fast SiC semiconductor

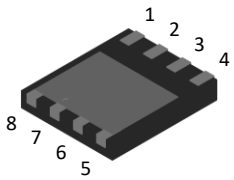
FC06004

Product Datasheet

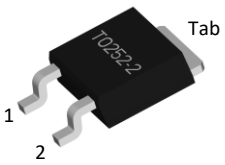
Silicon Carbide Merged PN-Schottky Diode

650V SiC MPS High Speed Rectifier – Cheetah Series

Product Information:



PQFN 5 x 6



TO-252-2L

Features

- Low Capacitive Charge (Q_C)
- Low Profile & Low Parasitic Inductance Packaging
- Zero Reverse Recovery and zero Forward Recovery
- Ultra-Low Switching Loss
- Optimized for High Speed Applications
- Compact MSL-1 SMT Package
- RoHS Compliant and Halogen Free

Terminal	Packaging Type	
	TO-252-2L	PQFN 5x6
Anode	2	1, 2, 3
Cathode	1, Tab	5, 6, 7, 8
N.C.	--	4

Benefits

- Higher System Efficiency
- Increase Parallel Device Convenience
- Enable High Temperature Application
- Allow High Frequency Operation
- Realize Compact and Lightweight Systems
- High Reliability

Potential Applications

- Switching Mode Power Supply
- Power Factor Correction
- Portable Adaptor
- Renewable Energy

Key Performance Parameters

Parameter	Symbol	Value	Unit
DC Blocking Voltage	V_R	650	V
Nominal Forward Current	$I_{F, NOM}$	4	A
Total Capacitive Charge	Q_C	6.4	nC
Capacitance Stored Energy	E_C	1.0	µJ
Junction & Storage Temperature	T_j, T_{stg}	-55 to 175	°C
TO-252-2L			
Continuous Forward Current	$I_{F, max (cont.)}$	8.2	A
I²t Value	$\int i^2dt$	0.6	A^2s
Power Dissipation	P_{tot}	25	W
PQFN 5x6			
Continuous Forward Current	$I_{F, max (cont.)}$	8.8	A
I²t Value	$\int i^2dt$	0.7	A^2s
Power Dissipation	P_{tot}	29	W

Part Number	Package	Marking
FC06004A	TO-252-2L	FC06004
FC06004B	PQFN 5 x 6	FC06004
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For further information about comparable products, please contact (www.fastsic.com).

Maximum Ratings:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
TO-252-2L						
Continuous Forward Current	I_F	--	--	4 6.5 8.2	A	T_c≤130˚C, *Duty*=100% T_c≤75˚C, *Duty*=100% T_c≤25˚C, *Duty*=100%
Non-Repetitive Forward Surge Current, Sinusoidal Halfwave	$I_{F,SM}$	--	--	11		T_c=25˚C, t_p=10ms
Non-Repetitive Peak Forward Surge Current	$I_{F,max}$	--	--	133		T_c=25˚C, t_p=10µs
I^2t Value	$\int i^2dt$	--	--	0.6	A^2s	T_c=25˚C, t_p=10ms
PQFN 5x6						
Continuous Forward Current	I_F	--	--	4 7 8.8	A	T_c≤136˚C, *Duty*=100% T_c≤75˚C, *Duty*=100% T_c≤25˚C, *Duty*=100%
Non-Repetitive Forward Surge Current, Sinusoidal Halfwave	$I_{F,SM}$	--	--	12		T_c=25˚C, t_p=10ms
Non-Repetitive Peak Forward Surge Current	$I_{F,max}$	--	--	132		T_c=25˚C, t_p=10µs
I^2t Value	$\int i^2dt$	--	--	0.7	A^2s	T_c=25˚C, t_p=10ms
Repetitive Peak Reverse Voltage	V_{RRM}	--	--	650	V	T_c=25˚C
Power Dissipation	P_{tot}	--	--	25	W	T_c=25˚C (TO-252-2L)
		--	--	29		T_c=25˚C (PQFN 5x6)
Junction Temperature	T_j	-55	--	175	˚C	--
Storage Temperature	T_{stg}	-55	--	175		
Soldering Temperature	T_L	--	--	260		

