

$V_R$	650V
$I_F$	4A
$Q_C$	11nC

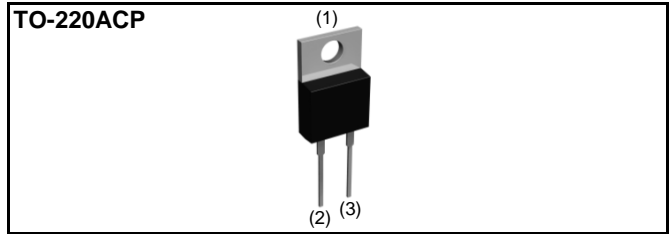
### ●Features

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

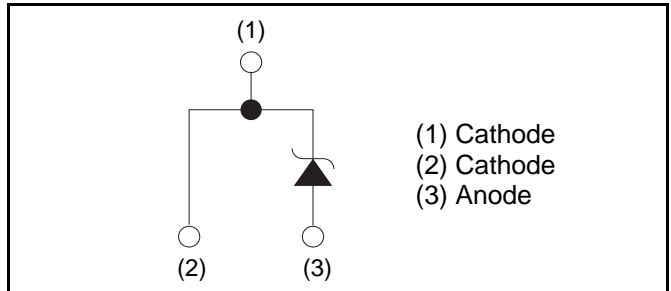
### ●Construction

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	A <sup>2</sup> s
		$1 \leq PW \leq 10\text{ms}$ , $T_j=150^\circ\text{C}$	2.4	A <sup>2</sup> s
Total power dissipation	$P_D$	34 <sup>*2</sup>	W	
Junction temperature	$T_j$	175	°C	
Range of storage temperature	$T_{stg}$	-55 to +175	°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<sub>j</sub> = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V <sub>DC</sub>	I <sub>R</sub> =20μA	650	-	-	V
Forward voltage	V <sub>F</sub>	I <sub>F</sub> =4A, T <sub>j</sub> =25°C	-	1.35	1.50	V
		I <sub>F</sub> =4A, T <sub>j</sub> =150°C	-	1.44	1.71	V
		I <sub>F</sub> =4A, T <sub>j</sub> =175°C	-	1.50	-	V
Reverse current	I <sub>R</sub>	V <sub>R</sub> =650V, T <sub>j</sub> =25°C	-	0.012	20	μA
		V <sub>R</sub> =650V, T <sub>j</sub> =150°C	-	0.8	80	μA
		V <sub>R</sub> =650V, T <sub>j</sub> =175°C	-	2.4	-	μA
Total capacitance	C	V <sub>R</sub> =1V, f=1MHz	-	200	-	pF
		V <sub>R</sub> =650V, f=1MHz	-	18	-	pF
Total capacitive charge	Q <sub>C</sub>	V <sub>R</sub> =400V, di/dt=350A/μs	-	11	-	nC
Switching time	t <sub>C</sub>	V <sub>R</sub> =400V, di/dt=350A/μs	-	14	-	ns
Non-repetitive Avaranche Energy	E <sub>ava</sub>	L=1mH	-	48	-	mJ

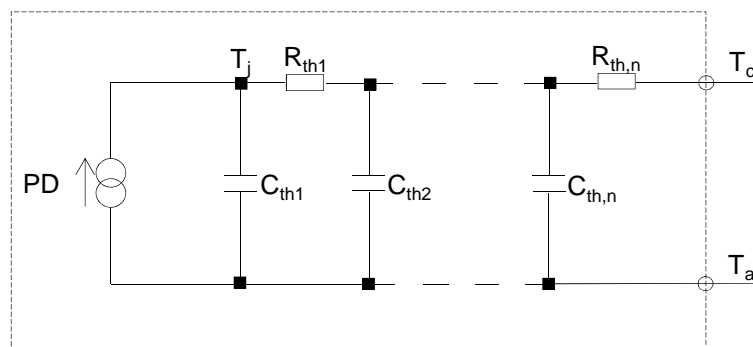
### ●Thermal characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	R <sub>th(j-c)</sub>	-	-	3.0	4.4	°C/W

### ●Typical Transient Thermal Characteristics

Symbol	Value	Unit
R <sub>th1</sub>	3.91E-02	K/W
R <sub>th2</sub>	3.76E-01	
R <sub>th3</sub>	2.54E+00	

Symbol	Value	Unit
C <sub>th1</sub>	1.01E-04	Ws/K
C <sub>th2</sub>	4.02E-04	
C <sub>th3</sub>	1.19E-03	



