TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

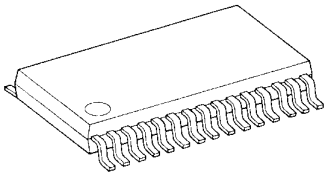
TA2029FNG,TA2029NG

FM F / E + AM / FM IF + PW IC

For Digital Tuning System

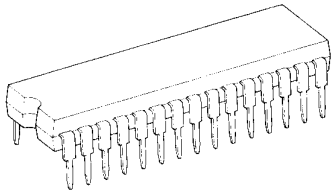
The TA2029FNG / NG are AM / FM single chip radio system ICs which are designed for monaural radio.
These ICs have many functions and can be used for digital tuning system.

TA2029FNG



SSOP30-P-300-0.65

TA2029NG



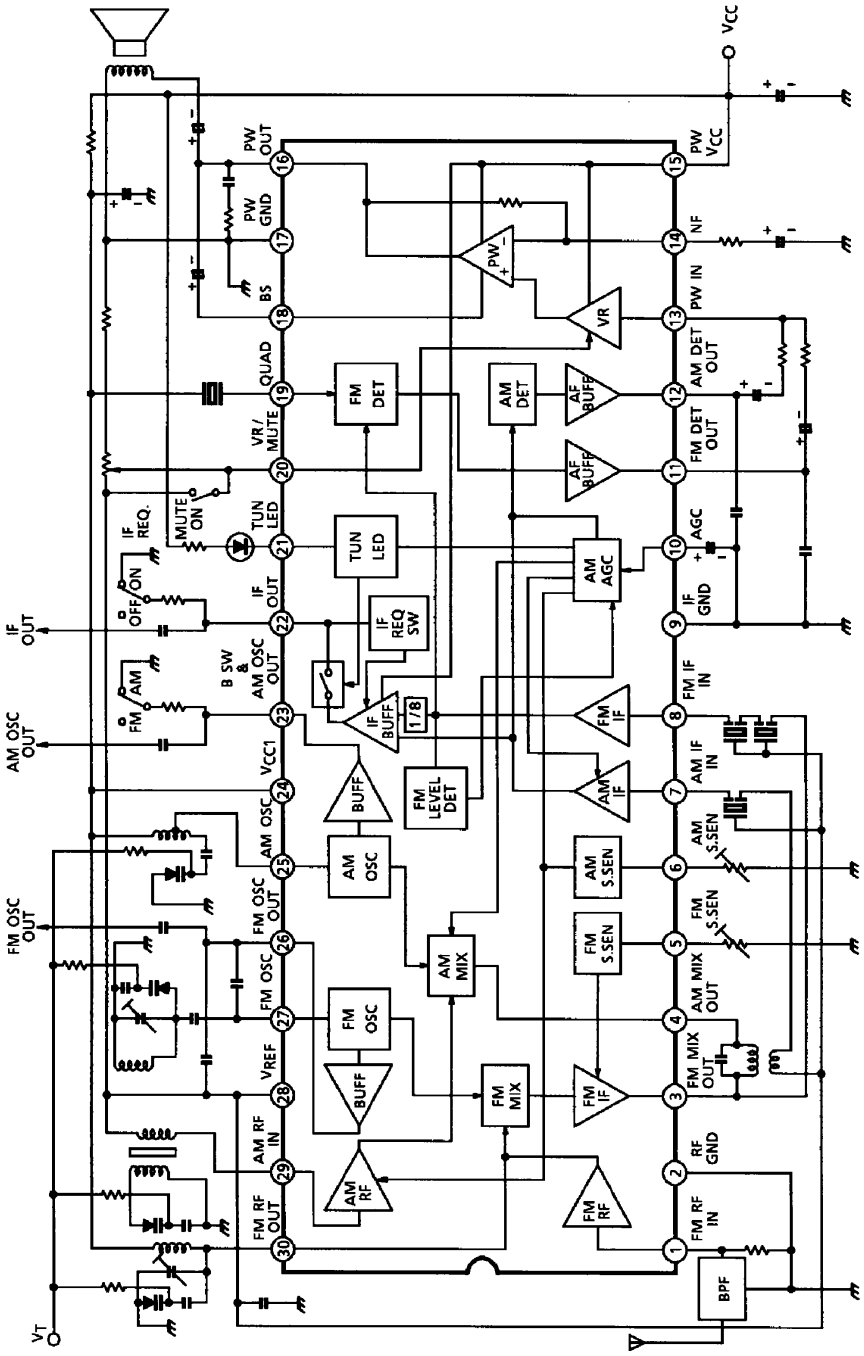
SDIP30-P-400-1.78

Weight
SSOP30−P−300−0.65: 0.17g (typ.)
SDIP30−P−400−1.78: 2.2g (typ.)

