

Fast Recovery Diode (FRD) Silicon Diffused Junction

# 3000GXHH32

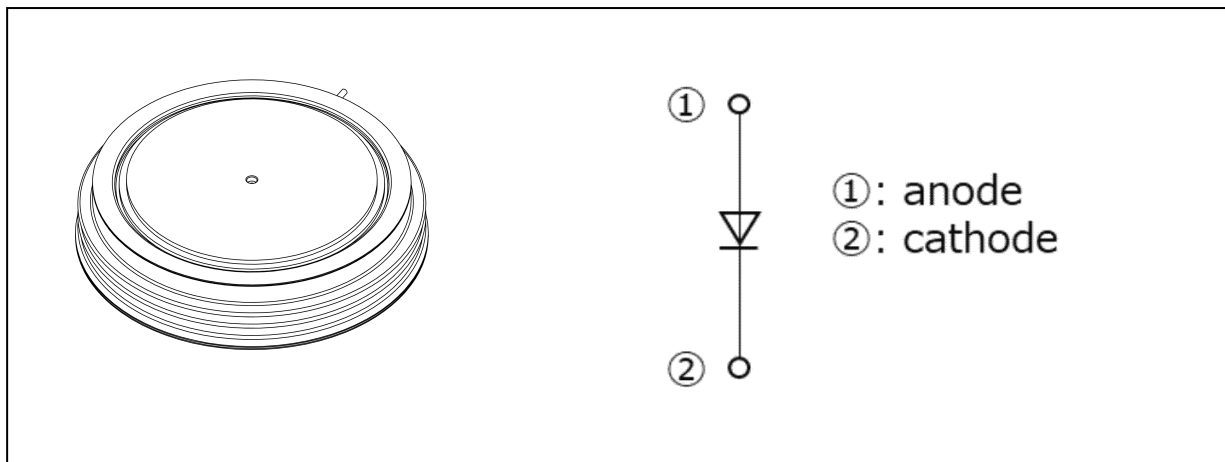
## 1. Applications

- Electric power transmission and distribution
- Motor Controllers

## 2. Features

- (1) High reliability due to hermetic sealing structure.
- (2) Double side cooling type.

## 3. Packaging and Internal Circuit



Start of commercial production

2022-03

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

Characteristics	Symbol	Note	Test Condition	Rating	Unit
Repetitive peak reverse voltage	$V_{RRM}$			4500	V
Forward current (DC)	$I_F$		$T_f = 42\text{ }^\circ\text{C}$	3000	A
Forward current (pulsed)	$I_{FP}$	(Note 1)		6000	A
Non-repetitive peak forward surge current	$I_{FSM}$		10 ms half-sine wave, $V_R = 0\text{ V}$ ,	21	kA
$I^2t$ limit value	$I^2t$		$T_j = 150\text{ }^\circ\text{C}$	$2.2 \times 10^6$	A <sup>2</sup> s
Power dissipation	$P_D$	(Note 2)	$T_f = 25\text{ }^\circ\text{C}$	12500	W
Junction temperature	$T_j$			-40 to 150	$^\circ\text{C}$
Operating junction temperature	$T_{j(opr)}$			-40 to 125	$^\circ\text{C}$
Storage temperature	$T_{stg}$			-40 to 125	$^\circ\text{C}$
Mounting force	—			29 to 64	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: Pulse width and repetition rate should be such that junction temperature ( $T_j$ ) does not exceed maximum  $T_j$  rating.

Note 2: Refer to the application notes.

### 5. Thermal Characteristics (Note)

Characteristics	Symbol	Note	Test Condition	Max	Unit
Thermal resistance (junction-to-fin)	$R_{th(j-f)}$	(Note 3)	Double side	10.0	K/kW

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

Note 3: Conductive thermal compound is added.

### 6. Electrical Characteristics

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Repetitive peak reverse current	$I_{RRM}$	$V_{RRM} = 4500\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$	—	—	100	mA
Forward voltage	$V_F$	$I_F = 3000\text{ A}$ , $T_j = 25\text{ }^\circ\text{C}$	—	2.85	—	V
		$I_F = 3000\text{ A}$ , $T_j = 150\text{ }^\circ\text{C}$	—	3.00	3.60	
Reverse recovery current	$I_{rr}$	$V = 2800\text{ V}$ , $I_F = 3000\text{ A}$ , $L_s \approx 300\text{ nH}$ , $T_j = 150\text{ }^\circ\text{C}$	—	2950	—	A
Reverse recovery time	$t_{rr}$	Drive side: ST3000GXH31A $di/dt \approx 5000\text{ A}/\mu\text{s}$ , $T_j = 150\text{ }^\circ\text{C}$	—	1.80	—	$\mu\text{s}$
Reverse recovery loss	$E_{rr}$	Inductive load, See Fig. 6.1 and Fig. 6.2	—	5.60	—	J

