

4.1-channel Electronic Volume with 3 Band Equalizer

■GENERAL DESCRIPTION

The NJW1222 is a 4.1-channel electronic volume with input selector. It includes 6-input stereo audio selector, master volume, fader volume, sub-woofer volume, mix signal volume, 3 band graphic equalizer, loudness, high pass filter, low pass filter, Level Meter function.

The NJW1222 performs low noise and low distortion characteristics with resistance ladder circuit.

All of functions are controlled by I²C BUS interface.

■PACKAGE OUTLINE

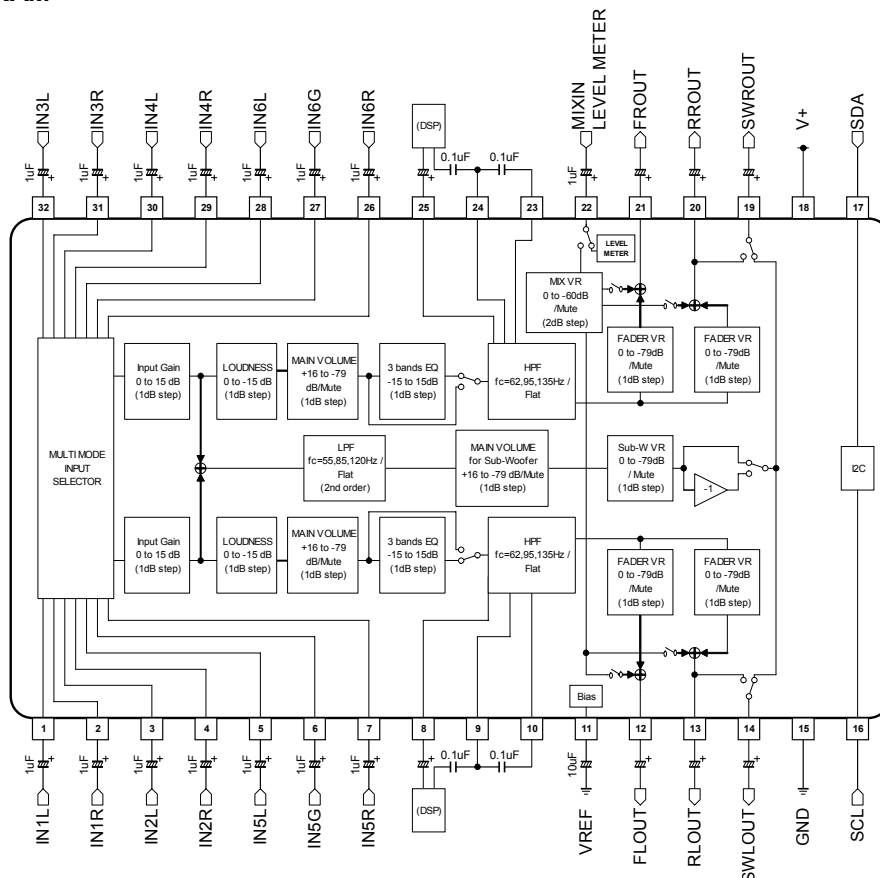


NJW1222V

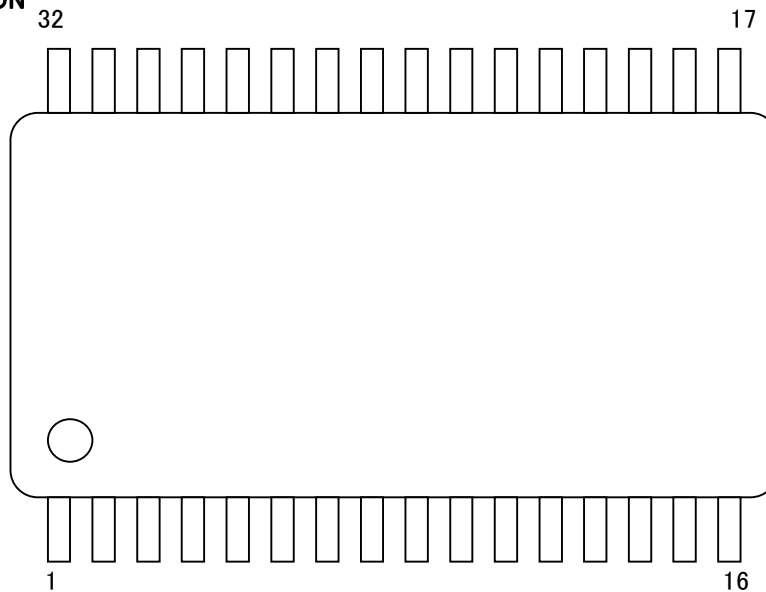
■FEATURES

- Operating Voltage +7.5 to +10V
- I²C BUS Control
- Low output noise -103dBVtyp.
- Low THD 0.01%typ.
- Multi Mode Input Selector 6SE, 5SE+1QD, 4SE+QD, 4SE+1FD, 3SE+1FD+1QD
2SE+2FD, 2SE+1FD+2QD, 2FD+2QD mode selectable
*SE: Single end, QD: Quasi differential, FD: Full differential
- Input Gain 0 to +15dB/1dBstep
- Main Volume +16 to -79dB/1dBstep, MUTE
- Loudness
- Graphic Equalizer 0 to ±15dB/1dBstep
- Fader Volume 0 to -79dB/1dBstep, MUTE
- Sub-Woofer Output 0 to -79dB/1dBstep, MUTE
- Mix Signal Volume 0 to -60dB/2dBstep, MUTE (FL,FR,RL,RR output selectable)
- Level Meter
- Bi-CMOS Technology
- Package Outline SSOP32

