PSC1665B1

650 V, 16 A SiC Schottky diode in bare die

7 May 2025 Product data sheet

1. General description

Nexperia introduces leading edge Silicon Carbide (SiC) Schottky diode for ultra-high performance, low loss, high efficiency power conversion applications. The Merged PiN Schottky (MPS) diode delivered as bare die in Tape and Reel (T & R) offers temperature independent capacitive turn-off, zero recovery switching behavior combined with an outstanding figure-of-merit (Q_C x V_F) and improves the robustness expressed in a high I_{FSM}.

2. Features and benefits

- Zero forward and reverse recovery
- Temperature independent fast and smooth switching performance
- Outstanding figure-of-merit (Q_c x V_F)
- High I_{FSM} capability
- High power density
- Reduced system costs
- System miniaturization
- Reduced EMI

3. Applications

- Switch Mode Power Supply (SMPS)
- AC-DC and DC-DC converter
- Battery charging infrastructure
- Server and telecom power supply
- Uninterruptible Power Supply (UPS)
- Photovoltaic inverters

4. Quick reference data

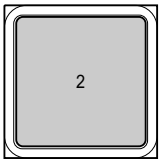
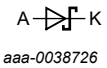
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DC}	DC blocking voltage		[1]	650	-	-	V
I_F	forward current	δ = 1; $T_c \leq 120$ °C	[2]	-	-	16	A
Q_C	total capacitive charge	V_R = 400 V; dI_F/dt = 200 A/µs; I_F = 16 A; T_j = 25 °C	[2]	-	34	-	nC

[1] Parameters 100% tested.
[2] Validation performed on TO-263-2 with mold compound.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode (back side)	 Transparent top view **Bare die (NBD2-03)**	 *aaa-0038726*
2	A	anode (top side)		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSC1665B1	Bare die	Bare die product; 1.81 mm × 1.81 mm × 0.11 mm die size	NBD2-03

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{RRM}	repetitive peak reverse voltage	T_j = 25 °C		-	650	V
dv/dt	diode dv/dt ruggedness	0 ≤ V_R ≤ 480 V		-	100	V/ns
I_F	forward current	δ = 1; T_c ≤ 120 °C	[1]	-	16	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 µs; square wave; T_c = 25 °C	[1]	-	650	A
		t_p = 10 ms; half sine-wave; T_c = 25 °C	[1]	-	80	A
		t_p = 10 ms; half sine-wave; T_c = 150 °C	[1]	-	65	A
$\int i^2dt$	i^2t value	t_p = 10 ms; T_c = 25 °C	[1]	-	32	A²s
		t_p = 10 ms; T_c = 150 °C	[1]	-	21	A²s
P_{tot}	total power dissipation	T_c ≤ 25 °C	[1]	-	90	W
T_j	junction temperature		[1]	-55	175	°C
T_{amb}	ambient temperature		[1]	-55	175	°C
T_{stg}	storage temperature		[1]	-65	175	°C

[1] Validation performed on TO-263-2 with mold compound.

8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-c)}$	thermal resistance from junction to case		[1]	-	1.3	1.7	K/W

[1] Validation performed on TO-263-2 with mold compound.

