MFC6040

ELECTRONIC ATTENUATOR

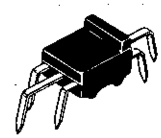
DEVICE DISCONTINUED – CONSULT FACTORY

ELECTRONIC ATTENUATOR

- Designed for use in:
  - DC Operated Volume Control
  - Compression and Expansion Amplifier Applications
- Controlled by DC Voltage or External Variable Resistor
- Economical 6-Lead Plastic Package

ELECTRONIC ATTENUATOR

Silicon Monolithic Integrated Circuit



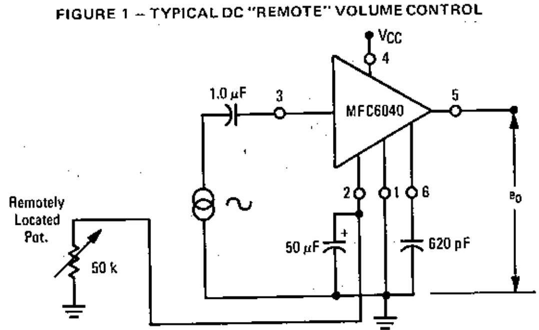
CASE 643A

PLASTIC PACKAGE

MAXIMUM RATINGS (T_A = +25°C unless otherwise noted.)

Rating	Value	Unit
Power Supply Voltage	20	Vdc
Power Dissipation @ T_A = 25°C (Package Limitation)	1.0	Watt
Derate above T_A = 25°C	10	mW/°C
Operating Temperature Range	0 to +75	°C

FIGURE 1 – TYPICAL DC "REMOTE" VOLUME CONTROL



See Packaging Information Section for outline dimensions.

ELECTRICAL CHARACTERISTICS (e_{in} = 100 mV (RMS), f = 1.0 kHz, R1 = 0, V_{CC} = 16 Vdc, T_A = +25°C unless otherwise noted.)

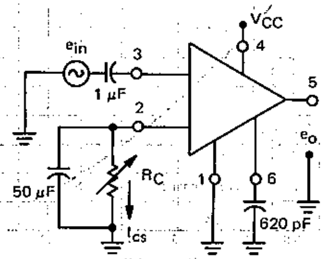
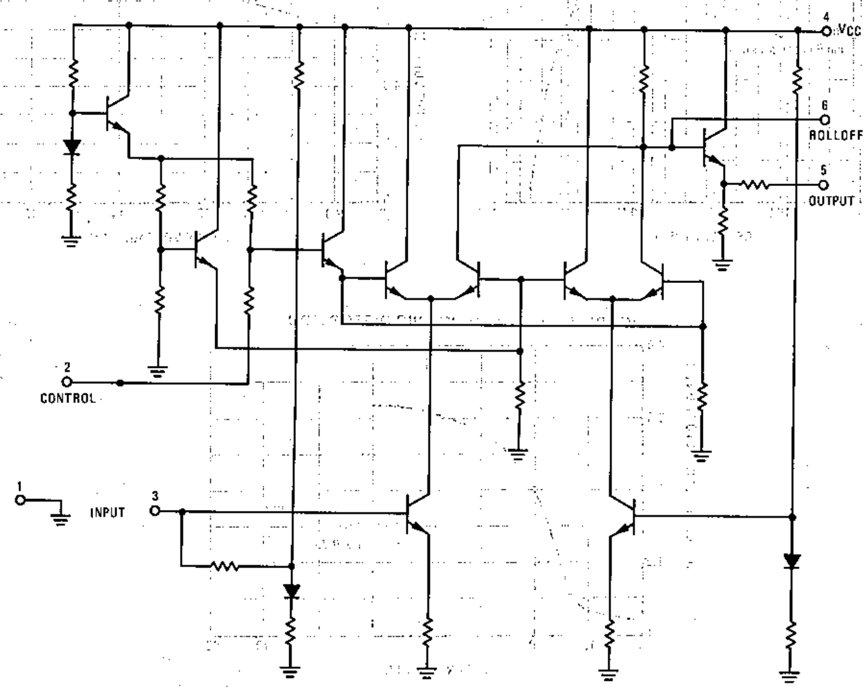
Circuit	Characteristic	Min	Typ	Max	Unit
	Operating Power Supply Voltage	9.0	–	18	Vdc
	Control Terminal Sink Current (e_{in} = 0)	–	–	2.0	mAdc
	Maximum Input Voltage	–	–	0.5	V(RMS)
	Voltage Gain	11	13	–	dB
	Attenuation Range (R_C = 33 k ohms)	70	90	–	dB
	Total Harmonic Distortion (Pin 2 Gnd) (e_{in} = 100 mV (RMS), $e_o = A_v \times e_{in}$)	–	0.6	1.0	%