Features

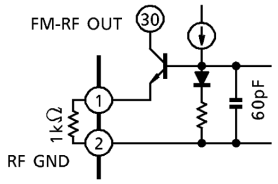
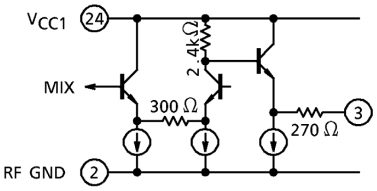
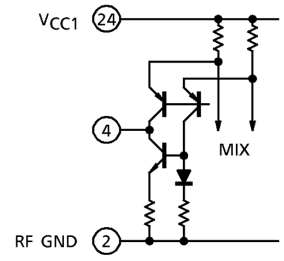
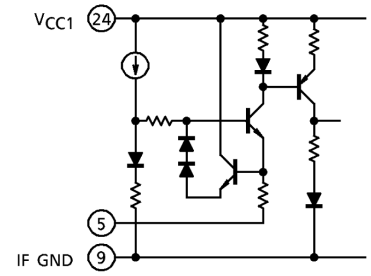
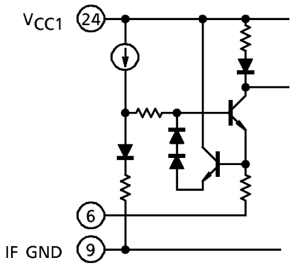
- Built−in FM F / E, AM / FM IF, electronic volume and power amplifier.
- Suitable for combination with digital tuning system which has IF counter.
  - AM / FM IF output for IF counter.
    FM: 1.3375MHz (1 / 8 IF)
    AM: 450kHz
  - AM / FM oscillation buffer outputs.
  - Auto stop sensitivity at the searching mode is adjustable by external resistances. (pin (5), pin(6))
- Adjustment−free type FM detector.
- Built−in AF power amplifier, electronic volume and audio muting circuits.
- Detector outputs FM / AM are independent each other.
- P_O = 100mW (typ.), THD = 10% (FN: 3V / 8Ω)
  P_O = 500mW (typ.), THD = 10% (N: 6V / 8Ω)
- Operating supply voltage range
  : V_{CC} = 1.8~8V (Ta = 25°C)

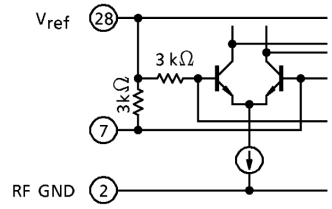
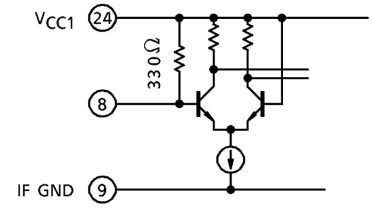
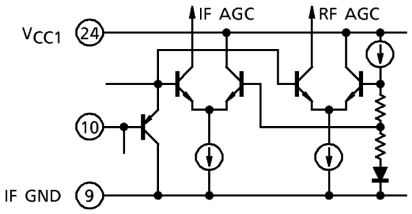
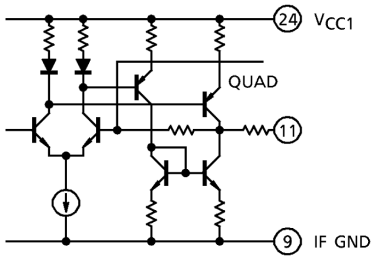
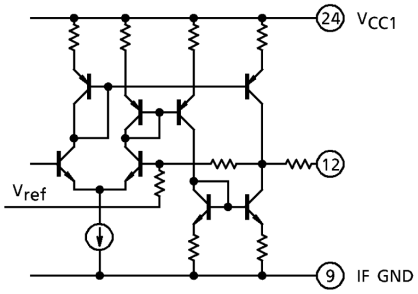
BLOCK DIAGRAM

