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SiC

Silicon Carbide Diode

5th Generation thinQ!TM

650V SiC Schottky Diode

IDW24G65C5B

Final Datasheet

Rev. 2.0, 2015-04-13

5th Generation thinQ![™] SiC Schottky Diode

IDW24G65C5B

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 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![™] 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 JEDEC¹⁾ for target applications
- Breakdown voltage tested at 9 mA²⁾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

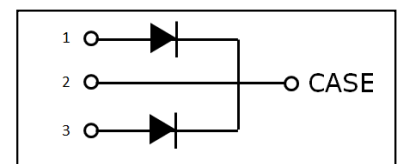
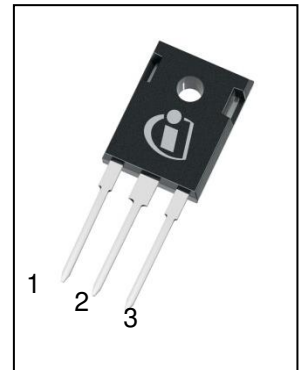


Table 1 Key Performance Parameters ⁴⁾

| Parameter | Value | Unit |
|---------------------------|---------|---------|
| V_{DC} | 650 | V |
| $Q_C; V_R=400V$ | 2 x 18 | nC |
| $E_C; V_R=400V$ | 2 x 4.1 | μJ |
| $I_F @ T_C < 125^\circ C$ | 2 x 12 | A |

Table 2 Pin Definition

| Pin 1 | Pin 2 | Pin 3 |
|-------|-------|-------|
| A | C | A |

| Type / ordering Code | Package | Marking | Related links |
|----------------------|------------|---------|--|
| IDW24G65C5B | PG-TO247-3 | D2465B5 | 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 | – | – | 12 | A | $T_C < 125^\circ\text{C}$, $D=1$ |
| Surge non-repetitive forward current, sine halfwave ¹⁾ | $I_{F,SM}$ | – | – | 71 | | $T_C = 25^\circ\text{C}$, $t_p=10$ ms |
| | | – | – | 56 | | $T_C = 150^\circ\text{C}$, $t_p=10$ ms |
| Non-repetitive peak forward current ¹⁾ | $I_{F,max}$ | – | – | 505 | | $T_C = 25^\circ\text{C}$, $t_p=10$ μs |
| i^2t value ¹⁾ | $\int i^2 dt$ | – | – | 25.4 | A ² s | $T_C = 25^\circ\text{C}$, $t_p=10$ ms |
| | | – | – | 15.7 | | $T_C = 150^\circ\text{C}$, $t_p=10$ ms |
| Repetitive peak reverse voltage | V_{RRM} | – | – | 650 | V | $T_j = 25^\circ\text{C}$ |
| Diode dv/dt ruggedness | dv/dt | – | – | 100 | V/ns | $V_R=0..480$ V |
| Power dissipation ²⁾ | P_{tot} | – | – | 152 | W | $T_C = 25^\circ\text{C}$ |
| 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} | – | 1.5 | 2.0 | K/W | lead |
| Thermal resistance, junction-ambient ¹⁾ | 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 ¹⁾ | V_{DC} | 650 | – | – | V | $T_j=25^{\circ}C$ |
| Diode forward voltage ¹⁾ | V_F | – | 1.5 | 1.7 | | $I_F=12\text{ A}, T_j=25^{\circ}C$ |
| | | – | 1.8 | 2.1 | | $I_F=12\text{ A}, T_j=150^{\circ}C$ |
| Reverse current ¹⁾ | I_R | – | 0.6 | 190 | μA | $V_R=650\text{ V}, T_j=25^{\circ}C$ |
| | | – | 0.2 | 68 | | $V_R=600\text{ V}, T_j=25^{\circ}C$ |
| | | – | 2.4 | 1350 | | $V_R=650\text{ V}, T_j=150^{\circ}C$ |

