Never stop thinking

SiC

Silicon Carbide Diode

2nd Generation thinQ!™

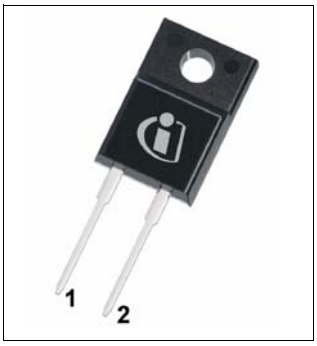
2nd Generation thinQ!™ SiC Schottky Diode
IDV03S60C

Data Sheet

Rev. 2.1, 2010-02-16
Final

Industrial & Multimarket

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 it´s 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 Rth,jc as the standard T0220
- Suitable for high temperature operation
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC[1)] 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	5	nC
I_F @ T_C < 120°C	3	A

Table 2 Pin Definition

Pin 1	Pin2	Pin 3
C	A	n.a.

Type / Ordering Code	Package	Marking	Related Links
IDV03S60C	PG-TO220 FullPAK	D03S60C	IFX SiC Diodes Webpage

1) J-STD20 and JESD22

Table of Contents

2 Maximum ratings

Table 3 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous forward current	I_F	-	-	3	A	T_C= < 120°C
Surge non-repetitive	$I_{F, SM}$	-	-	16		T_C= 25°C, t_p = 10 ms
forward current, sine halfwave		-	-	14		T_C= 150°C, t_p = 10 ms
Non-repetitive peak forward current	$I_{F, max}$	-	-	115		T_C= 25°C, t_p = 10 µs
i² t value	∫i²dt	-	-	1,2	A²s	T_C= 25°C, t_p = 10 ms
		-		0,96		T_C= 150°C, t_p = 10 ms
Repetitive peak reverse voltage	V_{RRM}	-	-	600	V	T_j= 25°C
Diode dv/dt ruggedness	dv/dt	-	-	50	V/ns	V_R= 0...480 V
Power dissipation	P_{tot}	-	-	25	W	T_C= 25 °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}	-	-	5,9	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 °C, I_R= 0.03 mA
Diode forward voltage	V_F	-	1.7	1.9		I_F= 3 A, T_j= 25 °C
		-	2.1	2.6		I_F= 3 A, T_j= 150 °C
Reverse current	I_R	-	0.32	30	µA	I_R= 600 V, T_j=25 °C
		-	1.3	300		I_R= 600 V, T_j=150 °C

Table 6 AC characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Total capacitive charge	Q_c	-	5	-	nC	V_R= 400 V, $F \leq$ I F_{max} di_F /dt =200 A/µs, T_j=150 °C
Switching time[1)]	t_c	-	-	<10	ns	
	C	-	90	-	pF	V_R= 1 V, f= 1 MHz
		-	12	-		V_R= 300 V, f= 1 MHz
		-	12	-		V_R= 600 V, f= 1 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

Table 7

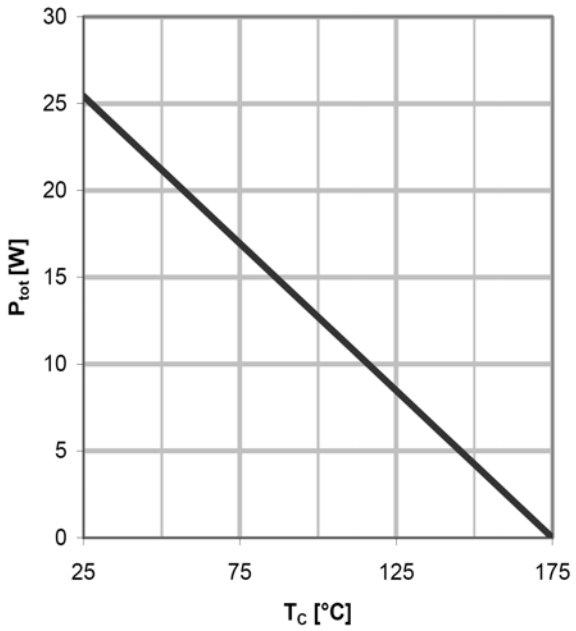
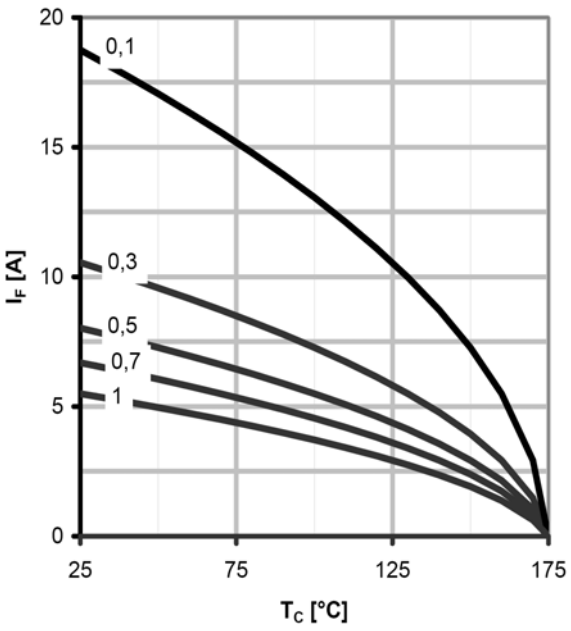
Power dissipation	Diode forward current
	
