



# BIPOLAR ANALOG INTEGRATED CIRCUIT

## $\mu$ PC1222C, $\mu$ PC1222C(R)

AM TUNER, FM IF SYSTEM WITH QUADRATURE DETECTOR  
SILICON BIPOLAR MONOLITHIC INTEGRATED CIRCUIT

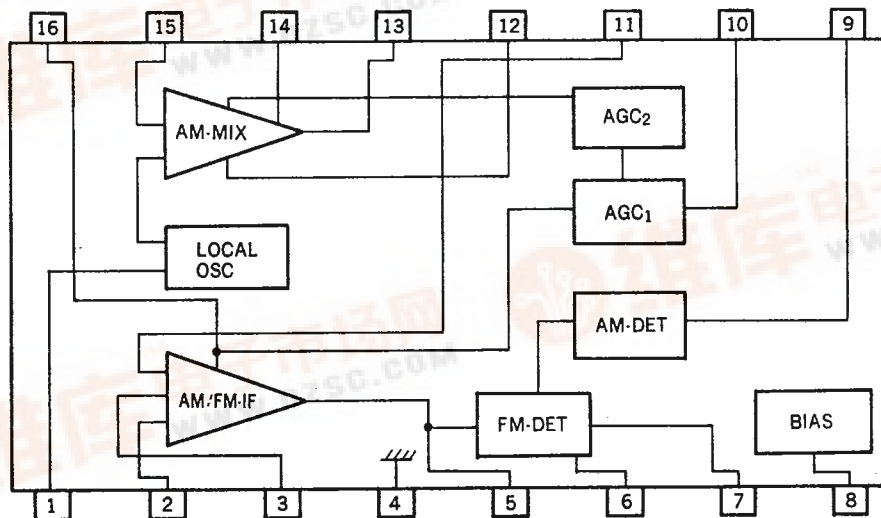
### DESCRIPTION

The  $\mu$ PC1222 is a low voltage silicon monolithic IC. It is designed for using in AM tuner and FM-IF.  
 $\mu$ PC1222 contains an AM Mixer, AM/FM IF amplifier, AM detector, FM detector and also AGC circuit.  
This IC is suitable for using in AM/FM radio, radio cassette etc..

### FEATURES

- Wide operating voltage.  $V_{CC}=2.0\text{ V}-6.0\text{ V}$
- Excellent low voltage characteristics.
- AM stage is composed a Mixer, local oscillator, IF amplifier, AM detector and AGC circuit.
- FM stage is composed a high gain FM-IF amplifier and FM detector.
- The AM stage has an excellent AGC characteristic and low distortion.
- $\mu$ PC1222C(R) is designed for upper heterodyne.
- $\mu$ PC1222C is designed for lower heterodyne.

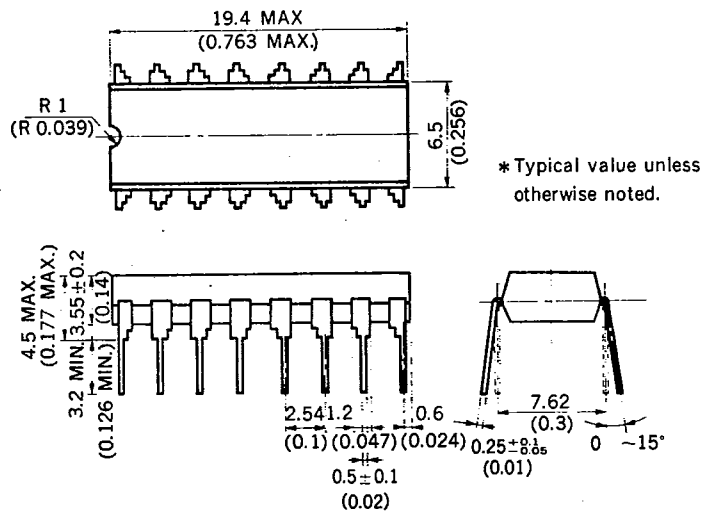
### BLOCK DIAGRAM (Top View)



