

NB7400GH Series

2 to 4 Serial Cell Li-ion or Li-polymer Battery Protection IC for Secondary Protection

FEATURES

High Voltage Tolerant Process

Absolute maximum ratings:	32 V
Low Supply Current	
Normal operation (Cell voltage: 4.15 V, 4 cells):	Typ. 2.5 μ A
Shutdown (Standby):	Max. 0.2 μ A

High-accuracy Voltage Detection for Cell n

(where n = 1 to 4)

Overcharge detection voltage (V_{DET1n}) and accuracy:
 4.20 V to 4.85 V,
 ± 0.020 V ($T_a = 25^\circ\text{C}$)
 ± 0.025 V ($0^\circ\text{C} < T_a < 60^\circ\text{C}$)

Overcharge detection delay time with delay time shortening ⁽¹⁾: 2-, 4-, or 6-sec

Overcharge release voltage (V_{REL1n}):
 $V_{DET1n} - 0$ V to $V_{DET1n} - 0.4$ V

Overcharge release voltage condition:
 Voltage Release type

Output Voltage

VROUT (built-in voltage regulator) pin output voltage (V_{VROUT}) and accuracy: 1.5 V to 3.3 V, $\pm 2\%$

COUT pin (CMOS output, active-high) output voltage:
 Typ. 4.7 V

Shutdown Function

Shutdown detection voltage (V_{SHTDn}) and accuracy:
 2.0 V ⁽²⁾ to 3.0 V, ± 0.05 V

Shutdown detection voltage delay time:
 2-, 4-, or 6-sec

Shutdown release voltage (V_{SHTRn}): $V_{SHTDn} + 0.2$ V

Selectable Overcharge Timer Reset Delay

⁽¹⁾ The delay time can be reduced down to approx. 1/80 by applying a voltage of 4 V \pm 0.2 V to the VDD – VC1 pins.

⁽²⁾ $V_{SHTD2} \geq 2.3$ V, only when two cells connected in series.

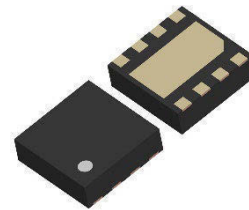
APPLICATIONS

Li-ion or Li-polymer Battery Protection

GENERAL DESCRIPTION

The NB7400GH is an overcharge protection IC for 2 to 4 serial cell Li-ion or Li-polymer secondary battery.

The NB7400GH provides high-accuracy voltage detection circuits, a delay circuit, and a voltage regulator for an external real-time clock (RTC). It also comes with the shut-down detection circuit that reduces the supply current to a minimum.

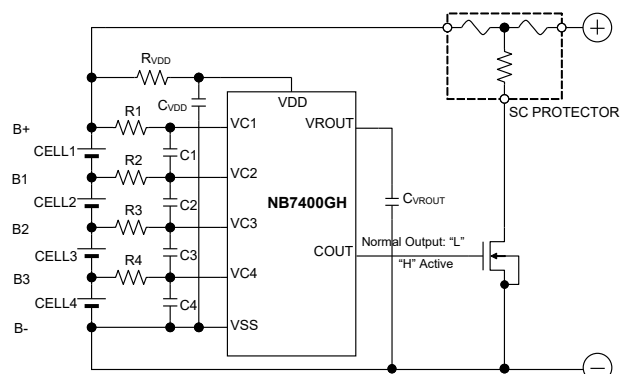


DFN(PL)2020-8-GH

2.0 x 2.0 x 0.6 ^{*1} [mm]

^{*1} Maximum thickness

TYPICAL APPLICATION CIRCUIT



Note: Connect the pins in the following order: B-, B3, B2, B1, and B+.

4-cell Protection Circuit

PRODUCT NAME INFORMATION

NB7400 GH *** * * E4 S
aa bbb c d ee f

Description of configuration

Composition	Item	Description
aa	Package	Indicates the package code.
bbb	Specific Option	Indicates a three-digit number code that combined set voltages. Refer to the table of set voltages for details.
c		Indicates a delay time code. Refer to the table of delay times for details.
d		Indicates a function code. Refer to the table of functions for details.
ee	Packing	Indicates the taping code of the package. Refer to Packing Specification in the appendix Package Information for details.
f	Grade	Indicates the quality grade. S: Standard Refer to the table of grade for details.

Note: For mass-produced products, refer to the Appendix "Product Code List".

Table of set voltage (bbb)

Code	V _{DET1n}	V _{REL1n}	V _{SHTDn}	V _{ROUT}
Voltage Range [V] (Step)	4.200 to 4.850 (0.005)	V _{DET1n} - 0 to V _{DET1n} - 0.04 (0.050)	2.0 to 3.0 (0.100)	1.5 to 3.3 (0.1)

n = 1, 2, 3, 4

Table of delay times (c)

Code	t _{VDET1} [s]	t _{VREL1} [ms]	t _{VSHTD} [s]	t _{TR} [ms]
Time	2 / 4 / 6	16	2 / 4 / 6	6
A	2	16	2	6
B	4	16	2	6
C	6	16	2	6
D	2	16	4	6
E	4	16	4	6
F	6	16	4	6
G	2	16	6	6
H	4	16	6	6
J	6	16	6	6

* The K code has fixed delay times as a special setting code.

K	1.5	12	4.5	4.5
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Table of functions (d)

Function	Timer Reset Delay Time
Type / Condition	Enabled / Disabled
A	Disabled
B	Enabled

Table of grade (f)

	Applications	Operating Temperature Range	Test Temperature
S	General-purpose and Consumer application	-40°C to 85°C	25°C

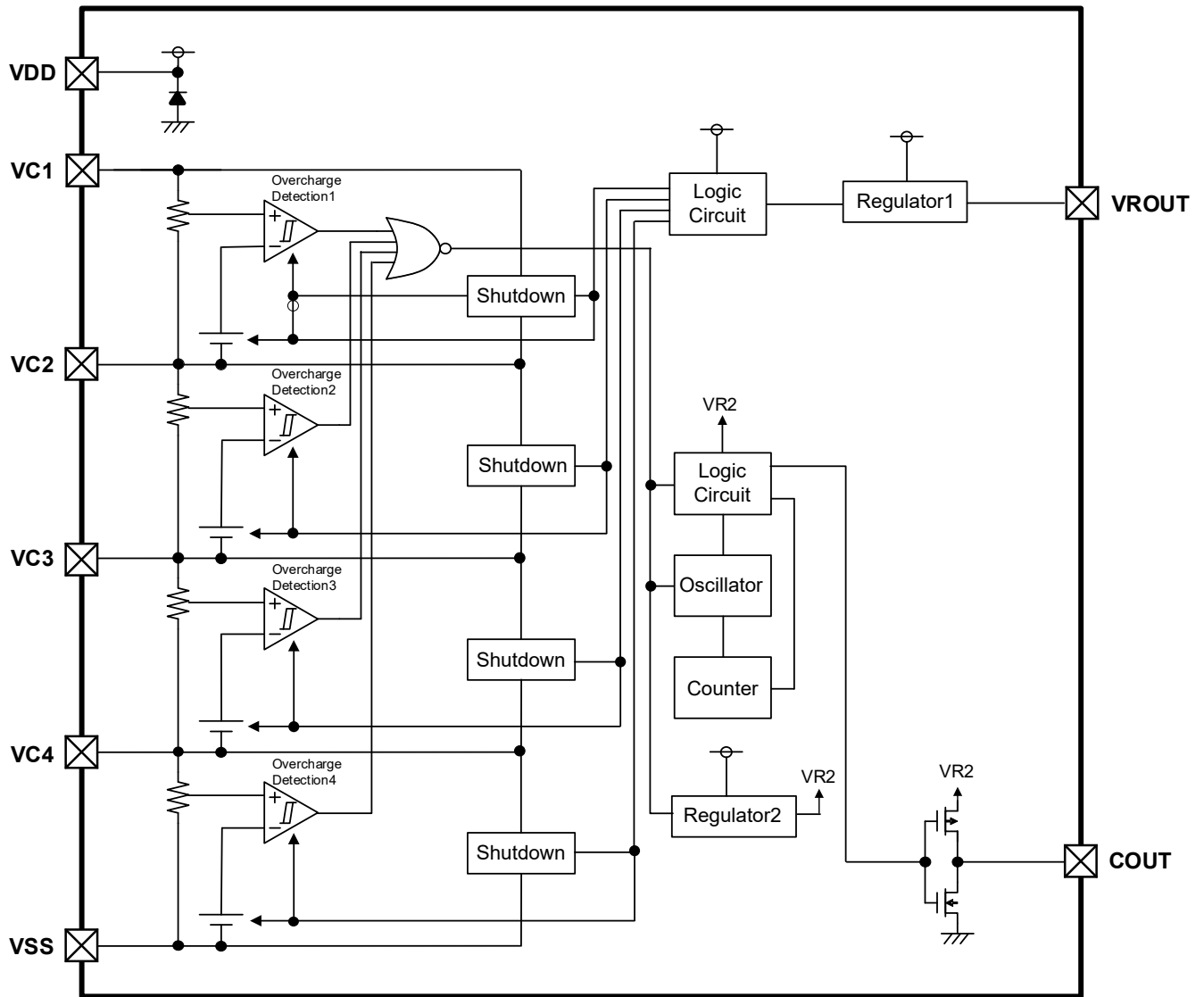
ORDER INFORMATION

For the orderable products, please refer to the Appendix "Product Code List" for more information.

