



PRELIMINARY

6-CHANNEL ELECTRONIC VOLUME

■ GENERAL DESCRIPTION

The **NJW1151** is a 6-CHANNEL ELECTRONIC VOLUME, which also includes tone control, balance and trim level control. The **NJW1151** is suitable for multi-channel audio system, such as AV amplifier, mini stereo component, speaker system, and others.

All of internal status and variables are controlled by I²C BUS interface.

■ PACKAGE OUTLINE

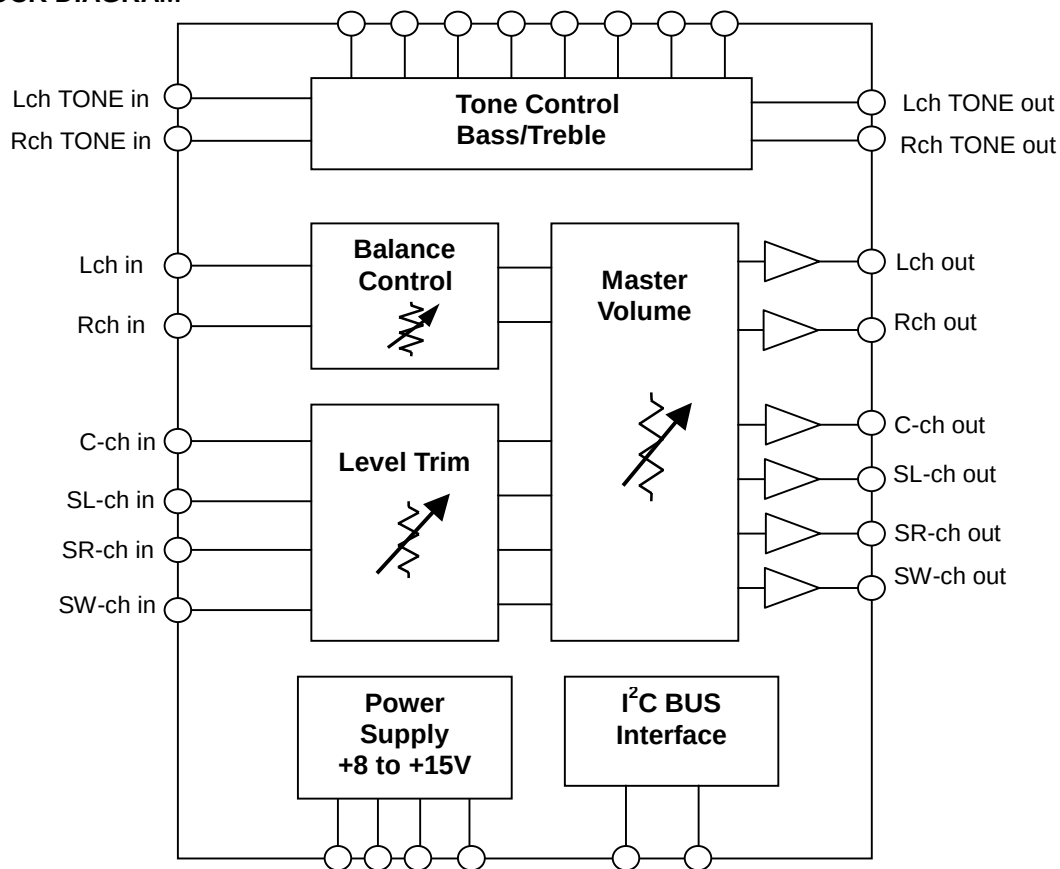


NJW1151M

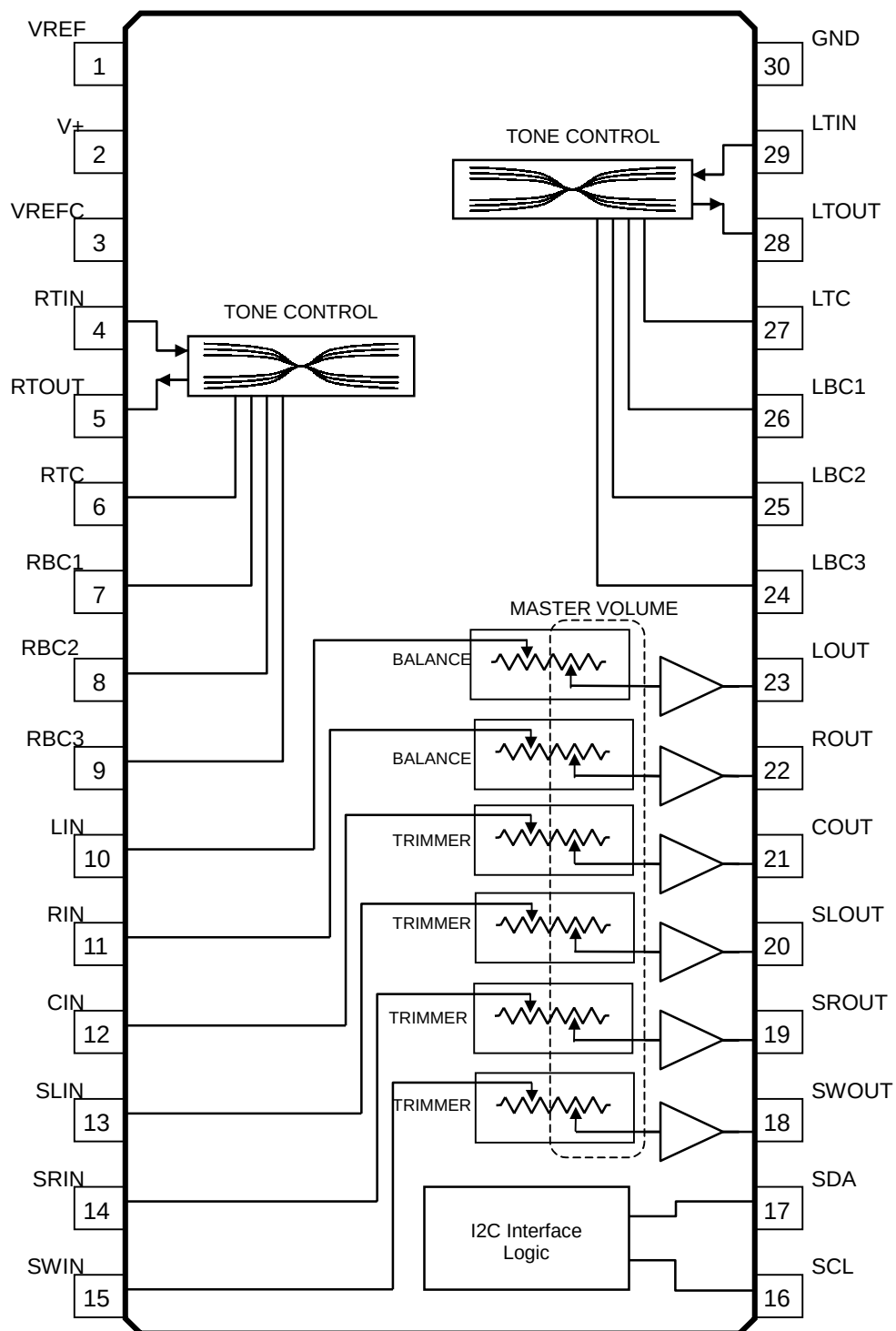
■ FEATURES

- Operating Voltage +8.0 to +15.0V
- I²C BUS Interface
- 6-Chnnel Master Volume 0 to -79dB, MUTE
- Balance control for L, R-ch 0 to -30dB, MUTE
- Trim Level Control for C, SL, SR, SW-ch 0 to -20dB
- Independent Tone Control (Bass, Treble) for L, R-ch
- Bi-CMOS Technology
- Package Outline SDMP30

