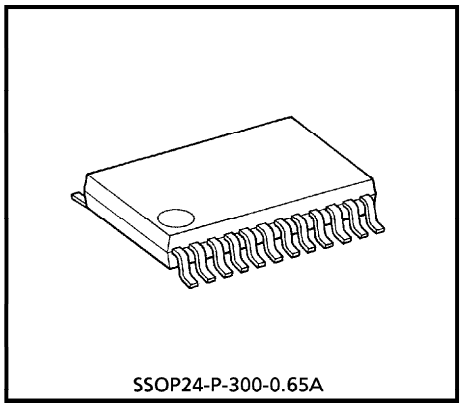
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA2056FNG

1.5V CORDLESS HEADPHONE RECEIVER

The TA2056FNG is an infrared ray linear audio signal receiver IC developed for IR cordless headphone systems. It is two built in FM receivers for stereo and muting function etc.



SSOP24-P-300-0.65A

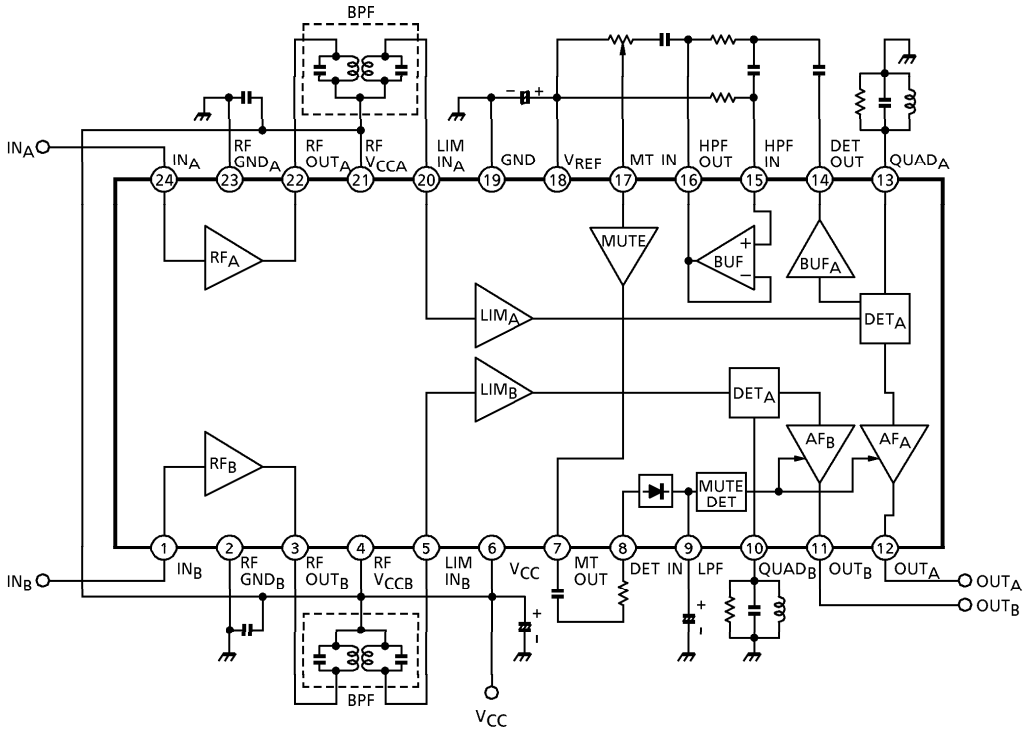
Weight : 0.14g (Typ.)

FEATURES

- Two built-in FM receivers for stereo
  (f = 2.3 / 2.8MHz)
- Excellent spurious radiation by direct detection type
- Built-in muting function (retuned noise detection type)
  - Built-in buffer amplifier for muting signal detection
  - Built-in muting amplifier
  - Built-in detector circuit
  - Muting attenuation (V_{CC} = 1.2V, Ta = 25°C)
    ATT = 65dB (Typ.)
- Two built-in RF amplifiers
- Low supply current (V_{CC} = 1.2V, Ta = 25°C)
  I_{CC} = 4.0mA (Typ.)
- Operating supply voltage range (Ta = 25°C)
  $V_{CC\ (opr)}$ = 0.95~2.2V

(*) Handle with care to prevent devices from deterioration by static electricity.

