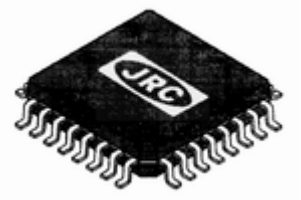
# Digital Audio Processor for TV

■ Package



NJU26103

## ■ General Description

The NJU26103 is a high performance 24-bit digital audio processor for TV that has a QFP 32-pin small package.
The NJU26103 provides an internal delay memory to adjust the output delay time for lip sync. Moreover, the NJU26103 adopts SRS WOW technology.

## ■ FEATURES

- Variable 2 Channels Audio Delay (16 bit data width).
  Maximum Delay 42msec at Fs = 48kHz ( 46msec at Fs = 44.1kHz )
- SRS WOW audio technology

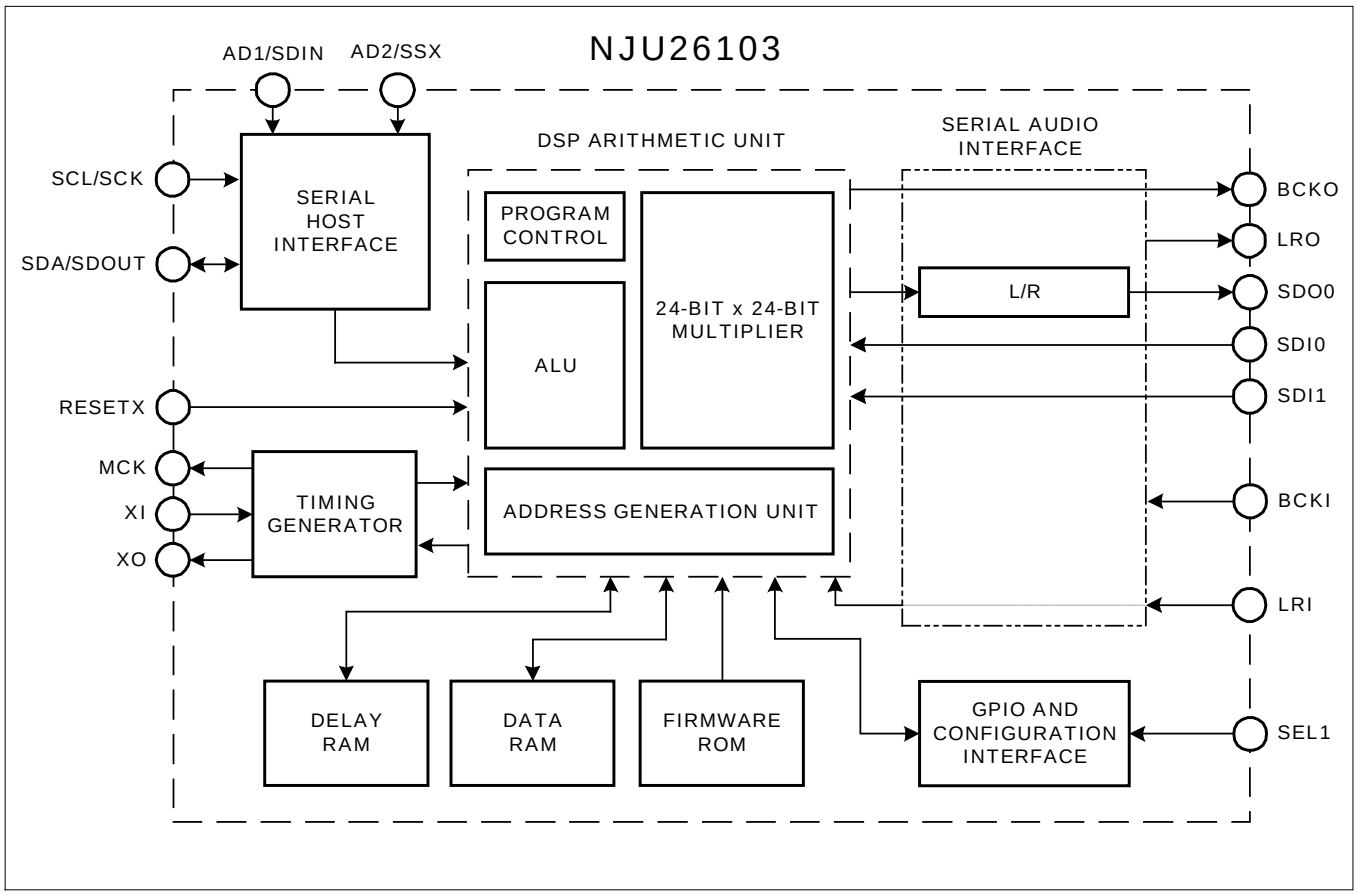
## ■ Digital Signal Processor Specification

