

TOSHIBA Transistor Silicon NPN / PNP Epitaxial Type (PCT Process)

TPCP8902

Portable Equipment Applications
Switching Applications

- Small footprint due to small and thin package
- High DC current gain : PNP $h_{FE} = 200$ to 500 ($I_C = -0.2$ A)
: NPN $h_{FE} = 200$ to 500 ($I_C = 0.2$ A)
- Low collector-emitter saturation : PNP $V_{CE(sat)} = -0.20$ V (max)
: NPN $V_{CE(sat)} = 0.14$ V (max)
- High-speed switching : PNP $t_f = 40$ ns (typ.)
: NPN $t_f = 45$ ns (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating		Unit
			PNP	NPN	
Collector-base voltage		V_{CBO}	-30	60	V
Collector-emitter voltage		V_{CEX}	-30	50	V
		V_{CEO}	-30	30	
Emitter-base voltage		V_{EBO}	-7	7	V
Collector current	DC (Note 1)	I_C	-2.0	2.0	A
	Pulse (Note 1)	I_{CP}	-8.0	8.0	
Base current		I_B	-0.5	0.5	A
Collector power dissipation (t = 10s)	Single-device operation	P_C (Note 2)	1.67		W
	Single-device value at dual operation		0.91		
Collector power dissipation (DC)	Single-device operation	P_C (Note 2)	0.89		W
	Single-device value at dual operation		0.52		
Junction temperature		T_j	150		°C
Storage temperature range		T_{stg}	-55 to 150		°C

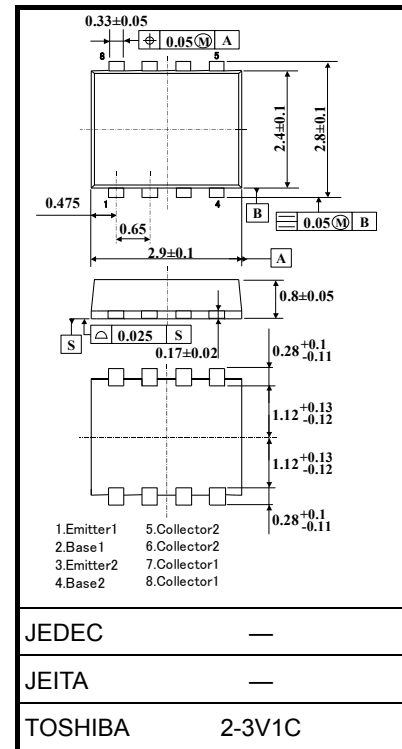
Note 1: Please use devices on condition that the junction temperature is below 150°C.
 $I_{cp} = \pm 8$ A (@ $t \leq 100 \mu$ s)

Note 2: Mounted on FR4 board (glass epoxy, 1.6 mm thick, Cu area: 645 mm²)

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).

Unit: mm



Weight: 0.017 g (typ.)

Figure 1. Circuit configuration (top view)

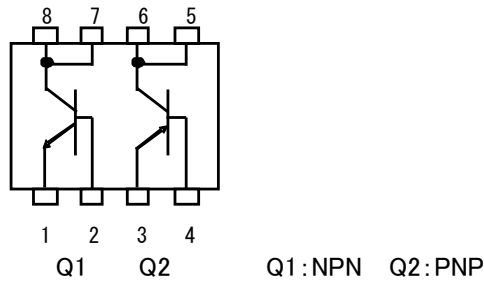
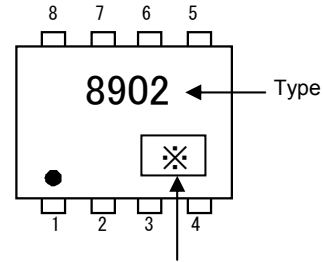
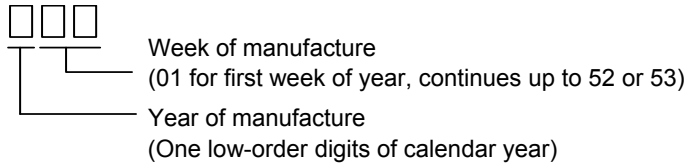


