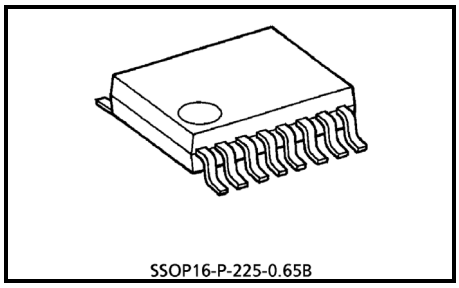
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA2030FNG

TV / FM System F / E (1.5V USE)

The TA2030FNG is a TV / FM system front end IC, which is developed for headphone radio in 1.5V use.
It is built in FM F / E and TV F / E (japanese VHF band).

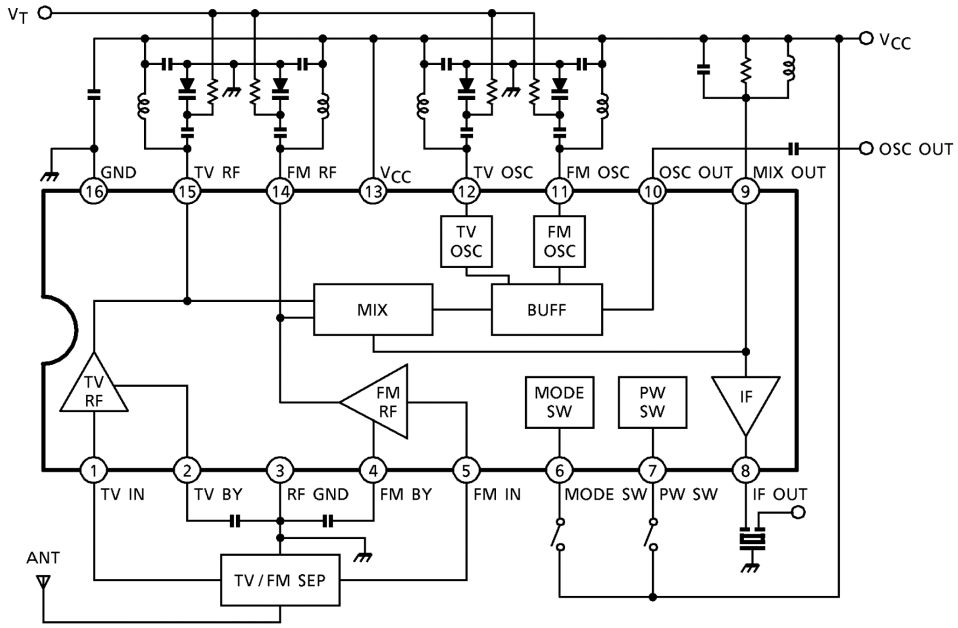


Weight: 0.09g (typ.)

Features

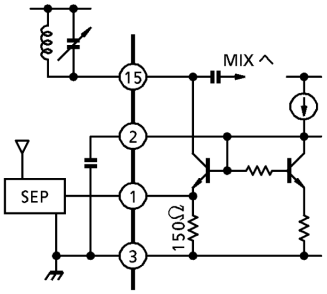
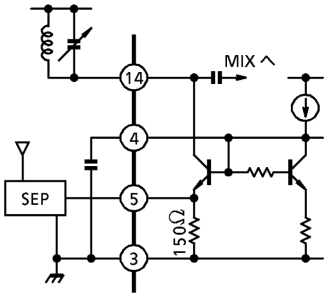
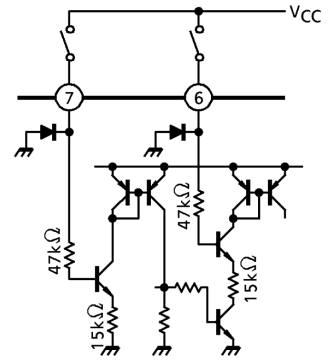
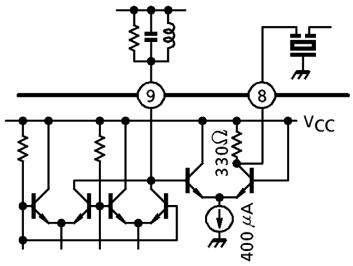
- Built−in FM F / E and TV F / E
  FM mode: 75~109MHz
  TV mode: 175~225MHz
- Suitable for combination with digital tuning system.
- Built−in power switch
- Built−in FM / TV switch
- Built−in IF amplifier
- Built−in OSC buffer circuit
- Improved inter−modulation characteristics by double balanced type mixer circuit.
- Supply current (V_{CC} = 1.2V, Ta = 25°C)
  FM mode: I_{CC} = 4.4mA (typ.)
  TV mode: I_{CC} = 6.3mA (typ.)
- Operating supply voltage range (Ta = 25°C)
  $V_{CC\ (opr)}$ = 0.95~4V

