

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

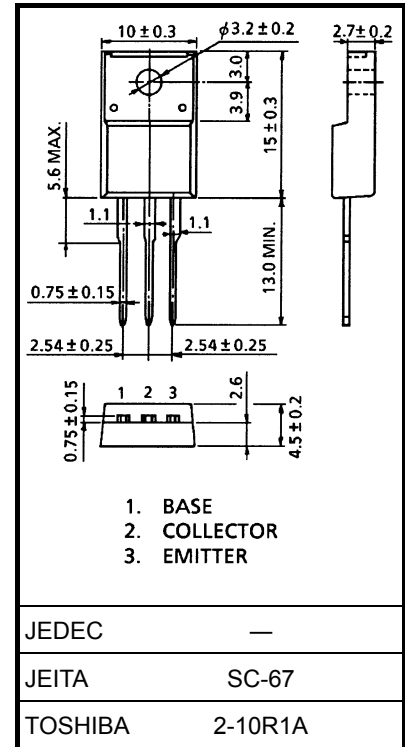
## Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

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).

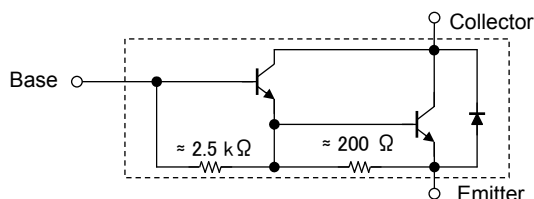
## Industrial Applications

Unit: mm

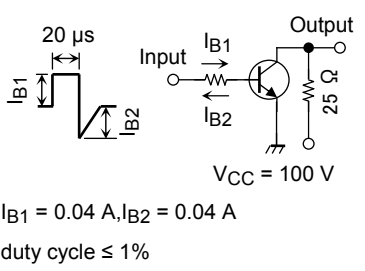


Weight: 1.7 g (typ.)

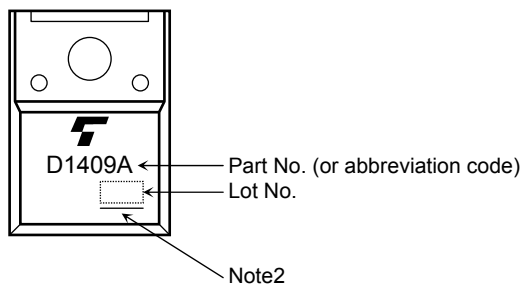
## Equivalent Circuit



## 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	—	$\mu\text{s}$
	Storage time	$t_{stg}$		—	8	—	
	Fall time	$t_f$		$I_{B1} = 0.04\text{ A}, I_{B2} = 0.04\text{ A}$ duty cycle $\leq 1\%$	—	5	

