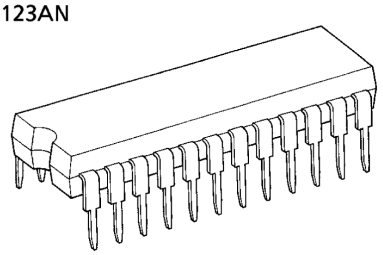
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA8122AN, TA8122AF, TA8123AN, TA8123AF

3V AV / FM 1Chip Tuner IC

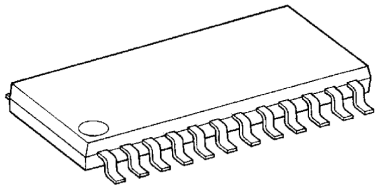
TA8122AN / AF and TA8123AN / AF are the AM / FM 1chip tuner ICs, which are designed for portable radios and 3V headphone radios.

TA8122AN
TA8123AN



SDIP24-P-300-1.78

TA8122AF
TA8123AF



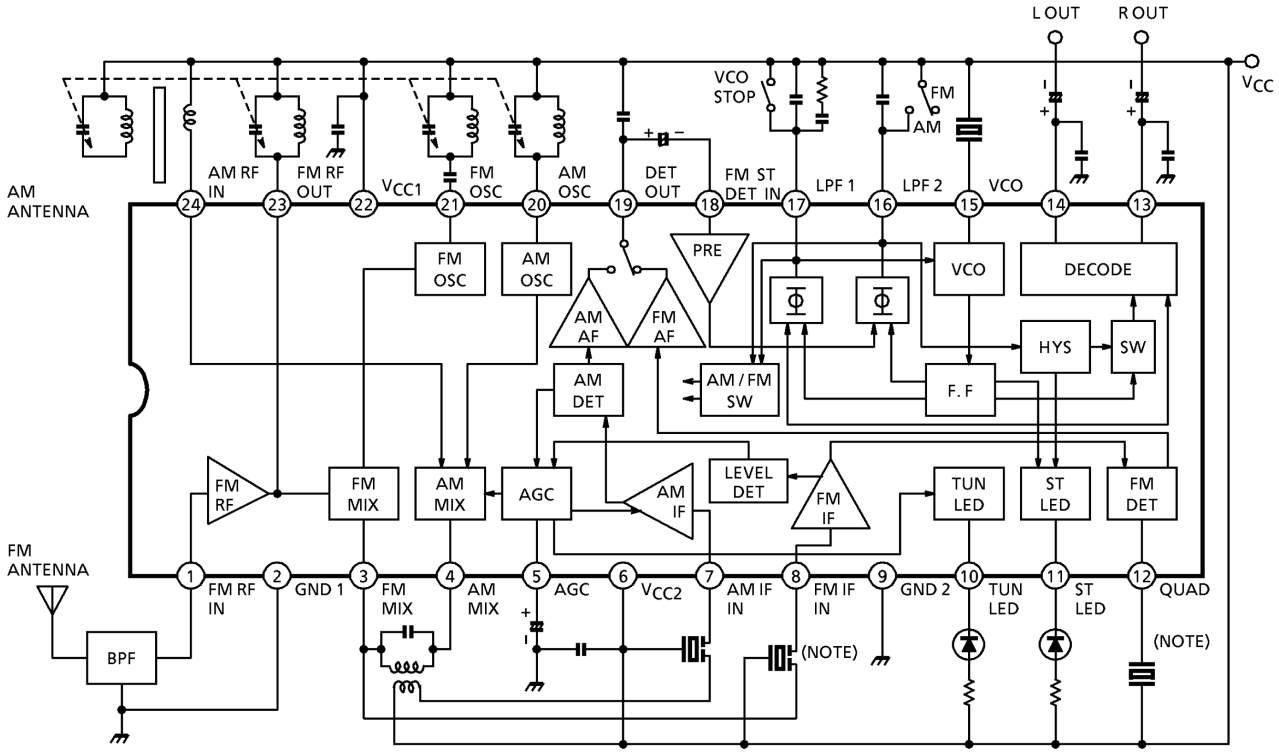
SSOP24-P-300-1.00

Weight
SDIP24−P−300−1.78: 1.2g (typ.)
SSOP24−P−300−1.00: 0.31g (typ.)

Features

- Built−in
  FM F / E, AM / FM IF and FM ST DET
- AM detector coil, FM IFT and IF coupling condenser are not needed.
- For adopting ceramic discriminator and ceramic resonator, it is not necessary to adjust the FM quad detector Circuit and FM ST DET VCO circuit.
- S curve characteristics of FM detection output in TA8122AN / AF and TA8123AN / AF are reverse to each other.
  TA8122AN / AF: Reverse characteristic
  TA8123AN / AF: Normal characteristic
- Compact pakage
  TA8122AN / 23AN: Shrink DIP 24 pin (1.78mm pitch)
  TA8122AF / 23AF: Mini flat package 24 pin
- Operating supply voltage range
  V_{CC} = 1.8~7.0V (Ta = 25°C)

Block Diagram

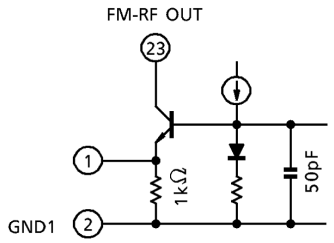
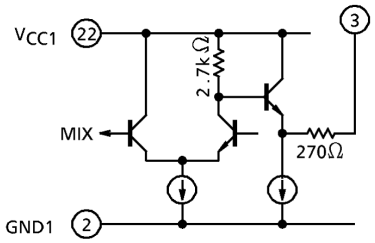
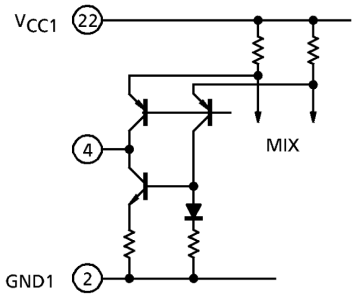
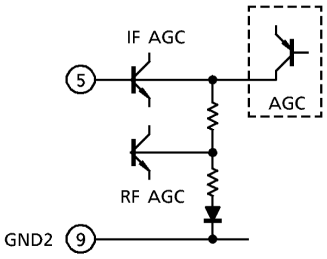


