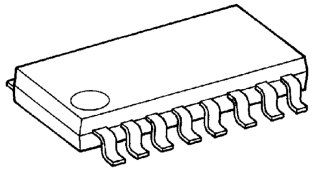
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA2062F

5 Band Graphic Equalizer

TA2062F is 5−band graphic equalizer IC, which have 5 resonance circuit and an output buffer amplifier.
5 band graphic equalizer for one channel can be formed easily by externally connecting capacitors and variable resistors which fix f_0 (resonance frequency).
This is suitable for sound field control of car audio system.



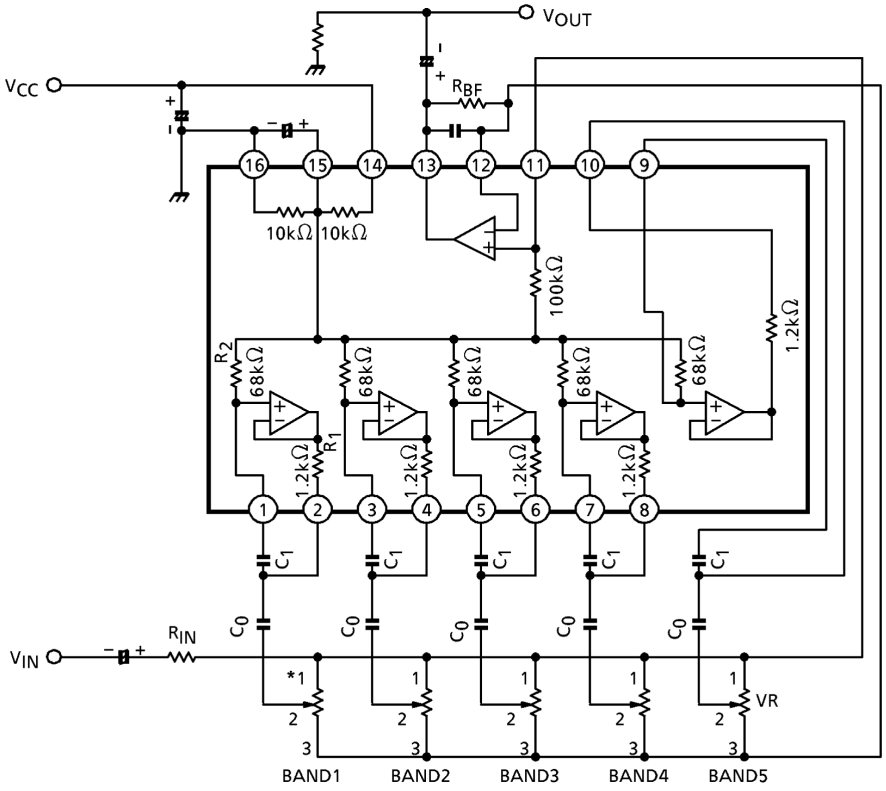
SSOP16-P-225-1.00A

Weight: 0.14g (typ.)

Features

- Few external parts
- Boost / cut control range: ±12dB
- Low distortion
  : THD = 0.001% (typ.)
  (V_{CC} = 8V, f = 1.1kHz, V_{IN} = 1V_{rms}, flat)
- Low noise
  : V_{NO} =3μV_{rms}
  (V_{CC} = 8V, R_g =0Ω, flat, BW = 20Hz~20kHz)
- Low harmonic distortion at boost or cut mode
  : 2nd and 3rd harmonic distortion are:
  2HD, 3HD ≤ 0.01% (typ.)
  (V_{CC} = 8V, V_{IN} = 1V_{rms}, ±6dB boost or cut, f = 20Hz~20kHz)
- Maximum output voltage
  : V_{OM} = 2.3V_{rms} (typ.)
  (V_{CC} = 8V, f = 1.1kHz, THD = 1%, flat)
- Operating supply voltage range
  : $V_{CC\ (opr)}$ = 4~16V (Ta = 25°C)

