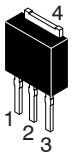
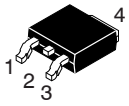
# Bipolar Transistor

## (–)50 V, (–)8 A, Low $V_{CE}$(sat), (PNP)NPN Single TP/TP–FA

# 2SA2040, 2SC5707




1: Base
2: Collector
3: Emitter
4: Collector




**IPAK / TP**
**CASE 369AJ**

**DPAK / TP–FA**
**CASE 369AH**

### Features

- Adoption of FBET and MBIT Processes
- Low Collector–to–emitter Saturation Voltage
- Large Current Capacitance
- High–speed Switching
- High Allowable Power Dissipation
- These are Pb–Free Devices

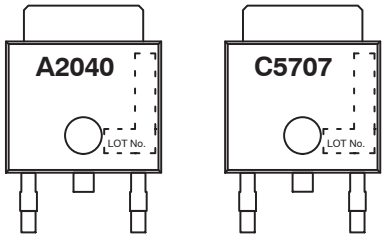
### Applications

- DC / DC Converter, Relay Drivers, Lamp Drivers, Motor Drivers, Flash

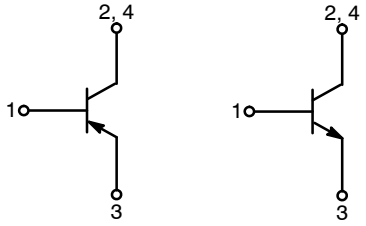
### Specifications

( ): 2SA2040

### MARKING DIAGRAMS




### ELECTRICAL CONNECTION




2SA2040 2SA2040

### ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Collector–to–Base Voltage | $V_{CBO}$ | | (–50)100 | V |
| Collector–to–Emitter Voltage | $V_{CES}$ | | (–50)100 | V |
| | $V_{CEO}$ | | (–)50 | V |
| Emitter to Base Voltage | $V_{EBO}$ | | (–)6 | V |
| Collector Current | $I_C$ | | (–)8 | A |
| Collector Current (Pulse) | $I_{CP}$ | | (–)11 | A |
| Base Current | $I_B$ | | (–)2 | A |
| Collector Dissipation | $P_C$ | | 1.0 | W |
| | | Tc = 25°C | 15 | |
| Junction Temperature | Tj | | 150 | °C |
| Storage Temperature | Tstg | | –55 to +150 | °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.

### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| 2SA2040–E | IPAK / TP (Pb–Free) | 500 Units / Bulk |
| 2SC5707–E | IPAK / TP (Pb–Free) | 500 Units / Bulk |
| 2SA2040–TL–E | DPAK / TP–FA (Pb–Free) | 700 / Tape & Reel |
| 2SC5707–TL–E | DPAK / TP–FA (Pb–Free) | 700 / Tape & Reel |

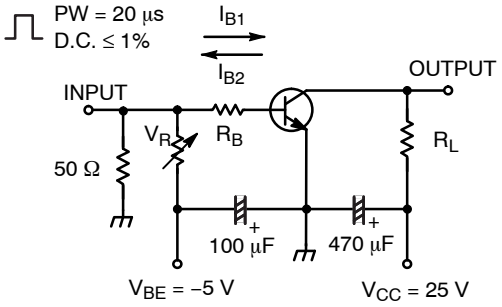
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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**ELECTRICAL CHARACTERISTICS** (Ta = 25°C)

