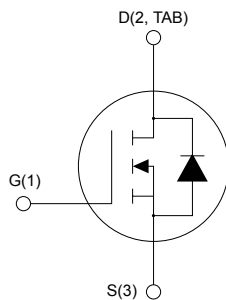
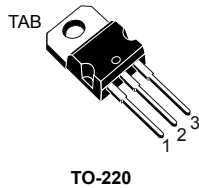


N-channel 100 V, 55 mΩ typ., 26 A STripFET II Power MOSFET in a TO-220 package



AM01475v1_noZen



Product status link

[STP24NF10](#)

Product summary

Order code	STP24NF10
Marking	P24NF10
Package	TO-220
Packing	Tube

Features

Type	V _{DS}	R _{DS(on)} max.	I _D
STP24NF10	100 V	60 mΩ	26 A

- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge

Applications

- Switching applications

Description

This Power MOSFET has been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	100	V
V_{DGR}	Drain-gate voltage ($R_{GS} = 20\text{ k}\Omega$)	100	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	26	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	18	
$I_{DM}^{(1)}$	Drain current (pulsed)	104	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	85	W
$E_{AS}^{(2)}$	Single-pulse avalanche energy	220	mJ
$dv/dt^{(3)}$	Peak diode recovery voltage slope	9	V/ns
T_{stg}	Storage temperature range	-55 to 175	$^\circ\text{C}$
T_J	Operating junction temperature range		$^\circ\text{C}$

1. Pulse width limited by safe operating area.
2. Starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = 12\text{ A}$, $V_{DD} = 30\text{ V}$.
3. $I_{SD} \leq 24\text{ A}$, $di/dt \leq 300\text{ A}/\mu\text{s}$, $V_{DD} = 80\%V_{(BR)DSS}$.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	1.76	$^\circ\text{C}/\text{W}$
R_{thJA}	Thermal resistance, junction-to-ambient	62.5	$^\circ\text{C}/\text{W}$

2 Electrical characteristics

$T_C = 25\text{ }^\circ\text{C}$ unless otherwise specified.

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	100			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$, $T_C = 125\text{ }^\circ\text{C}^{(1)}$			10	
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 12\text{ A}$		55	60	m Ω

1. Specified by design, not tested in production.

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 15\text{ V}$, $I_D = 12\text{ A}$	-	10		S
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	870		pF
C_{oss}	Output capacitance		-	125		pF
C_{rss}	Reverse transfer capacitance		-	50		pF
Q_g	Total gate charge	$V_{DD} = 80\text{ V}$, $I_D = 24\text{ A}$, $V_{GS} = 10\text{ V}$ (see Figure 13. Test circuit for gate charge behavior)	-	30	41	nC
Q_{gs}	Gate-source charge		-	6		nC
Q_{gd}	Gate-drain charge		-	10		nC

1. Pulsed: pulse duration=300 μs , duty cycle 1.5%.

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\text{ V}$, $I_D = 12\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	60	-	ns
t_r	Rise time		-	15	-	ns
$t_{d(off)}$	Turn-off delay time	(see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	50	-	ns
t_f	Fall time		-	20	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		26	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		104	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 24 \text{ A}$, $V_{GS} = 0 \text{ V}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 24 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$,	-	100		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 30 \text{ V}$, $T_J = 150 \text{ }^\circ\text{C}$	-	375		nC
I_{RRM}	Reverse recovery current	(see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	7.5		A

