

ELECTRONIC TUNING AM RADIO RECEIVER SILICON BIPOLAR MONOLITHIC INTEGRATED CIRCUIT

The μ PC1215V is a monolithic integrated circuit that is provided with the mixer, low level oscillator, IF amplifier, detector and station detector for an electronic tuning AM radio receiver.

This IC also contains internal AGC for the first IF amplifier stage, delayed AGC for an optional external RF amplifier and oscillator buffer amplifier to drive a logic section.

The μ PC1215V is suitable for use in automotive radio receivers, specially where compact mounting is required, such as car stereo sets, because its package is the 19-leads vertical dual in-line plastic package (V-DIP).

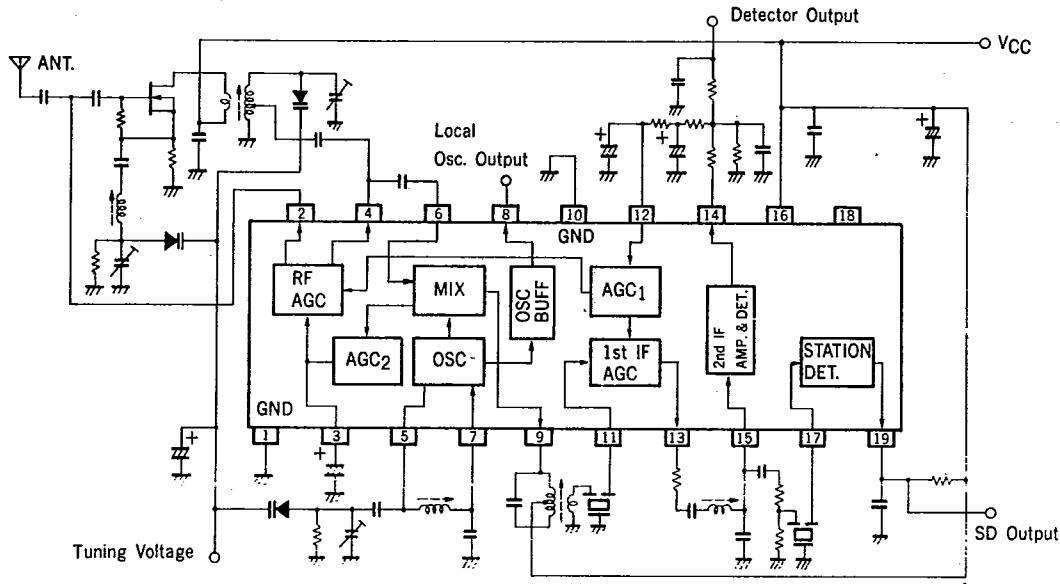
- High sensitivity and wide AGC range.
- Excellent overload characteristics.
- Delayed AGC for RF amplifier.
- Special low level oscillator to reduce tracking error.
- Oscillator buffer output.
- Station detector for auto scan stop.
- Occupation of minimum area in P.C. Board.

Technical drawing of a marking board. The board is rectangular with a width of 25.5 MAX. and a height of 8.5 MAX. The top edge is labeled "C 1.3". The front edge is labeled "MARKING" and has 19 numbered slots (1 to 19). The distance between the first and second slot is 2.54, and the distance between the second and third slot is 2.54. The total width of the board is 22.86. The distance between the last slot and the right edge is 0.6 MAX. The board is shown with a side view on the right, indicating a thickness of 2.8. The side view also shows a height of 10.2 MAX. and a distance of 13.8 MAX. from the bottom edge to the top of the board. The bottom edge of the board is labeled 14.8 MAX. The bottom edge of the side view is labeled 0.35 and 1. The bottom edge of the board is labeled 2.54.

NEC cannot assume any responsibility for any circuits shown or represent that they are free from patent infringement.

