

SiC

Silicon Carbide Diode

thinQ!™ SiC Schottky Diode

1200V SiC Schottky Diode

IDW20S120

Final Datasheet

Rev. 2.0,<2012-03-23>

Power Management & Multimarket

thinQ!™ SiC Schottky Diode

1 Description

The 1200V family of Infineon SiC Schottky diodes has emerged over the years as the industry standard and is now being extended with the IDWxxS120 product family in the TO247 package.

The very good thermal characteristics of the TO247 in combination with the low V_f of the 1200V diodes make it particularly suitable in power applications where relatively high currents are demanded and utmost efficiency is required. With the introduction of this package, Infineon now offers a current capability of up to 30A in the 1200V 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
- 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

- SMPS; CCM PFC
- Solar applications; UPS; Motor Drives

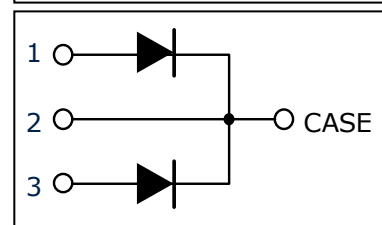
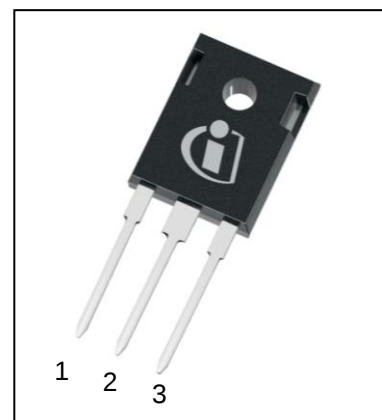
Table 1 Key Performance Parameters

Parameter	Value (leg/device)	Unit
V_{DC}	1200	V
$Q_C @ V_R=400V$	36/72	nC
$I_F @ T_c < 140^\circ C$	10/20	A

Table 2 Pin Definition

Pin 1	Pin 2	Pin 3
A	C	A

IDW20S120



Type / ordering Code	Package	Marking	Related links
IDW20S120	PG-TO247-3	D20S120	www.infineon.com/sic

1) J-STD20 and JESD22

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2 Maximum ratings

Table 3 Maximum ratings

Parameter	Symbol	Values (leg/device)			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Continuous forward current	I_F	—	—	10/20	A	$T_C < 140^\circ\text{C}$, $D=1$
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	—	—	53/106		$T_C = 25^\circ\text{C}$, $t_p=10\text{ ms}$
		—	—	44/88		$T_C = 150^\circ\text{C}$, $t_p=10\text{ ms}$
Non-repetitive peak forward current	$I_{F,max}$	—	—	266/532		$T_C = 25^\circ\text{C}$, $t_p=10\text{ }\mu\text{s}$
i ² t value	$\int i^2 dt$	—	—	14/55	A ² s	$T_C = 25^\circ\text{C}$, $t_p=10\text{ ms}$
		—	—	10/39		$T_C = 150^\circ\text{C}$, $t_p=10\text{ ms}$
Repetitive peak reverse voltage	V_{RRM}	—	—	1200	V	
Diode dv/dt ruggedness	dv/dt	—	—	50	V/ns	$V_R=0..480\text{ V}$
Power dissipation	P_{tot}	—	—	115/230	W	$T_C = 25^\circ\text{C}$
Operating and storage temperature	$T_j; T_{stg}$	-55	—	175	°C	
Mounting torque		—	—	60	Ncm	M3 and M3.5 screws

3 Thermal characteristics

Table 4 Thermal characteristics TO-247-3

Parameter	Symbol	Values (leg/device)			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction-case	R_{thJC}	—	—	1.3/0.65	K/W	
Thermal resistance, junction-ambient	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