**FUNCTION**

- AM Stage ..... MIXER CIRCUIT  
 LOCAL OSC  
 IF AMPLIFIER  
 DETECTOR CIRCUIT  
 AGC CIRCUIT
  
- FM Stage ..... IF AMPLIFIER  
 DETECTOR CIRCUIT

**PACKAGE DIMENSIONS** in millimeters (inches)



**CONNECTION DIAGRAM**

Pin No.	CONNECTION	Pin No.	CONNECTION
1	AM LOCAL OSC	9	AM OUTPUT
2	IF BYPASS	10	AGC INPUT
3	FM IF INPUT	11	AM IF INPUT
4	GND	12	AM MIX BIAS
5	DET. INPUT (1)	13	AM MIX OUT
6	DET. INPUT (2)	14	AM RF AGC BYPASS
7	FM OUTPUT	15	AM MIX INPUT
8	VCC	16	AM IF AGC BYPASS

**ABSOLUTE MAXIMUM RATINGS (Ta = 25 °C)**

Supply Voltage	V <sub>CC</sub>	9.0	V
Package Dissipation	P <sub>D</sub>	350*	mW
Operating Temperature	T <sub>opt</sub>	-20 to +75	°C
Storage Temperature	T <sub>stg</sub>	-40 to +125	°C

\*Ta = 75 °C

**RECOMMENDED OPERATING CONDITION (Ta = 25 °C)**

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V <sub>CC</sub>	2.0	4.0	6.0	V

**ELECTRICAL CHARACTERISTICS (Ta = 25 °C)**

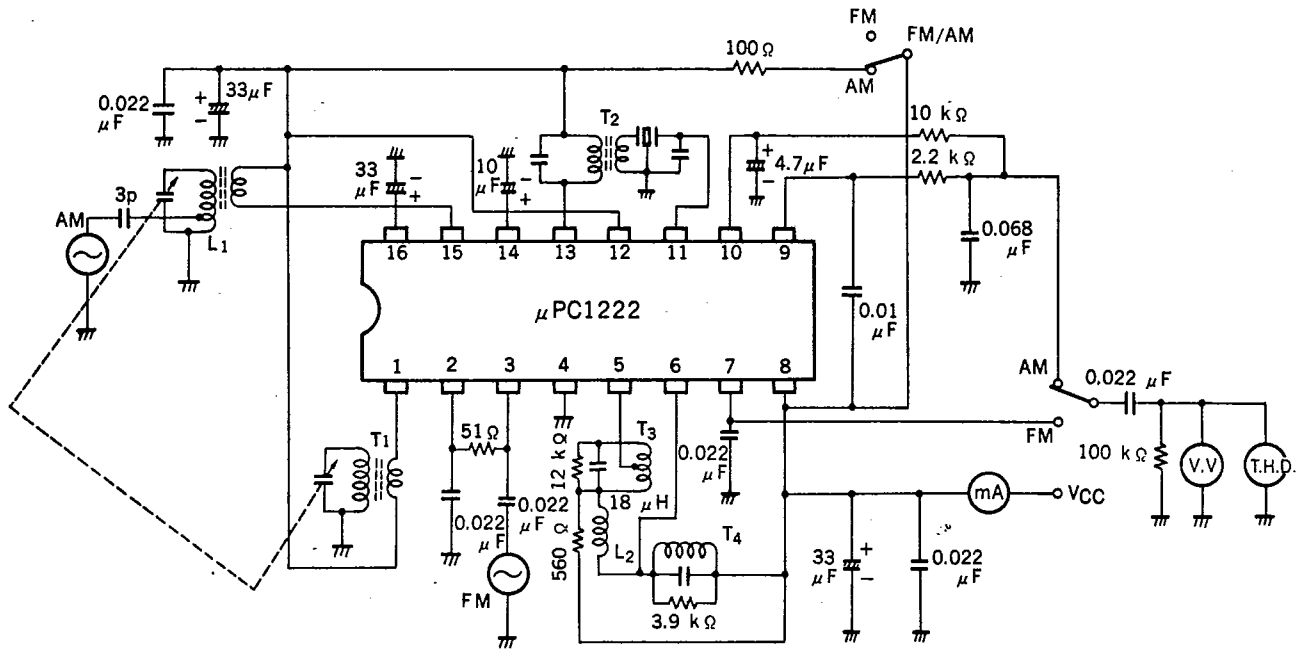
(V<sub>CC</sub> = 4 V FM: f = 10.7 MHz, Δf = ±22.5 kHz DEV.

