M5243AP/FP

3-ELEMENT (SIMPLE 4-ELEMENT) DUAL CHANNEL GRAPHIC EQUALIZER IC

DESCRIPTION

The M5243 is a dual channel 3-element graphic equalizer IC best suited to Hi-Fi audio systems. Each channel incorporates 3-elements of transistor-based resonance circuits and an output OP amp.

Applications cover radio cassette tape recorders, car stereo sets, and portable stereo systems.

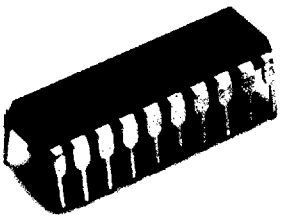
FEATURES

- It is possible to stereo (dual-channel) with single IC
- Large capacitor take off by reference voltage circuit self-contained
- Variable Gv by external resistance
- Low noise ····· V_{NO} FLAT = 4 μVrms(typ)
- Low distortion ratio ····· THD = 0.004 %(typ) (@ f = 1kHz, Flat)

Type(marking)	Recommended supply voltage	Type(marking)	Recommended supply voltage
M5243P06	4.0 to 6.0V	**M5243FP06**	4.0 to 6.0V
M5243P75	5.0 to 7.5V	**M5243FP75**	5.0 to 7.5V
M5243P09	6.0 to 9.0V	**M5243FP09**	6.0 to 9.0V
M5243P12	8.0 to 12.0V	**M5243FP12**	8.0 to 12.0V

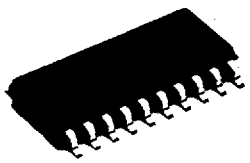
RECOMMENDED OPERATING CONDITIONS

Rated disspation voltage ····· 1000mW(AP)
550mW(AFP)



Outline 20P4(AP)

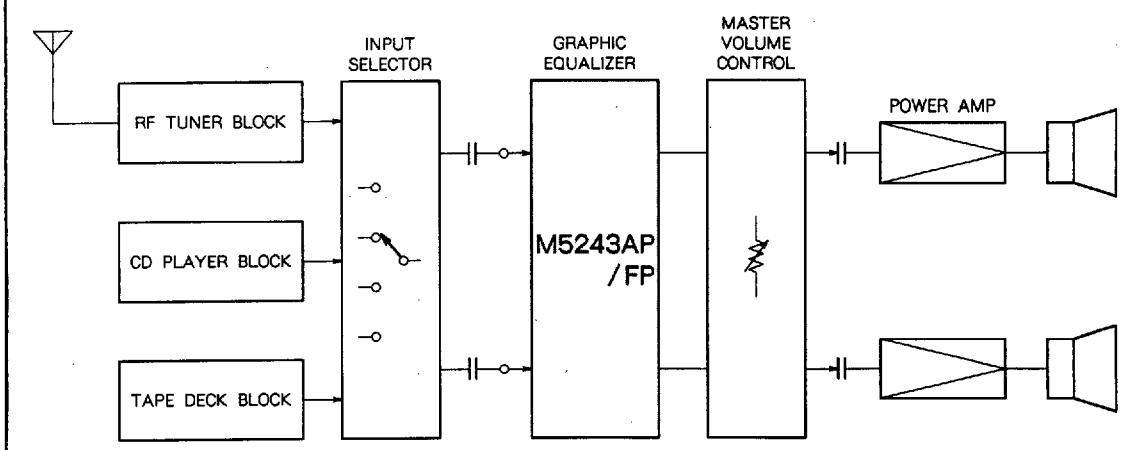
2.54mm pitch 300mil DIP
(6.3mm × 24.0mm × 3.3mm)



Outline 20P2N-A(AFP)

1.27mm pitch 300mil SOP
(5.3mm × 12.6mm × 1.8mm)

