

# 2SD1509

Micro-Motor Drive, Hammer Drive Applications

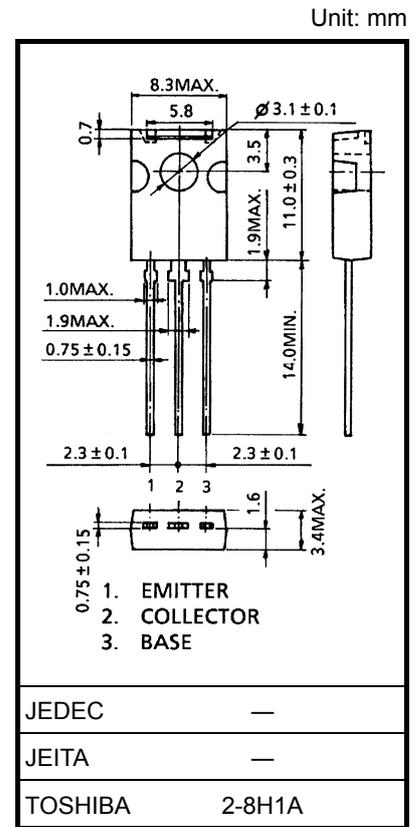
Switching Applications

Power Amplifier Applications

- High DC current gain:  $h_{FE} = 2000$  (min) ( $V_{CE} = 2\text{ V}$ ,  $I_C = 1\text{ A}$ )
- Low saturation voltage:  $V_{CE(sat)} = 1.5\text{ V}$  (max) ( $I_C = 1\text{ A}$ ,  $I_B = 1\text{ mA}$ )

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

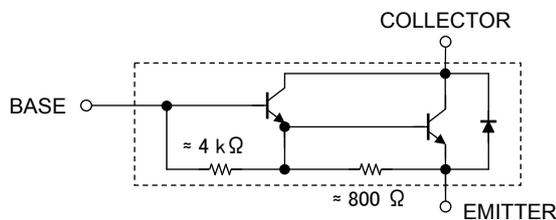
| Characteristics             |                          | Symbol    | Rating     | Unit             |
|-----------------------------|--------------------------|-----------|------------|------------------|
| Collector-base voltage      |                          | $V_{CBO}$ | 80         | V                |
| Collector-emitter voltage   |                          | $V_{CEO}$ | 80         | V                |
| Emitter-base voltage        |                          | $V_{EBO}$ | 8          | V                |
| Collector current           |                          | $I_C$     | 2          | A                |
| Base current                |                          | $I_B$     | 0.5        | A                |
| Collector power dissipation | $T_a = 25^\circ\text{C}$ | $P_C$     | 1.5        | W                |
|                             | $T_c = 25^\circ\text{C}$ |           | 10         |                  |
| Junction temperature        |                          | $T_j$     | 150        | $^\circ\text{C}$ |
| Storage temperature range   |                          | $T_{stg}$ | -55 to 150 | $^\circ\text{C}$ |



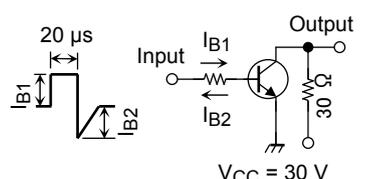
Weight: 0.82 g (typ.)

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).

