

$V_R$	650V
$I_F$	4A
$Q_C$	6nC

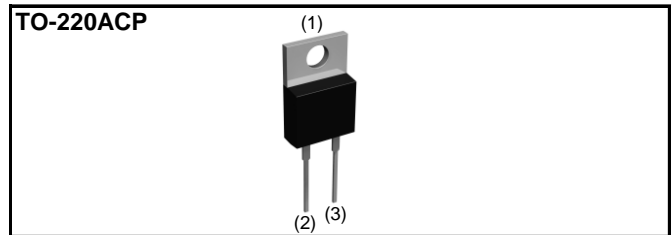
#### ●Features

- 1) Shorter recovery time
- 2) Reduced temperature dependence
- 3) High-speed switching possible
- 4) High surge current capability

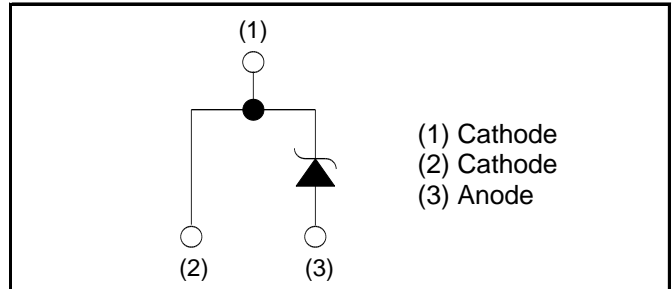
#### ●Construction

Silicon carbide epitaxial planar type

#### ●Outline



#### ●Inner circuit



#### ●Packaging specifications

Type	Packaging	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	50
	Packing code	C9
	Marking	SCS304AP

#### ●Absolute maximum ratings ( $T_j = 25^\circ\text{C}$ )

Parameter	Symbol	Value	Unit	
Reverse voltage (repetitive peak)	$V_{RM}$	650	V	
Reverse voltage (DC)	$V_R$	650	V	
Continuous forward current ( $T_c = 140^\circ\text{C}$ )	$I_F$	4	A	
Surge non-repetitive forward current	$I_{FSM}$	PW=10ms sinusoidal, $T_j=25^\circ\text{C}$	27	A
		PW=10ms sinusoidal, $T_j=150^\circ\text{C}$	22	A
		PW=10μs square, $T_j=25^\circ\text{C}$	100	A
Repetitive peak forward current	$I_{FRM}$	20 <sup>*1</sup>	A	
$i^2t$ value	$\int i^2 dt$	$1 \leq PW \leq 10\text{ms}$ , $T_j=25^\circ\text{C}$	3.6	$\text{A}^2\text{s}$
		$1 \leq PW \leq 10\text{ms}$ , $T_j=150^\circ\text{C}$	2.4	$\text{A}^2\text{s}$
Total power dissipation	$P_D$	34 <sup>*2</sup>	W	
Junction temperature	$T_j$	175	$^\circ\text{C}$	
Range of storage temperature	$T_{stg}$	-55 to +175	$^\circ\text{C}$	

\*1  $T_c=100^\circ\text{C}$ ,  $T_j=150^\circ\text{C}$ , Duty cycle=10% \*2  $T_c=25^\circ\text{C}$