SYSTEM CONFIGURATION



M5243AP/FP

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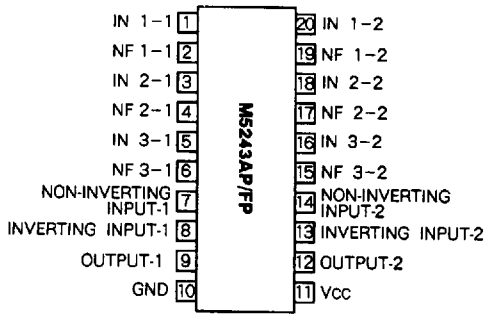
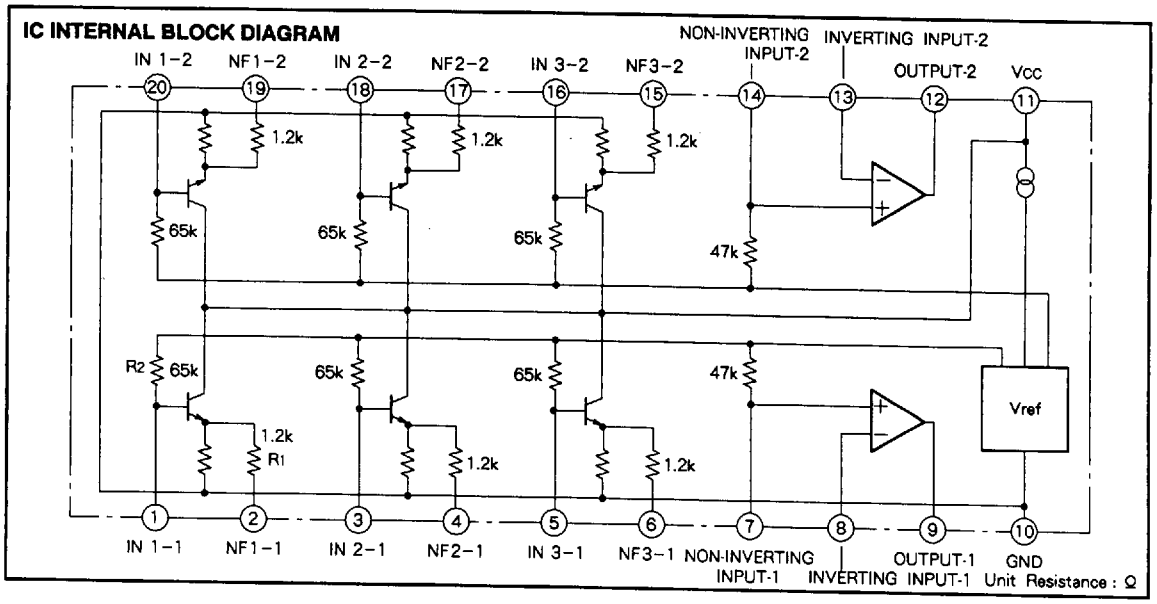
PIN CONFIGURATION (TOP VIEW)



Outline 20P4(AP)
20P2N-A(AFP)

