

MFC6070

AUDIO POWER AMPLIFIER

Advance Information

1-WATT AUDIO POWER AMPLIFIER

... designed primarily for low-cost audio amplifiers in phonograph, TV and radio applications.

- 100 mV Sensitivity for 1-Watt*
- Low Distortion – 1% @ 1-Watt typ*
- Short-Circuit Proof – Short Term (10 seconds typ)
- No Heatsink Required for 1-Watt Output at $T_A = 55^\circ\text{C}^{**}$
- Excellent Hum Rejection

*Circuit Dependent
**Voltage Dependent

MAXIMUM RATINGS ($T_A = +25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Power Supply Voltage	V^+	20	Vdc
Power Dissipation	P_D	1.0	Watt
Derate above $T_A = +25^\circ\text{C}$	$1/\theta_{JA}$	8.0	mW/ $^\circ\text{C}$
Operating Temperature Range	T_A	-10 to +55	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-40 to +150	$^\circ\text{C}$

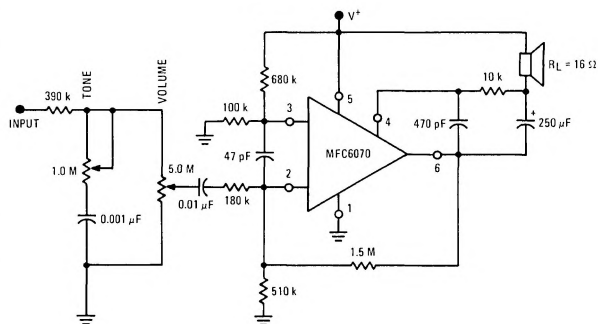
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	θ_{JA}^*	125	$^\circ\text{C}/\text{W}$

*Thermal resistance is measured in still air with fine wires connected to the leads, representing the "worst case" situation.

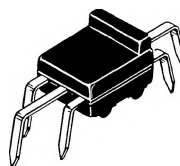
For a larger power requirement, pin 1 must be soldered to at least one sq. in. of copper foil on the printed circuit board. The θ_{JA} will be no greater than $+90^\circ\text{C}/\text{W}$. Thus, 1.39 Watts could be dissipated at $+25^\circ\text{C}$, which must be linearly derated at $11.1 \text{ mW}/^\circ\text{C}$ from $+25^\circ\text{C}$ to $+150^\circ\text{C}$.

FIGURE 1 – TYPICAL 1-WATT PHONOGRAPH AMPLIFIER
(Ceramic cartridge input)



1-WATT AUDIO POWER AMPLIFIER

Silicon Monolithic
Functional Circuit



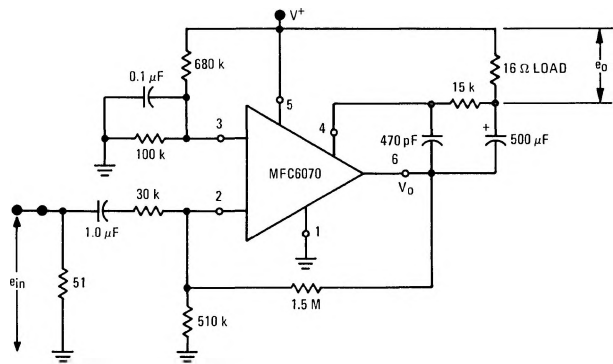
CASE 643A
PLASTIC PACKAGE

MFC6070 (continued)

