Ordering number:ENN1513D

Monolithic Linear IC

LA3600

5-Band Graphic Equalizer

Applications

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

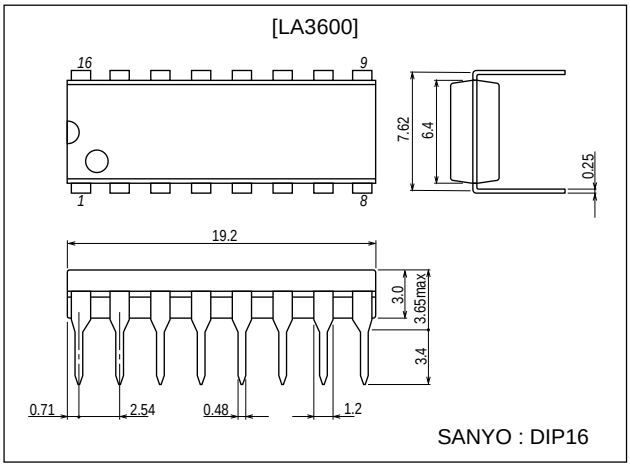
Features

• 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 Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum Supply Voltage	V_{CC} max		20	V
Allowable Power Dissipation	Pd max		300	mW
Operating Temperature	Topr		–20 to +75	˚C
Storage Temperature	Tstg		–40 to +125	˚C

Operating Conditions at Ta = 25˚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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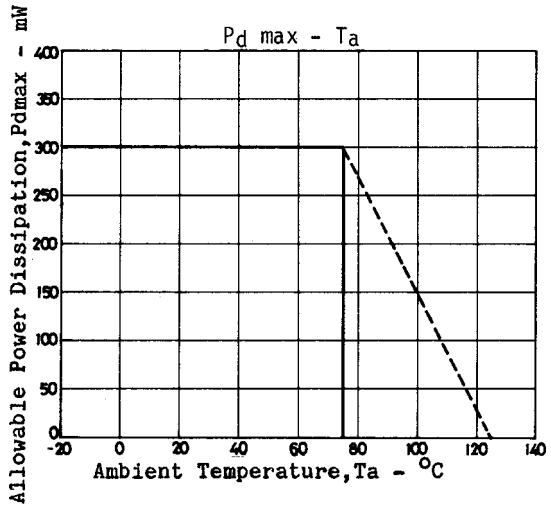
Operating Characteristics at Ta = 25˚C, V_{CC}=8V, R_L=10kΩ, Rg=600Ω, See specified Test Circuit.