■BLOCK DIAGRAM



■PIN CONFIGURATION



■Multi Mode Input Selector

No.	Symbol	Function	No.	Symbol	Function
1	IN1L	Lch SE Input 1 Terminal Lch FD Input 1 Terminal	17	SDA	I ² C Data Input Terminal / Acknowledge Output
2	IN1R	Rch SE Input 1 Terminal Lch FD Input 1 Ref Terminal	18	V+	Power Supply Terminal
3	IN2L	Lch SE Input 2 Terminal Rch FD Input 1 Ref Terminal	19	SWROUT	Rch Sub Woofer Vol. Output Terminal
4	IN2R	Rch SE Input 2 Terminal Rch FD Input 1 Terminal	20	RROUT	Rch Rear Vol. Output Terminal
5	IN5L	Lch SE Input 5 Terminal Lch QD Input 1 Terminal	21	FROUT	Rch Front Vol. Output Terminal
6	IN5G	QD Input 1 Ref Terminal	22	MIXIN LMOUT	Mix Signal Input Terminal Level Meter Output Terminal
7	IN5R	Rch SE Input 5 Terminal Rch QD Input 1 Terminal	23	HPF3R	Rch High Pass Filter Terminal 3
8	HPF1L	Lch High Pass Filter Terminal 1	24	HPF2R	Rch High Pass Filter Terminal 2
9	HPF2L	Lch High Pass Filter Terminal 2	25	HPF1R	Rch High Pass Filter Terminal 1
10	HPF3L	Lch High Pass Filter Terminal 3	26	IN6R	Rch SE Input 6 Terminal Rch QD Input 2 Terminal
11	VREF	Reference Voltage Terminal	27	IN6G	QD Input 2 Ref Terminal
12	FLOUT	Lch Front Vol. Output Terminal	28	IN6L	Lch SE Input 6 Terminal Lch QD Input 2 Terminal
13	RLOUT	Lch Rear Vol. Output Terminal	29	IN4R	Rch SE Input 4 Terminal Rch FD Input 2 Terminal
14	SWLOUT	Lch Sub Woofer Vol. Output Terminal	30	IN4L	Lch SE Input 4 Terminal Rch FD Input 2 Ref Terminal
15	GND	Ground Terminal	31	IN3R	Rch SE Input 3 Terminal Lch FD Input 2 Ref Terminal
16	SCL	I ² C Clock Input Terminal	32	IN3L	Lch SE Input 3 Terminal Lch FD Input 2 Terminal

*SE: Single Ended Input Mode

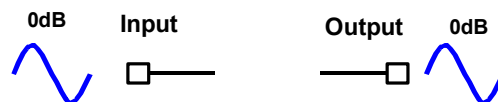
Input Mode	Input Terminal No.													
	1	2	3	4	5	6	7	26	27	28	29	30	31	32
6SE	SE L1	SE R1	SE L2	SE R2	SE L5	-	SE R5	SE R6	-	SE L6	SE R4	SE L4	SE R3	SE L3
5SE+1QD	SE L1	SE R1	SE L2	SE R2	QD L1	QD G1	QD R1	SE R6	-	SE L6	SE R4	SE L4	SE R3	SE L3
	SE L1	SE R1	SE L2	SE R2	SE L5	-	SE R5	QD R2	QD G2	QD L2	SE R4	SE L4	SE R3	SE L3
4SE+2QD	SE L1	SE R1	SE L2	SE R2	QD L1	QD G1	QD R1	QD R2	QD G2	QD L2	SE R4	SE L4	SE R3	SE L3
4SE+1FD	FD L1	FD LG1	FD RG1	FD R1	SE L5	-	SE R5	SE R6	-	SE L6	SE R4	SE L4	SE R3	SE L3
	SE L1	SE R1	SE L2	SE R2	SE L5	-	SE R5	SE R6	-	SE L6	FD R2	FD RG2	FD LG2	FD L2
3SE+1FD+1QD	SE L1	SE R1	SE L2	SE R2	SE L5	-	SE R5	QD R2	QD G2	QD L2	FD R2	FD RG2	FD LG2	FD L2
	SE L1	SE R1	SE L2	SE R2	QD L1	QD G1	QD R1	SE R6	-	SE L6	FD R2	FD RG2	FD LG2	FD L2
	FD L1	FD LG1	FD RG1	FD R1	SE L5	-	SE R5	QD R2	QD G2	QD L2	SE R4	SE L4	SE R3	SE L3
	FD L1	FD LG1	FD RG1	FD R1	QD L1	QD G1	QD R1	SE R6	-	SE L6	SE R4	SE L4	SE R3	SE L3
2SE+2FD	FD L1	FD LG1	FD RG1	FD R1	SE L5	-	SE R5	SE R6	-	SE L6	FD R2	FD RG2	FD LG2	FD L2
2SE+1FD+2QD	SE L1	SE R1	SE L2	SE R2	QD L1	QD G1	QD R1	QD R2	QD G2	QD L2	FD R2	FD RG2	FD LG2	FD L2
	FD L1	FD LG1	FD RG1	FD R1	QD L1	QD G1	QD R1	QD R2	QD G2	QD L2	SE R4	SE L4	SE R3	SE L3
2FD+2QD	FD L1	FD LG1	FD RG1	FD R1	QD L1	QD G1	QD R1	QD R2	QD G2	QD L2	FD R2	FD RG2	FD LG2	FD L2

QD: 3 Terminals Quasi Differential Input Mode (L/COMMON/R)

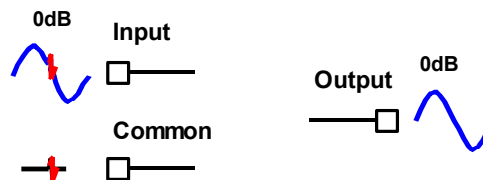
FD: 4 Terminals Full Differential Input Mode (L+/L-/R+/R-)

(Example) All Gain Setting = 0dB

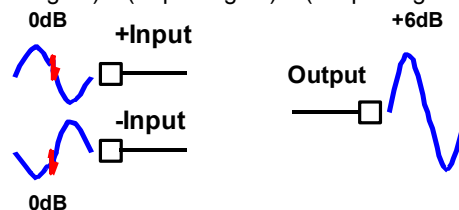
SE: (Input Signal) = (Output Signal)



