



SANYO Semiconductors

## DATA SHEET

An ON Semiconductor Company

# 2SA2039/2SC5706 — High-Current Switching Applications

PNP/NPN Epitaxial Planar Silicon Transistor

## 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 ( ) : 2SA2221

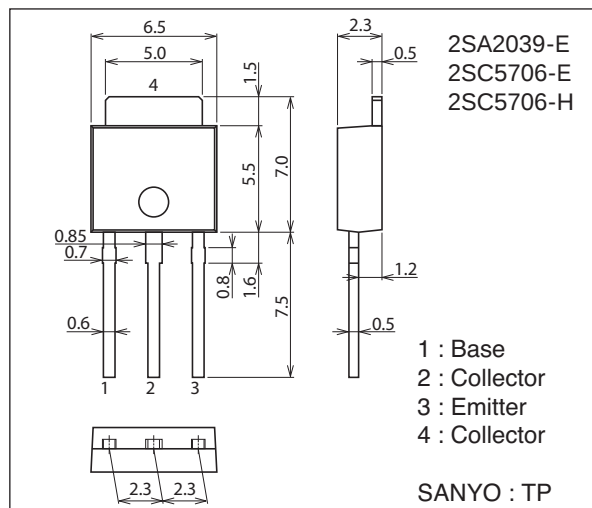
Absolute Maximum Ratings at Ta=25°C

| Parameter                    | Symbol           | Conditions | Ratings  | Unit |
|------------------------------|------------------|------------|----------|------|
| Collector-to-Base Voltage    | V <sub>CBO</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    |

Continued on next page.

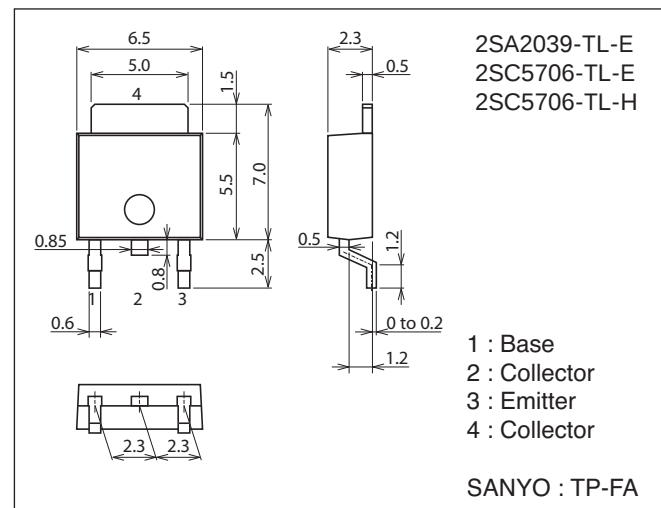
## Package Dimensions unit : mm (typ)

7518-003



## Package Dimensions unit : mm (typ)

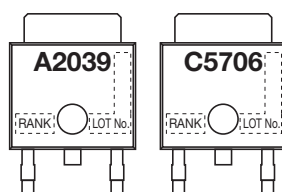
7003-003



## Product & Package Information

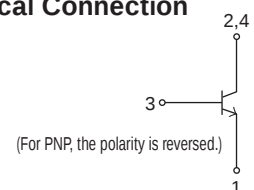
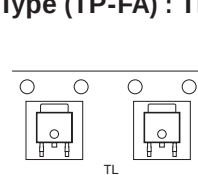
- Package : TP
- JEITA, JEDEC : SC-64, TO-251, SOT-553, DPAK
- Minimum Packing Quantity : 500 pcs./bag

## Marking (TP, TP-FA)



- Package : TP-FA
- JEITA, JEDEC : SC-63, TO-252, SOT-428, DPAK
- Minimum Packing Quantity : 700 pcs./reel

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



(For PNP, the polarity is reversed.)

SANYO Semiconductor Co., Ltd.

