

V_R	650V
I_F	20A
Q_C	31nC

●Features

- 1) Shorter recovery time
- 2) Reduced temperature dependence
- 3) High-speed switching possible

●Applications

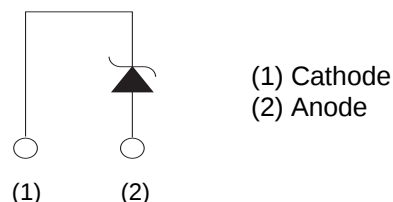
- PFC Boost Topology
- Secondary Side Rectification
- Data Center
- PV Power Conditioners

●Outline

TO-220FM



●Inner circuit



●Packaging specifications

Type	Packaging	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	50
	Packing code	C
	Marking	SCS220AM

●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 ($T_c = 21^\circ\text{C}$)		I_F	20	A
Surge non-repetitive forward current	PW=10ms sinusoidal, $T_j=25^\circ\text{C}$	I_{FSM}	68	A
	PW=10ms sinusoidal, $T_j=150^\circ\text{C}$		53	A
	PW=10μs square, $T_j=25^\circ\text{C}$		260	A
Repetitive peak forward current		I_{FRM}	41 *1	A
i^2t value	PW=10ms, $T_j=25^\circ\text{C}$	$\int i^2 dt$	23	A^2s
	PW=10ms, $T_j=150^\circ\text{C}$		14	A^2s
Total power dissipation		P_D	40 *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 ($T_j = 25^\circ\text{C}$)

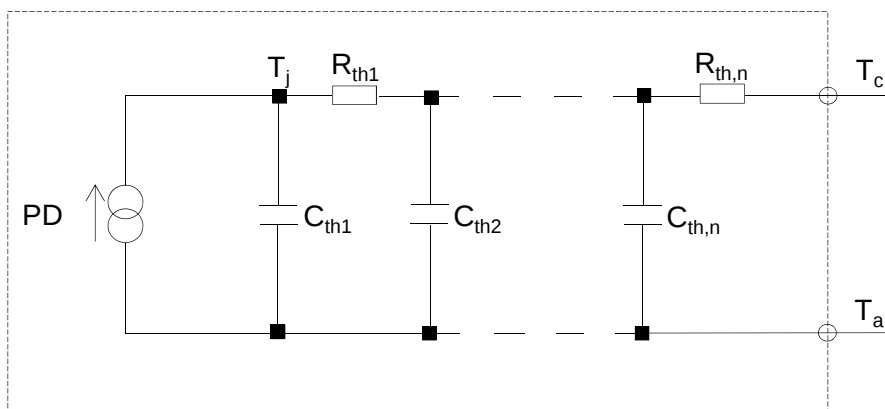
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V_{DC}	$I_{\text{R}}=4.0\text{mA}$	650	-	-	V
Forward voltage	V_{F}	$I_{\text{F}}=20\text{A}, T_j=25^\circ\text{C}$	-	1.35	1.55	V
		$I_{\text{F}}=20\text{A}, T_j=150^\circ\text{C}$	-	1.55	-	V
		$I_{\text{F}}=20\text{A}, T_j=175^\circ\text{C}$	-	1.63	-	V
Reverse current	I_{R}	$V_{\text{R}}=650\text{V}, T_j=25^\circ\text{C}$	-	4	400	μA
		$V_{\text{R}}=650\text{V}, T_j=150^\circ\text{C}$	-	60	-	μA
		$V_{\text{R}}=650\text{V}, T_j=175^\circ\text{C}$	-	140	-	μA
Total capacitance	C	$V_{\text{R}}=1\text{V}, f=1\text{MHz}$	-	730	-	pF
		$V_{\text{R}}=600\text{V}, f=1\text{MHz}$	-	74	-	pF
Total capacitive charge	Q_{C}	$V_{\text{R}}=400\text{V}, di/dt=350\text{A}/\mu\text{s}$	-	31	-	nC
Switching time	t_{C}	$V_{\text{R}}=400\text{V}, di/dt=350\text{A}/\mu\text{s}$	-	19	-	ns

