



PRELIMINARY

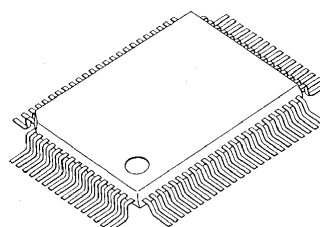
AV SWITCH

■GENERAL DESCRIPTION

The **NJW1310** is an Audio / Video switch for TV. All of functions are controlled by I²C BUS interface.

The **NJW1310** includes 7-input 2-output Audio switches. Also it includes 5-input 2-output Video switches, and 2-input 2-output YUV switches.

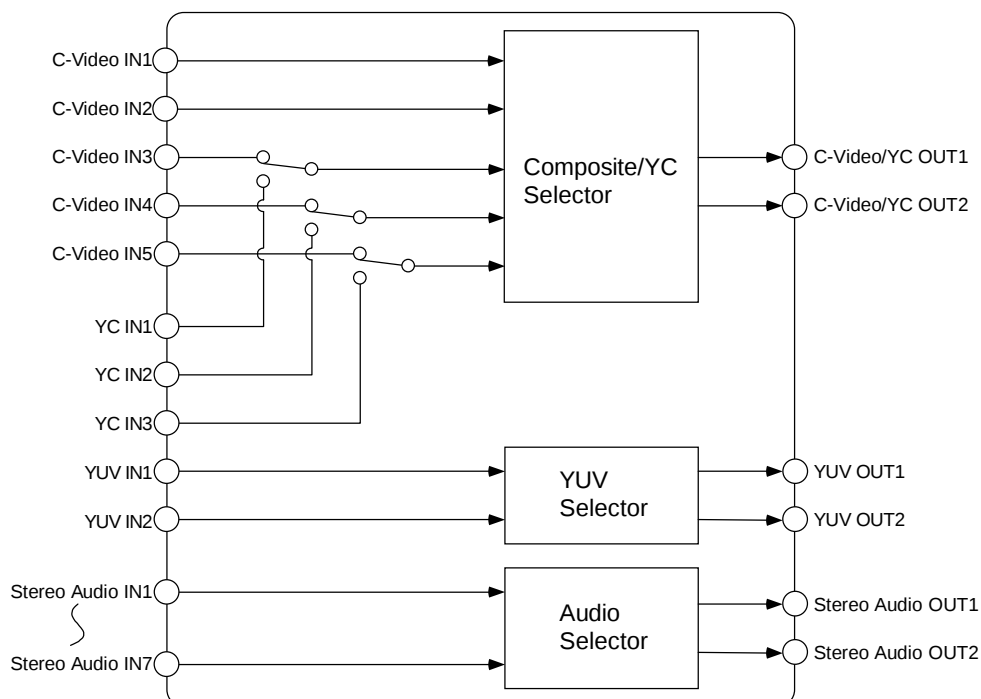
■ PACKAGE OUTLINE


NJW1310FC2

