

SiC

Silicon Carbide Diode

5th Generation thinQ!TM

650V SiC Schottky Diode

IDK10G65C5

Final Data Sheet

Rev. 2.1, 2017-08-11

Power Management & Multimarket

5th Generation thinQ!TM SiC Schottky Diode

IDK10G65C5

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 22 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

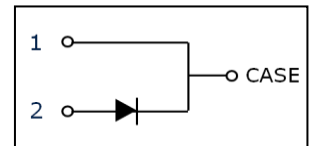
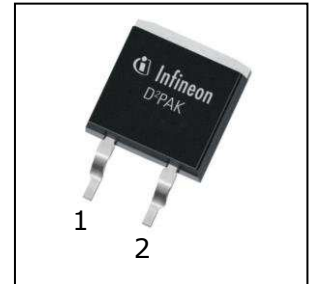


Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|---------------------------------|-------|---------------|
| V_{DC} | 650 | V |
| $Q_C (V_R = 400 \text{ V})$ | 15 | nC |
| $E_C (V_R = 400 \text{ V})$ | 3.5 | μJ |
| $I_F (T_C < 140^\circ\text{C})$ | 10 | A |

Table 2 Pin Definition

| Pin 1 | Pin 2 | Pin 3 |
|-------|-------|-------|
| C | A | n.a. |

| Type / ordering Code | Package | Marking | Related links |
|----------------------|------------|---------|--|
| IDK10G65C5 | PG-TO263-2 | D1065C5 | www.infineon.com/sic |

1) J-STD20 and JESD22

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

Table of Contents

| | | |
|---|---|---|
| 1 | Description..... | 2 |
| 2 | Maximum ratings..... | 4 |
| 3 | Thermal characteristics..... | 4 |
| 4 | Electrical characteristics..... | 5 |
| 5 | Electrical characteristics diagrams..... | 6 |
| 6 | Simplified forward characteristics model..... | 8 |
| 7 | Package outlines..... | 9 |

2 Maximum ratings

Table 3 Maximum ratings

| Parameter | Symbol | Values | | | Unit | Note/Test Condition |
|---|----------------|--------|------|------|--|--|
| | | Min. | Typ. | Max. | | |
| Continuous forward current | I_F | – | – | 10 | A | $T_C < 140^\circ\text{C}$, $D = 1$ |
| Surge non-repetitive forward current, sine halfwave | $I_{F,SM}$ | – | – | 82 | | $T_C = 25^\circ\text{C}$, $t_p = 10\text{ ms}$ |
| | | – | – | 71 | | $T_C = 150^\circ\text{C}$, $t_p = 10\text{ ms}$ |
| Non-repetitive peak forward current | $I_{F,max}$ | – | – | 431 | A ² s | $T_C = 25^\circ\text{C}$, $t_p = 10\text{ }\mu\text{s}$ |
| i^2t value | $\int i^2 dt$ | – | – | 34 | | $T_C = 25^\circ\text{C}$, $t_p = 10\text{ ms}$ |
| | | – | – | 25 | $T_C = 150^\circ\text{C}$, $t_p = 10\text{ ms}$ | |
| 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} | – | – | 89 | W | $T_C = 25^\circ\text{C}$ |
| Operating and storage temperature | $T_j; T_{stg}$ | -55 | – | 175 | $^\circ\text{C}$ | – |

3 Thermal characteristics

Table 4 Thermal characteristics TO-263-2

| Parameter | Symbol | Values | | | Unit | Note/Test Condition |
|--|------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction-case | R_{thJC} | – | 1.0 | 1.7 | K/W | – |
| Thermal resistance, junction-ambient ¹⁾ | R_{thJA} | – | – | 62 | | SMD version, device on PCB, minimal footprint |
| | | – | 35 | – | | SMD version, device on PCB, 6 cm ² cooling area |

