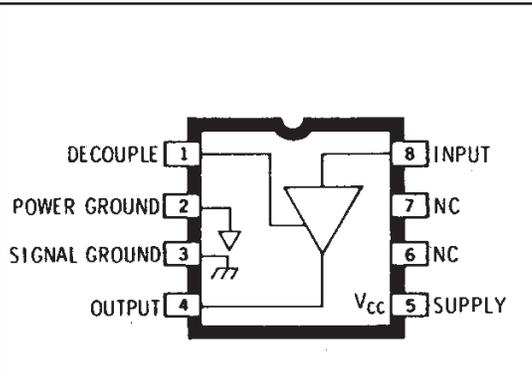


## LOW-VOLTAGE AUDIO POWER AMPLIFIER



Dwg. No. A-11,715

Providing a low-cost, compact alternative to discrete transistor amplifiers, the ULN3718M integrated circuit is ideal for application as a headphone driver in portable radios, tape players, and other battery-operated equipment. The low-power audio amplifier's wide frequency response and low noise ensure premium performance.

The amplifier will operate (at reduced volume) with supply voltages as low as 1.8 V without a significant increase in distortion. This feature allows operation with a 3 V battery supply and minimizes concern about weak batteries. The class-AB audio amplifier has low quiescent current drain for maximum battery life. This device is rated for operation with supply voltages up to 9 V.

The ULN3718M audio amplifier is supplied in an 8-pin mini-DIP plastic package. A copper alloy lead frame gives the amplifier enhanced power dissipation ratings.

### FEATURES

- Wide Operating Voltage Range 1.8 - 9.0 V
- Low Quiescent Current
- AC Short-Circuit Protection
- Low External Parts Count
- Low Distortion
- 40 dB Voltage Gain
- Low Noise

### ABSOLUTE MAXIMUM RATINGS

Supply Voltage,  $V_{CC}$  ..... 10 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

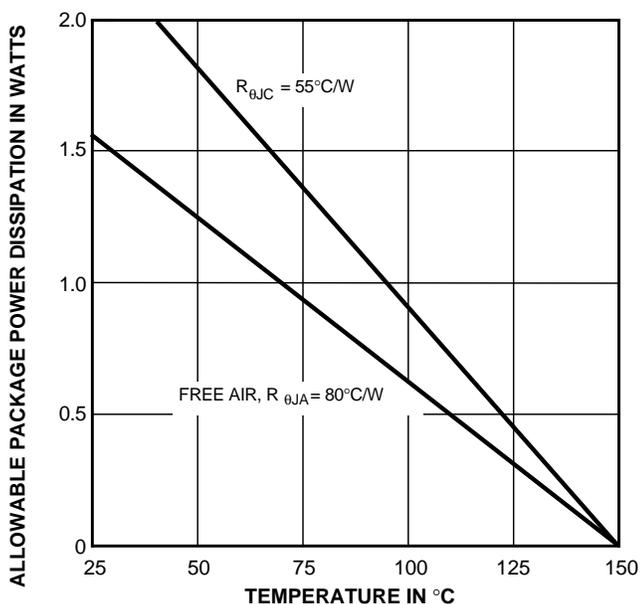
Always order by complete part number: **ULN3718M**.

# 3718

## LOW-VOLTAGE AUDIO POWER AMPLIFIER

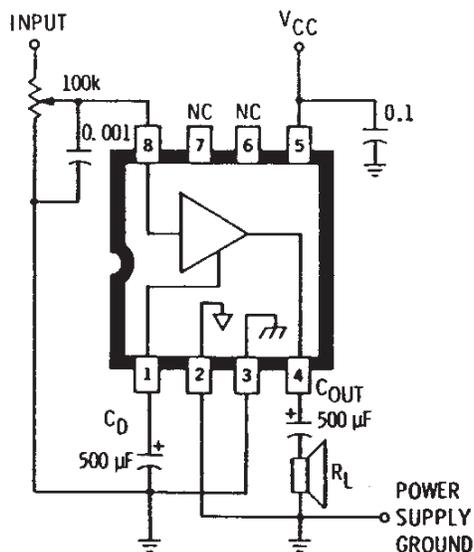
**ELECTRICAL CHARACTERISTICS at  $T_A = +25^\circ\text{C}$ ,  $V_{CC} = 3\text{ V}$ ,  $R_L = 32\Omega$ ,  $f_{in} = 400\text{ Hz}$  (unless otherwise noted).**

