



SANYO Semiconductors

# DATA SHEET

An ON Semiconductor Company

## 2SA1417/2SC3647 — PNP / NPN Epitaxial Planar Silicon Transistor

### High-Voltage Switching Applications

#### Features

- Adoption of FBET, MBIT processes
- High breakdown voltage and large current capacity
- Fast switching speed
- Ultrasmall size making it easy to provide high-density small-sized hybrid ICs

#### Specifications ( ) : 2SA1417

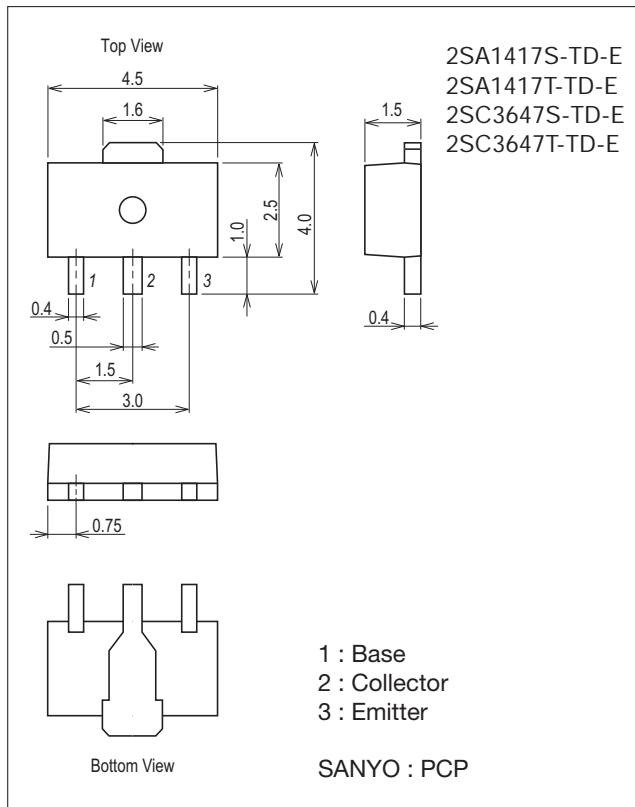
Absolute Maximum Ratings at Ta=25°C

| Parameter                    | Symbol | Conditions  | Ratings     | Unit |
|------------------------------|--------|---|-------------|------|
| Collector-to-Base Voltage    | VCBO   |   | (-)120      | V    |
| Collector-to-Emitter Voltage | VCEO   |   | (-)100      | V    |
| Emitter-to-Base Voltage      | VEBO   |   | (-)6        | V    |
| Collector Current            | IC     |   | (-)2        | A    |
| Collector Current (Pulse)    | ICP    |   | (-)3        | A    |
| Collector Dissipation        | PC     |   | 500         | mW   |
|                              |        | When mounted on ceramic substrate (250mm <sup>2</sup> ×0.8mm) | 1.5         | W    |
| Junction Temperature         | Tj     |   | 150         | °C   |
| Storage Temperature          | Tstg   |   | -55 to +150 | °C   |

#### Package Dimensions

unit : mm (typ)

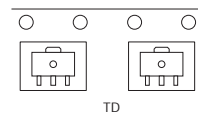
7007B-004



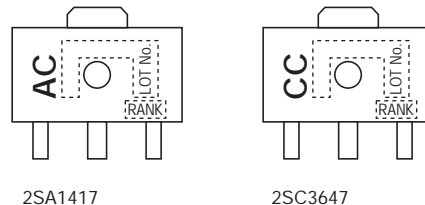
#### Product & Package Information

- Package : PCP
- JEITA, JEDEC : SC-62, SOT-89, TO-243
- Minimum Packing Quantity : 1,000 pcs./reel

