



SANYO Semiconductors

## DATA SHEET

An ON Semiconductor Company

PNP / NPN Epitaxial Planar Silicon Transistor

# 2SA1417/2SC3647 — 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

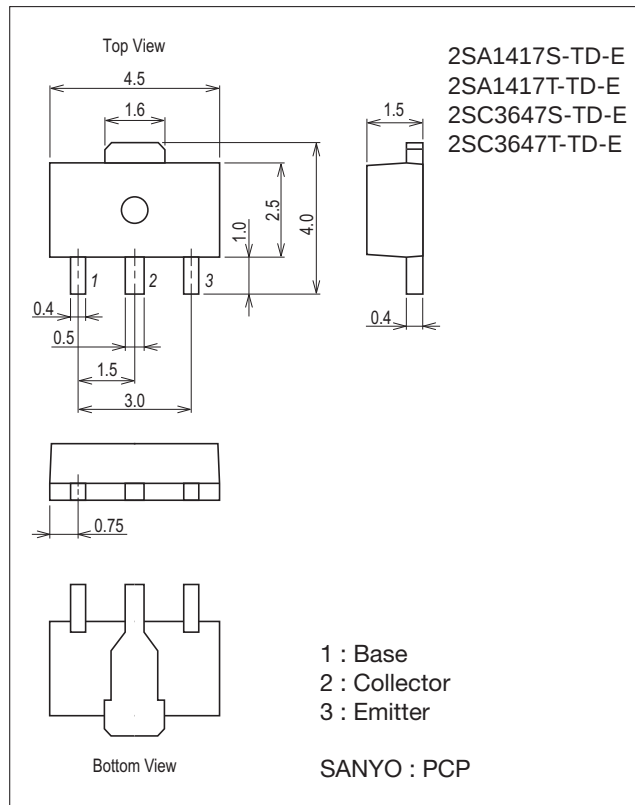
Absolute Maximum Ratings at Ta=25°C

| Parameter                    | Symbol           | Conditions                                                    | Ratings     | Unit |
|------------------------------|------------------|---------------------------------------------------------------|-------------|------|
| Collector-to-Base Voltage    | V <sub>CBO</sub> |                                                               | (-)-120     | V    |
| Collector-to-Emitter Voltage | V <sub>CEO</sub> |                                                               | (-)-100     | V    |
| Emitter-to-Base Voltage      | V <sub>EB0</sub> |                                                               | (-)-6       | V    |
| Collector Current            | I <sub>C</sub>   |                                                               | (-)-2       | A    |
| Collector Current (Pulse)    | I <sub>CP</sub>  |                                                               | (-)-3       | A    |
| Collector Dissipation        | P <sub>C</sub>   |                                                               | 500         | mW   |
|                              |                  | When mounted on ceramic substrate (250mm <sup>2</sup> ×0.8mm) | 1.5         | W    |
| Junction Temperature         | T <sub>j</sub>   |                                                               | 150         | °C   |
| Storage Temperature          | T <sub>stg</sub> |                                                               | -55 to +150 | °C   |

## Package Dimensions

unit : mm (typ)

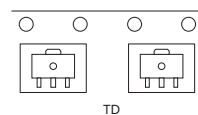
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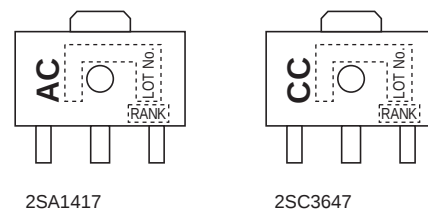
## Product & Package Information

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

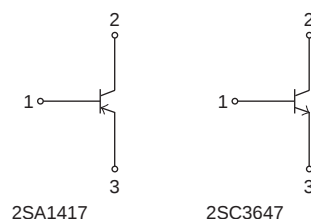
## Packing Type: TD



## Marking



## Electrical Connection



SANYO Semiconductor Co., Ltd.

