LM833和LM837高保真运放介绍

美国国家半导体公司生产的LM833(双运放)和LM837(四运放)都是特别着重考虑在高保真音频系统应用的大动态，高速率，低噪声，低失真运算放大器。其性能完全可与NE5532，NE5534等相媲美。

LM833双运放早已为广大音响爱好者熟悉。LM833内部采用了新的电路和处理技术，因此可在不增加外围元件和降低稳定性的条件下实现了低噪声，高速率和宽带等优良性能。LM833有普通双列直插封装(型号为LM833N)和超小型封装(SO封装，型号为LM833M)两种外型。它的引脚如图1所示。LM833的主要性能如下：电源电压范围：±5V~±15V，动态范围：>140dB，输入噪声电压：4.5nV/$\sqrt{Hz}$ (典型值)，转换速率：7V/μs，增益带宽：15MHz，失真度：0.002%。

从以上性能可看出用LM833可做出性能优异的Hi－Fi放大器。它的性能见表1。

LM837除了具有LM833的优点外，它还具有功耗大(双列直插封装的LM837N可达1.2W)，输出电流可达±40mA，可直接驱动600Ω负载，因此用LM837可设计制作标准输出的Hi－Fi前置放大器或直接驱动功放管。LM837的引脚如图2所示，它也有超小型封装(SO封装，型号为LM837M)。LM837为四运放。转换速率比LM833还高，达10V/μs，增益带宽达25MHz。LN837的性能参数见表2。用LM837可设计制作数字音频系统，图示均衡器，HI－Fi前置放大器伺服电源等等。

□四川 古文

①

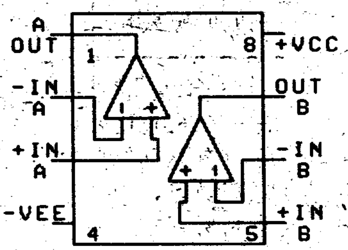
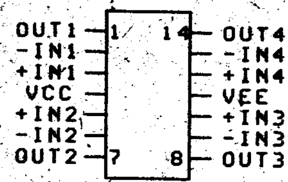


表1 T_A=25℃ Vs=±15V

参 数	测试条件	典型值
电源电压范围		±5~±15V
输入失调电压	Rs=10Ω	0.3mV
输入失调电流		10nA
输入偏置电流		500nA
电压增益	R_L=2kΩ V_o=±10V	110dB
输出电压摆幅	R_L=10kΩ R_L=2kΩ	±13.5V ±13.4V
共模输入电压范围		±14.0V
共模抑制比	Vin=±12V	100dB
电源抑制比	Vs=15~5V, -15~-5V	100dB
电源电流	V_O=0V,两个运放	5mA
转换速率	R_L=2kΩ	7V/μs
增益带宽乘积	f=100kHz	15MHz
失真度*	R_L=2KΩ, f=20~20KHz VouT=3Vrms, Av=1	0.002%
输入失调电压的平均温度系数*		2μV/℃
输入噪声电压*	Rs=100Ω, f=1kHz	4.5n/$\sqrt{Hz}$
输入噪声电流*	f=1kHz	0.7p/$\sqrt{Hz}$
功率带宽*	V0=27Vp-p, RL=2kΩ, THD≤1%	120kHz

*此项指标不测试。

②



1、最大允许范围

电源电压	V_{CC}/V_{EE}	±18V
差动输入电压	V_{ID}	±30V
共模输入电压	V_{IC}	±15V
功耗	P_D	1.2 W(LM837N) 0.83 W(LM837M)
工作温度范围	T_{opR}	-40~+85℃

2、直流电性能

符号	参数	测试条件	典型值
V_O	输入失调电压	Rs=50Ω	0.3mV
Ios	输入失调电流		10nA
I_B	输入偏流		500nA
Av	大信号电压增益	R_L=2kΩ V_{OUT}=±10V	110 dB
V_{OM}	输出电压摆幅	R_L=2kΩ	±13.5V
		R_L=600Ω	±12.5V
V_{CM}	共模输入电压		±14.0V
CMRR	共模抑制比	V_{IN}=±12V	100dB
PSRR	电源抑制比	Vs=15~5V -15~-5V	100 dB
Is	电源电流	R_L= 四运放	10mA

