

TOSHIBA Transistor Silicon PNP Epitaxial Type

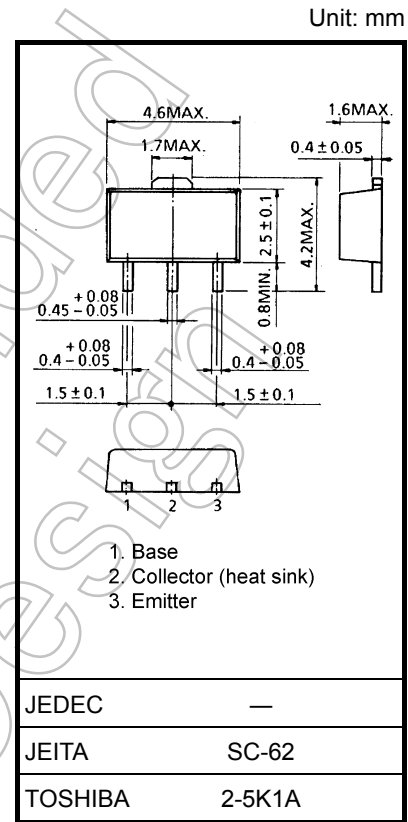
# 2SA2069

High-Speed Switching Applications  
DC-DC Converter Applications

- High DC current gain:  $h_{FE} = 200$  to  $500$  ( $I_C = -0.15$  A)
- Low collector-emitter saturation voltage:  $V_{CE(sat)} = -0.14$  V (max)
- High-speed switching:  $t_f = 37$  ns (typ.)

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

Characteristics		Symbol	Rating	Unit
Collector-base voltage		$V_{CBO}$	-20	V
Collector-emitter voltage		$V_{CEO}$	-20	V
Emitter-base voltage		$V_{EBO}$	-7	V
Collector current	DC	$I_C$	-1.5	A
	Pulse	$I_{CP}$	-2.5	
Base current		$I_B$	-150	mA
Collector power dissipation	$t = 10$ s	$P_C$	2.0	W
	DC	(Note 1)	1.0	
Junction temperature		$T_j$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$



Weight: 0.05 g (typ.)

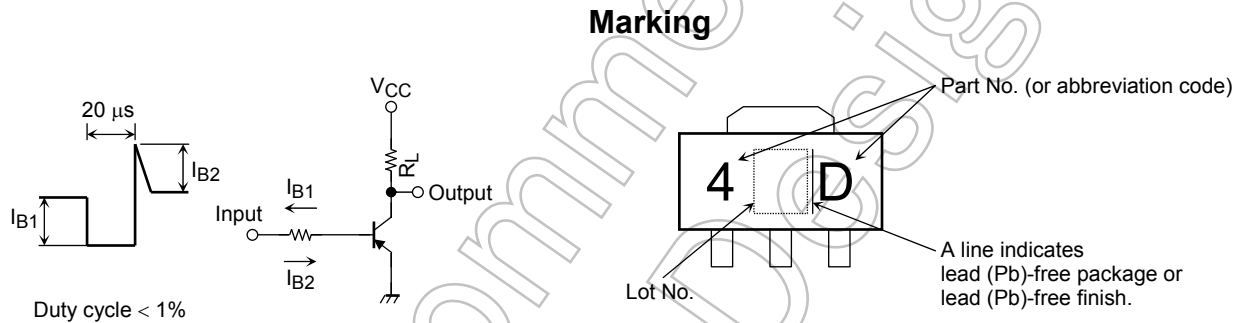
Note 1: Mounted on an FR4 board (glass epoxy, 1.6 mm thick, Cu area: 645 mm<sup>2</sup>)

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.