$P_{tot} = f(T_C)$	$I_F = f(T_C)$; $T_j \leq 175$ °C

Table 8

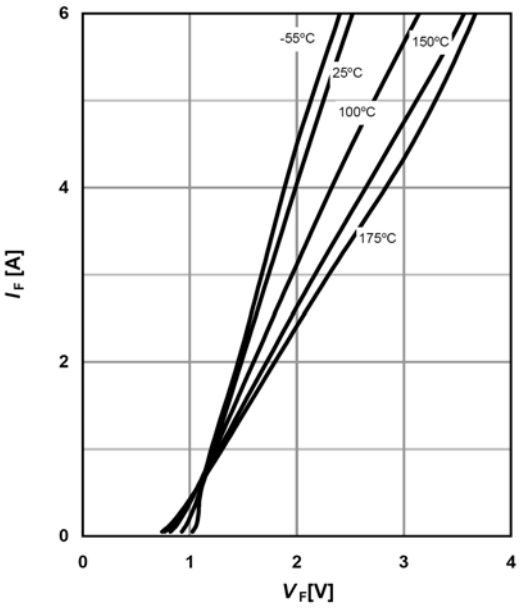
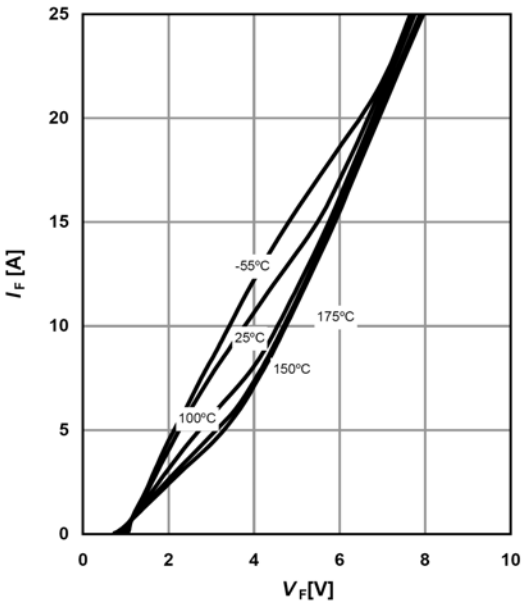
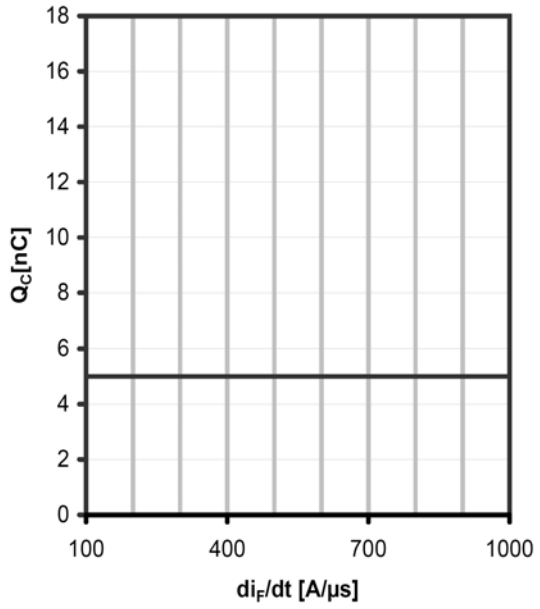
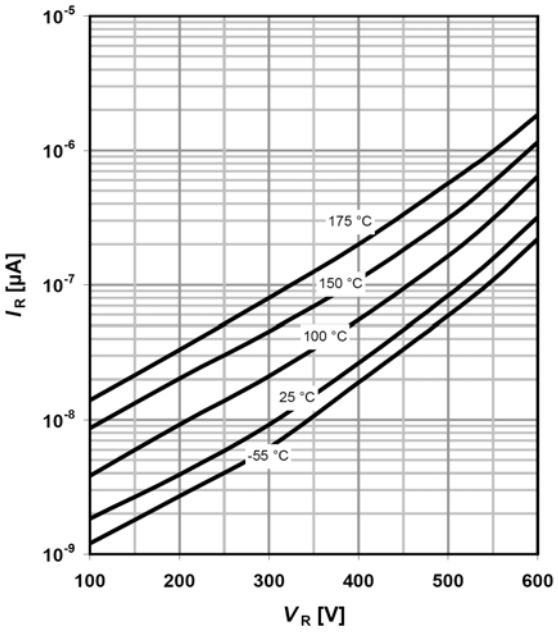
Typ. forward characteristic	Typ. forward characteristic in surge current
	
