

V_R	650V
I_F	10A/20A*
Q_C	15nC(Per leg)

(*Per leg/ Both legs)

●Features

- 1) Low forward voltage
- 2) Negligible recovery time/current
- 3) Temperature independent switching behavior

●Applications

- Switch Mode Power Supply
- Uninterruptible Power Supply
- Solar Inverter
- Motor Drive
- Air Conditioner
- EV Charger

●Absolute maximum ratings ($T_j = 25^\circ\text{C}$)

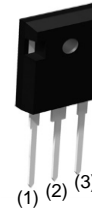
Parameter	Symbol	Value	Unit	
Reverse voltage (repetitive peak)	V_{RM}	650	V	
Reverse voltage (DC)	V_R	650	V	
Continuous forward current *4 ($T_c = 137^\circ\text{C}$)	I_F	10/20	A	
Surge non-repetitive forward current *4	I_{FSM}	PW=10ms sinusoidal, $T_j=25^\circ\text{C}$	38/76	A
		PW=10ms sinusoidal, $T_j=150^\circ\text{C}$	30/60	A
		PW=10μs square, $T_j=25^\circ\text{C}$	150/300	A
Repetitive peak forward current*4	I_{FRM}	45/91 *2	A	
i^2t value*4	$\int i^2 dt$	PW=10ms, $T_j=25^\circ\text{C}$	7.2/29	A^2s
		PW=10ms, $T_j=150^\circ\text{C}$	4.5/18	A^2s
Total power dissipation *4	P_D	83/160 *3	W	
Junction temperature	T_j	175	$^\circ\text{C}$	
Range of storage temperature	T_{stg}	-55 to +175	$^\circ\text{C}$	

*1 Tolerances of dimensions and packing specifications slightly differ between TO-247 and TO-247N, which is unlikely to influence compatibility for mounting. Please refer to corresponding specifications of dimensions for more details.

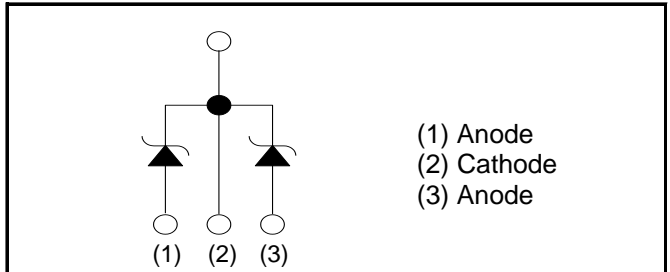
*2 $T_c=100^\circ\text{C}$, $T_j=150^\circ\text{C}$, Duty cycle=10% *3 $T_c=25^\circ\text{C}$ *4 Per leg/ Both legs

●Outline

TO-247
TO-247N



●Inner circuit



●Packaging specifications*1

Package	TO-247	TO-247N	
Type	Packing	Tube	
	Reel size (mm)	-	
	Tape width (mm)	-	
	Basic ordering unit (pcs)	30	
	Packing code	C	C11
	Marking	SCS220AE2	

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

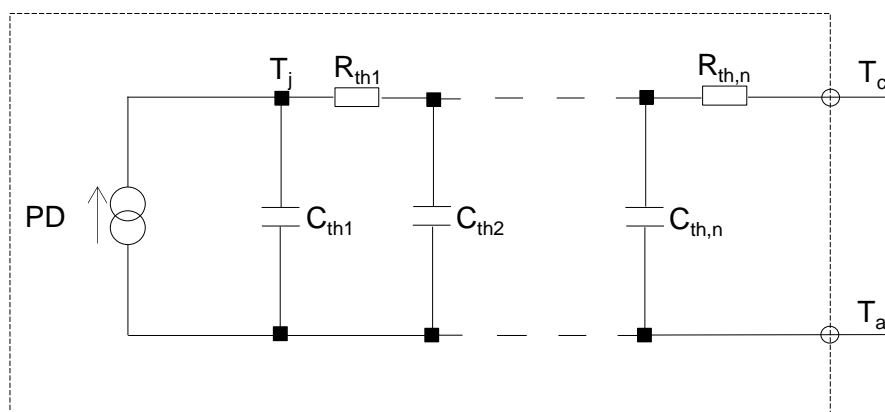
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V_{DC}	$I_R=2.0\text{mA}$	650	-	-	V
Forward voltage	V_F	$I_F=10\text{A}, T_j=25^\circ\text{C}$	-	1.35	1.55	V
		$I_F=10\text{A}, T_j=150^\circ\text{C}$	-	1.55	-	V
		$I_F=10\text{A}, T_j=175^\circ\text{C}$	-	1.63	-	V
Reverse current	I_R	$V_R=600\text{V}, T_j=25^\circ\text{C}$	-	2	200	μA
		$V_R=600\text{V}, T_j=150^\circ\text{C}$	-	30	-	μA
		$V_R=600\text{V}, T_j=175^\circ\text{C}$	-	70	-	μA
Total capacitance	C	$V_R=1\text{V}, f=1\text{MHz}$	-	360	-	pF
		$V_R=600\text{V}, f=1\text{MHz}$	-	37	-	pF
Total capacitive charge	Q_C	$V_R=400\text{V}, di/dt=350\text{A}/\mu\text{s}$	-	15	-	nC
Switching time	t_C	$V_R=400\text{V}, di/dt=350\text{A}/\mu\text{s}$	-	15	-	ns

