

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

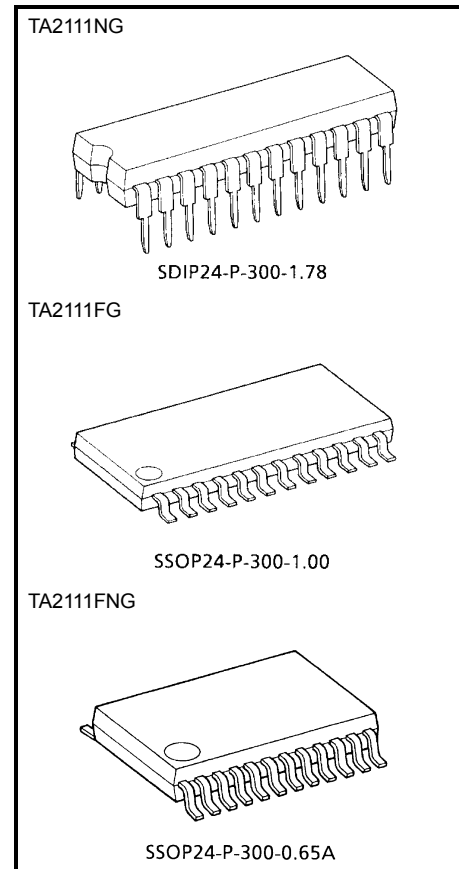
TA2111NG,TA2111FG,TA2111FNG

3 V AM/FM 1 Chip Tuner IC

TA2111NG/FG/FNG are AM/FM 1 chip tuner ICs, which are designed for portable radios and 3 V Head phone radios. FM local oscillation voltage is set up low relatively, for NEW FCC.

Features

- For NEW FCC.
- AM Detector coil, FM IFT, IF coupling condenser are not needed.
- For adopting ceramic discriminator, it is not necessary to adjust the FM quad detector circuit.
- Built-in FM MPX VCO circuit.
- Built-in varactor diode for AFC.
- Built-in AM low cut circuit.
- Low supply current. ($V_{CC} = 3\text{ V}$, $T_a = 25^\circ\text{C}$)
 ICC_q (FM) = 9.0 mA (typ.)
 ICC_q (AM) = 5.0 mA (typ.)
- Operating supply voltage range: $V_{CC} = 1.8\sim 7\text{ V}$ ($T_a = 25^\circ\text{C}$)

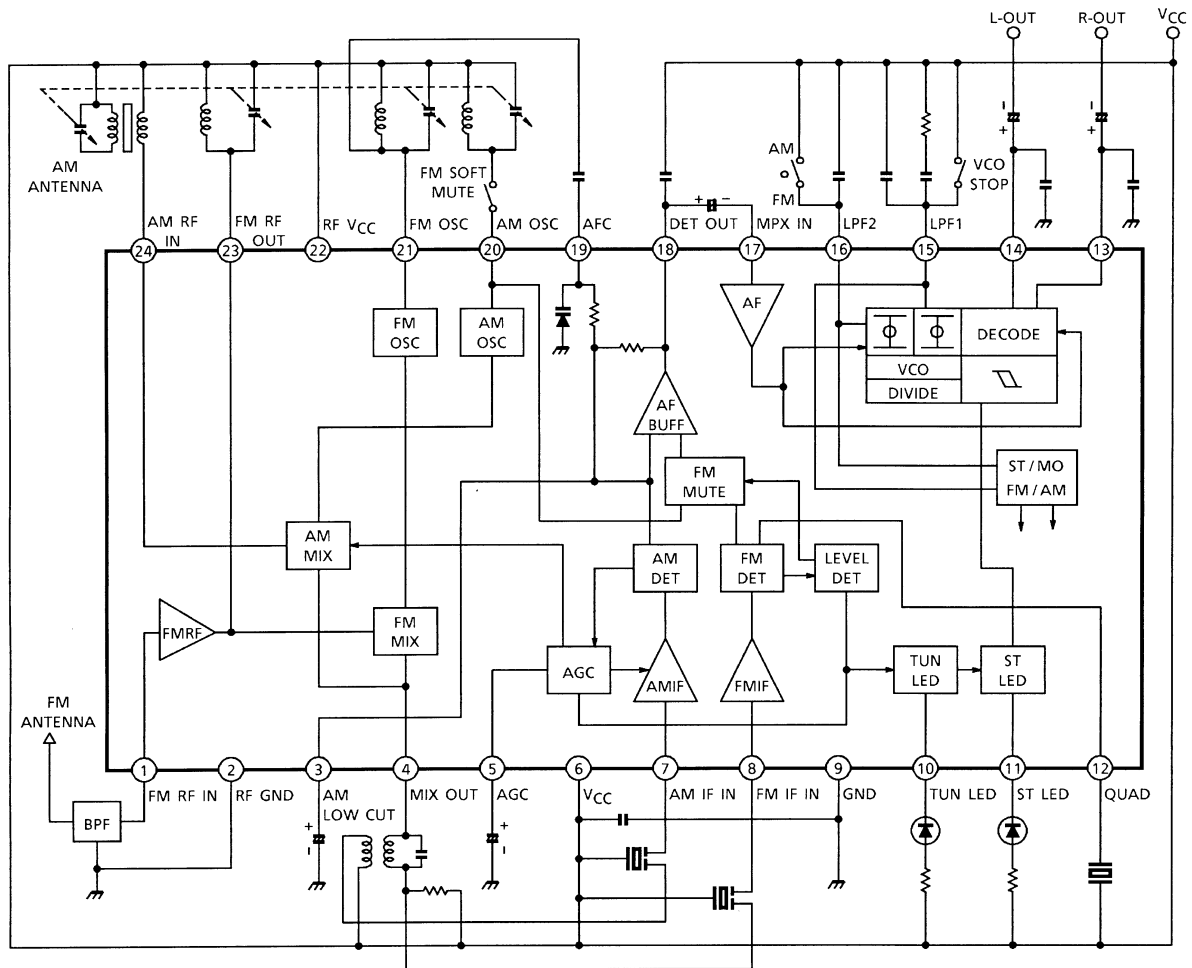


Weight

SDIP24-P-300-1.78: 1.2 g (typ.)
 SSOP24-P-300-1.00: 0.31 g (typ.)
 SSOP24-P-300-0.65A: 0.14 g (typ.)

