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# AUTOMOTIVE, 105°C OPERATION, 5.5 V INPUT, 150 mA VOLTAGE REGULATOR

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Rev.1.1_01

The S-19251 Series, developed by using CMOS process technology, is a positive voltage regulator with a low current consumption, high ripple-rejection and high-accuracy output voltage. This IC has high ripple-rejection of 75 dB typ., and operates with low current consumption of 20 μA typ.
Also, a built-in overcurrent protection circuit to limit overcurrent of the output transistor and a built-in thermal shutdown circuit to limit heat are included. In addition to the conventional package SOT-23-5, the super-small packages HSNT-4(1010)B and HSNT-4(0808)B are added to the lineup, which realizes higher-density mounting.

**Caution This product can be used in vehicle equipment and in-vehicle equipment. Before using the product in the purpose, contact to ABLIC Inc. is indispensable.**

## ■ Features

- Output voltage: 1.0 V to 3.5 V, selectable in 0.05 V step
- Input voltage: 1.5 V to 5.5 V
- Output voltage accuracy: ±2.5% ($T_j$ = –40°C to +105°C)
- Current consumption: During operation: 20 μA typ., 50 μA max. ($T_j$ = –40°C to +105°C)
  During power-off: 0.1 μA typ., 4.5 μA max. ($T_j$ = –40°C to +105°C)
- Dropout voltage: 0.16 V typ. (2.8 V output product, $I_{OUT}$ = 100 mA)
- Output current: Possible to output 150 mA ($V_{IN} \geq V_{OUT(S)}$ + 1.0 V)*1
- Ripple rejection: 75 dB typ. (1.2 V output product, f = 1.0 kHz)
  70 dB typ. (2.8 V output product, f = 1.0 kHz)
- Input capacitor: A ceramic capacitor can be used. (1.0 μF or more)
- Output capacitor: A ceramic capacitor can be used. (1.0 μF or more)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 150°C typ.
- Built-in ON / OFF circuit: Ensures long battery life.
  Discharge shunt function "available" / "unavailable" is selectable.
  Pull-down function "available" / "unavailable" is selectable.
- Operation temperature range: Ta = –40°C to +105°C
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*2

***1.** Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.
***2.** Contact our sales office for details.

## ■ Applications

- For automotive use (meter, car body, headlight, ITS, accessory, car navigation system, car audio system, etc.)
  : SOT-23-5 package product

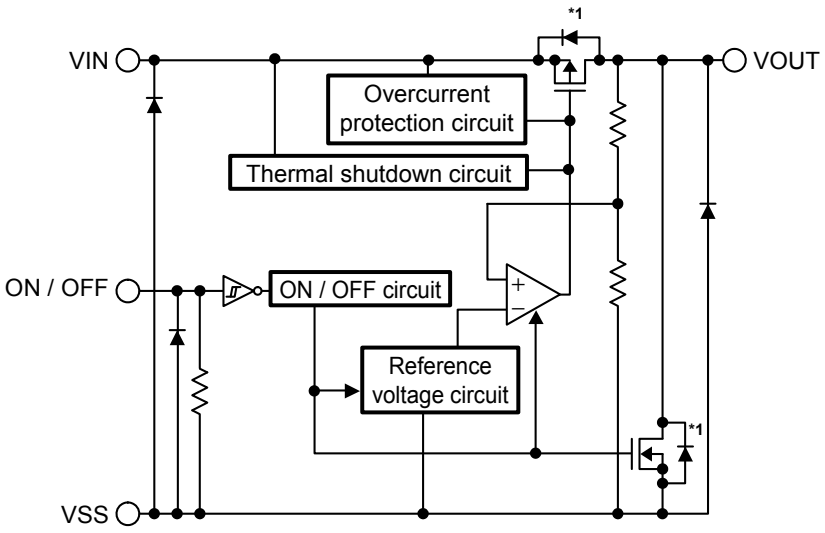
- For automotive use (accessory, car navigation system, car audio system, etc.)
  : HSNT-4(1010)B package product, HSNT-4(0808)B package product

## ■ Packages

- SOT-23-5
- HSNT-4(1010)B
- HSNT-4(0808)B

## ■ Block Diagrams

### 1. S-19251 Series A type

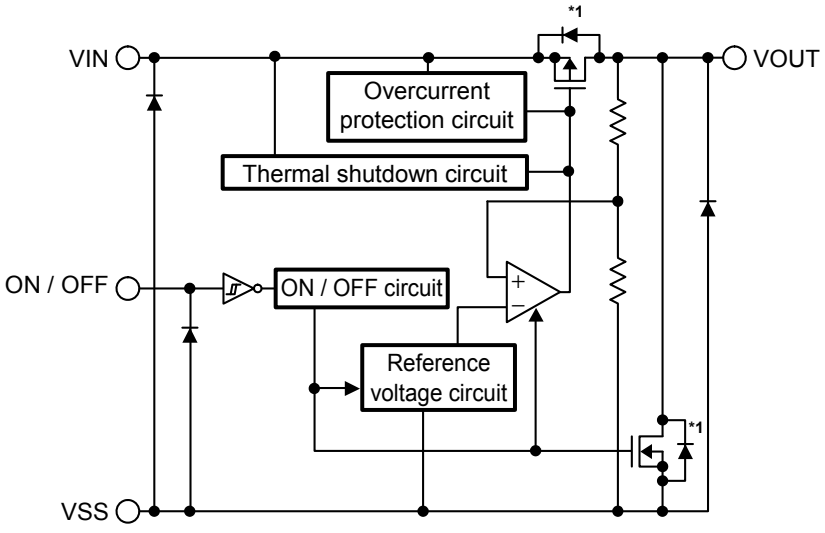



| Function | Status |
|---|---|
| ON / OFF logic | Active "H" |
| Discharge shunt function | Available |
| Pull-down resistor | Available |

***1.** Parasitic diode

**Figure 1**

### 2. S-19251 Series B type

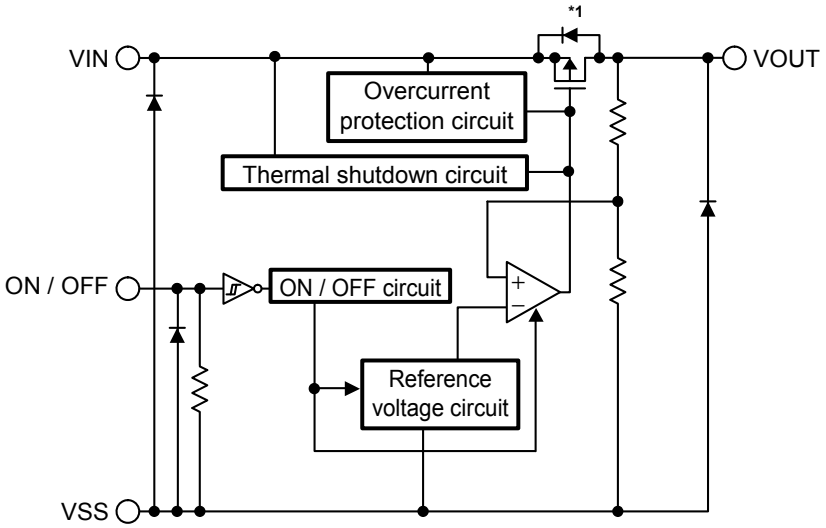



| Function | Status |
|---|---|
| ON / OFF logic | Active "H" |
| Discharge shunt function | Available |
| Pull-down resistor | Unavailable |

***1.** Parasitic diode

**Figure 2**

### 3. S-19251 Series C type

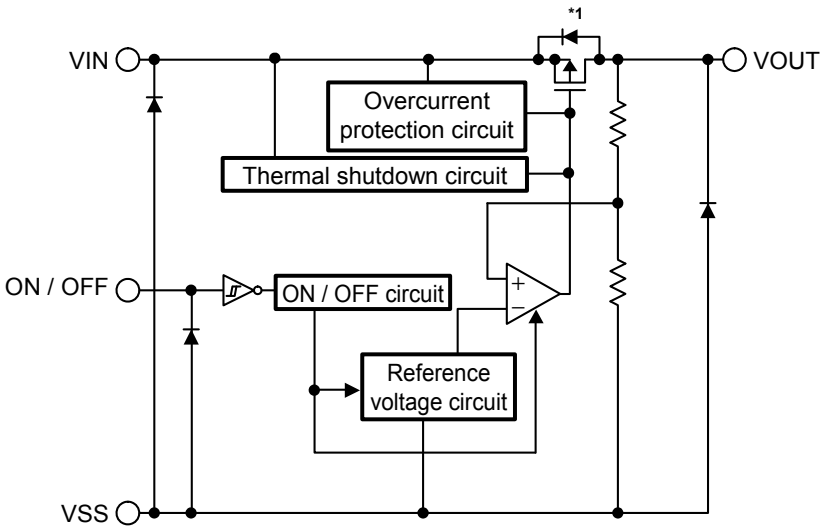



| Function | Status |
|---|---|
| ON / OFF logic | Active "H" |
| Discharge shunt function | Unavailable |
| Pull-down resistor | Available |

***1.** Parasitic diode

**Figure 3**

### 4. S-19251 Series D type




| Function | Status |
|---|---|
| ON / OFF logic | Active "H" |
| Discharge shunt function | Unavailable |
| Pull-down resistor | Unavailable |

***1.** Parasitic diode

**Figure 4**

## ■ AEC-Q100 Qualified

This IC supports AEC-Q100 for operation temperature grade 2.
Contact our sales office for details of AEC-Q100 reliability specification.

## ■ Product Name Structure

Users can select the product type, output voltage, and package type for the S-19251 Series. Refer to "**1. Product name**" regarding the contents of product name, "**2. Function list of product types**" regarding the product type, "**3. Packages**" regarding the package drawings, "**4. Product name list**" regarding details of the product name.

### 1. Product name

**S-19251 x xx H - xxxx U 4**

- Environmental code
  - U: Lead-free (Sn 100%), halogen-free
- Package abbreviation and IC packing specifications*1
  - M5T1: SOT-23-5, Tape
  - A4T7: HSNT-4(1010)B, Tape
  - A4T6: HSNT-4(0808)B, Tape
- Operation temperature
  - H: Ta = −40°C to +105°C
- Set output voltage*2
  - 10 to 35
  - (e.g., when the set output voltage is 1.0 V, it is expressed as 10.)
- Product type*3
  - A to D

***1.** Refer to the tape drawing.
***2.** If you request the product which has 0.05 V step, contact our sales office.
***3.** Refer to "**2. Function list of product types**".

### 2. Function list of product types

**Table 1**

| Product Type | ON / OFF Logic | Discharge Shunt Function | Pull-down Resistor |
|---|---|---|---|
| A | Active "H" | Available | Available |
| B | Active "H" | Available | Unavailable |
| C | Active "H" | Unavailable | Available |
| D | Active "H" | Unavailable | Unavailable |

### 3. Packages

**Table 2 Package Drawing Codes**

| Package Name | Dimension | Tape | Reel | Land |
|---|---|---|---|---|
| SOT-23-5 | MP005-A-P-SD | MP005-A-C-SD | MP005-A-R-SD | – |
| HSNT-4(1010)B | PL004-B-P-SD | PL004-B-C-SD | PL004-B-R-SD | PL004-B-L-SD |
| HSNT-4(0808)B | PK004-B-P-SD | PK004-B-C-SD | PK004-B-R-SD | PK004-B-L-SD |

## 4. Product name list

### 4. 1 S-19251 Series A type

ON / OFF logic: Active "H"
Discharge shunt function: Available Pull-down resistor: Available

**Table 3**

| Output Voltage | SOT-23-5 | HSNT-4(1010)B | HSNT-4(0808)B |
|---|---|---|---|
| 1.0 V ± 2.5% | S-19251A10H-M5T1U4 | S-19251A10H-A4T7U4 | S-19251A10H-A4T6U4 |
| 1.2 V ± 2.5% | S-19251A12H-M5T1U4 | S-19251A12H-A4T7U4 | S-19251A12H-A4T6U4 |
| 1.8 V ± 2.5% | S-19251A18H-M5T1U4 | S-19251A18H-A4T7U4 | S-19251A18H-A4T6U4 |
| 2.0 V ± 2.5% | S-19251A20H-M5T1U4 | S-19251A20H-A4T7U4 | S-19251A20H-A4T6U4 |
| 2.5 V ± 2.5% | S-19251A25H-M5T1U4 | S-19251A25H-A4T7U4 | S-19251A25H-A4T6U4 |
| 2.7 V ± 2.5% | S-19251A27H-M5T1U4 | S-19251A27H-A4T7U4 | S-19251A27H-A4T6U4 |
| 2.8 V ± 2.5% | S-19251A28H-M5T1U4 | S-19251A28H-A4T7U4 | S-19251A28H-A4T6U4 |
| 2.85 V ± 2.5% | S-19251A2JH-M5T1U4 | S-19251A2JH-A4T7U4 | S-19251A2JH-A4T6U4 |
| 2.9 V ± 2.5% | S-19251A29H-M5T1U4 | S-19251A29H-A4T7U4 | S-19251A29H-A4T6U4 |
| 3.0 V ± 2.5% | S-19251A30H-M5T1U4 | S-19251A30H-A4T7U4 | S-19251A30H-A4T6U4 |
| 3.3 V ± 2.5% | S-19251A33H-M5T1U4 | S-19251A33H-A4T7U4 | S-19251A33H-A4T6U4 |
| 3.5 V ± 2.5% | S-19251A35H-M5T1U4 | S-19251A35H-A4T7U4 | S-19251A35H-A4T6U4 |

**Remark** Please contact our sales office for products with specifications other than the above.

### 4. 2 S-19251 Series B type

ON / OFF logic: Active "H"
Discharge shunt function: Available Pull-down resistor: Unavailable

**Table 4**

| Output Voltage | SOT-23-5 | HSNT-4(1010)B | HSNT-4(0808)B |
|---|---|---|---|
| 1.0 V ± 2.5% | S-19251B10H-M5T1U4 | S-19251B10H-A4T7U4 | S-19251B10H-A4T6U4 |
| 1.2 V ± 2.5% | S-19251B12H-M5T1U4 | S-19251B12H-A4T7U4 | S-19251B12H-A4T6U4 |
| 1.8 V ± 2.5% | S-19251B18H-M5T1U4 | S-19251B18H-A4T7U4 | S-19251B18H-A4T6U4 |
| 2.0 V ± 2.5% | S-19251B20H-M5T1U4 | S-19251B20H-A4T7U4 | S-19251B20H-A4T6U4 |
| 2.5 V ± 2.5% | S-19251B25H-M5T1U4 | S-19251B25H-A4T7U4 | S-19251B25H-A4T6U4 |
| 2.7 V ± 2.5% | S-19251B27H-M5T1U4 | S-19251B27H-A4T7U4 | S-19251B27H-A4T6U4 |
| 2.8 V ± 2.5% | S-19251B28H-M5T1U4 | S-19251B28H-A4T7U4 | S-19251B28H-A4T6U4 |
| 2.85 V ± 2.5% | S-19251B2JH-M5T1U4 | S-19251B2JH-A4T7U4 | S-19251B2JH-A4T6U4 |
| 2.9 V ± 2.5% | S-19251B29H-M5T1U4 | S-19251B29H-A4T7U4 | S-19251B29H-A4T6U4 |
| 3.0 V ± 2.5% | S-19251B30H-M5T1U4 | S-19251B30H-A4T7U4 | S-19251B30H-A4T6U4 |
| 3.3 V ± 2.5% | S-19251B33H-M5T1U4 | S-19251B33H-A4T7U4 | S-19251B33H-A4T6U4 |
| 3.5 V ± 2.5% | S-19251B35H-M5T1U4 | S-19251B35H-A4T7U4 | S-19251B35H-A4T6U4 |

