

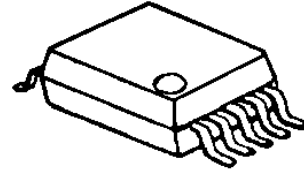
Monaural BTL Output Switching Driver for Class D Amplifier

■ GENERAL DESCRIPTION

The **NJU8719** is a monaural BTL output switching driver for class D amplifier. It converts 1bit digital signal input, such as PWM or PDM signal, to analog signal output with simple external LC low-pass filter.

The **NJU8719** realizes very high power-efficiency by class D operation. Therefore, It is suitable for portable set with speaker.

■ PACKAGE OUTLINE

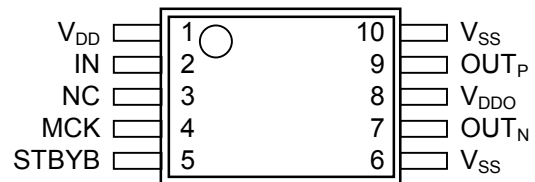


NJU8719V

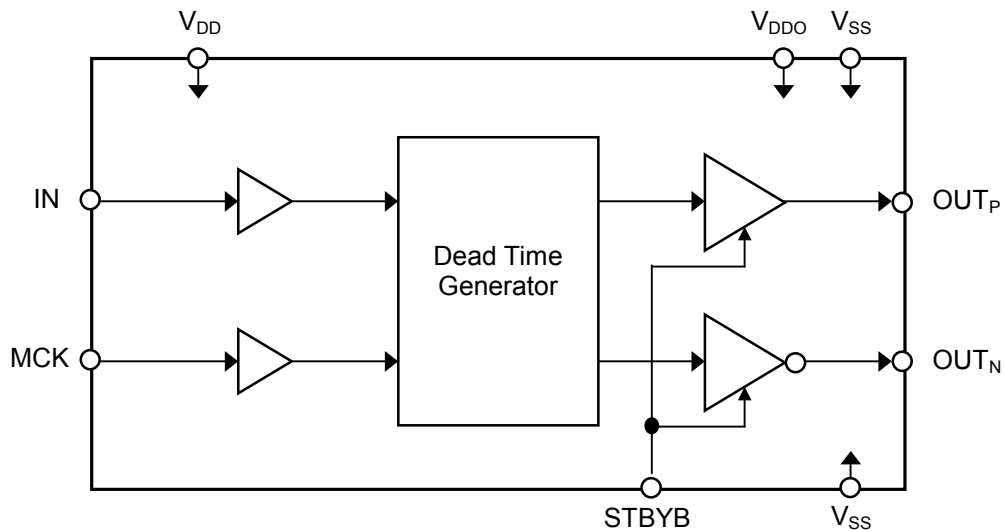
■ FEATURES

- 1-channel 1bit Audio Signal Input
- Monaural BTL Output
- Standby(Hi-Z) Control Function
- Operating Voltage : 2.4V to 5.25V
- CMOS Technology
- Package Outline : SSOP10

■ PIN CONFIGURATION



■ BLOCK DIAGRAM



■ TERMINAL DESCRIPTION

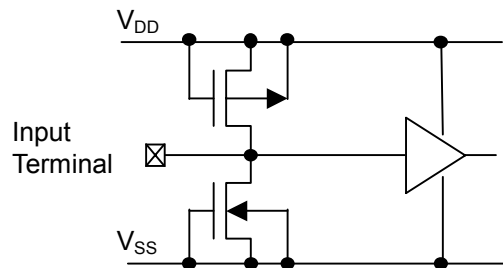
| No. | SYMBOL | I/O | Function |
|---------|-----------|-----|---|
| 1 | V_{DD} | – | Power Supply, $V_{DD}=5V$ |
| 2 | IN | I | 1-bit Data Input Terminal |
| 3 | NC | – | Non connection |
| 4 | MCK | I | Master Clock Input Terminal The condition of the data input terminal is fetched with the rising edge of this signal. |
| 5 | STBYB | I | Standby Control Terminal (L:Standby) |
| 6 10 | V_{SS} | – | Power GND and Output GND terminal: $V_{SS}=0V$ |
| 7 | OUT_N | O | Negative output |
| 8 | V_{DDO} | – | Output Power Supply, $V_{DD}=5V$ |
| 9 | OUT_P | O | Positive output |

* V_{SS} (Terminal No.6,10) should be connected at a nearest point to the IC.