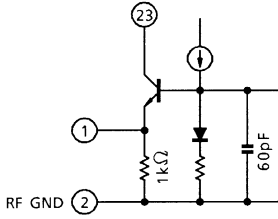
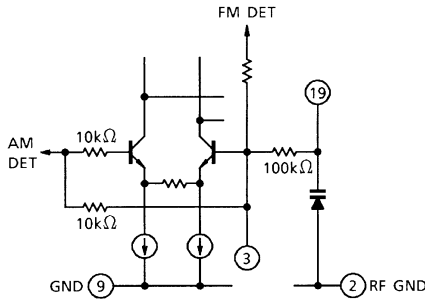
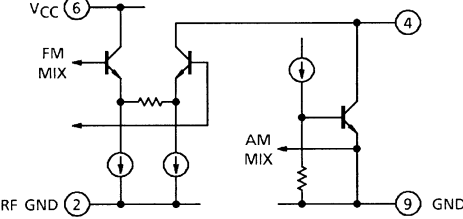
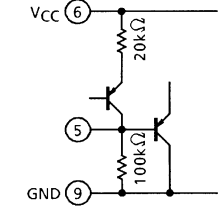
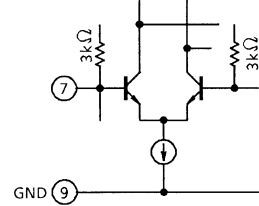
Note 1: Handle with care to prevent devices from deteriorations by static electricity.

Block Diagram

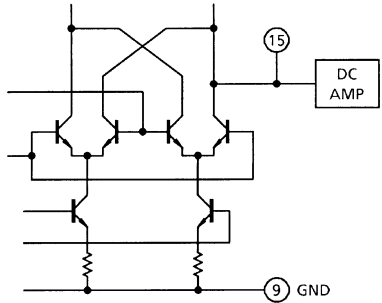
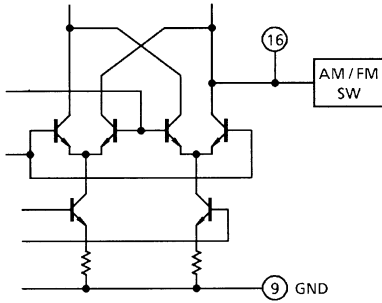
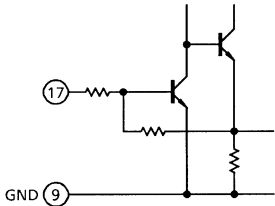
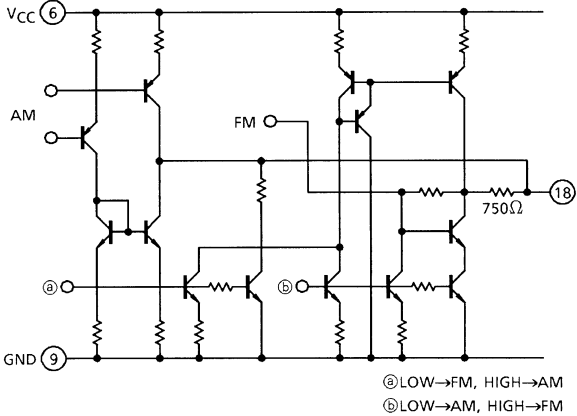


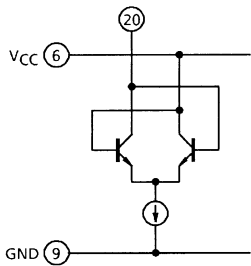
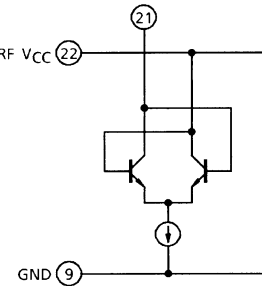
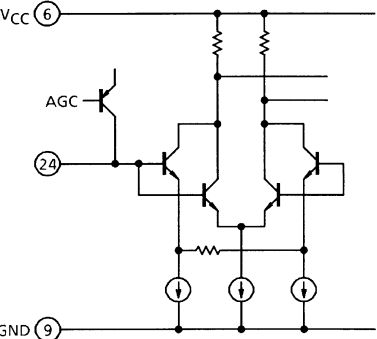
Explanation of Terminals

(Terminal voltage: Typical terminal voltage at no signal with test circuit, $V_{CC} = 3\text{ V}$, $T_a = 25^\circ\text{C}$)

Pin No.	Characteristics	Internal Circuit	Terminal Voltage (Typ.) (V)	
			AM	FM
1	FM-RF IN		0	0.8
2	RF GND (GND for FM RF, FM OSC stage)	—	0	0
3	AM LOW CUT		1.0	0.8
4	MIX OUT		3.0	2.9
5	AGC (AM AGC)		0	0
6	V_{CC} (V_{CC} for AM, FM IF, FM MPX stage)	—	3.0	3.0
7	AM IF IN		2.3	2.6

Pin No.	Characteristics	Internal Circuit	Terminal Voltage (Typ.) (V)	
			AM	FM
8	FM IF IN		3.0	3.0
9	GND (GND for AM, FM IF, FM MPX stage)	—	0	0
10	TUN LED (Tuning LED)		—	—
11	ST LED (Stereo LED)		—	—
12	QUAD (FM QUAD. Detector)		2.5	2.2
13 14	R-OUT (R-ch Output) L-OUT (L-ch Output)		1.2	1.2

