

## CMOS IC Application Note

# HSNT Package User's Guide

Rev.3.0\_00

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This manual describes the features, package dimensions, recommended land, handling methods as well as marking specifications and packing specifications of the HSNT small package, for users in the semiconductor mounting technology fields.

In addition, mounting evaluation results 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 the conditions and other information listed in this document may require adjustment or modification depending on the customer's equipment, materials, conditions, environment, and other factors.

### [Target Packages]

- HSNT-4(0808)
- HSNT-4(1010)
- HSNT-6(1212)
- HSNT-6A
- HSNT-6(1618)
- HSNT-8(1616)
- HSNT-8(2030)

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## 1. Features of HSNT Package

### 1.1 General description of HSNT package

The HSNT package is a small, thin and lightweight resin molded package for surface-mounting onto printed circuit boards, and there is a heat sink on the back of the package which also gives the package excellent heat dissipation performance.

In addition, the HSNT package Series is very thin, with a maximum thickness of 0.5 mm, making it especially well-suited for products in which you want to reduce the attachment height of mounted parts.

The HSNT package series consists of 7 types of packages: HSNT-4(0808), HSNT-4(1010), HSNT-6(1212), HSNT-6A, HSNT-6(1618), HSNT-8(1616), and HSNT-8(2030).

Despite being ultra-compact and thin, the HSNT package fully meets the same level of reliability as ABLIC's other compact packages.

**Table 1 Specifications of HSNT Package (1 / 2)**

Item	HSNT-4(0808)	HSNT-4(1010)	HSNT-6(1212)	HSNT-6A
Dimensions (mm)	0.8 × 0.8 × t0.4 max.	1.0 × 1.0 × t0.4 max.	1.2 × 1.2 × t0.4 max.	2.46 × 1.96 × t0.5 max.
Number of pins	4	4	6	6
Pitch (mm)	0.40	0.65	0.40	0.50
Package weight*1 (mg)	0.64	1.05	1.59	6.20
JEDEC MSL	Level 1			

**Table 1 Specifications of HSNT Package (2 / 2)**

Item	HSNT-6(1618)	HSNT-8(1616)	HSNT-8(2030)
Dimensions (mm)	1.8 × 1.6 × t0.4 max.	1.6 × 1.6 × t0.4 max.	3.0 × 2.0 × t0.5 max.
Number of pins	6	8	8
Pitch (mm)	0.50	0.40	0.50
Package weight*1 (mg)	2.70	2.81	7.50
JEDEC MSL	Level1		

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

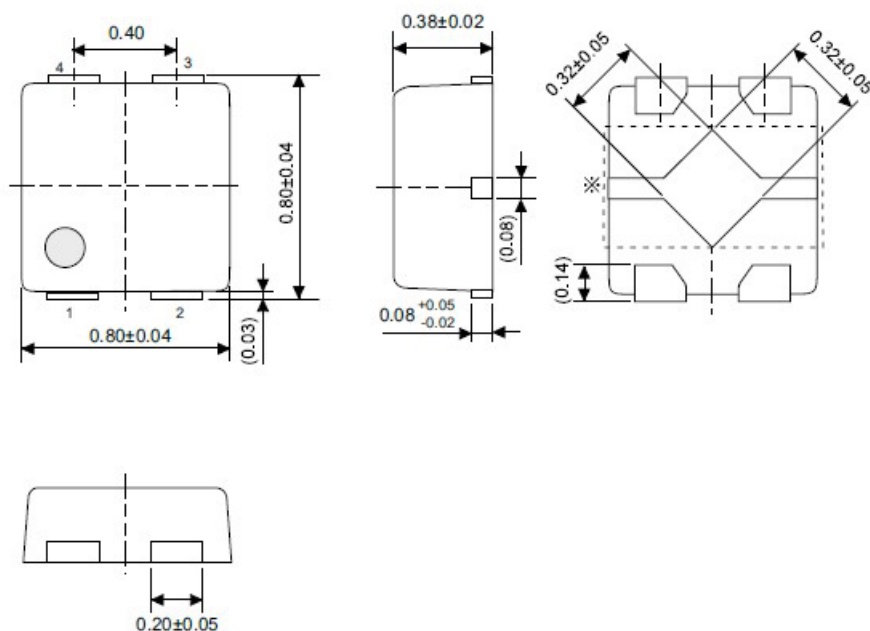
**Table 2 Package, Tape and Reel Materials**

Package and Reel Component	Material / Quality
Molding resin	EP
Lead frame	Cu
Surface processing on pins	Sn 100%
Bonding wire	Au
Die bonding agent	EP
Embossed carrier tape	PS
Cover tape	PET
Reel	PS

## 1. 2 Dimension, land and stencil opening of HSNT package

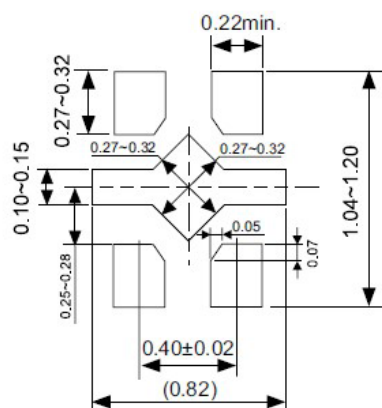
The land drawing and mask aperture drawing dimensions are not design values but finished dimension values. Finish to the noted dimensions with reference for the circuit board and mask manufacturing tolerances.

### 1. 2. 1 HSNT-4(0808)



Unit : mm

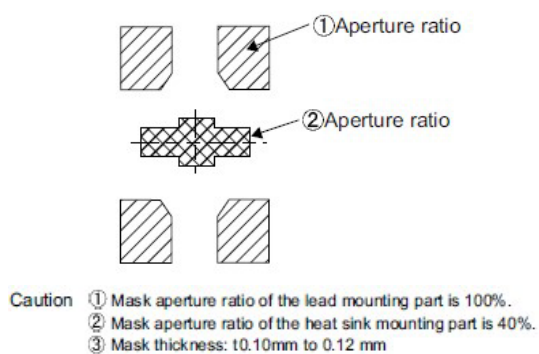
Figure 1 Dimensions of HSNT-4(0808)



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

Unit : mm

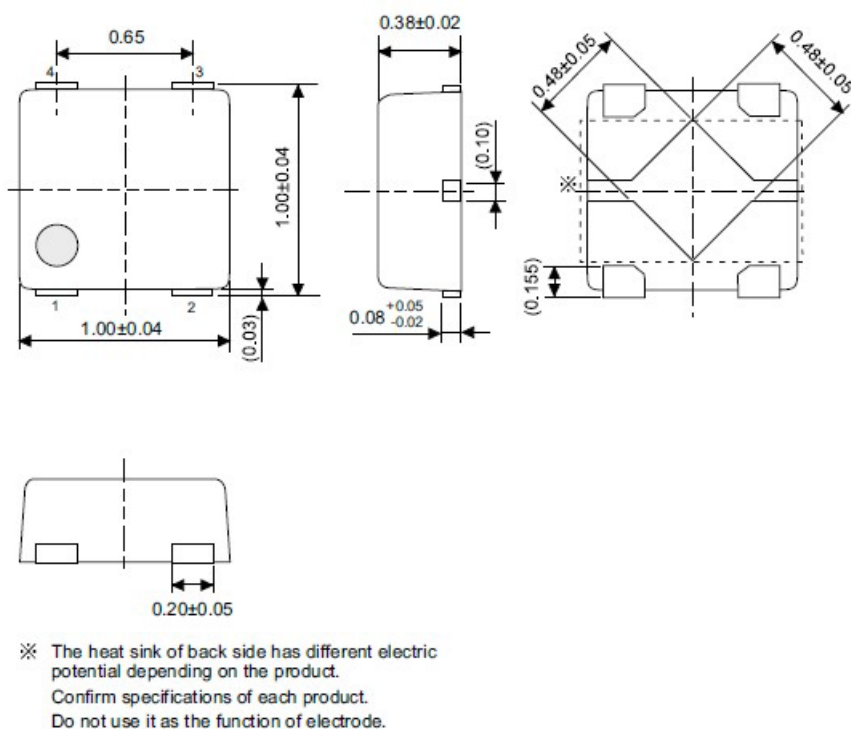
Figure 2 Land of HSNT-4(0808)



Unit : mm

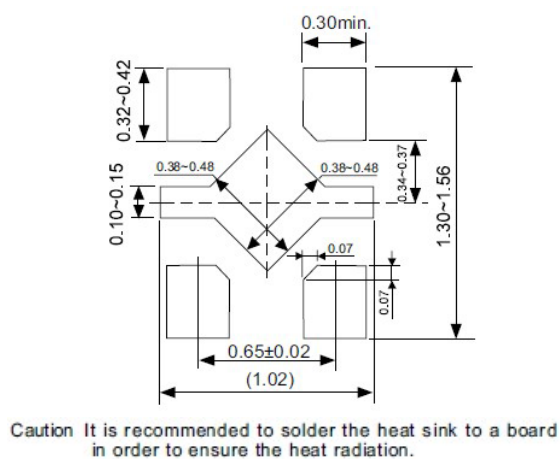
Figure 3 Stencil Opening of HSNT-4(0808)

