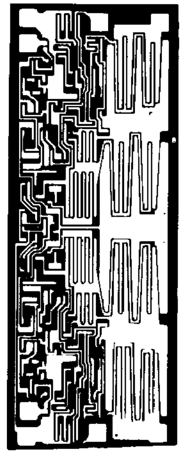
ULN-3783M
DUAL LOW-VOLTAGE AUDIO POWER AMPLIFIER

FEATURES

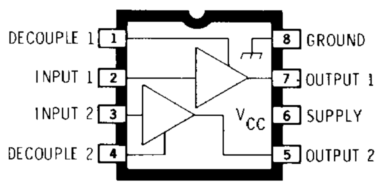
- Wide Operating Voltage Range
- Low Quiescent Current
- A-C Short-Circuit Protection
- Low External Parts Count
- Low Distortion
- 42 dB Voltage Gain
- Low Noise



SPECIFICALLY DESIGNED as a stereo headphone driver for portable radios and tape players, the Type ULN-3783M dual low-voltage audio power amplifier is well suited to use in all types of battery-operated equipment. Its small size and low external component count contribute to portability and low system cost. Its low-noise output and excellent channel separation provide for premium performance.

The dual audio amp operates with supply voltages as low as 2.4 V (at reduced volume) without significant increase in distortion. Weak batteries need no longer be a major concern. Class AB operation results in low quiescent current drain for maximum battery life.

Type ULN-3783B is supplied in a compact 8-pin dual in-line plastic package. A copper alloy lead frame allows maximum power dissipation without the need for an external heat sink.



DWG. NO. A-12,384

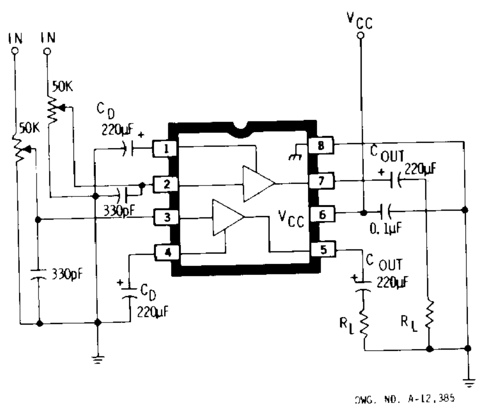
ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{CC}	12 V
Package Power Dissipation, P_D	See Graph
Operating Temperature Range, T_A	−20°C to +85°C
Storage Temperature Range, T_S	−65°C to +150°C

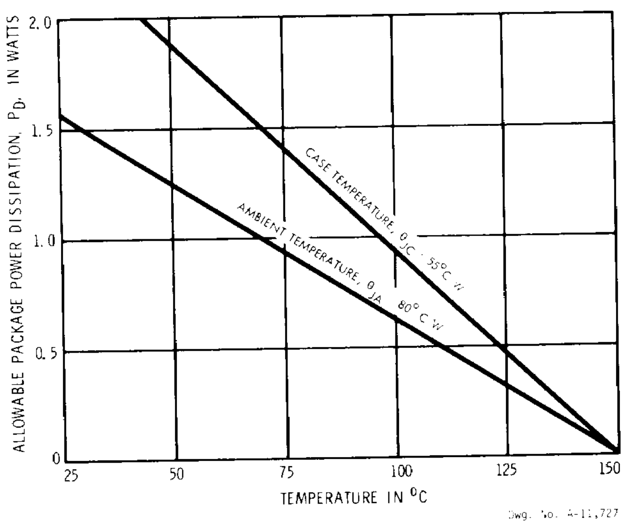
ELECTRICAL CHARACTERISTICS at $T_A = +25°C$, $V_{CC} = +6$ V, $R_L = 32\ \Omega$, $f_{in} = 400$ Hz, one channel driven (unless otherwise noted)