●Thermal characteristics

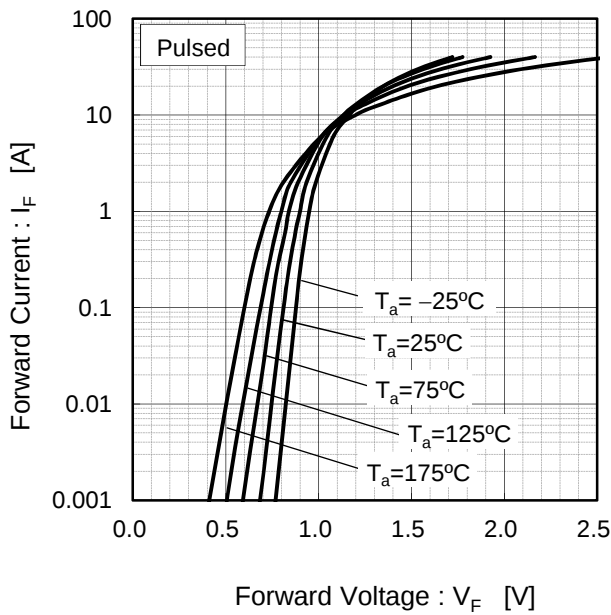
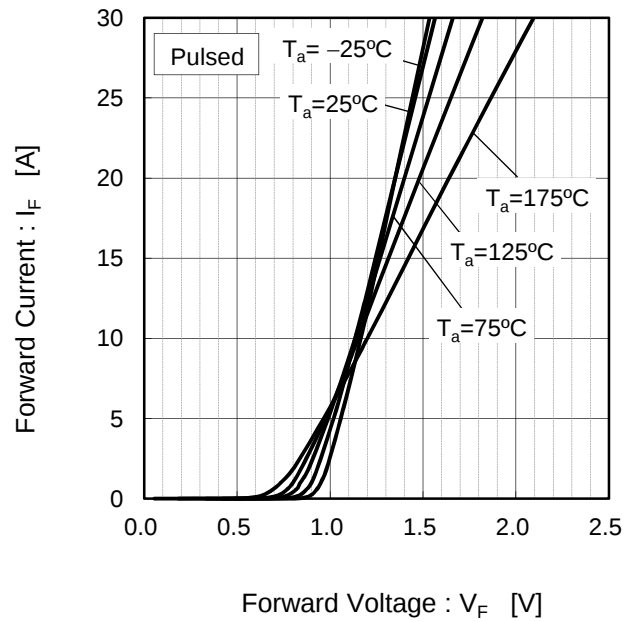
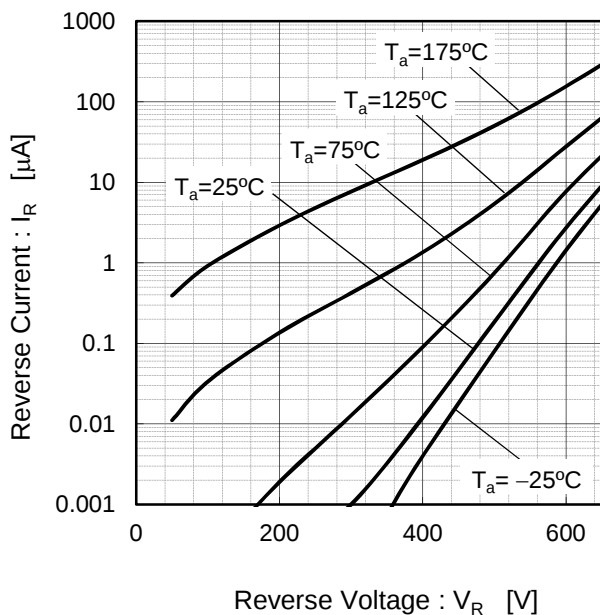
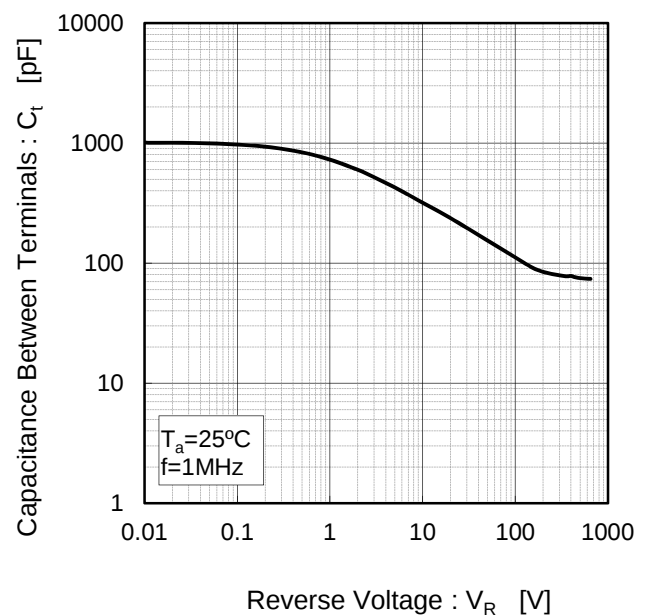
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	$R_{\text{th(j-c)}}$	-	-	3.2	3.7	$^\circ\text{C/W}$

●Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
R_{th1}	5.45E-01	K/W	C_{th1}	2.76E-03	Ws/K
R_{th2}	1.17E+00		C_{th2}	9.35E-03	
R_{th3}	1.50E+00		C_{th3}	8.16E-01	



