

V_R	650V
I_F	20A/40A*
Q_C	31nC(Per leg)

(*Per leg/ Both legs)

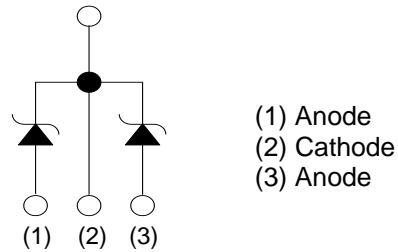
●Outline

TO-247
TO-247N

●Features

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

●Inner circuit



●Applications

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

●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	SCS240AE2	

●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} ($T_c = 129^\circ\text{C}$)	I_F	20/40	A
Surge non-repetitive forward current ^{*4}	I_{FSM}	67/130	A
		53/100	A
		260/520	A
Repetitive peak forward current ^{*4}	I_{FRM}	81/160 ^{*2}	A
i^2t value ^{*4}	$\int i^2 dt$	22/91	A^2s
		14/56	A^2s
Total power dissipation ^{*4}	P_D	130/270 ^{*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

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

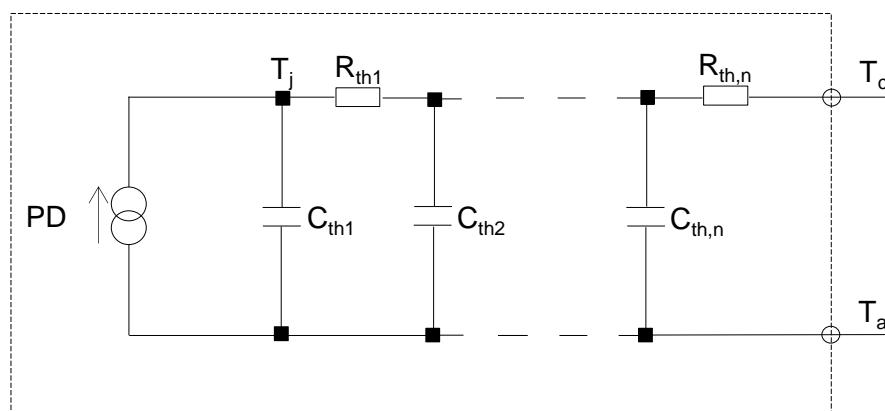
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V_{DC}	$I_R = 4.0\text{mA}$	650	-	-	V
Forward voltage	V_F	$I_F = 20\text{A}, T_j = 25^\circ\text{C}$	-	1.35	1.55	V
		$I_F = 20\text{A}, T_j = 150^\circ\text{C}$	-	1.55	-	V
		$I_F = 20\text{A}, T_j = 175^\circ\text{C}$	-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

●Thermal characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance	$R_{th(j-c)}$	Per Leg	-	0.92	1.1	$^\circ\text{C}/\text{W}$
		Both Legs	-	0.46	0.55	$^\circ\text{C}/\text{W}$

●Typical Transient Thermal Characteristics (Per Leg)

Symbol	Value	Unit	Symbol	Value	Unit
R_{th1}	1.94×10^{-1}	K/W	C_{th1}	3.08×10^{-3}	Ws/K
R_{th2}	7.23×10^{-1}		C_{th2}	8.36×10^{-3}	
R_{th3}	5.52×10^{-3}		C_{th3}	1.03×10^0	



●Electrical characteristic curves

Fig.1 V_F - I_F Characteristics (Per Leg)

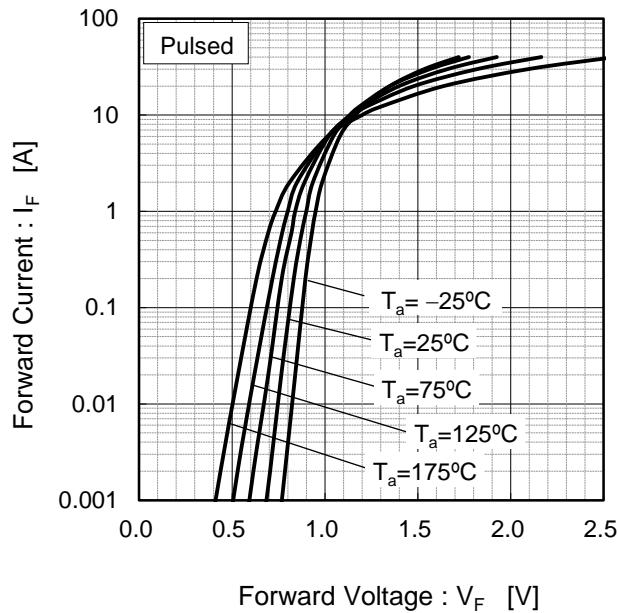


Fig.2 V_F - I_F Characteristics (Per Leg)

