

SOT-227 Power Module

Single Switch - Power MOSFET, 420 A



SOT-227

FEATURES

- $I_D > 420\text{ A}$, $T_C = 25\text{ °C}$
- TrenchFET® power MOSFET
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Ultra low gate charge (Q_g)
- Avalanche energy rated (U_{IS})
- UL approved file E78996 
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT

PRIMARY CHARACTERISTICS

V_{DSS}	100 V
$R_{DS(on)}$	1.3 mΩ
$I_D^{(1)}$	330 A at 90 °C
Type	Modules - MOSFET
Package	SOT-227

ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ °C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
MOSFET				
Drain to source voltage	V_{DSS}		100	V
Continuous drain current, V_{GS} at 10 V	I_D	$T_C = 25\text{ °C}$	435	A
		$T_C = 90\text{ °C}$	330	
Pulsed drain current	$I_{DM}^{(1)}$		1130	
Power dissipation	P_D	$T_C = 25\text{ °C}$	652	W
Gate to source voltage	V_{GS}		± 20	V
Single pulse avalanche energy	E_{AS}	$T_C = 25\text{ °C}$, $L = 10\text{ mH}$, $V_{GS} = 10\text{ V}$	11 500	mJ
Single pulse avalanche current	I_{AS}	$T_C = 25\text{ °C}$, $L = 10\text{ mH}$, $V_{GS} = 10\text{ V}$	48	A
MODULE				
Insulation voltage (RMS)	V_{ISOL}	any terminal to case, $t = 1\text{ min}$	2500	V
Operating junction temperature range	T_J		-55 to +175	°C

Notes

(1) Limited at maximum junction temperature

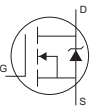
**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Junction and storage temperature range	T_J, T_{Stg}		-55	-	175	°C
Junction to case MOSFET	R_{thJC}		-	-	0.23	°C/W
Case to heat sink Module	R_{thCS}	Flat, greased surface	-	0.1	-	
Weight			-	30	-	g
Mounting torque		Torque to terminal	-	-	1.1 (9.7)	Nm (lbf.in)
		Torque to heatsink	-	-	1.8 (15.9)	Nm (lbf.in)
Case style			SOT-227			

ELECTRICAL CHARACTERISTICS ($T_J = 25\text{ °C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Drain to source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 750\text{ }\mu\text{A}$	100	-	-	V
Static drain to source on-resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 200\text{ A}$	-	1.3	2.15	mΩ
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 750\text{ }\mu\text{A}$	2.2	2.9	3.8	V
Forward transconductance	g_{fs}	$V_{DS} = 20\text{ V}, I_D = 20\text{ A}, V_{GS} = 10\text{ V}$	-	94	-	S
Drain to source leakage current	I_{DSS}	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$	-	0.6	4	μA
		$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ °C}$	-	32	-	
Gate to source leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$	-	-	± 350	nA
Total gate charge	Q_g	$I_D = 200\text{ A}$ $V_{DS} = 50\text{ V}$ $V_{GS} = 10\text{ V}$	-	375	-	nC
Gate to source charge	Q_{gs}		-	84	-	
Gate to drain ("Miller") charge	Q_{gd}		-	138	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 50\text{ V}$ $I_D = 100\text{ A}$ $R_g = 1.2\text{ }\Omega$ $V_{GS} = 10\text{ V}$	-	45	-	ns
Rise time	t_r		-	275	-	
Turn-off delay time	$t_{d(off)}$		-	152	-	
Fall time	t_f		-	172	-	
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}$ $V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$	-	17.3	-	nF
Output capacitance	C_{oss}		-	9.2	-	
Reverse transfer capacitance	C_{rss}		-	0.9	-	