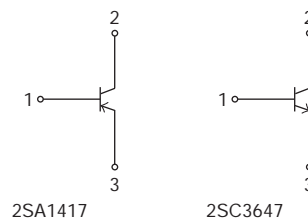
#### Packing Type: TD



#### Marking



#### Electrical Connection



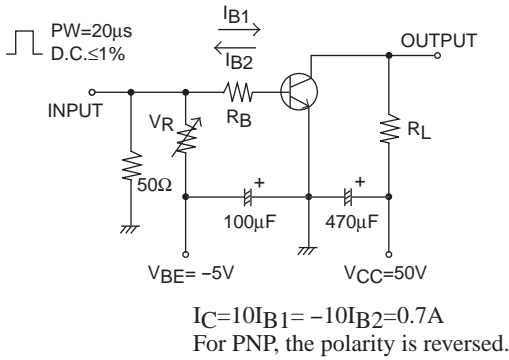
Electrical Characteristics at Ta=25°C

| Parameter                               | Symbol               | Conditions  | Ratings |             |           | Unit |
|---|----------------------|---|---------|-------------|-----------|------|
|   |                      |   | min     | typ         | max       |      |
| Collector Cutoff Current                | ICBO                 | V <sub>CB</sub> =(-)100V, I <sub>E</sub> =0A      |         |             | (-)100    | nA   |
| Emitter Cutoff Current                  | IEBO                 | V <sub>EB</sub> =(-)4V, I <sub>C</sub> =0A        |         |             | (-)100    | nA   |
| DC Current Gain                         | h <sub>FE</sub>      | V <sub>CE</sub> =(-)5V, I <sub>C</sub> =(-)100mA  | 100*    |             | 400*      |      |
| Gain-Bandwidth Product                  | f <sub>T</sub>       | V <sub>CE</sub> =(-)10V, I <sub>C</sub> =(-)100mA |         | 120         |           | MHz  |
| Output Capacitance                      | Cob                  | V <sub>CB</sub> =(-)10V, f=1MHz                   |         | (25)16      |           | pF   |
| Collector-to-Emitter Saturation Voltage | V <sub>CE(sat)</sub> | I <sub>C</sub> =(-)1A, I <sub>B</sub> =(-)100mA   |         | (-0.22)0.13 | (-0.6)0.4 | V    |
| Base-to-Emitter Saturation Voltage      | V <sub>BE(sat)</sub> | I <sub>C</sub> =(-)1A, I <sub>B</sub> =(-)100mA   |         | (-)0.85     | (-)1.2    | V    |
| Collector-to-Base Breakdown Voltage     | V <sub>(BR)CBO</sub> | I <sub>C</sub> =(-)10μA, I <sub>E</sub> =0A       | (-)120  |             |           | V    |
| Collector-to-Emitter Breakdown Voltage  | V <sub>(BR)CEO</sub> | I <sub>C</sub> =(-)1mA, R <sub>BE</sub> =∞        | (-)100  |             |           | V    |
| Emitter-to-Base Breakdown Voltage       | V <sub>(BR)EBO</sub> | I <sub>E</sub> =(-)10μA, I <sub>C</sub> =0A       | (-)6    |             |           | V    |
| Turn-On Time                            | t <sub>on</sub>      | See specified Test Circuit.                       |         | (80)80      |           | ns   |
| Storage Time                            | t <sub>stg</sub>     |   |         | (750)1000   |           | ns   |
| Fall Time                               | t <sub>f</sub>       |   |         | (40)50      |           | ns   |

\* : The 2SA1417 / 2S3647 are classified by 100mA h<sub>FE</sub> as follows :

