



SANYO Semiconductors

# DATA SHEET

An ON Semiconductor Company

## 2SA2039/2SC5706 — PNP/NPN Epitaxial Planar Silicon Transistor

### High-Current Switching Applications

#### Applications

- DC / DC converter, relay drivers, lamp drivers, motor drivers, flash

#### Features

- Adoption of FBET and MBIT processes
- Large current capacitance
- Low collector-to-emitter saturation voltage
- High-speed switching
- High allowable power dissipation

#### Specifications ( ) : 2SA2039

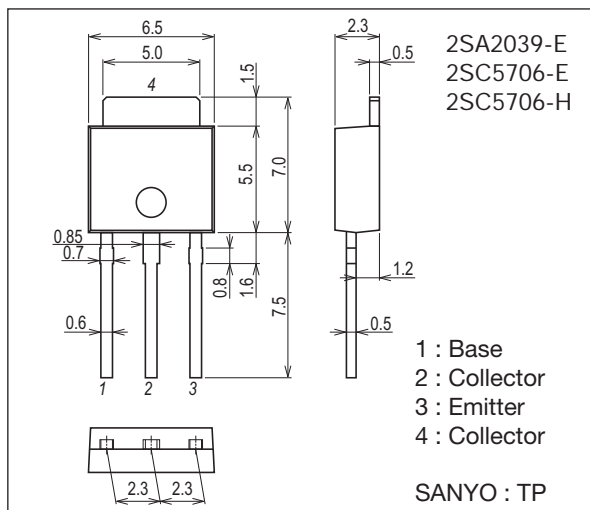
#### Absolute Maximum Ratings at Ta=25°C

| Parameter                    | Symbol           | Conditions | Ratings  | Unit |
|------------------------------|------------------|------------|----------|------|
| Collector-to-Base Voltage    | V <sub>CB0</sub> |            | (-50)100 | V    |
| Collector-to-Emitter Voltage | V <sub>CES</sub> |            | (-50)100 | V    |
| Collector-to-Emitter Voltage | V <sub>CEO</sub> |            | (-50)    | V    |
| Emitter-to-Base Voltage      | V <sub>EBO</sub> |            | (-6)     | V    |
| Collector Current            | I <sub>C</sub>   |            | (-5)     | A    |
| Collector Current (Pulse)    | I <sub>CP</sub>  |            | (-7.5)   | A    |

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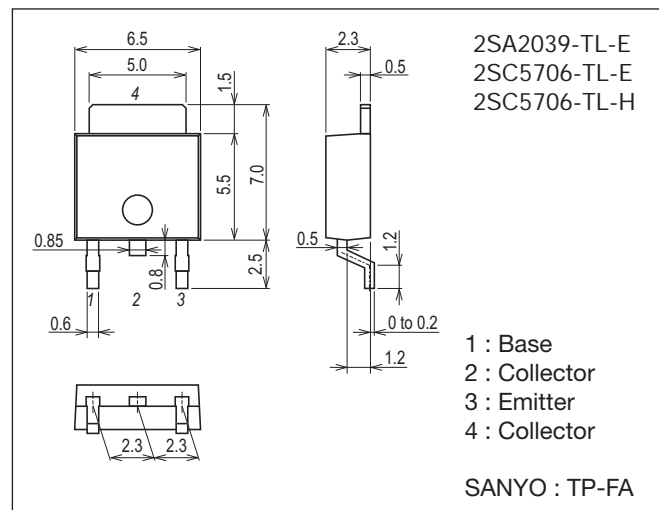
#### Package Dimensions unit : mm (typ)

7518-003



#### Package Dimensions unit : mm (typ)

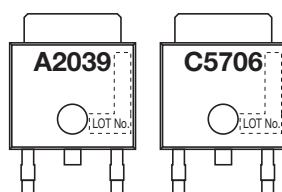
7003-003



#### Product & Package Information

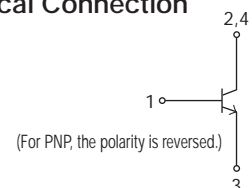
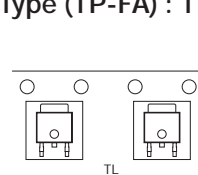
- Package : TP
- JEITA, JEDEC : SC-64, TO-251
- Minimum Packing Quantity : 500 pcs./bag

#### Marking (TP, TP-FA)



- Package : TP-FA
- JEITA, JEDEC : SC-63, TO-252
- Minimum Packing Quantity : 700 pcs./reel

#### Packing Type (TP-FA) : TL Electrical Connection



SANYO Semiconductor Co., Ltd.

