

TOSHIBA Transistor Silicon PNP Epitaxial Type

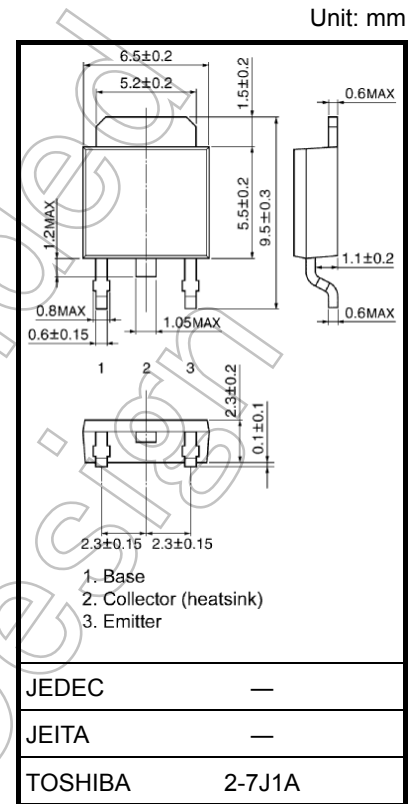
# 2SA2097

High-Speed Switching Applications  
DC-DC Converter Applications

- High DC current gain:  $h_{FE} = 200$  to  $500$  ( $I_C = -0.5$  A)
- Low collector-emitter saturation:  $V_{CE(sat)} = -0.27$  V (max)
- High-speed switching:  $t_f = 55$  ns (typ.)

### Absolute 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	$I_C$	-5	A
	Pulse	$I_{CP}$	-10	
Base current		$I_B$	-0.5	A
Collector power dissipation	$T_a = 25^\circ\text{C}$	$P_C$	1	W
	$T_c = 25^\circ\text{C}$		20	
Junction temperature		$T_j$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$



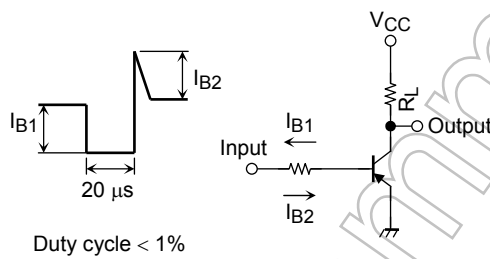
Weight: 0.36 g (typ.)

Note: 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).

Start of commercial production  
2002-04

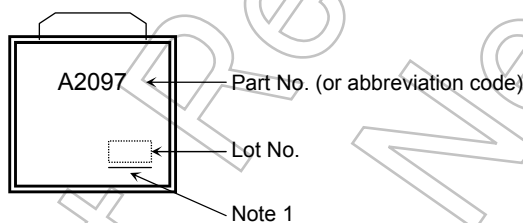
**Electrical Characteristics (Ta = 25°C)**

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		$h_{FE}(1)$	$V_{CE} = -2\text{ V}, I_C = -0.5\text{ A}$	200	—	500	
		$h_{FE}(2)$	$V_{CE} = -2\text{ V}, I_C = -1.6\text{ A}$	100	—	—	
Collector-emitter saturation voltage		$V_{CE(sat)}$	$I_C = -1.6\text{ A}, I_B = -53\text{ mA}$	—	—	-0.27	V
Base-emitter saturation voltage		$V_{BE(sat)}$	$I_C = -1.6\text{ A}, I_B = -53\text{ mA}$	—	—	-1.10	V
Switching time	Rise time	$t_r$	See Figure 1. $V_{CC} \approx -24\text{ V}, R_L = 15\ \Omega$ $I_{B1} = -I_{B2} = -53\text{ mA}$	—	63	—	ns
	Storage time	$t_{stg}$		—	280	—	
	Fall time	$t_f$		—	55	—	



