

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

HN4B102J

MOS Gate Drive Applications

Switching Applications

- Small footprint due to a 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 ($T_a = 25^\circ\text{C}$)

Characteristic		Symbol	Rating		Unit
			PNP	NPN	
Collector-base voltage		V_{CBO}	-30	60	V
Collector-emitter voltage		V_{CEO}	-30	30	V
Emitter-base voltage		V_{EBO}	-7	7	V
Collector current	DC (Note 1)	I_C	-1.8	2.0	A
	Pulse (Note 1)	I_{CP}	-8.0	8.0	
Base current		I_B	-0.5	0.5	A
Collector power dissipation ($t = 10$ s)	Single-device operation	P_C (Note 2)	1.1		W
Collector power dissipation (DC)	Single-device operation	P_C (Note 2)	0.75		W
Junction temperature		T_j	150		$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 150		$^\circ\text{C}$

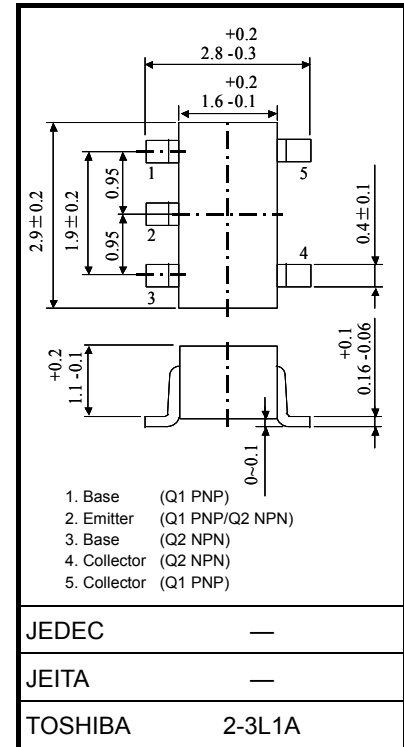
Note 1: Ensure that the channel temperature does not exceed 150°C during use of the device.

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.).

Unit: mm



Weight: 0.014g (typ.)

Figure 1 Circuit Configuration (top view)

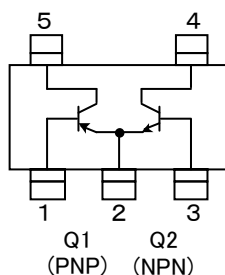
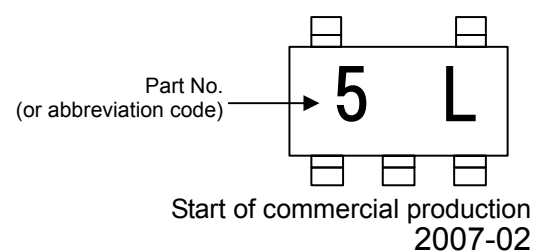


Figure 2 Marking



Electrical Characteristics (Ta = 25°C)

PNP

Characteristic		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	See Figure 3 circuit diagram $V_{CC} \approx -18 \text{ V}, R_L = 30 \Omega$ $I_{B1} = I_{B2} = 20 \text{ mA}$	—	40	—	ns
	Storage time	t_{stg}		—	280	—	
	Fall time	t_f		—	40	—	

NPN

Characteristic		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	See Figure 4 circuit diagram $V_{CC} \approx 18 \text{ V}, R_L = 30 \Omega$ $I_{B1} = I_{B2} = 20 \text{ mA}$	—	45	—	ns
	Storage time	t_{stg}		—	580	—	
	Fall time	t_f		—	45	—	

