National Semiconductor

February 1995

LM837 Low Noise Quad Operational Amplifier

General 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.

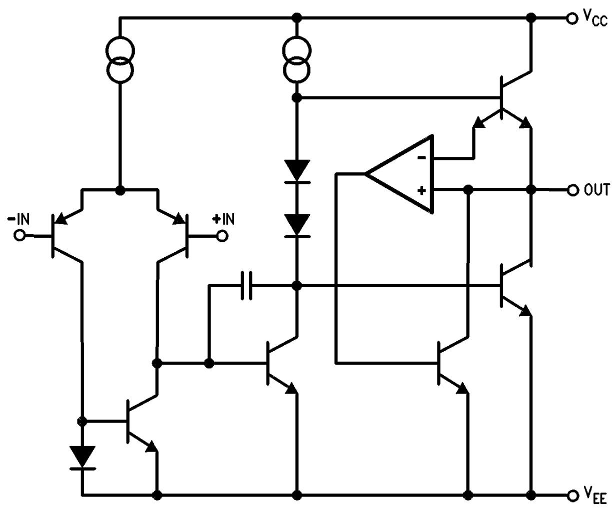
The LM837 is internally compensated for unity gain operation. It is pin compatible with most other standard quad op amps and can therefore be used to upgrade existing systems with little or no change.

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

Schematic and Connection Diagrams

1/4 Quad



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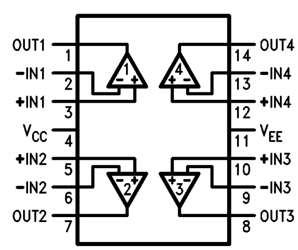
Dual-In-Line Package



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Top View

Order Number LM837M or LM837N
See NS Package Number M14A or N14A

RRD-B30M75/Printed in U. S. A.

Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	V_{CC}/V_{EE}	±18V
Differential Input Voltage (Note 1)	V_{ID}	±30V
Common Mode Input Voltage (Note 1)	V_{IC}	±15V
Power Dissipation (Note 2)	P_D	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 is to be determined.

See AN-450 "Surface Mounting Methods and Their Effect on Product Reliability" for other methods of soldering surface mount devices.

DC Electrical Characteristics $T_A = 25°C, V_S = \pm 15V$

Symbol	Parameter	Condition	Min	Typ	Max	Units
V_{OS}	Input Offset Voltage	$R_S = 50\Omega$		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	$R_L = 2\ k\Omega, V_{OUT} = \pm 10V$	90	110		dB
V_{OM}	Output Voltage Swing	$R_L = 2\ k\Omega$	±12	±13.5		V
		$R_L = 600\Omega$	±10	±12.5		V
V_{CM}	Common Mode Input Voltage		±12	±14.0		V
CMRR	Common Mode Rejection Ratio	$V_{IN} = \pm 12V$	80	100		dB
PSRR	Power Supply Rejection Ratio	$V_S = 15 \sim 5, -15 \sim -5$	80	100		dB
I_S	Power Supply Current	$R_L = \infty$, Four Amps		10	15	mA

AC Electrical Characteristics $T_A = 25°C, V_S = \pm 15V$

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

Design Electrical Characteristics $T_A = 25°C, V_S = \pm 15V$ (Note 3)

