# SYSTEM RESET IC WITH DELAY CIRCUIT

## ■ GENERAL DESCRIPTION

The NJU7296 is a system reset IC with built-in delay circuit that monitors the status of a power line, and outputs a reset signal to the microcomputer.

The NJU7296 outputs a reset signal when fall below the detection voltage.

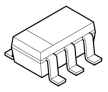
Delay times are fixed internally and those are set in each of rising and falling.

It is possible to monitor multiplex power line by combination of NJU7296 because output voltage $V_{OUT}$ is kept Low level when EXT Pin is Low level by connecting with other NJU7296.

Detection voltage's default value is 1.0V. It can be adjusted to desired voltage by the resistor divider.

In addition, a hysteresis voltage can be set arbitrarily by inserting a resistor between the $V_{IN}$ pin and the HYS pin.

## ■ PACKAGE OUTLINE

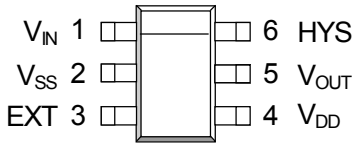


NJU7296F1

## ■ FEATURES

| | |
|---|---|
| ● High Precision Detection Voltage | ±1.0% (Ta=25°C) |
| ● Detection Voltage | 1.0V (default) and adjustable with external resistor |
| ● Reset Output Logic | Reset Low output when $V_{IN}$ pin is detection voltage or below<br>*If required reset low output when $V_{IN}$ pin is detection voltage or more, see the NJU7295. |
| ● Delay Circuit (Internal Fixed type) | Rising / Falling independent setting |
| ● Ultra Low Quiescent Current | 1.7μA typ. |
| ● Supply Voltage Range | 1.5 to 5.5V |
| ● External Input pin | While inputting low signal, keep output Low level |
| ● Adjustable Hysteresis Voltage | |
| ● Output Type | CMOS output |
| ● Package | SOT-23-6-1 |

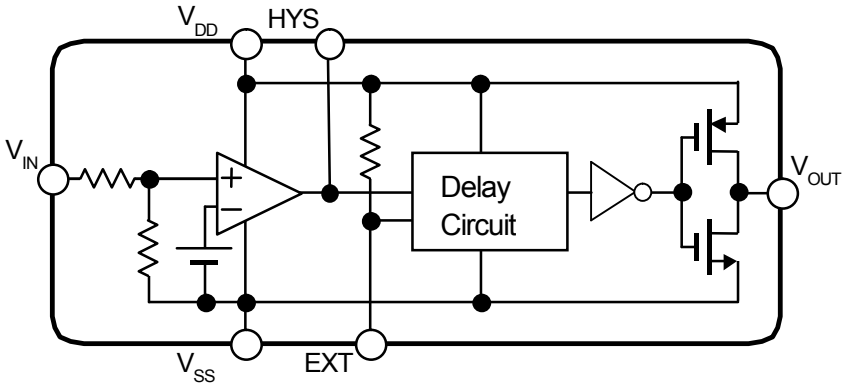
## ■ PIN CONFIGURATION




Pin Function

1. $V_{IN}$ : Input Voltage pin
2. $V_{SS}$ : Ground pin
3. EXT : External Input pin
4. $V_{DD}$ : Supply Voltage pin
5. $V_{OUT}$ : Output pin
6. HYS : External Resistor pin for setting Hysteresis Voltage

■ BLOCK DIAGRAM




■ PRODUCT CLASSFICATION

| Device Name | Version | Delay Time1(Typ.) | Delay Time2(Typ.) |
|---|---|---|---|
| NJU7296F1-A | A | 1.25ms | 10ms |
| NJU7296F1-B | B | 10ms | 20ms |
| NJU7296F1-C | C | 10ms | 10ms |
| NJU7296F1-D | D | 30μs | 10ms |

