

# SiC

Silicon Carbide Diode

## 2nd Generation thinQ!™

2nd Generation thinQ!™ SiC Schottky Diode  
IDY10S120

## Data Sheet

Rev. 2.1, 2011-05-25  
Final

## Industrial & Multimarket

## 2nd Generation thinQ!™ SiC Schottky Diode

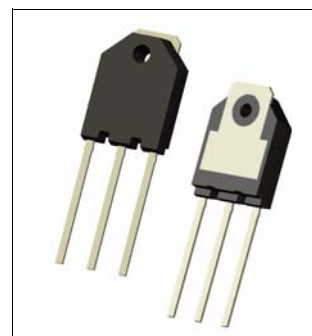
IDY10S120

### 1 Description

The second generation of Infineon SiC Schottky diodes has emerged over the years as the industry standard. The IDYxxS120 products are extending the already broad portfolio with the new TO-247HC (high creepage) package.

The new package layout is fully compatible with the industry standard TO247, and can therefore easily be placed in already existing designs, with no extra efforts.

The higher creepage distance increases the safety margin against the risk of short circuits, especially arcing, which might be triggered by the presence of dust or dirt inside the system. This reduces the need of additional chemical (silicone gel or creams) or mechanical (sheaths or foils) solutions to lower the pollution level between the leads, with all consequent benefits of a lean and faster manufacturing process



#### Features

- Revolutionary semiconductor material - Silicon Carbide
- Switching behavior benchmark
- 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
- 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 and less fans
- Package design with high creepage distance
- Reduced EMI

#### Applications

- Solar applications; UPS; Motor Drives;
- SMPS e.g.; CCM PFC

**Table 1 Key Performance Parameters**

| Parameter                 | Value | Unit |
|---------------------------|-------|------|
| $V_{DC}$                  | 1200  | V    |
| $Q_C$                     | 36    | nC   |
| $I_F @ T_C < 150^\circ C$ | 10    | A    |

**Table 2 Pin Definition**

| Pin 1 | Pin2 | Pin 3 |
|-------|------|-------|
| A     | C    | A     |



| Type / Ordering Code | Package      | Marking | Related Links                          |
|----------------------|--------------|---------|----------------------------------------|
| IDY10S120            | PG-TO247HC-3 | D10S120 | <a href="#">IFX SiC Diodes Webpage</a> |

1) J-STD20 and JESD22

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## 2 Maximum ratings

**Table 3 Maximum ratings**

| Parameter                                           | Symbol         | Values<br>(leg/device) |      |         | Unit                 | Note / Test Condition                          |
|-----------------------------------------------------|----------------|------------------------|------|---------|----------------------|------------------------------------------------|
|                                                     |                | Min.                   | Typ. | Max.    |                      |                                                |
| Continuous forward current                          | $I_F$          | -                      | -    | 5/10    | A                    | $T_C = < 150^\circ\text{C}$                    |
| Surge non-repetitive forward current, sine halfwave | $I_{F, SM}$    | -                      | -    | 29/58   |                      | $T_C = 25^\circ\text{C}, t_p = 10 \text{ ms}$  |
|                                                     |                | -                      | -    | 25/48   |                      | $T_C = 150^\circ\text{C}, t_p = 10 \text{ ms}$ |
| Non-repetitive peak forward current                 | $I_{F, max}$   | -                      | -    | 125/250 |                      | $T_C = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ |
| $i^2 t$ value                                       | $\int i^2 dt$  | -                      | -    | 4/16    | $\text{A}^2\text{s}$ | $T_C = 25^\circ\text{C}, t_p = 10 \text{ ms}$  |
|                                                     |                | -                      | -    | 3/12    |                      | $T_C = 150^\circ\text{C}, t_p = 10 \text{ ms}$ |
| Repetitive peak reverse voltage                     | $V_{RRM}$      | -                      | -    | 1200    | V                    | $T_J = 25^\circ\text{C}$                       |
| Diode dv/dt ruggedness                              | dv/dt          | -                      | -    | 50      | V/ns                 | $V_R = 0 \dots 960 \text{ V}$                  |
| Power dissipation                                   | $P_{tot}$      | -                      | -    | 75/150  | W                    | $T_C = 25^\circ\text{C}$                       |
| Operating and storage temperature                   | $T_j, T_{stg}$ | -55                    | -    | 150     | $^\circ\text{C}$     |                                                |
| Mounting torque                                     |                | -                      | -    | 0.6     | Ncm                  | M3 screws<br>Maximum of mounting processes:3   |