FIGURE 2 – CIRCUIT SCHEMATIC



8

TYPICAL ELECTRICAL CHARACTERISTICS

(V_{CC} = 16 Vdc, T_A = +25°C unless otherwise noted.)

FIGURE 3 — ATTENUATION versus DC CONTROL VOLTAGE

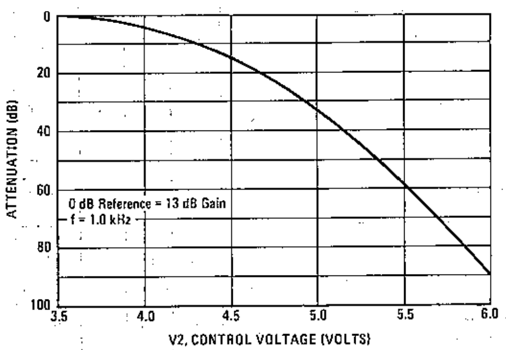


FIGURE 4 — ATTENUATION versus CONTROL RESISTOR

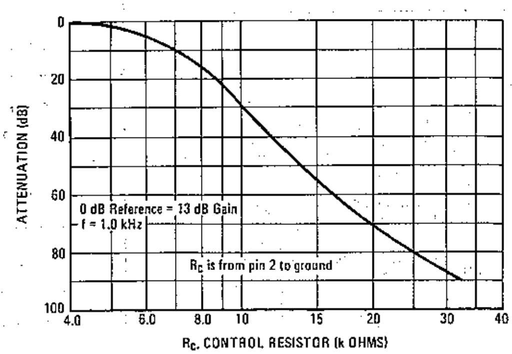


FIGURE 5 — FREQUENCY RESPONSE

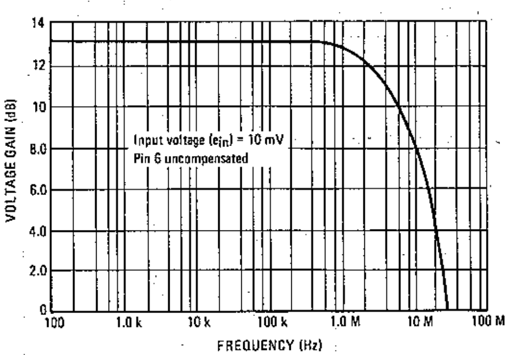


FIGURE 6 — OUTPUT VOLTAGE SWING

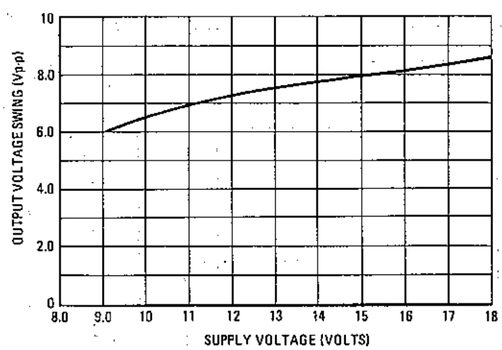
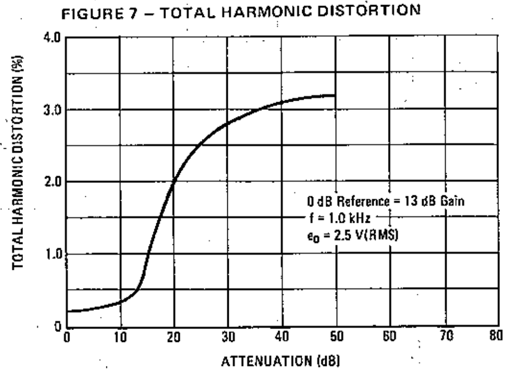