AM: f = 1 MHz, MOD. = 30 %

f<sub>MOD</sub> = 400 Hz)

	CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
FM STAGE	Circuit Current	I <sub>CC-FM</sub>	6.5	10	15	mA	No Signal
	Detector Output Voltage	V <sub>O-FM</sub>	35	50	70	mVr.m.s.	V <sub>i</sub> = 80 dBμV
	Input Limiting Voltage	V <sub>i(lim)</sub>	33	39	45	dBμV	-3 dB point from V <sub>O</sub> with 100 dBμV input
	Signal to Noise Ratio	S/N-FM	50	60		dB	V <sub>i</sub> = 80 dBμV
	Total Harmonic Distortion	T.H.D.-FM		0.2	0.8	%	V <sub>i</sub> = 80 dBμV
	AM Rejection Ratio	A.M.R.	25	35		dB	V <sub>i</sub> = 80 dBμV AM: 30 % MOD.
	Drop Voltage Gain Loss	ΔA <sub>V-FM</sub>		1.5	5.0	dB	V <sub>O</sub> = 5 mVr.m.s. V <sub>CC</sub> = 4 → 2 V
AM STAGE	Circuit Current	I <sub>CC-AM</sub>	6	12	18	mA	No Signal
	MAX. Sensitivity	V <sub>i-AM</sub>	28	35	42	dBμV	V <sub>O</sub> = 10 mVr.m.s.
	Detector Output Voltage	V <sub>O-AM</sub>	25	34	50	mVr.m.s.	V <sub>i</sub> = 100 dBμV
	Signal to Noise Ratio	S/N-AM	45	51		dB	V <sub>i</sub> = 100 dBμV
	Oscillation Voltage	V <sub>OSC</sub>		150		mVr.m.s.	f <sub>OSC</sub> = 1 455 kHz
	Total Harmonic Distortion	T.H.D.-AM		0.5	2.0	%	V <sub>i</sub> = 100 dBμV
	Drop Voltage Gain Loss	ΔA <sub>V-AM</sub>		5	10	dB	V <sub>O</sub> = 10 mVr.m.s. V <sub>CC</sub> = 4 → 2 V

