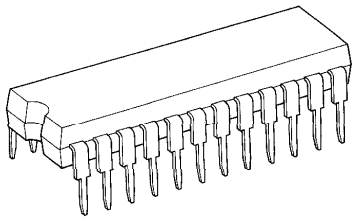
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA2111N, TA2111F, TA2111FN

3V AM / FM 1 CHIP TUNER IC

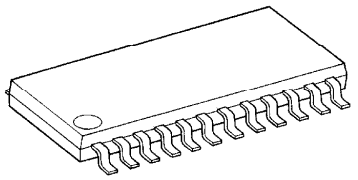
TA2111N / F / FN are AM / FM 1 chip tuner ICs, which are designed for portable Radios and 3V Head phone Radios. FM Local Oscillation Voltage is set up low relativity, for NEW FCC.

TA2111N



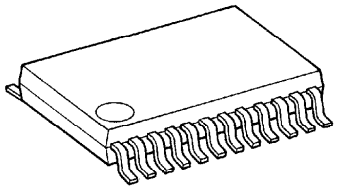
SDIP24-P-300-1.78

TA2111F



SSOP24-P-300-1.00

TA2111FN



SSOP24-P-300-0.65A

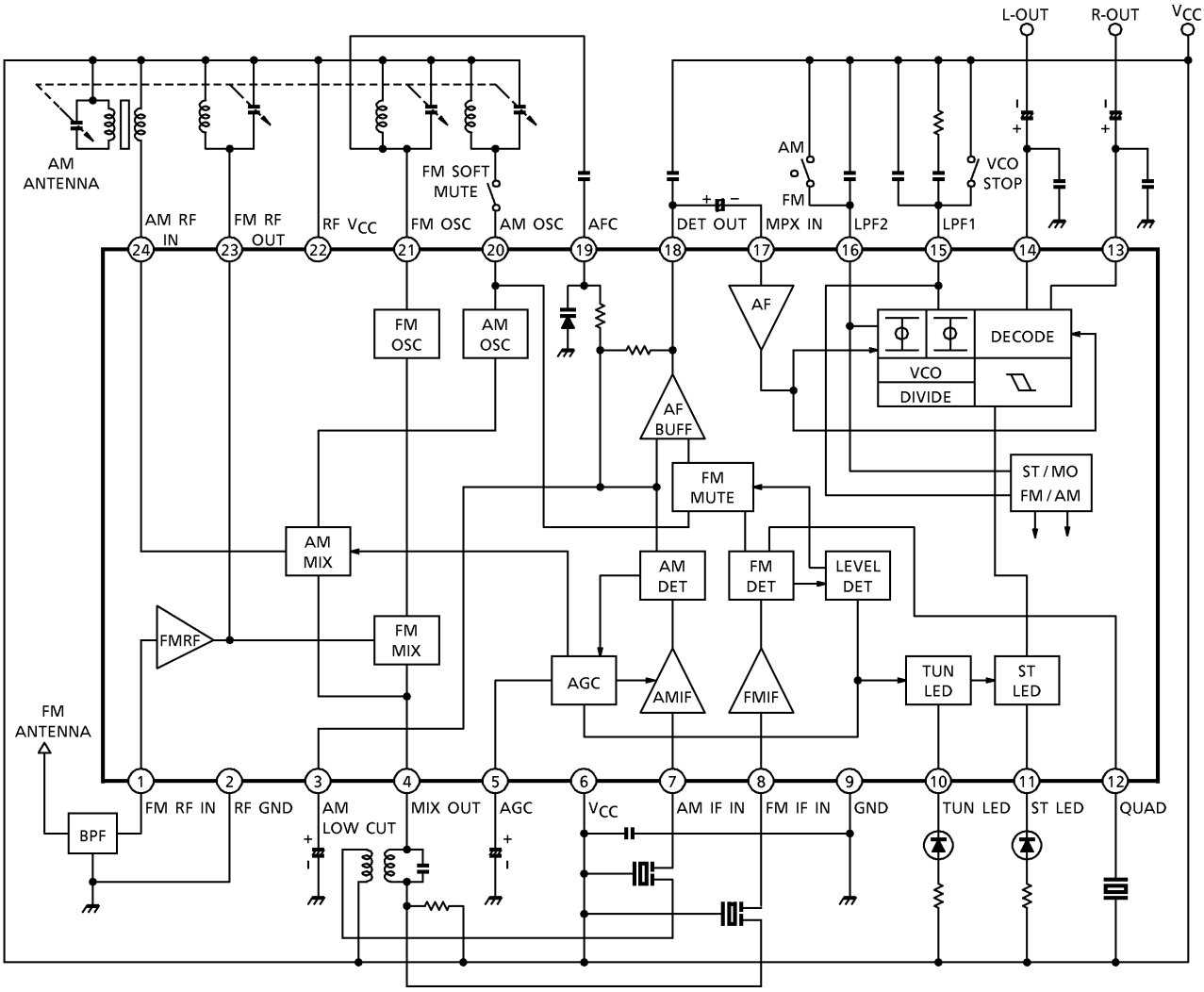
FEATURES

- 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} = 3V, Ta = 25°C)
  I_{CCq} (FM) = 9.0mA (Typ.)
  I_{CCq} (AM) = 5.0mA (Typ.)
- Operating Supply voltage range : V_{CC} = 1.8~7V (Ta = 25°C)

(*) Handle with care to prevent devices from deteriorations by static electricity.

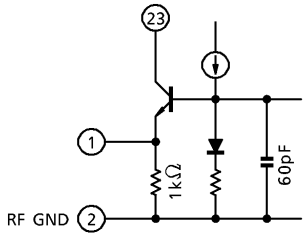
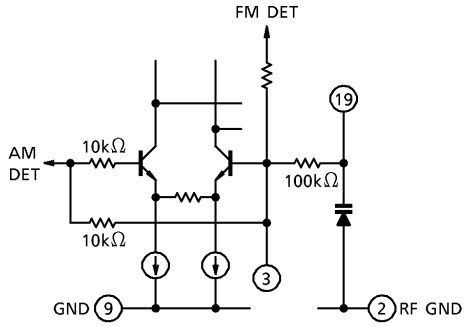
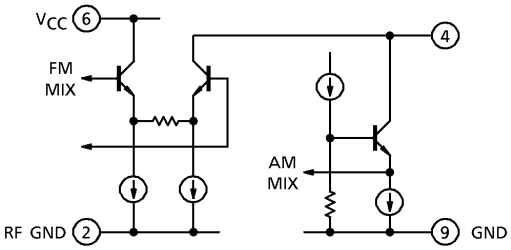
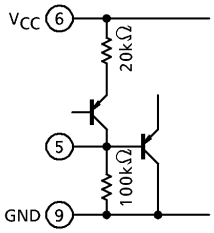
Weight
SDIP24-P-300-1.78 : 1.2g (Typ.)
SSOP24-P-300-1.00 : 0.31g (Typ.)
SSOP24-P-300-0.65A : 0.14g (Typ.)