### 1.2.2 HSNT-4(1010)



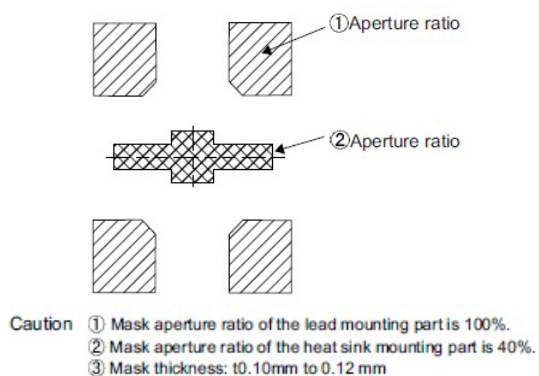
Unit : mm

**Figure 4 Dimensions of HSNT-4(1010)**



Unit : mm

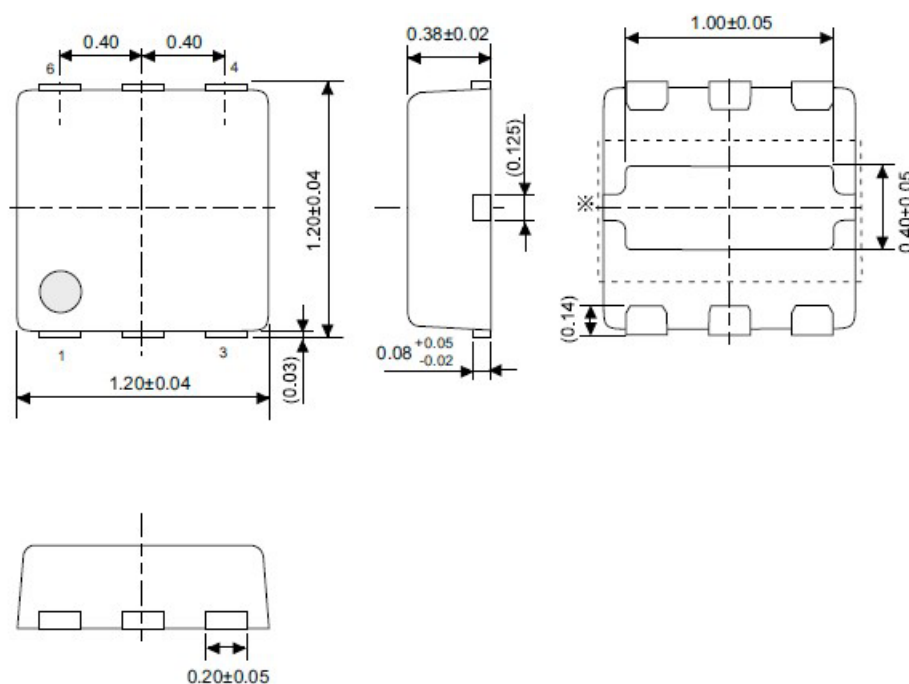
**Figure 5 Land of HSNT-4(1010)**



Unit : mm

Figure 6 Stencil Opening of HSNT-4(1010)

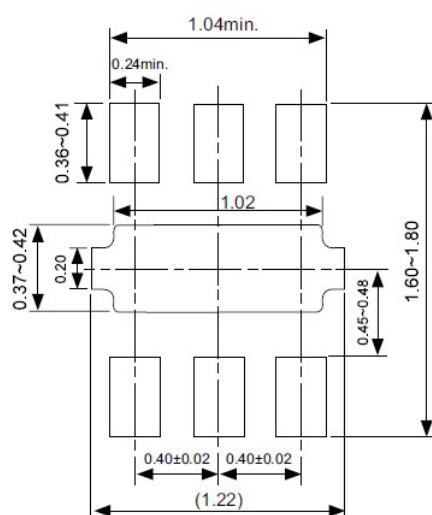
### 1. 2. 3 HSNT-6(1212)



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

Unit : mm

Figure 7 Dimensions of HSNT-6(1212)

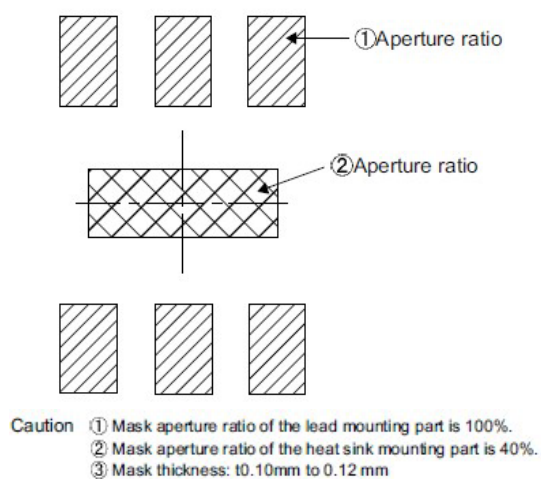


Caution It is recommended to solder the heat sink to a board in order to ensure the heat radiation.

Unit : mm

Figure 8 Land of HSNT-6(1212)

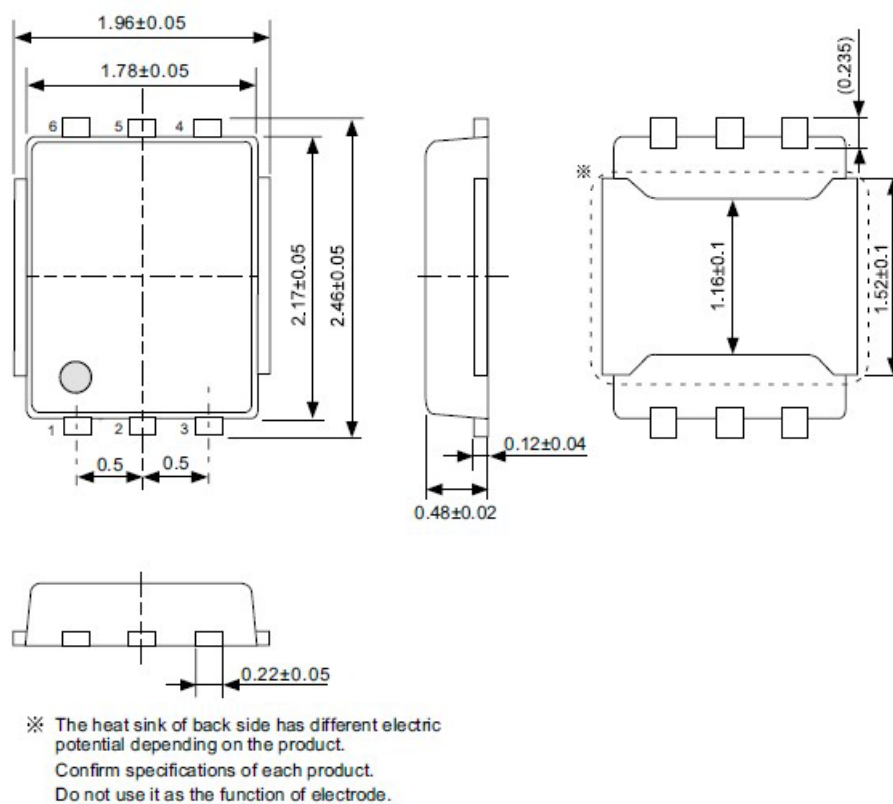




Unit : mm

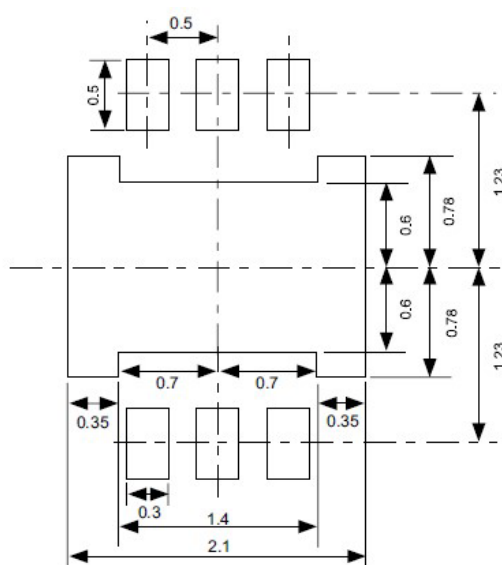
Figure 9 Stencil Opening of HSNT-6(1212)