FIGURE 7 — TOTAL HARMONIC DISTORTION



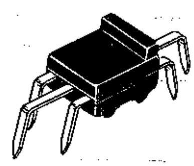
DEVICE DISCONTINUED – CONSULT FACTORY

DUAL TOGGLE FLIP-FLOP WITH RESET

- Wide Operating Voltage Range – 6.0 to 16 Volts
- Regulated Supply Not Required
- Ideal for Remote Control Applications
- Economical 6-Lead Plastic Package
- Reset (R) Available to Set Output to 0 Regardless of Previous History

DUAL TOGGLE FLIP-FLOP WITH RESET

Silicon Monolithic Functional Circuit

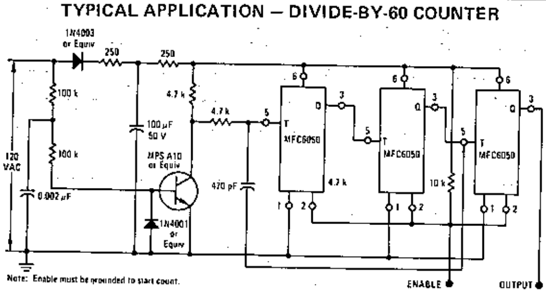


CASE 643A
PLASTIC PACKAGE

MAXIMUM RATINGS (T_A = +25°C unless otherwise noted.)

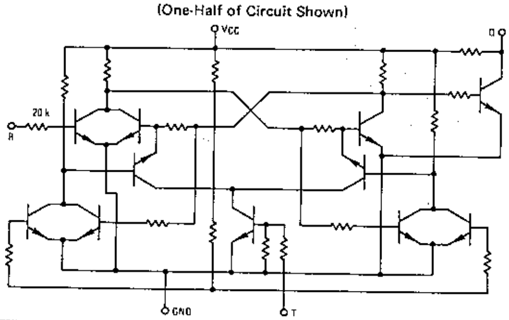
Rating	Value	Volts
Power Supply Voltage	19	Vdc
Output Sinking Current	15	mA
Negative Input Voltage	0.5	Vdc
Power Dissipation (Package Limitation) Derate above T_A = +25°C	1.0 10	Watt mW/°C
Operating Temperature Range	+10 to +75	°C

TYPICAL APPLICATION – DIVIDE-BY-60 COUNTER

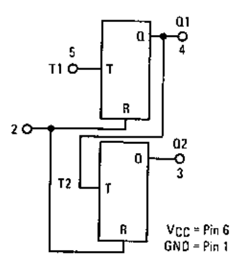


Note: Enable must be grounded to start count.

SIMPLIFIED CIRCUIT SCHEMATIC
(One-Half of Circuit Shown)



BLOCK DIAGRAM

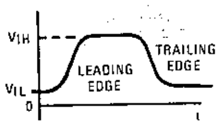


See Packaging Information Section for outline dimensions.

ELECTRICAL CHARACTERISTICS (V_{CC} = 12 Vdc, V_{in} = 4.0 V, Square Pulse, f = 10 kHz, 50% Duty Cycle, t_{PHL} = 1.0 V/μs (Min), T_A = +25°C unless otherwise noted.)

