MOSFET – P-Channel POWERTRENCH®

-20 V, -6 A, 37 mΩ

FDME510PZT

V_{DS}	I_D MAX	$R_{DS(on)}$ MAX
−20 V	−6 A	37 mΩ

General Description

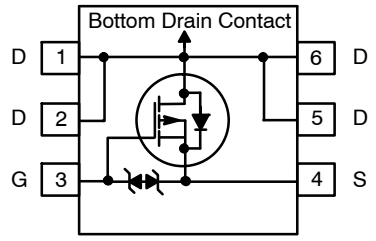
This device is designed specifically for battery charging or load switching in cellular handset and other ultraportable applications. It features a MOSFET with low on−state resistance.

The MicroFET™ 1.6x1.6 Thin package offers exceptional thermal performance for its physical size and is well suited to switching and linear mode applications.

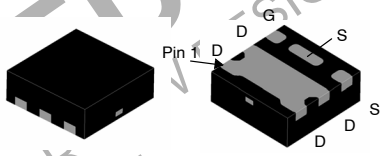
Features

- Max $r_{DS(on)}$ = 37 mΩ at V_{GS} = −4.5 V, I_D = −5 A
- Max $r_{DS(on)}$ = 50 mΩ at V_{GS} = −2.5 V, I_D = −4 A
- Max $r_{DS(on)}$ = 65 mΩ at V_{GS} = −1.8 V, I_D = −3 A
- Max $r_{DS(on)}$ = 100 mΩ at V_{GS} = −1.5 V, I_D = −2 A
- Low Profile: 0.55 mm Maximum in the New Package MicroFET 1.6x1.6 Thin
- Free from Halogenated Compounds and Antimony Oxides
- HBM ESD Protection Level > 2400 V (Note 3)
- These Devices are Pb−Free and are RoHS Compliant

ELECTRICAL CONNECTION



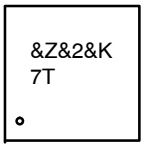
P-Channel MOSFET



Top View Bottom View

MicroFET (UDFN6) CASE 517DV

MARKING DIAGRAM



&Z = Assembly Plant Code
&2 = 2−Digit Date Code (YW)
&K = 2−Digit Lot Traceability Code
7T = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

MOSFET MAXIMUM RATINGS (T_A = 25°C, Unless otherwise specified)

Symbol	Parameter	Ratings	Unit
V_{DS}	Drain to Source Voltage	−20	V
V_{GS}	Gate to Source Voltage	±8	V
I_D	Drain Current Continuous (T_A = 25°C) (Note 1a) Pulsed	 −6 −15	A
P_D	Power Dissipation for Single Operation (T_A = 25°C) (Note 1a) (T_A = 25°C) (Note 1b)	 2.1 0.7	W
T_J, T_{STG}	Operating and Storage Junction Temperature Range	−55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	60	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	175	°C/W

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PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Shipping†
7T	FDME510PZT	MicroFET 1.6x1.6 Thin (Pb−Free / Halide Free)	5,000 units / Tape & Reel

† For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = −250 μA, V_{GS} = 0 V	−20	–	–	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = −250 μA, referenced to 25°C	–	−13	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = −16 V, V_{GS} = 0 V	–	–	−1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±8 V, V_{DS} = 0 V	–	–	±10	μA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = −250 μA	−0.4	−0.5	−1.0	V
$\Delta V_{GS(th)}/\Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = −250 μA, referenced to 25°C	–	3	–	mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = −4.5 V, I_D = −5 A V_{GS} = −2.5 V, I_D = −4 A V_{GS} = −1.8 V, I_D = −3 A V_{GS} = −1.5 V, I_D = −2 A V_{GS} = −4.5 V, I_D = −5 A, T_J = 125°C	– – – – –	31 38 48 57 40	37 50 65 100 60	mΩ
g_{FS}	Forward Transconductance	V_{DS} = −5 V, I_D = −5 A	–	21	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = −10 V, V_{GS} = 0 V, f = 1 MHz	–	1120	1490	pF
C_{oss}	Output Capacitance		–	155	210	pF
C_{rss}	Reverse Transfer Capacitance		–	140	210	pF
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = −10 V, I_D = −5 A, V_{GS} = −4.5 V, R_{GEN} = 6 Ω	–	6.5	13	ns
t_r	Rise Time		–	10	16	ns
$t_{d(off)}$	Turn-Off Delay Time		–	93	149	ns
t_f	Fall Time		–	54	86	ns
Q_g	Total Gate Charge	V_{DD} = −10 V, I_D = −5 A V_{GS} = −4.5 V	–	16	22	nC
Q_{gs}	Gate to Source Gate Charge		–	1.6	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	4	–	nC
DRAIN-SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = −1.6 A (Note 2)	–	−0.6	−1.2	V
t_{rr}	Reverse Recovery Time	I_F = −5 A, di/dt = 100 A/μs	–	38	61	ns
Q_{rr}	Reverse Recovery Charge		–	16	29	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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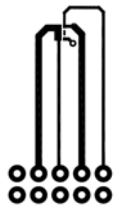
NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 × 1.5 in. board of FR−4 material. $R_{\theta JC}$ is determined by the user's board design.