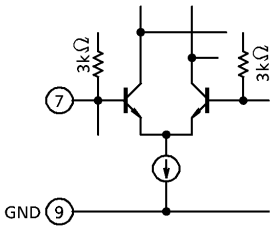
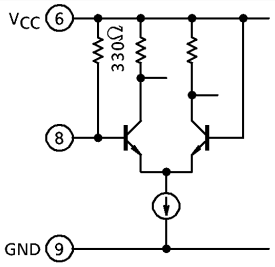
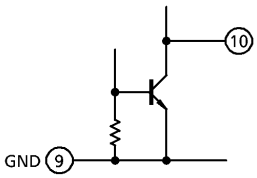
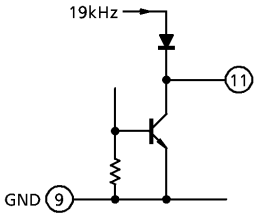
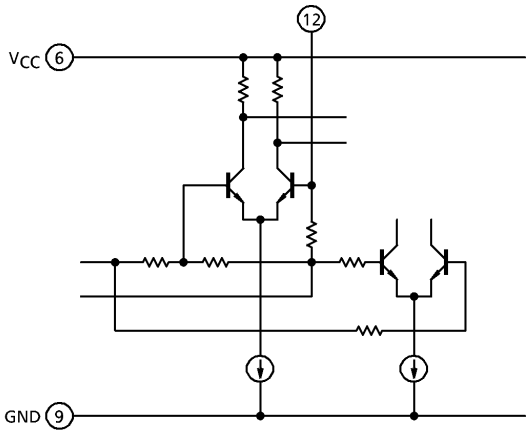
BLOCK DIAGRAM

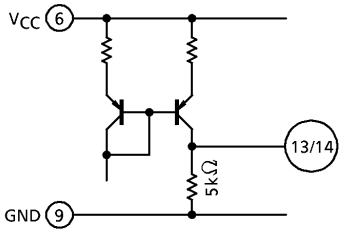
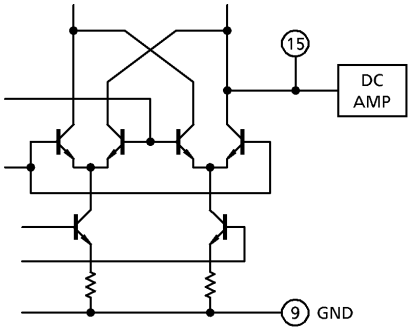
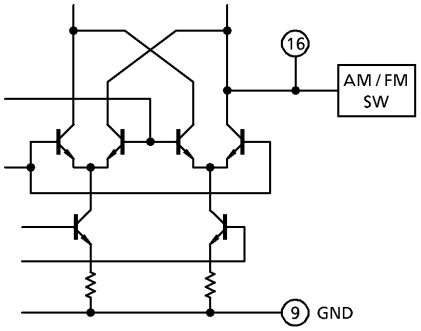
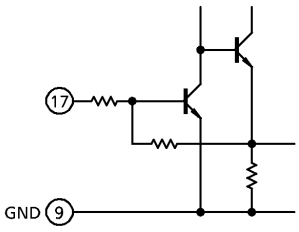


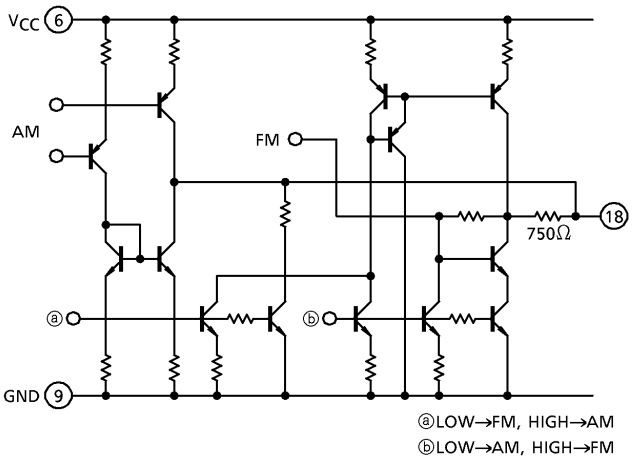
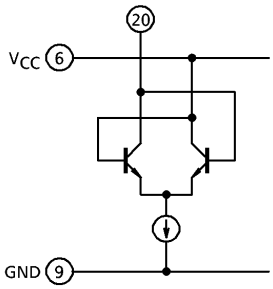
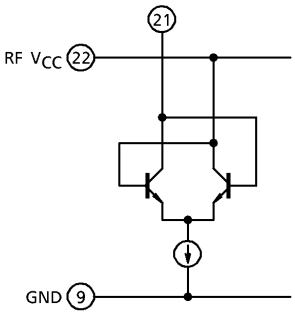
EXPLANATION OF TERMINALS

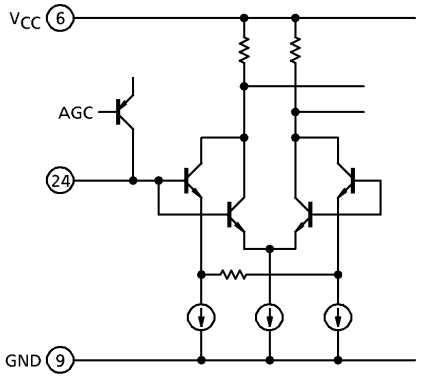
(Terminal voltage : Typical terminal voltage at no signal with test circuit, V_{CC} = 3V, Ta = 25°C)

PIN No.	CHARACTERISTIC	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

PIN No.	CHARACTERISTIC	INTERNAL CIRCUIT	TERMINAL VOLTAGE (Typ.) (V)	
			AM	FM
7	AM IF IN		2.3	2.6
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

PIN No.	CHARACTERISTIC	INTERNAL CIRCUIT	TERMINAL VOLTAGE (Typ.) (V)	
			AM	FM
13 14	R-OUT (R-ch Output) L-OUT (L-ch Output)		1.2	1.2
15	LPF1 ● LPF terminal for synchronous Detector ● VCO stop terminal V15 = V_{CC}→VCO STOP		2.3	2.3
16	LPF2 ● LPF terminal for phase Detector ● Bias terminal for AM / FM SW circuit V16 = V_{CC}→AM V16 = OPEN→FM		3	2.2
17	MPX IN		0.7	0.7

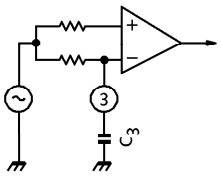
PIN No.	CHARACTERISTIC	INTERNAL CIRCUIT	TERMINAL VOLTAGE (Typ.) (V)	
			AM	FM
18	DET OUT		1.0	0.9
19	AFC	cf. pin ③	—	—
20	AM OSC		3.0	3.0
21	FM OSC		3.0	3.0
22	RF V_{CC} (V_{CC} for FM OSC stage)	—	3.0	3.0
23	FM RF OUT	cf. pin ①	3.0	3.0

PIN No.	CHARACTERISTIC	INTERNAL CIRCUIT	TERMINAL VOLTAGE (Typ.) (V)	
			AM	FM
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 : C_3 by-passes this component.