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## 2SA2039/2SC5706

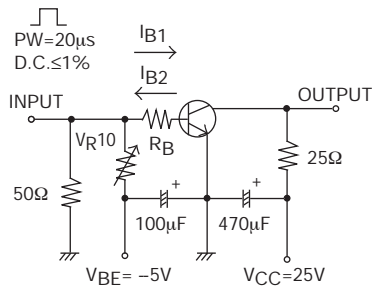
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| Parameter             | Symbol    | Conditions             | Ratings     | Unit             |
|-----------------------|-----------|------------------------|-------------|------------------|
| Base Current          | $I_B$     |                        | (-)-1.2     | A                |
| Collector Dissipation | $P_C$     |                        | 0.8         | W                |
|                       |           | $T_C=25^\circ\text{C}$ | 15          | W                |
| Junction Temperature  | $T_j$     |                        | 150         | $^\circ\text{C}$ |
| Storage Temperature   | $T_{stg}$ |                        | -55 to +150 | $^\circ\text{C}$ |

### Electrical Characteristics at $T_a=25^\circ\text{C}$

| Parameter                               | Symbol         | Conditions                                  | Ratings    |             |             | Unit          |
|---|----------------|---|------------|-------------|-------------|---------------|
|   |                |   | min        | typ         | max         |               |
| Collector Cutoff Current                | $I_{CBO}$      | $V_{CB}=(-)40\text{V}, I_E=0\text{A}$       |            |             | (-)-1       | $\mu\text{A}$ |
| Emitter Cutoff Current                  | $I_{EBO}$      | $V_{EB}=(-)4\text{V}, I_C=0\text{A}$        |            |             | (-)-1       | $\mu\text{A}$ |
| DC Current Gain                         | $h_{FE}$       | $V_{CE}=(-)2\text{V}, I_C=(-)500\text{mA}$  | 200        |             | 560         |               |
| Gain-Bandwidth Product                  | $f_T$          | $V_{CE}=(-)10\text{V}, I_C=(-)500\text{mA}$ |            | (360)400    |             | MHz           |
| Output Capacitance                      | $C_{ob}$       | $V_{CB}=(-)10\text{V}, f=1\text{MHz}$       |            | (24)15      |             | pF            |
| Collector-to-Emitter Saturation Voltage | $V_{CE(sat)1}$ | $I_C=(-)1\text{A}, I_B=(-)50\text{mA}$      |            | (-)-115)90  | (-)-195)135 | mV            |
|   | $V_{CE(sat)2}$ | $I_C=(-)2\text{A}, I_B=(-)100\text{mA}$     |            | (-)-255)160 | (-)-430)240 | mV            |
| Base-to-Emitter Saturation Voltage      | $V_{BE(sat)}$  | $V_{CE}=(-)2\text{V}, I_B=(-)100\text{mA}$  |            | (-)-0.89    | (-)-1.2     | V             |
| Collector-to-Base Breakdown Voltage     | $V_{(BR)CBO}$  | $I_C=(-)10\mu\text{A}, I_E=0\text{A}$       | (-)-50)100 |             |             | V             |
| Collector-to-Emitter Breakdown Voltage  | $V_{(BR)CES}$  | $I_C=(-)100\mu\text{A}, R_{BE}=0\Omega$     | (-)-50)100 |             |             | V             |
| Collector-to-Emitter Breakdown Voltage  | $V_{(BR)CEO}$  | $I_C=(-)1\text{mA}, R_{BE}=\infty$          | (-)-50     |             |             | V             |
| Emitter-to-Base Breakdown Voltage       | $V_{(BR)EBO}$  | $I_E=(-)10\mu\text{A}, I_C=0\text{A}$       | (-)-6      |             |             | V             |
| Turn-On Time                            | $t_{on}$       |   |            | (30)35      |             | ns            |
| Storage Time                            | $t_{stg}$      | See specified Test Circuit.                 |            | (230)300    |             | ns            |
| Fall Time                               | $t_f$          |   |            | (15)20      |             | ns            |

