

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

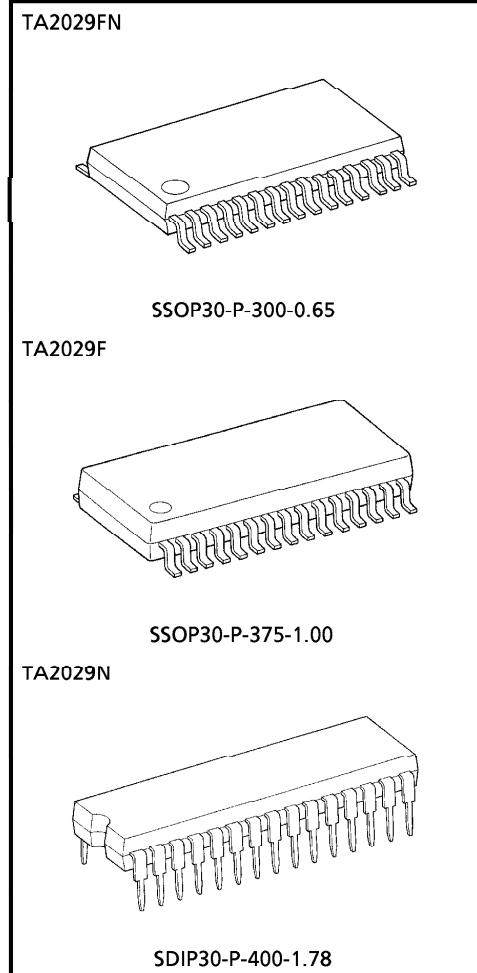
TA2029FN, TA2029F, TA2029N

FM F/E + AM / FM IF + PW IC FOR DIGITAL TUNING SYSTEM

The TA2029FN/F/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. (Pin⑤, Pin⑥)
- 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/F : 3V/8 Ω)
 $P_O = 500\text{mW}$ (Typ.), THD = 10% (N : 6V/8 Ω)
- Operating supply voltage range
 - : $V_{CC} = 1.8 \sim 8\text{V}$ ($T_a = 25^\circ\text{C}$)