Pin No.	Characteristics	Internal Circuit	Terminal Voltage (Typ.) (V)	
			AM	FM
15	<p>LPF1</p> <ul style="list-style-type: none"> • LPF terminal for synchronous Detector • VCO stop terminal <p>V15 = V_{CC} → VCO STOP</p>		2.3	2.3
16	<p>LPF2</p> <ul style="list-style-type: none"> • LPF terminal for phase Detector • Bias terminal for AM/FM SW circuit <p>V16 = V_{CC} → AM V16 = OPEN → FM</p>		3	2.2
17	MPX IN		0.7	0.7
18	DET OUT	 <p>③ LOW→FM, HIGH→AM ④ LOW→AM, HIGH→FM</p>	1.0	0.9

Pin No.	Characteristics	Internal Circuit	Terminal Voltage (Typ.) (V)	
			AM	FM
19	AFC	cf. pin 3	—	—
20	AM OSC		3.0	3.0
21	FM OSC		3.0	3.0
22	RF V _{CC} (V _{CC} for FM OSC stage)	—	3.0	3.0
23	FM RF OUT	cf. pin 1	3.0	3.0
24	AM RF IN		3.0	3.0

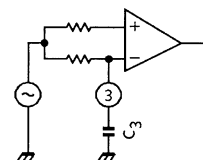
Application Note

1. AM low-cut circuit

- The AM Low-Cut action is carried out by the bypass of the high frequency component of the positive-feedback signal at the AF AMP stage. The external capacitor: C₃ by-passes this component.
- The cut-off frequency f_L is determined by the internal resistance 10 kΩ (typ.) and the external capacitor C₃ as following ;

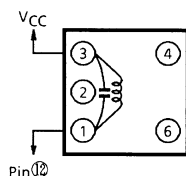
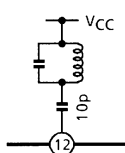
$$f_L = \frac{1}{2 \times \pi \times 10 \times 10^3 \times C_3} \text{ (Hz)}$$

- In the case of the AM Low-Cut function is not needed, set up the value of C₃ over 1 μF. In the condition of C₃ ≥ 1 μF, the frequency characteristic has flat response at the low frequency.
- In FM mode, C₃ is a capacitor for AFC Low-Pass filter circuit.



2. FM detection circuit

For the FM detection circuit, detection coil is able to use instead of ceramic discriminator. Recommended circuit and recommended coil are as follows. In this case, please take care that V_{in} (lim.) falls a little.



Test Frequency	C ₀ (pF)	Q ₀	Turns				Wire (mmφ)	Reference
			1-2	2-3	1-3	4-6		
10.7 MHz	51	45	—	—	30	—	0.08 UEW	TOKO Co., Ltd. 600BEAS-10018Z

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Supply voltage		V _{CC}	8	V
LED current		I _{LED}	10	mA
LED voltage		V _{LED}	8	V
Power dissipation	TA2111NG	P _D (Note 2)	1200	mW
	TA2111FG		400	
	TA2111FNG		500	
Operating temperature		T _{opr}	-25~75	°C
Storage temperature		T _{stg}	-55~150	°C

Note 2: Derated above Ta = 25°C in the proportion of 9.6 mW/°C for TA2111NG, of 3.2 mW/°C for TA2111FG and of 4 mW/°C for TA2111FNG.

Electrical Characteristics

unless otherwise specified, Ta = 25°C, Vcc = 3 V,

F/E : f = 98 MHz, fm = 1 kHz

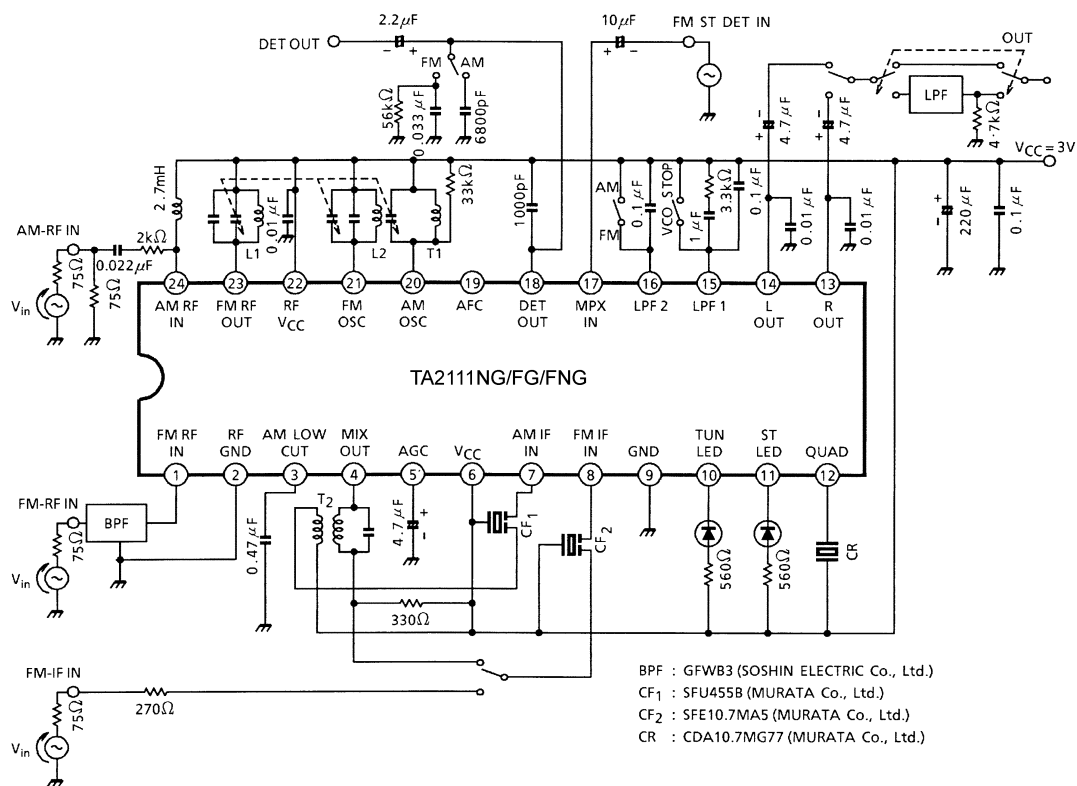
FM IF : f = 10.7 MHz, Δf = ±22.5 kHz, fm = 1 kHz