### Switching Time Test Circuit

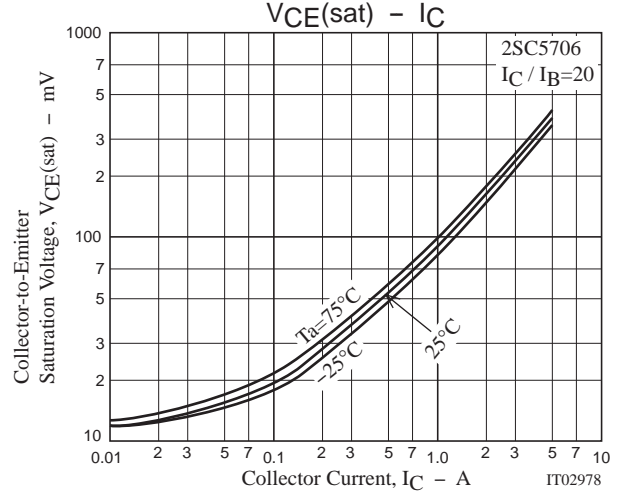
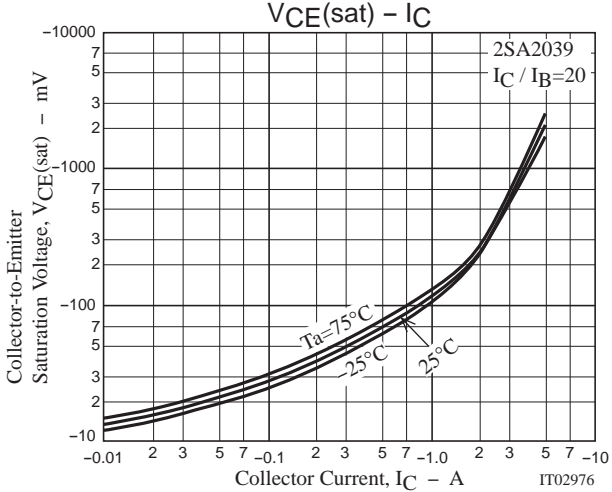
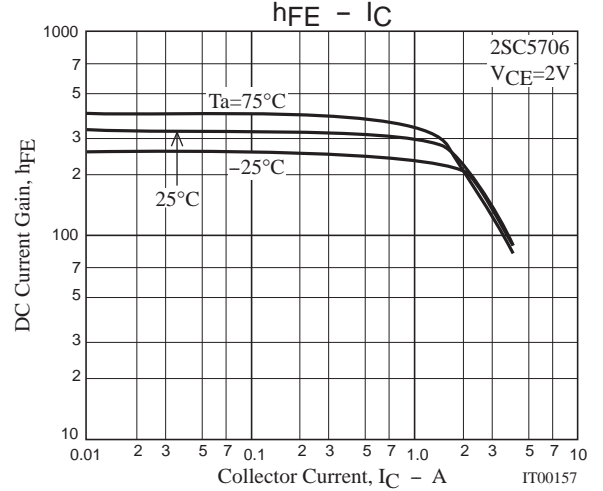
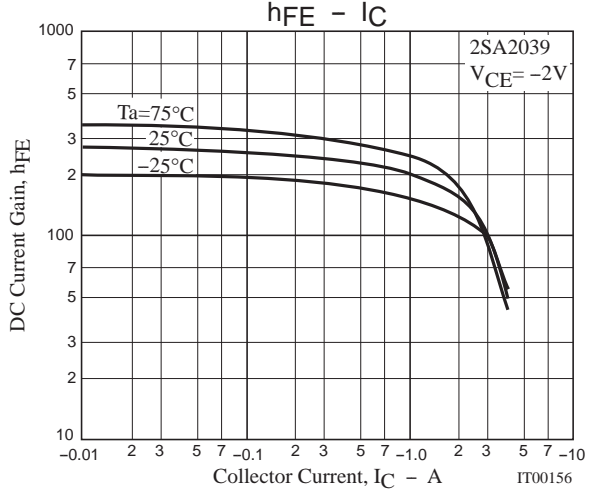
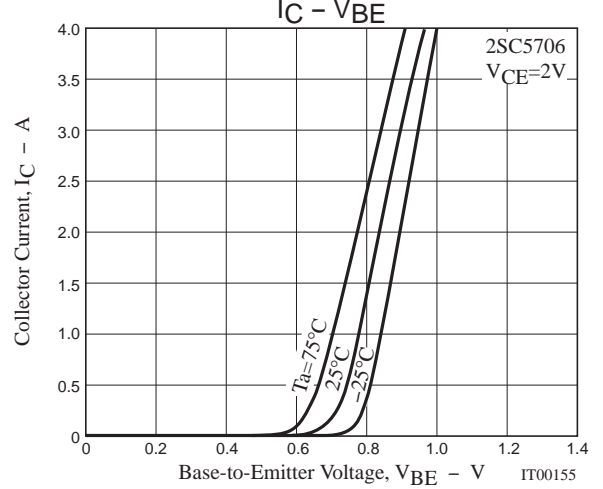
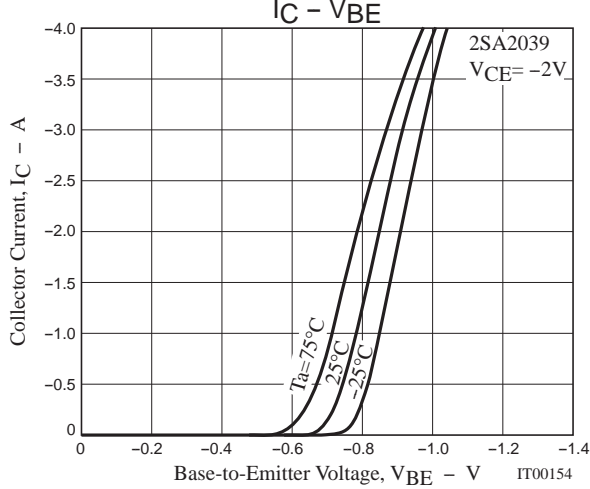
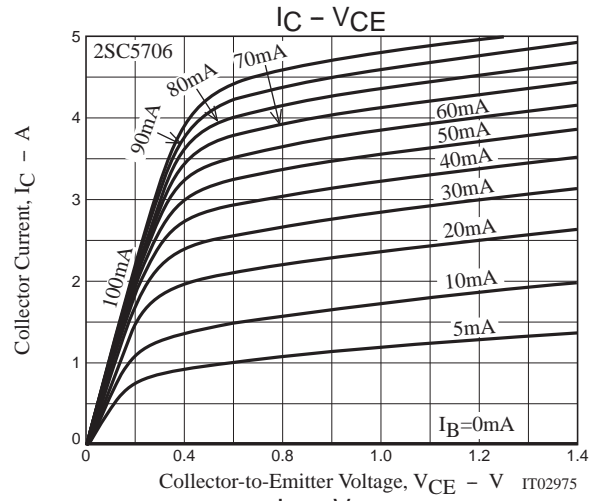
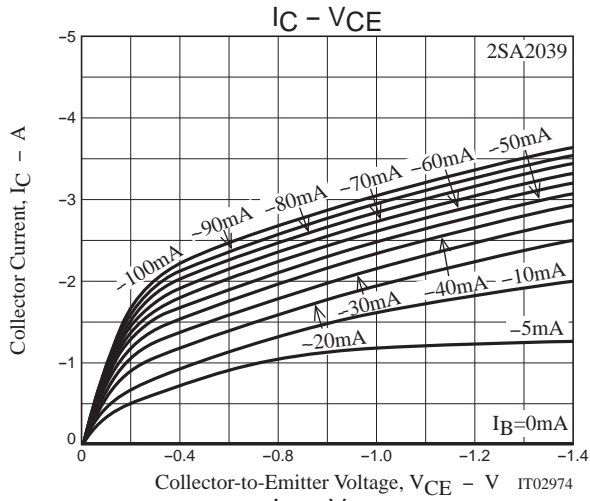


