NEC ELECTRON DEVICE

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC1222C, μPC1222C(R)

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

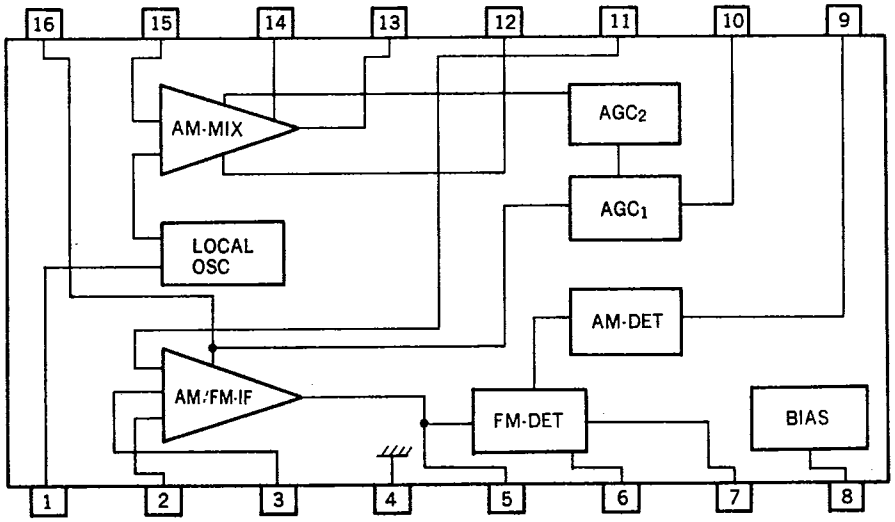
DESCRIPTION

The μPC1222 is a low voltage silicon monolithic IC. It is designed for using in AM tuner and FM-IF. μPC1222 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 V–6.0 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.
- μPC1222C(R) is designed for upper heterodyne.
- μPC1222C is designed for lower heterodyne.

BLOCK DIAGRAM (Top View)



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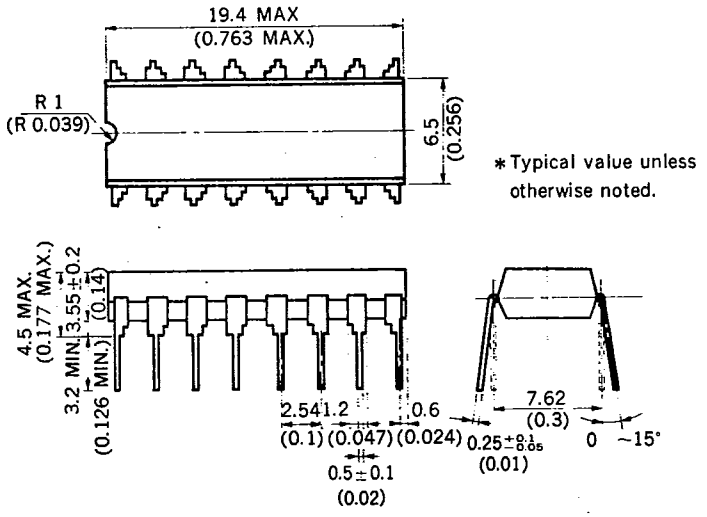
FUNCTION

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	V_{CC}	16	AM IF AGC BYPASS

ABSOLUTE MAXIMUM RATINGS (Ta = 25 °C)

Supply Voltage	V_{CC}	9.0	V
Package Dissipation	P_D	350*	mW
Operating Temperature	T_{opt}	−20 to +75	°C
Storage Temperature	T_{stg}	−40 to +125	°C
		*Ta = 75 °C	

RECOMMENDED OPERATING CONDITION (Ta = 25 °C)