Table 6 AC characteristics

| Parameter | Symbol | Values | | | Unit | Note/Test Condition |
|---------------------------------------|--------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Total capacitive charge ¹⁾ | Q_c | – | 18 | | nC | $V_R=400\text{ V}, di/dt=200\text{ A}/\mu\text{s}, I_F \leq I_{F,MAX}, T_j=150^{\circ}C$ |
| Total Capacitance ¹⁾ | C | – | 360 | – | pF | $V_R=1\text{ V}, f=1\text{ MHz}$ |
| | | – | 47 | – | | $V_R=300\text{ V}, f=1\text{ MHz}$ |
| | | – | 46 | – | | $V_R=600\text{ V}, f=1\text{ MHz}$ |

1) Per Leg

2) Per Device

5 Electrical characteristics diagrams

Table 7

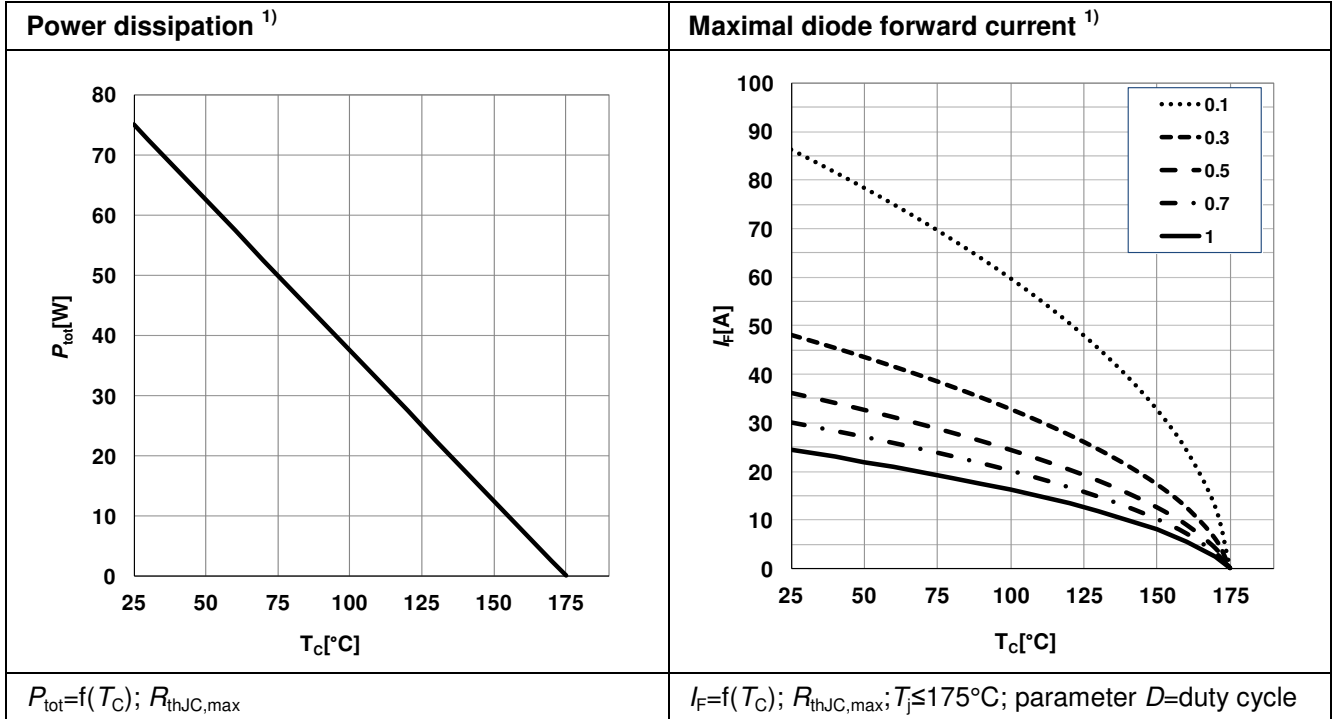
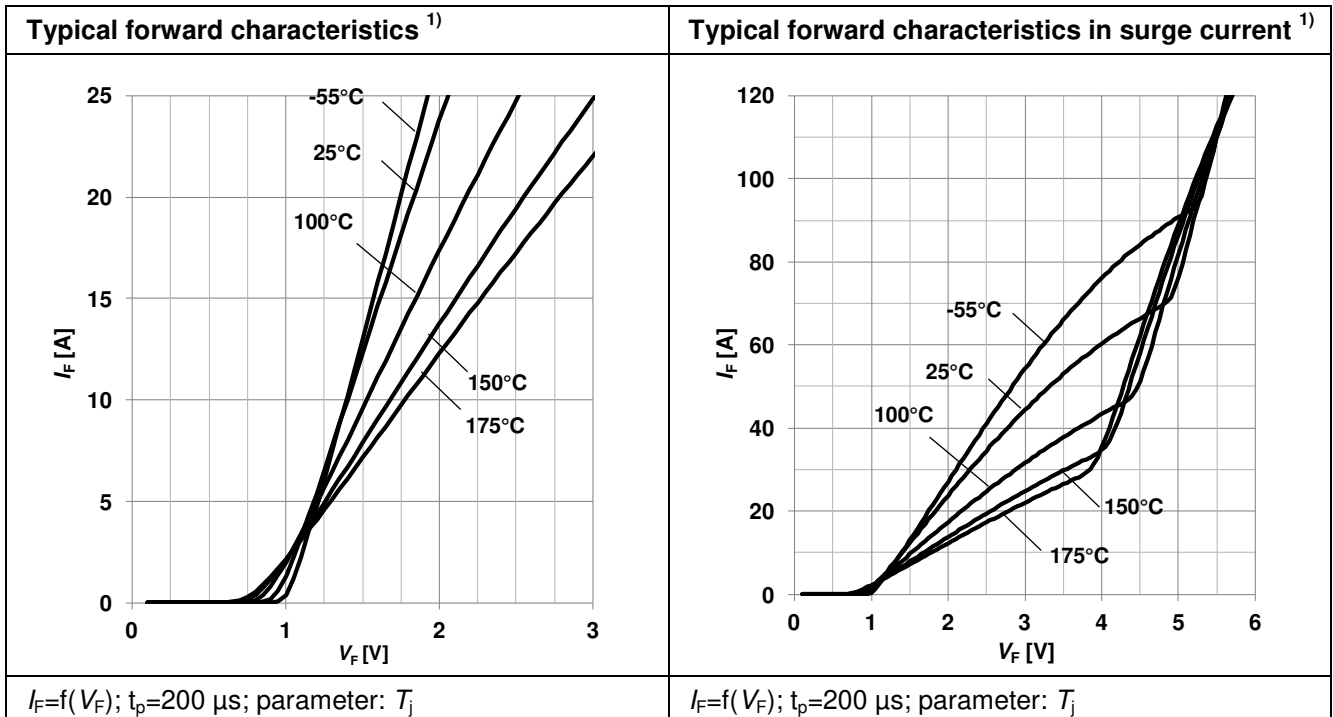