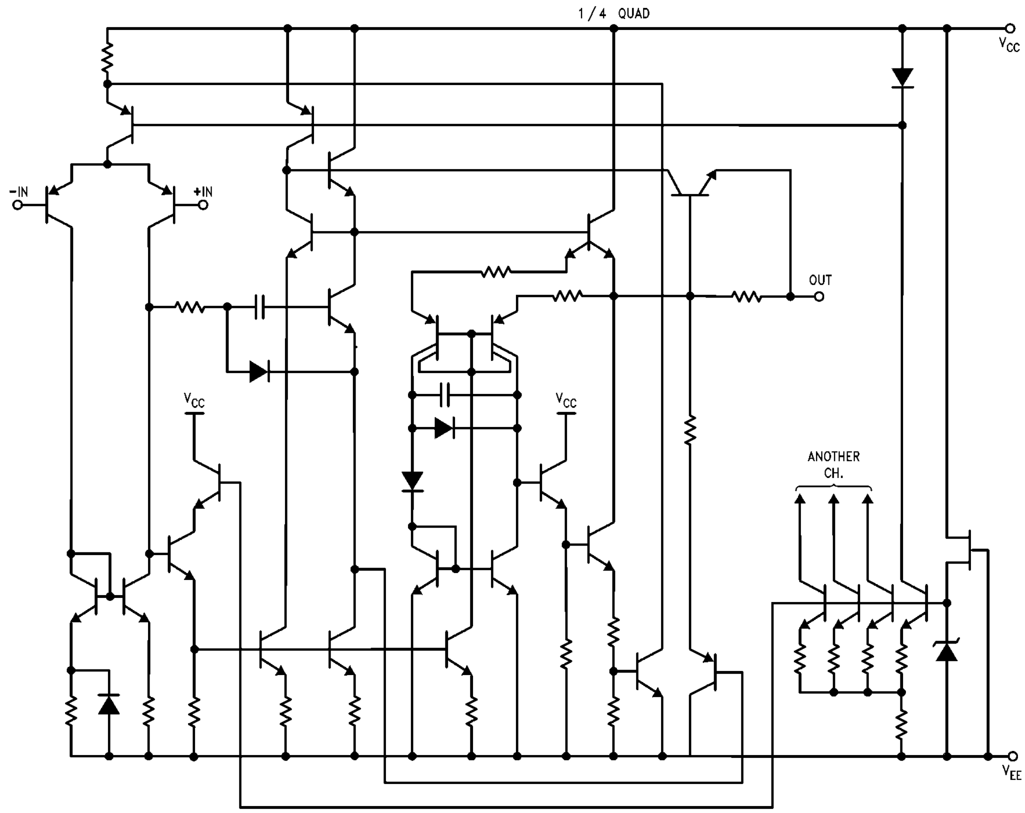
Symbol	Parameter	Condition	Min	Typ	Max	Units
PBW	Power Bandwidth	$V_O = 25\ V_{P-P}, R_L = 600\Omega$, THD < 1%		200		kHz
e_{n1}	Equivalent Input Noise Voltage	JIS A, $R_S = 100\Omega$		0.5		μV
e_{n2}	Equivalent Input Noise Voltage	f = 1 kHz		4.5		$nV/\sqrt{Hz}$
i_n	Equivalent Input Noise Current	f =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

Note 1: Unless otherwise specified the absolute maximum input voltage is equal to the power supply voltage.

Note 2: 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.

Note 3: The following parameters are not tested or guaranteed.

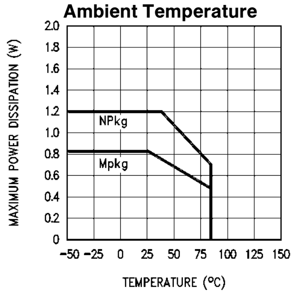
Detailed Schematic



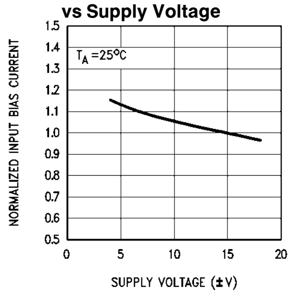
TL/H/9047–3

Typical Performance Characteristics

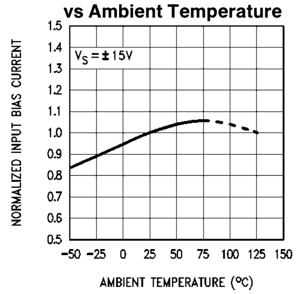
Maximum Power Dissipation vs Ambient Temperature



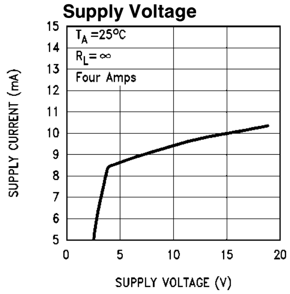
Normalized Input Bias Current vs Supply Voltage



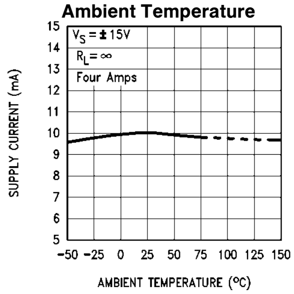
Normalized Input Bias Current vs Ambient Temperature



