PRELIMINARY
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MITSUBISHI SOUND PROCESSORS

M62446FP

6CH ELECTRIC VOLUME WITH TONE CONTROL

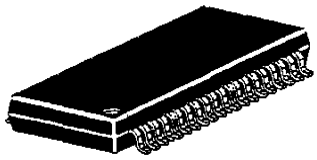
DESCRIPTION

The M62446FP is 6 channels electric volume controlled 3-wire serial data.
The IC is suitable for use in home-use audio systems and TV sets.

FEATURES

- Electric volume
  - •Volume level•••••••• 0dB ~ -79dB,- ∞dB (1dB / step)
- Tone control
  - •Bass / Treble , 0dB ~ ±10dB(2dB / step)
- 4 Output ports
- Built-in microcomputer interface circuit controlled by 16-bit serial data.

PACKAGE



Outline 42P2R

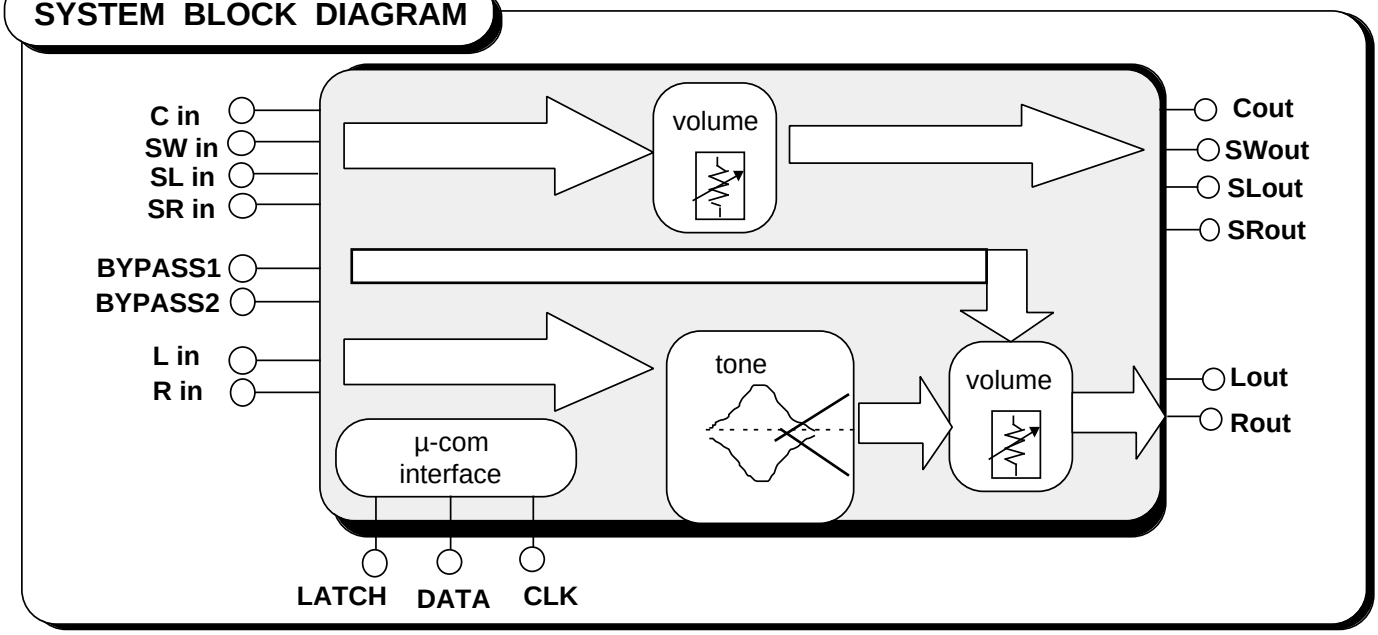
APPLICATION

DVD,Home Audio equipment,TV

RECOMMENDED OPERATING CONDITIONS

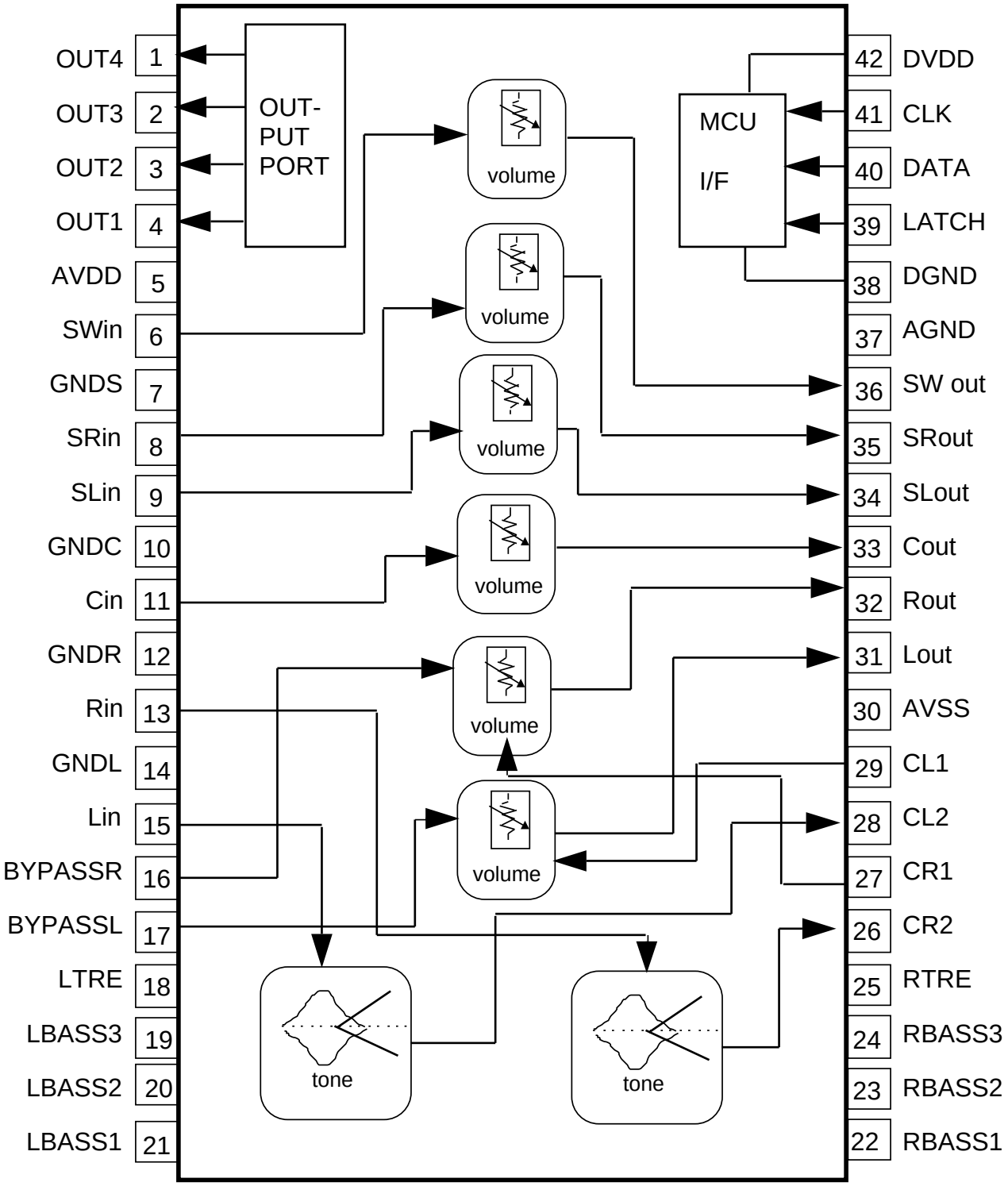
Supply voltage range•••• ±4.5 ~ ±7.3V (analog)
4.5 ~ 5.5V (digital)
Rated supply voltage •••• ±7.0V (analog)
5.0V (digital)