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| Collector Cutoff Current | $I_{CBO}$ | $V_{CB}$ = (−)40 V, $I_E$ = 0 A | − | − | (−)0.1 | μA |
| Emitter Cutoff Current | $I_{EBO}$ | $V_{EB}$ = (−)4 V, $I_C$ = 0 A | − | − | (−)0.1 | μA |
| DC Current Gain | $h_{FE}$ | $V_{CE}$ = (−)2 V, $I_C$ = (−)500 mA | 200 | − | 560 | |
| Gain−Bandwidth Product | $f_T$ | $V_{CE}$ = (−)10 V, $I_C$ = (−)500 mA | − | (290)330 | − | MHz |
| Output Capacitance | Cob | $V_{CB}$ = (−)10 V, f = 1 MHz | − | (50)28 | − | pF |
| Collector−to−Emitter Saturation Voltage | $V_{CE}$(sat)1 | $I_C$ = (−)3.5 A, $I_B$ = (−)175 mA | − | (−230)160 | (−390)240 | mV |
| | $V_{CE}$(sat)2 | $I_C$ = (−)2 A, $I_B$ = (−)40 mA | − | (−240)110 | (−400)170 | mV |
| Base−to−Emitter Saturation Voltage | $V_{BE}$(sat) | $I_C$ = (−)2 A, $I_B$ = (−)40 mA | | (−)0.83 | (−)1.2 | V |
| Collector−to−Base Breakdown Voltage | $V_{(BR)CBO}$ | $I_C$ = (−)10 μA, $I_E$ = 0 A | (−50)100 | − | −− | V |
| Collector−to−Emitter Breakdown Voltage | $V_{(BR)CES}$ | $I_C$ = (−)100 μA, $R_{BE}$ = 0 Ω | (−50)100 | − | − | V |
| | $V_{(BR)CEO}$ | $I_C$ = (−)1 mA, $R_{BE}$ = ∞ | (−)50 | − | − | V |
| Emitter−to−Base Breakdown Voltage | $V_{(BR)EBO}$ | $I_E$ = (−)10 μA, $I_C$ = 0 A | (−)6 | − | − | V |
| Turn−On Time | $t_{on}$ | See specified Test Circuit | − | (40)30 | − | ns |
| Storage Time | $t_{stg}$ | | − | (225)420 | − | ns |
| Fall Time | $t_f$ | | − | 25 | − | 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.




$20I_{B1} = -20I_{B2} = I_C = 2.5$ A
For PNP, the polarity is reversed.

**Figure 1. Switching Time Test Circuit**



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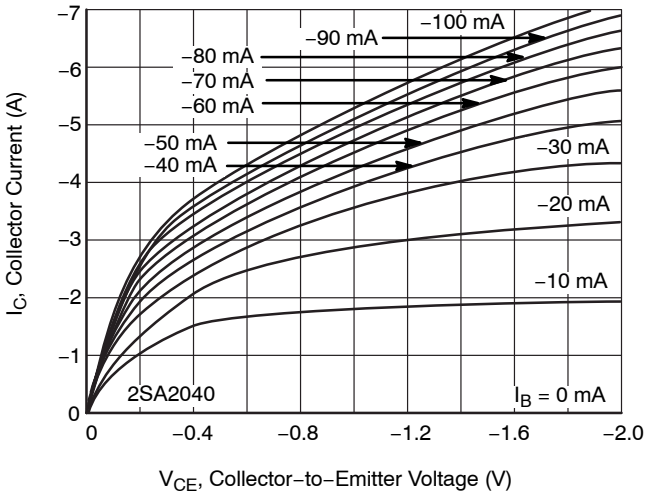