BLOCK DIAGRAM



BPF

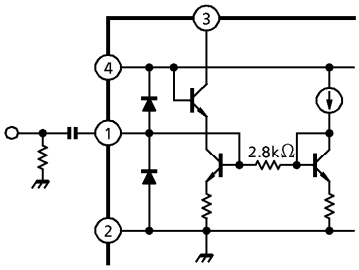
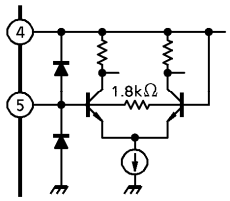
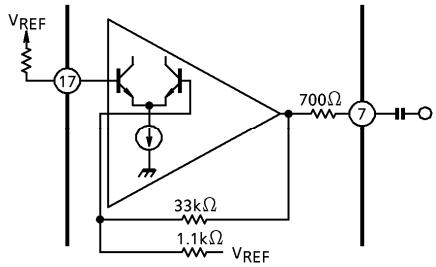
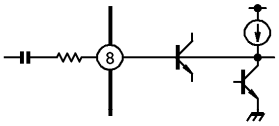
We recommended

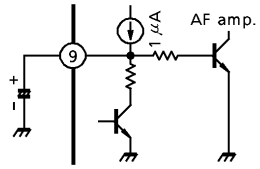
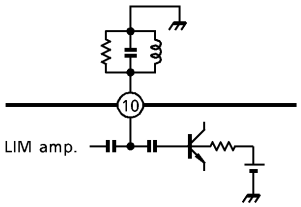
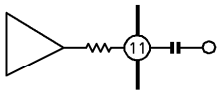
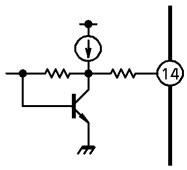
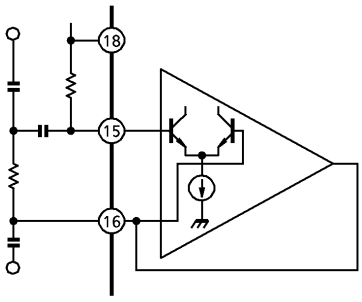
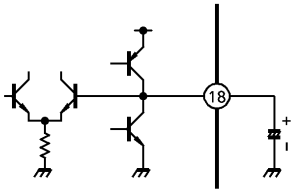
2.3MHz : TH354BAI-6727 (TOKO, INC.)

2.8MHz : TH354BAI-6728 (TOKO, INC.)

TERMINAL EXPLANATION

TERMINAL VOLTAGE : Typical voltage at no signal with test circuit (V_{CC} = 1.2V, Ta = 25°C)

TERMINAL No.	NAME	FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)
1	IN_B	Input of RF amplifier ● Input impedance : 3.3kΩ (Typ.) ● A resistor (R≦330Ω) should be connected to GND through a capacitor		0.7
24	IN_A			
2	RF GND_B	GND of RF amplifier		0
23	RF GND_A			
3	RF OUT_B	Output of RF amplifier		—
22	RF OUT_A			
4	RF V_{CCB}	V_{CC}, for RF amplifier and part of limiter amplifier		1.2
21	RF V_{CCA}			
5	LIM IN_B	Input of limiter amplifier ● Input impedance : 1.8kΩ (Typ.)		1.2
20	LIM IN_A			
6	V_{CC}	V_{CC}, except RF V_{CC}	—	1.2
7	MT OUT	Output of muting amplifier		0.5
17	MT IN	Input of muting amplifier It is necessary to connect a resistor between V_{REF} terminal (pin⑱) and this terminal (pin⑰) for bias.		0.7
8	DET IN	Input of muting detector circuit		0.7

