Datasheet

SiC Schottky Barrier Diode

| V_R | 650V |
|----------------|---------------|
| I _F | 20A/40A* |
| Q_{C} | 31nC(Per leg) |

(*Per leg/ Both legs)

Features

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

Applications

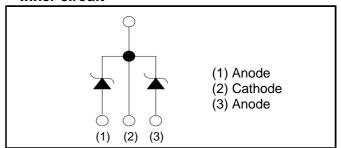
- Switch Mode Power Supply
- Uninterruptible Power Supply
- Solar Inverter
- Motor Drive
- Air Conditioner
- EV Charger

● Absolute maximum ratings (T_{vi} = 25°C)

TO-247N

•Inner circuit

Outline



Packaging specifications

| or dokaging opeomodions | | | | |
|-------------------------|---------------------------|-----------|--|--|
| Package | | TO-247N | | |
| | Packing | Tube | | |
| | Reel size (mm) | - | | |
| Туре | Tape width (mm) | - | | |
| . , , , | Basic ordering unit (pcs) | 30 | | |
| | Packing code | C11 | | |
| | Marking | SCS240AE2 | | |

| Parameter | | Symbol | Value | Unit |
|--|--|---------------------|----------------------|------------------|
| Reverse voltage (repetitive peak) | | V_{RM} | 650 | V |
| Reverse voltage (DC) | | V_R | 650 | V |
| Continuous forward current *3 (T _c = 129°C) | | I _F | 20/40 | Α |
| Surge non- | PW=10ms sinusoidal, T _{vj} =25°C | | 67/130 | Α |
| repetitive forward current *3 | PW=10ms sinusoidal, T _{vj} =150°C | I _{FSM} | 53/100 | Α |
| | PW=10μs square, T _{vj} =25°C | | 260/520 | Α |
| Repetitive peak forward current*3 | | I _{FRM} | 81/160* ¹ | Α |
| PW=10ms, T _{vj} =25°C | | ſ.2 | 22/91 | A ² s |
| i ² t value⁴³ | PW=10ms, T _{vj} =150°C | ∫ i ² dt | 14/56 | A ² s |
| Total power dissipation *3 | | P _D | 130/270*2 | W |
| Virtual Junction temperature | | T_{vj} | 175 | °C |
| Range of storage temperature | | T _{stg} | -55 to +175 | °C |

^{*1} T_c=100°C, T_{vi}=150°C, Duty cycle=10% *2 T_c=25°C *3 Per leg/ Both legs

•Electrical characteristics ($T_{vj} = 25$ °C) (Per Leg)

| Parameter | Symbol | Conditions | Values | | | Unit |
|-------------------------|----------------|---|--------|------|------|------|
| | | | Min. | Тур. | Max. | Unit |
| DC blocking voltage | V_{DC} | I _R =4.0mA | 650 | - | - | V |
| | V _F | I _F =20A,T _{vj} =25°C | - | 1.35 | 1.55 | V |
| Forward voltage | | I _F =20A,T _{vj} =150°C | - | 1.55 | - | V |
| | | I _F =20A,T _{vj} =175°C | - | 1.63 | - | V |
| Reverse current | I _R | V _R =600V,T _{vj} =25°C | - | 4 | 400 | μΑ |
| | | V _R =600V,T _{vj} =150°C | - | 60 | - | μΑ |
| | | V _R =600V,T _{vj} =175°C | - | 140 | - | μΑ |
| Total capacitance | С | V _R =1V,f=1MHz | - | 730 | - | pF |
| | | V _R =600V,f=1MHz | - | 74 | - | pF |
| Total capacitive charge | Q _C | V _R =400V,di/dt=350A/μs | - | 31 | - | nC |
| Switching time | t _C | V _R =400V,di/dt=350A/μs | - | 19 | - | ns |

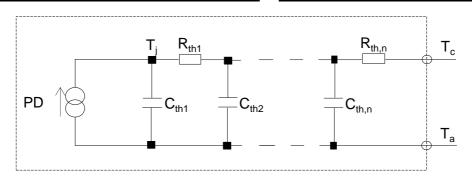
Thermal characteristics

| Parameter | Symbol | Conditions | Values | | | Unit |
|--------------------|------------|------------|--------|------|------|-------|
| | | | Min. | Тур. | Max. | Offic |
| Thermal resistance | R_{thJC} | Per Leg | - | 0.92 | 1.1 | K/W |
| | | Both Legs | - | 0.46 | 0.55 | K/W |

