

PRELIMINARY
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 some parametric limits are subject to change.

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.

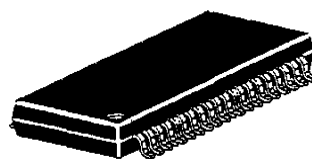
FEATURES

- 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.

APPLICATION

DVD,Home Audio equipment,TV

PACKAGE

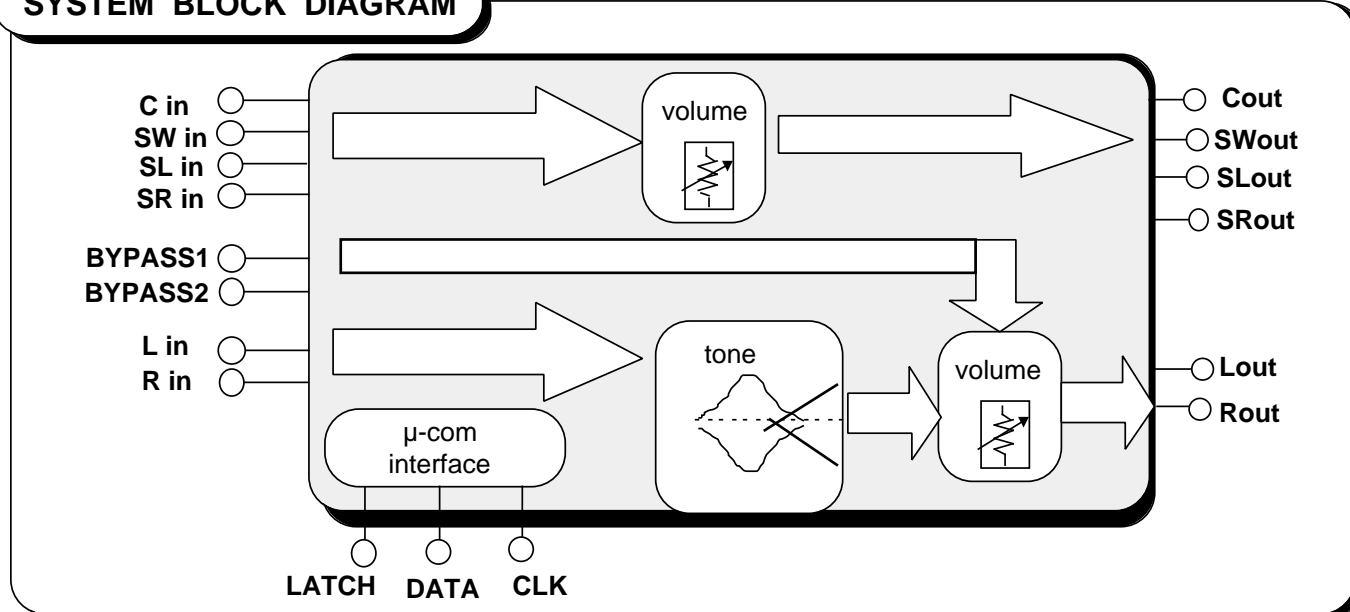


Outline 42P2R

