

$V_R$	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

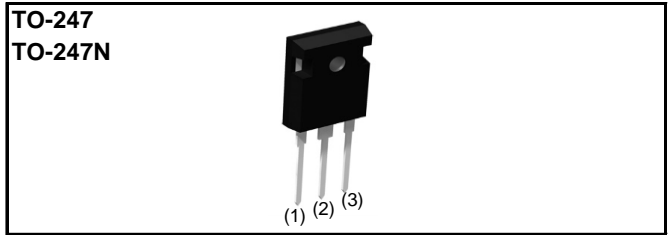
### ●Absolute maximum ratings ( $T_j = 25^\circ\text{C}$ )

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	$\text{A}^2\text{s}$
		PW=10ms, $T_j=150^\circ\text{C}$	4.5/18	$\text{A}^2\text{s}$
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	$^\circ\text{C}$	

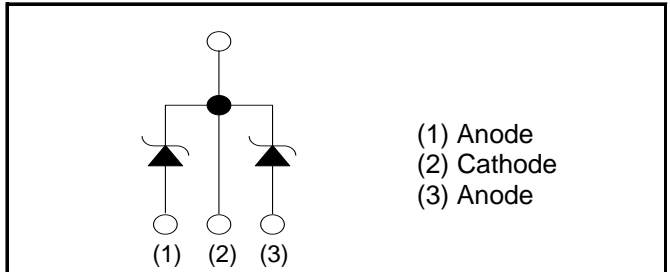
\*1 Tolerances of dimensions and packing specifications slightly differ between TO-247 and TO-247N, which is unlikely to influence compatibility for mounting. Please refer to corresponding specifications of dimensions for more details.

\*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



### ●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)**

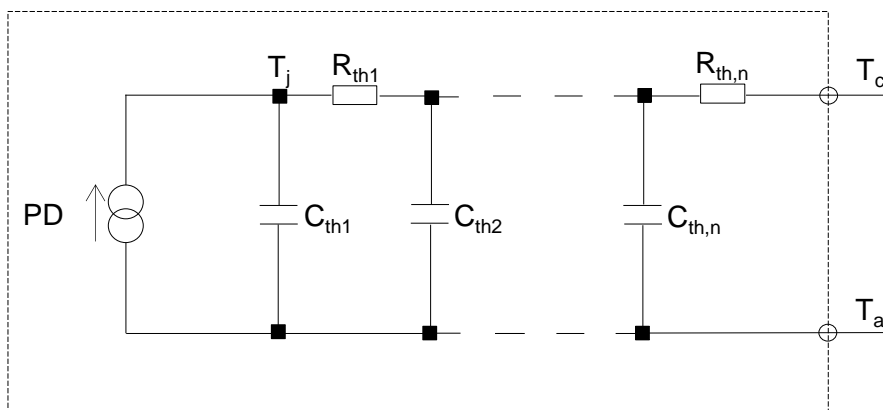
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	$V_{DC}$	$I_R=2.0\text{mA}$	650	-	-	V
Forward voltage	$V_F$	$I_F=10\text{A}, T_j=25^\circ\text{C}$	-	1.35	1.55	V
		$I_F=10\text{A}, T_j=150^\circ\text{C}$	-	1.55	-	V
		$I_F=10\text{A}, T_j=175^\circ\text{C}$	-	1.63	-	V
Reverse current	$I_R$	$V_R=600\text{V}, T_j=25^\circ\text{C}$	-	2	200	$\mu\text{A}$
		$V_R=600\text{V}, T_j=150^\circ\text{C}$	-	30	-	$\mu\text{A}$
		$V_R=600\text{V}, T_j=175^\circ\text{C}$	-	70	-	$\mu\text{A}$
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
$R_{th1}$	$4.16 \times 10^{-1}$	K/W	$C_{th1}$	$1.55 \times 10^{-3}$	Ws/K
$R_{th2}$	$9.92 \times 10^{-1}$		$C_{th2}$	$6.13 \times 10^{-3}$	
$R_{th3}$	$1.93 \times 10^{-1}$		$C_{th3}$	$1.34 \times 10^{-1}$	



●Electrical characteristic curves

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

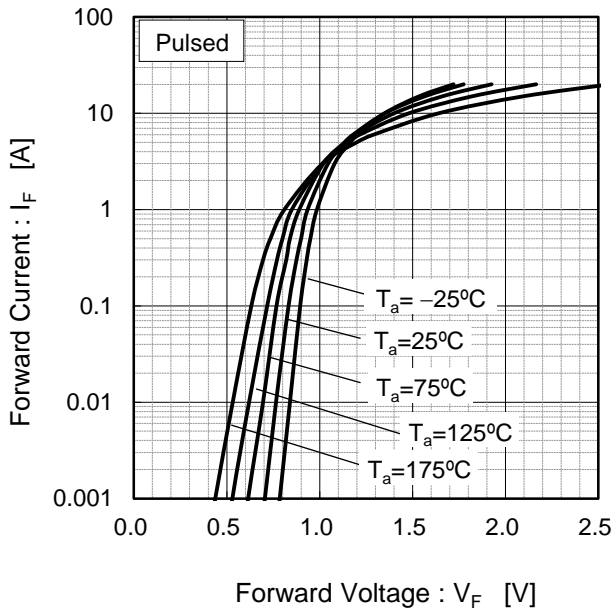


Fig.2  $V_F - I_F$  Characteristics (Per Leg)

