

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

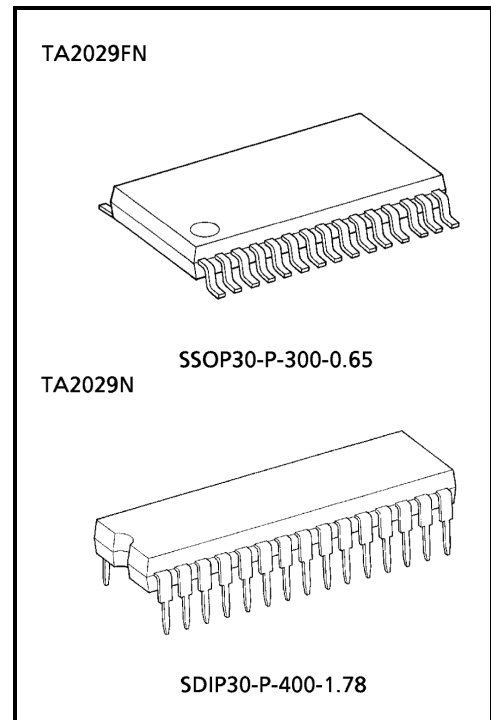
TA2029FN, TA2029N

FM F / E + AM / FM IF + PW IC
For Digital Tuning System

The TA2029FN / N 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.

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.
- $P_o = 100\text{mW}$ (typ.), THD = 10% (FN: 3V / 8Ω)
- $P_o = 500\text{mW}$ (typ.), THD = 10% (N: 6V / 8Ω)
- Operating supply voltage range
 - : $V_{CC} = 1.8\sim 8\text{V}$ ($T_a = 25^\circ\text{C}$)