Product Name	Package	RoHS	Halogen-Free	Plating Composition	Weight (mg)	Quantity (pcs/reel)
NB7400GH *****E4S	DFN(PL)2020-8-GH	Yes	Yes	Au	6	5,000

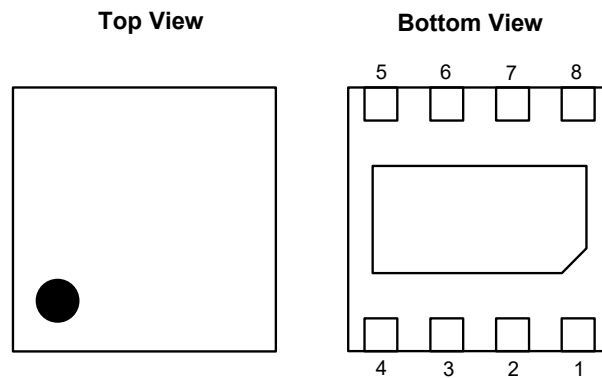
Note: Contact our sales representatives for other specific option code (indicated with five asterisks).

BLOCK DIAGRAM



NB7400GH Block Diagram

PIN DESCRIPTIONS



NB7400GH (DFN(PL)2020-8-GH) Pin Configuration

Pin No.	Pin Name	I/O	Description
1	VDD	I	Power supply pin, the substrate level of the IC
2	VC1	I	Cell1 plus input pin
3	VC2	I	Cell2 plus input pin
4	VC3	I	Cell3 plus input pin
5	VC4	I	Cell4 plus input pin
6	VSS	-	Ground pin for the IC
7	COU	O	Overcharge detection output pin, CMOS output
8	VR	O	Voltage output pin for built-in regulator

I = Input, O = Output

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Unit
Supply Voltage	V_{DD}	$V_{VC1} - 0.3$ to $V_{VC1} + 6.5$ - 0.3 to 32	V
VC1 (CELL1 Plus) Pin Input Voltage	V_{VC1}	$V_{VC2} - 0.3$ to $V_{VC2} + 6.5$	V
VC2 (CELL2 Plus) Pin Input Voltage	V_{VC2}	$V_{VC3} - 0.3$ to $V_{VC3} + 6.5$	V
VC3 (CELL3 Plus) Pin Input Voltage	V_{VC3}	$V_{VC4} - 0.3$ to $V_{VC4} + 6.5$	V
VC4 (CELL4 Plus) Pin Input Voltage	V_{VC4}	-0.3 to 6.5	V
COOUT Pin Output Voltage	V_{COOUT}	-0.3 to $V_{COH1} + 0.3$	V
VROUT Pin Output Voltage	V_{OUT}	-0.3 to 6.5	V
VROUT Pin Output Current	I_{OUT}	3	mA
Junction Temperature Range *1	T_j	-40 to 125	°C
Storage Temperature Range	T_{stg}	-55 to 125	°C

*1 Calculate the power consumption of the IC from the operating conditions and calculate the junction temperature with the thermal resistance.

Please refer to the chapter of "THERMAL CHARACTERISTICS" below for thermal resistance under our measured substrate conditions.

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause permanent damage and may degrade the lifetime and safety for both device and system using the device in the field. The functional operation at or over these absolute maximum ratings is not assured.

THERMAL CHARACTERISTICS

Package	Parameter	Measurement Result	Unit
DFN(PL)2020-8-GH	Thermal Resistance (θ_{ja})	53	°C / W
	Thermal Characterization Parameter (ψ_{jt})	27	

θ_{ja} : Junction-to-Ambient Thermal Resistance

ψ_{jt} : Junction-to-Top Thermal Characterization Parameter

For more information [here](#).

ELECTROSTATIC DISCHARGE (ESD) PROTECTION VOLTAGE

	Condition	Rating	Unit
HBM (Human Body Model)	C = 100 pF, R = 1.5 k Ω	± 2000	V
CDM (Charged Device Model)	Field Included CDM (FI-CDM)	± 1000	V

ELECTROSTATIC DISCHARGE RATINGS

The electrostatic discharge test is done based on JEDEC JS001, JS002.

RECOMMENDED OPERATING CONDITIONS

	Symbol	Rating	Unit
VDD Pin Operating Voltage	V_{OPE}	4.0 to 25 / $V_{VC1} + 5.0$	V
VC4 (CELL4 Plus) Pin Operating Voltage	V_{OPEVC4}	1.5 to 5.0	V
Operating Temperature Range	T_a	-40 to 85	°C

RECOMMENDED OPERATING CONDITIONS

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

ELECTRICAL CHARACTERISTICS

V_{CELLn} = CELLn voltage, n number of cells where n = 1 to 4, voltages stated at $T_a = 25^\circ\text{C}$, unless otherwise noted.

*1 Ex. V_{CELL1} is a voltage difference between VC1 and VC2.

NB7400GH Electrical Characteristics

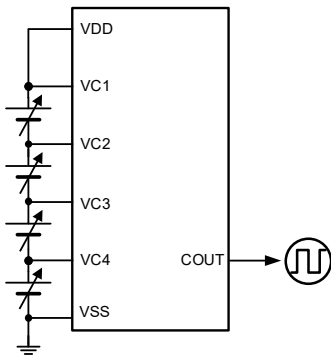
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
CELLn Overcharge Detection Voltage	V_{DET1n}	CELLn rising edge $T_a = 25^\circ\text{C}$ $0^\circ\text{C} \leq T_a \leq 60^\circ\text{C}$	$V_{DET1n} - 0.020$	V_{DET1n}	$V_{DET1n} + 0.020$	V
			$V_{DET1n} - 0.025$	V_{DET1n}	$V_{DET1n} + 0.025$	V
CELLn Overcharge Release Voltage	V_{REL1n}	CELLn falling edge	$V_{REL1n} - 0.050$	V_{REL1n}	$V_{REL1n} + 0.050$	V
Overcharge Detection Delay Time	t_{VDET1}	$V_{CELLn} = 4.15\text{ V}$ (n = 2, 3, 4), $V_{CELL1} = 4.15\text{ V} \rightarrow 4.9\text{ V}$	$t_{VDET1} \times 0.8$	t_{VDET1}	$t_{VDET1} \times 1.2$	s
Overcharge Release Delay Time	t_{VREL1}	$V_{CELLn} = V_{REL1n} - 0.20\text{ V}$ (n = 2,3,4), $V_{CELL1} = 4.9\text{ V} \rightarrow V_{REL1n} - 0.20\text{ V}$	$t_{VREL1} \times 0.8$	t_{VREL1}	$t_{VREL1} \times 1.2$	ms
Overcharge Timer Reset Delay Time (when the Timer Reset Delay function is enabled)	t_{TR}	$V_{CELLn} = V_{DET1n} + 0.05\text{ V} \rightarrow V_{REL1n} - 0.10\text{ V}$ $\rightarrow V_{DET1n} + 0.05\text{ V} \rightarrow V_{REL1n} - 0.10\text{ V}$ $t_{TR} = 6.0\text{ ms}$ $t_{TR} = 4.5\text{ ms}$	2	6	10	ms
			1.5	4.5	7.5	ms
CELLn Shutdown Detection Voltage	V_{SHTDn}	CELLn falling edge	$V_{SHTDn} - 0.050$	V_{SHTDn}	$V_{SHTDn} + 0.050$	V
CELLn Shutdown Release Voltage	V_{SHTRn}	CELLn rising edge	$V_{SHTRn} - 0.1$	$V_{SHTDn} + 0.2$	$V_{SHTRn} + 0.1$	V
Shutdown Detection Delay Time	t_{VSHTD}	$V_{CELLn} = 3.5\text{ V}$ (n = 2, 3, 4), $V_{CELL1} = 3.5\text{ V} \rightarrow V_{SHTDn} - 0.2\text{ V}$	$t_{VSHTD} \times 0.8$	t_{VSHTD}	$t_{VSHTD} \times 1.2$	s
Shutdown Release Delay Time	t_{VSHTR}	$V_{CELLn} = 3.5\text{ V}$ (n = 2, 3, 4), $V_{CELL1} = V_{SHTDn} - 0.2\text{ V} \rightarrow 3.5\text{ V}$	0.5	2.0	5.5	ms
COUt Pin Output Low Voltage	V_{COL}	$I_{COL} = 50\text{ }\mu\text{A}$, $V_{CELLn} = 4.15\text{ V}$	-	0.1	0.5	V
COUt Pin Output High Voltage 1	V_{COH1}	$I_{COH1} = 0\text{ }\mu\text{A}$, $V_{CELLn} = 4.9\text{ V}$	4.0	4.7	5.4	V
COUt Pin Output High Voltage 2	V_{COH2}	$I_{COH2} = -50\text{ }\mu\text{A}$, $V_{CELLn} = 4.9\text{ V}$	$V_{COH1} - 0.5$	$V_{COH1} - 0.1$	-	V
Shutdown Current	I_{SHT}	$V_{CELLn} = V_{SHTDn} - 0.2$	-	-	0.2	μA
Supply Current	I_{DD}	2-serial cell: $V_{CELL1} = V_{CELL2} = 0\text{ V}$, $V_{CELLn} = 4.15\text{ V}$ (n = 3, 4) 3-serial cell: $V_{CELL1} = 0\text{ V}$, $V_{CELLn} = 4.15\text{ V}$ (n = 2, 3, 4) 4-serial cell: $V_{CELLn} = 4.15\text{ V}$ (n = 1, 2, 3, 4)	-	3.0	7.5	μA
			-	3.0	7.5	μA
			-	2.5	6.0	μA
VDD Pin Current	I_{VDD}	$V_{CELLn} = 4.15\text{ V}$	-	2.4	5.2	μA
VC1 Pin Current	I_{VC1}	$V_{CELLn} = 4.15\text{ V}$	-	1.6	2.8	μA
VC2 Pin Current	I_{VC2}	$V_{CELLn} = 4.15\text{ V}$	-0.3	-	0.3	μA
VC3 Pin Current	I_{VC3}	$V_{CELLn} = 4.15\text{ V}$	-0.3	-	0.3	μA
VC4 Pin Current	I_{VC4}	$V_{CELLn} = 4.15\text{ V}$	-0.3	-	0.3	μA

