

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 ($Q_C \times V_F$) 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 ($Q_C \times V_F$)
- 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

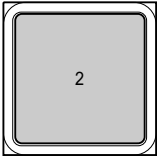
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DC}	DC blocking voltage		[1]	650	-	-	V
I_F	forward current	$\delta = 1$; $T_c \leq 120\text{ }^{\circ}\text{C}$	[2]	-	-	16	A
Q_C	total capacitive charge	$V_R = 400\text{ V}$; $dI_F/dt = 200\text{ A}/\mu\text{s}$; $I_F = 16\text{ A}$; $T_J = 25\text{ }^{\circ}\text{C}$	[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	$T_j = 25\text{ }^{\circ}\text{C}$		-	650	V
dv/dt	diode dv/dt ruggedness	$0 \leq V_R \leq 480\text{ V}$		-	100	V/ns
I_F	forward current	$\delta = 1; T_c \leq 120\text{ }^{\circ}\text{C}$	[1]	-	16	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10\text{ }\mu\text{s}; \text{ square wave}; T_c = 25\text{ }^{\circ}\text{C}$	[1]	-	650	A
		$t_p = 10\text{ ms}; \text{ half sine-wave}; T_c = 25\text{ }^{\circ}\text{C}$	[1]	-	80	A
		$t_p = 10\text{ ms}; \text{ half sine-wave}; T_c = 150\text{ }^{\circ}\text{C}$	[1]	-	65	A
$\int i^2 dt$	$i^2 t$ value	$t_p = 10\text{ ms}; T_c = 25\text{ }^{\circ}\text{C}$	[1]	-	32	A ² s
		$t_p = 10\text{ ms}; T_c = 150\text{ }^{\circ}\text{C}$	[1]	-	21	A ² s
P_{tot}	total power dissipation	$T_c \leq 25\text{ }^{\circ}\text{C}$	[1]	-	90	W
T_j	junction temperature		[1]	-55	175	$^{\circ}\text{C}$
T_{amb}	ambient temperature		[1]	-55	175	$^{\circ}\text{C}$
T_{stg}	storage temperature		[1]	-65	175	$^{\circ}\text{C}$

[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.

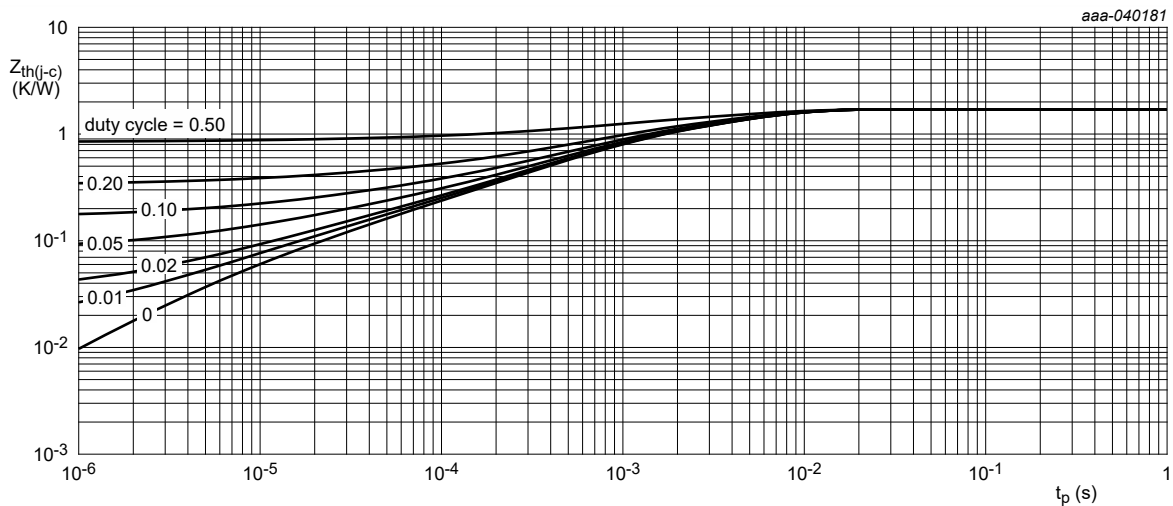


Fig. 1. Transient thermal impedance as a function of pulse duration; maximum values