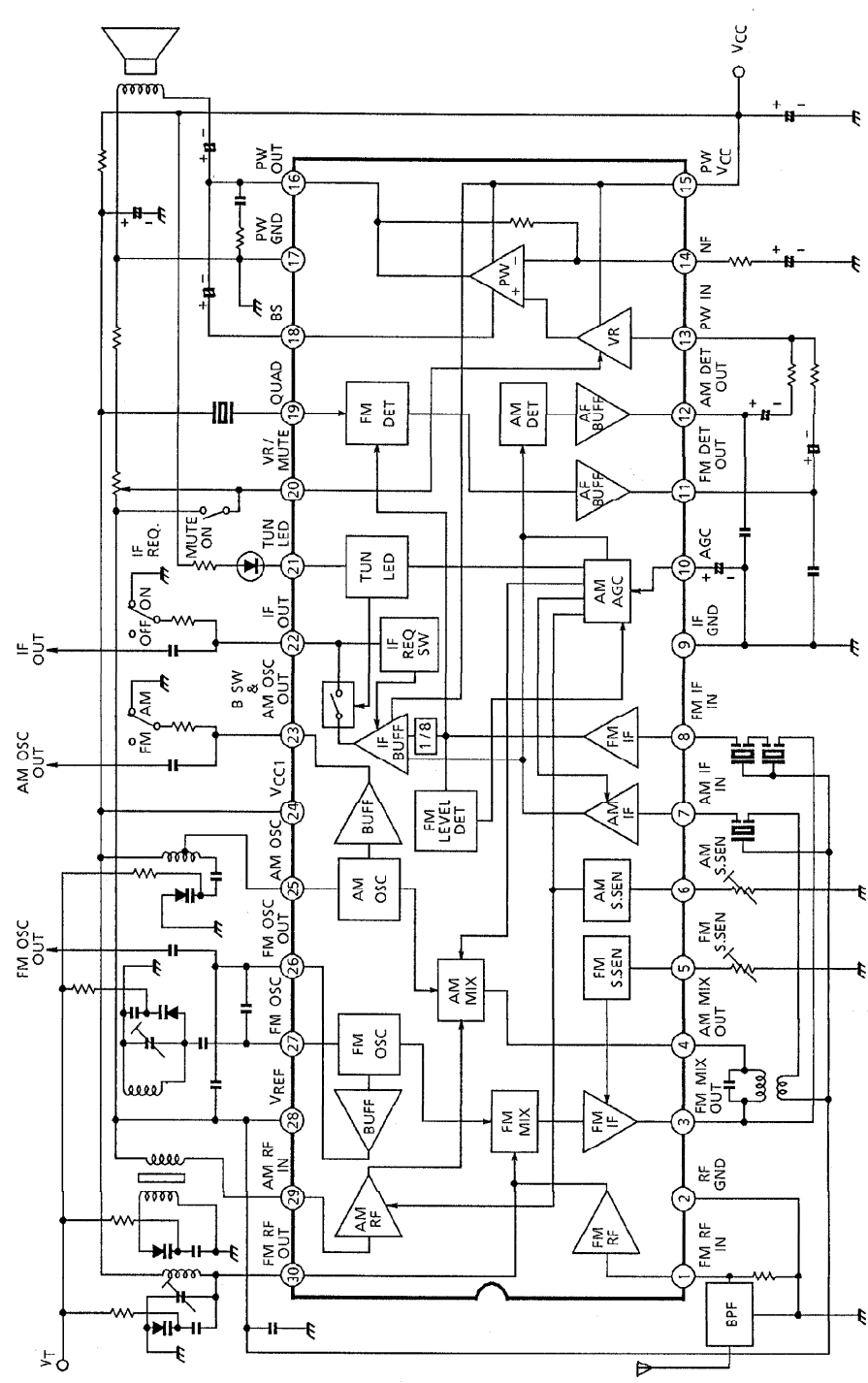


Weight	
SSOP30-P-300-0.65	: 0.17g (Typ.)
SSOP30-P-375-1.00	: 0.7g (Typ.)
SDIP30-P-400-1.78	: 2.2g (Typ.)

961001EBA2

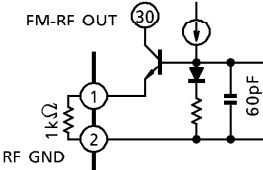
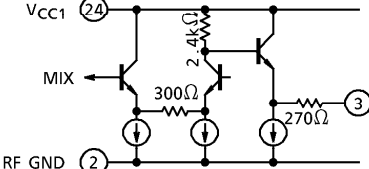
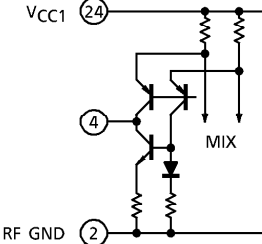
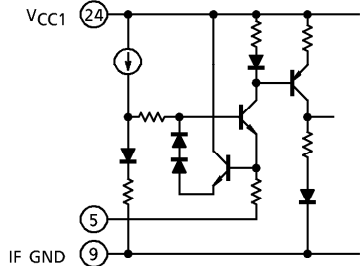