Characteristic	Symbol	Test Conditions	Limits Min.	Limits Typ.	Limits Max.	Units
Supply Voltage Range	V_{CC}		2.4	6.0	9.0	V
Quiescent Supply Current	I_{CC}	$V_{CC} = 4.5$ V	—	13	—	mA
		$V_{CC} = 6.0$ V	—	15	25	mA
		$V_{CC} = 9.0$ V	—	20	—	mA
Voltage Gain	A_v		—	42	—	dB
Channel Balance	ΔA_v		—	±1	±3	dB
Separation			35	55	—	dB
Audio Power Output	P_{OUT}	$R_L = 8\ \Omega$, $V_{CC} = 4.5$ V, THD = 10%	—	220	—	mW
		$R_L = 8\ \Omega$, $V_{CC} = 6.0$ V, THD = 10%	250	430	—	mW
		$R_L = 16\ \Omega$, $V_{CC} = 4.5$ V, THD = 10%	—	125	—	mW
		$R_L = 16\ \Omega$, $V_{CC} = 6.0$ V, THD = 10%	150	240	—	mW
		$R_L = 16\ \Omega$, $V_{CC} = 9.0$ V, THD = 10%	—	600	—	mW
		$R_L = 32\ \Omega$, $V_{CC} = 4.5$ V, THD = 10%	—	60	—	mW
		$R_L = 32\ \Omega$, $V_{CC} = 6.0$ V, THD = 10%	85	110	—	mW
		$R_L = 32\ \Omega$, $V_{CC} = 9.0$ V, THD = 10%	—	310	—	mW
Distortion	THD	$P_{OUT} = 50$ mW, $R_L = 32\ \Omega$	—	0.4	1.0	%
		$P_{OUT} = 50$ mW, $R_L = 16\ \Omega$	—	0.5	—	%
Output Noise	V_{out}	Input shorted, BW = 80 kHz	—	225	—	µV
Input Resistance	R_{IN}	Pin 2 or Pin 3	—	250	—	kΩ
Power Supply Rejection	PSRR	$C_D = 500\ \mu F$, f = 120 Hz	—	34	—	dB

TEST CIRCUIT AND TYPICAL APPLICATION



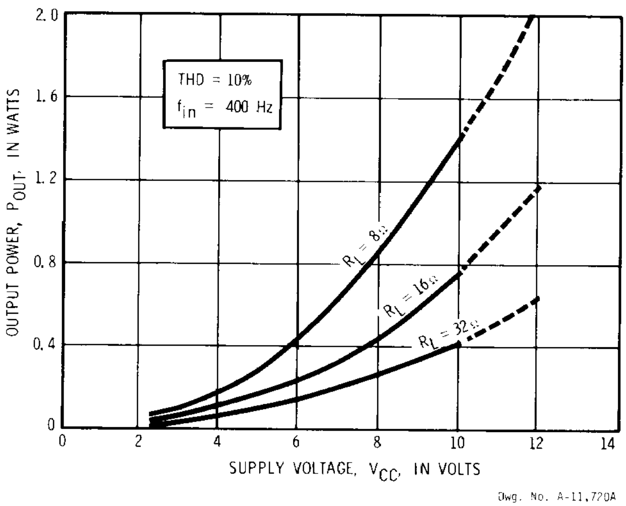
ALLOWABLE AVERAGE PACKAGE POWER DISSIPATION AS A FUNCTION OF TEMPERATURE



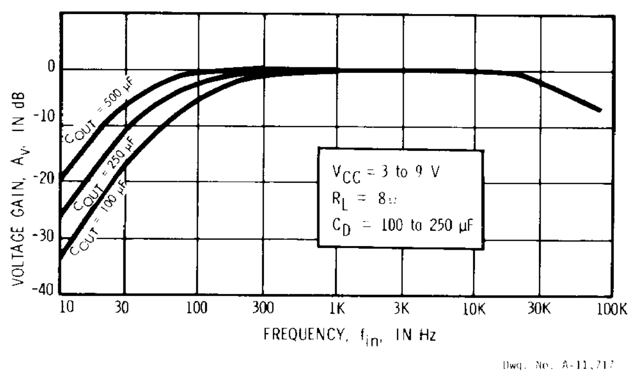
TYPICAL CHARACTERISTICS

(One Channel Driven)

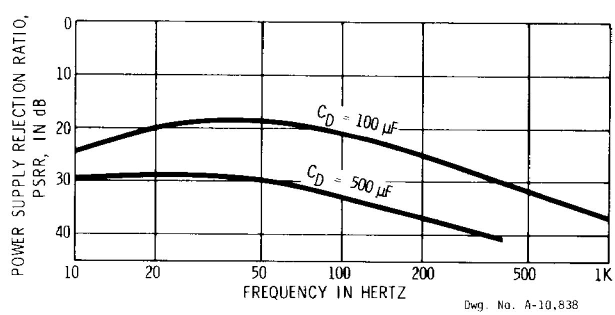
TYPICAL OUTPUT POWER AS A FUNCTION OF SUPPLY VOLTAGE



