

TOSHIBA Transistor Silicon NPN Epitaxial Type (Darlington Power)

2SD2686

Solenoid Drive Applications
 Motor Drive Applications

- High DC current gain: $h_{FE} = 2000$ (min) ($V_{CE} = 2\text{ A}$, $I_C = 1\text{ A}$)
- Zener diode included between collector and base

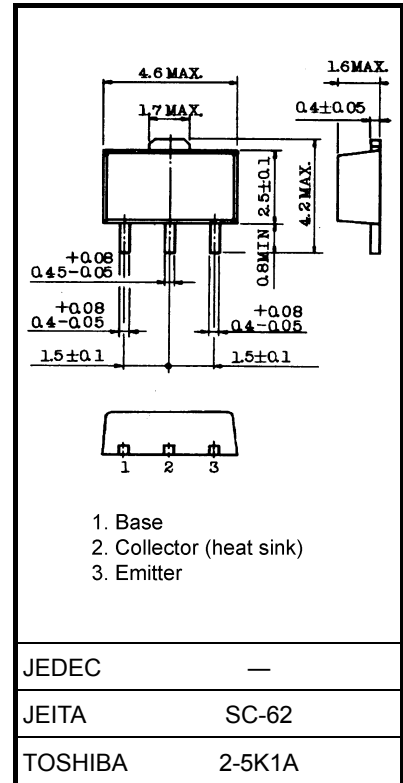
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	60 ± 10	V
Emitter-base voltage	V_{EBO}	8	V
Collector current	DC	I_C	1
	Pulse	I_{CP}	3
Base current	I_B	0.5	A
Collector power dissipation	DC	P_C (Note 1)	1.0
	$t = 10\text{ s}$		2.5
Junction temperature	T_j	150	$^\circ\text{C}$
Storage temperature range	T_{stg}	-55 to 150	$^\circ\text{C}$

Note 1: Mounted on an FR4 board (glass-epoxy; 1.6 mm thick; Cu area, 645 mm²)

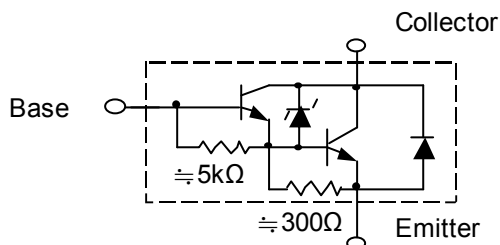
Note 2: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

Unit: mm



Weight: 0.05 g (typ.)

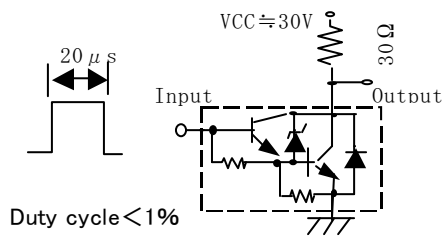
Equivalent Circuit



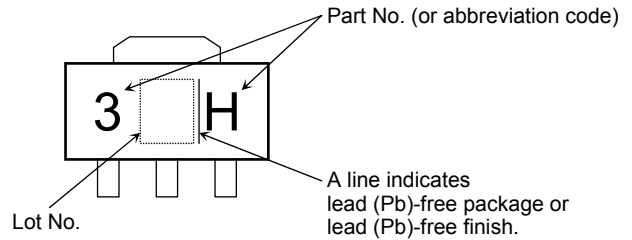
Electrical Characteristics (Ta = 25°C)

