Bipolar Transistors Silicon NPN Epitaxial Type

TTC016

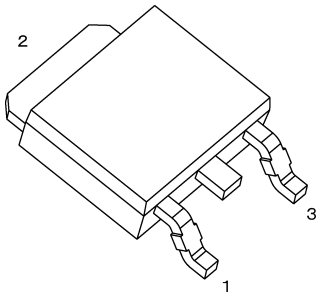
1. Applications

- High-Speed Switching
- DC-DC Converters

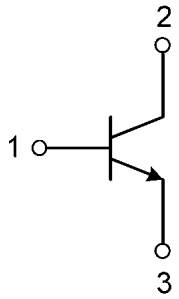
2. Features

(1) High DC current gain : h_{FE} = 400 to 1000 (I_C = 0.5 A)
(2) Low collector saturation voltage : $V_{CE(sat)}$ = 0.22 V (max) (I_C = 1.6 A, I_B = 32 mA)
(3) High-speed switching : t_f = 95 ns (typ.)

3. Packaging and Internal Circuit



New PW-Mold



1. Base
2. Collector (Heatsink)
3. Emitter

4. Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25 °C)

Characteristics		Symbol	Rating	Unit
Collector-base voltage		V_{CBO}	120	V
Collector-emitter voltage		V_{CEX}	100	
Collector-emitter voltage		V_{CEO}	50	
Emitter-base voltage		V_{EBO}	9	
Collector current (DC)	(Note 1)	I_C	5	A
Collector current (pulsed)	(Note 1)	I_{CP}	10	
Base current		I_B	0.5	
Collector power dissipation	(T_a = 25 °C)	P_C	1.2	W
Collector power dissipation	(T_c = 25 °C)	P_C	24	
Junction temperature	(Note 2)	T_j	175	°C
Storage temperature		T_{stg}	-55 to 150	

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).

Note 1: Ensure that the junction temperature does not exceed 175 °C.

Note 2: The definitions of the absolute maximum junction and storage temperatures are based on AEC-Q101.

Start of commercial production
2014-12

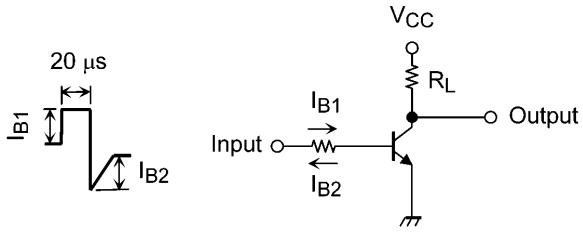
5. Electrical Characteristics

5.1. Static Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 120 V, I_E = 0 A	—	—	100	nA
Emitter cut-off current	I_{EBO}	V_{EB} = 9 V, I_C = 0 A	—	—	100	
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	I_C = 10 mA, I_B = 0 A	50	—	—	V
DC current gain	$h_{FE(1)}$	V_{CE} = 2 V, I_C = 0.5 A	400	—	1000	—
	$h_{FE(2)}$	V_{CE} = 2 V, I_C = 1.6 A	200	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 1.6 A, I_B = 32 mA	—	—	0.22	V
Base-emitter saturation voltage	$V_{BE(sat)}$	I_C = 1.6 A, I_B = 32 mA	—	—	1.10	

5.2. Dynamic Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Switching time (rise time)	t_r	See Figure 5.2.1.	—	60	—	ns
Switching time (storage time)	t_{stg}	$V_{CC} \approx$ 24 V, R_L = 15 Ω, I_{B1} = 32 mA, I_{B2} = 53 mA, Duty cycle ≤ 1 %	—	500	—	
Switching time (fall time)	t_f		—	95	—	



Duty cycle ≤ 1%

Fig. 5.2.1 Switching Time Test Circuit

6. Marking (Note)

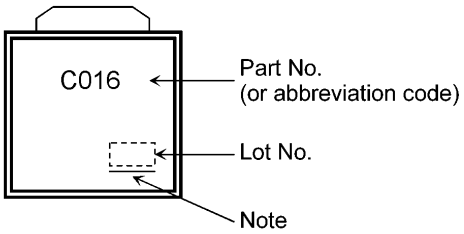


Fig. 6.1 Marking

Note: A line under a Lot No. identifies the indication of product Labels.
Not underlined: [[Pb]]/INCLUDES > MCV
Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]
Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product.
The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

