NEC ELECTRON DEVICE

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC1243C

AM TUNER

SILICON BIPOLAR MONOLITHIC INTEGRATED CIRCUIT

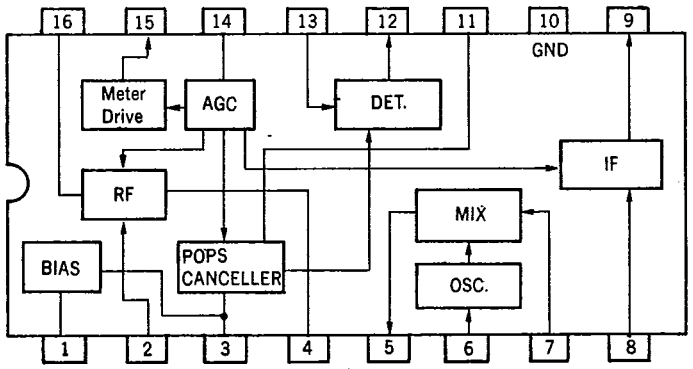
DESCRIPTION

μPC1243C is a silicon monolithic integrated circuit designed for AM tuner and the most suitable for high class tuner.
It is composed of an RF amplifier, a mixer, a local oscilator, an IF amplifier, a detector, a turn on and turn off pops canceller, an AGC amplifier and a signal meter driver.
Package is the 16 lead Dual In-Line Plastic Package (DIP).

FEATURES

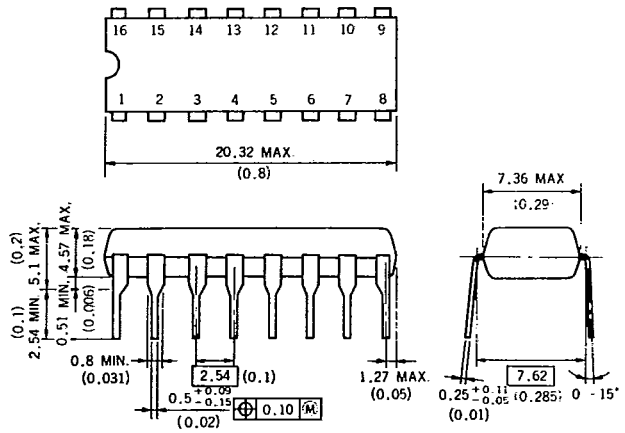
- Internally turn on and turn off pops canceller.
  The pop level is one eighth that of NEC's conventional circuit.
- High signal to noise ratio.
  S/N = 57 dB TYP. (V_{in} = 100 dB/m, f_{MOD} = 400 Hz, MOD = 30 %)
- Low harmonic distortion in wide range of input level.
  T.H.D. = 0.3 % TYP. (V_{in} = 100 dB/m, f_{MOD} = 400 Hz, MOD = 30 %)
  T.H.D. = 0.9 % TYP. (V_{in} = 130 dB/m, f_{MOD} = 400 Hz, MOD = 80 %)
- A three-stage delay-type AGC.
- High tweet ratio.
  Tweet ratio = 22 dB TYP. (V_{in} = 60 dB/m, 2 IF)
- High usable sensitivity.
  U.S. = 46 dB/m TYP. (f = 1 MHz, S/N = 20 dB)
- Signal meter driver provides excellent linearty.
  Driving current = 500 μA MAX.

CONNECTION DIAGRAM (Top View)



PACKAGE DIMENSIONS

in millimeters (inches)