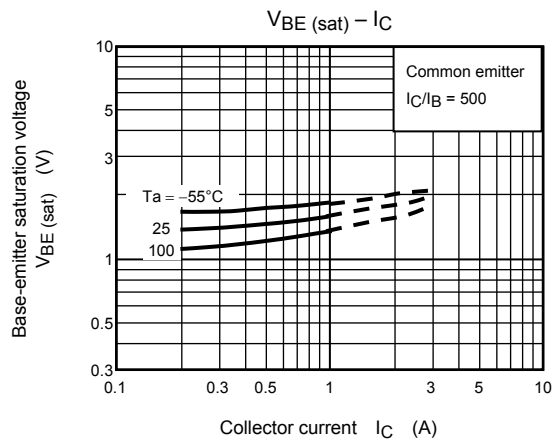
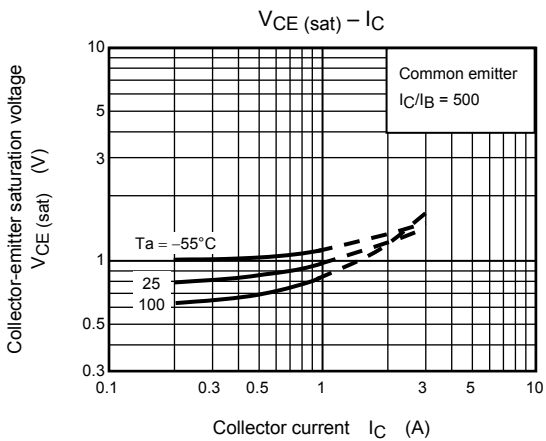
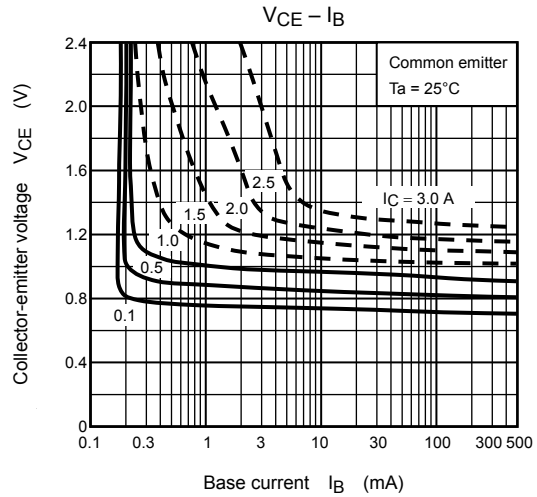
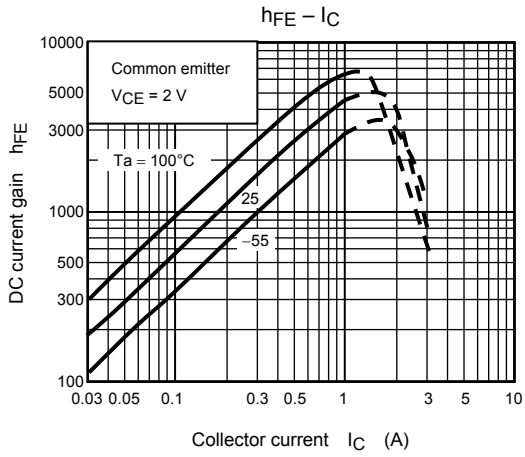
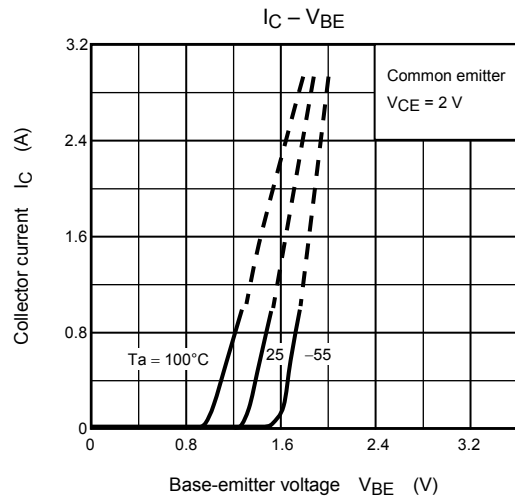
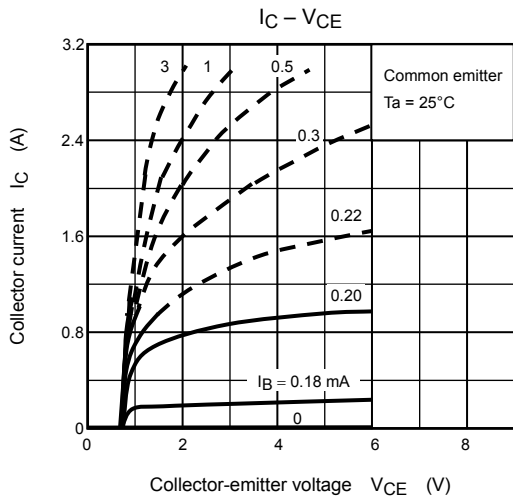
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cutoff current		I_{CBO}	$V_{CB} = 45\text{ V}, I_E = 0$	—	—	10	μA
		I_{CEO}	$V_{CE} = 45\text{ V}, I_E = 0$	—	—	10	μA
Emitter cutoff current		I_{EBO}	$V_{EB} = 8\text{ V}, I_C = 0$	0.80	—	4.0	mA
Collector-emitter breakdown voltage		$V_{(BR)CEO}$	$I_C = 10\text{ mA}, I_B = 0$	50	60	70	V
DC current gain		h_{FE}	$V_{CE} = 2\text{ V}, I_C = 1.0\text{ A}$	2000	—	—	
Collector-emitter saturation voltage		$V_{CE(sat)}(1)$	$I_C = 0.5\text{ A}, I_B = 1\text{ mA}$	—	—	1.2	V
		$V_{CE(sat)}(2)$	$I_C = 1.0\text{ A}, I_B = 1\text{ mA}$	—	—	1.5	V
Base-emitter saturation voltage		$V_{BE(sat)}$	$I_C = 1.0\text{ A}, I_B = 1\text{ mA}$	—	—	2.0	V
Switching time	Rise time	t_{on}	See Figure 1 circuit diagram. $V_{CC} \approx 30\text{ V}, R_L = 30\ \Omega$	—	0.4	—	μs
	Storage time	t_{stg}		—	4.0	—	
	Fall time	t_f		—	0.6	—	

