

**LA3600****5-Band Graphic Equalizer****Applications**

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

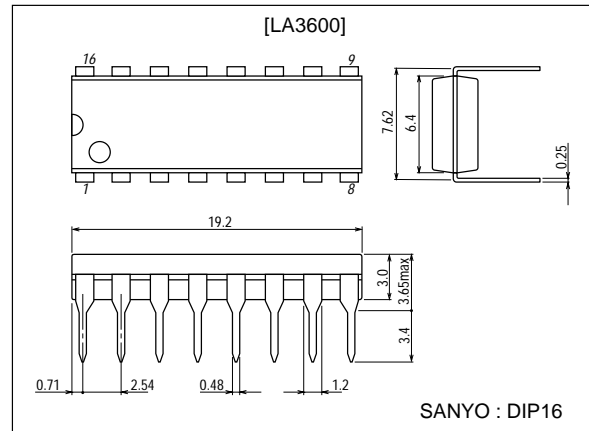
Features

- 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.

Package Dimensions

unit:mm

3006B-DIP16

**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 |

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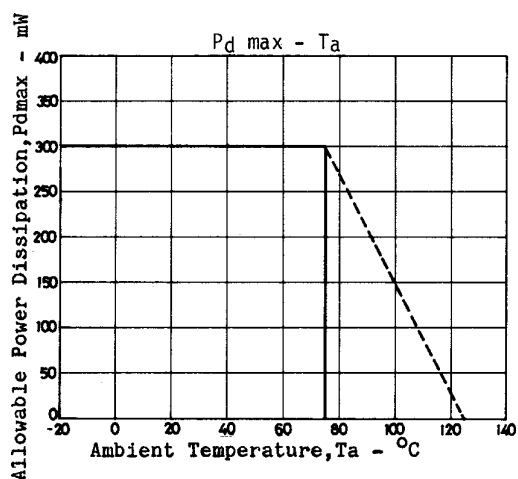
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21000TH (KT)/33194HO/7297AT/8225MW/7274KI, TS No.1513-1/7