<http://www.sanyosemi.com/en/network/>

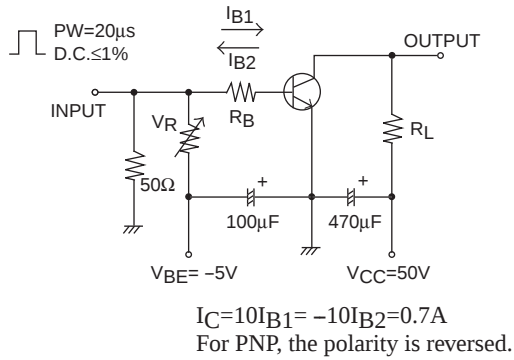
**Electrical Characteristics** at Ta=25°C

| Parameter                               | Symbol        | Conditions                    | Ratings  |               |             | Unit |
|-----------------------------------------|---------------|-------------------------------|----------|---------------|-------------|------|
|                                         |               |                               | min      | typ           | max         |      |
| Collector Cutoff Current                | $I_{CBO}$     | $V_{CB}=(-)100V, I_E=0A$      |          |               | $(-)100$    | nA   |
| Emitter Cutoff Current                  | $I_{EBO}$     | $V_{EB}=(-)4V, I_C=0A$        |          |               | $(-)100$    | nA   |
| DC Current Gain                         | $h_{FE}$      | $V_{CE}=(-)5V, I_C=(-)100mA$  | 100*     |               | 400*        |      |
| Gain-Bandwidth Product                  | $f_T$         | $V_{CE}=(-)10V, I_C=(-)100mA$ |          | 120           |             | MHz  |
| Output Capacitance                      | $C_{ob}$      | $V_{CB}=(-)10V, f=1MHz$       |          | (25)16        |             | pF   |
| Collector-to-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C=(-)1A, I_B=(-)100mA$     |          | $(-0.22)0.13$ | $(-0.6)0.4$ | V    |
| Base-to-Emitter Saturation Voltage      | $V_{BE(sat)}$ | $I_C=(-)1A, I_B=(-)100mA$     |          | $(-)0.85$     | $(-)1.2$    | V    |
| Collector-to-Base Breakdown Voltage     | $V_{(BR)CBO}$ | $I_C=(-)10\mu A, I_E=0A$      | $(-)120$ |               |             | V    |
| Collector-to-Emitter Breakdown Voltage  | $V_{(BR)CEO}$ | $I_C=(-)1mA, R_{BE}=\infty$   | $(-)100$ |               |             | V    |
| Emitter-to-Base Breakdown Voltage       | $V_{(BR)EBO}$ | $I_E=(-)10\mu A, I_C=0A$      | $(-)6$   |               |             | V    |
| Turn-On Time                            | $t_{on}$      | See specified Test Circuit.   |          | (80)80        |             | ns   |
| Storage Time                            | $t_{stg}$     |                               |          | (750)1000     |             | ns   |
| Fall Time                               | $t_f$         |                               |          | (40)50        |             | ns   |

\* : The 2SA1417 / 2S3647 are classified by 100mA  $h_{FE}$  as follows :

