SiC

Silicon Carbide Diode

5th Generation thinQ!™

650V SiC Schottky Diode

IDL08G65C5

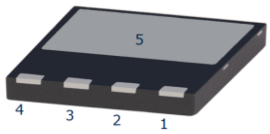
Final Data Sheet

Rev2.1, 2016-04-19

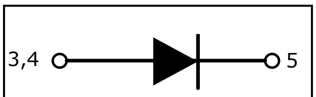
Power Management & Multimarket

5^{th} Generation thinQ!™ SiC Schottky Diode **IDL08G65C5**

ThinPAK 8x8



Bottom view



1 Description

ThinQ!™ 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 (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 18 mA[2)]
- 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

Related Links
http://www.infineon.com/sic
ThinPAK Webpage
ThinPAK Application Note

Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DC}	650	V
Q_C; V_R=400V	13	nC
E_C; V_R=400V	2.9	µJ
I_F @ T_C < 150°C	8	A

Table 2 Pin Definition

Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
n.c.	n.c.	A	A	C

Type / ordering Code	Package	Marking
IDL08G65C5	PG-VSON-4	D0865C5

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

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	–	–	8	A	T_C < 125°C, D=1
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	–	–	43		T_C = 25°C, t_p=10 ms
		–	–	36		T_C = 150°C, t_p=10 ms
Non-repetitive peak forward current	$I_{F,max}$	–	–	364		T_C = 25°C, t_p=10 µs
i²t value	$\int i^2dt$	–	–	9.5	A²s	T_C = 25°C, t_p=10 ms
		–	–	6.4		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	P_{tot}	–	–	96	W	T_C = 25°C
Operating and storage temperature	T_j;T_{stg}	-55	–	150	°C	

3 Thermal characteristics

Table 4 Thermal characteristics

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction-case	R_{thJC}	–	1.0	1.3	K/W	
Thermal resistance, junction-ambient	R_{thJA}	–	–	45		SMD version, device on PCB, 6cm² cooling area[1)]

1) Device on 40mm*40mm*1.5mm one layer epoxy PCB FR4 with 6cm^2 copper area (thickness 70µm) for drain 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= 0.14 mA, T_j=25°C
Diode forward voltage	V_F	–	1.5	1.7		I_F= 8 A, T_j=25°C
		–	1.8	2.1		I_F= 8 A, T_j=150°C
Reverse current	I_R	–	0.4	140	µA	V_R=650 V, T_j=25°C
		–	0.1	50		V_R=600 V, T_j=25°C
		–	1.6	1000		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	–	13		nC	V_R=400 V, di/dt=200A/µs, $I_F \leq I_{F,MAX}$, T_j=150°C.
Total Capacitance	C	–	250	–	pF	V_R=1 V, f=1 MHz
		–	32	–		V_R=300 V, f=1 MHz
		–	32	–		V_R=600 V, f=1 MHz

