

SiC Schottky Barrier Diode

# TRS40N120HB

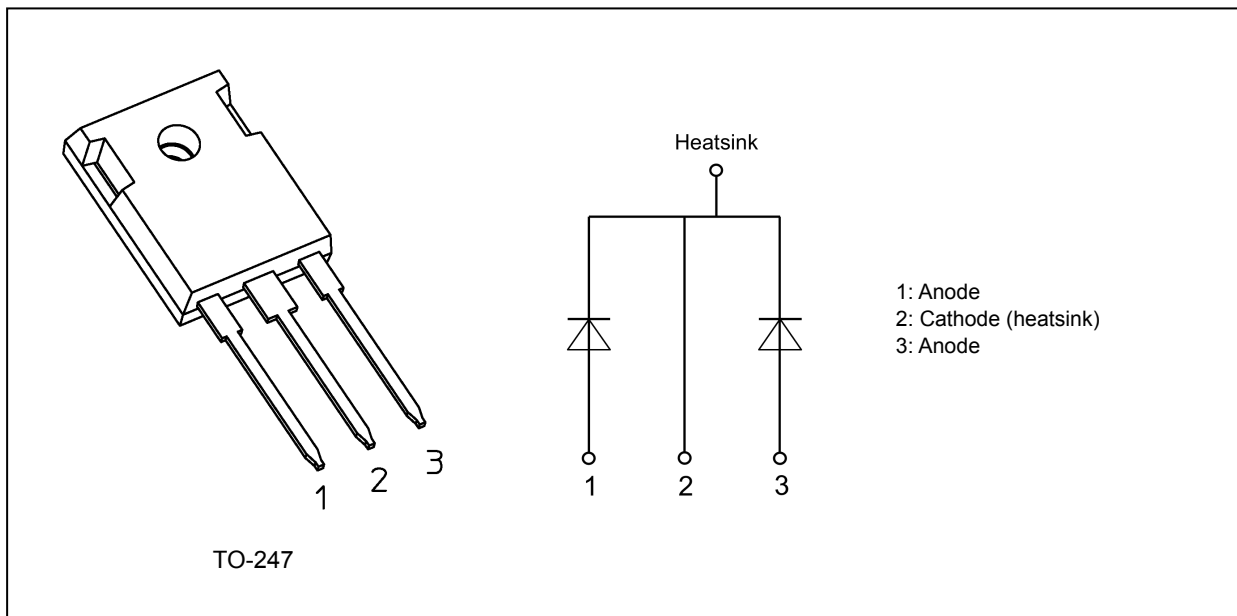
## 1. Applications

- Power Factor Correction
- Solar Inverters
- Uninterruptible Power Supplies
- DC-DC Converters

## 2. Features

- (1) Chip design of 3rd generation
- (2) Low forward voltage :  $V_F$  (Per Leg) = 1.27 V (typ.)
- (3) Low total capacitive charge:  $Q_c$  (Per Leg) = 108 nC (typ.)
- (4) Low reverse current:  $I_R$  (Per Leg) = 1.8  $\mu$ A (typ.)

## 3. Packaging and Internal Circuit



Start of commercial production  
2024-07

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

| Characteristics                           | Symbol      | Note    | Test Condition | Rating     | Unit             |
|---|-------------|---------|----------------|------------|------------------|
| Repetitive peak reverse voltage           | $V_{RRM}$   |         |                | 1200       | V                |
| Forward DC current                        | $I_{F(DC)}$ | (Note1) | Per Leg        | 20         | A                |
|   |             |         | Both Legs      | 40         |                  |
|   |             | (Note2) | Per Leg        | 51         |                  |
|   |             |         | Both Legs      | 102        |                  |
| Non-repetitive peak forward surge current | $I_{FSM}$   | (Note3) | Per Leg        | 135        | A                |
|   |             |         | Both Legs      | 270        |                  |
|   |             | (Note4) | Per Leg        | 115        |                  |
|   |             |         | Both Legs      | 230        |                  |
|   |             | (Note5) | Per Leg        | 1080       |                  |
|   |             |         | Both Legs      | 2160       |                  |
| Power dissipation                         | $P_D$       | (Note2) | Per Leg        | 227        | W                |
|   |             |         | Both Legs      | 454        |                  |
| Junction temperature                      | $T_j$       |         |                | 175        | $^\circ\text{C}$ |
| Storage temperature                       | $T_{stg}$   |         |                | -55 to 175 | $^\circ\text{C}$ |
| Mounting torque                           | TOR         |         |                | 0.8        | N · m            |

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).

