Parallel Input 8-channel Sink Driver with Flip-Flops

■FEATURES

- ●8-channel Parallel Input Parallel Output
- ●Built-in Flip-Flops for latching Input data
- ●Supply Voltage V_{DD}=4.0 to 5.5V
- ●Output Voltage V_{DS}=up to 40V (45V Rating)
- ●Output Current   300mA(DC) / ch.
  - 600mA(Peak) / ch.
- ●Built-in Noise Filter (CLRb Pin)
- ●Protection Circuit   OCP, TSD
- ●Output Slew Rate Control
- ●Operating Temperature   Topr=-40 to 125°C
- ●Package Outline   SDIP22

■GENERAL DESCRIPTION

The NJW4828-A is 8-channel sink driver with 600mA output.

The input circuits have built-in flip-flops, and they can latch the input data signals by using the LP signal as trigger.

The CLRb input has built-in filter for noise immunity.

Supply voltage and input voltage correspond to 5V logic, maximum rating of output voltage is 45V.

The protection circuits have over current protection (OCP) and thermal shutdown (TSD).

Moreover, because it has built-in output slew rate adjustment function, it can be applied as EMI countermeasure.
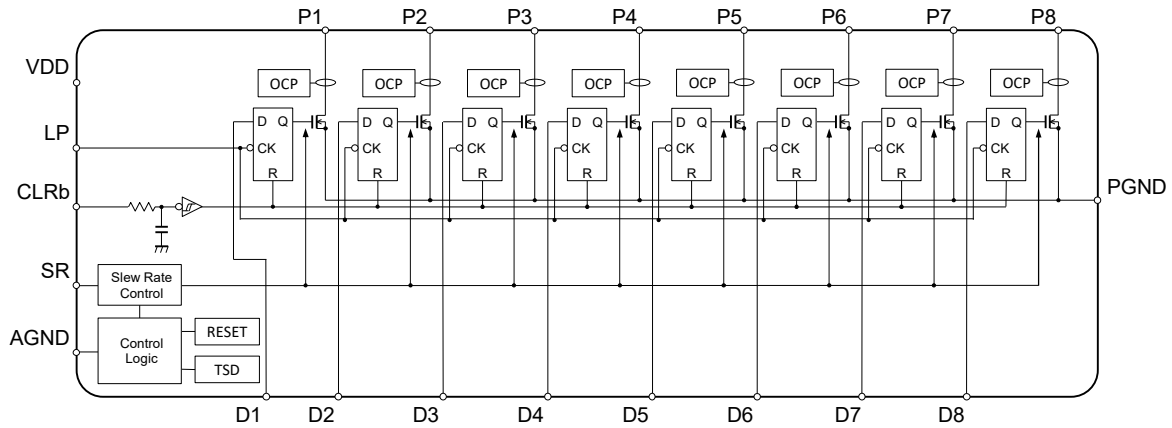
■APPLICATION

LED applications

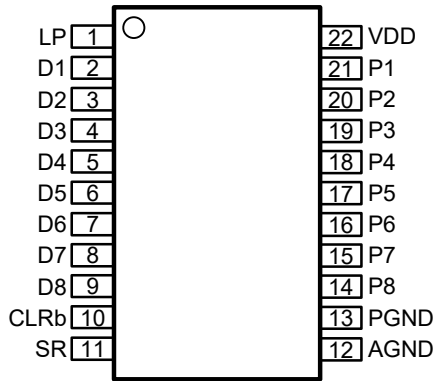Relay and solenoid applications for industrial equipment

