

# 2SB1202/2SD1802

## Bipolar Transistor

(-)50 V, (-)3 A, Low  $V_{CE(sat)}$  (PNP)NPN  
Single TP/TP-FA

### Features

- Adoption of FBET and MBIT Processes
- Large Current Capacitance and Wide ASO
- Low Collector to Emitter Saturation Voltage
- Fast Switching Speed
- Small and Slim Package Making it Easy to Make  
2SB1202/2SD1802-used Sets Smaller
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- Voltage Regulators, Relay Drivers, Lamp Drivers, Electrical Equipment

### ABSOLUTE MAXIMUM RATINGS at $T_A = 25^\circ\text{C}$

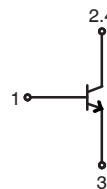
| Parameter                    | Symbol    | Conditions               | Ratings      | Unit             |
|------------------------------|-----------|--------------------------|--------------|------------------|
| Collector to Base Voltage    | $V_{CBO}$ |                          | (-)60        | V                |
| Collector to Emitter Voltage | $V_{CEO}$ |                          | (-)50        | V                |
| Emitter to Base Voltage      | $V_{EBO}$ |                          | (-)6         | V                |
| Collector Current            | $I_C$     |                          | (-)3         | A                |
| Collector Current (Pulse)    | $I_{CP}$  |                          | (-)6         | A                |
| Collector Dissipation        | $P_C$     |                          | 1            | W                |
|                              |           | $T_C = 25^\circ\text{C}$ | 15           | W                |
| Junction Temperature         | $T_J$     |                          | 150          | $^\circ\text{C}$ |
| Storage Temperature          | $T_{STG}$ |                          | - 55 to +150 | $^\circ\text{C}$ |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

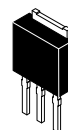


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(For PNP, the polarity is reversed.)

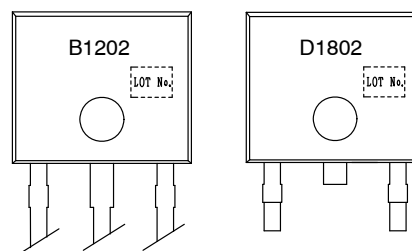


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CASE 369AH

### MARKING DIAGRAM



### ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

## 2SB1202/2SD1802

### ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$

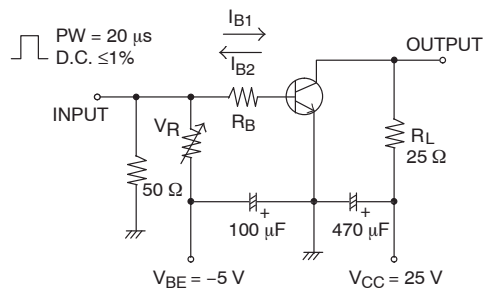
| Parameter                               | Symbol        | Conditions                                         | Ratings |               |             | Unit          |
|-----------------------------------------|---------------|----------------------------------------------------|---------|---------------|-------------|---------------|
|                                         |               |                                                    | 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                         | $h_{FE1}$     | $V_{CE} = (-)2\text{ V}, I_C = (-)100\text{ mA}$   | 100*    |               | 560*        |               |
|                                         | $h_{FE2}$     | $V_{CE} = (-)2\text{ V}, I_C = (-)3\text{ A}$      | 35      |               |             |               |
| Gain-Bandwidth Product                  | $f_T$         | $V_{CE} = (-)10\text{ V}, I_C = (-)50\text{ mA}$   |         | 150           |             | MHz           |
| Output Capacitance                      | $C_{ob}$      | $V_{CB} = (-)10\text{ V}, f = 1\text{ MHz}$        |         | (39)25        |             | pF            |
| Collector to Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = (-)2\text{ A}, I_B = (-)100\text{ mA}$      |         | $(-0.35)0.19$ | $(-0.7)0.5$ | V             |
| Base to Emitter Saturation Voltage      | $V_{BE(sat)}$ | $V_{CE} = (-)2\text{ V}, I_C = (-)100\text{ mA}$   |         | $(-)0.94$     | $(-)1.2$    | V             |
| Collector to Base Breakdown Voltage     | $V_{(BR)CBO}$ | $I_C = (-)10\text{ }\mu\text{A}, I_E = 0\text{ A}$ | $(-)60$ |               |             | V             |
| Collector to Emitter Breakdown Voltage  | $V_{(BR)CEO}$ | $I_C = (-)1\text{ mA}, R_{BE} = \Omega$            | $(-)50$ |               |             | V             |
| Emitter to Base Breakdown Voltage       | $V_{(BR)EBO}$ | $I_E = (-)10\text{ }\mu\text{A}, I_C = 0\text{ A}$ | $(-)6$  |               |             | V             |
| Turn-On Time                            | $t_{on}$      | See specified Test Circuit                         |         | 70            |             | ns            |
| Storage Time                            | $t_{stg}$     |                                                    |         | (450)650      |             | ns            |
| Fall Time                               | $t_f$         |                                                    |         | 35            |             | ns            |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

