

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

HN4B101J

MOS Gate Drive Applications
Switching Applications

- Small footprint due to a small and thin package
- High DC current gain : $h_{FE} = 200$ to 500 ($I_C = -0.12$ A)
- Low collector-emitter saturation: PNP $V_{CE(sat)} = -0.20$ V (max)
: NPN $V_{CE(sat)} = 0.17$ V (max)
- High-speed switching : PNP $t_f = 45$ ns (typ.)
: NPN $t_f = 50$ ns (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating		Unit	
		PNP	NPN		
Collector-base voltage	V_{CBO}	-30	50	V	
Collector-emitter voltage	V_{CEO}	-30	30	V	
Emitter-base voltage	V_{EBO}	-7	7	V	
Collector current	DC (Note 1)	I_C	-1.0	1.2	A
	Pulse (Note 1)	I_{CP}	-5.0	5.0	
Base current	I_B	-120	120	mA	
Collector power dissipation (t = 10 s)	Single-device operation	P_C (Note 2)	0.85	W	
Collector power dissipation (DC)	Single-device operation	P_C (Note 2)	0.55	W	
Junction temperature	T_j	150		°C	
Storage temperature range	T_{stg}	-55 to 150		°C	

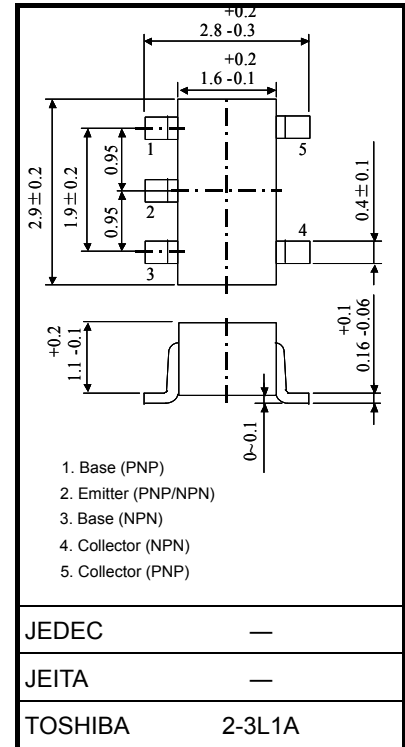
Note 1: Ensure that the channel temperature does not exceed 150°C during use of the device.

Note 2: Mounted on an FR4 board (glass-epoxy; 1.6 mm thick; Cu area, 645 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: 0.014g (typ.)

Figure 1. Circuit Configuration (top view)

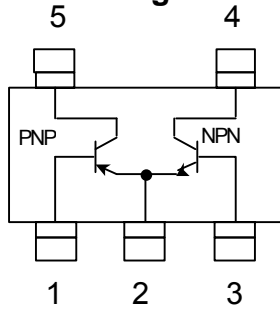
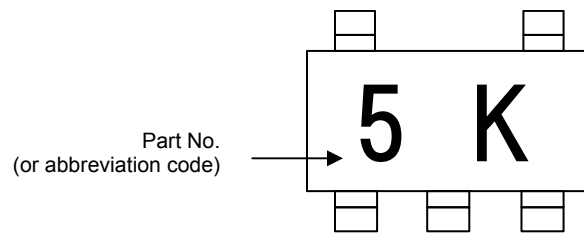


Figure 2. Marking



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	$h_{FE(1)}$	$V_{CE} = -2\text{ V}, I_C = -0.12\text{ A}$	200	—	500	
	$h_{FE(2)}$	$V_{CE} = -2\text{ V}, I_C = -0.4\text{ A}$	125	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = -0.4\text{ A}, I_B = -13\text{ mA}$	—	—	-0.20	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C = -0.4\text{ A}, I_B = -13\text{ mA}$	—	—	-1.10	V
Collector output capacitance	C_{ob}	$V_{CB} = -10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	7.8	—	pF
Switching time	Rise time	See Figure 3 circuit diagram $V_{CC} \approx -16\text{ V}, R_L = 40\ \Omega$ $-I_{B1} = I_{B2} = 13\text{ mA}$	—	40	—	ns
	Storage time		—	200	—	
	Fall time		—	45	—	