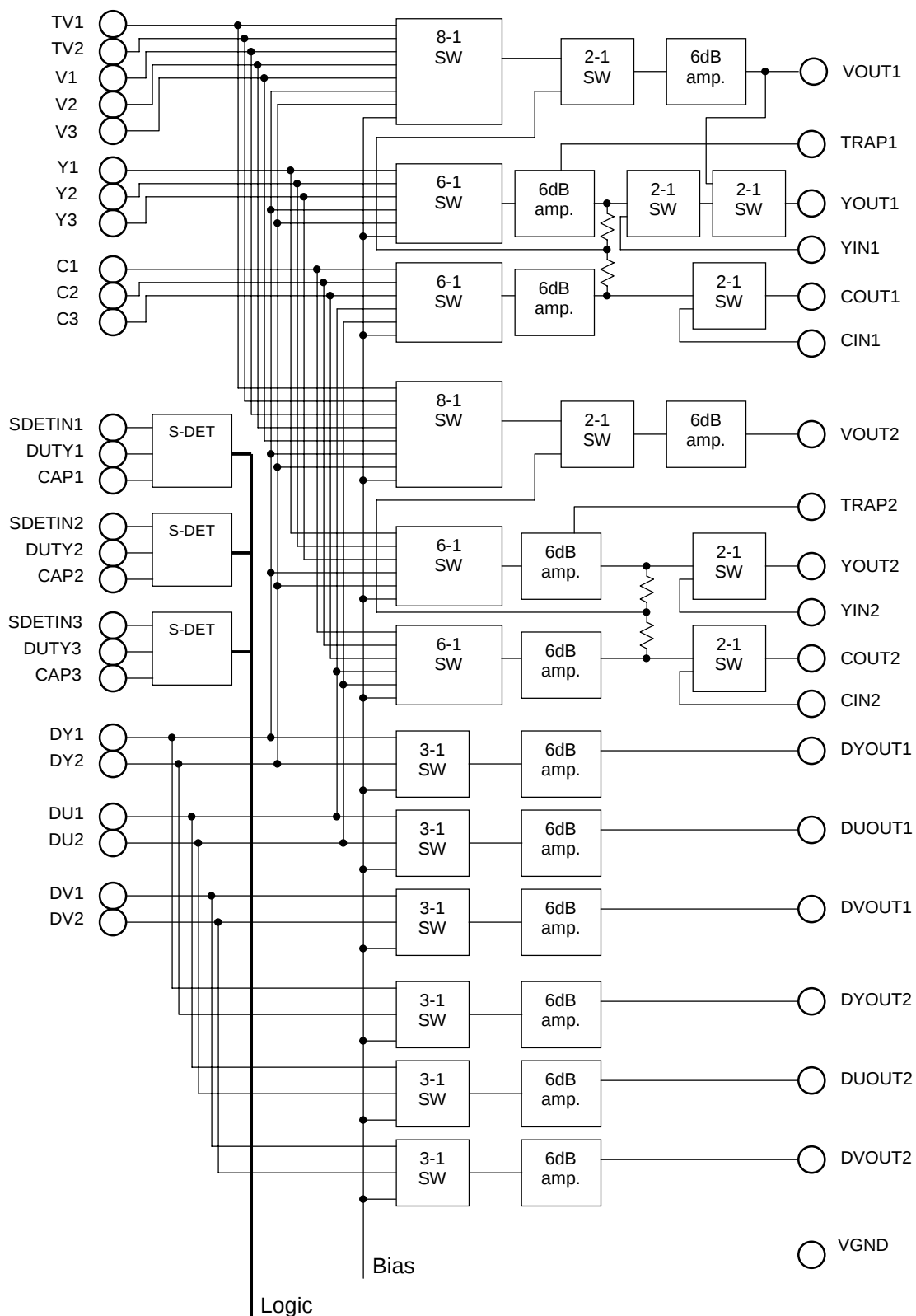
■FEATURES

- Operating Voltage 8 to 13V
- 7-Input 2-output Audio Switches
- 5-Input 2-output Video Switches
- 2-Input 2-output YUV Switches
- Y/C MIX Circuit
- S-Input Detection
- Wide Range Video Amplifier 20MHz, -3dB
- Audio Muting from External Pin
- Wide Range Audio Amplifier 3Vrms typ.
- Includes Auxiliary DC Outputs
- I²C BUS Interface
- Bi-CMOS Technology
- Package Outline QFP80

