

**SiC**

Silicon Carbide Diode

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

650V SiC Schottky Diode

IDW40G65C5

**Final Datasheet**

Rev. 2.0 <2012-06-28>

**Power Management & Multimarket**

## 5th Generation thinQ!™ SiC Schottky Diode

### 1 Description

ThinQ!™ Generation 5 represents Infineon leading edge technology for the SiC Schottky Barrier diodes. Thanks to the more compact design and thin-wafer technology, the new family of products shows 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!™ Generation 5 has been designed to complement our 650V CoolMOS™ 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
- 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**

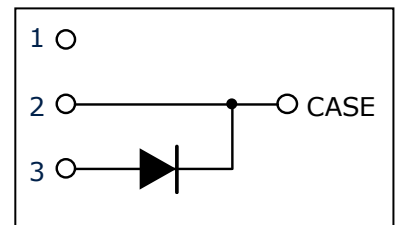
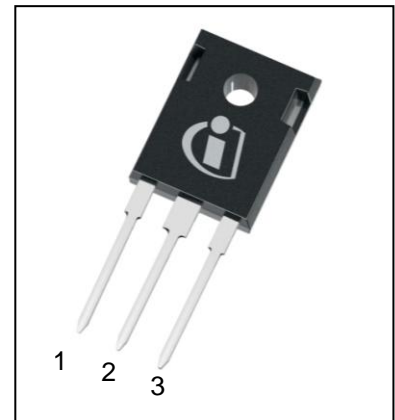
Parameter	Value	Unit
$V_{DC}$	650	V
$Q_C; V_R=400V$	55	nC
$E_C; V_R=400V$	14	$\mu J$
$I_F @ T_C < 110^\circ C$	40	A

**Table 2 Pin Definition**

Pin 1	Pin 2	Pin 3
n.c.	C	A

Type / ordering Code	Package	Marking	Related links
IDW40G65C5	PG-TO247-3	D4065C5	<a href="http://www.infineon.com/sic">www.infineon.com/sic</a>

### IDW40G65C5



1) J-STD20 and JESD22

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## 2 Maximum ratings

Table 3 Maximum ratings

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Continuous forward current	$I_F$	–	–	40	A	$T_C < 110^\circ\text{C}$ , $D=1$
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	–	–	182		$T_C = 25^\circ\text{C}$ , $t_p=10\text{ ms}$
		–	–	153		$T_C = 150^\circ\text{C}$ , $t_p=10\text{ ms}$
Non-repetitive peak forward current	$I_{F,max}$	–	–	1432		$T_C = 25^\circ\text{C}$ , $t_p=10\text{ }\mu\text{s}$
i <sup>2</sup> t value	$\int i^2 dt$	–	–	166	A <sup>2</sup> s	$T_C = 25^\circ\text{C}$ , $t_p=10\text{ ms}$
		–	–	118		$T_C = 150^\circ\text{C}$ , $t_p=10\text{ ms}$
Repetitive peak reverse voltage	$V_{RRM}$	–	–	650	V	
Diode dv/dt ruggedness	$dv/dt$	–	–	100	V/ns	$V_R=0..480\text{ V}$
Power dissipation	$P_{tot}$	–	–	183	W	$T_C = 25^\circ\text{C}$
Operating and storage temperature	$T_j; T_{stg}$	-55	–	175	°C	
Mounting torque		–	50	70	Ncm	M3 and M4 screws

## 3 Thermal characteristics

Table 4 Thermal characteristics TO-247-3

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction-case	$R_{thJC}$	–	0.6	0.8	K/W	
Thermal resistance, junction-ambient	$R_{thJA}$	–	–	62		leaded
Soldering temperature, wavesoldering only allowed at leads	$T_{sold}$	–	–	260	°C	1.6mm (0.063 in.) from case for 10 s

## 4 Electrical characteristics

**Table 5 Static characteristics**

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
DC blocking voltage	$V_{DC}$	650	–	–	V	$I_R = 7 \text{ mA}, T_j = 25^\circ\text{C}$
Diode forward voltage	$V_F$	–	1.5	1.8		$I_F = 40 \text{ A}, T_j = 25^\circ\text{C}$
		–	1.8	2.2		$I_F = 40 \text{ A}, T_j = 150^\circ\text{C}$
Reverse current	$I_R$	–	2.2	7000	$\mu\text{A}$	$V_R = 650 \text{ V}, T_j = 25^\circ\text{C}$
		–	0.5	1800		$V_R = 600 \text{ V}, T_j = 25^\circ\text{C}$
		–	8.2	26500		$V_R = 650 \text{ V}, T_j = 150^\circ\text{C}$