QD: (Input Signal) - (Common Signal) = (Output Signal)



FD: (+Input Signal) - (-Input Signal) = (Output Signal)



■ABSOLUTE MAXIMUM RATING (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Power Supply Voltage	V+	10.5	V
Power Dissipation	P _D	950 NOTE: EIA/JEDEC STANDARD Test board (76.2x114.3x1.6mm, 2layer, FR-4) mounting	mW
Operating Temperature Range	Topr	-40 ~ +85	°C
Storage Temperature Range	Tstg	-40 ~ +125	°C

■ELECTRICAL CHARACTERISTICS

(Ta=25°C, V⁺=9V, R_g=600Ω, R_L=47kΩ, V_{in}=1.5Vrms, f=1kHz, all controls flat unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V+		7.5	9.0	10.0	V
Supply Current	I _{CC}	No signal	-	30	35	mA
Reference Voltage	V _{REF}	No signal	4.0	4.5	5.0	V
Maximum Input Voltage	V _{IM}	MAIN VOLUME=-20dB THD=1%	2.0	2.2	-	Vrms
Maximum Output Voltage 1	V _{OM1}	THD=1%	2.0	2.2	-	Vrms
Maximum Output Voltage 2	V _{OM2}	THD=1%, f=50kHz	1.5	2.2	-	Vrms
Voltage Gain 1	G _{V1}	MAIN VOLUME=0dB INPUT GAIN=+15dB V _{in} =100mVrms	13	15	17	dB
Voltage Gain 2	G _{V2}		-1	0	1	dB
Voltage Gain 3	G _{V3}	MAIN VOLUME=-79dB	-82	-79	-76	dB
Voltage Gain 4	G _{V4}	FADER VOLUME FL, FR, RL, RR =-79dB	-82	-79	-76	dB
Voltage Gain 5	G _{V5}	MIX SIGNAL VOLUME =-60dB	-63	-60	-57	dB
Mute Level	Mute	MAIN VOLUME=Mute Filter : 400Hz-30kHz	-	-100	-90	dB
Channel Balance	G _{CB}	MAIN VOLUME=0dB	-1	0	1	dB
Total Harmonic Distortion	THD	V _O =1.5Vrms, BW=400Hz-30kHz	-	0.01	0.05	%
Output Noise Voltage 1	V _{NO1}	R _g =0Ω, Filter : A-Weighted	-	-103 (7)	-96.5 (15)	dBV (uVrms)
Output Noise Voltage 2	V _{NO2}	Fader Volume=Mute R _g =0Ω, Filter : A-Weighted	-	-110 (3)	-100 (10)	dBV (uVrms)
Cross Talk	CT	Selected Input : R _g =0Ω Unselected Input : Signal	90	100	-	dB
Channel Separation	CS	R _g =0Ω	90	100	-	dB

◆Level Meter

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Level	LM _{OUT}	V _{IN} =1Vpeak	0.7	1	1.4	V
Maximum Output Level	LM _{OM}	V _{IN} =3Vpeak	2.7	3.0	3.3	V
DC Offset Voltage	V _{DC}	No Signal	-	10	50	mV

◆ Loudness

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Maximum Low Level	G _{LDL}	Loudness Level=-15dB High Boost Level= 0dB, f=10kHz	-18	-15	-12	dB
Maximum High Frequency Boost Level	G _{LDH}	Loudness Level=-15dB High Boost Level=+9dB, f=10kHz	-9	-6	-3	dB

◆ Parametric Equalizer

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Bass Boost Level	G _{1BST}	Bass=+15dB, f=100Hz Vin=0.1Vrms	12.5	15.0	17.5	dB
Bass Cut Level	G _{1UT}	Bass=+15dB, f=100Hz	-17.5	-15.0	-12.5	dB
Middle Boost Level	G _{2BST}	Middle=+15dB, f=1kHz Vin=0.1Vrms	12.5	15.0	17.5	dB
Middle Cut Level	G _{2CUT}	Middle=+15dB, f=1kHz	-17.5	-15.0	-12.5	dB
Treble Boost Level	G _{3BST}	Treble=+15dB, f=10kHz Vin=0.1Vrms	12.5	15.0	17.5	dB
Treble Cut Level	G _{3CUT}	Treble=+15dB, f=10kHz	-17.5	-15.0	-12.5	dB
Bass Center Frequency	f _{C11}		-	50	-	Hz
	f _{C12}		-	100	-	Hz
	f _{C13}		-	200	-	Hz
Middle Center Frequency	f _{C21}		-	0.5	-	kHz
	f _{C22}		-	1	-	kHz
	f _{C23}		-	2	-	kHz
Treble Frequency	f _{C31}		-	5	-	kHz
	f _{C32}		-	10	-	kHz
	f _{C33}		-	15	-	kHz
Quality Factor	Q ₁		-	0.7	-	
	Q ₂		-	1	-	
	Q ₃		-	1.4	-	
	Q ₄		-	2	-	

