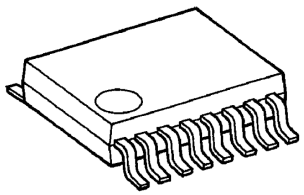
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA8187AFN

1.5V Dual FM IF



SSOP16-P-225-0.65B

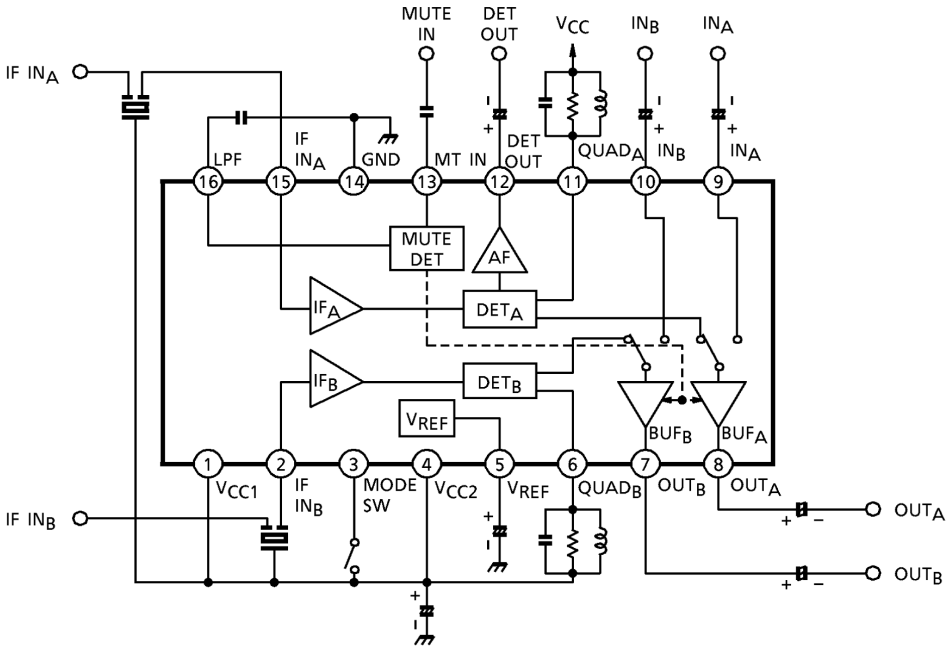
Weight: 0.09g (typ.)

The TA8187AFN is dual FM IF system IC, developed for headphone stereo etc.
It is built in dual FM IF systems, dual buffer amplifiers and soft muting function etc.

Features

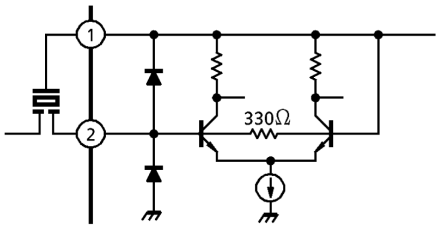
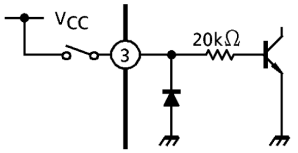
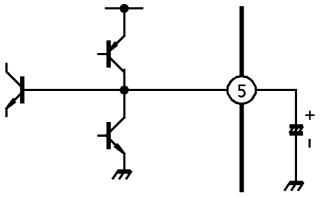
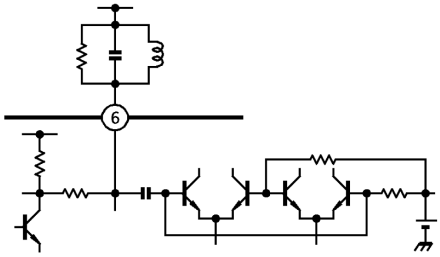
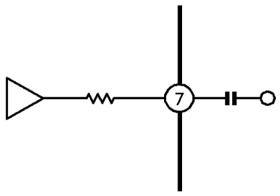
- Built−in dual FM IF systems
- Built−in dual buffer amplifiers
- Built−in soft muting function (only dual IF mode)
  ATT = 21dB (typ.)
- Low supply current (V_{CC} = 1.2V, Ta = 25°C)
  Single IF mode: 2.8mA (typ.)
  Dual IF mode: 3.2mA (typ.)
- Built−in mode switch
- Output of buffer amplifier is high−impedance in power off mode.
- Operating supply voltage range (typ.)
  $V_{CC\ (opr)}$ = 0.95~2.2V