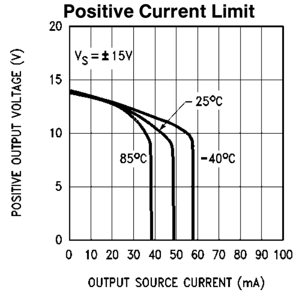
Supply Current vs Supply Voltage



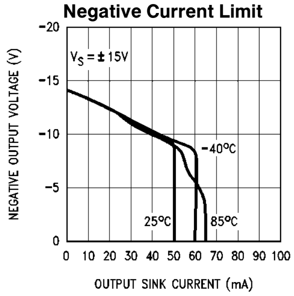
Supply Current vs Ambient Temperature



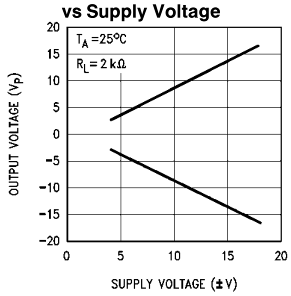
Positive Current Limit



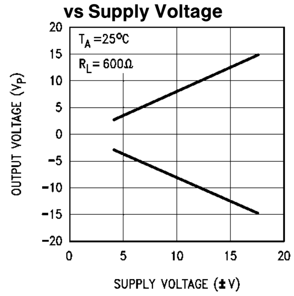
Negative Current Limit



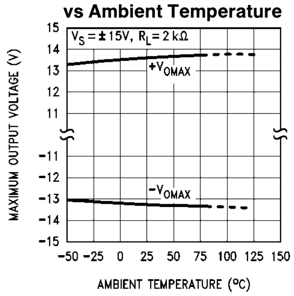
Maximum Output Voltage vs Supply Voltage



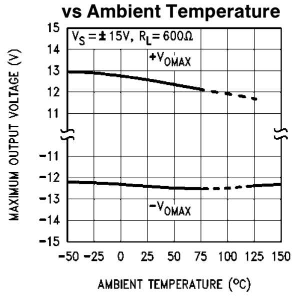
Maximum Output Voltage vs Supply Voltage



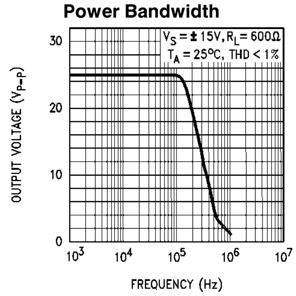
Maximum Output Voltage vs Ambient Temperature



Maximum Output Voltage vs Ambient Temperature



Power Bandwidth



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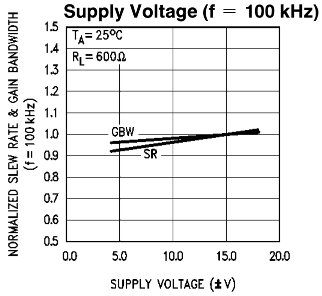
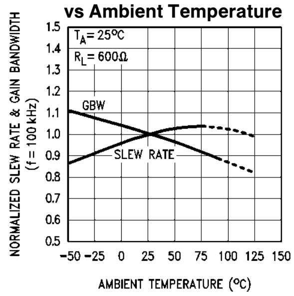
Typical Performance Characteristics (Continued)

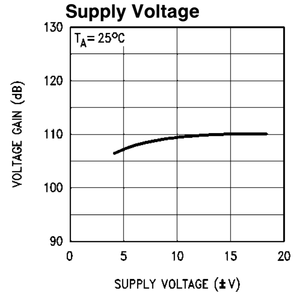
Normalized Slew Rate & Gain Bandwidth vs Supply Voltage (f = 100 kHz)



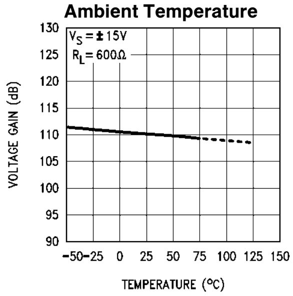
Normalized Slew Rate & Gain Bandwidth (f = 100 kHz) vs Ambient Temperature