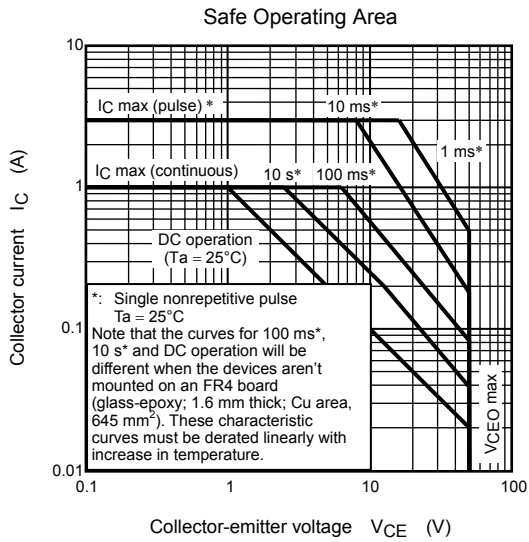
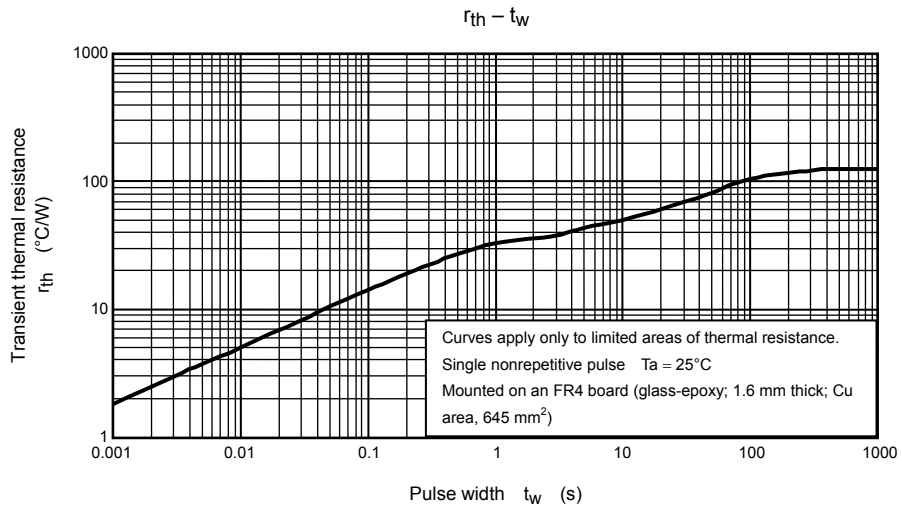
Figure 1. Switching Time Test Circuit & Timing Chart



Marking







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