

$V_R$	650V
$I_F$	12A
$Q_C$	28nC

## ●Outline

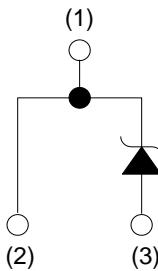
TO-220ACP



## ●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

## ●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	$I_{FSM}$	96	A
		81	A
		350	A
Repetitive peak forward current	$I_{FRM}$	52 * <sup>1</sup>	A
$i^2t$ value	$\int i^2 dt$	46	$\text{A}^2\text{s}$
		32	$\text{A}^2\text{s}$
Total power dissipation	$P_D$	78 * <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 ( $T_j = 25^\circ\text{C}$ )

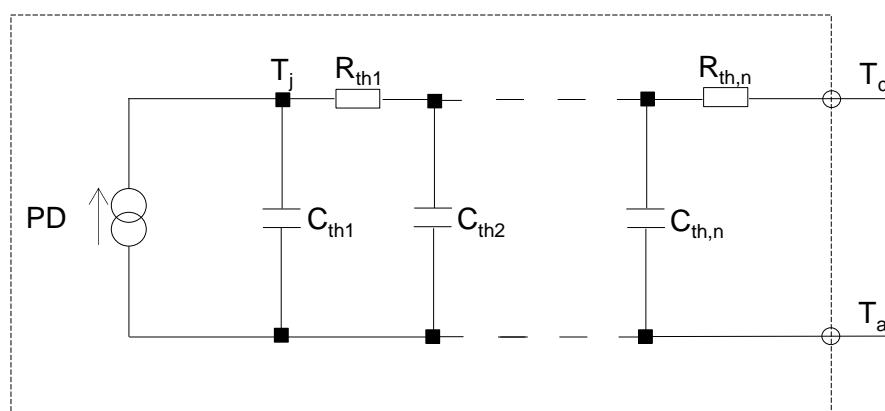
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	$V_{DC}$	$I_R = 60\mu\text{A}$	650	-	-	V
Forward voltage	$V_F$	$I_F = 12\text{A}, T_j = 25^\circ\text{C}$	-	1.35	1.50	V
		$I_F = 12\text{A}, T_j = 150^\circ\text{C}$	-	1.44	1.71	V
		$I_F = 12\text{A}, T_j = 175^\circ\text{C}$	-	1.50	-	V
Reverse current	$I_R$	$V_R = 650\text{V}, T_j = 25^\circ\text{C}$	-	0.036	60	$\mu\text{A}$
		$V_R = 650\text{V}, T_j = 150^\circ\text{C}$	-	2.4	240	$\mu\text{A}$
		$V_R = 650\text{V}, T_j = 175^\circ\text{C}$	-	7.2	-	$\mu\text{A}$
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
$R_{th1}$	$1.36 \times 10^{-2}$	K/W	$C_{th1}$	$3.33 \times 10^{-4}$	Ws/K
$R_{th2}$	$9.66 \times 10^{-2}$		$C_{th2}$	$2.75 \times 10^{-4}$	
$R_{th3}$	$1.19 \times 10^0$		$C_{th3}$	$9.28 \times 10^{-4}$	