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 | μV |

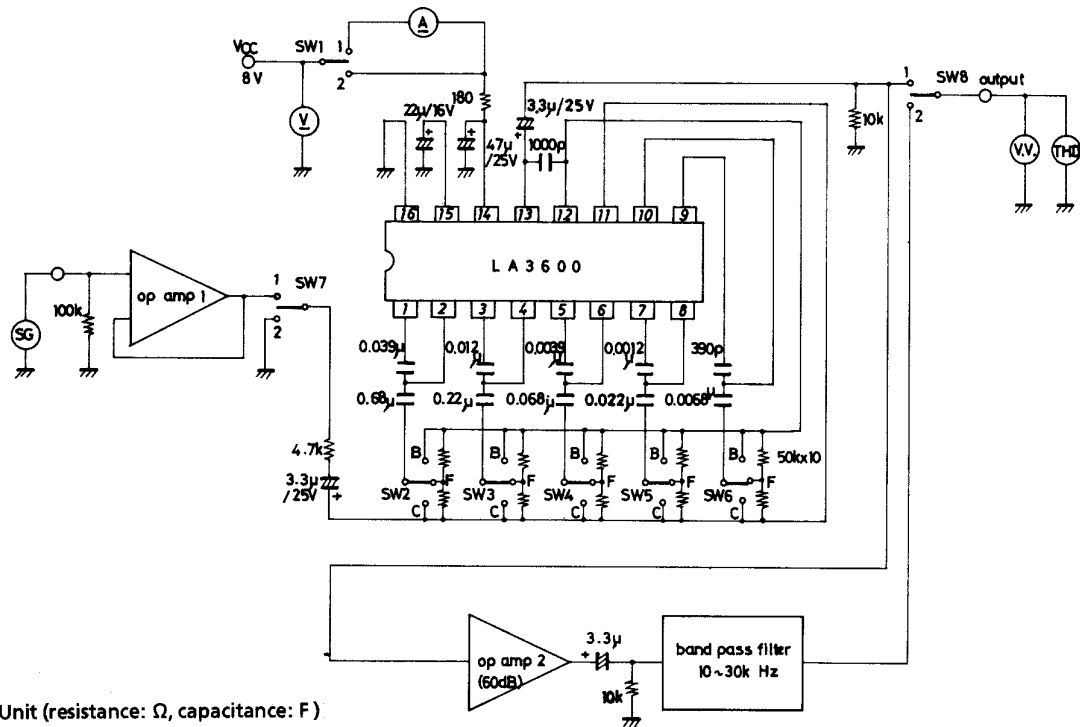


Test Method : $V_{CC}=8\text{V}$, $R_L=10\text{k}\Omega$, $R_g=600\Omega$

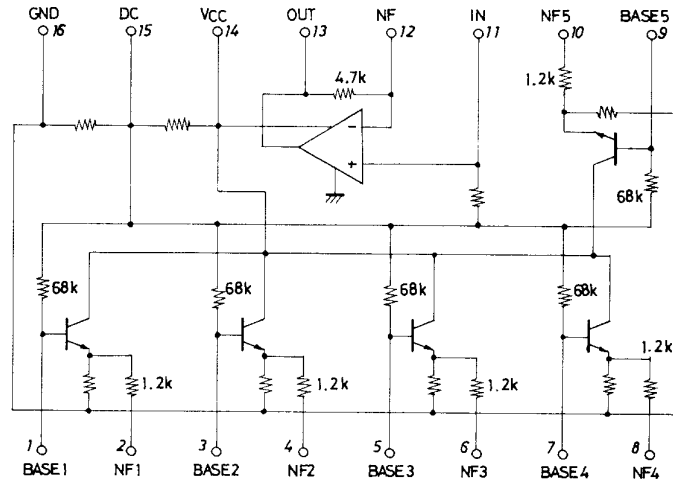
| Item | SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | SW7 | SW8 | Conditions |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|---|
| I_{CCO} | 1 | - | - | - | - | - | 2 | 1 | |
| VG | 2 | F | F | F | F | F | 1 | 1 | $f=1\text{kHz}$, $V_{in}=-10\text{dB}$ |
| BOOST | 2 | B | F | F | F | F | 1 | 1 | $f=100\text{Hz}$ |
| 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 | |

LA3600

Test Circuit

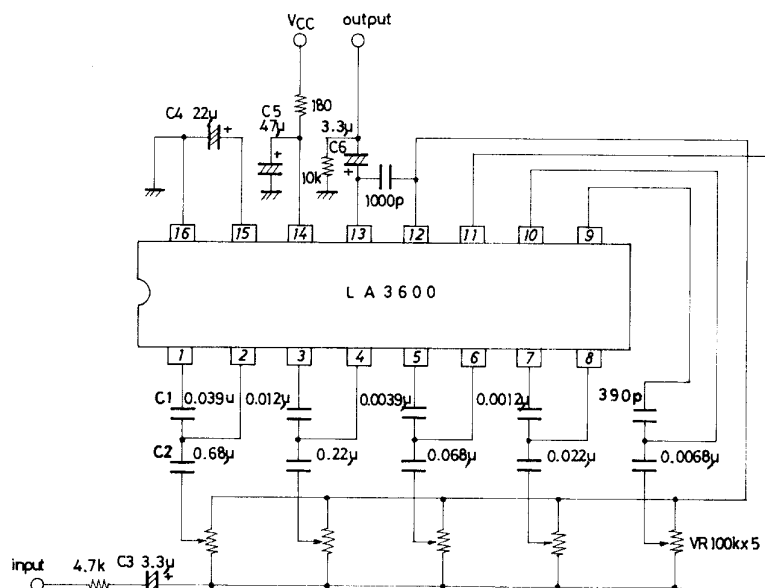


Equivalent Circuit Block Diagram



Sample Application Circuit

Unit (resistance: Ω , 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.

