CONSUMER PRODUCTS

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MC1303 L

CONSUMER PRODUCTS

MONOLITHIC DUAL STEREO PREAMPLIFIER

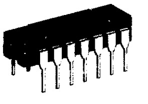
. . . designed for amplifying low-level stereo audio signals with two preamplifiers built into a single monolithic semiconductor.

Each Preamplifier Features:

- Large Output Voltage Swing – 4.0 Vrms min
- High Open-Loop Voltage Gain = 6000 min
- Channel Separation = 60 dB min at 10 kHz
- Short-Circuit-Proof Design

DUAL STEREO PREAMPLIFIER INTEGRATED CIRCUIT

MONOLITHIC SILICON EPITAXIAL PASSIVATED

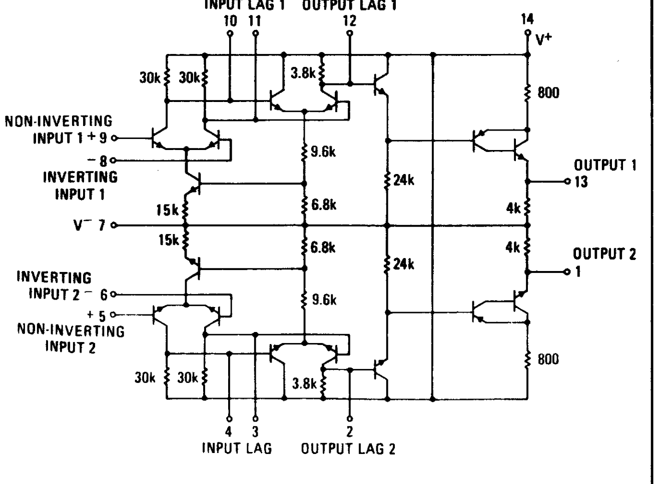


CERAMIC PACKAGE
CASE 632
TO-116

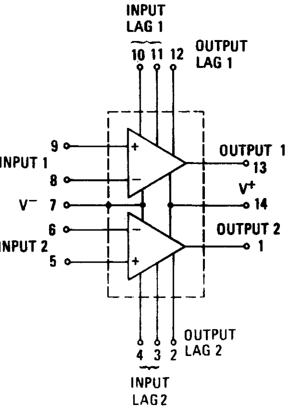
MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Power Supply Voltage	V^+ V^-	+15 -15	Vdc Vdc
Power Dissipation (Package Limitation) Derate above 25°C	P_D	625 5.0	mW mW/°C
Operating Temperature Range	T_A	0 to +75	°C

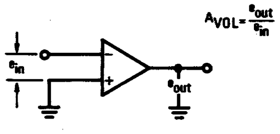
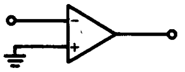
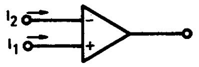
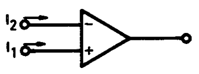
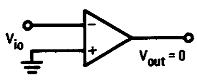
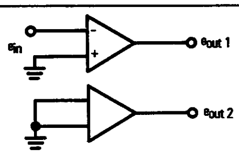
CIRCUIT SCHEMATIC



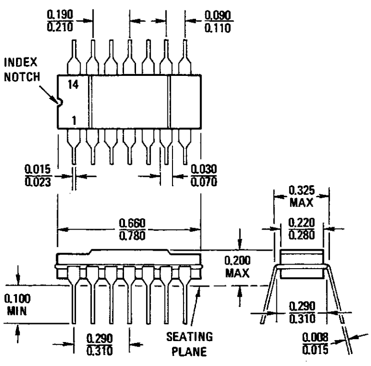
EQUIVALENT CIRCUIT



ELECTRICAL CHARACTERISTICS (Each Preamplifier) (V^+ = +13 Vdc, V^- = -13 Vdc, T_A = 25°C unless otherwise noted)

Characteristic Definitions (linear operation)	Characteristic	Symbol	Min	Typ	Max	Unit
	Open Loop Voltage Gain	A_{VOL}	6,000	10,000	-	V/V
	Output Voltage Swing (R_L = 10 kΩ)	V_{out}	4.0	5.5	-	V rms
	Input Bias Current $I_b = \frac{I_1 + I_2}{2}$	I_b	-	1.0	10	µA
	Input Offset Current ($I_{io} = I_1 - I_2$)	I_{io}	-	0.2	0.4	µA
	Input Offset Voltage	V_{io}	-	1.5	10	mV
	DC Power Dissipation (Power Supply = ±13 V, V_{out} = 0)	P_D	-	-	400	mW
	Channel Separation (f = 10 kHz)	$\frac{e_{out\ 1}}{e_{out\ 2}}$	60	70	-	dB

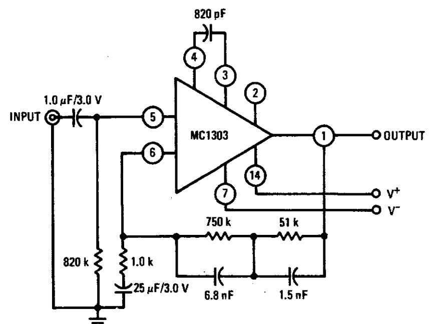
OUTLINE DIMENSIONS

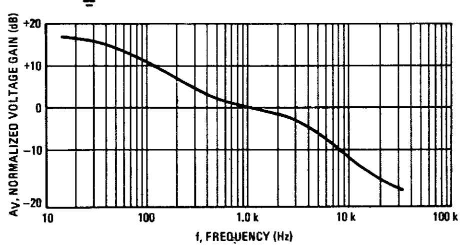


CERAMIC PACKAGE
CASE 632
TO-116

TYPICAL PREAMPLIFIER APPLICATIONS

FIGURE 1 – MAGNETIC PHONO PLAYBACK PREAMPLIFIER/RIAA EQUALIZED

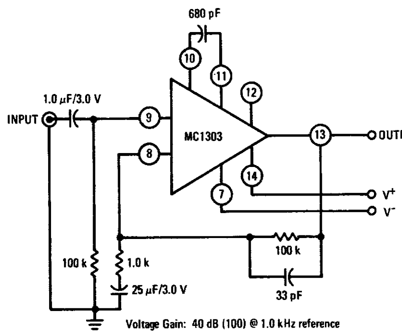




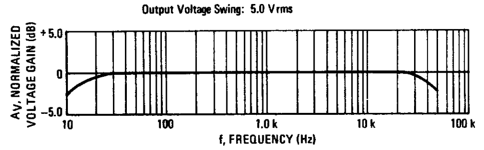
TYPICAL PERFORMANCE CHARACTERISTICS

Voltage Gain	:	34 dB (50) @ 1.0 kHz
Input Overload Point	:	100 mVrms @ 1.0 kHz
Output Voltage Swing	:	5.0 Vrms @ 1.0 kHz @ 0.1% THD.
Output Noise Level	:	Better Than 70 dB Below 10 mV Phono Input (Input Shorted)

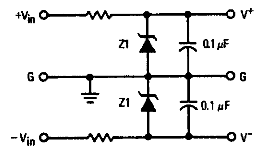
FIGURE 2 – BROADBAND AUDIO AMPLIFIER



Voltage Gain: 40 dB (100) @ 1.0 kHz reference
Output Voltage Swing: 5.0 Vrms



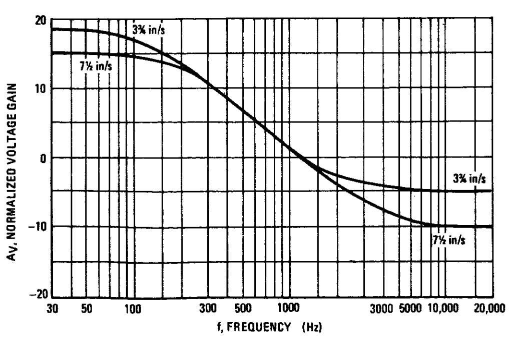
SUGGESTED POWER SUPPLY CIRCUIT

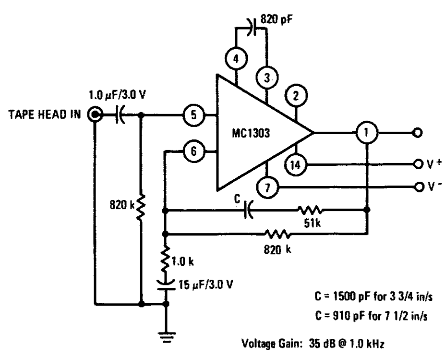


Z1 = MZ-500-19 (13 V nom.)

Select series R by allowing 11 mA for zener, and each dual I/C Preamplifier

FIGURE 3 – NAB TAPE HEAD EQUALIZATION





C = 1500 pF for 3 3/4 in/s
C = 910 pF for 7 1/2 in/s

Voltage Gain: 35 dB @ 1.0 kHz
Output Voltage Swing: 5.0 Vrms

FIGURE 4 – POWER DISSIPATION versus SUPPLY VOLTAGE

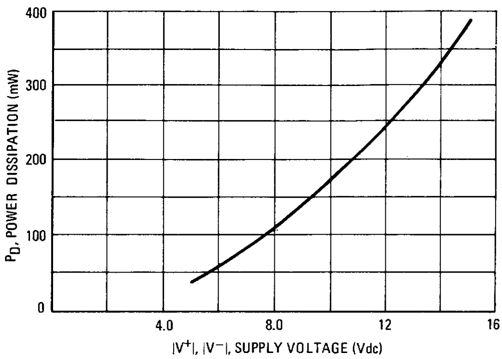


FIGURE 5 – OUTPUT LINEARITY

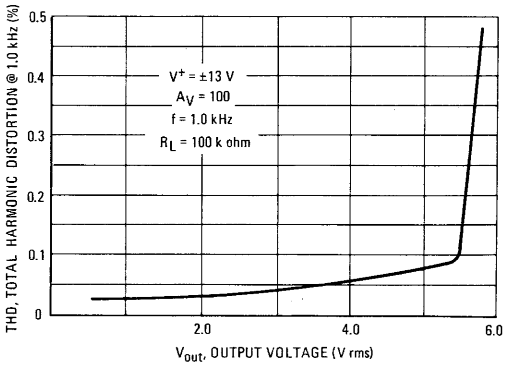
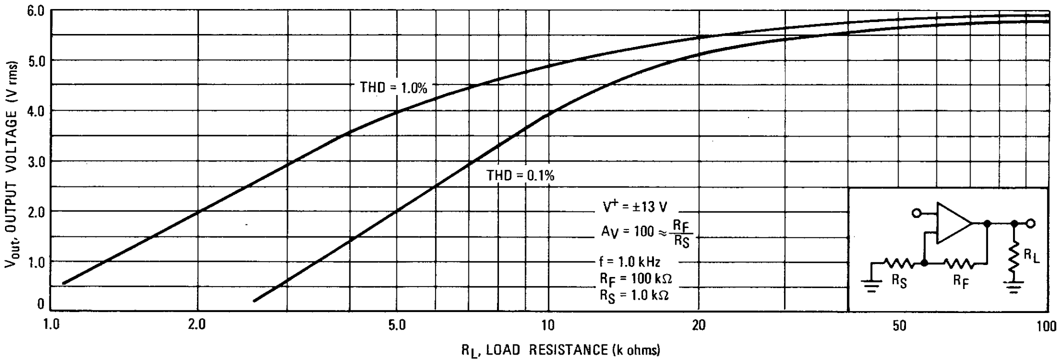


FIGURE 6 – INFLUENCE OF OUTPUT LOADING



NOISE CHARACTERISTICS

FIGURE 7A – INFLUENCE OF SOURCE RESISTANCE & BANDWIDTH

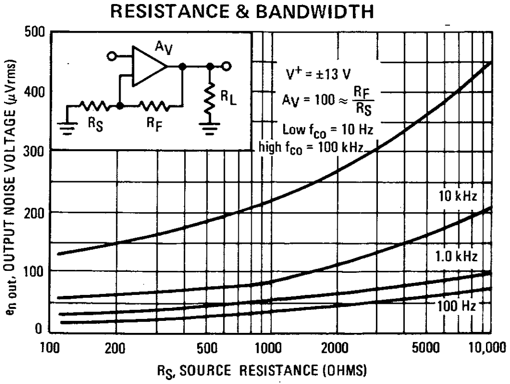
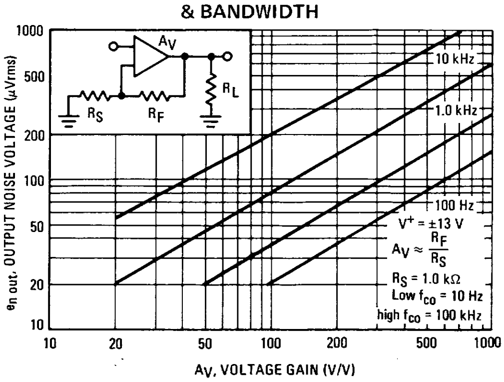


FIGURE 7B – INFLUENCE OF VOLTAGE GAIN & BANDWIDTH

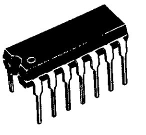


FM MULTIPLEX
STEREO DEMODULATORS

MC1304P • MC1305P

. . . derive the left and right audio information from the detected composite signal. The MC1304 eliminates the need for an external stereo-channel separation control. The MC1305 is similar to the MC1304 but permits the use of an external stereo-channel separation control for maximum separation.

