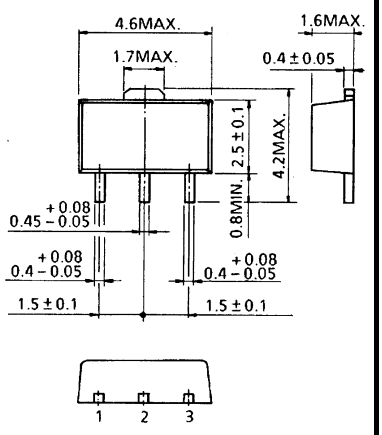
TOSHIBA Transistor Silicon PNP Epitaxial Type

2SA2070

High-Speed Switching Applications
DC-DC Converter Applications

- High DC current gain: h_{FE} = 200 to 500 (I_C = -0.1 A)
- Low collector-emitter saturation voltage: $V_{CE\ (sat)}$ =- 0.20 V (max)
- High-speed switching: t_f = 70 ns (typ.)

Unit: mm



1. Base
2. Collector (heat sink)
3. Emitter

JEDEC	—
JEITA	SC-62
TOSHIBA	2-5K1A

Weight: 0.05 g (typ.)

Absolute Maximum Ratings (Ta = 25°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	−1.0	A
	Pulse	I_{CP}	−2.0	
Base current		I_B	−0.1	A
Collector power dissipation	DC	P_C (Note 1)	1.0	W
	t = 10 s		2.0	
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

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

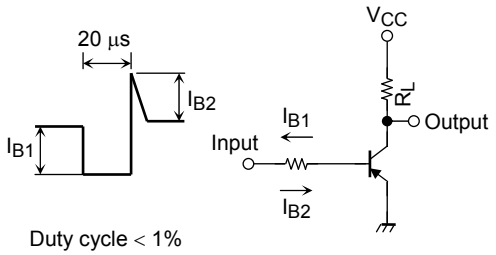
Note 2: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

Start of commercial production
2001-09

Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	V_{CB} = −50 V, I_E = 0	—	—	−100	nA
Emitter cut-off current		I_{EBO}	V_{EB} = −7 V, I_C = 0	—	—	−100	nA
Collector-emitter breakdown voltage		$V_{(BR)\ CEO}$	I_C = −10 mA, I_B = 0	−50	—	—	V
DC current gain		h_{FE} (1)	V_{CE} = −2 V, I_C = −0.1 A	200	—	500	
		h_{FE} (2)	V_{CE} = −2 V, I_C = −0.3 A	125	—	—	
Collector-emitter saturation voltage		$V_{CE\ (sat)}$	I_C = −0.3 A, I_B = −0.01 A	—	—	−0.20	V
Base-emitter saturation voltage		$V_{BE\ (sat)}$	I_C = −0.3 A, I_B = −0.01 A	—	—	−1.10	V
Collector output capacitance		C_{ob}	V_{CB} = −10 V, I_E = 0, f = 1 MHz	—	8	—	pF
Switching time	Rise time	t_r	See Figure 1. V_{CC} ≈ −30 V, R_L = 100 Ω I_{B1} = 10 mA, I_{B2} = 10 mA	—	60	—	ns
	Storage time	t_{stg}		—	280	—	
	Fall time	t_f		—	70	—	

Marking



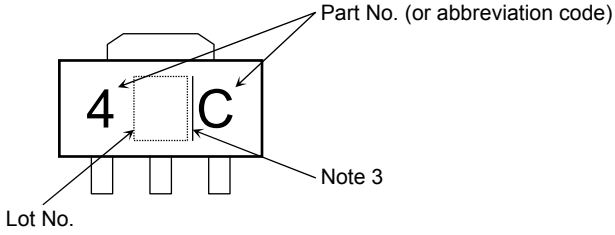
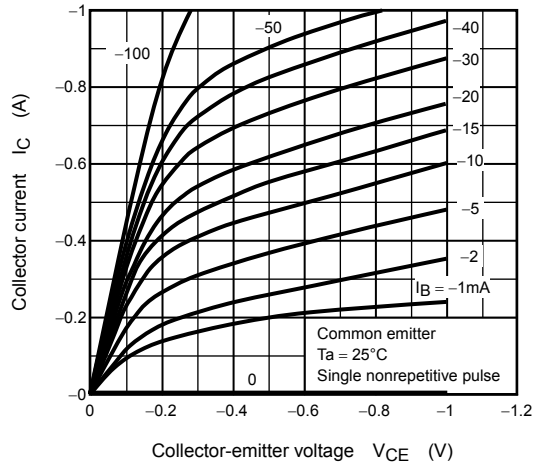