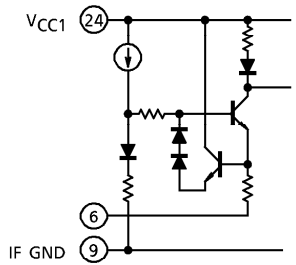
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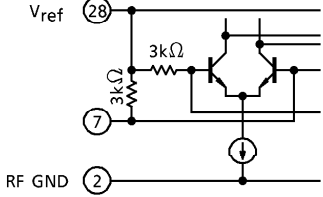
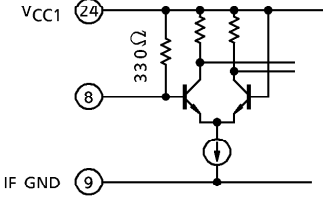
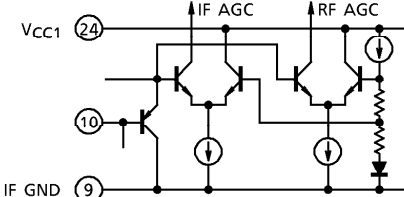
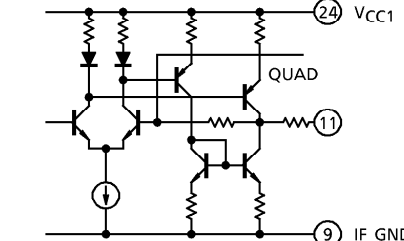
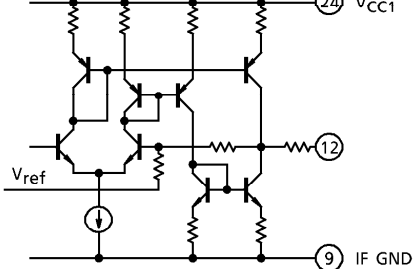
BLOCK DIAGRAM