IC INTERNAL BLOCK DIAGRAM



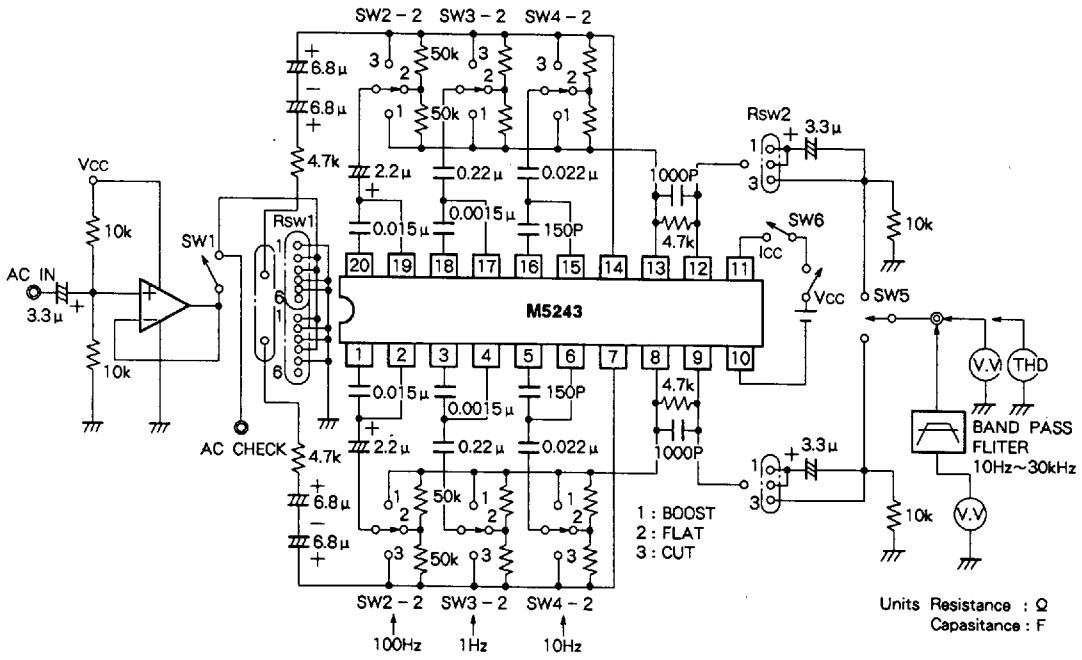
ABSOLUTE MAXIMUM RATINGS (Ta = 25℃, unless otherwise noted)

Symbol	Parameter	Ratings	Unit
V_{CC}	Supply voltage	20	V
I_{LP}	Load current	30	mA
P_d	Power dissipation	AFP : 550/AP : 1	mW/W
T_{opr}	Operating temperature	− 20 to + 75	℃
T_{stg}	Strage temperature	− 55 to + 125	℃

ELECTRICAL CHARACTERISTICS (Ta = 25℃)

Symbol	Parameter		Test conditions	f(Hz)	Limits Min	Typ	Max	Unit
I_{CC}	Circuit current			−	5.0	7.5	12.0	mA
$G_{V\ (FLAT)}$	Voltege gain	Flat	V_i = − 10dBm, R_g = 4.7k Ω	1k	− 2.0	− 0.5	1.0	dB
$G_{V(BOOST)}$		Boost		100	8.0	10.0	12.0	
				1k	8.0	10.0	12.0	
				10k	8.8	10.0	12.0	
$G_{V\ (CUT)}$		Cut		100	− 13.0	− 11.0	− 9.0	
				1k	− 13.0	− 11.0	− 9.0	
				10k	− 13.0	− 11.0	− 9.0	
THD	Total harmonic distortion		V_i = 1Vrms, All flat	1k	−	0.004	0.1	%
V_{OM}	Maximum output voltage	**M5243X06**	THD = 0.1 %, All flat	1k	0.5	1.0	−	Vrms
		M5243X75			1.0	1.5	−	
		M5243X09			1.5	1.9	−	
		M5243X12			2.0	2.9	−	
CS	Channel separation		V_i = − 10dBm, All flat	1k	60	75	−	dB
RR	Ripple rejection		V_i = − 10dBm, All flat	120	55	65	−	dB
V_{NO}	Output noise voltage		All flat BW : 10Hz to 30kHz	−	−	4	15	μVrms
V_M	Middle point voltage	**M5243X06**		−	2.1	3.0	3.9	V
		M5243X75			2.7	3.75	4.8	
		M5243X09			3.5	4.5	5.5	
		M5243X12			5.0	6.0	7.0	