**Remark** Please contact our sales office for products with specifications other than the above.

### 4. 3 S-19251 Series C type

ON / OFF logic: Active "H"
Discharge shunt function: Unavailable Pull-down resistor: Available

**Table 5**

| Output Voltage | SOT-23-5 | HSNT-4(1010)B | HSNT-4(0808)B |
|---|---|---|---|
| 1.0 V ± 2.5% | S-19251C10H-M5T1U4 | S-19251C10H-A4T7U4 | S-19251C10H-A4T6U4 |
| 1.2 V ± 2.5% | S-19251C12H-M5T1U4 | S-19251C12H-A4T7U4 | S-19251C12H-A4T6U4 |
| 1.8 V ± 2.5% | S-19251C18H-M5T1U4 | S-19251C18H-A4T7U4 | S-19251C18H-A4T6U4 |
| 2.0 V ± 2.5% | S-19251C20H-M5T1U4 | S-19251C20H-A4T7U4 | S-19251C20H-A4T6U4 |
| 2.5 V ± 2.5% | S-19251C25H-M5T1U4 | S-19251C25H-A4T7U4 | S-19251C25H-A4T6U4 |
| 2.7 V ± 2.5% | S-19251C27H-M5T1U4 | S-19251C27H-A4T7U4 | S-19251C27H-A4T6U4 |
| 2.8 V ± 2.5% | S-19251C28H-M5T1U4 | S-19251C28H-A4T7U4 | S-19251C28H-A4T6U4 |
| 2.85 V ± 2.5% | S-19251C2JH-M5T1U4 | S-19251C2JH-A4T7U4 | S-19251C2JH-A4T6U4 |
| 2.9 V ± 2.5% | S-19251C29H-M5T1U4 | S-19251C29H-A4T7U4 | S-19251C29H-A4T6U4 |
| 3.0 V ± 2.5% | S-19251C30H-M5T1U4 | S-19251C30H-A4T7U4 | S-19251C30H-A4T6U4 |
| 3.3 V ± 2.5% | S-19251C33H-M5T1U4 | S-19251C33H-A4T7U4 | S-19251C33H-A4T6U4 |
| 3.5 V ± 2.5% | S-19251C35H-M5T1U4 | S-19251C35H-A4T7U4 | S-19251C35H-A4T6U4 |

**Remark** Please contact our sales office for products with specifications other than the above.

### 4. 4 S-19251 Series D type

ON / OFF logic: Active "H"
Discharge shunt function: Unavailable Pull-down resistor: Unavailable

**Table 6**

| Output Voltage | SOT-23-5 | HSNT-4(1010)B | HSNT-4(0808)B |
|---|---|---|---|
| 1.0 V ± 2.5% | S-19251D10H-M5T1U4 | S-19251D10H-A4T7U4 | S-19251D10H-A4T6U4 |
| 1.2 V ± 2.5% | S-19251D12H-M5T1U4 | S-19251D12H-A4T7U4 | S-19251D12H-A4T6U4 |
| 1.8 V ± 2.5% | S-19251D18H-M5T1U4 | S-19251D18H-A4T7U4 | S-19251D18H-A4T6U4 |
| 2.0 V ± 2.5% | S-19251D20H-M5T1U4 | S-19251D20H-A4T7U4 | S-19251D20H-A4T6U4 |
| 2.5 V ± 2.5% | S-19251D25H-M5T1U4 | S-19251D25H-A4T7U4 | S-19251D25H-A4T6U4 |
| 2.7 V ± 2.5% | S-19251D27H-M5T1U4 | S-19251D27H-A4T7U4 | S-19251D27H-A4T6U4 |
| 2.8 V ± 2.5% | S-19251D28H-M5T1U4 | S-19251D28H-A4T7U4 | S-19251D28H-A4T6U4 |
| 2.85 V ± 2.5% | S-19251D2JH-M5T1U4 | S-19251D2JH-A4T7U4 | S-19251D2JH-A4T6U4 |
| 2.9 V ± 2.5% | S-19251D29H-M5T1U4 | S-19251D29H-A4T7U4 | S-19251D29H-A4T6U4 |
| 3.0 V ± 2.5% | S-19251D30H-M5T1U4 | S-19251D30H-A4T7U4 | S-19251D30H-A4T6U4 |
| 3.3 V ± 2.5% | S-19251D33H-M5T1U4 | S-19251D33H-A4T7U4 | S-19251D33H-A4T6U4 |
| 3.5 V ± 2.5% | S-19251D35H-M5T1U4 | S-19251D35H-A4T7U4 | S-19251D35H-A4T6U4 |

**Remark** Please contact our sales office for products with specifications other than the above.

## ■ Pin Configurations

### 1. SOT-23-5

Top view

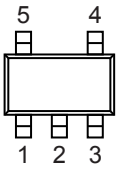



**Figure 5**

**Table 7**

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VIN | Input voltage pin |
| 2 | VSS | GND pin |
| 3 | ON / OFF | ON / OFF pin |
| 4 | NC*1 | No connection |
| 5 | VOUT | Output voltage pin |

***1.** The NC pin is electrically open.
The NC pin can be connected to the VIN pin or the VSS pin.

### 2. HSNT-4(1010)B

Top view




Bottom view

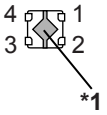



**Figure 6**

**Table 8**

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VOUT | Output voltage pin |
| 2 | VSS | GND pin |
| 3 | ON / OFF | ON / OFF pin |
| 4 | VIN | Input voltage pin |

***1.** Connect the heat sink of backside at shadowed area to the board, and set electric potential GND.
However, do not use it as the function of electrode.

### 3. HSNT-4(0808)B

Top view




Bottom view

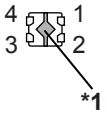



**Figure 7**

**Table 9**

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VOUT | Output voltage pin |
| 2 | VSS | GND pin |
| 3 | ON / OFF | ON / OFF pin |
| 4 | VIN | Input voltage pin |

***1.** Connect the heat sink of backside at shadowed area to the board, and set electric potential GND.
However, do not use it as the function of electrode.

## ■ Absolute Maximum Ratings

**Table 10**

(Ta = +25°C unless otherwise specified)

| Item | Symbol | Absolute Maximum Rating | Unit |
|---|---|---|---|
| Input voltage | $V_{IN}$ | $V_{SS}$ – 0.3 to $V_{SS}$ + 6.0 | V |
| | $V_{ON / OFF}$ | $V_{SS}$ – 0.3 to $V_{IN}$ + 0.3 ≤ $V_{SS}$ + 6.0 | V |
| Output voltage | $V_{OUT}$ | $V_{SS}$ – 0.3 to $V_{IN}$ + 0.3 ≤ $V_{SS}$ + 6.0 | V |
| Output current | $I_{OUT}$ | 180 | mA |
| Junction temperature | $T_j$ | –40 to +125 | °C |
| Operation ambient temperature | $T_{opr}$ | –40 to +105 | °C |
| Storage temperature | $T_{stg}$ | –40 to +125 | °C |

**Caution The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.**

## ■ Thermal Resistance Value

**Table 11**

| Item | Symbol | Condition | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Junction-to-ambient thermal resistance*1 | $\theta_{JA}$ | SOT-23-5 | Board A | – | 192 | – | °C/W |
| | | | Board B | – | 160 | – | °C/W |
| | | | Board C | – | – | – | °C/W |
| | | | Board D | – | – | – | °C/W |
| | | | Board E | – | – | – | °C/W |
| | | HSNT-4(1010)B | Board A | – | 378 | – | °C/W |
| | | | Board B | – | 317 | – | °C/W |
| | | | Board C | – | – | – | °C/W |
| | | | Board D | – | – | – | °C/W |
| | | | Board E | – | – | – | °C/W |
| | | HSNT-4(0808)B | Board A | – | 402 | – | °C/W |
| | | | Board B | – | 336 | – | °C/W |
| | | | Board C | – | – | – | °C/W |
| | | | Board D | – | – | – | °C/W |
| | | | Board E | – | – | – | °C/W |

***1.** Test environment: compliance with JEDEC STANDARD JESD51-2A

**Remark** Refer to "■ **Power Dissipation**" and "**Test Board**" for details.

## ■ Electrical Characteristics

**Table 12**

($T_j$ = –40°C to +105°C unless otherwise specified)

| Item | Symbol | Condition | | Min. | Typ. | Max. | Unit | Test Circuit |
|---|---|---|---|---|---|---|---|---|
| Output voltage*1 | $V_{OUT(E)}$ | $V_{IN}$ = $V_{OUT(S)}$ + 1.0 V, $I_{OUT}$ = 30 mA | | $V_{OUT(S)}$ × 0.975 | $V_{OUT(S)}$ | $V_{OUT(S)}$ × 1.025 | V | 1 |
| Output current*2 | $I_{OUT}$ | $V_{IN}$ ≥ $V_{OUT(S)}$ + 1.0 V | | 150*4 | – | – | mA | 3 |
| Dropout voltage*3 | $V_{drop}$ | $I_{OUT}$ = 100 mA, Ta = +25°C | 1.0 V ≤ $V_{OUT(S)}$ < 1.1 V | 0.50 | 0.68 | 0.86 | V | 1 |
| | | | 1.1 V ≤ $V_{OUT(S)}$ < 1.2 V | – | 0.52 | 0.71 | V | 1 |
| | | | 1.2 V ≤ $V_{OUT(S)}$ < 1.3 V | – | 0.31 | 0.63 | V | 1 |
| | | | 1.3 V ≤ $V_{OUT(S)}$ < 1.4 V | – | 0.28 | 0.56 | V | 1 |
| | | | 1.4 V ≤ $V_{OUT(S)}$ < 1.5 V | – | 0.26 | 0.50 | V | 1 |
| | | | 1.5 V ≤ $V_{OUT(S)}$ < 1.7 V | – | 0.24 | 0.47 | V | 1 |
| | | | 1.7 V ≤ $V_{OUT(S)}$ < 2.0 V | – | 0.22 | 0.43 | V | 1 |
| | | | 2.0 V ≤ $V_{OUT(S)}$ < 2.5 V | – | 0.18 | 0.36 | V | 1 |
| | | | 2.5 V ≤ $V_{OUT(S)}$ < 3.0 V | – | 0.16 | 0.32 | V | 1 |
| | | | 3.0 V ≤ $V_{OUT(S)}$ < 3.3 V | – | 0.15 | 0.28 | V | 1 |
| | | | 3.3 V ≤ $V_{OUT(S)}$ ≤ 3.5 V | – | 0.14 | 0.27 | V | 1 |
| Line regulation | $\frac{\Delta V_{OUT1}}{\Delta V_{IN} \bullet V_{OUT}}$ | 1.0 V ≤ $V_{OUT(S)}$ < 1.1 V, 1.6 V ≤ $V_{IN}$ ≤ 5.5 V, $I_{OUT}$ = 30 mA, Ta = +25°C | | – | 0.02 | 0.1 | %/V | 1 |
| | | 1.1 V ≤ $V_{OUT(S)}$ ≤ 3.5 V, $V_{OUT(S)}$ + 0.5 V ≤ $V_{IN}$ ≤ 5.5 V, $I_{OUT}$ = 30 mA, Ta = +25°C | | – | 0.02 | 0.1 | %/V | 1 |
| Load regulation | $\Delta V_{OUT2}$ | $V_{IN}$ = $V_{OUT(S)}$ + 1.0 V, 100 µA ≤ $I_{OUT}$ ≤ 100 mA, Ta = +25°C | | – | 20 | 40 | mV | 1 |
| Current consumption during operation | $I_{SS1}$ | $V_{IN}$ = $V_{OUT(S)}$ + 1.0 V, ON / OFF pin = ON, no load | | – | 20 | 50 | µA | 2 |
| Current consumption during power-off | $I_{SS2}$ | $V_{IN}$ = $V_{OUT(S)}$ + 1.0 V, ON / OFF pin = OFF, no load | | – | 0.1 | 4.5 | µA | 2 |
| Input voltage | $V_{IN}$ | – | | 1.5 | – | 5.5 | V | – |
| ON / OFF pin input voltage "H" | $V_{SH}$ | $V_{IN}$ = $V_{OUT(S)}$ + 1.0 V, $R_L$ = 1.0 kΩ, determined by $V_{OUT}$ output level | | 1.0 | – | – | V | 4 |
| ON / OFF pin input voltage "L" | $V_{SL}$ | $V_{IN}$ = $V_{OUT(S)}$ + 1.0 V, $R_L$ = 1.0 kΩ, determined by $V_{OUT}$ output level | | – | – | 0.25 | V | 4 |
| ON / OFF pin input current "H" | $I_{SH}$ | $V_{IN}$ = 5.5 V, $V_{ON / OFF}$ = 5.5 V | B / D type (without pull-down resistor) | –0.1 | – | 0.1 | µA | 4 |
| | | | A / C type (with pull-down resistor) | 1.0 | 2.5 | 5.2 | µA | 4 |
| ON / OFF pin input current "L" | $I_{SL}$ | $V_{IN}$ = 5.5 V, $V_{ON / OFF}$ = 0 V | | –0.1 | – | 0.1 | µA | 4 |
| Ripple rejection | \|RR\| | $V_{IN}$ = $V_{OUT(S)}$ + 1.0 V, f = 1.0 kHz, $\Delta V_{rip}$ = 0.5 Vrms, $I_{OUT}$ = 30 mA | 1.0 V ≤ $V_{OUT(S)}$ ≤ 1.2 V | – | 75 | – | dB | 5 |
| | | | 1.2 V < $V_{OUT(S)}$ ≤ 2.85 V | – | 70 | – | dB | 5 |
| | | | 2.85 V < $V_{OUT(S)}$ ≤ 3.5 V | – | 65 | – | dB | 5 |
| Short-circuit current | $I_{short}$ | $V_{IN}$ = $V_{OUT(S)}$ + 1.0 V, ON / OFF pin = ON, $V_{OUT}$ = 0 V, Ta = +25°C | | – | 50 | – | mA | 3 |
| Thermal shutdown detection temperature | $T_{SD}$ | Junction temperature | | – | 150 | – | °C | – |
| Thermal shutdown release temperature | $T_{SR}$ | Junction temperature | | – | 120 | – | °C | – |
| Discharge shunt resistance during power-off | $R_{LOW}$ | $V_{OUT}$ = 0.1 V, $V_{IN}$ = 5.5 V | A / B type (with discharge shunt function) | – | 35 | – | Ω | 3 |
| Power-off pull-down resistance | $R_{PD}$ | – | A / C type (with pull-down resistor) | 1.0 | 2.2 | 5.5 | MΩ | 4 |

***1.** $V_{OUT(S)}$: Set output voltage
$V_{OUT(E)}$: Actual output voltage
The output voltage when $V_{IN} = V_{OUT(S)} + 1.0$ V, $I_{OUT} = 30$ mA

***2.** The output current at which the output voltage becomes 95% of $V_{OUT(E)}$ after gradually increasing the output current.

***3.** $V_{drop} = V_{IN1} - (V_{OUT3} \times 0.98)$
$V_{IN1}$ is the input voltage at which the output voltage becomes 98% of $V_{OUT3}$ after gradually decreasing the input voltage.
$V_{OUT3}$ is the output voltage when $V_{IN} = V_{OUT(S)} + 1.0$ V and $I_{OUT} = 100$ mA.

***4.** Due to limitation of the power dissipation, this value may not be satisfied. Attention should be paid to the power dissipation when the output current is large.
This specification is guaranteed by design.

