Bipolar Transistors Silicon NPN Triple-Diffused Type

TTC013

1. Applications

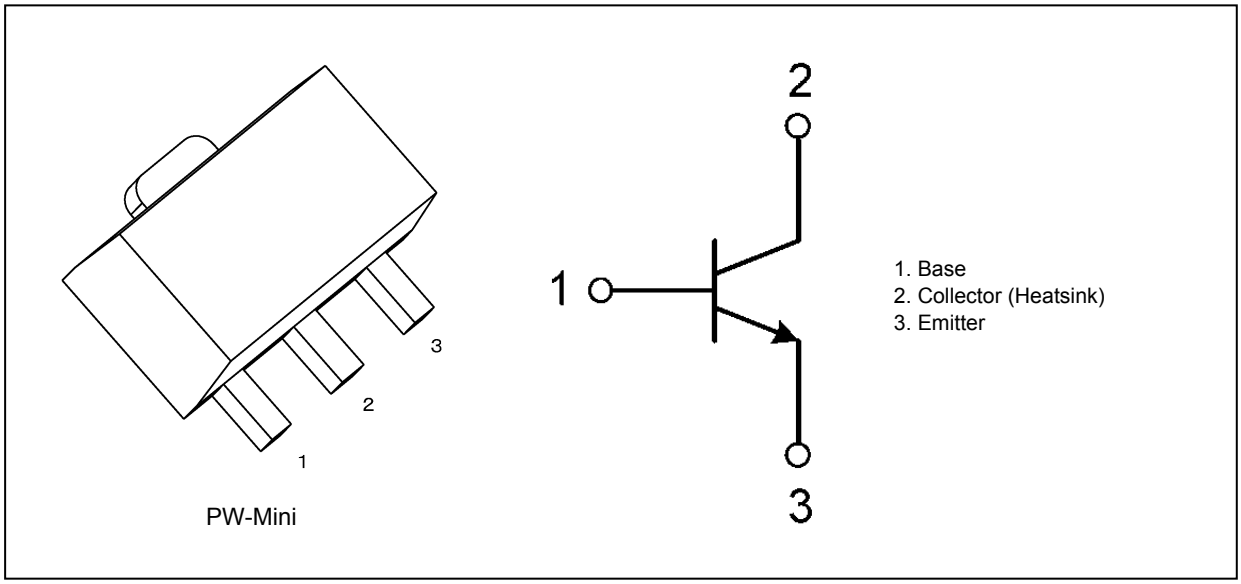
- High-Voltage Switching
- LCD Backlighting

2. Features

(1) High collector breakdown voltage: V_{CEO} = 350 V

(2) High DC current gain: h_{FE} = 100 to 200 (I_C = 50 mA)

3. Packaging and Internal Circuit



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

Characteristics			Symbol	Rating	Unit
Collector-base voltage			V_{CBO}	600	V
Collector-emitter voltage			V_{CEO}	350	
Emitter-base voltage			V_{EBO}	7	
Collector current (DC)		(Note 1)	I_C	0.5	A
Collector current (pulsed)		(Note 1)	I_{CP}	1	
Base current			I_B	0.25	
Collector power dissipation	DC	(Note 2)	P_C	1	W
Collector power dissipation	(t = 10 s)	(Note 2)		2.5	
Junction temperature			T_j	150	°C
Storage temperature			T_{stg}	-55 to 150	

Note 1: Ensure that the junction temperature does not exceed 150°C.

Note 2: Device mounted on a 25.4 mm x 25.4 mm x 1.6 mm FR-4 glass epoxy board (with a dissipating copper surface of 645 mm^2)

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).

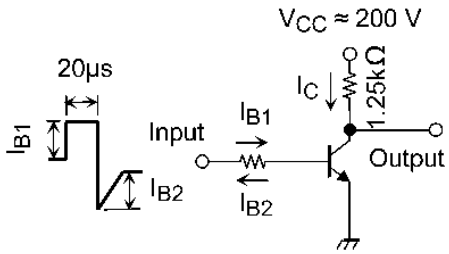
5. Electrical Characteristics

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} = 600 V, I_E = 0 A	—	—	1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 7 V, I_C = 0 A	—	—	1	
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	I_C = 10 mA, I_B = 0 A	350	—	—	V
DC current gain	$h_{FE(1)}$	V_{CE} = 5 V, I_C = 1 mA	80	—	—	—
	$h_{FE(2)}$	V_{CE} = 5 V, I_C = 50 mA	100	—	200	
	$h_{FE(3)}$	V_{CE} = 5 V, I_C = 0.16 A	30	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 0.16 A, I_B = 20 mA	—	—	0.3	V
Base-emitter saturation voltage	$V_{BE(sat)}$	I_C = 0.16 A, I_B = 20 mA	—	—	1.1	

