To our customers,

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April 1st, 2010
Renesas Electronics Corporation

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RENESAS

# SILICON POWER TRANSISTOR
# 2SA1741

## PNP SILICON EPITAXIAL TRANSISTOR FOR HIGH-SPEED SWITCHING

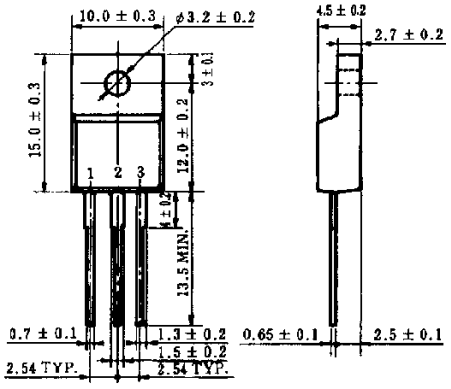
The 2SA1741 is a power transistor developed for high-speed switching and features a high $h_{FE}$ at low $V_{CE(sat)}$. This transistor is ideal for use as a driver in DC/DC converters and actuators.

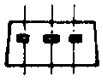
In addition, a small resin-molded insulation type package contributes to high-density mounting and reduction of mounting cost.

### FEATURES

- High $h_{FE}$ and low $V_{CE(sat)}$:
  $h_{FE} \geq 100$ ($V_{CE} = -2$ V, $I_C = -1$ A)
  $V_{CE(sat)} \leq 0.3$ V ($I_C = -3$ A, $I_B = -0.15$ A)
- Full-mold package that does not require an insulating board or bushing when mounting.

### PACKAGE DRAWING (UNIT: mm)



Electrode Connection
1. Base
2. Collector
3. Emitter

### ABSOLUTE MAXIMUM RATINGS (Ta = 25°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) | $I_{C(DC)}$ | −5.0 | A |
| Collector current (pulse) | $I_{C(pulse)}$* | −10 | A |
| Base current (DC) | $I_{B(DC)}$ | −2.5 | A |
| Total power dissipation | $P_T$ (Tc = 25°C) | 25 | W |
| Total power dissipation | $P_T$ (Ta = 25°C) | 2.0 | W |
| Junction temperature | $T_j$ | 150 | °C |
| Storage temperature | $T_{stg}$ | −55 to +150 | °C |

* PW ≤ 300 μs, duty cycle ≤ 50%



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## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

