TOSHIBA Transistor Silicon NPN Triple Diffused Type (Darlington)

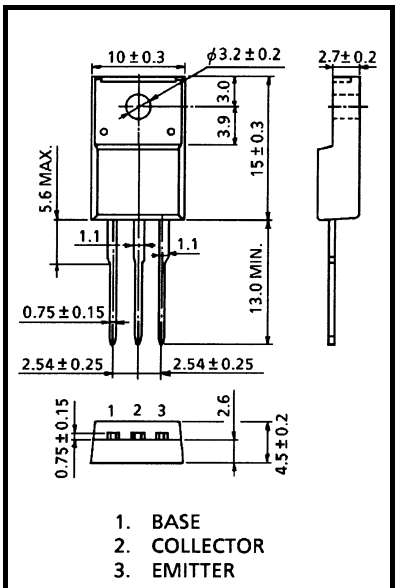
2SD2131

High-Power Switching Applications

Hammer Drive, Pulse Motor Drive Applications

- High DC current gain: h_{FE} = 2000 (min) (V_{CE} = 3 V, I_C = 3 A)
- Low saturation voltage: $V_{CE\ (sat)}$ = 1.5 V (max) (I_C = 3 A)
- Zener diode included between collector and base.
- Unclamped inductive load energy: E = 150 mJ (min)

Unit: mm



JEDEC	—
JEITA	SC-67
TOSHIBA	2-10R1A

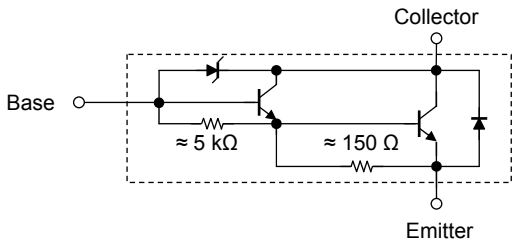
Weight: 1.7 g (typ.)

Absolute Maximum Ratings (Tc = 25°C)

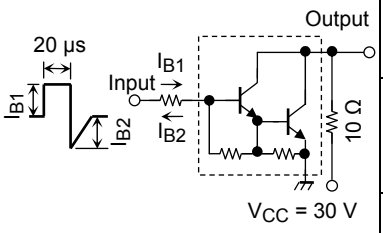
Characteristics		Symbol	Rating	Unit
Collector-base voltage		V_{CBO}	60 ± 10	V
Collector-emitter voltage		V_{CEO}	60 ± 10	V
Emitter-base voltage		V_{EBO}	7	V
Collector current	DC	I_C	5	A
	Pulse	I_{CP}	8	
Base current		I_B	0.5	A
Collector power dissipation	Ta = 25°C	P_C	2.0	W
	Tc = 25°C		30	
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

Note: 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).

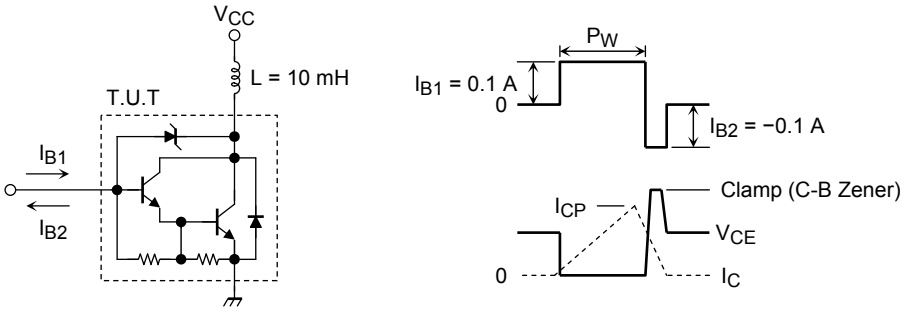
Equivalent Circuit



Electrical Characteristics (Tc = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	V_{CB} = 45 V, I_E = 0	—	—	10	μA
Collector cut-off current		I_{CEO}	V_{CE} = 45 V, I_B = 0	—	—	10	μA
Emitter cut-off current		I_{EBO}	V_{EB} = 6 V, I_C = 0	—	—	2.5	mA
Collector-base breakdown voltage		$V_{(BR)\ CBO}$	I_C = 1 mA, I_E = 0	50	60	70	V
Collector-emitter breakdown voltage		$V_{(BR)\ CEO}$	I_C = 10 mA, I_B = 0	50	60	70	V
DC current gain		$h_{FE\ (1)}$	V_{CE} = 3 V, I_C = 3 A	2000	—	15000	
		$h_{FE\ (2)}$	V_{CE} = 3 V, I_C = 5 A	1000	—	—	
Collector-emitter saturation voltage		$V_{CE\ (sat)\ (1)}$	I_C = 3 A, I_B = 6 mA	—	1.1	1.5	V
		$V_{CE\ (sat)\ (2)}$	I_C = 5 A, I_B = 20 mA	—	1.3	2.5	
Base-emitter saturation voltage		$V_{BE\ (sat)}$	I_C = 3 A, I_B = 6 mA	—	1.7	2.5	V
Unclamped inductive load energy		$E_{S/B}$	(Note 1)	150	—	—	mJ
Switching time	Turn-on time	t_{on}	 $I_{B1} = -I_{B2}$ = 6 mA, duty cycle ≤ 1%	—	1.0	—	μs
	Storage time	t_{stg}		—	4.0	—	
	Fall time	t_f		—	2.5	—	