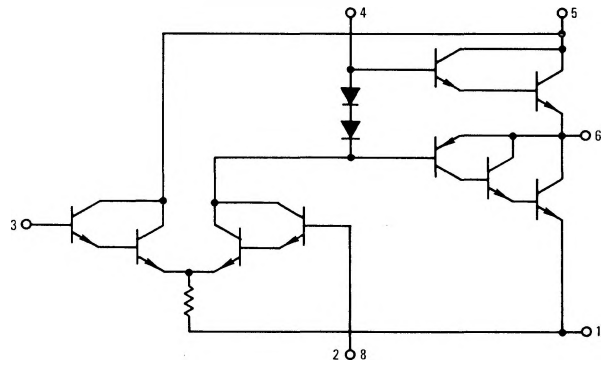
ELECTRICAL CHARACTERISTICS ($V^+ = 16\text{ Vdc}$, See Figure 2 for test circuit, $T_A = +25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Quiescent Output Voltage	V_O	—	8.0	—	Vdc
Quiescent Drain Current ($e_{in} = 0$)	I_D	—	5.0	18	mA
Sensitivity, Input Voltage (e_{in} adjusted for $e_O = 4.0\text{ V(rms)}$ @ 1.0 kHz, Power Output = 1.0 Watt)	e_{in}	—	100	150	mV
Total Harmonic Distortion ($e_O = 4.0\text{ V(rms)}$ @ 1.0 kHz, Power Output = 1.0 Watt) (e_{in} adjusted for $e_O = 1.26\text{ V(rms)}$ @ 1.0 kHz, Power Output = 100 mW)	THD	—	1.0	10	%
Hum and Noise (IHF Standard A201, 1966)	—	—	-40	—	dB

FIGURE 2 – 1-WATT AUDIO POWER AMPLIFIER TEST CIRCUIT



Circuit Schematic



TYPICAL CHARACTERISTICS

($V^+ = 16\text{ Vdc}$, $T_A = +25^\circ\text{C}$ unless otherwise noted)

FIGURE 3 – TOTAL HARMONIC DISTORTION
versus OUTPUT POWER

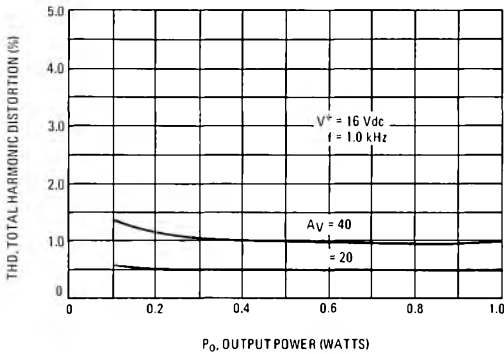


FIGURE 4 – POWER DISSIPATION versus OUTPUT POWER

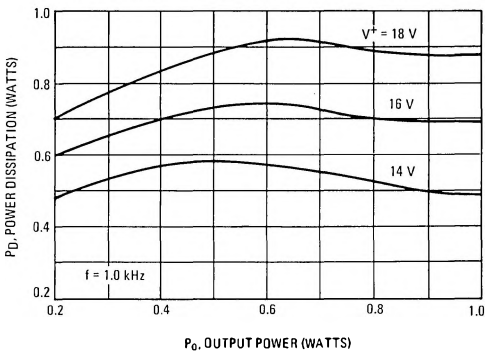
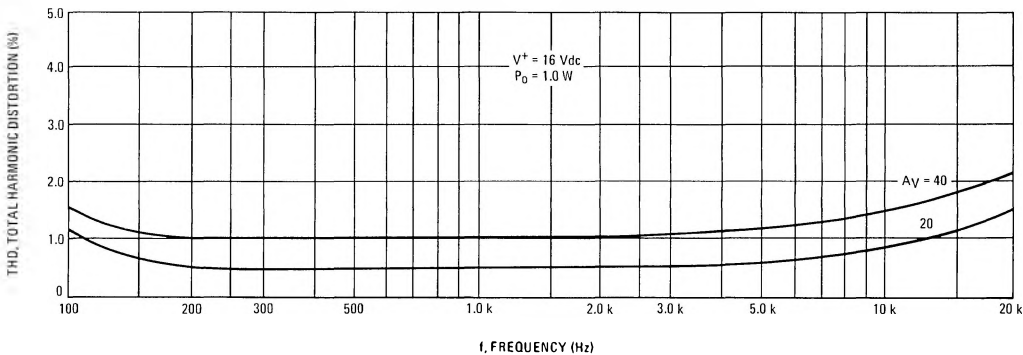


FIGURE 5 – TOTAL HARMONIC DISTORTION versus FREQUENCY



APPLICATIONS INFORMATION

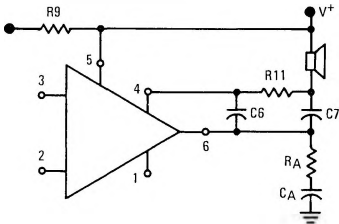
Shown in Figures 7 and 11 are low cost 1 W phono amplifiers with a sensitivity (@ 1 kHz) of approximately 450 mV. The input impedance of both amplifiers is approximately equal to R_4 and the gain is determined by $(R_7 + R_{10})/R_5$. To change the gain of the amplifier, change the value of R_5 and hold $(R_7 + R_{10})$ between 1 M and 2.2 M. This allows the use of a small and less expensive capacitor for C2.