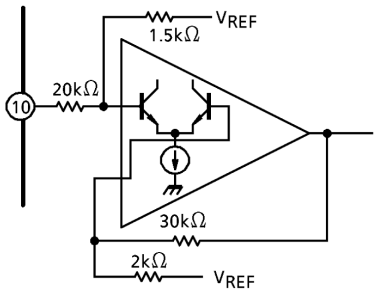
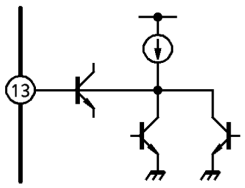
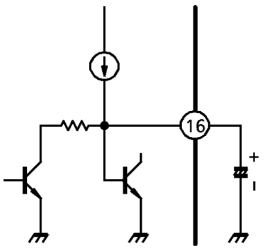
Block Diagram



Terminal Explanation

Terminal Voltage: Typical Terminal Voltage with Test Circuit (V_{CC} = 1.2V, Ta = 25°C)

Terminal No.	Name	Function	Internal Circuit	Terminal Voltage (V)
1	V_{CC1}	V_{CC}, for IF amplifier		1.2
2	IF IN_B	Input of IF amplifier ・Input impedance: 330Ω (typ.)		1.2
15	IF IN_A			
3	Mode SW	Mode switch V_{CC}: Single IF mode GND / OPEN: Dual IF mode		—
4	V_{CC2}	V_{CC}, except V_{CC1}	—	1.2
5	V_{REF}	Reference circuit		0.75
6	$QUAD_B$	QUAD detector circuit ・DET coil should be connected with V_{CC}.		1.2
11	$QUAD_A$			
7	OUT_B	Output of audio signal ・Output impedance: 1kΩ (typ.)		0.6
8	OUT_A			
12	DET OUT	Detector output ・This output level is recovered output voltage of the signal is applied to the terminal of IF IN_A. It isn't under the influence of mode switch condition. ・Output impedance: 1kΩ (typ.)		0.6

Termi–nal No.	Name	Function	Internal Circuit	Terminal Voltage (V)
9	IN_A	Input of audio signal ・Input impedance : 21.5kΩ (typ.)		0.75
10	IN_B			
13	MT IN	Input of muting signal		0.7
14	GND	—	—	0
16	LPF	Smoothing circuit of soft muting		0.7

Application Note

1. Mode SW (pin(3))
   - It is necessary to connect an external pull–down resistor with the terminal of mode SW (pin(3)), in case that this IC mode doesn't operate normally due to external noise etc.
   - Reducing a pop sound
     It is advised to connect R1, R2 and C with the terminal of mode SW (pin(3)), to reduce a pop sound is switchover between single IF mode and dual IF mode (see Fig.1).
     It is better that the constants are R1≒R2≒100kΩ, C≒1μF at V_{CC} = 1.2V. As for the constants, select the optimum one depending on each a set carefully.
   - Operating amplifier etc. is decided by condition of mode switch.
     It is as follows.

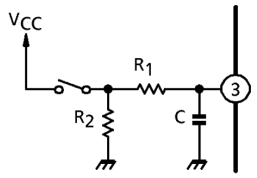


Fig.1 Mode switch circuit reducing a pop sound

	Input Terminal	Output Terminal	Operating amp.
Dual IF mode	IF IN_A (pin(15))	OUT_A (pin(8)) DET OUT (pin(12))	IF_A, BUF_A AF
	IF IN_B (pin(2))	OUT_B (pin(7))	IF_B, BUF_B
Single IF mode	IF IN_A (pin(15))	DET OUT (pin(12))	IF_A, AF
	IN_A (pin(9))	OUT_A (pin(8))	BUF_A
	IN_B (pin(10))	OUT_B (pin(7))	BUF_B

