

M62413FP

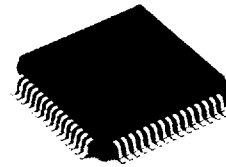
ELECTRONIC SOUND CONTROL WITH ELECTRONIC VOLUME FOR MULTIPLE SOURCES

DESCRIPTION

The M62413FP Integrated Circuit is developed for audio-visual equipment. It being used for controls sound in the power amplifier front stage. This IC having are 2 channel input selector with 4 inputs, master volume control [by the VCA (voltage controlled amplifier) system], tone controls (bass, mid, treble) and super bass that IC can be operated by using serial data from microcomputer. This IC can be applied to not only audio systems but also TV.

FEATURES

- Built-in electronic volume circuit for main volume control
- Volume variation range..... - 96dB to + 9dB
- With built-in bus boost circuit, bass can be intensified
- Sound control
 - Treble..... - 10dB to + 16dB(2dB/step)
 - Mid..... - 10dB to + 10dB(2dB/step)
 - Bass..... - 10dB to + 16dB(2dB/step)
 - Super bass..... - 12dB to + 12dB(2dB and 3dB/step)
- Volume is controlled by 8-bit serial data from micro-computer
 - Treble, mid, bass and super bass are controlled each by 4-bit serial data
- Built-in microcomputer interface circuit
- Built-in selector circuit (4 inputs)
- Built-in output ports (9 lines)



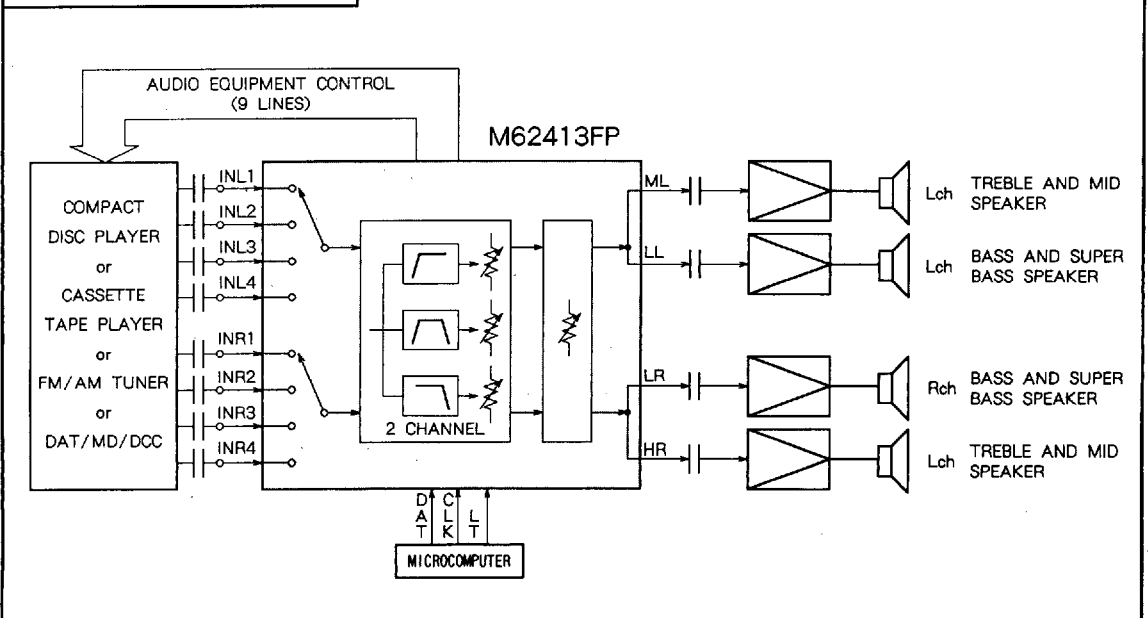
Outline 64P6N-A

0.8mm pitch QFP
(14.0mm × 14.0mm × 2.8mm)

RECOMMENDED OPERATING CONDITIONS

Supply voltage range..... $V_{CC} = 7.5$ to 12V
Rated supply voltage..... $V_{CC} = 9V$