<http://semicon.sanyo.com/en/network>

## 2SA2039/2SC5706

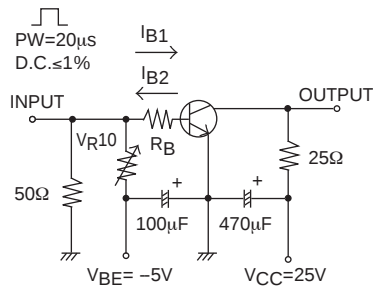
Continued from preceding page.

| 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                            | $t_{on}$       | See specified Test Circuit.                    |          | (30)35    |           | ns            |
| Storage Time                            | $t_{stg}$      |                                                |          | (230)300  |           | ns            |
| Fall Time                               | $t_f$          |                                                |          | (15)20    |           | ns            |

### Switching Time Test Circuit

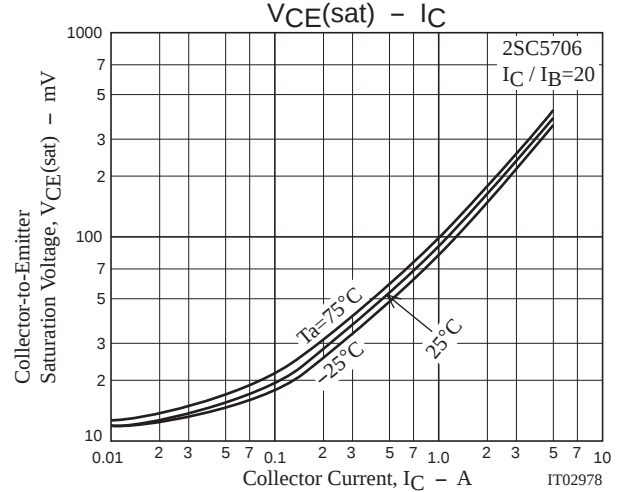
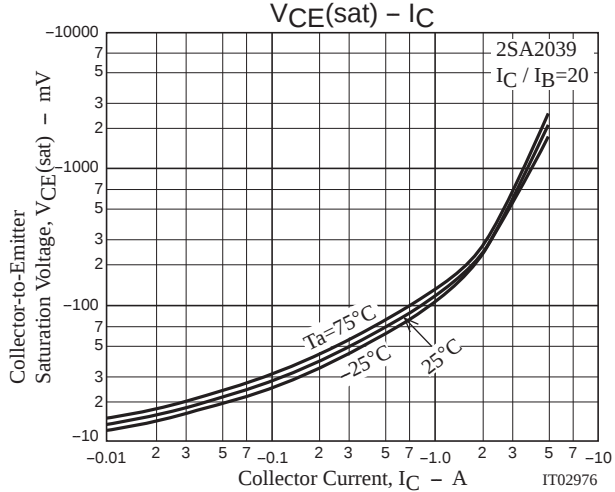
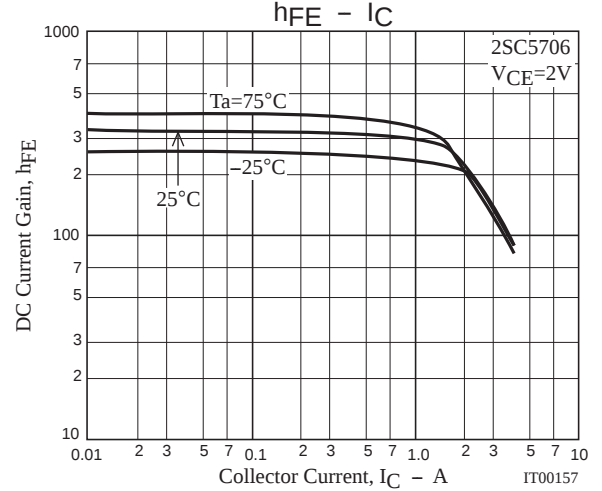
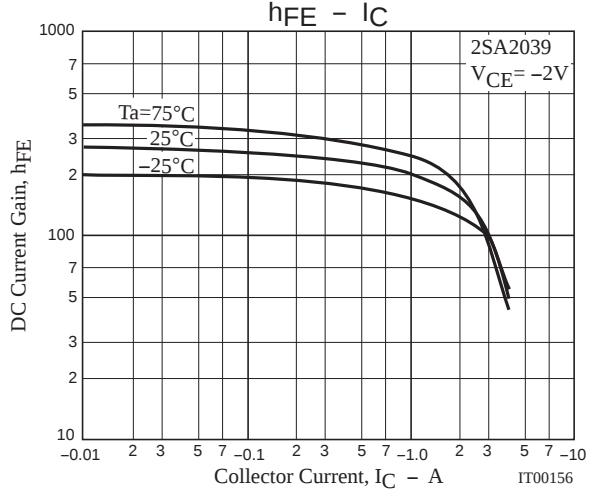
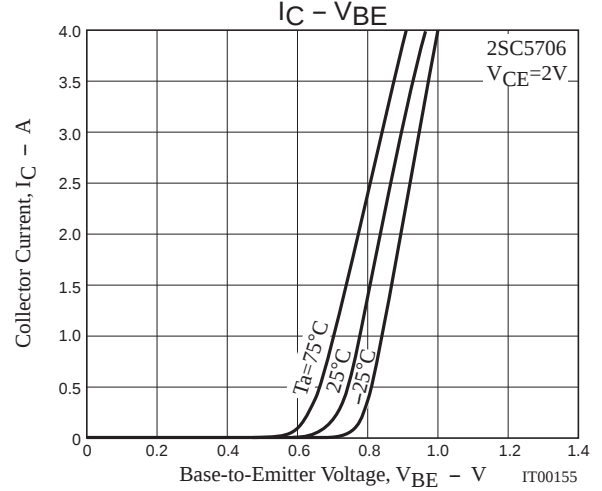
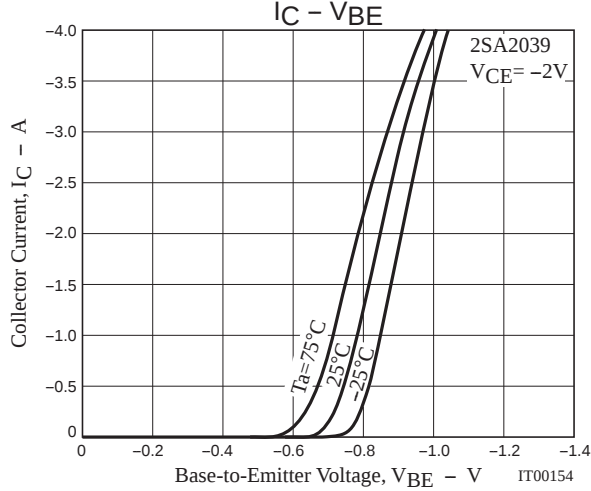
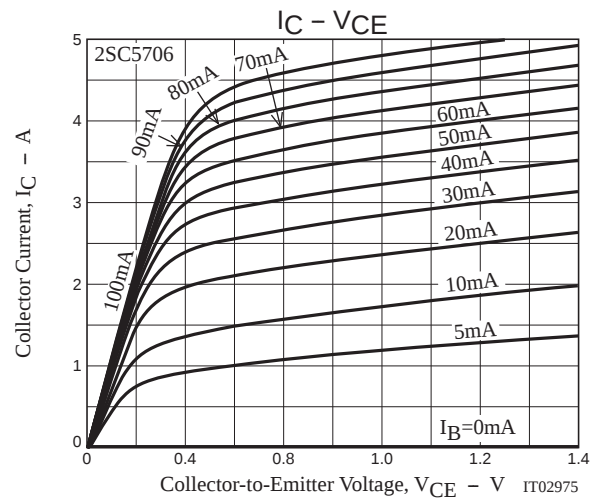
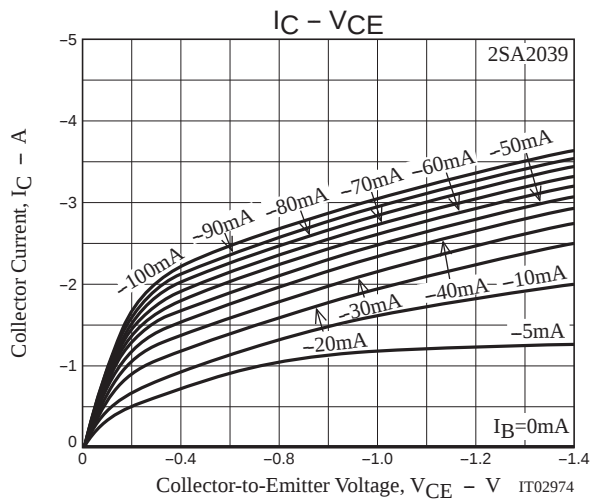


