LM837 Low Noise Quad Operational Amplifier

Check for Samples: LM837

FEATURES

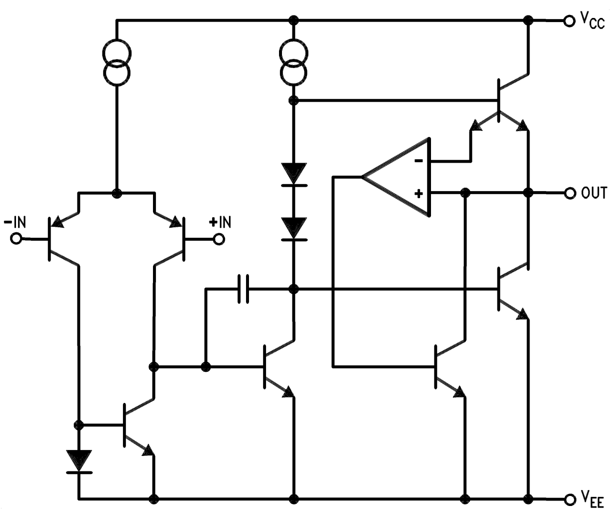
- **High Slew Rate 10 V/μs (typ); 8 V/μs (min)**
- **Wide Gain Bandwidth Product 25 MHz (typ); 15 MHz (min)**
- **Power Bandwidth 200 kHz (typ)**
- **High Output Current ±40 mA**
- **Excellent Output Drive Performance >600Ω**
- **Low Input Noise Voltage 4.5 nV/√Hz**
- **Low Total Harmonic Distortion 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



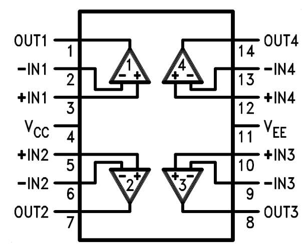


Figure 1. PDIP Package Top View See Package Number D0014A or NFF0014A

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)

Supply Voltage, V_{CC}/V_{EE}	±18V
Differential Input Voltage, V_{ID} (3)	±30V
Common Mode Input Voltage, V_{IC} (3)	±15V
Power Dissipation, P_D (4)	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 PDIP Package Soldering (10 seconds)	260°C
SOIC Package Vapor Phase (60 seconds)	215°C
Infrared (15 seconds)	220°C
ESD rating to be determined.	
See http://www.ti.com 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 ensure specific performance limits. Electrical Characteristics state DC and AC electrical specifications under particular test conditions which ensure specific performance limits. This assumes that the device is within the Operating Ratings. Specifications are not specified for parameters where no limit is given, however, the typical value is a good indication of device performance.
(2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/Distributors for availability and specifications.
(3) Unless otherwise specified the absolute maximum input voltage is equal to the power supply voltage.
(4) 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

