

$V_R$	650V
$I_F$	20A
$Q_C$	47nC

### ●Features

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

### ●Construction

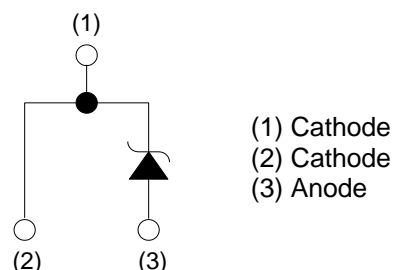
Silicon carbide epitaxial planar type

### ●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	SCS320AH

### ●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 ( $T_c = 125^\circ\text{C}$ )		$I_F$	20	A
Surge non-repetitive forward current	PW=10ms sinusoidal, $T_j=25^\circ\text{C}$	$I_{FSM}$	123	A
	PW=10ms sinusoidal, $T_j=150^\circ\text{C}$		104	A
	PW=10μs square, $T_j=25^\circ\text{C}$		450	A
Repetitive peak forward current		$I_{FRM}$	81 <sup>*1</sup>	A
$i^2t$ value	$1 \leq PW \leq 10\text{ms}$ , $T_j=25^\circ\text{C}$	$\int i^2 dt$	75	A <sup>2</sup> s
	$1 \leq PW \leq 10\text{ms}$ , $T_j=150^\circ\text{C}$		54	A <sup>2</sup> s
Total power dissipation		$P_D$	115 <sup>*2</sup>	W
Junction temperature		$T_j$	175	°C
Range of storage temperature		$T_{stg}$	-55 to +175	°C

<sup>\*1</sup>  $T_c=100^\circ\text{C}$ ,  $T_j=150^\circ\text{C}$ , Duty cycle=10% <sup>\*2</sup>  $T_c=25^\circ\text{C}$

**●Electrical characteristics** ( $T_j = 25^\circ\text{C}$ )

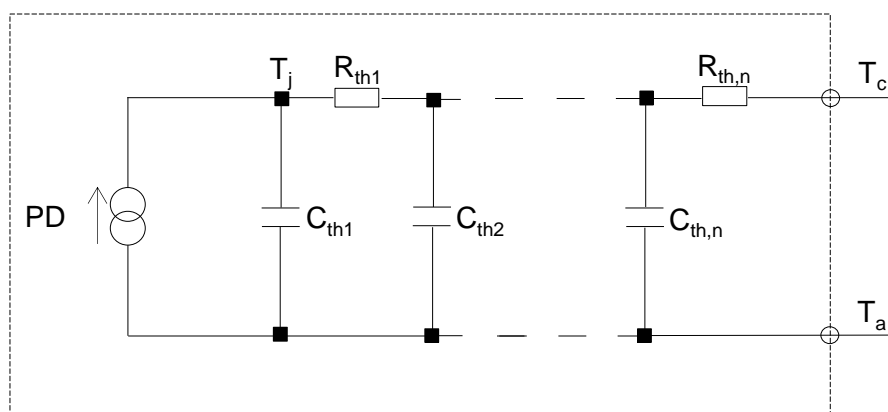
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	$V_{DC}$	$I_R = 100\mu\text{A}$	650	-	-	V
Forward voltage	$V_F$	$I_F = 20\text{A}, T_j = 25^\circ\text{C}$	-	1.35	1.50	V
		$I_F = 20\text{A}, T_j = 150^\circ\text{C}$	-	1.44	1.71	V
		$I_F = 20\text{A}, T_j = 175^\circ\text{C}$	-	1.50	-	V
Reverse current	$I_R$	$V_R = 650\text{V}, T_j = 25^\circ\text{C}$	-	0.06	100	$\mu\text{A}$
		$V_R = 650\text{V}, T_j = 150^\circ\text{C}$	-	4	400	$\mu\text{A}$
		$V_R = 650\text{V}, T_j = 175^\circ\text{C}$	-	12	-	$\mu\text{A}$
Total capacitance	$C$	$V_R = 1\text{V}, f = 1\text{MHz}$	-	1000	-	pF
		$V_R = 650\text{V}, f = 1\text{MHz}$	-	91	-	pF
Total capacitive charge	$Q_C$	$V_R = 400\text{V}, di/dt = 350\text{A}/\mu\text{s}$	-	47	-	nC
Switching time	$t_C$	$V_R = 400\text{V}, di/dt = 350\text{A}/\mu\text{s}$	-	25	-	ns
Non-repetitive Avaranche Energy	$E_{ava}$	$L = 1\text{mH}$	-	220	-	mJ