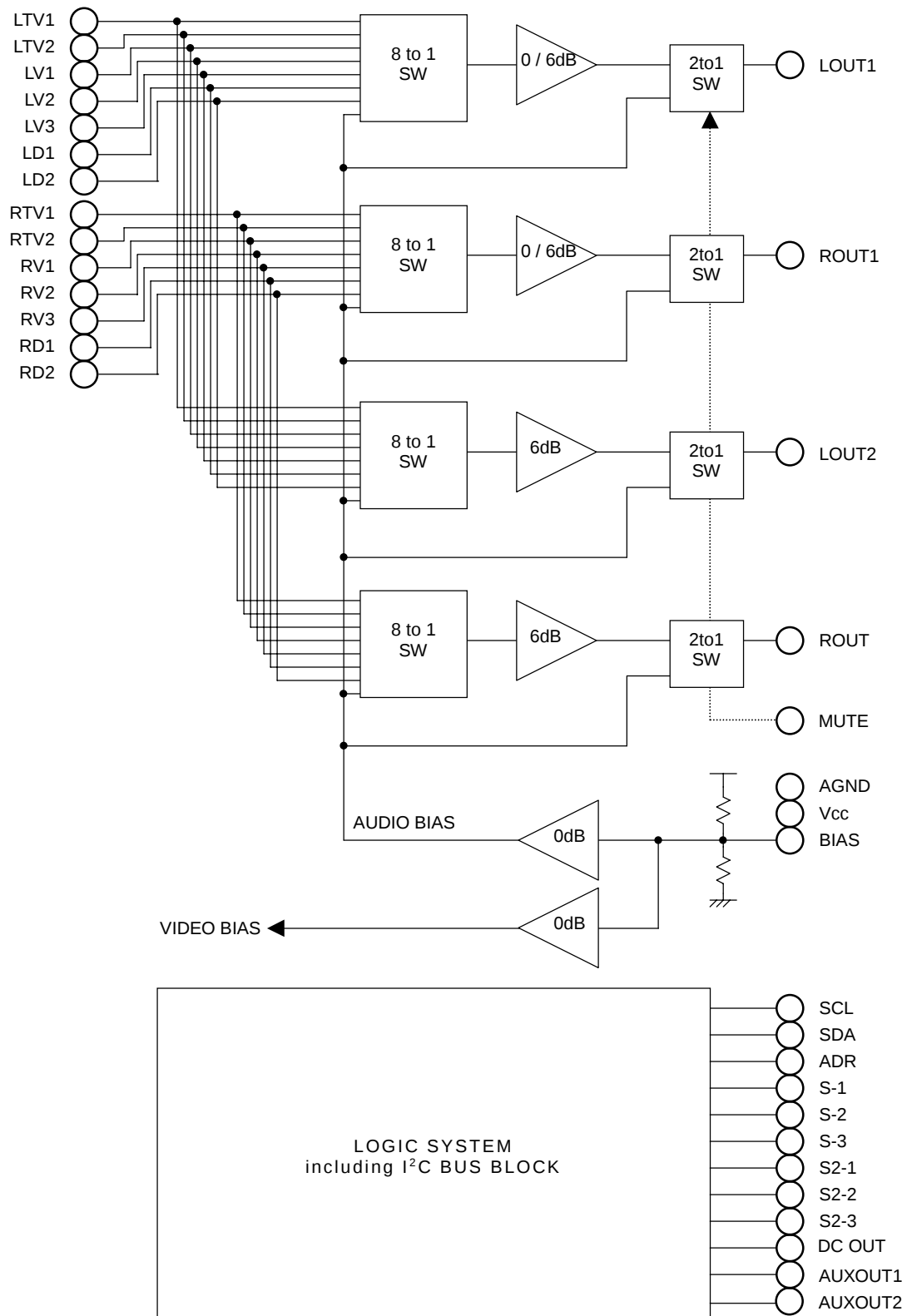
■FUNCTION BLOCK DIAGRAM



■BLOCK DIAGRAM (Video System)



■BLOCK DIAGRAM (Audio System, Logic System)



■ABSOLUTE MAXIMUM RATING (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V ⁺	15	V
Power Dissipation	P _D	1300	mW
Operating Temperature Range	Topr	-40 to +85	°C
Storage Temperature Range	Tstg	-40 to +125	°C

■ELECTRICAL CHARACTERISTICS (Ta=25°C, V⁺=9V)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V ⁺		8.0	9.0	13.0	V
Supply Current	I _{cc}	No Signal	56	80	104	mA
Reference Voltage	V _{REF}	No Signal	4.0	4.5	5.0	V

● Video system

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gain	GV _V	f=100kHz, 0.3Vp-p input	5.9	6.4	6.9	dB
Frequency Response Characteristics	FBW _{V1}	f=100kHz, input frequency where output amplitude is -3dB with 0.3Vp-p output serving as 0dB	-	15	-	MHz
Frequency Response Characteristics (YUV)	FBW _{V2}		-	20	-	MHz
Input Dynamic Range	D _{dv}	f=100kHz, maximum with distortion < 1.0%	1.4	-	-	Vp-p
Cross Talk	V _{ctv}	f=4.43MHz, 1Vp-p input	-	-	-50	dB

● Audio system

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gain	GV _A	f=1kHz, 1Vrms input, 5.7kΩ resistor inserted to input	-1	0	1	dB
Frequency Response Characteristics	FBW _A	f=1kHz, input frequency where output amplitude is -3dB with 1Vrms output serving as 0dB	50	-	-	kHz
Total Harmonic Distortion	THD	f=1kHz, 1Vrms input, where 400Hz HPF + 80kHz LPF are inserted	-	0.03	-	%
Input Dynamic Range	D _{dA}	f=1kHz, maximum with distortion < 0.3%	2.8	3.0	-	Vrms
Cross Talk	V _{ctv}	f=1kHz, 1Vrms input	-	-80	-	dB
Ripple Rejection Ratio	V _{rrA}	f=100Hz, 100mVrms applied to V _{cc}	-	-55	-40	dB
Output DC Offset	V _{off}	Offset voltage between input and output	-30	-	30	mV
Output Noise Voltage	V _{NO}	No signal JIS-A	-	20	-	uVrms

■ELECTRICAL CHARACTERISTICS (Ta=25°C, V⁺=9V)

●Audio system

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
High Level Mute Control Voltage	V _{muH}	Mute on	2.0	-	V ⁺	V
Low Level Mute Control Voltage	V _{muL}	Mute off	0	-	0.5	V