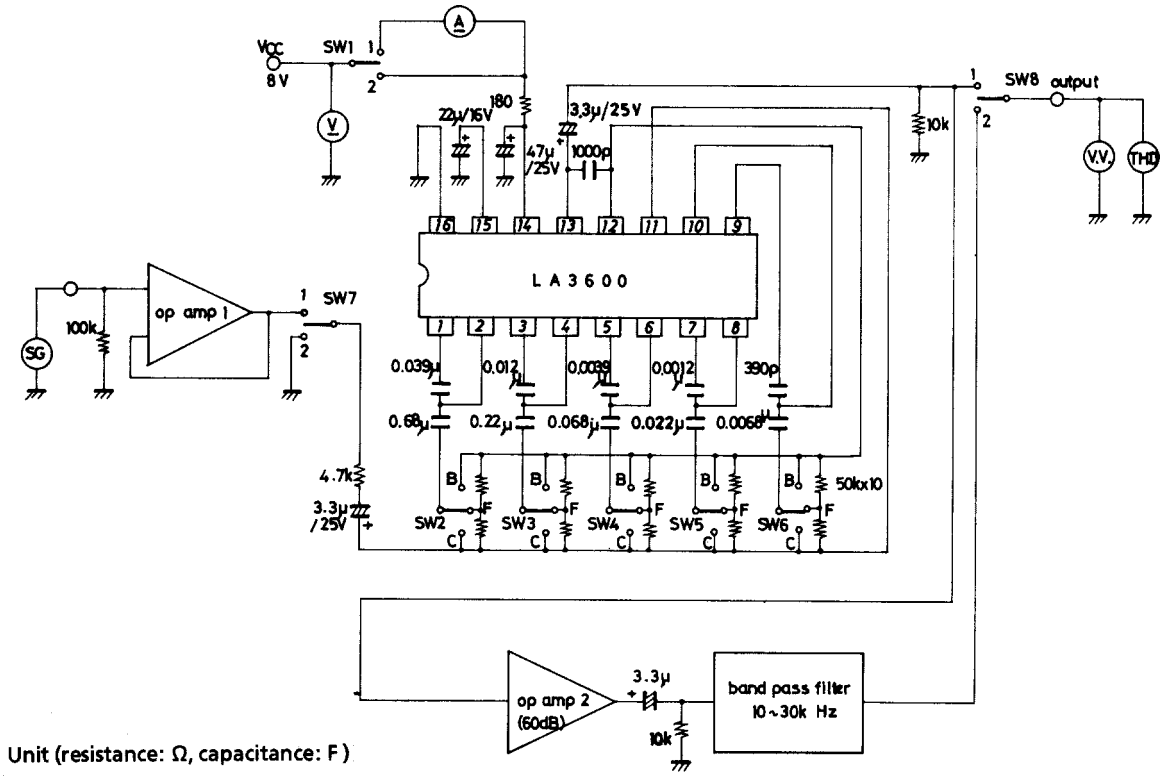
Parameter	Symbol	Conditions		Ratings min	Ratings typ	Ratings max	Unit
Quiescent Current	Icco			3.0	5.0	8.0	mA
Voltage Gain	VG	f=1kHz, Vin=–10dB at all flat mode		–3.8	+0.8	+2.2	dB
Boost Amount	BOOST	f=100Hz	Vo=–10dB is taken as 0dB at all flat mode at f=1kHz.	8	10	12	dB
		f=340Hz		8	10	12	dB
		f=1kHz		8	10	12	dB
		f=3.4kHz		8	10	12	dB
		f=10kHz		8	10	12	dB
Cut Amount	CUT	f=100Hz		–12	–10	–8	dB
		f=340Hz		–12	–10	–8	dB
		f=1kHz		–12	–10	–8	dB
		f=3.4kHz		–12	–10	–8	dB
		f=10kHz		–12	–10	–8	dB
Total Harmonic Distortion	THD	f=1kHz, V_O=1.0V			0.03	0.1	%
Output Noise Voltage	V_{NO}	Rg=0, All flat B.P.F. 10Hz to 30kHz			2.0	20	μV



Test Method : V_{CC}=8V, R_L=10kΩ, Rg=600Ω

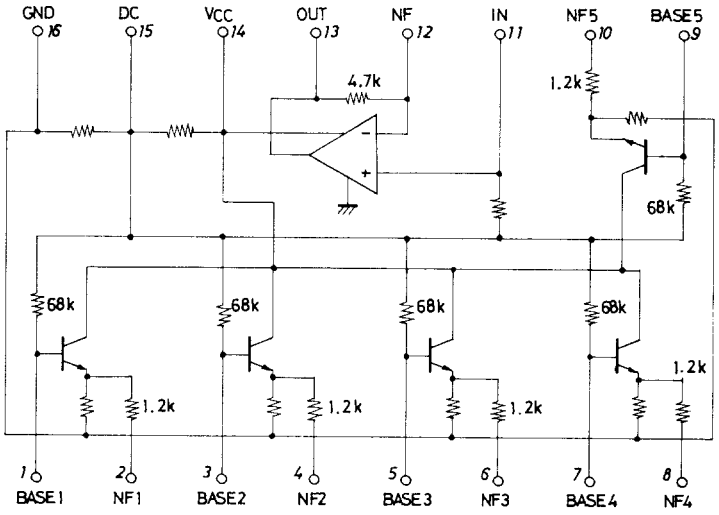
Item	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Conditions
Icco	1	–	–	–	–	–	2	1	
VG	2	F	F	F	F	F	1	1	f=1kHz, Vin=–10dB
BOOST	2	B	F	F	F	F	1	1	f=100Hz
BOOST	2	F	B	F	F	F	1	1	f=340Hz
BOOST	2	F	F	B	F	F	1	1	f=1kHz
BOOST	2	F	F	F	B	F	1	1	f=3.4kHz
BOOST	2	F	F	F	F	B	1	1	f=10kHz
CUT	2	C	F	F	F	F	1	1	f=100Hz
CUT	2	F	C	F	F	F	1	1	f=340Hz
CUT	2	F	F	C	F	F	1	1	f=1kHz
CUT	2	F	F	F	C	F	1	1	f=3.4kHz
CUT	2	F	F	F	F	C	1	1	f=10kHz
THD	2	F	F	F	F	F	1	1	f=1kHz, Vo=1.0V
V_{NO}	2	F	F	F	F	F	2	2	