SYSTEM BLOCK DIAGRAM



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PIN CONFIGURATION AND IC INTERNAL BLOCK DIAGRAM

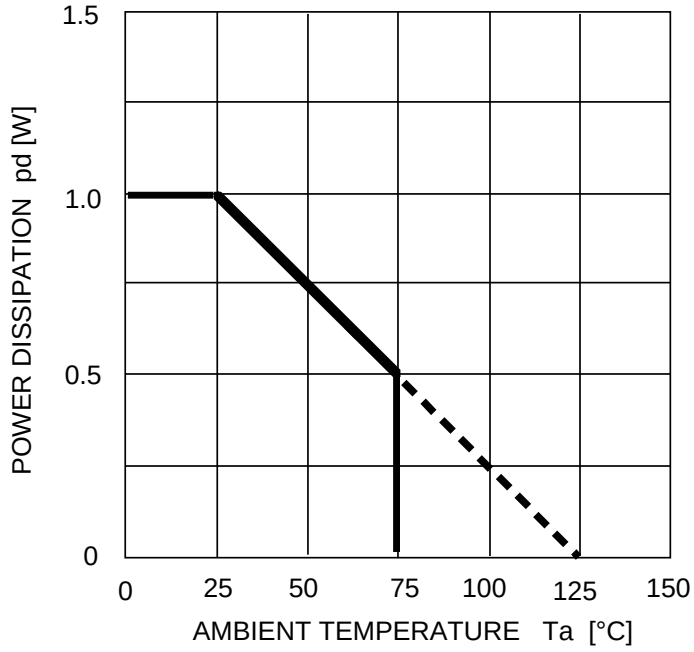


PRELIMINARY
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ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Conditions	Ratings	Unit
Vsupply	Supply Voltage	AVDD-AVSS	15.0	V
Pd	Power dissipation	Ta≤25°C	1000	mW
K_θ	Thermal derating	Ta>25°C *standard board	10	mW/°C
Topr	Operating temperature		-20~+75	°C
Tstg	Storage temperature		-40~+125	°C

THERMAL DERATING
(MAXIMUM RATING)



*Standard board

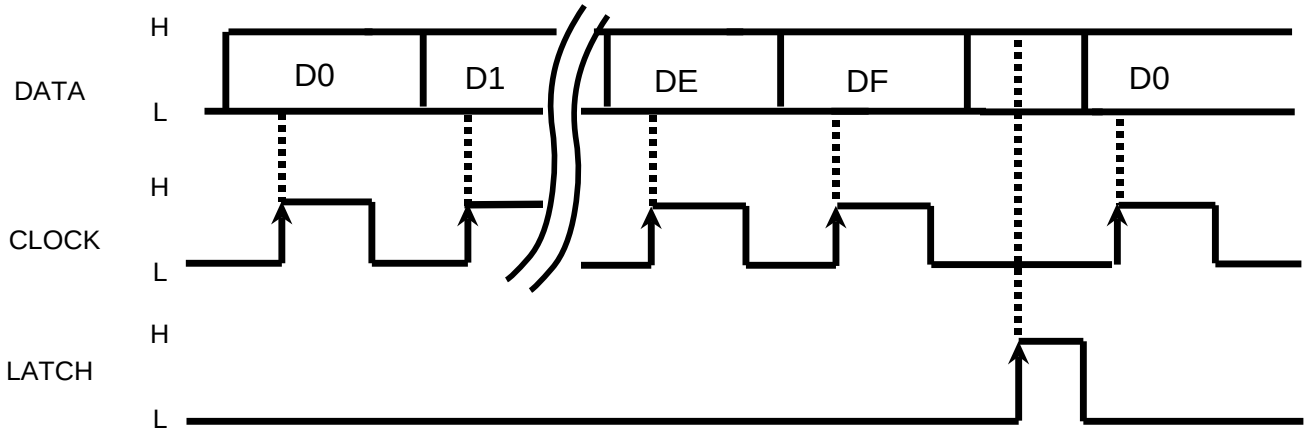
PRELIMINARY
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RECOMMENDED OPERATING CONDITION

Parameter	Symbol	Condition	MIN	TYP	MAX	Unit
Analog positive Supply Voltage	AVDD		4.5	7.0	7.3	V
Analog negative Supply Voltage	AVSS		-7.3	-7.0	-4.5	V
Digital Supply Voltage	DVDD		4.5	5.0	5.5	V
High-level Input Voltage	VIH		DVDD/2+1	—	DVDD	V
Low-level Input Voltage	VIL		DGND	—	DVDD/2-1	V