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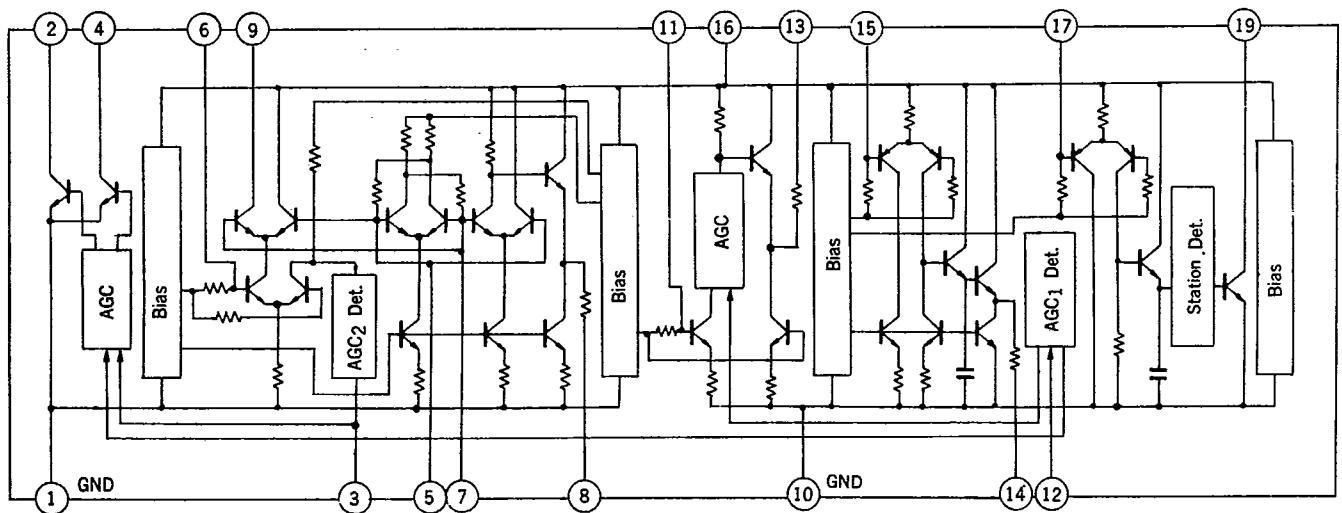
BLOCK DIAGRAM



CONNECTION DIAGRAM

Pin No.	Connection	Pin No.	Connection
1	GND ₁	2	AGC for Antenna
3	AGC Filter	4	AGC for RF
5	OSC Tank	6	MIX Input
7	OSC Bypass	8	OSC Buffer Output
9	MIX Output	10	GND ₂
11	1st IF Amp. Input	12	AGC Input
13	1st IF Amp. Output	14	Detector Output
15	2nd. IF Amp. Input	16	V _{CC}
17	Station Det. Input	18	
19	Station Det. Output		

EQUIVALENT CIRCUIT



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

DC Supply Voltage	V_{CC}	15	V
Input Voltage	V_i	3.0	Vp-p
Package Dissipation	P_d	430 ($T_a = 75^\circ\text{C}$)	mW
Operating Temperature	T_{opt}	-30 to +75	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to +125	$^\circ\text{C}$

RECOMENDED OPERATING CONDITIONS

DC Supply Voltage Range	V_{CC}	8.0 to 15	V
Operating Ambient Temperature	T_a	-30 to +75	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$, $V_{CC} = 10\text{ V}$, $f = 1.0\text{ MHz}$, $f_{mod.} = 400\text{ Hz}$, $mod. = 30\%$)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Circuit Current	I_{CC}	10	14	21	mA	At no signal
Maximum Sensitivity	MS	14	21	28	dB μV	$v_o = 30\text{ mVr.m.s.}$
Signal to Noise Ratio	S/N	8.0	13		dB	$v_i = 21\text{ dB}\mu\text{V}$
Detector Output Volt.*	v_o	70	100	130	mVr.m.s.	$v_i = 74\text{ dB}\mu\text{V}$
Harmonic Distortion	T.H.D.		0.5	1.0	%	$v_i = 120\text{ dB}\mu\text{V}$
SD Output Voltage	VSD-L			0.5	V	$v_i = 0\text{ dB}\mu\text{V}$
	VSD-H	8.0			V	$v_i = 74\text{ dB}\mu\text{V}$

