

V_R	650V
I_F	6A
Q_C	19nC

●Features

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

●Construction

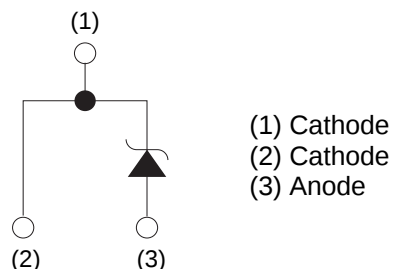
Silicon carbide epitaxial planar type

●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	SCS306AP

●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	6	A
Surge non-repetitive forward current	PW=10ms sinusoidal, $T_j=25^\circ\text{C}$	I_{FSM}	47	A
	PW=10ms sinusoidal, $T_j=150^\circ\text{C}$		40	A
	PW=10μs square, $T_j=25^\circ\text{C}$		170	A
Repetitive peak forward current		I_{FRM}	28 ^{*1}	A
i^2t value	$1 \leq PW \leq 10\text{ms}$, $T_j=25^\circ\text{C}$	$\int i^2 dt$	11	A ² s
	$1 \leq PW \leq 10\text{ms}$, $T_j=150^\circ\text{C}$		8	A ² s
Total power dissipation		P_D	46 ^{*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 ($T_j = 25^\circ\text{C}$)

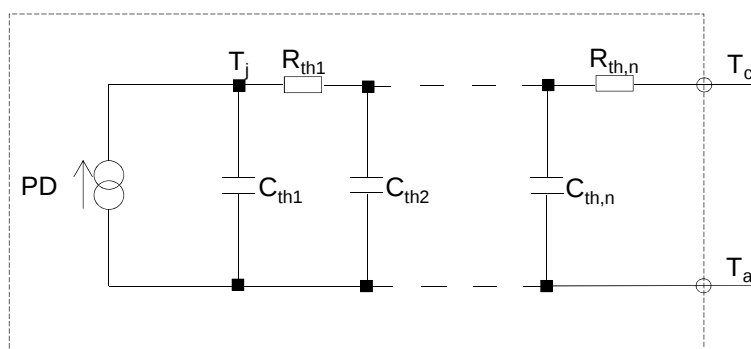
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V_{DC}	$I_R = 50\mu\text{A}$	650	-	-	V
Forward voltage	V_F	$I_F = 6\text{A}, T_j = 25^\circ\text{C}$	-	1.35	1.50	V
		$I_F = 6\text{A}, T_j = 150^\circ\text{C}$	-	1.44	1.71	V
		$I_F = 6\text{A}, T_j = 175^\circ\text{C}$	-	1.50	-	V
Reverse current	I_R	$V_R = 650\text{V}, T_j = 25^\circ\text{C}$	-	0.018	30	μA
		$V_R = 650\text{V}, T_j = 150^\circ\text{C}$	-	1.2	120	μA
		$V_R = 650\text{V}, T_j = 175^\circ\text{C}$	-	3.6	-	μA
Total capacitance	C	$V_R = 1\text{V}, f = 1\text{MHz}$	-	300	-	pF
		$V_R = 650\text{V}, f = 1\text{MHz}$	-	27	-	pF
Total capacitive charge	Q_C	$V_R = 400\text{V}, di/dt = 350\text{A}/\mu\text{s}$	-	19	-	nC
Switching time	t_C	$V_R = 400\text{V}, di/dt = 350\text{A}/\mu\text{s}$	-	15	-	ns
Non-repetitive Avaranche Energy	E_{ava}	$L = 1\text{mH}$	-	71	-	mJ

●Thermal characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	$R_{th(j-c)}$	-	-	2.2	3.2	$^\circ\text{C}/\text{W}$

●Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
R_{th1}	3.09E-02	K/W	C_{th1}	1.81E-04	Ws/K
R_{th2}	3.09E-01		C_{th2}	6.65E-04	
R_{th3}	1.83E+00		C_{th3}	1.58E-03	



