

# 2SD1160

Switching Applications  
Suitable for Motor Drive Applications

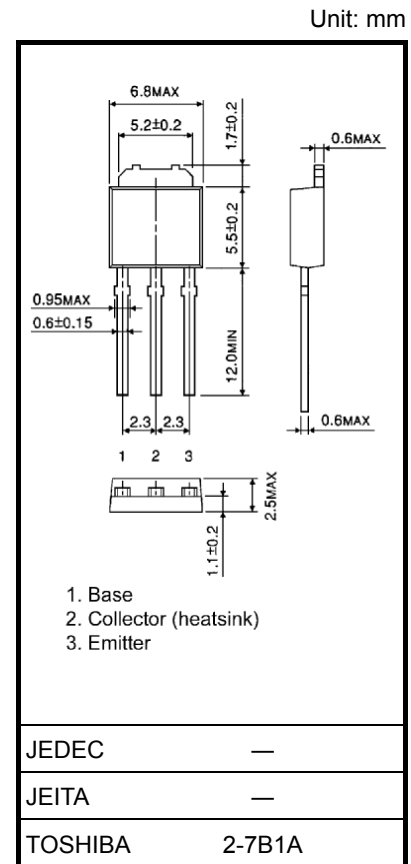
- High DC current gain
- Low saturation voltage:  $V_{CE(sat)} = 0.6\text{ V (max)}$  ( $I_C = 2\text{ A}$ ,  $I_B = 40\text{ mA}$ )
- Built-in free wheel diode

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

Characteristics		Symbol	Rating	Unit
Collector-base voltage		$V_{CBO}$	50	V
Collector-emitter voltage		$V_{CEO}$	20	V
Emitter-base voltage		$V_{EBO}$	6	V
Collector current	DC	$I_C$	2	A
	Pulse	$I_{CP}$	4	
Diode forward surge current ( $t = 1\text{ s}$ )		$I_{FP}$	1	A
Collector power dissipation	$T_a = 25^\circ\text{C}$	$P_C$	1	W
	$T_c = 25^\circ\text{C}$		10	
Junction temperature		$T_j$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

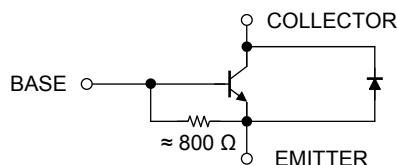
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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



Weight: 0.36 g (typ.)

### Equivalent Circuit



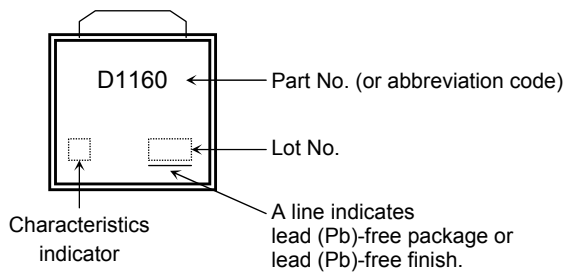
## Electrical Characteristics (Ta = 25°C)

