

TOSHIBA Field Effect Transistor Silicon NPN Epitaxial Type (PCT Process) (Darlington)

# 2SD1784

Micro Motor Drive, Hammer Drive Applications

Switching Applications

Power Amplifier Applications

- High DC current gain:  $h_{FE} = 4000$  (min) ( $V_{CE} = 2$  V,  $I_C = 150$  mA)
- Low saturation voltage:  $V_{CE(sat)} = 1.5$  V (max) ( $I_C = 1$  A,  $I_B = 1$  mA)

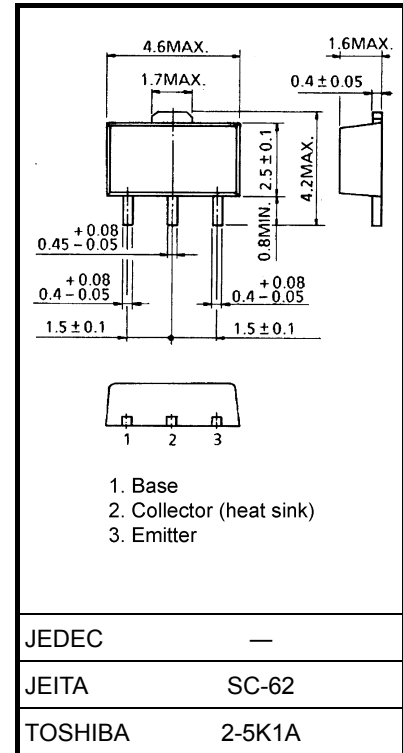
## Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	30	V
Collector-emitter voltage	$V_{CEO}$	30	V
Emitter-base voltage	$V_{EBO}$	10	V
Collector current	$I_C$	1.5	A
Base current	$I_B$	50	mA
Collector power dissipation	$P_C$ (Note 1)	1000	mW
Junction temperature	$T_j$	150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55 to 150	$^\circ\text{C}$

Note 1: 2SD1784 mounted on a ceramic substrate ( $250\text{ mm}^2 \times 0.8\text{ mm}$ )

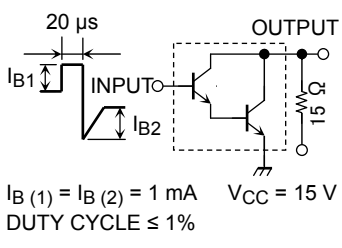
Note 2: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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).

Unit: mm

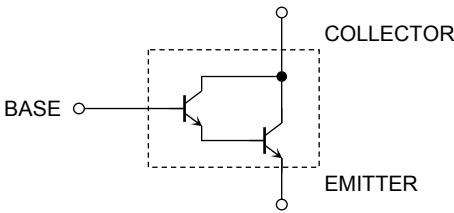


Weight: 0.05 g (typ.)

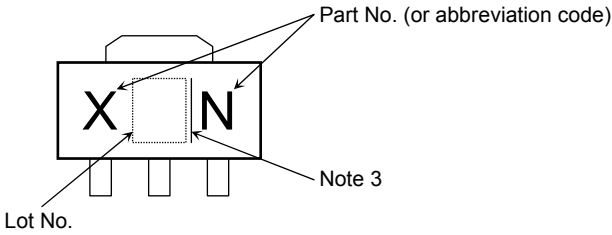
**Electrical Characteristics (Ta = 25°C)**

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		$I_{CBO}$	$V_{CB} = 30\text{ V}, I_E = 0$	—	—	10	$\mu\text{A}$
Emitter cut-off current		$I_{EBO}$	$V_{EB} = 10\text{ V}, I_C = 0$	—	—	10	$\mu\text{A}$
Collector-emitter breakdown voltage		$V_{(BR)CEO}$	$I_C = 10\text{ mA}, I_B = 0$	30	—	—	V
DC current gain		$h_{FE}$	$V_{CE} = 2\text{ V}, I_C = 150\text{ mA}$	4000	—	—	—
Collector-emitter saturation voltage		$V_{CE(sat)}$	$I_C = 1\text{ A}, I_B = 1\text{ mA}$	—	—	1.5	V
Base-emitter saturation voltage		$V_{BE(sat)}$	$I_C = 1\text{ A}, I_B = 1\text{ mA}$	—	—	2.2	V
Switching time	Turn-on time	$t_{on}$	 <p><math>I_{B(1)} = I_{B(2)} = 1\text{ mA}</math> DUTY CYCLE <math>\leq 1\%</math> <math>V_{CC} = 15\text{ V}</math></p>	—	0.20	—	$\mu\text{s}$
	Storage time	$t_{stg}$		—	0.6	—	
	Fall time	$t_f$		—	0.3	—	

