



SRS CSII 5.1 & TruSurround XT Decoder

■ Package

■ General Description

The NJU26110 is a digital signal processor that provides the function of Circle Surround II 5.1 / TruSurroundXT and Mono-to-Stereo.

The NJU26110 processes the stereo matrix-encoded signal into spacious sound of 5.1 channels by Circle Surround II 5.1. Also non matrix-encoded audio signal can be processed into effective spacious sound.

The decoded 2-channel signal can be converted into spacious 2-channel virtual surround output by the TruSurroundXT technology.

The applications of NJU26110 are suitable for multi-channel products such as DVD Receivers, AV Amplifiers, TV, Car Audio or ordinary audio products such as small speakers system.



NJU26110FR1

■ FEATURES

- 5.1-Channel signal outputs by Circle Surround II 5.1
- 2-Channel outputs by SRS TruSurroundXT
- Mono-to-Stereo function
- LFE by SRS TruBass
- SRS Focus
- Two kinds of micro computer interfaces
 - I²C bus (standard-mode / 100Kbps)
 - Serial Interface (4 lines: Clock, Enable, Input data, Output data)

■ Digital Signal Processor Specification

- 24bit Fixed-point Digital Signal Processing
- Maximum System Clock Frequency : 38MHz
- Digital Audio Interface : 2 Input ports / 3 Output ports
- Master / Slave Mode
- Master Mode MCK : 1/2 fclk, 1/3 fclk
ex. MCK = 384Fs(1/2) or MCK = 256Fs(1/3) at fclk=768Fs
- Two kinds of micro computer interface
 - I²C bus (standard-mode/100kbps)
 - Serial interface (4 lines: clock, enable, input data, output data)
- Power Supply : 2.5V (3.3V Input tolerant)
- Package : QFP32-R1

The detail hardware specification of the NJU26110 is described in the “ NJU26100 Series Hardware Data Sheet”.

