

|       |      |
|-------|------|
| $V_R$ | 650V |
| $I_F$ | 12A  |
| $Q_C$ | 17nC |

### ●Features

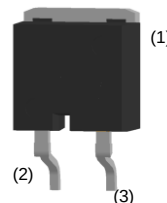
- 1) AEC-Q101 qualified
- 2) Low forward voltage
- 3) Negligible recovery time/current
- 4) Temperature independent switching behavior
- 5) Wide creepage distance = min. 5.10mm

### ●Applications

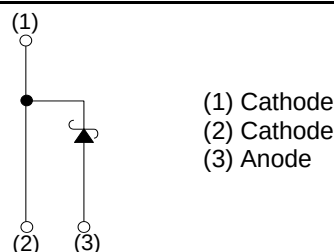
- On Board Charger
- DC/DC Converter
- Wireless Charger
- EV Charger

### ●Outline

TO-263-2L



### ●Inner circuit



### ●Packaging specifications

|      |                           |               |
|------|---------------------------|---------------|
| Type | Packaging                 | Embossed tape |
|      | Reel size (mm)            | 330           |
|      | Tape width (mm)           | 24            |
|      | Basic ordering unit (pcs) | 1000          |
|      | Packing code              | TRL           |
|      | Marking                   | SCS212AN      |

### ●Absolute maximum ratings ( $T_{vj} = 25^\circ\text{C}$ unless otherwise specified)

| Parameter                                                |                                                    | Symbol        | Value            | Unit                 |
|----------------------------------------------------------|----------------------------------------------------|---------------|------------------|----------------------|
| Reverse voltage (repetitive peak)                        |                                                    | $V_{RM}$      | 650              | V                    |
| Reverse voltage (DC)                                     |                                                    | $V_R$         | 650              | V                    |
| Continuous forward current ( $T_c = 135^\circ\text{C}$ ) |                                                    | $I_F$         | 12 <sup>*1</sup> | A                    |
| Surge non-repetitive forward current                     | PW = 10ms sinusoidal, $T_{vj} = 25^\circ\text{C}$  | $I_{FSM}$     | 43               | A                    |
|                                                          | PW = 10ms sinusoidal, $T_{vj} = 150^\circ\text{C}$ |               | 34               | A                    |
|                                                          | PW = 10μs square, $T_{vj} = 25^\circ\text{C}$      |               | 170              | A                    |
| Repetitive peak forward current                          |                                                    | $I_{FRM}$     | 52 <sup>*2</sup> | A                    |
| $i^2t$ value                                             | PW = 10ms, $T_{vj} = 25^\circ\text{C}$             | $\int i^2 dt$ | 9.2              | $\text{A}^2\text{s}$ |
|                                                          | PW = 10ms, $T_{vj} = 150^\circ\text{C}$            |               | 5.7              | $\text{A}^2\text{s}$ |
| Total power dissipation                                  |                                                    | $P_D$         | 93 <sup>*3</sup> | W                    |
| Virtual Junction temperature                             |                                                    | $T_{vj}$      | 175              | $^\circ\text{C}$     |
| Range of storage temperature                             |                                                    | $T_{stg}$     | -40 to +175      | $^\circ\text{C}$     |

<sup>\*1</sup> Limited by maximum  $T_{vj}$  and for Max.  $R_{thJC}$ .

<sup>\*2</sup>  $T_c = 100^\circ\text{C}$ ,  $T_{vj} = 150^\circ\text{C}$ , Duty cycle = 10% <sup>\*3</sup>  $T_c = 25^\circ\text{C}$