## 3 Thermal characteristics

**Table 4 Thermal characteristics**

| Parameter                                                  | Symbol     | Values<br>(leg/device) |      |      | Unit             | Note / Test Condition                 |
|------------------------------------------------------------|------------|------------------------|------|------|------------------|---------------------------------------|
|                                                            |            | Min.                   | Typ. | Max. |                  |                                       |
| Thermal resistance, junction - case                        | $R_{thJC}$ | -                      | -    | 2/1  | K/W              |                                       |
| Thermal resistance, junction - ambient                     | $R_{thJA}$ | -                      | -    | 40   |                  | leaded                                |
| Soldering temperature, wavesoldering only allowed at leads | $T_{sold}$ | -                      | -    | 260  | $^\circ\text{C}$ | 1.6 mm (0.063 in.) from case for 10 s |

## 4 Electrical characteristics

Electrical characteristics, at  $T_j=25\text{ °C}$ , unless otherwise specified.

**Table 5 Static characteristics**

| Parameter             | Symbol   | Values<br>(leg/device) |       |          | Unit          | Note / Test Condition                         |
|-----------------------|----------|------------------------|-------|----------|---------------|-----------------------------------------------|
|                       |          | Min.                   | Typ.  | Max.     |               |                                               |
| DC blocking voltage   | $V_{DC}$ | 1200                   | -     | -        | V             | $T_j = 25\text{ °C}$ , $I_R = 0.1\text{ mA}$  |
| Diode forward voltage | $V_F$    | -                      | 1.65  | 1.8      |               | $I_F = 10\text{ A}$ , $T_j = 25\text{ °C}$    |
|                       |          | -                      | 2.55  |          |               | $I_F = 10\text{ A}$ , $T_j = 150\text{ °C}$   |
| Reverse current       | $I_R$    | -                      | 5/10  | 120/240  | $\mu\text{A}$ | $I_R = 1200\text{ V}$ , $T_j = 25\text{ °C}$  |
|                       |          | -                      | 20/40 | 500/1000 |               | $I_R = 1200\text{ V}$ , $T_j = 150\text{ °C}$ |

**Table 6 AC characteristics**

| Parameter                    | Symbol | Values<br>(leg/device) |         |      | Unit        | Note / Test Condition                                           |
|------------------------------|--------|------------------------|---------|------|-------------|-----------------------------------------------------------------|
|                              |        | Min.                   | Typ.    | Max. |             |                                                                 |
| Total capacitive charge      | $Q_c$  | -                      | 18/36   | -    | nC          | $V_R = 400\text{ V}$ , $F \leq F_{\max}$                        |
| Switching time <sup>1)</sup> | $t_c$  | -                      | -       | <10  | ns          | $di_F/dt = 200\text{ A}/\mu\text{s}$ ,<br>$T_j = 150\text{ °C}$ |
|                              | $C$    | -                      | 250/500 | -    | $\text{pF}$ | $V_R = 1\text{ V}$ , $f = 1\text{ MHz}$                         |
|                              |        | -                      | 20/40   | -    |             | $V_R = 300\text{ V}$ , $f = 1\text{ MHz}$                       |
|                              |        | -                      | 18/36   | -    |             | $V_R = 600\text{ V}$ , $f = 1\text{ MHz}$                       |

1)  $t_c$  is the time constant for the capacitive displacement current waveform (independent from  $T_j$ ,  $I_{LOAD}$  and  $di/dt$ ), different from  $t_{rr}$  which is dependent on  $T_j$ ,  $I_{LOAD}$  and  $di/dt$ . No reverse recovery time constant  $t_{rr}$  due to absence of minority carrier injection.

## 5 Electrical characteristics diagrams

Electrical characteristics, at  $T_j=25\text{ °C}$ , unless otherwise specified.

