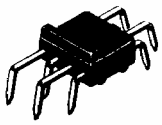
MFC8020A
MFC8021A
MFC8022A

CLASS B AUDIO DRIVERS

. . . designed as preamplifiers and driver circuits for complementary output transistors.

- Driver for Auto Radios – and up to 20-Watt Amplifiers
- High Gain – 7.0 mV for 1.0 Watt, R_L = 3.2 Ohms
- High Input Impedance – 500-Kilohm Capability
- Output Biasing Diodes Included
- No Special h_{FE} Matching of Outputs Required

CLASS B AUDIO DRIVERS
SILICON MONOLITHIC
FUNCTIONAL CIRCUITS



CASE 644A
PLASTIC PACKAGE

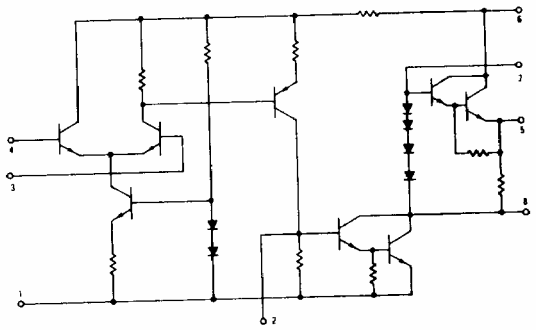
MAXIMUM RATINGS (T_A = +25°C unless otherwise noted)

Rating	Value			Unit
	MFC8020A	MFC8021A	MFC8022A	
Power Supply Voltage	35	20	45	Vdc
Power Dissipation	1.0	1.0	1.0	Watt
Derate above T_A = +25°C	10	10	10	mW/°C
Peak Output Current (pins 5 & 8)	150	150	150	mA
Operating Temperature Range	-10 to +75	-10 to +75	-10 to +75	°C
Storage Temperature Range	-55 to +125	-55 to +125	-55 to +125	°C

THERMAL CHARACTERISTICS

Characteristic	Value	Unit
Thermal Resistance	100	°C/W
Junction Temperature	125	°C

FIGURE 1 – CIRCUIT SCHEMATIC

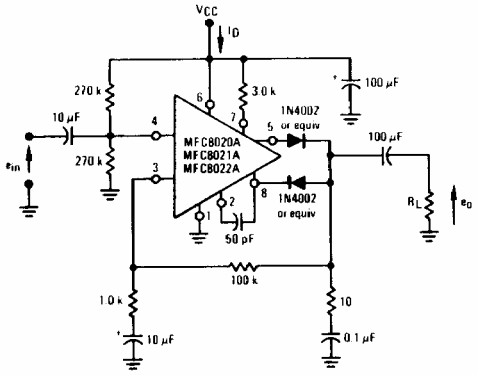


See Packaging Information Section for outline dimensions.

ELECTRICAL CHARACTERISTICS (T_A = +25°C unless otherwise noted) (See Figure 2)

