

TOSHIBA Multi-Chip Device Silicon PNP Epitaxial Type, Schottky Barrier Diode

TPC6D03

High-Speed Switching Applications
DC-DC Converter Applications

- A PNP transistor and a Schottky barrier diode are housed on a compact and slim package.

Absolute Maximum Ratings

Transistor (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Collector-base voltage		V _{CBO}	-20	V
Collector-emitter voltage		V _{CEO}	-20	V
Emitter-collector voltage		V _{ECO}	-9.5	V
Emitter-base voltage		V _{EBO}	-9.5	V
Collector current	DC	I _C	-1.2	A
	Pulse	I _{CP}	-2.0	A
Base current		I _B	-120	mA
Collector power dissipation (Q1 single-device operation)		P _C (Note 1)	400	mW
Junction temperature		T _j	150	°C

Diode (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Repetitive peak reverse voltage	V _{RRM}	30	V
Average forward current	I _{F (AV)}	0.7	A
Peak one cycle surge forward current (sine wave)	I _{FSM}	7.0	A
Power dissipation (D1 single-device operation)	P _D (Note 1)	320	mW
Junction temperature	T _j	125	°C

Transistor and Diode (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Total power dissipation (simultaneous operation)	P _T (Note 2)	600	mW
Storage temperature range	T _{stg}	-55 to 150	°C

Thermal Resistance Characteristics (for transistor and diode)

Characteristics	Symbol	Max	Unit
Thermal resistance, junction to ambient (single-device operation)	R _{th (j-a)} (Note 1)	312	°C/W

Note 1: Mounted on an FR4 board (glass epoxy, 1.6 mm thick, Cu area: 645 mm²)

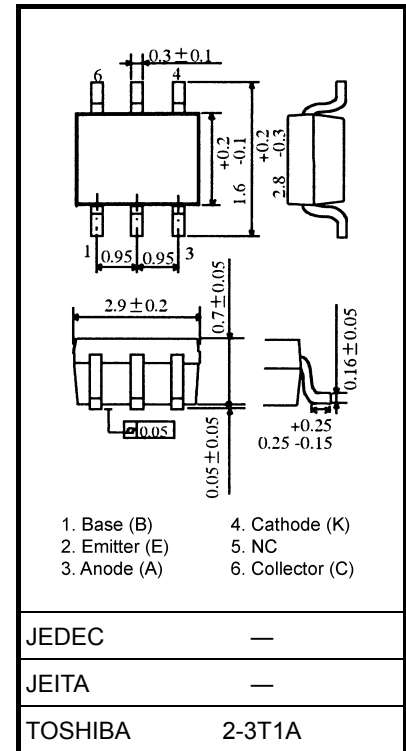
Note 2: Mounted on an FR4 board (glass epoxy, 1.6 mm thick, Cu area: 645 mm²)

Total power dissipation value when two devices are operated at the same time

Note 3: 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).

Unit: mm



Weight: 0.011 g (typ.)

Electrical Characteristics (Ta = 25°C)

Transistor

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = -20\text{ V}, I_E = 0\text{ A}$	—	—	-100	nA
Emitter cut-off current	I_{EBO}	$V_{EB} = -9.5\text{ V}, I_C = 0\text{ A}$	—	—	-100	nA
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = -10\text{ mA}, I_B = 0\text{ A}$	-20	—	—	V
DC current gain	$h_{FE(1)}$	$V_{CE} = -2\text{ V}, I_C = -0.15\text{ A}$	140	—	350	—
	$h_{FE(2)}$	$V_{CE} = -2\text{ V}, I_C = -0.5\text{ A}$	85	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = -0.5\text{ A}, I_B = -16.7\text{ mA}$	—	—	-0.17	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C = -0.5\text{ A}, I_B = -16.7\text{ mA}$	—	—	-1.10	V
Switching time	Rise time	t_r	See Figure 1 circuit diagram.		—	ns
	Storage time	t_{stg}	$V_{CC} \approx -12\text{ V}, R_L = 24\ \Omega$		—	
	Fall time	t_f	$I_{B1} = -I_{B2} = -16.7\text{ mA}$		—	