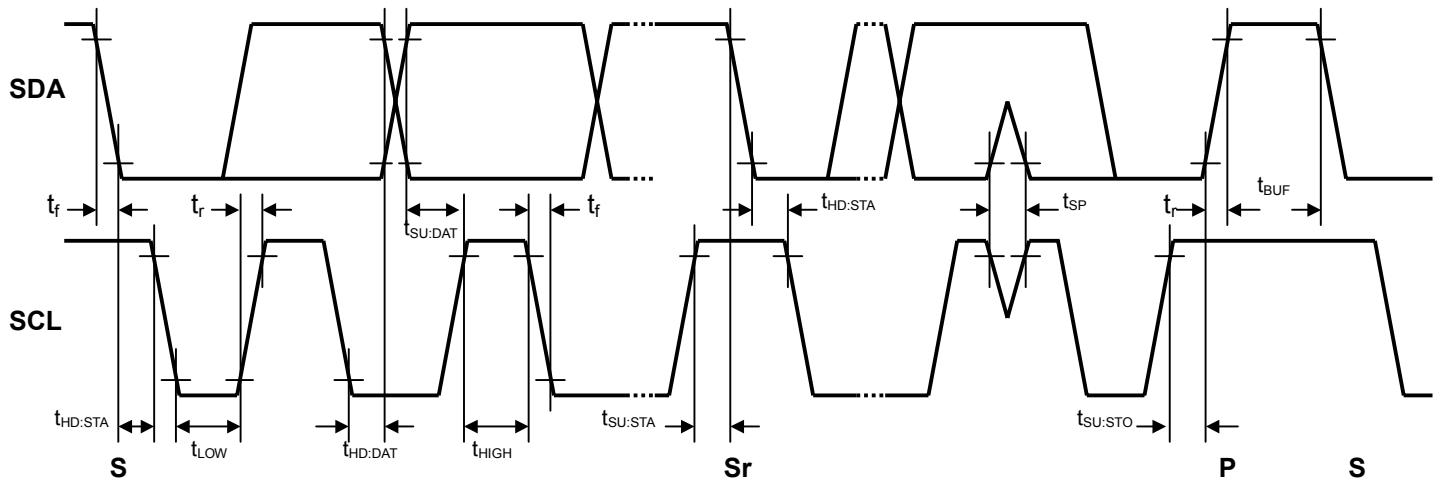
◆ High Pass Filter

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Cut off Frequency	f _{HP1}		-	62	-	Hz
	f _{HP2}		-	95	-	Hz
	f _{HP3}		-	135	-	Hz

◆ Sub Woofer

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Maximum Gain	G _{SWMAX}	SUB WOOFER VOLUME=0dB	-2	0	2	dB
Minimum Gain	G _{SWMIN}	SUB WOOFER VOLUME=-79dB	-82	-79	-76	dB
Maximum Input Voltage	V _{IMSW}	THD=1%	2.0	2.2	-	Vrms
Maximum Output Voltage	V _{OMSW}	THD=1%	2.0	2.2	-	Vrms
Total Harmonic Distortion	THD	f=50Hz, V _{in} =1.5Vrms	-	0.05	0.1	%
Cut off Frequency	f _{CSW1}		-	55	-	Hz
	f _{CSW2}		-	85	-	Hz
	f _{CSW3}		-	120	-	Hz
Phase Changer		OFF	-	0	-	deg.
		ON	-	180	-	deg.

■TIMING ON THE I²C BUS (SDA,SCL)



■CHARACTERISTICS OF I/O STAGES FOR I2C BUS (SDA,SCL)

I²C BUS Load Conditions

STANDARD MODE : Pull up resistance 4kΩ (Connected to +5V), Load capacitance 200pF (Connected to GND)

FAST MODE : Pull up resistance 4kΩ (Connected to +5V), Load capacitance 50pF (Connected to GND)

PARAMETER	SYMBOL	Standard mode			Fast mode			UNIT
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Low Level Input Voltage	V _{IL}	0.0	-	1.5	0.0	-	1.5	V
High Level Input Voltage	V _{IH}	2.7	-	5.5	2.7	-	5.5	V
Low level output voltage (3mA at SDA pin)	V _{OL}	0	-	0.4	0	-	0.4	V
Input current each I/O pin with an input voltage between 0.1V _{DD} and 0.9V _{DDmax}	I _i	-10	-	10	-10	-	10	μA

■CHARACTERISTICS OF BUS LINES (SDA,SCL) FOR I²C-BUS DEVICES

PARAMETER	SYMBOL	Standard mode			Fast mode			UNIT
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
SCL clock frequency	f _{SCL}	-	-	100	-	-	400	kHz
Hold time (repeated) START condition.	t _{HD:STA}	4.0	-	-	0.6	-	-	μs
Low period of the SCL clock	t _{LOW}	4.7	-	-	1.3	-	-	μs
High period of the SCL clock	t _{HIGH}	4.0	-	-	0.6	-	-	μs
Set-up time for a repeated START condition	t _{SU:STA}	4.7	-	-	0.6	-	-	μs
Data hold time ^(NOTE)	t _{HD:DAT}	0	-	-	0	-	-	μs
Data set-up time	t _{SU:DAT}	250	-	-	100	-	-	ns
Rise time of both SDA and SCL signals	t _r	-	-	1000	-	-	300	ns
Fall time of both SDA and SCL signals	t _f	-	-	300	-	-	300	ns
Set-up time for STOP condition	t _{SU:STO}	4.0	-	-	0.6	-	-	μs
Bus free time between a STOP and START condition	t _{BUF}	4.7	-	-	1.3	-	-	μs
Capacitive load for each bus line	C _b	-	-	400	-	-	400	pF
Noise margin at the Low level	V _{nL}	0.5	-	-	0.5	-	-	V
Noise margin at the High level	V _{nH}	1	-	-	1	-	-	V

C_b ; total capacitance of one bus line in pF.

NOTE). Data hold time : t_{HD:DAT}

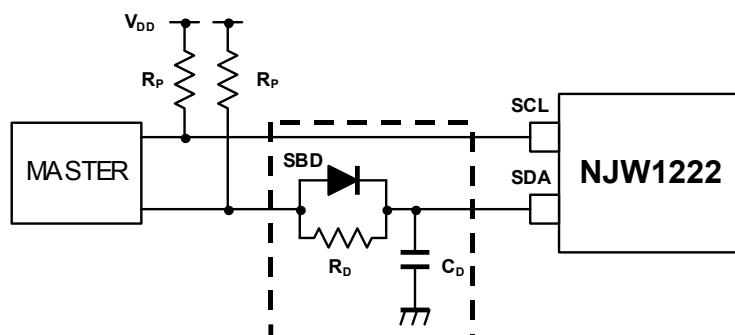
Please hold the Data Hold Time (t_{HD:DAT}) to 300ns or more to avoid status of unstable at SCL falling edge.

