CMOS IC Application Note

HSNT-6A Package User's Guide

Rev.2.0_02

This manual describes the features, package dimensions, recommended land, handling methods as well as marking specifications and packing specifications of the HSNT-6A super small package, for users in the semiconductor mounting technology fields.
In addition, mounting evaluation, reliability testing results and thermal resistance data are also provided as reference data.
For the quality assurance system, notes on use and electrical characteristics of ABLIC Inc. CMOS ICs, refer to our website and individual data sheets available from ABLIC Inc.
Note that recommended conditions are subject to change depending on the external materials, conditions, environment, etc.

[Target Package]

- HSNT-6A

Contents

1. Features of HSNT-6A package

1. 1 General description of HSNT-6A package

The HSNT-6A package is a high heat radiation type, super small, thin and lightweight resin molded package for surface-mounting onto printed circuit boards.

- The package size of the small, thin HSNT-6A is 2.46 mm × 1.96 mm × t0.5 mm max.
- The HSNT-6A package has a good ability of heat radiation due to the heat sink.

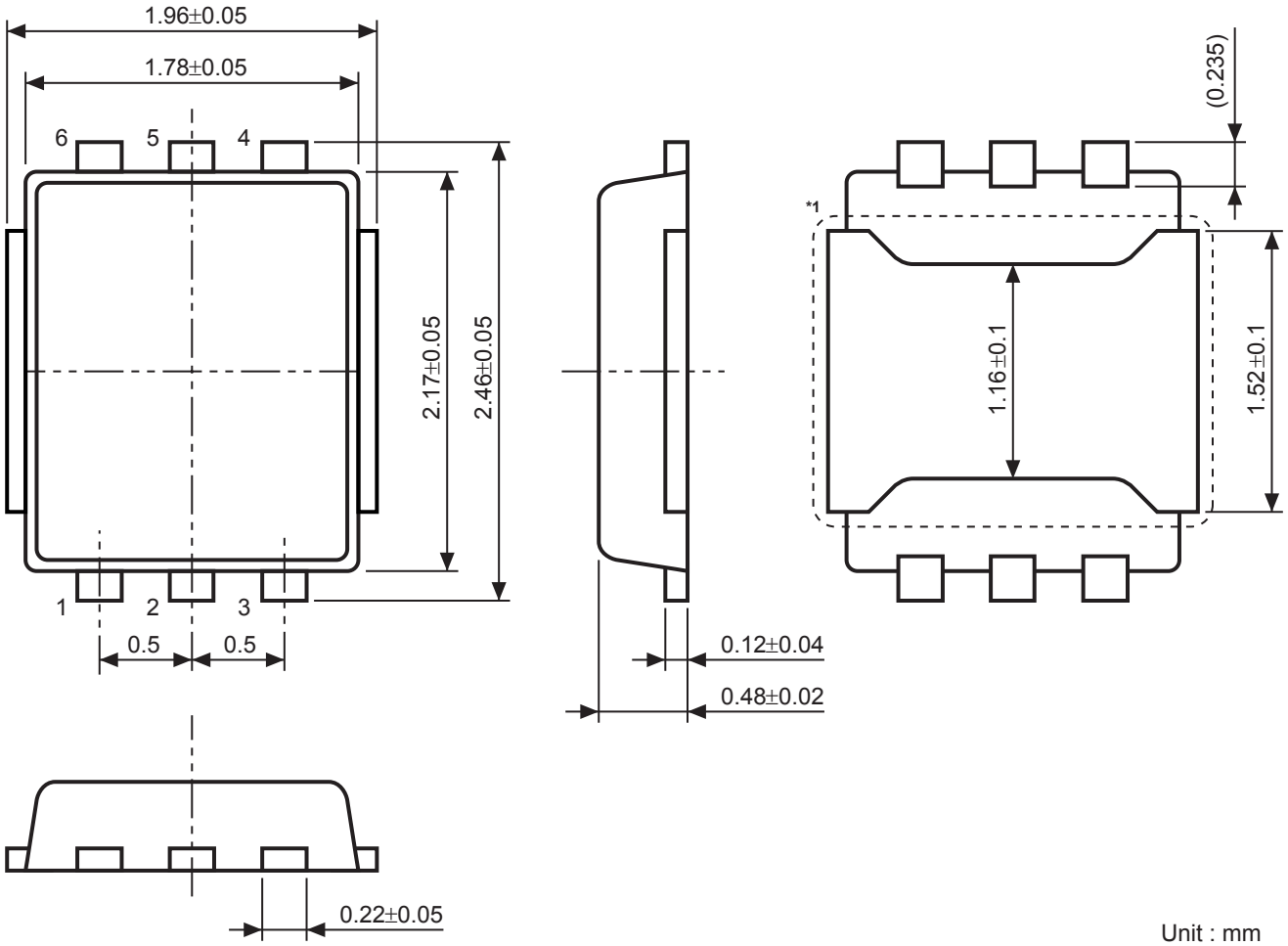
Figure 1 shows the dimensions of HSNT-6A package.
Despite its compact size and thin shape, the HSNT-6A package fully meets the same reliability level as is applied to our other conventional packages (Refer to **Table 3**).