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

| PARAMETER | SYMBOL | RATINGS | | UNIT |
|---|---|---|---|---|
| Supply Voltage | $V_{DD}$ | +7 | | V |
| Input Voltage | $V_{IN}$ | $V_{SS}$-0.3 to +7 | | V |
| Output Voltage | $V_{OUT}$ | $V_{SS}$-0.3 to $V_{DD}$+0.3 | | V |
| HYS Pin Voltage | $V_{HYS}$ | $V_{SS}$-0.3 to $V_{DD}$+0.3 | | V |
| EXT Pin Input Voltage | $V_{EXT}$ | $V_{SS}$-0.3 to $V_{DD}$+0.3 | | V |
| Output Current | $I_{OUT}$ | 50 | | mA |
| HYS Pin Current | $I_{HYS}$ | 10 | | mA |
| Power Dissipation | $P_D$ | SOT-23-6-1 | 410(*1) | mW |
| | | | 580(*2) | |
| Surge Current | $I_{IN\_SRG}$ | ±2.5(*3) | | mA |
| Operating Temperature | $T_{opr}$ | -40 to +105 | | °C |
| Storage Temperature | $T_{stg}$ | -40 to +125 | | °C |

(*1): Mounted on glass epoxy board. (76.2×114.3×1.6mm: based on EIA/JDEC standard, 2Layers)

(*2): Mounted on glass epoxy board. (76.2×114.3×1.6mm:based on EIA/JDEC standard, 4Layers), internal Cu area: 74.2×74.2mm

(*3): Permissible current range there is no logical error in $V_{OUT}$ and no destruction

■ ELECTRICAL CHARACTERISTICS

Unless otherwise noted, $V_{DD}$=3.3V, Ta=25°C

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Detection Voltage | $V_{DET}$ | | -1.0% | 1.0 | +1.0% | V |
| Quiescent Current | $I_{SS}$ | No Signal | - | 1.7 | 3.0 | μA |
| Output Current | $I_{OUT}$ | Nch, $V_{DS}$=0.5V | 12 | 15 | - | mA |
| | | Pch, $V_{DS}$=0.5V | 7.5 | 11 | - | |
| HYS Pin Current | $I_{HYS}$ | Nch, $V_{DS}$=0.5V | 7.5 | 12 | - | mA |
| | | Pch, $V_{DS}$=0.5V | 5.0 | 9.0 | - | |
| Average Temperature Coefficient of Detection Voltage | $\Delta V_{DET}/\Delta Ta$ | Ta=0°C to +85°C | - | ±100 | - | ppm/°C |
| EXT Pin High Level Voltage | $V_{EXT\_H}$ | | 0.67x$V_{DD}$ | - | $V_{DD}$ | V |
| EXT Pin Low Level Voltage | $V_{EXT\_L}$ | | - | - | 0.33x$V_{DD}$ | V |
| $V_{IN}$ Pin Resistance | $R_{IN}$ | | 10 | 20 | - | MΩ |
| EXT Pin Resistance | $R_{EXT}$ | | 0.5 | 1.0 | - | MΩ |
| Operating Voltage | $V_{OPL}$ | | 1.5 | - | 5.5 | V |

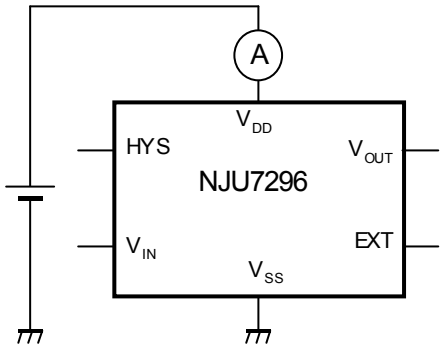
■ ELECTRICAL CHARACTERISTICS (Defined by each versions)

Unless otherwise noted, $V_{DD}$=3.3V, Ta=25°C

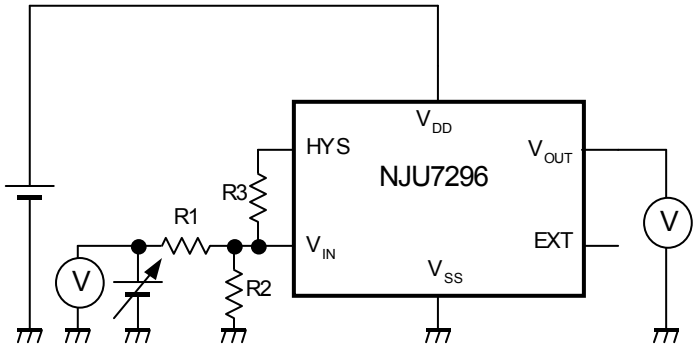
| PARAMETER | SYMBOL | TEST CONDITION | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Delay Time 1 | $t_{d1}$ | $V_{IN}$=H→L | NJU7296F1-A | 1.05 | 1.25 | 1.43 | ms |
| | | | NJU7296F1-B | 7 | 10 | 14 | ms |
| | | | NJU7296F1-C | 7 | 10 | 14 | ms |
| | | | NJU7296F1-D | - | 30 | 100 | μs |
| Delay Time 2 | $t_{d2}$ | $V_{IN}$=L→H | NJU7296F1-A | 7 | 10 | 14 | ms |
| | | | NJU7296F1-B | 16 | 20 | 24 | ms |
| | | | NJU7296F1-C | 7 | 10 | 14 | ms |
| | | | NJU7296F1-D | 7 | 10 | 14 | ms |

