

Multi Input SD/ HD Video Interface with I²C Control

■ GENERAL DESCRIPTION

The **NJW1327** is a multi input SD/ HD video interface IC with I²C control. It includes video switch, 0/ 6dB amplifier and 75-ohm driver for SD/ HD.

The **NJW1327** is suitable for the AV equipment that has the multi-input multi-output system.

■ FEATURES

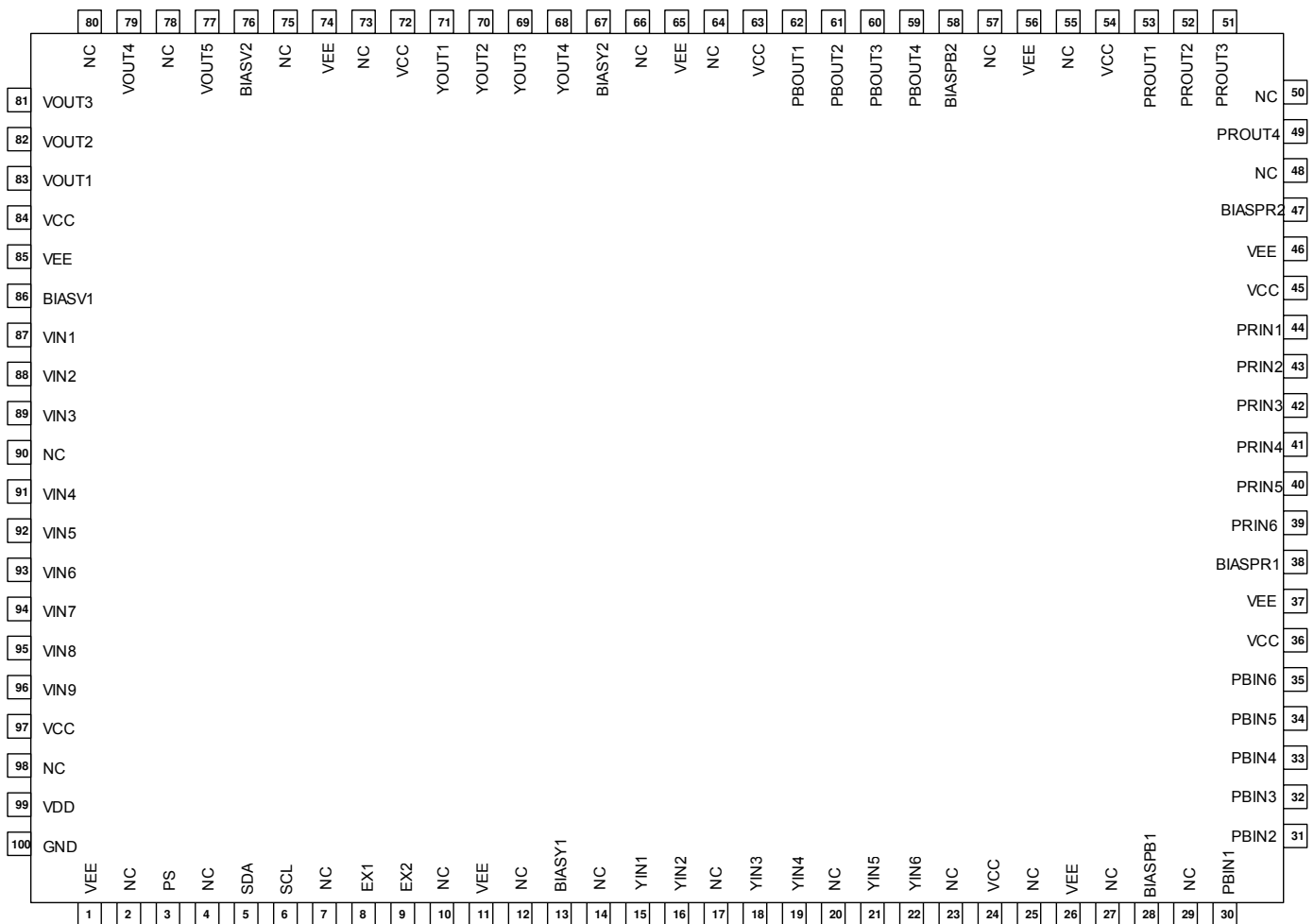
- Operating Voltage (Dual supply) +3.0 to +3.45V, -3.0 to -5.5V
- 9-input 5-channel switch for SD (CVBS)
- 6-input 4-channel switch for HD (Y/Pb/Pr)
- 3-channel 75-ohm driver for SD (CVBS)
- 2-channel buffer for SD (CVBS)
- 2-channel 75-ohm driver for HD (Y/Pb/Pr)
- 2-channel buffer for HD (Y/Pb/Pr)
- I²C BUS control
- Bi-CMOS Technology
- Package Outline QFP100-U1