Table 1 Specifications of HSNT-6A Package

Item	Specification
Number of pins	6
Sealing	Resin mold
Dimensions (L × W × H)	2.46 mm × 1.96 mm × t0.5 mm max.
Pitch	0.5 mm
Pin material / surface processing	Cu / Sn-Bi, Sn 100%
Plating thickness	Approximately 10 μm
Package weight*1	6.2 mg
MSL	JEDEC Level 1

***1.** There may be some variation depending on the mounted IC.

1. 2 Dimensions of HSNT-6A package



Unit : mm

***1.** The heat sink of back side has different electric potentials depending on the product.
Confirm specifications of each product.
Do not use it as the function of electrode.

Figure 1 Dimensions of HSNT-6A Package

2. Components and materials of HSNT-6A package

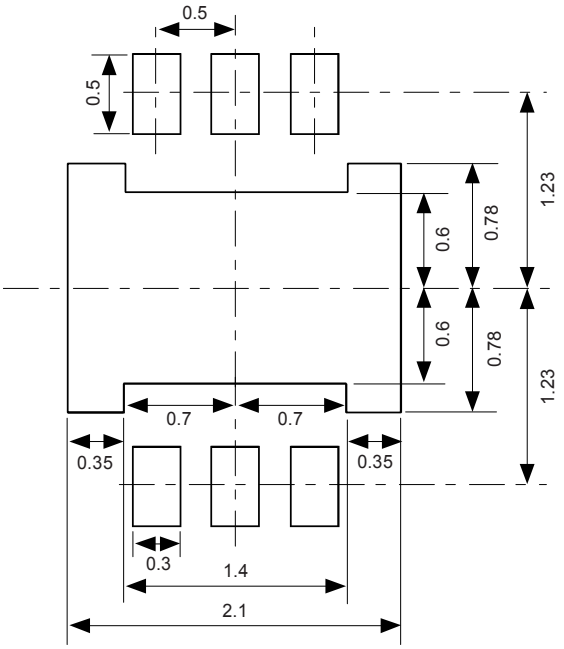
Table 2 Package, Tape and Reel Materials

Package and Reel Component	Material / Quality
Molding resin	Halogen free epoxy-based resin
Lead frame	Cu
Surface processing on pins	Sn-Bi, Sn 100%
Bonding wire	Au (at least 99.99% pure)
Die bonding agent	Epoxy-based resin with Ag filler
Embossed tape	PS
Cover tape	PET
Reel	PS

3. Recommended land dimensions for HSNT-6A package and recommended mask aperture dimensions for solder printing

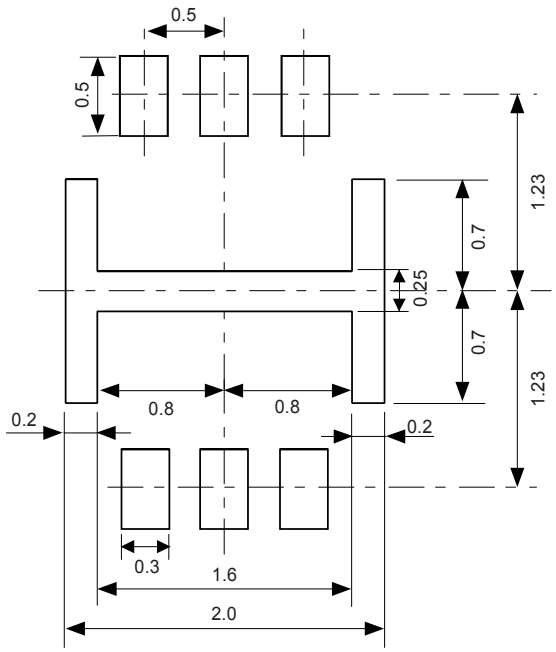
3. 1 Recommended land dimensions and recommended mask aperture dimensions

The figures below show the recommended land dimensions and solder printing mask dimensions.



Unit: mm

Figure 2 HSNT-6A Package Recommended Land Dimensions



Remark Mask thickness: t0.12 mm

Unit: mm

Figure 3 HSNT-6A Package Recommended Mask Aperture Dimensions

Caution It is recommended to solder the heat sink to a board in order to ensure the heat radiation.

3. 2 Mount position of HSNT-6A package

This figure shows the position where the HSNT-6A package is mounted to the recommended land.