- Operation Specified Over Wide Power-Supply Range, 8-14 Vdc
- Built-in Stereo-Indicator Lamp Driver
- Total Audio Muting Capability
- Automatic Switching – Stereo-Monaural
- Monaural Squelch Capability



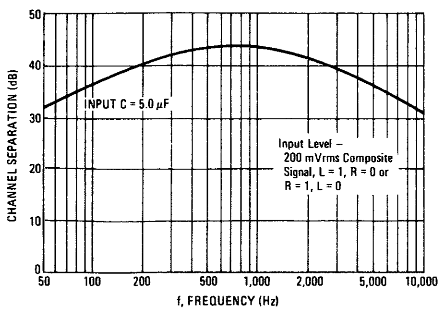
PLASTIC PACKAGE
CASE 605
TO-116

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

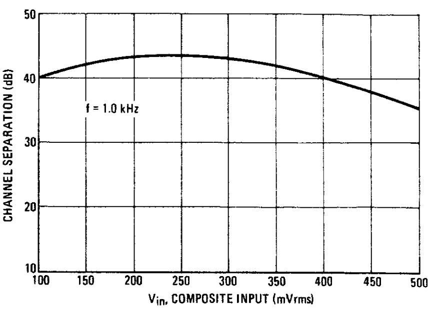
Rating	Symbol	Value	Unit
Power Supply Voltage (Pins 1, 6, 9,*11, 12) (Pin 7 is grounded)	V+	+22	Vdc
Lamp Driver Current	I_L	40	mAdc
Power Dissipation (Package Limitation)	P_D	625	mW
Derate above T_A = 25°C		5.0	mW/°C
Operating Temperature Range	T_A	0 to +75	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

*Pin 8 for MC1305

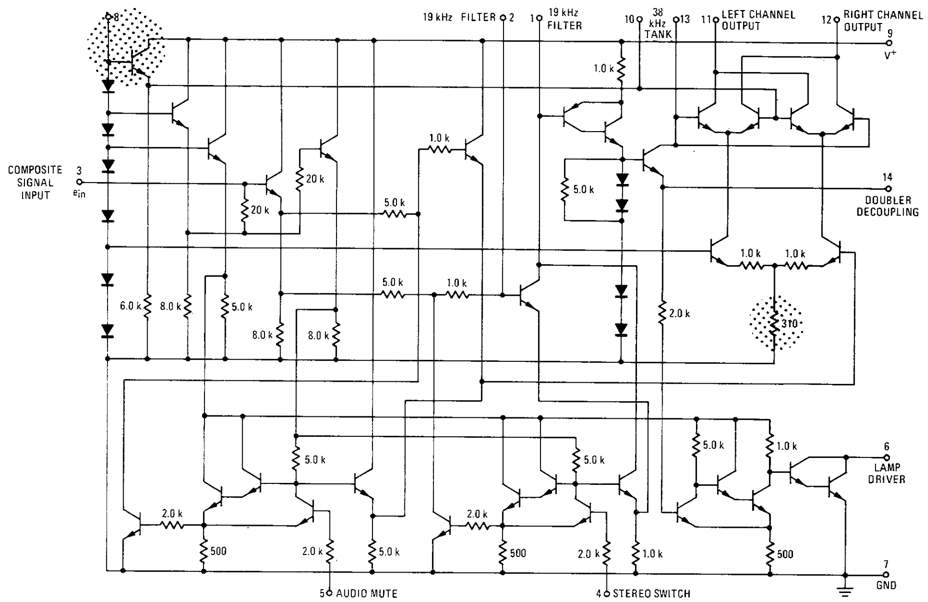
CHANNEL SEPARATION versus FREQUENCY



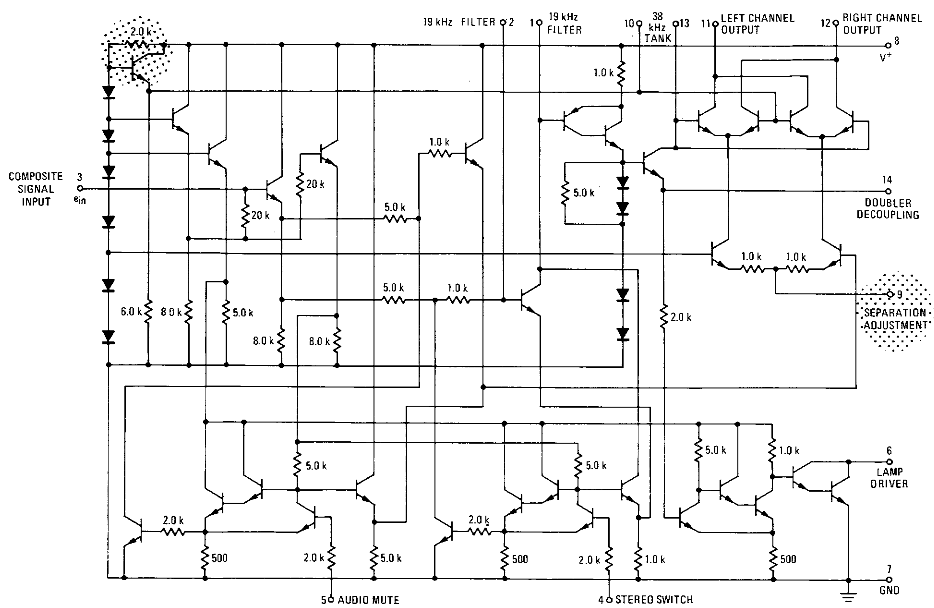
CHANNEL SEPARATION versus COMPOSITE INPUT LEVEL



MC1304 CIRCUIT SCHEMATIC



MC1305 CIRCUIT SCHEMATIC



Portions of the circuits shown within the dotted areas pertain to the MC1304 or MC1305 as indicated by the titles of the circuits.

ELECTRICAL CHARACTERISTICS [V+ = 8.0 to 14.0 Vdc, T_A = 25°C unless otherwise noted. Test made with 75 μs de-emphasis network (3.9 kΩ, 0.02 μF) unless otherwise noted].

Characteristics	Symbol	Min	Typ	Max	Unit
Input Impedance (f = 20 Hz)	Z_{in}	12	20	–	kΩ
Stereo Channel Separation (See Notes 1 and 2)					dB
(f = 100 Hz)		–	35	–	
(f = 1.0 kHz)		–	45	–	
(f = 10 kHz)		–	30	–	
Channel Balance (Monaural Input = 200 mVrms), (Monaural, Left and Right Outputs)		–	0.5	–	dB
Total Harmonic Distortion (See Notes 1 and 3) (Modulation frequency - 1.0 kHz)	THD	–	0.5	1.0	%
Ultrasonic Frequency Rejection (See Note 4)					dB
(19 kHz)		–	25	–	
(38 kHz)		–	20	–	
Inherent SCA Rejection (without filter) @ 60 kHz, 67 kHz and 74 kHz	SCA_{rej}	–	50	–	dB
Lamp Indicator (R_A = 120Ω)					mVrms
Minimum 19 kHz Input Level for lamp on		–	16	25	
Maximum 19 kHz Input Level for lamp off		5.0	14	–	
Audio Muting					
Mute on (Voltage required at pin 5)	$V_{5(on)}$	0.6	–	1.0	Vdc
Mute off (Voltage required at pin 5)	$V_{5(off)}$	1.3	–	2.0	Vdc
Attentuation in Mute Mode (Note 5)		–	55	–	dB
Stereo-Monaural Switching					Vdc
Stereo (Voltage required at pin 4)	V_{4S}	1.3	–	2.0	
Monaural (Voltage required at pin 4)	V_{4M}	0.6	–	1.0	
Power Dissipation (V+ = 10 V)	P_D				mW
(Without lamp)		–	150	–	
(With lamp)		–	180	–	

Note 1 – Measurement made with 200 mVrms Standard Multiplex Composite Signal and L = 1, R = 0 or R = 1, L = 0. Standard Multiplex Composite signal is here defined as a signal containing left and/or right audio information with a 10% (19 kHz) pilot signal in accordance with FCC regulations.

Note 2 – Stereo channel separation is adjustable for the MC1305 with a resistor from pin 9 to ground.

Note 3 – Distortion specification also applies to Monaural Signal.

Note 4 – Referenced to 1 kHz output signal with Standard Multiplex Composite Input Signal.

Note 5 – This is referenced to 1.0 kHz output signal with either Standard Multiplex Composite Signal or Monaural Input Signal.

FIGURE 1 – DISTORTION COMPONENTS IN AUDIO SIGNAL versus FREQUENCY

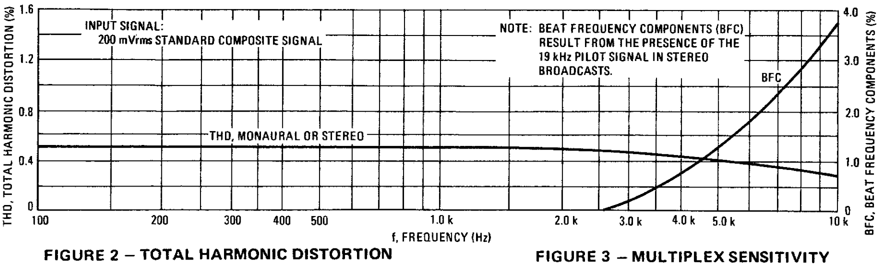


FIGURE 2 – TOTAL HARMONIC DISTORTION versus COMPOSITE INPUT LEVEL

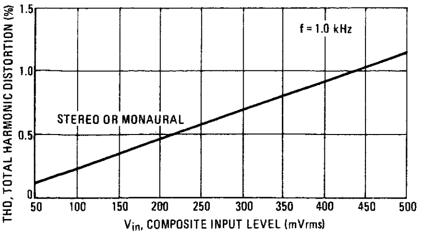
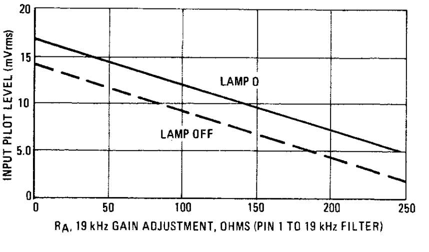
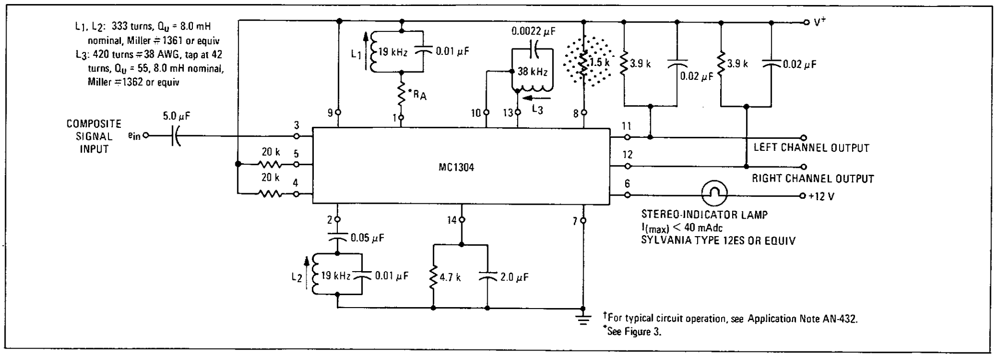


FIGURE 3 – MULTIPLEX SENSITIVITY versus 19 kHz GAIN ADJUSTMENT



MC1304 TYPICAL CIRCUIT CONFIGURATION†

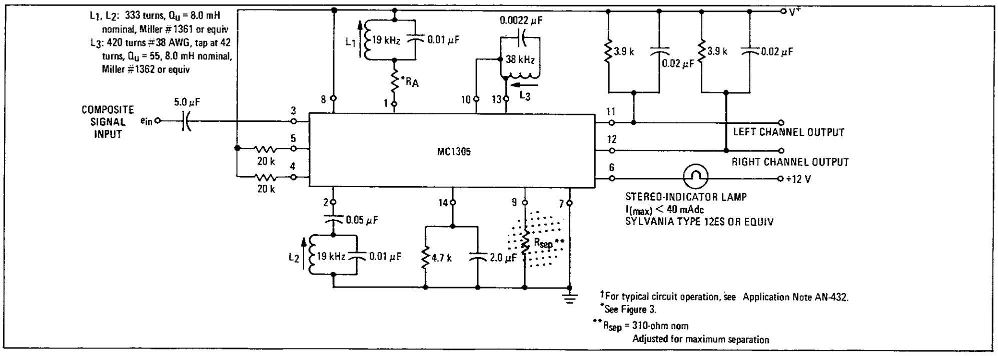


Typical dc voltages (All voltages measured with respect to ground, Pin 7, R_A = 0)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
V_{CC} = 8.5 Vdc	8.5	2.0	2.8	1.6	1.6	0.8	0	4.6*	8.5	3.9	6.3	6.3	3.9	1.9
V_{CC} = 12 Vdc	12	2.0	2.8	1.9	1.9	0.8	0	4.6**	12	3.9	9.7	9.7	3.9	1.9

*1.5 kΩ in series with pin 8
**2.7 kΩ in series with pin 8

MC1305 TYPICAL CIRCUIT CONFIGURATION†

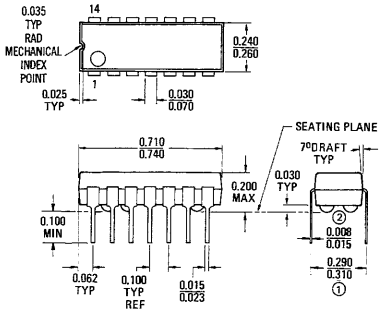


Typical dc voltages (All voltages measured with respect to ground (Pin 7)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
V_{CC} = 8.5 Vdc	8.5	2.0	2.8	1.6	1.6	0.8	0	8.5	0.32	3.9	6.3	6.3	3.9	1.9
V_{CC} = 12 Vdc	12	2.0	2.8	1.9	1.9	0.8	0	12	0.36	3.9	9.7	9.7	3.9	1.9

Portions of the circuits shown within the dotted areas pertain to the MC1304 or MC1305 as indicated by the titles of the circuits.

OUTLINE DIMENSIONS



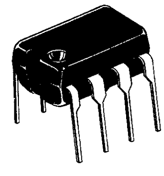
① This dimension is measured at the seating plane.
② 4 insulating stand-offs are provided.
Weight ≈ 0.911 gram

PLASTIC PACKAGE
CASE 605
TO-116

MC1306P

The MC1306 is a monolithic complementary power amplifier and preamplifier designed to deliver 1/4-Watt into a loudspeaker with a 3.0 mV(rms) input. Gain and bandwidth are externally adjustable. Typical applications include portable AM-FM radios, tape recorders, phonographs, intercoms, and general audio usages.

- ¼ - Watt Power Output (9.0 Vdc Supply, 16-Ohm Load)
- High Overall Gain – 3.0 mV(rms) Sensitivity for 1/4-Watt Output
- Low Zero-Signal Current Drain – 4.0 mAdc @ 9.0 V typ
- Low Distortion – 1.0% at 200 mW typ



PLASTIC PACKAGE
CASE 626

TYPICAL APPLICATIONS

FIGURE 1 – AM-FM RADIO, AUDIO SECTION

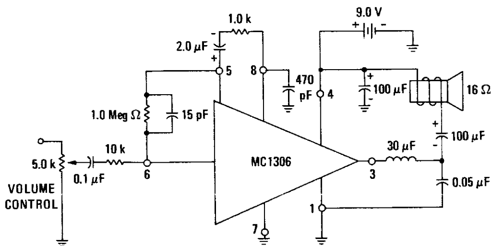
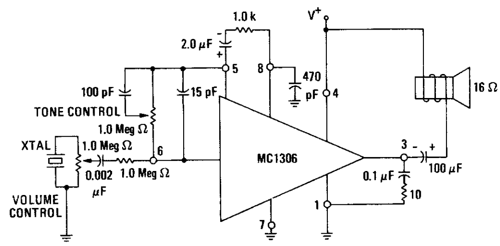
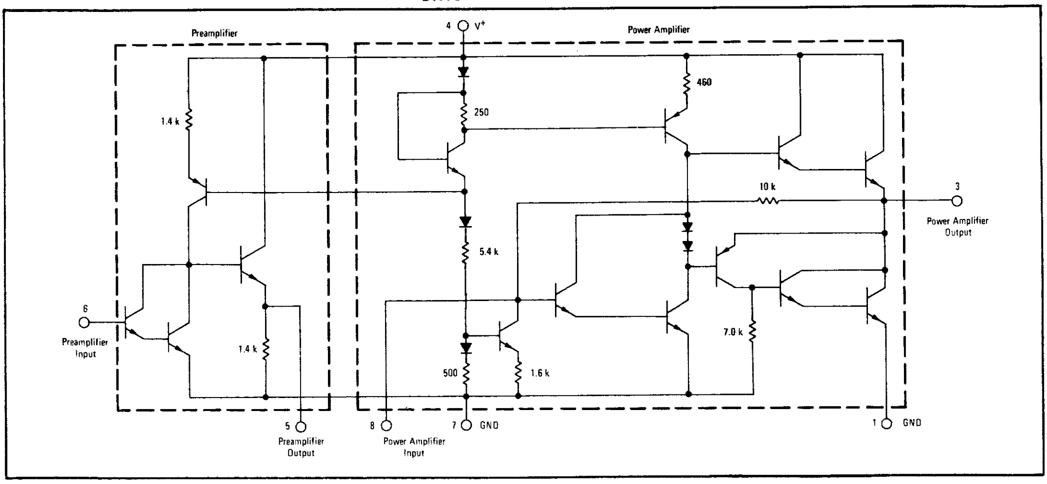


FIGURE 2 – PHONOGRAPH AMPLIFIER (CERAMIC CARTRIDGE)



