SiC

Silicon Carbide Diode

5^{th} Generation thinQ!^{TM}

650V SiC Schottky Diode

IDW32G65C5B

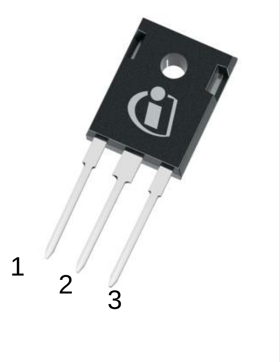
Final Datasheet

Rev. 2.0, 2015-04-13

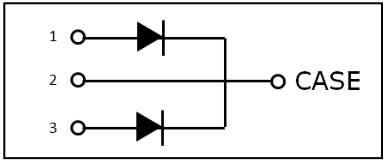
Power Management & Multimarket

5th Generation thinQ!™ SiC Schottky Diode IDW32G65C5B

1 Description



ThinQ!™ Generation 5 represents Infineon leading edge technology for the SiC Schottky Barrier diodes. A combination with a new, more compact design and thin-wafer technology results 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 (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
- Breakdown voltage tested at 35 mA[2) 3)]
- 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 [4)]

Parameter	Value	Unit
V_{DC}	650	V
Q_C; V_R=400V	2 x 23	nC
E_C; V_R=400V	2 x 5.4	µJ
I_F @ $T_C < 120°C$	2 x 16	A

Table 2 Pin Definition

Pin 1	Pin 2	Pin 3
A	C	A

Type / ordering Code	Package	Marking	Related links
IDW32G65C5B	PG-TO247-3	D3265B5	www.infineon.com/sic

1) J-STD20 and JESD22
2) All devices tested under avalanche conditions for a time periode of 10ms
3) Per Leg
4) Per Device

Table of Contents

2 Maximum ratings

Table 3 Maximum ratings

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Continuous forward current [1]	I_F	–	–	16	A	T_C < 120°C, D=1
Surge non-repetitive forward current, sine halfwave [1]	$I_{F,SM}$	–	–	95		T_C = 25°C, t_p=10 ms
		–	–	74		T_C = 150°C, t_p=10 ms
Non-repetitive peak forward current [1]	$I_{F,max}$	–	–	637		T_C = 25°C, t_p=10 µs
i²t value [1]	$\int i^2 dt$	–	–	45	A²s	T_C = 25°C, t_p=10 ms
		–	–	28		T_C = 150°C, t_p=10 ms
Repetitive peak reverse voltage	V_{RRM}	–	–	650	V	T_j = 25°C
Diode dv/dt ruggedness	dv/dt	–	–	100	V/ns	V_R=0..480 V
Power dissipation [2]	P_{tot}	–	–	188	W	T_C = 25°C
Operating and storage temperature	T_j;T_{stg}	-55	–	175	°C	
Mounting torque		–	50	70	Ncm	M3 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 [1]	R_{thJC}	–	1.2	1.6	K/W	
Thermal resistance, junction-ambient [1]	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

1) Per Leg
2) Per Device

Electrical characteristics

Table 5 Static characteristics

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
DC blocking voltage 1)	V_{DC}	650	–	–	V	T_j=25°C
Diode forward voltage 1)	V_F	–	1.5	1.7	V	I_F= 16 A, T_j=25°C
		–	1.8	2.1		I_F= 16 A, T_j=150°C
Reverse current 1)	I_R	–	0.8	200	µA	V_R=650 V, T_j=25°C
		–	0.2	71		V_R=600 V, T_j=25°C
		–	3.2	1400		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 1)	Q_c	–	23		nC	V_R=400 V, di/dt=200A/µs, $I_F \leq I_{F,MAX}$, T_j=150°C
Total Capacitance 1)	C	–	470	–	pF	V_R=1 V, f=1 MHz
		–	61	–		V_R=300 V, f=1 MHz
		–	60	–		V_R=600 V, f=1 MHz