Table 1 Operating amplifier etc. by mode switch condition

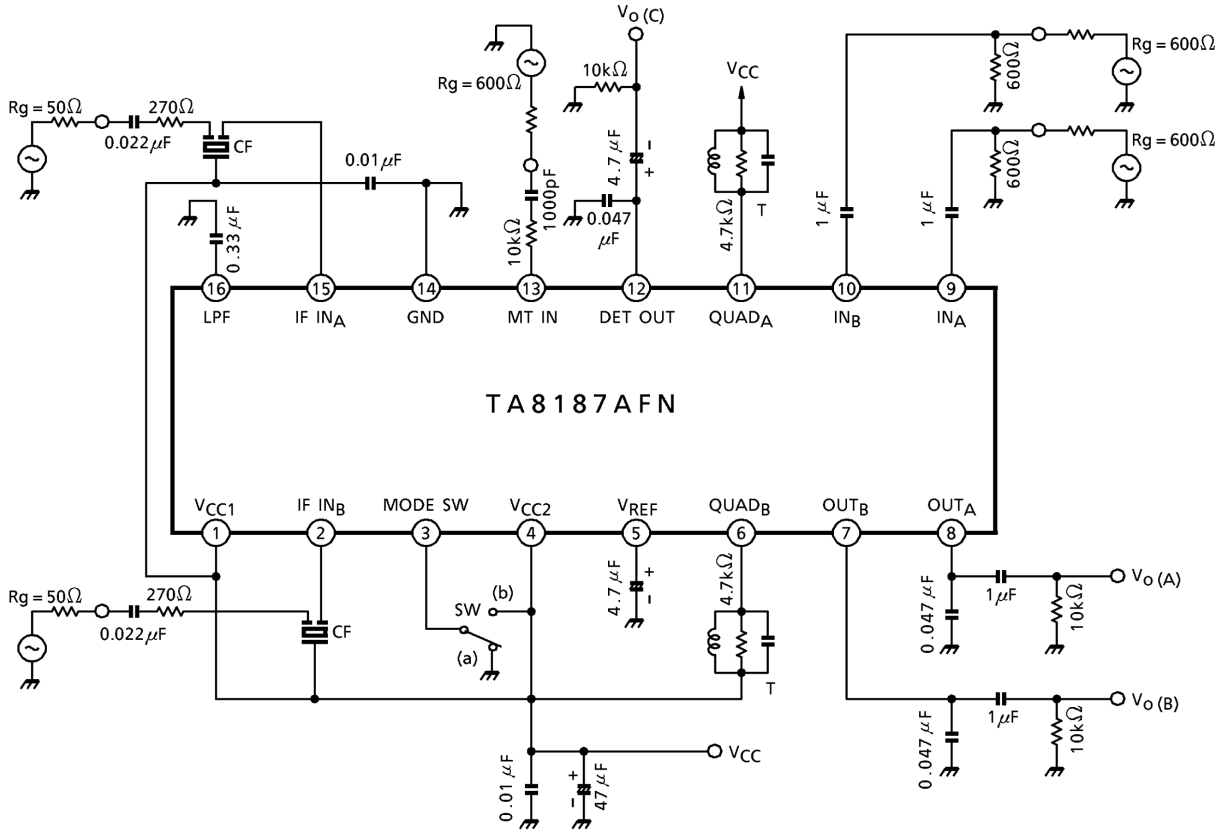
2. IF in (pin(2)(15))
   External parts (ceramic filter etc.) of IF amplifier should be connected V_{CC1} terminal with common terminal of external parts, because IF amplifier circuits operate on V_{CC1} voltage.
   In case that these external parts are connected with GND reference etc., there is a possibility that this circuit doesn't operate normally at large signal input.
3. In case that the muting function isn't used.
   In case that the muting function isn't used, the terminal of MT in (pin(13)) and LPF (pin(16)) should be opened.
   In case that these terminal connected with V_{CC} or GND, internal circuit doesn't operate normally.
   It is necessary to connect an external capacitor (C = 0.01μF) with the terminal of MT in (pin(13)) and LPF (pin(16)), in case that the muting function operates due to external noise etc.
4. Input of audio signal
   The audio signal should be applied to the terminal of IN_A (pin(9)) or IN_B (pin(10)) through a coupling capacitor because buffer amplifier is operated by V_{REF}.
   In case that DC current or DC voltage is applied to the terminal of IN_A (pin(9)) or IN_B (pin(10)), the internal circuit has unbalance and buffer amplifier doesn't operate normally.