●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

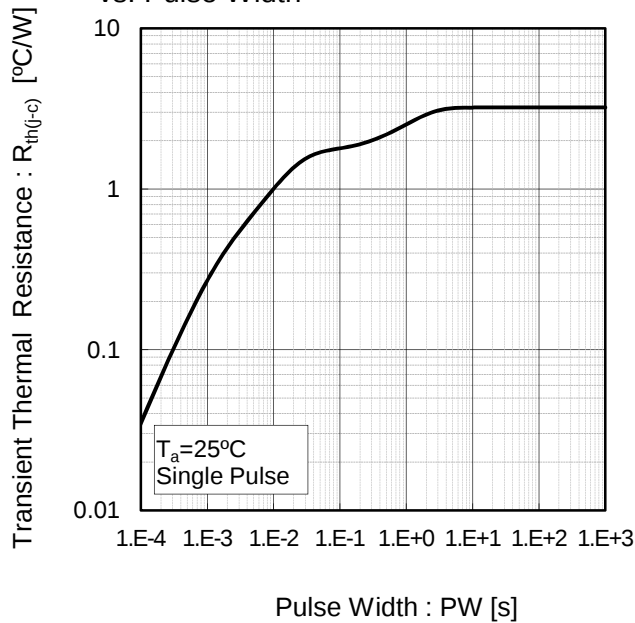


Fig.6 Power Dissipation

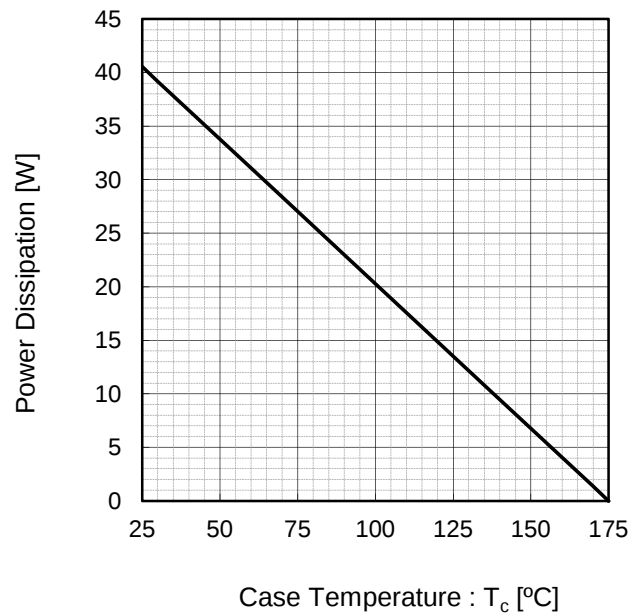
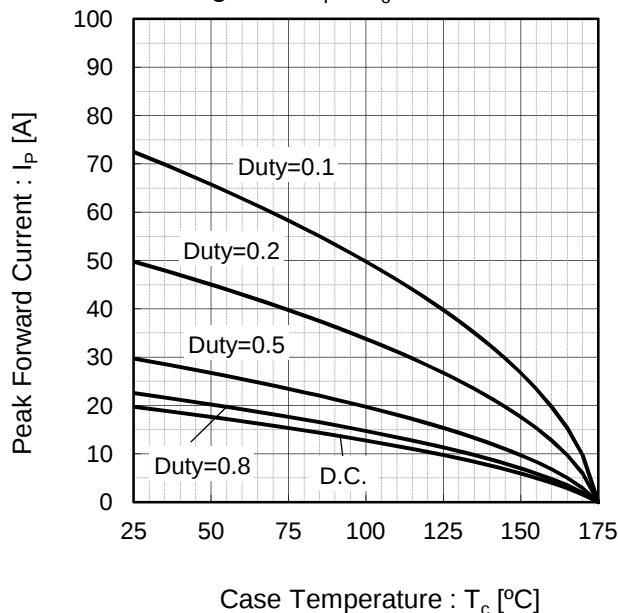
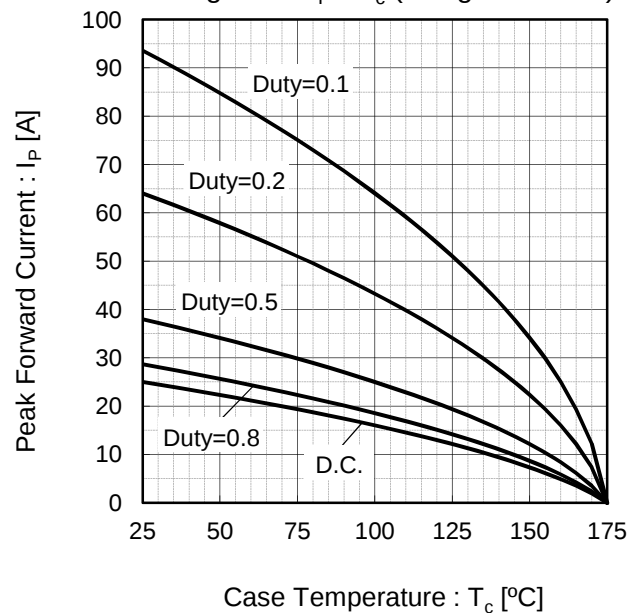


