

2nd Generation thinQ!TM SiC Schottky Diode

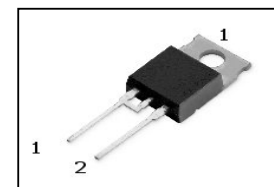
Features

- Revolutionary semiconductor material - Silicon Carbide
- Switching behavior benchmark
- No reverse recovery/ No forward recovery
- No temperature influence on the switching behavior
- High surge current capability
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC¹⁾ for target applications
- Breakdown voltage tested at 5mA²⁾

Product Summary

| | | |
|----------|-----|----|
| V_{DC} | 600 | V |
| Q_c | 8 | nC |
| I_F | 4 | A |

PG-TO220-2-2



thinQ! 2G Diode specially designed for fast switching applications like:

- CCM PFC
- Motor Drives

| Type | Package | | Marking | Pin 1 | Pin 2 |
|-----------|--------------|--|---------|-------|-------|
| IDT04S60C | PG-TO220-2-2 | | D04S60C | C | A |

Maximum ratings, at $T_j=25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Conditions | Value | Unit |
|-----------------------------------------------------|-------------------|--------------------------------------------------------------------------------|-------------|------------------|
| Continuous forward current | I_F | $T_C < 140\text{ }^\circ\text{C}$ | 4 | A |
| RMS forward current | $I_{F,RMS}$ | $f=50\text{ Hz}$ | 5.6 | |
| Surge non-repetitive forward current, sine halfwave | $I_{F,SM}$ | $T_C=25\text{ }^\circ\text{C}$, $t_p=10\text{ ms}$ | 32 | |
| Repetitive peak forward current | $I_{F,RM}$ | $T_j=150\text{ }^\circ\text{C}$, $T_C=100\text{ }^\circ\text{C}$, $D=0.1$ | 18 | |
| Non-repetitive peak forward current | $I_{F,max}$ | $T_C=25\text{ }^\circ\text{C}$, $t_p=10\text{ }\mu\text{s}$ | 132 | |
| i^2t value | $\int i^2 dt$ | $T_C=25\text{ }^\circ\text{C}$, $t_p=10\text{ ms}$ | 5.1 | A ² s |
| Repetitive peak reverse voltage | V_{RRM} | | 600 | V |
| Diode dv/dt ruggedness | dv/dt | $V_R = 0 \dots 480\text{V}$ | 50 | V/ns |
| Power dissipation | P_{tot} | $T_C=25\text{ }^\circ\text{C}$ | 42 | W |
| Operating and storage temperature | T_j , T_{stg} | | -55 ... 175 | $^\circ\text{C}$ |
| Mounting torque | | M3 and M3.5 screws | 60 | Mcm |

| Parameter | Symbol | Conditions | Values | | | Unit |
|-----------|--------|------------|--------|------|------|------|
| | | | min. | typ. | max. | |

Thermal characteristics

| | | | | | | |
|------------------------------------------------------------|------------|-------------------------------------|---|---|-----|-----|
| Thermal resistance, junction - case | R_{thJC} | | - | - | 3.6 | K/W |
| Thermal resistance, junction - ambient | R_{thJA} | leaded | - | - | 62 | |
| Soldering temperature, wavesoldering only allowed at leads | T_{sold} | 1.6mm (0.063 in.) from case for 10s | - | - | 260 | °C |

Electrical characteristics, at $T_j=25\text{ °C}$, unless otherwise specified
Static characteristics

| | | | | | | |
|-----------------------|----------|---------------------------------------|-----|-----|-----|----|
| DC blocking voltage | V_{DC} | $I_R=0.05\text{ mA}$ | 600 | - | - | V |
| Diode forward voltage | V_F | $I_F=4\text{ A}, T_j=25\text{ °C}$ | - | 1.7 | 1.9 | |
| | | $I_F=4\text{ A}, T_j=150\text{ °C}$ | - | 2 | 2.4 | |
| Reverse current | I_R | $V_R=600\text{ V}, T_j=25\text{ °C}$ | - | 0.5 | 50 | µA |
| | | $V_R=600\text{ V}, T_j=150\text{ °C}$ | - | 2 | 500 | |

AC characteristics

| | | | | | | |
|------------------------------|-------|---------------------------------------------------------------------------------------------|---|-----|-----|----|
| Total capacitive charge | Q_c | $V_R=400\text{ V}, I_F \leq I_{F,max}, di_F/dt=200\text{ A/}\mu\text{s}, T_j=150\text{ °C}$ | - | 8 | - | nC |
| Switching time ³⁾ | t_c | $T_j=150\text{ °C}$ | - | - | <10 | ns |
| | C | $V_R=1\text{ V}, f=\text{ MHz}$ | - | 130 | - | pF |
| | | $V_R=300\text{ V}, f=1\text{ MHz}$ | - | 20 | - | |
| | | $V_R=600\text{ V}, f=1\text{ MHz}$ | - | 20 | - | |

¹⁾ J-STD20 and JESD22

²⁾ All devices tested under avalanche conditions, for a time periode of 5ms, at 5mA.

