

### PNP SILICON EPITAXIAL TRANSISTOR FOR HIGH-SPEED SWITCHING

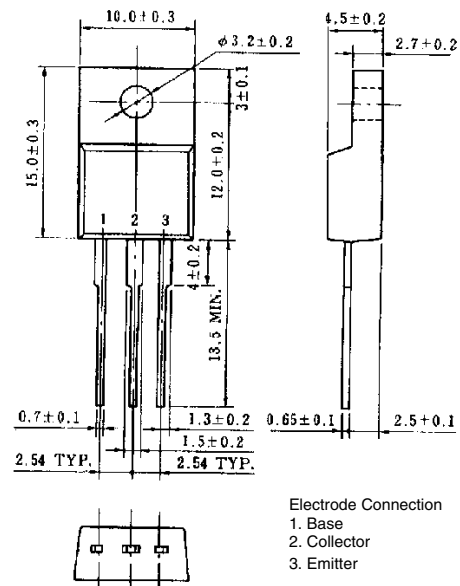
The 2SA1744 is a power transistor developed for high-speed switching and features a high  $h_{FE}$  at Low  $V_{CE(sat)}$ . This transistor is ideal for use as a driver in DC/DC converters and actuators.

In addition, a small resin-molded insulation type package contributes to high-density mounting and reduction of mounting cost.

#### FEATURES

- High  $h_{FE}$  and low  $V_{CE(sat)}$ :  
 $h_{FE} \geq 100$  ( $V_{CE} = -2$  V,  $I_C = -3$  A)  
 $V_{CE(sat)} \leq 0.3$  V ( $I_C = -8$  A,  $I_B = -0.4$  A)
- Full-mold package that does not require an insulating board or bushing

#### PACKAGE DRAWING (UNIT: mm)



ISOLATED TO-220(MP 45F)

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

| Parameter                    | Symbol                             | Ratings     | Unit             |
|------------------------------|------------------------------------|-------------|------------------|
| Collector to base voltage    | $V_{CBO}$                          | -100        | V                |
| Collector to emitter voltage | $V_{CEO}$                          | -60         | V                |
| Emitter to base voltage      | $V_{EBO}$                          | -7.0        | V                |
| Collector current (DC)       | $I_{C(DC)}$                        | -15         | A                |
| Collector current (pulse)    | $I_{C(pulse)}^*$                   | -30         | A                |
| Base current (DC)            | $I_{B(DC)}$                        | -7.5        | A                |
| Total power dissipation      | $P_T$ ( $T_C = 25^\circ\text{C}$ ) | 30          | W                |
| Total power dissipation      | $P_T$ ( $T_A = 25^\circ\text{C}$ ) | 2.0         | W                |
| Junction temperature         | $T_j$                              | 150         | $^\circ\text{C}$ |
| Storage temperature          | $T_{stg}$                          | -55 to +150 | $^\circ\text{C}$ |

\*  $PW \leq 300 \mu\text{s}$ , duty cycle  $\leq 10\%$

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**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