Electrical Characteristics:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
DC Characteristics						
DC Blocking Voltage	V_{DC}	650	--	--	V	T_j=25˚C
Forward Voltage	V_F	--	1.4 1.8	1.75 --		I_F=4A, T_j=25˚C I_F=4A, T_j=175˚C
Reverse Current	I_R	--	1 5	25 --	µA	V_R=520V, T_j=25˚C V_R=520V, T_j=175˚C
AC Characteristics						
Total Capacitive Charge	Q_C	--	6.4	--	nC	V_R=400V, T_j=25˚C
Total Capacitance	C_j	--	100 12 10	--	pF	V_R=1V, f=1MHz, T_j=25˚C V_R=200V, f=1MHz, T_j=25˚C V_R=400V, f=1MHz, T_j=25˚C
Capacitance Stored Energy	E_C	--	1.0	--	µJ	V_R=400V, T_j=25˚C

Thermal Characteristics:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Thermal Impedance, junction – case (TO-252-2L)	$R_{th\text{-}jc}$	--	5.9	--	K/W	--
Thermal Impedance, junction – case (PQFN 5x6)	$R_{th\text{-}jc}$	--	5.1	--		--
Thermal Impedance, junction – ambient	$R_{th\text{-}ja}$	--				Device on PCB, with 6 cm² of cooling area

