

BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC1021C

AM TUNER

SILICON BIPOLAR MONOLITHIC INTEGRATED CIRCUIT

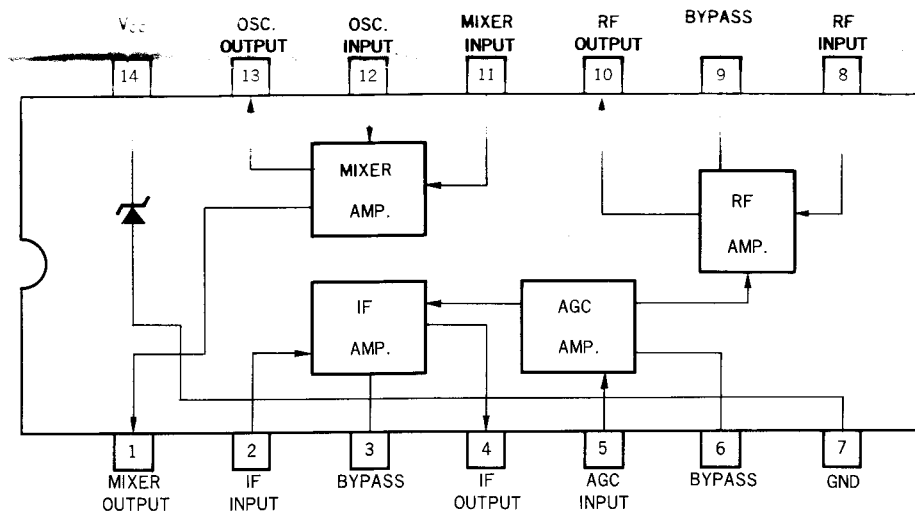
DESCRIPTION

The μ PC1021C is a silicon monolithic integrated circuit designed for an AM tuner application in automobile receivers. The device contains an RF amplifier, a mixer, an IF amplifier and an AGC circuit.

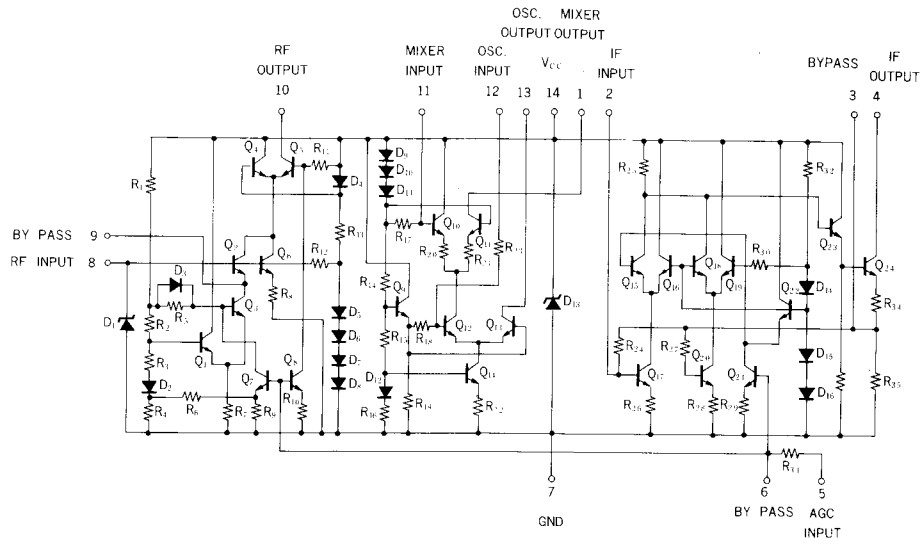
FEATURES

- Excellent overload characteristics : T.H.D.=0.5% TYP. at 132 dB μ input.
- Good sensitivity and wide AGC range.
- Large S/N ratio : S/N=49 dB TYP. at 74 dB μ input.
- Internal zener diode provides stable operation for supply voltage change.