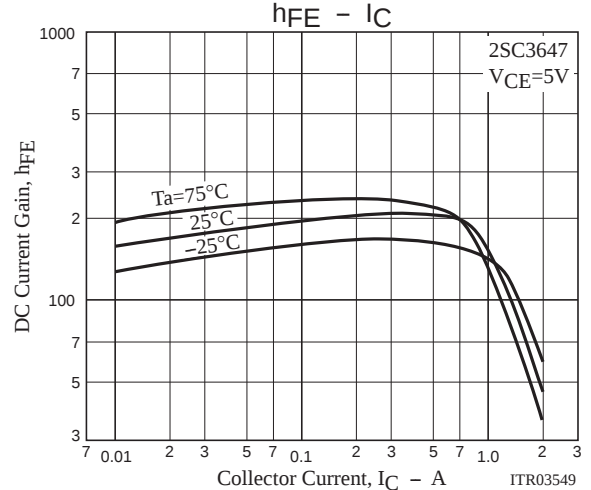
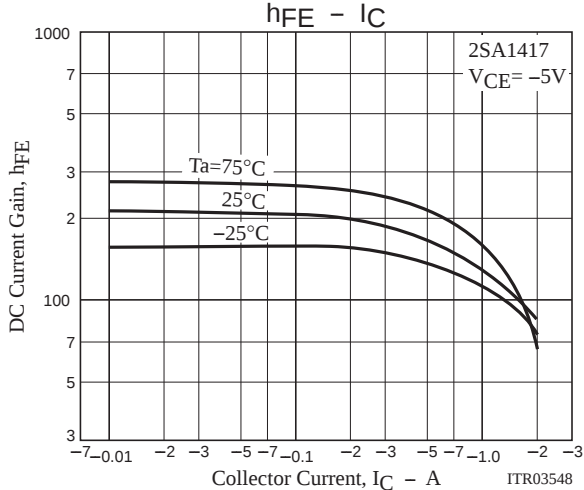
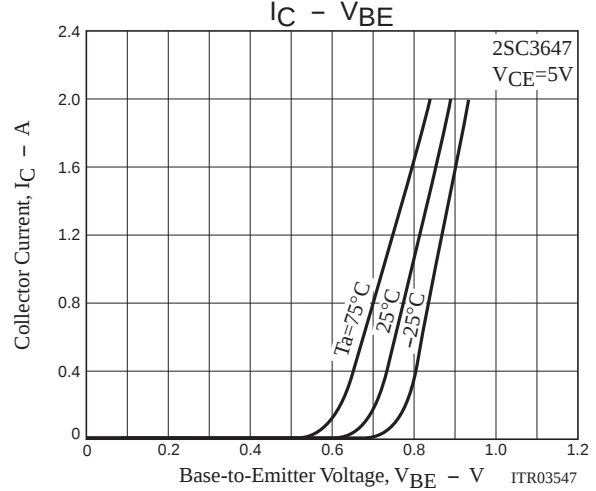
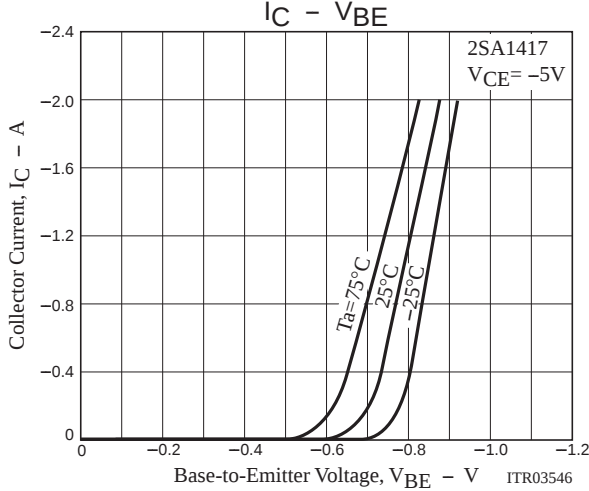
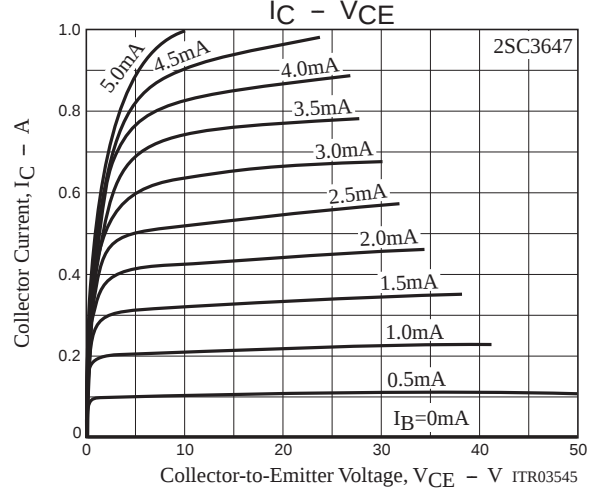
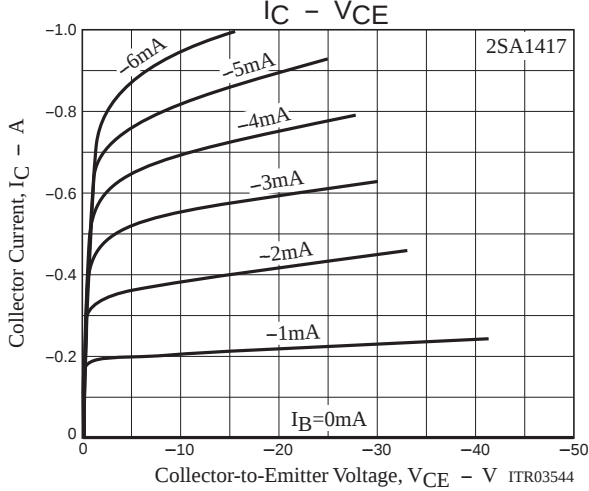