4 Electrical characteristics

Table 5 Static characteristics

Parameter	Symbol	Values (leg/device)			Unit	Note/Test Condition
		Min.	Typ.	Max.		
DC blocking voltage	V_{DC}	1200	–	–	V	$I_R = 0.48 \text{ mA}$, $T_j = 25^\circ\text{C}$
Diode forward voltage	V_F	–	1.5	1.8		$I_F = 20 \text{ A}$, $T_j = 25^\circ\text{C}$
		–	2.4	–		$I_F = 20 \text{ A}$, $T_j = 150^\circ\text{C}$
Reverse current	I_R	–	5/10	240/480	μA	$V_R = 1200 \text{ V}$, $T_j = 25^\circ\text{C}$
		–	20/40	500/1000		$V_R = 1200 \text{ V}$, $T_j = 150^\circ\text{C}$

Table 6 AC characteristics

Parameter	Symbol	Values (leg/device)			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Total capacitive charge	Q_c	–	36/72	–	nC	$V_R = 400 \text{ V}$, $di/dt = 200 \text{ A}/\mu\text{s}$, $I_F \leq I_{F,MAX}$, $T_j = 150^\circ\text{C}$.
		–	55/110	–		$V_R = 1000 \text{ V}$, $di/dt = 200 \text{ A}/\mu\text{s}$, $I_F \leq I_{F,MAX}$, $T_j = 150^\circ\text{C}$.
Total Capacitance	C	–	580/1160	–	pF	$V_R = 1 \text{ V}$, $f = 1 \text{ MHz}$
		–	50/100	–		$V_R = 300 \text{ V}$, $f = 1 \text{ MHz}$
		–	40/80	–		$V_R = 600 \text{ V}$, $f = 1 \text{ MHz}$