STANDARD TEST CIRCUIT

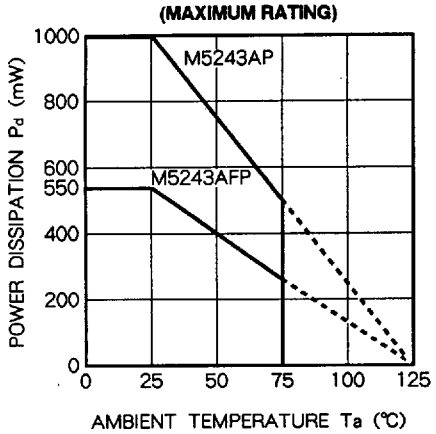


SWITCH MATRIX

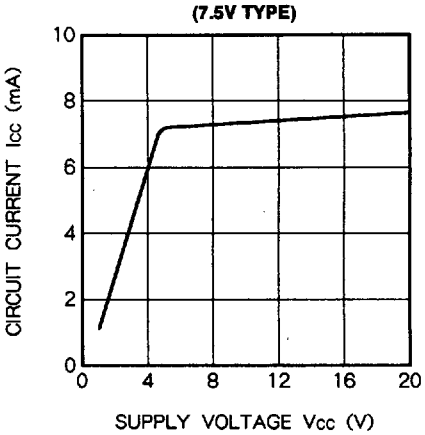
Parameter				Vcc	Rsw1	Rsw2	SW1	SW2-1	SW3-1	SW4-1	SW2-2	SW3-2	SW4-2	SW5	SW6	Remarks
Circuit current			Icc	ON	–	ch1 or 2	–	–	–	–	–	–	–	–	OFF	
Voltage gain	$G_{V(FLAT)}$	ch1		ON	ch1	ch1	ON	2	2	2	–	–	–	ch1	ON	
		ch2		ON	ch2	ch2	ON	–	–	–	2	2	2	ch2	ON	
	$G_{V(BOOST)}$	ch1	100Hz	ON	ch1	ch1	ON	1	2	2	–	–	–	ch1	ON	
			1kHz	ON	ch1	ch1	ON	2	1	2	–	–	–	ch1	ON	
			10kHz	ON	ch1	ch1	ON	2	2	1	–	–	–	ch1	ON	
		ch2	100Hz	ON	ch2	ch2	ON	–	–	–	1	2	2	ch2	ON	
			1kHz	ON	ch2	ch2	ON	–	–	–	2	1	2	ch2	ON	
			10kHz	ON	ch2	ch2	ON	–	–	–	2	2	1	ch2	ON	
	$G_{V(CUT)}$	ch1	100Hz	ON	ch1	ch1	ON	3	2	2	–	–	–	ch1	ON	
			1kHz	ON	ch1	ch1	ON	2	3	2	–	–	–	ch1	ON	
			10kHz	ON	ch1	ch1	ON	2	2	3	–	–	–	ch1	ON	
		ch2	100Hz	ON	ch2	ch2	ON	–	–	–	3	2	2	ch2	ON	
			1kHz	ON	ch2	ch2	ON	–	–	–	2	3	2	ch2	ON	
			10kHz	ON	ch2	ch2	ON	–	–	–	2	2	3	ch2	ON	
Maximum output voltage V_{OM}		ch1		ON	ch1	ch1	ON	2	2	2	–	–	–	ch1	ON	
		ch2		ON	ch2	ch2	ON	–	–	–	2	2	2	ch2	ON	
Total harmonic distortion THD (FLAT)		ch1		ON	ch1	ch1	ON	2	2	2	–	–	–	ch1	ON	BOOST : SW2 to 4① CUT : SW 2 to 4③
		ch2		ON	ch2	ch2	ON	–	–	–	2	2	2	ch2	ON	
Output noise voltage V_{NO} (FLAT)		ch1		ON	V_{NO}	ch1	OFF	2	2	2	–	–	–	ch1	ON	
		ch2		ON	V_{NO}	ch2	OFF	–	–	–	2	2	2	ch2	ON	
Channel separation CS		ch1		ON	ch1	ch1	ON	2	2	2	–	–	–	ch1	ON	
		ch2		ON	ch2	ch2	ON	–	–	–	2	2	2	ch2	ON	
Ripple rejection RR		ch1		ON	HR	ch1	OFF	2	2	2	–	–	–	ch1	ON	
		ch2		ON	HR	ch2	OFF	–	–	–	2	2	2	ch2	ON	
Middle point voltage V_M		ch1		ON	V_M	V_M	OFF	–	–	–	–	–	–	ch1	ON	
		ch2		ON	V_M	V_M	OFF	–	–	–	–	–	–	ch2	ON	