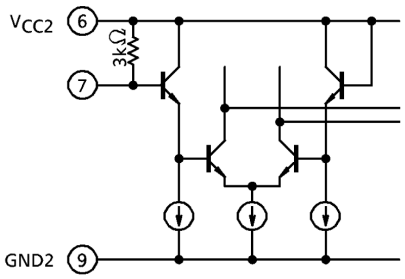
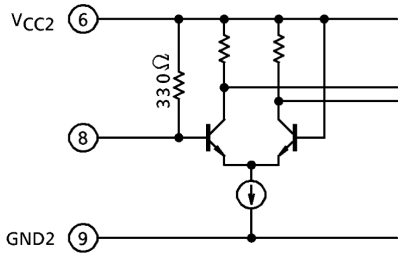
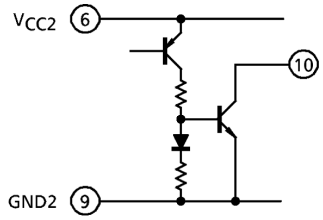
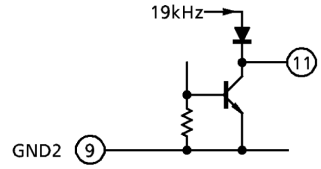
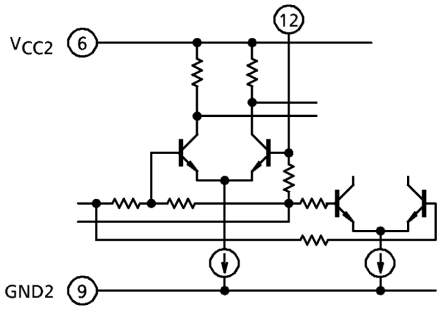
(Note)
We recommend the kit of the ceramic filter and the ceramic resonator which are shown in the table as below.
It is necessary to meet the center frequency of the ceramic filter and the ceramic resonator, otherwise there are some cases that the characteristics get worse.

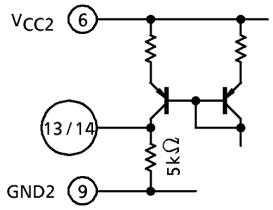
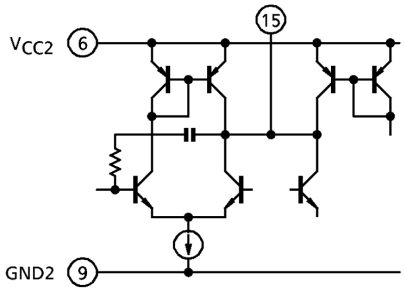
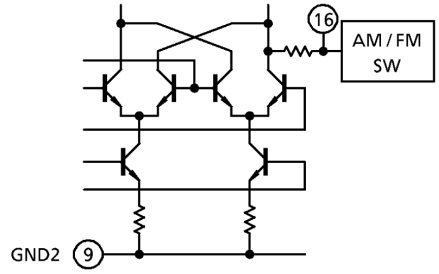
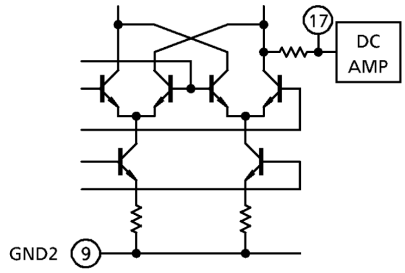
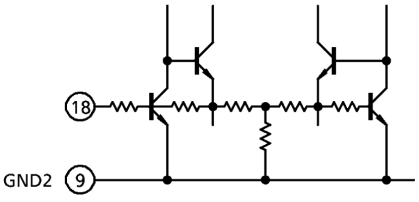
Kit Name	Combination			
	Ceramic Filter	Q'ty	Ceramic Resonator	Q'ty
KMFC403–Z	SFE10.7MA5–Z	2	CDA10.7MG16–Z	1
KMFC411–Z	SFE10.7MA5–Z	1	CDA10.7MG16–Z	1
KMFC422–Z	SFE10.7MA2–Z	2	CDA10.7MG16–Z	1
KMFC435–Z	SFE10.7MA5L–Z	2	CDA10.7MG16–Z	1
KMFC445–Z	SFE10.7MA5L–Z	1	CDA10.7MG16–Z	1

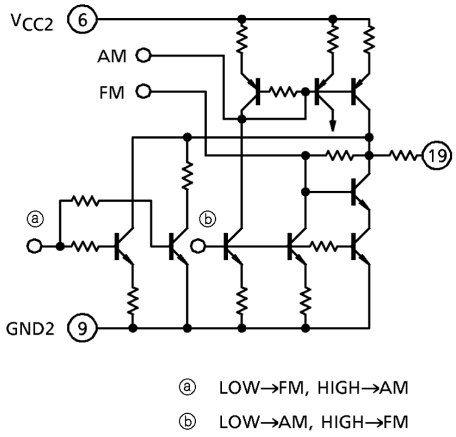
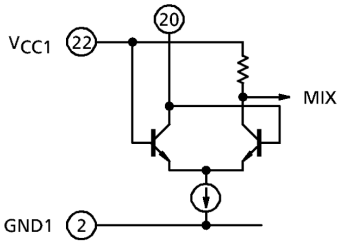
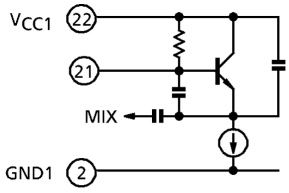
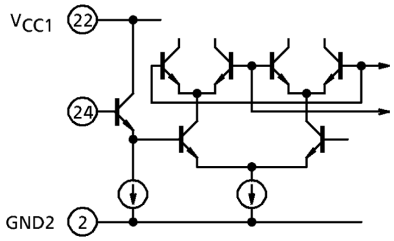
Manufacturer: MURATA MFG. CO., LTD