#### 1.2.4 HSNT-6A



Unit : mm

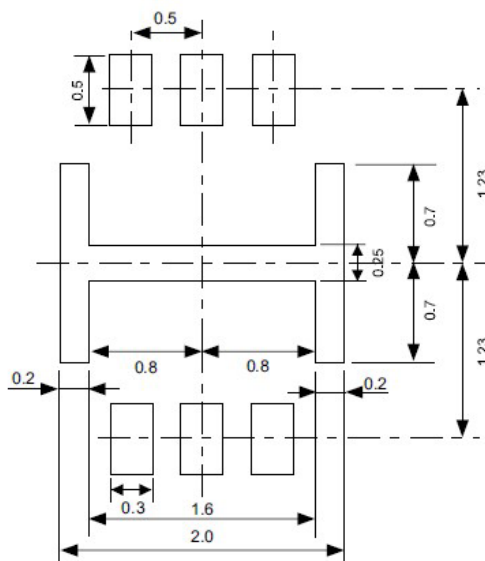
Figure 10 Dimensions of HSNT-6A



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

Unit : mm

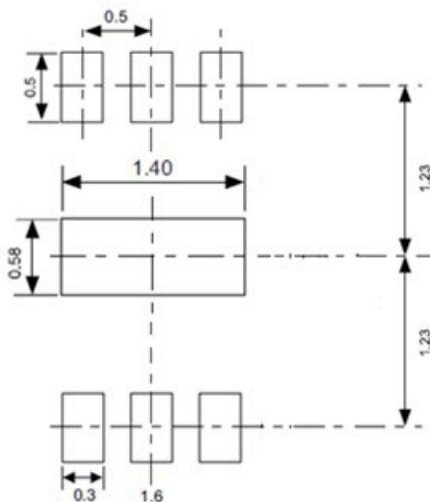
Figure 11 Land of HSNT-6A



Unit : mm

**Figure 12 Stencil Opening of HSNT-6A**

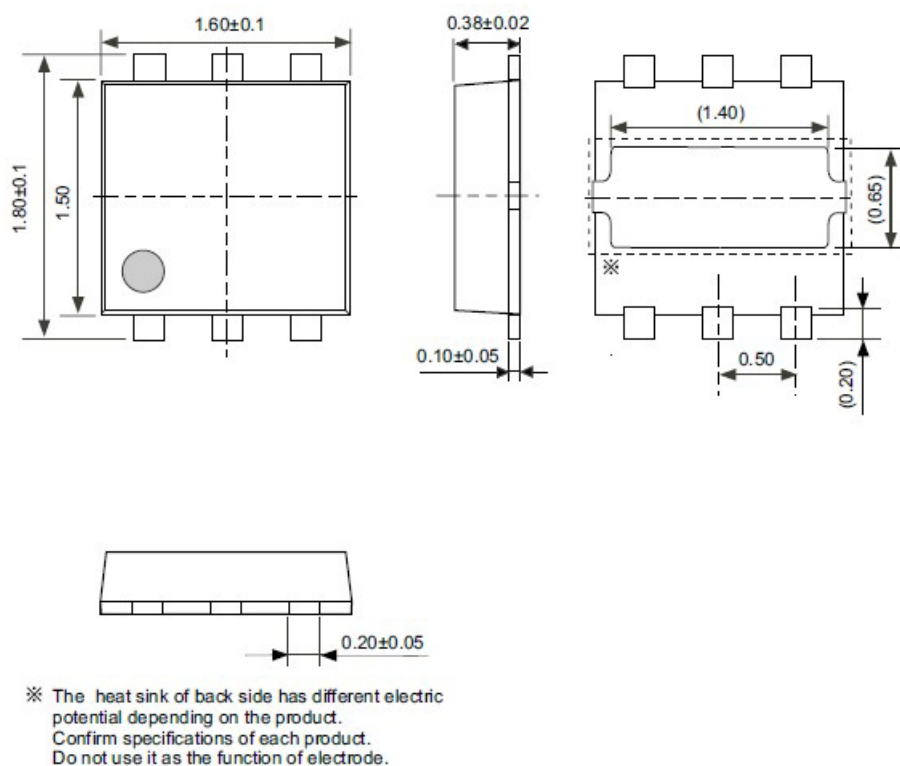
There is no issue using a rectangular shape as shown in **Figure 13**, as long as the opening size of the heat sink section is 30% to 40% of the recommended land pattern.



Unit : mm

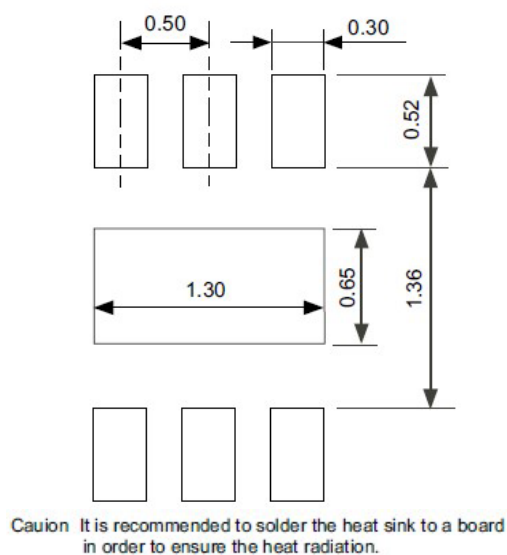
**Figure 13 Heat Sink Section Stencil Opening Shape Example**

### 1. 2. 5 HSNT-6(1618)



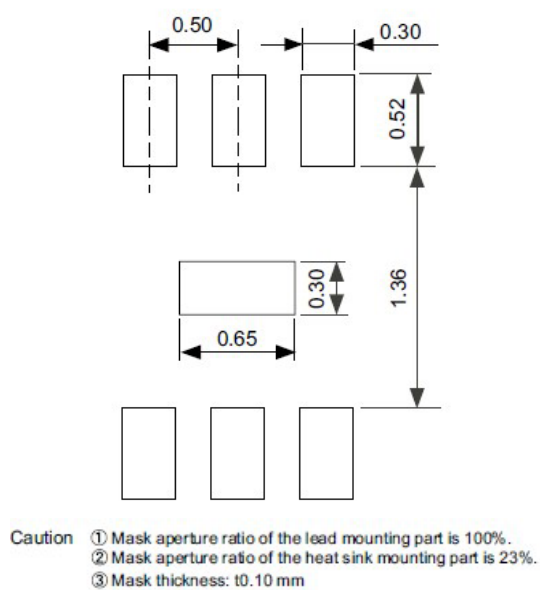
Unit : mm

Figure 14 Dimensions of HSNT-6(1618)



Unit : mm

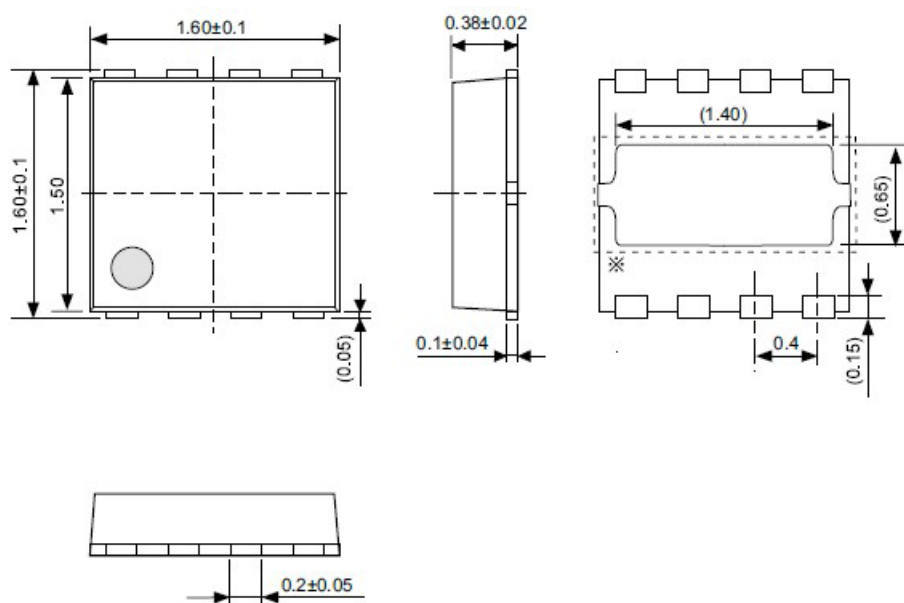
Figure 15 Land of HSNT-6(1618)



Unit : mm

Figure 16 Stencil Opening of HSNT-6(1618)

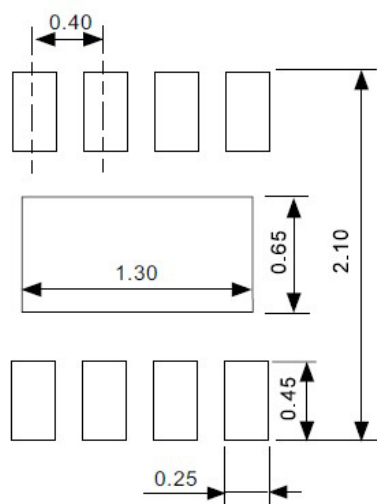
### 1.2.6 HSNT-8(1616)



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

Unit : mm

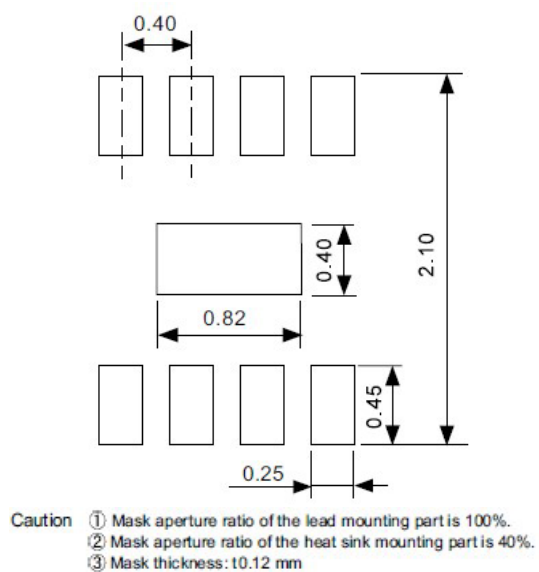
Figure 17 Dimensions of HSNT-8(1616)