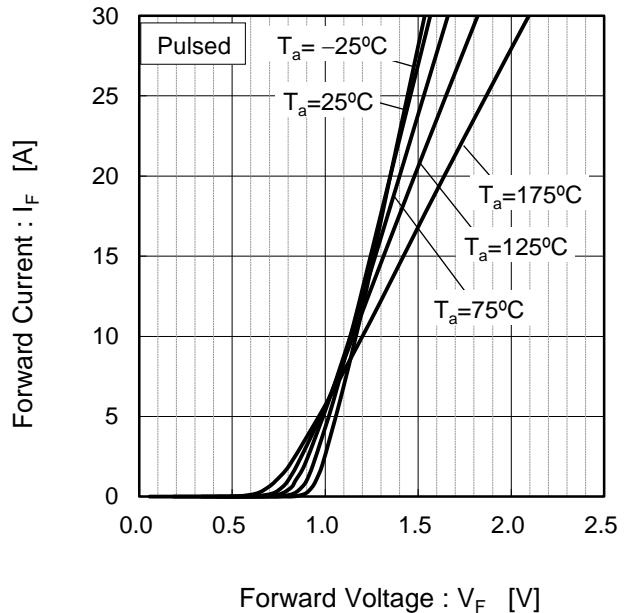


Fig.3 V_R - I_R Characteristics (Per Leg)

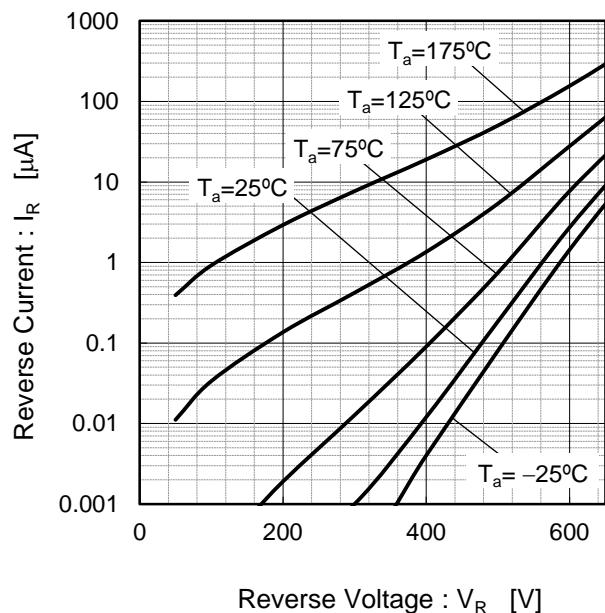
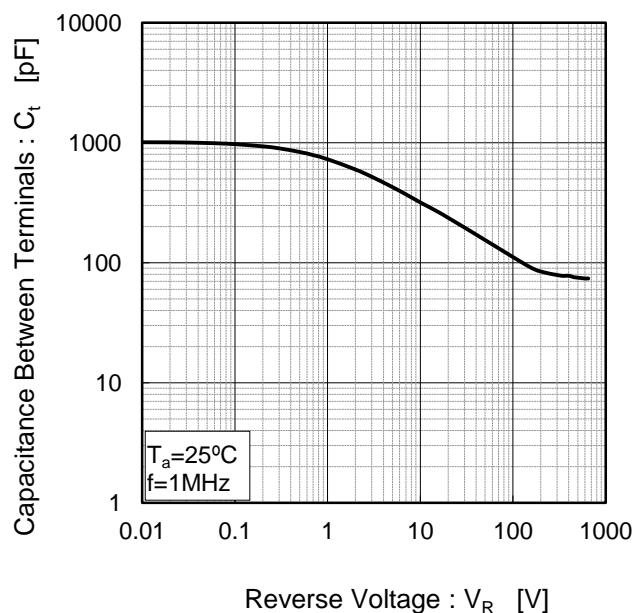


Fig.4 V_R - C_t Characteristics (Per Leg)



