

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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# M5243BFP

## 3-element 2-ch Graphic Equalizer IC

REJ03F0082-0100Z

Rev.1.0

Sep.22.2003

### Description

This 2-ch, 3-element graphic equalizer IC is ideal for Hi-Fi audio devices, and features three transistor-type resonance circuits and an output operating amp that handles two channels built into it. It is designed for use in radio cassette players, car stereos, portable stereos and other devices.

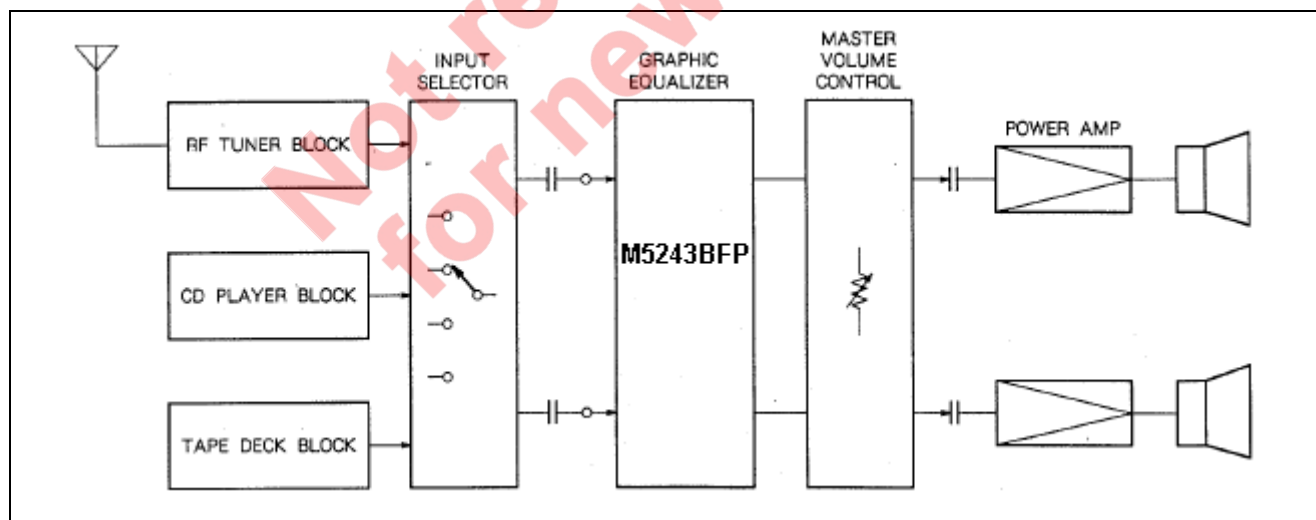
### Features

- Two-channel (stereo) processing is possible with single IC.
- An internal reference voltage circuit eliminates the need for a large-volume capacitor and makes it possible to use fewer components.
- The Gv can be varied using an external resistor.
- Low noise .....  $V_{NO\ FLAT} = 4\ \mu V_{rms}$  (standard)
- Low distortion ..... THD = 0.004% (standard)  
(@f = 1 kHz, FLAT)