**Table 6 AC characteristics**

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Total capacitive charge	$Q_c$	–	55	–	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	–	1210	–	pF	$V_R = 1 \text{ V}, f = 1 \text{ MHz}$
		–	156	–		$V_R = 300 \text{ V}, f = 1 \text{ MHz}$
		–	155	–		$V_R = 600 \text{ V}, f = 1 \text{ MHz}$

## 5 Electrical characteristics diagrams

Table 7

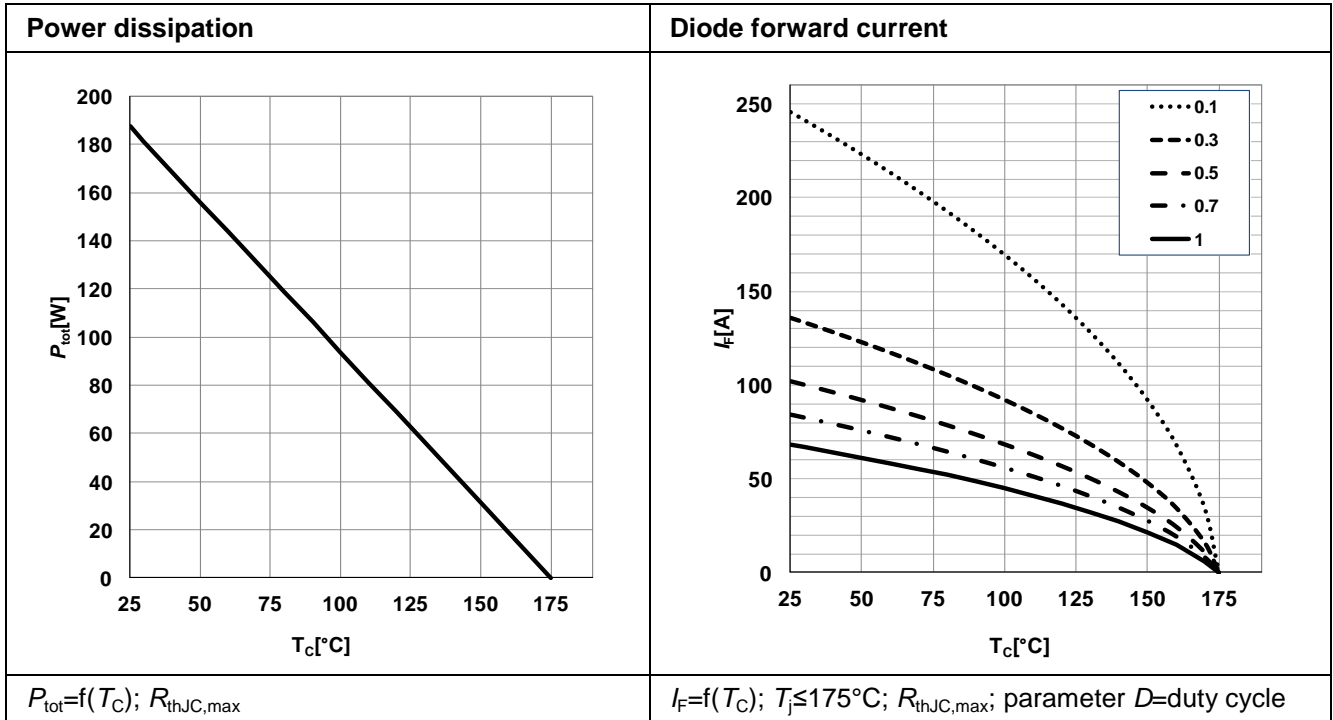


Table 8

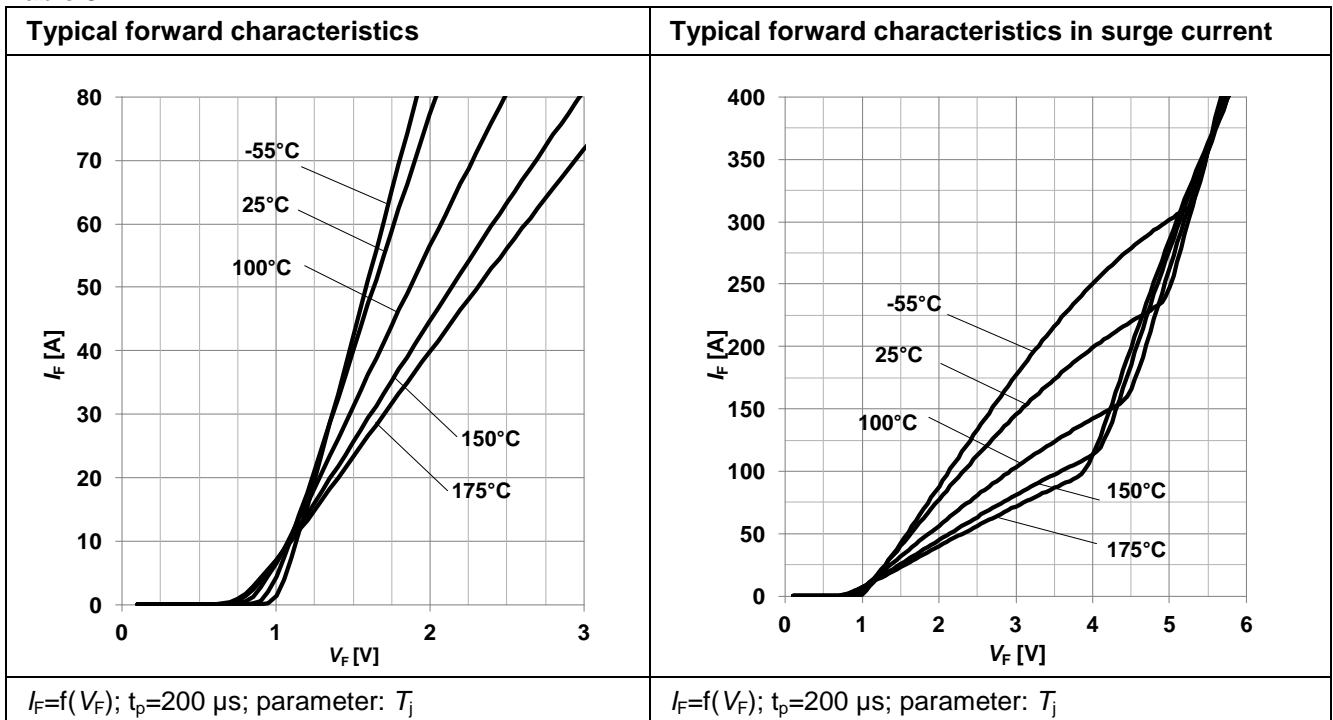


Table 9

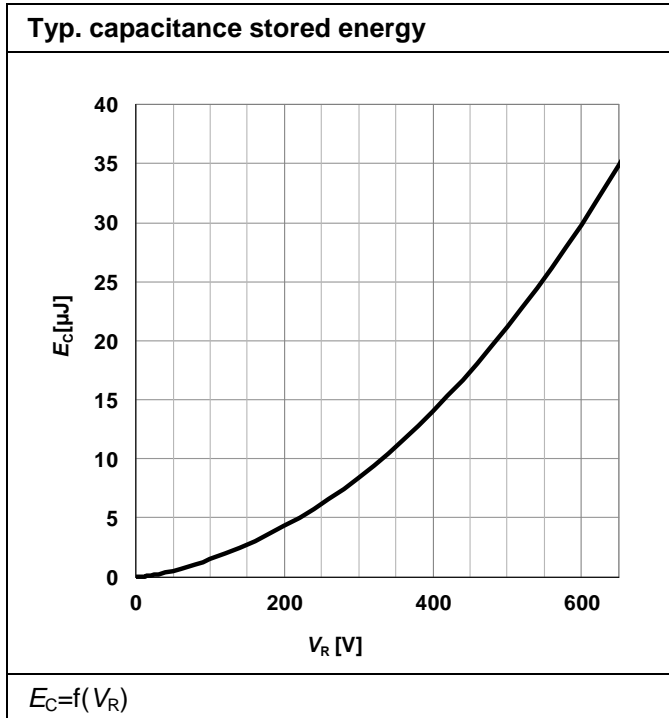
Typ. capacitance charge vs. current slope <sup>1)</sup>	Typ. reverse current vs. reverse voltage
$Q_C=f(dI_F/dt); T_j=150^\circ\text{C}; V_R=400\text{ V}; I_F\leq I_{F,max}$	$I_R=f(V_R); \text{parameter: } T_j$

