



SANYO Semiconductors

DATA SHEET

LA3607 — Monolithic Linear IC

7-Band Graphic Equalizer

Overview

The LA3607 is a 7-band graphic equalizer.

Features

- 7-band graphic equalizer for one channel can be formed easily by externally connecting capacitors and variable resistors which fix f_0 (resonance frequency).
- Series connection of the LA3607 makes multiband available.
- Boost, cut amount can be varied by external resistors.
- Highly stable to capacitive load.

Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\ max}$		20	V
Allowable power dissipation	$P_d\ max$		300	mW
Operating temperature	T_{opr}		-20 to +75	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +125	$^\circ\text{C}$

Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		8	V
Operating voltage range	$V_{CC\ op}$		5 to 15	V

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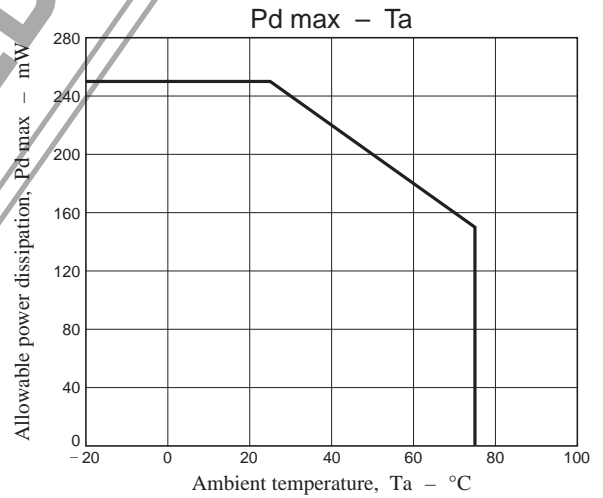
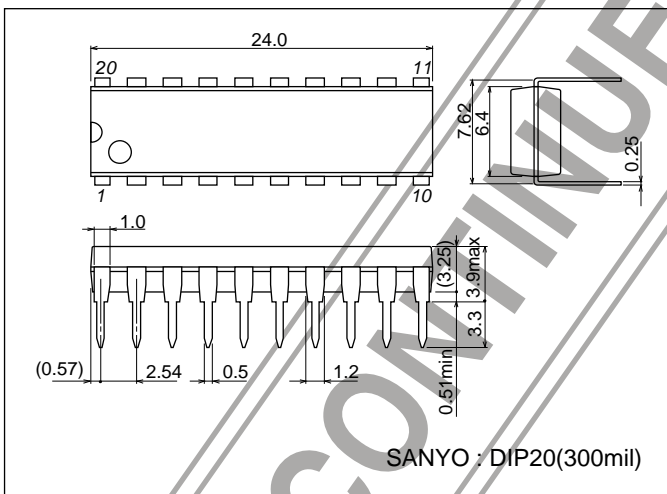
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Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 8\text{V}$, $R_L = 10\text{k}\Omega$, $R_g = 600\Omega$, See specified Test Circuit.

Parameter	Symbol	Conditions	Ratings			Unit	
			min	typ	max		
Quiescent current	I_{CCO}	Quiescent		7	9	mA	
Voltage gain	VG	$f = 1\text{kHz}$, $V_{IN} = -10\text{dB}$ at all flat mode	-3.8	-0.8	2.2	dB	
Boost amount	BOOST	$f = 60\text{Hz}$	$V_O = -10\text{dB}$ is taken as 0dB at all flat mode at $f = 1\text{kHz}$.	10	12	14	dB
		$f = 150\text{Hz}$		10	12	14	dB
		$f = 400\text{Hz}$		10	12	14	dB
		$f = 1\text{kHz}$		10	12	14	dB
		$f = 2.5\text{kHz}$		10	12	14	dB
		$f = 6\text{kHz}$		10	12	14	dB
		$f = 15\text{kHz}$		10	12	14	dB
Cut amount	CUT	$f = 60\text{Hz}$	$V_O = -10\text{dB}$ is taken as 0dB at all flat mode at $f = 1\text{kHz}$.	-14	-12	-10	dB
		$f = 150\text{Hz}$		-14	-12	-10	dB
		$f = 400\text{Hz}$		-14	-12	-10	dB
		$f = 1\text{kHz}$		-14	-12	-10	dB
		$f = 2.5\text{kHz}$		-14	-12	-10	dB
		$f = 6\text{kHz}$		-14	-12	-10	dB
		$f = 15\text{kHz}$		-14	-12	-10	dB
Total harmonic distortion	THD	$f = 1\text{kHz}$, $V_O = 1.0\text{V}$ at all flat mode input		0.02	0.1	%	
Output noise voltage	V_{NO}	All flat, input short, B.P.F., 10Hz to 30kHz		7	40	μV	