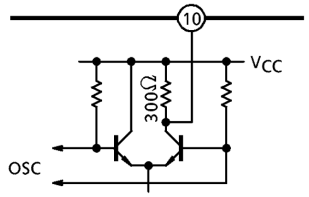
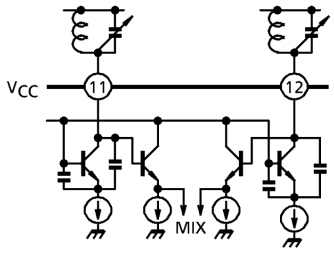
Block Diagram



Terminal Explanation

Terminal Voltage: Typical Terminal Voltage at no Signal with Test Circuit. (V_{CC} = 1.2V, Ta = 25°C)

Terminal No.	Terminal Name	Function	Internal Circuit	Terminal Voltage(V)	
				FM	TV
1	TV IN	Input of TV RF signal (common−base type)		—	0.1
2	TV BY	By−pass terminal of TV RF and MIX (radiation is lightened by connected capacitor.)		—	0.7
15	TV RF	TV RF tuning circuit is connected.		1.2	1.2
3	RF GND	—	—	0	0
4	FM BY	By−pass terminal of FM RF and MIX (radiation is lightened by connected capacitor.)		0.7	—
5	FM IN	Input of FM RF signal (common−base type)		0.1	—
14	FM RF	FM RF tuning circuit is connected.		1.2	1.2
6	MODE SW	Mode switch V_{CC}: TV mode OPEN / GND: FM mode		0	1.2
7	PW SW	Power switch V_{CC}: Power on OPEN / GND: Power off		1.2	1.2
8	IF OUT	Output of TV / FM IF signal. Output impedance 330Ω (typ.)		1.1	1.1
9	MIX OUT	MIX coil is connected.		1.2	1.2

Termi–nal No.	Terminal Name	Function	Internal Circuit	Terminal Voltage(V)	
				FM	TV
10	OSC OUT	Output of OSC buffer circuit.		1.1	1.1
11	FM OSC	FM OSC tank circuit is connected. (colpitts type oscillator)		1.2	1.2
12	TV OSC	TV OSC tank circuit is connected. (colpitts type oscillator)		1.2	1.2
13	V_{CC}	V_{CC}		1.2	1.2
16	GND	GND(except RF part)		0	0

Application Note

1. PW SW

It is necessary to connect an external pull–down resistor with the terminal PW SW (pin(7)), in case that this IC is turned on due to external noise etc.

2. MODE SW

It is necessary to connect an external pull–down resistor with the terminal MODE SW (pin(6)), in case that this IC doesn't operate normally due to external noise etc.

3. RF GND

This IC has two GND terminals (pin(3): RF GND, pin(16): GND). External parts shown in below should be connected with RF GND (pin(3)), and other parts should be connected with GND (pin(16)).

・ By–pass capacitor at pin(14) (FM RF) and pin(15) (TV RF)

・ By–pass capacitor at pin(4) (FM BY) and pin(2) (TV BY)

The pattern diagram of capacitor connected with pin(2) and pin(4) should be shortly, because RF circuit and MIX circuit operate on the voltage of pin(2) or pin(4).

Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Supply voltage	V_{CC}	4.5	V
Power dissipation (Note)	P_D	400	mW
Operating temperature	T_{opr}	−25~75	°C
Storage temperature	T_{stg}	−55~150	

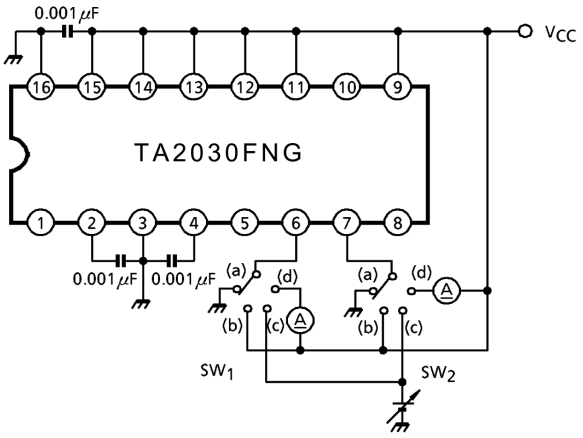
Note: Derated above Ta = 25°C in the proportion of 3.2mW / °C

