SiC

Silicon Carbide Diode

5th Generation thinQ!™

650V SiC Schottky Diode

IDW20G65C5B

Final Datasheet

Rev. 2.0, 2015-04-13

Power Management & Multimarket

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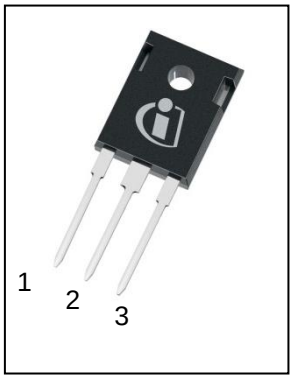
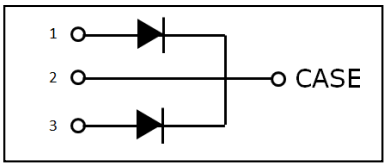
5th Generation thinQ!™ SiC Schottky Diode IDW20G65C5B

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 9 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 15	nC
E_C; V_R=400V	2 x 3.5	µJ
I_F @ T_C < 125°C	2 x 10	A

Table 2 Pin Definition

Pin 1	Pin 2	Pin 3
A	C	A

Type / ordering Code	Package	Marking	Related links
IDW20G65C5B	PG-TO247-3	D2065B5	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

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2 Maximum ratings

Table 3 Maximum ratings

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Continuous forward current [1]	I_F	–	–	10	A	T_C < 125°C, D=1
Surge non-repetitive forward current, sine halfwave [1]	$I_{F,SM}$	–	–	58		T_C = 25°C, t_p=10 ms
		–	–	46		T_C = 150°C, t_p=10 ms
Non-repetitive peak forward current [1]	$I_{F,max}$	–	–	431		T_C = 25°C, t_p=10 µs
i²t value [1]	$\int i^2dt$	–	–	16.6	A²s	T_C = 25°C, t_p=10 ms
		–	–	10.5		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}	–	–	130	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}	–	1.8	2.3	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

4 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		I_F= 10 A, T_j=25°C
		–	1.8	2.1		I_F= 10 A, T_j=150°C
Reverse current [1)]	I_R	–	0.5	180	µA	V_R=650 V, T_j=25°C
		–	0.1	60		V_R=600 V, T_j=25°C
		–	2.0	1250		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	–	15		nC	V_R=400 V, *di/dt*=200A/µs, $I_F \leq I_{F,MAX}$, T_j=150°C
Total Capacitance [1)]	C	–	300	–	pF	V_R=1 V, *f*=1 MHz
		–	40	–		V_R=300 V, *f*=1 MHz
		–	39	–		V_R=600 V, *f*=1 MHz

