NT9003HDAE4S
Diode for 1mW Class Rectifier

FEATURES

- High reverse voltage*: 20 V
- Low forward voltage: 0.1 V typ. @ I_F = 4 μA
- Low reverse leakage current: 1.0 μA typ. @ V_R = 2 V
- Low series resistance: 55Ω typ.
  @ V_F = 0.85 ± 0.01 V
- Low total capacitance: 0.03 pF typ.
  @ V_R = 2 V, f = 100 MHz
- Package size: 1.2 x 1.2 mm typ.
  t = 0.427 mm max.
- RoHS compliant, Halogen free, MSL1

* Absolute maximum ratings

APPLICATIONS

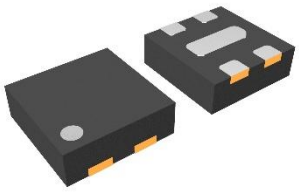
- Rectifier circuits for microwave wireless power transfer systems
- Detector

GENERAL DESCRIPTION

The NT9003HDAE4S is a 1 mW-class rectifier diode optimized for rectifier circuits in microwave WPT operating in the 920 MHz, 2.4 GHz, and 5.7 GHz bands.

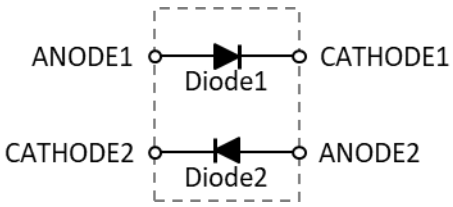
This diode features low forward voltage and high reverse voltage, enabling a wide dynamic range and high efficiency in WPT rectifier circuits.

This diode enables a compact mounting area with its small DFN package.

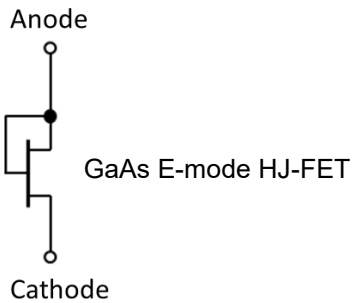


DFN1212-4-HD
1.2 × 1.2 × 0.427 (mm)

BLOCK DIAGRAM



< Gated Anode Diode >



■ PRODUCT NAME INFORMATION

NT9003 HD A E4 S

Description of configuration

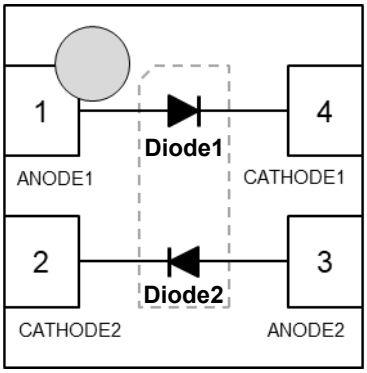
Composition	Item	Description
HD	Package code	Indicates the package. Refer to the order information.
A	Version	Indicates the product version. “A” is initial version.
E4	Packing	Refer to the packing specifications.
S	Grade	Indicates the quality grade. “S” means general-purpose and consumer application. Operating temperature range: -40ºC to +85ºC, Test temperature: +25ºC

■ ORDER INFORMATION

PRODUCT NAME	PACKAGE	RoHS	HALOGEN-FREE	PLATING COMPOSITION	WEIGHT (mg)	QUANTITY (pcs/reel)
NT9003HDAE4S	DFN1212-4-HD	Yes	Yes	SnBi	1.6	3,000

■ PIN DESCRIPTIONS

(Top View)



DFN1212-4-HD Pin configuration

Pin No.	Pin Name	Description
1	ANODE1	Anode terminal (Diode1)
2	CATHODE2	Cathode terminal (Diode2)
3	ANODE2	Anode terminal (Diode2)
4	CATHODE1	Cathode terminal (Diode1)
Exposed PAD		Connecting to the ground plane is recommended.