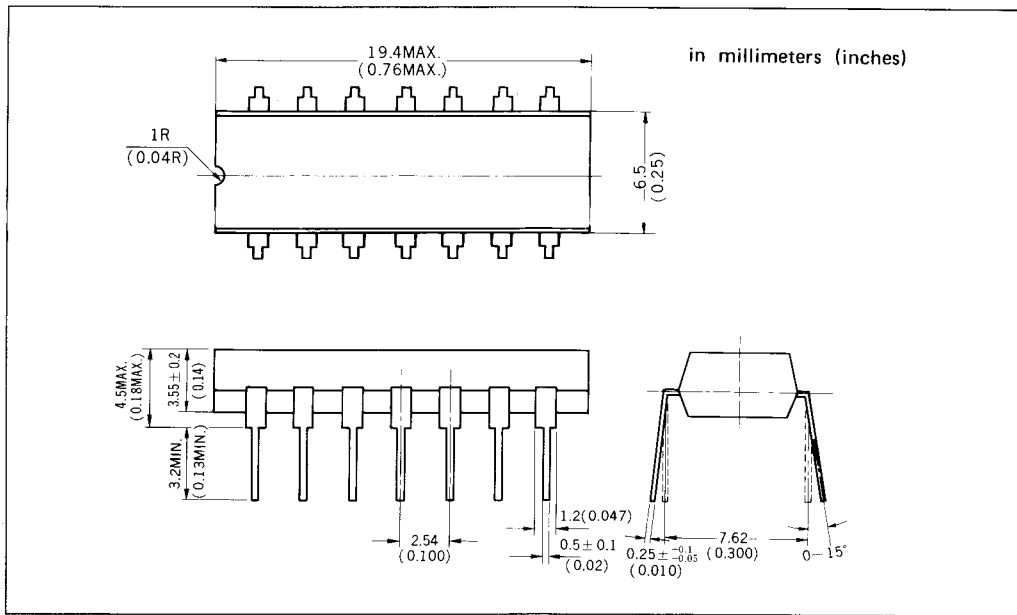
BLOCK DIAGRAM



EQUIVALENT CIRCUIT



PACKAGE DIMENSIONS AND CONNECTION DIAGRAM (Top View)



Pin No.	Electrical Connections	Pin No.	Electrical Connections
1	MIXER OUTPUT	8	RF INPUT
2	IF INPUT	9	BYPASS
3	BYPASS	10	RF OUT
4	IF OUTPUT	11	MIXER INPUT
5	AGC INPUT	12	OSC INPUT
6	BYPASS	13	OSC OUTPUT
7	GND	14	POWER SUPPLY (Vcc)

ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Supply Voltage	VCC	18	V
Input Voltage	Vi	7	V
Package Dissipation (Ta=75°C)	PD	350	mW
Operating Temperature	Topt	-20 to +75	°C
Storage Temperature	Tstg	-40 to +125	°C

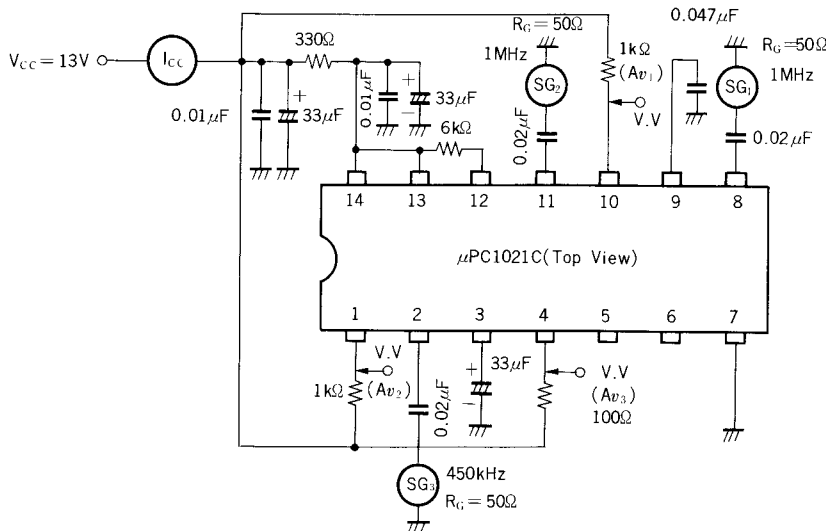
RECOMMENDED CONDITIONS (Ta=25°C)

Operating Supply Voltage	VCC	13	V
Supply Voltage Range		9 to 16	V
Operating Ambient Temperature	Ta	-20 to +75	°C

ELECTRICAL CHARACTERISTICS (Ta=25°C, Vcc=13V)

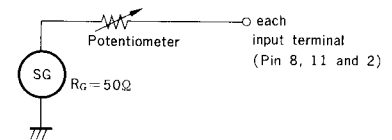
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Circuit Current	I _{CC}	18	27		mA	Quiescent
Voltage Gain (RF Amplifier)	A _{v1}	28	32		dB	v _i =1mV, f=1MHz (Pin 8), R _L =1kΩ (Pin 10)
Voltage Gain (Mixer)	A _{v2}	8	12		dB	v _i =10mV, f=1MHz (Pin 11) R _L =1kΩ (Pin 1)
Voltage Gain (IF Amplifier)	A _{v3}	31	36		dB	v _i =1mV, f=450kHz (Pin 2) R _L =100Ω (Pin 4)
Input Impedance (RF Amplifier)	Z _{i1}		1.3		kΩ	f=1MHz (Pin 8)
Input Impedance (Mixer)	Z _{i2}		1.8		kΩ	f=1MHz (Pin 11)
Input Impedance (IF Amplifier)	Z _{i3}		2.1		kΩ	f=450kHz (Pin 2)
AGC Range	AGC		117		dB	Input Voltage Range for 10 dB Output Voltage Change