Characteristic	Symbol	Test Conditions	Limits			Units
			Min.	Typ.	Max.	
Supply Voltage Range	$V_{CC}$		1.8	3.0	9.0	V
Quiescent Supply Current	$I_{CC}$	$V_{CC} = 3.0\text{ V}$	—	6.0	10	mA
		$V_{CC} = 6.0\text{ V}$	—	9.0	15	mA
		$V_{CC} = 9.0\text{ V}$	—	12	20	mA
Voltage Gain	$A_V$		36	40	44	dB
Audio Power Output	$P_{OUT}$	$R_L = 8\Omega$ , $V_{CC} = 3.0\text{ V}$ , THD = 10%	—	80	—	mW
		$R_L = 8\Omega$ , $V_{CC} = 6.0\text{ V}$ , THD = 10%	250	430	—	mW
		$R_L = 32\Omega$ , $V_{CC} = 3.0\text{ V}$ , THD = 10%	15	25	—	mW
		$R_L = 32\Omega$ , $V_{CC} = 6.0\text{ V}$ , THD = 10%	—	125	—	mW
Distortion	THD	$P_{OUT} = 10\text{ mW}$	—	0.3	1.0	%
		$P_{OUT} = 1.0\text{ mW}$ , $V_{CC} = 1.8\text{ V}$	—	1.5	3.0	%
Output Noise	$V_{out}$	Input Shorted, BW = 80 kHz	—	200	500	$\mu\text{V}$
Input Resistance	$R_{IN}$	Pin 8	—	250	—	k $\Omega$
Power Supply Rejection	PSRR	$C_D$ (Pin 1) = 500 $\mu\text{F}$ , $f = 120\text{ Hz}$	—	28	—	dB