**Figure 2. $I_C$ – $V_{CE}$**

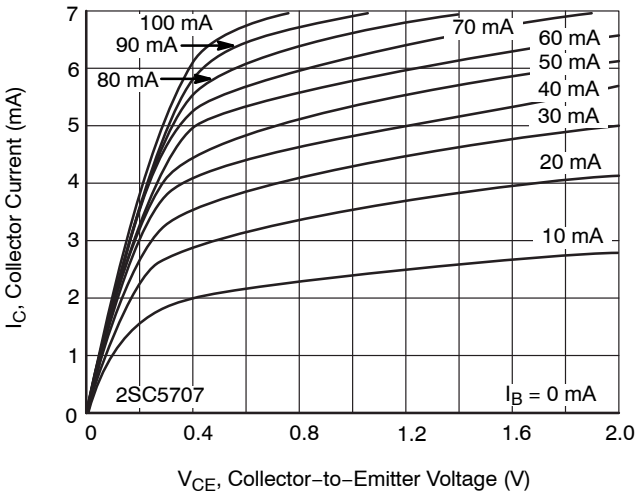



**Figure 3. $I_C$ – $V_{CE}$**

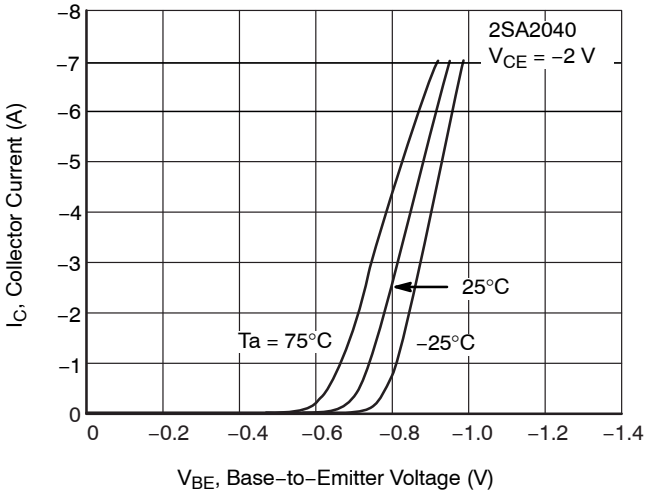



**Figure 4. $I_C$ – $V_{BE}$**

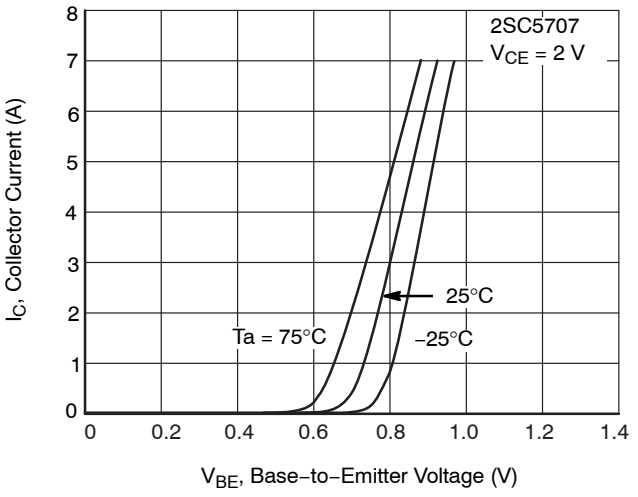



**Figure 5. $I_C$ – $V_{BE}$**

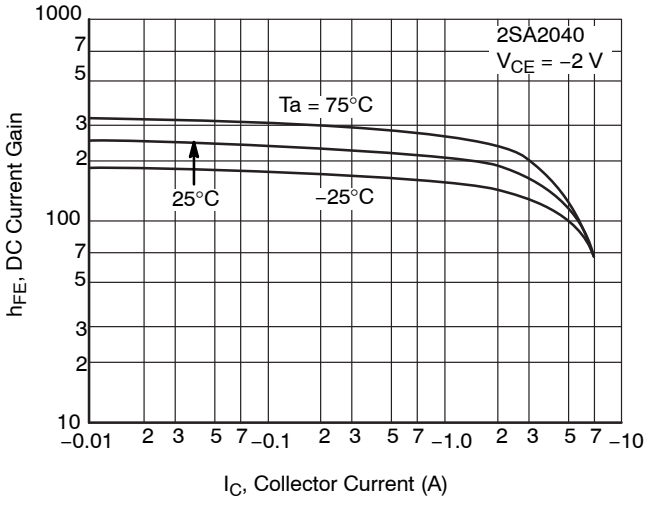



**Figure 6. $h_{FE}$ – $I_C$**

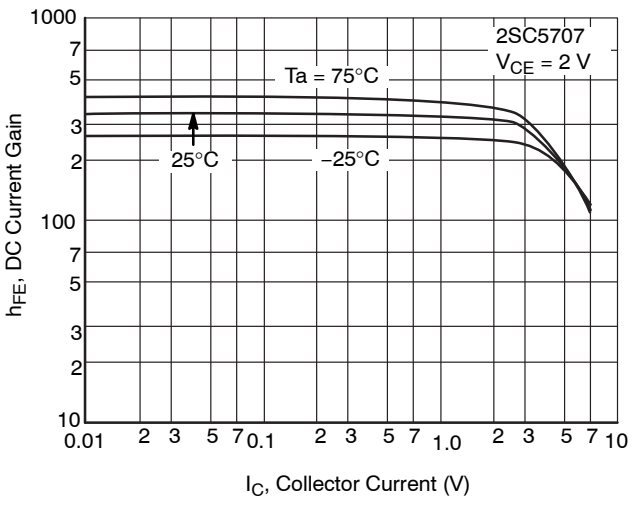



**Figure 7. $h_{FE}$ – $I_C$**



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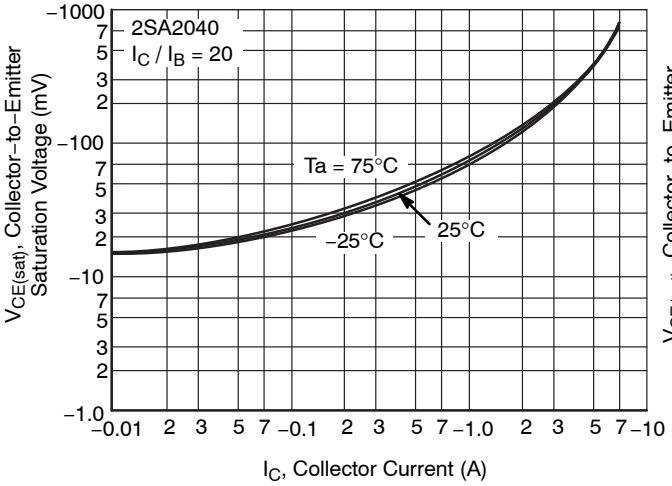