**●Electrical characteristics** ( $T_{vj} = 25^{\circ}\text{C}$  unless otherwise specified)

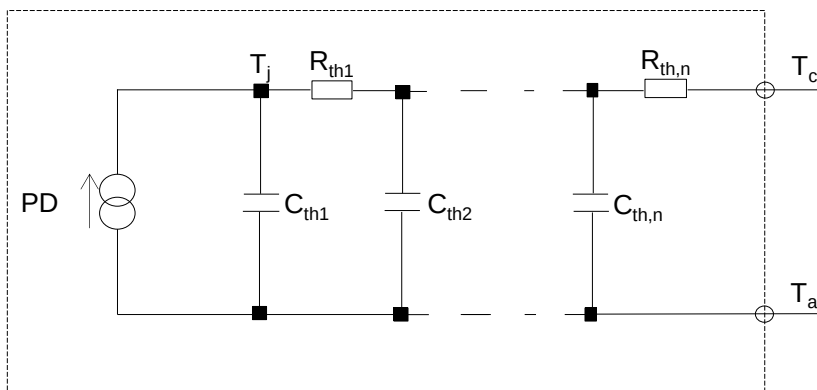
| Parameter               | Symbol   | Conditions                                           | Values |      |      | Unit          |
|-------------------------|----------|------------------------------------------------------|--------|------|------|---------------|
|                         |          |                                                      | Min.   | Typ. | Max. |               |
| DC blocking voltage     | $V_{DC}$ | $I_R = 2.4\text{mA}$                                 | 650    | -    | -    | V             |
| Forward voltage         | $V_F$    | $I_F = 12\text{A}, T_{vj} = 25^{\circ}\text{C}$      | -      | 1.35 | 1.55 | V             |
|                         |          | $I_F = 12\text{A}, T_{vj} = 150^{\circ}\text{C}$     | -      | 1.55 | -    | V             |
|                         |          | $I_F = 12\text{A}, T_{vj} = 175^{\circ}\text{C}$     | -      | 1.63 | -    | V             |
| Reverse current         | $I_R$    | $V_R = 600\text{V}, T_{vj} = 25^{\circ}\text{C}$     | -      | 2.4  | 240  | $\mu\text{A}$ |
|                         |          | $V_R = 600\text{V}, T_{vj} = 150^{\circ}\text{C}$    | -      | 36   | -    | $\mu\text{A}$ |
|                         |          | $V_R = 600\text{V}, T_{vj} = 175^{\circ}\text{C}$    | -      | 84   | -    | $\mu\text{A}$ |
| Total capacitance       | $C$      | $V_R = 1\text{V}, f = 1\text{MHz}$                   | -      | 440  | -    | pF            |
|                         |          | $V_R = 600\text{V}, f = 1\text{MHz}$                 | -      | 44   | -    | pF            |
| Total capacitive charge | $Q_C$    | $V_R = 400\text{V}, di/dt = 350\text{A}/\mu\text{s}$ | -      | 17   | -    | nC            |
| Switching time          | $t_C$    | $V_R = 400\text{V}, di/dt = 350\text{A}/\mu\text{s}$ | -      | 14   | -    | ns            |

**●Thermal characteristics**

| Parameter          | Symbol     | Conditions | Values |      |      | Unit |
|--------------------|------------|------------|--------|------|------|------|
|                    |            |            | Min.   | Typ. | Max. |      |
| Thermal resistance | $R_{thJC}$ | -          | -      | 1.2  | 1.6  | K/W  |

**●Typical Transient Thermal Characteristics**

| Symbol    | Value                 | Unit | Symbol    | Value                 | Unit |
|-----------|-----------------------|------|-----------|-----------------------|------|
| $R_{th1}$ | $2.75 \times 10^{-1}$ | K/W  | $C_{th1}$ | $5.34 \times 10^{-4}$ | Ws/K |
| $R_{th2}$ | $9.14 \times 10^{-1}$ |      | $C_{th2}$ | $2.03 \times 10^{-3}$ |      |
| $R_{th3}$ | $4.19 \times 10^{-4}$ |      | $C_{th3}$ | $5.64 \times 10^0$    |      |