* V_{DD} (Terminal No.1) and V_{DDO} (Terminal No.8) should be connected at a nearest point to the IC.

*STBYB(Terminal No.5) must be connected to V_{DD} , when this terminal is not used.

■ INPUT TERMINAL STRUCTURE



■ FUNCTIONAL DESCRIPTION

(1) Signal Output

The OUT_P and OUT_N generate PWM output signal, which is converted to analog signal via external 2nd-order or higher LC filter. The NJU8719 drives a speaker by the BTL output, and OUT_P is a positive output and OUT_N is a negative outputs.

A switching regulator with a high response against a voltage fluctuation is the best selection for the V_{DDO} , which is the power supply for output drivers. To obtain better T.H.D. performance, the stabilization of the power is required.

(2) Standby Control Function

By setting the STBYB terminal to "L", the **NJU8719** becomes standby condition. During standby condition, OUT_P and OUT_N are in Hi-Z.

(3) Master Clock

Master clock (MCK) synchronizes with the Audio signal input (IN). The setup time and the hold time should be kept in the AC characteristics because IN is fetched with the rising edge of MCK. MCK requires jitter-free or jitter as small as possible because the jitter downs S/N ratio.

OUT_P and OUT_N occur the pop noise when MCK is stopped in operation without standby mode. Therefore, the standby mode should be set before MCK stop.

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

| PARAMETER | SYMBOL | RATING | UNIT |
|-----------------------|-----------------|----------------------|------|
| Supply Voltage | V_{DD} | -0.3 to +5.5 | V |
| | V_{DDO} | -0.3 to +5.5 | |
| Input Voltage | V_{in} | -0.3 to $V_{DD}+0.3$ | V |
| Operating Temperature | T_{opr} | -40 to +85 | °C |
| Storage Temperature | T_{stg} | -40 to +125 | °C |
| Power Dissipation | SSOP10 P_D | 360* | mW |

* : Mounted on two-layer board of based on the JEDEC.

Note 1) All voltage values are specified as $V_{SS}=0V$.

Note 2) If the LSI is used on condition beyond the absolute maximum rating, the LSI may be destroyed. Using LSI within electrical characteristics is strongly recommended for normal operation. Use beyond the electrical characteristics conditions will cause malfunction and poor reliability.

Note 3) De-coupling capacitors should be connected between $V_{DD}-V_{SS}$ and $V_{DDO}-V_{SS}$ due to the stabilized operation.

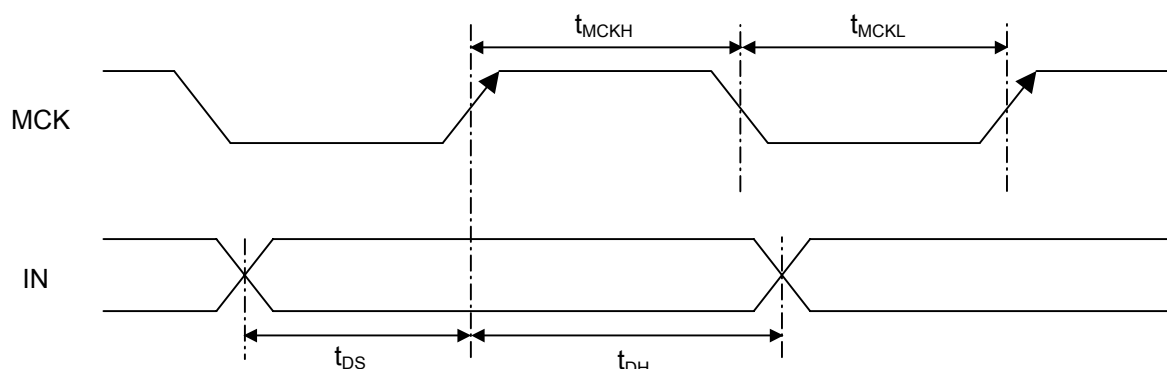
■ ELECTRICAL CHARACTERISTICS

(Ta=25°C, $V_{DD}=V_{DDO}=5.0V$, $V_{SS}=0V$, $f_s=44.1kHz$, unless otherwise noted)