The bass boost effect shown in the frequency response curves (Figures 10 and 14) is provided by the parallel combination of C4 and R10 and can be eliminated by removing C4 and replacing $(R_7 + R_{10})$ with a 2.2 Megohm resistor. High frequency compensation is provided by C6 and the low frequency roll-off is determined by the impedance network of C2 and R5, C3 and R4, and C8 and the speaker. The series combination of R_A and C_A from pin 6 to ground may be required for stability, depending on printed circuit board layout, speaker reactance, and lead lengths.

Device ac short-circuit capability was tested in both the 8-ohm and 16-ohm amplifiers by shorting pin 6 thru a 500 microfarad capacitor to ground for a period of ten seconds with the amplifier operating at full rated output.

The speaker can be connected to V^+ (alternate connection shown below) or ground (Figures 7 and 11). Printed circuit board art work (1:1 pattern) is shown for both systems in Figures 16 and 18. A picture of the completed board for the grounded speaker system is shown in Figure 21.

ALTERNATE CONNECTION FOR SPEAKER TO V^+
(See Figure 20 for Parts List)



APPLICATIONS INFORMATION (continued)

($R_L = 8.0$ ohms, $T_A = +25^\circ\text{C}$ unless otherwise noted)

FIGURE 6 – POWER SUPPLY

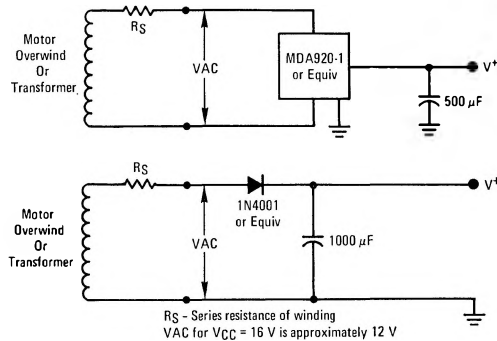


FIGURE 7 – PHONOGRAPH AMPLIFIER 1 WATT - 8 OHM
(See Figure 15 for Parts List)