■ TEST CIRCUIT

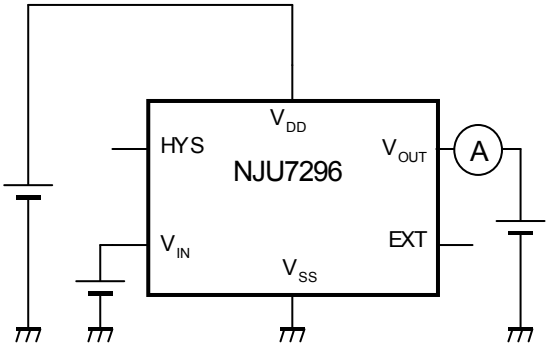
● Quiescent Current



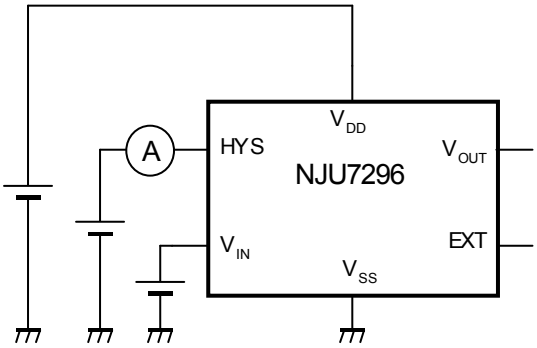

● Detection Voltage



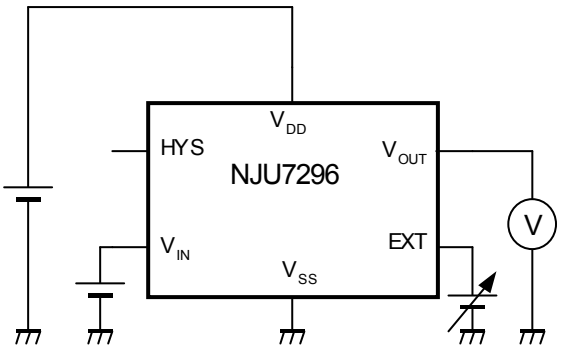

● Output Current



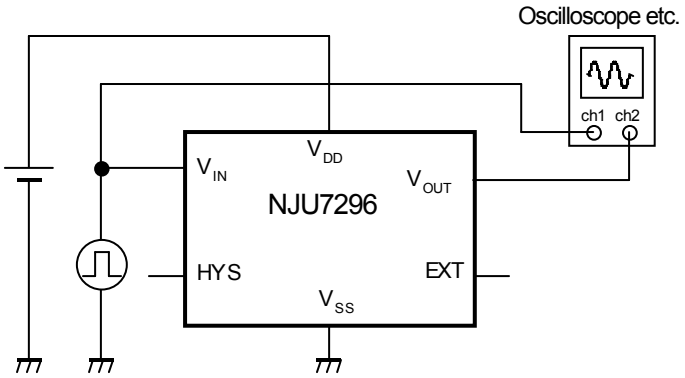

● HYS Pin Current



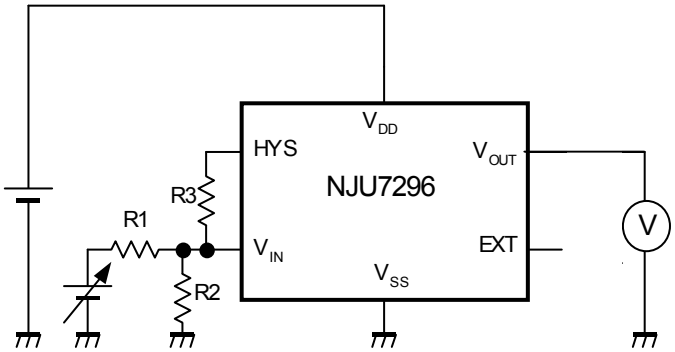

● EXT Pin Input Voltage




● Delay Time

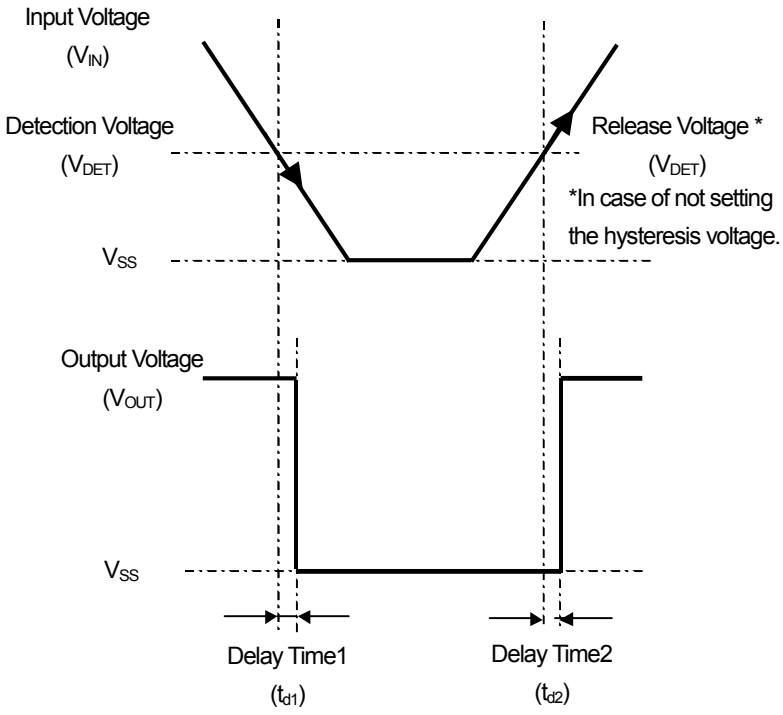



● Minimum Operating Voltage



■ FUNCTION DESCRIPTION

(1) Basic Operation

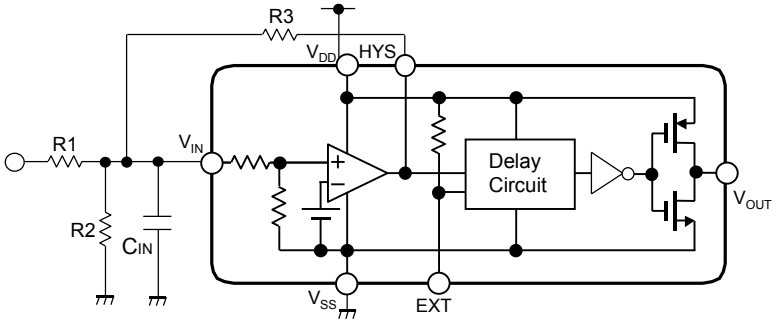



(1) When input voltage $V_{IN}$ falls below the detection voltage $V_{DET}$, after the delay time which is fixed for each version, the output voltage $V_{OUT}$ is switched from High level to Low level.

(2) In the state of $V_{IN}$ is below the release voltage $V_{DET}$, the reset state is maintained. The default release voltage $V_{DET}$ is same as detection voltage $V_{DET}$, although can be set the hysteresis by inserting a resistor between the $V_{IN}$ pin and the HYS pin.

(3) When $V_{IN}$ increases and it reaches release voltage $V_{DET}$, after the delay time which is fixed for each version, $V_{OUT}$ is switched from Low level to High level.

■ TYPICAL APPLICATION




R1, R2 : Adjust the detection voltage by resistor divider

R3 : Setting the hysteresis voltage

CIN : To prevent malfunction due to noise (Recommend about 10pF to 1000pF)

EXT :The input logic signals from other power line

● Adjusting of Detection Voltage

The Detection voltage of NJU7296 is fixed as 1.0V (typ.) internally, although it can be adjusted to a desired Detection Voltage by connecting external resistor (R1,R2) to a $V_{IN}$ pin.