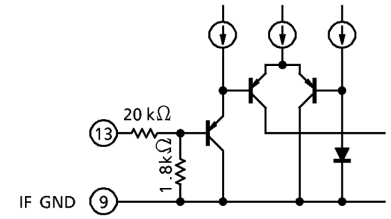
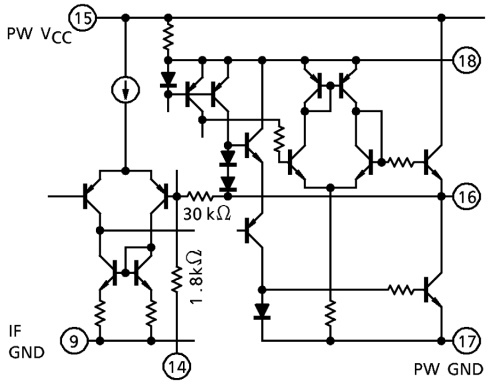
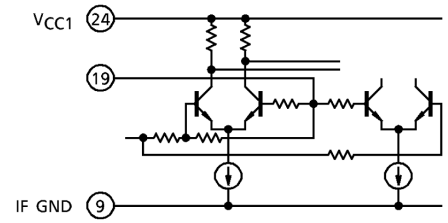
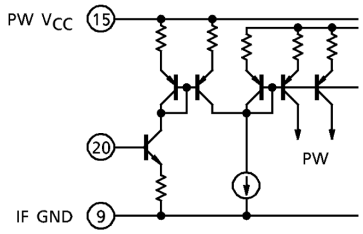
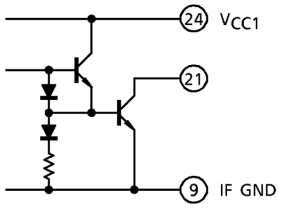


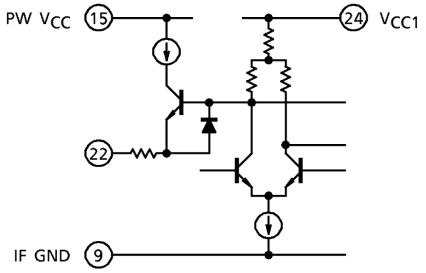
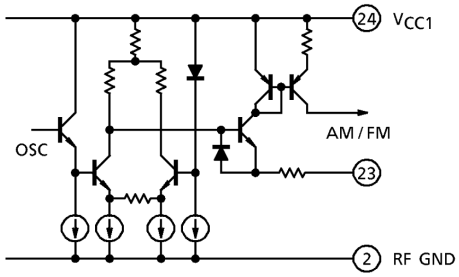
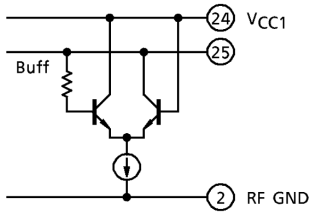
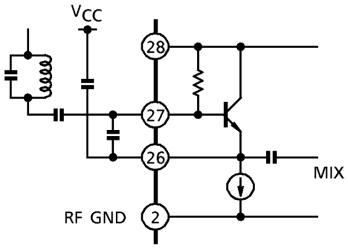
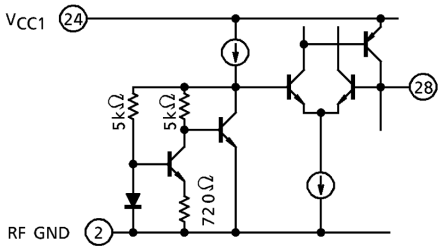
TA2029FNG/NG-2

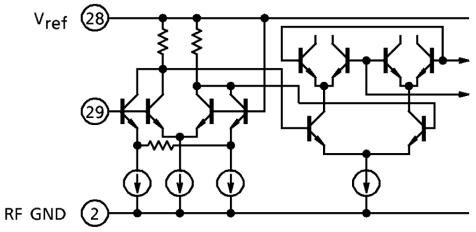
Explanation Of Terminal (Note: Ta = 25°C, V_{CC} = 3V, at no signal)

Pin No.	Characteristic	Internal Circuit	DC Voltage (V) (typ.)	
			AM	FM
1	FM RF in FM RF input terminal		0	0.7
2	RF GND (GND of RF stage)	—	0	0
3	FM mix out Ceramic filter is connected. Recommendation SFE10.7MA5L (murata MFG. Co., LTD)		2.3	1.8
4	AM mix out		2.3	1.8
5	FM S. SEN Adjustable for FM IF output sensitivity by external resistor.		0	0.3
6	AM S. SEN Adjustable for AM IF output sensitivity by external resistor.		0.3	0