●Thermal characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	$R_{th(j-c)}$	Per Leg	-	1.6	1.8	$^\circ\text{C}/\text{W}$
		Both Legs	-	0.80	0.90	$^\circ\text{C}/\text{W}$

●Typical Transient Thermal Characteristics (Per Leg)

Symbol	Value	Unit	Symbol	Value	Unit
R_{th1}	4.16×10^{-1}	K/W	C_{th1}	1.55×10^{-3}	Ws/K
R_{th2}	9.92×10^{-1}		C_{th2}	6.13×10^{-3}	
R_{th3}	1.93×10^{-1}		C_{th3}	1.34×10^{-1}	



●Electrical characteristic curves

Fig.1 $V_F - I_F$ Characteristics (Per Leg)

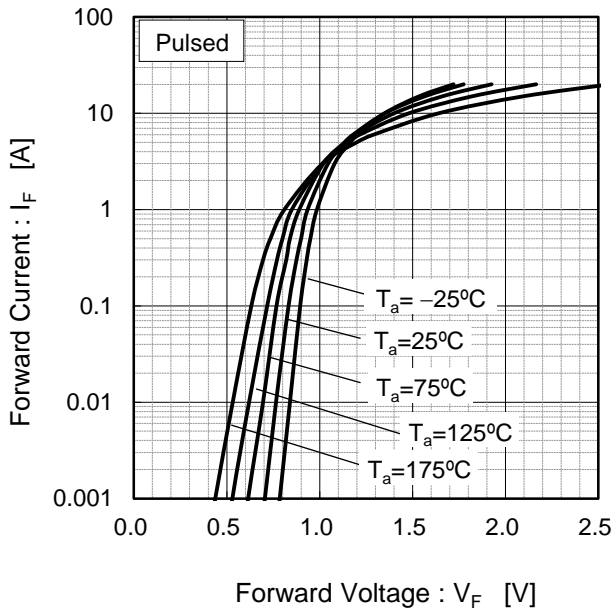


Fig.2 $V_F - I_F$ Characteristics (Per Leg)

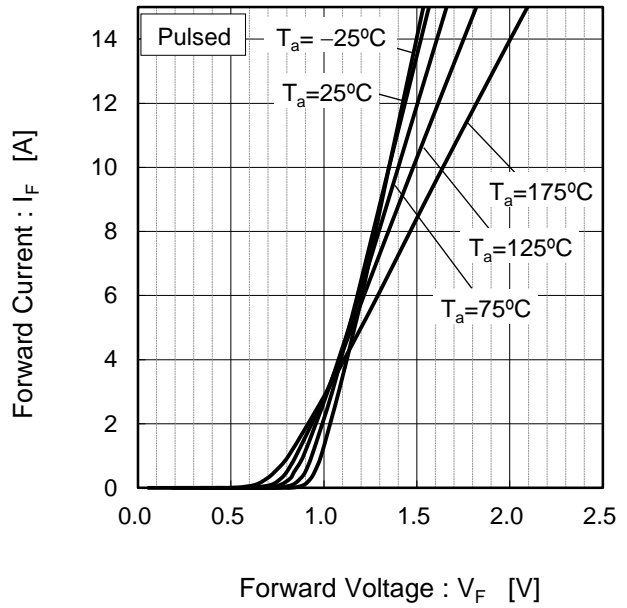


Fig.3 $V_R - I_R$ Characteristics (Per Leg)