TEST CIRCUIT



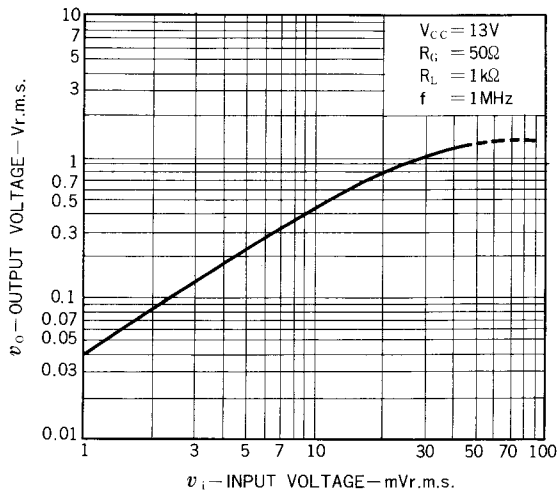
Input Impedance Test Procedure

1. Increase 6dB the SG output level than the case of voltage gain test.
2. Adjust the potentiometer for the same output voltage as the case of voltage gain test.
3. The potentiometer value shows the equivalent input impedance of the device under test.

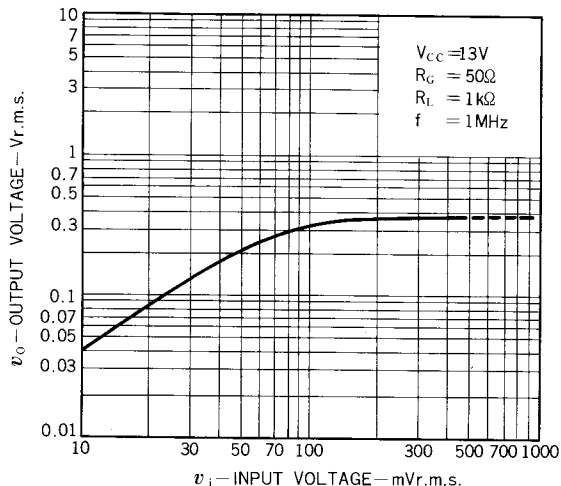


TYPICAL CHARACTERISTICS ($T_a=25^\circ\text{C}$)

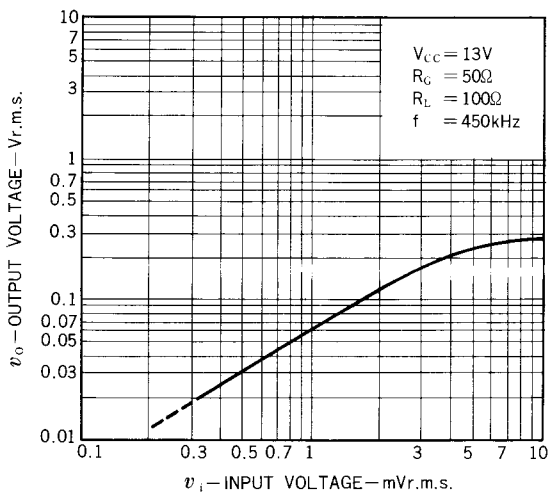
INPUT CHARACTERISTIC (RF AMPLIFIER)



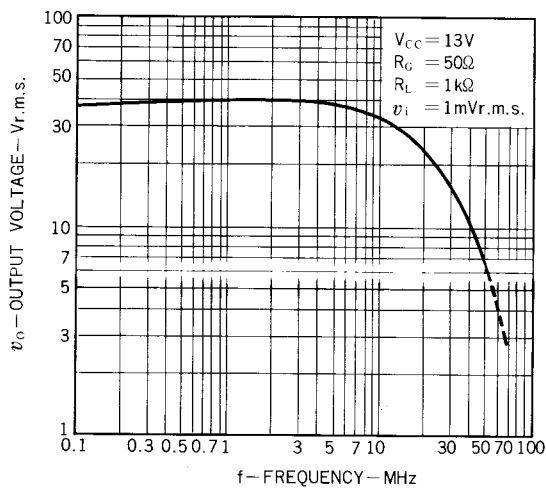
INPUT CHARACTERISTIC (MIXER)



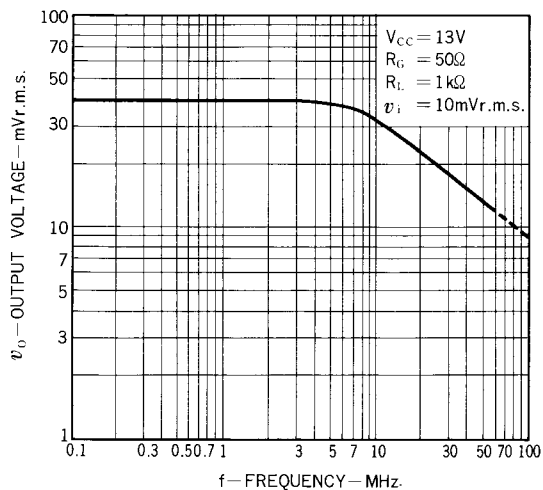
INPUT CHARACTERISTIC (IF AMPLIFIER)



