

# 5<sup>th</sup> Generation CoolSiC™ 1200V Schottky Diode

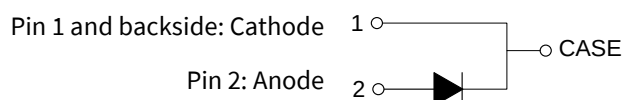
## SiC Diode

### Features

- No reverse recovery current / no forward recovery
- High surge current capability
- Temperature independent switching behaviour
- Low forward voltage even at high operating temperature
- Tight forward voltage distribution
- Specified dv/dt ruggedness
- Pb-free lead plating; RoHS compliant



**Pin definition**



### Potential applications

- Industrial power supplies: Industrial UPS
- Infrastructure-Charge: Charger
- Metal treatment: Welding
- Solar central inverters, Solar string inverter and Solar optimizer

### Product validation

Qualified for industrial applications according to the relevant tests of JEDEC 47/20/22

### Description

- System efficiency improvement over Si diodes
- Enabling higher frequency / increased power density solutions
- System size/cost savings due to reduced heatsink requirements and smaller magnetics
- Reduced EMI
- Highest efficiency across the entire load range
- Robust diode operation during surge events
- High reliability
- Related Links: [www.infineon.com/SiC](http://www.infineon.com/SiC)



### Key performance parameters

| Type         | $V_{DC}$ | $I_F$ | $Q_C$ | $T_{vj,max}$ | Marking | Package    |
|--------------|----------|-------|-------|--------------|---------|------------|
| IDWD20G120C5 | 1200 V   | 20 A  | 106nC | 175°C        | D2012C5 | PG-TO247-2 |

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## Maximum ratings

## 1 Maximum ratings

**Note:** For optimum lifetime and reliability, Infineon recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.

| Parameter                                                                                                                                                      | Symbol        | Value          | Unit             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|------------------|
| Repetitive peak reverse voltage<br>$T_C \geq 25^\circ\text{C}$                                                                                                 | $V_{RRM}$     | 1200           | V                |
| Continuous forward current for $R_{th(j-c,max)}$<br>$T_C = 156^\circ\text{C}$ , $D=1$<br>$T_C = 135^\circ\text{C}$ , $D=1$<br>$T_C = 25^\circ\text{C}$ , $D=1$ | $I_F$         | 20<br>29<br>62 | A                |
| Surge repetitive forward current, sine halfwave <sup>1</sup><br>$T_C=25^\circ\text{C}$ , $t_p=10\text{ms}$<br>$T_C=100^\circ\text{C}$ , $t_p=10\text{ms}$      | $I_{F,RM}$    | 80<br>60       | A                |
| Surge non-repetitive forward current, sine halfwave<br>$T_C=25^\circ\text{C}$ , $t_p=10\text{ms}$<br>$T_C=150^\circ\text{C}$ , $t_p=10\text{ms}$               | $I_{F,SM}$    | 190<br>180     | A                |
| Non-repetitive peak forward current<br>$T_C = 25^\circ\text{C}$ , $t_p=10\text{ }\mu\text{s}$                                                                  | $I_{F,max}$   | 1774           | A                |
| $i^2t$ value<br>$T_C = 25^\circ\text{C}$ , $t_p=10\text{ ms}$<br>$T_C = 150^\circ\text{C}$ , $t_p=10\text{ ms}$                                                | $\int i^2 dt$ | 180<br>162     | A <sup>2</sup> s |
| Diode $dv/dt$ ruggedness<br>$V_R=0\dots960\text{ V}$                                                                                                           | $dv/dt$       | 150            | V/ns             |
| Power dissipation for $R_{th(j-c,max)}$<br>$T_C = 25^\circ\text{C}$                                                                                            | $P_{tot}$     | 250            | W                |

<sup>1</sup> Not subject to production test. The test was performed with 20000 pulses (two consecutive half-wave rectified sines with 10 ms period).