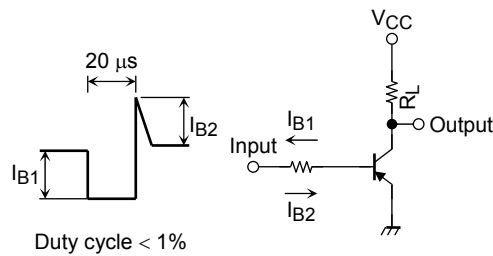
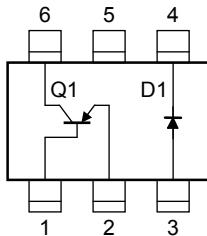
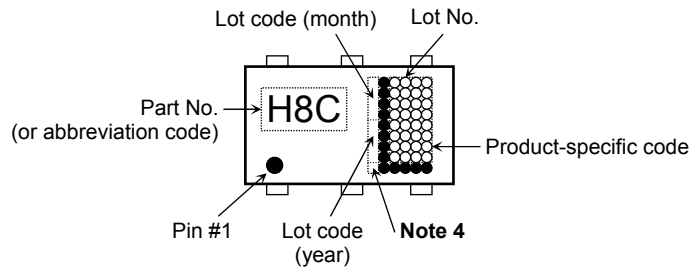


Figure 1 Switching Time Test Circuit & Timing Chart

Circuit Configuration



Marking



Note 4: A dot marking identifies the indication of product Labels.
 Without a dot: [[Pb]]/INCLUDES > MCV
 With a dot: [[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.

