

V_R	650V
I_F	12A
Q_C	28nC

●Outline

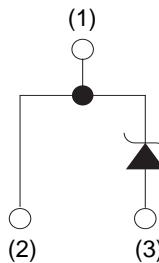
TO-220ACP



●Features

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

●Inner Circuit



(1) Cathode
(2) Cathode
(3) Anode

●Construction

Silicon carbide epitaxial planar type

●Packaging Specifications

Type	Packaging	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	50
	Packing code	C9
	Marking	SCS312AH

●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 ($T_c=135^\circ\text{C}$)	I_F	12	A
Surge non-repetitive forward current	I_{FSM}	96	A
		81	A
		350	A
Repetitive peak forward current	I_{FRM}	52 *1	A
i^2t value	$\int i^2 dt$	46	A^2s
		32	A^2s
Total power dissipation	P_D	78 *2	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 ($T_j = 25^\circ\text{C}$)

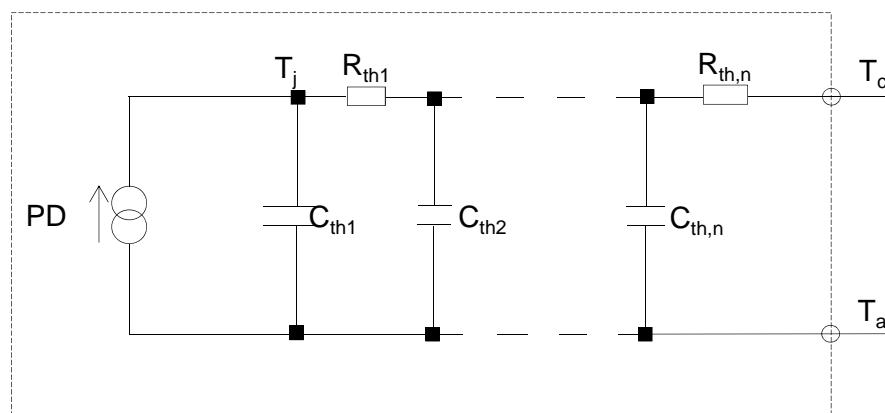
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V_{DC}	$I_R = 60\mu\text{A}$	650	-	-	V
Forward voltage	V_F	$I_F = 12\text{A}, T_j = 25^\circ\text{C}$	-	1.35	1.50	V
		$I_F = 12\text{A}, T_j = 150^\circ\text{C}$	-	1.44	1.71	V
		$I_F = 12\text{A}, T_j = 175^\circ\text{C}$	-	1.50	-	V
Reverse current	I_R	$V_R = 650\text{V}, T_j = 25^\circ\text{C}$	-	0.036	60	μA
		$V_R = 650\text{V}, T_j = 150^\circ\text{C}$	-	2.4	240	μA
		$V_R = 650\text{V}, T_j = 175^\circ\text{C}$	-	7.2	-	μA
Total capacitance	C	$V_R = 1\text{V}, f = 1\text{MHz}$	-	600	-	pF
		$V_R = 650\text{V}, f = 1\text{MHz}$	-	55	-	pF
Total capacitive charge	Q_C	$V_R = 400\text{V}, di/dt = 350\text{A}/\mu\text{s}$	-	28	-	nC
Switching time	t_C	$V_R = 400\text{V}, di/dt = 350\text{A}/\mu\text{s}$	-	18	-	ns
Non-repetitive Avalanche Energy	E_{ava}	$L = 1\text{mH}$	-	150	-	mJ

● Thermal characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	$R_{th(j-c)}$	-	-	1.3	1.9	°C/W

● Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
R_{th1}	1.36E-02	K/W	C_{th1}	3.33E-04	Ws/K
R_{th2}	9.66E-02		C_{th2}	2.75E-04	
R_{th3}	1.19E+00		C_{th3}	9.28E-04	



