



# LA3600

## 5-Band Graphic Equalizer

### Applications

- Portable component stereos, tape-recorders, radio-cassette recorders, car stereos.

### Features

- On-chip one operational amplifier.
- 5-band graphic equalizer for one channel can be formed easily by externally connecting capacitors and variable resistors which fix  $f_o$  (resonance frequency).
- Series connection of two LA3600's makes multiband (6 to 10 bands) available.
- Highly stable to capacitive load.

### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum Supply Voltage	$V_{CC \text{ max}}$		20	V
Allowable Power Dissipation	$P_d \text{ max}$		300	mW
Operating Temperature	$T_{opr}$		-20 to +75	$^\circ\text{C}$
Storage Temperature	$T_{stg}$		-40 to +125	$^\circ\text{C}$

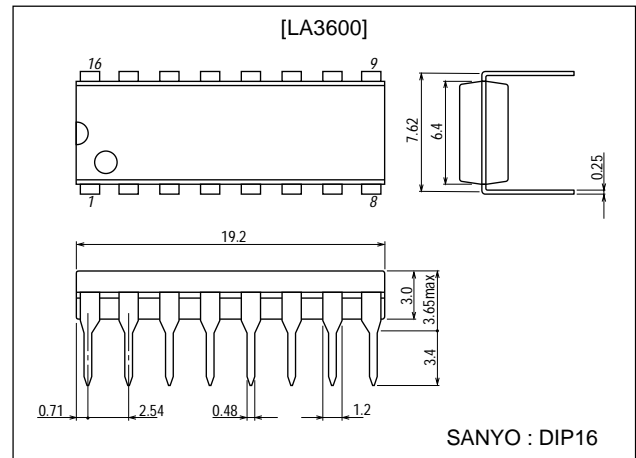
#### Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended Supply Voltage	$V_{CC}$		8	V
Operating Voltage Range	$V_{CC \text{ op}}$		5 to 15	V

### Package Dimensions

unit:mm

3006B-DIP16



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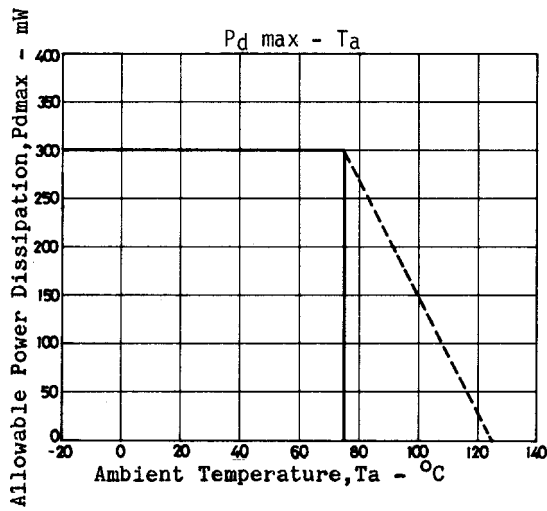
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

21000TH (KT)/33194HO/7297AT/8225MW/7274KI, TS No.1513-1/7

# LA3600

**Operating 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	$I_{CCO}$		3.0	5.0	8.0	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	$f=100\text{Hz}$	8	10	12	dB
		$f=340\text{Hz}$	8	10	12	dB
		$f=1\text{kHz}$	8	10	12	dB
		$f=3.4\text{kHz}$	8	10	12	dB
		$f=10\text{kHz}$	8	10	12	dB
Cut Amount	CUT	$f=100\text{Hz}$	-12	-10	-8	dB
		$f=340\text{Hz}$	-12	-10	-8	dB
		$f=1\text{kHz}$	-12	-10	-8	dB
		$f=3.4\text{kHz}$	-12	-10	-8	dB
		$f=10\text{kHz}$	-12	-10	-8	dB
Total Harmonic Distortion	THD	$f=1\text{kHz}$ , $V_o=1.0\text{V}$		0.03	0.1	%
Output Noise Voltage	$V_{NO}$	$R_g=0$ , All flat B.P.F. 10Hz to 30kHz		2.0	20	$\mu\text{V}$