NB7400GH Electrical Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
VROUT Pin Output Voltage	V_{VROUT}	When $V_{SHTDn} \geq 2.3\text{ V}$, $V_{SHTDn} \times 2 + 0.1\text{ V} \leq V_{DD} \leq 25\text{ V}$; When $V_{SHTDn} < 2.3\text{ V}$, $5.1\text{ V} \leq V_{DD} \leq 25\text{ V}$, $I_{VROUT} = 10\ \mu\text{A}$	$V_{VROUT} \times 0.98$	V_{VROUT}	$V_{VROUT} \times 1.02$	V
VROUT Pin Output Current	I_{VROUT}	When $V_{SHTDn} \geq 2.3\text{ V}$, $V_{SHTDn} \times 2 + 0.1\text{ V} \leq V_{DD} \leq 25\text{ V}$; When $V_{SHTDn} < 2.3\text{ V}$, $5.1\text{ V} \leq V_{DD} \leq 25\text{ V}$	-	-	2	mA

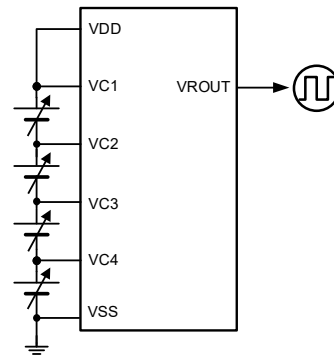
Test Circuits

Voltage Detection and Current Consumption



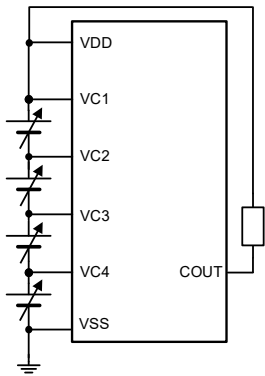
V_{DET1n} , V_{REL1n} , t_{VDET1} , t_{VREL1} , t_{TR} , I_{SHT} , I_{DD} , I_{VCn}

Shutdown Function



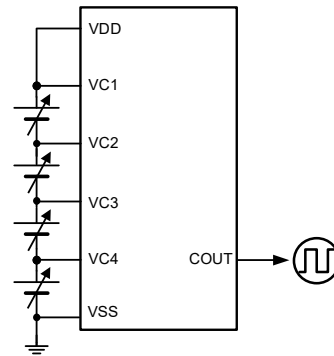
V_{SHTDn} , V_{SHTRn} , t_{VSHTD} , t_{VSHTR}

COUT Pin Output Low-voltage



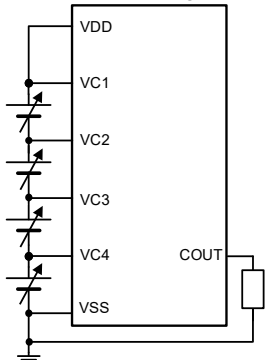
V_{COL}

COUT Pin Output High-voltage 1



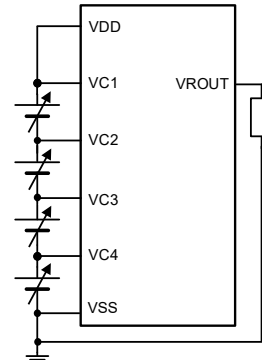
V_{COH1}

COUT Pin Output High-voltage 2



V_{COH2}

VROUT Pin Output



V_{VROUT} , I_{VROUT}

THEORY OF OPERATION

Overcharge Protection-n (where n = 1 to 4)

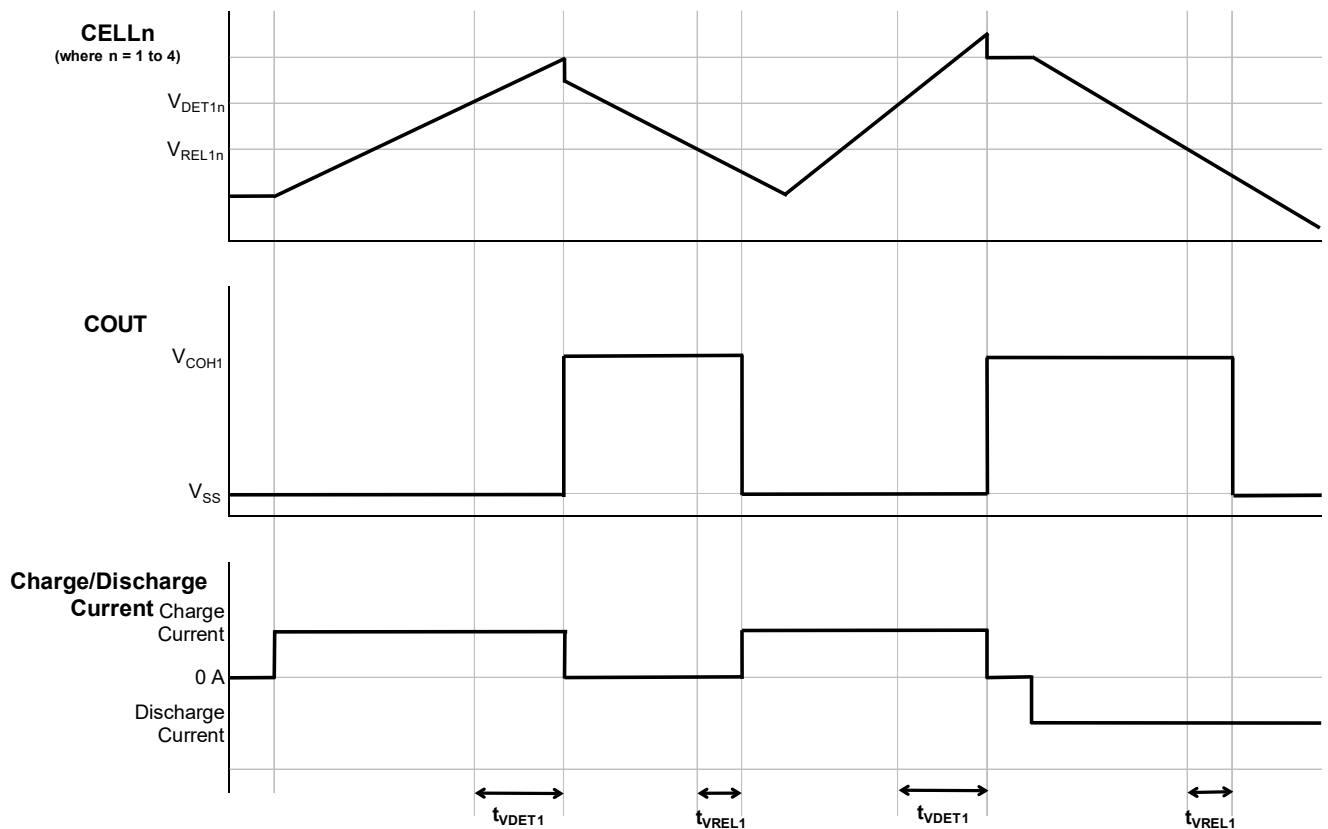
When at least one cell voltage (V_{CELLn} where $n = 1$ to 4)^{*1} exceeds the CELLn overcharge detection voltage (V_{DET1n}) for longer than the overcharge detection delay time (t_{VDET1}), this IC enters the overcharge state. In this state, the COUT pin becomes High, and the charge control FET is turned on to blow the fuse in the charger path and stop charging. The COUT pin provides a high-level CMOS output voltage between the VSS pin and the internal regulator.