a) 60°C/W when mounted on a 1 in^2 pad of 2 oz copper.



b) 175°C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. The diode connected between the gate and source serves only as protection ESD. No gate overvoltage rating is implied.

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TYPICAL CHARACTERISTICS (T_J = 25°C, unless otherwise noted)

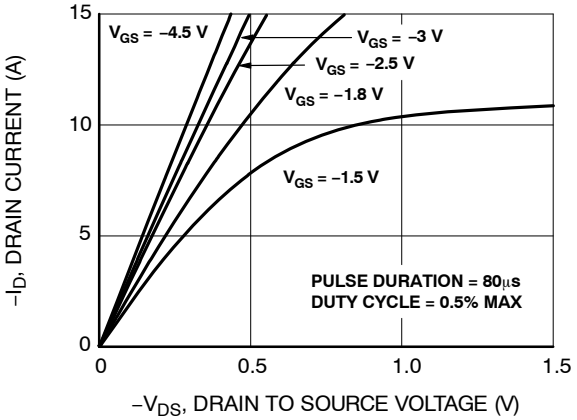

Figure 1. On−Region Characteristics

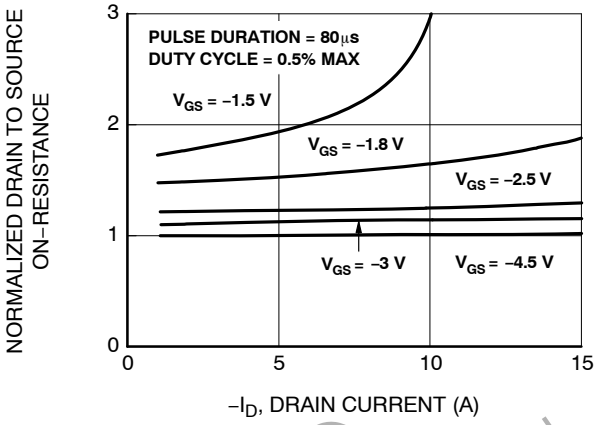

Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