●Electrical characteristic curves

Fig.1  $V_F - I_F$  Characteristics

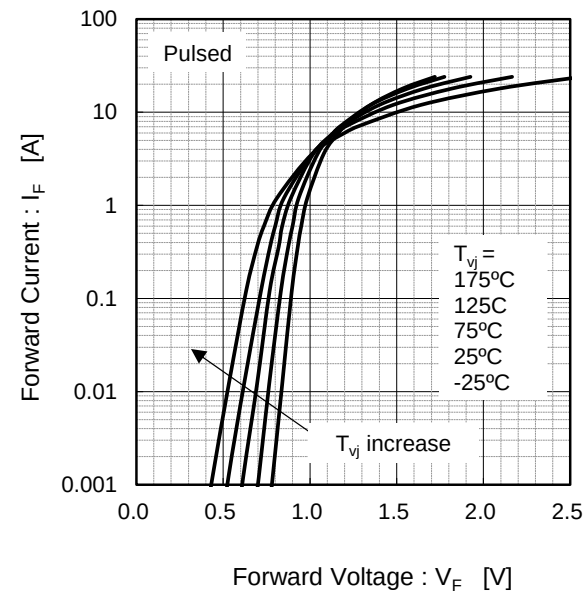


Fig.2  $V_F - I_F$  Characteristics

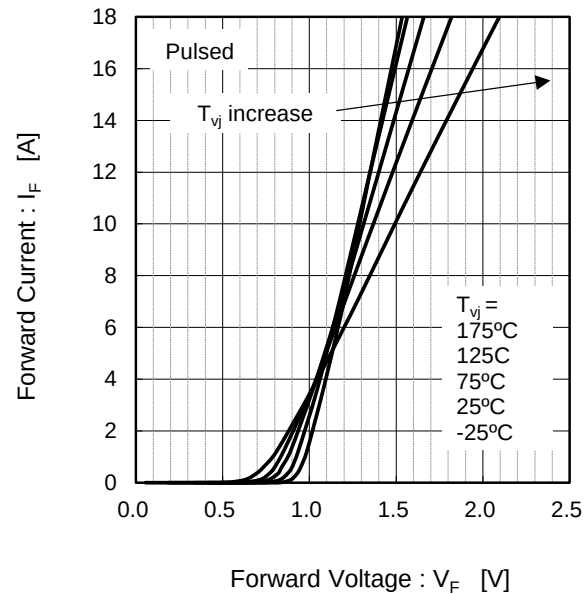


Fig.3  $V_R - I_R$  Characteristics

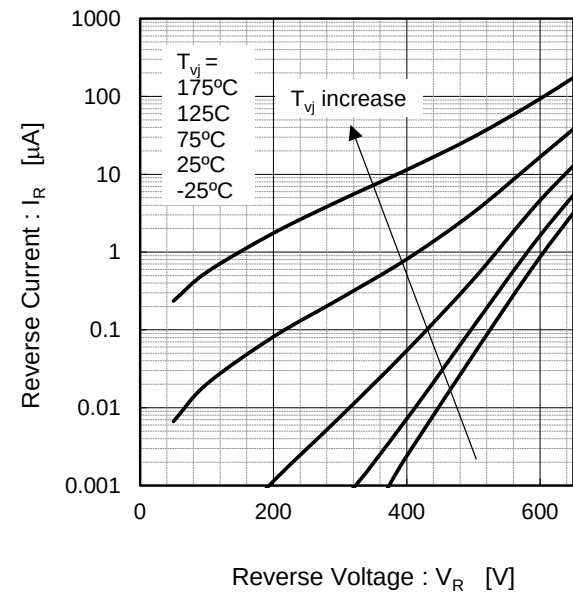
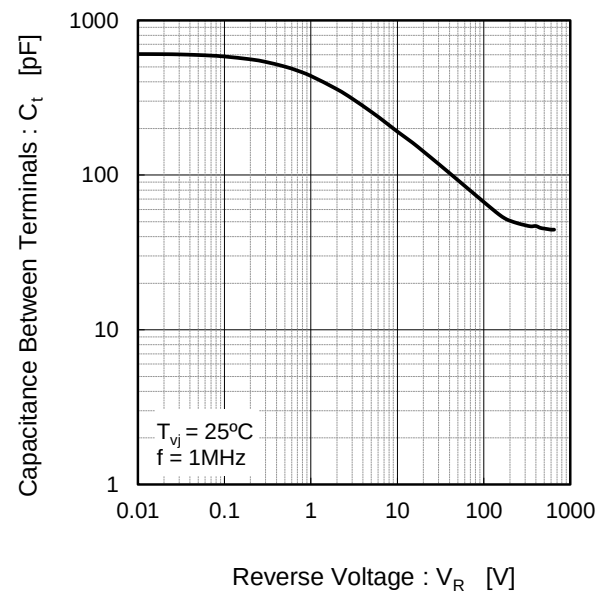