SOURCE-DRAIN RATINGS AND CHARACTERISTICS ($T_J = 25\text{ °C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Continuous source current (body diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode 	-	-	435	A
Pulsed source current (body diode)	I_{SM}		-	-	1130	
Diode forward voltage	V_{SD}	$I_S = 200\text{ A}, V_{GS} = 0\text{ V}$	-	0.91	1.5	V
Reverse recovery time	t_{rr}	$T_J = 25\text{ °C}, I_F = I_S = 50\text{ A},$ $di/dt = 100\text{ A}/\mu\text{s}, V_R = 50\text{ V}$	-	171	-	ns
Reverse recovery charge	Q_{rr}		-	740	-	nC
Reverse recovery current	I_{RM}		-	8.7	-	A

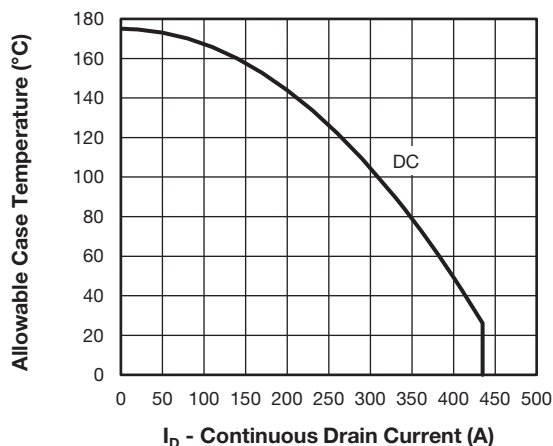


Fig. 1 - Maximum Continuous Drain Current vs. Case Temperature

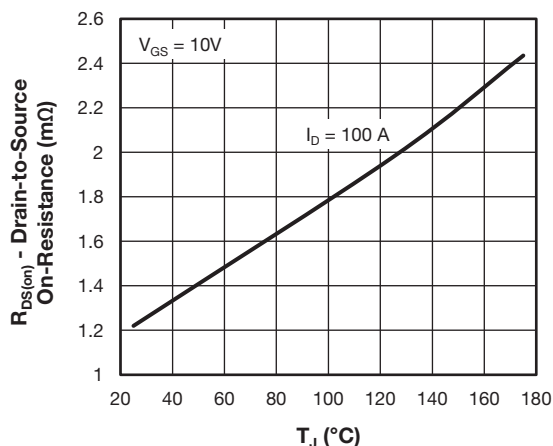


Fig. 4 - Typical Drain-to-Source On-Resistance vs. Temperature

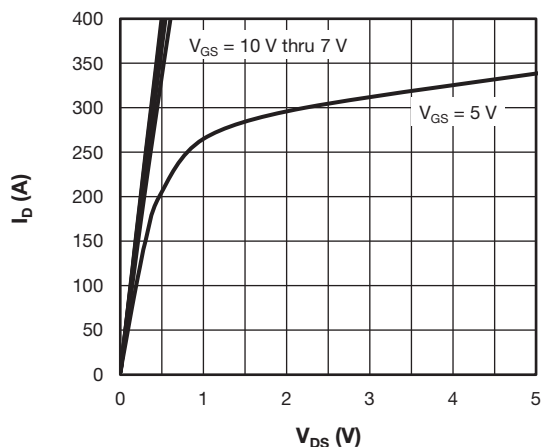
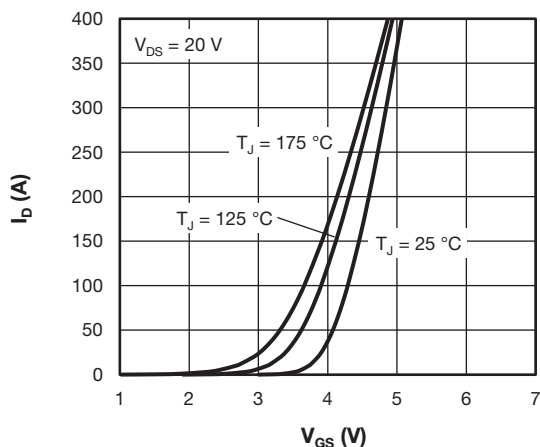

Fig. 2 - Typical Drain to Source Current Output Characteristics at $T_J = 25^\circ C$