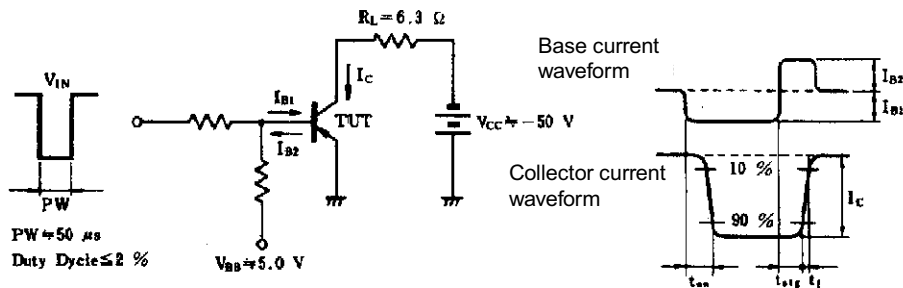
| Parameter                    | Symbol                  | Conditions   | MIN. | TYP. | MAX. | Unit |
|------------------------------|-------------------------|--|------|------|------|------|
| Collector to emitter voltage | V <sub>CEO(SUS)</sub>   | I <sub>C</sub> = -8.0 A, I <sub>B</sub> = -0.8 A, L = 1 mH   | -60  |      |      | V    |
| Collector to emitter voltage | V <sub>CEX(SUS)</sub>   | I <sub>C</sub> = -8.0 A, I <sub>B1</sub> = -I <sub>B2</sub> = -0.8 A, V <sub>BE(OFF)</sub> = 1.5 V, L = 180 μH, clamped                                | -60  |      |      | V    |
| Collector cutoff current     | I <sub>CBO</sub>        | V <sub>CB</sub> = -60 V, I <sub>E</sub> = 0  |      |      | -10  | μA   |
| Collector cutoff current     | I <sub>CER</sub>        | V <sub>CE</sub> = -60 V, R <sub>BE</sub> = 50 Ω, T <sub>A</sub> = 125°C  |      |      | -1.0 | mA   |
| Collector cutoff current     | I <sub>CEx1</sub>       | V <sub>CE</sub> = -60 V, V <sub>BE(OFF)</sub> = 1.5 V  |      |      | -10  | μA   |
| Collector cutoff current     | I <sub>CEx2</sub>       | V <sub>CE</sub> = -60 V, V <sub>BE(OFF)</sub> = 1.5 V, T <sub>A</sub> = 125°C  |      |      | -1.0 | mA   |
| Emitter cutoff current       | I <sub>EBO</sub>        | V <sub>EB</sub> = -5.0 V, I <sub>C</sub> = 0   |      |      | -10  | μA   |
| DC current gain              | h <sub>FE1</sub> *      | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -1.5 A  | 100  |      |      |      |
| DC current gain              | h <sub>FE2</sub> *      | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -3.0 A  | 100  |      | 400  |      |
| DC current gain              | h <sub>FE3</sub> *      | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -8.0 A  | 60   |      |      |      |
| Collector saturation voltage | V <sub>CE(sat)1</sub> * | I <sub>C</sub> = -8.0 A, I <sub>B</sub> = -0.4 A   |      |      | -0.3 | V    |
| Collector saturation voltage | V <sub>CE(sat)2</sub> * | I <sub>C</sub> = -12 A, I <sub>B</sub> = -0.6 A  |      |      | -0.5 | V    |
| Base saturation voltage      | V <sub>BE(sat)1</sub> * | I <sub>C</sub> = -8.0 A, I <sub>B</sub> = -0.4 A   |      |      | -1.2 | V    |
| Base saturation voltage      | V <sub>BE(sat)2</sub> * | I <sub>C</sub> = -12 A, I <sub>B</sub> = -0.6 A  |      |      | -1.5 | V    |
| Collector capacitance        | C <sub>ob</sub>         | V <sub>CB</sub> = -10 V, I <sub>E</sub> = 0, f = 1.0 MHz   |      | 300  |      | pF   |
| Gain bandwidth product       | f <sub>T</sub>          | V <sub>CE</sub> = -10 V, I <sub>C</sub> = -1.5 A   |      | 80   |      | MHz  |
| Turn-on time                 | t <sub>on</sub>         | I <sub>C</sub> = -8.0 A, R <sub>L</sub> = 6.3 Ω,<br>I <sub>B1</sub> = -I <sub>B2</sub> = -0.4 A, V <sub>CC</sub> ≅ -50 V<br>Refer to the test circuit. |      |      | 0.3  | μs   |
| Storage time                 | t <sub>stg</sub>        |  |      |      | 1.5  | μs   |
| Fall time                    | t <sub>f</sub>          |  |      |      | 0.3  | μs   |

