

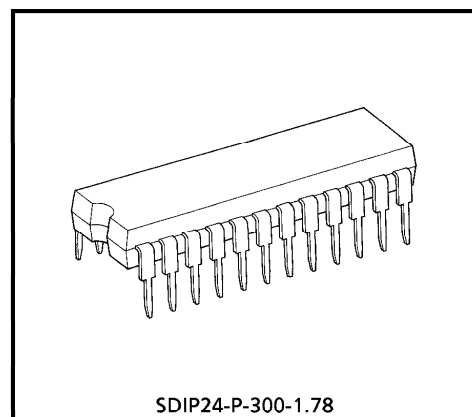
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8167N**3V AM / FM 1CHP TUNER IC**

TA8167N is the AM / FM 1chip tuner IC, which is designed for Portable radios and 3V Headphone radios.

FEATURES

- Built-in
FM F/E, AM / FM IF and FM MPX
- AM Detector Coil and IF Coupling Condenser are not needed.
- S curve characteristics of FM detection output is Reverse characteristic.
- The FM Local Oscillation Voltage is set up low relatively for measures against FM radiation.
- Operating Supply Voltage Range
 $V_{CC} = 1.8 \sim 7.0V$ ($T_a = 25^\circ C$)



Weight : 1.2g (Typ.)

961001EBA2

- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- The products described in this document are subject to foreign exchange and foreign trade control laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

EXPLANATION OF TERMINALS

PIN No.	SYMBOL	INTERNAL CIRCUIT	DC VOLTAGE (V) (AT NO SIGNAL)	
			AM	FM
1	FM-RF IN		0	0.7
2	GND1 (GND for RF Stage)	—	0	0
3	FM MIX		3.0	3.0
4	AM MIX		3.0	3.0
5	AGC (AM AGC)		0	0
6	VCC2 (VCC for IF/MPX Stage)	—	3.0	3.0
7	AM IF IN		3.0	3.0
8	FM IF IN		3.0	3.0

PIN No.	SYMBOL	INTERNAL CIRCUIT	DC VOLTAGE (V) (AT NO SIGNAL)	
			AM	FM
9	GND2 (GND for IF/MPX Stage)	—	0	0
10	TUN LED (Tuning LED)		—	—
11	ST LED (Stereo LED)		—	—
12	QUAD (FM QUAD, Detector)		3.0	3.0
13	R-OUT (R-ch Output)		1.0	1.0
14	L-OUT (L-ch Output)			
15	VCO		2.5	2.5 (VCO STOP MODE)
16	LPF2 <ul style="list-style-type: none"> ● LPF Terminal for Synchronous Detector ● Bias Terminal for AM/FM SW Circuit $V_{16} = V_{CC} \rightarrow \text{AM (VCO Stop)}$ $V_{16} = \text{Open} \rightarrow \text{FM}$		3.0	2.2 (VCO STOP MODE) 2.7
17	LPF1 <ul style="list-style-type: none"> ● LPF Terminal for Phase Detector ● VCO Stop Terminal $V_{17} = V_{CC} \rightarrow \text{VCO Stop}$		2.7	2.2

PIN No.	SYMBOL	INTERNAL CIRCUIT	DC VOLTAGE (V) (AT NO SIGNAL)	
			AM	FM
18	MPX IN		0.7	0.7
19	DET OUT		1.5	1.2
20	AM OSC		3.0	3.0
21	FM OSC		3.0	3.0
22	V _{CCL} (V _{CC} for RF Stage)	—	3.0	3.0
23	FM RF OUT	cf. pin①	3.0	3.0
24	AM RF IN		3.0	3.0

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V _{CC}	8	V
LED Current	I _{LED}	10	mA
LED Voltage	V _{LED}	8	V
Power Dissipation	P _D (Note)	1200	mW
Operating Temperature	T _{opr}	- 25~75	°C
Storage Temperature	T _{stg}	- 55~150	°C

(Note) Derated above Ta = 25°C in the proportion of 9.6mW / °C.

