

SiC Schottky Barrier Diode

## TRS4E65F

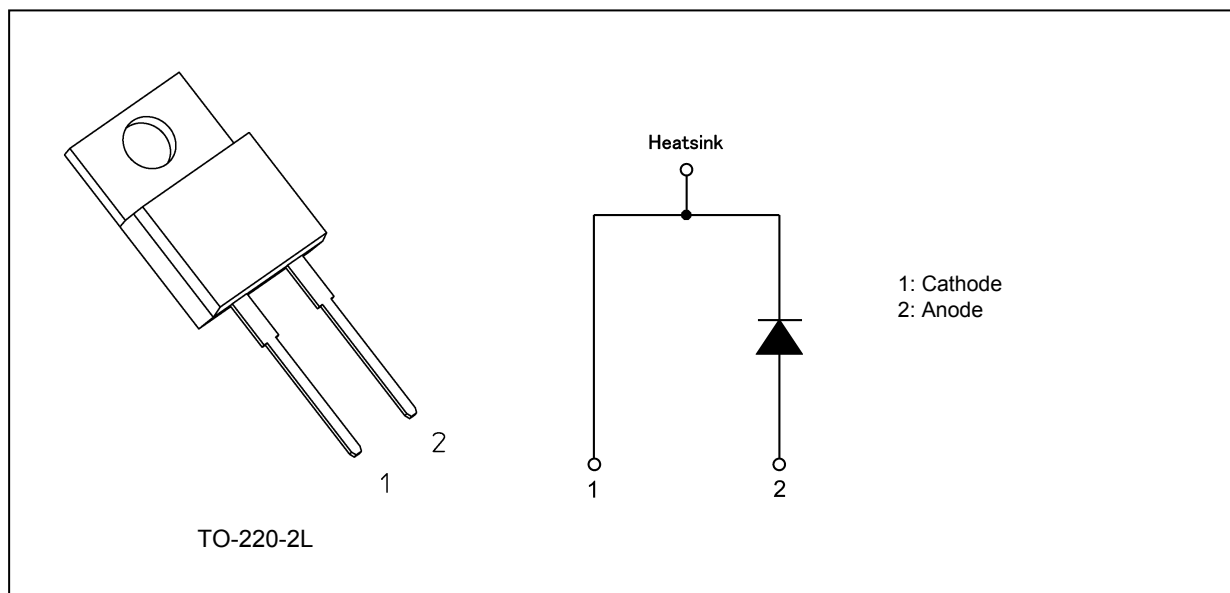
### 1. Applications

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

### 2. Features

- (1) Chip design of 2nd generation.
- (2) High surge current capability :  $I_{FSM} = 39A$  (Max)
- (3) The junction capacitance is small :  $C_j = 16$  pF (Typ.)
- (4) The reverse current is small. :  $I_R = 0.2$   $\mu A$  (Typ.)

### 3. Packaging and Internal Circuit



Start of commercial production  
2016-07

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

Characteristics	Symbol	Note	Rating	Unit
Repetitive peak reverse voltage	$V_{RRM}$		650	V
Forward DC current	$I_{F(DC)}$		4	A
Forward pulse current	$I_{FP}$	(Note 1)	40	A
Non-repetitive peak forward surge current	$I_{FSM}$	(Note 2)	39	A
$I^2t$ limit value	$I^2t$		7.61	$\text{A}^2\text{s}$
Junction temperature	$T_j$		175	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to 175	$^\circ\text{C}$
Mounting torque	TOR		0.6	$\text{N} \cdot \text{m}$

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).

