



PSC0665B1

650 V, 6 A SiC Schottky diode in bare die

10 October 2024

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

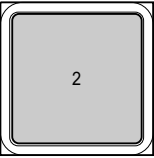
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DC}	DC blocking voltage	$T_J = 25\text{ °C}$	[1]	650	-	-	V
I_F	forward current	$\delta = 1$; $T_c \leq 128\text{ °C}$	[2]	-	-	6	A
Q_C	total capacitive charge	$V_R = 400\text{ V}$; $dI_F/dt = 200\text{ A}/\mu\text{s}$; $I_F = 6\text{ A}$; $T_J = 25\text{ °C}$	[2]	-	14	-	nC

[1] Parameters 100% tested.

[2] Validation performed on TO-220-2 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 PSC0665B1	 <i>aaa-0038726</i>
2	A	anode (top side)		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSC0665B1	PSC0665B1	Bare die product; 1.21 mm × 1.21 mm × 0.11 mm die size	PSC0665B1

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			-	650	V
dv/dt	diode dv/dt ruggedness	$0 \leq V_R \leq 480\text{ V}$		-	100	V/ns
I_F	forward current	$\delta = 1$; $T_c \leq 128\text{ }^{\circ}\text{C}$	[1]	-	6	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10\text{ }\mu\text{s}$; square wave; $T_c = 25\text{ }^{\circ}\text{C}$	[1]	-	300	A
		$t_p = 10\text{ ms}$; half sine-wave; $T_c = 25\text{ }^{\circ}\text{C}$	[1]	-	36	A
		$t_p = 10\text{ ms}$; half sine-wave; $T_c = 150\text{ }^{\circ}\text{C}$	[1]	-	30	A
$\int i^2 dt$	$i^2 t$ value	$t_p = 10\text{ ms}$; $T_c = 25\text{ }^{\circ}\text{C}$	[1]	-	6.5	A ² s
		$t_p = 10\text{ ms}$; $T_c = 150\text{ }^{\circ}\text{C}$	[1]	-	4.5	A ² s
P_{tot}	total power dissipation	$T_c = 25\text{ }^{\circ}\text{C}$	[1]	-	37	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-220-2 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]	-	2.9	4	K/W

[1] Validation performed on TO-220-2 with mold compound.

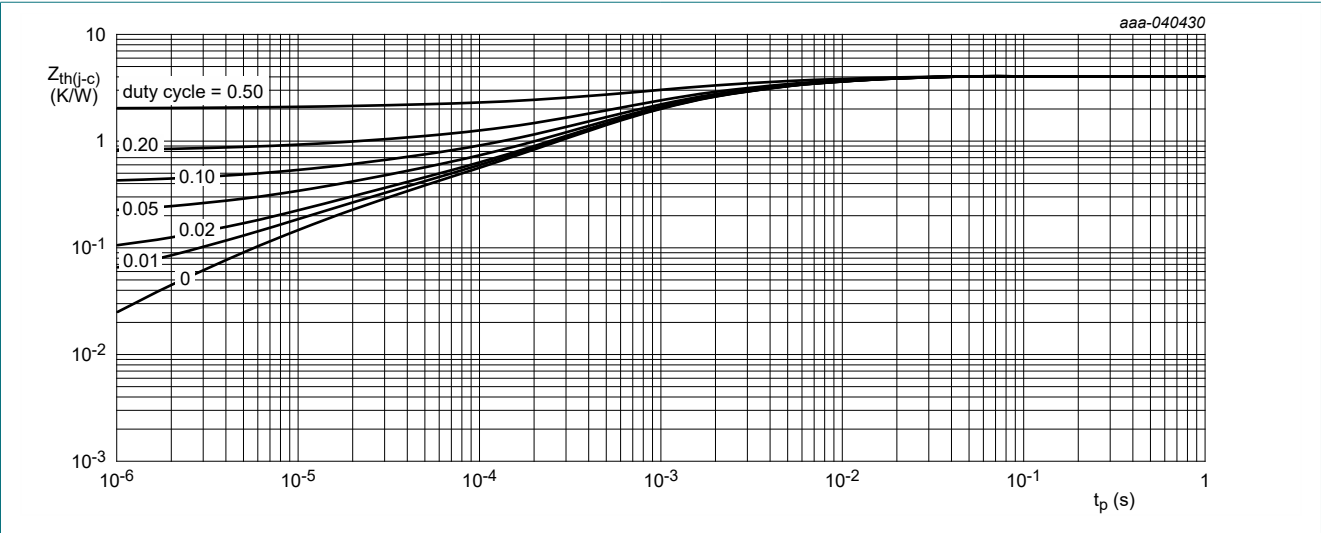


Fig. 1. Transient thermal impedance as a function of pulse duration; maximum values

