

| | |
|-------|------|
| V_R | 650V |
| I_F | 4A |
| Q_C | 11nC |

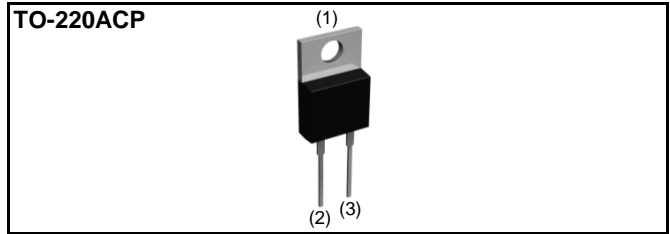
●Features

- 1) Shorter recovery time
- 2) Reduced temperature dependence
- 3) High-speed switching possible
- 4) High surge current capability

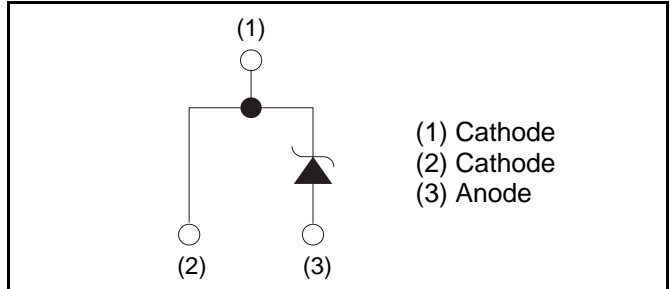
●Construction

Silicon carbide epitaxial planar type

●Outline



●Inner circuit



●Packaging specifications

| Type | Packaging | Tube |
|------|---------------------------|----------|
| | Reel size (mm) | - |
| | Tape width (mm) | - |
| | Basic ordering unit (pcs) | 50 |
| | Packing code | C9 |
| | Marking | SCS304AP |

●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 ($T_c = 140^\circ\text{C}$) | I_F | 4 | A | |
| Surge non-repetitive forward current | I_{FSM} | PW=10ms sinusoidal, $T_j=25^\circ\text{C}$ | 27 | A |
| | | PW=10ms sinusoidal, $T_j=150^\circ\text{C}$ | 22 | A |
| | | PW=10 μs square, $T_j=25^\circ\text{C}$ | 100 | A |
| Repetitive peak forward current | I_{FRM} | 20 ^{*1} | A | |
| i^2t value | $\int i^2 dt$ | $1 \leq PW \leq 10\text{ms}$, $T_j=25^\circ\text{C}$ | 3.6 | A ² s |
| | | $1 \leq PW \leq 10\text{ms}$, $T_j=150^\circ\text{C}$ | 2.4 | A ² s |
| Total power dissipation | P_D | 34 ^{*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°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---------------------------------|------------------|---|--------|-------|------|------|
| | | | Min. | Typ. | Max. | |
| DC blocking voltage | V _{DC} | I _R =20μA | 650 | - | - | V |
| Forward voltage | V _F | I _F =4A, T _j =25°C | - | 1.35 | 1.50 | V |
| | | I _F =4A, T _j =150°C | - | 1.44 | 1.71 | V |
| | | I _F =4A, T _j =175°C | - | 1.50 | - | V |
| Reverse current | I _R | V _R =650V, T _j =25°C | - | 0.012 | 20 | μA |
| | | V _R =650V, T _j =150°C | - | 0.8 | 80 | μA |
| | | V _R =650V, T _j =175°C | - | 2.4 | - | μA |
| Total capacitance | C | V _R =1V, f=1MHz | - | 200 | - | pF |
| | | V _R =650V, f=1MHz | - | 18 | - | pF |
| Total capacitive charge | Q _C | V _R =400V, di/dt=350A/μs | - | 11 | - | nC |
| Switching time | t _C | V _R =400V, di/dt=350A/μs | - | 14 | - | ns |
| Non-repetitive Avaranche Energy | E _{ava} | L=1mH | - | 48 | - | mJ |