CIRCUIT SCHEMATIC



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

Rating	Symbol	Value	Unit
Power Supply Voltage	V^+	12	Vdc
Load Current	I_L	400	mAdc
Power Dissipation (Package Limitation) T_A = +25°C Derate above T_A = +25°C	P_D $1/\theta_{JA}$	 625 5.0	 mW mW/°C
Operating Temperature Range	T_A	0 to +75	°C
Storage Temperature Range	T_{stg}	-65 to +125	°C

ELECTRICAL CHARACTERISTICS (V^+ = 9.0 V, R_L = 16 ohms, f = 1.0 kHz, (using test circuit of Figure 3), T_A = +25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Open Loop Voltage Gain Pre-amplifier (R_L = 1.0 k ohm) Power-amplifier (R_L = 16 ohms)	A_{VOL}	 – –	 270 360	 – –	V/V
Sensitivity (P_o = 250 mW)	S	–	3.0	–	mV(rms)
Output Impedance (Power-amplifier)	Z_o	–	0.5	–	Ohm
Signal to Noise Ratio (P_o = 150 mW, f = 300 Hz to 10 kHz)	S/N	–	55	–	dB
Total Harmonic Distortion (P_o = 200 mW)	THD	–	1.0	–	%
Quiescent Output Voltage	V_o	–	$V^+/2$	–	Vdc
Power Output (THD ≤ 10%)	P_o	200	250	–	mW
Current Drain (zero signal)	I_D	–	4.0	–	mA
Power Dissipation (zero signal)	P_D	–	36	–	mW

FIGURE 3 – TEST CIRCUIT

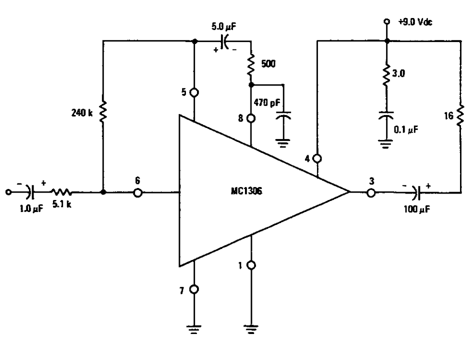
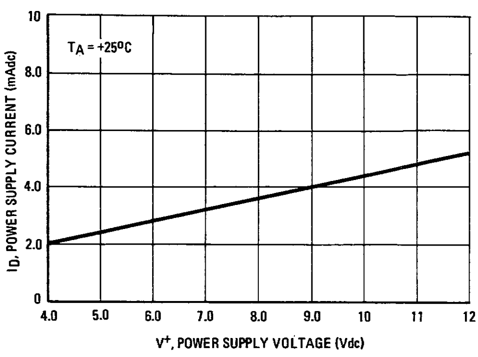


FIGURE 4 – ZERO SIGNAL BIAS CURRENT



TYPICAL CHARACTERISTICS

(V^+ = 9.0 V, f = 1.0 kHz, T_A = +25°C unless otherwise noted)

FIGURE 5 – EFFICIENCY versus POWER SUPPLY VOLTAGE

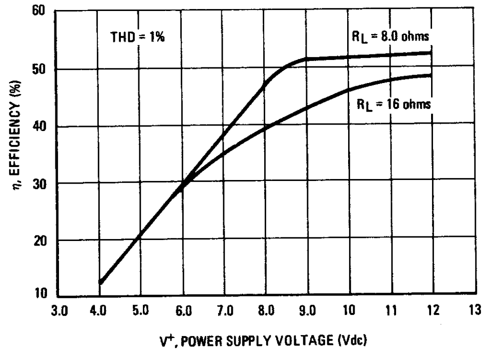


FIGURE 6 – OUTPUT POWER versus POWER SUPPLY VOLTAGE

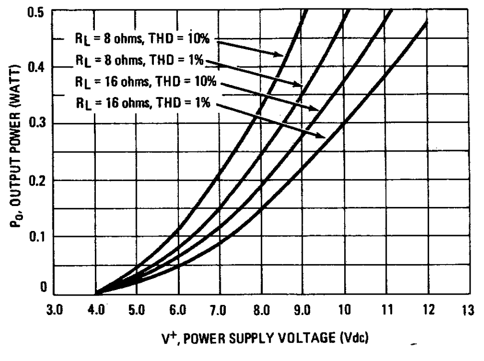


FIGURE 7 – TOTAL HARMONIC DISTORTION versus FREQUENCY

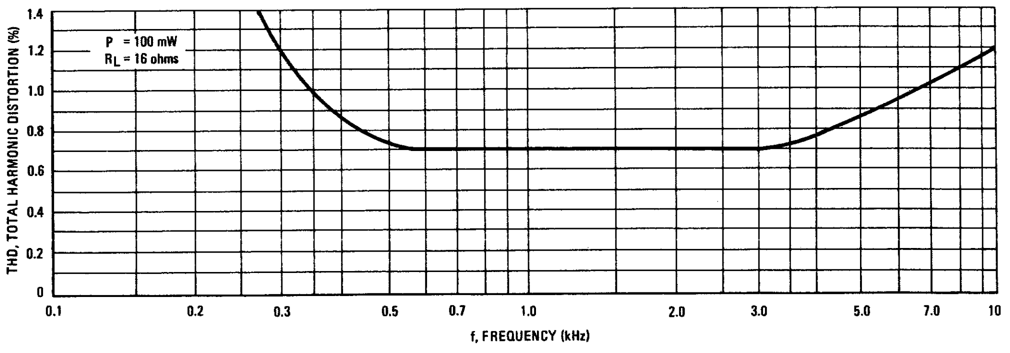


FIGURE 8 – EFFECT OF BATTERY AGING ON LOW-LEVEL DISTORTION

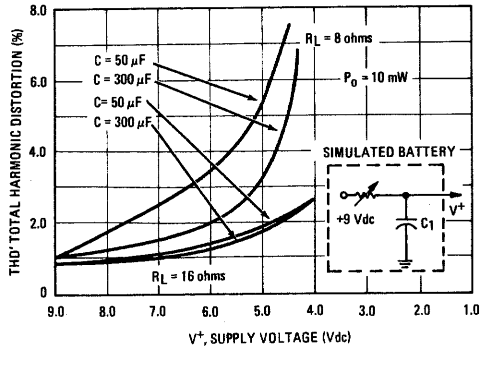


FIGURE 9 – DISTORTION versus POWER OUTPUT

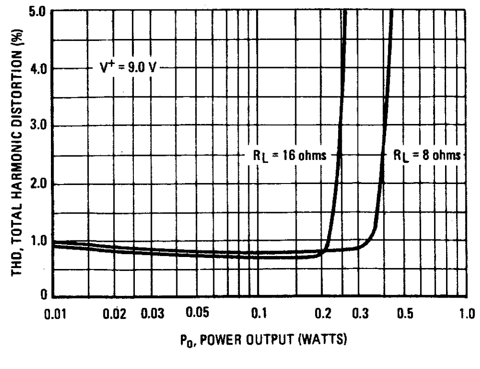
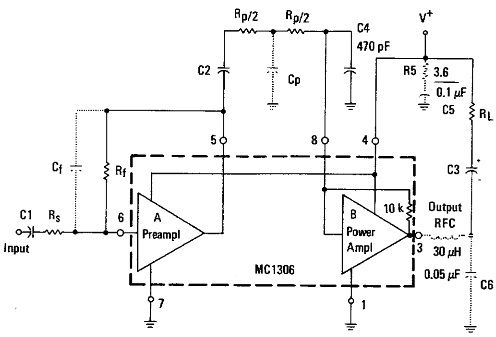
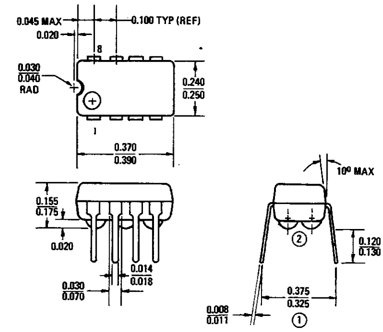


FIGURE 10 – TYPICAL CIRCUIT CONNECTION



OUTLINE DIMENSIONS



① This dimension is measured at the seating plane.
② Four insulating stand-offs are provided.

Weight ≈ 0.446 gram

CASE 626
PLASTIC PACKAGE

DESIGN CONSIDERATIONS

The MC1306P provides the designer with a means to control preamplifier gain, power amplifier gain, input impedance, and frequency response. The following relationship will serve as a guide.

1. Gain

The Preamplifier Stage Voltage Gain is:

$$A_{VA} \approx \frac{R_f}{R_s}$$

and is limited only by the open-loop gain (270 V/V). For good preamplifier dc stability R_f should be no larger than 1.0-megohm.

The Power Amplifier Voltage Gain is controlled in a similar manner where:

$$A_{VB} \approx \frac{10\text{ k}}{R_p}$$

The 10-k ohm feedback resistor is provided in the integrated circuit.

Recommended values of R_p range from 500-ohms to 3.3-k ohms. The low end is limited primarily by low-level distortion and the upper end is limited due to the voltage drive capabilities of the pre-amplifier. (A resistor can be added in the dc feedback loop, from pin 6 to ground, to increase this drive): The Overall Voltage Gain, then, is:

$$A_{VT} = \frac{R_f\ 10\text{ k}}{R_s\ R_p}$$

2. Input Impedance

The Preamplifier Input Impedance is:

$$Z_{in\,A} \approx R_s$$

and the Power Amplifier Input Impedance is:

$$Z_{in\,B} \approx R_p$$

3. Frequency Response

The low frequency response is controlled by the cumulative effect of the series coupling capacitors C1, C2, and C3. High-frequency response can be determined by the feedback capacitor, C_f, and the –3.0 dB point occurs when

$$X_{C_f} = R_f$$

Additional high frequency roll-off and noise reduction can be achieved by placing a capacitor from the center point of R_p to ground as shown in Figure 10.

Capacitor C4 and the RC network shown in dotted lines may be needed to prevent high frequency parasitic oscillations. The RF choke, shown in series with the output, and capacitor C6 are used to prevent the high-frequency components in a large-signal clipped audio output waveform from radiating into the RF or IF sections of a radio (Figure 10).

4. Battery Operation

The increase of battery resistance with age has two undesirable effects on circuit performance. One effect is the increasing of amplifier distortion at low signal levels. This is readily corrected by increasing the size of the filter capacitor placed across the battery (as shown in Figure 8; a 300-µF filter capacitor gives distortions at low-tonal levels that are comparable to the "stiff" supply). The second effect of supply impedance is a lowering of power output capability for steady signals. This condition is not correctable, but is of questionable importance for music and voice signals.

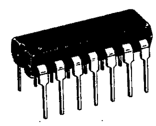
5. Application Examples: (1) The audio section of the AM-FM radio (Figure 1) is adjusted for a preamplifier gain of 100 with an input impedance of 10-k ohms. The power amplifier gain is set at 10, which gives an overall voltage gain of 1000. The bandwidth has been set at 10-kHz. (2) The phono amplifier (Figure 2) is designed for a preamplifier gain of unity and a power amplifier gain of 10. The input impedance is 1.0-megohm. An adjustable treble control is provided within the feedback loop.

DUAL CHROMA
DEMODULATOR

CONSUMER PRODUCTS

MC1325P

. . . designed for color TV, requiring only the chroma signal and two phases of reference to provide low impedance signals to drive the R-Y, G-Y, B-Y output stages directly.

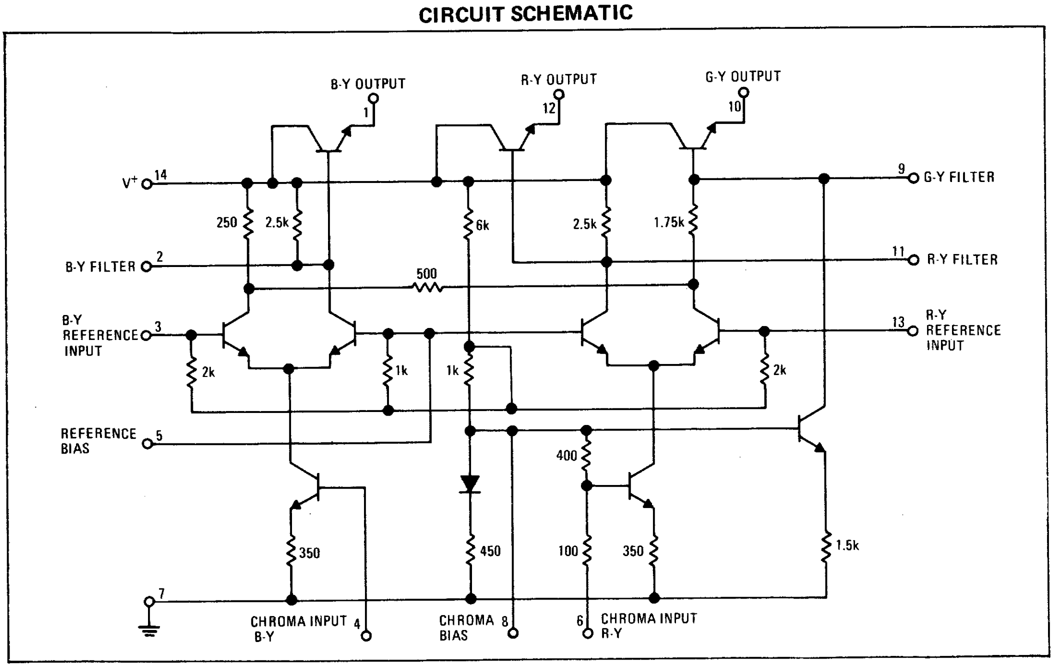


P SUFFIX
PLASTIC PACKAGE
CASE 605
TO-116

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

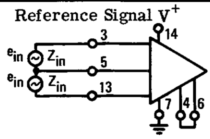
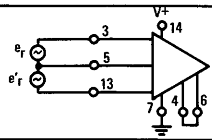
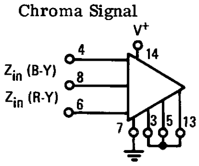
Rating	Symbol	Value	Unit
Power Supply Voltage	V^+	+24	Vdc
Reference Signal Input	e_r, e'_r	12	V_{p-p}
Output Current	I_{out}	30	mA
Chroma Signal Input	e_c	8.0	V_{p-p}
Power Dissipation (Package Limitation) Derate above T_A = 25°C	P_D	625 5.0	mW mW/°C
Operating Temperature Range	T_A	0 to +70	°C

CIRCUIT SCHEMATIC



ELECTRICAL CHARACTERISTICS

($V^+ = +20Vdc$, $T_A = 25°C$ unless otherwise noted)

Characteristic Definitions	Characteristic	Symbol	Min	Typ	Max	Unit
	Large-Signal Input Impedance ($e_{in} > 6\ V_{p-p}$)	Z_{in}	-	2.3	-	k Ohms
	Recommended Reference Voltage Range	e_r e'_r	- -	2.0-10 2.0-10	- -	V_{p-p}
Chroma Signal 	Input Impedance (B-Y Demodulator, pin 4)	$Z_{in(B-Y)}$	10	35	-	k Ohms
	Input Impedance (R-Y Demodulator, pin 6)	$Z_{in(R-Y)}$	-	500	-	Ohms
	Undistorted Output (R-Y or B-Y)		-	4.0	-	V_{p-p}
	Chroma Signal (NTSC Test Pattern) for 4.0 V_{p-p}(R-Y, B-Y)		-	3.5	-	V_{p-p}
	Output Impedance (f = 1.0 kHz at pins 1, 10,12)	Z_{out}	-	-	100	Ohms
	Output Impedance (f = 1.0 kHz at pins 2, 9, 11)	Z_{out}	-	2.5	-	k Ohms
	DC Conditions: Supply Current	I_{dc}	-	12	20	mA
	Output Voltage (Quiescent)	V_{out}	14.5	15.5	16.5	V

MATRIX

An internal resistor matrix produces the G-Y signal from B-Y and R-Y such that:

$$E_{G-Y} = -0.3\ E_{R-Y}\ -0.1\ E_{B-Y}$$

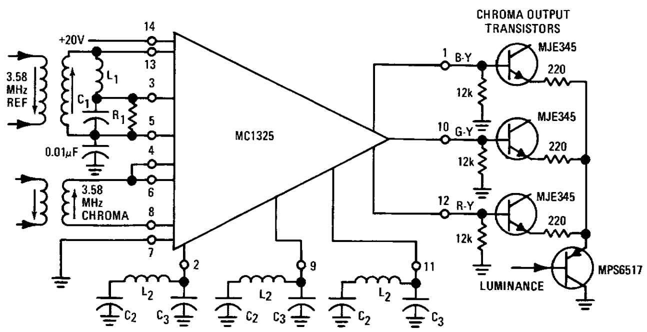
Tolerance on this matrix is ± 3.0%.