Fig. 5 - Typical Transfer Characteristics

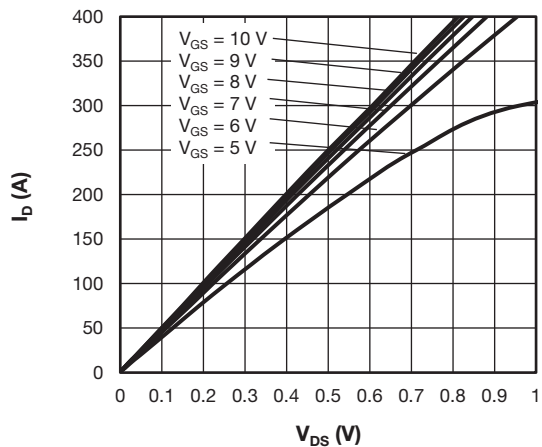
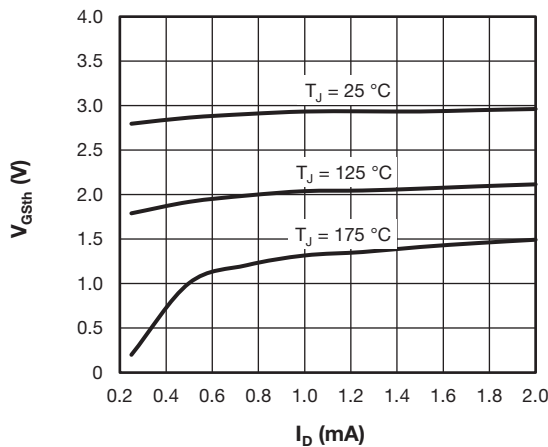

Fig. 3 - Typical Drain to Source Current Output Characteristics at $T_J = 125^\circ C$


Fig. 6 - Typical Gate Threshold Voltage Characteristics

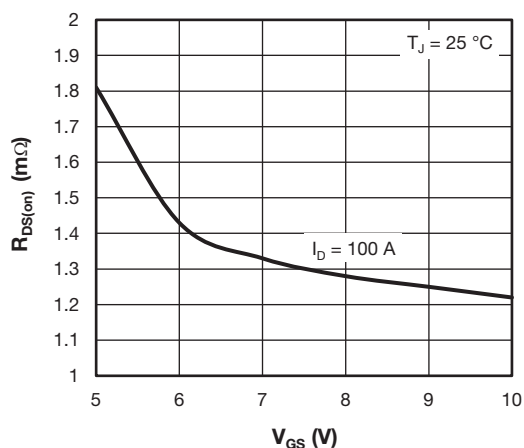


Fig. 7 - Typical Drain-State Resistance vs. Gate-to-Source Voltage

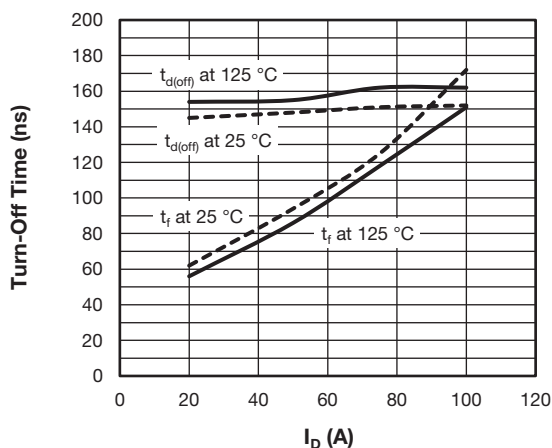
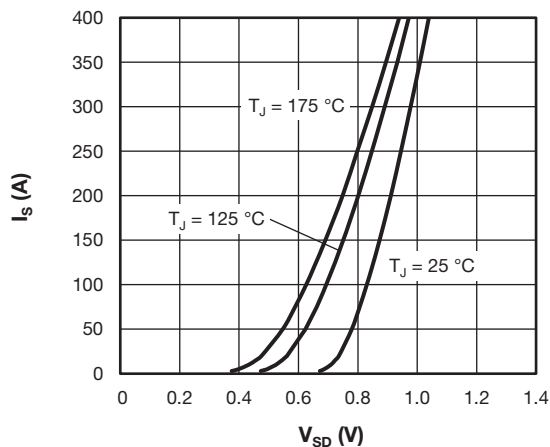

