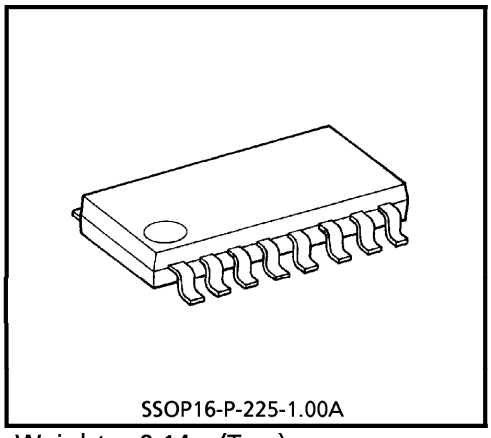
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

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.



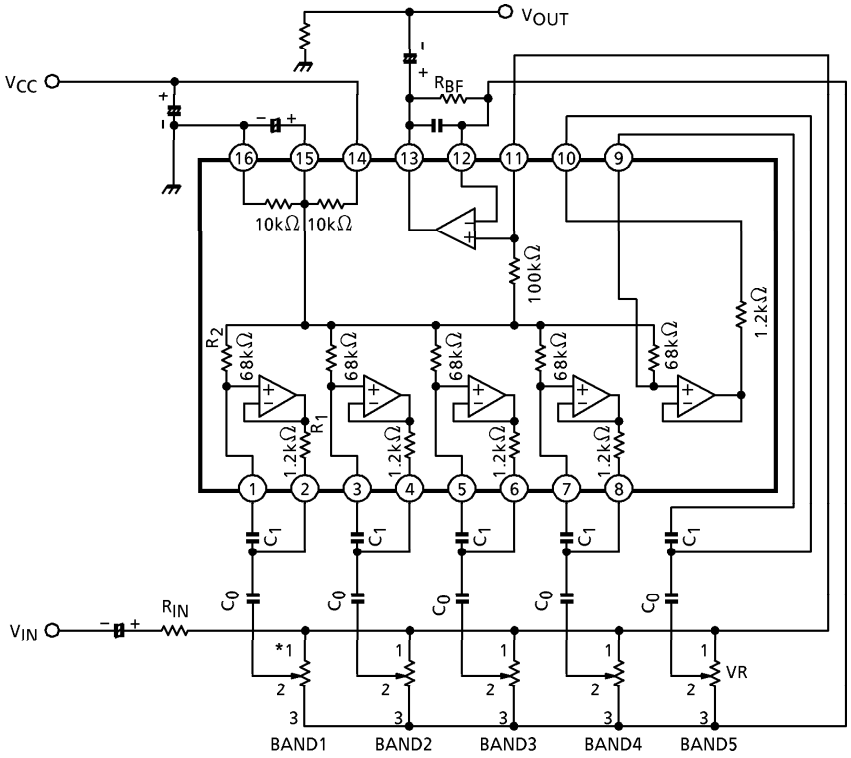
SSOP16-P-225-1.00A

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)

