

## N-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY		
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
60	0.028 at $V_{GS} = 10$ V	8.5
	0.031 at $V_{GS} = 4.5$ V	7.9

### FEATURES

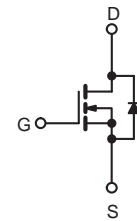
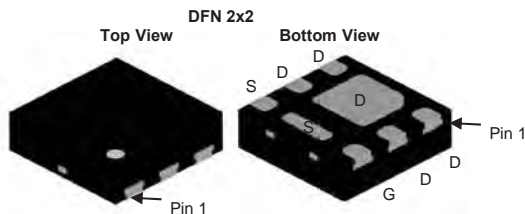
- DT-Trench Power MOSFET
- 100 %  $R_g$  Tested
- 100 % UIS Tested
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT

### APPLICATIONS

- Primary Side Switch
- Synchronous Rectification



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted					
Parameter	Symbol	10 s	Steady State	Unit	
Drain-Source Voltage	$V_{DS}$	60		V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$			
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	$T_A = 25$ °C	8.5	6.0	A
		$T_A = 70$ °C	7.6	4.8	
Pulsed Drain Current	$I_{DM}$	40			
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	3.2	1.3		
Single Avalanche Current	$I_{AS}$	L = 0.1 mH	22		mJ
Single Avalanche Energy			$E_{AS}$	24	
Maximum Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25$ °C	3.8	1.5	W
		$T_A = 70$ °C	2.4	1.0	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150		°C	
Soldering Recommendations (Peak Temperature) <sup>b, c</sup>		260			

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a</sup>	t $\leq$ 10 s	$R_{thJA}$	26	33	°C/W
	Steady State		65	81	
Maximum Junction-to-Case (Drain)	Steady State	$R_{thJC}$	1.9	2.4	

Notes:

- Surface mounted on 1" x 1" FR4 board.
- The DFN2X2 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.

<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	1.5	2.5	3.0	V
Gate Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 55\text{ }^\circ\text{C}$			5	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$ , $V_{GS} = 10\text{ V}$	30			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 8.5\text{ A}$		0.028	0.031	$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 6.9\text{ A}$		0.031	0.034	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 8.5\text{ A}$		35		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 3.2\text{ A}$ , $V_{GS} = 0\text{ V}$		0.78	1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = 10\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 8.5\text{ A}$		30	45	nC
Gate-Source Charge	$Q_{gs}$			6.9		
Gate-Drain Charge	$Q_{gd}$			5.8		
Gate Resistance	$R_g$		0.65	1.3	1.95	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}$ , $R_L = 30\text{ }\Omega$ $I_D \cong 1\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 6\text{ }\Omega$		14	25	ns
Rise Time	$t_r$			12	20	
Turn-Off Delay Time	$t_{d(off)}$			50	80	
Fall Time	$t_f$			12	20	
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = 3.2\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		60	100	

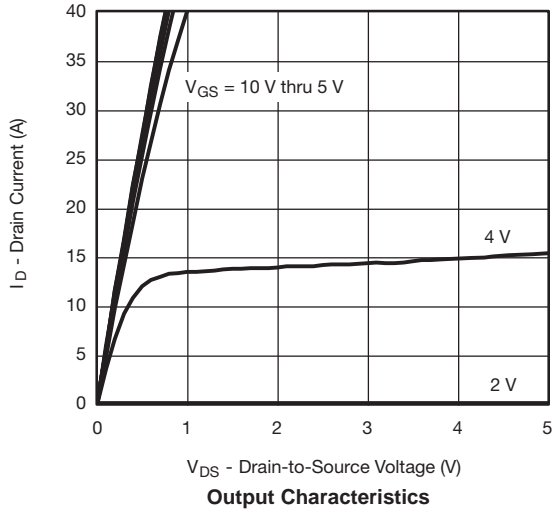
Notes:

a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

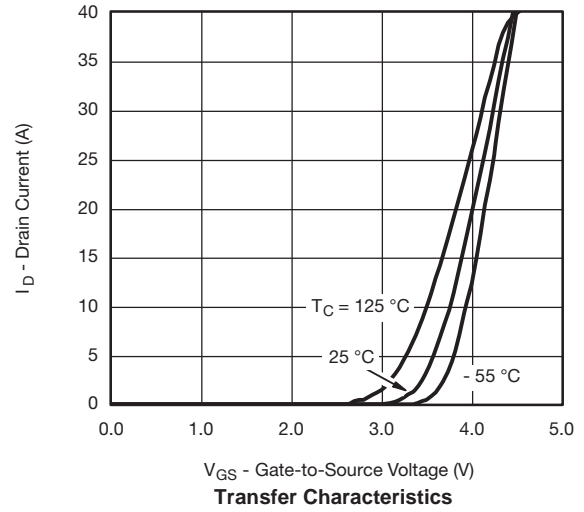
b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