Fig.4  $V_R - C_t$  Characteristics



### ●Electrical characteristic curves

Fig.5 Typical Transient Thermal Impedance vs. Pulse Width

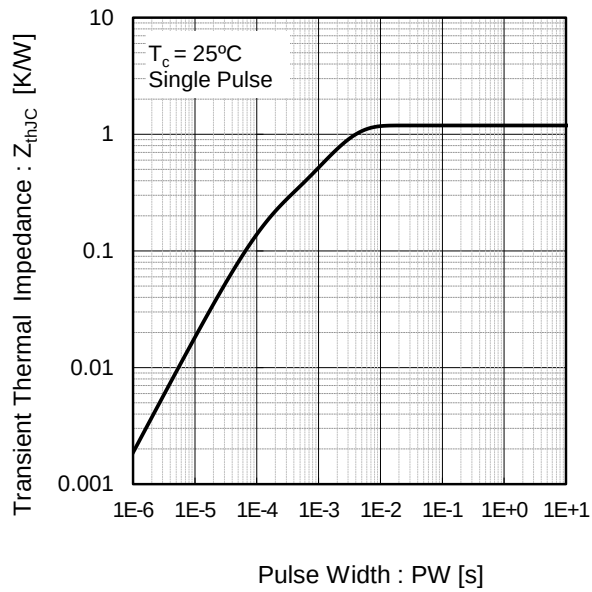


Fig.6 Power Dissipation

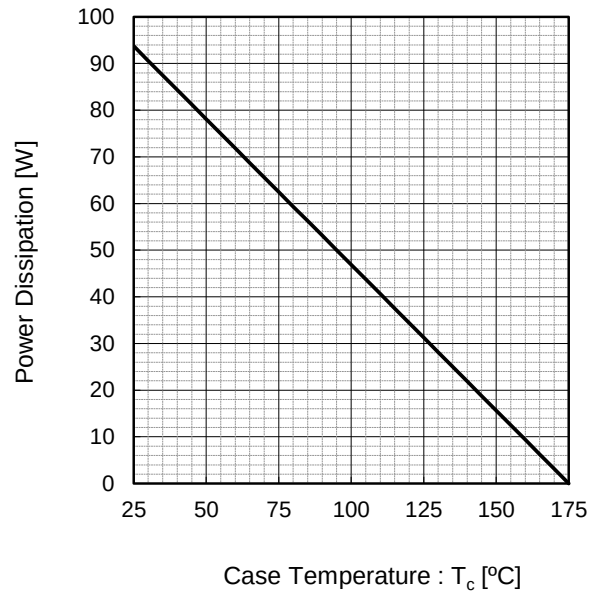
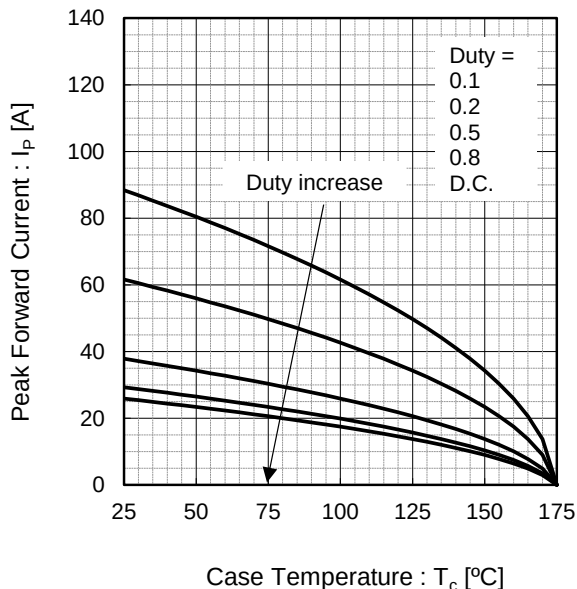
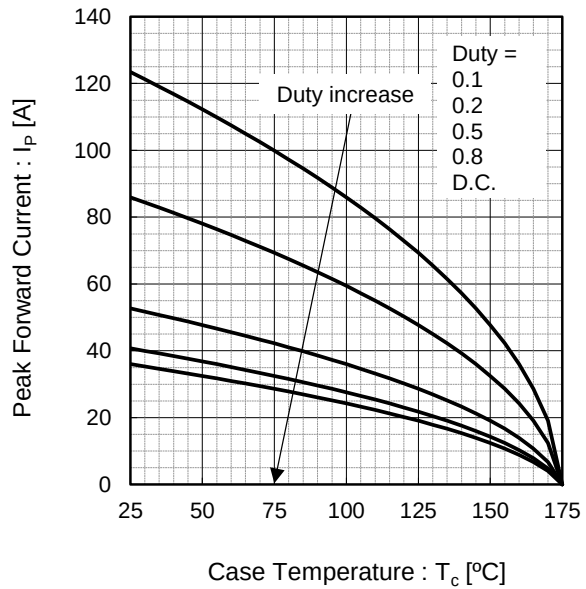


