

# SILICON POWER TRANSISTOR 2SA1742

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

The 2SA1742 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  $V_{CE(sat)}$ :  
 $h_{FE} \geq 100$  MIN. @  $V_{CE} = -2.0$  V,  $I_C = -1.5$  A  
 $V_{CE(sat)} \geq -0.3$  V MAX. @  $I_C = -4.0$  V,  $I_B = -0.2$  A
- Full-mold package that does not require an insulating board or bushing

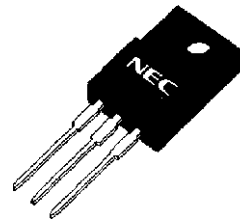
#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

| Parameter                    | Symbol         | Conditions                                      | 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)       | $I_{C(DC)}$    |   | -7.0        | A                |
| Collector current (pulse)    | $I_{C(pulse)}$ | $PW \leq 300 \mu s$ ,<br>duty cycle $\leq 10\%$ | -14         | A                |
| Base current (DC)            | $I_{B(DC)}$    |   | -3.5        | A                |
| Total power dissipation      | $P_T$          | $T_C = 25^\circ\text{C}$                        | 30          | W                |
|                              |                | $T_A = 25^\circ\text{C}$                        | 2.0         | W                |
| Junction temperature         | $T_j$          |   | 150         | $^\circ\text{C}$ |
| Storage temperature          | $T_{stg}$      |   | -55 to +150 | $^\circ\text{C}$ |

#### ORDERING INFORMATION

| Part No. | Package         |
|----------|-----------------|
| 2SA1742  | Isolated TO-220 |

(Isolated TO-220)



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

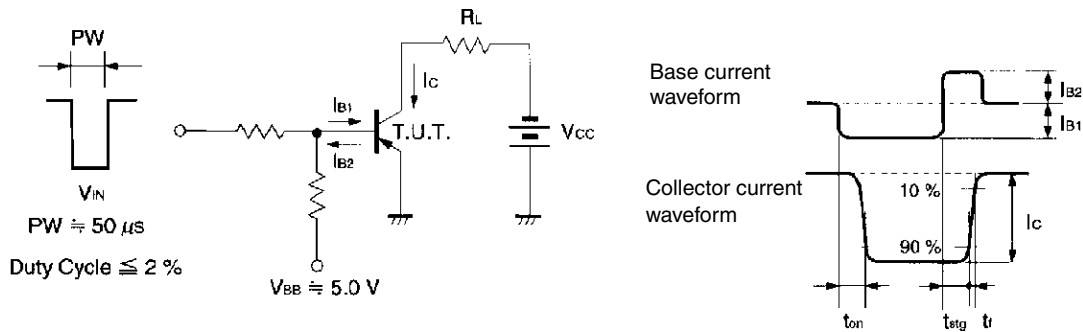
| Parameter                    | Symbol                | Conditions   | MIN. | TYP. | MAX. | Unit |
|------------------------------|-----------------------|--|------|------|------|------|
| Collector to emitter voltage | V <sub>CE0(SUS)</sub> | I <sub>C</sub> = -4.0 V, I <sub>B</sub> = -0.4 A, L = 1 mH   | -60  |      |      | V    |
|                              | V <sub>CEx(SUS)</sub> | I <sub>C</sub> = -4.0 A, I <sub>B1</sub> = -I <sub>B2</sub> = -0.4 A, V <sub>BE(OFF)</sub> = 1.5 V, L = 180 μH, clamped                              | -60  |      |      | V    |
