

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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**Phase-out/Discontinued**

**NPN SILICON EPITAXIAL TRANSISTOR**

**DESCRIPTION**

The 2SD1583-Z is designed for Audio Frequency Amplifier and Switching, especially in Hybrid Integrated Circuits.

**FEATURES**

- High  $h_{FE}$ :  $h_{FE} = 800$  to  $3200$
- Low  $V_{CE(sat)}$ :  $V_{CE(sat)} = 0.18$  V TYP.

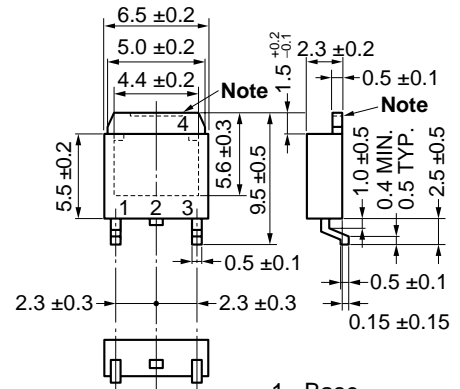
**ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )**

|  |                |             |                  |
|--|----------------|-------------|------------------|
| Collector to Base Voltage  | $V_{CBO}$      | 30          | V                |
| Collector to Emitter Voltage   | $V_{CEO}$      | 20          | V                |
| Base to Emitter Voltage  | $V_{EBO}$      | 5           | V                |
| Collector Current (DC)   | $I_{C(DC)}$    | 2           | A                |
| Collector Current (pulse) <sup>Note 1</sup>                            | $I_{C(pulse)}$ | 3           | A                |
| Total Power Dissipation ( $T_A = 25^\circ\text{C}$ ) <sup>Note 2</sup> | $P_T$          | 2.0         | W                |
| Junction Temperature   | $T_j$          | 150         | $^\circ\text{C}$ |
| Storage Temperature  | $T_{stg}$      | -55 to +150 | $^\circ\text{C}$ |

**Notes 1.**  $PW \leq 10$  ms, Duty Cycle  $\leq 50\%$

**2.** When mounted on ceramic substrate of  $7.5\text{ cm}^2 \times 0.7\text{ mm}$

<R> **PACKAGE DRAWING (Unit: mm)**



1. Base
2. Collector
3. Emitter
4. Collector Fin

TO-252 (MP-3Z)

**Note** The depth of notch at the top of the fin is from 0 to 0.2 mm.

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

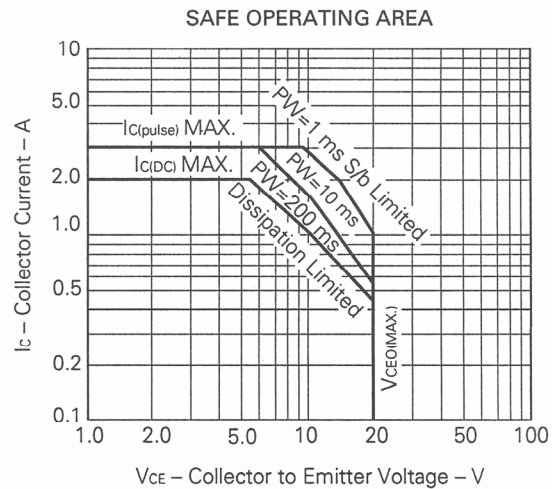
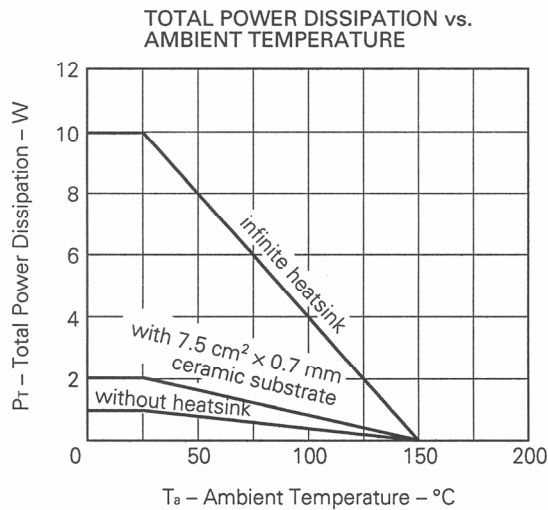
| CHARACTERISTIC               | SYMBOL                 | MIN. | TYP.  | MAX.  | UNIT | TEST CONDITIONS   |
|------------------------------|------------------------|------|-------|-------|------|---|
| Collector Cutoff Current     | I <sub>cBO</sub>       |      |       | 10    | μA   | V <sub>CB</sub> = 20 V, I <sub>E</sub> = 0  |
| Emitter Cutoff Current       | I <sub>EBO</sub>       |      |       | 10    | μA   | V <sub>EB</sub> = 5.0 V, I <sub>C</sub> = 0   |
| DC Current Gain              | h <sub>FE1</sub> *     | 600  | 2 000 |       |      | V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 50 mA   |
| DC Current Gain              | h <sub>FE2</sub> *     | 800  | 2 000 | 3 200 |      | V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 0.5 A   |
| DC Current Gain              | h <sub>FE3</sub> *     | 500  | 1 400 |       |      | V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 2.0 A   |
| Collector Saturation Voltage | V <sub>CE(sat)</sub> * |      | 0.18  | 0.5   | V    | I <sub>C</sub> = 1.0 A, I <sub>B</sub> = 10 mA  |
| Base Saturation Voltage      | V <sub>BE(sat)</sub> * |      | 0.85  | 1.2   | V    | I <sub>C</sub> = 1.0 A, I <sub>B</sub> = 10 mA  |
| Gain Bandwidth Product       | f <sub>T</sub>         |      | 270   |       | MHz  | V <sub>CE</sub> = 5.0 V, I <sub>E</sub> = 100 mA  |
| Output Capacitance           | C <sub>ob</sub>        |      | 20    |       | pF   | V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0, f = 1.0 MHz                                   |
| Turn-on Time                 | t <sub>on</sub>        |      | 0.6   |       | μs   | I <sub>C</sub> = 1A, V <sub>CC</sub> = 10 V<br>I <sub>B1</sub> = -I <sub>B2</sub> = 10 mA |
| Storage Time                 | t <sub>stg</sub>       |      | 1.5   |       | μs   |   |
| Fall Time                    | t <sub>f</sub>         |      | 0.3   |       | μs   |   |

\* Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2 %

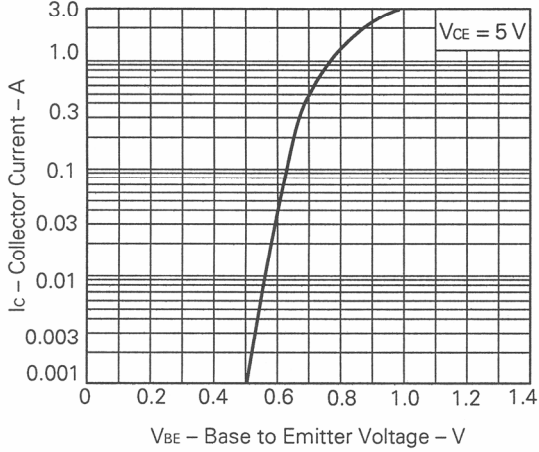
**h<sub>FE</sub> Classification**

| MARKING          | M            | L              | K              |
|------------------|--------------|----------------|----------------|
| h <sub>FE2</sub> | 800 to 1 600 | 1 000 to 2 000 | 1 600 to 3 200 |

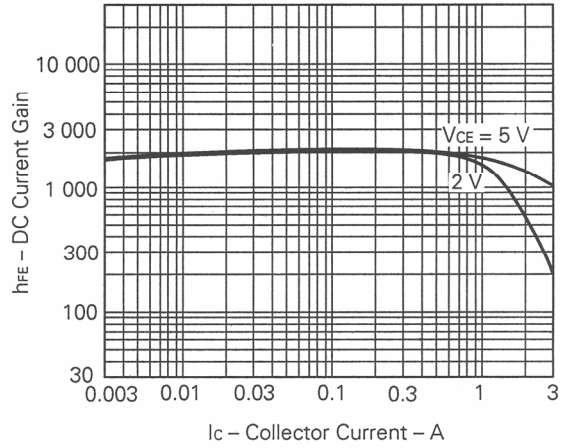
**TYPICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)**



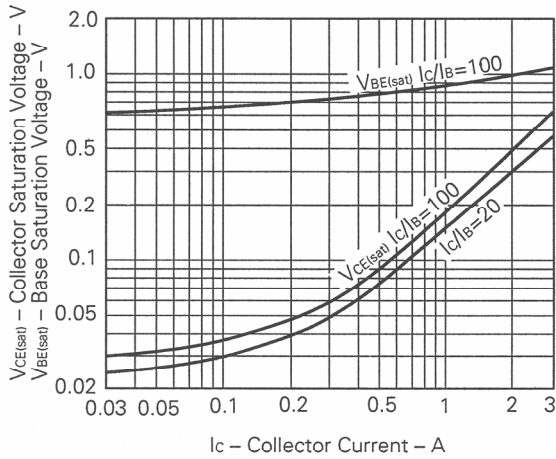
BASE TO EMITTER VOLTAGE vs. COLLECTOR CURRENT



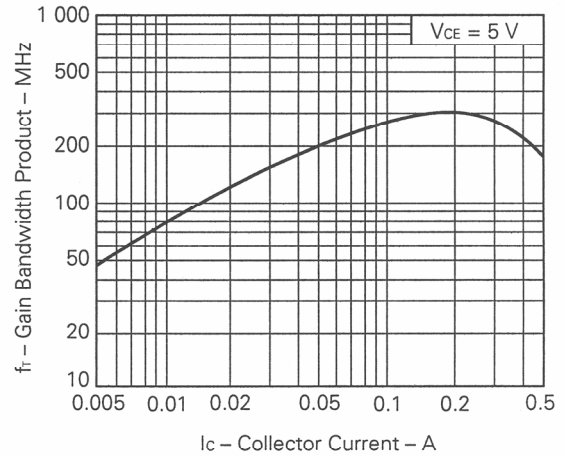
DC CURRENT GAIN vs. COLLECTOR CURRENT



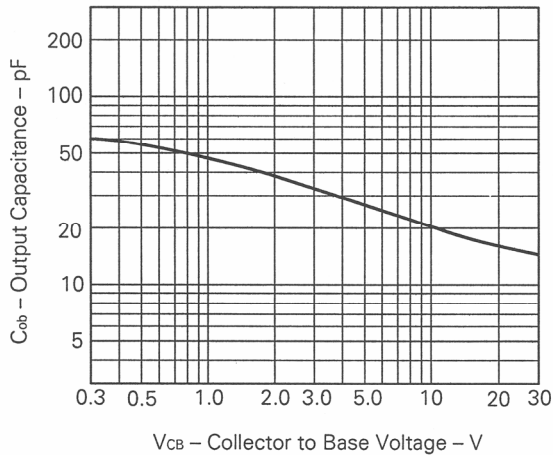
COLLECTOR TO BASE SATURATION VOLTAGE vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



OUTPUT CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



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