1) Device on 40 mm * 40mm * 1.5 mm one layer epoxy PCB FR4 with 6 cm² copper area (thickness 70 μm) for cathode 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 | $I_R = 0.18 \text{ mA}, T_j = 25^\circ\text{C}$ |
| Diode forward voltage | V_F | – | 1.5 | 1.8 | | $I_F = 10 \text{ A}, T_j = 25^\circ\text{C}$ |
| | | – | 1.8 | 2.2 | | $I_F = 10 \text{ A}, T_j = 150^\circ\text{C}$ |
| Reverse current | I_R | – | 0.5 | 180 | μA | $V_R = 650 \text{ V}, T_j = 25^\circ\text{C}$ |
| | | – | 0.13 | 64 | | $V_R = 600 \text{ V}, T_j = 25^\circ\text{C}$ |
| | | – | 2.0 | 1250 | | $V_R = 650 \text{ V}, T_j = 150^\circ\text{C}$ |

Table 6 AC characteristics

| Parameter | Symbol | Values | | | Unit | Note/Test Condition |
|-------------------------|--------|--------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Total capacitive charge | Q_c | – | 15 | – | 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 | – | 300 | – | pF | $V_R = 1 \text{ V}, f = 1 \text{ MHz}$ |
| | | – | 40 | – | | $V_R = 300 \text{ V}, f = 1 \text{ MHz}$ |
| | | – | 39 | – | | $V_R = 600 \text{ V}, f = 1 \text{ MHz}$ |

5 Electrical characteristics diagrams

Table 7

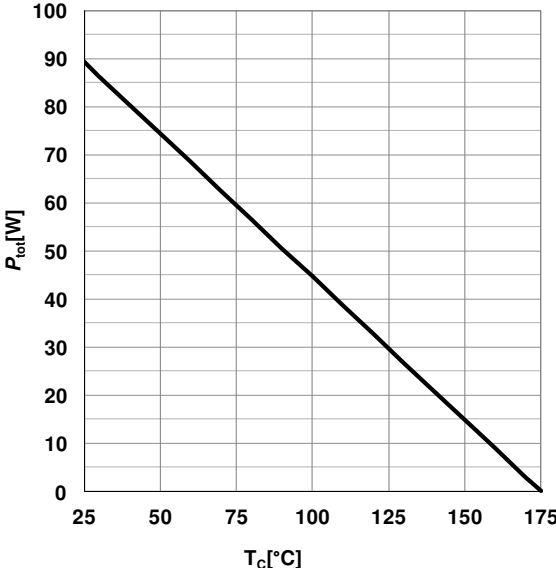
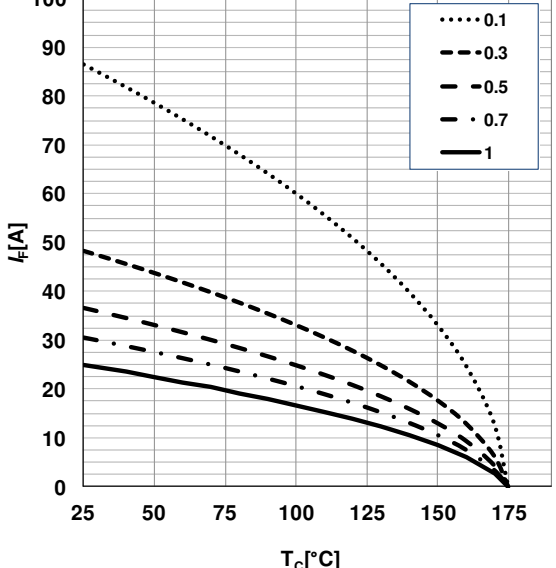
| Power dissipation | Diode forward current |
|--|--|
|  |  |
| $P_{\text{tot}} = f(T_c); R_{\text{thJC,max}}$ | $I_F = f(T_c); T_j \leq 175^\circ\text{C}; R_{\text{thJC,max}};$ Parameter: $D = \text{duty cycle}$ |