Package Dimensions

unit : mm (typ)
3021C

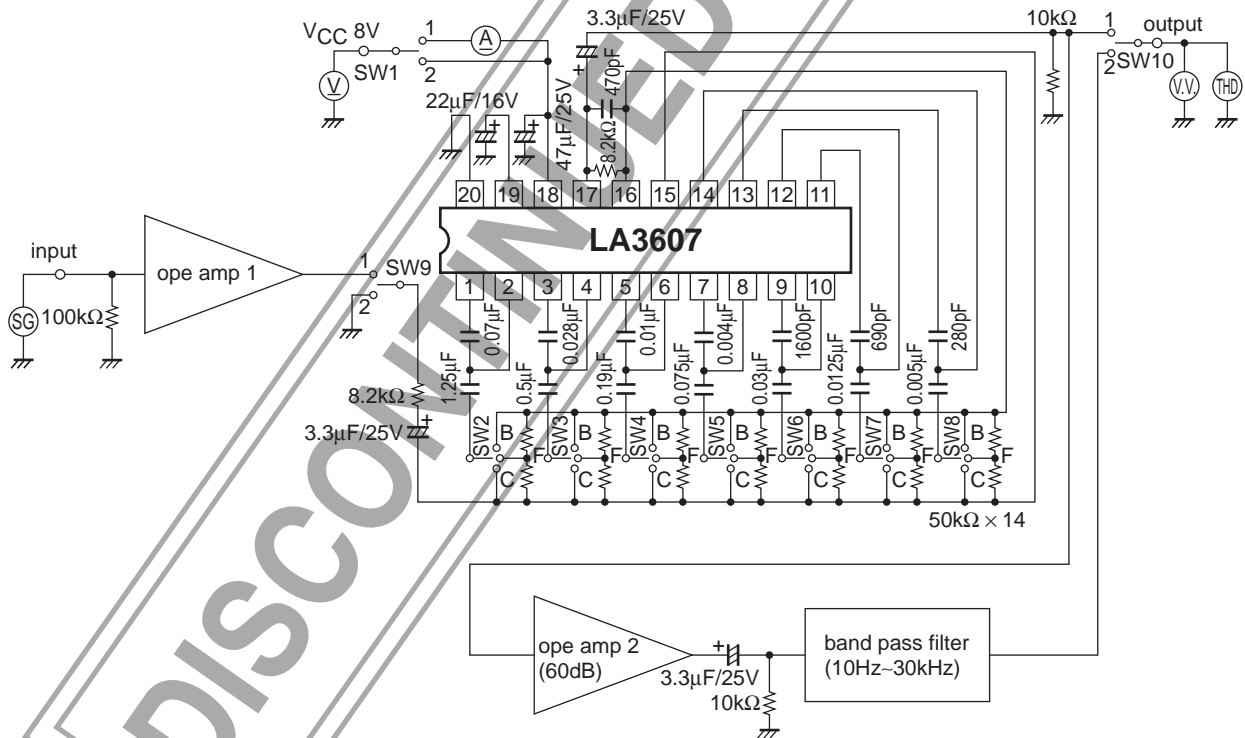


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Test Method : $V_{CC} = 8V$, $R_L = 10k\Omega$, $R_g = 600\Omega$