## ■ Test Circuits

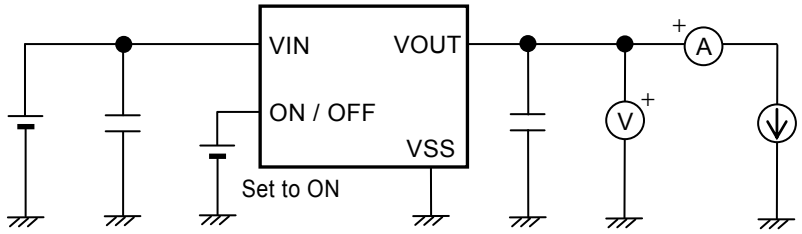



**Figure 8 Test Circuit 1**

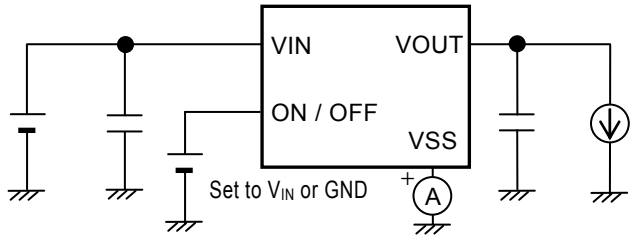



**Figure 9 Test Circuit 2**

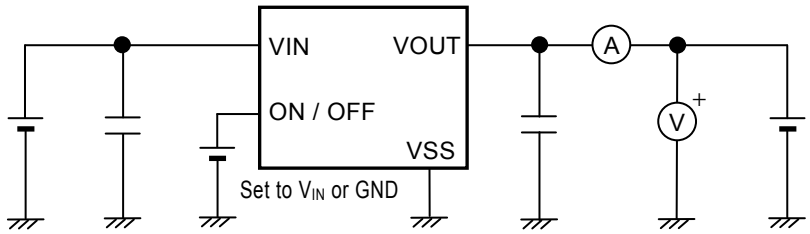



**Figure 10 Test Circuit 3**

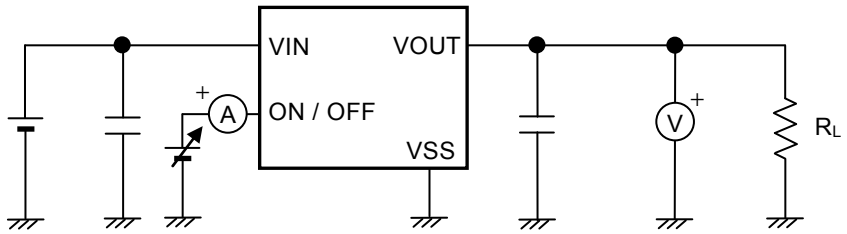



**Figure 11 Test Circuit 4**

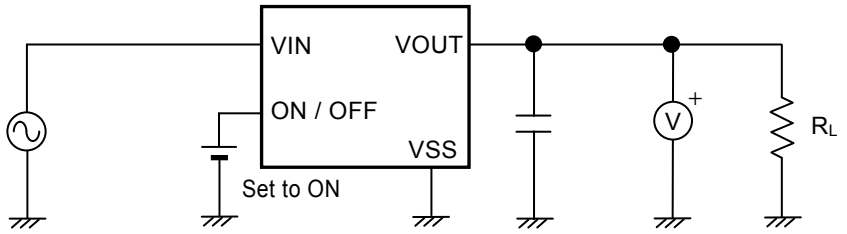
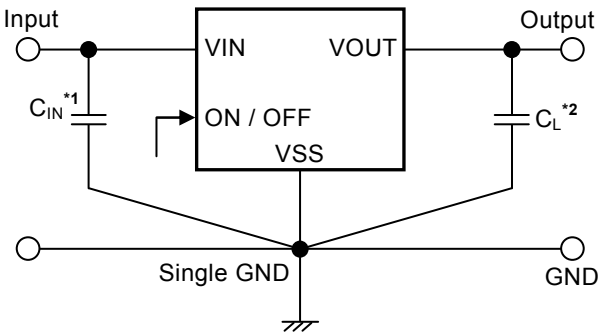



**Figure 12 Test Circuit 5**

## ■ Standard Circuit




***1.** $C_{IN}$ is a capacitor for stabilizing the input.
***2.** $C_L$ is a capacitor for stabilizing the output.

**Figure 13**

**Caution The above connection diagram and constant will not guarantee successful operation. Perform thorough evaluation including the temperature characteristics with an actual application to set the constant.**

## ■ Condition of Application

Input capacitor ($C_{IN}$): A ceramic capacitor with capacitance of 1.0 μF or more is recommended.
Output capacitor ($C_L$): A ceramic capacitor with capacitance of 1.0 μF or more is recommended.

**Caution Generally, in a voltage regulator, an oscillation may occur depending on the selection of the external parts. Perform thorough evaluation including the temperature characteristics with an actual application using the above capacitors to confirm no oscillation occurs.**

## ■ Selection of Input Capacitor ($C_{IN}$) and Output Capacitor ($C_L$)

The S-19251 Series requires $C_L$ between the VOUT pin and the VSS pin for phase compensation. The operation is stabilized by a ceramic capacitor with capacitance of 1.0 μF or more. When using an OS capacitor, a tantalum capacitor or an aluminum electrolytic capacitor, the capacitance also must be 1.0 μF or more. However, an oscillation may occur depending on the equivalent series resistance (ESR).
Moreover, the S-19251 Series requires $C_{IN}$ between the VIN pin and the VSS pin for a stable operation.
Generally, an oscillation may occur when a voltage regulator is used under the conditon that the impedance of the power supply is high.
Note that the output voltage transient characteristics varies depending on the capacitance of $C_{IN}$ and $C_L$ and the value of ESR.

**Caution Perform thorough evaluation including the temperature characteristics with an actual application to select $C_{IN}$ and $C_L$.**

## ■ Explanation of Terms

### 1. Low dropout voltage regulator

This voltage regulator has the low dropout voltage due to its built-in low on-resistance transistor.

### 2. Output voltage ($V_{OUT}$)

This voltage is output at an accuracy of ±2.5% when the input voltage, the output current and the temperature are in a certain condition*1.

***1.** Differs depending on the product.

**Caution If the certain condition is not satisfied, the output voltage may exceed the accuracy range of ±2.5%. Refer to "■ Electrical Characteristics" and "■ Characteristics (Typical Data)" for details.**

### 3. Line regulation $\left(\frac{\Delta V_{OUT1}}{\Delta V_{IN} \bullet V_{OUT}}\right)$

Indicates the dependency of the output voltage on the input voltage. That is, the values show how much the output voltage changes due to a change in the input voltage with the output current remaining unchanged.

### 4. Load regulation ($\Delta V_{OUT2}$)

Indicates the dependency of the output voltage on the output current. That is, the values show how much the output voltage changes due to a change in the output current with the input voltage remaining unchanged.

### 5. Dropout voltage ($V_{drop}$)

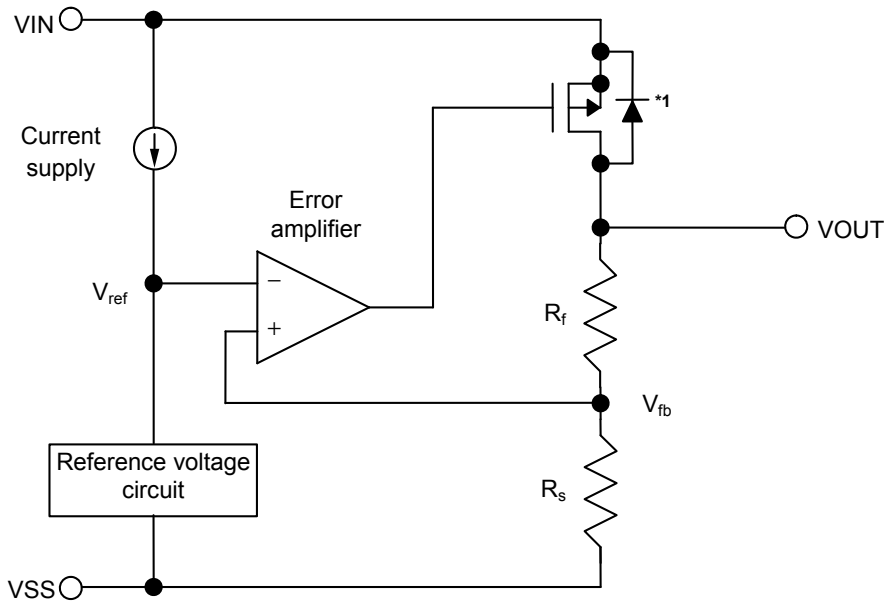
Indicates the difference between input voltage ($V_{IN1}$) and the output voltage when the output voltage becomes 98% of the output voltage value ($V_{OUT3}$) at $V_{IN} = V_{OUT(S)} + 1.0$ V after the input voltage ($V_{IN}$) is decreased gradually.

$V_{drop} = V_{IN1} - (V_{OUT3} \times 0.98)$

## ■ Operation

### 1. Basic operation

**Figure 14** shows the block diagram of the S-19251 Series to describe the basic operation.
The error amplifier compares the feedback voltage ($V_{fb}$) whose output voltage ($V_{OUT}$) is divided by the feedback resistors ($R_s$ and $R_f$) with the reference voltage ($V_{ref}$). The error amplifier controls the output transistor, consequently, the regulator starts the operation that keeps $V_{OUT}$ constant without the influence of the input voltage ($V_{IN}$).




***1***. Parasitic diode

**Figure 14**

### 2. Output transistor

In the S-19251 Series, a low on-resistance P-channel MOS FET is used between the VIN pin and the VOUT pin as the output transistor. In order to keep $V_{OUT}$ constant, the on-resistance of the output transistor varies appropriately according to the output current ($I_{OUT}$).

**Caution Since a parasitic diode exists between the VIN pin and the VOUT pin due to the structure of the transistor, the IC may be damaged by a reverse current if $V_{OUT}$ becomes higher than $V_{IN}$. Therefore, be sure that $V_{OUT}$ does not exceed $V_{IN}$ + 0.3 V.**

### 3. ON / OFF pin

The ON / OFF pin controls the internal circuit and the output transistor in order to start and stop the regulator. When the ON / OFF pin is set to OFF, the internal circuit stops operating and the output transistor between the VIN pin and the VOUT pin is turned off, reducing current consumption significantly.
Note that the current consumption increases when a voltage of 0.25 V to $V_{IN}$ – 0.3 V is applied to the ON / OFF pin. The ON / OFF pin is configured as shown in **Figure 15** and **Figure 16**.

#### 3. 1 S-19251 Series A / C type

The ON / OFF pin is internally pulled down to the VSS pin in the floating status, so the VOUT pin is set to the $V_{SS}$ level.
For the ON / OFF pin current, refer to the A / C type of the ON / OFF pin input current "H" in "■ **Electrical Characteristics**".

#### 3. 2 S-19251 Series B / D type

The ON / OFF pin is internally not pulled up or pulled down, so do not use this pin in the floating status. When not using the ON / OFF pin, connect the pin to the VIN pin.

**Table 13**

| Product Type | ON / OFF Pin | Internal Circuit | VOUT Pin Voltage | Current Consumption |
|---|---|---|---|---|
| A / B / C / D | "H": ON | Operate | Constant value*1 | $I_{SS1}$*2 |
| A / B / C / D | "L": OFF | Stop | Pulled down to $V_{SS}$*3 | $I_{SS2}$ |

***1.** The constant value is output due to the regulating based on the set output voltage value.
***2.** Note that the IC's current consumption increases as much as current flows into the pull-down resistor when the ON / OFF pin is connected to the VIN pin and the S-19251 Series A / C type is operating (refer to **Figure 15**).
***3.** The VOUT pin voltage of the S-19251 Series A / B type is pulled down to $V_{SS}$ due to the discharge shunt circuit ($R_{LOW}$ = 35 Ω typ.), the feedback resistors ($R_s$ and $R_f$) and a load.

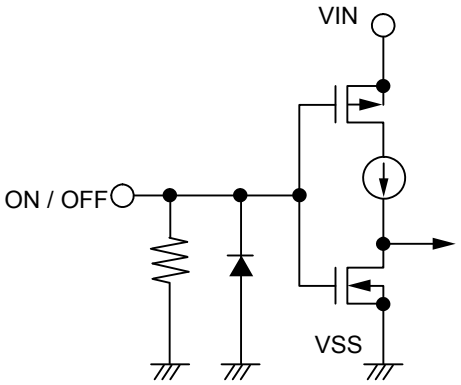



**Figure 15 S-19251 Series A / C Type**

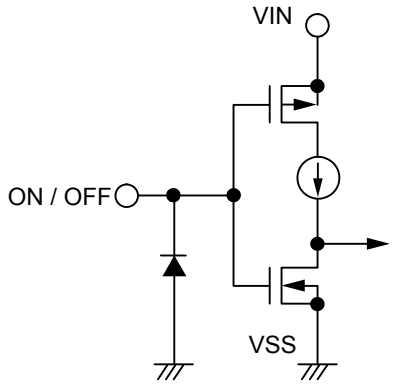


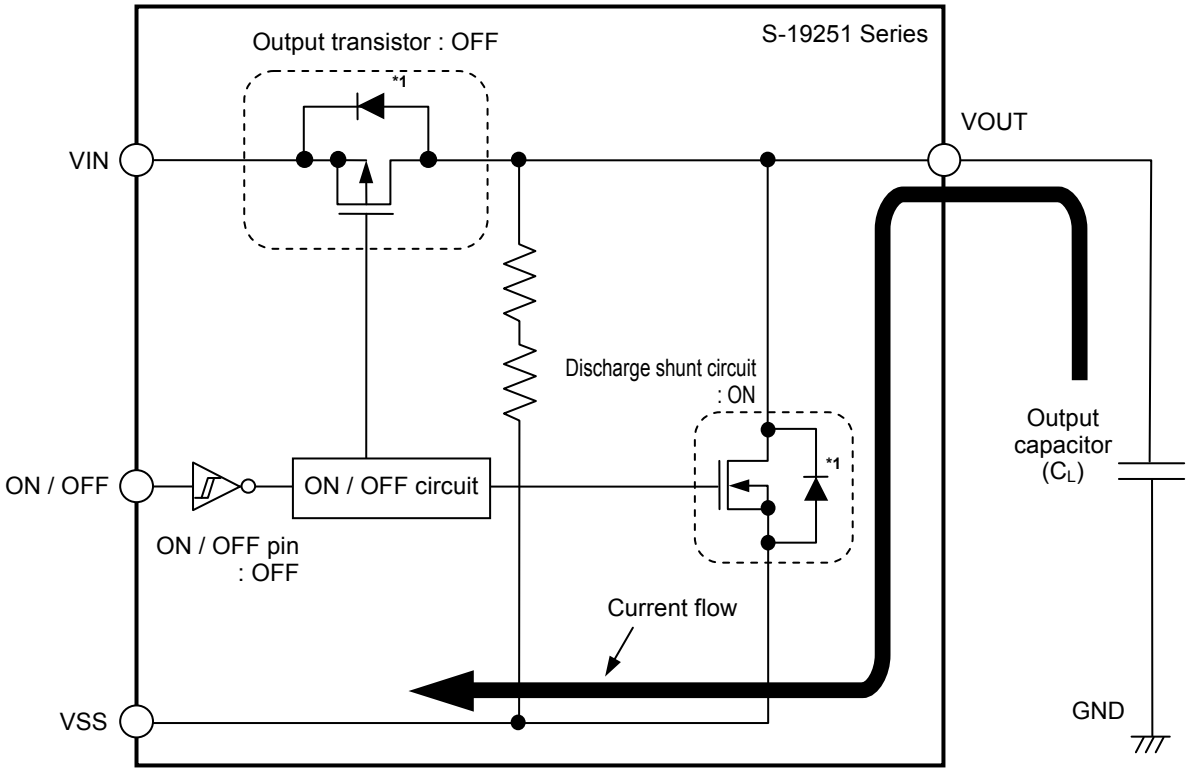

**Figure 16 S-19251 Series B / D Type**

### 4. Discharge shunt function (S-19251 Series A / B type)

The S-19251 Series A / B type has a built-in discharge shunt circuit to discharge the output capacitance. The output capacitance is discharged as follows so that the VOUT pin reaches the $V_{SS}$ level.

