

TOSHIBA Transistor Silicon PNP Epitaxial Type

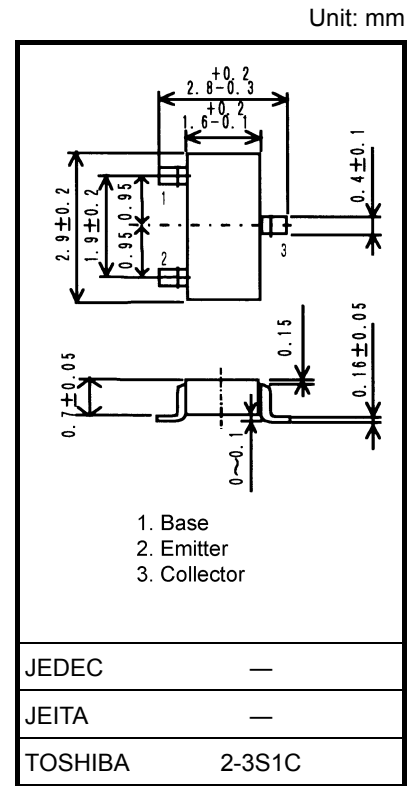
# 2SA2056

High-Speed Switching Applications  
 DC-DC Converter Applications  
 Strobe Applications

- High DC current gain:  $h_{FE} = 200$  to  $500$  ( $I_C = -0.5$  A)
- Low collector-emitter saturation voltage:  $V_{CE(sat)} = -0.2$  V (max)
- High-speed switching:  $t_f = 90$  ns (typ.)

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

Characteristics		Symbol	Rating	Unit
Collector-base voltage		$V_{CBO}$	-50	V
Collector-emitter voltage		$V_{CEO}$	-50	V
Emitter-base voltage		$V_{EBO}$	-7	V
Collector current	DC	$I_C$	-2.0	A
	Pulse	$I_{CP}$	-3.5	
Base current		$I_B$	-200	mA
Collector power dissipation	$t = 10$ s	$P_C$	1000	mW
	DC	(Note 1)	625	
Junction temperature		$T_j$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$



Weight: 0.01 g (typ.)

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

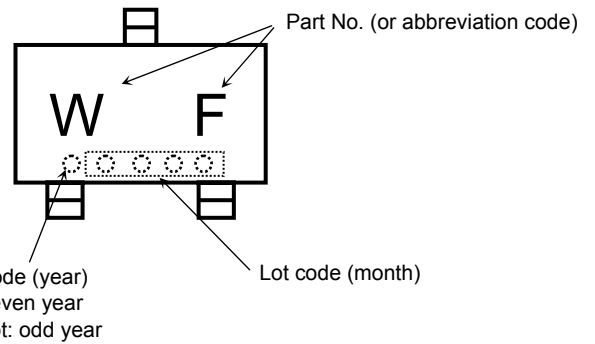
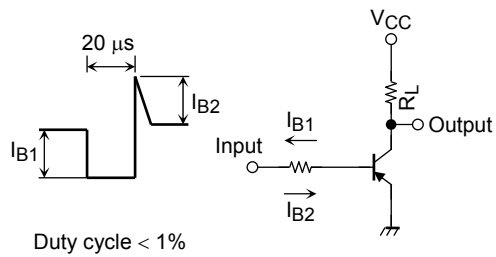
Note 2: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