■ PACKAGE OUTLINE

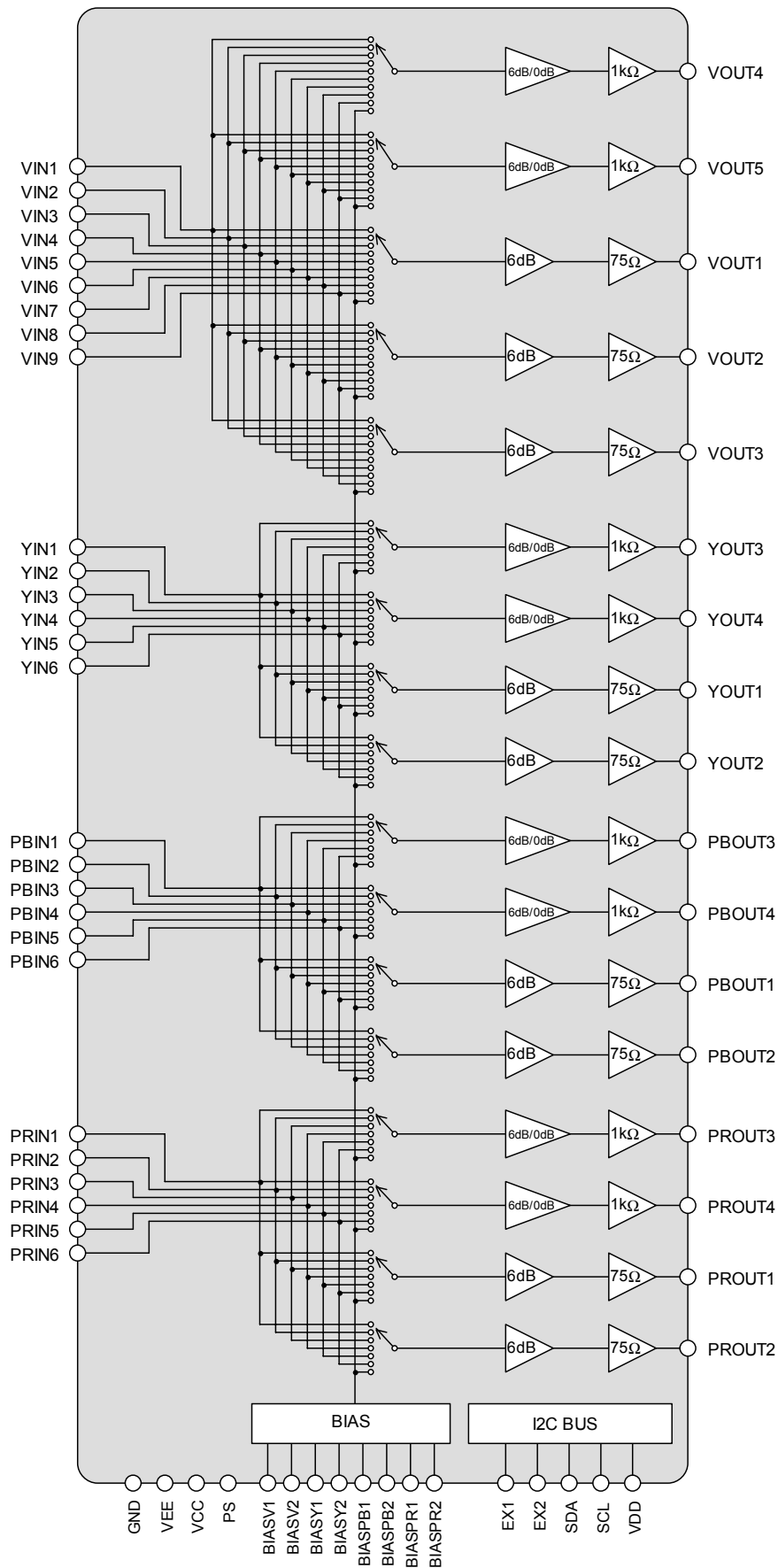


NJW1327FU1

■ PIN CONFIGURATION



■BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	VCC	3.5	V
Supply Voltage	VEE	-6.0	V
Power Dissipation	P _D	2500 ^(NOTE)	mW
Operating Temperature Range	T _{opr}	-25 to +75	°C
Storage Temperature Range	T _{str}	-40 to +150	°C

(Note) At on a board of EIA/JEDEC specification (114.3 x 76.2 x 1.6mm Two layers, FR-4) with a heat sink.

■ RECOMMEND OPERATING VOLTAGE

(Ta=25°C, VDD=0V)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX	UNIT
Operating Dual Voltages 1	Vopr1	VCC-GND	3.0	3.3	3.45	V
Operating Dual Voltages 2	Vopr2	VEE-GND	-5.0	-3.3	-3.0	V

■ ELECTRICAL CHARACTERISTICS

(Ta=25°C, VCC =3.3V, VDD=0V, VEE=-3.3V)

◆ DC CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX	UNIT
Operating Current 1	I _{CC}	VCC, No Signal	-	110	165	mA
Operating Current 2	I _{EE}	VEE, No Signal	-165	-110	-	mA
Operating Current 1 at power save mode	I _{save1}	VCC, Power Save Mode	-	1.0	4.0	mA
Operating Current 2 at power save mode	I _{save2}	VEE, Power Save Mode	-4.0	-1.0	-	mA

◆ AC CHARACTERISTICS

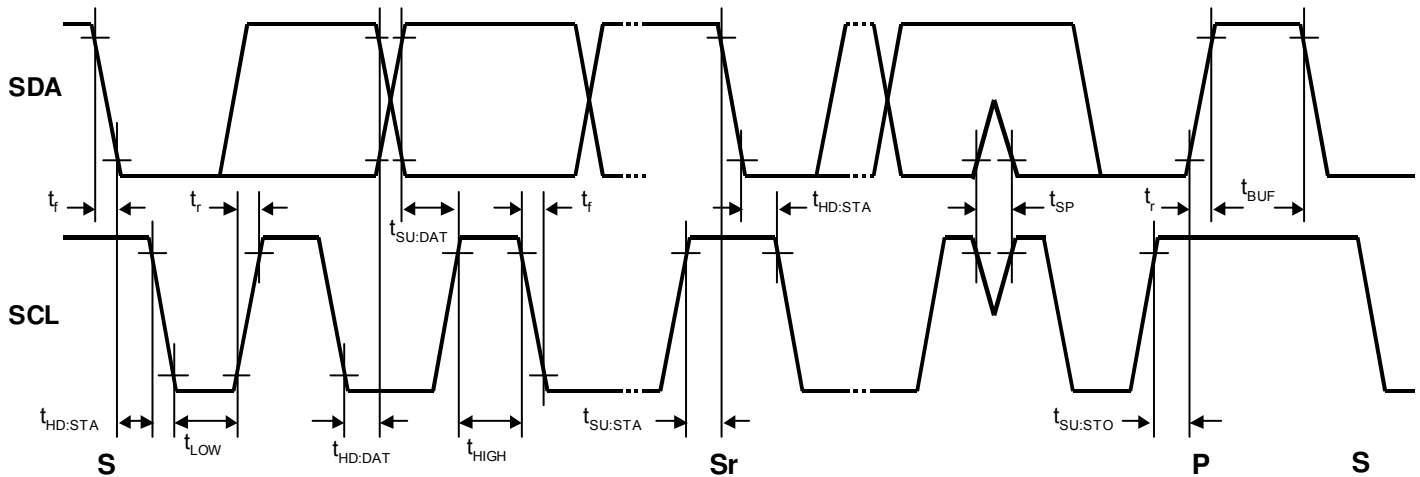
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX	UNIT