Table 8



1) Per Leg

2) Per Device

Table 9

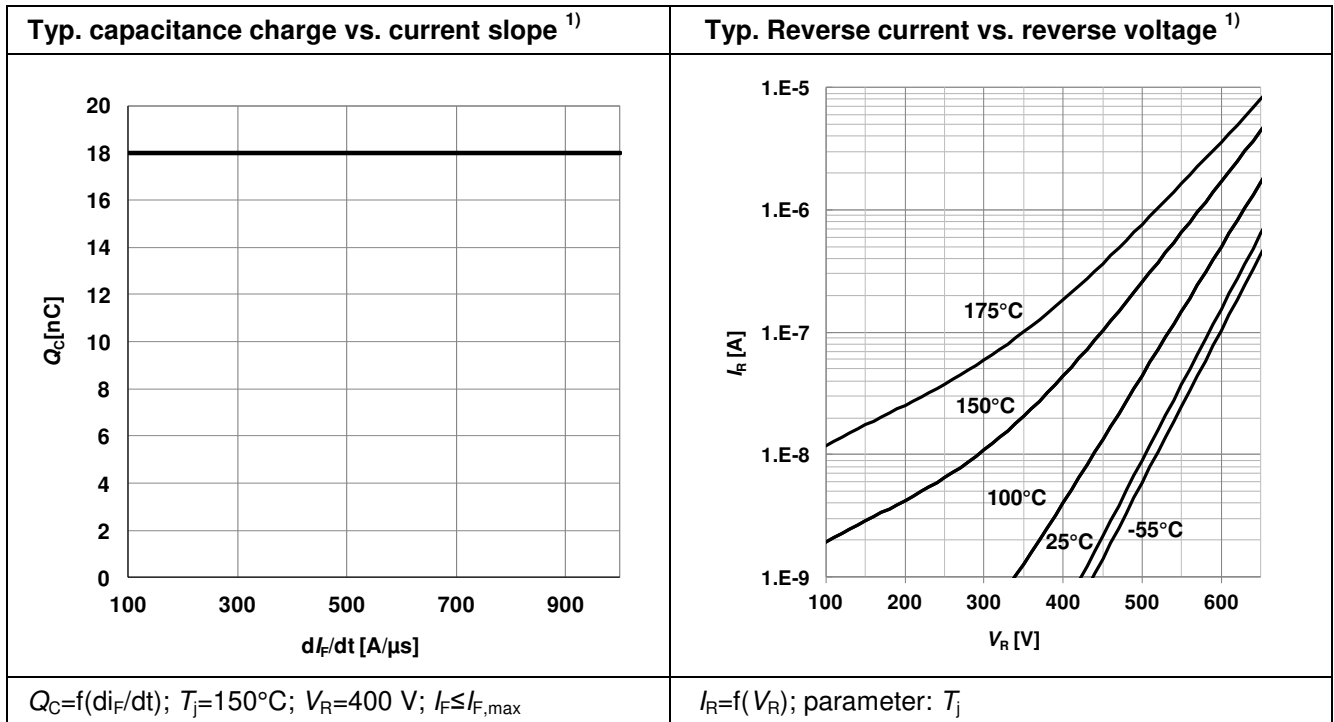
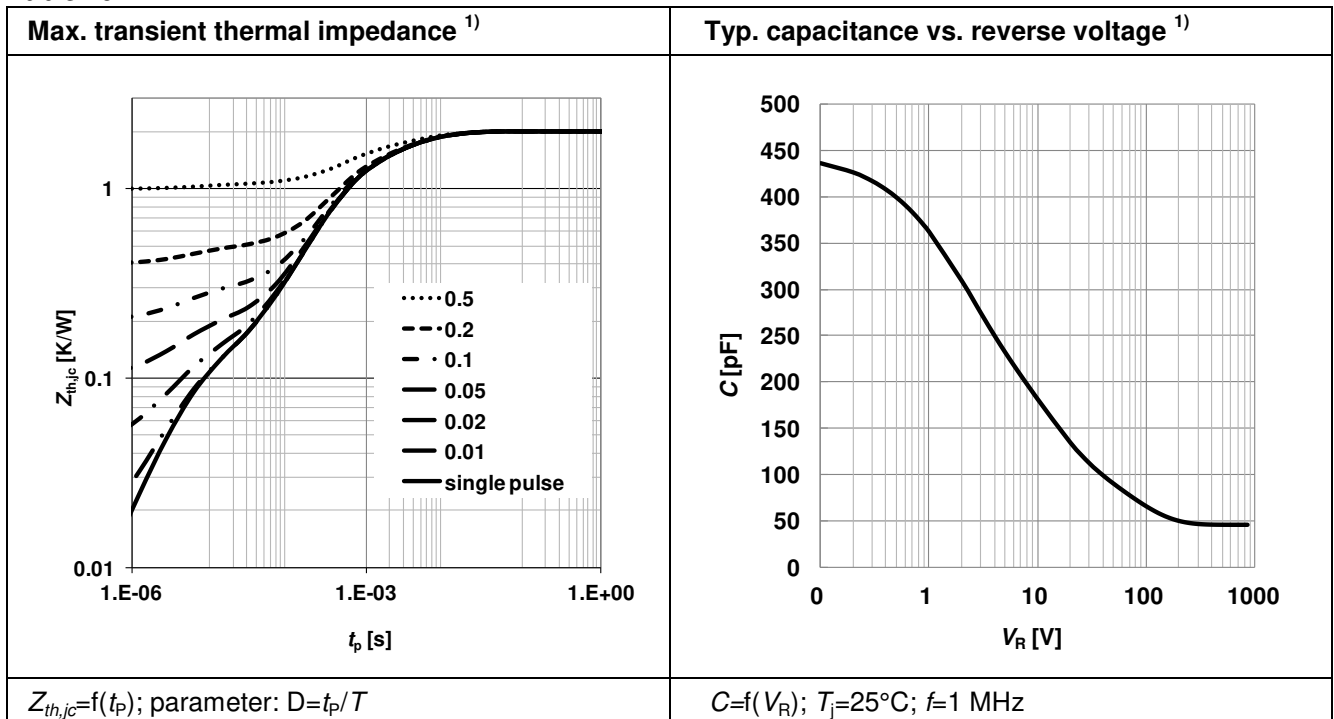