(note)AVSS≤DGND<DVDD≤AVDD

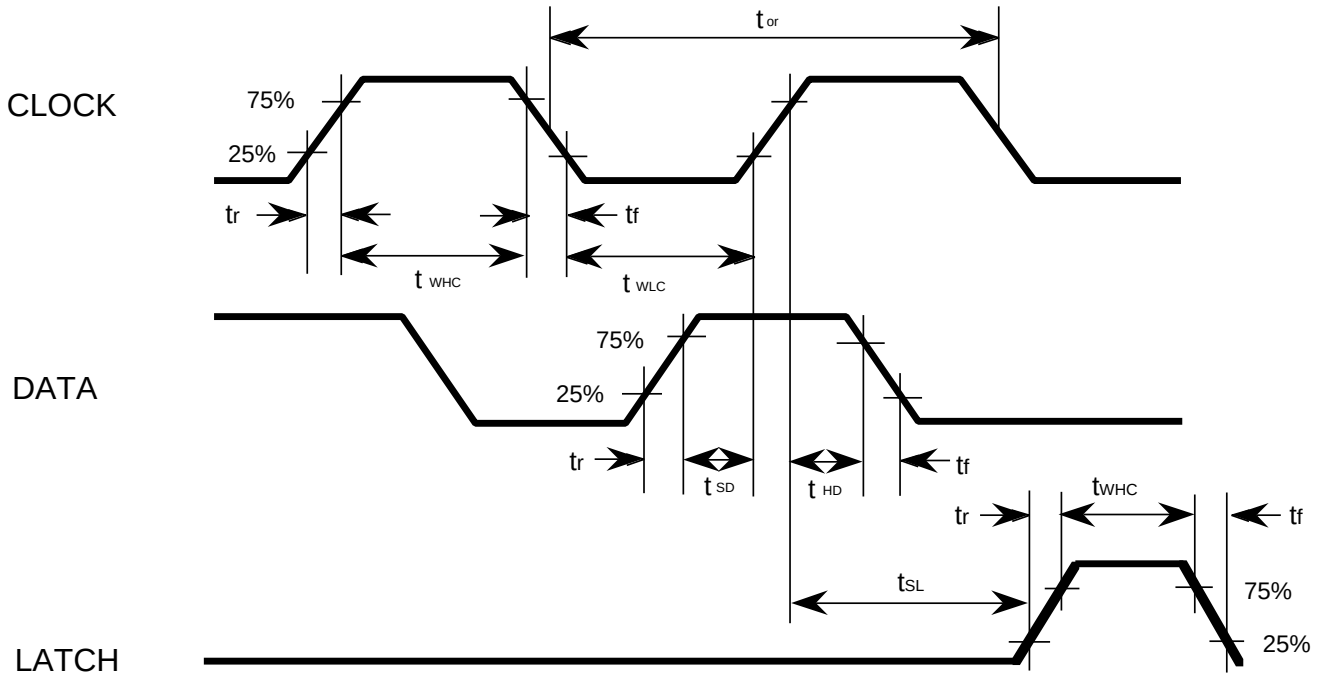
DATA TIMING (Recommended conditions)



note : CLOCK and LATCH function at raising edges of pulse .

PRELIMINARY
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CLOCK, DATA,LATCH TIMING



DIGITAL BLOCK TIMING REGULATION

Symbol	Parameter	Limits			Unit
		Min	typ	Max	
t_{or}	CLOCK cycle time	8	–	–	µsec
t_{WHC}	CLOCK pulse width ("H"level)	3.2	–	–	
t_{WLC}	CLOCK pulse width ("L"level)	3.2	–	–	
t_r	CLOCK,DATA,LATCH rise time	–	–	0.8	
t_f	CLOCK,DATA,LATCH fall time	–	–	0.8	
t_{SD}	DATA setup time	1.6	–	–	
t_{HD}	DATA hold time	1.6	–	–	
t_{SL}	LATCH setup time	2	–	–	
t_{WHL}	LATCH pulse width	3.2	–	–	

PRELIMINARY
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DIGITAL CONTROL SPECIFICATION

Fore kinds of input format options are available by changing slot settings of DE and DF.
(When the IC is powered up , the internal settings are not fixed.)

