

NEC
ELECTRON DEVICE

BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC1222C, μ PC1222C(R)

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

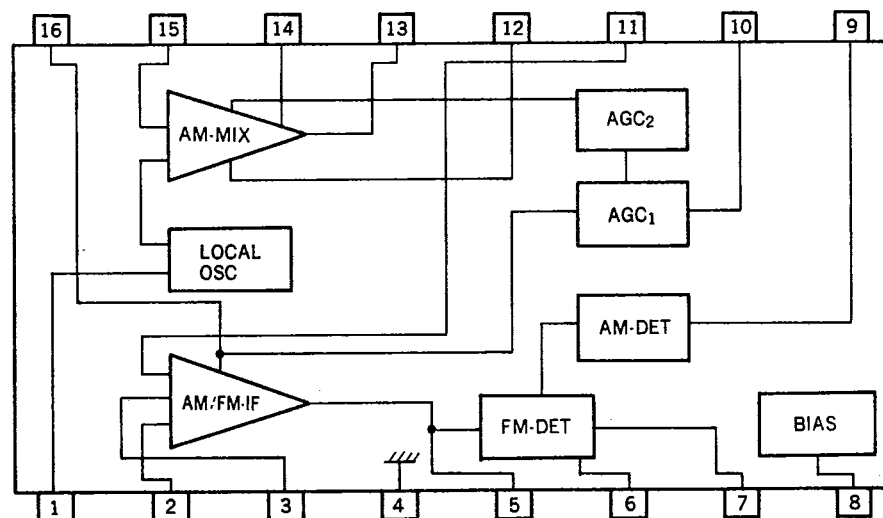
DESCRIPTION

The μ PC1222 is a low voltage silicon monolithic IC. It is designed for using in AM tuner and FM-IF. μ 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.
- μ PC1222C(R) is designed for upper heterodyne.
- μ PC1222C is designed for lower heterodyne.

BLOCK DIAGRAM (Top View)



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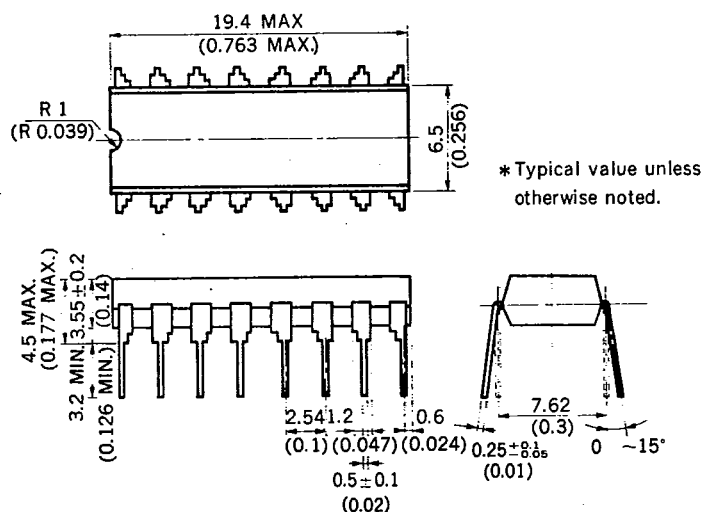
Nippon Electric Co., Ltd.

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 ($T_a = 25^\circ\text{C}$)

Supply Voltage	V_{CC}	9.0	V
Package Dissipation	P_D	350*	mW
Operating Temperature	T_{opt}	-20 to +75	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to +125	$^\circ\text{C}$