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

Unit : mm

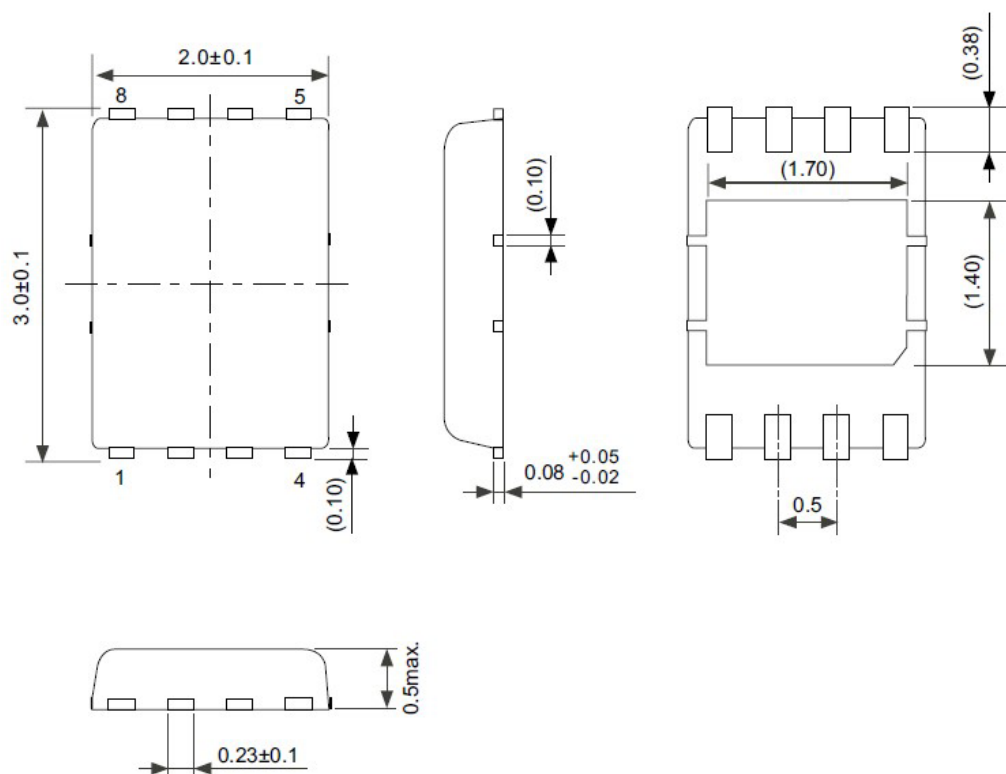
Figure 18 Land of HSNT-8(1616)



Unit : mm

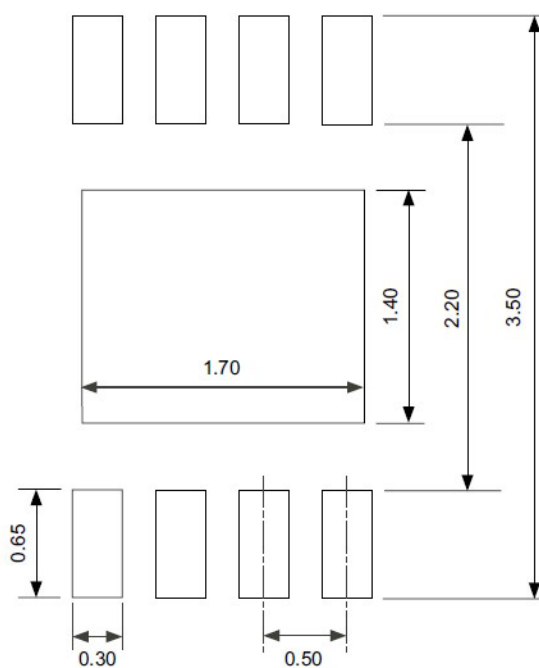
Figure 19 Stencil Opening of HSNT-8(1616)

1.2.7 HSNT-8(2030)



Unit : mm

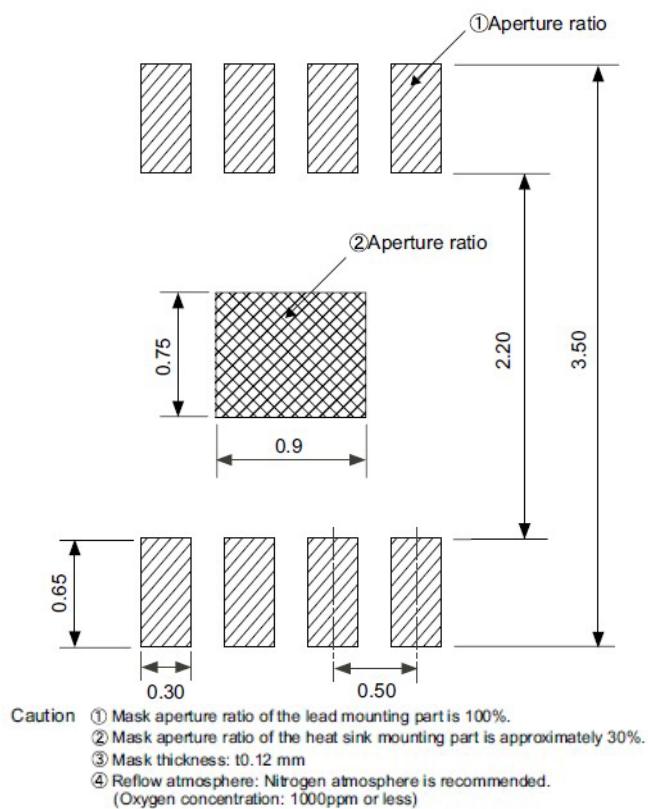
Figure 20 Dimensions of HSNT-8(2030)



Unit : mm

Figure 21 Land of HSNT-8(2030)





Unit : mm

Figure 22 Stencil Opening of HSNT-8(2030)

## 2. Mounting Method

### 2.1 Storage of HSNT package

Like other plastic packages, the HSNT 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 package 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.

### 2.2 Cautions when mounting

#### 2.2.1 Printing process

The HSNT package has small land dimensions on the printed circuit board. Therefore, it requires very precise printing with cream solder.

##### (1) Printing machine

The recommended printing accuracy of the printing machine is as follows.

Cream solder printing accuracy:  $\pm 20\ \mu\text{m}$  or less is recommended.

##### (2) Solder printing mask

###### (a) Mask aperture ratio

- Aperture ratio of lead mounting part

Print sufficient solder to achieve good mounting.

It is recommended that the lead section mask aperture ratio be 100% or higher.

- Aperture ratio of heat sink mounting part

It is recommended to reduce the mask aperture ratio to 30% to 40%. Refer to the mask aperture drawings for each package.

If a large amount of solder is printed on the heat sink section, it could cause the package to float off of the board surface and result in bad mounting of the lead section.

Also mask aperture ratio of the heat sink part may need to be adjusted depending on the mask thickness.

**Remark** The heat sink is exposed out of the package back surface in order to improve HSNT package heat dissipation.

It is recommended that the heat sink and printed circuit board be soldered together to improve heat dissipation and mounting strength.

###### (b) Mask aperture processing

It is recommended to use a smoothed mask aperture wall surface to improve solder printability.

##### (3) Cream solder

Use a cream solder which has good printability for the small mask aperture sections, and which has good solder wettability for the package lead and heat sink.

The recommended solder particle diameter is as follows.

Solder particle diameter: 15  $\mu\text{m}$  to 25  $\mu\text{m}$  or less is recommended.

**Remark** Printability and solder solderability will differ depending on the solder used and printing conditions. Please confirm the status in advance.

## 2. 2. 2 Mounting process

The HSNT package size is very small, so accuracy of mounting on the printed circuit board is important. The recommended mounting accuracy of the mounter is as follows.

Mounting accuracy:  $\pm 50\ \mu\text{m}$  or less is recommended.

Use a tape feeder with small vibration during tape feed.

If tape feeder vibration is large, it may result in the package flying off of the tape or the posture changing within the tape pocket. Confirm the status in the pocket before package pickup.

Also confirm that the pickup nozzle sucks the package in the correct posture.