Dwg. GP-009-1B

### TEST CIRCUIT AND TYPICAL APPLICATION



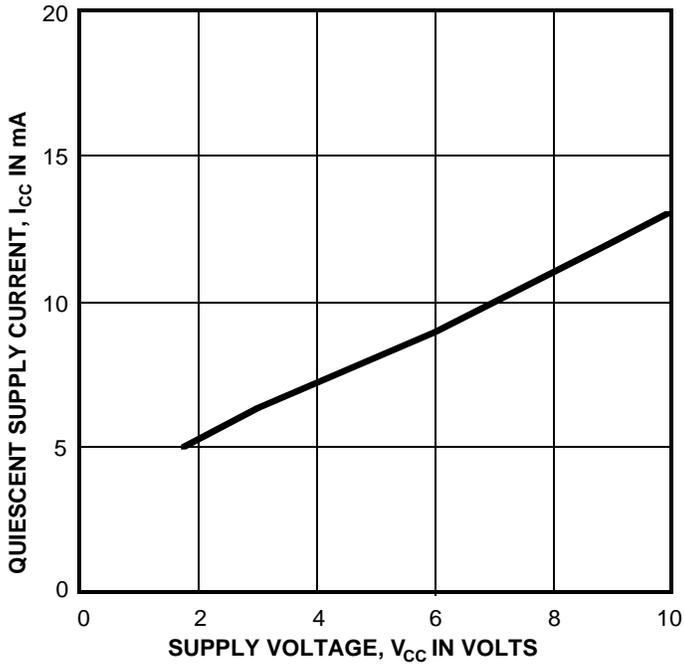
Dwg. No. A-11,716A



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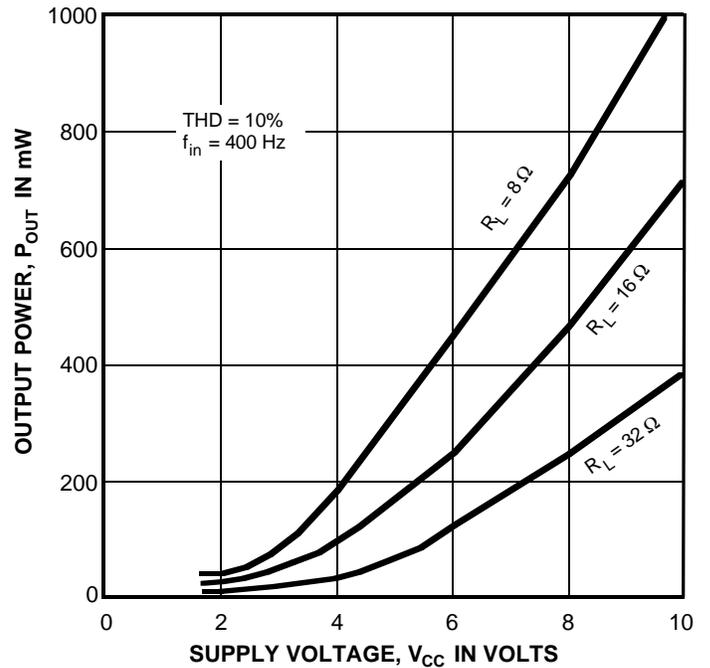
### TYPICAL CHARACTERISTICS

**QUIESCENT SUPPLY CURRENT AS A FUNCTION OF SUPPLY VOLTAGE**



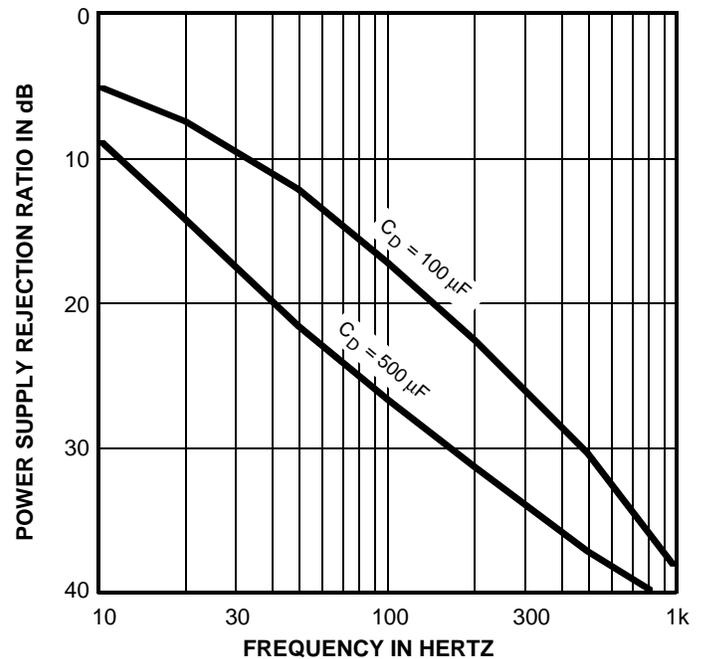
Dwg. GS-011

**OUTPUT POWER AS A FUNCTION OF SUPPLY VOLTAGE**



Dwg. GS-010

**POWER SUPPLY REJECTION RATIO AS A FUNCTION OF FREQUENCY**



Dwg. GS-012

**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 ac short-circuit immune.

External component selection for this low-power amplifier involves only two capacitors — 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  $\mu\text{F}$  capacitor achieves typically 25 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 dc path to ground. A current of typically 1  $\mu\text{A}$  flows from the input through the volume control. This produces an IR drop that is multiplied by the closed loop dc gain of the amplifier and appears as an error in output centering. This recommends a value of 200 k $\Omega$  or less for the volume control; values of less than 100 k $\Omega$  are preferred.