(1) The ON / OFF pin is set to OFF level.
(2) The output transistor is turned off.
(3) The discharge shunt circuit is turned on.
(4) The output capacitor discharges.

Since the S-19251 Series C / D type does not have a discharge shunt circuit, the VOUT pin is set to the $V_{SS}$ level through several hundred kΩ internal divided resistors between the VOUT pin and the VSS pin. The S-19251 Series A / B type allows the VOUT pin to reach the $V_{SS}$ level rapidly due to the discharge shunt circuit.




***1**. Parasitic diode

**Figure 17**

### 5. Pull-down resistor (S-19251 Series A / C type)

The ON / OFF pin is internally pulled down to the VSS pin in the floating status, so the VOUT pin is set to the $V_{SS}$ level.

Note that the IC's current consumption increases as much as current flows into the pull-down resistor of 2.2 MΩ typ. when the ON / OFF pin is connected to the VIN pin and the S-19251 A / C type is operating.

## 6. Overcurrent protection circuit

The S-19251 Series has a built-in overcurrent protection circuit to limit the overcurrent of the output transistor. When the VOUT pin is shorted to the VSS pin, that is, at the time of the output short-circuit, the output current is limited to 50 mA typ. due to the overcurrent protection circuit operation. The S-19251 Series restarts regulating when the output transistor is released from the overcurrent status.

**Caution This overcurrent protection circuit does not work as for thermal protection. For example, when the output transistor keeps the overcurrent status long at the time of output short-circuit or due to other reasons, pay attention to the conditions of the input voltage and the load current so as not to exceed the power dissipation.**

## 7. Thermal shutdown circuit

The S-19251 Series has a built-in thermal shutdown circuit to limit overheating. When the junction temperature increases to 150°C typ., the thermal shutdown circuit becomes the detection status, and the regulating is stopped. When the junction temperature decreases to 120°C typ., the thermal shutdown circuit becomes the release status, and the regulator is restarted.
If the thermal shutdown circuit becomes the detection status due to self-heating, the regulating is stopped and $V_{OUT}$ decreases. For this reason, the self-heating is limited and the temperature of the IC decreases. The thermal shutdown circuit becomes release status when the temperature of the IC decreases, and the regulating is restarted, thus the self-heating is generated again. Repeating this procedure makes the waveform of $V_{OUT}$ into a pulse-like form. This phenomenon continues unless decreasing either or both of the input voltage and the output current in order to reduce the internal power consumption, or decreasing the ambient temperature. Note that the product may suffer physical damage such as deterioration if the above phenomenon occurs continuously.

**Caution 1. When the heat radiation of the application is not in a good condition, the self-heating cannot be limited immediately, and the IC may suffer physical damage. Perform thorough evaluation including the temperature characteristics with an actual application to confirm no problems happen.**

**2. If a large load current flows during the restart process of regulating after the thermal shutdown circuit changes to the release status from the detection status, the thermal shutdown circuit becomes the detection status again due to self-heating, and a problem may happen in the restart of regulating. A large load current, for example, occurs when charging to the $C_L$ whose capacitance is large.**
**Perform thorough evaluation including the temperature characteristics with an actual application to select $C_L$.**

**Table 14**

| Thermal Shutdown Circuit | VOUT Pin Voltage |
|---|---|
| Release: 120°C typ.*1 | Constant value*2 |
| Operate: 150°C typ.*1 | Pulled down to $V_{SS}$*3 |

***1.** Junction temperature
***2.** The constant value is output due to the regulating based on the set output voltage value.
***3.** The VOUT pin voltage is pulled down to $V_{SS}$ due to the feedback resistors ($R_s$ and $R_f$) and a load.

## ■ Precautions

- Generally, when a voltage regulator is used under the condition that the load current value is small (1.0 mA or less), the output voltage may increase due to the leakage current of an output transistor.
- Generally, when a voltage regulator is used under the condition that the temperature is high, the output voltage may increase due to the leakage current of an output transistor.
- Generally, when the ON / OFF pin is used under the condition of OFF, the output voltage may increase due to the leakage current of an output transistor.
- Generally, when a voltage regulator is used under the condition that the impedance of the power supply is high, an oscillation may occur. Perform thorough evaluation including the temperature characteristics with an actual application to select $C_{IN}$.
- Generally, in a voltage regulator, an oscillation may occur depending on the selection of the external parts. The following use conditions are recommended in the S-19251 Series, however, perform thorough evaluation including the temperature characteristics with an actual application to select $C_{IN}$ and $C_L$.

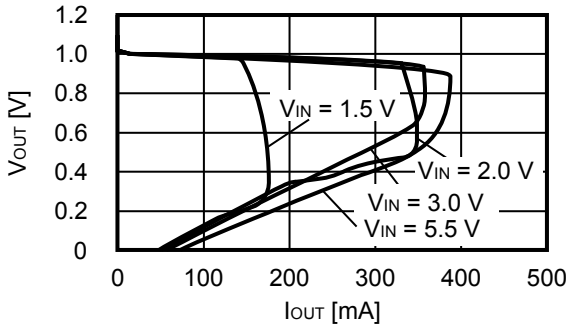
  Input capacitor ($C_{IN}$): A ceramic capacitor with capacitance of 1.0 μF or more is recommended.
  Output capacitor ($C_L$): A ceramic capacitor with capacitance of 1.0 μF or more is recommended.

- Generally, in a voltage regulator, the values of an overshoot and an undershoot in the output voltage vary depending on the variation factors of input voltage start-up, input voltage fluctuation and load fluctuation etc., or the capacitance of $C_{IN}$ or $C_L$ and the value of the equivalent series resistance (ESR), which may cause a problem to the stable operation. Perform thorough evaluation including the temperature characteristics with an actual application to select $C_{IN}$ and $C_L$.
- Generally, in a voltage regulator, an overshoot may occur in the output voltage momentarily if the input voltage steeply changes when the input voltage is started up or the input voltage fluctuates etc. Perform thorough evaluation including the temperature characteristics with an actual application to confirm no problems happen.
- Generally, in a voltage regulator, if the VOUT pin is steeply shorted with GND, a negative voltage exceeding the absolute maximum ratings may occur in the VOUT pin due to resonance phenomenon of the inductance and the capacitance including $C_L$ on the application. The resonance phenomenon is expected to be weakened by inserting a series resistor into the resonance path, and the negative voltage is expected to be limited by inserting a protection diode between the VOUT pin and the VSS pin.
- If the input voltage is started up steeply under the condition that the capacitance of $C_L$ is large, the thermal shutdown circuit may be in the detection status by self-heating due to the charge current to $C_L$.
- Make sure of the conditions for the input voltage, output voltage and the load current so that the internal loss does not exceed the power dissipation.
- Do not apply an electrostatic discharge to this IC that exceeds the performance ratings of the built-in electrostatic protection circuit.
- When considering the output current value that the IC is able to output, make sure of the output current value specified in **Table 12** in "■ **Electrical Characteristics**" and footnote ***4** of the table.
- Wiring patterns on the application related to the VIN pin, the VOUT pin and the VSS pin should be designed so that the impedance is low. When mounting $C_{IN}$ between the VIN pin and the VSS pin and $C_L$ between the VOUT pin and the VSS pin, connect the capacitors as close as possible to the respective destination pins of the IC.
- In the package equipped with heat sink of backside, mount the heat sink firmly. Since the heat radiation differs according to the condition of the application, perform thorough evaluation with an actual application to confirm no problems happen.
- ABLIC Inc. claims no responsibility for any disputes arising out of or in connection with any infringement by products including this IC of patents owned by a third party.

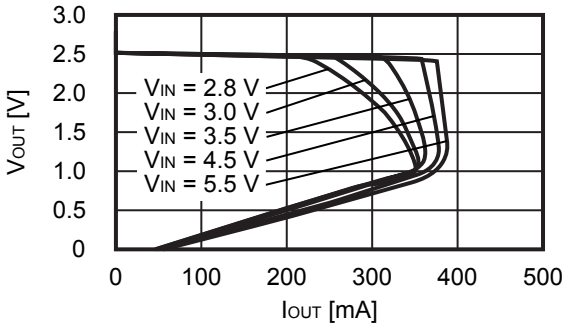
## ■ Characteristics (Typical Data)

### 1. Output voltage vs. Output current (When load current increases) (Ta = +25°C)

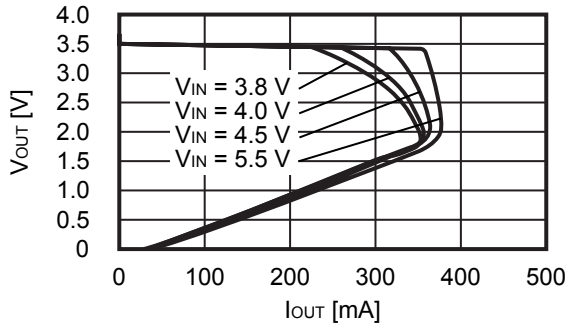
#### 1. 1 $V_{OUT}$ = 1.0 V




#### 1. 2 $V_{OUT}$ = 2.5 V



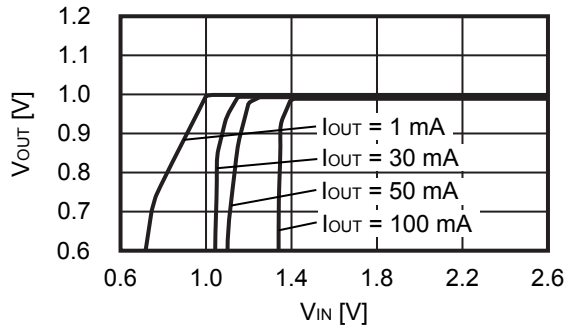

#### 1. 3 $V_{OUT}$ = 3.5 V



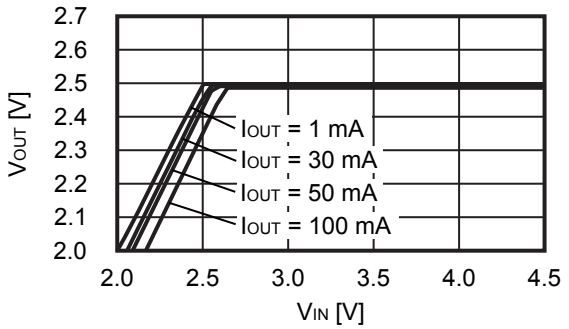

**Remark** In determining the output current, attention should be paid to the following.
1. The minimum output current value and footnote ***4** in **Table 12** in "■ **Electrical Characteristics**"
2. Power dissipation