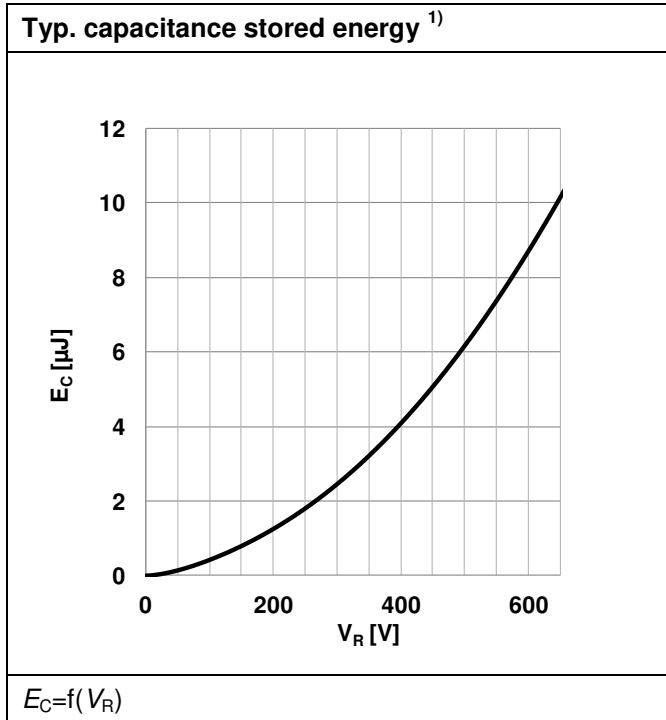
Table 10



1) Per Leg

2) Per Device

Table 11



6 Simplified Forward Characteristics Model

Table 12

| Equivalent forward current curve ¹⁾ | Mathematical Equation |
|--|---|
| | $V_F = V_{TH} + R_{DIFF} \cdot I_F$ $V_{TH}(T_j) = -0.001 \cdot T_j + 1.04 \text{ [V]}$ $R_{DIFF}(T_j) = 1.07 \cdot 10^{-6} \cdot T_j^2 + 1.07 \cdot 10^{-4} \cdot T_j + 0.039 \text{ [}\Omega\text{]}$ |
| $V_F = f(I_F)$ | T_j in °C; $-55^\circ\text{C} < T_j < 175^\circ\text{C}$; $I_F < 24 \text{ A}$ |