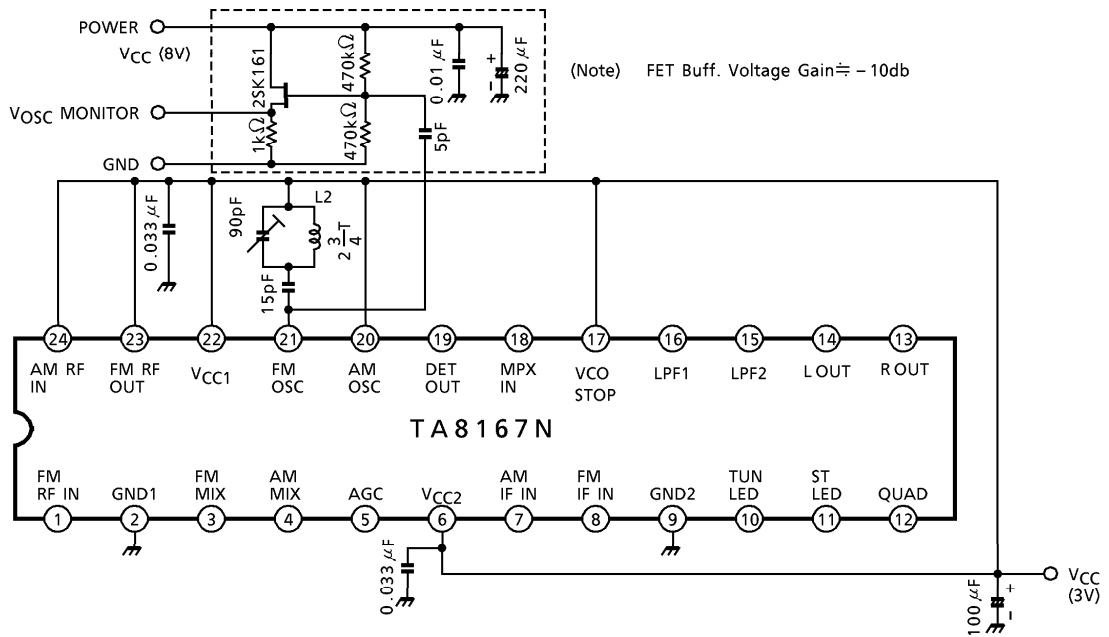
ELECTRICAL CHARACTERISTICS

Unless otherwise specified, Ta = 25°C, V_{CC} = 3V, F / E : f = 83MHz, f_m = 1kHz
 FM IF : f = 10.7MHz, Δf = ± 22.5kHz, f_m = 1kHz
 AM : f = 1MHz, MOD = 30%, f_m = 1kHz
 MPX : f_m = 1kHz

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current		I _{CC} (FM)	1	V _{in} = 0, FM Mode	—	13.2	20.0	mA
		I _{CC} (AM)	1	V _{in} = 0, AM Mode	—	8.4	13.5	
F / E	Input Limiting Voltage	V _{in} (lim)	1	- 3dB Limiting	—	10.0	—	dB _μ V EMF
	Local OSC Voltage	V _{OSC}	2	f _{OSC} = 72.3MHz	—	70	—	mV _{rms}
FM IF	Input Limiting Voltage	V _{in} (lim) IF	1	- 3dB Limiting	40	46	53	dB _μ V EMF
	Recovered Output Voltage	V _{OD}	1	V _{in} = 80dB _μ V EMF	55	80	110	mV _{rms}
	Signal To Noise Ratio	S / N	1	V _{in} = 80dB _μ V EMF	—	70	—	dB
	Total Harmonic Distortion	THD	1	V _{in} = 80dB _μ V EMF	—	0.4	—	%
	AM Rejection Ratio	AMR	1	V _{in} = 80dB _μ V EMF	—	32	—	dB
	Lamp ON sensitivity	V _L	1	I _L = 1mA	45	51	56	dB _μ V EMF
AM	Gain	G _V	1	V _{in} = 26dB _μ V EMF	40	70	110	mV _{rms}
	Recovered Output Voltage	V _{OD}	1	V _{in} = 60dB _μ V EMF	55	80	110	mV _{rms}
	Signal To Noise Ratio	S / N	1	V _{in} = 60dB _μ V EMF	—	42	—	dB
	Total Harmonic Distortion	THD	1	V _{in} = 60dB _μ V EMF	—	1.0	—	%
	Lamp ON Sensitivity	V _L	1	I _L = 1mA	20	25	30	dB _μ V EMF
Pin ^⑩ Output Resistance		R ₁₉	—	FM Mode	—	0.75	—	kΩ
				AM Mode	—	12.5	—	