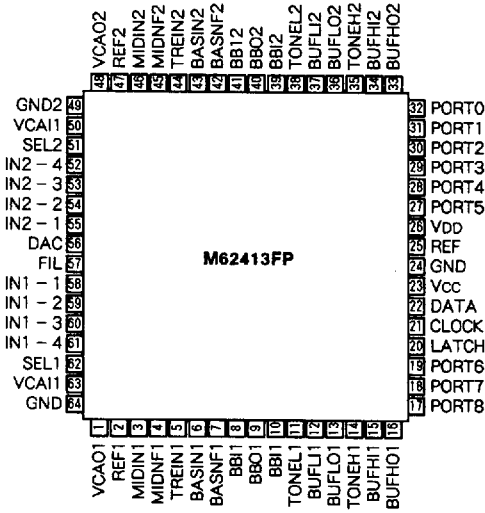
SYSTEM CONFIGURATION



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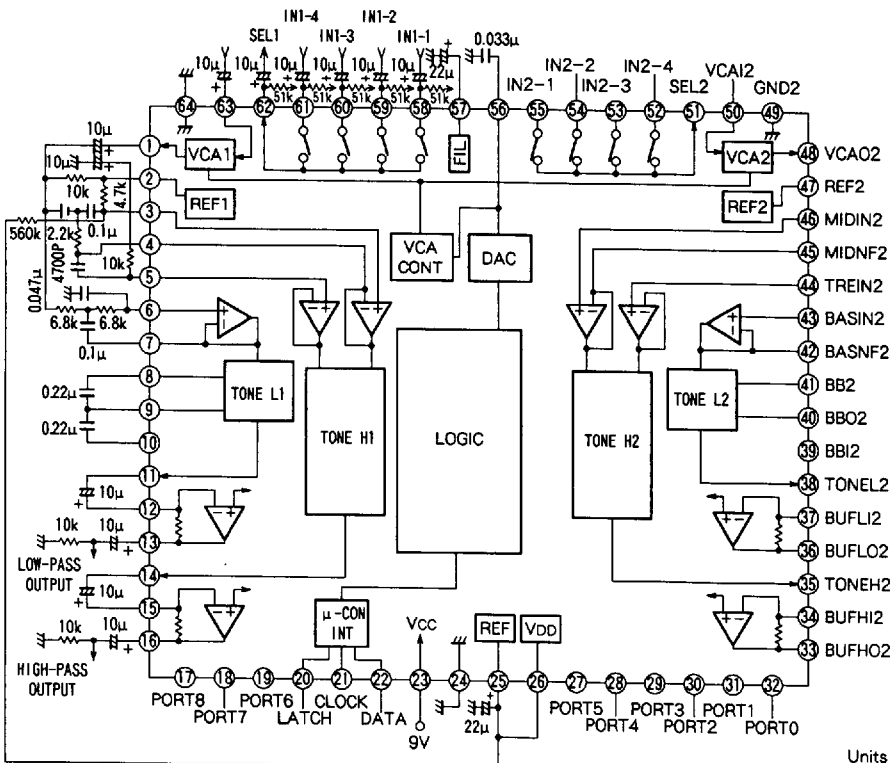
ELECTRONIC SOUND CONTROL WITH ELECTRONIC VOLUME FOR MULTIPLE SOURCES

PIN CONFIGURATION (TOP VIEW)



Outline 64P6N-A

IC INTERNAL BLOCK DIAGRAM



Units Resistance : Ω
Capacitance : F

ELECTRONIC SOUND CONTROL WITH ELECTRONIC VOLUME FOR MULTIPLE SOURCES

PIN DESCRIPTION

Pin No.	Symbol	DC voltage(V)	I/O	Equivalent circuit
① ④⑧	VCA01 VCA02	3.5	O	
② ④⑦	REF1 REF2	3.5	O	
⑤ ④④	TREIN1 TREIN2	-	I	
③ ④⑤ ⑥ ④③	MIDIN1 MIDIN2 BISIN1 BISIN2	-	I	
④ ④⑤ ⑦ ④②	MIDNF1 MIDNF2 BASNF1 BASNF2	-	I	
⑧ ④①	BBI1 BBI2	1.75	-	
⑪ ④③	TONEL1 TONEL2	1.75	O	
⑨ ④④	BBO1 BBO2	2.3	O	
⑩ ④③	BBI1 BBI2	3.0	I	

ELECTRONIC SOUND CONTROL WITH ELECTRONIC VOLUME FOR MULTIPLE SOURCES

PIN DESCRIPTION (Continued)

Pin No.	Symbol	DC voltage(V)	I/O	Equivalent circuit
12 37	BUFLI1 BUFLI2	3.5	I	
13 36	BUFL01 BUFL02	3.5	O	
14 35	TONEH1 TONEH2	1.75	O	
15 34	BUFHI1 BUFHI2	3.5	I	
16 33	BUFHO1 BUFHO2	3.5	O	
17 32	PORT8 PORT0	H: 4.4 L: 0	O	
18 19 27 28 29 30 31	PORT7 PORT6 PORT5 PORT4 PORT3 PORT2 PORT1	-	O	
20 21 22	LATCH CLOCK DATA	-	I	

ELECTRONIC SOUND CONTROL WITH ELECTRONIC VOLUME FOR MULTIPLE SOURCES

PIN DESCRIPTION (Continued)

Pin No.	Symbol	DC voltage(V)	I/O	Equivalent circuit
23	Vcc	9	-	
24	GND	0	-	
25	REF	5.8	O	
26	Vdd	-	I	
49	GND	0	-	
64	GND	0	-	
51	VCAI2	3.9	I	
63	VCAI1	3.9	I	
51	SEL1	-	O	
62	SEL2	-	O	
52	IN2 - 1	-	I	
61	IN1 - 1	-	I	
53	IN2 - 2	-	I	
60	IN1 - 2	-	I	
54	IN2 - 3	-	I	
59	IN1 - 3	-	I	
55	IN2 - 4	-	I	
60	IN1 - 4	-	I	
56	DAC	0~5.8	O	
57	FIL	8.9	I	

ELECTRONIC SOUND CONTROL WITH ELECTRONIC VOLUME FOR MULTIPLE SOURCES

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

Symbol	Parameter	Ratings	Unit
V _{CC}	Supply voltage	14	V
V _i	Digital input voltage	-0.3 to 7.0	V
P _d	Power dissipation	1000*Standard circuit board	mW
K _θ	Thermal derating	10	mW/°C
T _{opr}	Operating temperature	-10 to +70	°C
T _{stg}	Storage temperature	-40 to +125	°C

ELECTRICAL CHARACTERISTICS

(Ta = 25°C, V_{CC} = 9V, control data (volume maximum/ tone flat) and f = 1kHz unless otherwise noted)