\*The 2SB1202/2SD1802 are classified by 100 mA  $h_{FE}$  as follows :

| Rank     | R          | S          | T          | U          |
|----------|------------|------------|------------|------------|
| $h_{FE}$ | 100 to 200 | 140 to 280 | 200 to 400 | 280 to 560 |

### Switching Time Test Circuit



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

TYPICAL CHARACTERISTICS

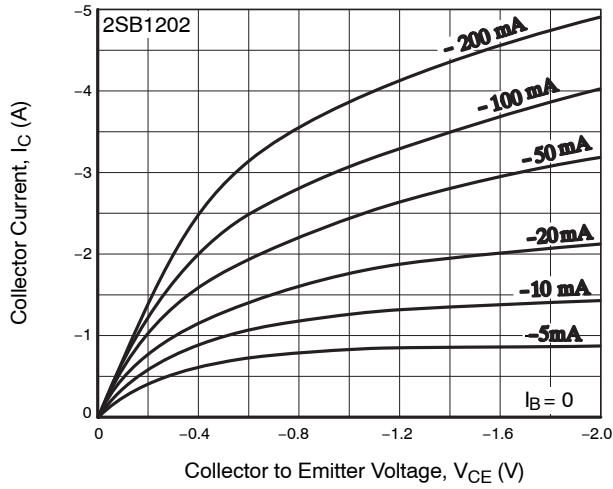