Explanation Of Terminals

Pin No.	Characteristic	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		2.3	1.8
4	AM mix		2.3	1.8
5	AGC (AM AGC)		0	0
6	V_{CC2} (V_{CC} for IF / MPX stage)	—	3.0	3.0

Pin No.	Characteristic	Internal Circuit	DC Voltage (V) (AT No Signal)	
			AM	FM
7	AM IF in		3.0	3.0
8	FM IF in		3.0	3.0
9	GND2 (GND for IF / MPX stage)	—	0	0
10	TUN LED (tuning LED)		—	—
11	ST LED (stereo LED)		—	—
12	QUAD (FM QUAD. Detector)		2.4	2.1

Pin No.	Characteristic	Internal Circuit	DC Voltage (V) (AT No Signal)	
			AM	FM
13 14	R–out (R–ch output) L–out (L–ch output)		1.0	1.0
15	VCO		2.5	2.5 (VCO stop mode)
16	LPF2 ・LPF terminal for synchronous detector ・Bias terminal for AM / FM SW circuit V_{16} = V_{CC}→AM V_{16} = open→FM		3.0	2.2 (VCO stop mode 2.7)
17	LPF1 LPF terminal for phase detector VCO stop terminal V_{17} = V_{CC}→VCO stop		2.7	2.2
18	FM ST DET in		0.7	0.7

Pin No.	Characteristic	Internal Circuit	DC Voltage (V) (AT No Signal)	
			AM	FM
19	DET out		1.5	1.2
20	AM OSC		3.0	3.0
21	FM OSC		3.0	3.0
22	V_{CC1} (V_{CC} for RF stage)	—	3.0	3.0
23	FM RF out	cf. Pin(1)	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	TA8122AN / 23AN	P_D (Note)	1200	mW
	TA8122AF / 23AF		400	
Operating temperature		T_{opr}	−25~75	°C
Storage temperature		T_{stg}	−55~150	°C

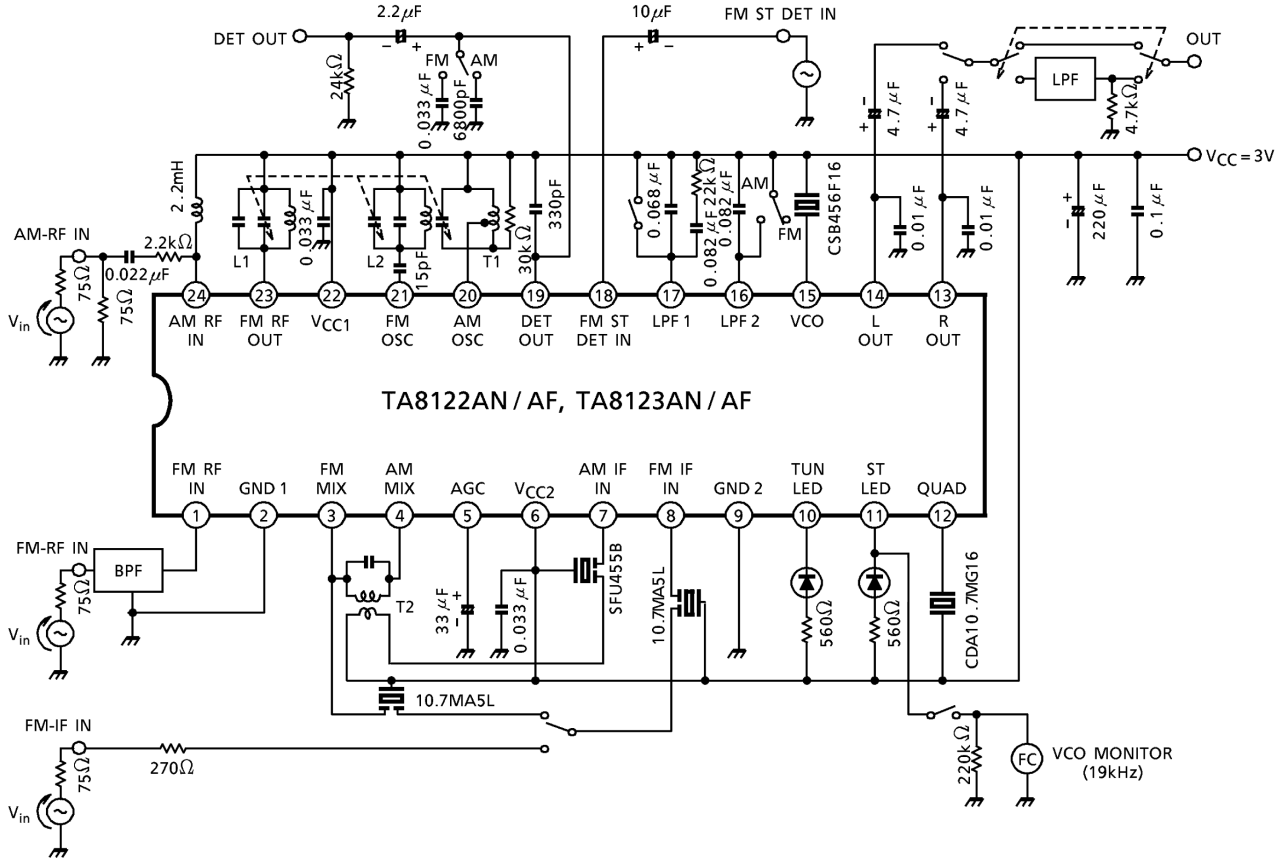
Note: Derated above 25°C in the proportion of 9.6mW / °C for TA8122AN / 23AN and of 3.2mW / °C for TA8122AF / 23AF