3、交流电性能

符号	参数	测试条件	典型值
SR	转换速率	R_L=600Ω	10V/μs
GBW	增益带宽乘积	f=100kHz R_L=600Ω	25 MHz

4、其它参数*

符号	参数	测试条件	典型值
PBW	功率带宽	V_O=25Vp-p R_L=600Ω THD<1%	200kHz
en1	等效输入噪声电压	JISA	Rs=100Ω
en2		f=1kHz	4.5nV/$\sqrt{Hz}$
THD	总谐波失真	Av=1 VouT=3Vrms f=20~20kHz R_L=600Ω	0.0015%

*本栏参数不测试。

National Semiconductor

August 2000

LM837
Low Noise Quad Operational Amplifier

General Description

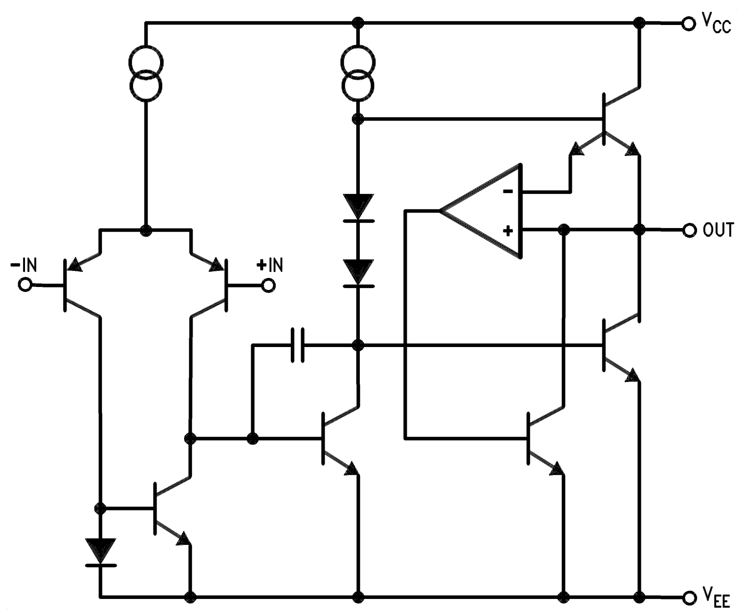
The LM837 is a quad operational amplifier designed for low noise, high speed and wide bandwidth performance. It has a new type of output stage which can drive a 600Ω load, making it ideal for almost all digital audio, graphic equalizer, preamplifiers, and professional audio applications. Its high performance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

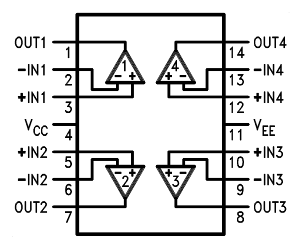
- High slew rate 10 V/µs (typ); 8 V/µs (min)
- Wide gain bandwidth product 25 MHz (typ); 15 MHz (min)
- Power bandwidth 200 kHz (typ)
- High output current ±40 mA
- Excellent output drive performance >600Ω
- Low input noise voltage 4.5 nV/$\sqrt{Hz}$
- Low total harmonic distortion 0.0015%
- Low offset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

Schematic and Connection Diagrams



DS009047-1

Dual-In-Line Package



DS009047-2

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

Absolute Maximum Ratings (Note 1)

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, V_{ID} (Note 2)	±30V
Common Mode Input Voltage, V_{IC} (Note 2)	±15V
Power Dissipation, P_D (Note 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.

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 (Note 4)

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

Note 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.

