Press Pack IEGT Silicon N-Channel IEGT

ST1500GXH24

1. Applications

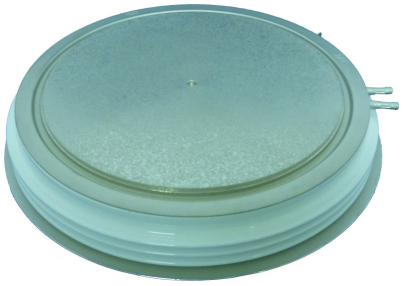
- High-Power Switching
- Motor Controllers

2. Features

(1) Enhancement mode.

(2) Double side cooling type.

3. Packaging and Internal Circuit Pin Assignment



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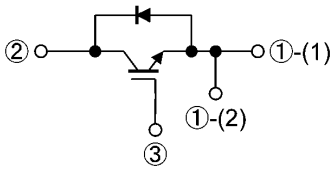


①-(1): Emitter (Anode)
①-(2): Emitter (Black)
② : Collector (Cathode)
③ : Gate (White)

Start of commercial production
2003-03

4. Absolute Maximum Ratings (Note) (T_C = 25°C unless otherwise specified)

Characteristics	Symbol	Note	Test Condition	Rating	Unit
Collector-emitter voltage	V_{CES}			4500	V
Gate-emitter voltage	V_{GES}			±20	V
Collector current (DC)	I_C	(Note 2)		1500	A
Collector current (pulsed)	I_{CP}	(Note 3)		3000	A
Forward current (DC)	I_F			1500	A
Forward current (pulsed)	I_{FP}	(Note 3)		3000	A
Non-repetitive peak forward surge current	I_{FSM}		10 ms half-sine wave	10	kA
Collector power dissipation	P_C	(Note 1)	T_f = 25°C	14285	W
Power dissipation	P_D	(Note 1)	Diode part, T_f = 25°C	5555	W
Junction temperature	T_j			-40 to 125	°C
Storage temperature	T_{stg}			-40 to 125	°C
Mounting force	—			50 to 70	kN

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: In addition to the above remarks, refer to the application notes.

Note 2: T_f = 80°C

Note 3: Pulse width and repetition rate should be such that junction temperature(T_j) does not exceed maximum T_j rating.

5. Thermal Characteristics

Characteristics		Symbol	Note	Test Condition	Max	Unit
Thermal resistance (junction-to-fin)	Transistor part	$R_{th(j-f)}$	(Note 1)	Emitter side	19	K/kW
				Collector side	12	K/kW
				Double side	7	K/kW
	Diode part			Anode side(Emitter side)	49	K/kW
				Cathode side(Collector side)	29	K/kW
				Double side	18	K/kW

Note 1: Conductive thermal compound is added.

Customers must also refer to and comply with (a) the latest versions of all relevant TOSHIBA information, including without limitation, this doucument, the specifications, the data sheets and application notes for Product and the precautions and conditions set forth in the "TOSHIBA Semiconductor Reliability Handbook" and (b) the instructions for the application with which the Product will be used with or for.