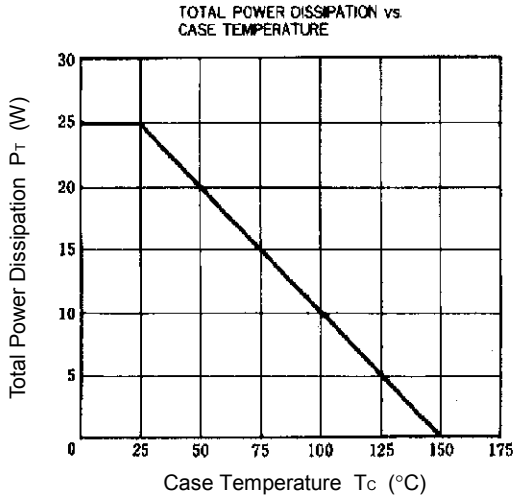
| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Collector to emitter voltage | $V_{CEO(SUS)}$ | $I_C$ = –3.0 A, $I_B$ = –0.3 A, L = 1 mH | –60 | | | V |
| Collector to emitter voltage | $V_{CEX(SUS)}$ | $I_C$ = –3.0 A, $I_{B1}$ = –$I_{B2}$ = –0.3 A, $V_{BE(OFF)}$ = 1.5 V, L = 180 μH, clamped | –60 | | | V |
| Collector cutoff current | $I_{CBO}$ | $V_{CB}$ = –60 V, $I_E$ = 0 | | | –10 | μA |
| Collector cutoff current | $I_{CER}$ | $V_{CE}$ = –60 V, $R_{BE}$ = 50 Ω, Ta = 125°C | | | –1.0 | mA |
| Collector cutoff current | $I_{CEX1}$ | $V_{CE}$ = –60 V, $V_{BE(OFF)}$ = 1.5 V | | | –10 | μA |
| Collector cutoff current | $I_{CEX2}$ | $V_{CE}$ = –60 V, $V_{BE(OFF)}$ = 1.5 V, Ta = 125 °C | | | –1.0 | mA |
| Emitter cutoff current | $I_{EBO}$ | $V_{EB}$ = –5.0 V, $I_C$ = 0 | | | –10 | μA |
| DC current gain | $h_{FE1}$* | $V_{CE}$ = –2.0 V, $I_C$ = –0.5 A | 100 | | | |
| DC current gain | $h_{FE2}$* | $V_{CE}$ = –2.0 V, $I_C$ = –1.0 A | 100 | | 400 | |
| DC current gain | $h_{FE3}$* | $V_{CE}$ = –2.0 V, $I_C$ = –3.0 A | 60 | | | |
| Collector saturation voltage | $V_{CE(sat)1}$* | $I_C$ = –3.0 A, $I_B$ = –0.15 A | | | –0.3 | V |
| Collector saturation voltage | $V_{CE(sat)2}$* | $I_C$ = –4.0 A, $I_B$ = –0.2 A | | | –0.5 | V |
| Base saturation voltage | $V_{BE(sat)1}$* | $I_C$ = –3.0 A, $I_B$ = –0.15 A | | | –1.2 | V |
| Base saturation voltage | $V_{BE(sat)2}$* | $I_C$ = –4.0 A, $I_B$ = –0.2 A | | | –1.5 | V |
| Collector capacitance | $C_{ob}$ | $V_{CB}$ = –10 V, $I_E$ = 0, f = 1.0 MHz | | 130 | | pF |
| Gain bandwidth product | $f_T$ | $V_{CE}$ = –10 V, $I_C$ = –0.5 A | | 80 | | MHz |
| Turn-on time | $t_{on}$ | $I_C$ = –3.0 A, $R_L$ = 17 Ω, $I_{B1}$ = –$I_{B2}$ = –0.15 A, $V_{CC}$ ≅ –50 V Refer to the test circuit. | | | 0.3 | μs |
| Storage time | $t_{stg}$ | | | | 1.5 | μs |
| Fall time | $t_f$ | | | | 0.3 | μs |

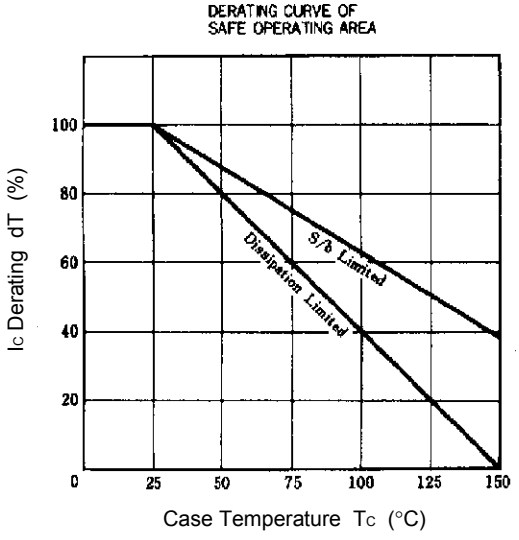
* Pulse test PW ≤ 350 μs, duty cycle ≤ 2%

## $h_{FE}$ CLASSIFICATION

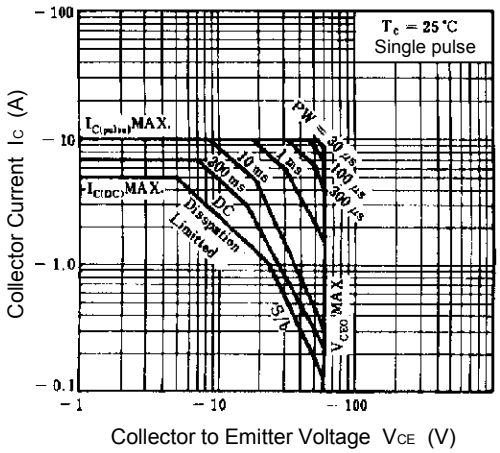
| Marking | M | L | K |
|---|---|---|---|
| $h_{FE2}$ | 100 to 200 | 150 to 300 | 200 to 400 |