Electrical Characteristics

(unless otherwise specified, V_{CC} = 1.2V, Ta = 25°C
FM IF / muting stage f = 10.7MHz, f_m = 1kHz, Δf = ±22.5kHz, V_{in} = 80dBμV EMF, SW: a
audio stage f = 1kHz, R_L = 10kΩ, SW: b)

Characteristic		Symbol	Test Cir–cuit	Test Condition		Min.	Typ.	Max.	Unit
Supply current 1		I_{CC1}	—	Single IF mode, V_{in} = 0, SW: b		—	2.8	4.2	mA
Supply current 2		I_{CC2}	—	Dual IF mode, V_{in} = 0, SW: a		—	3.2	4.8	mA
Reference voltage		V_{REF}	—			0.65	0.75	0.85	V
FM IF stage	Recovered output voltage 1	V_{OD1}	—			30	45	65	mV_{rms}
	V_{OD} channel balance	CB1	—			–2	0	+2	dB
	Recovered output voltage 2	V_{OD2}	—			—	45	—	mV_{rms}
	Input limiting voltage	$V_{in\ (lim)}$	—	–3dB limiting point		—	54	59	dBμV EMF
	$V_{in\ (lim)}$ channel balance	CB2	—			—	0	—	dB
	Total harmonic distortion 1	THD1	—			—	0.2	—	%
	Signal to noise ratio 1	S / N1	—	Δf = ±22.5kHz→0		—	58	—	dB
	AM rejection ratio	AMR	—	MOD = 30%		—	36	—	dB
	Cross talk	CT1	—			—	53	—	dB
	Recovered output voltage 3	V_{OD3}	—			30	45	65	mV_{rms}
	Total harmonic distortion 2	THD2	—			—	0.2	—	%
	Signal to noise ratio 2	S / N2	—	Δf = ±22.5kHz→0		—	58	—	dB
	Audio amplifier attenuation	ATT1	—	V_o = –22dBV, SW: b→a		—	62	—	dB
Audio stage	Voltage gain	G_V	—	V_o = –22dBV		–2.3	–0.3	+1.7	dB
	G_V channel balance	CB3	—	V_o = –22dBV		–2	0	+2	dB
	Maximum output voltage	V_{om}	—	THD = 1%		180	310	—	mV_{rms}
	Total harmonic distortion	THD3	—	V_o = –22dBV		—	0.1	—	%
	Cross talk	CT2	—	V_o = –22dBV		—	74	—	dB
	Output noise voltage	V_{no}	—	R_g = 600Ω, BW = 20Hz~20kHz		—	14	—	$μV_{rms}$
	FM IF attenuation	ATT2	—	0dB = V_{OD} level, SW: a→b		—	70	—	dB
Muting stage	Muting off voltage	MT (OFF)	—	f = 60kHz, V_{OD} > 3dB		—	—	30	mV_{rms}
	Muting on voltage	MT (ON)	—	f = 60kHz, V_{OD} < 15dB		90	—	—	mV_{rms}
	Muting attenuation	ATT3	—			—	21	—	dB
Single IF mode on current		I_3	—	V_{CC} = 0.95V	V_o > –42dBV	5	—	—	μA
Dual IF mode on voltage		V_3	—	V_{in} = –32dBV	V_o < –52dBV	0	—	0.3	V

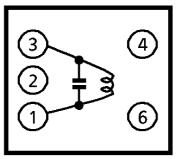
Test Circuit



CF: SFE10.7MA5–A (MURATA)