   ○ The cut-off frequency f_L is determined by the internal resistance 10kΩ (Typ.) and the external capacitor C_3 as following ;

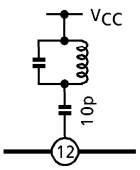
   $$f_L = \frac{1}{2 \times \pi \times 10 \times 10^3 \times C_3} \text{ (Hz)}$$

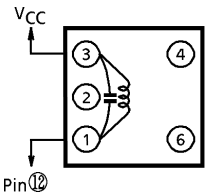
   ○ In the case of the AM Low-Cut function is not needed, set up the value of C_3 over 1μF. In the condition of $C_3 \geqq 1\mu F$, the frequency characteristic has flat response at the low frequency.

   ○ In FM mode, C_3 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_O (pF)	Q_O	TURNS				WIRE (mmϕ)	REFERENCE
			1-2	2-3	1-3	4-6		
10.7MHz	51	45	—	—	30	—	0.12 UEW	TOKO Co., Ltd. 600BEAS-10018Z

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V_{CC}	8	V
LED Current		ILED	10	mA
LED Voltage		VLED	8	V
Power Dissipation	TA2111N	P_D (Note)	1200	mW
	TA2111F		400	
	TA2111FN		500	
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 for TA2111N, of 3.2mW / °C for TA2111F and of 4mW / °C for TA2111FN.

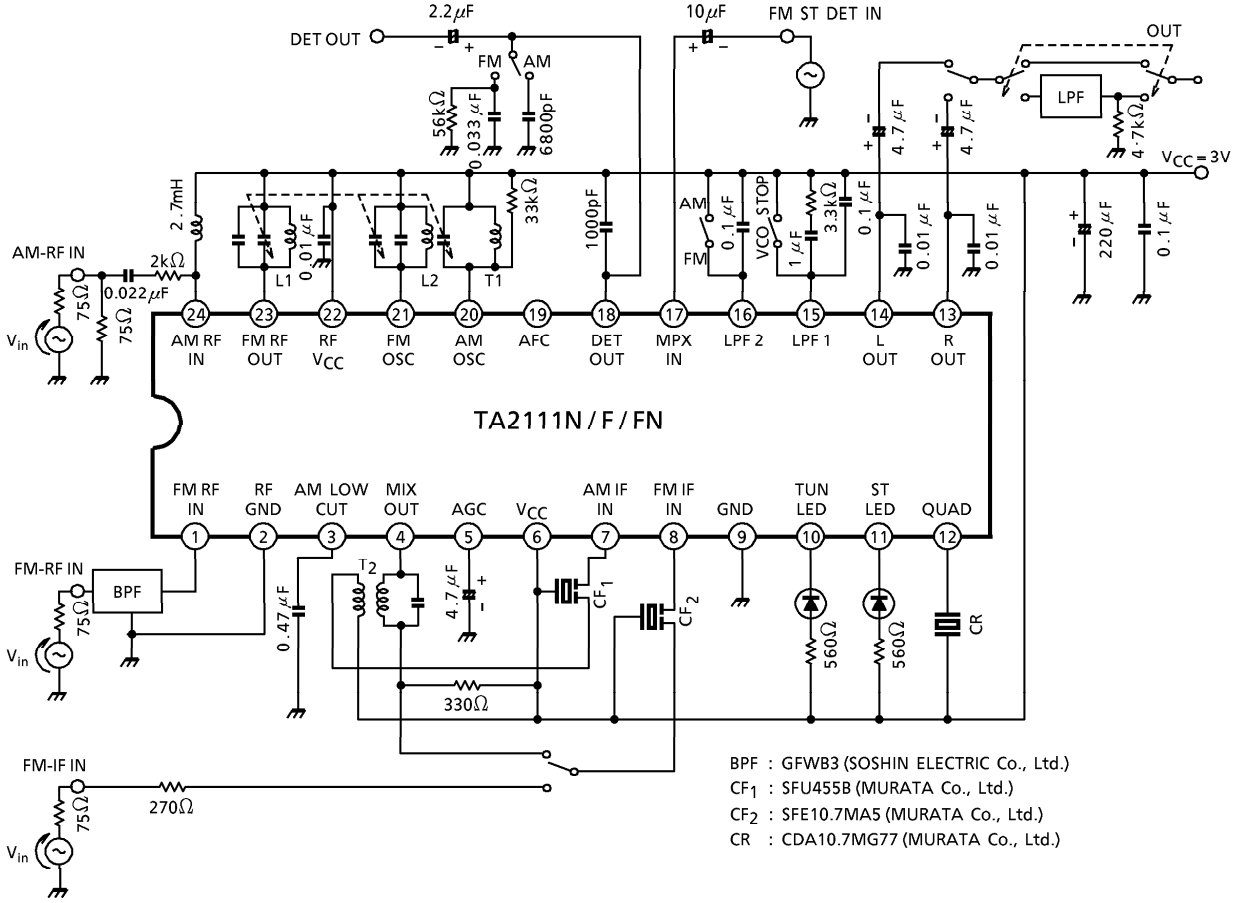
ELECTRICAL CHARACTERISTICS

Unless otherwise specified, Ta = 25°C, V_{CC} = 3V, F / E : f = 98MHz, 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	Vin = 0, FM mode	—	9	12.5	mA
		I_{CC} (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	V_{OSC}	2	f_{OSC} = 108.7MHz	—	105	—	mV_{rms}
FM IF	Input Limiting Voltage	Vin (lim) IF	1	−3dB limiting	35	40	45	dBμV EMF
	Recovered Output Voltage	V_{OD}	1	Vin = 80dBμV EMF	60	75	90	mV_{rms}
	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	—	50	—	dB
	LED On Sensitivity	V_L	1	I_L = 1mA	40	45	50	dBμV EMF
	Soft Mute Attenuation	MUTE	1	Vin = 0	—	20	—	dB
AM	Gain	G_V	1	Vin = 25dBμV EMF	18	35	70	mV_{rms}
	Recovered Output Voltage	V_{OD}	1	Vin = 60dBμV EMF	50	70	90	mV_{rms}
	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	V_L	1	I_L = 1mA	23	28	33	dBμV EMF
Pin ⑱ Output Resistance		R_{18}	—	FM mode	—	0.75	—	kΩ
				AM mode	—	15.5	—	

