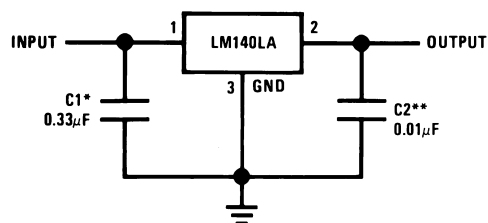


Figure 11.

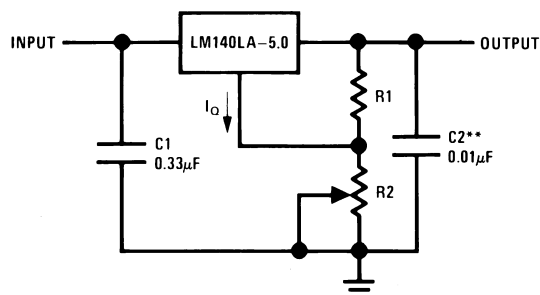
TYPICAL APPLICATIONS



*Required if the regulator is located far from the power supply filter.

**It is recommended that a minimum load capacitor of 0.01 μF be used to limit the high frequency noise bandwidth.

Figure 12. Fixed Output Regulator

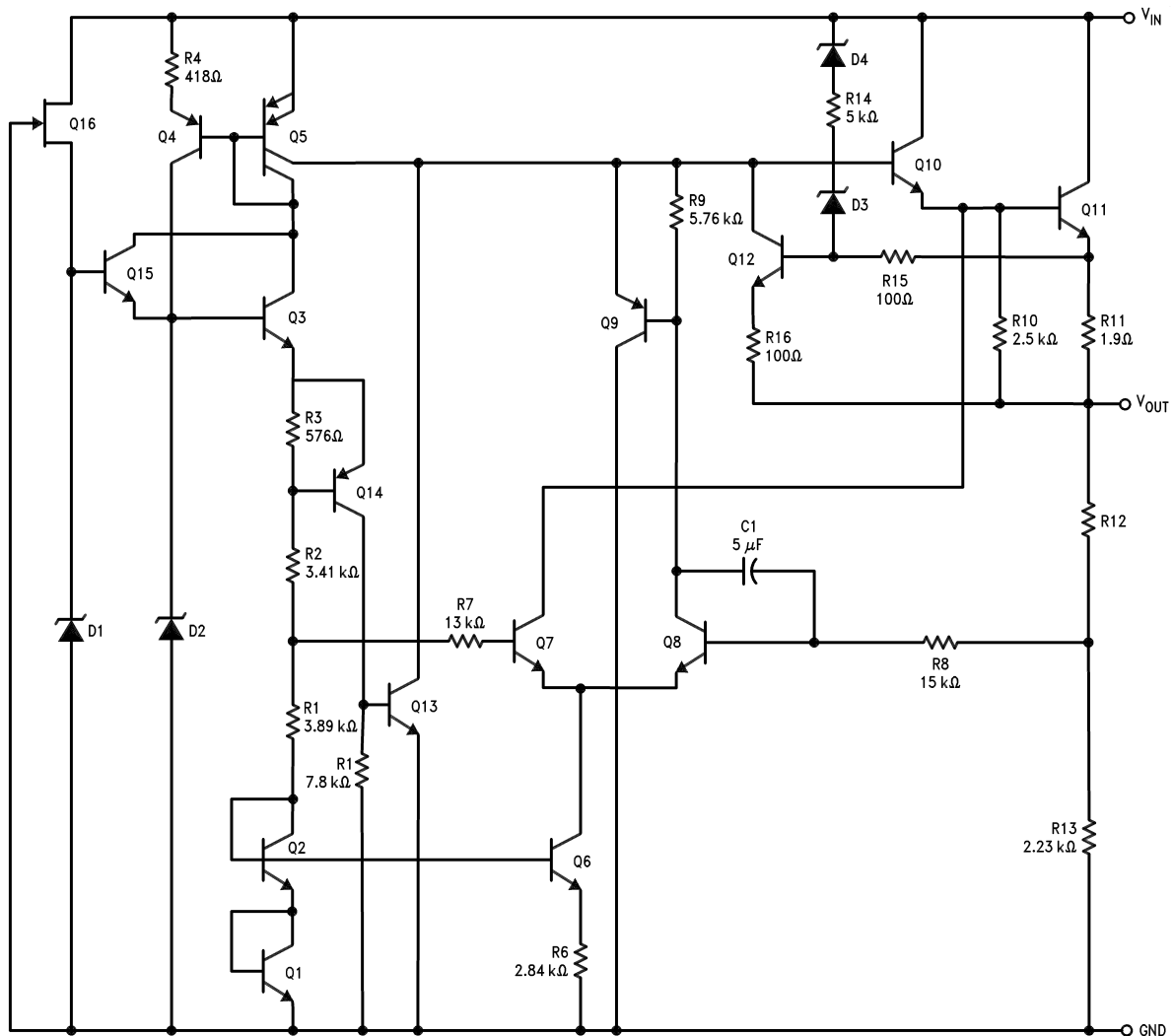


$$V_{OUT} = 5V + (5V/R1 + I_O) R2$$

$$5V/R1 = 3 I_O \text{ load regulation (L.) } [(R1 + R2)/R1] \text{ (L. of LM140LA-5.0)}$$