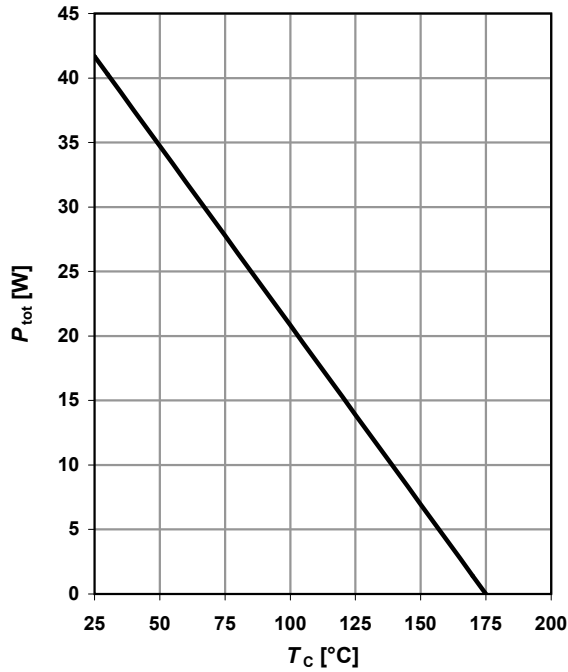
³⁾ t_c is the time constant for the capacitive displacement current waveform (independent from T_j, I_{LOAD} and di/dt), different from t_{rr} , which is dependent on $T_j, I_{LOAD}, di/dt$. No reverse recovery time constant t_{rr} due to absence of minority carrier injection.

⁴⁾ Only capacitive charge occuring, guaranteed by design.

1 Power dissipation

$$P_{tot} = f(T_c)$$

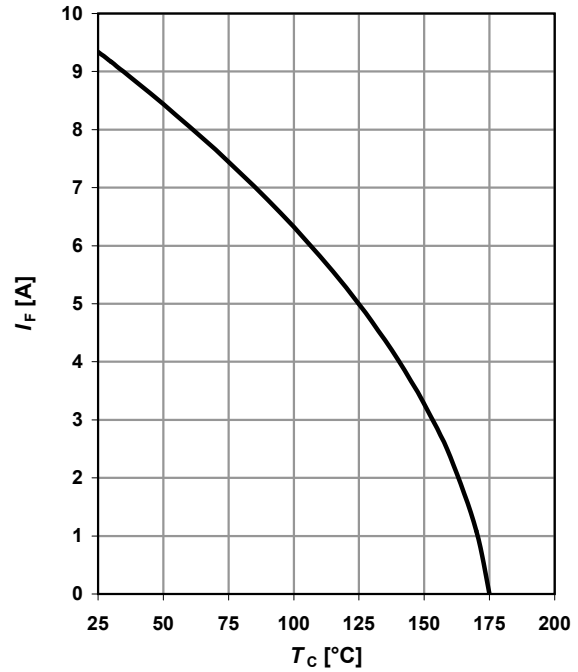
parameter: $R_{thJC(max)}$



2 Diode forward current

$$I_F = f(T_c); T_j \leq 175^\circ C$$

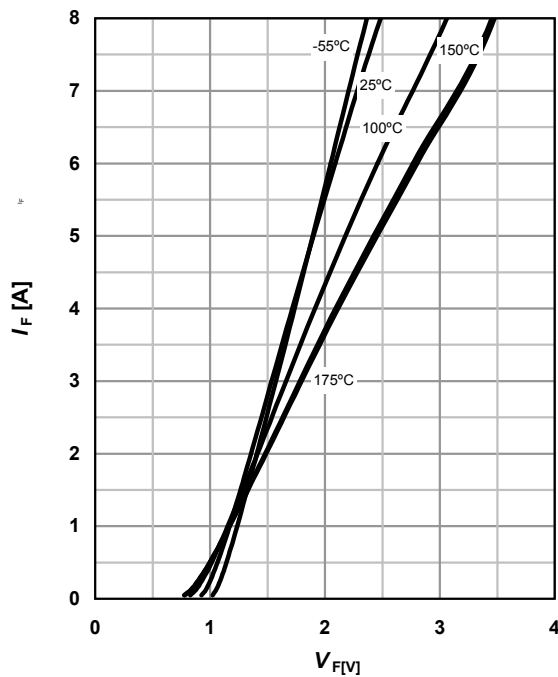
parameter: $R_{thJC(max)}$; $V_{F(max)}$