Test Circuit



Unit (resistance: Ω, capacitance: F)

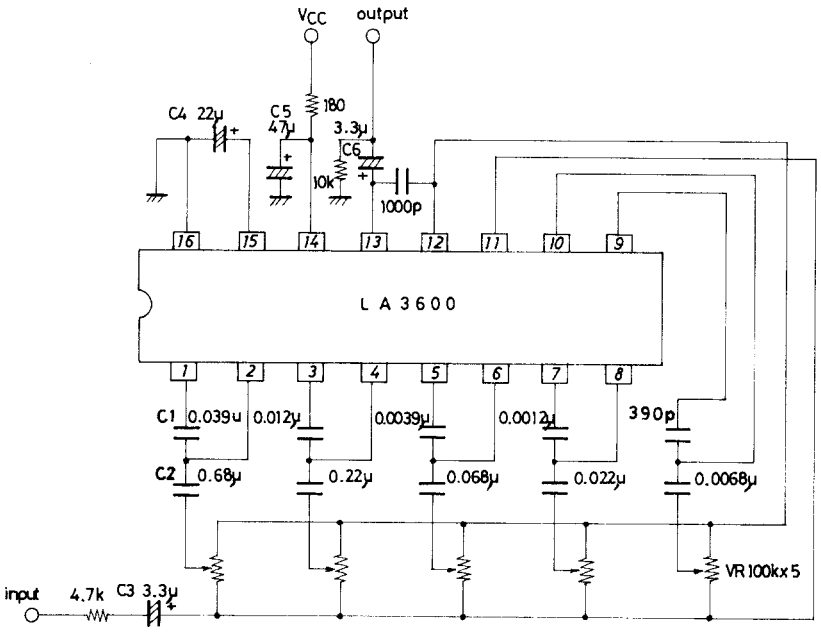
Equivalent Circuit Block Diagram



Unit (resistance: Ω, capacitance: F)

Sample Application Circuit

Unit (resistance: Ω, capacitance: F)



fo (resonance frequency)