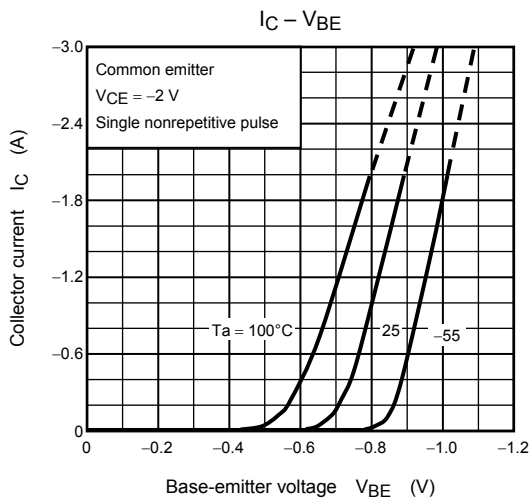
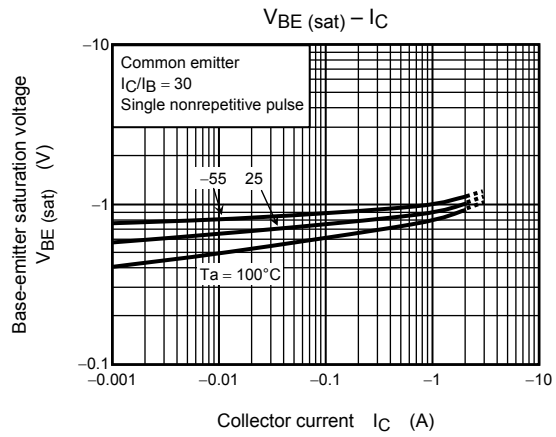
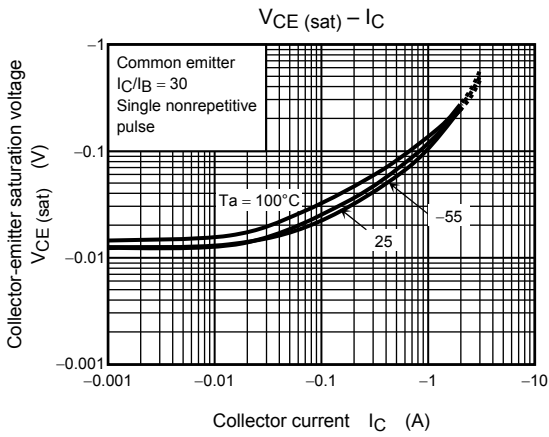
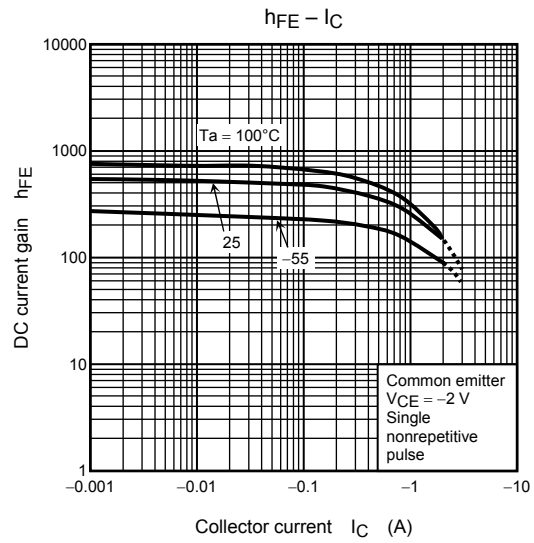
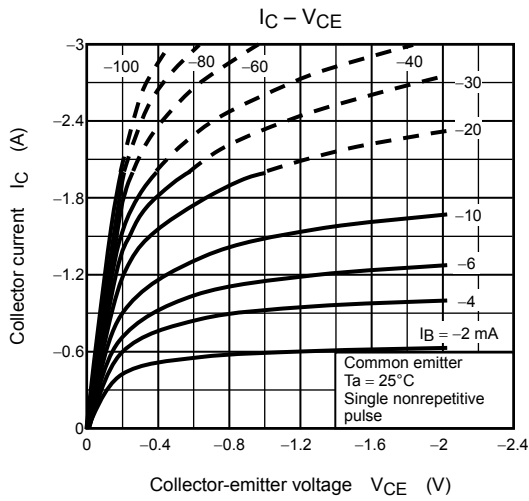
**Electrical Characteristics (Ta = 25°C)**