(1)

DO1	D11	D21	D31	D41	D51	D61	D71	D81	D91	DA1	DB1	DC1	DD1	DE	DF
TONE CONTROL TREBLE				1	2	3	4	TONE CONTROL BASS				0	BY PASS 1: ON 0: OFF	0	0
				OUTPUT PORT n 1: High 0: Low											

(2)

DO2	D12	D22	D32	D42	D52	D62	D72	D82	D92	DA2	DB2	DC2	DD2	DE	DF
VOLUME Lch							VOLUME Rch							0	1

(3)

DO3	D13	D23	D33	D43	D53	D63	D73	D83	D93	DA3	DB3	DC3	DD3	DE	DF
VOLUME Cch							VOLUME SWch							1	0

(4)

DO4	D14	D24	D34	D44	D54	D64	D74	D84	D94	DA4	DB4	DC4	DD4	DE	DF
VOLUME SLch							VOLUME SRch							1	1

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SETTING CODE

(1) Tone control (bass / treble)

ATT	treble / bass	D01 / D81	D11 / D91	D21 / DA1	D31 / DB1
- 10dB		1	1	1	0
- 8dB		1	1	0	0
- 6dB		1	0	1	1
- 4dB		1	0	1	0
- 2dB		1	0	0	1
+ 0dB		0	0	0	0
+ 2dB		0	0	0	1
+ 4dB		0	0	1	0
+ 6dB		0	0	1	1
+ 8dB		0	1	0	0
+ 10dB		0	1	1	0

Port output

		D41	D51	D61	D71
PORT1	0	L	-	-	-
	1	H			
PORT2	0	-	L	-	-
	1		H		
PORT3	0	-	-	L	-
	1			H	
PORT4	0	-	-	-	L
	1				H

BYPASS control

DD1	
TONE	0
BYPASS	1

Note : Do not input other data than the above.

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(2),(3),(4) VOLUME (0 ~ -39dB) Note : Do not input other data than the above.

ATT VOLUME	D0X D7X	D1X D8X	D2X D9X	D3X DAX	D4X DBX	D5X DCX	D6X DDX
- 0 dB	0	0	0	0	0	0	0
- 1 dB	0	0	0	0	0	0	1
- 2 dB	0	0	0	0	0	1	0
- 3 dB	0	0	0	0	0	1	1
- 4 dB	0	0	0	0	1	0	0
- 5 dB	0	0	0	0	1	0	1
- 6 dB	0	0	0	0	1	1	0
- 7 dB	0	0	0	0	1	1	1
- 8 dB	0	0	0	1	0	0	0
- 9 dB	0	0	0	1	0	0	1
- 10 dB	0	0	0	1	0	1	0
- 11 dB	0	0	0	1	0	1	1
- 12 dB	0	0	0	1	1	0	0
- 13 dB	0	0	0	1	1	0	1
- 14 dB	0	0	0	1	1	1	0
- 15 dB	0	0	0	1	1	1	1
- 16 dB	0	0	1	0	0	0	0
- 17 dB	0	0	1	0	0	0	1
- 18 dB	0	0	1	0	0	1	0
- 19 dB	0	0	1	0	0	1	1
- 20 dB	0	0	1	0	1	0	0
- 21 dB	0	0	1	0	1	0	1
- 22 dB	0	0	1	0	1	1	0
- 23 dB	0	0	1	0	1	1	1
- 24 dB	0	0	1	1	0	0	0
- 25 dB	0	0	1	1	0	0	1
- 26 dB	0	0	1	1	0	1	0
- 27 dB	0	0	1	1	0	1	1
- 28 dB	0	0	1	1	1	0	0
- 29 dB	0	0	1	1	1	0	1
- 30 dB	0	0	1	1	1	1	0
- 31 dB	0	0	1	1	1	1	1
- 32 dB	0	1	0	0	0	0	0
- 33 dB	0	1	0	0	0	0	1
- 34 dB	0	1	0	0	0	1	0
- 35 dB	0	1	0	0	0	1	1
- 36 dB	0	1	0	0	1	0	0
- 37 dB	0	1	0	0	1	0	1
- 38 dB	0	1	0	0	1	1	0
- 39 dB	0	1	0	0	1	1	1

PRELIMINARY
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VOLUME (-40 ~ - ∞dB)

Note : Do not input other data than the above.

