

TOSHIBA Transistor Silicon NPN Epitaxial Type

# 2SC6133

High-Speed Switching Applications  
DC-DC Converter Applications

Unit: mm

- High DC current gain:  $h_{FE} = 400$  to  $1000$  ( $I_C = 0.15A$ )
- Low collector-emitter saturation voltage:  $V_{CE(sat)} = 0.12$  V (max)
- High-speed switching:  $t_f = 45$  ns (typ.)

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

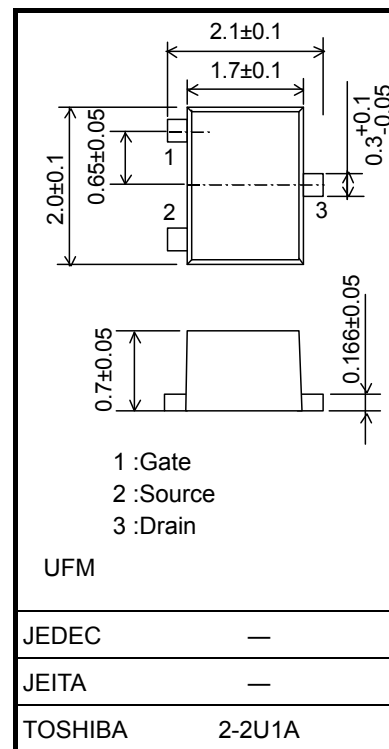
Characteristics		Symbol	Rating	Unit
Collector-base voltage		$V_{CBO}$	40	V
Collector-emitter voltage		$V_{CEX}$	30	V
Collector-emitter voltage		$V_{CEO}$	20	V
Emitter-base voltage		$V_{EBO}$	7	V
Collector current	DC	$I_C$	1.5	A
	Pulse	$I_{CP}$	2.5	
Base current		$I_B$	150	mA
Collector power dissipation		$P_C$ (Note1)	800	mW
		$P_C$ (Note2)	500	
Junction temperature		$T_j$	150	$^\circ C$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ C$

Note1: Mounted on ceramic board.  
(25.4 mm × 25.4 mm × 0.8 mm, Cu Pad: 645 mm<sup>2</sup>)

Note2: Mounted on FR4 board.  
(25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 645 mm<sup>2</sup>)

Note3: 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.

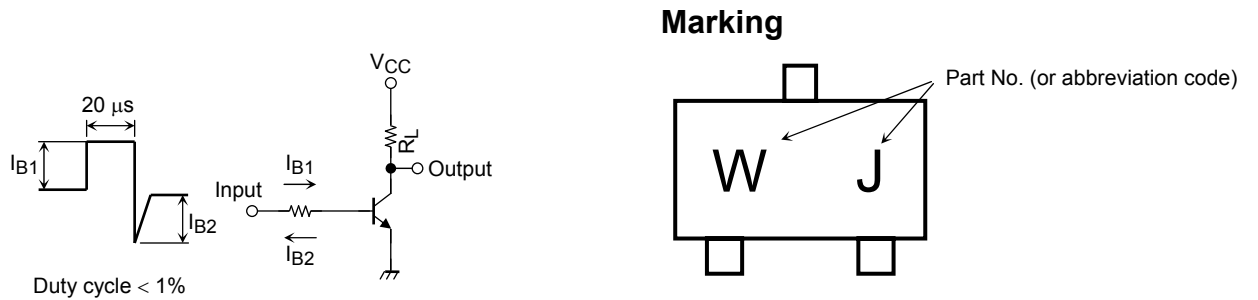
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).