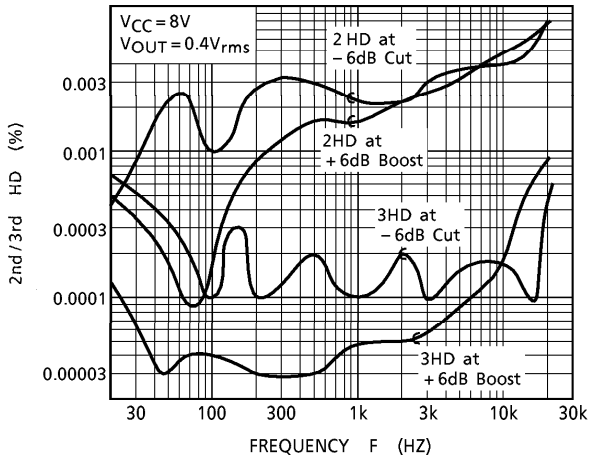
BLOCK DIAGRAM



*1 : CUT 2 : FLAT 3 : BOOST

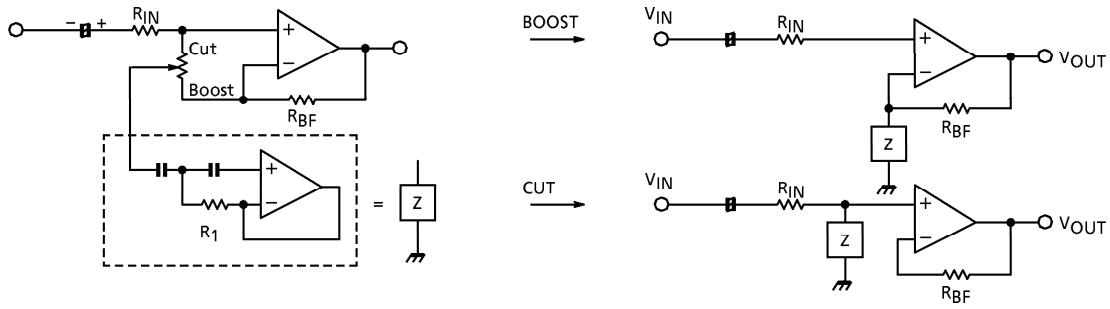
1. (2ND AND 3RD) HARMONIC DISTORTION AT 6dB BOOST OR CUT MODE

This IC is designed 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.

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

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

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

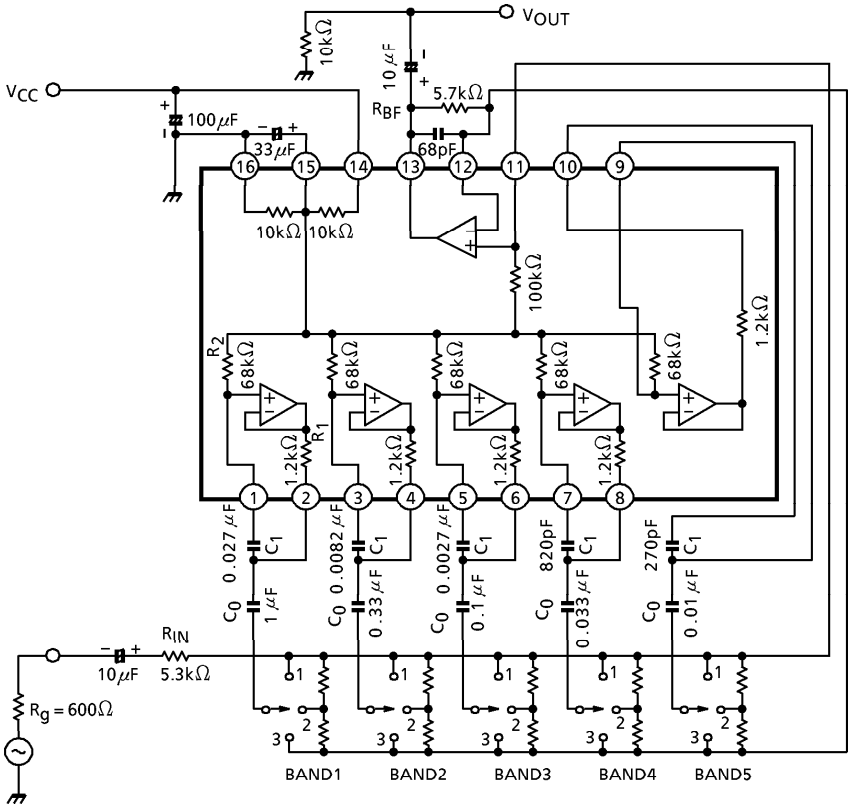
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	16	V
Power Dissipation	P_D	350	mW
Operating Temperature	T_{opr}	−40~85	°C
Storage Temperature (Note)	T_{stg}	−55~150	°C

(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 CIR-CUIT	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 (CUT)	—	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



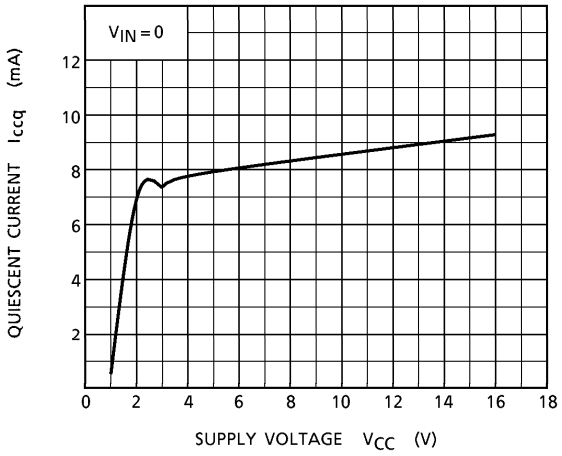
- Fixed $R_{BF} \simeq (R_{IN} + R_g)$ to be same as Boost and Cut amount.
- At each band :