If pins 4 and 6 are connected together, the ratio of R-Y to B-Y is fixed.

$$|R-Y| = 0.8\ |B-Y|$$

Tolerance on this matrix is ± 5.0%.

RECOMMENDED APPLICATION *



L_1, C_1, R_1 selected for 105° phase shift between R-Y and B-Y reference phases.

L_2, C_2 selected to resonate at 3.58 MHz, and C_3 selected to give roll-off in frequency response with 2.5k ohms output impedance.

L_1 = 30µH	C_1 = 82pF	R_1 = 680Ω
L_2 = 47 µH	C_2 = 39pF	C_3 = 100 pF

*See Application Note AN-430.

MC1335P

FM RADIO OR COLOR TV TUNING INDICATOR

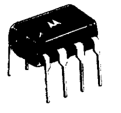
. . . a monolithic circuit designed to function as a tuning indicator for FM radios and a fine tuning indicator for color TV sets.

TYPICAL FEATURES INCLUDE:

- Very sharp positive tuning to eliminate error
- Cost and space saving over conventional tuning meters
- Low standby current – 5.5 mA typical

FM RADIO OR COLOR TV TUNING INDICATOR

MONOLITHIC SILICON EPITAXIAL PASSIVATED

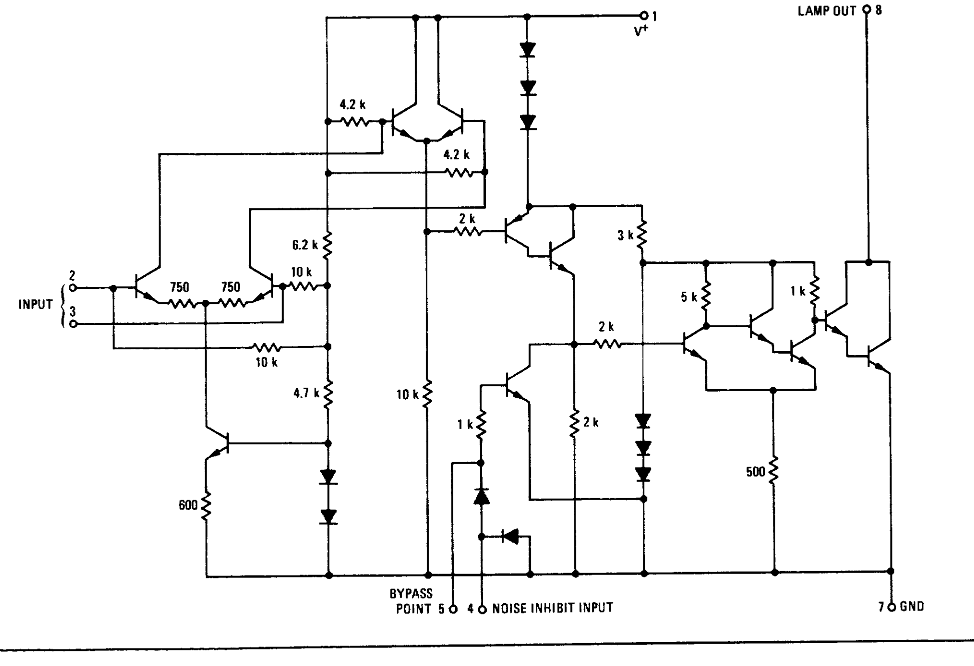


PLASTIC PACKAGE
CASE 626

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

Rating	Symbol	Value	Unit
Power Supply Voltage	V^+	20	Vdc
Maximum Current to Pin 8	$I_{8(max)}$	40	mA
Power Dissipation (Package Limitation)	P_D	625	mW
Derate above T_A = +25°C	$1/\theta_{JA}$	5.0	mW/°C
Operating Temperature Range	T_A	0 to +75	°C

FIGURE 1 – CIRCUIT SCHEMATIC

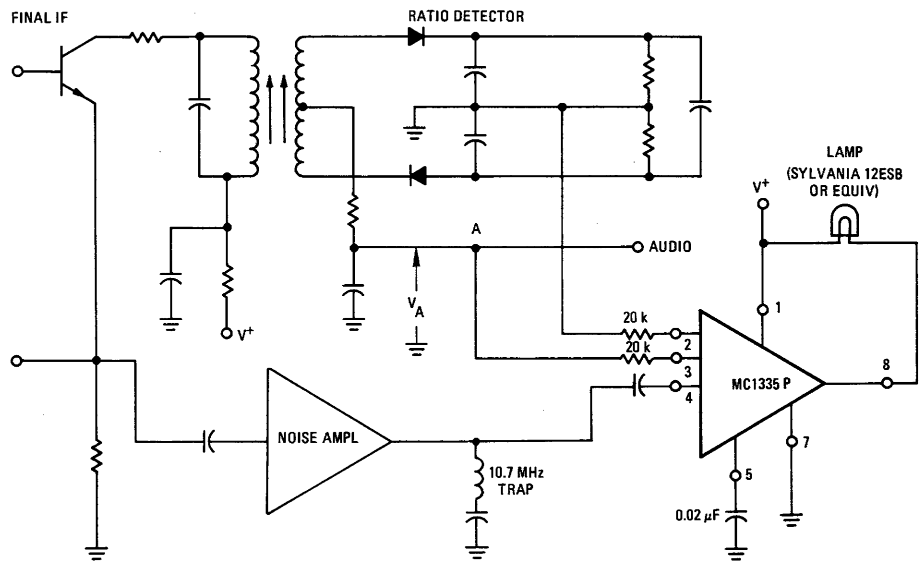


ELECTRICAL CHARACTERISTICS (T_A = +25°C unless otherwise noted, V^+ = 12 V)

Characteristic	Symbol	Min	Typ	Max	Unit
Drain Current (Lamp Off)	I_D	4.0	5.5	8.0	mA
Saturation Voltage	V_{sat}	–	0.85	1.3	Vdc
Noise Inhibit (Lamp Off*)	NI	1.7	1.9	–	Vdc
Threshold (See Figure 2)	V_A				Vdc
Lamp On		≥5.8	–	≤6.2	
Lamp Off		≤5.1	–	≥6.9	

*Applied to pin 4

FIGURE 2 – TYPICAL FM RADIO TUNING INDICATOR APPLICATION



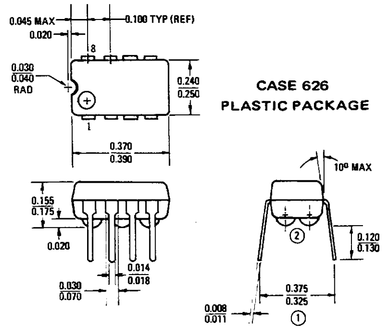
APPLICATIONS INFORMATION

The MC1335P is used to light a lamp when an FM receiver is correctly tuned. The three conditions of receiver operation that determine the response of the MC1335P indicator lamp are:

1. Lamp "ON" – The voltage developed at the input (Pins 2 and 3) is equal when the receiver is correctly tuned to the center of the incoming station.
2. Lamp "OFF" – Unequal voltages are present at the input (Pins 2 and 3); the receiver is not tuned correctly to the center of the incoming signal.
3. Lamp "EXTINGUISHED" – Noise voltage is supplied from the IF amplifier to the noise inhibitor (Pin 4) when the receiver is not tuned to a station and only noise is present at the receiver output.

Note: Voltages to satisfy conditions 1 and 2 are normally available from discriminator and ratio detector circuits. To satisfy condition 3, a noise amplifier normally is used, (See Figure 2).

CASE DIMENSIONS



CASE 626
PLASTIC PACKAGE

① This dimension is measured at the seating plane.
② Four insulating stand-offs are provided. Weight ≈ 0.446 gram

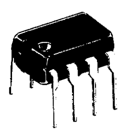
MONOLITHIC IF AMPLIFIER

. . . an integrated circuit featuring wide range AGC for use as an IF amplifier in radio and TV over the temperature range 0 to +75°C. The MC1352 is similar in design but has a keyed-AGC amplifier as an integral part of the same chip.

- Power Gain – 50 dB typ at 45 MHz
- AGC Range – 60 dB min, dc to 45 MHz
- Nearly Constant Input and Output Admittance Over the Entire AGC Range
- y_{21} Constant (-3.0 dB) to 90 MHz
- Low Reverse Transfer Admittance – << 1.0 μmho typ
- 12-Volt Operation, Single-Polarity Power Supply

IF AMPLIFIER INTEGRATED CIRCUIT

MONOLITHIC SILICON EPITAXIAL PASSIVATED



PLASTIC PACKAGE
CASE 626

FIGURE 1 – TYPICAL GAIN REDUCTION

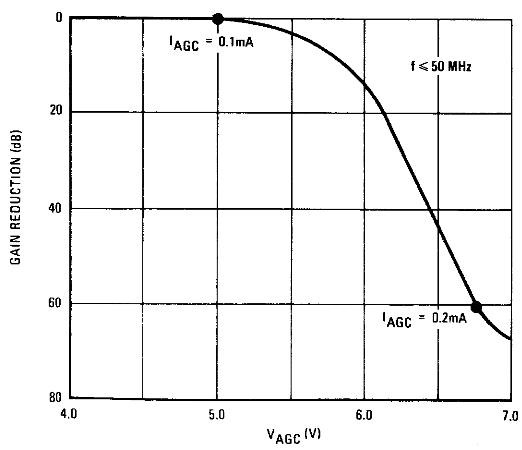
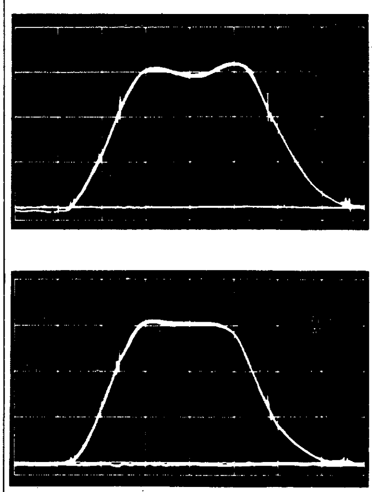


FIGURE 2 –

IF Response versus AGC



Vertical Scale = 1.0 Vdc/cm
Horizontal Scale = 1.0 MHz/cm
Markers: 41.25, 41.67, 42.17, 42.67, 45.75, and 47.25 MHz

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

Rating	Symbol	Value	Unit
Power Supply Voltage	V^+	+18	Vdc
Output Supply	V_1, V_8	+18	Vdc
AGC Supply	V_{AGC}	V^+	Vdc
Differential Input Voltage	V_{in}	5.0	Vdc
Power Dissipation (Package Limitation) Plastic Package Derate above 25°C	P_D	 625 5.0	 mW mW/°C
Operating Temperature Range	T_A	0 to +75	°C

ELECTRICAL CHARACTERISTICS (V^+ = +12 Vdc; T_A = +25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
AGC Range, 45 MHz (5.0 V to 7.0 V) (Figure 1)		60	68	–	dB
Power Gain V_{AGC} = 5.0 Vdc f = 45 MHz, BW = 4.5 MHz f = 10.7 MHz, BW = 350 kHz f = 455 kHz, BW = 20 kHz	A_p	 46 – –	 50 58 62	 – – –	dB
Noise Figure, f = 60 MHz, R_s = 50 ohms	N_f	–	9.0	–	dB
Maximum Differential Voltage Swing 0 dB AGC –30 dB AGC	V_o	 – –	 20 8.0	 – –	V_{p-p}
Output Stage Current (Pins 1 and 8)	$I_1 + I_8$	–	5.6	–	mA
Total Supply Current (Pins 1, 2 and 8)	I_S	–	14	17	mAdc
Power Dissipation	P_D	–	168	204	mW

DESIGN PARAMETERS, Typical Values (V+ = +12 Vdc, T_A = +25°C unless otherwise noted)

Parameter	Symbol	Frequency			Unit
		455 kHz	10.7 MHz	45 MHz	
Single-Ended Input Admittance	g_{11} b_{11}	0.31 0.022	0.36 0.50	0.39 2.30	mmhos
Input Admittance Variations with AGC (0 to 60 dB)	Δg_{11} Δb_{11}	– –	– –	60 0	μmhos
Differential Output Admittance	g_{22} b_{22}	4.0 3.0	4.4 78	69 300	μmhos
Output Admittance Variations with AGC (0 to 60 dB)	Δg_{22} Δb_{22}	– –	– –	4.0 90	μmhos
Reverse Transfer Admittance (Magnitude)	$\|y_{12}\|$	<<1.0	<<1.0	<<1.0	μmho
Forward Transfer Admittance Magnitude Angle (0 dB AGC) Angle (–30 dB AGC)	 $\|y_{21}\|$ $< y_{21}$ $< y_{21}$	 160 -5.0 -3.0	 160 -20 -15	 200 -80 -69	 mmhos degrees degrees
Single-Ended Input Capacitance	C_{in}	7.2	7.2	8.1	pF
Differential Output Capacitance	C_o	1.2	1.2	1.3	pF

GENERAL OPERATING INFORMATION

The input amplifiers (Q1 and Q2) operate at constant emitter currents so that input impedance remains independent of AGC action. Input signals may be applied single-ended or differentially (for ac) with identical results. Terminals 4 and 6 may be driven from a transformer, but a dc path from either terminal to ground is not permitted.

AGC action occurs as a result of an increasing voltage on the base of Q4 and Q5 causing these transistors to conduct more heavily thereby shunting signal current from the interstage amplifiers Q3 and Q6. The output amplifiers are supplied from an active current source to maintain constant quiescent bias thereby holding output admittance nearly constant. Collector voltage for the output amplifier must be supplied through a center-tapped tuning coil to Pins 1 and 8. The 12-volt supply (V^+) at Pin 2 may be used for this purpose, but output admittance remains more nearly constant if a separate 15-volt supply (V^{++}) is used, because the base voltage on the output amplifier varies with AGC bias.