5 Electrical characteristics diagrams

Table 7

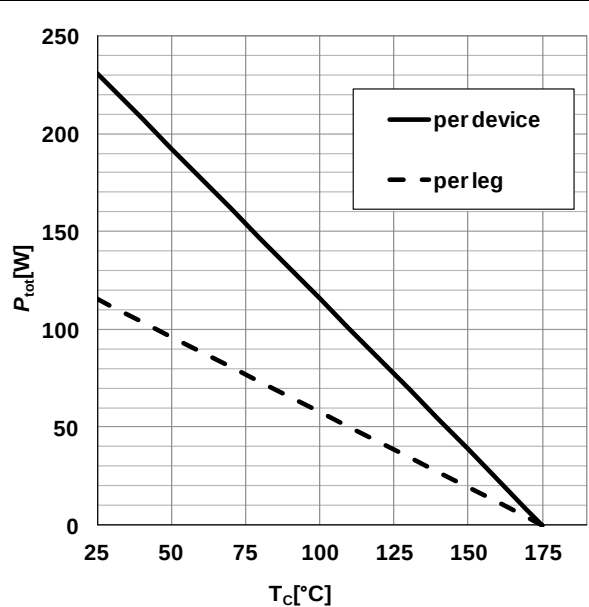
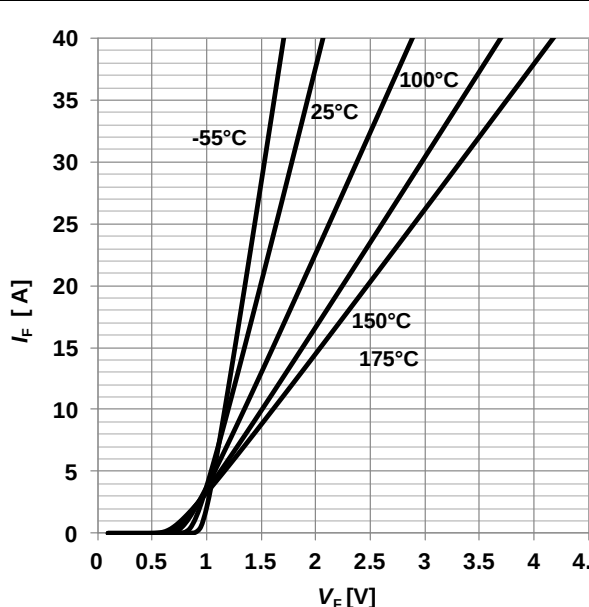
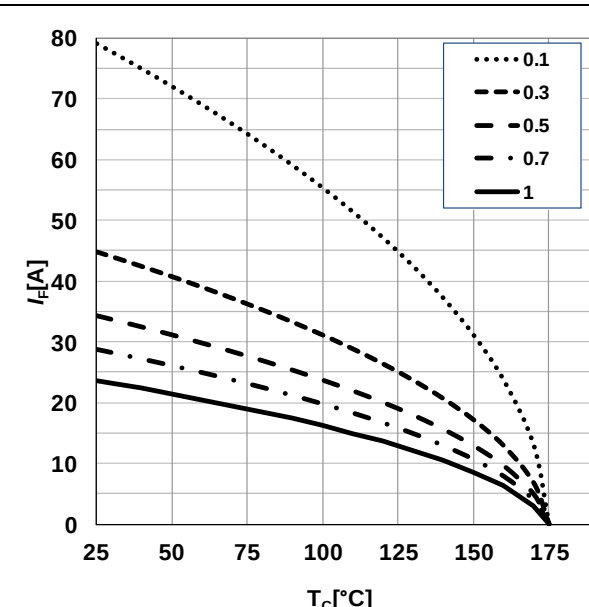
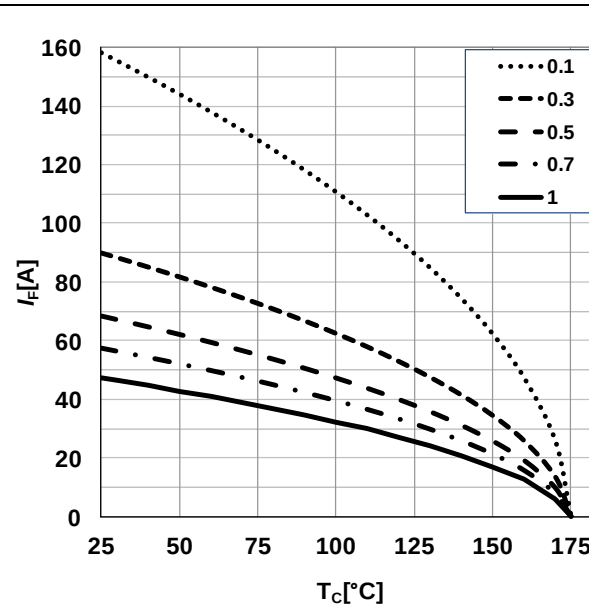
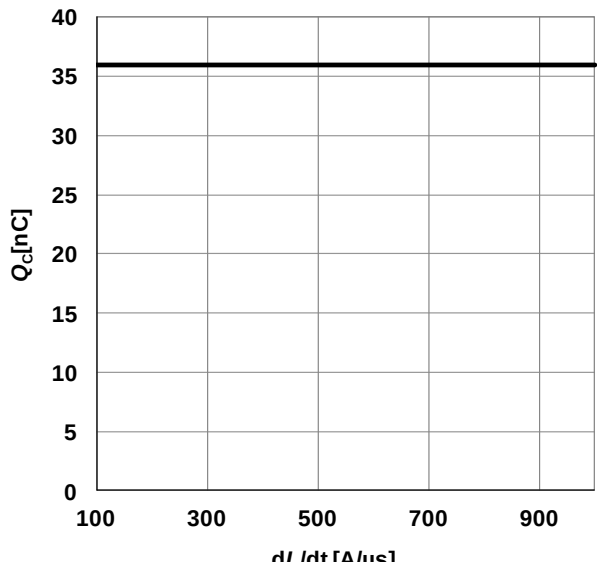
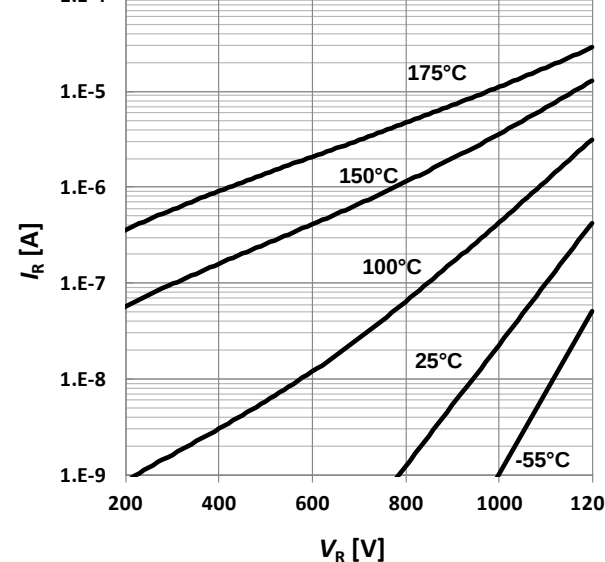
Power dissipation	Typical forward characteristics (per device)
 The graph shows total power dissipation P_{tot} in Watts versus case temperature T_c in degrees Celsius. Two lines are plotted: a solid line for 'per device' and a dashed line for 'per leg'. Both lines show a linear decrease in power dissipation as temperature increases, starting from approximately 230W at 25°C and ending at 0W at 175°C.	 The graph shows forward current I_F in Amperes versus forward voltage V_F in Volts for various temperatures: -55°C, 25°C, 100°C, 150°C, and 175°C. The curves show that for a given forward voltage, the forward current increases as the temperature decreases.
$P_{tot}=f(T_C); R_{thJC,max}$	$I_F=f(V_F); t_p=200\text{ }\mu\text{s}; \text{parameter: } T_j$