TYPICAL CHARACTERISTICS

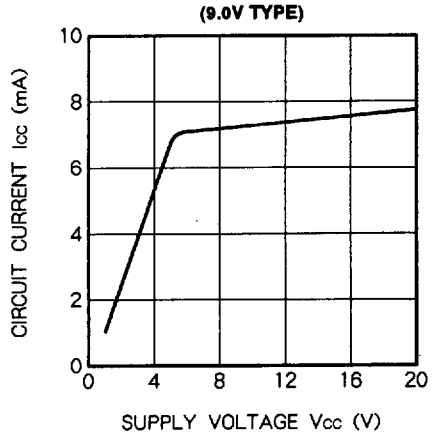
THERMAL DERATING
(MAXIMUM RATING)



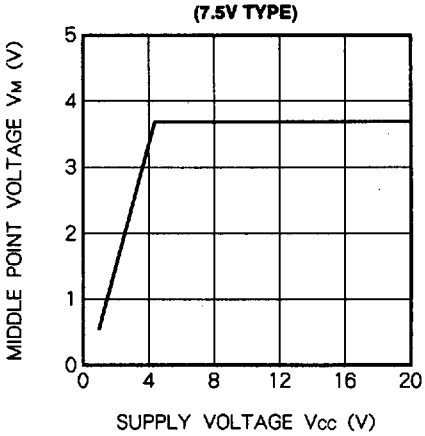
CIRCUIT CURRENT VS.
SUPPLY VOLTAGE
(7.5V TYPE)



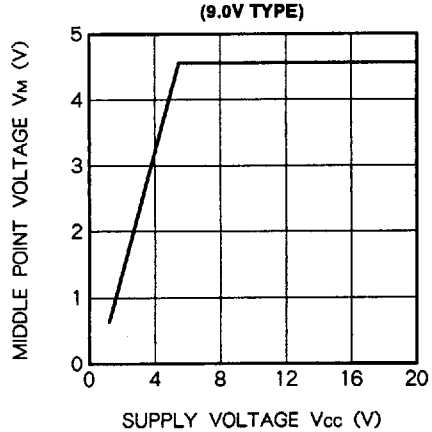
CIRCUIT CURRENT VS.
SUPPLY VOLTAGE
(9.0V TYPE)



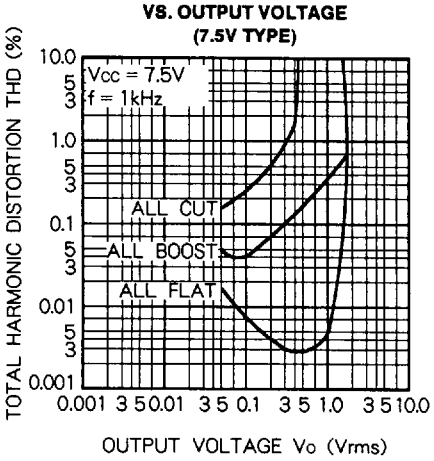
MIDDLE POINT VOLTAGE VS.
SUPPLY VOLTAGE
(7.5V TYPE)



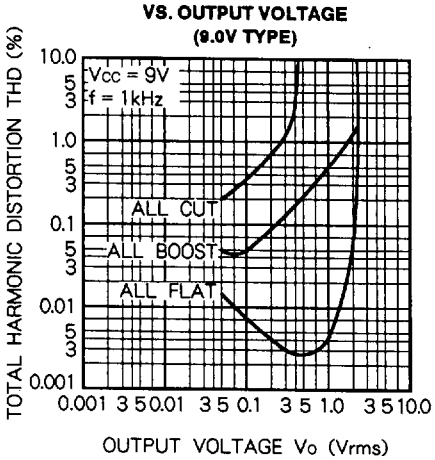
MIDDLE POINT VOLTAGE VS.
SUPPLY VOLTAGE
(9.0V TYPE)