1) Per Leg

2) Per Device

Package outlines

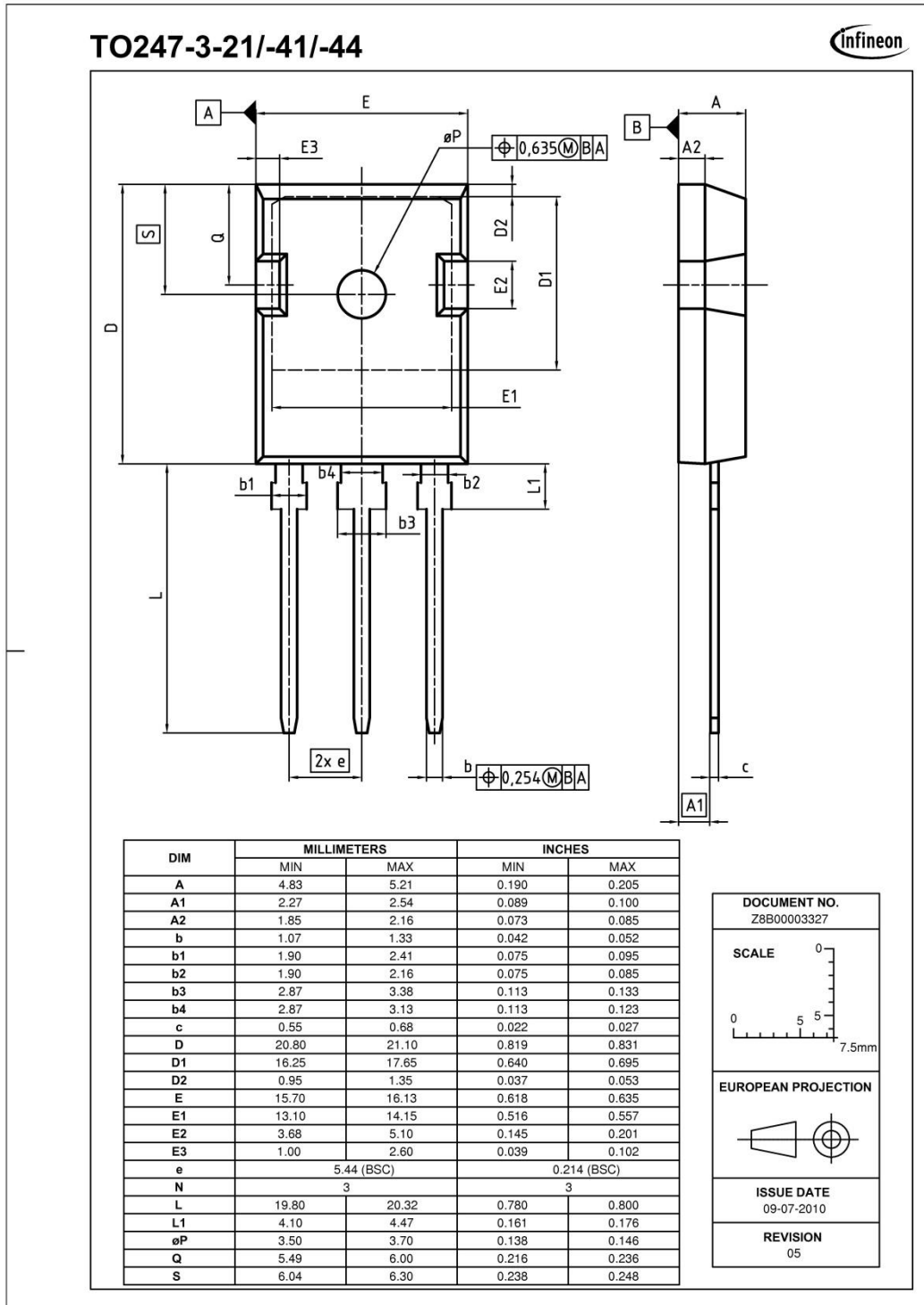


Figure 1 Outlines TO-247, dimensions in mm/inches

- 1) Per Leg
- 2) Per Device

7 Revision History

5th Generation thinQ!TM 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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