TERMINAL No.	NAME	FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)
9	LPF	Smoothing circuit of muting signal		—
10	$QUAD_B$	QUAD detector		0
13	$QUAD_A$			
11	OUT_B	Output of audio signal ● Output impedance : 1kΩ (Typ.)		0.6
12	OUT_A			
14	DET OUT	Detector output for muting function ● This terminal is detector output of FM detector, it can be used for muting signal detection. ● Output impedance : 2kΩ (Typ.)		0.5
15	HPF IN	Input of HPF for muting signal detection		0.7
16	HPF OUT	Output of HPF for muting signal detection		0.7
18	V_{REF}	Reference circuit		0.7
19	GND	—	—	0

APPLICATION NOTE

1. Input of RF amplifier (PIN ① / ㉔)

   A resistor (R≦330Ω) should be connected to GND through a capacitor. Because input impedance of this terminal is designed for 3.3kΩ (Typ.), internal circuit doesn't operate normally.

2. Muting function (Retuned noise detection type)

   The muting function is operated by audio amplifier muting which is decided by noise level which is taken out by high-pass filter from recovered output voltage of channel A.
   Muting signal is detected only channel A, not from channel B.
   The detected noise level peaks near the input limiting voltage. Bellow the input limiting voltage, the noise level decreases and there is a possibility that the muting function doesn't operate normally.
   Thus in case that muting sensitivity is set near the input limiting voltage, it is necessary to caution that the muting function operate normally.

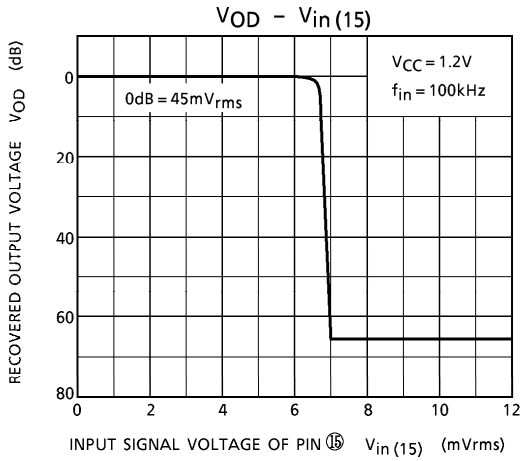


Fig. Muting sensitivity

3. Pattern layout

   The TA2056FNG has three V_{CC} and GND terminals. External parts should be connected with each V_{CC} and GND shortly, these pattern layouts should be isolated.

   RF V_{CCA} (pin ㉑)、RF GND_A (pin ㉓) ..... RF amp. (A-ch), part of LIM amp. (A-ch)
   RF V_{CCB} (pin ④)、RF GND_B (pin ②) ..... RF amp. (B-ch), part of LIM amp. (B-ch)
   V_{CC} (pin ⑥)、GND (pin ⑲) ..... Except RF V_{CC} and RF GND

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	3	V
Power Dissipation	P_D (Note)	500	mW
Operating Temperature	T_{opr}	−25~75	°C
Storage Temperature	T_{stg}	−55~150	°C