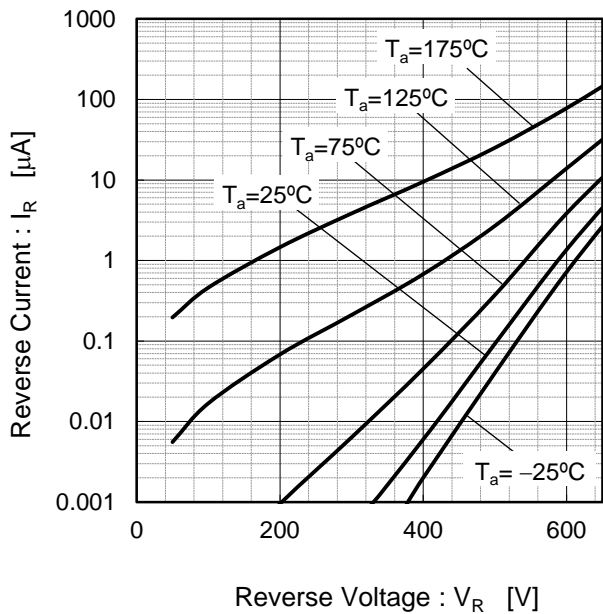
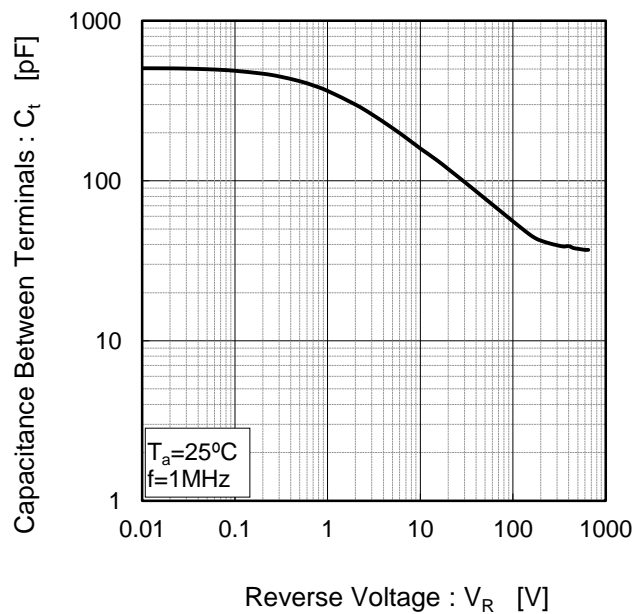


Fig.4 $V_R - C_t$ Characteristics (Per Leg)



●Electrical characteristic curves

Fig.5 Typical Transient Thermal Resistance vs. Pulse Width (Per Leg)

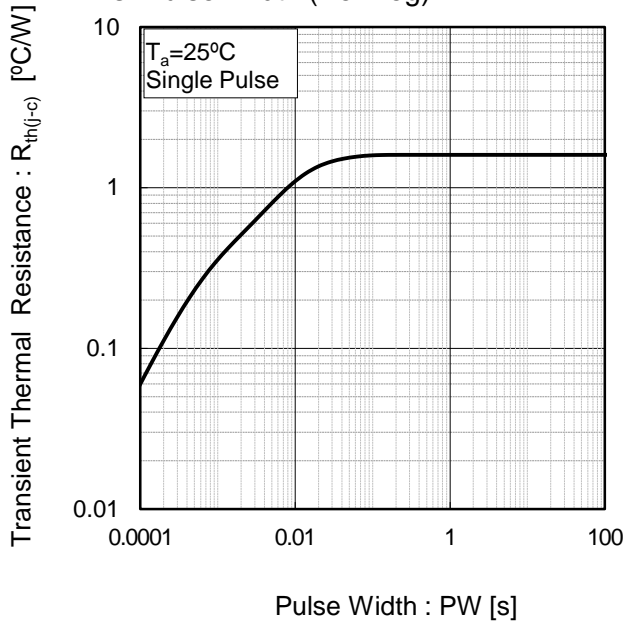


Fig.6 Power Dissipation (Per Leg)