AM : f = 1 MHz, MOD = 30%, fm = 1 kHz

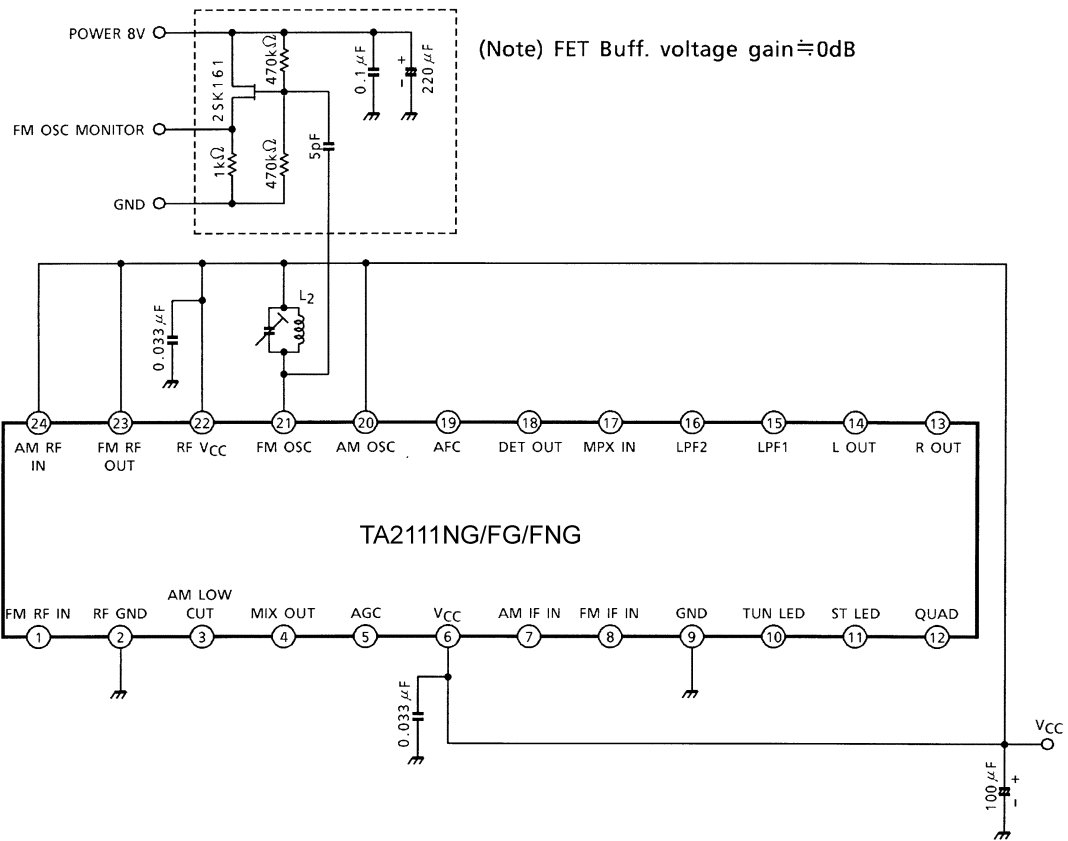
MPX : fm = 1 kHz

Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Supply current		ICC (FM)	1	Vin = 0, FM mode	—	9	12.5	mA
		ICC (AM)	1	Vin = 0, AM mode	—	5	7.5	
F/E	Input limiting voltage	Vin (lim)	1	−3dB limiting	—	7	—	dBμV EMF
	Local OSC voltage	VOSC	2	fOSC = 108.7 MHz	—	105	—	mVrms
FM IF	Input limiting voltage	Vin (lim) IF	1	−3dB limiting	35	40	45	dBμV EMF
	Recovered output voltage	VOD	1	Vin = 80dBμV EMF	60	75	90	mVrms
	Signal to noise ratio	S/N	1	Vin = 80dBμV EMF	—	65	—	dB
	Total harmonic distortion	THD	1	Vin = 80dBμV EMF	—	0.2	—	%
	AM rejection ration	AMR	1	Vin = 80dBμV EMF	—	45	—	dB
	LED on sensitivity	VL	1	IL = 1 mA	40	45	50	dBμV EMF
	Soft mute attenuation	MUTE	1	Vin = 0	—	20	—	dB
AM	Gain	GV	1	Vin = 25dBμV EMF	18	35	70	mVrms
	Recovered output voltage	VOD	1	Vin = 60dBμV EMF	50	70	90	mVrms
	Signal to noise ratio	S/N	1	Vin = 60dBμV EMF	—	41	—	dB
	Total harmonic distortion	THD	1	Vin = 60dBμV EMF	—	0.7	—	%
	LED on sensitivity	VL	1	IL = 1 mA	23	28	33	dBμV EMF
Pin 18 output resistance		R18	—	FM mode	—	0.75	—	kΩ
				AM mode	—	15.5	—	
MPX	Input resistance	RIN	—	—	—	55	—	kΩ
	Output resistance	ROUT	—	—	—	5	—	kΩ
	Max composite signal input voltage	Vin MAX (STEREO)	1	L + R = 90%, P = 10%, fm = 1 kHz, THD = 3%	—	700	—	mVrms
	Separation	Sep	1	L + R = 180 mVrms, P = 20 mVrms	fm = 100 Hz	—	45	dB
					fm = 1 kHz	—	45	
					fm = 10 kHz	—	45	
	Total harmonic distortion	Monaural THD (MONAURAL)	1	Vin = 200 mVrms	—	0.3	—	%
		Stereo THD (STEREO)	1	L + R = 180 mVrms, P = 20 mVrms	—	0.3	—	
	Voltage gain	GV	1	Vin = 200 mVrms	−2.5	−1	0.5	dB
	Channel balance	C.B.	1	Vin = 200 mVrms	−1.5	0	1.5	dB
	Stereo LED sensitivity	ON VL (ON)	1	Pilot input	—	8	12	mVrms
		OFF VL (OFF)	1		3	6	—	
	Stereo LED hysteresis	VH	1	To LED turn off from LED turn on	—	2	—	mVrms
	Capture range	C.R.	1	P = 20 mVrms	—	±8	—	%
	Signal to noise ratio	S/N	1	—	—	80	—	dB