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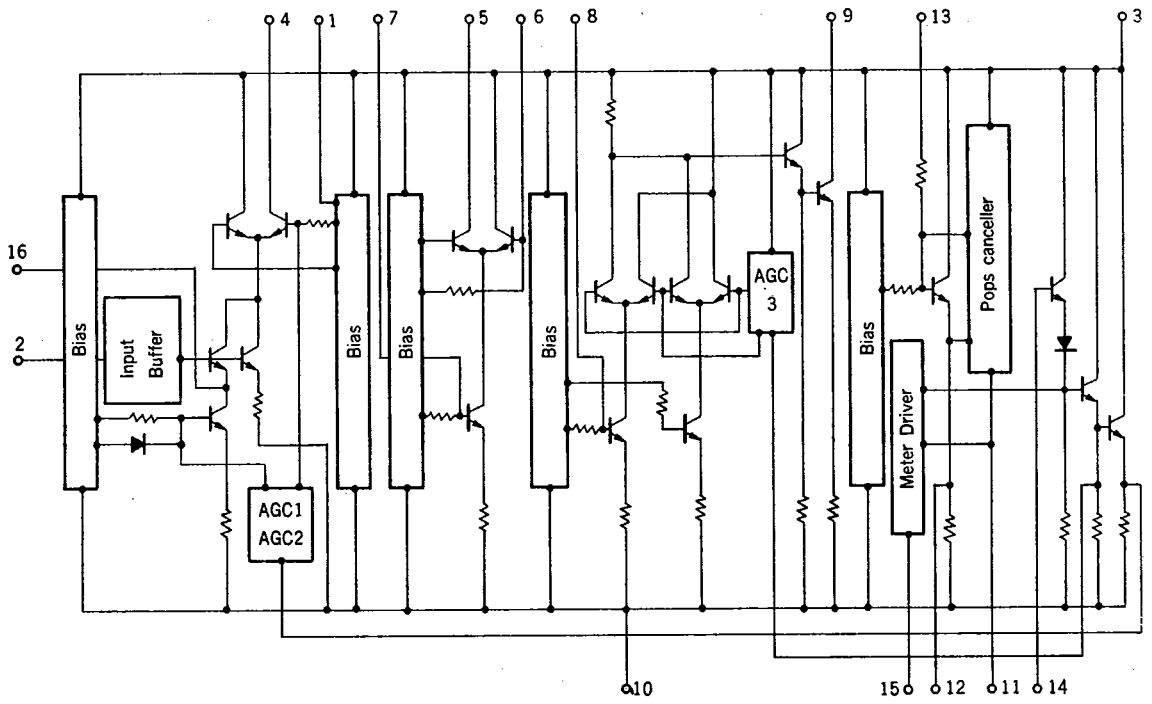
CONNECTIONS

Pin No.	Connection	Pin No.	Connection
1	Bias	9	IF output
2	RF input	10	GND
3	V_{CC}	11	Timing condenser
4	RF output	12	DET. output
5	MIX output	13	DET. input
6	Local osc.	14	AGC input
7	MIX input	15	Signal meter
8	IF input	16	Bypass

EQUIVALENT CIRCUIT



ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

Supply Voltage	V_{CC}	15	V	
Input Voltage	V_{in}	7	V_{p-p}	
Power Dissipation	P_D	350	mW	(T_a = 75 °C)
Operating Temperature	T_{opt}	−20 to +75	°C	
Storage Temperature	T_{stg}	−40 to +125	°C	

RECOMMENDED OPERATING CONDITION (T_a = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}	9	12	15	V

