

TOSHIBA Transistor Silicon NPN Triple Diffused Type (Darlington)

2SD1409A

High Voltage Switching Applications

- High DC current gain:  $h_{FE} = 600$  (min.) ( $V_{CE} = 2\text{ V}$ ,  $I_C = 2\text{ A}$ )
- Monolithic construction with built-in base-emitter shunt resistor

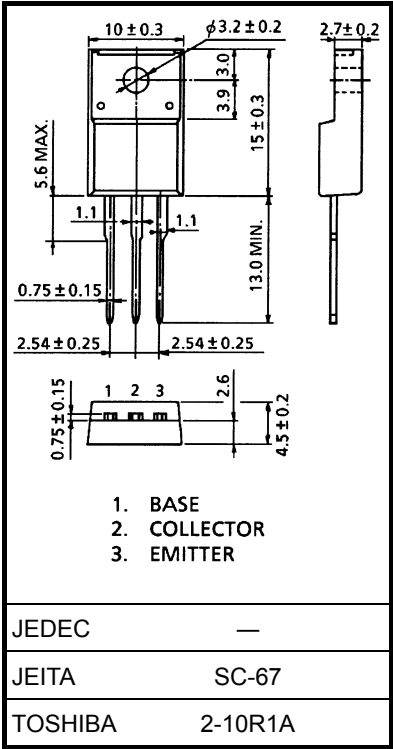
Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

| Characteristics             |                          | Symbol    | Rating     | Unit             |
|-----------------------------|--------------------------|-----------|------------|------------------|
| Collector-base voltage      |                          | $V_{CBO}$ | 600        | V                |
| Collector-emitter voltage   |                          | $V_{CEO}$ | 400        | V                |
| Emitter-base voltage        |                          | $V_{EBO}$ | 5          | V                |
| Collector current           |                          | $I_C$     | 6          | A                |
| Base current                |                          | $I_B$     | 1          | A                |
| Collector power dissipation | $T_a = 25^\circ\text{C}$ | $P_C$     | 2.0        | W                |
|                             | $T_c = 25^\circ\text{C}$ |           | 25         |                  |
| Junction temperature        |                          | $T_j$     | 150        | $^\circ\text{C}$ |
| Storage temperature range   |                          | $T_{stg}$ | -55 to 150 | $^\circ\text{C}$ |

Note1: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

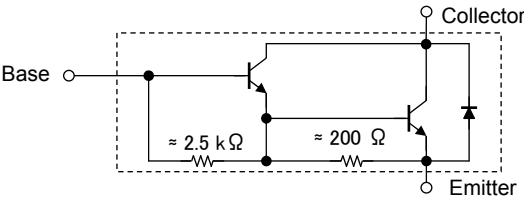
Industrial Applications

Unit: mm

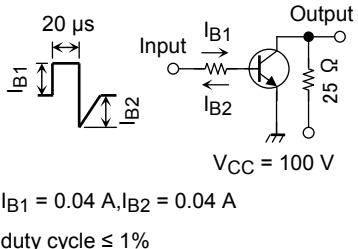


Weight: 1.7 g (typ.)