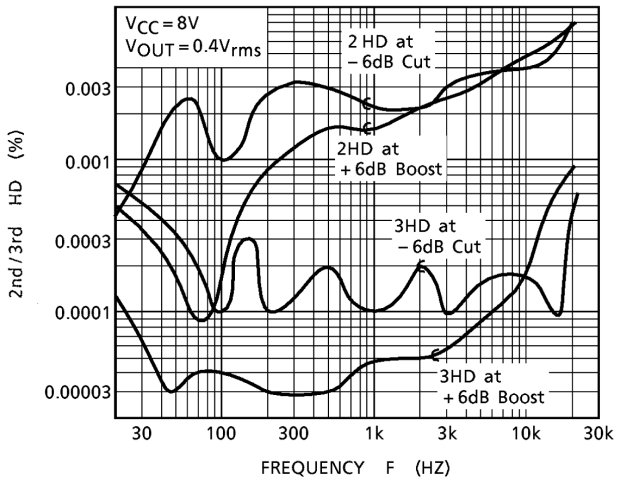
Block Diagram



*1: Cut 2: Flat 3: Boost

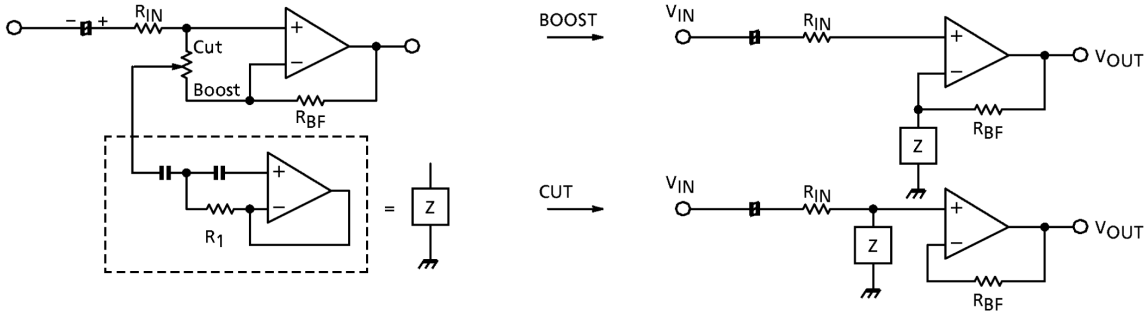
1. (2nd and 3rd) harmonic distortion at 6dB boost or cut mode

This IC is desiged the 2nd and 3rd harmonic distortion are less than 0.01% at 6dB boost or cut between 20Hz and 20kHz.



(Fig-1)

2. Adjustment of boost and cut amount



(Fig-2)

Boost and cut amount are decided as below.

$$\text{Boost: } G_{V\,(BOOST)} = \frac{R_{BF} + Z}{Z} \left(\simeq \frac{R_{BF} + R_1}{R_1} \right)$$

$$\text{Cut: } G_{V\,(CUT)} = \frac{Z}{R_{IN} + Z} \left(\simeq \frac{R_1}{R_{IN} + R_1} \right)$$

It must be adjusted $R_{BF} = R_{IN}$ if boost amount is same as cut amount.
In case signal source resistance R_g is large enough, it is necessary to be set $R_{BF} = R_{IN} + R_g$.