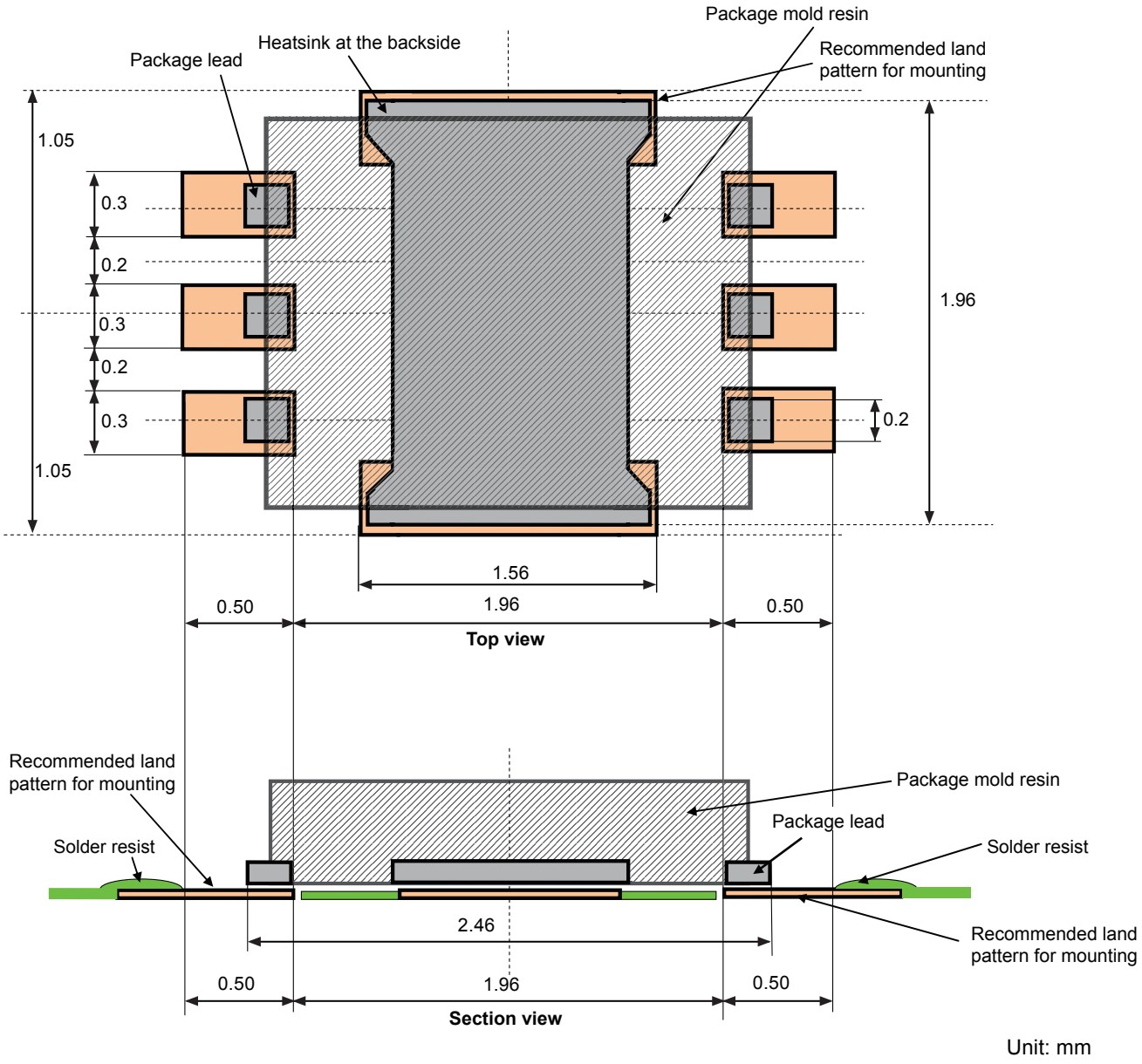


Figure 4 Position of Recommended Land for Mounting and Package on HSNT-6A Package

4. Handling and mounting methods

4. 1 Storage

Like other plastic packages, the HSNT-6A Package tends to absorb moisture from the ambient air.
If too much moisture is absorbed, the moisture may expand during solder mounting, which may cause delamination between the IC chip and the resin or cracks the resin mold.
In addition, if stored in high temperature or high humidity environments, the package lead plating solder wettability may deteriorate or the adhesive strength of the carrier tape and cover tape may change.
Store at the room temperature and humidity shown below.

Storage conditions: Ta = 5°C to 30°C, RH = 40% to 70%

It is recommended the package be used within 1 year of delivery.

4. 2 Rinsing of HSNT-6A package

Various types of rinsing methods are used to eliminate contamination from manufacturing processes, for soldering, etc. The rinsing method may adversely affect products.
The followings are points to note and recommended conditions for rinsing.