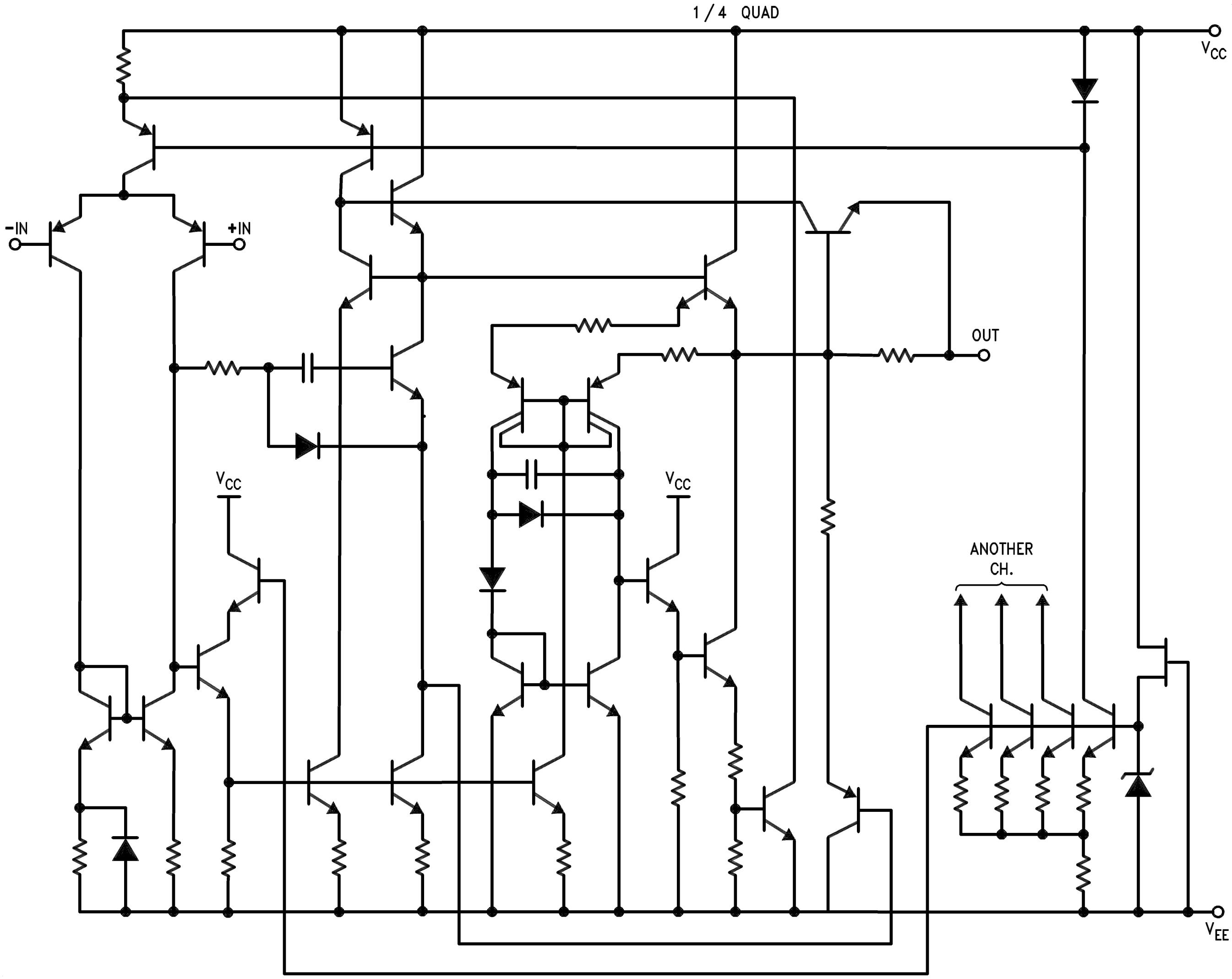
DESIGN ELECTRICAL CHARACTERISTICS

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
$ΔV_{OS}/ΔT$	Average TC of Input Offset Voltage			2		μV/°C

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

DETAILED SCHEMATIC



TYPICAL PERFORMANCE CHARACTERISTICS

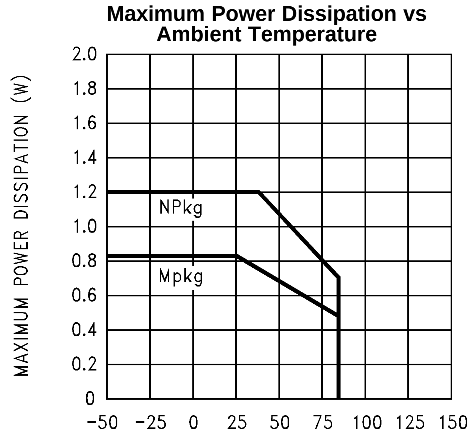


Figure 2.

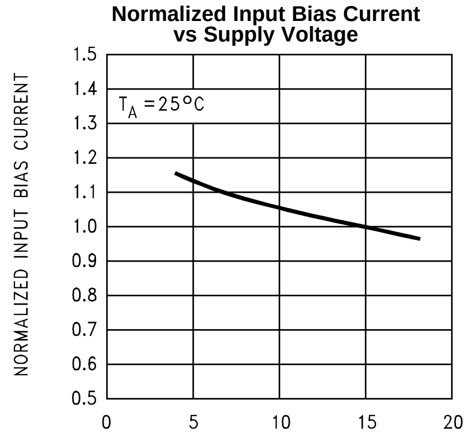


Figure 3.