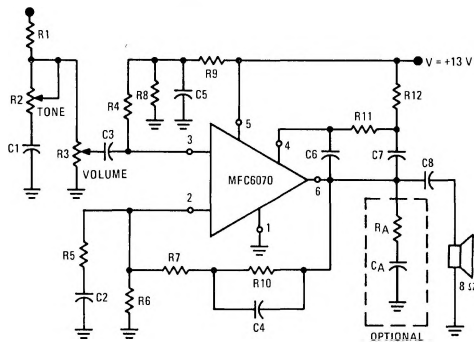


FIGURE 8 – TOTAL HARMONIC DISTORTION
versus OUTPUT POWER FOR FIGURE 7

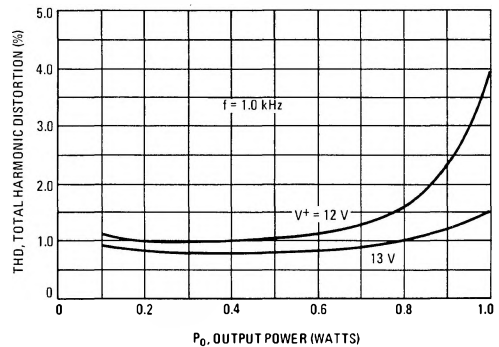


FIGURE 9 – TOTAL HARMONIC DISTORTION
versus FREQUENCY FOR FIGURE 7

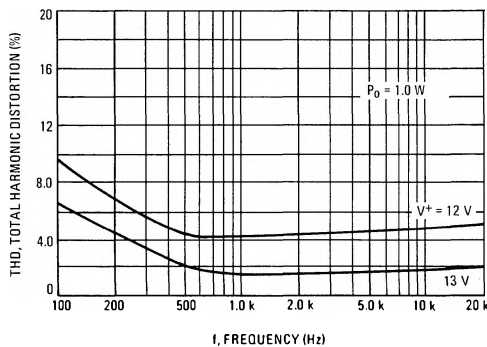
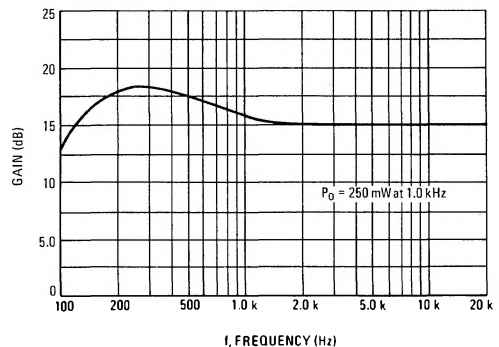


FIGURE 10 – FREQUENCY RESPONSE FOR FIGURE 7



APPLICATIONS INFORMATION (continued)

($R_L = 16 \text{ ohms}$, $T_A = +25^\circ\text{C}$ unless otherwise noted)

FIGURE 11 – 1.0 WATT, 16 OHM LOAD PHONOGRAPH AMPLIFIER
(See Figure 15 for Parts List)