### 2. Output voltage vs. Input voltage (Ta = +25°C)

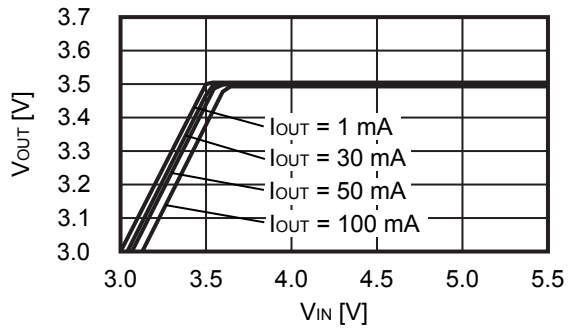
#### 2. 1 $V_{OUT}$ = 1.0 V




#### 2. 2 $V_{OUT}$ = 2.5 V

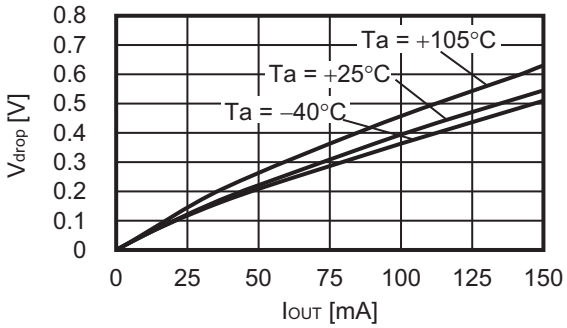



#### 2. 3 $V_{OUT}$ = 3.5 V

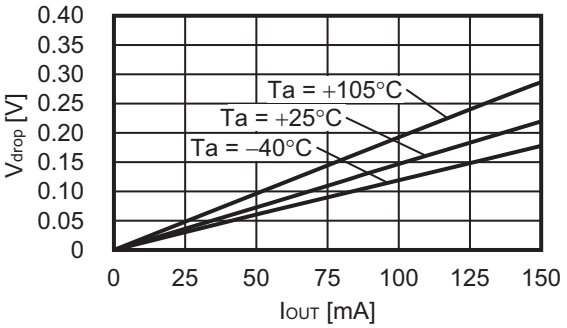


### 3. Dropout voltage vs. Output current

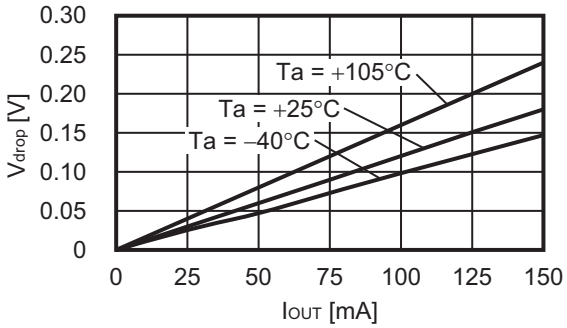
#### 3. 1 $V_{OUT}$ = 1.0 V



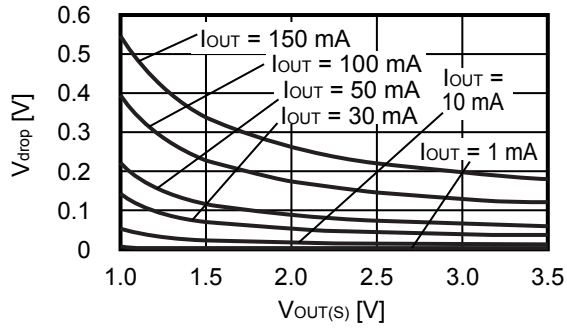

#### 3. 2 $V_{OUT}$ = 2.5 V




#### 3. 3 $V_{OUT}$ = 3.5 V

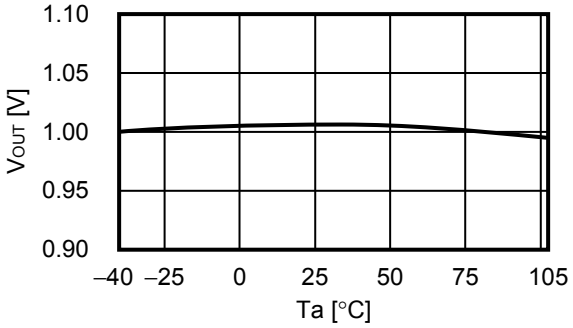



### 4. Dropout voltage vs. Set output voltage

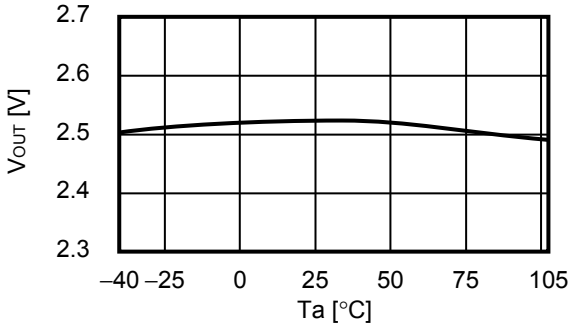


## 5. Output voltage vs. Ambient temperature

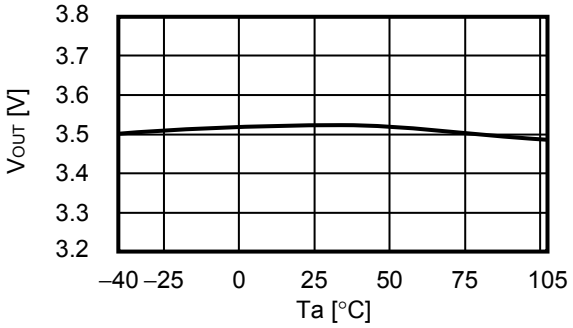
### 5. 1 $V_{OUT}$ = 1.0 V




### 5. 2 $V_{OUT}$ = 2.5 V

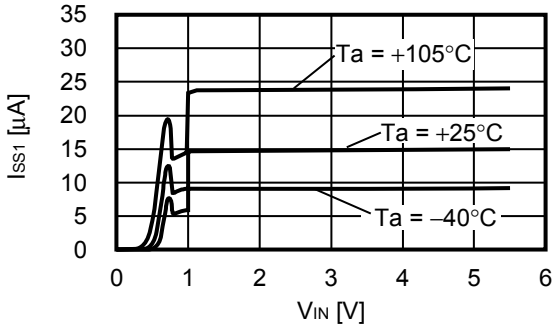



### 5. 3 $V_{OUT}$ = 3.5 V

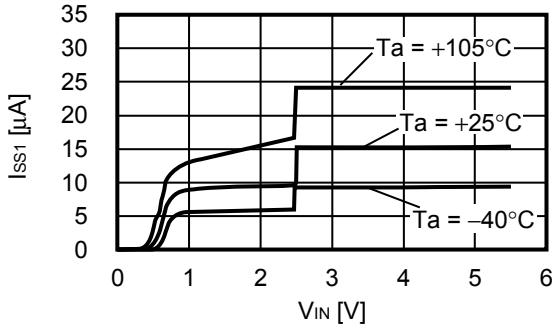



## 6. Current consumption vs. Input voltage

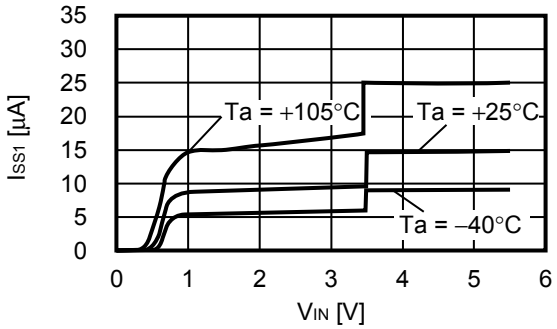
### 6. 1 $V_{OUT}$ = 1.0 V




### 6. 2 $V_{OUT}$ = 2.5 V

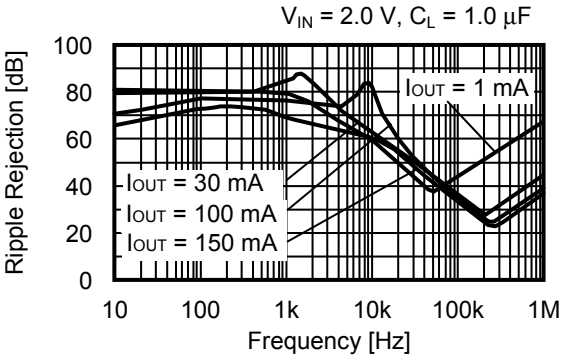



### 6. 3 $V_{OUT}$ = 3.5 V

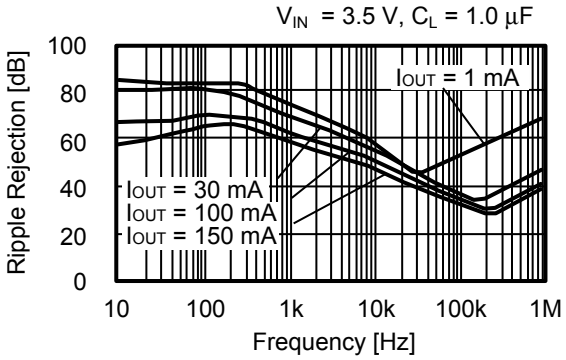


## 7. Ripple rejection (Ta = +25°C)

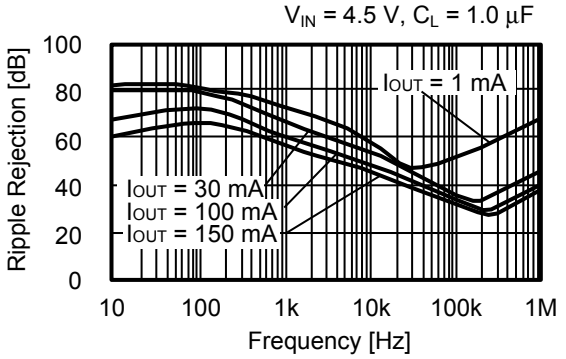
### 7. 1 $V_{OUT}$ = 1.0 V




### 7. 2 $V_{OUT}$ = 2.5 V




### 7. 3 $V_{OUT}$ = 3.5 V

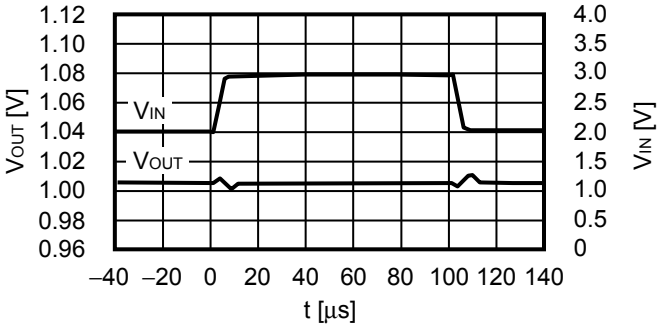


## ■ Reference Data

### 1. Transient response characteristics when input (Ta = +25°C)

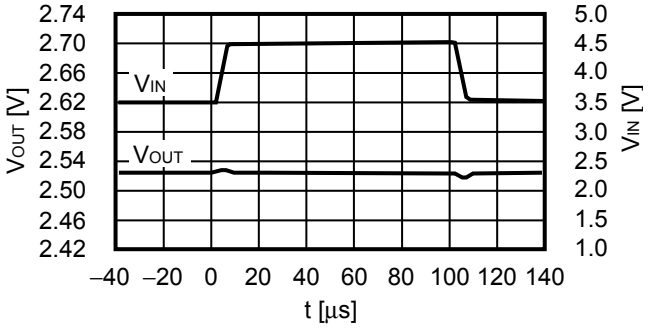
#### 1. 1 $V_{OUT}$ = 1.0 V

$I_{OUT}$ = 30 mA, $C_L$ = 1.0 µF, $V_{IN}$ = 2.0 V ↔ 3.0 V, $t_r$ = $t_f$ = 5.0 µs



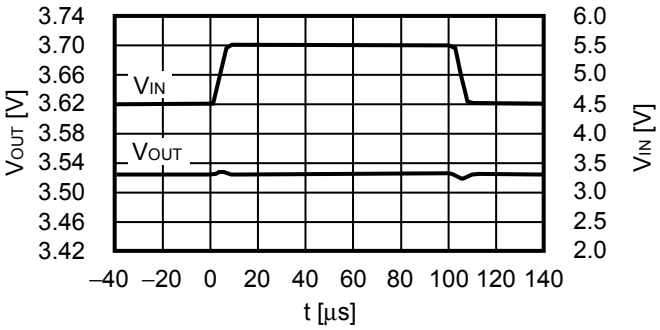

#### 1. 2 $V_{OUT}$ = 2.5 V

$I_{OUT}$ = 30 mA, $C_L$ = 1.0 µF, $V_{IN}$ = 3.5 V ↔ 4.5 V, $t_r$ = $t_f$ = 5.0 µs




#### 1. 3 $V_{OUT}$ = 3.5 V

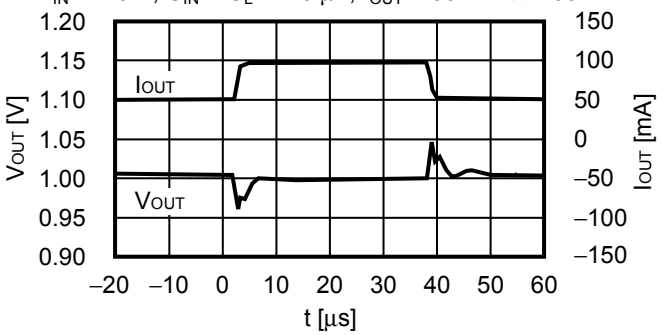
$I_{OUT}$ = 30 mA, $C_L$ = 1.0 µF, $V_{IN}$ = 4.5 V ↔ 5.5 V, $t_r$ = $t_f$ = 5.0 µs




### 2. Transient response characteristics of load (Ta = +25°C)

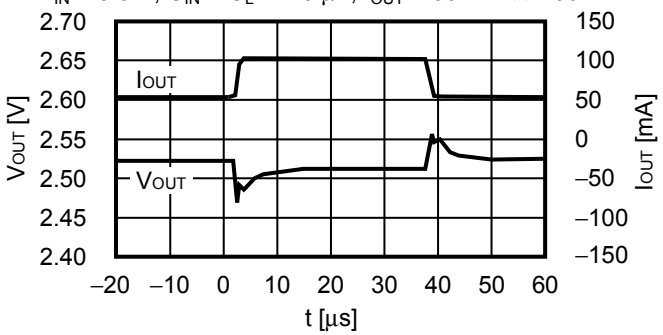
#### 2. 1 $V_{OUT}$ = 1.0 V

$V_{IN}$ = 2.0 V, $C_{IN}$ = $C_L$ = 1.0 µF, $I_{OUT}$ = 50 mA ↔ 100 mA



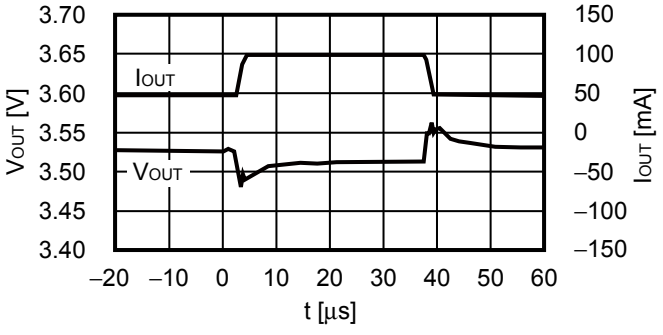

#### 2. 2 $V_{OUT}$ = 2.5 V

$V_{IN}$ = 3.5 V, $C_{IN}$ = $C_L$ = 1.0 µF, $I_{OUT}$ = 50 mA ↔ 100 mA




#### 2. 3 $V_{OUT}$ = 3.5 V

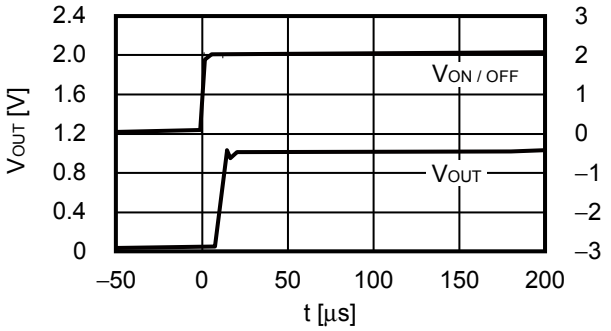
$V_{IN}$ = 4.5 V, $C_{IN}$ = $C_L$ = 1.0 µF, $I_{OUT}$ = 50 mA ↔ 100 mA



### 3. Transient response characteristics of ON / OFF pin (Ta = +25°C)

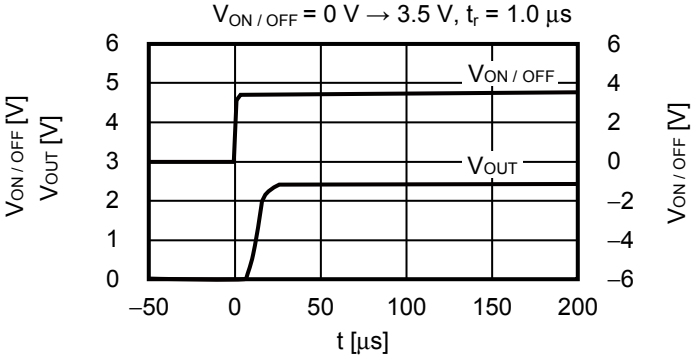
#### 3. 1 $V_{OUT}$ = 1.0 V

$V_{IN}$ = 2.0 V, $C_{IN}$ = $C_L$ = 1.0 µF, $I_{OUT}$ = 100 mA,
$V_{ON / OFF}$ = 0 V → 2.0 V, $t_r$ = 1.0 µs



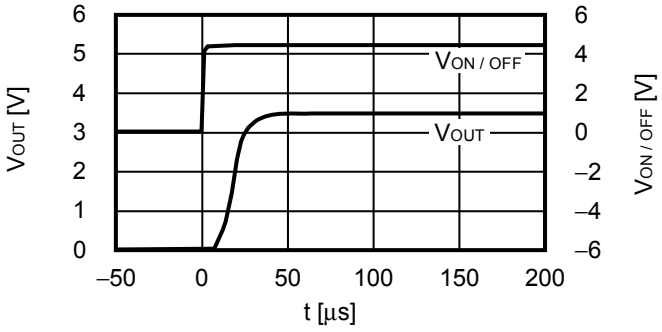

#### 3. 2 $V_{OUT}$ = 2.5 V

$V_{IN}$ = 3.5 V, $C_{IN}$ = $C_L$ = 1.0 µF, $I_{OUT}$ = 100 mA,
$V_{ON / OFF}$ = 0 V → 3.5 V, $t_r$ = 1.0 µs




#### 3. 3 $V_{OUT}$ = 3.5 V

$V_{IN}$ = 4.5 V, $C_{IN}$ = $C_L$ = 1.0 µF, $I_{OUT}$ = 100 mA,
$V_{ON / OFF}$ = 0 V → 4.5 V, $t_r$ = 1.0 µs



**4. Output capacitance vs. Characteristics of discharge time (Ta = +25°C)**

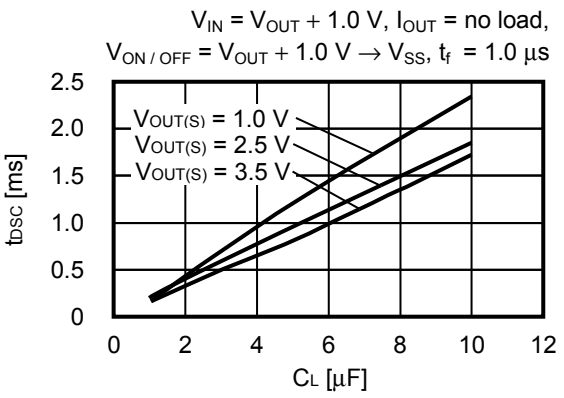



**Figure 18 S-19251 Series A / B Type (with discharge shunt function)**

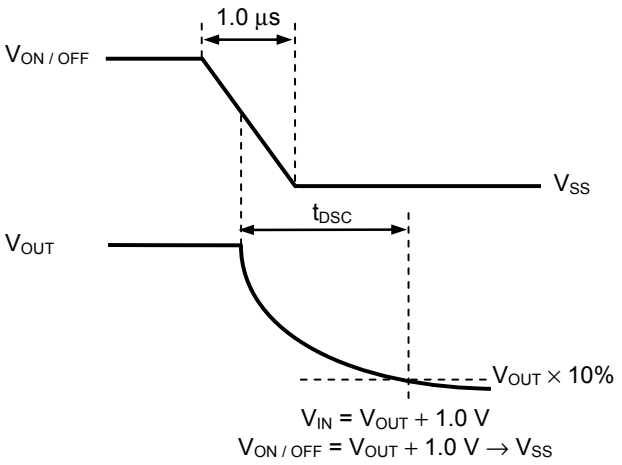



**Figure 19 Measurement Condition of Discharge Time**

**5. Example of equivalent series resistance vs. Output current characteristics (Ta = +25°C)**

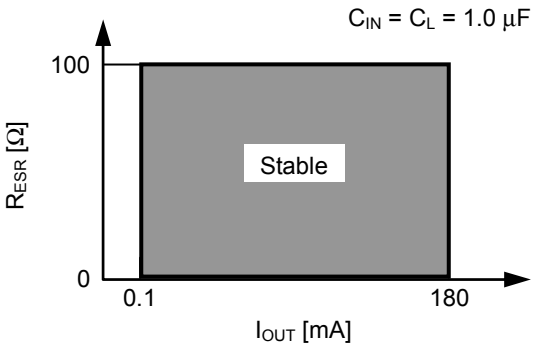
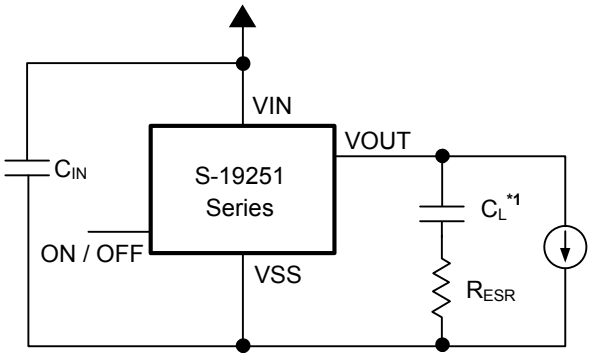