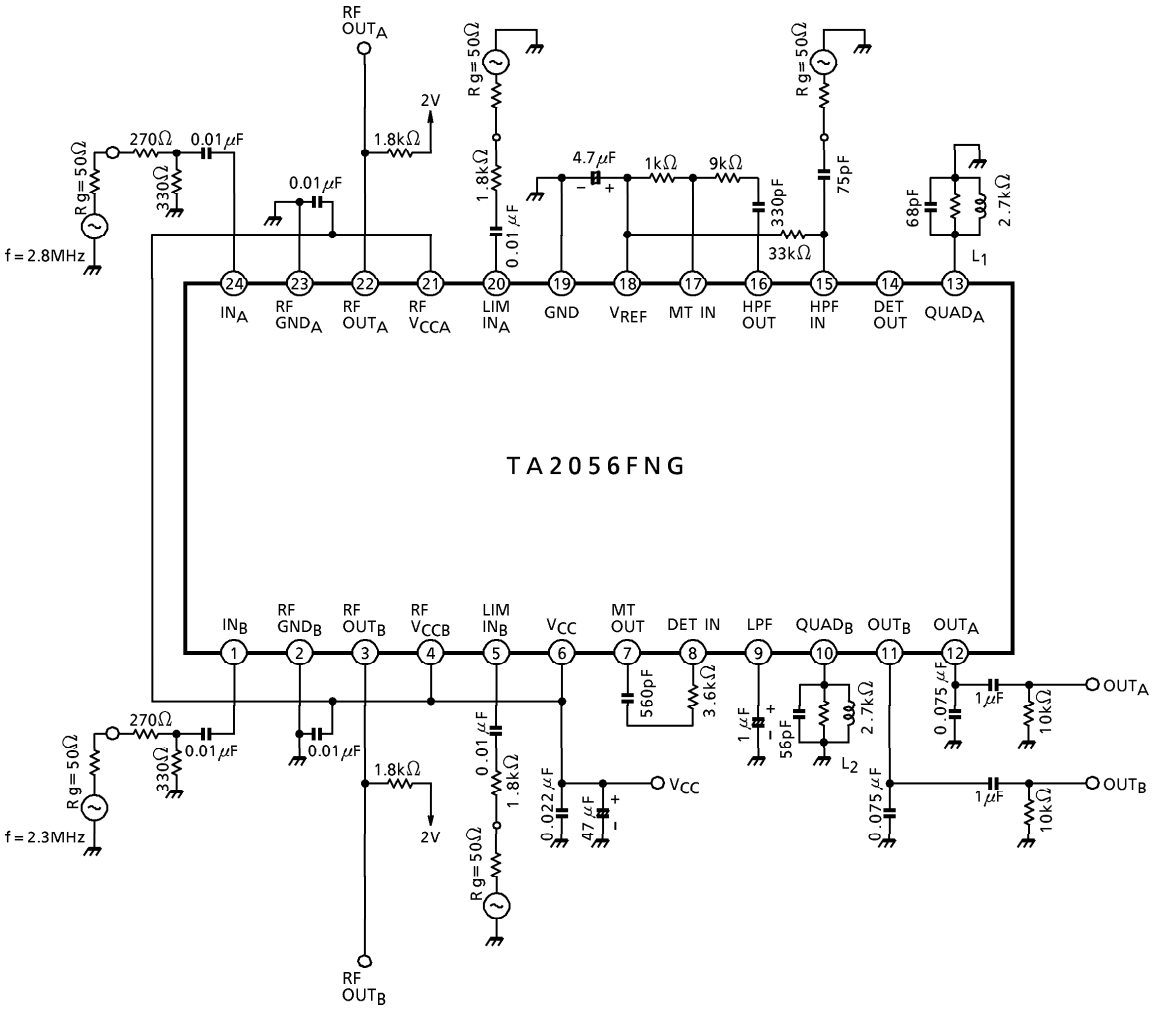
(Note) Derated above Ta = 25°C in the proportion of 4mW / °C.

ELECTRICAL CHARACTERISTICS

Unless otherwise specified : V_{CC} = 1.2V, Ta = 25°C
f = 2.3 / 2.8MHz, f_m = 1kHz, Δf = ±22.5kHz, V_{in} = 80dBμV EMF

	CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
	Supply Current	I_{CC}	—	V_{in} = 0	—	4.0	6.0	mA
	Reference Voltage	V_{REF}	—		0.65	0.75	0.85	V
Receiver Stage	RF Amp. Voltage Gain	G_V	—	V_{in} = 10mVrms	—	8	—	dB
	Recovered Output Voltage 1	V_{OD1}	—	f = 2.8MHz	27	45	63	mVrms
	Recovered Output Voltage 2	V_{OD2}	—	f = 2.3MHz	—	42	—	mVrms
	V_{OD} Channel Balance	CB	—	$V_{OD1} - V_{OD2}$	−1.4	+0.6	+2.6	dB
	Input Limiting Voltage	$V_{in\ (lim)}$	—	−3dB limiting point	40	45	50	dBμV EMF
	Total Harmonic Distortion	THD	—		—	0.2	—	%
	Signal to Noise Ratio	S / N	—	Δf = ±22.5kHz→0	—	56	—	dB
	AM Rejection Ratio	AMR	—	MOD = 30%	—	45	—	dB
	Cross Talk	CT	—		—	55	—	dB
Muting Stage	Muting Circuit Off Voltage	MT (OFF)	—	f = 100kHz, V_{OD} > −3dB	—	—	2	mVrms
	Muting Circuit On Voltage	MT (ON)	—	f = 100kHz, V_{OD} < −40dB	12	—	—	mVrms
	Muting Attenuation	ATT	—		—	65	—	dB

TEST CIRCUIT

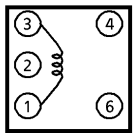


COIL DATA (Test circuit)

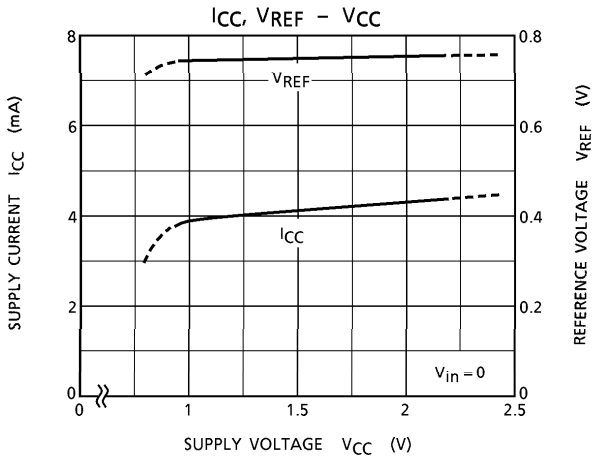
COIL NAME	TEST FREQ.	L (μH)	Q_0	TURNS 1-3	WIRE (mmϕ)	REFERENCE
L_1 DET	2.52MHz	35	70	59	0.06UEW	Ⓢ4165-JPS-047-6
L_2 DET	2.52MHz	60	65	74	0.06UEW	Ⓢ4165-JPS-047-11

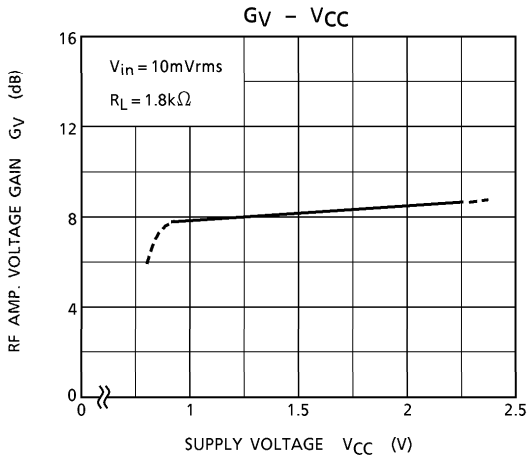
Ⓢ : SUMIDA ELECTRIC Co., LTD.

