

# SiC

Silicon Carbide Diode

## 2nd Generation thinQ!<sup>TM</sup>

2nd Generation thinQ!<sup>TM</sup> SiC Schottky Diode  
IDV04S60C

## Data Sheet

Rev. 2.0, 2010-01-08  
Final

Industrial & Multimarket

## 2nd Generation thinQ!™ SiC Schottky Diode

IDV04S60C

### 1 Description

The second generation of Infineon SiC Schottky diodes has emerged over the years as the industry standard. The IDVxxS60C family is extending the already broad portfolio with the TO220FullPAK package. In order to greatly reduce the impact of the internal isolation of the FullPAK on the thermal performance, Infineon is applying its new diffusion soldering process for attaching the chip to the leadframe. The result of this is nearly identical thermal characteristics to that of the SiC diodes in the non-isolated TO220 package.



#### Features

- Revolutionary semiconductor material - Silicon Carbide
- Nearly no reverse / forward recovery charge
- High surge current capability
- Fully isolated package with nearly similar  $R_{th,jc}$  as the standard TO220
- Suitable for high temperature operation
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Switching behavior independent of forward current, switching speed and temperature



#### Benefits

- System efficiency improvement over Si diodes
- System cost / size savings due to reduced cooling requirements
- Good thermal performance without the need for additional isolation layer and washer
- Enabling higher frequency / increased power density solutions
- Higher system reliability due to lower operating temperatures and less fans
- Reduced EMI

#### Applications

Fully isolated TO220 package for e.g. CCM PFC; Motor Drives; Solar Applications; UPS

**Table 1 Key Performance Parameters**

Parameter	Value	Unit
$V_{DC}$	600	V
$Q_C$	8	nC
$I_F @ T_C < 100^\circ\text{C}$	4	A

**Table 2 Pin Definition**

Pin 1	Pin2	Pin 3
C	A	n.a.

Type / Ordering Code	Package	Marking	Related Links
IDV04S60C	PG-TO220 FullPAK	D04S60C	<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			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous forward current	$I_F$	-	-	4	A	$T_C = < 110^\circ\text{C}$
Surge non-repetitive forward current, sine halfwave	$I_{F, SM}$	-	-	32		$T_C = 25^\circ\text{C}, t_p = 10 \text{ ms}$
		-	-	23		$T_C = 150^\circ\text{C}, t_p = 10 \text{ ms}$
Non-repetitive peak forward current	$I_{F, max}$	-	-	190		$T_C = 25^\circ\text{C}, t_p = 10 \mu\text{s}$
$i^2 t$ value	$\int i^2 dt$	-	-	4	A <sup>2</sup> s	$T_C = 25^\circ\text{C}, t_p = 10 \text{ ms}$
		-	-	2		$T_C = 150^\circ\text{C}, t_p = 10 \text{ ms}$
Repetitive peak reverse voltage	$V_{RRM}$	-	-	600	V	$T_j = 25^\circ\text{C}$
Diode dv/dt ruggedness	dv/dt	-	-	50	V/ns	$V_R = 0 \dots 480 \text{ V}$
Power dissipation	$P_{tot}$	-	-	26	W	$T_C = 25^\circ\text{C}$
Operating and storage temperature	$T_j, T_{stg}$	- 55	-	175	°C	
Mounting torque		-	-	50	Ncm	M2.5 screws

## 3 Thermal characteristics

**Table 4 Thermal characteristics TO-220 FullPAK**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	$R_{thJC}$	-	-	5.6	K/W	
Thermal resistance, junction - ambient	$R_{thJA}$	-	-	62		leaded
Soldering temperature, wavesoldering only allowed at leads	$T_{sold}$	-	-	260	°C	1.6 mm (0.063 in.) from case for 10 s

## 4 Electrical characteristics

**Table 5 Static characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
DC blocking voltage	$V_{DC}$	600	-	-	V	$T_j = 25\text{ °C}$ , $I_R = 0.05\text{ mA}$
Diode forward voltage	$V_F$	-	1.7	1.9	V	$I_F = 4\text{ A}$ , $T_j = 25\text{ °C}$
		-	2	2.4		$I_F = 4\text{ A}$ , $T_j = 150\text{ °C}$
Reverse current	$I_R$	-	0.5	50	$\mu\text{A}$	$I_R = 600\text{ V}$ , $T_j = 25\text{ °C}$
		-	2	500		$I_R = 600\text{ V}$ , $T_j = 150\text{ °C}$