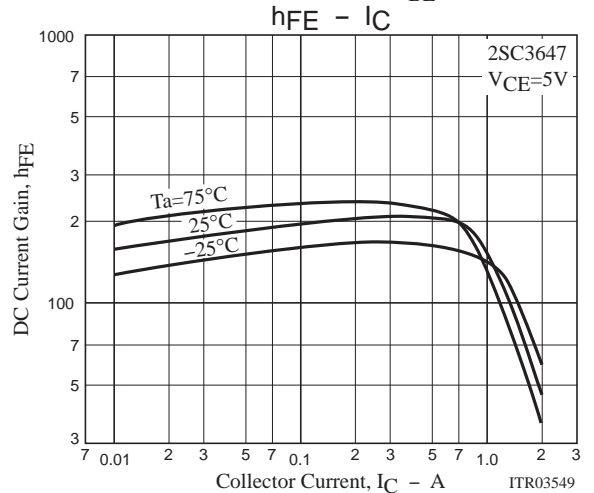
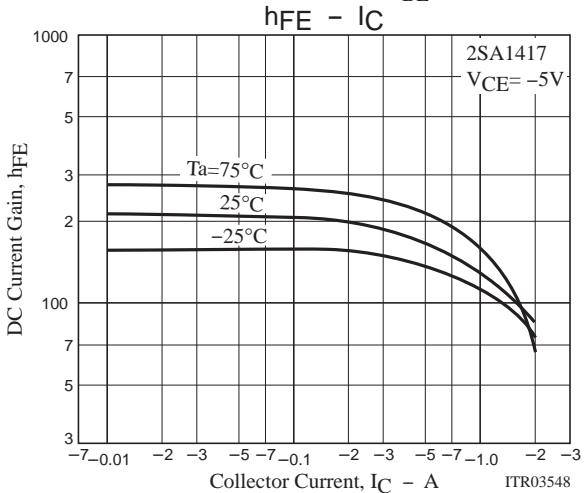
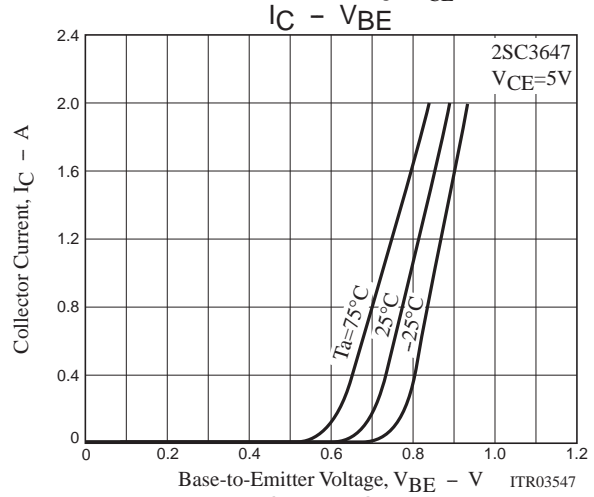
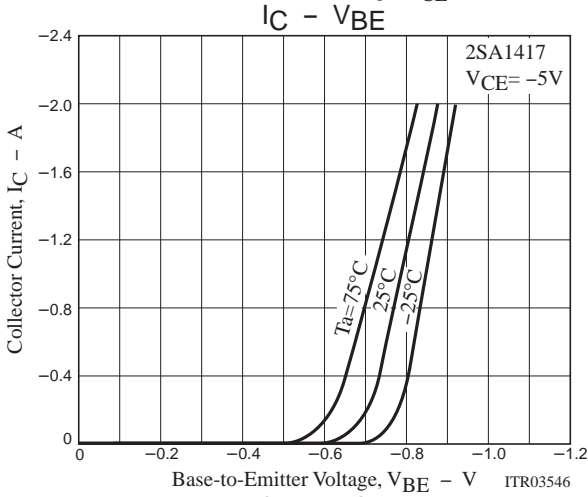
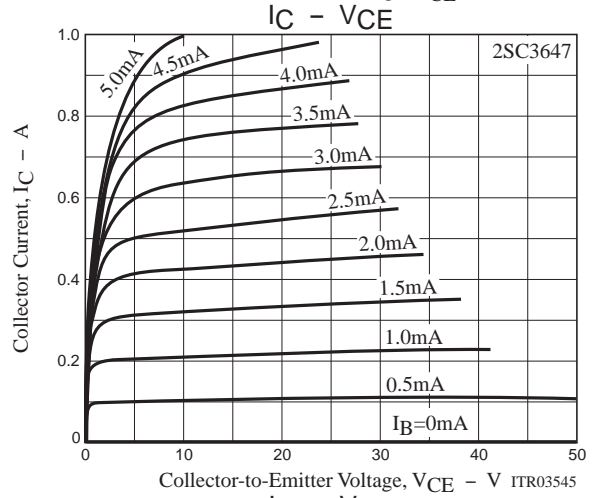
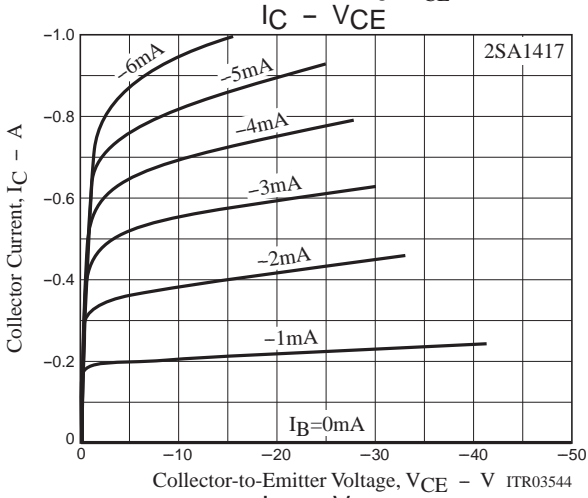