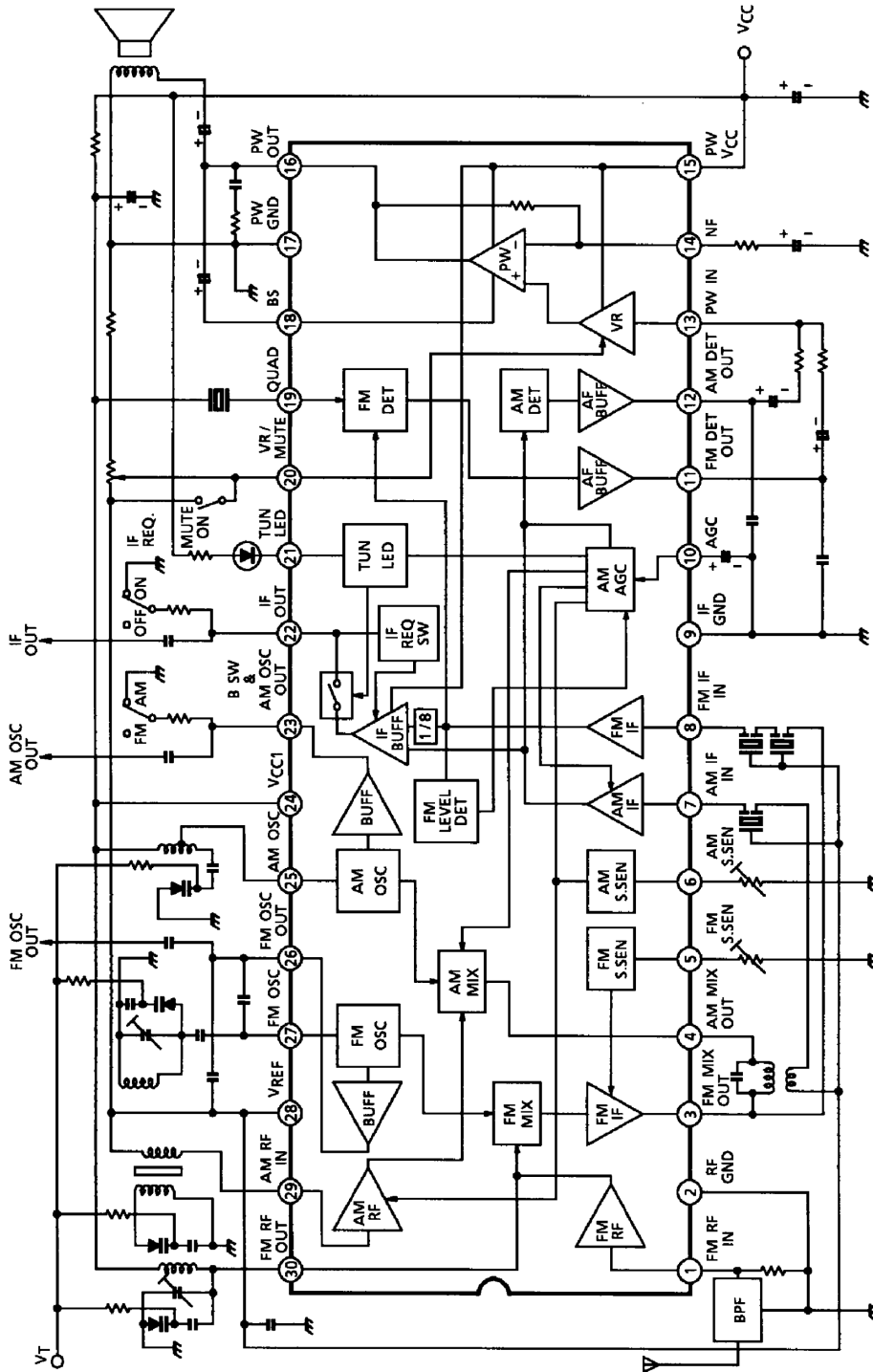


Weight:

SSOP30-P-300-0.65: 0.17g (typ.)

SDIP30-P-400-1.78: 2.2g (typ.)

BLOCK DIAGRAM

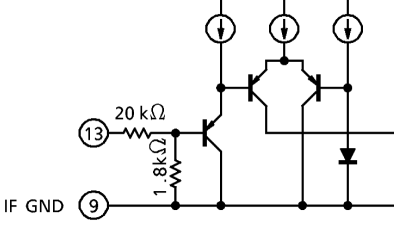
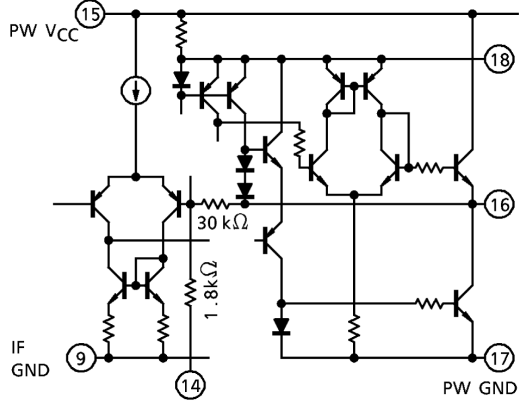
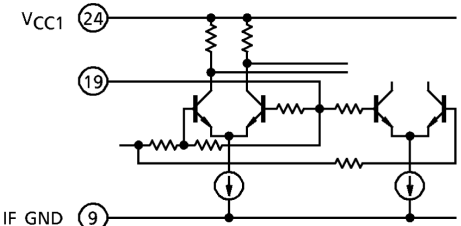
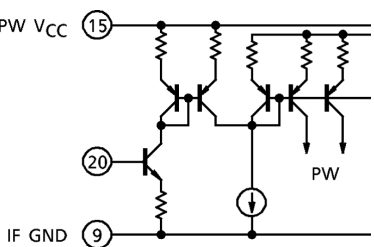
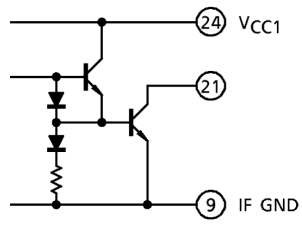