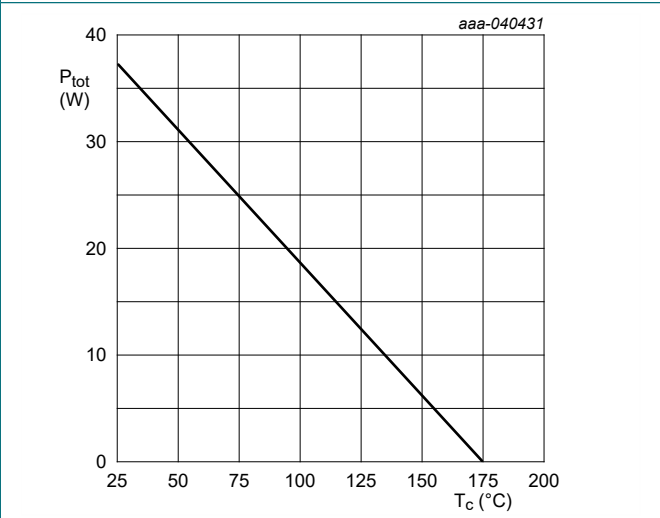


Fig. 2. Power dissipation; maximum values

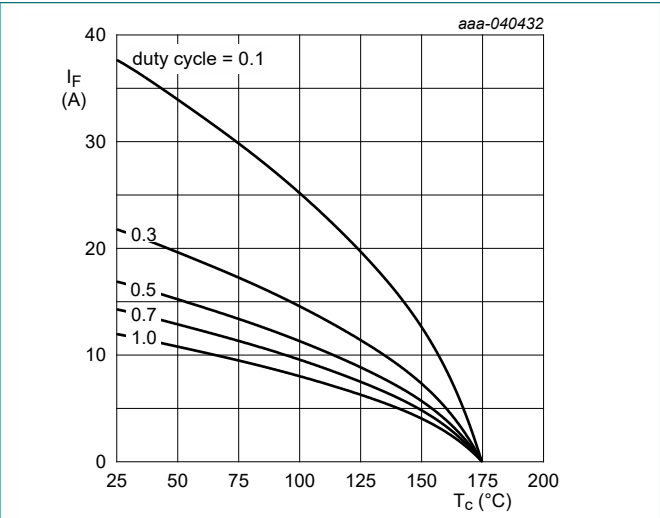


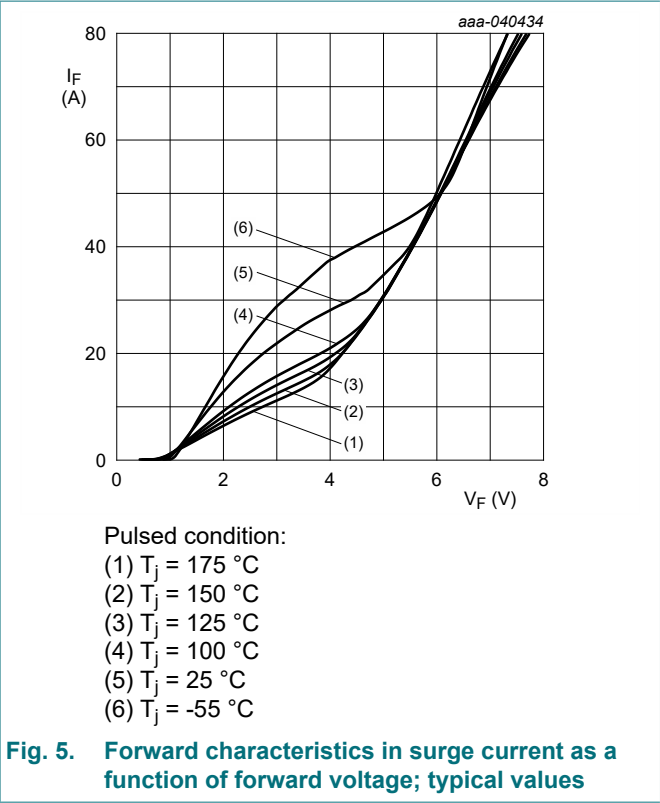
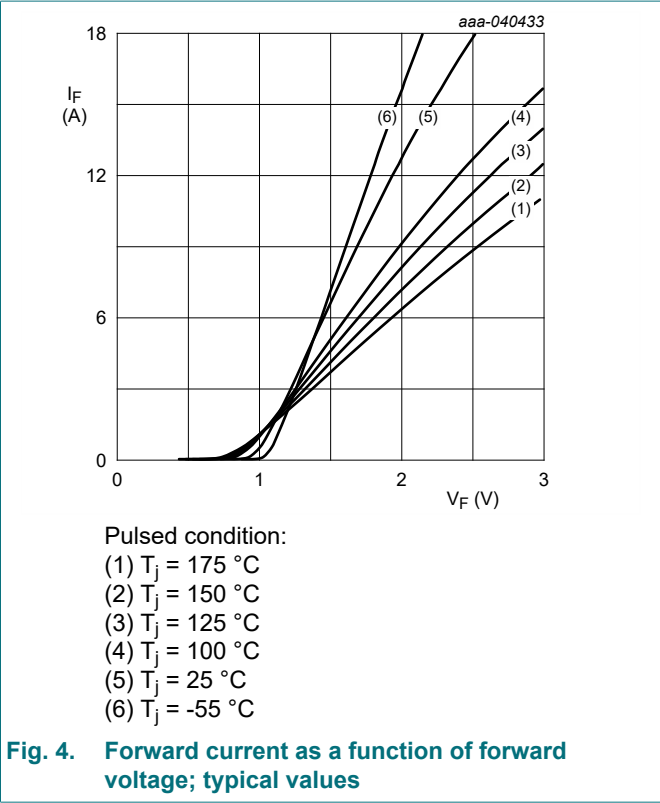
Fig. 3. Forward current as a function of case temperature; maximum values

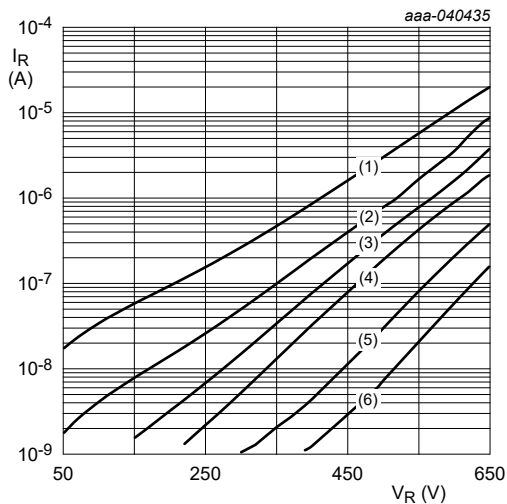
9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{DC}	DC blocking voltage	T _j = 25 °C	[1]	650	-	-	V
V _F	forward voltage	I _F = 6 A; T _j = 25 °C	[1]	-	1.5	1.8	V
		I _F = 6 A; T _j = 150 °C	[2]	-	1.95	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]	-	225	-	pF
Q _C	total capacitive charge	V _R = 400 V; dI _F /dt = 200 A/μs; I _F = 6 A; T _j = 25 °C	[2]	-	14	-	nC

[1] Parameters 100% tested.
[2] Validation performed on TO-220-2 with mold compound.

