SiC

Silicon Carbide Diode

5th Generation thinQ!™

650V SiC Schottky Diode

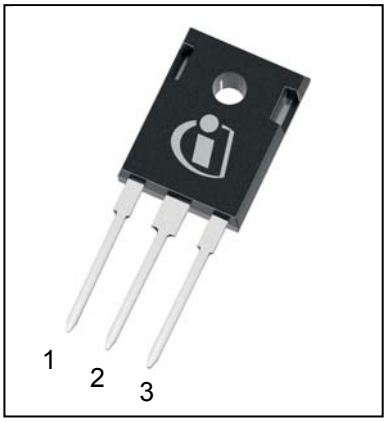
IDW12G65C5

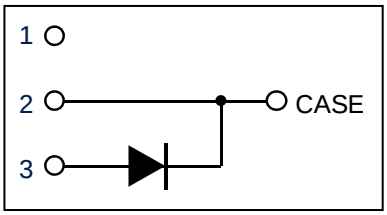
Final Datasheet

Rev. 2.1, 2012-09-10

Power Management & Multimarket

5th Generation thinQ!™ SiC Schottky Diode IDW12G65C5





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 (Qc x Vf).
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[1)] 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	18	nC
E_C; V_R=400V	4.1	µJ
I_F @ T_C < 125°C	12	A

Table 2 Pin Definition

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

Type / ordering Code	Package	Marking	Related links
IDW12G65C5	PG-TO247-3	D1265C5	www.infineon.com/sic

1) J-STD20 and JESD22

Table of Contents

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 < 125°C, D=1
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	–	–	71		T_C = 25°C, t_p=10 ms
		–	–	56		T_C = 150°C, t_p=10 ms
Non-repetitive peak forward current	$I_{F,max}$	–	–	505		T_C = 25°C, t_p=10 µs
i²t value	$\int i^2dt$	–	–	25.4	A²s	T_C = 25°C, t_p=10 ms
		–	–	15.7		T_C = 150°C, t_p=10 ms
Repetitive peak reverse voltage	V_{RRM}	–	–	650	V	
Diode dv/dt ruggedness	dv/dt	–	–	100	V/ns	V_R=0..480 V
Power dissipation	P_{tot}	–	–	76	W	T_C = 25°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}	–	1.5	2.0	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= 0.5 mA, T_j = 25°C
Diode forward voltage	V_F	–	1.5	1.7		I_F= 12 A, T_j=25°C
		–	1.8	2.1		I_F= 12 A, T_j=150°C
Reverse current	I_R	–	0.6	500	µA	V_R=650 V, T_j=25°C
		–	0.2	100		V_R=600 V, T_j=25°C
		–	2.4	1600		V_R=650 V, T_j=150°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 V, *di/dt*=200A/µs, $I_F \le I_{F,MAX}$, T_j=150°C.
Total Capacitance	C	–	360	–	pF	V_R=1 V, *f*=1 MHz
		–	47	–		V_R=300 V, *f*=1 MHz
		–	46	–		V_R=600 V, *f*=1 MHz

5 Electrical characteristics diagrams

Table 7

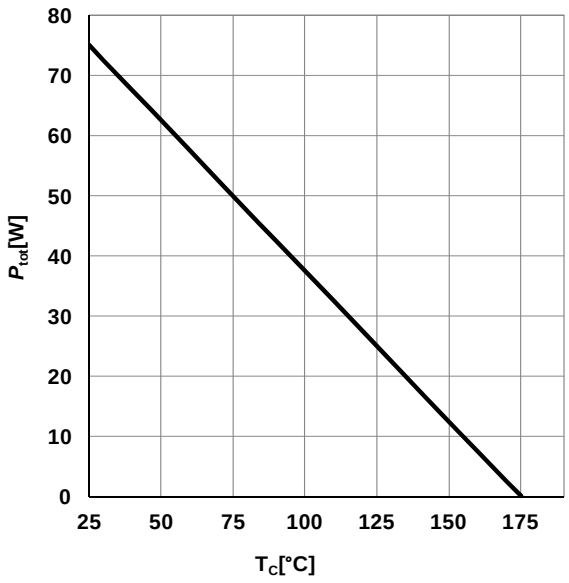
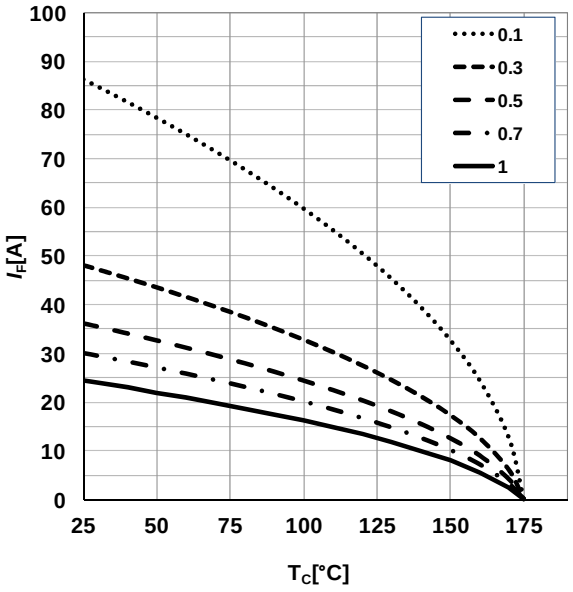
Power dissipation	Diode forward current
	