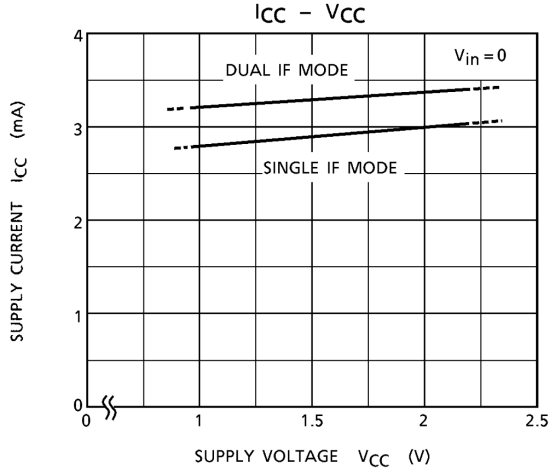
Coil Data: T

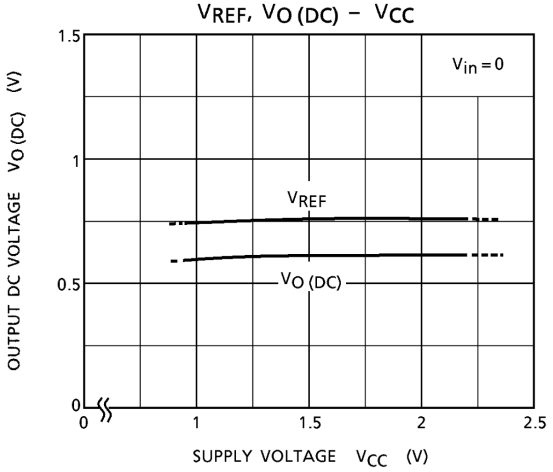
Test Frequency	C_o (pF)	Q_0	Turn 1–3	Wire (mmϕ)	Reference
10.7MHz	82	60	13	0.07UEW	4162–080 SUMIDA ELECTRIC Co., Ltd.

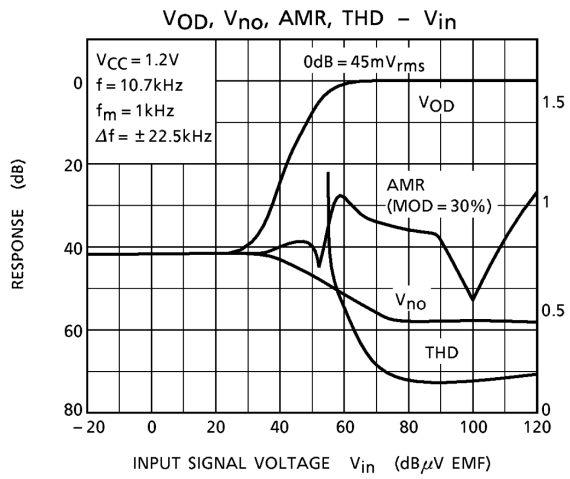


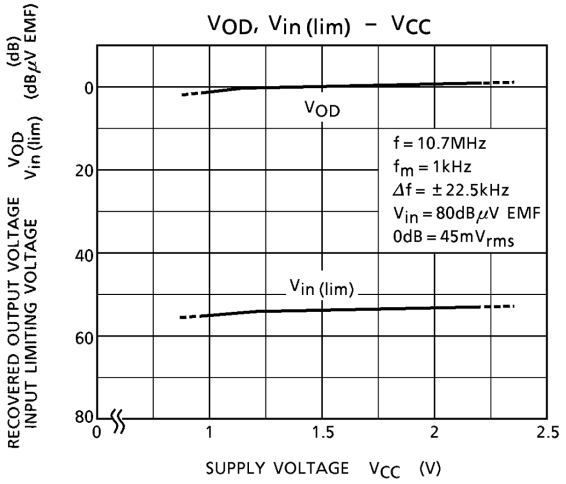
(Bottom of view)

