

**SiC**

Silicon Carbide Diode

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

650V SiC Schottky Diode

**IDW40G65C5B**

**Final Datasheet**

Rev. 2.0, 2015-04-13

**Power Management & Multimarket**

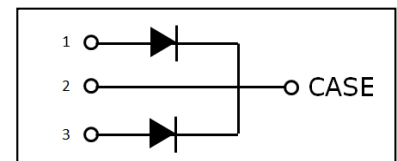
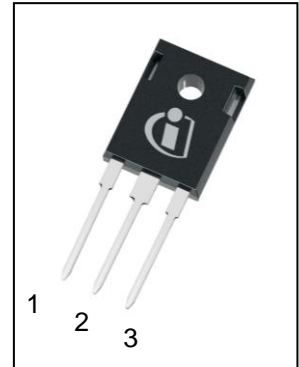
## 5<sup>th</sup> Generation thinQ!<sup>TM</sup> SiC Schottky Diode

IDW40G65C5B

### 1 Description

ThinQ!<sup>TM</sup> 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 in 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 ( $Q_c \times V_f$ ).

The new thinQ!<sup>TM</sup> Generation 5 has been designed to complement our 650V CoolMOS<sup>TM</sup> 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
- Breakdown voltage tested at 44 mA<sup>2)3)</sup>
- 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** <sup>4)</sup>

Parameter	Value	Unit
$V_{DC}$	650	V
$Q_C; V_R=400V$	2 x 29	nC
$E_C; V_R=400V$	2 x 6.6	$\mu J$
$I_F @ T_C < 120^\circ C$	2 x 20	A

**Table 2 Pin Definition**

Pin 1	Pin 2	Pin 3
A	C	A

Type / ordering Code	Package	Marking	Related links
IDW40G65C5B	PG-TO247-3	D4065B5	<a href="http://www.infineon.com/sic">www.infineon.com/sic</a>

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 <sup>1)</sup>	$I_F$	–	–	20	A	$T_C < 120^\circ\text{C}$ , $D=1$
Surge non-repetitive forward current, sine halfwave <sup>1)</sup>	$I_{F,SM}$	–	–	103		$T_C = 25^\circ\text{C}$ , $t_p=10\text{ ms}$
		–	–	87		$T_C = 150^\circ\text{C}$ , $t_p=10\text{ ms}$
Non-repetitive peak forward current <sup>1)</sup>	$I_{F,max}$	–	–	776		$T_C = 25^\circ\text{C}$ , $t_p=10\ \mu\text{s}$
$i^2t$ value <sup>1)</sup>	$\int i^2 dt$	–	–	53	A <sup>2</sup> s	$T_C = 25^\circ\text{C}$ , $t_p=10\text{ ms}$
		–	–	38		$T_C = 150^\circ\text{C}$ , $t_p=10\text{ ms}$
Repetitive peak reverse voltage	$V_{RRM}$	–	–	650	V	$T_j = 25^\circ\text{C}$
Diode dv/dt ruggedness	$dv/dt$	–	–	100	V/ns	$V_R=0..480\text{ V}$
Power dissipation <sup>1)</sup>	$P_{tot}$	–	–	112	W	$T_C = 25^\circ\text{C}$
Operating and storage temperature	$T_j, T_{stg}$	-55	–	175	°C	
Mounting torque		–	–	60	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 <sup>1)</sup>	$R_{thJC}$	–	1.0	1.3	K/W	leaded
Thermal resistance, junction-ambient <sup>1)</sup>	$R_{thJA}$	–	–	62		
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	$V_{DC}$	650	–	–	V	$T_j=25^{\circ}C$
Diode forward voltage	$V_F$	–	1.5	1.7		$I_F=20\text{ A}, T_j=25^{\circ}C$
		–	1.8	2.1		$I_F=20\text{ A}, T_j=150^{\circ}C$
Reverse current <sup>1)</sup>	$I_R$	–	1.1	210	$\mu A$	$V_R=650\text{ V}, T_j=25^{\circ}C$
		–	0.3	75		$V_R=600\text{ V}, T_j=25^{\circ}C$
		–	4.1	1450		$V_R=650\text{ V}, T_j=150^{\circ}C$