Diode

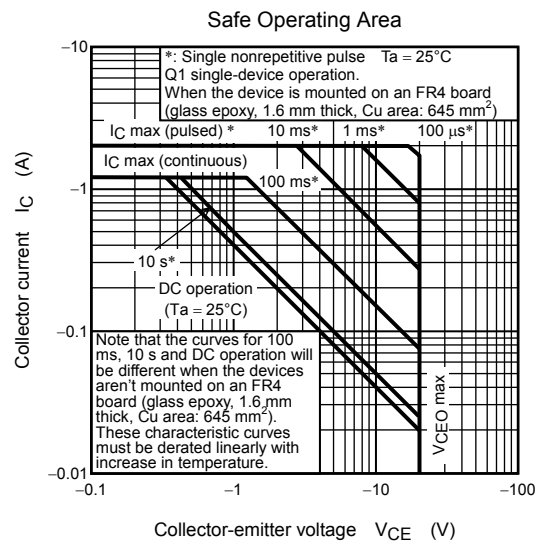
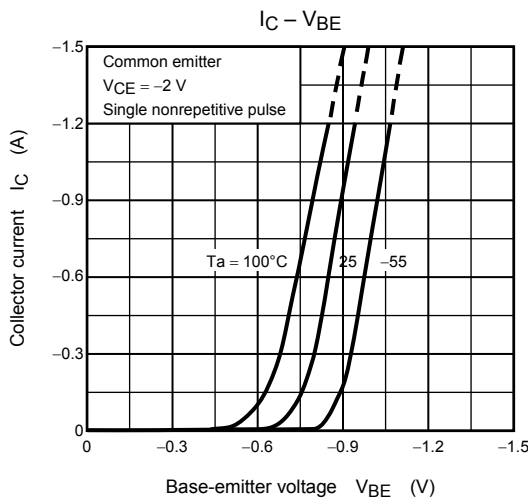
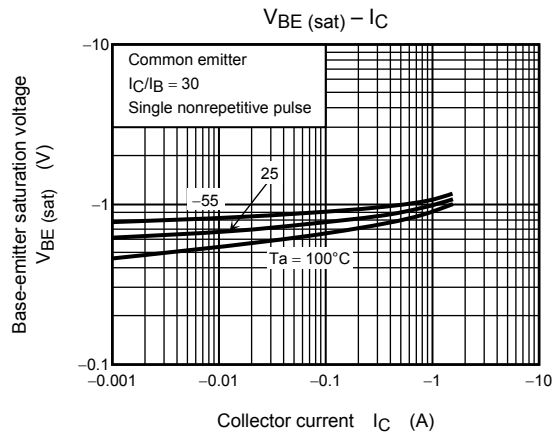
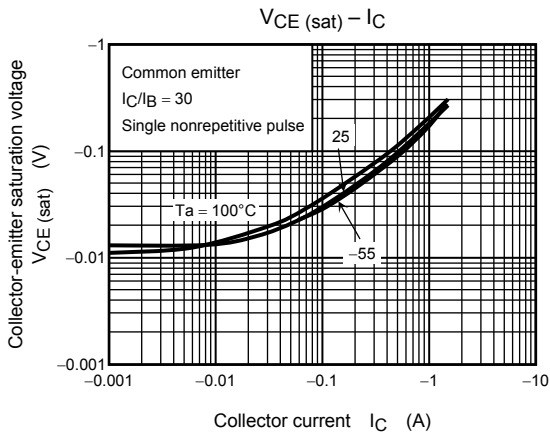
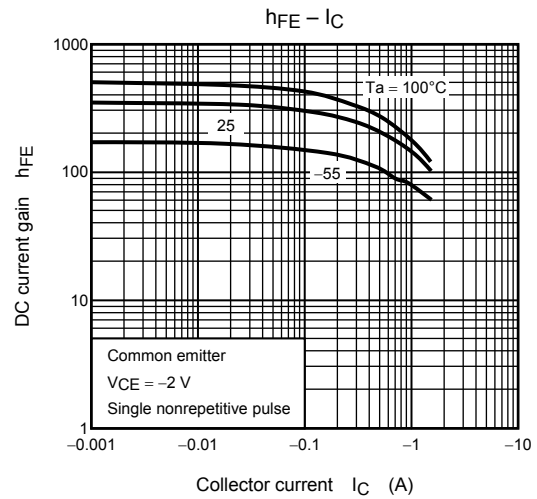
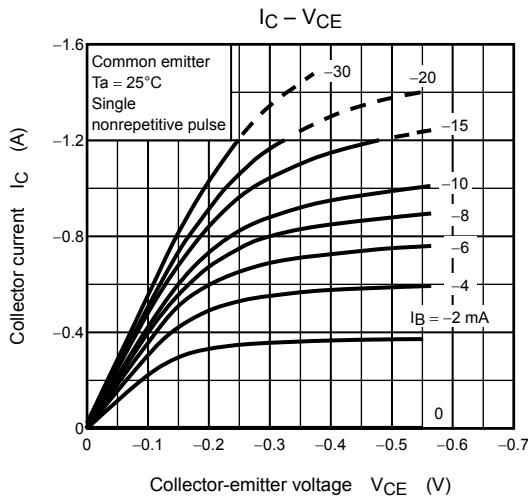
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Peak forward voltage	$V_{FM(1)}$	$I_F = 0.5 \text{ A}$	—	0.35	0.4	V
Peak forward voltage	$V_{FM(2)}$	$I_F = 0.7 \text{ A}$	—	0.38	0.43	V
Repetitive peak reverse voltage	V_{RRM}	$I_R = 3 \text{ mA}$	30	40	—	V
Repetitive peak reverse current	I_{RRM}	$V_R = 10 \text{ V}$	—	25	100	μA
Junction capacitance	C_j	$V_R = 10 \text{ V}, f = 1 \text{ MHz}$	—	19	—	pF