●Logic system

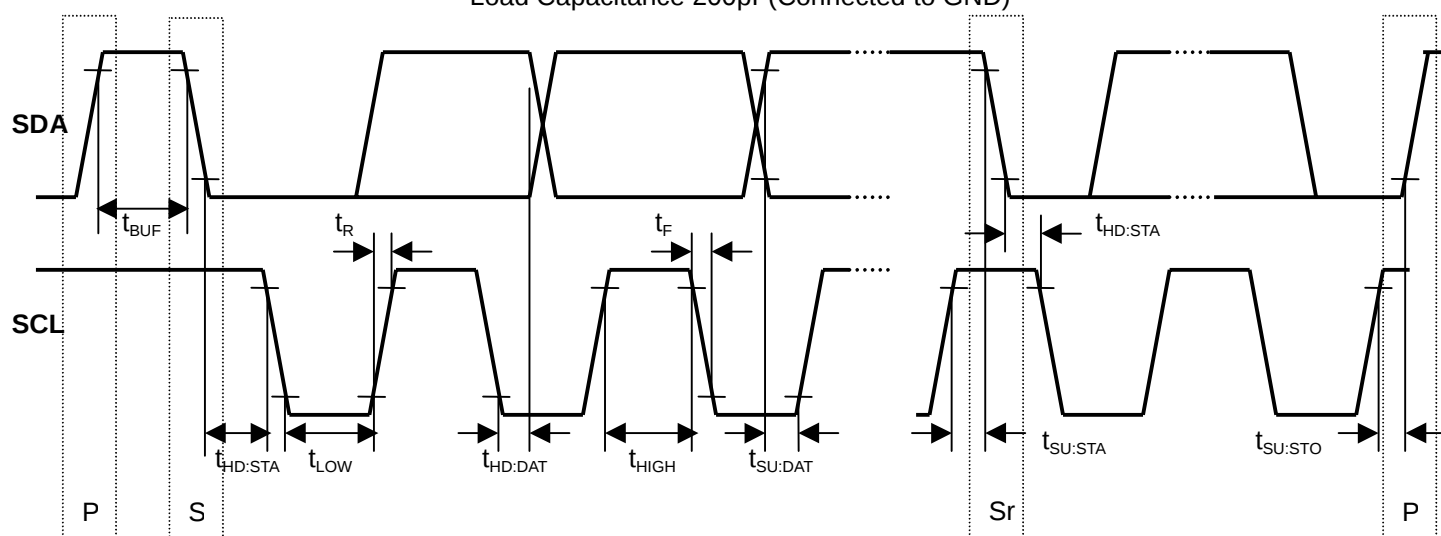
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
High Level Auxiliary Output Voltage	V _{AUXH}	Is _{source} =100uA	4.0	-	-	V
Low Level Auxiliary Output Voltage	V _{AUXL}	Is _{sink} =100uA	-	-	0.5	V

●I²C BUS (SDA, SCL)

PARAMETER	SYMBOL	TEST CONDITION	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
Low Level Output Voltage	V _{OL}	With SDA 3mA current supplied	0	-	0.4	V
High Level Input Current	I _{IH}	V _{IH} =4.5V	0	-	10	uA
Low Level Input Current	I _{IL}	V _{IL} =0.4V	0	-	10	uA
Maximum Clock Frequency	f _{SCL}		0	-	100	kHz
Minimum Waiting Time for Data Change	t _{BUF}		4.7	-	-	us
Minimum Waiting Time for Data Transfer Start	t _{HD:STA}		4.0	-	-	us
Low Level Clock Pulse Width	t _{LOW}		4.7	-	-	us
High Level Clock Pulse Width	t _{HIGH}		4.0	-	-	us
Minimum Waiting Time for Start Preparation	t _{SU:STA}		4.7	-	-	us
Minimum Data Hold Time	t _{HD:DAT}		300	-	-	ns
Minimum Data Preparation Time	t _{SU:DAT}		250	-	-	ns
Rise Time	t _R		-	-	1	us
Fall Time	t _F		-	-	300	ns
Minimum Waiting Time for Stop Preparation	t _{SU:STO}		4.7	-	-	us

I2C BUS Load Condition: Pull up resistance 4kΩ(Connected to +5V)

Load Capacitance 200pF(Connected to GND)



DESCRIPTION OF I²C BUS INTERFACE

The **NJW1310** has two function mode with I²C BUS interface, receive mode and transmit mode. And the **NJW1310** can use two slave addresses, so it's possible to control two **NJW1310** with one Master.

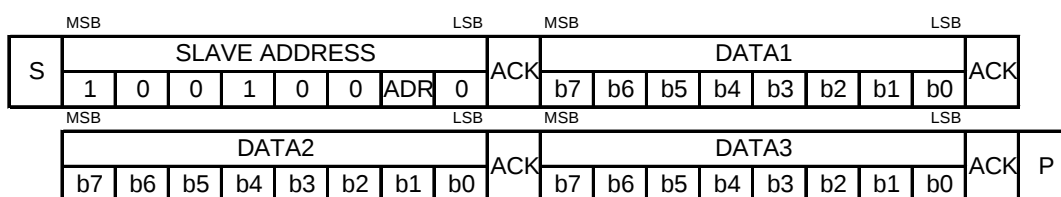
SLAVE ADDRESSES



★Two Slave Addresses are available by to set the Bit ADR to either “0”, or “1”.