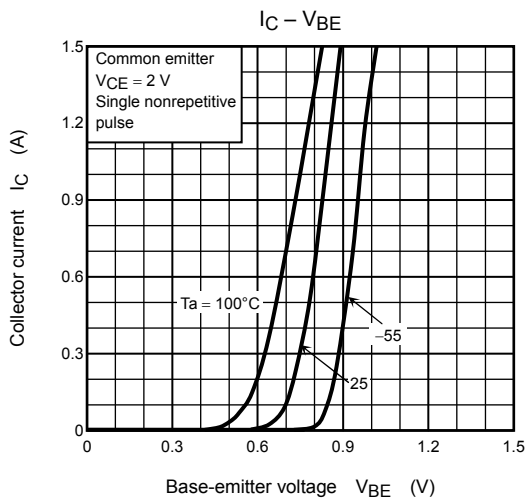
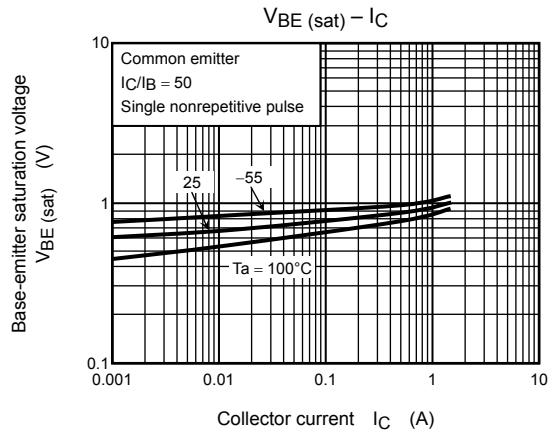
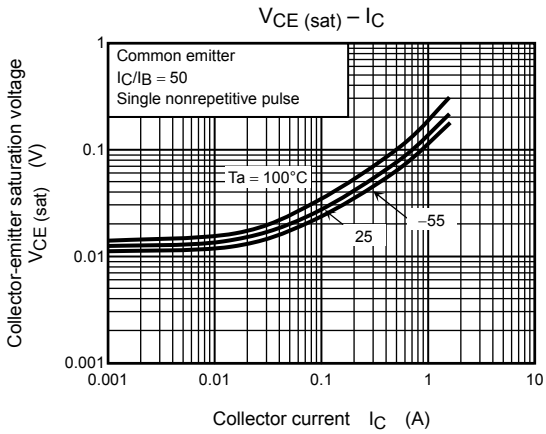
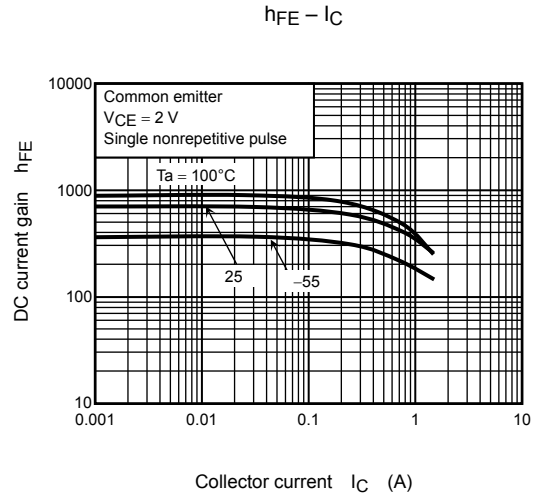
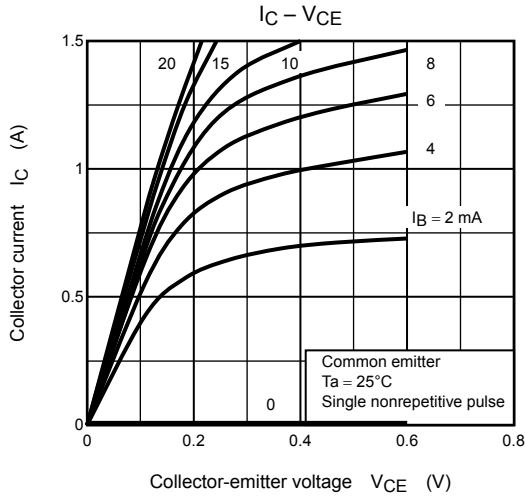
Weight: 6.6 mg (typ.)

**Electrical Characteristics (Ta = 25°C)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = 40\text{ V}, I_E = 0$	—	—	100	nA
Emitter cut-off current	$I_{EBO}$	$V_{EB} = 7\text{ V}, I_C = 0$	—	—	100	nA
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 10\text{ mA}, I_B = 0$	20	—	—	V
DC current gain	$h_{FE}(1)$	$V_{CE} = 2\text{ V}, I_C = 0.15\text{ A}$	400	—	1000	
	$h_{FE}(2)$	$V_{CE} = 2\text{ V}, I_C = 0.5\text{ A}$	200	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 0.5\text{ A}, I_B = 10\text{ mA}$	—	—	0.12	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C = 0.5\text{ A}, I_B = 10\text{ mA}$	—	—	1.10	V
Collector output capacitance	$C_{ob}$	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	18	—	pF
Switching time	Rise time	$t_r$	See Figure 1.		—	ns
	Storage time	$t_{stg}$	$V_{CC} \approx 12\text{ V}, R_L = 24\ \Omega$		—	
	Fall time	$t_f$	$I_{B1} = -I_{B2} = 17\text{ mA}$		—	



**Figure 1 Switching Time Test Circuit & Timing Chart**



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