

| | |
|-------|---------------|
| V_R | 1200V |
| I_F | 20A/40A* |
| Q_C | 66nC(Per leg) |

(*Per leg/ Both legs)

●Features

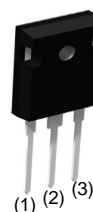
- 1) Low forward voltage
- 2) Negligible recovery time/current
- 3) Temperature independent switching behavior

●Applications

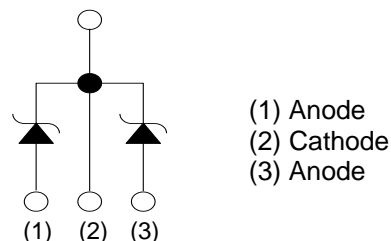
- Switch Mode Power Supply
- Uninterruptible Power Supply
- Solar Inverter
- Motor Drive
- Air Conditioner
- EV Charger

●Outline

TO-247N



●Inner circuit



●Packaging specifications*1

| Package | | TO-247 | TO-247N |
|---------|---------------------------|-----------|---------|
| Type | Packaging | Tube | |
| | Reel size (mm) | - | |
| | Tape width (mm) | - | |
| | Basic ordering unit (pcs) | 30 | |
| | Packing code | C | C11 |
| | Marking | SCS240KE2 | |

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

| Parameter | | Symbol | Value | Unit |
|---|---|---------------|-------------|----------------------|
| Reverse voltage (repetitive peak) | | V_{RM} | 1200 | V |
| Reverse voltage (DC) | | V_R | 1200 | V |
| Continuous forward current *4 ($T_c = 134^\circ\text{C}$) | | I_F | 20/40 | A |
| Surge non-repetitive forward current *3 | PW=10ms sinusoidal, $T_j=25^\circ\text{C}$ | I_{FSM} | 78/150 | A |
| | PW=10ms sinusoidal, $T_j=150^\circ\text{C}$ | | 59/110 | A |
| | PW=10μs square, $T_j=25^\circ\text{C}$ | | 310/620 | A |
| Repetitive peak forward current*4 | | I_{FRM} | 83/160 *2 | A |
| i^2t value*3 | PW=10ms, $T_j=25^\circ\text{C}$ | $\int i^2 dt$ | 31/120 | A^2s |
| | PW=10ms, $T_j=150^\circ\text{C}$ | | 17/69 | A^2s |
| Total power dissipation *4 | | P_D | 210/420*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)

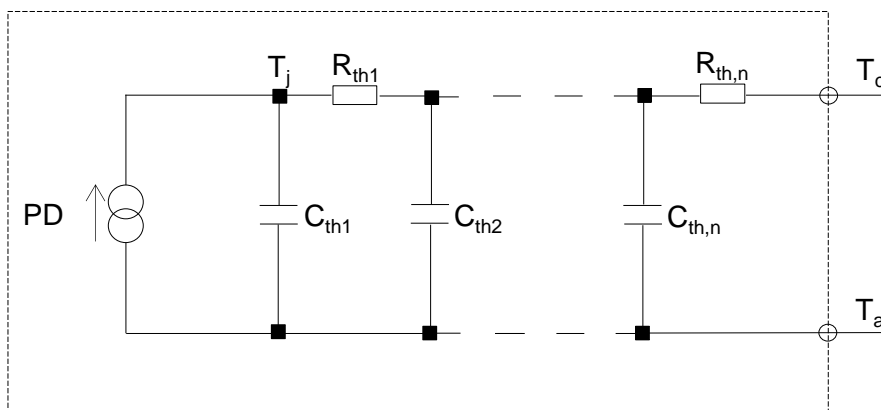
| Parameter | Symbol | Conditions | Values | | | Unit |
|-------------------------|----------|--|--------|------|------|---------------|
| | | | Min. | Typ. | Max. | |
| DC blocking voltage | V_{DC} | $I_R = 0.4\text{mA}$ | 1200 | - | - | V |
| Forward voltage | V_F | $I_F = 20\text{A}, T_j = 25^\circ\text{C}$ | - | 1.4 | 1.6 | V |
| | | $I_F = 20\text{A}, T_j = 150^\circ\text{C}$ | - | 1.8 | - | V |
| | | $I_F = 20\text{A}, T_j = 175^\circ\text{C}$ | - | 1.9 | - | V |
| Reverse current | I_R | $V_R = 1200\text{V}, T_j = 25^\circ\text{C}$ | - | 20 | 400 | μA |
| | | $V_R = 1200\text{V}, T_j = 150^\circ\text{C}$ | - | 160 | - | μA |
| | | $V_R = 1200\text{V}, T_j = 175^\circ\text{C}$ | - | 260 | - | μA |
| Total capacitance | C | $V_R = 1\text{V}, f = 1\text{MHz}$ | - | 1050 | - | pF |
| | | $V_R = 600\text{V}, f = 1\text{MHz}$ | - | 85 | - | pF |
| Total capacitive charge | Q_C | $V_R = 800\text{V}, di/dt = 500\text{A}/\mu\text{s}$ | - | 66 | - | nC |
| Switching time | t_C | $V_R = 800\text{V}, di/dt = 500\text{A}/\mu\text{s}$ | - | 18 | - | ns |