4. 2. 1 Rinsing conditions (reference examples)

Rinsing solvent
• Ethyl alcohol, Isopropyl alcohol, Hexane, Purified water

Ultrasonic cleaning conditions
• Frequency: 24 kHz to 36 kHz
• Output: 150 W to 400 W / 10 liters
• Time: 2 minutes to 3 minutes

Immersion rinsing conditions
• Fluid temperature: 60°C or lower

4. 2. 2 Points to note

• Ensure the object being rinsed does not resonate.
• Do not use chlorine-based solvents.
• Do not expose the products to a high temperature, and do not heat or cool the products rapidly.
• Complete rinsing quickly.

Caution The above rinsing conditions are not guaranteed conditions. Confirm the effect of rinsing on samples before rinsing products.

4. 3 Other special notes

- Design the printed circuit board with a flat surface for mounting the HSNT-6A package.
  This is a flat lead type package, so if the package mounting surface of the printed circuit board is uneven, then the package may incline and defects may appear in the lead's soldering.
  Also pay much attention to printed circuit board curvature.

- Lead soldering appearance
  Cu, which is the lead frame material, is exposed on the lead cut surface.
  Solder may not wet on this area, but this is not an issue with actual use.
  There is not difference in mounting strength based on if there is any solder wetting on the lead cut surface.
  Mounting evaluations implemented by our company is cleared.
  Refer to "**5. 1 Mounting evaluation results of HSNT-6A package (reference values)**".

- When mounting this package on the perimeter of the circuit board, do not subject to any shock during the circuit board splitting process.
  The package solder connection could be damaged by any vibration or curvature during circuit board splitting.

- Even if mounted exactly as noted in this user's guide, satisfactory mounting results may not be obtained depending on customer mounting conditions (mounting equipment, circuit board, mask conditions, reflow conditions, solder material, etc.).
  In such cases, it is necessary to adjust the mounting conditions to achieve the mounting status required by the customer.
  This user's guide proposes recommended conditions based on our company's evaluation results.

5. Evaluation results of HSNT-6A package

5. 1 Mounting evaluation results of HSNT-6A package (reference values)

5. 1. 1 Mounting evaluation results of HSNT-6A package (reference values)

Table 3 Mounting Evaluation Results of HSNT-6A Package (reference values)

Evaluation Item	Result	Main Condition
(1) Solderability	Pass (r/n = 0/5)	Wetting Balance Method Solder: Sn-3.0Ag-0.5Cu Solder vat temperature: 245°C Criteria: Pass if 3 seconds or less
(2) Push strength test for soldering joint	Pass (r/n = 0/5) HSNT-6A: 48 N	Test methods are based on EIAJ ET-7403. Criteria: No peeling, etc., (visual inspection) when 10 N pressure is applied for 10 seconds. Reference data: Pressed with jig from side of package to test for breaking strength. (Data: n = 5 (average))
(3) PCB bending test (constant stress method)	Pass (r/n = 0/5)	Bend amount: 1 mm Repetitions: 1500 Bend span: 90 mm Criteria: Resistance value fluctuation must not exceed twice the initial value. Must be without visual defects.
(4) PCB bending test (step stress method)	Pass (r/n = 0/5)	Maximum bend amount: 3 mm Bend span: 90 mm Criteria: Resistance value fluctuation must not exceed twice the initial value. Must be without visual defects.
(5) Drop test	Pass (r/n = 0/5)	HSNT-6A package mounting boards are fixed to a 100-g jig. Dropped 16 times from a 170 cm height (6 times on bottom side, 2 times each on the other 5 sides) Drop surface: Concrete or steel plate Criteria: Resistance value fluctuation must not exceed twice the initial value. Must be without visual defects.
(6) Mounting reliability	Pass (r/n = 0/22)	Temperature cycle: −40°C to 125°C, 1000 cycles Resistance value after testing must not exceed twice the initial value. Must be without visual defects.

Remark In tests (3) to (6), a daisy chain was formed in the package to confirm that the resistance value did not increase.

<Mounting Evaluation Conditions>

• Printed circuit board for evaluation
  Single-sided FR4
  Thickness = 1.0 mm
  Surface processing of mounting land = Gold plating

• Packages are preprocessed before each test (before PCB mounting).
  Preconditioning = 105°C, 100%, 8 hours

• Print mask
  Mask thickness = 120 μm
  Aperture ratio: Refer to "**3. 1 Recommended land dimensions and recommended mask aperture dimensions**".

• Reflow conditions
  Refer to "**5. 2. 2 Reflow profile for HSNT-6A package at thermal resistance evaluation**" for profile.
  Atmosphere: Air

• Solder
  Composition: Sn-3Ag-0.5Cu

5. 1. 2 Reflow profile for HSNT-6A package at mounting evaluation

Reflow conditions vary depending on factors such as the reflow oven and the specifications of printed circuit board to be used. The following figure shows the reflow profile used by ABLIC Inc. when evaluating mounting.