The COUT pin provides a high-level CMOS output voltage between the VSS pin and the internal regulator.

A release from the overcharge state must meet the following pin condition and delay time.

Pin Condition	Delay Time	Remarks
$V_{CELLn} < V_{REL1n}$ in all cell voltages	t_{VREL1}	V_{CELLn} / V_{REL1n} where $n = 1$ to 4 Even if all cell voltages fall below V_{REL1n} , the overcharge state is not released when at least one cell voltage exceeds the CELLn overcharge release voltage (V_{REL1n}) for the overcharge release delay time (t_{VREL1}).

*1 V_{CELLn} ($n = 1$ to 4): V_{CELL1} between VC1 and VC2 pins, V_{CELL2} between VC2 and VC3 pins, V_{CELL3} between VC3 and VC4 pins, and V_{CELL4} between VC4 and VSS pins

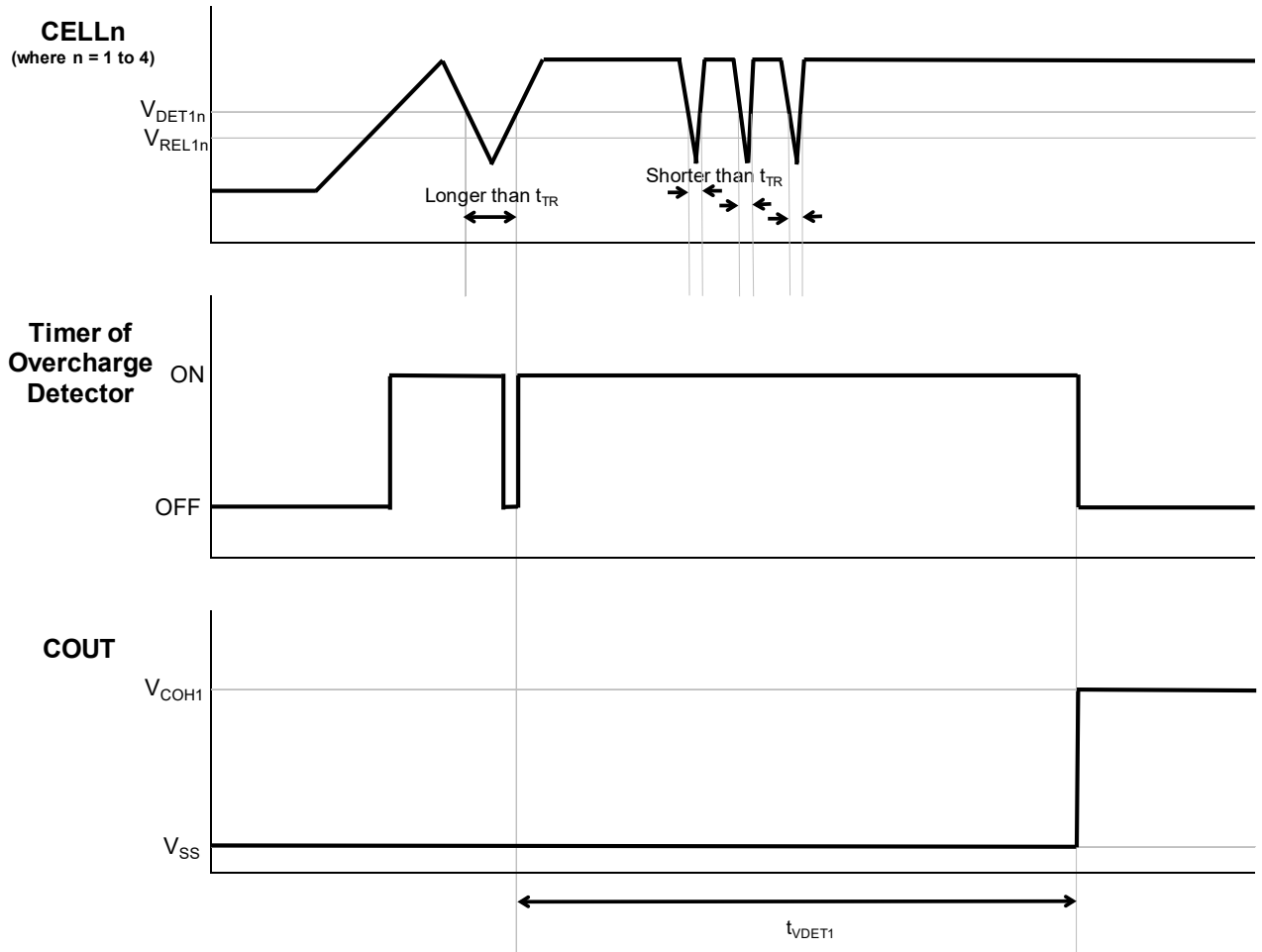


Overcharge Protection Timing Diagram

Overcharge Timer Reset Delay Function

In the event that the battery voltage temporarily falls below the overcharge detection voltage (V_{DET1}) due to noise during the overcharge detection delay time (t_{VDET1}), if the period is shorter than the overcharge timer reset delay time (t_{TR}), the t_{VDET1} count is maintained. If it is longer than t_{TR} , the t_{VDET1} count is reset. After that, the t_{VDET1} count resumes when the battery voltage exceeds V_{DET1} .

When the overcharge timer reset function is disabled, t_{TR} is nearly 0ms.

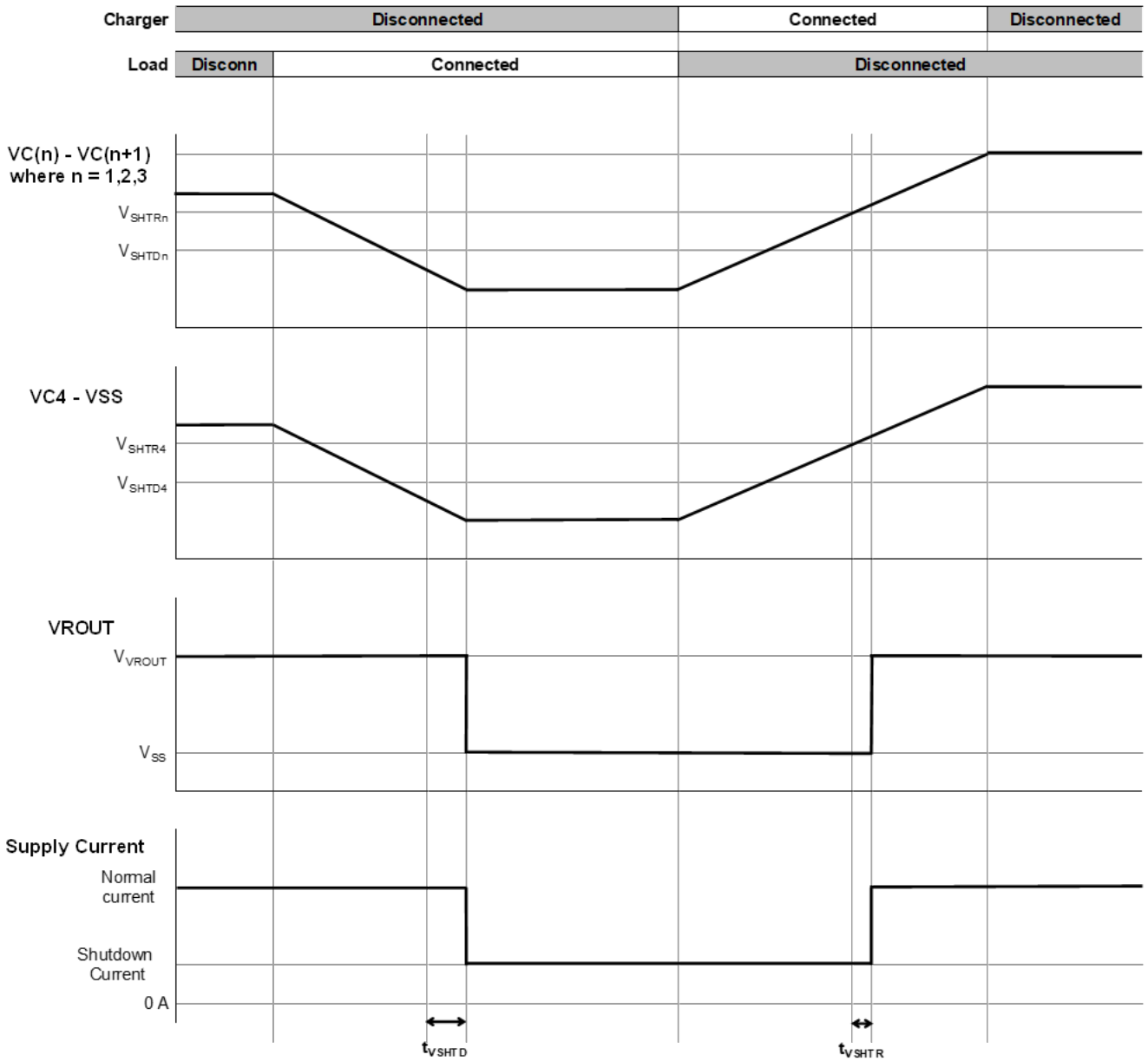


Overcharge Timer Reset Function Timing Diagram

Shutdown Function

When at least one cell voltage (V_{CELLn} where $n = 1$ to 4) fall below the shutdown detection voltage (V_{SHTDn}), all circuits in the IC are halted to shut down. Consequently, the shutdown current (I_{SHT}) is markedly reduced, as is the IC's current consumption.