■TYPICAL APPLICATION
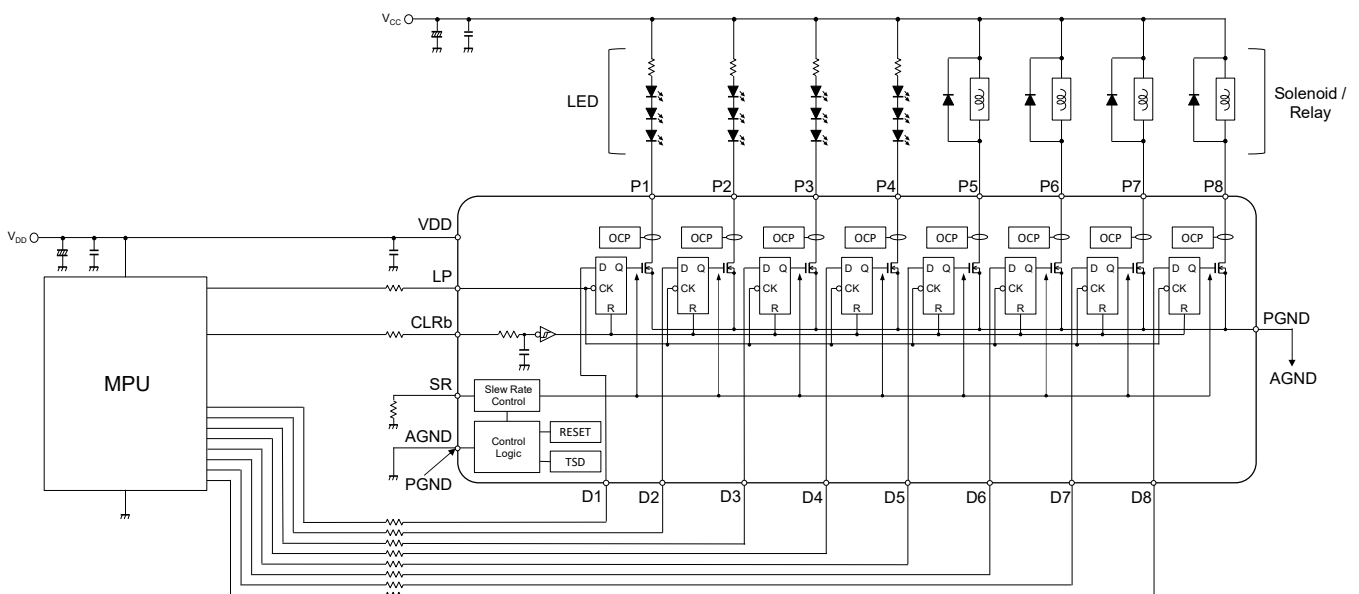
■BLOCK DIAGRAM

■PIN CONFIGURATION

PIN NO.	SYMBOL	I/O	DESCRIPTION
1	LP	I	Latch Signal Input Pin
2	D1	I	Parallel Data Input Pin
3	D2	I	
4	D3	I	
5	D4	I	
6	D5	I	
7	D6	I	
8	D7	I	
9	D8	I	
10	CLRb	I	Clear Signal Input Pin
11	SR	-	Output Slew Rate Setting Pin
12	AGND	-	Control Block Ground Pin
13	PGND	-	Output Block Ground Pin
14	P8	O	Parallel Output Pin
15	P7	O	
16	P6	O	
17	P5	O	
18	P4	O	
19	P3	O	
20	P2	O	
21	P1	O	
22	VDD	-	Power Supply Pin

■**PRODUCT NAME INFORMATION**

NJW4828 L - A

Part Number | Package
L: SDIP22 | Input Block Type
A: Built-in Flip-Flops
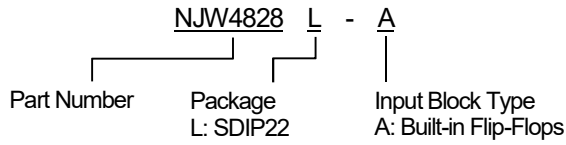
■**ORDERING INFORMATION**

PRODUCT NAME	PACKAGE OUTLINE	RoHS	HALOGEN-FREE	TERMINAL FINISH	MARKING	WEIGHT (mg)	MOQ(pcs)
NJW4828L-A	SDIP22	yes	-	Sn2Bi	NJW4828LA	1080	1000

■**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	RATINGS	UNIT	NOTE
Supply Voltage	V_{DD}	-0.3 to +7	V	VDD Pin
Output Pin Voltage	V_{DS}	-0.3 to +45	V	P1 to P8 Pin
Input Pin Voltage	V_{IN}	-0.3 to V_{DD}	V	D1 to D8, LP, CLRb Pin
Output Current	I_{DS}	600	mA	P1 to P8 Pin
Power Dissipation (Ta=25°C)	P_D	$1.5^{(1)}$	W	
SDIP22		$2.1^{(2)}$		
Junction Temperature Range	Tj	-40 to +150	°C	
Operating Temperature Range	Topr	-40 to +125	°C	
Storage Temperature Range	Tstg	-50 to +150	°C	

(1): Mounted on glass epoxy board. (101.5×114.5×1.6mm: based on EIA/JEDEC standard, 2Layers FR-4)

(2): Mounted on glass epoxy board. (101.5×114.5×1.6mm: NJRC original board, 2Layers FR-4, 2Layer side Cu area 99.5×99.5mm)

■**RECOMMENDED OPERATING CONDITIONS**

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	4.0 to 5.5	V
Output Pin Voltage	V_{DS}	0 to 40	V
Output Current[3]	I_{DS}	0 to 300	mA

(3): Caution that the total power consumption of P1 to P8 does not exceed the power dissipation of rating.

■**ELECTRICAL CHARACTERISTICS (DC Parameter)**   (Unless otherwise noted, V_{DD}=5V, R_{SR}=500kΩ, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current 1	I_{Q1}	All outputs OFF	-	1.4	2.8	mA
Quiescent Current 2	I_{Q2}	All outputs ON	-	1.6	3.2	mA
H level Input Voltage	V_{IH}	LP, CLRb, D1 to D8 Pin	$0.7V_{DD}$	-	V_{DD}	V
L level Input Voltage	V_{IL}	LP, CLRb, D1 to D8 Pin	0	-	$0.3V_{DD}$	V
H level Input Current	I_{IH}	V_{DD}=5.5V, V_{IN}=5.5V, LP, CLRb, D1 to D8 Pin	-	-	1	µA
L level Input Current	I_{IL}	V_{DD}=5.5V, V_{IN}=0V, LP, CLRb, D1 to D8 Pin	-	-	1	µA
Output ON Resistance	R_{ON_P}	V_{SR}=0V, I_{DS}=100mA, P1 to P8 Pin	-	0.9	2.7	Ω
Maximum Output Current	I_{DMAX_P}	V_{SR}=0V, P1 to P8 Pin	600	-	-	mA
Output Leak Current	I_{LEAK_P}	V_{DS}=40V, P1 to P8 Pin	-	-	1	µA
Thermal Shutdown Operating Temperature	T_{TSD_DET}		-	170	-	°C
Thermal Shutdown Recovery Temperature	T_{TSD_REV}		-	150	-	°C

