

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

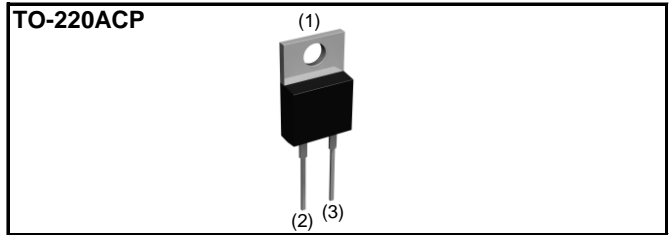
### ●Features

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

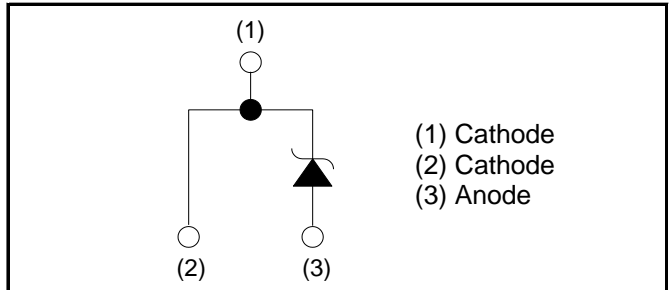
### ●Construction

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	SCS304AH

### ●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	PW=10ms sinusoidal, $T_j=25^\circ\text{C}$	$I_{FSM}$	27	A
	PW=10ms sinusoidal, $T_j=150^\circ\text{C}$		22	A
	PW=10 $\mu\text{s}$ square, $T_j=25^\circ\text{C}$		100	A
Repetitive peak forward current		$I_{FRM}$	20 <sup>*1</sup>	A
$i^2t$ value	$1 \leq PW \leq 10\text{ms}$ , $T_j=25^\circ\text{C}$	$\int i^2 dt$	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<sub>j</sub> = 25°C)**

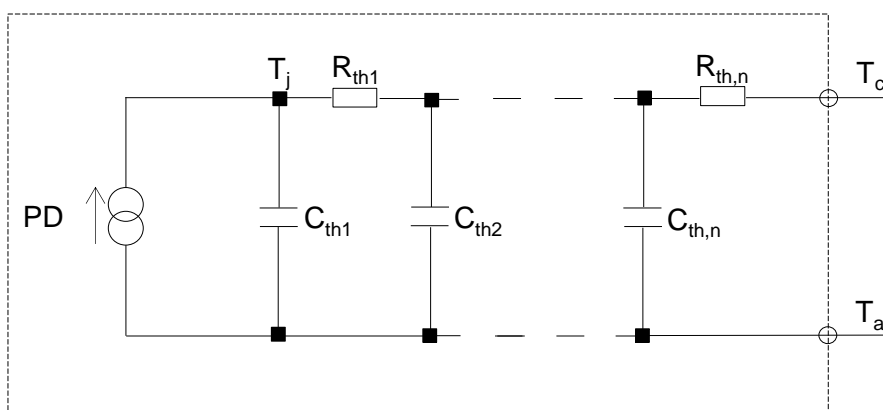
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V <sub>DC</sub>	I <sub>R</sub> =20μA	650	-	-	V
Forward voltage	V <sub>F</sub>	I <sub>F</sub> =4A, T <sub>j</sub> =25°C	-	1.35	1.50	V
		I <sub>F</sub> =4A, T <sub>j</sub> =150°C	-	1.44	1.71	V
		I <sub>F</sub> =4A, T <sub>j</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	20.0	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	K/W

**●Typical Transient Thermal Characteristics**

Symbol	Value	Unit	Symbol	Value	Unit
R <sub>th1</sub>	3.91×10 <sup>-2</sup>	K/W	C <sub>th1</sub>	1.01×10 <sup>-4</sup>	Ws/K
R <sub>th2</sub>	3.76×10 <sup>-1</sup>		C <sub>th2</sub>	4.02×10 <sup>-4</sup>	
R <sub>th3</sub>	2.54×10 <sup>0</sup>		C <sub>th3</sub>	1.19×10 <sup>-3</sup>	