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
FM ST DET: f_m = 1kHz

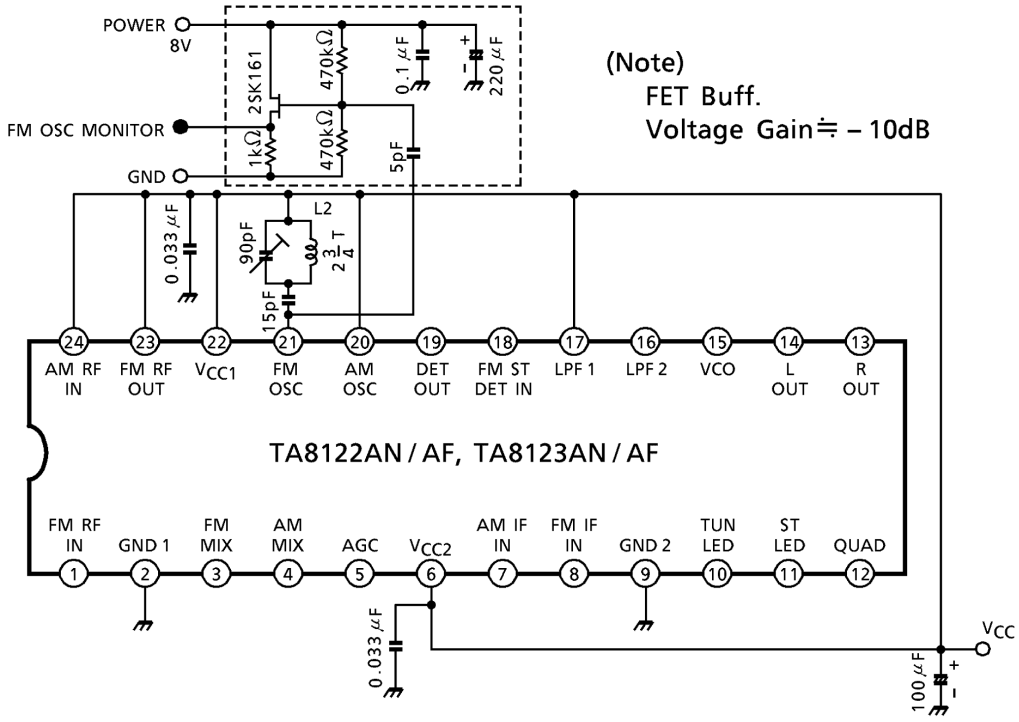
	Characteristic	Symbol	Test Circuit	Test Condition	Min.	Typ.	Max.	Unit
Supply current		$I_{CC\ (FM)}$	1	V_{in} = 0, FM mode	—	14.0	18.5	mA
		$I_{CC\ (AM)}$	1	V_{in} = 0, AM mode	—	6.0	8.3	
F / E	Input limiting voltage	$V_{in\ (lim.)}$	1	−3dB limiting	—	14.0	—	dBμV EMF
	Local OSC voltage	V_{OSC}	2	f_{OSC} = 72.3MHz	70	105	140	mV_{rms}
	Input limiting voltage	$V_{in\ (lim.)\ IF}$	1	−3dB limiting	39	44	49	dBμV EMF
FM in	Recovered output voltage	V_{OD}	1	V_{in} = 80dBμV EMF	55	80	110	mV_{rms}
	Signal to noise ratio	S / N	1	V_{in} = 80dBμV EMF	—	70	—	dB
	Total harmonic distortion	THD	1	V_{in} = 80dBμV EMF	—	0.4	—	%
	AM rejection ratio	AMR	1	V_{in} = 80dBμV EMF	—	50	—	dB
	LED on sensitivity	V_L	1	I_L = 1mA	43	48	53	dBμV EMF
AM	Gain	G_V	1	V_{in} = 23dBμV EMF	20	40	80	mV_{rms}
	Recovered output voltage	V_{OD}	1	V_{in} = 60dBμV EMF	50	60	100	mV_{rms}
	Signal to noise ratio	S / N	1	V_{in} = 60dBμV EMF	—	44	—	dB
	Total harmonic destortion	THD	1	V_{in} = 60dBμV EMF	—	1.0	—	%
	LED on sensitivity	V_L	1	I_L = 1mA	19	24	29	dBμV EMF
Pin(19) output resistance		R_{19}	1	FM mode	—	0.75	—	kΩ
				AM mode	—	12.5	—	

	Characteristic		Symbol	Test Cir–cuit	Test Condition		Min.	Typ.	Max.	Unit
FM ST DET	Input resistance		R_{IN}	—	—		—	24	—	kΩ
	Output resistance		R_{OUT}	—	—		—	5	—	
	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	—	42	—	dB
						f_m = 1kHz	35	42	—	
						f_m = 10kHz	—	42		
	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		$G_{V\ (FM\ ST\ DET)}$	1	V_{in} = 150mV_{rms}		–5	–3	–1	dB
	Channel balance		C.B.	1	V_{in} = 150mV_{rms}		–2	0	2	
	Stereo LED sensitivity	On	$V_{L\ (ON)}$	1	Pilot input		—	8	15	mV_{rms}
		Off	$V_{L\ (OFF)}$				2	6	—	
	Stereo LED hysteresis		V_H	1	To LED turn off from LED turn on		—	2	—	mV_{rms}
	Capture range		C.R.	1	P = 15mV_{rms}		—	1.3	—	%
	Signal to noise ratio		S / N	1	V_{in} = 150mV_{rms}		—	70	—	dB

Test Circuit 1



Test Circuit 2

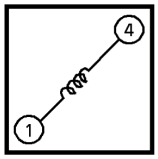


Coil Data

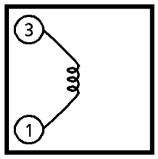
Coil No.	Test Freq.	L (μH)	C_o (pF)	Q_o	Turns					Wire (mmϕ)	Reference
					1–2	2–3	1–3	1–4	4–6		
L_1 FM RF	100MHz	—	—	100	—	—	—	$2\frac{1}{2}$	—	0.5UEW	(S) 53T–037–202
L_2 FM OSC	100MHz	—	—	100	—	—	$2\frac{3}{4}$	—	—	0.5UEW	(S) 0258–244
T_1 AM OSC	796kHz	288	—	115	13	73	—	—	—	0.08UEW	(S) 4147–1356–038
T_2 AM IFT	455kHz	—	180	120	—	—	180	—	15	0.08UEW	(S) 2150–2162–165

(S): SUMIDA ELECTRIC CO., LED.