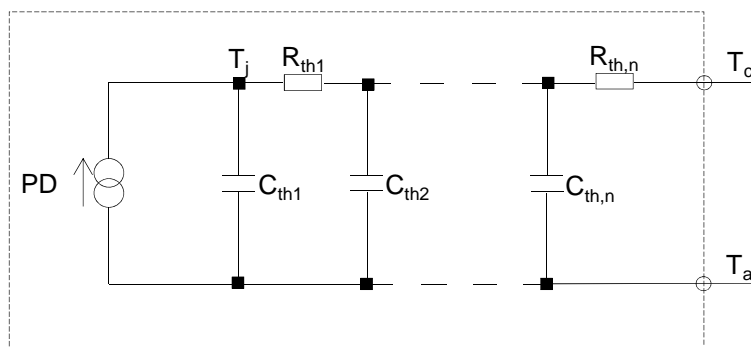
●Thermal characteristics

| Parameter | Symbol | Conditions | Values | | | Unit |
|--------------------|----------------------|------------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Thermal resistance | R _{th(j-c)} | - | - | 3.0 | 4.4 | °C/W |

●Typical Transient Thermal Characteristics

| Symbol | Value | Unit |
|------------------|----------|------|
| R _{th1} | 3.91E-02 | K/W |
| R _{th2} | 3.76E-01 | |
| R _{th3} | 2.54E+00 | |

| Symbol | Value | Unit |
|------------------|----------|------|
| C _{th1} | 1.01E-04 | Ws/K |
| C _{th2} | 4.02E-04 | |
| C _{th3} | 1.19E-03 | |