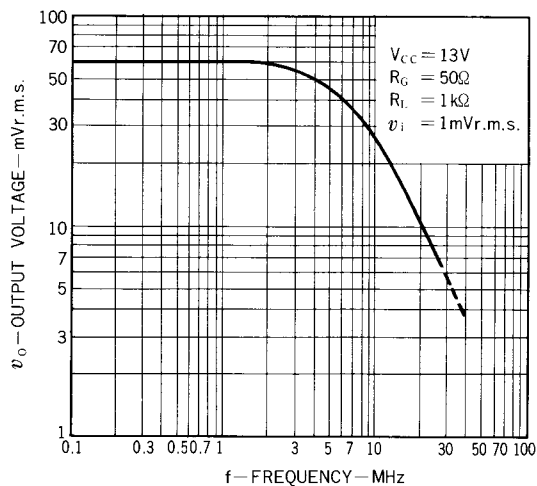
FREQUENCY RESPONSE (RF AMPLIFIER)

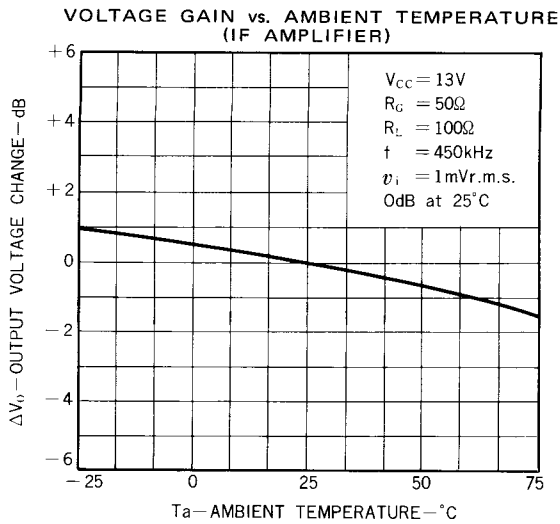
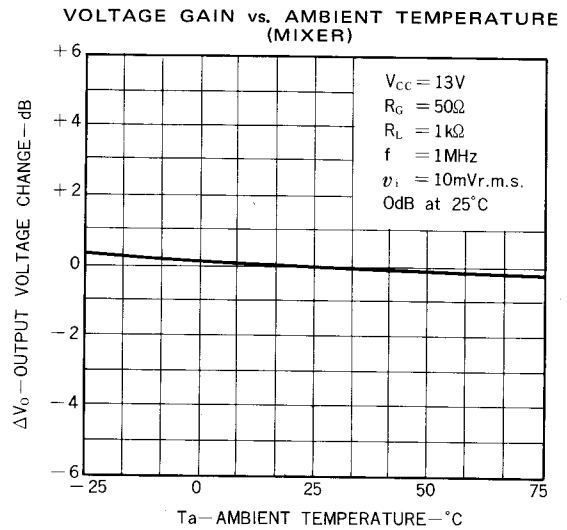
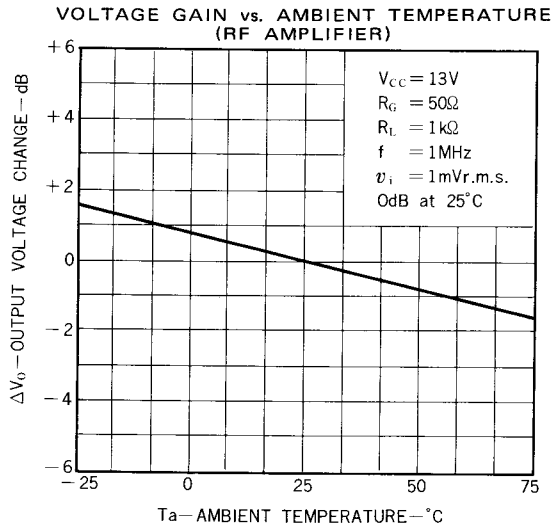


FREQUENCY RESPONSE (MIXER)

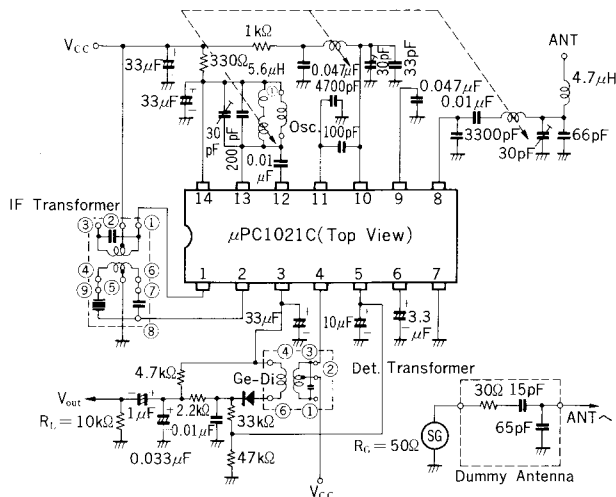


FREQUENCY RESPONSE (IF AMPLIFIER)