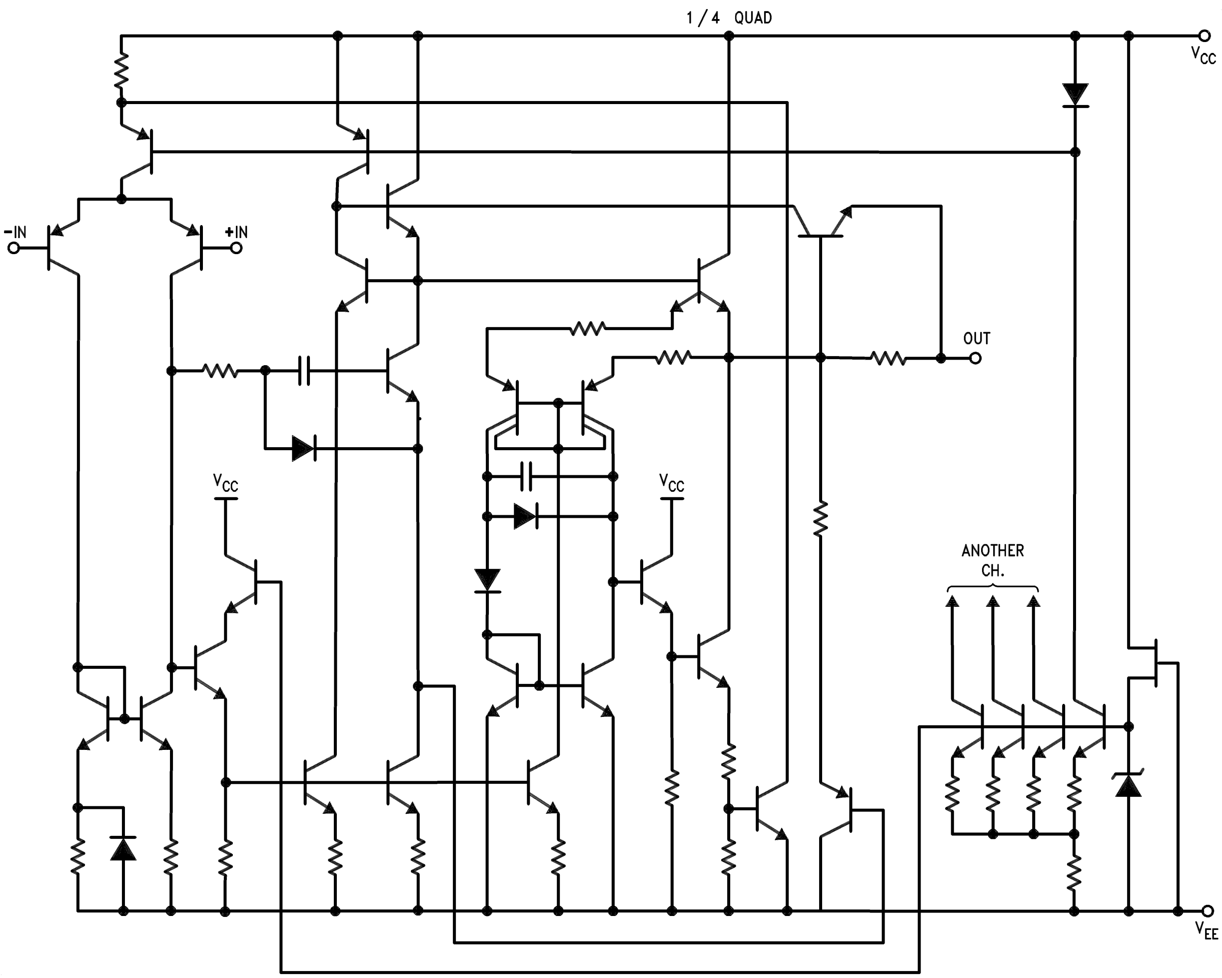
Note 2: Unless otherwise specified the absolute maximum input voltage is equal to the power supply voltage.

Design Electrical Characteristics (Continued)

Note 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.

Note 4: The following parameters are not tested or guaranteed.

