

DOLBY PRO LOGIC SURROUND DECODER

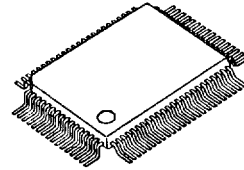
■ GENERAL DESCRIPTION

The NJW1103 is a surround processor including all of the necessary circuits of Dolby Pro Logic Surround decoder and digital delay.

In addition to Dolby Pro Logic Surround function, it performs easily other surround function such as Hall, Live, Disco and others.

It also includes echo and microphone mixing functions for Karaoke.

■ PACKAGE OUTLINE



NJW1103F03

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This device is available only to licensees of Dolby Lab.

Licensing and application information may be obtained from Dolby Lab.

■ FEATURE

- Operating Voltage : $V_{CC}=9V$ (Analog Block), $V_{DD}=5V$ (Digital Block)
- Digital Delay on chip
- Center and Surround Channel Level Trimmer : -31 TO 0dB / 1dB step (0dB = Dolby Level)
- Karaoke Function(Echo, Mic.mixing)
- Serial Data Interface(3-wire) DATA, REQ, SCK
- Bi-CMOS Technology
- Package Outline QFP80

■ FUNCTION

【Dolby Pro Logic Surround】

- Automatic input balance
- Noise sequencer
- Adaptive matrix
- Center channel control
(wideband, normal, phantom)
- Modified B-type noise reduction
- 7kHz low-pass filter
- Dolby 3 stereo mode
- Digital time delay

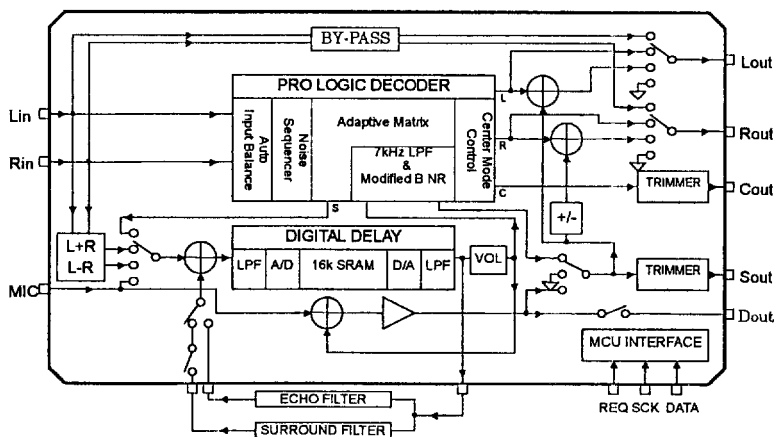
【Other Surround】

- Sound field control
- Front mixing control
- Digital time delay

【Karaoke】

- Echo control
- Mic mixing

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|-----------------------------|------------------|------------|------|
| Supply Voltage | V _{CC} | 11 | V |
| | V _{DD} | 7 | V |
| Power Dissipation | P _D | 1.37 | W |
| Operating Temperature Range | T _{opr} | -20 ~ +75 | °C |
| Storage Temperature Range | T _{stg} | -40 ~ +125 | °C |

 ■ ELECTRICAL CHARACTERISTICS (T_a = 25 °C, V_{oo} = 1.0 V, V_{DD} = 5 V, V_{IN} = 300 mV_{rms}/1 kHz)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--|------------------|------------------------------------|--------------------|-------|--------------------|------|
| ◆ OVERALL | | | | | | |
| Supply Voltage Range | V _{CC} | | 8 | 9 | 10 | V |
| | V _{DD} | | 4.5 | 5 | 5.5 | V |
| Supply Current | I _{CC} | No Signal | — | 25 | — | mA |
| | I _{DD} | No Signal | — | 25 | — | mA |
| Reference Voltage | V _{ref} | No Signal | 3.5 | 4.0 | 4.5 | V |
| Threshold voltage | V _{thh} | Digital input high level | 0.7V _{DD} | — | V _{DD} | V |
| | V _{thl} | Digital input low level | 0.0 | — | 0.3V _{DD} | V |
| ◆ INPUT AUTO BALANCE | | | | | | |
| Capture Range | CPR | | — | ±5 | — | dB |
| Error Correction | GER | | — | ±4 | — | dB |
| ◆ ADAPTIVE MATRIX | | | | | | |
| Output Level Accuracy relative to Cch. | ΔV _{oi} | L, R, S' ch. out | -0.5 | 0 | 0.5 | dB |
| Matrix Rejection relative Headroom | MR | L, R, C, S' ch. out | 25 | 40 | — | dB |
| | HR-AM | V _{CC} =9V at THD=1% | 15 | 17 | — | dB |
| Total Harmonic Distortion | THD-AM | L, R, C, S' ch. out at 4ch. mode | — | 0.05 | 0.2 | % |
| | | L, Rch. out at 2ch. mode | — | 0.002 | 0.05 | % |
| Signal to Noise Ratio | SN-AM | Rg=0, wt:CCIR/ARM 4ch | 75 | 80 | — | dB |
| | | L, Rch. out at 2ch. mode | 93 | 100 | — | dB |
| ◆ NOISE SEQUENCER | | | | | | |
| Output Noise Level | V _{No} | | -15.0 | -12.5 | -10.0 | dB |
| Output Noise Level Accuracy relative to Cch. | ΔV _{No} | L, R, S' ch. out | -0.5 | 0.0 | 0.5 | dB |
| ◆ MODIFIED B-TYPE NOISE REDUCTION | | | | | | |
| Voltage Gain | GV-NR | V _{in} = 0dBd, f=100Hz | — | 9.2 | — | dB |
| Decode Response 1 | DEC1 | V _{in} = 0dBd, f=1.0kHz | -1.6 | -0.1 | 1.4 | dB |
| Decode Response 2 | DEC2 | V _{in} = -15dBd, f=1.4kHz | -3.0 | -1.5 | 0.0 | dB |
| Decode Response 3 | DEC3 | V _{in} = -20dBd, f=1.4kHz | -4.9 | -3.4 | -1.9 | dB |
| Decode Response 4 | DEC4 | V _{in} = -40dBd, f=5.0kHz | -6.8 | -5.3 | -3.8 | dB |
| Total Harmonic Distortion | THD-NR | V _{in} = 0dBd, f=1kHz | — | 0.07 | 0.3 | % |
| Headroom | HR-NR | V _{CC} =9V, THD=1% | 15 | 17 | — | dB |
| Signal to Noise Ratio | SN-NR | Rg=0, wt:CCIR/ARM | 73 | 78 | — | dB |