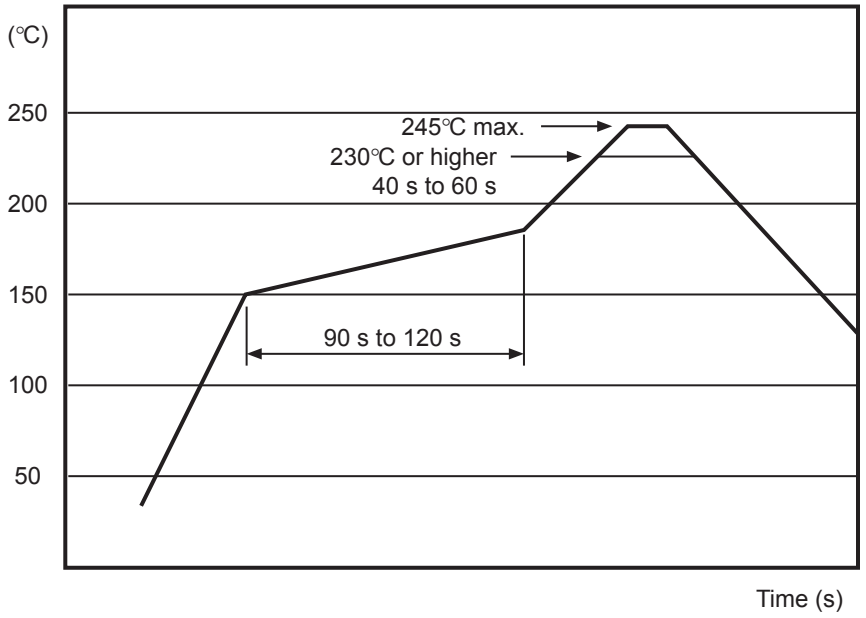


Figure 5 Reflow Profile for Mounting Evaluation

5. 2 Reliability testing results of HSNT-6A package

5. 2. 1 Reliability testing results of HSNT-6A package

Table 4 shows some reliability testing results of the HSNT-6A package.
Reliability testing results for each product can be downloaded from our company's website.
Select desired series names on the "**Datasheet Search**" page.

Table 4 Reliability Testing Results of HSNT-6A Package

Test Item	Test Condition	Criteria	Result
High temperature storage	Ta = 150°C, 1000 h	Must meet product standards.	Pass
Low temperature storage	Ta = −65°C, 1000 h		Pass
Temperature cycle (gas phase)	Ta = 150°C ⇔ −65°C, 30 minutes each, 200 cycles		Pass
Thermal shock (liquid phase)	Ta = 150°C ⇔ −65°C, 5 minutes each, 100 cycles		Pass
Solder thermal resistance (reflow)	T = 260°C max., 10 s, 3 times (Refer to reflow profile for heat resistance evaluation)	Must meet product standards. Must be without visible defects.	Pass
Whisker 1 (room temperature storage)	Ta = 30°C, RH = 60%, 4000 h	Whisker length must be 50 μm or less.	Pass
Whisker 2 (temperature cycle)	Ta = −40°C ⇔ 85°C, 1500 cycles		Pass
Whisker 3 (high-temperature high-humidity storage)	Ta = 55°C, RH = 85%, 4000 h		Pass

5. 2. 2 Reflow profile for HSNT-6A package for thermal resistance evaluation

Compatible with 260°C max. for up to 10 seconds.

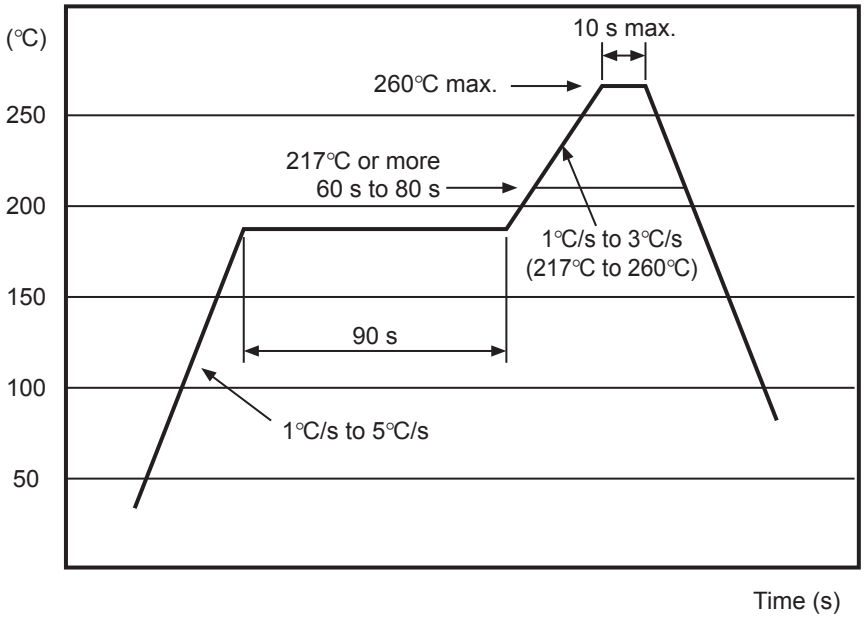


Figure 6 Reflow Profile for Thermal Resistance Evaluation

Remark Preheated parts will actually be a slight slope.

