



## Description

The FDN304PZ uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

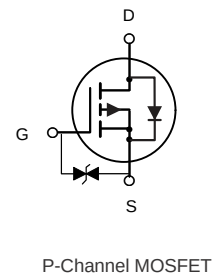


## General Features

$V_{DS} = -20V$   $I_D = -4.1A$   
 $R_{DS(ON)} < 45m\Omega @ V_{GS} = -4.5V$   
ESD Rating: 1500V HBM

## Application

Battery protection  
Load switch  
Uninterruptible power supply



## Ordering Information

| Product ID | Pack      | Brand      | Qty(PCS) |
|------------|-----------|------------|----------|
| FDN304PZ   | SOT-23-3L | HXY MOSFET | 3000     |

## Absolute Maximum Ratings ( $T_A = 25^\circ C$ unless otherwise noted)

| Symbol          | Parameter                                        | Limit      | Unit         |
|-----------------|--------------------------------------------------|------------|--------------|
| $V_{DS}$        | Drain-Source Voltage                             | -20        | V            |
| $V_{GS}$        | Gate-Source Voltage                              | $\pm 10$   | V            |
| $I_D$           | Drain Current-Continuous                         | -4.1       | A            |
| $I_{DM}$        | Drain Current-Pulsed (Note 1)                    | -30        | A            |
| $P_D$           | Maximum Power Dissipation                        | 1.4        | W            |
| $T_J, T_{STG}$  | Operating Junction and Storage Temperature Range | -55 To 150 | $^\circ C$   |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 2) | 89.3       | $^\circ C/W$ |



**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

|                                    |                     |                                                                                              |       |       |      |    |
|------------------------------------|---------------------|----------------------------------------------------------------------------------------------|-------|-------|------|----|
| Zero Gate Voltage Drain Current    | I <sub>DSS</sub>    | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V                                                   | -     | -     | 1    | μA |
| Gate-Body Leakage Current          | I <sub>GSS</sub>    | V <sub>GS</sub> =±10V, V <sub>DS</sub> =0V                                                   | -     | -     | ±10  | μA |
| On Characteristics (Note 3)        |                     |                                                                                              |       |       |      |    |
| Gate Threshold Voltage             | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                    | -0.35 | -0.55 | -0.9 | V  |
| Drain-Source On-State Resistance   | R <sub>DS(ON)</sub> | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A                                                  | -     | 34    | 45   | mΩ |
|                                    |                     | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-4A                                                  | -     | 44    | 60   | mΩ |
| Forward Transconductance           | g <sub>FS</sub>     | V <sub>DS</sub> =-5V, I <sub>D</sub> =-4A                                                    | 8     | -     | -    | S  |
| Dynamic Characteristics (Note4)    |                     |                                                                                              |       |       |      |    |
| Input Capacitance                  | C <sub>iss</sub>    | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V,<br>F=1.0MHz                                      | -     | 950   | -    | PF |
| Output Capacitance                 | C <sub>oss</sub>    |                                                                                              | -     | 165   | -    | PF |
| Reverse Transfer Capacitance       | C <sub>rss</sub>    |                                                                                              | -     | 120   | -    | PF |
| Switching Characteristics (Note 4) |                     |                                                                                              |       |       |      |    |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>DD</sub> =-10V, R <sub>L</sub> =2. 5Ω<br>V <sub>GS</sub> =-4.5V, R <sub>GEN</sub> =3Ω | -     | 12    |      | nS |
| Turn-on Rise Time                  | t <sub>r</sub>      |                                                                                              | -     | 10    |      | nS |
| Turn-Off Delay Time                | t <sub>d(off)</sub> |                                                                                              | -     | 19    |      | nS |
| Turn-Off Fall Time                 | t <sub>f</sub>      |                                                                                              | -     | 25    |      | nS |
| Total Gate Charge                  | Q <sub>g</sub>      | V <sub>DS</sub> =-10V, I <sub>D</sub> =-4A,<br>V <sub>GS</sub> =-4.5V                        | -     | 12    |      | nC |
| Gate-Source Charge                 | Q <sub>gs</sub>     |                                                                                              | -     | 1.4   | -    | nC |
| Gate-Drain Charge                  | Q <sub>gd</sub>     |                                                                                              | -     | 3.6   | -    | nC |
| Drain-Source Diode Characteristics |                     |                                                                                              |       |       |      |    |
| Diode Forward Voltage (Note 3)     | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =-4A                                                     | -     | -     | -1.2 | V  |
| Diode Forward Current (Note 2)     | I <sub>S</sub>      |                                                                                              | -     | -     | -4   | A  |