● Electrical characteristic curves

Fig.1 V_F - I_F Characteristics

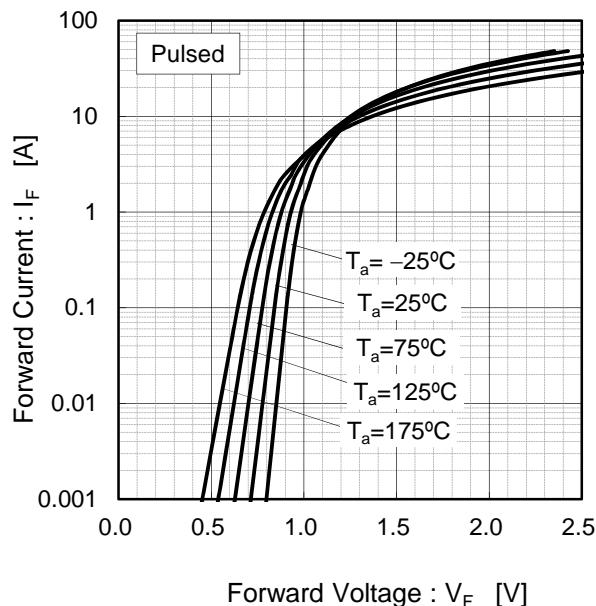


Fig.2 V_F - I_F Characteristics

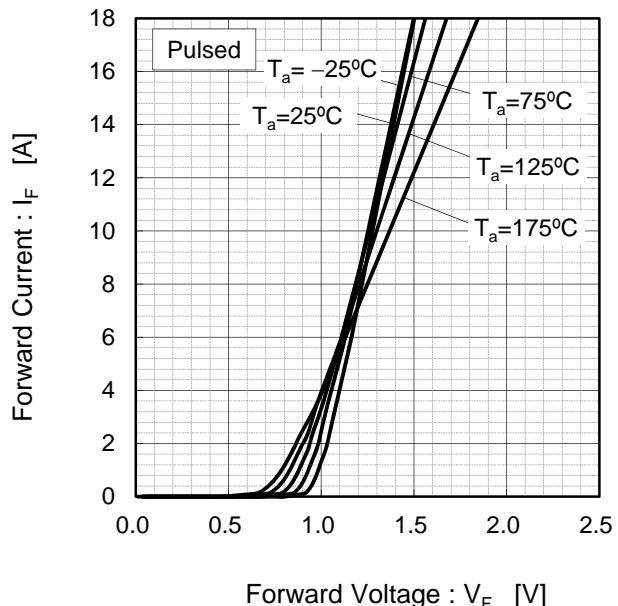


Fig.3 V_R - I_R Characteristics

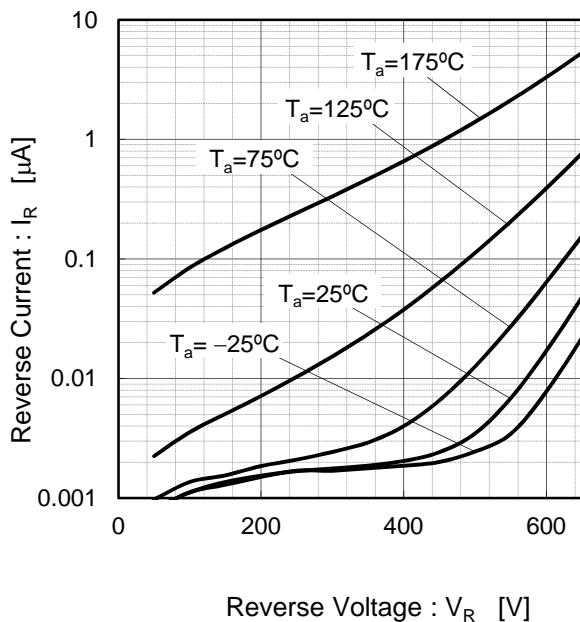
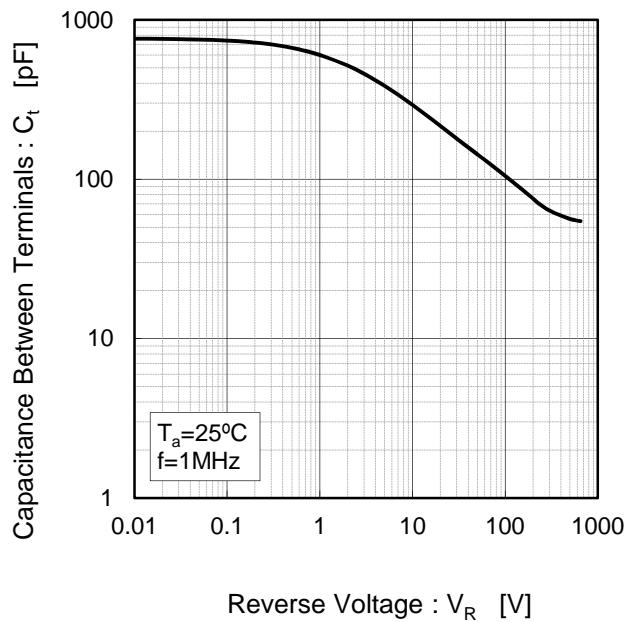