FIGURE 3 – CIRCUIT SCHEMATIC

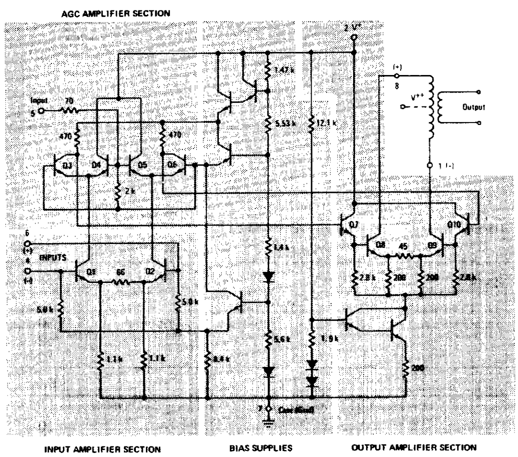


FIGURE 4 – AGC TEST CIRCUIT

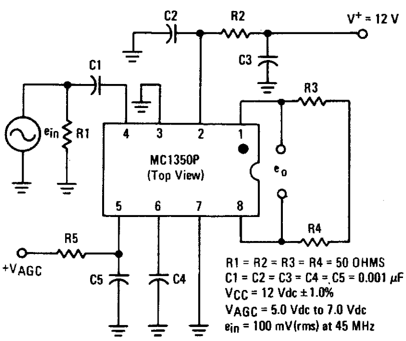


FIGURE 5 – POWER GAIN TEST CIRCUIT

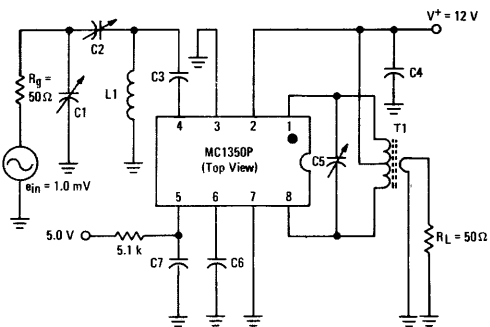


FIGURE 6 – COMPONENT VALUES FOR TEST CIRCUIT

Component	Frequency		
	455 kHz	10.7 MHz	45 MHz
C1	–	80–450 pF	9.0–35 pF
C2	–	5.0–80* pF	2.0–8.0 pF
C3	0.05 μF	0.001 μF	0.001 μF
C4	0.05 μF	0.05 μF	0.001 μF
C5	0.001 μF	36 pF	1.0–5.0 pF
C6	0.05 μF	0.05 μF	0.001 μF
C7	0.05 μF	0.05 μF	0.001 μF
L1	–	4.6 μH*	0.8 μH
T1	Note 1	Note 2	Note 3

*Circuit positions of L1 and C2 are interchanged.

Note 1. Primary: 120 μH (center-tapped)
Q_u = 140 at 455 kHz
Primary: Secondary turns ratio ≈ 13

Note 2. Primary: 6.0 μH
Primary winding = 24 turns #36 AWG (close-wound on 1/4" dia. form)
Core = Arnold Type TH or equiv.
Secondary winding = 1-1/2 turns #36 AWG, 1/4" dia. (wound over center-tap)

Note 3. Primary winding = 18 turns #22 AWG (center-tapped)
Secondary winding = 1 turn #22 AWG (over-wound at center of primary)

y PARAMETERS AND GAIN versus FREQUENCY
(V^+ = 12 V, V_{AGC} = 5.0 V, T_A = +25°C)

FIGURE 7 – INPUT ADMITTANCE

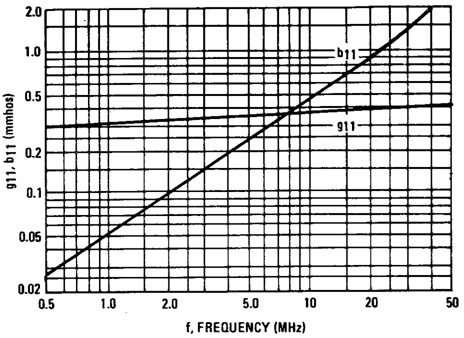


FIGURE 8 – FORWARD TRANSFER ADMITTANCE

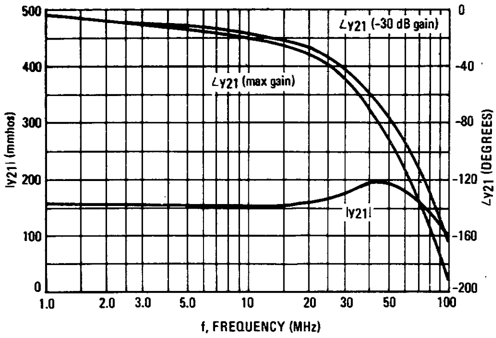


FIGURE 9 – DIFFERENTIAL OUTPUT ADMITTANCE

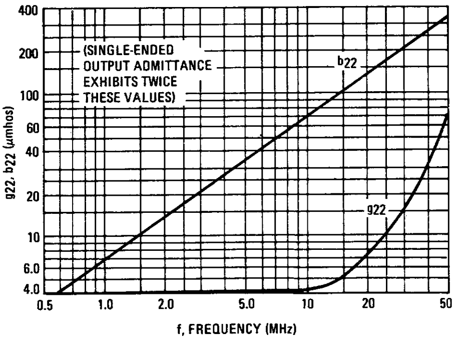


FIGURE 10 – MAXIMUM AVAILABLE GAIN

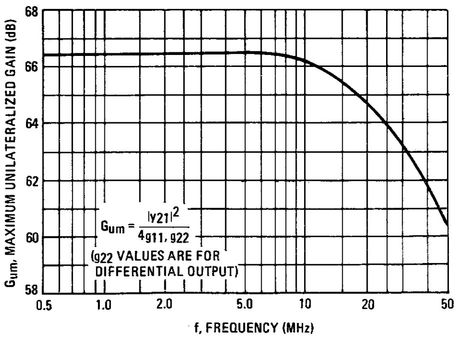
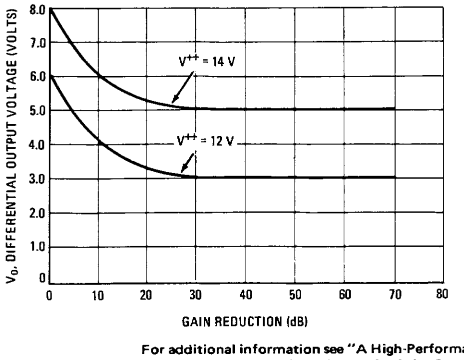
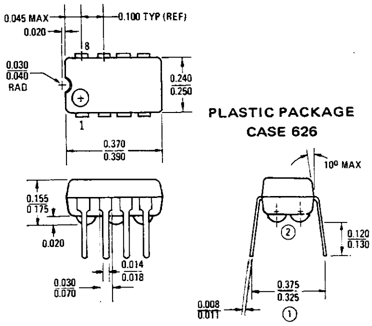


FIGURE 11 – DIFFERENTIAL OUTPUT VOLTAGE



For additional information see "A High-Performance Monolithic IF Amplifier Incorporating Electronic Gain Control", by W. R. Davis and J. E. Solomon, IEEE Journal on Solid State Circuits, December 1968.

OUTLINE DIMENSIONS



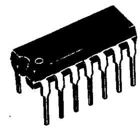
PLASTIC PACKAGE
CASE 626

① This dimension is measured at the seating plane
② Four insulating stand-offs are provided. Weight ≈ 0.446 gram.

MC1351P

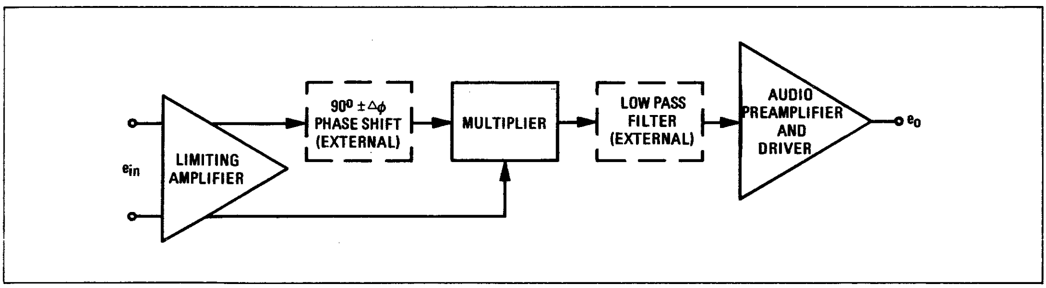
A wide-band FM-amplifier designed for IF limiting, detection, audio preamplifier and driver for the sound portion of a TV receiver.

- Excellent Limiting with 80 μVrms Input Signal
- Large Output-Voltage Swing – to 3.0 Vrms
- High IF Voltage Gain – 65 dB typ
- Zener Power-Supply Regulation Built-In
- Short-Circuit Protection
- A Coincidence Discriminator that Requires Only One RLC Phase Shift Network
- Preamplifier to Drive a Single External-Transistor Class-A Audio-Output Stage

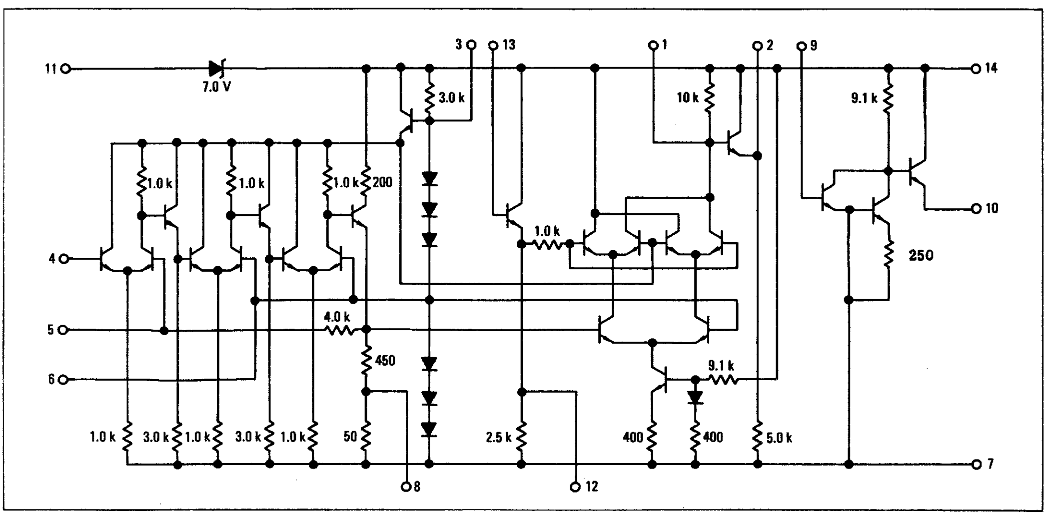


PLASTIC PACKAGE
CASE 605
TO-116

BLOCK DIAGRAM



CIRCUIT SCHEMATIC



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

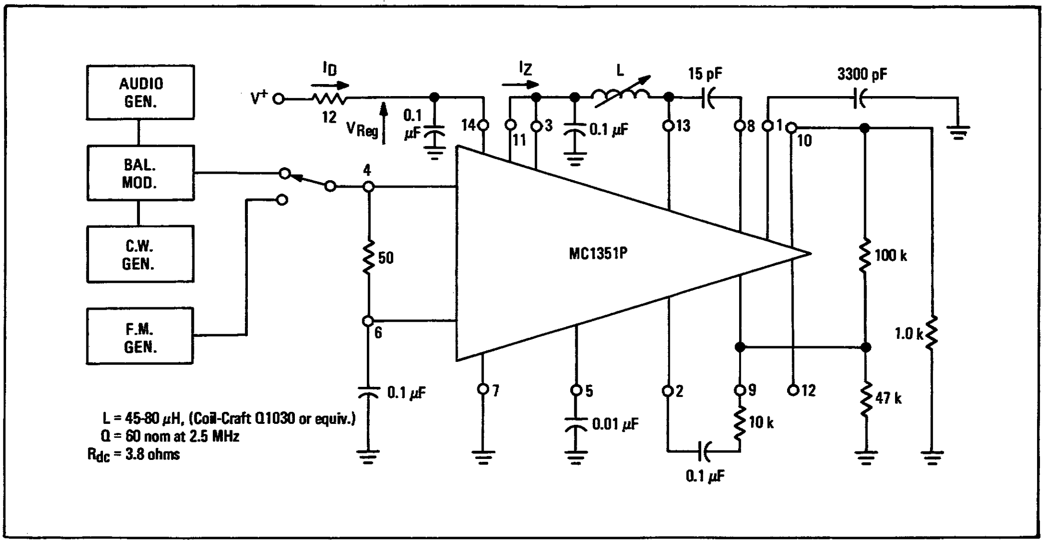
Rating	Symbol	Value	Unit
Power Supply Voltage	V+	+16	Vdc
Input Voltage	V_{in}	0.7	Vrms
Power Dissipation (Package Limitation) Plastic Package Derate above 25°C	 P_D $1/\theta_{JA}$	 625 5.0	 mW mW/°C
Operating Temperature Range	T_A	0 to +75	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

ELECTRICAL CHARACTERISTIC (V+ = 12 Vdc; T_A = 25°C, f = 4.5 MHz, Deviation = ±25 kHz unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Input Voltage (–3.0 dB Limiting)	V_L	–	80	160	μVrms
AM Rejection (V_{in} = 20 mVrms, AM = 30%) (See Note 1) $AMR = 20 \log \frac{V_{OFM}}{V_{OAM}}$ f = 4.5 MHz, Deviation = ±25 kHz, Q_L = 24 f = 5.5 MHz, Deviation = ±50 kHz, Q_L = 30	AMR	 38 –	 45 50	 – –	dB
Total Harmonic Distortion (Q_L = 24) (See Note 1) (7.5 kHz Deviation)	THD	–	1.0	–	%
Maximum Undistorted Audio Output Voltage (Pin 10) (See Note 1) (Audio Gain Adjusted Externally) (Q = 24)	$V_{o\,max}$	–	3.5	–	Vrms
Recovered Audio (Pin 2) (See Note 1) f = 4.5 MHz, Deviation = ±25 kHz, Q_L = 24 f = 5.5 MHz, Deviation = ±50 kHz, Q_L = 30	V_A	 0.35 –	 0.50 0.80	 – –	Vrms
Audio Preamplifier Open Loop Gain	A_{VP}	–	40	–	dB
IF Voltage Gain	A_{VIF}	–	65	–	dB
Parallel Input Resistance	R_{in}	–	9.0	–	kΩ
Parallel Input Capacitance	C_{in}	–	6.0	–	pF
Nominal Zener Voltage (I_Z = 5.0 mAdc)	V_{Reg}	–	11.6	–	Vdc
Power Supply Current (I_Z = 5.0 mAdc)	I_D	–	31	–	mAdc
Power Dissipation (I_Z = 5.0 mAdc)	P_D	–	300	375	mW

Note 1: Q_L is loaded circuit Q.