| Collector cutoff current     | I <sub>CB0</sub>      | V <sub>CB</sub> = -60 V, I <sub>E</sub> = 0 A  |      |      | -10  | μA   |
|                              | 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   |
|                              | I <sub>CEx1</sub>     | V <sub>CE</sub> = -60 V, V <sub>BE(OFF)</sub> = 1.5 V  |      |      | -10  | μA   |
|                              | 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 A   |      |      | -10  | μA   |
| DC current gain              | h <sub>FE1</sub>      | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.7 A <sup>Note</sup>  | 100  |      |      |      |
|                              | h <sub>FE2</sub>      | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -1.5 A <sup>Note</sup>  | 100  |      | 400  |      |
|                              | h <sub>FE3</sub>      | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -4.0 A <sup>Note</sup>  | 60   |      |      |      |
| Collector saturation voltage | V <sub>CE(sat)1</sub> | I <sub>C</sub> = -4.0 A, I <sub>B</sub> = -0.2 A <sup>Note</sup>   |      |      | -0.3 | V    |
|                              | V <sub>CE(sat)2</sub> | I <sub>C</sub> = -6.0 A, I <sub>B</sub> = -0.3 A <sup>Note</sup>   |      |      | -0.5 | V    |
| Base saturation voltage      | V <sub>BE(sat)1</sub> | I <sub>C</sub> = -4.0 A, I <sub>B</sub> = -0.2 A <sup>Note</sup>   |      |      | -1.2 | V    |
|                              | V <sub>BE(sat)2</sub> | I <sub>C</sub> = -6.0 A, I <sub>B</sub> = -0.3 A <sup>Note</sup>   |      |      | -1.5 | V    |
| Collector capacitance        | C <sub>ob</sub>       | V <sub>CB</sub> = -10 V, I <sub>E</sub> = 0 A, f = 1.0 MHz   |      | 180  |      | pF   |
| Gain bandwidth product       | f <sub>T</sub>        | V <sub>CB</sub> = -10 V, I <sub>C</sub> = -1.0 A   |      | 40   |      | MHz  |
| Turn-on time                 | t <sub>on</sub>       | I <sub>C</sub> = -4.0 A, R <sub>L</sub> = 12.5 Ω, I <sub>B1</sub> = -I <sub>B2</sub> = -0.2 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   |