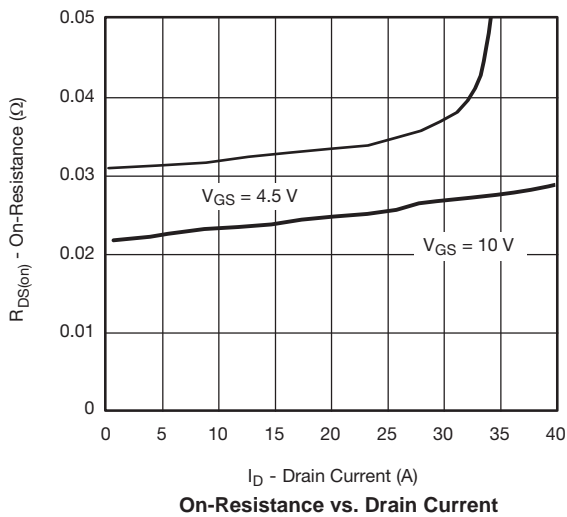
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



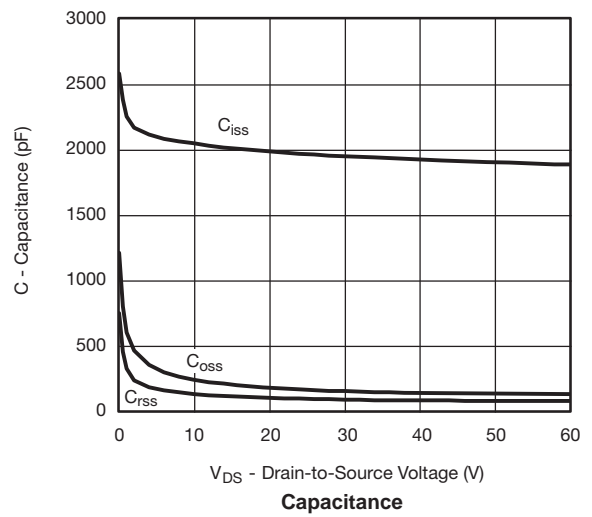
**Output Characteristics**



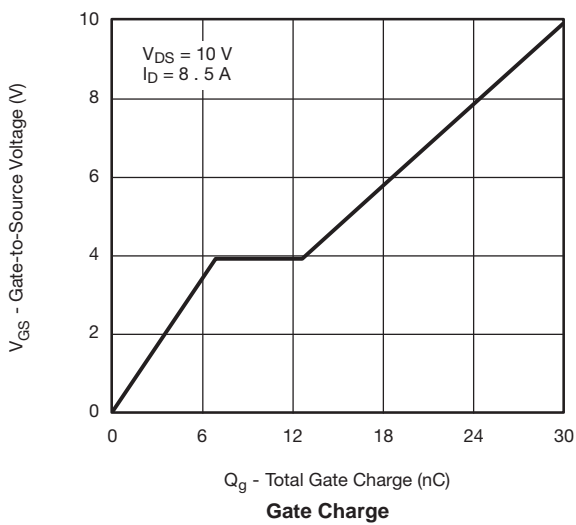
**Transfer Characteristics**



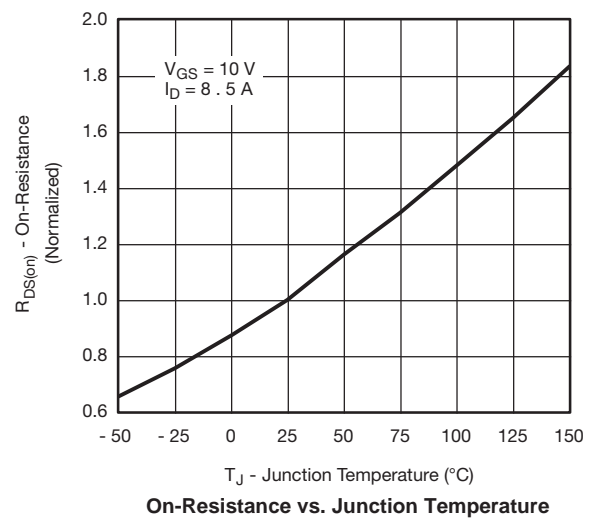