Electrical Characteristics

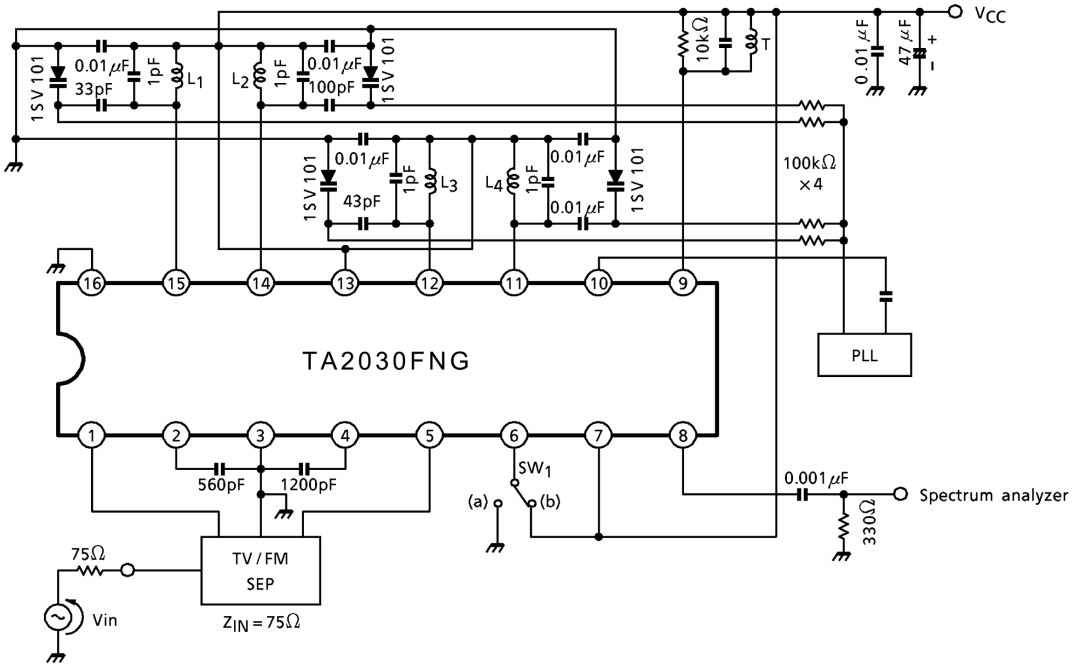
Unless Otherwise Specified, V_{CC} = 1.2V, Ta = 25°C, f_{FM} = 92MHz, f_{TV} = 200MHz
Δf = ± 22.5kHz, f_m = 1kHz, SW_2 : b

Characteristic		Symbol	Test Circuit	SW_1	Test Condition		Min.	Typ.	Max.	Unit
Supply current		I_{CC1}	1	a	Vin < −20bBμV EMF	IC OFF, SW_2: a	—	0.1	5	μA
		I_{CC2}				FM mode	—	4.4	6.6	mA
		I_{CC3}		b		TV mode	—	6.3	9.5	
FM	Conversion gain	G_{C1}	2	a	Vin = 65dBμV EMF		29	33	—	dB
	Local oscillator voltage	V_{OSC1}	3		f_{osc} = 65MHz		—	360	—	mV_{rms}
	OSC buffer output voltage	V_{BUF1}					—	50	—	
	Local oscillator stop voltage	V_{STP1}					—	0.89	0.95	V
TV	Conversion gain	G_{C2}	2	b	Vin = 65dBμV EMF		25	29	—	dB
	Local oscillator voltage	V_{OSC2}	3		f_{osc} = 165MHz		—	180	—	mV_{rms}
	OSC buffer output voltage	V_{BUF2}					—	22	—	
	Local oscillator stop voltage	V_{STP2}					—	0.86	0.95	V
Power on current		I_7	1	a	V_{CC} = 0.95V, V_2 ≤ 0.2 V SW_2: d V_4 ≥ 0.4 V		5	—	—	μA
Power off voltage		V_7		a	V_{CC} = 0.95V, V_2 ≤ 0.2 V SW_2: c V_4 ≤ 0.2 V		0	—	0.3	V
TV mode on current		I_6		d	V_{CC} = 0.95V, V_2 ≥ 0.4 V V_4 ≤ 0.2 V		5	—	—	μA
FM mode on voltage		V_6		c	V_{CC} = 0.95V, V_2 ≤ 0.2 V V_4 ≥ 0.4 V		0	—	0.3	V