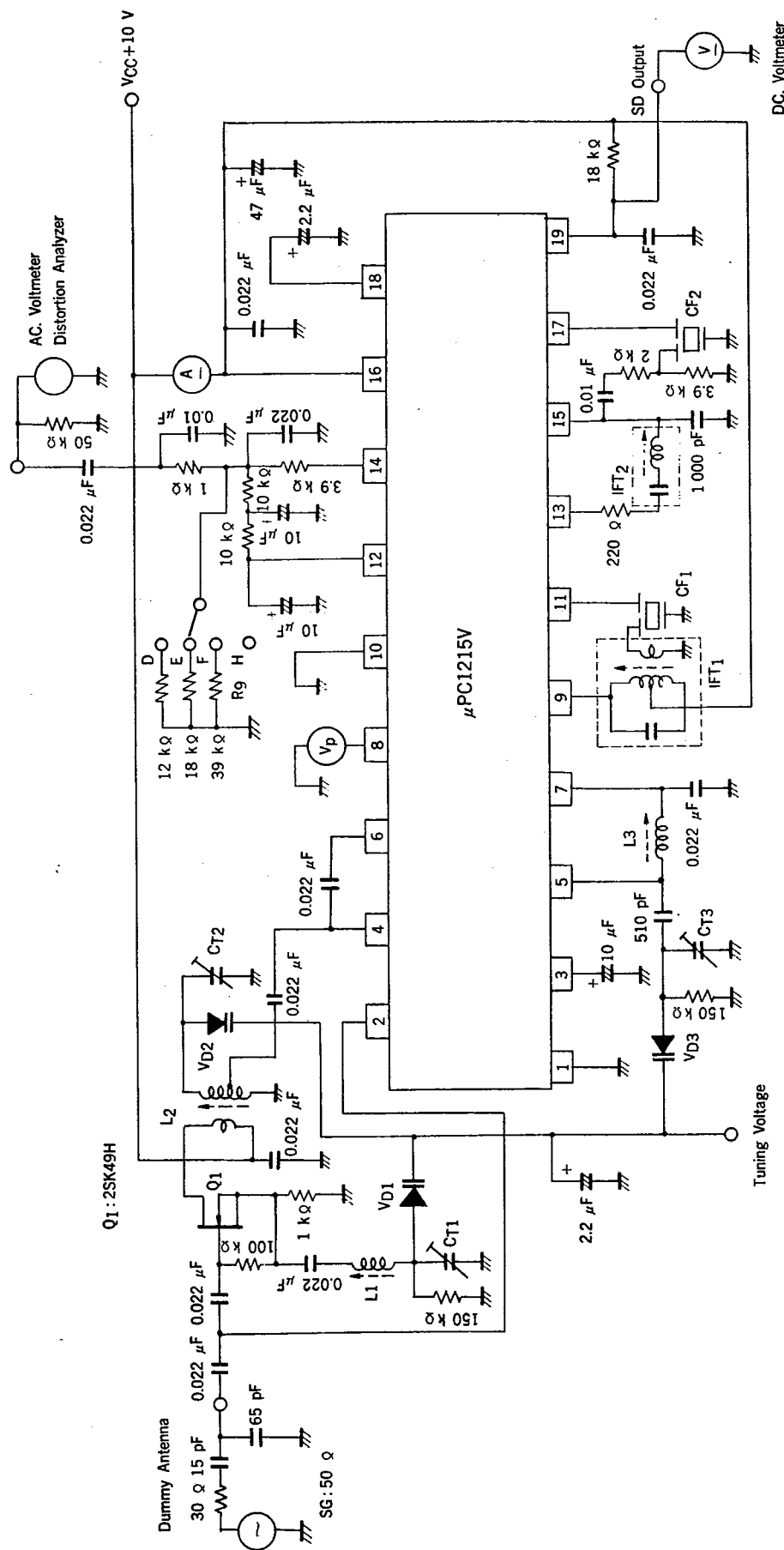
* Detector output voltage is classified into four ranks (D,E,F and H) which have different resistor R_g connected to pin-14.

TUNER PERFORMANCE CHARACTERISTICS

($T_a = 25^\circ\text{C}$, $V_{CC} = 10\text{ V}$, $f = 1.0\text{ MHz}$, $f_{mod.} = 400\text{ Hz}$, $mod. = 30\%$)

CHARACTERISTIC	TEST CONDITION	VALUE	UNIT
Maximum Sensitivity	$v_o = 30\text{ mVr.m.s.}$	22	dB μV
Usable Sensitivity	S/N = 20 dB	28	dB μV
Detector Output Voltage	$v_i = 74\text{ dB}\mu\text{V}$	100	mVr.m.s.
Total Harmonic Distortion	$v_i = 74\text{ dB}\mu\text{V}$	0.3	%
	$v_i = 126\text{ dB}\mu\text{V}$	0.6	%
	$v_i = 74\text{ dB}\mu\text{V}$, $mod. = 80\%$	1.2	%
Signal to Noise Ratio	$v_i = 74\text{ dB}\mu\text{V}$	52	dB
IF Rejection Ratio	$v_o = 30\text{ mVr.m.s.}$, IF = 450 kHz	56	dB
Image Rejection Ratio	$v_o = 30\text{ mVr.m.s.}$, f+2 IF	57	dB
Selectivity	$\Delta f = \pm 10\text{ kHz}$	39	dB
Tweet	$v_i = 74\text{ dB}\mu\text{V}$, 2 IF = 900 kHz	40	dB
	$v_i = 74\text{ dB}\mu\text{V}$, 3 IF = 1 350 kHz	47	dB
DX Sensitivity	V19 = 8.0 V	26	dB μV
SD Bandwidth	$v_i = 74\text{ dB}\mu\text{V}$, $V_{SD} = 7\text{ V}$	5.0	kHz
Oscillation Voltage	At terminal 5	150	mVr.m.s.
	At terminal 8	4.0	Vp-p