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	—	0.12	—	μs
Switching time (storage time)	t_{stg}	$V_{CC} \approx$ 200 V, R_L = 1.25 kΩ, I_{B1} = 20 mA, I_{B2} = 40 mA, Duty cycle ≤ 1%	—	3.2	—	
Switching time (fall time)	t_f		—	0.17	—	



I_{B1} = 20 mA, I_{B2} = 40 mA

Duty cycle ≤ 1%

Fig. 5.2.1 Switching Time Test Circuit

6. Marking (Note)

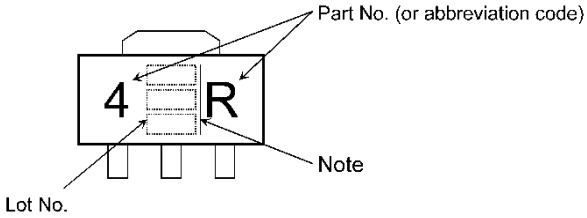
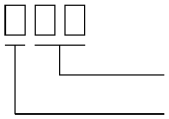


Fig. 6.1 Marking

Lot No. :

Weekly code (Three digits)



Week of manufacture
(01 for the first week of calendar year; sequential number up to 52 or 53)

Year of manufacture
(Last digit of calendar year)

Note: A line beside a Lot No. identifies the indication of product Labels.
[[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 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