■**ELECTRICAL CHARACTERISTICS (Switching Parameter)**

(Unless otherwise noted, V_{DD}=5V, V_{CC}=24V, CL=30pF(P-PGND), R_L=240Ω(P-V_{CC}), Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output "H-L" Transition Time	t_{THL}	R_{SR}=500kΩ	-	2.5	-	µs
Output "L-H" Transition Time	t_{TLH}	R_{SR}=500kΩ	-	1.8	-	µs
Output "H-L" Propagation Delay Time (LP-P)	t_{pdHL_LP}	V_{SR}=0V	-	0.2	-	µs
Output "L-H" Propagation Delay Time (LP-P)	t_{pdLH_LP}	V_{SR}=0V	-	0.9	-	µs
D Setup Time for LP	t_{SU_D}		30	-	-	ns
D Hold Time for LP	t_{HD_D}		15	-	-	ns
LP "H" Pulse Width	t_{W_LP}		90	-	-	ns
CLRb "L" Pulse Width	t_{W_CLRb}		5	-	-	µs

■**THERMAL CHARACTERISTICS**

PARAMETER	SYMBOL	VALUE	UNIT
Junction to ambient thermal resistance	θja	83[4] 59[5]	°C/W
Junction to top of package characterization parameter	ψjt	23[4] 22[5]	°C/W

(4): Mounted on glass epoxy board. (101.5×114.5×1.6mm: based on EIA/JEDEC standard, 2Layers FR-4)

(5): Mounted on glass epoxy board. (101.5×114.5×1.6mm: NJRC original board, 2Layers FR-4, 2Layer side Cu area 99.5×99.5mm)

■APPLICATION NOTE / GLOSSARY

●Truth Table

INPUT			P OUTPUT (with pull-up resistor)	OPERATION
CLRb	LP	D		
L	X	X	All OFF (H)	Reset all data of the input circuit and protection circuit
H	↑	L	OFF (H)	Set "L" to the input latch circuit
	↑	H	ON (L)	Set "H" to the input latch circuit
	↓	X	P0	Input data can't be imported

↑ : Change from "L" to "H"   H : High Level   X : Don't Care

↓ : Change from "H" to "L"   L : Low Level

P0 : The P output level just before input condition in the above table

●Timing Chart / Timing Definition
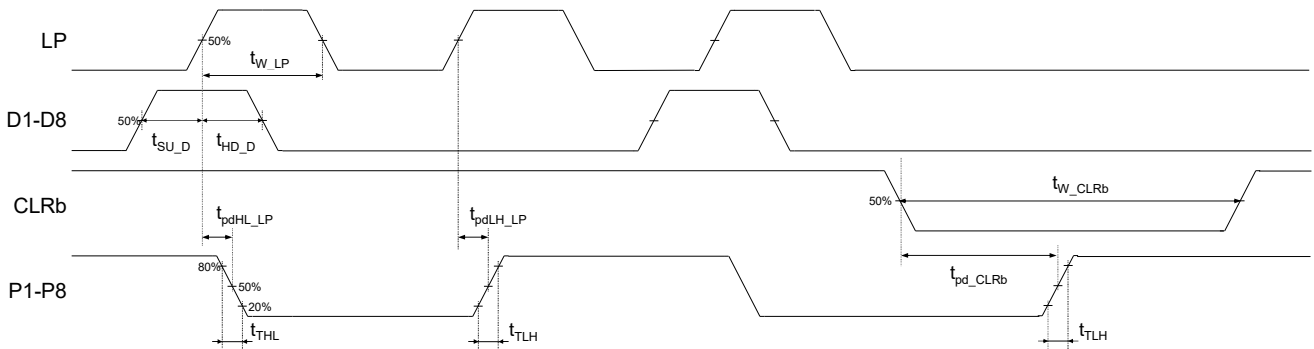
●Over Current Protection Circuit (OCP)

Overcurrent detection operates for each P1 - P8 output.

When overcurrent is detected, the corresponding P output is turned OFF.

After overcurrent is detected, when data is reset or passage of internal recovery time(10μs typ.), it returns to normal operation.