1) Per Leg
2) Per Device

4 Electrical characteristics diagrams

Table 7

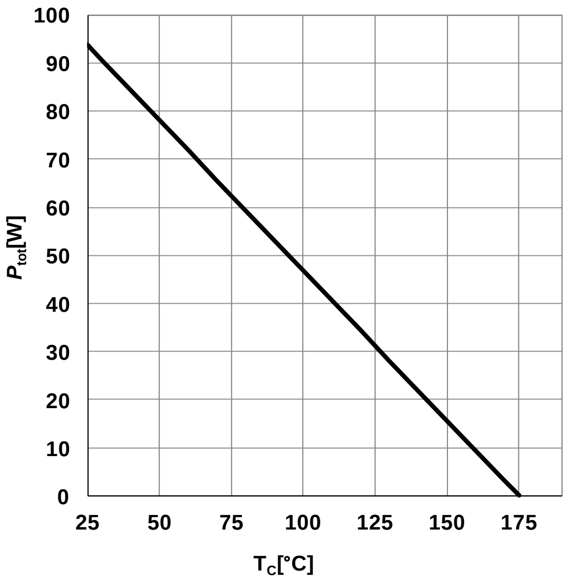
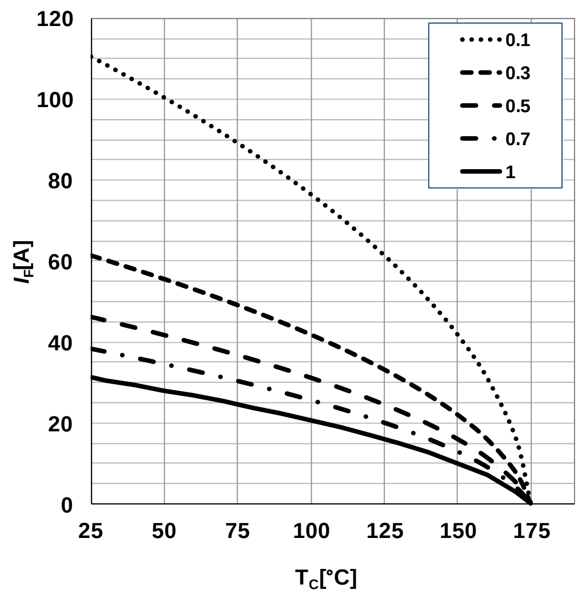
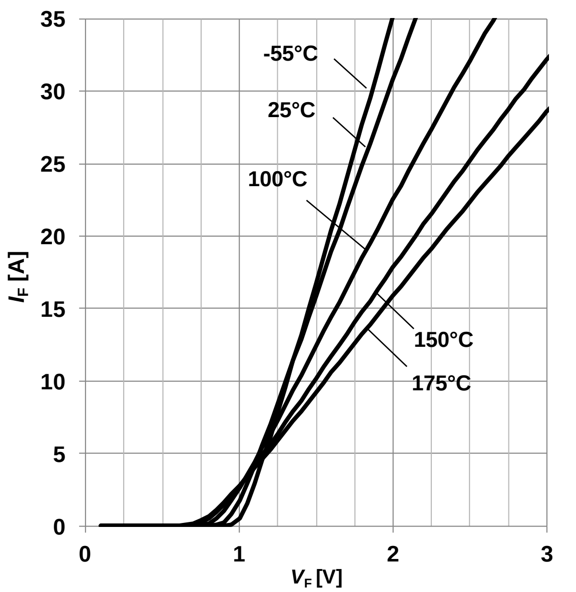
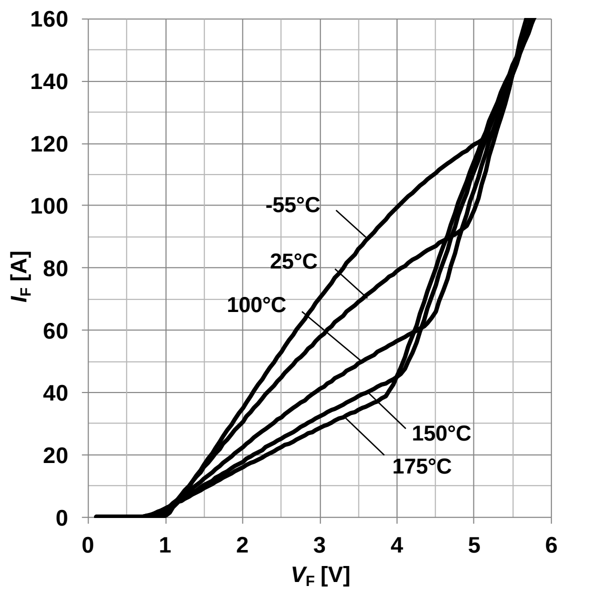
Power dissipation [1)]	Maximal diode forward current [1)]
	