Note 1:  $t = 50\ \mu\text{s}$

Note 2:  $f = 50\ \text{Hz}$  (half-sine wave  $t = 10\ \text{ms}$ )

## 5. Thermal Characteristics

Characteristics	Symbol	Test Condition	Max	Unit
Thermal resistance (junction-to-case)	$R_{th(j-c)}$	—	2.7	$^\circ\text{C}/\text{W}$
Thermal resistance (junction-to-ambient)	$R_{th(j-a)}$	—	89	$^\circ\text{C}/\text{W}$

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward voltage	$V_F$ (1)	$I_F = 2\ \text{A}$ (pulse measurement)	—	1.2	—	V
Forward voltage	$V_F$ (2)	$I_F = 4\ \text{A}$ (pulse measurement)	—	1.45	1.6	V
Reverse current	$I_R$	$V_R = 650\ \text{V}$ (pulse measurement)	—	0.2	20	$\mu\text{A}$
Junction capacitance	$C_j$	$V_R = 650\ \text{V}$ , $f = 1\ \text{MHz}$	—	16	—	pF

## 7. Marking

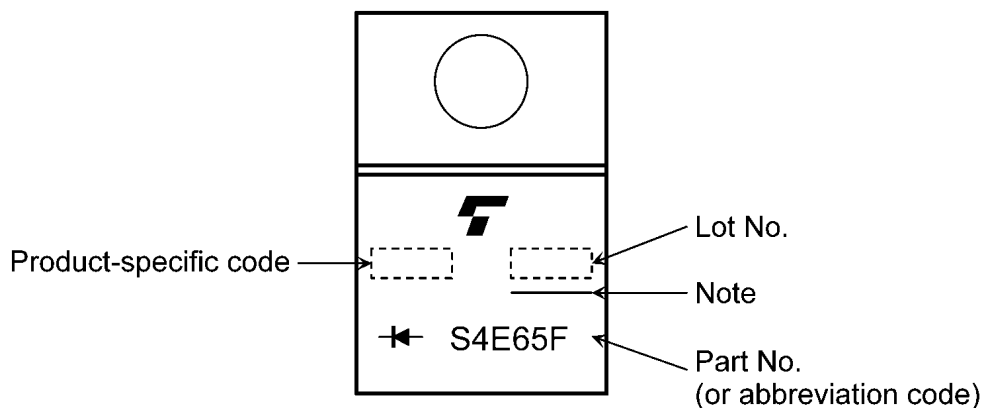


Fig. 7.1 Marking

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
S4E65F	TRS4E65F

## 8. Usage Considerations

- (1) The absolute maximum ratings are rated values that must not be exceeded during operation, even for an instant.

The following are the recommended general derating methods for designing a circuit board using this device.

$V_{RRM}$  :  $V_{RRM}$  has a temperature coefficient of 0.1 %/°C.

Take this coefficient into account when designing a circuit board that will be operated in a low-temperature environment.

$I_{F(DC)}$  : We recommend that the worst-case current be no greater than 80 % of the absolute maximum rating of  $I_{F(DC)}$ .

$I_{FP}$  : We recommend that the worst-case current be no greater than 80 % of the absolute maximum rating of  $I_{FP}$ .

$I_{FSM}$  : This rating specifies a non-repetitive limit value.

This only applies to an abnormal operation, which seldom occurs during the lifespan of a device.

$I^2t$  : This rating specifies a non-repetitive limit value.

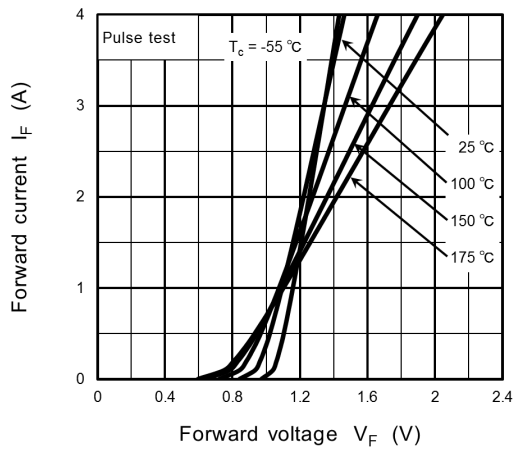
This only applies to an abnormal operation, which seldom occurs during the lifespan of a device.

$T_j$  : Derate device parameters in proportion to this rating in order to ensure high reliability.