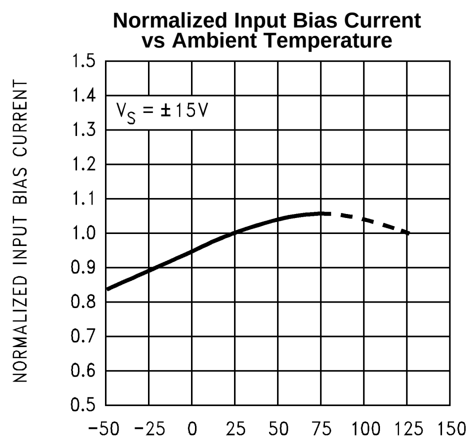


Figure 4.

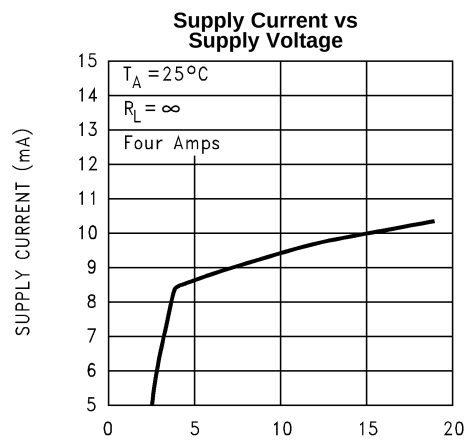


Figure 5.

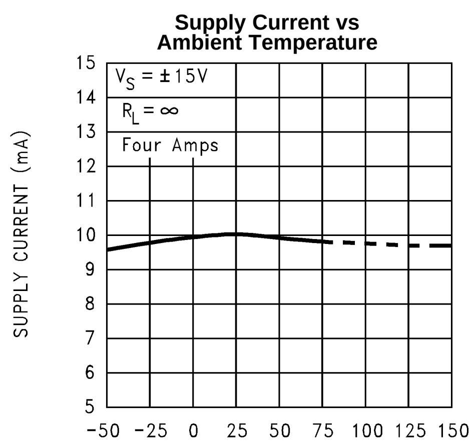


Figure 6.

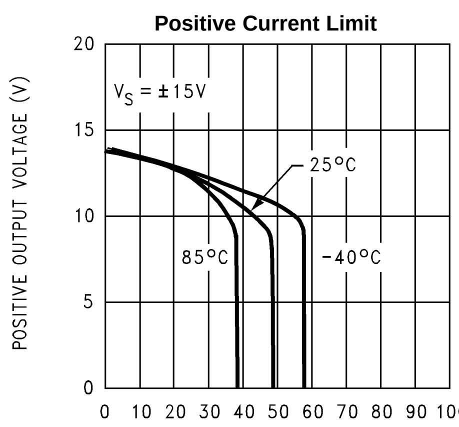


Figure 7.

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Negative Current Limit

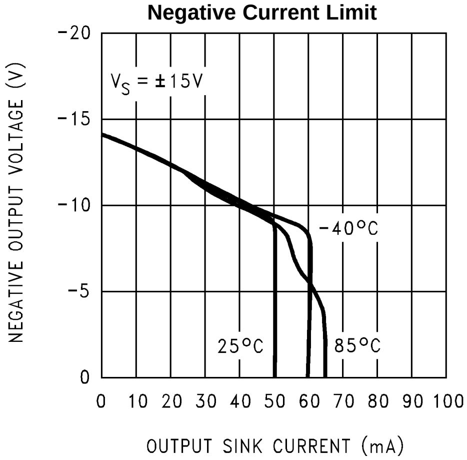


Figure 8.