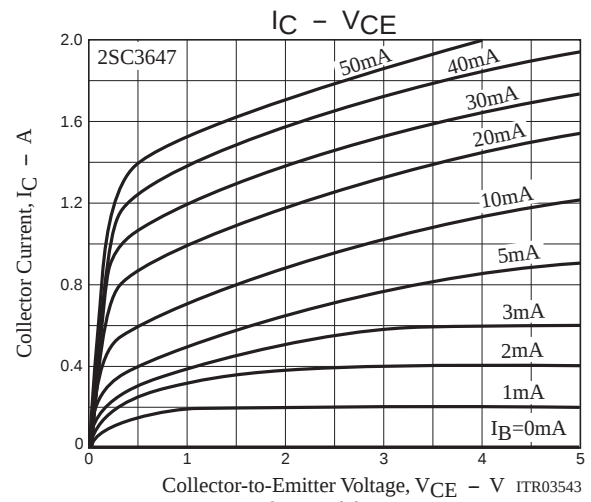
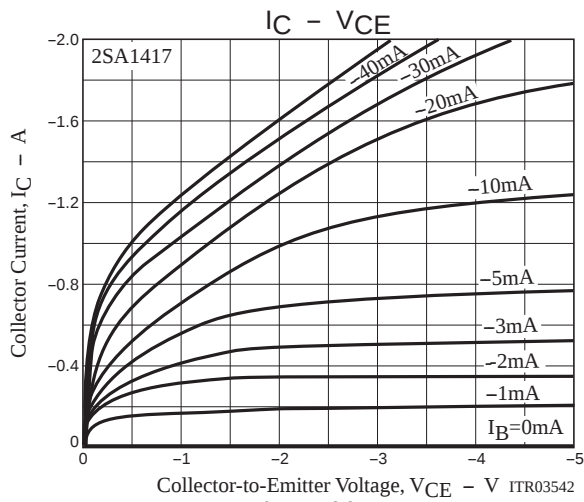
| Rank     | R          | S          | T          |
|----------|------------|------------|------------|
| $h_{FE}$ | 100 to 200 | 140 to 280 | 200 to 400 |