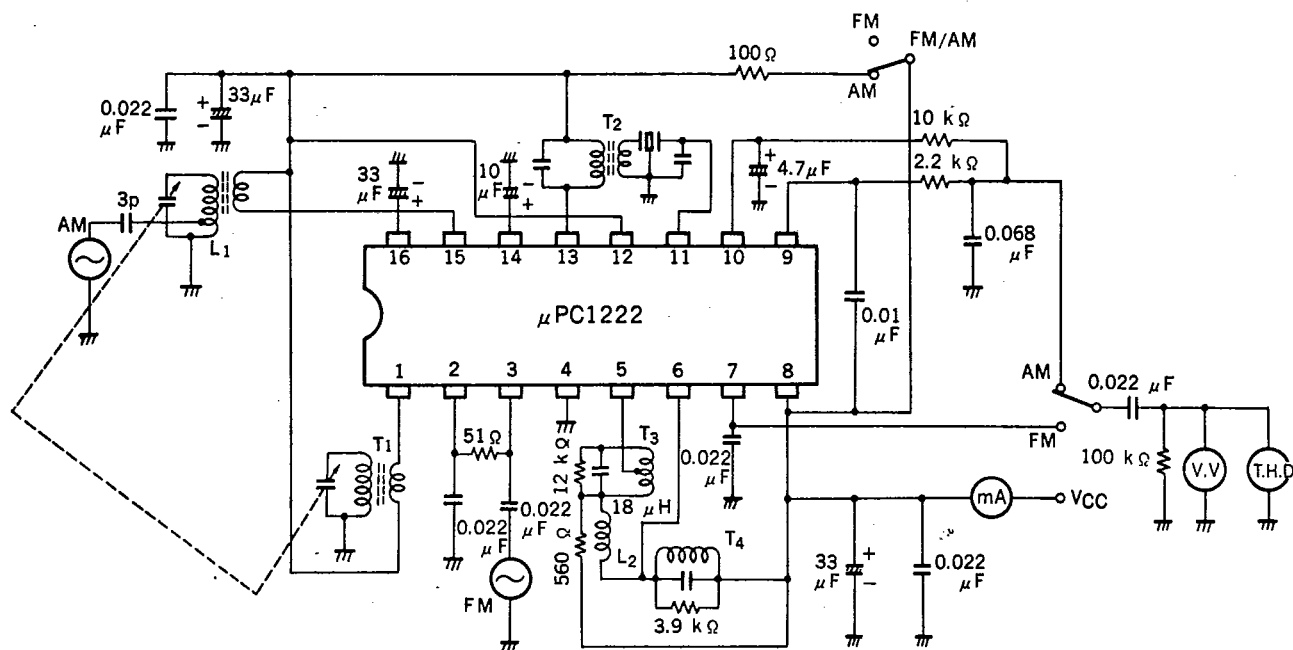
* $T_a = 75^\circ\text{C}$ RECOMMENDED OPERATING CONDITION ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}	2.0	4.0	6.0	V

ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)($V_{CC} = 4\text{ V}$ FM: $f = 10.7\text{ MHz}$, $\Delta f = \pm 22.5\text{ kHz DEV.}$ AM: $f = 1\text{ MHz}$, MOD. = 30 % $f_{MOD} = 400\text{ Hz}$)