Maximum Output Voltage vs Supply Voltage

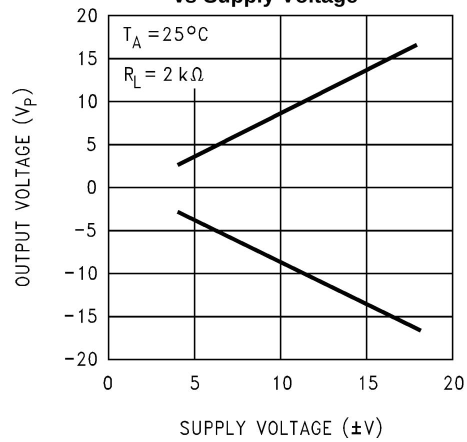


Figure 9.

Maximum Output Voltage vs Supply Voltage

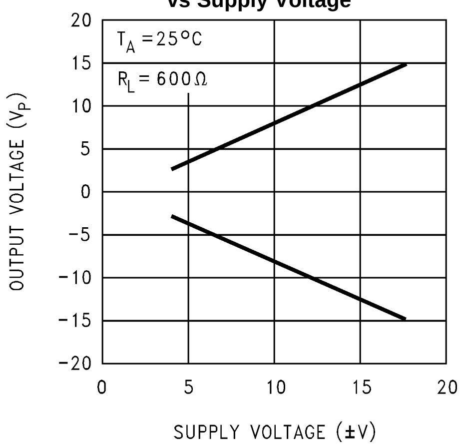


Figure 10.

Maximum Output Voltage vs Ambient Temperature

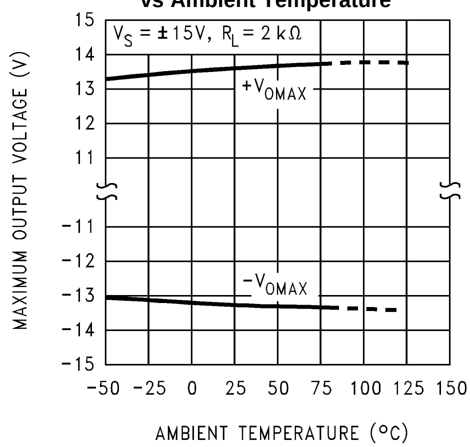


Figure 11.

Maximum Output Voltage vs Ambient Temperature

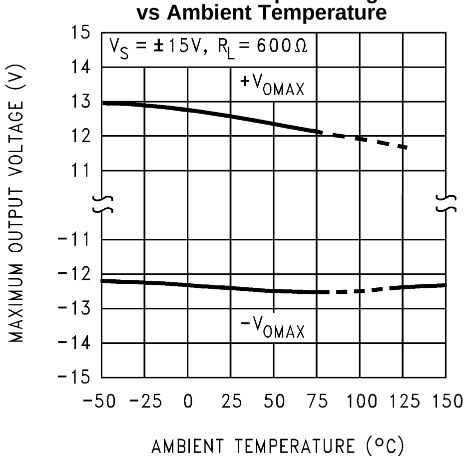


Figure 12.

Power Bandwidth

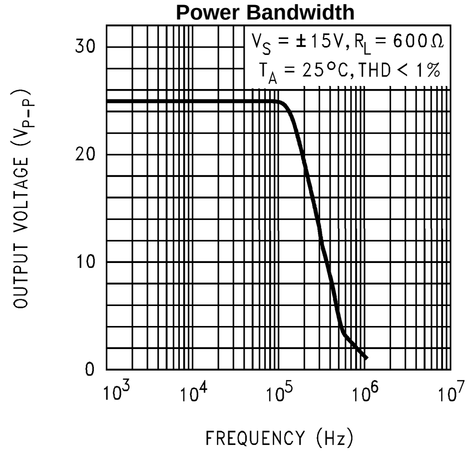


Figure 13.