Figure 2. Marking (Note 4)



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

※ Weekly code: (Three digits)



Lot No.
(Weekly code)

Electrical Characteristics (Ta = 25°C)

PNP

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = -30 \text{ V}, I_E = 0$	—	—	-100	nA
Emitter cut-off current	I_{EBO}	$V_{EB} = -7 \text{ V}, I_C = 0$	—	—	-100	nA
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = -10 \text{ mA}, I_B = 0$	-30	—	—	V
DC current gain	$h_{FE(1)}$	$V_{CE} = -2 \text{ V}, I_C = -0.2 \text{ A}$	200	—	500	
	$h_{FE(2)}$	$V_{CE} = -2 \text{ V}, I_C = -0.6 \text{ A}$	125	—	—	
	$h_{FE(3)}$	$V_{CE} = -2 \text{ V}, I_C = -2.0 \text{ A}$	40	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = -0.6 \text{ A}, I_B = -20 \text{ mA}$	—	—	-0.20	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C = -0.6 \text{ A}, I_B = -20 \text{ mA}$	—	—	-1.10	V
Collector output capacitance	C_{ob}	$V_{CB} = -10 \text{ V}, I_E = 0, f = 1 \text{ MHz}$	—	16.5	—	pF
Switching time	Rise time	t_r	—	40	—	ns
	Storage time	t_{stg}	—	280	—	
	Fall time	t_f	—	40	—	

NPN

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = 60 \text{ V}, I_E = 0$	—	—	100	nA
Emitter cut-off current	I_{EBO}	$V_{EB} = 7 \text{ V}, I_C = 0$	—	—	100	nA
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 10 \text{ mA}, I_B = 0$	30	—	—	V
DC current gain	$h_{FE(1)}$	$V_{CE} = 2 \text{ V}, I_C = 0.2 \text{ A}$	200	—	500	
	$h_{FE(2)}$	$V_{CE} = 2 \text{ V}, I_C = 0.6 \text{ A}$	125	—	—	
	$h_{FE(3)}$	$V_{CE} = 2 \text{ V}, I_C = 2.0 \text{ A}$	40	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 0.6 \text{ A}, I_B = 20 \text{ mA}$	—	—	0.14	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C = 0.6 \text{ A}, I_B = 20 \text{ mA}$	—	—	1.10	V
Collector output capacitance	C_{ob}	$V_{CB} = 10 \text{ V}, I_E = 0, f = 1 \text{ MHz}$	—	14	—	pF
Switching time	Rise time	t_r	—	45	—	ns
	Storage time	t_{stg}	—	580	—	
	Fall time	t_f	—	45	—	