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
MPX	Input Resistance	R _{IN}	—	—	—	24	—	kΩ	
	Output Resistance	R _{OUT}	—	—	—	5	—	kΩ	
	Max. Composite Signal Input Voltage		V _{in max} (STEREO)	1	L + R = 90%, P = 10%, f _m = 1kHz, THD = 3%	—	350	—	mV _{rms}
	Separation		Sep	1	L + R = 135mV _{rms} P = 15mV _{rms}	f _m = 100Hz — f _m = 1kHz 35 f _m = 10kHz —	42 42 42	— — —	dB
	Total Harmonic Distortion	Monaural	THD (MONAURAL)	1	V _{in} = 150mV _{rms}	—	0.2	—	%
		Stereo	THD (STEREO)		L + R = 135mV _{rms} , P = 15mV _{rms}	—	0.2	—	
	Voltage Gain		G _V (MPX)	1	V _{in} = 150mV _{rms}	-5	-3	-1	dB
	Channel Balance		C.B.	1	V _{in} = 150mV _{rms}	-2	0	2	dB
	Stereo Lamp Sensitivity	ON	V _L (ON)	1	Pilot Input	—	8	16	mV _{rms}
		OFF	V _L (OFF)			2	6	—	
	Stereo Lamp Hysteresis		V _H	1	To LED turn off from LED turn on	—	2	—	mV _{rms}
	Capture Range		C.R.	1	P = 15mV _{rms}	—	±3	—	%
Signal To Noise Ratio		S/N	1	—	—	70	—	dB	

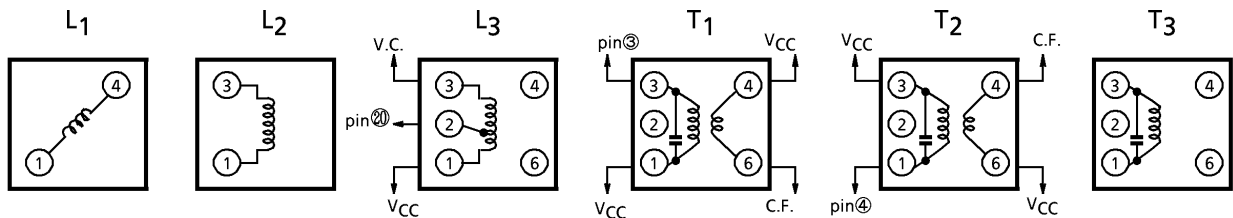
TEST CIRCUIT 2



COIL DATA

COIL No.	TEST FREQ. (Hz)	L (μH)	C ₀ (pF)	Q ₀	TURNS					WIRE (mm φ)	REFERENCE
					1-2	2-3	1-3	1-4	4-6		
L ₁ FM RF	100M	—	—	100	—	—	—	2 $\frac{1}{2}$	—	0.5UEW	Ⓢ 53T-037-202
L ₂ FM OSC	100M	—	—	100	—	—	2 $\frac{3}{4}$	—	—	0.5UEW	Ⓢ 0258-244
L ₃ AM OSC	796k	288	—	115	13	73	—	—	—	0.08UEW	Ⓢ 4147-1356-038
T ₁ FM MIX	10.7M	—	75	100	—	—	13	—	2	0.1UEW	Ⓢ 2153-414-041
T ₂ AM MIX	455k	—	180	120	—	—	180	—	15	0.08UEW	Ⓢ 2150-2162-165
T ₃ FM DET	10.7M	—	47	165	—	—	16	—	—	0.09UEW	Ⓢ 2153-4095-122