6. Electrical Characteristics (T_C = 25°C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate-emitter leakage current	I_{GES}	V_{GE} = ±20 V, V_{CE} = 0 V	—	—	±20	nA
Collector-emitter cut-off current	I_{CES}	V_{CE} = 4500 V, V_{GE} = 0 V, T_j = 125°C	—	—	100	mA
Gate-emitter cut-off voltage	$V_{GE(off)}$	I_C = 1.5 A, V_{CE} = 10 V	6.5	7.5	8.5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 1500 A, V_{GE} = 15 V, T_j = 125°C	—	3.0	4.0	V
Input capacitance	C_{ies}	V_{CE} = 10 V, V_{GE} = 0 V, f = 100 kHz	—	320	—	nF
Switching time (turn-on delay time)	$t_{d(on)}$	V_{CC} = 2700 V, I_C = 1500 A, V_{GE} = ±15 V, $R_{G(on)}$= 5.1Ω, $R_{G(off)}$ = 10Ω, T_j = 125°C (Inductive load, L_s ≈ 330 nH) See Fig. 6.1 and Fig. 6.2.	—	0.6	—	μs
Switching time (rise time)	t_r		—	0.4	—	μs
Switching time (turn-on time)	t_{on}		—	1.0	—	μs
Switching time (turn-off delay time)	$t_{d(off)}$		—	7.5	—	μs
Switching time (fall time)	t_f		—	2.5	—	μs
Switching time (turn-off time)	t_{off}		—	10	—	μs
Forward voltage	V_F	I_F = 1500 A, T_j = 125°C	—	3.2	4.2	V
Peak reverse recovery current	I_{rr}	V_{CC} = 2700 V, I_F = 1500 A, V_{GE} = -15 V, T_j = 125°C, Drive side:V_{GE} = ±15V, $R_{G(on)}$= 5.1Ω (Inductive load, L_s ≈ 330 nH) See Fig. 6.1 and Fig. 6.3.	—	1500	—	A
Reverse recovery time	t_{rr}		—	1.3	—	μs
Turn-on switching loss	E_{on}	V_{CC} = 2700 V, I_C = 1500 A, V_{GE} = ±15 V, $R_{G(on)}$= 5.1Ω, $R_{G(off)}$ = 10Ω, T_j = 125°C (Inductive load, L_s ≈ 330 nH) See Fig. 6.1 and Fig. 6.2.	—	8.0	—	J
Turn-off switching loss	E_{off}		—	7.0	—	J
Reverse recovery loss	E_{rr}	V_{CC} = 2700 V, I_F = 1500 A, V_{GE} = -15 V, T_j = 125°C, Drive side:V_{GE} = ±15V, $R_{G(on)}$= 5.1Ω (Inductive load, L_s ≈ 330 nH) See Fig. 6.1 and Fig. 6.3.	—	3.5	—	J
Short-circuit pulse width	t_{psc}	V_{CC} = 3000 V, V_{GE} = ±15 V, $R_{G(on)}$ = 5.1Ω, $R_{G(off)}$ = 10Ω, T_j = 125°C	—	—	10	μs

