

## 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

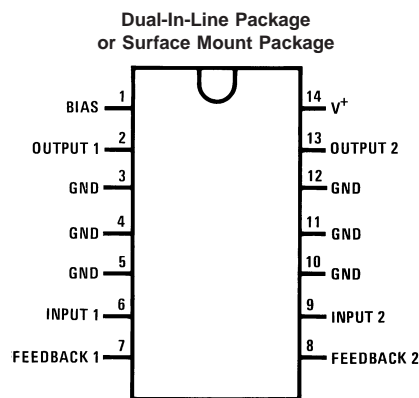
- 2W/channel
- -65 dB ripple rejection, output referred
- -65 dB channel separation, output referred

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

### Applications

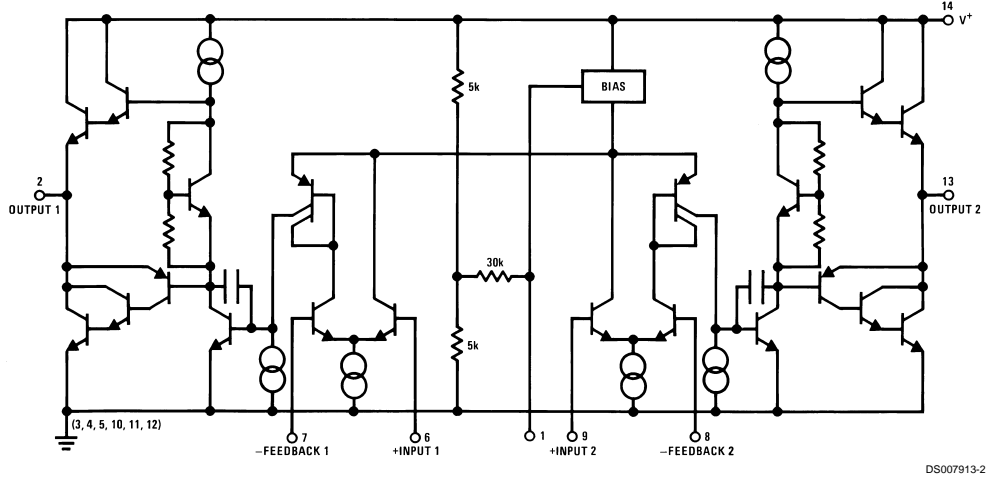
- Multi-channel audio systems
- Stereo phonographs
- Tape recorders and players
- AM-FM radio receivers
- Servo amplifiers
- Intercom systems
- Automotive products

### Connection Diagram



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

# Equivalent Schematic Diagram



DS007913-2

## 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 Infrared (15 sec.)	220°C
M-Package Vapor Phase (60 sec.)	215°C
Thermal Resistance	
$\theta_{JC}$ (N-Package)	30°C/W
$\theta_{JA}$ (N-Package)	79°C/W
$\theta_{JC}$ (M-Package)	27°C/W
$\theta_{JA}$ (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

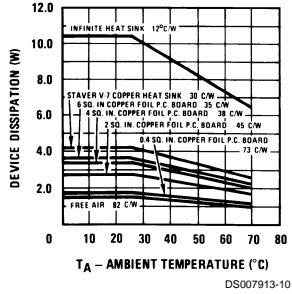
$V_S = 20V$ ,  $T_A = 25^\circ C$ , (Note 2)  $R_L = 8\Omega$ ,  $A_V = 50$  (34 dB) unless otherwise specified

