

# Bipolar Transistor

50 V, 2 A, Low  $V_{CE(sat)}$ , NPN Single

## 2SC5994

### Features

- Adoption of MBIT Process
- Low Collector to Emitter Saturation Voltage
- Large Current Capacity
- High Speed Switching

### Applications

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

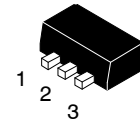
### SPECIFICATIONS

**ABSOLUTE MAXIMUM RATINGS** at  $T_a = 25^\circ\text{C}$

| Parameter                                                     | Symbol    | Value       | Unit             |
|---------------------------------------------------------------|-----------|-------------|------------------|
| Collector to Base Voltage                                     | $V_{CBO}$ | 100         | V                |
| Collector to Emitter Voltage                                  | $V_{CES}$ | 100         | V                |
|                                                               | $V_{CEO}$ | 50          | V                |
| Emitter to Base Voltage                                       | $V_{EBO}$ | 6           | V                |
| Collector Current                                             | $I_C$     | 2           | A                |
| Collector Current (Pulse)                                     | $I_{CP}$  | 4           | A                |
| Base Current                                                  | $I_B$     | 400         | mA               |
| Collector Dissipation<br>(Note 1)<br>$T_C = 25^\circ\text{C}$ | $P_C$     | 1.3         | W                |
|                                                               |           | 3.5         |                  |
| Junction Temperature                                          | $T_J$     | 150         | $^\circ\text{C}$ |
| Storage Temperature                                           | $T_{STG}$ | -55 to +150 | $^\circ\text{C}$ |

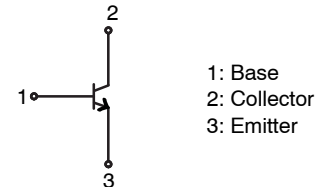
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface mounted on ceramic substrate (450 mm<sup>2</sup> x 0.8 mm).

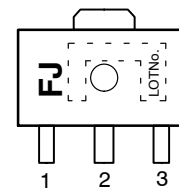


SOT-89 / PCP-1  
CASE 419AU

### ELECTRICAL CONNECTION



### MARKING DIAGRAM



FJ = Specific Device Code

### ORDERING INFORMATION

| Device       | Package           | Shipping <sup>†</sup> |
|--------------|-------------------|-----------------------|
| 2SC5994-TD-E | SOT-89 /<br>PCP-1 | 1000 /<br>Tape & Reel |

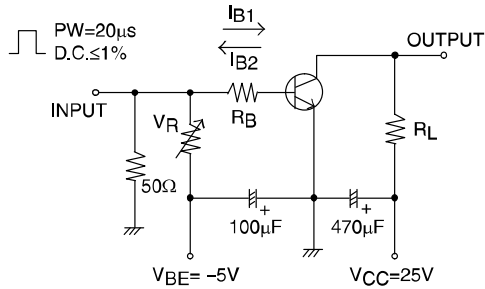
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](http://www.onsemi.com/BRD8011/D).

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

| Parameter                               | Symbol        | Conditions                                               | Value |     |     | Unit          |
|-----------------------------------------|---------------|----------------------------------------------------------|-------|-----|-----|---------------|
|                                         |               |                                                          | Min   | Typ | Max |               |
| Collector Cutoff Current                | $I_{CBO}$     | $V_{CB} = 50\text{ V}, I_E = 0\text{ A}$                 |       |     | 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                         | $h_{FE1}$     | $V_{CE} = 2\text{ V}, I_C = 100\text{ mA}$               | 200   |     | 560 |               |
|                                         | $h_{FE2}$     | $V_{CE} = 2\text{ V}, I_C = 1.5\text{ A}$                | 40    |     |     |               |
| Gain-Bandwidth Product                  | $f_T$         | $V_{CE} = 10\text{ V}, I_C = 300\text{ mA}$              |       | 420 |     | MHz           |
| Output Capacitance                      | $C_{ob}$      | $V_{CB} = 10\text{ V}, f = 1\text{ MHz}$                 |       | 9   |     | pF            |
| Collector to Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = 1\text{ A}, I_B = 50\text{ mA}$                   |       | 135 | 300 | mV            |
| Base to Emitter Saturation Voltage      | $V_{BE(sat)}$ | $I_C = 1\text{ A}, I_B = 50\text{ mA}$                   |       | 0.9 | 1.2 | V             |
| Collector to Base Breakdown Voltage     | $V_{(BR)CBO}$ | $I_C = 10\text{ }\mu\text{A}, I_E = 0\text{ A}$          | 100   |     |     | V             |
| Collector to Emitter Breakdown Voltage  | $V_{(BR)CES}$ | $I_C = 100\text{ }\mu\text{A}, R_{BE} = 0\text{ }\Omega$ | 100   |     |     | V             |
|                                         | $V_{(BR)CEO}$ | $I_C = 1\text{ mA}, R_{BE} = \infty$                     | 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                               |       | 30  |     | ns            |
| Storage Time                            | $t_{stg}$     |                                                          |       | 330 |     | ns            |
| Fall Time                               | $t_f$         |                                                          |       | 40  |     | ns            |