**Figure 20**

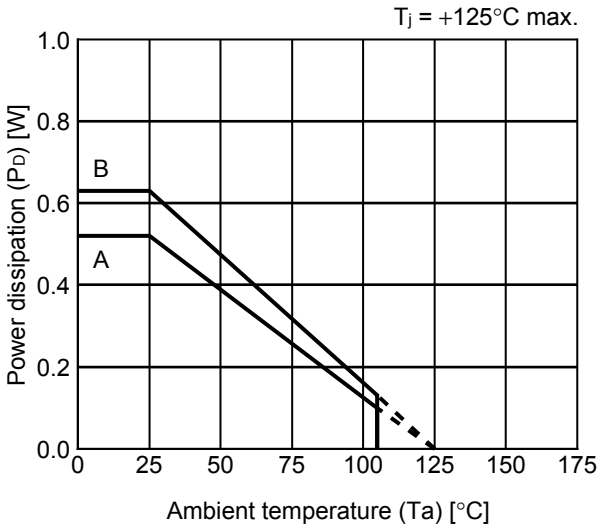



***1.** $C_L$: TDK Corporation CGA5L3X8R1H105K (1.0 µF)

**Figure 21**

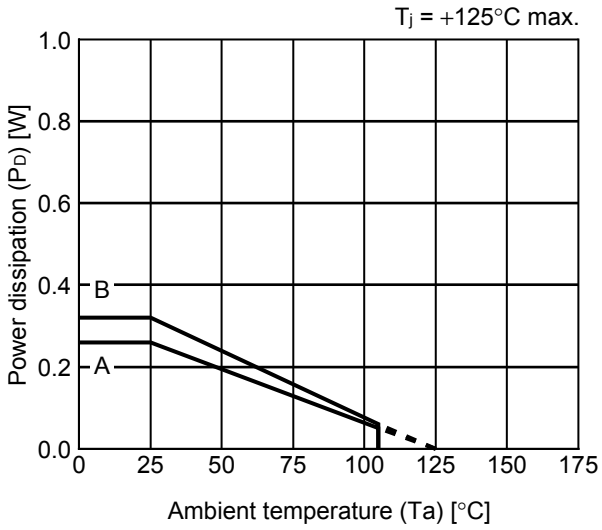
## ■ Power Dissipation

**SOT-23-5**



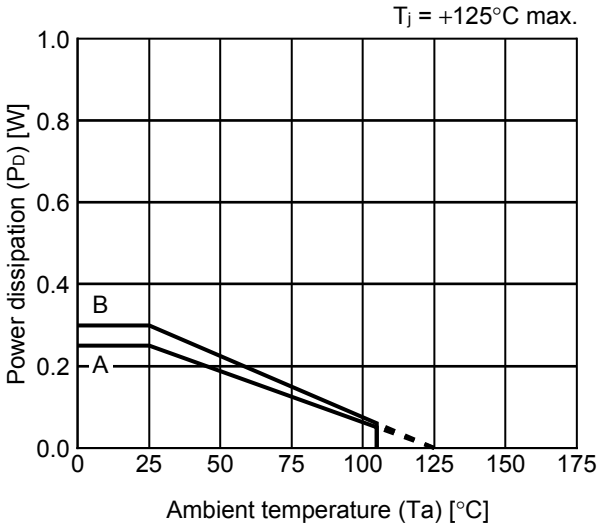

| Board | Power Dissipation ($P_D$) |
|---|---|
| A | 0.52 W |
| B | 0.63 W |
| C | – |
| D | – |
| E | – |

**HSNT-4(1010)B**




| Board | Power Dissipation ($P_D$) |
|---|---|
| A | 0.26 W |
| B | 0.32 W |
| C | – |
| D | – |
| E | – |

**HSNT-4(0808)B**

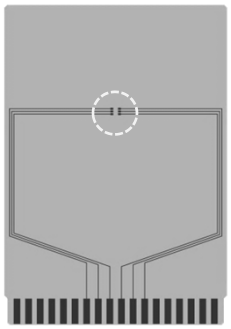



| Board | Power Dissipation ($P_D$) |
|---|---|
| A | 0.25 W |
| B | 0.30 W |
| C | – |
| D | – |
| E | – |

# SOT-23-3/3S/5/6 Test Board

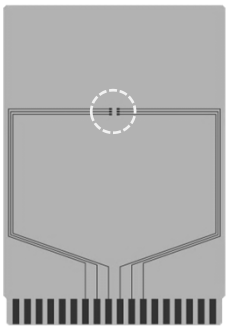
IC Mount Area

**(1) Board A**



| Item | | Specification |
|---|---|---|
| Size [mm] | | 114.3 x 76.2 x t1.6 |
| Material | | FR-4 |
| Number of copper foil layer | | 2 |
| Copper foil layer [mm] | 1 | Land pattern and wiring for testing: t0.070 |
| | 2 | - |
| | 3 | - |
| | 4 | 74.2 x 74.2 x t0.070 |
| Thermal via | | - |

**(2) Board B**



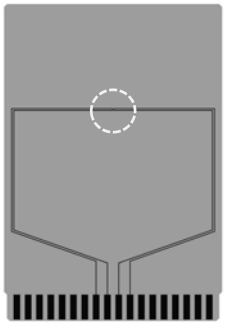
| Item | | Specification |
|---|---|---|
| Size [mm] | | 114.3 x 76.2 x t1.6 |
| Material | | FR-4 |
| Number of copper foil layer | | 4 |
| Copper foil layer [mm] | 1 | Land pattern and wiring for testing: t0.070 |
| | 2 | 74.2 x 74.2 x t0.035 |
| | 3 | 74.2 x 74.2 x t0.035 |
| | 4 | 74.2 x 74.2 x t0.070 |
| Thermal via | | - |

No. SOT23x-A-Board-SD-2.0

# HSNT-4(1010)B Test Board

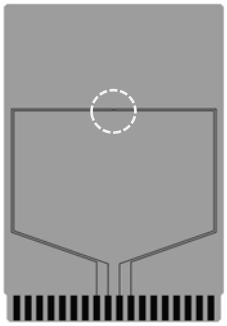
IC Mount Area

**(1) Board A**



| Item | | Specification |
|---|---|---|
| Size [mm] | | 114.3 x 76.2 x t1.6 |
| Material | | FR-4 |
| Number of copper foil layer | | 2 |
| Copper foil layer [mm] | 1 | Land pattern and wiring for testing: t0.070 |
| | 2 | - |
| | 3 | - |
| | 4 | 74.2 x 74.2 x t0.070 |
| Thermal via | | - |

**(2) Board B**



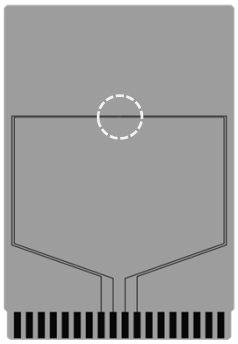
| Item | | Specification |
|---|---|---|
| Size [mm] | | 114.3 x 76.2 x t1.6 |
| Material | | FR-4 |
| Number of copper foil layer | | 4 |
| Copper foil layer [mm] | 1 | Land pattern and wiring for testing: t0.070 |
| | 2 | 74.2 x 74.2 x t0.035 |
| | 3 | 74.2 x 74.2 x t0.035 |
| | 4 | 74.2 x 74.2 x t0.070 |
| Thermal via | | - |

No. HSNT4-D-Board-SD-1.0

# HSNT-4(0808)B Test Board

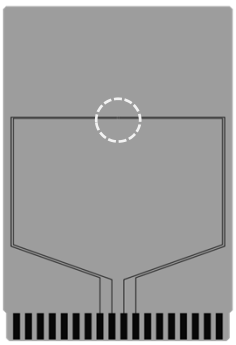
IC Mount Area

**(1) Board A**



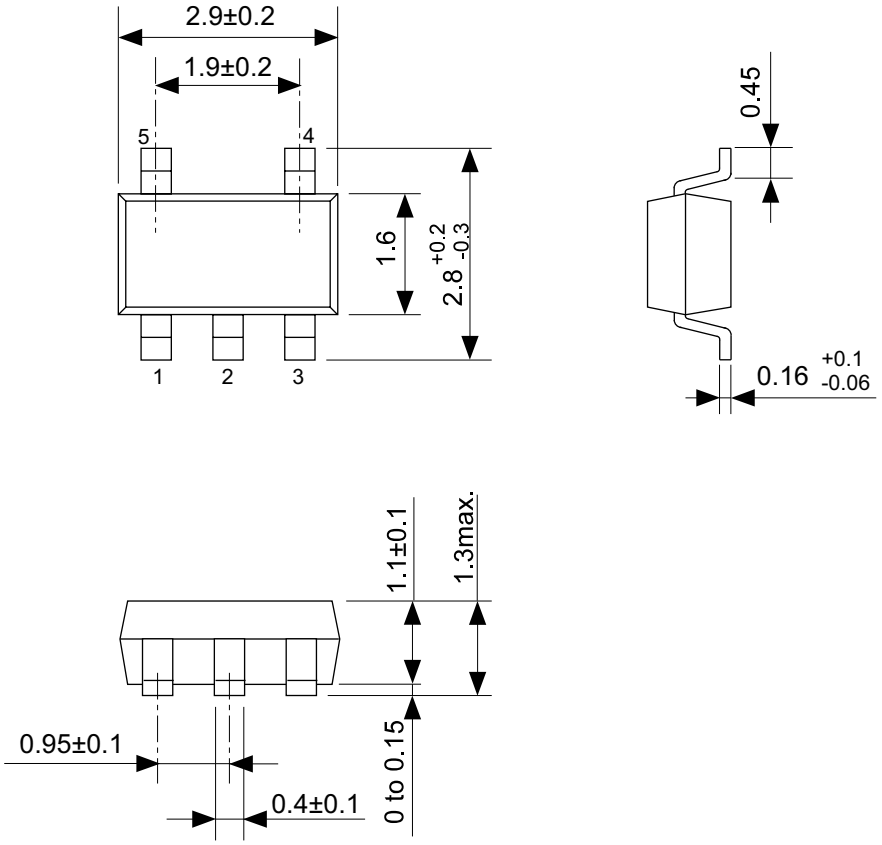
| Item | | Specification |
|---|---|---|
| Size [mm] | | 114.3 x 76.2 x t1.6 |
| Material | | FR-4 |
| Number of copper foil layer | | 2 |
| Copper foil layer [mm] | 1 | Land pattern and wiring for testing: t0.070 |
| | 2 | - |
| | 3 | - |
| | 4 | 74.2 x 74.2 x t0.070 |
| Thermal via | | - |

**(2) Board B**



| Item | | Specification |
|---|---|---|
| Size [mm] | | 114.3 x 76.2 x t1.6 |
| Material | | FR-4 |
| Number of copper foil layer | | 4 |
| Copper foil layer [mm] | 1 | Land pattern and wiring for testing: t0.070 |
| | 2 | 74.2 x 74.2 x t0.035 |
| | 3 | 74.2 x 74.2 x t0.035 |
| | 4 | 74.2 x 74.2 x t0.070 |
| Thermal via | | - |