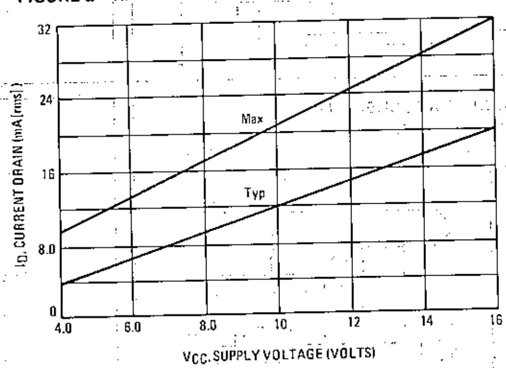
Characteristic		Min	Typ	Max	Unit
Operating Power Supply Voltage		6.0		16	Vdc
Toggle Frequency		–	3.0	–	MHz
Output Voltage (High)					Vdc
(V_{CC} = 6.0 Vdc)	Q1	3.7	–	–	
	Q2	5.5	–	–	
(V_{CC} = 16 Vdc)	Q1	10	–	–	
	Q2	15.5	–	–	
Output Voltage (Low)					Vdc
(V_{CC} = 6.0 Vdc)		–	–	0.5	
(V_{CC} = 16 Vdc)		–	–	1.0	
Operating Drain Current		–	–	32	mAdc
Output Sinking Current (V_O ≤ 1.0 Vdc)		–	8.0	–	mAdc
Rise Time		–	250	–	ns
Storage Time		–	350	–	ns
Fall Time		–	60	–	ns
Input Resistance		10	–	–	kΩ
Output Resistance (Output High)		–	–	6.0	kΩ

INPUT PULSE REQUIREMENTS



Characteristic	Symbol	Min	Max	Unit
Pulse Magnitude	V_{IH}	+4.0	–	Volts
Zero Level	V_{IL}	–	+1.0	Volts
Leading Edge	–	+0.1	–	V/μs
Trailing Edge	$\frac{dv}{dt}$	-1.0	–	Volts/μs

FIGURE 2 – RMS CURRENT DRAIN versus SUPPLY VOLTAGE



DEVICE DISCONTINUED – CONSULT FACTORY

1-WATT AUDIO POWER AMPLIFIER

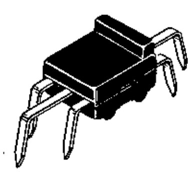
. . . designed primarily for low-cost audio amplifiers in phonograph, TV and radio applications.

- 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 $T_A = 55^oC$**
- Excellent Hum Rejection

*Circuit Dependent
**Voltage Dependent

1-WATT AUDIO POWER AMPLIFIER

Silicon Monolithic Functional Circuit



CASE 643A
PLASTIC PACKAGE

MAXIMUM RATINGS ($T_A = +25^oC$ unless otherwise noted)

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

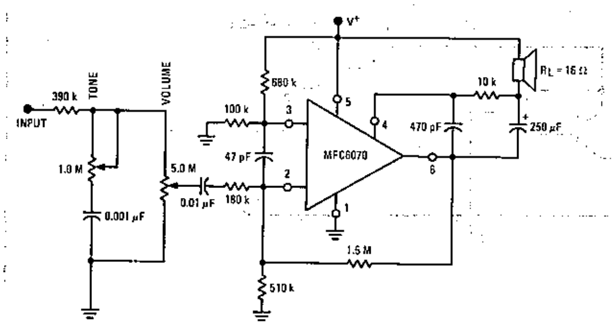
THERMAL CHARACTERISTICS

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

*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 $+90^oC/W$. Thus, 1.39 Watts could be dissipated at $+25^oC$, which must be linearly derated at 11.1 $mW/^oC$ from $+25^oC$ to $+150^oC$.