- 24bit Fixed-point Digital Signal Processing
- Maximum Clock Frequency : 38MHz
- Digital Audio Interface : 2 Input ports ／ 1 Output port
- Digital Audio Format : $I^2S$ 24bit, Left-Justified, Right-Justified, BCK : 32Fs / 64Fs
- 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
  - $I^2C$ Bus (standard-mode/100Kbps)
  - 4-Wire Serial Bus (4-Wire: Clock, Enable, Input data, Output data)
- Power Supply : DSP Core : 2.5V I/O interface: 2.5V ( +3.3V tolerant )
- Package : QFP 32pin

The detail hardware specification of the NJU26103 is described in the " NJU26100 Series Hardware Data Sheet". In respect to software commands, request NJR.

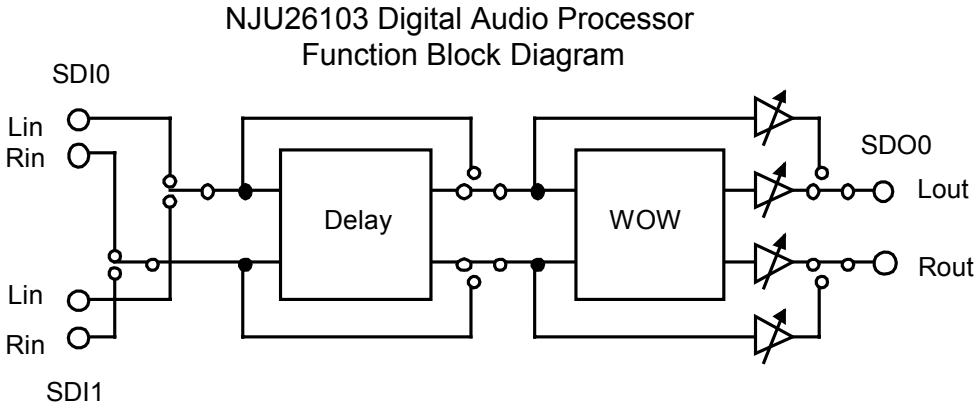
## ■ DSP Block Diagram

**Fig.1 NJU26103 Block Diagram**

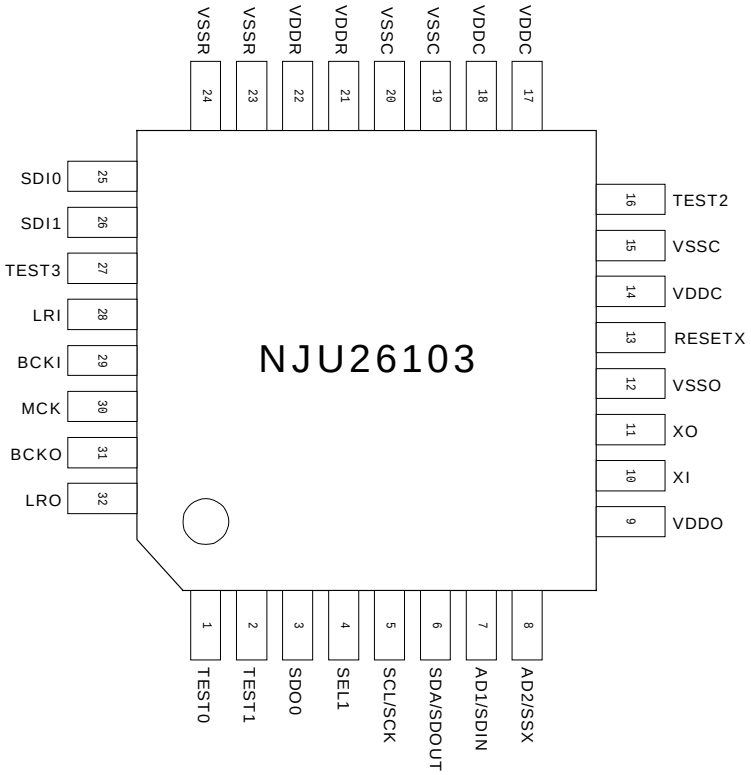



## ■ DSP Function Diagram

**Fig.2 NJU26103 Function Diagram**



## ■ Pin Configuration




## ■ Pin Description

**Table1 Pin Description**

| No. | Symbol | I/O | Description | No. | Symbol | I/O | Description |
|---|---|---|---|---|---|---|---|
| 1 | TEST0 | O | OPEN | 17 | VDDC | P | Core Power Supply +2.5V |
| 2 | TEST1 | O | OPEN | 18 | VDDC | P | Core Power Supply +2.5V |
| 3 | SDO0 | O | Audio Data Output L / R | 19 | VSSC | G | Core GND |
| 4 | SEL1 | I | Select $I^2C$(L) or Serial bus(H) | 20 | VSSC | G | Core GND |
| 5 | SCL/SCK | I | $I^2C$ Clock / Serial Clock | 21 | VDDR | P | I/O Power Supply +2.5V |
| 6 | SDA/SDOUT | IO | $I^2C$ I/O / Serial Output | 22 | VDDR | P | I/O Power Supply +2.5V |
| 7 | AD1/SDIN | I | $I^2C$ Address / Serial Input | 23 | VSSR | G | I/O GND |
| 8 | AD2/SSX | I | $I^2C$ Address / Serial Enable | 24 | VSSR | G | I/O GND |
| 9 | VDDO | P | OSC Power Supply +2.5V | 25 | SDI0 | 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 | X'tal Clock Output | 27 | TEST 3 | I | GND |
| 12 | VSSO | G | OSC GND | 28 | LRI | I | LR Clock Input |
| 13 | RESETX | I | RESET | 29 | BCKI | I | Bit Clock Input |
| 14 | VDDC | P | Core Power Supply +2.5V | 30 | MCK | O | Master Clock Output |
| 15 | VSSC | G | Core GND | 31 | BCKO | O | Bit Clock Output |
| 16 | TEST2 | IO | OPEN | 32 | LRO | O | LR Clock Output |