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



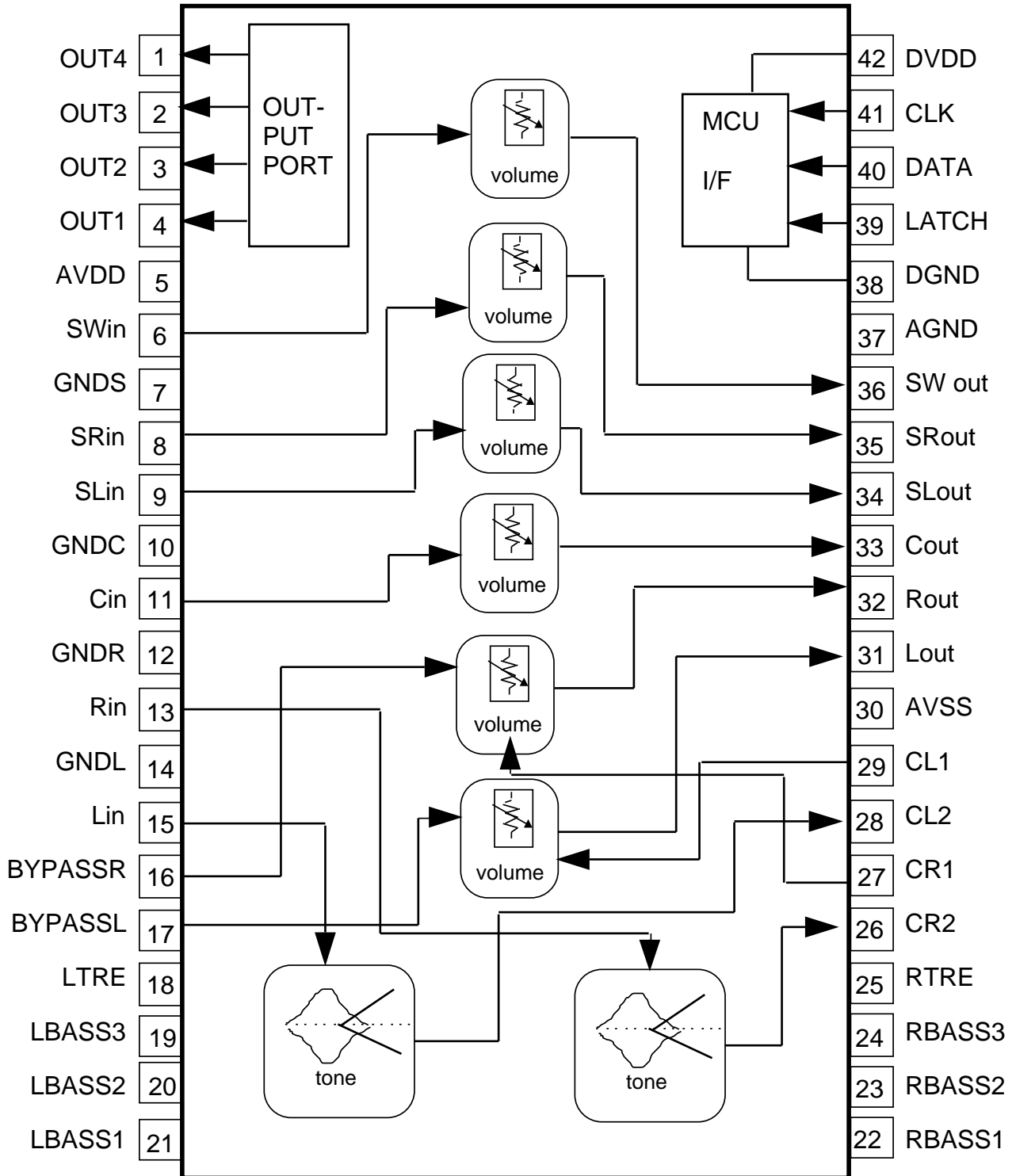
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PIN CONFIGURATION AND IC INTERNAL BLOCK DIAGRAM



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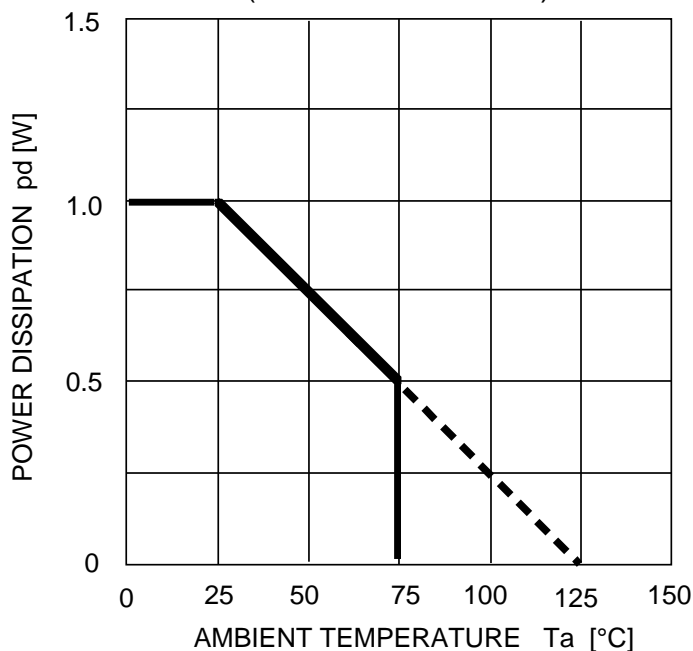
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6CH ELECTRIC VOLUME WITH TONE CONTROL