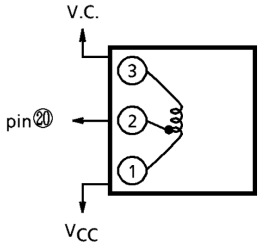
L_1 : FM RF



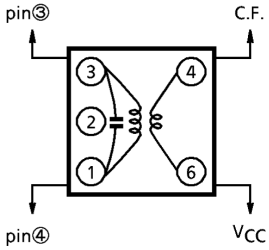
L_2 : FM OSC



T_1 : AM OSC

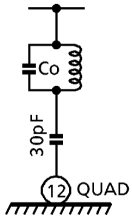


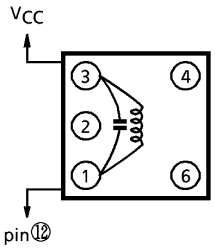
T_2 : AM IFT



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.

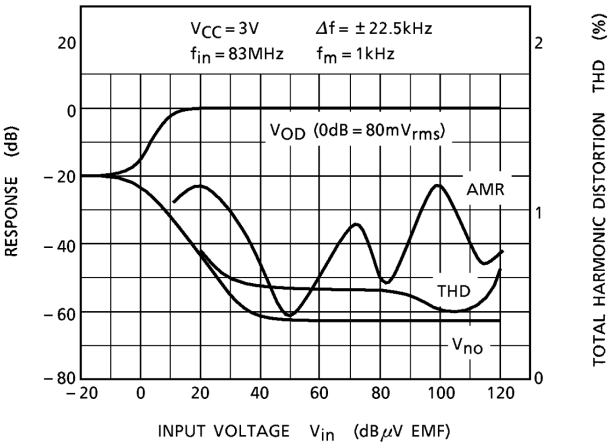




Test Frequency	C_o (pF)	Q_o	Turns				Wire (mmϕ)	REF
			1–2	2–3	1–3	4–6		
10.7MHz	100	100	—	—	12	—	0.12UEW	SUMIDA ELECTRIC CO., LTD 2153–4095–189 or equivalent

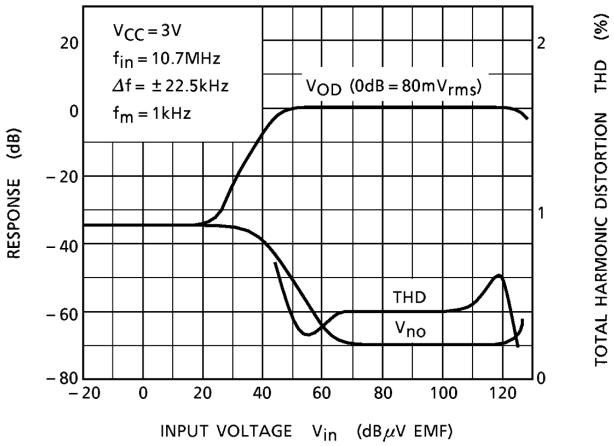
FM (F / E + IF)

V_{OD}, V_{no}, THD, AMR – V_{in}



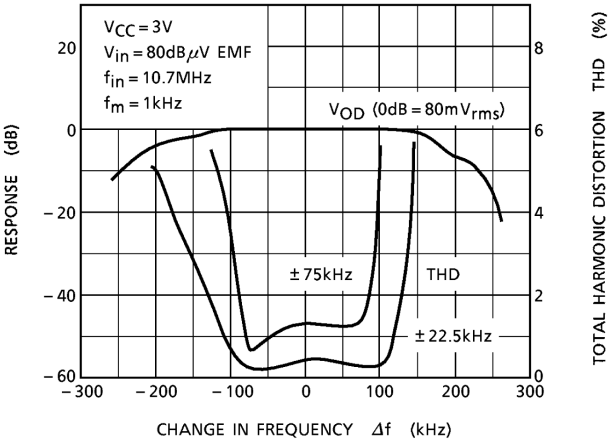
FM (IF)

V_{OD}, V_{no}, THD – V_{in}



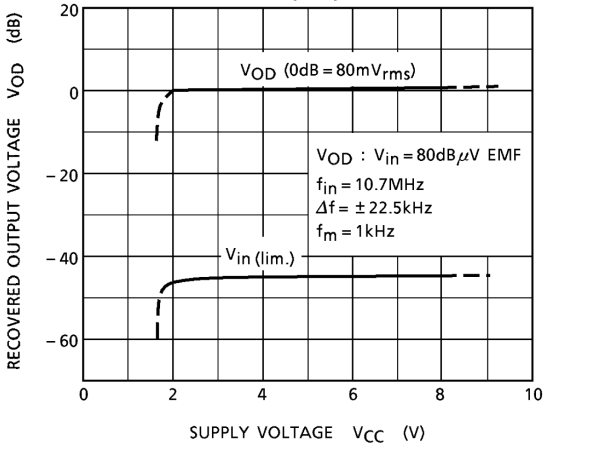
FM (IF)