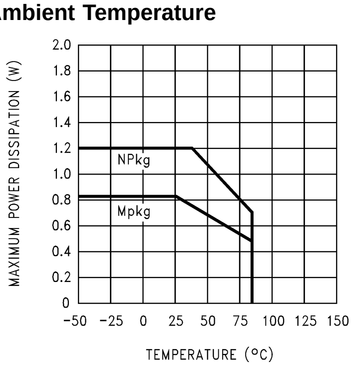
Detailed Schematic



DS009047-3

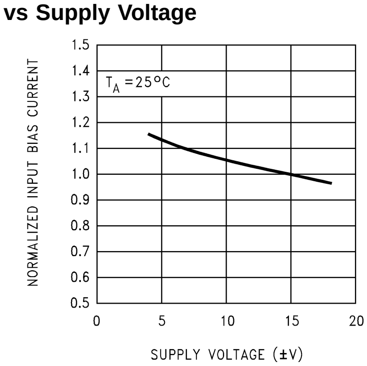
Typical Performance Characteristics

Maximum Power Dissipation vs Ambient Temperature



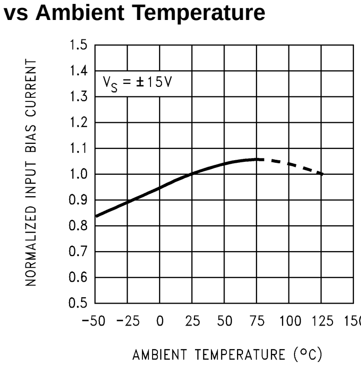
DS009047-10

Normalized Input Bias Current vs Supply Voltage



DS009047-11

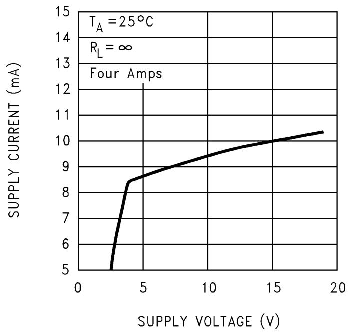
Normalized Input Bias Current vs Ambient Temperature



DS009047-12

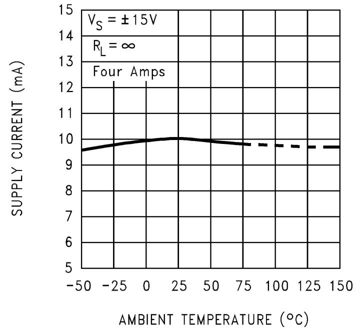
Typical Performance Characteristics (Continued)

