LM837 Low Noise Quad Operational Amplifier

Check for Samples: LM837

FEATURES

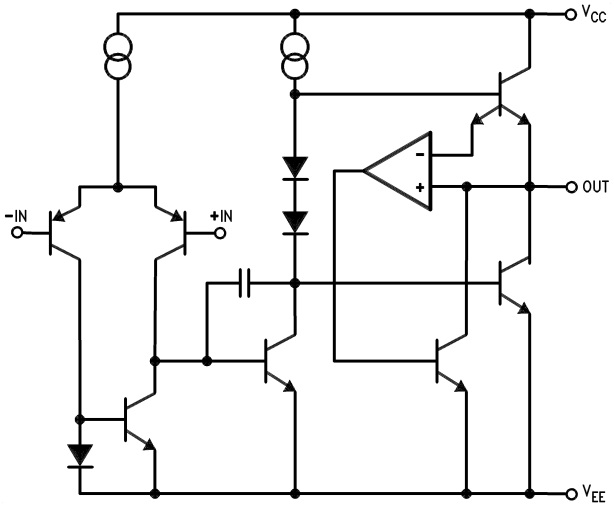
- **High slew rate 10 V/µs (typ); 8 V/µs (min)**
- **Wide gain bandwidth product 25 MHz (typ); 15 MHz (min)**
- **Power bandwidth 200 kHz (typ)**
- **High output current ±40 mA**
- **Excellent output drive performance >600Ω**
- **Low input noise voltage 4.5 nV/$\sqrt{Hz}$**
- **Low total harmonic distortion 0.0015%**
- **Low offset voltage 0.3 mV**

DESCRIPTION

The LM837 is a quad operational amplifier designed for low noise, high speed and wide bandwidth performance. It has a new type of output stage which can drive a 600Ω load, making it ideal for almost all digital audio, graphic equalizer, preamplifiers, and professional audio applications. Its high performance characteristics also make it suitable for instrumentation applications where low noise is the key consideration.

The LM837 is internally compensated for unity gain operation. It is pin compatible with most other standard quad op amps and can therefore be used to upgrade existing systems with little or no change.

Schematic and Connection Diagrams



Dual-In-Line Package

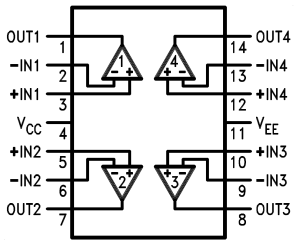


Figure 1. Top View
Order Number LM837M, LM837MX or LM837N
See NS Package Number M14A or N14A

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.

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)

Supply Voltage, V_{CC}/V_{EE}	±18V
Differential Input Voltage, V_{ID} (2)	±30V
Common Mode Input Voltage, V_{IC} (2)	±15V
Power Dissipation, P_D (3)	1.2W (N) 830 mW (M)
Operating Temperature Range, T_{OPR}	−40°C to +85°C
Storage Temperature Range, T_{STG}	−60°C to +150°C
Soldering Information	
Dual-In-Line Package	
Soldering (10 seconds)	260°C
Small Outline Package	
Vapor Phase (60 seconds)	215°C
Infrared (15 seconds)	220°C
ESD rating to be determined.	
See AN-450 “Surface Mounting Methods and Their Effect on Product Reliability” for other methods of soldering surface mount devices.	

(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. Electrical Characteristics state DC and AC electrical specifications under particular test conditions which guarantee specific performance limits. This assumes that the device is within the Operating Ratings. Specifications are not guaranteed for parameters where no limit is given, however, the typical value is a good indication of device performance.

(2) Unless otherwise specified the absolute maximum input voltage is equal to the power supply voltage.

(3) For operation at ambient temperatures above 25°C, the device must be derated based on a 150°C maximum junction temperature and a thermal resistance, junction to ambient, as follows: LM837N, 90°C/W; LM837M, 150°C/W.