The SDA block in the NJW1222 does not hold data. Add external data-delay-circuit of the SDA terminal, in case of not providing a hold time of at least 300nsec for the SDA in the master device.

The time-consists of the data-delay-circuit of the SDA terminal are as follows.

- (a) Low level → High level : $T_{LH} \approx R_p * C_D$
- (b) High level → Low level : $T_{HL} \approx R_D * C_D$

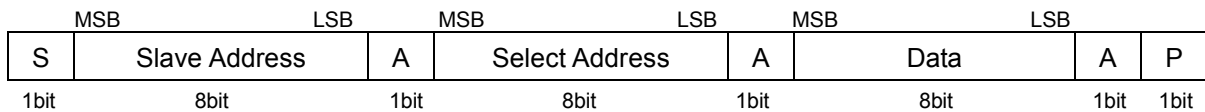
In addition, Schottky barrier diode (SBD) influences a Low level at the Acknowledge. Therefore choose the low forward voltage (V_f) as much as possible.



■ DEFINITION OF I²C REGISTER

Note) Please don't send except specified data for avoiding an incorrect operation.

◆ I²C BUS FORMAT



S: Starting Term
A: Acknowledge Bit
P: Ending Term

◆ SLAVE ADDRESS

Slave Address								Hex
MSB							LSB	-
1	0	0	0	0	0	0	0	80(h)

◆ CONTROL REGISTER TABLE

The select address sets each function (Multi Mode Input Selector, Input Gain, Main Volume, Loudness, Parametric Equalizer, Low Pass Filter, Fader Volume, Subwoofer Volume, Mix Signal Volume, Other Settings).
The auto increment function cycles the select address as follows.

00H→01H→02H→03H→04H→05H→06H→07H→08H→09H→0AH→0BH→0CH→0DH→0EH→0FH→00H

<Write Mode>

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	MULTI MODE INPUT SELECTOR				INPUT GAIN			
01H	*	MAIN VOL						
02H	LOUD FC		LOUD HBST		LOUD LVL			
03H	SM SP	SM TIME		EQPASS	HPF		LPF	
04H	*	EQ1Q		BCEQ1	EQ1LVL			
05H	*	EQ2Q		BCEQ2	EQ2LVL			
06H	*	EQ3Q		BCEQ3	EQ3LVL			
07H	*	*	EQ1FC		EQ2FC		EQ3FC	
08H	MIX FL	FADER FL						
09H	MIX FR	FADER FR						
0AH	MIX RL	FADER RL						
0BH	MIX RR	FADER RR						
0CH	PHASE	SUBW VOL						
0DH	*	*	LM	MIX VOL				
0EH	*	SUBW SW	SSMAIN	SSEQ	SSFADER	SS SW	SS TIME	
0FH	*	*	*	TEST MODE				

*: Don't Care

◆ CONTROL REGISTER DEFAULT VALUE

Control register default value is all "0".

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	0	0	0	0	0	0	0	0
01H	0	0	0	0	0	0	0	0
02H	0	0	0	0	0	0	0	0
03H	0	0	0	0	0	0	0	0
04H	0	0	0	0	0	0	0	0
05H	0	0	0	0	0	0	0	0
06H	0	0	0	0	0	0	0	0
07H	0	0	0	0	0	0	0	0
08H	0	0	0	0	0	0	0	0
09H	0	0	0	0	0	0	0	0
0AH	0	0	0	0	0	0	0	0
0BH	0	0	0	0	0	0	0	0
0CH	0	0	0	0	0	0	0	0
0DH	0	0	0	0	0	0	0	0
0EH	0	0	0	0	0	0	0	0
0FH	0	0	0	0	0	0	0	0

*The control resistor setting may not be above values when power is turned on due to the noise of power supply. Please send initial data after power on.

■ INSTRUCTION CODE

a) MULTI MODE INPUT SELECTOR, INPUT GAIN SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	MULTI MODE INPUT SELECTOR				INPUT GAIN			

- MULTI MODE INPUT SELECTOR
6SE, 5SE+1QD, 4SE+QD, 4SE+1FD, 3SE+1FD+1QD2SE+2FD, 2SE+1FD+2QD, 2FD+2QD, Mute
SE(Single Ended), QD(Quasi Differential),FD (Full Differential)
- INPUT GAIN : 0 to +15 dB (1dB/Step)

b) MAIN VOLUME SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
01H	*	MAIN VOL						

- MAIN VOL: Main volume setting +16 to -79 dB (1dB/Step) / Mute

c) LOUDNESS, HIGH BOOST SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
02H	LOUD FC		LOUD HBST		LOUD LVL			

- LOUD FC: Loudness center frequency setting
- LOUD HBST: Loudness high frequency boost level setting
- LOUD LVL: Loudness level setting 0dB to -15dB (1dB/Step)

d) SOFT MUTE, SOFT MUTE TIME, EQUALIZER PASS, HPF, LPF SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
03H	SM SP	SM TIME		EQPASS	HPF		LPF	

- SM SP: Soft mute for fader volume and subwoofer volume
- SMTIME: Soft mute time setting
- EQPASS: Equalizer pass switch ON/OFF setting
- HPF: High pass filter cut off frequency setting
- LPF: Low pass filter cut off frequency setting

e) EQUALIZER QUALITY FACTOR, LEVEL SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
04H	*	EQ1Q		BCEQ1	EQ1LVL			
05H	*	EQ2Q		BCEQ2	EQ2LVL			
06H	*	EQ3Q		BCEQ3	EQ3LVL			

- EQ1Q, EQ2Q and EQ3Q: Equalizer quality factor setting
Quality Factor: 0.7, 1.0, 1.4, 2.0
- BCEQ1, BCEQ2 and BCEQ3: Boost cut select for equalizer control
"0": Cut
"1": Boost
- EQ1LVL, EQ2LVL and EQ3LVL: Equalizer Level Setting
Cut Level : -15 to 0dB (1dB/Step)
Boost Level : 0 to +15dB (1dB/Step)

f) EQUALIZER CENTER FREQUENCY

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
07H	*	*	EQ1FC		EQ2FC		EQ3FC	