## 2. 2. 3 Reflow process

### (1) Reflow oven internal settings

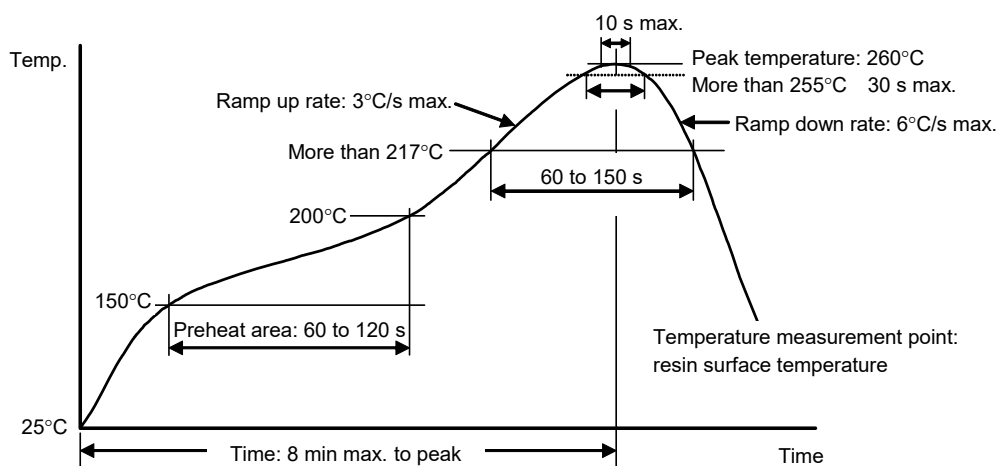
The HSNT package is very small and light, so it can be affected by airflow and vibration in the reflow oven. Please use appropriate oven internal environment settings.

Make sure the temperature is applied evenly to each of the HSNT package leads and that there is no deviation in the timing between melting and solidification among the leads.

### (2) Reflow atmosphere

A nitrogen atmosphere is recommended for the atmosphere inside the reflow oven. The oxygen concentration should be 1000 ppm or less.

The HSNT package series reflow profile for heat resistance evaluation is compliant with JEDEC J-STD-020.



Number of maximum reflow cycles: three times

Figure 23 Reflow Profile for Heat Resistance Evaluation

**2. 2. 4 Other mounting processes****(1) Flow mounting compatibility**

HSNT packages are non-lead packages with a heat sink on the back surface and are not compatible with flow mounting. Do not carry out flow mounting because rapid temperature increases can cause chip surface peeling and package cracking in the molded resin parts.

**(2) Manual soldering compatibility**

HSNT packages are non-lead packages and are not compatible with manual soldering.

**2. 2. 5 Cleaning method**

When clean-free flux is applied, cleaning is not necessary. It may cause corrosion when residue of the active agents remained in the flux. Good selection of flux is indispensable to avoid corrosion.

Avoid chloride and chlorofluocarbon cleaning agents, and use environmentally-friendly flux cleaning solvents, pure water, etc. for cleaning.

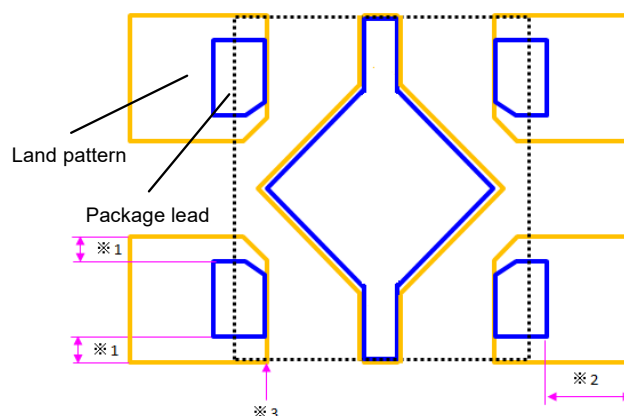
Avoid high temperatures, rapid heating, and rapid cooling for cleaning agents and drying temperatures.

If performing ultrasonic cleaning, do the processing in the shortest possible time, and ensure the products being cleaned do not resonate.

## 2.3 Land pattern design and solder printing mask specifications

### 2.3.1 Land pattern design precautions

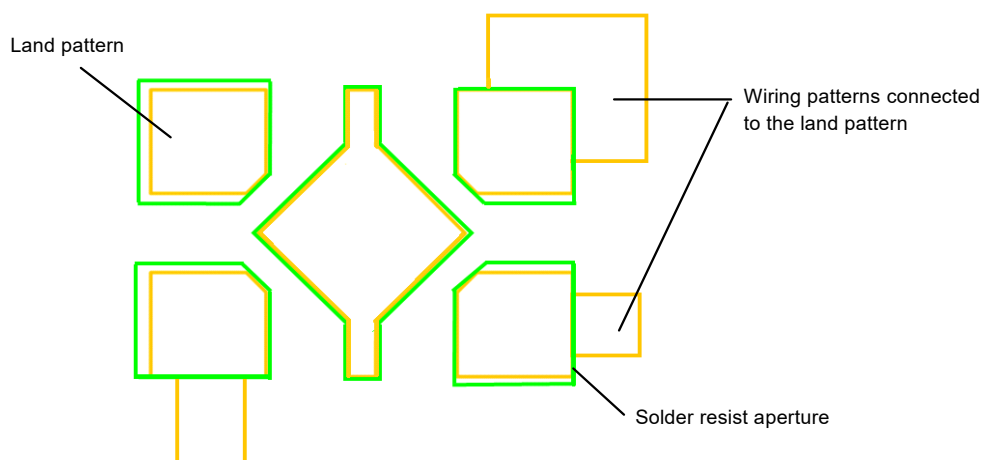
- (1) When designing the board for HSNT packages, be sure to design within the dimension values shown in **Figure 24**. **Figure 24** shows an example with the HSNT-4(1010), however the dimensions are the same for other HSNT packages.



**Figure 24 Land Pattern Design Precautions**

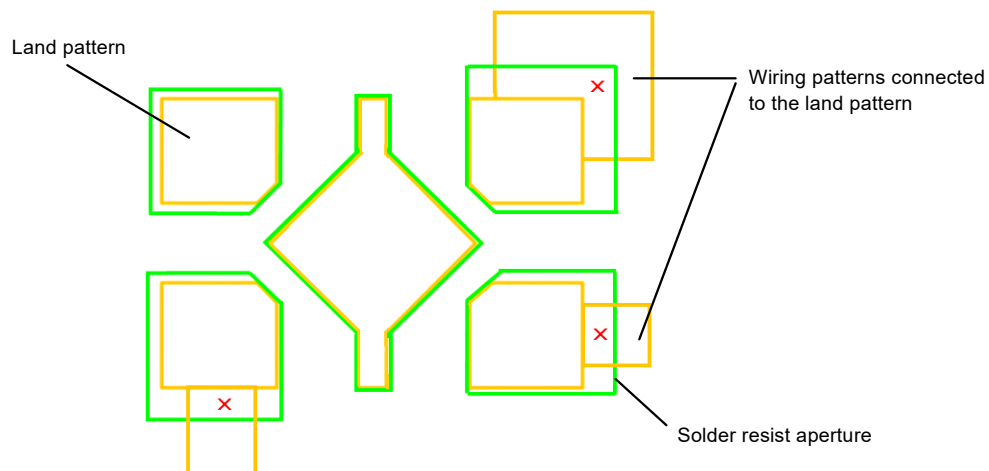
- \*1. Make the land pattern width wider than the lead width in order to improve solder wettability from the lead side.  
For 0.4 mm pitch packages, it is recommended the width be 0.02 mm larger, and for 0.5 mm pitch and larger packages, it is recommended the width be 0.05 mm larger.
- \*2. In order to wet the HSNT package leads with solder, expand the land pattern in the direction of the lead tips to improve solder wettability from the lead tips. Expand the land pattern by approximately 0.25 mm to 0.3 mm from the lead tip section.
- \*3. Do not expand the land pattern past the back of the heel. Doing so could cause the package to float or impede self-alignment. It is recommended to align the land pattern to the lead heel section (0 mm to 0.05 mm max.).

- (2) For the solder resist forming method, make sure that solder does not flow into the wiring pattern which is directly connected to the land pattern as shown in **Figure 25**. Preventing solder from flowing into the wiring pattern makes it possible to maintain the amount of solder required for the package leads.



**Figure 25 Solder Resist Formation Example (Good Example)**

Solder resist aperture areas which are too wide and into which solder will flow are marked with an "x" in **Figure 26**. In such a case, solder may flow into the wiring patterns, and a sufficient amount of solder may not be supplied to the package leads. In addition, the package leads may get pulled toward certain lands in some cases.



**Figure 26 Solder Resist Formation Example (Bad Example)**

### 2.3.2 Solder printing mask specifications

- (1) The aperture ratio is different for sections where package leads are mounted and the sections where heat sinks are mounted for HSNT package solder printing masks. A sufficient amount of solder is required for the sections where package leads are mounted, so the mask aperture ratio should be 100% relative to the land pattern area. However, for the heat sink sections, if the amount of printed solder is excessive, the package may float up, so the mask aperture ratio must be lower. It is recommended that the heat sink section mask aperture ratio be maintained between 30% to 40%.