Maximum Output Voltage	V _{om}	Input sine signal voltage (100kHz), THD=1%	3.8	-	-	V _{p-p}
Voltage Gain 1	G _{v1}	0dB mode Input sine signal voltage (100kHz, 1.0V _{p-p}),	-0.5	0	0.5	dB
Voltage Gain 2	G _{v2}	6dB mode Input sine signal voltage (100kHz, 1.0V _{p-p}),	5.5	6.0	6.5	dB
Frequency Characteristic 1	G _{f1}	Input sine signal voltage (12MHz/100kHz, 1.0V _{p-p}), 6dB mode for V/SY/SC input	-3.0	0.0	-	dB
Frequency Characteristic 2	G _{f2}	Input sine signal voltage (100MHz/100kHz, 1.0V _{p-p}), 6dB mode for Y/PB/PR input	-	-3.0	-	dB
Frequency Characteristic 3	G _{f3}	Input sine signal voltage (150MHz/100kHz, 1.0V _{p-p}), 6dB mode for Y/PB/PR input	-	-3.0	-	dB
Cross Talk between Input terminals1	CT1	Input sine signal voltage (3.58MHz, 1.0V _{p-p})	-	-60	-50	dB
Cross Talk between Input terminals2	CT2	Input sine signal voltage (50MHz, 1.0V _{p-p})	-	-40	-	dB
Differential Gain	DG	Input video signal voltage (1.0V _{p-p} , 10step)	-	0.5	-	%
Differential Phase	DP	Input video signal voltage (1.0V _{p-p} , 10step)	-	0.5	-	deg
Output voltage Difference on mute mode	dVDo	Mute mode	-0.4	-	0.4	V
S/N ratio	SNv	White video signal input (1.0V _{p-p} , 100%), S/N ratio for V/Y/PB/PR input	-	75	-	dB