**Table 6 AC characteristics**

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Total capacitive charge <sup>1)</sup>	$Q_c$	–	29	–	nC	$V_R=400\text{ V}, di/dt=200A/\mu s,$ $I_F \leq I_{F,MAX}, T_j=150^{\circ}C$
Total Capacitance <sup>1)</sup>	C	–	590	–	pF	$V_R=1\text{ V}, f=1\text{ MHz}$
		–	76	–		$V_R=300\text{ V}, f=1\text{ MHz}$
		–	74	–		$V_R=600\text{ V}, f=1\text{ MHz}$

1) Per Leg

2) Per Device

## 5 Electrical characteristics diagrams

Table 7

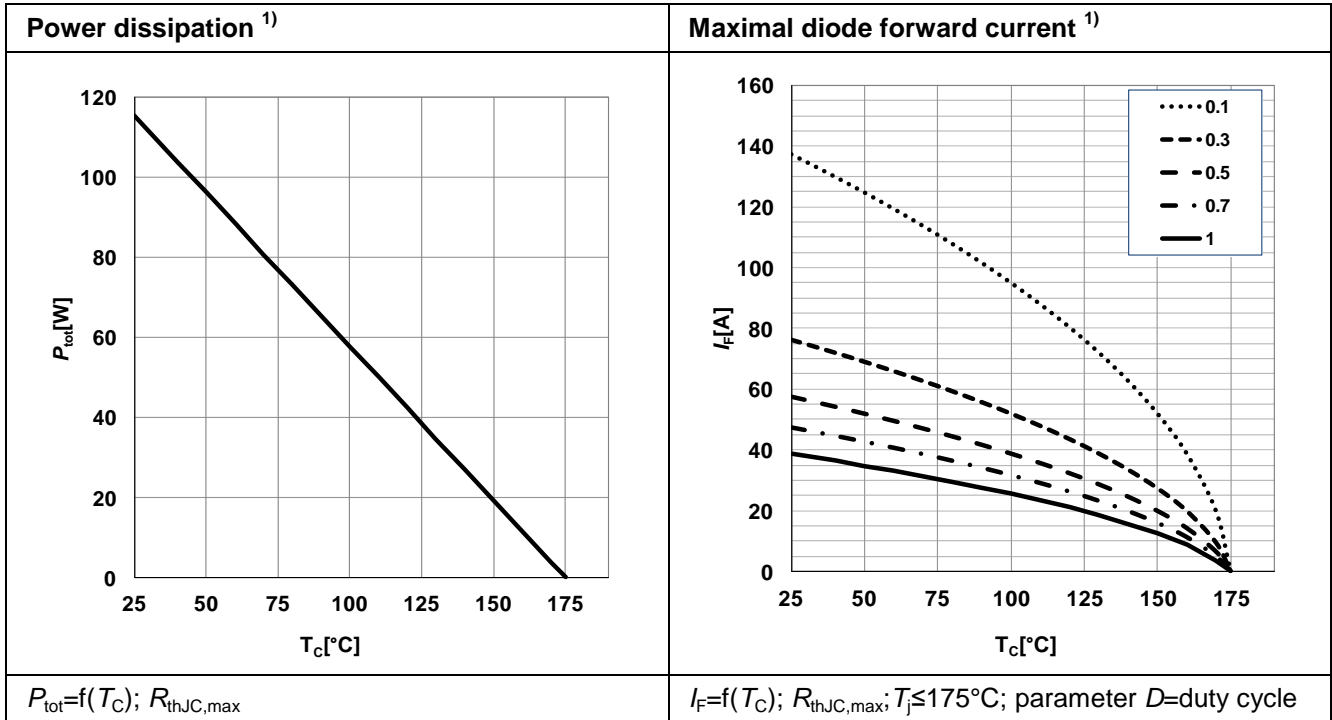
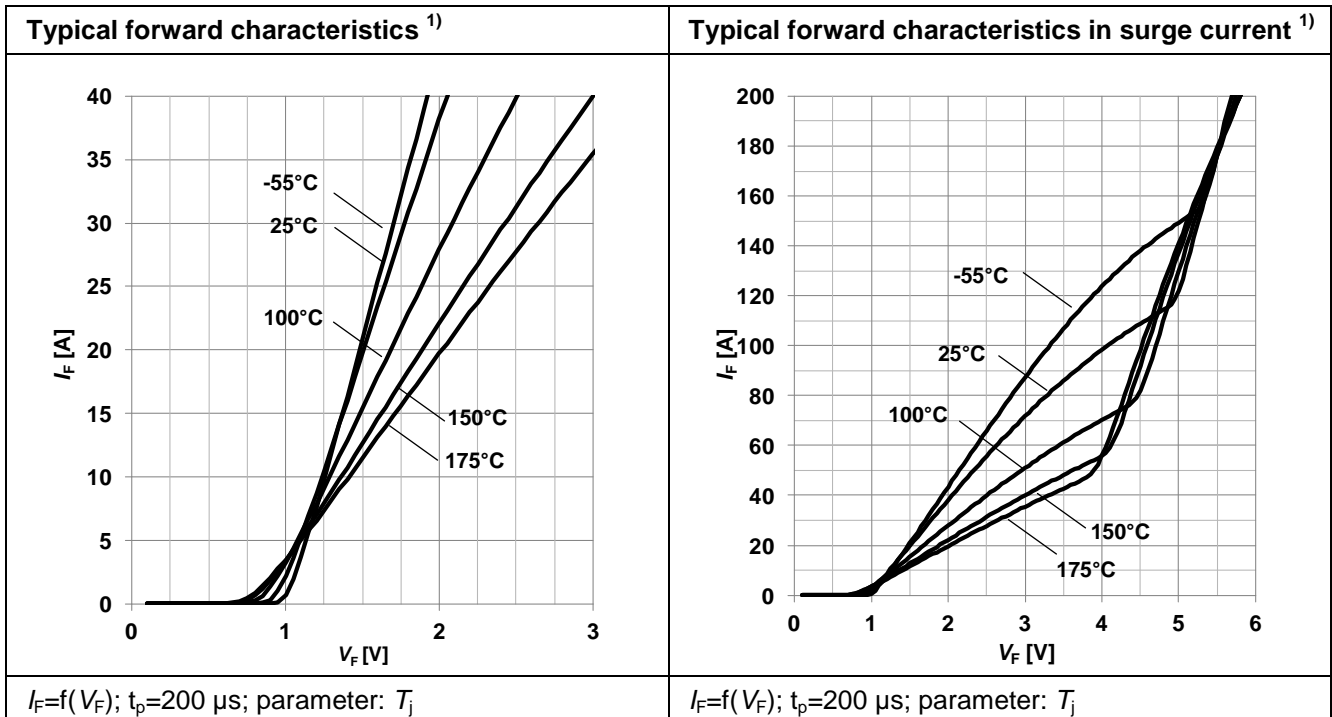


