

V_R	650V
I_F	12A
Q_C	28nC

●Features

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

●Construction

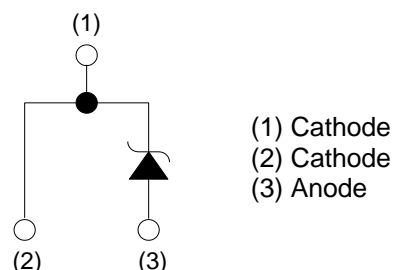
Silicon carbide epitaxial planar type

●Outline

TO-220ACP



●Inner circuit



●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 ($T_c = 130^\circ\text{C}$)		I_F	12	A
Surge non-repetitive forward current	PW=10ms sinusoidal, $T_j=25^\circ\text{C}$	I_{FSM}	96	A
	PW=10ms sinusoidal, $T_j=150^\circ\text{C}$		81	A
	PW=10μs square, $T_j=25^\circ\text{C}$		350	A
Repetitive peak forward current		I_{FRM}	52 ^{*1}	A
i^2t value	$1 \leq PW \leq 10\text{ms}$, $T_j=25^\circ\text{C}$	$\int i^2 dt$	46	A ² s
	$1 \leq PW \leq 10\text{ms}$, $T_j=150^\circ\text{C}$		32	A ² s
Total power dissipation		P_D	78 ^{*2}	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 ($T_j = 25^\circ\text{C}$)

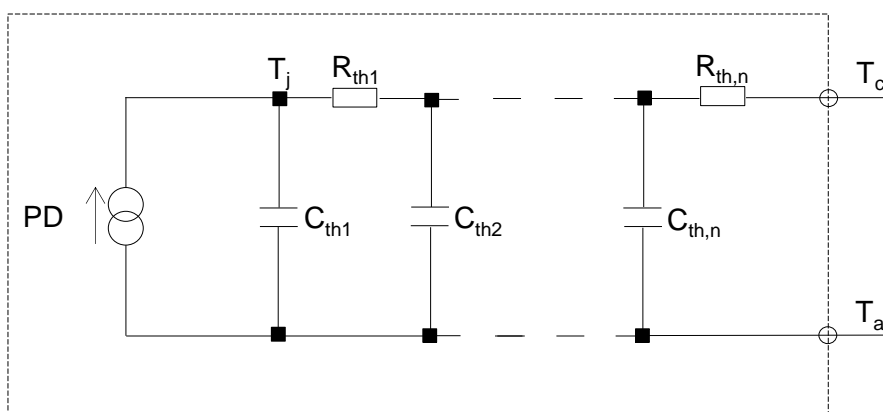
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V_{DC}	$I_R = 60\mu\text{A}$	650	-	-	V
Forward voltage	V_F	$I_F = 12\text{A}, T_j = 25^\circ\text{C}$	-	1.35	1.50	V
		$I_F = 12\text{A}, T_j = 150^\circ\text{C}$	-	1.44	1.71	V
		$I_F = 12\text{A}, T_j = 175^\circ\text{C}$	-	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 Avaranche Energy	E_{ava}	$L = 1\text{mH}$	-	150	-	mJ