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

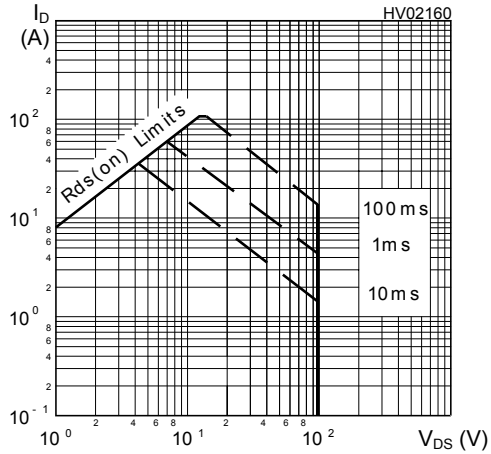


Figure 2. Thermal impedance

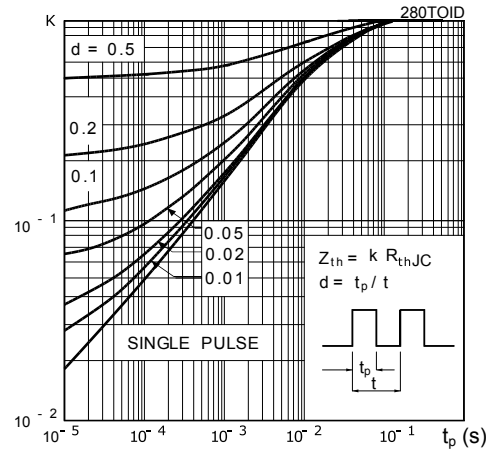


Figure 3. Output characteristics

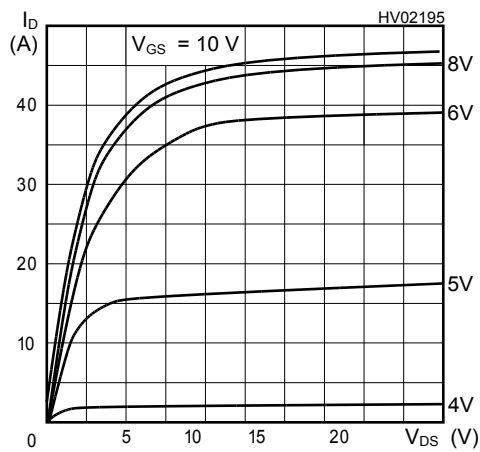


Figure 4. Transfer characteristics

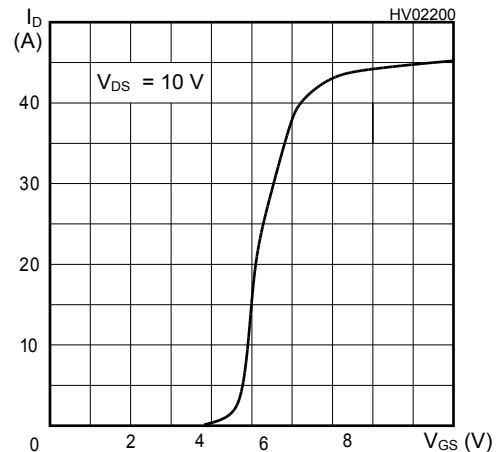


Figure 5. Transconductance

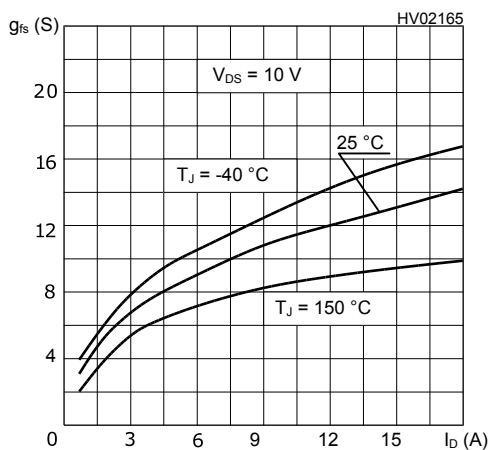


Figure 6. Static drain-source on-resistance

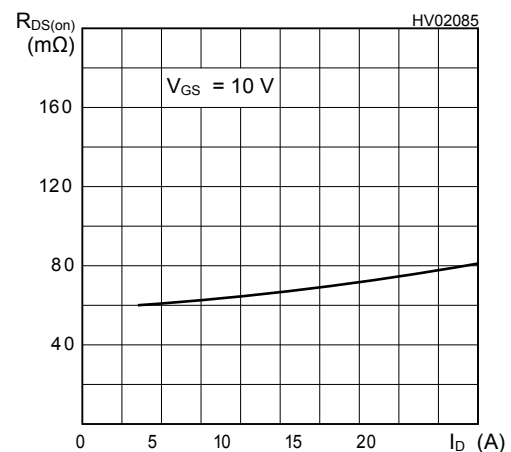