Function Block Diagram

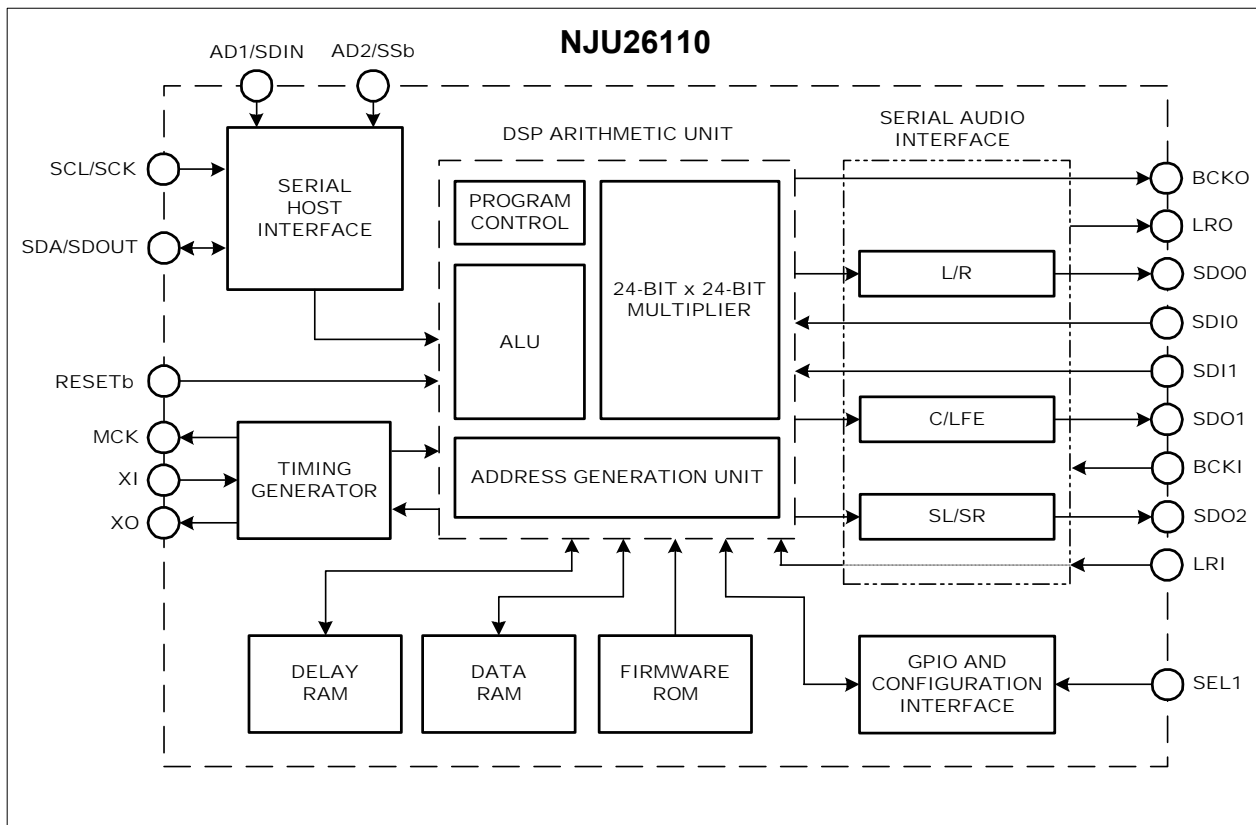


Fig. 1 NJU26110 Block Diagram

DSP Block Diagram

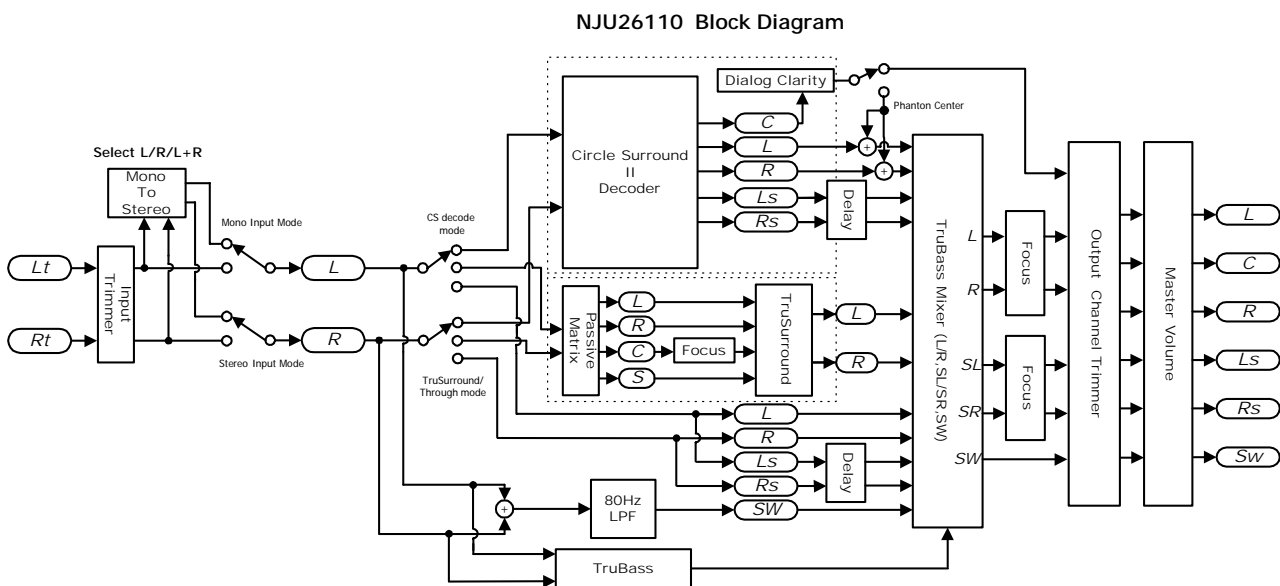


Fig. 2 NJU26110 Function Diagram

Pin Configuration

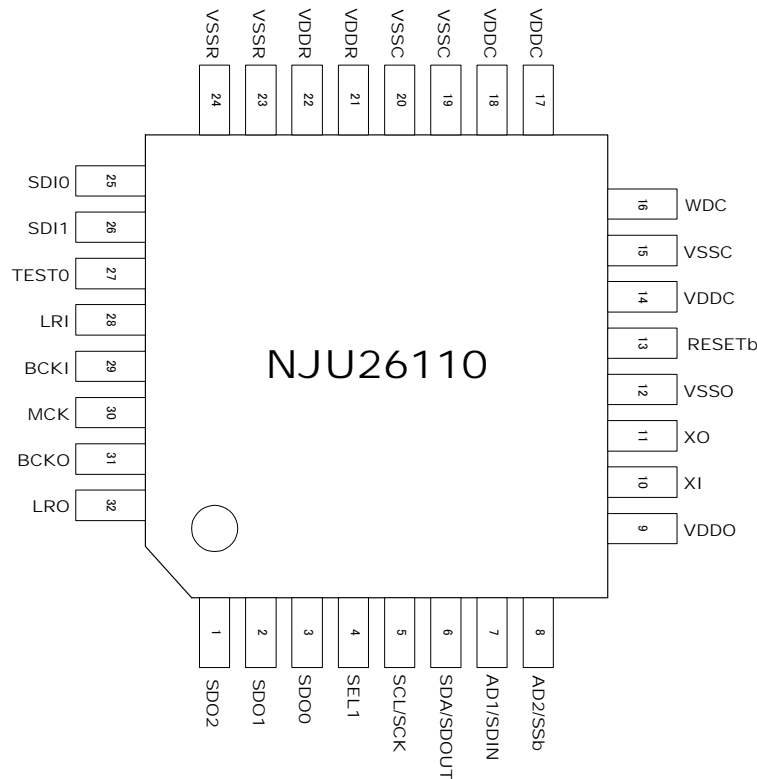


Fig. 3 NJU26110 Pin Configuration

Pin Description

Table 1 Pin Description

| No. | Symbol | I/O | Description | No. | Symbol | I/O | Description |
|-----|-----------|-----------------|--|-----|--------|-----|--------------------------|
| 1 | SDO2 | O | Audio Data Output 2 S_L/S_R | 17 | VDDC | -- | Core Power Supply +2.5V |
| 2 | SDO1 | O | Audio Data Output 1 C/SW | 18 | VDDC | -- | Core Power Supply +2.5V |
| 3 | SDO0 | O | Audio Data Output 0 L/R | 19 | VSSC | -- | Core GND |
| 4 | SEL1 | I ^{*2} | Select I ² C or Serial bus | 20 | VSSC | -- | Core GND |
| 5 | SCL/SCK | I | I ² C Clock / Serial Clock | 21 | VDDR | -- | I/O Power Supply +2.5V |
| 6 | SDA/SDOUT | I/O | I ² C I/O / Serial Output | 22 | VDDR | -- | I/O Power Supply +2.5V |
| 7 | AD1/SDIN | I | I ² C Address / Serial Input | 23 | VSSR | -- | I/O GND |
