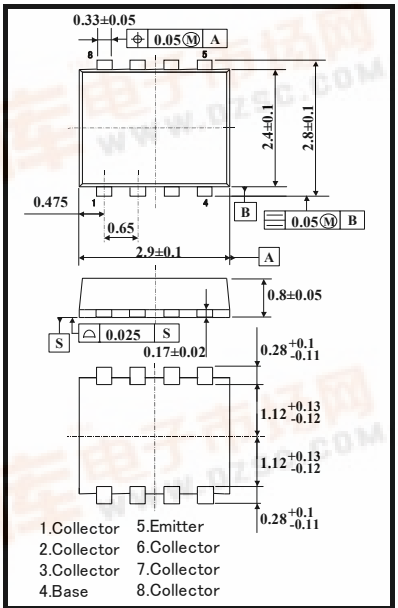
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process)

TPCP8505

High-Speed Switching Applications
DC-DC Converter Applications

- High DC current gain: h_{FE} = 400 to 1000 (I_C = 0.3 A)
- Low collector-emitter saturation: $V_{CE\ (sat)}$ = 0.14 V (max)
- High-speed switching: t_f = 120 ns (typ.)

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-3V1A

Weight: 0.017 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Collector-base voltage		V_{CBO}	100	V
Collector-emitter voltage		V_{CEX}	80	V
		V_{CEO}	50	
Emitter-base voltage		V_{EBO}	7	V
Collector current	DC (Note 1)	I_C	3.0	A
	Pulse (Note 1)	I_{CP}	5.0	
Base current		I_B	0.3	A
Collector power dissipation (t = 10 s)	t = 10s	P_C (Note 2)	3.0	W
	DC		1.25	
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

Note 1: Ensure that the junction temperature does not exceed 150°C during use of this device.

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

Note 3: 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).

Figure 1. Circuit Configuration (top view)

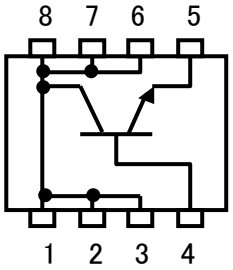
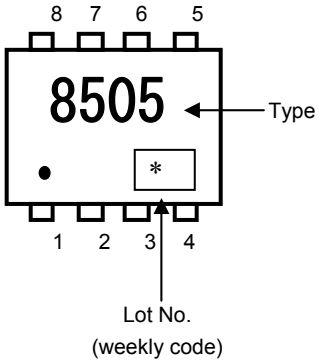
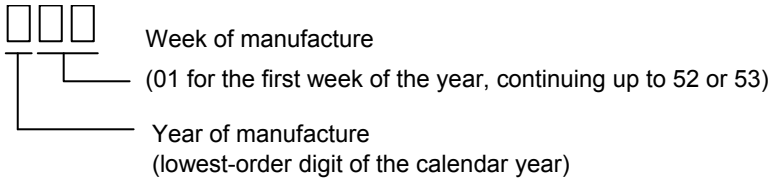


Figure 2. Marking (Note 4)



Note 4: ● on the lower left of the marking indicates Pin 1.

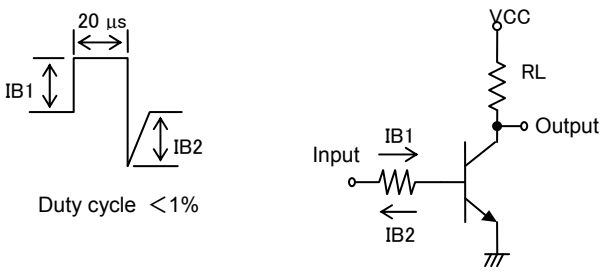
* Weekly code (three digits):



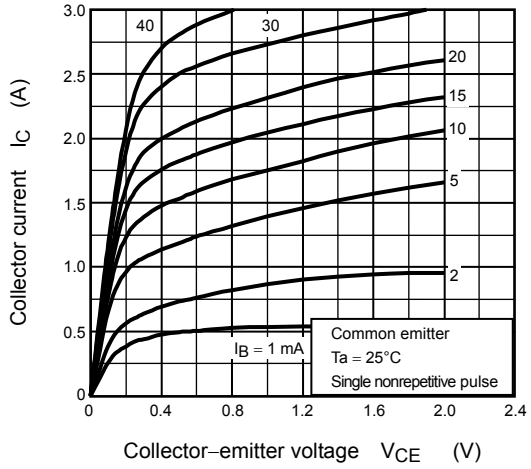
Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	V_{CB} = 100 V, I_E = 0	—	—	100	nA
Emitter cut-off current		I_{EBO}	V_{EB} = 7 V, I_C = 0	—	—	100	nA
Collector-base breakdown voltage		$V_{(BR)\ CBO}$	I_C = 1 mA, I_B = 0	100	—	—	V
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 = 0.3 A	400	—	1000	
		h_{FE} (2)	V_{CE} = 2 V, I_C = 1.0 A	200	—	—	
Collector-emitter saturation voltage		$V_{CE\ (sat)}$	I_C = 1 A, I_B = 20 mA	—	—	0.14	V
Base-emitter saturation voltage		$V_{BE\ (sat)}$	I_C = 1 A, I_B = 20 mA	—	—	1.1	V
Switching time	Rise time	t_r	See Figure 3 circuit diagram $V_{CC} \simeq$ 30 V, R_L = 30 Ω $I_{B1} = -I_{B2}$ = 33 mA	—	40	—	ns
	Storage time	t_{stg}		—	500	—	
	Fall time	t_f		—	120	—	

