



SANYO Semiconductors

# DATA SHEET

An ON Semiconductor Company

## 2SA2039 / 2SC5706 — PNP / NPN Epitaxial Planar Silicon Transistors 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    |
| Base Current                 | I <sub>B</sub>   |                      | (-)1.2      | A    |
| Collector Dissipation        | P <sub>C</sub>   | T <sub>C</sub> =25°C | 0.8         | W    |
|                              |                  |                      | 15          | W    |
| Junction Temperature         | T <sub>J</sub>   |                      | 150         | °C   |
| Storage Temperature          | T <sub>stg</sub> |                      | -55 to +150 | °C   |

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

| Parameter                | Symbol           | Conditions  | Ratings |          |      | Unit |
|--------------------------|------------------|---|---------|----------|------|------|
|                          |                  |   | min     | typ      | max  |      |
| Collector Cutoff Current | I <sub>CBO</sub> | V <sub>CB</sub> =(-)40V, I <sub>E</sub> =0A       |         |          | (-)1 | μA   |
| Emitter Cutoff Current   | I <sub>EBO</sub> | V <sub>EB</sub> =(-)4V, I <sub>C</sub> =0A        |         |          | (-)1 | μA   |
| DC Current Gain          | h <sub>FE</sub>  | V <sub>CE</sub> =(-)2V, I <sub>C</sub> =(-)500mA  | 200     |          | 560  |      |
| Gain-Bandwidth Product   | f <sub>T</sub>   | V <sub>CE</sub> =(-)10V, I <sub>C</sub> =(-)500mA |         | (360)400 |      | MHz  |

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**SANYO Electric Co., Ltd. Semiconductor Company**

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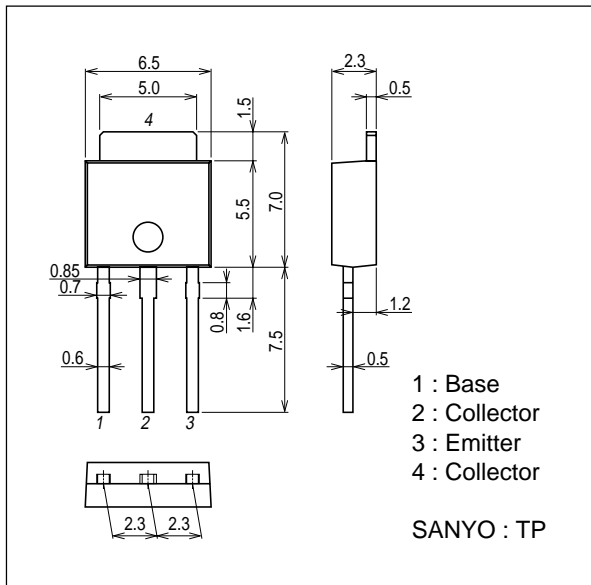
## 2SA2039 / 2SC5706

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| Parameter                               | Symbol                | Conditions                                      | Ratings  |           |           | Unit |
|---|-----------------------|---|----------|-----------|-----------|------|
|   |                       |   | min      | typ       | max       |      |
| Output Capacitance                      | Cob                   | V <sub>CB</sub> =(-)10V, f=1MHz                 |          | (24)15    |           | pF   |
| Collector-to-Emitter Saturation Voltage | V <sub>CE(sat)1</sub> | I <sub>C</sub> =(-)1A, I <sub>B</sub> =(-)50mA  |          | (-115)90  | (-195)135 | mV   |
|   | V <sub>CE(sat)2</sub> | I <sub>C</sub> =(-)2A, I <sub>B</sub> =(-)100mA |          | (-255)160 | (-430)240 | mV   |
| Base-to-Emitter Saturation Voltage      | V <sub>BE(sat)</sub>  | I <sub>C</sub> =(-)2A, I <sub>B</sub> =(-)100mA |          | (-)0.89   | (-)1.2    | V    |
| Collector-to-Base Breakdown Voltage     | V <sub>(BR)CBO</sub>  | I <sub>C</sub> =(-)10μA, I <sub>E</sub> =0A     | (-50)100 |           |           | V    |
| Collector-to-Emitter Breakdown Voltage  | V <sub>(BR)CES</sub>  | I <sub>C</sub> =(-)100μA, R <sub>BE</sub> =0Ω   | (-50)100 |           |           | V    |
| Collector-to-Emitter Breakdown Voltage  | V <sub>(BR)CEO</sub>  | I <sub>C</sub> =(-)1mA, R <sub>BE</sub> =∞      | (-)50    |           |           | 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.                     |          | (30)35    |           | ns   |
| Storage Time                            | t <sub>stg</sub>      | See specified Test Circuit.                     |          | (230)300  |           | ns   |
| Fall Time                               | t <sub>f</sub>        | See specified Test Circuit.                     |          | (15)20    |           | ns   |