●Electrical characteristic curves

Fig.1  $V_F$  -  $I_F$  Characteristics

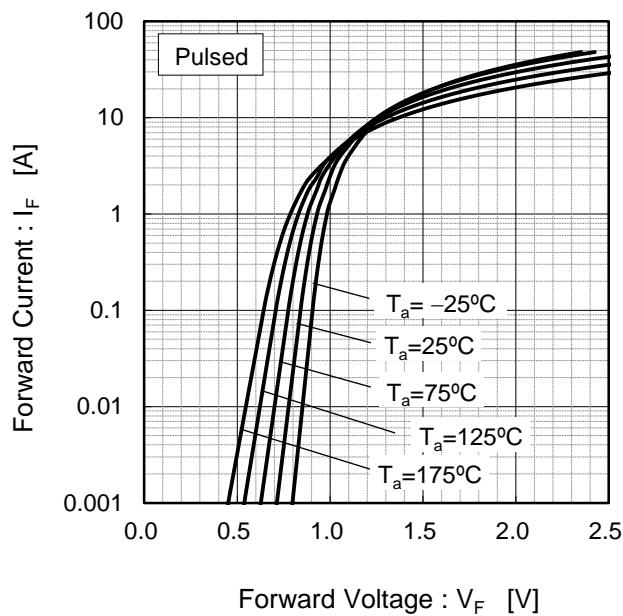


Fig.2  $V_F$  -  $I_F$  Characteristics

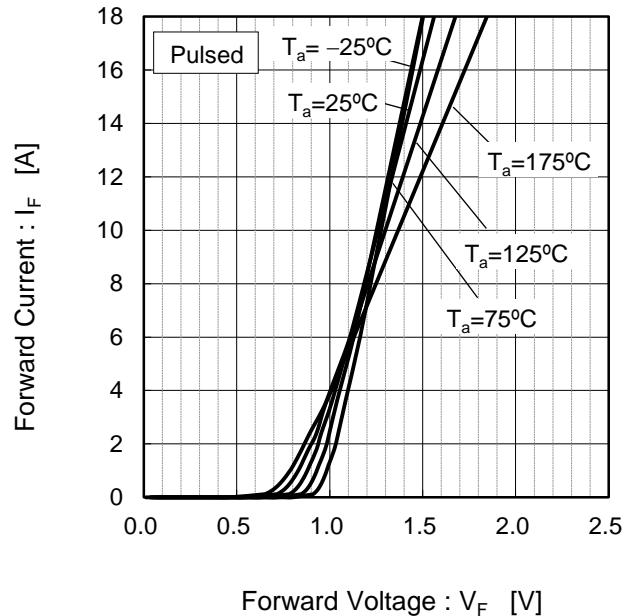


Fig.3  $V_R$  -  $I_R$  Characteristics

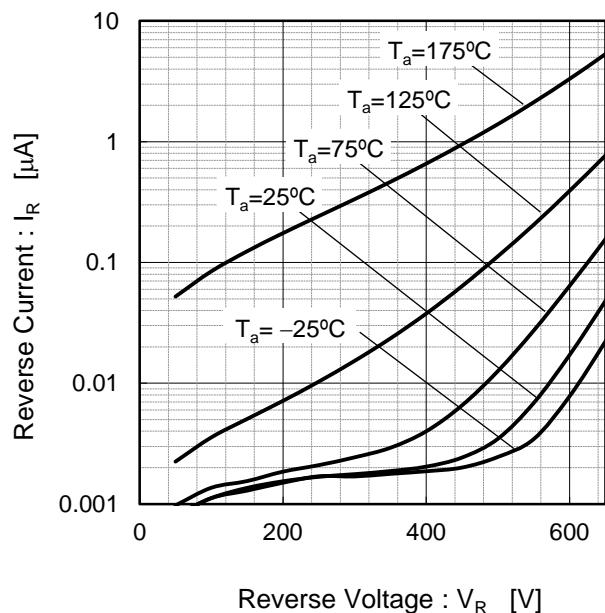
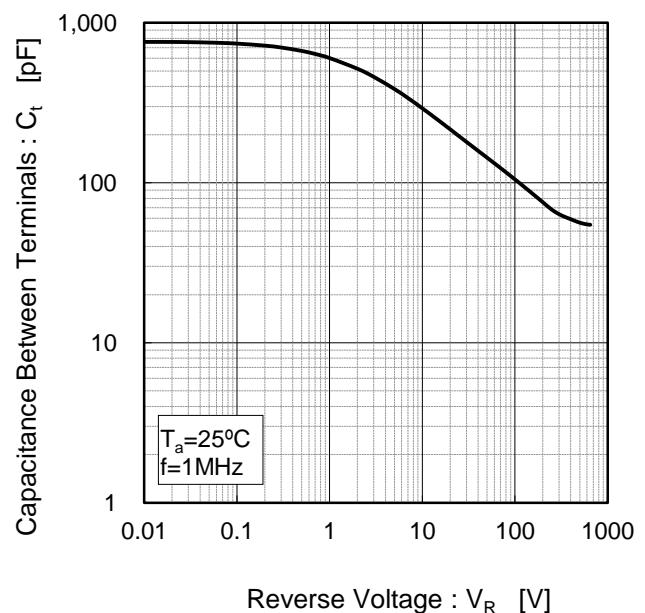