**●Thermal characteristics**

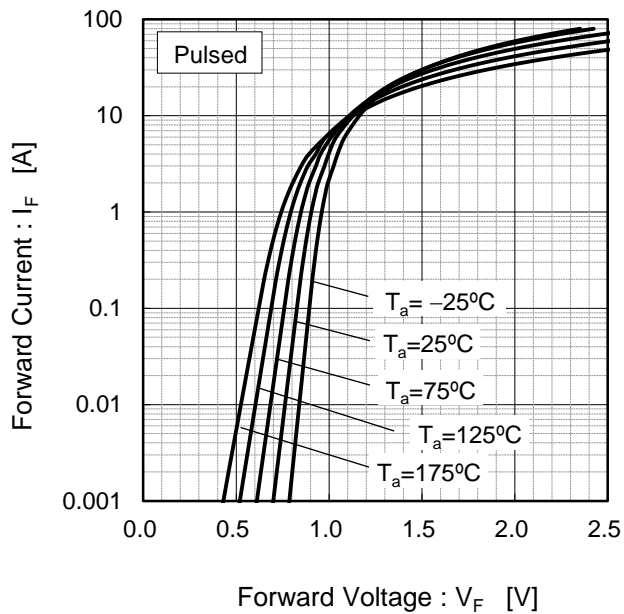
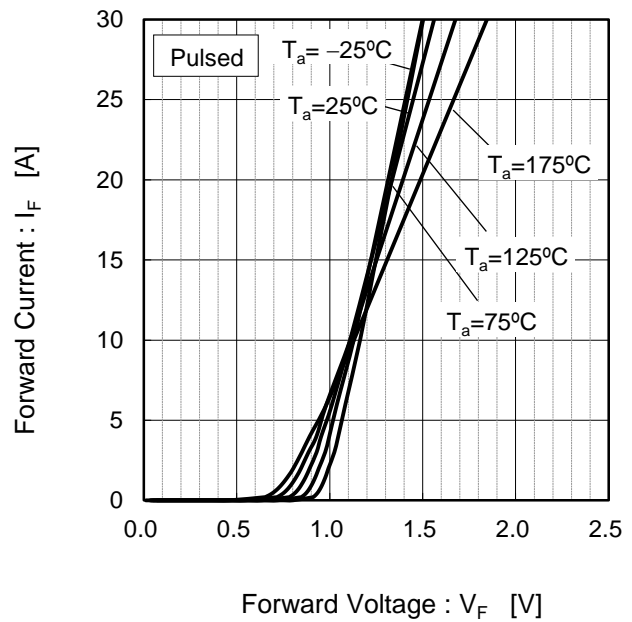
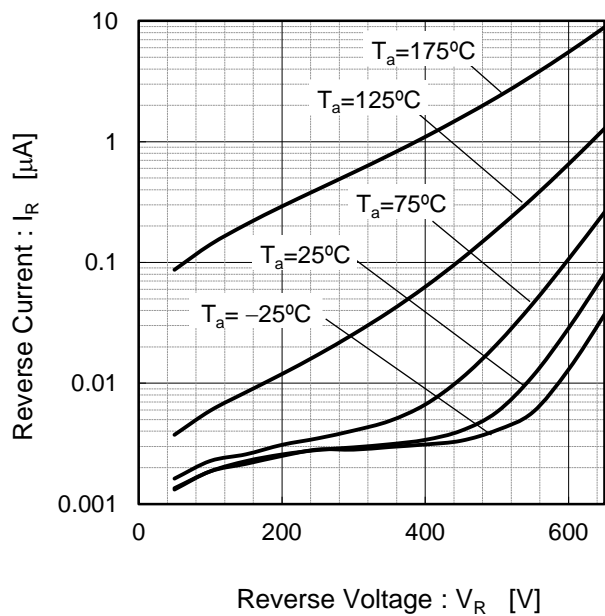
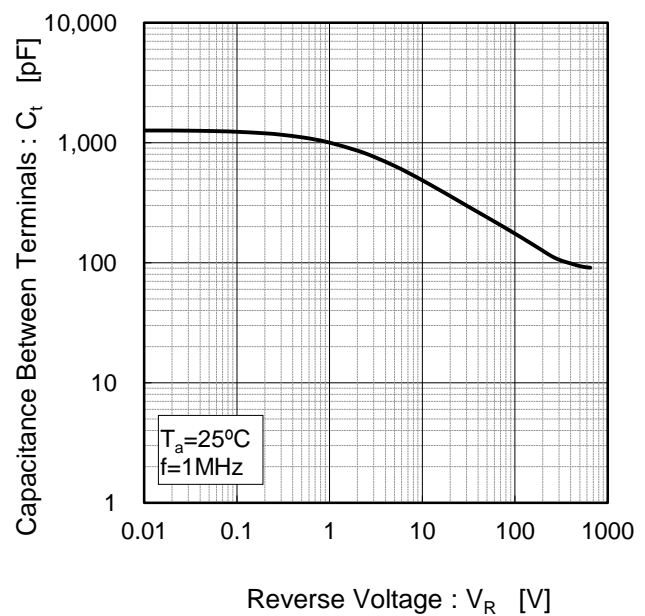
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	$R_{th(j-c)}$	-	-	0.87	1.3	K/W