●Thermal characteristics

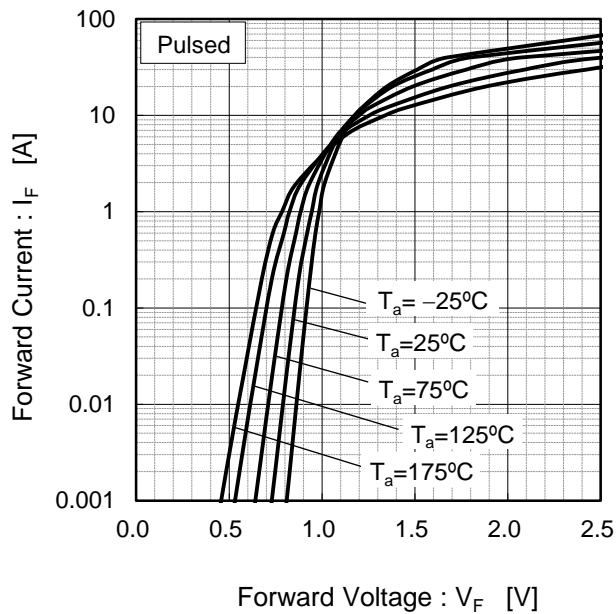
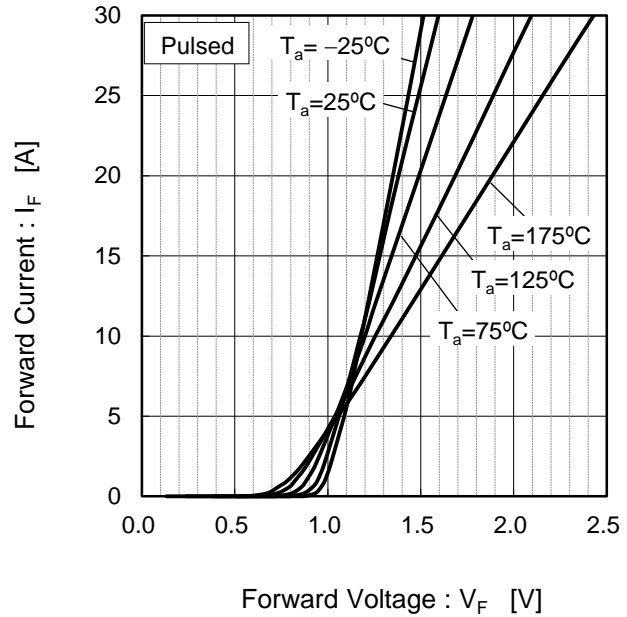
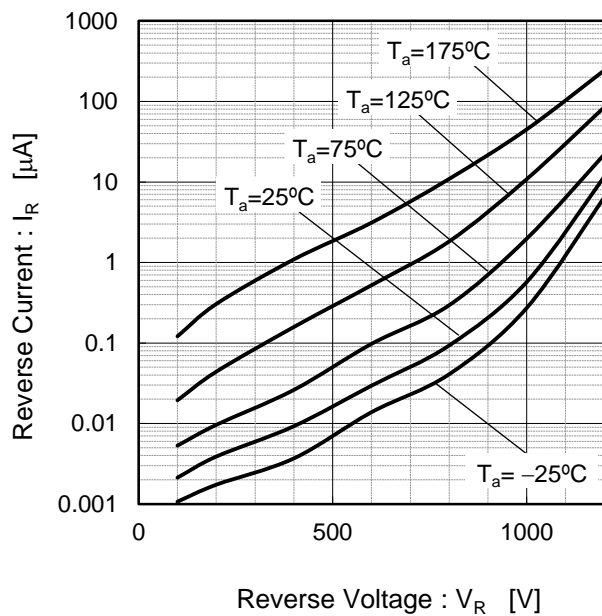
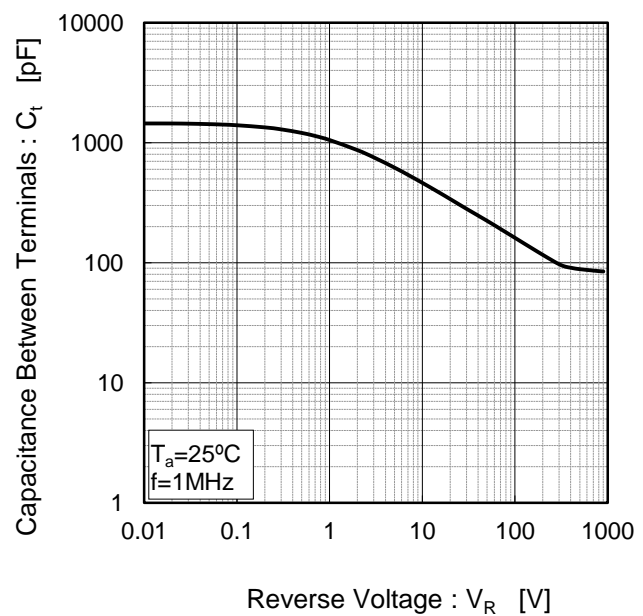
| Parameter | Symbol | Conditions | Values | | | Unit |
|--------------------|---------------|------------|--------|------|------|---------------------------|
| | | | Min. | Typ. | Max. | |
| Thermal resistance | $R_{th(j-c)}$ | Per Leg | - | 0.56 | 0.70 | $^\circ\text{C}/\text{W}$ |
| | | Both Legs | - | 0.28 | 0.35 | $^\circ\text{C}/\text{W}$ |