Parameter	Conditions	Min	Typ	Max	Units
Total Supply Current	$P_O = 0W$		25	50	mA
Output Power LM1877	THD = 10% $V_S = 20V$ , $R_L = 8\Omega$ $V_S = 12V$ , $R_L = 8\Omega$	2.0	1.3		W/Ch W/Ch
Total Harmonic Distortion LM1877	$f = 1$ kHz, $V_S = 14V$				
	$P_O = 50$ mW/Channel		0.075		%
	$P_O = 500$ mW/Channel		0.045		%
	$P_O = 1$ W/Channel		0.055		%
Output Swing	$R_L = 8\Omega$		$V_S - 6$		Vp-p
Channel Separation	$C_F = 50$ $\mu F$ , $C_{IN} = 0.1$ $\mu F$ , $f = 1$ kHz, Output Referred				
	$V_S = 20V$ , $V_O = 4$ Vrms	-50	-70		dB
	$V_S = 7V$ , $V_O = 0.5$ Vrms		-60		dB
PSRR Power Supply Rejection Ratio	$C_F = 50$ $\mu F$ , $C_{IN} = 0.1$ $\mu F$ , $f = 120$ Hz, Output Referred				
	$V_S = 20V$ , $V_{RIPPLE} = 1$ Vrms	-50	-65		dB
	$V_S = 7V$ , $V_{RIPPLE} = 0.5$ Vrms		-40		dB
Noise	Equivalent Input Noise				
	$R_S = 0$ , $C_{IN} = 0.1$ $\mu F$ , BW = 20 Hz–20 kHz, Output Noise Wideband		2.5		$\mu V$
	$R_S = 0$ , $C_N = 0.1$ $\mu F$ , $A_V$ 200		0.80		mV
Open Loop Gain	$R_S = 0$ , $f = 100$ kHz, $R_L = 8\Omega$		70		dB
Input Offset Voltage			15		mV
Input Bias Current			50		nA
Input Impedance	Open Loop		4		M $\Omega$
DC Output Level	$V_S = 20V$	9	10	11	V
Slew Rate			2.0		V/ $\mu s$
Power Bandwidth			65		kHz
Current Limit			1.0		A

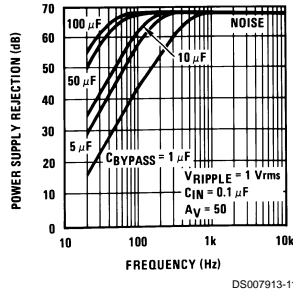
**Note 2:** For operation at ambient temperature greater than 25°C, the LM1877 must be derated based on a maximum 150°C junction temperature.

# Typical Performance Characteristics

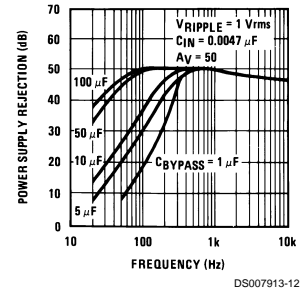
**Device Dissipation vs Ambient Temperature**



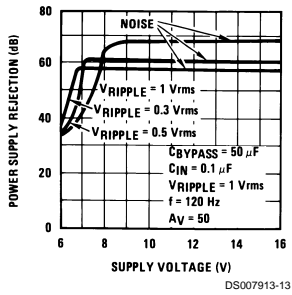
**Power Supply Rejection Ratio (Referred to the Output) vs Frequency**



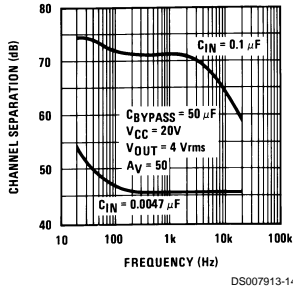
**Power Supply Rejection Ratio (Referred to the Output) vs Frequency**



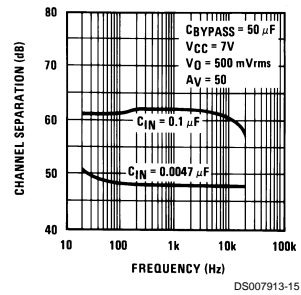
**Power Supply Rejection Ratio (Referred to the Output) vs Supply Voltage**



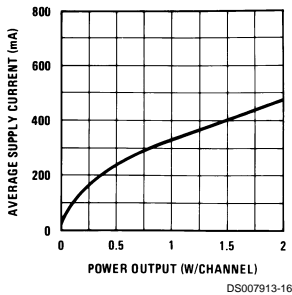
**Channel Separation (Referred to the Output) vs Frequency**