VROUT pin turns Low during this function. When all cell voltages exceed the CELLn Shutdown Release Voltage (V_{SHTRn}), the VROUT pin becomes High. When the cell voltage becomes V_{DET1n} or more during this function, the overcharge is detected.



Shutdown Timing Diagram

Delay Time Shortening

Applying a voltage of $4\text{ V} \pm 0.2\text{ V}$ between VDD and VC1 can shorten the overcharge detection delay time (t_{VDET1}) and the Shutdown detection delay time (t_{VSHTD}) into approximately 1/80, likewise, the overcharge release delay time (t_{VREL1}) into approximately 1/60.

Voltage Regulator

This IC provides voltage regulators to drive an external RTC.

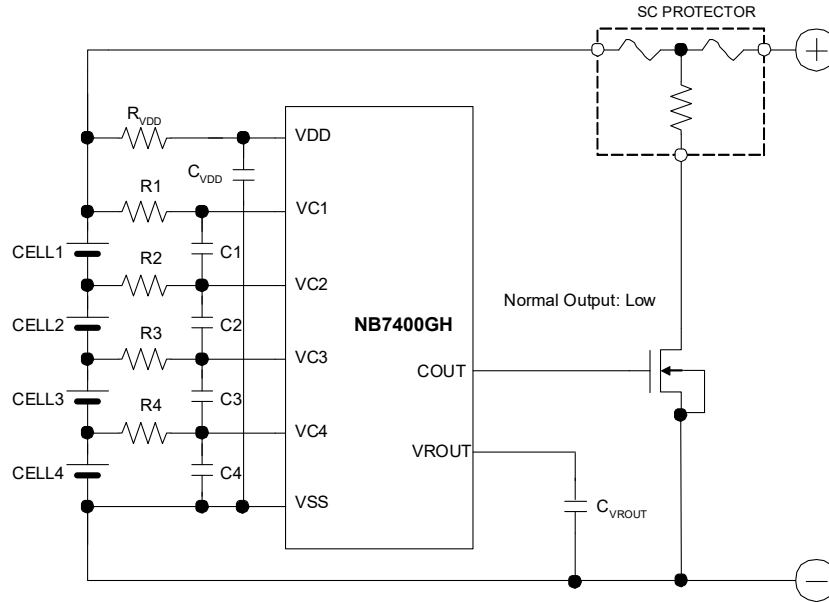
Alternative method for 2-/3-cell protection

This IC provides 2- / 3-cell series protection by creating a short circuit to VC1 pin as follows.

Protected Cells	Short-circuited Pins
2-cell protection	VC2 and VC3 pins
3-cell protection	VC2 pin

APPLICATION INFORMATION

Typical Application Circuit



NB7400GH Typical Application Circuit

This application circuit diagram is an example. The performance of the circuit depends on the PCB layout and external components. In the actual application, fully evaluation is required.

External Components

Symbol	Typ.	Unit	Range
R _{VDD}	100	Ω	100 to 1000
R1	330	Ω	330 to 1000
R2	330	Ω	330 to 1000
R3	330	Ω	330 to 1000
R4	330	Ω	330 to 1000
C _{VDD}	0.1	μF	0.1 to 1.0
C1	0.1	μF	0.1 to 1.0
C2	0.1	μF	0.1 to 1.0
C3	0.1	μF	0.1 to 1.0
C4	0.1	μF	0.1 to 1.0
C _{VROUT}	0.1	μF	0.1

Technical Notes on the Selection Components

- The voltage fluctuation is stabilized with R_{VDD} and C_{VDD} . If a small R_{VDD} is set, in the case of the large transient may happen to the cell voltage, by the flowing current, the IC may be unstable. If a large R_{VDD} is set, by the consumption current of the IC itself, the voltage difference between VDD pin and VC1 pin is generated, and unexpected operation may result. Therefore, the appropriate value range of R_{VDD} is from 100 Ω to 1 k Ω . The built-in voltage regulator (VR) is designed as a power source for an RTC. If the VR is used for other purpose, R_{VDD} value should be set so that V_{DD} does not become smaller than VC1-0.3V by R_{VDD} and a load current. If V_{DD} value is smaller than VC1-0.3V, the overvoltage detection voltage might shift or unexpected operation might result. To make a stable operation of the IC, the appropriate value range of C_{VDD} is from 0.1 μ F to 1.0 μ F.
- The voltage fluctuation is stabilized with R1 to R4 and C1 to C4. If a R1 to R4 is too large, by the conduction current at detection, the detector threshold may shift higher. Therefore, the appropriate value range of R1 to R4 is equal or less than 1 k Ω . To make a stable operation of the IC, the appropriate value range of C1 to C4 is 0.1 μ F or more.
- The typical application circuit diagrams are just examples. This circuit performance largely depends on the PCB layout and external components. In the actual application, fully evaluation is necessary.
- Over-voltage and the over current beyond the absolute maximum rating should not be forced to the protection IC and external components. During the time until the fuse is open after detecting over-charge, a large current may flow through the FET. Select an FET with large enough current capacity in order to endure the large current.
- NISD cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a NISD product. If technical notes are not complied with the circuit which is used NISD product, NISD is not responsible for any damages and any accidents.
- To connect the SC protector, connect the SC protector to the cell must be the last.

Contact Information for Inquiries regarding SC PROTECTOR

Dexerials Corporation (Sony Chemical & Information Device Company Ltd.)

URL: <http://www.dexerials.jp>

TECHNICAL NOTES

A peripheral component or the device mounted on PCB should not exceed a rated voltage, a rated current or a rated power. When designing a peripheral circuit, please be fully aware of the following points.

- Please evaluate the product at the PCB level before use, as some symptoms may remain that cannot be confirmed by the evaluation at the IC level.
- When using any coating or underfill to improve moisture resistance or joining strength, evaluate them adequately before using. In certain materials or coating conditions, corrosion by contained constituents, current leakage by moisture absorption, crack and delamination by physical stress can happen. If the curing temperature of the coating material or underfill material exceeds the absolute maximum rating, the electrical characteristics of this product may change.
- When performing X-ray inspection in mass production process and evaluation build stage such as the product functions and characteristics confirmation, please confirm X-ray irradiation does not exceed 1.5Gy (absorbed dose for air).

THERMAL CHARACTERISTICS (DFN(PL)2020-8-GH)

Thermal characteristics depend on mounting conditions. The thermal characteristics below are the results of measurements under measurement conditions determined by our company with reference to JEDEC STD. (JESD51).

Measurement Result

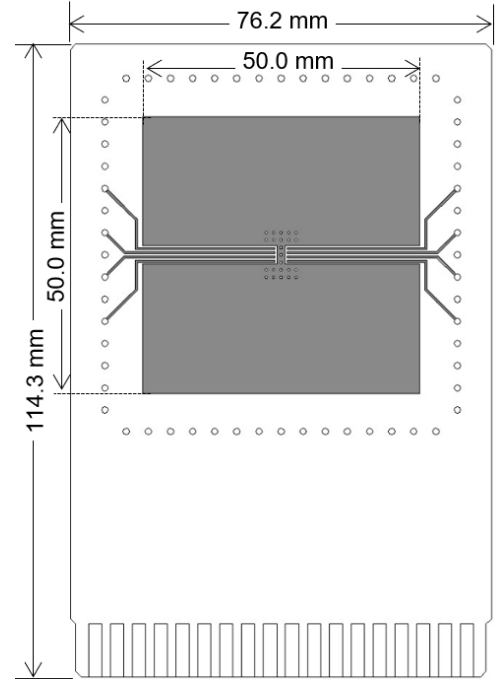
Item	Measurement Result
Thermal Resistance (θ_{ja})	53 °C/W
Thermal Characterization Parameter (ψ_{jt})	27 °C/W