**Table 6 AC characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Total capacitive charge	$Q_c$	-	8	-	nC	$V_R = 400\text{ V}$ , $F \leq F_{max}$
Switching time <sup>1)</sup>	$t_c$	-	-	<10	ns	$di_F/dt = 200\text{ A}/\mu\text{s}$ , $T_j = 150\text{ °C}$
		$C$	-	130		
	-		20	-	$V_R = 300\text{ V}$ , $f = 1\text{ MHz}$	
	-		20	-	$V_R = 600\text{ V}$ , $f = 1\text{ MHz}$	

1)  $t_c$  is the time constant for the capacitive displacement current waveform (independent from  $T_j$ ,  $I_{LOAD}$  and  $di/dt$ ), different from  $t_r$  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

Table 7

Power dissipation	Diode forward current
$P_{tot} = f(T_c)$	$I_F = f(T_c); T_j \leq 175\text{ °C}$

Table 8

Typ. forward characteristic	Typ. forward characteristic in surge current
$I_F = f(V_F); t_p = 400\text{ }\mu\text{s}; \text{parameter: } T_j$	$I_F = f(V_F); t_p = 400\text{ }\mu\text{s}; \text{parameter: } T_j$

Table 9

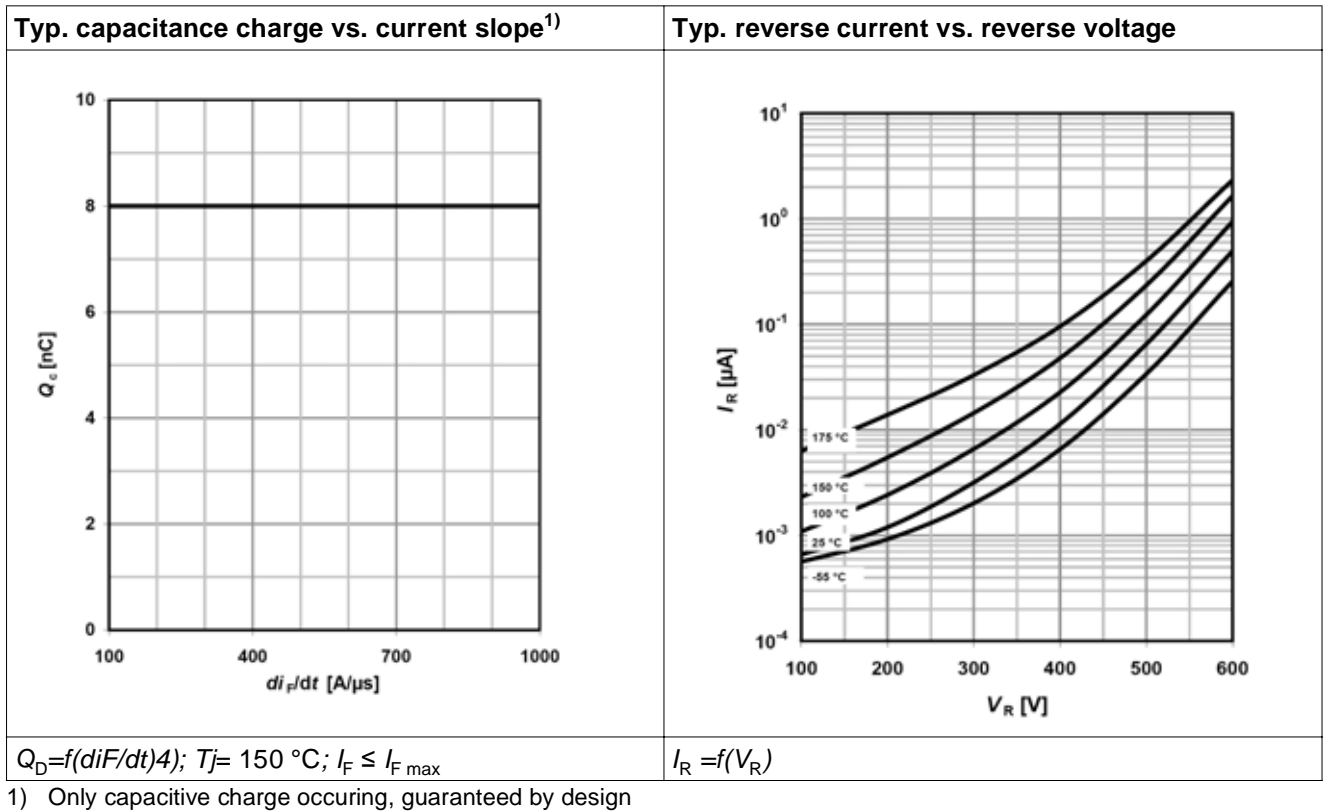


Table 10

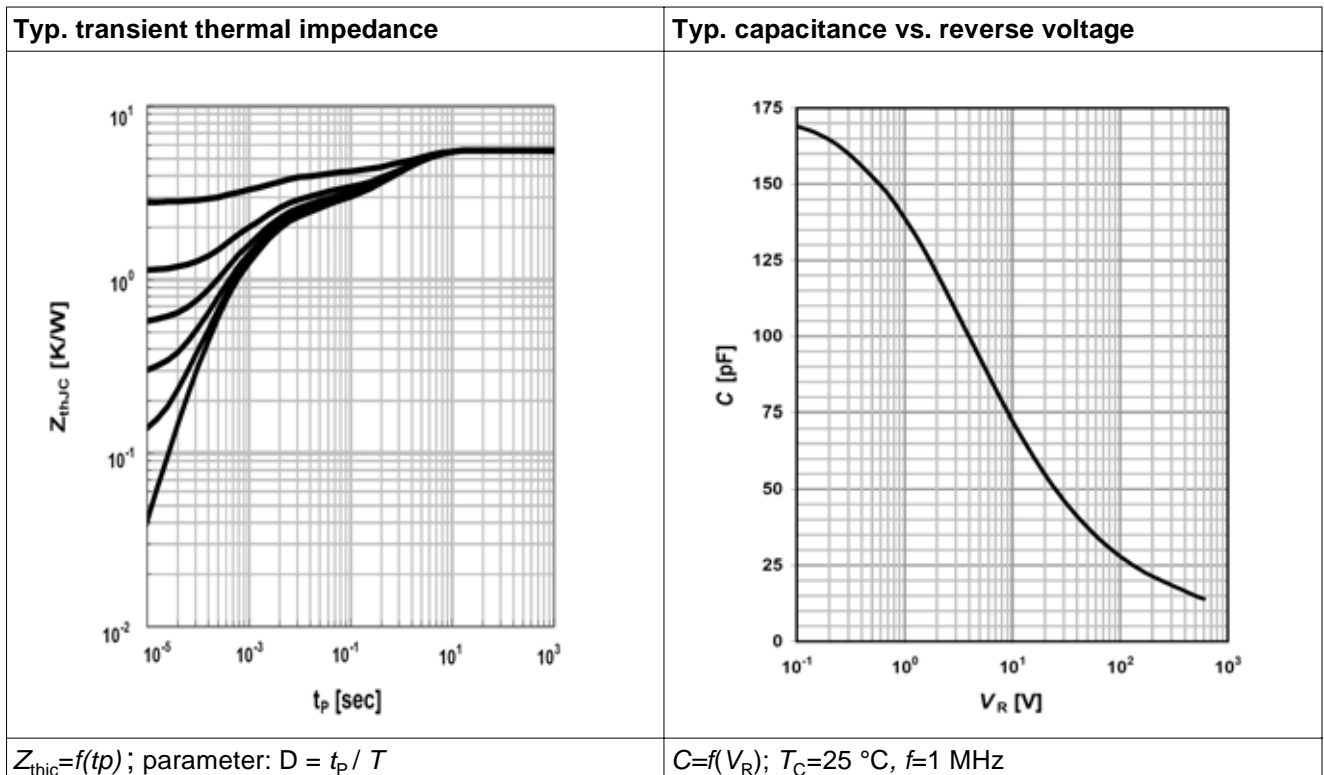
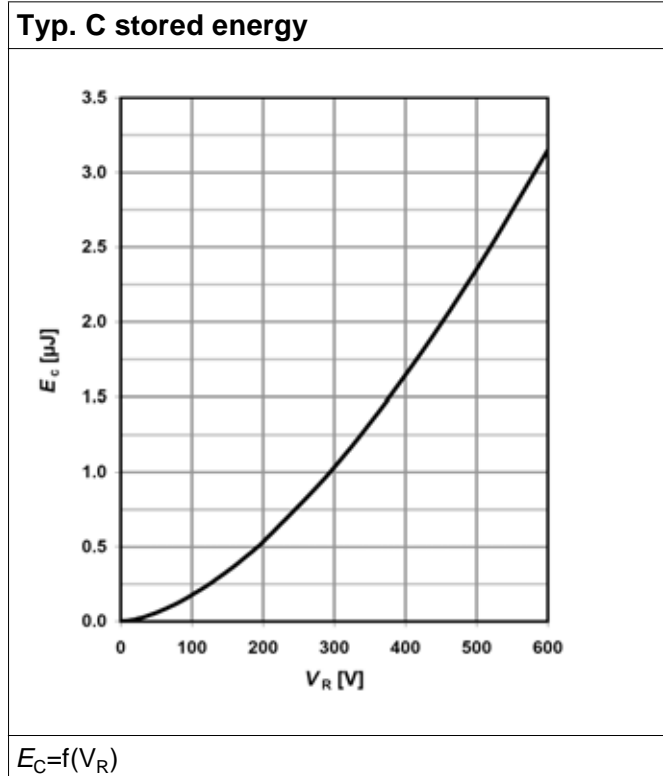