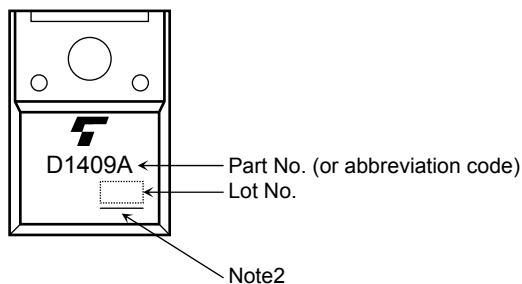
Equivalent Circuit



## Electrical Characteristics (Ta = 25°C)

| Characteristics                      |              | Symbol         | Test Condition   | Min | Typ. | Max | Unit |
|--------------------------------------|--------------|----------------|--|-----|------|-----|------|
| Collector cut-off current            |              | $I_{CBO}$      | $V_{CB} = 600\text{ V}, I_E = 0$   | —   | —    | 0.5 | mA   |
| Emitter cut-off current              |              | $I_{EBO}$      | $V_{EB} = 5\text{ V}, I_C = 0$   | —   | —    | 3   | mA   |
| Collector-emitter breakdown voltage  |              | $V_{(BR) CEO}$ | $I_C = 10\text{ mA}, I_B = 0$  | 400 | —    | —   | V    |
| DC current gain                      |              | $h_{FE} (1)$   | $V_{CE} = 2\text{ V}, I_C = 2\text{ A}$  | 600 | —    | —   |      |
|                                      |              | $h_{FE} (2)$   | $V_{CE} = 2\text{ V}, I_C = 4\text{ A}$  | 100 | —    | —   |      |
| Collector-emitter saturation voltage |              | $V_{CE (sat)}$ | $I_C = 4\text{ A}, I_B = 0.04\text{ A}$  | —   | —    | 2.0 | V    |
| Base-emitter saturation voltage      |              | $V_{BE (sat)}$ | $I_C = 4\text{ A}, I_B = 0.04\text{ A}$  | —   | —    | 2.5 | V    |
| Emitter-collector forward voltage    |              | $V_{ECF}$      | $I_E = 4\text{ A}, I_B = 0$  | —   | —    | 3.0 | V    |
| Collector output capacitance         |              | $C_{ob}$       | $V_{CB} = 50\text{ V}, I_E = 0, f = 1\text{ MHz}$                                  | —   | 35   | —   | pF   |
| Switching time                       | Turn-on time | $t_{on}$       |  | —   | 1    | —   | μs   |
|                                      | Storage time | $t_{stg}$      |  | —   | 8    | —   |      |
|                                      | Fall time    | $t_f$          |  | —   | 5    | —   |      |

## Marking

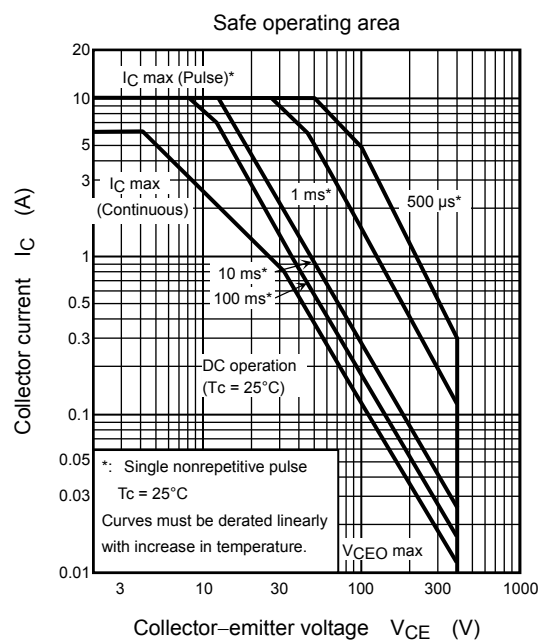
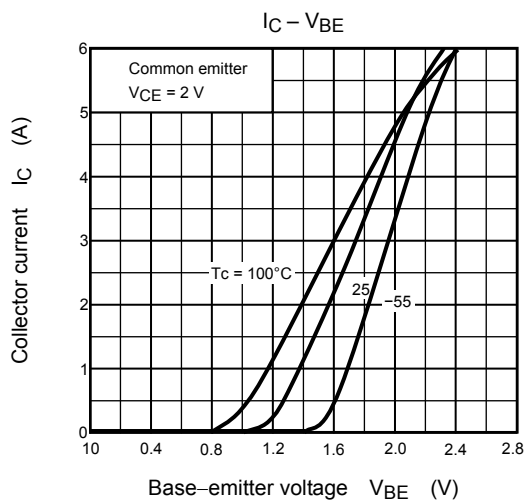
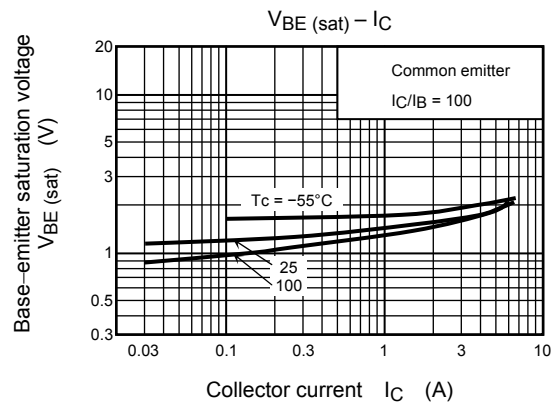
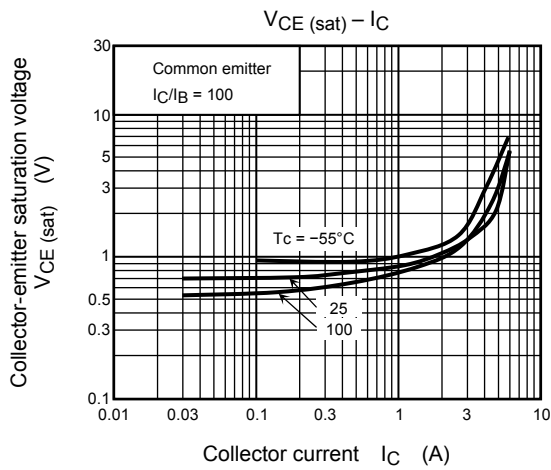
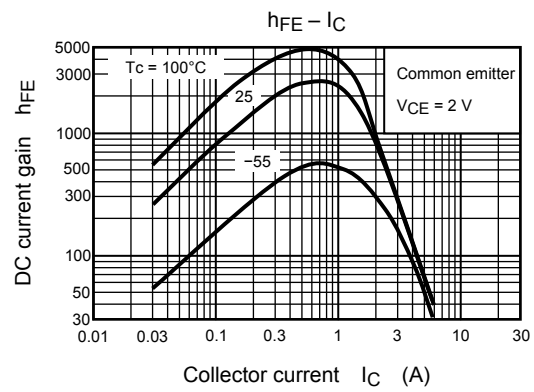
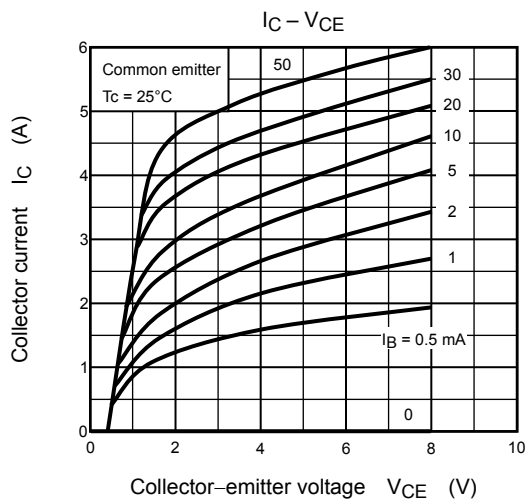