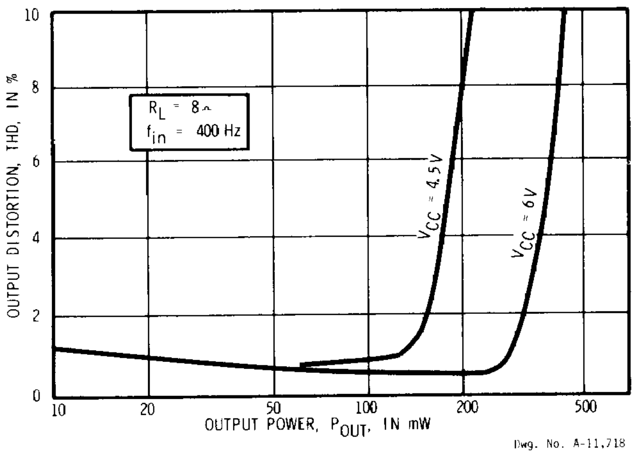
TYPICAL FREQUENCY RESPONSE



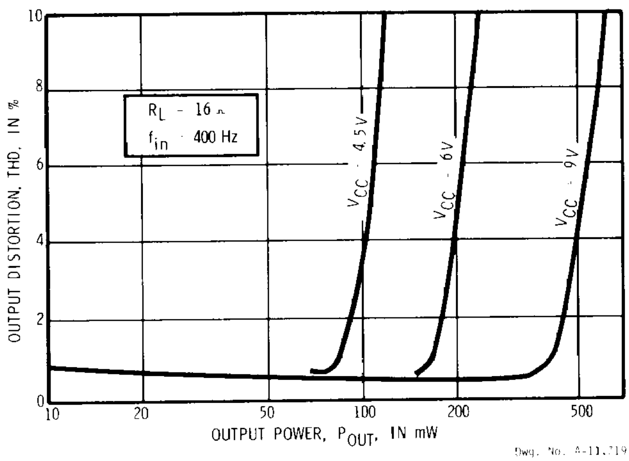
POWER SUPPLY REJECTION RATIO AS A FUNCTION OF FREQUENCY



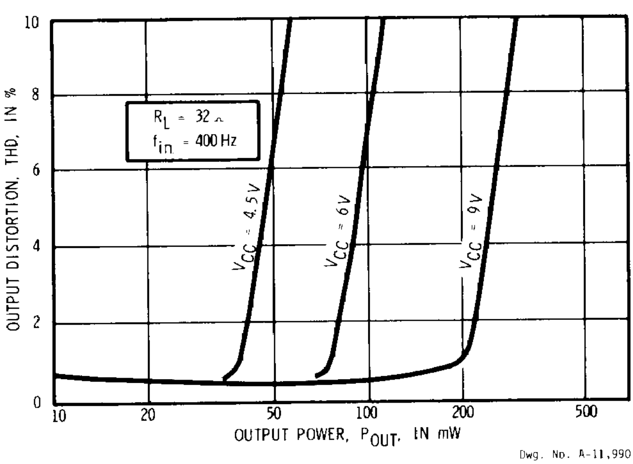
TYPICAL CHARACTERISTICS (Continued)



TOTAL HARMONIC DISTORTION WITH 8 Ω LOAD



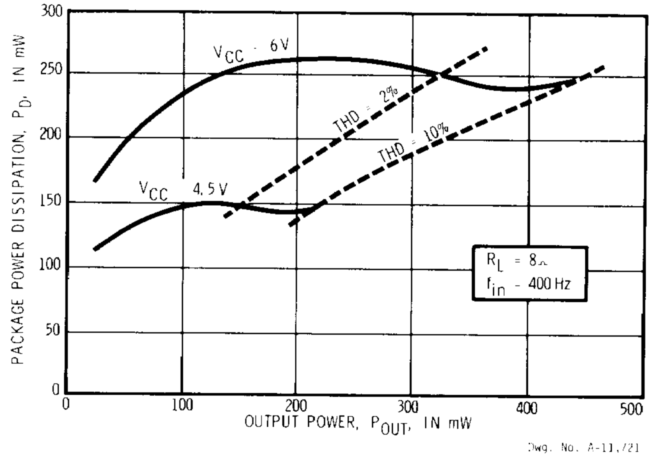
TOTAL HARMONIC DISTORTION WITH 16 Ω LOAD



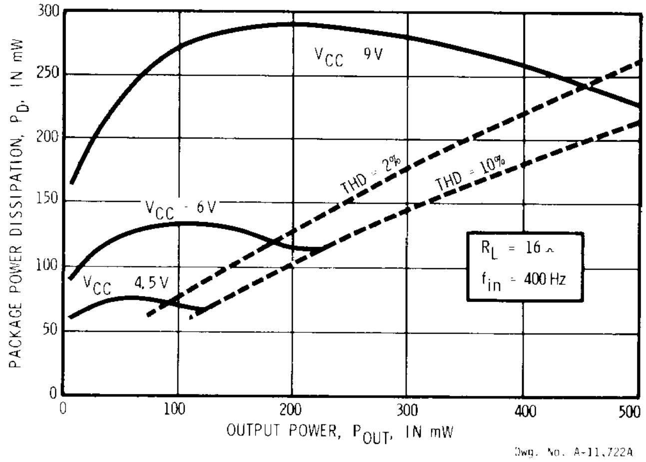
TOTAL HARMONIC DISTORTION WITH 32 Ω LOAD