RECEIVE MODE

CONSTRUCT OF CONTROL REGISTER

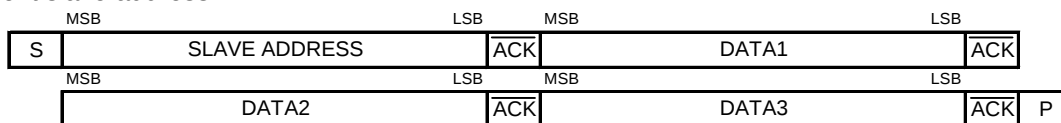


★Bit R/W must be “0”, to function the **NJW1310** with receive mode.

★Bit ADR specify the slave address.
 ADR 0 : 90H
 1 : 92H

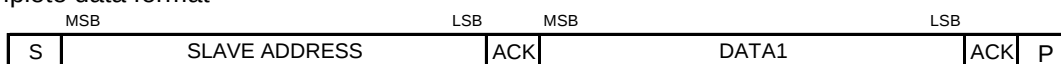
INVALID DATA PROCESSING

1) Different slave address.



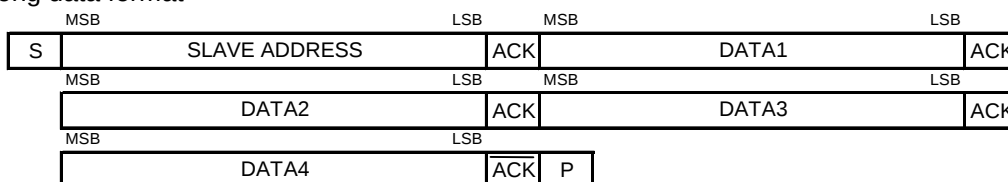
When the **NJW1310** receives a different slave address, no acknowledgement from the **NJW1310** is replied.

2) Incomplete data format



As an example, if the **NJW1310** receives only 1st data, the **NJW1310** ignores the 1st data.

3) Too long data format



As an example, if the **NJW1310** receives 4th data, the **NJW1310** ignores the 4th data.
 In addition, no acknowledgement after 4th data is replied.

NJW1310

◆CONSTRUCT OF DATA1 TO DATA3

MSB								LSB
	b7	b6	b5	b4	b3	b2	b1	b0
DATA1	S/COMP1	V-OUTPUT1			A-OUTPUT1			VMODE
DATA2	S/COMP2	V-OUTPUT2			A-OUTPUT2			A-GAIN
DATA3	V-OUTPUT3		V-OUTPUT4		AUX1	AUX2	S2OUT	

All resistors are reset to "0" when power on.

◆DETAILS OF EACH BIT

< V-OUTPUT1, VOUTPUT2 >

These Bit specify the input line which are sent to the port VOUT1, YOUT1, COUT1, VOUT2, YOUT2, and COUT2.

V-OUTPUT1			VOUT1, YOUT1, COUT1
V-OUTPUT2			VOUT2, YOUT2, COUT2
b6	b5	b4	selected input line
0	0	0	MUTE
0	0	1	TV1
0	1	0	TV2
0	1	1	V1, Y1/C1
1	0	0	V2, Y2/C2
1	0	1	V3, Y3/C3
1	1	0	DY1
1	1	1	DY2

< S/COMP1, S/COMP2 >

These Bit specify the types of the input signals which are sent to the port VOUT1, YOUT1, COUT1, VOUT2, YOUT2, and COUT2.

S/COMP1	VOUT1, YOUT1, COUT1
S/COMP2	VOUT2, YOUT2, COUT2
b7	selected type
0	Composite
1	S input

★Normally, the fixing of Video output signals needs the selection of both the input signal line and the types of the input signal.

< VMODE >

These Bit specify the types of the VOUT1 signals which are sent to the port YOUT1,

VOUT1	YOUT1
b0	selected type
0	S input
1	VOUT1

< V-OUTPUT3, V-OUTPUT4 >

These Bit specify the input line which are sent to the port DYOUT1, DUOUT1, DVOUT1, DYOUT2, DUOUT2, and DVOUT2.