Fig.7\*4 Maximum peak forward current derating curve  $I_P - T_c$



Case Temperature :  $T_c$  [ $^\circ\text{C}$ ]  
 \*4 Based on max Vf, max  $Z_{thJC}$   
 Valid for switching of above 10kHz,  
 excluding D.C. curve.

Fig.8\*5 Typical peak forward current derating curve  $I_P - T_c$  (Not guaranteed)



Case Temperature :  $T_c$  [ $^\circ\text{C}$ ]  
 \*5 Based on typ Vf, typ  $Z_{thJC}$   
 Typical value, not guaranteed  
 Valid for switching of above 10kHz,  
 excluding D.C. curve

●Electrical characteristic curves

Fig.9 Surge non-repetitive forward current vs. Pulse width (Sinusoidal waveform)

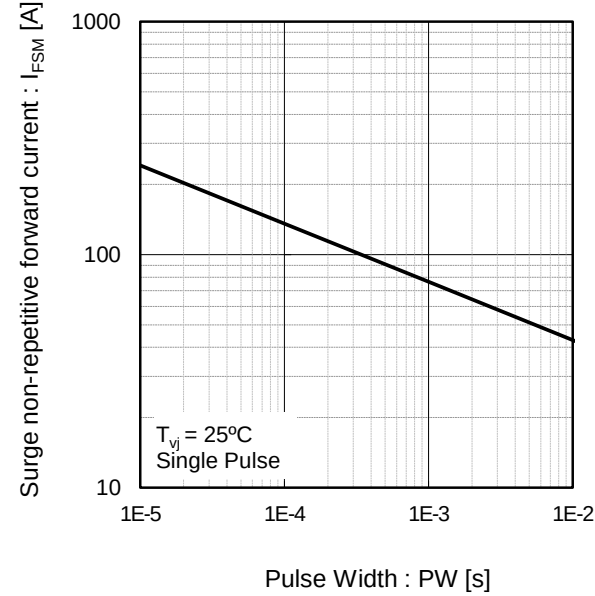
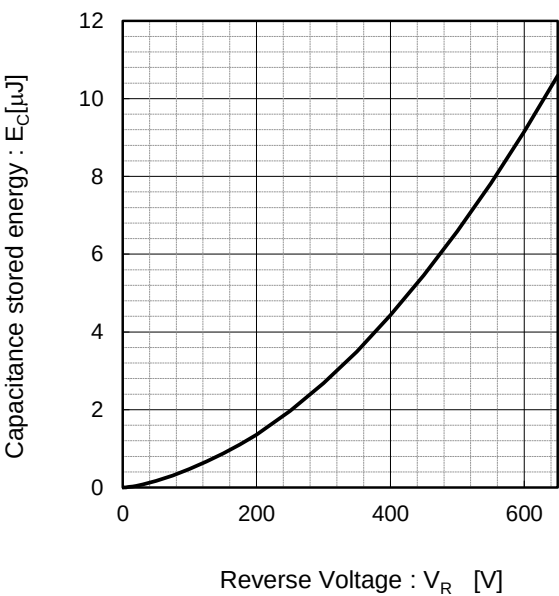
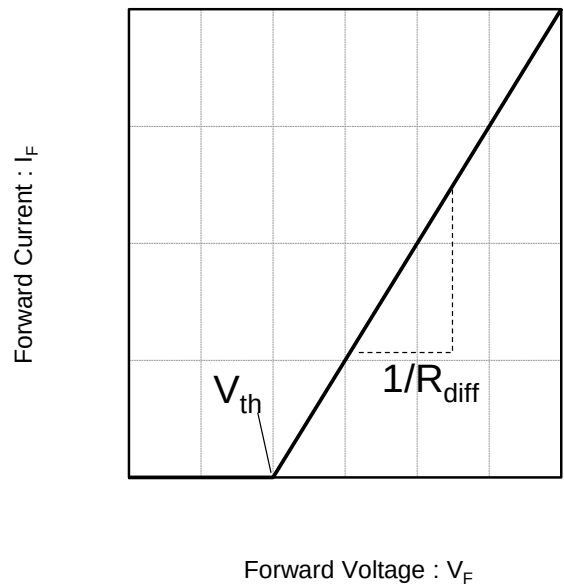