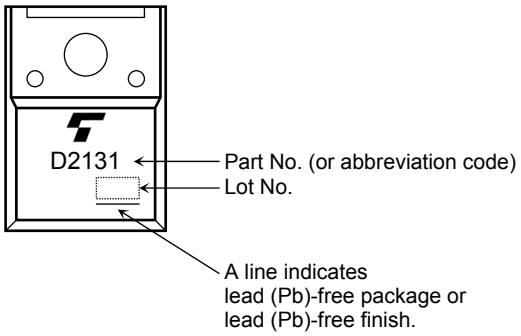
Note 1: Measurement circuit for unclamped inductive load energy



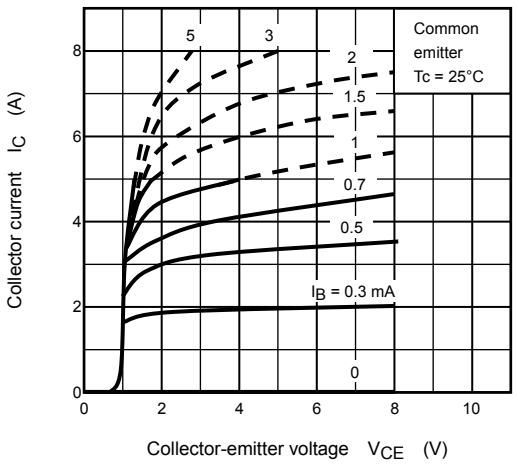
Note 2: (1) Pulse width adjusted for desired I_{CP} (I_{CP} = 5.47 A min)