■ BLOCK DIAGRAM



■ PIN FUNCTION



■ ABSOLUTE MAXIMUM RATING (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V ⁺	+15	V
Maximum Input Voltage	V _{IM}	V ⁺ (*)	V
Power Dissipation	P _D	700	mW
Operating Temperature Range	Topr	-40 to +85	°C
Storage Temperature Range	Tstg	-40 to +125	°C

(*) For the maximum input voltage less than 0 to V⁺

■ ELECTRICAL CHARACTERISTICS (Ta=25°C, V⁺/V⁻=±7V, V_{DD}=5V)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
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◆ Power Supply

Operating Voltage	V ⁺		8.0	14.0	15.0	V
Supply Current	I _{CC}	No Signal	-	10	30	mA

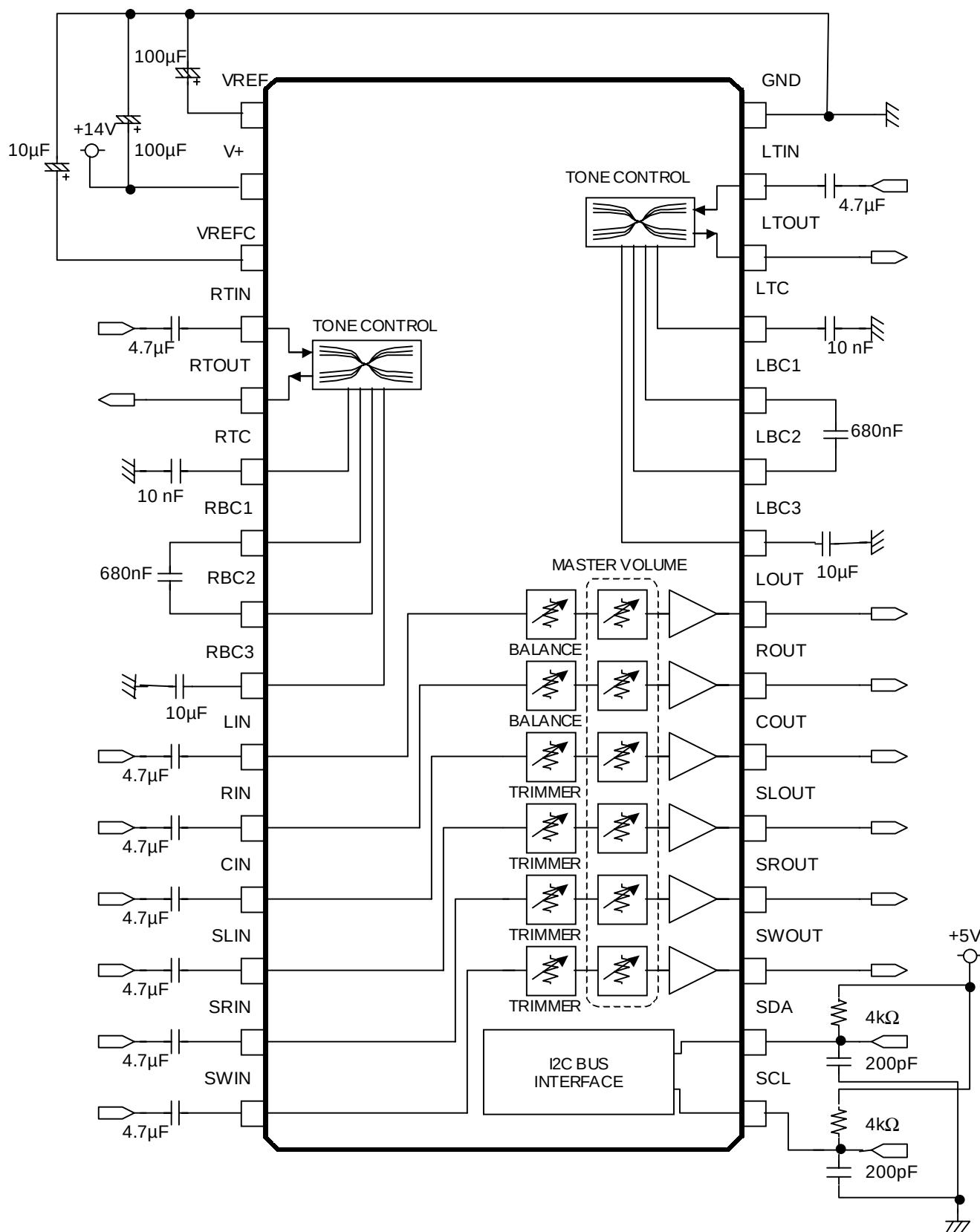
◆ Input/Output Characteristics

Voltage Gain	G _V	V _{IN} =1Vrms, f=1kHz Master=0dB, Balance=0dB Trimmer=0dB	-0.5	0	0.5	dB
Voltage Gain Error	ΔG _V	V _{IN} =1Vrms, f=1kHz Master=0dB	-0.5	0	0.5	dB