ATT VOLUME	D0X D7X	D1X D8X	D2X D9X	D3X DAX	D4X DBX	D5X DCX	D6X DDX
- 40 dB	0	1	0	1	0	0	0
- 41 dB	0	1	0	1	0	0	1
- 42 dB	0	1	0	1	0	1	0
- 43 dB	0	1	0	1	0	1	1
- 44 dB	0	1	0	1	1	0	0
- 45 dB	0	1	0	1	1	0	1
- 46 dB	0	1	0	1	1	1	0
- 47 dB	0	1	0	1	1	1	1
- 48 dB	0	1	1	0	0	0	0
- 49 dB	0	1	1	0	0	0	1
- 50 dB	0	1	1	0	0	1	0
- 51 dB	0	1	1	0	0	1	1
- 52 dB	0	1	1	0	1	0	0
- 53 dB	0	1	1	0	1	0	1
- 54 dB	0	1	1	0	1	1	0
- 55 dB	0	1	1	0	1	1	1
- 56 dB	0	1	1	1	0	0	0
- 57 dB	0	1	1	1	0	0	1
- 58 dB	0	1	1	1	0	1	0
- 59 dB	0	1	1	1	0	1	1
- 60 dB	0	1	1	1	1	0	0
- 61 dB	0	1	1	1	1	0	1
- 62 dB	0	1	1	1	1	1	0
- 63 dB	0	1	1	1	1	1	1
- 64 dB	1	0	0	0	0	0	0
- 65 dB	1	0	0	0	0	0	1
- 66 dB	1	0	0	0	0	1	0
- 67 dB	1	0	0	0	0	1	1
- 68 dB	1	0	0	0	1	0	0
- 69 dB	1	0	0	0	1	0	1
- 70 dB	1	0	0	0	1	1	0
- 71 dB	1	0	0	0	1	1	1
- 72 dB	1	0	0	1	0	0	0
- 73 dB	1	0	0	1	0	0	1
- 74 dB	1	0	0	1	0	1	0
- 75 dB	1	0	0	1	0	1	1
- 76 dB	1	0	0	1	1	0	0
- 77 dB	1	0	0	1	1	0	1
- 78 dB	1	0	0	1	1	1	0
- 79 dB	1	0	0	1	1	1	1
- ∞ dB	1	0	1	0	0	0	0

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ELECTRICAL CHARACTERISTICS

(Ta=25°C, AVDD=7.0V , AVSS=-7.0V , DVDD=5.0V , f=1kHz, unless otherwise noted.
TONE CONTROL , VOLUME are set to 0dB)

(1) Power supply characteristics

Parameter	Symbol	Test condition	Limits			Unit
			Min	typ	Max	
Analog positive circuit current	AIdd	Current at pin 5 No signal	—	25	35	mA
Analog negaitive circuit current	AIss	Current at pin 30 No signal	—	25	35	mA
Digital circuit current	DIdd	Current at pin 42 No signal	—	0.5	2.0	mA