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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

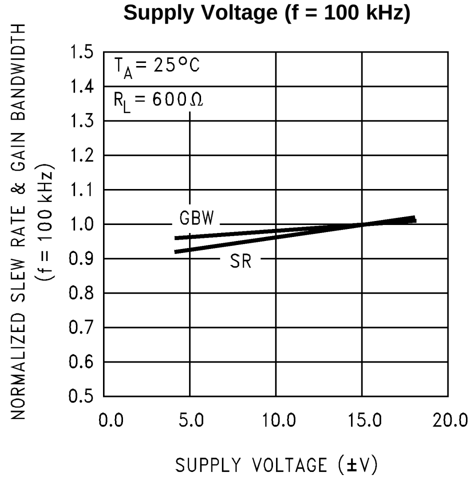


Figure 14.

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

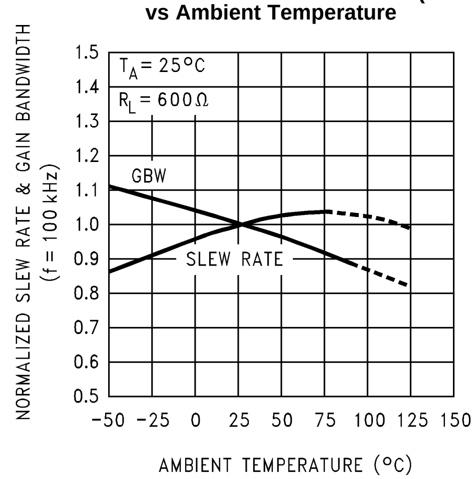


Figure 15.

Voltage Gain vs Supply Voltage

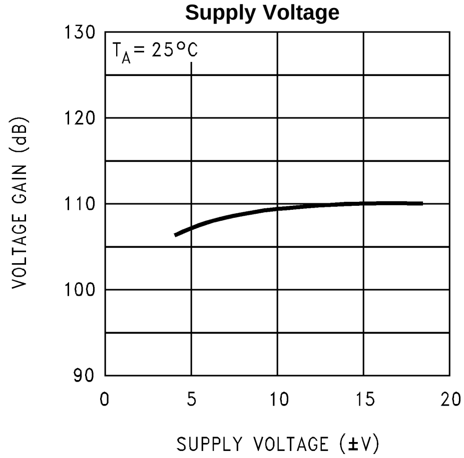


Figure 16.

Voltage Gain vs Ambient Temperature

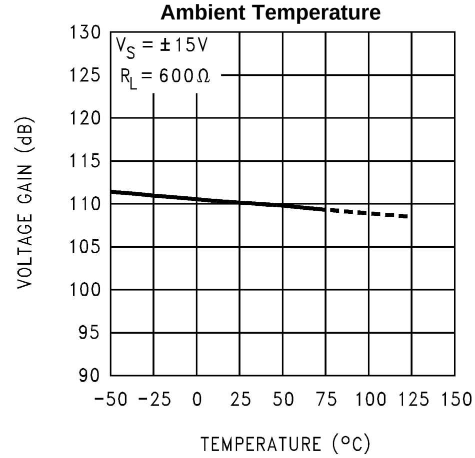


Figure 17.

Power Supply Rejection vs Frequency

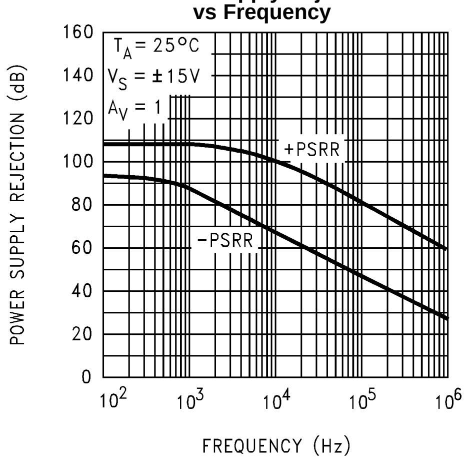


Figure 18.