**●Electrical characteristics ( $T_j = 25^\circ\text{C}$ )**

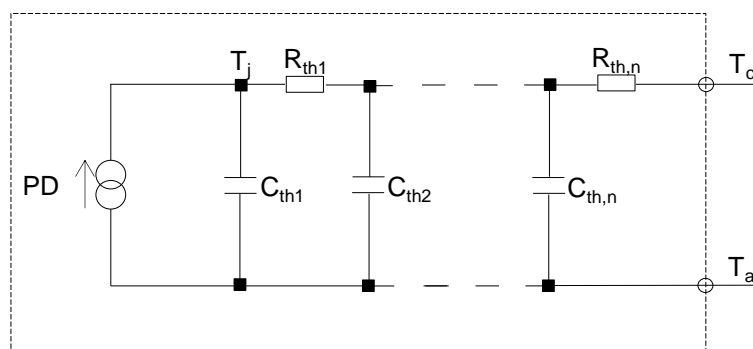
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	$V_{DC}$	$I_R = 20\mu\text{A}$	650	-	-	V
Forward voltage	$V_F$	$I_F = 4\text{A}, T_j = 25^\circ\text{C}$	-	1.35	1.50	V
		$I_F = 4\text{A}, T_j = 150^\circ\text{C}$	-	1.44	1.71	V
		$I_F = 4\text{A}, T_j = 175^\circ\text{C}$	-	1.50	-	V
Reverse current	$I_R$	$V_R = 650\text{V}, T_j = 25^\circ\text{C}$	-	0.012	20	$\mu\text{A}$
		$V_R = 650\text{V}, T_j = 150^\circ\text{C}$	-	0.8	80	$\mu\text{A}$
		$V_R = 650\text{V}, T_j = 175^\circ\text{C}$	-	2.4	-	$\mu\text{A}$
Total capacitance	C	$V_R = 1\text{V}, f = 1\text{MHz}$	-	200	-	pF
		$V_R = 650\text{V}, f = 1\text{MHz}$	-	18	-	pF
Total capacitive charge	$Q_C$	$V_R = 400\text{V}, di/dt = 350\text{A}/\mu\text{s}$	-	11	-	nC
Switching time	$t_C$	$V_R = 400\text{V}, di/dt = 350\text{A}/\mu\text{s}$	-	14	-	ns
Non-repetitive Avaranche Energy	$E_{ava}$	$L = 1\text{mH}$	-	48	-	mJ

**●Thermal characteristics**

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	$R_{th(j-c)}$	-	-	3.0	4.4	$^\circ\text{C}/\text{W}$

**●Typical Transient Thermal Characteristics**

Symbol	Value	Unit	Symbol	Value	Unit
$R_{th1}$	3.91E-02	K/W	$C_{th1}$	1.01E-04	Ws/K
$R_{th2}$	3.76E-01		$C_{th2}$	4.02E-04	
$R_{th3}$	2.54E+00		$C_{th3}$	1.19E-03	



