

5th Generation CoolSiC™ 1200V Schottky Diode

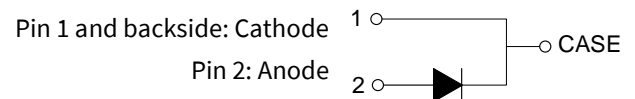
SiC Diode

Features

- Revolutionary semiconductor material - Silicon Carbide
- No reverse recovery current / no forward recovery
- Temperature independent switching behaviour
- Low forward voltage even at high operating temperature
- Tight forward voltage distribution
- Excellent thermal performance
- Extended surge current capability
- Specified dv/dt ruggedness
- Pb-free lead plating; RoHS compliant



Pin definition



Potential applications

- Drives
- Industrial power supplies: Industrial UPS
- Solar central inverters and Solar string inverter

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



Key performance parameters

| Type | V_{DC} | I_F | Q_C | $T_{vj,max}$ | Marking | Package |
|-------------|----------|-------|-------|--------------|---------|------------|
| IDK20G120C5 | 1200 V | 20 A | 82nC | 175°C | D2012C5 | PG-TO263-2 |



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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 $T_C \geq 25^\circ\text{C}$ | V_{RRM} | 1200 | V |
| Continuous forward current for $R_{th(j-c,max)}$ $T_C = 145^\circ\text{C}, D=1$ $T_C = 135^\circ\text{C}, D=1$ $T_C = 25^\circ\text{C}, D=1$ | I_F | 20 27 56 | A |
| Surge repetitive forward current, sine halfwave ¹ $T_C=25^\circ\text{C}, t_p=10\text{ms}$ $T_C=100^\circ\text{C}, t_p=10\text{ms}$ | $I_{F,RM}$ | 80 60 | A |
| Surge non-repetitive forward current, sine halfwave $T_C=25^\circ\text{C}, t_p=10\text{ms}$ $T_C=150^\circ\text{C}, t_p=10\text{ms}$ | $I_{F,SM}$ | 198 168 | A |
| Non-repetitive peak forward current $T_C = 25^\circ\text{C}, t_p=10 \mu\text{s}$ | $I_{F,max}$ | 1200 | A |
| i^2t value $T_C = 25^\circ\text{C}, t_p=10 \text{ms}$ $T_C = 150^\circ\text{C}, t_p=10 \text{ms}$ | $\int i^2 dt$ | 195 140 | A^2s |
| Diode dv/dt ruggedness $V_R=0\dots960 \text{V}$ | dv/dt | 80 | V/ns |
| Power dissipation for $R_{th(j-c,max)}$ $T_C = 25^\circ\text{C}$ | P_{tot} | 330 | W |

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

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SiC Diode



Maximum ratings

| | | | |
|---|------------|-----------|----|
| Operating temperature | T_{vj} | -55...175 | °C |
| Storage temperature | T_{stg} | -55...150 | °C |
| Soldering temperature, reflow soldering (MSL1 according to JEDEC J-STD-020) | T_{sold} | 260 | °C |

2 Thermal resistances

| Parameter | Symbol | Conditions | Value | | | Unit |
|--|---------------|------------|-------|------|------|------|
| | | | min. | typ. | max. | |
| Characteristic | | | | | | |
| Diode thermal resistance, junction – case | $R_{th(j-c)}$ | | - | 0.35 | 0.46 | K/W |
| Thermal resistance, junction – ambient | $R_{th(j-a)}$ | 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} | $T_{vj} = 25^{\circ}\text{C}$, $I_R=50\mu\text{A}$ | 1200 | - | - | V |
| Diode forward voltage | V_F | $I_F=20\text{A}$, $T_{vj}=25^{\circ}\text{C}$ | - | 1.5 | 1.8 | V |
| | | $I_F=20\text{A}$, $T_{vj}=150^{\circ}\text{C}$ | - | 2.0 | - | |
| Reverse current | I_R | $V_R=1200\text{V}$, $T_{vj}=25^{\circ}\text{C}$ | - | 8.5 | 123 | μA |
| | | $V_R=1200\text{V}$, $T_{vj}=150^{\circ}\text{C}$ | - | 44 | - | |