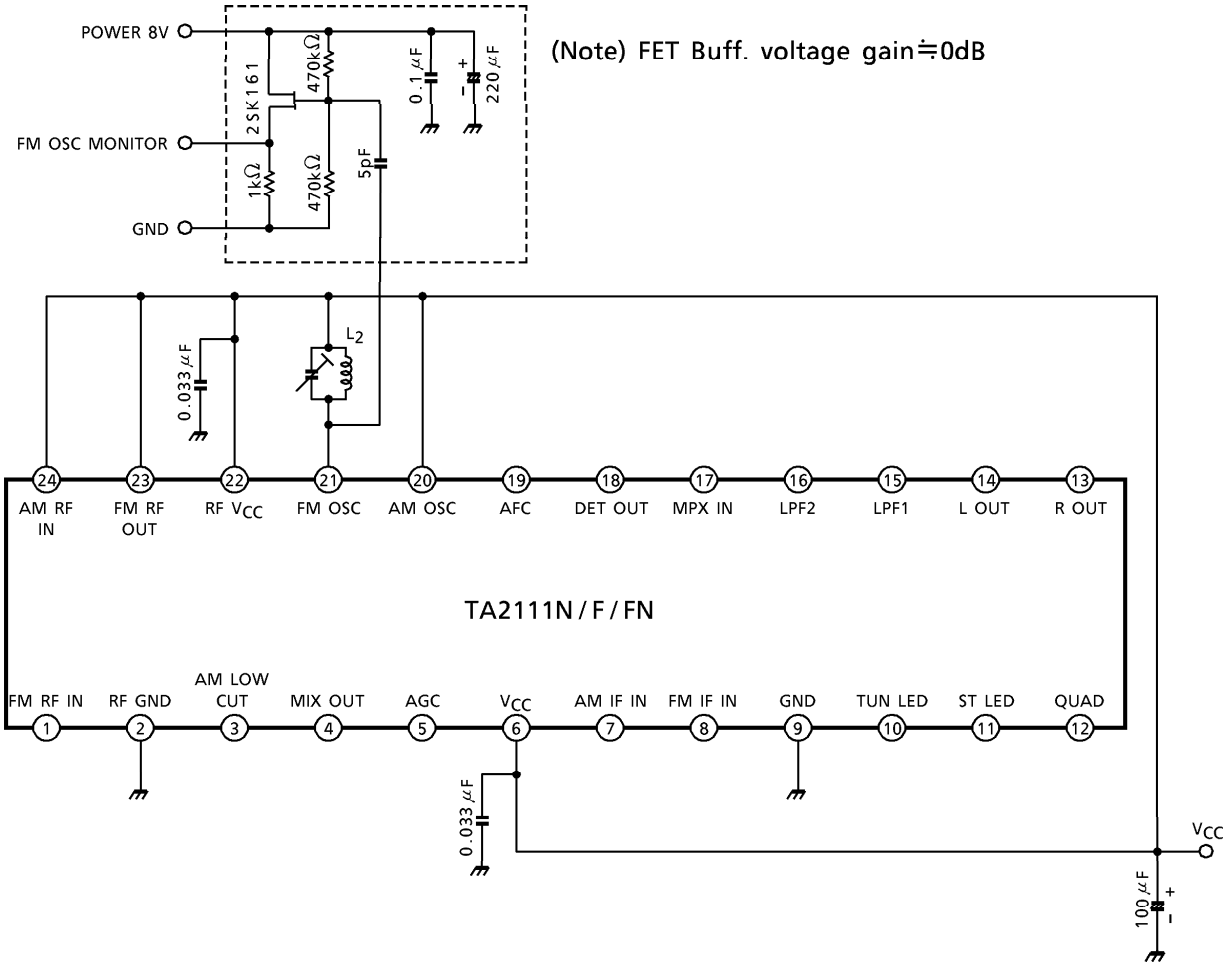
CHARACTERISTIC			SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
MPX	Input Resistance		R_{IN}	—	—		—	55	—	kΩ
	Output Resistance		R_{OUT}	—	—		—	5	—	kΩ
	Max. Composite Signal Input Voltage		Vin MAX (STEREO)	1	L + R = 90%, P = 10%, f_m = 1kHz, THD = 3%		—	700	—	mV_{rms}
	Separation		Sep	1	L + R = 180mV_{rms}, P = 20mV_{rms}	f_m = 100Hz	—	45	—	dB
						f_m = 1kHz	35	45	—	
						f_m = 10kHz	—	45	—	
	Total Harmonic Distortion	Monaural	THD (MONAURAL)	1	Vin = 200mV_{rms}		—	0.3	—	%
		Stereo	THD (STEREO)	1	L + R = 180mV_{rms}, P = 20mV_{rms}		—	0.3	—	
	Voltage Gain		G_V	1	Vin = 200mV_{rms}		− 2.5	− 1	0.5	dB
	Channel Balance		C.B.	1	Vin = 200mV_{rms}		− 1.5	0	1.5	dB
	Stereo LED Sensitivity	ON	$V_{L\,(ON)}$	1	Pilot Input		—	8	12	mV_{rms}
		OFF	$V_{L\,(OFF)}$	1			3	6	—	
	Stereo LED Hysteresis		V_H	1	To LED turn off from LED turn on		—	2	—	mV_{rms}
	Capture Range		C.R.	1	P = 20mV_{rms}		—	±8	—	%
	Signal To Noise Ratio		S / N	1	—		—	80	—	dB

TEST CIRCUIT 1



BPF : GFWB3 (SOSHIN ELECTRIC Co., Ltd.)
CF_1 : SFU455B (MURATA Co., Ltd.)
CF_2 : SFE10.7MA5 (MURATA Co., Ltd.)
CR : CDA10.7MG77 (MURATA Co., Ltd.)

TEST CIRCUIT 2

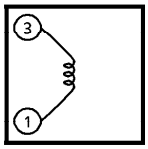


COIL DATA

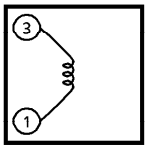
COIL No.	TEST FREQ.	L (μH)	Co (pF)	Qo	TURNS					WIRE (mmϕ)	REFERENCE
					1 – 2	2 – 3	1 – 3	1 – 4	4 – 6		
L_1 FM RF	100MHz	—	—	79	—	—	—	$2\frac{1}{2}$	—	0.16UEW	Ⓣ 666SNF-305NK
L_2 FM OSC	100MHz	—	—	79	—	—	—	2	—	0.16UEW	Ⓣ 666SNF-306NK
T_1 AM OSC	796kHz	268	—	65	19	95	—	—	—	0.05UEW	Ⓣ 5PNR-5146Y
T_2 AM IFT	455kHz	—	470	60	—	—	109	—	7	0.05UEW	Ⓣ 5PLG-5147X

Ⓣ : TOKO Co., Ltd.