■ ABSOLUTE MAXIMUM RATINGS

	Symbol	Ratings	Unit
Reverse voltage	V_R	20	V
Forward current	I_F	20	mA
Power dissipation	P_D *1	920	mW
Junction temperature	Tj	+150	°C
Storage temperature	T_{stg}	−55 ~ +150	°C

*1 4-layer FR4 PCB with through-hole (101.5 x 114.5 mm), T_j = 150 °C

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.

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

Please refer to "*THERMAL CHARACTERISTICS*" for the thermal resistance under our measurement board conditions.

■ THERMAL CHARACTERISTICS

Parameter	Measurement Result
Thermal Resistance (θja)	θja =135.3 °C/W

θja: Junction-to-Ambient Thermal Resistance

■ ELECTROSTATIC DISCHARGE RATINGS

	Conditions	Pin No.	Pin Name	Protection Voltage	
				CATHODE1	CATHODE2
HBM	C = 100 pF, R = 1.5 kΩ	1	ANODE1	±60 V	-
		2	CATHODE2	-	COM.
		3	ANODE2	-	±60 V
		4	CATHODE1	COM.	-

	Conditions	Protection Voltage
CDM	Field Induced CDM	±1000 V

ELECTROSTATIC DISCHARGE RATINGS
The electrostatic discharge test is done based on JESD47. In the HBM method, ESD is applied using the power supply pin and Cathode terminal as reference pins.

When handling devices, devices may encounter electrostatic failure due to a static electricity discharge from the charged operator or equipment. Pay attention during handling.

■ RECOMMENDED OPERATING CONDITIONS

	Symbol	Value	Unit
Operating temperature	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 when 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 (DC)

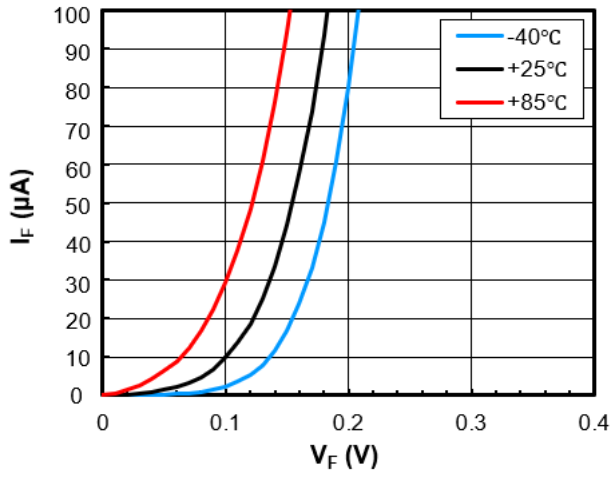
General conditions: T_a = +25 °C

Parameter	Symbol	Test Condition	MIN.	TYP.	MAX.	UNIT
Reverse leakage current	I_R	V_R = 2 V	-	1.0	-	μA
Forward voltage	V_F	I_F = 4 μA	-	0.1	-	V
Forward voltage difference	ΔV_F	Diode1 V_F – Diode 2 V_F	-0.05	-	0.05	V
Series resistance	R_S	V_F = 0.85 ± 0.01 V	-	55	-	Ω
Total capacitance	C_T	V_R = 2 V, f = 100 MHz	-	0.03	-	pF

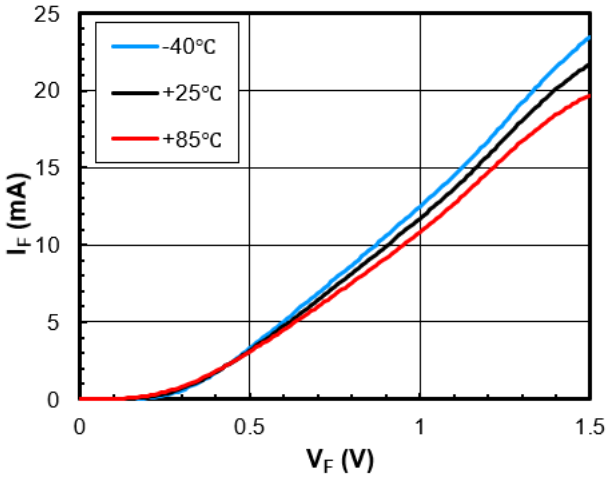
■ TYPICAL CHARACTERISTICS

(Typical Characteristics are intended to be used as reference data; they are not guaranteed.)