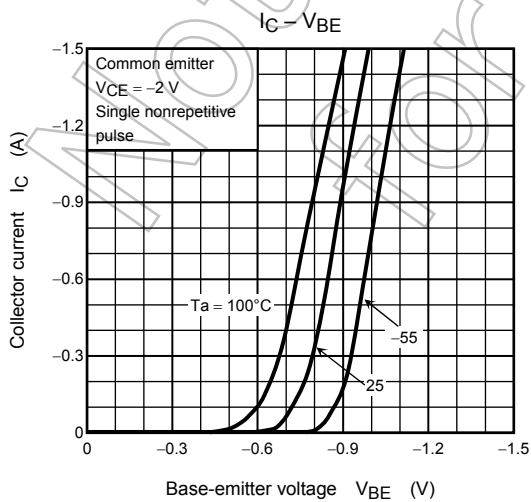
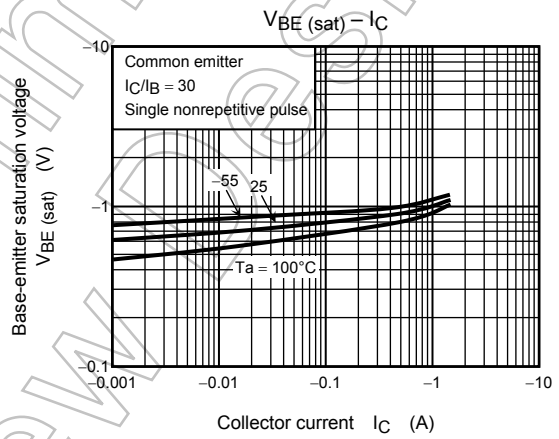
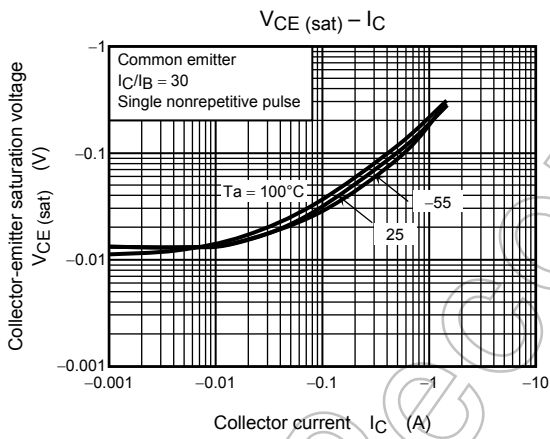
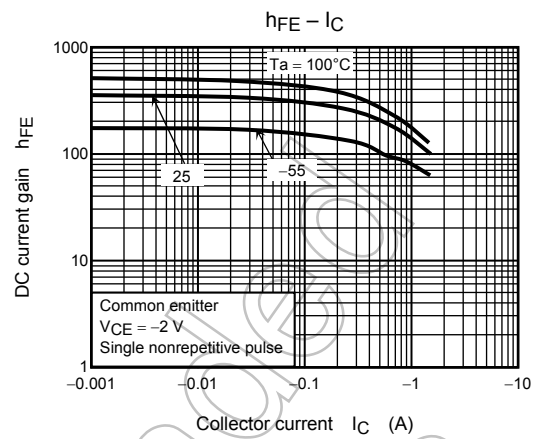
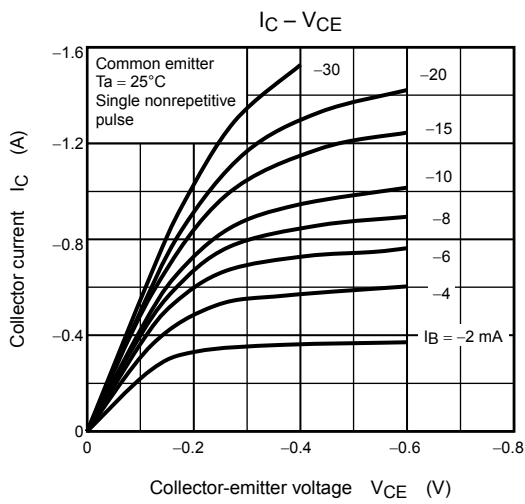
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