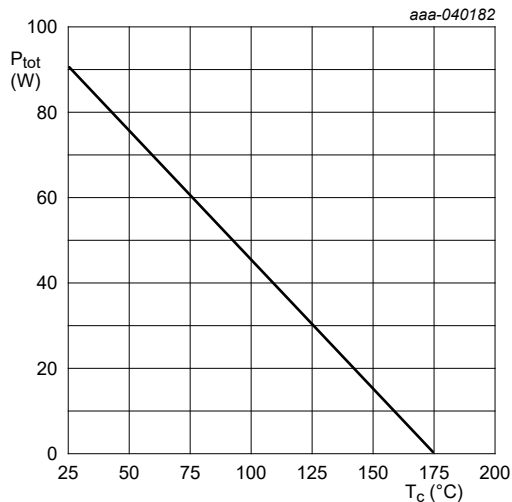


Fig. 2. Power dissipation; maximum values

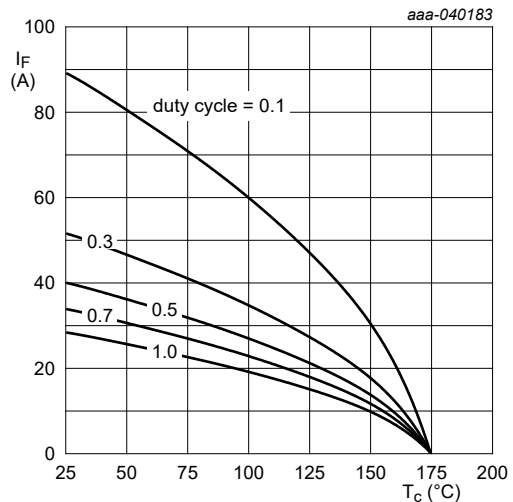


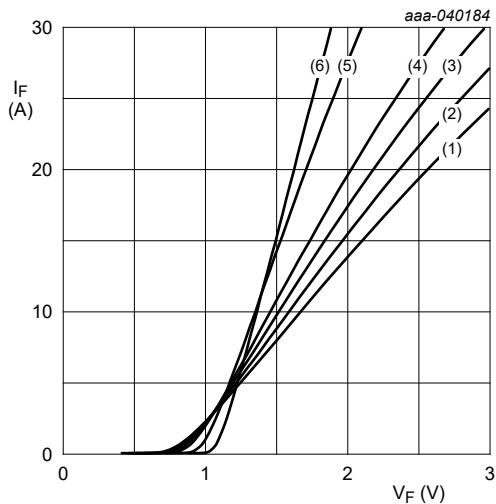
Fig. 3. Forward current as a function of case temperature; maximum values

9. Characteristics

Table 6. Characteristics

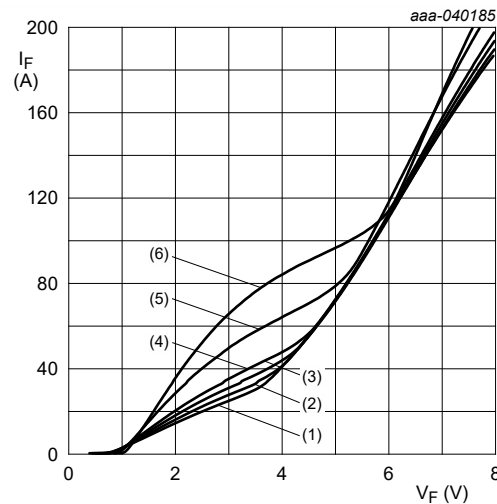
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{DC}	DC blocking voltage		[1]	650	-	-	V
V _F	forward voltage	I _F = 16 A; T _j = 25 °C	[1]	-	1.5	1.8	V
		I _F = 16 A; T _j = 150 °C	[2]	-	2	2.6	V
I _R	reverse current	V _R = 650 V; T _j = 25 °C	[1]	-	1	180	μA
		V _R = 650 V; T _j = 150 °C	[2]	-	10	1250	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.



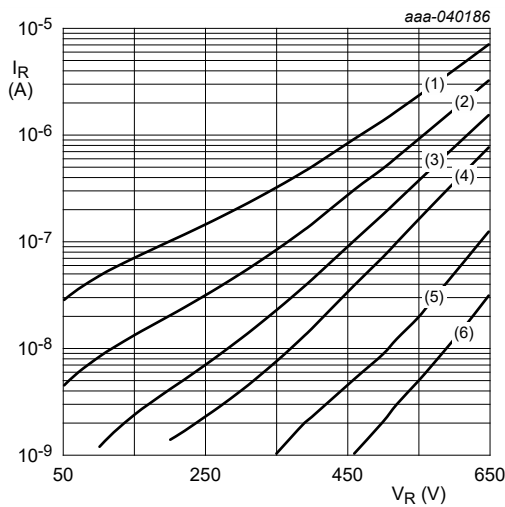
Pulsed condition:
(1) $T_j = 175\text{ °C}$
(2) $T_j = 150\text{ °C}$
(3) $T_j = 125\text{ °C}$
(4) $T_j = 100\text{ °C}$
(5) $T_j = 25\text{ °C}$
(6) $T_j = -55\text{ °C}$