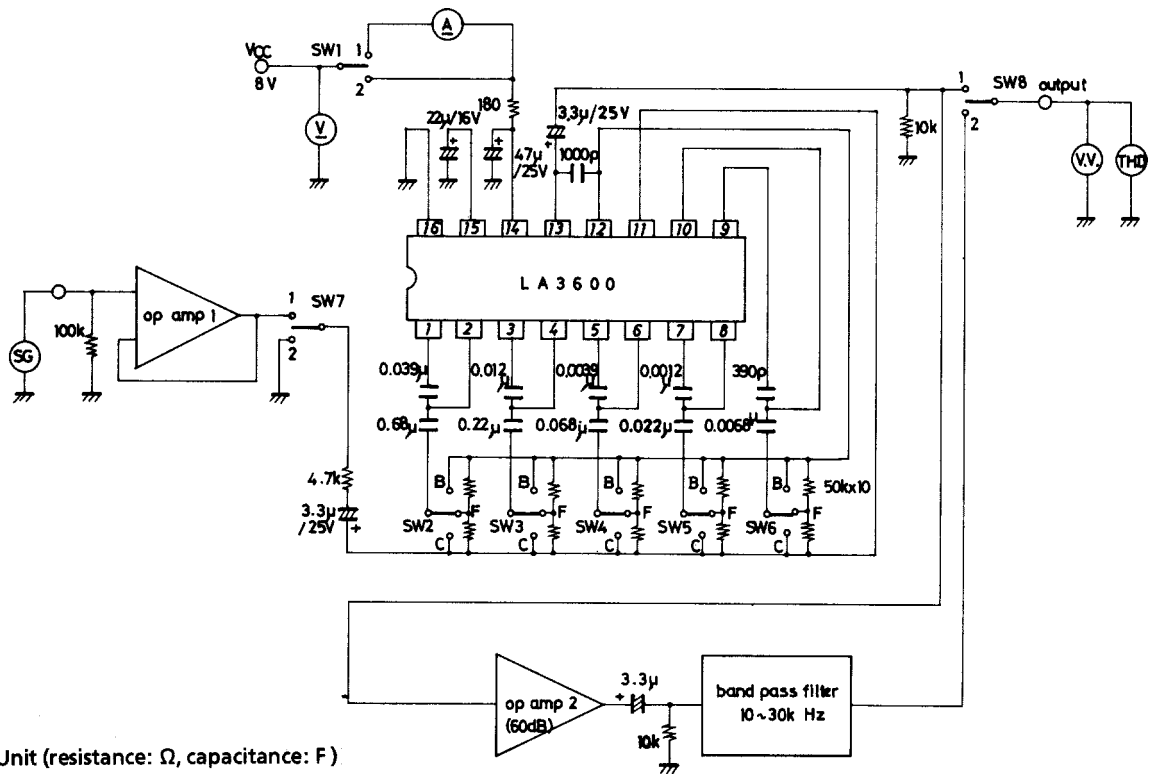


Test Method :  $V_{CC}=8\text{V}$ ,  $R_L=10\text{k}\Omega$ ,  $R_g=600\Omega$

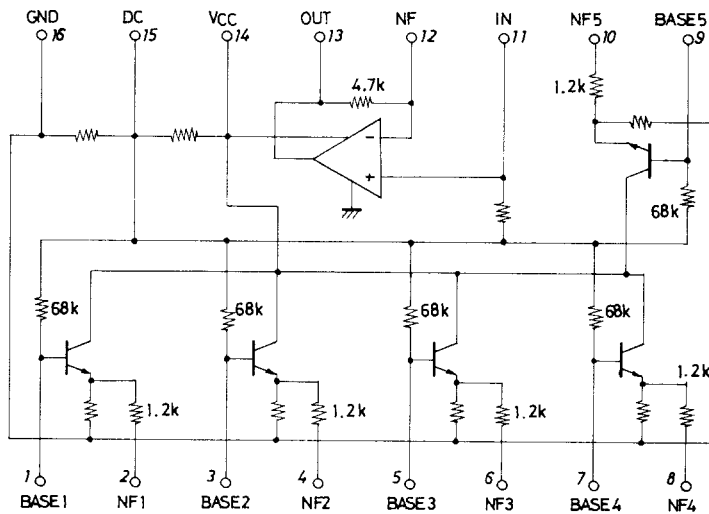
Item	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Conditions
$I_{CCO}$	1	-	-	-	-	-	2	1	
VG	2	F	F	F	F	F	1	1	$f=1\text{kHz}$ , $V_{in}=-10\text{dB}$
BOOST	2	B	F	F	F	F	1	1	$f=100\text{Hz}$
BOOST	2	F	B	F	F	F	1	1	$f=340\text{Hz}$
BOOST	2	F	F	B	F	F	1	1	$f=1\text{kHz}$
BOOST	2	F	F	F	B	F	1	1	$f=3.4\text{kHz}$
BOOST	2	F	F	F	F	B	1	1	$f=10\text{kHz}$
