

# PSC1065B1

650 V, 10 A SiC Schottky diode in bare die

15 May 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

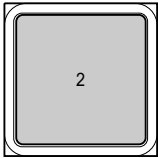

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{DC}$	DC blocking voltage		[1]	650	-	-	V
$I_F$	forward current	$\delta = 1$ ; $T_c \leq 126\text{ }^\circ\text{C}$	[2]	-	-	10	A
$Q_C$	total capacitive charge	$V_R = 400\text{ V}$ ; $dI_F/dt = 200\text{ A}/\mu\text{s}$ ; $I_F = 10\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$	[2]	-	22	-	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 <b>PSC1065B1</b>	 <i>aaa-0038726</i>
2	A	anode (top side)		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSC1065B1	PSC1065B1	Bare die product; 1.45 mm × 1.45 mm × 0.11 mm die size	PSC1065B1

7. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>RRM</sub>	repetitive peak reverse voltage			-	650	V
dv/dt	diode dv/dt ruggedness	0 ≤ V <sub>R</sub> ≤ 480 V		-	100	V/ns
I <sub>F</sub>	forward current	δ = 1; T <sub>c</sub> ≤ 126 °C	[1]	-	10	A
I <sub>FSM</sub>	non-repetitive peak forward current	t <sub>p</sub> = 10 μs; square wave; T <sub>c</sub> = 25 °C	[1]	-	440	A
		t <sub>p</sub> = 10 ms; half sine-wave; T <sub>c</sub> = 25 °C	[1]	-	52	A
		t <sub>p</sub> = 10 ms; half sine-wave; T <sub>c</sub> = 150 °C	[1]	-	42	A
∫i <sup>2</sup> dt	i <sup>2</sup> t value	t <sub>p</sub> = 10 ms; T <sub>c</sub> = 25 °C	[1]	-	14	A <sup>2</sup> s
		t <sub>p</sub> = 10 ms; T <sub>c</sub> = 150 °C	[1]	-	9	A <sup>2</sup> s
P <sub>tot</sub>	total power dissipation	T <sub>c</sub> = 25 °C	[1]	-	65	W
T <sub>j</sub>	junction temperature		[1]	-	175	°C
T <sub>amb</sub>	ambient temperature		[1]	-55	175	°C
T <sub>stg</sub>	storage temperature		[1]	-65	175	°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]	-	1.7	2.3	K/W

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

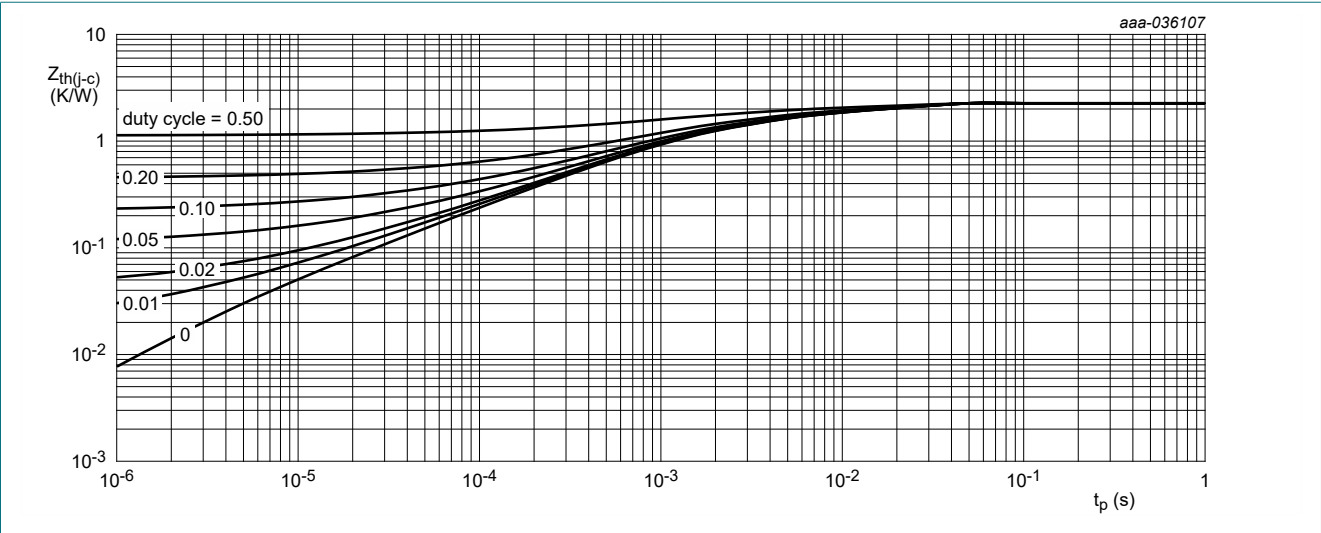


Fig. 1. Transient thermal impedance as a function of pulse duration; maximum values