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 | $V_R = 800\text{V}$, $T_{vj}=150^{\circ}\text{C}$ $Q_C = \int_0^{V_R} C(V)dV$ | - | 82 | - | nC |
| Total Capacitance | C | $V_R=1\text{V}$, $f=1\text{MHz}$ | - | 1050 | - | pF |
| | | $V_R=400\text{V}$, $f=1\text{MHz}$ | - | 74 | - | |
| | | $V_R=800\text{V}$, $f=1\text{MHz}$ | - | 59 | - | |

4 Electrical Characteristics Diagrams

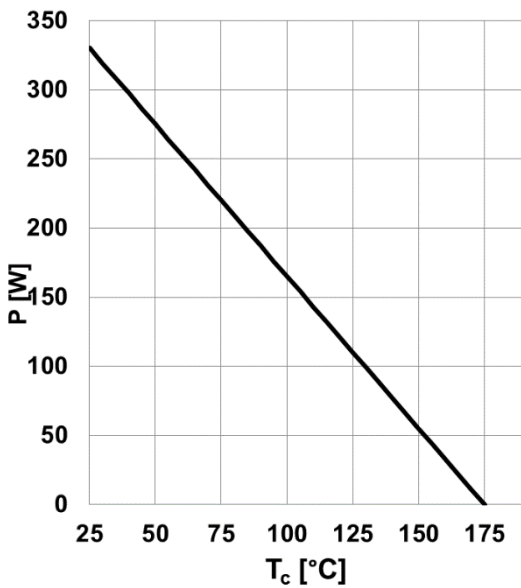


Figure 1. Power dissipation as function of case temperature, $P_{tot}=f(T_c)$, $R_{th(j-c),max}$

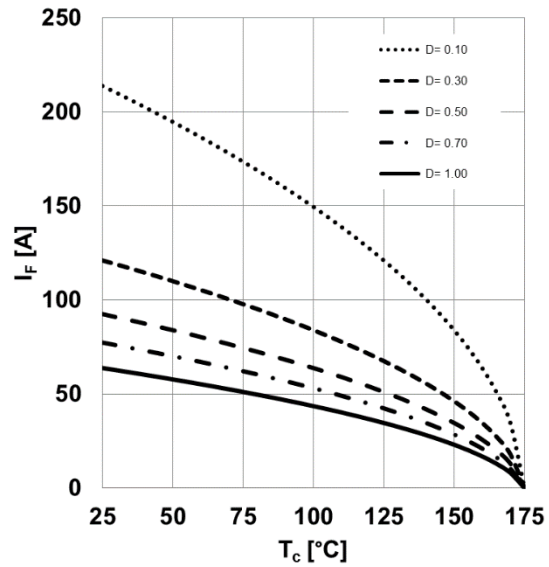


Figure 2. Diode forward current as function of temperature, parameter: $T_{vj} \leq 175^\circ\text{C}$, $R_{th(j-c),max}$, D =duty cycle, V_{th} , R_{diff} @ $T_{vj}=175^\circ\text{C}$

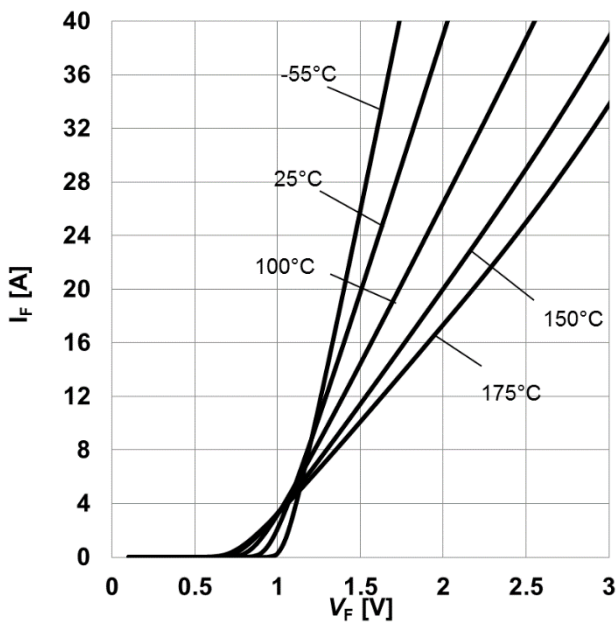


Figure 3. Typical forward characteristics, $I_F=f(V_F)$, $t_p=10 \mu\text{s}$, parameter: T_{vj}