Fig. 10 - Typical Turn off Switching Time vs. I_D
 $V_{DD} = 50 \text{ V}$, $R_g = 1.2 \text{ } \Omega$, $V_{GS} = \pm 10 \text{ V}$, $L = 500 \text{ } \mu\text{H}$


Fig. 8 - Typical Body Diode Source-to-Drain Current Characteristics

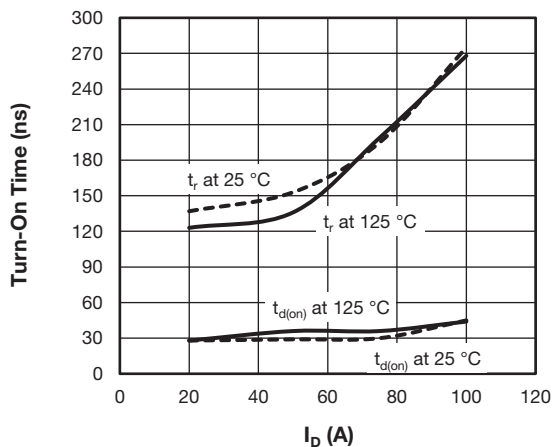
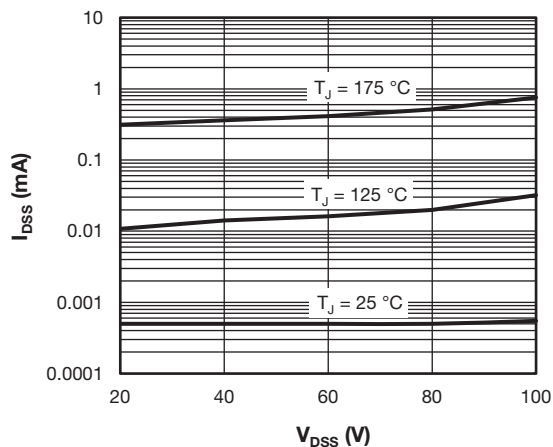

Fig. 11 - Typical Turn-on Switching Time vs. I_D
 $V_{DD} = 50 \text{ V}$, $R_g = 1.2 \text{ } \Omega$, $V_{GS} = \pm 10 \text{ V}$, $L = 500 \text{ } \mu\text{H}$