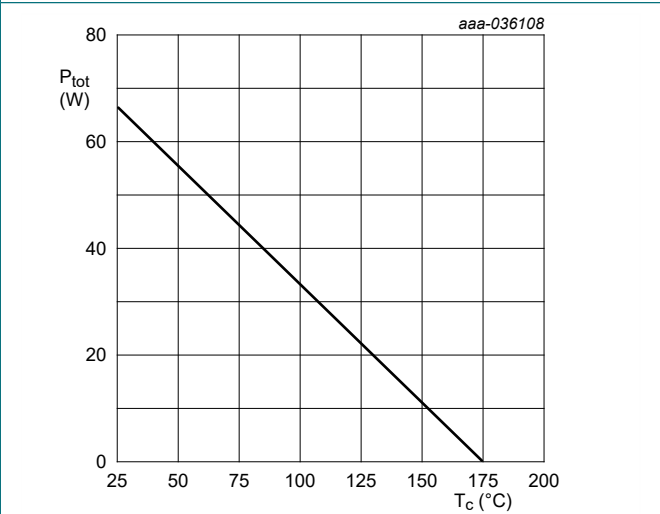


Fig. 2. Power dissipation; maximum values

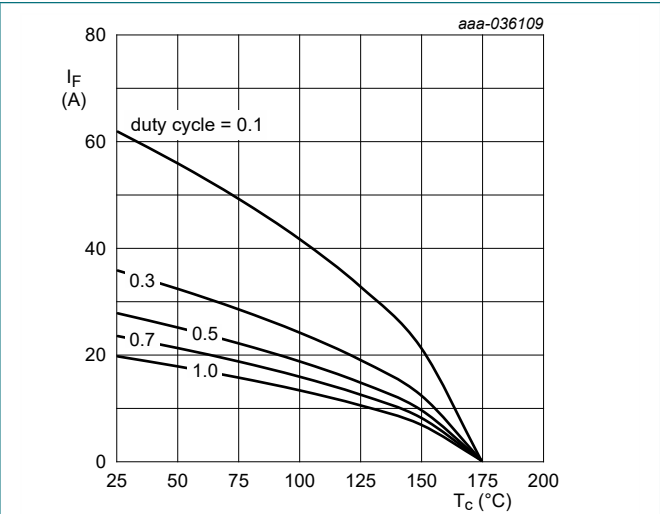


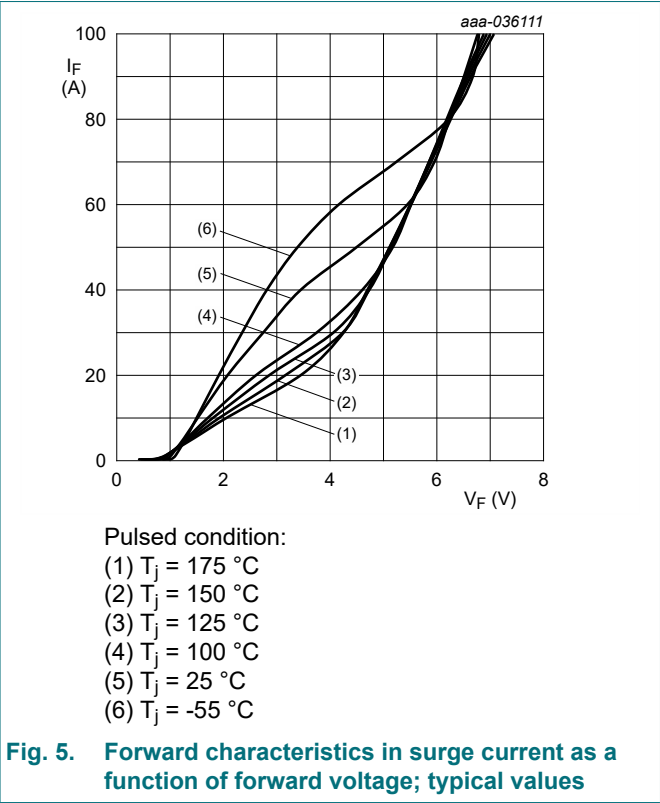
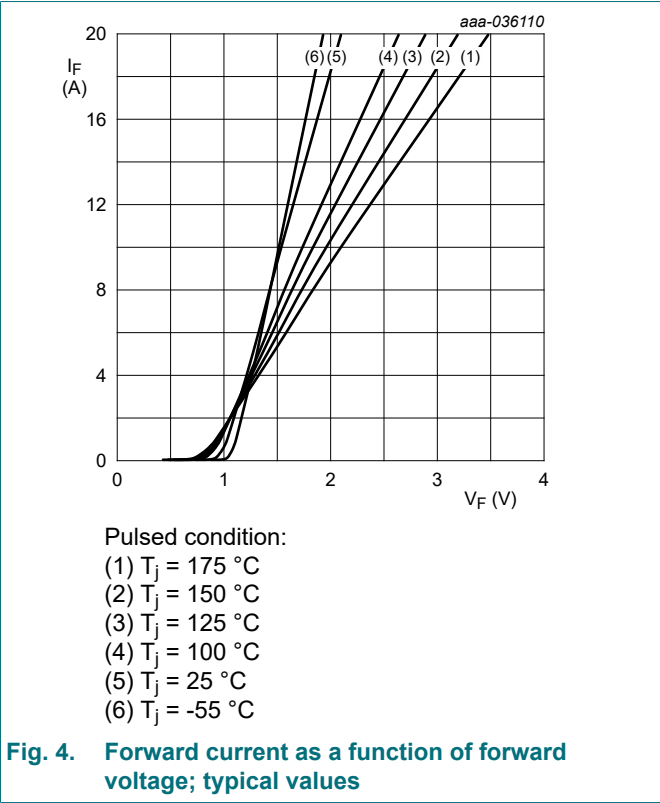
Fig. 3. Forward current as a function of case temperature; maximum values

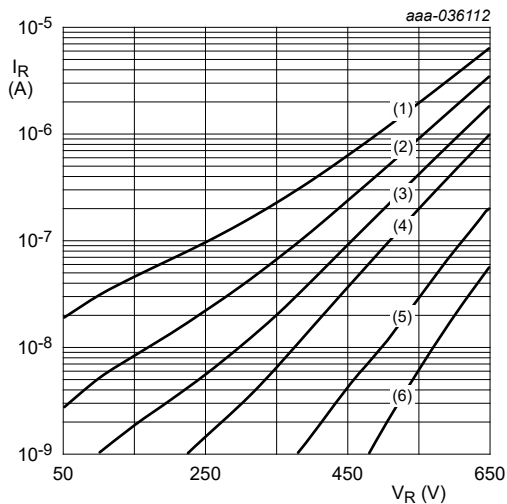
9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V <sub>DC</sub>	DC blocking voltage		[1]	650	-	-	V
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 10 A; T <sub>j</sub> = 25 °C	[1]	-	1.5	1.8	V
		I <sub>F</sub> = 10 A; T <sub>j</sub> = 150 °C	[2]	-	1.95	2.6	V
I <sub>R</sub>	reverse current	V <sub>R</sub> = 650 V; T <sub>j</sub> = 25 °C	[1]	-	1	60	μA
		V <sub>R</sub> = 650 V; T <sub>j</sub> = 150 °C	[2]	-	10	120	μA
C <sub>d</sub>	diode capacitance	f = 1 MHz; V <sub>R</sub> = 1 V; T <sub>j</sub> = 25 °C	[2]	-	340	-	pF
		f = 1 MHz; V <sub>R</sub> = 400 V; T <sub>j</sub> = 25 °C	[2]	-	36	-	pF
Q <sub>C</sub>	total capacitive charge	V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 200 A/μs; I <sub>F</sub> = 10 A; T <sub>j</sub> = 25 °C	[2]	-	22	-	nC