Test Circuit 1



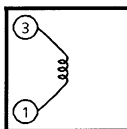
Test Circuit 2



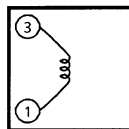
Coil Data

Coil No.	Test Freq.	L (μ H)	C ₀ (pF)	Q ₀	Turns					Wire (mm ϕ)	Reference
					1-2	2-3	1-3	1-4	4-6		
L ₁ FM RF	100 MHz	—	—	79	—	—	—	2 $\frac{1}{2}$	—	0.16UEW	TOKO Co., Ltd. 666SNF-305NK
L ₂ FM OSC	100 MHz	—	—	76	—	—	—	2	—	0.16UEW	TOKO Co., Ltd. 666SNF-306NK
T ₁ AM OSC	796 kHz	268	—	65	19	95	—	—	—	0.05UEW	TOKO Co., Ltd. 5PNR-5146Y
T ₂ AM IFT	455 kHz	—	470	60	—	—	109	—	7	0.05UEW	TOKO Co., Ltd. 5PLG-5147X

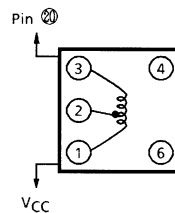
L₁ : FM RF



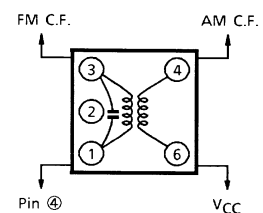
L₂ : FM OSC



T₁ : AM OSC

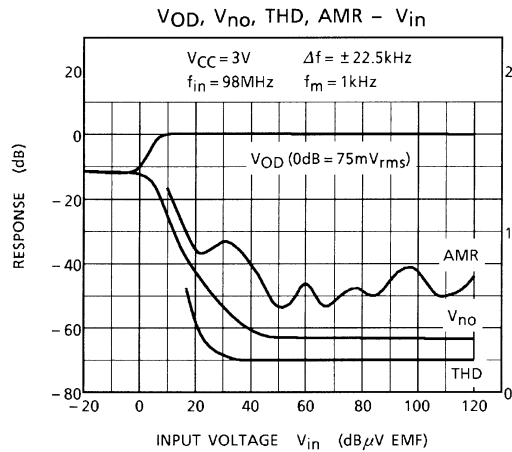


T₂ : AM IFT

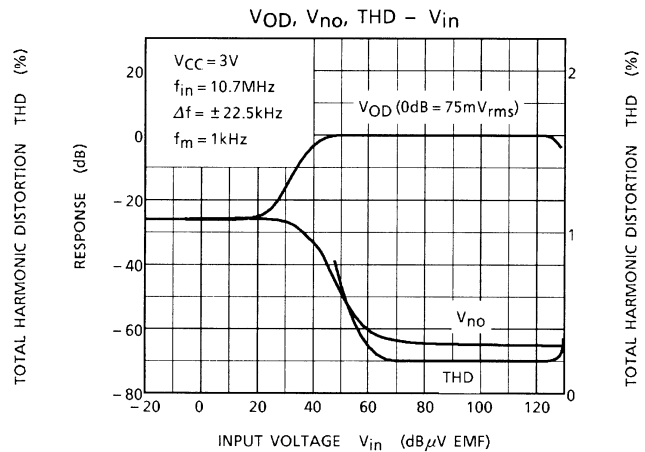


(BOTTOM VIEW)

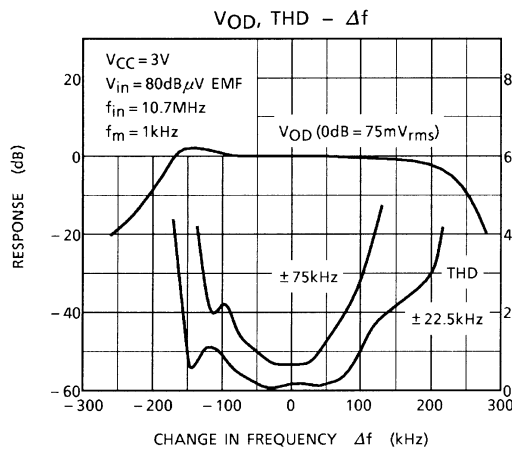
FM (F/E+IF)



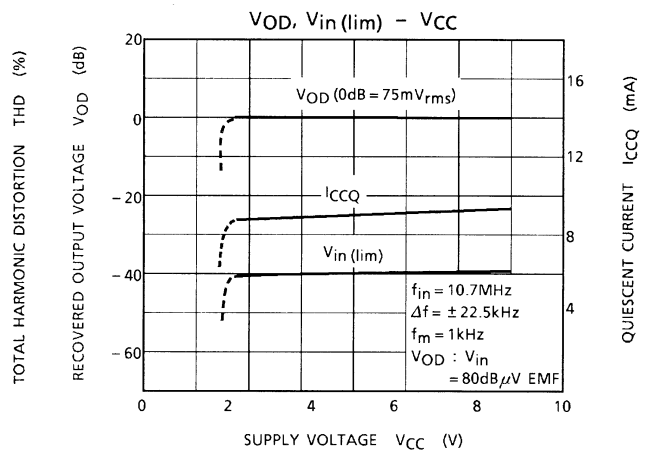
FM (IF)



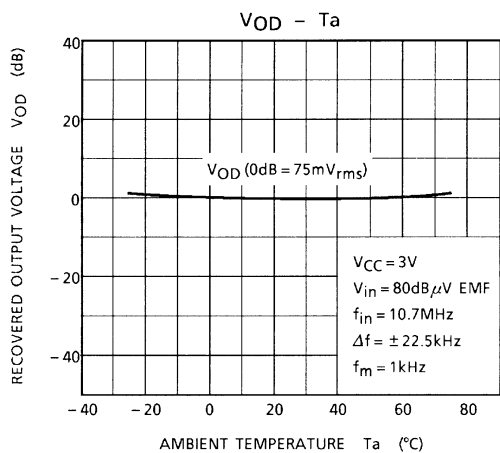
FM (IF)