DC Electrical Characteristics

T_A = 25°C, V_S = ±15V

Symbol	Parameter	Condition	Min	Typ	Max	Units
V_{OS}	Input Offset Voltage	R_S = 50Ω		0.3	5	mV
I_{OS}	Input Offset Current			10	200	nA
I_B	Input Bias Current			500	1000	nA
A_V	Large Signal Voltage Gain	R_L = 2 kΩ, V_{OUT} = ±10V	90	110		dB
V_{OM}	Output Voltage Swing	R_L = 2 kΩ	±12	±13.5		V
		R_L = 600Ω	±10	±12.5		V
V_{CM}	Common Mode Input Voltage		±12	±14.0		V
CMRR	Common Mode Rejection Ratio	V_{IN} = ±12V	80	100		dB
PSRR	Power Supply Rejection Ratio	V_S = 15 ~ 5, −15 ~ −5	80	100		dB
I_S	Power Supply Current	R_L = ∞, Four Amps		10	15	mA

AC Electrical Characteristics

T_A = 25°C, V_S = ±15V

Symbol	Parameter	Condition	Min	Typ	Max	Units
SR	Slew Rate	R_L = 600Ω	8	10		V/µs
GBW	Gain Bandwidth Product	f = 100 kHz, R_L = 600Ω	15	25		MHz