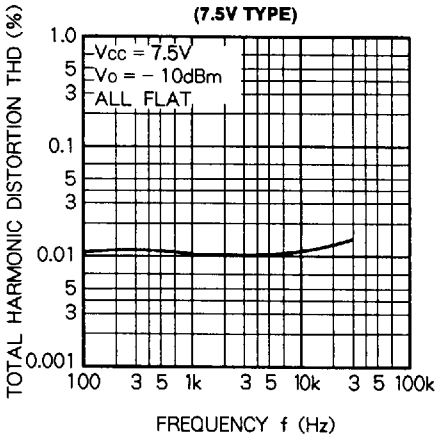
TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE (7.5V TYPE)



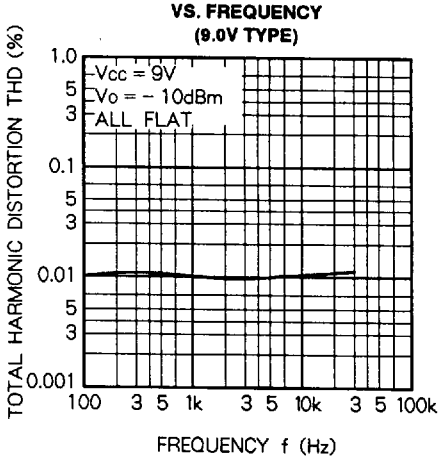
TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE (9.0V TYPE)



TOTAL HARMONIC DISTORTION VS. FREQUENCY (7.5V TYPE)