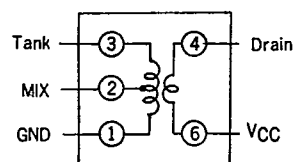
TEST CIRCUIT



- L₁, L₂ : 7BR-5407N (Toko Inc.)
- L₃ : 7BR-6048Z (Toko Inc.)
- IFT₁ : 7MC-4718N (Toko Inc.)
- IFT₂ : 7MC-101000CO (Toko Inc.)
- CF₁ : CMF2-450BL (Toko Inc.)
- CF₂ : CFM2-450ZL (Toko Inc.)

COIL DATA

L1 & L2 : Ant. & RF Coil



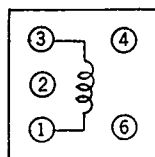
TYPE 7BR-5407N (Toko Inc.)

 $Q_u = 80$ min., $L = 170 \mu H$

①-②, ②-③, ④-⑥

7T 62T 14T

L3 : OSC Coil



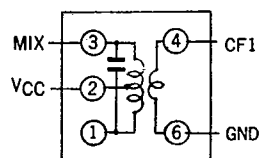
TYPE 7BR-6048Z (Toko Inc.)

 $Q_u = 60$ min., $L = 95 \mu H$

①-③

48T

IFT1 : IFT



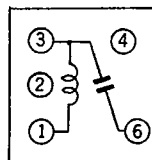
TYPE 7MC-4718N (Toko Inc.)

 $Q_u = 115 \pm 20 \%$, $C = 180$ pF built in

①-②, ②-③, ④-⑥

69T 77T 14T

IFT2 : IFT

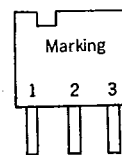


TYPE 7MC-101000CO (Toko Inc.)

 $L = 680 \mu H$, $C = 180$ pF built in

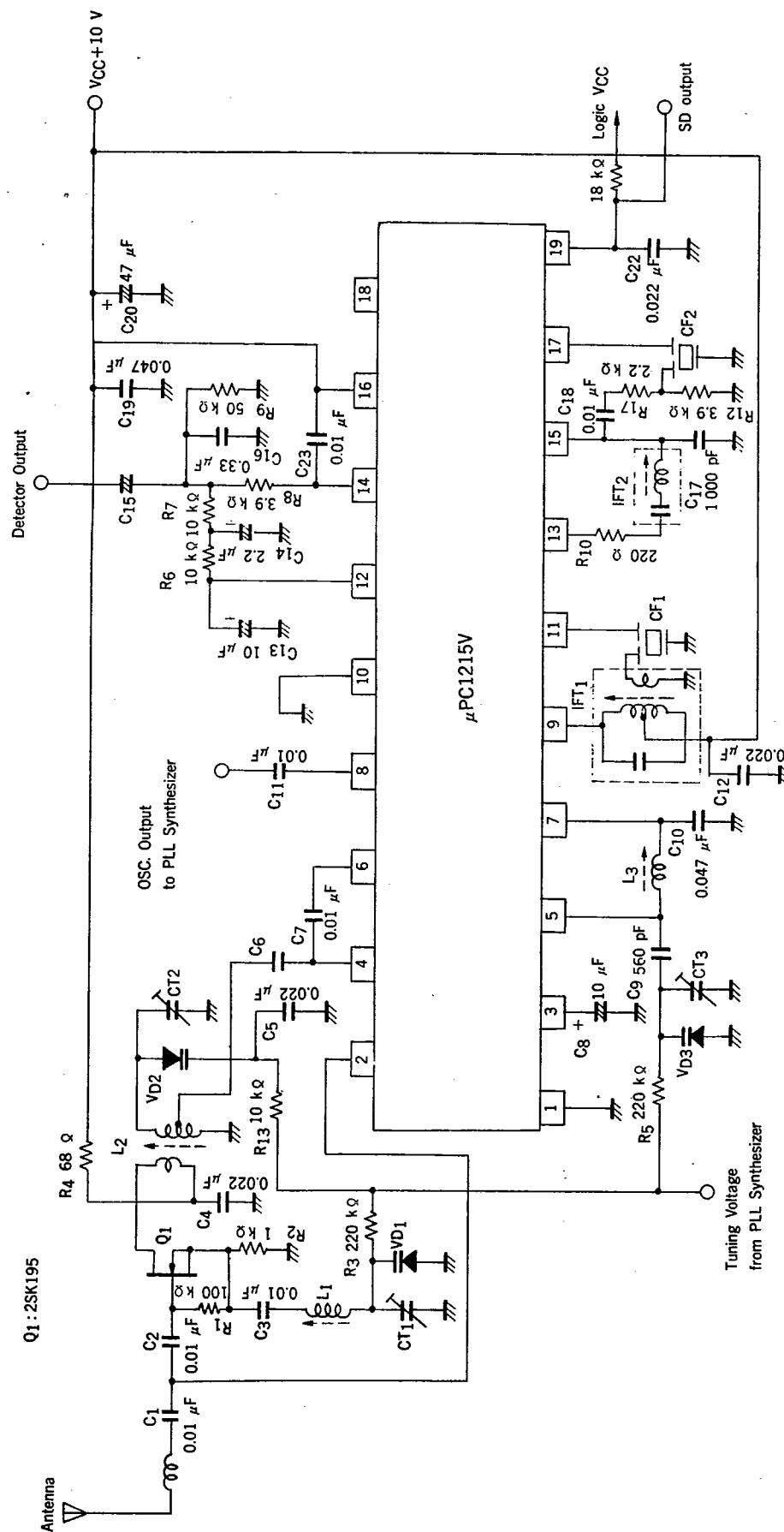
CERAMIC FILTER (Toko Inc.)