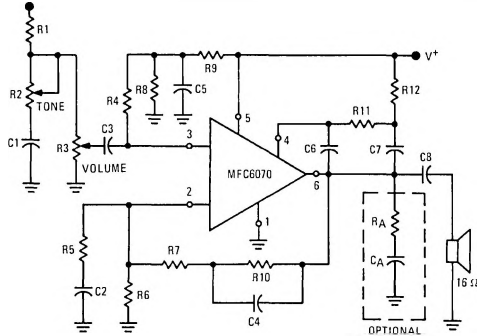


FIGURE 12 – TOTAL HARMONIC DISTORTION
versus OUTPUT POWER FOR FIGURE 11

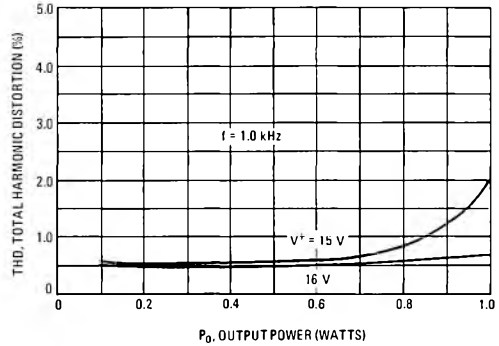


FIGURE 13 – TOTAL HARMONIC DISTORTION
versus FREQUENCY FOR FIGURE 11

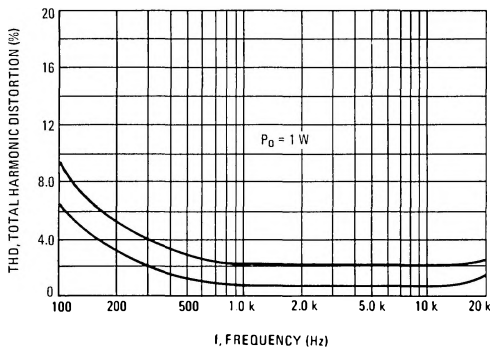


FIGURE 14 – FREQUENCY RESPONSE FOR FIGURE 11

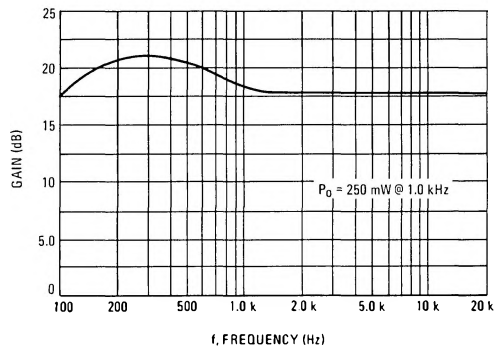


FIGURE 15 – PARTS LIST FOR FIGURES 7 AND 11

R1 = 180 k ohms	R9 = 1.0 Megohm	C3 = 0.05 μF
R2 = 5.0 Megohms	R10 = 1.5 Megohms	C4 = 470 pF
R3 = 5.0 Megohms	R11 = 6.8 kilohms	C5 = 0.1 μF
R4 = 1.0 Megohm	R12 = 6.8 kilohms	C6 = 470 pF
R5 = 150 k ohms*	R _A = 10 ohms**	C7 = 0.1 μF
R6 = 910 k ohms*	C1 = 470 pF	C8 = 500 μF *
R7 = 680 k ohms	C2 = 0.1 μF	C _A = 0.1 μF **
R8 = 180 k ohms		

*For Figure 11 (16-ohm load) change R5 to 100 k ohms, R6 to 820 k ohms and C8 to 250 μF .

**Optional – Not included on board. (See Applications Information Note)

APPLICATIONS INFORMATION (continued)

FIGURE 16 – PRINTED CIRCUIT BOARD (Foil Side)
1:1 PATTERN (Speaker Grounded)

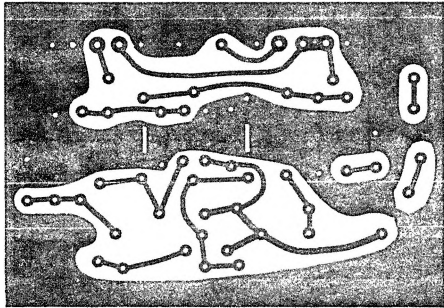


FIGURE 17 – COMPONENT DIAGRAM FOR FIGURE 16

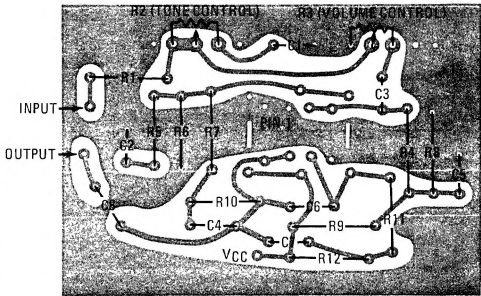


FIGURE 18 – PRINTED CIRCUIT BOARD (Foil Side)
1:1 PATTERN (Speaker to V*)

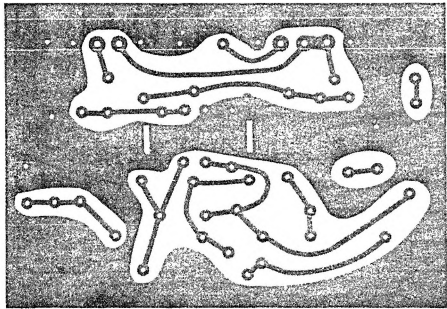


FIGURE 19 – COMPONENT DIAGRAM FOR FIGURE 18

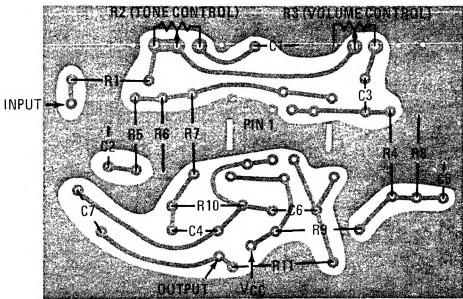


FIGURE 20 – PARTS LIST FOR FIGURE 19
(See Applications Information Note)

- R1 = 180 k ohms
- R2,R3 = 5.0 Megohms
- R4,R9 = 1.0 Megohm
- R5 = 82 k ohms
- R6 = 820 k ohms
- R7 = 680 k ohms
- R8 = 180 k ohms
- R10 = 1.5 Megohms
- R11 = 15 k ohms
- RA = 10 ohms*

- C1,C4,C6 = 470 pF
- C2,C5 = 0.1 μ F
- C3 = 0.05 μ F
- C7 = 250 μ F
- CA = 0.1 μ F*

*Optional - Not included on board. (See Applications Information Note)

FIGURE 21 – COMPLETED BOARD
(Speaker Grounded)

