

# LM1877

## Dual Audio Power Amplifier

### General Description

The LM1877 is a monolithic dual power amplifier designed to deliver 2W/channel continuous into 8Ω loads. The LM1877 is designed to operate with a low number of external components, and still provide flexibility for use in stereo phonographs, tape recorders and AM-FM stereo receivers, etc. Each power amplifier is biased from a common internal regulator to provide high power supply rejection, and output Q point centering. The LM1877 is internally compensated for all gains greater than 10.

### Features

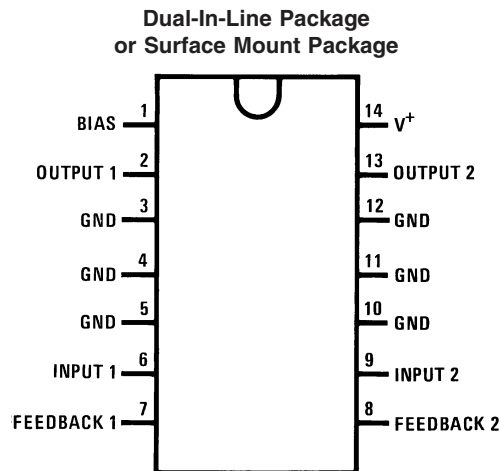
- 2W/channel
- -65 dB ripple rejection, output referred
- -65 dB channel separation, output referred

- Wide supply range, 6V–24V
- Very low cross-over distortion
- Low audio band noise
- AC short circuit protected
- Internal thermal shutdown

### Applications

- Multi-channel audio systems
- Stereo phonographs
- Tape recorders and players
- AM-FM radio receivers
- Servo amplifiers
- Intercom systems
- Automotive products

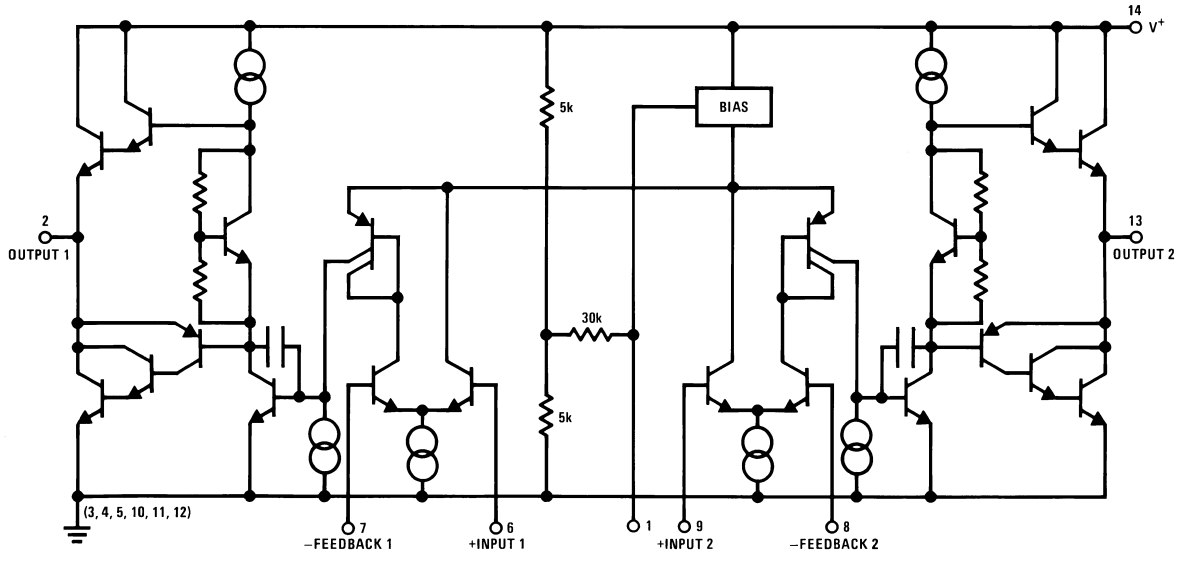
### Connection Diagram



00791301

**Top View**  
Order Number LM1877M-9 or LM1877N-9  
See NS Package Number M14B or N14A

# Equivalent Schematic Diagram



00791302

**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	26V
Input Voltage	±0.7V
Operating Temperature	0°C to +70°C
Storage Temperature	-65°C to +150°C
Junction Temperature	150°C
Lead Temperature	
N-Package Soldering (10 sec.)	260°C