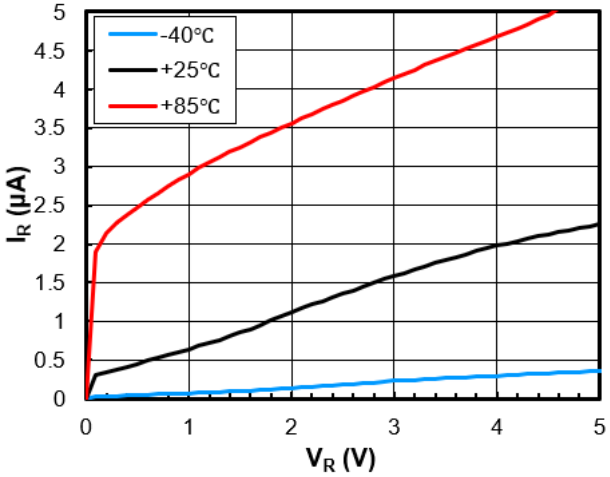
NT9003 Forward Characteristics



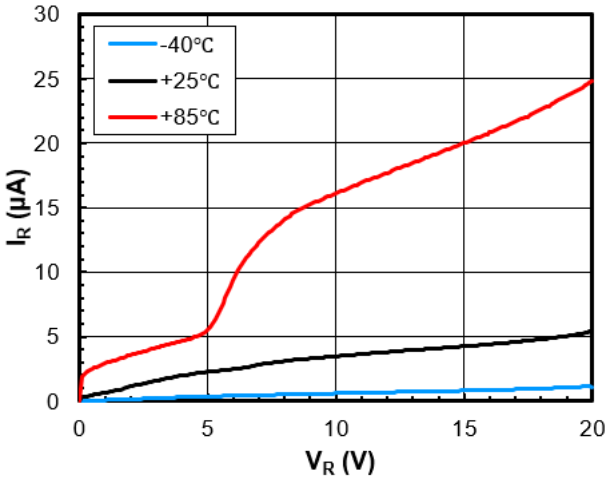
NT9003 Forward Characteristics



NT9003 Reverse Characteritics

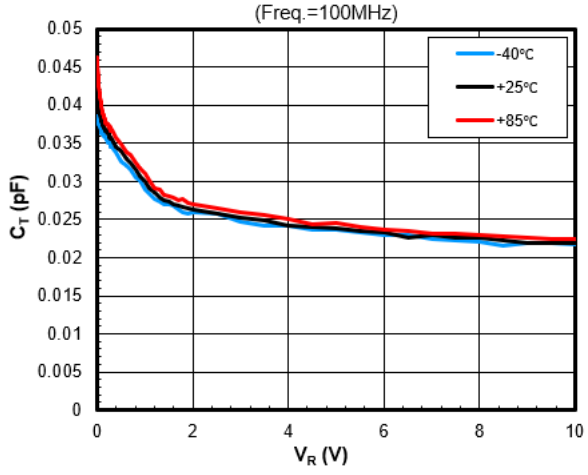


NT9003 Reverse Characteritics



NT9003 Total Capacitance

(Freq.=100MHz)



■ SPICE MODEL

NT9003HDAE4S Diode model

<SPICE model Parameter>

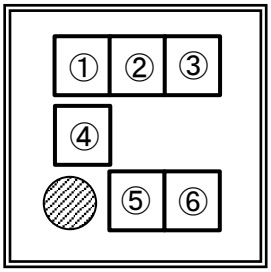
Parameter	Value	Unit
Is	0.52	μA
Rs	53.2	Ω
N	1.55	-
Cd	0.02	pF
Cj0	0.023	pF
Vj	0.34	V

● Notes on Using the SPICE Model

It requires a capacitor C_{GND} = 0.1 pF between each of the external anode and cathode terminals and ground (GND) to improve the simulation accuracy when using the SPICE model.