Note1:  $T_c = 147\text{ }^\circ\text{C}$

Note2:  $T_c = 25\text{ }^\circ\text{C}$

Note3:  $f = 50\text{ Hz}$  (half-sine wave,  $t = 10\text{ ms}$ ),  $T_c = 25\text{ }^\circ\text{C}$

Note4:  $f = 50\text{ Hz}$  (half-sine wave,  $t = 10\text{ ms}$ ),  $T_c = 150\text{ }^\circ\text{C}$

Note5: Square wave,  $t = 10\text{ }\mu\text{s}$ ,  $T_c = 25\text{ }^\circ\text{C}$

### 5. Thermal Characteristics

| Characteristics                          | Symbol        | Note    | Test Condition | Max  | Unit               |
|--|---------------|---------|----------------|------|--------------------|
| Thermal resistance (junction-to-case)    | $R_{th(j-c)}$ | (Note1) | Per Leg        | 0.66 | $^\circ\text{C/W}$ |
|  |               |         | Both Legs      | 0.33 |                    |
| Thermal resistance (junction-to-ambient) | $R_{th(j-a)}$ | (Note2) | —              | 50   |                    |

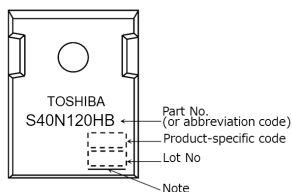
Note1:  $T_c = 25\text{ }^\circ\text{C}$

Note2:  $T_a = 25\text{ }^\circ\text{C}$

### 6. Electrical Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ ) (Per Leg)

| Characteristics                     | Symbol | Test Condition  | Min | Typ. | Max  | Unit          |
|-------------------------------------|--------|---|-----|------|------|---------------|
| Forward voltage (pulse measurement) | $V_F$  | $I_F = 10\text{ A}$                                       | —   | 1.0  | —    | V             |
|                                     |        | $I_F = 20\text{ A}$                                       | —   | 1.27 | 1.45 |               |
|                                     |        | $I_F = 20\text{ A}$ , $T_a = 150\text{ }^\circ\text{C}$   | —   | 1.64 | —    |               |
| Reverse current (pulse measurement) | $I_R$  | $V_R = 1200\text{ V}$                                     | —   | 1.8  | 130  | $\mu\text{A}$ |
|                                     |        | $V_R = 1200\text{ V}$ , $T_a = 150\text{ }^\circ\text{C}$ | —   | 20   | —    |               |
| Total capacitance                   | $C_t$  | $V_R = 1\text{ V}$ , $f = 1\text{ MHz}$                   | —   | 2211 | —    | pF            |
|                                     |        | $V_R = 800\text{ V}$ , $f = 1\text{ MHz}$                 | —   | 70   | —    |               |
|                                     |        | $V_R = 1200\text{ V}$ , $f = 1\text{ MHz}$                | —   | 67   | —    |               |
| Total capacitive charge             | $Q_c$  | $V_R = 800\text{ V}$ , $f = 1\text{ MHz}$                 | —   | 108  | —    | nC            |

### 7. Marking (Note)



**Fig. 7.1 Marking**

Note: A line under 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.

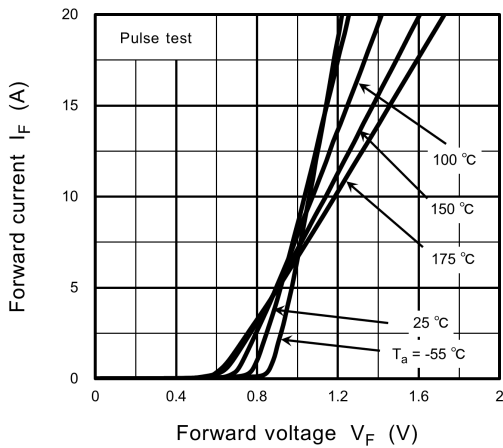
The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

| Abbreviation Code | Part Number |
|-------------------|-------------|
| S40N120HB         | TRS40N120HB |

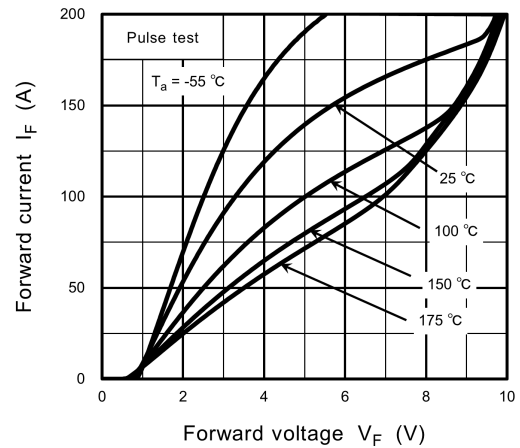
### 8. Usage Considerations

For other design considerations, see the Toshiba website.