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



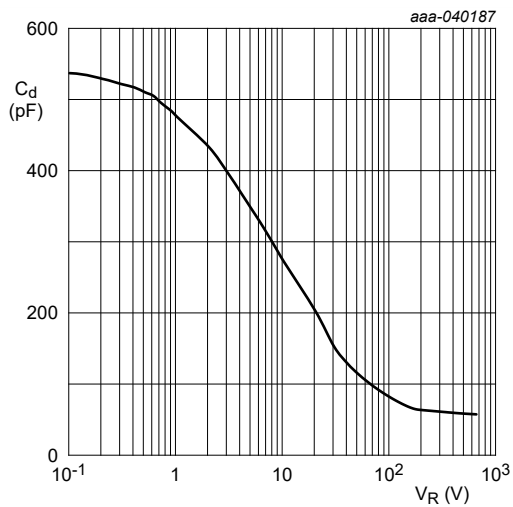
Pulsed condition:
(1) $T_j = 175\text{ °C}$
(2) $T_j = 150\text{ °C}$
(3) $T_j = 125\text{ °C}$
(4) $T_j = 100\text{ °C}$
(5) $T_j = 25\text{ °C}$
(6) $T_j = -55\text{ °C}$

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



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

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



$f = 1\text{ MHz}$; $T_{amb} = 25\text{ °C}$

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

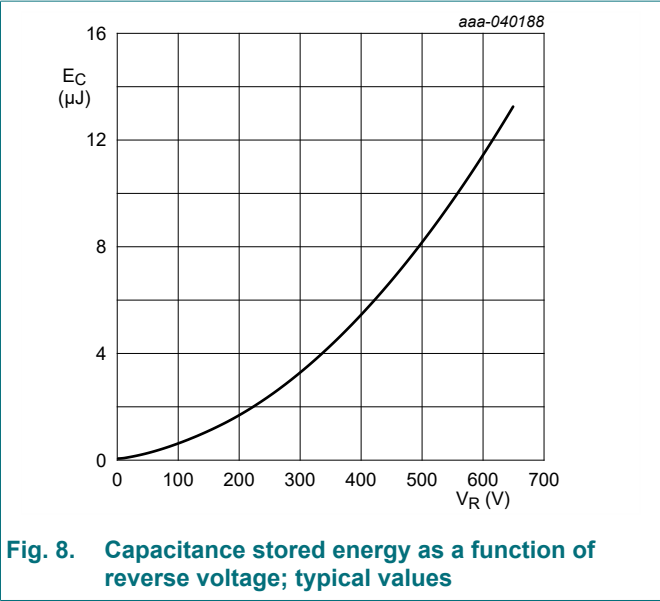


Fig. 8. Capacitance stored energy as a function of reverse voltage; typical values