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

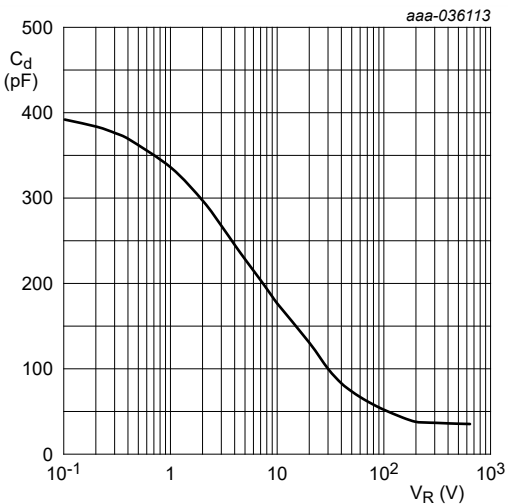




Pulsed condition:

- (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

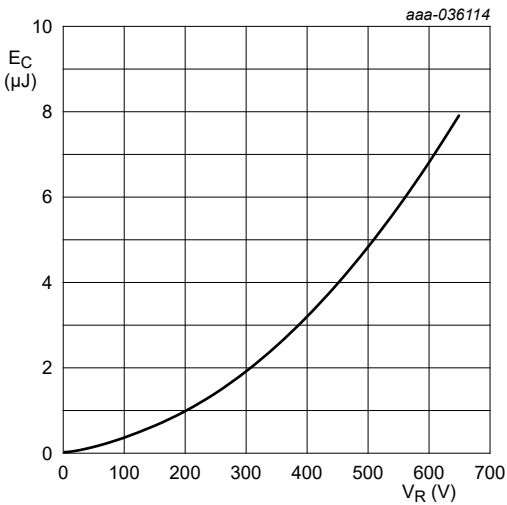


Fig. 8. Capacitance stored energy as a function of reverse voltage; typical values