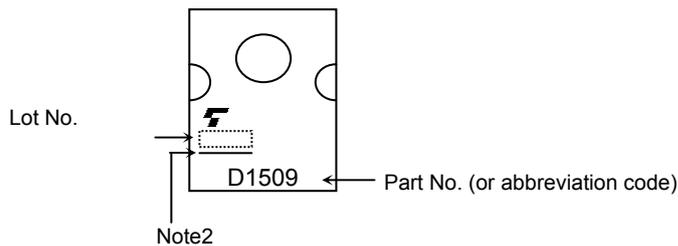
## Equivalent Circuit



## Electrical Characteristics (Ta = 25°C)

| Characteristics                      |              | Symbol        | Test Condition   | Min  | Typ. | Max | Unit          |
|--------------------------------------|--------------|---------------|--|------|------|-----|---------------|
| Collector cut-off current            |              | $I_{CBO}$     | $V_{CB} = 80\text{ V}, I_E = 0$  | —    | —    | 10  | $\mu\text{A}$ |
| Emitter cut-off current              |              | $I_{EBO}$     | $V_{EB} = 8\text{ V}, I_C = 0$   | —    | —    | 4   | $\text{mA}$   |
| Collector-emitter breakdown voltage  |              | $V_{(BR)CEO}$ | $I_C = 10\text{ mA}, I_B = 0$  | 80   | —    | —   | $\text{V}$    |
| DC current gain                      |              | $h_{FE}$      | $V_{CE} = 2\text{ V}, I_C = 1\text{ A}$  | 2000 | —    | —   |               |
| Collector-emitter saturation voltage |              | $V_{CE(sat)}$ | $I_C = 1\text{ A}, I_B = 1\text{ mA}$  | —    | —    | 1.5 | $\text{V}$    |
| Base-emitter saturation voltage      |              | $V_{BE(sat)}$ | $I_C = 1\text{ A}, I_B = 1\text{ mA}$  | —    | —    | 2.0 | $\text{V}$    |
| Transition frequency                 |              | $f_T$         | $V_{CE} = 2\text{ V}, I_C = 0.5\text{ A}$  | —    | 100  | —   | $\text{MHz}$  |
| Collector output capacitance         |              | $C_{ob}$      | $V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$                                  | —    | 20   | —   | $\text{pF}$   |
| Switching time                       | Turn-on time | $t_{on}$      |  | —    | 0.4  | —   | $\mu\text{s}$ |
|                                      | Storage time | $t_{stg}$     |  | —    | 4.0  | —   |               |
|                                      | Fall time    | $t_f$         |  | —    | 0.6  | —   |               |