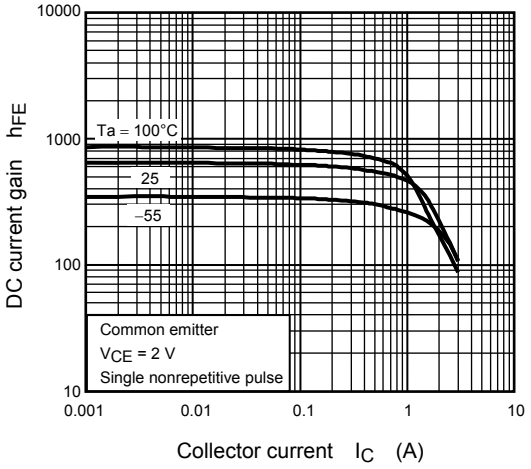
Figure 3. Switching Time Test Circuit & Timing Chart



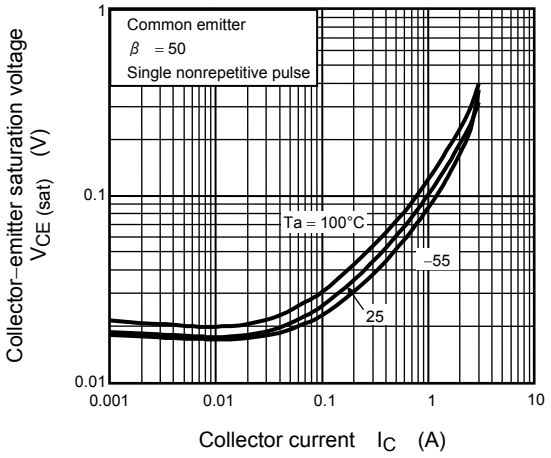
$I_C - V_{CE}$



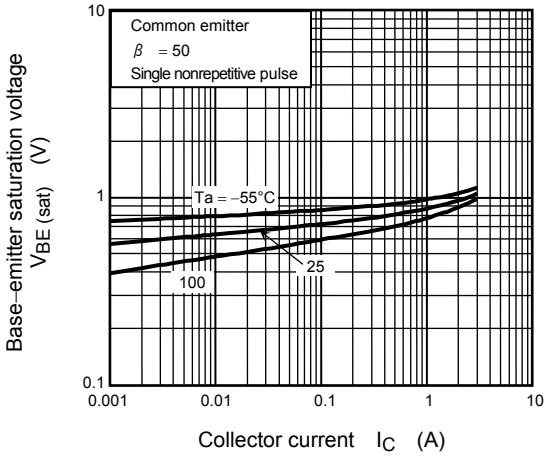
$h_{FE} - I_C$



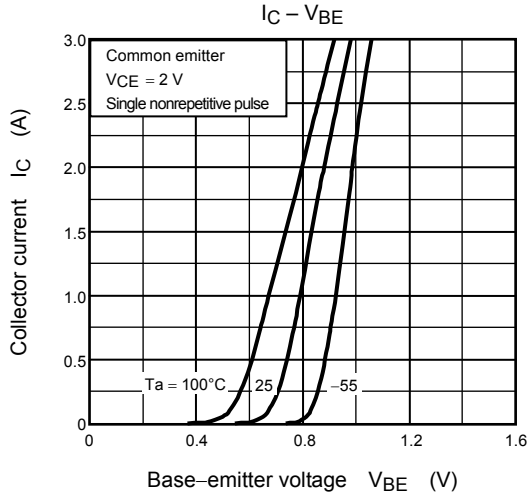
$V_{CE\ (sat)} - I_C$



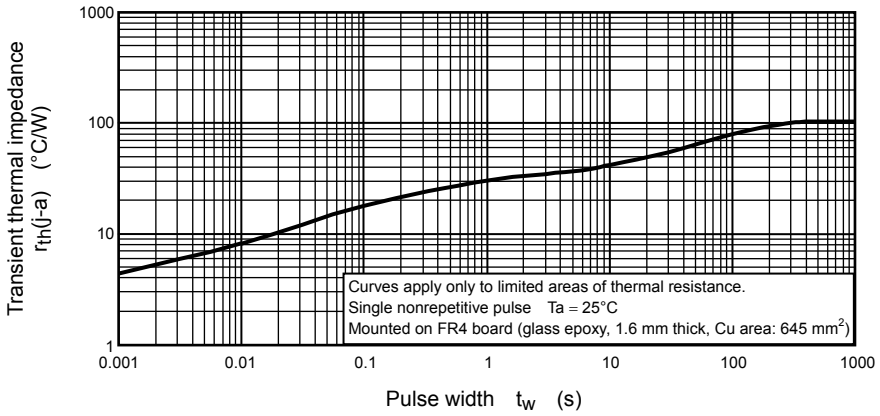
$V_{BE\ (sat)} - I_C$



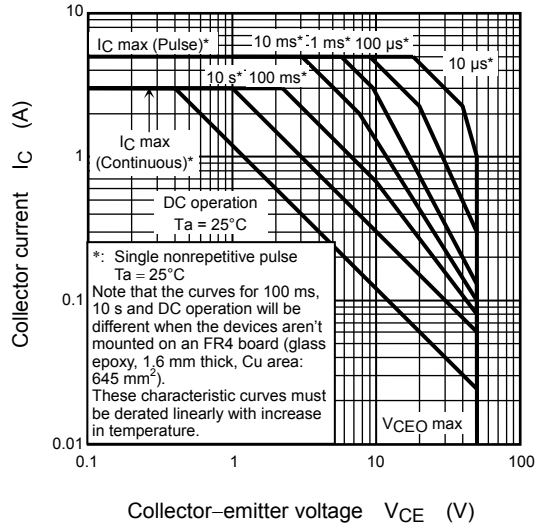
$I_C - V_{BE}$



$r_{th} - t_w$



Safe operating area



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