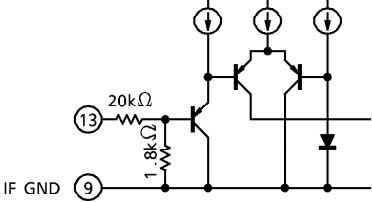
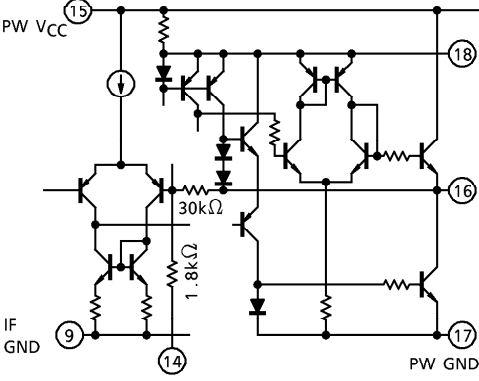
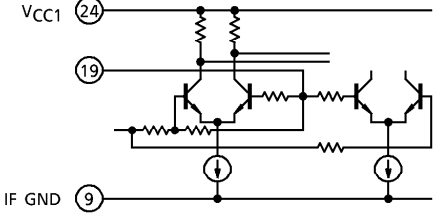
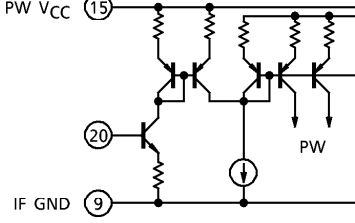
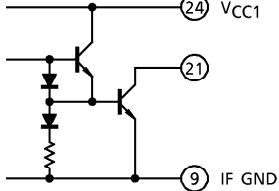


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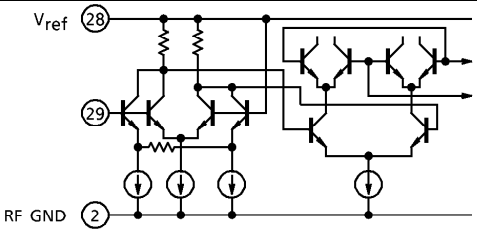
EXPLANATION OF TERMINALS (Note : Ta = 25°C, V_{CC} = 3V, at no signal)

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 GND (GND 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 VCC (VCC 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. (MURATA 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 Pin②② connects with GND by resistor→Come out Pin②② : 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. Pin②③ connects with GND by resistor→AM MODE Pin②③ : OPEN→FM MODE		1.7	2.5
24	VCC1 (VCC 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 Pin②⑦ 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. Pin①	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	mW
	TA2029F		890	
	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, 7.2mW/°C for TA2029F and 12mW/°C for TA2029N.