	CFM2-450BL	CFM2-450ZL
Center Frequency	450 kHz	450 kHz
6 dB Bandwidth	6 kHz min.	4 kHz min.
Selectivity ± 9 kHz	16 dB min.	18 dB min.
Insertion Loss	6 dB max.	6 dB max.
Input Impedance	1.5 k Ω	1.0 k Ω
Output Impedance	2.0 k Ω	1.5 k Ω



1 : Input
2 : GND
3 : Output

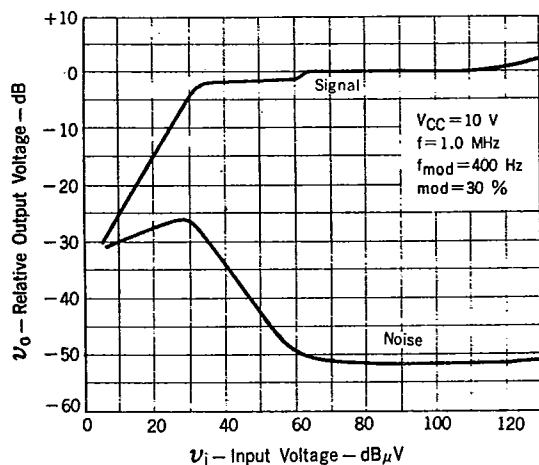
TYPICAL APPLICATION



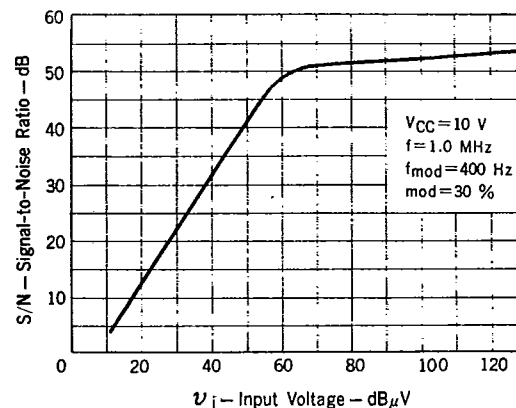
VD1, VD2 & VD3: 1SV117

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