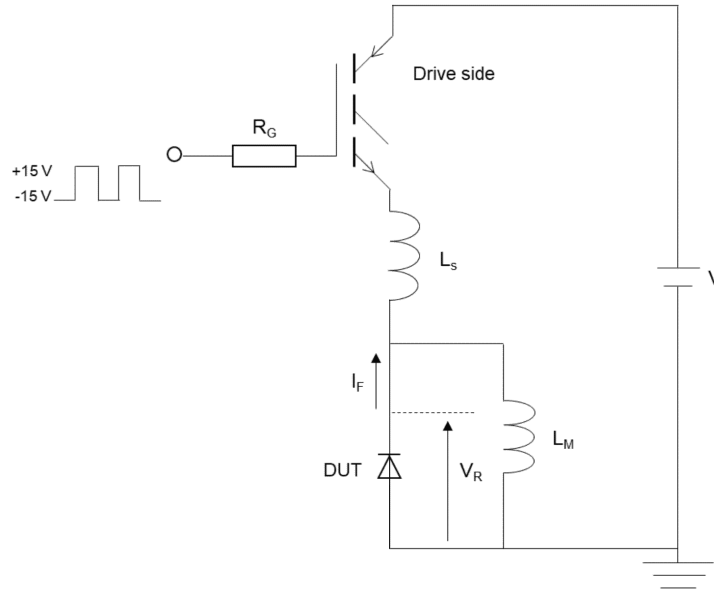
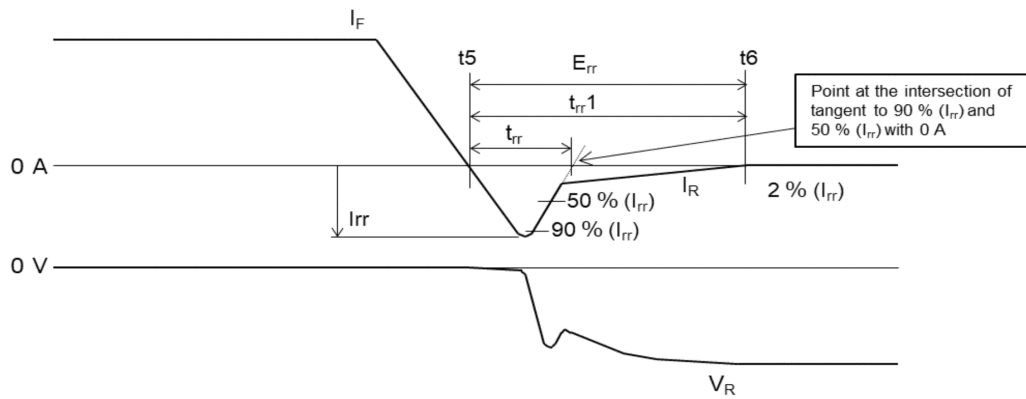


Fig. 6.1 Test Circuit



$$E_{rr} = \int_{t_5}^{t_6} (I_R \times V_R) dt$$

Fig. 6.2 Timing Chart

## 7. Characteristics Curves (Note)

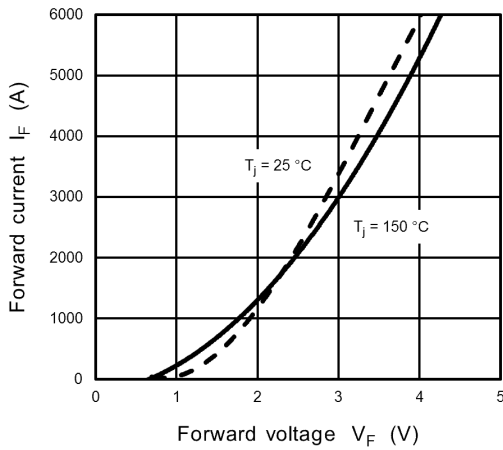


Fig. 7.1  $I_F - V_F$

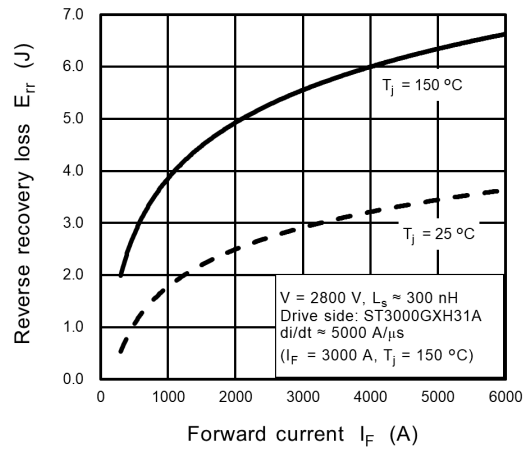


Fig. 7.2  $E_{rr} - I_F$

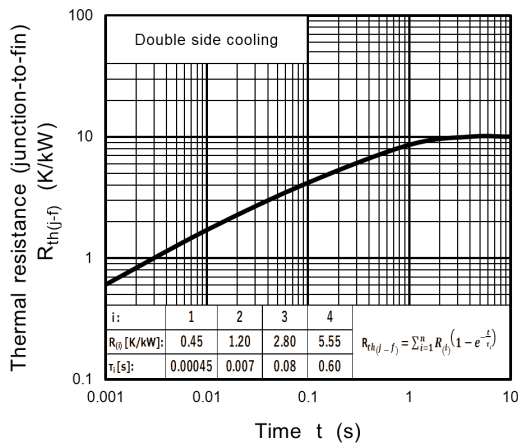


Fig. 7.3  $R_{th(j-f)} - t$  (Guaranteed value)