Figure 1.  $I_C - V_{CE}$

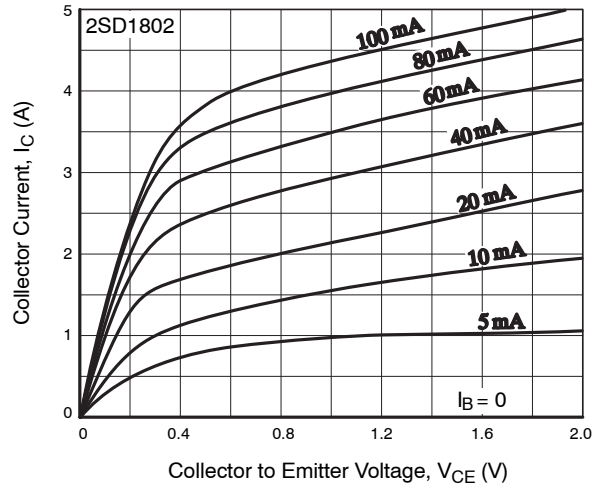


Figure 2.  $I_C - V_{CE}$

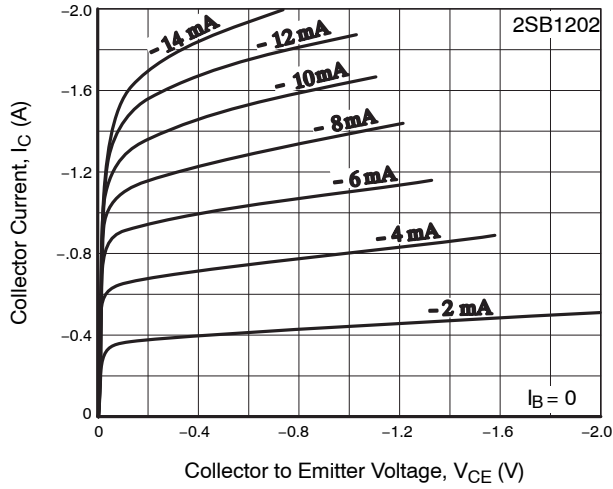


Figure 3.  $I_C - V_{CE}$

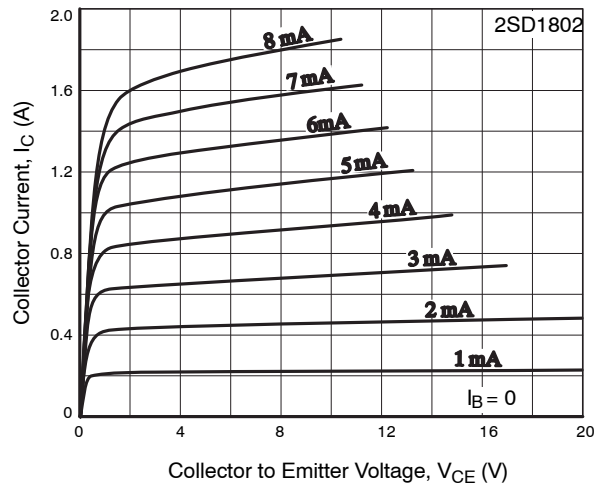


Figure 4.  $I_C - V_{CE}$

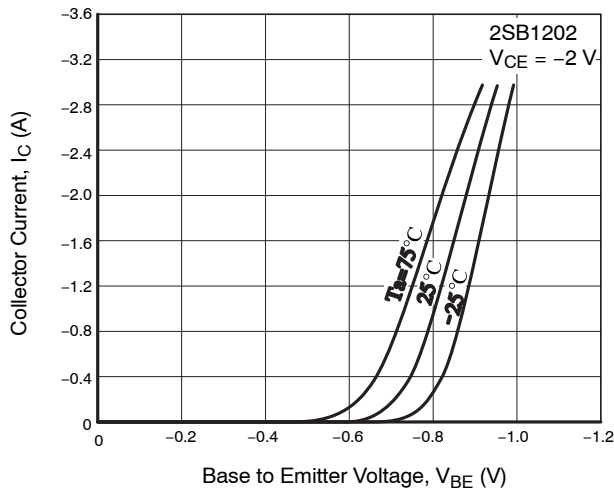


Figure 5.  $I_C - V_{BE}$

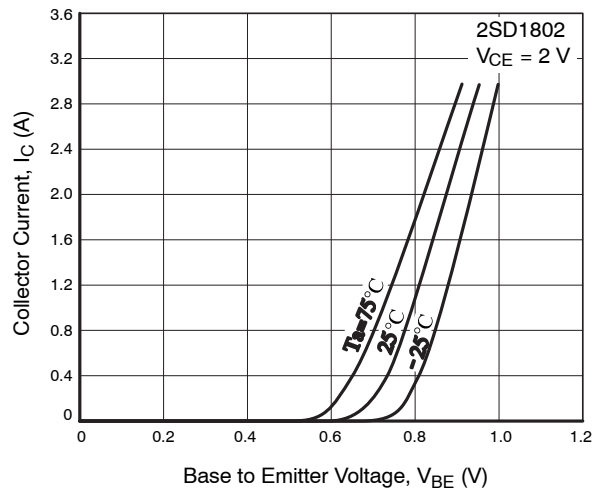


Figure 6.  $I_C - V_{BE}$

TYPICAL CHARACTERISTICS (continued)