## Marking

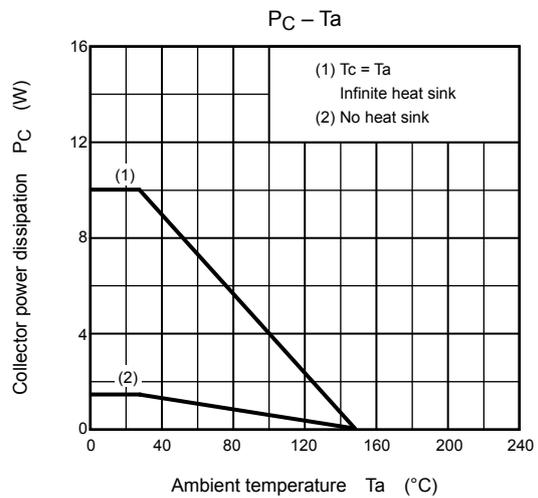
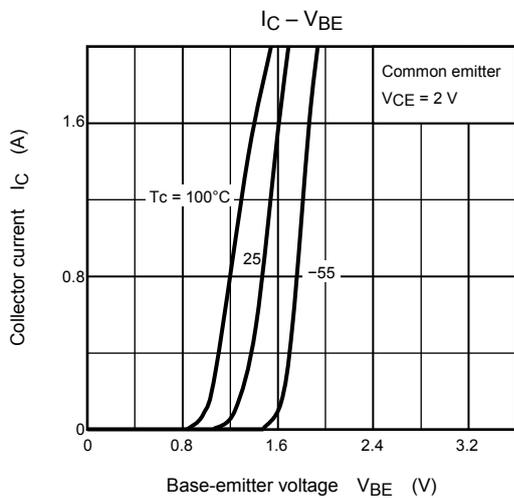
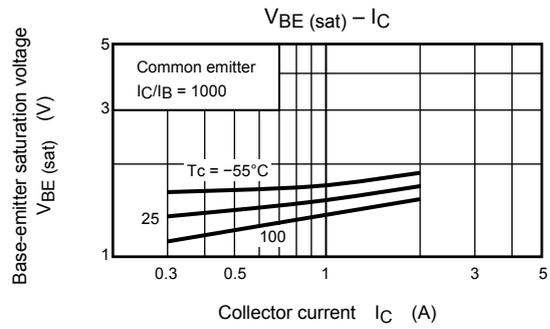
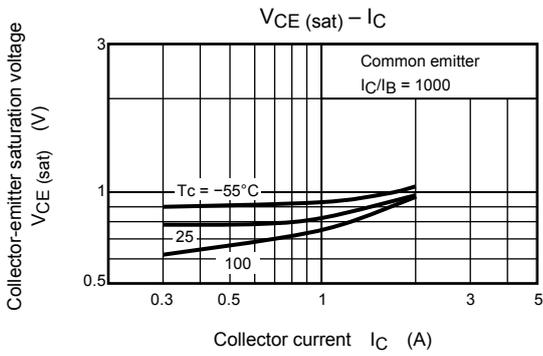
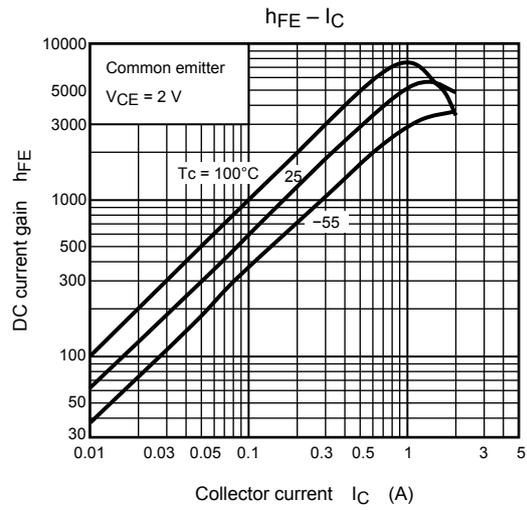
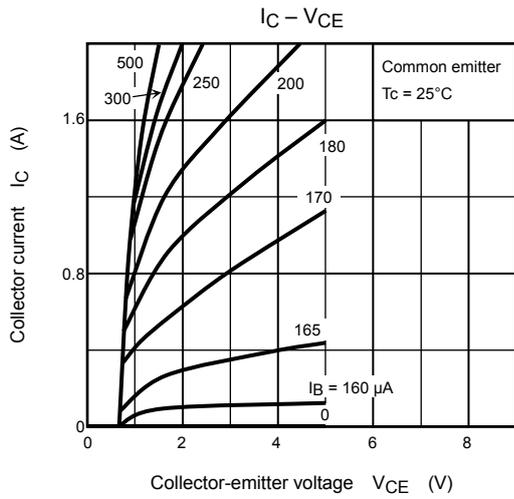


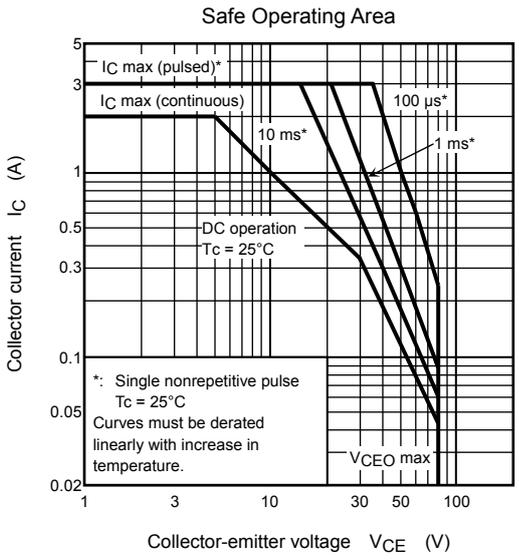
Note2: A line under a Lot No. identifies the indication of product Labels.

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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