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production



## Typical Electrical and Thermal Characteristics

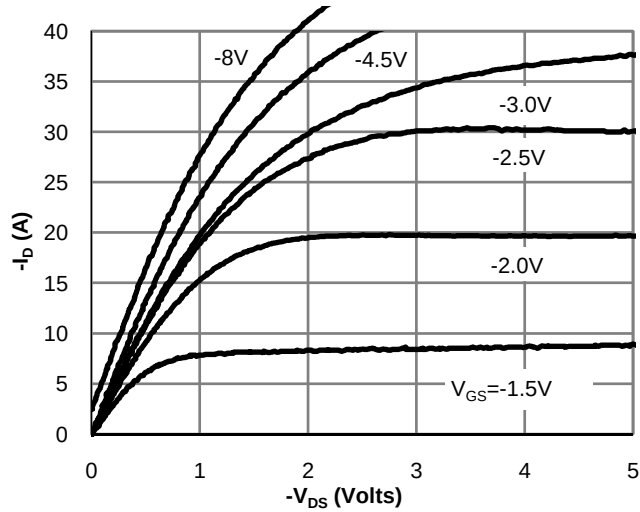


Fig 1: On-Region Characteristics (Note E)

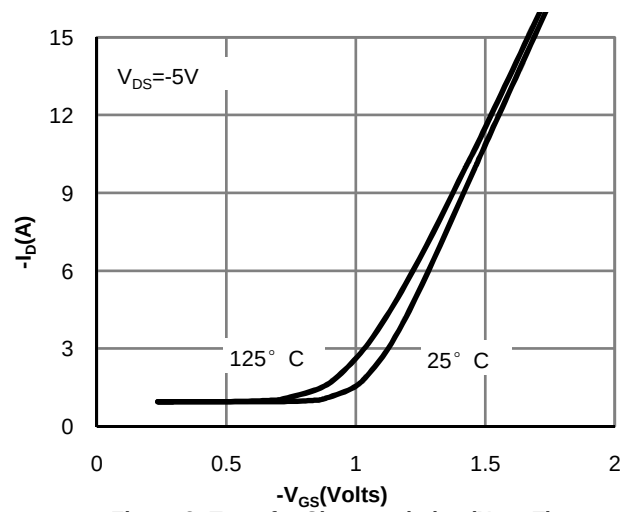


Figure 2: Transfer Characteristics (Note E)