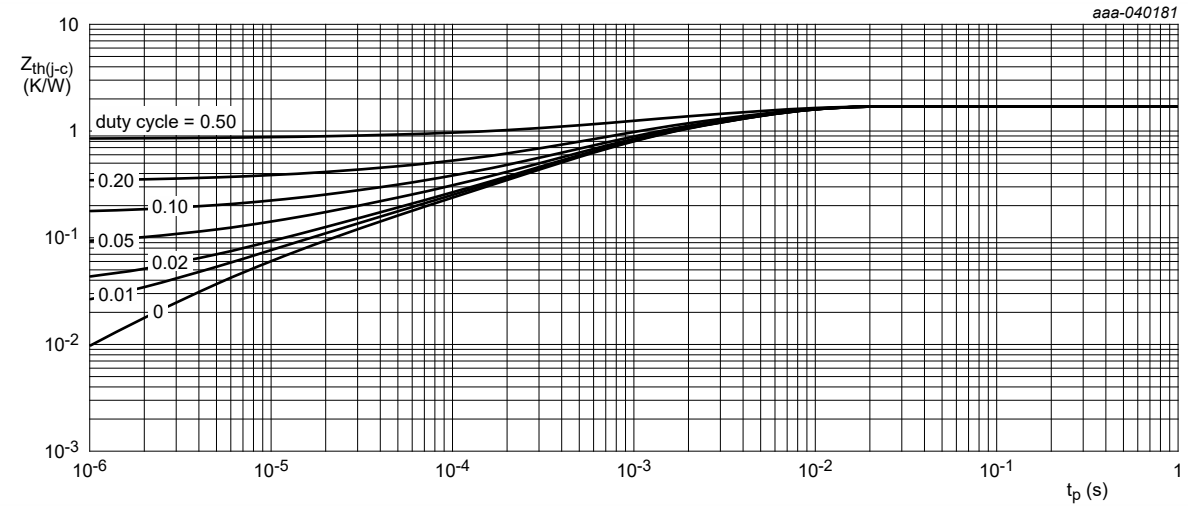


Fig. 1. Transient thermal impedance as a function of pulse duration; maximum values

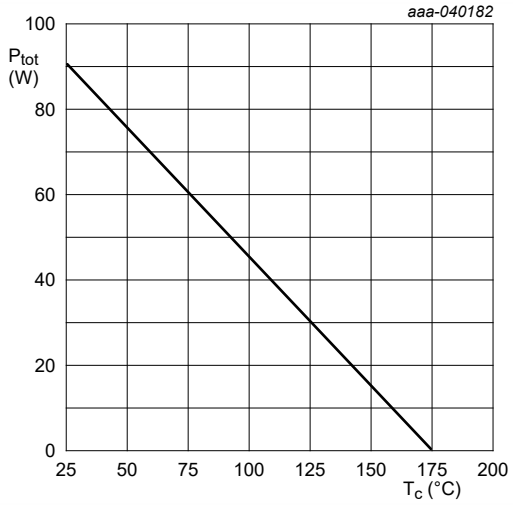


Fig. 2. Power dissipation; maximum values

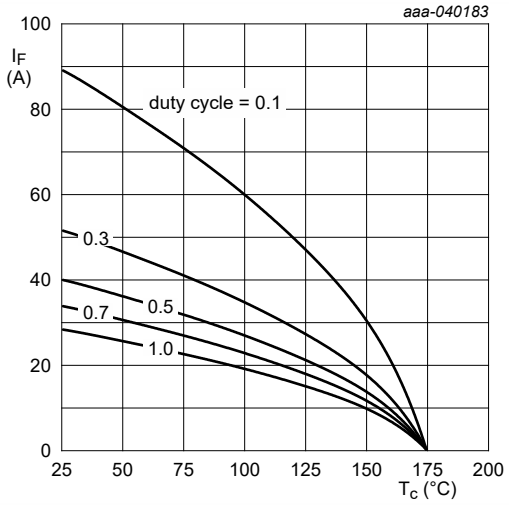


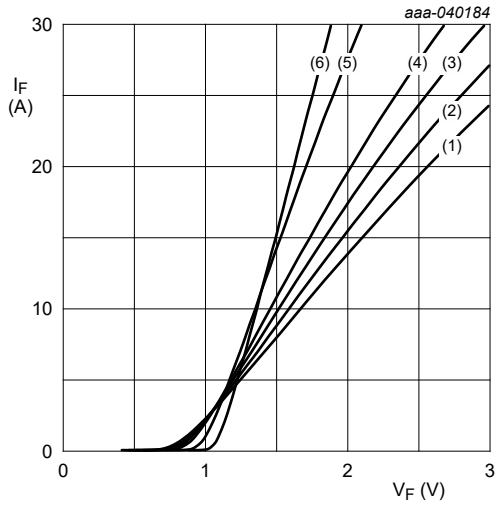
Fig. 3. Forward current as a function of case temperature; maximum values