Supply Current vs Supply Voltage



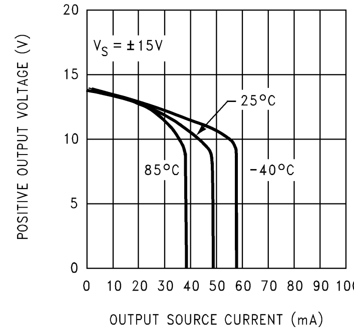
DS009047-13

Supply Current vs Ambient Temperature



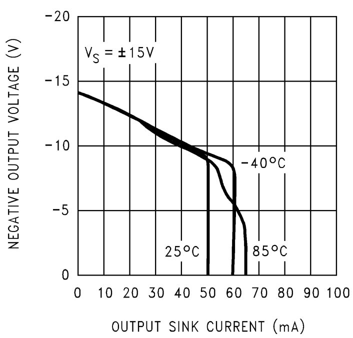
DS009047-14

Positive Current Limit



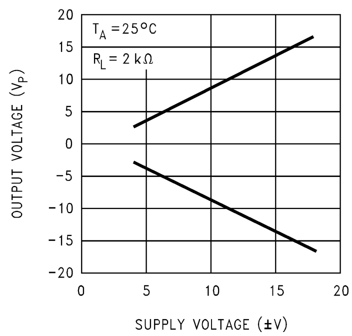
DS009047-15

Negative Current Limit



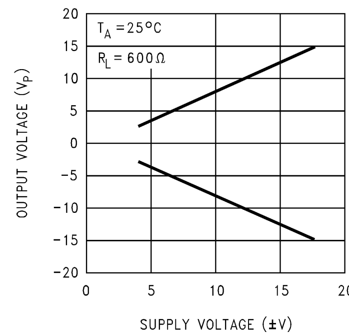
DS009047-16

Maximum Output Voltage vs Supply Voltage



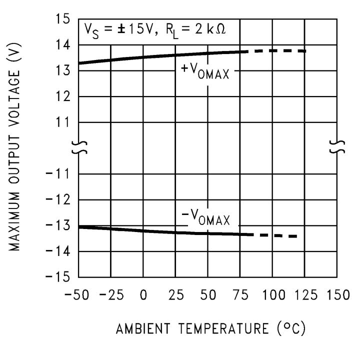
DS009047-17

Maximum Output Voltage vs Supply Voltage



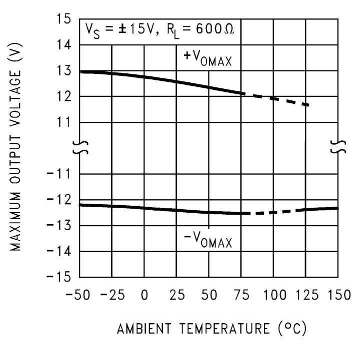
DS009047-18

Maximum Output Voltage vs Ambient Temperature



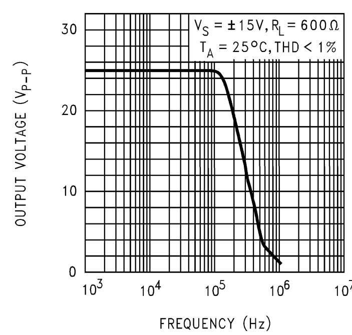
DS009047-19

Maximum Output Voltage vs Ambient Temperature



DS009047-20

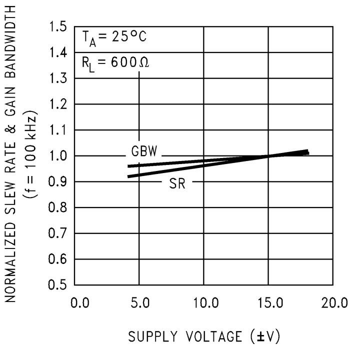
Power Bandwidth



DS009047-21

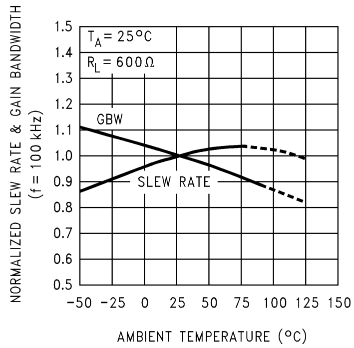
Typical Performance Characteristics (Continued)