Maximum Attenuation 1	A _{TT1}	f=1KHz, V _{IN} =1Vrms Master=-79dB	-	-79	-	dB
Maximum Attenuation 2	A _{TT2}	f=1KHz, V _{IN} =1Vrms Mute	-	-90	-	dB
Attenuation Error	ΔA _{TT}	f=1KHz, V _{IN} =1Vrms Master=-50dB Trimmer=-10dB	-1	0	1	dB
Maximum Output Voltage	V _{OM}	f=1KHz, THD=1% Master=0dB	3.0	4.0	-	Vrms
Output Noise	V _{NO}	Master=0dB, Rg=0, A-weight	-	-110 (3.2μ)	-100 (10μ)	dBV (Vrms)
Total Harmonic Distortion	T.H.D.	f=1KHz, Vo=1Vrms, Master=0dB, Trimmer=0dB	-	0.005	0.05	%
Channel Separation	CS	f=1KHz, Vo=1Vrms Master=0dB, A-weight	-	-80	-70	dB

◆ Tone Control Characteristics

Treble Boost Gain1	HF _{BST}	Vo=1Vrms f=10KHz Treble=10dB	8	10	12	dB
Treble Boost Gain2	HF _{CUT}	Vo=1Vrms f=10KHz Treble=-10dB	-12	-10	-8	dB
Bass Boost Gain1	LF _{BST}	Vo=1Vrms f=50Hz Bass=10dB	8	10	12	dB
Bass Boost Gain2	LF _{CUT}	Vo=1Vrms f=50Hz Bass=-10dB	-12	-10	-8	dB