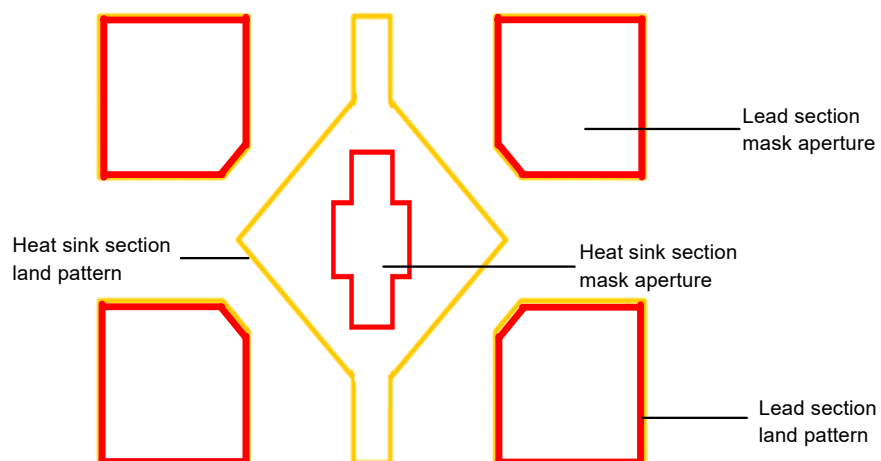


Figure 27 Stencil Opening

- (2) If the printed solder shorts between the lands, expand the lead section mask aperture in the direction of the lead tips, and adjust the solder printing amount so that it is the same as the 100% aperture ratio (Refer to **Figure 28**). Do not expand the aperture toward the center (the sections marked with an "x" in **Figure 29**), even if it is to increase the solder printing amount.

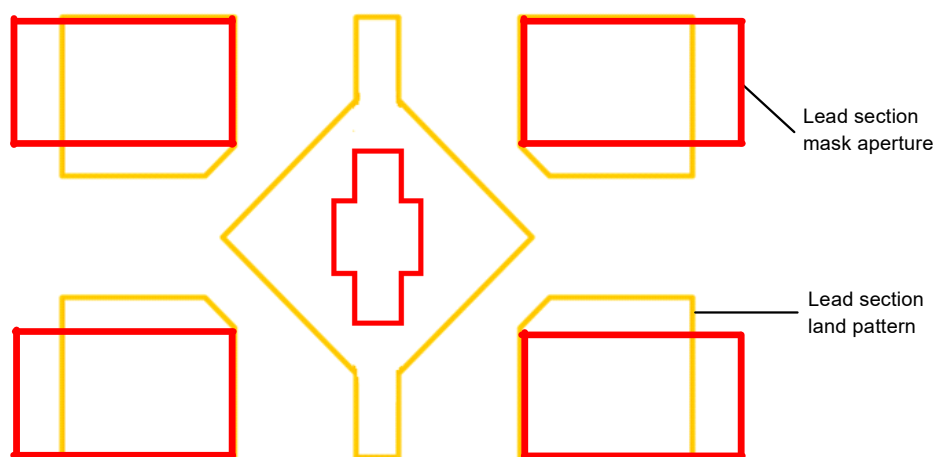


Figure 28 Special Mask Aperture Example

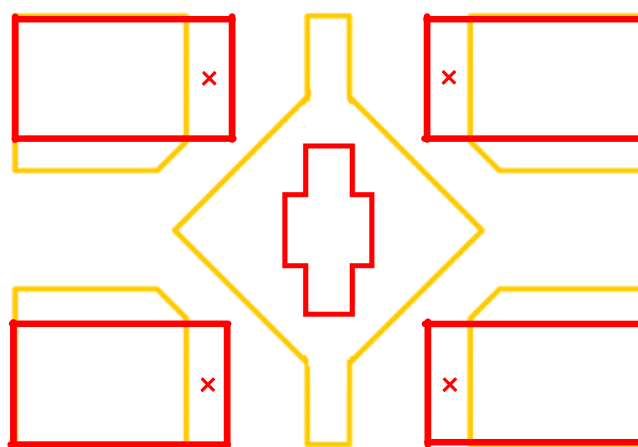


Figure 29 Special Mask Aperture Example (Bad Example)

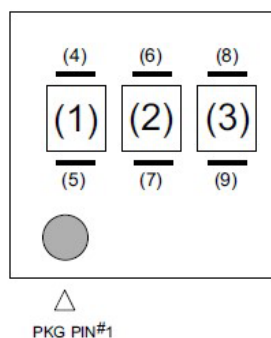


### 2. 3. 3 Other special notes

- Design the printed circuit board with a flat surface for mounting the HSNT package.  
The HSNT package is a flat lead type, 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 mounting.  
The following are potential causes of unevenness in the board surface.  
(1) Silk printing on package installation sections  
(2) Uneven thickness of the solder resist
- Also pay much attention to printed circuit board curvature.
- The package solder connection could be damaged by any vibration during circuit board splitting or board curvature during the assembly process, etc., so exercise caution when planning the board mounting layout.
- Lead soldering appearance  
Cu, which is the lead frame material, is exposed on the cut surface of the lead tip.  
Solder may not wet on this area, but this is not a package defect.
- The content described in this user's guide might not satisfy some customer's mounting quality requirements.  
In such cases, optimal mounting conditions must be adjusted by each customer.

### 3. Marking Specifications

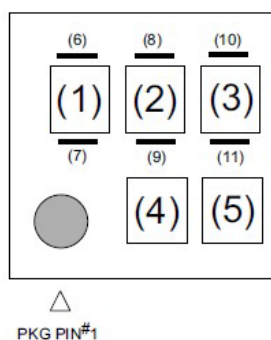
#### 3.1 HSNT-4(0808)



(1) to (3) : Product code  
(4) , (5) : Year of assembly (bar)  
(6) to (9) : Month of assembly (bar)

Figure 30 Marking Specification of HSNT-4(0808)

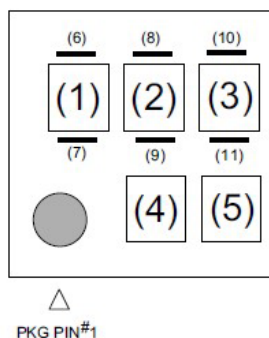
#### 3.2 HSNT-4(1010)



(1) to (3) : Product code  
(4) , (5) : Lot No.  
(6) , (7) : Year of assembly (bar)  
(8) to (11) : Month of assembly (bar)

Figure 31 Marking Specification of HSNT-4(1010)

### 3.3 HSNT-6(1212)



(1) to (3) : Product code

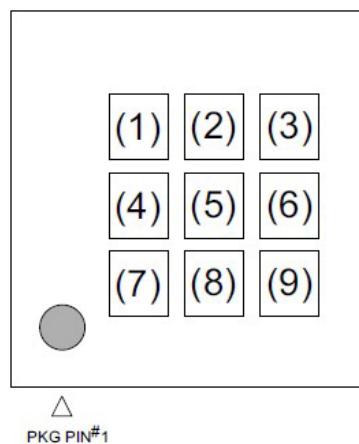
(4), (5) : Lot No.

(6), (7) : Year of assembly (bar)

(8) to (11) : Month of assembly (bar)

Figure 32 Marking Specification of HSNT-6(1212)

### 3.4 HSNT-6A



(1) to (4) : Product code

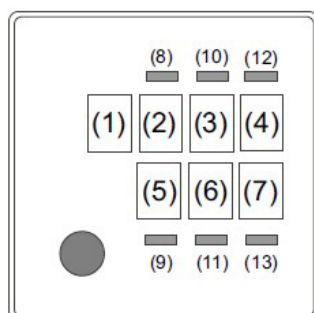
(5) : Year of assembly

(6) : Month of assembly

(7) to (9) : Lot No.

Figure 33 Marking Specification of HSNT-6A

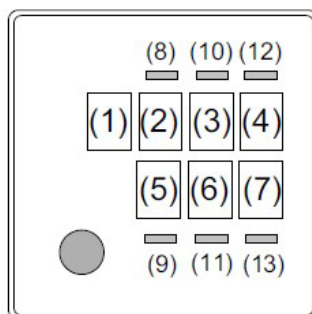
### 3. 5 HSNT-6(1618)



(1) to (4) : Product code  
(5) to (7) : Lot No.  
(8) , (9) : Year of assembly ( bar )  
(10) to (13) : Month of assembly ( bar )  
● : 1Pin mark

Figure 34 Marking Specification of HSNT-6(1618)

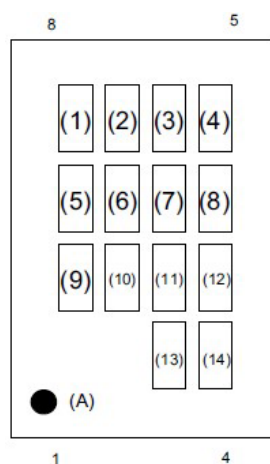
### 3. 6 HSNT-8(1616)



(1) to (4) : Product code  
(5) to (7) : Lot No.  
(8) , (9) : Year of assembly ( bar )  
(10) to (13) : Month of assembly ( bar )  
● : 1 Pin mark

Figure 35 Marking Specification of HSNT-8(1616)

### 3.7 HSNT-8(2030)



- (1) to (8) : Product code
- (9) : Assembly code
- (10) : Year of assembly
- (11) : Month of assembly
- (12) to (14) : Lot No. code
- (A) : 1 Pin mark

Figure 36 Marking Specification of HSNT-8(2030)