NPN

Characteristic	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	$V_{(BR)CEO}$	$I_C = 10\text{ mA}, I_B = 0$	30	—	—	V
DC current gain	$h_{FE(1)}$	$V_{CE} = 2\text{ V}, I_C = 0.12\text{ A}$	200	—	500	
	$h_{FE(2)}$	$V_{CE} = 2\text{ V}, I_C = 0.4\text{ A}$	125	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 0.4\text{ A}, I_B = 13\text{ mA}$	—	—	0.17	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C = 0.4\text{ A}, I_B = 13\text{ mA}$	—	—	1.10	V
Collector output capacitance	C_{ob}	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	7.0	—	pF
Switching time	Rise time	See Figure 4 circuit diagram $V_{CC} \approx 16\text{ V}, R_L = 40\ \Omega$ $I_{B1} = -I_{B2} = 13\text{ mA}$	—	45	—	ns
	Storage time		—	450	—	
	Fall time		—	50	—	

Figure 3. Switching Time Test Circuit & Timing Chart

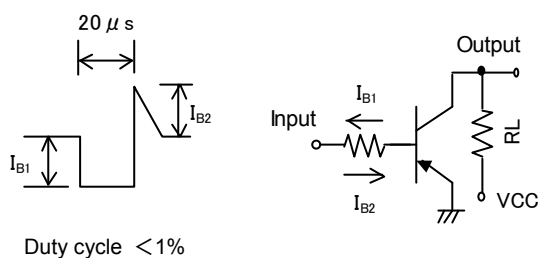
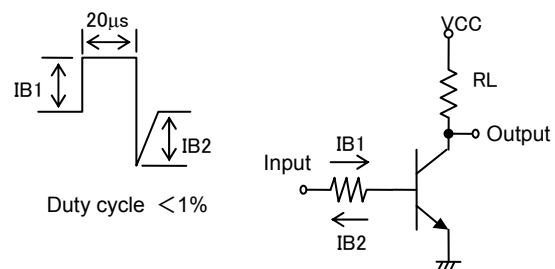
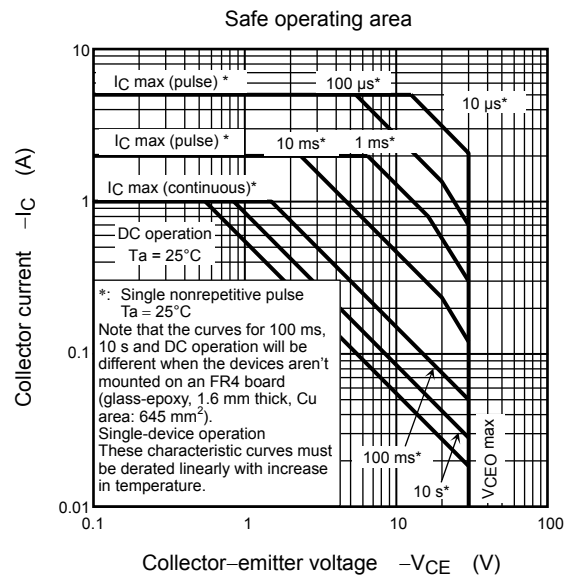
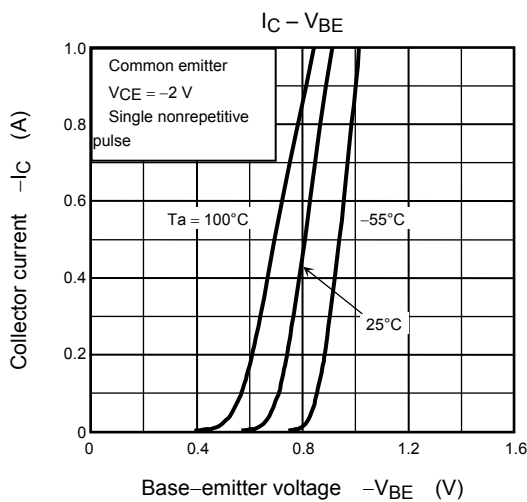
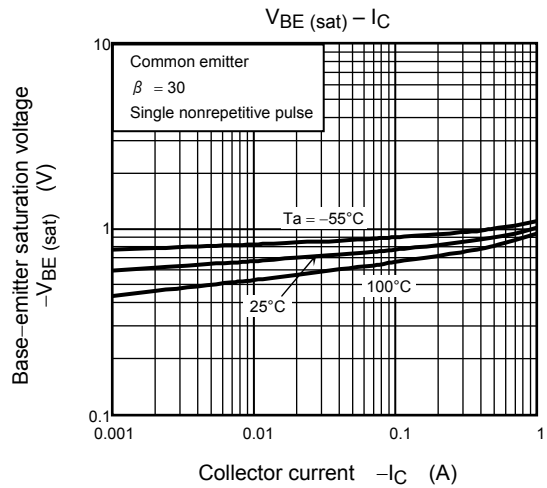
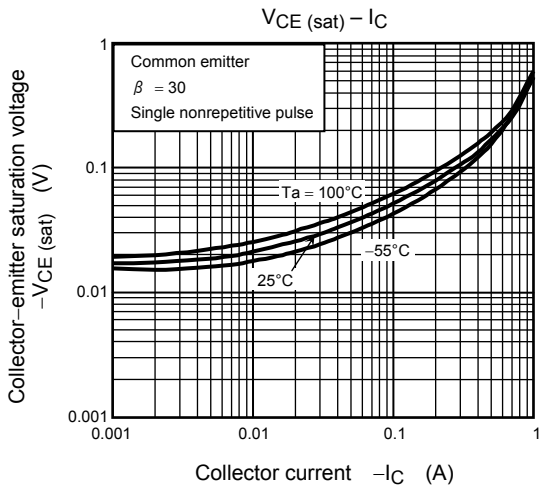
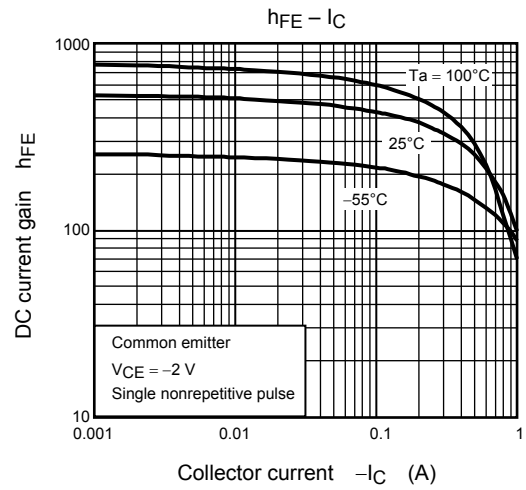
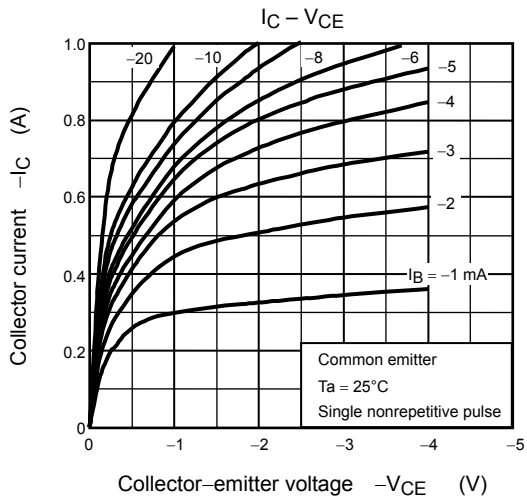