**Figure 8. $V_{CE(sat)}$ − $I_C$**

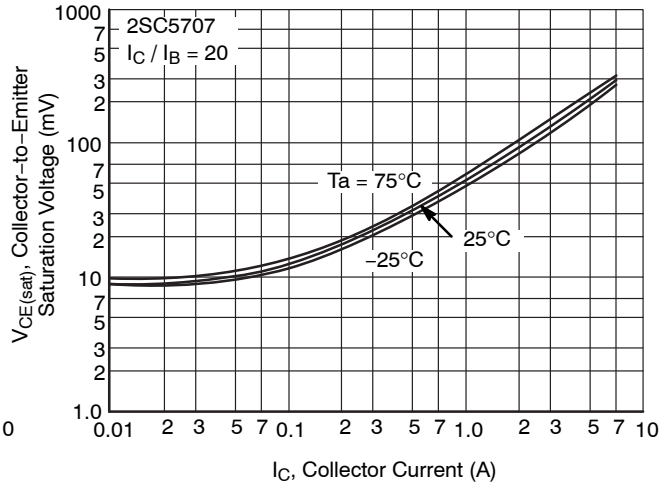



**Figure 9. $V_{CE(sat)}$ − $I_C$**

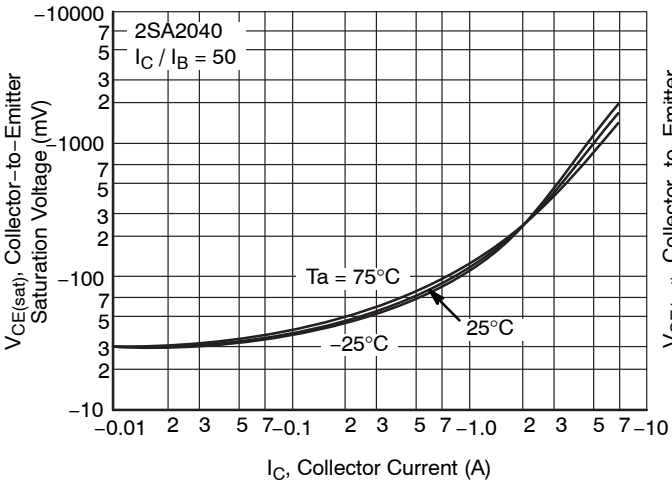



**Figure 10. $V_{CE(sat)}$ − $I_C$**

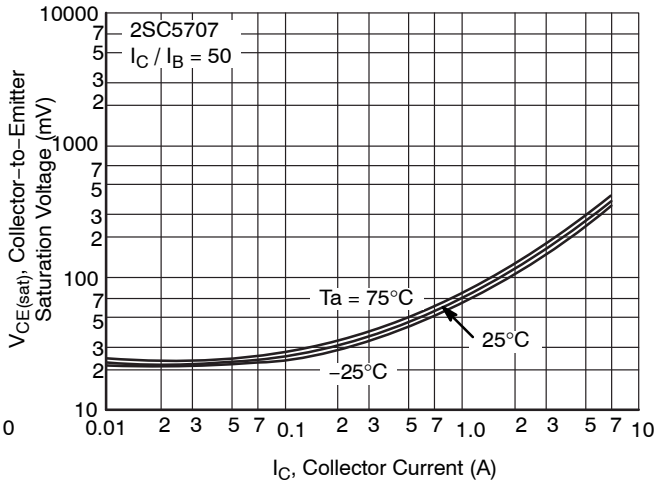