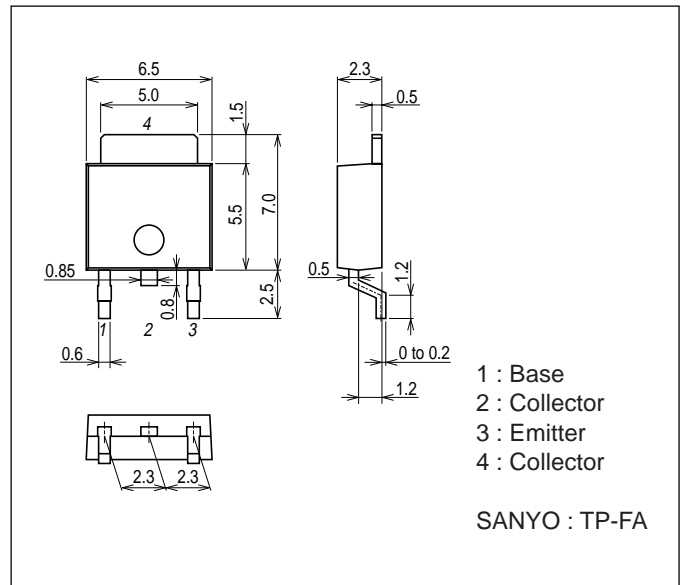
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unit : mm  
7518-003