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX	UNIT
Switch Change Over Voltage (H level)	VthH		2.0	-	VCC	V
Switch Change Over Voltage (L level)	VthL		0	-	1.0	V
Maximum inflow current on Switch ON	IthH	V=3.3V	-	-	120	μA
Maximum inflow current on Switch OFF	IthL	V=0.3V	-	-	8	μA
Low level Voltage at EX Output	VEXL		0	-	0.4	V
Leak Current on EX Output OFF	IEXoff		-	-	1	μA

■ POWER SAVE CONTROL

PARAMETER	LOGIC	MODE
Power Save	H	Active Mode: Power Save OFF
	L	Power Save Mode: Mute, Controllable I ² C BUS

■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 +3.3V), Load capacitance 200pF (Connected to GND)

FAST MODE : Pull up resistance 4kΩ (Connected to +3.3V), 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	-	0.3VCC	0.0	-	0.3VCC	V
High Level Input Voltage	V_{IH}	0.7VCC	-	5.5	0.7VCC	-	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}

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

■ DEFINITION OF I²C RESISTOR
• I²C BUS FORMAT

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

S: Starting term
A: Acknowledge bit
P: Ending term

• SLAVE ADDRESS

Slave Address								Hex
MSB				LSB				-
1	0	0	1	0	1	1	R/W	-
R/W = 0: write mode								-
1	0	0	1	0	1	1	0	96(h)

• WRITE MODE

The auto increment function cycles the select address as follows.

00H → 01H → 02H → 03H → 04H → 00H

No.	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	VOUT1 Select				VOUT2 Select			
01H	VOUT3 Select				VOUT4 Select			
02H	VOUT5 Select				VOUT4 Gain	VOUT5 Gain	EX1	EX2
03H	YOUT1/ PBOUT1/ PROUT1 Select			YOUT2/ PBOUT2/ PROUT2 Select			PS	-
04H	YOUT3/ PBOUT3/ PROUT3 Select			YOUT4/ PBOUT4/ PROUT4 Select			YOUT4/ PBOUT4/ PROUT4 Gain	YOUT3/ PBOUT3/ PROUT3 Gain

■ CONTROL REGISTER TABLE

No.	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

■ INSTRUCTION CODE

a)

No.	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	VOUT1 Select				VOUT2 Select			