CMRR vs Frequency

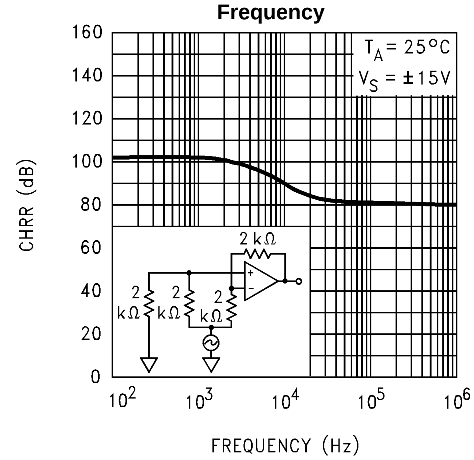


Figure 19.

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Open Loop Gain & Phase vs Frequency

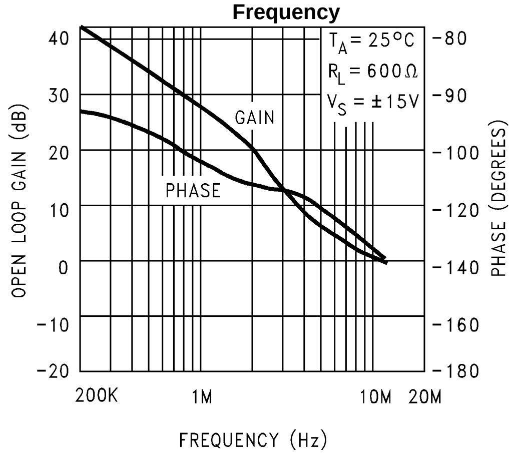


Figure 20.

Total Harmonic Distortion vs Frequency

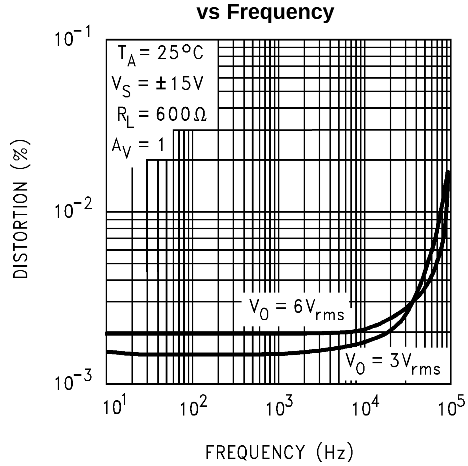


Figure 21.

Equivalent Input Noise Voltage vs Frequency

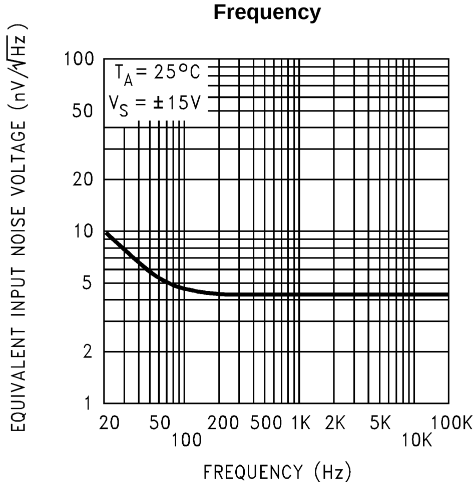


Figure 22.

Equivalent Input Noise Current vs Frequency

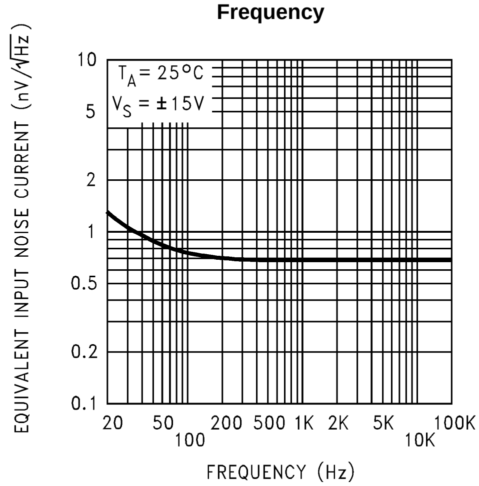


Figure 23.