CUT	2	C	F	F	F	F	1	1	$f=100\text{Hz}$
CUT	2	F	C	F	F	F	1	1	$f=340\text{Hz}$
CUT	2	F	F	C	F	F	1	1	$f=1\text{kHz}$
CUT	2	F	F	F	C	F	1	1	$f=3.4\text{kHz}$
CUT	2	F	F	F	F	C	1	1	$f=10\text{kHz}$
THD	2	F	F	F	F	F	1	1	$f=1\text{kHz}$ , $V_o=1.0\text{V}$
$V_{NO}$	2	F	F	F	F	F	2	2	

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## Test Circuit

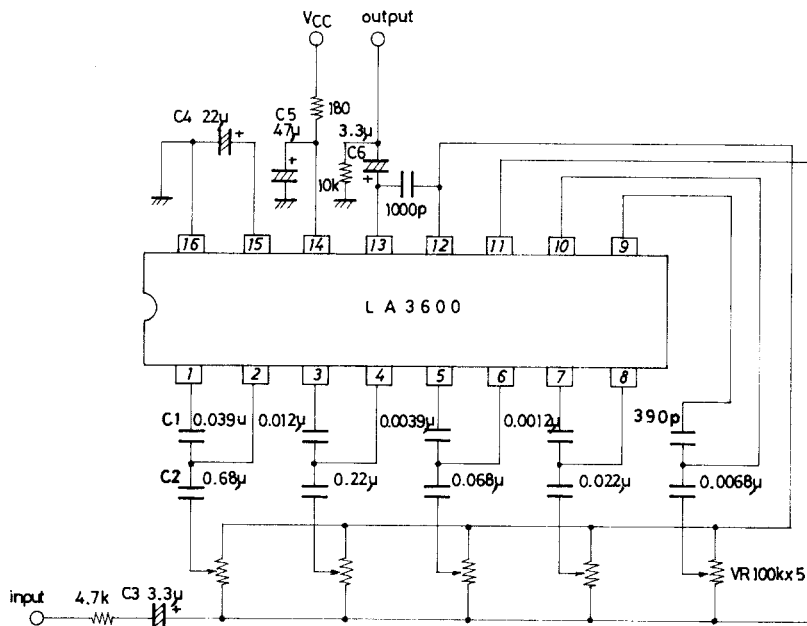


## Equivalent Circuit Block Diagram



## Sample Application Circuit

Unit (resistance:  $\Omega$ , capacitance: F)



$f_0$  (resonance frequency)