• VOUT1 SELECT TABLE

VOUT1 Select				VOUT1
D7	D6	D5	D4	
0	0	0	0	Mute*
0	0	0	1	VIN1
0	0	1	0	VIN2
0	0	1	1	VIN3
0	1	0	0	VIN4
0	1	0	1	VIN5
0	1	1	0	VIN6
0	1	1	1	VIN7
1	0	0	0	VIN8
1	0	0	1	VIN9

*: Default Value

• VOUT2 SELECT TABLE

VOUT2 Select				VOUT2
D3	D2	D1	D0	
0	0	0	0	Mute*
0	0	0	1	VIN1
0	0	1	0	VIN2
0	0	1	1	VIN3
0	1	0	0	VIN4
0	1	0	1	VIN5
0	1	1	0	VIN6
0	1	1	1	VIN7
1	0	0	0	VIN8
1	0	0	1	VIN9

*: Default Value

INSTRUCTION CODE

b)

No.	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
01H	VOUT3 Select				VOUT4 Select			

VOUT3 SELECT TABLE

VOUT3 Select				VOUT3
D7	D6	D5	D4	
0	0	0	0	Mute*
0	0	0	1	VIN1
0	0	1	0	VIN2
0	0	1	1	VIN3
0	1	0	0	VIN4
0	1	0	1	VIN5
0	1	1	0	VIN6
0	1	1	1	VIN7
1	0	0	0	VIN8
1	0	0	1	VIN9

*: Default Value

VOUT4 SELECT TABLE

VOUT4 Select				VOUT4
D3	D2	D1	D0	
0	0	0	0	Mute*
0	0	0	1	VIN1
0	0	1	0	VIN2
0	0	1	1	VIN3
0	1	0	0	VIN4
0	1	0	1	VIN5
0	1	1	0	VIN6
0	1	1	1	VIN7
1	0	0	0	VIN8
1	0	0	1	VIN9

*: Default Value

INSTRUCTION CODE

c)

No.	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
02H	VOUT5 Select				VOUT4 Gain	VOUT5 Gain	EX1	EX2

VOUT5 SELECT TABLE

VOUT5 Select				VOUT5
D3	D2	D1	D0	
0	0	0	0	Mute*
0	0	0	1	VIN1
0	0	1	0	VIN2
0	0	1	1	VIN3
0	1	0	0	VIN4
0	1	0	1	VIN5
0	1	1	0	VIN6
0	1	1	1	VIN7
1	0	0	0	VIN8
1	0	0	1	VIN9

*: Default Value

VOUT4 GAIN SELECT TABLE

VOUT4 Gain	Gain
D3	
0	0dB*
1	6dB

*: Default Value

VOUT5 GAIN SELECT TABLE

VOUT5 Gain	Gain
D2	
0	0dB*
1	6dB

*: Default Value

EXTERNAL CONTROL OUTPUT

EX1	EX1 OUT
D1	
0	Open*
1	Low

*: Default Value

EX2	EX2 OUT
D0	
0	Open*
1	Low

*: Default Value

INSTRUCTION CODE

d)

No.	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
03H	YOUT1/PBOUT1/PROUT1 Select			YOUT2/PBOUT2/PROUT2 Select			PS	-

YOUT1/PBOUT1/PROUT1 SELECT TABLE

YOUT1/PBOUT1/PROUT1			YOUT1	PBOUT1	PROUT1
D7	D6	D5			
0	0	0	Mute*	Mute*	Mute*
0	0	1	YIN1	PBIN1	PRIN1
0	1	0	YIN2	PBIN2	PRIN2
0	1	1	YIN3	PBIN3	PRIN3
1	0	0	YIN4	PBIN4	PRIN4
1	0	1	YIN5	PBIN5	PRIN5
1	1	0	YIN6	PBIN6	PRIN6

*: Default Value

YOUT2/PBOUT2/PROUT2 SELECT TABLE

YOUT2/PBOUT2/PROUT2			YOUT2	PBOUT2	PROUT2
D4	D3	D2			
0	0	0	Mute*	Mute*	Mute*
0	0	1	YIN1	PBIN1	PRIN1
0	1	0	YIN2	PBIN2	PRIN2
0	1	1	YIN3	PBIN3	PRIN3
1	0	0	YIN4	PBIN4	PRIN4
1	0	1	YIN5	PBIN5	PRIN5
1	1	0	YIN6	PBIN6	PRIN6

*: Default Value

POWER SAVE SELECT TABLE

PS	Power Save
D1	
0	IC Off*
1	IC On

*: Default Value

 (Note) Connect power save terminal (3pin) with GND when power save control by I²C BUS.