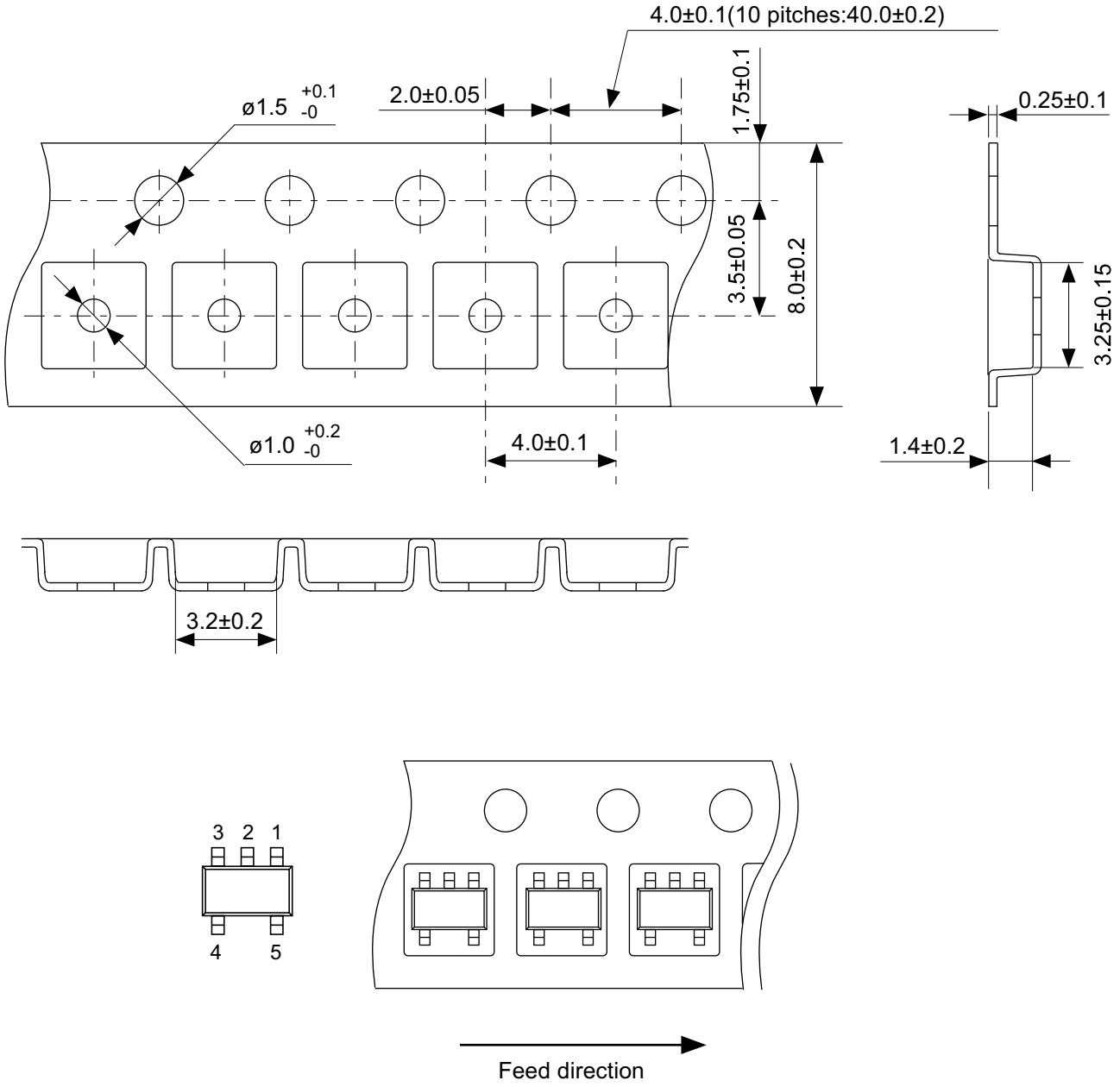
No. HSNT4-C-Board-SD-1.0




No. MP005-A-P-SD-1.3

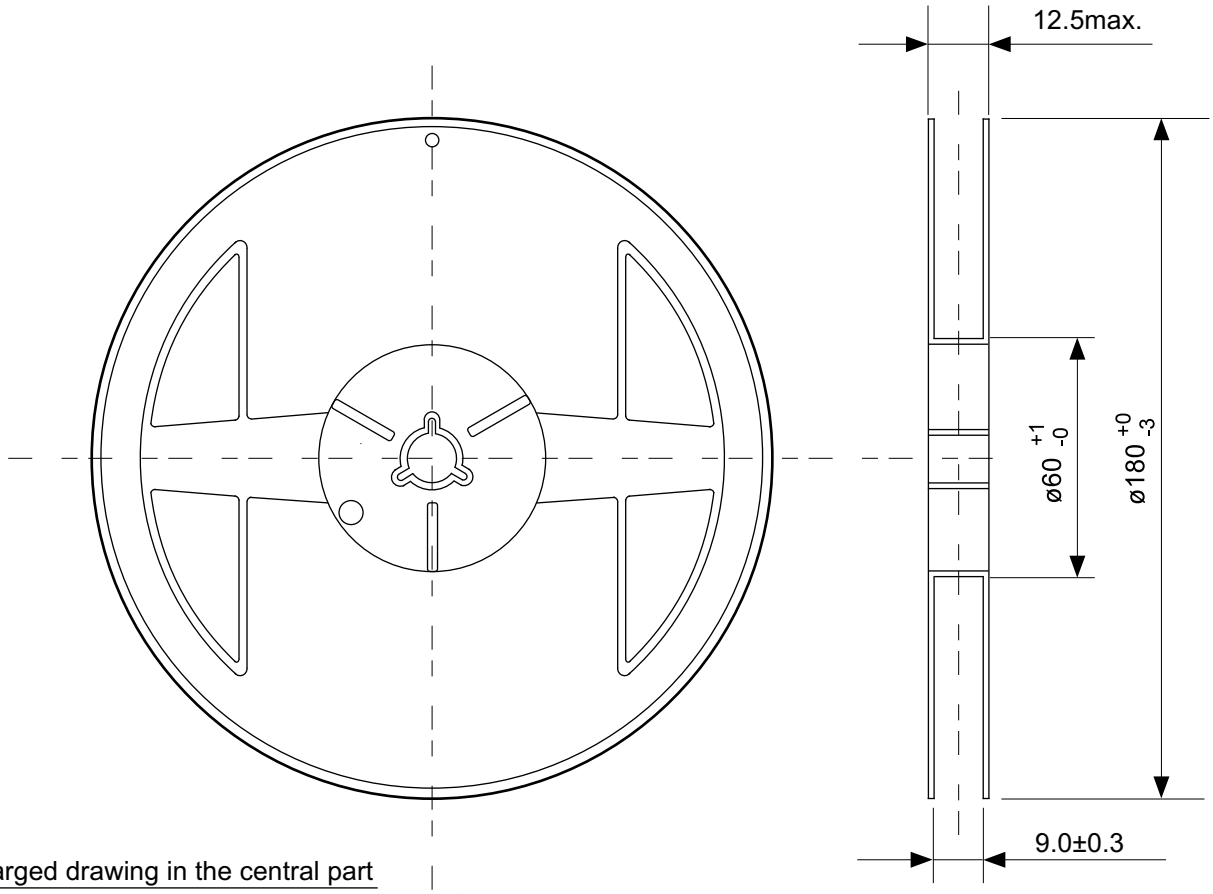
| | |
|---|---|
| TITLE | SOT235-A-PKG Dimensions |
| No. | MP005-A-P-SD-1.3 |
| ANGLE | |
| UNIT | mm |
| | |

**ABLIC Inc.**

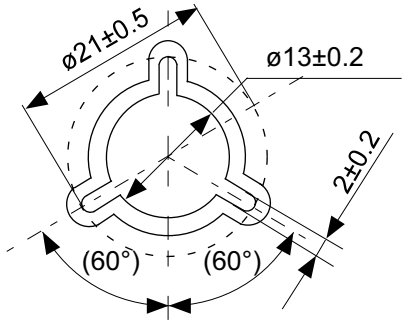



No. MP005-A-C-SD-2.1

| | |
|---|---|
| TITLE | SOT235-A-Carrier Tape |
| No. | MP005-A-C-SD-2.1 |
| ANGLE | |
| UNIT | mm |
| | |
| **ABLIC Inc.** | |

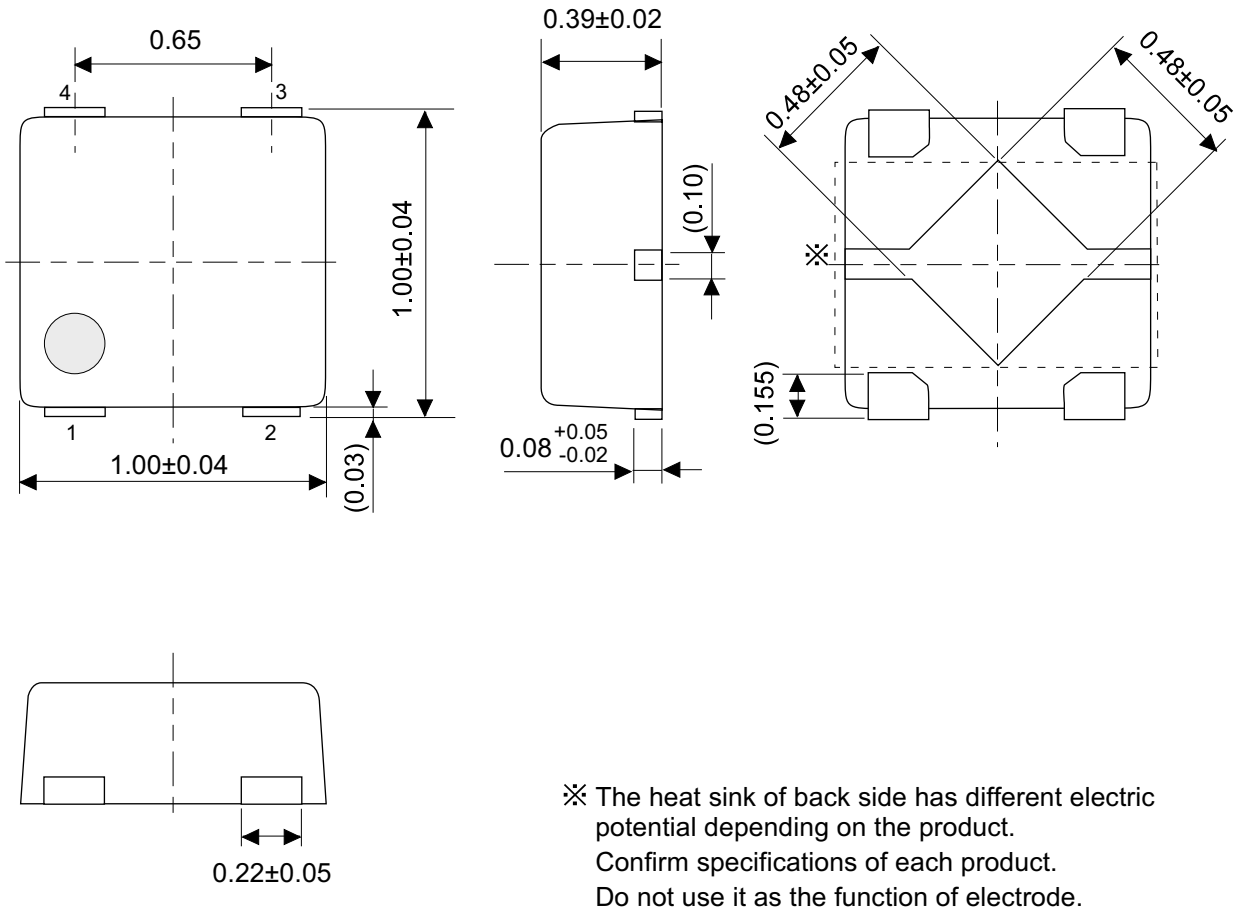



Enlarged drawing in the central part




No. MP005-A-R-SD-1.1

| | | | |
|---|---|---|---|
| TITLE | SOT235-A-Reel | | |
| No. | MP005-A-R-SD-1.1 | | |
| ANGLE | | QTY. | 3,000 |
| UNIT | mm | | |
| | | | |
| **ABLIC Inc.** | | | |



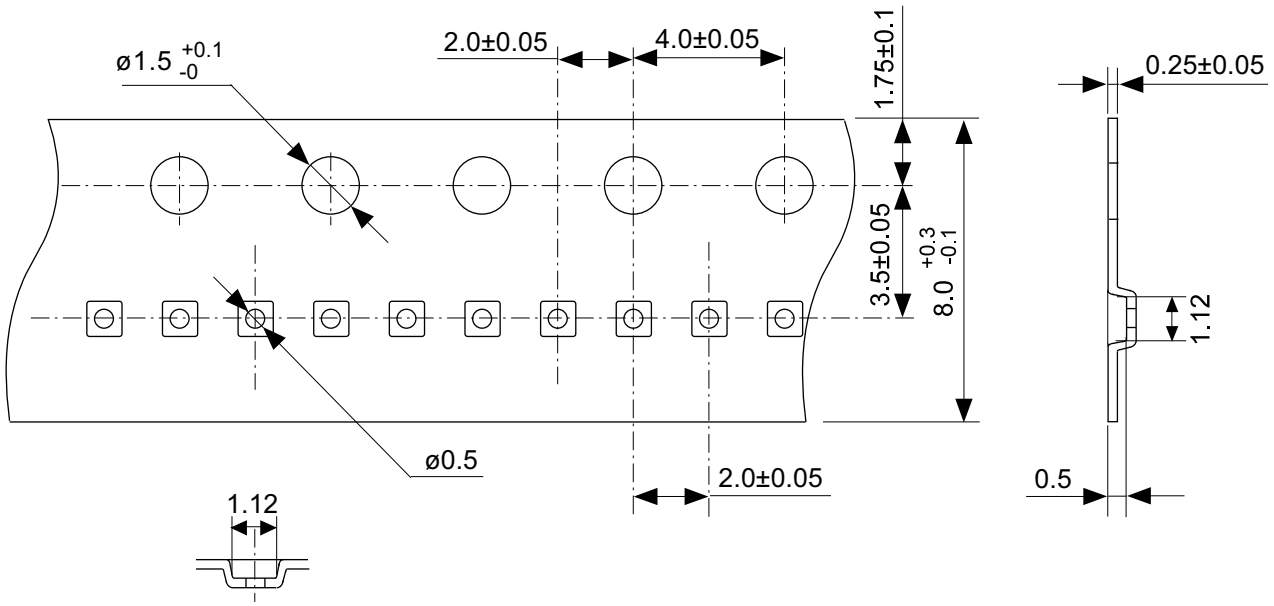


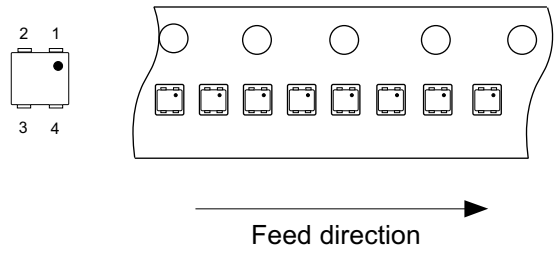


※ The heat sink of back side has different electric potential depending on the product.
Confirm specifications of each product.
Do not use it as the function of electrode.

No. PL004-B-P-SD-1.0

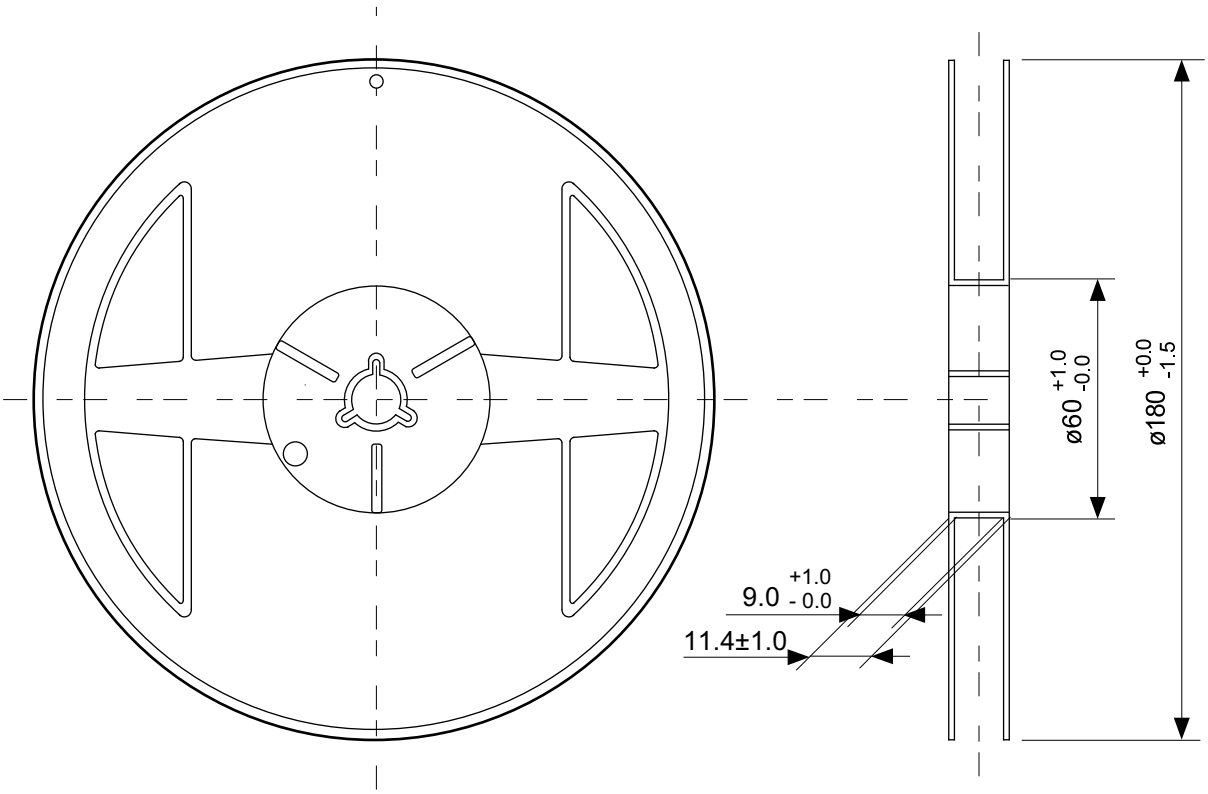
| | |
|---|---|
| TITLE | HSNT-4-D-PKG Dimensions |
| No. | PL004-B-P-SD-1.0 |
| ANGLE | |
| UNIT | mm |
| | |
| **ABLIC Inc.** | |