V-OUTPUT3	b7	b6	DYOUT1, DUOUT1, DVOUT1
V-OUTPUT4	b5	b4	DYOUT2, DUOUT2, DVOUT2
			selected input line
	0	0	MUTE
	0	1	DY1, DU1, DV1
	1	0	DY2, DU2, DV2
	1	1	Reserved

< A-OUTPUT1, A-OUTPUT2 >

These Bit specify the input line which are sent to the port LOUT1, ROUT1, LOUT2, and ROUT2.

A-OUTPUT1			LOUT1, ROUT1
A-OUTPUT2			LOUT2, ROUT2
b3	b2	b1	selected input line
0	0	0	MUTE
0	0	1	LTV1, RTV1
0	1	0	LTV2, RTV2
0	1	1	LV1, RV1
1	0	0	LV2, RV2
1	0	1	LV3, RV3
1	1	0	LD1, RD1
1	1	1	LD2, RD2

★In each Audio output signals, both L ch. and R ch. are changed at the same time.

< A-GAIN >

This Bit specify the output gain of the port LOUT1, ROUT1.

A-GAIN	LOUT1, ROUT1
b0	output gain
0	+6dB
1	0dB

< AUX1, AUX2 >

These Bit specify the output DC voltage of port AUXOUT1, and AUXOUT2.

AUX1	b3	AUXOUT1
AUX2	b2	AUXOUT2
		output DC voltage
	0	Low
	1	High

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< S2OUT >

These Bit specify the output DC voltage of port DCOUT.

S2OUT		DCOUT
b1	b0	output DC voltage
0	0	4.2V
0	1	1.9V
1	0	0V
1	1	4.2V

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●SWITCH CONTROL TABLE

■ V-OUTPUT1														
Hex	DATA1								Output Signal					
	b7 S/COMP1	b6 V-OUTPUT1	b5 V-OUTPUT1	b4 V-OUTPUT1	b3 A-OUTPUT1	b2 A-OUTPUT1	b1 A-OUTPUT1	b0 VMODE	VOUT1	YOUT1	COUT1	LOUT1	ROUT1	
00H	0	0	0	0	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	
12H	0	0	0	1	0	0	1	0	TV1	YIN1	CIN1	LTV1	RTV1	
24H	0	0	1	0	0	1	0	0	TV2	YIN1	CIN1	LTV2	RTV2	
36H	0	0	1	1	0	1	1	0	V1	YIN1	CIN1	LV1	RV1	
48H	0	1	0	0	1	0	0	0	V2	YIN1	CIN1	LV2	RV2	
5AH	0	1	0	1	1	0	1	0	V3	YIN1	CIN1	LV3	RV3	
6CH	0	1	1	0	1	1	0	0	DY1	YIN1	CIN1	LD1	RD1	
7EH	0	1	1	1	1	1	1	0	DY2	YIN1	CIN1	LD2	RD2	
80H	1	0	0	0	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	
92H	1	0	0	1	0	0	1	0	MUTE	MUTE	MUTE	LTV1	RTV1	
A4H	1	0	1	0	0	1	0	0	MUTE	MUTE	MUTE	LTV2	RTV2	
B6H	1	0	1	1	0	1	1	0	Y1/C1 MIX	Y1	C1	LV1	RV1	
C8H	1	1	0	0	1	0	0	0	Y2/C2 MIX	Y2	C2	LV2	RV2	
DAH	1	1	0	1	1	0	1	0	Y3/C3 MIX	Y3	C3	LV3	RV3	
ECH	1	1	1	0	1	1	0	0	DY1/DU1 MIX	DY1	DU1	LD1	RD1	
FEH	1	1	1	1	1	1	1	0	DY2/DU2 MIX	DY2	DU2	LD2	RD2	
01H	0	0	0	0	0	0	0	1	MUTE	MUTE	MUTE	MUTE	MUTE	
13H	0	0	0	1	0	0	1	1	TV1	TV1	CIN1	LTV1	RTV1	
25H	0	0	1	0	0	1	0	1	TV2	TV2	CIN1	LTV2	RTV2	
37H	0	0	1	1	0	1	1	1	V1	V1	CIN1	LV1	RV1	
49H	0	1	0	0	1	0	0	1	V2	V2	CIN1	LV2	RV2	
5BH	0	1	0	1	1	0	1	1	V3	V3	CIN1	LV3	RV3	
6DH	0	1	1	0	1	1	0	1	DY1	DY1	CIN1	LD1	RD1	
7FH	0	1	1	1	1	1	1	1	DY2	DY2	CIN1	LD2	RD2	
81H	1	0	0	0	0	0	0	1	MUTE	MUTE	MUTE	MUTE	MUTE	
93H	1	0	0	1	0	0	1	1	MUTE	MUTE	MUTE	LTV1	RTV1	
A5H	1	0	1	0	0	1	0	1	MUTE	MUTE	MUTE	LTV2	RTV2	
B7H	1	0	1	1	0	1	1	1	Y1/C1 MIX	Y1/C1 MIX	C1	LV1	RV1	
C9H	1	1	0	0	1	0	0	1	Y2/C2 MIX	Y2/C2 MIX	C2	LV2	RV2	
DBH	1	1	0	1	1	0	1	1	Y3/C3 MIX	Y3/C3 MIX	C3	LV3	RV3	
EDH	1	1	1	0	1	1	0	1	DY1/DU1 MIX	DY1/DU1 MIX	DU1	LD1	RD1	
FFH	1	1	1	1	1	1	1	1	DY2/DU2 MIX	DY2/DU2 MIX	DU2	LD2	RD2	