**Maximum ratings**

|                                                                                                        |           |           |    |
|--------------------------------------------------------------------------------------------------------|-----------|-----------|----|
| Operating temperature                                                                                  | $T_{vj}$  | -55...175 | °C |
| Storage temperature                                                                                    | $T_{stg}$ | -55...150 | °C |
| Soldering temperature,<br>wave soldering only allowed at leads<br>1.6mm (0.063 in.) from case for 10 s | $T_{sld}$ | 260       | °C |
| Mounting torque, M3 screw<br>Maximum of mounting processes: 3                                          | $M$       | 0.6       | Nm |

## 2 Thermal resistances

| Parameter                                    | Symbol               | Conditions | Value |      |      | Unit |
|----------------------------------------------|----------------------|------------|-------|------|------|------|
|                                              |                      |            | min.  | typ. | max. |      |
| Characteristic                               |                      |            |       |      |      |      |
| Diode thermal resistance,<br>junction – case | R <sub>th(j-c)</sub> |            | -     | 0.45 | 0.6  | K/W  |
| Thermal resistance,<br>junction – ambient    | R <sub>th(j-a)</sub> | leaded     | -     | -    | 62   | K/W  |

### 3 Electrical Characteristics

#### Static Characteristics, at $T_{vj}=25^{\circ}\text{C}$ , unless otherwise specified

| Parameter             | Symbol   | Conditions                                         | Value |      |      | Unit          |
|-----------------------|----------|----------------------------------------------------|-------|------|------|---------------|
|                       |          |                                                    | min.  | typ. | max. |               |
| DC blocking voltage   | $V_{DC}$ | $T_{vj}=25^{\circ}\text{C}$ , $I_R=500\mu\text{A}$ | 1200  | -    | -    | V             |
| Diode forward voltage | $V_F$    | $I_F=20\text{A}$ , $T_{vj}=25^{\circ}\text{C}$     | -     | 1.4  | 1.65 | V             |
|                       |          | $I_F=20\text{A}$ , $T_{vj}=150^{\circ}\text{C}$    | -     | 1.7  | -    |               |
| Reverse current       | $I_R$    | $V_R=1200\text{V}$ , $T_{vj}=25^{\circ}\text{C}$   | -     | 12   | 166  | $\mu\text{A}$ |
|                       |          | $V_R=1200\text{V}$ , $T_{vj}=150^{\circ}\text{C}$  | -     | 58   | -    |               |

#### Dynamic Characteristics, at $T_{vj}=25^{\circ}\text{C}$ , unless otherwise specified

| Parameter               | Symbol | Conditions                                                                                              | Value |      |      | Unit |
|-------------------------|--------|---------------------------------------------------------------------------------------------------------|-------|------|------|------|
|                         |        |                                                                                                         | min.  | typ. | max. |      |
| Total capacitive charge | $Q_C$  | $V_R=800\text{V}$ , $T_{vj}=150^{\circ}\text{C}$ & $25^{\circ}\text{C}$<br>$Q_C = \int_0^{V_R} C(V) dV$ | -     | 106  | -    | nC   |
| Total Capacitance       | C      | $V_R=1\text{V}$ , $f=1\text{MHz}$                                                                       | -     | 1368 | -    | pF   |
|                         |        | $V_R=400\text{V}$ , $f=1\text{MHz}$                                                                     | -     | 96   | -    |      |
|                         |        | $V_R=800\text{V}$ , $f=1\text{MHz}$                                                                     | -     | 76   | -    |      |

## 4 Electrical Characteristics Diagrams

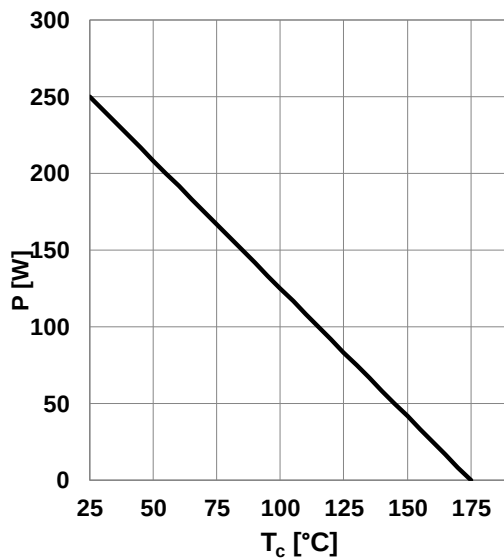


Figure 1. Power dissipation as function of case temperature,  $P_{\text{tot}}=f(T_c)$ ,  $R_{\text{th(j-c),max}}$