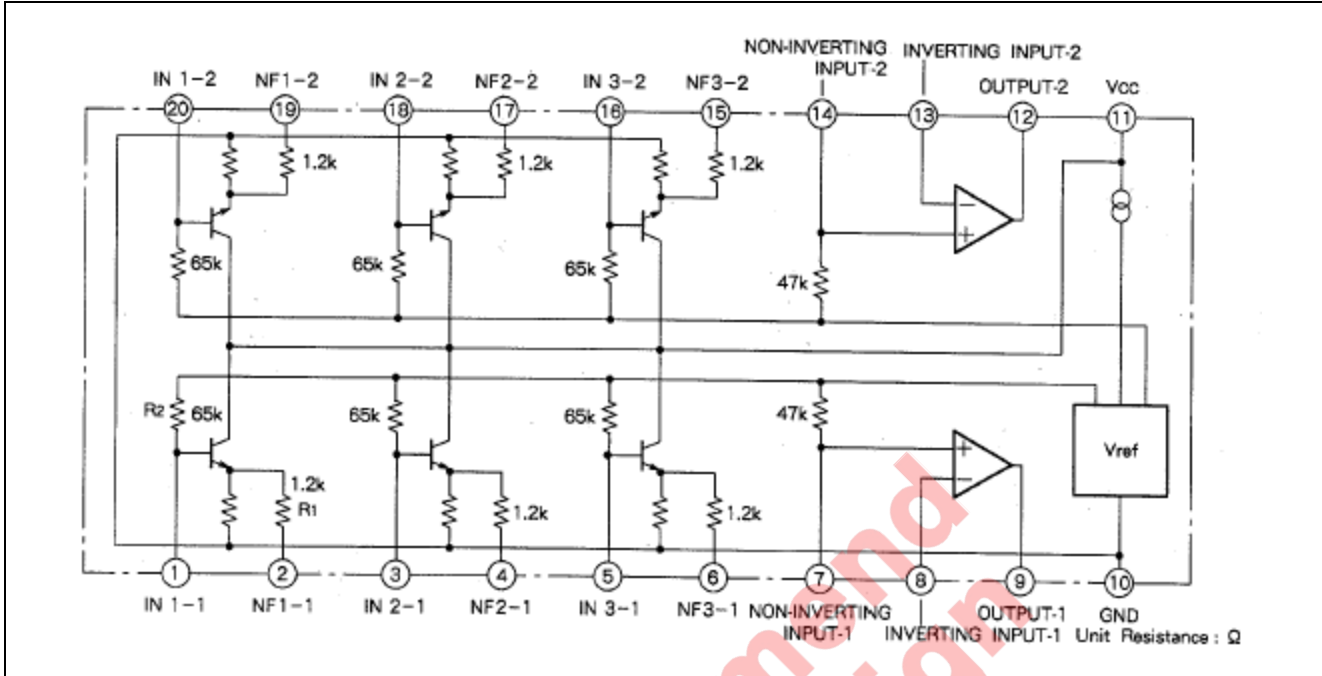
### Recommended Operating Conditions

Rated power dissipation : 550 mW (FP)

