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SiC

Silicon Carbide Diode

5th Generation thinQ!TM

650V SiC Schottky Diode

IDL12G65C5

Final Data Sheet

Rev. 2.0, 2013-12-05

Power Management & Multimarket

5th Generation thinQ!TM SiC Schottky Diode

IDL12G65C5

1 Description

ThinQ!TM Generation 5 represents Infineon leading edge technology for the SiC Schottky Barrier diodes. The Infineon proprietary diffusion soldering process, already introduced with G3 is now combined with a new, more compact design and thin-wafer technology. The result is a new family of products showing improved efficiency over all load conditions, resulting from both the improved thermal characteristics and a lower figure of merit ($Q_c \times V_f$).

The new thinQ!TM Generation 5 has been designed to complement our 650V CoolMOSTM families: this ensures meeting the most stringent application requirements in this voltage range.

Features

- Revolutionary semiconductor material - Silicon Carbide
- Benchmark switching behavior
- No reverse recovery/ No forward recovery
- Temperature independent switching behavior
- High surge current capability
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC¹⁾ for target applications
- Breakdown voltage tested at 27 mA²⁾
- Optimized for high temperature operation

Benefits

- System efficiency improvement over Si diodes
- System cost / size savings due to reduced cooling requirements
- Enabling higher frequency / increased power density solutions
- Higher system reliability due to lower operating temperatures
- Reduced EMI

Applications

- Switch mode power supply
- Power factor correction
- Solar inverter
- Uninterruptible power supply

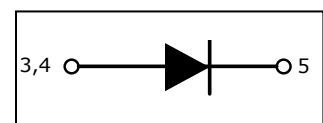
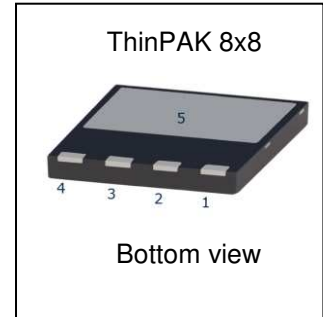
Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|---------------------------|-------|---------|
| V_{DC} | 650 | V |
| $Q_C; V_R=400V$ | 18 | nC |
| $E_C; V_R=400V$ | 4.1 | μJ |
| $I_F @ T_C < 145^\circ C$ | 12 | A |

Table 2 Pin Definition

| Pin 1 | Pin 2 | Pin 3 | Pin 4 | Pin 5 |
|-------|-------|-------|-------|-------|
| n.c. | n.c. | A | A | C |

| Type / ordering Code | Package | Marking |
|----------------------|-----------|---------|
| IDL12G65C5 | PG-VSON-4 | D1265C5 |



Related Links

- <http://www.infineon.com/sic>
- [ThinPAK Webpage](#)
- [ThinPAK Application Note](#)

1) J-STD20 and JEDEC22

2) All devices tested under avalanche conditions for a time period of 10ms

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2 Maximum ratings

Table 3 Maximum ratings

| Parameter | Symbol | Values | | | Unit | Note/Test Condition |
|---|----------------|--------|------|------|------------------|--|
| | | Min. | Typ. | Max. | | |
| Continuous forward current | I_F | – | – | 12 | A | $T_C < 145^\circ\text{C}$, $D=1$ |
| Surge non-repetitive forward current, sine halfwave | $I_{F,SM}$ | – | – | 57 | | $T_C = 25^\circ\text{C}$, $t_p=10\text{ ms}$ |
| | | – | – | 50 | | $T_C = 150^\circ\text{C}$, $t_p=10\text{ ms}$ |
| Non-repetitive peak forward current | $I_{F,max}$ | – | – | 505 | | $T_C = 25^\circ\text{C}$, $t_p=10\ \mu\text{s}$ |
| i^2t value | $\int i^2 dt$ | – | – | 16.5 | A ² s | $T_C = 25^\circ\text{C}$, $t_p=10\text{ ms}$ |
| | | – | – | 12.6 | | $T_C = 150^\circ\text{C}$, $t_p=10\text{ ms}$ |
| Repetitive peak reverse voltage | V_{RRM} | – | – | 650 | V | $T_j = 25^\circ\text{C}$ |
| Diode dv/dt ruggedness | dv/dt | – | – | 100 | V/ns | $V_R=0..480\text{ V}$ |
| Power dissipation | P_{tot} | – | – | 138 | W | $T_C = 25^\circ\text{C}$ |
| Operating and storage temperature | $T_j; T_{stg}$ | -55 | – | 150 | °C | |