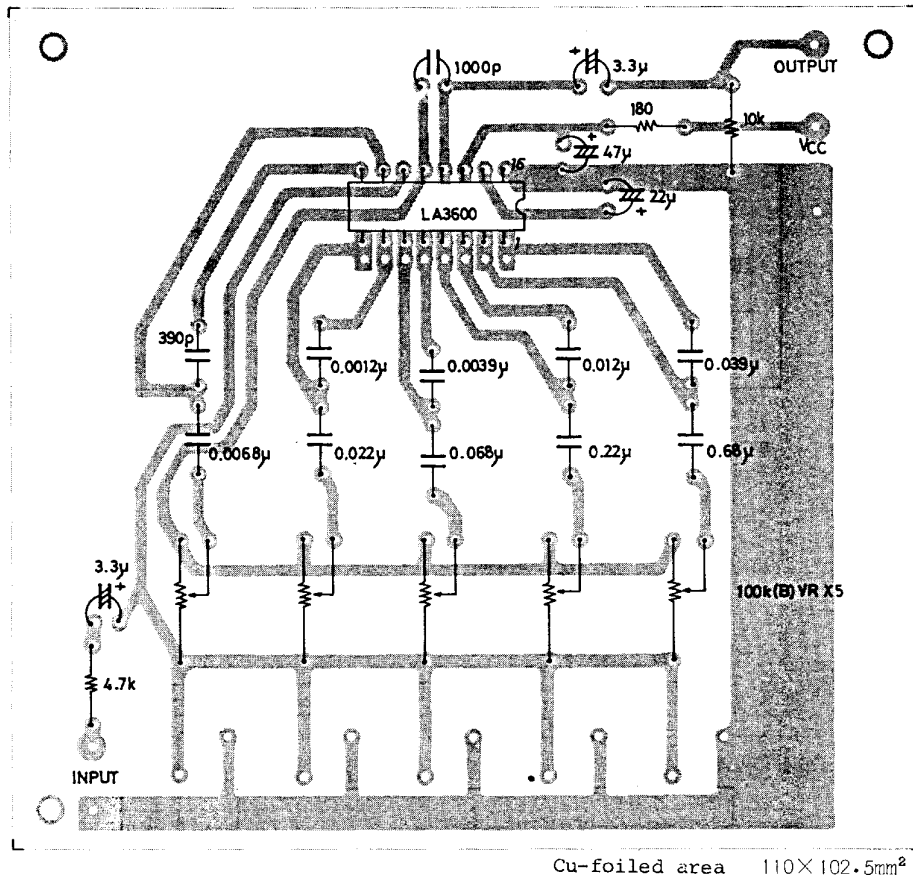
C4 : Decoupling capacitor. Decreasing the capacitor value makes the effect of power supply stronger, whereby ripple is liable to occur.

C5 : Power capacitor.

C6 : Output capacitor. Decreasing the capacitor value lowers the frequency response at low frequencies.

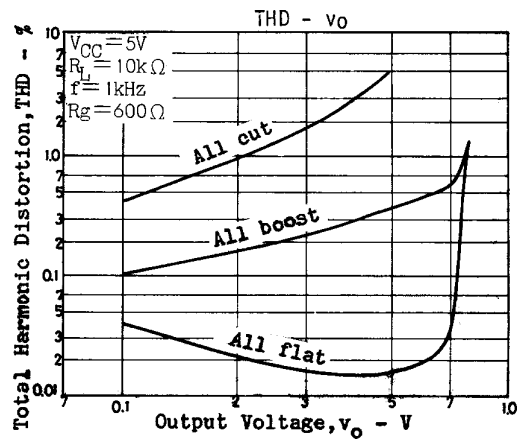
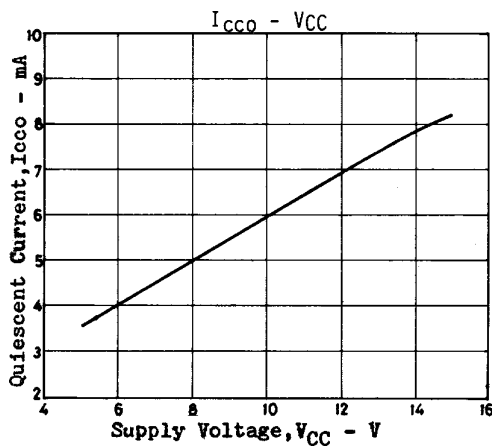
Sample Printed Circuit Pattern