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

TEST CIRCUIT



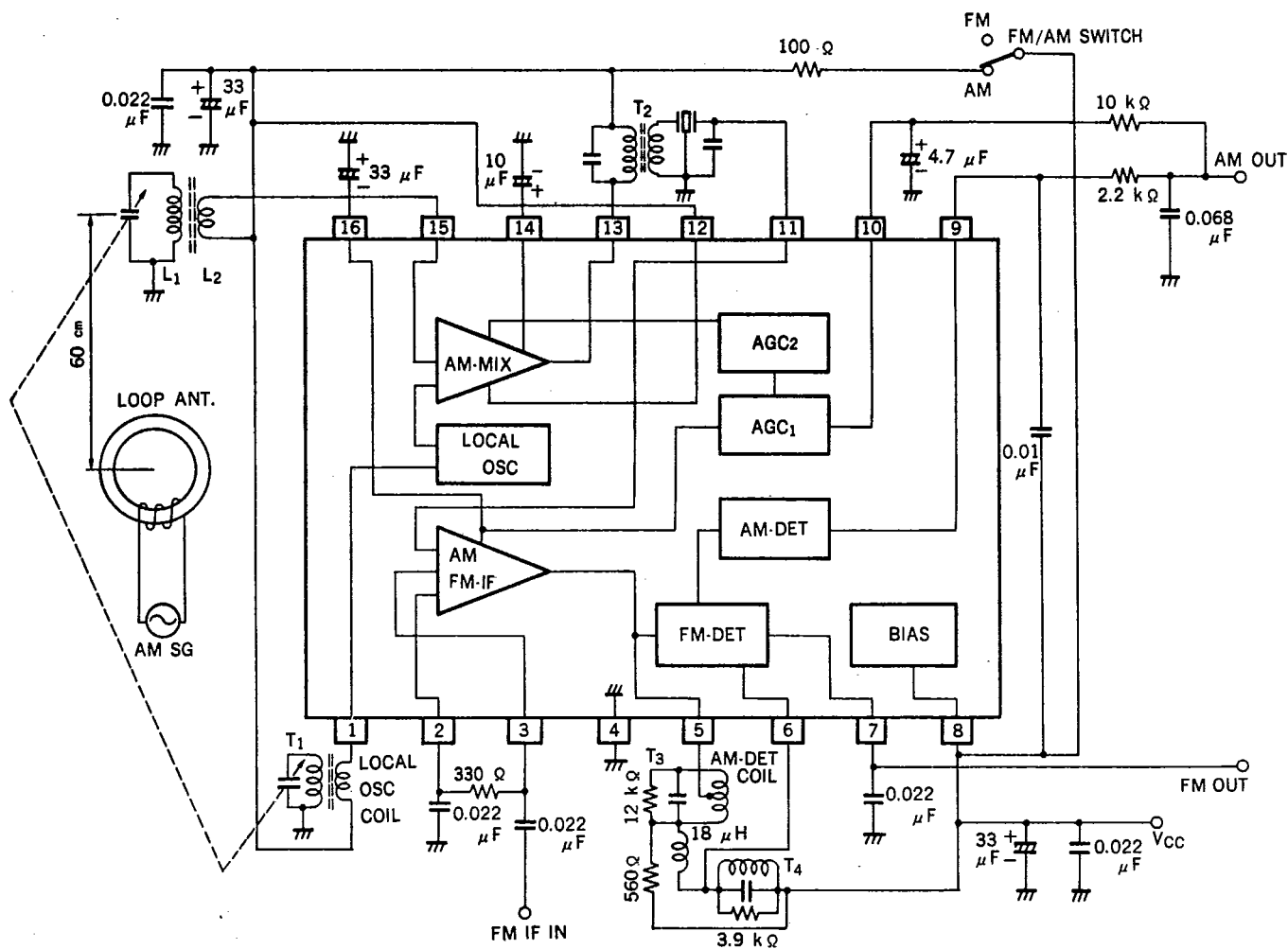
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|-----|--------------------------------|---------------------|
| L1: | AM ANT. COIL | 25A-1195-08 (CORIN) |
| T1: | AM LOCAL OSCILLATION COIL (MM) | 26-1791-13 (CORIN) |
| T2: | AM IF COIL | CFZ-455C (TOKO) |
| T3: | AM DETECTION COIL (455 kHz) | 5251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

AM STAGE REFERENCE CHARACTERISTICS

($V_{CC} = 4V$, $f = 1MHz$, $MOD = 30\%$, $f_{MOD} = 400Hz$, at APPLICATION CIRCUIT)

CHARACTERISTIC	SYMBOL	TYP.	UNIT	TEST CONDITION
Usable Sensitivity	V_i-S/N	48	dBμV/m	S/N=20 dB
Maximum Sensitivity	V_i-AM	35	dBμV/m	$V_O=10mVr.m.s.$
Detector Output	V_O-AM	34	mVr.m.s.	$V_i=100dBμV/m$
S/N Ratio	S/N	51	dB	$V_i=100dBμV/m$
Total Harmonic Distortion	T.H.D.	0.5	%	MOD=30 %, $V_i=100dBμV/m$
Drop Voltage Gain Loss	ΔA_{V-AM}	5	dB	$V_O=10mVr.m.s., V_{CC}=4 \rightarrow 2V$

TYPICAL APPLICATION

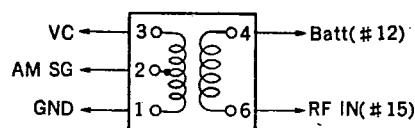


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|------------------|--------------------------------|--------------------|
| T ₁ : | AM LOCAL OSCILLATION COIL (MM) | 26-1791-13 (CORIN) |
| T ₂ : | AM IF COIL | CFZ-455C (TOKO) |
| T ₃ : | AM DETECTION COIL (455 kHz) | 5251 (TOKO) |
| T ₄ : | FM DETECTION COIL (10.7 MHz) | 12747 (TOKO) |

AM BAR ANT
CORE: ϕ 10 x 80 mm
 $L_0=600 \mu\text{H}$
 $Q=220$
 $L_1: L_2=107:25$

COIL SPECIFICATIONS

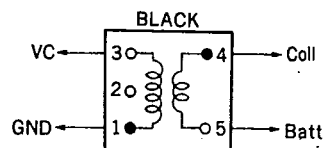
(1) ANTENNA COIL (MW) 25A-1195-08 (CORIN)