Block name	Symbol	Parameter	Test conditions										Limits			Unit	
			Input condition	Number of data	SW conditions								Test point	Min	Typ		Max
					SA 1	SA 2	SB 1	SB 2	SC 1	SC 2	SD						
Power supply	I _{CC}	Circuit current	Quiescent	1	OFF	OFF	OFF	OFF	OFF	OFF	a	PIN23	33	45	57	mA	
	V _{REF}	Reference voltage	↑	↑	↑	↑	↑	↑	↑	↑	↑	PIN25	5.3	5.8	6.3	V	
	V _{FIL}	Filter voltage	↑	↑	↑	↑	↑	↑	↑	↑	↑	PIN57	8.2	8.9	—	V	
Logic input	I _{IH}	"H" level input current	V _{IH} = 4.5V	—	↑	↑	↑	↑	↑	↑	b	PIN20 PIN21 PIN22	0.3	1	3	μA	
	I _{IL}	"L" level input current	V _{IL} = 0.5V	—	↑	↑	↑	↑	↑	↑	↑	↑	—0.3	0	0.3	μA	
	V _{IH}	"H" level input voltage	(Recommended condition)	—	↑	↑	↑	↑	↑	↑	↑	↑	3.6	4.5	5	V	
	V _{IL}	"L" level input voltage	(Recommended condition)	—	↑	↑	↑	↑	↑	↑	↑	↑	0	0.5	1.4	V	
Logic output	V _{PTH}	PORT0	I _{OH} = —1mA	1	OFF	OFF	OFF	OFF	OFF	OFF	a	PIN32	3.5	4.4	—	V	
	I _{OL} = 4mA		2	↑	↑	↑	↑	↑	↑	↑	↑	PIN32	—	0.3	0.5		
	I _{PIH}	PORT1	V _{OH} = 9V	1	↑	↑	↑	↑	↑	↑	↑	↑	PIN31	—	0	20	μA
	I _{PIL}		I _{OL} = 5mA	3	↑	↑	↑	↑	↑	↑	↑	↑	PIN31	—	0	0.5	V
	I _{P2H}	PORT2	V _{OH} = 9V	1	↑	↑	↑	↑	↑	↑	↑	↑	PIN30	—	0	20	μA
	I _{P2L}		I _{OL} = 5mA	4	↑	↑	↑	↑	↑	↑	↑	↑	PIN30	—	0	0.5	V
	I _{P3H}	PORT3	V _{OH} = 9V	1	↑	↑	↑	↑	↑	↑	↑	↑	PIN29	—	0	20	μA
	I _{P3L}		I _{OL} = 5mA	5	↑	↑	↑	↑	↑	↑	↑	↑	PIN29	—	0	0.5	V
	I _{P4H}	PORT4	V _{OH} = 9V	1	↑	↑	↑	↑	↑	↑	↑	↑	PIN28	—	0	20	μA
	I _{P4L}		I _{OL} = 5mA	6	↑	↑	↑	↑	↑	↑	↑	↑	PIN28	—	0	0.5	V
	I _{P5H}	PORT5	V _{OH} = 9V	1	↑	↑	↑	↑	↑	↑	↑	↑	PIN27	—	0	20	μA
	I _{P5L}		I _{OL} = 5mA	7	↑	↑	↑	↑	↑	↑	↑	↑	PIN27	—	0	0.5	V
	I _{P6H}	PORT6	V _{OH} = 9V	1	↑	↑	↑	↑	↑	↑	↑	↑	PIN19	—	0	20	μA
	I _{P6L}		I _{OL} = 5mA	8	↑	↑	↑	↑	↑	↑	↑	↑	PIN19	—	0	0.5	V
	I _{P7H}	PORT7	V _{OH} = 9V	1	↑	↑	↑	↑	↑	↑	↑	↑	PIN18	—	0	20	μA
	I _{P7L}		I _{OL} = 5mA	9	↑	↑	↑	↑	↑	↑	↑	↑	PIN18	—	0	0.5	V
	I _{P8H}	PORT8	I _{OH} = —1mA	1	↑	↑	↑	↑	↑	↑	↑	↑	PIN17	3.5	4.4	—	V
	I _{P8L}		I _{OL} = 4mA	10	↑	↑	↑	↑	↑	↑	↑	↑	PIN17	—	0.3	0.5	
	I _{P8OPEN}		V _O = 0V~5V	11	↑	↑	↑	↑	↑	↑	↑	↑	PIN17	—20	—	20	
Selector	G _{VS}	Gain	V _i = —25dBV	12~15	ON	ON	↑	↑	↑	↑	↑	A(1), A(2)	—1.0	0	1.0	dB	
	THDs	Total harmonic distortion	V _i = —25dBV, 400Hz to 30kHz	12~15	↑	↑	↑	↑	↑	↑	↑	A(1), A(2)	—	0.01	0.1	%	
	THDs _{max}	Maximum total harmonic distortion	V _i = —14dBV, 400Hz to 30kHz	12~15	↑	↑	↑	↑	↑	↑	↑	A(1), A(2)	—	0.1	1.0	%	
Switching offset	OFST _{M1}	Treble/mid switching offset voltage	No signals (measure of data switching offset)	16→17	OFF	OFF	↑	↑	↑	↑	↑	PIN14 PIN35	—20	0	+20	mV	
	OFS _{BB1}	Boost switching offset voltage 1	↑	1→18	↑	↑	↑	↑	↑	↑	↑	PIN8 PIN41	—10	0	+10	mV	
	OFS _{BB2}	Boost switching offset voltage 2	↑	1→19	↑	↑	↑	↑	↑	↑	↑	PIN8 PIN41	—10	0	+10	mV	

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ELECTRICAL CHARACTERISTICS (Continued)