V_{OD}, THD – Δf



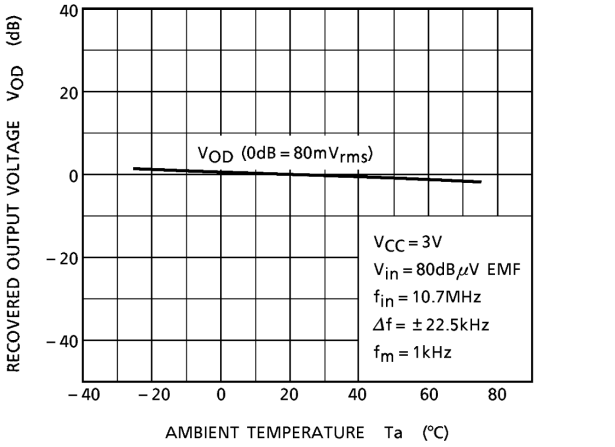
FM (IF)

V_{OD}, V_{in} (lim.) – V_{CC}



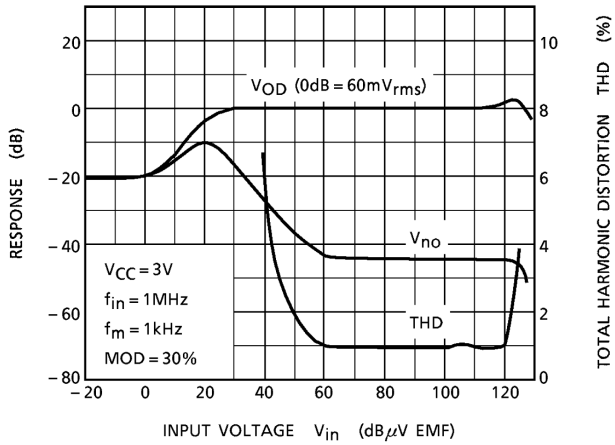
FM (IF)