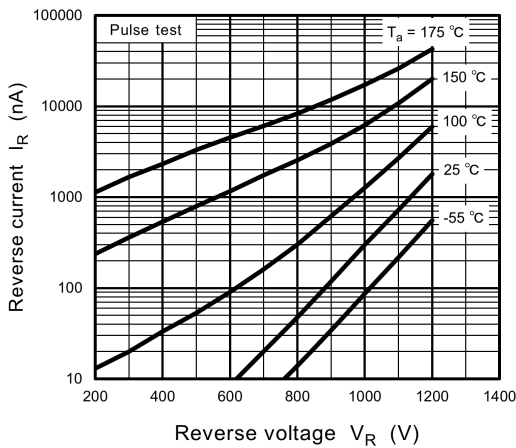
## 9. Characteristics Curves (Note)



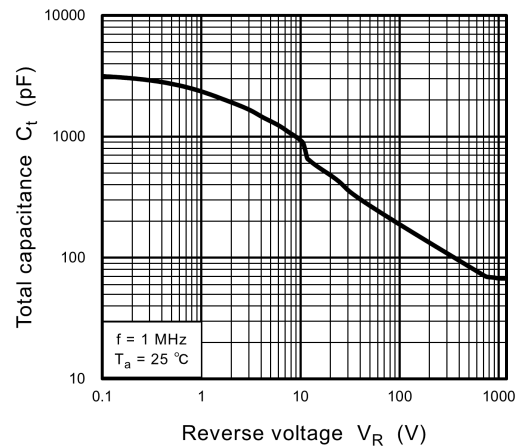
**Fig. 9.1  $I_F - V_F$  (Per Leg)**



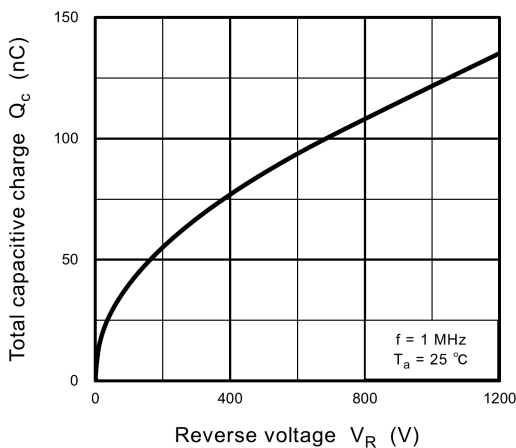
**Fig. 9.2  $I_F - V_F$  (Per Leg)**



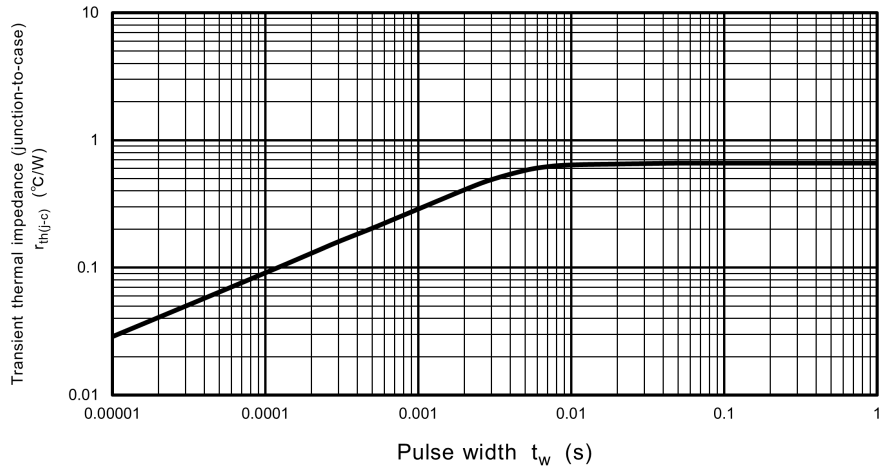
**Fig. 9.3  $I_R - V_R$  (Per Leg)**



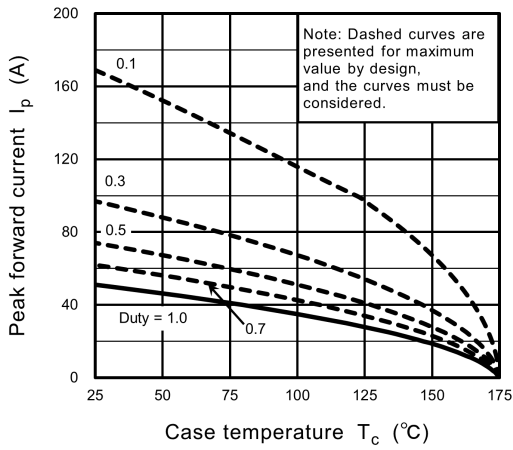
**Fig. 9.4  $C_t - V_R$  (Per Leg)**



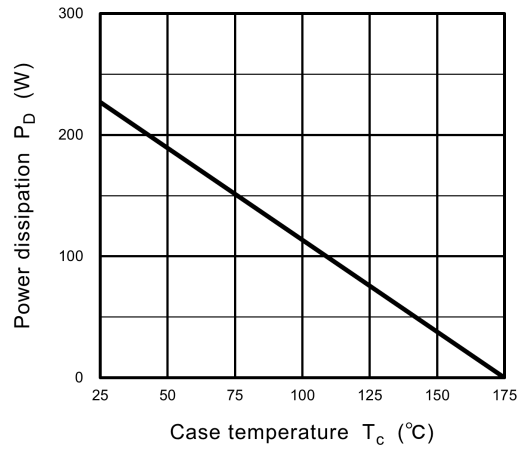