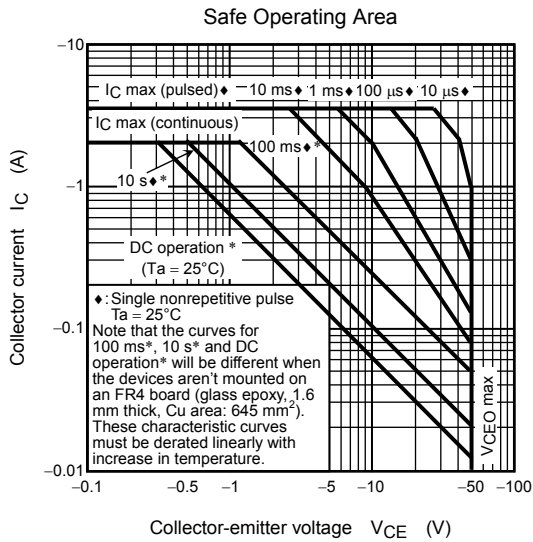
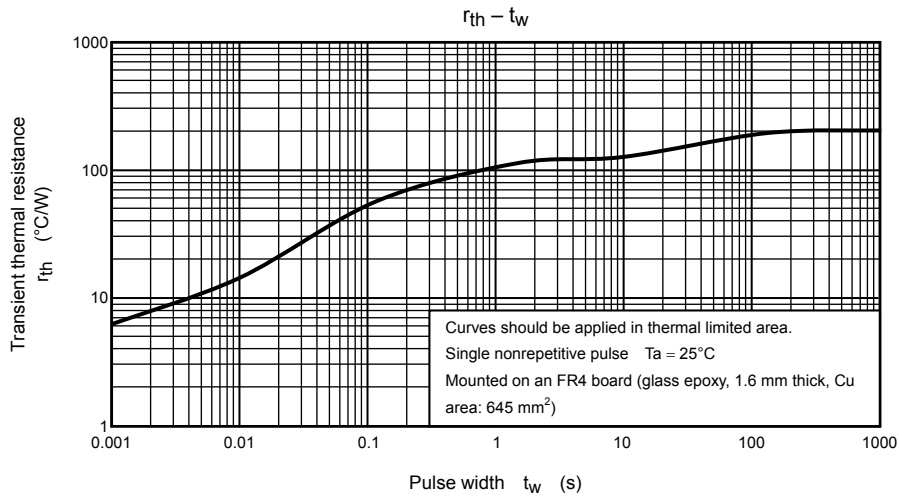
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		$I_{CBO}$	$V_{CB} = -50\text{ V}, I_E = 0$	—	—	-100	nA
Emitter cut-off current		$I_{EBO}$	$V_{EB} = -7\text{ V}, I_C = 0$	—	—	-100	nA
Collector-emitter breakdown voltage		$V_{(BR)CEO}$	$I_C = -10\text{ mA}, I_B = 0$	-50	—	—	V
DC current gain		$h_{FE(1)}$	$V_{CE} = -2\text{ V}, I_C = -0.3\text{ A}$	200	—	500	
		$h_{FE(2)}$	$V_{CE} = -2\text{ V}, I_C = -1.0\text{ A}$	100	—	—	
Collector-emitter saturation voltage		$V_{CE(sat)}$	$I_C = -1.0\text{ A}, I_B = -0.033\text{ A}$	—	—	-0.2	V
Base-emitter saturation voltage		$V_{BE(sat)}$	$I_C = -1.0\text{ A}, I_B = -0.033\text{ A}$	—	—	-1.1	V
Collector output capacitance		$C_{ob}$	$V_{CB} = -10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	20	—	pF
Switching time	Rise time	$t_r$	See Figure 1 circuit diagram. $V_{CC} \approx -30\text{ V}, R_L = 30\ \Omega$ $-I_{B1} = I_{B2} = -33\text{ mA}$	—	60	—	ns
	Storage time	$t_{stg}$		—	250	—	
	Fall time	$t_f$		—	90	—	

**Marking**



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





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