## 4. Packing Specifications

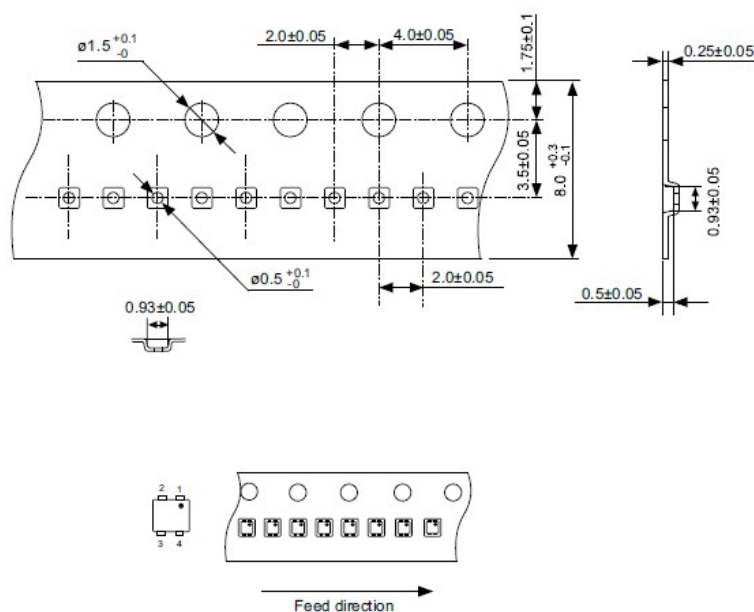
### 4.1 Packed units

HSNT-4(0808), HSNT-4(1010): 10000 / reel

HSNT-6(1212), HSNT-6A, HSNT-6(1618), HSNT-8(1616), HSNT-8(2030): 5000 / reel

### 4.2 Embossed carrier tape specifications

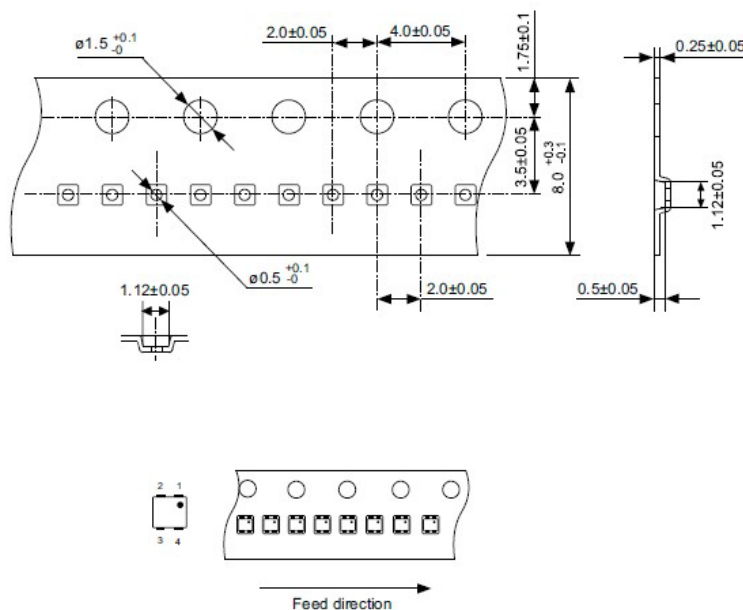
#### 4.2.1 HSNT-4(0808)



Unit : mm

Figure 37 Tape Dimensions of HSNT-4(0808)

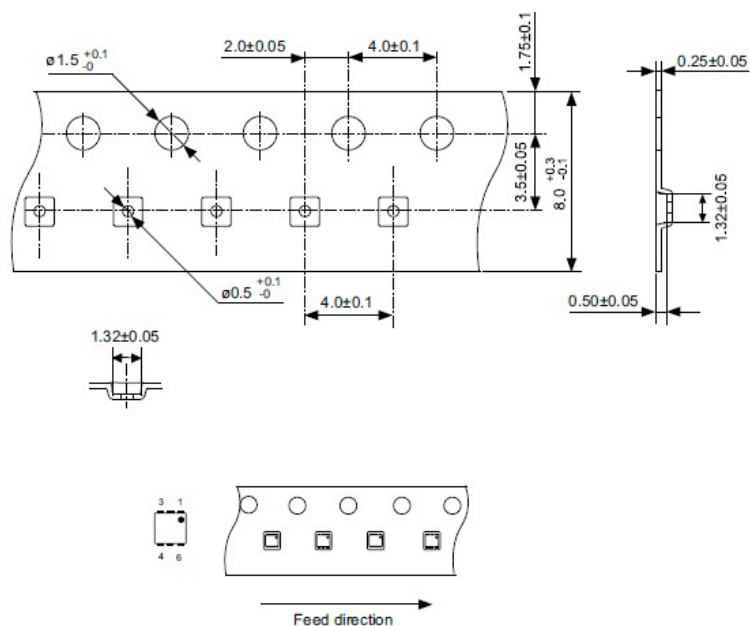
#### 4.2.2 HSNT-4(1010)



Unit : mm

Figure 38 Tape Dimensions of HSNT-4(1010)

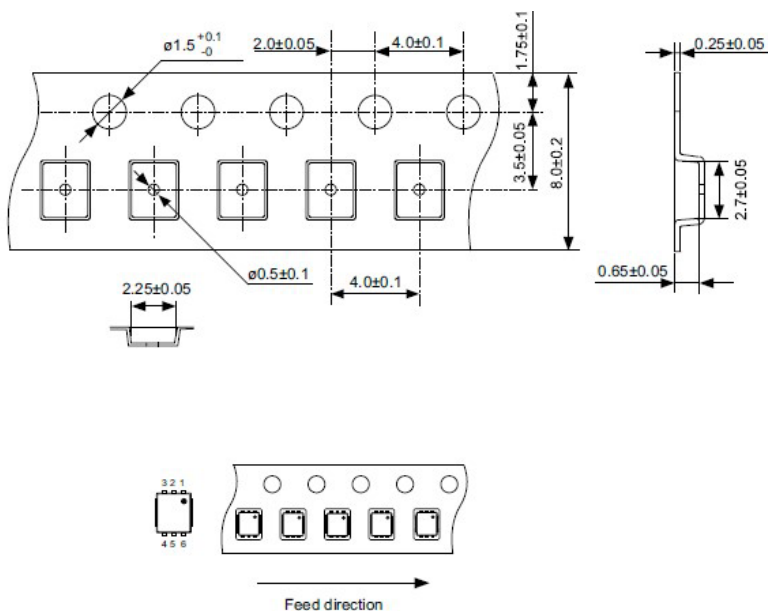
#### 4.2.3 HSNT-6(1212)



Unit : mm

Figure 39 Tape Dimensions of HSNT-6(1212)

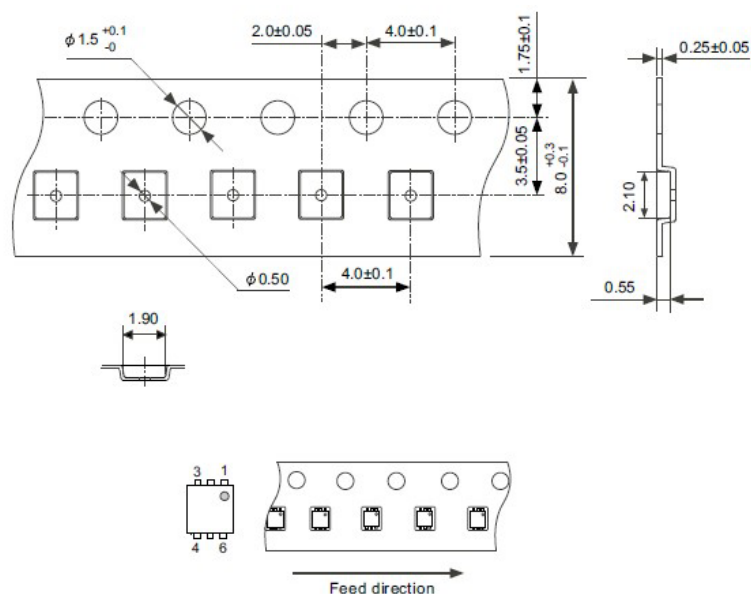
#### 4.2.4 HSNT-6A



Unit : mm

Figure 40 Tape Dimensions of HSNT-6A

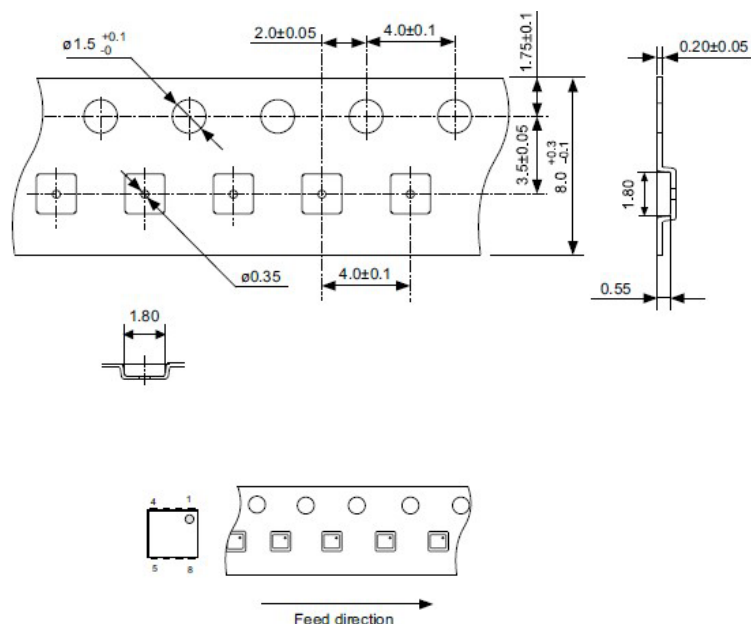
#### 4. 2. 5 HSNT-6(1618)