In the sample application circuit,  $f_0$  for each of 5 bands is set as follows :

$f_0=108\text{Hz}$ ,  $343\text{kHz}$ ,  $1.08\text{kHz}$ ,  $3.43\text{kHz}$ ,  $10.8\text{kHz}$

$$f_0 = \frac{1}{2\pi \sqrt{C1, C2, R1, R2}} \quad (R1=1.2\text{k}\Omega, R2=68\text{k}\Omega \text{ on-chip resistor})$$

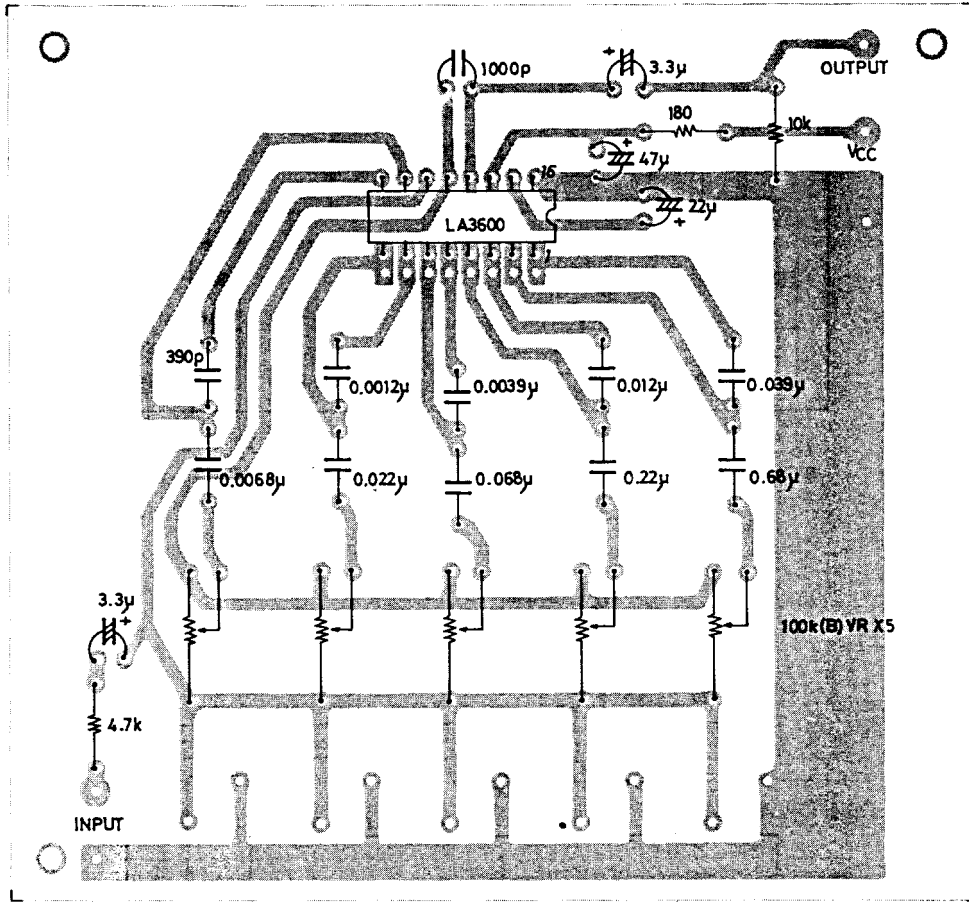
Description of external parts

- C1, C2 : Capacitors used to fix  $f_0$  (resonance frequency)
- C2 : Input capacitor. Decreasing the capacitor value lowers the frequency response at low frequencies.
- 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.