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

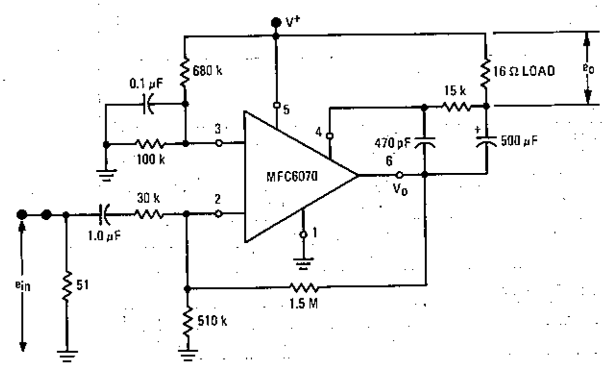


See Packaging Information Section for outline dimensions.

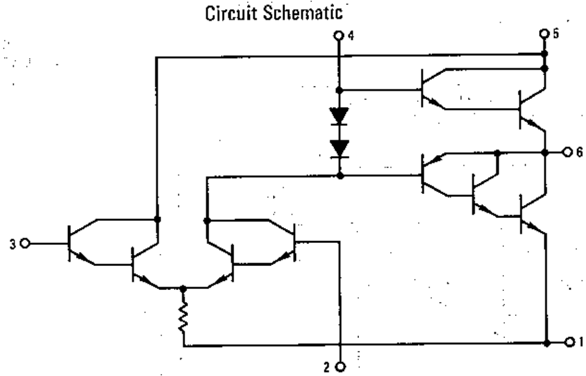
ELECTRICAL CHARACTERISTICS (V^+ = 16 Vdc, See Figure 2 for test circuit, T_A = +25°C unless otherwise noted)

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 V(rms) @ 1.0 kHz, Power Output = 1.0 Watt)	e_{in}	–	100	150	mV
Total Harmonic Distortion	THD				%
(e_o = 4.0 V(rms) @ 1.0 kHz, Power Output = 1.0 Watt)		–	1.0	10	
(e_{in} adjusted for e_o = 1.26 V(rms) @ 1.0 kHz, Power Output = 100 mW)		–	1.0	3.0	
Hum and Noise (IHF Standard A201, 1966)	–	–	-40	–	dB

FIGURE 2 – 1-WATT AUDIO POWER AMPLIFIER TEST CIRCUIT



Circuit Schematic



8

TYPICAL CHARACTERISTICS

(V^+ = 16 Vdc, T_A = +25°C unless otherwise noted)