$P_{tot}=f(T_C)$; $R_{thJC,max}$	$I_F=f(T_C)$; $T_j \leq 175°C$; $R_{thJC,max}$; parameter D=duty cycle

Table 8

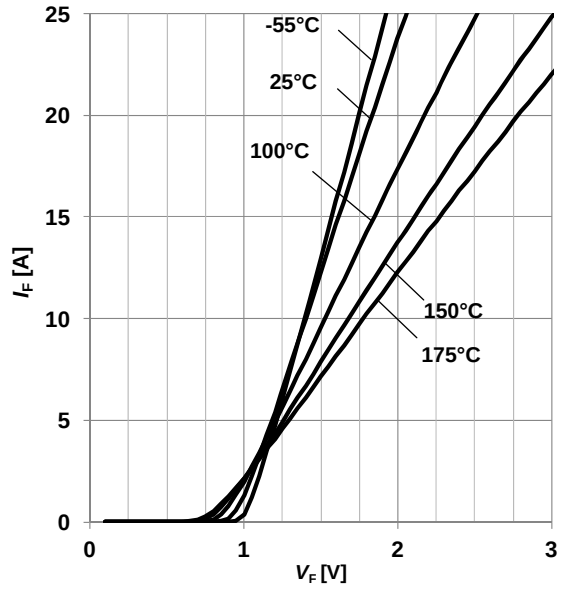
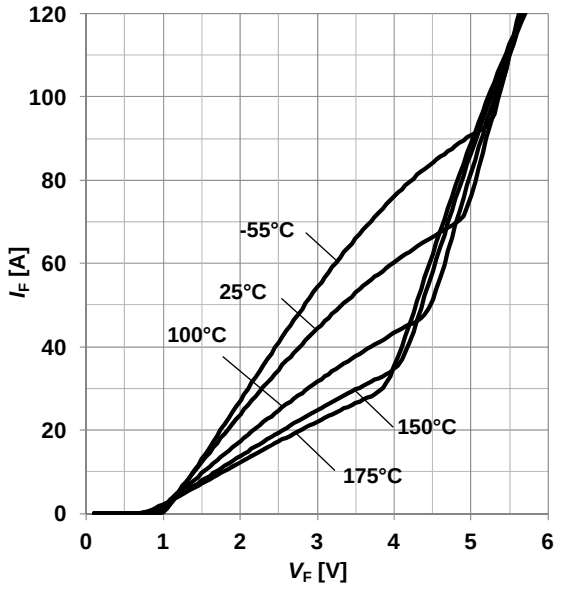
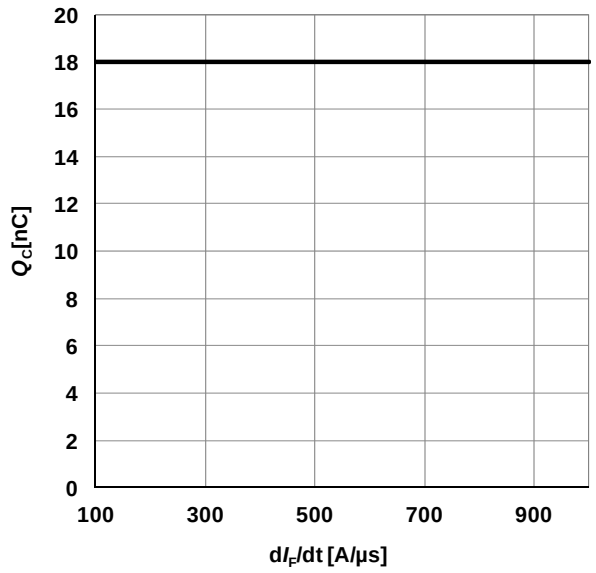
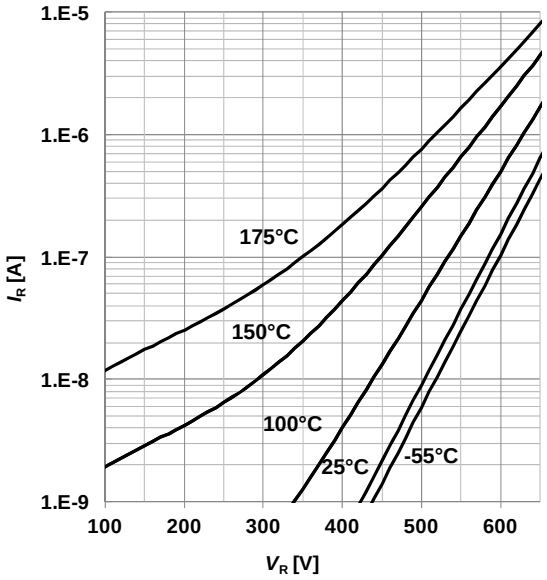
Typical forward characteristics	Typical forward characteristics in surge current
	