9. Characteristics

Table 6. Characteristics

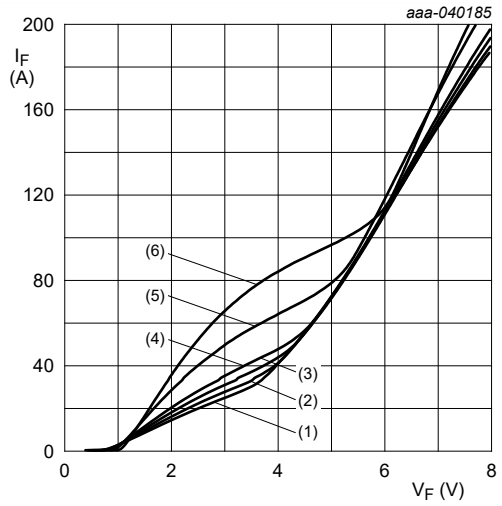
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DC}	DC blocking voltage		[1]	650	-	-	V
V_F	forward voltage	I_F = 16 A; T_j = 25 °C	[1]	-	1.5	1.8	V
		I_F = 16 A; T_j = 150 °C	[2]	-	2	2.6	V
I_R	reverse current	V_R = 650 V; T_j = 25 °C	[1]	-	1	180	µA
		V_R = 650 V; T_j = 150 °C	[2]	-	10	1250	µA
C_d	diode capacitance	f = 1 MHz; V_R = 1 V; T_j = 25 °C	[2]	-	475	-	pF
		f = 1 MHz; V_R = 400 V; T_j = 25 °C	[2]	-	61	-	pF
Q_C	total capacitive charge	V_R = 400 V; dI_F/dt = 200 A/µs; I_F = 16 A; T_j = 25 °C	[2]	-	34	-	nC

[1] Parameters 100% tested.
[2] Validation performed on TO-263-2 with mold compound.



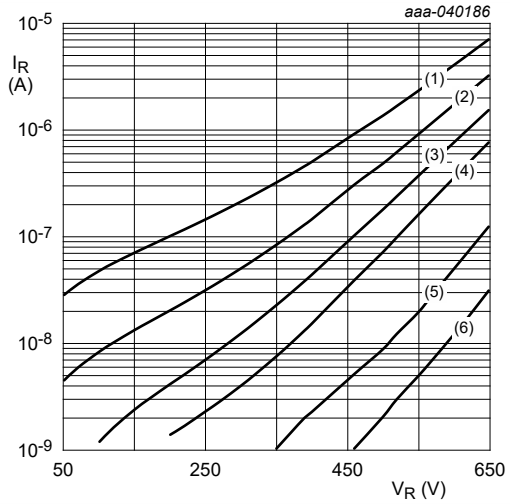
Pulsed condition:
(1) T_j = 175 °C
(2) T_j = 150 °C
(3) T_j = 125 °C
(4) T_j = 100 °C
(5) T_j = 25 °C
(6) T_j = -55 °C

Fig. 4. Forward current as a function of forward voltage; typical values



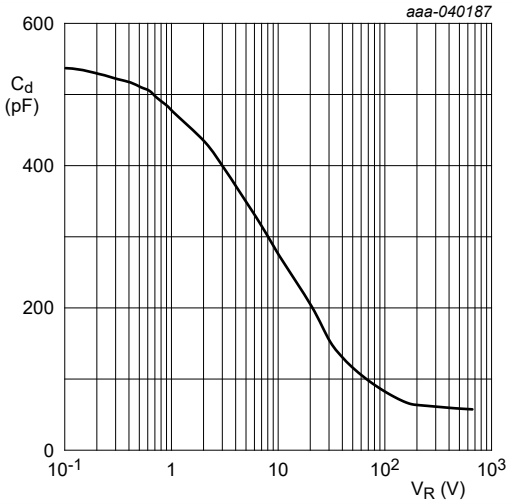
Pulsed condition:
(1) T_j = 175 °C
(2) T_j = 150 °C
(3) T_j = 125 °C
(4) T_j = 100 °C
(5) T_j = 25 °C
(6) T_j = -55 °C

Fig. 5. Forward characteristics in surge current as a function of forward voltage; typical values



Pulsed condition:
(1) T_j = 175 °C
(2) T_j = 150 °C
(3) T_j = 125 °C
(4) T_j = 100 °C
(5) T_j = 25 °C
(6) T_j = -55 °C