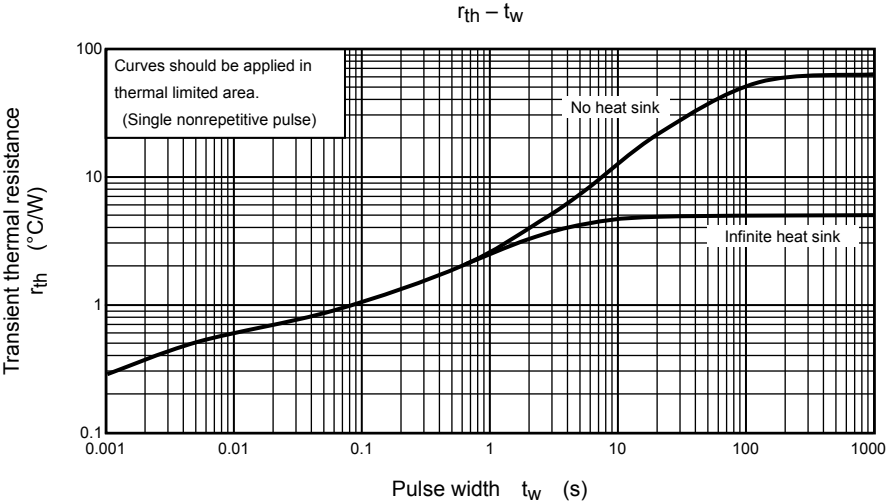
Note2: A line under a Lot No. identifies the indication of product Labels.

Not underlined: [[Pb]]/INCLUDES > MCV

Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.





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