■ MARKING SPECIFICATION

①, ②, ③: Product code
④, ⑤, ⑥: Lot number ⋯ Alphabetic Serial number



DFN1212-4-HD Marking Specification

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.

DFN1212-4-HD Marking List

Product Name	① to ③
NT9003HDAE4S	0 0 5

■ Revision History

Date	Revision	Changes
March 10, 2026	Ver. 1.1	Revised FEATURES Revised GENERAL DESCRIPTION
February 20, 2026	Ver. 1.0	Initial release

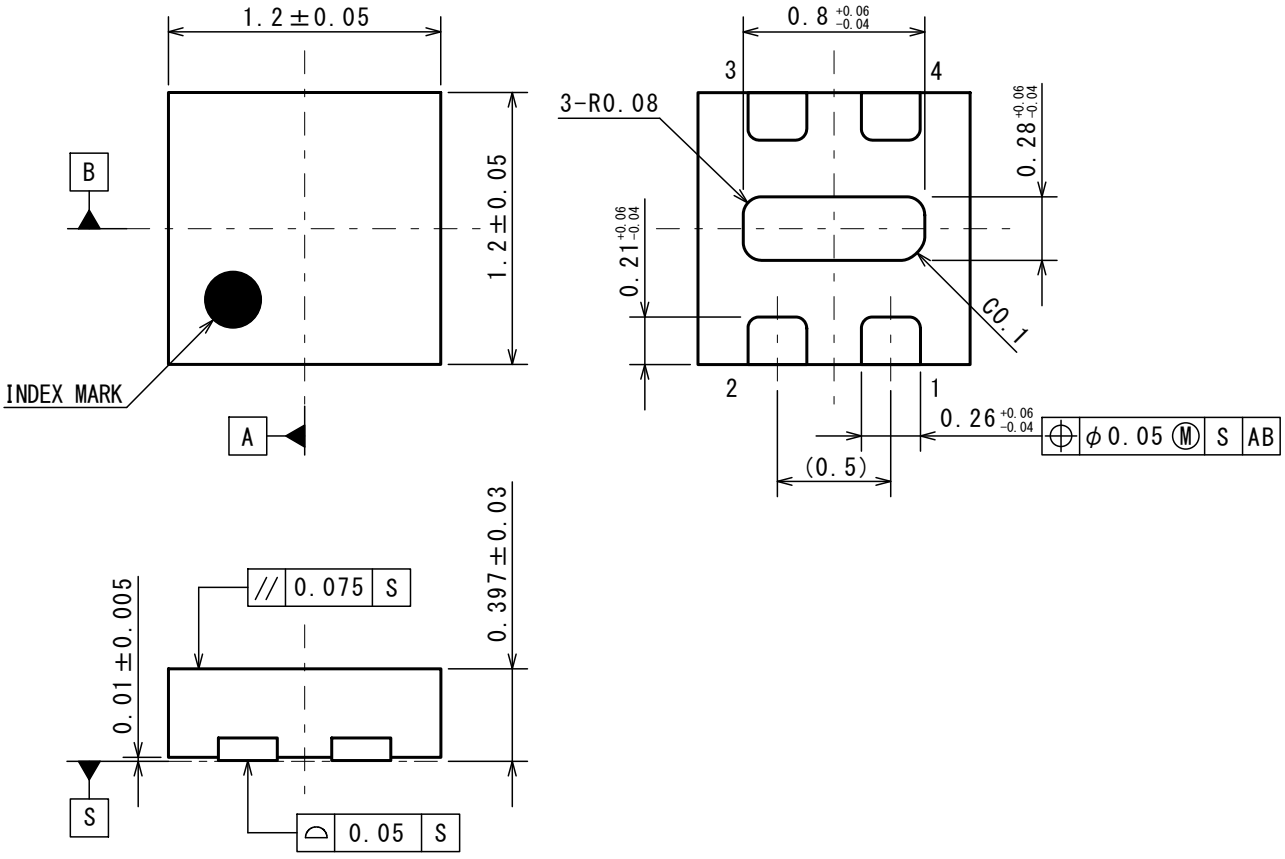
Nisshinbo Micro Devices Inc.