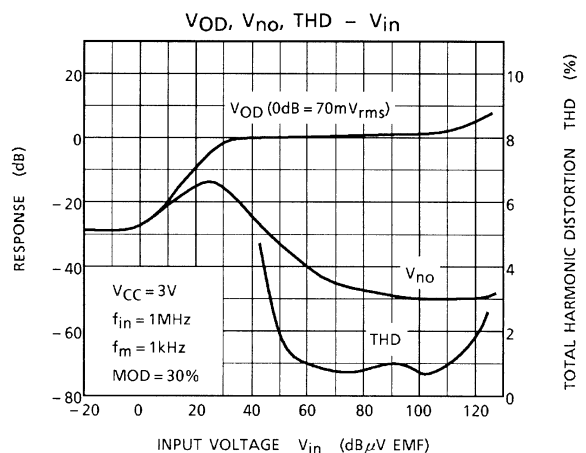
FM (IF)



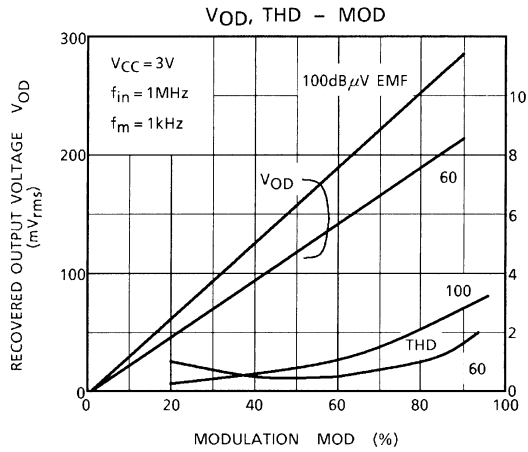
FM (IF)



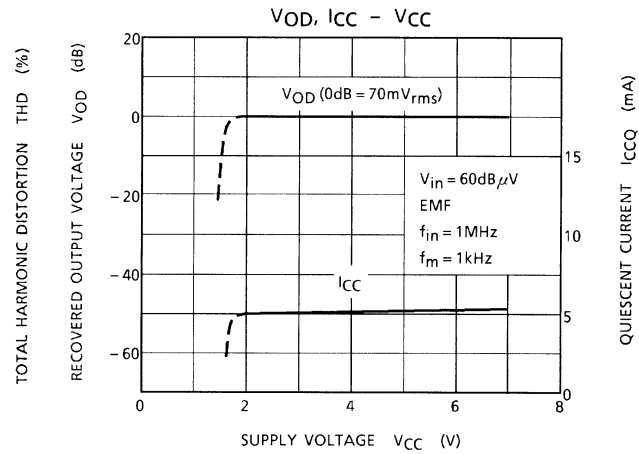
AM



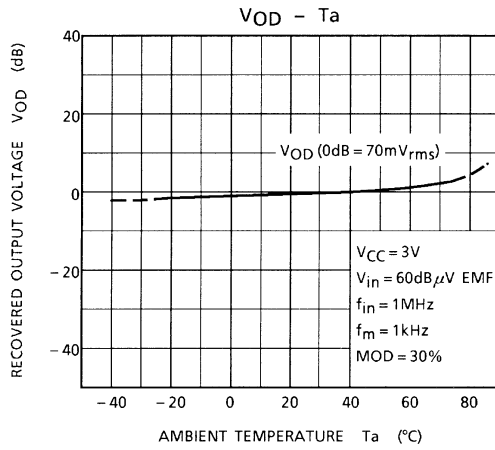
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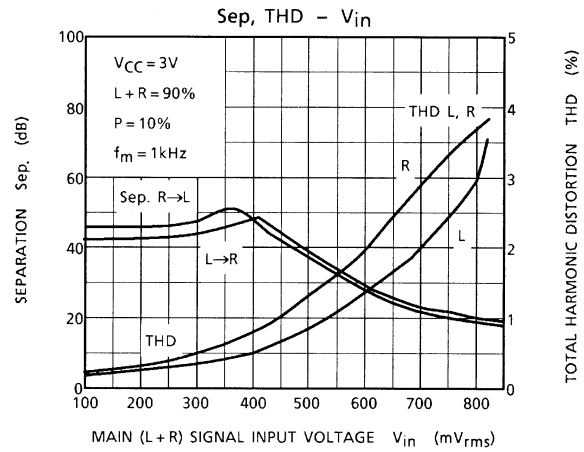
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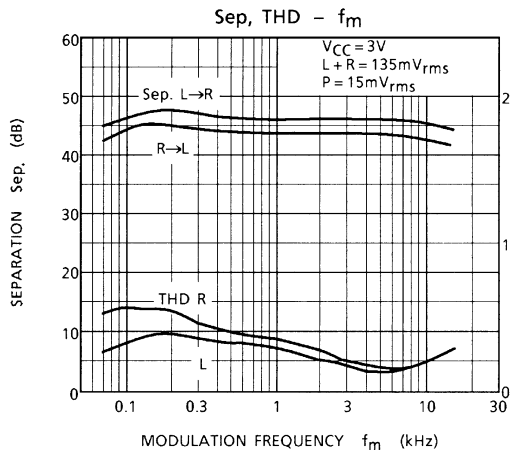
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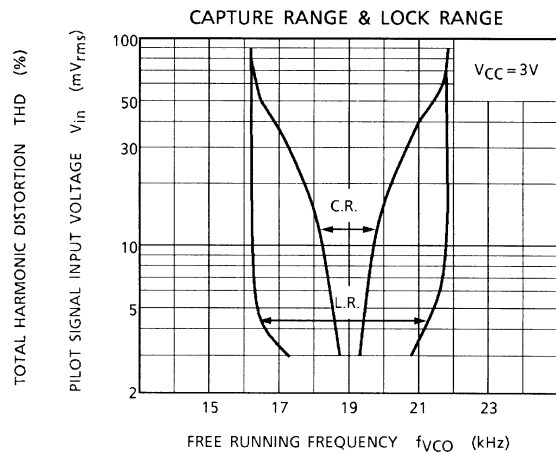
MPX