P_{tot}=f(T_C); $R_{thJC,max}$	I_F=f(T_C); $R_{thJC,max}$;T_j≤175°C; parameter D=duty cycle

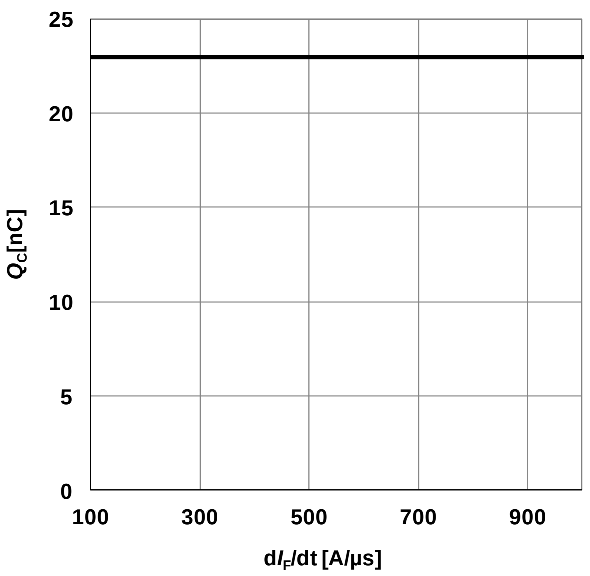
Table 8

Typical forward characteristics [1)]	Typical forward characteristics in surge current [1)]
	
I_F=f(V_F); t_p=200 µs; parameter: T_j	I_F=f(V_F); t_p=200 µs; parameter: T_j

1) Per Leg
2) Per Device

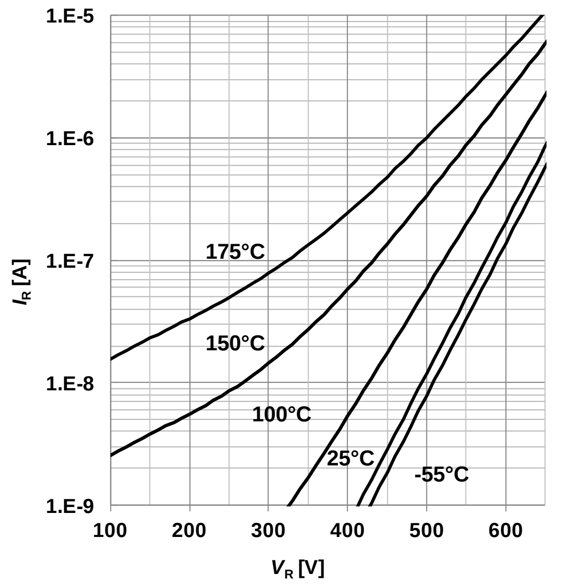
Table 9

Typ. capacitance charge vs. current slope [1)]