In the condition of the P output is already overcurrent detected and turned off, if another P output is detected continuously, all the recovery timing of the corresponding P outputs will be all taken over.
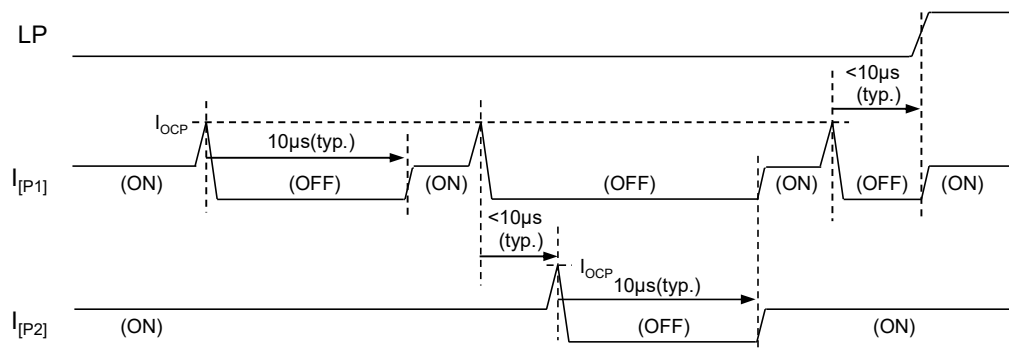
●Thermal Shutdown Circuit (TSD)

When the junction temperature inside the IC exceeds T_{TSD_DET}, all P outputs are turned OFF.

When the internal junction temperature drops to T_{TSD_REV} or less, it returns to normal operation state.

Input signals other than CLRb are not accepted while the thermal shutdown circuit is operating.

●Power ON Reset Function

The power supply pin has built-in power on reset function.

When the V_{DD} voltage below V_{DPOR} (typ.), all outputs are turned off and all internal states are initialized.

When the V_{DD} voltage exceeds V_{RPOR} (typ.), it operates normally, but the V_{DD} voltage should be used within the recommended operating voltage range (V_{DD}=4.0V to 5.5V)
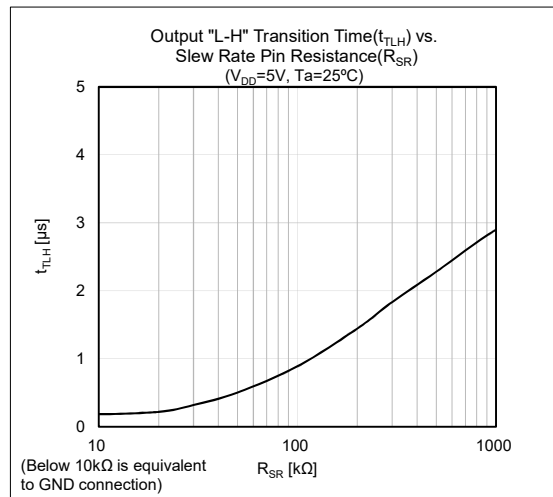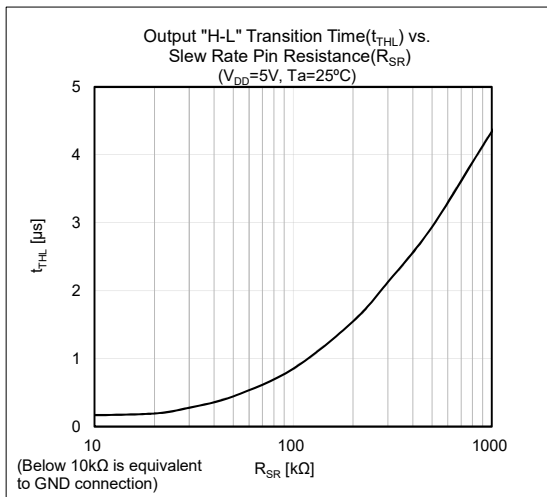
Power ON Reset Detection Voltage(V_{DPOR}),
Recovery Voltage(V_{RPOR}) vs. Junction Temperature(Tj)
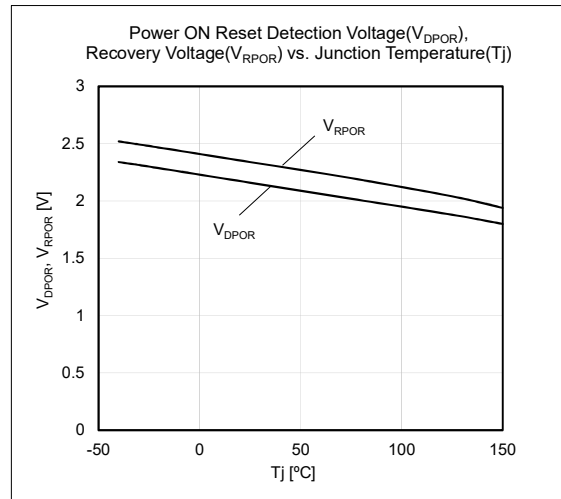
●Output Slew Rate Setting Function (SR Pin)

The SR function can set the rise time and fall time of the gate voltage of the output FETs by connecting a pull-down resistor to the SR pin.