●Electrical characteristic curves

Fig.1  $V_F - I_F$  Characteristics

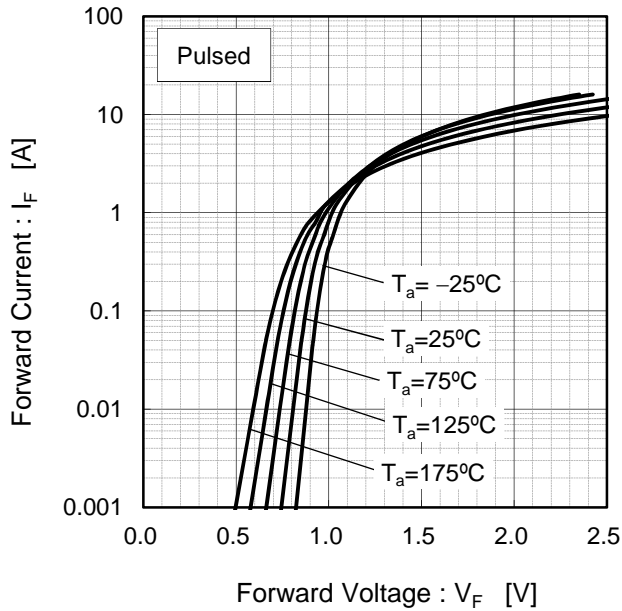


Fig.2  $V_F - I_F$  Characteristics

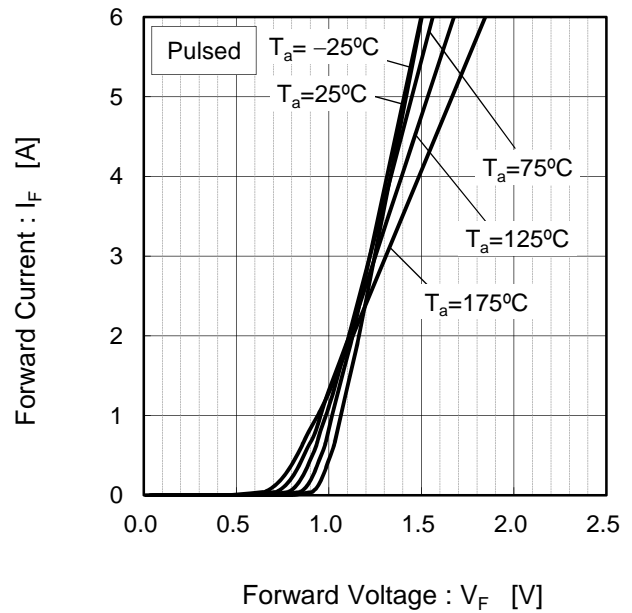


Fig.3  $V_R - I_R$  Characteristics

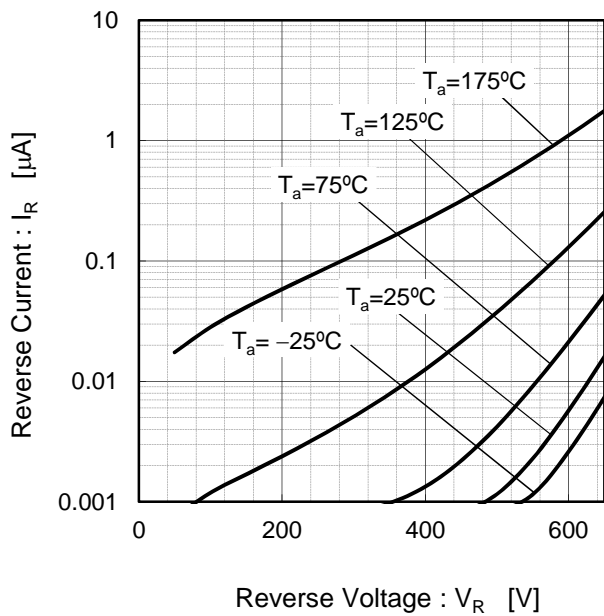
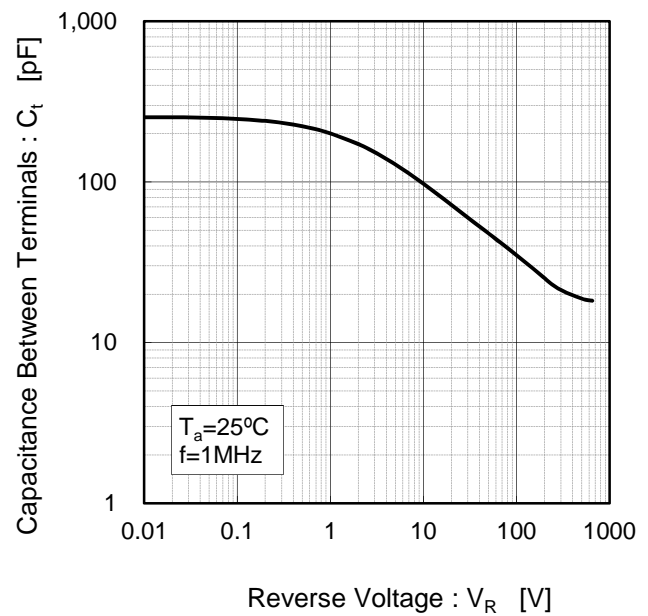