●Electrical characteristic curves

Fig.1 $V_F - I_F$ Characteristics

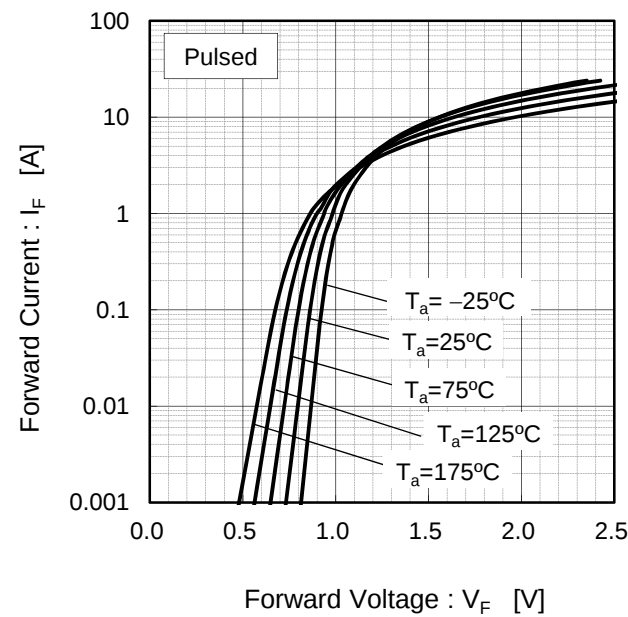


Fig.2 $V_F - I_F$ Characteristics

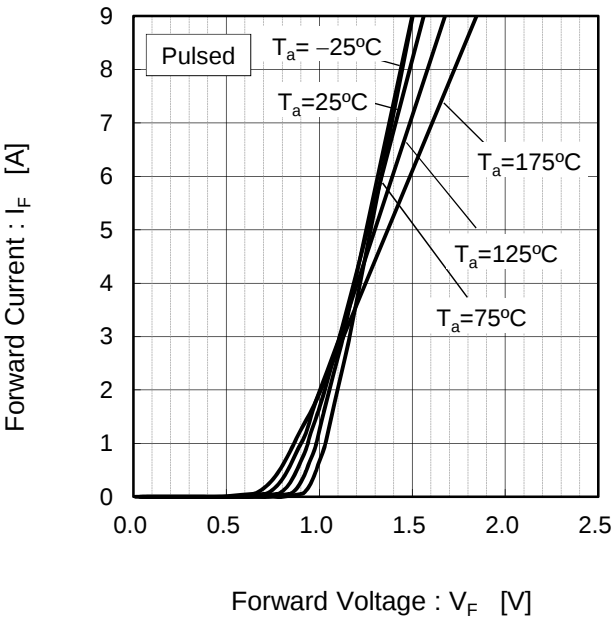


Fig.3 $V_R - I_R$ Characteristics

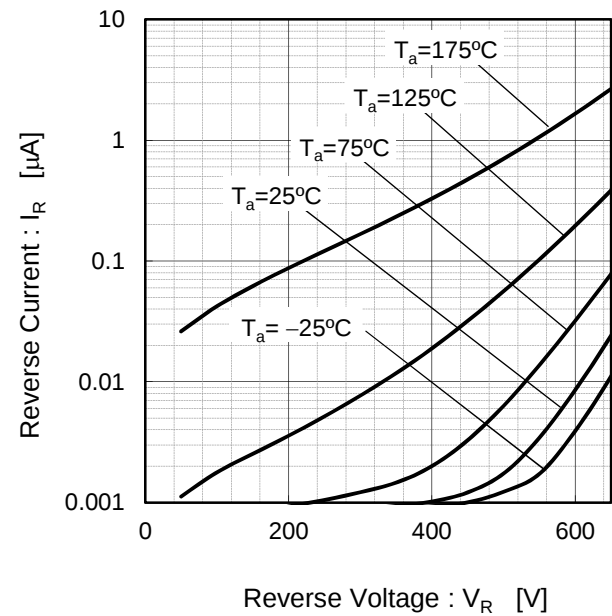
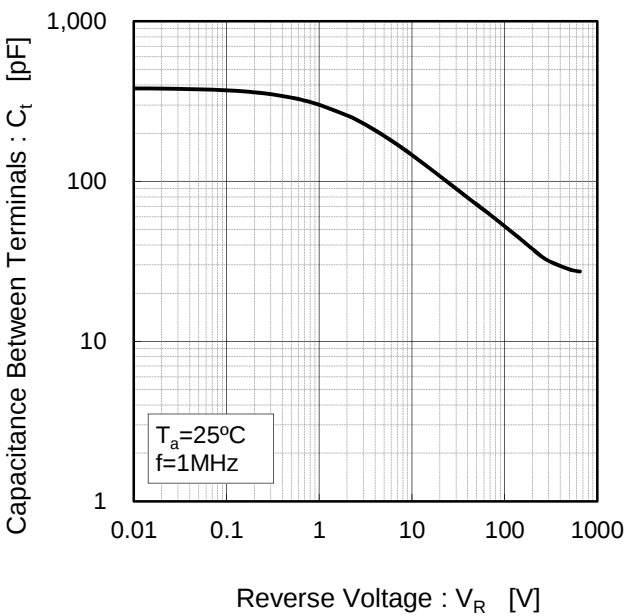