Electrical Characteristics Diagrams

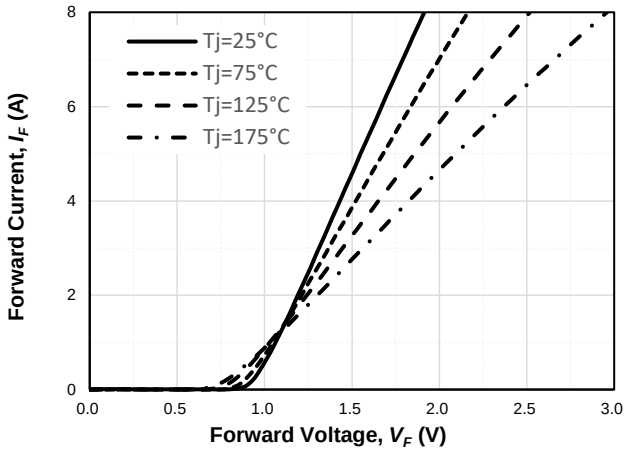


Fig. 1 Forward Characteristics

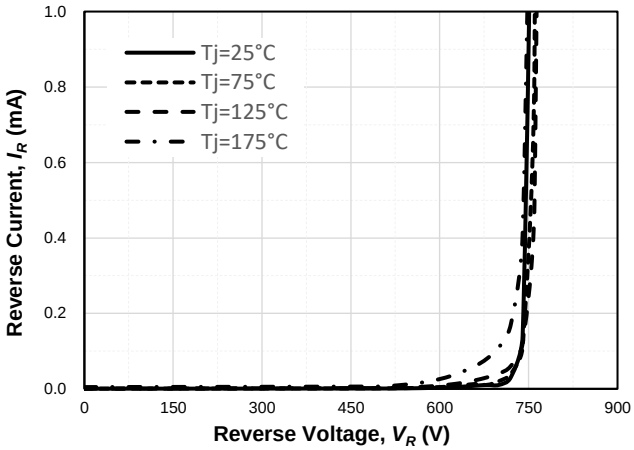


Fig. 2 Reverse Characteristics

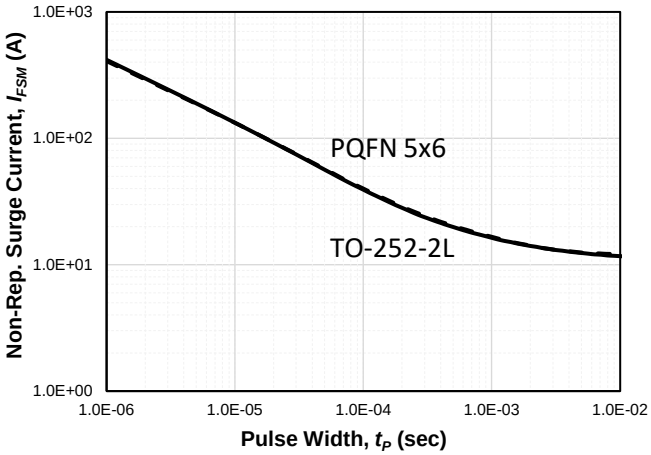


Fig. 3 Non-repetitive Peak Forward Surge Current vs. Pulse Width

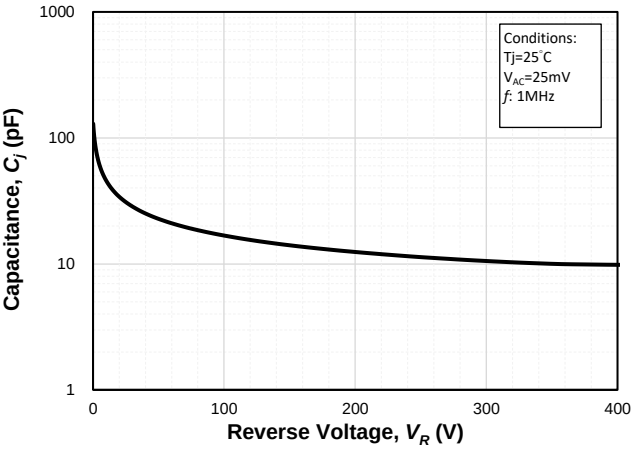


Fig. 4 Capacitance vs. Reverse Voltage

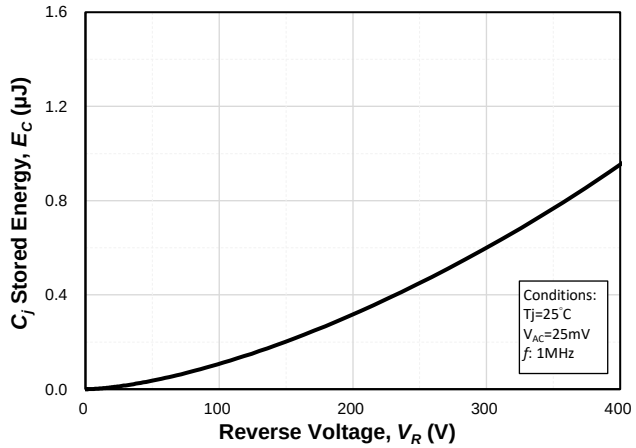


Fig. 5 Capacitance Stored Energy vs. Reverse Voltage

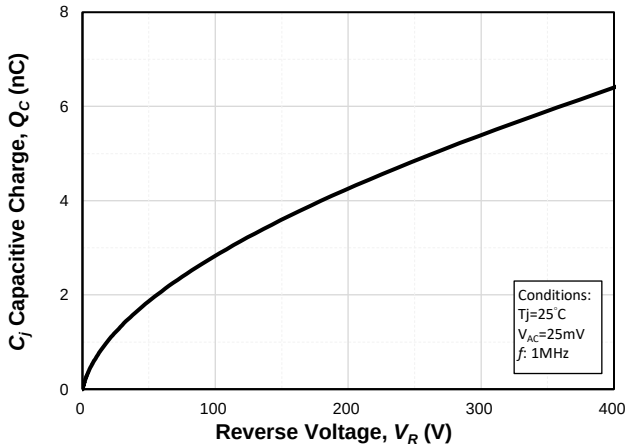


Fig. 6 Capacitive Charge vs. Reverse Voltage

Electrical Characteristics Diagrams

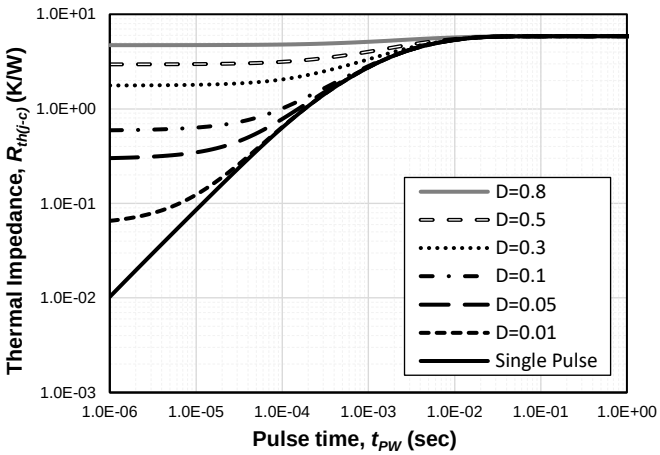


Fig. 7 Typ. Transient Thermal Impedance $R_{th\text{-}jc}$ (TO-252-2L)