| PARAMETER | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--|----------|---|-------------|------|-------------|----------|
| V_{DD}, V_{DDO} Supply Voltage | V_{DD} | | 2.4 | 5.0 | 5.25 | V |
| Output Driver High side Resistance | R_H | $V_{OUT}=V_{DDO}-0.1V$ | - | 0.5 | 1.5 | Ω |
| Output Driver Low side Resistance | R_L | $V_{OUT}=0.1V$ | - | 0.5 | 1.5 | Ω |
| Operating Current at Standby | I_{ST} | IN, STBYB=0V No-load operating | - | - | 1 | μA |
| Operating Current at Operating (Mute signal input) | I_{DD} | IN=32f _s MCK=256f _s No-load operating | - | 3.8 | 5.7 | mA |
| Input Voltage | V_{IH} | | $0.7V_{DD}$ | - | V_{DD} | V |
| | V_{IL} | | 0 | - | $0.3V_{DD}$ | V |
| Input Leakage Current | I_{LK} | | - | - | ± 1 | μA |

■ TIMING CHARACTERISTICS

- Audio Signal Input



(Ta=25°C, V_{DD}=V_{DDO}=5.0V, V_{SS}=0V, f_s=44.1kHz, unless otherwise noted)

| PARAMETER | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------------|-------------------|------------|------|------|------|------|
| MCK Frequency | f _{MCKI} | | - | - | 25 | MHz |
| MCK Pulse Width (H) | t _{MCKH} | | 12 | - | - | ns |
| MCK Pulse Width (L) | t _{MCKL} | | 12 | - | - | ns |
| IN Setup Time | t _{DS} | | 20 | - | - | ns |
| IN Hold Time | t _{DH} | | 20 | - | - | ns |

- Output Control Signal Input



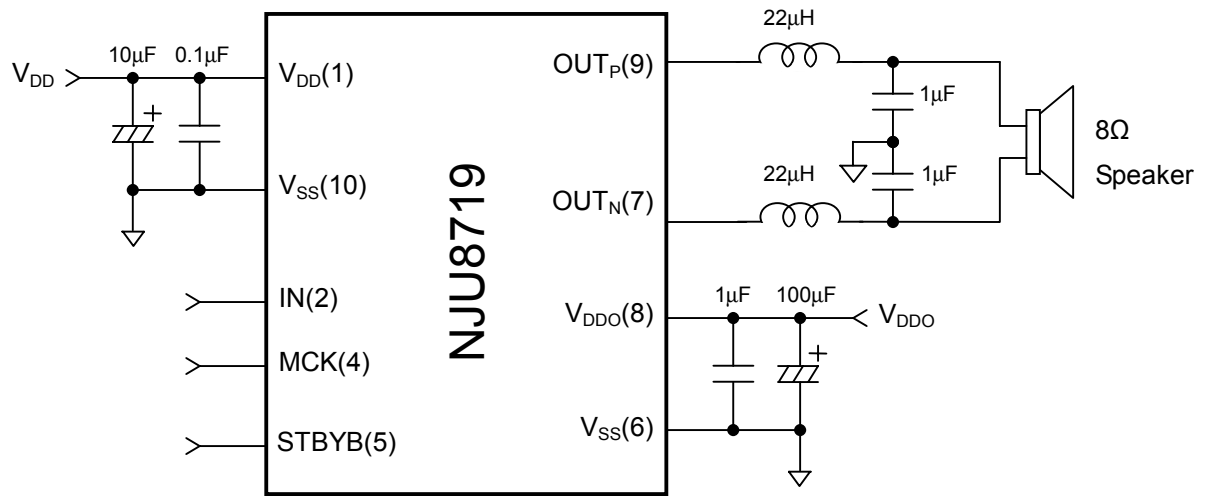
(Ta=25°C, V_{DD}=V_{DDO}=5.0V, V_{SS}=0V, f_s=44.1kHz, unless otherwise noted)

| PARAMETER | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-----------|-----------------|------------|------|------|------|------|
| Rise Time | t _{UP} | | - | - | 50 | ns |
| Fall Time | t _{DN} | | - | - | 50 | ns |

Note 4) All timings are based on 30% and 70% voltage level of V_{DD}.

NJU8719

■ APPLICATION CIRCUIT



- Note 5) De-coupling capacitors must be connected between each power supply terminal and GND terminal.
- Note 6) The power supply for V_{DDO} requires fast driving response performance such as a switching regulator for T.H.D..
- Note 7) The above circuit shows only application example and does not guarantee the any electrical characteristics. Therefore, please consider and check the circuit carefully to fit your application.

[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.

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