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

fo=108Hz, 343kHz, 1.08kHz, 3.43kHz, 10.8kHz

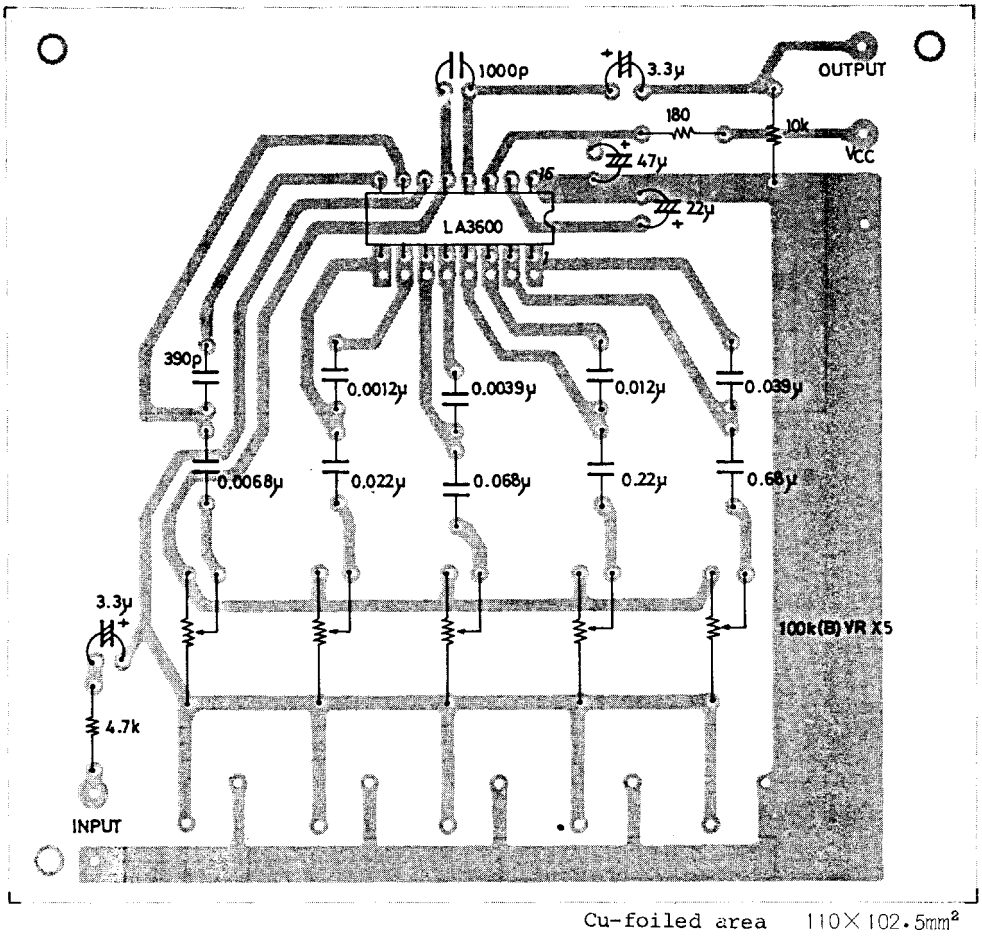
$$fo = \frac{1}{2\pi\sqrt{C1, C2, R1, R2}}$$ (R1=1.2kΩ, R2=68kΩ on-chip resistor)

Description of external parts

C1, C2 : Capacitors used to fix fo (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.

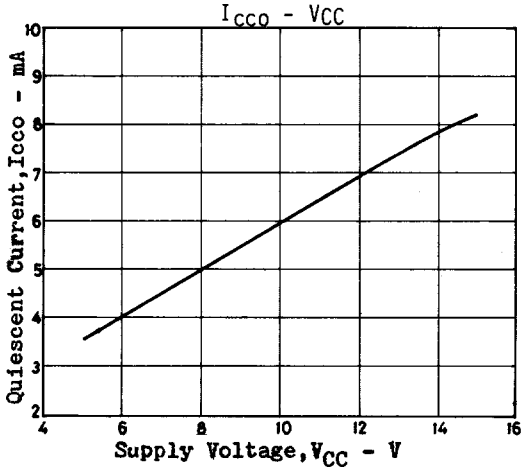
Sample Printed Circuit Pattern

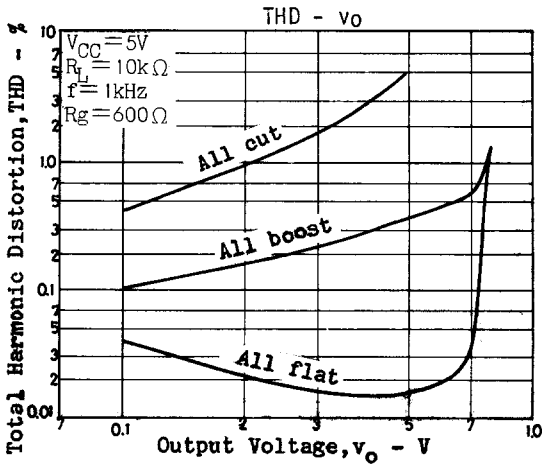
Unit (resistance: Ω, capacitance: F)