Fig.4 V_R - C_t Characteristics



●Electrical characteristic curves

Fig.5 Typical Transient Thermal Resistance vs. Pulse Width

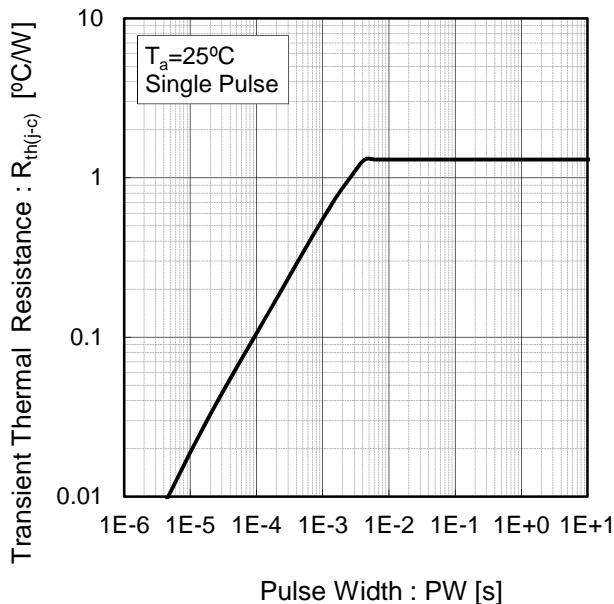


Fig.6 Power Dissipation

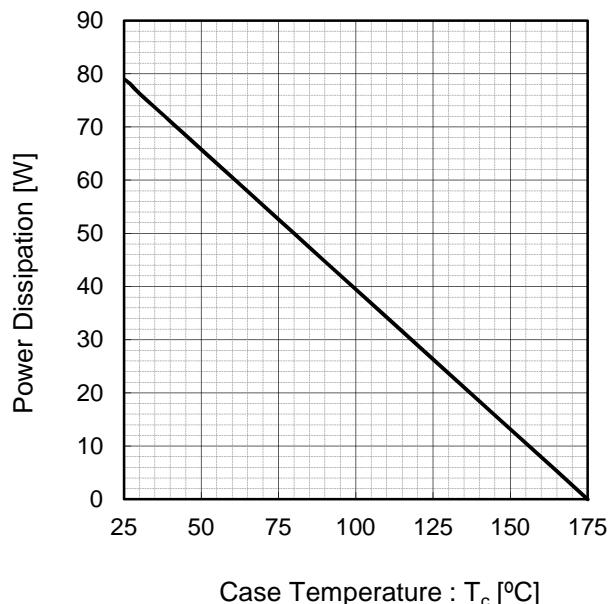
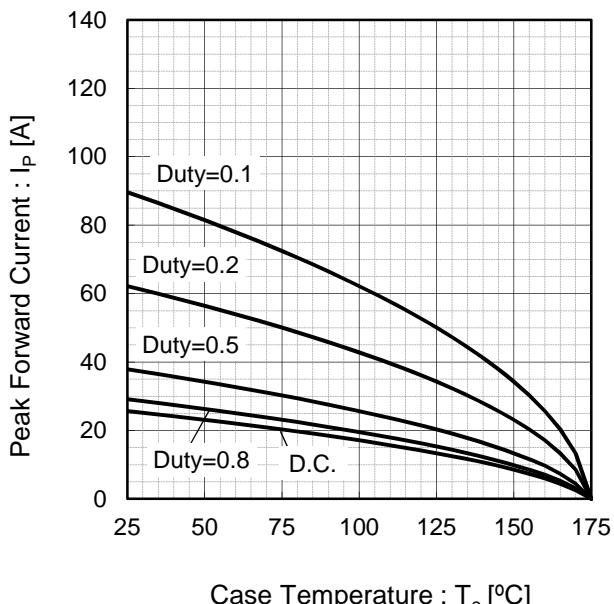
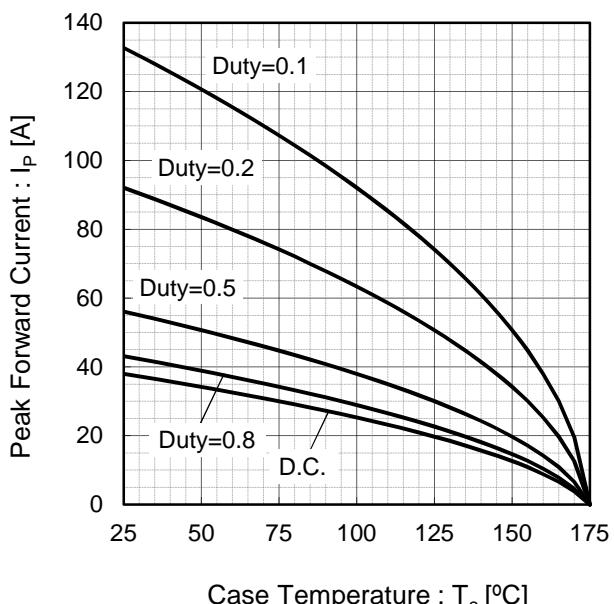