●Typical Transient Thermal Characteristics (Per Leg)

| Symbol | Value | Unit | Symbol | Value | Unit |
|-----------|-----------------------|------|-----------|-----------------------|------|
| R_{th1} | 1.57×10^{-1} | K/W | C_{th1} | 5.03×10^{-3} | Ws/K |
| R_{th2} | 2.46×10^{-1} | | C_{th2} | 6.74×10^{-3} | |
| R_{th3} | 1.57×10^{-1} | | C_{th3} | 6.11×10^{-2} | |



●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)

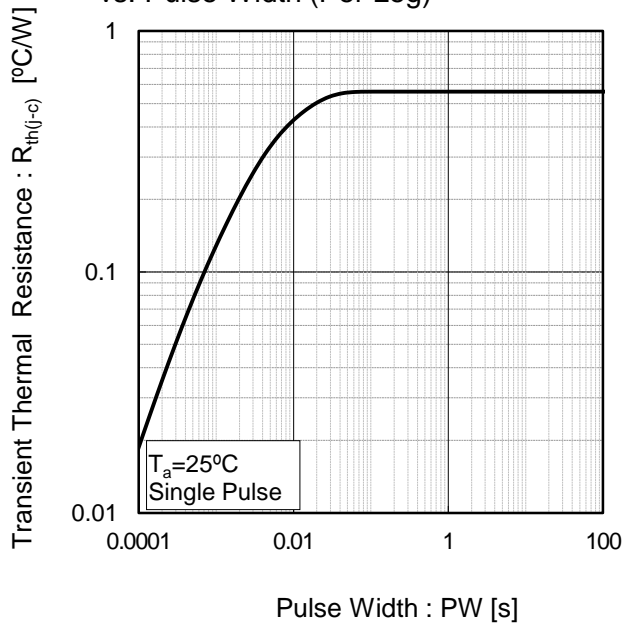


Fig.6 Power Dissipation (Per Leg)