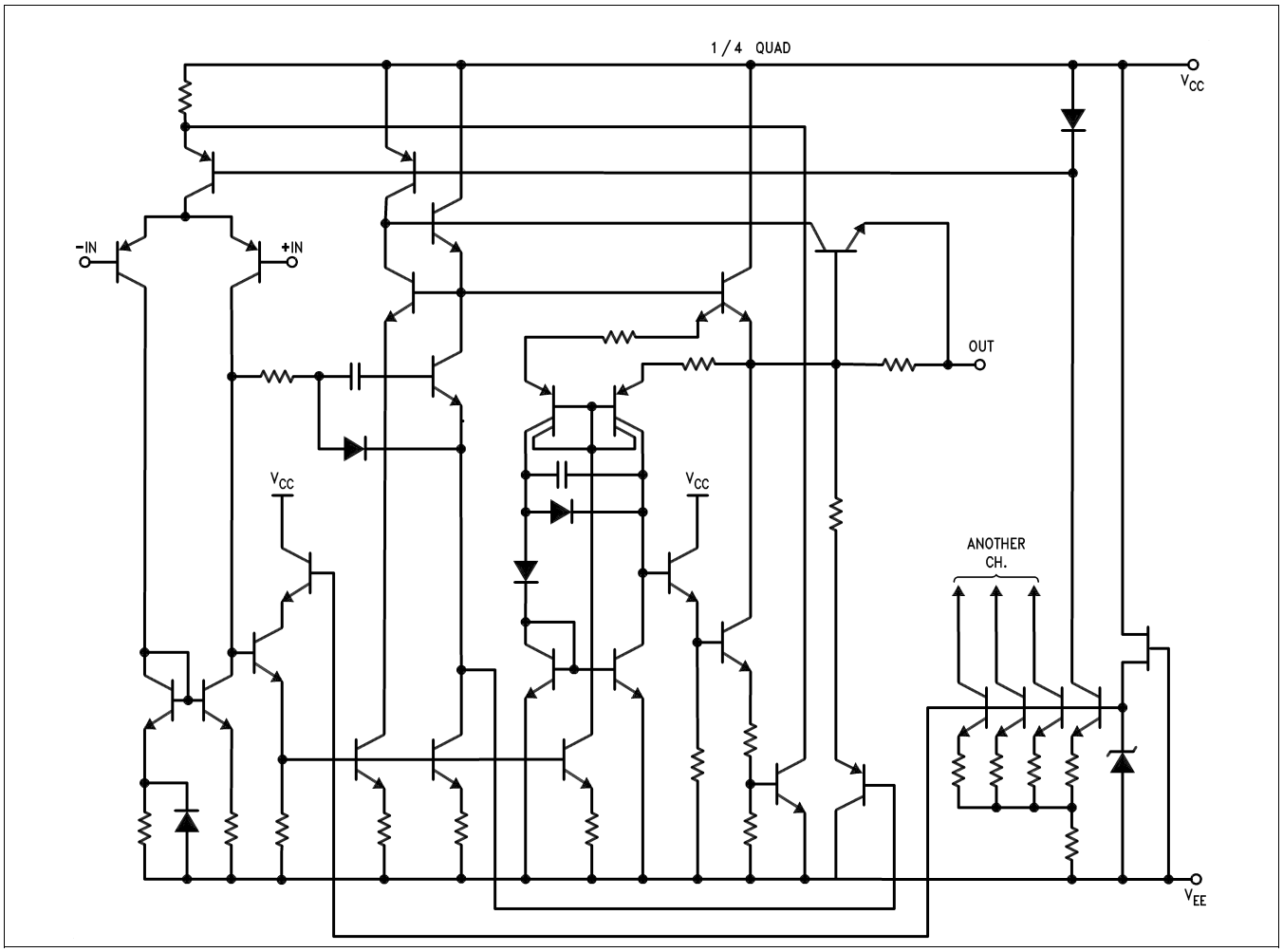
Design Electrical Characteristics

T_A= 25°C, V_S=±15V (1)

Symbol	Parameter	Condition	Min	Typ	Max	Units
PBW	Power Bandwidth	V_O = 25 V_{P-P}, R_L = 600Ω, THD < 1%		200		kHz
e_{n1}	Equivalent Input Noise Voltage	JIS A, R_S = 100Ω		0.5		µV
e_{n2}	Equivalent Input Noise Voltage	f = 1 kHz		4.5		nV/ $\sqrt{Hz}$
i_n	Equivalent Input Noise Current	f = 1 kHz		0.7		pA/ $\sqrt{Hz}$
THD	Total Harmonic Distortion	A_V = 1, V_{OUT} = 3 Vrms, f = 20 ~ 20 kHz, R_L = 600Ω		0.0015		%
f_U	Zero Cross Frequency	Open Loop		12		MHz
φ_m	Phase Margin	Open Loop		45		deg
	Input-Referred Crosstalk	f = 20 ~ 20 kHz		−120		dB
$\Delta V_{OS}/\Delta T$	Average TC of Input Offset Voltage			2		µV/°C

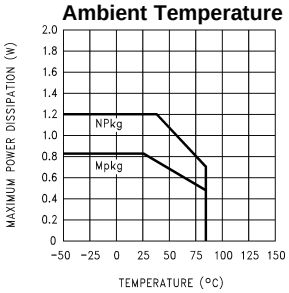
(1) The following parameters are not tested or guaranteed.

Detailed Schematic

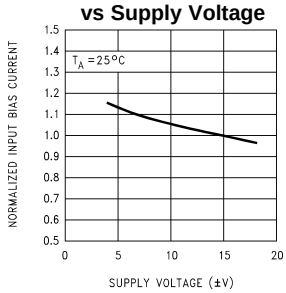


Typical Performance Characteristics

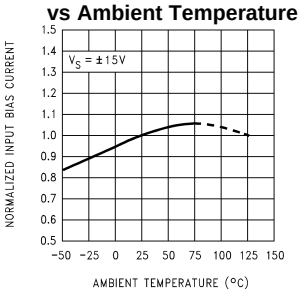
Maximum Power Dissipation vs Ambient Temperature



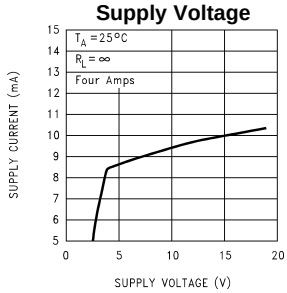
Normalized Input Bias Current vs Supply Voltage



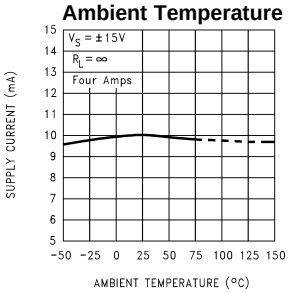
Normalized Input Bias Current vs Ambient Temperature