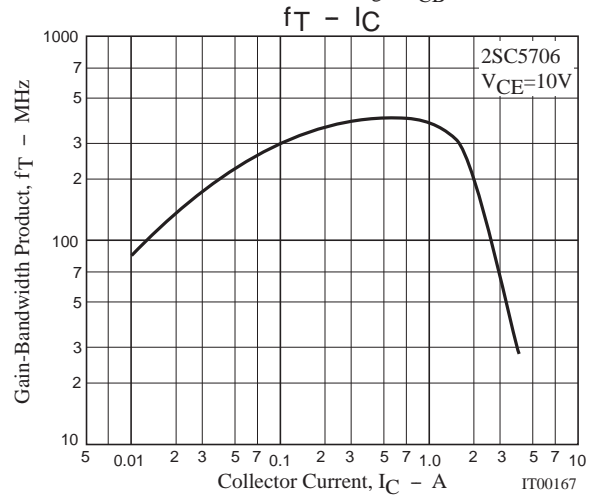
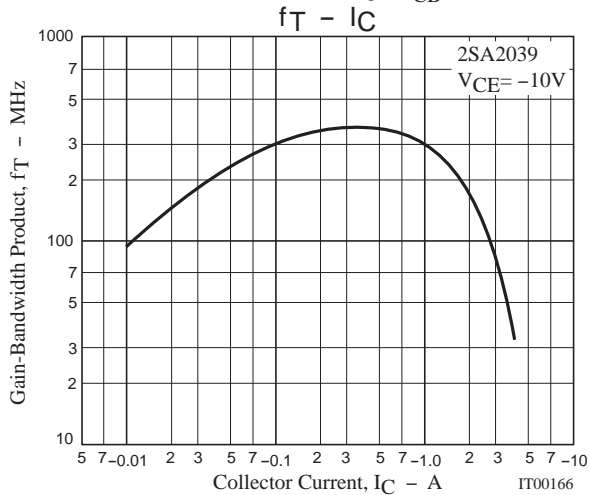
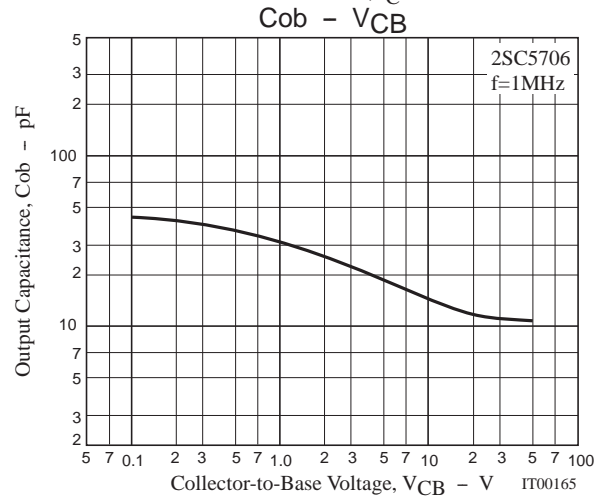
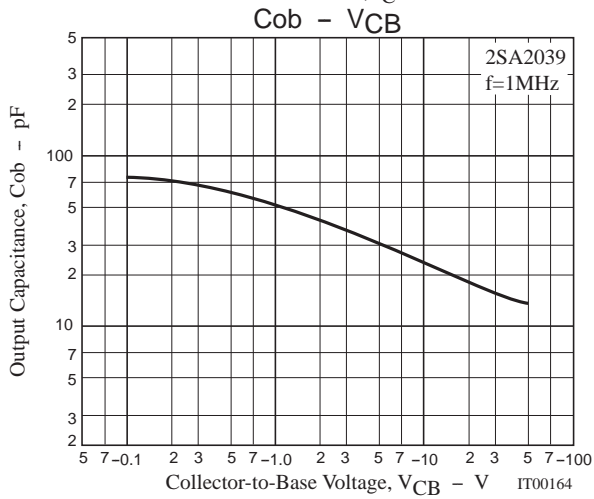