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## Sample Printed Circuit Pattern

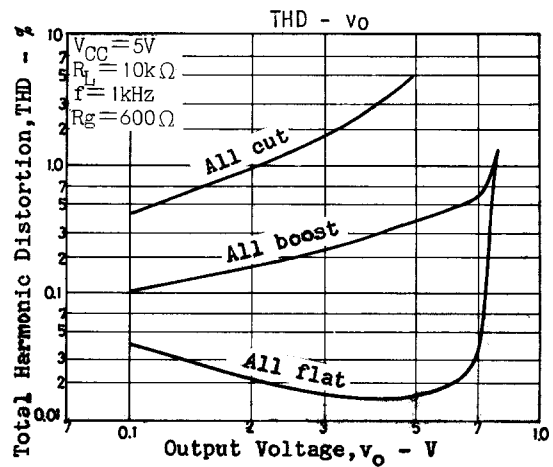
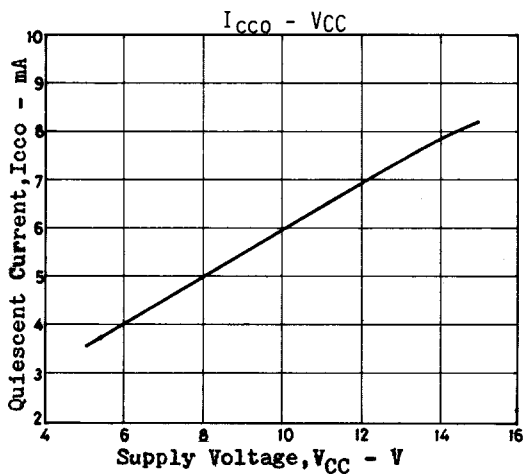
Unit (resistance:  $\Omega$ , capacitance: F)