When adjusting to a desired Detection Voltage, it's necessary to consider $V_{IN}$ pin resistance $R_{IN}$. (20 MΩ typ.)

● Setting of Hysteresis Voltage

The NJU7296 doesn't have the Hysteresis Voltage between the Release Voltage and Detecting Voltage in default. It's able to set the Hysteresis Voltage optionally by connecting dividing resistor between the $V_{IN}$-HYS pin.

Detection Voltage $= VDET + \dfrac{R1(R2+RIN)}{RIN \cdot R2} VDET - \dfrac{R1}{R3}(VDD - VDET)$

Hysteresis Voltage = $\dfrac{R1}{R3} VDD$

Release Voltage = Detection Voltage + Hysteresis Voltage

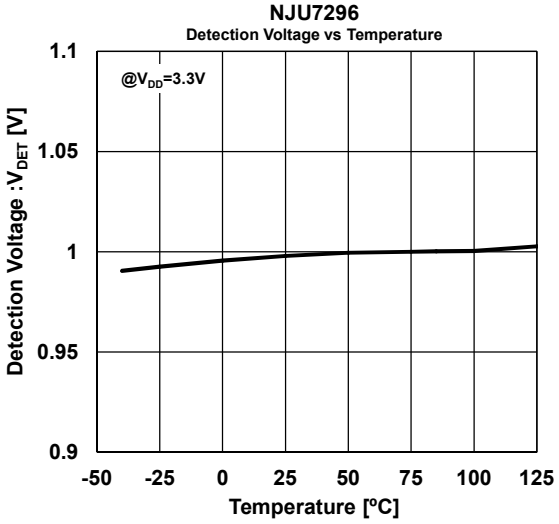
● External input pin

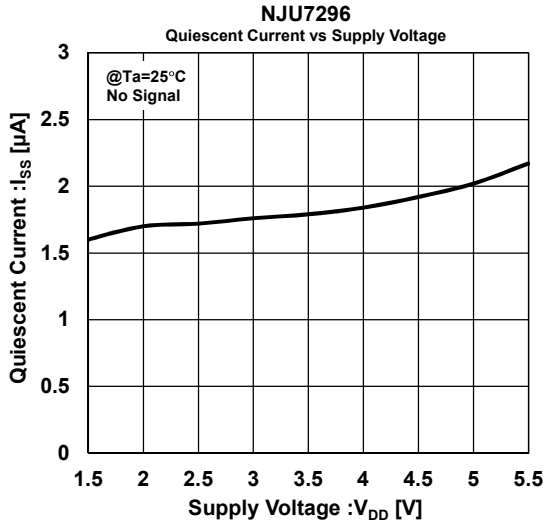
If inputs the logic signal from other power line into the EXT pin, it can be kept the status of the output "Low level" and ignoring the status of detection voltage $V_{DET}$.

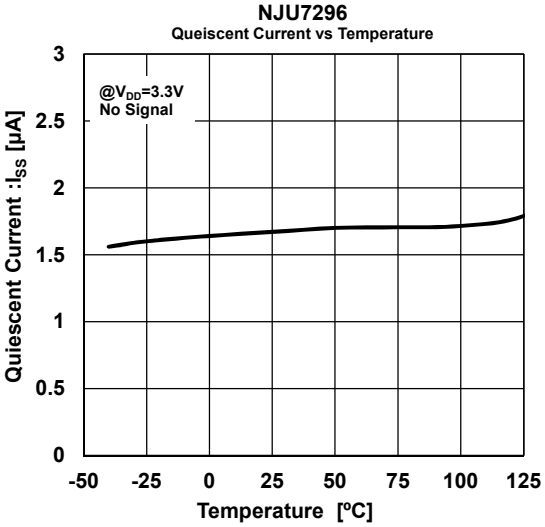
When inputs a low level signal into the EXT pin, $V_{OUT}$ is kept low level. It is useful for manual reset function.