**Equivalent Circuit**



**Marking**

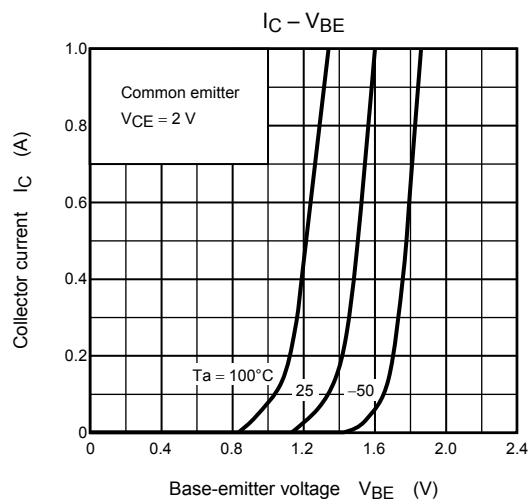
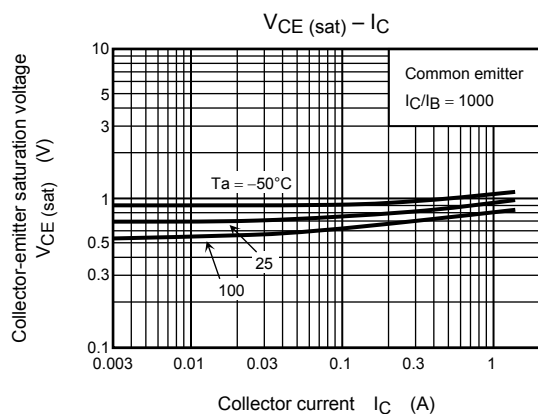
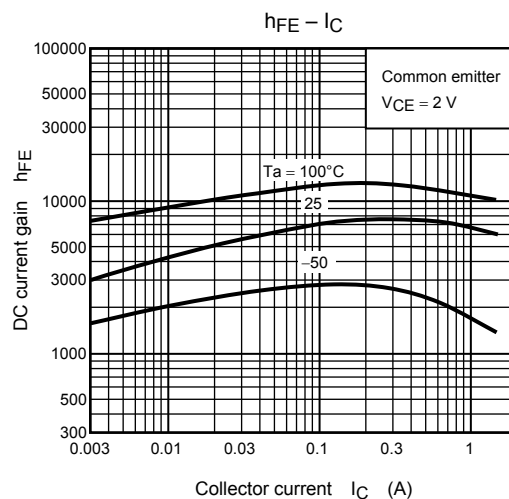
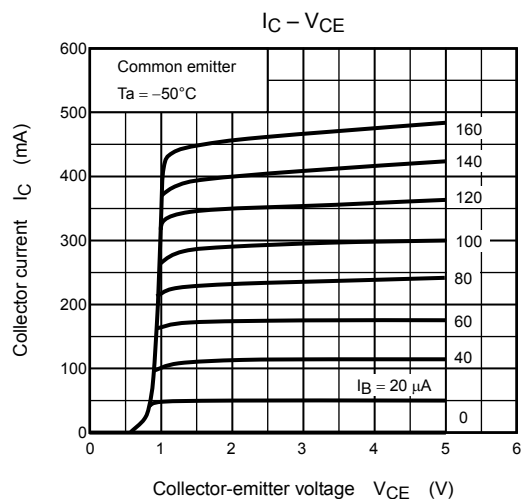
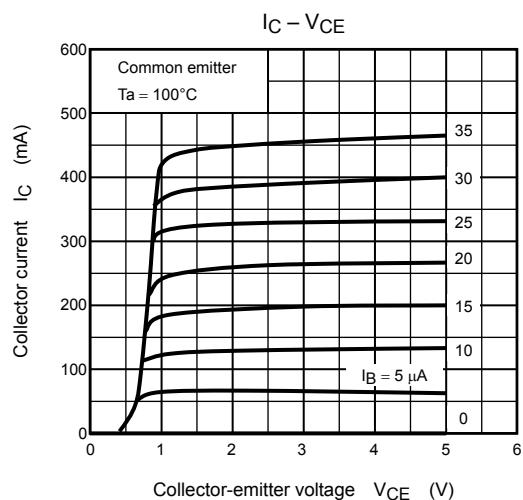
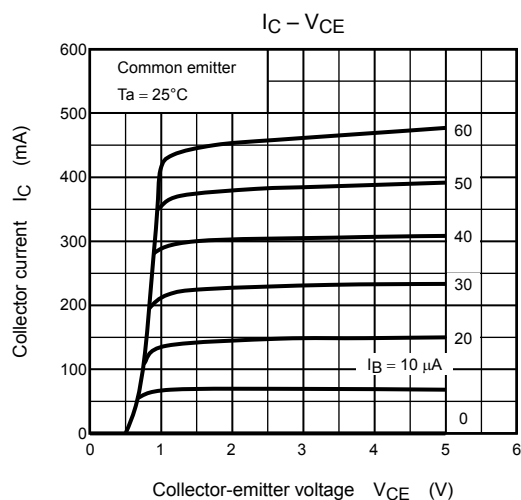