Fig.4  $V_R$ - $C_t$  Characteristics



## ●Electrical characteristic curves

Fig.5 Typical Transient Thermal Resistance vs. Pulse Width

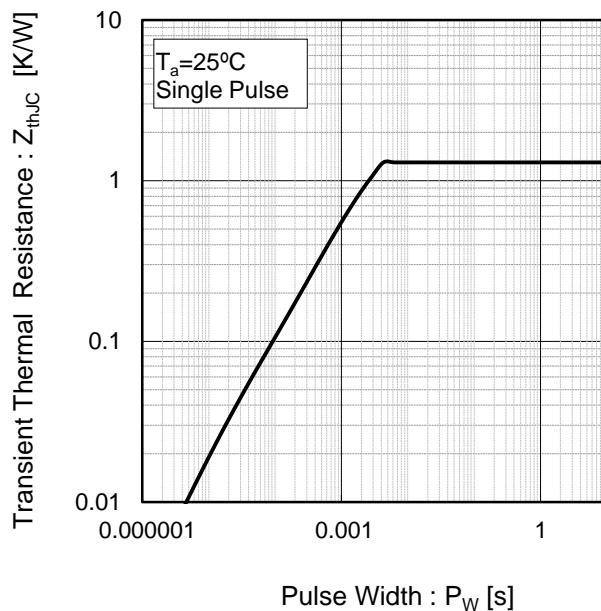


Fig.6 Power Dissipation

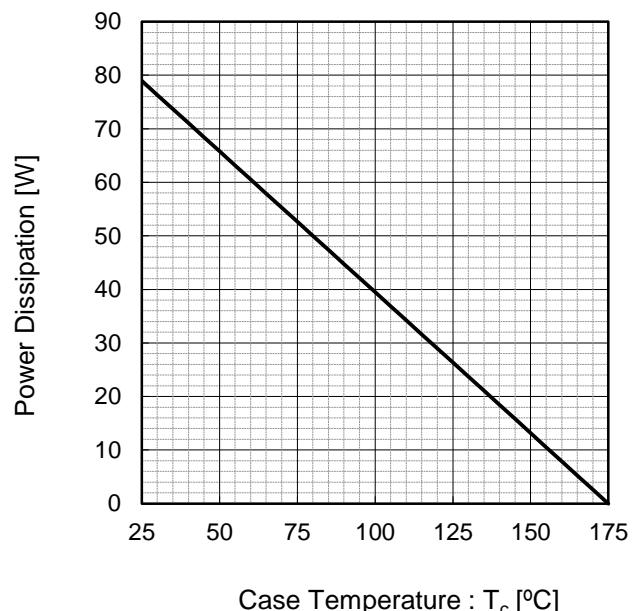
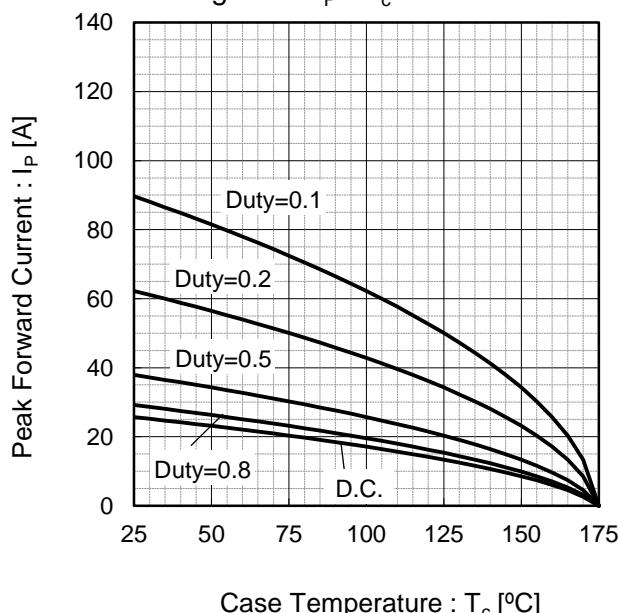
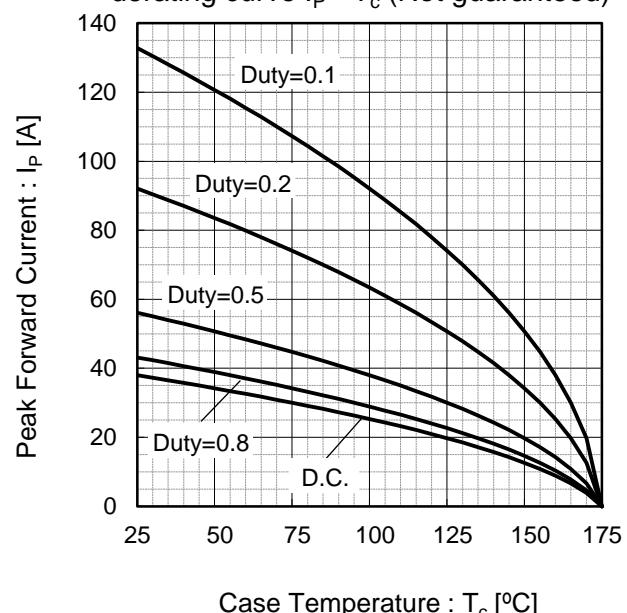


Fig.7\*<sup>3</sup> Maximum peak forward current derating curve  $I_P$  -  $T_c$



\*3 Based on max  $V_f$ , max  $R_{th(j-c)}$   
Valid for switching of above 10kHz,  
excluding D.C. curve.