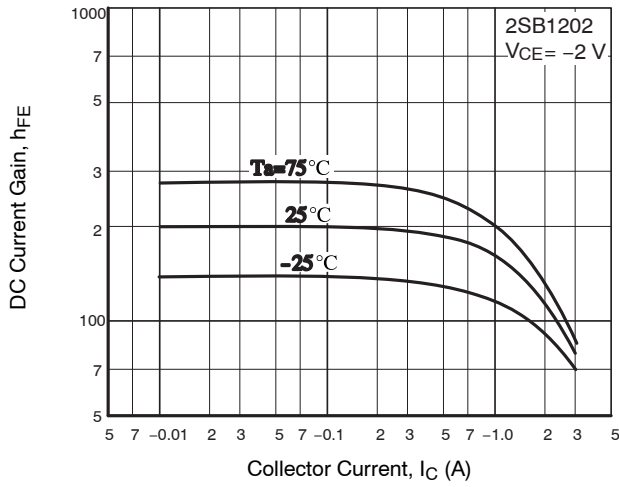


Figure 7.  $h_{FE} - I_C$

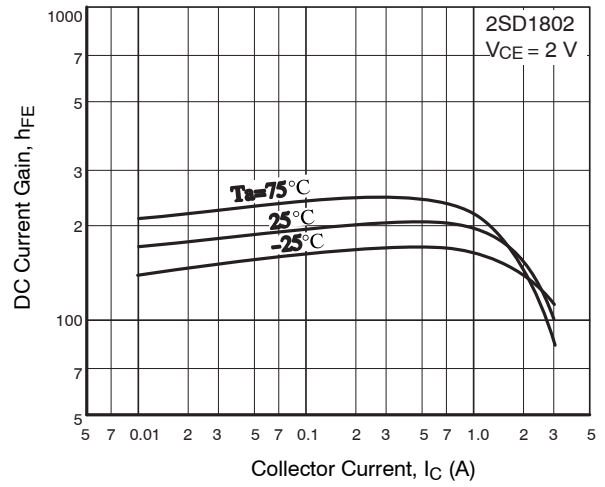


Figure 8.  $h_{FE} - I_C$

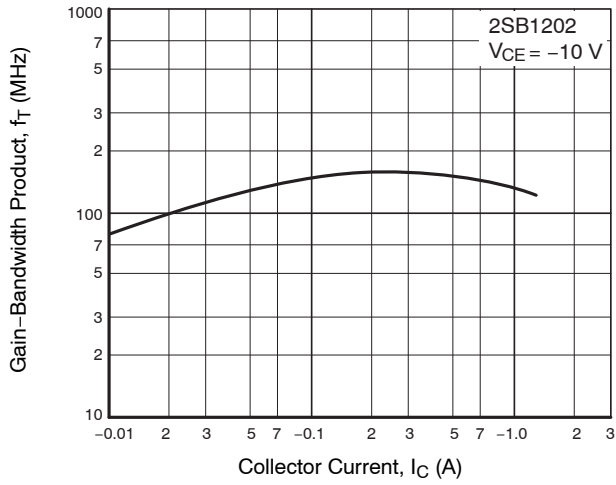


Figure 9.  $f_T - I_C$

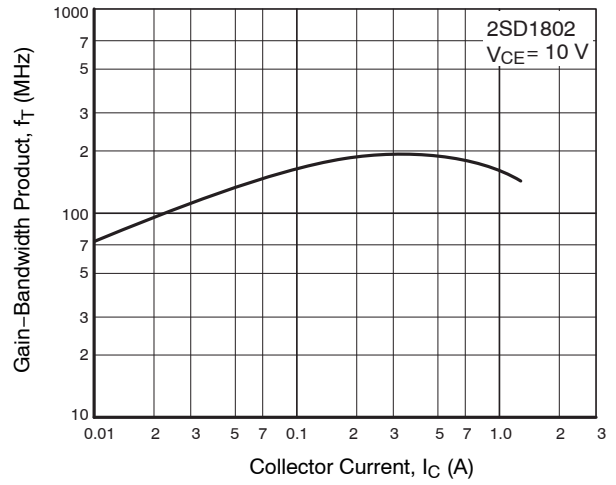


Figure 10.  $f_T - I_C$

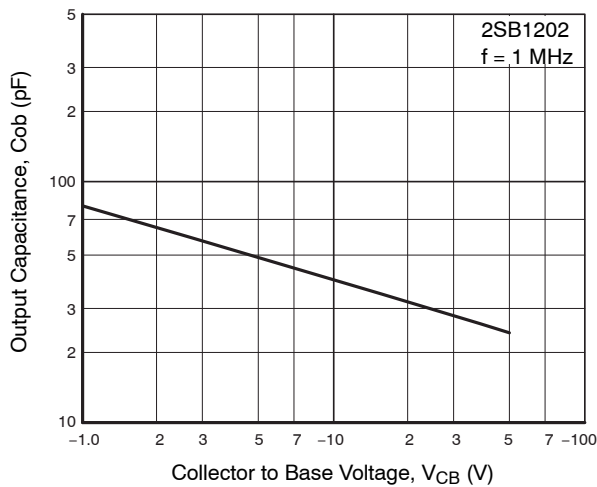


Figure 11.  $C_{ob} - V_{CB}$

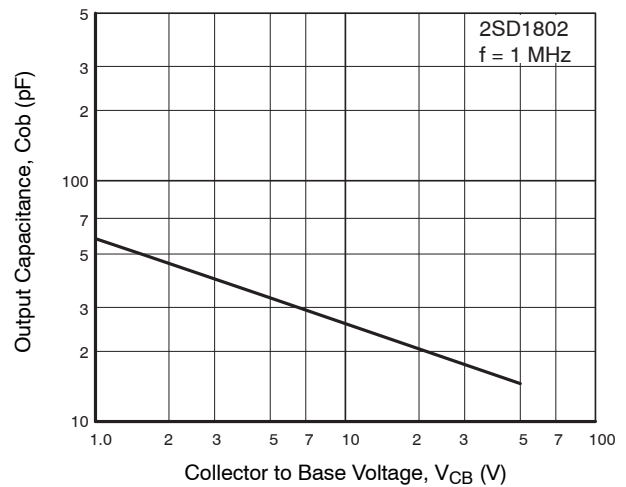


Figure 12.  $C_{ob} - V_{CB}$