  1 : CUT 2 : FLAT 3 : BOOST
- f_o (Resonance Frequency)

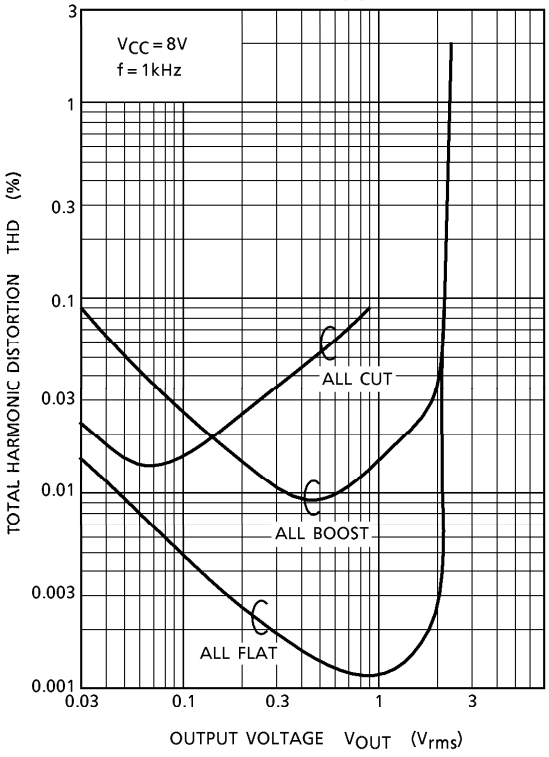
$$f_o = \frac{1}{2\pi\sqrt{C_0 \cdot C_1 \cdot R_1 \cdot R_2}} \quad (R_1 = 1.2k\Omega,\ R_2 = 68k\Omega \text{ on chip resistor})$$