Table 7

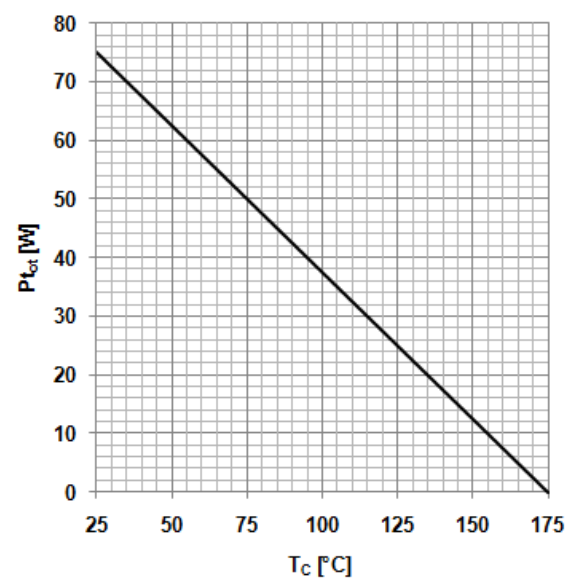
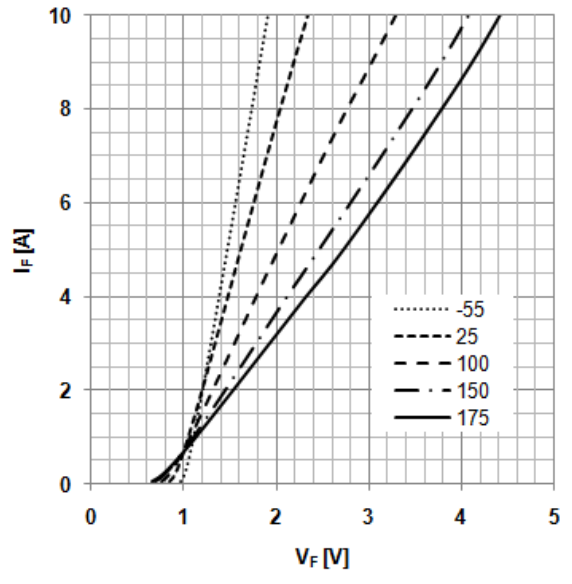
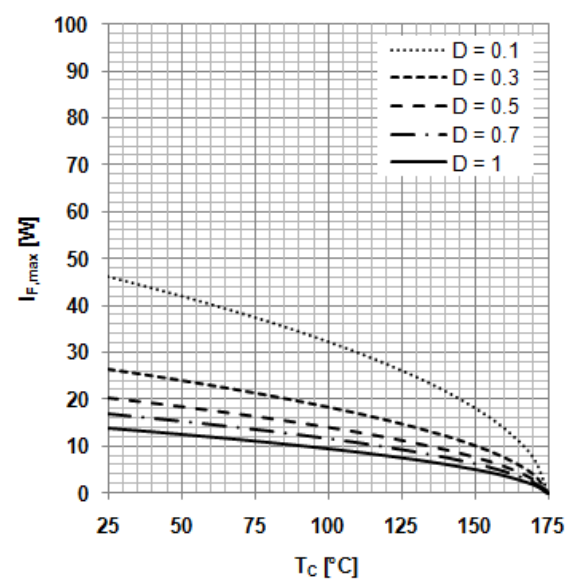
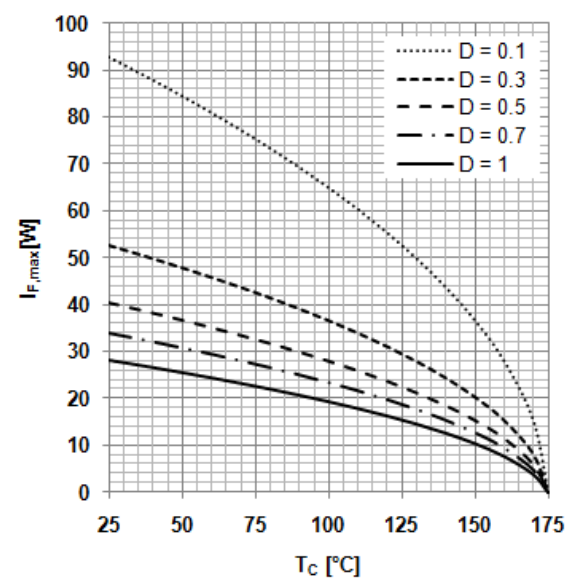
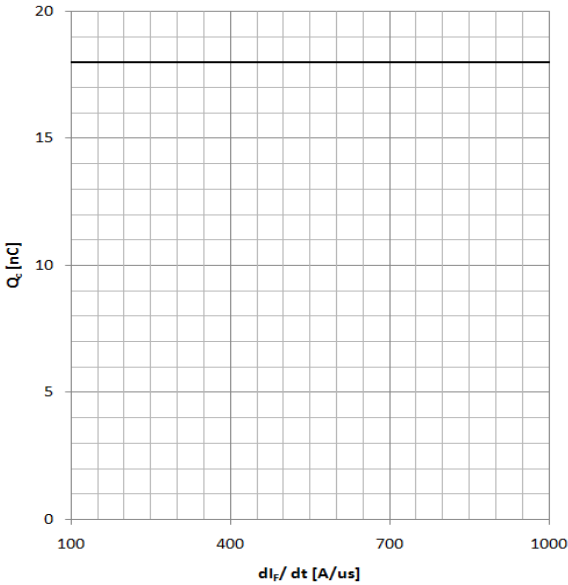
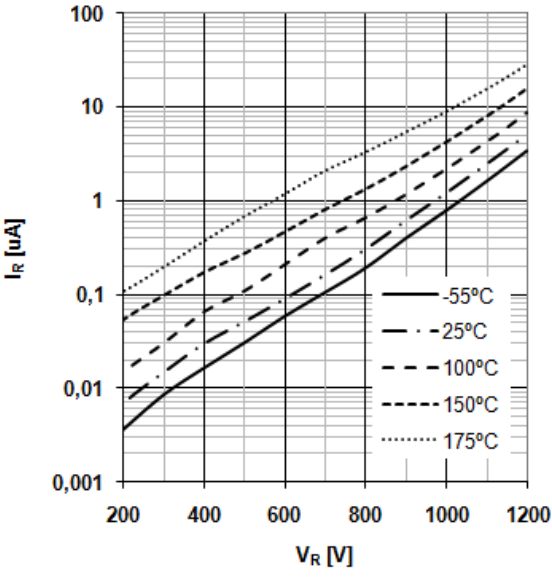
| Power dissipation (per leg)                                                                     | Typ. forward characteristic (per leg)                                                                                 |
|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
|               |                                    |
| $P_{\text{tot}} = f(T_c)$ ; parameter: $R_{\text{thJC(max)}}$ ;<br>per device the values double | $I_F = f(V_F)$ ; $t_p = 400\text{ }\mu\text{s}$ ; parameter: $T_j$ ; $I_F = f(T_c)$ ;<br>per device the values double |