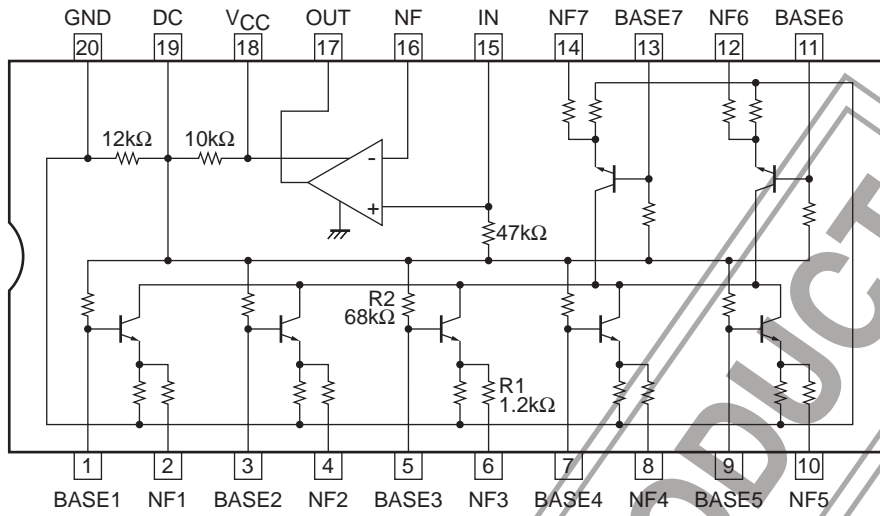
Item	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10	Conditions
I_{CCO}	1	F	F	F	F	F	F	F	2	1	
VG	2	F	F	F	F	F	F	F	1	1	$f = 1kHz$, $V_{IN} = -10dB$
BOOST1	2	B	F	F	F	F	F	F	1	1	$f = 60Hz$
BOOST2	2	F	B	F	F	F	F	F	1	1	$f = 150Hz$
BOOST3	2	F	F	B	F	F	F	F	1	1	$f = 400Hz$
BOOST4	2	F	F	F	B	F	F	F	1	1	$f = 1kHz$
BOOST5	2	F	F	F	F	B	F	F	1	1	$f = 2.5kHz$
BOOST6	2	F	F	F	F	F	B	F	1	1	$f = 6kHz$
BOOST7	2	F	F	F	F	F	F	B	1	1	$f = 15kHz$
CUT1	2	C	F	F	F	F	F	F	1	1	$f = 60Hz$
CUT2	2	F	C	F	F	F	F	F	1	1	$f = 150Hz$
CUT3	2	F	F	C	F	F	F	F	1	1	$f = 400Hz$
CUT4	2	F	F	F	C	F	F	F	1	1	$f = 1kHz$
CUT5	2	F	F	F	F	C	F	F	1	1	$f = 2.5kHz$
CUT6	2	F	F	F	F	F	C	F	1	1	$f = 6kHz$
CUT7	2	F	F	F	F	F	F	C	1	1	$f = 15kHz$
THD	2	F	F	F	F	F	F	F	1	1	$f = 1kHz$, $V_O = 1.0V$
V_{NO}	2	F	F	F	F	F	F	F	2	2	