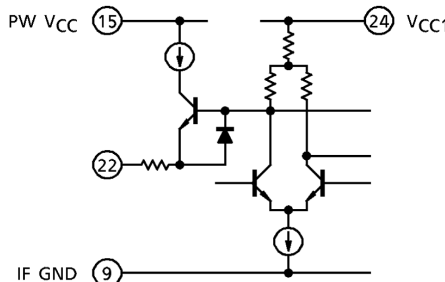
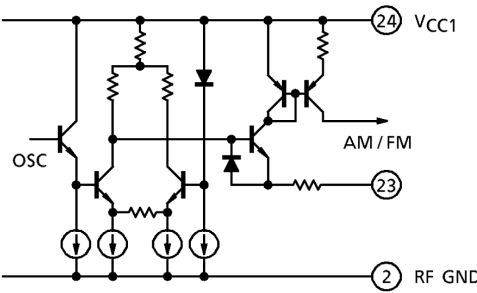
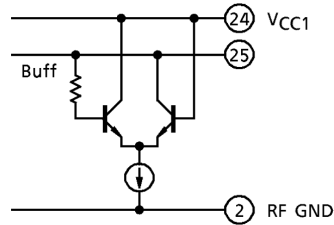
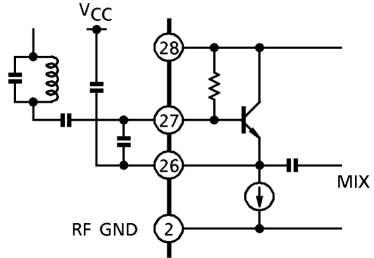
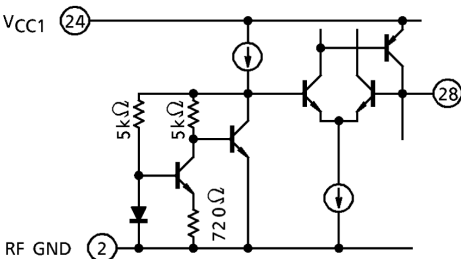
TA2029FN / N - 2

Explanation Of Terminal (Note: Ta = 25°C, VCC = 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 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	TA2029FN	P_D (Note)	500
	TA2029N		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 TA2029FN and 12mW / °C for TA2029N.

Electrical Characteristics

Unless Otherwise Specified, $T_a = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, SW_2 : Off, SW_3 : Off, $\text{SW}_7 = \text{Off}$

F / E: $f = 83\text{MHz}$, $f_m = 1\text{kHz}$

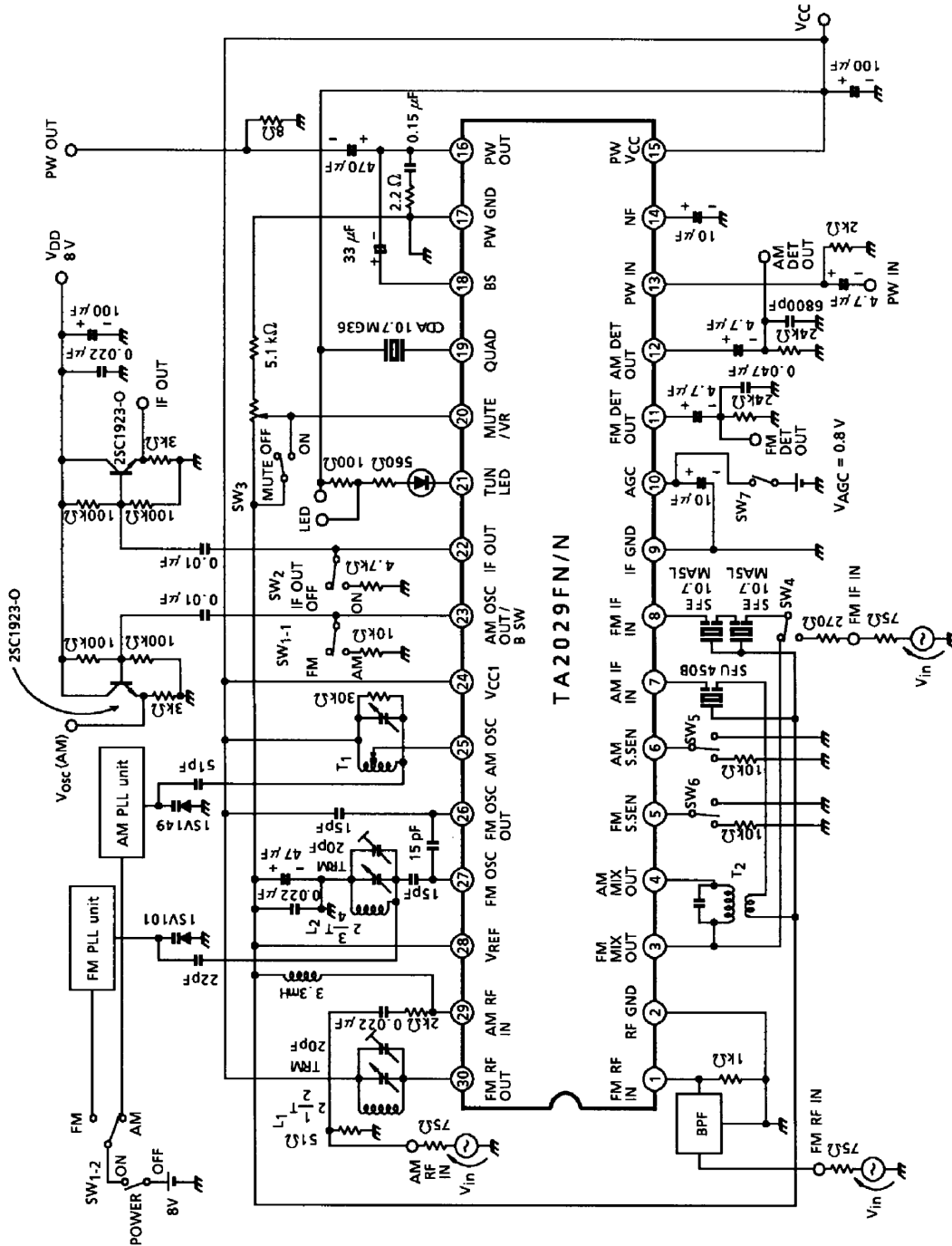
FM IF: $f = 10.7\text{MHz}$, $\Delta f = \pm 22.5\text{kHz}$, $f_m = 1\text{kHz}$