■ INSTRUCTION CODE

e)

No.	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
04H	YOUT3/PBOUT3/PROUT3 Select			YOUT4/PBOUT4/PROUT4 Select			YOUT4/ PBOUT4/ PROUT4 Gain	YOUT3/ PBOUT3/ PROUT3 Gain

• YOUT3/PBOUT3/PROUT3 SELECT TABLE

YOUT3/PBOUT3/PROUT3			YOUT3	PBOUT3	PROUT3
D7	D6	D5			
0	0	0	Mute*	Mute*	Mute*
0	0	1	YIN1	PBIN1	PRIN1
0	1	0	YIN2	PBIN2	PRIN2
0	1	1	YIN3	PBIN3	PRIN3
1	0	0	YIN4	PBIN4	PRIN4
1	0	1	YIN5	PBIN5	PRIN5
1	1	0	YIN6	PBIN6	PRIN6

*: Default Value

• YOUT4/PBOUT4/PROUT4 SELECT TABLE

YOUT4/PBOUT4/PROUT4			YOUT4	PBOUT4	PROUT4
D4	D3	D2			
0	0	0	Mute*	Mute*	Mute*
0	0	1	YIN1	PBIN1	PRIN1
0	1	0	YIN2	PBIN2	PRIN2
0	1	1	YIN3	PBIN3	PRIN3
1	0	0	YIN4	PBIN4	PRIN4
1	0	1	YIN5	PBIN5	PRIN5
1	1	0	YIN6	PBIN6	PRIN6

*: Default Value

• YOUT4/PBOUT4/PROUT4 GAIN SELECT TABLE

YOUT4/PBOUT4/PROUT4 Gain	Gain
D1	
0	0dB*
1	6dB

*: Default Value

• YOUT3/PBOUT3/PROUT3 GAIN SELECT TABLE

YOUT3/PBOUT3/PROUT3 Gain	Gain
D0	
0	0dB*
1	6dB

*: Default Value

■ TERMINAL DESCRIPTION

PIN No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL VOLTAGE
87 88 89 91 92 93 94 95 96	VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9	Composit Signal Input		0V
15 16 18 19 21 22 30 31 32 33 34 35 39 40 41 42 43 44	YIN1 YIN2 YIN3 YIN4 YIN5 YIN6 PBIN1 PBIN2 PBIN3 PBIN4 PBIN5 PBIN6 PRIN1 PRIN2 PRIN3 PRIN4 RPIN5 PRIN6	Component Signal Input		0V

■ TERMINAL DESCRIPTION

PIN No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL VOLTAGE
86	BIASV1	Bias for CVBS		0V
13 28 38	BIASY1 BIASPB1 BIASPR1	Bias for Y/Pb/Pr		0V

■ TERMINAL DESCRIPTION

PIN No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL VOLTAGE
24 36 45 54 63 72 84 97	VCC	Power Supply		3.3V
1 11 26 37 46 56 65 74 85	VEE	Power Supply		-3.3V
100	GND	GND		0V
99	VDD	Logic Power Supply		0V
5	SDA	I ² C Data		
6	SCL	I ² C Clock		

■ TERMINAL DESCRIPTION

PIN No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL VOLTAGE
3	PS	Power Save Control		0V
8 9	EX1 EX2	External Control Output		