3 Thermal characteristics

Table 4 Thermal characteristics

| Parameter | Symbol | Values | | | Unit | Note/Test Condition |
|--------------------------------------|------------|--------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction-case | R_{thJC} | – | 0.7 | 0.9 | K/W | SMD version, device on PCB, 6cm ² cooling area ¹⁾ |
| Thermal resistance, junction-ambient | R_{thJA} | – | – | 45 | | |

1) Device on 40mm*40mm*1.5mm one layer epoxy PCB FR4 with 6cm² copper area (thickness 70µm) for drain connection. PCB is vertical without air stream cooling.

4 Electrical characteristics

Table 5 Static characteristics

| Parameter | Symbol | Values | | | Unit | Note/Test Condition |
|-----------------------|----------|--------|------|------|---------------|---|
| | | Min. | Typ. | Max. | | |
| DC blocking voltage | V_{DC} | 650 | – | – | V | $I_R = 0.19 \text{ mA}, T_j = 25^\circ\text{C}$ |
| Diode forward voltage | V_F | – | 1.5 | 1.7 | | $I_F = 12 \text{ A}, T_j = 25^\circ\text{C}$ |
| | | – | 1.8 | 2.1 | | $I_F = 12 \text{ A}, T_j = 150^\circ\text{C}$ |
| Reverse current | I_R | – | 0.65 | 190 | μA | $V_R = 650 \text{ V}, T_j = 25^\circ\text{C}$ |
| | | – | 0.16 | 68 | | $V_R = 600 \text{ V}, T_j = 25^\circ\text{C}$ |
| | | – | 2.4 | 1350 | | $V_R = 650 \text{ V}, T_j = 150^\circ\text{C}$ |

Table 6 AC characteristics

| Parameter | Symbol | Values | | | Unit | Note/Test Condition |
|-------------------------|--------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Total capacitive charge | Q_c | – | 18 | – | nC | $V_R = 400 \text{ V}, di/dt = 200 \text{ A}/\mu\text{s}, I_F \leq I_{F,MAX}, T_j = 150^\circ\text{C}.$ |
| Total Capacitance | C | – | 360 | – | pF | $V_R = 1 \text{ V}, f = 1 \text{ MHz}$ |
| | | – | 48 | – | | $V_R = 300 \text{ V}, f = 1 \text{ MHz}$ |
| | | – | 47 | – | | $V_R = 600 \text{ V}, f = 1 \text{ MHz}$ |