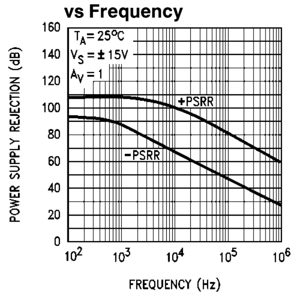
Voltage Gain vs Supply Voltage



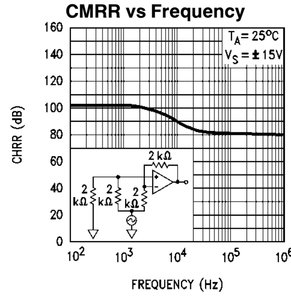
Voltage Gain vs Ambient Temperature



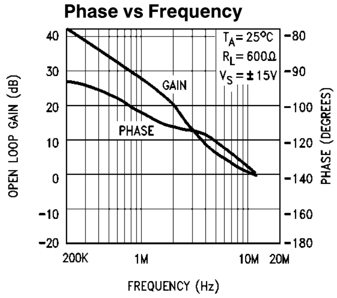
Power Supply Rejection vs Frequency



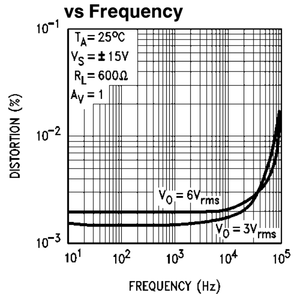
CMRR vs Frequency



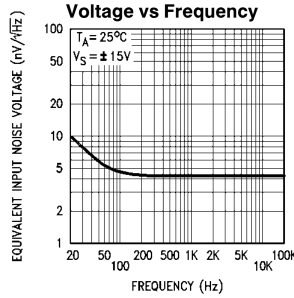
Open Loop Gain & Phase vs Frequency



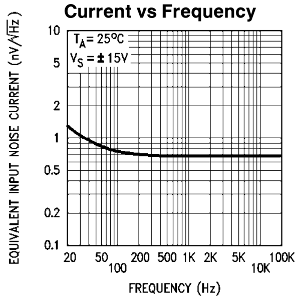
Total Harmonic Distortion vs Frequency



Equivalent Input Noise Voltage vs Frequency



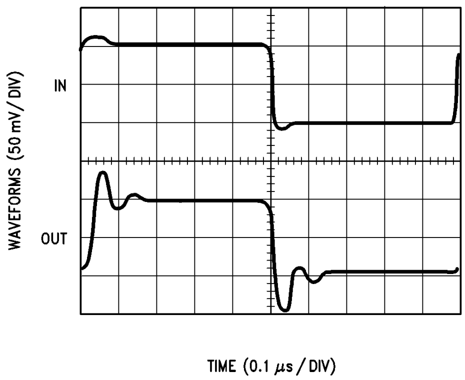
Equivalent Input Noise Current vs Frequency



TL/H/9047–5

Typical Performance Characteristics (Continued)

Small Signal, Non-Inverting
$T_A = 25°C, A_V = 1, R_L = 600\Omega, V_S = \pm 15V$



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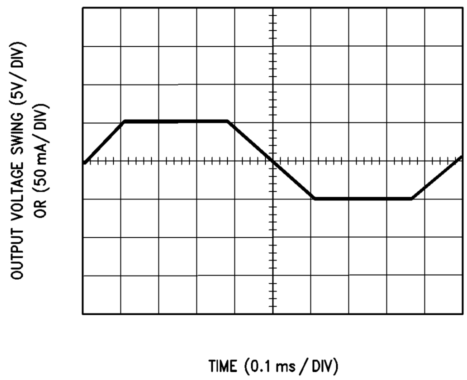
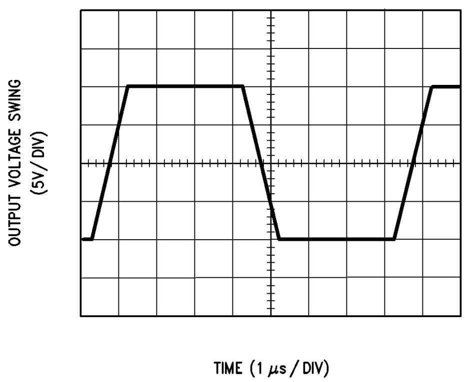
Current Limit
$T_A = 25°C, V_S = \pm 15V, R_L = 100\Omega, A_V = 1$