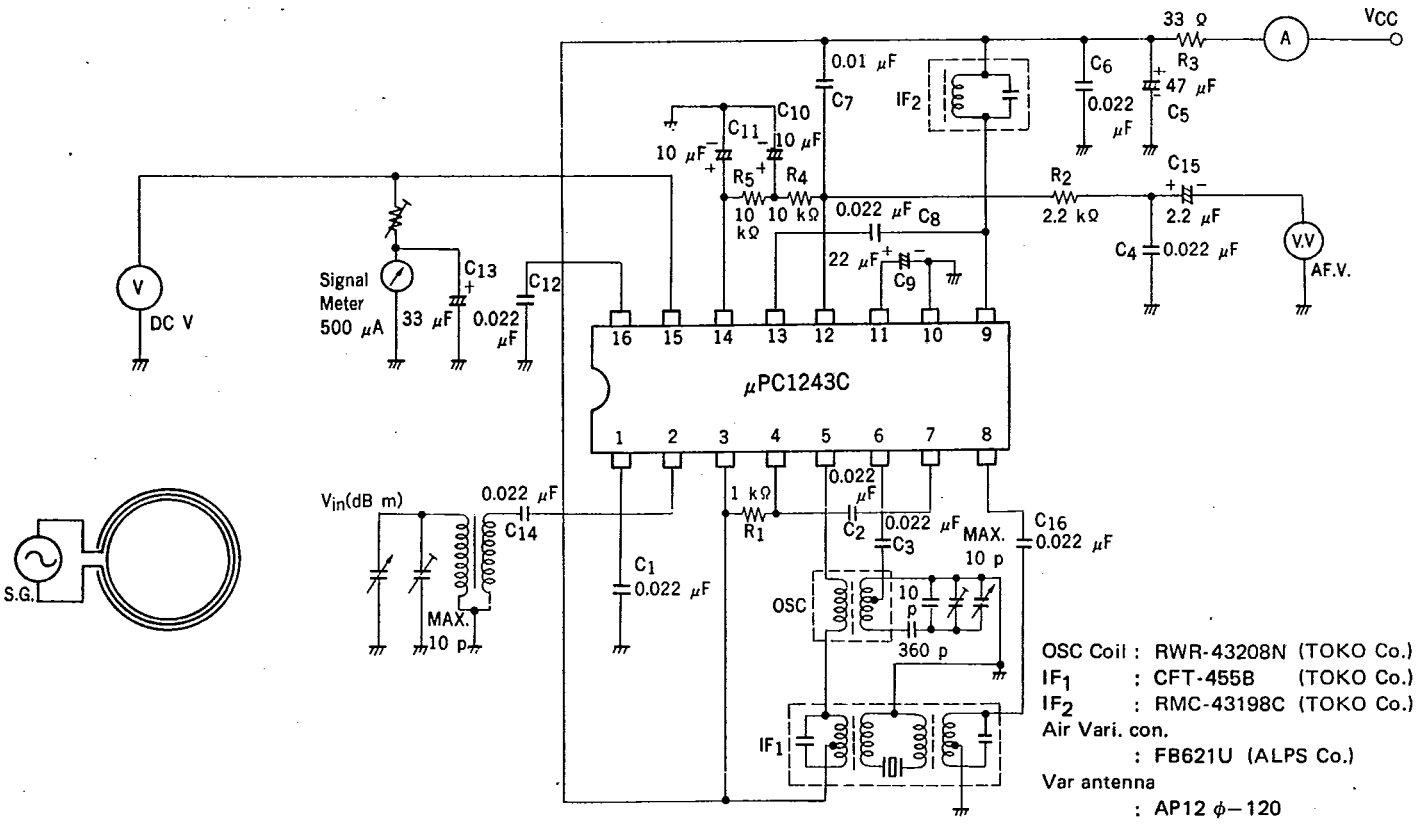
ELECTRICAL CHARACTERISTICS (T_a = 25 °C, V_{CC} = 12 V, f_{MOD} = 400 Hz, f = 1 MHz, MOD = 30 %)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Supply Current	I_{CC}	10	14.5	21	mA	V_{in} = 0
Usable Sensitivity	U. Sens	–	46	–	dB/m	S/N = 20 dB
Derector Output	V_o	120	180	240	$mV_{r.m.s.}$	V_{in} = 100 dB/m
Harmonic Distortion	T.H.D. 1	–	0.3	0.8	%	V_{in} = 100 dB/m
Harmonic Distortion	T.H.D. 2	–	0.9	–	%	V_{in} = 130 dB/m, MOD = 80 %
AGC FOM	FOM	75	83	–	dB	−10 dB point
Signal to Noise Ratio	S/N	50	57	–	dB	V_{in} = 100 dB/m
Max. Sensitivity	M.S.	31	38	45	dB/m	V_o = 30 $mV_{r.m.s.}$

CHARACTERISTICS FOR REFERENCE (T_a = 25 °C, V_{CC} = 12.0 V)