Figure 13. Adjustable Output Regulator

Equivalent Circuit



REVISION HISTORY

Changes from Revision A (March 2013) to Revision B	Page
• 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
LM140LAH-12	ACTIVE	TO	NDT	3	500	Green (RoHS & no Sb/Br)	Call TI	Level-1-NA-UNLIM	-55 to 125	(LM140LAH-12 ~ LM140LAH-12)	Samples
LM140LAH-12/NOPB	ACTIVE	TO	NDT	3	500	Green (RoHS & no Sb/Br)	Call TI	Level-1-NA-UNLIM	-55 to 125	(LM140LAH-12 ~ LM140LAH-12)	Samples
LM140LAH-15	ACTIVE	TO	NDT	3	500	TBD	Call TI	Call TI	-55 to 125	(LM140LAH-15 ~ LM140LAH-15)	Samples
LM140LAH-15/NOPB	ACTIVE	TO	NDT	3	500	Green (RoHS & no Sb/Br)	Call TI	Level-1-NA-UNLIM	-55 to 125	(LM140LAH-15 ~ LM140LAH-15)	Samples
LM140LAH-5.0	ACTIVE	TO	NDT	3	500	Green (RoHS & no Sb/Br)	Call TI	Level-1-NA-UNLIM	-55 to 125	(LM140LAH-5.0 ~ LM140LAH-5.0)	Samples
LM140LAH-5.0/NOPB	ACTIVE	TO	NDT	3	500	Green (RoHS & no Sb/Br)	Call TI	Level-1-NA-UNLIM	-55 to 125	(LM140LAH-5.0 ~ LM140LAH-5.0)	Samples
LM340LAZ-5.0/LFT4	ACTIVE	TO-92	LP	3	2000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type		340LA Z-5.0	Samples
LM340LAZ-5.0/NOPB	ACTIVE	TO-92	LP	3	1800	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	0 to 70	340LA Z-5.0	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.

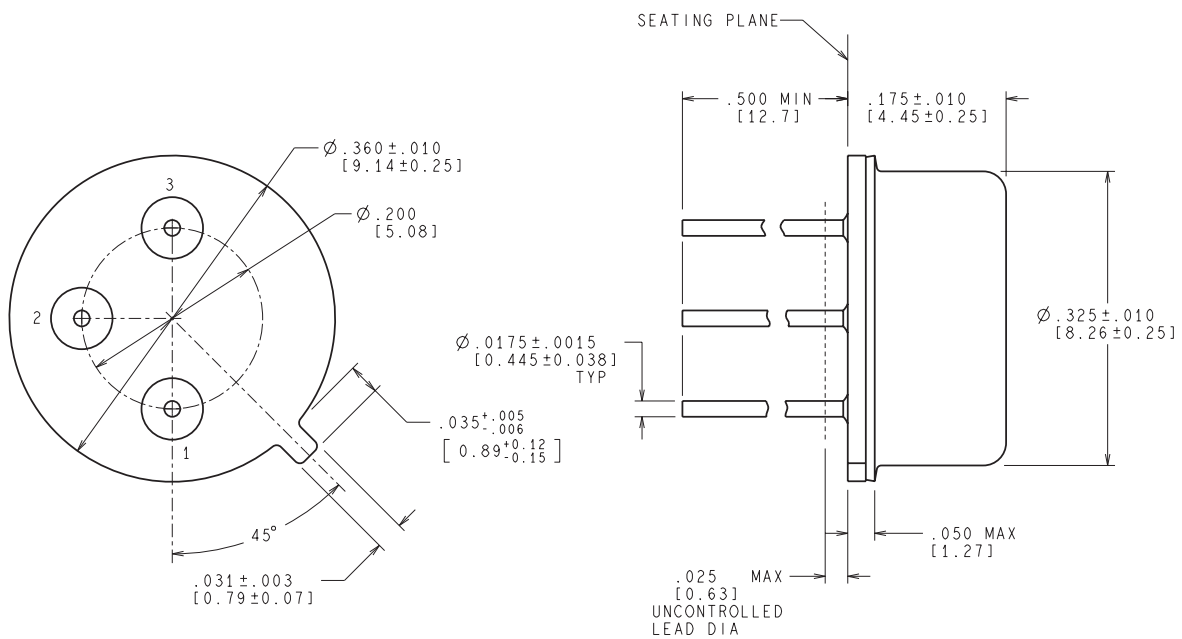
⁽⁵⁾ Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