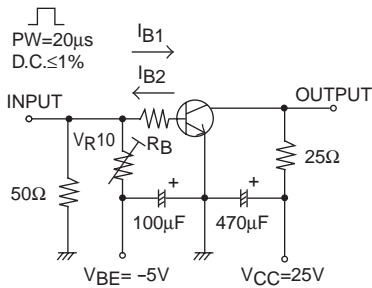


### Package Dimensions

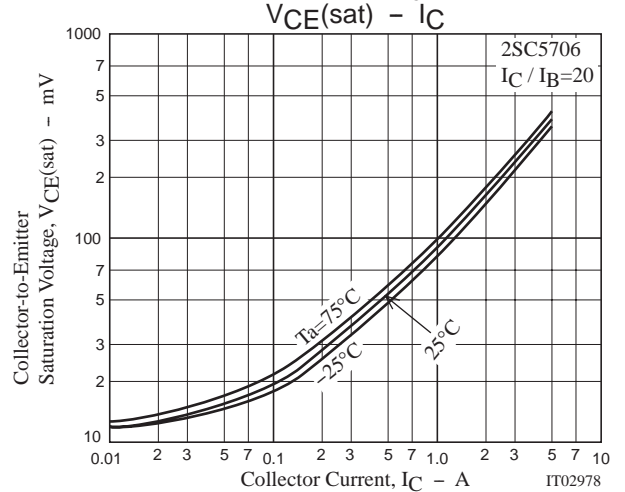
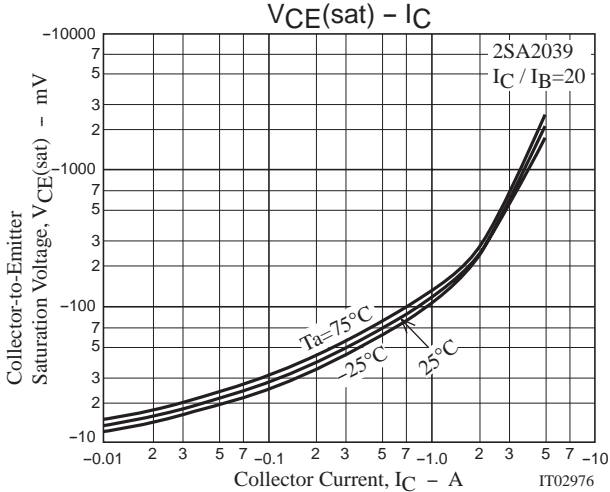
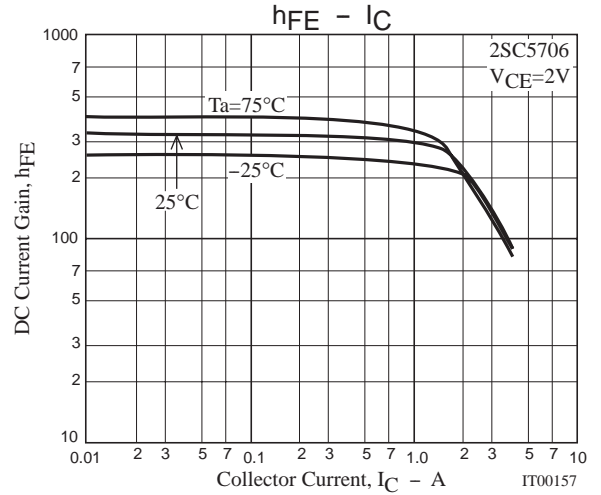
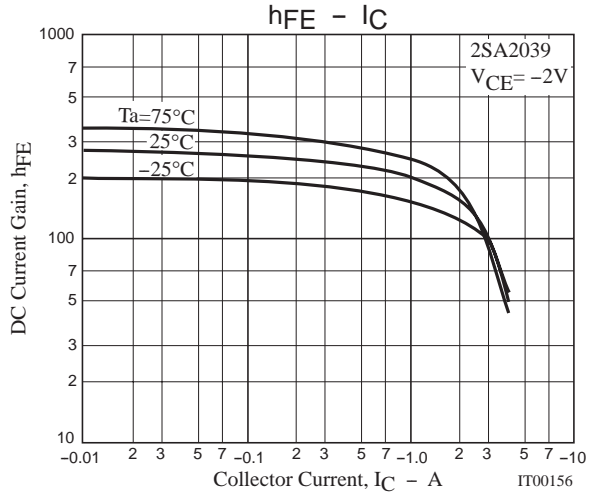
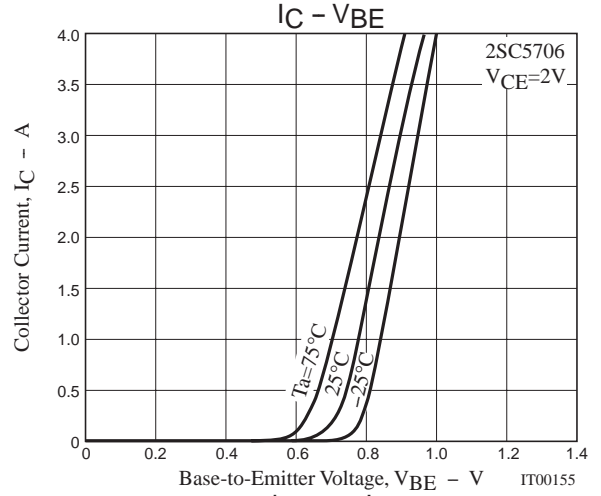