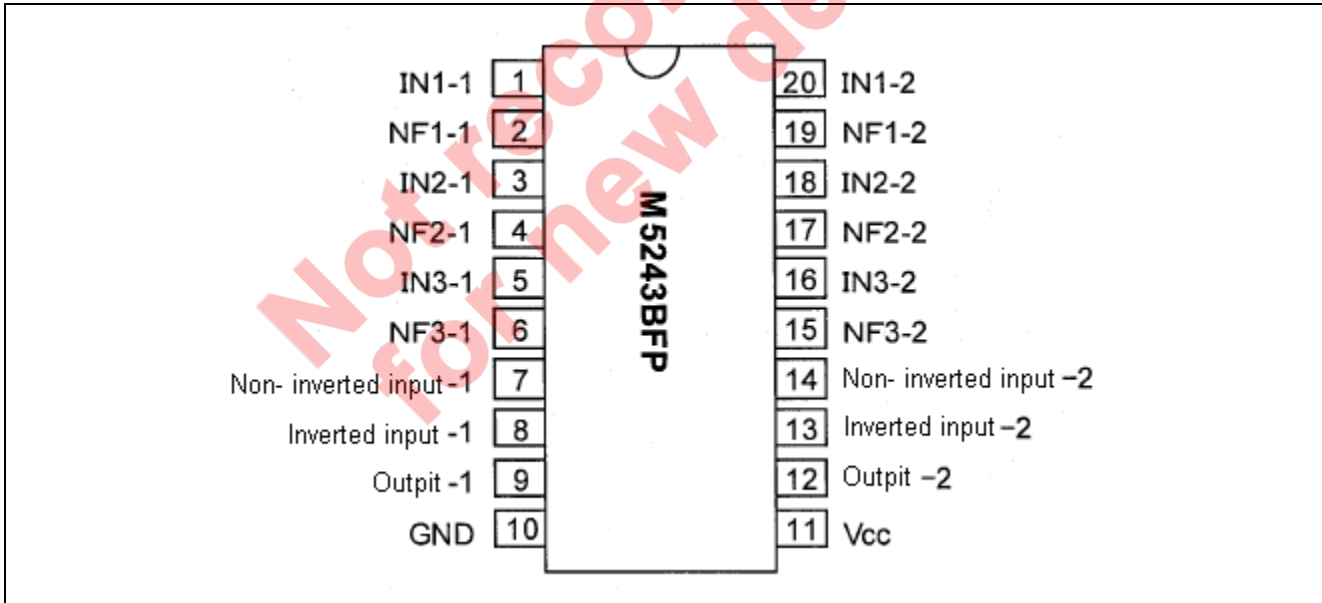
### System Configuration



Block Diagram



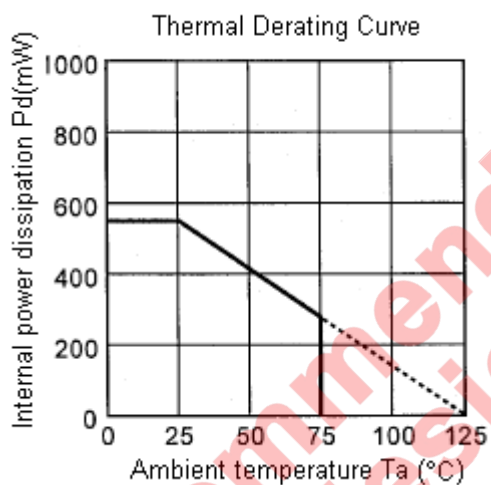
Pin Configuration



## Absolute Maximum Ratings

(Unless otherwise noted,  $T_a = 25^\circ\text{C}$ )

Symbol	Item	Conditions	Rated values	Unit
$V_{CC}$	Power supply voltage		16	V
$I_{LP}$	Current load		30	mA
$P_d$	Internal power dissipation		550	mW
$T_{opr}$	Ambient operating temperature		-20 to +75	$^\circ\text{C}$
$T_{stg}$	Storage temperature		-55 to +125	$^\circ\text{C}$