Table 8



1) Per Leg

2) Per Device

Electrical characteristics diagrams

Table 9

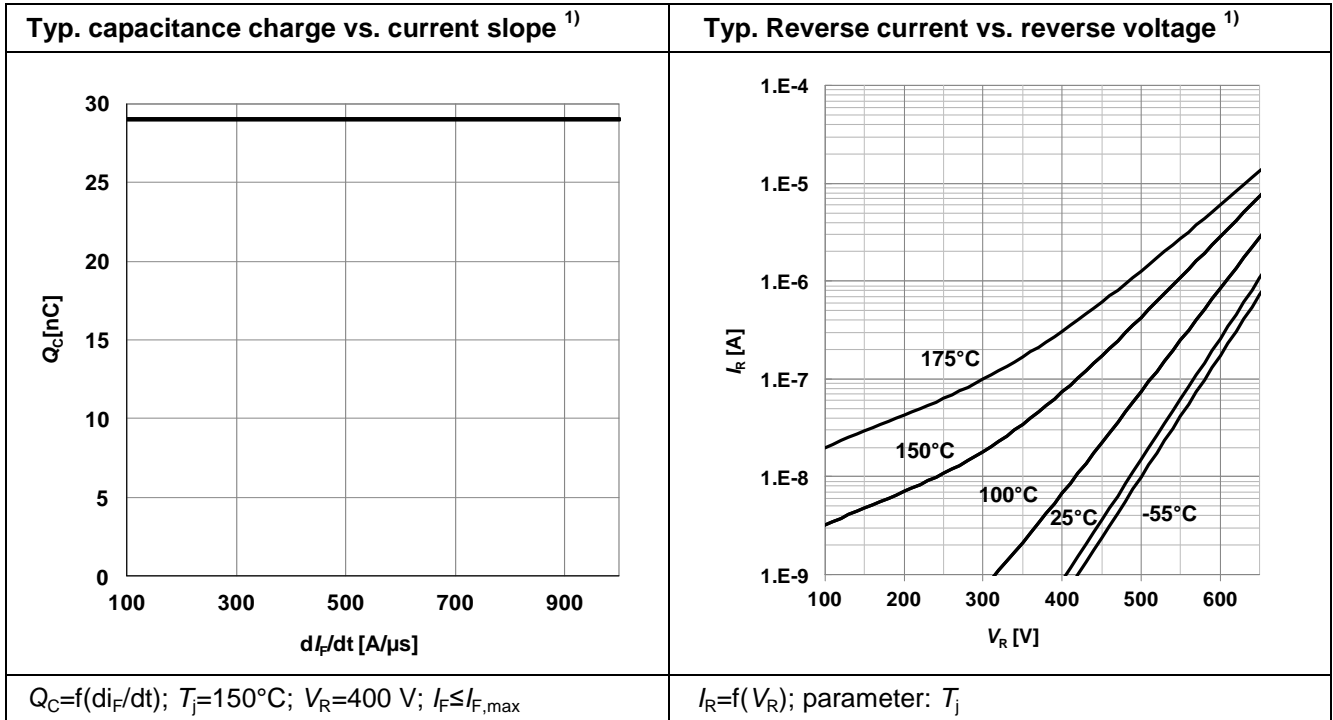
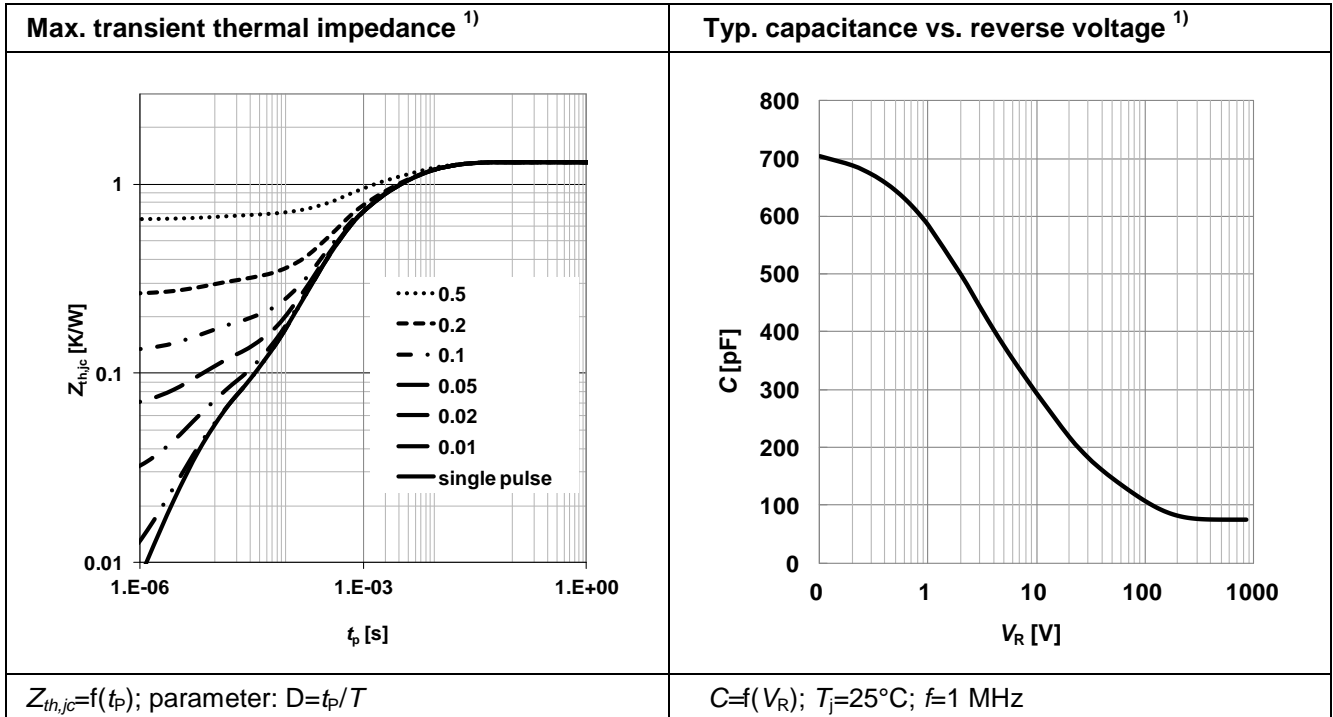
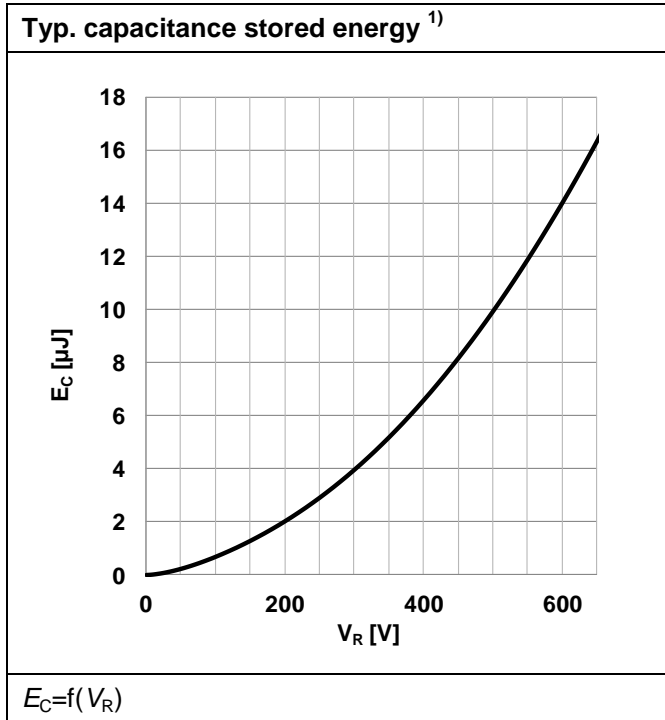