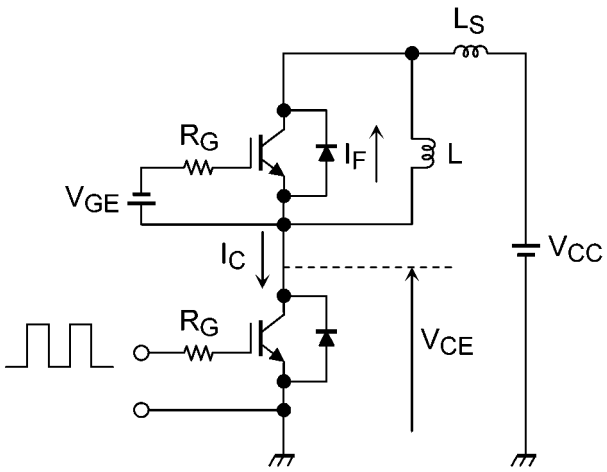
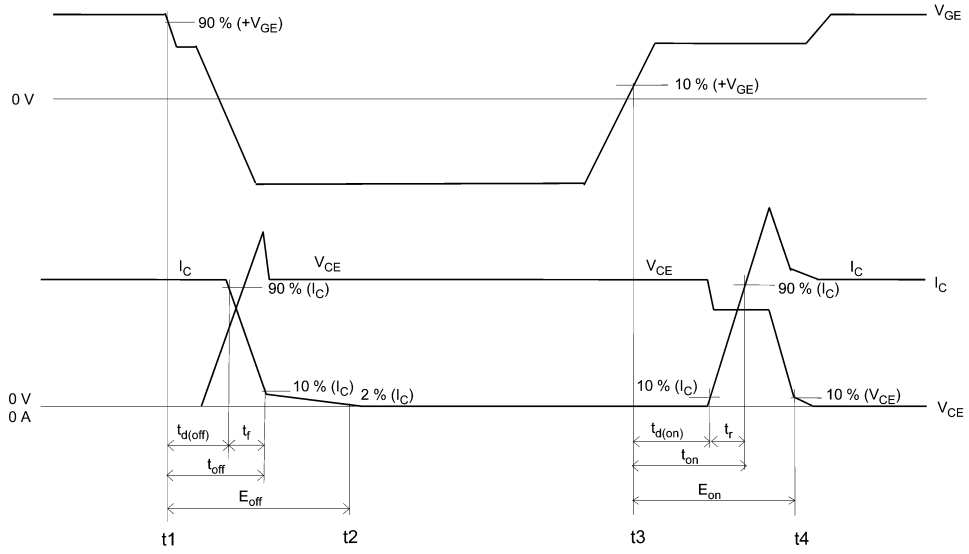
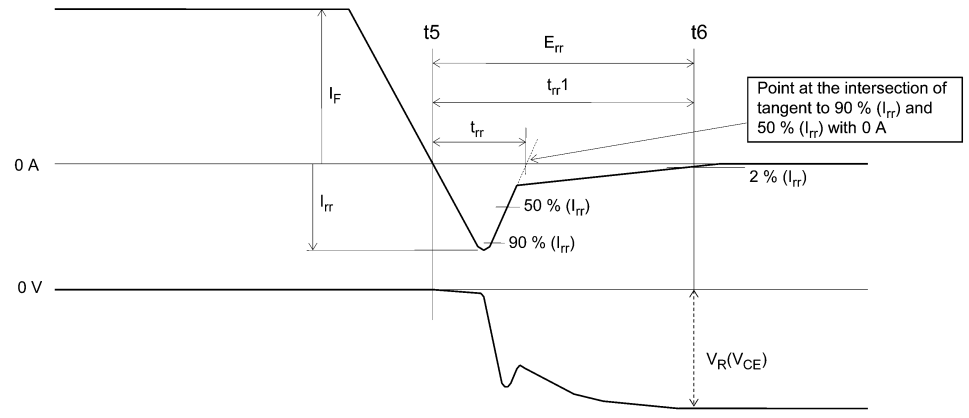


Fig. 6.1 Test Circuit



$$E_{off} = \int_{t1}^{t2} I_C \times V_{CE}\, dt \qquad E_{on} = \int_{t3}^{t4} I_C \times V_{CE}\, dt$$

Fig. 6.2 Timing Chart (Transistor part)



$$E_{rr} = \int_{t5}^{t6} I_F \times V_R\, dt$$

Fig. 6.3 Timing Chart (Diode part)