\* Pulse test PW ≤ 350 μs, duty cycle ≤ 2%

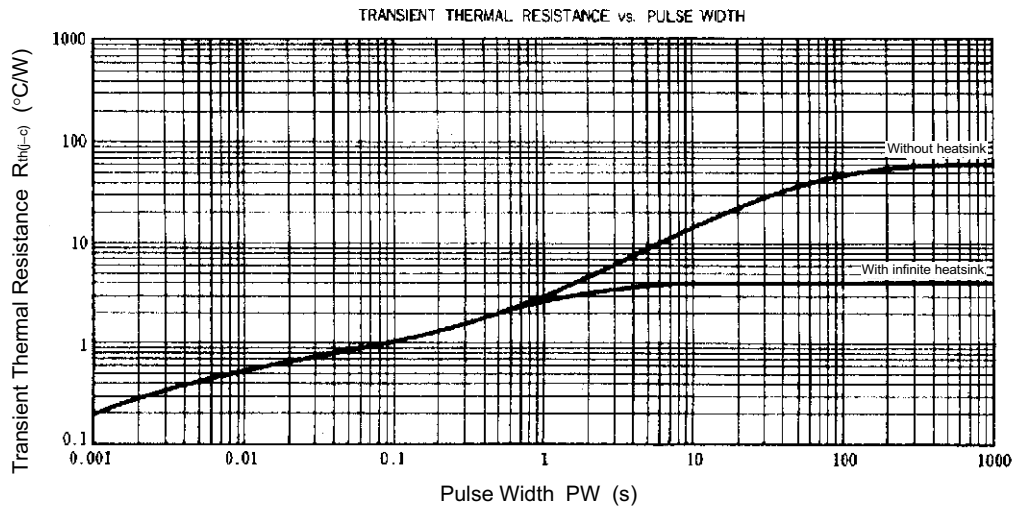
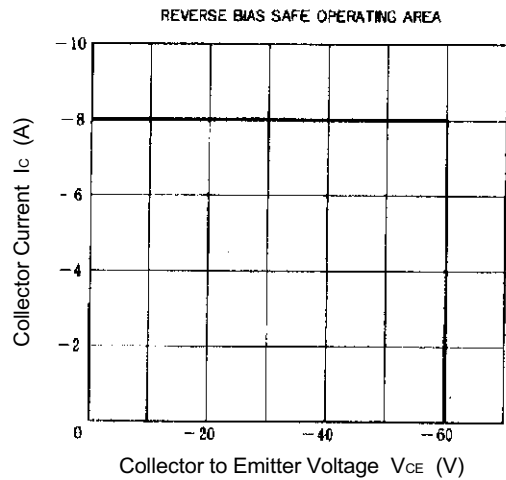
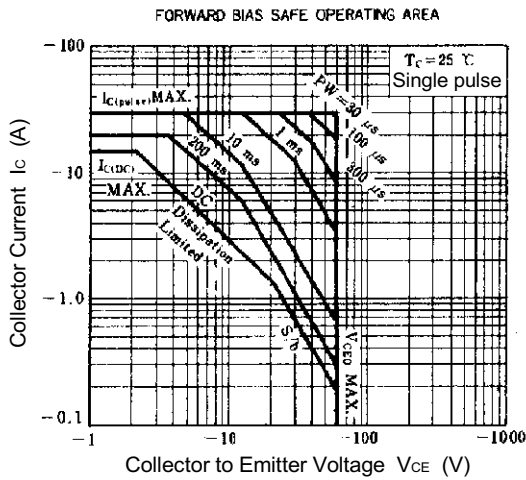
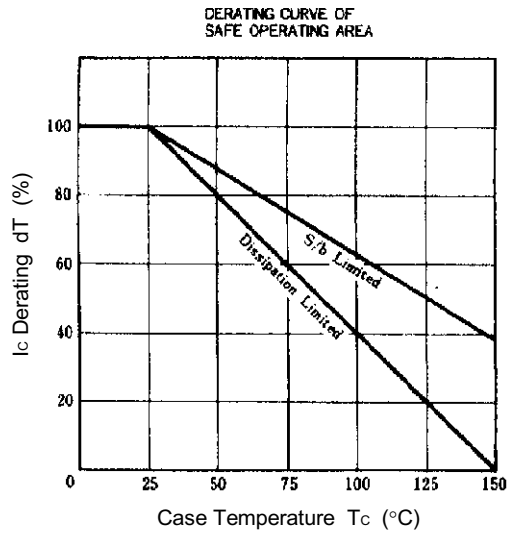
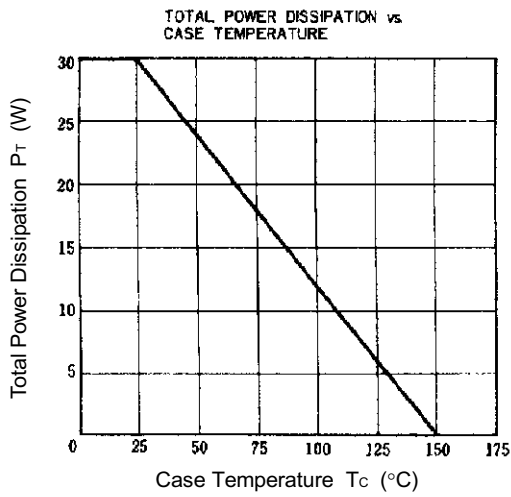
**h<sub>FE</sub> CLASSIFICATION**

