

V_R	650V
I_F	4A
Q_C	11nC

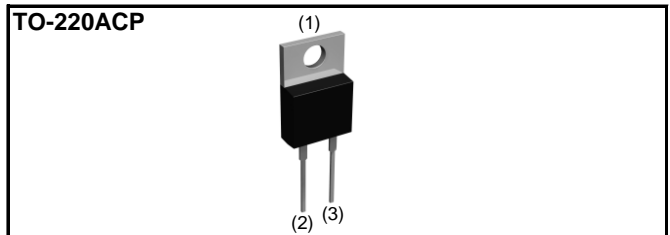
●Features

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

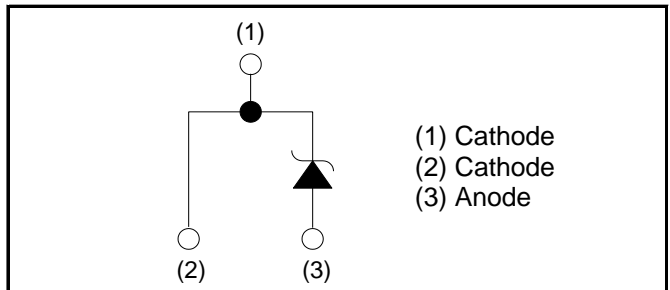
●Construction

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	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=10 μs square, $T_j=25^\circ\text{C}$	100	A
Repetitive peak forward current	I_{FRM}	20 ^{*1}	A	
i^2t value	$\int i^2 dt$	$1 \leq PW \leq 10\text{ms}$, $T_j=25^\circ\text{C}$	3.6	A^2s
		$1 \leq PW \leq 10\text{ms}$, $T_j=150^\circ\text{C}$	2.4	A^2s
Total power dissipation	P_D	34 ^{*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°C)

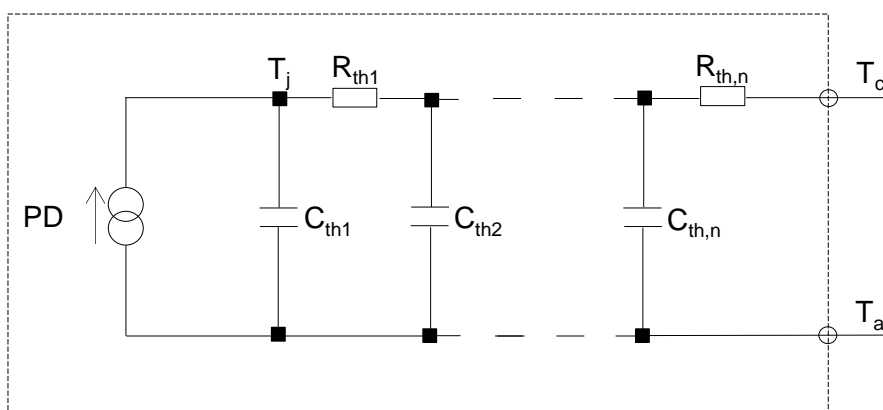
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V _{DC}	I _R =20μA	650	-	-	V
Forward voltage	V _F	I _F =4A, T _j =25°C	-	1.35	1.50	V
		I _F =4A, T _j =150°C	-	1.44	1.71	V
		I _F =4A, T _j =175°C	-	1.50	-	V
Reverse current	I _R	V _R =650V, T _j =25°C	-	0.012	20.0	μA
		V _R =650V, T _j =150°C	-	0.8	80	μA
		V _R =650V, T _j =175°C	-	2.4	-	μA
Total capacitance	C	V _R =1V, f=1MHz	-	200	-	pF
		V _R =650V, f=1MHz	-	18	-	pF
Total capacitive charge	Q _C	V _R =400V, di/dt=350A/μs	-	11	-	nC
Switching time	t _C	V _R =400V, di/dt=350A/μs	-	14	-	ns
Non-repetitive Avaranche Energy	E _{ava}	L=1mH	-	48	-	mJ

●Thermal characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	R _{th(j-c)}	-	-	3.0	4.4	K/W

●Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
R _{th1}	3.91×10 ⁻²	K/W	C _{th1}	1.01×10 ⁻⁴	Ws/K
R _{th2}	3.76×10 ⁻¹		C _{th2}	4.02×10 ⁻⁴	
R _{th3}	2.54×10 ⁰		C _{th3}	1.19×10 ⁻³	