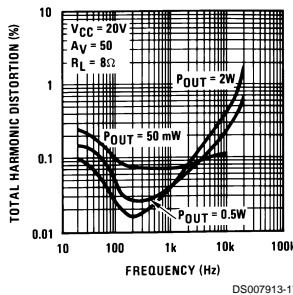
**Channel Separation (Referred to the Output) vs Frequency**



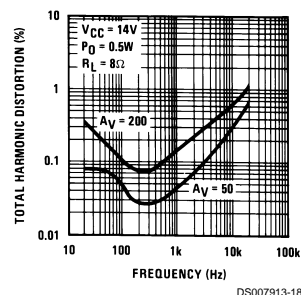
**Average Supply Current vs P<sub>OUT</sub>**



**Total Harmonic Distortion vs Frequency**

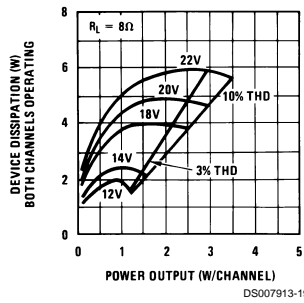


**Total Harmonic Distortion vs Frequency**

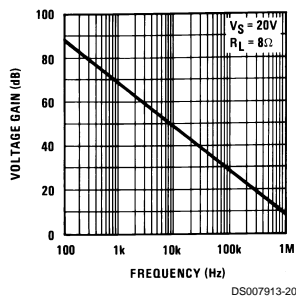


## Typical Performance Characteristics (Continued)

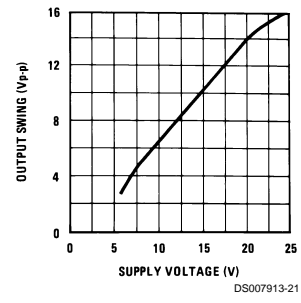
**Power Dissipation (W)  
Both Channels Operating**