FIGURE 1 – TEST CIRCUIT (V^+ = +12 Vdc, T_A = +25°C)



TYPICAL CHARACTERISTICS

FIGURE 2 – DETECTED AUDIO OUTPUT versus INPUT LEVEL @ f = 4.5 MHz, ±25 kHz DEVIATION

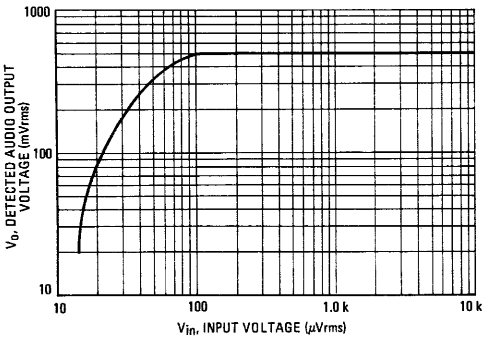


FIGURE 3 – DETECTED AUDIO OUTPUT versus INPUT LEVEL @ f = 5.5 MHz, ±50 kHz DEVIATION

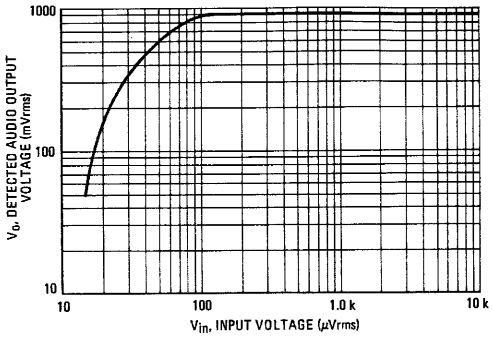


FIGURE 4 – DETECTOR "S" CURVE @ f = 4.5 MHz, BW = 200 kHz, Q = 24

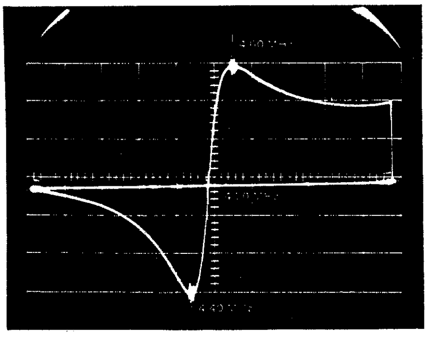


FIGURE 5 – DETECTOR "S" CURVE @ f = 5.5 MHz, BW = 220 kHz, Q = 30

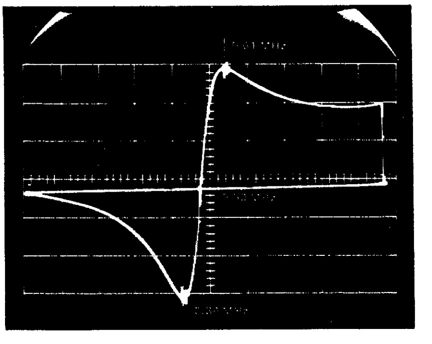


FIGURE 6 – IF VOLTAGE GAIN versus FREQUENCY

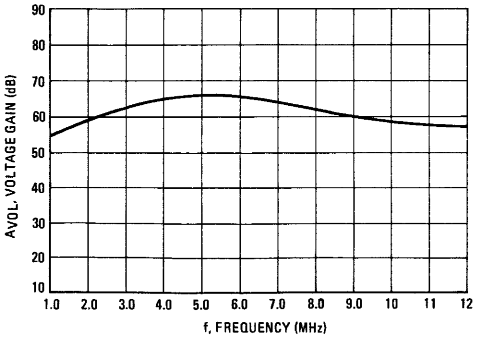


FIGURE 7 – AM REJECTION

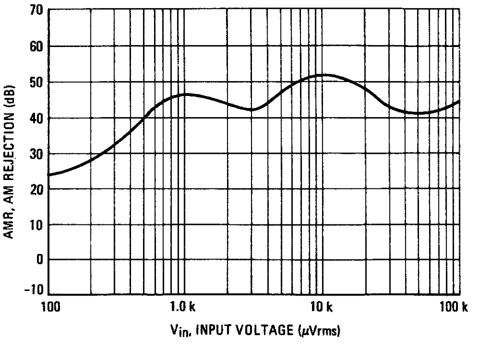
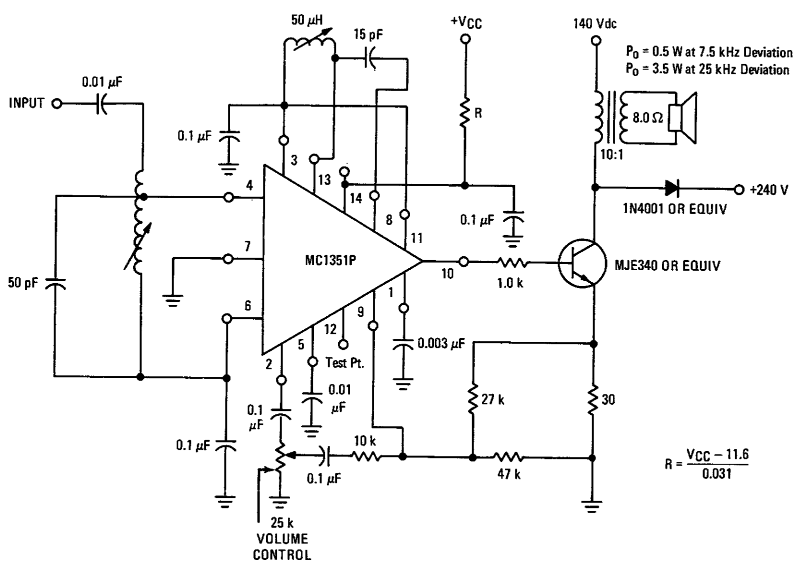
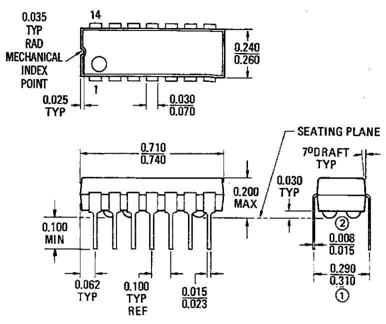


FIGURE 8 — 4.5 MHz TYPICAL APPLICATION



OUTLINE DIMENSIONS



① This dimension is measured at the seating plane.
② 4 insulating stand-offs are provided.

Weight ≈ 0.911 gram

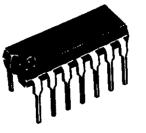
PLASTIC PACKAGE
CASE 605
TO-116

TV VIDEO IF AMPLIFIER WITH AGC AND KEYER CIRCUIT

MC1352P

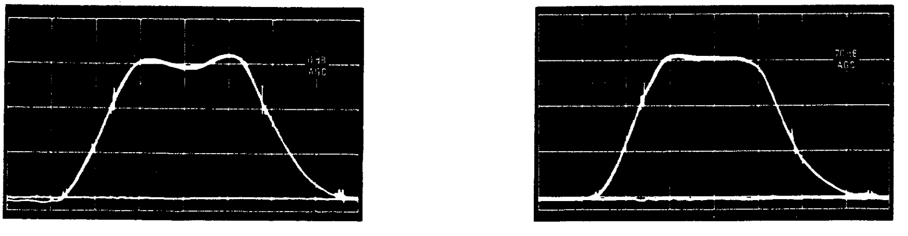
. . . a monolithic IF amplifier with a complete gated wide-range AGC system for use as the 1st and 2nd IF stages and AGC keyer and amplifier in color or monochrome TV receivers.

- 0.3 dB Output Change for 60 dB IF Input Signal Change
- Power Gain at 45 MHz, 53 dB (Typ)
- AGC Range > 65 dB (Min)
- Extremely Low Reverse-Transfer Admittance – << 1.0 μmho (Typ)
- Nearly Constant Input and Output Admittance Over AGC Range
- Single-Polarity Power-Supply Operation
- Forward Transfer Admittance – 3.0 dB Down at 60 MHz
- High-Gain Gated AGC System for Either Positive or Negative-Going Video Signals
- Control Signal Available for Delayed Forward AGC of Tuner



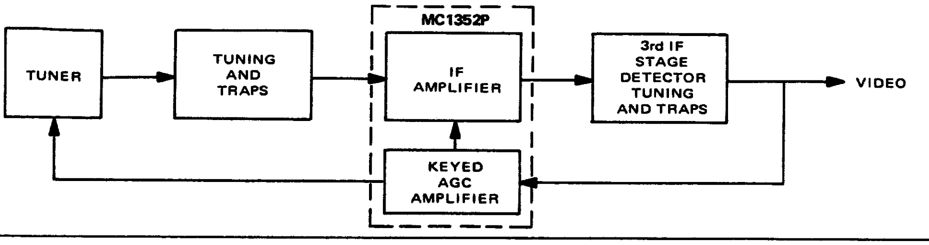
PLASTIC PACKAGE
CASE 606
TO-116

IF Response versus AGC



Vertical Scale = 1.0 Vdc/cm
Horizontal Scale = 1.0 MHz/cm
Markers: 41.25, 41.67, 42.17, 42.67, 45.75, and 47.25 MHz

BLOCK DIAGRAM FOR A TV RF AND IF SECTION



MAXIMUM RATINGS (Voltages referenced to pin 4, ground; T_A = +25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Power Supply (Pin 11)	V^+	+18	Vdc
Output Supply (Pins 7 and 8)	V_7, V_8	+18	Vdc
Signal Input Voltage (Pin 1 or 2, other pin ac grounded)	V_1, V_2	10	V_{p-p}
AGC Input Voltage (Pin 6 or 10, other pin ac grounded)	V_6, V_{10}	+6.0	Vdc
Gating Voltage, Pin 5	V_5	+10, -20	Vdc
Power Dissipation Derate above T_A = +25°C	P_D $1/\theta_{JA}$	625 5.0	mW mW/°C
Operating Temperature Range	T_A	0 to +70	°C
Storage Temperature Range	T_{stg}	-55 to +150	°C

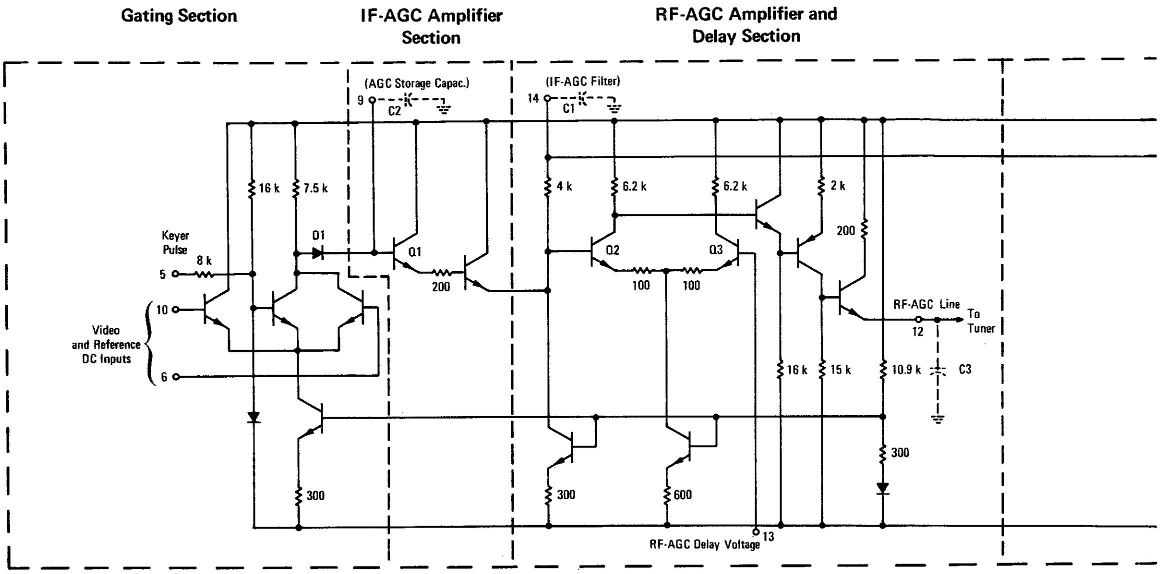
ELECTRICAL CHARACTERISTICS (V+ = +12 Vdc, Voltages referenced to pin 4, ground; T_A = +25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
AGC Range, f = 45 MHz, 5.0 Vdc to 7.0 Vdc		65	68	–	dB
Power Gain, f = 45 MHz (See Figure 2)	A_p	–	53	–	dB
Noise Figure f = 60 MHz, R_s = 50Ω f = 30 MHz, R_s = 200Ω	N_f	 – –	 8.5 8.0	 – –	dB
Maximum Differential Output Voltage Swing 0 dB AGC -30 dB AGC	V_o	 – –	 16.8 8.4	 – –	V_{p-p}
Voltage Range for RF-AGC at Pin 12 Maximum Minimum	V_{12}	 – –	 7.0 0.2	 – –	Vdc
Output Change for 60 dB IF Signal Change		–	0.3	–	dB
IF Gain Change Over RF-AGC Range		–	10	–	dB
Output Stage Current ($I_7 + I_8$)	I_o	–	5.7	–	mAdc
Total Supply Current ($I_7 + I_8 + I_{11}$)	I_S	–	27	31	mAdc
Total Power Dissipation	P_D	–	325	370	mW

DESIGN PARAMETERS, TYPICAL VALUES (V+ = +12 Vdc, T_A = +25°C unless otherwise noted)

Parameter	Symbol	f = 35 MHz	f = 45 MHz	Unit
Single-Ended Input Admittance	g_{11} b_{11}	0.55 1.70	0.70 2.80	mmhos
Input Admittance Variations with AGC (0 to 60 dB)	Δg_{11} Δb_{11}	50 0	60 0	μmhos
Differential Output Admittance	g_{22} b_{22}	40 430	90 570	μmhos
Output Admittance Variations with AGC (0 to 60 dB)	Δg_{22} Δb_{22}	3.0 80	4.0 100	μmhos
Reverse Transfer Admittance (Magnitude)	$\lvert y_{12} \rvert$	<<1.0	<<1.0	μmho
Forward Transfer Admittance Magnitude Angle (0 dB AGC) Angle (-30 dB AGC)	 $\lvert y_{21} \rvert$ $\angle y_{21}$ $\angle y_{21}$	 280 -73 -52	 260 -100 -70	 mmhos degrees
Single-Ended Input Capacitance	C_{in}	9.5	10	pF
Differential Output Capacitance	C_o	2.0	2.0	pF

FIGURE 1 – CIRCUIT SCHEMATIC



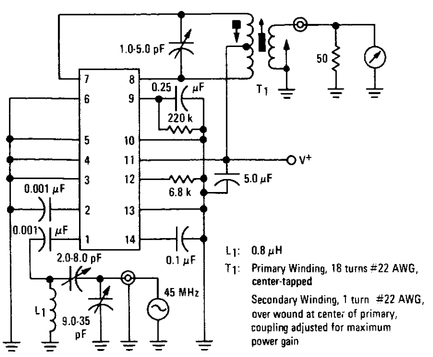
GENERAL OPERATING INFORMATION

The MC1352 consists of an AGC section and an IF signal amplifier (Figure 1) subdivided into different functions as indicated by the illustration.

A gating pulse, a reference level, and a composite video signal are required for proper operation of the AGC section. Either positive or negative-going video may be used; necessary connections and signal levels are shown in Figure 3. The essential difference is that the video is fed into Pin 10 and the AGC reference level is applied to Pin 6 for a video signal with positive-going sync while the input connections are reversed for negative-going sync.

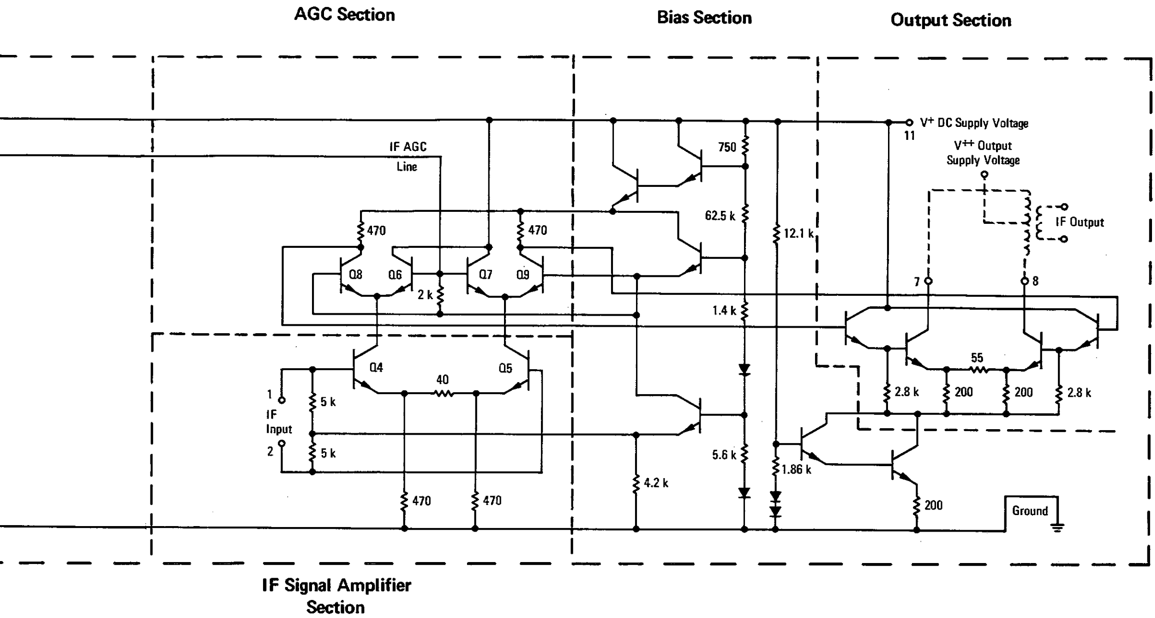
The action of the gating section is such that the proper voltage, V_C, is maintained across the external capacitor, C2, for a particular video level and dc reference setting. The voltage V_C, is the result of the charge delivered through D1 and the charge drained by Q1. The charge delivered occurs during the time of the gating pulse, and its magnitude is determined by the amplitude of the video signal relative to the dc reference level. The voltage V_C is delivered via the IF-AGC amplifier and applied to the variable gain stage of the IF signal amplifier and is also applied to the RF-AGC amplifier, where it is compared to the fixed RF-AGC delay voltage reference by the differential amplifier, Q2 and Q3. The following stages amplify the output signal of Q2 and shift the dc levels causing the RF-AGC voltage to vary from zero to 7 volts for a very small change in IF-AGC voltage.