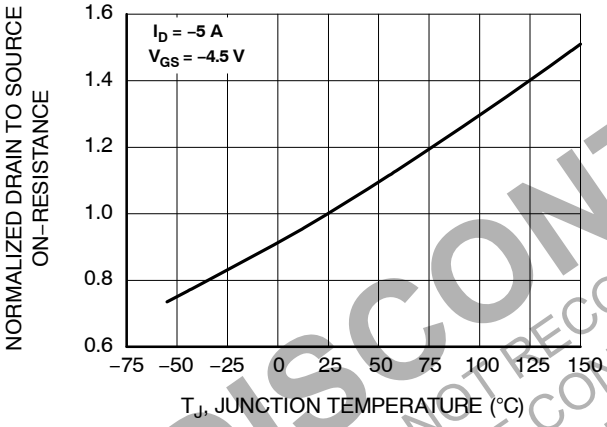

Figure 3. Normalized On Resistance vs. Junction Temperature

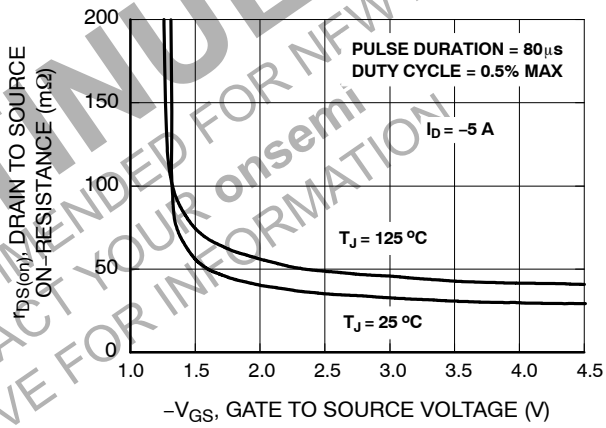

Figure 4. On−Resistance vs. Gate to Source Voltage

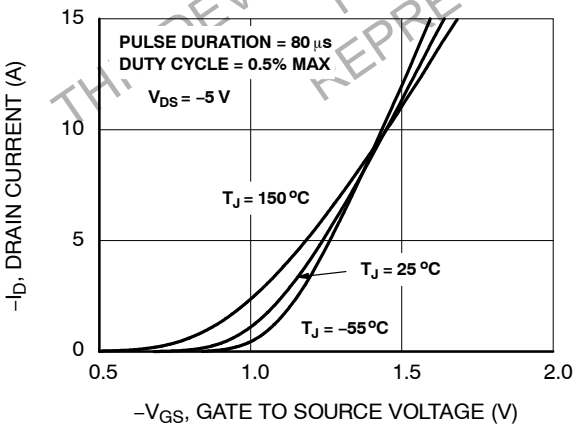

Figure 5. Transfer Characteristics

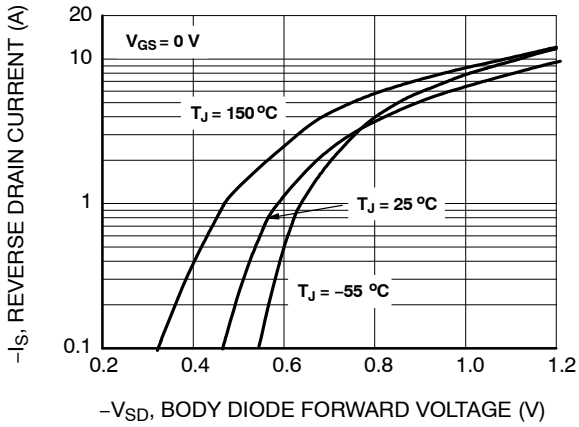

Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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TYPICAL CHARACTERISTICS (T_J = 25°C, unless otherwise noted) (continued)