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

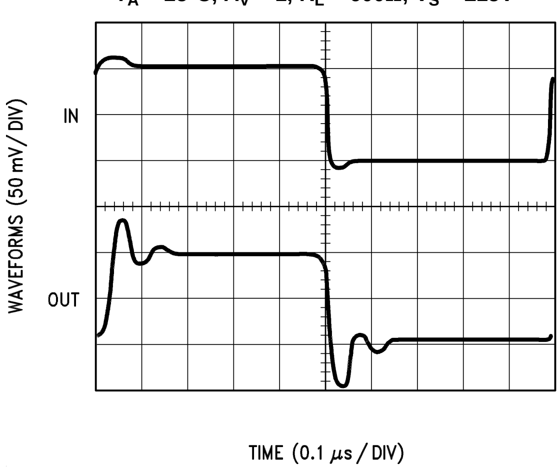


Figure 24.

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

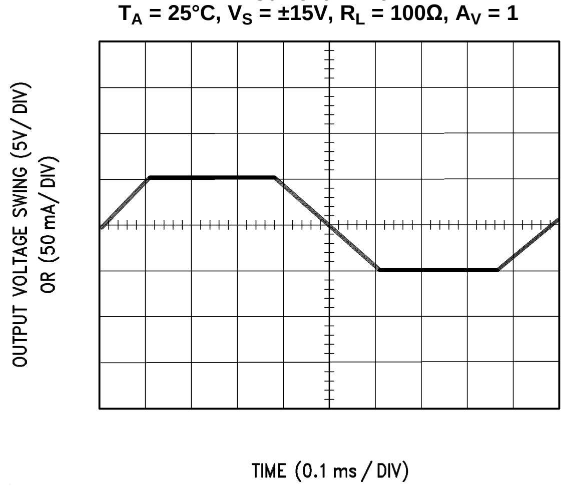


Figure 25.

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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

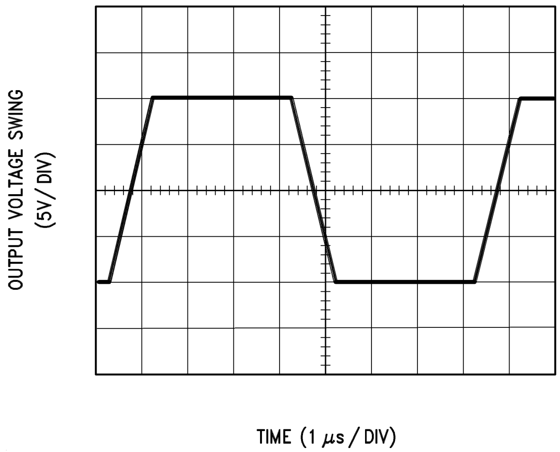


Figure 26.

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

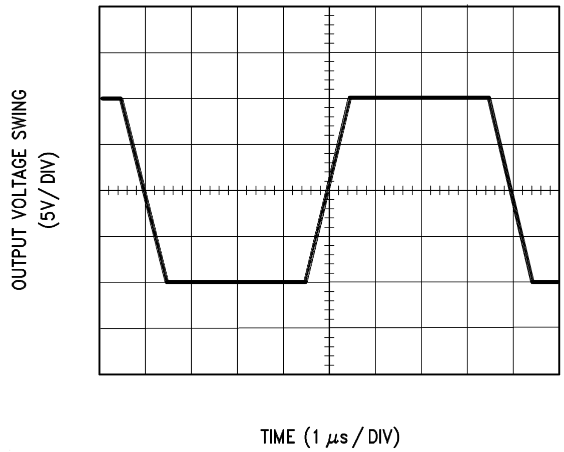


Figure 27.

REVISION HISTORY

Changes from Revision B (March 2013) to Revision C	Page
• Changed layout of National Data Sheet to TI format	5

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM837M	ACTIVE	SOIC	D	14	55	TBD	Call TI	Call TI	-40 to 85	LM837M	Samples
LM837M/NOPB	ACTIVE	SOIC	D	14	55	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	LM837M	Samples
LM837MX	ACTIVE	SOIC	D	14	2500	TBD	Call TI	Call TI	-40 to 85	LM837M	Samples
LM837MX/NOPB	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	LM837M	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) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side 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 Top-Side Marking for that device.