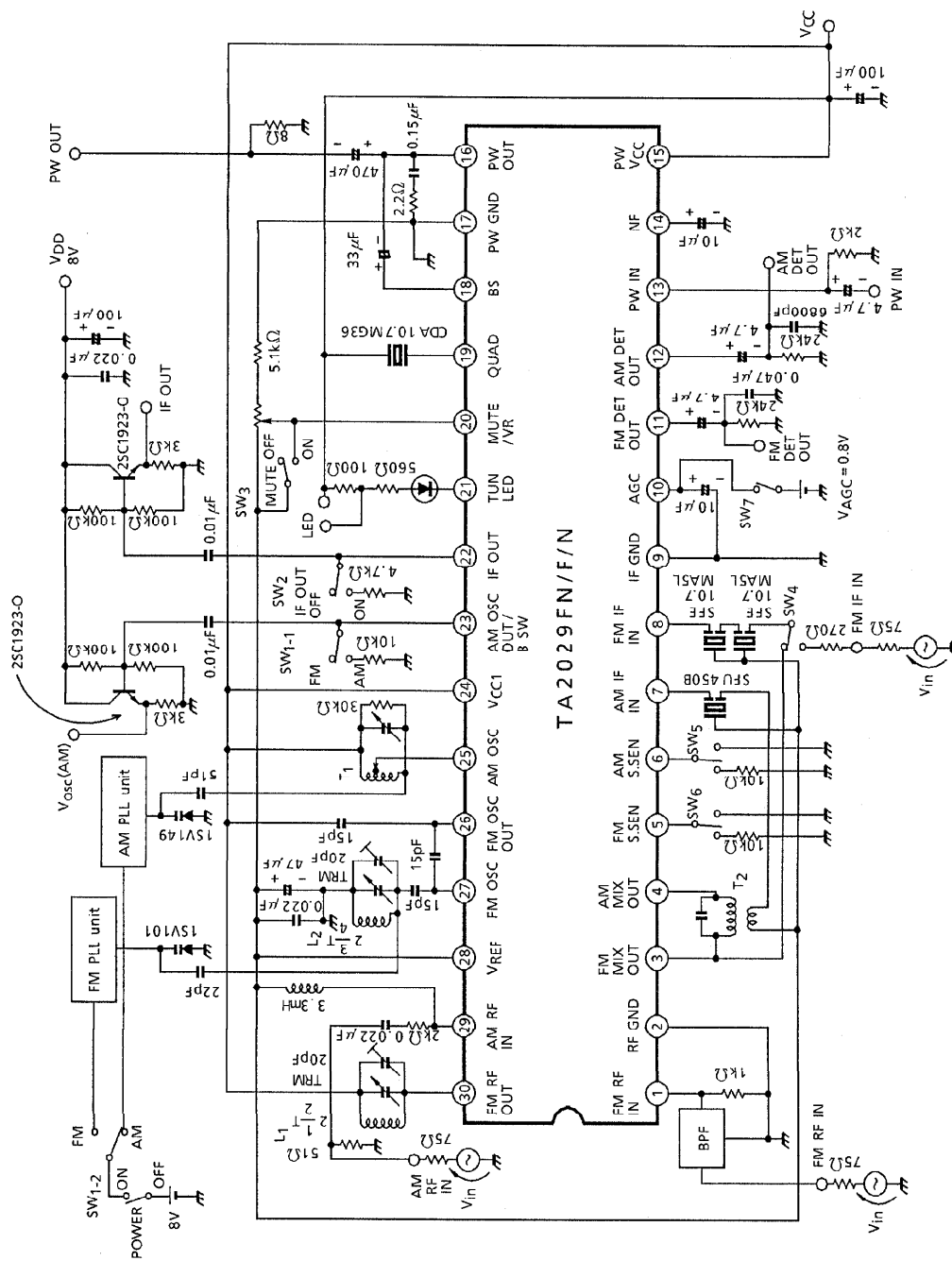
ELECTRICAL CHARACTERISTICS

Unless otherwise specified, $T_a = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, SW_2 : OFF, SW_3 : OFF, SW_7 : OFFF / 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 Power AMP : OFF $V_{in} = 0$	—	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 $V_{in} = 0$	—	7.5	11.0	
		I_{CC} (AM)	1	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	—	dB μV EMF
	Quiescent Sensitivity	Q_S		S / N = 30dB	—	15	—	dB μV EMF
	Local OSC Stop Voltage	V_{stop} (FM)	2	$V_{in} = 0$	—	1.35	—	V
	Local OSC Buffer Output Voltage	V_{osc} (buff)	2	$f_{\text{osc}} = 108\text{MHz}$	—	130	—	mV $_{\text{rms}}$
FM	Input Limiting Voltage	$V_{in}(\text{lim})$ IF	1	− 3dB Limiting	39	44	49	dB μV EMF
	Recovered Output Voltage	V_{OD}	1	$V_{in} = 80\text{dB}\mu\text{V}$ EMF	55	80	110	mV $_{\text{rms}}$
	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	dB μV EMF
	IF Count Output Frequency	1 / 8 IF $f_{1/8\text{IF}}$ (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 $V_{1/8\text{IF}}$ (FM)	1	SW_2 : ON, $V_{in} = 80\text{dB}\mu\text{V}$ EMF	110	200	—	mV $_{\text{rms}}$
	IF Count Output Sensitivity	IFS _{SENS} (FM)1	1	SW_6 : $10\text{k}\Omega$	—	48	—	dB μV
		IFS _{SENS} (FM)2	1	SW_6 : 0Ω	—	68	—	EMF
	Pin① Output Resistance	R_{11}	1	—	—	1	—	$\text{k}\Omega$