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

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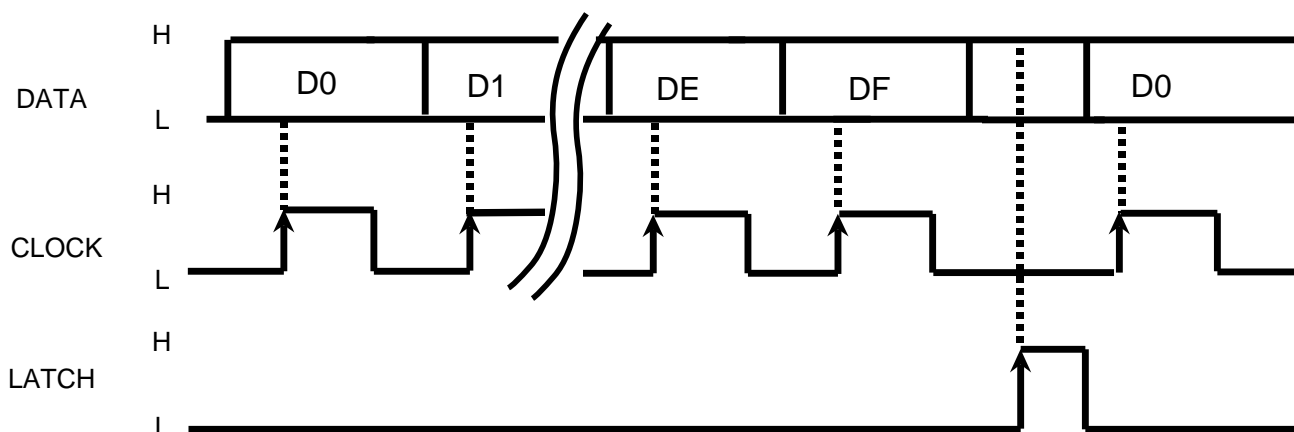
6CH ELECTRIC VOLUME WITH TONE CONTROL

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 .

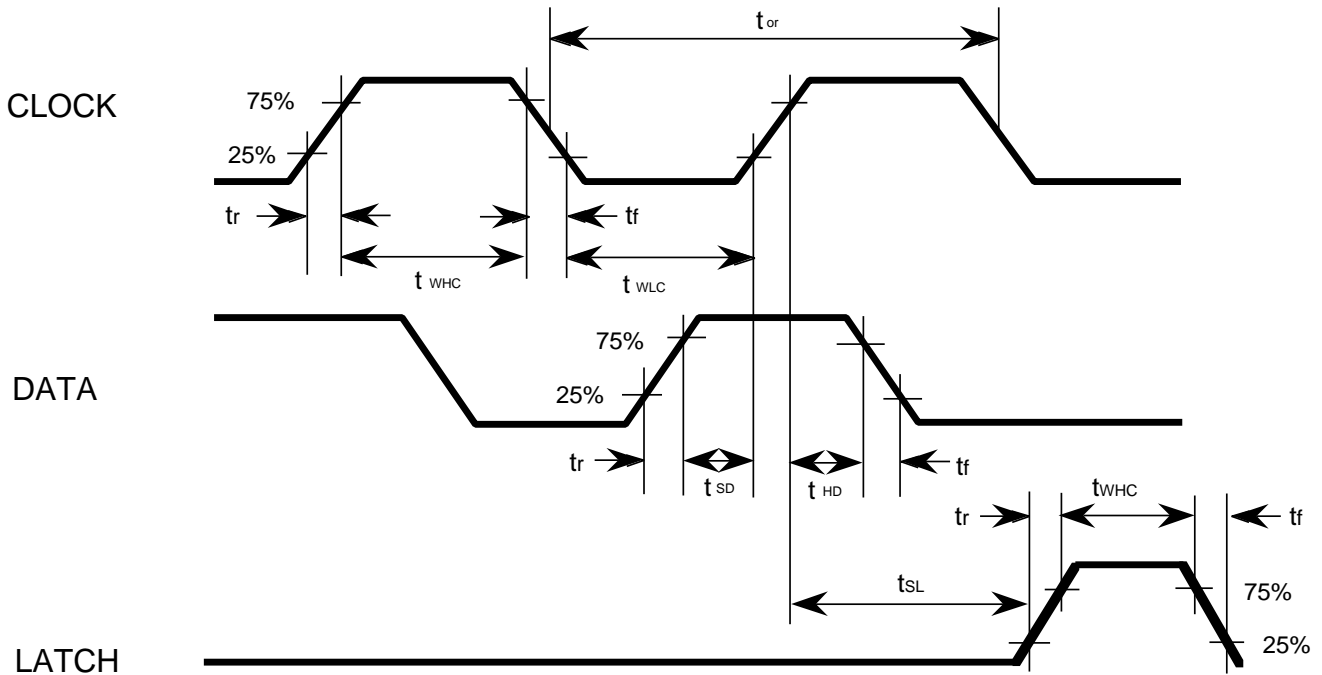
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6CH ELECTRIC VOLUME WITH TONE CONTROL