Fig. 6. Reverse current as a function of reverse voltage; typical values



f = 1 MHz; T_{amb} = 25 °C

Fig. 7. Diode capacitance as a function of reverse voltage; typical values

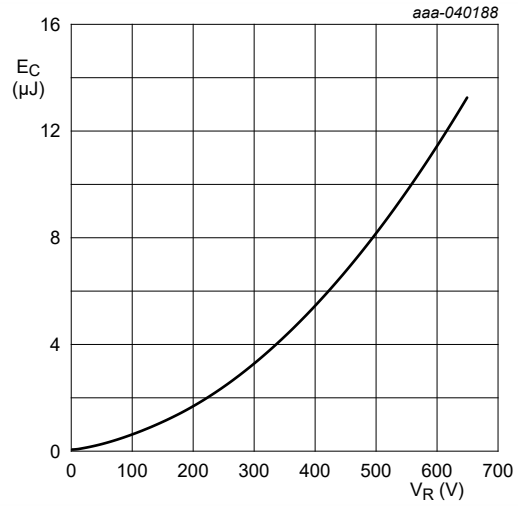


Fig. 8. Capacitance stored energy as a function of reverse voltage; typical values

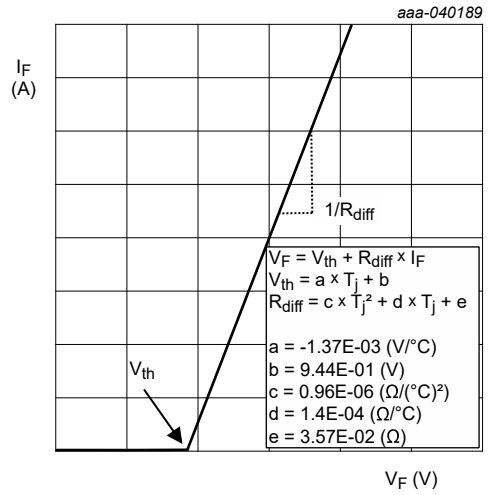


Fig. 9. Simplified forward characteristics mode

10. Test information

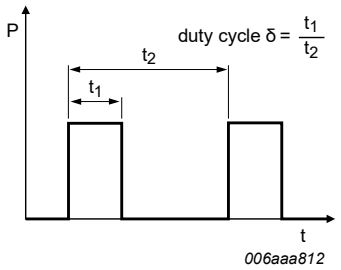


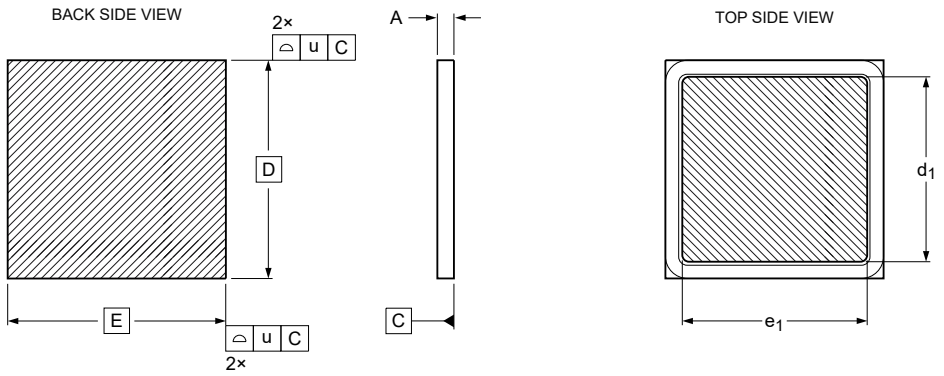
Fig. 10. Duty cycle definition

Quality information

The reliability of the bare die product was tested in the TO-263-2 package with epoxy mold compound.

11. Package outline

Bare die product; 1.81 mm × 1.81 mm × 0.11 mm die size **NBD2-03**



Dimensions (mm are the original dimensions)

Unit		A	D	E	d_1	e_1	u
mm	max	0.13	1.81 BSC	1.81 BSC	1.52	1.52	0.05
	nom	0.11					
	min	0.09					

Metalization

Top side: AlCu (5 µm TYP.) (for wire)
Back side: TiNiAg (1.5 µm TYP.)

nbd2-03_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	EIAJ			
NBD2-03						24-12-10

Fig. 11. Package outline Bare die (NBD2-03)

12. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PSC1665B1 v.1	20250507	Product data sheet	-	-

13. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
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