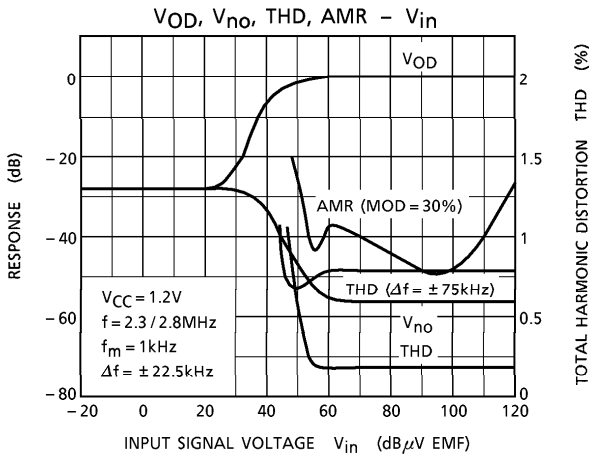
L_1, L_2

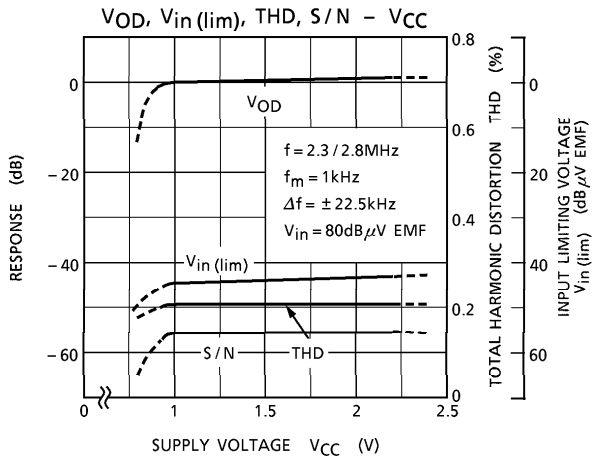


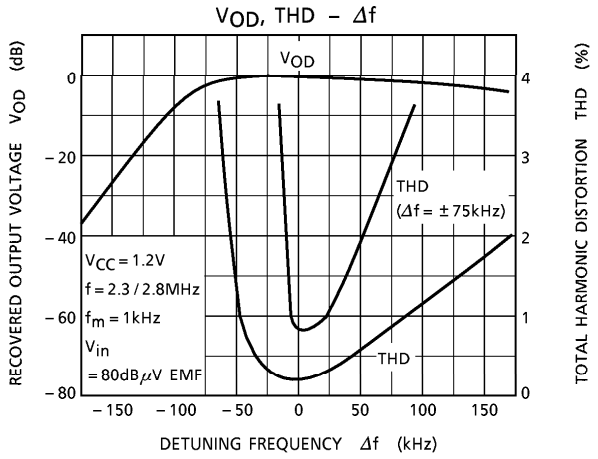
(BOTTOM VIEW)

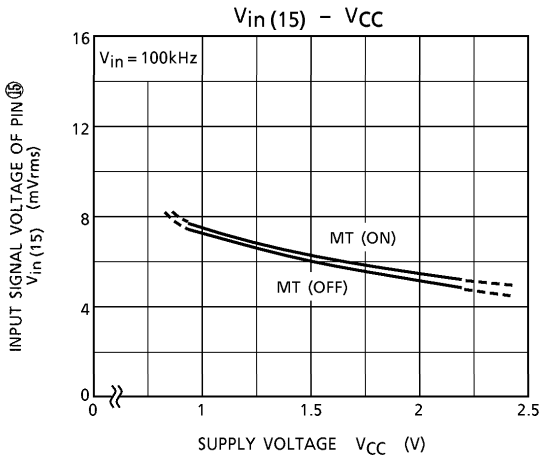

ICC, VREF – VCC
SUPPLY CURRENT ICC (mA)
REFERENCE VOLTAGE VREF (V)
VREF
ICC
Vin = 0
SUPPLY VOLTAGE VCC (V)


GV – VCC
RF AMP. VOLTAGE GAIN GV (dB)
Vin = 10mVrms
RL = 1.8kΩ
SUPPLY VOLTAGE VCC (V)