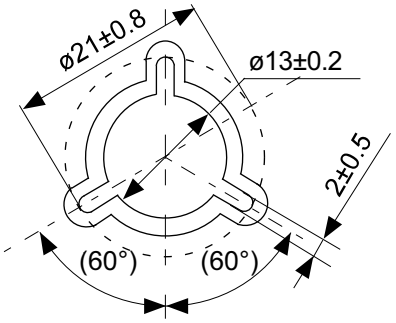




No. PL004-B-C-SD-1.0

| | |
|---|---|
| TITLE | HSNT-4-D-Carrier Tape |
| No. | PL004-B-C-SD-1.0 |
| ANGLE | |
| UNIT | mm |
| | |
| **ABLIC Inc.** | |



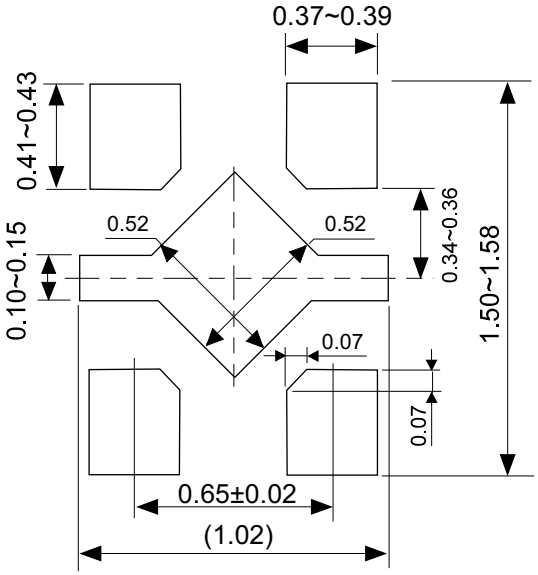

Enlarged drawing in the central part




No. PL004-B-R-SD-1.0

| | | | |
|---|---|---|---|
| TITLE | HSNT-4-D-Reel | | |
| No. | PL004-B-R-SD-1.0 | | |
| ANGLE | | QTY. | 10,000 |
| UNIT | mm | | |
| | | | |
| **ABLIC Inc.** | | | |

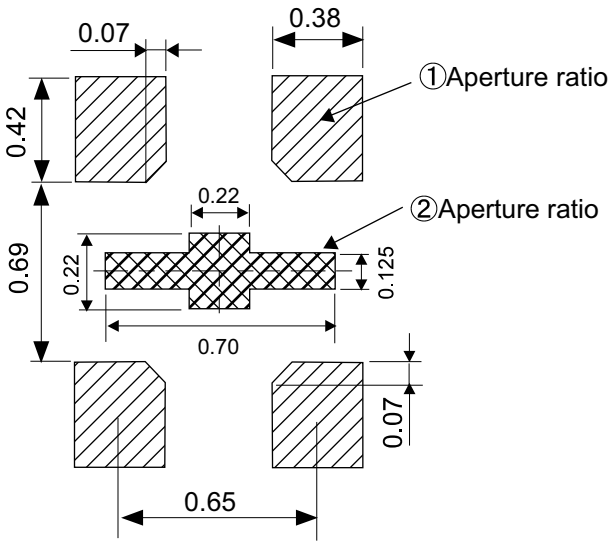
## Land Pattern




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

注意 放熱性を確保する為に、PKGの裏面放熱板（ヒートシンク）を基板に半田付けする事を推奨いたします。

## Metal Mask Pattern

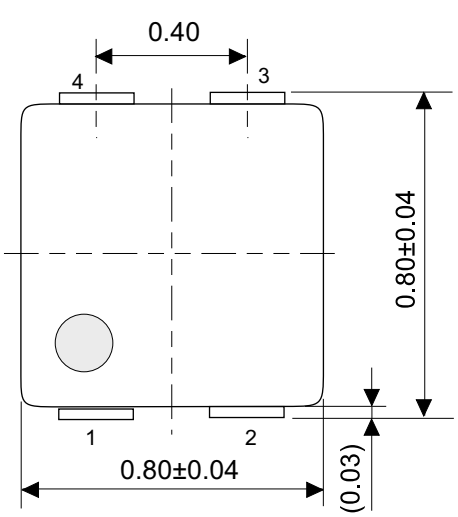


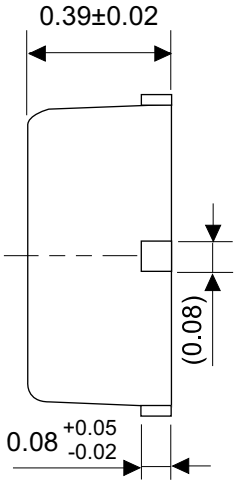

Caution ① Mask aperture ratio of the lead mounting part is 100%.
② Mask aperture ratio of the heat sink mounting part is approximately 40%.
③ Mask thickness: t0.12 mm

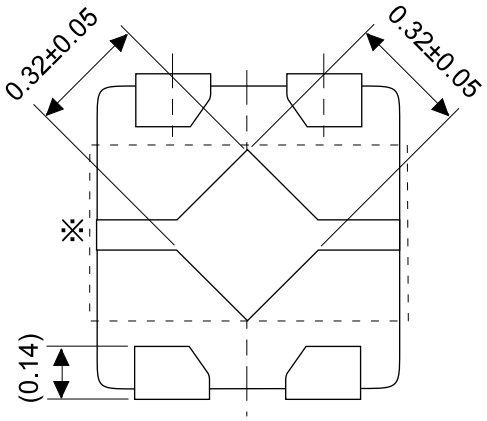
注意 ①リード実装部のマスク開口率は100%です。
②放熱板実装のマスク開口率は約40%です。
③マスク厚み: t 0.12 mm

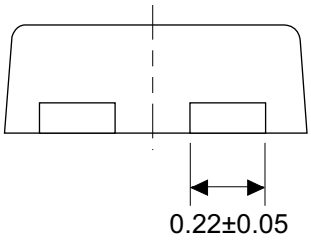
No. PL004-B-L-SD-1.0

| | |
|---|---|
| TITLE | HSNT-4-D -Land Recommendation |
| No. | PL004-B-L-SD-1.0 |
| ANGLE | |
| UNIT | mm |
| | |
| | **ABLIC Inc.** |



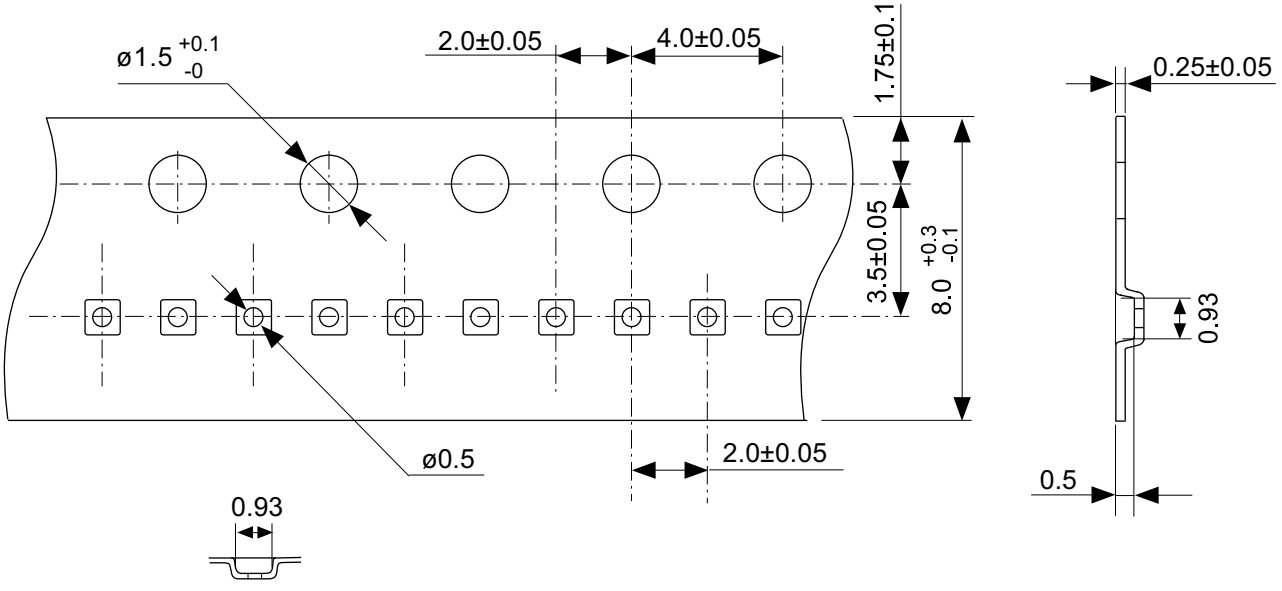



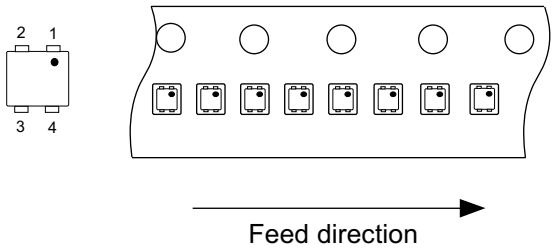




※ The heat sink of back side has different electric potential depending on the product.
Confirm specifications of each product.
Do not use it as the function of electrode.

No. PK004-B-P-SD-1.0

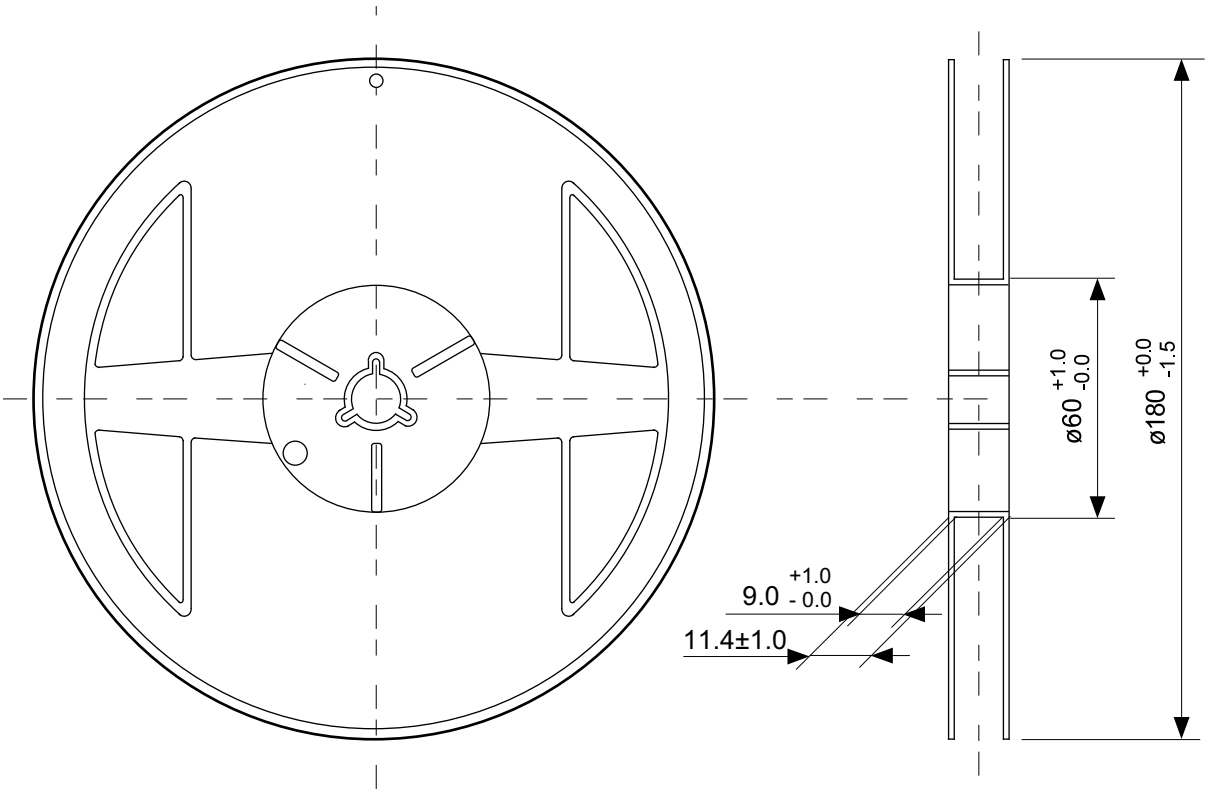
| | |
|---|---|
| TITLE | HSNT-4-C-PKG Dimensions |
| No. | PK004-B-P-SD-1.0 |
| ANGLE | |
| UNIT | mm |
| | |
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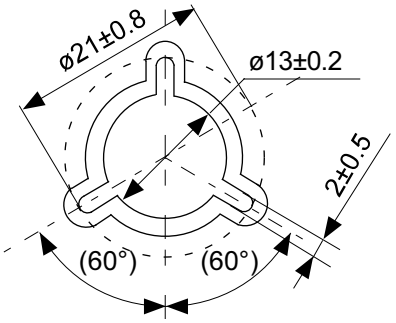




No. PK004-B-C-SD-1.0

| | |
|---|---|
| TITLE | HSNT-4-C-Carrier Tape |
| No. | PK004-B-C-SD-1.0 |
| ANGLE | |
| UNIT | mm |
| | |
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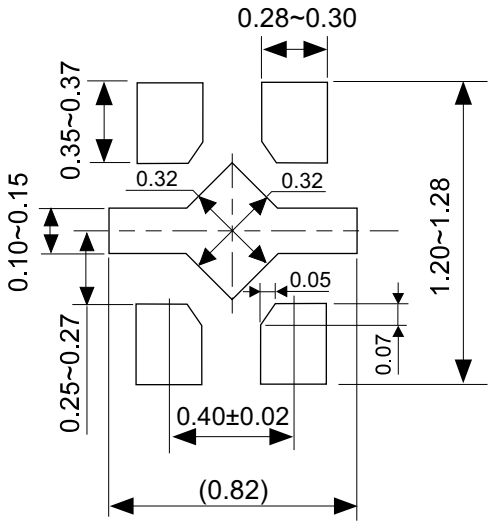

Enlarged drawing in the central part




No. PK004-B-R-SD-1.0

| | | | |
|---|---|---|---|
| TITLE | HSNT-4-C-Reel | | |
| No. | PK004-B-R-SD-1.0 | | |
| ANGLE | | QTY. | 10,000 |
| UNIT | mm | | |
| | | | |
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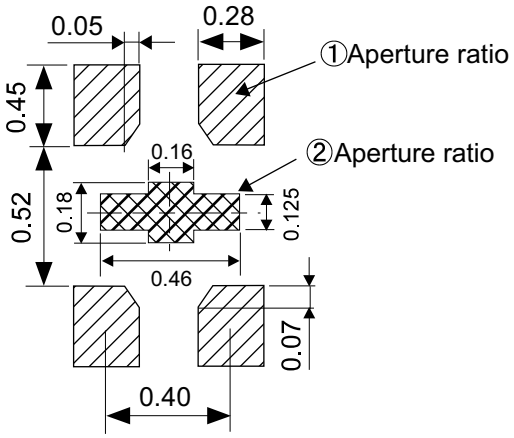
## Land Pattern




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

注意　放熱性を確保する為に、PKGの裏面放熱板（ヒートシンク）を基板に半田付けする事を推奨いたします。

## Metal Mask Pattern




Caution ① Mask aperture ratio of the lead mounting part is 120%.
② Mask aperture ratio of the heat sink mounting part is approximately 40%.
③ Mask thickness: t0.12 mm

注意 ①リード実装部のマスク開口率は120%です。
②放熱板実装のマスク開口率は約40%です。
③マスク厚み: t0.12 mm

No. PK004-B-L-SD-1.1

| | |
|---|---|
| TITLE | HSNT-4-C<br>-Land Recommendation |
| No. | PK004-B-L-SD-1.1 |
| ANGLE | |
| UNIT | mm |
| | |
| **ABLIC Inc.** | |

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2.4-2019.07