Fig.8\*<sup>4</sup> 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)

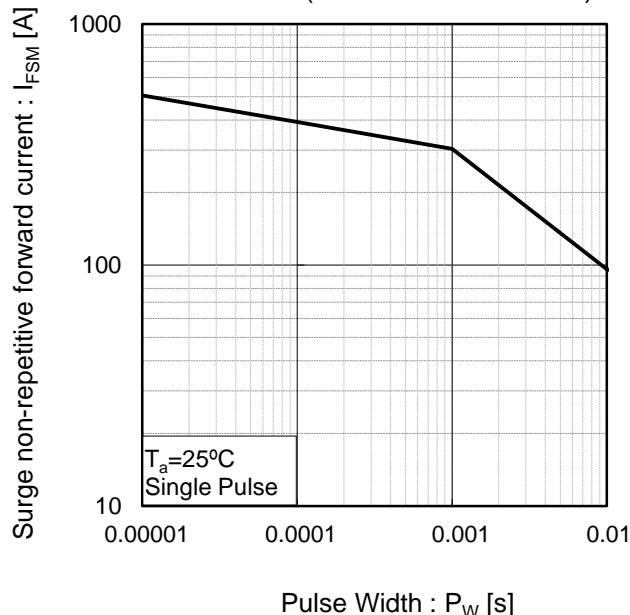
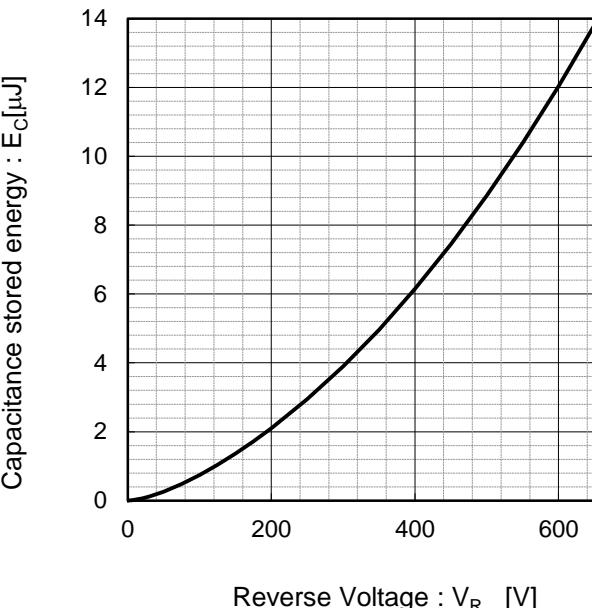
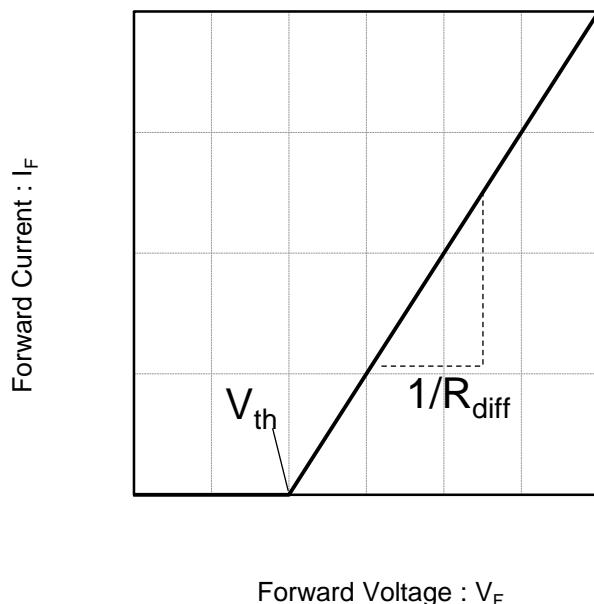


Fig.10 Typical capacitance store energy



## ●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
$a_0$	$9.66 \times 10^{-1}$	V
$a_1$	$-1.1 \times 10^{-3}$	V/°C
$b_0$	$2.93 \times 10^{-2}$	Ω
$b_1$	$6.22 \times 10^{-5}$	Ω/°C
$b_2$	$6.40 \times 10^{-7}$	Ω/°C <sup>2</sup>

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

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