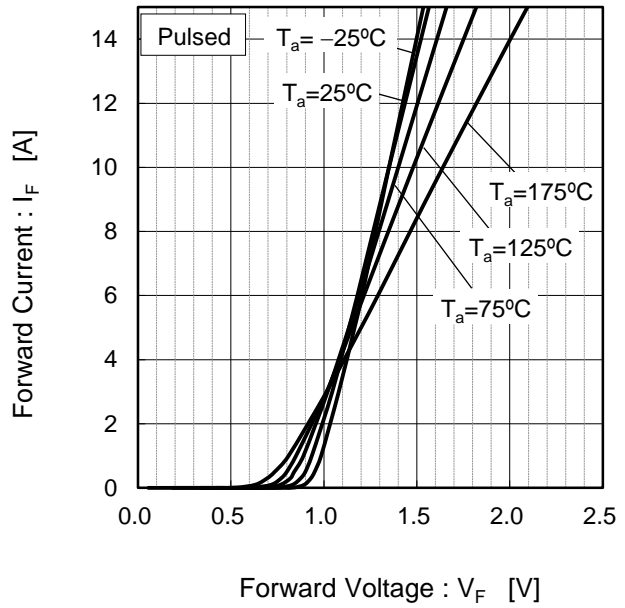


Fig.3  $V_R - I_R$  Characteristics (Per Leg)

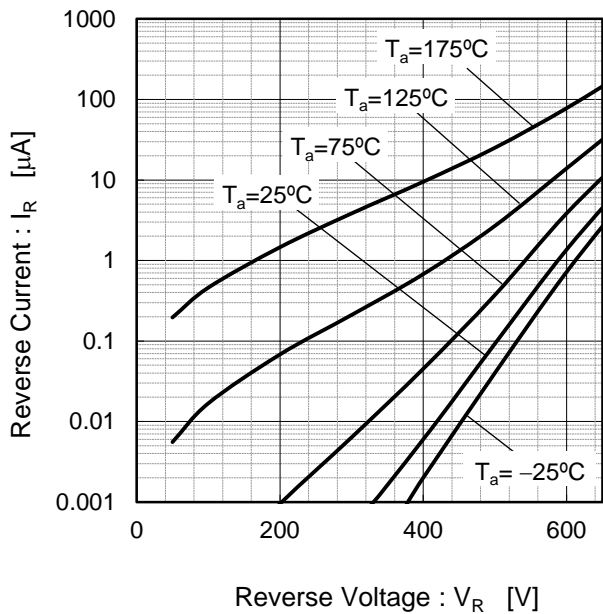
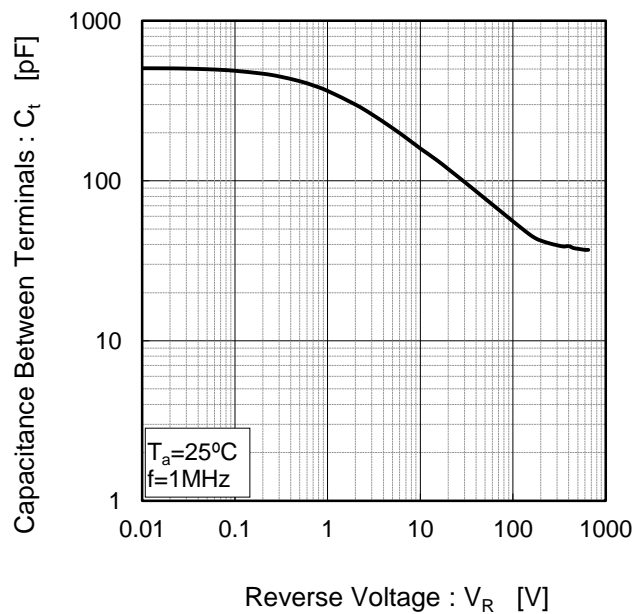


Fig.4  $V_R - C_t$  Characteristics (Per Leg)