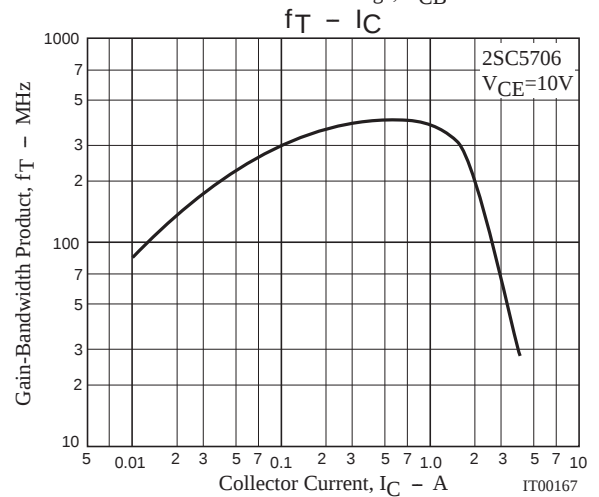
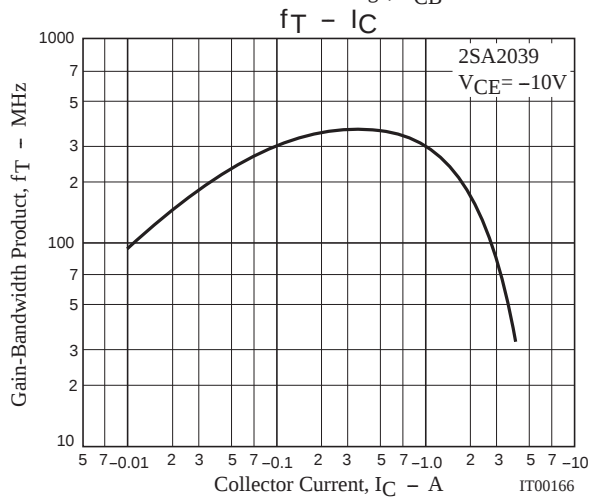
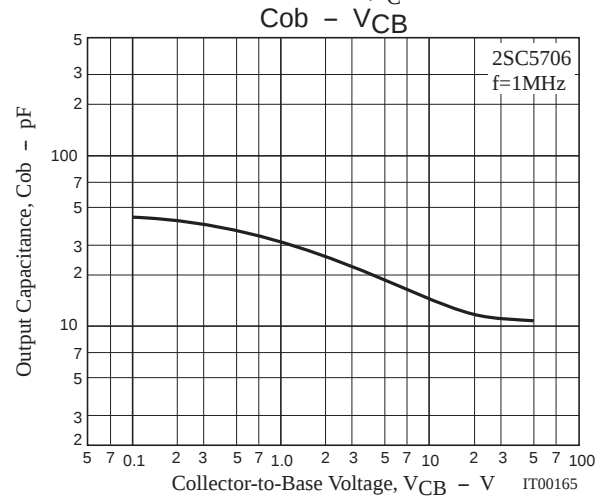
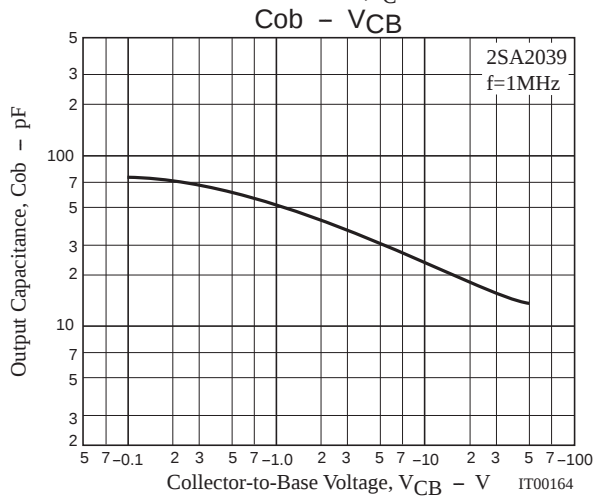
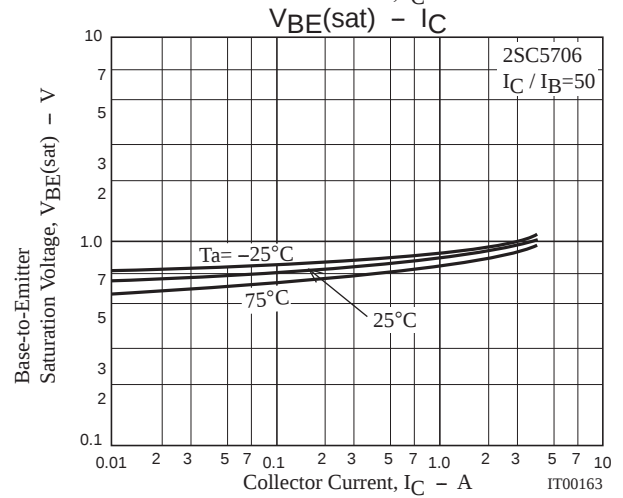
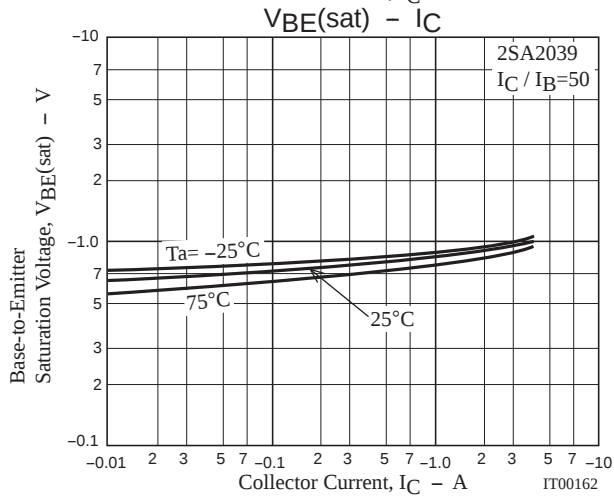
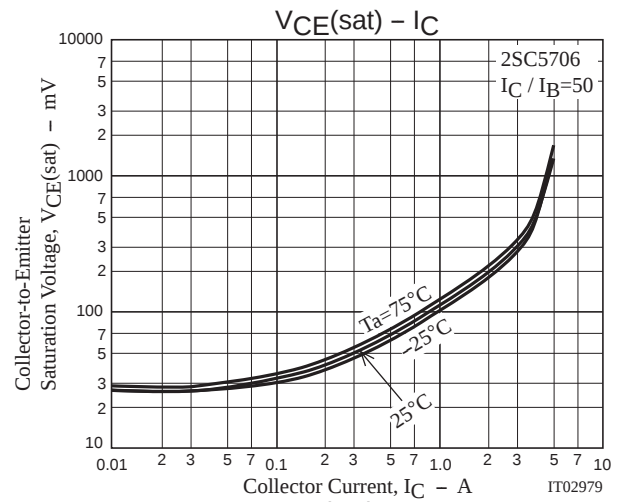
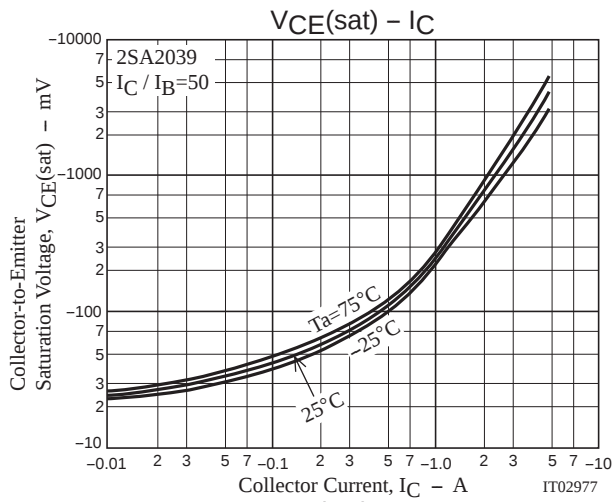
$$10I_{B1} = -10I_{B2} = I_C = 1\text{A}$$