| 8 | AD2/SSb | I | I ² C Address / Serial Enable | 24 | VSSR | -- | I/O GND |
| 9 | VDDO | -- | OSC Power Supply +2.5V | 25 | SDIO | I | Audio Data Input 0 L/R |
| 10 | XI | I | X'tal Clock Input | 26 | SDI1 | I | Audio Data Input 1 L/R |
| 11 | XO | O | OSC Output | 27 | TEST0 | I | Connect to GND |
| 12 | VSSO | -- | OSC GND | 28 | LRI | I | LR Clock Input |
| 13 | RESETb | I | RESET (active Low) | 29 | BCKI | I | Bit Clock Input |
| 14 | VDDC | -- | Core Power Supply +2.5V | 30 | MCK | O | Master Clock Output |
| 15 | VSSC | -- | Core GND | 31 | BCKO | O | Bit Clock Output |
| 16 | WDC | O ^{*2} | Clock for Watch Dog Timer | 32 | LRO | O | LR Clock Output |

*1 I : Input, O : Output, I/O : Bi-directional

*2 SEL1 : Input, WDC : Output

■ Audio Data Output

The NJU26110 audio interface provides industry standard serial data formats of I²S, MSB-first left-justified or MSB-first right-justified. The NJU26110 audio interface provides two data inputs, SDI0 and SDI1, and three data outputs, SDO0, SDO1 and SDO2, as shown in table 2 and 3. The input serial data is selected by the firmware command.