TYPICAL APPLICATION



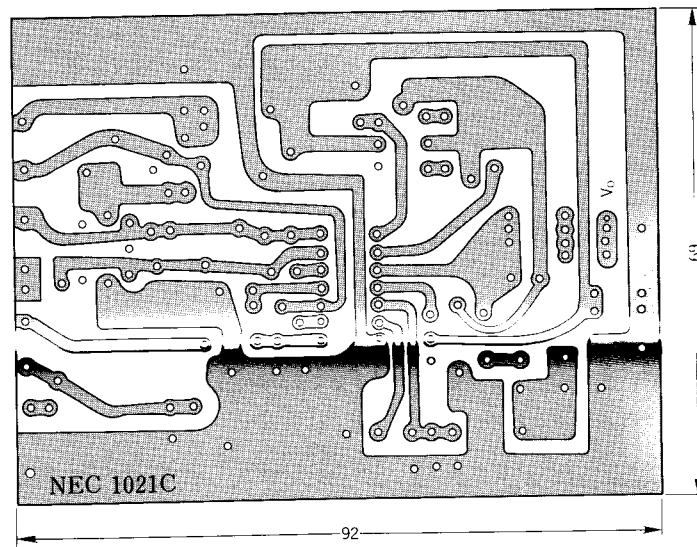
- Tuner:** NIHON TUNER made Model 5M or equivalent
IF Transformer: TOKO INC. made CFV-005 or equivalent
Det. Transformer: TOKO INC. made PMC-1313A or equivalent
Osc. Transformer: TOKO INC. made YXR-19931HIB or equivalent
Trimmer Capacitor: MURATA Co. made CV03-15D300 or equivalent

TUNER PERFORMANCE CHARACTERISTICS

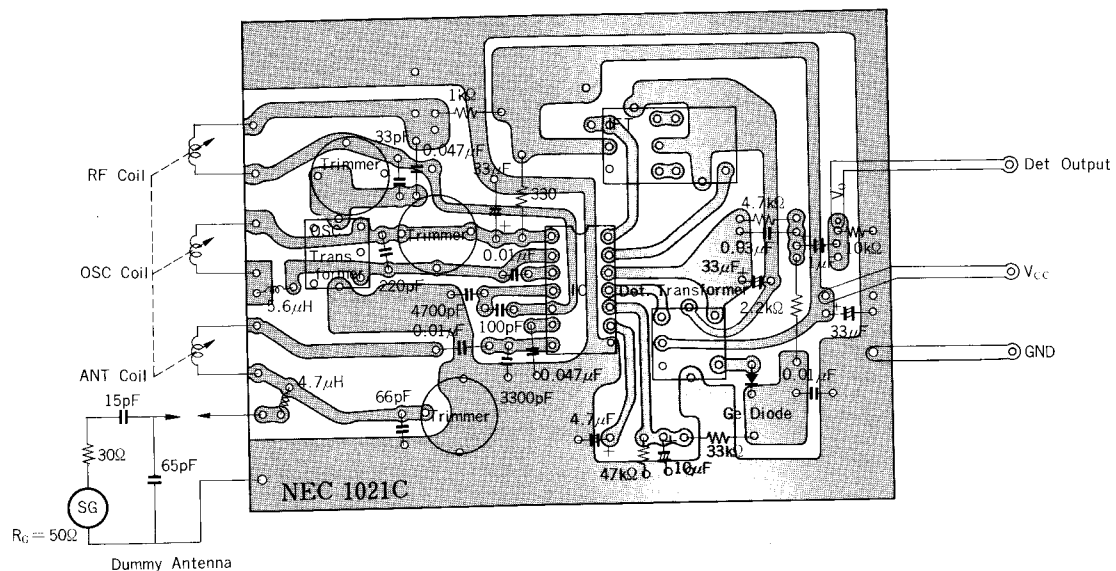
($T_a=25^\circ\text{C}$, $V_{cc}=13\text{V}$, $f=1\text{MHz}$, $f_{\text{mod}}=400\text{Hz}$, $\text{MOD}=30\%$, $R_L=10\text{k}\Omega$)

CHARACTERISTIC	TEST CONDITION	VALUE	UNIT
Max. Sensitivity	Input Voltage at which Det. Output Voltage is 20mVr.m.s.	11	dB μV
Usable Sensitivity	Input Voltage at which S/N Ratio is 20dB.	24	dB μV
Detector Output	Resistors connected Pin 5 are 47k Ω and 33k Ω . $v_i=74\text{dB}\mu\text{V}$	65	mV.r.m.s.
Detector Distortion	$v_i=74\text{dB}\mu\text{V}$	0.4	%
S/N Ratio	$v_i=74\text{dB}\mu\text{V}$	49	dB
Overload Distortion	$v_i=126\text{dB}\mu\text{V}$	0.4	%
IF Rejection	$f=1\text{MHz}$, $v_o=20\text{mV}$, 1F=450kHz	67	dB
Image Rejection	$f=1\text{MHz}$, $v_o=20\text{mV}$, f+2 IF	80	dB
Selectivity	$f=1\text{MHz}$, $\Delta f=\pm 10\text{kHz}$	31	dB
Tweet	$v_i=74\text{dB}\mu\text{V}$, 2 IF= 900kHz	40	dB
	3 IF=1350kHz	50	