5 Electrical characteristics diagrams

Table 7

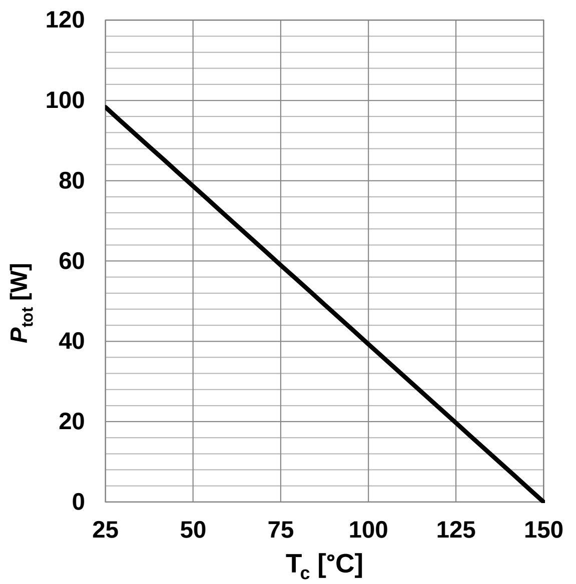
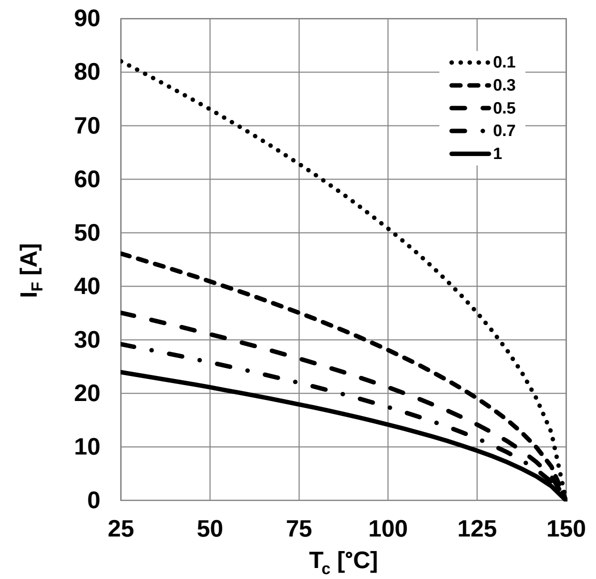
Power dissipation	Maximal diode forward current
	
P_{tot}=f(T_C); $R_{thJC,max}$	I_F=f(T_C); $R_{thJC,max}$; T_j≤150°C; parameter D=duty cycle

Table 8

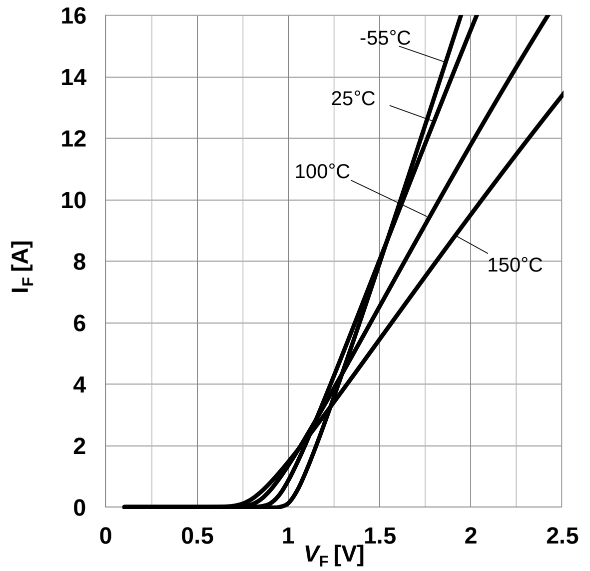
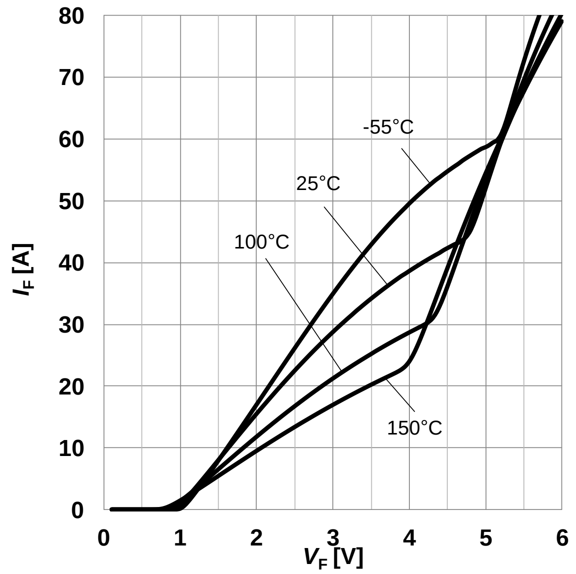
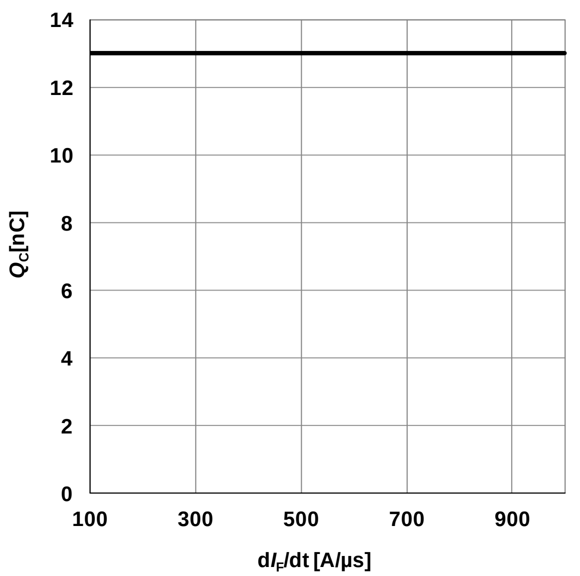
Typical forward characteristics	Typical forward characteristics in surge current
	