●Electrical characteristic curves

Fig.1  $V_F - I_F$  Characteristics

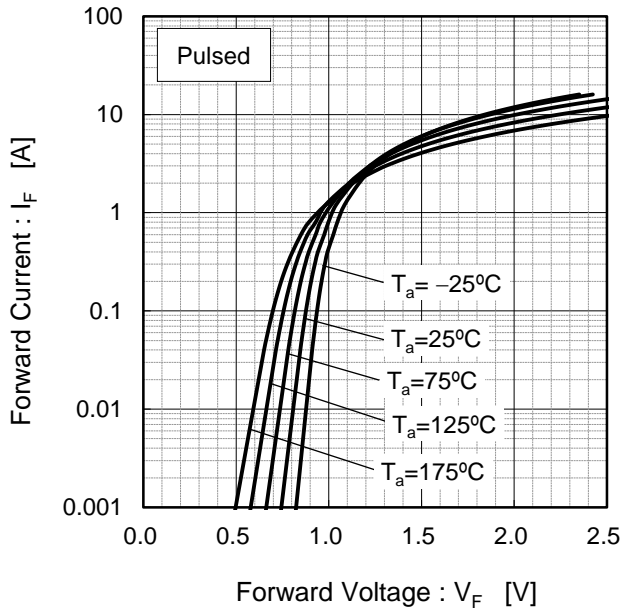


Fig.2  $V_F - I_F$  Characteristics

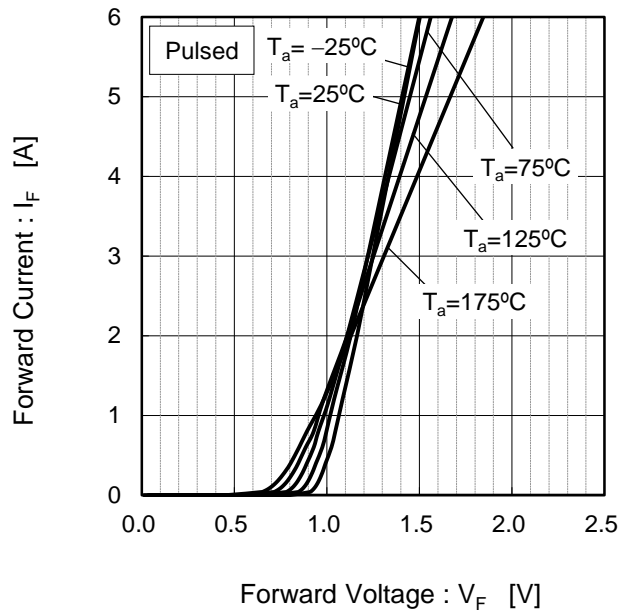


Fig.3  $V_R - I_R$  Characteristics

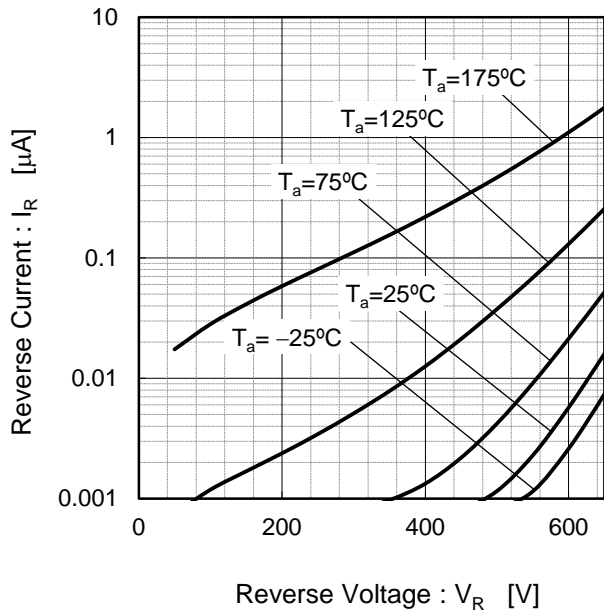
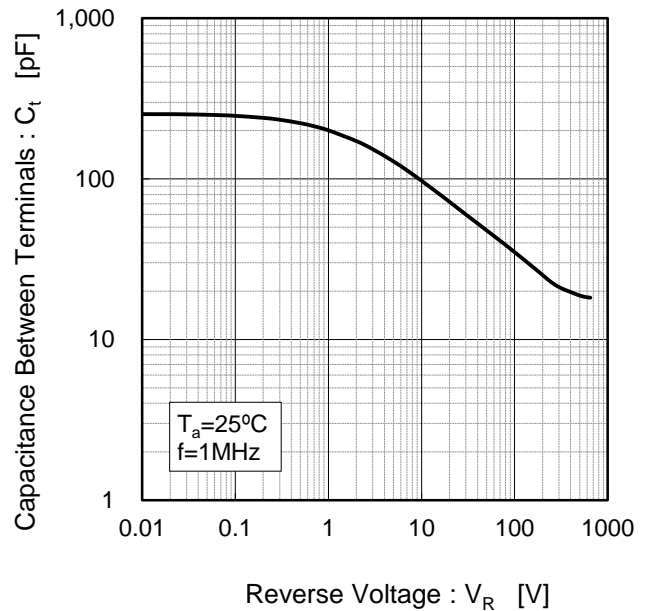