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	-	-	

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6CH ELECTRIC VOLUME WITH TONE CONTROL

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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6CH ELECTRIC VOLUME WITH TONE CONTROL

SETTING CODE

(1) Tone control (bass / treble)

ATT	treble	D01	D11	D21	D31
	bass	D81	D91	DA1	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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6CH ELECTRIC VOLUME WITH TONE CONTROL

(2),(3),(4) VOLUME (0 ~ -39dB)

Note : Do not input other data than the above.

A T T	VOLUME	D0X	D1X	D2X	D3X	D4X	D5X	D6X
		D7X	D8X	D9X	DAX	DBX	DCX	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

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VOLUME (-40 ~ - dB)

Note : Do not input other data than the above.

A T T	VOLUME	D0X	D1X	D2X	D3X	D4X	D5X	D6X
		D7X	D8X	D9X	DAX	DBX	DCX	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

($T_a=25^{\circ}\text{C}$, $AVDD=7.0\text{V}$, $AVSS=-7.0\text{V}$, $DVDD=5.0\text{V}$, $f=1\text{kHz}$, 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	A _{Idd}	Current at pin 5 No signal	—	25	35	mA
Analog negative circuit current	A _{Iss}	Current at pin 30 No signal	—	25	35	mA
Digital circuit current	D _{Idd}	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	R _i	13,15,16,17,27,29pin	35	70	150	K
Maximum output voltage	V _{OM}	6,8,9,11,13,15,16,17pin INPUT 31 ~ 36pin OUTPUT R _L =10K, THD=1%	3.0	4.0	—	V _{rms}
Pass gain	G _v	V _i =0.2V _{rms} , FLAT 6,8,9,11,13,15,16,17pin INPUT 31 ~ 36pin OUTPUT	-2.0	0	2.0	dB
Distortion	THD	BW=400 ~ 30kHz V _i =0.2V _{rms} , R _L =10K	—	0.02	0.09	%
Output noise voltage	V _n (VOL)	31 ~ 36pin, R _g =0K JIS-A, VOL=0dB	—	2	6	μV _{rms}
	V _n (tone)	31,32pin, R _g =1K, JIS-A, VOL=0dB	—	8	20	μV _{rms}
Maximum attenuation	ATT _{max}	31 ~ 36pin, R _g =1K, JIS-A, VOL=- dB	-86	—	—	dB
Volume gain between channels	D _{vol}		-1.5	0	1.5	dB
Crosstalk between channels	CT	V _o =0.5V _{rms} , R _L =10K, JIS-A R _g =1K	—	-80	-65	dB
Port output current	I _L	R _L =22K	0.2	—	—	mA