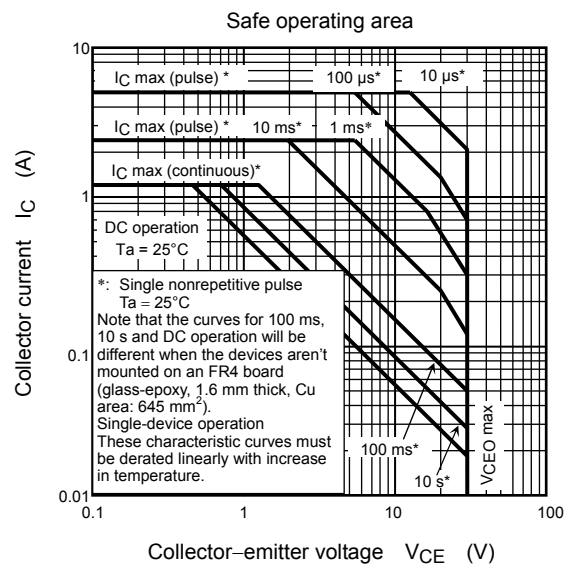
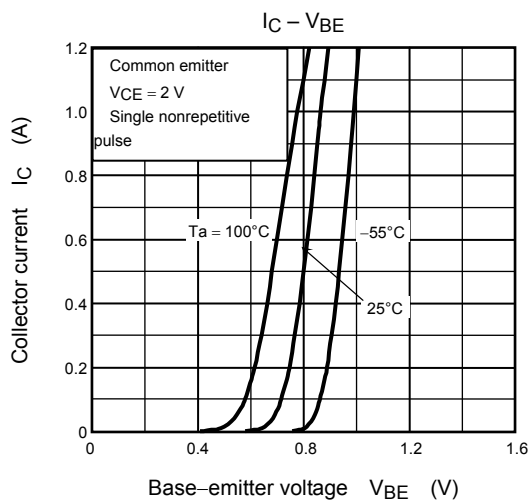
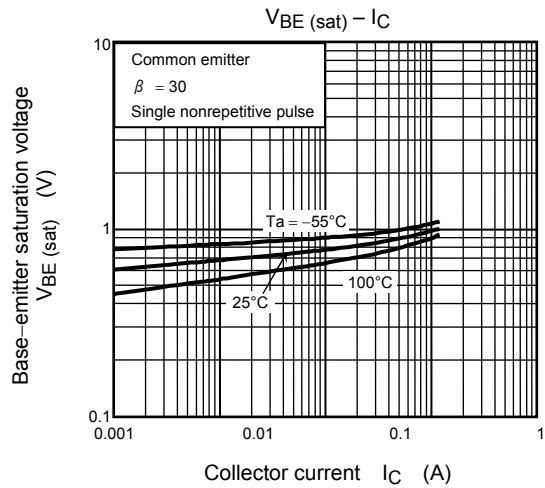
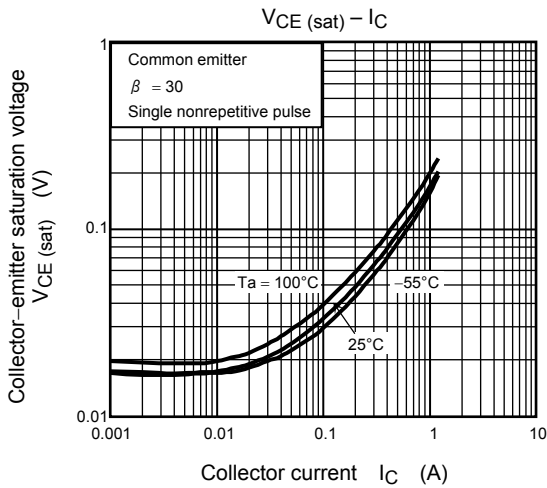
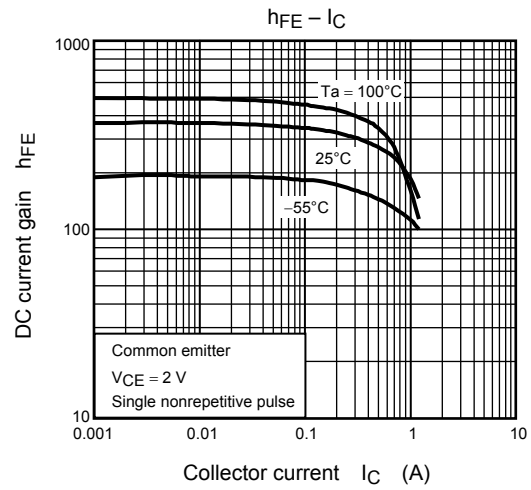
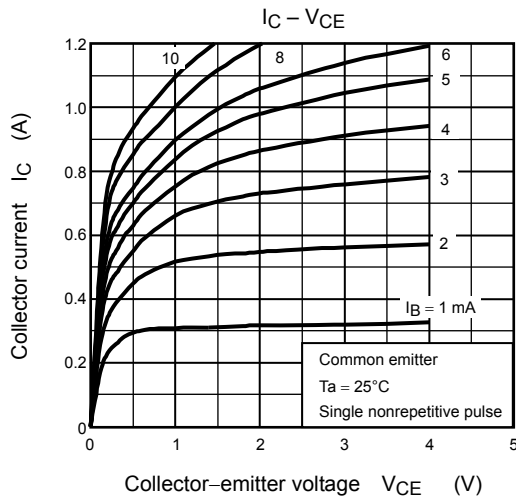
Figure 4. Switching Time Test Circuit & Timing Chart