Fig.4 $V_R - C_t$ Characteristics



●Electrical characteristic curves

Fig.5 Typical Transient Thermal Resistance vs. Pulse Width

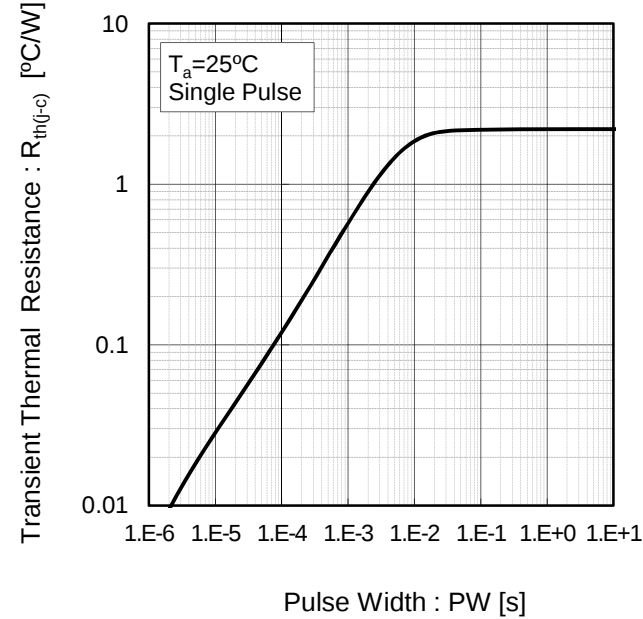


Fig.6 Power Dissipation

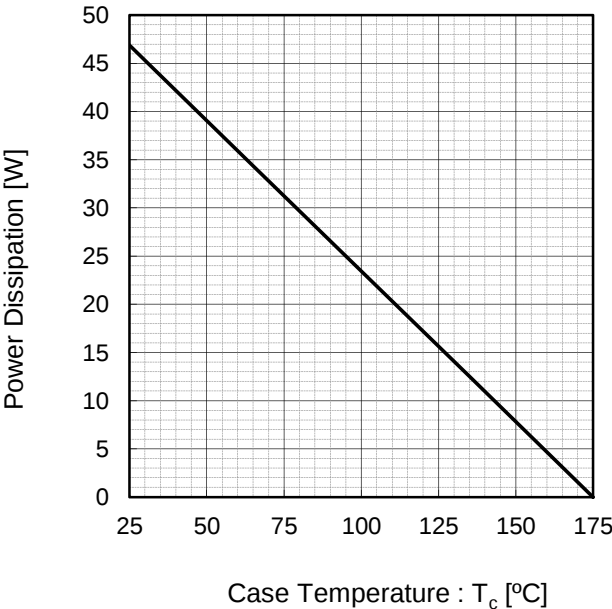
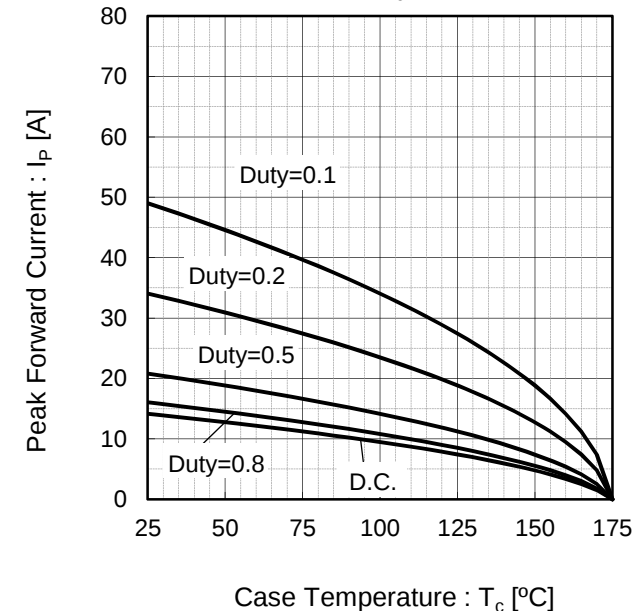
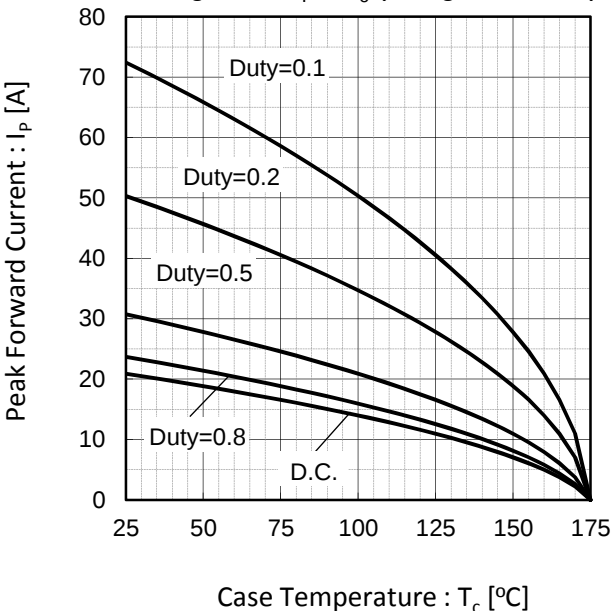