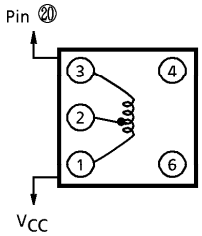
L_1 : FM RF



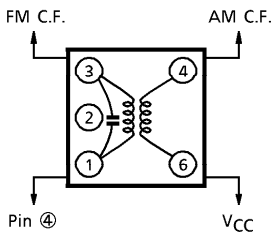
L_2 : FM OSC



T_1 : AM OSC



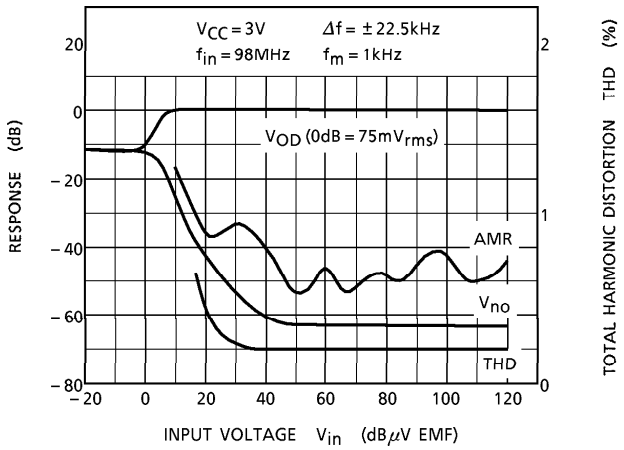
T_2 : AM IFT



(BOTTOM VIEW)

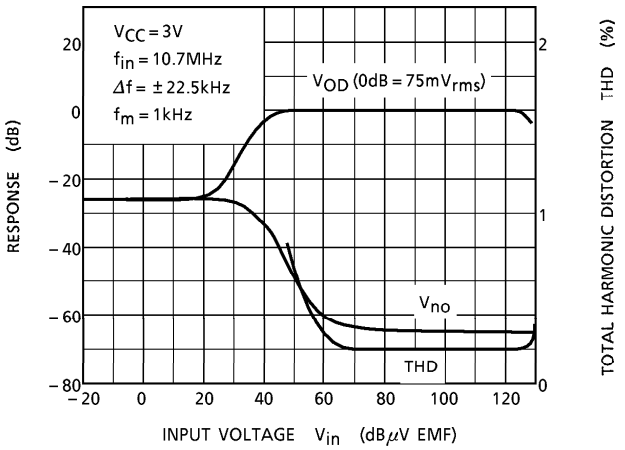
FM (F / E + IF)

V_{OD}, V_{no}, THD, AMR – V_{in}



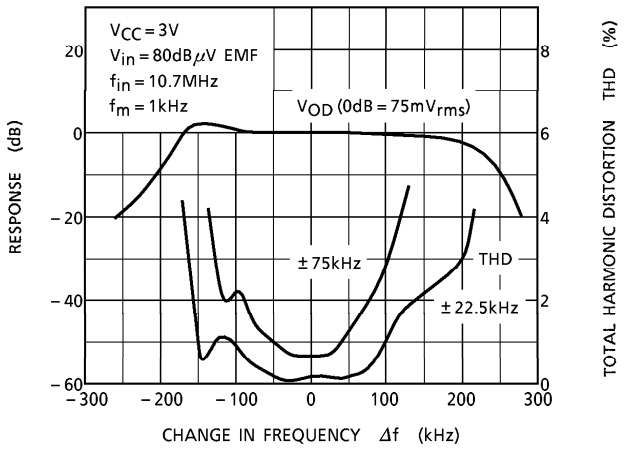
FM (IF)

V_{OD}, V_{no}, THD – V_{in}



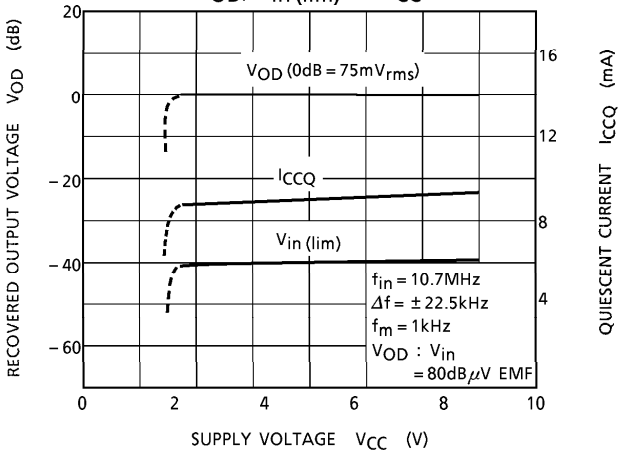
FM (IF)

V_{OD}, THD – Δf



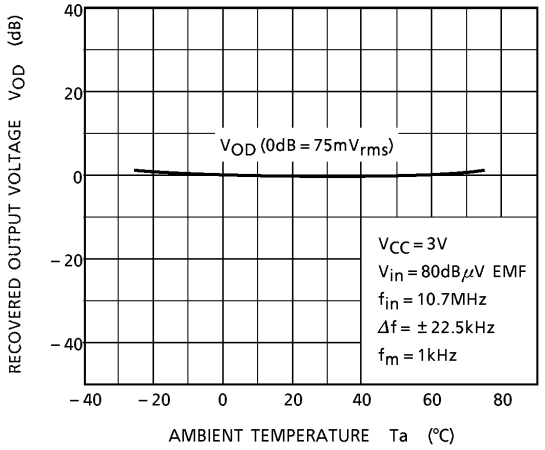
FM (IF)

V_{OD}, V_{in} (lim) – V_{CC}



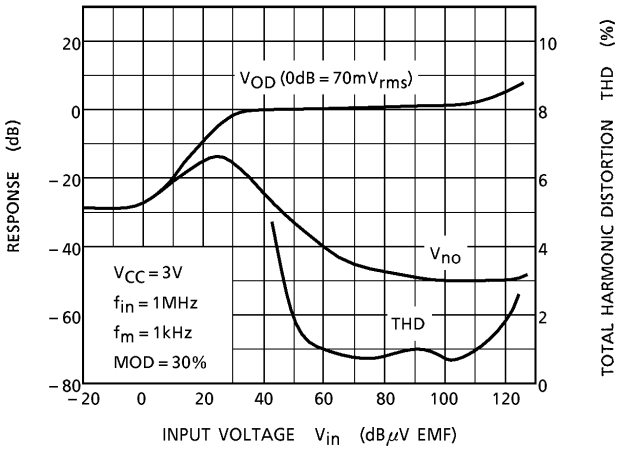
FM (IF)