Fig.10 Typical capacitance stored energy



●Simplified forward characteristic model

Fig.11 Equivalent forward current curve



$$V_F = V_{th} + R_{diff} I_F$$

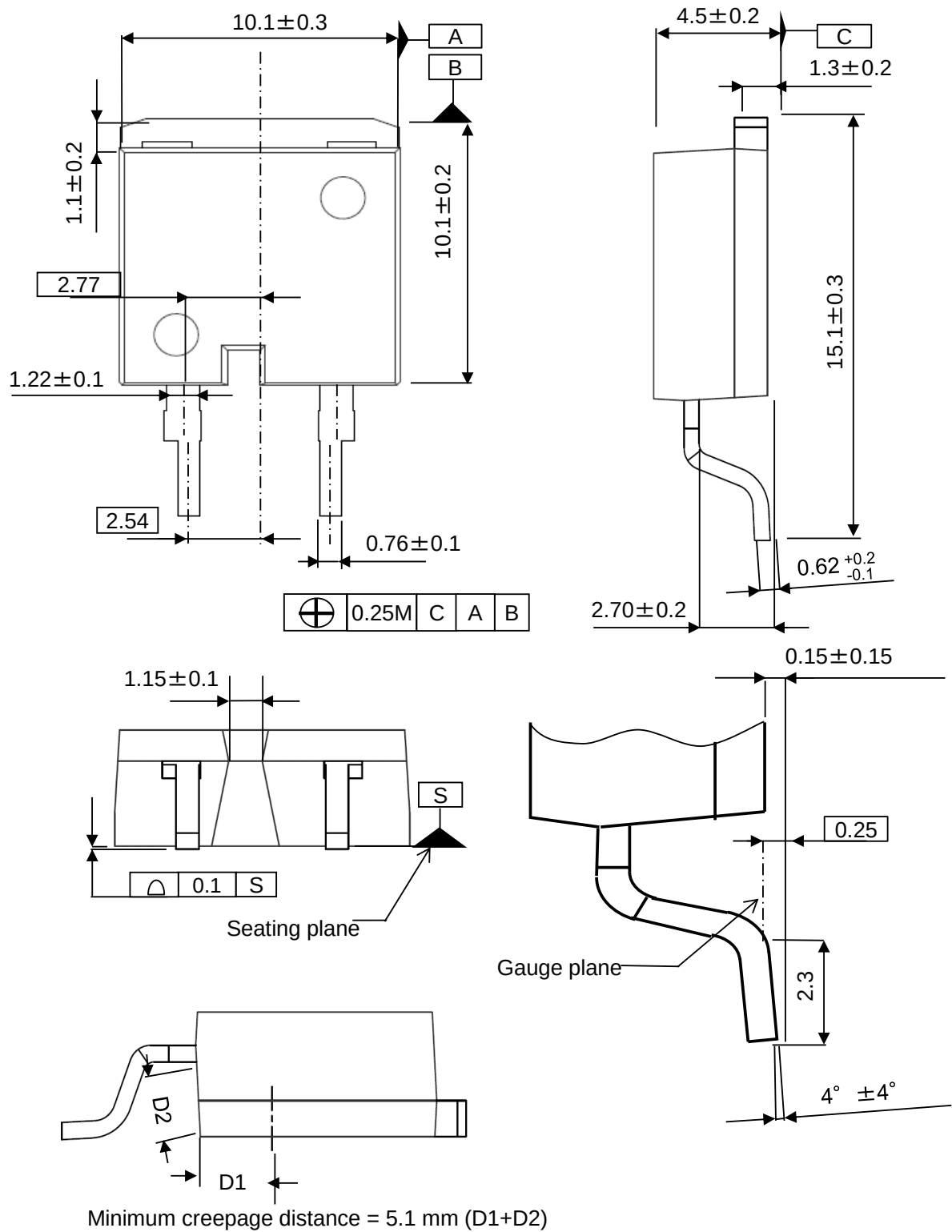
$$V_{th} ( T_{vj} ) = a_0 + a_1 T_{vj}$$
$$R_{diff} ( T_{vj} ) = b_0 + b_1 T_{vj} + b_2 T_{vj}^2$$

| Symbol         | Typical Value            | Unit              |
|----------------|--------------------------|-------------------|