Table 8

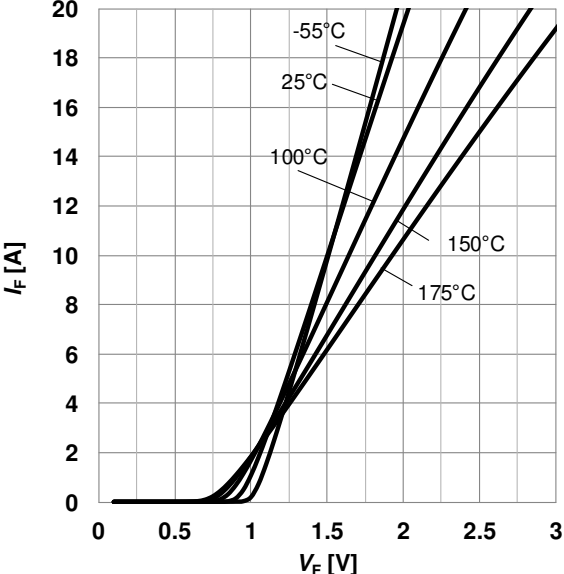
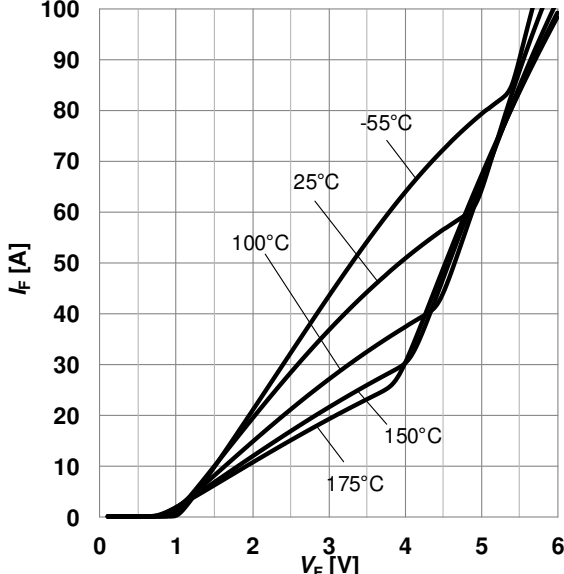
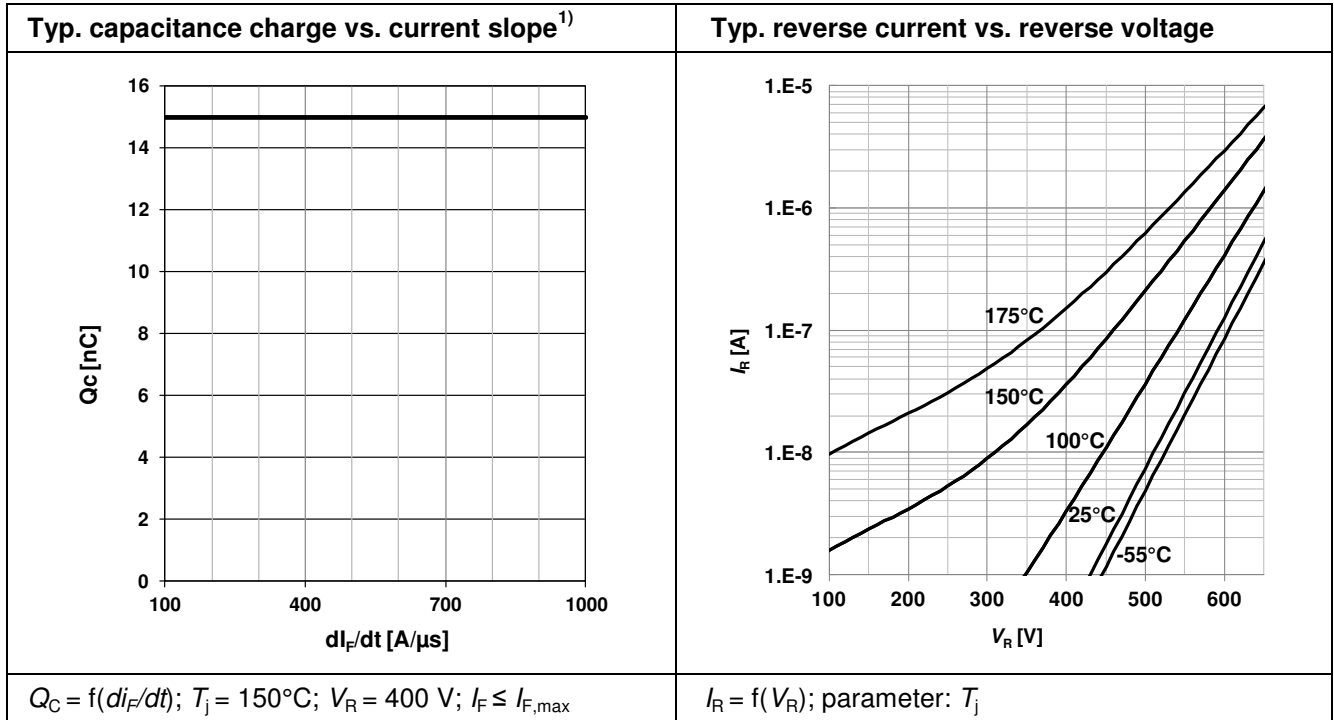
| Typical forward characteristics | Typical forward characteristics in surge current |
|---|--|
|  |  |
| $I_F = f(V_F); t_p = 200 \mu\text{s}; \text{parameter: } T_j$ | $I_F = f(V_F); t_p = 200 \mu\text{s}; \text{parameter: } T_j$ |