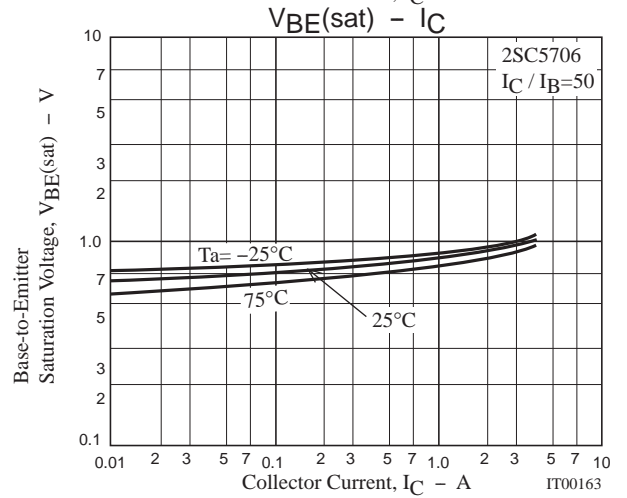
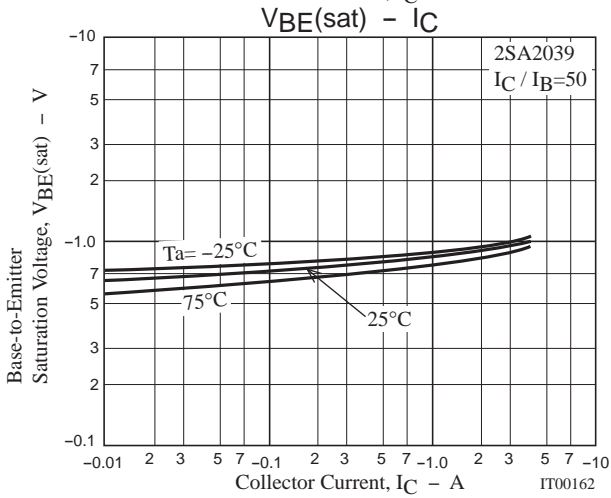
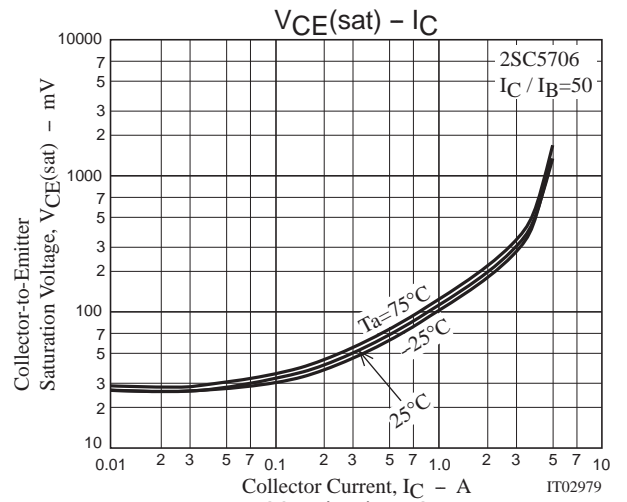
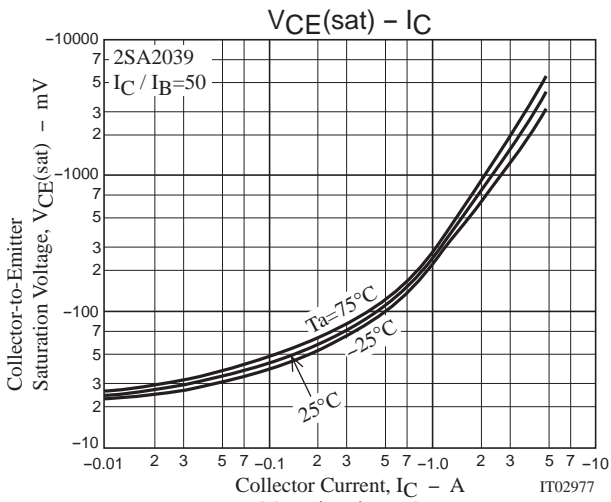
$$I_C=10I_{B1} = -10I_{B2}=1\text{A}$$