$I_F = f(V_F)$; t_p=400 µs; parameter: T_j	$I_F = f(V_F)$; t_p=400 µs; parameter: T_j

Table 9

Typ. capacitance charge vs. current slope[1)]	Typ. reverse current vs. reverse voltage
	
$Q_D=f(diF/dt)4)$; Tj= 150 °C; $I_F \le I_{F\ max}$	$I_R=f(V_R)$

1) Only capacitive charge occuring, guaranteed by design

Table 10

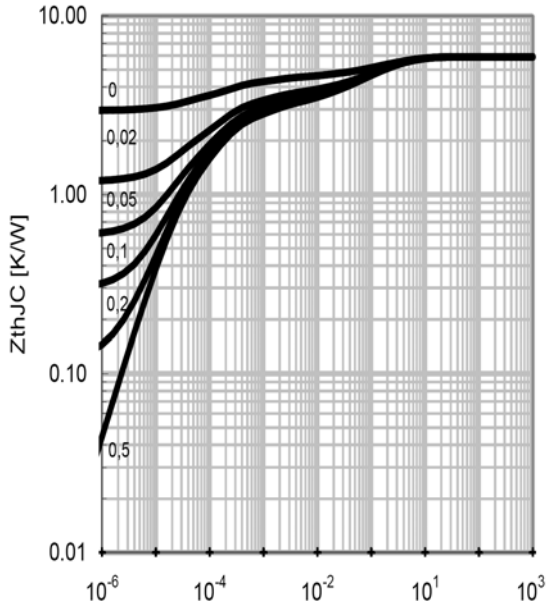
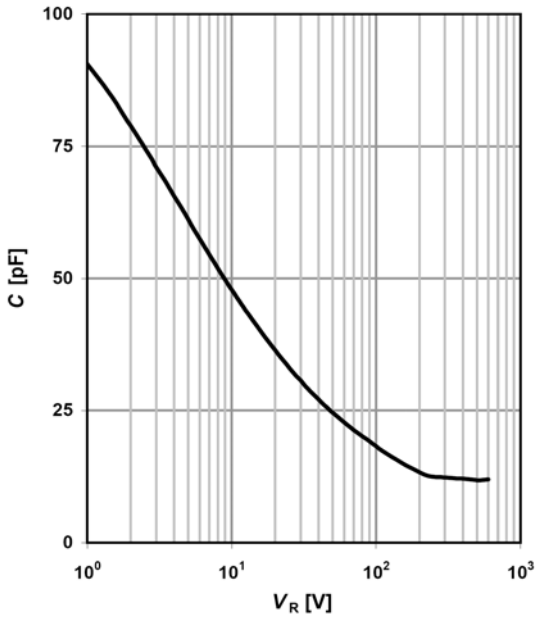
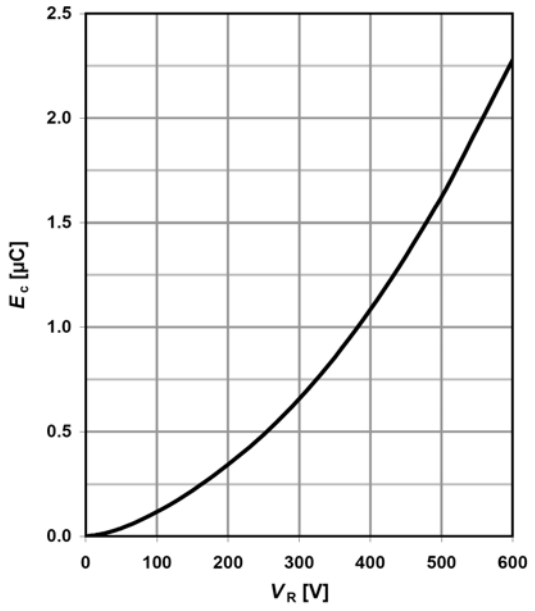
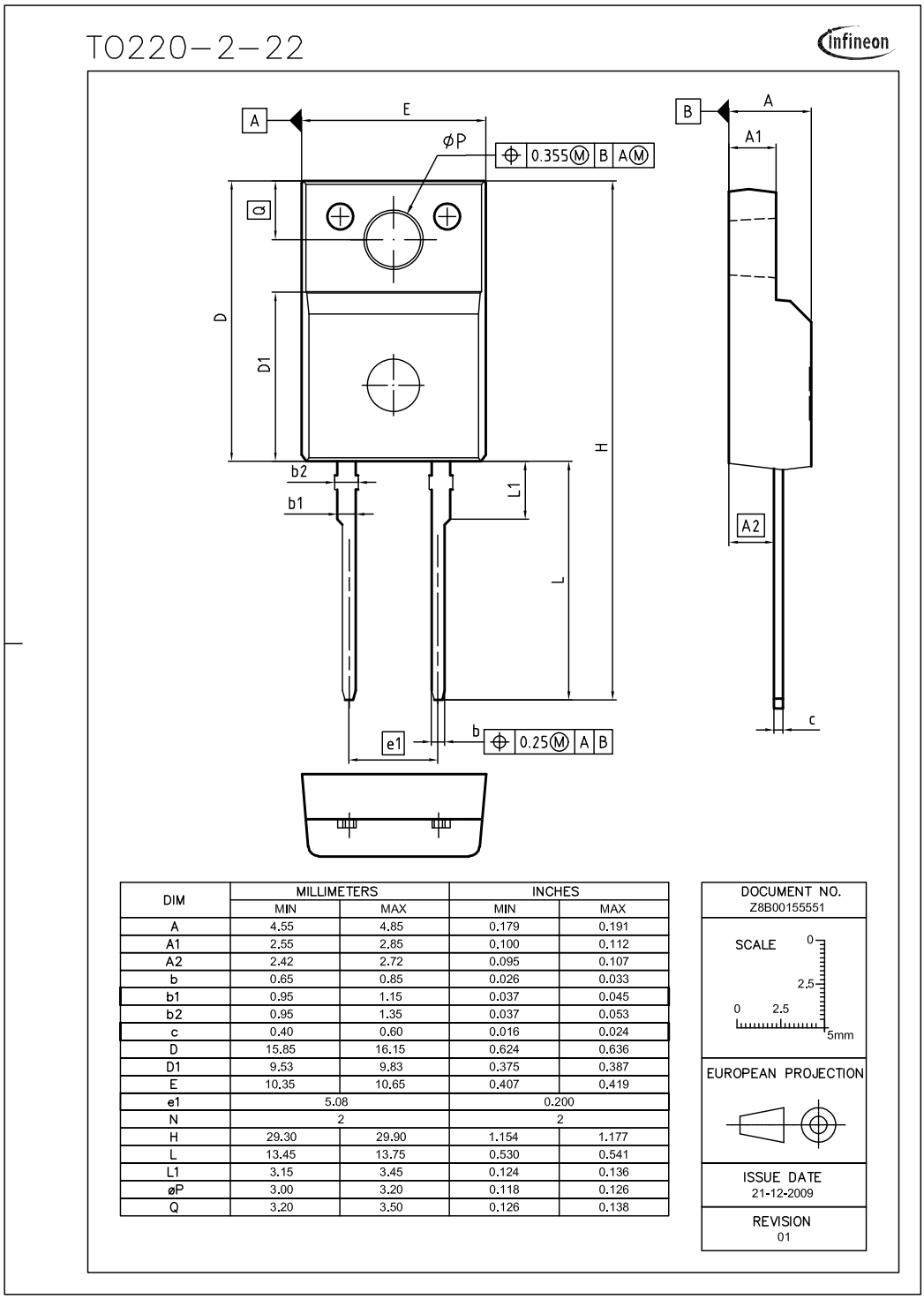
Typ. transient thermal impedance	Typ. capacitance vs. reverse voltage
	
$Z_{thjc}=f(tp)$; parameter: D = t_P / T	$C=f(V_R)$; T_C=25 °C, f=1 MHz

Table 11

Typ. C stored energy

E_C=f(V_R)

6 Package outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.55	4.85	0.179	0.191
A1	2.55	2.85	0.100	0.112
A2	2.42	2.72	0.095	0.107
b	0.65	0.85	0.026	0.033
b1	0.95	1.15	0.037	0.045
b2	0.95	1.35	0.037	0.053
c	0.40	0.60	0.016	0.024
D	15.85	16.15	0.624	0.636
D1	9.53	9.83	0.375	0.387
E	10.35	10.65	0.407	0.419
e1	5.08		0.200	
N	2		2	
H	29.30	29.90	1.154	1.177
L	13.45	13.75	0.530	0.541
L1	3.15	3.45	0.124	0.136
øP	3.00	3.20	0.118	0.126
Q	3.20	3.50	0.126	0.138

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SCALE 0 2.5 0 2.5 5mm

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REVISION
01

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

7 Revision History

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

Revision History: 2010-02-16, Rev. 2.1

Previous Revision:

Revision	Subjects (major changes since last revision)
2.0	Release of final data sheet
2.1	Update of Thermal resistance, junction - case

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