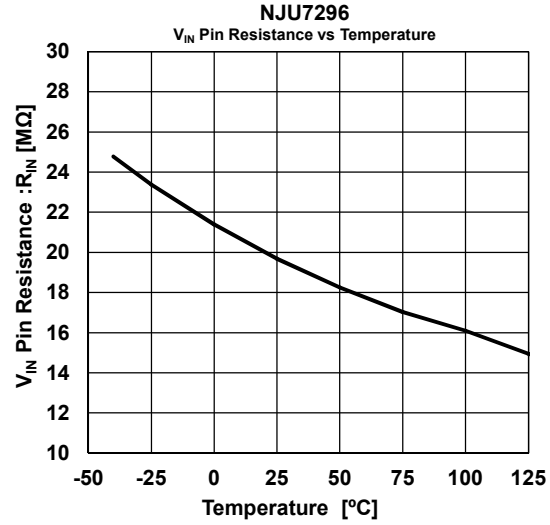
If do not use the External input, the EXT pin should be connected to $V_{DD}$ or Open.

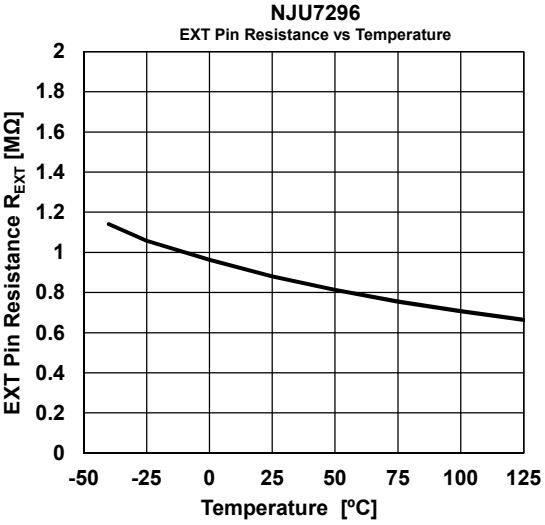
■ TYPICAL CHARACTERISTICS



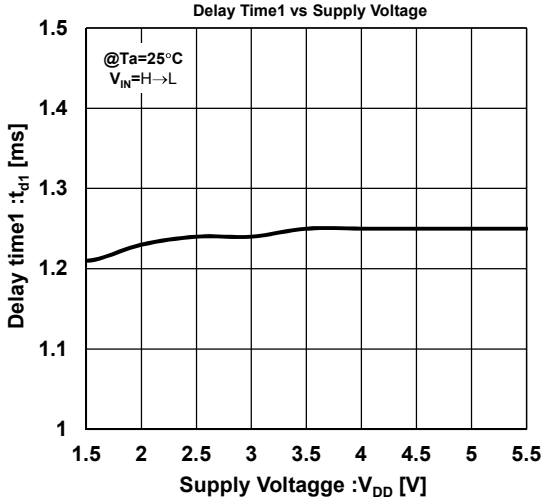



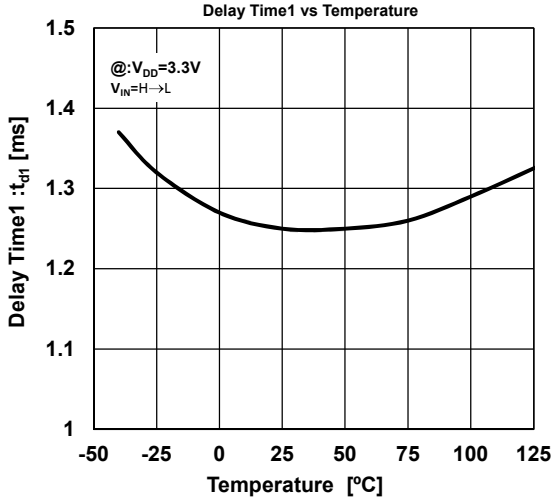



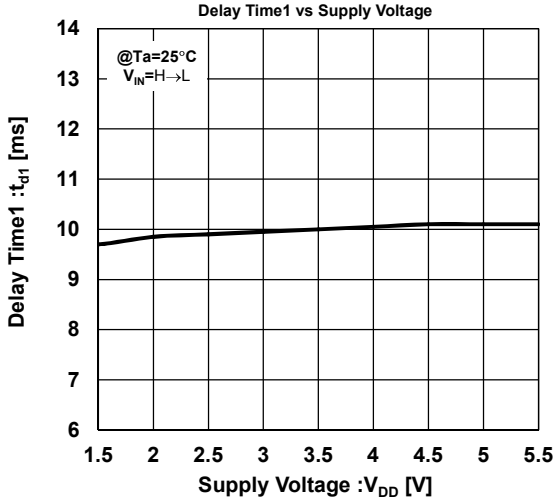
**NJU7296-A**
**Delay Time1 vs Supply Voltage**