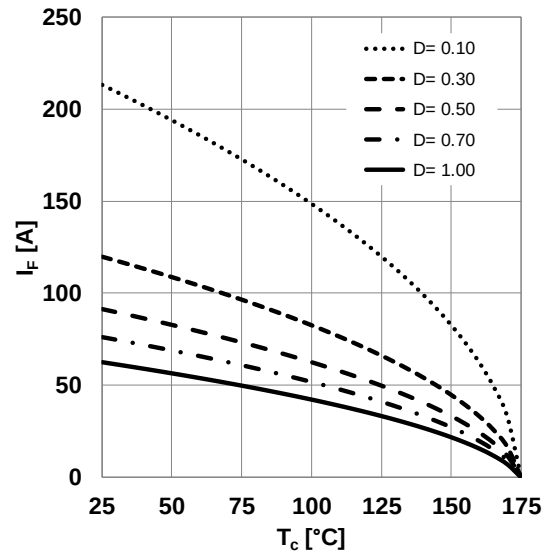


Figure 2. Diode forward current as function of temperature, parameter:  $T_{vj} \leq 175^\circ\text{C}$ ,  $R_{\text{th(j-c),max}}$ ,  $D$ =duty cycle,  $V_{\text{th}}$ ,  $R_{\text{diff}}$  @  $T_{vj}=175^\circ\text{C}$

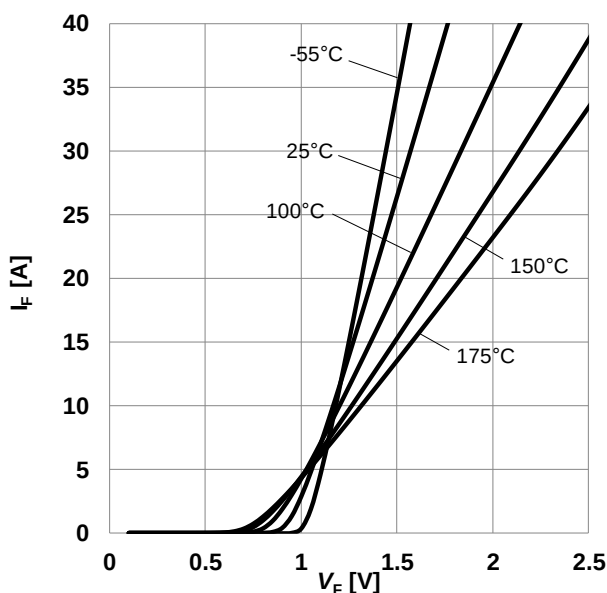


Figure 3. Typical forward characteristics,  $I_F=f(V_F)$ ,  $t_p=10\text{ }\mu\text{s}$ , parameter:  $T_{vj}$

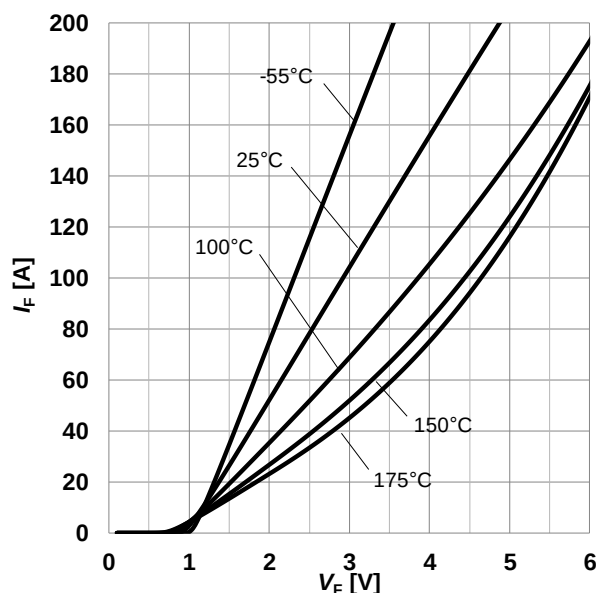


Figure 4. Typical forward characteristics in surge current,  $I_F=f(V_F)$ ,  $t_p=10\text{ }\mu\text{s}$ , parameter:  $T_{vj}$

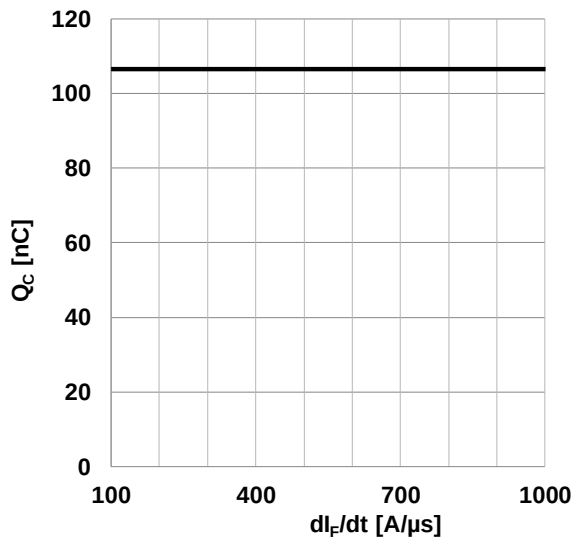


Figure 5. Typical capacitive charge as function of current slope<sup>2</sup>,  $Q_C=f(dI_F/dt)$ ,  $T_{vj}=150^\circ\text{C}$