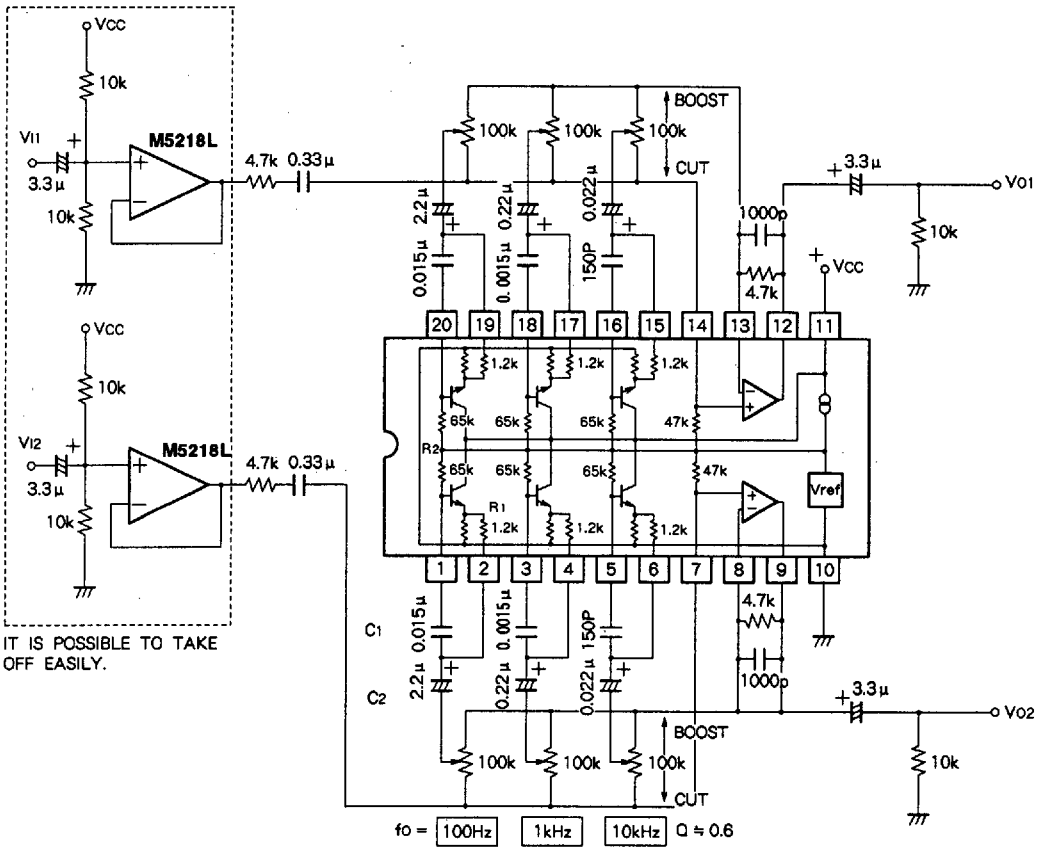


TOTAL HARMONIC DISTORTION VS. FREQUENCY (9.0V TYPE)



APPLICATION EXAMPLE – 1

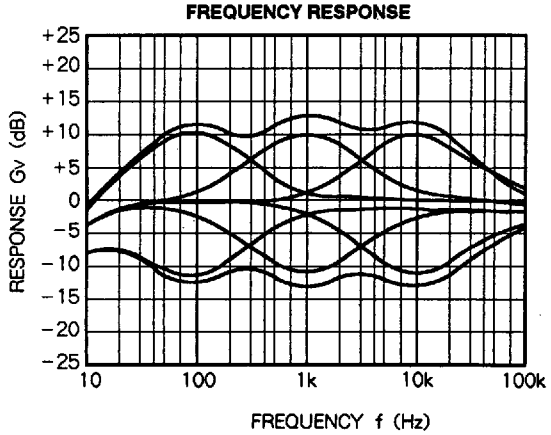
3-Element graphic equalizer (Dual channel)