## TYPICAL CHARACTERISTICS (Ta = 25°C)

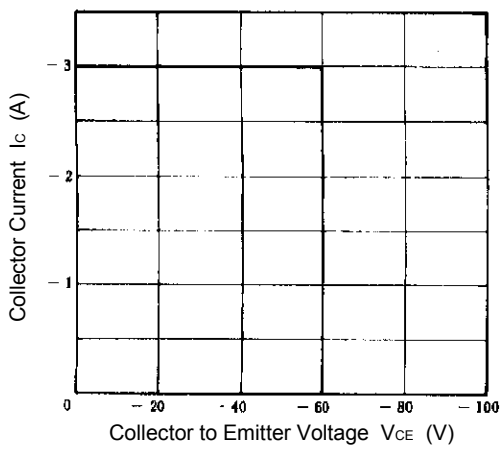


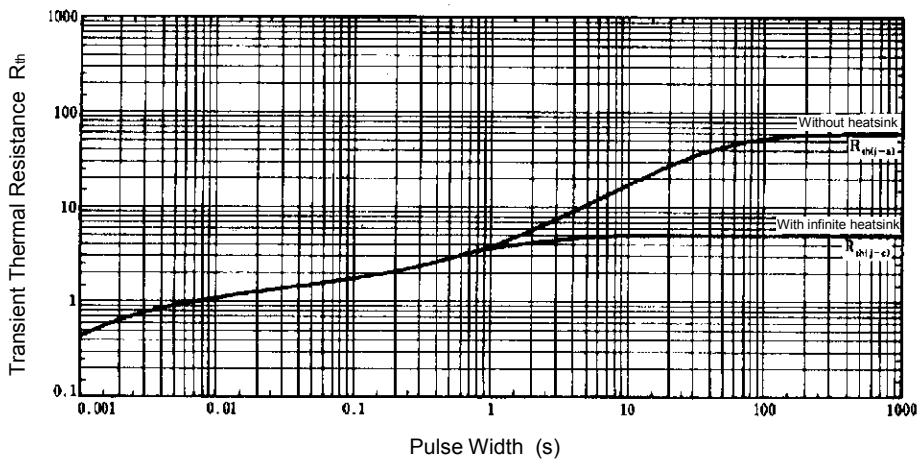
FORWARD BIAS SAFE OPERATING AREA



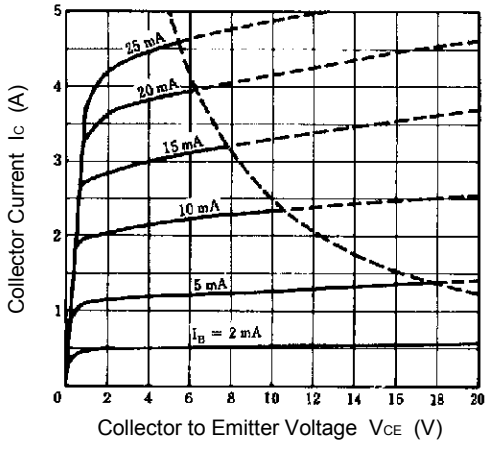

REVERSE BIAS SAFE OPERATING AREA



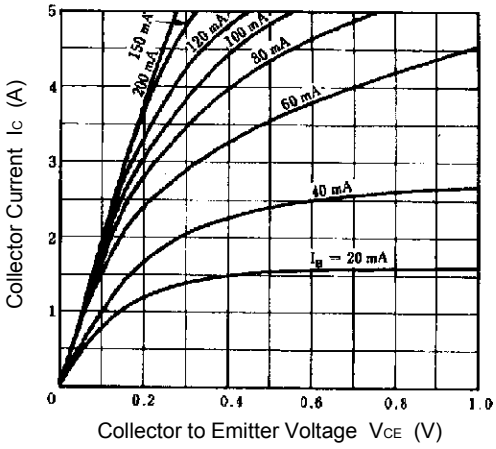

TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



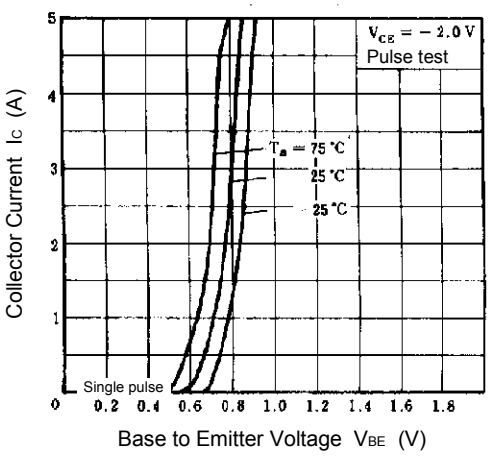

COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



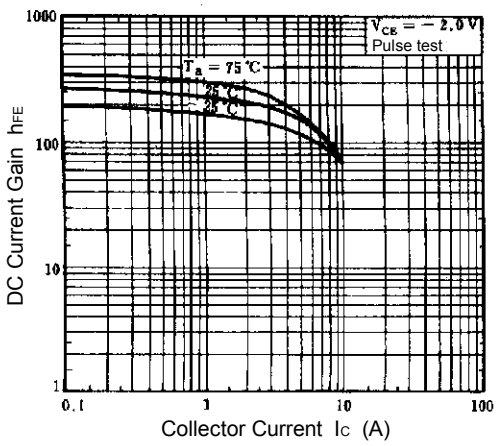

COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE

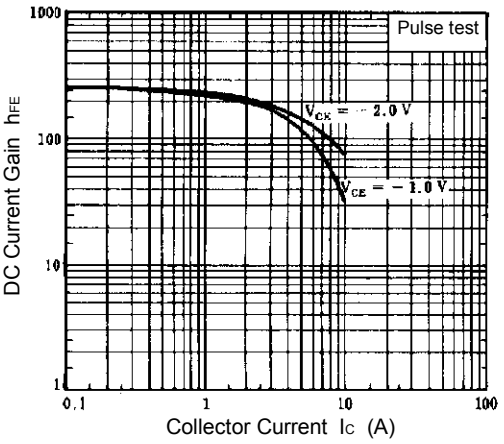



DC CURRENT GAIN vs. COLLECTOR CURRENT

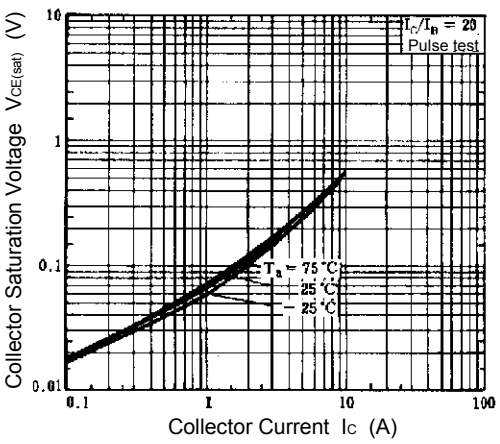



Pulse test

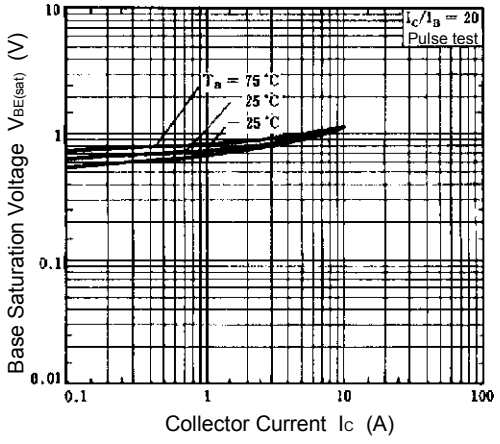
DC CURRENT GAIN vs.COLLECTOR CURRENT



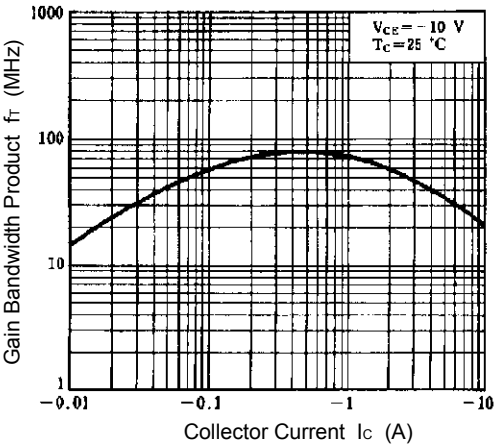