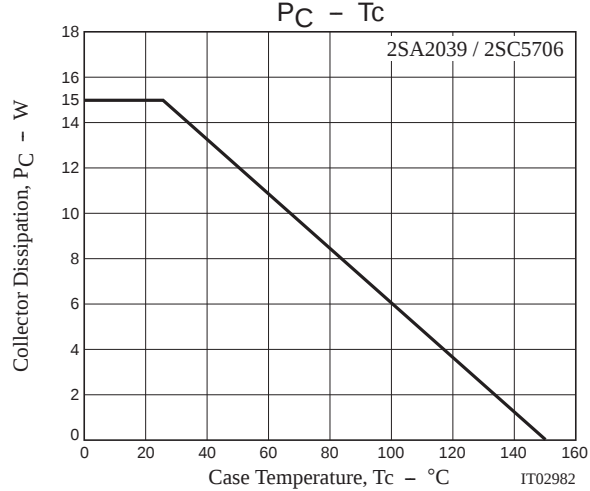
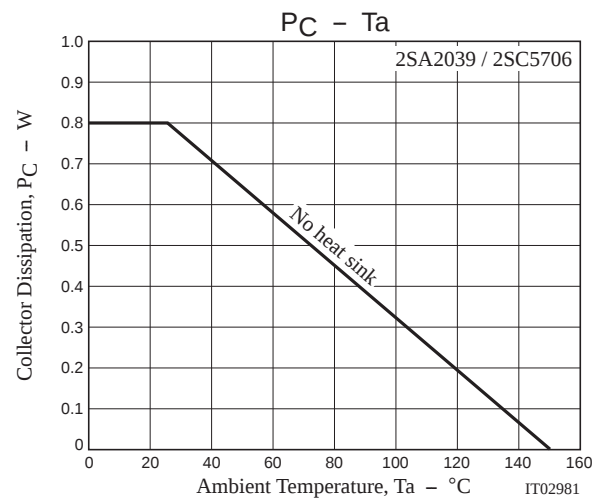
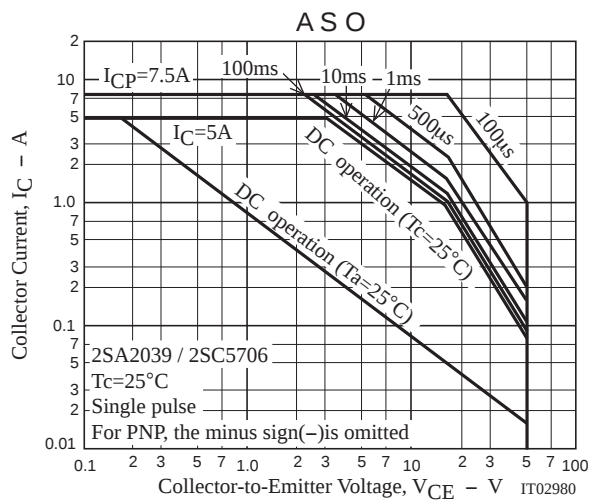
For PNP, the polarity is reversed.