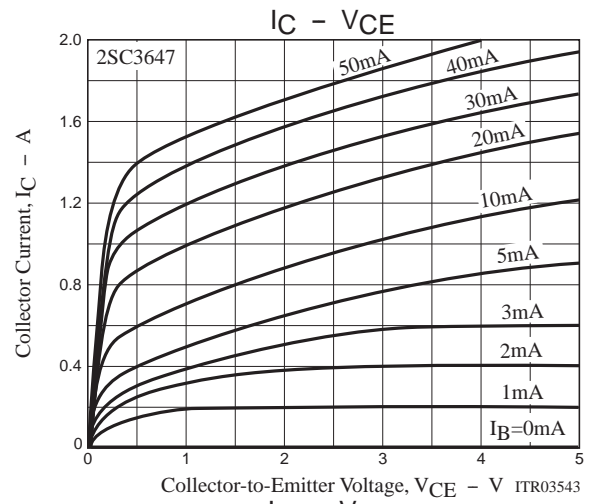
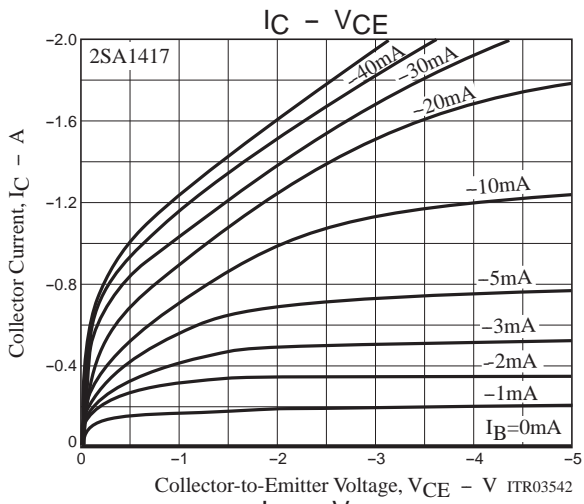
| Rank            | R          | S          | T          |
|-----------------|------------|------------|------------|
| h <sub>FE</sub> | 100 to 200 | 140 to 280 | 200 to 400 |