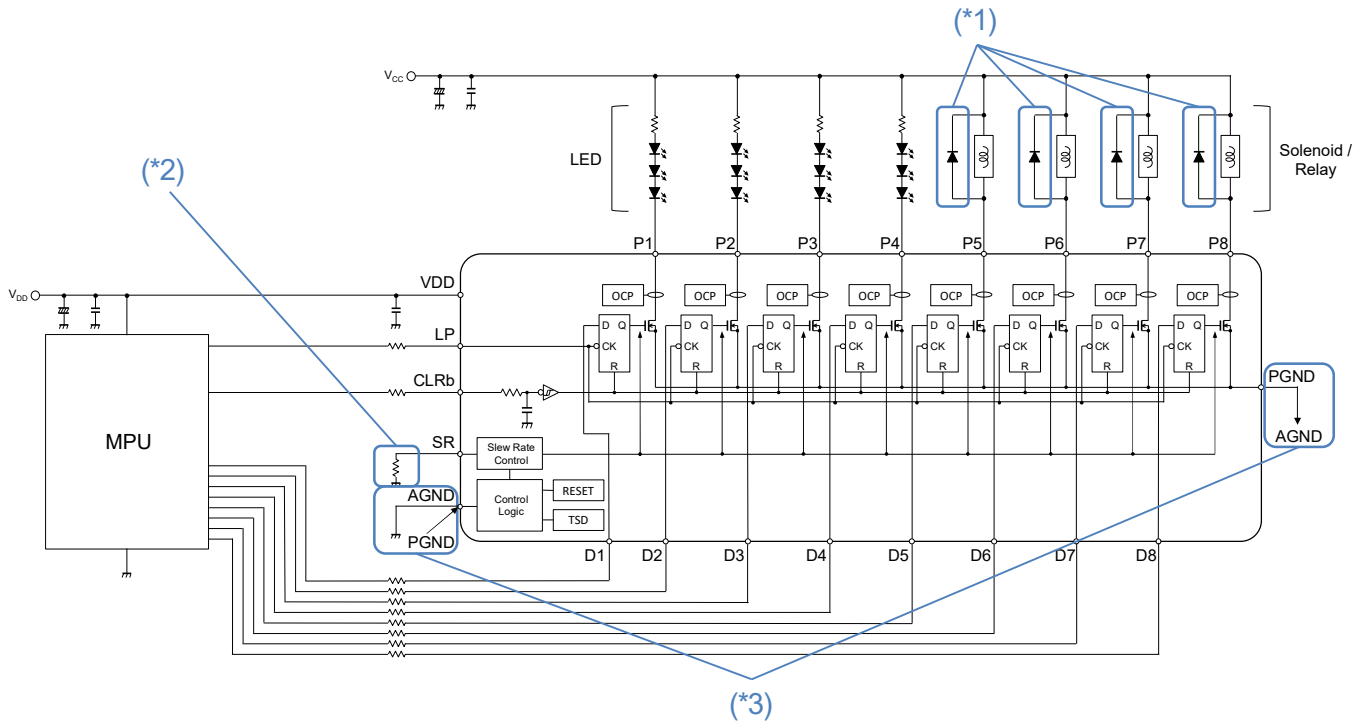The pull-down resistance can be set from 0 Ω (connected to AGND) to 1M Ω. It should not be open.

When this function is not used, connect the SR pin to AGND.

Output "H-L" Transition Time(t_{THL}) vs.
Slew Rate Pin Resistance(R_{SR})
(V_{DD}=5V, Ta=25ºC)

(Below 10kΩ is equivalent to GND connection)

Output "L-H" Transition Time(t_{TLH}) vs.
Slew Rate Pin Resistance(R_{SR})
(V_{DD}=5V, Ta=25ºC)

(Below 10kΩ is equivalent to GND connection)

●Power Dissipation vs. Ambient Temperature

NJW4828L-A P_D vs. Ta
(Topr=-40 to +125ºC, Tj=150ºC)

Mounted on 2Layers board
(FR-4 101.5×114.5×1.6mm, 2Layer side Cu area: 99.5×99.5mm)