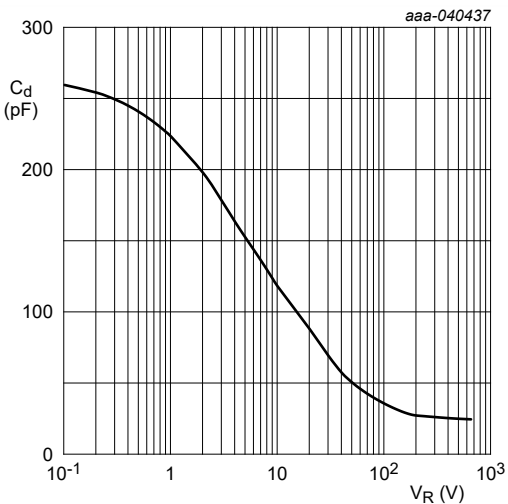




Pulsed condition:

- (1) $T_j = 175\text{ }^{\circ}\text{C}$
- (2) $T_j = 150\text{ }^{\circ}\text{C}$
- (3) $T_j = 125\text{ }^{\circ}\text{C}$
- (4) $T_j = 100\text{ }^{\circ}\text{C}$
- (5) $T_j = 25\text{ }^{\circ}\text{C}$
- (6) $T_j = -55\text{ }^{\circ}\text{C}$

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



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

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

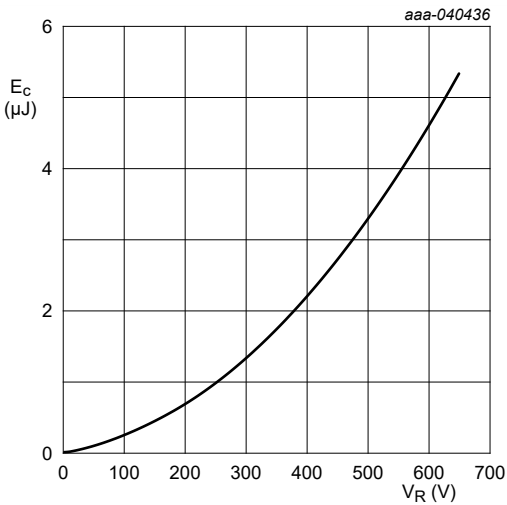


Fig. 8. Capacitance stored energy as a function of reverse voltage; typical values