●Thermal characteristics

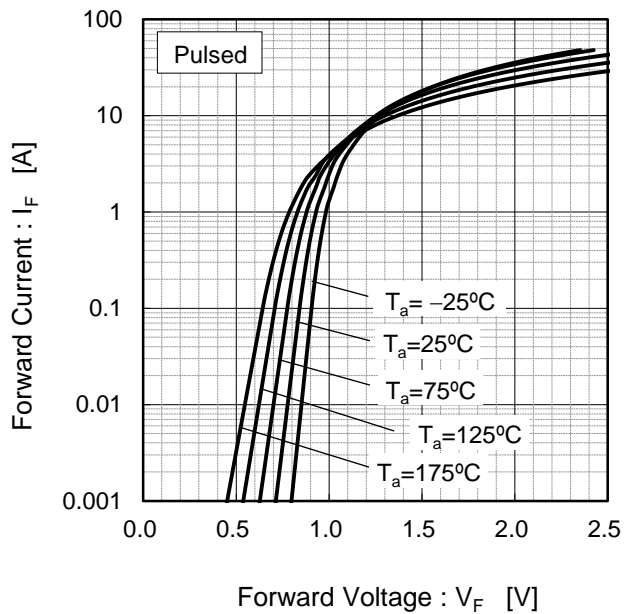
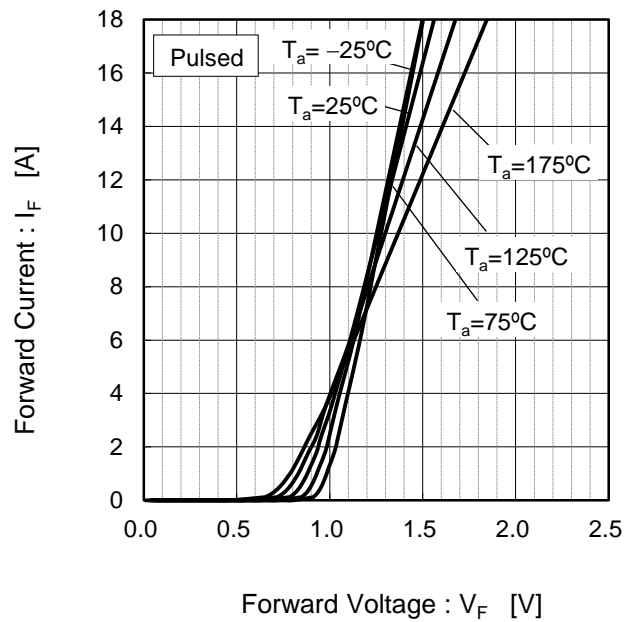
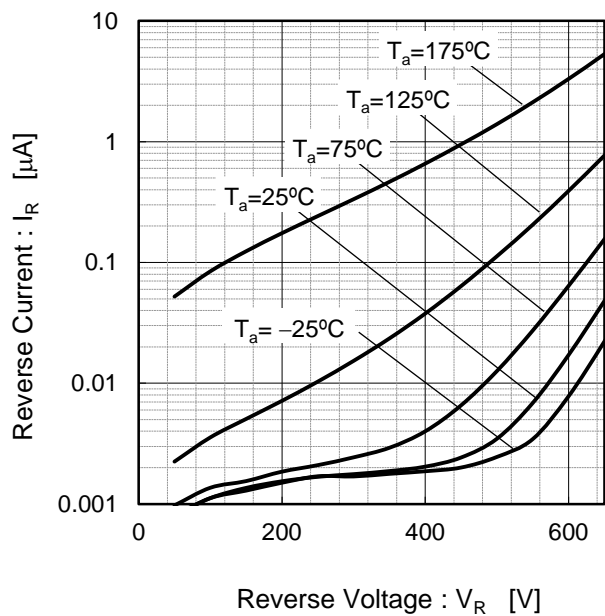
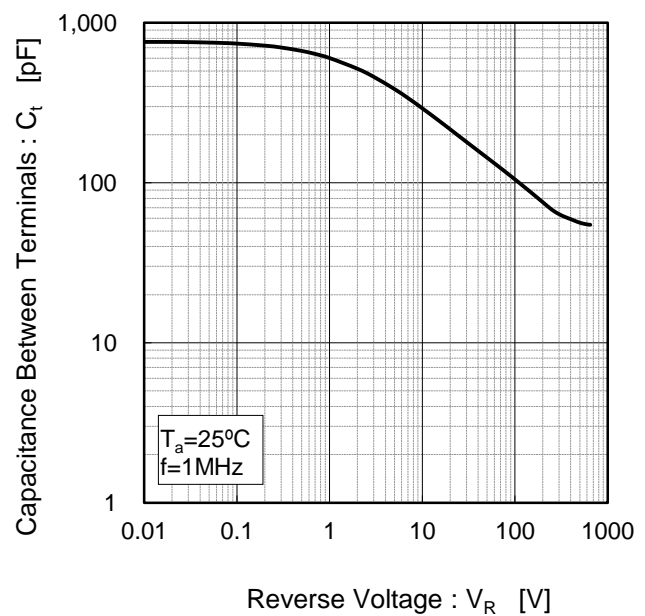
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	$R_{th(j-c)}$	-	-	1.3	1.9	K/W

●Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
R_{th1}	1.36×10^{-2}	K/W	C_{th1}	3.33×10^{-4}	Ws/K
R_{th2}	9.66×10^{-2}		C_{th2}	2.75×10^{-4}	
R_{th3}	1.19×10^0		C_{th3}	9.28×10^{-4}	



●Electrical characteristic curves

Fig.1 $V_F - I_F$ CharacteristicsFig.2 $V_F - I_F$ CharacteristicsFig.3 $V_R - I_R$ CharacteristicsFig.4 $V_R - C_t$ Characteristics