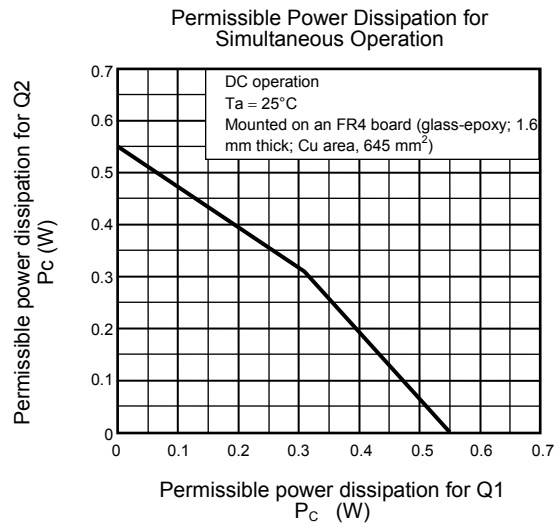
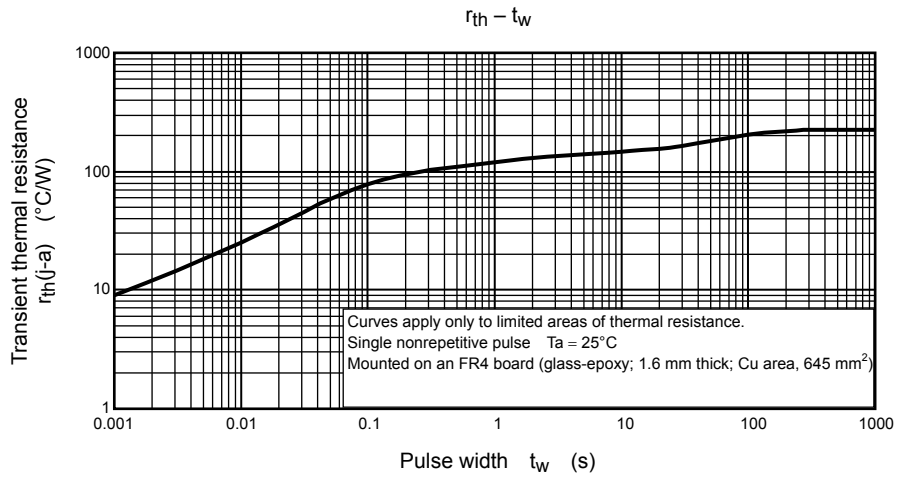
PNP



NPN



Common



Collector power dissipation at single-device operation is 0.55 W.
 Collector power dissipation at single-device value at dual operation is 0.31 W.
 Collector power dissipation at dual operation is set to 0.62 W.

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