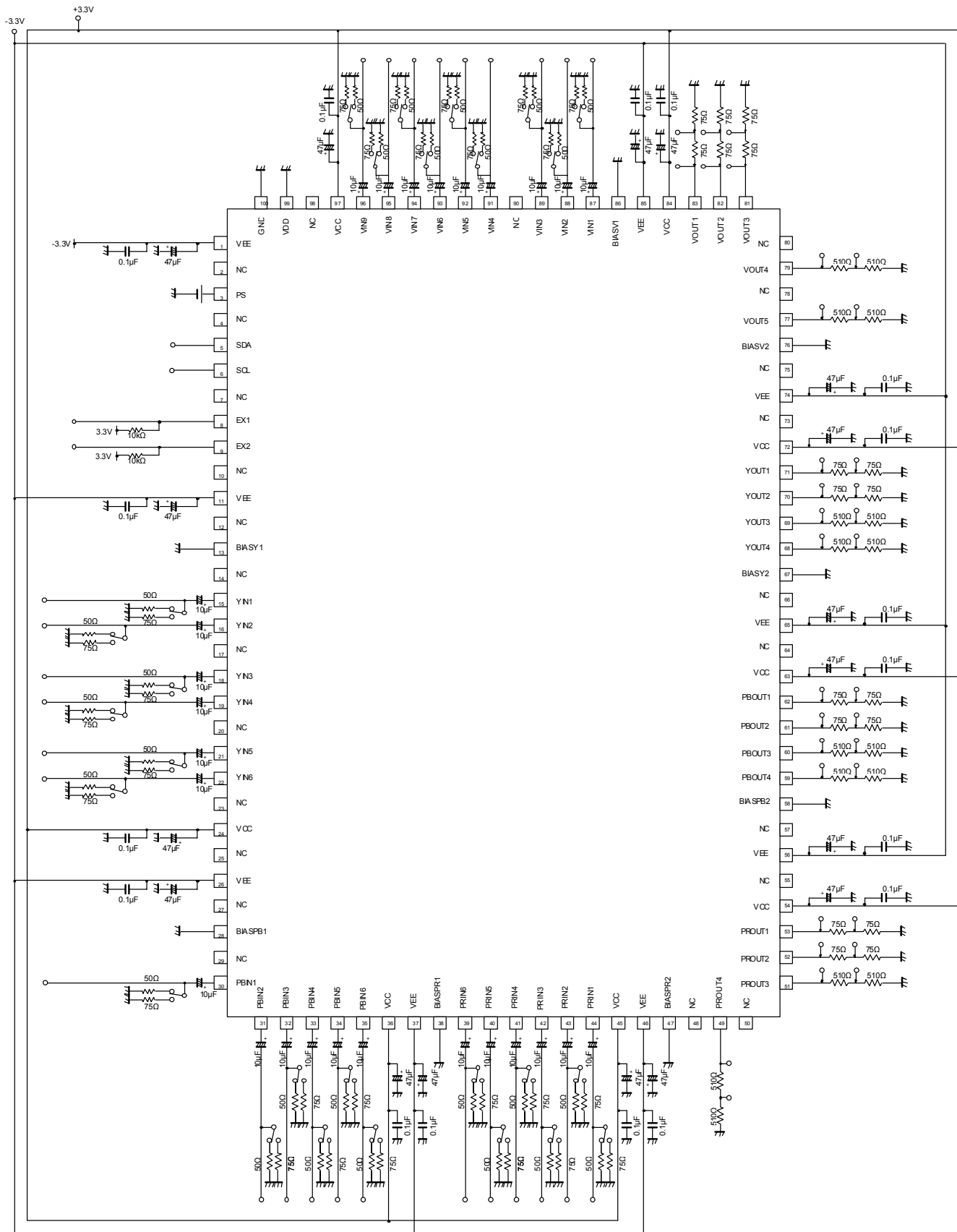
■ TERMINAL DESCRIPTION

PIN No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL VOLTAGE
49 51 59 60 68 69	PROUT4 PROUT3 PBOUT4 PBOUT3 YOUT4 YOUT3	Y/Pb/Pr Output 1k-ohm driver		0V
52 53 61 62	PROUT2 PROUT1 PBOUT2 PBOUT1	Pb/Pr Output 75-ohm driver		0V
70 71	YOUT2 YOUT1	Y Output 75-ohm driver		0V
77 79	VOUT5 VOUT4	CVBS Output 1k-ohm driver		0V