FIGURE 3 – TOTAL HARMONIC DISTORTION versus OUTPUT POWER

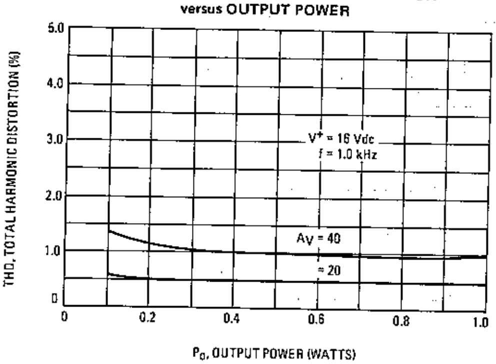


FIGURE 4 – POWER DISSIPATION versus OUTPUT POWER

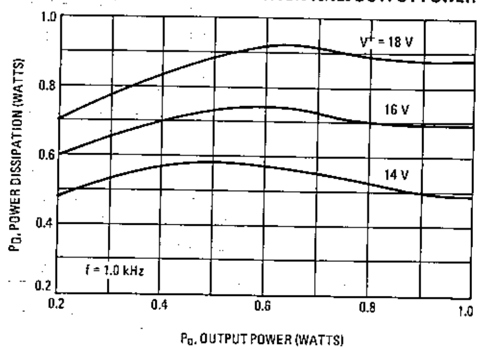
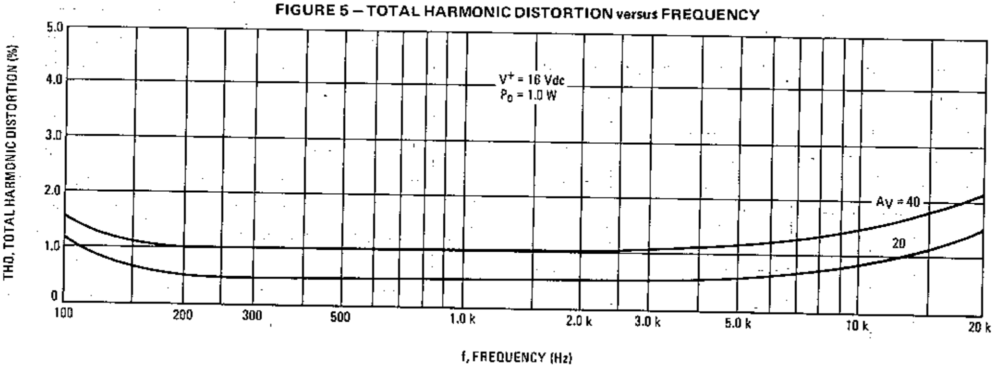


FIGURE 5 – TOTAL HARMONIC DISTORTION versus FREQUENCY



APPLICATIONS INFORMATION

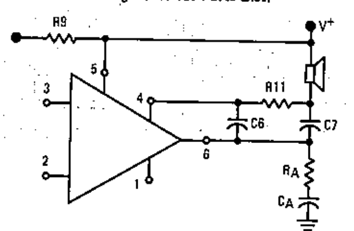
Shown in Figures 7 and 11 are low cost 1 W phono amplifiers with a sensitivity (@ 1 kHz) of approximately 450 mV. The input impedance of both amplifiers is approximately equal to R4 and the gain is determined by (R7 + R10)/R5. To change the gain of the amplifier, change the value of R5 and hold (R7 + R10) 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 (R7 + R10) 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 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)

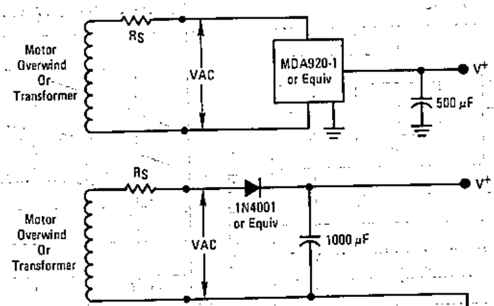


8

APPLICATIONS INFORMATION (continued)

(R_L = 8.0 ohms, T_A = +25°C unless otherwise noted)