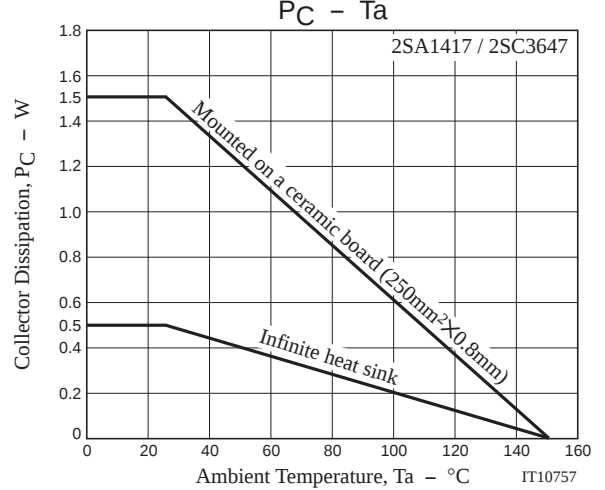
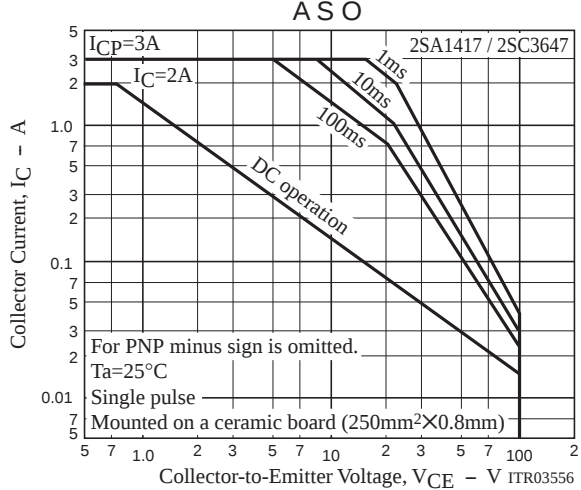
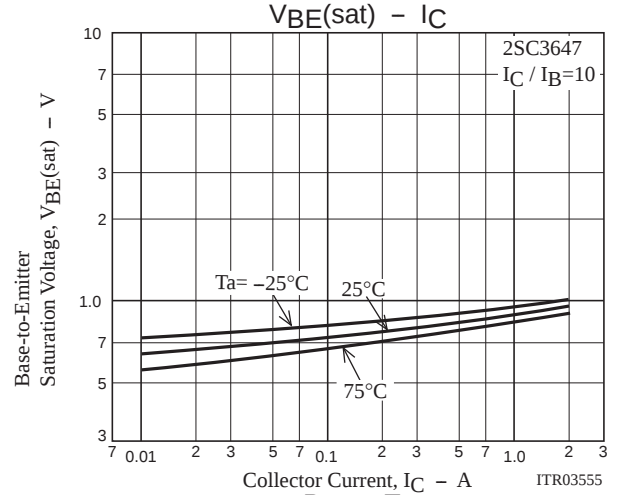
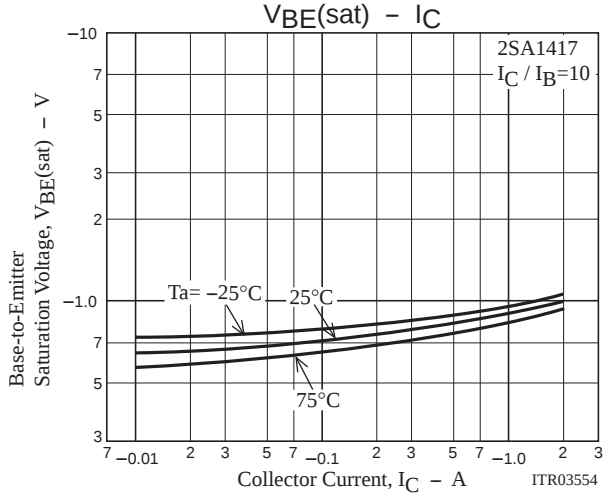