7. Characteristics Curves (Note)

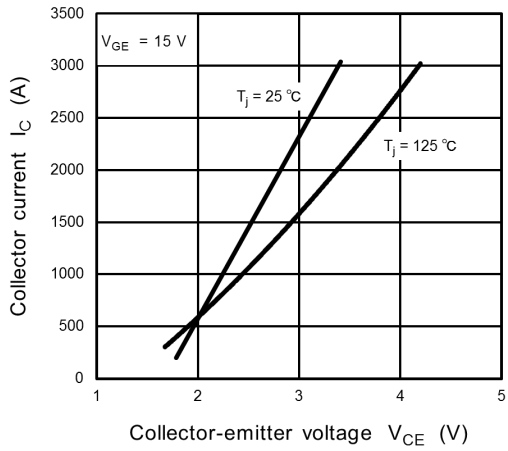


Fig. 7.1 I_C - V_{CE}

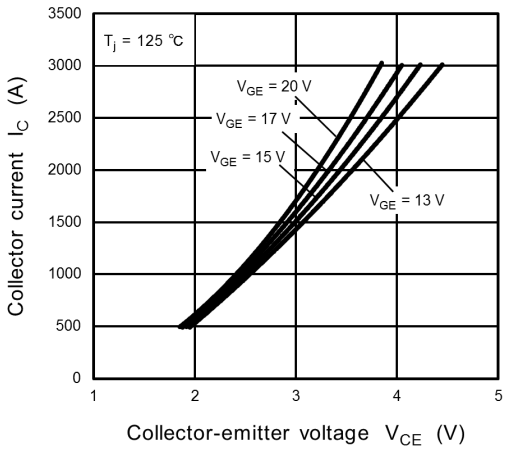


Fig. 7.2 I_C - V_{CE}

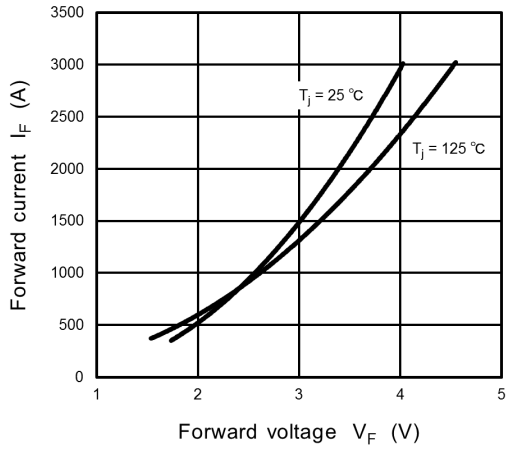


Fig. 7.3 I_F - V_F

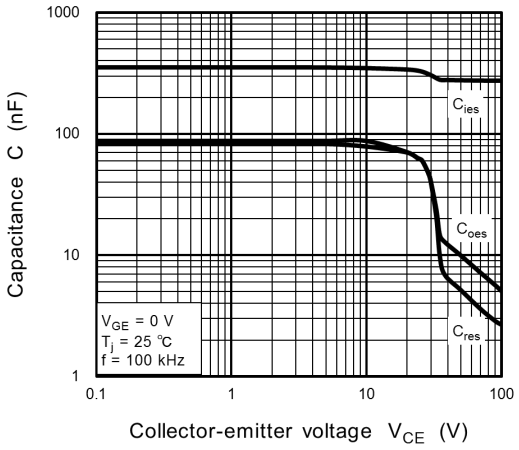


Fig. 7.4 C_{ies},C_{oes},C_{res} - V_{CE}

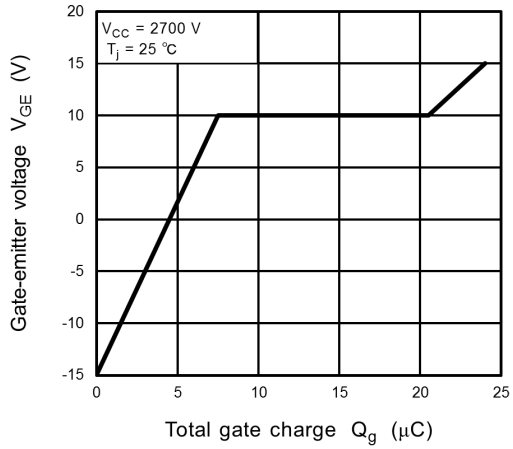


Fig. 7.5 V_{GE} - Q_g