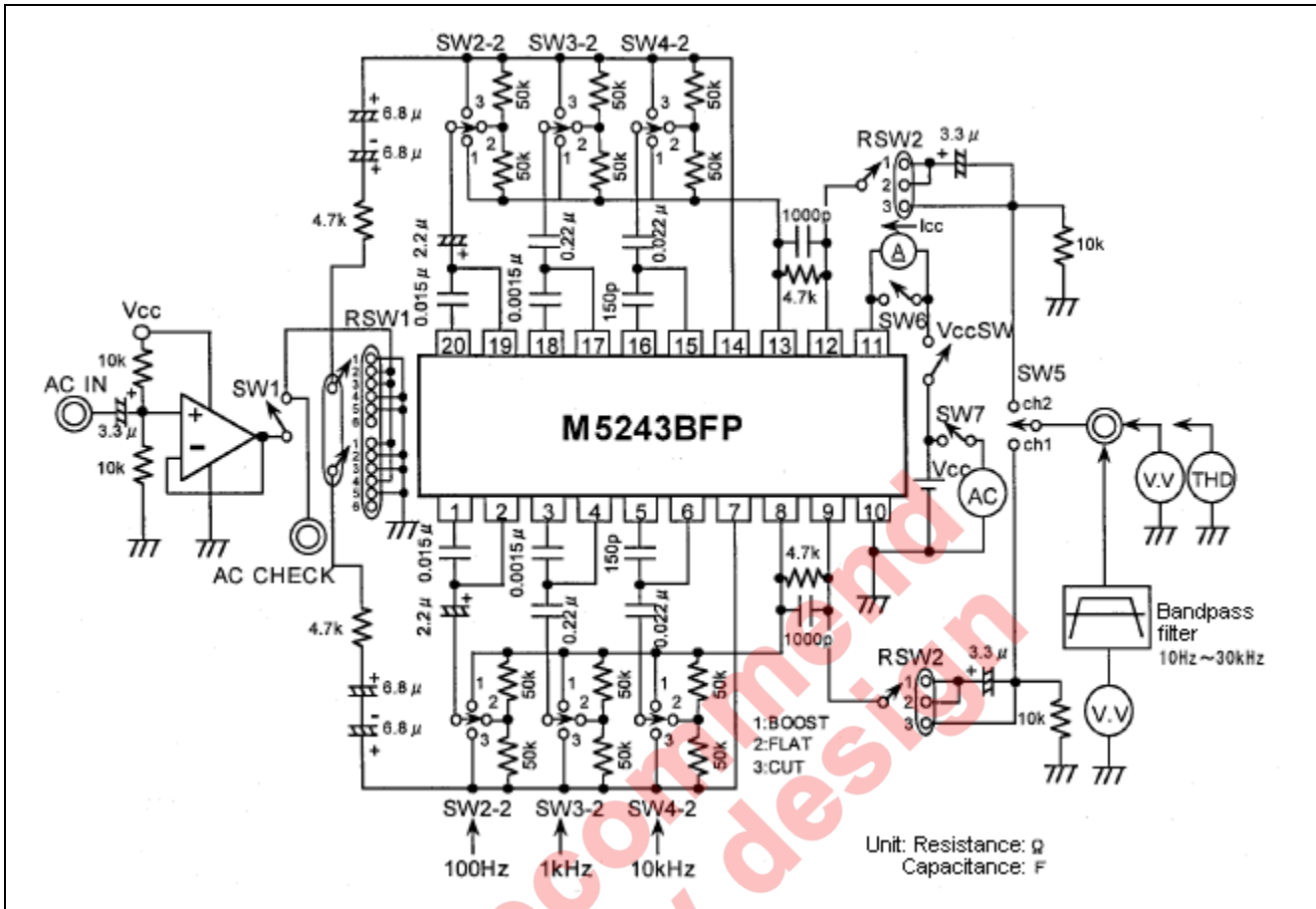


## Electrical Characteristics

(Unless otherwise noted, Ta = 25°C)

Symbol	Item	Measurement conditions	f (Hz)	Limits			Unit	
				Min.	Typ.	Max.		
I <sub>CC</sub>	Circuit current		—	9.0	12.5	16.0	mA	
G <sub>V</sub> (FLAT)	Voltage gain	Flat	V <sub>I</sub> = -10dBm	1k	-2.0	-0.5	1.0	dB
G <sub>V</sub> (BOOST)		Boost	V <sub>I</sub> = -10dBm V <sub>i</sub> = 0 dBm R <sub>g</sub> = 4.7k	100	10.0	12.0	14.0	
G <sub>V</sub> (CUT)	Cut			1k	10.0	12.0	14.0	
				10k	10.0	12.0	14.0	
				100	-14.0	-12.0	-10.0	
				1k	-14.0	-12.0	-10.0	
				10k	-10.0	-12.0	-10.0	
THD	Total harmonic distortion	V <sub>i</sub> = 1Vms All FLAT	1k	—	0.003	0.1	%	
V <sub>OM</sub>	Maximum out put voltage	THD = 0.1% All FLAT	1k	1.5	1.9	—	V <sub>rms</sub>	
C.C	Channel separation	V <sub>I</sub> = -10 dBm All FLAT	1k	60	75	—	dB	
H.R	Hum rejection	V <sub>I</sub> = -10 dBm All FLAT	120	55	65	—	dB	
V <sub>NO</sub>	Output noise voltage	All FLAT BW: 10 Hz to 30 kHz	—	—	3.5	15	μV <sub>rms</sub>	
V <sub>M</sub>	Midpoint potential		—	3.5	4.5	5.5	V	