M-Package Infared (15 sec.)	220°C
M-Package Vapor Phase (60 sec.)	215°C
Thermal Resistance	
θ <sub>JC</sub> (N-Package)	30°C/W
θ <sub>JA</sub> (N-Package)	79°C/W
θ <sub>JC</sub> (M-Package)	27°C/W
θ <sub>JA</sub> (M-Package)	114°C/W

**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**

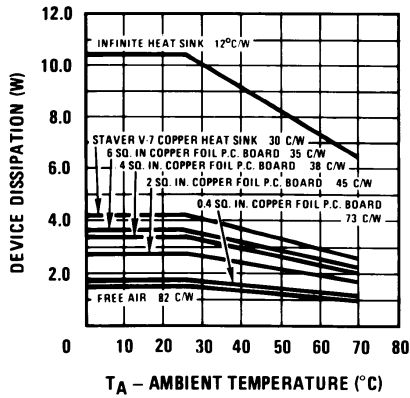
V<sub>S</sub> = 20V, T<sub>A</sub> = 25°C, (Note 2) R<sub>L</sub> = 8Ω, A<sub>V</sub> = 50 (34 dB) unless otherwise specified

Parameter	Conditions	Min	Typ	Max	Units
Total Supply Current	P <sub>O</sub> = 0W		25	50	mA
Output Power LM1877	THD = 10% V <sub>S</sub> = 20V, R <sub>L</sub> = 8Ω V <sub>S</sub> = 12V, R <sub>L</sub> = 8Ω	2.0	1.3		W/Ch W/Ch
Total Harmonic Distortion LM1877	f = 1 kHz, V <sub>S</sub> = 14V				
	P <sub>O</sub> = 50 mW/Channel		0.075		%
	P <sub>O</sub> = 500 mW/Channel		0.045		%
	P <sub>O</sub> = 1 W/Channel		0.055		%
Output Swing	R <sub>L</sub> = 8Ω		V <sub>S</sub> -6		Vp-p
Channel Separation	C <sub>F</sub> = 50 μF, C <sub>IN</sub> = 0.1 μF, f = 1 kHz, Output Referred				
	V <sub>S</sub> = 20V, V <sub>O</sub> = 4 Vrms	-50	-70		dB
	V <sub>S</sub> = 7V, V <sub>O</sub> = 0.5 Vrms		-60		dB
PSRR Power Supply Rejection Ratio	C <sub>F</sub> = 50 μF, C <sub>IN</sub> = 0.1 μF, f = 120 Hz, Output Referred				
	V <sub>S</sub> = 20V, V <sub>RIPPLE</sub> = 1 Vrms	-50	-65		dB
	V <sub>S</sub> = 7V, V <sub>RIPPLE</sub> = 0.5 Vrms		-40		dB
Noise	Equivalent Input Noise				
	R <sub>S</sub> = 0, C <sub>IN</sub> = 0.1 μF, BW = 20 Hz–20 kHz, Output Noise Wideband		2.5		μV
	R <sub>S</sub> = 0, C <sub>N</sub> = 0.1 μF, A <sub>V</sub> 200		0.80		mV
Open Loop Gain	R <sub>S</sub> = 0, f = 100 kHz, R <sub>L</sub> = 8Ω		70		dB
Input Offset Voltage			15		mV
Input Bias Current			50		nA
Input Impedance	Open Loop		4		MΩ
DC Output Level	V <sub>S</sub> = 20V	9	10	11	V
Slew Rate			2.0		V/μs
Power Bandwidth			65		kHz
Current Limit			1.0		A

**Note 2:** For operation at ambient temperature greater than 25°C, the LM1877 must be derated based on a maximum 150°C junction temperature.