I_F=f(V_F); t_p=200 µs; parameter: T_j	I_F=f(V_F); t_p=200 µs; parameter: T_j

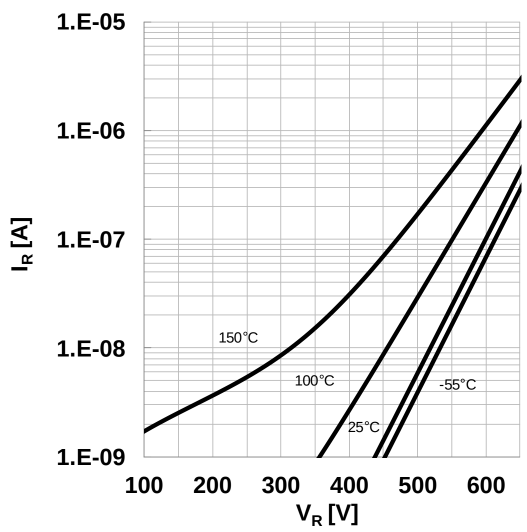
Table 9

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



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

Typ. reverse current vs. reverse voltage

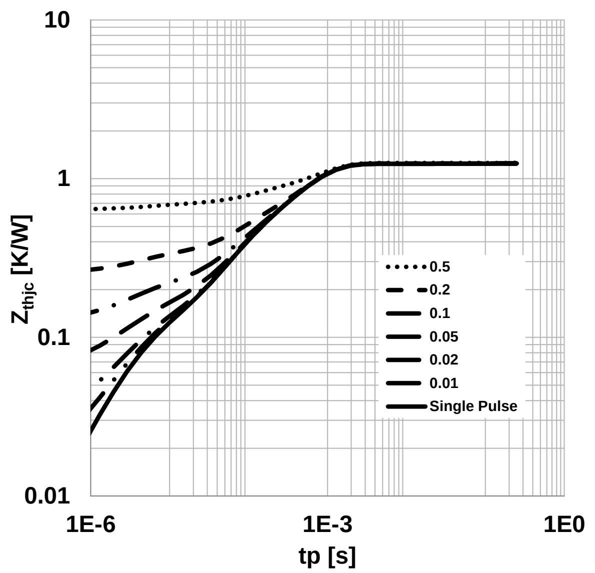


I_R=f(V_R); parameter: T_j;

1) Only capacitive charge, guaranteed by design.

