

## TTA005

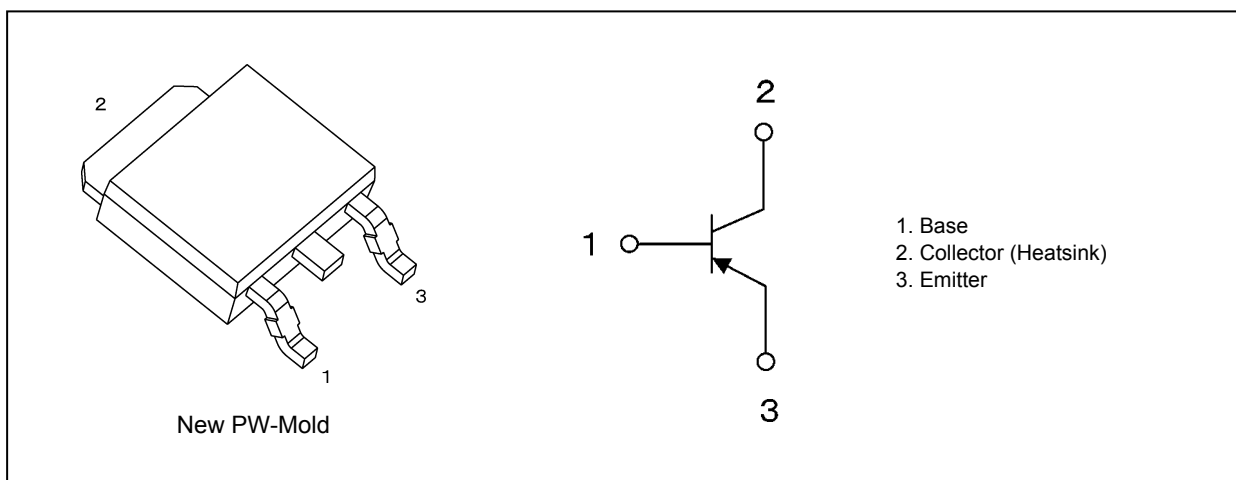
### 1. Applications

- High-Speed Switching
- DC-DC Converters

### 2. Features

- (1) High DC current gain:  $h_{FE} = 200$  to  $500$  ( $I_C = -0.5$  A)
- (2) Low collector-emitter saturation voltage:  $V_{CE(sat)} = -0.27$  V (max) ( $I_C = -1.6$  A,  $I_B = -53$  mA)
- (3) High-speed switching:  $t_f = 55$  ns (typ.)

### 3. Packaging and Internal Circuit



### 4. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	-50	V
Collector-emitter voltage	$V_{CEO}$	-50	
Emitter-base voltage	$V_{EBO}$	-7	
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	$P_C$	( $T_a = 25^\circ\text{C}$ ) 1.2	W
Collector power dissipation		( $T_c = 25^\circ\text{C}$ ) 24	
Junction temperature	(Note 2) $T_j$	175	$^\circ\text{C}$
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  $175^\circ\text{C}$ .

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

Start of commercial production

2012-04

## 5. Electrical Characteristics

### 5.1. Static Characteristics (Unless otherwise specified, $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = -50\text{ V}, I_E = 0\text{ A}$	—	—	-100	nA
Emitter cut-off current	$I_{EBO}$	$V_{EB} = -7\text{ V}, I_C = 0\text{ A}$	—	—	-100	nA
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = -10\text{ mA}, I_B = 0\text{ A}$	-50	—	—	V
DC current gain	$h_{FE(1)}$	$V_{CE} = -2\text{ V}, I_C = -0.5\text{ A}$	200	—	500	—
	$h_{FE(2)}$	$V_{CE} = -2\text{ V}, I_C = -1.6\text{ A}$	100	—	—	—
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = -1.6\text{ A}, I_B = -53\text{ mA}$	—	—	-0.27	V
Base-emitter saturation voltage	$V_{BE(sat)}$		—	—	-1.10	V