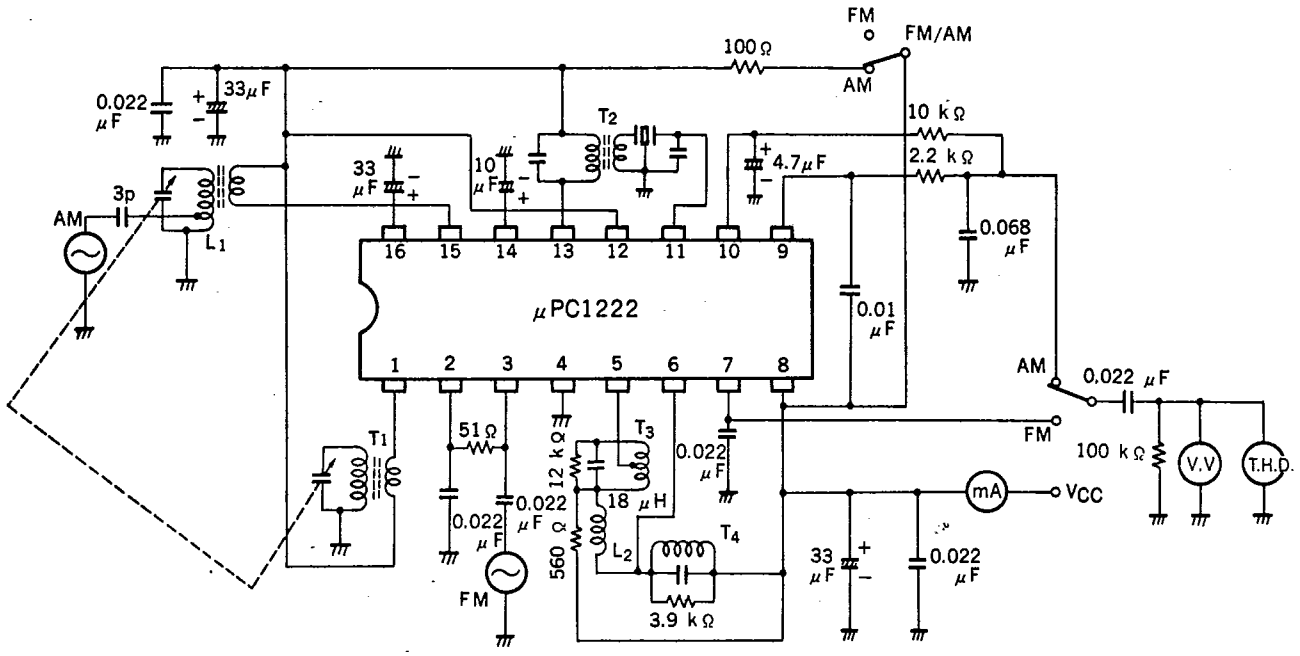
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}	2.0	4.0	6.0	V

ELECTRICAL CHARACTERISTICS (Ta = 25 °C)

(V_{CC} = 4 V FM: f = 10.7 MHz, Δf = ± 22.5 kHz DEV.
AM: f = 1 MHz, MOD. = 30 % f_{MOD} = 400 Hz)