Test Circuit 1

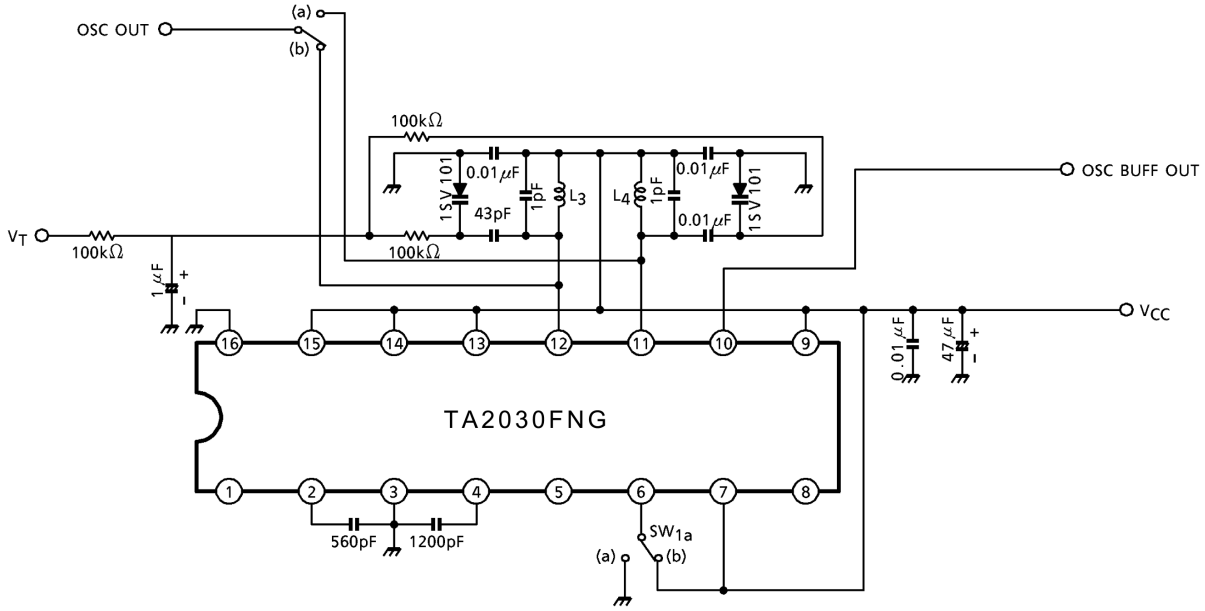


Test Circuit 2



G_C(dB) = 20ℓog V_{IF}(μV_{rms}) – (V_{in}(dBμV EMF) –6dB)
TV / FM Separator: GTVS05(SOSHIN ELECTRIC CO., LTD.)

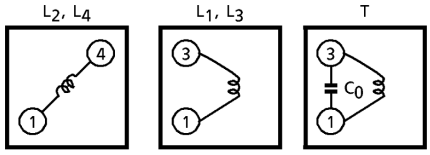
Test Circuit 3



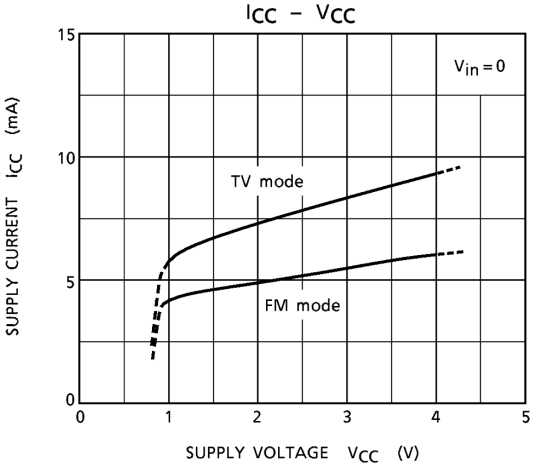
Coil Data (test circuit)