7. Characteristics Curves (Note)

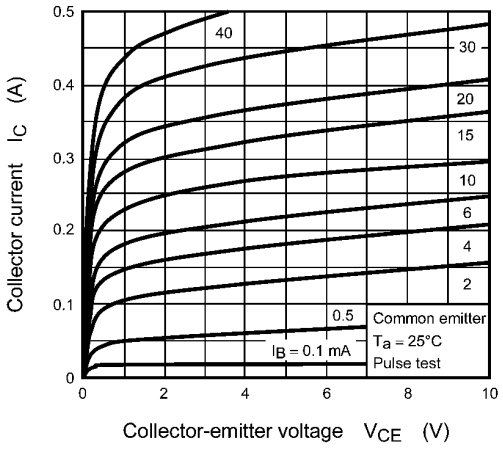


Fig. 7.1 I_C - V_{CE}

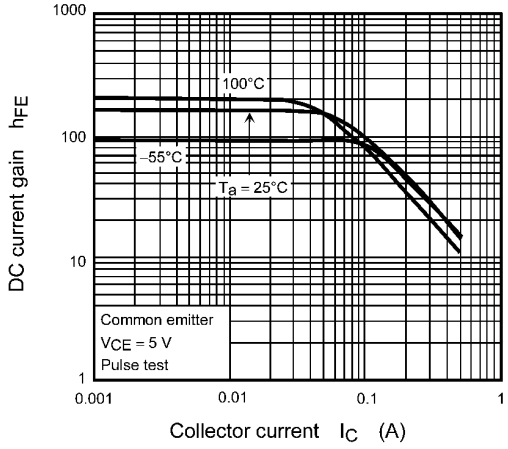


Fig. 7.2 h_{FE} - I_C

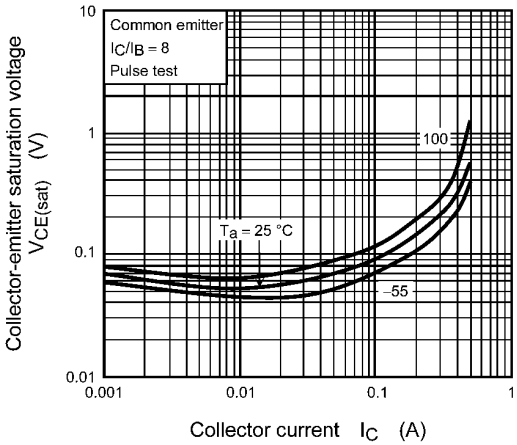


Fig. 7.3 $V_{CE(sat)}$ - I_C

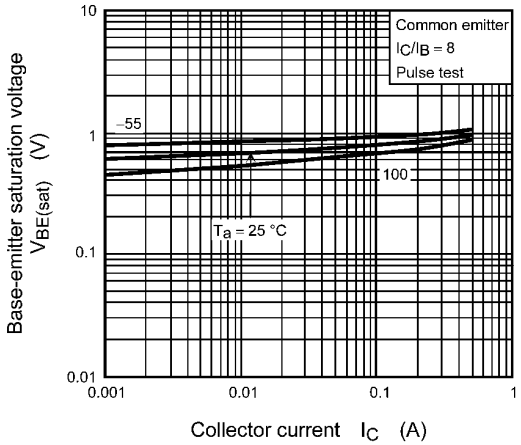


Fig. 7.4 $V_{BE(sat)}$ - I_C

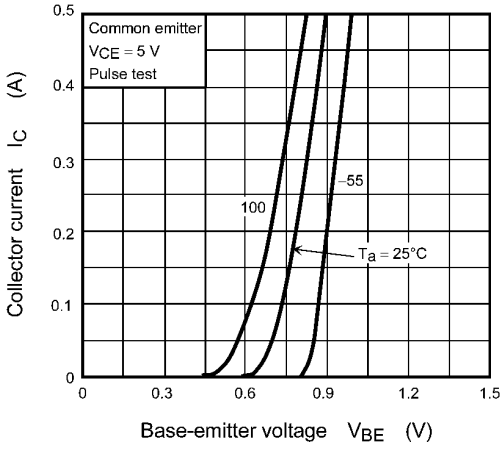


Fig. 7.5 I_C - V_{BE}

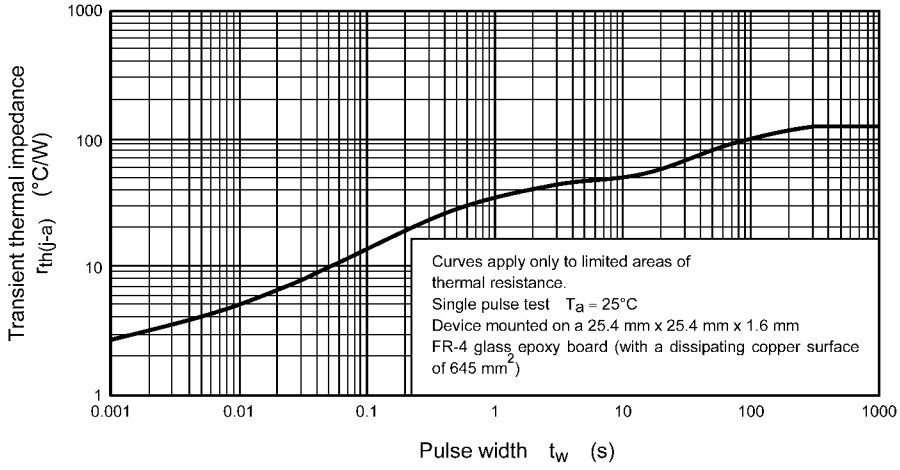


Fig. 7.6 $r_{th(j-a)}$ - t_w (Guaranteed Maximum)