Table 11





6 Package outlines

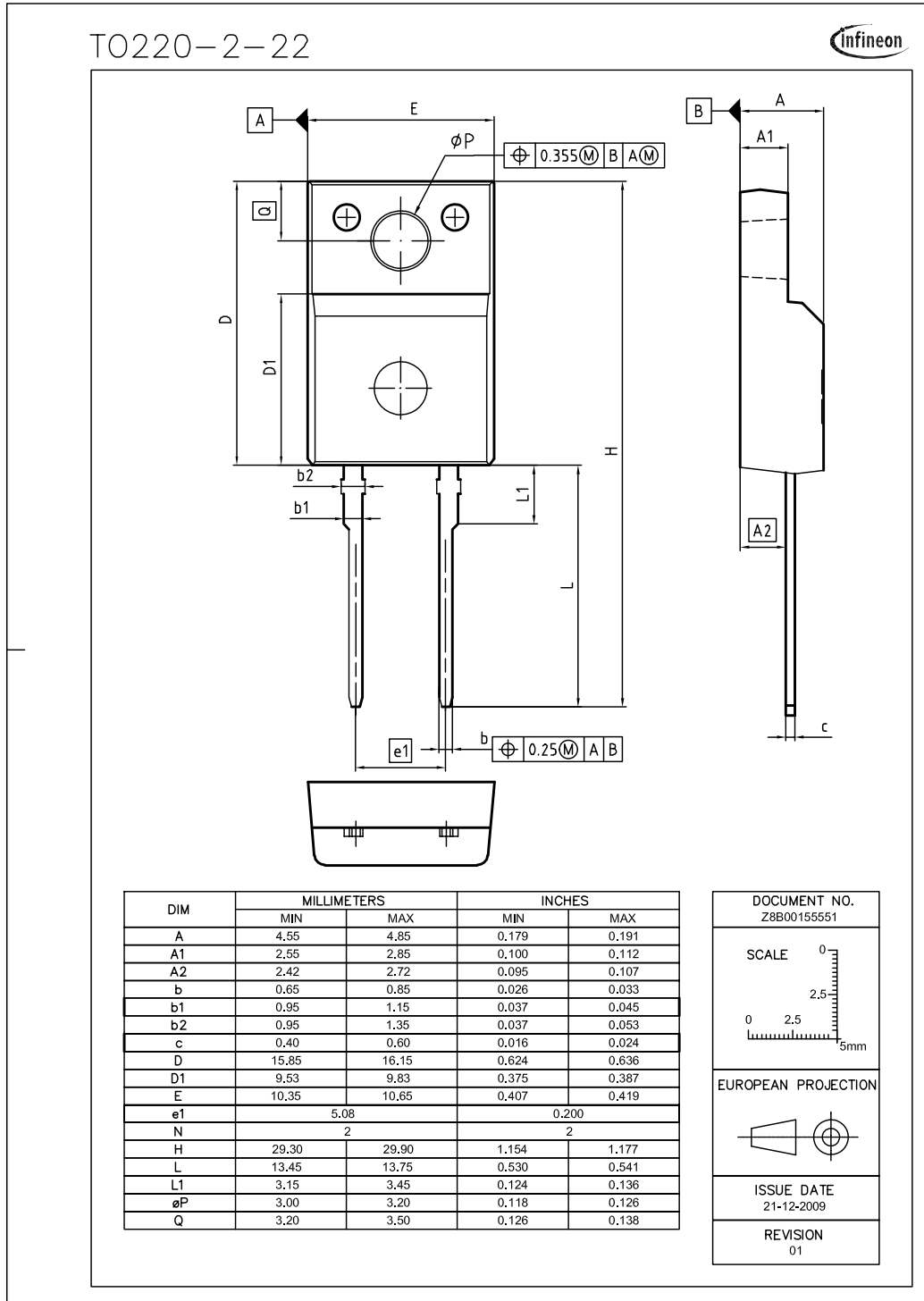


Figure 1 Outlines TO-220 FullPAK, dimensions in mm/inches

## 7 Revision History

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

Revision History: 2010-01-08, Rev. 2.0

**Previous Revision:**

Revision	Subjects (major changes since last revision)
2.0	Release of final data sheet

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