Table 8

| Diode forward current (per leg)                                                                  | Diode forward current (per device)                                                               |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|               |              |
| $T_j \leq 175\text{ °C}$ ; parameter: $R_{\text{thJC(max)}}$ ; $V_F(\text{max})$ ; $D = t_p / T$ | $T_j \leq 175\text{ °C}$ ; parameter: $R_{\text{thJC(max)}}$ ; $V_F(\text{max})$ ; $D = t_p / T$ |

Electrical characteristics diagrams

Table 9

| Typ. capacitance charge vs. current slope <sup>1)</sup><br>(per leg)                                    | Typ. reverse current vs. reverse voltage (per leg)                                  |
|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                       |  |
| $Q_D = f(diF/dt)$ ; $T_j = 150\text{ °C}$ ; $I_F \leq I_{F\text{ max}}$<br>per device the values double | $I_R = f(V_R)$ ; parameter: $T_j$ ; per device the values double                    |

1) Only capacitive charge occurring, guaranteed by design

Table 10

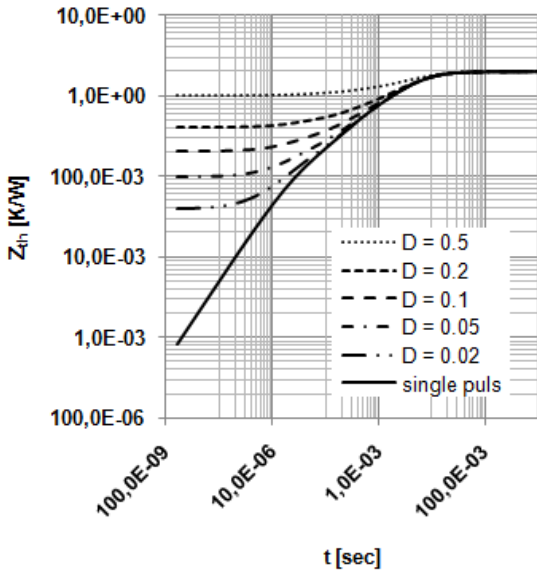
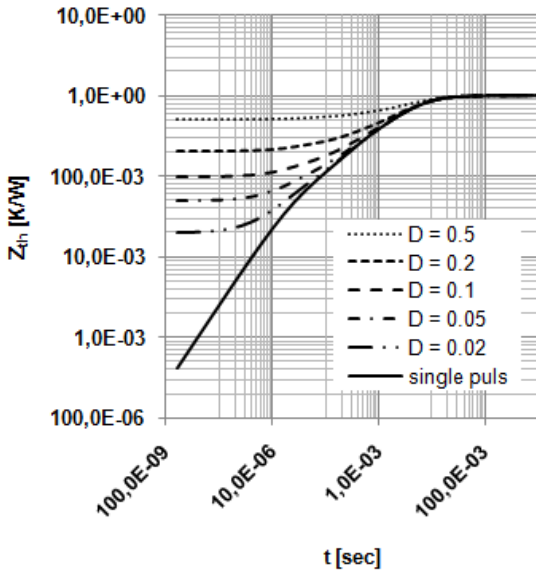
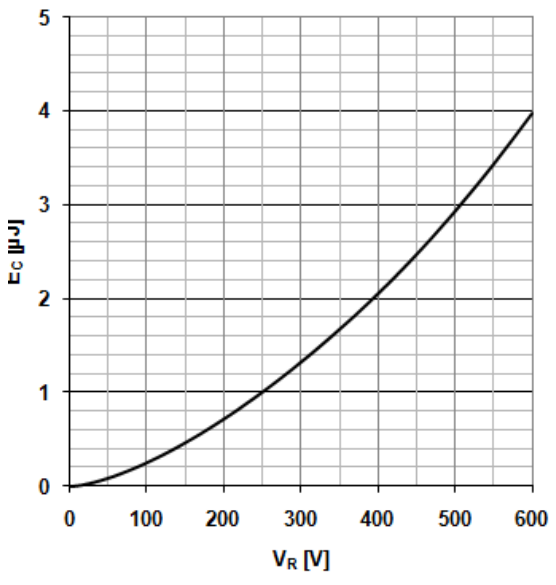
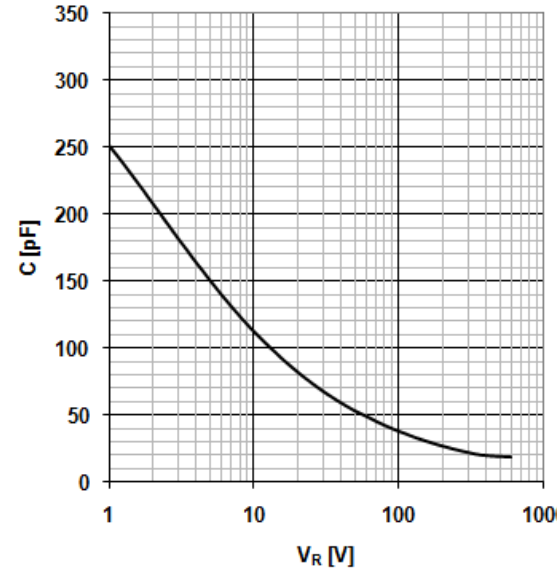
| Typ. transient thermal impedance (per leg)                                          | Typ. transient thermal impedance (per device)                                        |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| $Z_{thjc} = f(t_p)$ ; parameter: $D = t_p / T$                                      | $Z_{thjc} = f(t_p)$ ; parameter: $D = t_p / T$                                       |

Table 11

| Typ. C stored energy (per leg)                                                     | Typ. capacitance vs. reverse voltage (per leg)                                       |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |   |
| $E_C=f(V_R)$ ; per device the values double                                        | $C=f(V_R)$ ; $T_C=25\text{ °C}$ , $f=1\text{ MHz}$ ;<br>per device the values double |