### 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 |







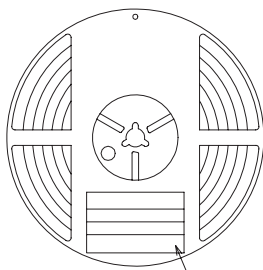
## Taping Specification

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



Reel label

Type No.  
LOT No.  
Quantity  
Origin

Reel label, Inner box label  
(unit:mm)

|             |                                |
|-------------|--------------------------------|
| (P) TYPE    | 000000000                      |
| (1) LOT     | 00                             |
| (Q) QTY     | 0,000 (1) LEAD FREE *          |
| (Z) SPECIAL |                                |
|             | *20722005310C*                 |
|             | ASSEMBLY:**** (DIFFUSION:****) |

Outer box label

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

|           |                                |
|-----------|--------------------------------|
| TYPE CODE |                                |
|           | *oooooooooooo*                 |
| TYPE      | ooooooo                        |
| QTY       | 0,000 PCS (1) LEAD FREE *      |
| LOT       | ooooooo                        |
| PACKAGE   | ooooooo                        |
| SPECIAL   |                                |
|           | *20722005310C*                 |
|           | ASSEMBLY:**** (DIFFUSION:****) |

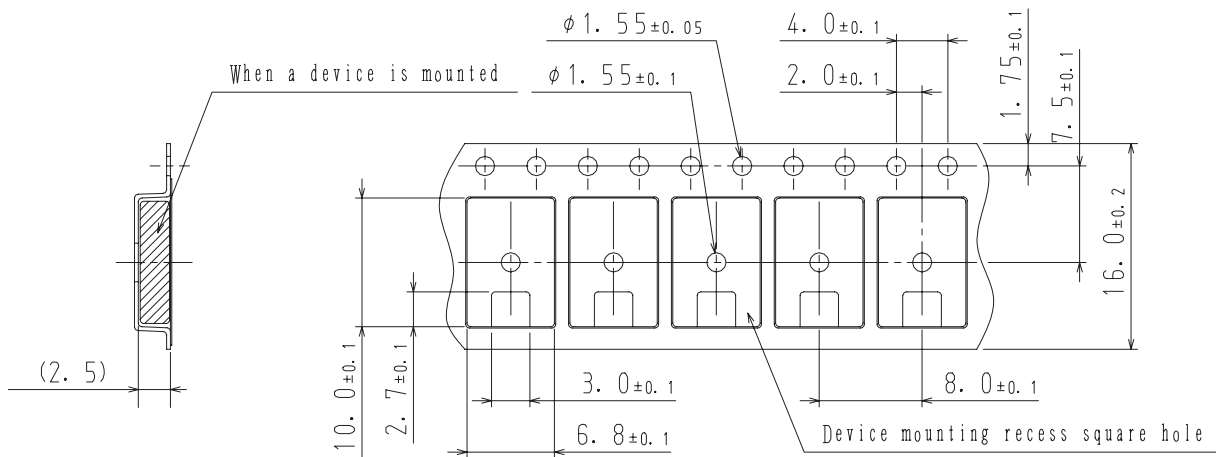
## NOTE (1)