■ A-OUTPUT1*

DATA1									Output Signal				
Hex	b7	b6	b5	b4	b3	b2	b1	b0	VOUT1	YOUT1	COUT1	LOUT1	ROUT1
	S/COMP1	V-OUTPUT1			A-OUTPUT1			VMODE					
00H	0	0	0	0	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE
12H	0	0	0	1	0	0	1	0	TV1	YIN1	CIN1	LTV1	RTV1
24H	0	0	1	0	0	1	0	0	TV2	YIN1	CIN1	LTV2	RTV2
36H	0	0	1	1	0	1	1	0	V1	YIN1	CIN1	LV1	RV1
48H	0	1	0	0	1	0	0	0	V2	YIN1	CIN1	LV2	RV2
5AH	0	1	0	1	1	0	1	0	V3	YIN1	CIN1	LV3	RV3
6CH	0	1	1	0	1	1	0	0	DY1	YIN1	CIN1	LD1	RD1
7EH	0	1	1	1	1	1	1	0	DY2	YIN1	CIN1	LD2	RD2

■ V-OUTPUT2

DATA2									Output Signal					
Hex	b7	b6	b5	b4	b3	b2	b1	b0	VOUT2	YOUT2	COUT2	LOUT2	ROUT2	LOUT1, ROUT1 GAIN
	S/COMP2	V-OUTPUT2			A-OUTPUT2			A-GAIN						
00H	0	0	0	0	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	6dB
12H	0	0	0	1	0	0	1	0	TV1	YIN2	CIN2	LTV1	RTV1	6dB
24H	0	0	1	0	0	1	0	0	TV2	YIN2	CIN2	LTV2	RTV2	6dB
36H	0	0	1	1	0	1	1	0	V1	YIN2	CIN2	LV1	RV1	6dB
48H	0	1	0	0	1	0	0	0	V2	YIN2	CIN2	LV2	RV2	6dB
5AH	0	1	0	1	1	0	1	0	V3	YIN2	CIN2	LV3	RV3	6dB
6CH	0	1	1	0	1	1	0	0	DY1	YIN2	CIN2	LD1	RD1	6dB
7EH	0	1	1	1	1	1	1	0	DY2	YIN2	CIN2	LD2	RD2	6dB
81H	1	0	0	0	0	0	0	1	MUTE	MUTE	MUTE	MUTE	MUTE	(0dB)
93H	1	0	0	1	0	0	1	1	MUTE	MUTE	MUTE	LTV1	RTV1	0dB
A5H	1	0	1	0	0	1	0	1	MUTE	MUTE	MUTE	LTV2	RTV2	0dB
B7H	1	0	1	1	0	1	1	1	Y1/C1 MIX	Y1	C1	LV1	RV1	0dB
C9H	1	1	0	0	1	0	0	1	Y2/C2 MIX	Y2	C2	LV2	RV2	0dB
DBH	1	1	0	1	1	0	1	1	Y3/C3 MIX	Y3	C3	LV3	RV3	0dB
EDH	1	1	1	0	1	1	0	1	DY1/DU1 MIX	DY1	DU1	LD1	RD1	0dB
FFH	1	1	1	1	1	1	1	1	DY2/DU2 MIX	DY2	DU2	LD2	RD2	0dB

■ A-OUTPUT2

DATA2									Output Signal					
Hex	b7	b6	b5	b4	b3	b2	b1	b0	VOUT2	YOUT2	COUT2	LOUT2	ROUT2	LOUT1, ROUT1 GAIN
	S/COMP2	V-OUTPUT2			A-OUTPUT2			A-GAIN						
00H	0	0	0	0	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	6dB
12H	0	0	0	1	0	0	1	0	TV1	YIN2	CIN2	LTV1	RTV1	6dB
24H	0	0	1	0	0	1	0	0	TV2	YIN2	CIN2	LTV2	RTV2	6dB
36H	0	0	1	1	0	1	1	0	V1	YIN2	CIN2	LV1	RV1	6dB
48H	0	1	0	0	1	0	0	0	V2	YIN2	CIN2	LV2	RV2	6dB
5AH	0	1	0	1	1	0	1	0	V3	YIN2	CIN2	LV3	RV3	6dB
6CH	0	1	1	0	1	1	0	0	DY1	YIN2	CIN2	LD1	RD1	6dB
7EH	0	1	1	1	1	1	1	0	DY2	YIN2	CIN2	LD2	RD2	6dB