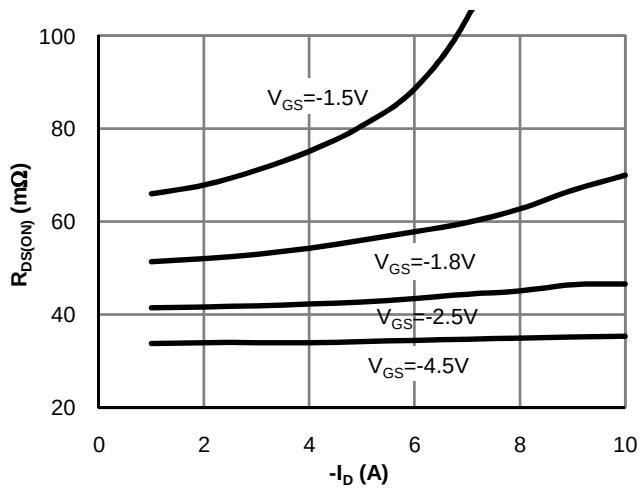


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

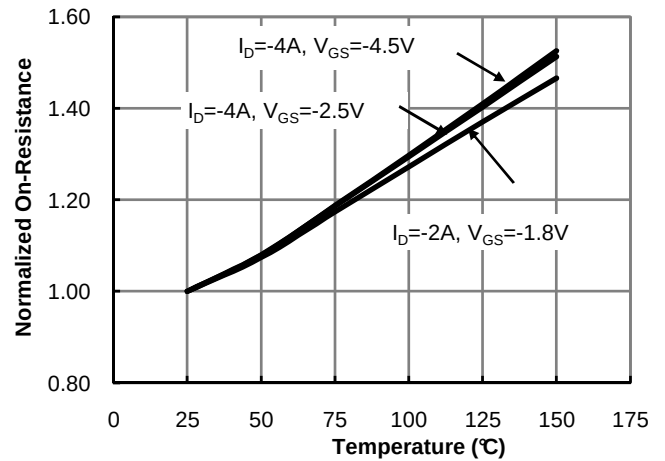


Figure 4: On-Resistance vs. Junction Temperature (Note E)