V_{OD} – Ta



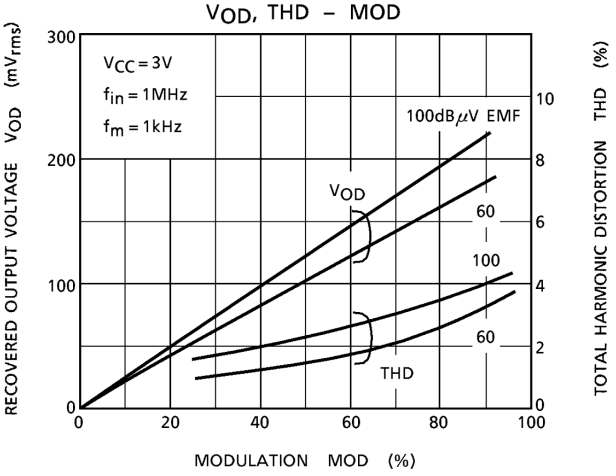
AM

V_{OD}, V_{no}, THD – V_{in}



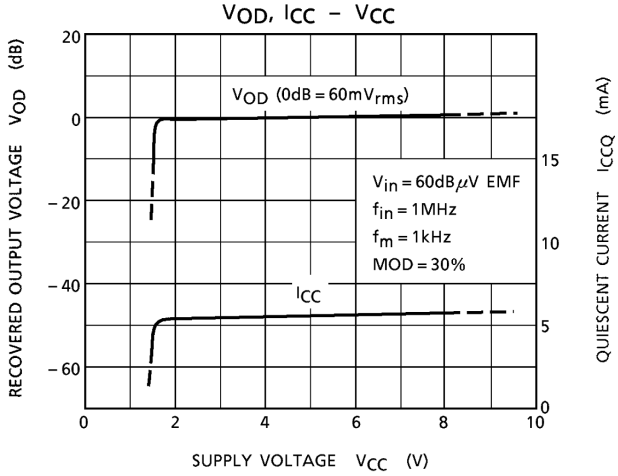
AM

V_{OD}, THD – MOD



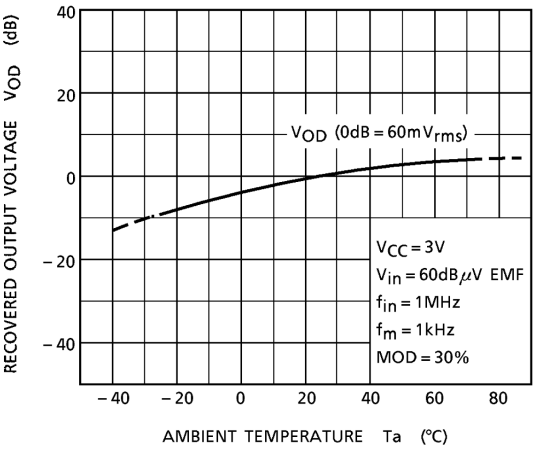
AM

V_{OD}, I_{CC} – V_{CC}



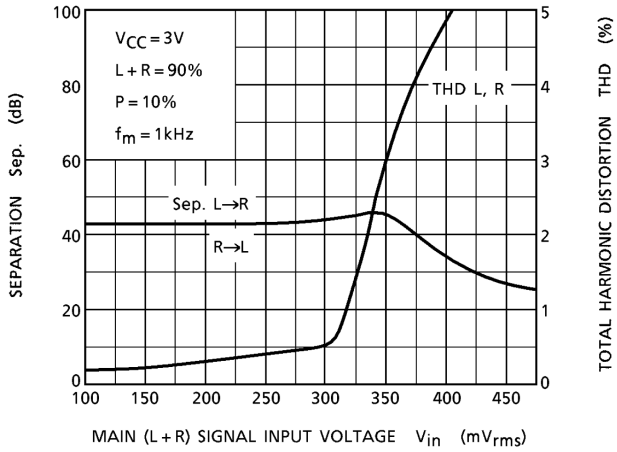
AM

V_{OD} – Ta



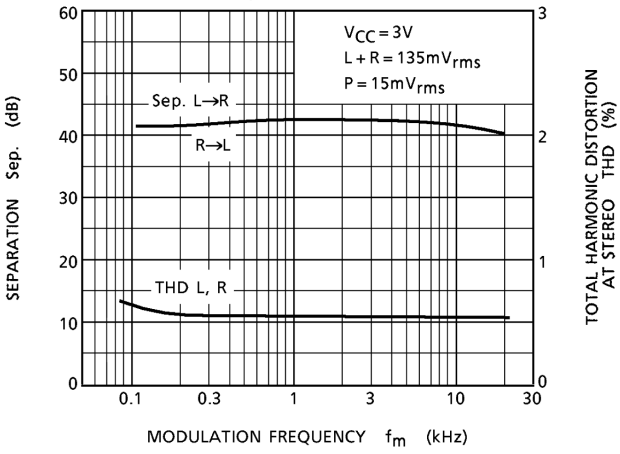
FM ST DET

Sep. THD – V_{in}



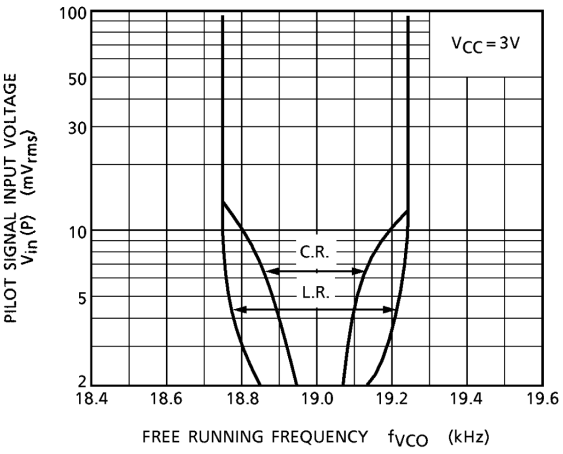
FM ST DET

Sep. THD – f_m



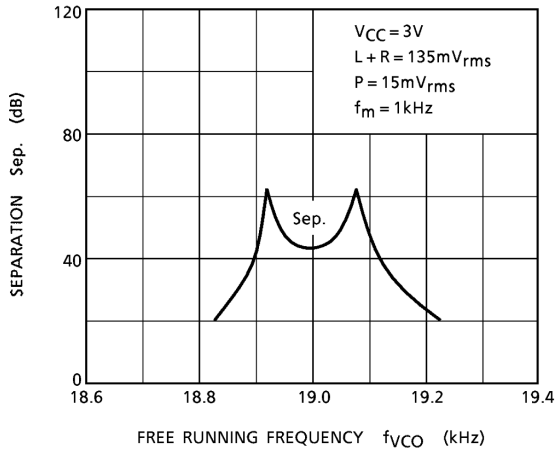
FM ST DET

CAPTURE RANGE & LOCK RANGE