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

TEST CIRCUIT



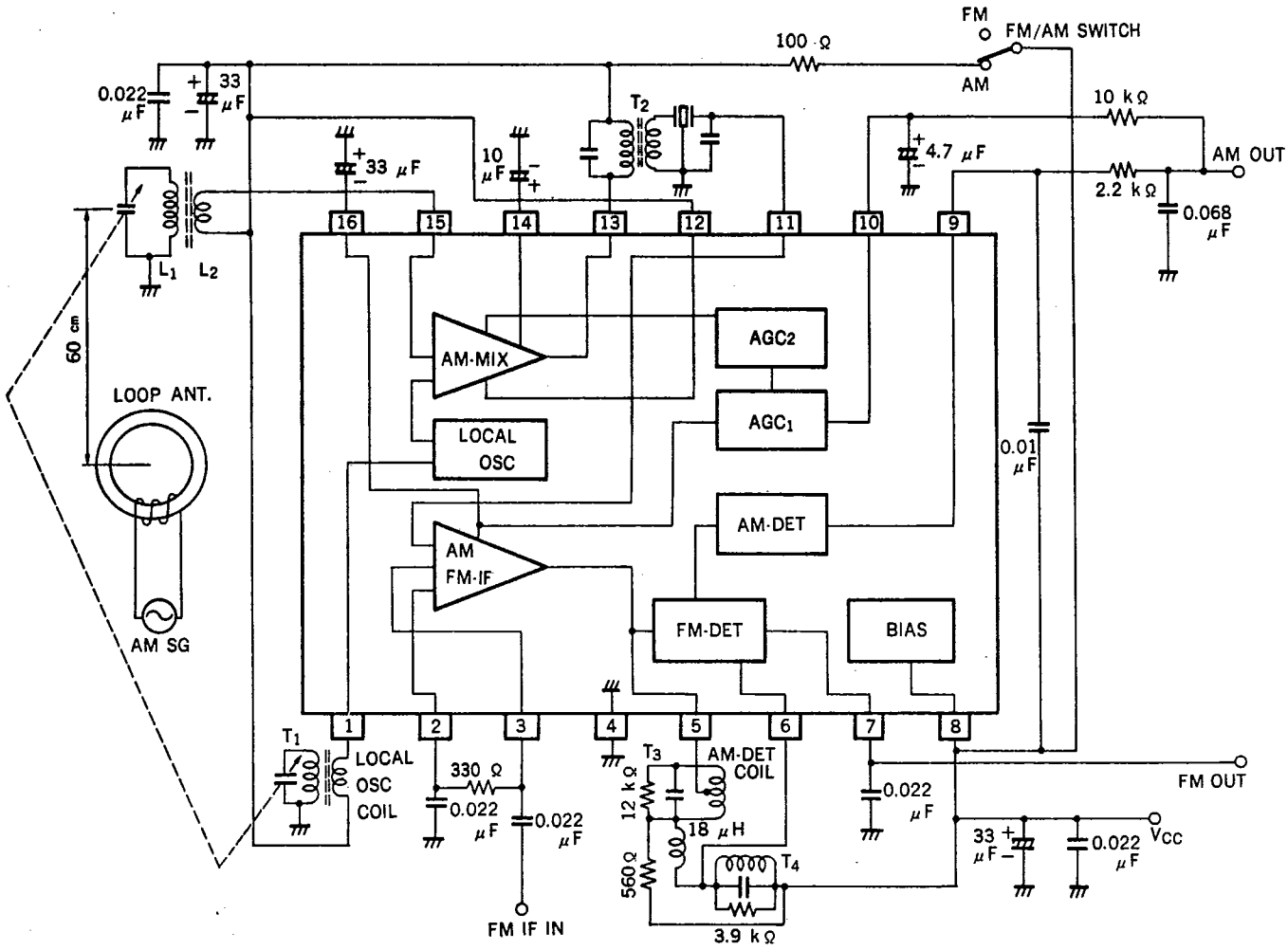
L_1:	AM ANT. COIL	25A-1195-08 (CORIN)
T_1:	AM LOCAL OSCILLATION COIL (MM)	26-1791-13 (CORIN)
T_2:	AM IF COIL	CFZ-455C (TOKO)
T_3:	AM DETECTION COIL (455 kHz)	5251 (TOKO)
T_4:	FM DETECTION COIL (10.7 MHz)	12747 (TOKO)
L_2:	PHASE SHIFT INDUCTOR	7BA 180JH (TOKO)