⁽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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

NDT0003A



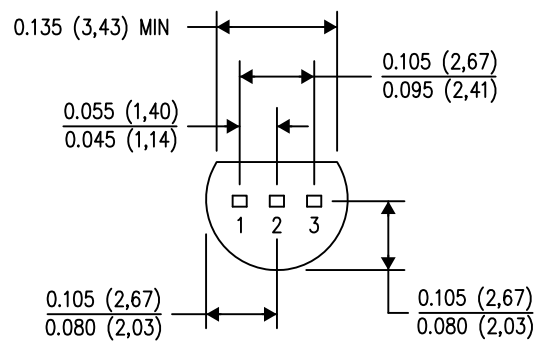
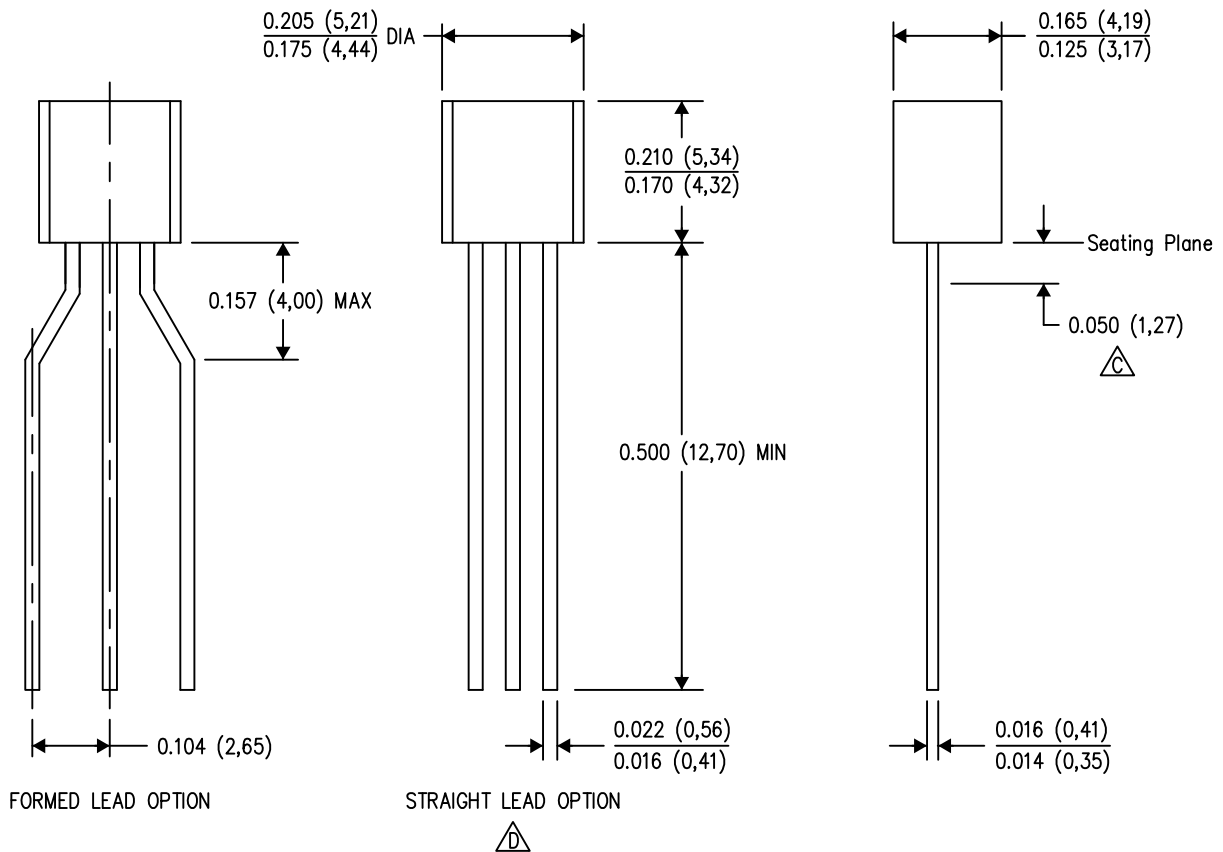
CONTROLLING DIMENSION IS INCH
VALUES IN [] ARE MILLIMETERS