FIGURE 6 – POWER SUPPLY



RS – Series resistance of winding
VAC for VCC = 16 V is approximately 12 V

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

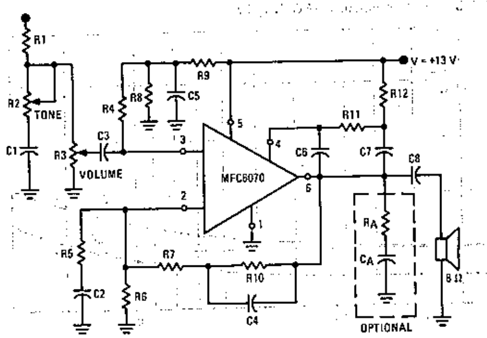


FIGURE 8 – TOTAL HARMONIC DISTORTION versus OUTPUT POWER FOR FIGURE 7

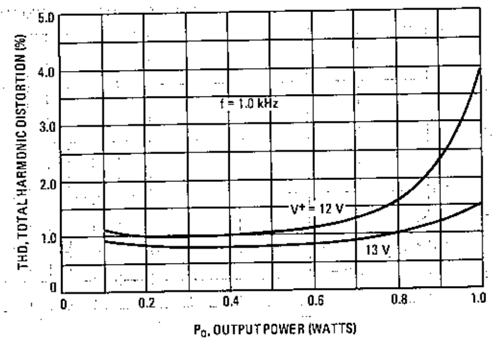


FIGURE 9 – TOTAL HARMONIC DISTORTION versus FREQUENCY FOR FIGURE 7

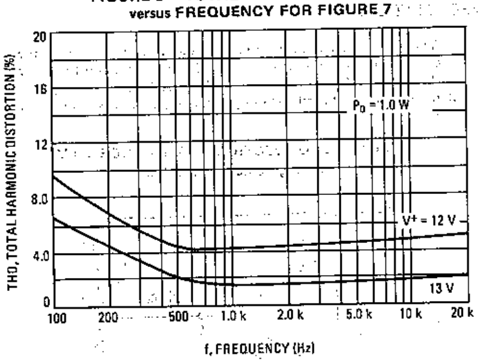
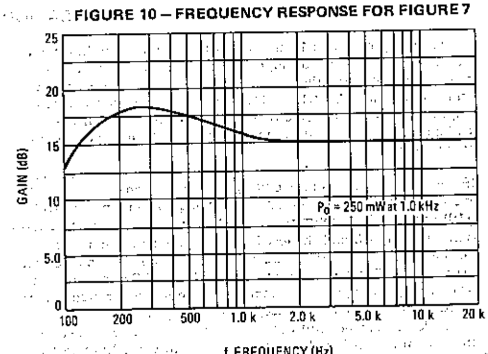


FIGURE 10 – FREQUENCY RESPONSE FOR FIGURE 7



APPLICATIONS INFORMATION (continued)

(R_L = 16 ohms, T_A = +25°C unless otherwise noted)