AM STAGE REFERENCE CHARACTERISTICS

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

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

TYPICAL APPLICATION

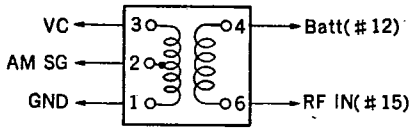


T_1:	AM LOCAL OSCILLATION COIL (MM)	26-1791-13 (CORIN)
T_2:	AM IF COIL	CFZ-455C (TOKO)
T_3:	AM DETECTION COIL (455 kHz)	5251 (TOKO)
T_4:	FM DETECTION COIL (10.7 MHz)	12747 (TOKO)

AM BAR ANT
CORE: ϕ 10 x 80 mm
L_O=600 μH
Q=220
L_1: L_2=107 : 25

COIL SPECIFICATIONS

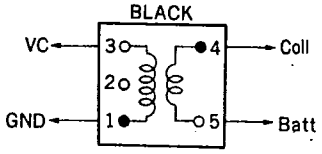
(1) ANTENNA COIL (MW) 25A-1195-08 (CORIN)



L_o = 650 μH
Q_o = 210±20 % (at 796 kHz)
1–2 25T 2–3 82T
1–3 107T 4–6 10T

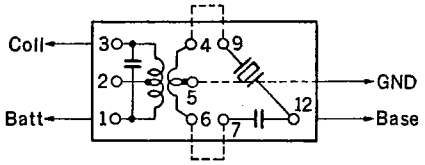
(2) AM LOCAL OSCILLATION COIL (MW) (CORIN)

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



L = 260 μH (±6 %)
Qu > 80 (f = 1.4 MHz)

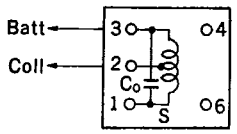
(3) AM IF COIL CFZ-455C (TOKO)



BANDWIDTH 6 kHz MIN.
SELECTIVITY (±10 kHz DETUNING) 20 dB MIN.

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

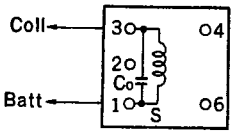
TYPE NO. 7P 1–2:2–3 = 1:1
BODY COLOR BLACK



CAPACITOR Co ..... 180 pF
Qu ..... 70±20 %

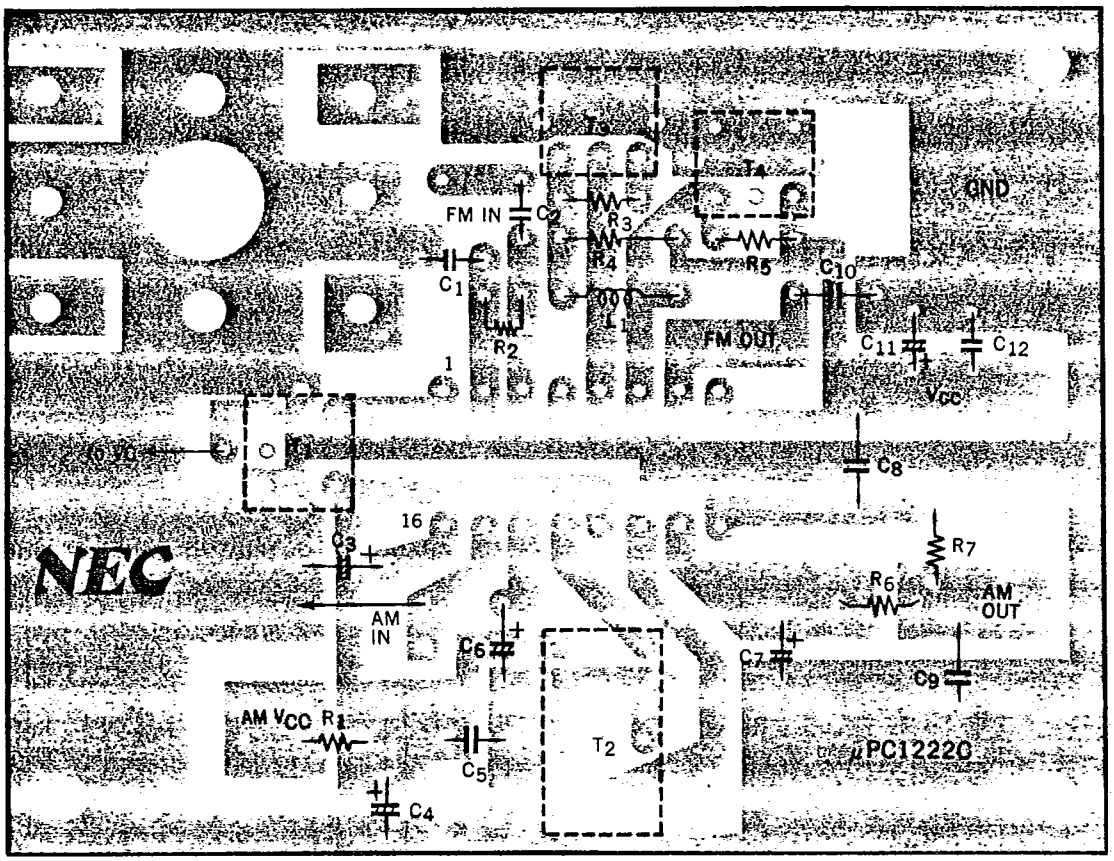
(5) FM DETECTION COIL (10.7 MHz) 12747 (TOKO)