DFN1212-4-HD

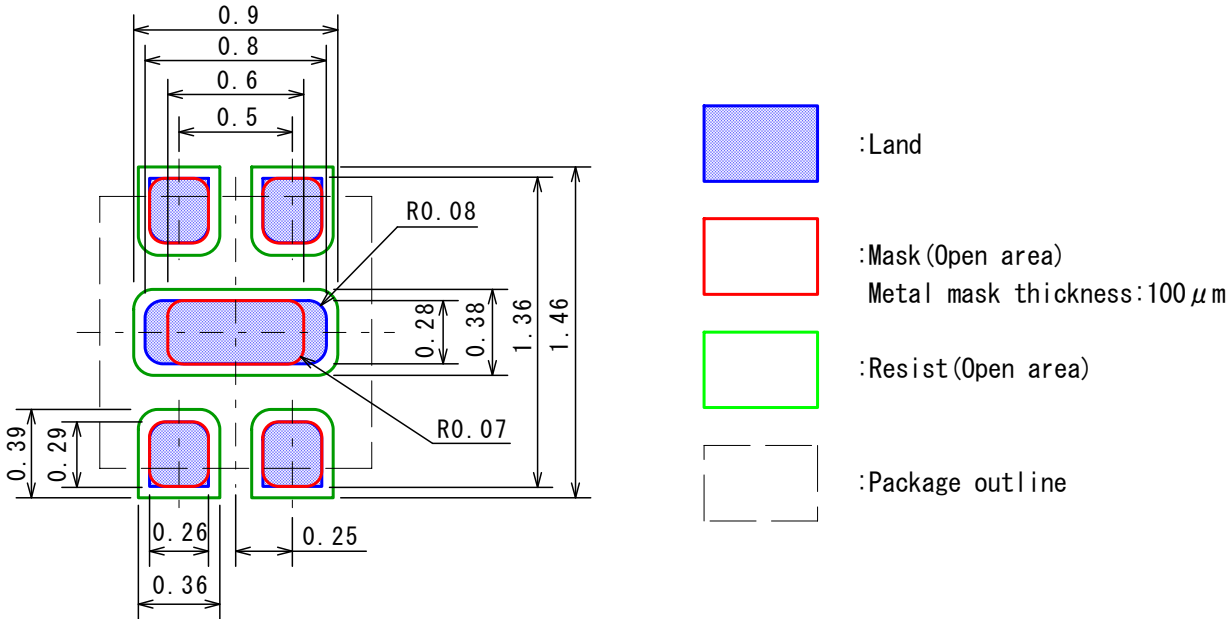
PI-DFN1212-4-HD-E-A

■ PACKAGE DIMENSIONS

UNIT: mm



■ EXAMPLE OF SOLDER PADS DIMENSIONS



Nisshinbo Micro Devices Inc.