Characteristic		Min	Typ	Max	Unit
Drain Current (e_{in} = 0)					mA
V_{CC} = 30 Vdc	MFC8020A	–	10	30	
V_{CC} = 14 Vdc	MFC8021A	–	7.0	30	
V_{CC} = 40 Vdc	MFC8022A	–	12	30	
Sensitivity (P_O = 1.0 Watt, f = 1.0 kHz)					mV
e_o = 8.95 V(RMS), R_L = 165 Ω	MFC8020A	–	89	112	
e_o = 3.2 V(RMS), R_L = 65 Ω	MFC8021A	–	32	40	
e_o = 12.65 V(RMS), R_L = 165 Ω	MFC8022A	–	126	160	
Total Harmonic Distortion (f = 1.0 kHz)					%
V_{CC} = 30 V, e_o = 8.95 V(RMS), R_L = 165 Ω	MFC8020A	–	0.7	5.0	
V_{CC} = 14 V, e_o = 3.2 V(RMS), R_L = 65 Ω	MFC8021A	–	1.0	5.0	
V_{CC} = 40 V, e_o = 12.65 V(RMS), R_L = 165 Ω	MFC8022A	–	1.5	5.0	
Open-Loop Gain					dB
V_{CC} = 30 V, R_L = 165 Ω	MFC8020A	–	89	–	
V_{CC} = 14 V, R_L = 65 Ω	MFC8021A	–	87	–	
V_{CC} = 40 V, R_L = 165 Ω	MFC8022A	–	90	–	
Ripple Rejection					dB
f = 60 Hz, A_v = 100, e_{in} = 0, Power Supply Ripple = 1.0 V(RMS)		–	27	–	
Equivalent Input Noise					μV
e_{in} = 0, R_S = 1.0 kΩ, BW = 100 Hz – 10 kHz		–	18	–	
Quiescent Output Voltage (e_{in} = 0)					Vdc
V_{CC} = 30 V	MFC8020A	–	15	–	
V_{CC} = 14 V	MFC8021A	–	7.0	–	
V_{CC} = 40 V	MFC8022A	–	20	–	

FIGURE 2 – TEST CIRCUIT



TYPICAL AUTO RADIO AUDIO APPLICATION and CHARACTERISTICS

(T_A = +25°C unless otherwise noted.)

FIGURE 3 – APPLICATION CIRCUIT FOR MFC8021A

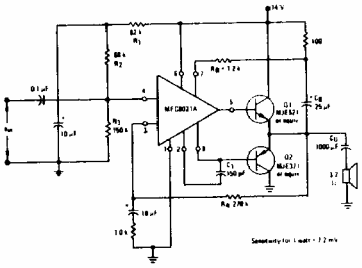


FIGURE 4 – TOTAL HARMONIC DISTORTION versus OUTPUT POWER

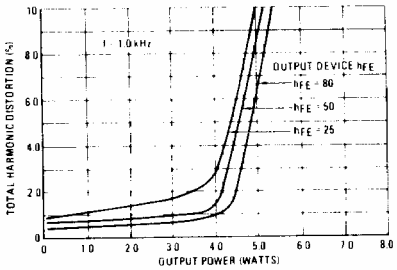


FIGURE 5 – TOTAL HARMONIC DISTORTION versus FREQUENCY

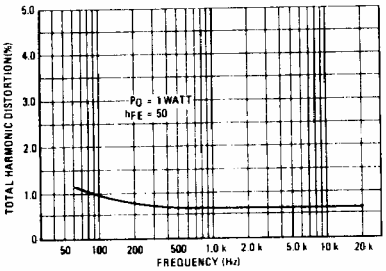
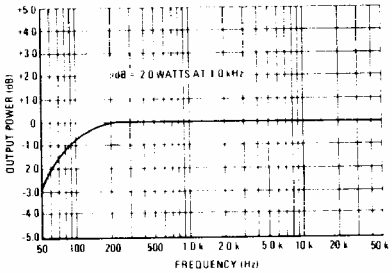


FIGURE 6 – FREQUENCY RESPONSE

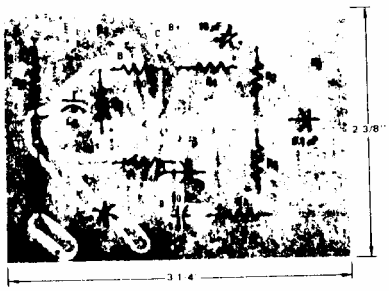


APPLICATIONS INFORMATION for MFC8021A (AUTO RADIO AUDIO)

The MFC8021A combines all the voltage gain required for an automotive radio audio amplifier into one package reducing the circuit-board area requirement. The circuit shown in Figure 3 has an input sensitivity of approximately 7.2 millivolts for a one-watt output. Sensitivity can be adjusted by changing the value of R_4. The circuit performance is a function of the output device h_{FE}, as shown in Figure 4. Figure 4 can be used to determine the minimum h_{FE} of the output transistors. The bandwidth of the amplifier is determined by the capacitor, C_1. If C_1 is increased to 390 pF the high frequency 3.0 dB point is typically 20 kHz.