5. 3 Power dissipation of HSNT-6A package (reference values)

Table 5 HSNT-6A Package θ_{ja} Measurement Values

Package	θ_{ja}
HSNT-6A	100°C/W

[Evaluation board]

High heat radiation type	
Size:	50.0 mm × 50.0 mm × t1.6 mm
Wiring ratio (ratio of area covered with copper):	50%
Layer:	both sides
Thickness of copper:	35 μm
The number of via on both sides:	20

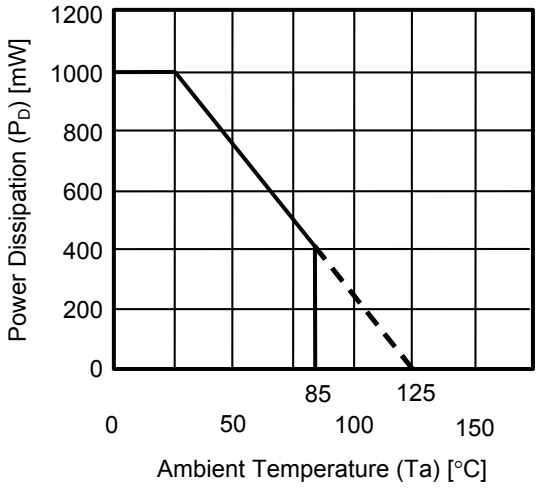
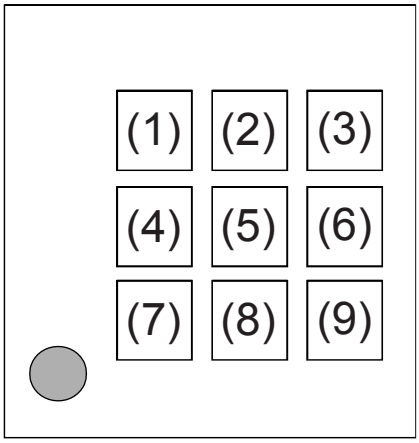


Figure 7 Power Dissipation of HSNT-6A Package

6. Marking specifications

Marking specifications of the HSNT-6A package are shown below.

6. 1 Marking specifications of HSNT-6A package



(1) to (4): Product code
(5): Year of assembly
(6): Month of assembly
(7) to (9): Lot No.

Figure 8 Marking Specifications of HSNT-6A Package

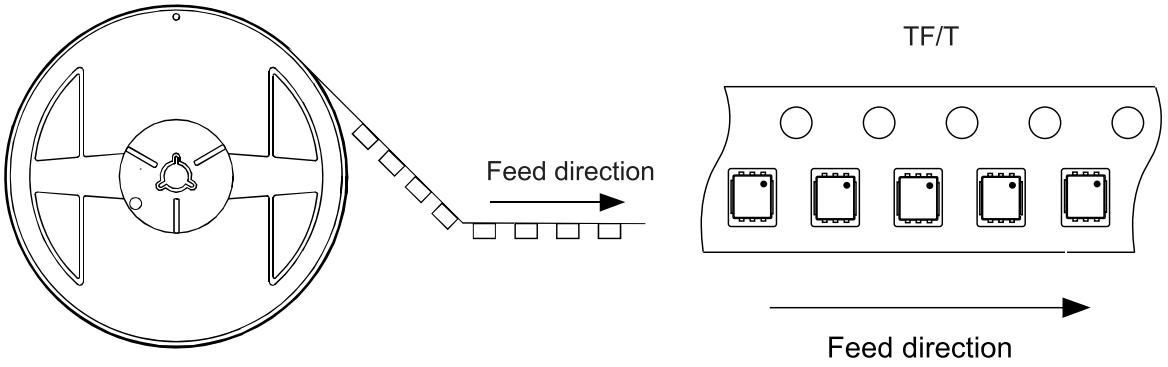
7. Packing Specifications

The reel specifications and the packing form of the HSNT-6A package are shown below.

7. 1 Packed unit

5000 / reel

7. 2 Embossed tape and reel specifications



TF/T: The pin #1 mark (●) is on the sprocket hole side.