Figure 3. Switching Time Test Circuit & Timing Chart

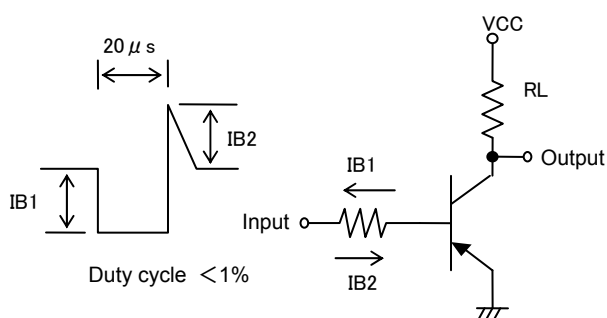
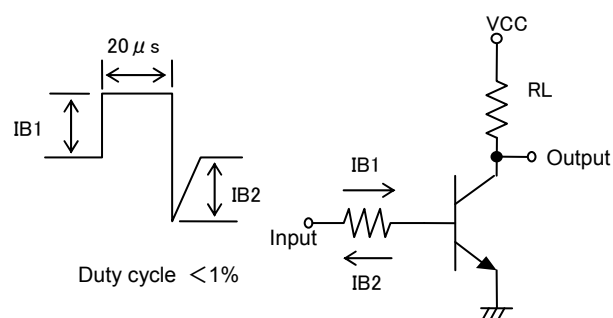
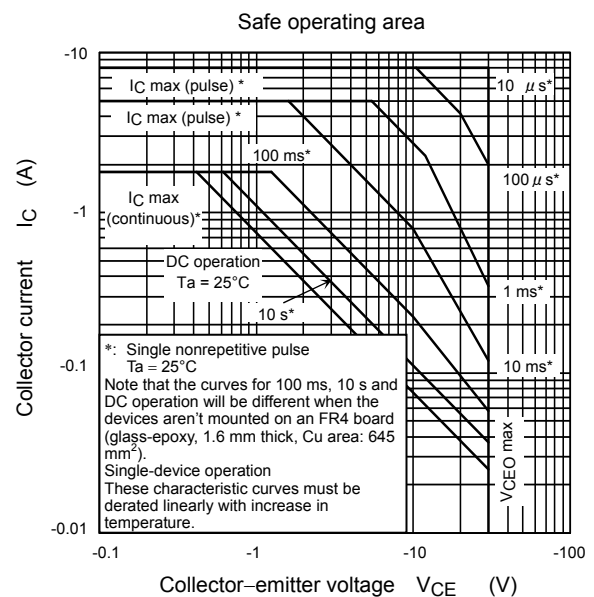