### 5.2. Dynamic Characteristics (Unless otherwise specified, $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Switching time (rise time)	$t_r$	See Figure 5.2.1 $V_{CC} \approx -24\text{ V}, R_L = 15\ \Omega,$ $I_{B1} = 53\text{ mA}, I_{B2} = 53\text{ mA},$ Duty cycle $\leq 1\%$	—	63	—	ns
Switching time (storage time)	$t_{stg}$		—	280	—	
Switching time (fall time)	$t_f$		—	55	—	

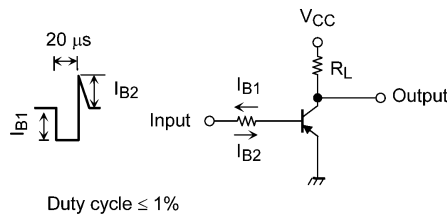


Fig. 5.2.1 Switching Time Test Circuit

## 6. Marking (Note)

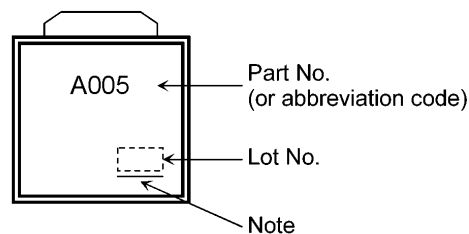


Fig. 6.1 Marking

Note: A line under a Lot No. identifies the indication of product Labels.

Not underlined:  $[[\text{Pb}]]/\text{INCLUDES} > \text{MCV}$

Underlined:  $[[\text{G}]]/\text{RoHS COMPATIBLE}$  or  $[[\text{G}]]/\text{RoHS } [[\text{Pb}]]$

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)