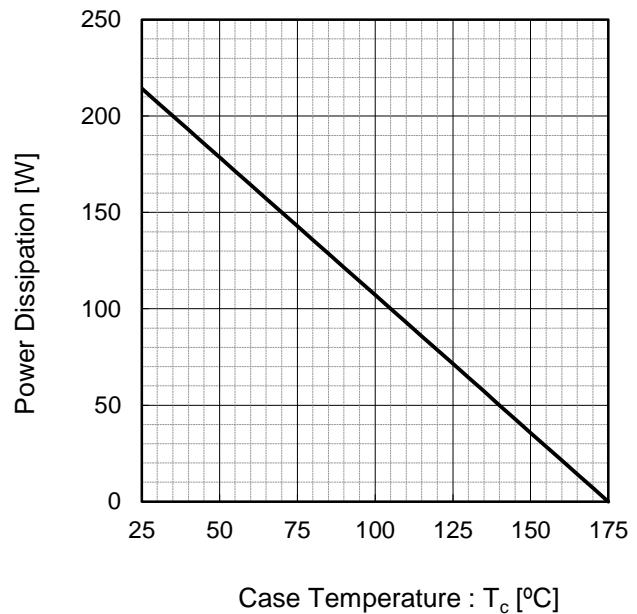
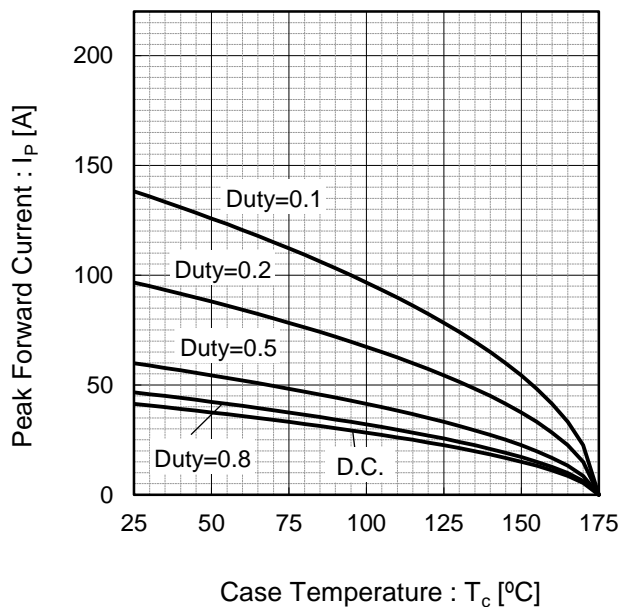
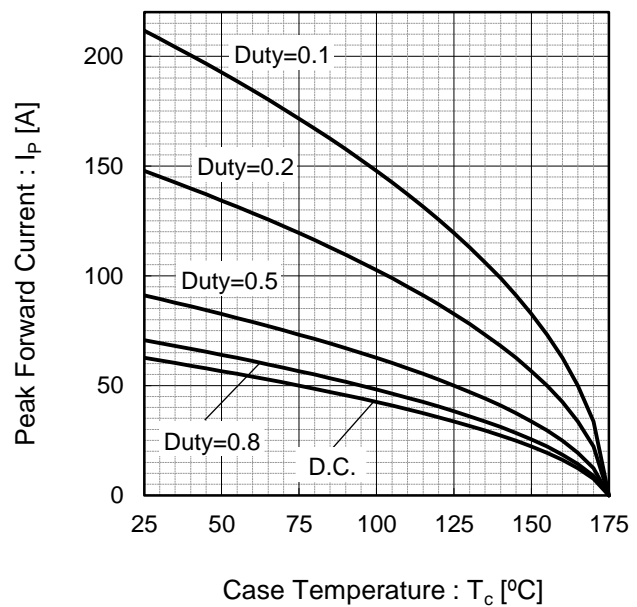


Fig.7*4 Maximum peak forward current derating curve $I_P - T_c$ (Per Leg)



Case Temperature : T_c [°C]
 *4 Based on max V_f , max $R_{th(j-c)}$
 Valid for switching of above 10kHz,
 excluding D.C. curve.