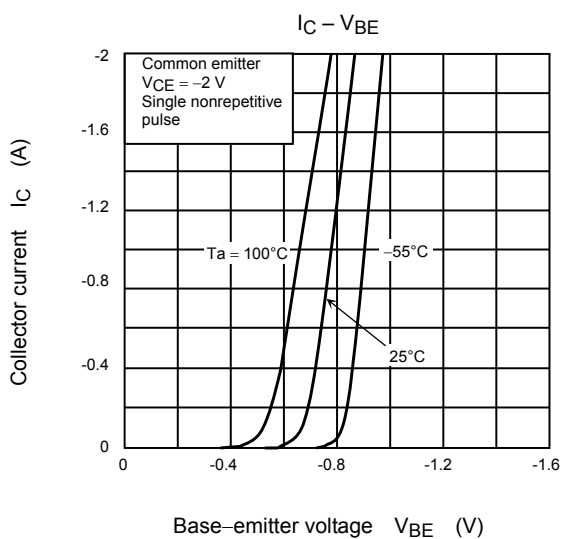
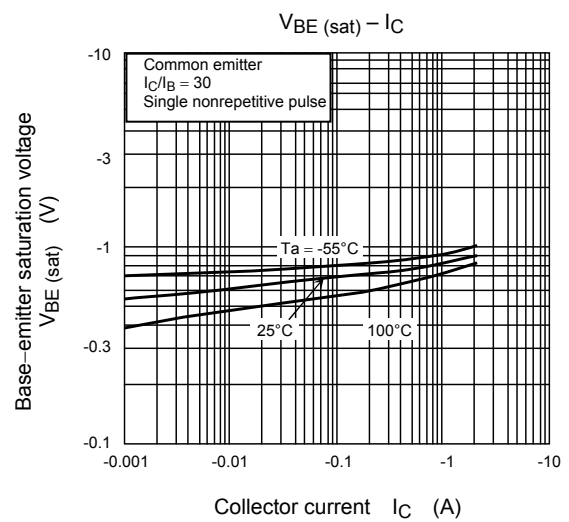
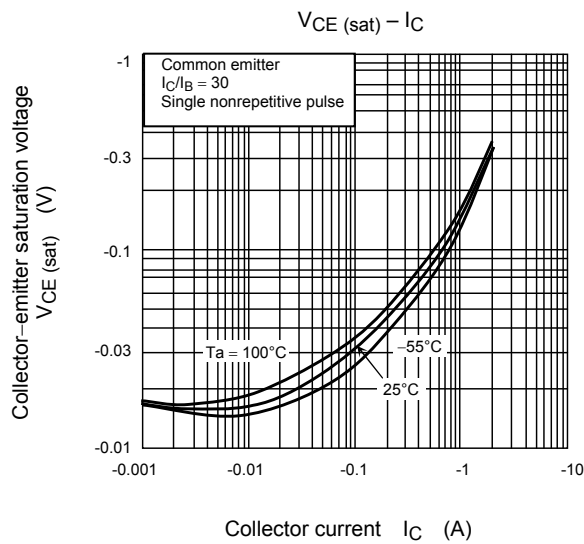
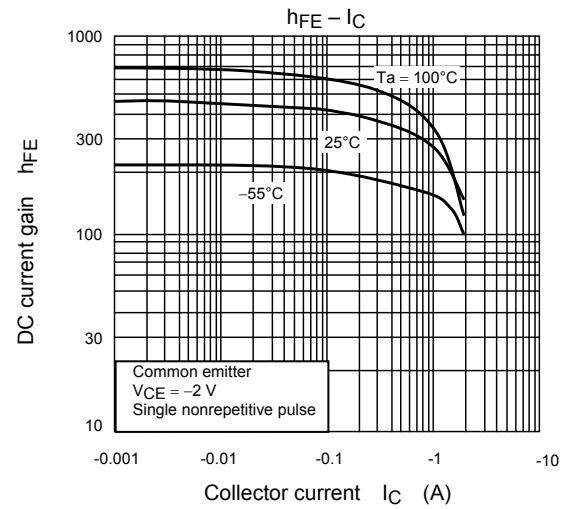
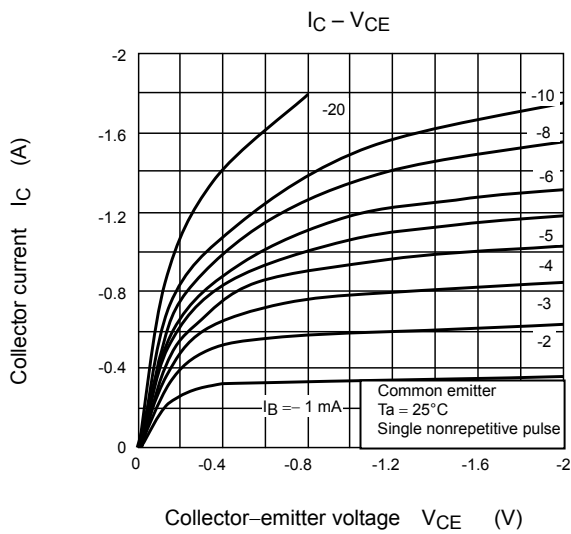