●Electrical characteristic curves

Fig.1 $V_F - I_F$ Characteristics

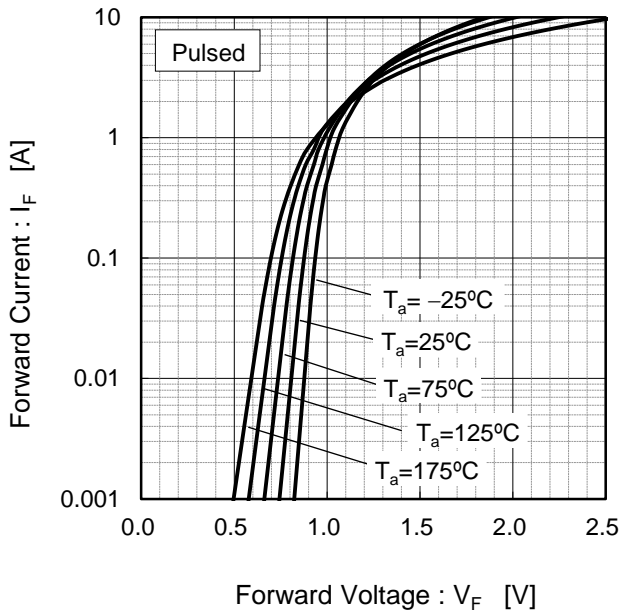


Fig.2 $V_F - I_F$ Characteristics

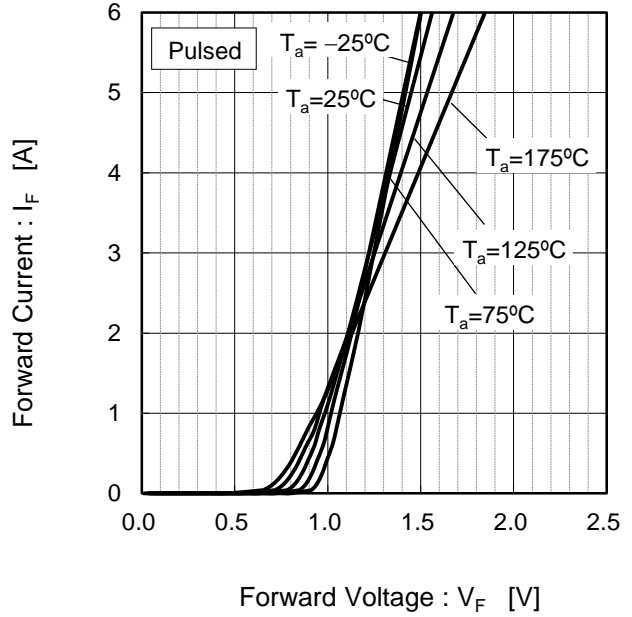


Fig.3 $V_R - I_R$ Characteristics

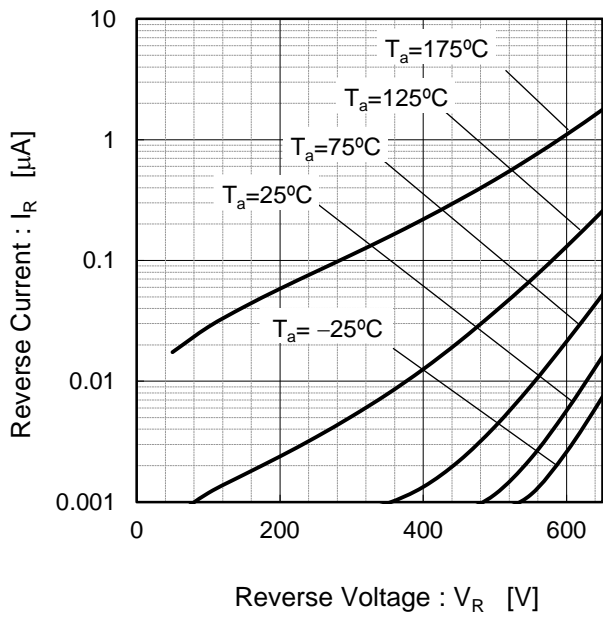
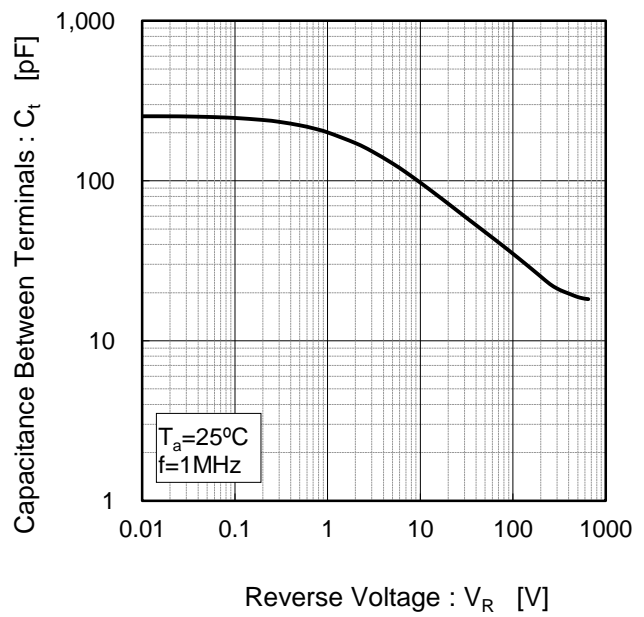