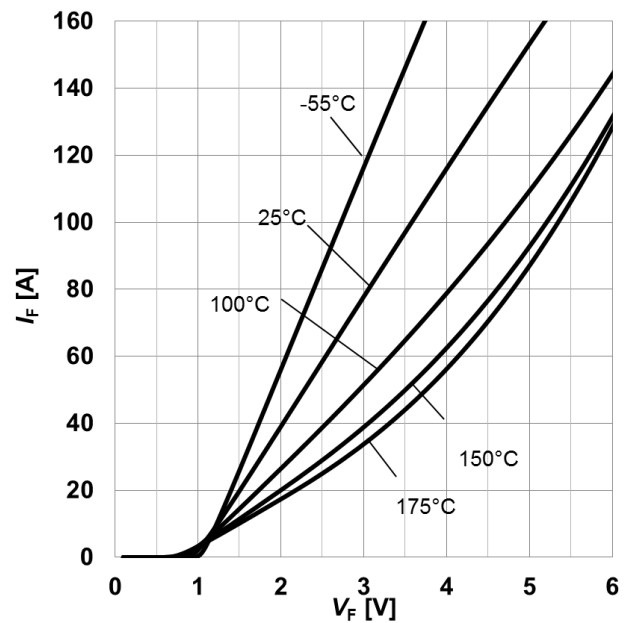


Figure 4. Typical forward characteristics in surge current, $I_F=f(V_F)$, $t_p=10 \mu\text{s}$, parameter: T_{vj}

Electrical Characteristics Diagrams

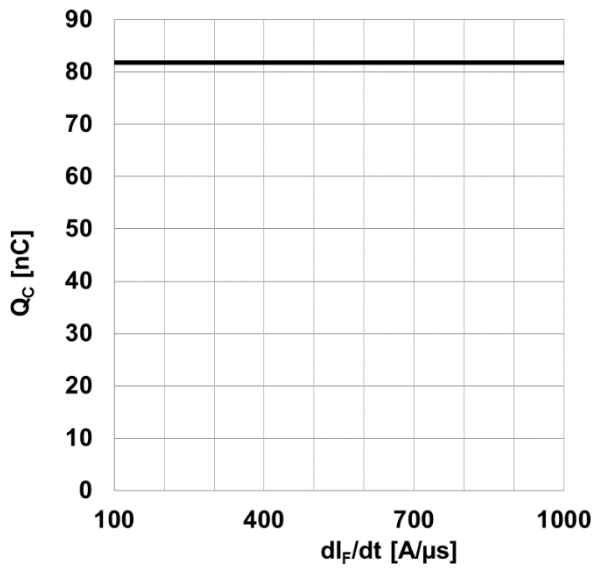


Figure 5. Typical capacitive charge as function of current slope, $Q_c=f(dI_F/dt)$, $T_{vj}=150^\circ\text{C}$