Table 8

Diode forward current (per leg)	Diode forward current (per device)
 The graph shows forward current I_F in Amperes versus case temperature T_c in degrees Celsius for various duty cycles D: 0.1, 0.3, 0.5, 0.7, and 1. The current decreases as temperature increases, and for a given temperature, the current is higher for higher duty cycles.	 The graph shows forward current I_F in Amperes versus case temperature T_c in degrees Celsius for various duty cycles D: 0.1, 0.3, 0.5, 0.7, and 1. The current decreases as temperature increases, and for a given temperature, the current is higher for higher duty cycles.
$I_F=f(T_C); T_j \leq 175^\circ\text{C}; R_{thJC,max}; \text{parameter } D=\text{duty cycle}$	$I_F=f(T_C); T_j \leq 175^\circ\text{C}; R_{thJC,max}; \text{parameter } D=\text{duty cycle}$

Electrical characteristics diagrams

Table 9

Typ. capacitance charge vs. current slope ¹⁾ (per leg)	Typ. reverse current vs. reverse voltage (per leg)
	
$Q_C=f(di_F/dt)$; $V_R=400V$; $T_j=150^{\circ}C$; $I_F \leq I_{F,max}$; per device the values double	$I_R=f(V_R)$; parameter: T_j ; per device the values double

1) Only capacitive charge, guaranteed by design.