- EQ1FC, EQ2FC and EQ3FC: Equalizer center frequency setting

g) MIX SIGNAL OUTPUT SELECTOR SETTING, FADER VOLUME SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
08H	MIX FL	FADER FL						
09H	MIX FR	FADER FR						
0AH	MIX RL	FADER RL						
0BH	MIX RR	FADER RR						

- MIX FL, MIX FR, MIX RL, MIX RR :select for Mix Signal output
- FADER FL, FADER FR, FADER RL, FADER RR : Fader volume setting 0 to -79 (1dB/step) / Mute

h) SUB WOOFER VOLUME SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
0CH	PHASE	SUBW VOL						

- PHASE: Sub woofer phase switch setting
- SUBW VOL: Sub woofer volume setting 0 to -79 (1dB/step) / Mute

i) LEVEL METER, MIX VOLUME SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
0DH	*	*	LM	MIX VOL				

- LM: Select for Level Meter Output or Mix Signal Input
- MIX VOL: Mix signal volume setting 0 to -60 (2dB/step) / Mute

j) SOFT STEP SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
0EH	*	SUBW SW	SSMAIN	SSEQ	SS FADER	SS SW	SS TIME	

- SUBW SW: Sub woofer output switch control
- SSMAIN: Soft step ON/OFF setting for main volume
- SSEQ: Soft step ON/OFF setting for equalizer
- SSFADER: Soft step ON/OFF setting for fader volume
- SS SW: Soft step ON/OFF setting for sub woofer volume
- SSTIME: Soft step time setting

k) TEST MODE SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
0FH	*	*	*	TEST MODE				

- TEST MODE: For device check use only. Set {D4,D3,D2,D1,D0}={0,0,0,0,0} in usual.

■INPUT SELECTOR (Select Address : 00H)

	INPUT SELECTOR			
	D7	D6	D5	D4
INPUT 1(Single Ended) *	0	0	0	0
INPUT 2(Single Ended)	0	0	0	1
INPUT 3(Single Ended)	0	0	1	0
INPUT 4(Single Ended)	0	0	1	1
INPUT 5(Single Ended)	0	1	0	0
INPUT 6 (Single Ended)	0	1	0	1
INPUT 1+2 (Full Differential)	0	1	1	0
INPUT 3+4 (Full Differential)	0	1	1	1
INPUT 5 (Quasi Differential)	1	0	0	0
INPUT 6 (Quasi Differential)	1	0	0	1
MUTE	1	1	1	1

*: Default Value

■INPUT GAIN (Select Address : 00H)

	INPUT GAIN			
	D3	D2	D1	D0
0*	0	0	0	0
+1	0	0	0	1
+2	0	0	1	0
+3	0	0	1	1
+4	0	1	0	0
+5	0	1	0	1
+6	0	1	1	0
+7	0	1	1	1
+8	1	0	0	0
+9	1	0	0	1
+10	1	0	1	0
+11	1	0	1	1
+12	1	1	0	0
+13	1	1	0	1
+14	1	1	1	0
+15	1	1	1	1

*: Default Value

■MAIN VOLUME (Select Address : 01H)

Gain (dB)	HEX	MAIN VOL						
		D6	D5	D4	D3	D2	D1	D0
+16	7F	1	1	1	1	1	1	1
+15	7E	1	1	1	1	1	1	0
+14	7D	1	1	1	1	1	0	1
+13	7C	1	1	1	1	1	0	0
+12	7B	1	1	1	1	0	1	1
+11	7A	1	1	1	1	0	1	0
...						
+2	71	1	1	1	0	0	0	1
+1	70	1	1	1	0	0	0	0
0	6F	1	1	0	1	1	1	1
-1	6E	1	1	0	1	1	1	0
-2	6D	1	1	0	1	1	0	1
...						
-75	24	0	1	0	0	1	0	0
-76	23	0	1	0	0	0	1	1
-77	22	0	1	0	0	0	1	0
-78	21	0	1	0	0	0	0	1
-79	20	0	1	0	0	0	0	0
Mute*	00	0	0	0	0	0	0	0

*: Default Value

■ **LOUDNESS CENTER FREQUENCY SETTING (Select Address : 02H)**

Loudness Center Frequency Setting	LOUD FC	
	D7	D6
1kHz*	0	0
400Hz	0	1
2.4kHz	1	0
Test Mode	1	1

*: Default Value

■ **LOUDNESS HIGH FREQUENCY BOOST LEVEL SETTING (Select Address : 02H)**

Loudness High Frequency Boost Level Setting	LOUD HBST	
	D5	D4
0 dB*	0	0
+3 dB	0	1
+6 dB	1	0
+9 dB	1	1

*: Default Value

■ **LOUDNESS LEVEL SETTING (Select Address : 02H)**

Loudness Level	EQ1LVL			
	D3	D2	D1	D0
-15 dB	1	1	1	1
-14 dB	1	1	1	0
-13 dB	1	1	0	1
-12 dB	1	1	0	0
-11 dB	1	0	1	1
-10 dB	1	0	1	0
-9 dB	1	0	0	1
-8 dB	1	0	0	0
-7 dB	0	1	1	1
-6 dB	0	1	1	0
-5 dB	0	1	0	1
-4 dB	0	1	0	0
-3 dB	0	0	1	1
-2 dB	0	0	1	0
-1 dB	0	0	0	1
0 dB *	0	0	0	0

*: Default Value

■SPEAKER OUTPUT SOFT MUTE (Select Address : 03H)

	SM SP
Soft Mute Setting	D7
OFF*	0
ON	1

*: Default Value

■SOFT MUTE TIME (Select Address : 03H)

	SM TIME	
Soft Mute Time	D6	D5
10msec*	0	0
20msec	0	1
50msec	1	0
100msec	1	1

*: Default Value

■EQUALIZER PASS SWITCH (Select Address : 03H)