Ⓢ : SUMIDA ELECTRIC CO., LTD



HINT ON USE OF TA8167N

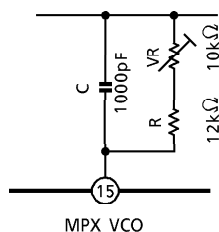
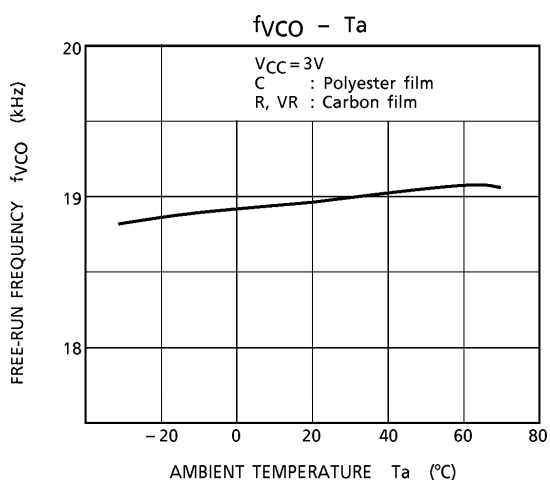
○ External parts of MPX VCO

(1) Temperature characteristic of MPX VCO free-run frequency.

The temperature characteristic of MPX VCO is shown in the diagram as below.

Select one with a better temperature characteristic (C, R and VR.) in use. We recommend,

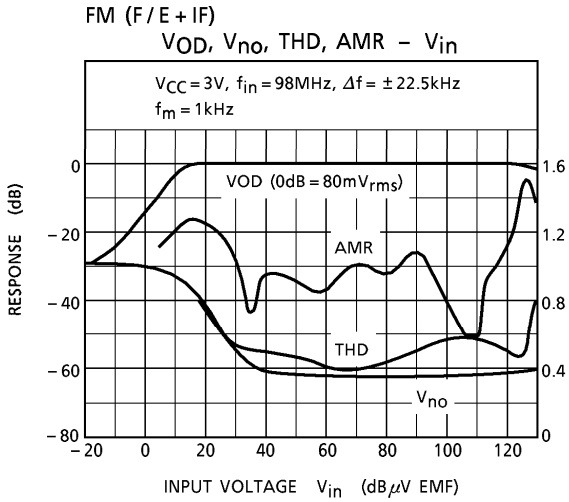
- (C : POLYESTER FILM
- (R, VR.: CARBON FILM



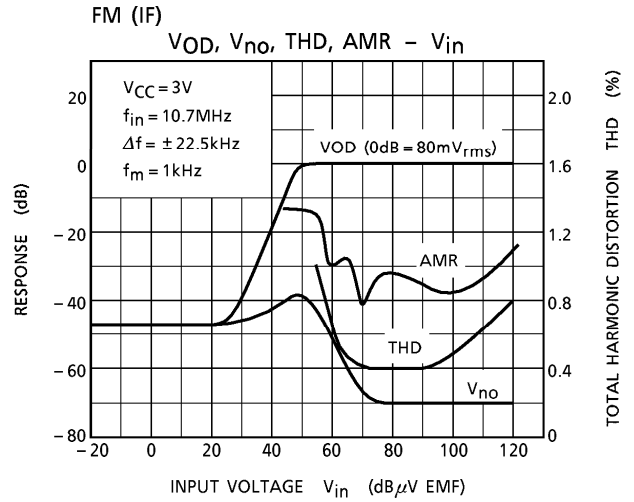
(2) Value of the external parts

We recommend to set up these value as below.