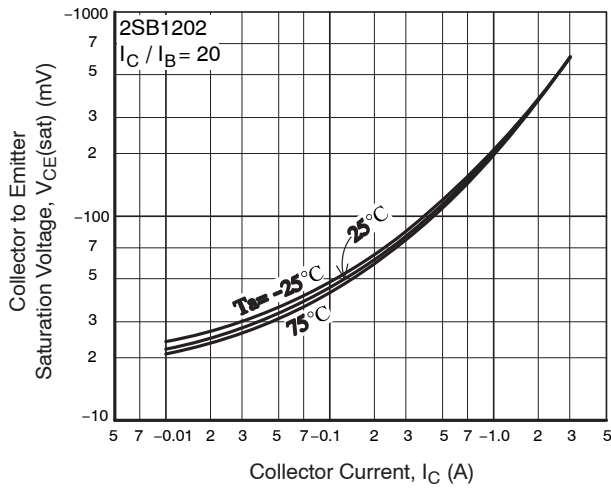


Figure 13.  $V_{CE(sat)} - I_C$

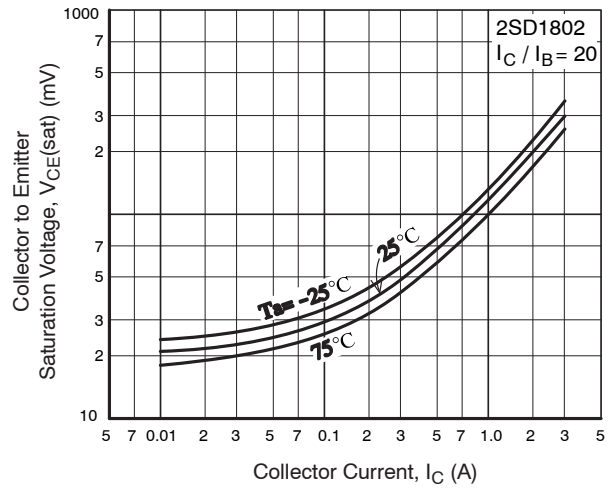


Figure 14.  $V_{CE(sat)} - I_C$

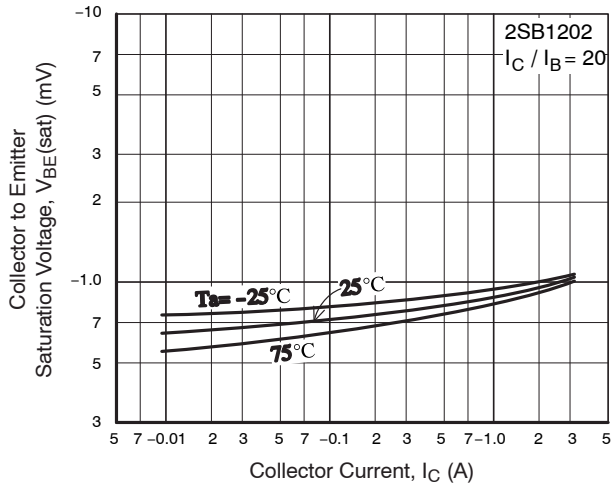


Figure 15.  $V_{BE(sat)} - I_C$

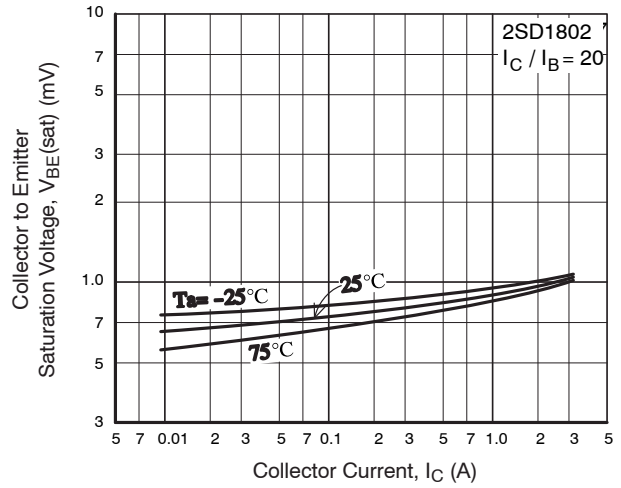


Figure 16.  $V_{BE(sat)} - I_C$

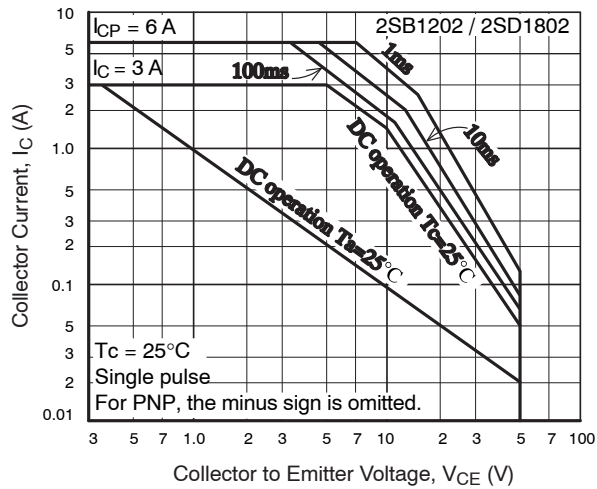


Figure 17. ASO

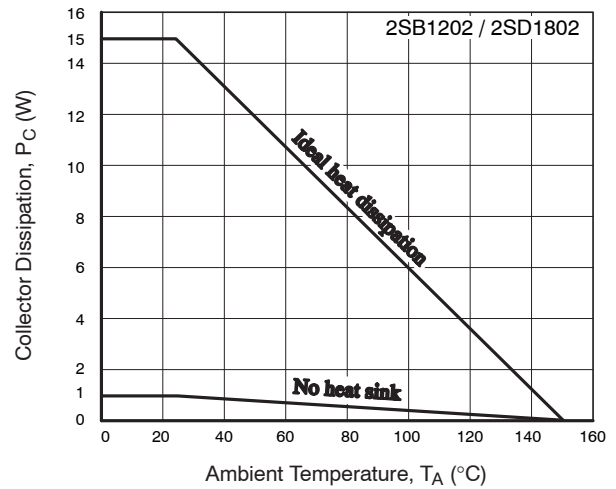