Table 2 Serial Audio Input Pin

| Pin No. | Symbol | Description |
|---------|--------|--------------------------|
| 25 | SDI0 | Audio Data Input 0 L / R |
| 26 | SDI1 | Audio Data Input 1 L / R |

Table 3 Serial Audio Output Pin

| Pin No. | Symbol | Description |
|---------|--------|--------------------------|
| 3 | SDO0 | Front Lch/Rch Output |
| 2 | SDO1 | Center/Sub Woofer Output |
| 1 | SDO2 | Rear Lch/Rch Output |

■ I²C address

AD1 and AD2 pins are used to configure the seven-bit SLAVE address of the serial host interface. These pins offer additional flexibility to SLAVE address. 4 addresses could be chosen by AD1 and AD2-pin. The AD1 and AD2-pin addresses are decided by the connections of AD1 and AD2-pin. The AD1 and AD2 addresses should be the same level as AD1 and AD2-pin connections.

Table 4 I²C Bus SLAVE Address

| bit7 | bit6 | bit5 | bit4 | Bit3 | bit2 | bit1 | bit0 |
|------|------|------|------|------|-------------------|-------------------|------|
| 0 | 0 | 1 | 1 | 1 | AD2 ^{*1} | AD1 ^{*1} | R/W |

*1 AD1 or AD2 address is 0 when AD1 or AD2-pin is "L". AD1 or AD2 address is 1 when AD1 or AD2-pin is "H".

The detail I²C bus timing of the NJU26110 is described in the "NJU26100 Series Hardware Data Sheet".

■ Firmware Command Table


Host processor can control the NJU26110 via I2C bus or 4-Wire serial bus interface. The following table summarizes the available user commands.

Table 5 NJU26110 Command

| No. | Command | Command Description |
|-----|------------------------------|---|
| 1 | Set Task | Set Task : Mono-Stereo, TruSurround, Focus, TruBass, CSII 5.1, Input Select |
| 2 | CSII Mode | Set CSII mode : Cinema / Music, Phantom Center, Rear Boost, Full Band Width, 525 Mode |
| 3 | TruBass Mode | Set TruBass mode : Sr/SI, Sub Woofer, L/R, Speaker Size |
| 4 | TruBass Base Control | Set TruBass Base : Gang Mode, Mute, TruBass Level |
| 5 | Focus Mode | Set Focus mode : SI / Sr, L / R, C |
| 6 | Focus Control | Focus Control : Gang, Mute, Focus Value |
| 7 | Mono Input Select | Set Mono Input : L / R, L+R |
| 8 | Sample Rate | Set Sample Rate : 48, 44.1, 32 KHz |
| 9 | Rear Space Gain | Set Rear Space Gain : 0 ~ -15dB |
| 10 | 4 Ch. Stereo Mode | Select 4 Ch. Stereo Mode : On / Off |
| 11 | Delay | Set Delay Time : 0 ~ 10 ms |
| 12 | Master Volume | Set Master Volume : 0 ~ -63dB |
| 13 | Input Trimmer | Set Input Trimmer : 0 ~ -63dB |
| 14 | Left Volume | Set Left Volume : 0 ~ -63dB |
| 15 | Right Volume | Set Right Volume : 0 ~ -63dB |
| 16 | Left Volume | Set Left Volume : 0 ~ -63dB |
| 17 | Center Volume | Set Center Volume : 0 ~ -63dB |
| 18 | SI Volume | Set SI Volume : 0 ~ -63dB |
| 19 | Sr Volume | Set Sr Volume : 0 ~ -63dB |
| 20 | SubWoofer Volume | Set SubWoofer Volume : 0 ~ -63dB |
| 21 | System Status | Set System Status : DSP Mode, Data Width, Serial Audio Mode, Audio Clock, MCK clock |
| 22 | TruBass Base Control SW | TruBass Base Control SW : Gang Mode, Mute, TruBass Level |
| 23 | TruBass Base Control SI / Sr | TruBass Base Control SI / Sr : Gang Mode, Mute, TruBass Level |
| 24 | Focus Control L / R | Focus Control L / R : Gang Mode, Mute, Focus Level |
| 25 | Focus Control SI / Sr | Focus Control SI / Sr : Gang Mode, Mute, Focus Level |
| 26 | NOP | Check DSP status |

In respect to detail command information, request NJR.

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