●Electrical characteristic curves

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

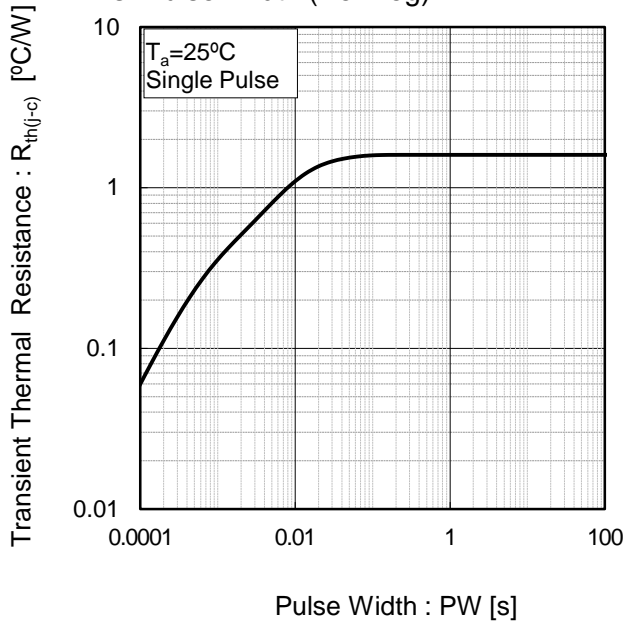


Fig.6 Power Dissipation (Per Leg)

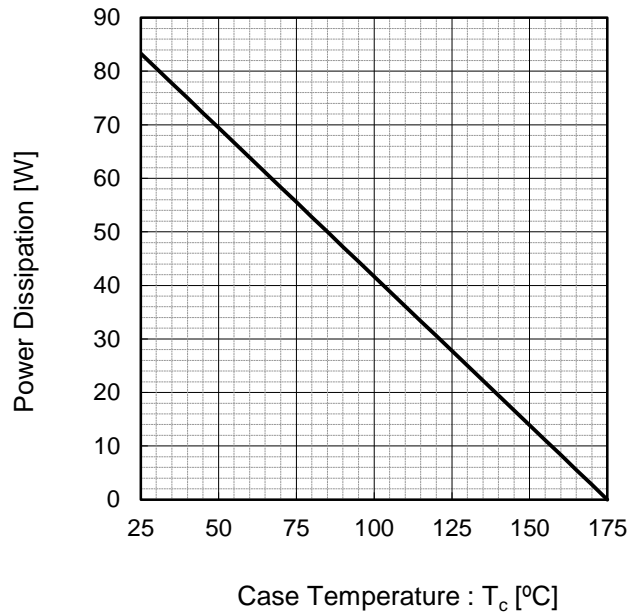
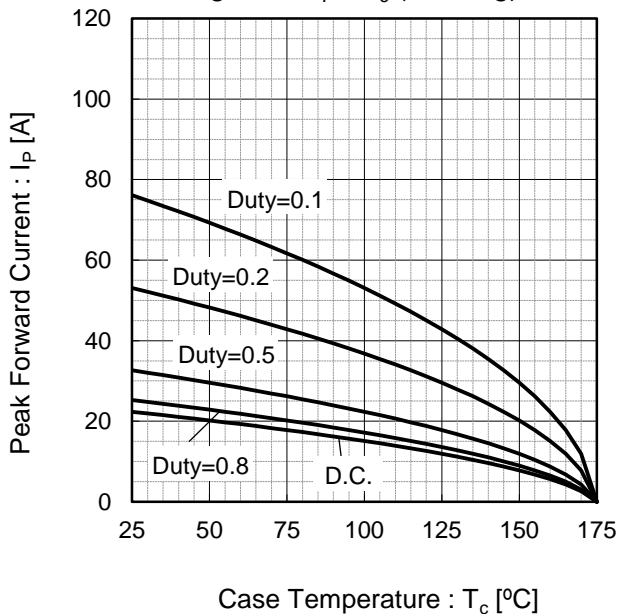
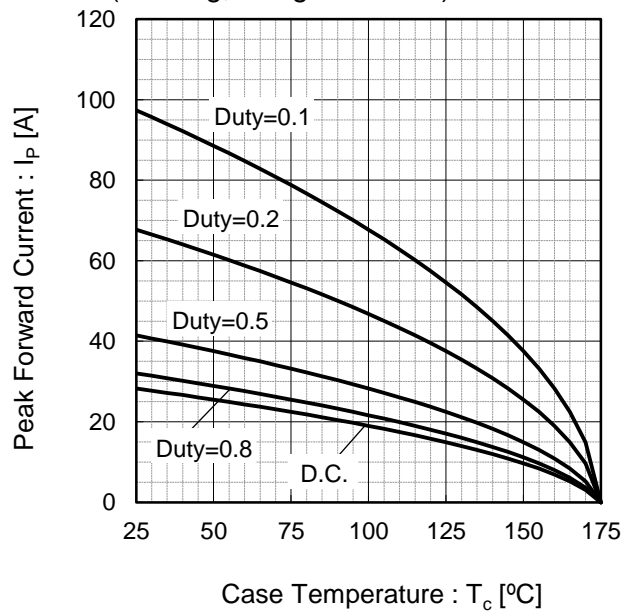