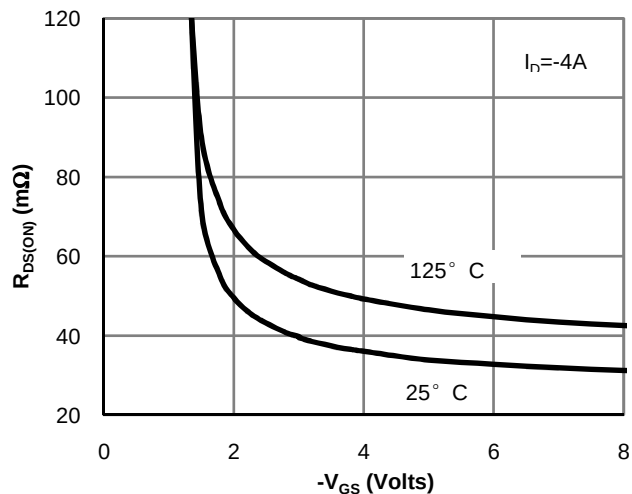


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

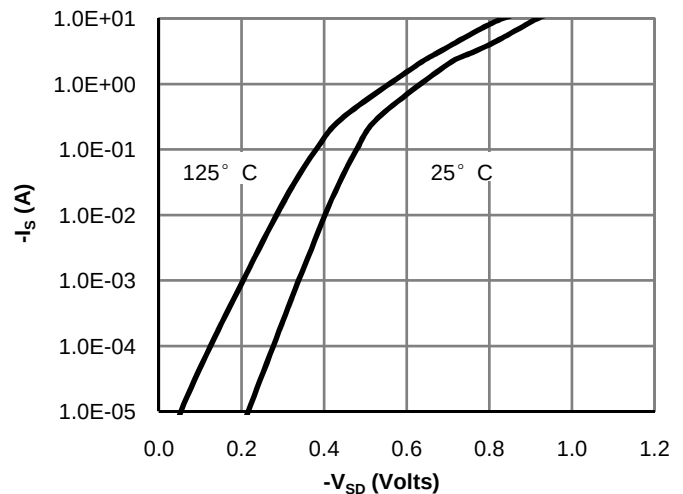
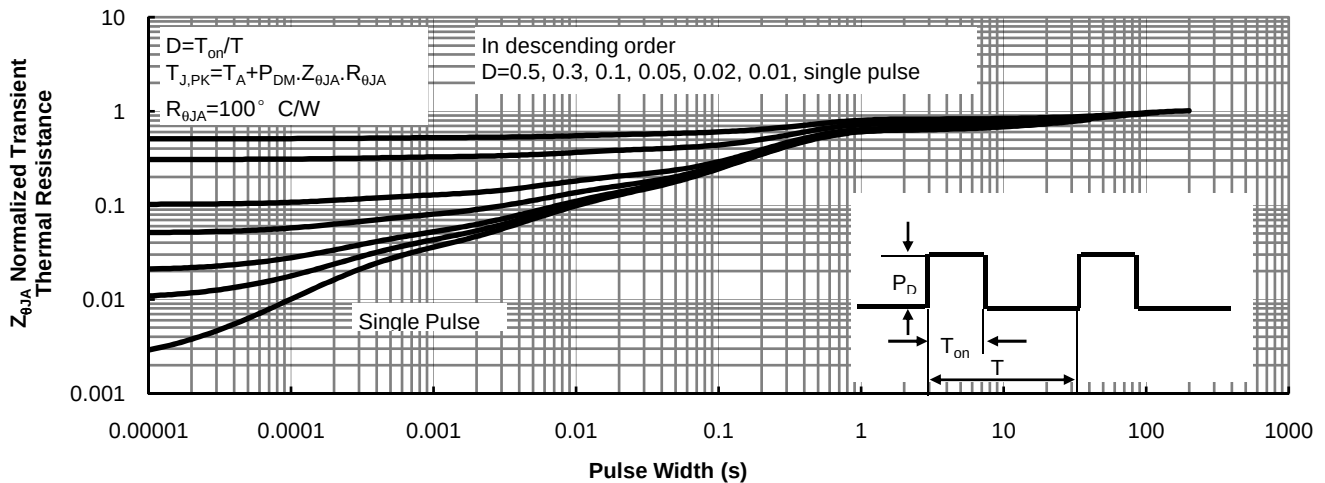
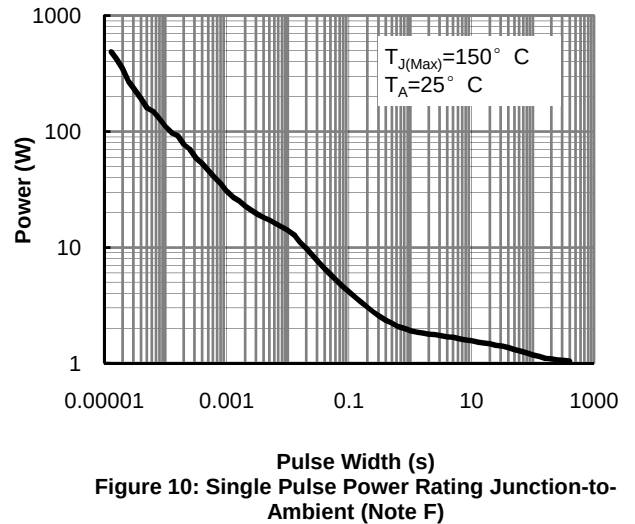
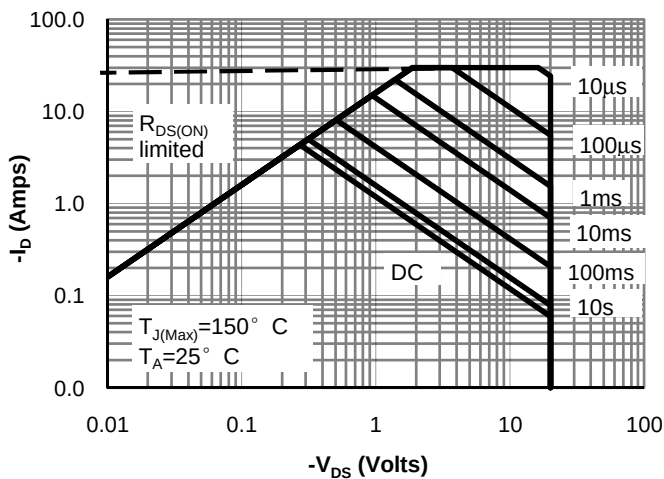
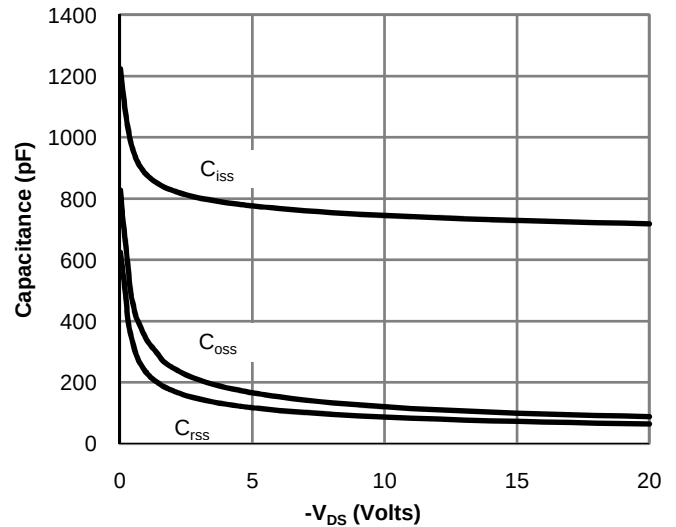
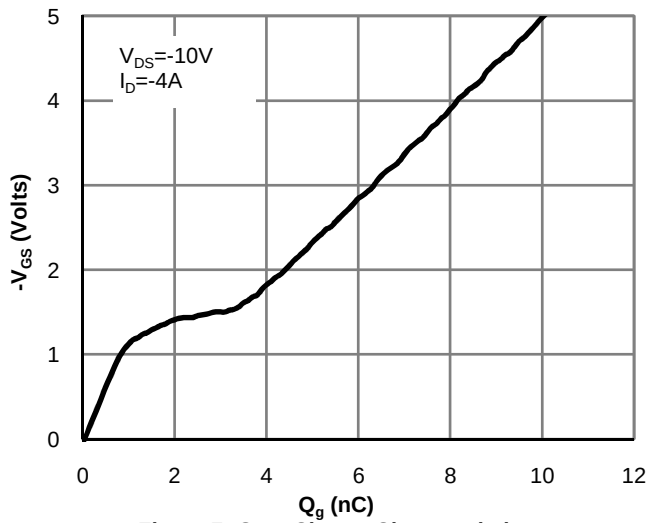
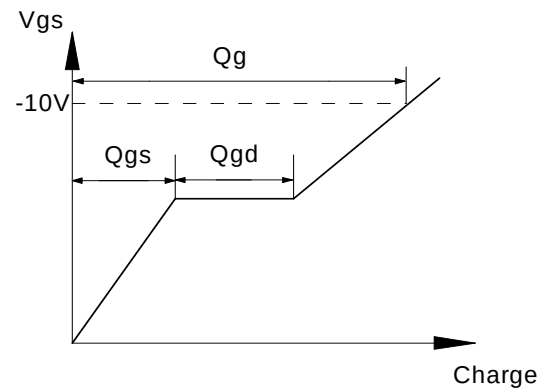
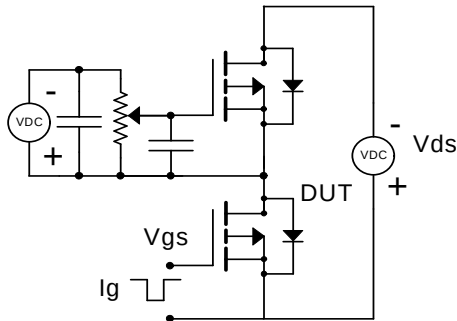