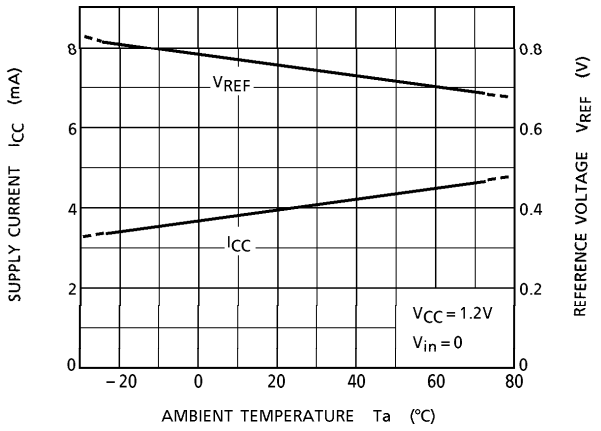

VOD, Vno, THD, AMR – Vin
RESPONSE (dB)
TOTAL HARMONIC DISTORTION THD (%)
VOD
AMR (MOD = 30%)
THD (Δf = ±75kHz)
Vno
THD
VCC = 1.2V
f = 2.3 / 2.8MHz
fm = 1kHz
Δf = ±22.5kHz
INPUT SIGNAL VOLTAGE Vin (dBμV EMF)


VOD, Vin (lim), THD, S / N – VCC
RESPONSE (dB)
TOTAL HARMONIC DISTORTION THD (%)
INPUT LIMITING VOLTAGE Vin (lim) (dBμV EMF)
VOD
f = 2.3 / 2.8MHz
fm = 1kHz
Δf = ±22.5kHz
Vin = 80dBμV EMF
Vin (lim)
S / N
THD
SUPPLY VOLTAGE VCC (V)

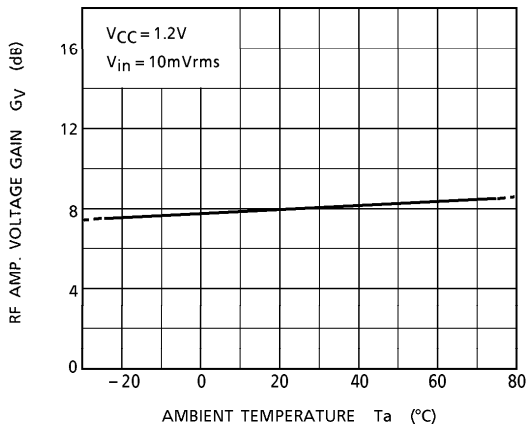

VOD, THD – Δf
RECOVERED OUTPUT VOLTAGE VOD (dB)
TOTAL HARMONIC DISTORTION THD (%)
VOD
THD
(Δf = ±75kHz)
THD
VCC = 1.2V
f = 2.3 / 2.8MHz
fm = 1kHz
Vin
= 80dBμV EMF
DETUNING FREQUENCY Δf (kHz)


Vin (15) – VCC
INPUT SIGNAL VOLTAGE OF PIN (15) Vin (15) (mVrms)
Vin = 100kHz
MT (ON)
MT (OFF)
SUPPLY VOLTAGE VCC (V)