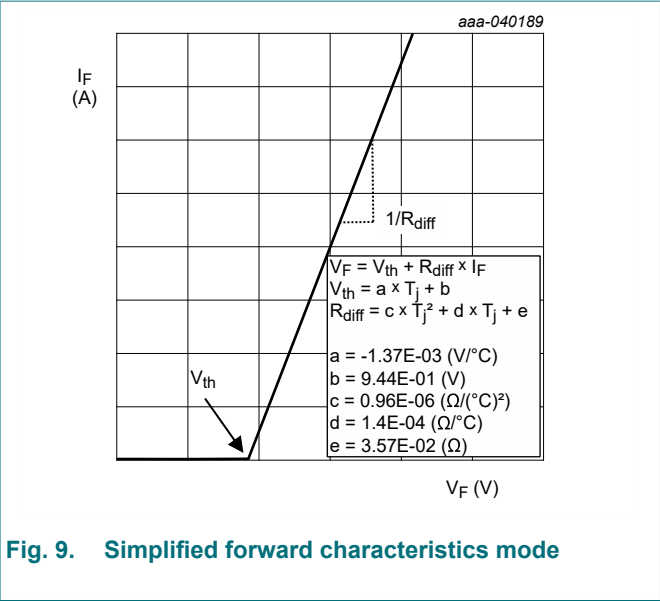


Fig. 9. Simplified forward characteristics mode

10. Test information

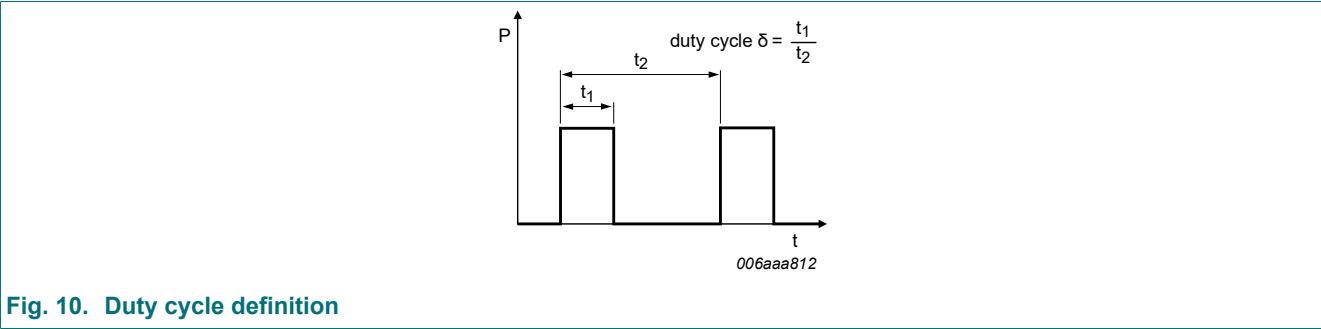


Fig. 10. Duty cycle definition

Quality information

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

11. Package outline

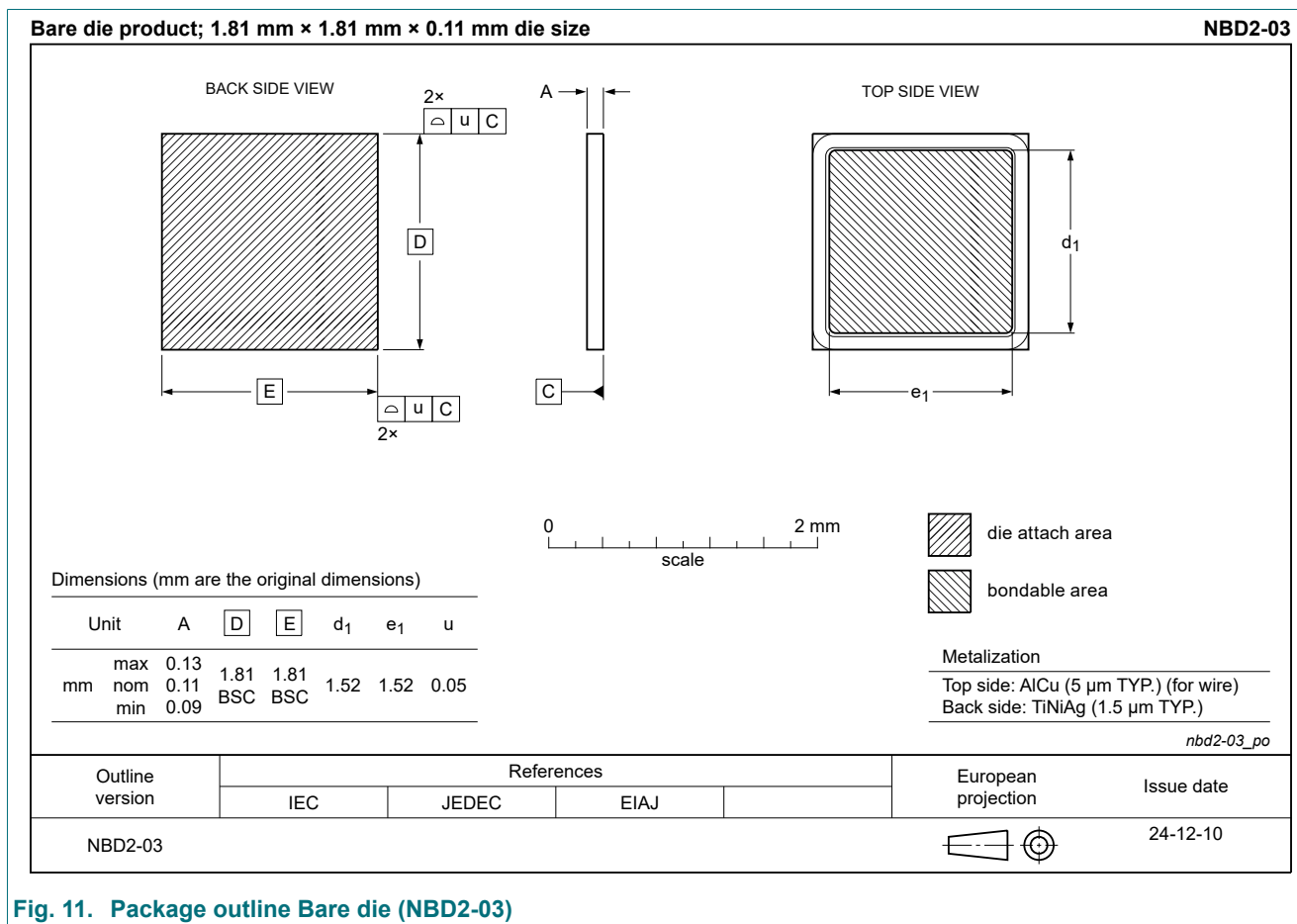


Fig. 11. Package outline Bare die (NBD2-03)

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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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