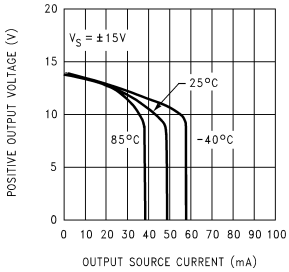
Supply Current vs Supply Voltage



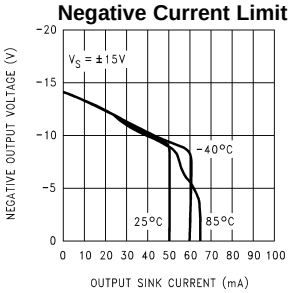
Supply Current vs Ambient Temperature



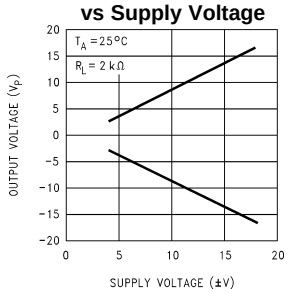
Positive Current Limit



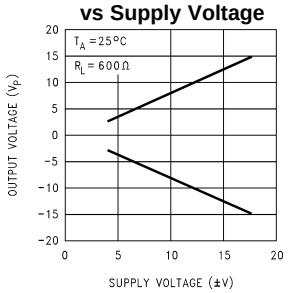
Negative Current Limit



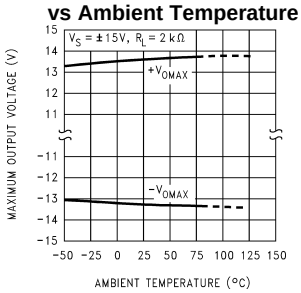
Maximum Output Voltage vs Supply Voltage



Maximum Output Voltage vs Supply Voltage

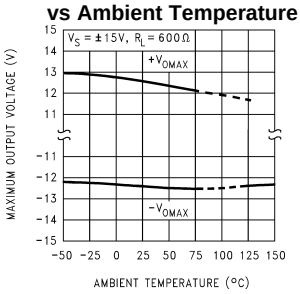


Maximum Output Voltage vs Ambient Temperature

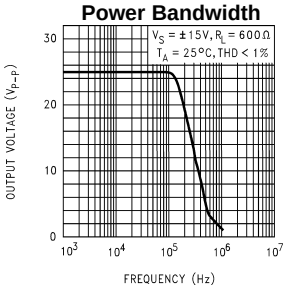


Typical Performance Characteristics (continued)

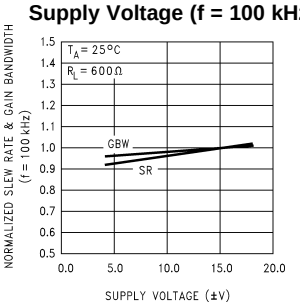
Maximum Output Voltage vs Ambient Temperature



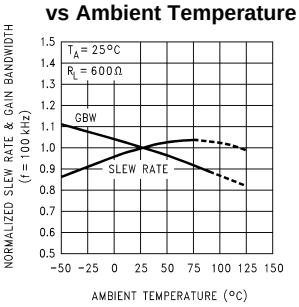
Power Bandwidth



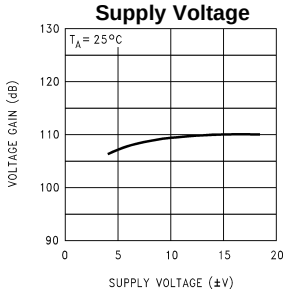
Normalized Slew Rate & Gain Bandwidth vs Supply Voltage (f = 100 kHz)



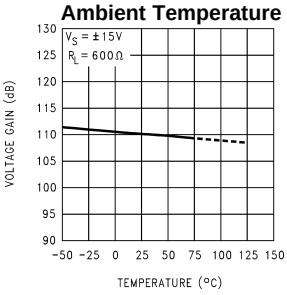
Normalized Slew Rate & Gain Bandwidth (f = 100 kHz) vs Ambient Temperature



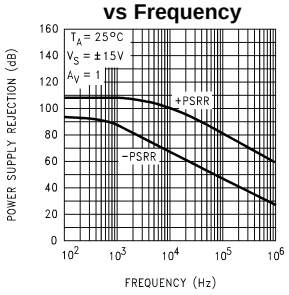
Voltage Gain vs Supply Voltage



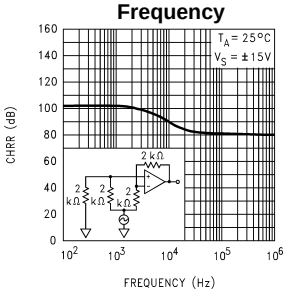
Voltage Gain vs Ambient Temperature



Power Supply Rejection vs Frequency

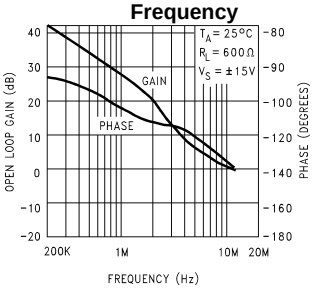


CMRR vs Frequency

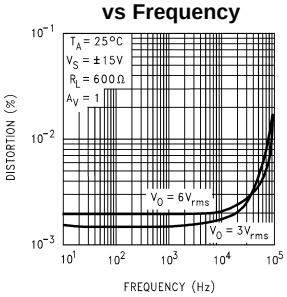


Typical Performance Characteristics (continued)