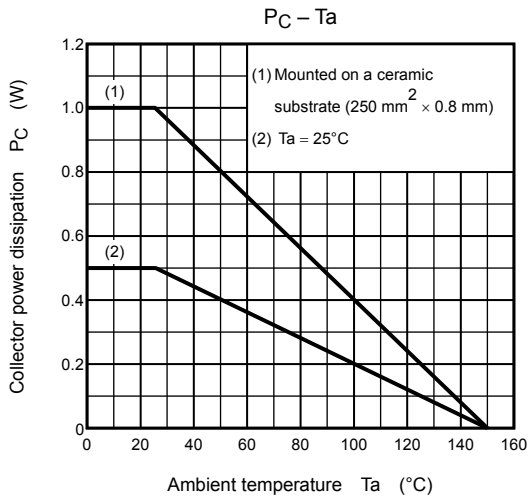
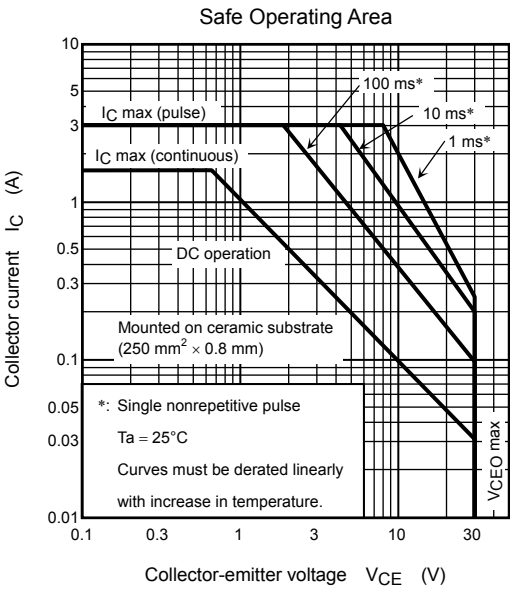
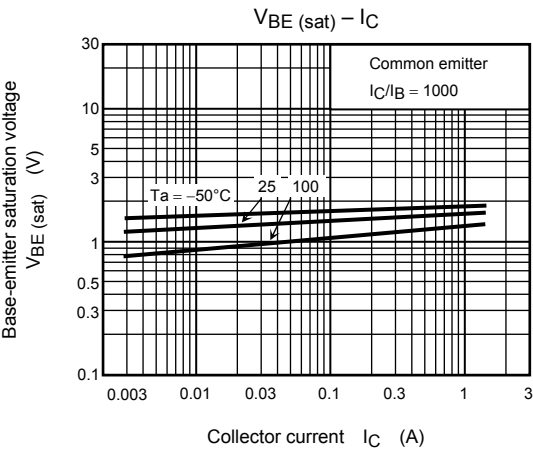
Note 3: A line beside a Lot No. identifies the indication of product Labels.

Without a line: [[Pb]]/INCLUDES > MCV

With a line: [[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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