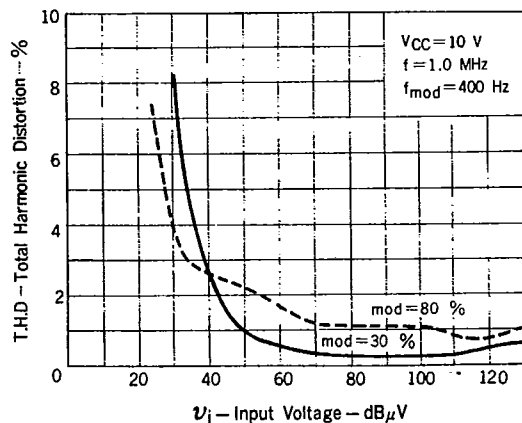
DETECTOR OUTPUT CHARACTERISTICS



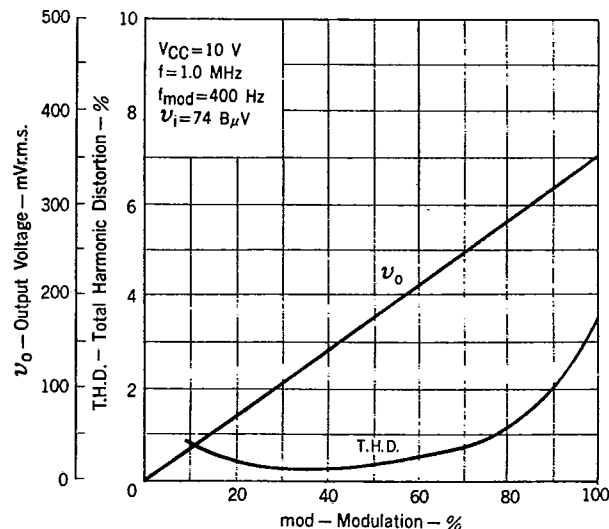
SIGNAL-TO-NOISE RATIO



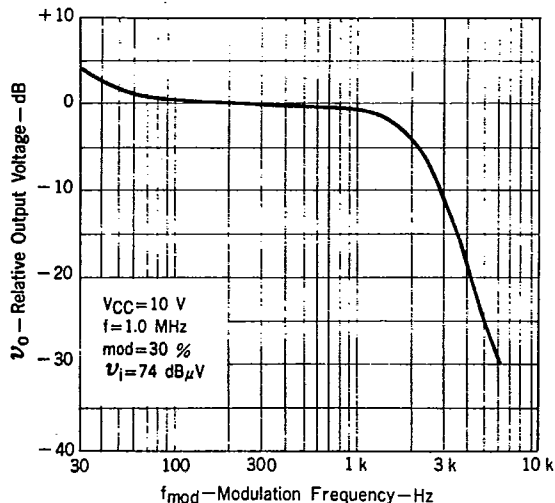
TOTAL HARMONIC DISTORTION vs. INPUT VOLTAGE



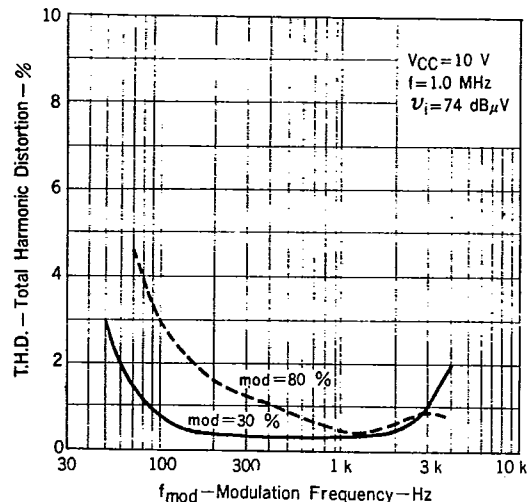
OUTPUT VOLTAGE AND TOTAL HARMONIC DISTORTION vs. MODULATION



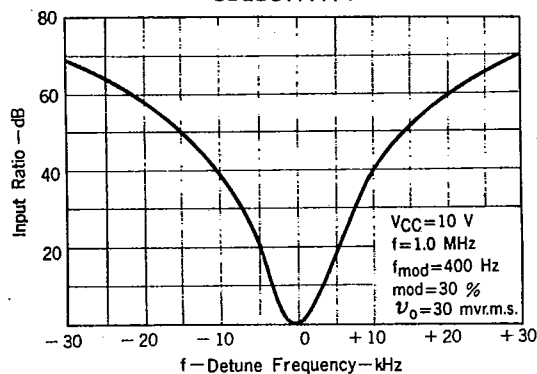
ELECTRICAL FIDELITY



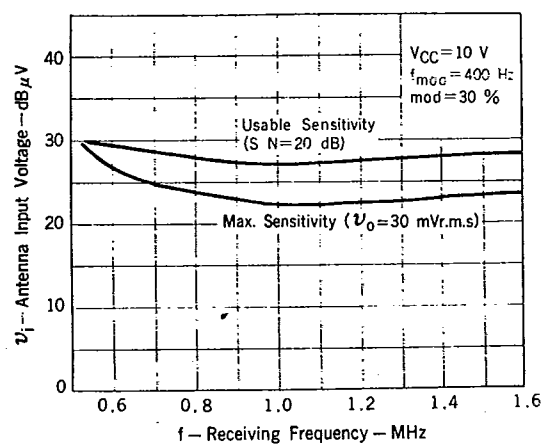
TOTAL HARMONIC DISTORTION vs. MODULATION FREQUENCY