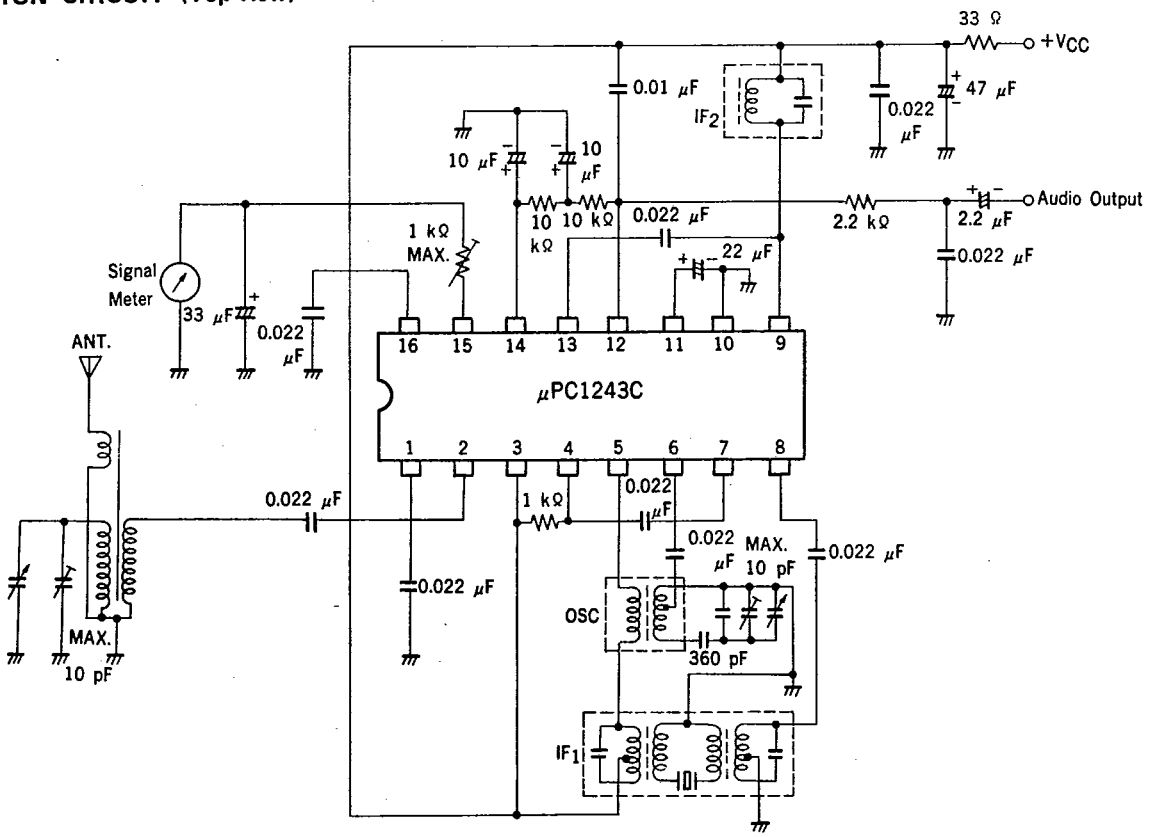
CHARACTERISTIC	TYP.	UNIT	TEST CONDITION
IF Response Ratio	42	dB	f = 1 MHz, V_o = 50 $mV_{r.m.s.}$, IF = 455 kHz
Image Response Ratio	60	dB	f = 1 MHz, V_o = 50 $mV_{r.m.s.}$, f + 2 IF
Selectivity	30	dB	f = 1 MHz, Δf = ± 10 kHz
Tweet Ratio	22	dB	V_i = 60 dB/m, 2 IF = 910 kHz
	48	dB	V_i = 100 dB/m, 3 IF = 1 365 kHz
RF Input Impedance	5.5	kΩ	f = 1 MHz
RF Input Capacitance	5	pF	f = 1 MHz
RF Output Impedance	80	kΩ	f = 1 MHz
RF Output Capacitance	2	pF	f = 1 MHz
MIX Input Impedance	8	kΩ	f = 1 MHz
MIX Input Capacitance	5	pF	f = 1 MHz
MIX Output Impedance	80	kΩ	f = 1 MHz
MIX Output Capacitance	2	pF	f = 1 MHz
IF Input Impedance	3.3	kΩ	f = 455 kHz
IF Input Capacitance	10	pF	f = 455 kHz
IF Output Impedance	80	kΩ	f = 455 kHz
IF Output Capacitance	2	pF	f = 455 kHz
Det. Input Impedance	6.5	kΩ	f = 455 kHz
Det. Input Capacitance	5	pF	f = 455 kHz

TEST CIRCUIT (Top view)



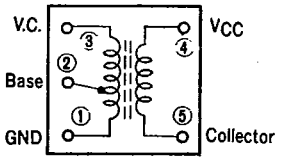
OSC Coil : RWR-43208N (TOKO Co.)
IF_1 : CFT-455B (TOKO Co.)
IF_2 : RMC-43198C (TOKO Co.)
Air Vari. con.
: FB621U (ALPS Co.)
Var antenna
: AP12 ϕ–120

APPLICATION CIRCUIT (Top view)



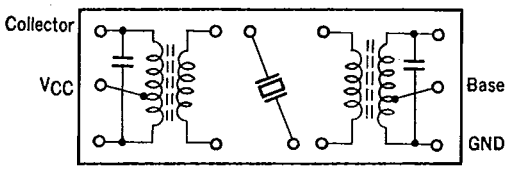
COIL SPECIFICATION (Bottom view)

(1) OSC Coil RWR-43208N (TOKO Co.)



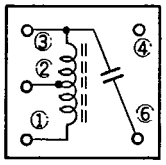
Qu = 110 ~ (796 kHz)
①~② ②~③ ④~⑥
4T 58T 10T
L = 160 μH ±6 %

(2) IFT_1 (IF transformer) CFT455B (TOKO Co.)