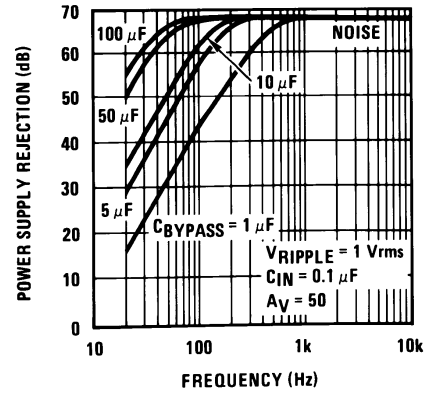
# Typical Performance Characteristics

Device Dissipation vs Ambient Temperature



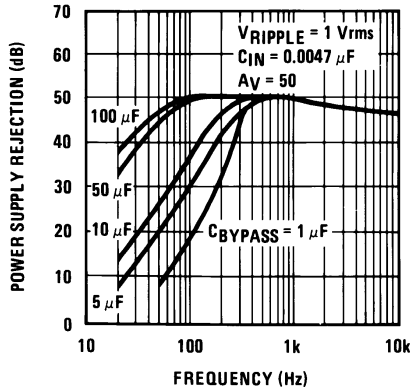
00791310

Power Supply Rejection Ratio (Referred to the Output) vs Frequency



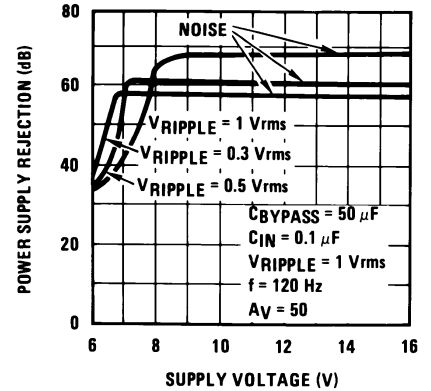
00791311

Power Supply Rejection Ratio (Referred to the Output) vs Frequency



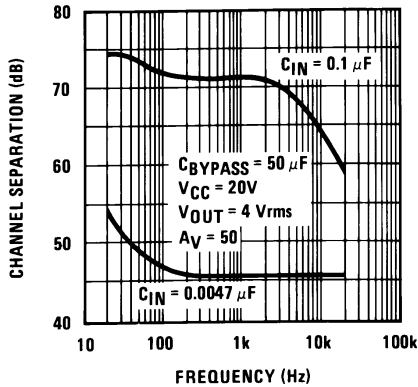
00791312

Power Supply Rejection Ratio (Referred to the Output) vs Supply Voltage



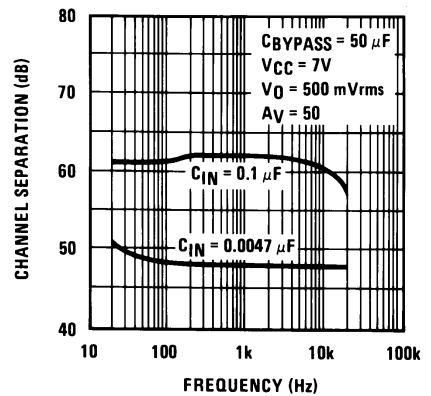
00791313

Channel Separation (Referred to the Output) vs Frequency



00791314

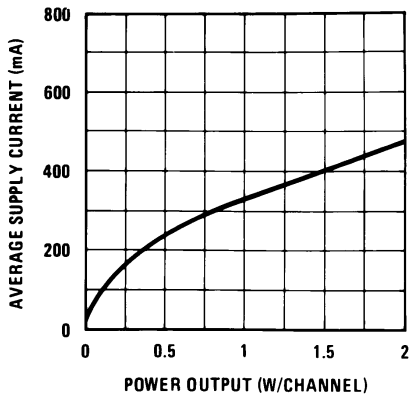
Channel Separation (Referred to the Output) vs Frequency



00791315

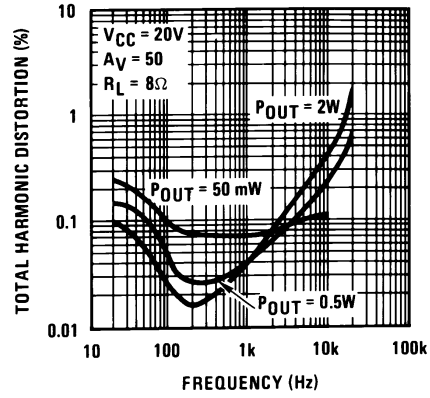
# Typical Performance Characteristics (Continued)

