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# FDMC8030

## Dual N-Channel Power Trench<sup>®</sup> MOSFET

40 V, 12 A, 10 mΩ

### Features

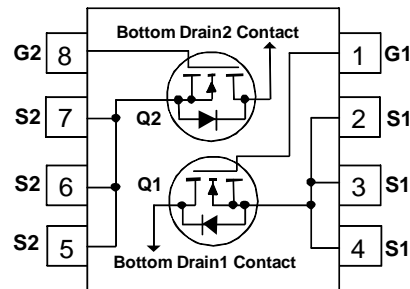
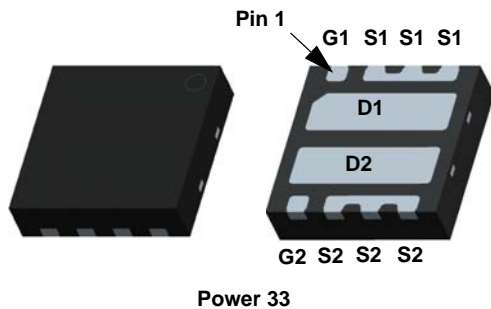
- Max  $r_{DS(on)}$  = 10 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 12\text{ A}$
- Max  $r_{DS(on)}$  = 14 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 10\text{ A}$
- Max  $r_{DS(on)}$  = 28 mΩ at  $V_{GS} = 3.2\text{ V}$ ,  $I_D = 4\text{ A}$
- Termination is Lead-free and RoHS Compliant

### General Description

This device includes two 40V N-Channel MOSFETs in a dual Power 33 (3 mm X 3 mm MLP) package. The package is enhanced for exceptional thermal performance.

### Applications

- Battery Protection
- Load Switching
- Point of Load



### MOSFET Maximum Ratings $T_A = 25\text{ °C}$ unless otherwise noted.

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	40	V
$V_{GS}$	Gate to Source Voltage	(Note 4) ±12	V
$I_D$	Drain Current -Continuous	$T_A = 25\text{ °C}$ (Note 1a)	12
	-Pulsed		50
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	21
$P_D$	Power Dissipation	$T_C = 25\text{ °C}$	14
	Power Dissipation	$T_A = 25\text{ °C}$ (Note 1a)	1.9
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case		9.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	65	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	155	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC8030	FDMC8030	Power 33	13 "	12 mm	3000 units

**Electrical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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**Off Characteristics**

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		19		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 32\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current, Forward	$V_{GS} = 12\text{ V}$ , $V_{DS} = 0\text{ V}$			100	nA

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	1.0	1.5	2.8	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 12\text{ A}$		8	10	m $\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 10\text{ A}$		10	14	
		$V_{GS} = 3.2\text{ V}$ , $I_D = 4\text{ A}$		19	28	
		$V_{GS} = 10\text{ V}$ , $I_D = 12\text{ A}$ $T_J = 125\text{ }^\circ\text{C}$		13	16	
$g_{FS}$	Forward Transconductance	$V_{DD} = 5\text{ V}$ , $I_D = 12\text{ A}$		57		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$ $f = 1\text{ MHz}$		1462	1975	pF
$C_{oss}$	Output Capacitance			321	430	pF
$C_{rss}$	Reverse Transfer Capacitance			20	30	pF
$R_g$	Gate Resistance			0.9	2.5	$\Omega$

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20\text{ V}$ , $I_D = 12\text{ A}$ $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		7	13	ns
$t_r$	Rise Time			3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			19	33	ns
$t_f$	Fall Time			3	10	ns
$Q_{g(TOT)}$	Total Gate Charge		$V_{GS} = 0\text{ V to }10\text{ V}$	$V_{DD} = 20\text{ V}$ $I_D = 12\text{ A}$	21	30
	Total Gate Charge	$V_{GS} = 0\text{ V to }5\text{ V}$	12		17	nC
$Q_{gs}$	Gate to Source Charge			2.8		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			2.5		nC

**Drain-Source Diode Characteristics**

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 12\text{ A}$ (Note 2)		0.83	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 12\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		25	40	ns
$Q_{rr}$	Reverse Recovery Charge			9	18	nC

## NOTES:

1.  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a. 65  $^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b. 155  $^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0 %.