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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

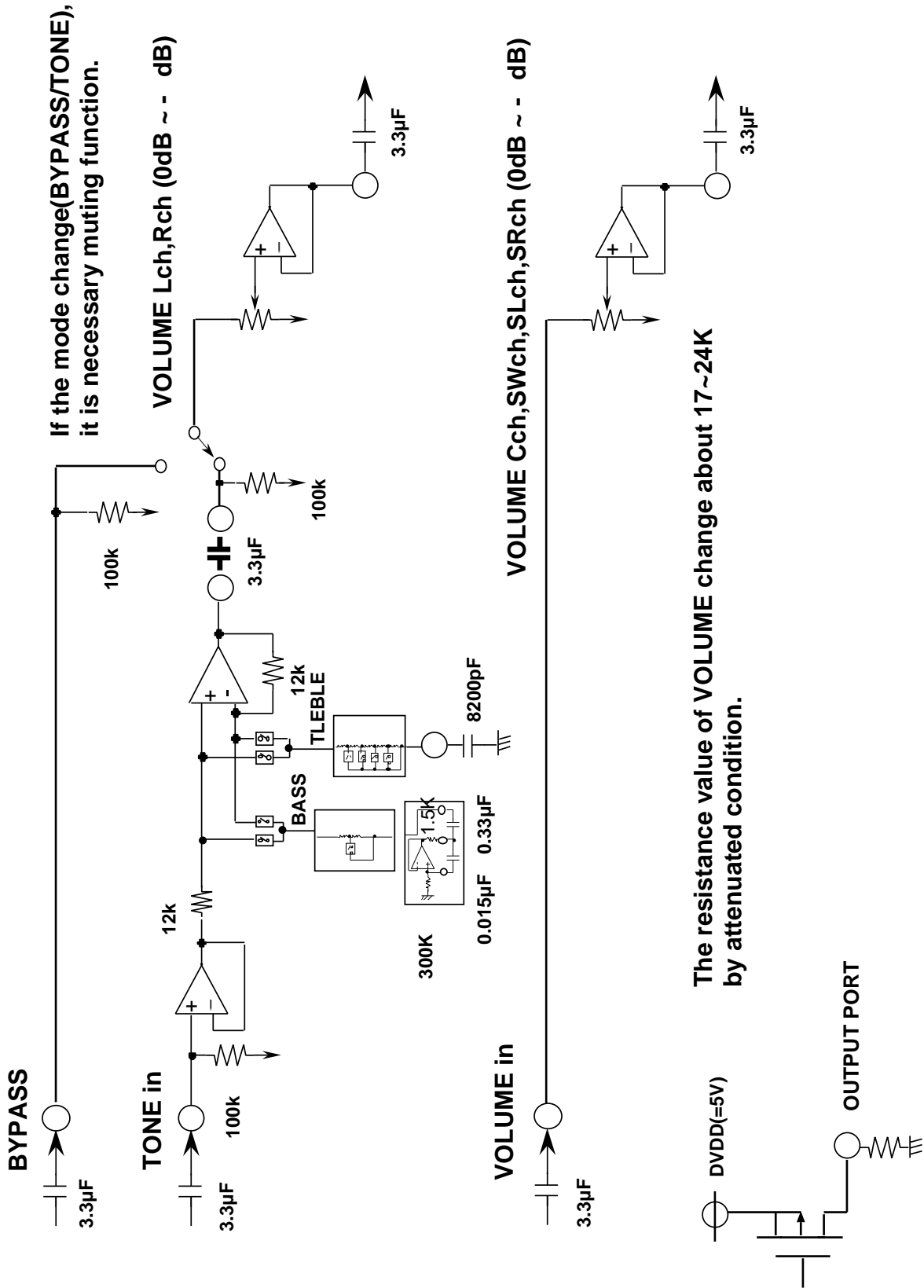
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SYSTEM DIAGRAM



If the mode change(BYPASS/TONE), it is necessary muting function.

VOLUME Lch,Rch (0dB ~ - dB)

VOLUME Cch,SWch,SLch,SRch (0dB ~ - dB)

The resistance value of VOLUME change about 17~24K by attenuated condition.