Figure 3. Switching Time Test Circuit & Timing Chart

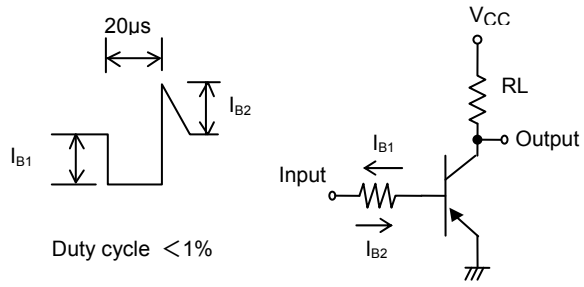
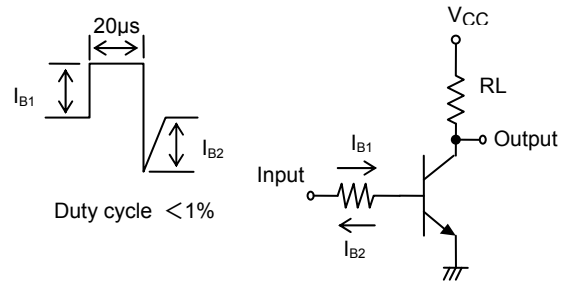
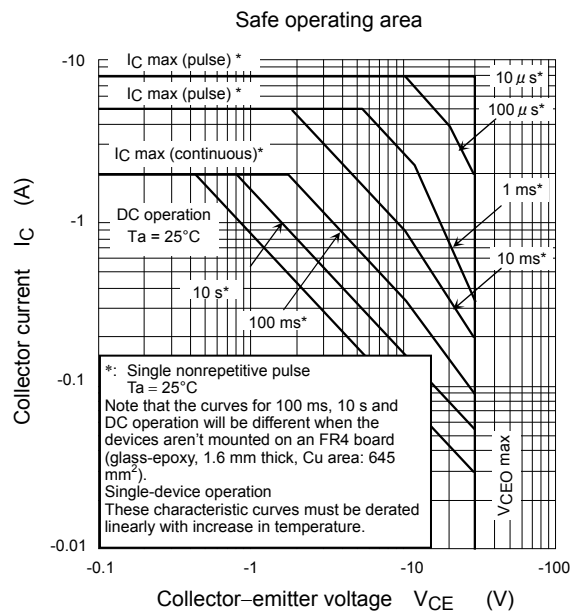