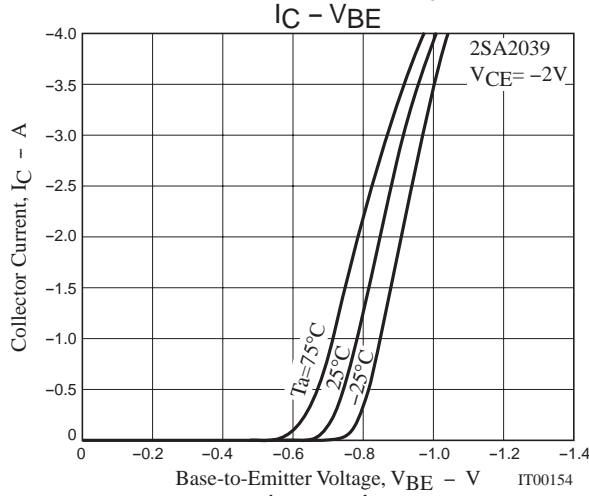
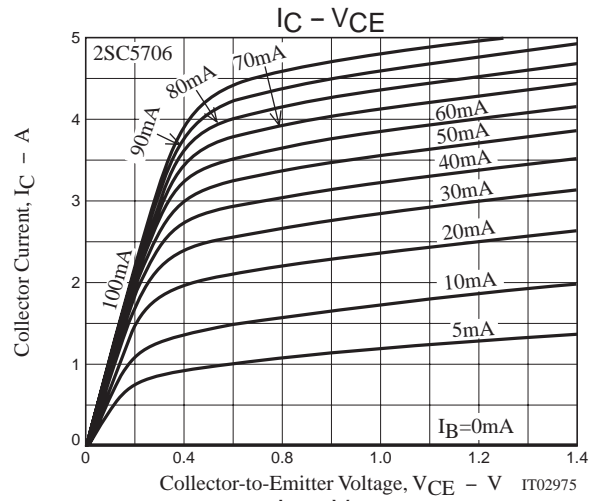
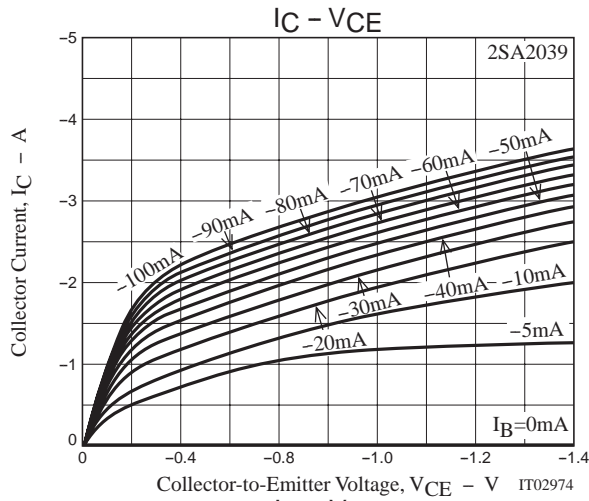
unit : mm  
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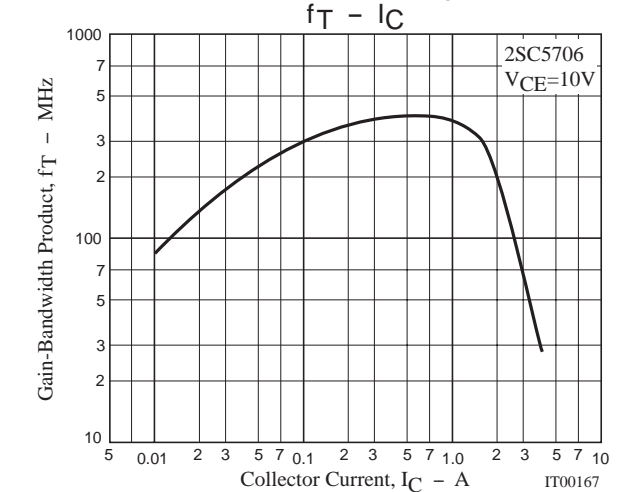
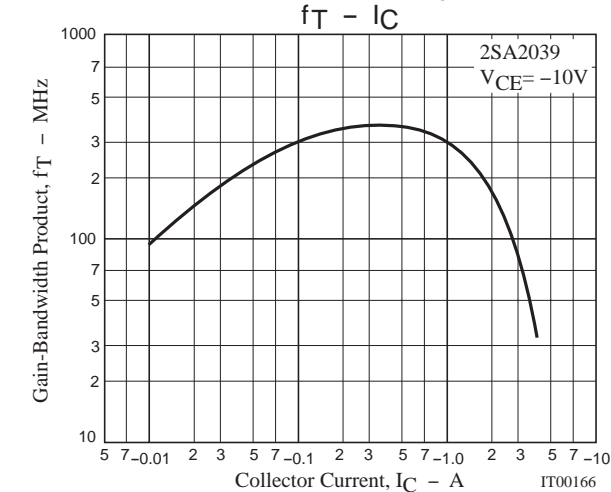