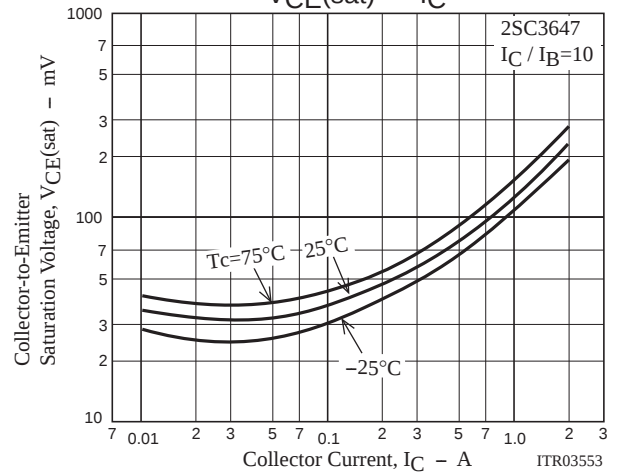
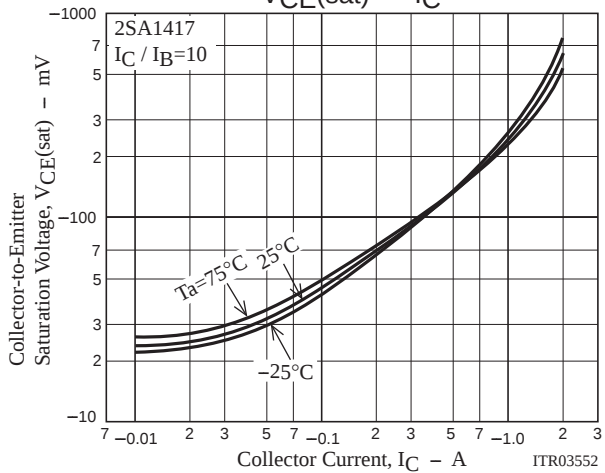
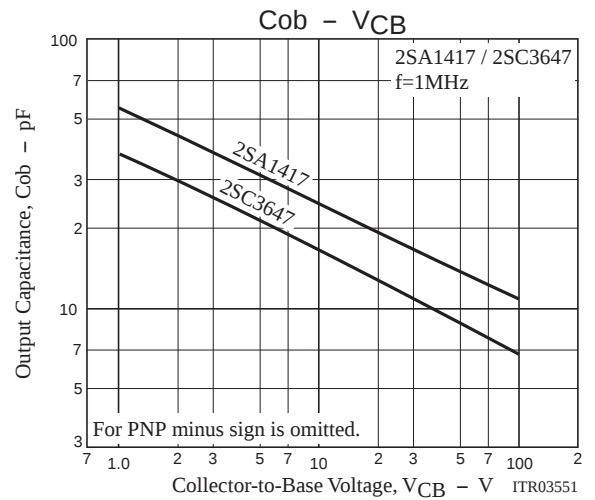
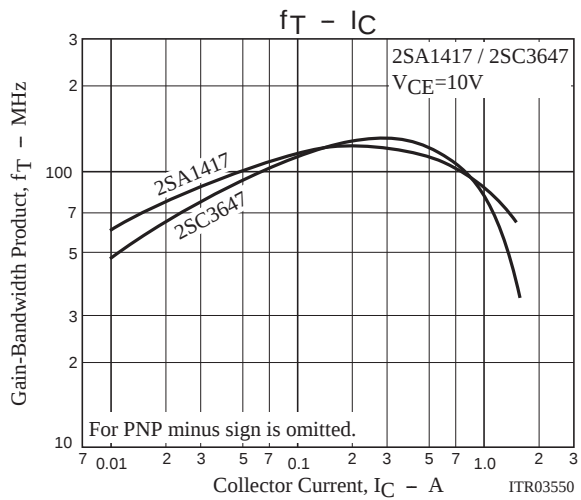
**Switching Time Test Circuit**