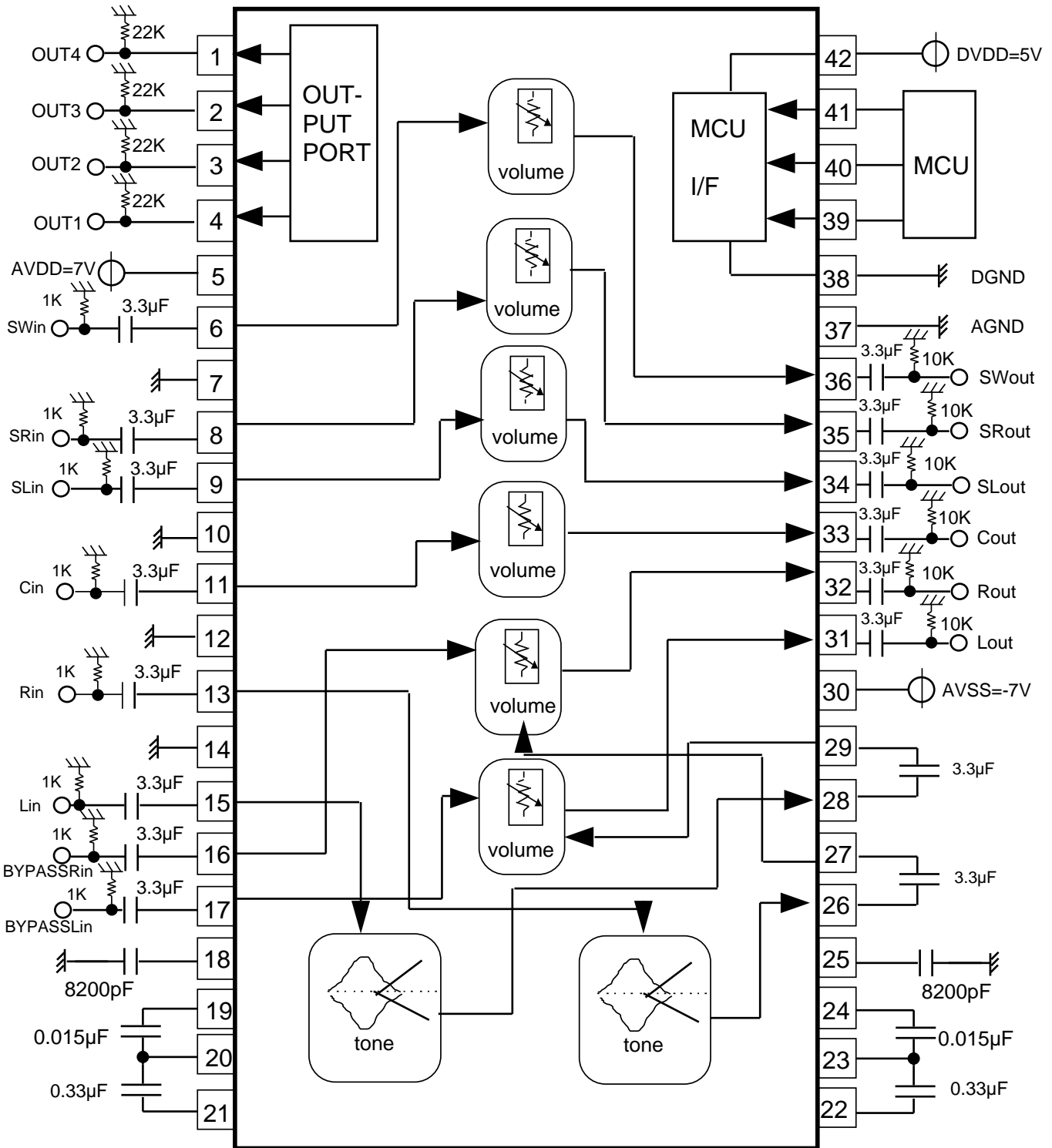
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APPLICATION EXAMPLE



Units Resistance :
 Capacitance : F