Figure 6: Body-Diode Characteristics (Note E)

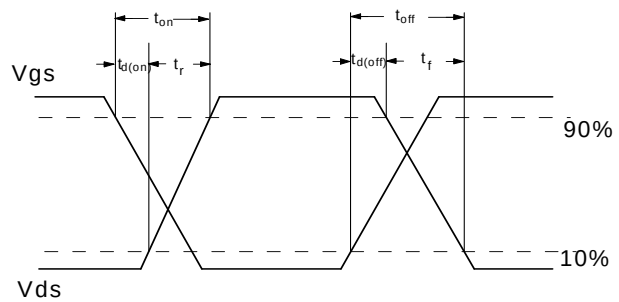
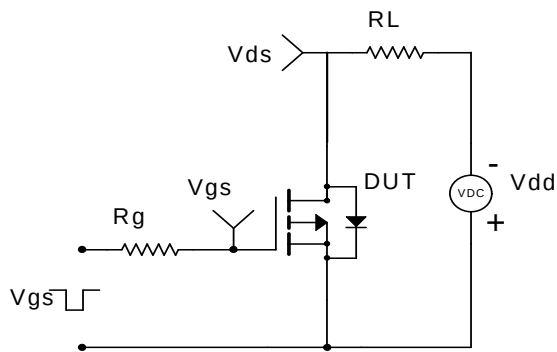