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



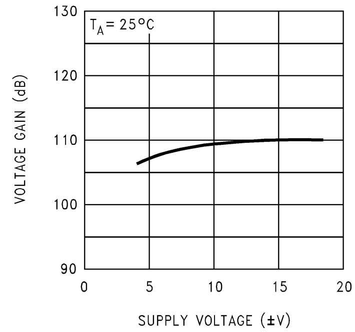
DS009047-22

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



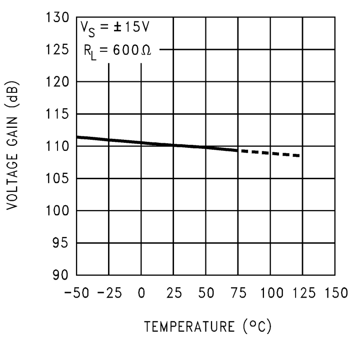
DS009047-23

Voltage Gain vs Supply Voltage



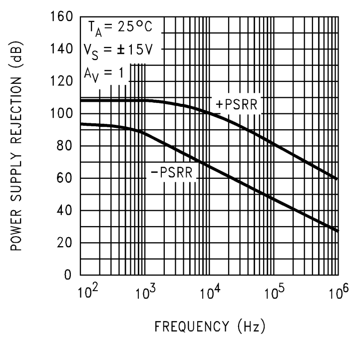
DS009047-24

Voltage Gain vs Ambient Temperature



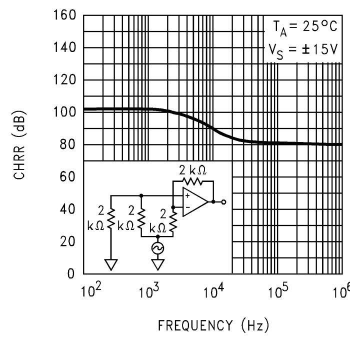
DS009047-25

Power Supply Rejection vs Frequency



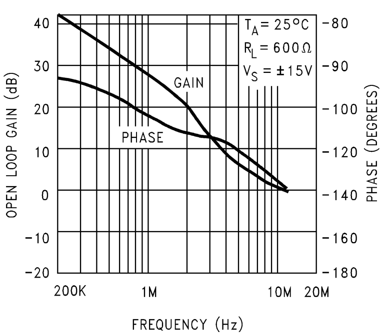
DS009047-26

CMRR vs Frequency



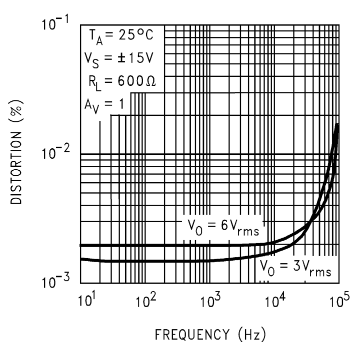
DS009047-27

Open Loop Gain & Phase vs Frequency



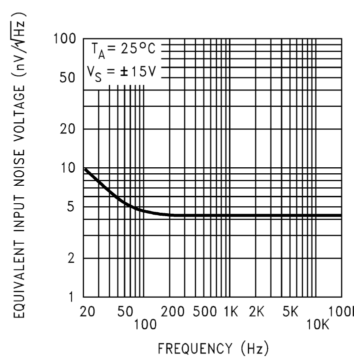
DS009047-28

Total Harmonic Distortion vs Frequency



DS009047-29

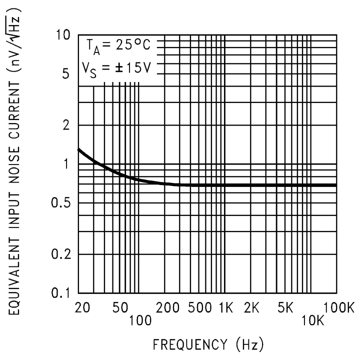
Equivalent Input Noise Voltage vs Frequency



DS009047-30

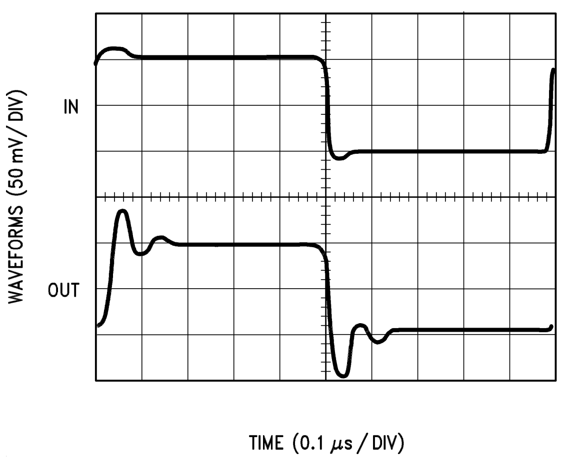
Typical Performance Characteristics (Continued)