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

**Marking**



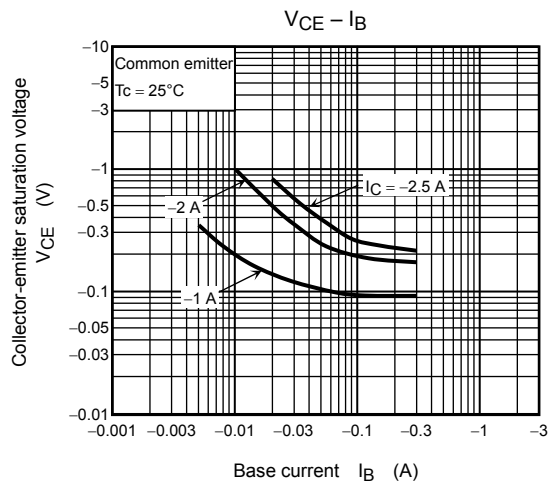
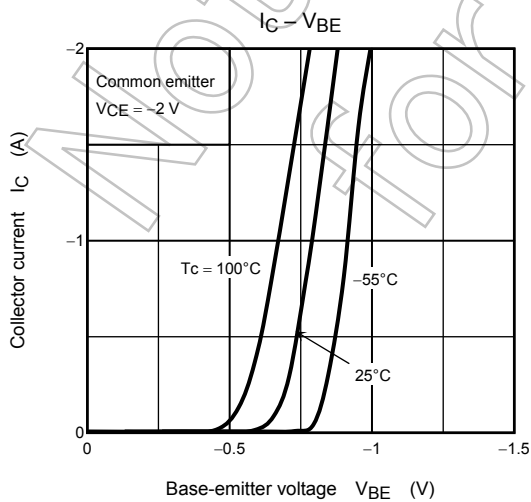
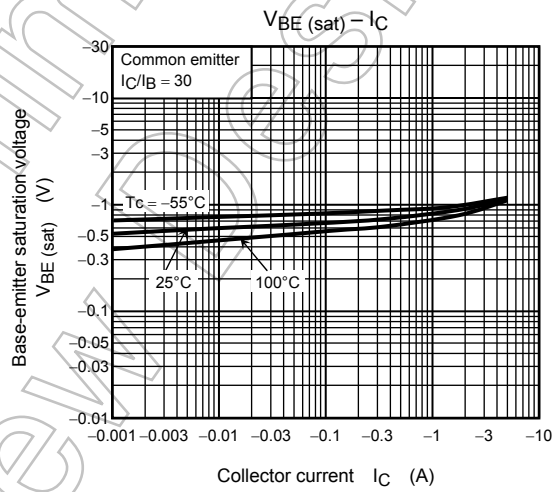
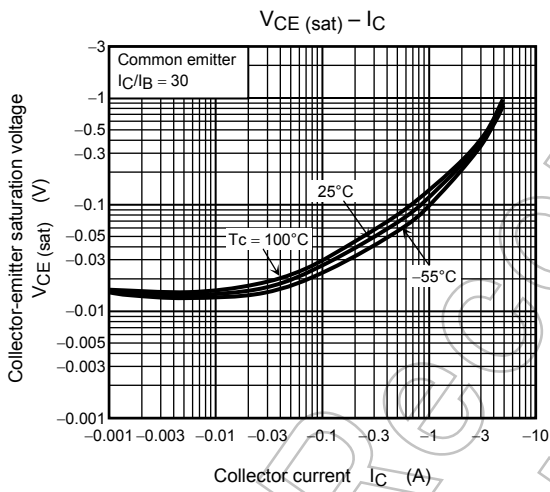
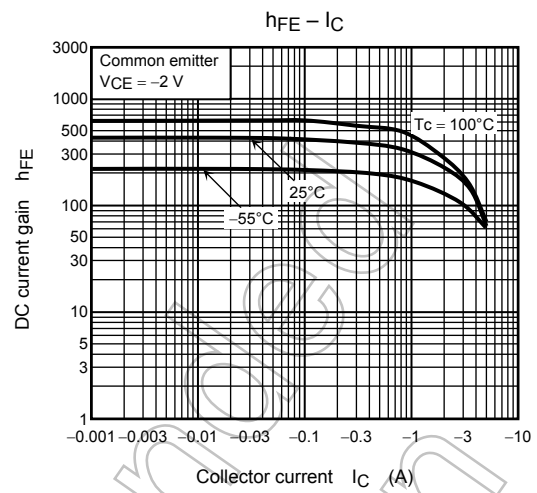
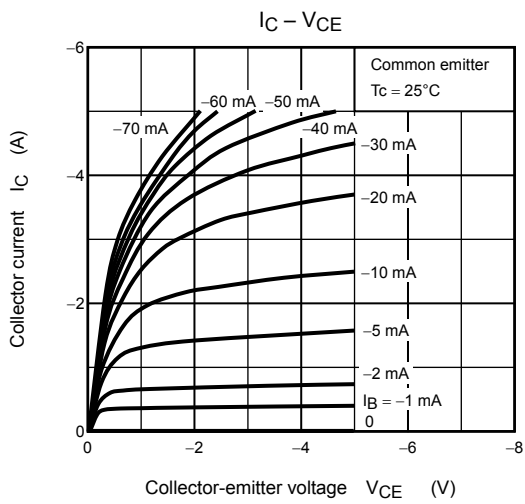
Note 1: A line under a Lot No. identifies the indication of product Labels.