**On-Resistance vs. Drain Current**



**Capacitance**

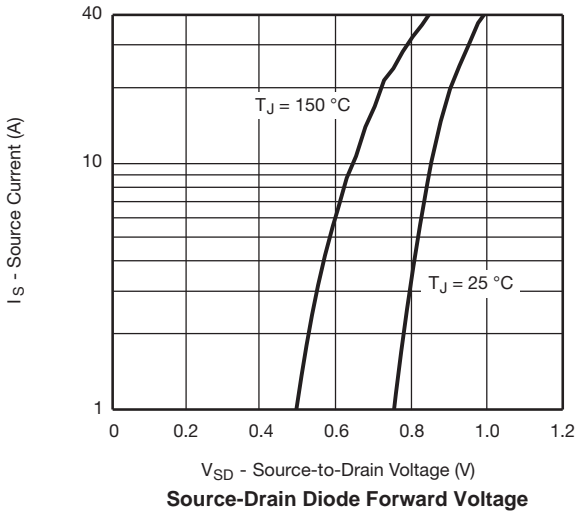


**Gate Charge**

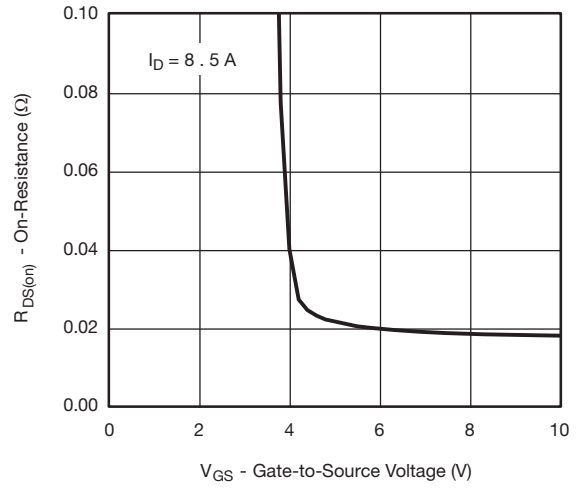


**On-Resistance vs. Junction Temperature**

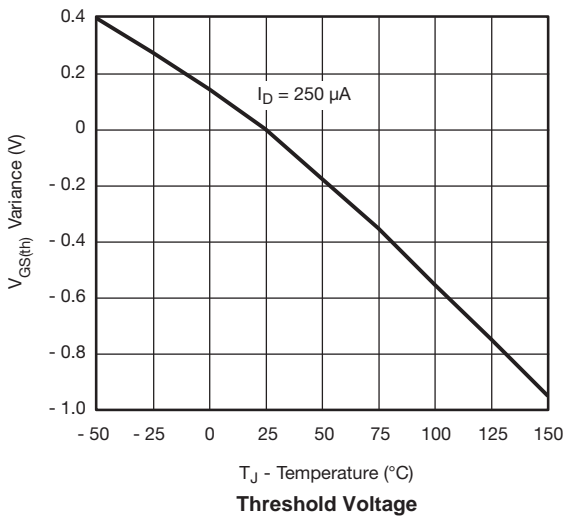
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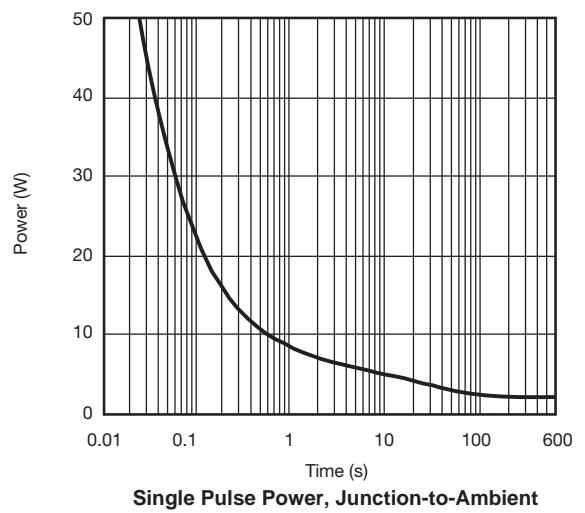
Source-Drain Diode Forward Voltage