θ_{ja} : Junction-to-Ambient Thermal Resistance

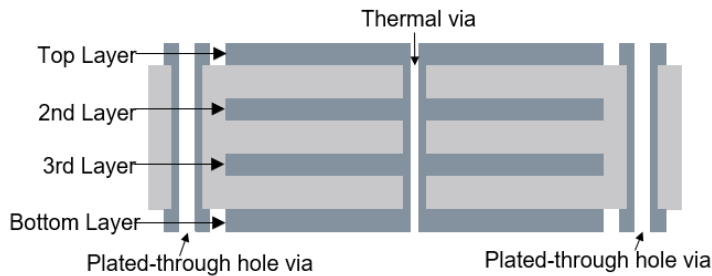
ψ_{jt} : Junction-to-Top Thermal Characterization Parameter

Measurement Conditions

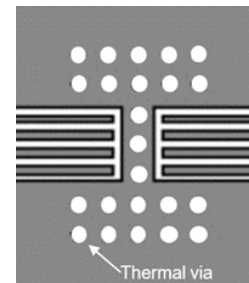
Item	Specification
Measurement Condition	Mounting on Board (Still Air)
Board material	FR-4
Board size	76.2 mm × 114.3 mm × t 0.8 mm
Copper foil layer	1 50 mm × 50 mm (coverage rate 95%), t 0.090 mm
	2 50 mm × 50 mm (coverage rate 100%), t 0.035 mm
	3 50 mm × 50 mm (coverage rate 100%), t 0.035 mm
	4 50 mm × 50 mm (coverage rate 100%), t 0.090 mm
Thermal vias	ϕ 0.3 mm × 23 pcs



Measurement Board Pattern



Cross section view of layers and vias



Enlarged view of IC mounting area

● CALCULATION METHOD OF JUNCTION TEMPERATURE

The junction temperature (T_j) can be calculated from the following formula.

$$T_j = T_a + \theta_{ja} \times P$$

$$T_j = T_c (\text{top}) + \psi_{jt} \times P$$

Where: T_a : Ambient temperature
 $T_c (\text{top})$: Package mark side center temperature
 P : Power consumption under user's conditions



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NB7400GH CodeList

	Set Voltage [V] / Delay Time					Optional Function
	V_{DET1n} $t_{VDET1}[s]$	V_{REL1n} $t_{VREL1}[ms]$	V_{SHTDn} $t_{VSHTD}[s]$	V_{VROUT} $t_{TR}[ms]$	Unit	Timer Reset Delay Time
NB7400GH101JA	4.65	4.35	2.5	1.5	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH102JA	4.6	4.3	2.5	1.5	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH105JA	4.6	4.3	2.5	3	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH106JA	4.6	4.3	2.5	3.3	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH107JA	4.65	4.35	2.5	3	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH108JA	4.65	4.35	2.5	3.3	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH109JA	4.55	4.25	2.5	3.3	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH110JA	4.55	4.25	2.5	3	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH111JA	4.7	4.4	2.5	3	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH112JA	4.7	4.4	2.5	3.3	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH401JA	4.65	4.35	3	3.3	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH402JA	4.6	4.3	3	1.5	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH403JA	4.65	4.35	3	1.5	V	Unavailable
	6	16	6	-	s / ms	

Please contact our sales representatives if required a product code other than the above combinations.



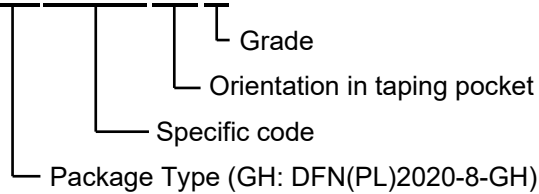
Nisshinbo Micro Devices Inc.

NB7400GH CodeList

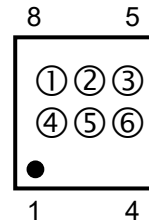
	Set Voltage [V] / Delay Time					Optional Function
	V_{DET1n} $t_{VDET1[s]}$	V_{REL1n} $t_{VREL1[ms]}$	V_{SHTDn} $t_{VSHTD[s]}$	V_{VROUT} $t_{TR[ms]}$	Unit	Timer Reset Delay Time
NB7400GH602JA	4.7	4.4	2	3.3	V	Unavailable
	6	16	6	-	s / ms	
NB7400GH113GA	4.3	4.15	2.5	3.3	V	Unavailable
	2	16	6	-	s / ms	

Please contact our sales representatives if required a product code other than the above combinations.

NB7400 GH xxxxx E4 S



PKG: DFN(PL)2020-8-GH



①②③④: Product code (See the table below)

⑤⑥: Lot No. (series) 0A,0B,0C...0Z,1A,1B...1Z,2A...9Z

(except I,O,Q)

NOTICE

There can be variation in the marking when different AOI (Automated Optical Inspection) equipment is used. In the case of recognizing the marking characteristic with AOI, please contact our sales or distributor before attempting to use AOI.

Product Name	①②③④
NB7400GH101JA	2A00
NB7400GH102JA	2A01
NB7400GH401JA	2A02
NB7400GH105JA	2A03
NB7400GH106JA	2A04
NB7400GH107JA	2A05
NB7400GH108JA	2A06
NB7400GH602JA	2A07
NB7400GH109JA	2A08
NB7400GH110JA	2A09
NB7400GH402JA	2A10
NB7400GH403JA	2A11
NB7400GH111JA	2A12
NB7400GH112JA	2A13
NB7400GH113GA	2A14

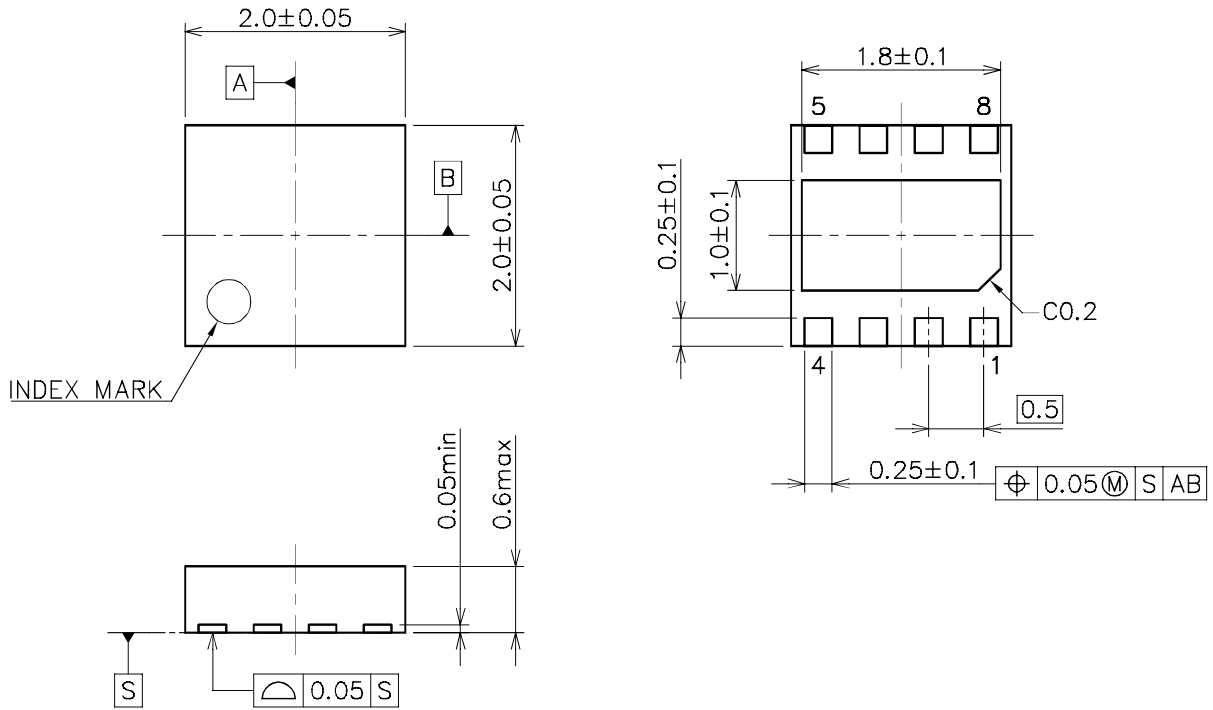
Nisshinbo Micro Devices Inc.