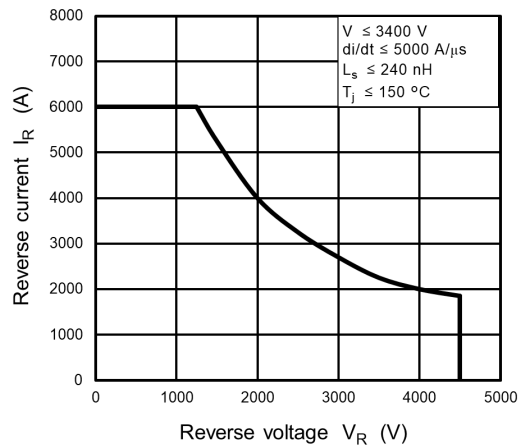
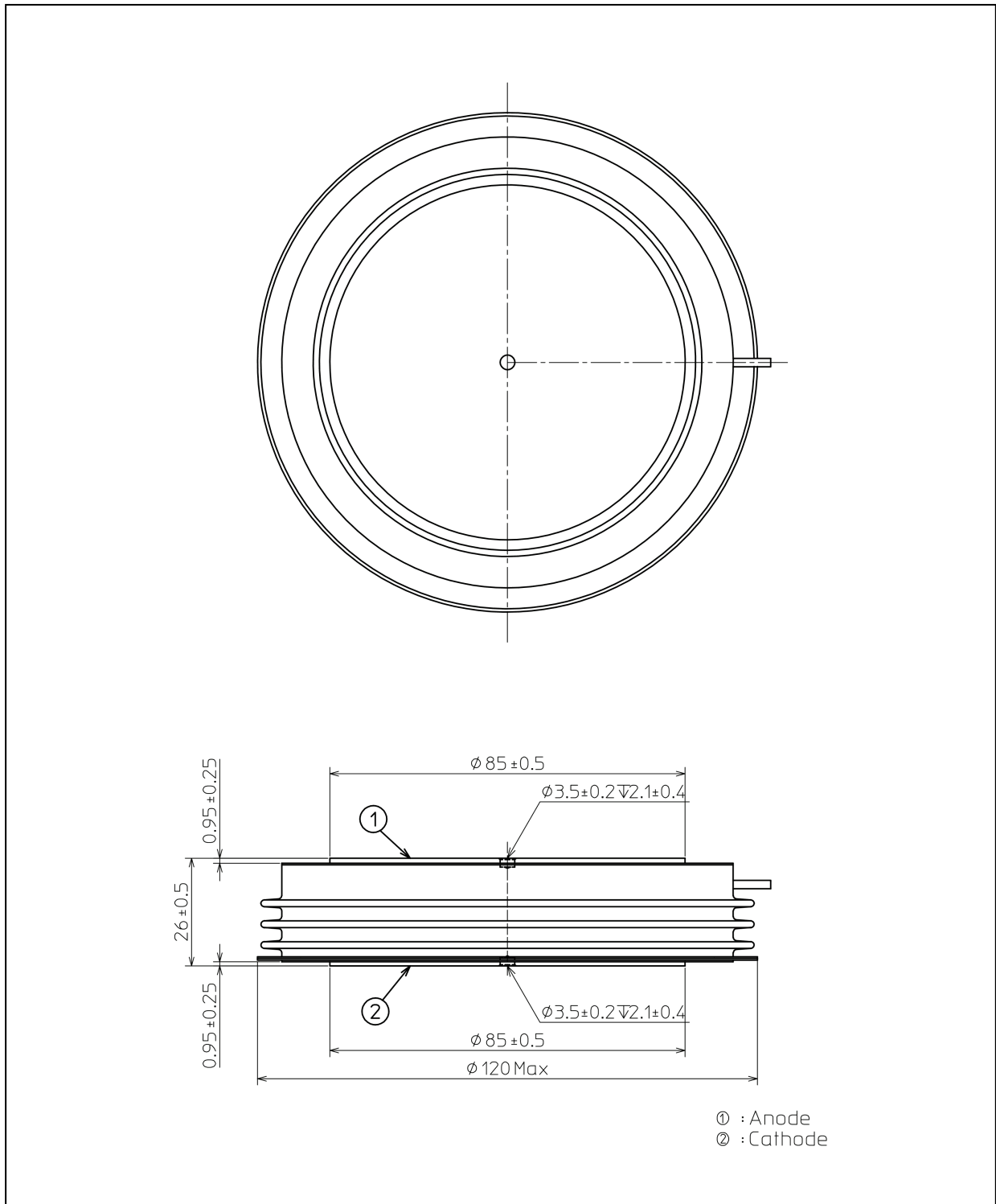


Fig. 7.4 RRSOA (Guaranteed value)

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

## Package Dimensions

Unit: mm



Weight: 1400 g (typ.)

Package Name(s)
TOSHIBA: 3-120D2S

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