Average Supply Current vs  $P_{OUT}$



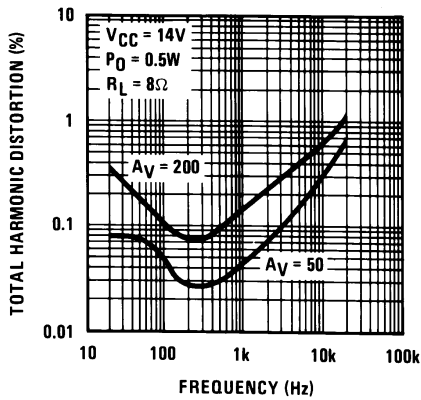
00791316

Total Harmonic Distortion vs Frequency



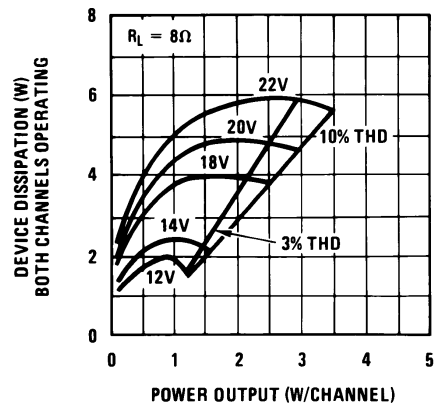
00791317

Total Harmonic Distortion vs Frequency



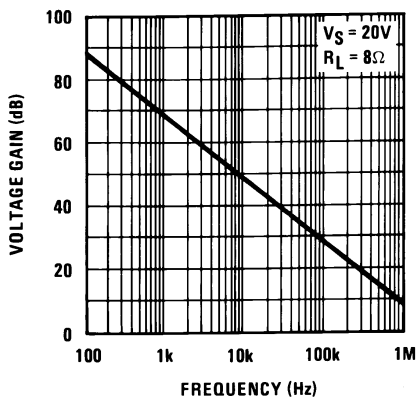
00791318

Power Dissipation (W) Both Channels Operating



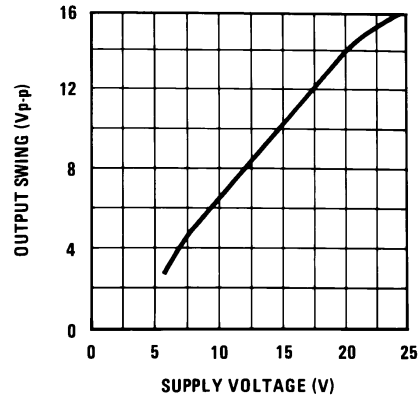
00791319