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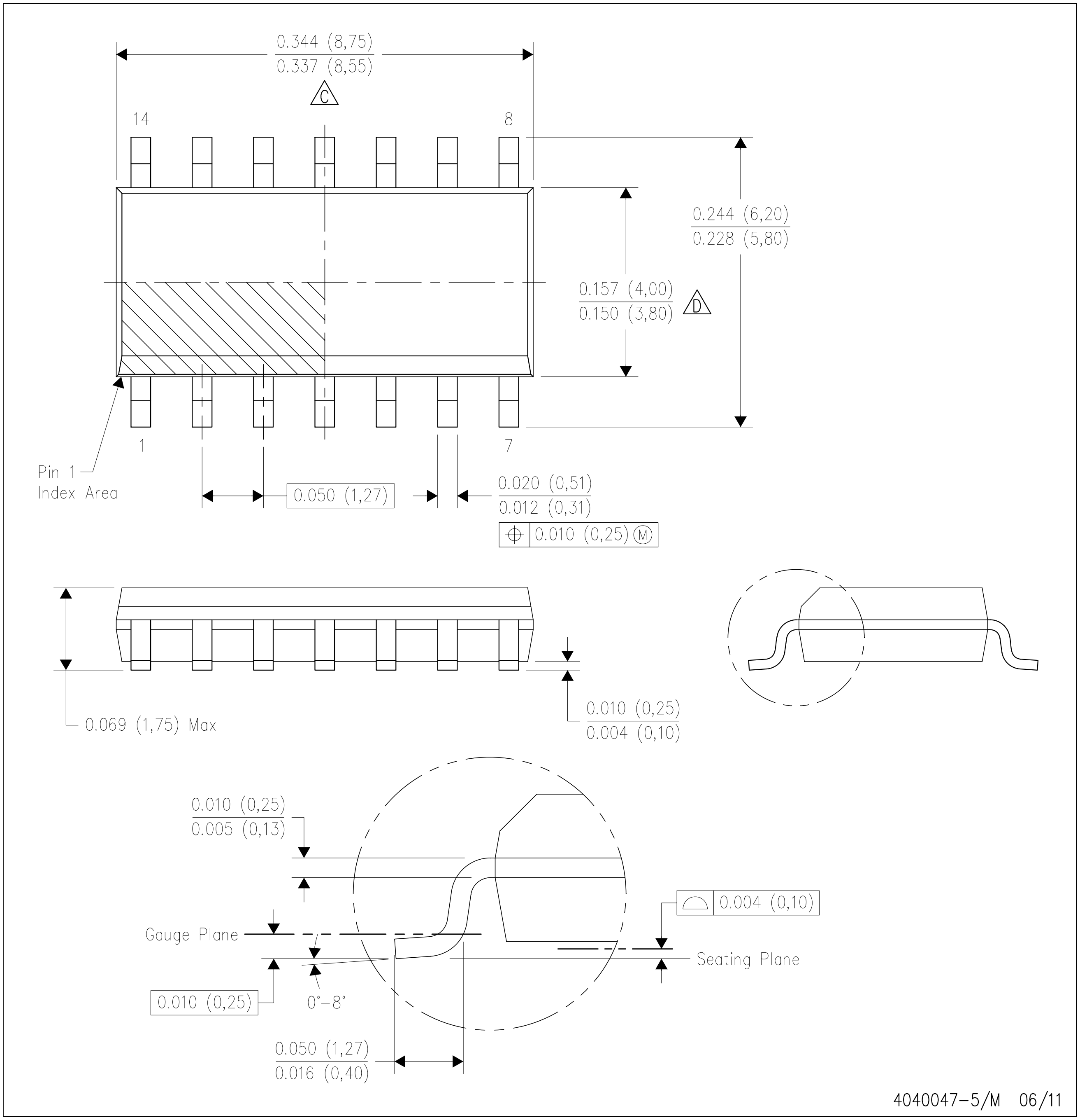
D (R–PDSO–G14) PLASTIC SMALL OUTLINE



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.

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