2) guaranteed by design

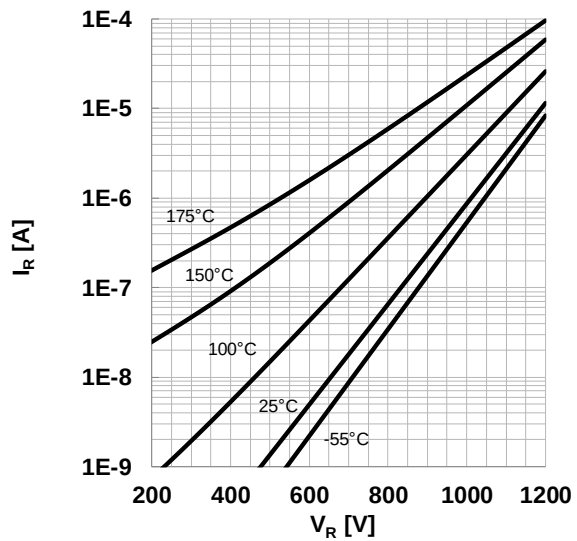


Figure 6. Typical reverse characteristics,  $I_R=f(V_R)$ , parameter:  $T_{vj}$

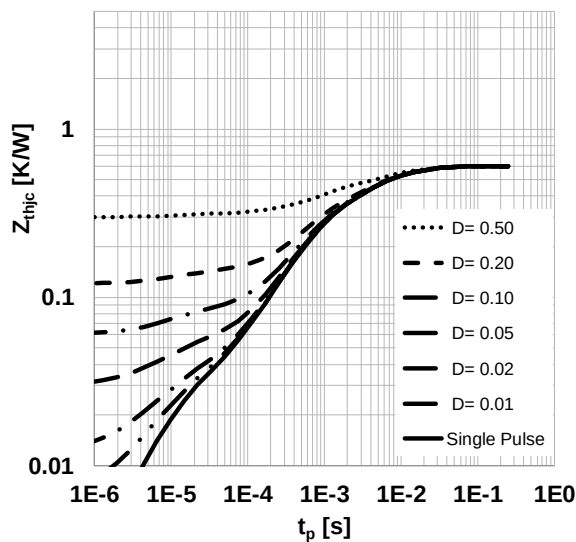


Figure 7. Max. transient thermal impedance,  $Z_{th,j-c}=f(t_P)$ , parameter:  $D=t_P/T$

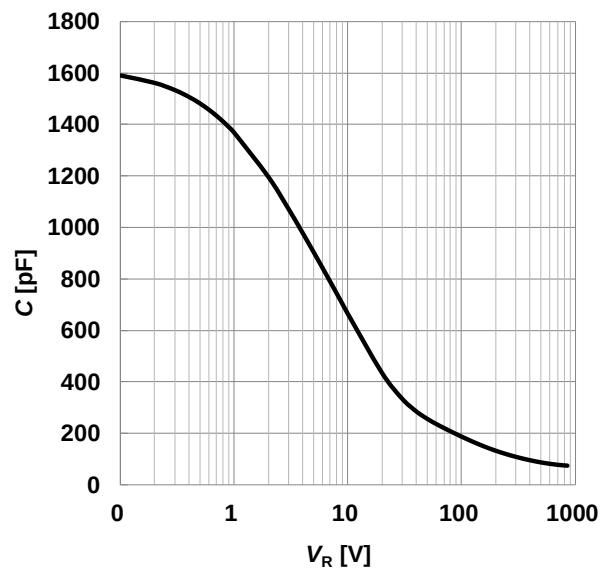
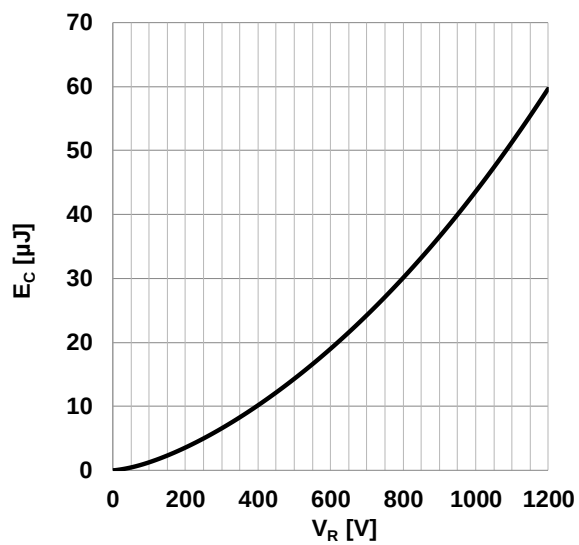