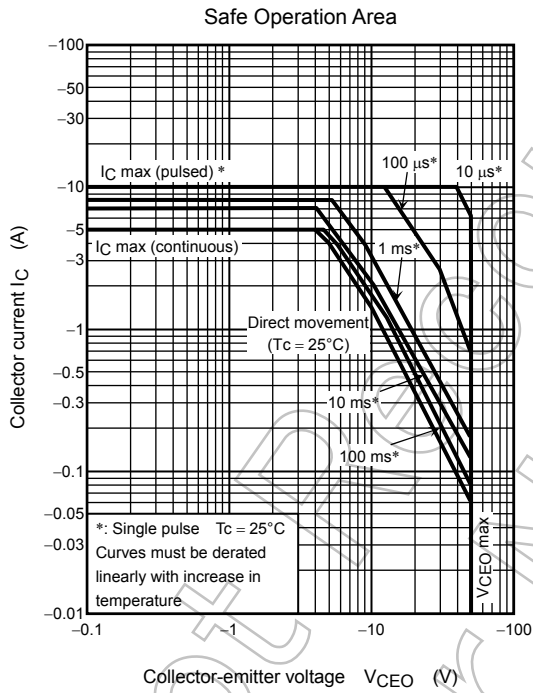
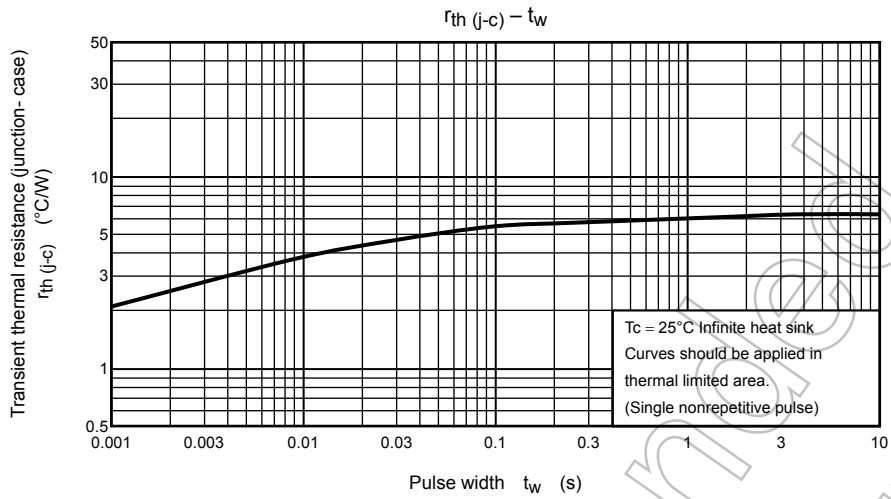
Not underlined :  $[[Pb]]/INCLUDES > MCV$

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 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.





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