AM: $f = 1005\text{kHz}$, $\text{MOD} = 30\%$, $f_m = 1\text{kHz}$

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	$V_{in}(\text{lim})$	1	-3dB limiting		—	12	—	$\text{dB}\mu\text{V}$ EMF
	Quiescent sensitivity	Q_S		S / N = 30dB		—	15	—	$\text{dB}\mu\text{V}$ EMF
	Local OSC stop voltage	$V_{\text{stop}}(\text{FM})$	2	$V_{in} = 0$		—	1.35	—	V
	Local OSC buffer output voltage	$V_{\text{osc}}(\text{buff})$	2	$f_{\text{osc}} = 108\text{MHz}$		—	130	—	mV_{rms}
FM	Input limiting voltage	$V_{in}(\text{lim})$ IF	1	-3dB limiting		39	44	49	$\text{dB}\mu\text{V}$ EMF
	Recovered output voltage	V_{OD}	1	$V_{in} = 80\text{dB}\mu\text{V}$ EMF		55	80	110	mV_{rms}
	Signal to noise ratio	S / N	1	$V_{in} = 80\text{dB}\mu\text{V}$ EMF		—	70	—	dB
	Total harmonic distortion	THD	1	$V_{in} = 80\text{dB}\mu\text{V}$ EMF		—	0.4	—	%
	AM rejection ratio	AMR	1	$V_{in} = 80\text{dB}\mu\text{V}$ EMF		—	48	—	dB
	LED on sensitivity	V_L	1	$I_L = 1\text{mA}$		40	45	50	$\text{dB}\mu\text{V}$ EMF
	IF count output frequency	$1/8$ IF $f_1/8$ IF (FM)	1	SW_2 : On, $V_{in} = 80\text{dB}\mu\text{V}$ EMF		1.3373	1.3375	1.3377	MHz
	IF count output voltage	$1/8$ IF $V_1/8$ IF (FM)	1	SW_2 : On, $V_{in} = 80\text{dB}\mu\text{V}$ EMF		110	200	—	mV_{rms}
	IF count output sensitivity	$I_{\text{Fsens}}(\text{FM})1$	1	SW_6 : 10k Ω		—	48	—	$\text{dB}\mu\text{V}$ EMF
		$I_{\text{Fsens}}(\text{FM})2$	1	SW_6 : 0 Ω		—	68	—	
Pin (11) output resistance	R_{11}	1	—		—	1	—	k Ω	