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

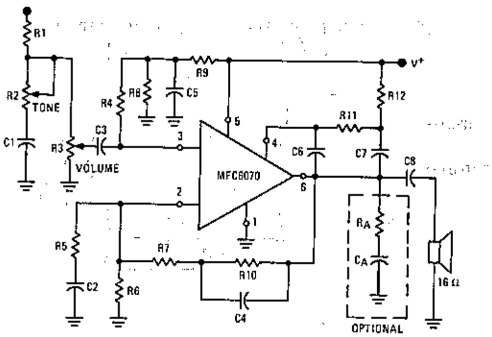


FIGURE 12 – TOTAL HARMONIC DISTORTION versus OUTPUT POWER FOR FIGURE 11

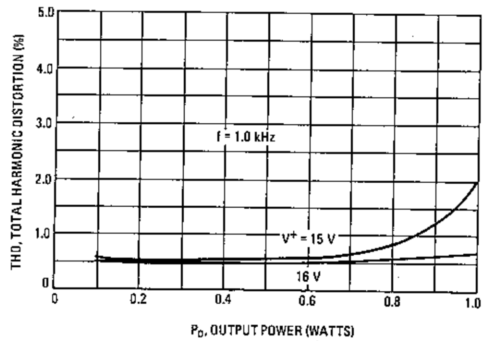


FIGURE 13 – TOTAL HARMONIC DISTORTION versus FREQUENCY FOR FIGURE 11

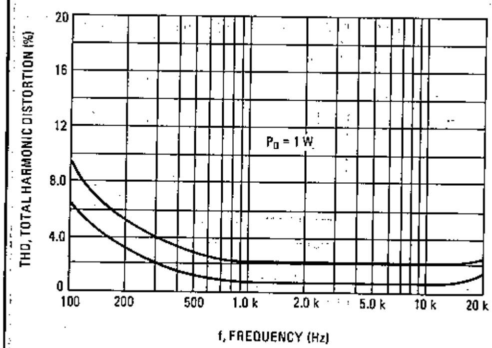


FIGURE 14 – FREQUENCY RESPONSE FOR FIGURE 11

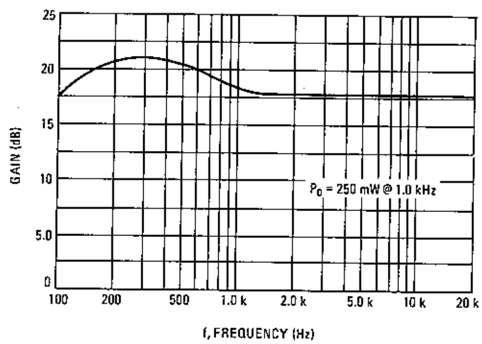


FIGURE 15 – PARTS LIST FOR FIGURES 7 AND 11

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 k ohms	C5 = 0.1 μF
R4 = 1.0 Megohm	R12 = 6.8 k ohms	C6 = 470 pF
R5 = 150 k ohms*	RA = 10 ohms**	C7 = 0.1 μF
R6 = 910 k ohms*	C1 = 470 pF	C8 = 500 μF*
R7 = 680 k ohms	C2 = 0.1 μF	CA = 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)
(Speaker Grounded)

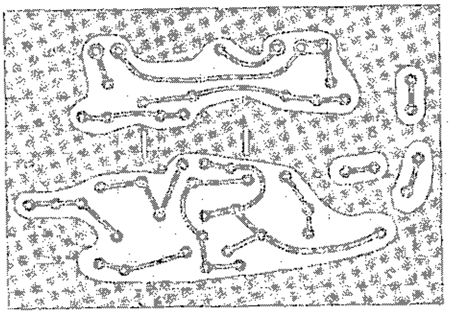


FIGURE 17 – COMPONENT DIAGRAM FOR FIGURE 16

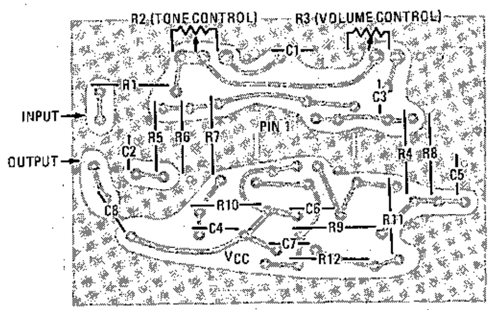


FIGURE 18 – PRINTED CIRCUIT BOARD (Foil Side)
(Speaker to V^+)

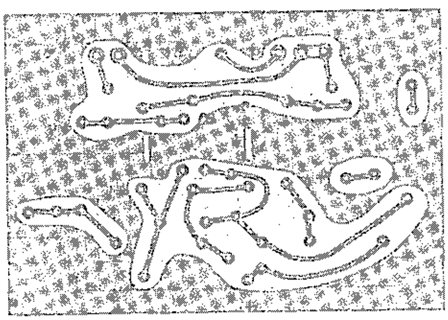


FIGURE 19 – COMPONENT DIAGRAM FOR FIGURE 18

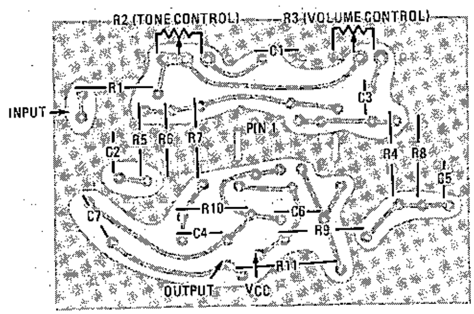


FIGURE 20 – PARTS LIST FOR FIGURE 19
(See Applications Information Note)

R1	= 180 k ohms	C1,C4,C6	= 470 pF
R2,R3	= 5.0 Megohms	C2,C5	= 0.1 μF
R4,R9	= 1.0 Megohm	C3	= 0.05 μF
R5	= 82 k ohms	C7	= 250 μF
R6	= 820 k ohms	C_A	= 0.1 μF*
R7	= 680 k ohms		
R8	= 180 k ohms		
R10	= 1.5 Megohms		
R11	= 15 k ohms		
R_A	= 10 ohms*		

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

FIGURE 21 – COMPLETED BOARD
(Speaker Grounded)