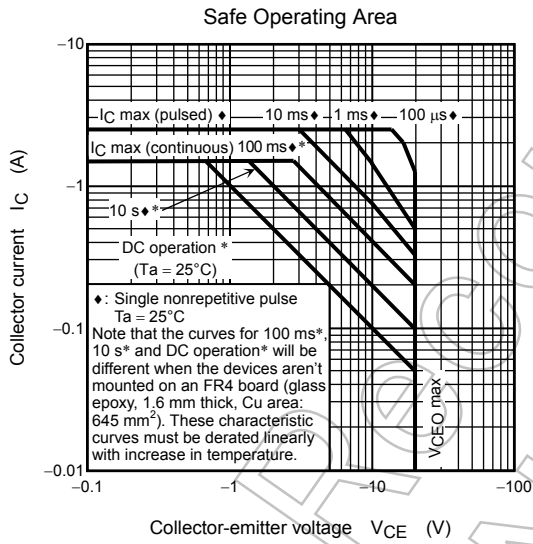
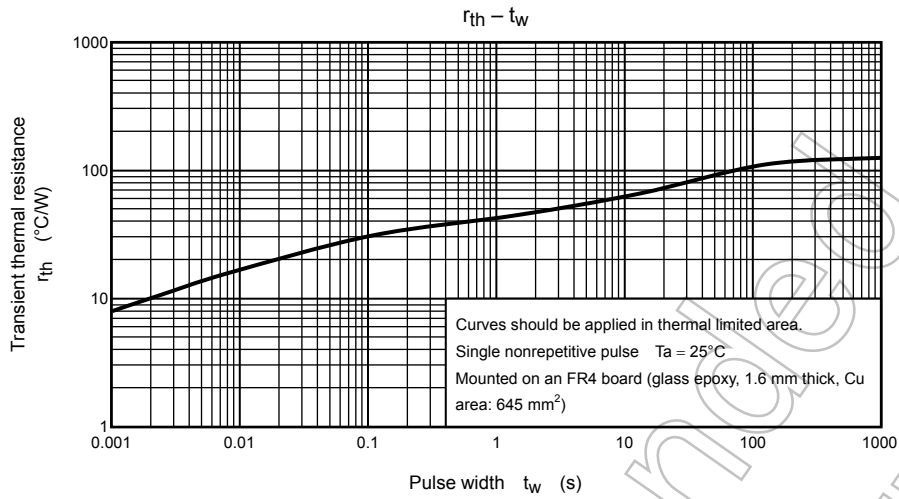
**Electrical Characteristics (Ta = 25°C)**

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		$I_{CBO}$	$V_{CB} = -20\text{ V}, I_E = 0$	—	—	-100	nA
Emitter cut-off current		$I_{EBO}$	$V_{EB} = -7\text{ V}, I_C = 0$	—	—	-100	nA
Collector-emitter breakdown voltage		$V_{(BR)CEO}$	$I_C = -10\text{ mA}, I_B = 0$	-20	—	—	V
DC current gain	$h_{FE(1)}$		$V_{CE} = -2\text{ V}, I_C = -0.15\text{ A}$	200	—	500	
	$h_{FE(2)}$		$V_{CE} = -2\text{ V}, I_C = -0.5\text{ A}$	125	—	—	
Collector-emitter saturation voltage		$V_{CE(sat)}$	$I_C = -0.5\text{ A}, I_B = -17\text{ mA}$	—	—	-0.14	V
Base-emitter saturation voltage		$V_{BE(sat)}$	$I_C = -0.5\text{ A}, I_B = -17\text{ mA}$	—	—	-1.10	V
Collector output capacitance		$C_{ob}$	$V_{CB} = -10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	12	—	pF
Switching time	Rise time	$t_r$	See Figure 1.	—	40	—	ns
	Storage time	$t_{stg}$	$V_{CC} \approx -10\text{ V}, R_L = 20\ \Omega$	—	135	—	
	Fall time	$t_f$	$-I_{B1} = I_{B2} = -17\text{ mA}$	—	37	—	



**Figure 1 Switching Time Test Circuit & Timing Chart**





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