Block name	Symbol	Parameter	Test conditions										Test point	Limits			Unit
			Input condition	Number of data	SW conditions							Min		Typ	Max		
Channel balance	CBVT	Total channel balance 1	—	—	—	—	—	—	—	—	—	CB + CBT	-3	0	3	dB	
	CBVM	Total channel balance 2	—	—	—	—	—	—	—	—	—	CB + CBM	-3	0	3	dB	
	CBVB	Total channel balance 3	—	—	—	—	—	—	—	—	—	CB + CBBA	-3	0	3	dB	
Electronic volume	ATT(min)	Minimum attenuation level	Reference $\textcircled{1}$ $V_i = -14\text{dBV}$	1	OFF	OFF	ON	ON	OFF	OFF	a	B(1),B(2)	7.2	9	10.8	dB	
	CB	Channel balance	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	B(1)/B(2)	-1.8	0	1.8	dB	
	THD	Total harmonic distortion	$V_i = -14\text{dBV}$, BPF = 400Hz to 30kHz $\textcircled{2}$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	B(1),B(2)	—	0.02	0.1	%	
	No(min)	Noise voltage	Quiescet, JIS - A	$\uparrow$	$\uparrow$	$\uparrow$	OFF	OFF	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	—	25	56	μVrms	
	THDmax	Maximum total harmonic distortion	$V_i = -3\text{dBV}$, BPF = 400Hz to 30kHz $\textcircled{2}$	1	$\uparrow$	$\uparrow$	ON	ON	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	—	0.1	1.0	%	
	ATT(-10)	Attenuation(-10dB)	Reference $\textcircled{1}$ $V_i = -14\text{dBV}$	20	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	-2.8	-1.0	0.8	dB	
	ATT(max)	Maximum attenuation	$V_i = -3\text{dBV}$, JIS - A $\textcircled{3}$	21	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	—	-97	-77	dB	
	No	Noise voltage under maximum attenuation	Quiescet, JIS - A	21	$\uparrow$	$\uparrow$	OFF	OFF	$\uparrow$	$\uparrow$	$\uparrow$	B(1),B(2)	—	10	20	μVrms	
Treble	CT	Crosstalk	$V_i = -3\text{dBV}$, JIS - A $\textcircled{3}$	1	$\uparrow$	$\uparrow$	OFF	ON	OFF	$\uparrow$	$\uparrow$	B(1) B(2)	—	-90	-70	dB	
	GVT	Gain	Reference $\textcircled{3}$ $V_i = -14\text{dBV}$	1	OFF	OFF	OFF	OFF	ON ab=ON	ON ab=ON	a	D(1),D(2)	-6	-4	-2	dB	
	CBT	Channel balance	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	D(1)/D(2)	-2	0	+2	dB	
	THDH	Total harmonic distortion	$\uparrow$ BPF=400Hz to 30kHz	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	D(1),D(2)	—	0.01	0.1	%	
	NoT	Noise voltage	Quiescet, JIS - A	1	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	OFF	OFF	$\uparrow$	$\uparrow$	—	11	22	μVrms	
	THDTmax	Maximum total harmonic distortion	$V_i = -6\text{dBV}$, BPF = 400Hz to 30kHz $\textcircled{2}$	22	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	ON ab=ON	ON ab=ON	$\uparrow$	$\uparrow$	—	0.1	1	%	
	GVT(max)	Maximum gain	Reference $\textcircled{3}$ $V_i = -14\text{dBV}$	22	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	+10	+12	+14	dB	
	GVT(min)	Minimum gain	$\uparrow$	23	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	D(1),D(2)	-16	-14	-12	dB	
Mid	CTT	Crosstalk	Reference $V_i = -6\text{dBV}$ JIS-A $\textcircled{2}$	22	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	OFF	ON	OFF	D(1) D(2)	—	-80	-60	dB	
	GVM	Gain	Reference $\textcircled{3}$ $V_i = -14\text{dBV}$	1	OFF	OFF	OFF	OFF	ON ab=ON	ON ab=ON	a	D(1),D(2)	-6	-4	-2	dB	
	CBM	Channel balance	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	D(1)/D(2)	-2	0	+2	dB	
	THDM	Total harmonic distortion	$\uparrow$ BPF = 400Hz~30kHz	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	D(1),D(2)	—	0.01	0.1	%	
	NoM	Noise voltage	Quiescet, JIS - A	1	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	OFF	OFF	$\uparrow$	$\uparrow$	—	11	22	μVrms	
	THDMmax	Maximum total harmonic distortion	$V_i = 0\text{dBV}$, BPF = 400Hz to 30kHz $\textcircled{3}$	24	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	ON ab=ON	ON ab=ON	$\uparrow$	$\uparrow$	—	0.1	1	%	
	GVM(max)	Maximum gain	Reference $\textcircled{3}$ $V_i = -14\text{dBV}$	24	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	+4	+6	+8	dB	
	GVM(min)	Minimum gain	$\uparrow$	25	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	D(1),D(2)	-16	-14	-12	dB	
Bass	CTM	Crosstalk	Reference $V_i = -6\text{dBV}$ JIS-A $\textcircled{3}$	24	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	OFF	ON	OFF	D(1) D(2)	—	-80	-60	dB	
	GVBA	Gain	Reference $\textcircled{3}$ $V_i = -14\text{dBV}$	1	OFF	OFF	OFF	OFF	ON C=ON	ON C=ON	a	C(1),C(2)	-6	-4	-2	dB	
	CBBA	Channel balance	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	C(1)/C(2)	-2	0	+2	dB	
	THDBA	Total harmonic distortion	$\uparrow$ BPF = 400Hz~30kHz	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	C(1),C(2)	—	0.01	0.1	%	
	NoBA	Noise voltage	Quiescet, JIS - A	1	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	OFF	OFF	$\uparrow$	$\uparrow$	—	10	20	μVrms	
	THDBAmax	Maximum total harmonic distortion	$V_i = -6\text{dBV}$, BPF = 400Hz to 30kHz $\textcircled{2}$	26	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	ON C=ON	ON C=ON	$\uparrow$	$\uparrow$	—	0.1	1	%	
	GVBA(max)	Maximum gain	Reference $\textcircled{3}$ $V_i = -14\text{dBV}$	26	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	10	12	14	dB	
	GVBA(min)	Minimum gain	$\uparrow$	27	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	C(1),C(2)	-16	-14	-12	dB	
	CTBA	Crosstalk	Reference $V_i = -6\text{dBV}$ JIS-A $\textcircled{2}$	26	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	OFF	ON	OFF	C(1) C(2)	—	-80	-60	dB	
	THDBBmax	Boost maximum total harmonic distortion	$V_i = -22\text{dBV}$, BPF = 400Hz to 30kHz $\textcircled{2}$	28	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	ON C=ON	ON C=ON	$\uparrow$	C(1),C(2)	—	0.1	1	%	
	GVBB(max)	Boost maximum total harmonic gain	$V_i = -10\text{dBV}$ $\textcircled{4}$	18	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	10	12	14	dB	
GVBB(min)	Boost minimum total harmonic gain	$\uparrow$	19	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	C(1),C(2)	-22	-20	-18	dB		