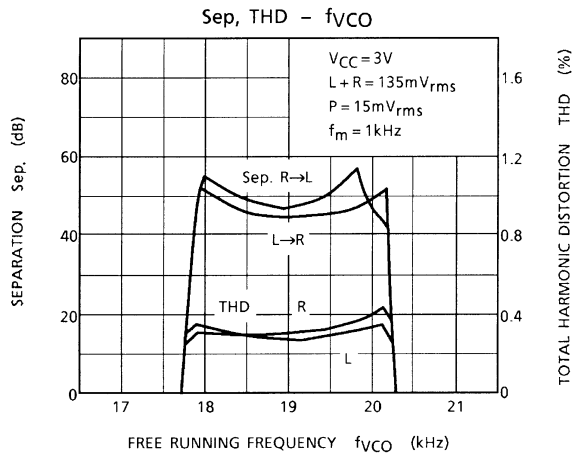
MPX



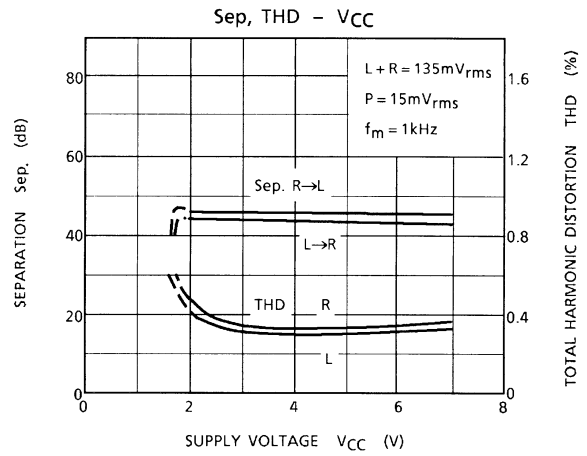
MPX



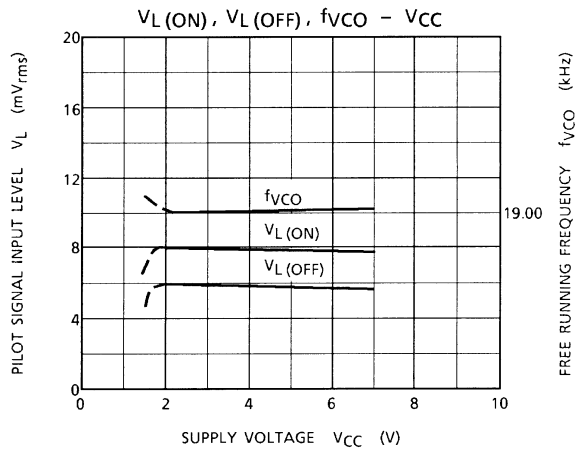
MPX



MPX



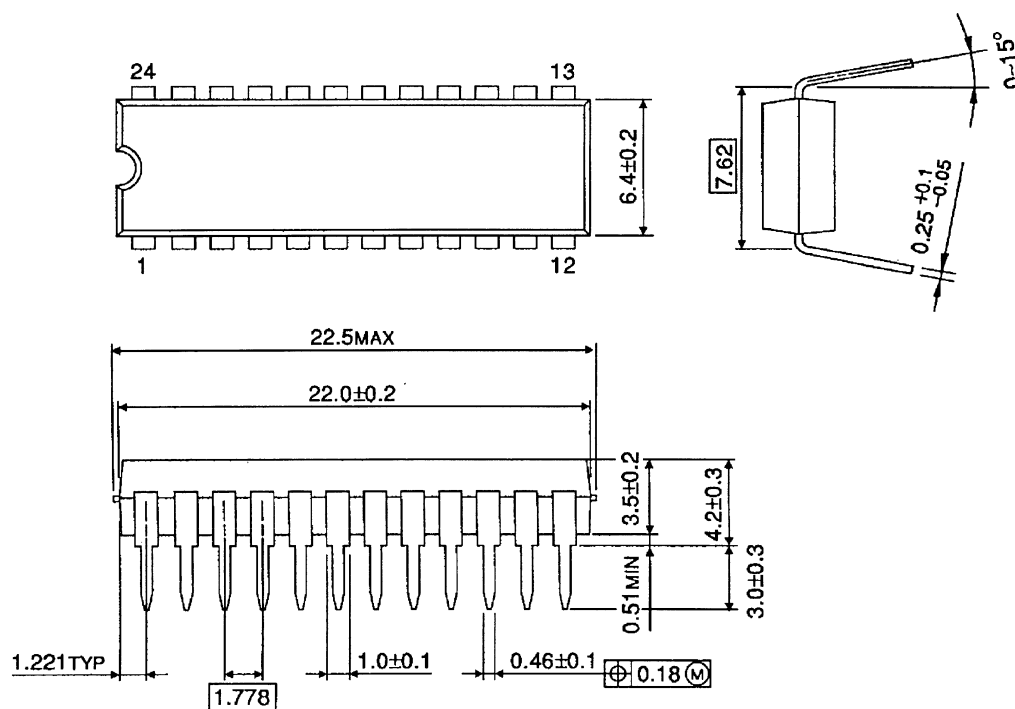
MPX



Package Dimensions

SDIP24-P-300-1.78

Unit : mm

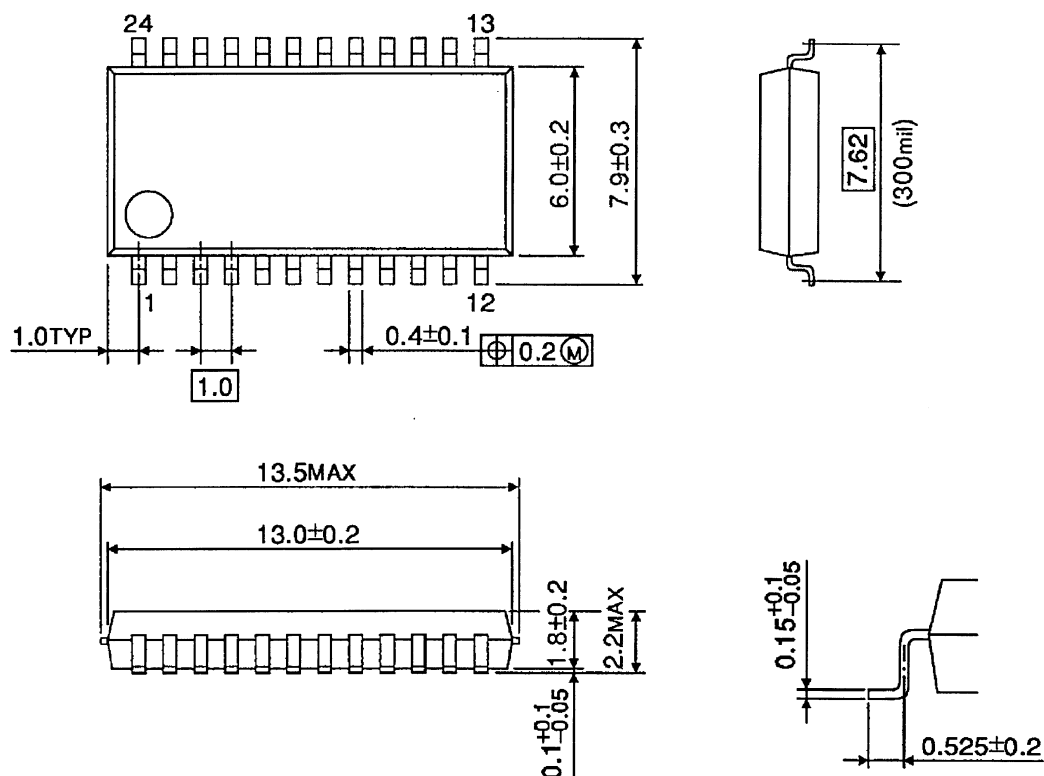


Weight: 1.2 g (typ.)

Package Dimensions

SSOP24-P-300-1.00

Unit : mm

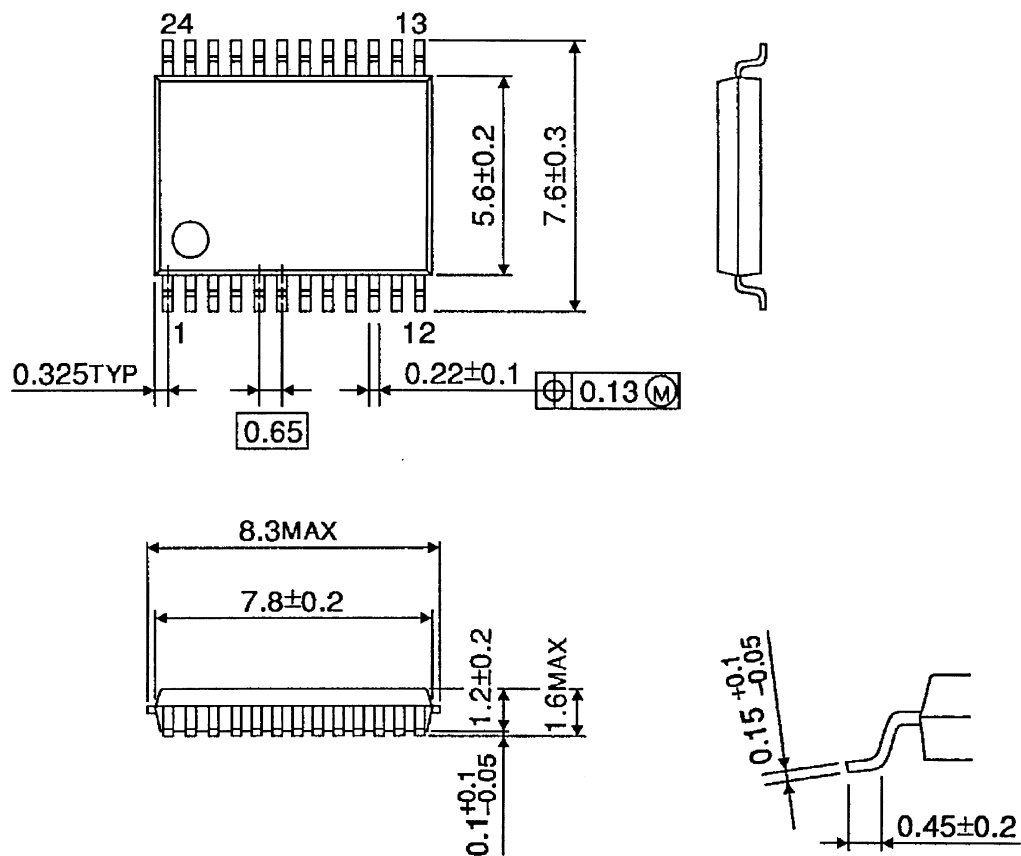


Weight: 0.31 g (typ.)

Package Dimensions

SSOP24-P-300-0.65A

Unit : mm



Weight: 0.14 g (typ.)

RESTRICTIONS ON PRODUCT USE

060116EBA

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- The products described in this document are subject to the foreign exchange and foreign trade laws. 021023_E

About solderability, following conditions were confirmed

- Solderability
 - (1) Use of Sn-37Pb solder Bath
 - solder bath temperature = 230°C
 - dipping time = 5 seconds
 - the number of times = once
 - use of R-type flux
 - (2) Use of Sn-3.0Ag-0.5Cu solder Bath
 - solder bath temperature = 245°C
 - dipping time = 5 seconds
 - the number of times = once
 - use of R-type flux