For PNP, the polarity is reversed.

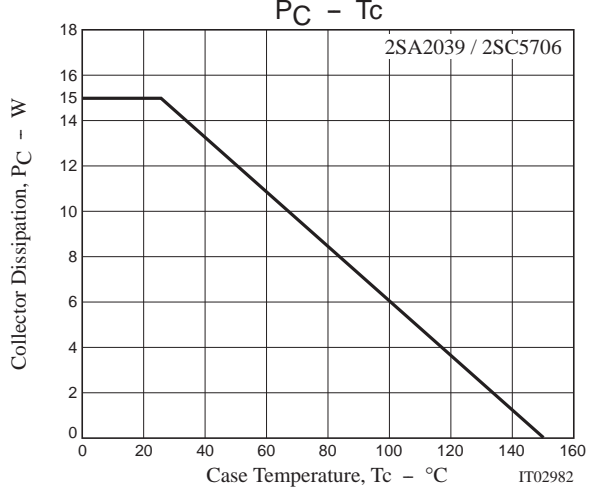
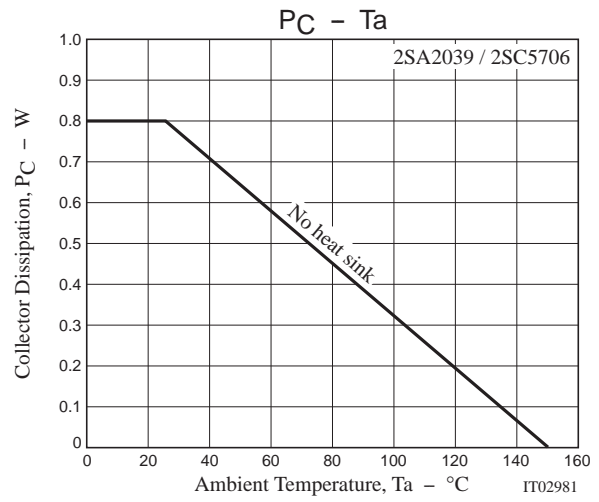
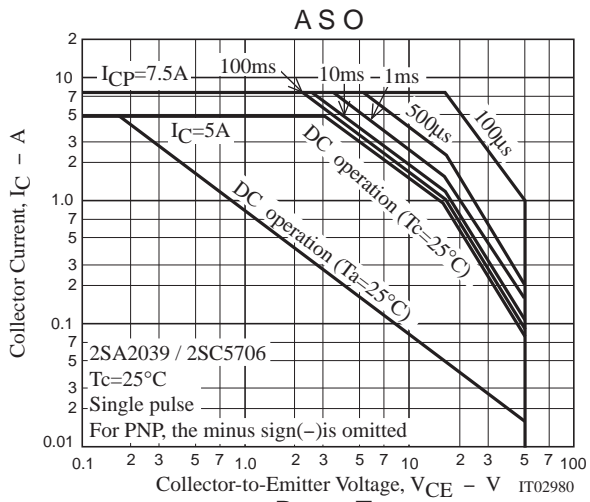
### Ordering Information

| Device       | Package | Shipping     | memo                   |
|--------------|---------|--------------|------------------------|
| 2SA2039-E    | TP      | 500pcs./bag  | Pb Free                |
| 2SC5706-E    | TP      | 500pcs./bag  |                        |
| 2SC5706-H    | TP      | 500pcs./bag  | Pb Free & Halogen Free |
| 2SA2039-TL-E | TP-FA   | 700pcs./reel | Pb Free                |
| 2SC5706-TL-E | TP-FA   | 700pcs./reel |                        |
| 2SC5706-TL-H | TP-FA   | 700pcs./reel | Pb Free & Halogen Free |