(2) $E = 1/2\ L\ I_{CP}^2$

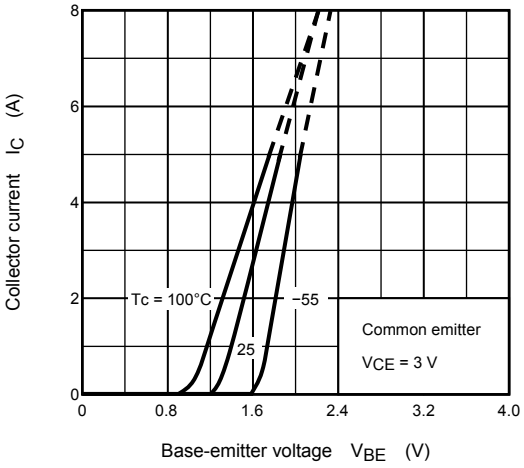
Marking



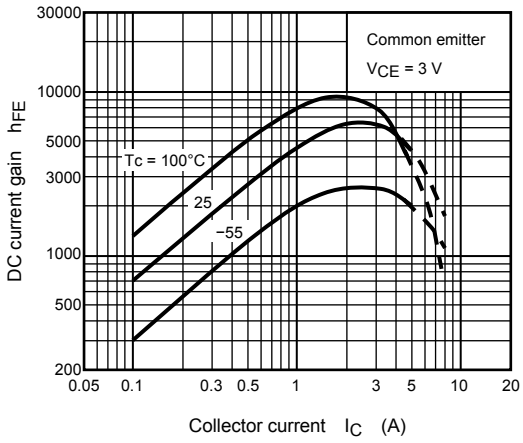
$I_C - V_{CE}$



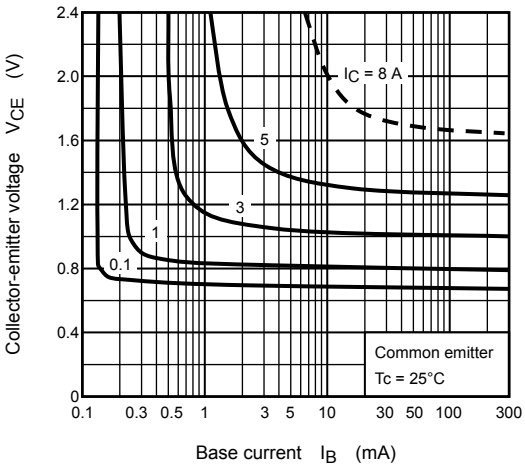
$I_C - V_{BE}$



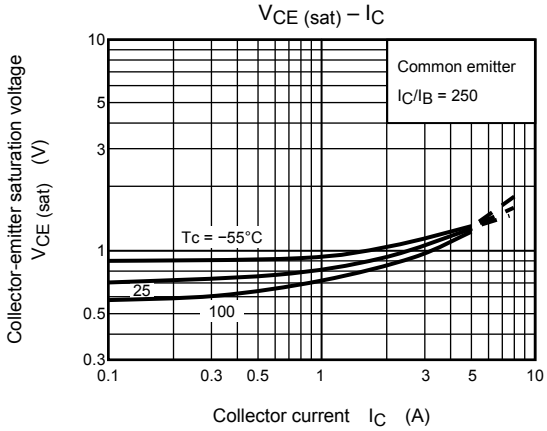
$h_{FE} - I_C$



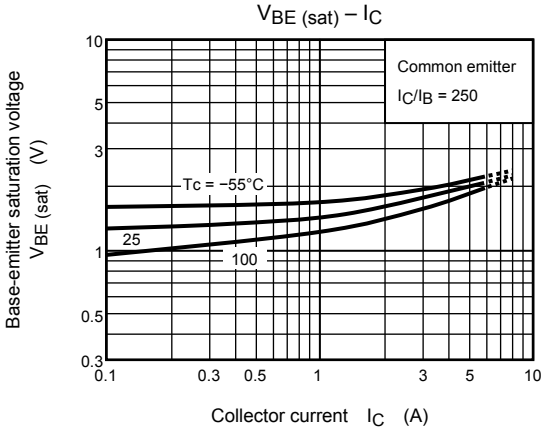
$V_{CE} - I_B$



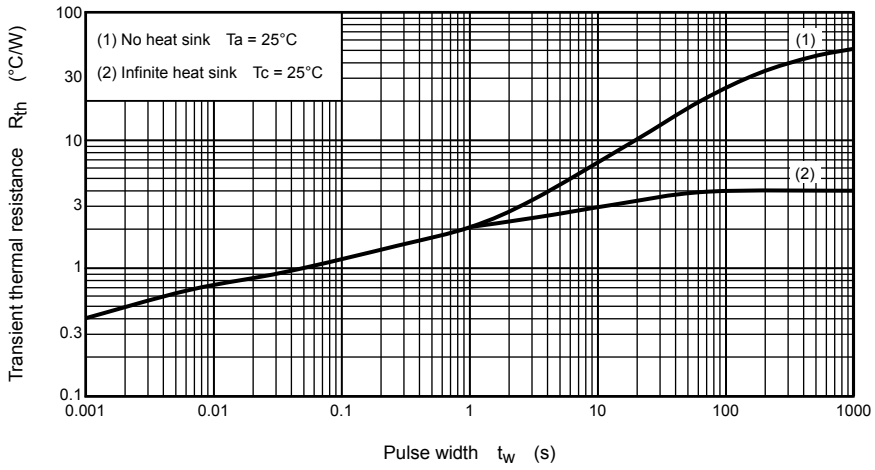
$V_{CE\ (sat)} - I_C$



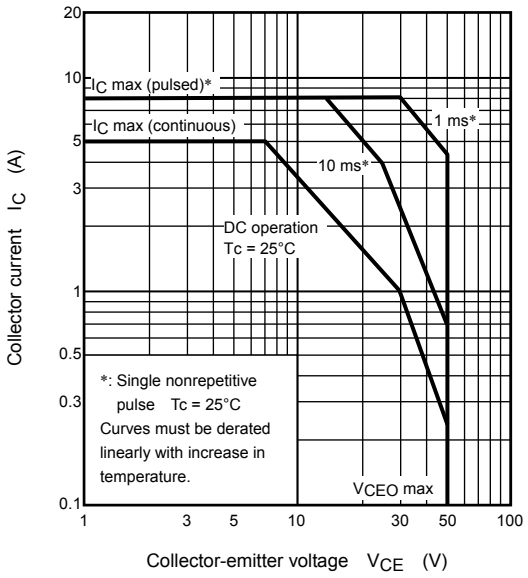
$V_{BE\ (sat)} - I_C$



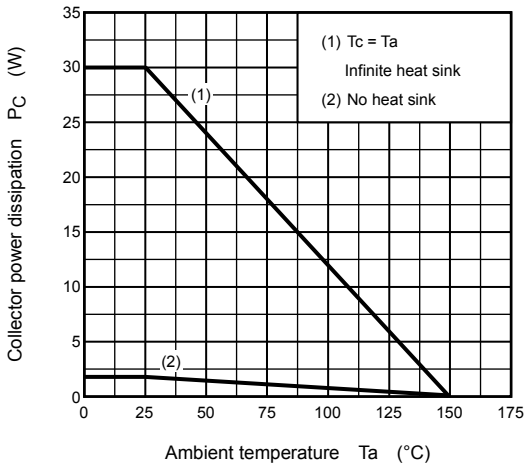
$R_{th} - t_w$



Safe Operating Area



$P_C - Ta$



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