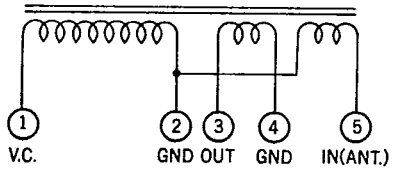
Centre freq. 455 kHz ±3.5 kHz
Selectivity ±10 kHz 26 dB Mini.

(3) IFT_2 (IF transformer) RMC-43198C (TOKO Co.)



Centre freq. 455 kHz
180 pF (Included)
Qu = 80 ~ (455 kHz)
①~③
164T

(4) Bar antenna AR12φ−120 (Coil Snake Co.)

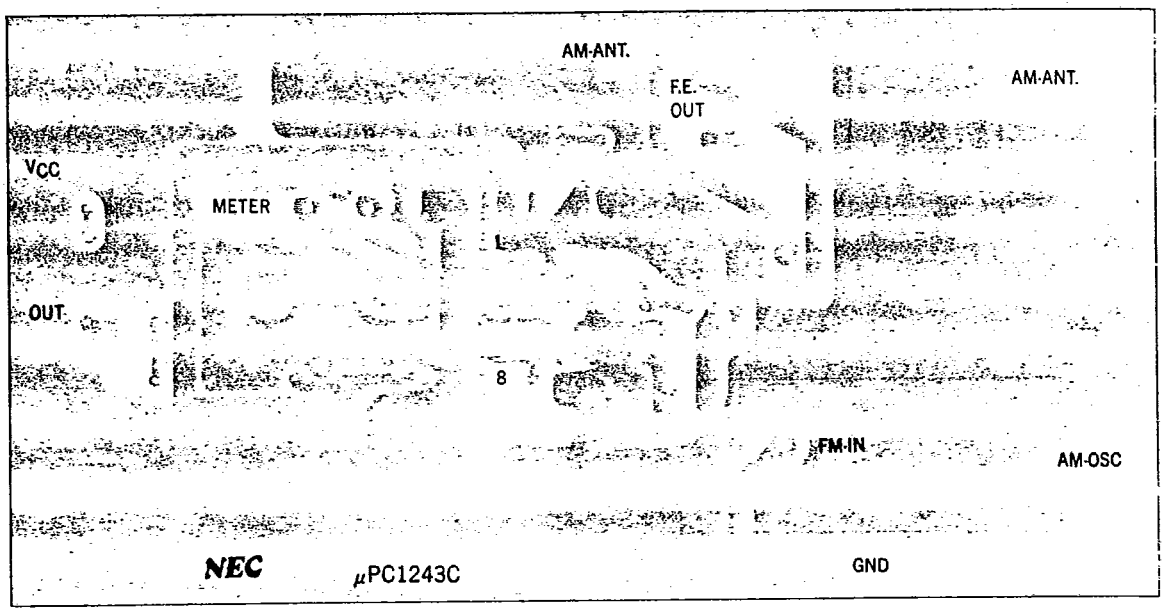


①~② ③~④ ②~⑤
58T 6T 5T

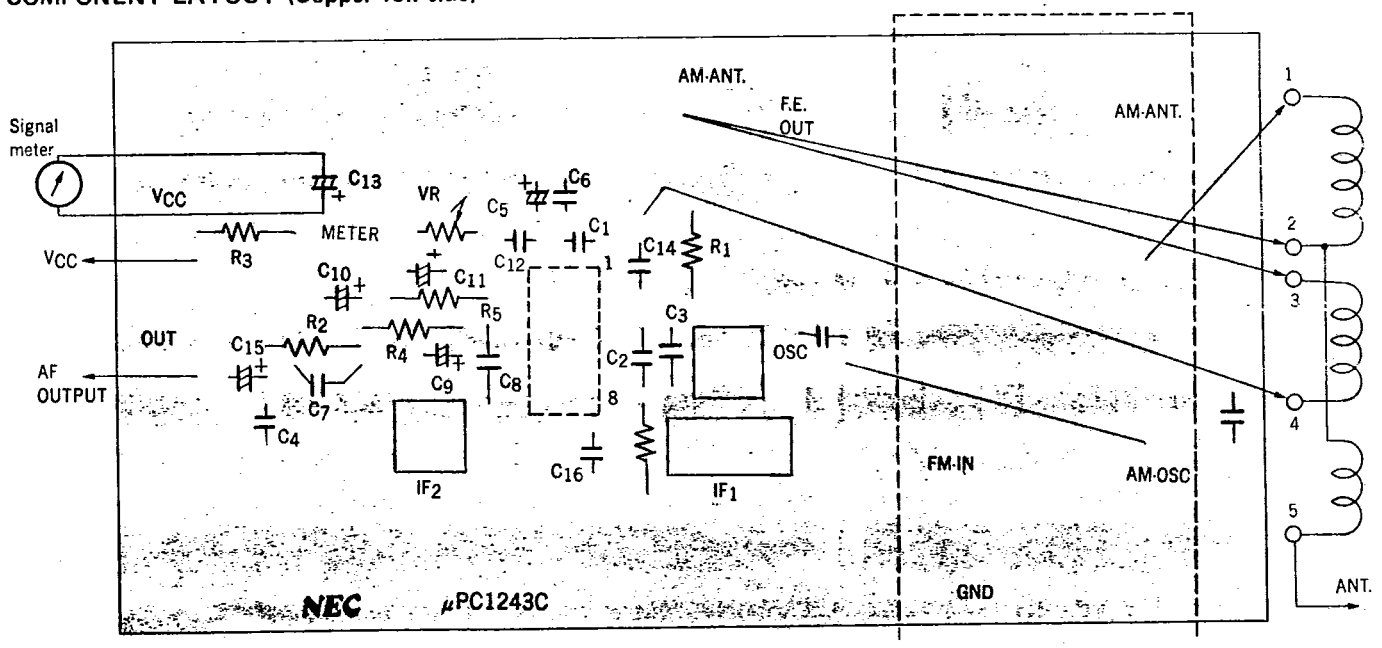
(5) Air variable FB621U (Alps Electric Co.)
Capacitor

$C_{MAX.}$ = 326 pF
$C_{MIN.}$ = 9 pF

EXAMPLE FOR PRINTED CIRCUIT BOARD (Copper foil side)



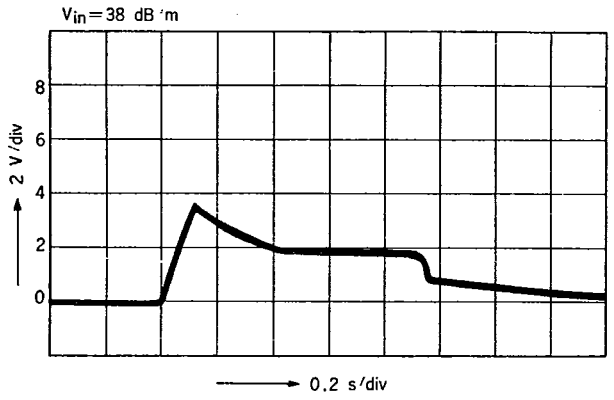
COMPONENT LAYOUT (Copper foil side)

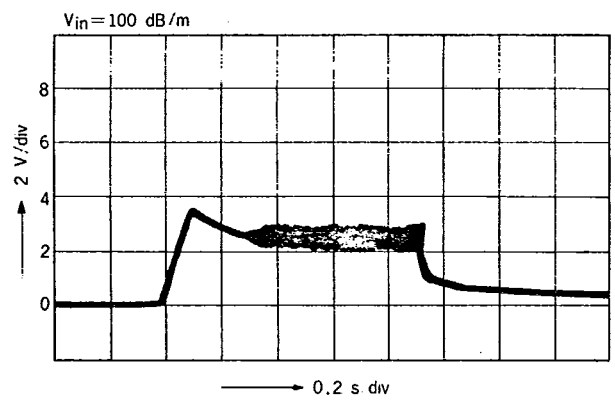


R_1 :	1kΩ	C_1	: 0.022 μF	Ceramic	VR	: 1 kΩ MAX.
R_2 :	2.2 kΩ	C_2	: 0.022 μF	Ceramic	OSC COIL	: RWR-43208N
R_3 :	33 Ω	C_3	: 0.022 μF	Ceramic	IF_1	: CFT-455B
R_4 :	10 kΩ	C_4	: 0.022 μF	Ceramic	IF_2	: RMC-43198C
R_5 :	10 kΩ	C_5	: 47 μF	Chemical	ANT.CO.	: AR12 ϕ– 120
		C_6	: 0.022 μF	Ceramic	Air vari. con.	: FB621U
		C_7	: 0.01 μF	Ceramic	Signal meter	: 500 μA MAX.
		C_8	: 0.022 μF	Ceramic		
		C_9	: 22 μF	Chemical		
		C_{10}	: 10 μF	Chemical		
		C_{11}	: 10 μF	Chemical		
		C_{12}	: 0.022 μF	Ceramic		
		C_{13}	: 33 μF	Chemical		
		C_{14}	: 0.022 μF	Ceramic		
		C_{15}	: 2.2 μF	Chemical		
		C_{16}	: 0.022 μF	Ceramic		