TEST CIRCUIT



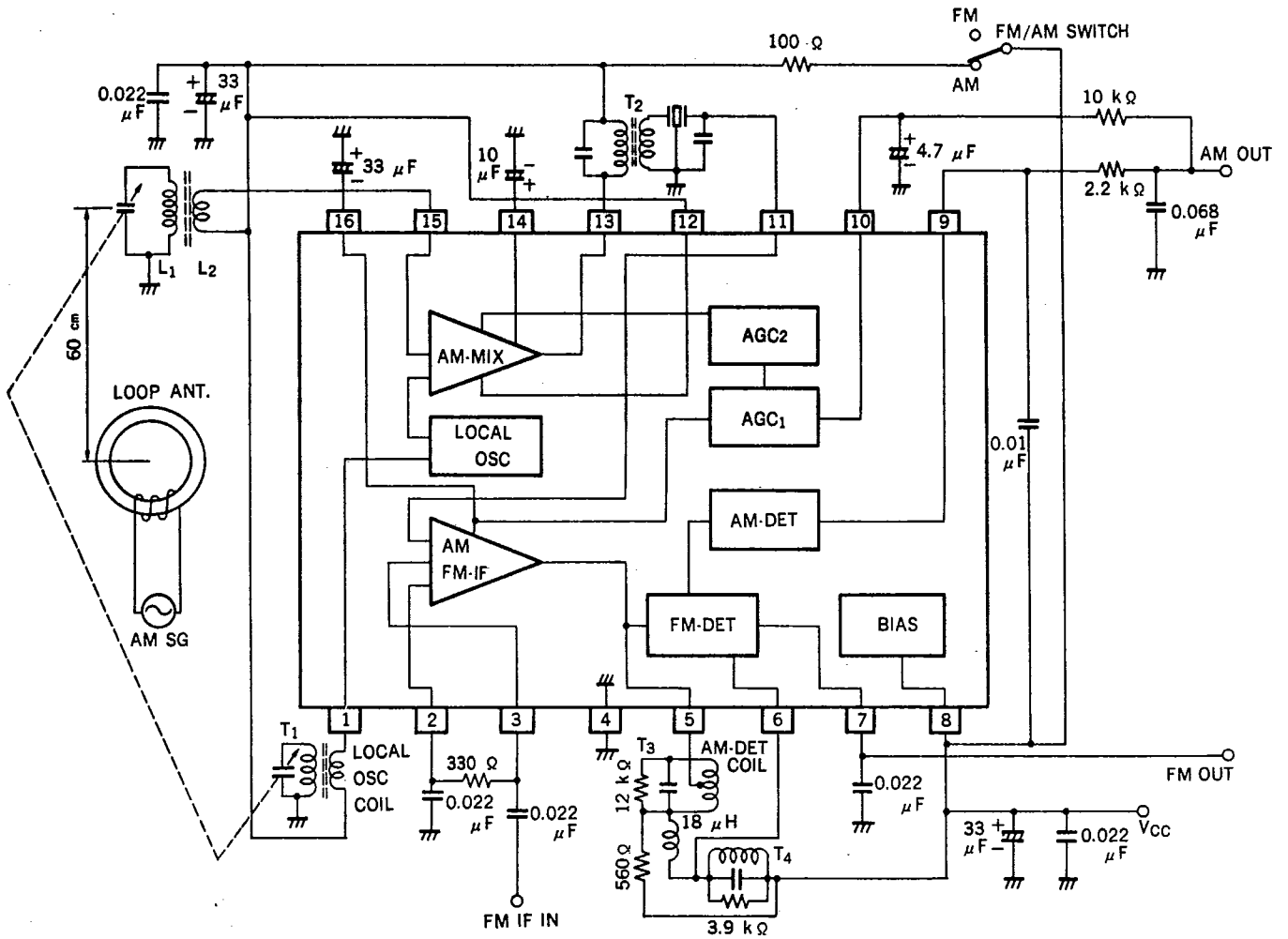
- L1: AM ANT. COIL 25A-1195-08 (CORIN)
- T1: AM LOCAL OSCILLATION COIL (MM) 26-1791-13 (CORIN)
- T2: AM IF COIL CFZ-455C (TOKO)
- T3: AM DETECTION COIL (455 kHz) 5251 (TOKO)
- T4: FM DETECTION COIL (10.7 MHz) 12747 (TOKO)
- L2: PHASE SHIFT INDUCTOR 7BA 180JH (TOKO)

AM STAGE REFERENCE CHARACTERISTICS

(V<sub>CC</sub> = 4 V, f = 1 MHz, MOD = 30 %, f<sub>MOD</sub> = 400 Hz, at APPLICATION CIRCUIT)

CHARACTERISTIC	SYMBOL	TYP.	UNIT	TEST CONDITION
Usable Sensitivity	V <sub>i-S/N</sub>	48	dBμV/m	S/N=20 dB
Maximum Sensitivity	V <sub>i-AM</sub>	35	dBμV/m	V <sub>O</sub> =10 mVr.m.s.
Detector Output	V <sub>O-AM</sub>	34	mVr.m.s.	V <sub>i</sub> =100 dBμV/m
S/N Ratio	S/N	51	dB	V <sub>i</sub> =100 dBμV/m
Total Harmonic Distortion	T.H.D.	0.5	%	MOD=30 %, V <sub>i</sub> =100 dBμV/m
Drop Voltage Gain Loss	ΔA <sub>V-AM</sub>	5	dB	V <sub>O</sub> =10 mVr.m.s., V <sub>CC</sub> =4 → 2 V