**●Typical Transient Thermal Characteristics**

Symbol	Value	Unit	Symbol	Value	Unit
$R_{th1}$	$8.13 \times 10^{-4}$	K/W	$C_{th1}$	$9.17 \times 10^{-5}$	Ws/K
$R_{th2}$	$4.07 \times 10^{-2}$		$C_{th2}$	$5.94 \times 10^{-4}$	
$R_{th3}$	$8.31 \times 10^{-1}$		$C_{th3}$	$1.68 \times 10^{-3}$	



# ●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

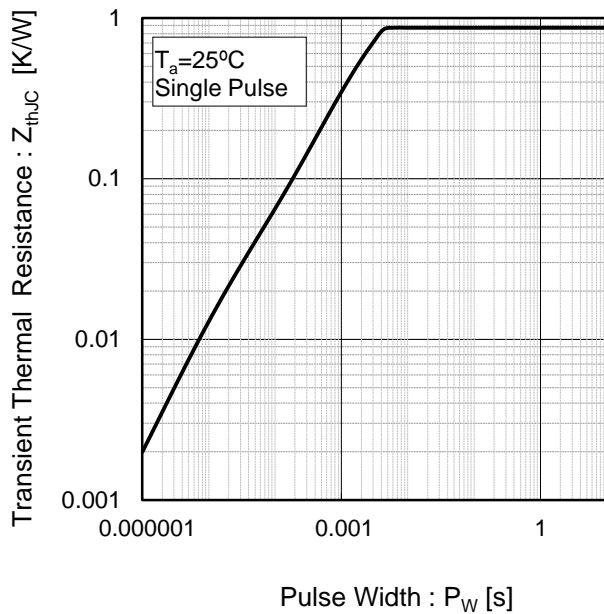


Fig.6 Power Dissipation

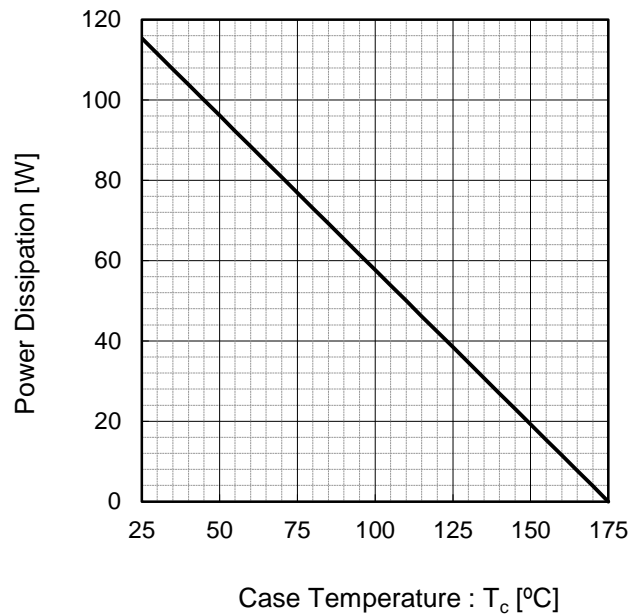
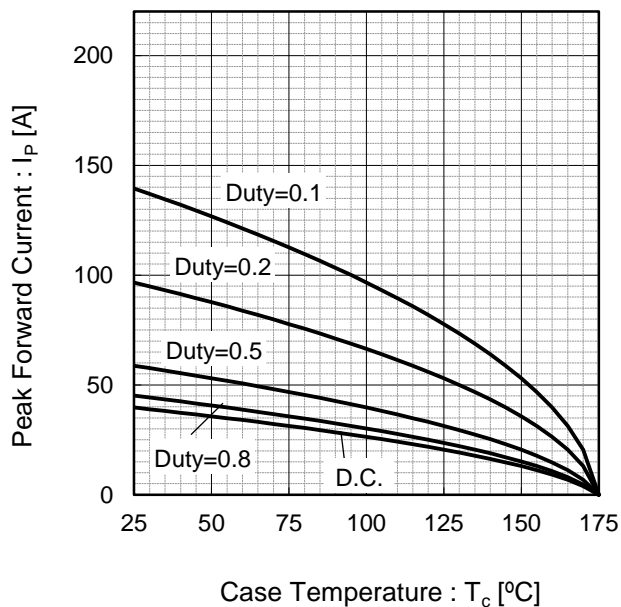
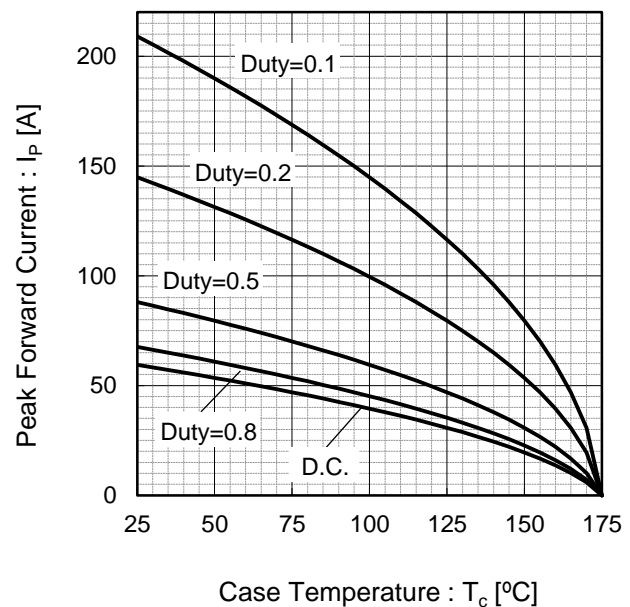


Fig.7\*3 Maximum peak forward current derating curve  $I_P - T_c$



\*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)