Note 1. V_i : Input voltage $\textcircled{1}$ = VCA, $\textcircled{2}$ = HPF, $\textcircled{3}$ = BPF, $\textcircled{4}$ = LPF

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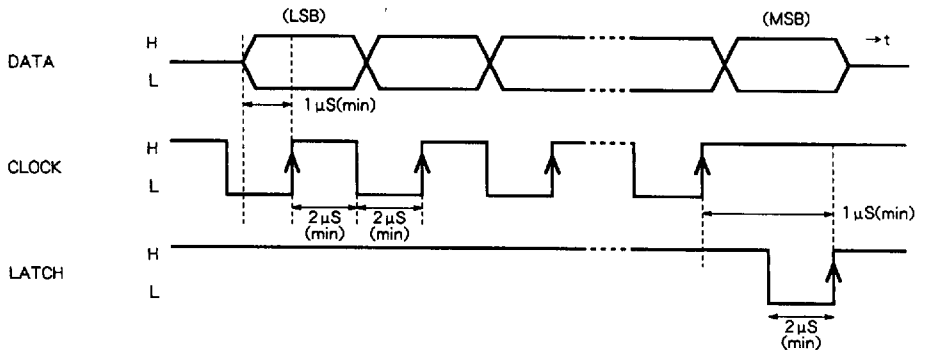
DIGITAL CONTROL SPECIFICATIONS

Data format (Refer to data setting table in the next page)

MSB	8bit	4bit	4bit	4bit	4bit	4bit											2bit	LSB
	Volume	Treble	Mid	Bass	Super bass	SEL	PORT	PORT	PORT	PORT	PORT	PORT	PORT	PORT	PORT	PORT	PORT8	
						1 2 3 4	0	1	2	3	4	5	6	7			1 2	

VOLUME : 00 to FF (8BIT D/A DATA)
TREBLE : 0 to D (14 STEPS)
MID : 0 to A (11 STEPS)
BASS : 0 to D (14 STEPS)
SUPER BASS : 0
 1 to 5
 9 to D
SEL : 4BITS FOR INPUT SWITCHING
PORT0 : TTL OUTPUT
PORT1 to 7 : OPEN COLLECTOR OUTPUT
PORT8 : 2BITS ; 3-STATE OUTPUT

TIMING CHART (Recommended conditions)



- Note 1. CLOCK and LATCH are operat at rising edges of pulse.
2. Logic input buffer threshold voltage is about 2.5V.

ELECTRONIC SOUND CONTROL WITH ELECTRONIC VOLUME FOR MULTIPLE SOURCES

VCA, tone data setting table

D/A converter for VCA		Treble		Mid		Bass		Super bass	
Data	Setting	Data	Setting	Data	Setting	Data	Setting	Data	Setting
00	V_Z	0	- 10dB	0	- 10dB	0	- 10dB	0	± 0 dB
01	$\frac{255V_Z + V_F}{256}$	1	- 8dB	1	- 8dB	1	- 8dB	1	- 2dB
 	 	2	- 6dB	2	- 6dB	2	- 6dB	2	+ 4dB
		3	- 4dB	3	- 4dB	3	- 4dB	3	+ 6dB
		4	- 2dB	4	- 2dB	4	- 2dB	4	+ 9dB
		5	± 0 dB	5	± 0 dB	5	± 0 dB	5	+ 12dB
		6	+ 2dB	6	+ 2dB	6	+ 2dB	6	-
		7	+ 4dB	7	+ 4dB	7	+ 4dB	7	-
		8	+ 6dB	8	+ 6dB	8	+ 6dB	8	-
		9	+ 8dB	9	+ 8dB	9	+ 8dB	9	- 2dB
		A	+ 10dB	A	+ 10dB	A	+ 10dB	A	- 4dB
		B	+ 12dB	B	-	B	+ 12dB	B	- 6dB
		C	+ 14dB	C	-	C	+ 14dB	C	- 9dB
		D	+ 16dB	D	-	D	+ 16dB	D	- 12dB
FE	$\frac{2V_Z + 254V_F}{256}$	E	-	E	-	E	-	E	-
FF	$\frac{V_Z + 255V_F}{256}$	F	-	F	-	F	-	F	-

Note 1. All data is design values. V_Z and V_F are internal power supply voltages. Between +12dB and +16dB of treble and bass are for loudness control.