Coil No.	Test Freq.	C_0 (pF)	Q_0	Turns		Wire (mmϕ)	Reference
				1–3	1–4		
L_1 TV RF	100MHz	—	55	1 1 / 4	—	0.5UEW	(S) 0258–250
L_2 FM RF	100MHz	—	90	—	3 1 / 2	0.5UEW	(S) 0258–238
L_3 TV OSC	100MHz	—	55	1 1 / 4	—	0.5UEW	(S) 0258–250
L_4 FM OSC	100MHz	—	90	—	3 1 / 2	0.5UEW	(S) 0258–238
T FM IFT	10.7MHz	82	45	18	—	0.09UEW	(S) 4162–083A

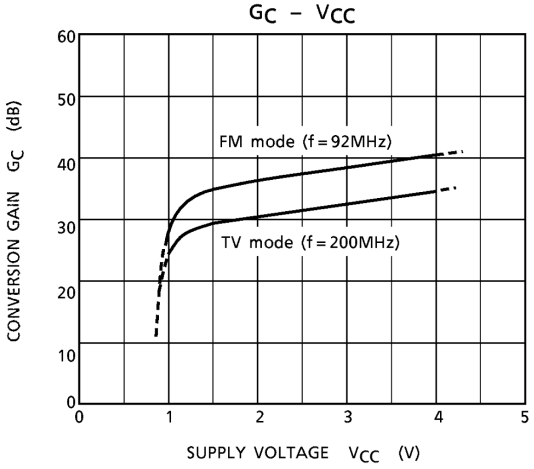
(S) : Sumida electric CO., LTD



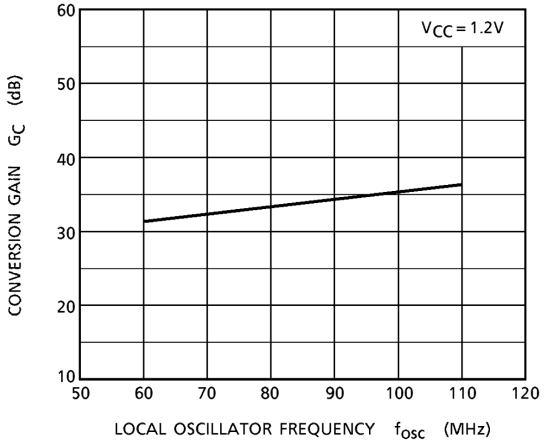
I_{CC} – V_{CC}



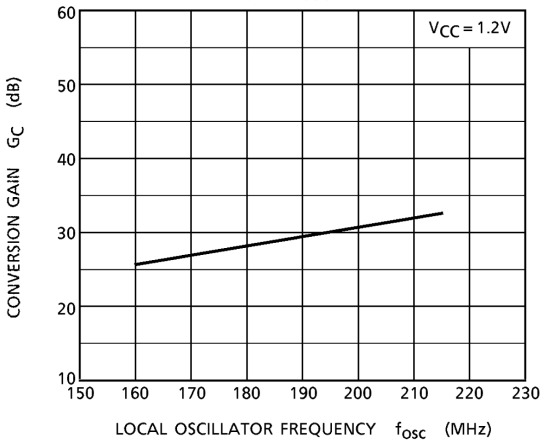
G_C – V_{CC}



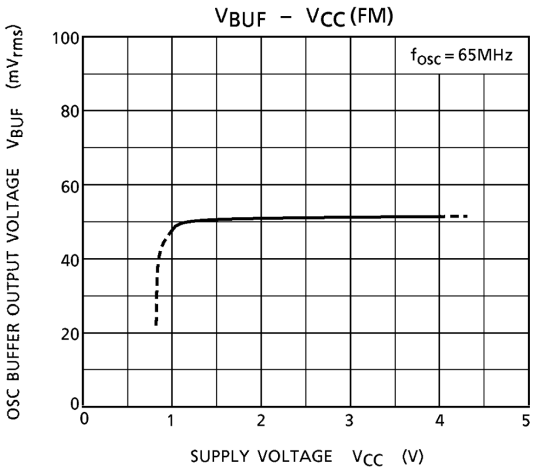
G_C – f_{osc} (FM)