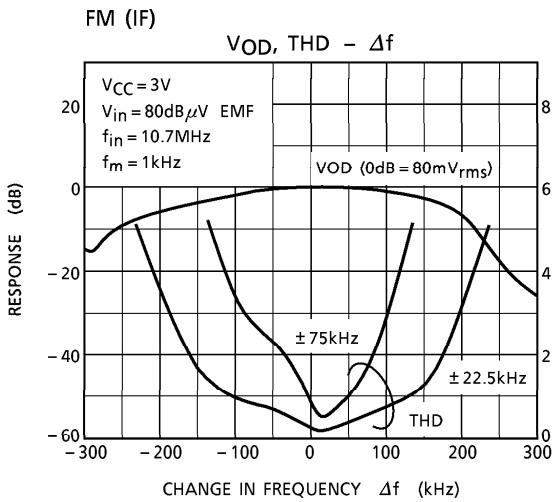
- (C = 1000pF
- (R = 12kΩ
- (VR = 10kΩ



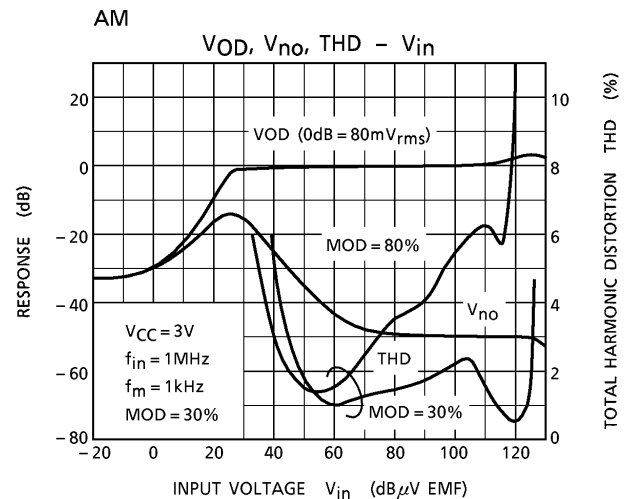
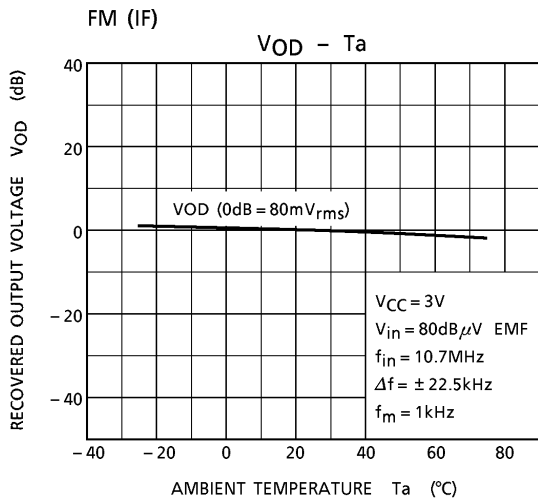
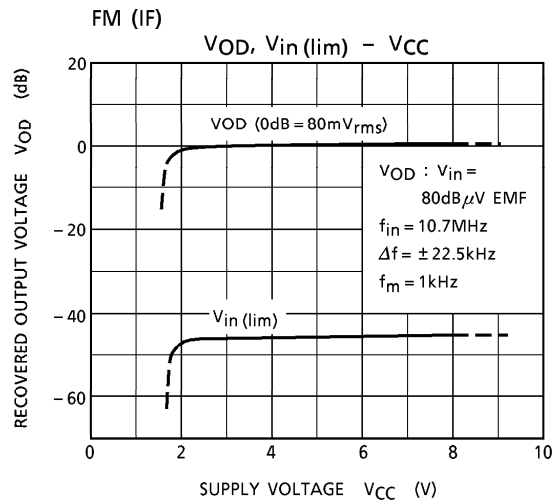
TOTAL HARMONIC DISTORTION THD (%)