5 Electrical characteristics diagrams

Table 7

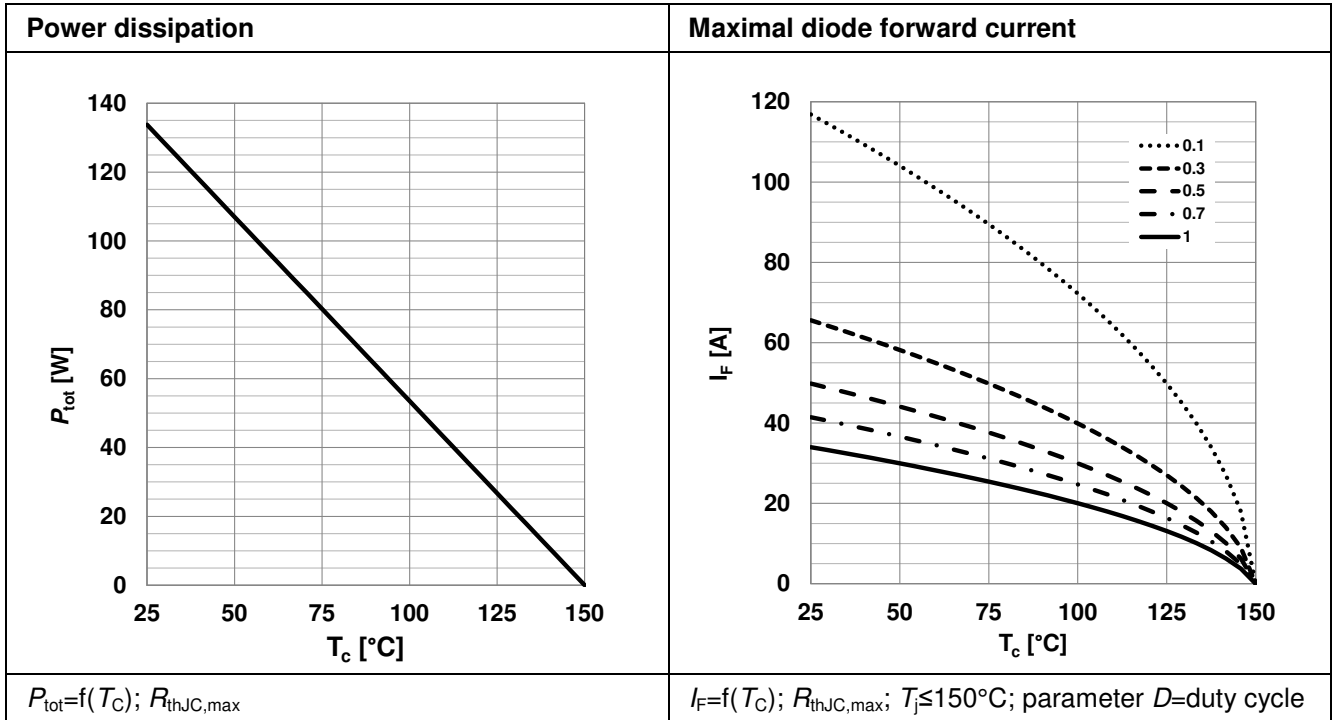


Table 8

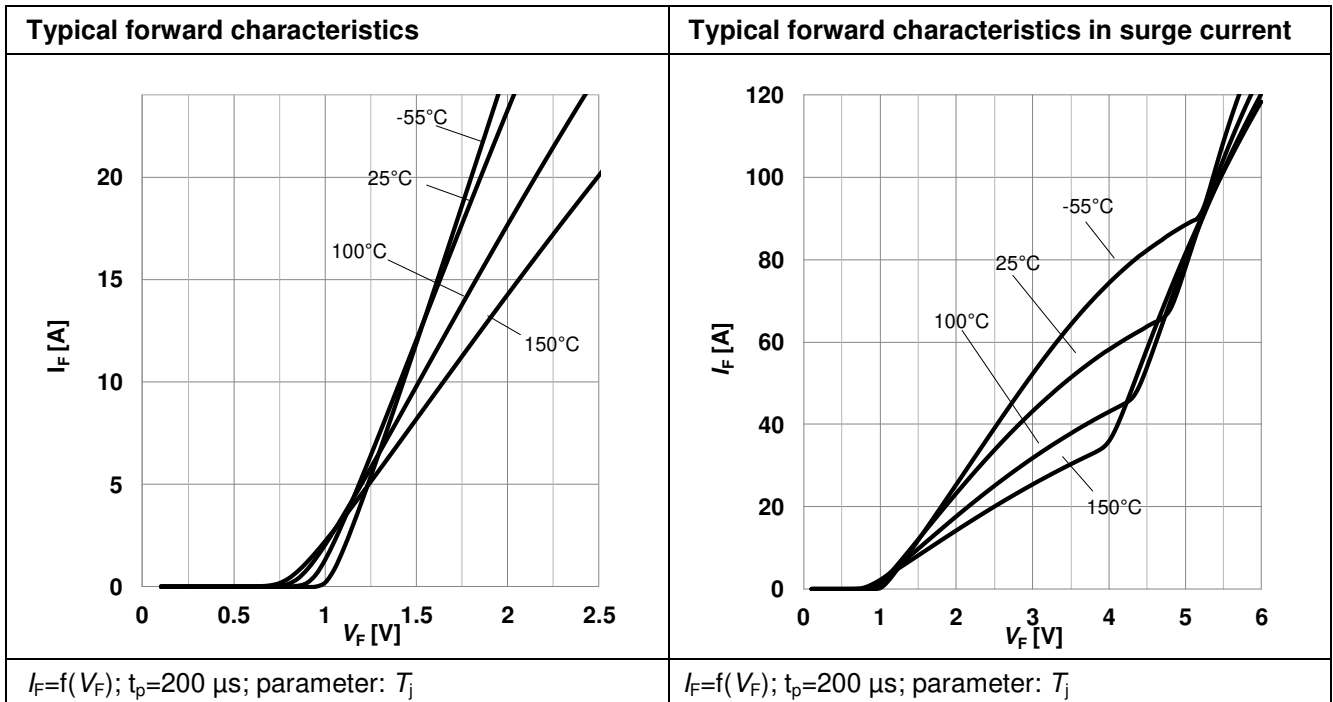


Table 9

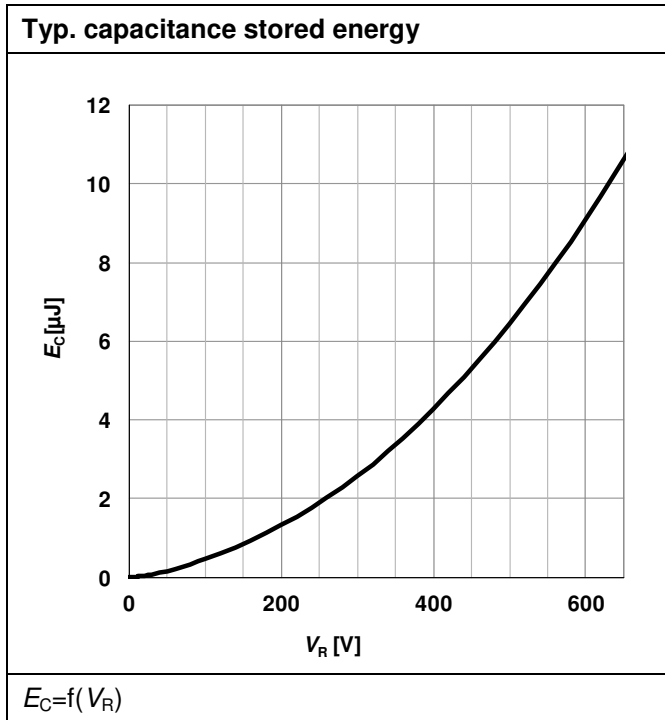
| Typ. capacitance charge vs. current slope ¹⁾ | Typ. reverse current vs. reverse voltage |
|--|--|
| | |
| $Q_C=f(dI_F/dt); T_j=150^{\circ}\text{C}; V_R=400\text{ V}; I_F \leq I_{F,\text{max}}$ | $I_R=f(V_R); \text{parameter: } T_j;$ |

1) Only capacitive charge, guaranteed by design.

Table 10

| Max. transient thermal impedance | Typ. capacitance vs. reverse voltage |
|--|--|
| | |
| $Z_{th,jc}=f(t_p); \text{parameter: } D=t_p/T$ | $C=f(V_R); T_j=25^{\circ}\text{C}; f=1\text{ MHz}$ |

Table 11



6 Simplified Forward Characteristics Model

Table 12

| Equivalent forward current curve | Mathematical Equation |
|----------------------------------|---|
| | $V_F = V_{TH} + R_{DIFF} \cdot I_F$ $V_{TH}(T_j) = -0.001 \cdot T_j + 1.04 \text{ [V]}$ $R_{DIFF}(T_j) = 1.07 \cdot 10^{-6} \cdot T_j^2 + 1.07 \cdot 10^{-4} \cdot T_j + 0.039 \text{ [}\Omega\text{]}$ |
| $V_F = f(I_F)$ | T_j in °C; $-55^\circ\text{C} < T_j < 150^\circ\text{C}$; $I_F < 24 \text{ A}$ |