TYPICAL PRINTED CIRCUIT BOARD PATTERN

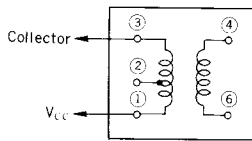


COMPONENT LAYOUT (Bottom View)



COIL DATA

① Oscillator Coil : TOKO INC. made YXR-19931 HB



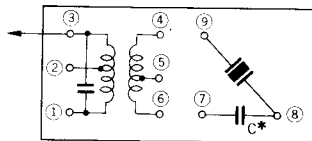
QU 80~ (796kHz)

①~② ②~③ ④~⑥

8T 67T 30T

L=220 μ H \pm 6%

② IF Transformer : TOKO INC. made CFV-005

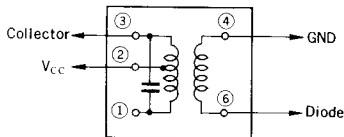


Center Frequency 450 \pm 3.5kHz, 180pF Built in.
Selectivity (\pm 10kHz) 16dB Minimum.

①~② ②~③ ①~③ ④~⑤ ⑤~⑥

83T 83T 166T 9T 12T

③ Detector Transformer : TOKO INC. made PMC-1313A



①~② ②~③ ④~⑥ 180pF Built in.

99T 16T 24T

450kHz + 5%

-2.5%

QU=110 \pm 20% QL=35 \pm 20%

④ Tuner : NIHON TUNER Co. made 5M-S

Minimum Frequency Cover Range 525~1615kHz

Tuning Capacitor

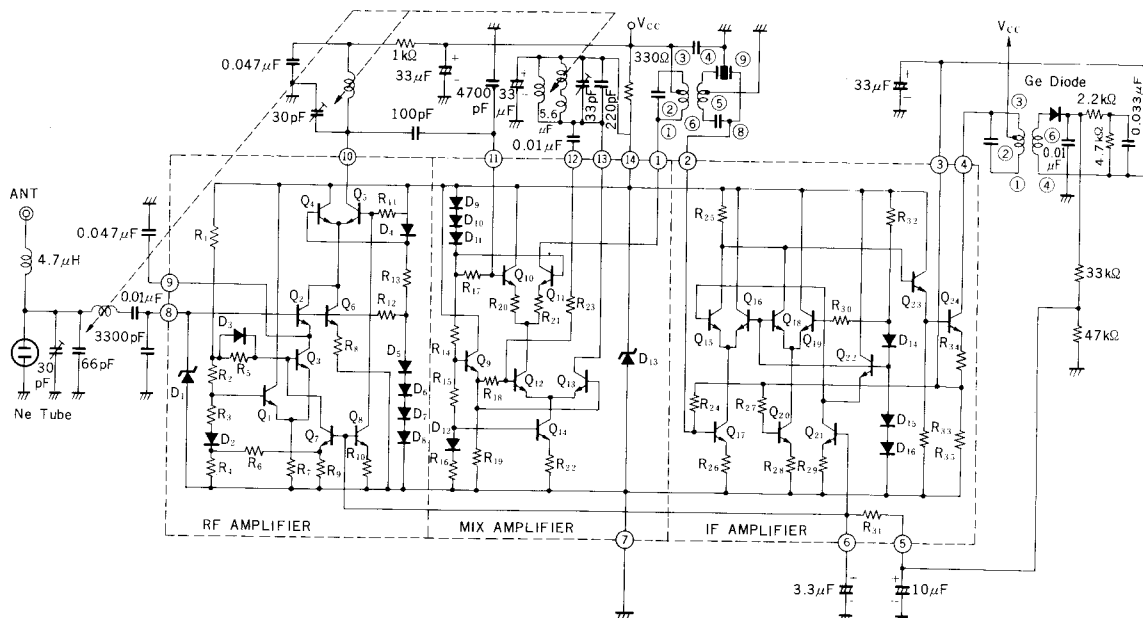
ANT Coil 150pF

RF Coil 150pF

Osc. Coil 450pF

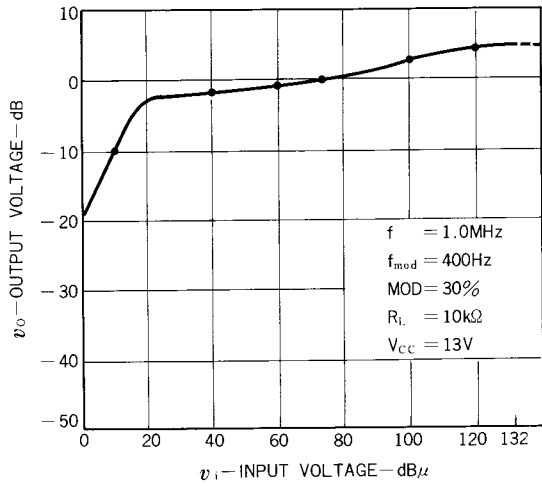
Equivalent performance characteristics are obtained
by MITSUMI ELECTRIC Co. made CBT-ZT-01 Tuner.