●Typical Transient Thermal Characteristics (Per Leg)

| Symbol | Value | Unit |
|------------------|-----------------------|------|
| R _{th1} | 1.94×10 ⁻¹ | |
| R _{th2} | 7.23×10 ⁻¹ | K/W |
| R _{th3} | 5.52×10 ⁻³ | |

| Symbol | Value | Unit |
|------------------|-----------------------|------|
| C _{th1} | 3.08×10 ⁻³ | |
| C _{th2} | 8.36×10 ⁻³ | Ws/K |
| C _{th3} | 1.03×10 ⁰ | |



2/8

•Electrical characteristic curves

Fig.1 V_F - I_F Characteristics (Per Leg)

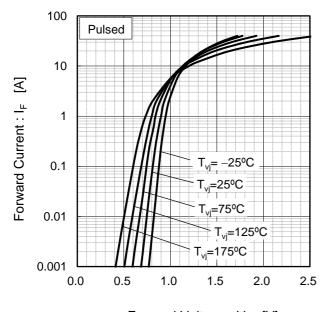
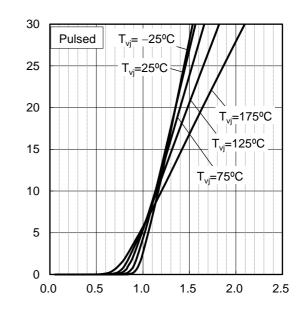


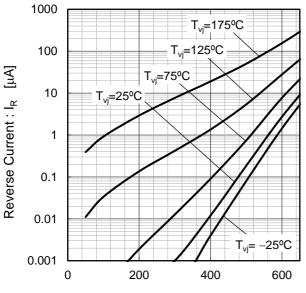
Fig.2 V_F - I_F Characteristics (Per Leg)



Forward Voltage : V_F [V]

Forward Voltage : V_F [V]

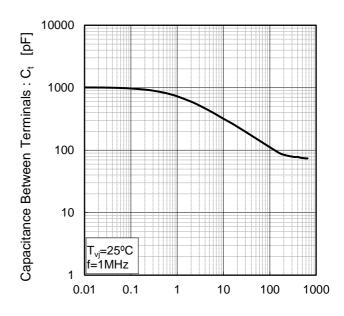
Fig.3 V_R - I_R Characteristics (Per Leg)



Reverse Voltage: V_R [V]

Forward Current : I_F

Fig.4 V_R - C_t Characteristics (Per Leg)



Reverse Voltage: V_R [V]

TSQ50215-SCS240AE2

6.May.2022 - Rev.002

SCS240AE2 Datasheet

•Electrical characteristic curves

1.E-4

1.E-3

vs. Pulse Width (Per Leg)

1

O.1

T_c=25°C
Single Pulse

O.01

1.E-2

Fig.5 Typical Transient Thermal Impedance

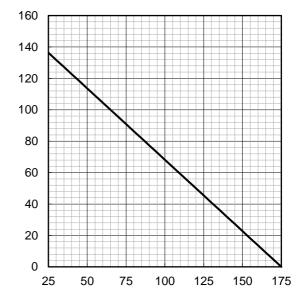
Pulse Width: PW [s]

1.E-1

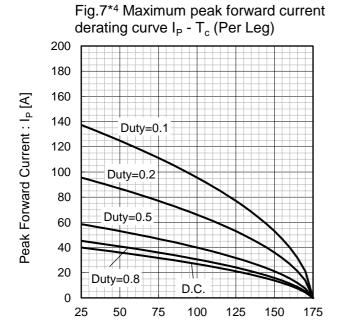
1.E+0

1.E+1

Fig.6 Power Dissipation (Per Leg)

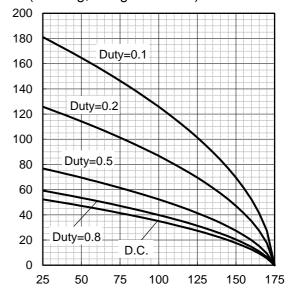


Case Temperature : T_c [°C]



Case Temperature : T_c [°C] *4 Based on max Vf, max R_{thJC} 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)

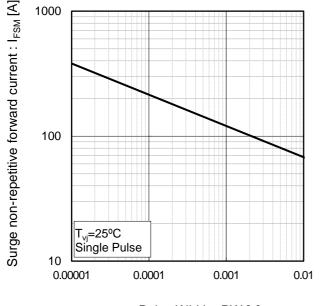


Case Temperature : T_c [°C] *5 Based on typ Vf, typ R_{thJC} Typical value, not guaranteed Valid for switching of above 10kHz, excluding D.C. curve

Peak Forward Current : Ip [A]