●Electrical characteristic curves

Fig.1  $V_F - I_F$  Characteristics

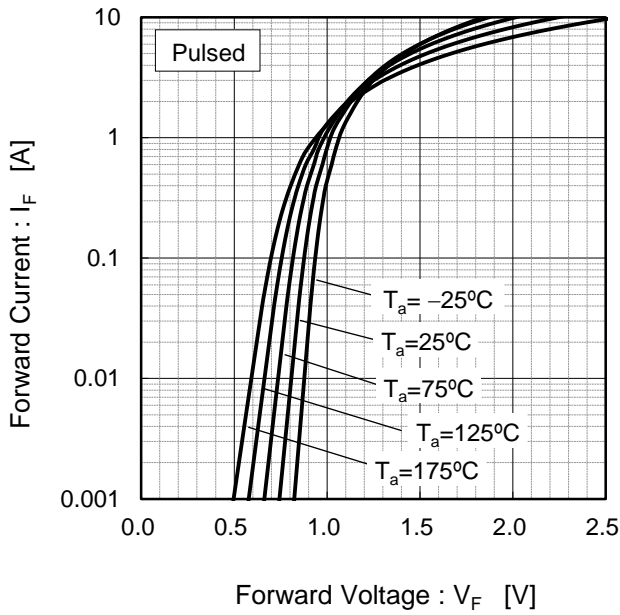


Fig.2  $V_F - I_F$  Characteristics

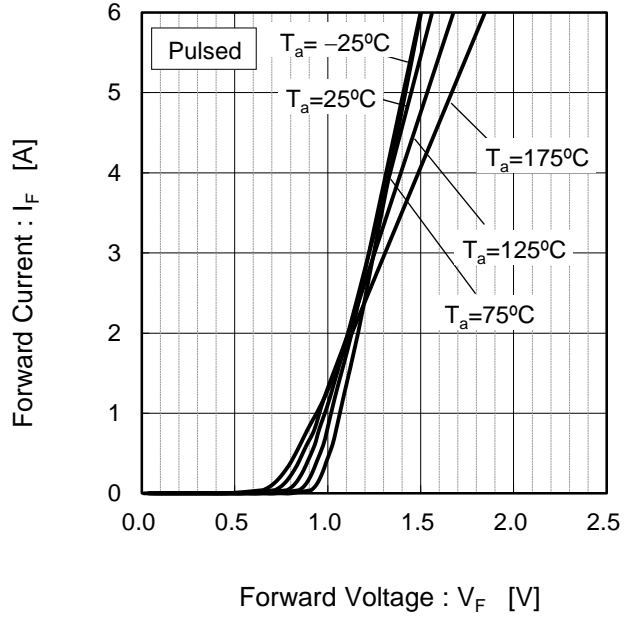


Fig.3  $V_R - I_R$  Characteristics

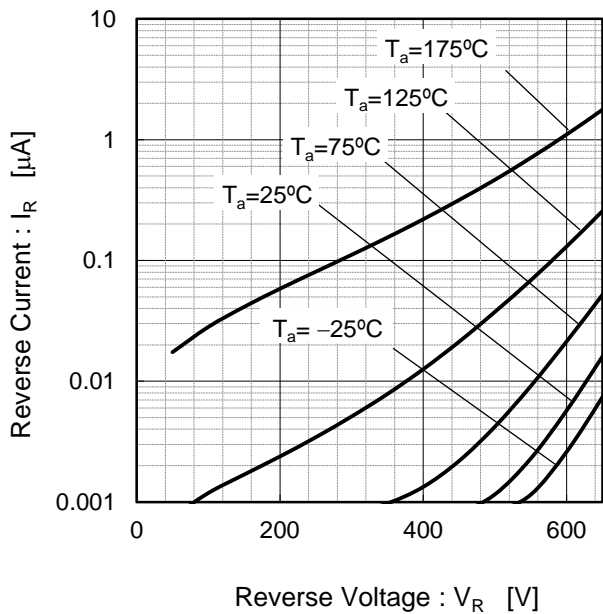
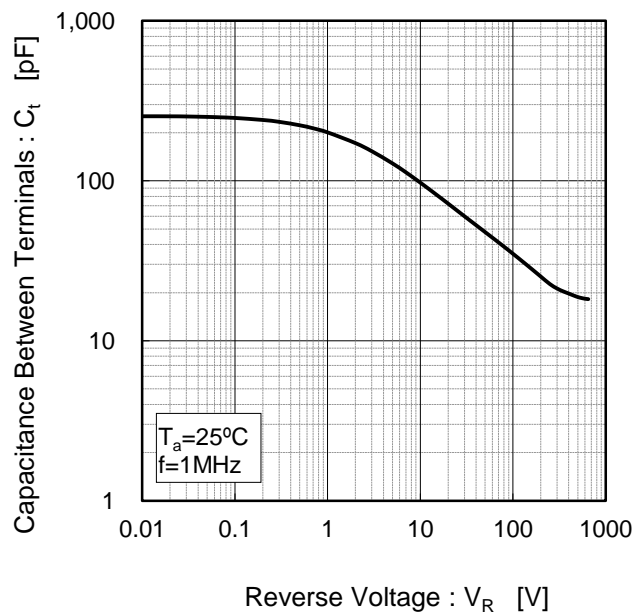