Table 9



1) Only capacitive charge, guaranteed by design.

Table 10

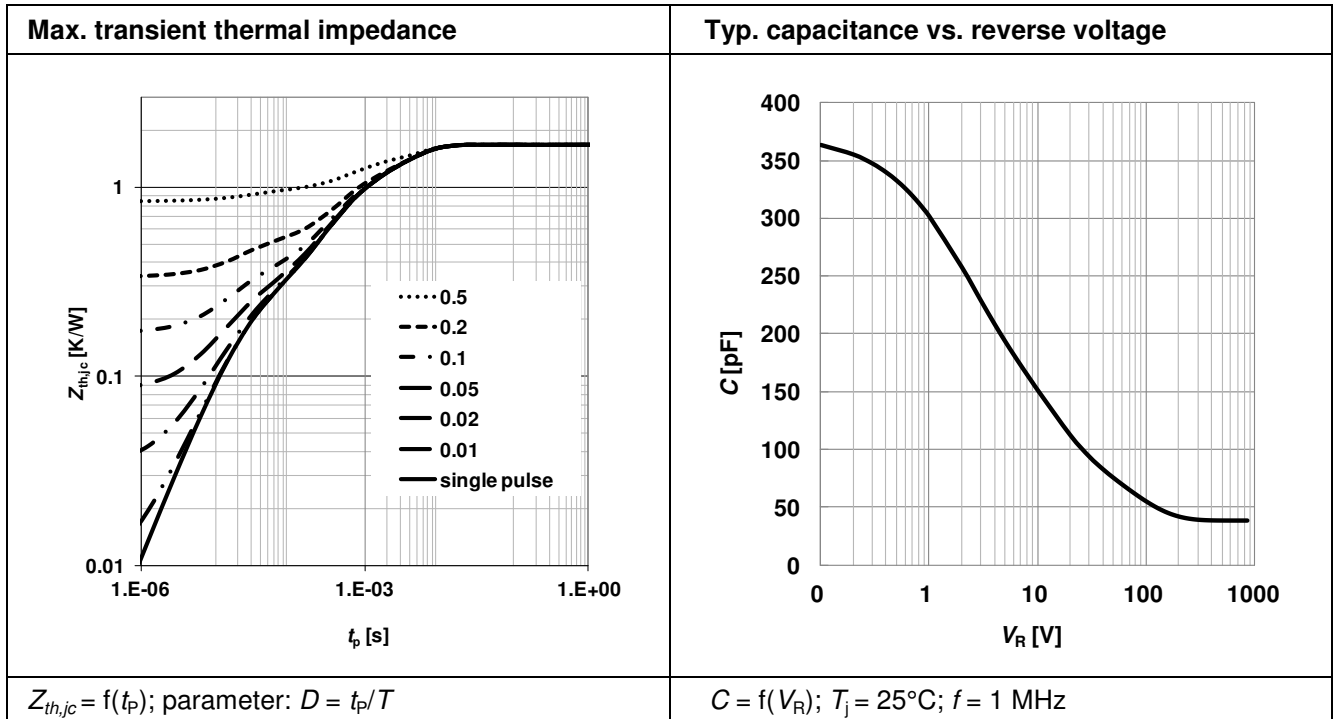
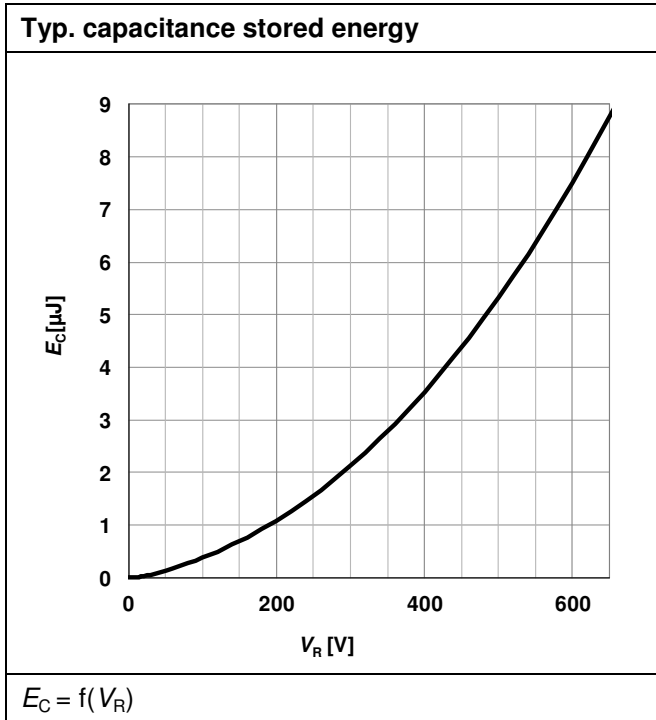


Table 11



6 Simplified forward characteristics model

Table 12

| Equivalent forward current curve | Mathematical Equation |
|----------------------------------|--|
| | $V_F = V_{TH} + R_{DIFF} \cdot I_F$ $V_{TH}(T_j) = -0.001 \cdot T_j + 1.04 \text{ [V]}$ $R_{DIFF}(T_j) = 1.29 \cdot 10^{-6} \cdot T_j^2 + 1.29 \cdot 10^{-4} \cdot T_j + 0.047 \text{ [\Omega]}$ |
| $V_F = f(I_F)$ | $T_j \text{ [}^\circ\text{C]}; -55^\circ\text{C} < T_j < 175^\circ\text{C}; I_F < 20 \text{ A}$ |