7. Characteristics Curves (Note)

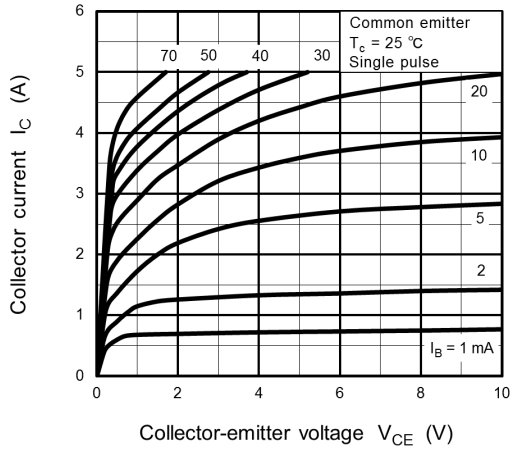


Fig. 7.1 I_C - V_{CE}

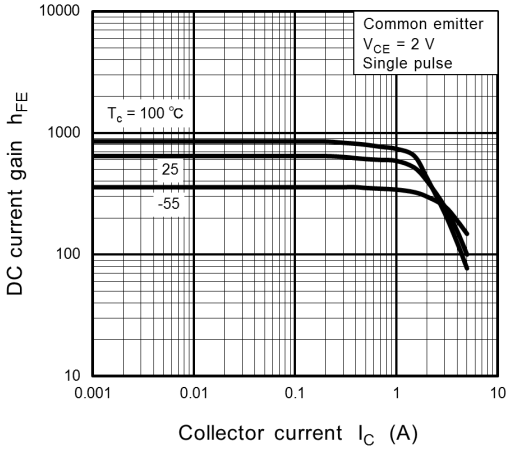


Fig. 7.2 h_{FE} - I_C

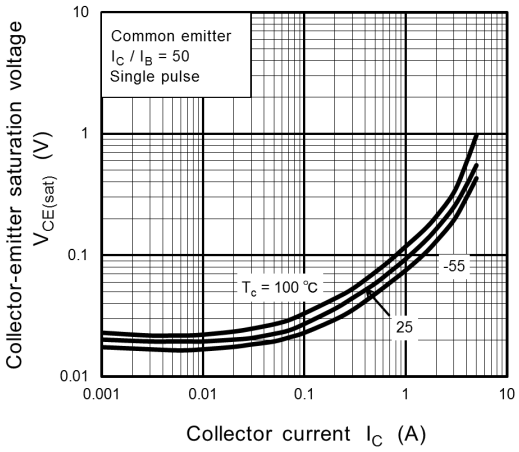


Fig. 7.3 $V_{CE(sat)}$ - I_C

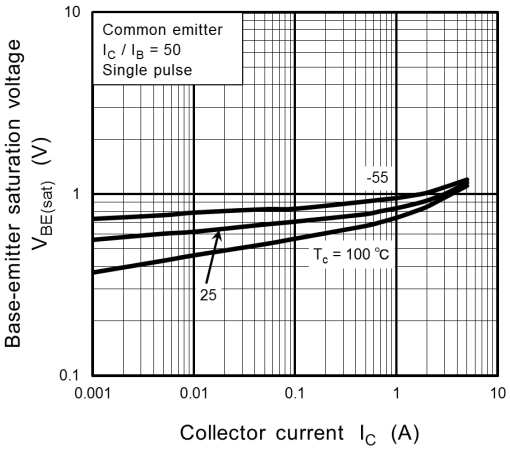


Fig. 7.4 $V_{BE(sat)}$ - I_C

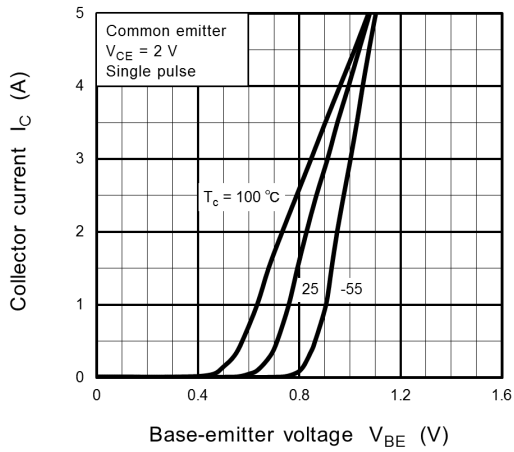


Fig. 7.5 I_C - V_{BE}

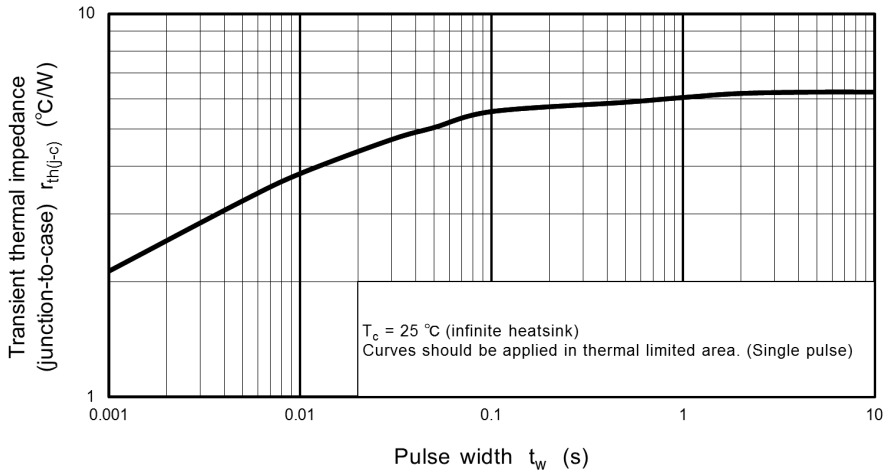


Fig. 7.6 $r_{th(j-c)}$ - t_w (Guaranteed Maximum)