TYPICAL APPLICATION

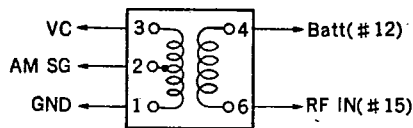


- T1: AM LOCAL OSCILLATION COIL (MM) 26-1791-13 (CORIN)
- T2: AM IF COIL CFZ-455C (TOKO)
- T3: AM DETECTION COIL (455 kHz) 5251 (TOKO)
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AM BAR ANT  
 CORE:  $\phi$  10 x 80 mm  
 $L_0 = 600 \mu H$   
 $Q = 220$   
 $L_1 : L_2 = 107 : 25$

**COIL SPECIFICATIONS**

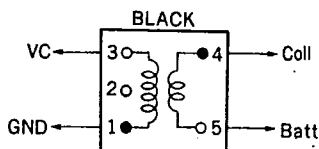
- (1) ANTENNA COIL (MW) 25A-1195-08 (CORIN)



$L_o = 650 \mu H$   
 $Q_o = 210 \pm 20 \% \text{ (at 796 kHz)}$   
 1-2 25T 2-3 82T  
 1-3 107T 4-6 10T

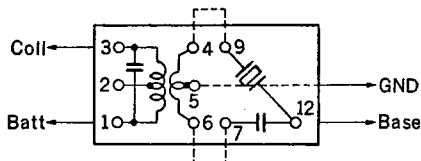
- (2) AM LOCAL OSCILLATION COIL (MW) (CORIN)

TYPE NO. 7P 1-3 99T  
 BODY COLOR BLACK 4-6 11T



$L = 260 \mu H (\pm 6 \%)$   
 $Q_u > 80 (f = 1.4 \text{ MHz})$

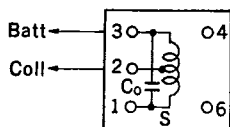
- (3) AM IF COIL CFZ-455C (TOKO)



BANDWIDTH 6 kHz MIN.  
 SELECTIVITY ( $\pm 10 \text{ kHz DETUNING}$ ) 20 dB MIN.

- (4) AM DETECTION COIL (455 kHz) 5251 (TOKO)

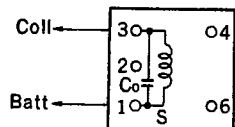
TYPE NO. 7P 1-2:2-3=1:1  
 BODY COLOR BLACK