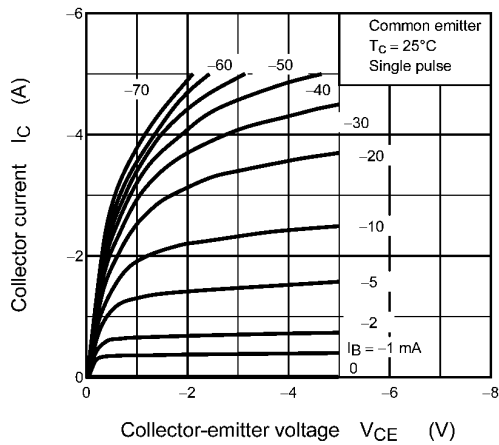


Fig. 7.1  $I_C - V_{CE}$

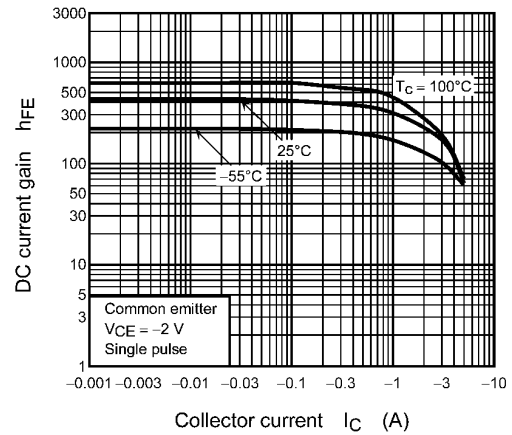


Fig. 7.2  $h_{FE} - I_C$

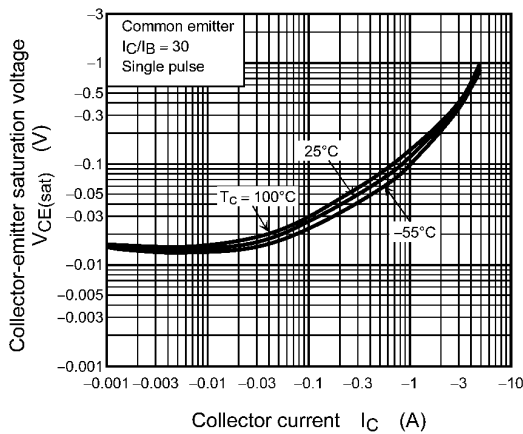


Fig. 7.3  $V_{CE(sat)} - I_C$

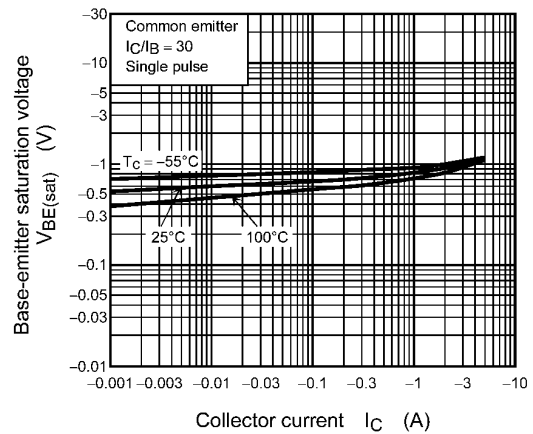


Fig. 7.4  $V_{BE(sat)} - I_C$

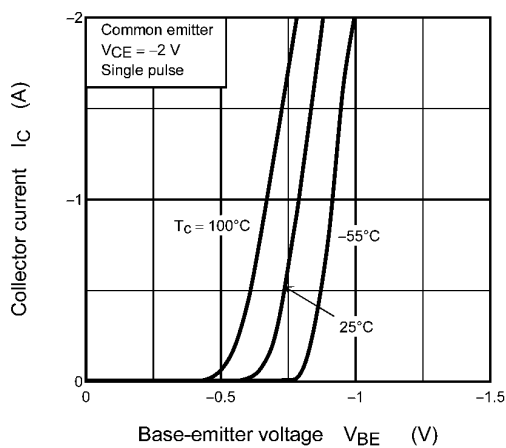
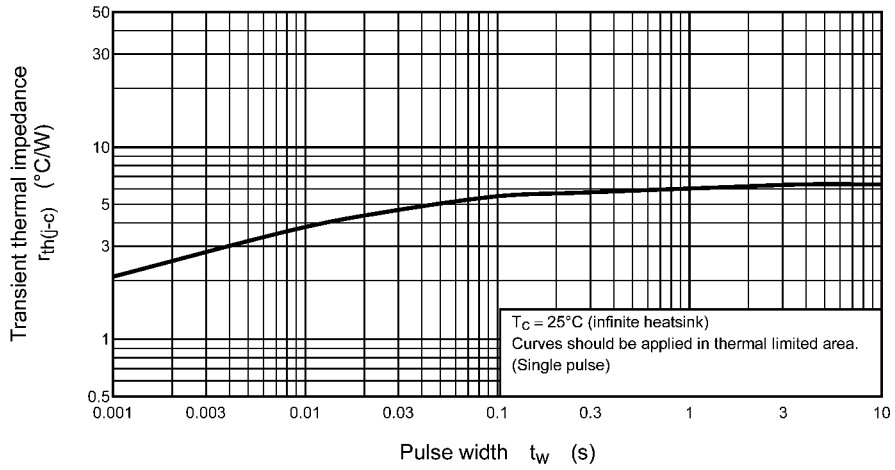
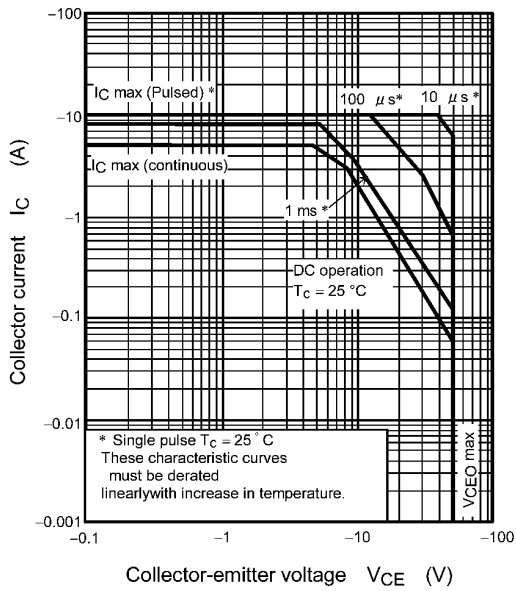