Mounted on 2Layers board
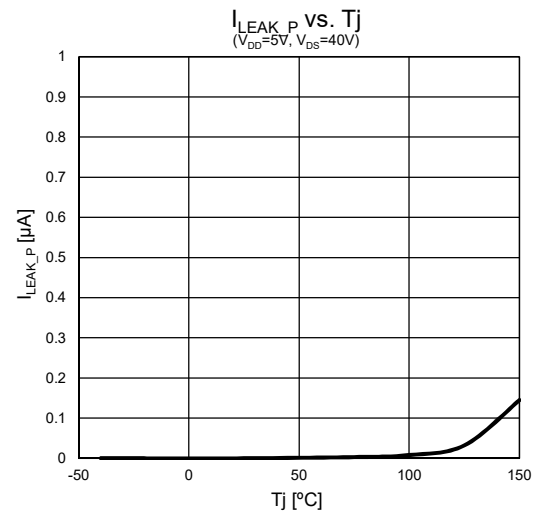(FR-4 101.5×114.5×1.6mm)
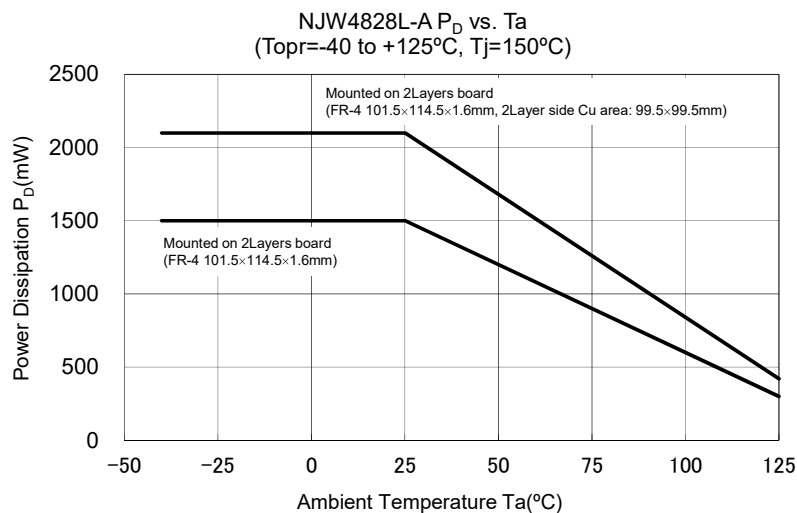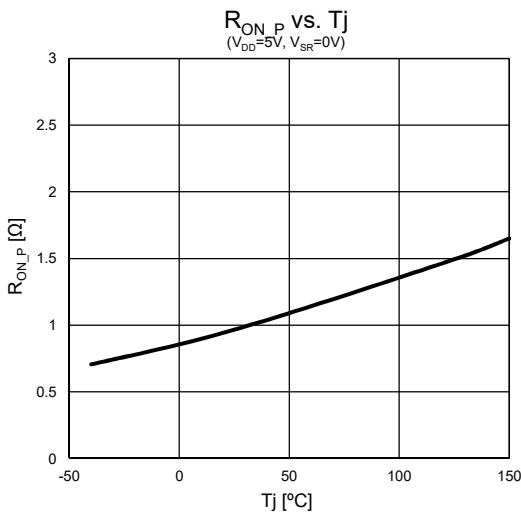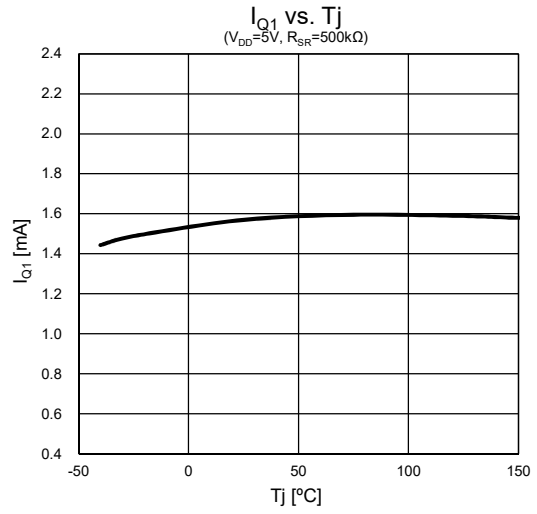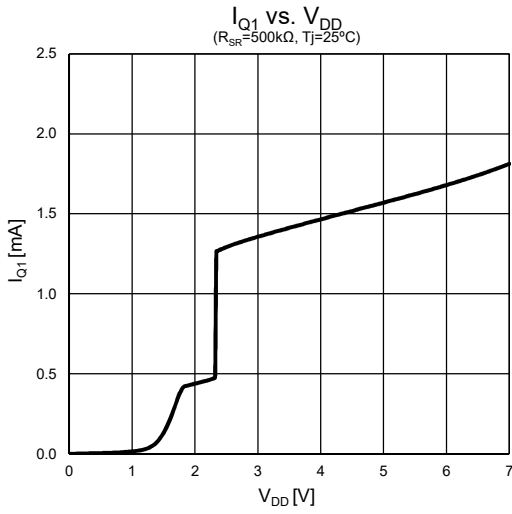
■TYPICAL APPLICATION