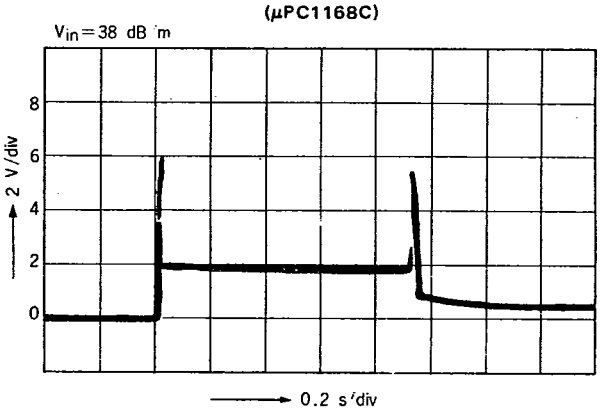
TURN ON–OFF POPS LEVEL

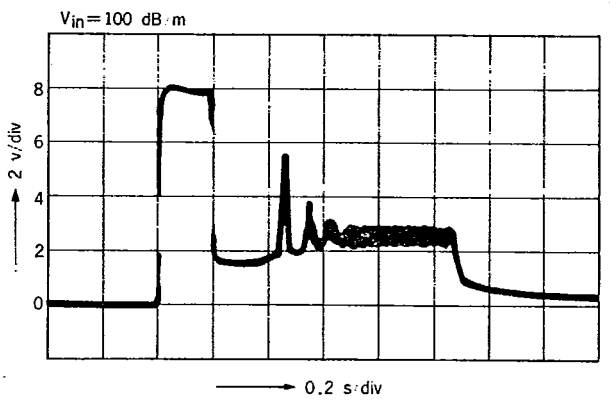
μPC1243C





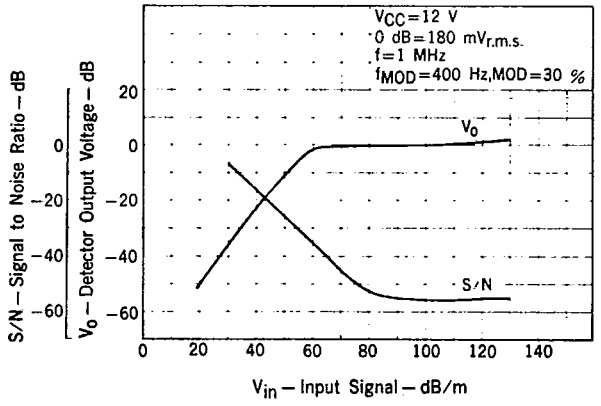
NEC's conventional circuit (μPC1168C)



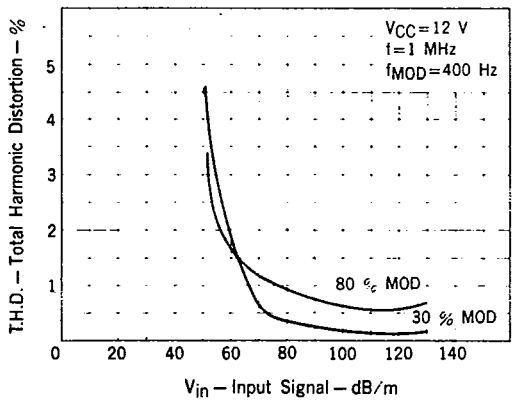


TYPICAL CHARACTERISTICS (T_a = 25 °C)