Handling Precaution

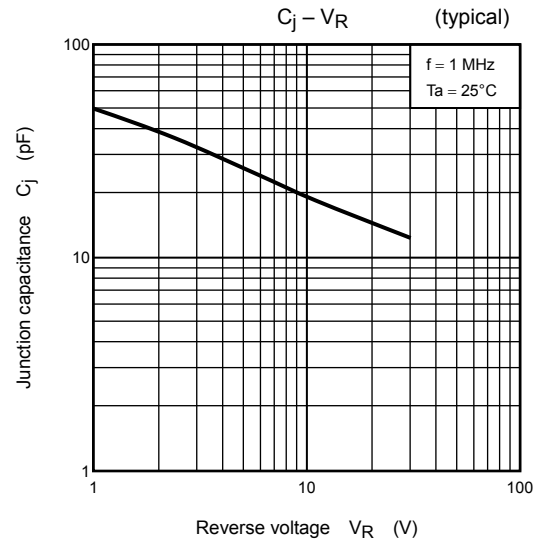
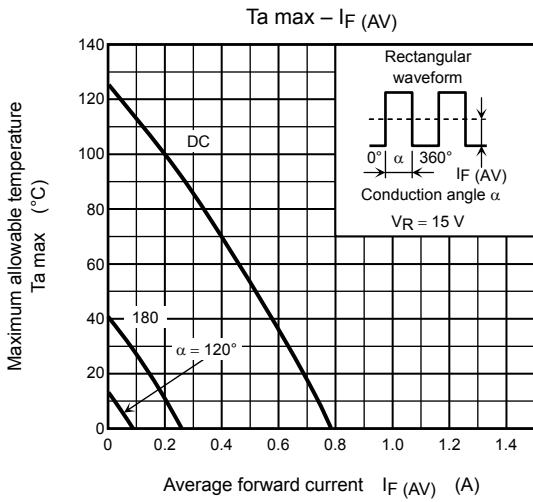
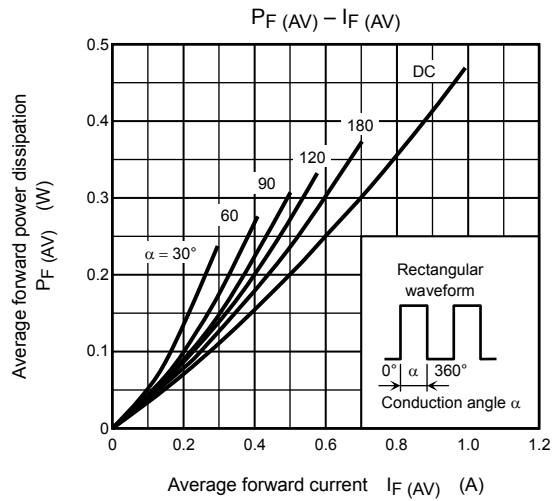
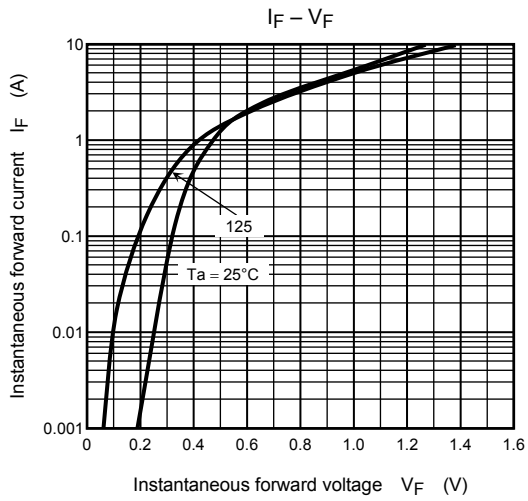
Schottky barrier diodes have large-reverse-current-leakage characteristic compared to other rectifier products. This current leakage and not proper operating temperature or voltage may cause thermal runaway.

Please take forward and reverse loss into consideration during design.