Figure 9 Embossed Tape and Reel Specifications

7. 2. 1 Tape drawing of HSNT-6A package

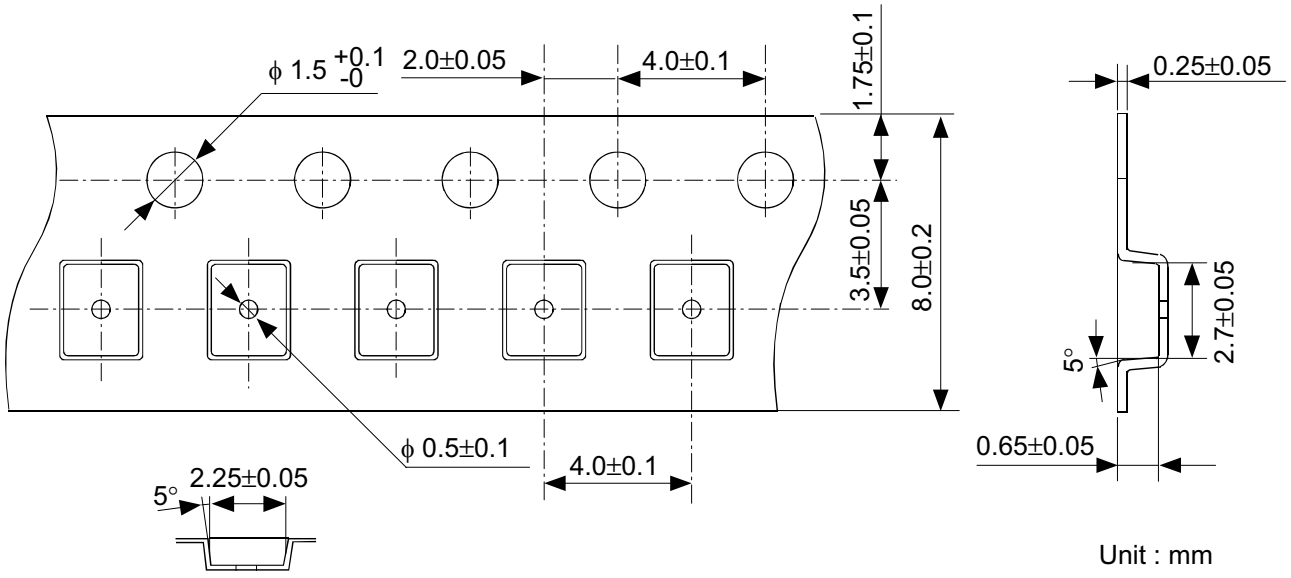


Figure 10 Tape Drawing of HSNT-6A Package

7. 3 Reel specifications

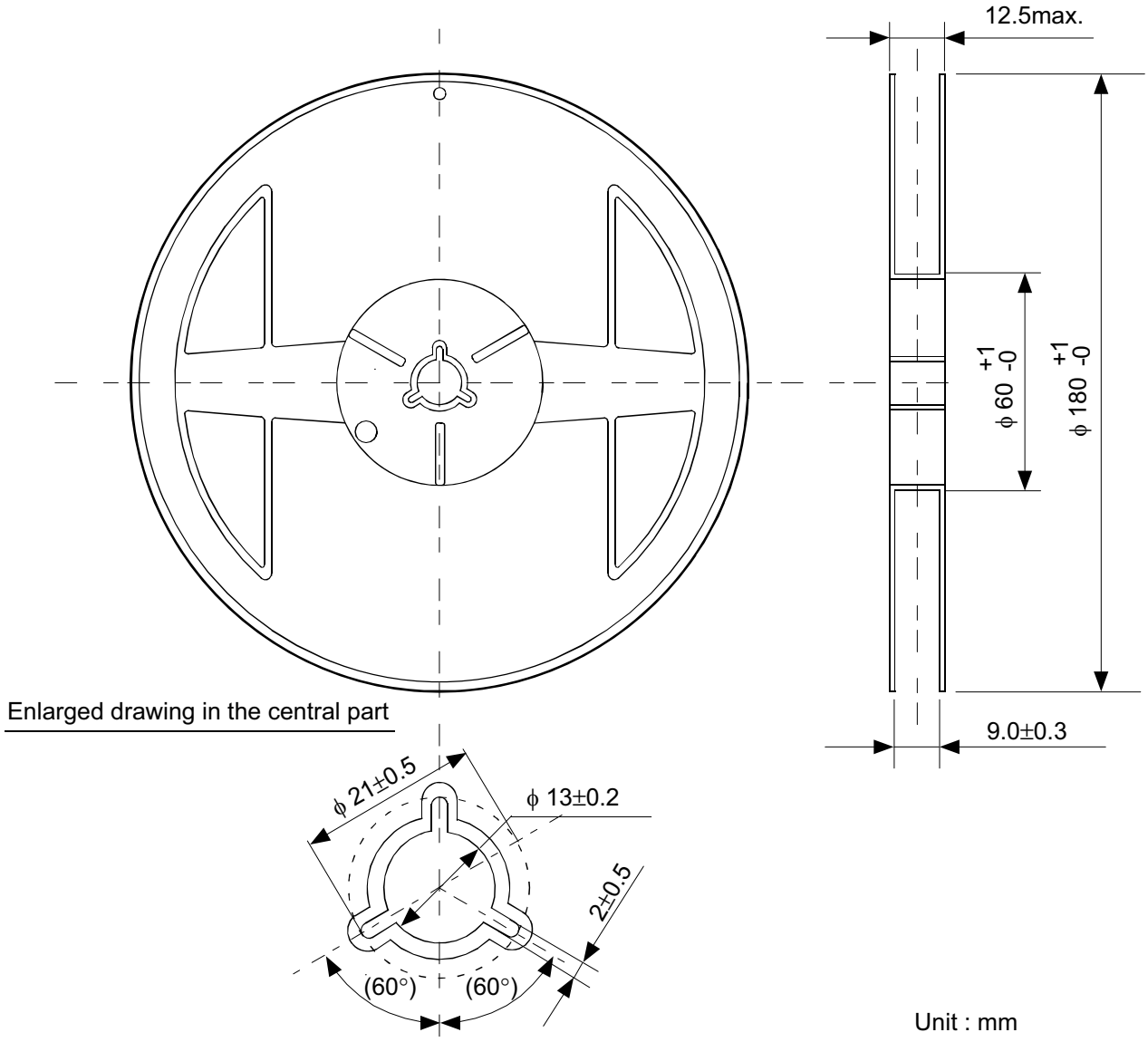


Figure 11 Reel Drawing of HSNT-6A Package

Disclaimers (Handling Precautions)

1. All the information described herein (product data, specifications, figures, tables, programs, algorithms and application circuit examples, etc.) is current as of publishing date of this document and is subject to change without notice.
2. The circuit examples and the usages described herein are for reference only, and do not guarantee the success of any specific mass-production design.
   ABLIC Inc. is not liable for any losses, damages, claims or demands caused by the reasons other than the products described herein (hereinafter "the products") or infringement of third-party intellectual property right and any other right due to the use of the information described herein.
3. ABLIC Inc. is not liable for any losses, damages, claims or demands caused by the incorrect information described herein.
4. Be careful to use the products within their ranges described herein. Pay special attention for use to the absolute maximum ratings, operation voltage range and electrical characteristics, etc.
   ABLIC Inc. is not liable for any losses, damages, claims or demands caused by failures and / or accidents, etc. due to the use of the products outside their specified ranges.
5. Before using the products, confirm their applications, and the laws and regulations of the region or country where they are used and verify suitability, safety and other factors for the intended use.
6. When exporting the products, comply with the Foreign Exchange and Foreign Trade Act and all other export-related laws, and follow the required procedures.
7. The products are strictly prohibited from using, providing or exporting for the purposes of the development of weapons of mass destruction or military use. ABLIC Inc. is not liable for any losses, damages, claims or demands caused by any provision or export to the person or entity who intends to develop, manufacture, use or store nuclear, biological or chemical weapons or missiles, or use any other military purposes.