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

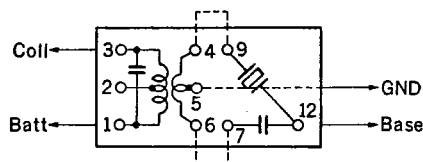
(2) AM LOCAL OSCILLATION COIL (MW) (CORIN)

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



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

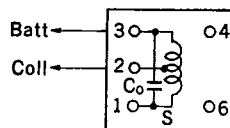
(3) AM IF COIL CFZ-455C (TOKO)



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

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

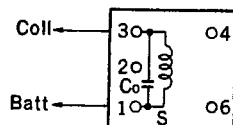
TYPE NO. 7P 1-2:2-3=1:1
 BODY COLOR BLACK



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

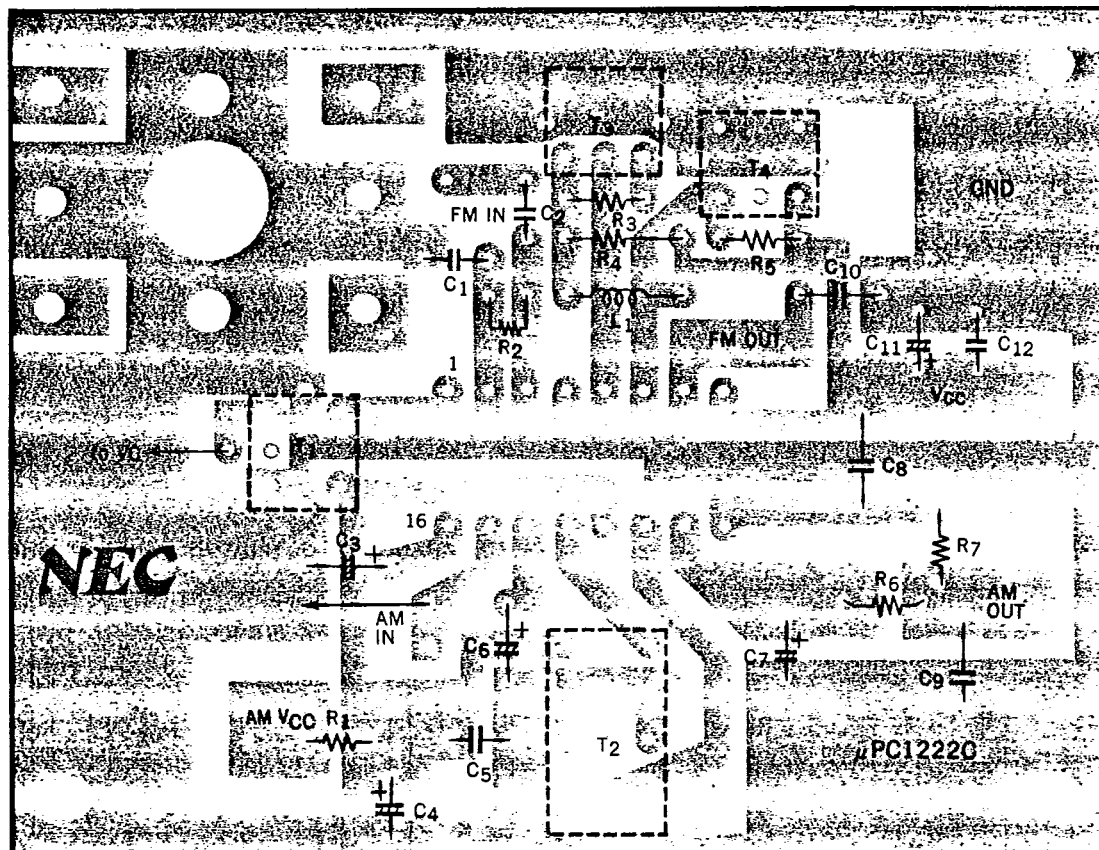
(5) FM DETECTION COIL (10.7 MHz) 12747 (TOKO)