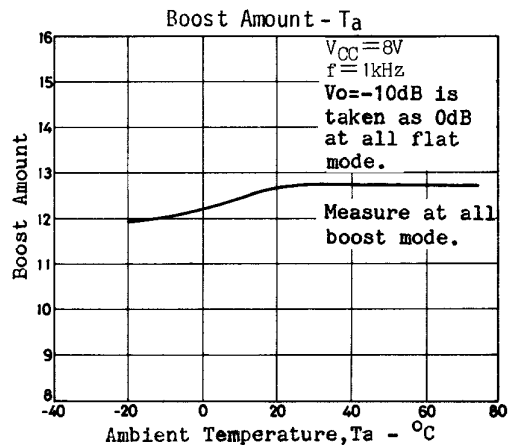
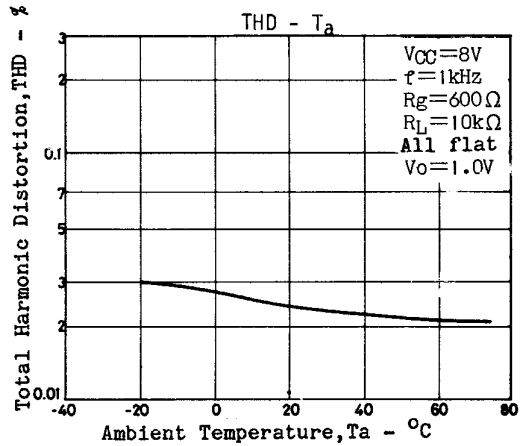
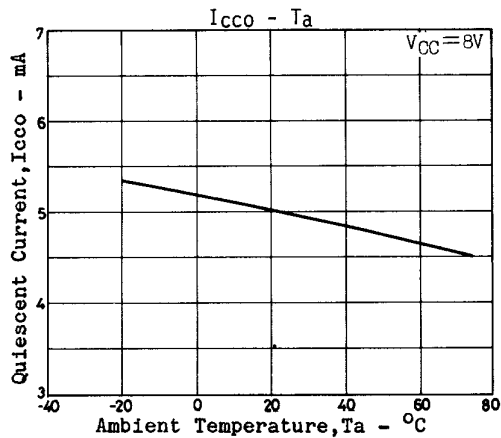
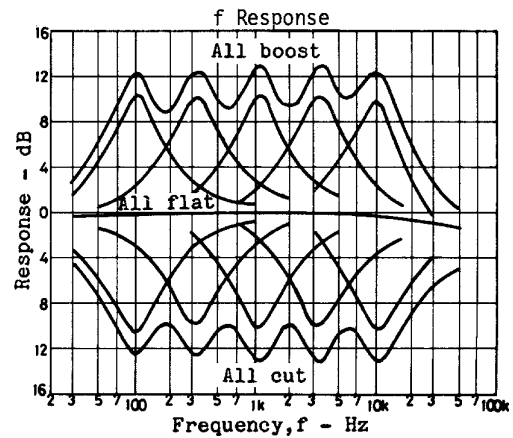
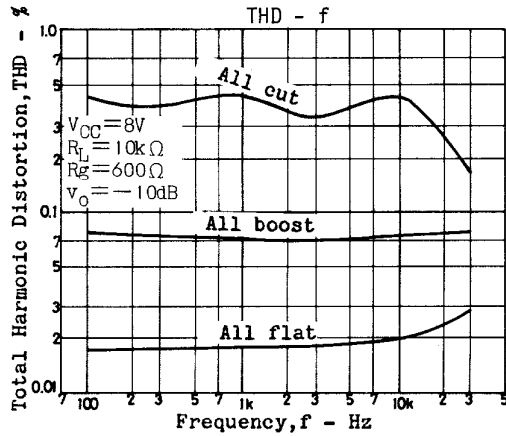
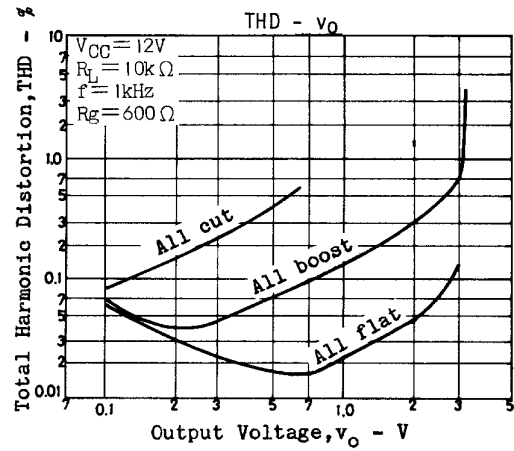
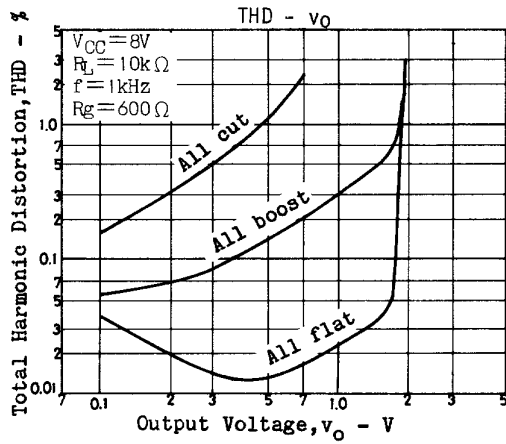
Unit (resistance: Ω , capacitance: F)



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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