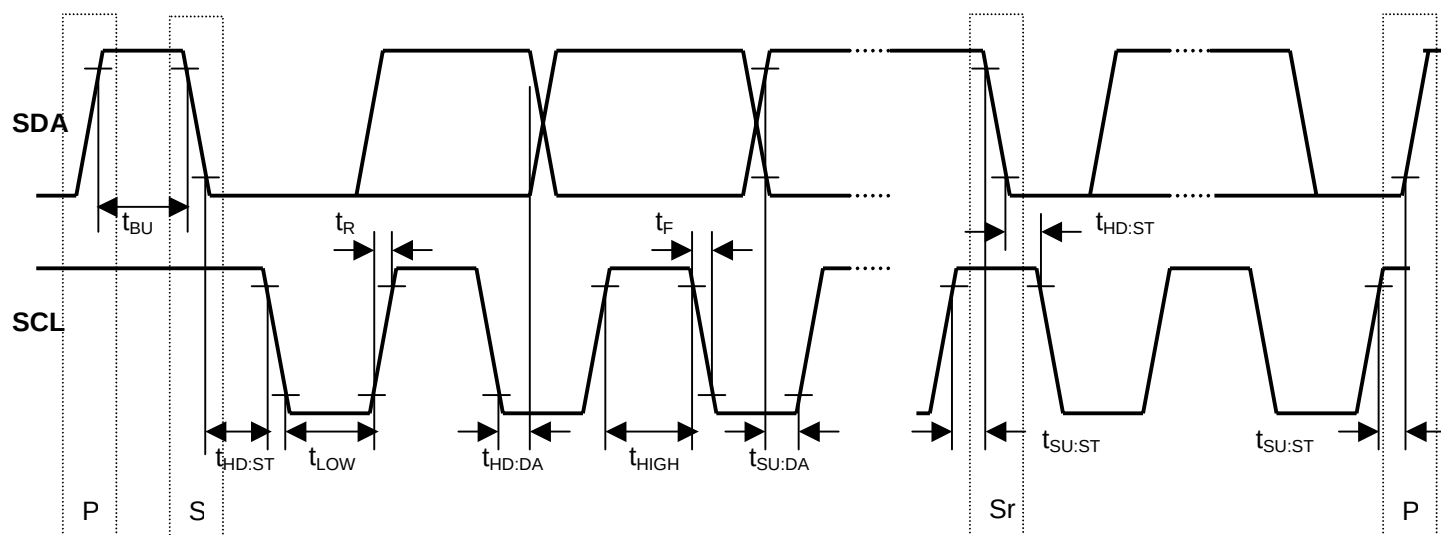
APPLICATION CIRCUIT



■ I²C BUS Block CHARACTERISTICS (SDA, SCL)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
High Level Input Voltage	V_{IH}	3.0	-	5.0	V
Low Level Input Voltage	V_{IL}	0	-	1.5	V
High Level Input Current	I_{IH}	-	-	10	μA
Low Level Input Current	I_{IL}	-	-	10	μA
Low Level Output Voltage (3mA at SDA pin)	V_{OL}	0	-	0.4	V
Maximum Output Current	I_{OL}	-3.0	-	-	mA
Maximum Clock Frequency	f_{SCL}	0	-	100	kHz
Data Change Minimum Waiting Time	t_{BUF}	4.7	-	-	μs
Data Transfer Start Minimum Waiting Time	$t_{HD:STA}$	4.0	-	-	μs
Low Level Clock Pulse Width	t_{LOW}	4.7	-	-	μs
High Level Clock Pulse Width	T_{HIGH}	4.0	-	-	μs
Minimum Start Preparation Waiting Time	$t_{SU:STA}$	4.7	-	-	μs
Minimum Data Hold Time	$t_{HD:DAT}$	5.0	-	-	μs
Minimum Data Preparation Time	$t_{SU:DAT}$	250	-	-	ns
Rise Time	t_R	-	-	1.0	μs
Fall Time	t_F	-	-	300	ns
Minimum Stop Preparation Waiting Time	$t_{SU:STO}$	4.7	-	-	μs

I²C BUS Load Condition: Pull up resistance 4k Ω (Connected to +5V)
Load capacitance 200pF (Connected to GND)



■ DEFINITION OF I²C REGISTER

● I²C BUS FORMAT

S: Starting Term

A: Acknowledge Bit

P: Ending Term

MSB	LSB	MSB	LSB	MSB	LSB		
S	Slave Address	A	Select Address	A	Data	A	P
1bit	8bit	1bit	8bit	1bit	8bit	1bit	1bit

● SLAVE ADDRESS

MSB							LSB
1	0	0	0	1	0	0	R/W

R/W=0: Receive Only

R/W=1: No Output Data

● CONTROL REGISTER TABLE

● CONTROL REGISTER TABLE

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	*	Master Volume						
01H	*			Left channel Balance				
02H	*			Right channel Balance				
03H	*			Center Channel Trimmer				
04H	*			SL Channel Trimmer				
05H	*			SR Channel Trimmer				
06H	*			SW Channel Trimmer				
07H	Tone (Treble)				Tone (Bass)			
08H	*		MUTE					

* : Don't care.