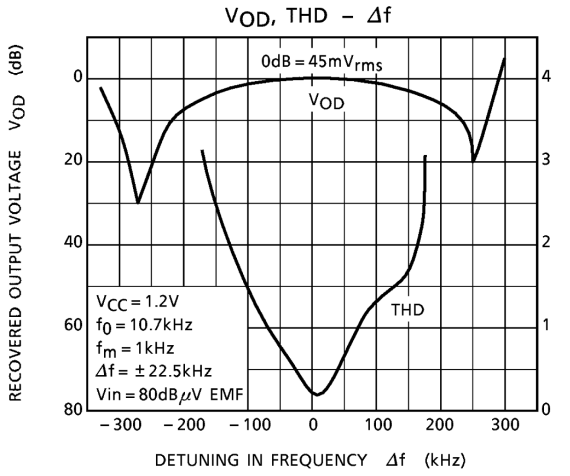
Characteristic Curves

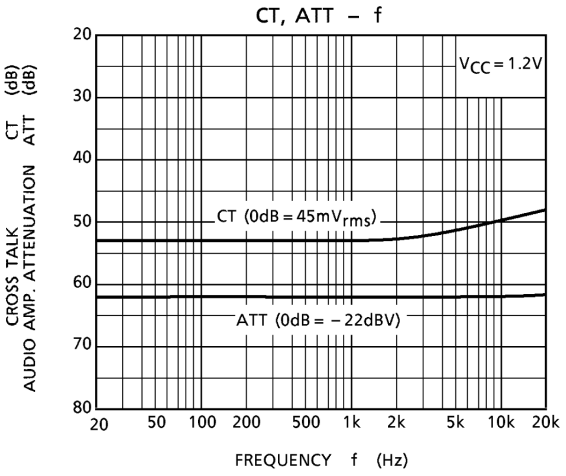




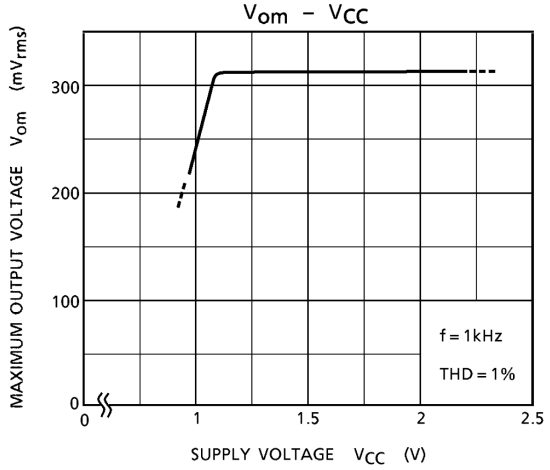




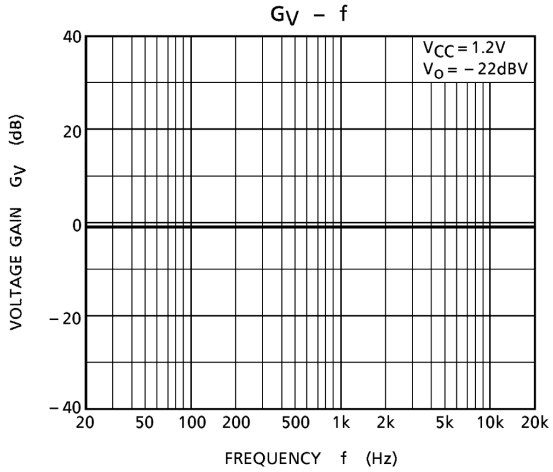




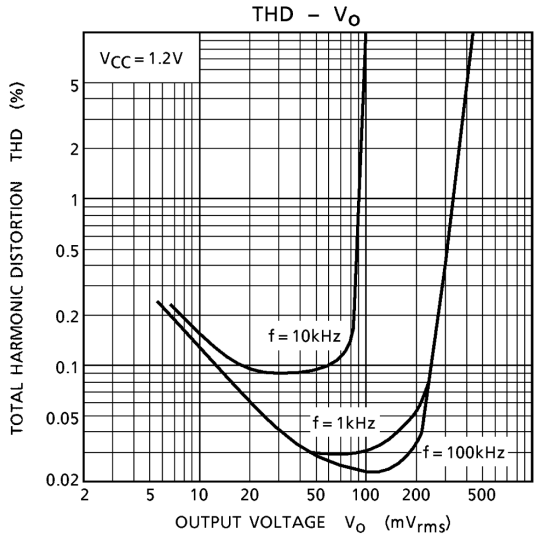
V_{om} – V_{CC}



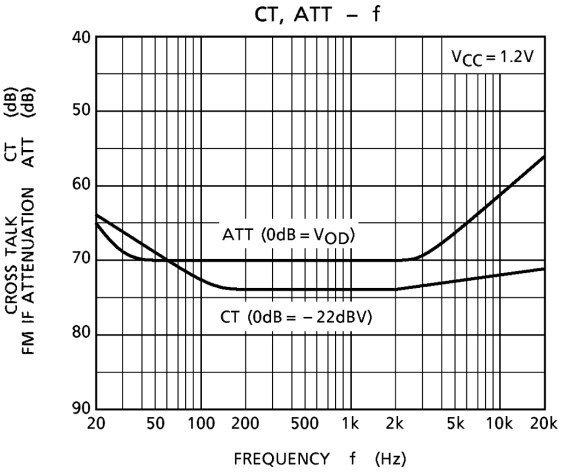
G_V – f