An illustration of the copper side of the printed-circuit board layout is shown in Figure 7. The output transistors are mounted on the heatsink which for auto radio audio applications should have a maximum thermal resistance of 18°C/W for each device or 9.0°C/W when both output transistors are mounted on the same heatsink.

FIGURE 7 – PRINTED CIRCUIT BOARD for AUTOMOTIVE RADIO AUDIO 10 and 20 WATT AMPLIFIERS (COPPER SIDE)



TYPICAL 10-and-20 WATT AMPLIFIER APPLICATION AND CHARACTERISTICS

(T_A = +25°C unless otherwise noted.)

FIGURE 8 – APPLICATION CIRCUIT for MFC8020A and MFC8022A

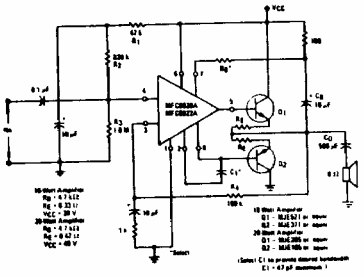


FIGURE 9 – TOTAL HARMONIC DISTORTION versus OUTPUT POWER

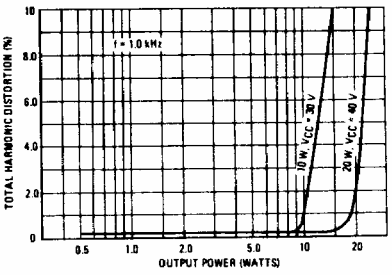


FIGURE 10 – TOTAL HARMONIC DISTORTION versus FREQUENCY

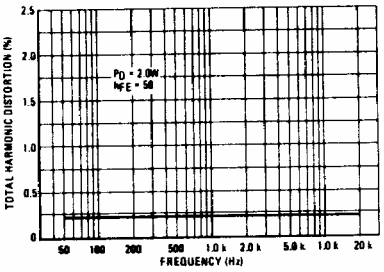
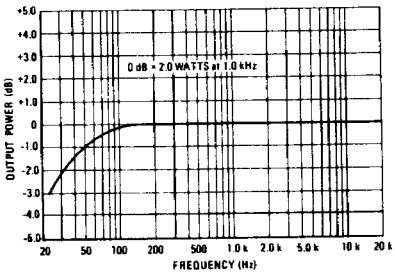


FIGURE 11 – FREQUENCY RESPONSE



APPLICATIONS INFORMATION for MFC8020A and MFC8022A (10-Watt and 20-Watt Amplifiers)

The MFC8020A and MFC8022A are high-voltage parts capable of driving 10-to-20 watt audio amplifiers. The gain of the circuit shown in Figure 8 changes when the value of R_4 is varied and the bandwidth is determined by C_1. Emitter resistors are required at the higher voltages used for 10-to-20 watt audio amplifiers to provide thermal stability. The value of R_E is a function of the heatsink thermal resistance and supply voltage. The heatsink requirements for operation at +65°C (with both devices mounted on the same heatsink) is about 14°C/W for the 10-watt amplifier and 8.0°C/W for the 20-watt amplifier. If the maximum ambient operating temperature is reduced then the heatsink can be reduced in size as calculated by

$$\theta_{SA} = \frac{T_J - (\theta_{JS})\,P_D - T_A}{P_D}$$

where

θ_{SA} = Heatsink thermal resistance

T_J = Maximum junction operating temperature

θ_{JS} = Junction to heatsink thermal resistance (includes all surface interface components for thermal resistance such as the insulating washer)

P_D = Maximum power dissipation of transistors (This occurs at about 60% of maximum output power) 6.0 W for 10 W, 7.2 W for 12 W

T_A = Maximum ambient temperature

The printed circuit board layout is shown in Figure 7.