	EQPASS
Switch Setting	D4
OFF*	0
ON	1

*: Default Value

■HIGH PASS FILTER (Select Address : 03H)

Cut Off Frequency	HPF	
	D3	D2
Flat*	0	0
62 Hz	0	1
95 Hz	1	0
135 Hz	1	1

*: Default Value

■LOW PASS FILTER (Select Address : 03H)

Cut Off Frequency	LPF	
	D1	D0
Flat*	0	0
55 Hz	0	1
85 Hz	1	0
120 Hz	1	1

*: Default Value

■EQUALIZER QUALITY FACTOR (Select Address : 04H, 05H, 06H)

Quality Factor	EQ1Q	
	EQ2Q	
	EQ3Q	
	D6	D5
0.7*	0	0
1.0	0	1
1.4	1	0
2.0	1	1

*: Default Value

■EQUALIZER BOOST/CUT LEVEL (Select Address : 04H, 05H, 06H)

Equalizer Cut or Boost	BCEQ1
	BCEQ2
	BCEQ3
	D4
Cut*	0
Boost	1

*: Default Value

		EQ1LVL			
		EQ2LVL			
		EQ3LVL			
Cut Gain(dB)	Boost Gain(dB)	D3	D2	D1	D0
-15	+15	1	1	1	1
-14	+14	1	1	1	0
-13	+13	1	1	0	1
-12	+12	1	1	0	0
-11	+11	1	0	1	1
-10	+10	1	0	1	0
-9	*9	1	0	0	1
-8	+8	1	0	0	0
-7	+7	0	1	1	1
-6	+6	0	1	1	0
-5	+5	0	1	0	1
-4	+4	0	1	0	0
-3	+3	0	0	1	1
-2	+2	0	0	1	0
-1	+1	0	0	0	1
0*	0	0	0	0	0

*: Default Value

■EQUALIZER BAND 1 CENTER FREQUENCY (Select Address : 07H)

Equalizer Band 1 Center Frequency	EQ1FC	
	D5	D4
100Hz*	0	0
50Hz	0	1
200Hz	1	0

*: Default Value

■EQUALIZER BAND 2 CENTER FREQUENCY (Select Address : 07H)

Equalizer Band 2 Center Frequency	EQ2FC	
	D3	D2
1kHz*	0	0
0.5kHz	0	1
2kHz	1	0

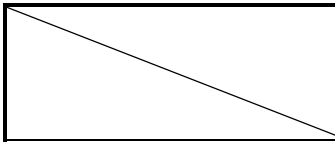
*: Default Value

■EQUALIZER BAND 3 CENTER FREQUENCY (Select Address : 07H)

Equalizer Band 3 Center Frequency	EQ3FC	
	D1	D0
10kHz*	0	0
5kHz	0	1
15kHz	1	0

*: Default Value

■MIX SIGNAL OUTPUT SELECTOR (Select Address : 08H, 09H, 0AH, 0BH)

	MIX FL
	MIX FR
	MIX RL
	MIX RR
Mix Signal Output Selector	D7
OFF *	0
ON	1

*: Default Value

■ FADER VOLUME (Select Address : 08H, 09H, 0AH, 0BH)

Gain(dB) HEX		FADER FL						
		FADER FR						
		FADER RL						
		FADER RR						
Gain(dB)	HEX	D6	D5	D4	D3	D2	D1	D0
0	7F	1	1	1	1	1	1	1
-1	7E	1	1	1	1	1	1	0
-2	7D	1	1	1	1	1	0	1
-3	7C	1	1	1	1	1	0	0
-4	7B	1	1	1	1	0	1	1
-5	7A	1	1	1	1	0	1	0
•••	•••	•••						
-76	33	0	1	1	0	0	1	1
-77	32	0	1	1	0	0	1	0
-78	31	0	1	1	0	0	0	1
-79	30	0	1	1	0	0	0	0
Mute*	00	0	0	0	0	0	0	0

*: Default Value

■ SUB WOOFER PHASE (Select Address : 0CH)

Phase	PHASE
	D7
0 degrees*	0
180 degrees	1

*: Default Value

■SUB WOOFER VOLUME (Select Address : 0CH)

		SUBW VOL						
Gain(dB)	HEX*	D6	D5	D4	D3	D2	D1	D0
0	7F	1	1	1	1	1	1	1
-1	7E	1	1	1	1	1	1	0
-2	7D	1	1	1	1	1	0	1
-3	7C	1	1	1	1	1	0	0
-4	7B	1	1	1	1	0	1	1
-5	7A	1	1	1	1	0	1	0
...						
-76	33	0	1	1	0	0	1	1
-77	32	0	1	1	0	0	1	0
-78	31	0	1	1	0	0	0	1
-79	30	0	1	1	0	0	0	0
Mute*	00	0	0	0	0	0	0	0

*: Default Value

■LEVEL METER (Select Address : 0DH)

	LM
Level Meter	D5
Level Meter OUT *	0
Mix Signal IN	1

*: Default Value

■MIX SIGNAL VOLUME (Select Address : 0DH)

		MIX VOL				
Gain(dB)	HEX	D4	D3	D2	D1	D0
0	1F	1	1	1	1	1
-2	1E	1	1	1	1	0
-4	1D	1	1	1	0	1
-6	1C	1	1	1	0	0
-8	1B	1	1	0	1	1
-10	1A	1	1	0	1	0
...				
-54	4	0	0	1	0	0
-56	3	0	0	0	1	1
-58	2	0	0	0	1	0
-60	1	0	0	0	0	1
Mute*	0	0	0	0	0	0

*: Default Value

■SUB WOOFER OUTPUT SWITCH (Select Address : 0EH)

	SUBW SW
Detect Point	D6
Sub Woofer Signal*	0
Rear Signal	1

*: Default Value

■MAIN VR SOFT STEP (Select Address : 0EH)

	SSMAIN
Soft Step Setting	D5
OFF*	0
ON	1

*: Default Value

■EQUALIZER SOFT STEP (Select Address : 0EH)