TYPE NO. 7P
 BODY COLOR BLACK



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

P.C. BOARD PATTERN



R1	100 Ω
R2	51 Ω
R3	12 k Ω
R4	560 Ω
R5	3.9 k Ω
R6	2.2 k Ω
R7	10 k Ω

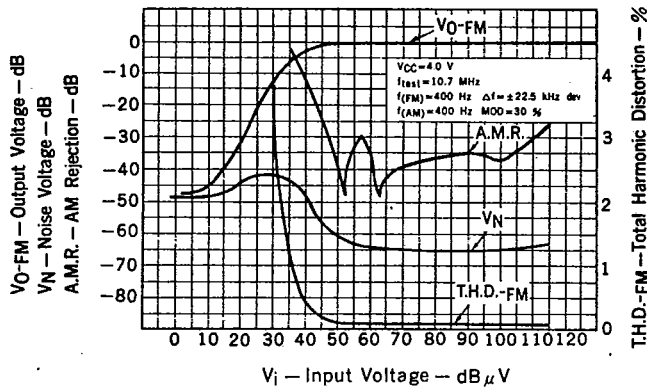
C1	0.022 μ F
C2	0.022 μ F
C3	33 μ F
C4	33 μ F
C5	0.022 μ F
C6	10 μ F
C7	4.7 μ F
C8	0.01 μ F
C9	0.068 μ F
C10	0.022 μ F
C11	33 μ F
C12	0.022 μ F

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 ($T_a = 25^\circ\text{C}$)

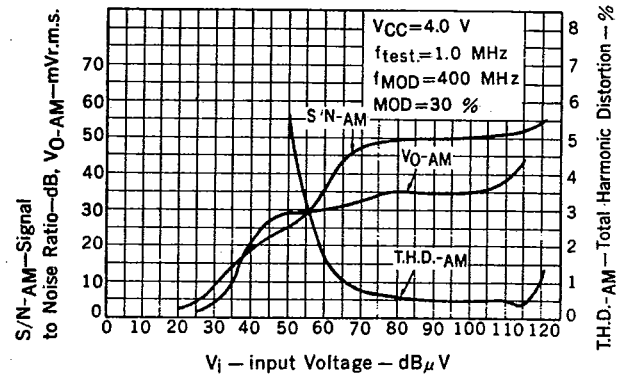
FM STAGE

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

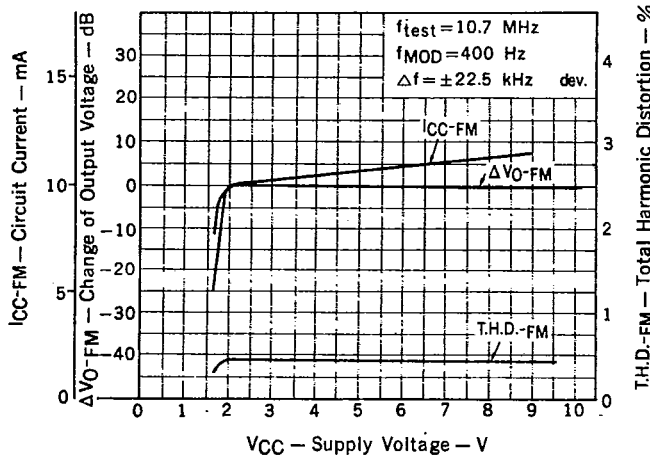


AM STAGE

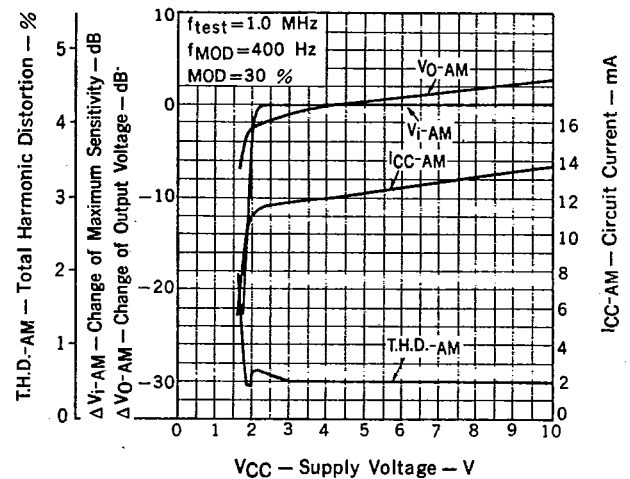
OUTPUT VOLTAGE, TOTAL HARMONIC DISTORTION, SIGNAL TO NOISE RATIO, vs. INPUT VOLTAGE



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