**Open Loop Gain vs  
Frequency**

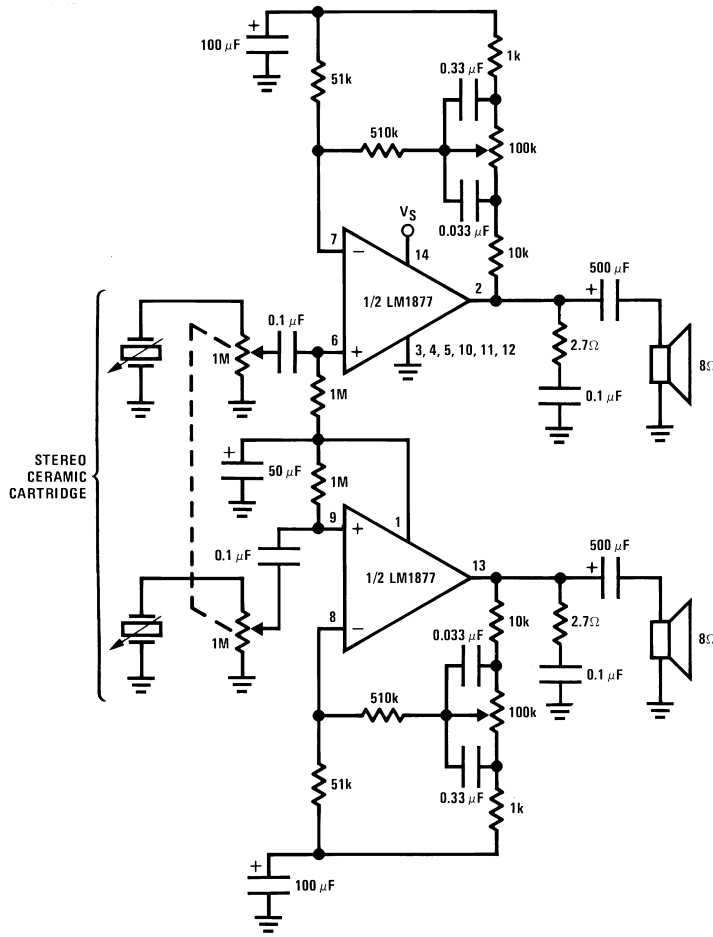


**Output Swing vs Supply  
Voltage**



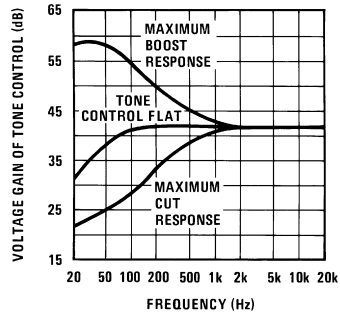
## Typical Applications

**Stereo Phonograph Amplifier with Bass Tone Control**

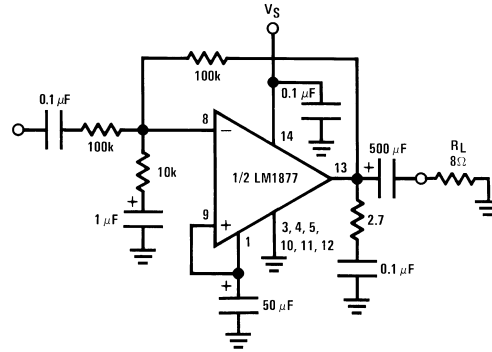


## Typical Applications (Continued)

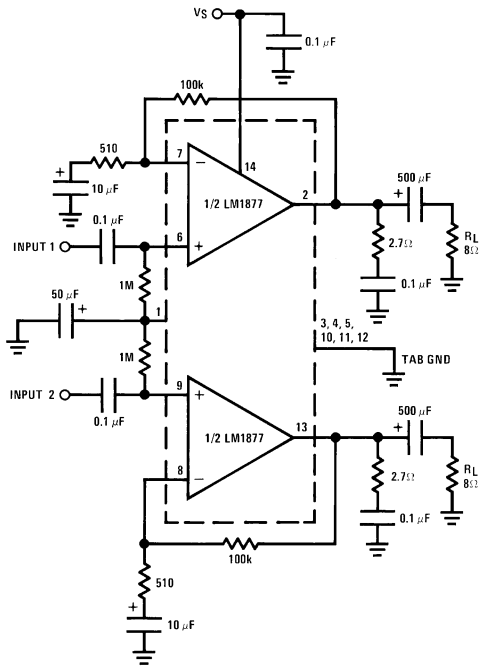
Frequency Response of Bass Tone Control



Inverting Unity Gain Amplifier

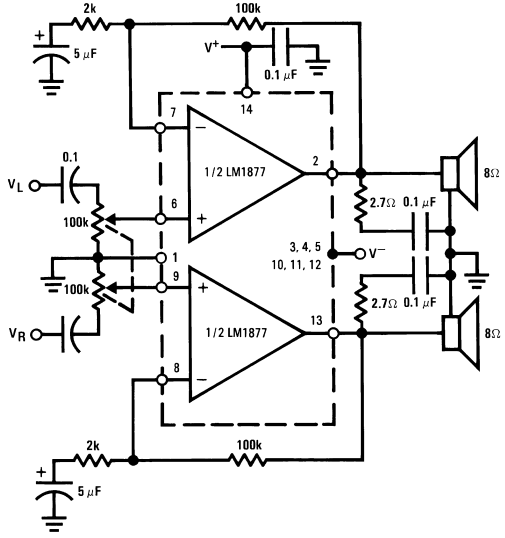


Stereo Amplifier with  $A_v = 200$

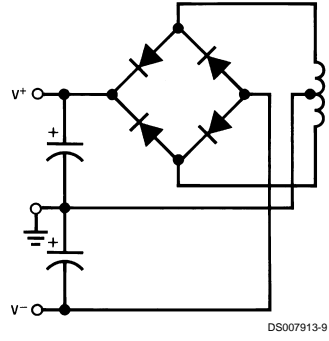


## Typical Applications (Continued)

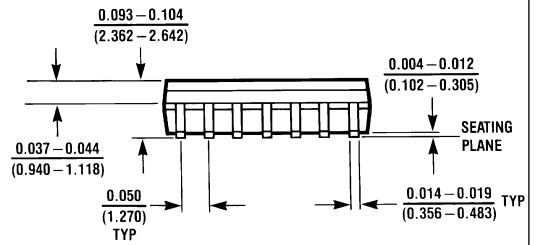
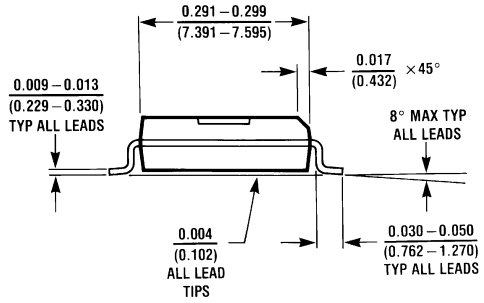
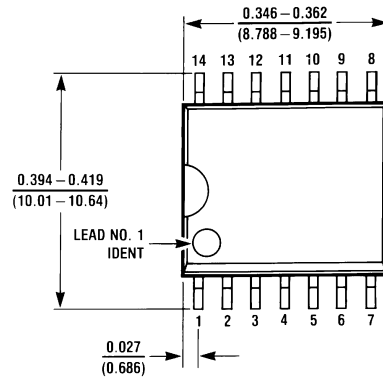
### Non-Inverting Amplifier Using Split Supply



### Typical Split Supply



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

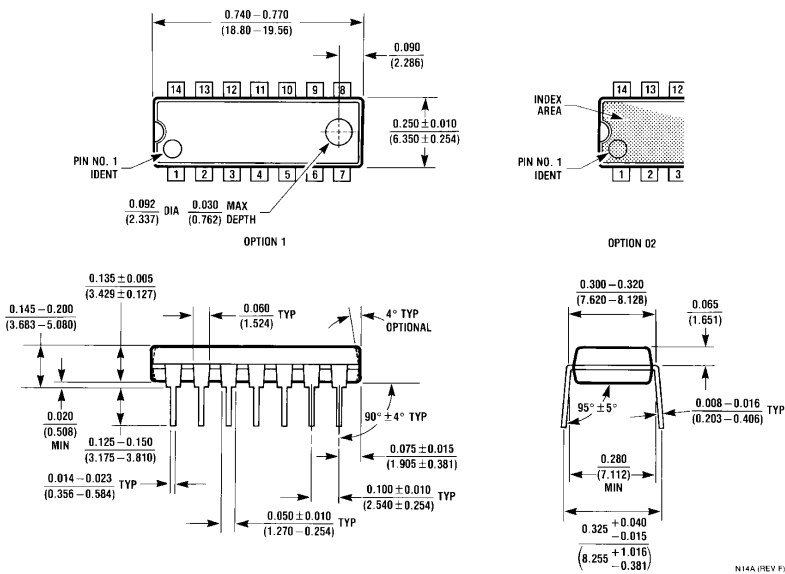


M14B (REV D)

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



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



**Molded Dual-In-Line Package (N)**  
**Order Number LM1877N-9**  
**NS Package Number N14A**

**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.

**National Semiconductor Corporation**  
 Americas  
 Tel: 1-800-272-9959  
 Fax: 1-800-737-7018  
 Email: support@nsc.com  
 www.national.com

**National Semiconductor Europe**  
 Fax: +49 (0) 1 80-530 85 86  
 Email: europe.support@nsc.com  
 Deutsch Tel: +49 (0) 1 80-530 85 85  
 English Tel: +49 (0) 1 80-532 78 32  
 Français Tel: +49 (0) 1 80-532 93 58  
 Italiano Tel: +49 (0) 1 80-534 16 80

**National Semiconductor Asia Pacific Customer Response Group**  
 Tel: 65-2544466  
 Fax: 65-2504466  
 Email: sea.support@nsc.com

**National Semiconductor Japan Ltd.**  
 Tel: 81-3-5639-7560  
 Fax: 81-3-5639-7507