V_{OD} – Ta



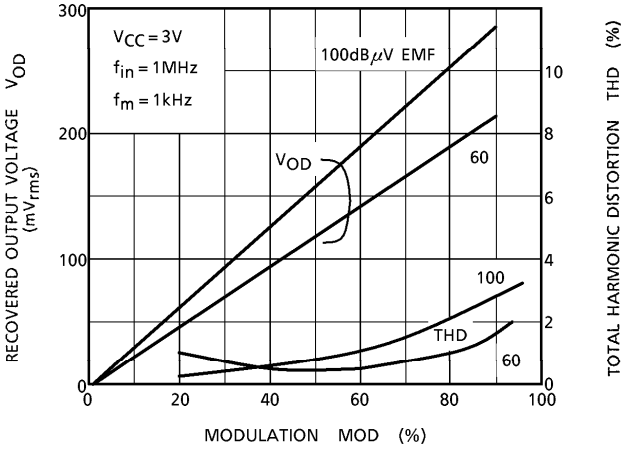
AM

V_{OD}, V_{no}, THD – V_{in}



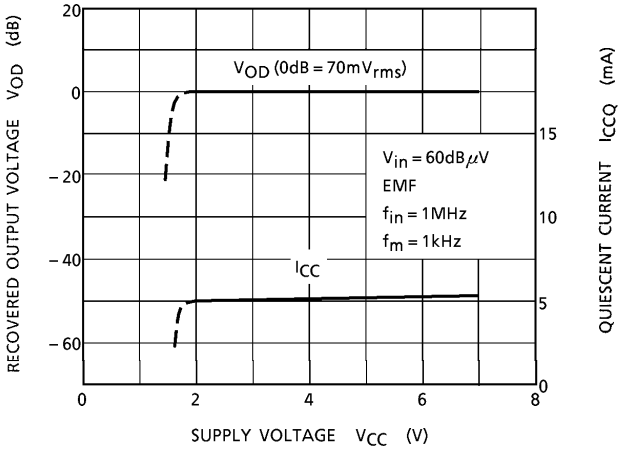
AM

V_{OD}, THD – MOD



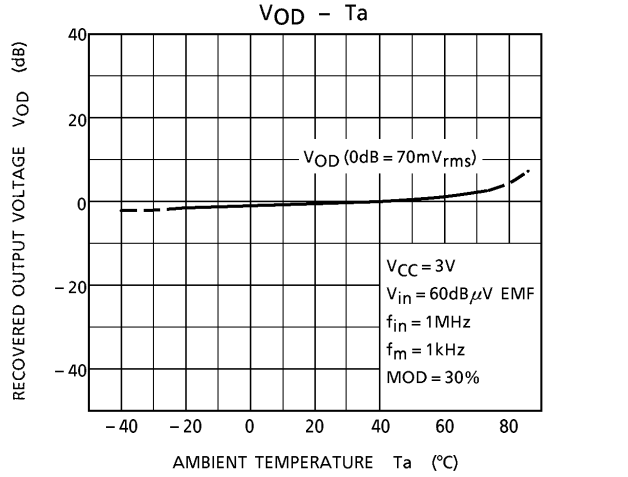
AM

V_{OD}, I_{CC} – V_{CC}



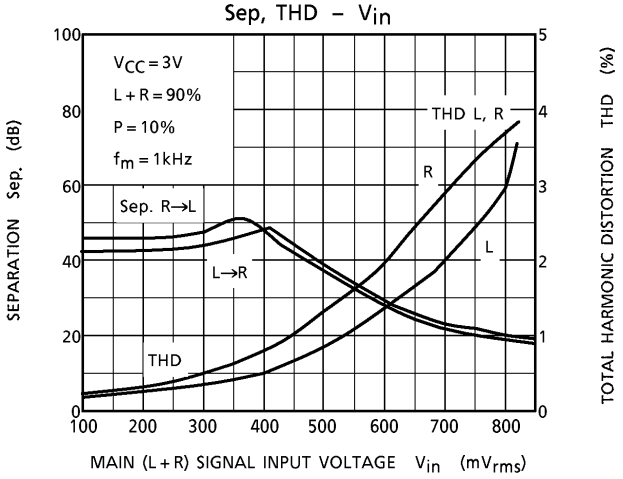
AM

V_{OD} – Ta



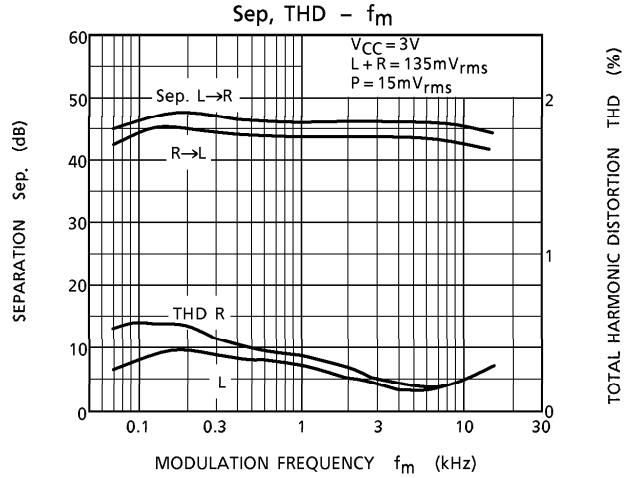
MPX