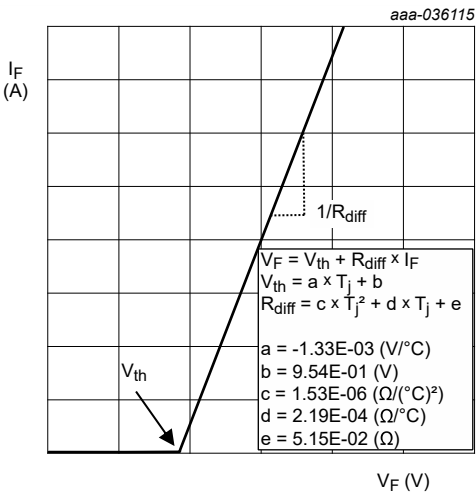


Fig. 9. Simplified forward characteristics mode

10. Test information

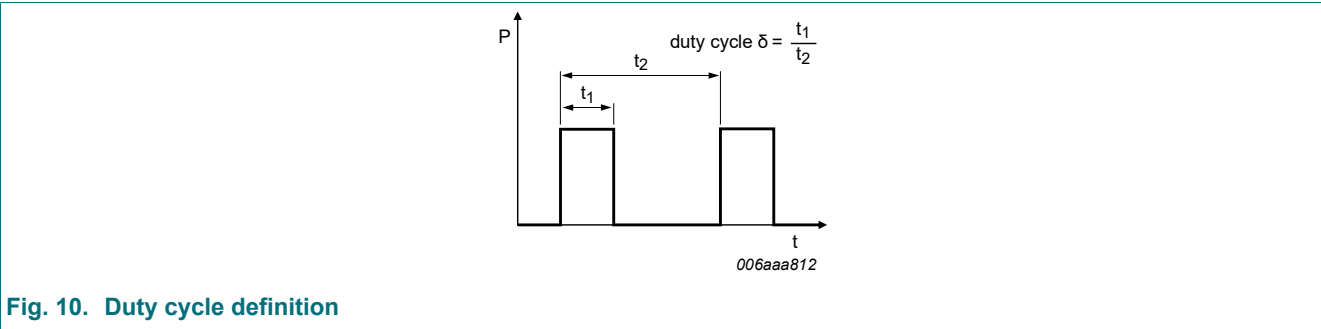


Fig. 10. Duty cycle definition

Quality information

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

11. Package outline

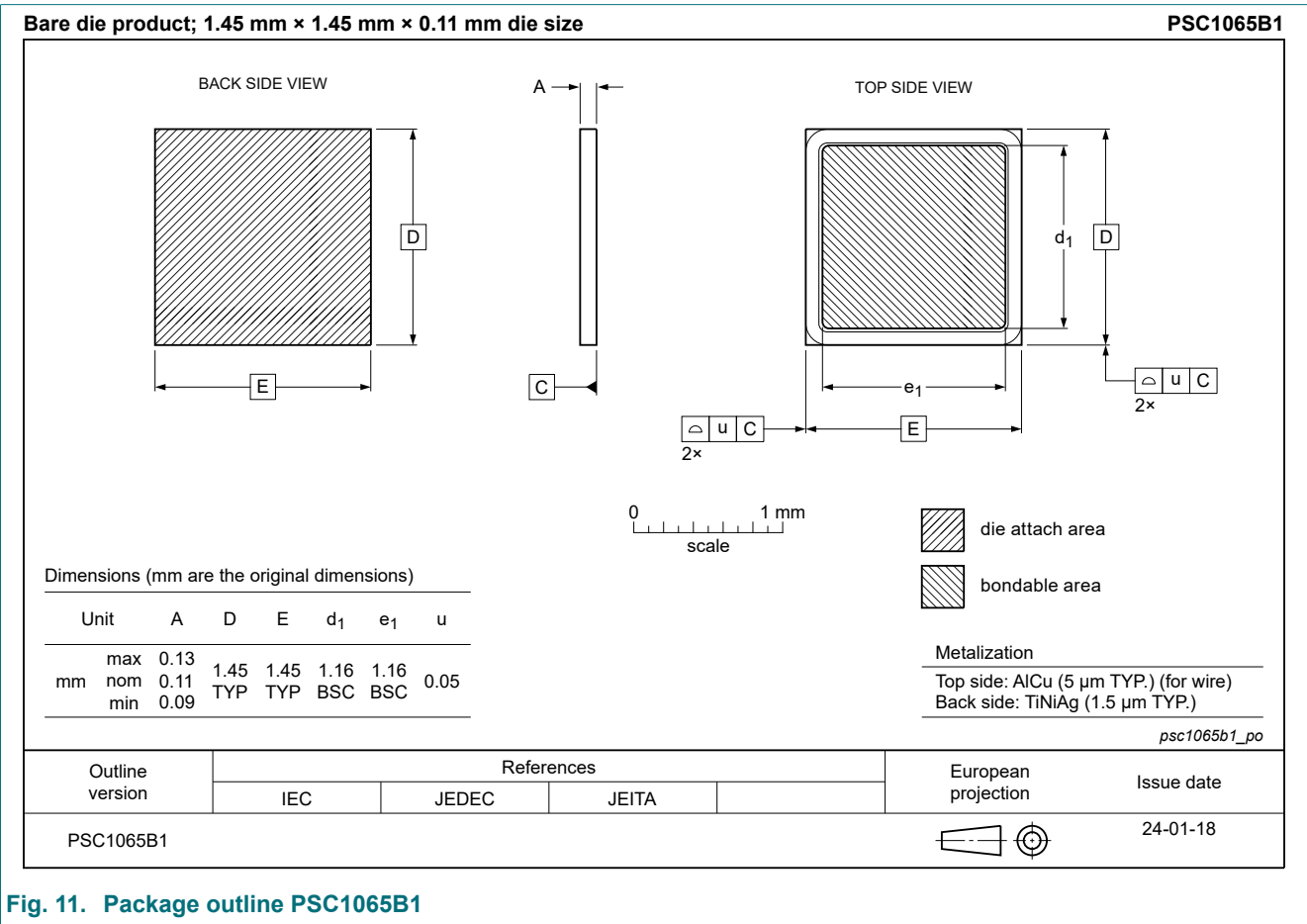


Fig. 11. Package outline PSC1065B1

12. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PSC1065B1 v.1	20240515	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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Contents

1. General description..... 1

2. Features and benefits..... 1

3. Applications..... 1

4. Quick reference data..... 1

5. Pinning information.....2

6. Ordering information.....2

7. Limiting values..... 2

8. Thermal characteristics..... 3

9. Characteristics.....4

10. Test information.....6

11. Package outline..... 6

12. Revision history.....7

13. Legal information.....8

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Date of release: 15 May 2024

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