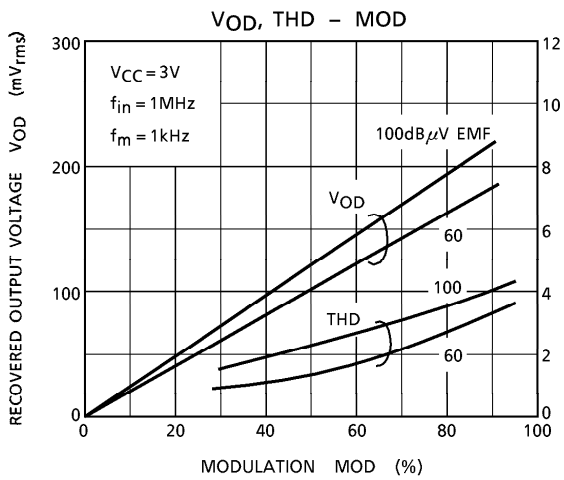
TOTAL HARMONIC DISTORTION THD (%)



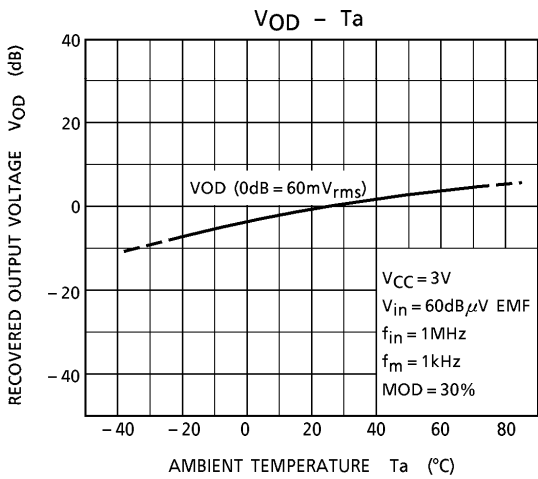
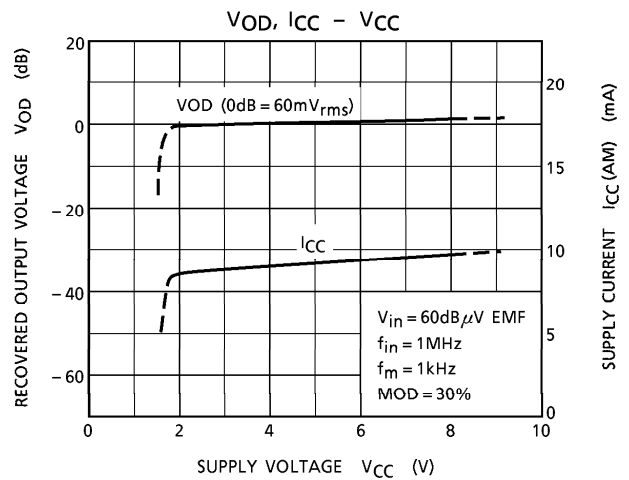
TOTAL HARMONIC DISTORTION THD (%)



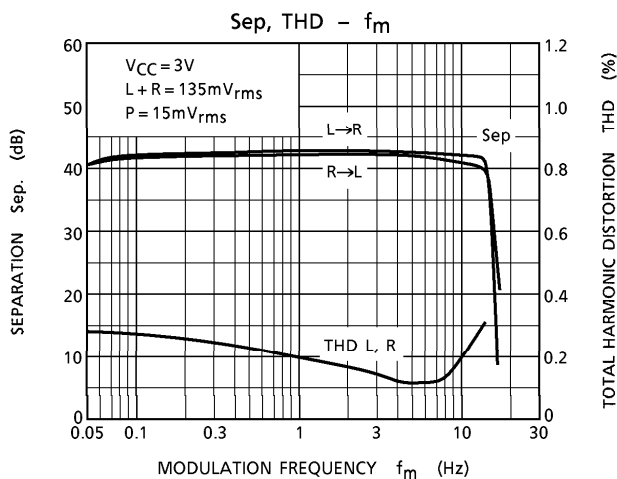
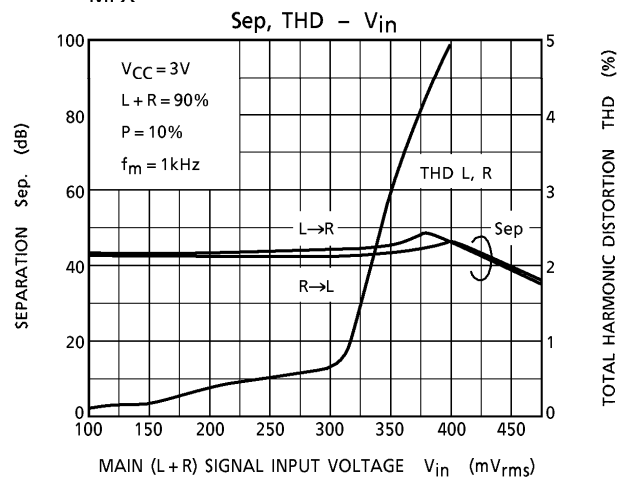
TOTAL HARMONIC DISTORTION THD (%)