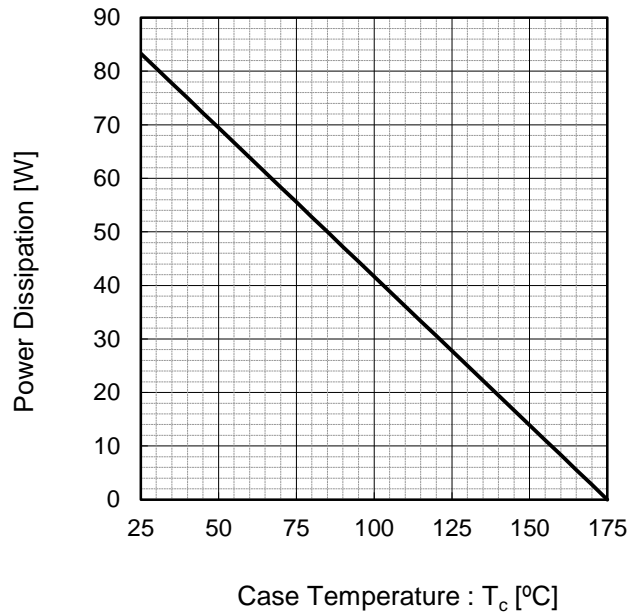
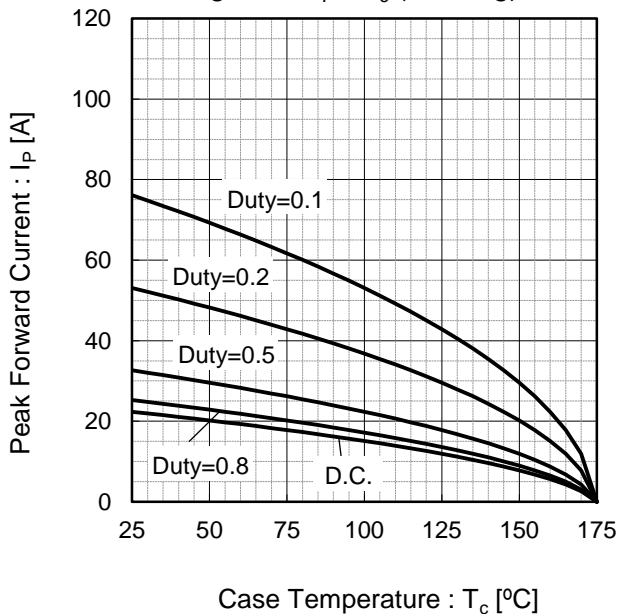
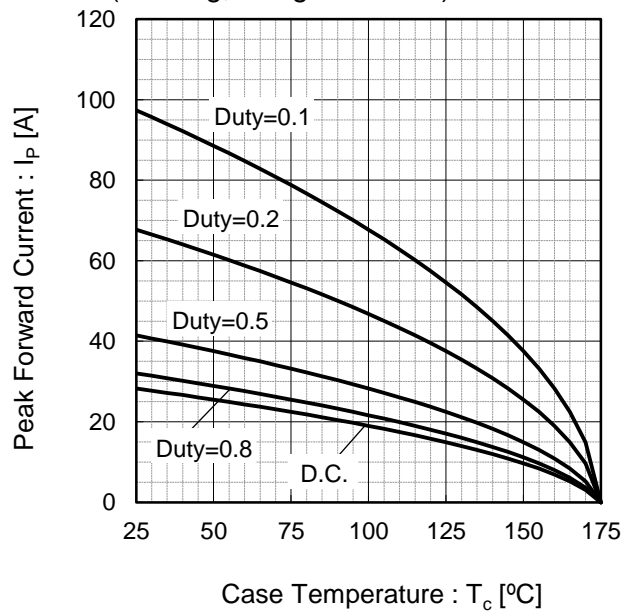


Fig.7*5 Maximum peak forward current derating curve $I_P - T_c$ (Per Leg)



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*6 Typical peak forward current derating curve $I_P - T_c$ (Per Leg, 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) (Per Leg)