Fig.4 $V_R - C_t$ Characteristics



●Electrical characteristic curves

Fig.5 Typical Transient Thermal Resistance vs. Pulse Width

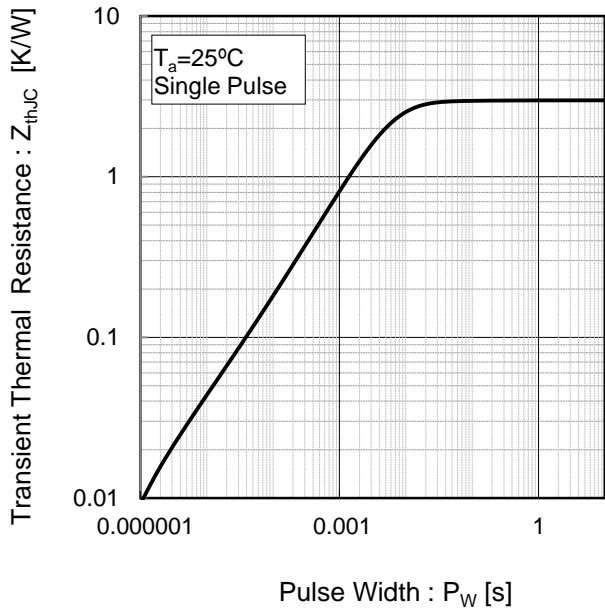


Fig.6 Power Dissipation

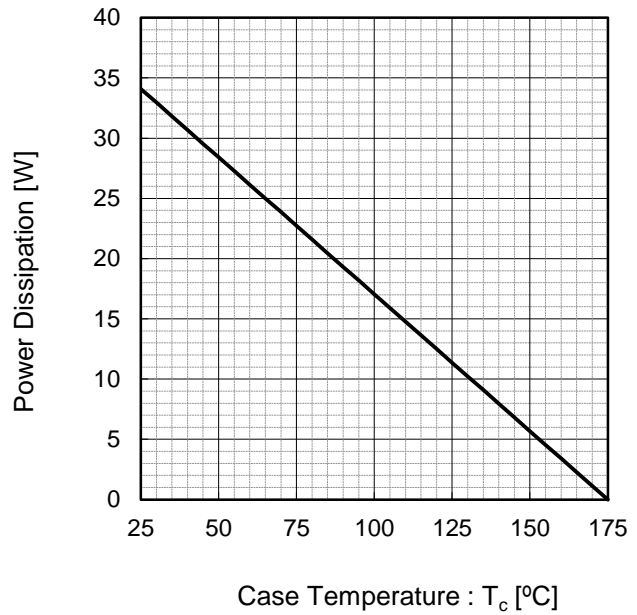
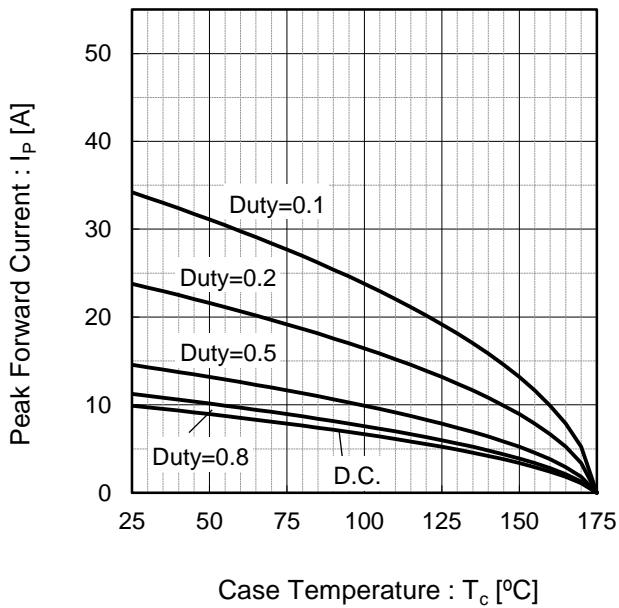
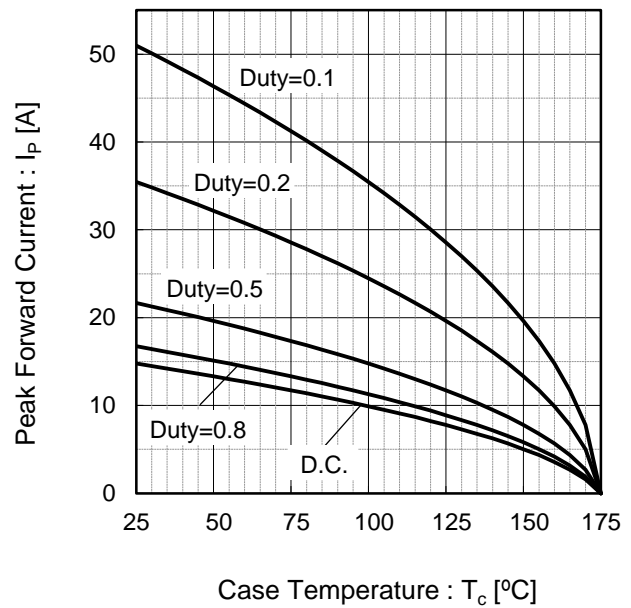