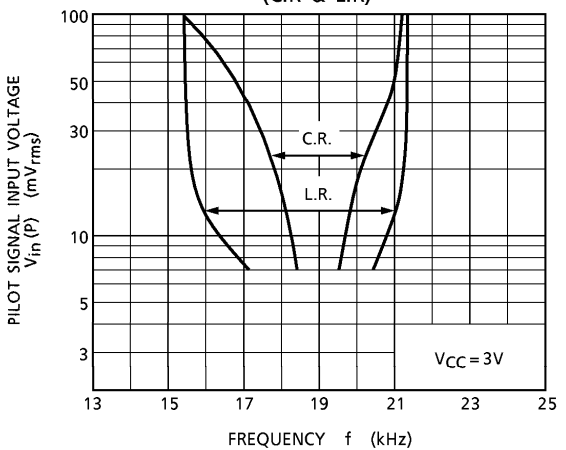
TOTAL HARMONIC DISTORTION THD (%)

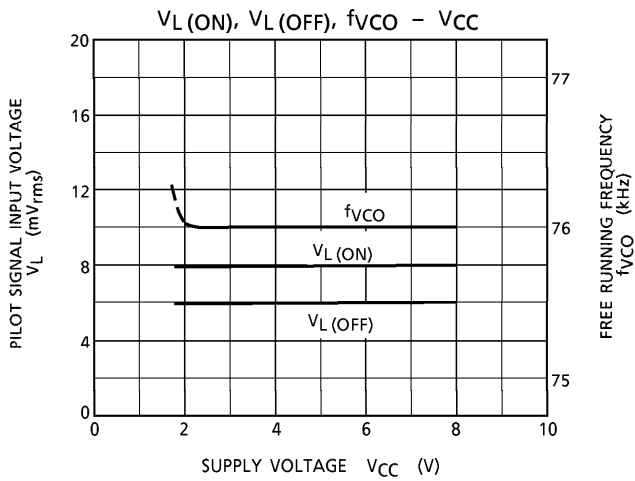
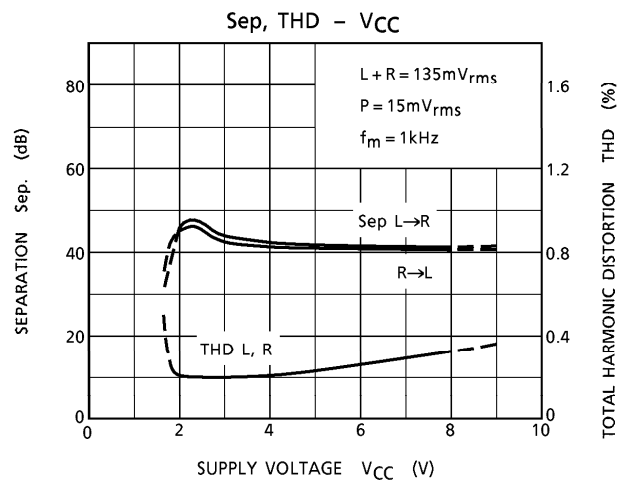
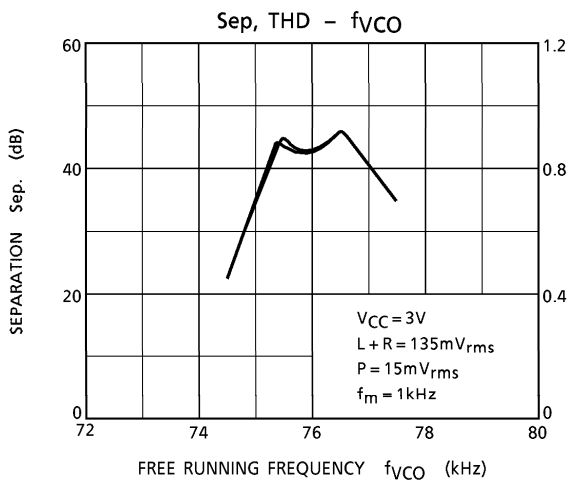