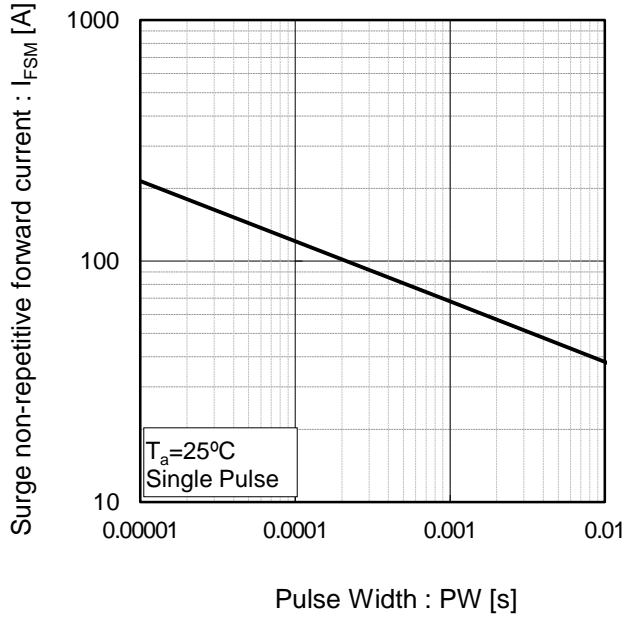
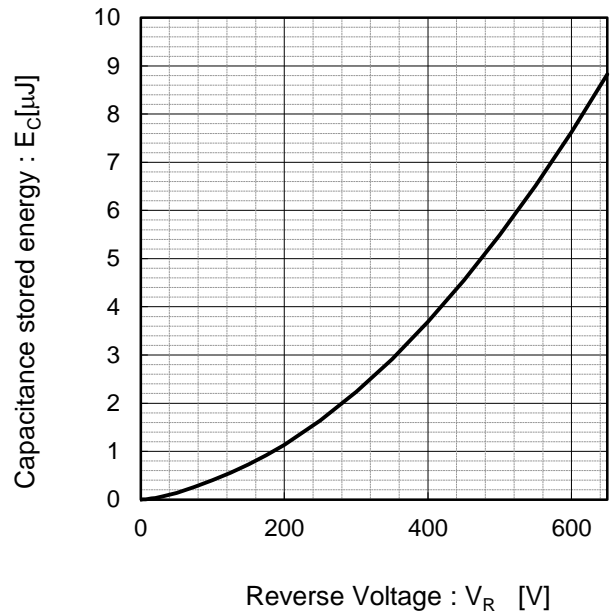
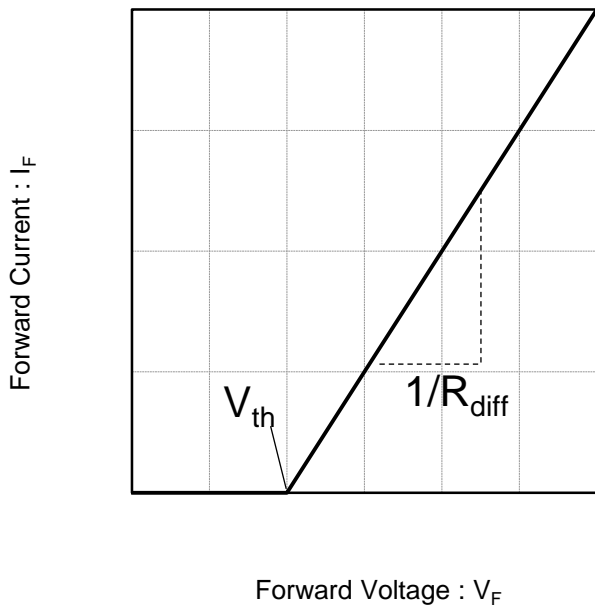


Fig.10 Typical capacitance store energy (Per Leg)



●Simplified forward characteristic model (Per Leg)

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	9.35×10 ⁻¹	V
a ₁	-1.12×10 ⁻³	V/°C
b ₀	3.98×10 ⁻²	Ω
b ₁	1.02×10 ⁻⁴	Ω/°C
b ₂	1.08×10 ⁻⁶	Ω/°C ²

T_j in °C; -55 °C < T_j < 175°C ; I_F < 20 A

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