TYPICAL TUNER CIRCUIT

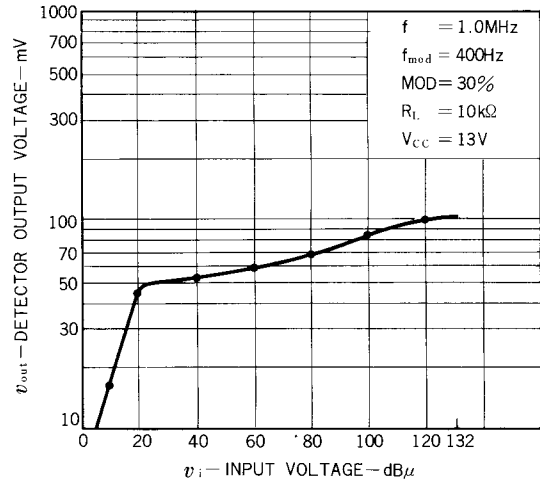


TYPICAL TUNER PERFORMANCE CHARACTERISTICS

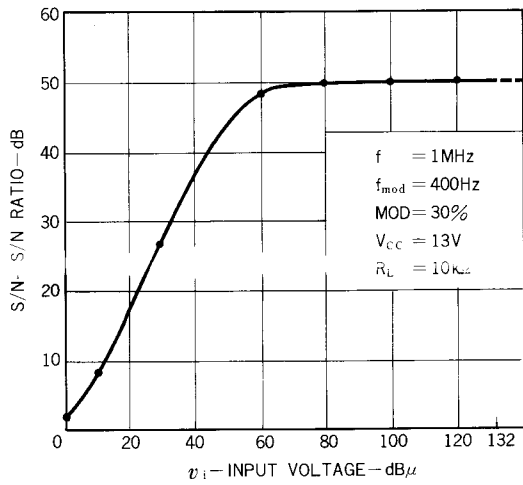
AGC CHARACTERISTIC



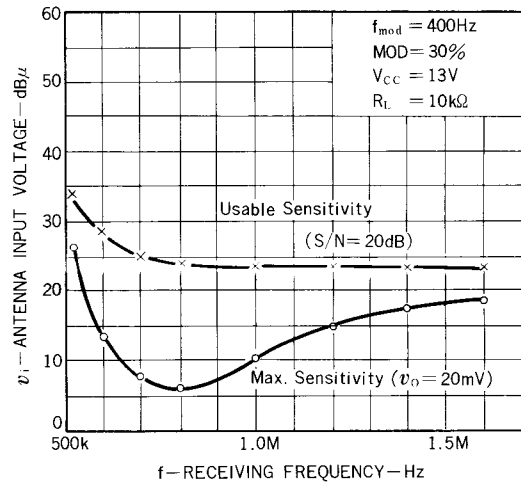
DETECTOR OUTPUT



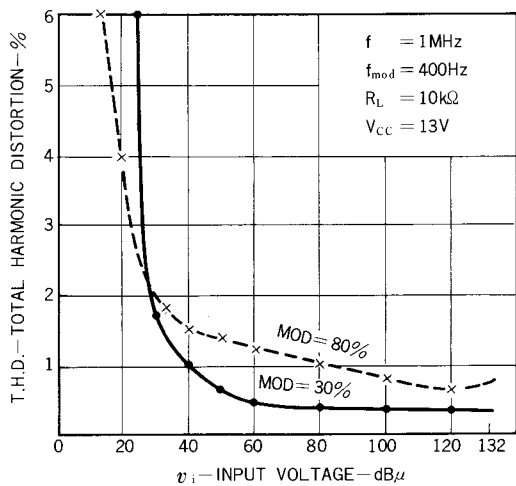
S/N RATIO



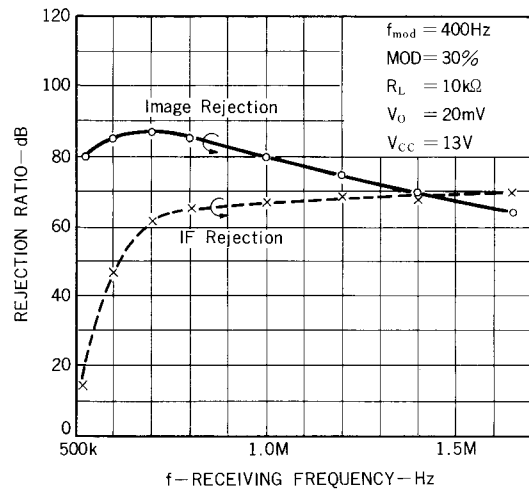
MAX. SENSITIVITY and USABLE SENSITIVITY



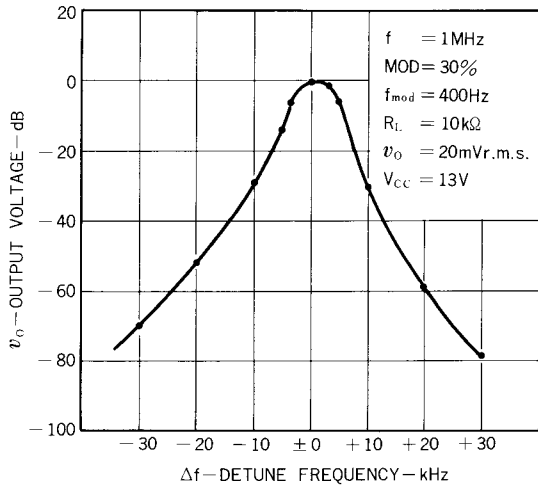
TOTAL HARMONIC DISTORTION



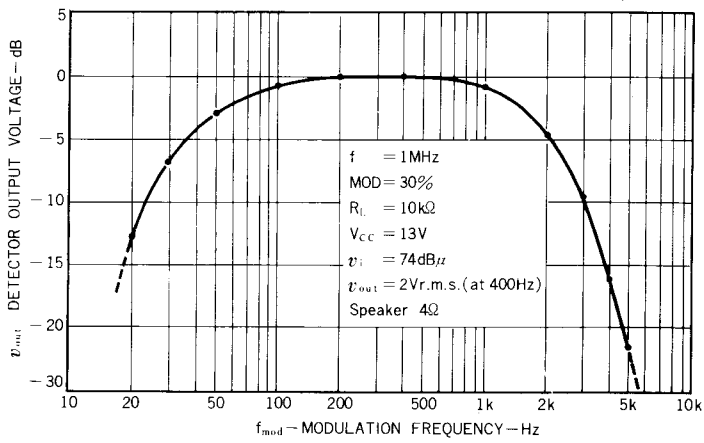