●Electrical characteristic curves

Fig.1 $V_F - I_F$ Characteristics

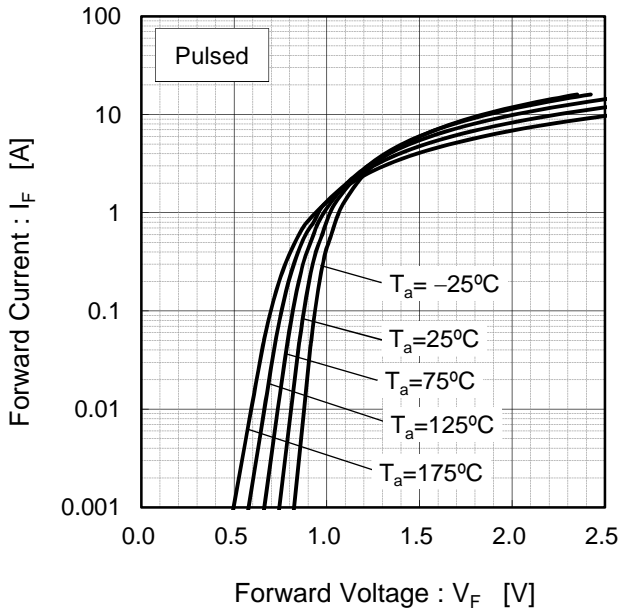


Fig.2 $V_F - I_F$ Characteristics

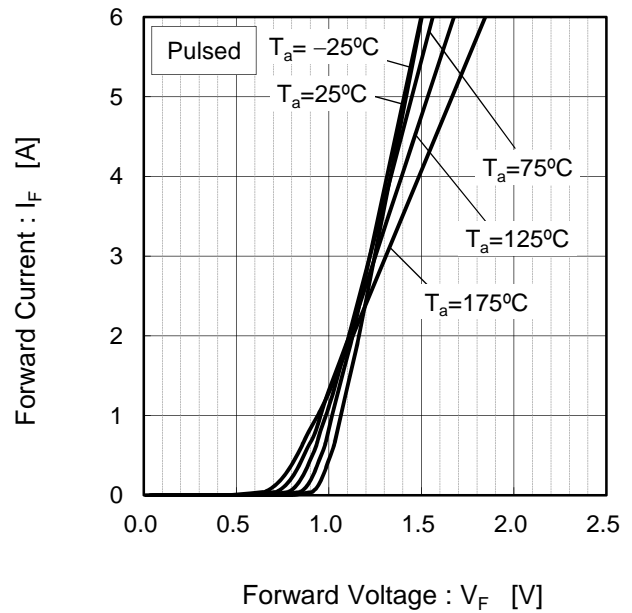


Fig.3 $V_R - I_R$ Characteristics

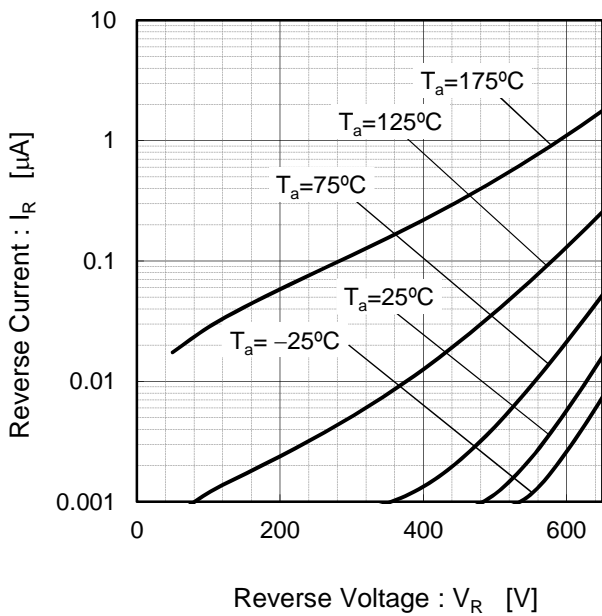
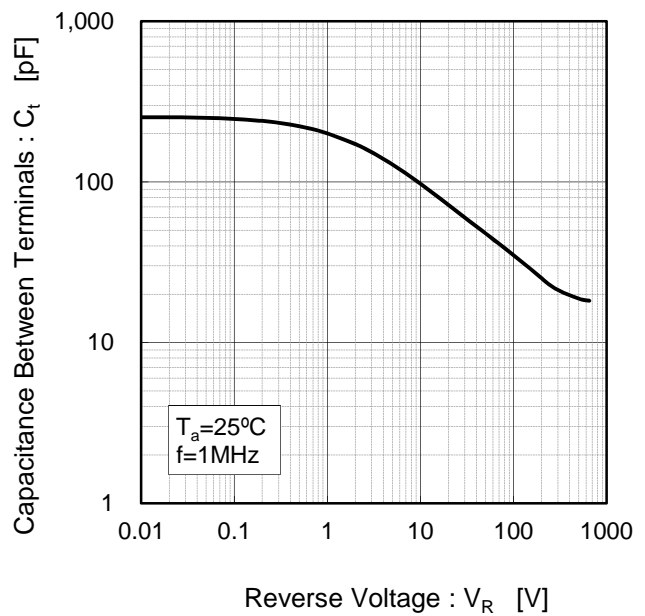