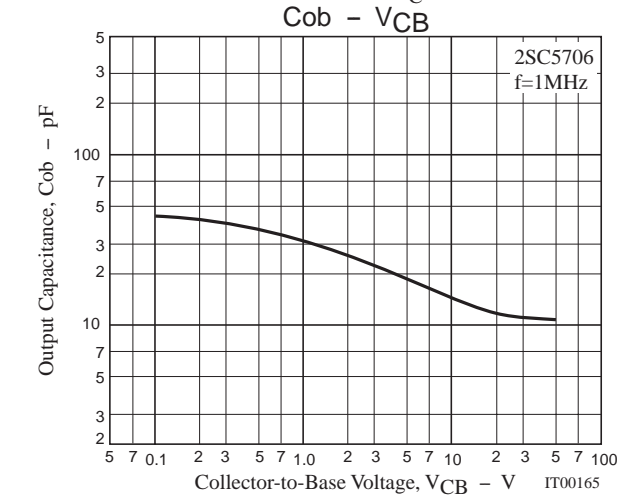
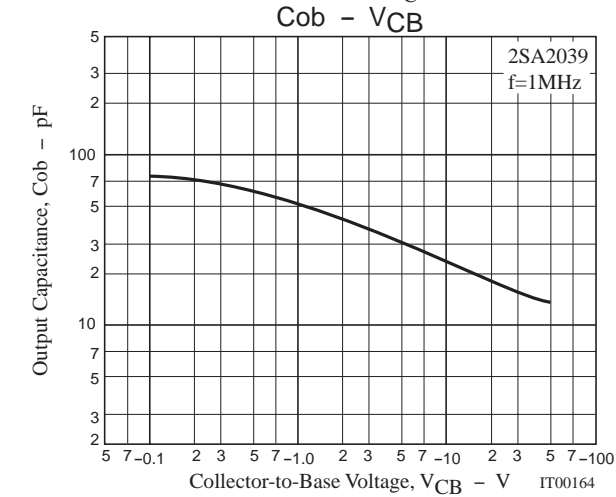
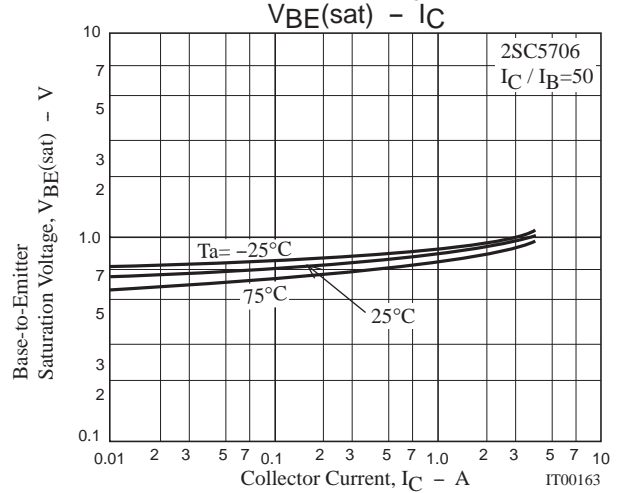
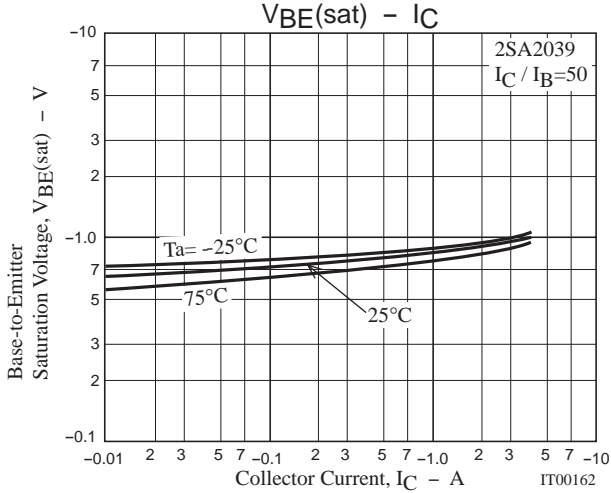
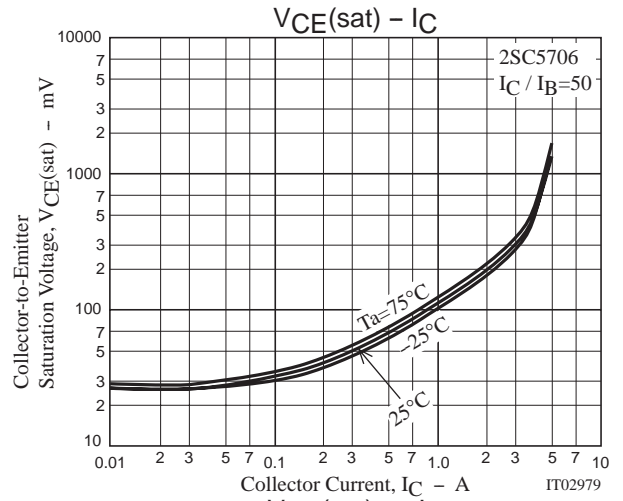
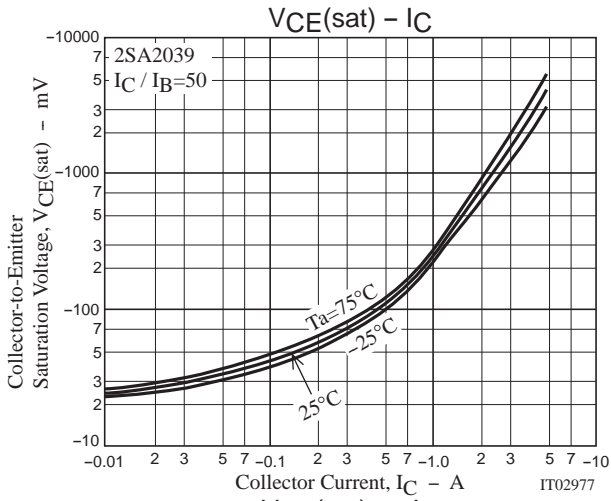
### Switching Time Test Circuit