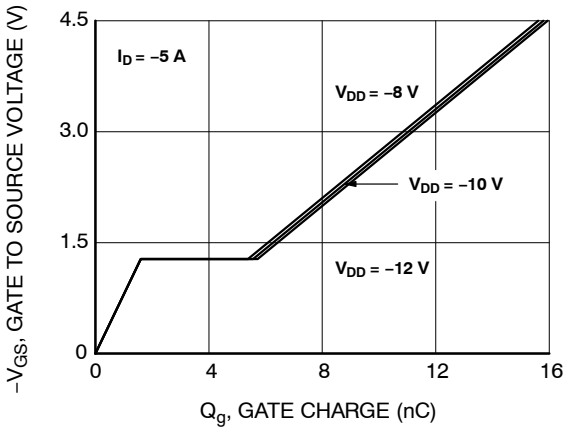

Figure 7. Gate Charge Characteristics

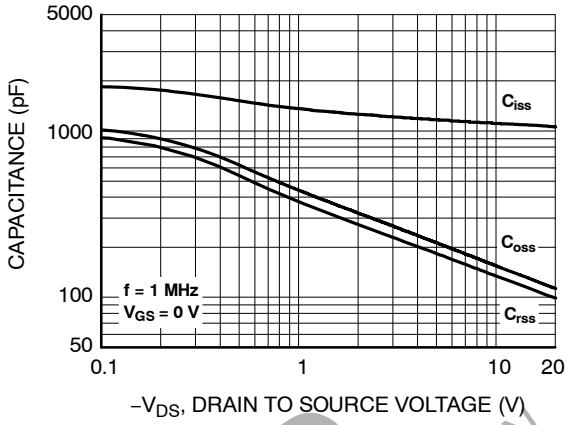

Figure 8. Capacitance vs. Drain to Source Voltage

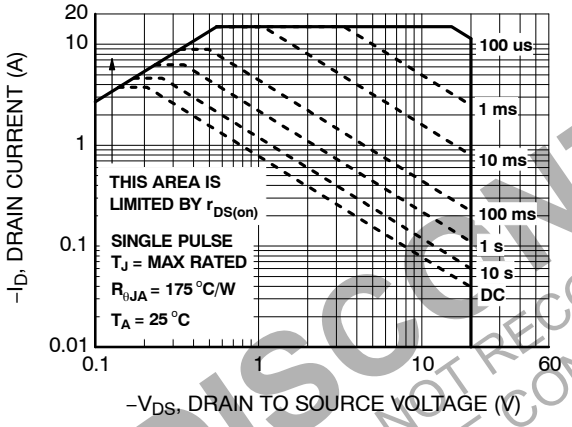

Figure 9. Forward Bias Safe Operating Area

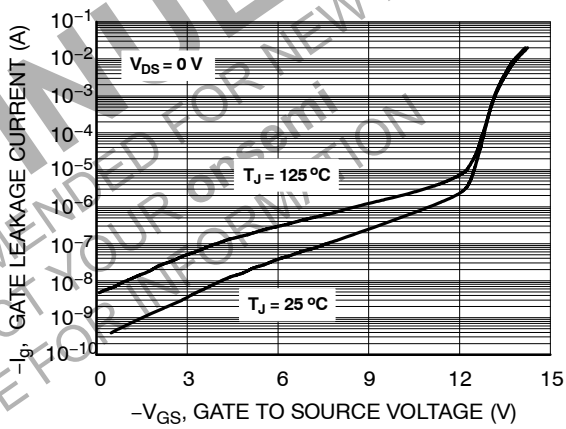

Figure 10. Gate Leakage Current vs. Gate to Source Voltage

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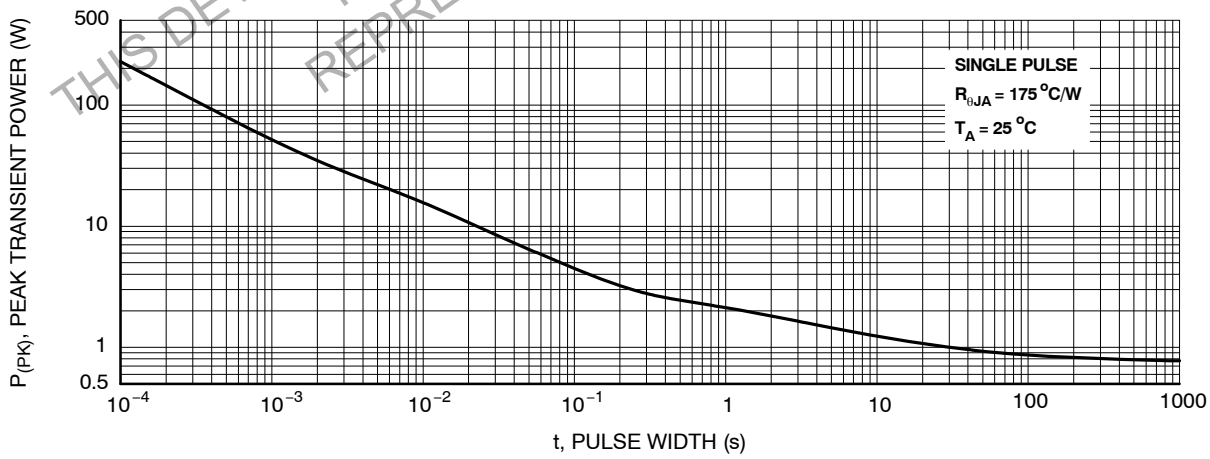

Figure 11. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (T_J = 25°C, unless otherwise noted) (continued)