Fig.4  $V_R - C_t$  Characteristics



●Electrical characteristic curves

Fig.5 Typical Transient Thermal Resistance vs. Pulse Width

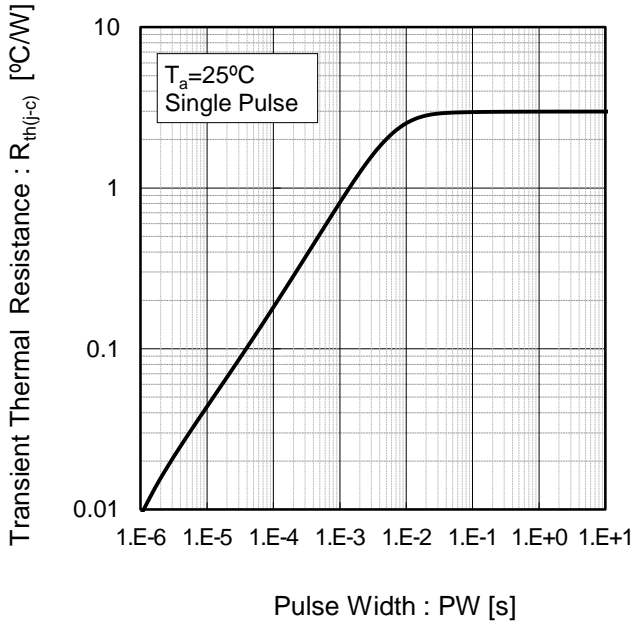


Fig.6 Power Dissipation

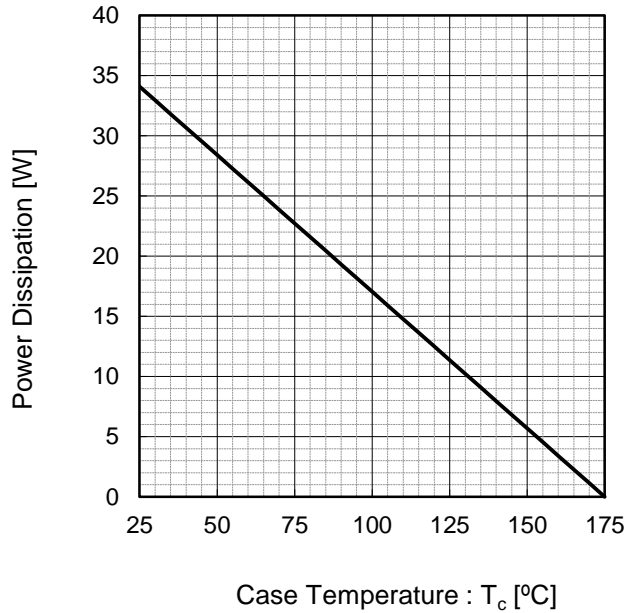
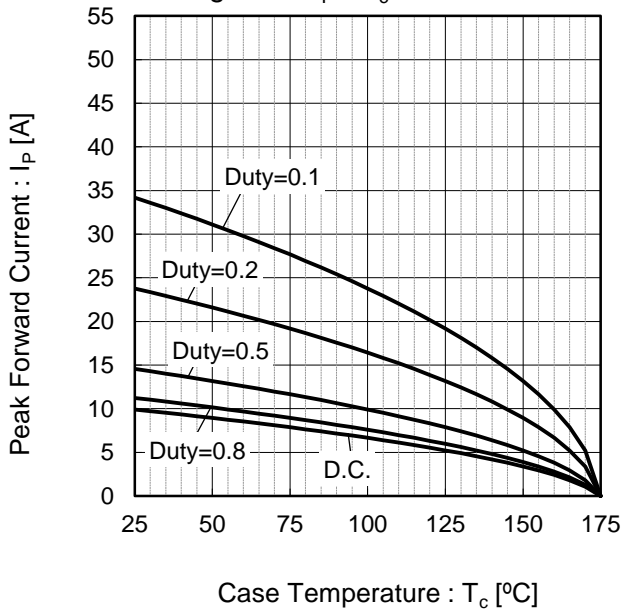
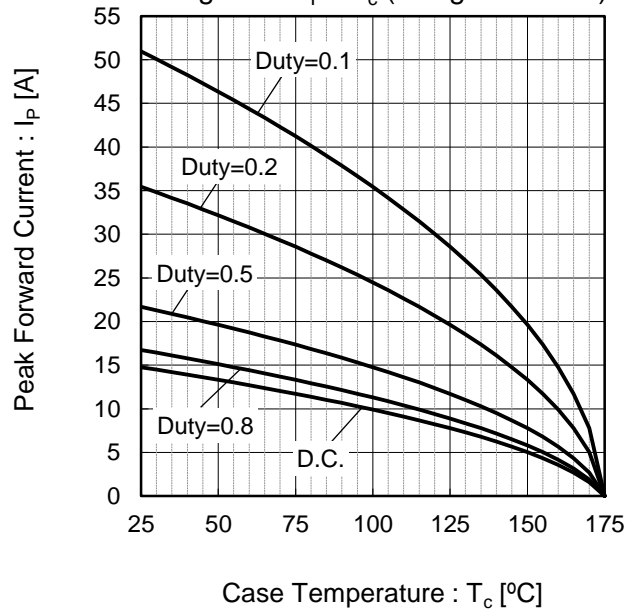


Fig.7\*3 Maximum peak forward current derating curve  $I_P - T_c$



\*3 Based on max Vf, max  $R_{th(j-c)}$   
Valid for switching of above 10kHz,  
excluding D.C. curve.