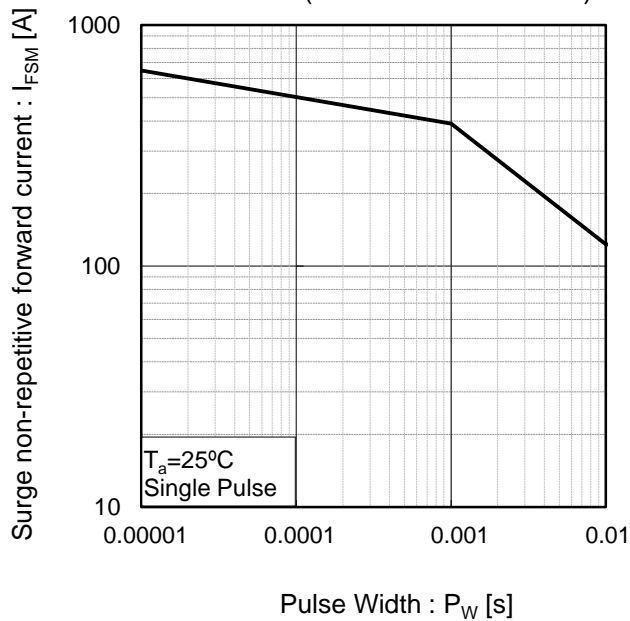
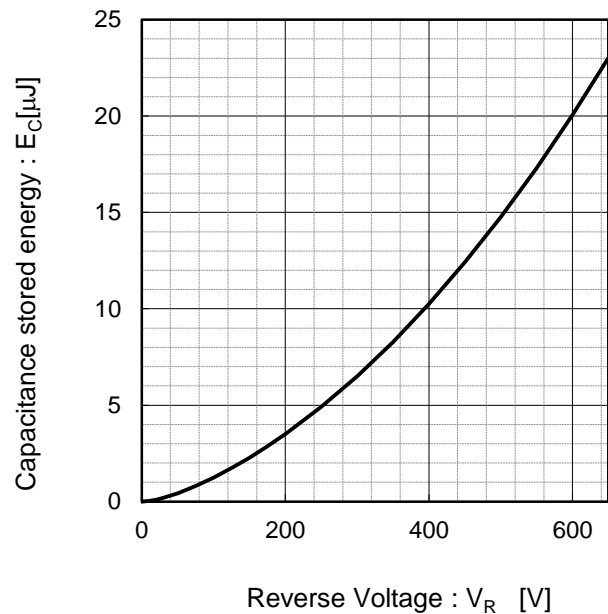
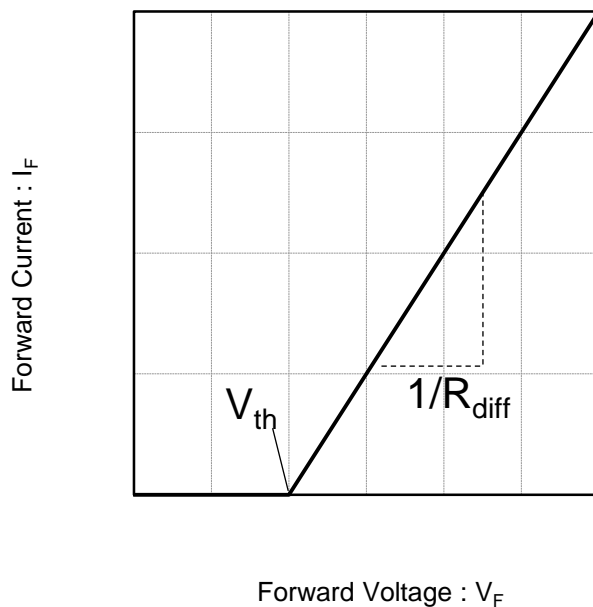


Fig.10 Typical capacitance store energy



## ●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
$a_0$	$9.66 \times 10^{-1}$	V
$a_1$	$-1.1 \times 10^{-3}$	V/°C
$b_0$	$1.76 \times 10^{-2}$	Ω
$b_1$	$3.73 \times 10^{-5}$	Ω/°C
$b_2$	$3.84 \times 10^{-7}$	Ω/°C <sup>2</sup>

$T_j$  in °C;  $-55^\circ\text{C} < T_j < 175^\circ\text{C}$ ;  $I_F < 40$  A

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