Maximum Ratings

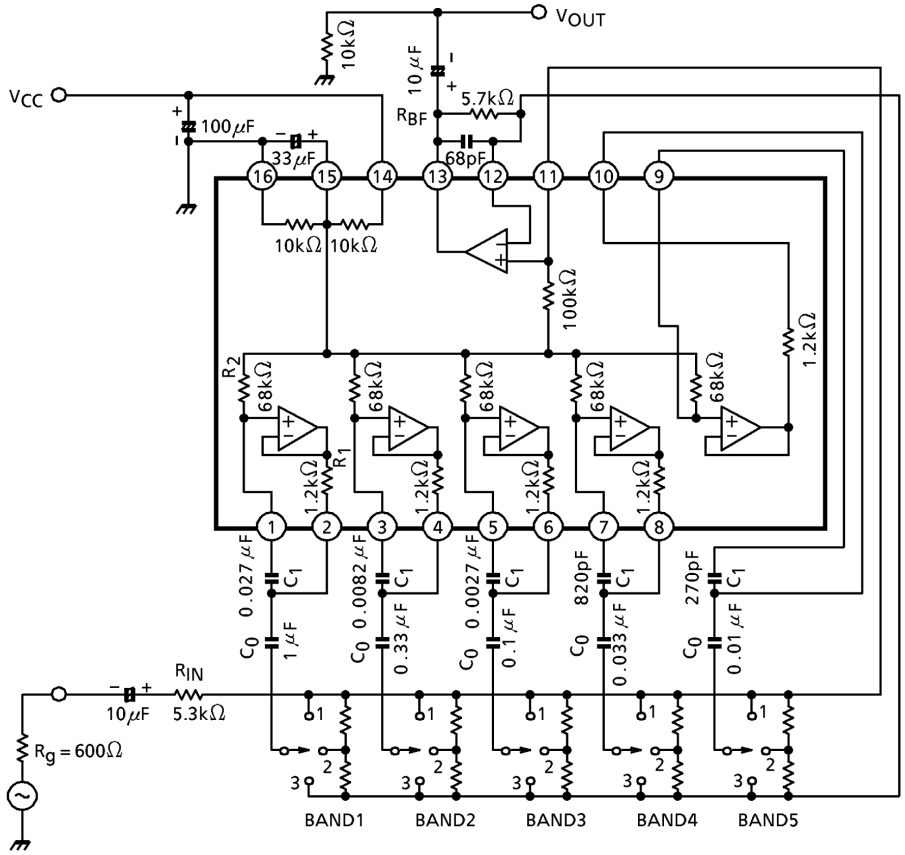
Characteristic	Symbol	Rating	Unit
Supply voltage	V_{CC}	16	V
Power dissipation	P_D	350	mW
Operation temperature	T_{opr}	−40~85	°C
Storage temperature (Note)	T_{stg}	−55~150	°C

(Note) Derated above Ta = 25°C in the proportion of 2.8mW / °C

Electrical Characteristics
(unless otherwise specified, V_{CC} = 8V, f = 1.1kHz, RL = 10kΩ, Ta = 25°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min.	Typ.	Max.	Unit
Quiescent current	I_{ccq}	—	V_{IN} = 0	—	9	15	mA
Voltage gain	G_V (FLAT)	—	V_{OUT} = 1V_{rms}	−1.5	0	+1.5	dB
	G_V (BST)	—	V_{OUT} = 1V_{rms}, f = 110Hz	10	12	14	
		—	V_{OUT} = 1V_{rms}, f = 340Hz	10	12	14	
		—	V_{OUT} = 1V_{rms}, f = 1.1kHz	10	12	14	
		—	V_{OUT} = 1V_{rms}, f = 3.4kHz	10	12	14	
		—	V_{OUT} = 1V_{rms}, f = 11kHz	10	12	14	
	G_V (BST)	—	V_{OUT} = 1V_{rms}, f = 110Hz	−14	−12	−10	
		—	V_{OUT} = 1V_{rms}, f = 340Hz	−14	−12	−10	
		—	V_{OUT} = 1V_{rms}, f = 1.1kHz	−14	−12	−10	
		—	V_{OUT} = 1V_{rms}, f = 3.4kHz	−14	−12	−10	
			V_{OUT} = 1V_{rms}, f = 11kHz	−14	−12	−10	
Total harmonic distortion	THD (FLT)		V_{OUT} = 1V_{rms}	—	0.001	0.01	%
Output noise voltage	V_{NO} (FLT)		R_g = 620Ω, V_{IN} = 0 BW = 20Hz~20kHz	—	3	8	μV_{rms}
Maximum output voltage	V_{OM}		THD = 1%	1.8	2.3	—	V_{rms}

Test Circuit

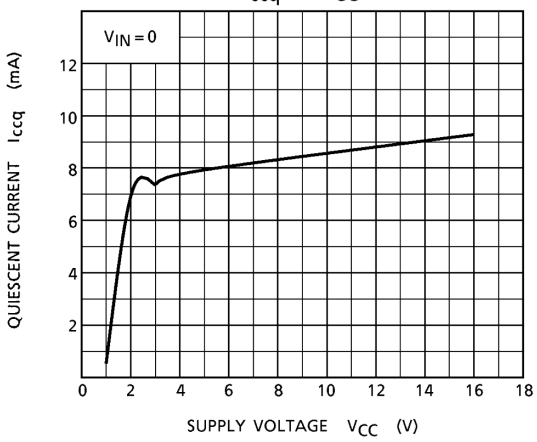


- Fixed $R_{BF} \simeq (R_{IN} + R_g)$ to be same as boost and cut amount.
- At each band:
  1: Cut 2: Flat 3: Boost
- f_o (resonance frequency)