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

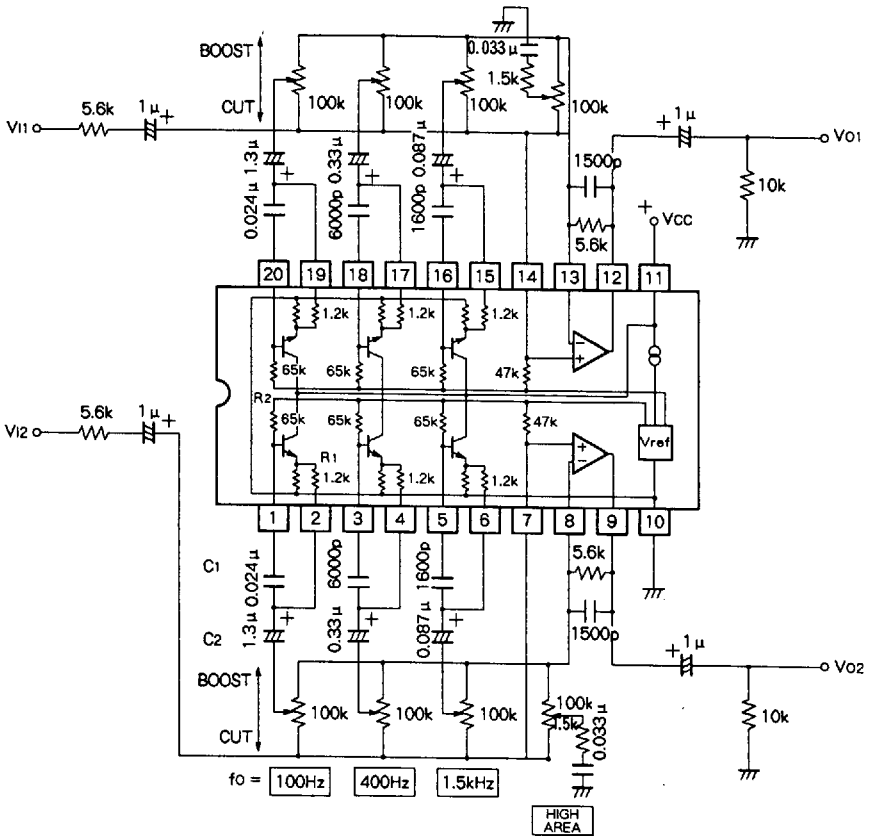
Units Resistance : Ω
Capacitance : F

FREQUENCY RESPONSE



APPLICATION EXAMPLE – 2

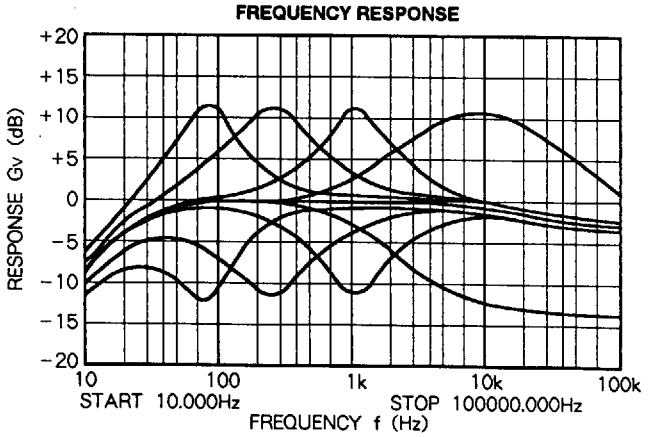
Simplicity 4-element graphic equalizer (Dual channel)



RESONANCE FREQUENCY $f_o = 1/2\pi \sqrt{C1 \cdot C2 \cdot R1 \cdot R2}$ (Hz) $Q = \sqrt{C1 \cdot R2/C2 \cdot R1} \fallingdotseq 1.0$

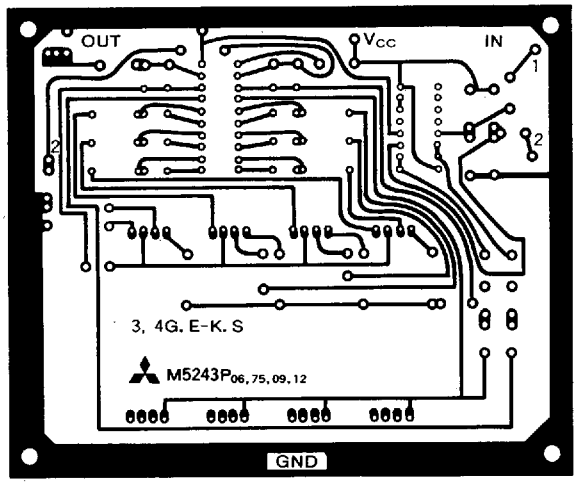
Units Resistance : Ω
Capacitance : F

FREQUENCY RESPONSE

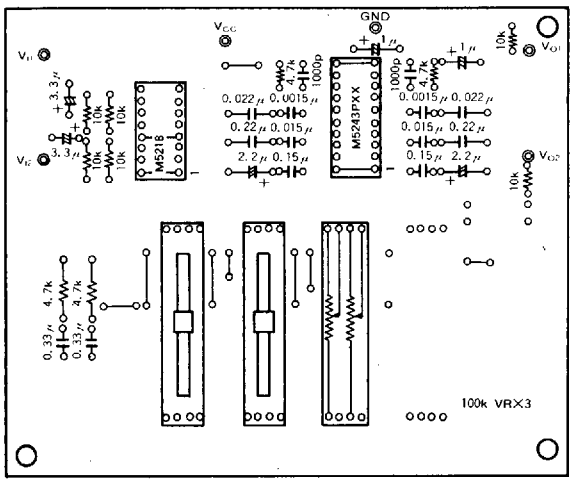


PCB FOR CIRCUIT TESTING

COPPER FOIL SIDE



(TYPICAL APPLICATION EXAMPLE)



(SIMMPLICITY 4-ELEMENT GRAPHIC EQUALIZER)