DFN(PL)2020-8-GH

PI-DFN(PL)2020-8-GH-E-A

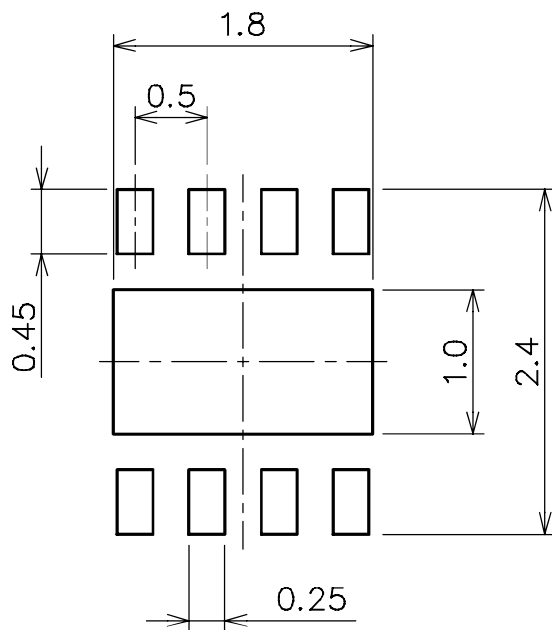
■ PACKAGE DIMENSIONS

UNIT: mm



■ EXAMPLE OF SOLDER PADS DIMENSIONS

UNIT: mm



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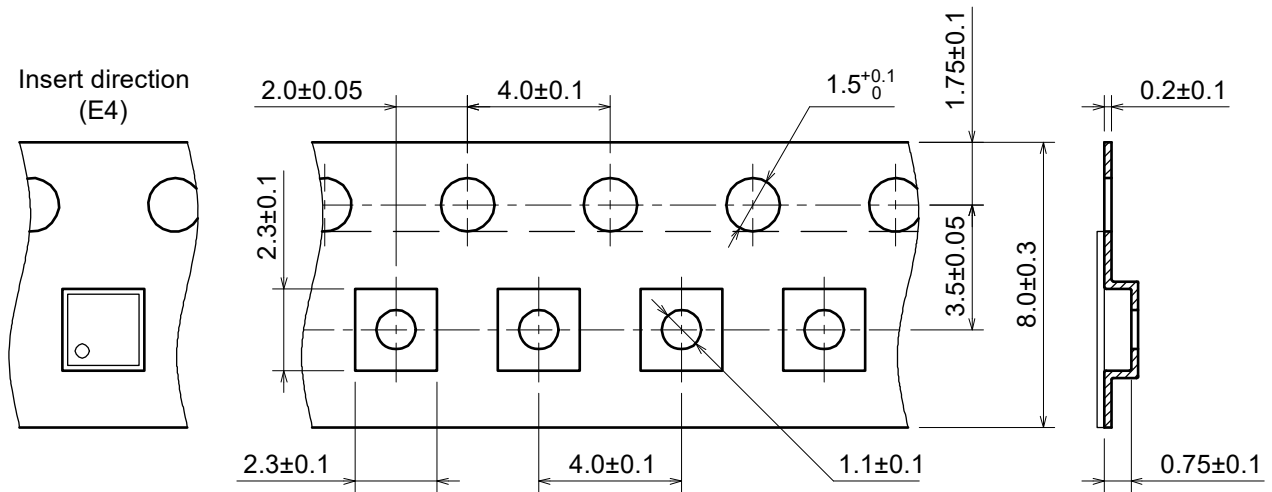
DFN(PL)2020-8-GH

PI-DFN(PL)2020-8-GH-E-A

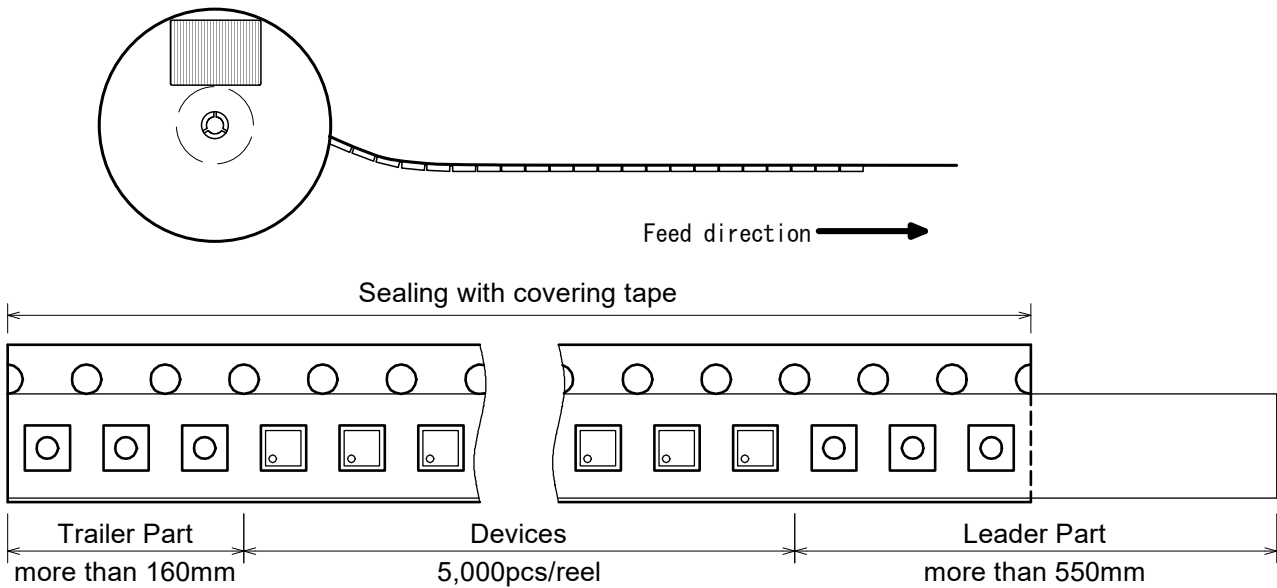
■ PACKING SPEC

UNIT: mm

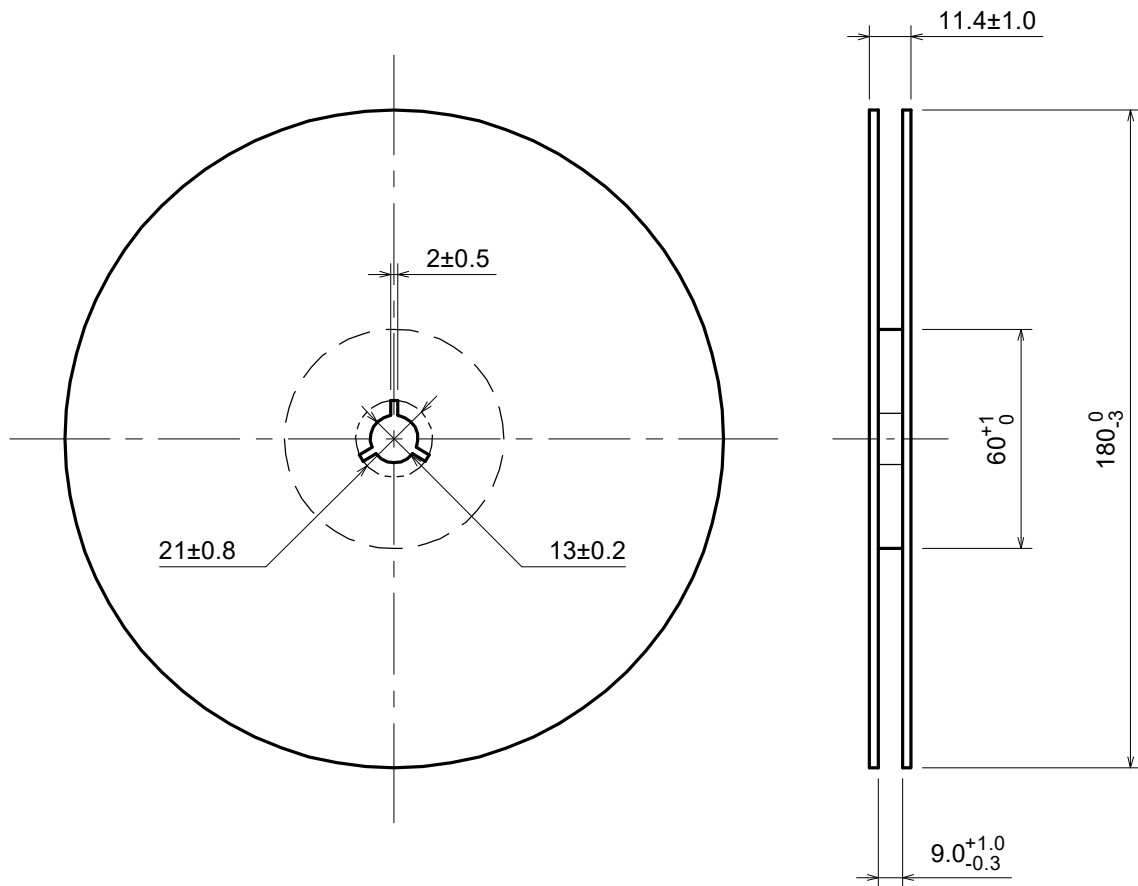
(1) Taping dimensions / Insert direction