7 Package outlines

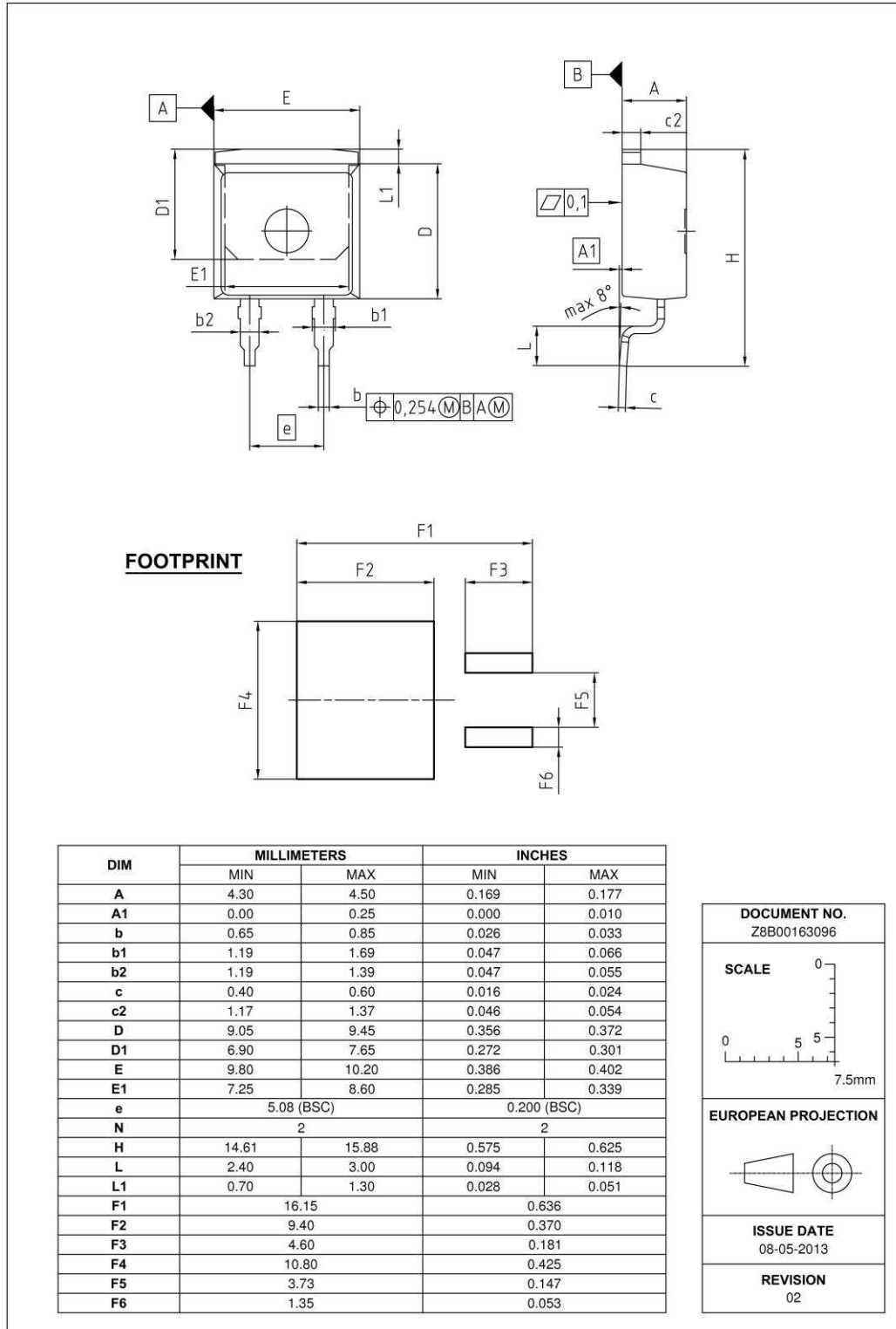


Figure 1 Outlines TO-263-2, dimensions in mm/inch

5th Generation thinQ!™ SiC Schottky Diode

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Revision History

IDK10G65C5

Revision: 2017-09-06, Rev. 2.1

Previous Revision

| Revision | Date | Subjects (major changes since last revision) |
|----------|------------|--|
| 2.1 | 2017-09-06 | Updated IR,max values in table 5 |

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Published by

Infineon Technologies AG

81726 München, Germany

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