

**SiC**

Silicon Carbide Diode

**5<sup>th</sup> Generation thinQ!<sup>TM</sup>**

650V SiC Schottky Diode

**IDK10G65C5**

**Final Data Sheet**

Rev. 2.1, 2017-08-11

**Power Management & Multimarket**

## 5<sup>th</sup> Generation thinQ!<sup>™</sup> SiC Schottky Diode

### IDK10G65C5

### 1 Description

ThinQ!<sup>™</sup> 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!<sup>™</sup> Generation 5 has been designed to complement our 650V CoolMOS<sup>™</sup> families: this ensures meeting the most stringent application requirements in this voltage range.

#### Features

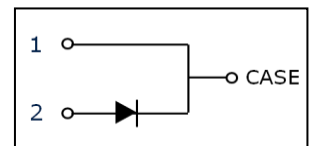
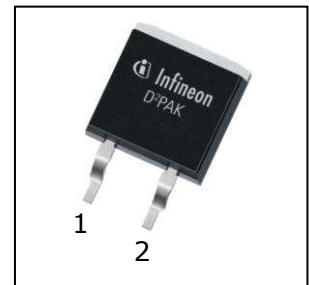
- Revolutionary semiconductor material - Silicon Carbide
- Benchmark switching behavior
- No reverse recovery/ No forward recovery
- Temperature independent switching behavior
- High surge current capability
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Breakdown voltage tested at 22 mA<sup>2)</sup>
- 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	$\mu\text{J}$
$I_F (T_C < 140^\circ\text{C})$	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	<a href="http://www.infineon.com/sic">www.infineon.com/sic</a>

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 <sup>2s</sup>	$T_C = 25^\circ\text{C}$ , $t_p = 10\text{ }\mu\text{s}$
$i^2t$ 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	°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 <sup>1)</sup>	$R_{thJA}$	–	–	62		SMD version, device on PCB, minimal footprint
		–	35	–		SMD version, device on PCB, 6 cm <sup>2</sup> cooling area

1) Device on 40 mm \* 40mm \* 1.5 mm one layer epoxy PCB FR4 with 6 cm<sup>2</sup> copper area (thickness 70  $\mu\text{m}$ ) 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	$\mu\text{A}$	$V_R = 650 \text{ V}, T_j = 25^\circ\text{C}$
		–	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