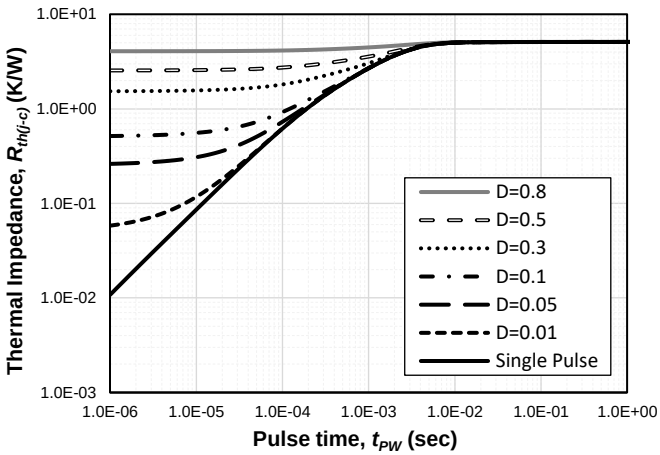


Fig. 8 Typ. Transient Thermal Impedance $R_{th\text{-}jc}$ (PQFN 5x6)

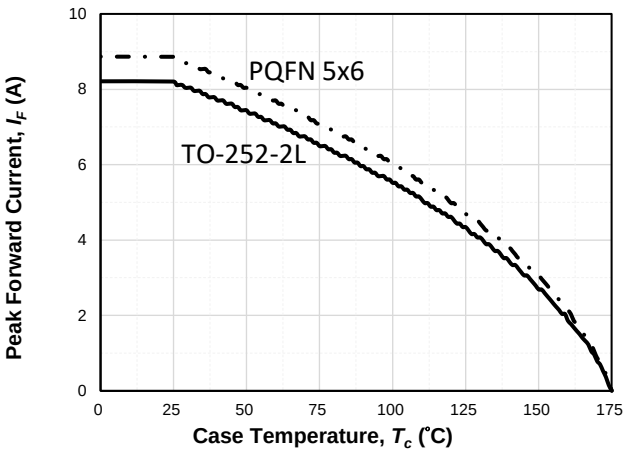


Fig. 9 Continuous I_F De-rating

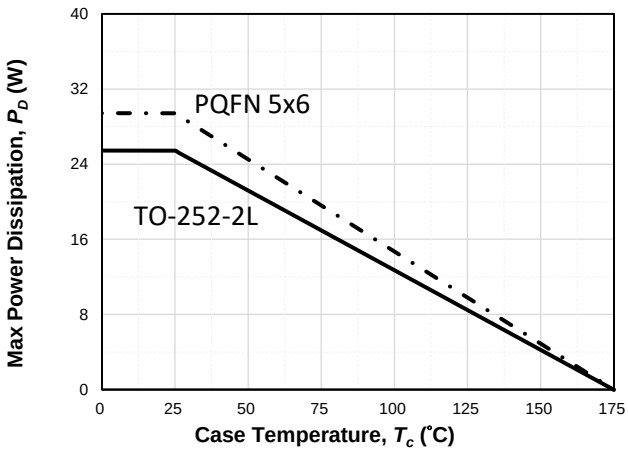
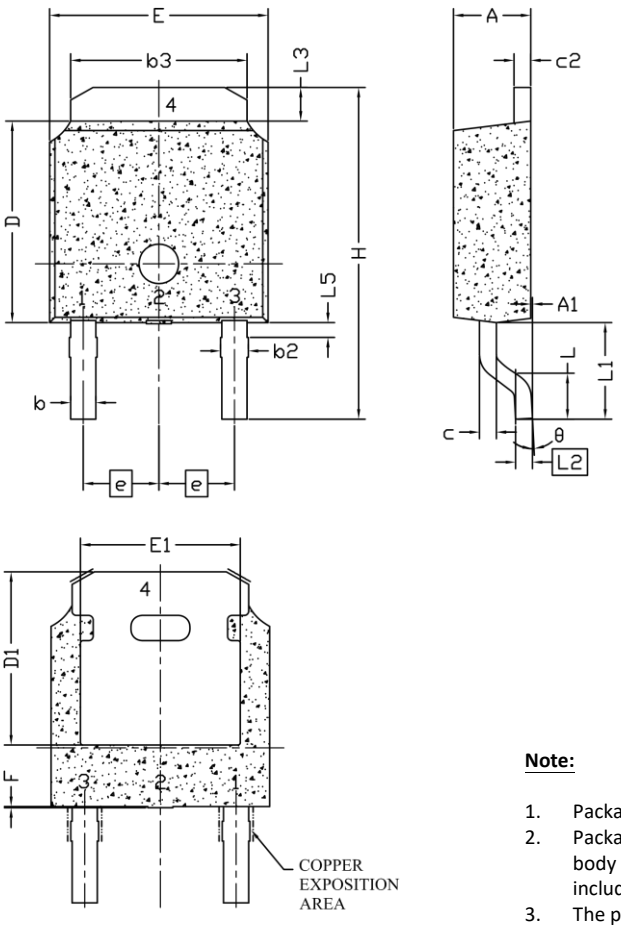