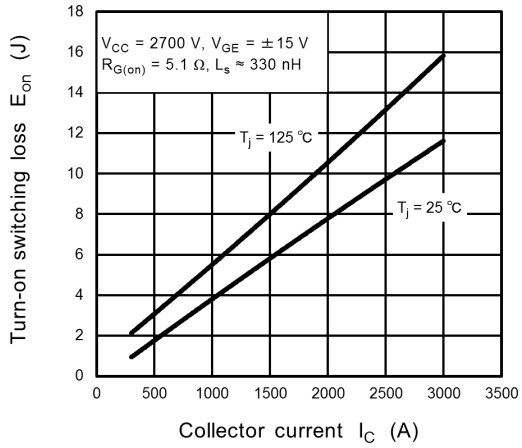


Fig. 7.6 E_{on} - I_C

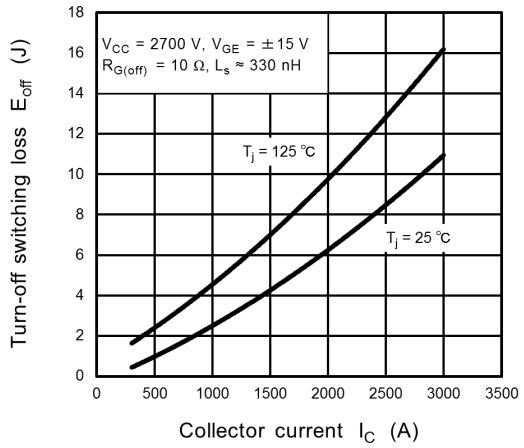


Fig. 7.7 E_{off} - I_C

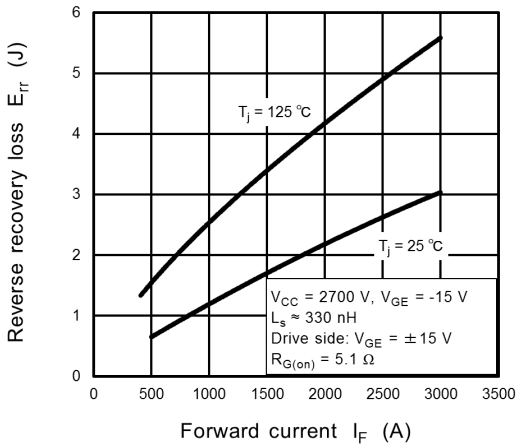


Fig. 7.8 E_{rr} - I_F

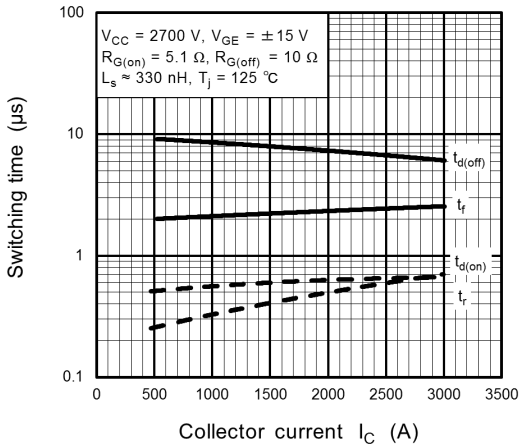


Fig. 7.9 $t_{d(off)}$,t_f,$t_{d(on)}$,t_r - I_C

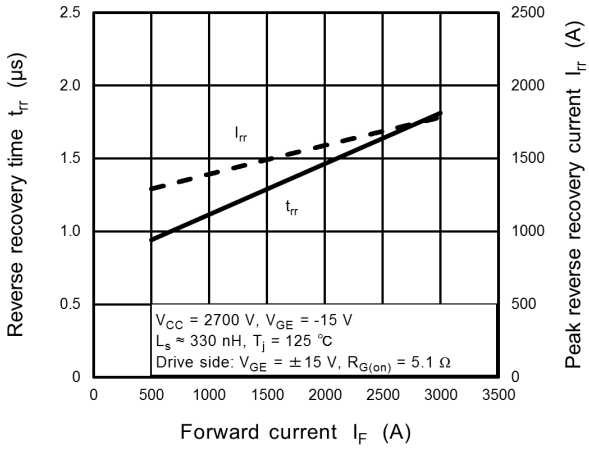


Fig. 7.10 t_{rr},I_{rr} - I_F