Fig.4 $V_R - C_t$ Characteristics



●Electrical characteristic curves

Fig.5 Typical Transient Thermal Resistance vs. Pulse Width

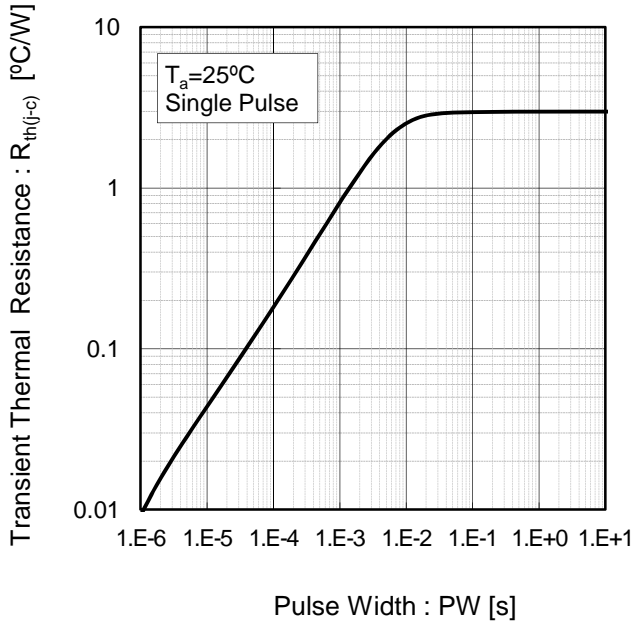


Fig.6 Power Dissipation

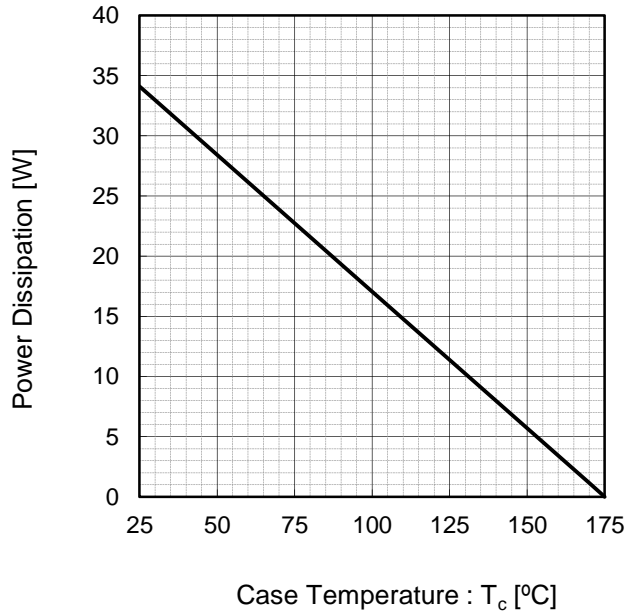
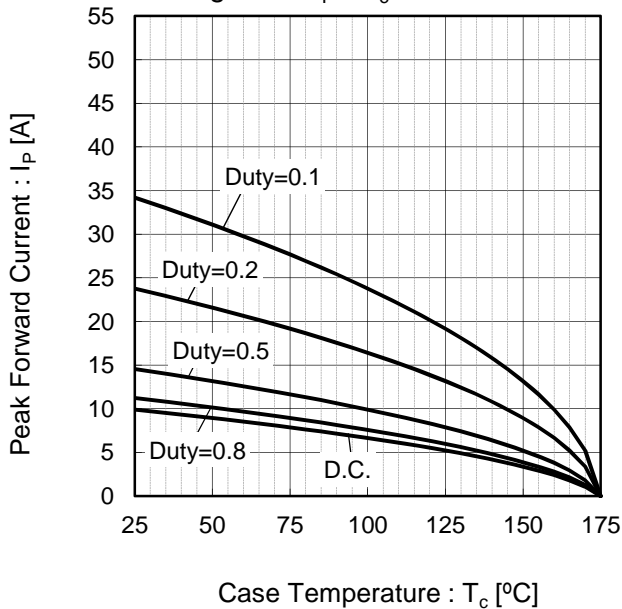
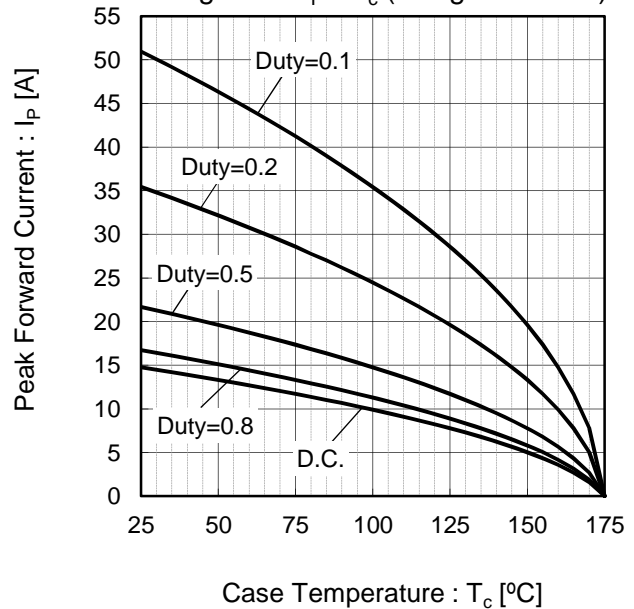


Fig.7*3 Maximum peak forward current derating curve $I_P - T_c$



*3 Based on max Vf, 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)



*4 Based on typ Vf, 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)