Equivalent Input Noise Current vs Frequency



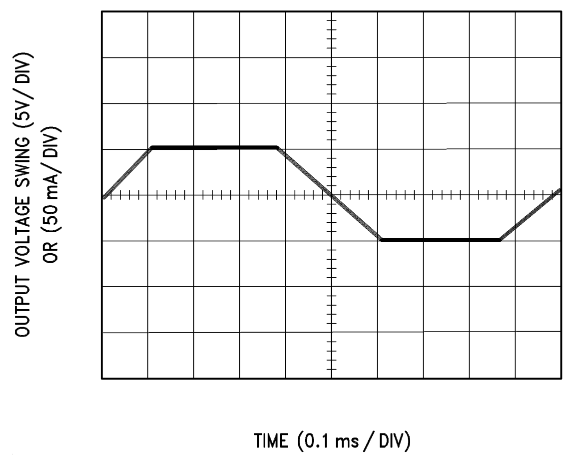
DS009047-31

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



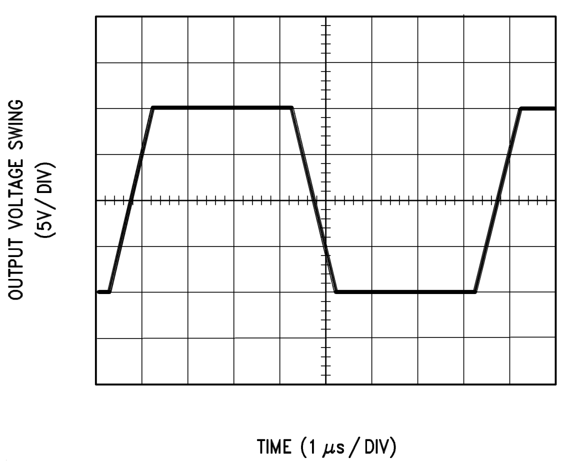
DS009047-6

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



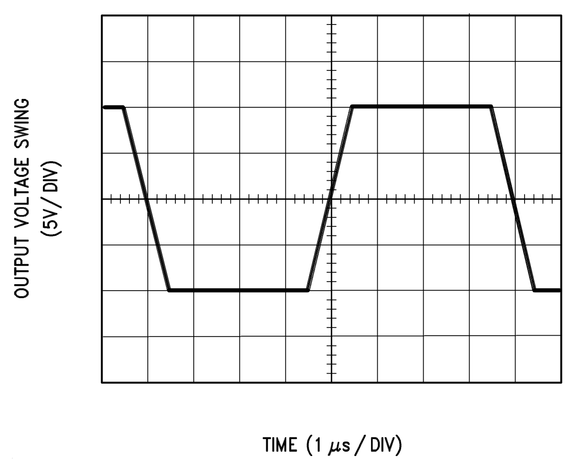
DS009047-7

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



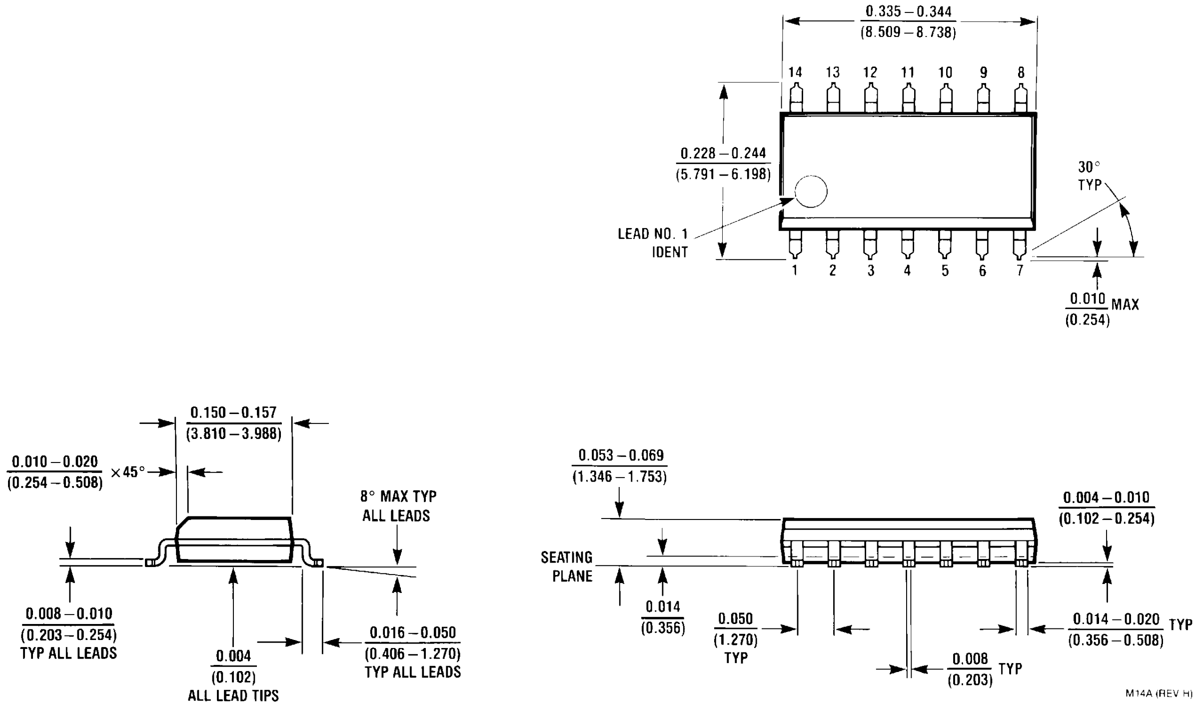
DS009047-8

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

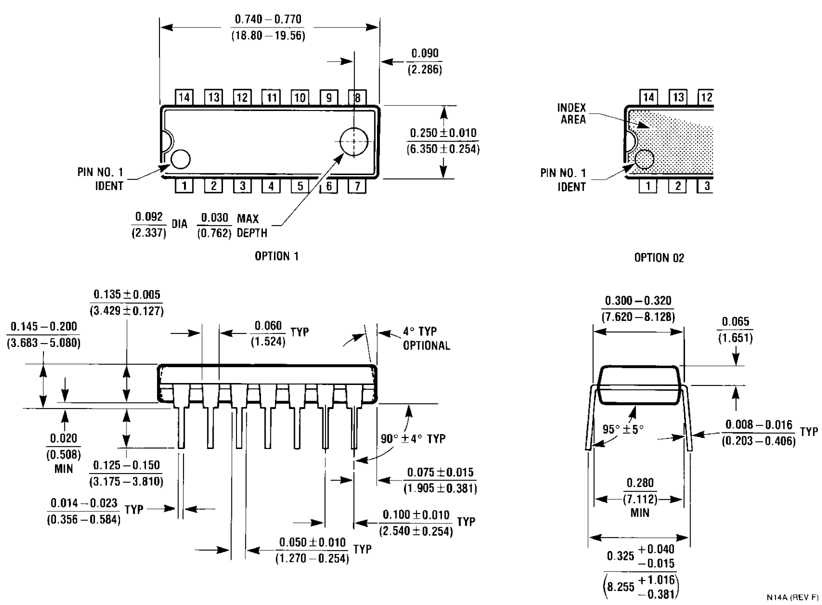


DS009047-9

Physical Dimensions inches (millimeters) unless otherwise noted



Molded Package (SO)
Order Number LM837M or LM837MX
NS Package Number M14A



Lit. #107255
Molded Dual-In-Line Package
Order Number LM837N
NS Package Number N14A

Notes

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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LM837 4回路, 低雑音

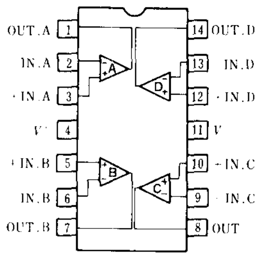
National Semiconductor

- ●入力雑音電圧:4.5nV/√Hz