■ A-GAIN

DATA2									Output Signal					
Hex	b7	b6	b5	b4	b3	b2	b1	b0	VOUT2	YOUT2	COUT2	LOUT2	ROUT2	LOUT1, ROUT1 GAIN
	S/COMP2	V-OUTPUT2			A-OUTPUT2			A-GAIN						
00H	0	0	0	0	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	6dB
FFH	1	1	1	1	1	1	1	1	DY2/DU2 MIX	DY2	DU2	LD2	RD2	0dB

■ V-OUTPUT3

DATA3									Output Signal								
Hex	b7	b6	b5	b4	b3	b2	b1	b0	DVOUT 1	DUOUT 1	DVOUT 1	DVOUT 2	DUOUT 2	DVOUT 2	AUXOUT 1	AUXOUT 2	DCOUT
	V- OUTPUT3		V- OUTPUT4		AUX 1	AUX 2	S2OUT										
00H	0	0	0	0	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	MUTE	Low	Low	16vs9
40H	0	1	0	0	0	0	0	0	DY1	DU1	DV1	MUTE	MUTE	MUTE	Low	Low	16vs9
80H	1	0	0	0	0	0	0	0	DY2	DU2	DV2	MUTE	MUTE	MUTE	Low	Low	16vs9
C0H	1	1	0	0	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	MUTE	Low	Low	16vs9

■ V-OUTPUT4

DATA3									Output Signal								
Hex	b7	b6	b5	b4	b3	b2	b1	b0	DVOUT 1	DUOUT 1	DVOUT 1	DVOUT 2	DUOUT 2	DVOUT 2	AUXOUT 1	AUXOUT 2	DCOUT
	V- OUTPUT3		V- OUTPUT4		AUX 1	AUX 2	S2OUT										
00H	0	0	0	0	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	MUTE	Low	Low	16vs9
10H	0	0	0	1	0	0	0	0	MUTE	MUTE	MUTE	DY1	DU1	DV1	Low	Low	16vs9
20H	0	0	1	0	0	0	0	0	MUTE	MUTE	MUTE	DY2	DU2	DV2	Low	Low	16vs9
30H	0	0	1	1	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	MUTE	Low	Low	16vs9

■ AUXOUT1																	
DATA3									Output Signal								
Hex	b7	b6	b5	b4	b3	b2	b1	b0	DVOUT 1	DUOUT 1	DVOUT 1	DVOUT 2	DUOUT 2	DVOUT 2	AUXOUT 1	AUXOUT 2	DCOUT
	V- OUTPUT3		V- OUTPUT4		AUX 1	AUX 2		S2OUT									
00H	0	0	0	0	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	MUTE	Low	Low	16vs9
08H	0	0	0	0	1	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	MUTE	High	Low	16vs9

■ AUXOUT2																	
DATA3									Output Signal								
Hex	b7	b6	b5	b4	b3	b2	b1	b0	DVOUT 1	DUOUT 1	DVOUT 1	DVOUT 2	DUOUT 2	DVOUT 2	AUXOUT 1	AUXOUT 2	DCOUT
	V- OUTPUT3		V- OUTPUT4		AUX 1	AUX 2		S2OUT									
00H	0	0	0	0	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	MUTE	Low	Low	16vs9
04H	0	0	0	0	0	1	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	MUTE	Low	High	16vs9

■ S2OUT																	
DATA3									Output Signal								
Hex	b7	b6	b5	b4	b3	b2	b1	b0	DVOUT 1	DUOUT 1	DVOUT 1	DVOUT 2	DUOUT 2	DVOUT 2	AUXOUT 1	AUXOUT 2	DCOUT
	V- OUTPUT3		V- OUTPUT4		AUX 1	AUX 2		S2OUT									
00H	0	0	0	0	0	0	0	0	MUTE	MUTE	MUTE	MUTE	MUTE	MUTE	Low	Low	16vs9
01H	0	0	0	0	0	0	0	1	MUTE	MUTE	MUTE	MUTE	MUTE	MUTE	Low	Low	4vs3
02H	0	0	0	0	0	0	1	0	MUTE	MUTE	MUTE	MUTE	MUTE	MUTE	Low	Low	Letter
03H	0	0	0	0	0	0	1	1	MUTE	MUTE	MUTE	MUTE	MUTE	MUTE	Low	Low	16vs9

■Note

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