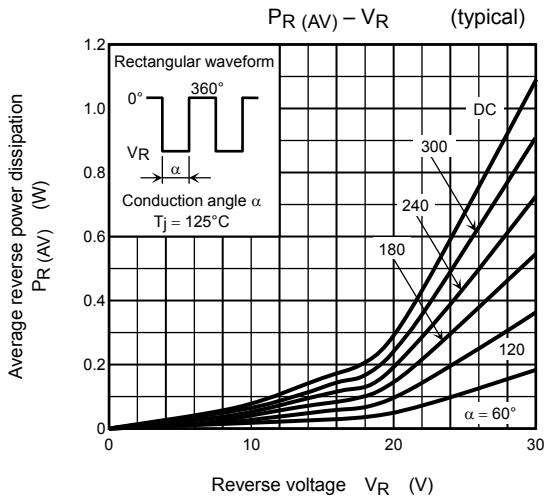
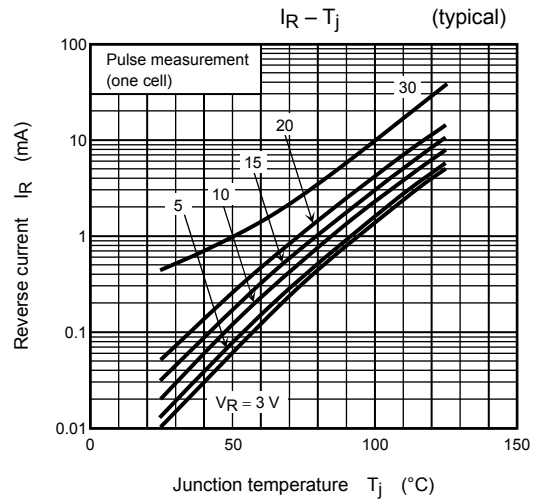
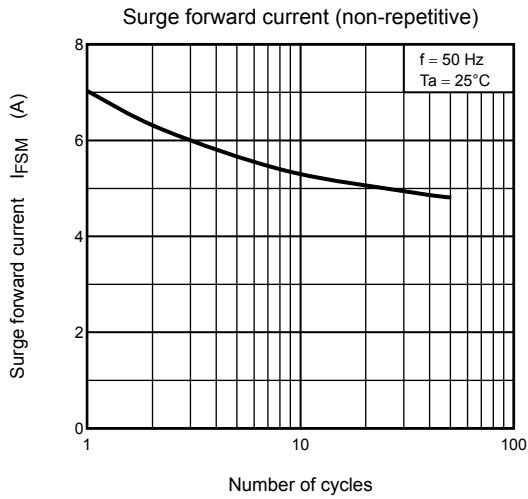
Transistor



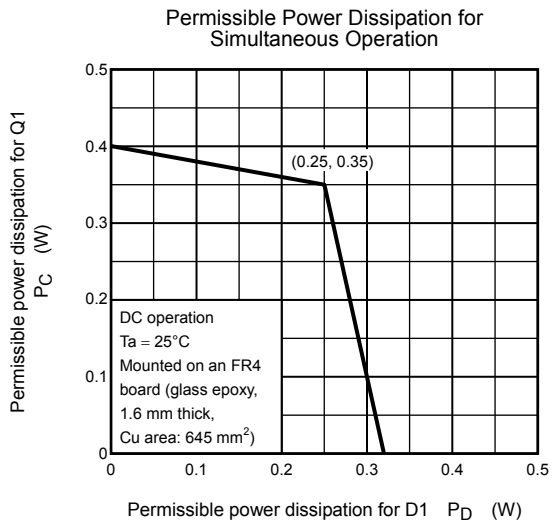
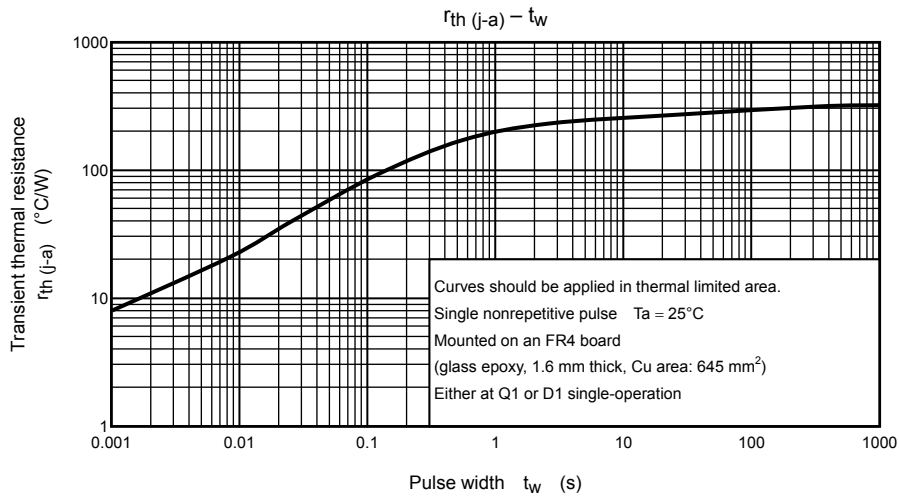
Diode



Diode



Transistor and Diode



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