MIL-PRF-38535
CONFIGURATION CONTROL

H03A (Rev D)

LP (O-PBCY-W3)

PLASTIC CYLINDRICAL PACKAGE

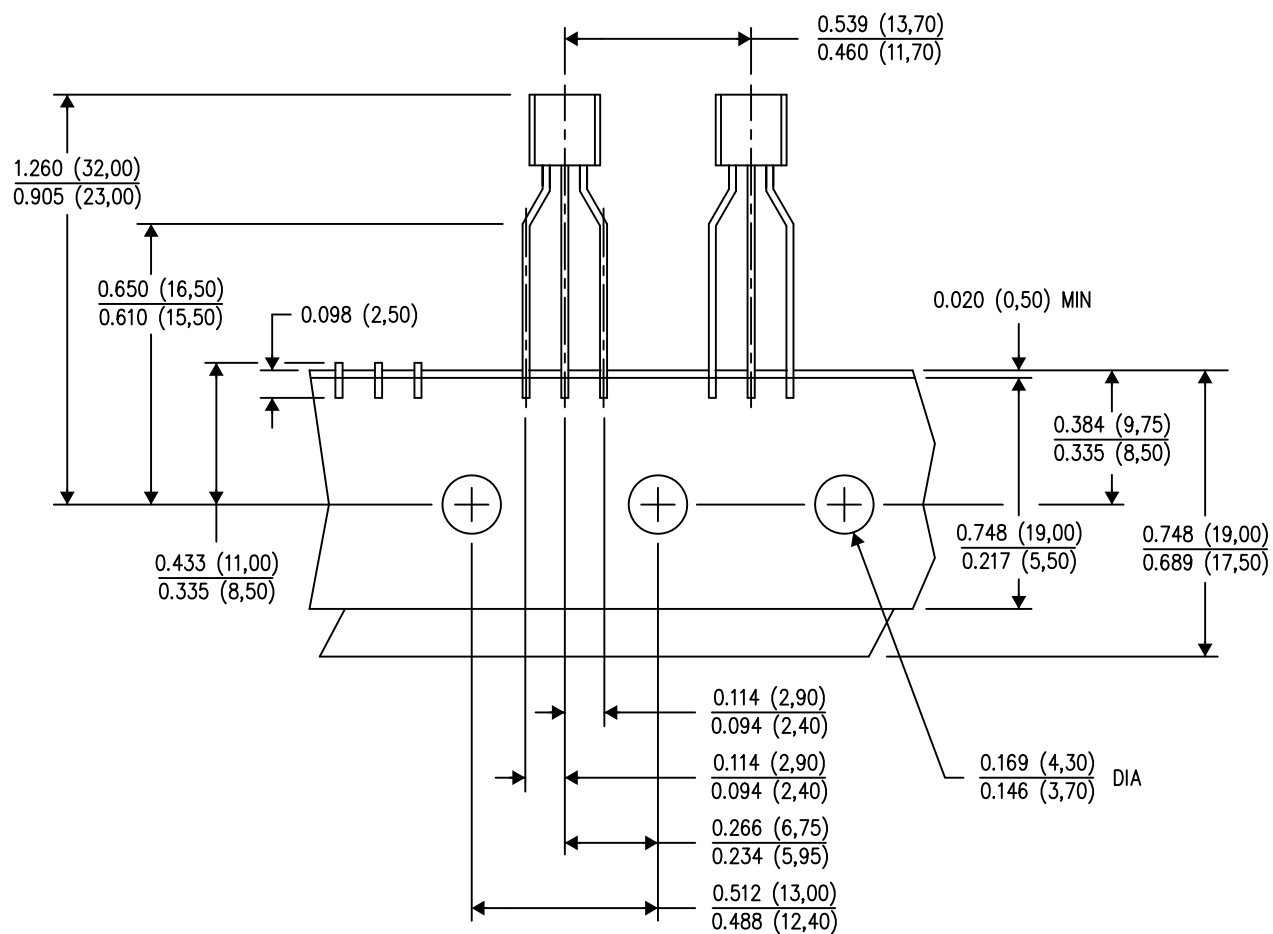


4040001-2/E 08/13

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Lead dimensions are not controlled within this area.
 - D. Falls within JEDEC TO-226 Variation AA (TO-226 replaces TO-92).
 - E. Shipping Method:
 Straight lead option available in bulk pack only.
 Formed lead option available in tape & reel or ammo pack.
 Specific products can be offered in limited combinations of shipping mediums and lead options.
 Consult product folder for more information on available options.

LP (O-PBCY-W3)

PLASTIC CYLINDRICAL PACKAGE



TAPE & REEL

4040001-3/E 08/13

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Tape and Reel information for the Formed Lead Option package.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com