●Electrical characteristic curves

Fig.5 Typical Transient Thermal Resistance vs. Pulse Width

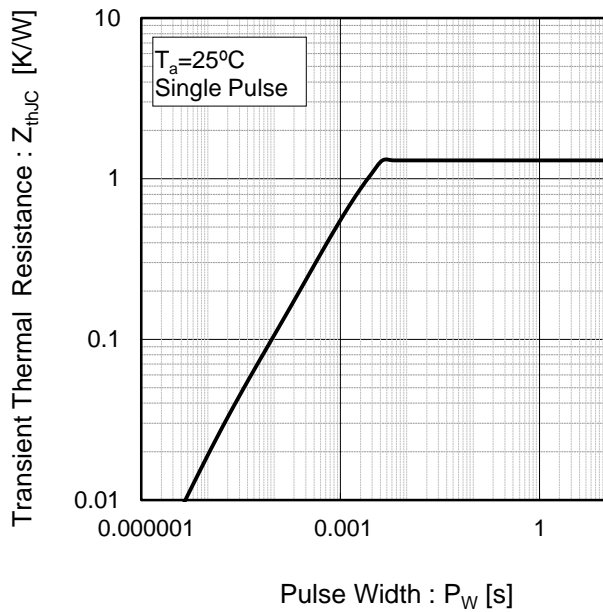


Fig.6 Power Dissipation

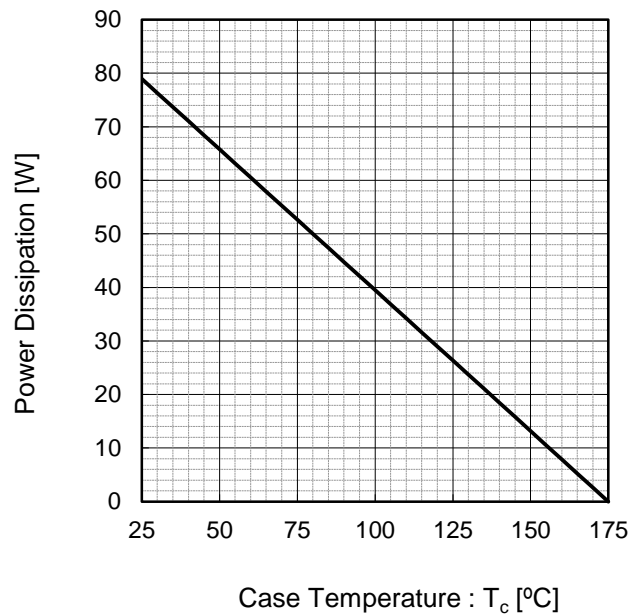
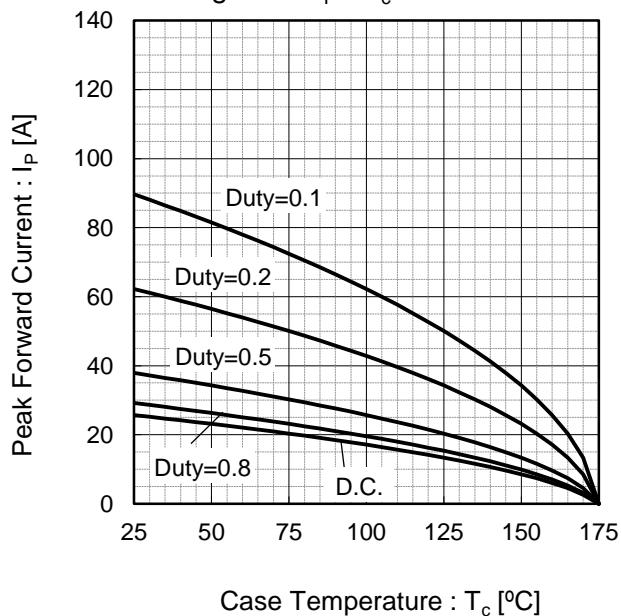
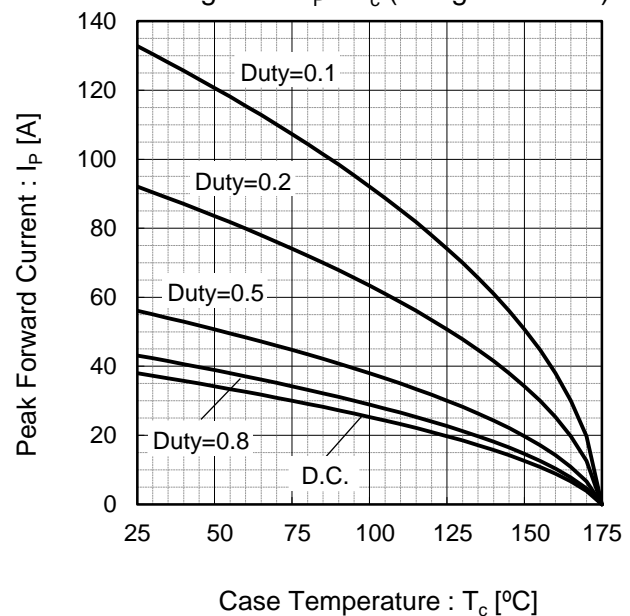