**Figure 11. $V_{CE(sat)}$ − $I_C$**

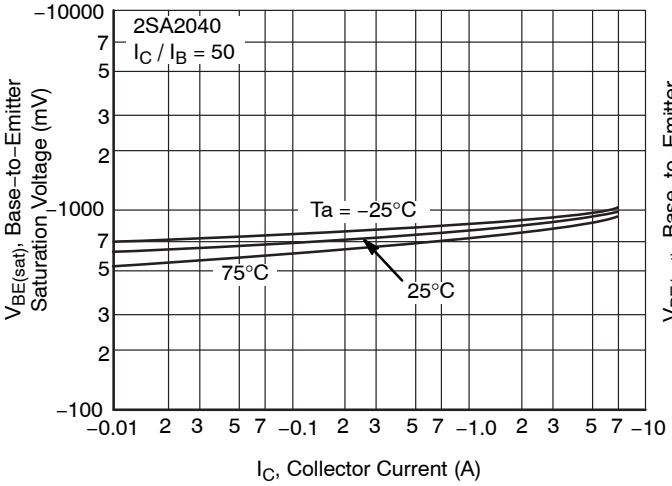



**Figure 12. $V_{BE(sat)}$ − $I_C$**

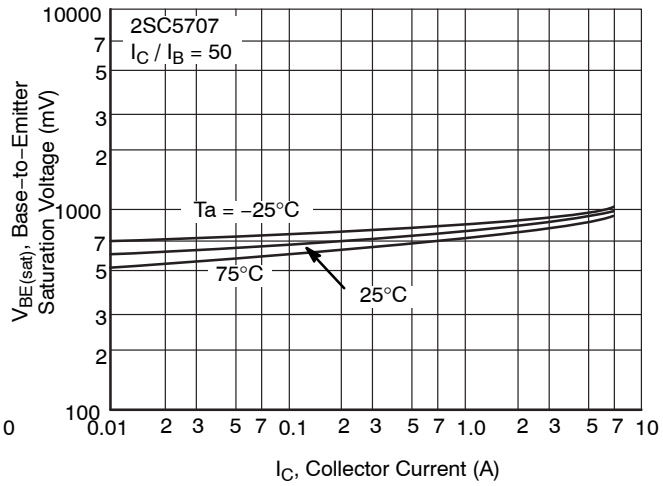



**Figure 13. $V_{BE(sat)}$ − $I_C$**



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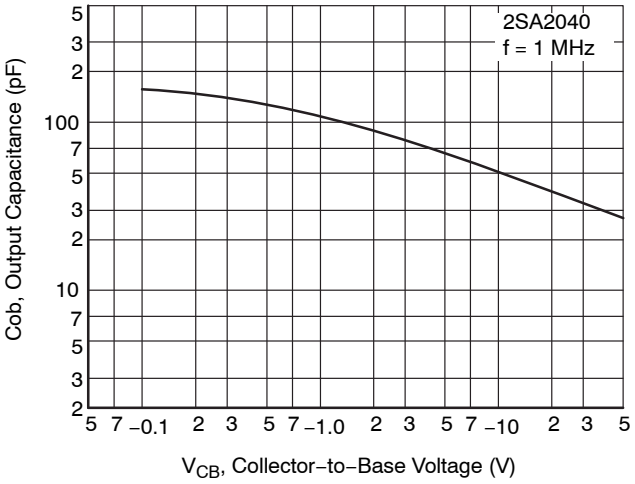