Figure 7. Gate charge vs gate-source voltage

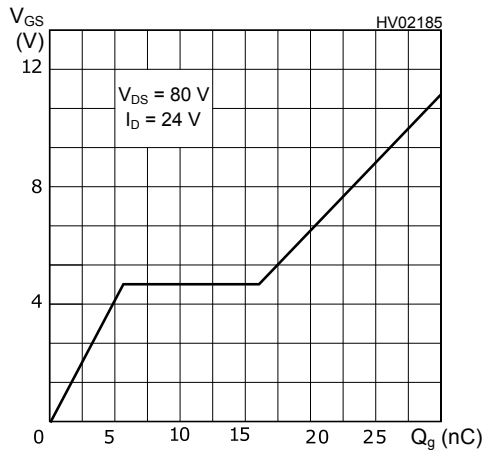


Figure 8. Capacitance variations

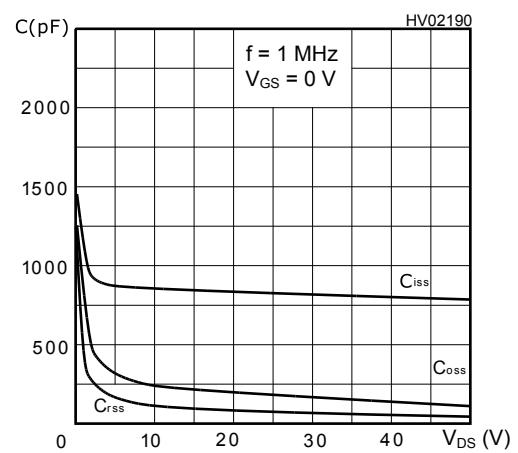


Figure 9. Normalized gate threshold voltage vs temperature

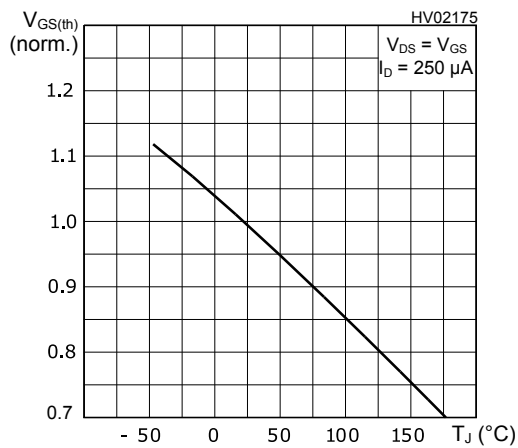


Figure 10. Normalized on-resistance vs temperature

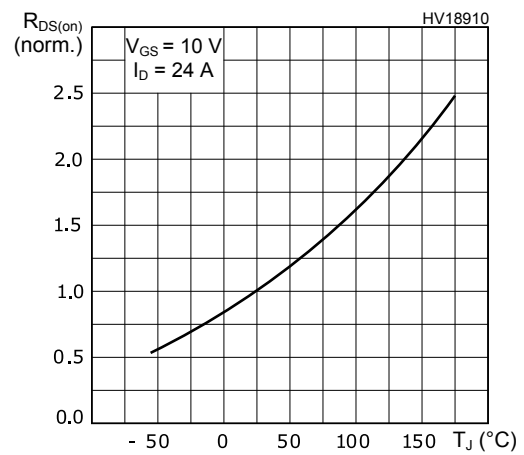
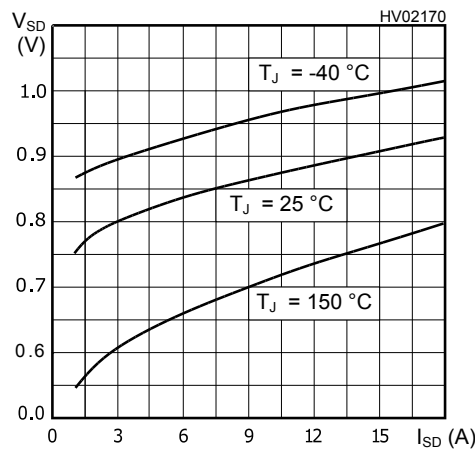
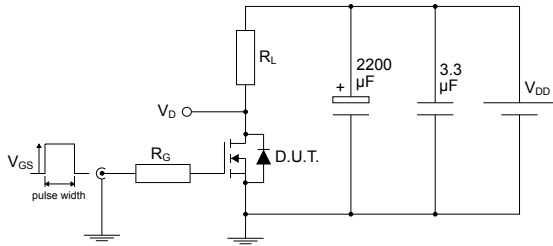