FIGURE 2 – POWER GAIN MEASUREMENT



NOTES:

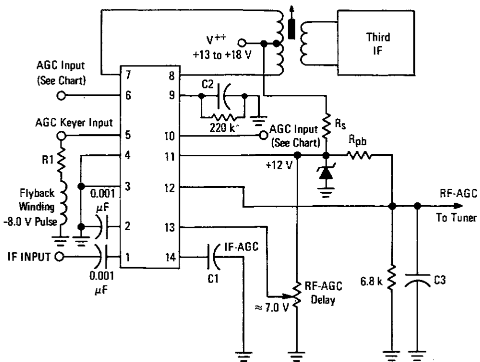
1. The 12-V supply must have a low ac impedance to prevent low-frequency instability in the RF-AGC loop. This can be achieved by a 12-V zener diode and a large decoupling capacitor. (5 µF).
2. To set a maximum-gain pre-bias on a forward-AGC RF transistor, a fixed resistor R_{pb} is connected from V+ to pin 12 forming a voltage divider with the 6.8 k ohm resistor to ground when the emitter follower is cut off (See Figure 3).
3. To set a fixed IF AGC operating point (e.g., for receiver alignment) connect a 22 k ohm resistor from pin 9 to pin 11 to give minimum gain, then bias pin 14 to give the correct operating point using a 200 k ohm variable resistor to ground.
4. Although the unit will normally be operating with a very high power gain, the pin configuration has been carefully chosen so that shielding between input and output terminals will not normally be necessary even when a standard socket is used.



The input amplifiers (Q4 and Q5) operate at constant emitter currents so that input impedance remains independent of AGC action. Input signals may be applied single-ended or differentially (for ac). Terminals 1 and 2 may be driven from a transformer, but a dc path from either terminal to ground is not permitted.

AGC action occurs as a result of an increasing voltage on the base of Q6 and Q7 causing those transistors to conduct more heavily thereby shunting signal current from the interstage amplifiers Q8 and Q9. The output amplifiers are fed from an active current source to maintain constant quiescent bias thereby holding output admittance nearly constant. Collector voltage for the output amplifier (V^{++}) must be supplied through a center-tapped tuning coil to Pins 7 and 8. The 12-volt V^+ at Pin 11 may be used for this purpose, but output admittance remains more nearly constant if a separate 15-volt supply is used because the base voltage on the output amplifier varies with AGC bias. For this case, R_S is chosen to allow 30 mA of current flow. (Figure 3)

FIGURE 3 – TYPICAL CIRCUIT CONNECTION



AGC APPLICATION CHART

Video Polarity	Pin 6 Voltage	Pin 10 Voltage	Pin 5 R1 (Ω)
Negative-Going Sync.	5.5 / 2.0 / 0	Adj. 1.0–4.0 Vdc Nom 2.0 V	0
Positive-Going Sync.	Adj. 1.0–8.0 Vdc Nom 4.5 V	4.5 / 0	3.9 k

Choices of C1, C2 and C3 depend somewhat on the set designers' preference concerning AGC stability versus AGC recovery speed. Typical values are C1 = 0.1 µF, C2 = 2.0 µF, C3 = 10 µF.

TYPICAL CHARACTERISTICS

($V^+ = +12$ Vdc, $T_A = +25^oC$ unless otherwise noted)

FIGURE 4 – INPUT ADMITTANCE

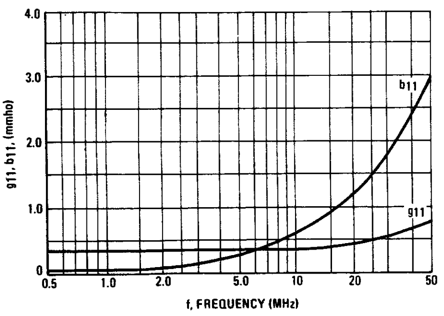


FIGURE 5 – OUTPUT ADMITTANCE

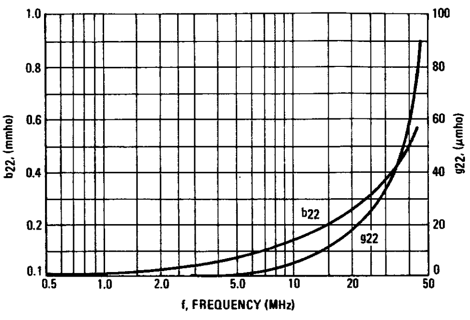


FIGURE 6 – FORWARD TRANSFER ADMITTANCE

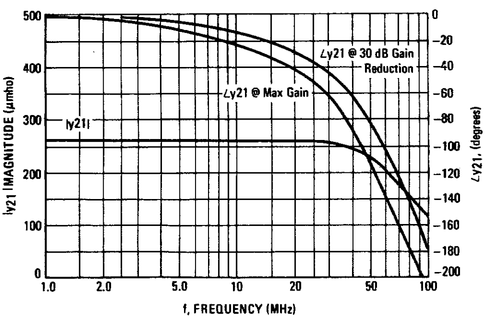


FIGURE 7 – DIFFERENTIAL OUTPUT VOLTAGE

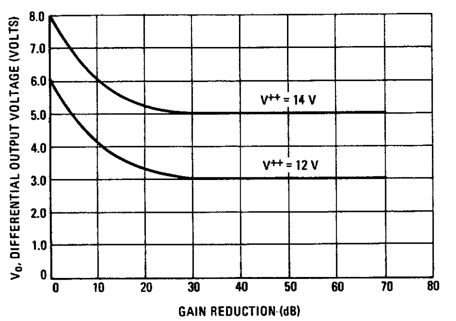
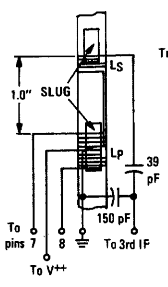
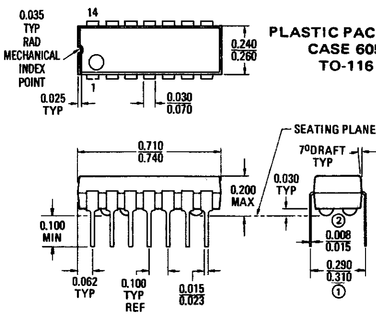


FIGURE 8 – SUGGESTED INTERSTAGE TRANSFORMER



Transformer Data	(Coil-Craft P792 or equiv.)
Primary:	AWG No. 32 wire, 20 turns, center tapped, ¼" diameter, tight wound, TH Arnold slug nearly centered, $L_p = 4.2\ \mu H$.
Secondary:	AWG No. 16 wire, 6 turns, of which 2/3 turn is over wound and loosely coupled to the primary.
Capacitive tap:	$C_1 = 39$ pF, $C_2 = 150$ pF

OUTLINE DIMENSIONS



PLASTIC PACKAGE
CASE 605
TO-116

① This dimension is measured at the seating plane.
② 4 insulating stand-offs are provided.

Weight ≈ 0.911 gram

For additional information see "A High-Performance Monolithic IF Amplifier Incorporating Electronic Gain Control", by W. R. Davis and J. E. Solomon, IEEE Journal on Solid State Circuits, December 1968.

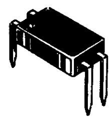
1/4-WATT AUDIO
AMPLIFIER

MFC4000P

CONSUMER PRODUCTS

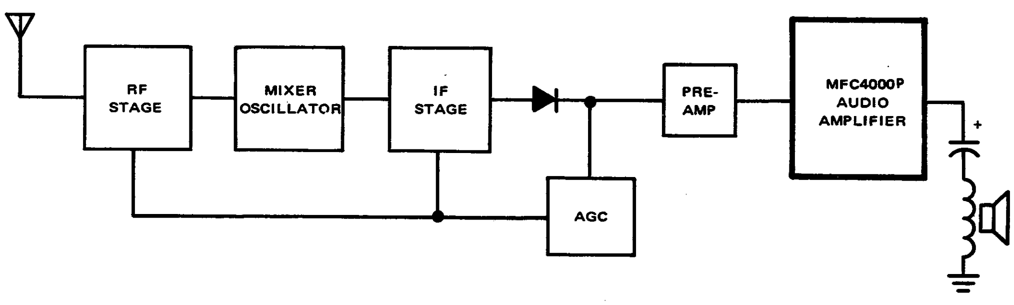
A monolithic silicon device designed for the output stage of battery-powered portable radios.

- 250 mW of Audio Output Power
- Low Standby Current – 3.5 mA typical
- Low Harmonic Distortion
- Reduces Component Count in Portable Radios by Two Transformers and Two Transistors
- Eliminates Costly Component Matching Requirements



PLASTIC PACKAGE
CASE 629

TYPICAL APPLICATION



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

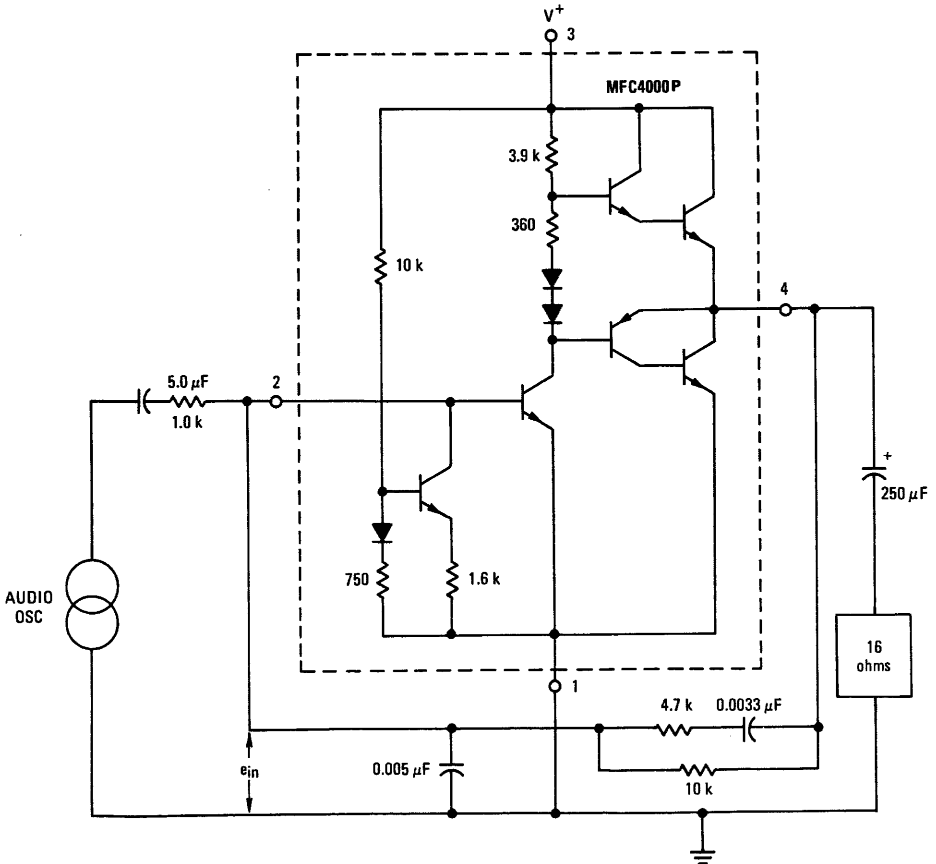
Rating	Symbol	Value	Unit
Power Supply Voltage	V^+	12	Vdc
Power Dissipation (Package Limitation) (Soldered on a circuit board and held in free air) Derate above T_A = 25°C	P_D	1.0 10	Watt mW/°C
Operating Temperature Range	T_A	-10 to +75	°C

ELECTRICAL CHARACTERISTICS* (V^+ = 9.0 Vdc, R_L = 16 Ohms, T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Zero Signal Current Drain	I_D	–	3.5	6.0	mAdc
Sensitivity P_{out} = 50 mW(rms)	e_{in}	–	–	15	mV(rms)
Output Power Total Harmonic Distortion ≤ 10%	P_{out}	250	350	–	mW(rms)
Total Harmonic Distortion P_{out} = 50 mW(rms) P_{out} = 50 mW(rms), V^+ = 6.0 Vdc	THD	 – –	 0.7 4.5	 – –	%

*As measured in test circuit shown in Figure 1.