**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 |         |



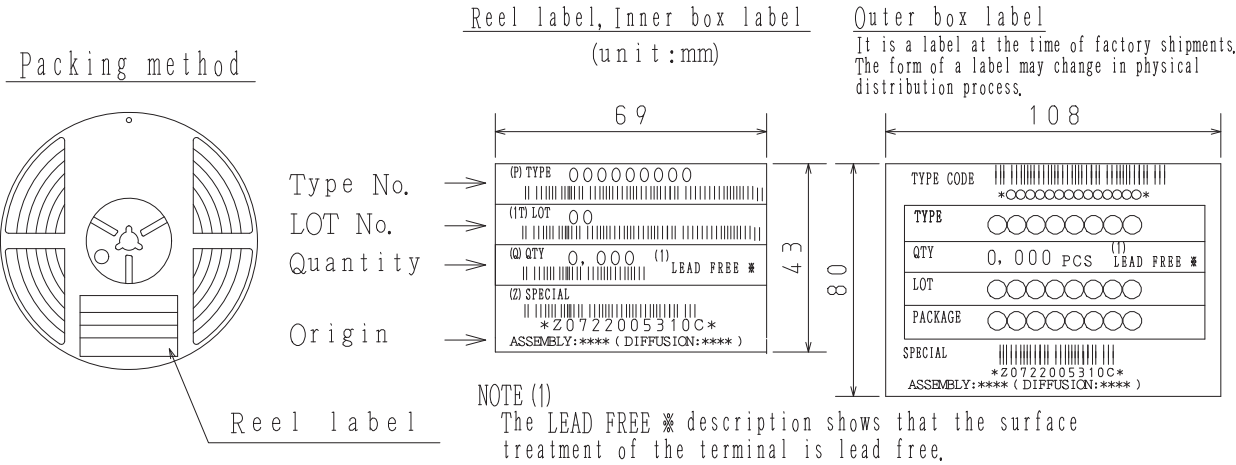


Embossed Taping Specification

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

1. Packing Format

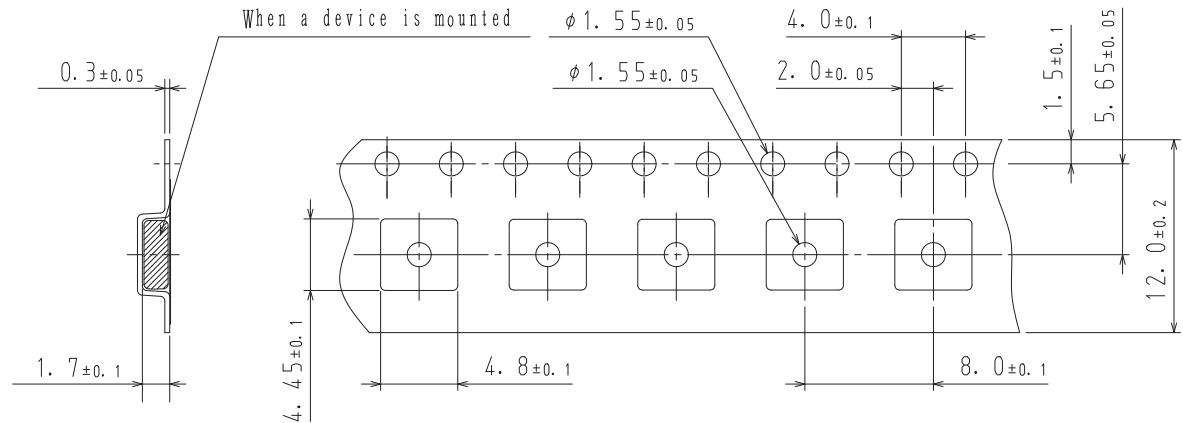
| Package Name | Carrier Tape Type | Maximum Number of devices contained (pcs) |           |           | Packing format                                              |                                                                    |
|--------------|-------------------|-------------------------------------------|-----------|-----------|-------------------------------------------------------------|--------------------------------------------------------------------|
|              |                   | 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 |



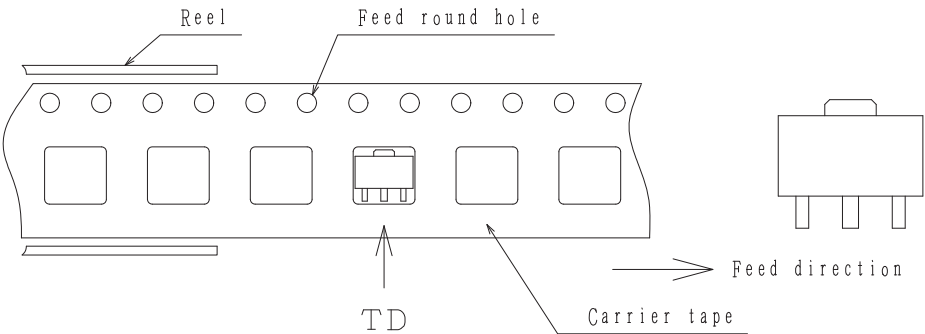
| Label       | JEITA Phase    |
|-------------|----------------|
| LEAD FREE 3 | JEITA Phase 3A |
| LEAD FREE 4 | JEITA Phase 3  |