2. Data is shown by the hexadecimal notation.

Input selector, output port data setting table

SELECTOR					PORT 0		PORT 1~7		PORT8		
Data				Input mode	Data	Output TTL/OUT	Data	Output open collector	Data		Output
1	2	3	4						1	2	
L	L	L	H	IN1 - 4, IN2 - 4	H	H(TTL)	H	OPEN	H	H	H(TTL)
L	L	H	L	IN1 - 3, IN2 - 3	L	L(TTL)	L	CLOSE	H	L	L(TTL)
L	H	L	L	IN1 - 2, IN2 - 2	-	-	-	-	L	Not a	High Impedance
H	L	L	L	IN1 - 1, IN2 - 1	-	-	-	-	-	-	-

Note 3. "L" or "H"

VCA attenuation (Reference)

Control data (D/A converter)	VCA attenuation (dB)
0F	(maximum attenuation)
1F	- 79
2F	- 59
3F	- 44
4F	- 32
5F	- 23
6F	- 15
7F	- 9
8F	- 4
9F	0
AF	+ 3
BF	+ 5
CF	+ 6
DF	+ 7
EF	+ 8
FF	+ 9

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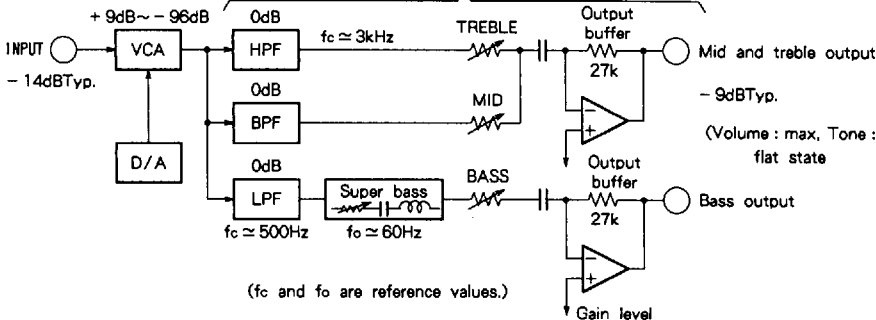
ELECTRONIC SOUND CONTROL WITH ELECTRONIC VOLUME FOR MULTIPLE SOURCES

ANALOG SIGNAL PROCESSING

(Basic construction (One channel))

(Total gain : + 5dB (VCA max))

(Tone section gain (Reference) : - 4dB)



(fc and fo are reference values.)

Gain level

(All data is design values.)

Volume : + 9dB to - 96dB Typ.

(VCA)

Treble : 10dB~0dB to +10dB (2dB/steps)

(For loudness control, +12dB, +14dB, +16dB)

Mid : -10dB~0dB to +10dB (2dB/steps)

Bass : -10dB~0dB to +10dB (2dB/steps)

(For loudness control, +12dB, +14dB, +16dB)