Figure 18.  $P_C - T_A$

## 2SB1202/2SD1802

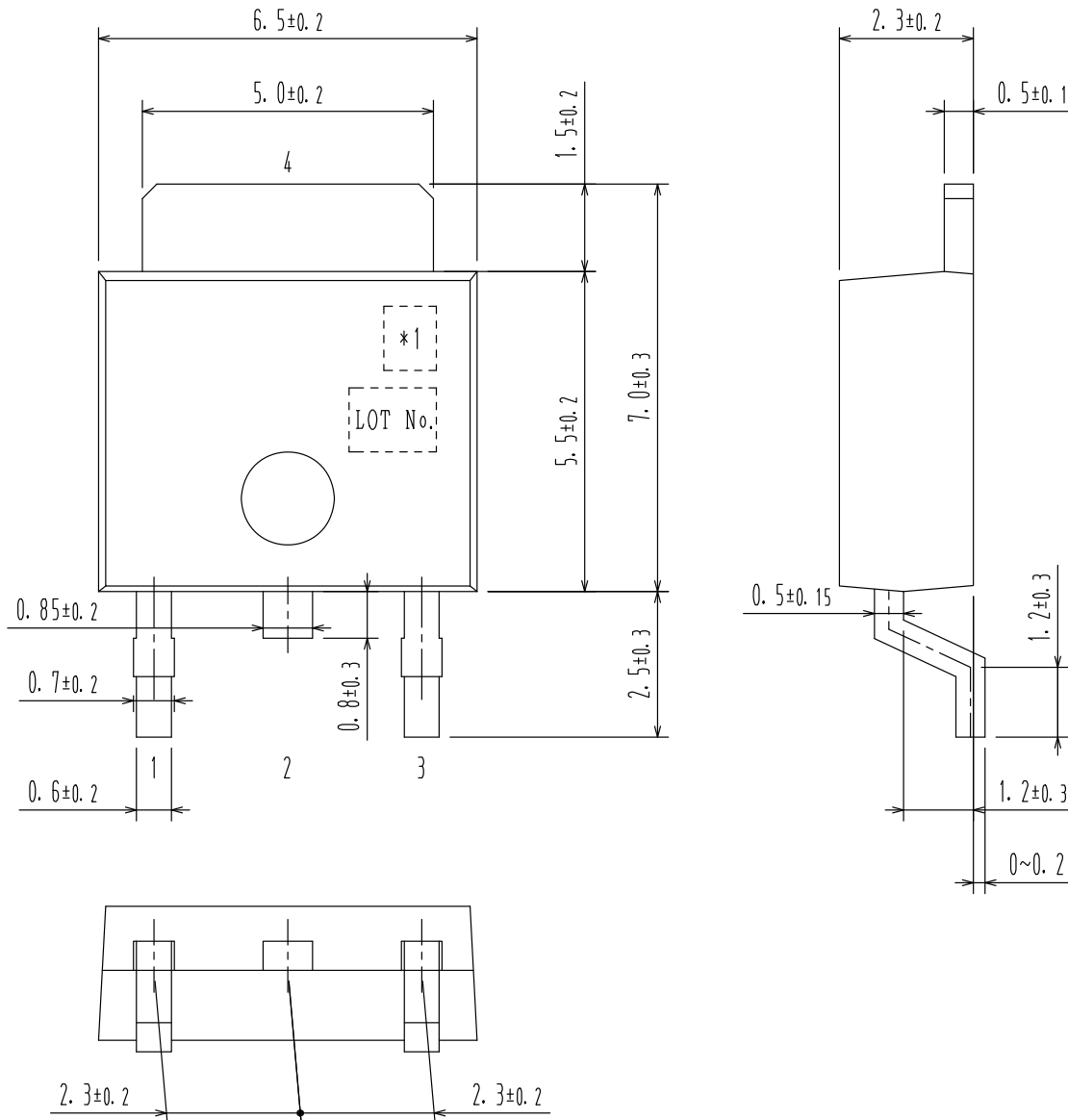
### ORDERING INFORMATION

| Device        | Package | Shipping†    | memo    |
|---------------|---------|--------------|---------|
| 2SB1202S-E    | TP      | 500pcs./bag  | Pb-Free |
| 2SB1202T-E    | TP      | 500pcs./bag  |         |
| 2SD1802S-E    | TP      | 500pcs./bag  |         |
| 2SD1802T-E    | TP      | 500pcs./bag  |         |
| 2SB1202S-TL-E | TP-FA   | 700pcs./reel |         |
| 2SB1202T-TL-E | TP-FA   | 700pcs./reel |         |
| 2SD1802S-TL-E | TP-FA   | 700pcs./reel |         |
| 2SD1802T-TL-E | TP-FA   | 700pcs./reel |         |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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Pin 2 is idle pin with electrical designation only carried.