$I_F=f(V_F)$; t_p=200 µs; parameter: T_j	$I_F=f(V_F)$; t_p=200 µs; parameter: T_j

Table 9

Typ. capacitance charge vs. current slope[1)]	Typ. reverse current vs. reverse voltage
	
Q_C=f(di$_F$/dt); T_j=150°C; V_R=400 V; $I_F \leq I_{F,max}$	I_R=f(V_R); parameter: T_j

1) Only capacitive charge, guaranteed by design.

Table 10

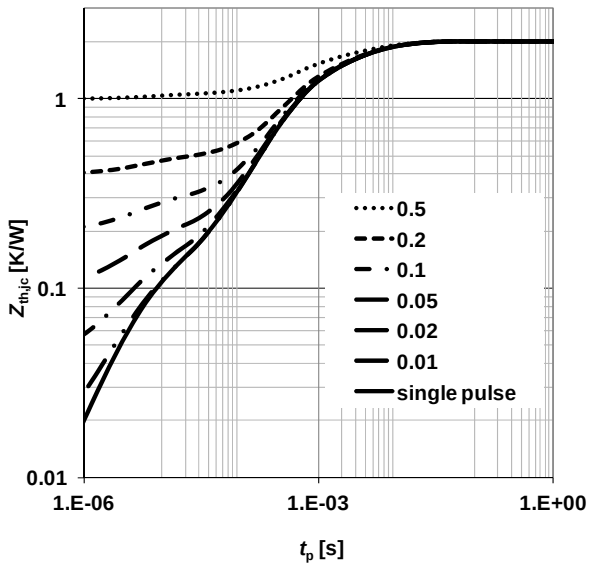
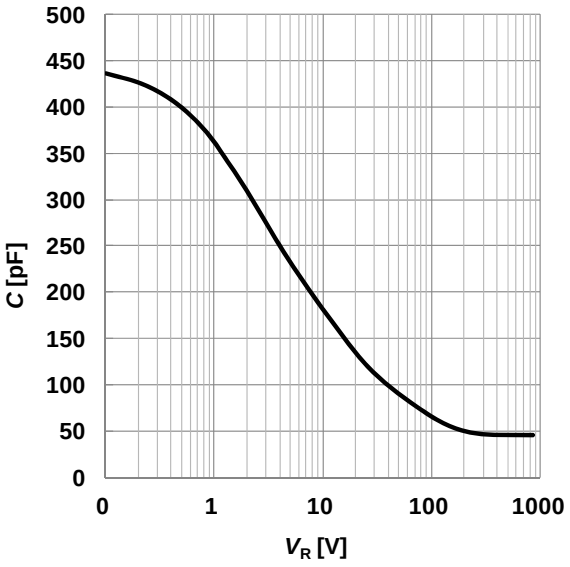
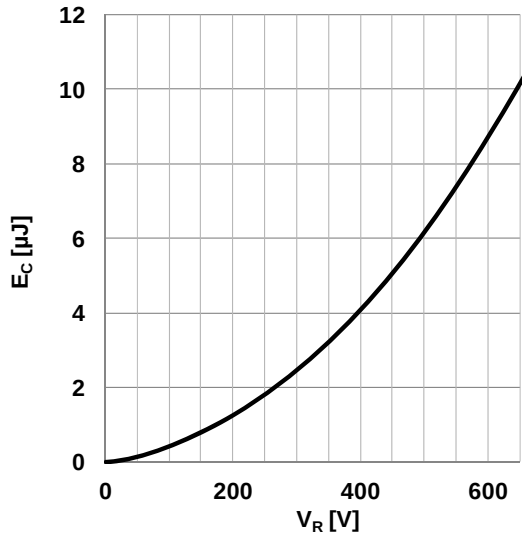
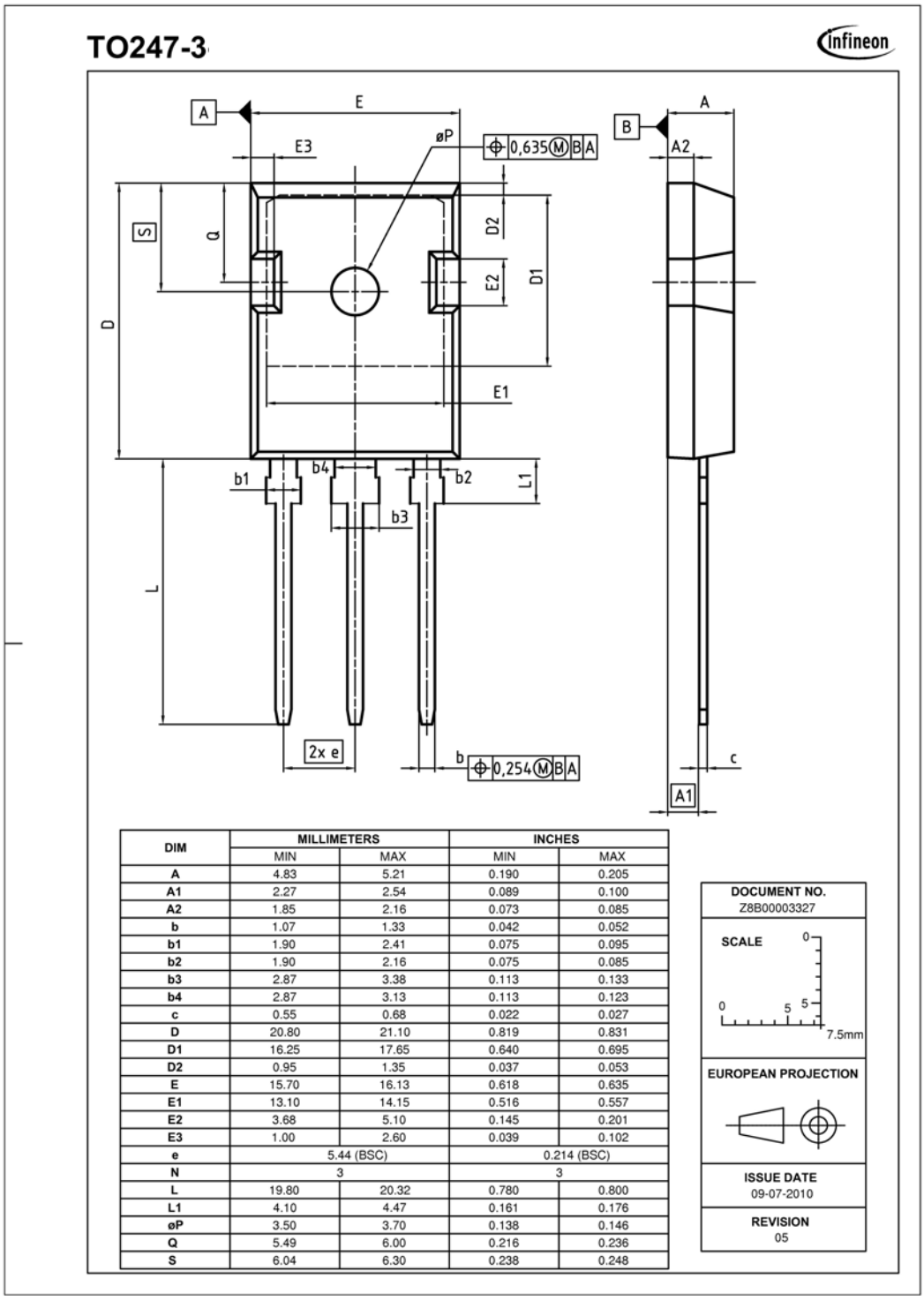
Max. transient thermal impedance	Typ. capacitance vs. reverse voltage
	
$Z_{th,jc}$=f(t_P); parameter: D=t_P/T	C=f(V_R); T_j=25°C; f=1 MHz

Table 11

Typ. capacitance stored energy

E_C=f(V_R)

6 Package outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44 (BSC)		0.214 (BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
øP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

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SCALE
0 5 5 7.5mm

EUROPEAN PROJECTION

ISSUE DATE
09-07-2010

REVISION
05

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

7 Revision History

5th Generation thinQ!™ SiC Schottky Diode

Revision History: 2012-09-10, Rev. 2.1

Previous Revision:

Revision	Subjects (major changes since last version)
2.0	Release of the final datasheet.
2.1	Reverse current values, maximum diode forward voltage.

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