●Electrical characteristic curves

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

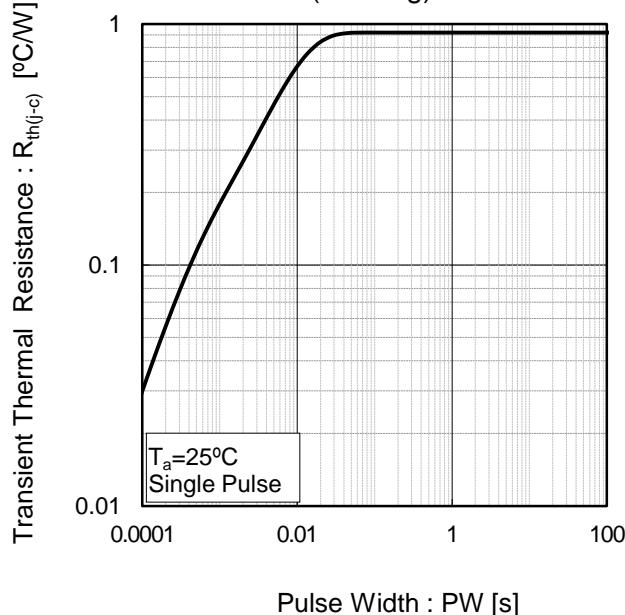


Fig.6 Power Dissipation (Per Leg)

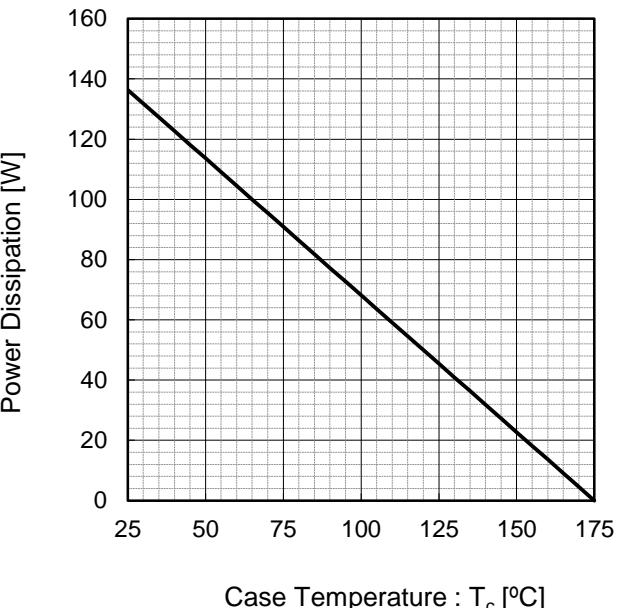
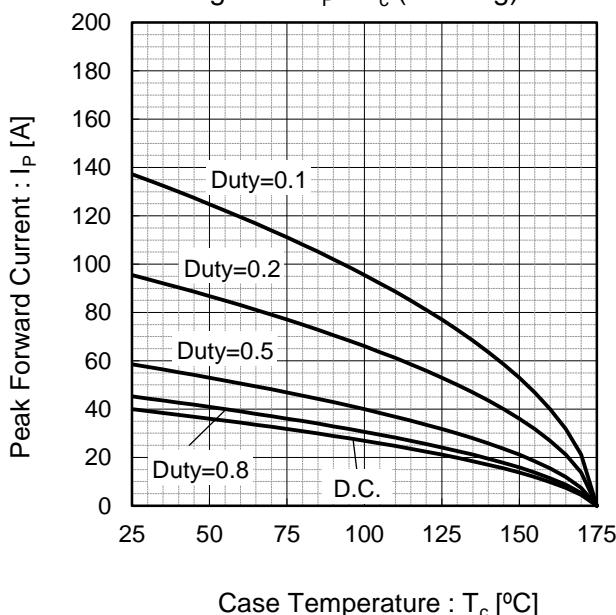
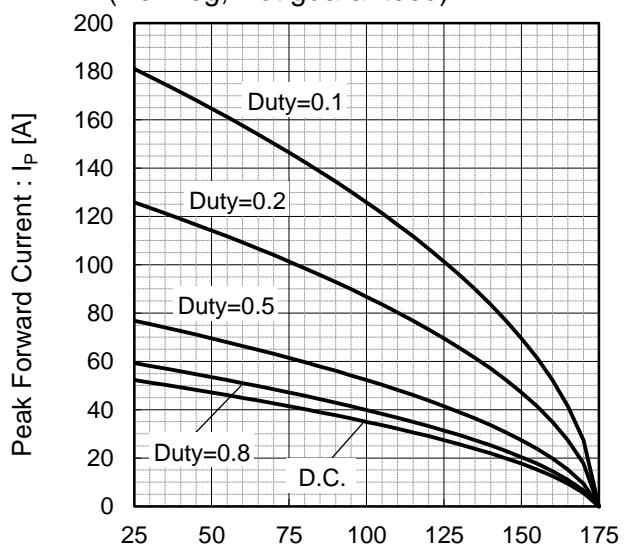