| a <sub>0</sub> | 9.35 × 10 <sup>-1</sup>  | V                 |
| a <sub>1</sub> | -1.12 × 10 <sup>-3</sup> | V/°C              |
| b <sub>0</sub> | 3.32 × 10 <sup>-2</sup>  | Ω                 |
| b <sub>1</sub> | 8.50 × 10 <sup>-5</sup>  | Ω/°C              |
| b <sub>2</sub> | 9.00 × 10 <sup>-7</sup>  | Ω/°C <sup>2</sup> |

T<sub>vj</sub> in °C; -40 °C < T<sub>vj</sub> < 175 °C ; I<sub>F</sub> < 24 A

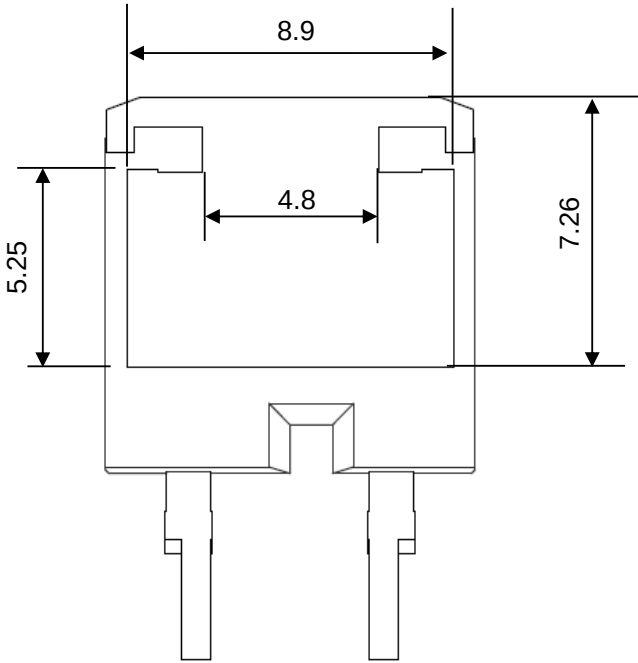
●Dimensions (Unit : mm)