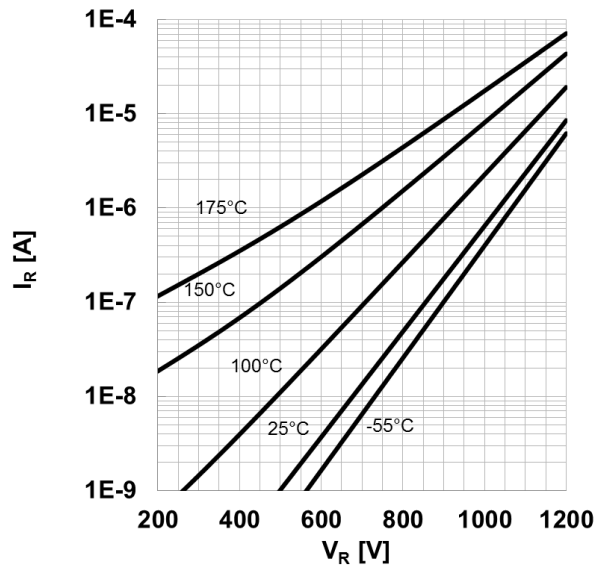


Figure 6. Typical reverse characteristics, $I_R=f(V_R)$, parameter: T_{vj}

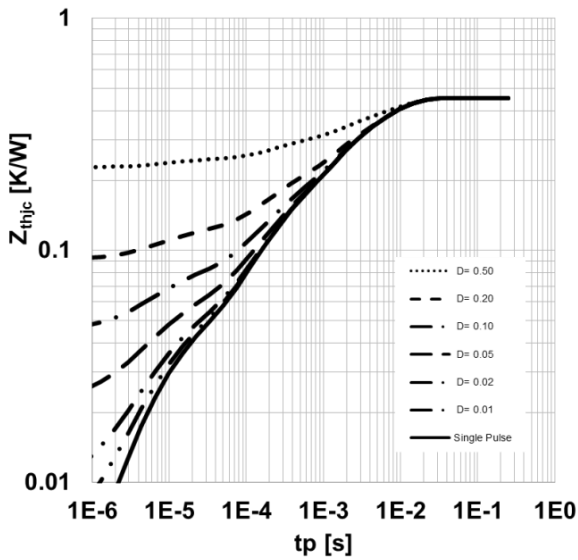


Figure 7. Max. transient thermal impedance, $Z_{th,j-c}=f(t_p)$, parameter: $D=t_p/T$

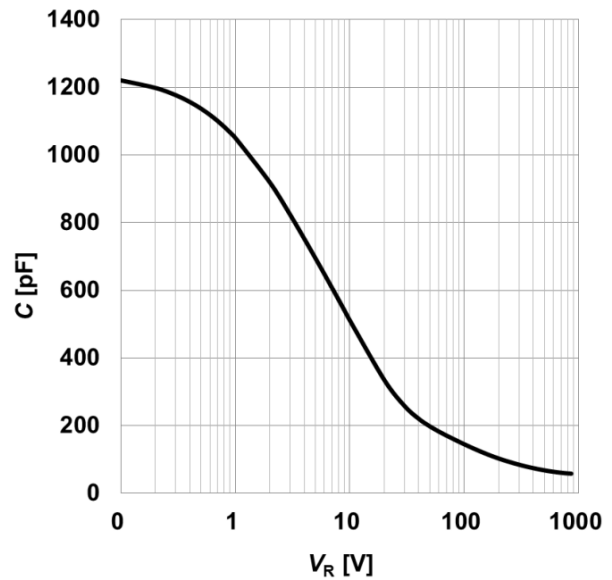


Figure 8. Typical capacitance as function of reverse voltage, $C=f(V_R)$; $T_{vj}=25^\circ\text{C}$; $f=1\text{ MHz}$