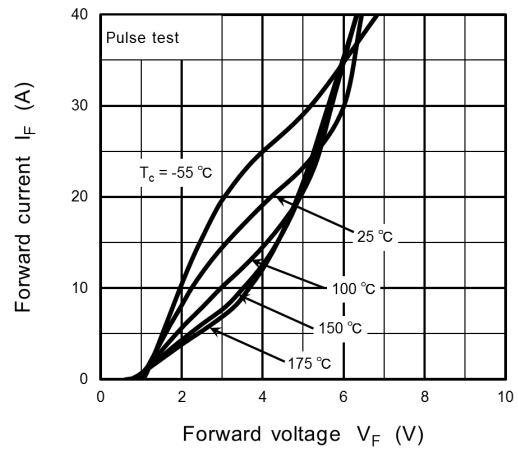
We recommend that the junction temperature ( $T_j$ ) of a device be kept below 140 °C.

- (2) For other design considerations, see the Toshiba Semiconductor website.

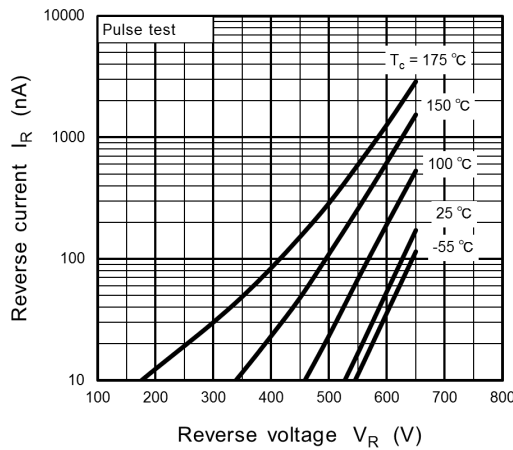
## 9. Characteristics Curves (Note)