3.  $E_{AS}$  of 21 mJ is based on starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 0.3\text{ mH}$ ,  $I_{AS} = 12\text{ A}$ ,  $V_{DD} = 36\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% tested at  $L = 3\text{ mH}$ ,  $I_{AS} = 5\text{ A}$ .

4. As an N-ch device, the negative  $V_{GS}$  rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted.

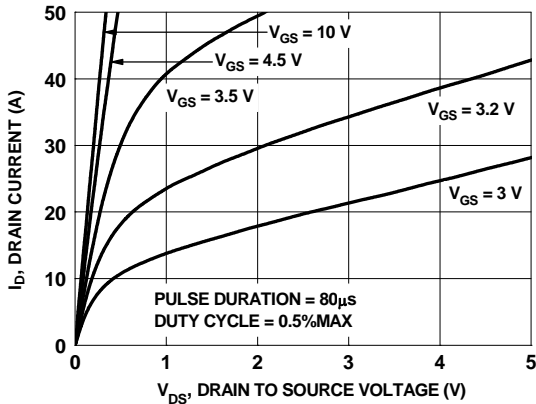


Figure 1. On-Region Characteristics

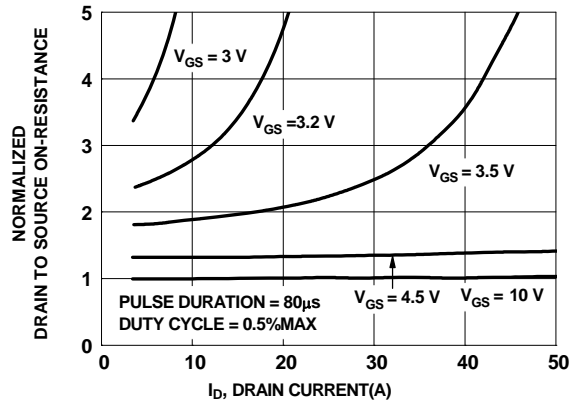


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

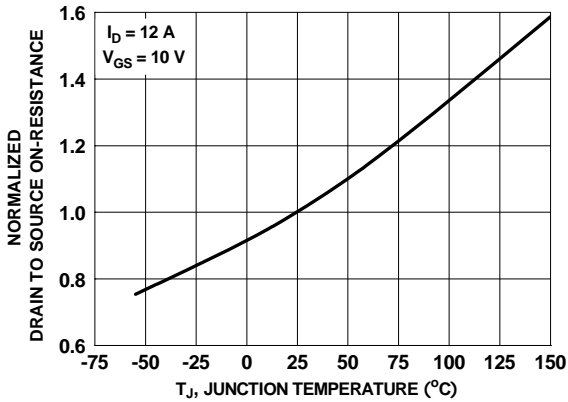