TYPICAL CHARACTERISTICS (Continued)

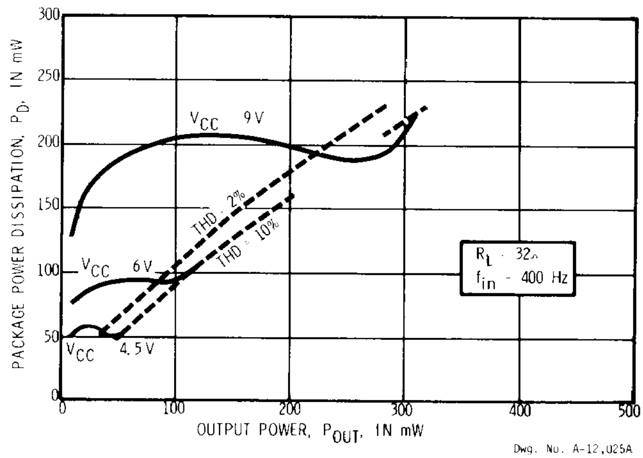
PACKAGE POWER DISSIPATION WITH 8 Ω LOAD



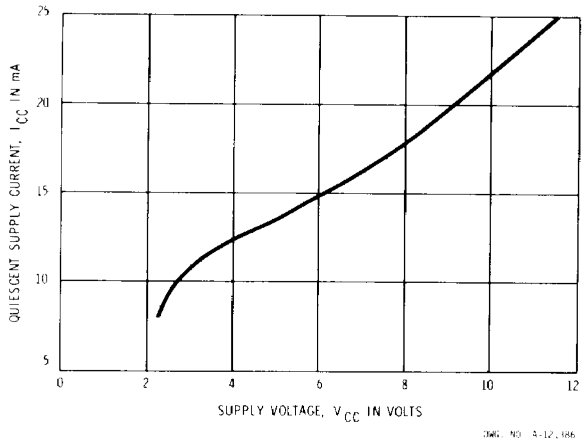
PACKAGE POWER DISSIPATION WITH 16 Ω LOAD



PACKAGE POWER DISSIPATION WITH 32 Ω LOAD



TYPICAL CHARACTERISTICS (Continued)



QUIESCENT SUPPLY CURRENT
AS A FUNCTION OF SUPPLY VOLTAGE

APPLICATIONS INFORMATION

Selection of power-supply voltage and speaker impedance allows a designer to choose audio power levels within the allowable package power dissipation rating for any maximum operating temperature. No unique precautions are necessary when designing with this device. It is stable and a-c short-circuit immune.

External component selection for this low-power amplifier involves only two capacitors per channel —one for output coupling and one for feedback and ripple decoupling. The coupling capacitor value should be selected to provide the desired low-frequency cutoff with the chosen load impedance. The decoupling capacitor should be chosen for both low-frequency audio rolloff and supply-ripple rejection.

Ripple rejection is not practical to calculate due to the large number of mechanisms involved. A 500 µF capacitor achieves typically 34 dB rejection at 120 Hz.

The high gain and the high input impedance of the power amplifier recommend use of this device in many diverse applications. However, the input stage does have other characteristics that should be taken into account for best results. The input is referenced to ground for internal biasing and must be provided with a d-c path to ground. A current of typically 1 µA flows from the input through the volume control, producing an IR drop that is multiplied by the closed loop d-c gain of the amplifier and appears as an error in output centering. This recommends a value of 200 kΩ or less for the volume control; values of less than 100 kΩ are preferred.

The selection of amplifier load impedance involves more than just consideration of the desired power output. A low load impedance will produce the highest power output for any given supply voltage. Higher impedances will furnish significant reduction in harmonic distortion and improvement in overall repeatability of power output capacity.

Special steps toward minimizing tendencies towards instabilities of all types were taken in the design of this device. However, as with all high-gain circuits, care should be given to printed wiring board layout to avoid undesirable effects. Inputs and outputs should be well separated and should avoid common-mode impedances wherever possible. For best performance, grounds should be kept reasonably close to the low level input-signal grounds because their respective inputs represent inverting and noninverting inputs to the amplifiers and exhibit about 40 dB of common-mode rejection. The high-level speaker ground should be connected directly to the power ground. The signal ground and the power ground should be interconnected at only one point.