Pin No.	Characteristic	Internal Circuit	DC Voltage (V) (typ.)	
			AM	FM
7	AM IF in		1.22	1.2
8	FM IF in		3.0	3.0
9	IF GDN (GDN of AM / FM IF)	—	0	0
10	AGC (AM AGC) Capacitor is connected.		0	0
11	FM DET out FM detector output terminal.		—	1.2
12	AM DET out AM detector output terminal.		0.5	1.2

Pin No.	Characteristic	Internal Circuit	DC Voltage (V) (typ.)	
			AM	FM
13	PW in		0	0
14	NF Capacitor is connected.		0.8	0.8
15	PW V_{CC} (V_{CC} of PW and buffer amplifier for IF counter)		3.0	3.0
16	PW out		1.6	1.6
17	PW GND (GND of PW)		0	0
18	BS Capacitor is connected.		3.0	3.0
19	QUAD FM QUAD detector ceramic discriminator is connected recommendation CDA10.7MG36. (Murat MFG. Co., LTD)		2.5	2.3
20	MUTE / VR ・Variable resistor for electronic volume control is connected. ・Mute terminal V_{20}: V_{ref} → mute on		—	—
21	Tun LED		—	—

Pin No.	Characteristic	Internal Circuit	DC Voltage (V) (typ.)	
			AM	FM
22	IF out IF output terminal pin (22) connects with GND by resistor → come out pin (22): Open → non output		2.5	2.5
23	AM OSC out / band SW AM oscillation buffer output terminal. Bias terminal for AM / FM switch circuit. Pin (23) connects with GND by resistor → AM mode pin (23): Open → FM mode		1.7	2.5
24	V_{CC1} (V_{CC} of RF stage)	—	3.0	3.0
25	AM OSC AM OSC tank circuit is connected.		3.0	3.0
26	FM OSC out Capacitor is connected between pin (26) and pin (27) shown in the right figure.		0.7	0.5
27	FM OSC FM OSC tank circuit is connected shown in the right figure.		1.22	1.15
28	V_{ref} regulator voltage output terminal V_{ref} = 1.2V (typ.): FM mode 1.22V (typ.): AM mode		1.22	1.2

Pin No.	Characteristic	Internal Circuit	DC Voltage (V) (typ.)	
			AM	FM
29	AM RF in AM RF input terminal.		1.22	1.2
30	FM RF out FM RF tank circuit is connected.	Cf. pin (1)	3.0	3.0

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Supply voltage		V_{CC}	9	V
Power dissipation	TA2029FNG	P_D (Note)	500	mW
	TA2029NG		1500	
Operating temperature		T_{opr}	−25~75	°C
Storage temperature		T_{stg}	−55~150	°C