Figure 3. Normalized On-Resistance vs. Junction Temperature

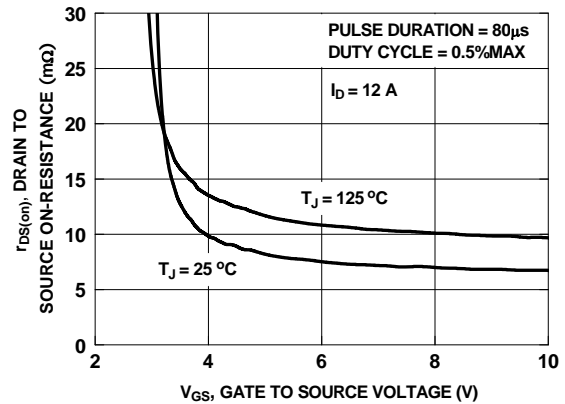


Figure 4. On-Resistance vs. Gate to Source Voltage

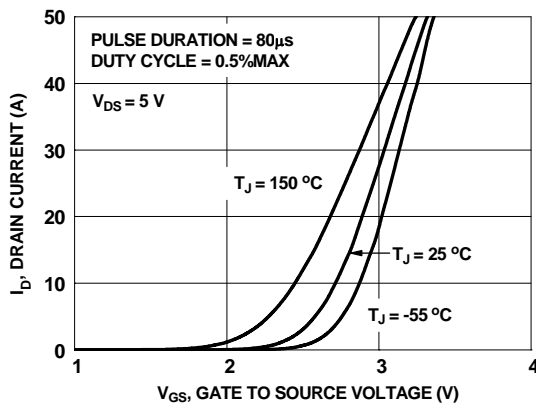


Figure 5. Transfer Characteristics

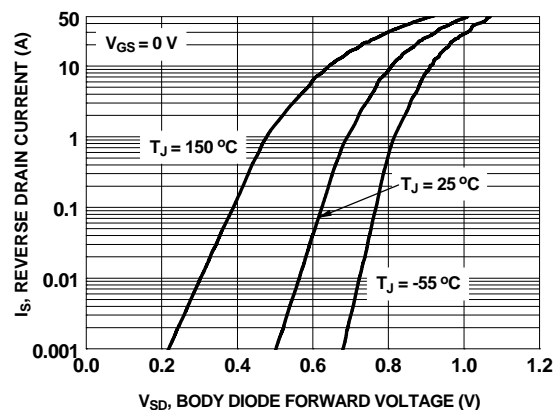
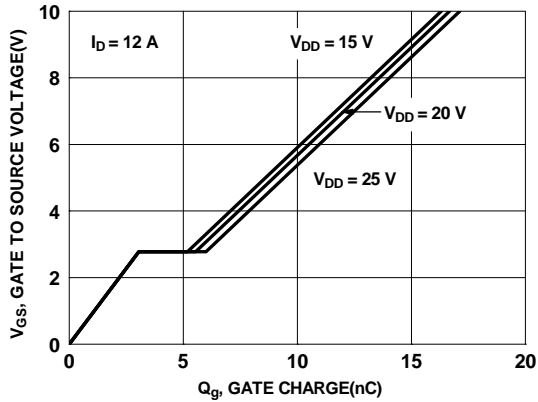
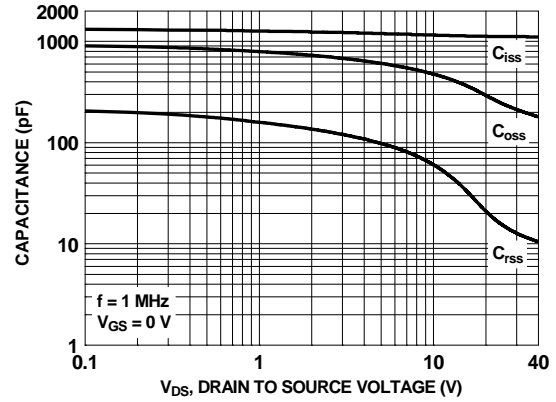


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

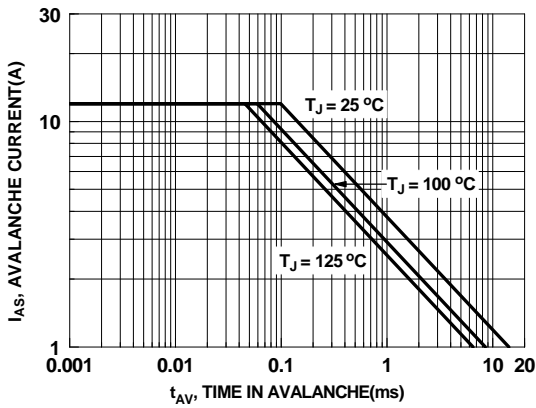
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted.



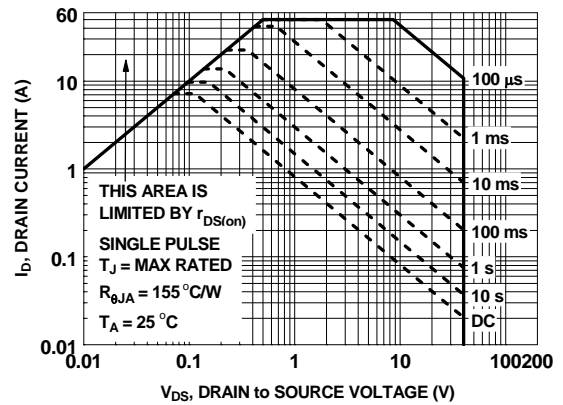
**Figure 7. Gate Charge Characteristics**