(*1): The output pins don't have clamp circuits.
Therefore, when driving inductive loads such as solenoids and relays, connect a diode to the outside and secure path of recirculation current at turn-off.
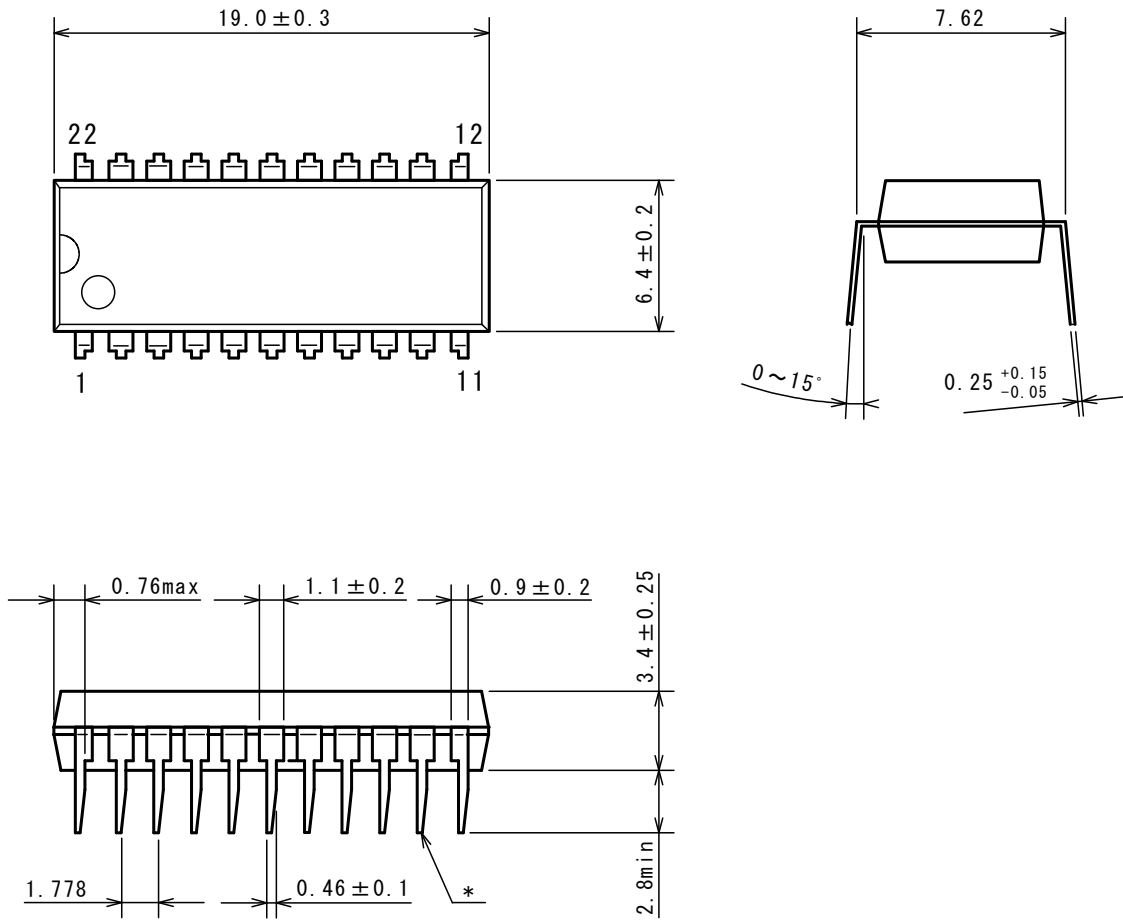
(*2): When SR function is not used, connect the SR pin to AGND and it should not be open.

(*3): It should be wired the board so that there is no potential difference between AGND and PGND.

■**TYPICAL CHARACTERISTICS**

I_{Q1} vs. V_{DD}
(R_{SR}=500kΩ, Tj=25ºC)

I_{Q1} vs. Tj
(V_{DD}=5V, R_{SR}=500kΩ)

R_{ON_P} vs. Tj
(V_{DD}=5V, V_{SR}=0V)

I_{LEAK_P} vs. Tj
(V_{DD}=5V, V_{DS}=40V)

I_{OCP} vs. V_{DD}
(V_{SR}=0V, Tj=25ºC)

I_{OCP} vs. Tj
(V_{DD}=5V, V_{SR}=0V)

NJW4828-A

SDIP22

Unit: mm
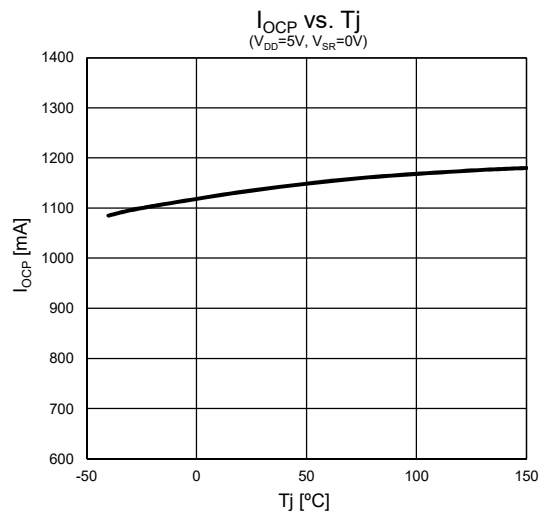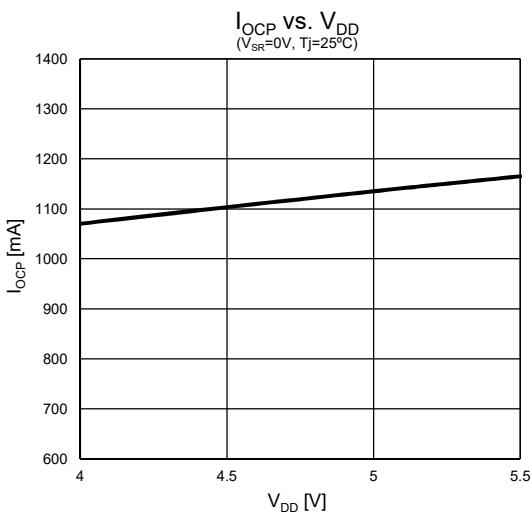
■PACKAGE DIMENSIONS

*There are device mixed with taper on the right and the left.