Open Loop Gain vs Frequency



00791320

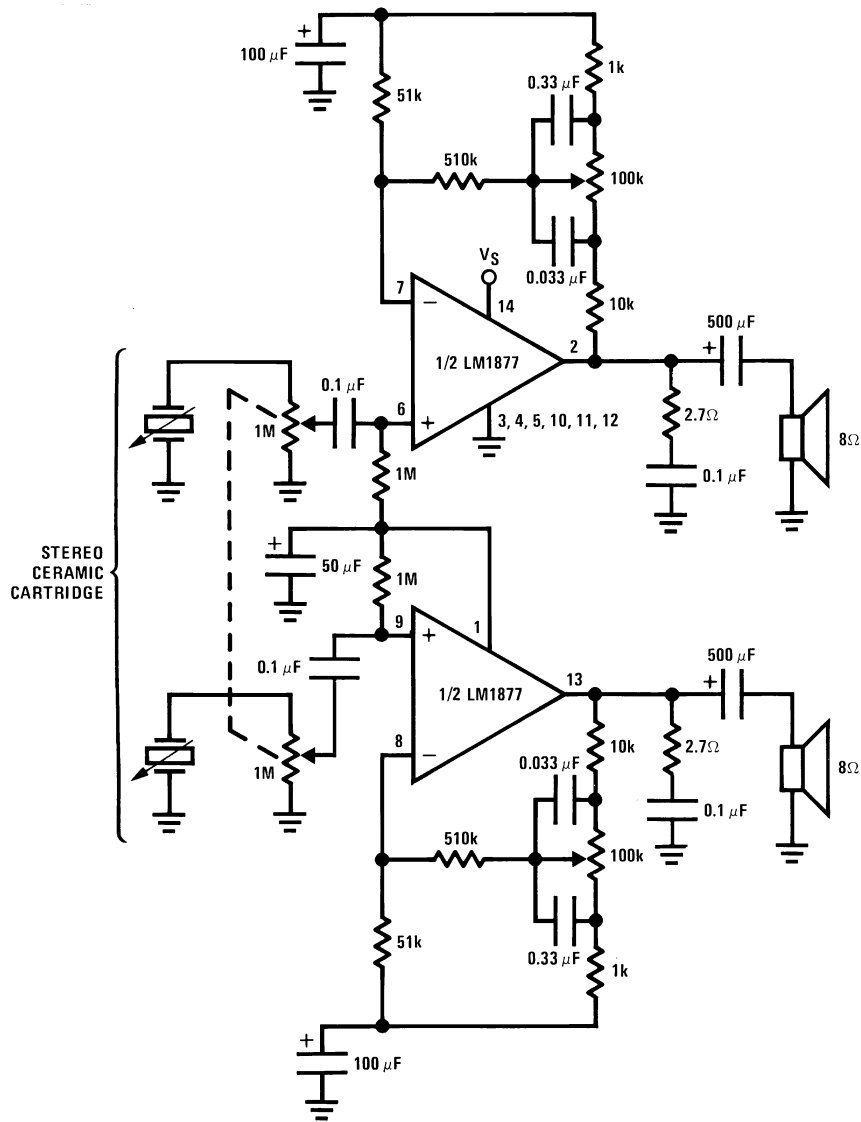
Output Swing vs Supply Voltage



00791321

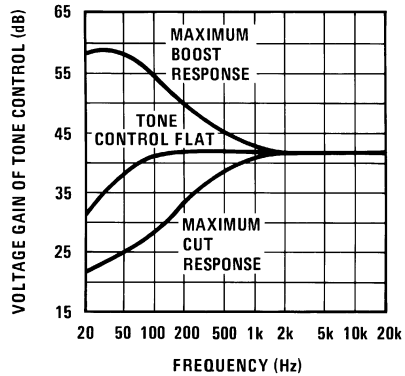
# Typical Applications

## Stereo Phonograph Amplifier with Bass Tone Control



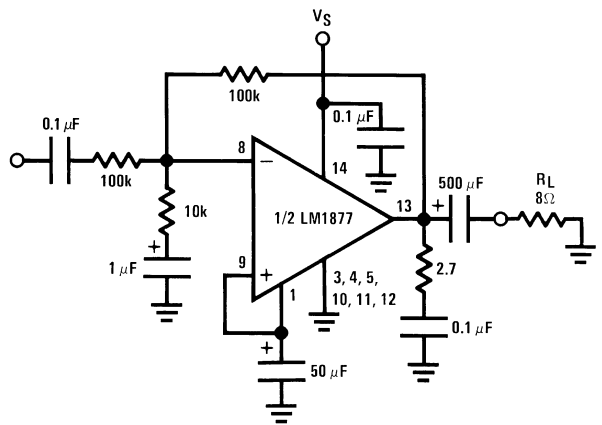
00791304

## Frequency Response of Bass Tone Control



00791305

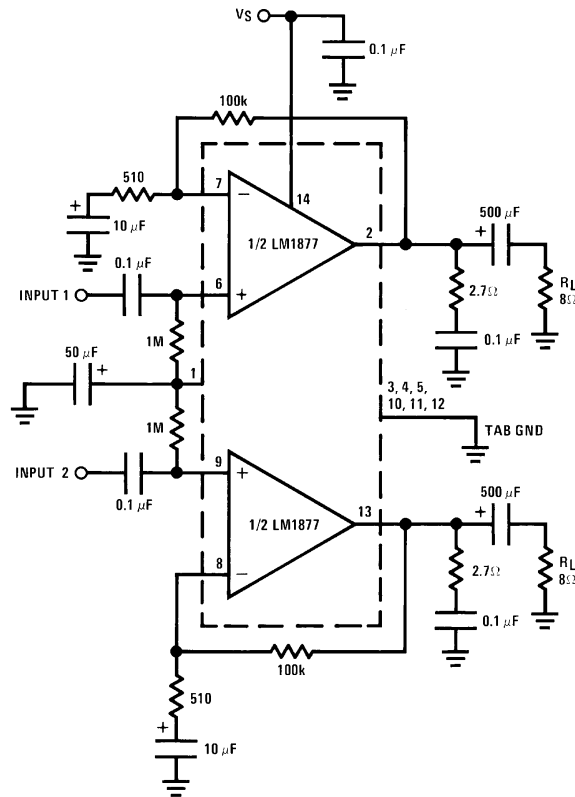