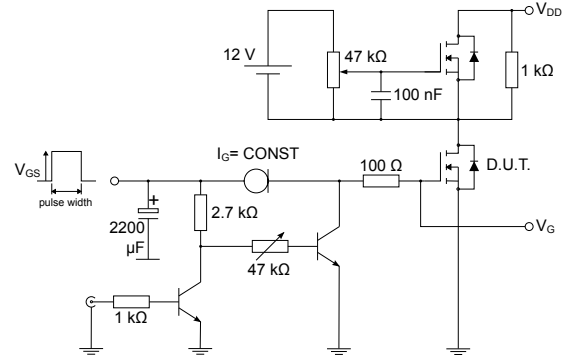
Figure 11. Source-drain diode forward characteristics



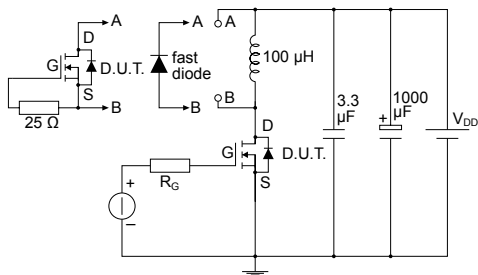
3 Test circuits

Figure 12. Test circuit for resistive load switching times


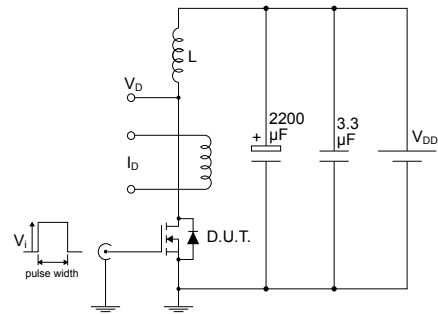
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Figure 13. Test circuit for gate charge behavior


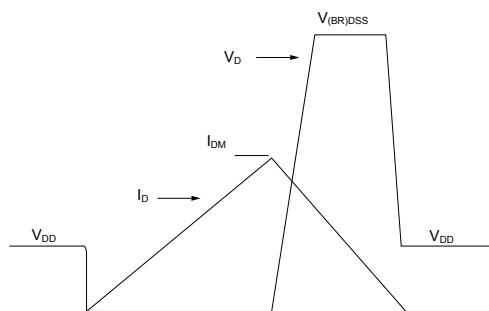
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Figure 14. Test circuit for inductive load switching and diode recovery times


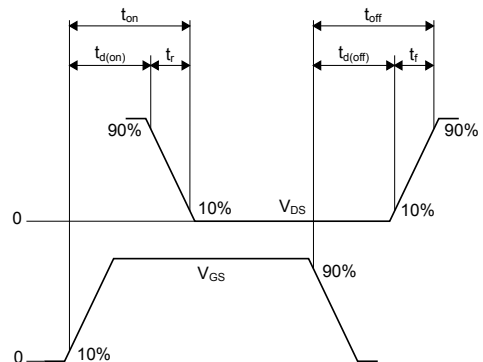
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Figure 15. Unclamped inductive load test circuit


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Figure 16. Unclamped inductive waveform


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Figure 17. Switching time waveform