Fig.4  $V_R - C_t$  Characteristics



●Electrical characteristic curves

Fig.5 Typical Transient Thermal Resistance vs. Pulse Width

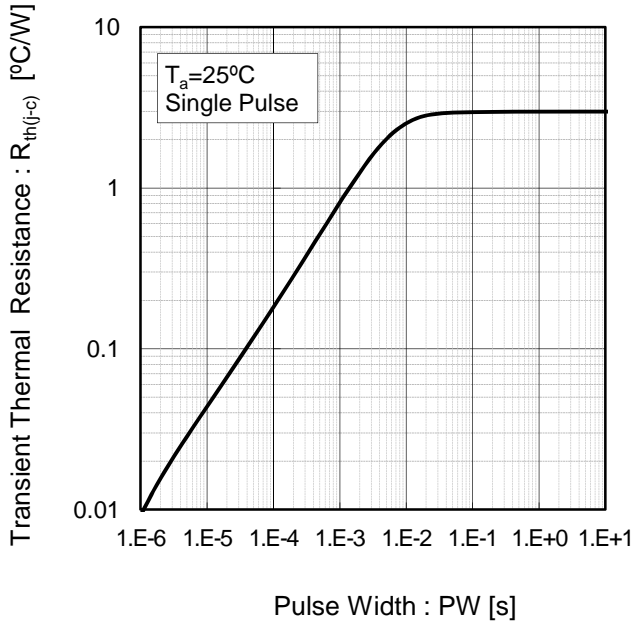


Fig.6 Power Dissipation

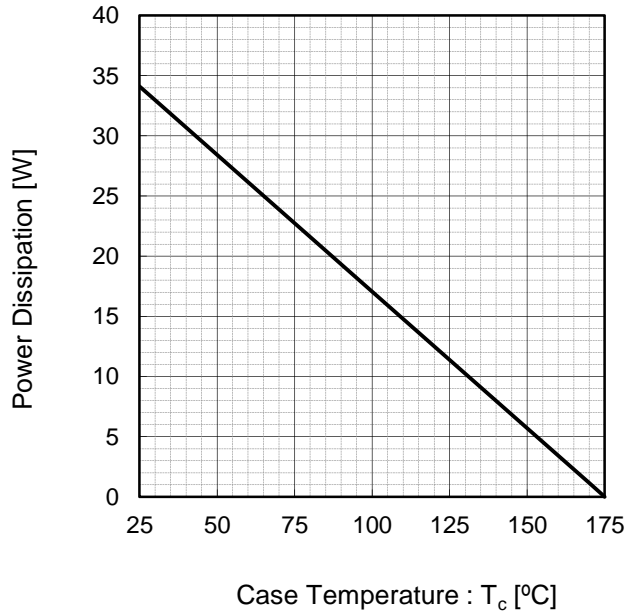
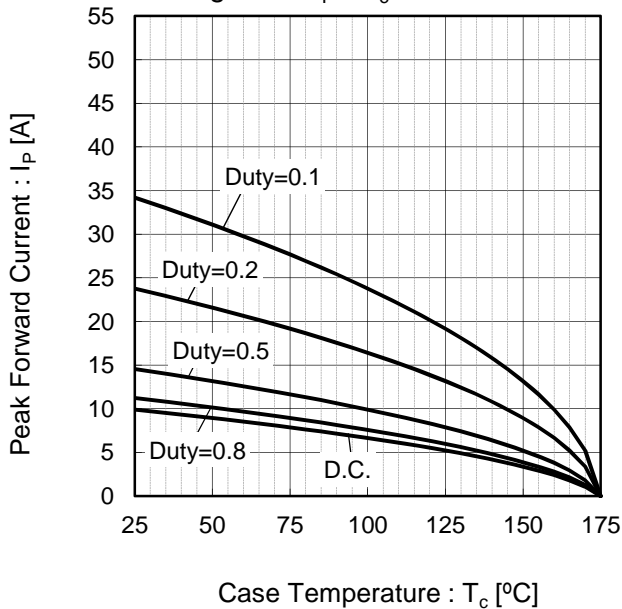
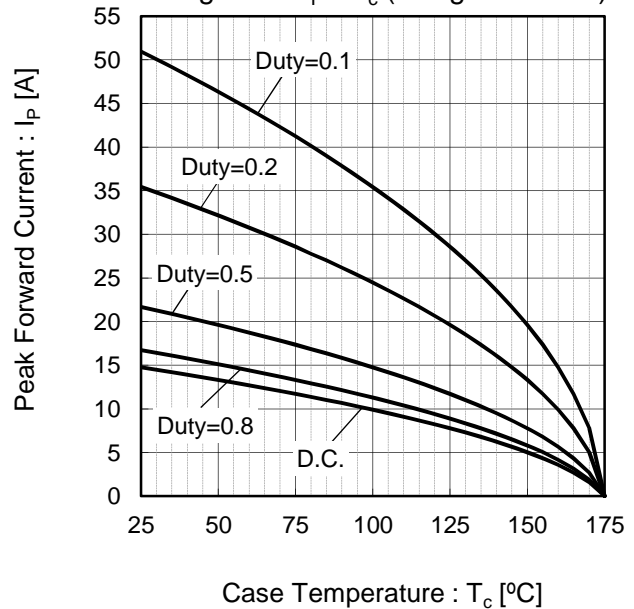