IF REJECTION and IMAGE REJECTION



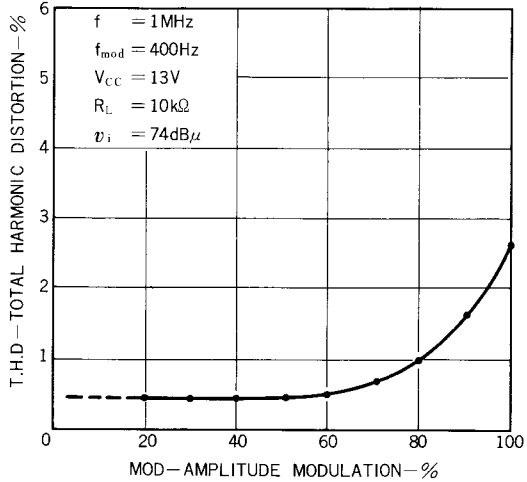
SELECTIVITY



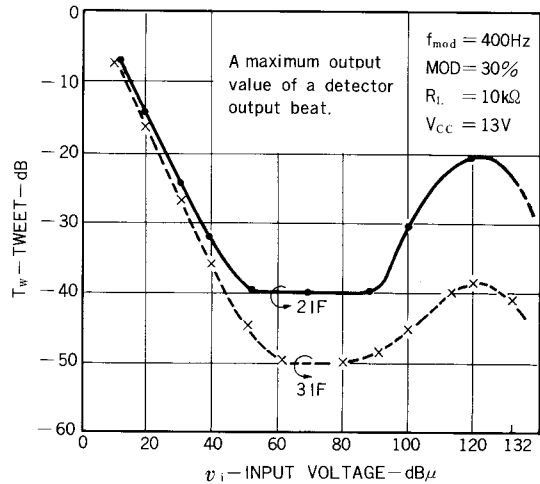
ELECTRICAL FIDELITY ($\mu\text{PC1021C} + \mu\text{PC1020H}$) AM Tuner Audio Amplifier



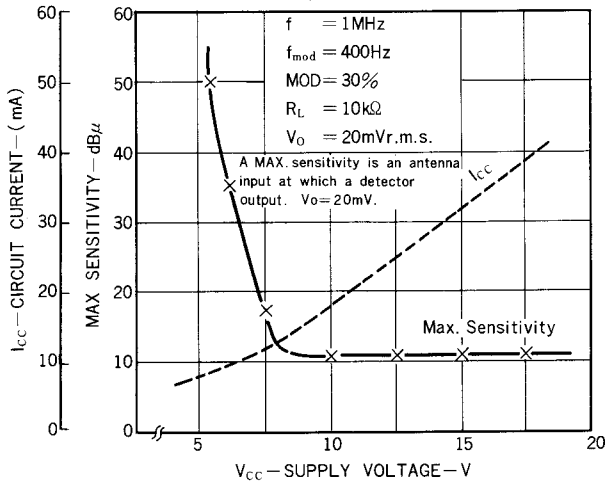
TOTAL HARMONIC DISTORTION vs. AMPLITUDE MODULATION



TWEET CHARACTERISTIC



CIRCUIT CURRENT and MAX. SENSITIVITY
vs. SUPPLY VOLTAGE



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