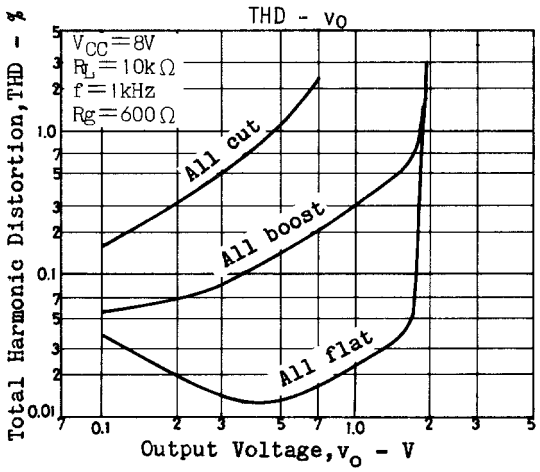


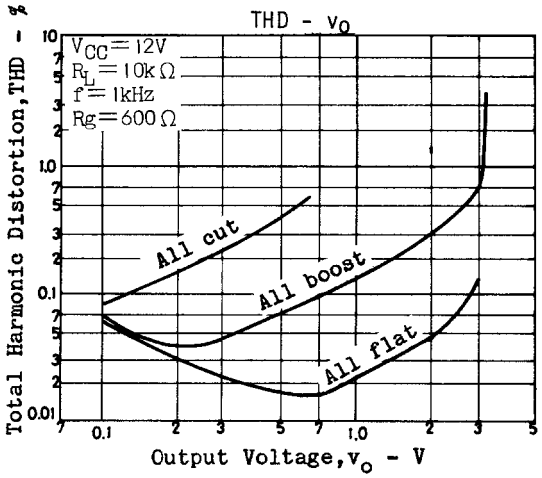
Proper cares in using IC

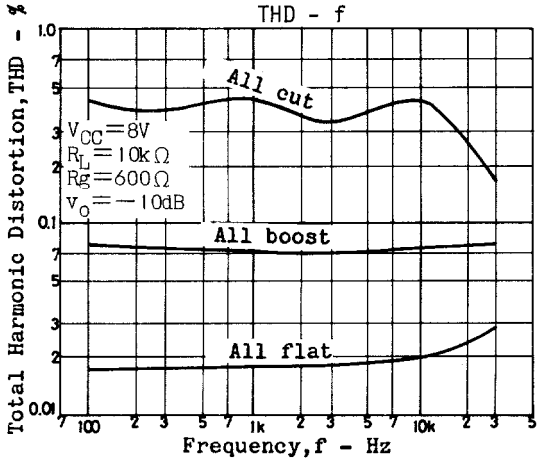
- Maximum supply voltage V_{CC} max 20V must not be exceeded. The operating voltage is in the range of 5 to 15V.
- Application of power with the pin-to-pin spaces shorted causes breakdown or deterioration of the IC to occur. When mounting the IC on the board or applying power, make sure that the pin-to-pin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