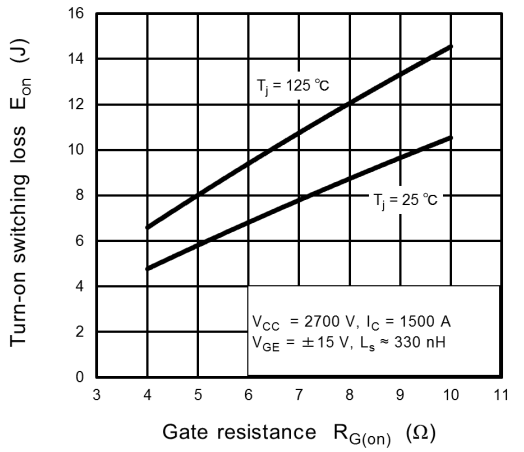


Fig. 7.11 E_{on} - $R_{G(on)}$

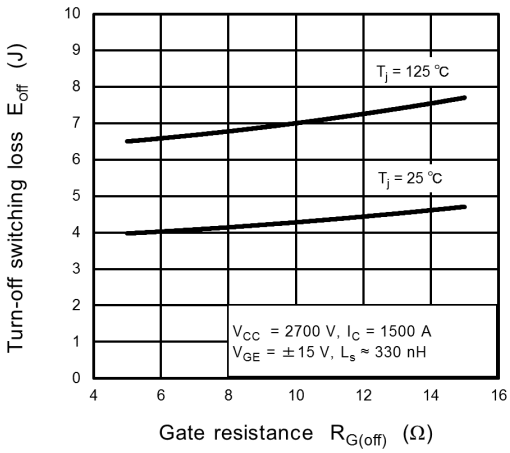


Fig. 7.12 E_{off} - $R_{G(off)}$

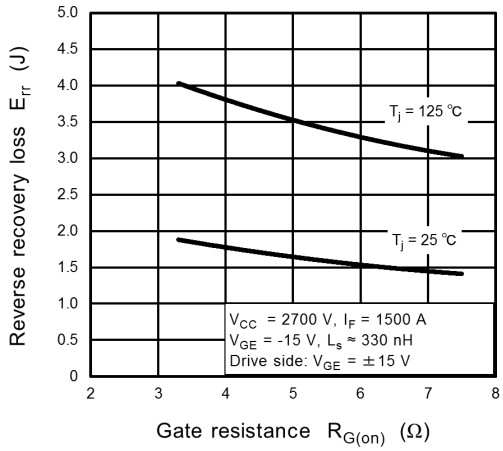


Fig. 7.13 E_{rr} - $R_{G(on)}$

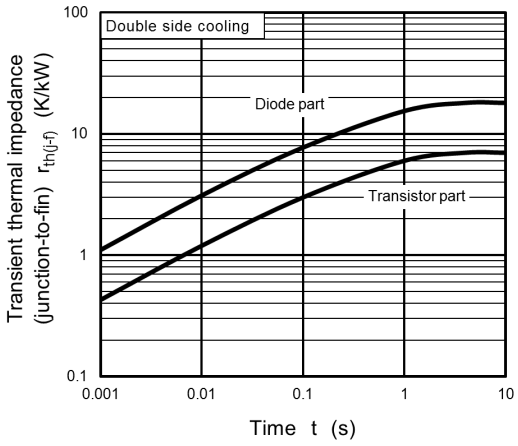


Fig. 7.14 $r_{th(j-f)}$ - t (Guaranteed value)

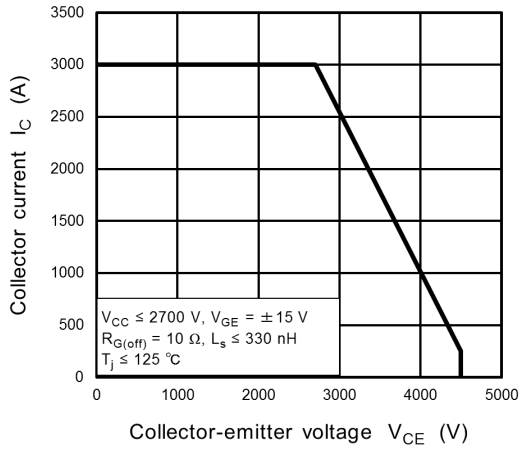


Fig. 7.15 RBSOA (Guaranteed value)