Test Circuit

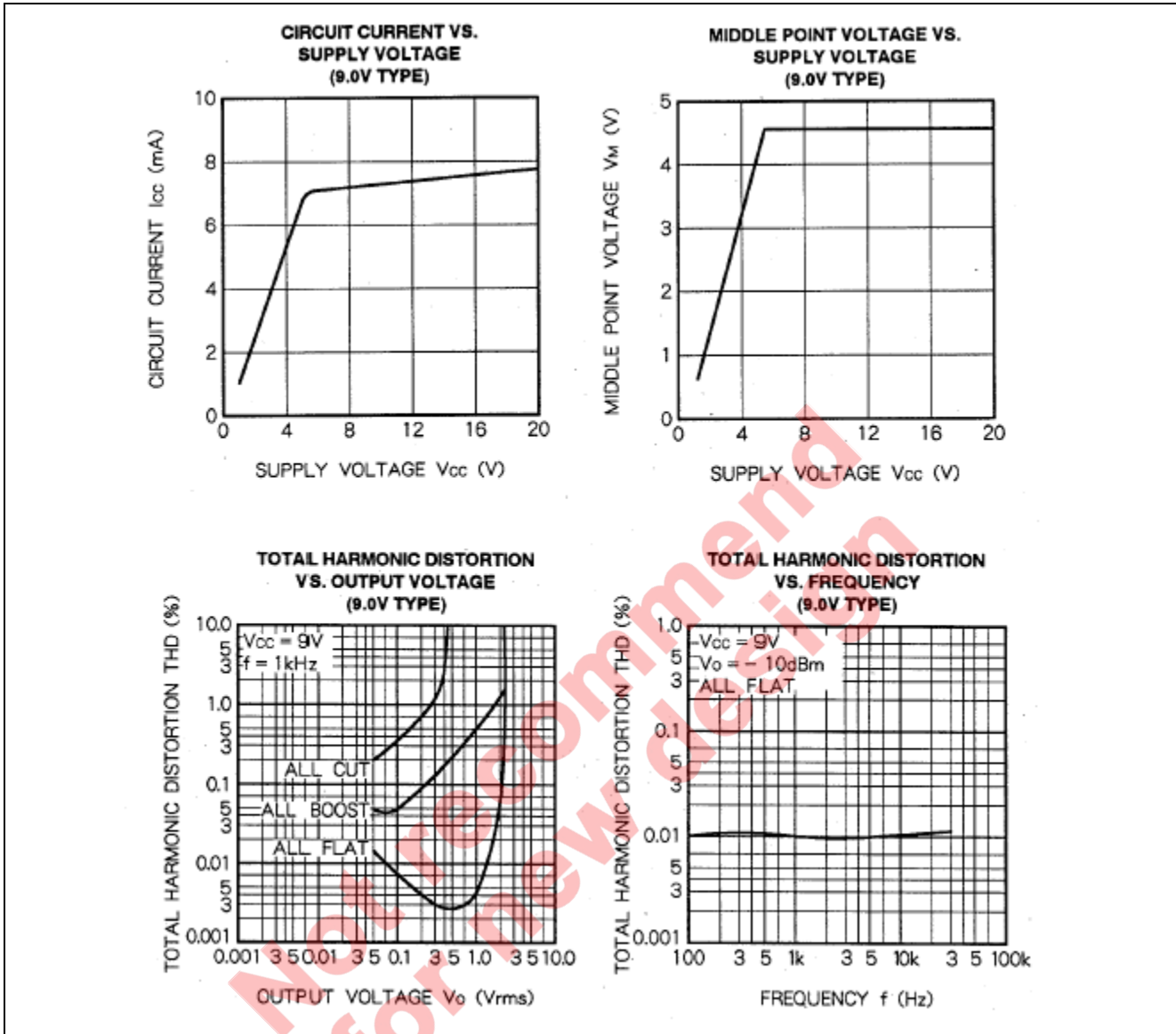


## Switch matrices

Item			RSW 1	RSW 2	SW 1	SW 2	SW 3-1	SW 4-1	SW 2-2	SW 3-2	SW 4-2	SW 5	SW 6	SW 7	Remarks	
Circuit current I <sub>cc</sub>			–	1 or 2	–	–	–	–	–	–	–	–	OFF	OFF		
Voltage gain	G <sub>v</sub> (FLAT)	ch1	1	1	ON	2	2	2	–	–	–	ch1	ON	OFF		
		ch2	2	2	ON	–	–	–	2	2	2	ch2	ON	OFF		
	G <sub>v</sub> (BOOST)	1	100 Hz	1	1	ON	1	2	2	–	–	–	ch1	ON	OFF	
			1 Hz	1	1	ON	2	1	2	–	–	–	ch1	ON	OFF	
			10 Hz	1	1	ON	2	2	1	–	–	–	ch1	ON	OFF	
		2	100 Hz	2	2	ON	–	–	–	1	2	2	ch2	ON	OFF	
			1 Hz	2	2	ON	–	–	–	2	1	2	ch2	ON	OFF	
			10 Hz	2	2	ON	–	–	–	2	2	1	ch2	ON	OFF	
	G <sub>v</sub> (CUT)	1	100 Hz	1	1	ON	3	2	2	–	–	–	ch1	ON	OFF	
			1 Hz	1	1	ON	2	3	2	–	–	–	ch1	ON	OFF	
			10 Hz	1	1	ON	2	2	3	–	–	–	ch1	ON	OFF	
		2	100 Hz	2	2	ON	–	–	–	3	2	2	ch2	ON	OFF	
			1 Hz	2	2	ON	–	–	–	2	3	2	ch2	ON	OFF	
			10 Hz	2	2	ON	–	–	–	2	2	3	ch2	ON	OFF	
	Maximum output voltage V <sub>OM</sub>	ch1	1	1	ON	2	2	2	–	–	–	ch1	ON	OFF		
ch2		2	2	ON	–	–	–	2	2	2	ch2	ON	OFF			
Total harmonic distortion THD (FLAT)	ch1	1	1	ON	2	2	2	–	–	–	ch1	ON	OFF	BOOST: Set SW2- SW4 to 1.CUT: SW4 to 3.		
	ch2	2	2	ON	–	–	–	2	2	2	ch2	ON	OFF			
Output noise voltage V <sub>No</sub> (FLAT)	ch1	5	1	OFF	2	2	2	–	–	–	ch1	ON	OFF			
	ch2	5	2	OFF	–	–	–	2	2	2	ch2	ON	OFF			
Channel separation CS	ch1	3	1	ON	2	2	2	–	–	–	ch1	ON	OFF			
	ch2	4	2	ON	–	–	–	2	2	2	ch2	ON	OFF			
Hum rejection HR	ch1	5	1	OFF	2	2	2	–	–	–	ch1	ON	ON			
	ch2	5	2	OFF	–	–	–	2	2	2	ch2	ON	ON			
Midpoint potential V <sub>M</sub>	ch1	6	3	OFF	–	–	–	–	–	–	ch1	ON	OFF			
	ch2	6	3	OFF	–	–	–	–	–	–	ch2	ON	OFF			