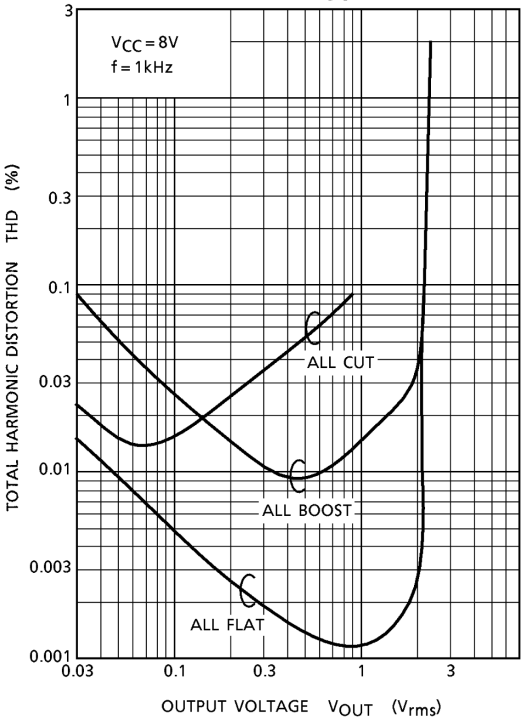
$$f_o = \frac{1}{2\pi\sqrt{C_0 \cdot C_1 \cdot R_1 \cdot R_2}} \quad (R_1 = 1.2k\Omega,\ R_2 = 68k\Omega \text{ on chip resistor})$$

Band	1	2	3	4	5
C_0 (F)	1μ	0.33μ	0.1μ	0.033μ	0.01μ
C_1 (F)	0.027μ	0.0082μ	0.0027μ	820p	270p
f_o (Hz)	107	340	1.07k	3.40k	10.7k