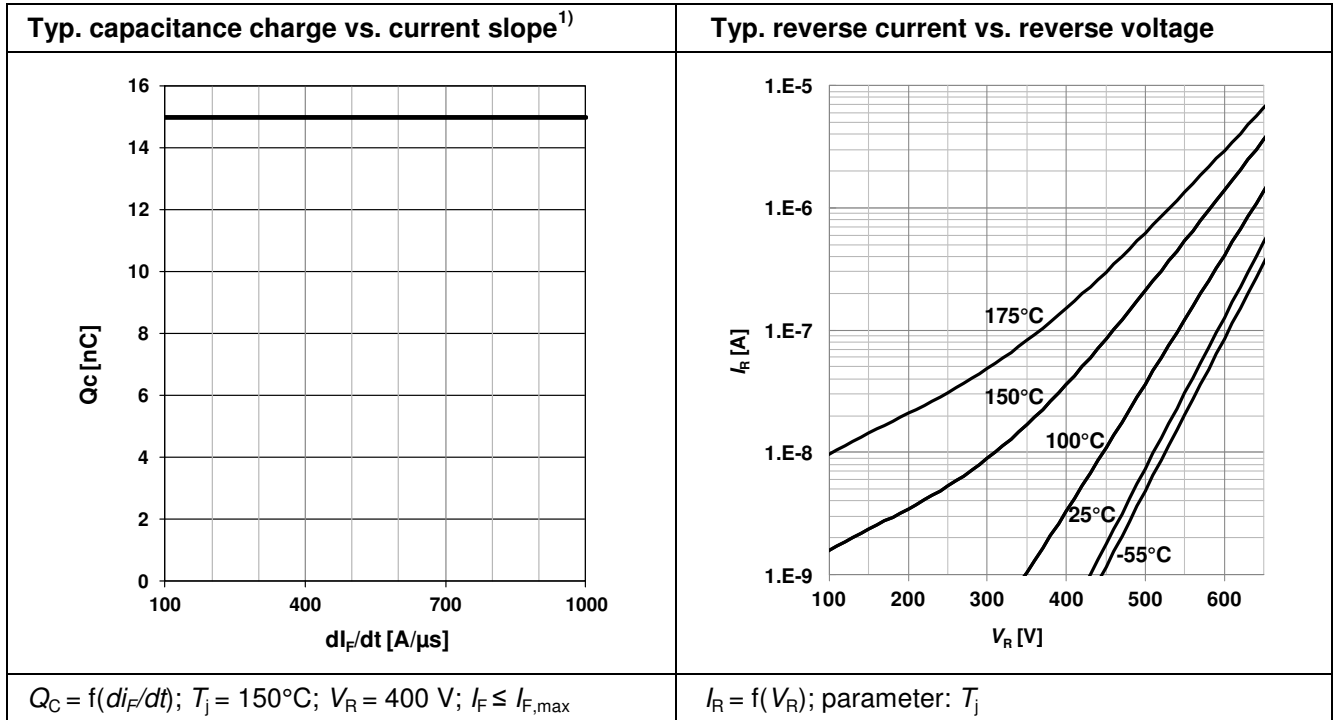
Table 7

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

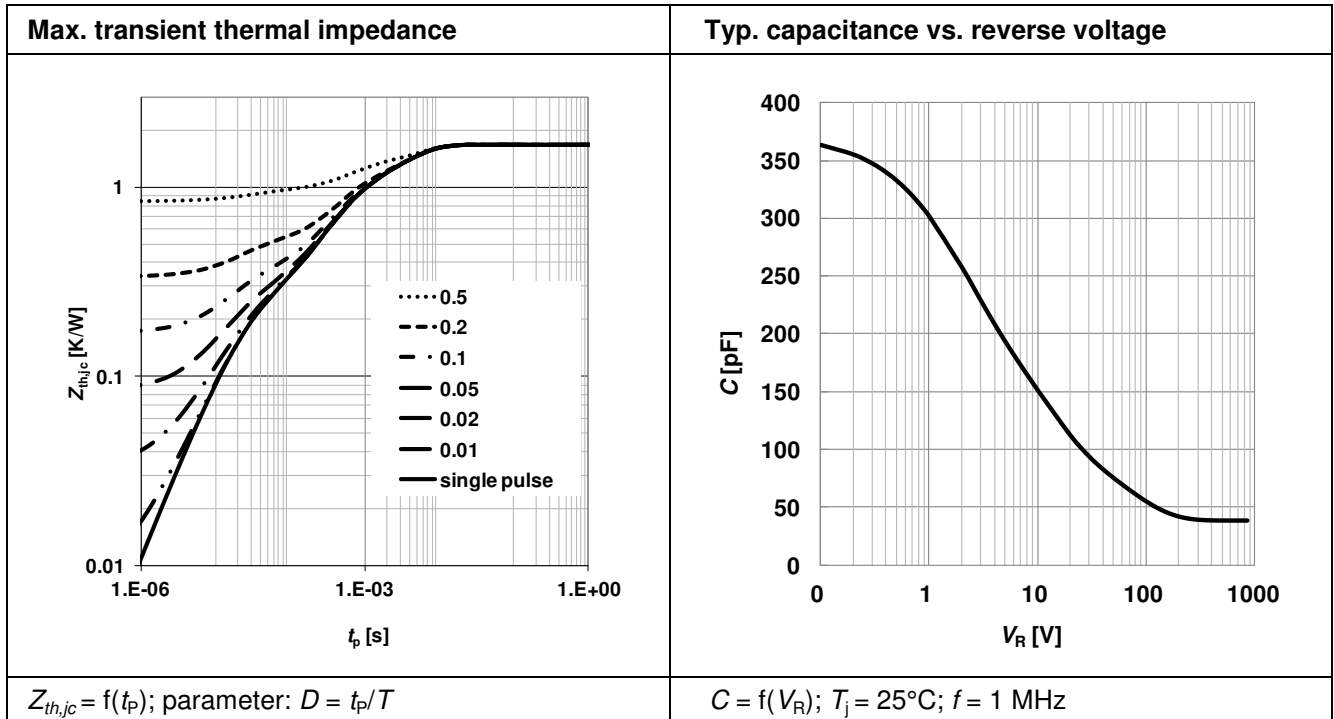
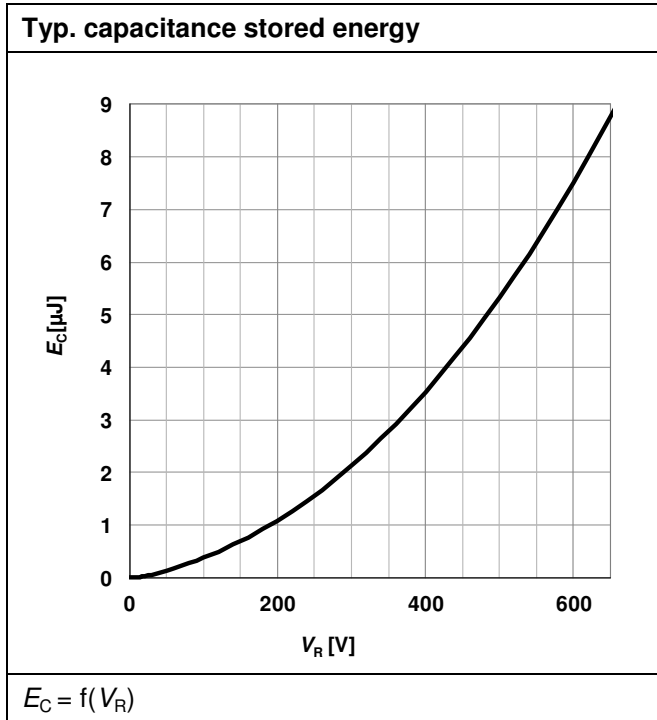