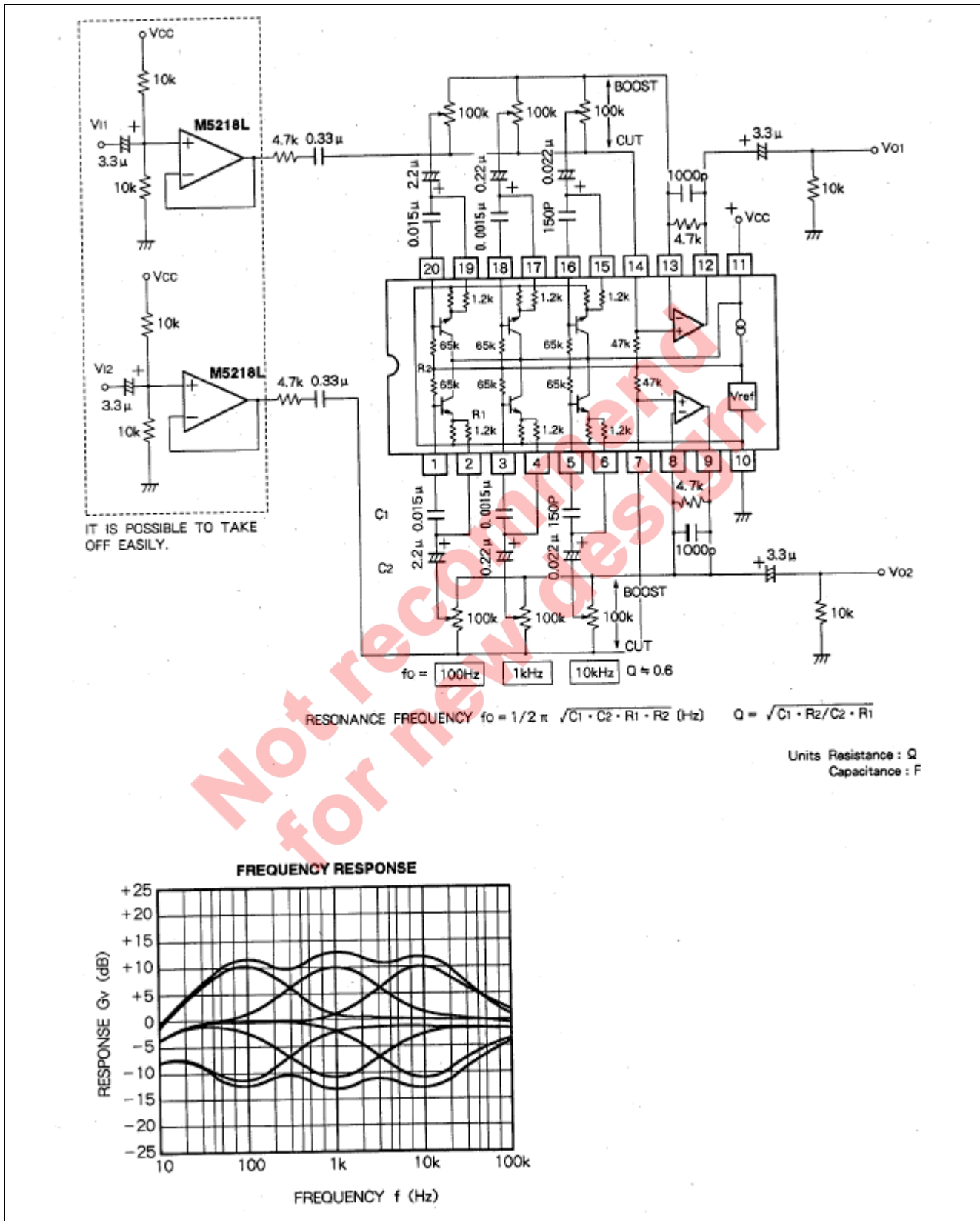


Typical Characteristics

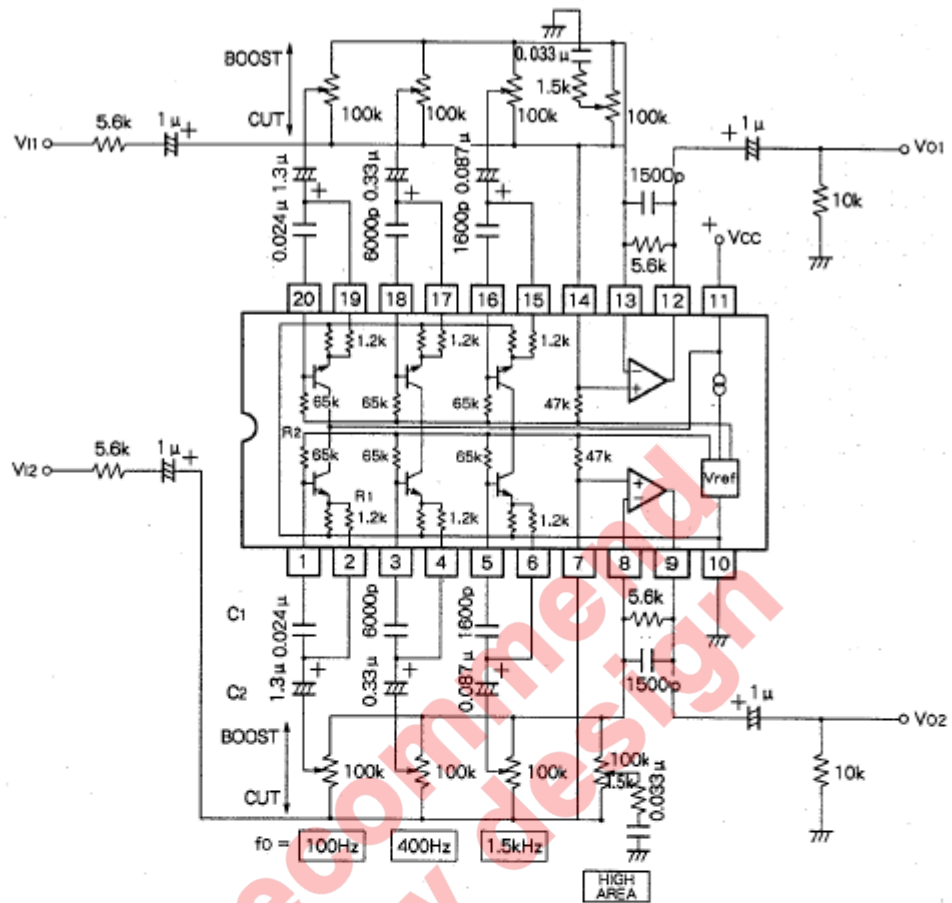


Application Example