Fig.7*3 Maximum peak forward current derating curve $I_P - T_c$



Case Temperature : T_c [°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)



Case Temperature : T_c [°C]
 *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)

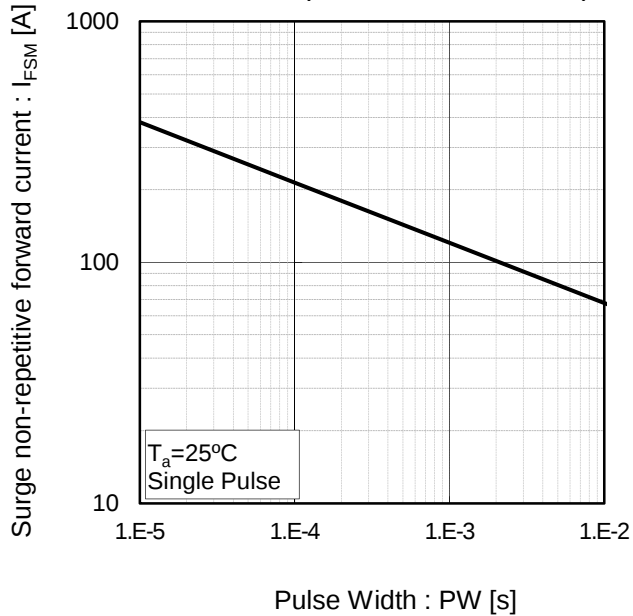
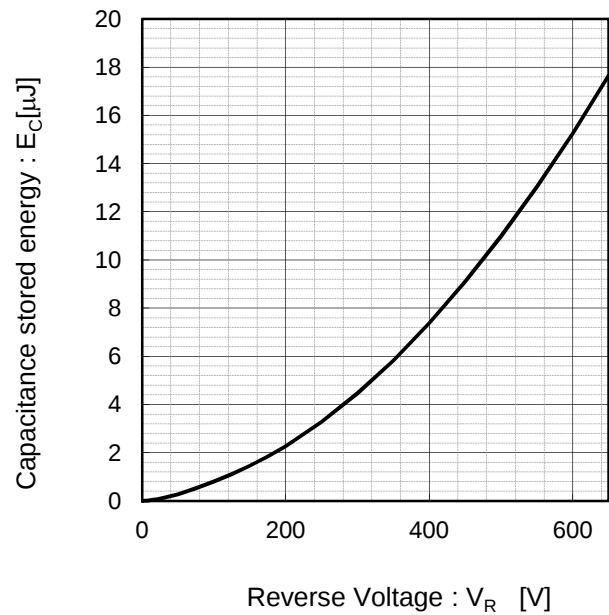
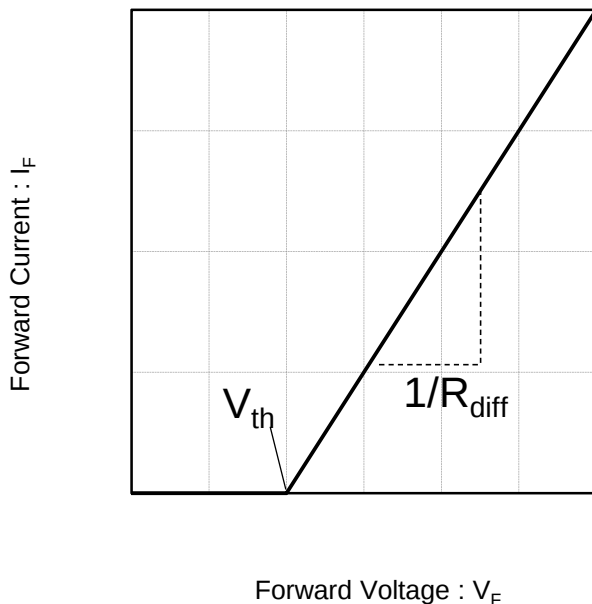


Fig.10 Typical capacitance store energy



●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	9.35E-01	V
a_1	-1.12E-03	V/°C
b_0	1.99E-02	Ω
b_1	5.10E-05	Ω/°C
b_2	5.40E-07	Ω/°C ²

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

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