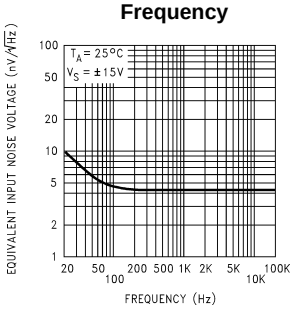
Open Loop Gain & Phase vs Frequency



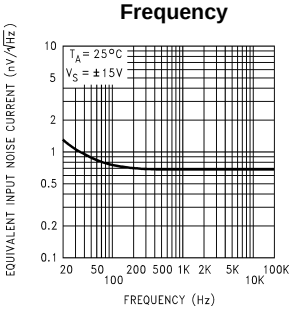
Total Harmonic Distortion vs Frequency



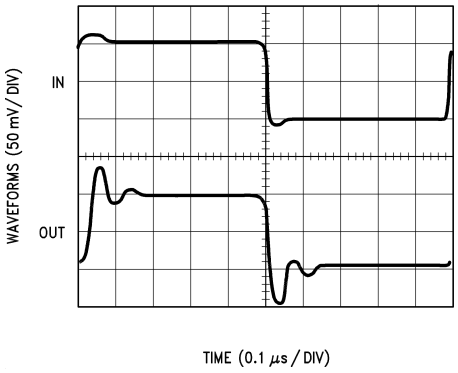
Equivalent Input Noise Voltage vs Frequency



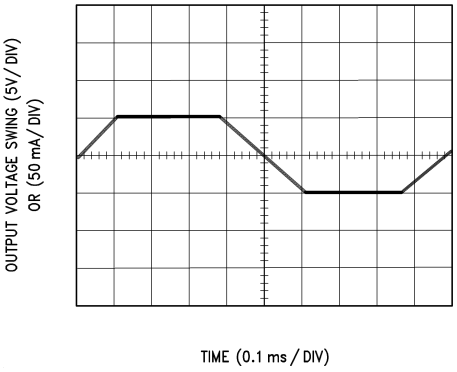
Equivalent Input Noise Current vs Frequency



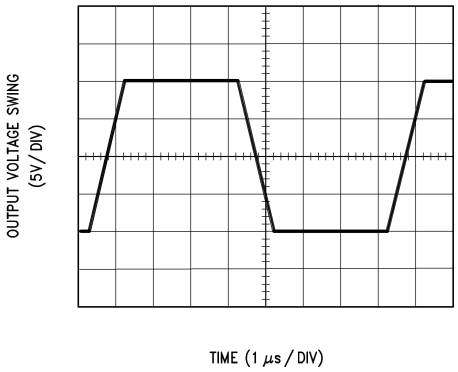
Small Signal, Non-Inverting
T_A = 25°C, A_V = 1, R_L = 600Ω, V_S = ±15V



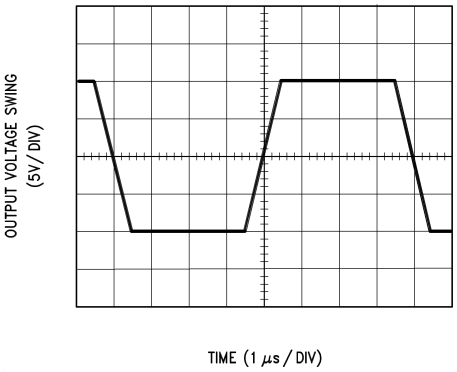
Current Limit
T_A = 25°C, V_S = ±15V, R_L = 100Ω, A_V = 1