## Inverting Unity Gain Amplifier



00791306

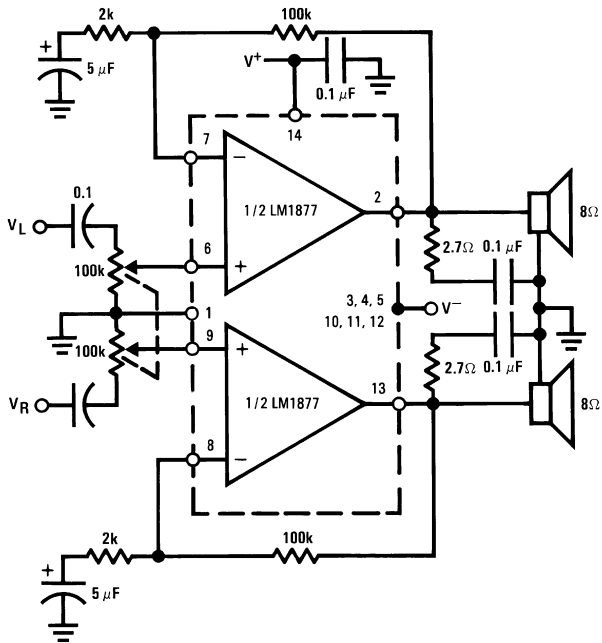
Typical Applications (Continued)

Stereo Amplifier with  $A_V = 200$



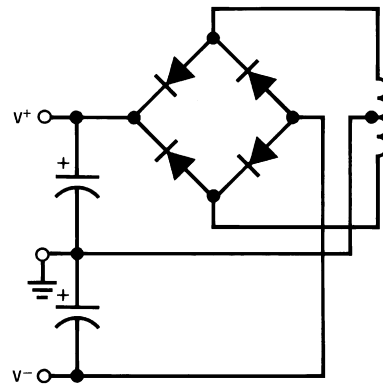
00791307

Non-Inverting Amplifier Using Split Supply



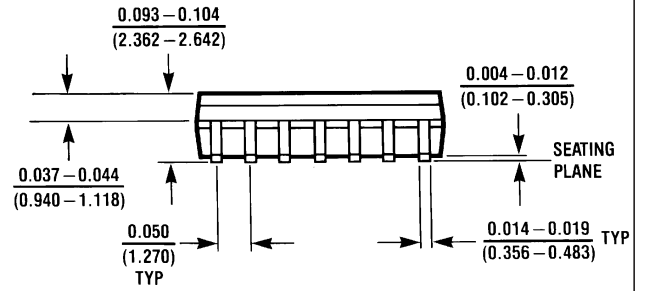
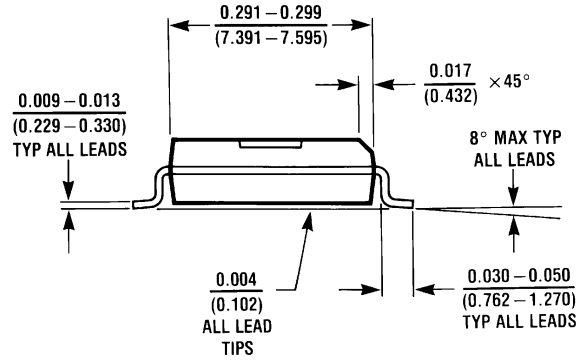
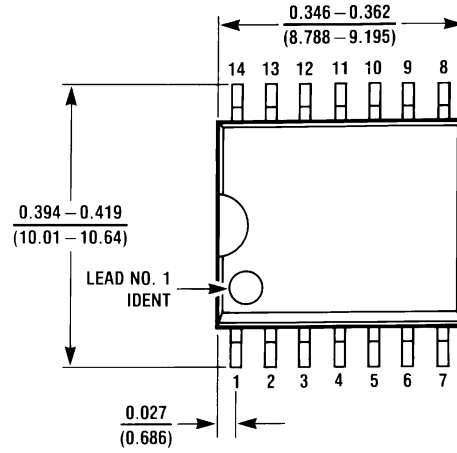
00791308