Fig.8*5 Typical peak forward current derating curve $I_P - T_c$ (Per Leg, Not guaranteed)



Case Temperature : T_c [°C]
 *5 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)

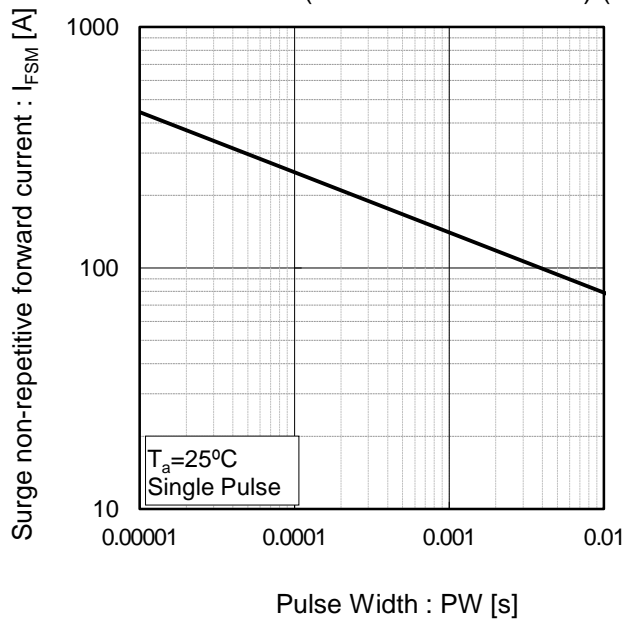
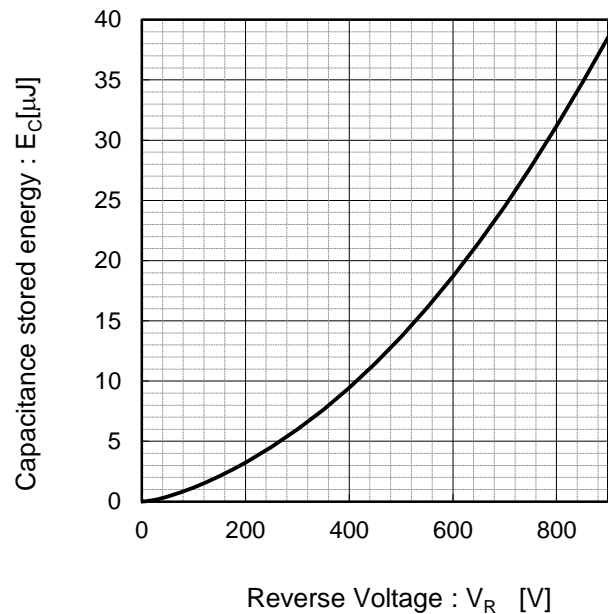
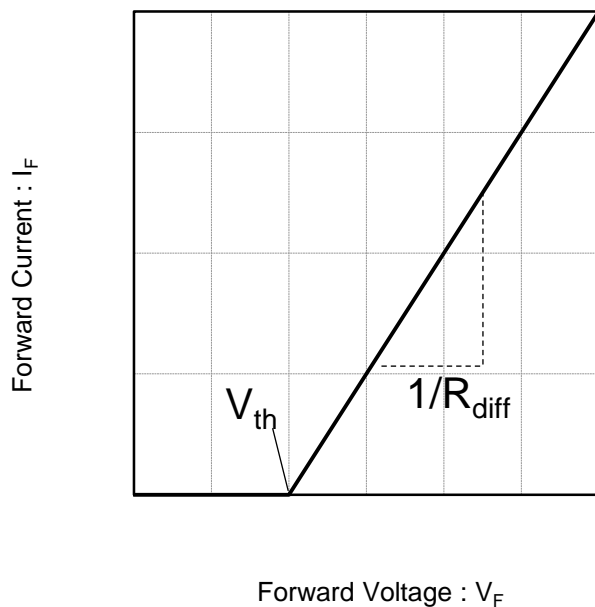


Fig.10 Typical capacitance store energy (Per Leg)



●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 | 9.93×10^{-1} | V |
| a_1 | -1.27×10^{-3} | V/°C |
| b_0 | 1.83×10^{-2} | Ω |
| b_1 | 1.03×10^{-4} | Ω/°C |
| b_2 | 6.65×10^{-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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