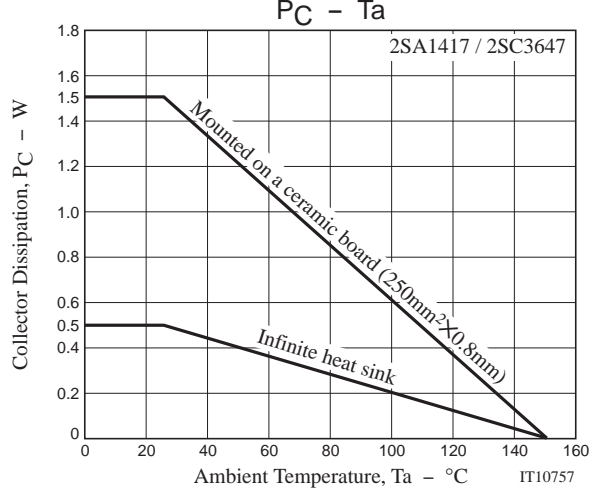
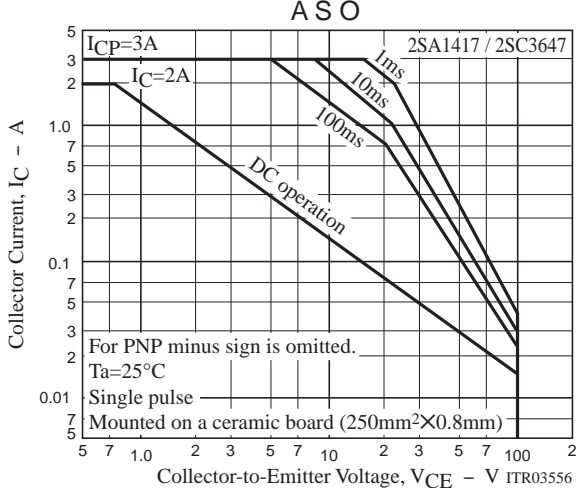
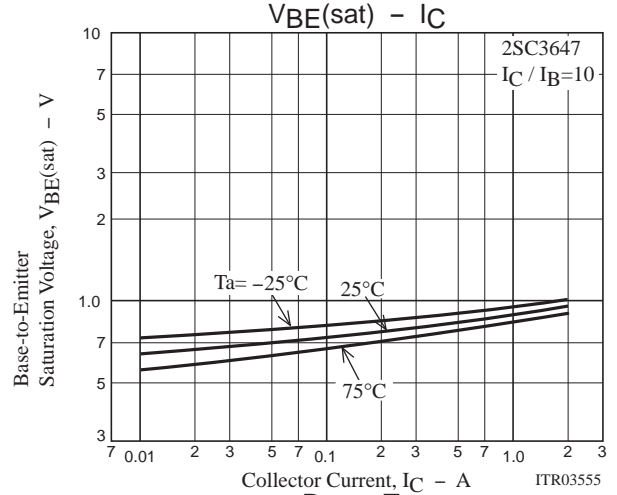
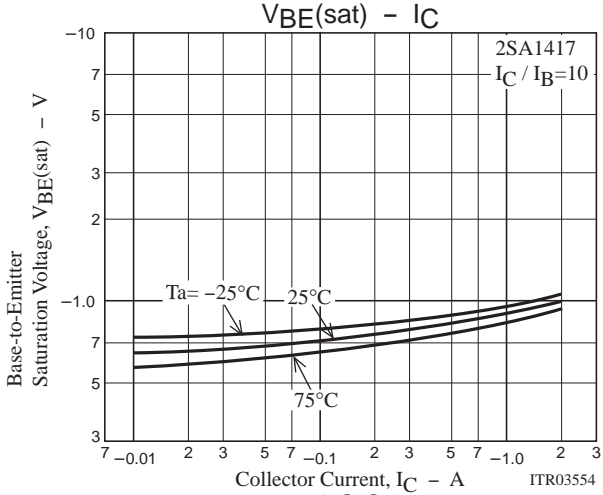