Fig.7*³ Maximum peak forward current derating curve $I_P - T_c$



*3 Based on max V_f , 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 V_f , 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)

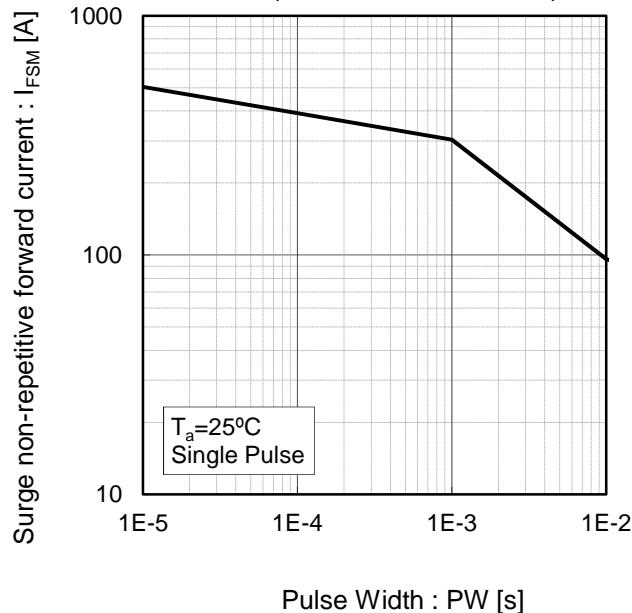


Fig.10 Typical capacitance store energy

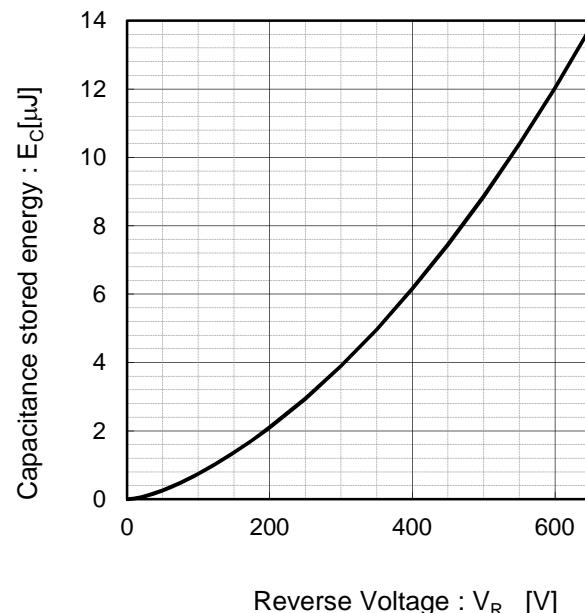
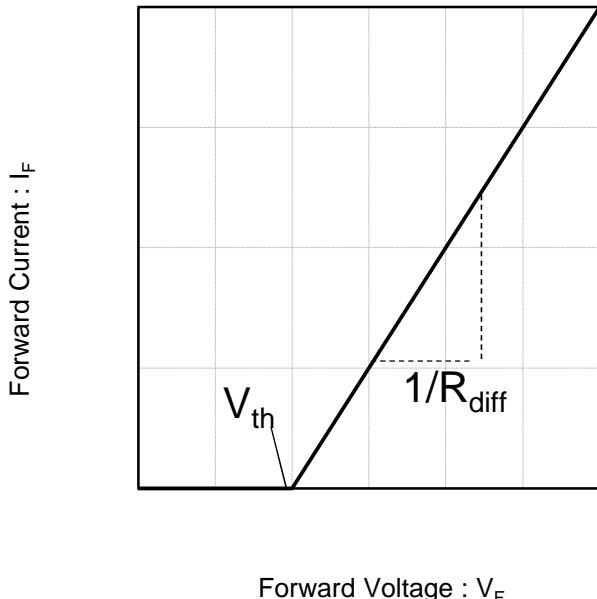


Fig.11 Equivalent forward current curve



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

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

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

Symbol	Typical Value	Unit
a_0	9.66E-01	V
a_1	-1.10E-03	V/°C
b_0	2.93E-02	Ω
b_1	6.22E-05	Ω/°C
b_2	6.40E-07	Ω/°C ²

T_j in °C; $-55^\circ\text{C} < T_j < 175^\circ\text{C}$; $I_F < 24\text{A}$

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