Fig.8\*4 Typical peak forward current derating curve  $I_P - T_c$  (Not guaranteed)



\*4 Based on typ Vf, typ  $R_{th(j-c)}$   
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)

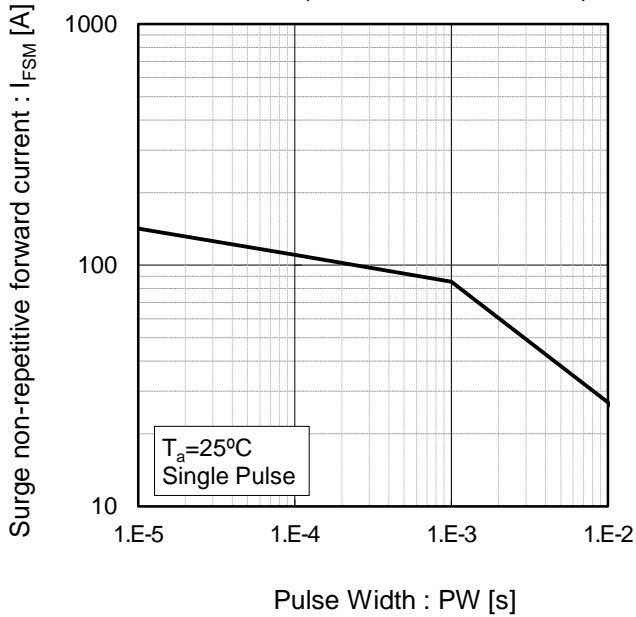
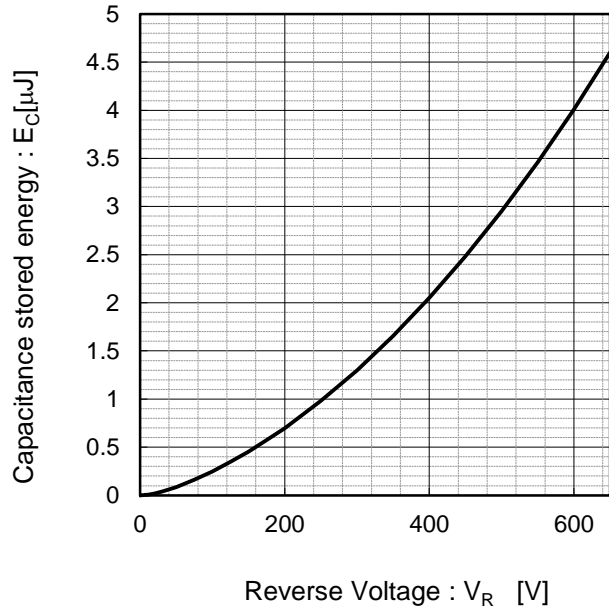
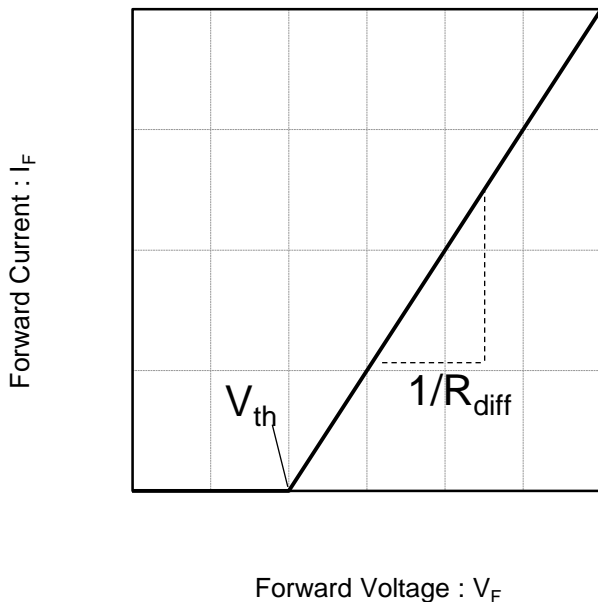