Fig.7*3 Maximum peak forward current derating curve $I_P - T_c$



*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)

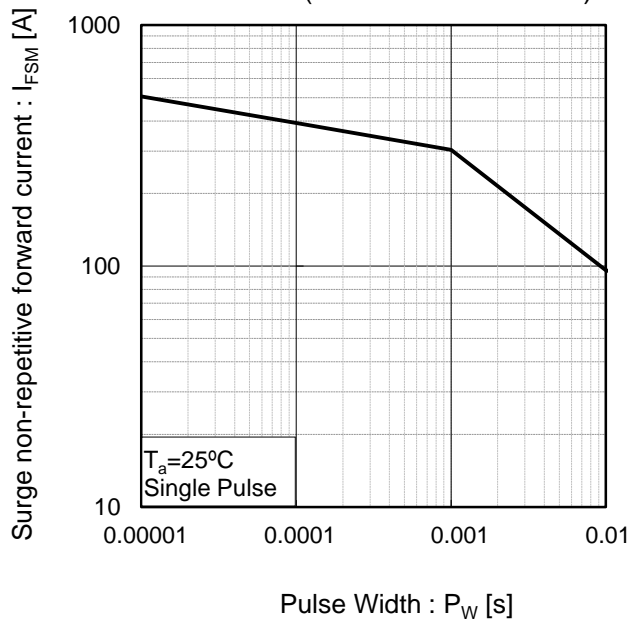
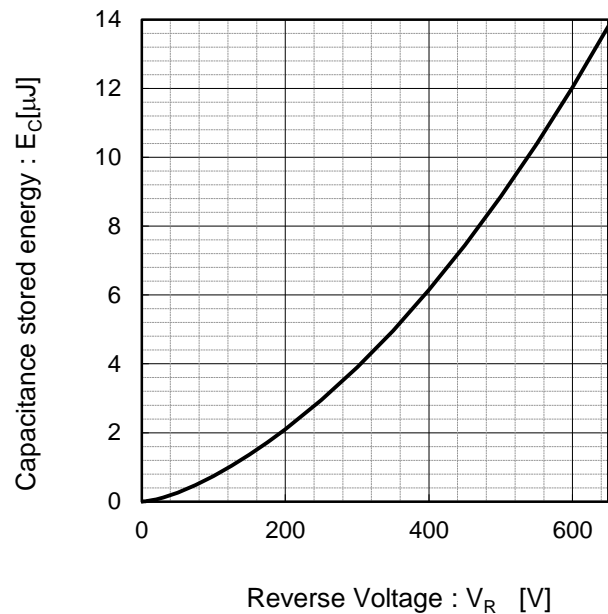
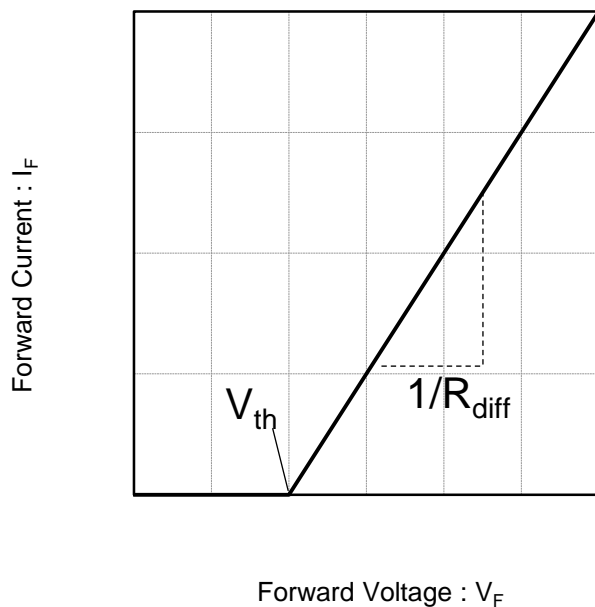


Fig.10 Typical capacitance store energy



●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	9.66×10^{-1}	V
a_1	-1.1×10^{-3}	V/°C
b_0	2.93×10^{-2}	Ω
b_1	6.22×10^{-5}	Ω/°C
b_2	6.40×10^{-7}	Ω/°C ²

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

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