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
AM	Gain	G _V	1	V _{in} = 26dB μ V EMF	20	45	80	mV _{rms}
	Recovered Output Voltage	V _{OD}	1	V _{in} = 60dB μ V EMF	50	75	100	mV _{rms}
	Signal To Noise Ratio	S / N	1	V _{in} = 60dB μ V EMF	—	42	—	dB
	Total Harmonic Distortion	THD	1	V _{in} = 60dB μ V EMF	—	1.0	—	%
	LED ON Sensitivity	V _L	1	I _L = 1mA	24	29	34	dB μ V 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} = 60dB μ V EMF	110	200	—	mV _{rms}
	IF Count Output Sensitivity	IFSENS(AM)1	1	SW ₅ : 10k Ω	—	29	—	dB μ V
		IFSENS(AM)2		SW ₅ : 0 Ω	—	45	—	EMF
	Pin $\textcircled{12}$ Output Resistance	R ₁₂	1	—	—	5	—	k Ω
PW	Voltage Gain	G _V	1	f = 1kHz, R _L = 8 Ω , V _O = 0.775V _{rms} , SW ₇ : ON	27	30	33	dB
	Output Power	P _{O1}	1	f = 1kHz, R _L = 8 Ω , THD = 10%, SW ₇ : ON	70	100	—	mW
		P _{O2}	1	V _{CC} = 6V, f = 1kHz, R _L = 8 Ω , THD = 10%, SW ₇ : ON	350	500	—	
	Total Harmonic Distortion	THD	1	f = 1kHz, R _L = 8 Ω , P _O = 50mW, SW ₇ : ON	—	0.6	1.5	%
	Output Noise Voltage	V _{no}	1	R _g = 10k Ω , R _L = 8 Ω , 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



TA2029FN/F/N - 10

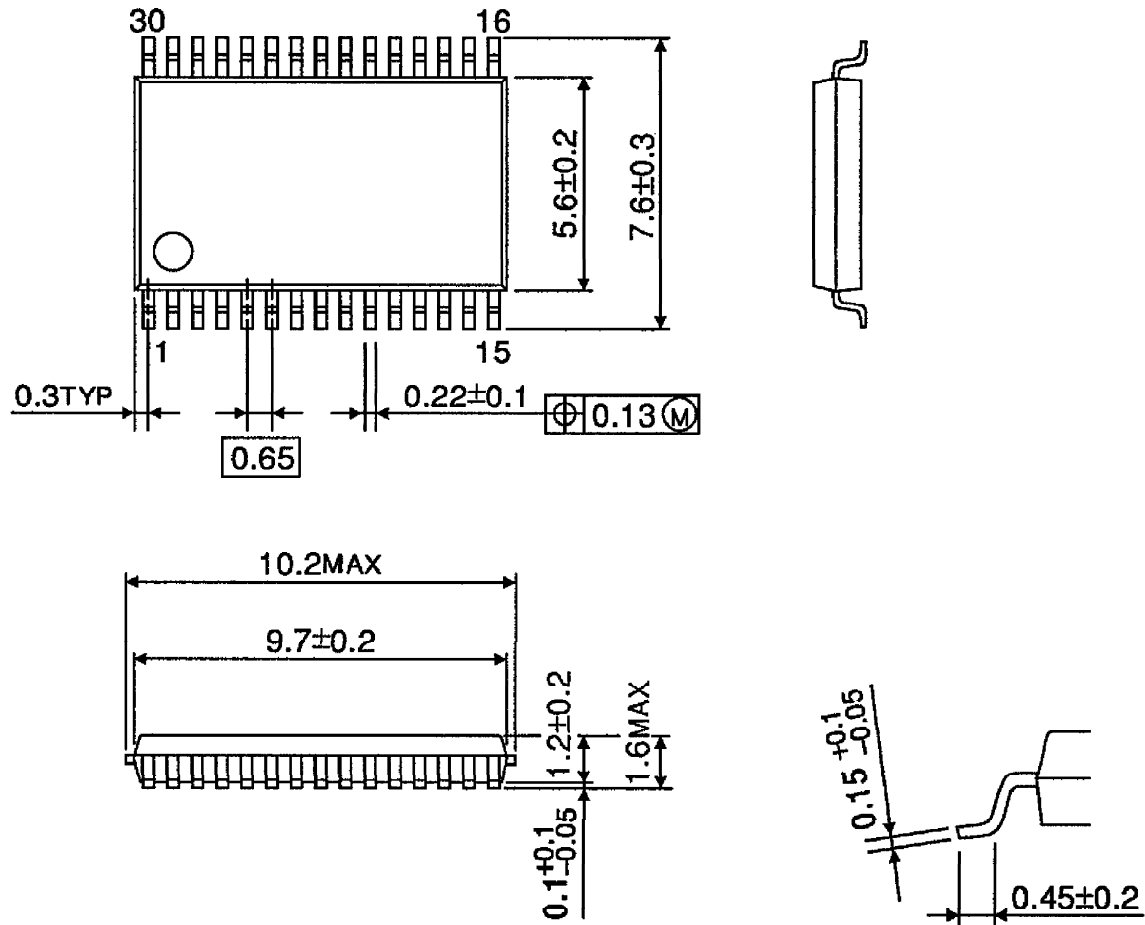
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COIL No.	TEST FREQUENCY	L (μ H)	C _O (pF)	Q _O	TURNS					WIRE (mm ϕ)	REF.
					1-2	2-3	1-3	1-4	4-6		
L ₁ FM RF	100MHz	—	—	100	—	—	—	2 $\frac{1}{2}$	—	0.5UEW	Ⓢ 53T-037-202
L ₂ FM OSC	100MHz	—	—	100	—	—	2 $\frac{3}{4}$	—	—	0.5UEW	Ⓢ 0258-244
T ₁ AM OSC	796kHz	288	—	115	13	73	—	—	—	0.08UEW	Ⓢ 4147-1356-038
T ₂ AM IFT	455kHz	—	180	120	—	—	180	—	15	0.08UEW	Ⓢ 2150-2162-165