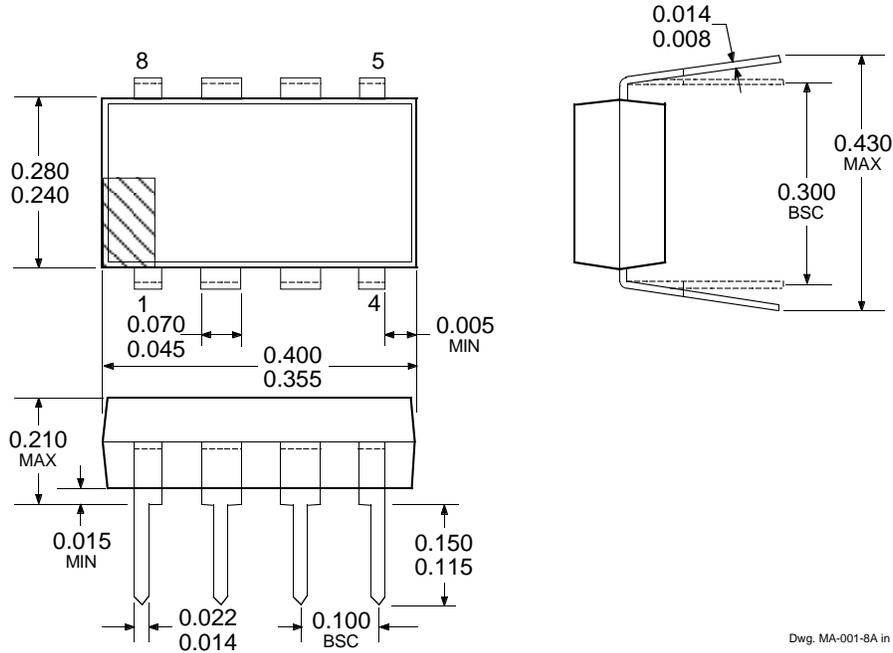
The selection of amplifier load impedance involves more than just consideration of the desired power output. A low load impedance will produce the highest power output for any given supply voltage. Higher impedances will furnish significant reduction in harmonic distortion and improvement in overall repeatability in 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, connect low-level input-signal ground terminals and the decoupling capacitor ground terminal together at pin 3 (signal ground); connect the high-level speaker ground terminal and the power supply ground terminal together at pin 2 (power ground). The signal ground and the power ground should be interconnected at only one point.

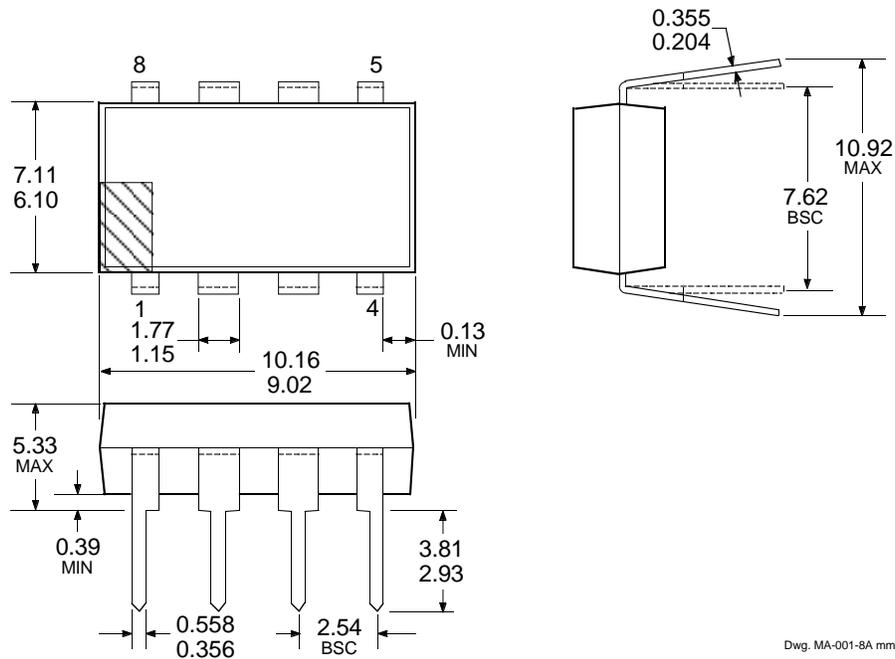
# 3718

## LOW-VOLTAGE AUDIO POWER AMPLIFIER

### Dimensions in Inches



### Dimensions in Millimeters (Based on 1" = 25.4 mm)



- NOTES:
1. Lead thickness is measured at seating plane or below.
  2. Lead spacing tolerance is non-cumulative.
  3. Exact body and lead configuration at vendor's option within limits shown.

**3718**

**LOW-VOLTAGE AUDIO POWER AMPLIFIER**

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