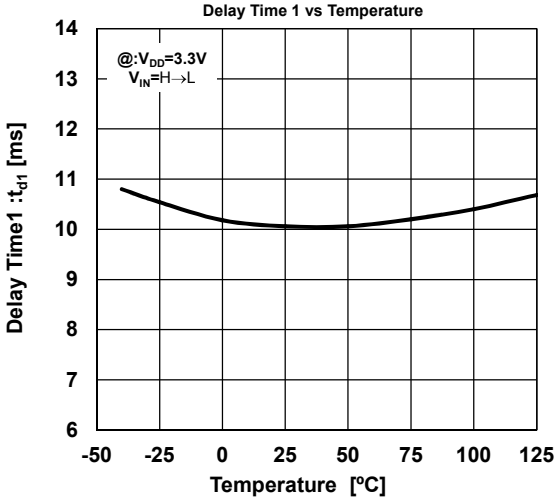

**NJU7296-A**
**Delay Time1 vs Temperature**



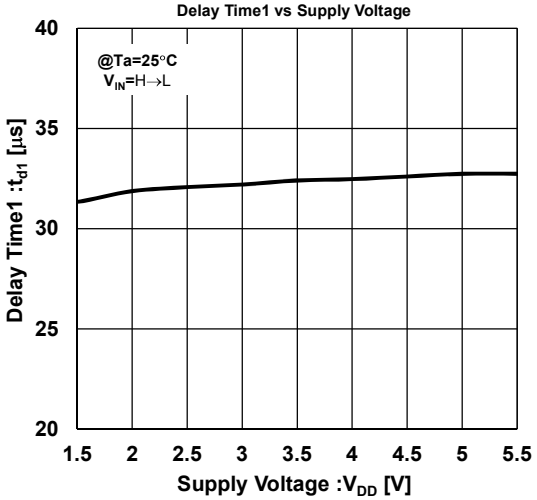

**NJU7296-B/C**
**Delay Time1 vs Supply Voltage**



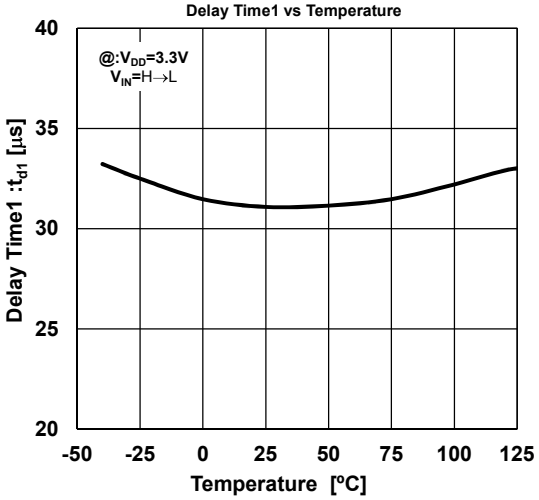

**NJU7296-B/C**
**Delay Time 1 vs Temperature**



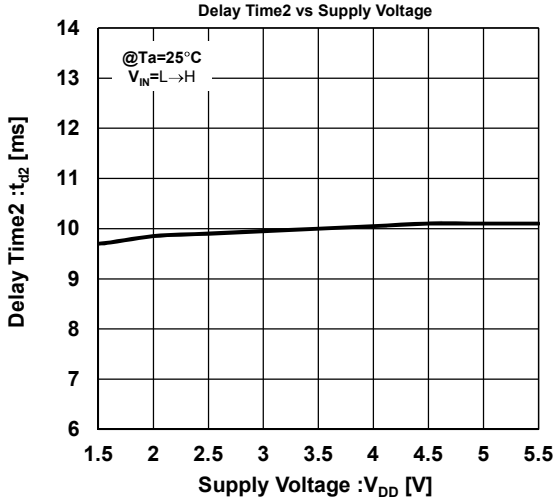

**NJU7296-D**
**Delay Time1 vs Supply Voltage**



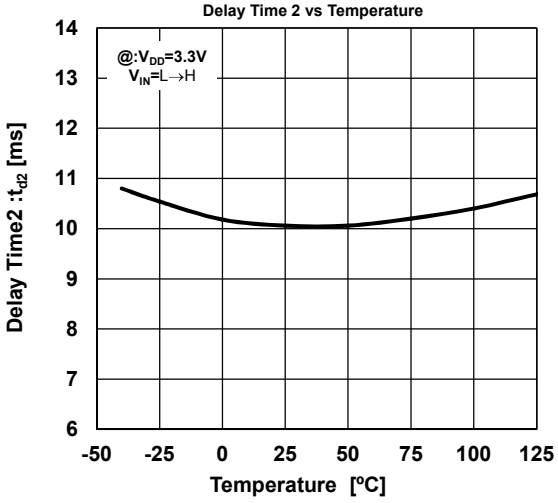