Super bass : -12dB~0dB to +12dB

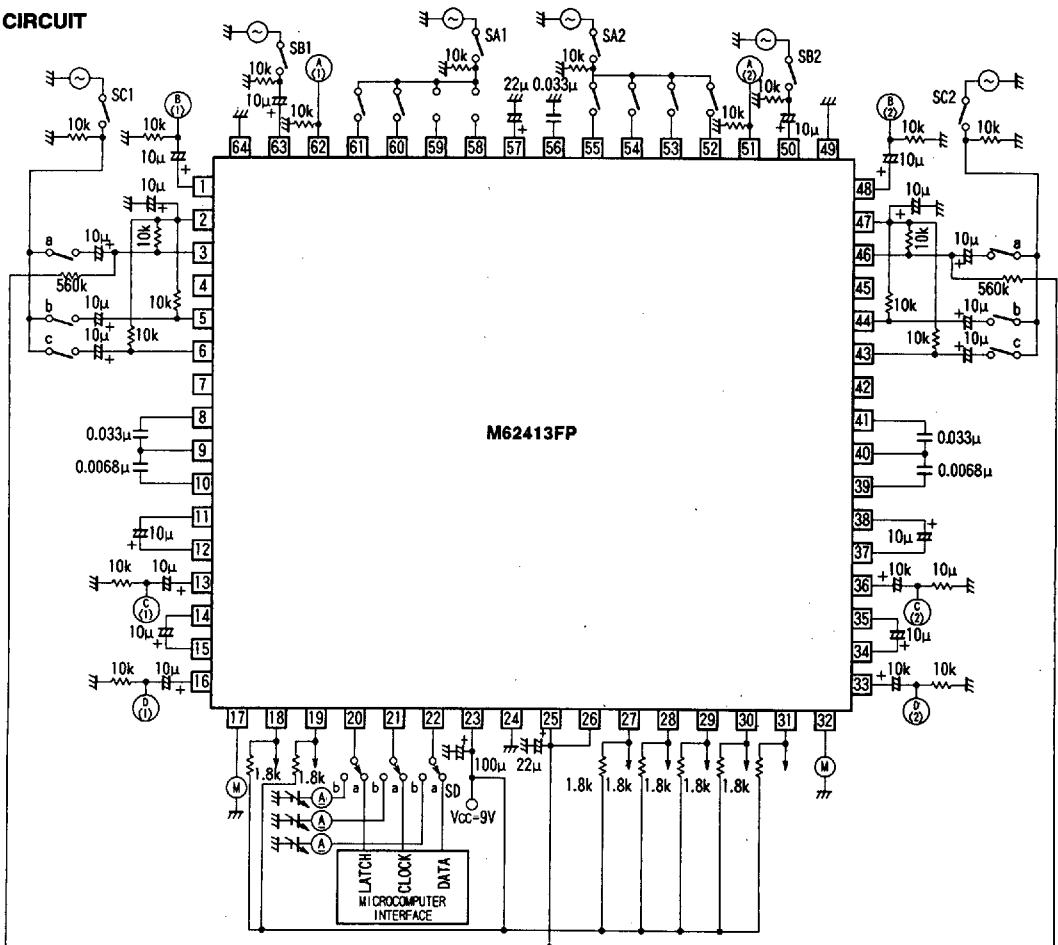
Data setting table

Data No.	Control data																
	Volume, tone (indicate hexadecimal)						Input selector and output port (indicate binaries)										
	VCA	Treble	Mid	Bass	Super bass		Input selector	PORT 0	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5	PORT 6	PORT 7	PORT 8	
1	F	F	5	5	5			0	0	0	0	1	1	1	1	1	1
2								0	1								
3								1	0	1							
4									1	0	1						
5										1	0	1					
6											1	0	1				
7												1	0	1			
8													1	0	1		
9														1	0	1	
10															1	1	0
11							0									0	0
12							1	0									1
13							0	1	0								
14								0	1	0							
15			5	5				0	1								
16			D	0						0							
17			0	A	0												
18			5	5	5												
19	F	F			D												
20	9	8			0												
21	0	0	5														
22	F	F	D														
23			0	5													
24			5	A													
25				0	5												
26				5	D												
27					0												
28	F	F	5	5	D	5	0	0	0	0	1	1	1	1	1	1	1

M62413FP

ELECTRONIC SOUND CONTROL WITH ELECTRONIC VOLUME FOR MULTIPLE SOURCES

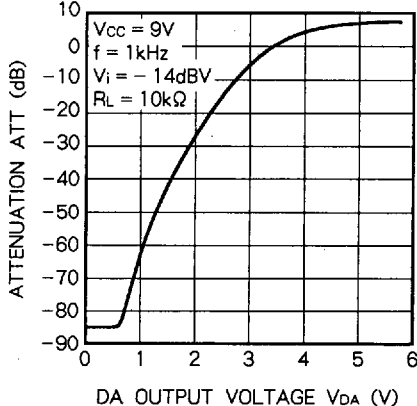
TEST CIRCUIT



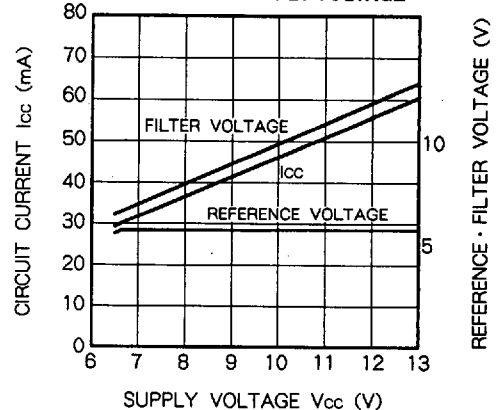
Units Resistance : Ω
Capacitance : F

TYPICAL CHARACTERISTICS

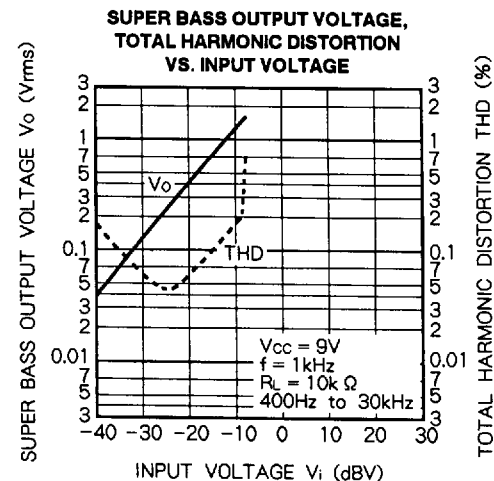
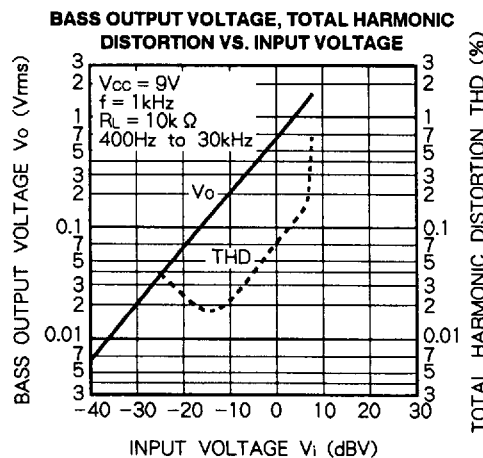
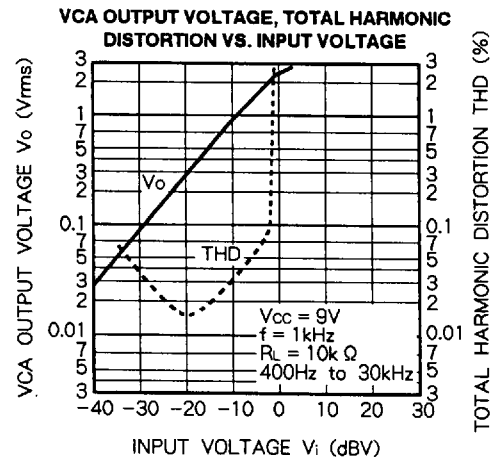
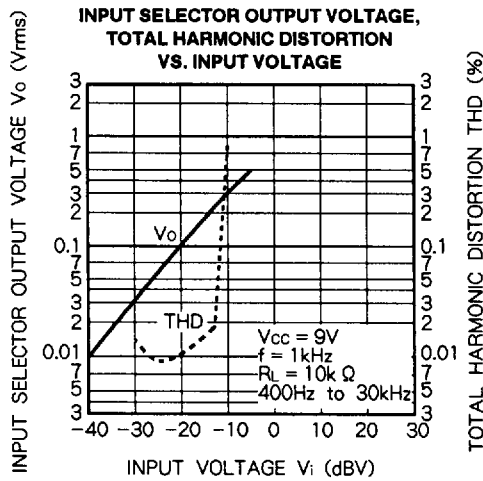
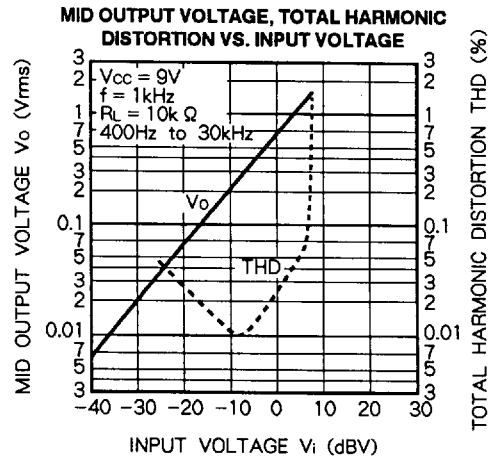
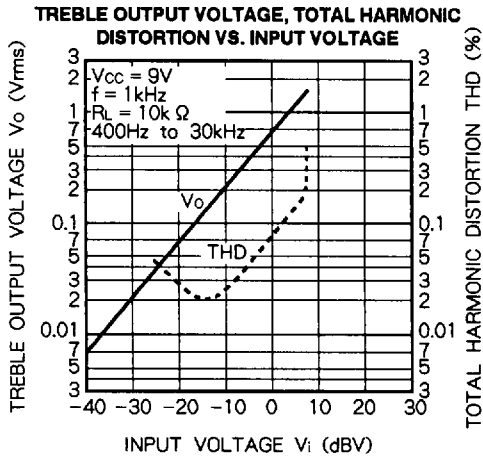
VCA ATTENUATION VS.
DA OUTPUT VOLTAGE