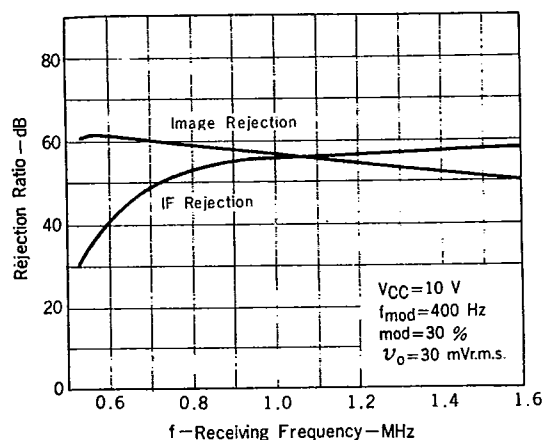
SELECTIVITY



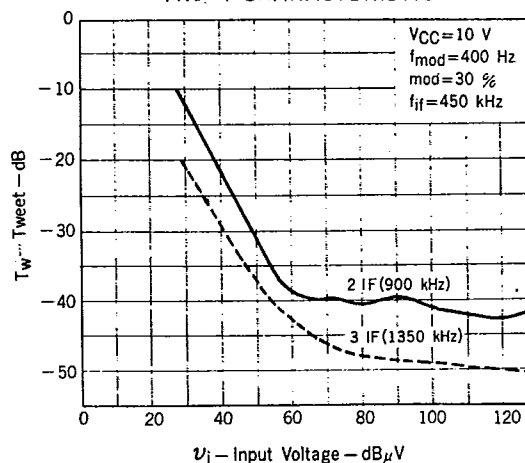
MAX. SENSITIVITY AND USABLE SENSITIVITY



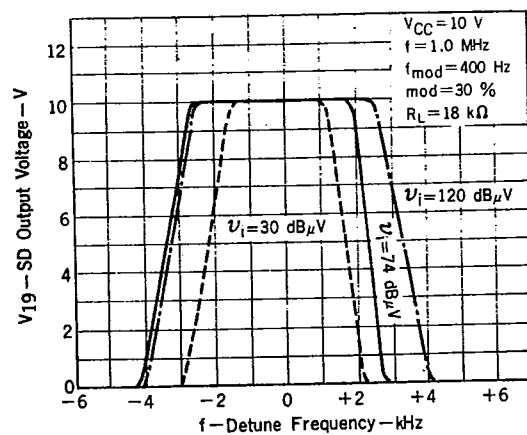
IF REJECTION AND IMAGE REJECTION

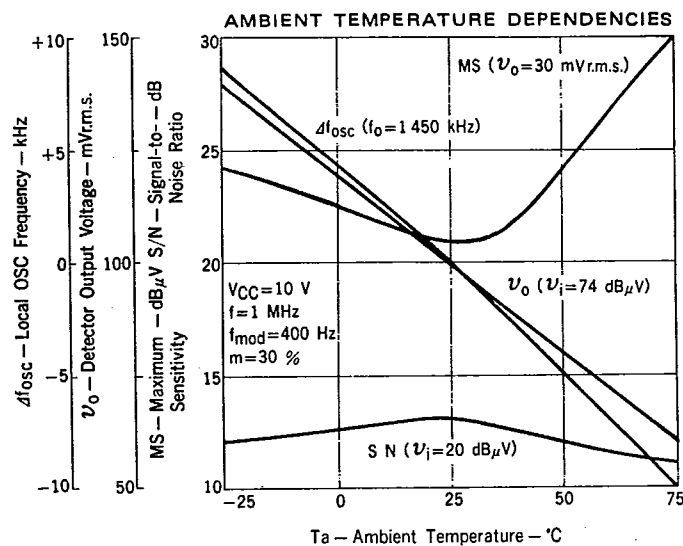
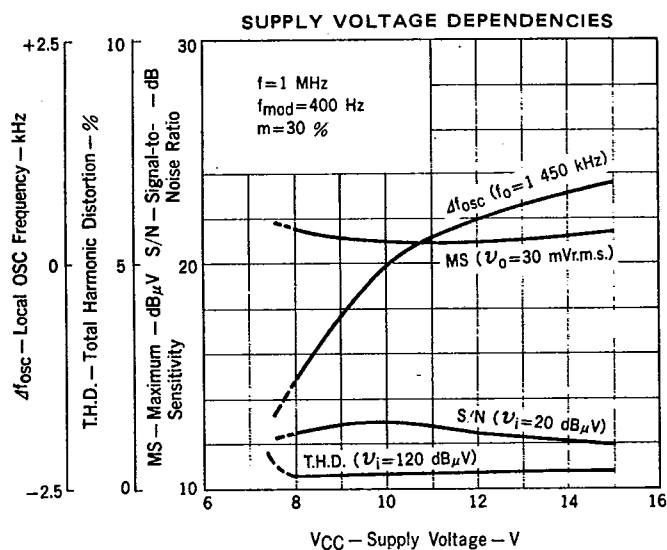