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

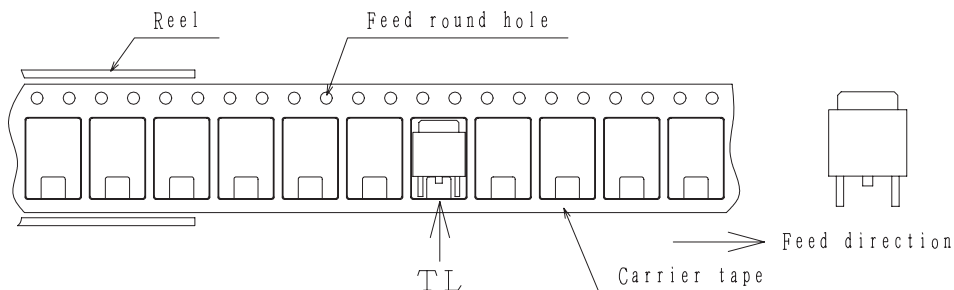
| Label       | JEITA Phase    |
|-------------|----------------|
| LEAD FREE 3 | JEITA Phase 3A |
| LEAD FREE 4 | JEITA Phase 3  |

## Taping configuration

## 1. Carrier tape size (unit:mm)



## 2. Device placement direction

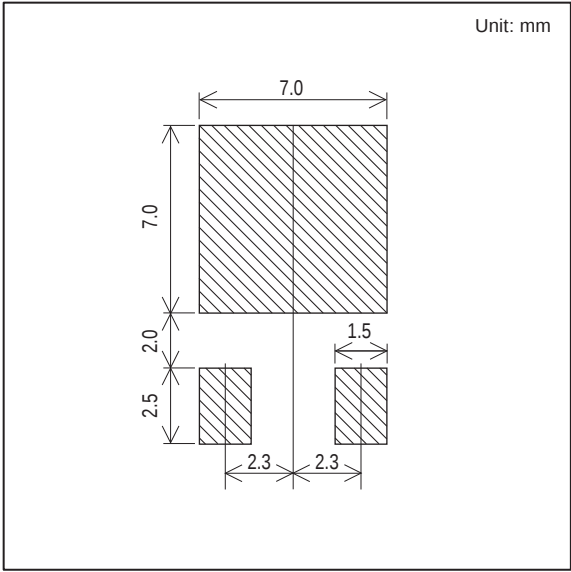
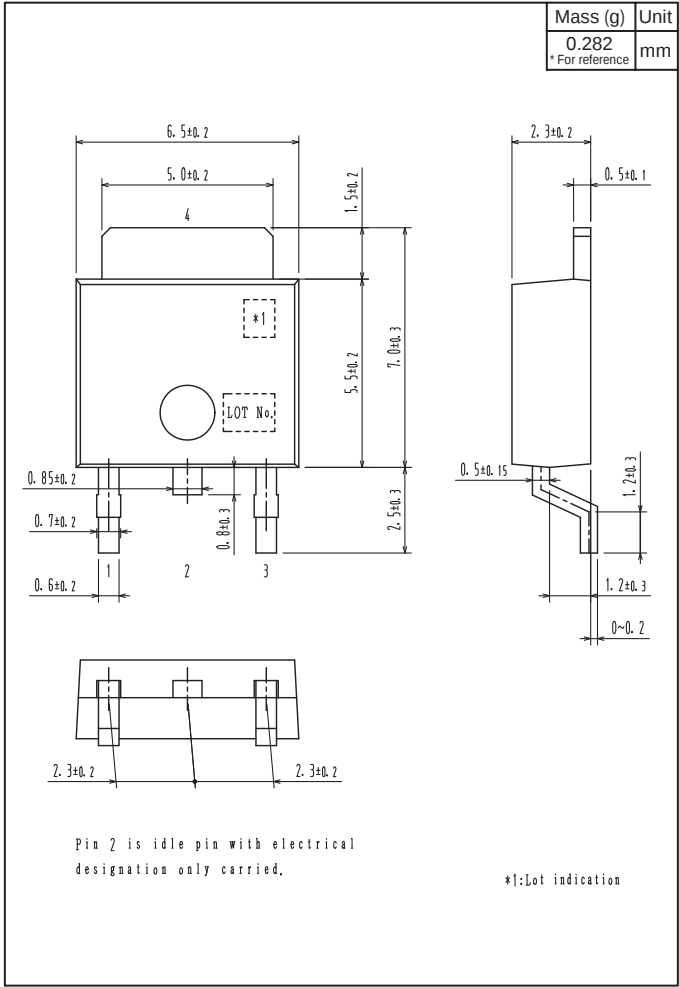