1. 3-Element graphic equalizer (Dual channel)



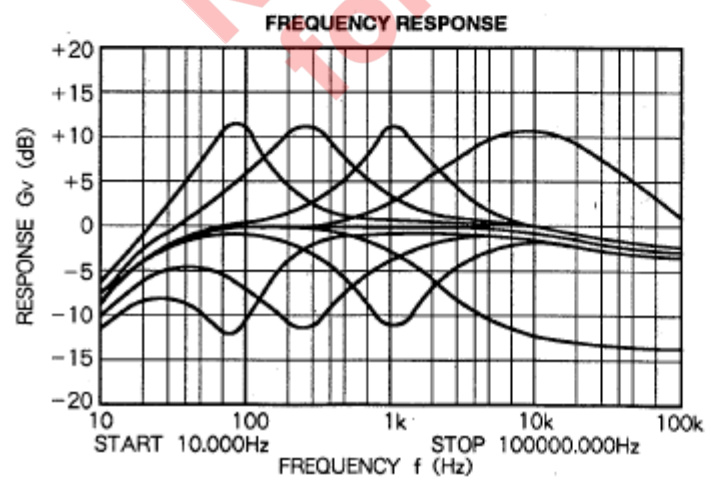
2. Simplicity 4-element graphic equalizer (Dual channel)