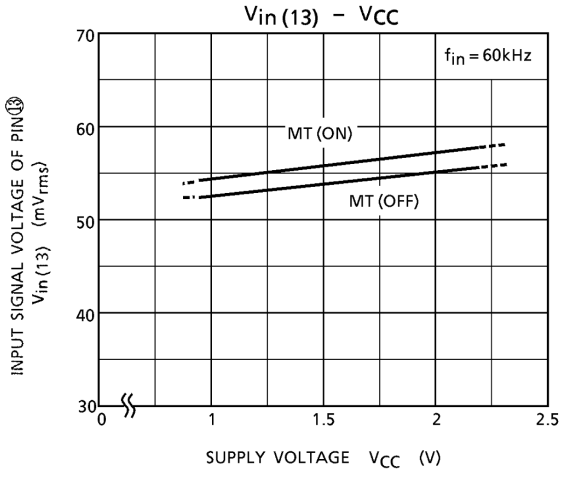
THD – V_o



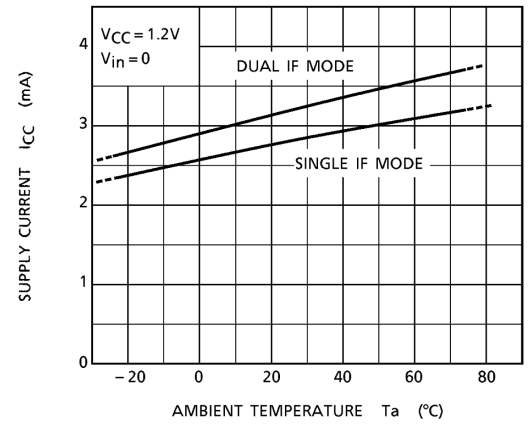
CT, ATT – f



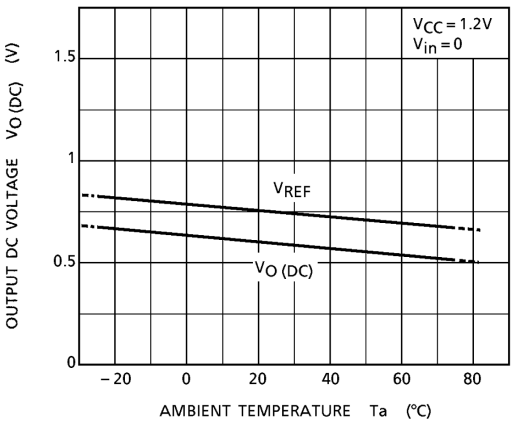
$V_{in\,(13)}$ – V_{CC}



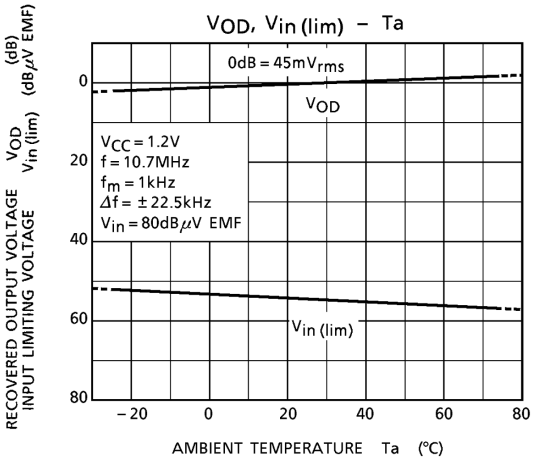
I_{CC} – Ta



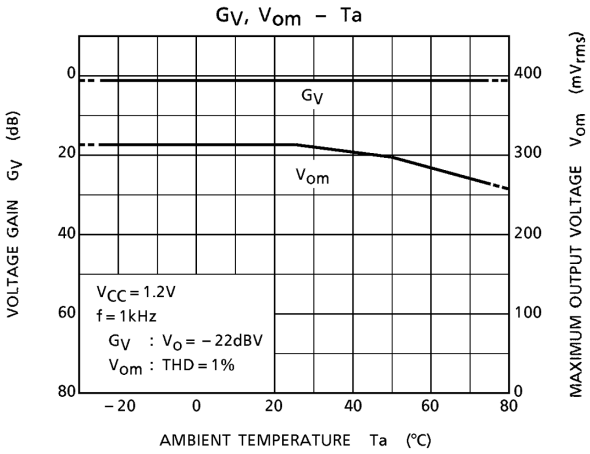
V_{REF}, $V_{O\,(DC)}$ – Ta



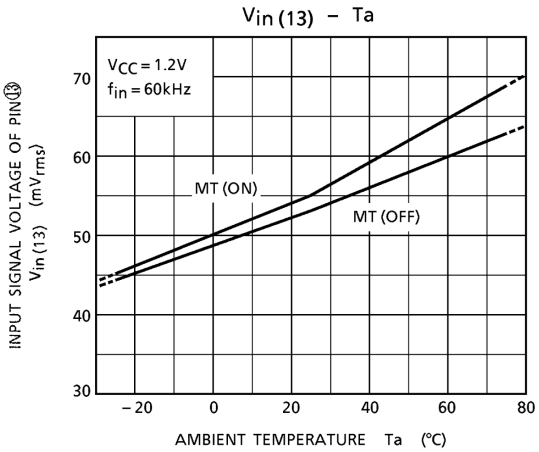