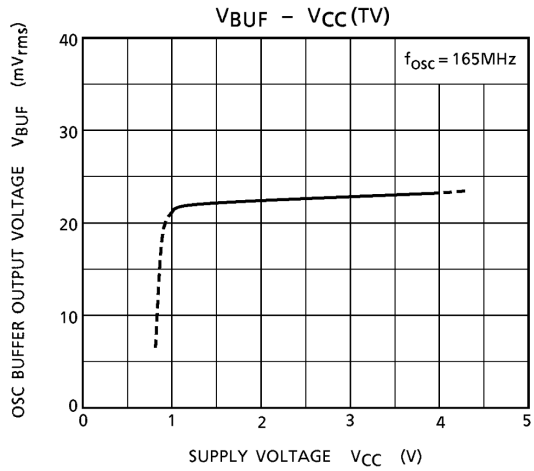
G_C – f_{osc} (TV)



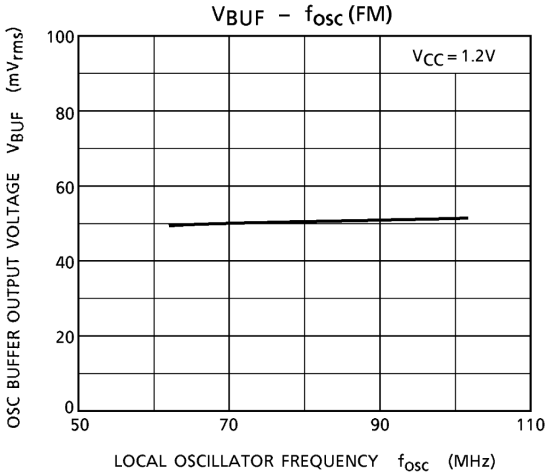
V_{BUF} – V_{CC} (FM)



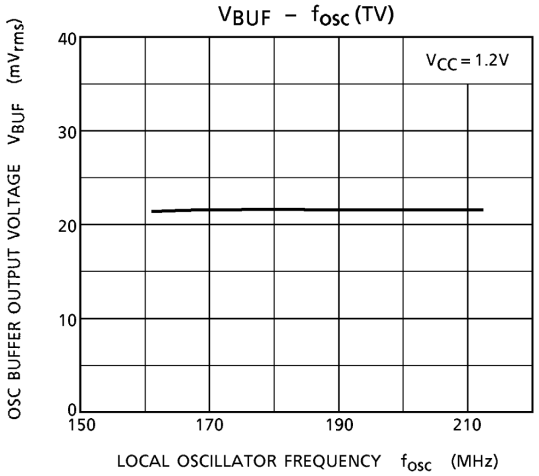
V_{BUF} – V_{CC} (TV)



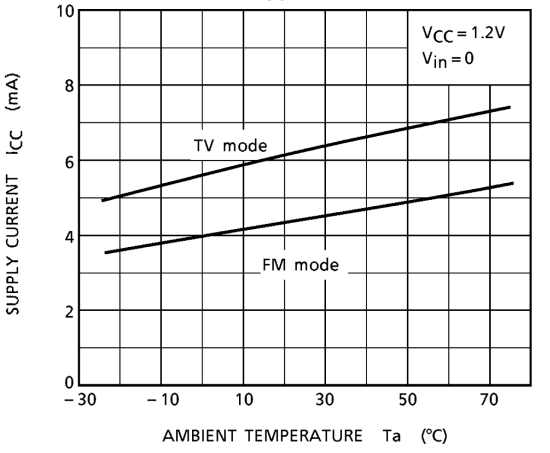
V_{BUF} – f_{osc} (FM)



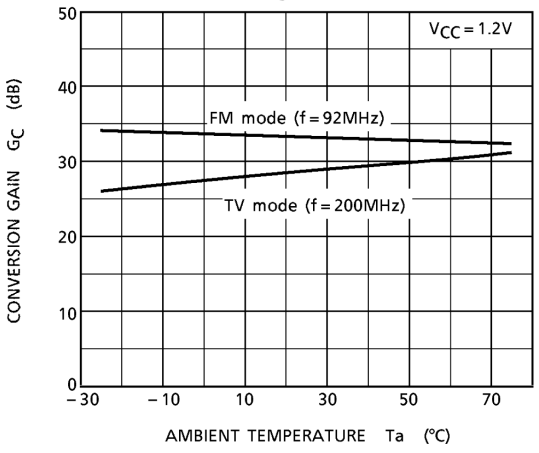
V_{BUF} – f_{osc} (TV)