Sep, THD – V_{in}



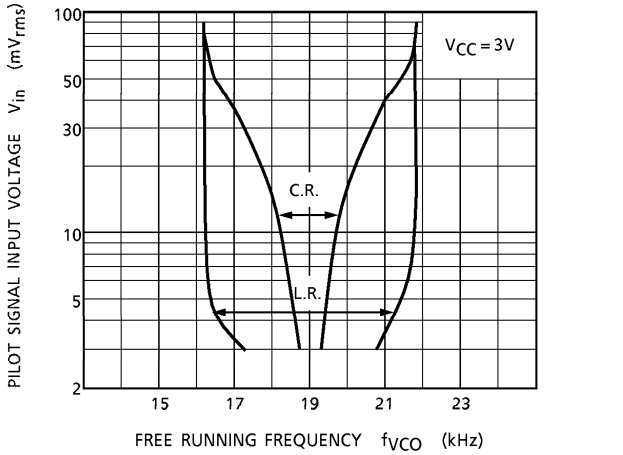
MPX

Sep, THD – f_m



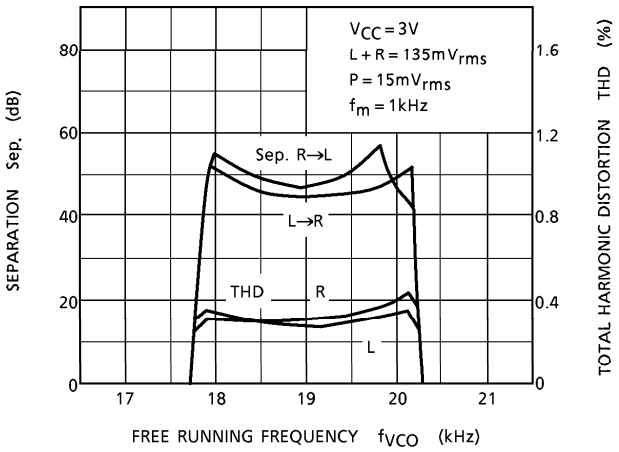
MPX

CAPTURE RANGE & LOCK RANGE



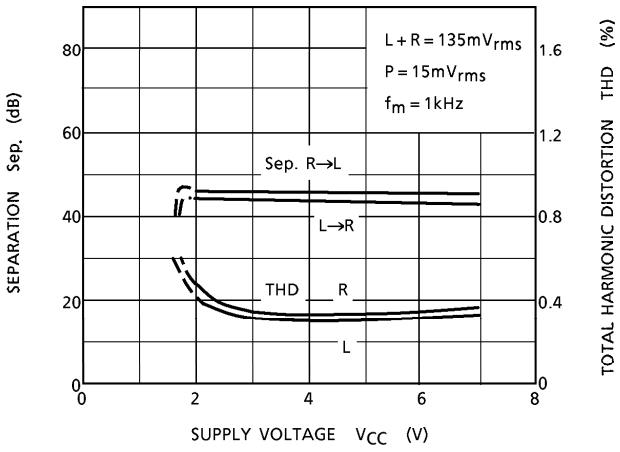
MPX

Sep, THD – f_{VCO}



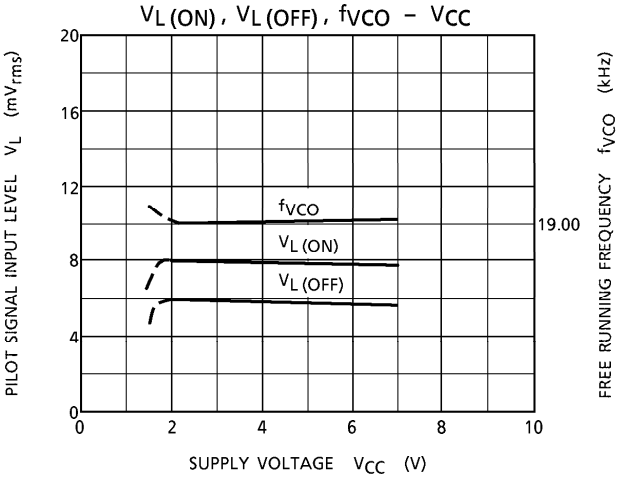
MPX

Sep, THD – V_{CC}



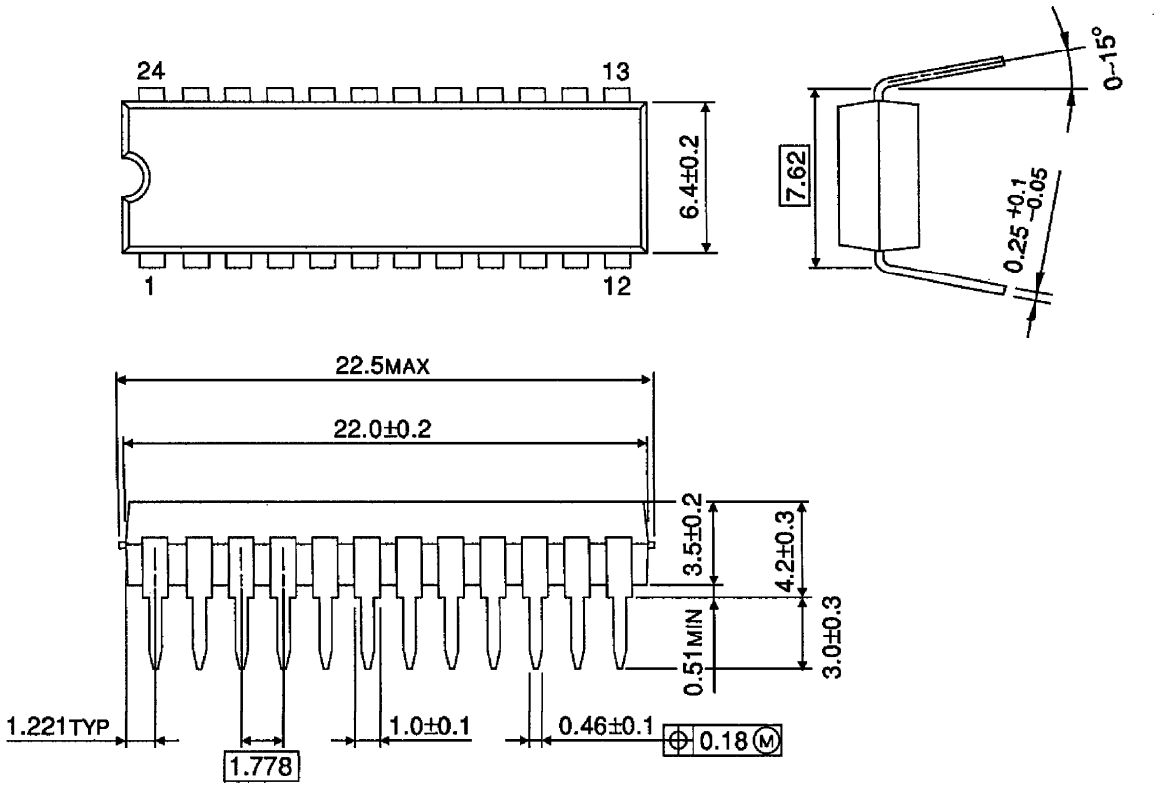
MPX