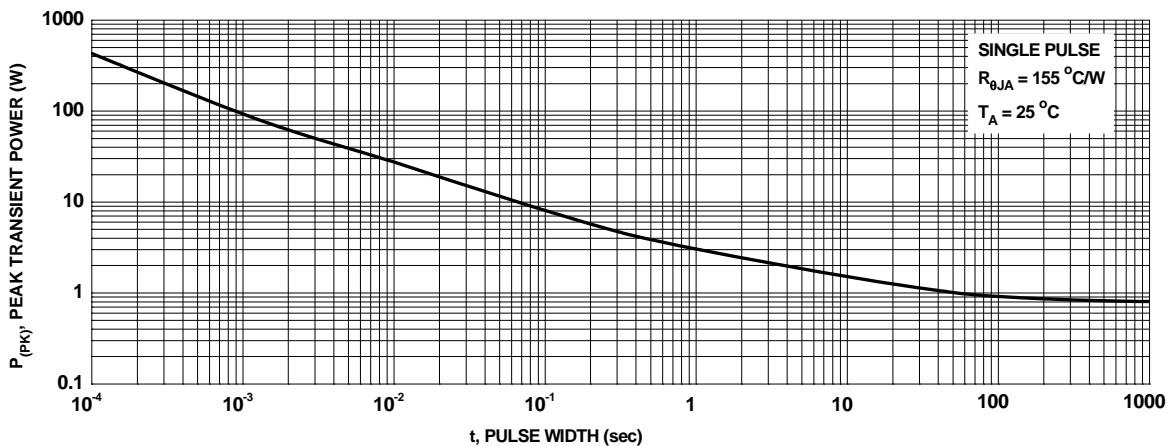
**Figure 8. Capacitance vs. Drain to Source Voltage**