Typical Split Supply



00791309

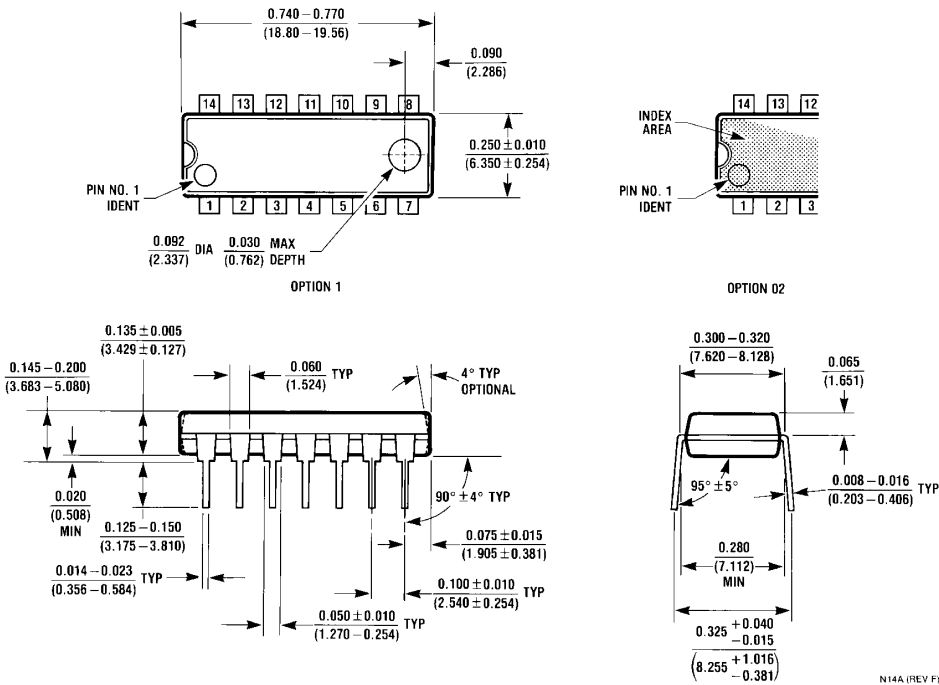
**Physical Dimensions** inches (millimeters) unless otherwise noted



M14B (REV D)

**Molded SOIC Package (M)**  
**Order Number LM1877M-9**  
**NS Package Number M14B**

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.

For the most current product information visit us at [www.national.com](http://www.national.com).

**LIFE SUPPORT POLICY**

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT AND GENERAL COUNSEL OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
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.

**BANNED SUBSTANCE COMPLIANCE**

National Semiconductor certifies that the products and packing materials meet the provisions of the Customer Products Stewardship Specification (CSP-9-111C2) and the Banned Substances and Materials of Interest Specification (CSP-9-111S2) and contain no "Banned Substances" as defined in CSP-9-111S2.

**National Semiconductor**  
**Americas Customer Support Center**  
 Email: [new.feedback@nsc.com](mailto:new.feedback@nsc.com)  
 Tel: 1-800-272-9959

**National Semiconductor**  
**Europe Customer Support Center**  
 Fax: +49 (0) 180-530 85 86  
 Email: [europa.support@nsc.com](mailto:europa.support@nsc.com)  
 Deutsch Tel: +49 (0) 69 9508 6208  
 English Tel: +44 (0) 870 24 0 2171  
 Français Tel: +33 (0) 1 41 91 8790

**National Semiconductor**  
**Asia Pacific Customer Support Center**  
 Email: [ap.support@nsc.com](mailto:ap.support@nsc.com)

**National Semiconductor**  
**Japan Customer Support Center**  
 Fax: 81-3-5639-7507  
 Email: [jpn.feedback@nsc.com](mailto:jpn.feedback@nsc.com)  
 Tel: 81-3-5639-7560