# 2SA2039/2SC5706



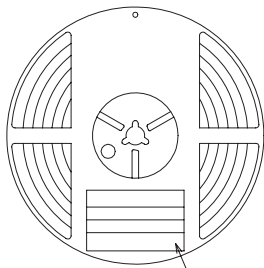
Taping Specification

2SA2039-TL-E, 2SC5706-TL-E, 2SC5706-TL-H

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)  |
| TP-FA        | TP                | 700                                       | 2,100     | 12,600    | 3 reels contained<br>Dimensions:mm (external)<br>183×72×185 | 6 inner boxes contained<br>Dimensions:mm (external)<br>440×195×210 |

Packing method



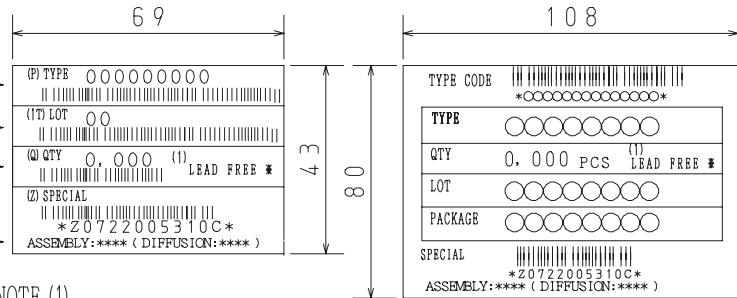
Type No.  
LOT No.  
Quantity  
Origin

Reel label

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.



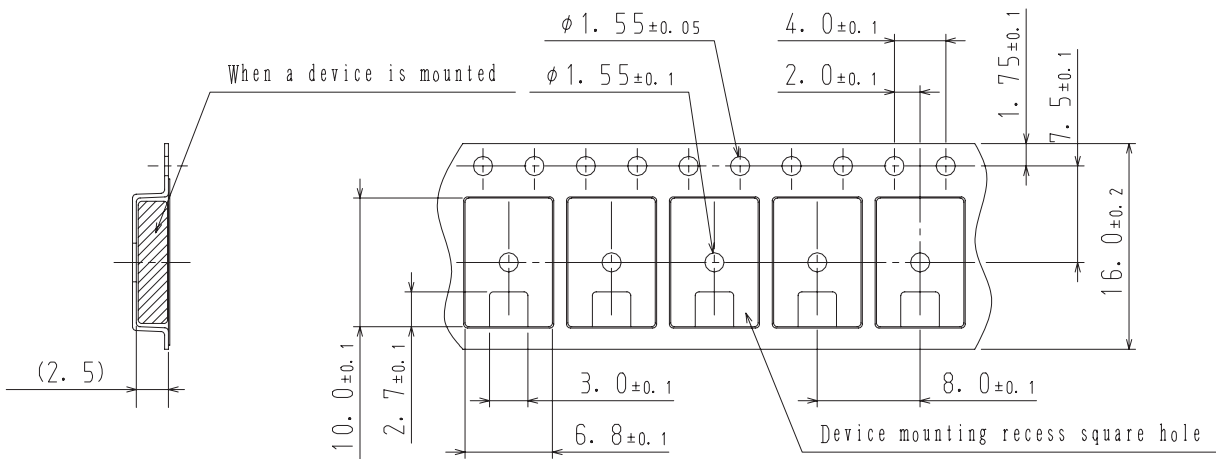
NOTE (1)