(2) Input / Output characteristics

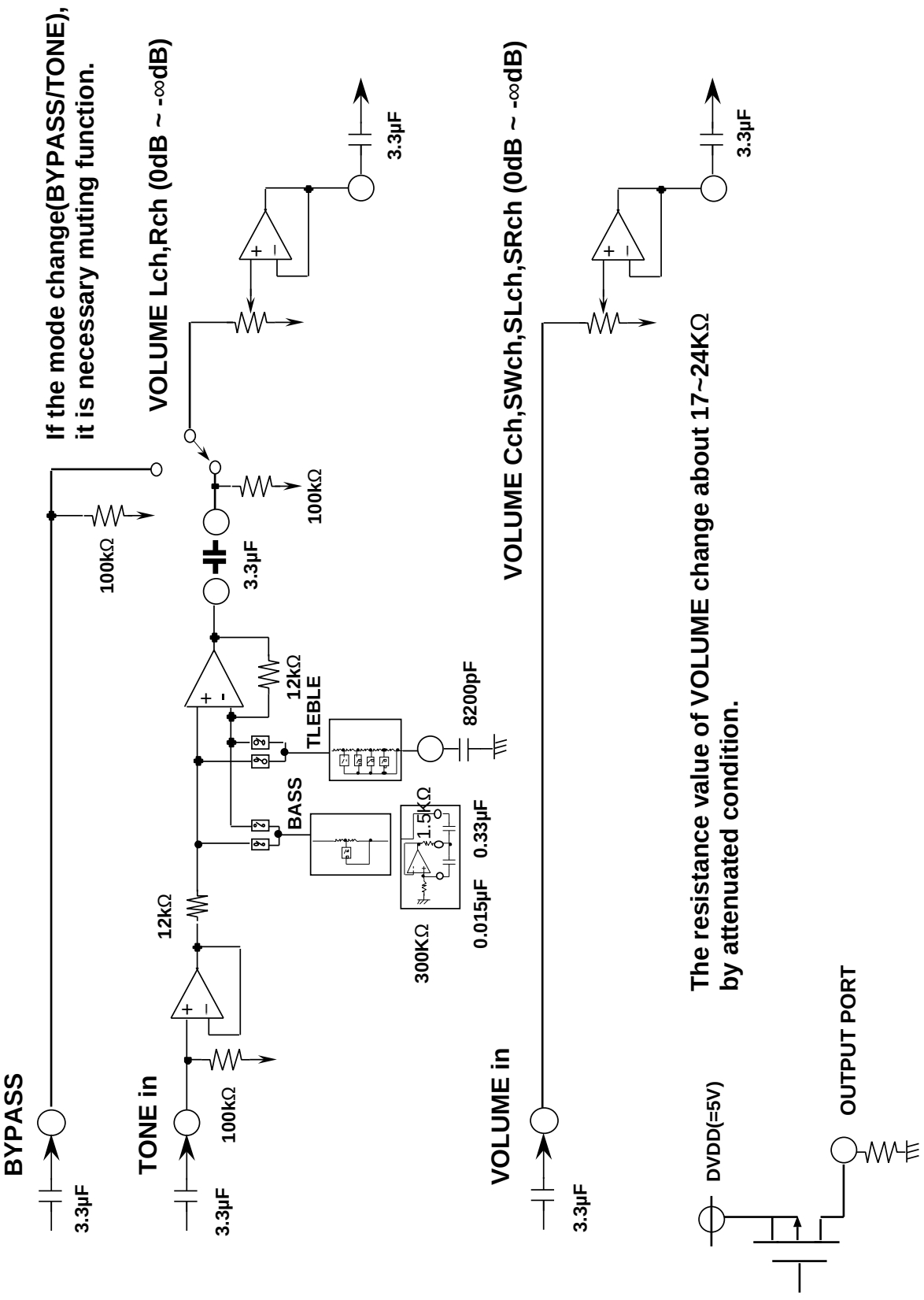
Parameter	Symbol	Test condition	Limits			Unit
			Min	typ	Max	
Input resistance	Ri	13,15,16,17,27,29pin	35	70	150	KΩ
Maximum output voltage	VOM	6,8,9,11,13,15,16,17pin INPUT 31 ~ 36pin OUTPUT RL =10KΩ,THD=1%	3.0	4.0	—	Vrms
Pass gain	Gv	Vi=0.2Vrms,FLAT 6,8,9,11,13,15,16,17pin INPUT 31 ~ 36pin OUTPUT	-2.0	0	2.0	dB
Distortion	THD	BW=400 ~ 30kHz Vi=0.2Vrms , RL=10KΩ	—	0.02	0.09	%
Output noise voltage	Vn(VOL)	31 ~ 36pin,Rg=0KΩ JIS-A,VOL=0dB	—	2	6	μVrms
	Vn(tone)	31,32pin,Rg=1KΩ, JIS-A,VOL=0dB	—	8	20	μVrms
Maximum attenuation	ATTmax	31 ~ 36pin,Rg=1KΩ, JIS-A,VOL=-∞dB	-86	—	—	dB
Volume gain between channels	Dvol		-1.5	0	1.5	dB
Crosstalk between channels	CT	Vo=0.5Vrms , RL=10KΩ,JIS-A Rg=1KΩ	—	-80	-65	dB
Port output current	IL	RL=22KΩ	0.2	—	—	mA

PRELIMINARY
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(3) Tone control characteristics

Parameter	Symbol	Test condition	Limits			Unit
			Min	typ	Max	
Tone control voltage gain	T -10dB	Vo=0.2Vrms,f=1kHz TLEBLE(f=10kHz) BASS(f=100Hz) INPUT 13,15pin OUTPUT 31,32pin	-12	-10	-8	dB
	T - 8dB		-10	-8	-6	dB
	T - 6dB		-7.5	-6	-4.5	dB
	T - 4dB		-5.5	-4	-2.5	dB
	T - 2dB		-3	-2	-1	dB
	T+2dB		1	2	3	dB
	T+4dB		2.5	4	5.5	dB
	T+6dB		4.5	6	7.5	dB
	T+8dB		6	8	10	dB
	T+10dB		8	10	12	dB
Balance between channel	BALT	Input pin13,15 Vo=0.2Vrms Output pin31,32,	-1.5	0	+1.5	dB