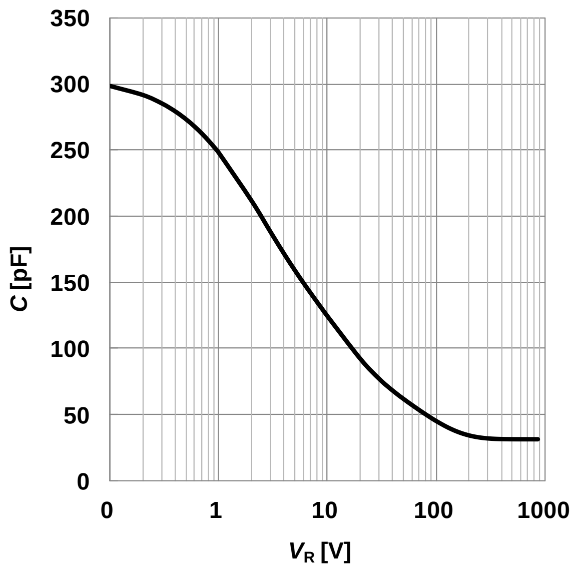
Table 10

Max. transient thermal impedance



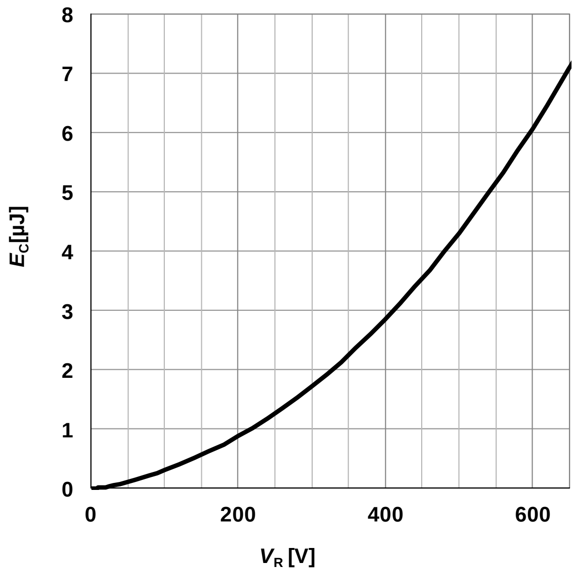
$Z_{th,jc}$=f(t_P); parameter: D=t_P/T

Typ. capacitance vs. reverse voltage



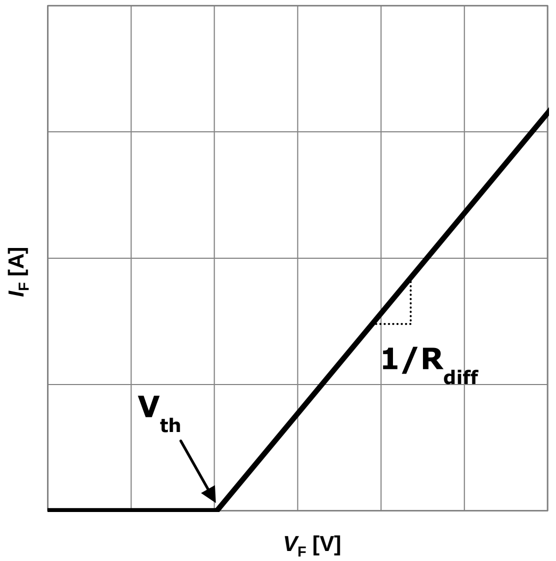
C=f(V_R); T_j=25°C; f=1 MHz

Table 11

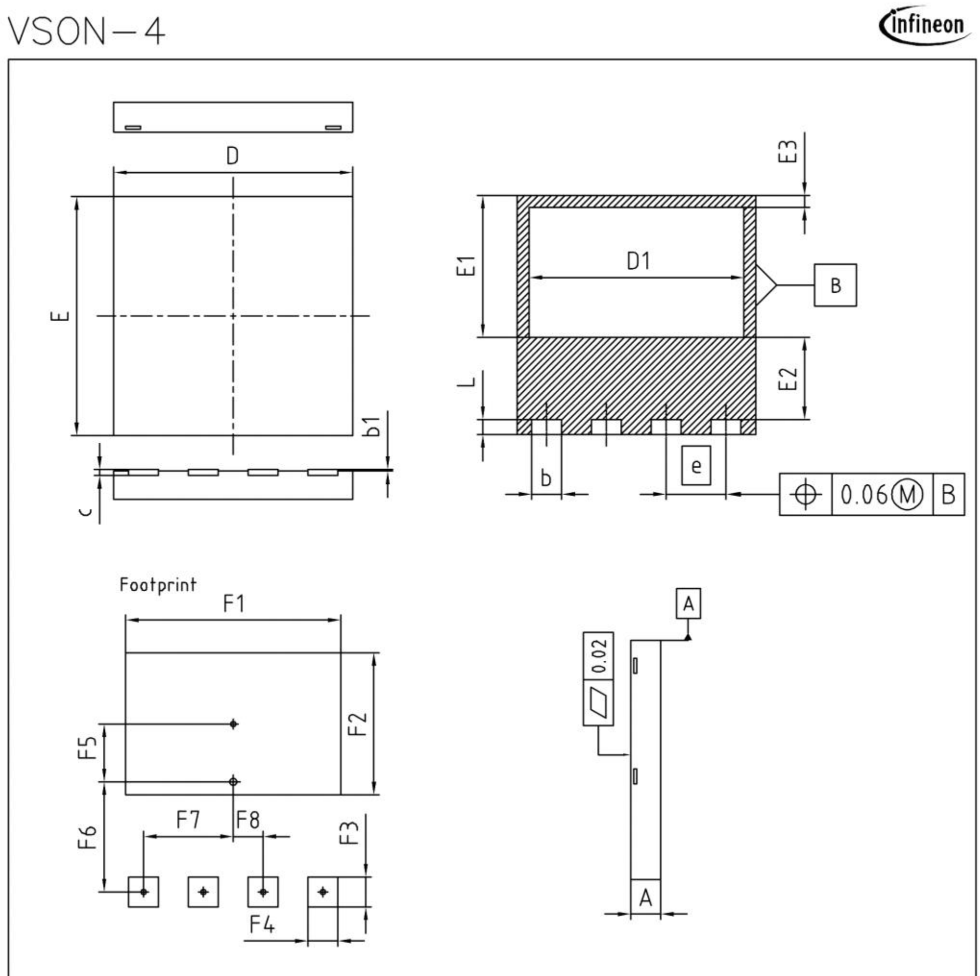
Typ. capacitance stored energy

E_C=f(V_R)

6 Simplified Forward Characteristics Model

Table 12

Equivalent forward current curve	Mathematical Equation
	$V_F = V_{TH} + R_{DIFF} \cdot I_F$ $V_{TH}(T_j) = -0.001 \cdot T_j + 1.04$ [V] $R_{DIFF}(T_j) = 1.6 \cdot 10^{-6} \cdot T_j^2 + 1.6 \cdot 10^{-4} \cdot T_j + 0.058$ [Ω]
V_F=f(I_F)	T_j in °C; -55°C < T_j < 150°C; I_F < 16 A

7 Package outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.10	0.035	0.043
b	0.90	1.10	0.035	0.043