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■PACKING SPEC

Unit: mm

STICK STATE

Stick (Max. 25pcs)
Material: PVC
Stopper: Stick pin

Cross section

13.2

10.6

5.0

494

5.0
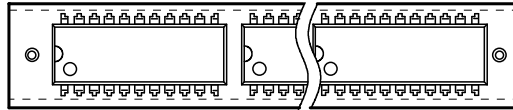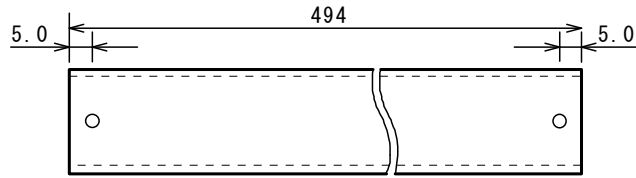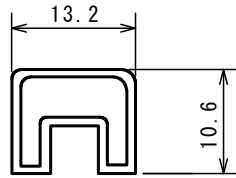
Direction of 1pin.

PACKING STATE

Label
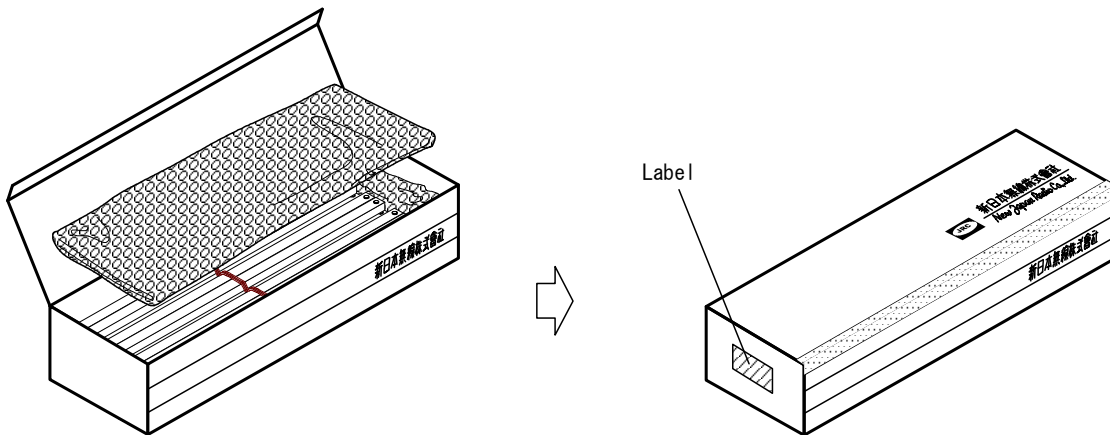
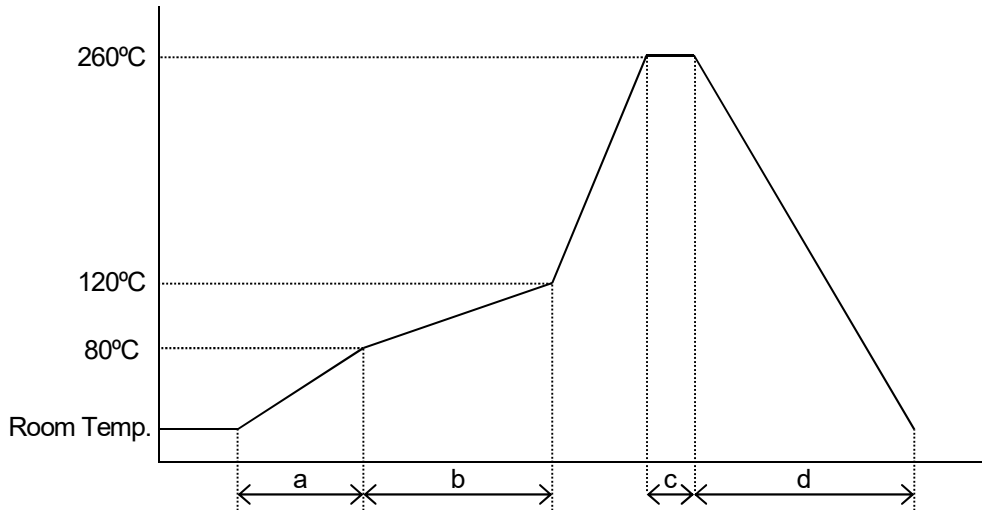■**RECOMMENDED MOUNTING METHOD**

FLOW SOLDERING METHOD

*flow soldering procedure

a : Temperature ramping rate   : 1 to 7ºC/s
b : Pre-heating temperature   : 80 to 120ºC
    Pre-heating time   : 60 to 120s
c : Peak temperature   : not exceeding 260ºC
    Peak time   : within 10s
d : Temperature ramping rate   : 1 to 7ºC/s

The temperature indicates at the lead terminal.

■REVISION HISTORY

Date	Revision	Changes
05.Jan.2018	Ver.1.0	New Release
21.Jun.2018	Ver.1.1	Corrected of GENERAL DESCRIPTION, APPLICATION NOTE (Power ON Reset Function) and ELECTRICAL CHARACTERISTICS (Test conditions of Output ON Resistance and Maximum Output Current).
23.Jul.2018	Ver.1.2	Corrected of APPLICATION NOTE (Truth Table)

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