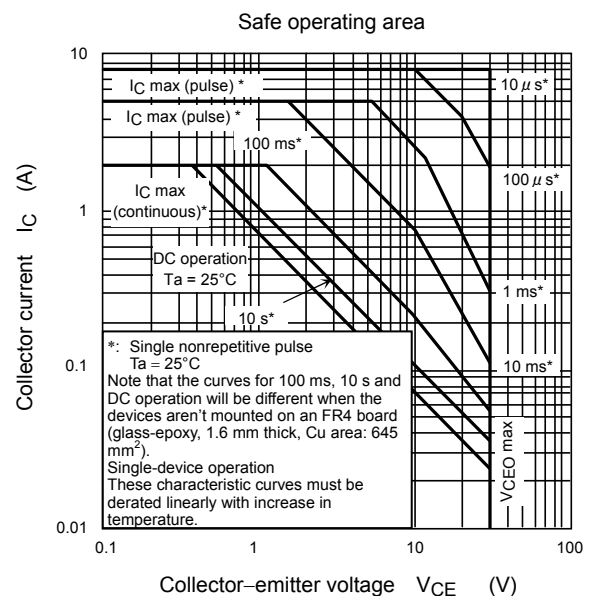
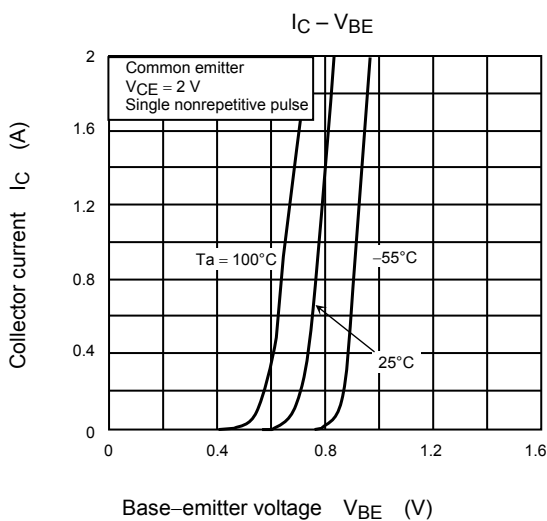
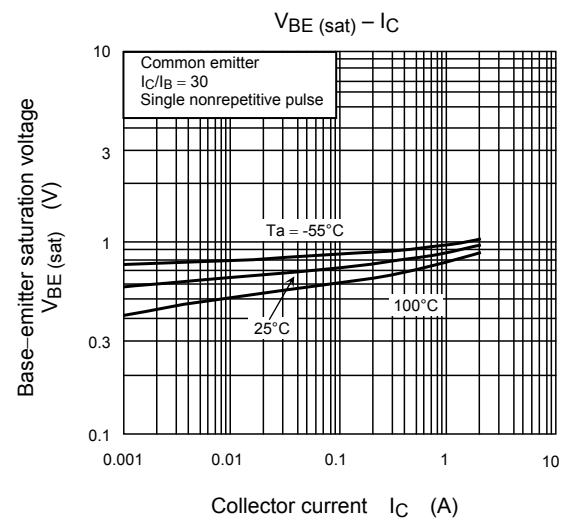
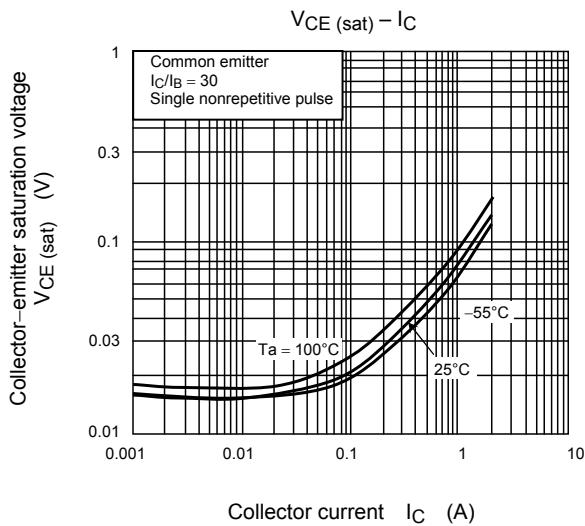
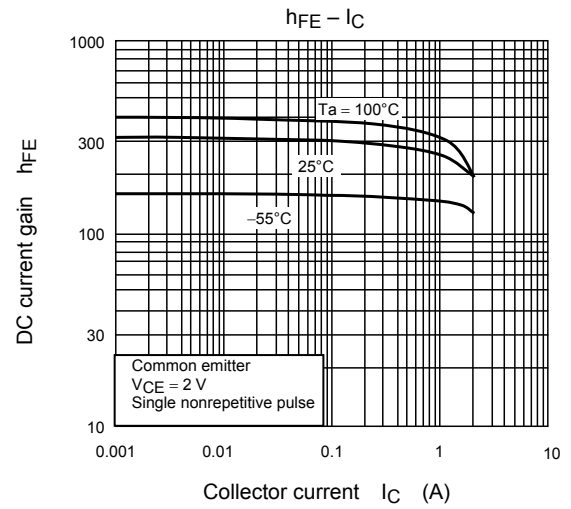
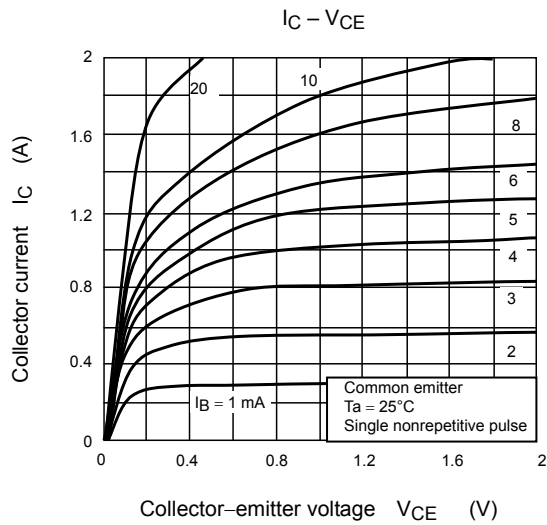
Figure 4. Switching Time Test Circuit & Timing Chart