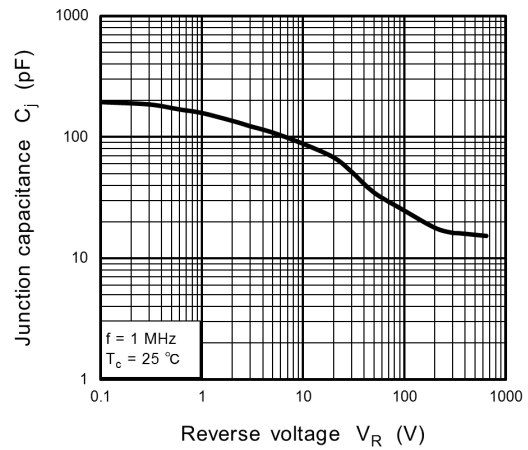
**Fig. 9.1  $I_F - V_F$**



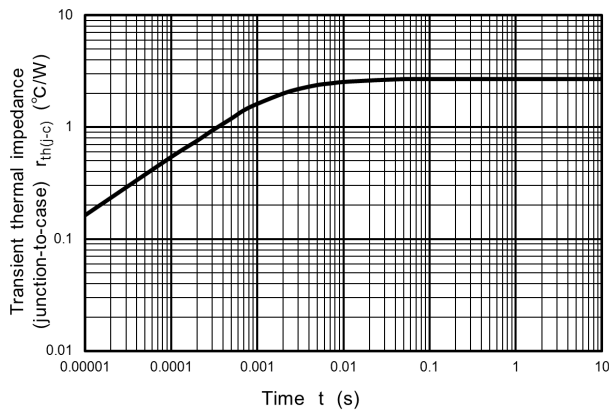
**Fig. 9.2  $I_F - V_F$**



**Fig. 9.3  $I_R - V_R$**



**Fig. 9.4  $C_j - V_R$**

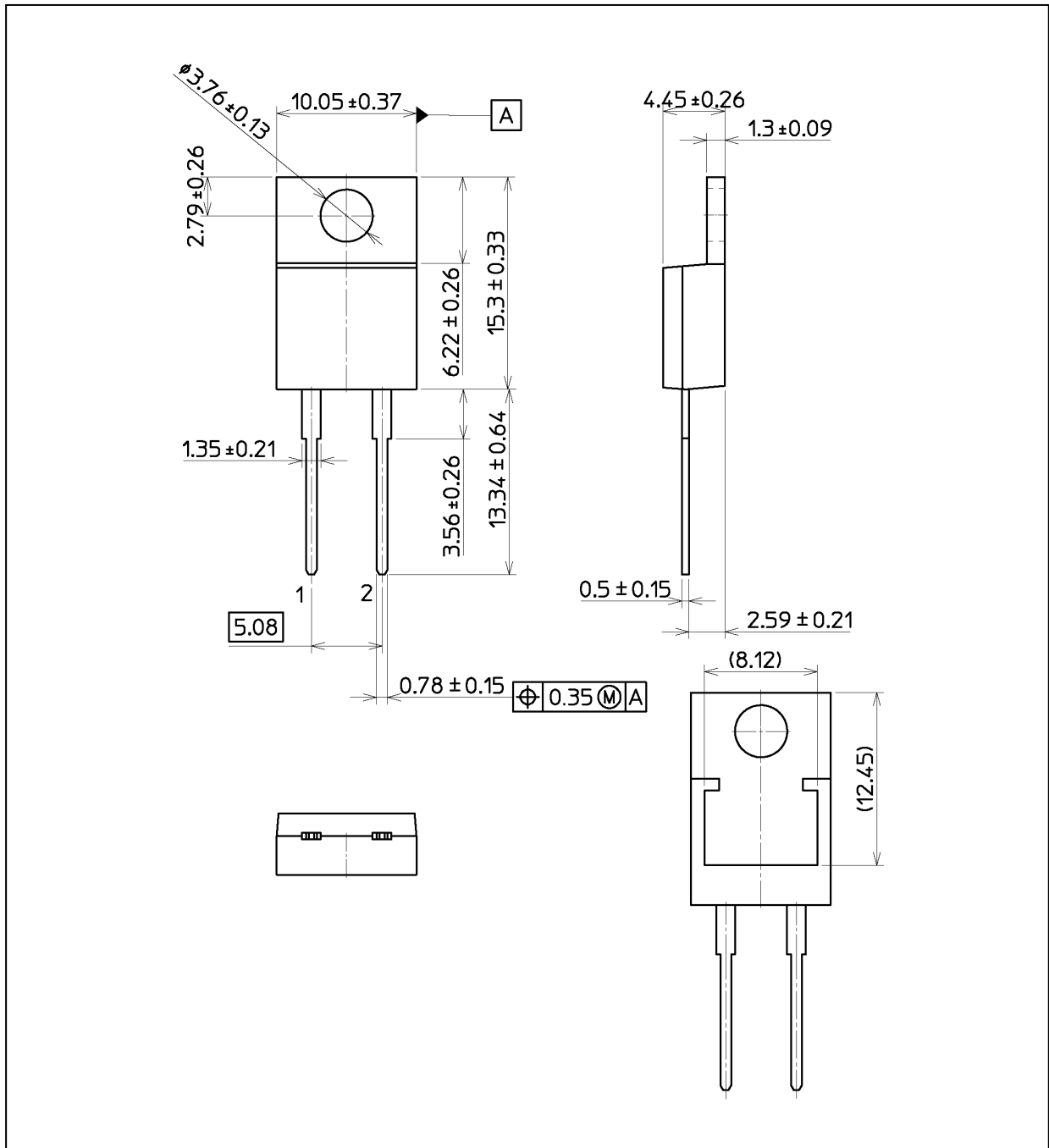


**Fig. 9.5  $r_{th(j-c)} - t$   
(Guaranteed Maximum)**

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

## Package Dimensions

Unit: mm



Weight: 1.9 g (typ.)

Package Name(s)
TOSHIBA: 2-10AE1A
Nickname: TO-220-2L

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