Table 10



1) Per Leg  
2) Per Device

Table 11



## 6 Simplified Forward Characteristics Model

Table 12

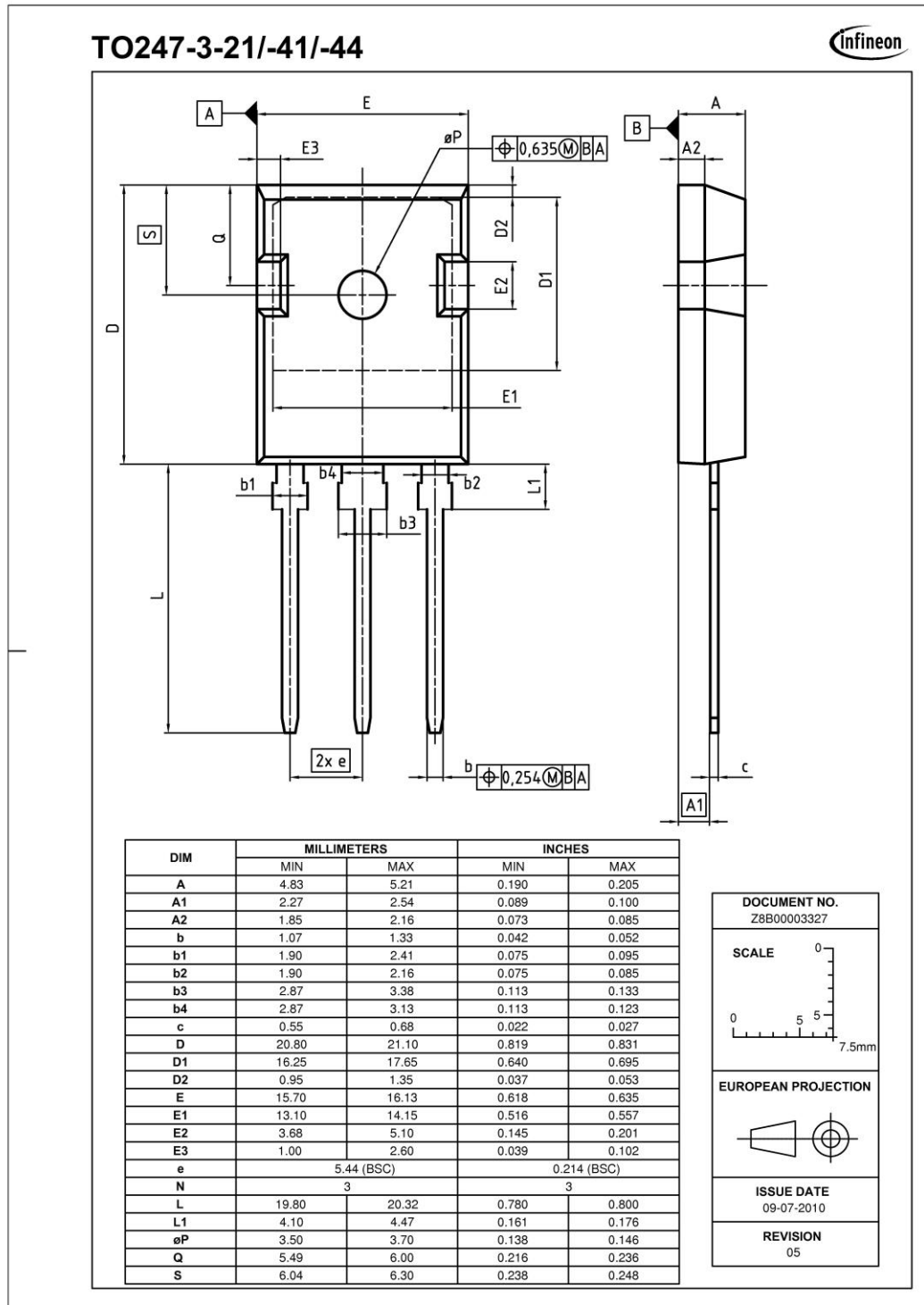
Equivalent forward current curve <sup>1)</sup>	Mathematical Equation
	$V_F = V_{TH} + R_{DIFF} \cdot I_F$ $V_{TH}(T_j) = -0.001 \cdot T_j + 1.04 \text{ [V]}$ $R_{DIFF}(T_j) = 6.4 \cdot 10^{-7} \cdot T_j^2 + 6.4 \cdot 10^{-5} \cdot T_j + 0.023 \text{ [}\Omega\text{]}$
$V_F = f(I_F)$	$T_j$ in °C; $-55^\circ\text{C} < T_j < 175^\circ\text{C}$ ; $I_F < 40 \text{ A}$

1) Per Leg

2) Per Device



## 7 Package outlines



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

- 1) Per Leg
- 2) Per Device

## 8 Revision History

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