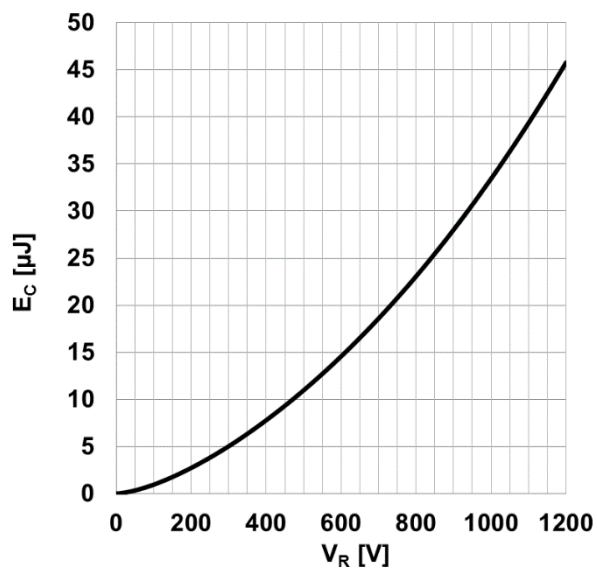
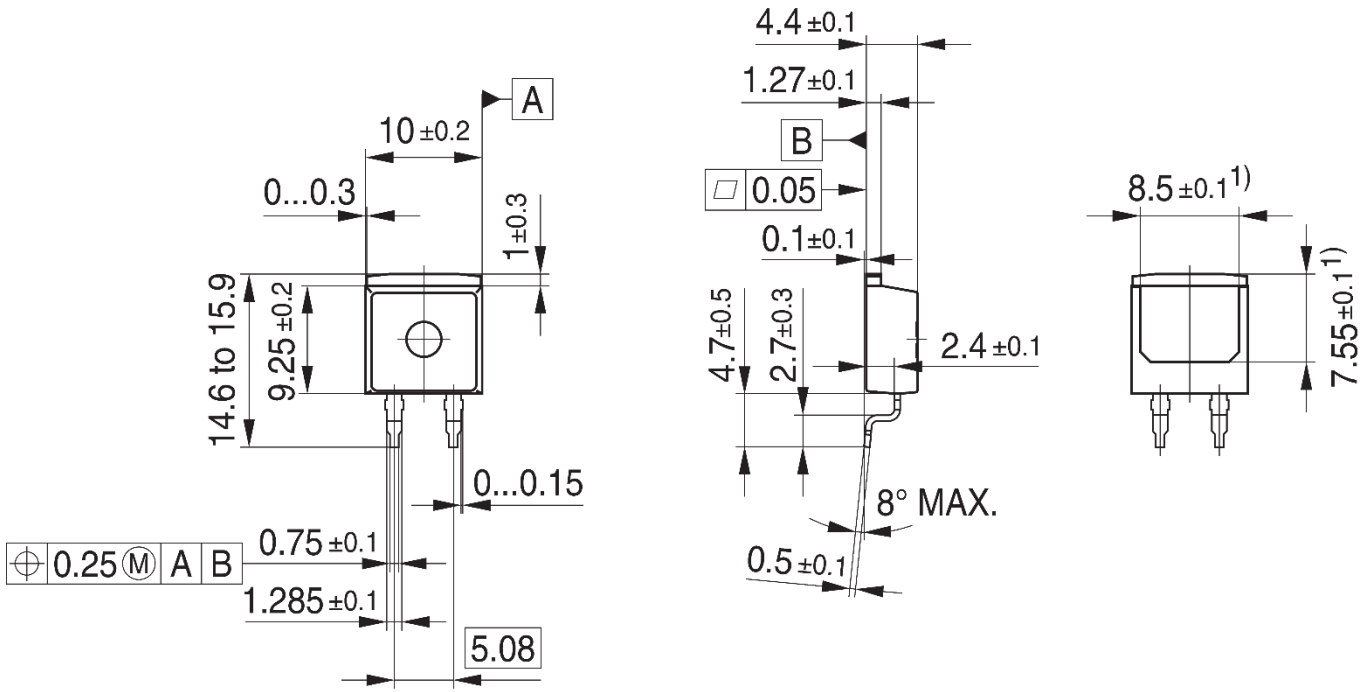


Figure 9. Typical capacitively stored energy as function of reverse voltage, $E_C=f(V_R)$

5 Package Drawing

PG-TO263-2



- 1) Typical
 Metal surface min. $X = 7.25$, $y = 6.9$
 All metal surfaces: tin plated, except area of cut

All dimensions do not include mold flash or protrusions
 All dimensions are in units mm
 The drawings is in compliance with ISO 128-30, Projection Methode 1 []

Revision history

Revision history

| Document version | Date of release | Description of changes |
|------------------|-----------------|------------------------|
| V 1.0 | 2019-01-25 | Preliminary Datasheet |
| V 2.0 | 2019-10-28 | Final Datasheet |
| | | |

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Edition 2017-09-05

Published by

Infineon Technologies AG

81726 München, Germany

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