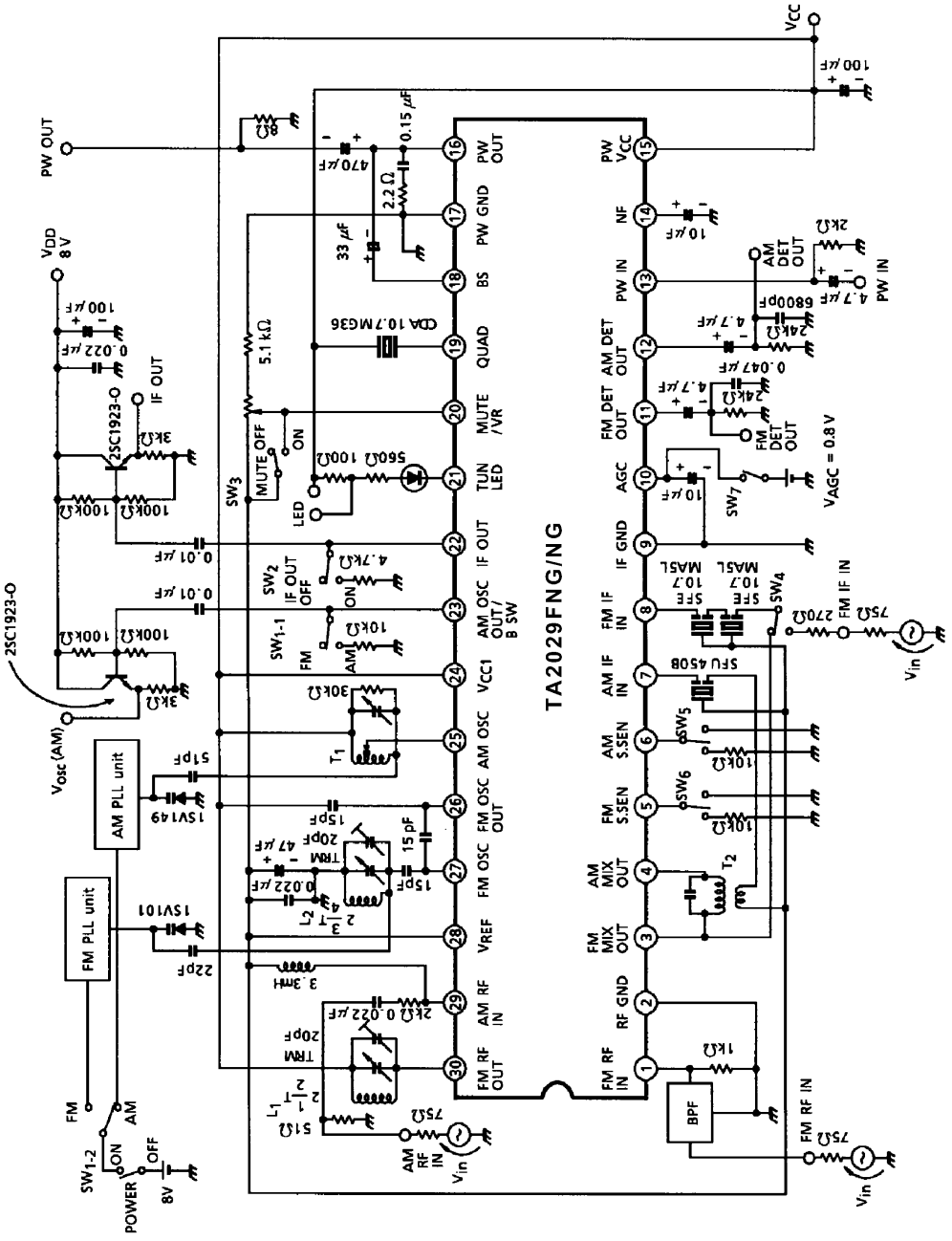
(Note): Derated above 25°C in the proportion of 4.8mW / °C for TA2029FNG and 12mW / °C for TA2029NG.

Electrical Characteristics
Unless Otherwise Specified, Ta = 25°C, V_{CC} = 3V, SW_2: Off, SW_3: Off, SW_7 = Off
F / E: f = 83MHz, f_m = 1kHz
FM IF: f = 10.7MHz, Δf = ±22.5kHz, f_m = 1kHz
AM: f = 1005kHz, MOD = 30%, f_m = 1kHz

Characteristic			Symbol	Test Circuit	Test Condition		Min.	Typ.	Max.	Unit
Supply current			I_{CCQ} (FM)	1	FM mode V_{in} = 0	Power amp: Off	—	11.5	16.0	mA
			I_{CC} (FM)	1		Power amp: On SW_2: On, SW_7: On	—	18.0	25.0	
			I_{CCQ} (AM)	1	AM mode	Power amp: Off	—	7.5	11.0	
			I_{CC} (AM)	1	V_{in} = 0	Power amp: On SW_2: On, SW_7: On	—	17.0	24.0	
F / E	Input limiting voltage		$V_{in\ (lim)}$	1	−3dB limiting		—	12	—	dBμV EMF
	Quiescent sensitivity		Q_S		S / N = 30dB		—	15	—	dBμV EMF
	Local OSC stop voltage		V_{stop} (FM)	2	V_{in} = 0		—	1.35	—	V
	Local OSC buffer output voltage		$V_{osc\ (buff)}$	2	f_{osc} = 108MHz		—	130	—	mV_{rms}
FM	Input limiting voltage		$V_{in\ (lim)}$ IF	1	−3dB limiting		39	44	49	dBμV EMF
	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		—	48	—	dB
	LED on sensitivity		V_L	1	I_L = 1mA		40	45	50	dBμV EMF
	IF count output frequency	1 / 8 IF	f1 / 8 IF (FM)	1	SW_2: On, V_{in} = 80dBμV EMF		1.3373	1.3375	1.3377	MHz
	IF count output voltage	1 / 8 IF	V1 / 8 IF (FM)	1	SW_2: On, V_{in} = 80dBμV EMF		110	200	—	mV_{rms}
	IF count output sensitivity		IF_{sens} (FM)1	1	SW_6: 10kΩ		—	48	—	dBμV EMF
			IF_{sens} (FM)2	1	SW_6: 0Ω		—	68	—	
	Pin (11) output resistance		R_{11}	1	—		—	1	—	kΩ