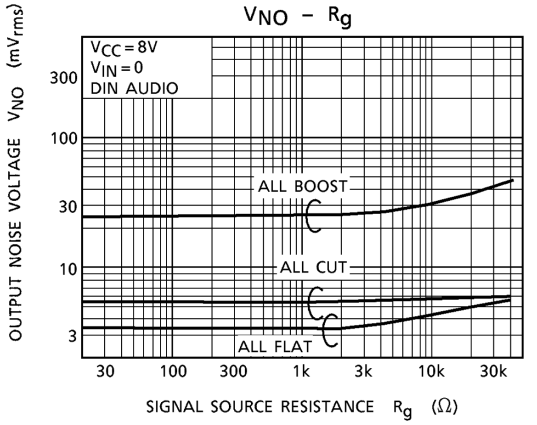
I_{ccq} – V_{CC}



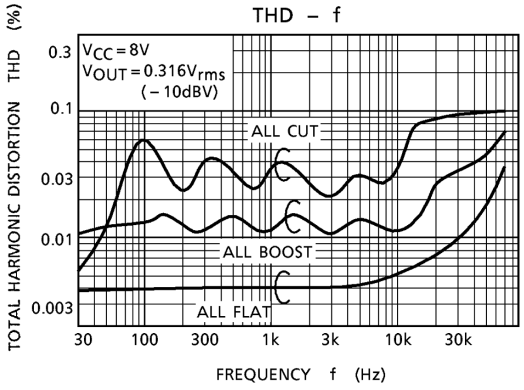
THD – V_{OUT}



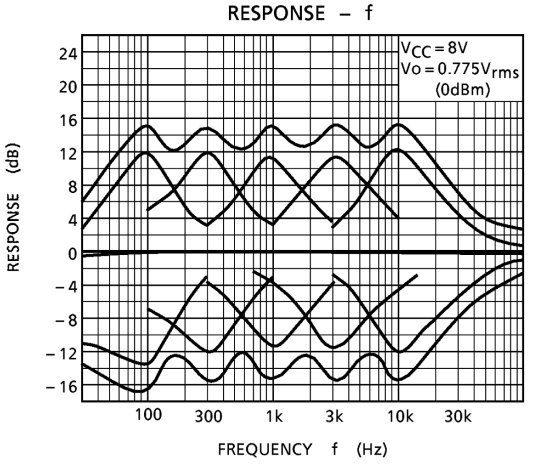
V_{NO} – R_g



THD – f

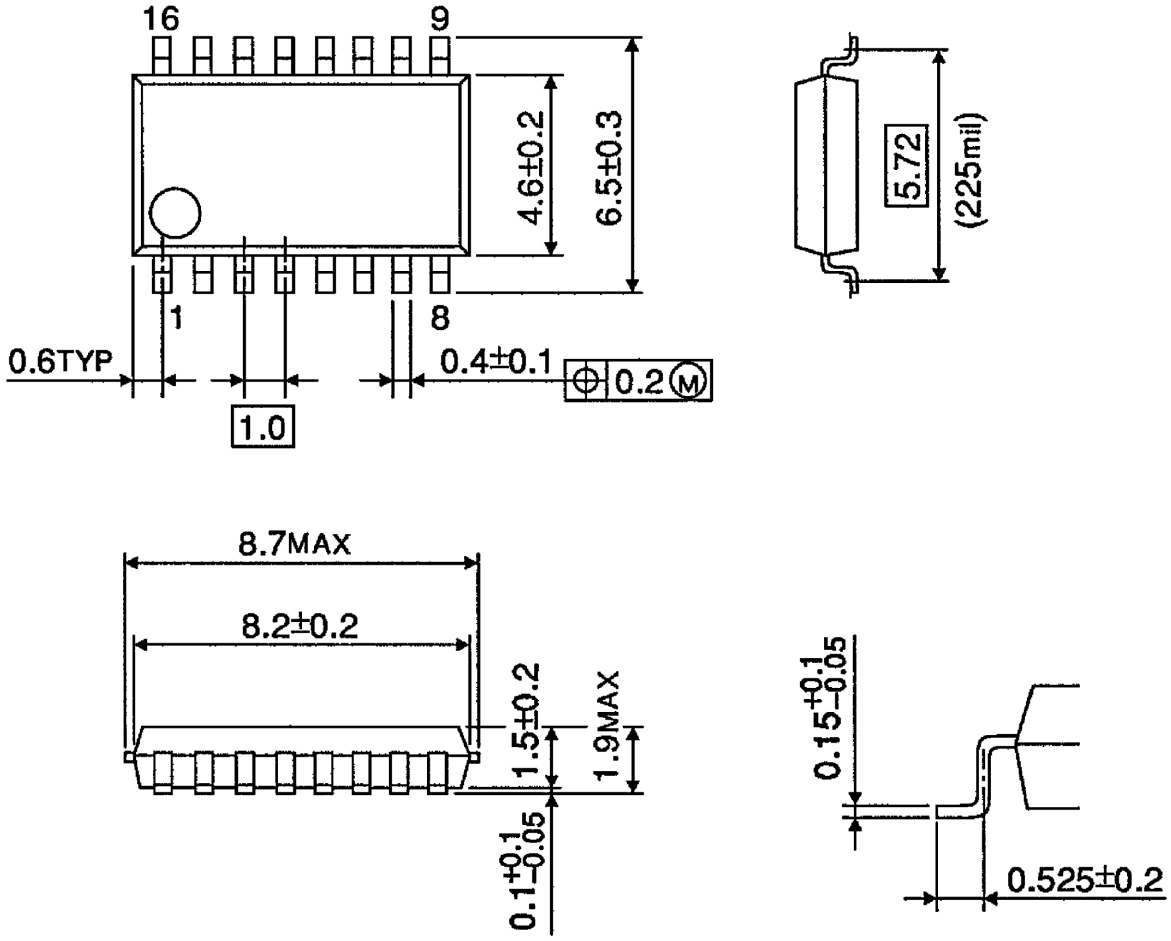


RESPONSE – f



Package Dimensions

SSOP16-P-225-1.00A Unit : mm



Weight: 0.14g (typ.)

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