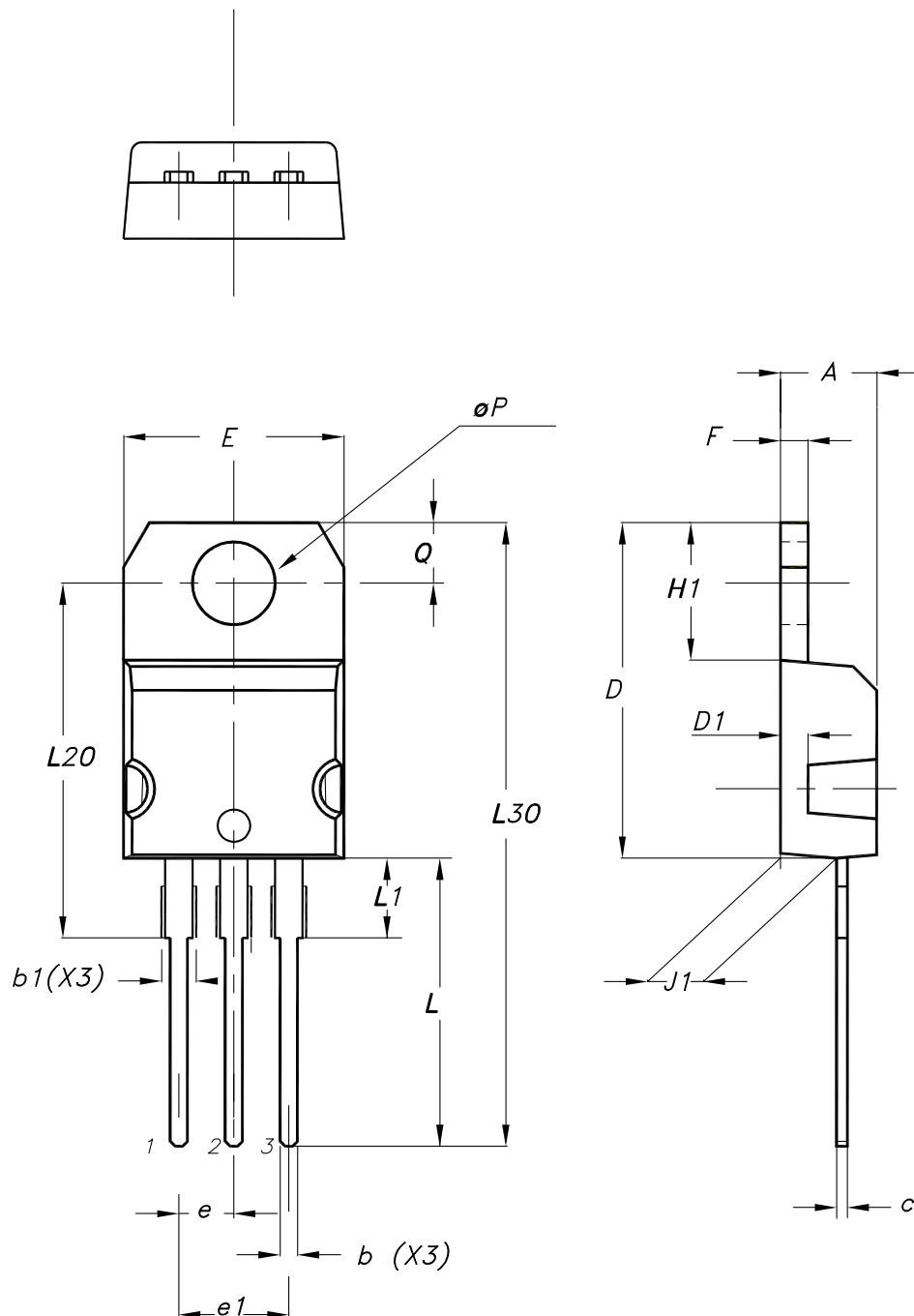
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4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

4.1 TO-220 type A package information

Figure 18. TO-220 type A package outline



0015988_typeA_Rev_23

Table 7. TO-220 type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95
Slug flatness		0.03	0.10

Revision history

Table 8. Document revision history

Date	Revision	Changes
09-Sep-2004	6	Complete version.
09-Aug-2006	7	New template, no content change.
22-Feb-2022	8	The part number STB24NF10 have been removed and the document has been updated accordingly. Updated title and Internal schematic on cover page. Updated Section 3 Test circuits . Updated Section 4 Package information . Minor text changes.

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