$V_{L\,(ON)}$, $V_{L\,(OFF)}$, f_{VCO} – V_{CC}



OUTLINE DRAWING

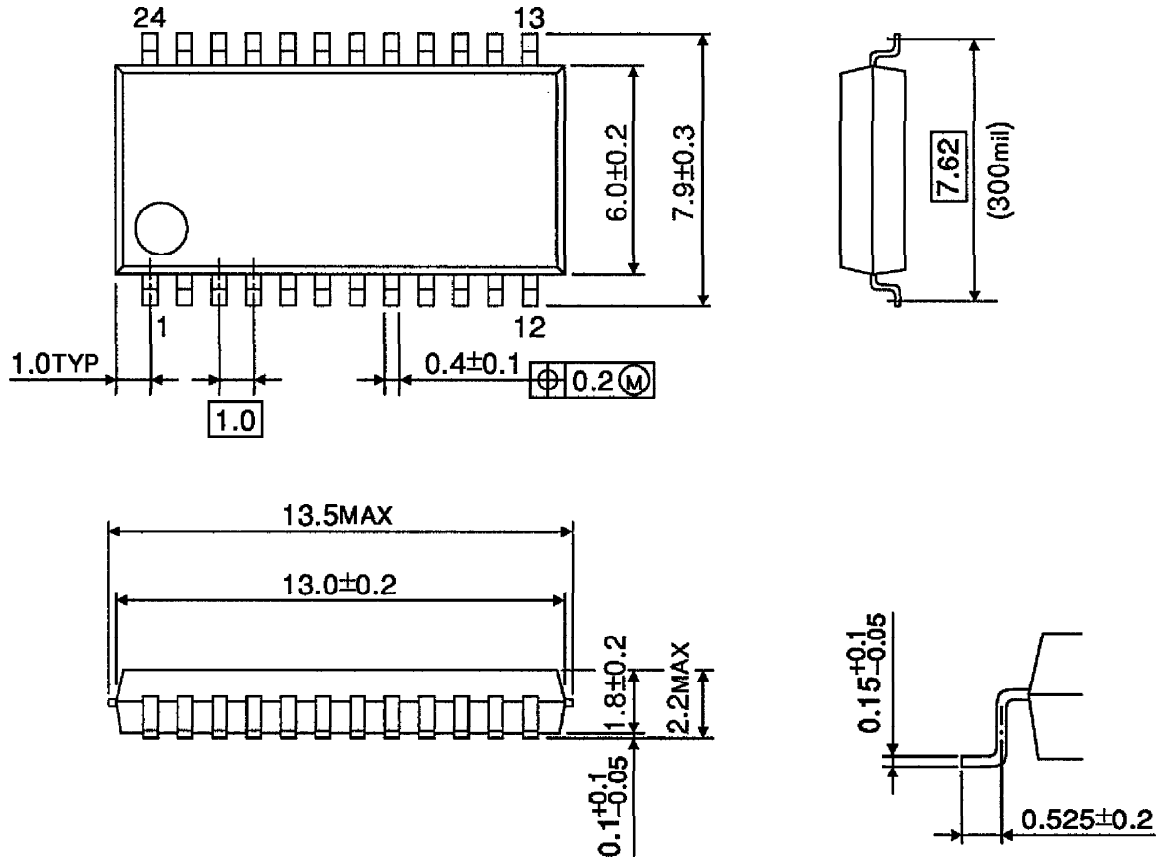
SDIP24-P-300-1.78 Unit : mm



Weight : 1.2g (Typ.)

OUTLINE DRAWING

SSOP24-P-300-1.00 Unit : mm

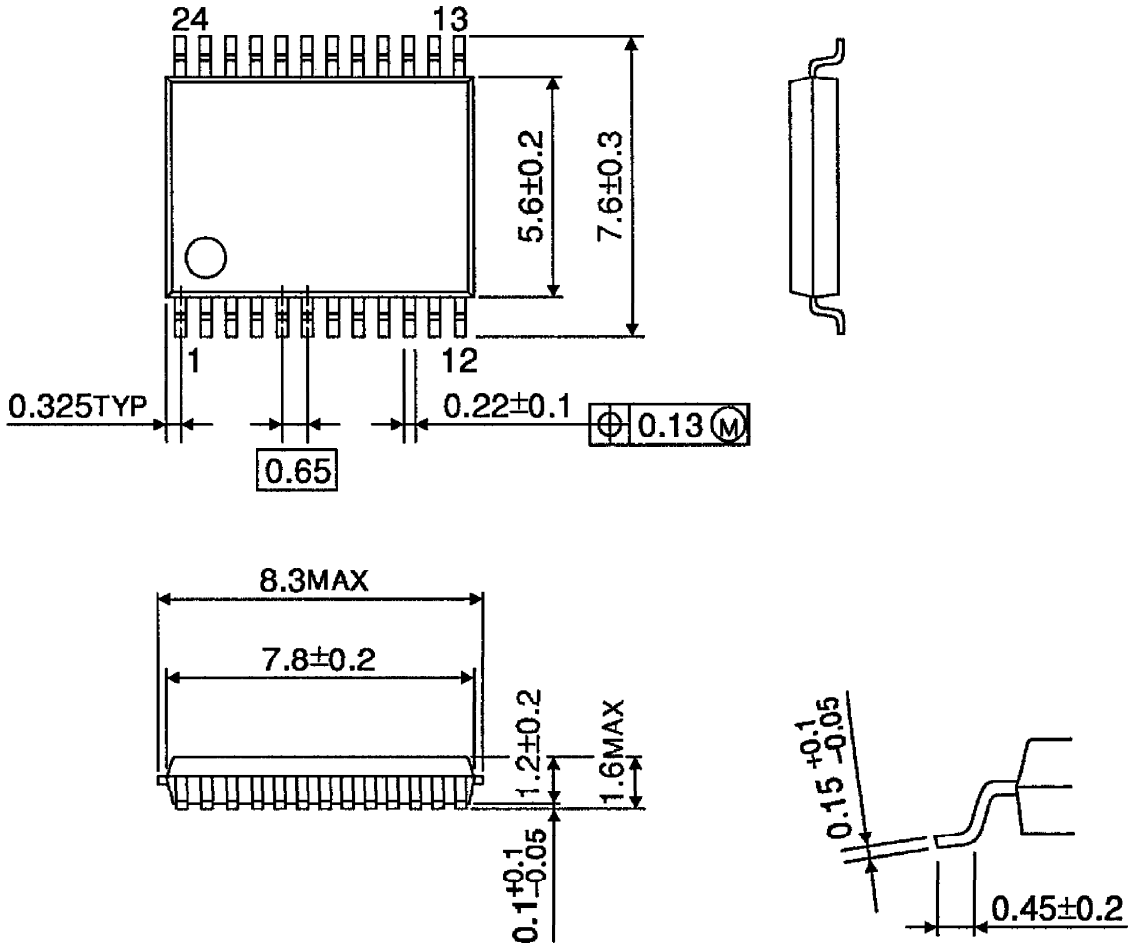


Weight : 0.31g (Typ.)

OUTLINE DRAWING

SSOP24-P-300-0.65A

Unit : mm



Weight : 0.14g (Typ.)