ELECTRICAL CHARACTERISTICS ($T_s = 25^\circ\text{C}$, $V_{os} = 10\text{V}$, $V_{DD} = 5\text{V}$, $V_{IN} = 300\text{mV}_{rms}/1\text{kHz}$)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT | |
|------------------------------|--------|---|----------------------------------|-------|-------|------|----|
| ◆ OTHER SURROUND | | | | | | | |
| Total Harmonic Distortion | THD-OS | $V_{in}=0\text{dBd}$, $f=1\text{kHz}$, L+R, L-R output | — | 0.05 | 0.2 | % | |
| Headroom | HR-OS | $V_{CC}=9\text{V}$, THD=1%, L+R, L-R output | 15 | 17 | — | dB | |
| Signal to Noise Ratio | SN-OS | $R_g=0$, wt:GCIR/ARM L+R, L-R output | 85 | 90 | — | dB | |
| ◆ C.S CHANNEL TRIMMER | | | | | | | |
| Full Scale | FS | Digital Input = -31dB | -25 | -31 | -37 | dB | |
| Trimmer Steps | NL | Digital Input = -1, -2, -4, -8, -16dB | -0.6 | 1.0 | 1.4 | dB | |
| ◆ DIGITAL TIME DELAY | | | | | | | |
| Delay Time | Td | | 12.4 | 15.4 | 18.4 | ms | |
| | | | 17.0 | 20.0 | 23.0 | ms | |
| | | | 25.6 | 28.6 | 31.6 | ms | |
| | | | 38.0 | 41.0 | 44.0 | ms | |
| | | | 46.2 | 49.2 | 52.2 | ms | |
| | | | 137.5 | 147.5 | 157.5 | ms | |
| Total Gain | Gv | | 186.6 | 196.6 | 206.6 | ms | |
| | | | -3.0 | 0.0 | 3.0 | dB | |
| | | 30kHz LPF | Td=15.4ms | — | 0.3 | 0.6 | % |
| | | | Td=20.0ms | — | 0.3 | 0.6 | % |
| | | | Td=28.6ms | — | 0.5 | 1.0 | % |
| | | | Td=41.0ms | — | 0.6 | 1.2 | % |
| Td=49.2ms | — | | 0.7 | 1.4 | % | | |
| Td=147.5ms | — | 1.5 | 3.0 | % | | | |
| Maximum Output Voltage | Vomax | 30kHz LPF THD=10% | 0.7 | 1.0 | — | Vrms | |
| | | Output Noise Voltage | Td=15.4ms | — | -92 | -80 | dB |
| | | | Td=20.0ms | — | -92 | -80 | dB |
| | | | $R_g=620\Omega$ Td=28.6ms | — | -92 | -80 | dB |
| | | | $V_i=0\text{mV}_{rms}$ Td=41.0ms | — | -90 | -75 | dB |
| | | | JIS-A Td=49.2ms | — | -90 | -75 | dB |
| Td=147.5ms | — | -82 | -67 | dB | | | |
| Td=196.6ms | — | -77 | -62 | dB | | | |
| ◆ DELAY VOLUME | | | | | | | |
| Total Gain | Gv | Vol.=Max | 0 | 3 | 6 | dB | |
| Maximum Attenuation | ATTmax | Delay OFF mode, Vol.=min., JIS-A | 0 | -70 | -60 | dB | |

RECOMMENDED PAD PATTERN

The recommended pin patterns are shown in the following examples. When designing products, give adequate consideration to the ease of mounting connection reliability, writing space and the presence of soldering bridge generation.

■ QFP80-C2, QFP80-C3

| Body Size | b | l | e | MID | MIE |
|-----------|------|------|------|------|------|
| 20×14 | 0.50 | 2.00 | 0.80 | 20.4 | 14.4 |