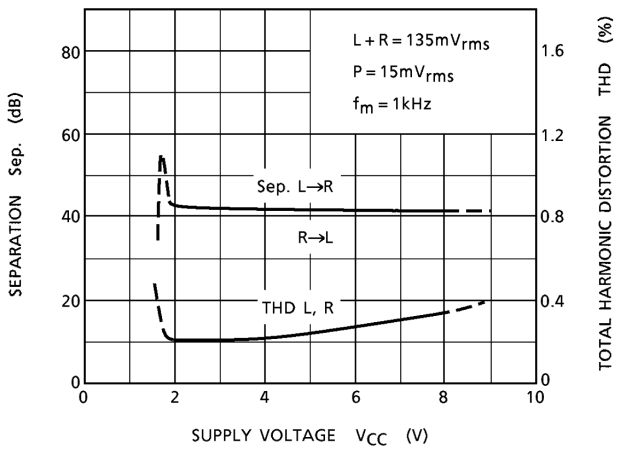
FM ST DET

Sep. – f_{VCO}



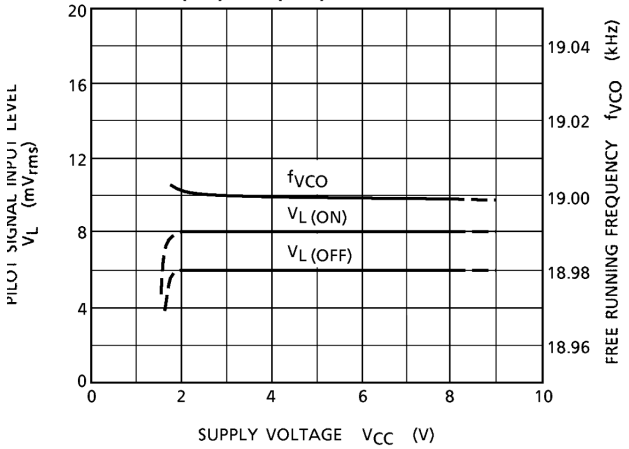
FM ST DET

Sep. THD – V_{CC}



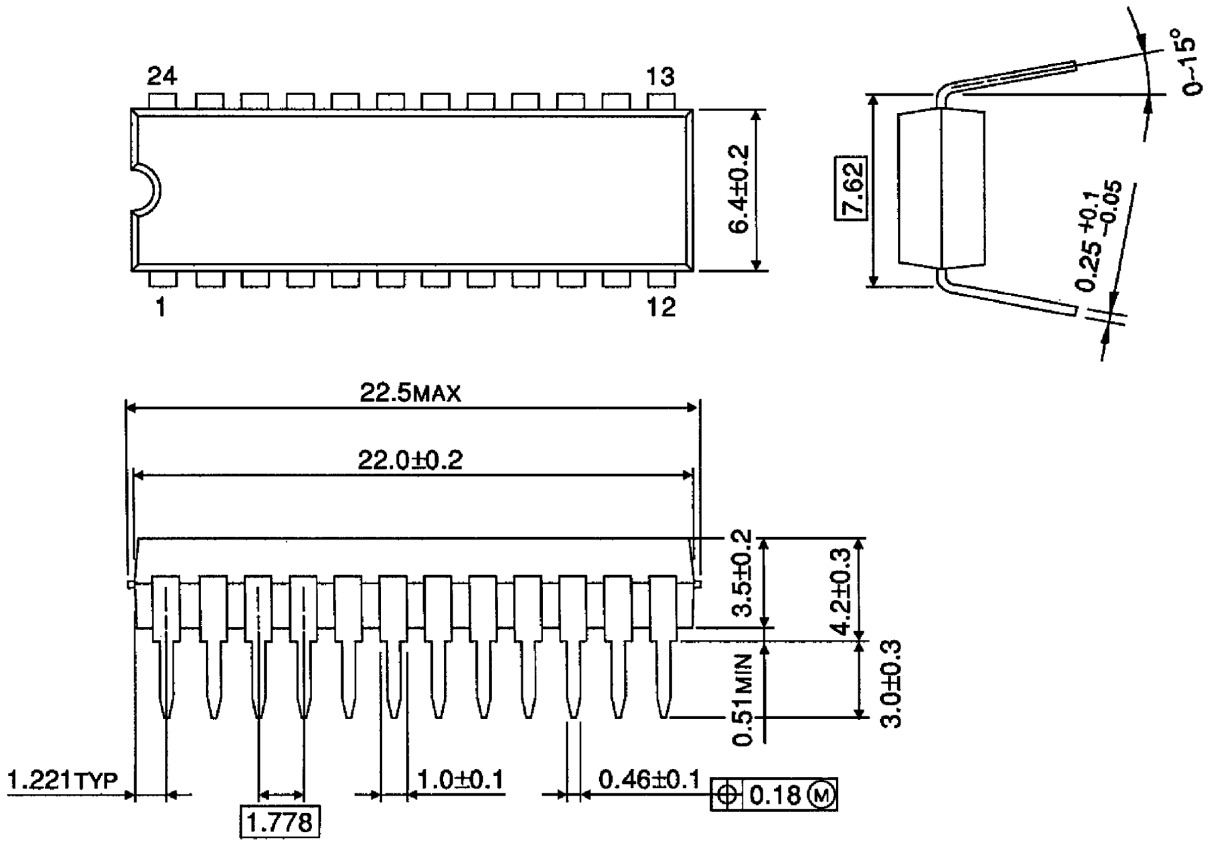
FM ST DET

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



Package Dimensions

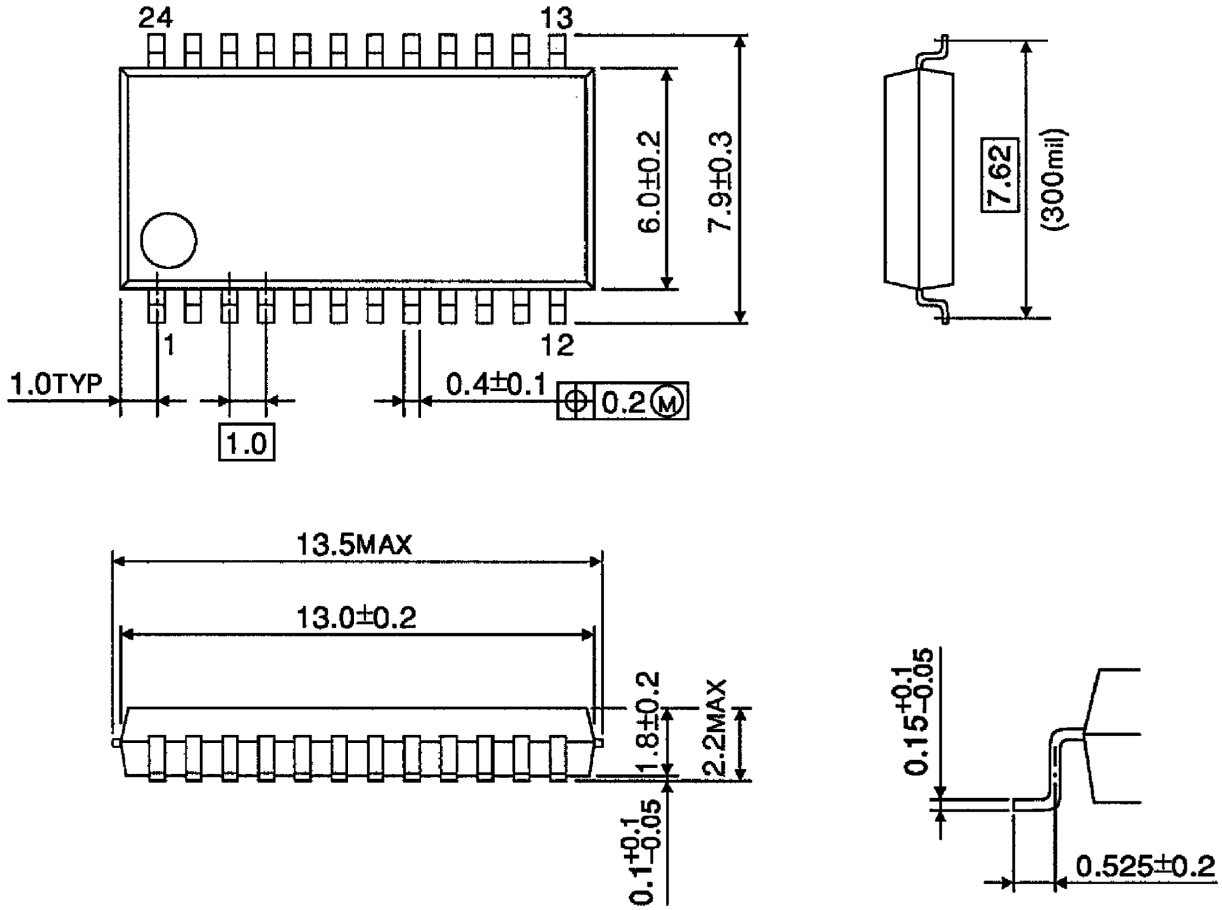
SDIP24-P-300-1.78 Unit : mm



Weight: 1.2g (typ.)

Package Dimensions

SSOP24-P-300-1.00 Unit : mm



Weight: 0.31g (typ.)

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000707EBA

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