Table 11



## 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

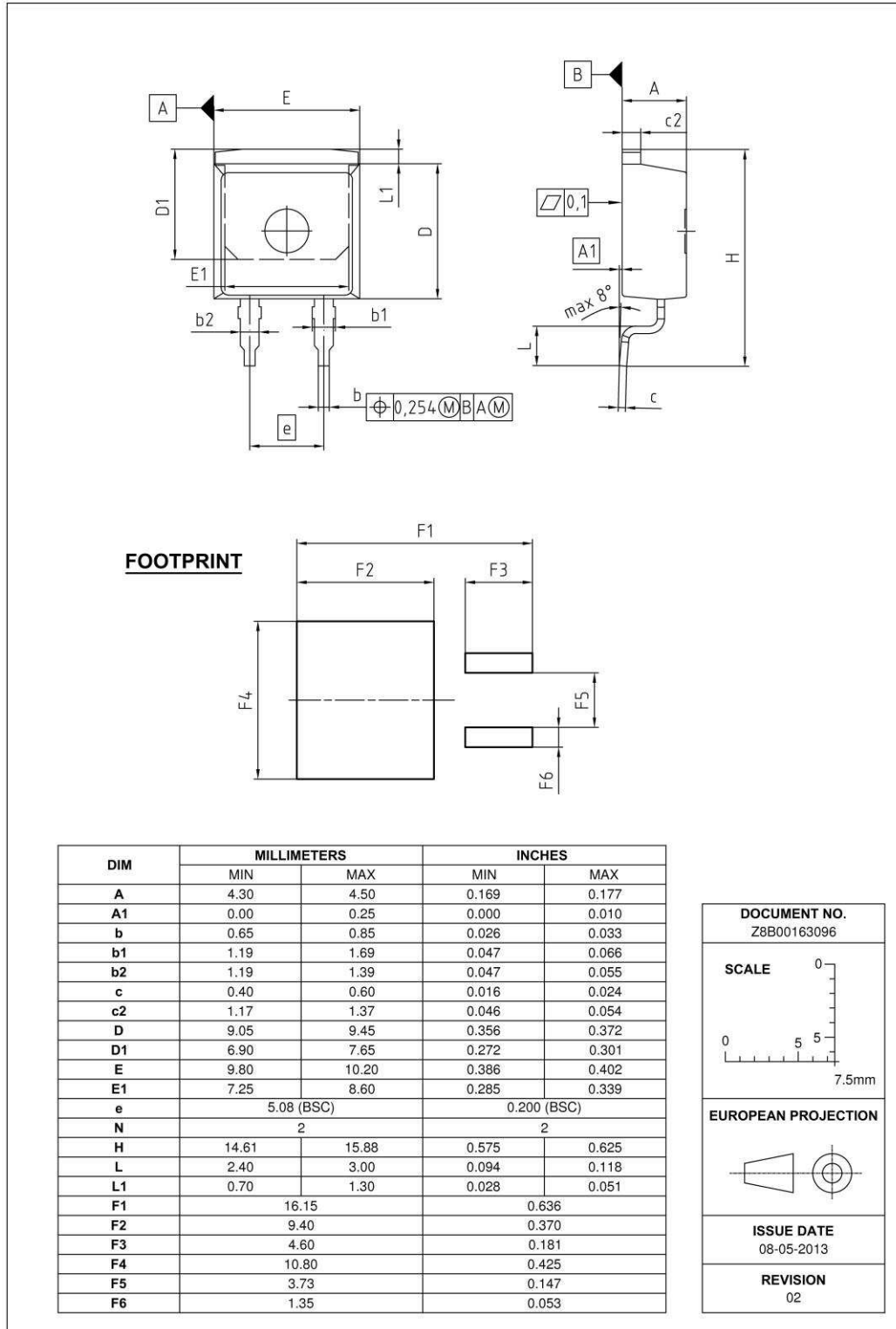


Figure 1 Outlines TO-263-2, dimensions in mm/inch

**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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