Fig. 9 - Typical Zero Gate Voltage Drain Current

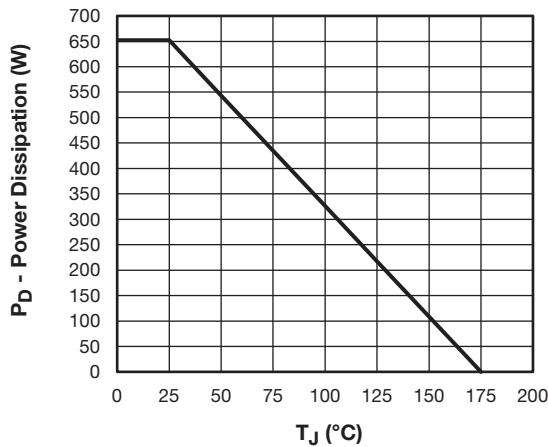


Fig. 12 - Power Dissipation Curve

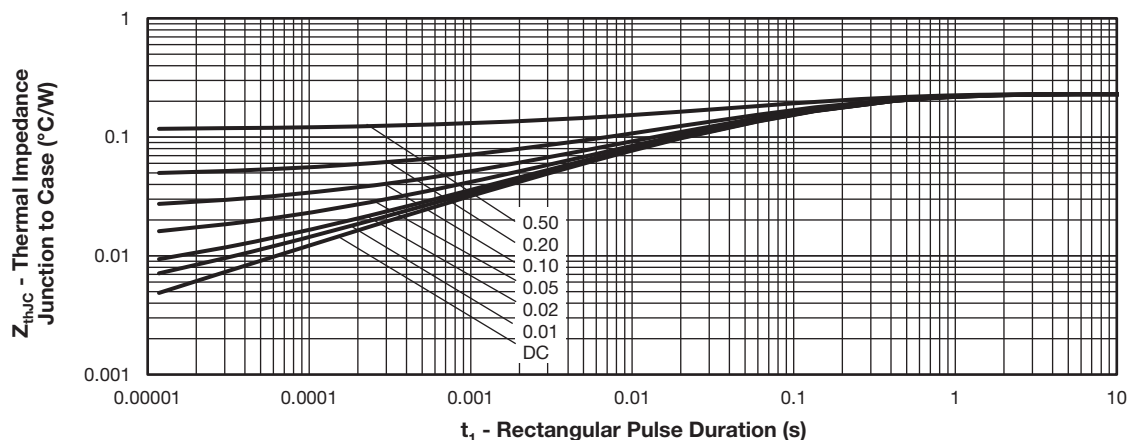


Fig. 13 - Maximum Thermal Impedance Junction-to-Case Characteristics

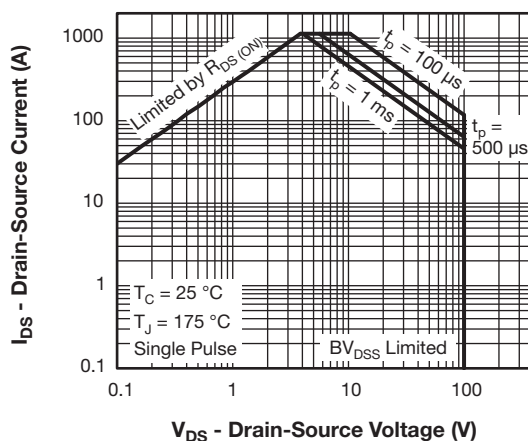


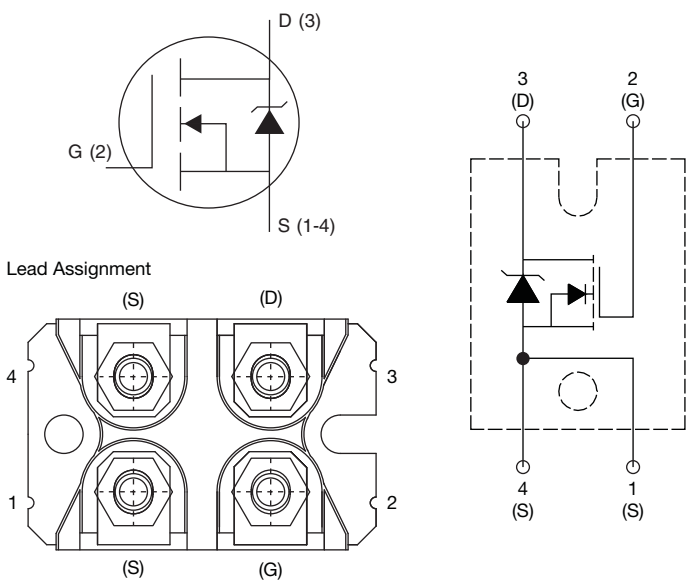
Fig. 14 - Safe Operating Area

ORDERING INFORMATION TABLE

Device code	VS-	F	C	420	S	A	10
	①	②	③	④	⑤	⑥	⑦

- ① - Vishay Semiconductors product
- ② - MOSFET module
- ③ - MOSFET die generation
- ④ - Current rating (420 = 420 A)
- ⑤ - Circuit configuration (S = single switch)
- ⑥ - Package indicator (SOT-227 standard insulated base)
- ⑦ - Voltage rating (10 = 100 V)