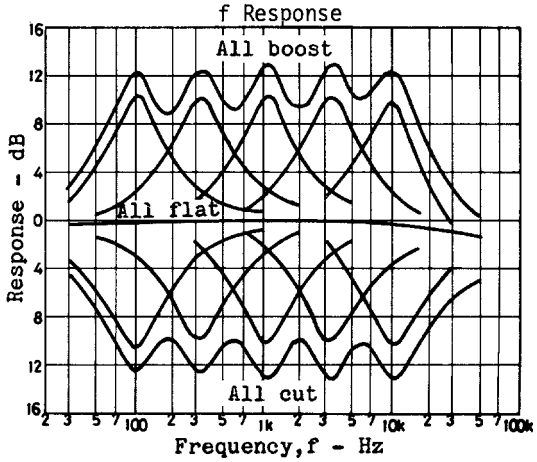


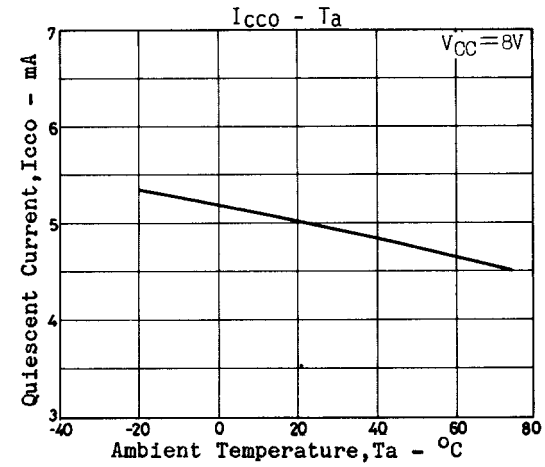


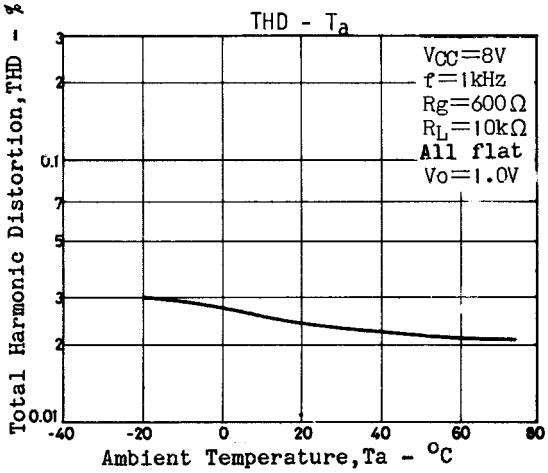

THD - v_O
V_{CC}=8V
R_L=10kΩ
f=1kHz
Rg=600Ω
All cut
All boost
All flat
Total Harmonic Distortion,THD - %
Output Voltage,v_O - V

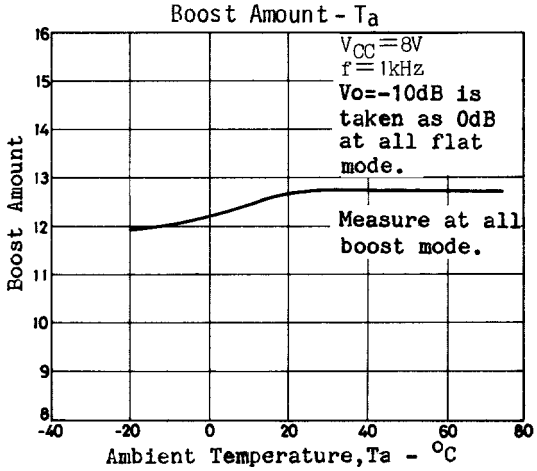

THD - v_O
V_{CC}=12V
R_L=10kΩ
f=1kHz
Rg=600Ω
All cut
All boost
All flat
Total Harmonic Distortion,THD - %
Output Voltage,v_O - V


THD - f
V_{CC}=8V
R_L=10kΩ
Rg=600Ω
v_O=−10dB
All cut
All boost
All flat
Total Harmonic Distortion,THD - %
Frequency,f - Hz


f Response
All boost
All flat
All cut
Response - dB
Frequency,f - Hz


Icco - Ta
V_{CC}=8V
Quiescent Current,Icco - mA
Ambient Temperature,Ta - °C


THD - T_a
V_{CC}=8V
f=1kHz
Rg=600Ω
R_L=10kΩ
All flat
Vo=1.0V
Total Harmonic Distortion,THD - %
Ambient Temperature,Ta - °C


Boost Amount - Ta
V_{CC}=8V
f=1kHz
Vo=-10dB is taken as 0dB at all flat mode.
Measure at all boost mode.
Boost Amount
Ambient Temperature,Ta - °C