Q_C=f(di_F/dt); T_j=150°C; V_R=400 V; $I_F \le I_{F,max}$

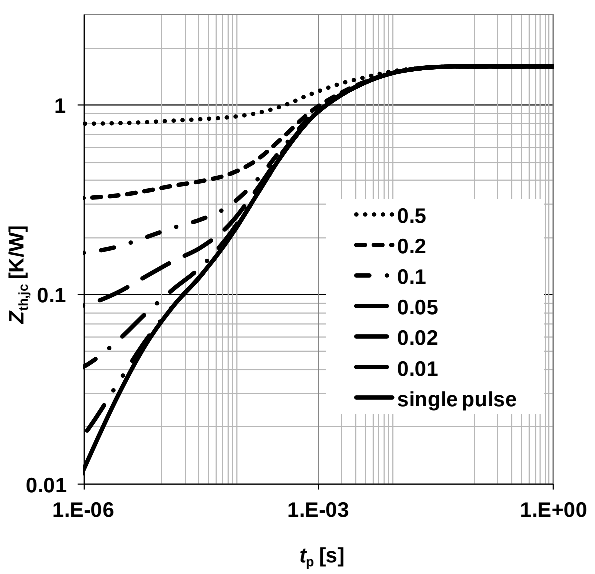
Typ. Reverse current vs. reverse voltage [1)]



I_R=f(V_R); parameter: T_j

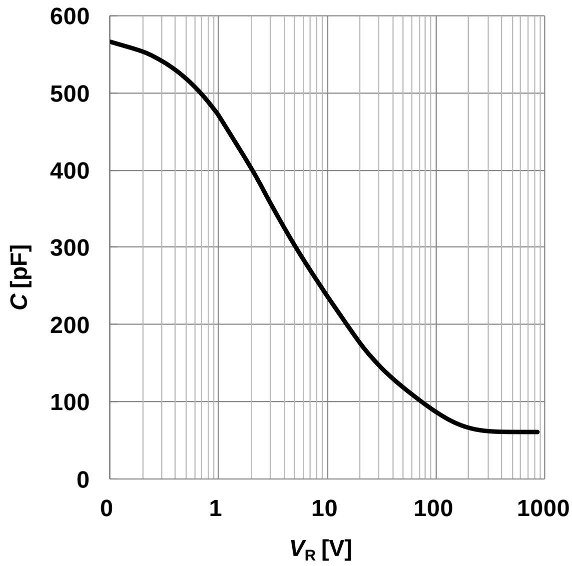
Table 10

Max. transient thermal impedance [1)]



$Z_{th,jc}$=f(t_P); parameter: D=t_P/T

Typ. capacitance vs. reverse voltage [1)]

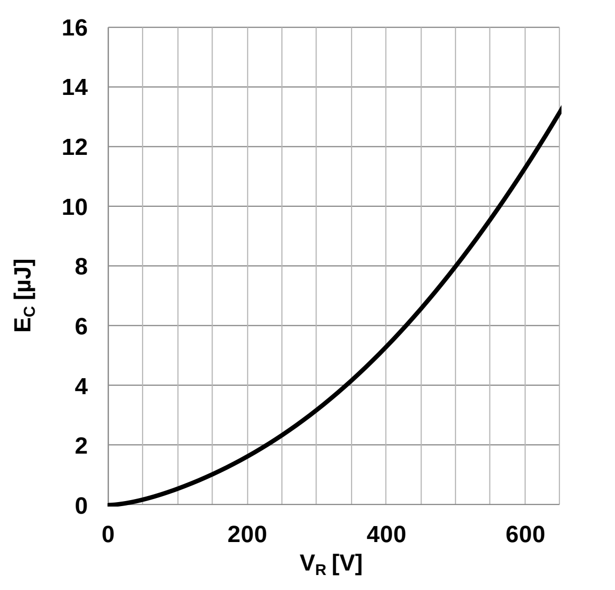


C=f(V_R); T_j=25°C; f=1 MHz

1) Per Leg

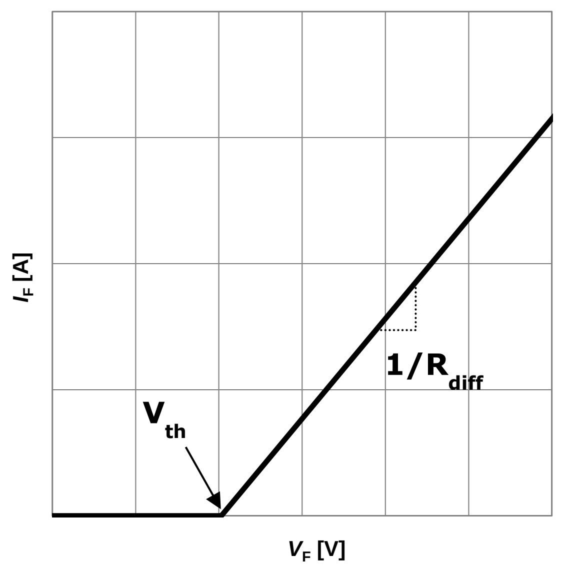
2) Per Device

Table 11

Typ. capacitance stored energy [1]