	SSEQ
Soft Step Setting	D4
OFF*	0
ON	1

*: Default Value

■FADER SOFT STEP (Select Address : 0EH)

	SSFADER
Soft Step Setting	D3
OFF*	0
ON	1

*: Default Value

■SUB WOOFER SOFT STEP (Select Address : 0EH)

	SSSW
Soft Step Setting	D2
OFF*	0
ON	1

*: Default Value

■SOFT STEP TIME (Select Address : 0EH)

	SS TIME	
Soft Step Time	D1	D0
10msec*	0	0
20msec	0	1
50msec	1	0
100msec	1	1

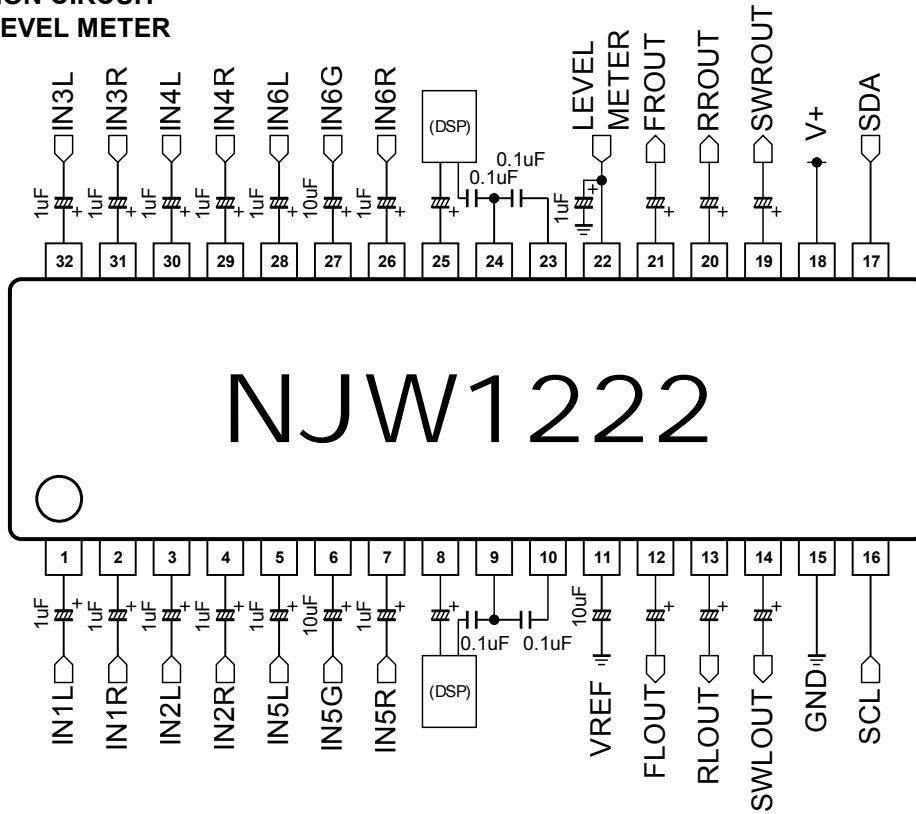
*: Default Value

■TEST MODE (Select Address : 0FH)

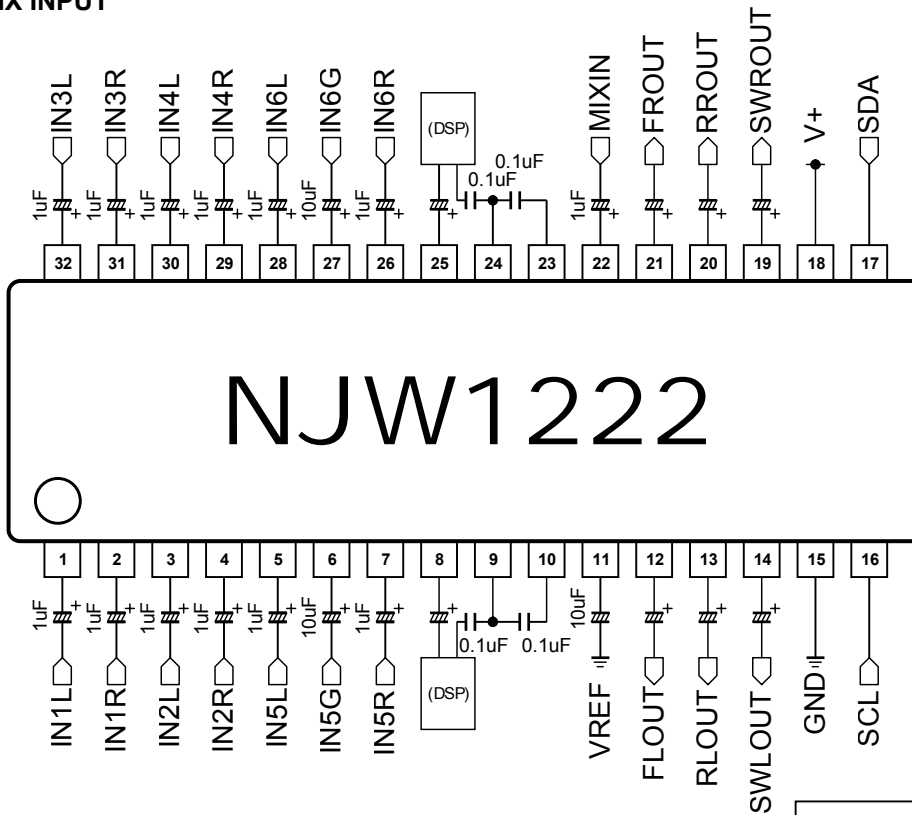
	TEST MODE				
TEST MODE	D4	D3	D2	D1	D0
ON	1	X	X	X	X
OFF*	0	X	X	X	X

*: Default Value

■ APPLICATION CIRCUIT
◆ FOR USE LEVEL METER



◆ FOR USE MIX INPUT



[CAUTION]
The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.