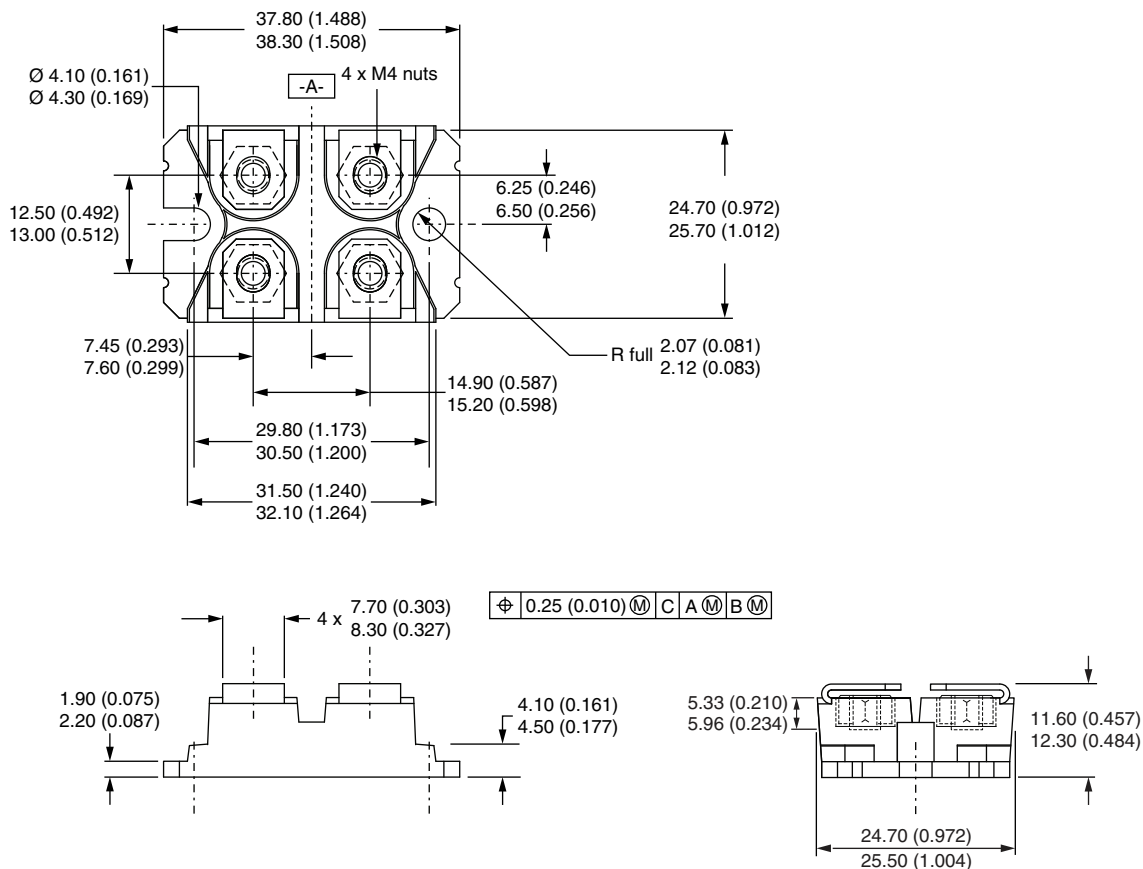
Quantity per tube is 10, M4 screw and washer included

CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Single switch	S	 The circuit drawing for the Single switch (S) configuration includes three diagrams: a schematic symbol showing a diode and a switch in series, with terminals D (3), G (2), and S (1-4); a lead assignment diagram showing the physical package with terminals (S), (D), (S), and (G) labeled; and a physical package diagram showing the internal wiring and terminal locations, with terminals 3 (D), 2 (G), 4 (S), and 1 (S) labeled.

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95423
Packaging information	www.vishay.com/doc?95425

SOT-227 Generation 2

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter



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