8. The products are not designed to be used as part of any device or equipment that may affect the human body, human life, or assets (such as medical equipment, disaster prevention systems, security systems, combustion control systems, infrastructure control systems, vehicle equipment, traffic systems, in-vehicle equipment, aviation equipment, aerospace equipment, and nuclear-related equipment), excluding when specified for in-vehicle use or other uses by ABLIC, Inc. Do not apply the products to the above listed devices and equipments.
   ABLIC Inc. is not liable for any losses, damages, claims or demands caused by unauthorized or unspecified use of the products.
9. In general, semiconductor products may fail or malfunction with some probability. The user of the products should therefore take responsibility to give thorough consideration to safety design including redundancy, fire spread prevention measures, and malfunction prevention to prevent accidents causing injury or death, fires and social damage, etc. that may ensue from the products' failure or malfunction.
   The entire system in which the products are used must be sufficiently evaluated and judged whether the products are allowed to apply for the system on customer's own responsibility.
10. The products are not designed to be radiation-proof. The necessary radiation measures should be taken in the product design by the customer depending on the intended use.
11. The products do not affect human health under normal use. However, they contain chemical substances and heavy metals and should therefore not be put in the mouth. The fracture surfaces of wafers and chips may be sharp. Be careful when handling these with the bare hands to prevent injuries, etc.
12. When disposing of the products, comply with the laws and ordinances of the country or region where they are used.
13. The information described herein contains copyright information and know-how of ABLIC Inc. The information described herein does not convey any license under any intellectual property rights or any other rights belonging to ABLIC Inc. or a third party. Reproduction or copying of the information from this document or any part of this document described herein for the purpose of disclosing it to a third-party is strictly prohibited without the express permission of ABLIC Inc.
14. For more details on the information described herein or any other questions, please contact ABLIC Inc.'s sales representative.
15. This Disclaimers have been delivered in a text using the Japanese language, which text, despite any translations into the English language and the Chinese language, shall be controlling.

2.4-2019.07