Figure 8. Typical capacitance as function of reverse voltage,  $C=f(V_R)$ ;  $T_{vj}=25^\circ\text{C}$ ;  $f=1\text{ MHz}$

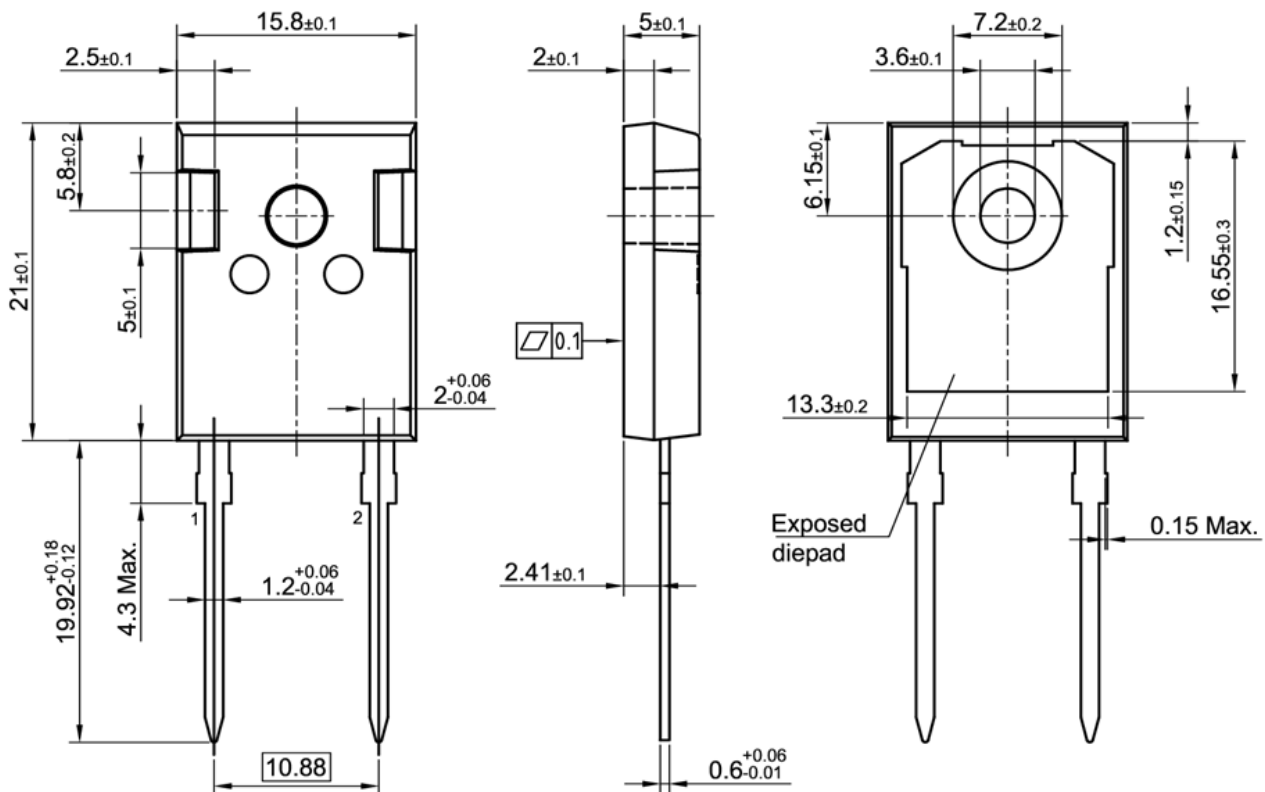




**Figure 9. Typical capacitively stored energy as function of reverse voltage,  $E_C=f(V_R)$**

## 5 Package Drawing

### PG-TO247-2



All dimensions do not include mold flash or protrusions

All dimensions are in units mm

The drawing is in compliance with ISO 128-30, Projection Method 1 [ ]

### Revision history

| Document version | Date of release | Description of changes     |
|------------------|-----------------|----------------------------|
| V 1.0            | 2018-12-21      | Preliminary Datasheet      |
| V 2.0            | 2019-01-30      | Final Datasheet            |
| V 2.1            | 2021-03-01      | Increased dv/dt ruggedness |

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