COLLECTOR SATURATION VOLTAGE vs.
COLLECTOR CURRENT

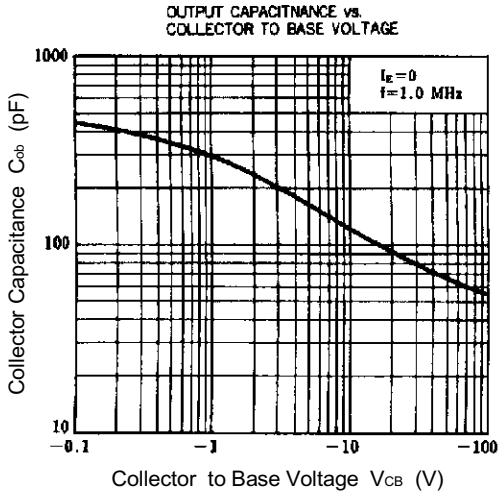


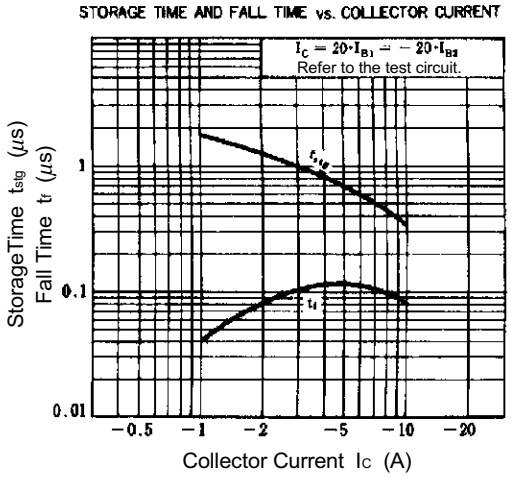

BASE SATURATION VOLTAGE vs.
COLLECTOR CURRENT



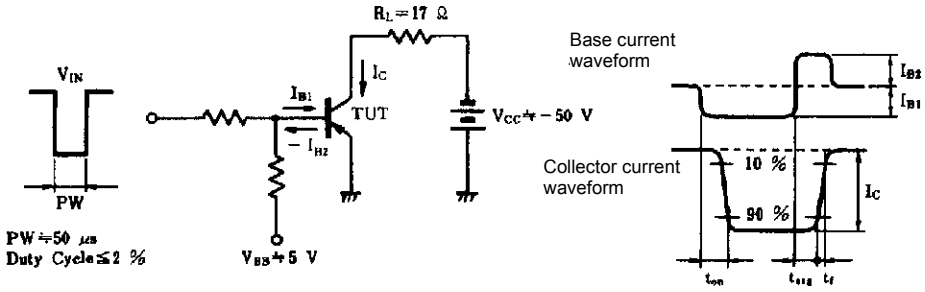

GAIN BANDWIDTH PROUCT vs.
COLLECTOR CURRENT






## SWITCHING TIME ($t_{on}$, $t_{stg}$, $t_f$) TEST CIRCUIT



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