7 Package outlines

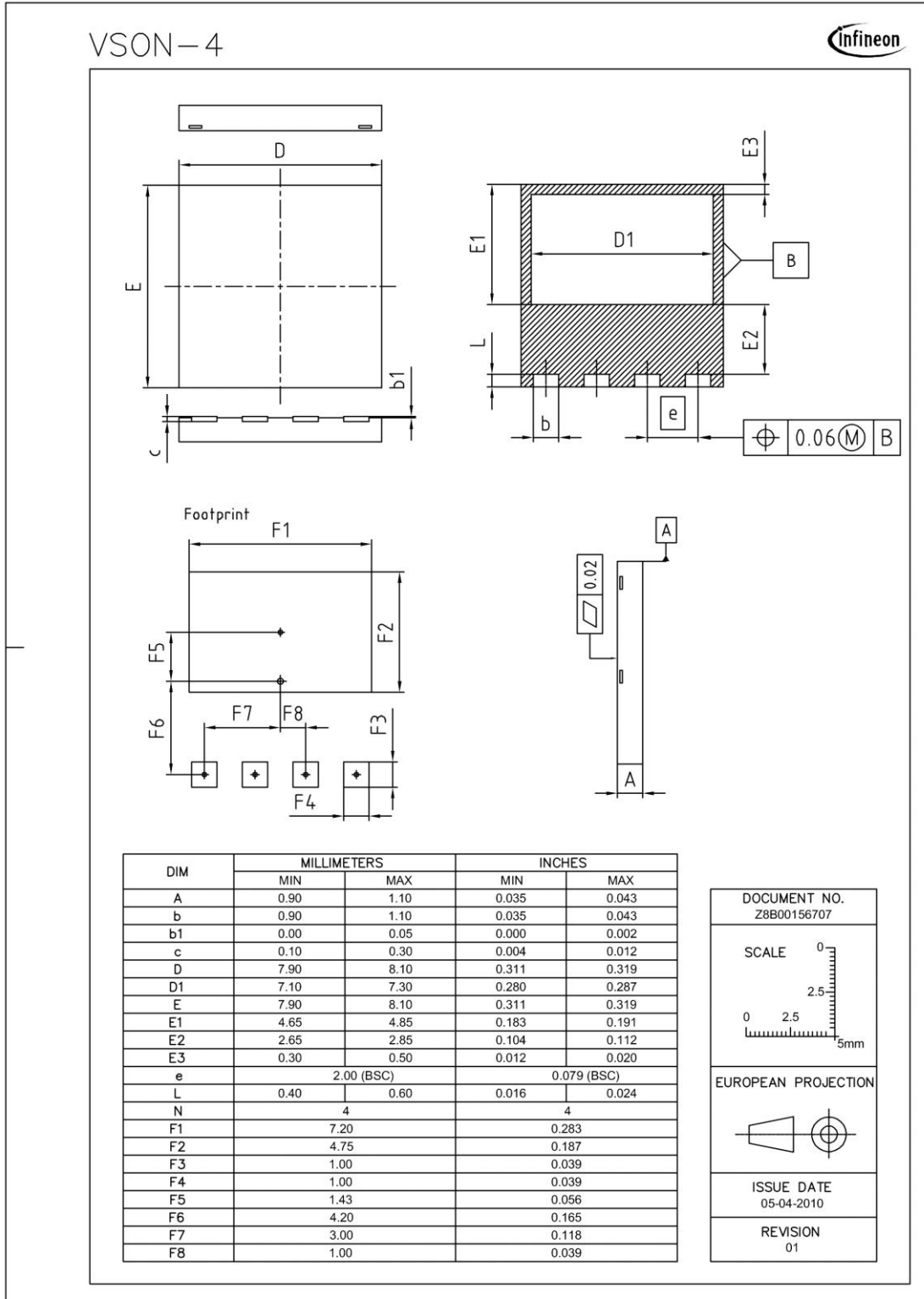


Figure 1 Outlines ThinPAK 8x8, dimensions in mm/inches

8 Revision History

5th Generation thinQ!TM SiC Schottky Diode

Revision History: 2013-12-05, Rev. 2.0

Previous Revision:

| Revision | Subjects (major changes since last version) |
|----------|---|
| 2.0 | Release of the data sheet |
| | |

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