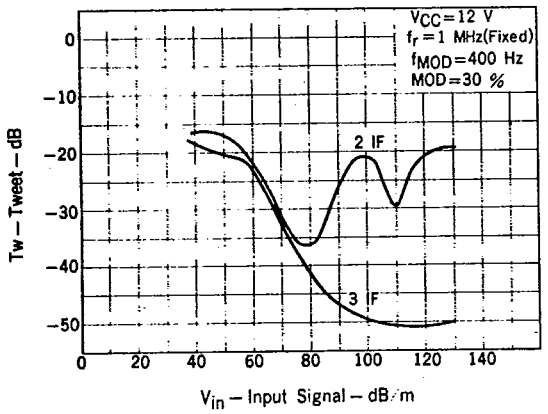
DETECTOR OUTPUT VOLTAGE AND SIGNAL TO NOISE RATIO vs. INPUT SIGNAL



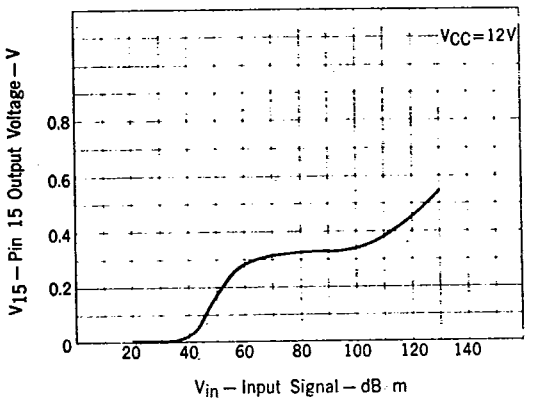
TOTAL HARMONIC DISTORTION vs. INPUT SIGNAL



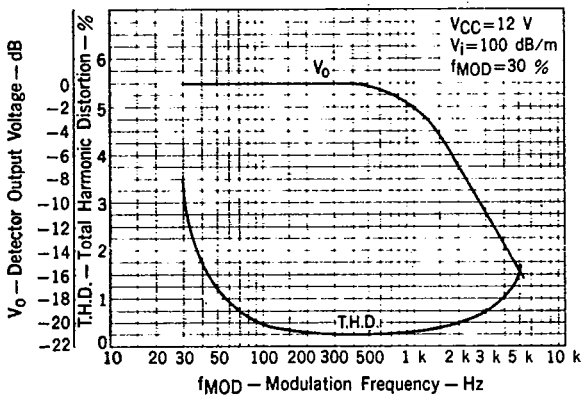
TWEET vs. INPUT SIGNAL



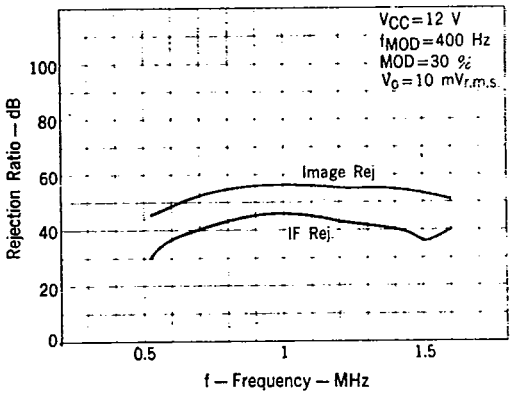
PIN 15 OUTPUT VOLTAGE vs. INPUT SIGNAL



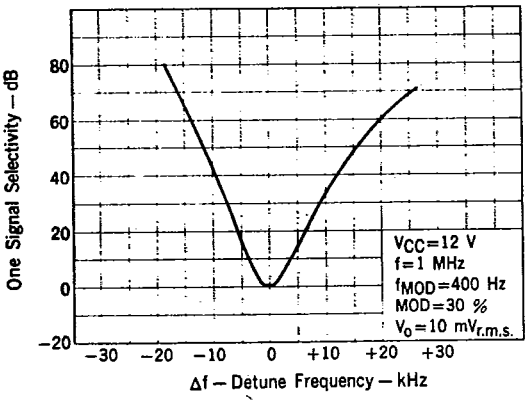
DETECTOR OUTPUT VOLTAGE AND TOTAL HARMONIC DISTORTION vs. MODULATION FREQUENCY



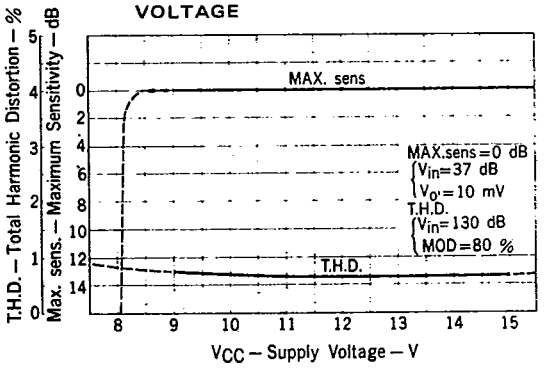
IF REJECTION AND IMAGE REJECTION vs. FREQUENCY



ONE-SIGNAL SELECTIVITY vs. DETUNE FREQUENCY



MAXIMUM SENSITIVITY AND TOTAL HARMONIC DISTORTION vs. SUPPLY VOLTAGE



CIRCUIT CURRENT vs. SUPPLY VOLTAGE