- ●スルーレート:10V/μs
- ●THD:0.0015%

セカンド・ソース			類似品
/			/

■ピン接続図

(TOP VIEW)



●電気的特性	●最大定格	LM837	単位
Vs=±15V	電源電圧	±18	V
Ta=25℃	入力電圧	±15	V
	差動入力電圧	±30	V
	動作温度	-40〜+85	℃
	許容損失	/	mW

規格	記号	条件	標準値	最悪値	単位
入力オフセット電圧	Vos		0.3	5	mV
Voの温度ドリフト	TC/Vos		2	/	μV/℃
Voの長期安定性	Vos/time		/	/	μV/月
入力バイアス電流	Ib		500	1000	nA
入力オフセット電流	Ios		10	200	nA
入力雑音電圧	Vn	①	0.5	/	μVp-p
入力雑音電圧密度	en	②	4.5	/	nV/√Hz
入力雑音電流密度	in	③	0.7	/	pA/√Hz
差動入力抵抗	Rin		/	/	MΩ
同相入力抵抗	RinCM		/	/	GΩ
同相入力電圧範囲	VCM		±14	±12	V
同相信号除去比	CMRR	④	100	80	dB
電源変動除去比	PSRR	⑤	100	80	dB
大信号電圧利得	Avo	⑥	110	90	V/mV
出力電圧振幅	Vo	⑦	±12.5	±10	V
出力インピーダンス	Zo		/	/	Ω
出力電流	Io		/	/	mA
電源電流	Is		10	15	mA
スルーレート	SR	⑧	10	8	V/μs
利得帯域幅積	GBW	⑨	25	10	MHz
帯域幅	fT		/	/	MHz
ライズ・タイム	tr		/	/	ns
セトリング・タイム	ts		/	/	ns
オーバシュート	OS		/	/	%
微分利得	DG		/	/	%
群遅延特性	GD		/	/	degree
高調波ひずみ率	THD	⑩	0.0015	/	%
チャネル・セパレーション	CS		/	/	dB

条件		
条件	① Rs=100, JIS-A	⑥ RL=2k, Vo=±10V
	② f0=1kHz	⑦ RL=600
	③ f0=1kHz	⑧ RL=600
	④ VCM=±12V	⑨ f=100kHz, RL=600
	⑤ Vs=±5〜±15V	⑩ RL=2k, f=20〜20kHz, Vo=3Vrms