E_C=f(V_R)

5 Simplified Forward Characteristics Model

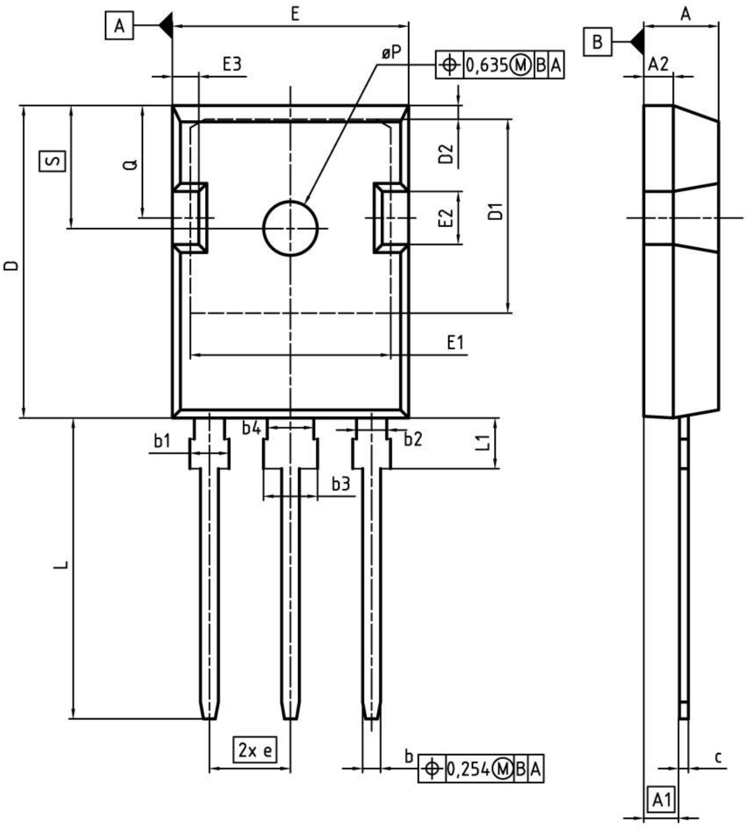
Table 12

Equivalent forward current curve [1]	Mathematical Equation
	$V_F = V_{TH} + R_{DIFF} \cdot I_F$ $V_{TH}(T_j) = -0.001 \cdot T_j + 1.04 \; [\mathrm{V}]$ $R_{DIFF}(T_j) = 8 \cdot 10^{-7} \cdot T_j^2 + 8 \cdot 10^{-5} \cdot T_j + 0.029 \; [\Omega]$
V_F=f(I_F)	T_j in °C; -55°C < T_j < 175°C; I_F < 32 A

1) Per Leg
2) Per Device

6 Package outlines

TO247-3-21/-41/-44

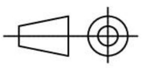


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	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

DOCUMENT NO.
Z8B00003327

SCALE
0 5 7.5mm

EUROPEAN PROJECTION



ISSUE DATE
09-07-2010

REVISION
05

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

1) Per Leg

2) Per Device

7 Revision History

5th Generation thinQ!™ SiC Schottky Diode

Revision History: 2015-04-13, Rev.2.0

Previous Revision:

Revision	**Subjects (major changes since last version)**
2.0	Release of the final datasheet.

We Listen to Your Comments

Any information within this document that you feel is wrong, unclear or missing at all?
Your feedback will help us to continuously improve the quality of this document.
Please send your proposal (including a reference to this document) to: **erratum@infineon.com**

Edition 2015-04-13
Published by
Infineon Technologies AG
81726 Munich, Germany

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (www.infineon.com).

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

w w w . i n f i n e o n . c o m

Published by Infineon Technologies AG