Test Circuit

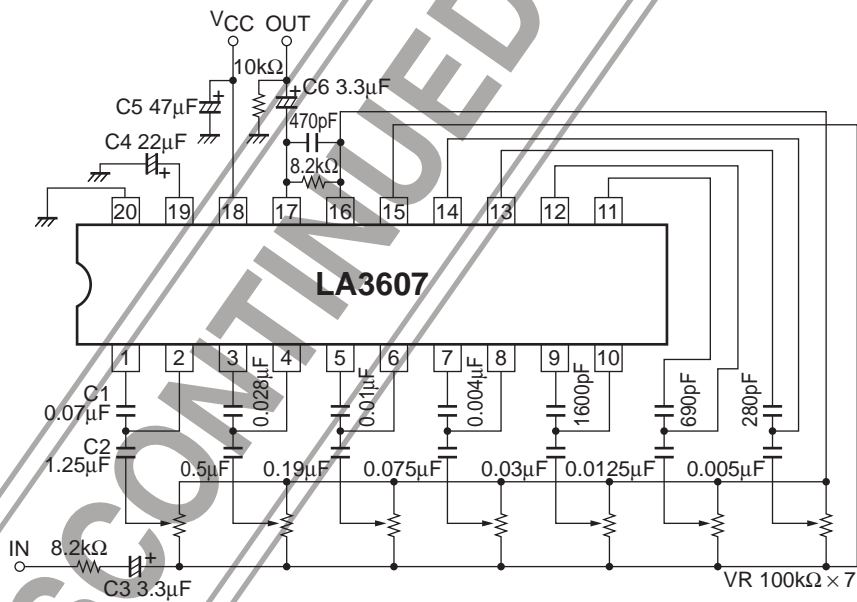


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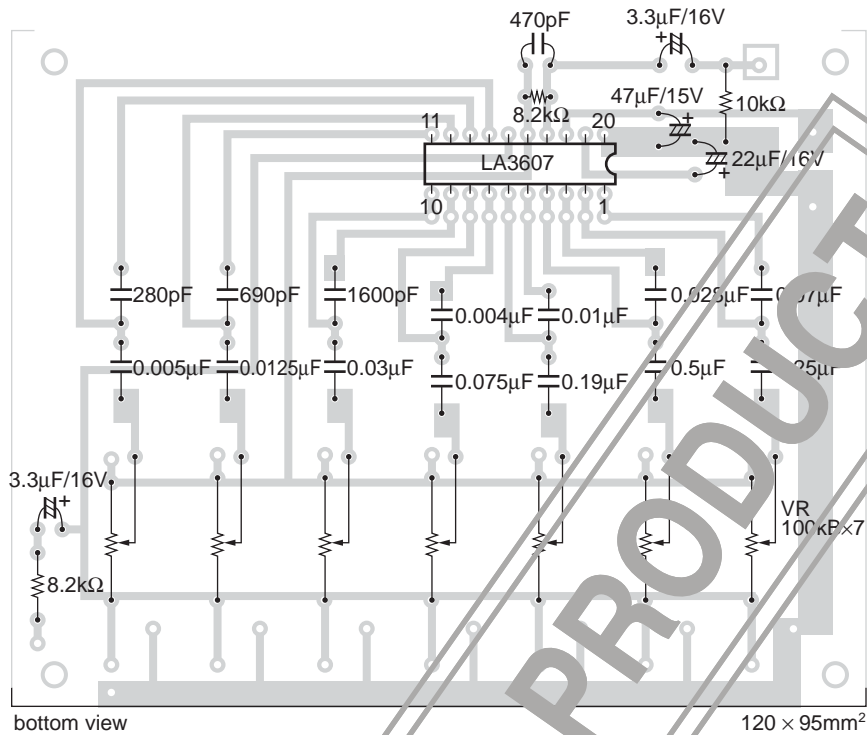
Block Diagram



Sample Application Circuit



Sample Printed Circuit Pattern (Cu-foilde side)



f_0 (resonance frequency)

In the sample application circuit, f_0 for each of 7 bands is as follows :

$f_0 = 60\text{Hz}, 150\text{Hz}, 400\text{Hz}, 1\text{kHz}, 2.5\text{kHz}, 6\text{kHz}, 15\text{kHz}$

f_0 is calculated using the following formula

$$f_0 = \frac{1}{2\pi\sqrt{C1 \cdot C2 \cdot R1 \cdot R2}}$$

Q (quality factor)

Q is calculated using the following formula.