Unit : mm

Figure 41 Tape Dimensions of HSNT-6(1618)

#### 4. 2. 6 HSNT-8(1616)

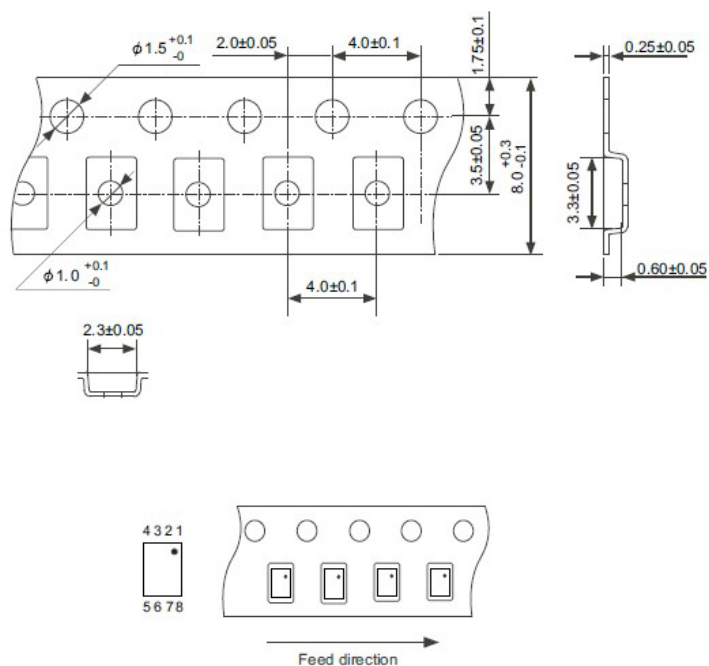


Unit : mm

Figure 42 Tape Dimensions of HSNT-8(1616)



#### 4.2.7 HSNT-8(2030)



Unit : mm

Figure 43 Tape Dimensions of HSNT-8(2030)

### 4.3 Reel specifications

The reel drawings for the HSNT-4(0808), HSNT-4(1010), HSNT-6(1212), HSNT-6A, HSNT-6(1618), HSNT-8(1616), HSNT-8(2030) packages are the same. The reel drawing for the HSNT-4(0808) is shown here.

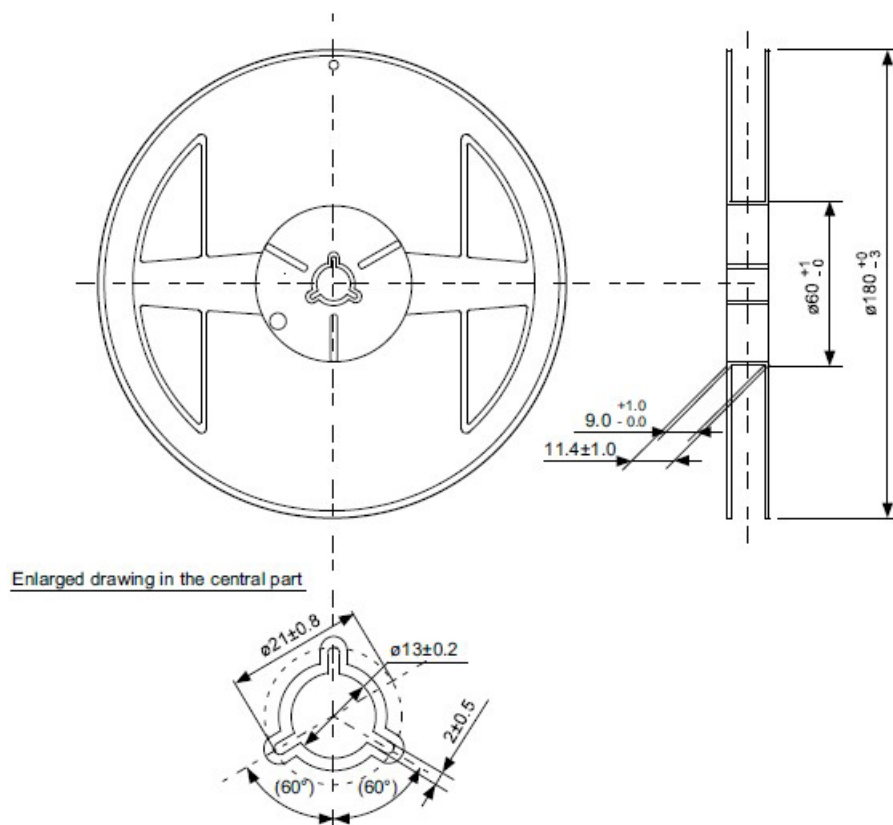


Figure 44 Reel Dimensions of HSNT-4(0808)

Unit : mm

## 5. Mounting Evaluation Results

HSNT package mounting evaluation results are shown as reference data in **Table 3**. The evaluation results are not guaranteed.

**Table 3 Mounting Evaluation Results of HSNT Package**

Evaluation Item	Result	Main Condition
(1) Solderability test	Pass	Wetting balance method Solder: Sn-3.0Ag-0.5Cu Solder vat temperature: 245°C Criteria: Pass if zero close time is 3 seconds or less.
(2) Push strength test for soldering joint	Pass	The package mounted to the board is pressed with a jig from the side to test for break resistance. Criteria: 10 N or more
(3) PCB bending test (constant stress method)	Pass	Bend amount: 1 mm Repetitions: 1500 Span: 90 mm Criteria: Resistance value fluctuation must not exceed twice the initial value. Must be without visual defects.
(4) PCB bending test (Monotonic bending test)	Pass	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	HSNT mounted boards are fixed to a 100-g jig. Dropped 30 times from a 170 cm height (six sides × five times each) Drop surface: Concrete Criteria: Resistance value fluctuation must not exceed twice the initial value. Must be without visual defects.
(6) Whisker evaluation	Pass	Temperature cycles: -40°C to 85°C × 1500 cycles Criteria: Whisker length 45 μm or less
		High-temperature and high-humidity storage: 55°C × 85% × 4000 h Criteria: Whisker length 40 μm or less
		Room temperature and room humidity storage: 30°C × 60% × 4000 h Criteria: Whisker length 40 μm or less

In tests (3) to (5), 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  
FR4 and FR5: 4 layer double-sided board  
Thickness = 1.0 mm  
Surface processing of mounting land: Gold flash plating
- Packages are preprocessed before each test (before PCB mounting).  
(Preconditioning = 105°C × 100% × 8 hours)
- Solder print mask  
Mask thickness: 120 μm  
Aperture ratio: Refer to the mask aperture drawings for each package.
- Solder  
Composition: Sn-3Ag-0.5Cu  
Solder particle diameter: Average 15 μm to 25 μm  
Flux: ROL1

- Reflow Conditions

This is the reflow profile used when evaluating mountability. An air atmosphere is used.

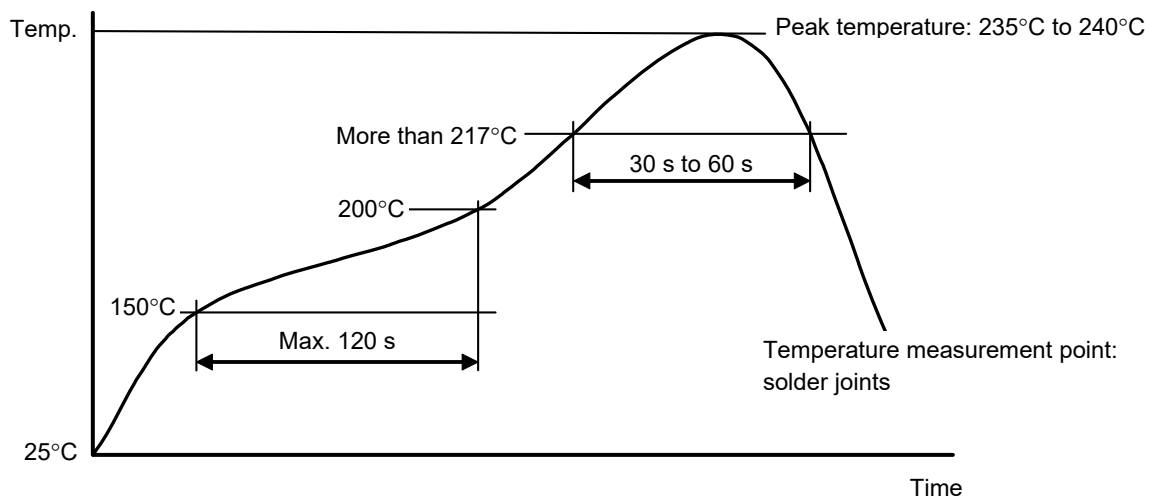


Figure 25 Mountability Evaluation Reflow Profile

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