Large Signal Non-Inverting
T_A = 25°C, R_L = 600Ω, V_S = ±15V



Large Signal Inverting
T_A = 25°C, R_L = 600Ω, V_S = ±15V



PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Samples (Requires Login)
LM837M	ACTIVE	SOIC	D	14	55	TBD	CU SNPB	Level-1-235C-UNLIM	
LM837M/NOPB	ACTIVE	SOIC	D	14	55	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	
LM837MX	ACTIVE	SOIC	D	14	2500	TBD	CU SNPB	Level-1-235C-UNLIM	
LM837MX/NOPB	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	

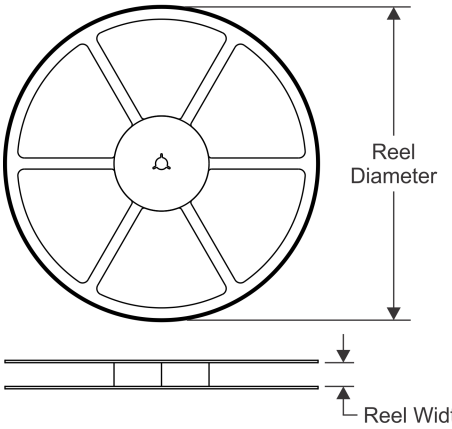
(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, 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)

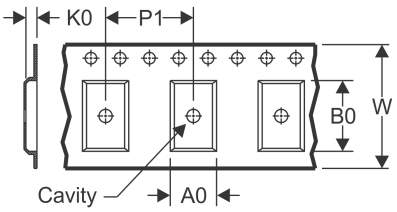
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

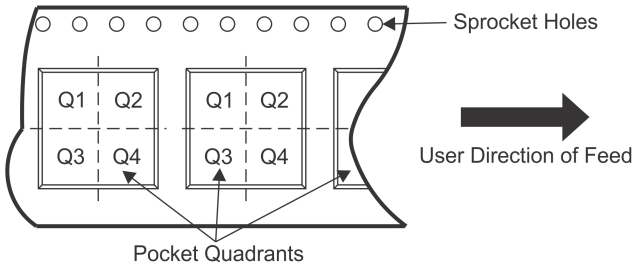


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

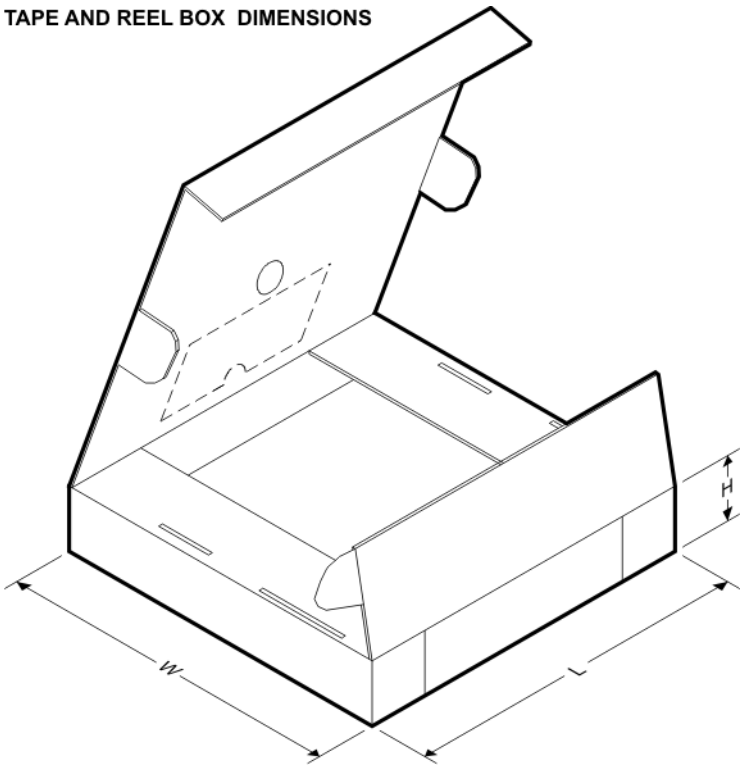
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
LM837MX	SOIC	D	14	2500	330.0	16.4	6.5	9.35	2.3	8.0	16.0	Q1
LM837MX/NOPB	SOIC	D	14	2500	330.0	16.4	6.5	9.35	2.3	8.0	16.0	Q1