**Figure 14. Cob – $V_{CB}$**

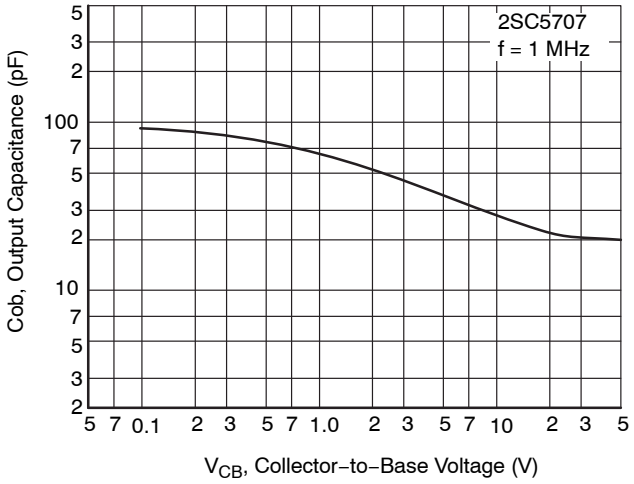



**Figure 15. Cob – $V_{CB}$**

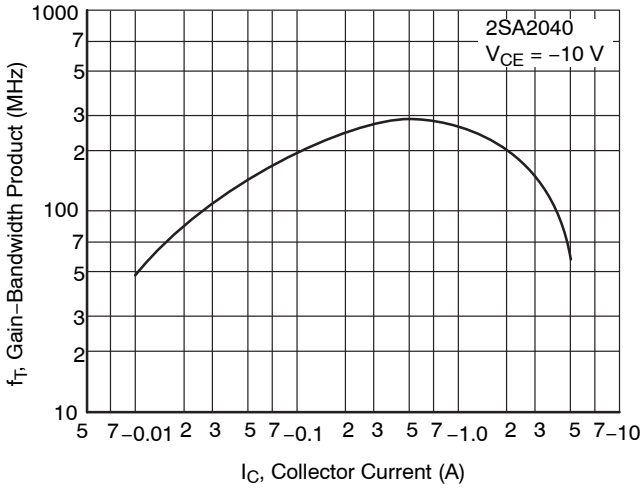



**Figure 16. $f_T$ – $I_C$**

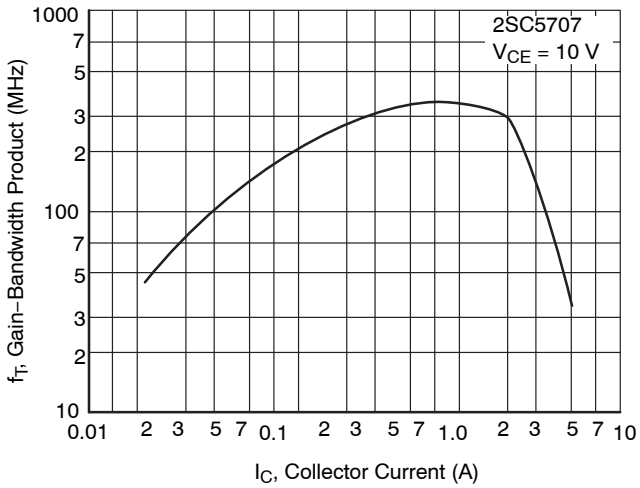



**Figure 17. $f_T$ – $I_C$**

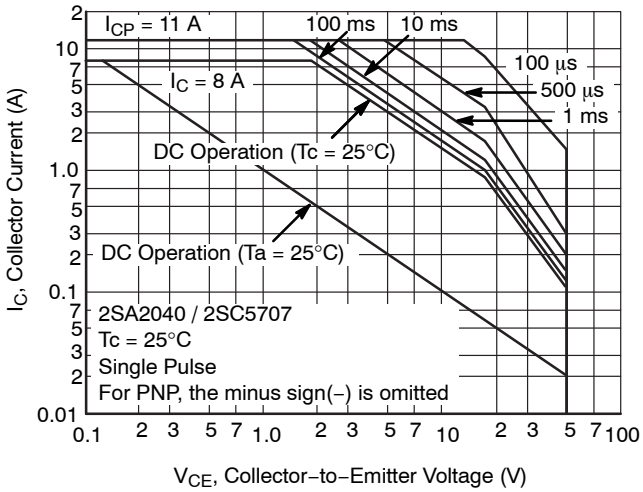



**Figure 18. ASO**

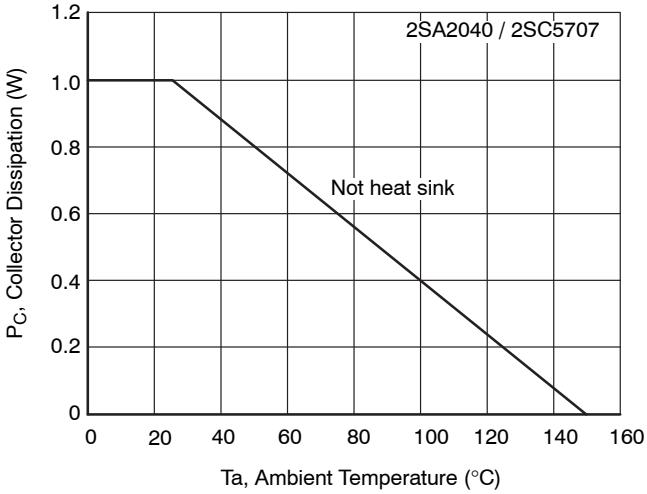



**Figure 19. $P_C$ – Ta**



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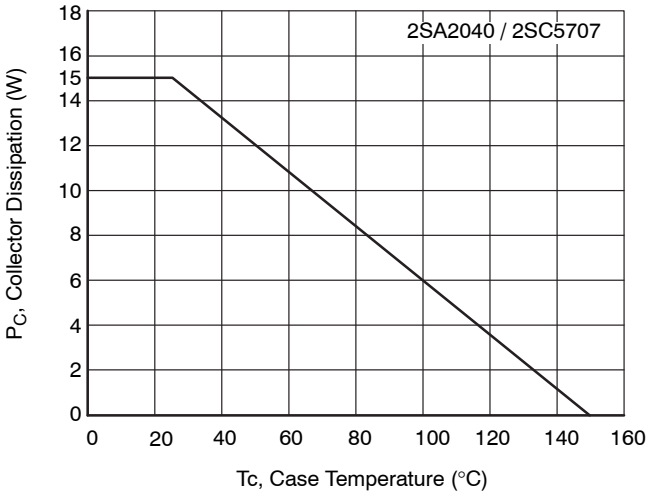