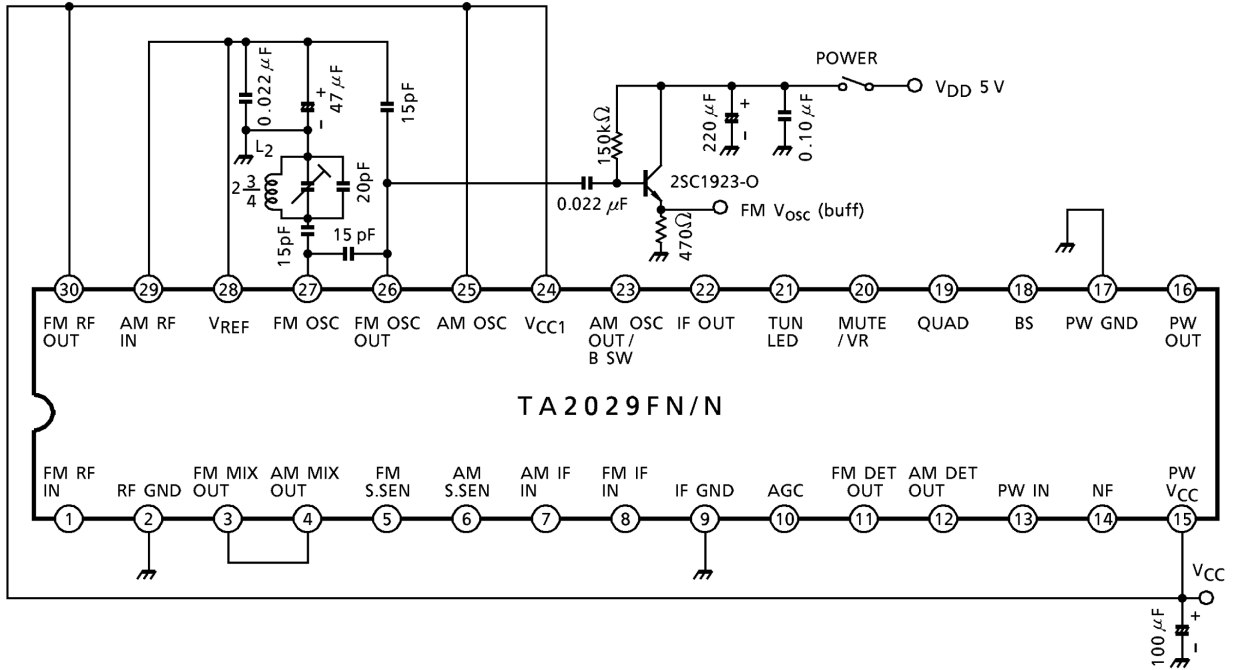
Characteristic		Symbol	Test Cir-cuit	Test Condition	Min.	Typ.	Max.	Unit
AM	Gain	G_V	1	$V_{in} = 26\text{dB}\mu\text{V EMF}$	20	45	80	mV_{rms}
	Recovered output voltage	V_{OD}	1	$V_{in} = 60\text{dB}\mu\text{V EMF}$	50	75	100	mV_{rms}
	Signal to noise ratio	S / N	1	$V_{in} = 60\text{dB}\mu\text{V EMF}$	—	42	—	dB
	Total harmonic distortion	THD	1	$V_{in} = 60\text{dB}\mu\text{V EMF}$	—	1.0	—	%
	LED on sensitivity	V_L	1	$I_L = 1\text{mA}$	24	29	34	$\text{dB}\mu\text{V EMF}$
	Local OSC buff. Output voltage	$V_{osc}(\text{AM})$	1	$f_{osc} = 1455\text{kHz}$	80	140	—	mV_{rms}
	IF count output voltage	$V_{IF}(\text{AM})$	1	SW ₂ : On, $V_{in} = 60\text{dB}\mu\text{V EMF}$	110	200	—	mV_{rms}
	IF count output sensitivity	IFSENS (AM) 1	1	SW ₅ : 10k Ω	—	29	—	$\text{dB}\mu\text{V EMF}$
		IFSENS (AM) 2		SW ₅ : 0 Ω	—	45	—	
Pin (12) output resistance	R_{12}	1	—	—	5	—	k Ω	
PW	Voltage gain	G_V	1	$f = 1\text{kHz}, R_L = 8\Omega,$ $V_o = 0.775V_{\text{rms}}, \text{SW}_7: \text{On}$	27	30	33	dB
	Output power	P_{o1}	1	$f = 1\text{kHz}, R_L = 8\Omega,$ THD = 10%, SW ₇ : On	70	100	—	mW
		P_{o2}	1	$V_{CC} = 6\text{V}, f = 1\text{kHz},$ $R_L = 8\Omega, \text{THD} = 10\%,$ SW ₇ : On	350	500	—	
	Total harmonic distortion	THD	1	$f = 1\text{kHz}, R_L = 8\Omega,$ $P_o = 50\text{mW}, \text{SW}_7: \text{On}$	—	0.6	1.5	%
	Output noise voltage	V_{no}	1	$R_g = 10\text{k}\Omega, R_L = 8\Omega,$ SW ₇ : On BPF = 30Hz~20kHz	—	0.45	—	mV_{rms}
	Muting attenuation	ATT	1	$V_o = 0.775V_{\text{rms}}$ SW ₃ : Off \rightarrow on, SW ₇ : On	65	77	—	dB

