

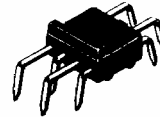
MFC8020A MFC8021A MFC8022A

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 Kiloohm 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

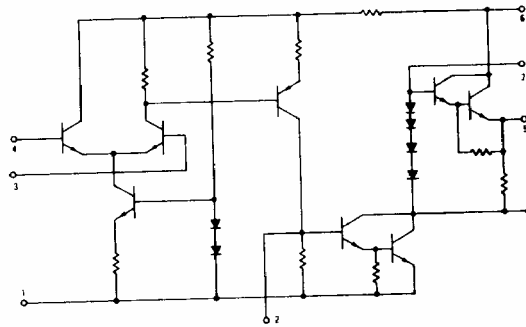
MAXIMUM RATINGS (T_A = +25°C unless otherwise noted)

Rating	MFC8020A	MFC8021A	MFC8022A	Unit
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



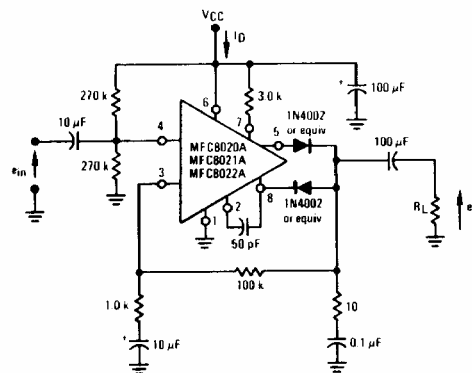
See Packaging Information Section for outline dimensions.

MFC8020A, MFC8021A, MFC8022A (continued)

ELECTRICAL CHARACTERISTICS ($T_A = +25^{\circ}\text{C}$ unless otherwise noted) (See Figure 2)

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

FIGURE 2 – TEST CIRCUIT



TYPICAL AUTO RADIO AUDIO APPLICATION and CHARACTERISTICS
($T_A = +25^\circ\text{C}$ unless otherwise noted.)

FIGURE 3 – APPLICATION CIRCUIT FOR MFC8021A

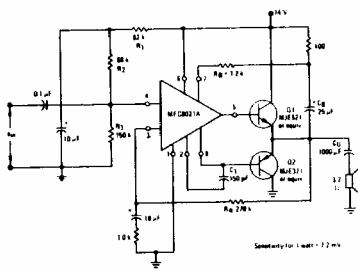


FIGURE 4 – TOTAL HARMONIC DISTORTION versus OUTPUT POWER

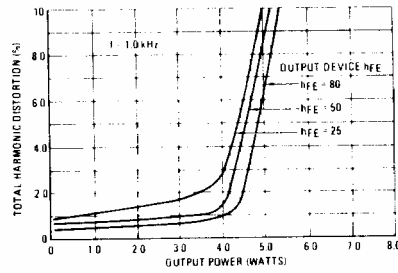


FIGURE 5 – TOTAL HARMONIC DISTORTION versus FREQUENCY

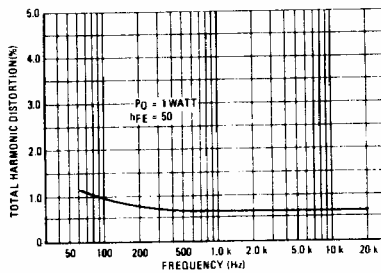
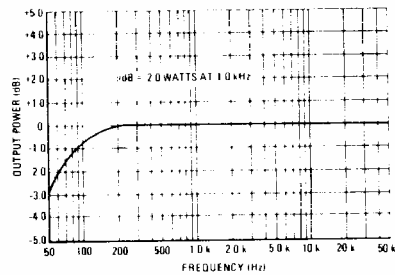


FIGURE 6 – FREQUENCY RESPONSE

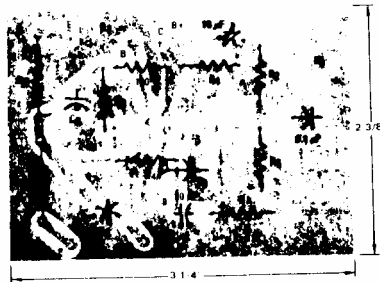


APPLICATIONS INFORMATION for MFC8021A (AUTO RADIO AUDIO)

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

[$T_A = +25^\circ\text{C}$ unless otherwise noted.]

**FIGURE 8 – APPLICATION CIRCUIT for
MEC8020A and MEC8022A**

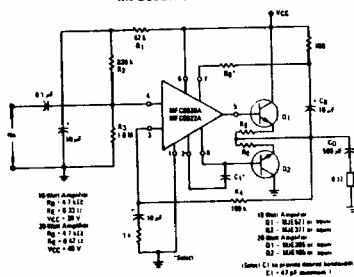
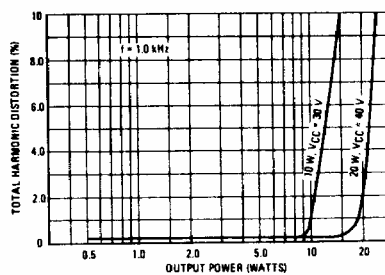


FIGURE 9 - TOTAL HARMONIC DISTORTION
VERSUS OUTPUT POWER



**FIGURE 10 - TOTAL HARMONIC DISTORTION
VERSUS FREQUENCY**

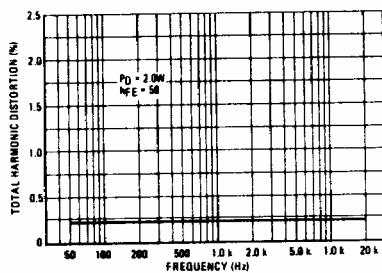
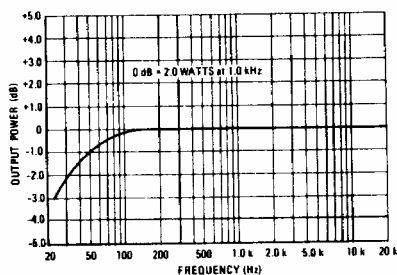


FIGURE 11 ~ FREQUENCY RESPONSE



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

The MFC8020A and MFC8032A 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_E is varied and the maximum P_{AV} 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.