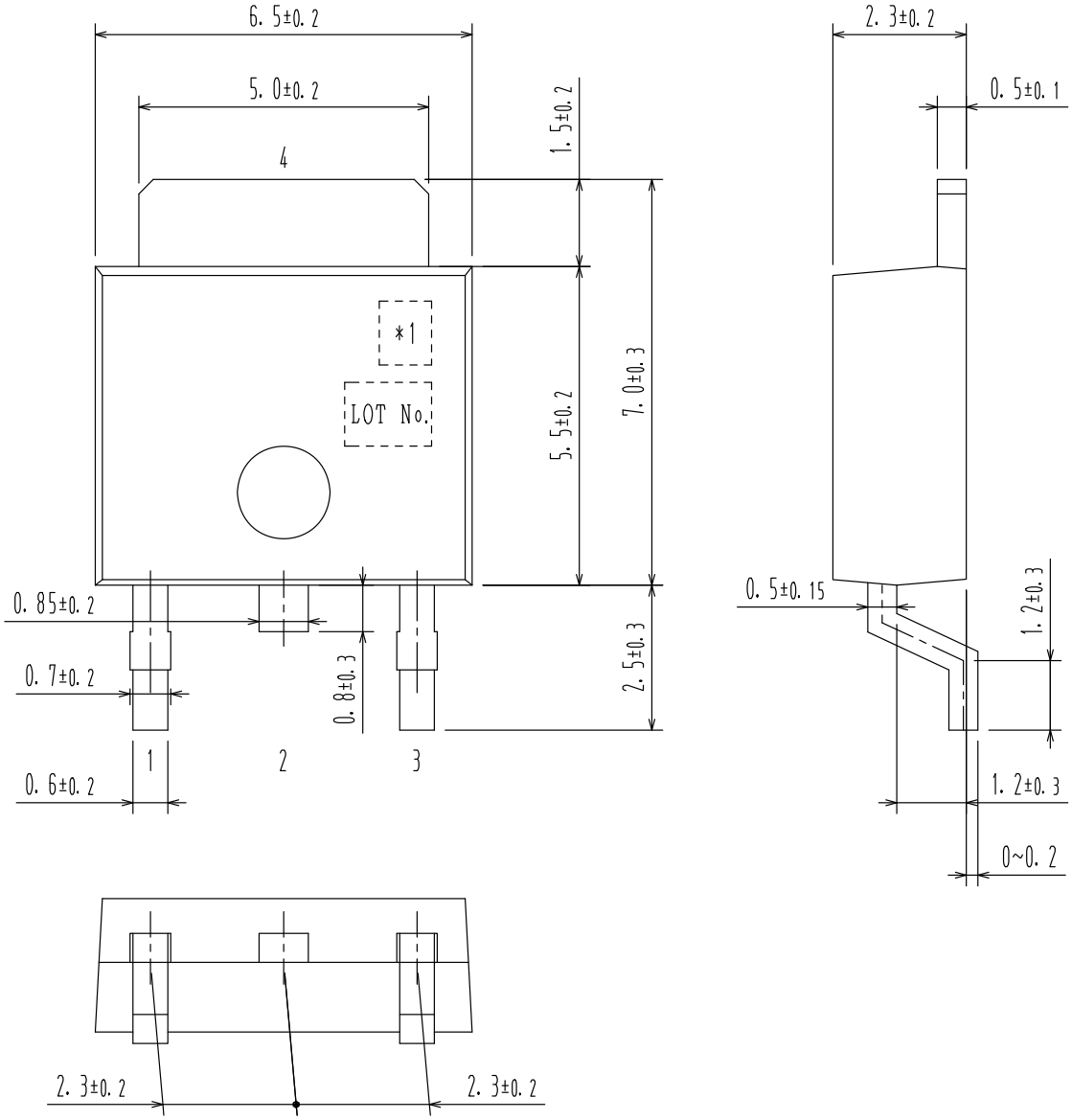

**Figure 20. $P_C$ – Tc**



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