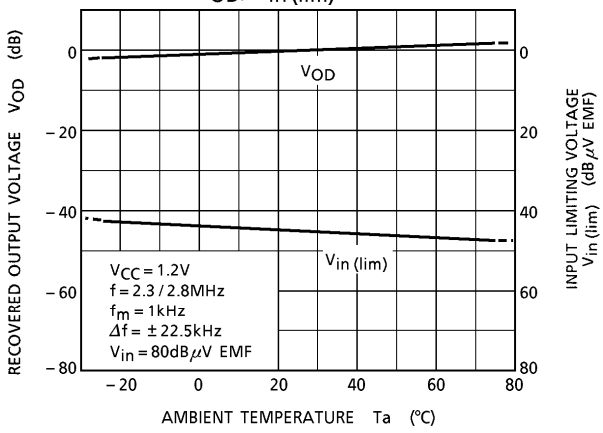
I_{CC}, V_{REF} – Ta



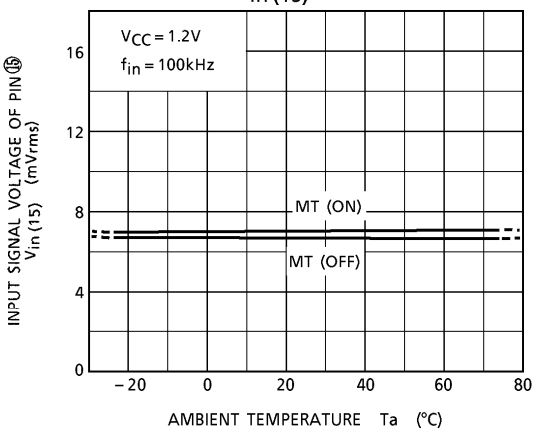
G_V – Ta



V_{OD}, $V_{in\,(lim)}$ – Ta

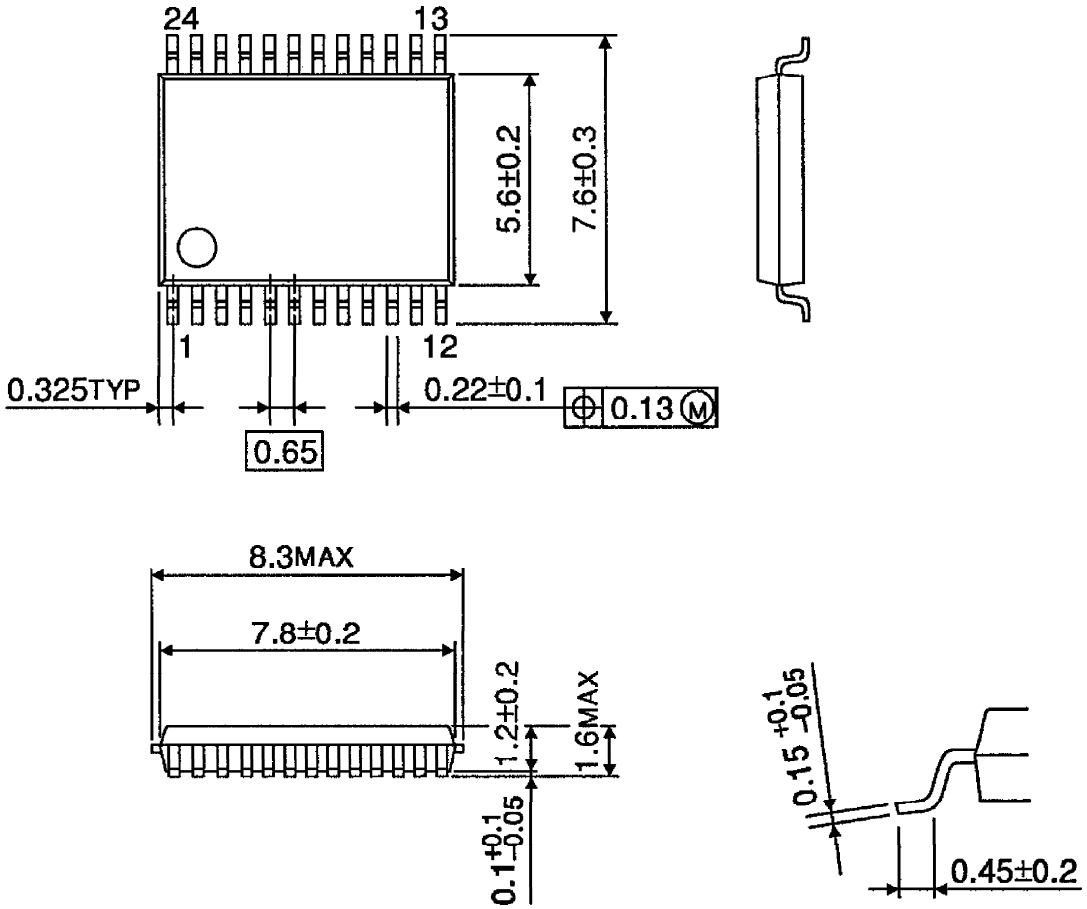


$V_{in\,(15)}$ – Ta



PACKAGE DIMENSIONS

SSOP24-P-300-0.65A Unit : mm



Weight : 0.14g (Typ.)

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060116EBA

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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