Table 10

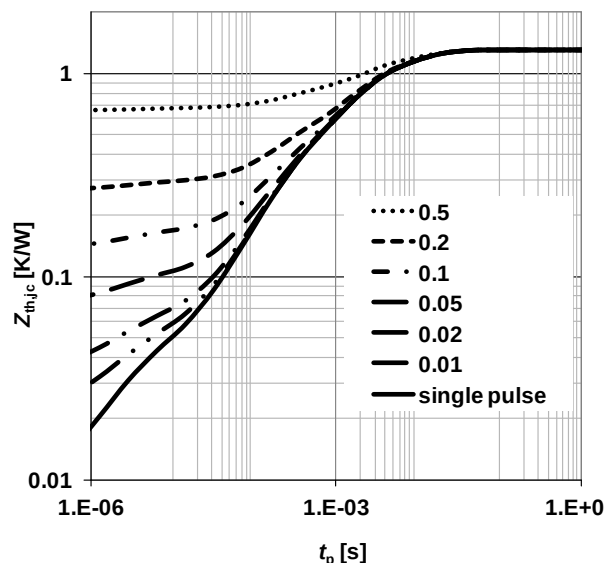
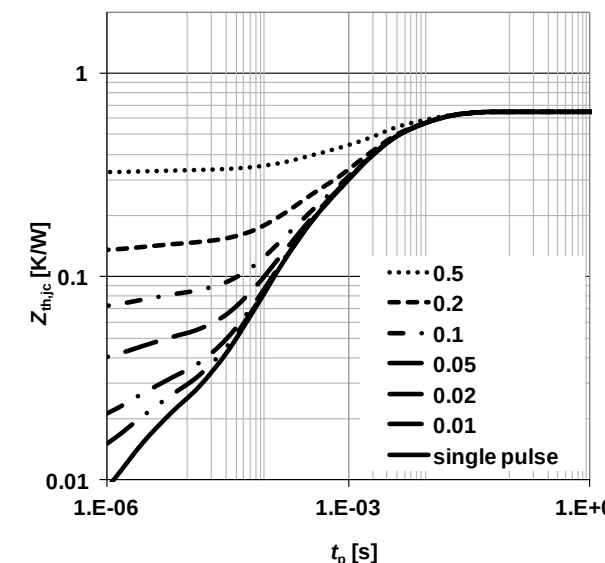
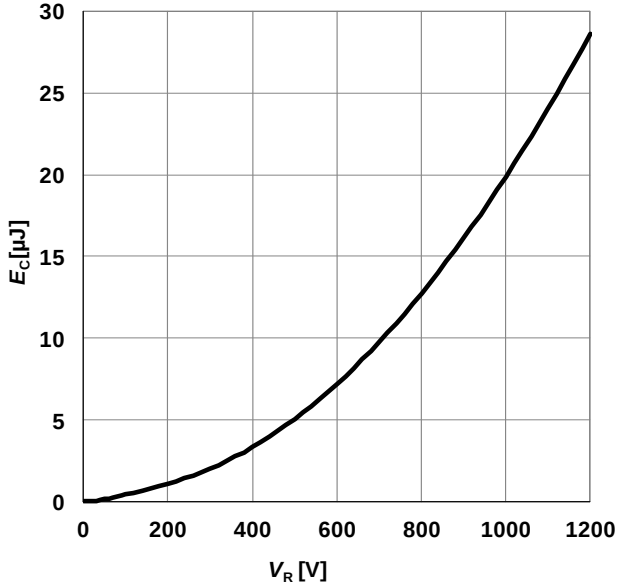
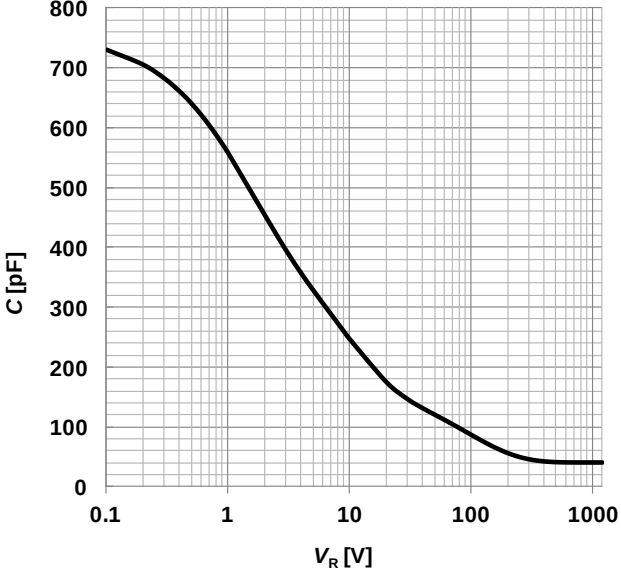
Max. transient thermal impedance (per leg)	Max. transient thermal impedance (per device)
	
$Z_{th,jc}=f(t_p)$; parameter: $D=t_p/T$	$Z_{th,jc}=f(t_p)$; parameter: $D=t_p/T$

Table 11

Typ. capacitance stored energy (per leg)	Typ. capacitance vs. reverse voltage (per leg)
 E_C [μJ] V_R [V]	 C [pF] V_R [V]
$E_C=f(V_R)$; per device the values double	$C=f(V_R)$; $T_j=25^\circ\text{C}$; $f=1\text{ MHz}$, per device the values double