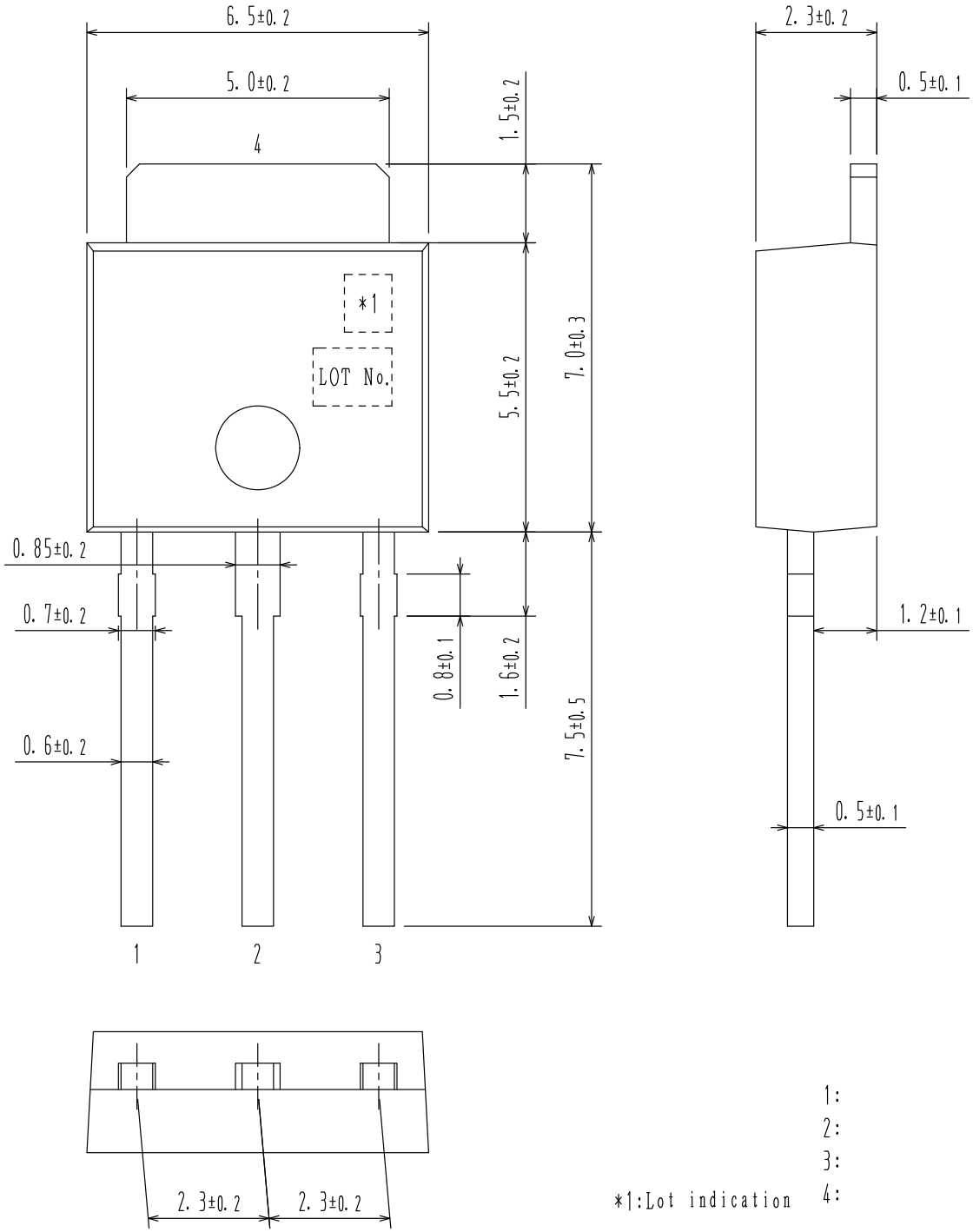
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