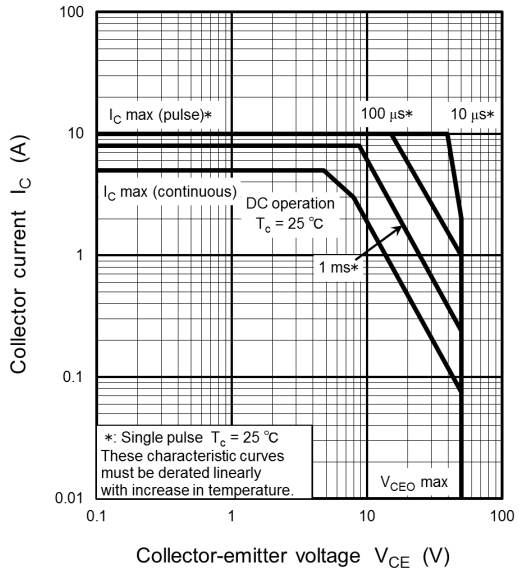
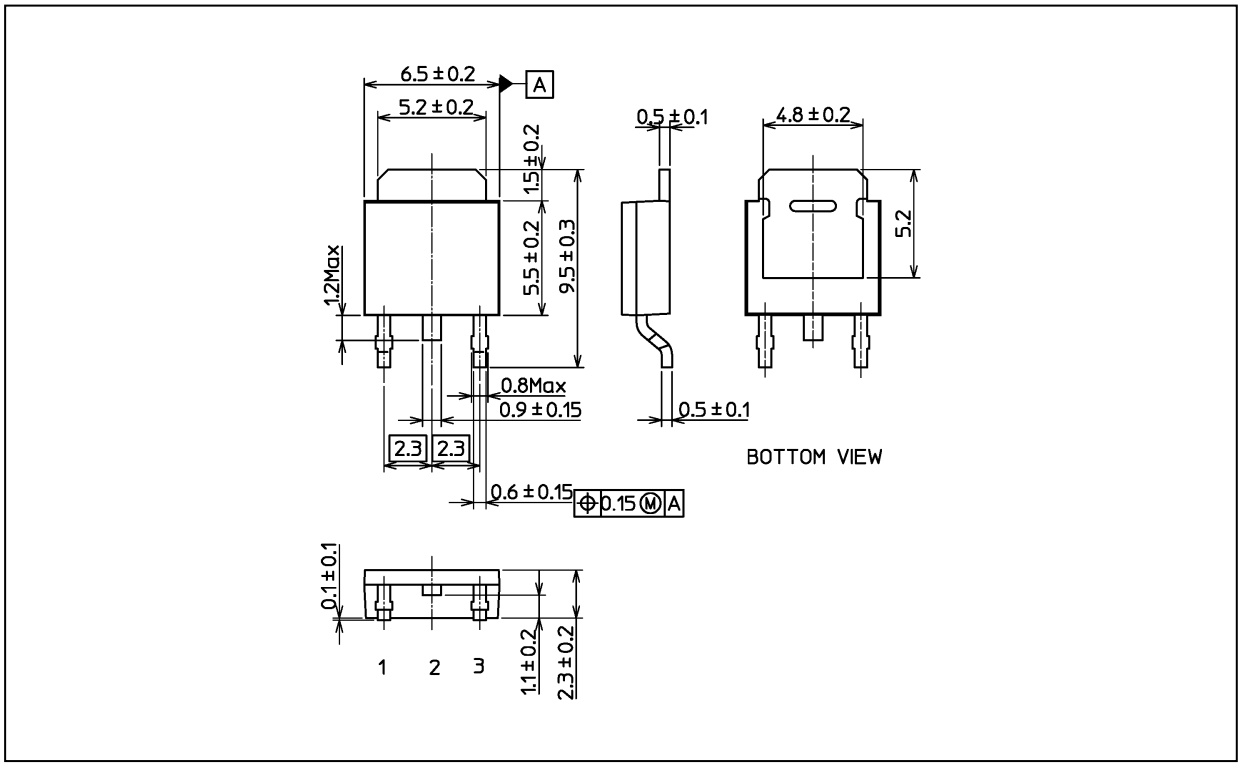


Fig. 7.7 Safe Operating Area (Guaranteed Maximum)

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

Package Dimensions

Unit: mm



Weight: 0.36 g (typ.)

Package Name(s)
TOSHIBA: 2-7J1S
Nickname: New PW-Mold

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