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

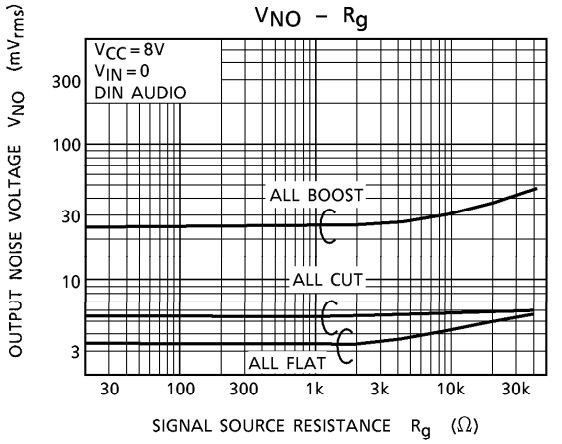
I_{ccq} – V_{CC}



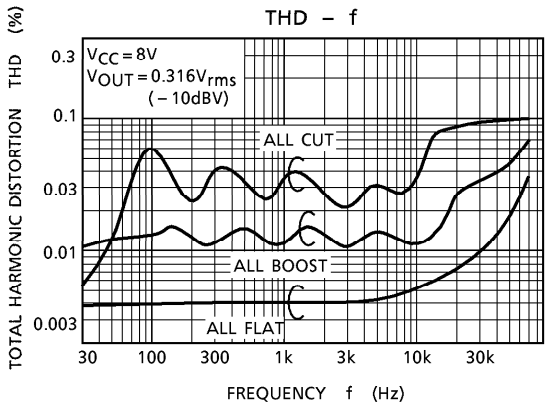
THD – V_{OUT}



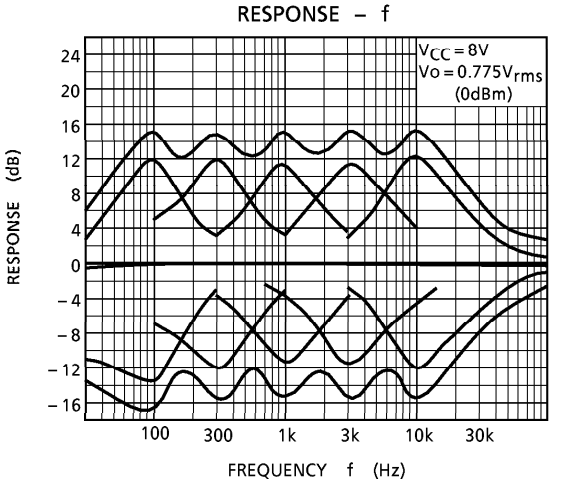
V_{NO} – R_g



THD – f

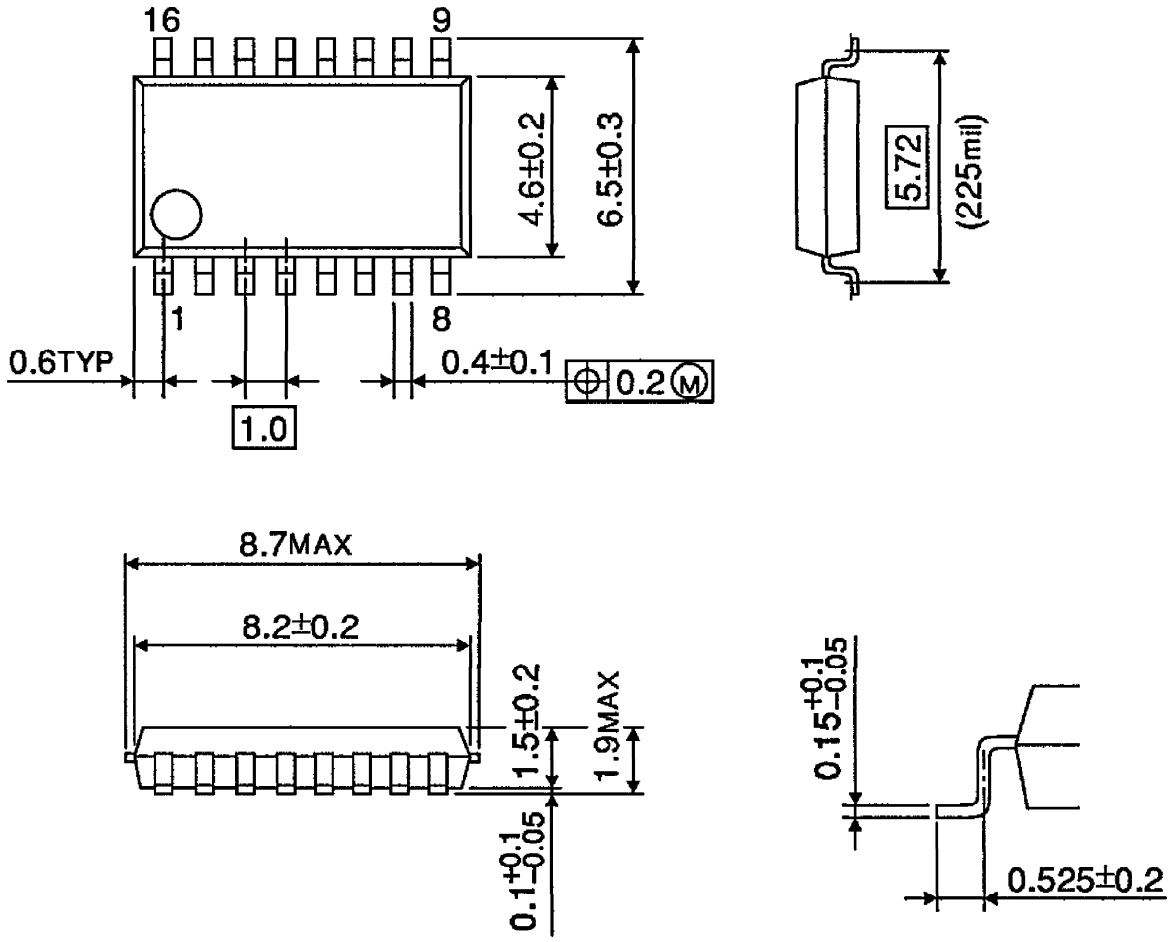


RESPONSE – f



PACKAGE DIMENSIONS

SSOP16-P-225-1.00A Unit : mm



Weight : 0.14g (Typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
  In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.