2. Taping configuration

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



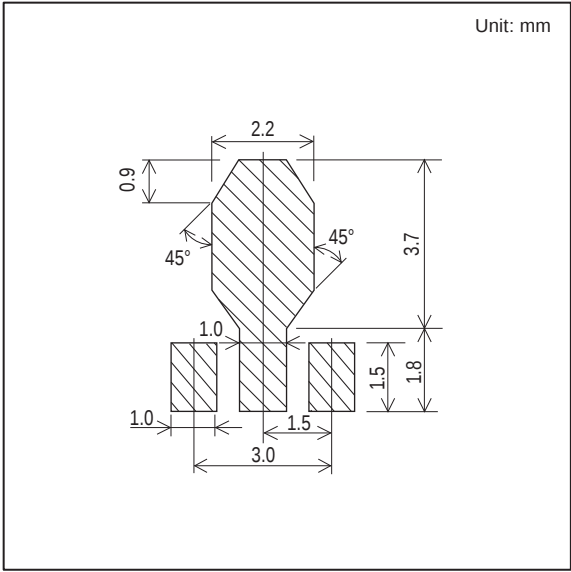
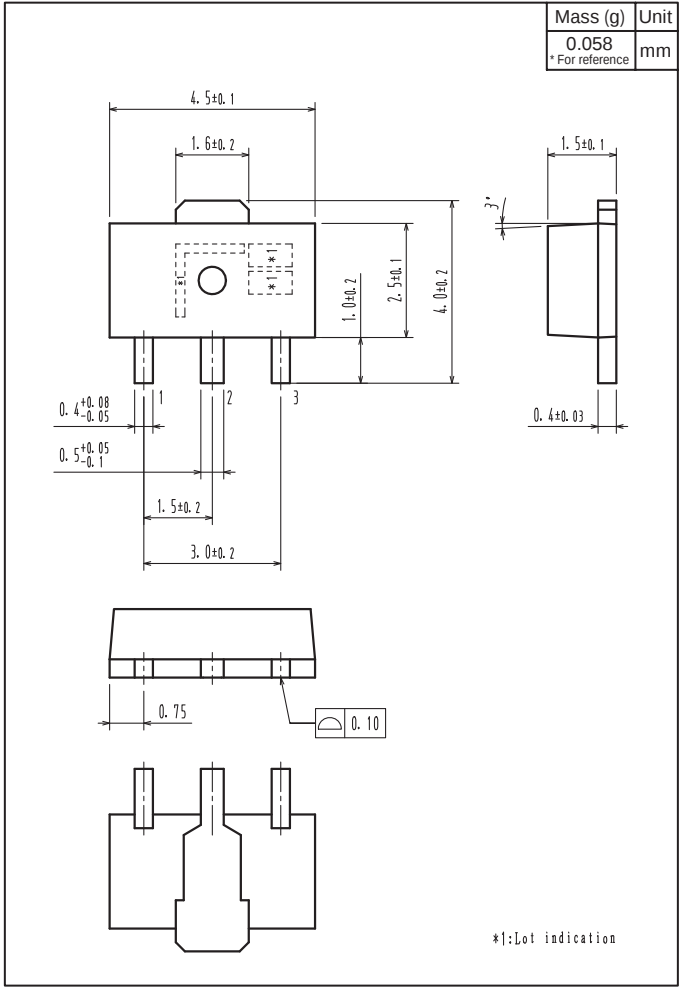
2-2. Device placement direction



Outline Drawing

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

Land Pattern Example



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