On Power up, The master volume mute is activated.

● CONTROL REGISTER DEFAULT VALUE

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	0	1	0	1	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	1	0	1	0
04H	0	0	0	0	1	0	1	0
05H	0	0	0	0	1	0	1	0
06H	0	0	0	0	1	0	1	0
07H	0	0	0	0	0	0	0	0
08H	0	0	0	0	0	0	0	0

● CONTROL COMMAND TABLE

Select Address	BIT								REMARKS
	D7	D6	D5	D4	D3	D2	D1	D0	
00H	*	VOL							VOL : Volume control for all channel (1dB/step) Ex.) "0000000"= 0dB "0000001"=-1dB "0000010"=- 2dB : : : : 1 0 0 1 1 1 1 1 0 1 0 0 0 0
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	1	
		0	0	0	0	0	1	0	
01H	*	L-BAL							L-BAL : Balance control for Left channel (1dB/step) Ex.) "00000"=0dB "00001"=-1dB : : : : "11110"=-30dB "11111"=MUTE
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	1	
		0	0	0	0	1	0	0	
		1	1	1	1	1	1	1	
02H	*	R-BAL							R-BAL : Balance control for Right channel (1dB/step) Ex.) "00000"=0dB "00001"=-1dB : : : : "11110"=-30dB "11111"= MUTE
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	1	
		0	0	0	0	1	0	0	
		1	1	1	1	1	1	1	
03H	*	C TRIM							C TRIM :Center Channel Trimmer Control Ex.) "00000"=0dB "00001"=-1dB "00010"=-2dB : : "10100"=-20dB "00001010"=-10dB Default Value
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	1	
		0	0	0	0	1	0	0	
		1	0	1	0	0	0	0	
04H	*	SL TRIM							SL TRIM :SL Channel Trimmer Control Ex.) "00000"=0dB "00001"=-1dB "00010"=-2dB : : "10100"=-20dB "00001010"=-10dB Default Value
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	1	
		0	0	0	0	1	0	0	
		1	0	1	0	0	0	0	
05H	*	SR TRIM							SR TRIM :SR Channel Trimmer Control Ex.) "00000"=0dB "00001"=-1dB "00010"=-2dB : : "10100"=-20dB "00001010"=-10dB Default Value
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	1	
		0	0	0	0	1	0	0	
		1	0	1	0	0	0	0	
06H	*	SW TRIM							SW TRIM :SW Channel Trimmer Control Ex.) "00000"=0dB "00001"=-1dB "00010"=-2dB : : "10100"=-20dB "00001010"=-10dB Default Value
		0	0	0	0	0	0	0	
		0	0	0	0	0	0	1	
		0	0	0	0	1	0	0	
		1	0	1	0	0	0	0	

● CONTROL COMMAND TABLE

CONTROL COMMAND TABLE									
Select Address	BIT								REMARKS
	D7	D6	D5	D4	D3	D2	D1	D0	
07H	TREBLE				BASS				TONE CONTROL Ex.) "11011101"=+10dB "11001100"=+8dB : "10001000"=0dB "00000000"=0dB : "01000111"=-8dB "01010101"=-10dB
	1	1	0	1	1	1	0	1	
	1	1	0	0	1	1	0	0	
					:				
	1	0	0	0	1	0	0	0	
	0	0	0	0	0	0	0	0	
					:				
	0	1	0	0	0	1	0	0	
08H	*		MUTE						MUTE CONTROL Ex.) "0"=OFF "1"=MUTE D5=L ch D4=R ch D3=C ch D2=SL ch D1=SR ch D0=SW ch
			0						
			1						

■ NOTE

Purchase of I²C components of New Japan Radio Co., Ltd or one of its sublicensed Associated Companies conveys a license under the Philips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C Standard Specification as defined by Philip.

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