1) Per Leg
2) Per Device

5 Electrical characteristics diagrams

Table 7

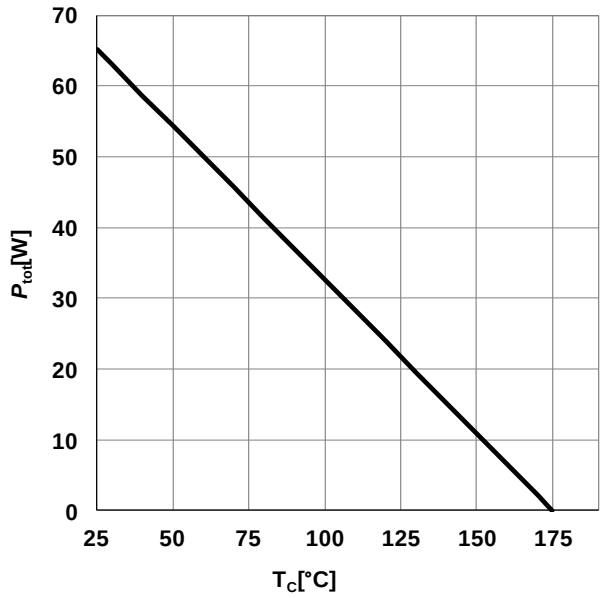
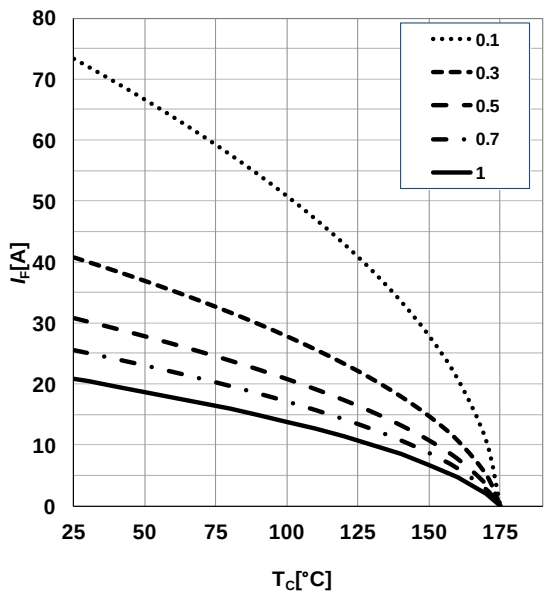
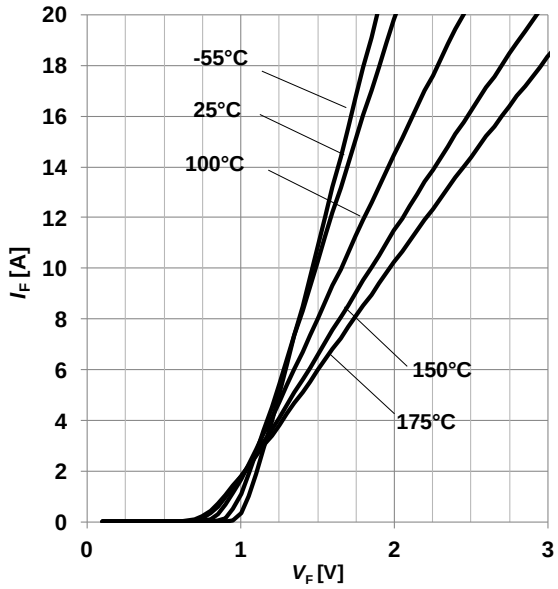
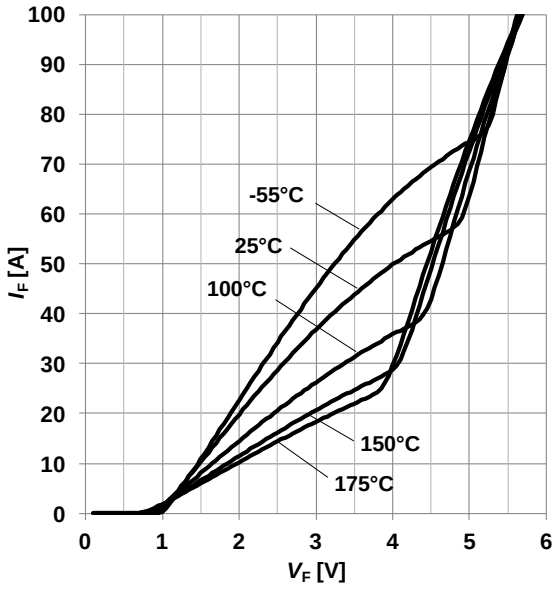
Power dissipation [1]	Maximal diode forward current [1]
	
P_{tot}=f(T_C); $R_{thJC,max}$	I_F=f(T_C); $R_{thJC,max}$;T_j≤175°C; parameter D=duty cycle