Fig.7*3 Maximum peak forward current derating curve $I_P - T_c$



*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)

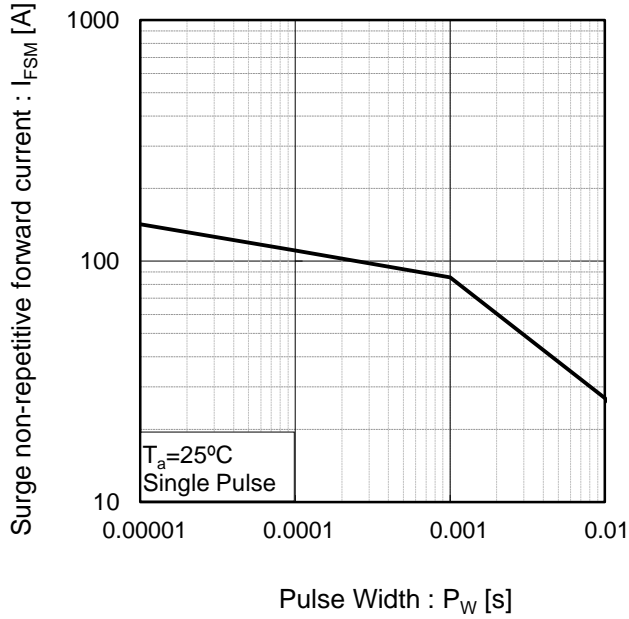
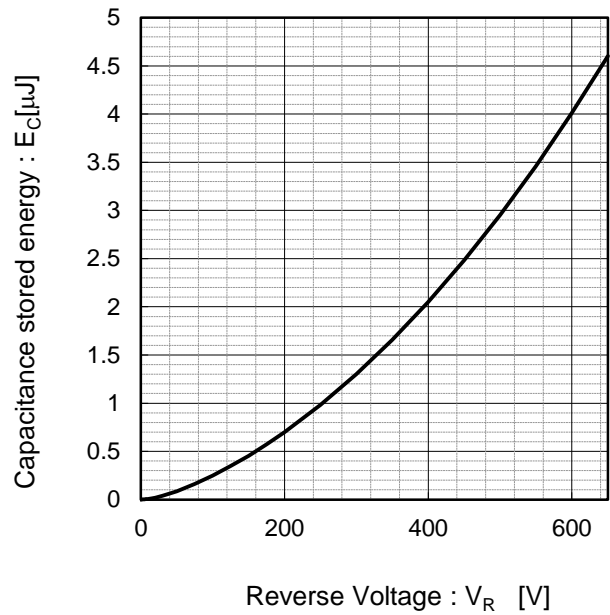
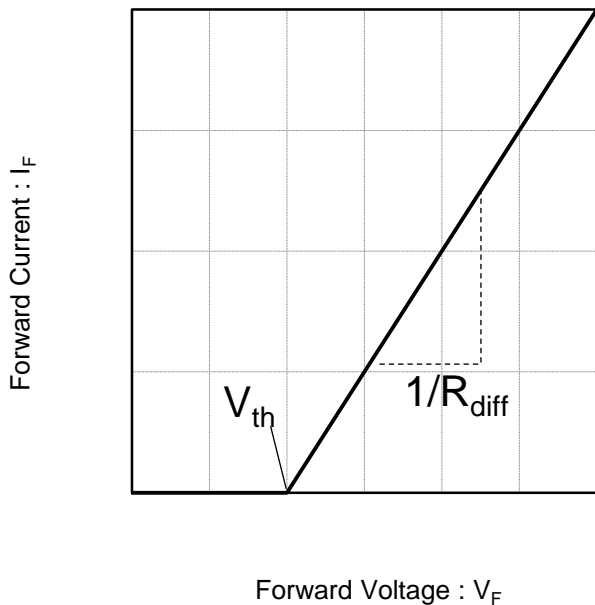


Fig.10 Typical capacitance store energy



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

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

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