TWEET CHARACTERISTIC



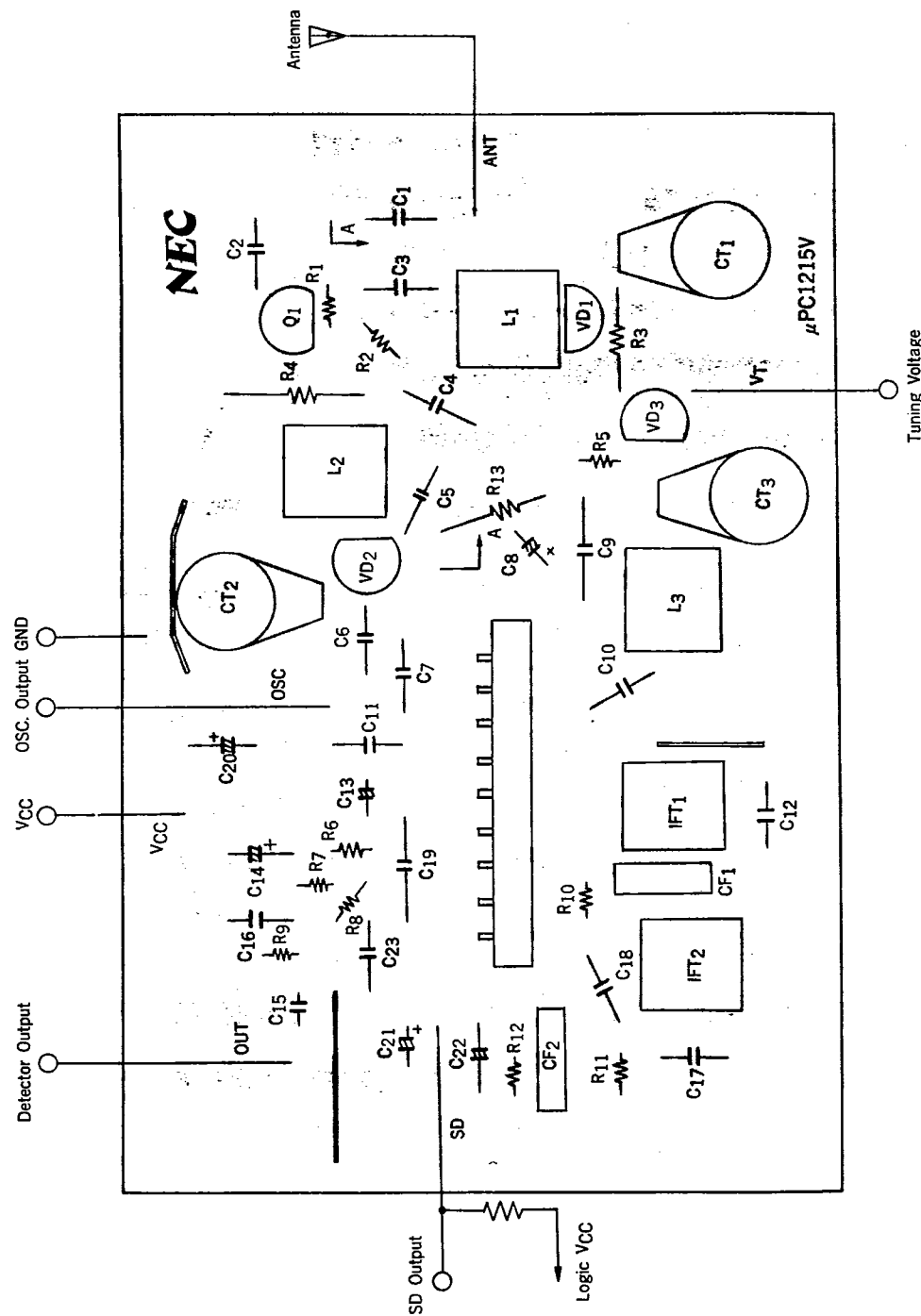
ON CHANNEL BANDWIDTH





Note: Only IC without peripheral components is heated and cooled.

COMPONENTS LAYOUT FOR P.C.ASSEMBLY (Copper side)



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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