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

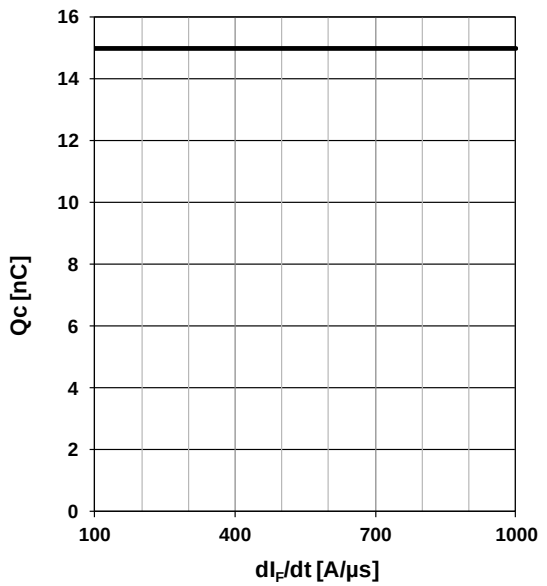
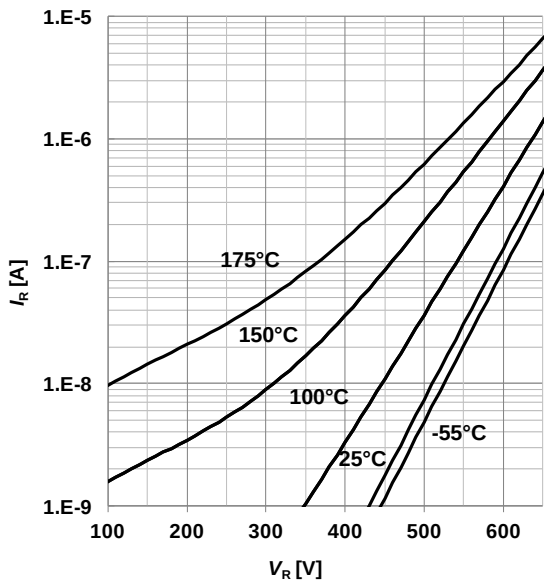
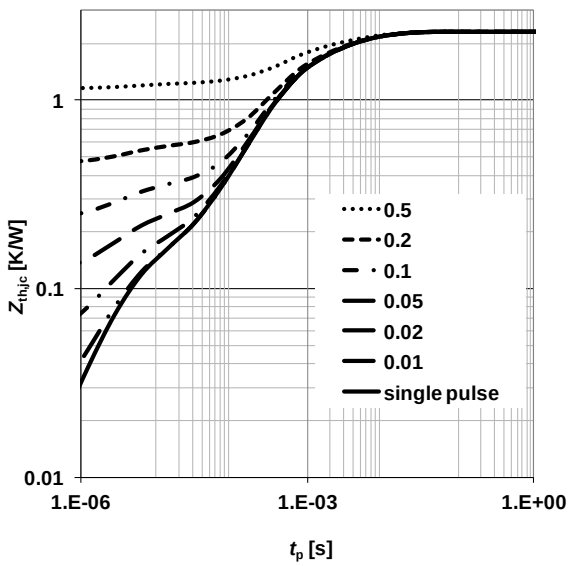
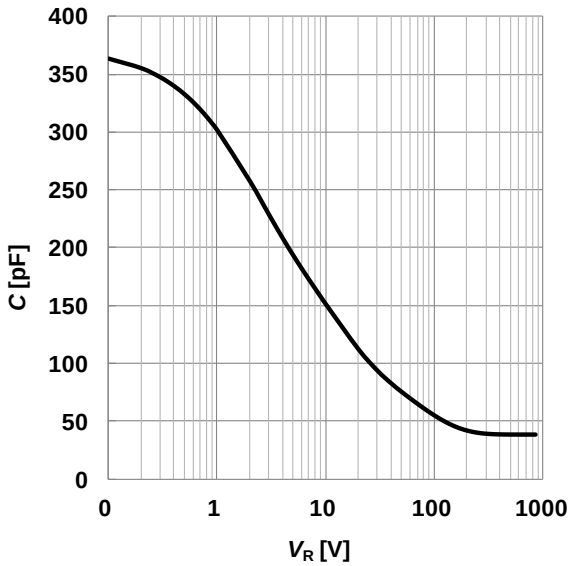
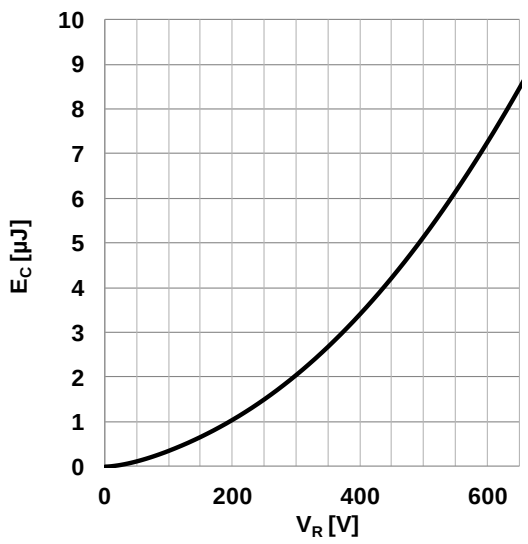
Typ. capacitance charge vs. current slope [1]	Typ. Reverse current vs. reverse voltage [1]
	
Q_C=f(di$_F$/dt); T_j=150°C; V_R=400 V; $I_F \leq I_{F,max}$	I_R=f(V_R); parameter: T_j

Table 10

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

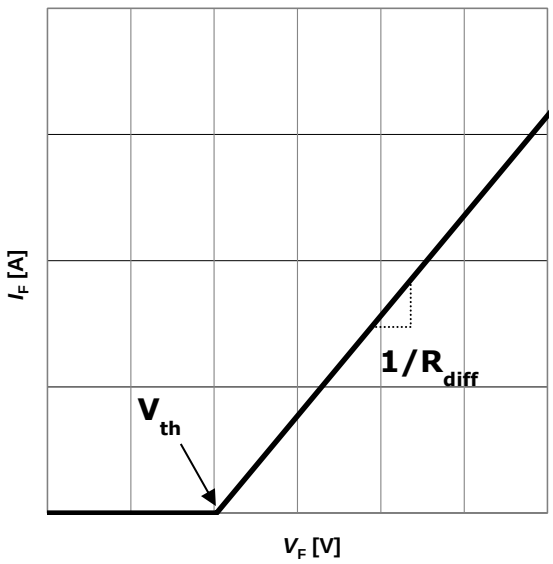
1) Per Leg
2) Per Device

Table 11

Typ. capacitance stored energy [1)]