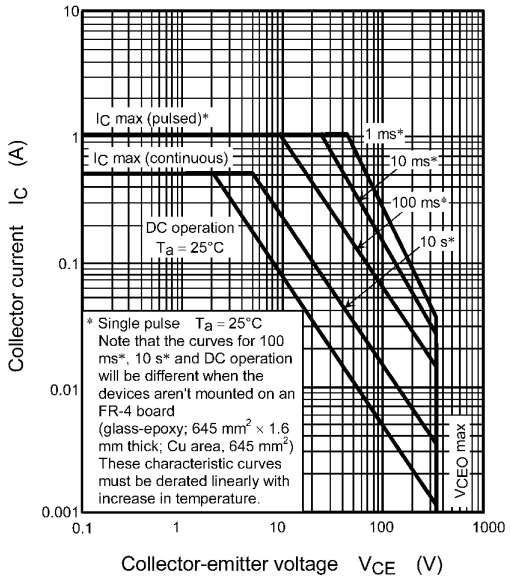
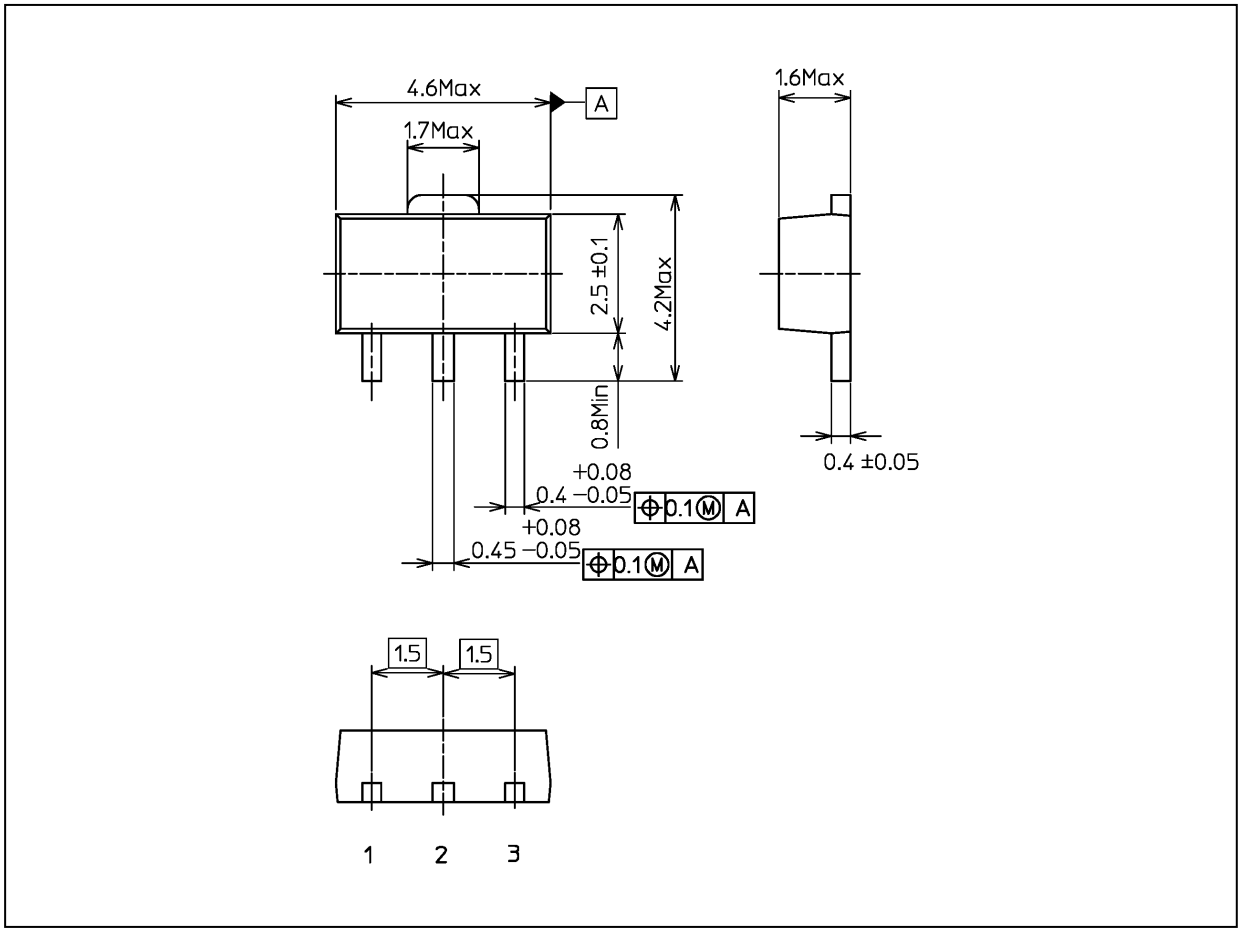


Fig. 7.7 Safe Operating Area (Guaranteed Maximum)

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

Package Dimensions

Unit: mm



The drawings shown may not accurately represent the actual shape or dimensions.

Weight: 0.05 g (typ.)

Package Name(s)
Nickname: PW-Mini

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