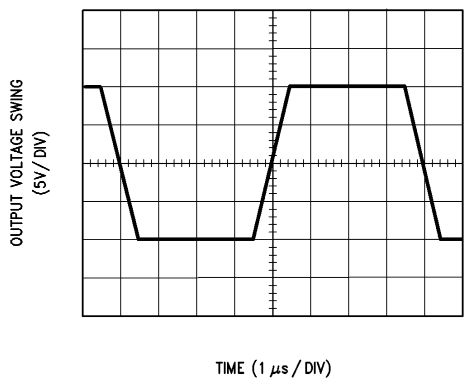
TL/H/9047–7

Large Signal Non-Inverting
$T_A = 25°C, R_L = 600\Omega, V_S = \pm 15V$



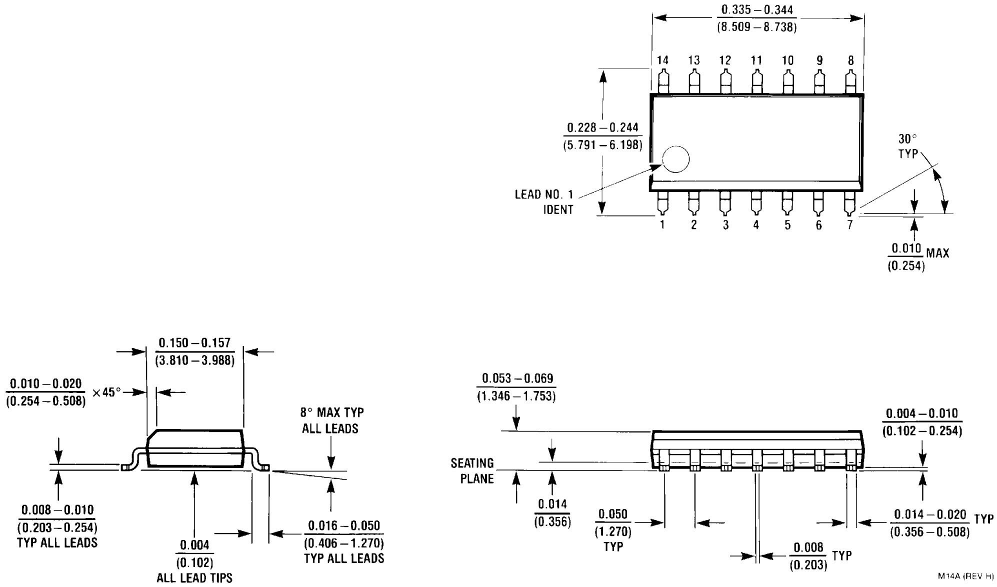
TL/H/9047–8

Large Signal Inverting
$T_A = 25°C, R_L = 600\Omega, V_S = \pm 15V$



TL/H/9047–9

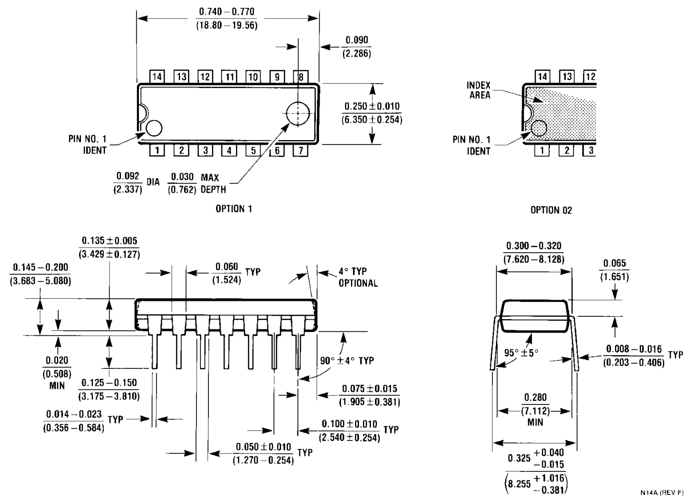
Physical Dimensions inches (millimeters)



Molded Package (SO)
Order Number LM837M
NS Package Number M14A

Physical Dimensions inches (millimeters) (Continued)

Lit. # 107255



Molded Dual-In-Line Package
Order Number LM837N
NS Package Number N14A

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