$$Q = \sqrt{\frac{C1 \cdot R2}{C2 \cdot R1}}$$

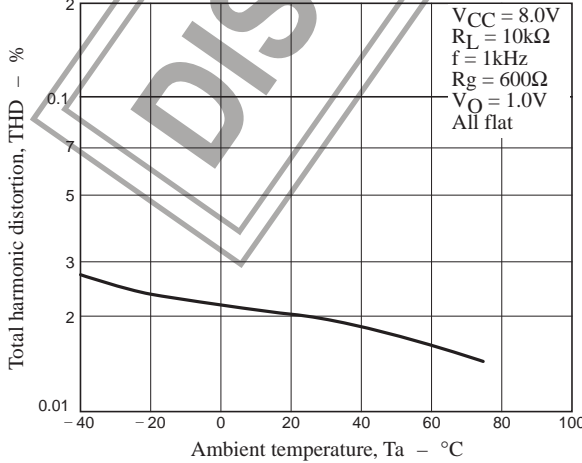
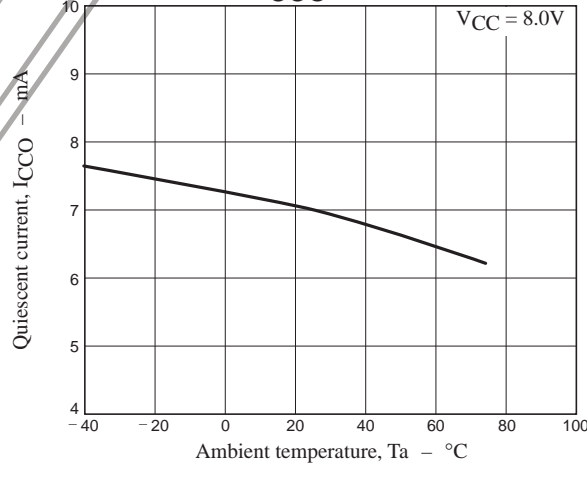
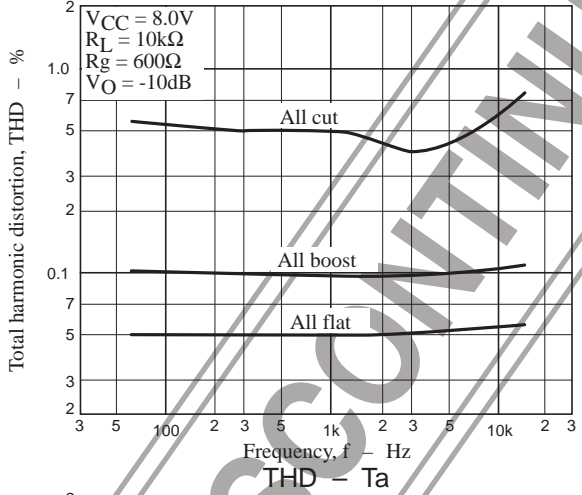
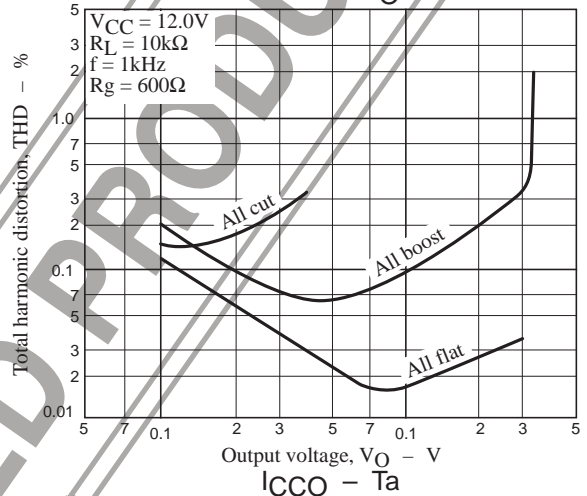
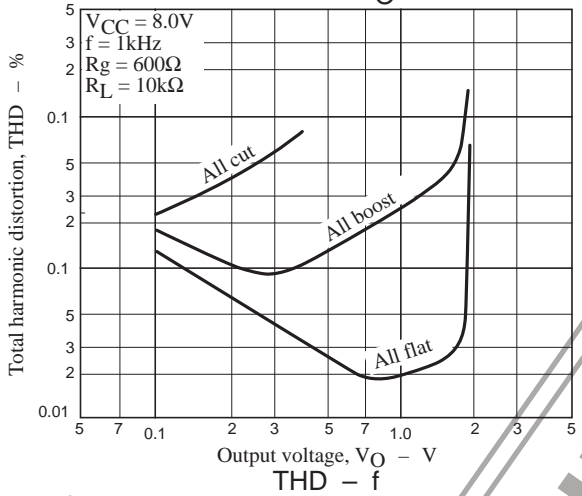
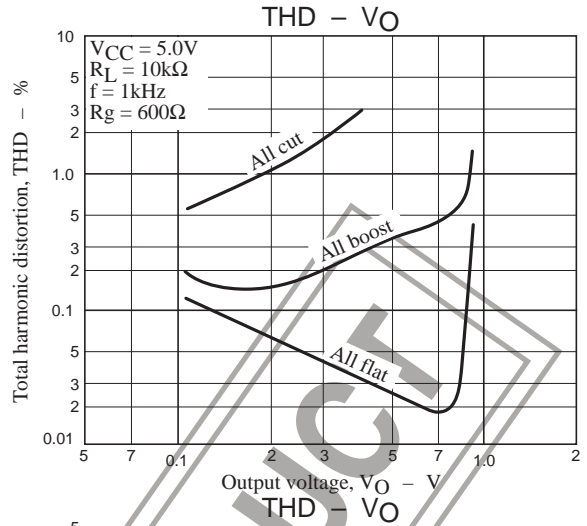
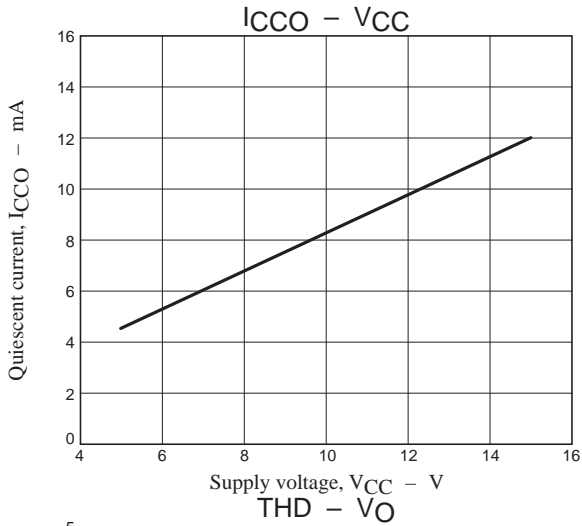
When Q is increased, the frequency band affected by the resonance circuit is narrowed and a clear distinction between this band and adjacent band is provided, but the frequency response swells greatly at all boost mode and the peak of the composite frequency is lowered. The above must be considered to fix C1, C2.