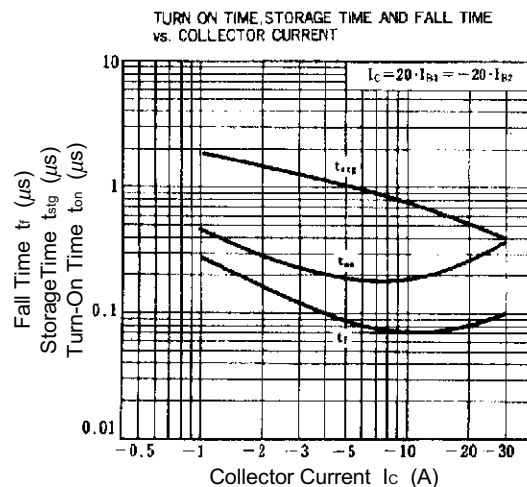
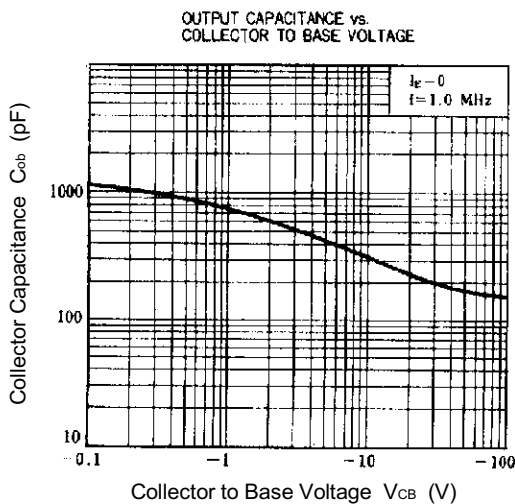
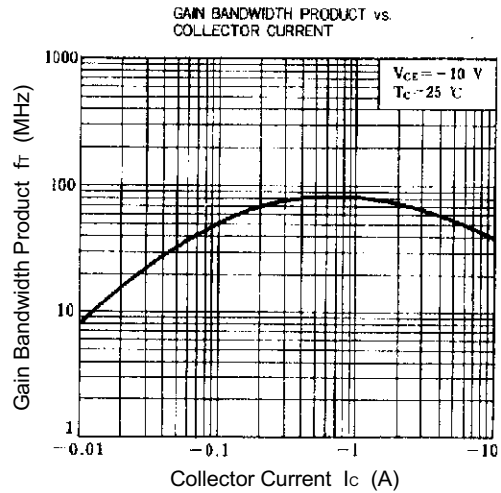
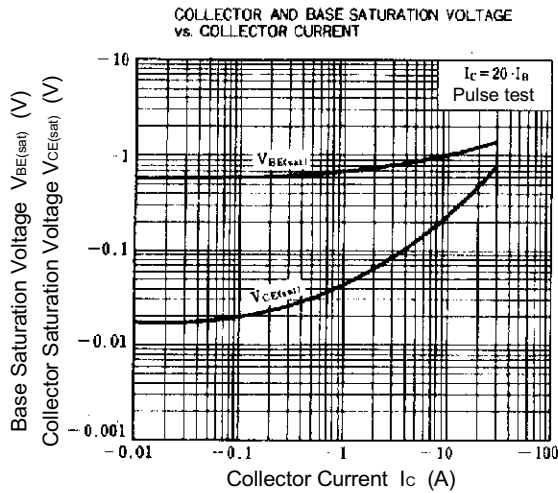
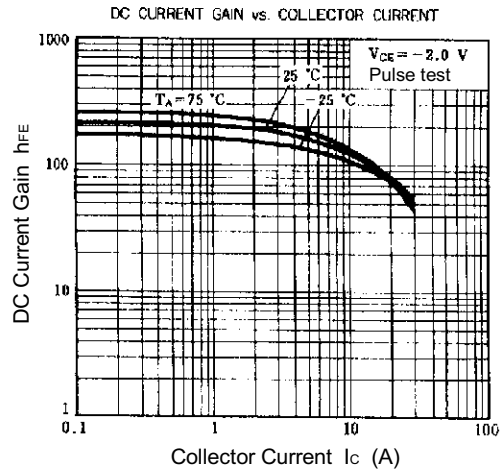
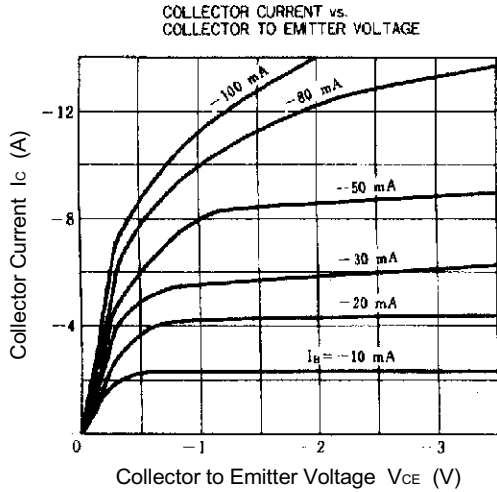
| Marking          | M          | L          | K          |
|------------------|------------|------------|------------|
| h <sub>FE2</sub> | 100 to 200 | 150 to 300 | 200 to 400 |

**SWITCHING TIME (t<sub>on</sub>, t<sub>stg</sub>, t<sub>f</sub>) TEST CIRCUIT**



TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)





[MEMO]

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