※ I : Input, O : Output, IO : Bi-directional, P : +Power, G : GND

## ■ Audio Data Interface

The NJU26103 audio interface provides Industry standard serial data formats of $I^2S$, MSB-first left-justified or MSB-first right-justified. The NJU26103 audio interface provides two data inputs, SDI0 and SDI1, and one data output, SDO0. The input serial data is selected by the firmaware command.

**Table 2 Serial Audio Input Pin**

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

**Table 3 Serial Audio Output Pin**

| Symbol | Pin No. | Description |
|---|---|---|
| SDO0 | 3 | Sound Data Output 0 |

## ■ $I^2C$ 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.

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**Table 4 $I^2C$ Bus SLAVE Address**

| bit7 | bit6 | bit5 | bit4 | Bit3 | bit2 | bit1 | bit0 |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 | AD2*[1] | AD1*[1] | R/$\overline{W}$ |

*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 **$I^2C$** bus timing of the NJU26103 is described in the “ NJU26100 Series Hardware Data Sheet”.

## ■ Firmware Command Table

The NJU26103 can be controlled by host processor vie $I^2C$ bus or 4-Wire serial bus interface. The following table summarizes the available user commands.

**Table 5 NJU26103 Command List**

| No. | Command | Command Description |
|---|---|---|
| 1 | Fs | Select the sampling frequency : 32/ 44.1/ 48KHz |
| 2 | Input Select | Select digital audio input |
| 3 | Mode Select | Select mode : Mute, Thru, WOW |
| 4 | WOW | Select WOW parameters : Bit rate, Focus, Input mode |
| 5 | TruBass | Select TruBass Speaker size |
| 6 | Delay Time | Set Delay time |
| 7 | Program Mode | Select mode : Stereo, TruBass, Focus, Delay |
| 8 | Through Output | Trim Through output level |
| 9 | WOW Output Trim | Trim WOW output level |
| 10 | TruBass | TruBass Control |
| 11 | Stereo Width | Stereo Width Control |
| 12 | System State | Set System parameters : Digital Audio Format |
| 13 | Firmware Version | Check Firmware Version |
| 14 | NOP | Check DSP condition |

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