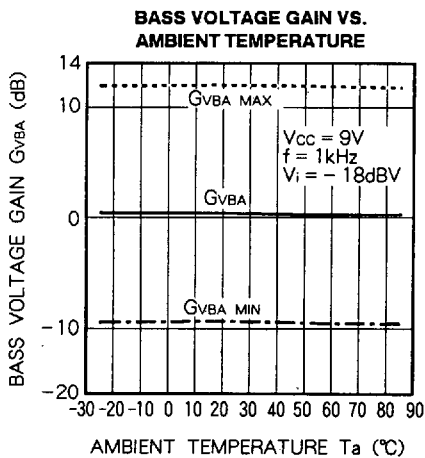
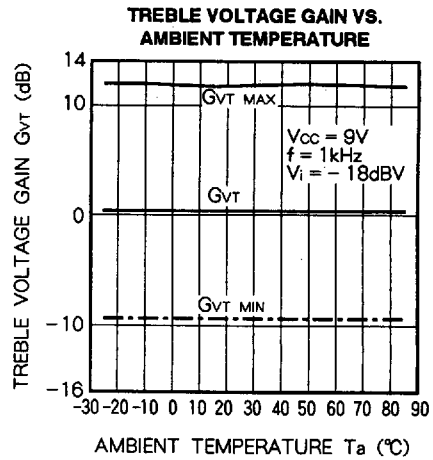
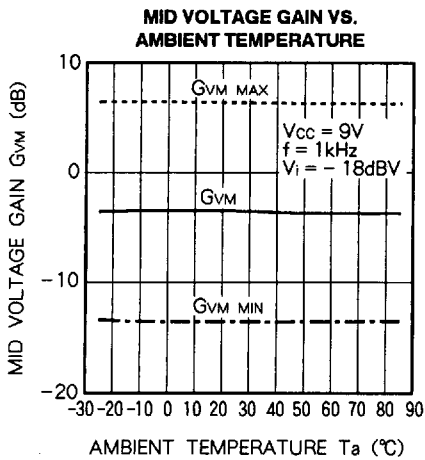
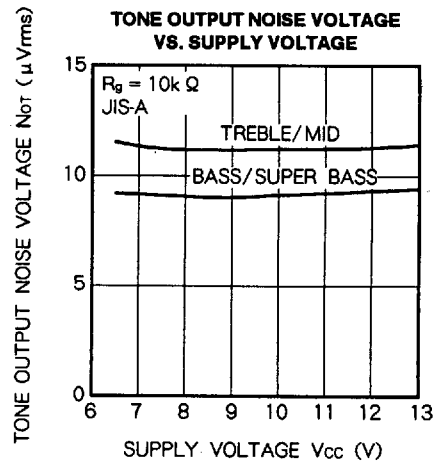
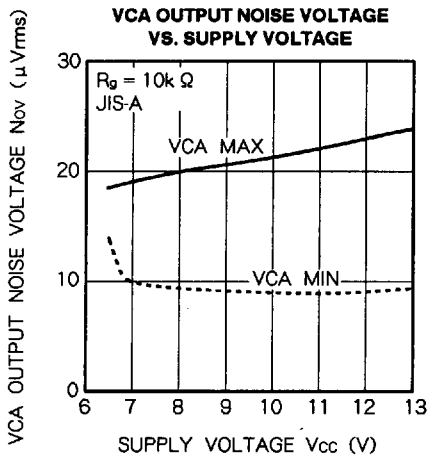
CIRCUIT CURRENT, REFERENCE-FILTER
VOLTAGE VS. SUPPLY VOLTAGE



ELECTRONIC SOUND CONTROL WITH ELECTRONIC VOLUME FOR MULTIPLE SOURCES



ELECTRONIC SOUND CONTROL WITH ELECTRONIC VOLUME FOR MULTIPLE SOURCES



ELECTRONIC SOUND CONTROL WITH ELECTRONIC VOLUME FOR MULTIPLE SOURCES

APPLICATION EXAMPLE