Figure 1 Switching Time Test Circuit & Timing Chart

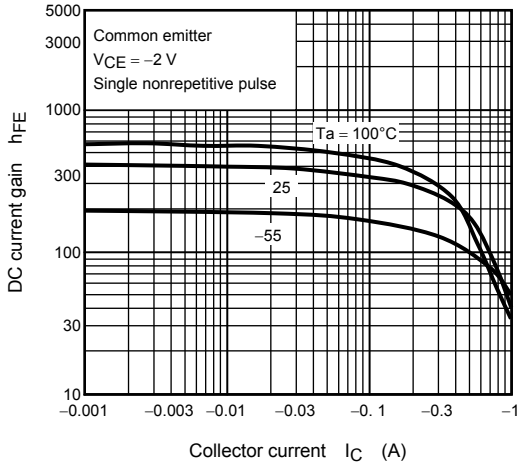
Note 3: A line beside a Lot No. identifies the indication of product Labels.
Without a line: [[Pb]]/INCLUDES > MCV
With a line: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 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.

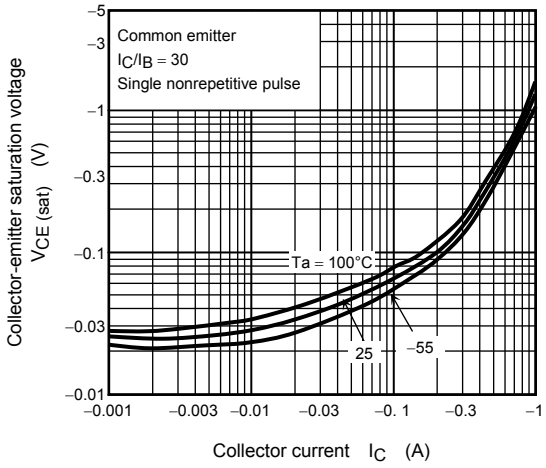
$I_C - V_{CE}$



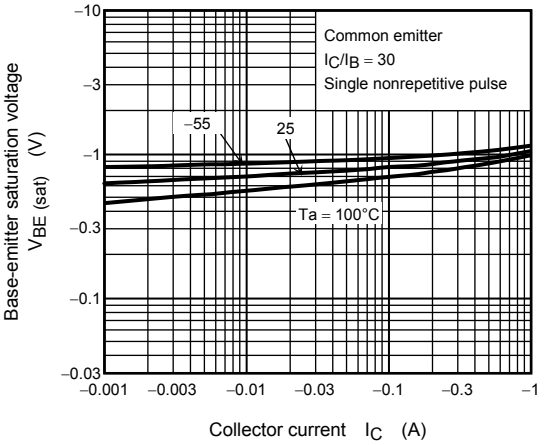
$h_{FE} - I_C$



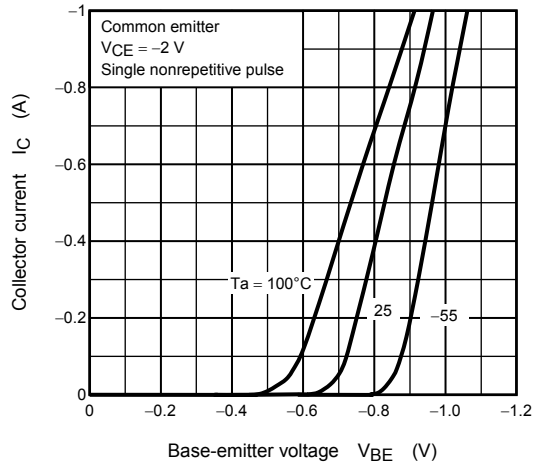
$V_{CE\ (sat)} - I_C$

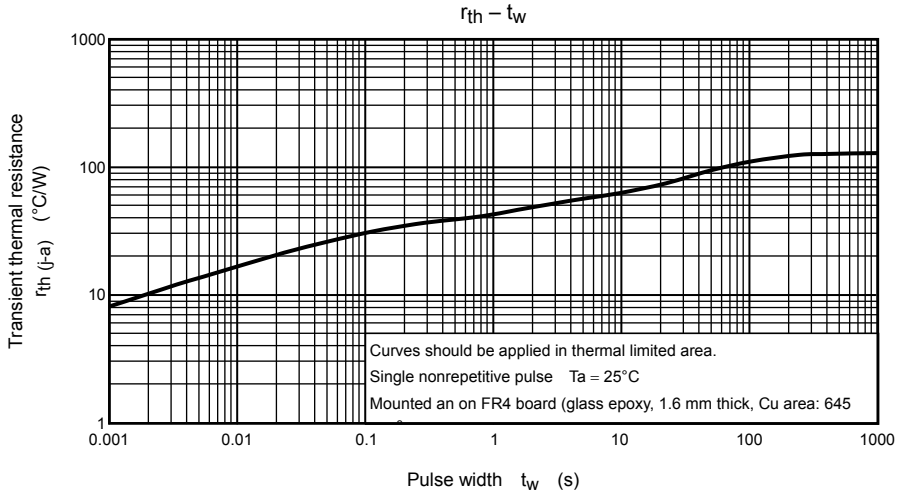


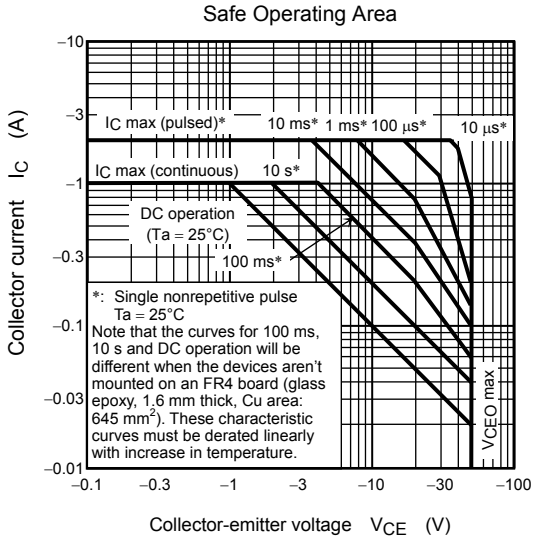
$V_{BE\ (sat)} - I_C$



$I_C - V_{BE}$




$r_{th} - t_w$
Transient thermal resistance $r_{th\ (j\text{-}a)}$ (°C/W)
1000
100
10
1
0.001
0.01
0.1
1
10
100
1000
Curves should be applied in thermal limited area.
Single nonrepetitive pulse Ta = 25°C
Mounted an on FR4 board (glass epoxy, 1.6 mm thick, Cu area: 645
Pulse width t_w (s)


Safe Operating Area
Collector current I_C (A)
−10
−3
−1
−0.3
−0.1
−0.03
−0.01
I_C max (pulsed)*
10 ms*
1 ms*
100 μs*
10 μs*
I_C max (continuous)
10 s*
DC operation
(Ta = 25°C)
100 ms*
*: Single nonrepetitive pulse
Ta = 25°C
Note that the curves for 100 ms, 10 s and DC operation will be different when the devices aren't mounted on an FR4 board (glass epoxy, 1.6 mm thick, Cu area: 645 mm^2). These characteristic curves must be derated linearly with increase in temperature.
V_{CEO} max
−0.1
−0.3
−1
−3
−10
−30
−100
Collector-emitter voltage V_{CE} (V)

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