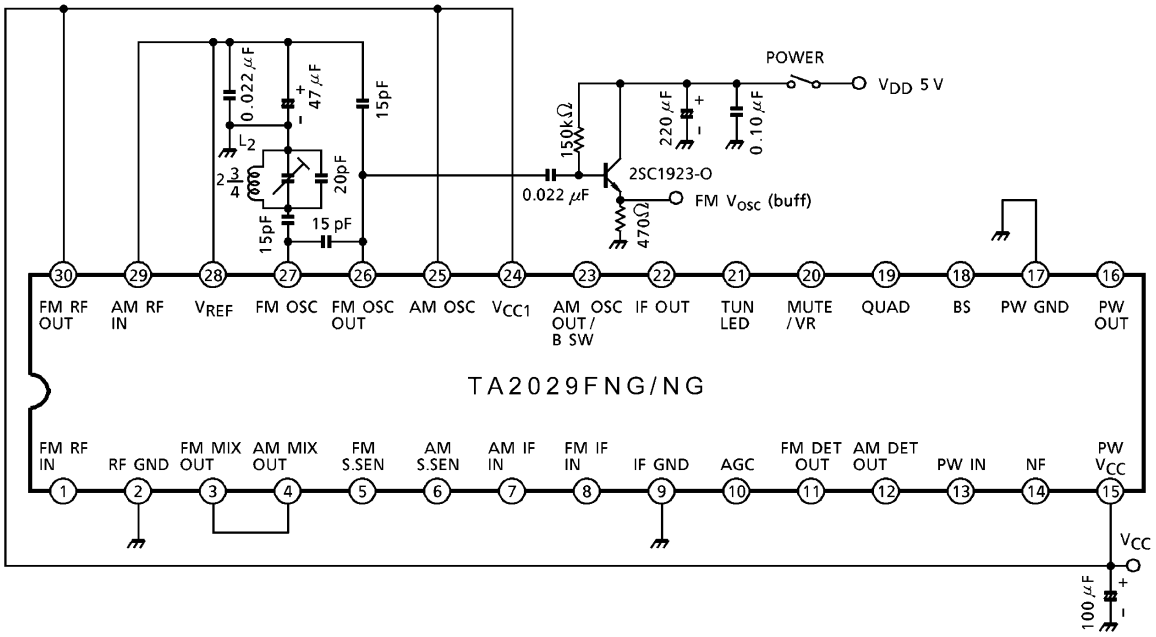
Characteristic		Symbol	Test Cir–cuit	Test Condition	Min.	Typ.	Max.	Unit
AM	Gain	G_V	1	V_{in} = 26dBμV EMF	20	45	80	mV_{rms}
	Recovered output voltage	V_{OD}	1	V_{in} = 60dBμV EMF	50	75	100	mV_{rms}
	Signal to noise ratio	S / N	1	V_{in} = 60dBμV EMF	—	42	—	dB
	Total harmonic distortion	THD	1	V_{in} = 60dBμV EMF	—	1.0	—	%
	LED on sensitivity	V_L	1	I_L = 1mA	24	29	34	dBμV EMF
	Local OSC buff. Output voltage	V_{osc} (AM)	1	f_{osc} = 1455kHz	80	140	—	mV_{rms}
	IF count output voltage	V_{IF} (AM)	1	SW_2: On, V_{in} = 60dBμV EMF	110	200	—	mV_{rms}
	IF count output sensitivity	IF_{SENS} (AM) 1	1	SW_5: 10kΩ	—	29	—	dBμV EMF
		IF_{SENS} (AM) 2		SW_5: 0Ω	—	45		
	Pin (12) output resistance	R_{12}	1	—	—	5	—	kΩ
PW	Voltage gain	G_V	1	f = 1kHz, R_L = 8Ω, V_o = 0.775V_{rms}, SW_7: On	27	30	33	dB
	Output power	P_{o1}	1	f = 1kHz, R_L = 8Ω, THD = 10%, SW_7: On	70	100	—	mW
		P_{o2}	1	V_{CC} = 6V, f = 1kHz, R_L = 8Ω, THD = 10%, SW_7: On	350	500	—	
	Total harmonic distortion	THD	1	f = 1kHz, R_L = 8Ω, P_o = 50mW, SW_7: On	—	0.6	1.5	%
	Output noise voltage	V_{no}	1	R_g = 10kΩ, R_L = 8Ω, SW_7: On BPF = 30Hz~20kHz	—	0.45	—	mV_{rms}
	Muting attenuation	ATT	1	V_o = 0.775V_{rms} SW_3: Off → on, SW_7: On	65	77	—	dB