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 Package outlines

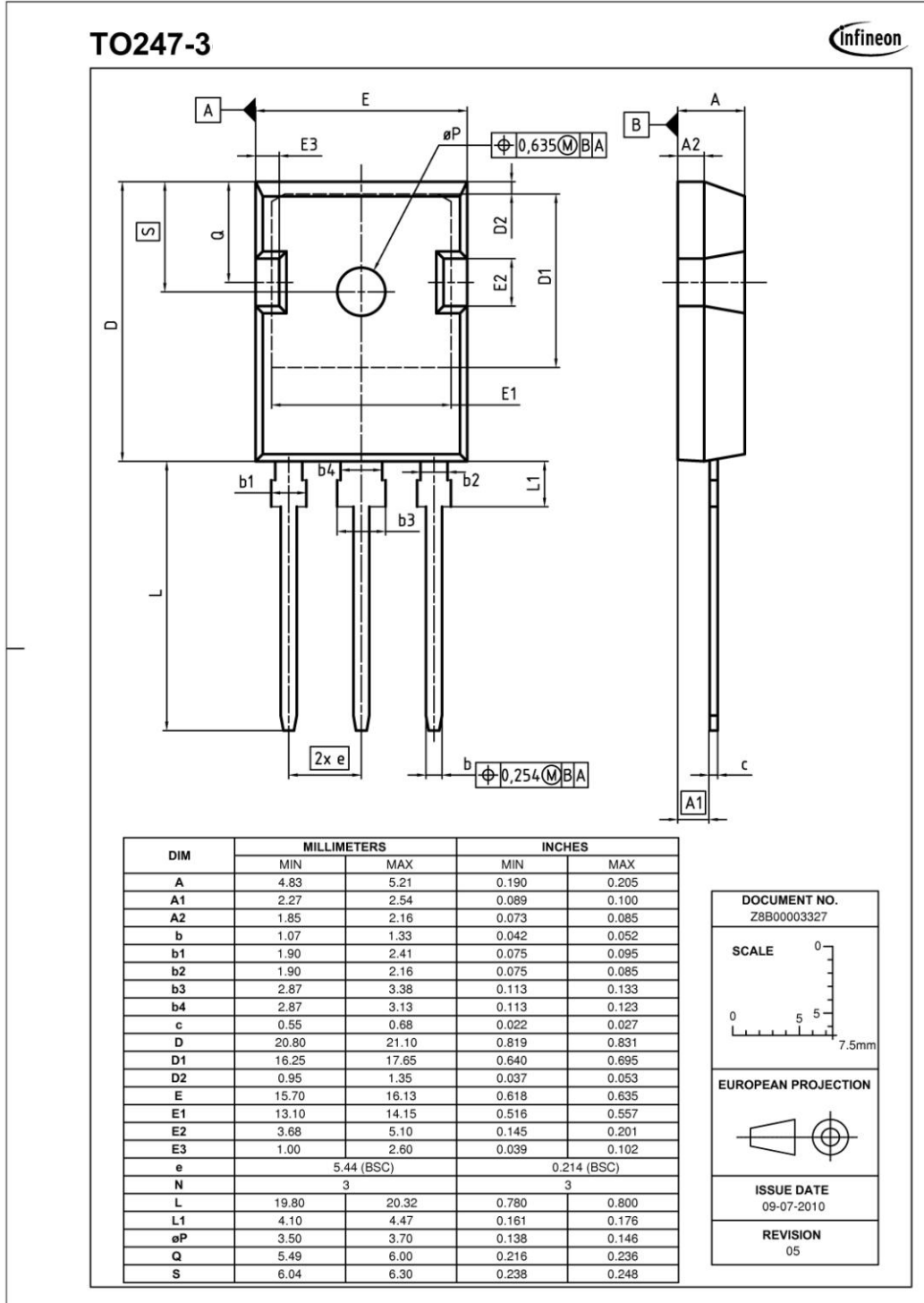


Figure 1 Outlines TO-247, dimensions in mm/inches

## 7 Revision History

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

Revision History: 2012-06-28, Rev. 2.0

#### Previous Revision:

Revision	Subjects (major changes since last version)

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