Marking Side

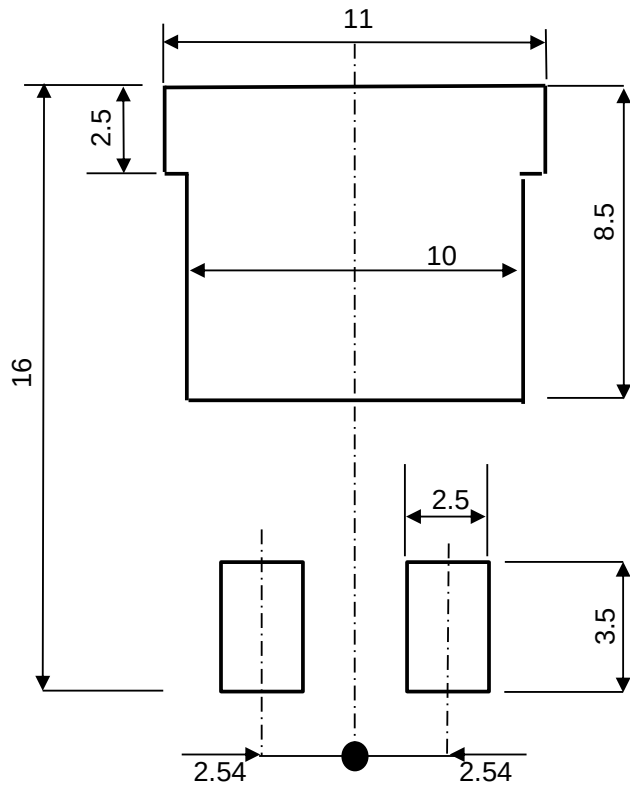


●Dimensions (Unit : mm)

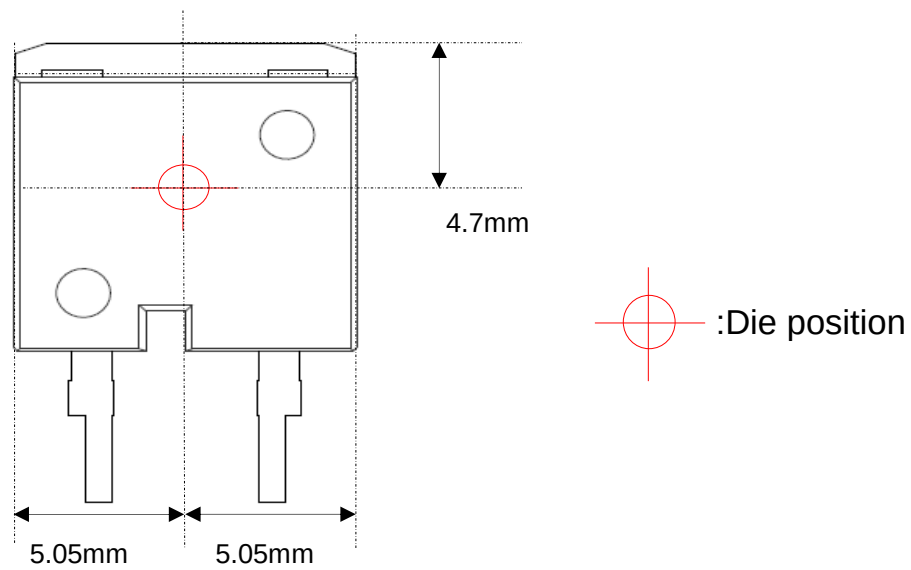
Back Side



Reference Copper Plate Area Dimension



## ●Die Bonding Layout



- Front view of the packaging.
- Dimensions are design values.
- If the heat sink is to be installed, it should be in contact with the die bonding point.

Unit: mm



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