Fig.7\*5 Maximum peak forward current derating curve  $I_P - T_c$  (Per Leg)



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)

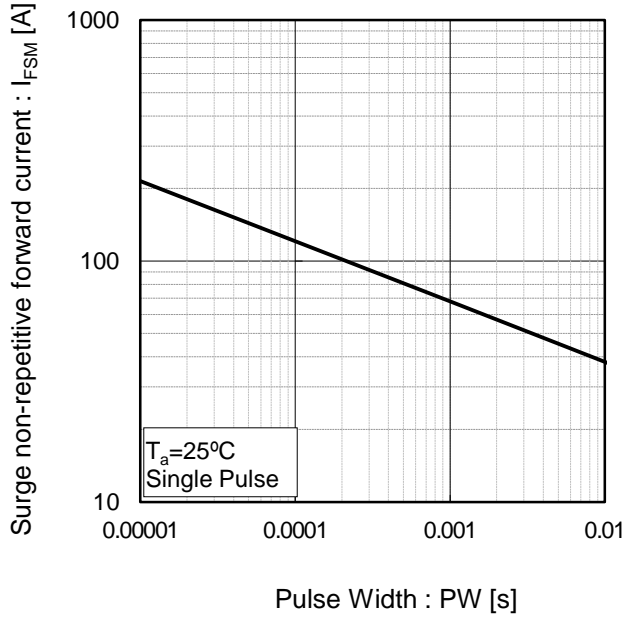
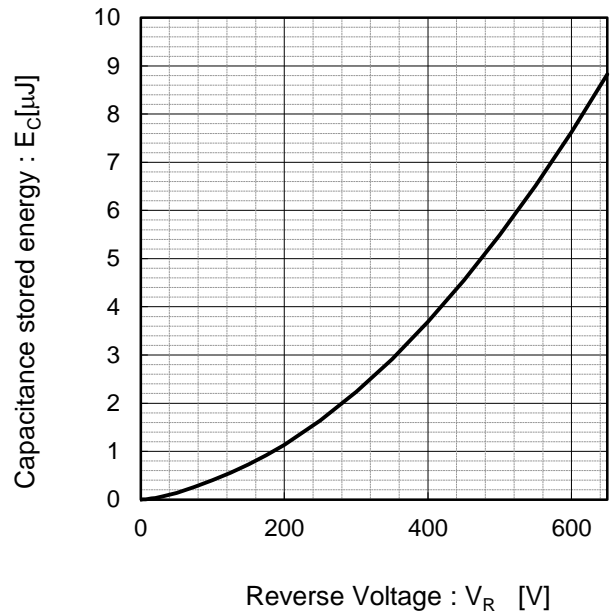
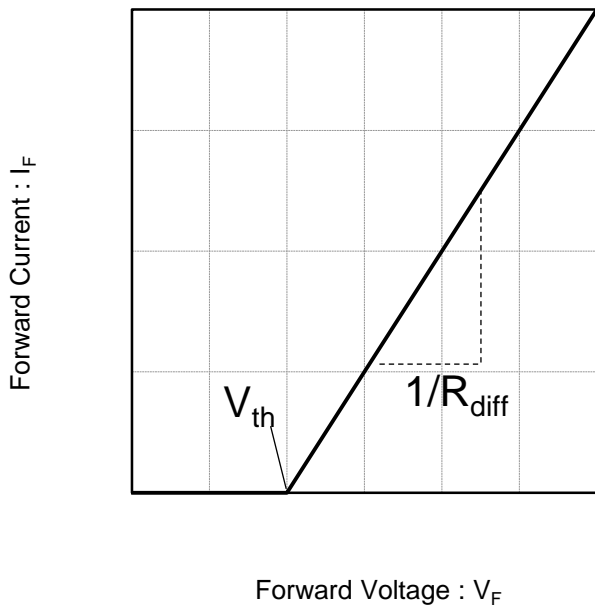


Fig.10 Typical capacitance store energy (Per Leg)



●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 <sub>0</sub>	9.35×10 <sup>-1</sup>	V
a <sub>1</sub>	-1.12×10 <sup>-3</sup>	V/°C
b <sub>0</sub>	3.98×10 <sup>-2</sup>	Ω
b <sub>1</sub>	1.02×10 <sup>-4</sup>	Ω/°C
b <sub>2</sub>	1.08×10 <sup>-6</sup>	Ω/°C <sup>2</sup>

T<sub>j</sub> in °C; -55 °C < T<sub>j</sub> < 175°C ; I<sub>F</sub> < 20 A

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