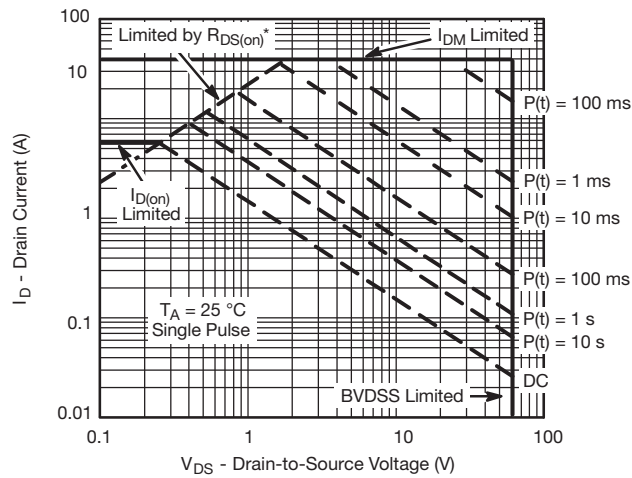
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



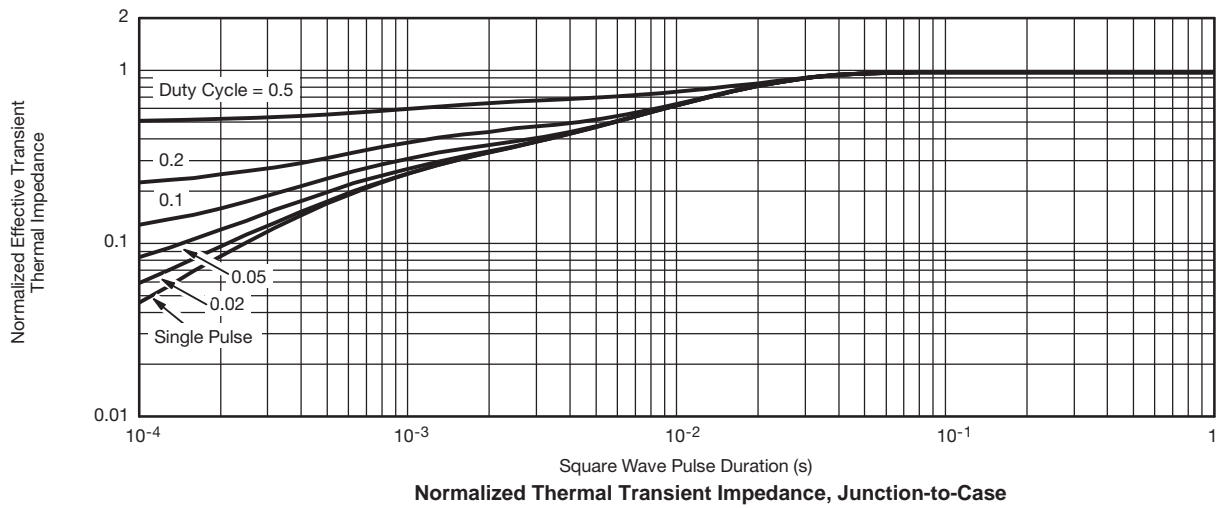
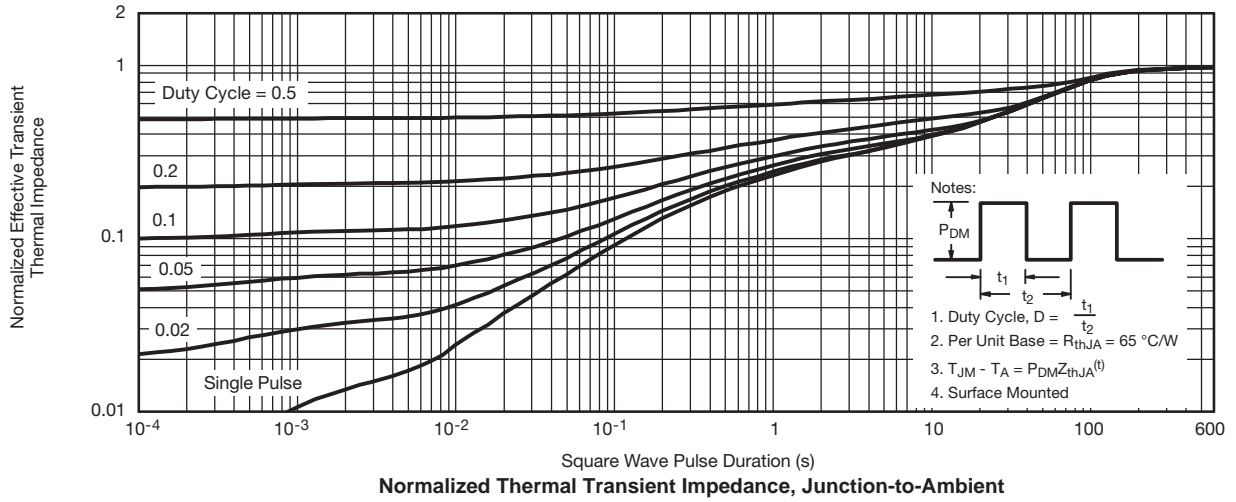
Single Pulse Power, Junction-to-Ambient