RESONANCE FREQUENCY  $f_0 = 1/2 \pi \sqrt{C_1 \cdot C_2 \cdot R_1 \cdot R_2}$  (Hz)

$Q = \sqrt{C_1 \cdot R_2 / C_2 \cdot R_1} \approx 1.0$

Units Resistance :  $\Omega$   
Capacitance : F



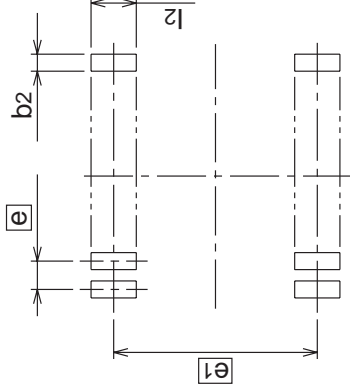
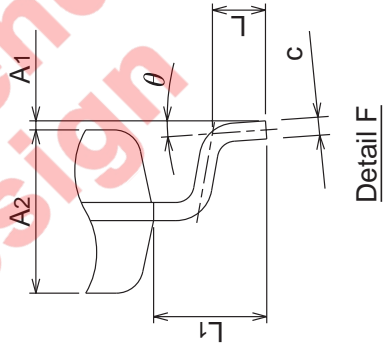
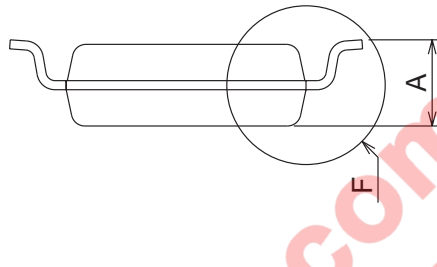
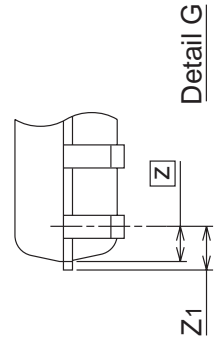
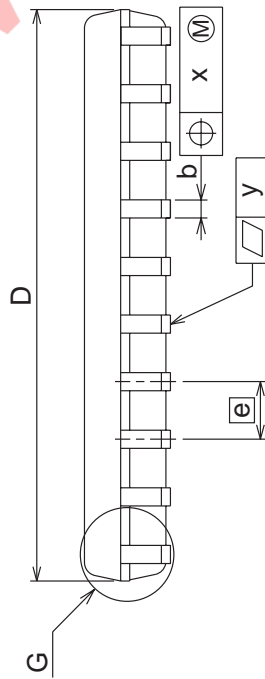
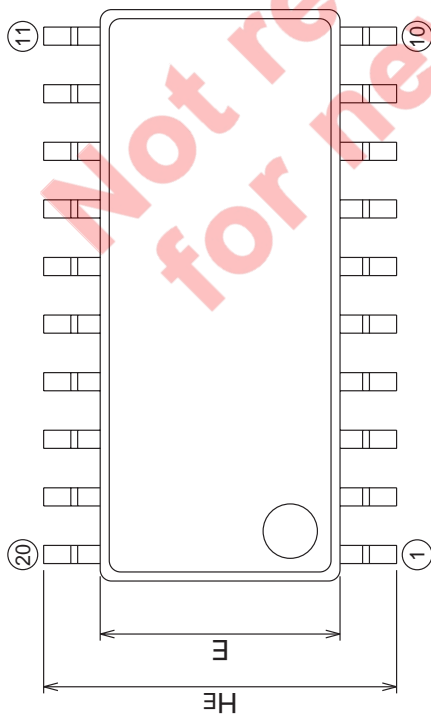
Package Dimensions

**20P2N-A**

(MMP)

**Plastic 20pin 300mil SOP**

EIAJ Package Code SOP20-P-300-1.27	JEDEC Code -	Weight(g) 0.26	Lead Material Cu Alloy
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Recommended Mount Pad

Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	-	-	2.1
A1	0	0.1	0.2
A2	-	1.8	-
b	0.35	0.4	0.5
c	0.18	0.2	0.25
D	12.5	12.6	12.7
E	5.2	5.3	5.4
e	-	1.27	-
HE	7.5	7.8	8.1
L	0.4	0.6	0.8
L1	-	1.25	-
Z	-	0.585	-
Z1	-	-	0.735
x	-	-	0.25
y	-	-	0.1
$\theta$	0°	-	8°
b2	-	0.76	-
e1	-	7.62	-
l2	1.27	-	-

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