## 6 Package outlines

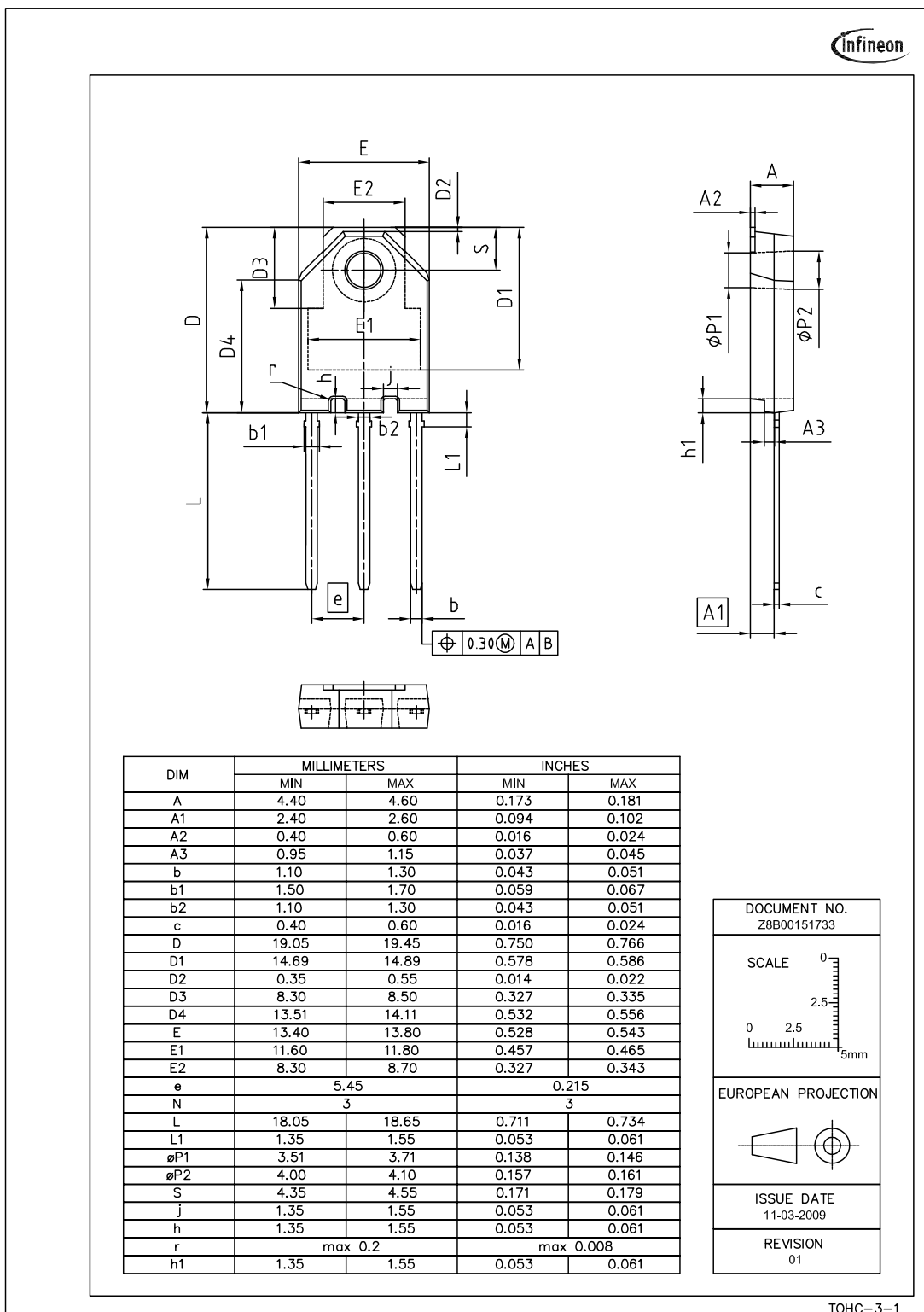


Figure 1 Dimensions in mm/inches

## 7 Revision History

### 2nd Generation thinQ!™ 2nd Generation thinQ!™ SiC Schottky Diode

Revision History: 2011-05-25, Rev. 2.1

#### Previous Revision:

| Revision | Subjects (major changes since last revision) |
|----------|----------------------------------------------|
| 2.0      | Release of final data sheet                  |
| 2.1      | Update of Total capacitive charge            |
|          |                                              |
|          |                                              |

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