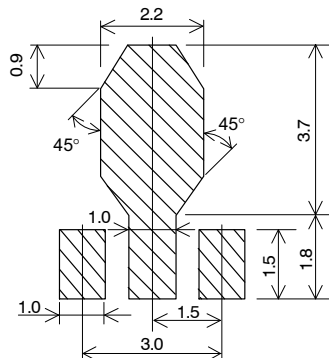
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

**Switching Time Test Circuit**

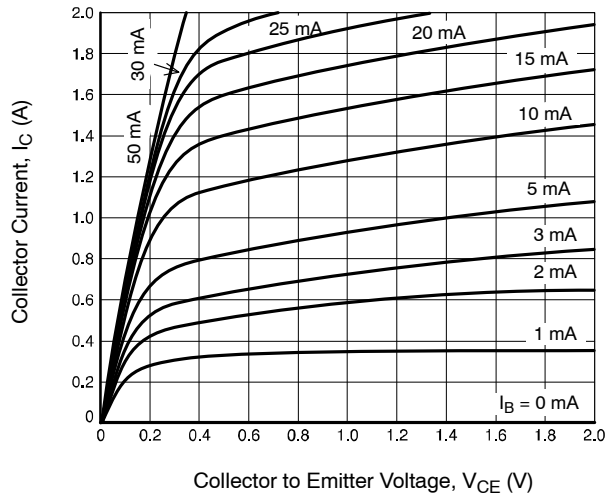
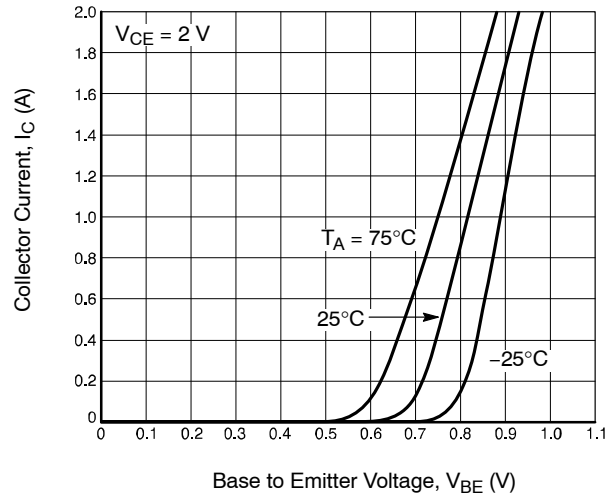
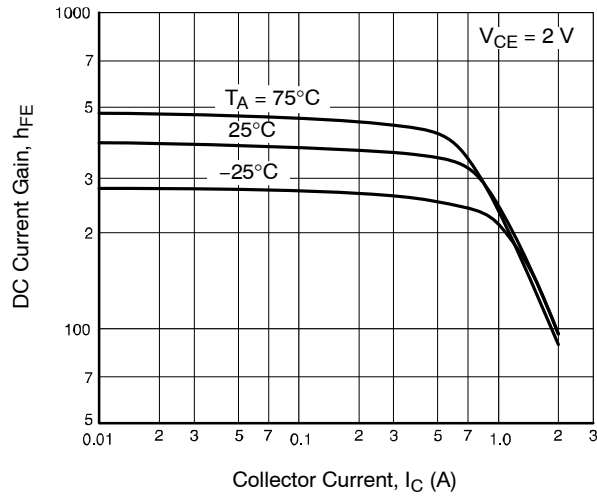
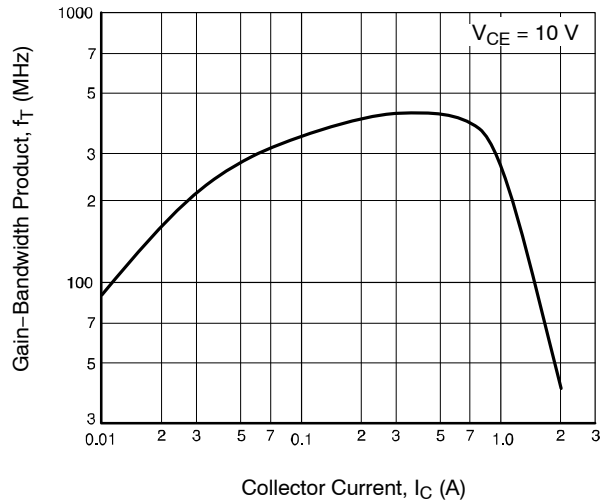
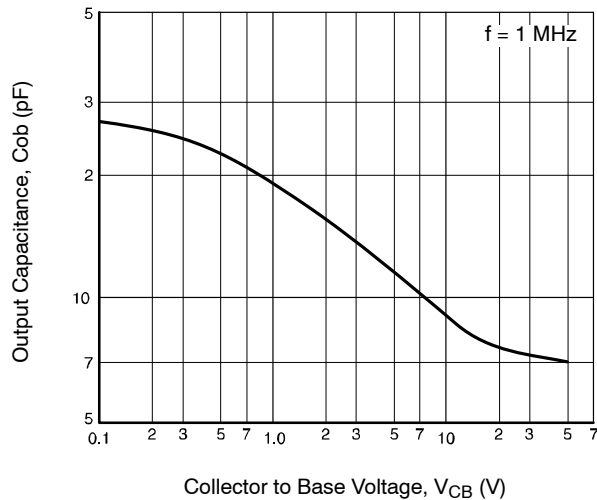
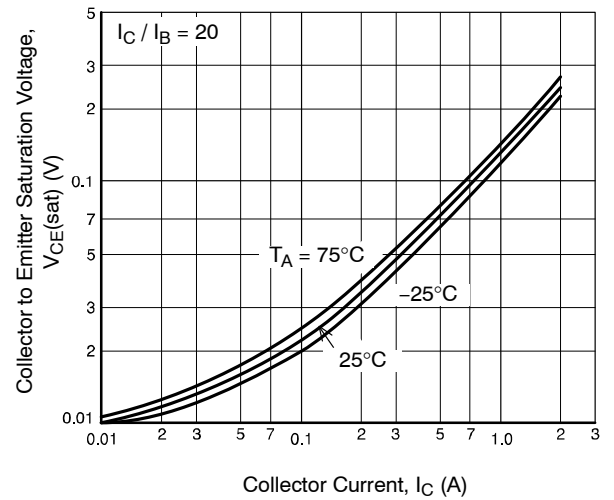


$$I_C = 10\text{ mA}, I_{B1} = -10\text{ mA}, I_{B2} = 700\text{ mA}$$

**Recommended Soldering Footprint**



## TYPICAL CHARACTERISTICS

Figure 1.  $I_C - V_{CE}$ Figure 2.  $I_C - V_{BE}$ Figure 3.  $h_{FE} - I_C$ Figure 4.  $f_T - I_C$ Figure 5.  $C_{ob} - V_{CB}$ Figure 6.  $V_{CE(sat)} - I_C$

TYPICAL CHARACTERISTICS (continued)