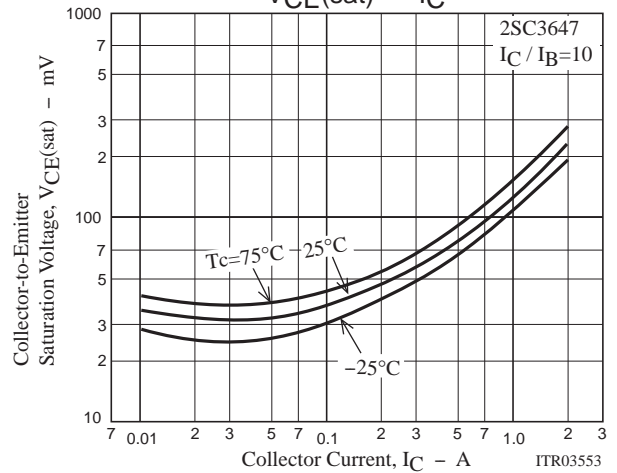
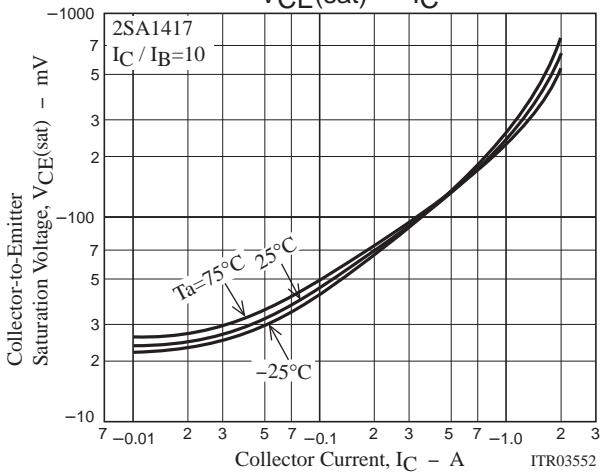
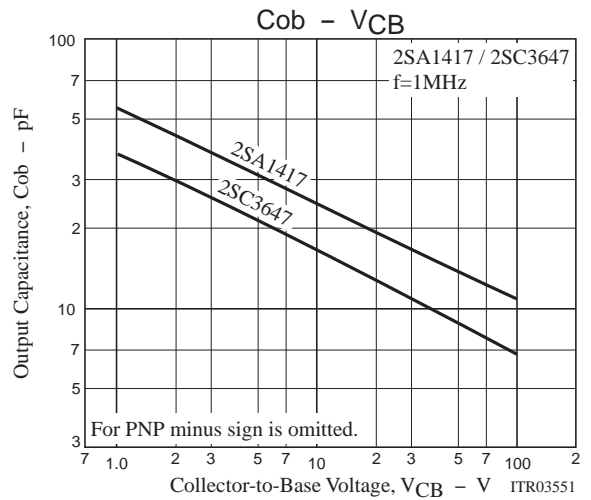
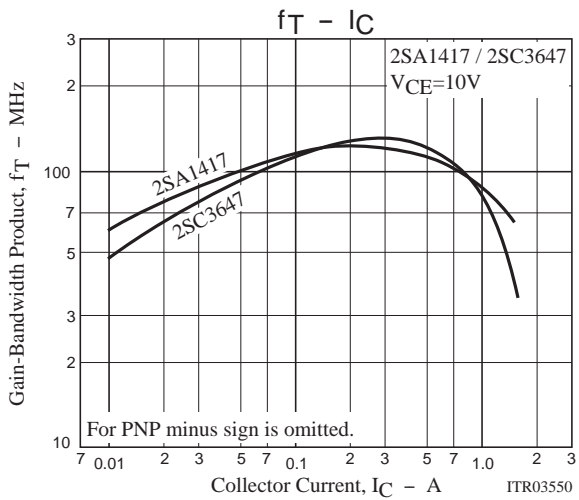
Switching Time Test Circuit