Fig.7*3 Maximum peak forward current derating curve $I_P - T_c$



*3 Based on max 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)

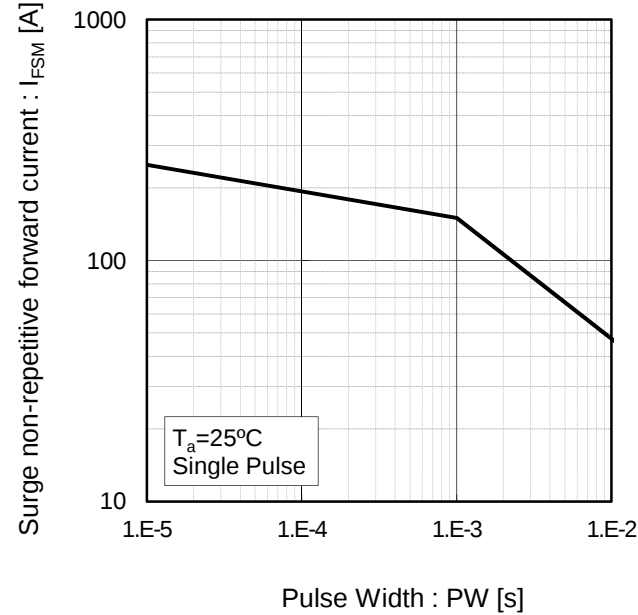
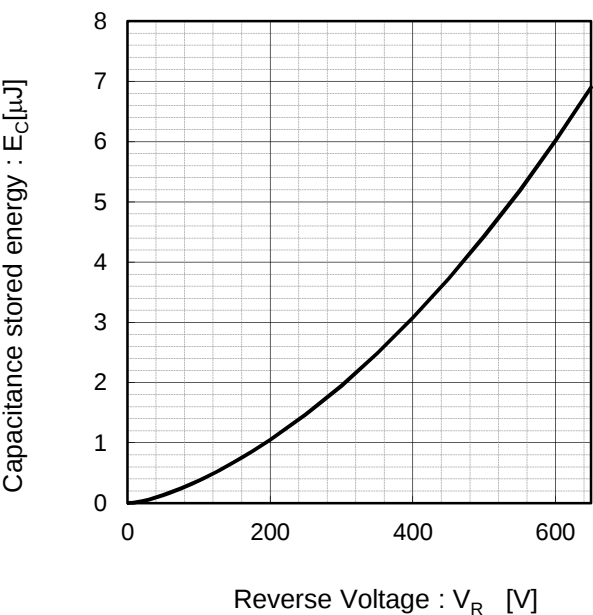
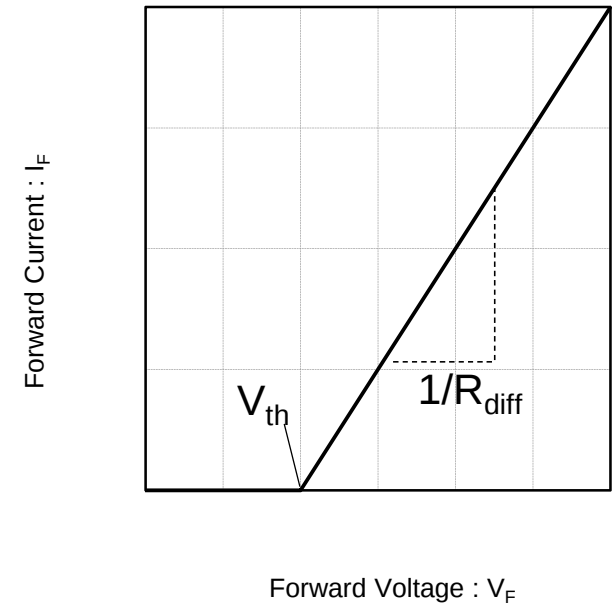


Fig.10 Typical capacitance store energy



●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	9.66E-01	V
a_1	-1.10E-03	V/ $^{\circ}\text{C}$
b_0	5.87E-02	Ω
b_1	1.24E-04	$\Omega/^{\circ}\text{C}$
b_2	1.28E-06	$\Omega/^{\circ}\text{C}^2$

T_j in $^{\circ}\text{C}$; $-55^{\circ}\text{C} < T_j < 175^{\circ}\text{C}$; $I_F < 12\text{A}$

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Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.