(2) Taping state



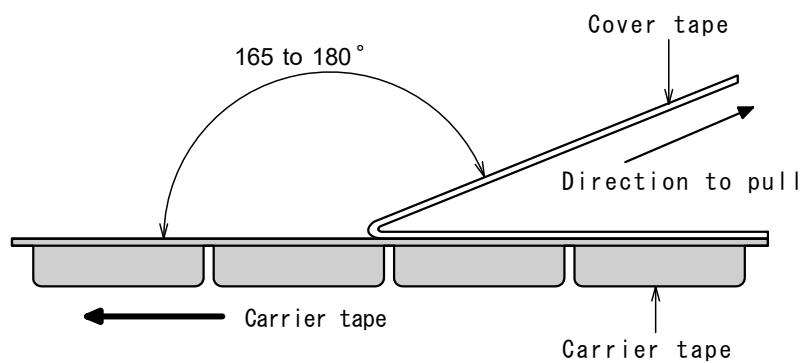
(3) Reel dimensions



(4) Peeling strength

Peeling strength of cover tape

- Peeling angle 165 to 180°degrees to the taped surface.
- Peeling speed 300mm/min
- Peeling strength 0.1 to 1.0N

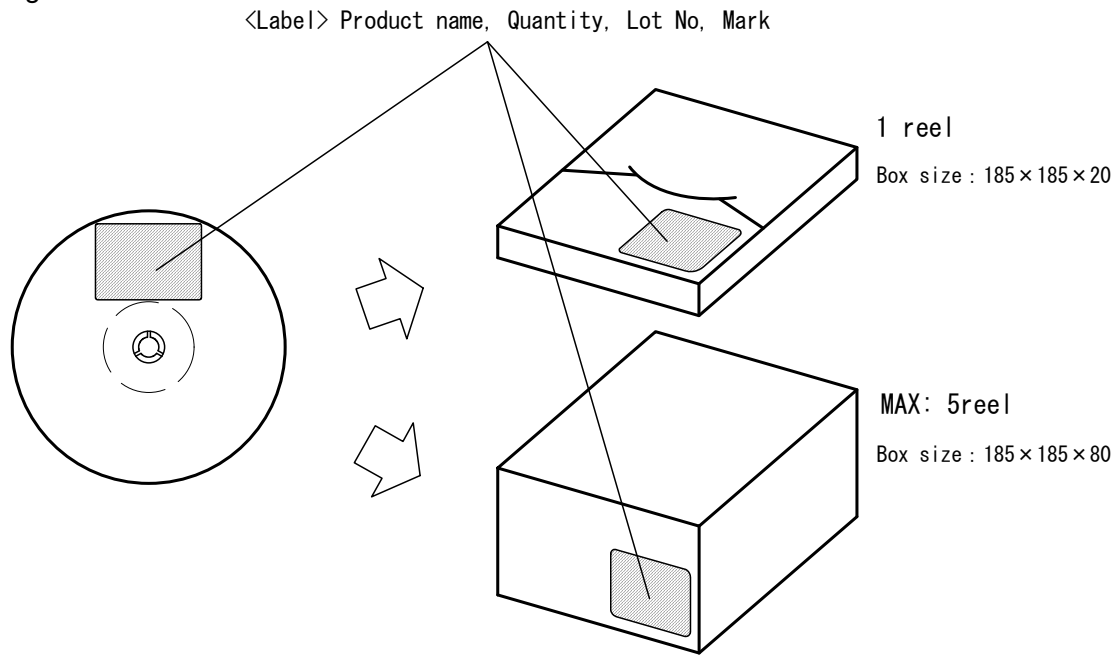


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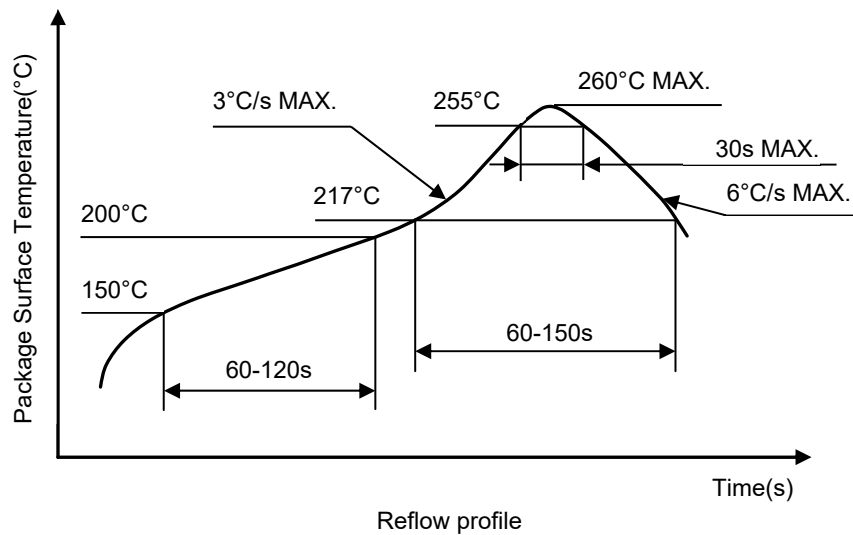
DFN(PL)2020-8-GH

PI-DFN(PL)2020-8-GH-E-A

(5) Packing state



■ HEAT-RESISTANCE PROFILES



REVISION HISTORY

Date	Version		Changes
May 23, 2025	1.0	a	First official version release
August 8, 2025	1.1	a	Added new codes: 105JA, 106JA, 107JA, and 108JA Updated the K code as a special setting code in <i>the PRODUCT NAME INFORMATION chapter</i> . Updated each condition of V _{VROUT} and I _{VROUT} in <i>the ELECTRICAL CHARACTERISTICS chapter</i> . Added the chapter of <i>THERMAL CHARACTERISTICS</i> .
October 14, 2025	1.1	b	Added a new code: 602JA
November 25, 2025	1.1	c	Added new codes: 109JA and 110JA
December 18, 2025	1.1	d	Added new codes: 402JA, 403JA
January 6, 2026	1.1	e	Added new codes: 111JA, 112JA
April 8, 2026	1.1	f	Added new codes: 113GA

1. The products and the product specifications described in this document are subject to change or discontinuation of production without notice for reasons such as improvement. Therefore, before deciding to use the products, please refer to our sales representatives for the latest information thereon.
2. The materials in this document may not be copied or otherwise reproduced in whole or in part without the prior written consent of us.
3. This product and any technical information relating thereto are subject to complementary export controls (so-called KNOW controls) under the Foreign Exchange and Foreign Trade Law, and related politics ministerial ordinance of the law. (Note that the complementary export controls are inapplicable to any application-specific products, except rockets and pilotless aircraft, that are insusceptible to design or program changes.) Accordingly, when exporting or carrying abroad this product, follow the Foreign Exchange and Foreign Trade Control Law and its related regulations with respect to the complementary export controls.
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 - Aerospace Equipment
 - Equipment Used in the Deep Sea
 - Power Generator Control Equipment (nuclear, steam, hydraulic, etc.)
 - Life Maintenance Medical Equipment
 - Fire Alarms / Intruder Detectors
 - Vehicle Control Equipment (automotive, airplane, railroad, ship, etc.)
 - Various Safety Devices
 - Traffic control system
 - Combustion equipment

In case your company desires to use this product for any applications other than general electronic equipment mentioned above, make sure to contact our company in advance. Note that the important requirements mentioned in this section are not applicable to cases where operation requirements such as application conditions are confirmed by our company in writing after consultation with your company.

6. We are making our continuous effort to improve the quality and reliability of our products, but semiconductor products are likely to fail with certain probability. In order to prevent any injury to persons or damages to property resulting from such failure, customers should be careful enough to incorporate safety measures in their design, such as redundancy feature, fire containment feature and fail-safe feature. We do not assume any liability or responsibility for any loss or damage arising from misuse or inappropriate use of the products.
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8. **Quality Warranty**
 - 8-1. **Quality Warranty Period**

In the case of a product purchased through an authorized distributor or directly from us, the warranty period for this product shall be one (1) year after delivery to your company. For defective products that occurred during this period, we will take the quality warranty measures described in section 8-2. However, if there is an agreement on the warranty period in the basic transaction agreement, quality assurance agreement, delivery specifications, etc., it shall be followed.
 - 8-2. **Quality Warranty Remedies**

When it has been proved defective due to manufacturing factors as a result of defect analysis by us, we will either deliver a substitute for the defective product or refund the purchase price of the defective product.

Note that such delivery or refund is sole and exclusive remedies to your company for the defective product.
 - 8-3. **Remedies after Quality Warranty Period**

With respect to any defect of this product found after the quality warranty period, the defect will be analyzed by us. On the basis of the defect analysis results, the scope and amounts of damage shall be determined by mutual agreement of both parties. Then we will deal with upper limit in Section 8-2. This provision is not intended to limit any legal rights of your company.
9. Anti-radiation design is not implemented in the products described in this document.
10. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
11. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
12. Warning for handling Gallium and Arsenic (GaAs) products (Applying to GaAs MMIC, Photo Reflector). These products use Gallium (Ga) and Arsenic (As) which are specified as poisonous chemicals by law. For the prevention of a hazard, do not burn, destroy, or process chemically to make them as gas or power. When the product is disposed of, please follow the related regulation and do not mix this with general industrial waste or household waste.
13. Please contact our sales representatives should you have any questions or comments concerning the products or the technical information.



Nisshinbo Micro Devices Inc.

Official website

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