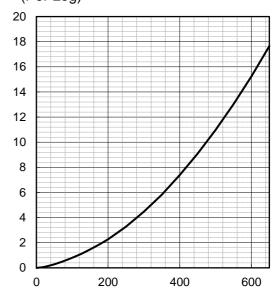
•Electrical characteristic curves

Fig.9 Surge non-repetitive forward current vs. Pulse width (Sinusoidal waveform) (Per Leg)



Pulse Width: PW [s]

Fig.10 Typical capacitance store energy (Per Leg)

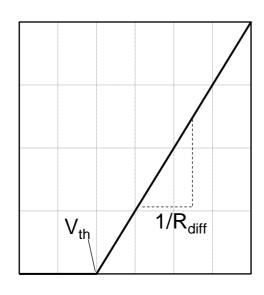


Capacitance stored energy : E_C[μJ]

Reverse Voltage : V_R [V]

Symplified forward characteristic model (Per Leg)

Fig.11 Equivalent forward current curve



Forward Voltage: V_F

$$V_F = V_{th} + R_{diff} I_F$$

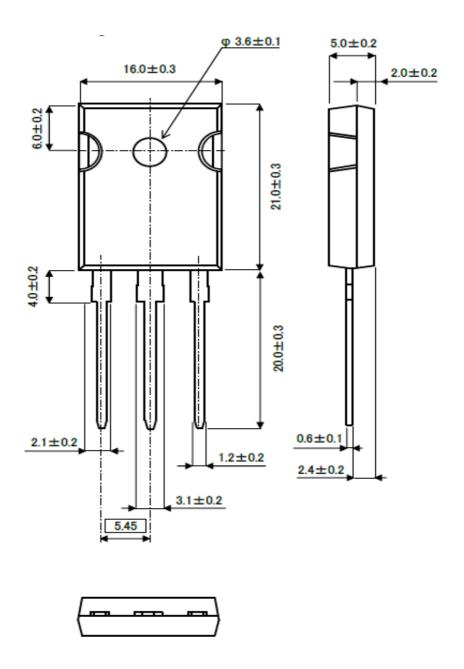
$$\begin{aligned} &V_{th} \left(\ T_{vj} \ \right) = a_0 + a_1 \ T_{vj} \\ &R_{diff} \left(\ T_{vj} \ \right) = b_0 + b_1 \ T_{vj} + b_2 \ T_{vj}^{\ 2} \end{aligned}$$

| 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 |

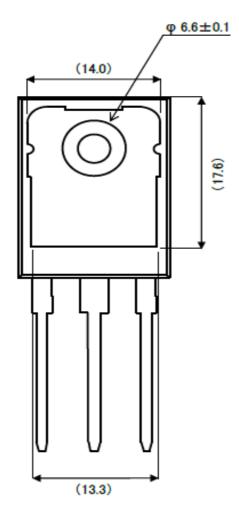
 T_{vj} in °C; -55 °C < T_{vj} < 175 °C; I_F < 40 A

Forward Current: IF

Package Dimensions

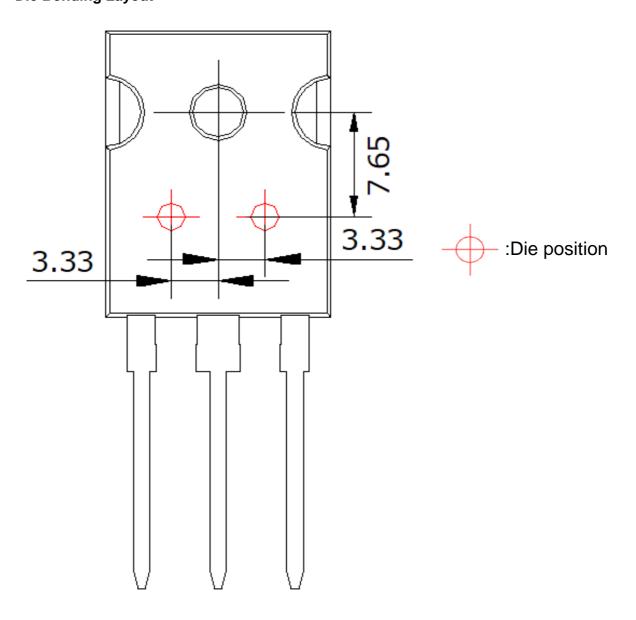


Unit: mm



Unit: mm

●Die Bonding Layout



- •Front view of the packaging.
- ·Dimensions are design values.
- ·If the heat sink is to be installed, it should be in contact with the die bonding point.

Unit: mm

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