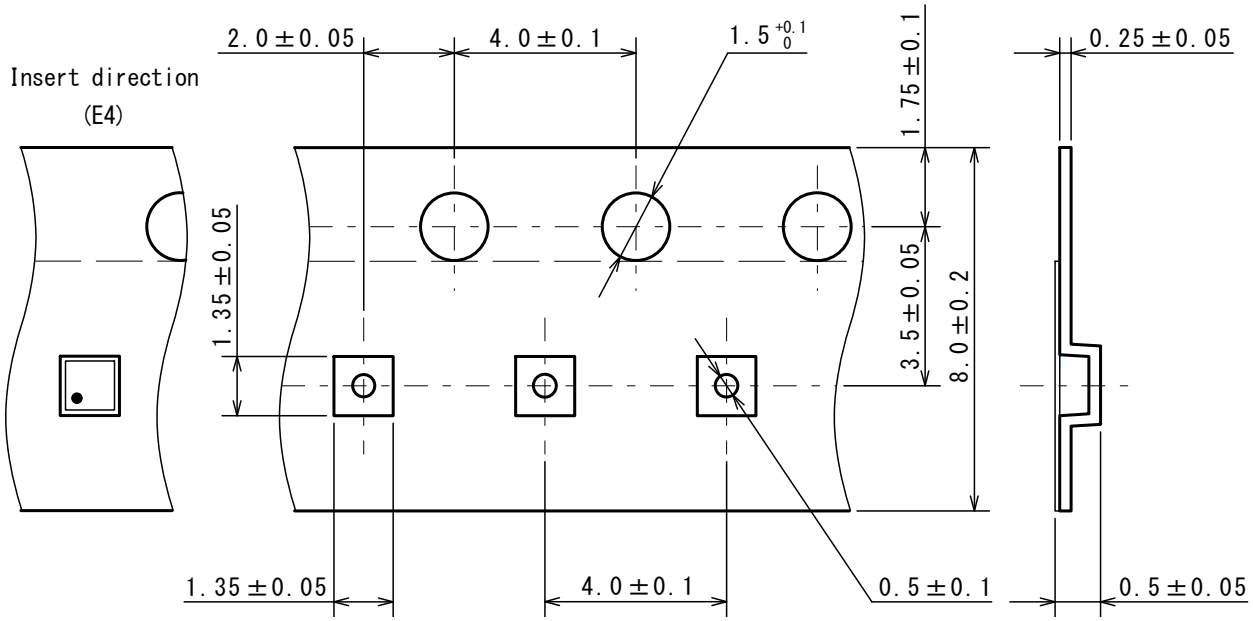
DFN1212-4-HD

PI-DFN1212-4-HD-E-A

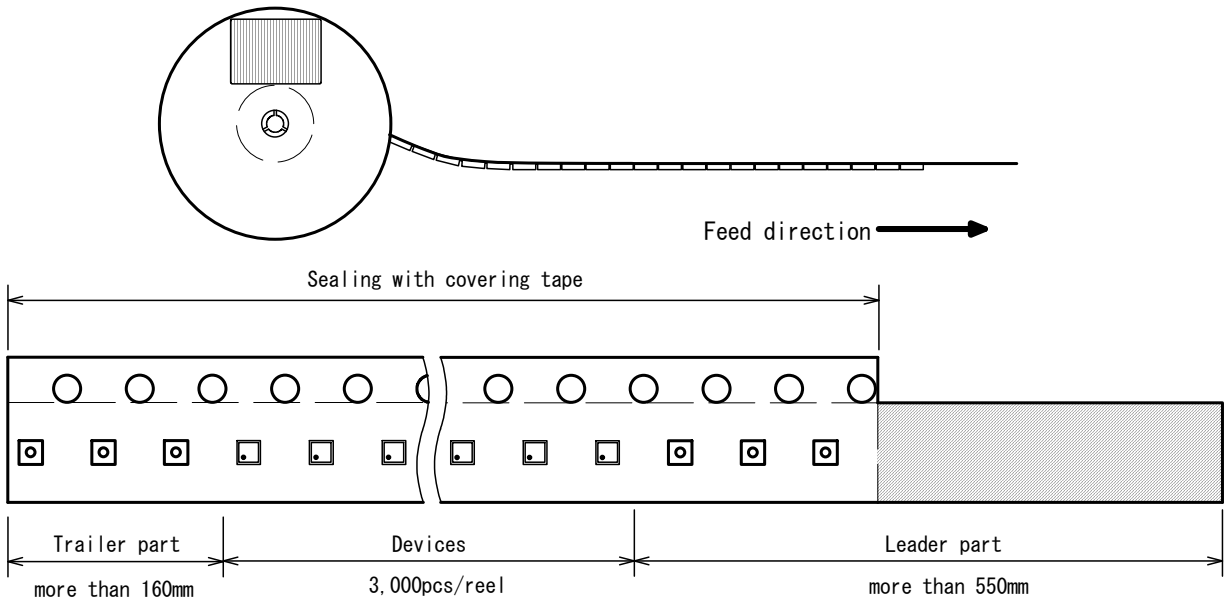