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  |

Taping configuration

1. Carrier tape size (unit:mm)



2. Device placement direction

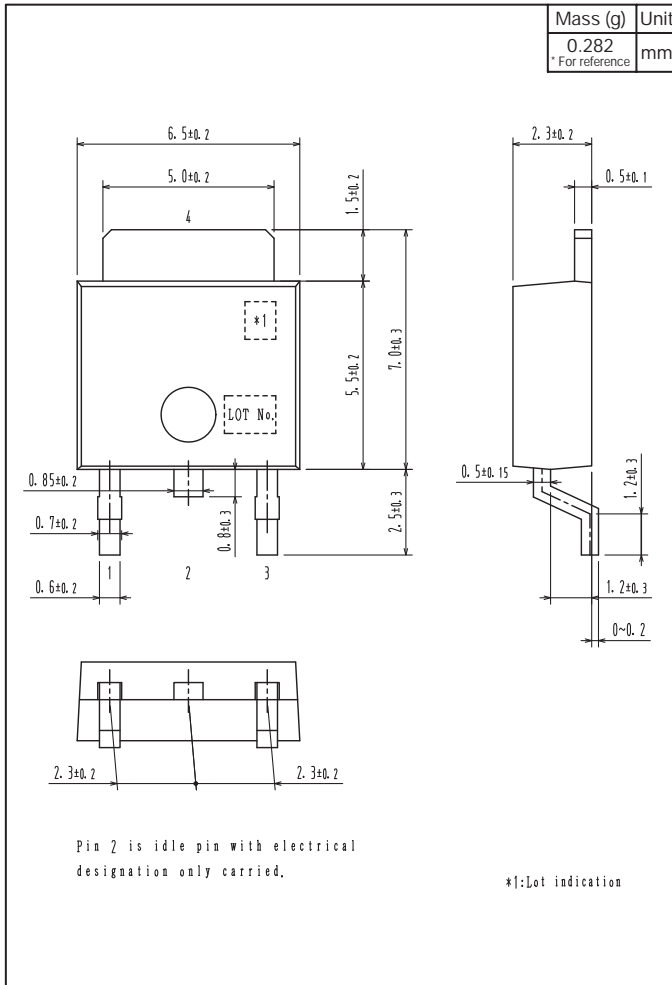


Those with one electrode terminal on the feed hole side.....TL

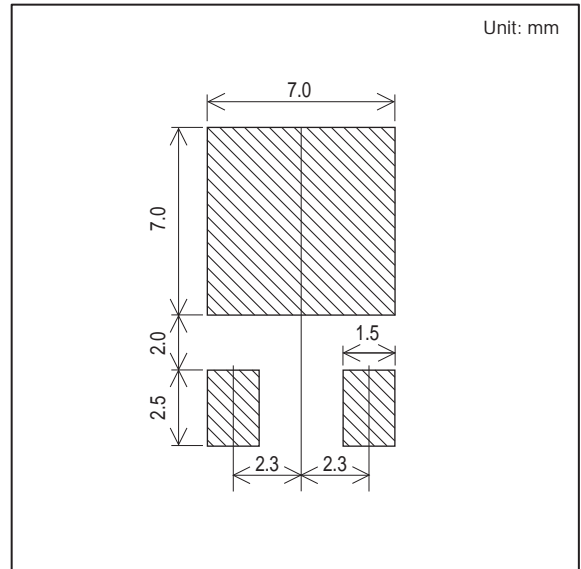
# 2SA2039/2SC5706

## Outline Drawing

2SA2039-TL-E, 2SC5706-TL-E, 2SC5706-TL-H



## Land Pattern Example



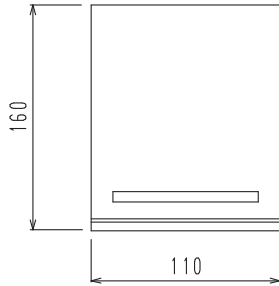
Bag Packing Specification

2SA2039-E, 2SC5706-E, 2SC5706-H

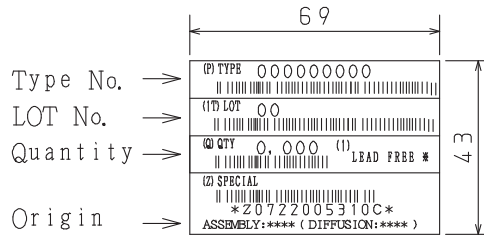
1. Packing Format

| Package Name | Maximum Number of devices contained (pcs) |            |             |             |
|--------------|---|------------|-------------|-------------|
|              | Bag                                       | Inner box  | Outer box   |             |
| TP           | 500                                       | B-1        | A-1         | A-2         |
|              |   | 10,000     | 50,000      | 30,000      |
|              | Packing format (Dimensions:mm (external)) |            |             |             |
|              |   | Inner box  | Outer box   |             |
|              |   | B-1        | A-1         | A-2         |
|              |   | 445×225×55 | 470×250×300 | 470×250×190 |

2. Bag dimensions  
(unit:mm)



3. Bag label, Inner box label  
(unit:mm)



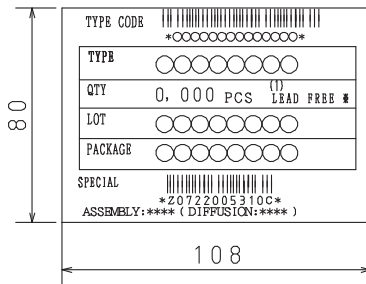
4. Outer box label  
(unit:mm)

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

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  |





Outline Drawing

2SA2039-E, 2SC5706-E, 2SC5706-H



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