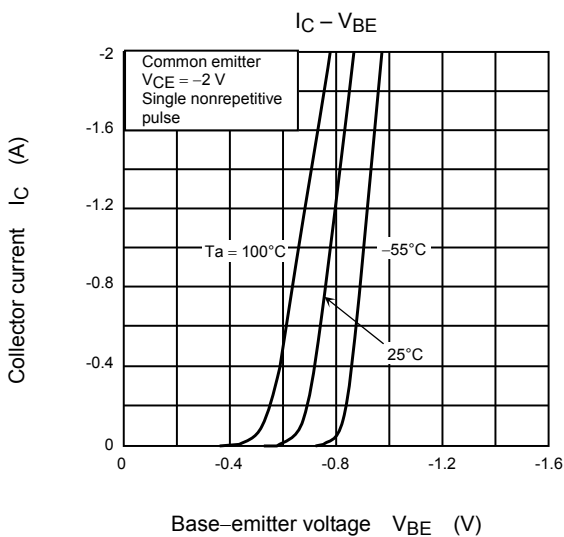
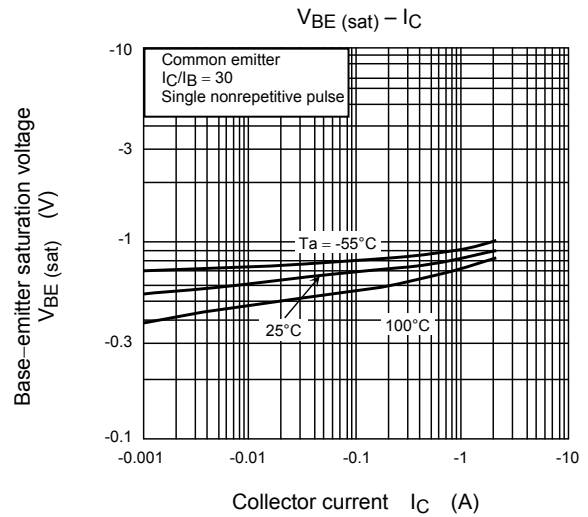
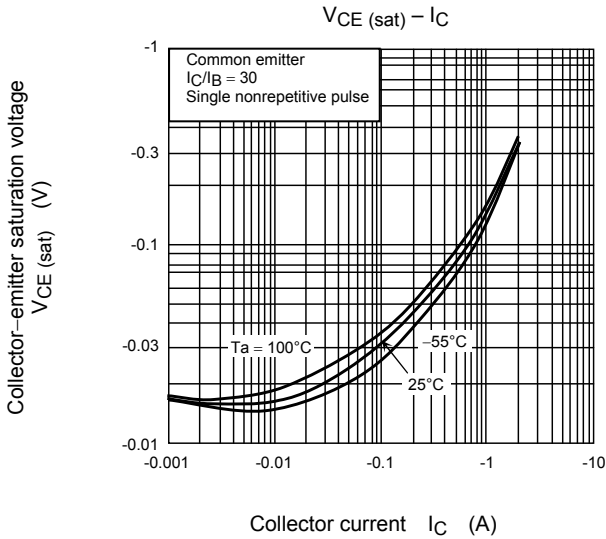
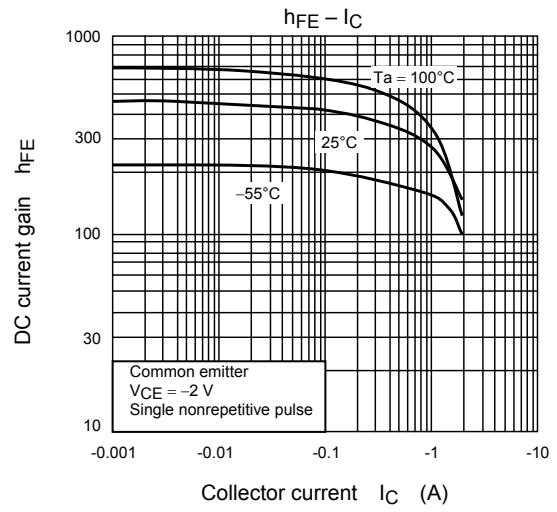
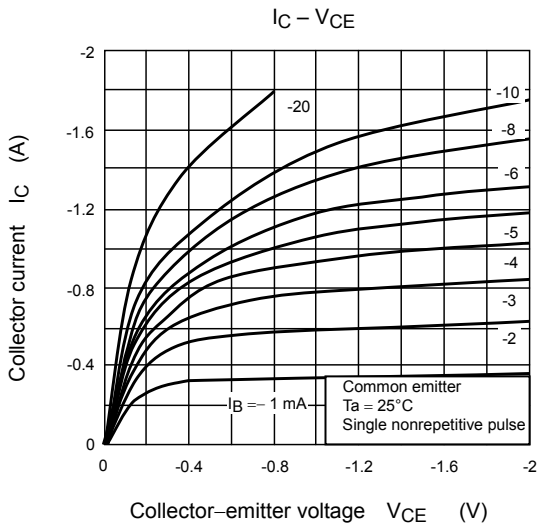