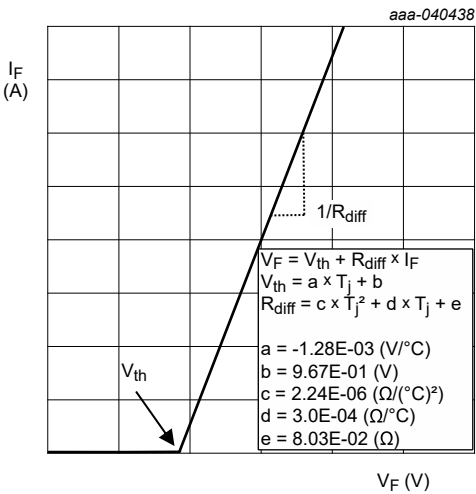


Fig. 9. Simplified forward characteristics mode

10. Test information

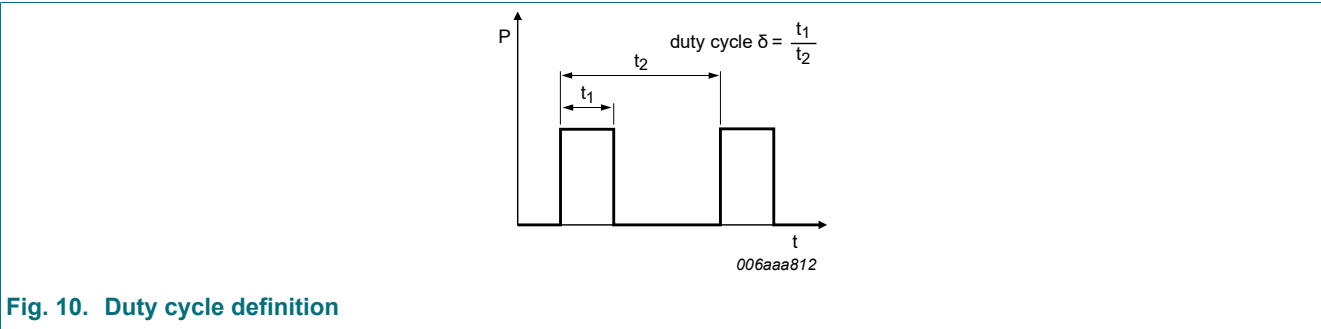
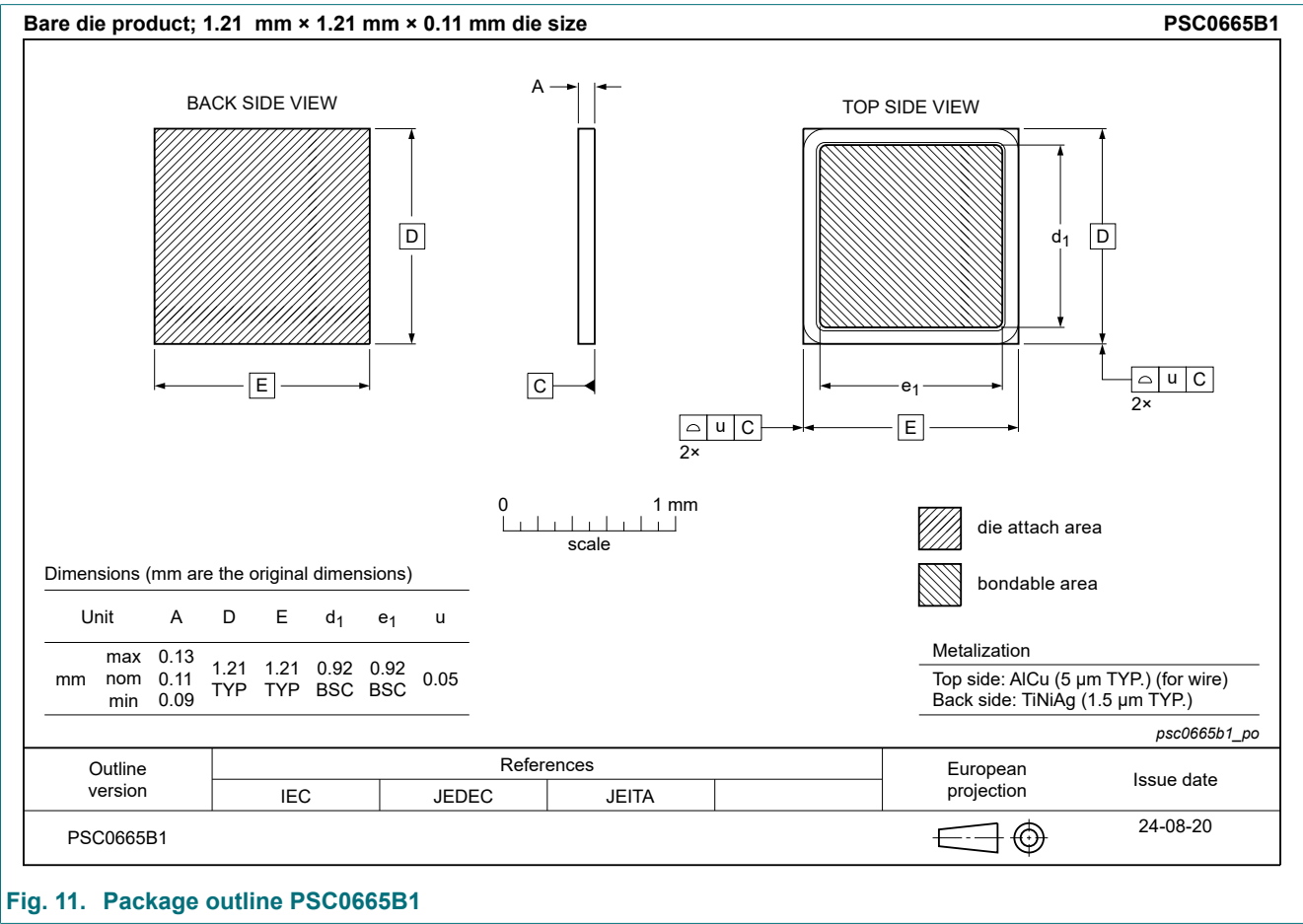


Fig. 10. Duty cycle definition

Quality information

The reliability of the bare die product was tested in the TO-220-2 package with epoxy mold compound.

11. Package outline



12. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PSC0665B1 v.2	20241010	Product data sheet	-	PSC0665B1 v.1
Modifications:	• Product status changed			
PSC0665B1 v.1	20240925	Preliminary 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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