Fig.7*5 Maximum peak forward current derating curve I_P - T_c (Per Leg)



*5 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)



*6 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)

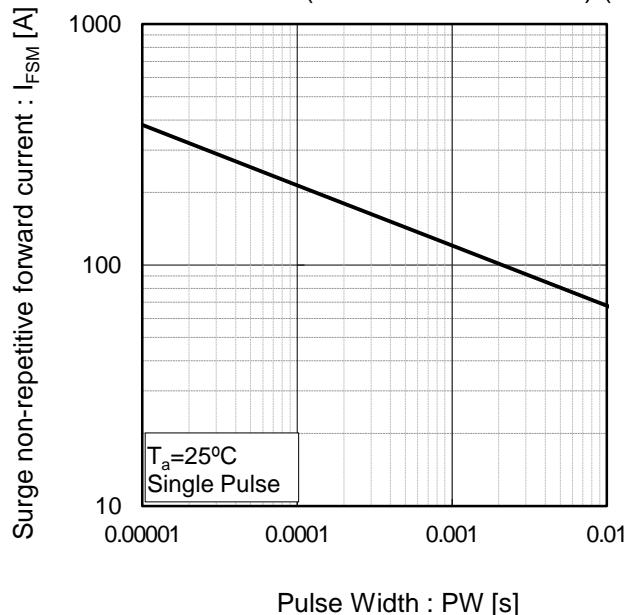
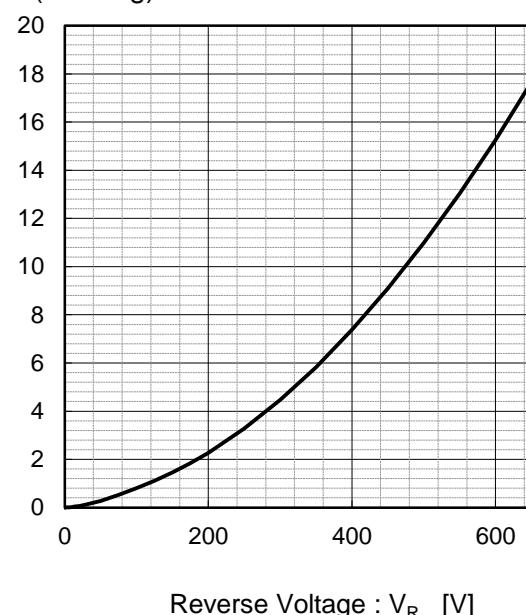
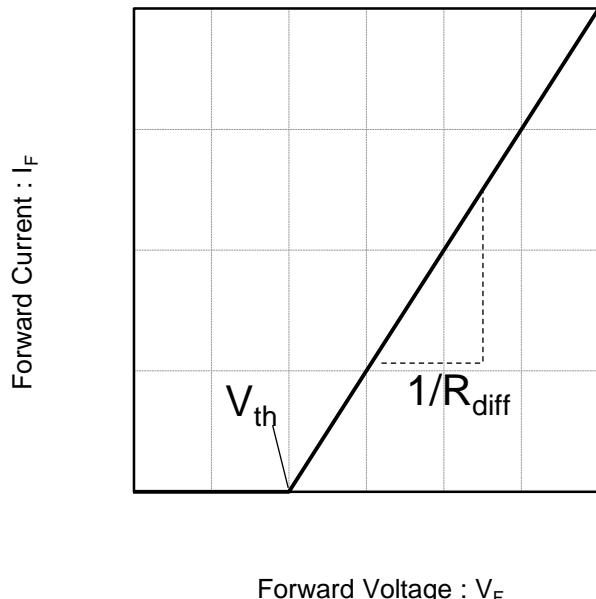


Fig.10 Typical capacitance store energy (Per Leg)



●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	1.99×10^{-2}	Ω
b_1	5.10×10^{-5}	Ω/°C
b_2	5.40×10^{-7}	Ω/°C ²

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

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