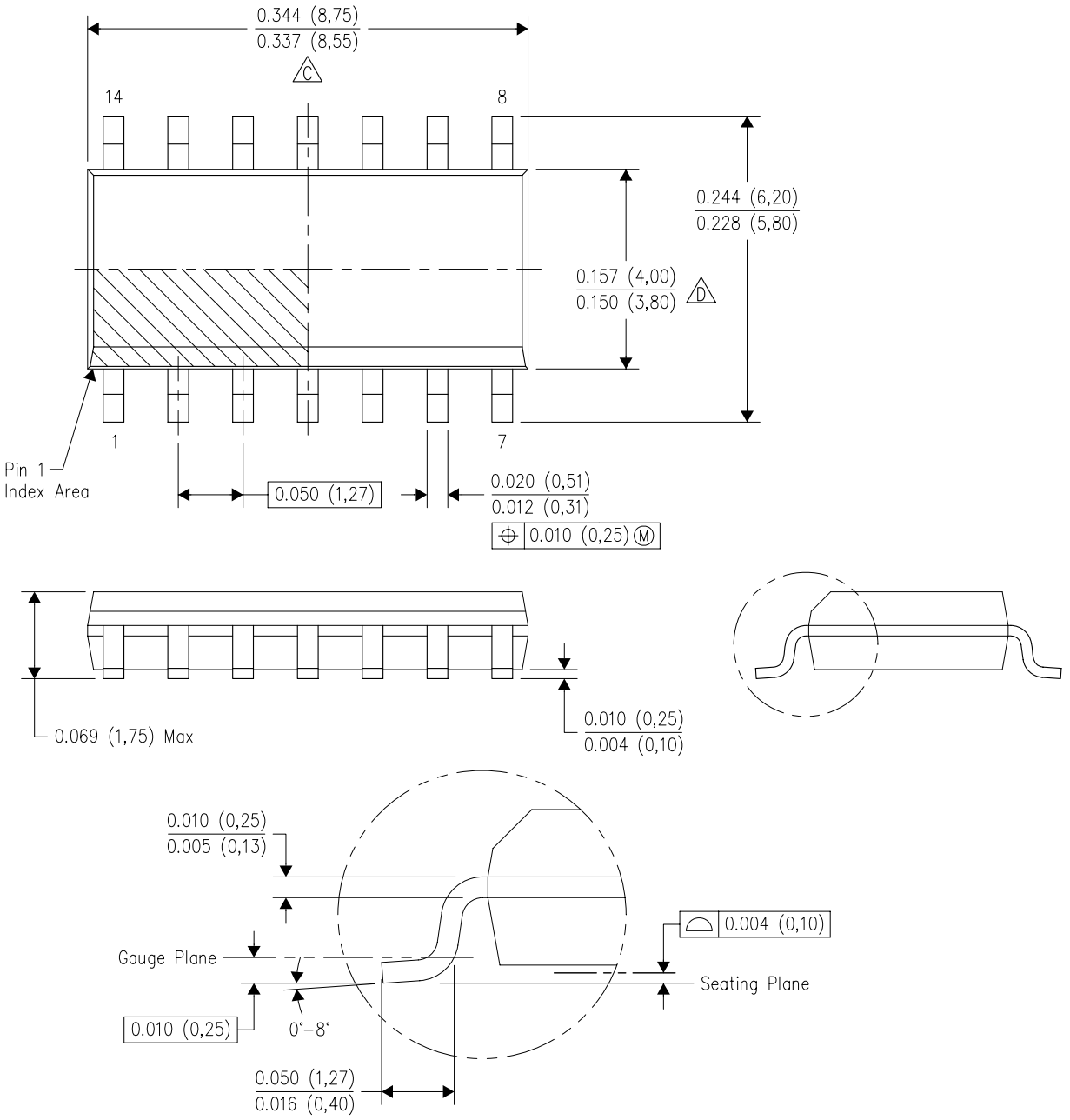
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM837MX	SOIC	D	14	2500	349.0	337.0	45.0
LM837MX/NOPB	SOIC	D	14	2500	349.0	337.0	45.0

D (R–PDSO–G14) PLASTIC SMALL OUTLINE



4040047–5/M 06/11

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
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.
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 AB.

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		**Applications**	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Applications Processors	www.ti.com/omap	**TI E2E Community**	e2e.ti.com
Wireless Connectivity	www.ti.com/wirelessconnectivity		

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265