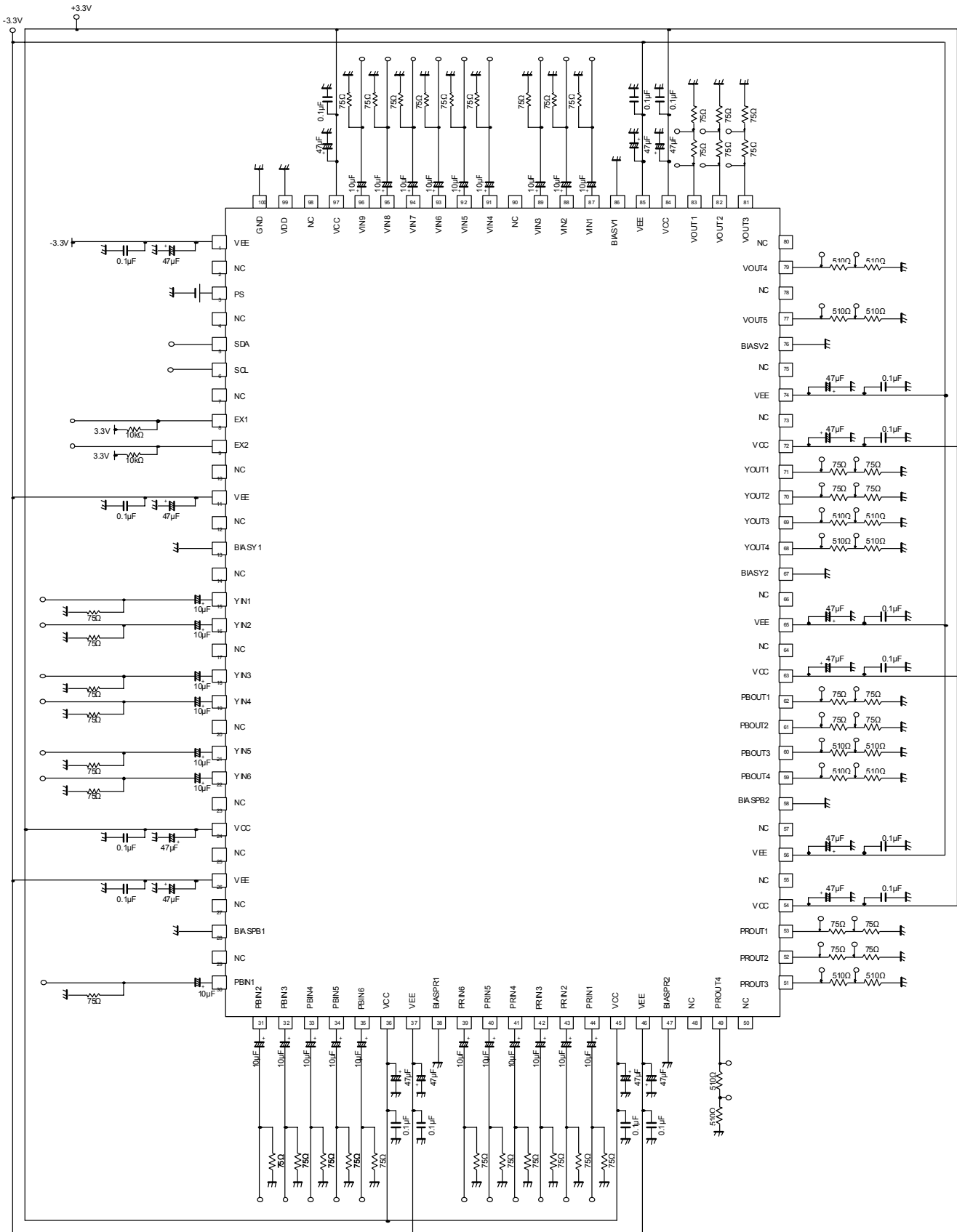
■ TERMINAL DESCRIPTION

PIN No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL VOLTAGE
81 82 83	VOUT3 VOUT2 VOUT1	CVBS Output 75-ohm driver		0V
47 58 67	BIASPR2 BIASPB2 BIASV2	Bias for Y/Pb/Pr		0V
76	BIASV2	Bias for CVBS		0V

TEST CIRCUIT



APPLICATION CIRCUIT



[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.