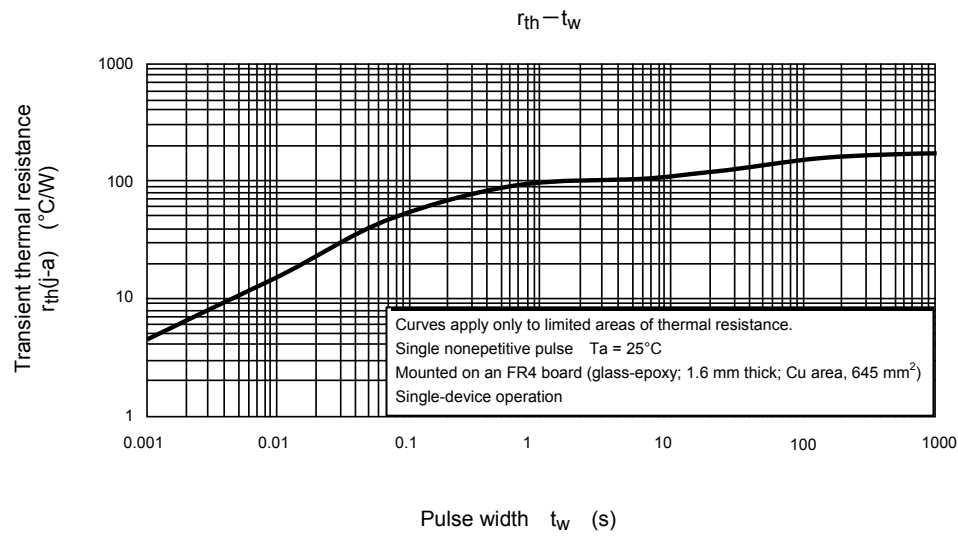
PNP



NPN



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