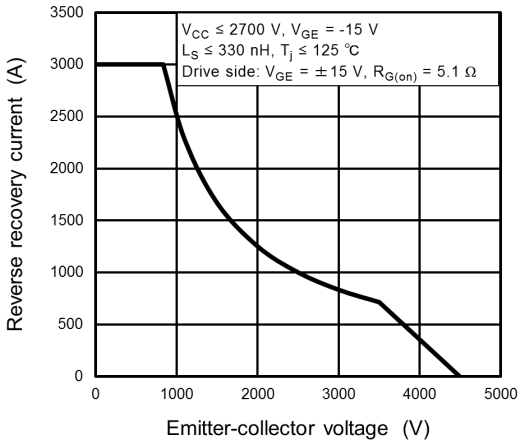
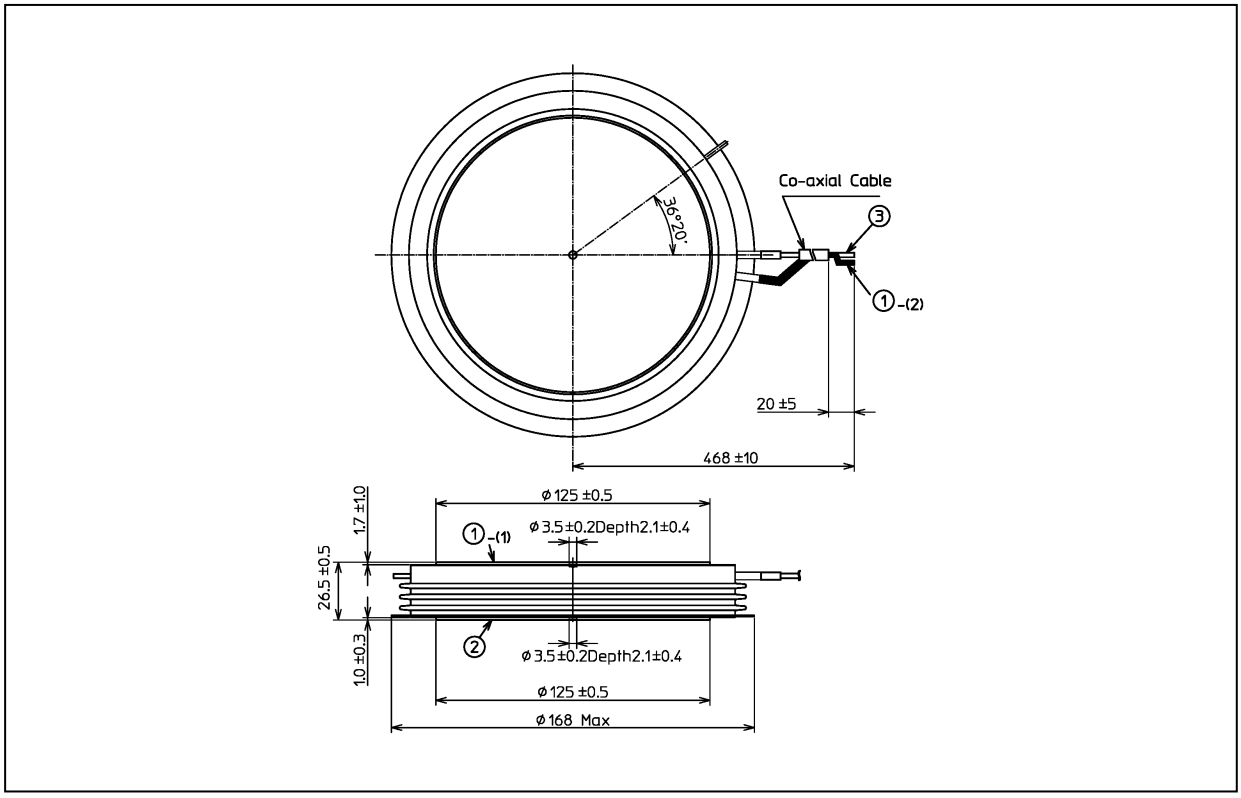


Fig. 7.16 RRSOA (Guaranteed value)

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

Package Dimensions

Unit: mm



Weight: 3500 g (typ.)

Package Name(s)
TOSHIBA: 2-168A2S
Nickname: PPI125A2

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