## Marking

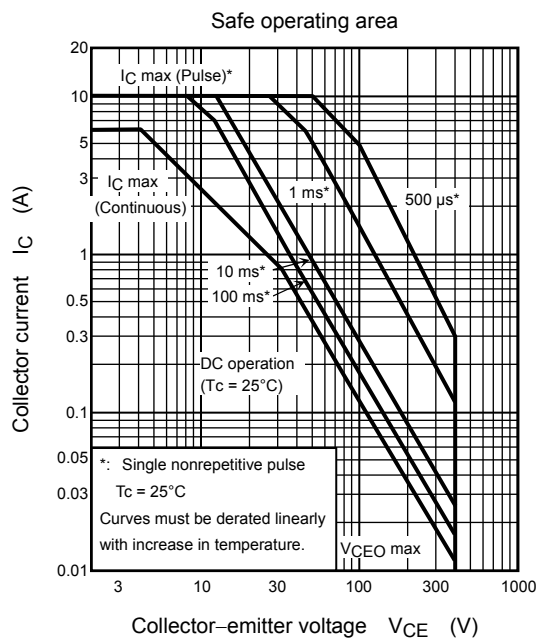
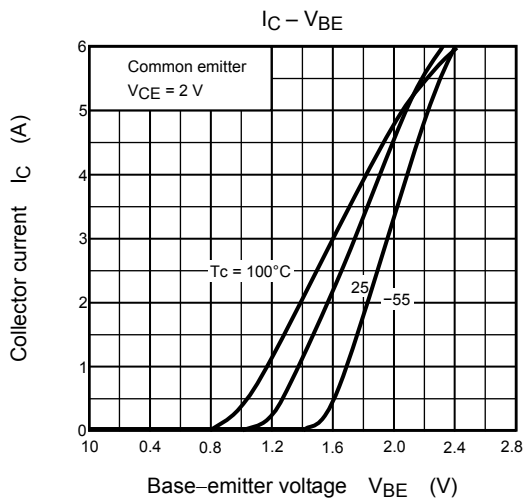
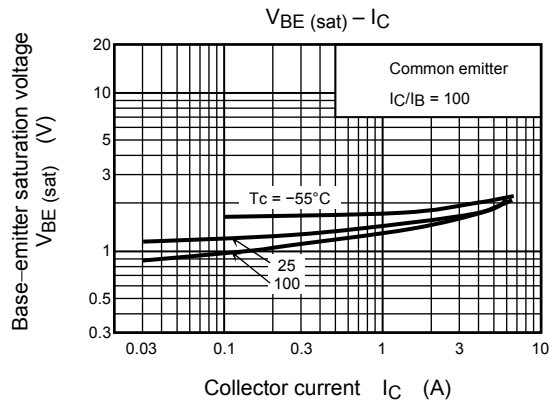
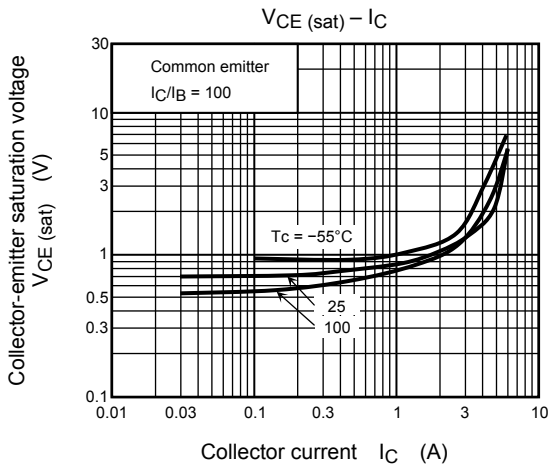
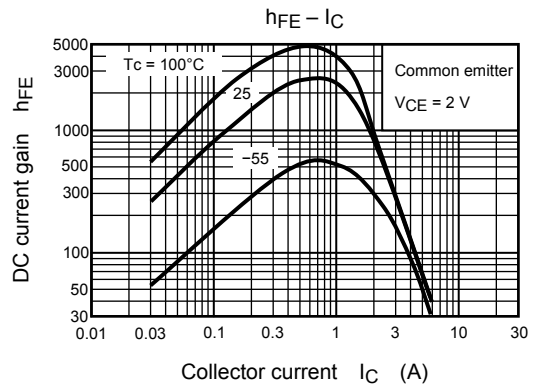
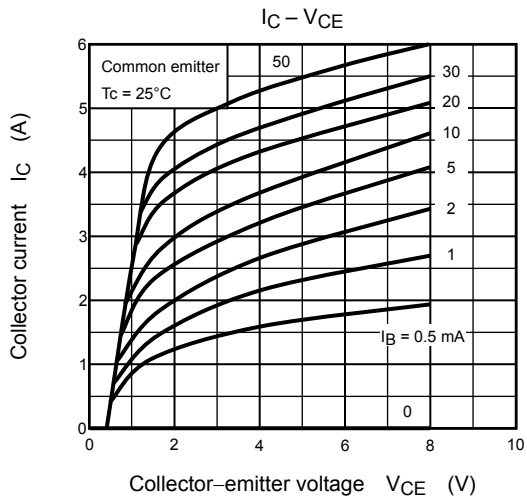


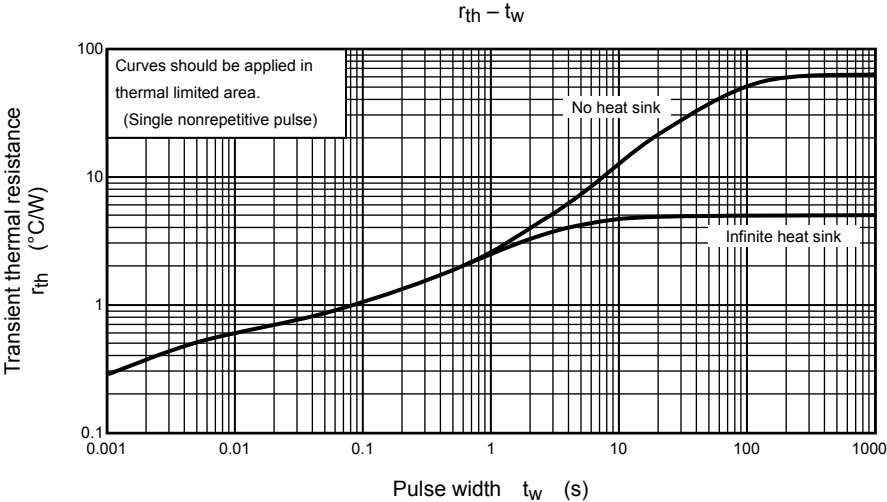
Note2: A line under a Lot No. identifies the indication of product Labels.

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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