V_{OD}, $V_{in\,(lim)}$ – Ta



G_V, V_{om} – Ta

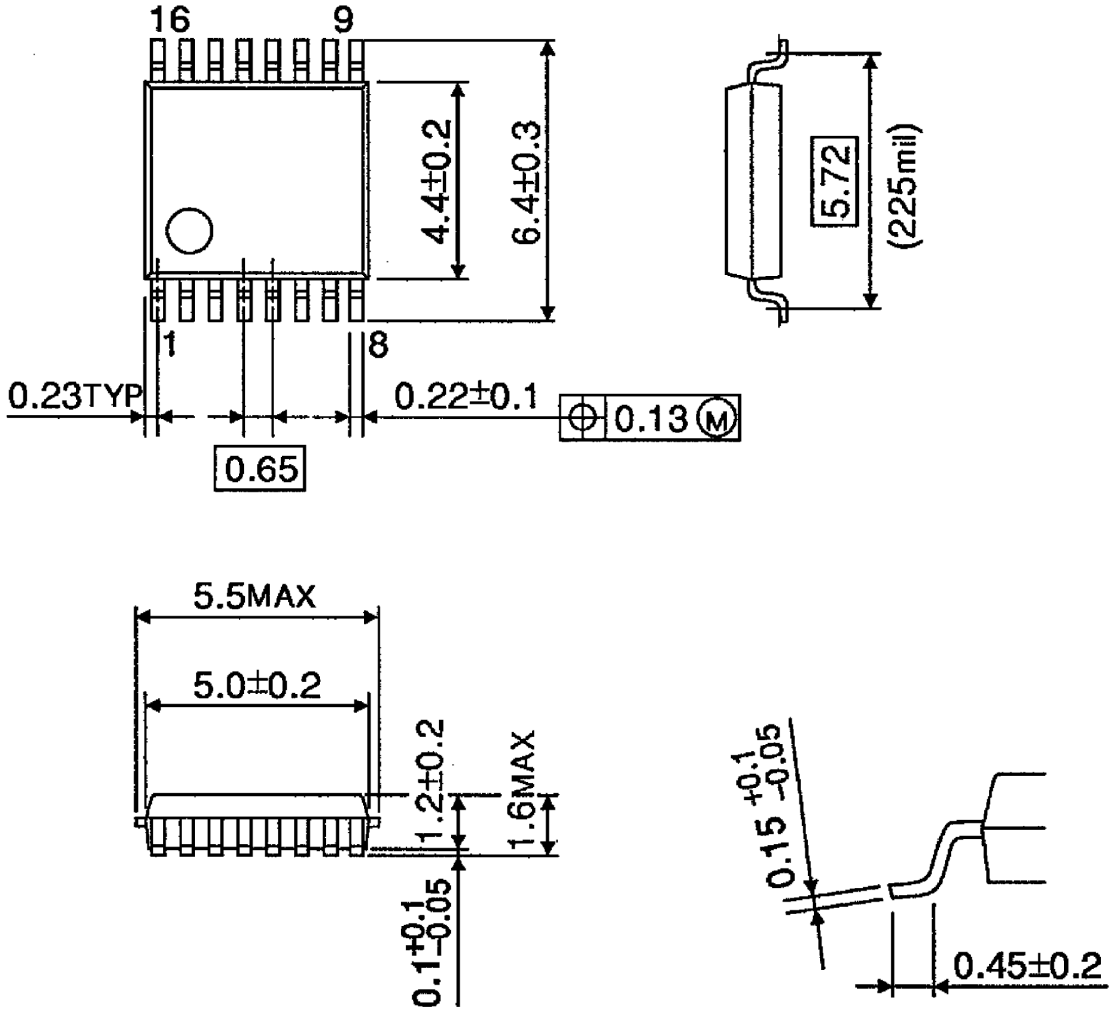


$V_{in\,(13)}$ – Ta



Package Dimensions

SSOP16-P-225-0.65B Unit : mm



Weight: 0.09g (typ.)

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000707EBA

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