Fig. 10 Power Dissipation

Package Outline (TO-252-2L)

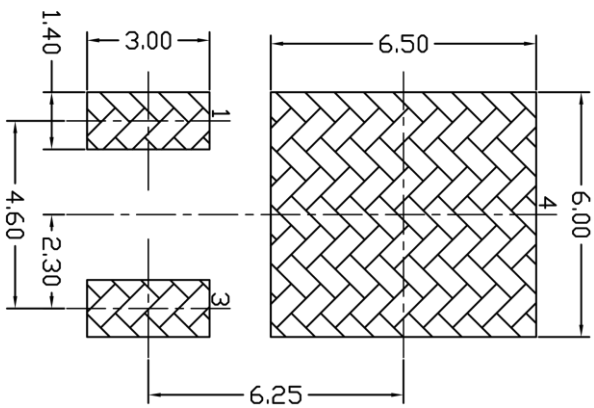


Symbol	Dimension (Millimeters)		
	Min.	Nom.	Max.
E	6.40	6.60	6.73
L	1.40	1.52	1.77
L1		2.743 REF.	
L2		0.508 BSC.	
L3	0.89	--	1.27
L5	--	--	--
D	6.00	6.10	6.22
H	9.40	10.00	10.40
b	0.64	0.76	0.88
b2	0.77	0.84	1.14
b3	5.21	5.34	5.46
e		2.286 BSC.	
A	2.20	2.30	2.38
A1	0.00	--	0.127
c	0.46	0.50	0.60
c2	0.46	0.50	0.58
D1	5.21	--	--
E1	4.40	--	--
F	--	--	0.45
θ	0°	--	10°