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

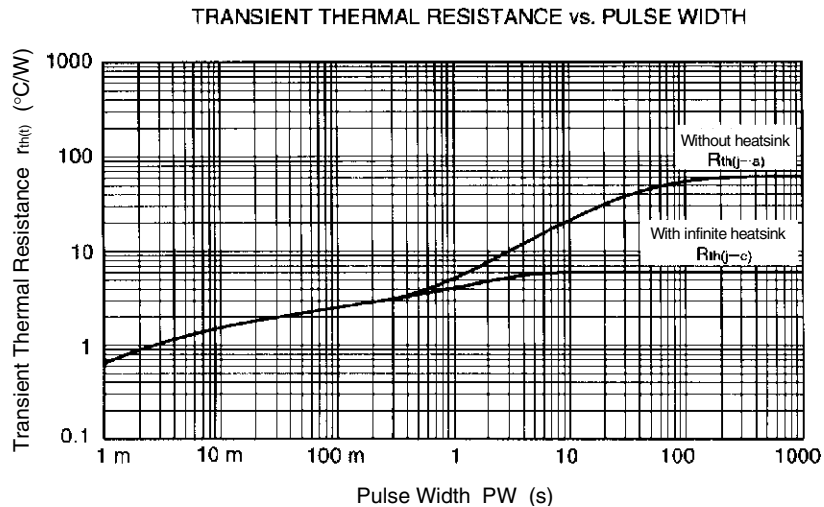
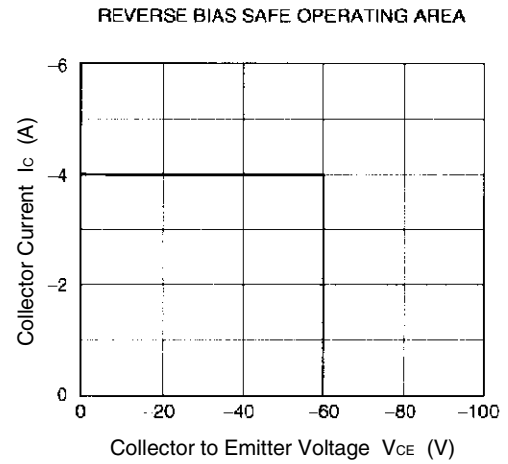
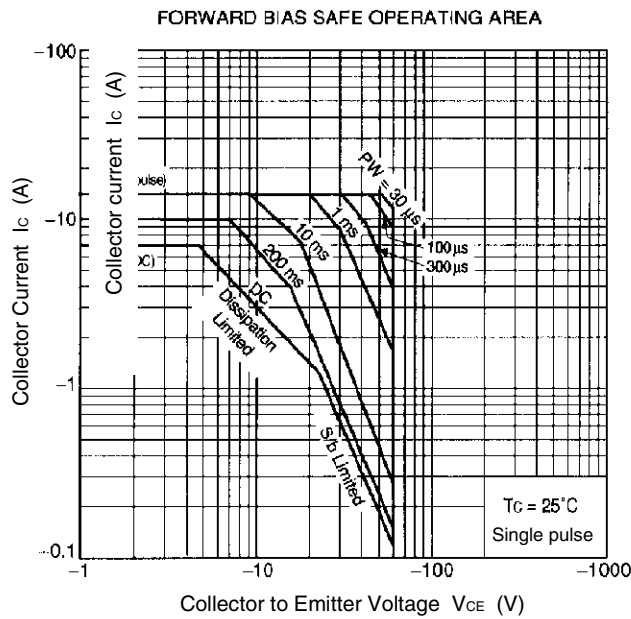
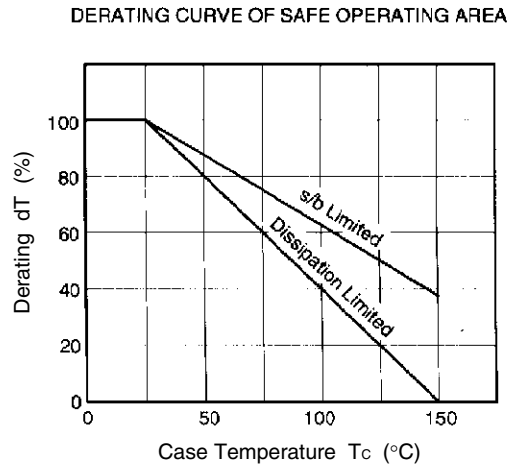
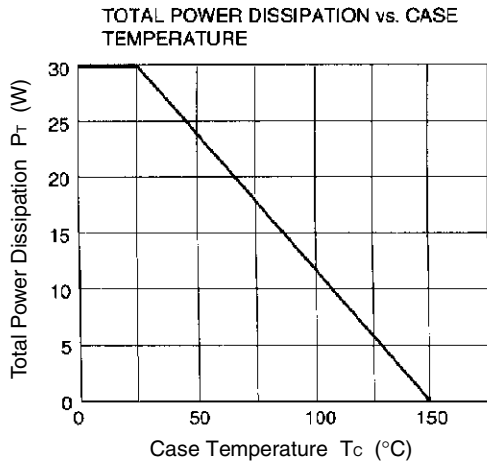
**h<sub>FE</sub> CLASSIFICATION**