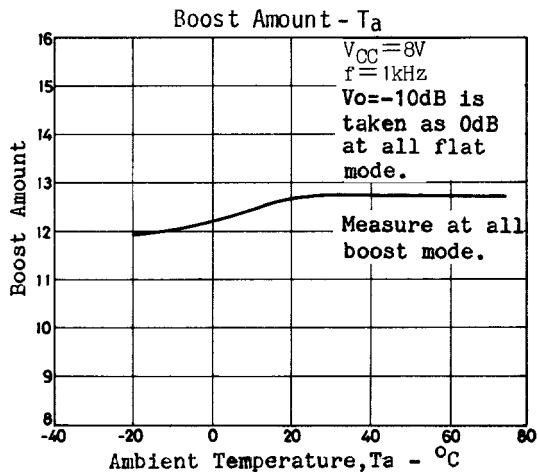
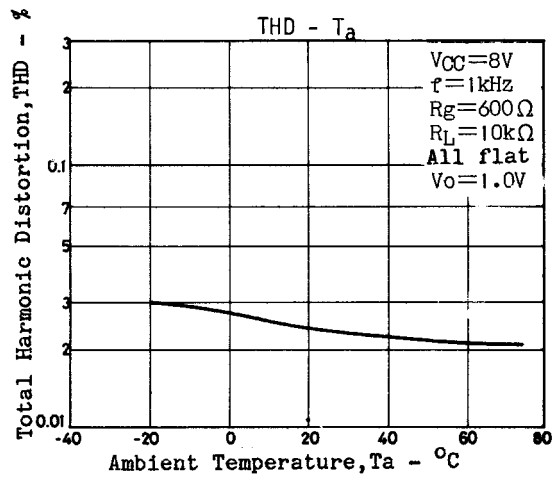
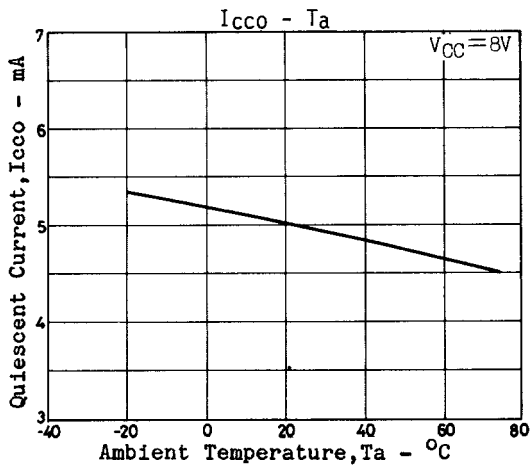
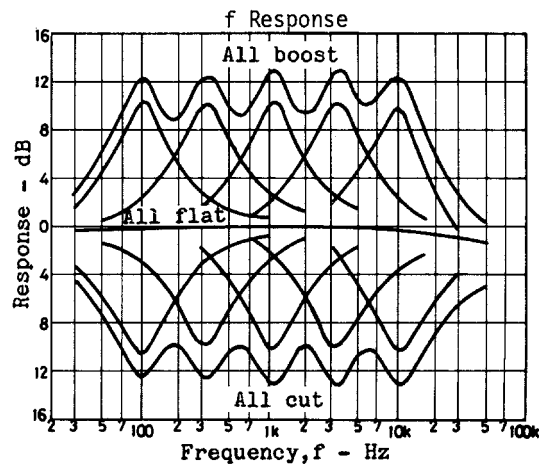
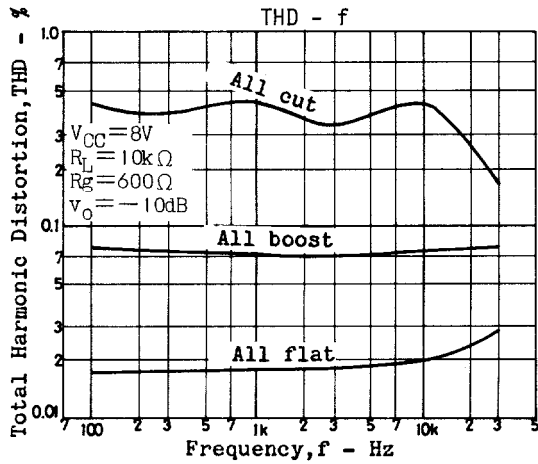
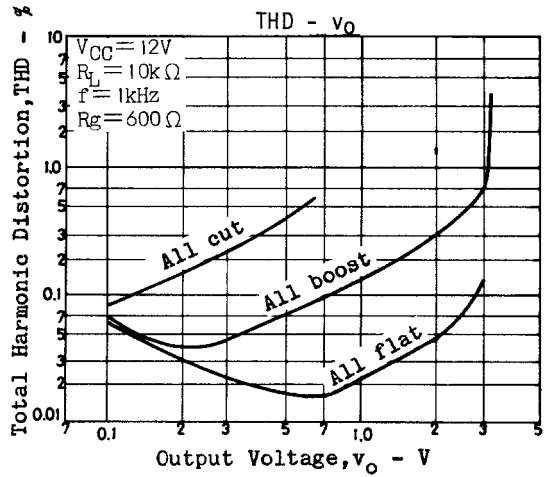
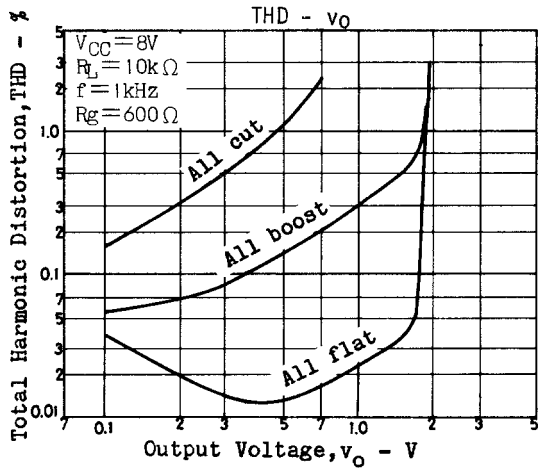
Cu-foiled area 110x102.5mm<sup>2</sup>

### 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 or applying power, make sure that the pin-to-pin spaces are not shorted with solder, etc.



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