**NJU7296-D**
**Delay Time1 vs Temperature**



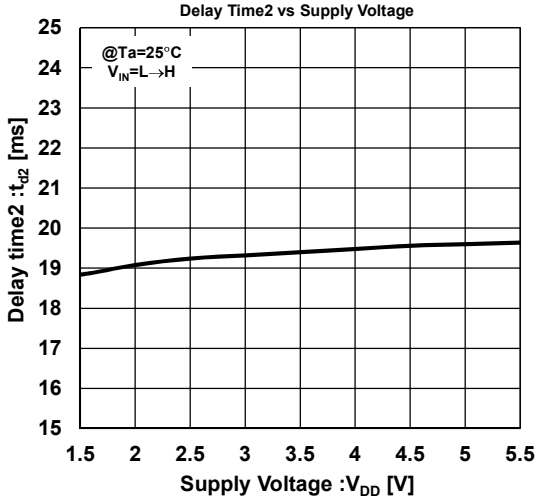
**NJU7296-A/C/D**
**Delay Time2 vs Supply Voltage**



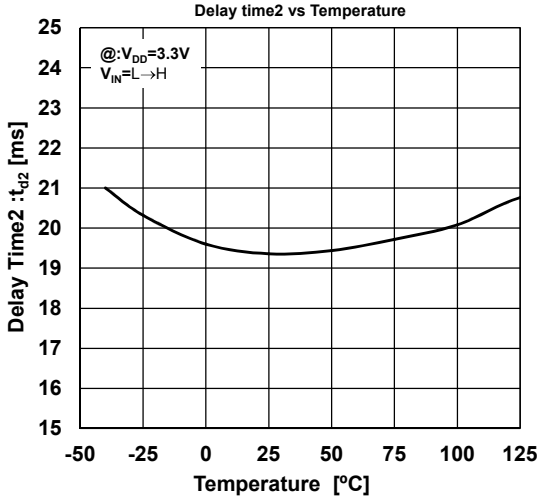

**NJU7296-A/C/D**
**Delay Time 2 vs Temperature**



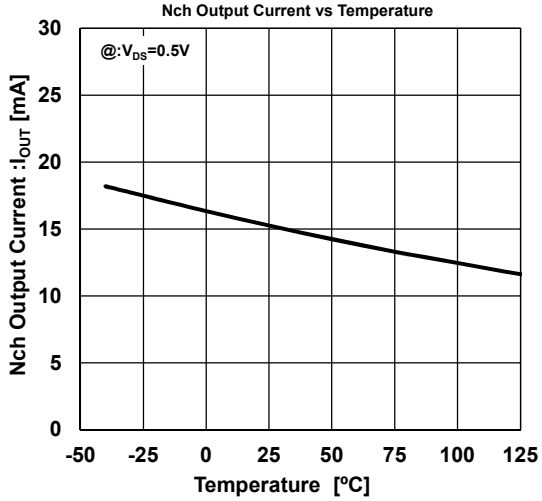

**NJU7296-B**
**Delay Time2 vs Supply Voltage**




**NJU7296-B**
**Delay time2 vs Temperature**




**NJU7296**
**Nch Output Current vs Temperature**




**NJU7296**
**Pch Output Current vs Temperature**