Ordering Information

| Device        | Package | Shipping       | memo    |
|---------------|---------|----------------|---------|
| 2SA1417S-TD-E | PCP     | 1,000pcs./reel | Pb Free |
| 2SA1417T-TD-E | PCP     | 1,000pcs./reel |         |
| 2SC3647S-TD-E | PCP     | 1,000pcs./reel |         |
| 2SC3647T-TD-E | PCP     | 1,000pcs./reel |         |





Embossed Taping Specification

2SA1417S-TD-E, 2SA1417T-TD-E, 2SC3647S-TD-E, 2SC3647T-TD-E

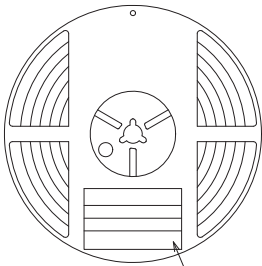
1. Packing Format

| Package Name | Carrier Tape Type | Maximum Number of devices contained (pcs) |           |           | Packing format  |  |
|--------------|-------------------|---|-----------|-----------|---|--|
|              |                   | Reel                                      | Inner box | Outer box | Inner BOX (C-1)   | Outer BOX (A-7)  |
| PCP          | PCP               | 1,000                                     | 4,000     | 24,000    | 4 reels contained<br>Dimensions:mm (external)<br>183×72×185 | 6 inner boxes contained<br>Dimensions:mm (external)<br>440×195×210 |

Reel label, Inner box label  
(unit : mm)

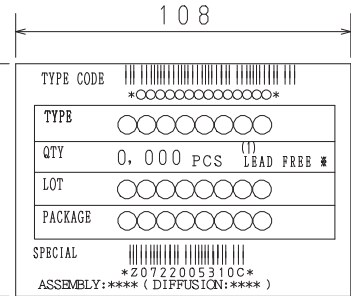
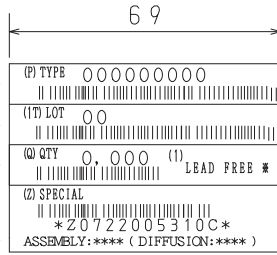
Outer box label  
It is a label at the time of factory shipments.  
The form of a label may change in physical distribution process.

Packing method



Reel label

Type No.  
LOT No.  
Quantity  
Origin



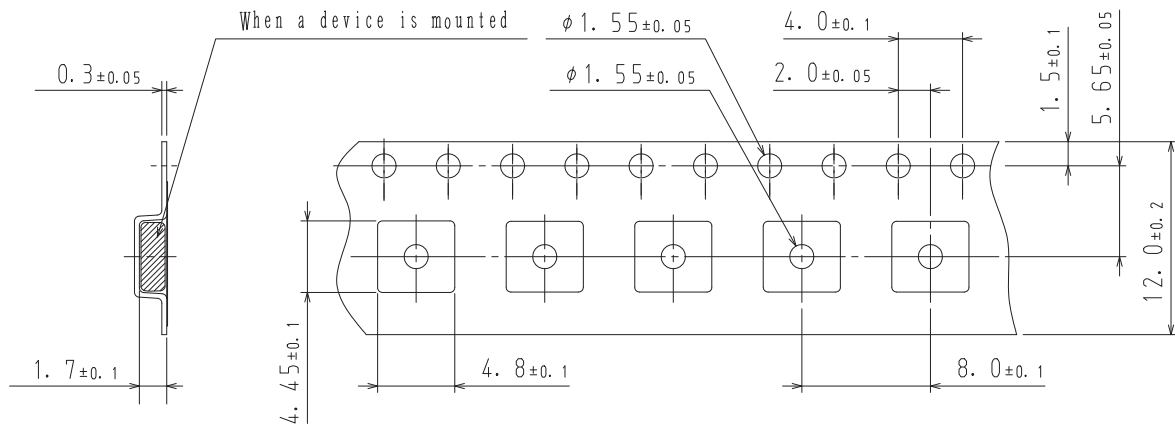
NOTE (1)

The LEAD FREE \* description shows that the surface treatment of the terminal is lead free.

| Label       | JEITA Phase    |
|-------------|----------------|
| LEAD FREE 3 | JEITA Phase 3A |
| LEAD FREE 4 | JEITA Phase 3  |

2. Taping configuration

2-1. Carrier tape size (unit:mm)



2-2. Device placement direction



Those with pin 1 index on the feed hole side.....TD



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