FIGURE 1 – TEST CIRCUIT



TOTAL HARMONIC DISTORTION versus OUTPUT POWER

FIGURE 2 – V+ = 9.0 Vdc

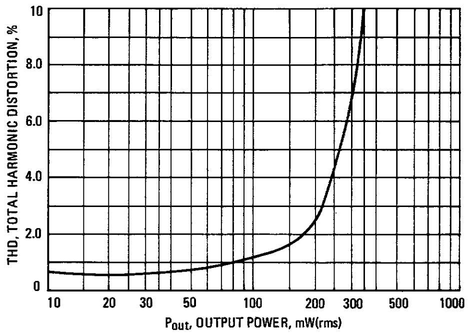


FIGURE 3 – V+ = 6.0 Vdc

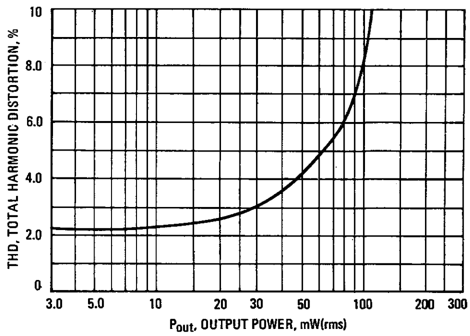


FIGURE 4 – CURRENT DRAIN versus OUTPUT POWER

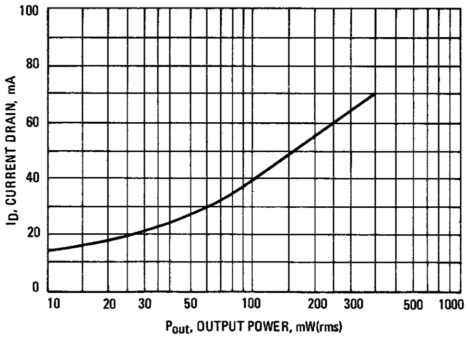


FIGURE 5 – TOTAL HARMONIC DISTORTION versus SUPPLY VOLTAGE

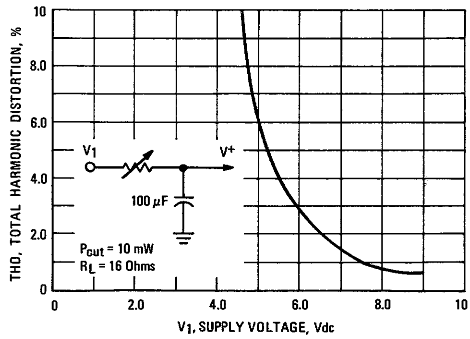
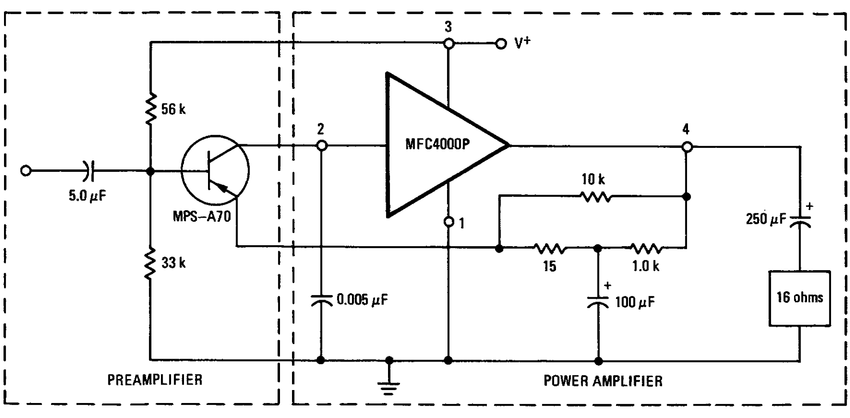
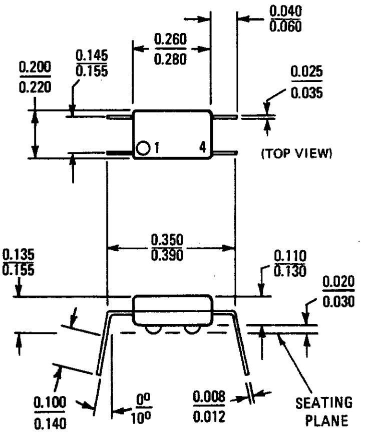


FIGURE 6 – TYPICAL CIRCUIT APPLICATION



OUTLINE DIMENSIONS



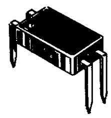
PLASTIC PACKAGE
CASE 629

Weight ≈ 0.25 gram

MFC4010P

A monolithic silicon device designed for AM/IF and low-level audio applications.

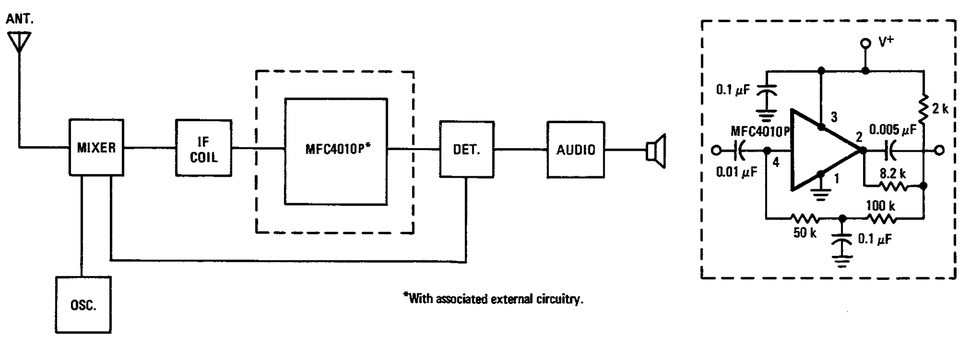
- High Gain — 60 dB minimum
- Low Output Noise — 1.0 mV(rms) typical
- Useful as a Microphone Amplifier and in Tape Recorders and Cassettes
- Excellent Performance as a 455 kHz AM/IF Amplifier
- Useful as a General Purpose Gain Block to Save Space and Component Count



PLASTIC PACKAGE
CASE 629

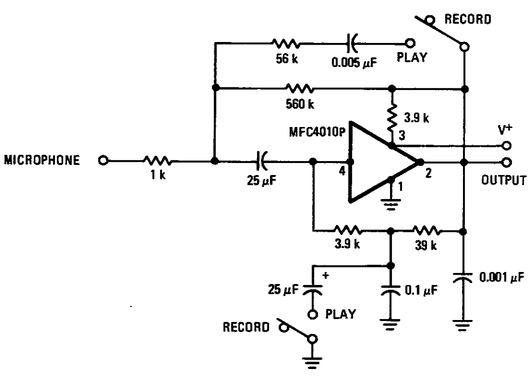
TYPICAL APPLICATIONS

FIGURE 1 — AM/IF AMPLIFIER



*With associated external circuitry.

FIGURE 2 — RECORD/PLAY PREAMPLIFIER FOR CASSETTE AND PORTABLE TAPE RECORDERS



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

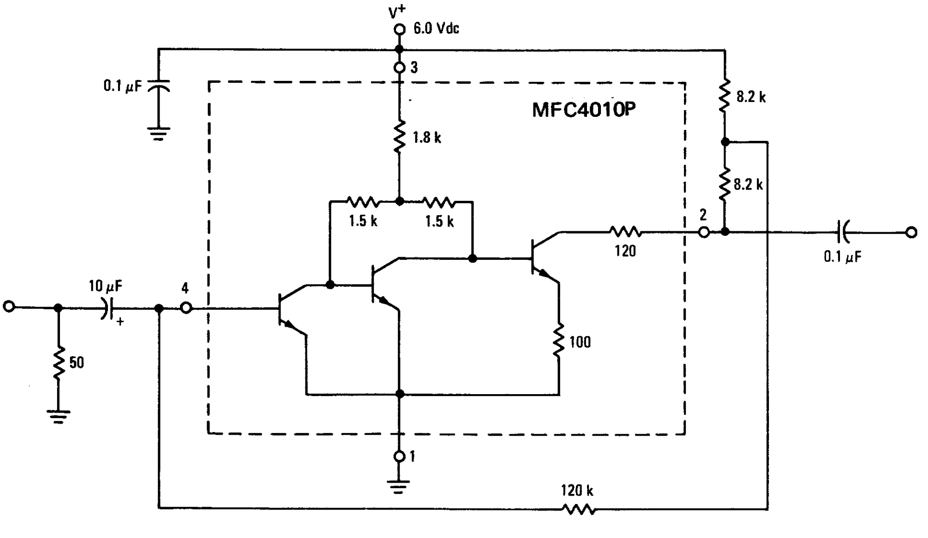
Rating	Symbol	Value	Unit
Power Supply Voltage	V^+	18	Vdc
Power Dissipation (Package Limitation) (Free Air)	P_D	0.5	Watt
Derate above T_A = 25°C		5.0	mW/°C
Operating Temperature Range	T_A	-10 to +75	°C

ELECTRICAL CHARACTERISTICS (V^+ = 6.0 Vdc, T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Voltage Gain (f = 1.0 kHz)	A_V	60	70	–	dB
h Parameters* (f = 1.0 kHz)	h_{11}	–	1.0	–	k ohms
	h_{12}	–	10^{-6}	–	–
	h_{21}	–	1000	–	–
	h_{22}	–	10^{-5}	–	mhos
Output Noise Voltage (Figure 3) (BW = 20 Hz to 20 kHz, R_S = 1.0 k ohms)	$e_{n(out)}$	–	1.0	–	mV(rms)
Current Drain (Figure 5)	I_D	–	3.0	–	mA

*Device only, without external passive components

FIGURE 3 – TEST CIRCUIT



MFC4010P (continued)

FIGURE 4 – VOLTAGE GAIN versus FREQUENCY

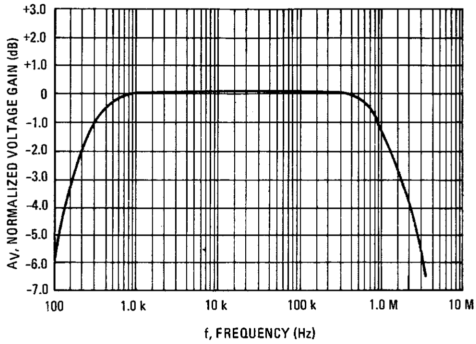


FIGURE 5 – DRAIN CURRENT versus SUPPLY VOLTAGE

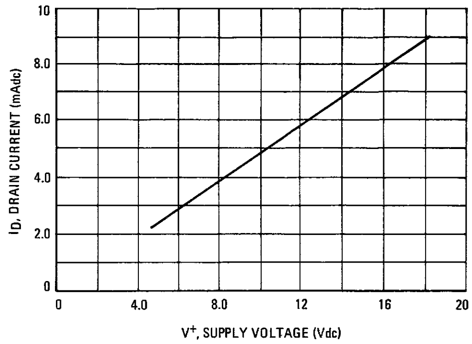
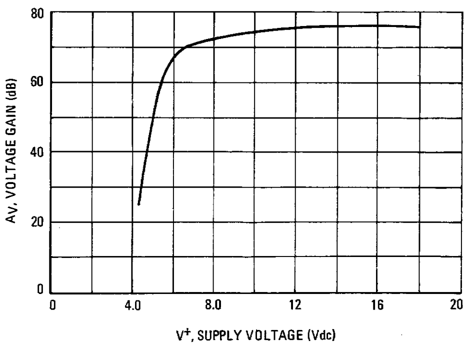
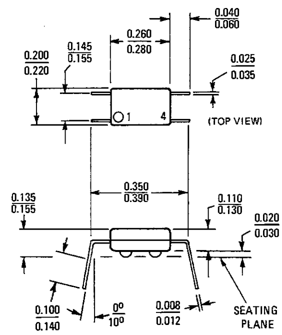


FIGURE 6 – VOLTAGE GAIN versus SUPPLY VOLTAGE



OUTLINE DIMENSIONS



PLASTIC PACKAGE
CASE 629

Weight ≈ 0.25 gram

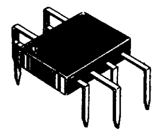
DUAL DIFFERENTIAL AMPLIFIER (Stereo Input Amplifier)

CONSUMER PRODUCTS

MFC8000P thru MFC8002P

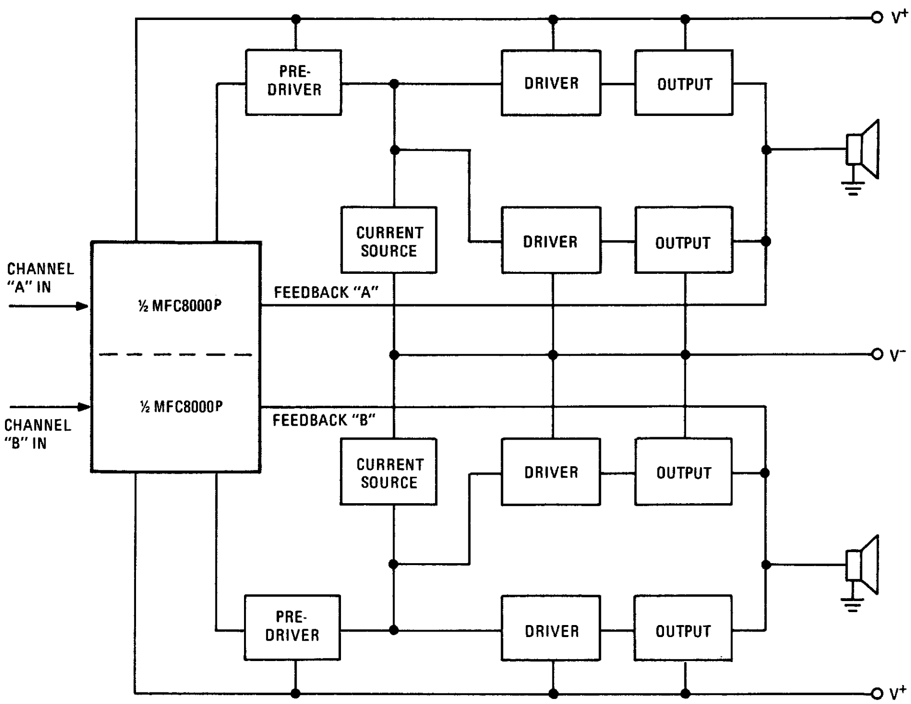
A monolithic silicon dual device designed for the input stage of stereo power amplifiers.

- Excellent Channel Separation — 60 dB minimum
- High Gain — h_{FE} = 75 minimum
- Satisfies Both Channel Requirements with One Compact Package
- Selection of Breakdown Voltages to Meet the Particular Applications



PLASTIC PACKAGE
CASE 630

TYPICAL APPLICATION



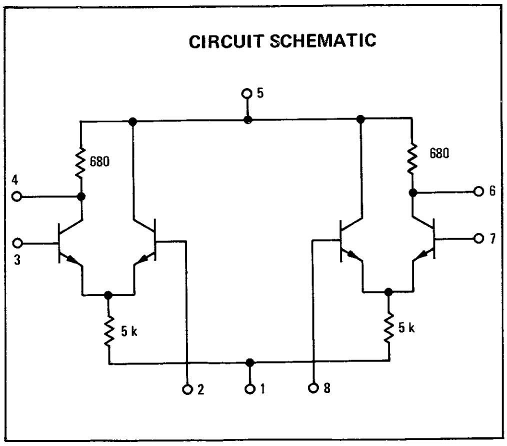
MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Maximum Supply Voltage — MFC8000 MFC8001 MFC8002	V^+	40 50 60	Vdc
Power Dissipation (Package Limitation) (Soldered on a circuit board) Derate above T_A = 25°C	P_D	1.0 10	Watt mW/°C
Operating Temperature Range	T_A	-10 to +75	°C

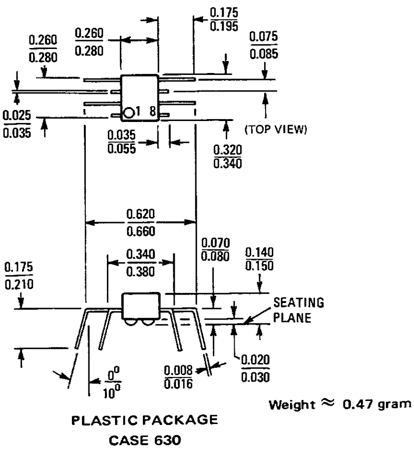
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Collector-Emitter Breakdown Voltage (I_C = 1.0 mAdc, I_B = 0)	MFC8000 MFC8001 MFC8002	BV_{CEO}	40 50 60	– – –	– – –	Vdc
DC Current Gain (V_{CE} = 20 Vdc, I_C = 1.0 mAdc)		h_{FE}	75	100	–	–
Base Differential Voltage (V_{CE} = 20 Vdc, I_C = 1.0 mAdc)		$\|\Delta V_{BE_3} - \Delta V_{BE_2}\|$ $\|\Delta V_{BE_8} - \Delta V_{BE_7}\|$	–	–	15	mVdc
Base Differential Current (V_{CE} = 20 Vdc, I_C = 1.0 mAdc)		$\|\Delta I_{B_3} - \Delta I_{B_2}\|$ $\|\Delta I_{B_8} - \Delta I_{B_7}\|$	–	–	1.0	µAdc
Channel Separation (Pins 2,3,8 grounded, signal at pin 7, e_{out1} at pin 6, e_{out2} at pin 4)		$\frac{e_{out\,1}}{e_{out\,2}}$	60	–	–	dB

CIRCUIT SCHEMATIC



OUTLINE DIMENSIONS



Weight ≈ 0.47 gram

PLASTIC PACKAGE
CASE 630