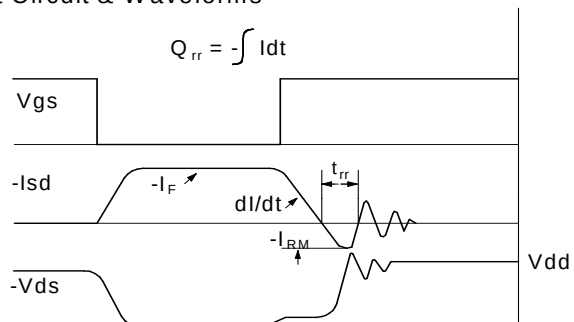
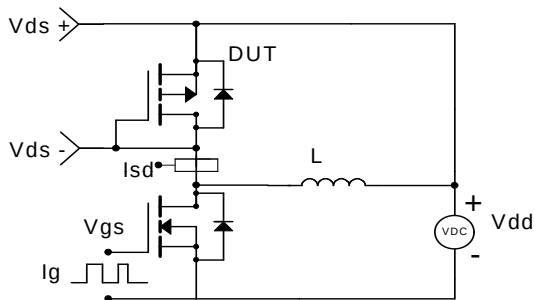
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms

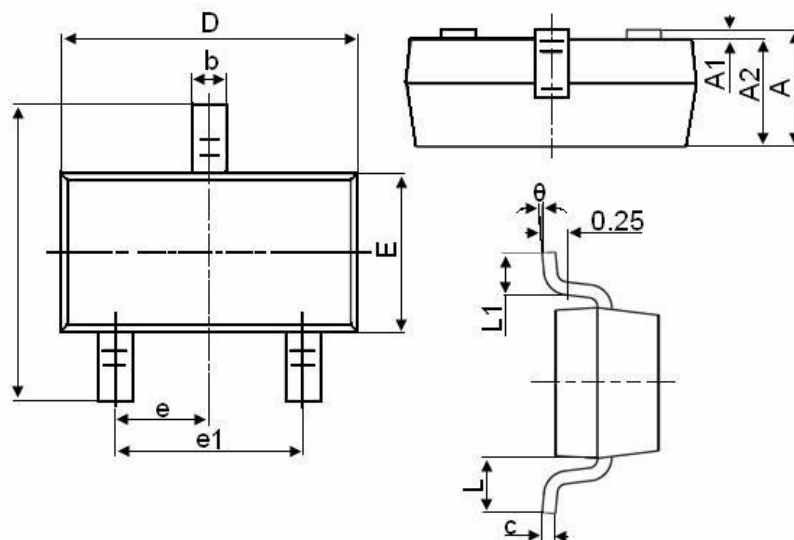


### Diode Recovery Test Circuit & Waveforms





## SOT-23-3L Package Information



| Symbol | Dimensions in Millimeters |       |
|--------|---------------------------|-------|
|        | MIN.                      | MAX.  |
| A      | 1.050                     | 1.250 |
| A1     | 0.000                     | 0.100 |
| A2     | 1.050                     | 1.150 |
| b      | 0.300                     | 0.500 |
| c      | 0.100                     | 0.200 |
| D      | 2.800                     | 3.000 |
| E      | 1.500                     | 1.700 |
| E1     | 2.650                     | 2.950 |
| e      | 0.950TYP                  |       |
| e1     | 1.800                     | 2.000 |
| L      | 0.550REF                  |       |
| L1     | 0.300                     | 0.600 |
| θ      | 0°                        | 8°    |



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