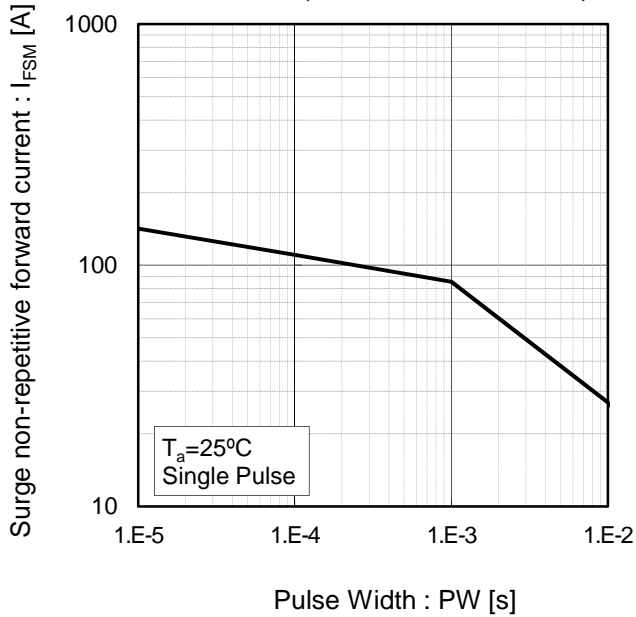
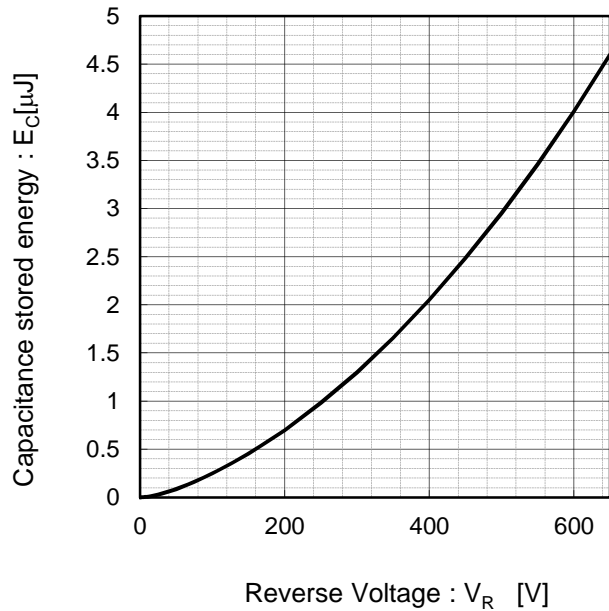
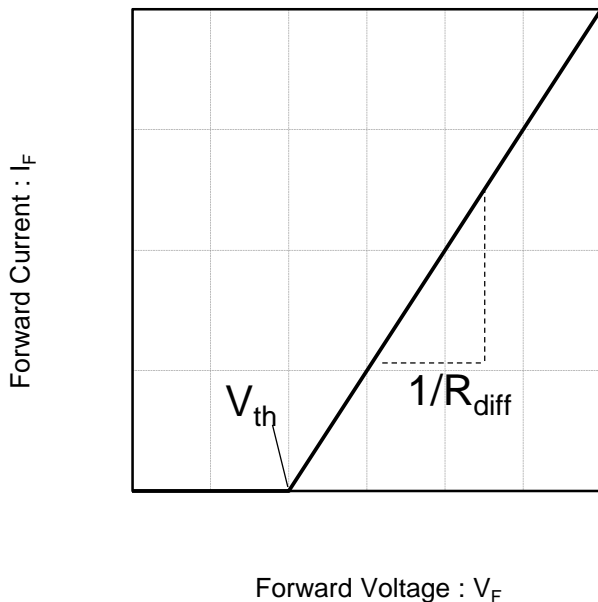


Fig.10 Typical capacitance store energy



●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 | 9.66E-01 | V |
| a ₁ | -1.10E-0.3 | V/°C |
| b ₀ | 8.80E-02 | Ω |
| b ₁ | 1.87E-04 | Ω/°C |
| b ₂ | 1.92E-06 | Ω/°C ² |

T_j in °C; -55 °C < T_j < 175 °C ; I_F < 8 A

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