Fig.7\*3 Maximum peak forward current derating curve  $I_P - T_c$



\*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)

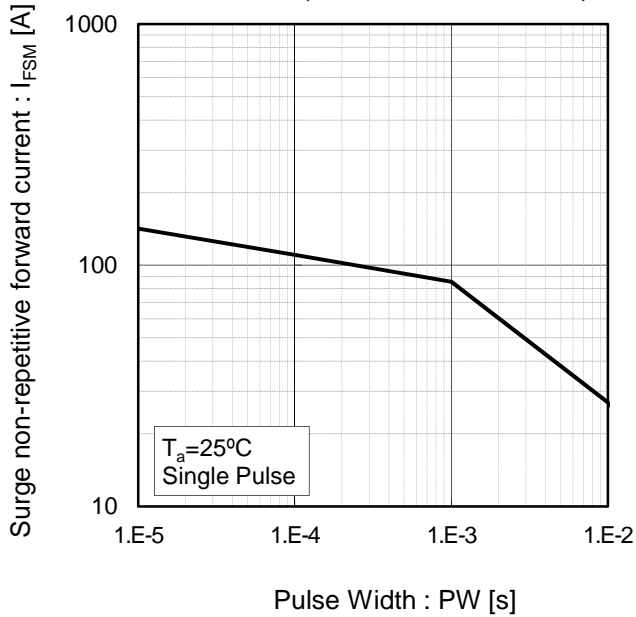
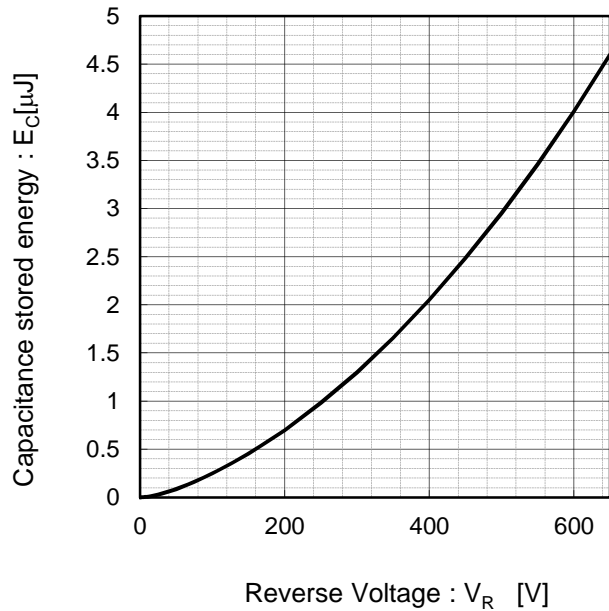
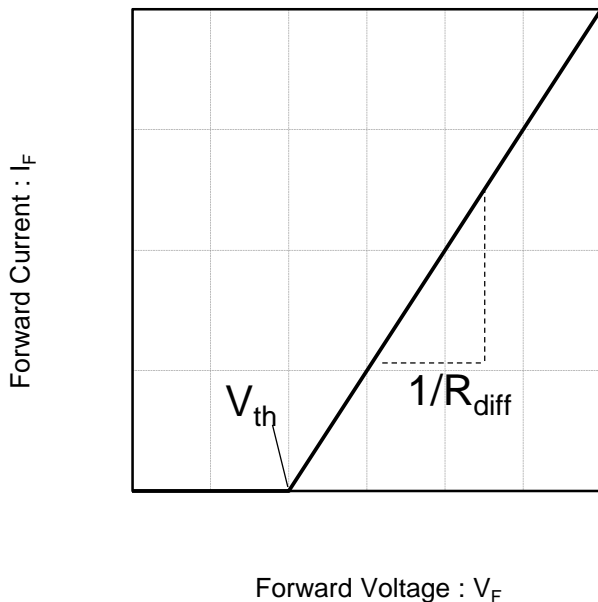


Fig.10 Typical capacitance store energy



●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

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## SCS304AP - Web Page

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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