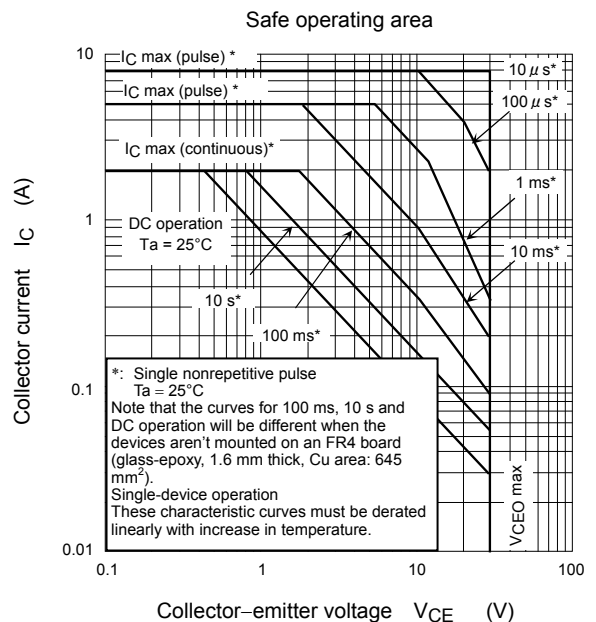
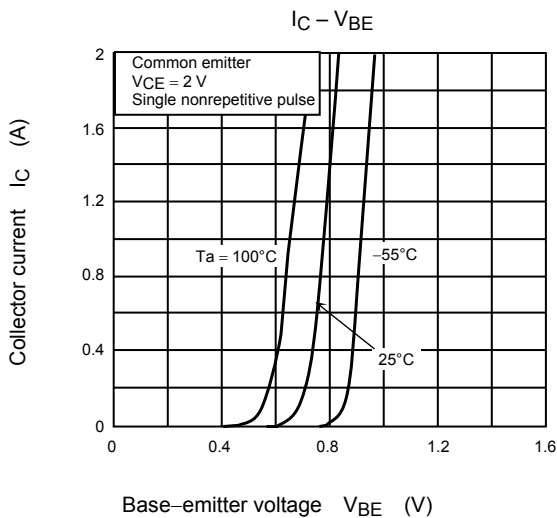
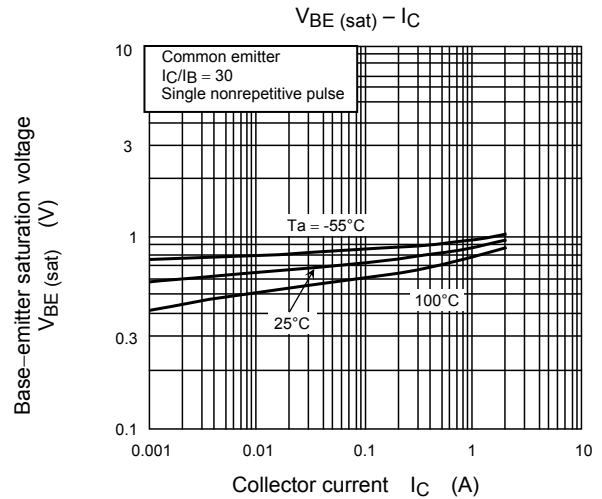
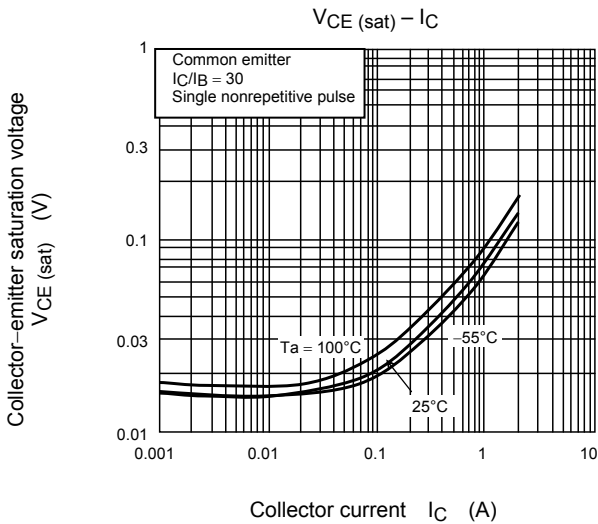
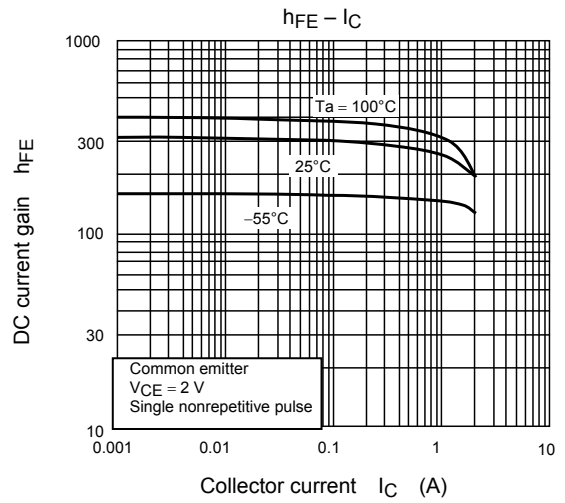
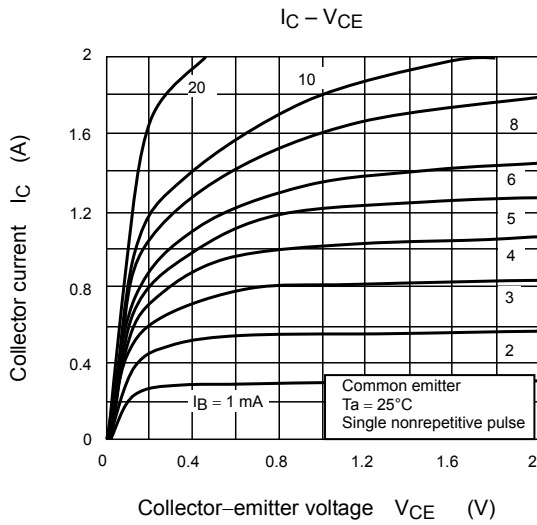
Figure 4. Switching Time Test Circuit & Timing Chart