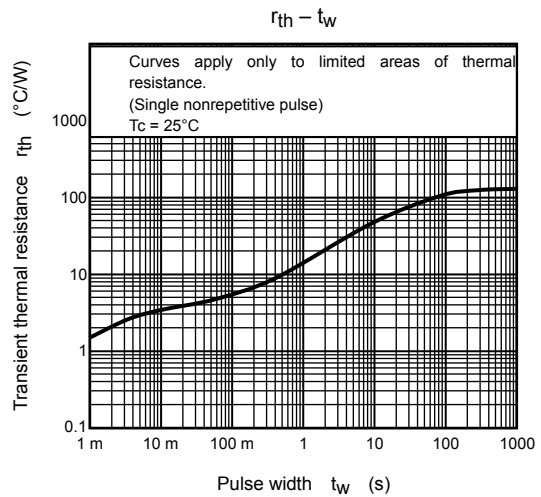
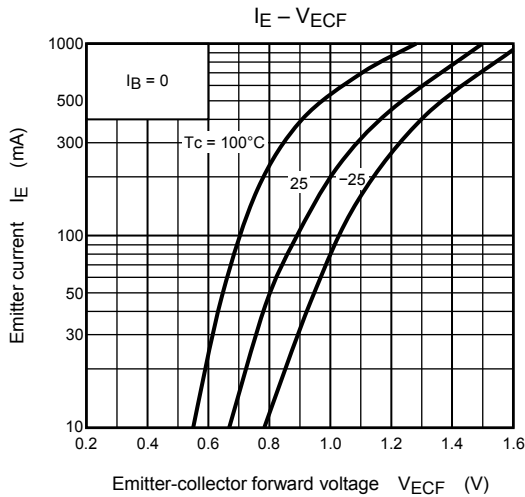
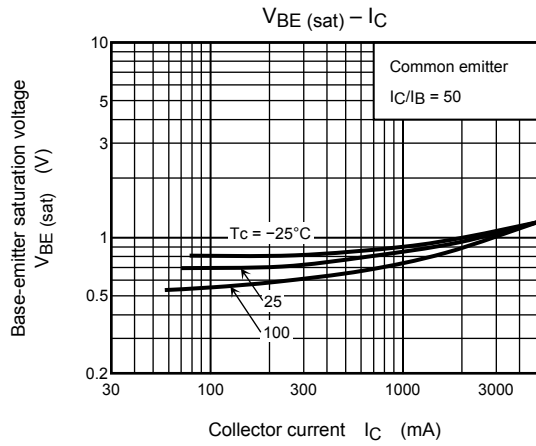
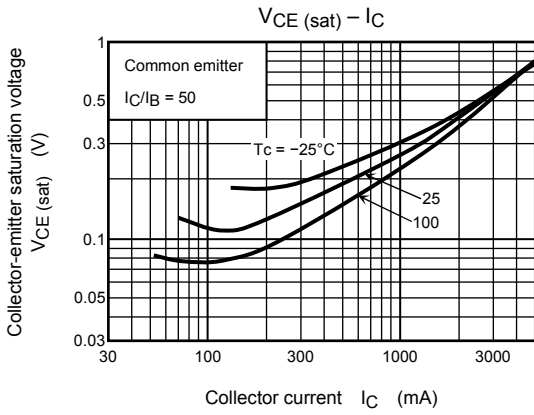
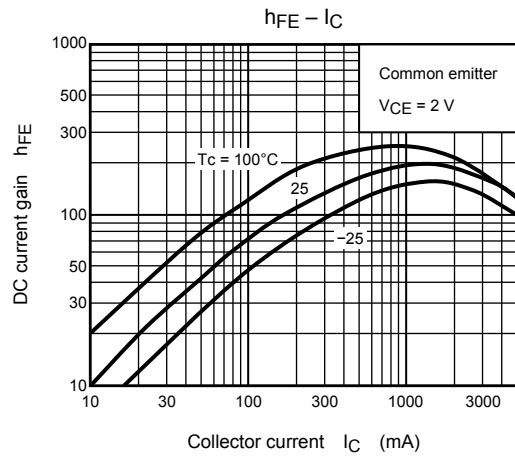
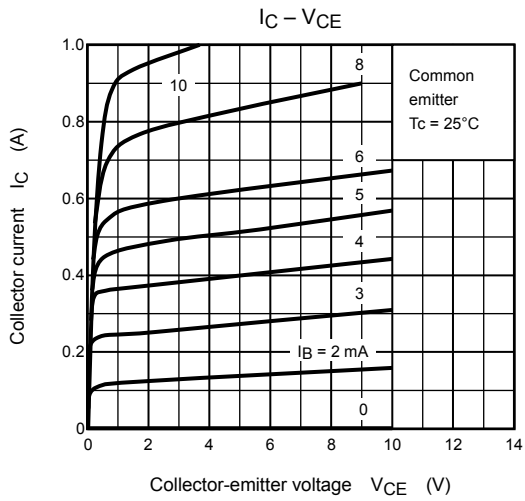
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = 50\text{ V}, I_E = 0$	—	—	1	$\mu\text{A}$
Emitter cut-off current	$I_{EBO}$	$V_{EB} = 5\text{ V}, I_C = 0$	2.5	6.25	15	mA
Collector-emitter sustaining voltage	$V_{CEO(SUS)}$	$I_C = 20\text{ mA}, L = 40\text{ mH}$	20	—	—	V
DC current gain	$h_{FE(1)}$ (Note)	$V_{CE} = 2\text{ V}, I_C = 1\text{ A}$	100	—	300	
	$h_{FE(2)}$	$V_{CE} = 2\text{ V}, I_C = 2\text{ A}$	60	—	—	
Collector emitter saturation voltage	$V_{CE(sat)}$	$I_C = 2\text{ A}, I_B = 40\text{ mA}$	—	0.4	0.6	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C = 2\text{ A}, I_B = 40\text{ mA}$	—	—	1.5	V
Emitter-collector forward voltage	$V_{ECF}$	$I_E = 1\text{ A}, I_B = 0$	—	—	2.0	V

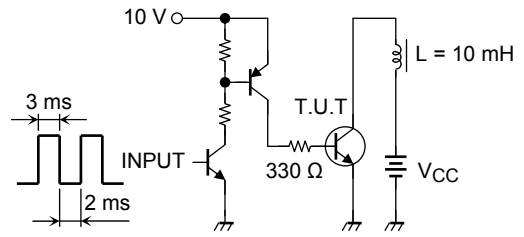
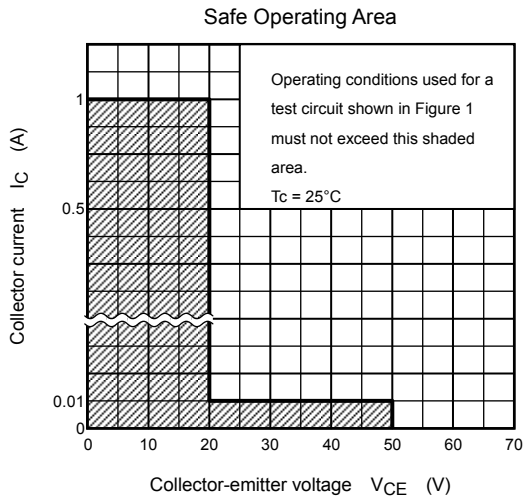
Note:  $h_{FE(1)}$  classification O: 100 to 200, Y: 150 to 300

Classification	Min	Max
2SD1160-O	100	200
2SD1160-Y	150	300

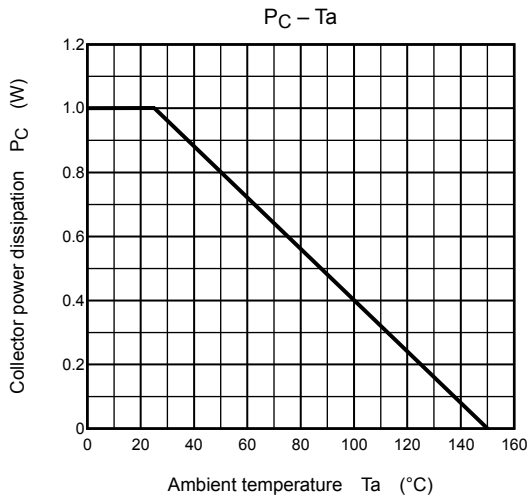
## Marking







**Figure 1 Safe Operating Area Test Circuit**



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