**Figure 9. Unclamped Inductive Switching Capability**

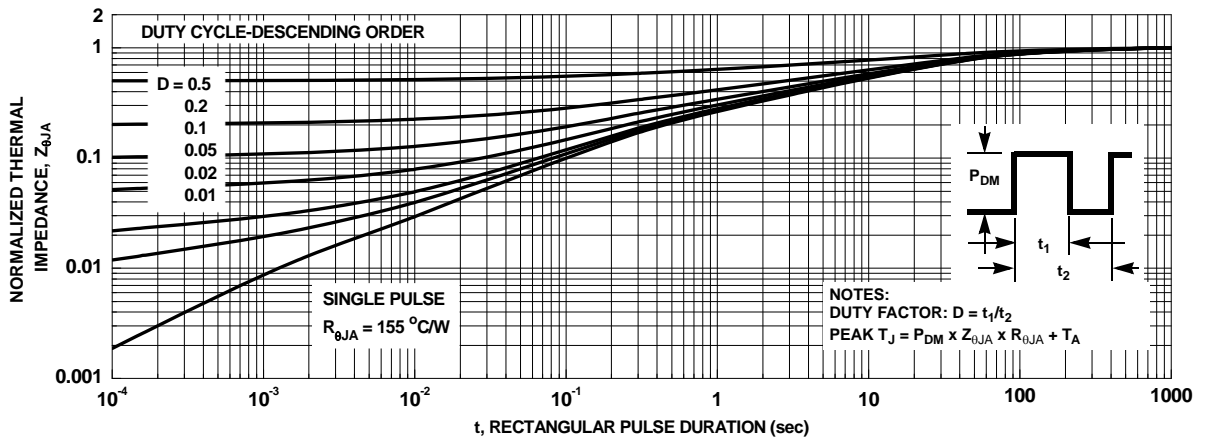


**Figure 10. Forward Bias Safe Operating Area**

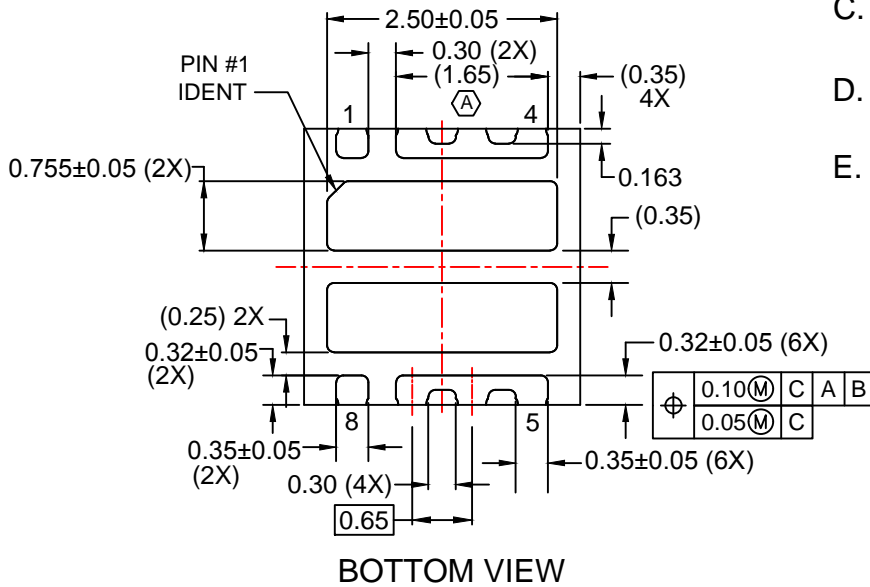
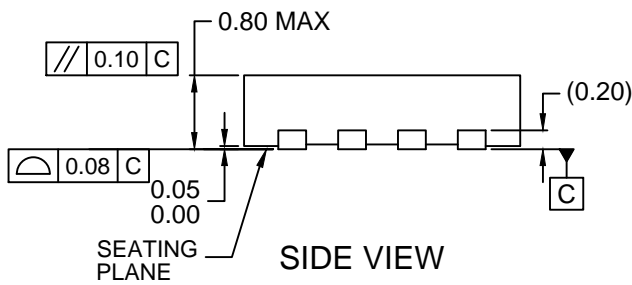
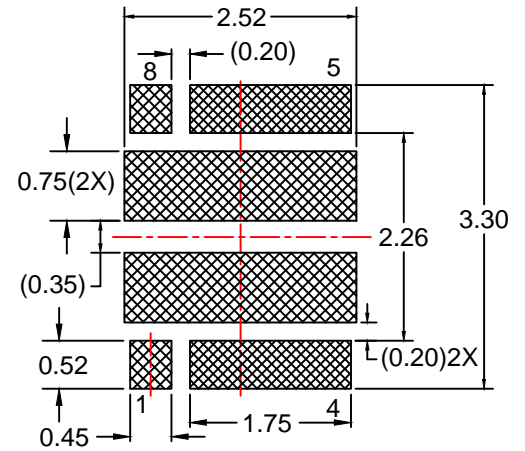
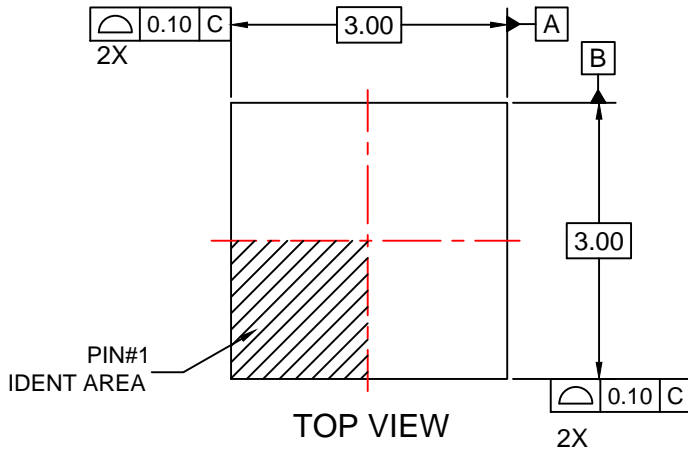


**Figure 11. Single Pulse Maximum Power Dissipation**

**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted.



**Figure 12. Junction-to-Ambient Transient Thermal Response Curve**



### RECOMMENDED LAND PATTERN

#### NOTES:

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- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
- D. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY
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