**Fig. 9.5  $Q_c - V_R$  (Per Leg)**



**Fig. 9.6  $r_{th(j-c)} - t_w$  (Per Leg)**  
(Guaranteed Maximum)



**Fig. 9.7  $I_p - T_c$  (Per Leg)**

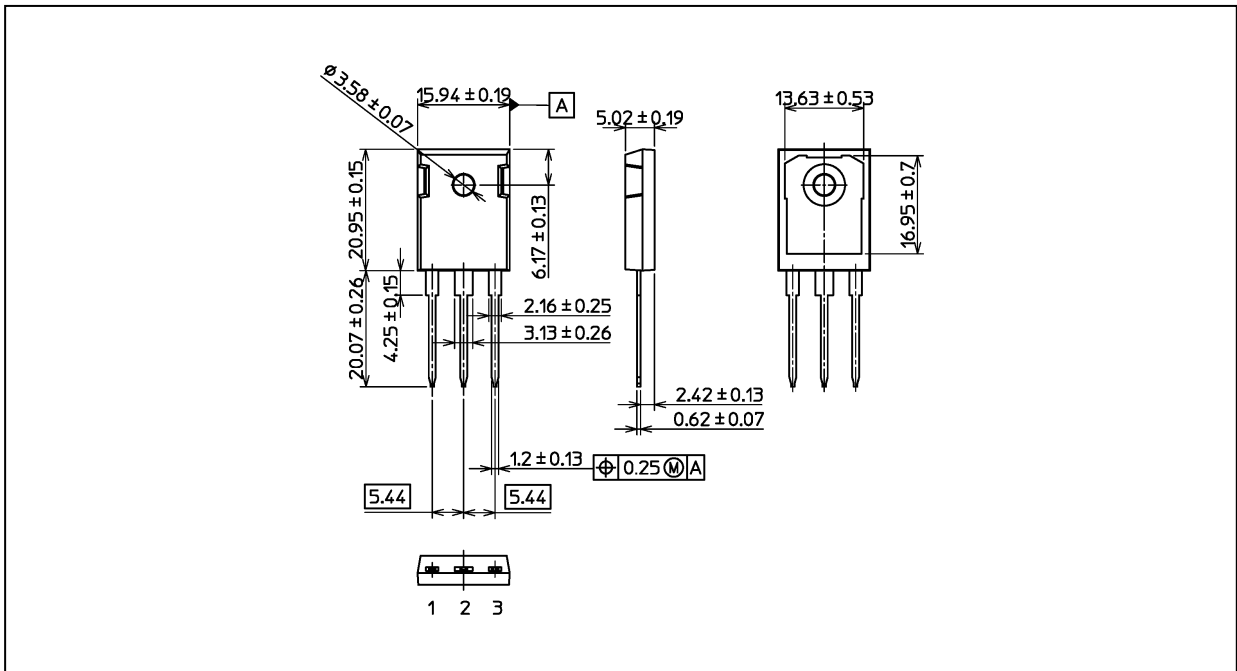


**Fig. 9.8  $P_D - T_c$  (Per Leg)**  
(Guaranteed Maximum)

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

## Package Dimensions

Unit: mm



Weight: 6.15 g (typ.)

| Package Name(s)  |
|------------------|
| TOSHIBA: 2-16L1A |
| Nickname: TO-247 |

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