TYPE NO. 7P
BODY COLOR BLACK



CAPACITOR Co ..... 82 pF
Qu ..... 70±20 %

P.C. BOARD PATTERN

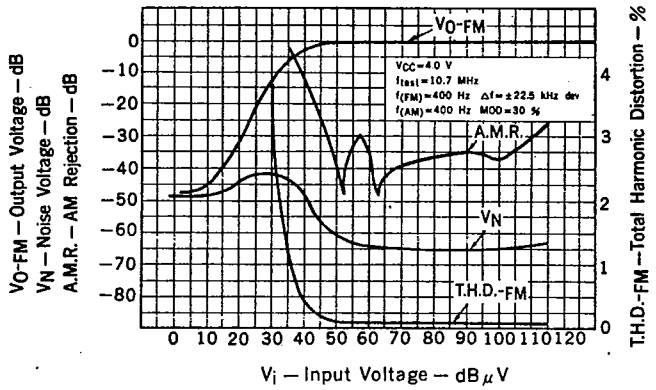


R_1	100 Ω	C_1	0.022 μF	T_1:	AM LOCAL OSC COIL 26-1791-13 (CORIN)
R_2	51 Ω	C_2	0.022 μF	T_2:	AM IF COIL CFZ-455C (TOKO)
R_3	12 kΩ	C_3	33 μF	T_3:	AM DET. COIL 5251 (TOKO)
R_4	560 Ω	C_4	33 μF	T_4:	FM DET. COIL 12747 (TOKO)
R_5	3.9 kΩ	C_5	0.022 μF	L_1:	PHASE SHIFT INDUCTOR : 7BA 180JH (TOKO)
R_6	2.2 kΩ	C_6	10 μF		
R_7	10 kΩ	C_7	4.7 μF		
		C_8	0.01 μF		
		C_9	0.068 μF		
		C_{10}	0.022 μF		
		C_{11}	33 μF		
		C_{12}	0.022 μF		

TYPICAL CHARACTERISTICS (Ta = 25 °C)