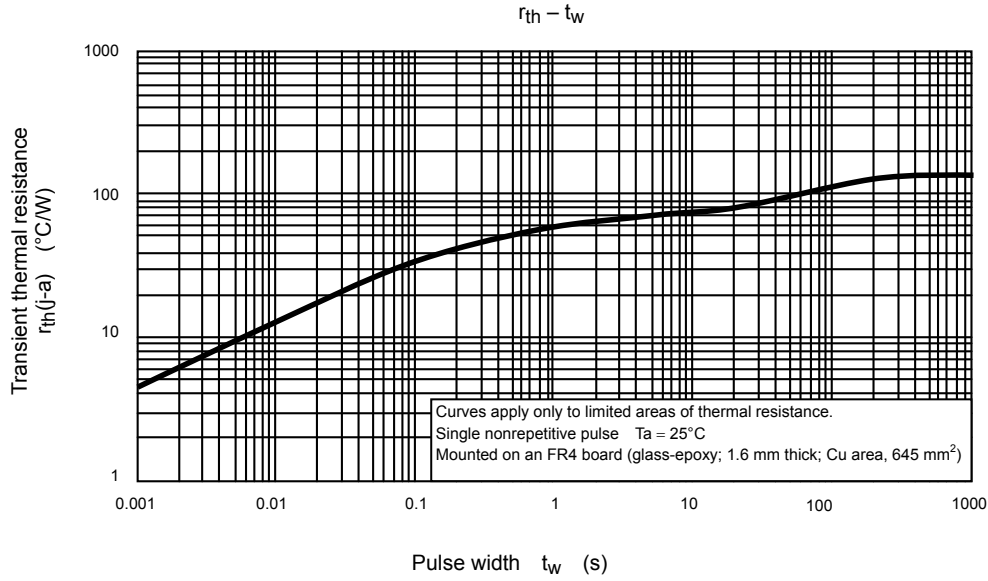


PNP

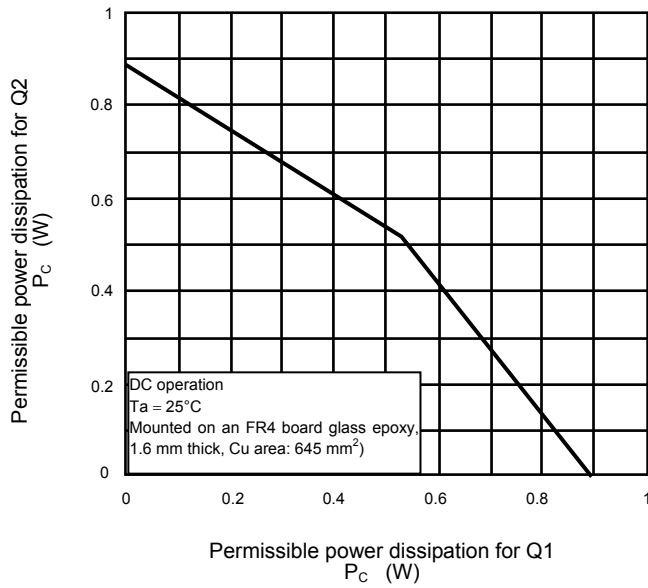


NPN





Permissible Power Dissipation for Simultaneous Operation



Collector power dissipation at the single-device operation is 0.89W.
 Collector power dissipation at the single-device value at dual operation is 0.52W.
 Collector power dissipation at the dual operation is set to 1.04W.

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