Those with one electrode terminal on the feed hole side.....TL

Outline Drawing

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

Land Pattern Example

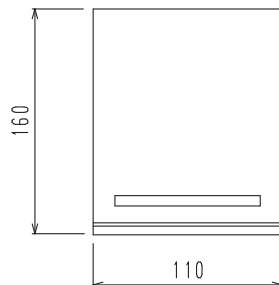
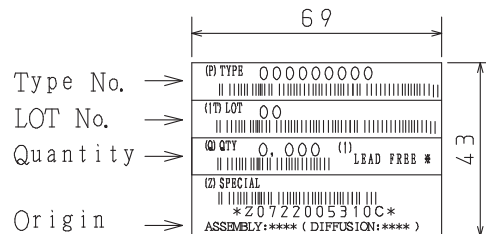


**Bag Packing Specification**

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 |

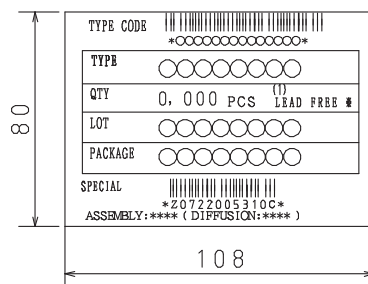
2. Bag dimensions  
(unit:mm)3. Bag label, Inner box label  
(unit:mm)4. Outer box label  
(unit:mm)

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

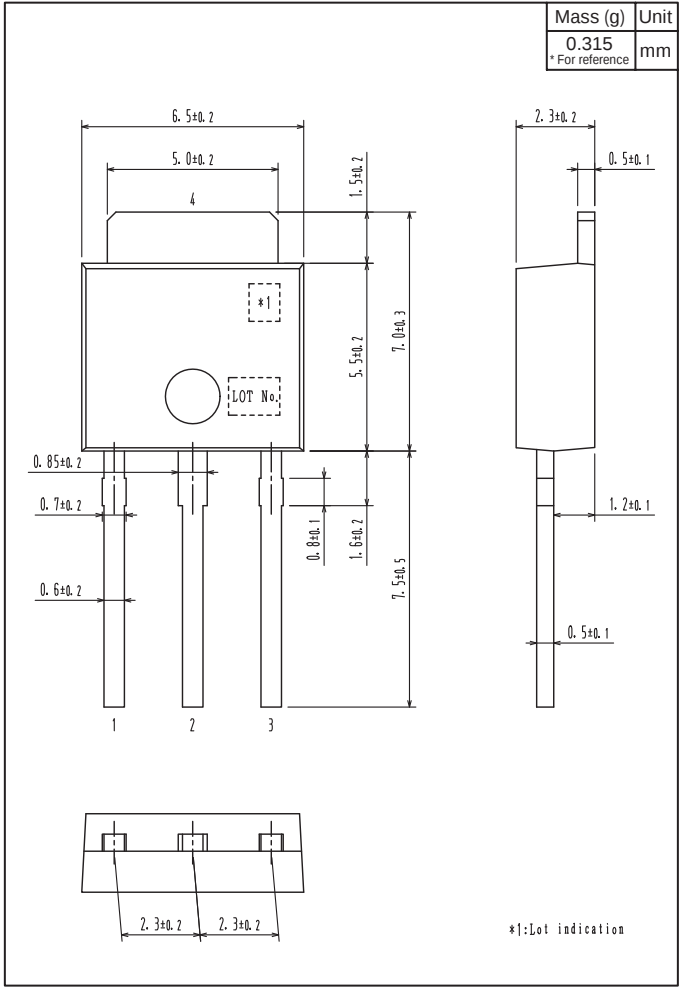
## NOTE (1)

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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- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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«FORSTAR» (основан в 1998 г.)

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