Fig.10 Typical capacitance store energy



●Simplified forward characteristic model

Fig.11 Equivalent forward current curve



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

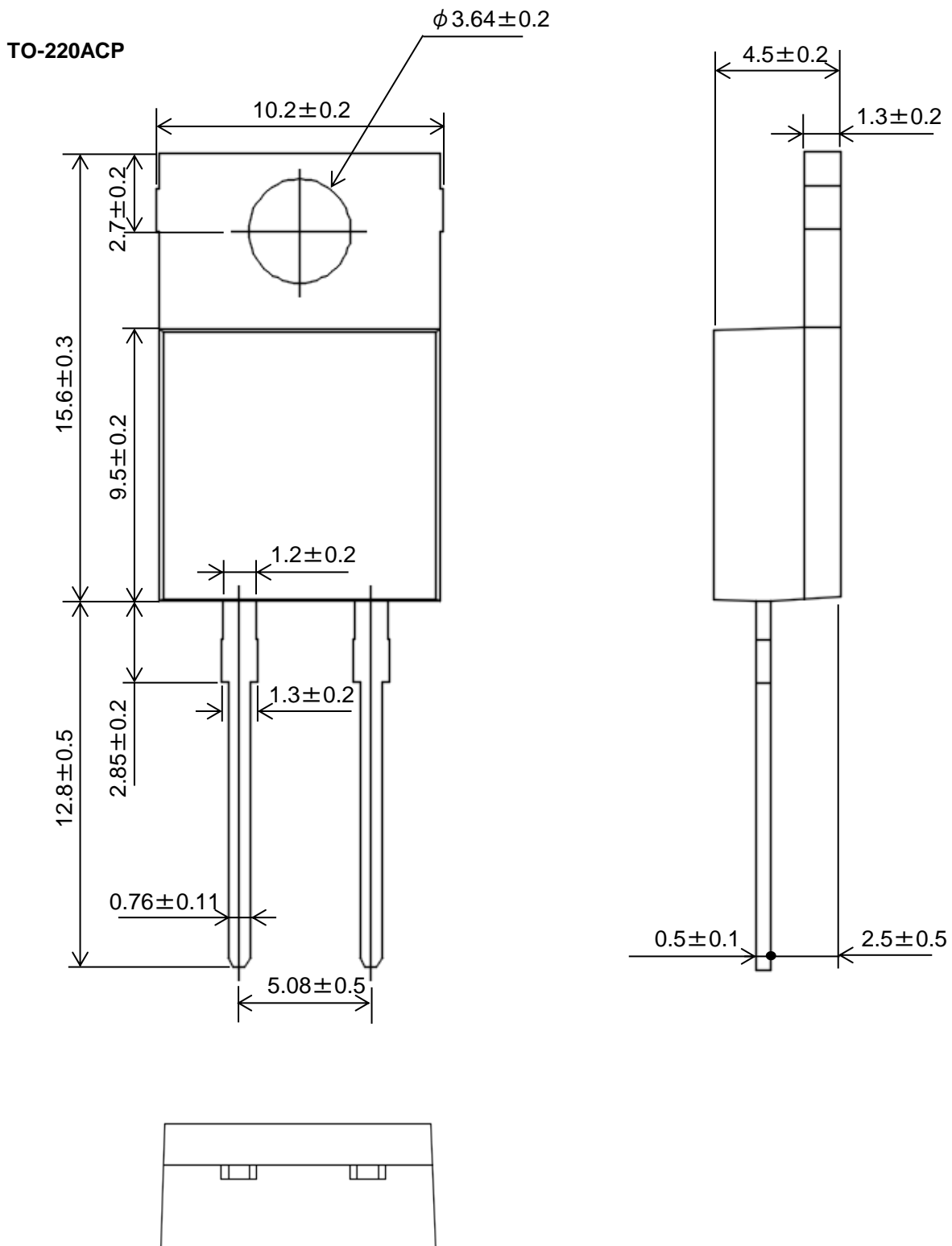
$$V_{th}(T_j) = a_0 + a_1 T_j$$

$$R_{diff}(T_j) = b_0 + b_1 T_j + b_2 T_j^2$$

Symbol	Typical Value	Unit
a <sub>0</sub>	9.66E-01	V
a <sub>1</sub>	-1.10E-0.3	V/°C
b <sub>0</sub>	8.80E-02	Ω
b <sub>1</sub>	1.87E-04	Ω/°C
b <sub>2</sub>	1.92E-06	Ω/°C <sup>2</sup>

T<sub>j</sub> in °C; -55 °C < T<sub>j</sub> < 175 °C ; I<sub>F</sub> < 8 A

## ●Dimensions (Unit : mm)



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Part Number	SCS304AP
Package	TO-220ACP
Unit Quantity	1000
Minimum Package Quantity	50
Packing Type	Tube
Constitution Materials List	inquiry
RoHS	Yes