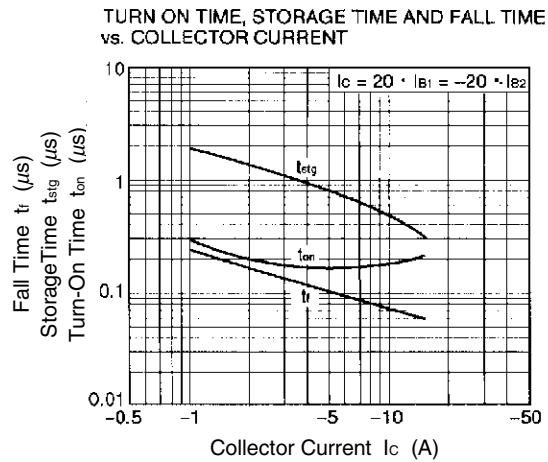
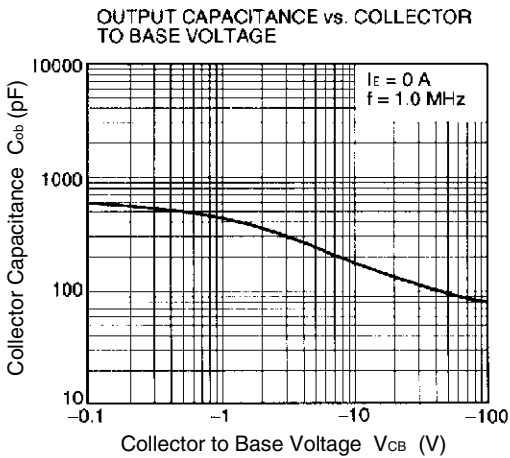
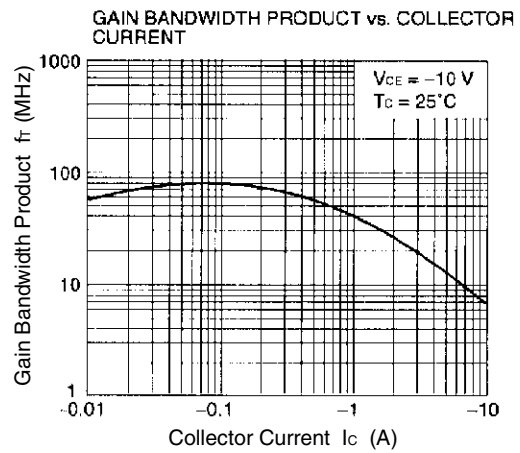
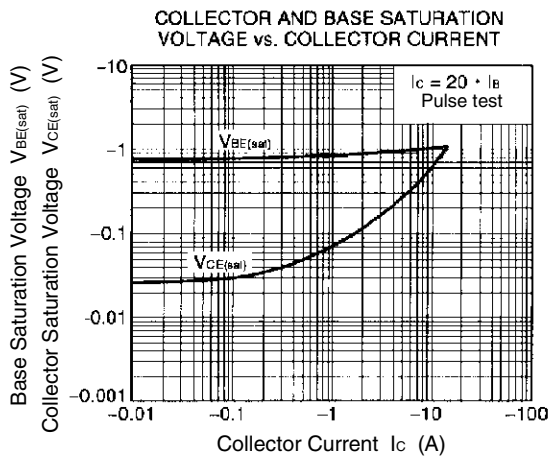
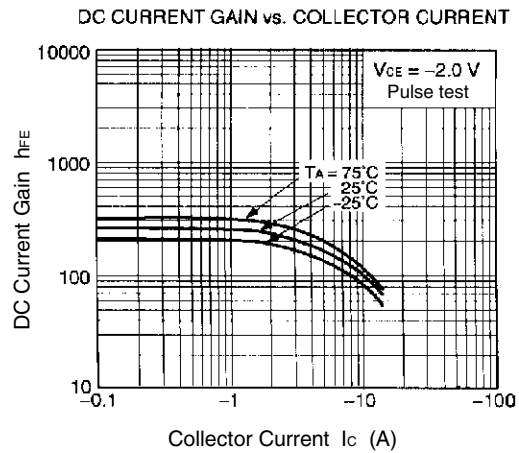
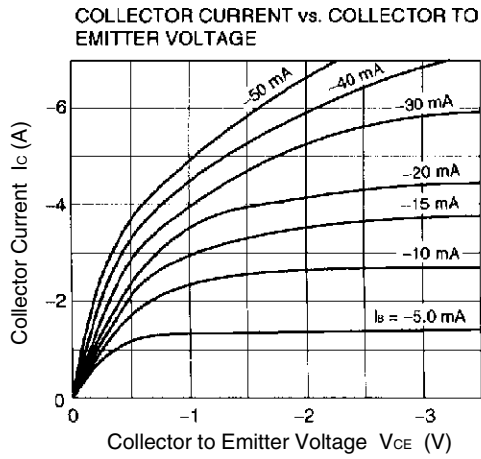
| Marking          | M          | L          | K          |
|------------------|------------|------------|------------|
| h <sub>FE2</sub> | 100 to 200 | 150 to 300 | 200 to 400 |

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



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







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