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To our customers,

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

April 1st, 2010
Renesas Electronics Corporation

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

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DATA SHEET

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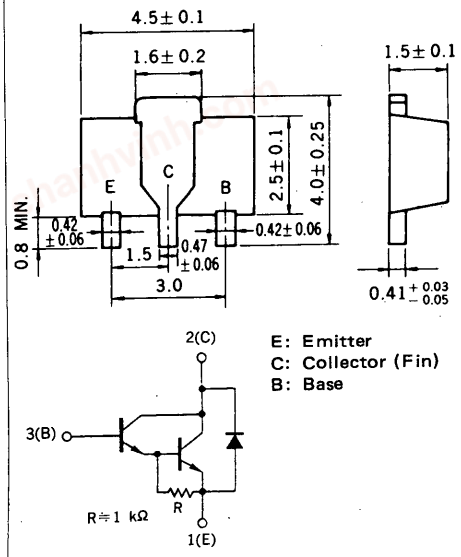
# SILICON TRANSISTOR
# 2SD1699

## NPN SILICON EPITAXIAL TRANSISTOR
## POWER MINI MOLD

### DESCRIPTION

The 2SD1699 is NPN silicon epitaxial darlington transistor designed for pulse motor, printer driver, solenoid driver. Circuits.

### PACKAGE DIMENSIONS
in millimeters




### FEATURES

- High DC Current gain.
- Includes a dumpter diode at E-C.

### ABSOLUTE MAXIMUM RATINGS

| | | | |
|---|---|---|---|
| Maximum Voltages and Currents ($T_a$ = 25 °C) | | | |
| Collector to Base Voltage | $V_{CBO}$ | 100 | V |
| Collector to Emitter Voltage | $V_{CEO}$ | 80 | V |
| Emitter to Base Voltage | $V_{EBO}$ | 8.0 | V |
| Collector Current (DC) | $I_C$ | ±0.8 | A |
| Collector Current (Pulse)* | $I_C$ | ±1.2 | A |
| Maximum Power Dissipation | | | |
| Total Power Dissipation at 25 °C Ambient Temperature** | $P_T$ | 2.0 | W |
| Maximum Temperatures | | | |
| Junction Temperature | $T_j$ | 150 | °C |
| Storage Temperature Range | $T_{stg}$ | −55 to +150 | °C |

* PW ≦ 10 ms, Duty Cycle ≦ 50 %

** When mounted on ceramic substrate of 16 cm² x 0.7 mm

### ELECTRICAL CHARACTERISTICS ($T_a$ = 25 °C)

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDICTIONS |
|---|---|---|---|---|---|---|
| DC Current Gain | $h_{FE1}$*** | 4000 | | 50000 | | $V_{CE}$ = 2.0 V, $I_C$ = 0.3 A |
| DC Current Gain | $h_{FE2}$*** | 1000 | | | | $V_{CE}$ = 2.0 V, $I_C$ = 0.8 A |
| Turn-on Time | $t_{on}$ | | 0.5 | | μs | $I_C$ = 0.5 A<br>$I_{B1}$ = −$I_{B2}$ = 1.0 mA<br>$V_{CC}$ = 40 V, $R_L$ = 80 Ω |
| Storage Time | $t_{stg}$ | | 2.5 | | μs | |
| Fall Time | $t_f$ | | 1.0 | | μs | |
| Collector Saturation Voltage | $V_{CE(sat)}$*** | | 0.9 | 1.2 | V | $I_C$ = 0.5 A, $I_B$ = 1.0 mA |
| Base Saturation Voltage | $V_{BE(sat)}$*** | | 1.5 | 2.0 | V | $I_C$ = 0.5 A, $I_B$ = 1.0 mA |
| Collector to Base Voltage | $V_{CBO}$ | 100 | | | V | $I_C$ = 0.1 mA, $I_E$ = 0 |
| Collector to Emitter Voltage | $V_{CEO}$ | 80 | | | V | $I_C$ = 5.0 mA, $I_B$ = 0 |
| Collector Cutoff Current | $I_{CBO}$ | | | 1.0 | μA | $V_{CB}$ = 80 V, $I_E$ = 0 |
| Emitter Cutoff Current | $I_{EBO}$ | | | 1.0 | μA | $V_{EB}$ = 5.0 V, $I_C$ = 0 |

***Pulsed: PW ≦ 350 μs, Duty Cycle ≦ 2 %

$h_{FE}$ Classification

| MARKING | TR | TQ |
|---|---|---|
| $h_{FE}$ | 4000 to 12000 | 8000 to 50000 |

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Date Published November 1994 M
Printed in Japan