CAPACITOR  $C_o$  ..... 180 pF  
 $Q_u$  ..... 70  $\pm$  20 %

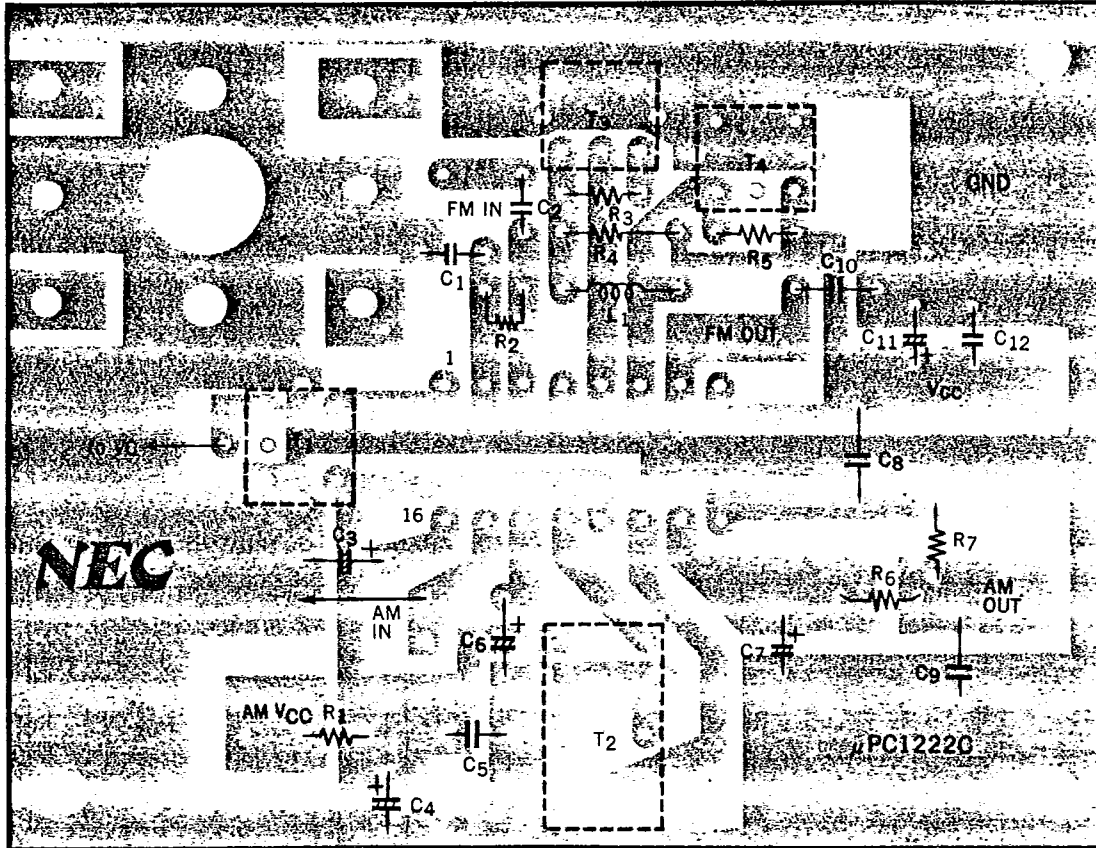
- (5) FM DETECTION COIL (10.7 MHz) 12747 (TOKO)

TYPE NO. 7P  
 BODY COLOR BLACK



CAPACITOR  $C_o$  ..... 82 pF  
 $Q_u$  ..... 70  $\pm$  20 %

P.C. BOARD PATTERN



R1	100 $\Omega$
R2	51 $\Omega$
R3	12 k $\Omega$
R4	560 $\Omega$
R5	3.9 k $\Omega$
R6	2.2 k $\Omega$
R7	10 k $\Omega$

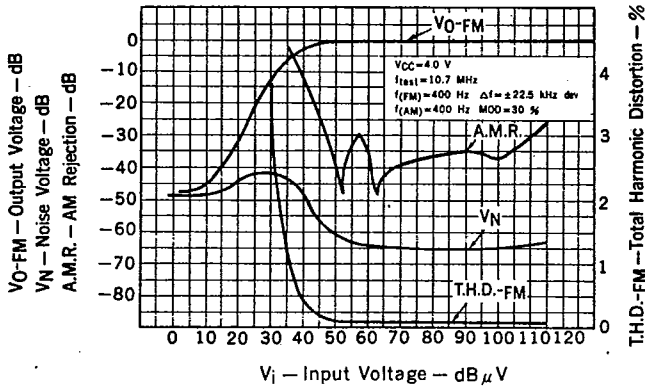
C1	0.022 $\mu$ F
C2	0.022 $\mu$ F
C3	33 $\mu$ F
C4	33 $\mu$ F
C5	0.022 $\mu$ F
C6	10 $\mu$ F
C7	4.7 $\mu$ F
C8	0.01 $\mu$ F
C9	0.068 $\mu$ F
C10	0.022 $\mu$ F
C11	33 $\mu$ F
C12	0.022 $\mu$ F