■ PACKING SPEC

UNIT: mm

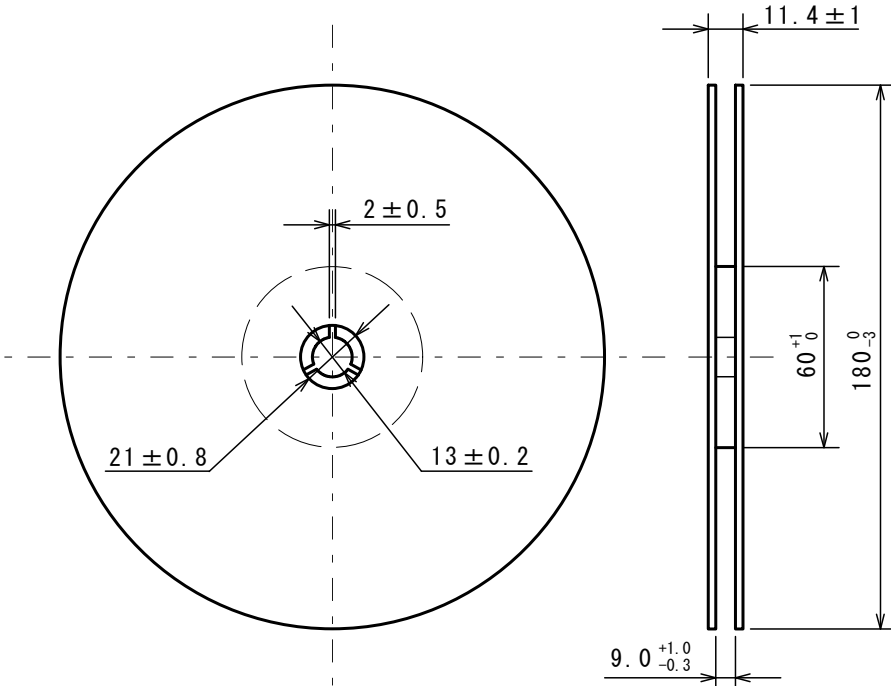
(1) Taping dimensions / Insert direction