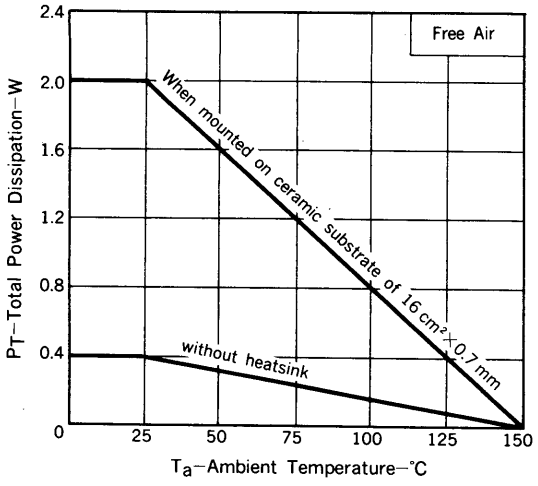
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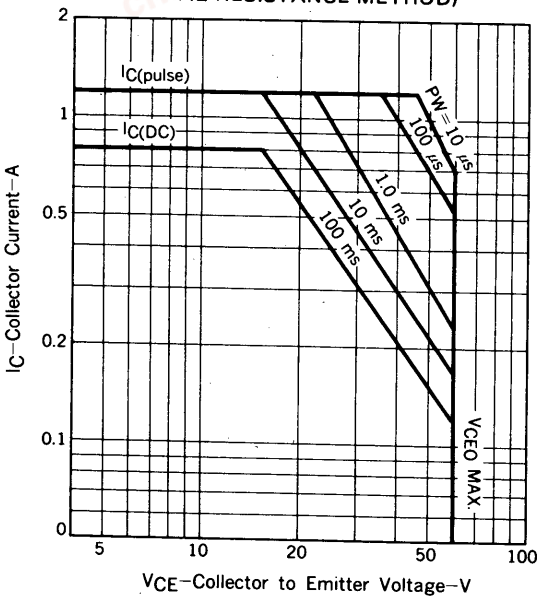


## TYPICAL CHARACTERISTICS ($T_a$ = 25 °C)

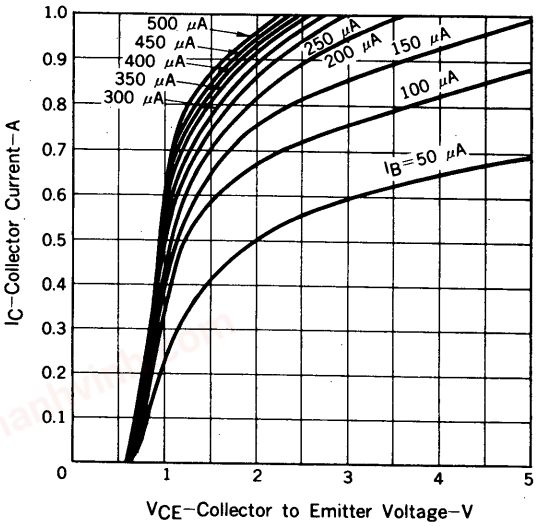
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



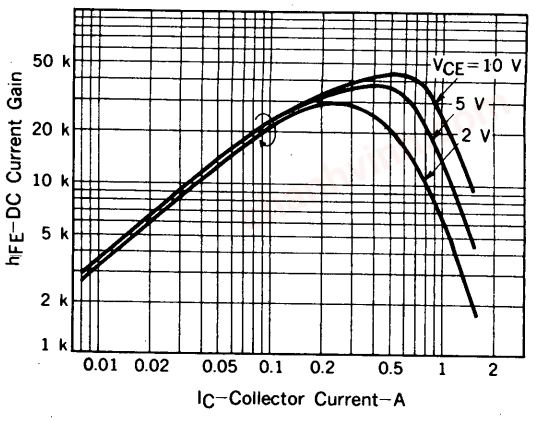

SAFE OPERATING AREAS (TRANSIENT THERMAL RESISTANCE METHOD)




COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



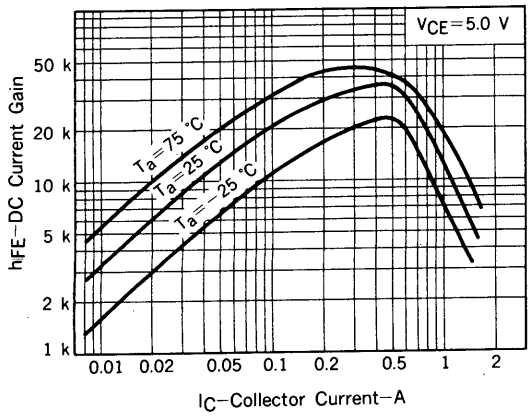

DC CURRENT GAIN vs. COLLECTOR CURRENT



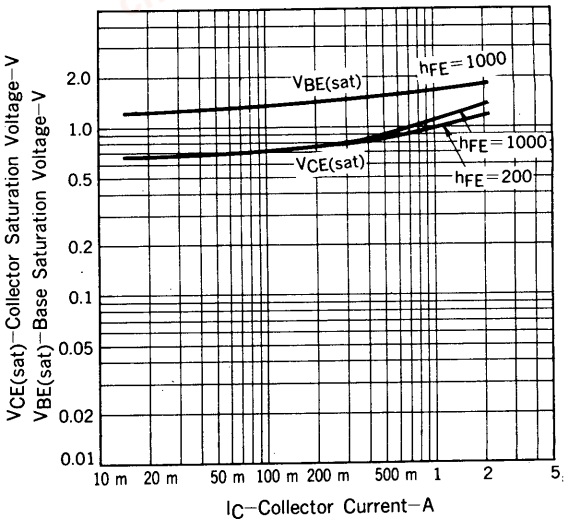
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DC CURRENT GAIN vs.
COLLECTOR CURRENT




BASE AND COLLECTOR SATURATION
VOLTAGE vs. COLLECTOR CURRENT




## REFERENCE

| Document Name | Document No. |
|---|---|
| NEC semiconductor device reliability/quality control system. | TEI-1202 |
| Quality grade on NEC semiconductor devices. | IEI-1209 |
| Semiconductor device mounting technology manual. | IEI-1207 |
| Semiconductor device package manual. | IEI-1213 |
| Guide to quality assurance for semiconductor devices. | MEI-1202 |
| Semiconductor selection guide. | MF-1134 |

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