A diagram showing a spring connecting two masses, labeled 1 and 4. Mass 1 is at the bottom left, and mass 4 is at the top right. The spring is represented by a coiled line between them.

OUTLINE DRAWING
SSOP30-P-300-0.65

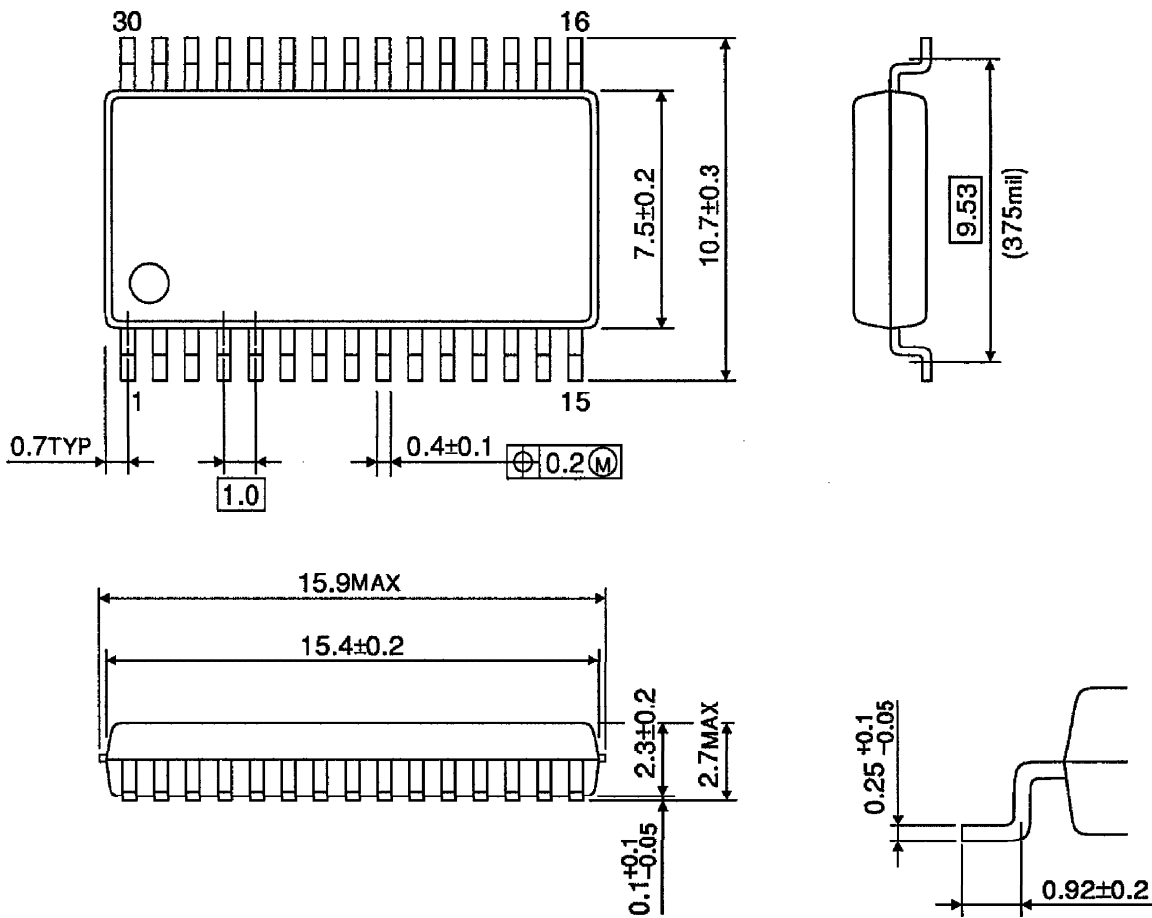
Unit : mm



Weight : 0.17g (Typ.)

OUTLINE DRAWING
SSOP30-P-375-1.00

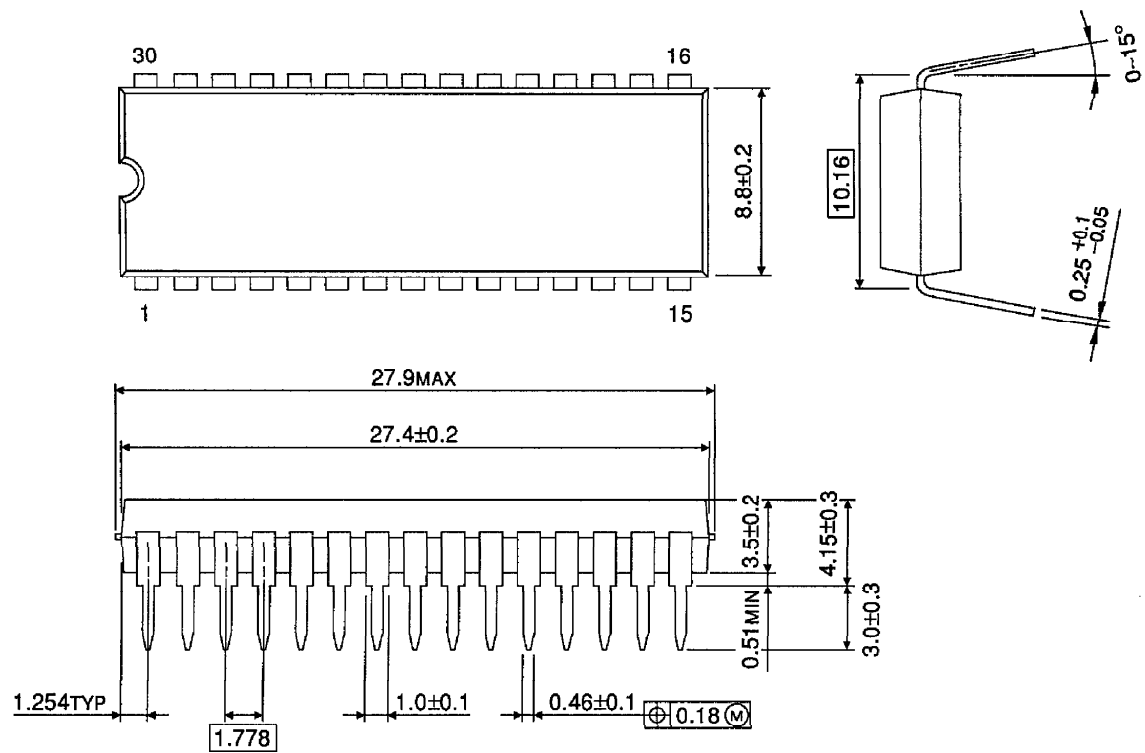
Unit : mm



Weight : 0.7g (Typ.)

OUTLINE DRAWING
SDIP30-P-400-1.78

Unit : mm



Weight : 2.2g (Typ.)