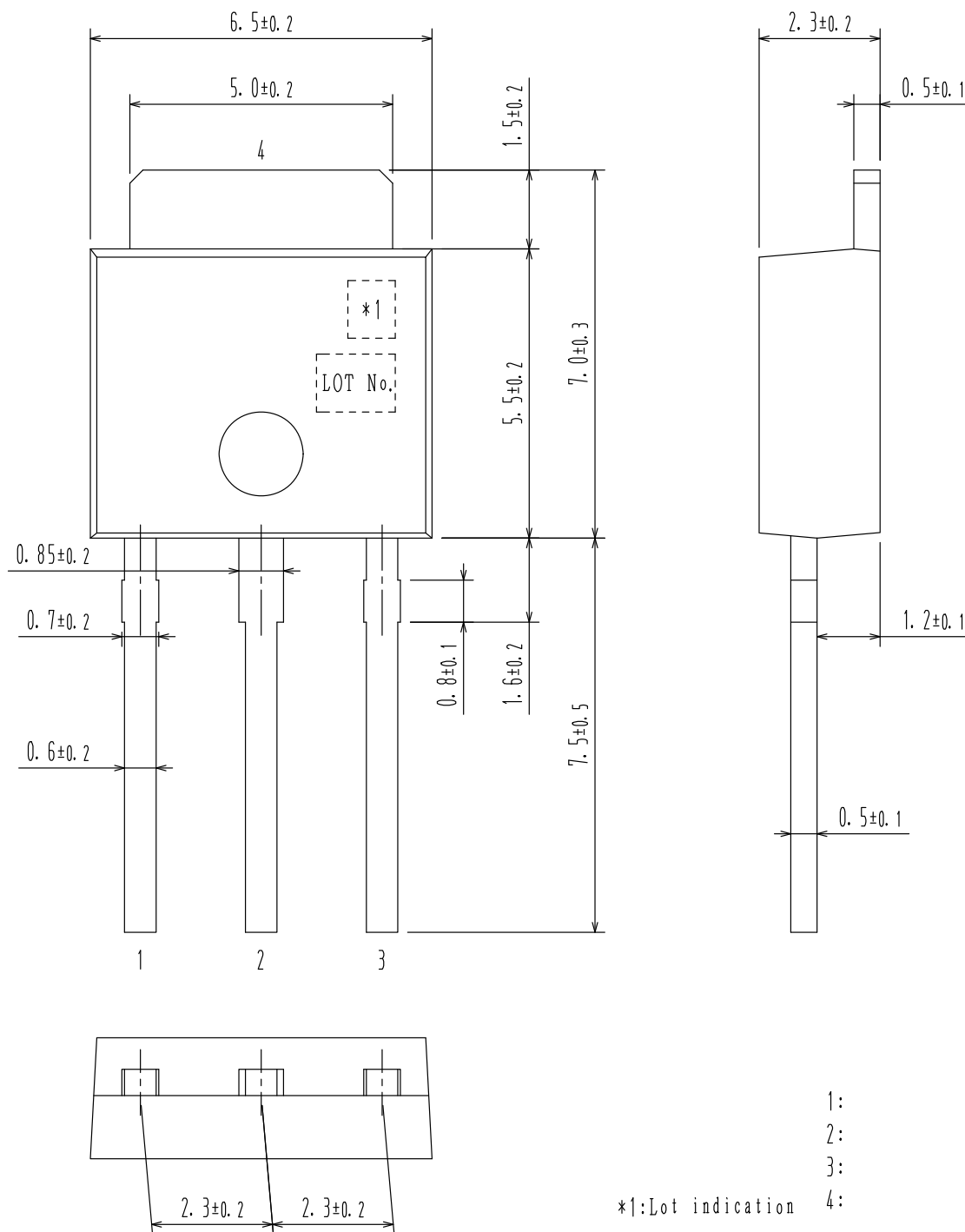
|                   |    |
|-------------------|----|
|                   | 1: |
|                   | 2: |
|                   | 3: |
| *1:Lot indication | 4: |

|                         |                     |                                                                                                                                                                                     |
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