Fig.4  $V_R - C_t$  Characteristics



●Electrical characteristic curves

Fig.5 Typical Transient Thermal Resistance vs. Pulse Width

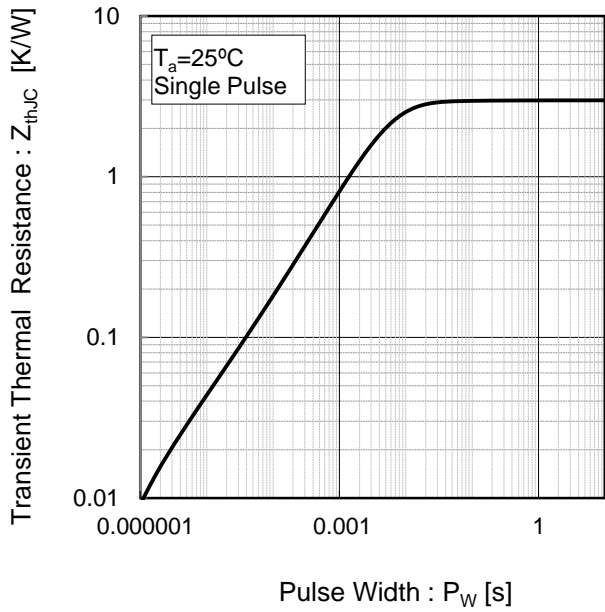


Fig.6 Power Dissipation

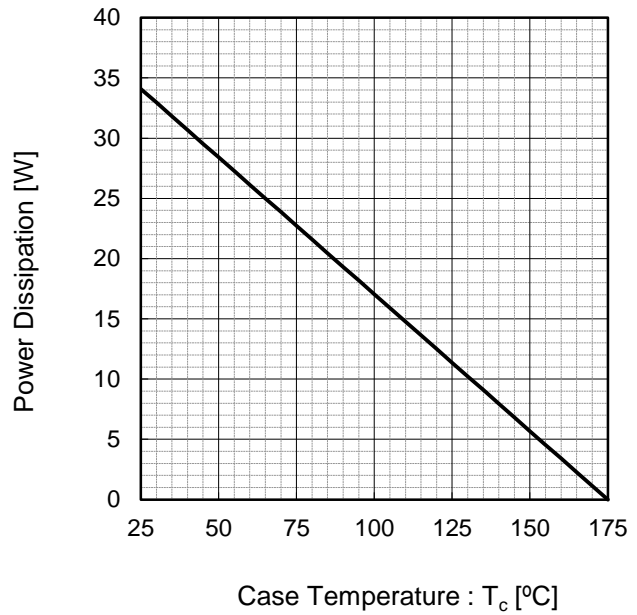
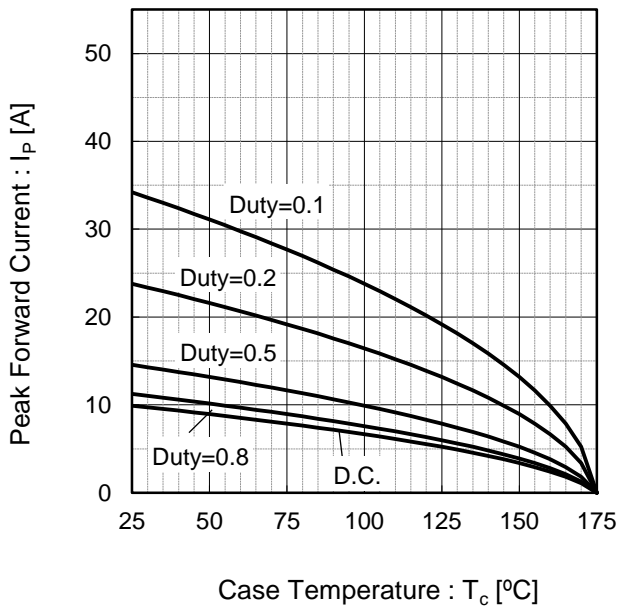
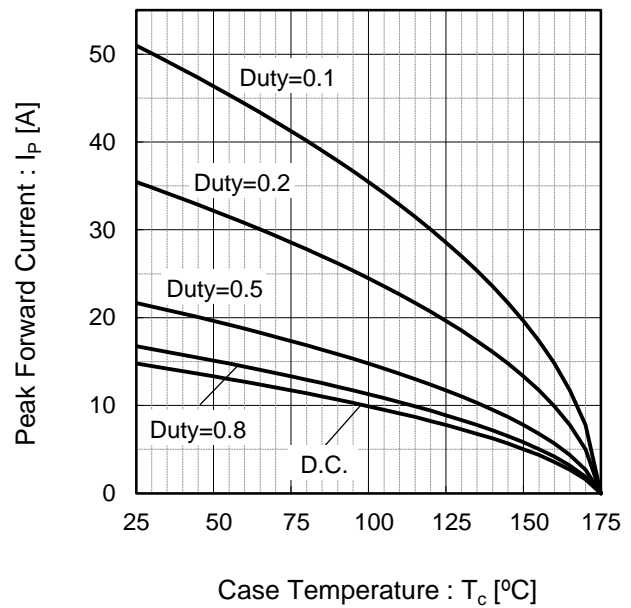