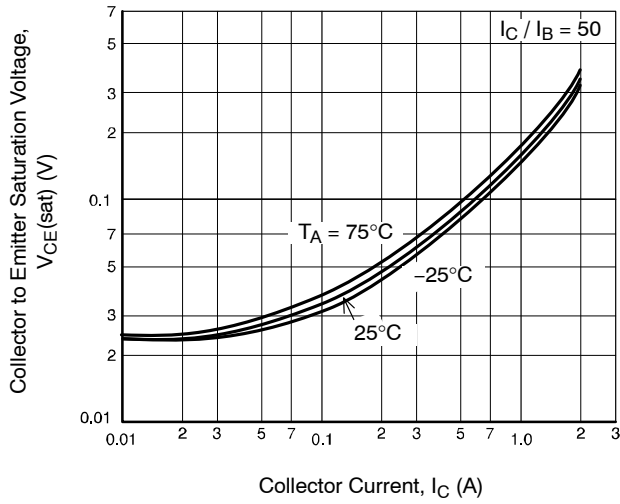


Figure 7.  $V_{CE(sat)} - I_C$

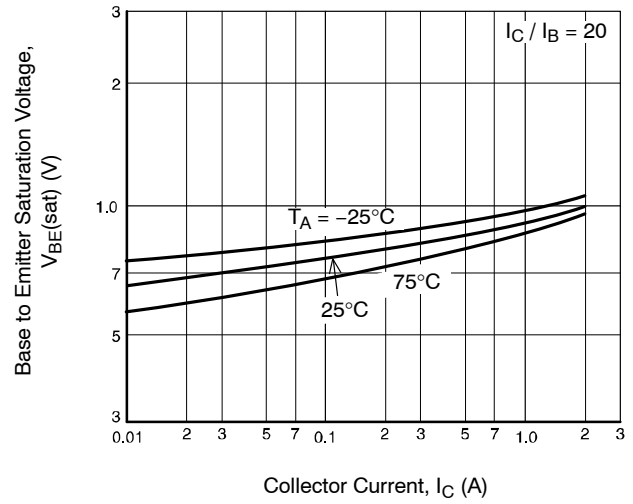


Figure 8.  $V_{BE(sat)} - I_C$

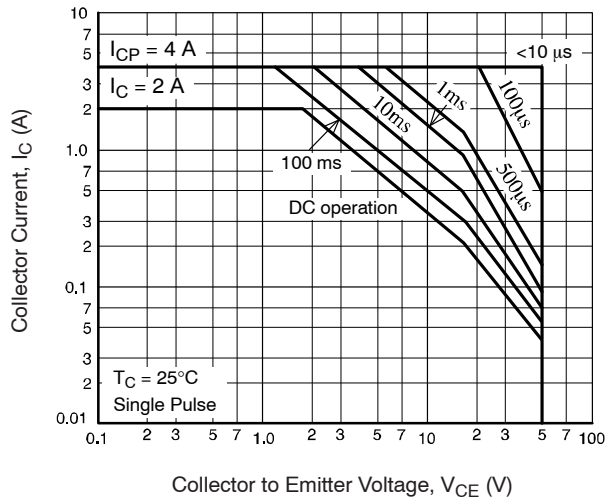


Figure 9. ASO

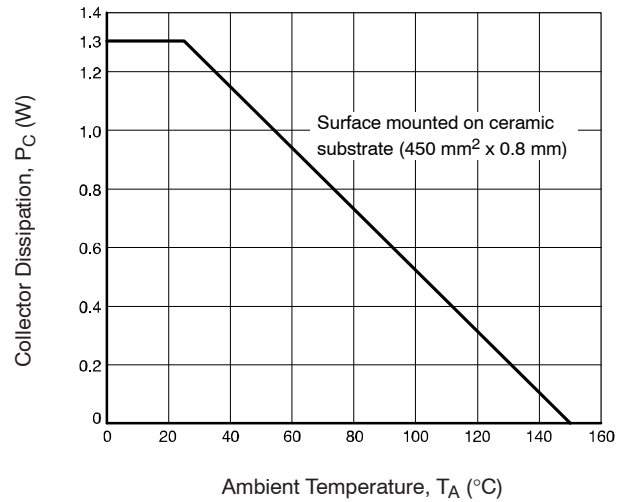


Figure 10.  $P_C - T_A$

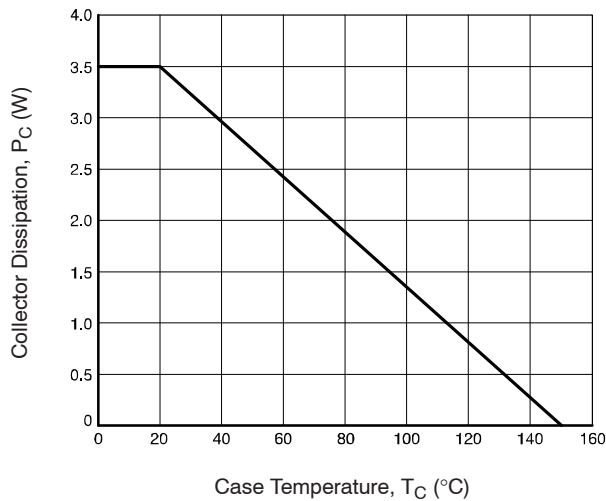
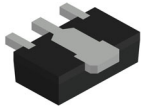
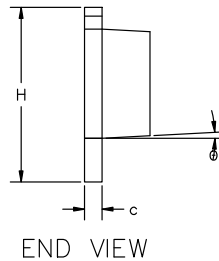
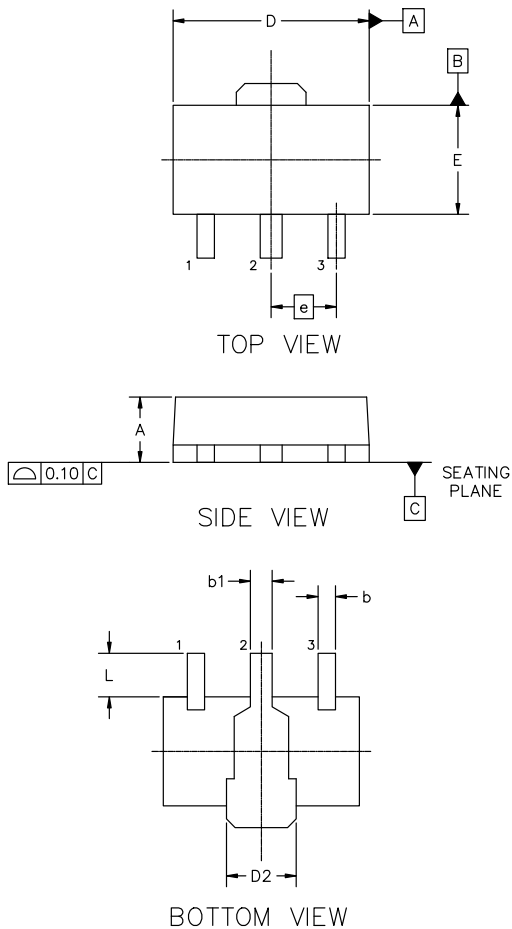


Figure 11.  $P_C - T_C$



**SOT-89 4.50x2.50x1.50 1.50P**  
**CASE 419AU**  
**ISSUE A**

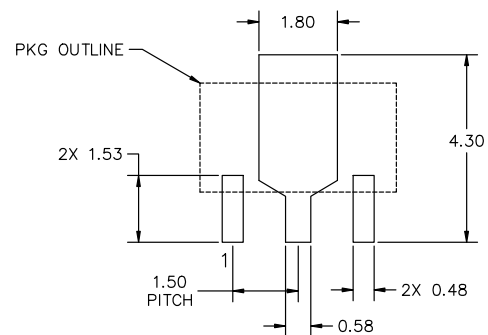
DATE 21 MAY 2025



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. LEAD THICKNESS INCLUDES LEAD FINISH.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| MILLIMETERS |          |      |      |
|-------------|----------|------|------|
| DIM         | MIN      | NOM  | MAX  |
| A           | 1.40     | 1.50 | 1.60 |
| b           | 0.35     | 0.40 | 0.48 |
| b1          | 0.40     | 0.50 | 0.55 |
| c           | 0.37     | 0.40 | 0.43 |
| D           | 4.40     | 4.50 | 4.60 |
| D2          | 1.40     | 1.60 | 1.80 |
| E           | 2.40     | 2.50 | 2.60 |
| e           | 1.50 BSC |      |      |
| H           | 3.80     | 4.00 | 4.20 |
| L           | 0.80     | 1.00 | 1.20 |
| Ø           | 0°       | ---  | 3°   |



RECOMMENDED MOUNTING FOOTPRINT

\*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

|                         |                                    |                                                                                                                                                                                  |
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