MPX



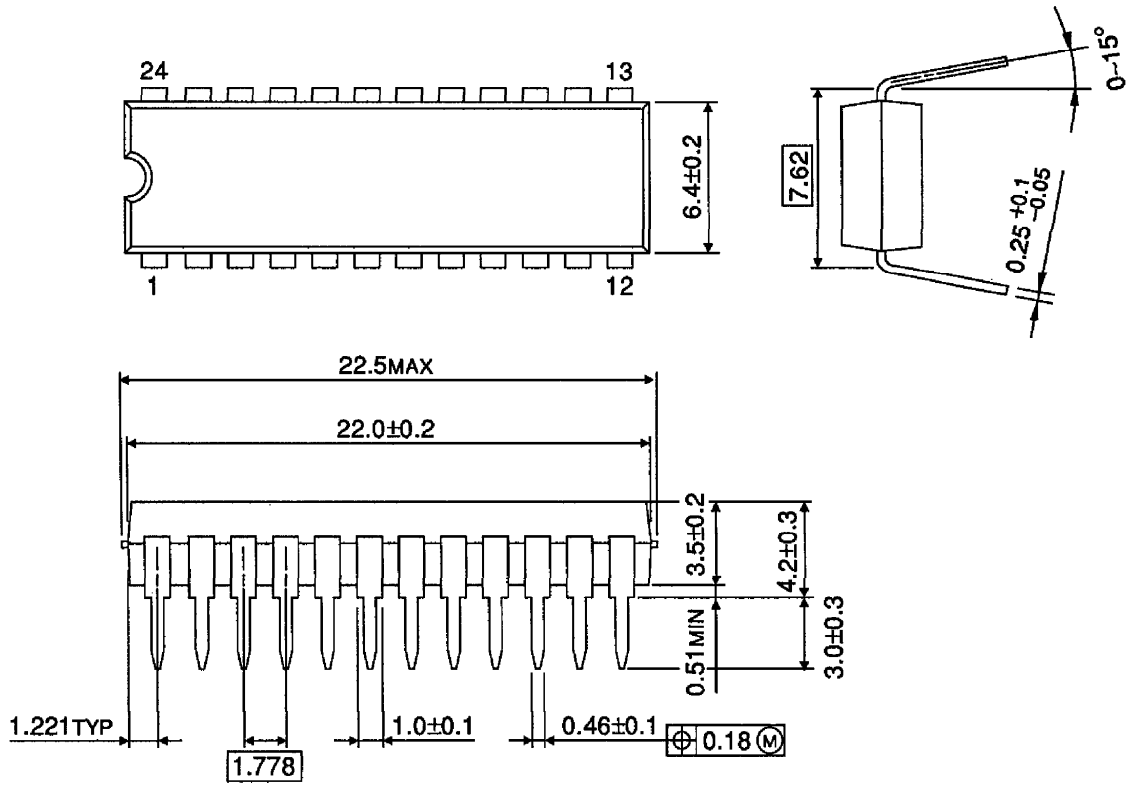
CAPTURE RANGE & LOCK RANGE (C.R. & L.R.)





OUTLINE DRAWING
SDIP24-P-300-1.78

Unit : mm



Weight : 1.2g (Typ.)