Fig.7\*3 Maximum peak forward current derating curve  $I_P - T_c$



\*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)

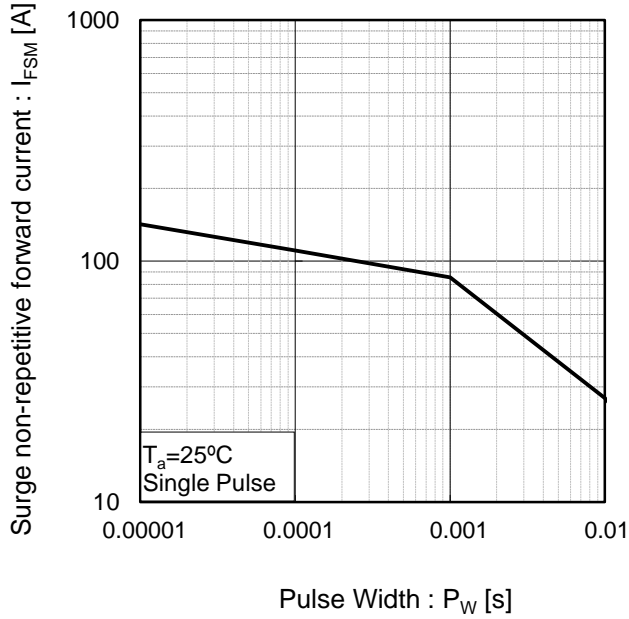
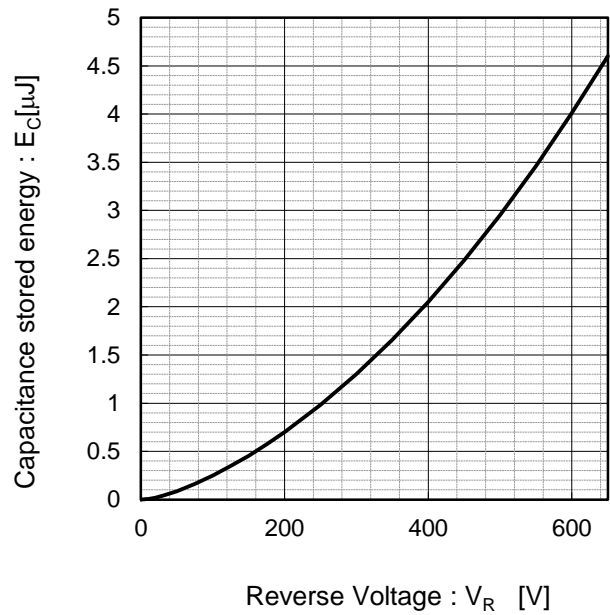
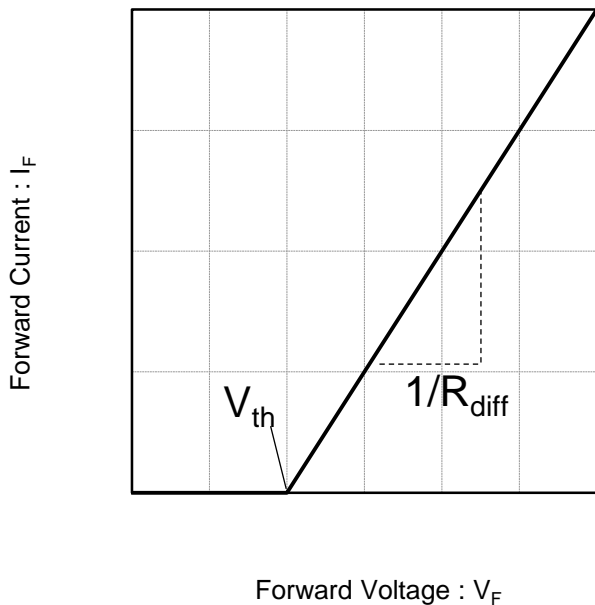


Fig.10 Typical capacitance store energy



●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
$a_0$	$9.66 \times 10^{-1}$	V
$a_1$	$-1.1 \times 10^{-3}$	V/°C
$b_0$	$8.80 \times 10^{-2}$	$\Omega$
$b_1$	$1.87 \times 10^{-4}$	$\Omega/^\circ\text{C}$
$b_2$	$1.92 \times 10^{-6}$	$\Omega/^\circ\text{C}^2$

$T_j$  in °C;  $-55^\circ\text{C} < T_j < 175^\circ\text{C}$ ;  $I_F < 8\text{ A}$

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