Fig. 7.5  $I_C - V_{BE}$



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

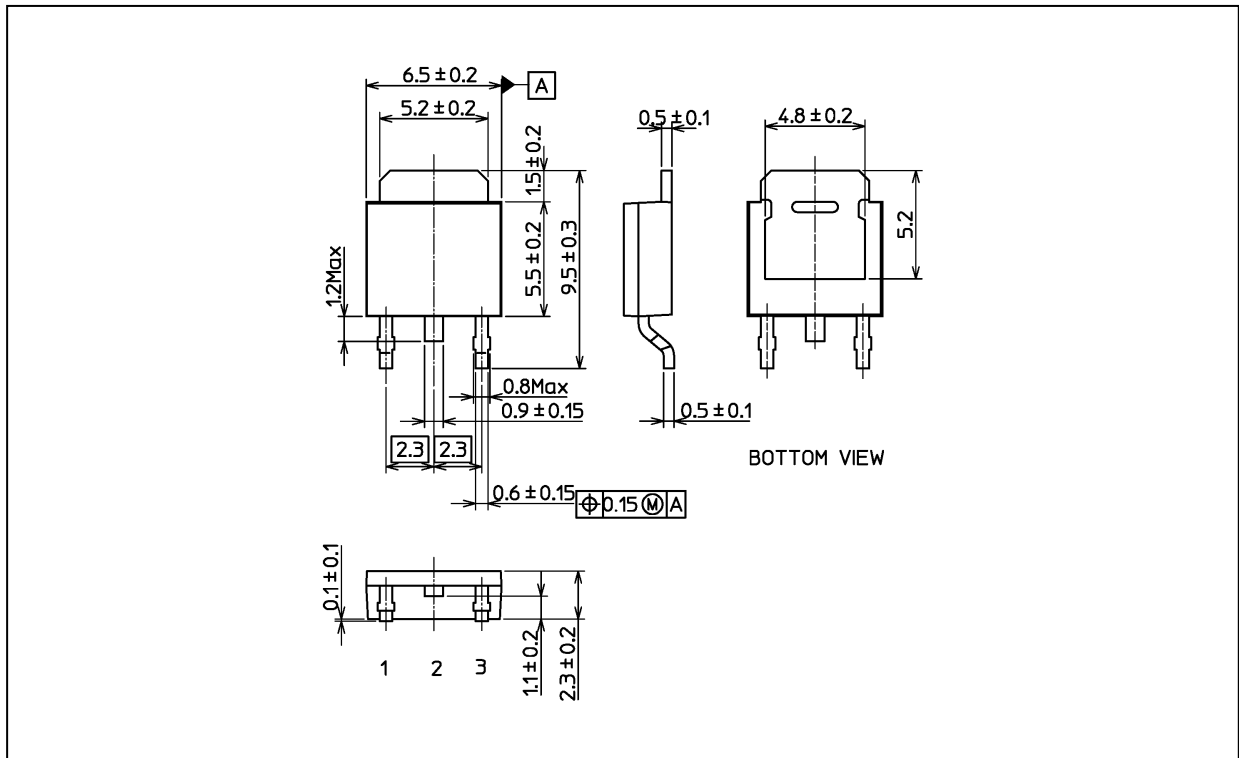


**Fig. 7.7 Safe Operating Area (Guaranteed Maximum)**

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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