Description of external parts

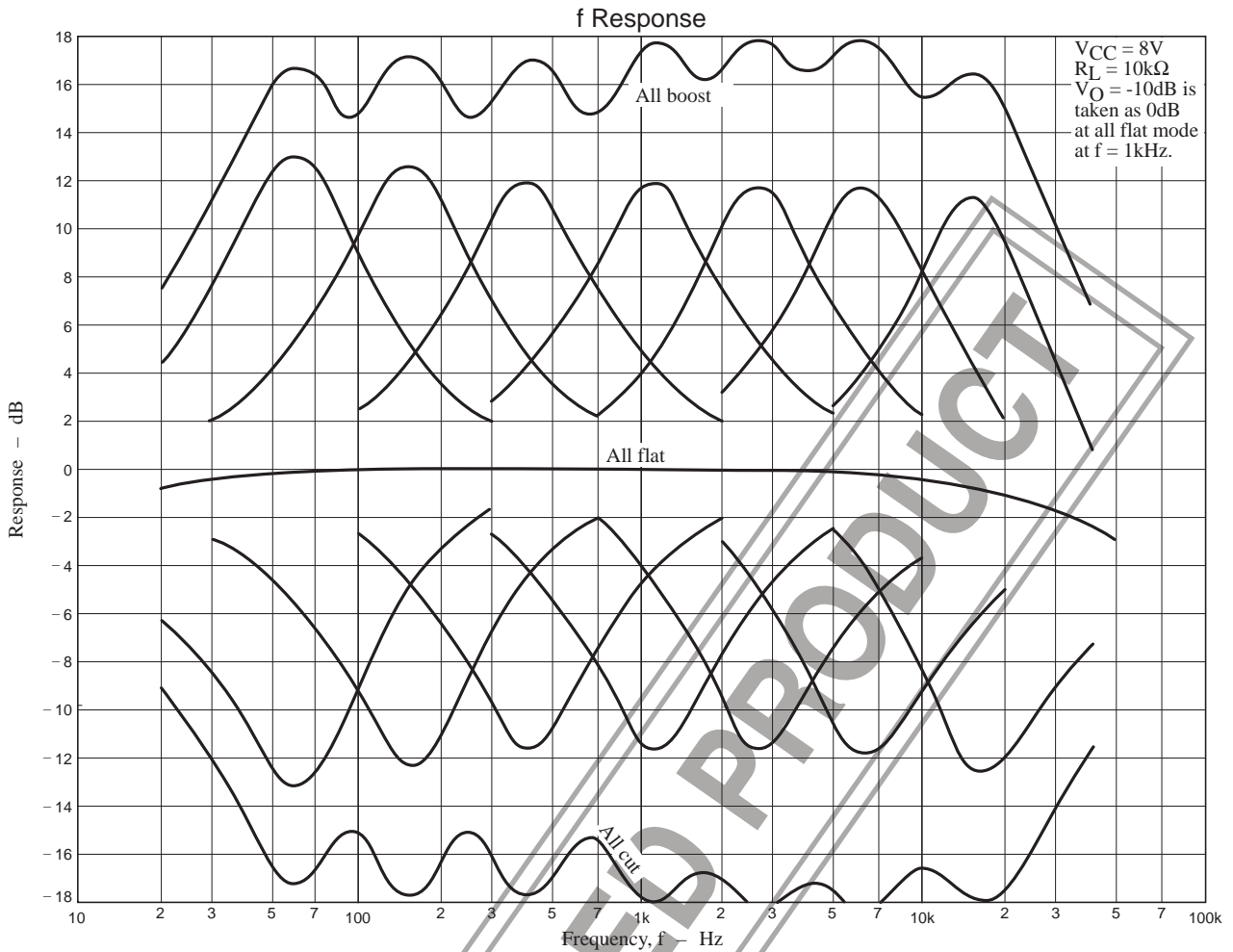
- C1, C2 : Capacitors used to fix f_0 (resonance frequency)
- C3 : Input capacitor. Decreasing the capacitor value lowers the frequency response at low frequencies.
- C4 : Decoupling capacitor. Decreasing the capacitor value makes the effect of power supply stronger, whereby ripple is liable to occur.
- C5 : Power capacitor.
- C6 : Output capacitor. Decreasing the capacitor value lowers the frequency response at low frequencies.

Proper cares in using IC

- Maximum supply voltage V_{CC} max 20V must not be exceeded. The operating voltage is in the range of 5 to 15V.
- Application of power with the pin-to-pin spaces shorted causes breakdown or deterioration of the IC to occur. When mounting the IC on the board of applying power, make sure that the pin-to-pin spaces are not shorted with solder, etc.



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