TEST CIRCUIT 1



TA2029FNG/NG-10

TEST CIRCUIT 2

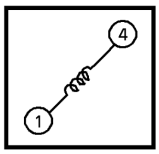


Coil Data

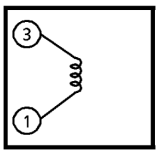
Coil No.	Test Frequency	L (μH)	C_o (pF)	Q_o	Turns					Wire (mmϕ)	Ref.
					1–2	2–3	1–3	1–4	4–6		
L_1 FM RF	100MHz	—	—	100	—	—	—	$2\frac{1}{2}$	—	0.5 UEW	(S) 53T–037–202
L_2 FM OSC	100MHz	—	—	100	—	—	$2\frac{3}{4}$	—	—	0.5 UEW	(S) 0258–244
T_1 AM OSC	796kHz	288	—	115	13	73	—	—	—	0.08 UEW	(S) 4147–1356–038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

(S) Sumida electric co., LTD

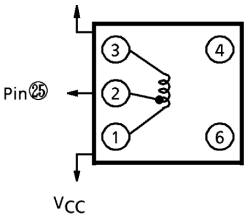
L_1 : FM RF



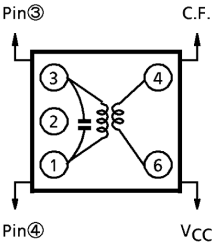
L_2 : FM OSC



T_1 : AM OSC

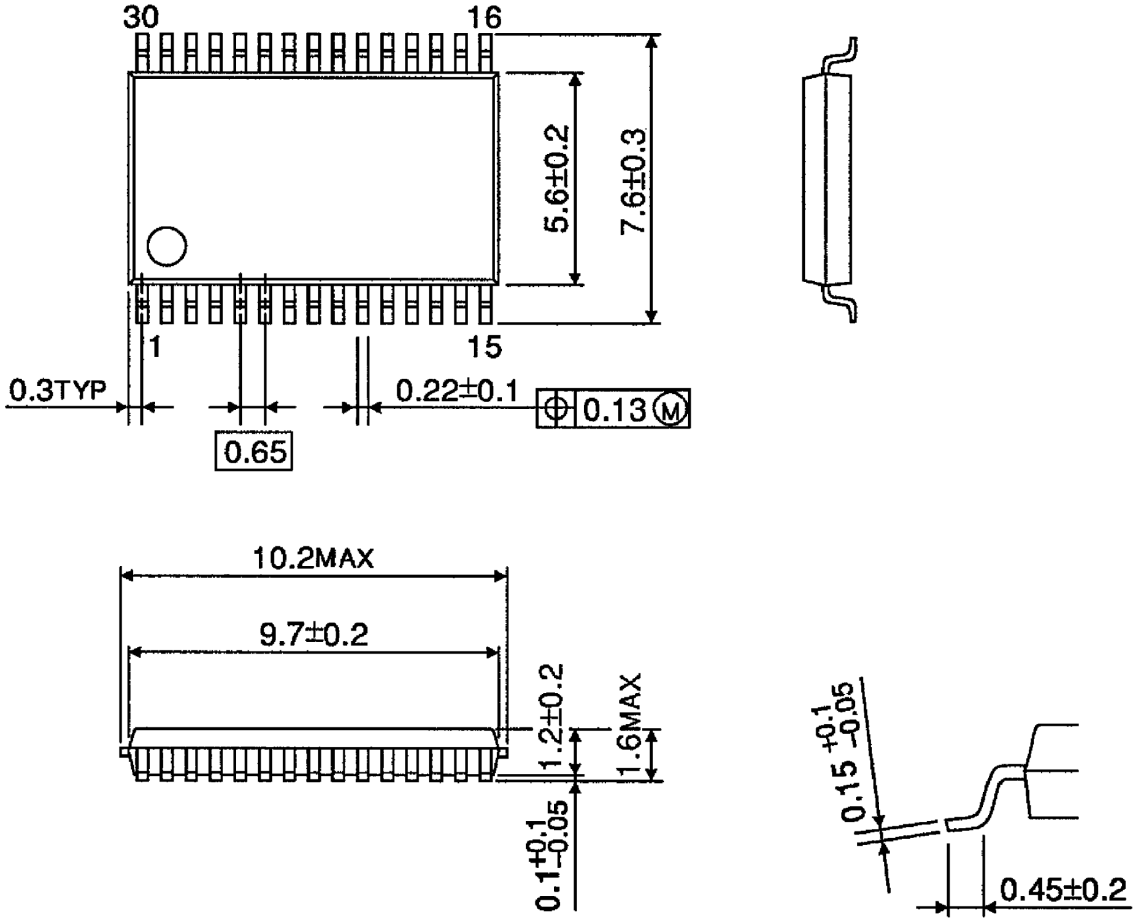


T_2 : AM IFT



PACKAGE DIMENSIONS

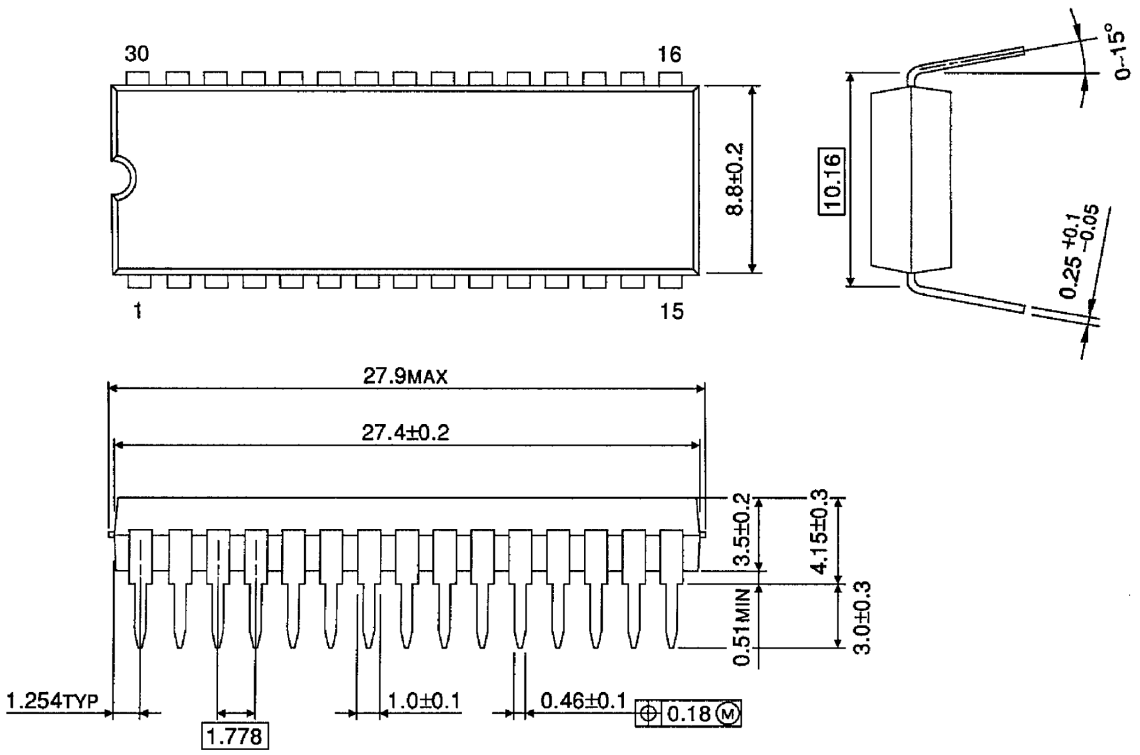
SSOP30-P-300-0.65 Unit : mm



Weight: 0.17g (typ.)

PACKAGE DIMENSIONS

SDIP30-P-400-1.78 Unit : mm



Weight: 2.2g (typ.)

About solderability, following conditions were confirmed

- Solderability

  (1) Use of Sn-63Pb 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

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030619EBA

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