T1	AM LOCAL OSC COIL	26-1791-13 (CORIN)
T2	AM IF COIL	CFZ-455C (TOKO)
T3	AM DET. COIL	5251 (TOKO)
T4	FM DET. COIL	12747 (TOKO)
L1	PHASE SHIFT INDUCTOR	7BA 180JH (TOKO)

TYPICAL CHARACTERISTICS (Ta = 25 °C)

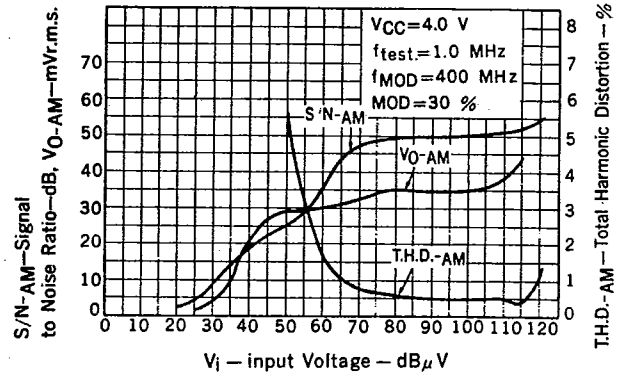
FM STAGE

OUTPUT VOLTAGE, TOTAL HARMONIC DISTORTION, AM Rejection, AND NOISE VOLTAGE vs. INPUT VOLTAGE

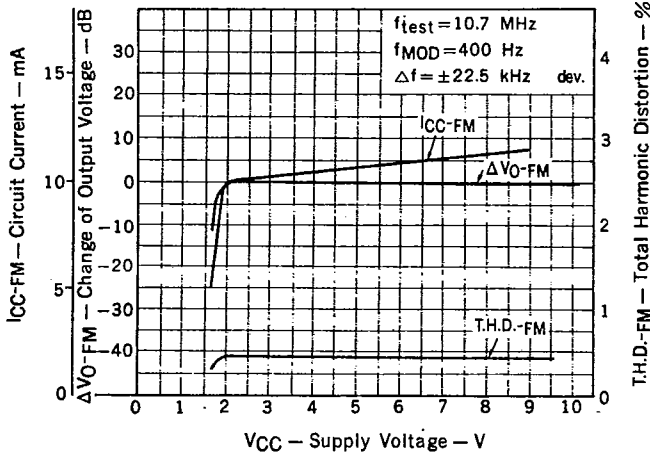


AM STAGE

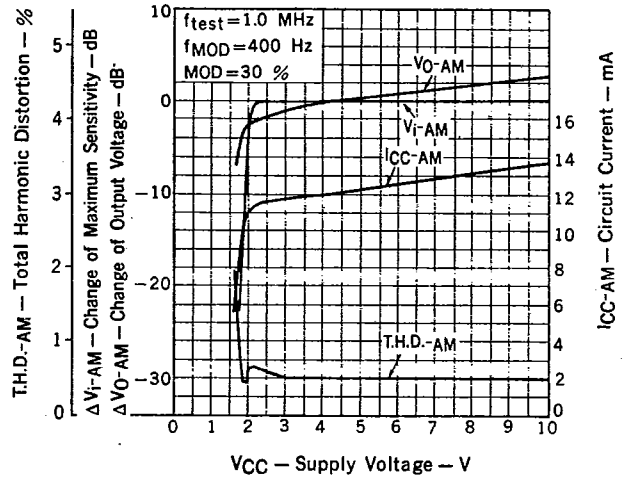
OUTPUT VOLTAGE, TOTAL HARMONIC DISTORTION, SIGNAL TO NOISE RATIO, vs. INPUT VOLTAGE



CIRCUIT CURRENT, CHANGE OF OUTPUT VOLTAGE TOTAL HARMONIC DISTORTION vs. SUPPLY VOLTAGE



CHANGE OF OUTPUT VOLTAGE, CHANGE OF MAXIMUM SENSITIVITY vs. SUPPLY VOLTAGE



DETECTOR OUTPUT VOLTAGE, TOTAL HARMONIC DISTORTION vs. MODULATION FREQUENCY