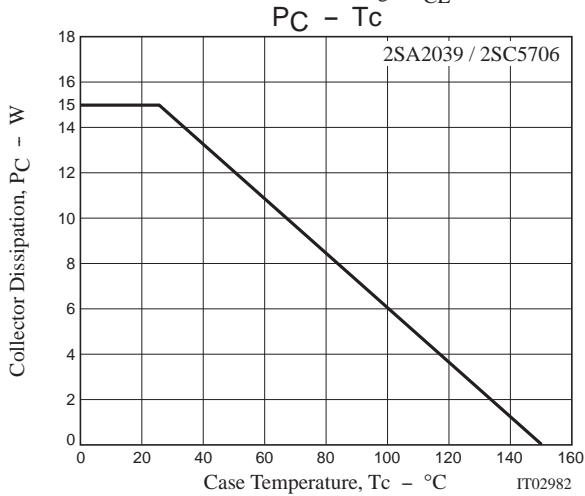
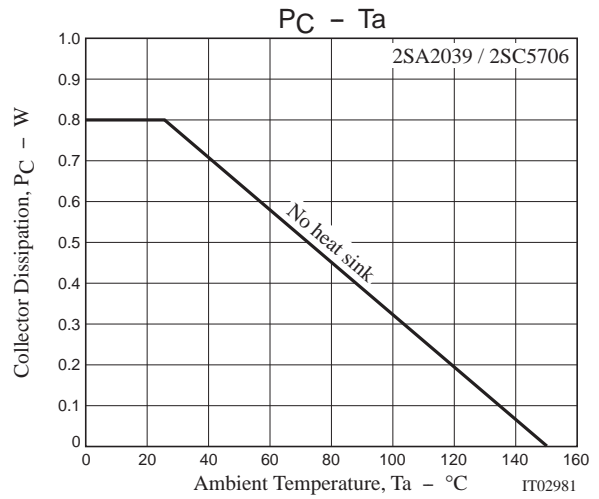
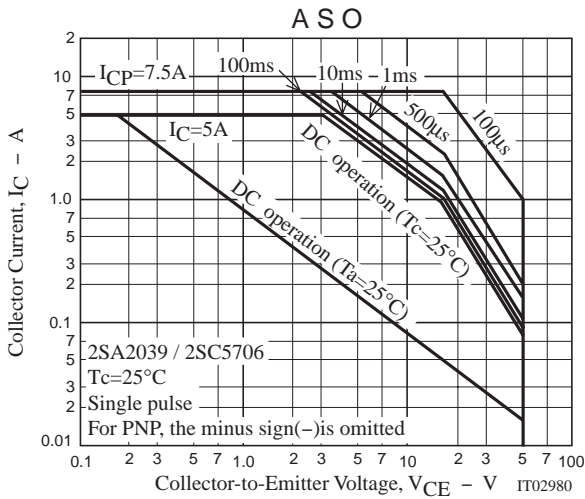
$10I_{B1} = -10I_{B2} = I_C = 1A$   
For PNP, the polarity is reversed.



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