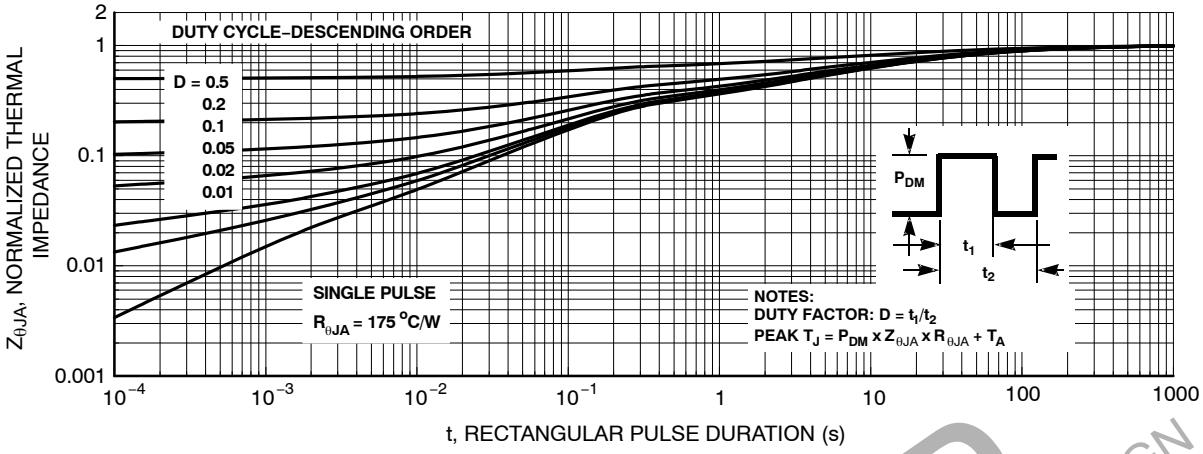

Figure 12. Junction−to−Ambient Transient Thermal Response Curve

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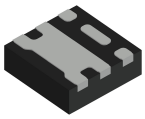
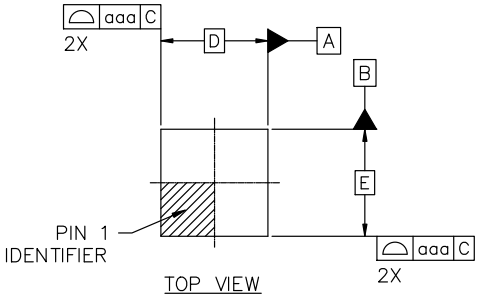
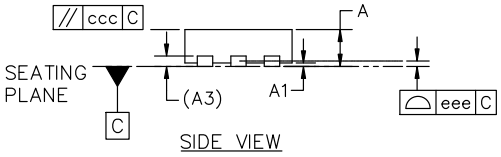


UDFN6 1.60x1.60x0.50, 0.50P
CASE 517DV
ISSUE A

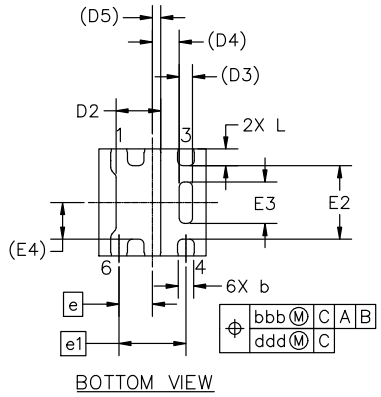
DATE 31 OCT 2024

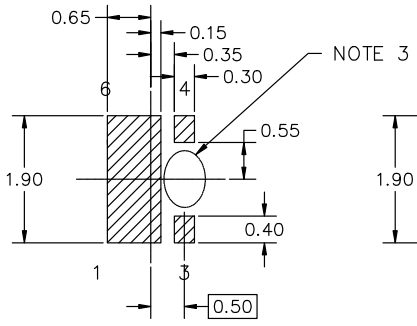




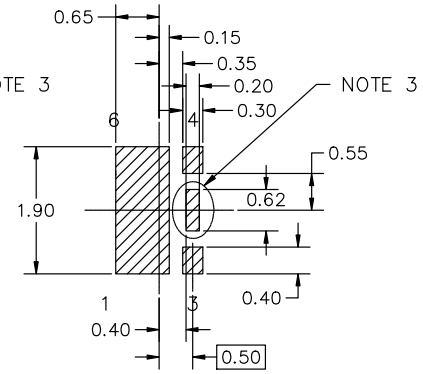
MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.45	0.50	0.55
A1	0.00	0.02	0.05
A3	0.15 REF		
D	1.60 BSC		
D2	0.62	0.67	0.72
D3	0.20 REF		
D4	0.40 REF		
D5	0.125 REF		
E	1.60 BSC		
E2	1.05	1.10	1.15
E3	0.57	0.62	0.67
E4	0.55 REF		
b	0.20	0.25	0.30
e	0.50 BSC		
e1	1.00 BSC		
L	0.20	0.25	0.30

TOLERANCE FORM AND POSITION	
aaa	0.10
bbb	0.10
ccc	0.10
ddd	0.05
eee	0.08





Option 1



Option 2

NOTES:
1. DIMENSIONING AND TOLERANCING AS PER ASMEY14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. NO VIAS OR TRACES ALLOWED IN THE AREA

RECOMMENDED MOUNTING FOOTPRINT

*For additional information on our Pb−Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference manual. SOLDERRM/D.

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