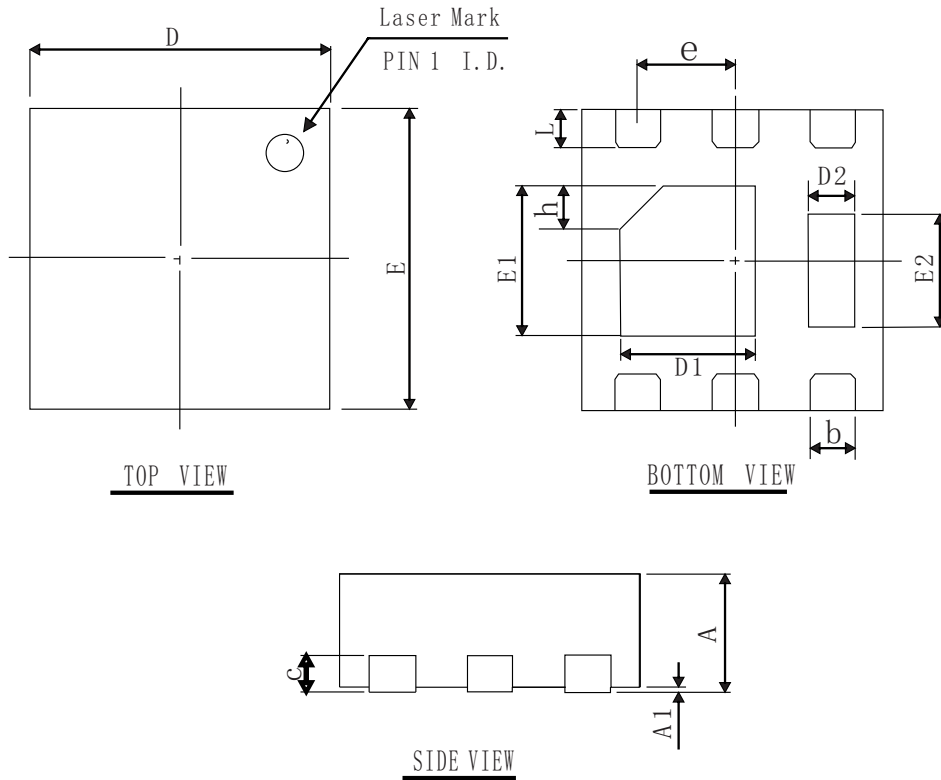


\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

Safe Operating Area

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted





COMMON DIMENSIONS  
(UNITS OF MEASURE=mm)

SYMBOL	MIN	NOM	MAX
A	0.60	0.75	0.90
A1	0.00	0.02	0.10
b	0.15	0.25	0.40
D	1.80	2.00	2.25
E	1.80	2.00	2.25
D1	0.70	0.90	1.10
E1	0.75	1.00	1.20
D2	0.15	0.30	0.45
E2	0.45	0.75	0.95
L	0.15	0.25	0.40
h	0.15	0.25	0.40
c	0.203 REF		
e	0.65 BSC		

Other thickness dimensions are as follows

A	0.50	0.55	0.60
A	0.40	0.45	0.50

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