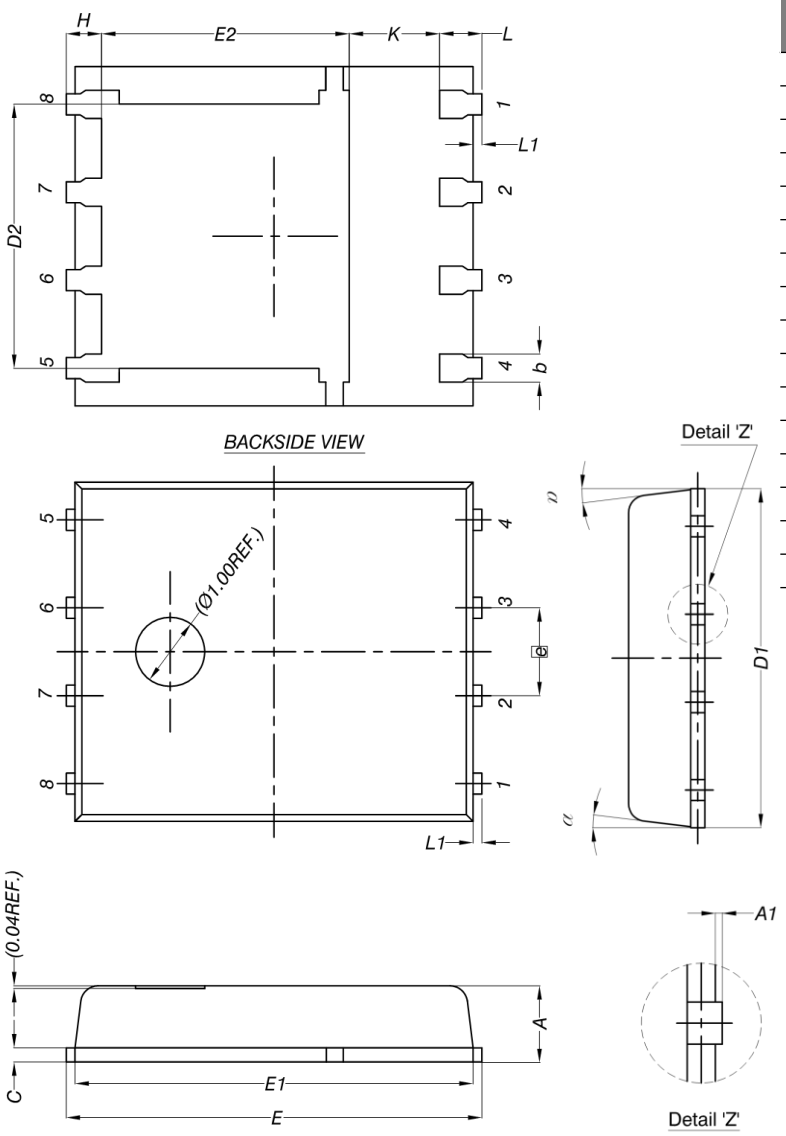
Note:

1. Package body sizes exclude mold flash, protrusion, or gate burrs.
2. Package body sizes determined at the outermost extremes of the plastic body exclusive of mold flash, gate burrs, and inter-lead flash, but including any mismatch between the top and bottom of the plastic body.
3. The package top may be smaller than the package bottom.
4. Dimension “b” does not include dambar protrusion. Allowable dambar protrusion shall be 0.1 mm total in excess of “b” dimension at the maximum material condition. The dambar cannot be located on the lower radius of the foot.
5. Dimension “F” is mold flash.

Land Pattern (Only for Reference)



Package Outline (PQFN 5x6)

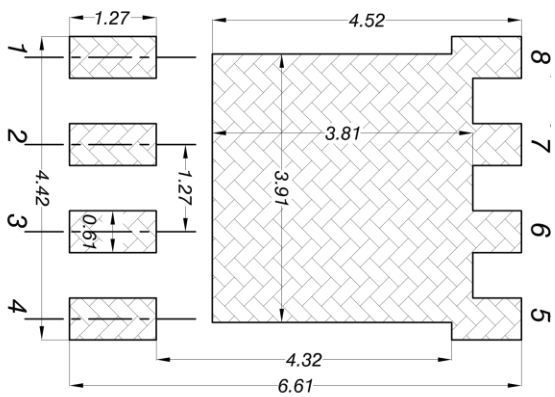


Symbol	Dimension (Millimeters)		
	Min.	Nom.	Max.
A	0.90	1.00	1.10
A1	0	--	0.05
b	0.33	0.41	0.51
C	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
e		1.27 BSC.	
H	0.41	0.51	0.61
K	1.10	--	--
L	0.51	0.61	0.71
L1	0.06	0.13	020
α	0°	--	12°

Note:

1. Package body sizes exclude mold flash, protrusion, or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 0.10 mm per side
2. Package body sizes determined at the outermost extremes of the plastic body exclusive of mold flash, tie bar, tie bar burrs, gate burrs, and inter-lead flash, but including any mismatch between the top and bottom of the plastic body.
3. The package top may be smaller than the package bottom.

Land Pattern (Only for Reference)



Revision History

Date	Revision	Changes
22.04	Tentative	1st issue
24.08	Preliminary	Update electrical parameters and characteristics

Important Note (Disclaimer)

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