TEST CIRCUIT 1



TA2029FN/N

TEST CIRCUIT 2

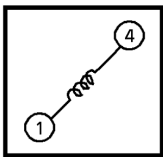


Coil Data

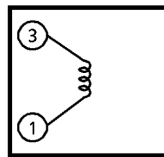
Coil No.	Test Frequency	L (µH)	C ₀ (pF)	Q ₀	Turns					Wire (mmφ)	Ref.
					1-2	2-3	1-3	1-4	4-6		
L ₁ FM RF	100MHz	—	—	100	—	—	—	2 ¹ / ₂	—	0.5 UEW	(S) 53T-037-202
L ₂ FM OSC	100MHz	—	—	100	—	—	2 ³ / ₄	—	—	0.5 UEW	(S) 0258-244
T ₁ AM OSC	796kHz	288	—	115	13	73	—	—	—	0.08 UEW	(S) 4147-1356-038
T ₂ AM IFT	455kHz	—	180	120	—	—	180	—	15	0.08 UEW	(S) 2150-2162-165

(S) Sumida electric co., LTD

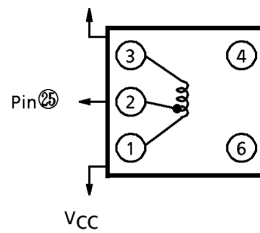
L₁ : FM RF



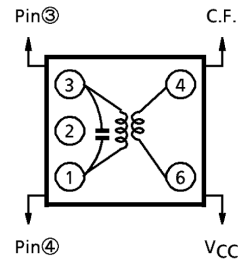
L₂ : FM OSC



T₁ : AM OSC

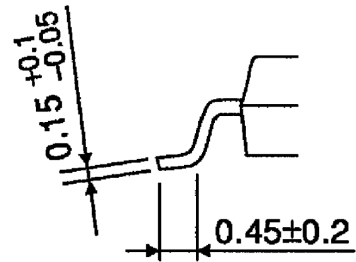
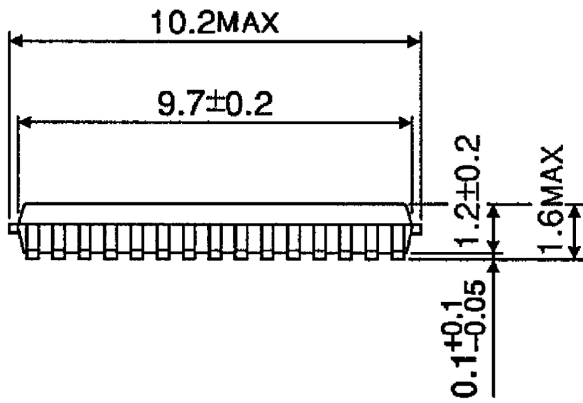
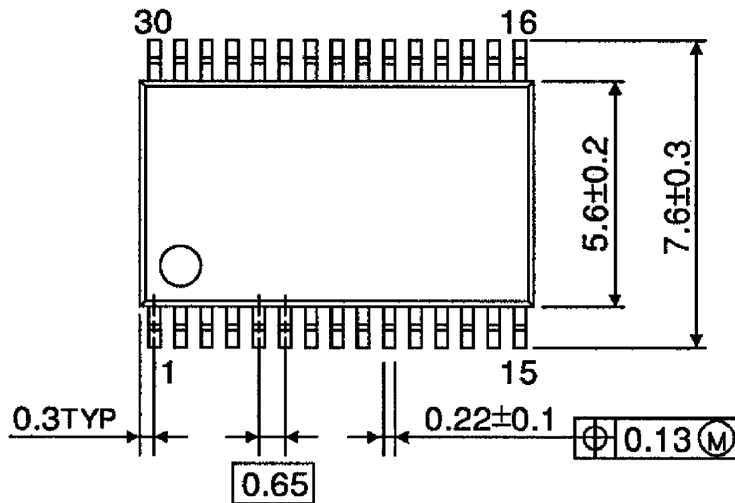