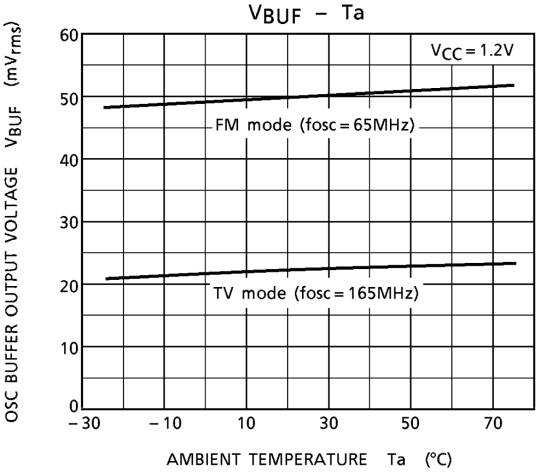
I_{CC} – Ta



G_C – Ta

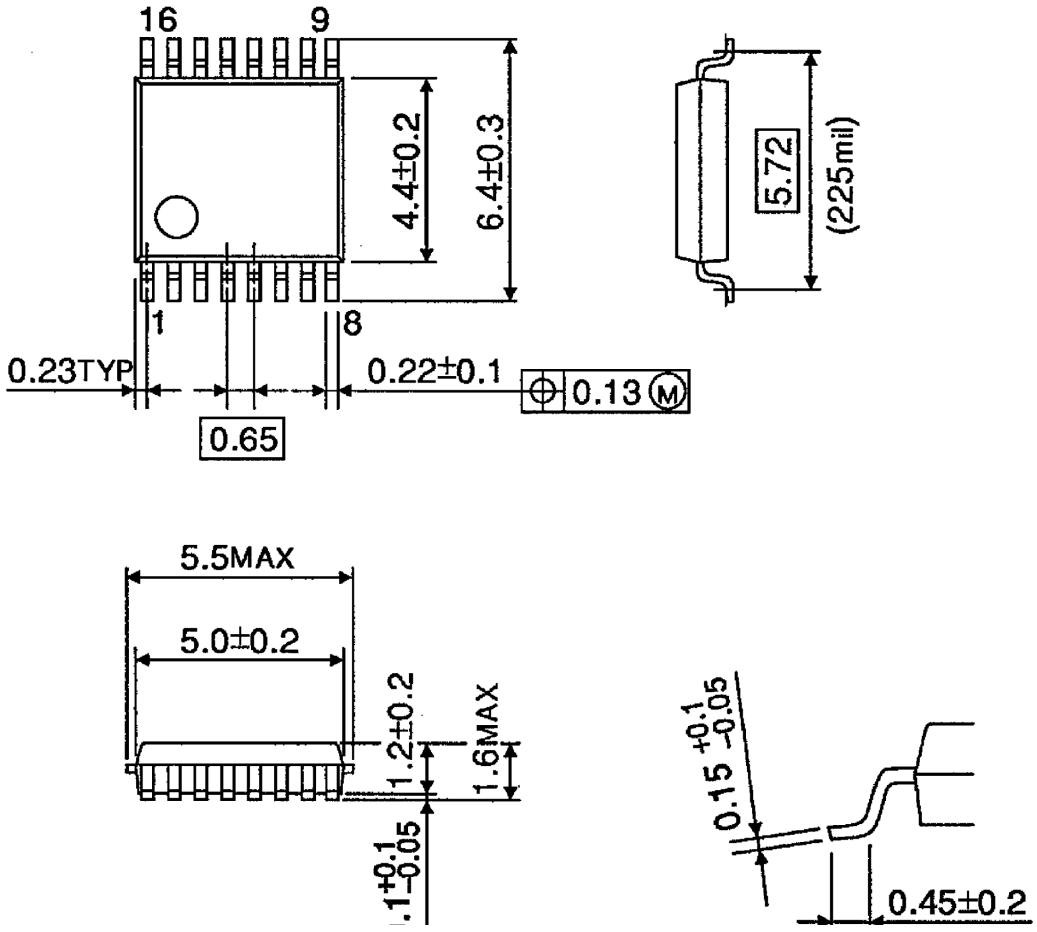


V_{BUF} – Ta



Package Dimensions

SSOP16-P-225-0.65B Unit : mm



Weight: 0.09g (typ.)

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About solderability, following conditions were confirmed

- Solderability

  (1) Use of Sn-37Pb 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