(2) Taping state



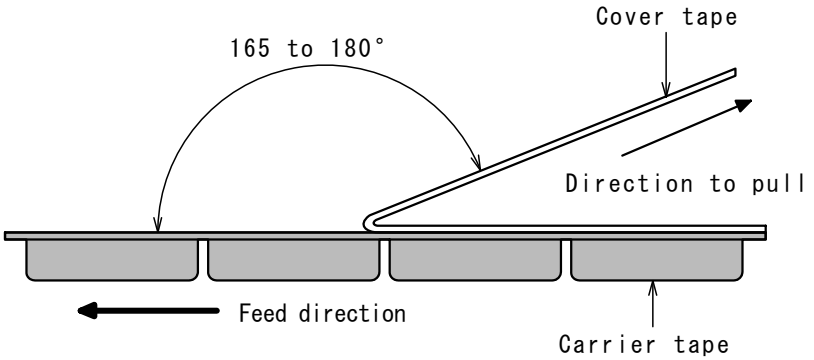
(3) Reel dimensions



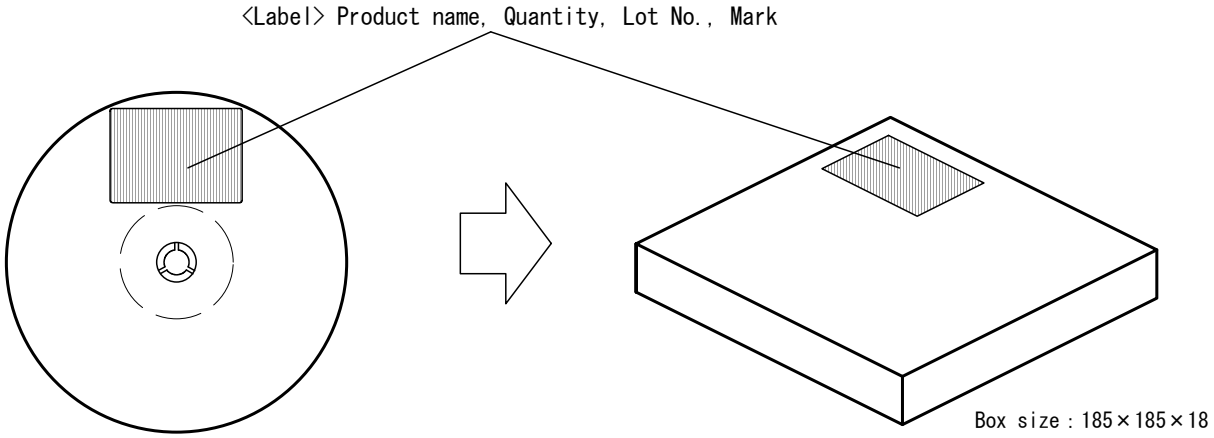
(4) Peeling strength

Peeling strength of cover tape

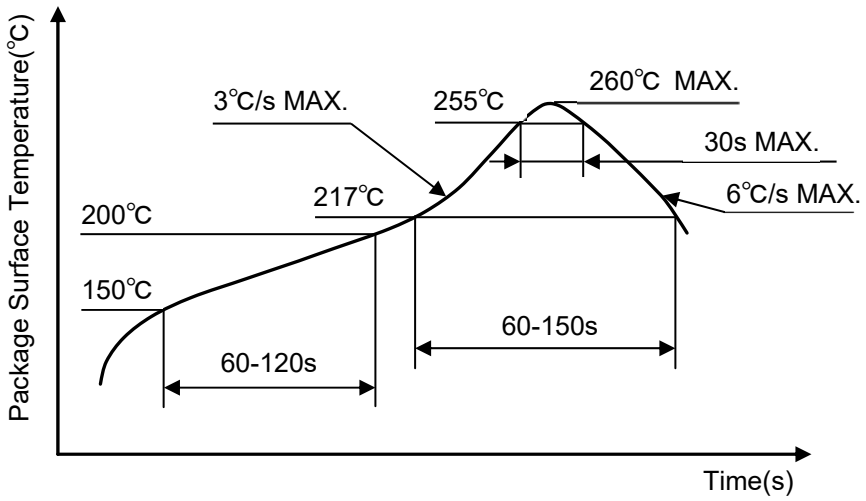
- Peeling angle 165 to 180° degrees to the taped surface.
- Peeling speed 300mm/min
- Peeling strength 0.1 to 1.0N



(5) Packing state



■ **HEAT-RESISTANCE PROFILES**



Reflow profile

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    - Various Safety Devices
    - Traffic control system
    - Combustion equipment

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    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.
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    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.
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13. Please contact our sales representatives should you have any questions or comments concerning the products or the technical information.

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