E_C=f(V_R)

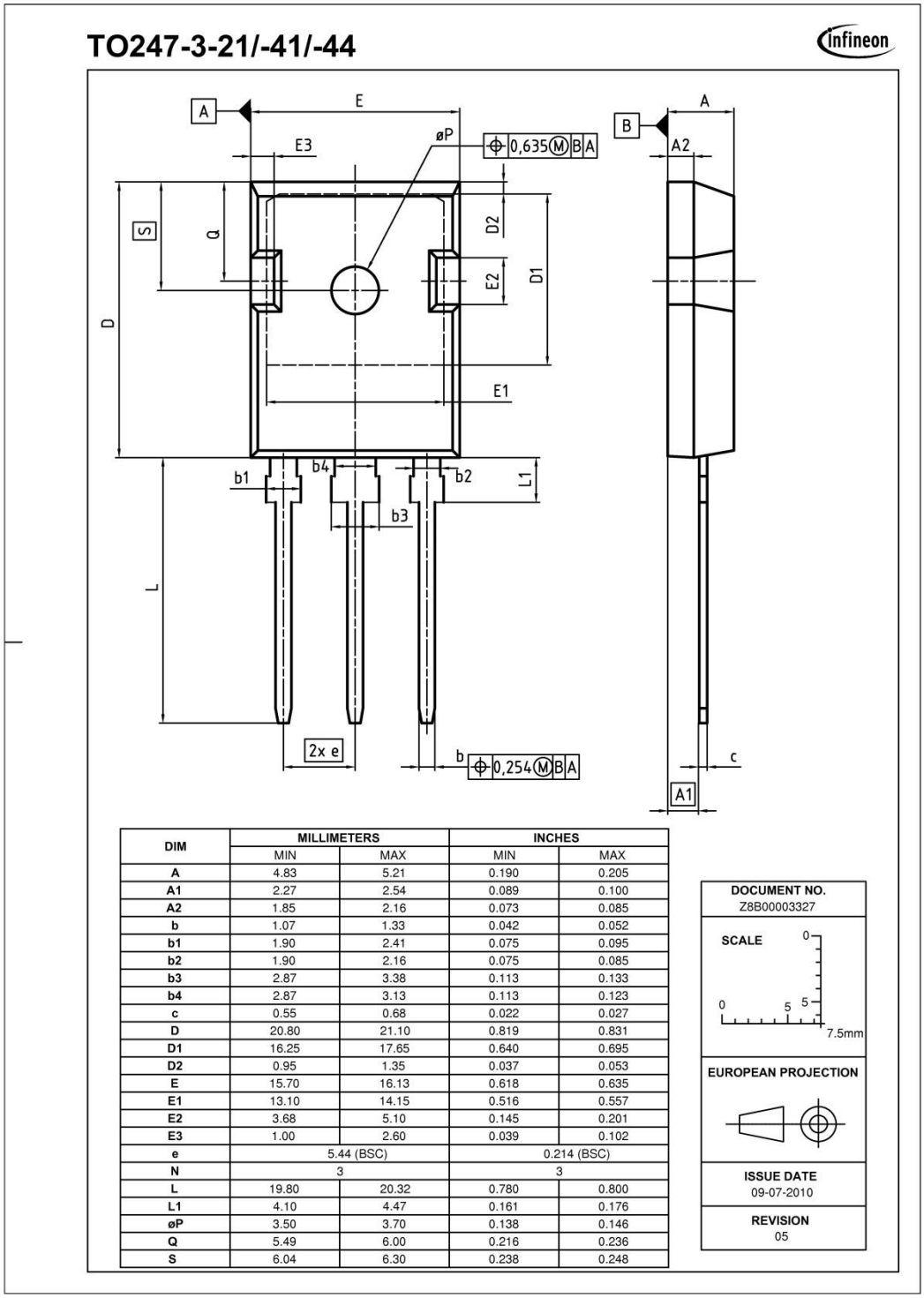
6 Simplified Forward Characteristics Model

Table 12

Equivalent forward current curve [1)]	Mathematical Equation
	$V_F = V_{TH} + R_{DIFF} \cdot I_F$ $V_{TH}(T_j) = -0.001 \cdot T_j + 1.04$ [V] $R_{DIFF}(T_j) = 1.29 \cdot 10^{-6} \cdot T_j^2 + 1.29 \cdot 10^{-4} \cdot T_j + 0.047$ [Ω]
V_F=f(I_F)	T_j in °C; -55°C < T_j < 175°C; I_F < 20 A

1) Per Leg
2) Per Device

7 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

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

1) Per Leg
2) Per Device

8 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.

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