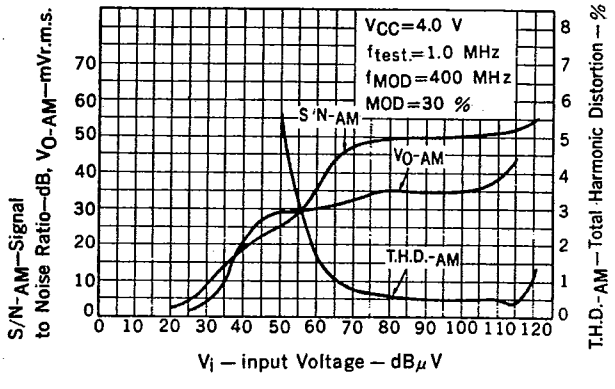
FM STAGE

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

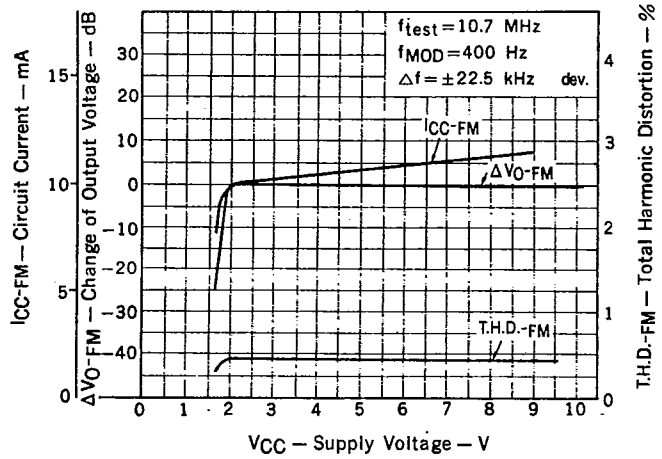


AM STAGE

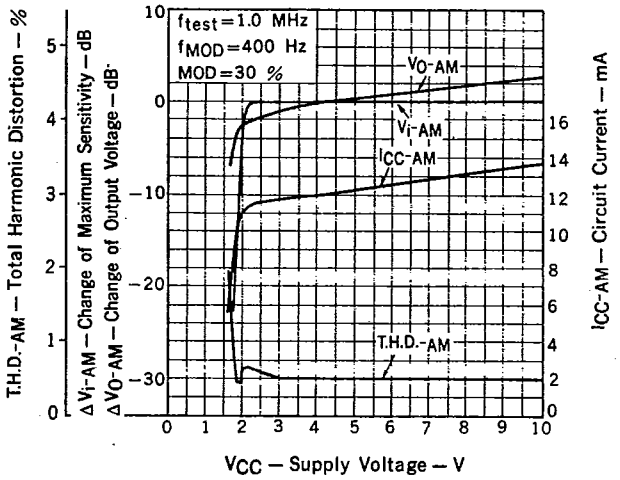
OUTPUT VOLTAGE, TOTAL HARMONIC DISTORTION, SIGNAL TO NOISE RATIO, vs. INPUT VOLTAGE



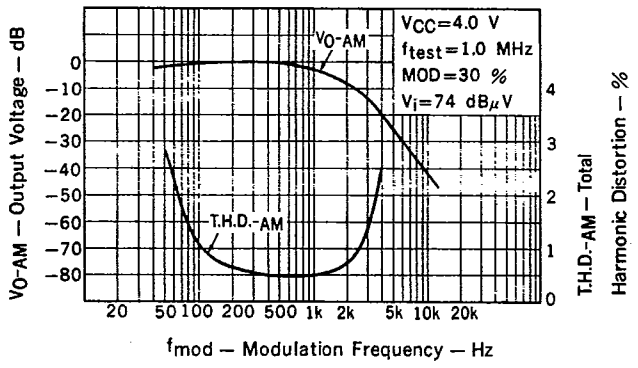
CIRCUIT CURRENT, CHANGE OF OUTPUT VOLTAGE TOTAL HARMONIC DISTORTION vs. SUPPLY VOLTAGE



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



DETECTOR OUTPUT VOLTAGE, TOTAL HARMONIC DISTORTION vs. MODULATION FREQUENCY



Nippon Electric Co.,Ltd.
NEC Building, 33-1, Shiba-Gochome, Minato-ku, Tokyo 108, Japan
Tel: Tokyo 454—1111
Telex Address: NECTOK J22686
Cable Address: MICROPHONE TOKYO

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