b1	0.00	0.05	0.000	0.002
c	0.10	0.30	0.004	0.012
D	7.90	8.10	0.311	0.319
D1	7.10	7.30	0.280	0.287
E	7.90	8.10	0.311	0.319
E1	4.65	4.85	0.183	0.191
E2	2.65	2.85	0.104	0.112
E3	0.30	0.50	0.012	0.020
e	2.00 (BSC)		0.079 (BSC)	
L	0.40	0.60	0.016	0.024
N	4		4	
F1	7.20		0.283	
F2	4.75		0.187	
F3	1.00		0.039	
F4	1.00		0.039	
F5	1.43		0.056	
F6	4.20		0.165	
F7	3.00		0.118	
F8	1.00		0.039	

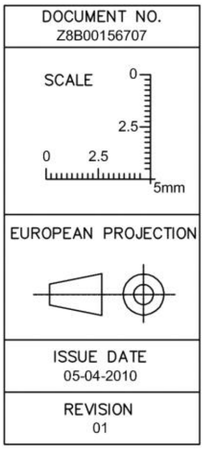


Figure 1 Outlines ThinPAK 8x8, dimensions in mm/inches

8 Revision History

5th Generation thinQ!™ SiC Schottky Diode

Revision History: 2016-04-19, Rev. 2.1

Previous Revision:

Revision	Subjects (major changes since last version)
2.0	Release of the final datasheet
2.1	Correction of Test Condition Diode Forward Voltage

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