T₂ : AM IFT



PACKAGE DIMENSIONS
SSOP30-P-300-0.65

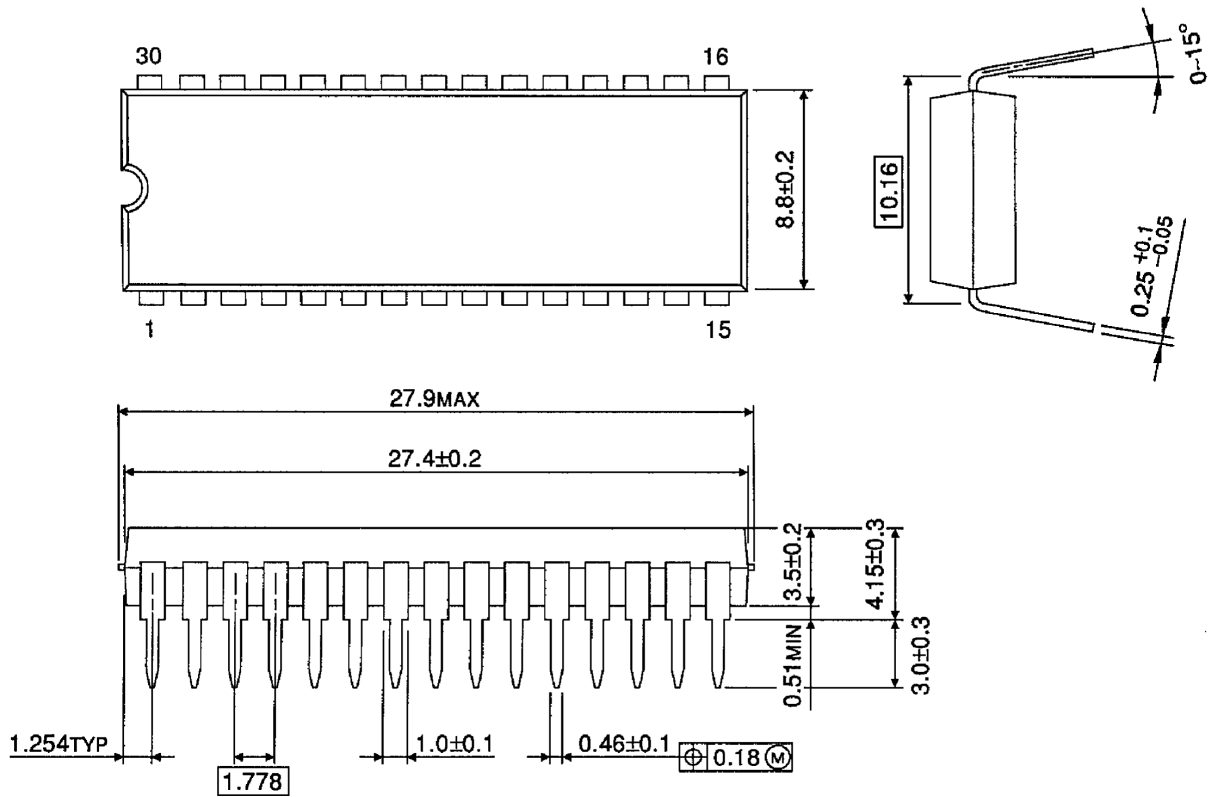
Unit : mm



Weight: 0.17g (typ.)

PACKAGE DIMENSIONS
SDIP30-P-400-1.78

Unit : mm



Weight: 2.2g (typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

- TOSHIBA is continually working to improve the quality and 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 comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products 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 TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade 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.