SYSTEM DIAGRAM

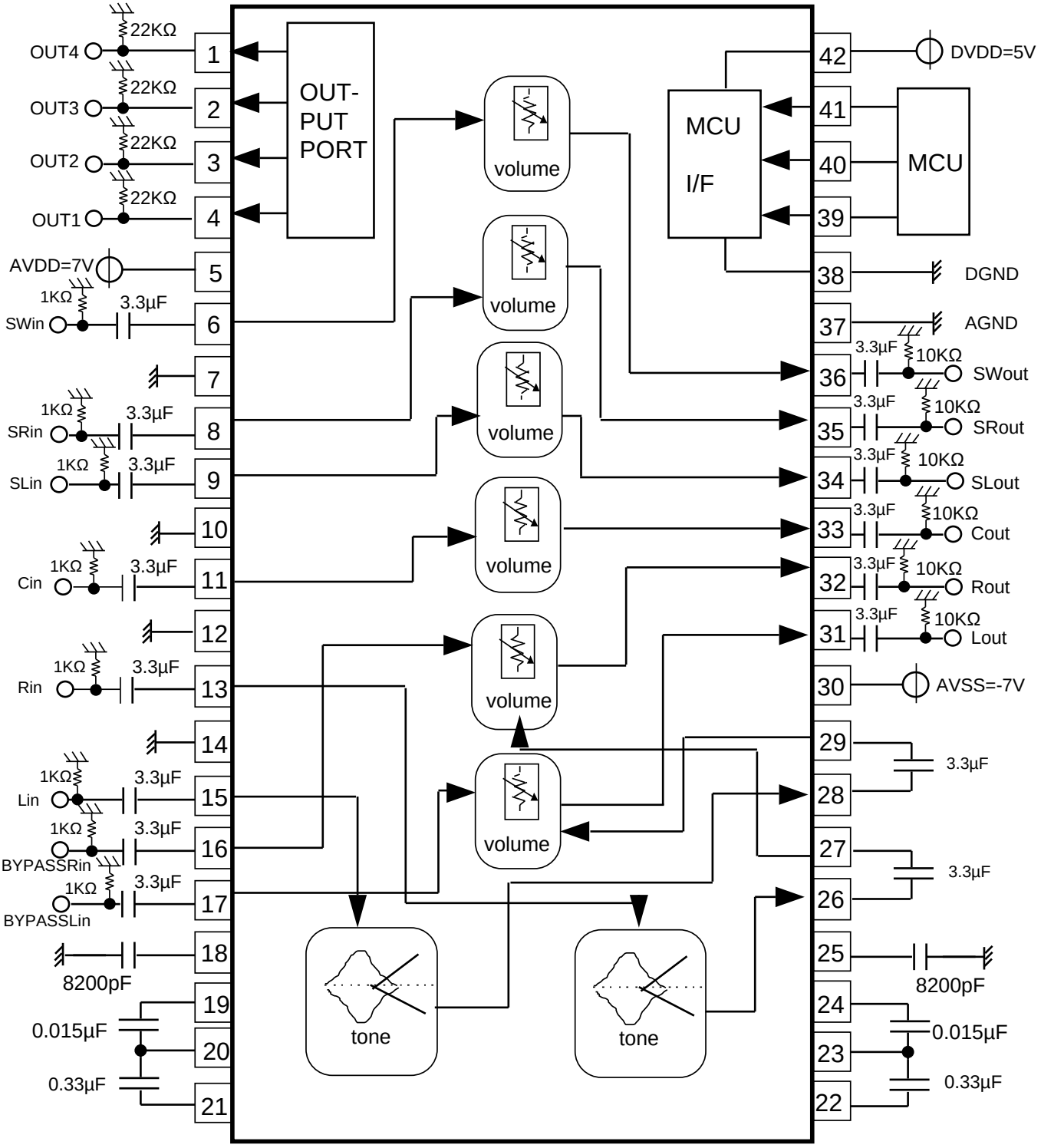


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M62446FP

6CH ELECTRIC VOLUME WITH TONE CONTROL

APPLICATION EXAMPLE



Units Resistance : Ω
Capacitance : F