6 Package outlines

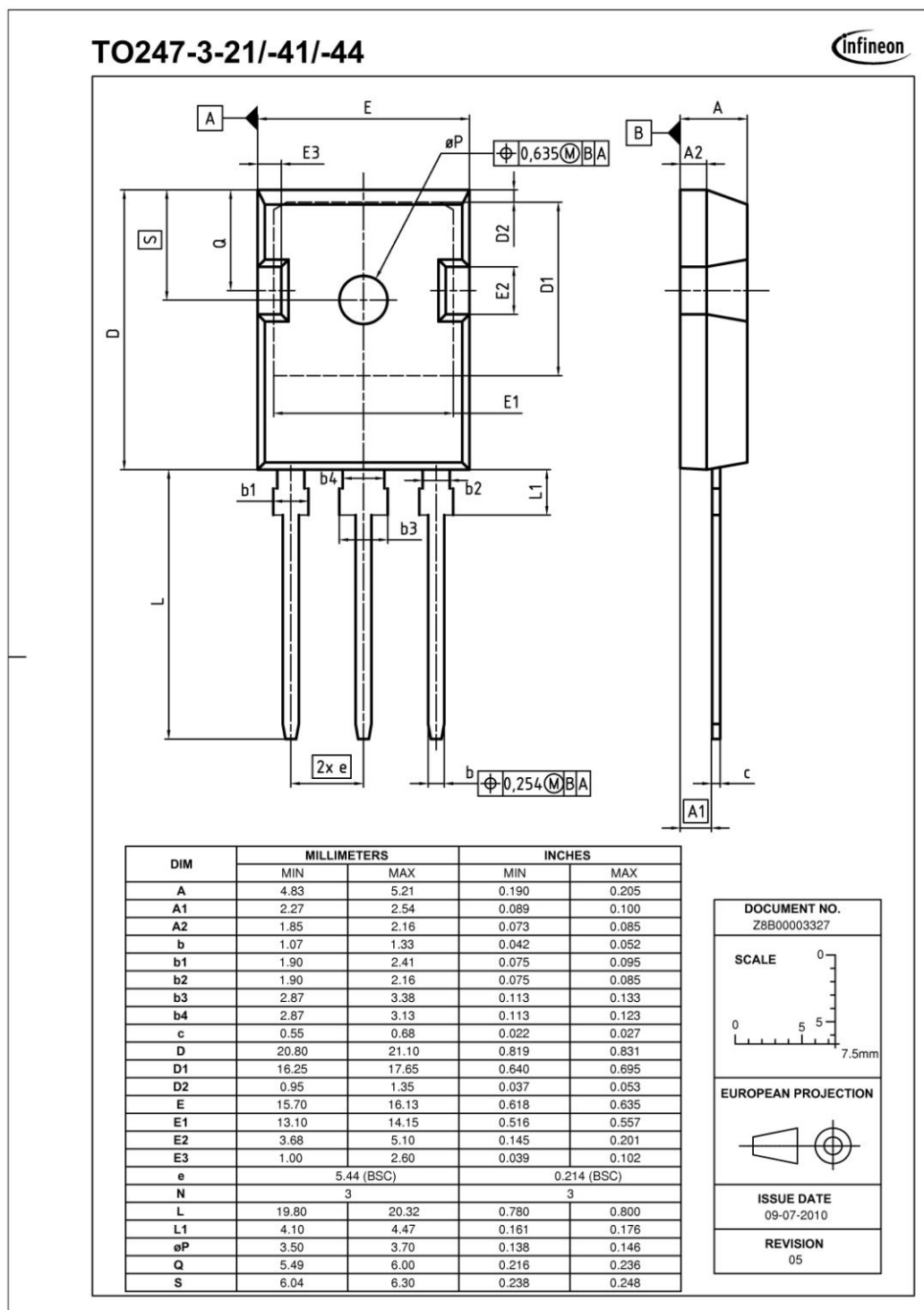


Figure 1 Outlines TO-247, dimensions in mm/inches

7 Revision History

thinQ!™ SiC Schottky Diode

Revision History: 2012-03-23, Rev. 2.0

Previous Revision:

Revision	Subjects (major changes since last version)

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Edition 2012-03-23

Published by

Infineon Technologies AG

81726 Munich, Germany

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