3 Typ. forward characteristic

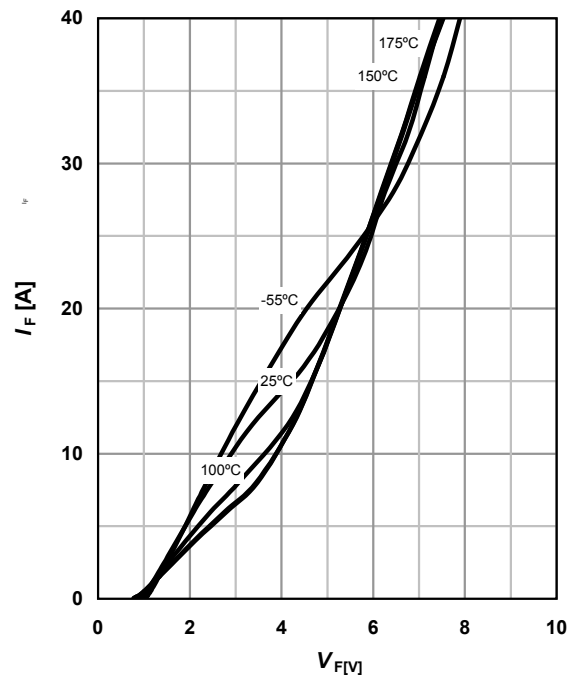
$$I_F = f(V_F); t_p = 400 \mu s$$

parameter: T_j



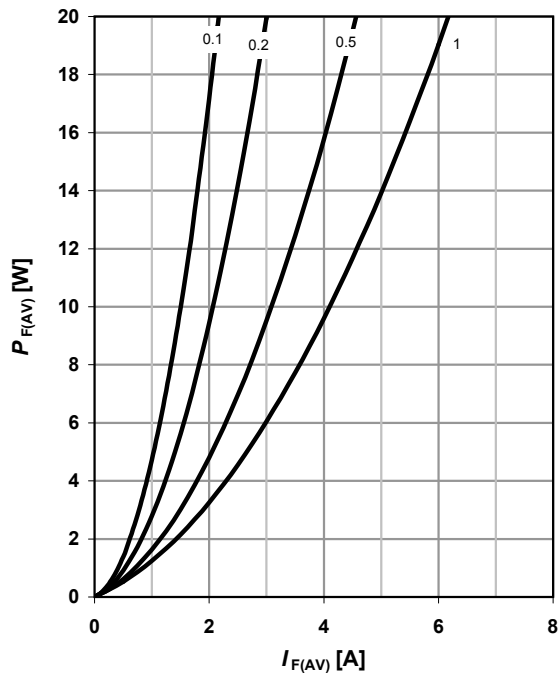
4 Typ. forward characteristic in surge current mode

$$I_F = f(V_F); t_p = 400 \mu s; \text{parameter: } T_j$$



5 Typ. forward power dissipation vs. average forward current

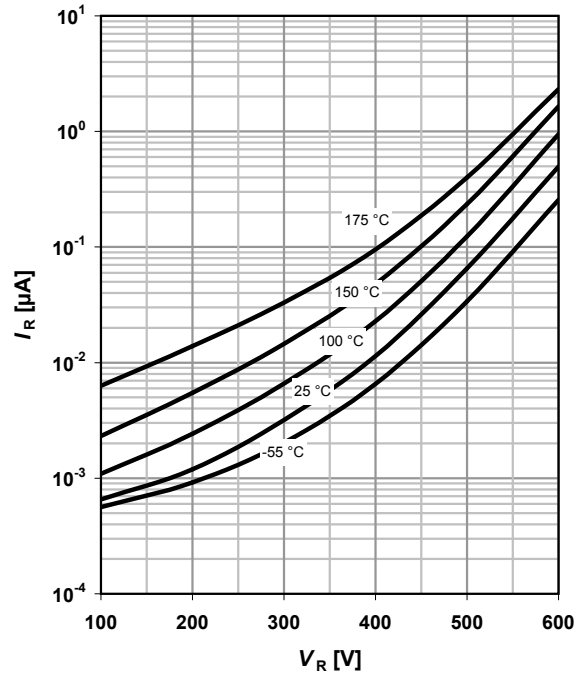
$P_{F,AV}=f(I_F)$, $T_C=100\text{ }^\circ\text{C}$, parameter: $D=t_p/T$



6 Typ. reverse current vs. reverse voltage

$I_R=f(V_R)$

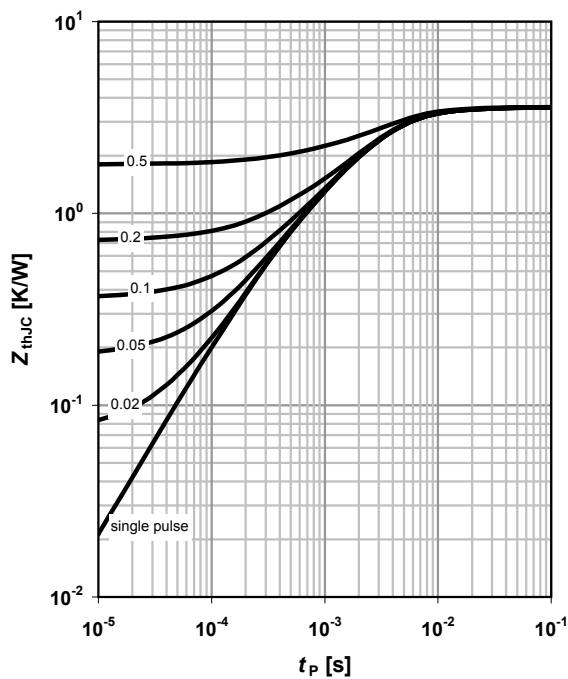
parameter: T_j



7 Transient thermal impedance

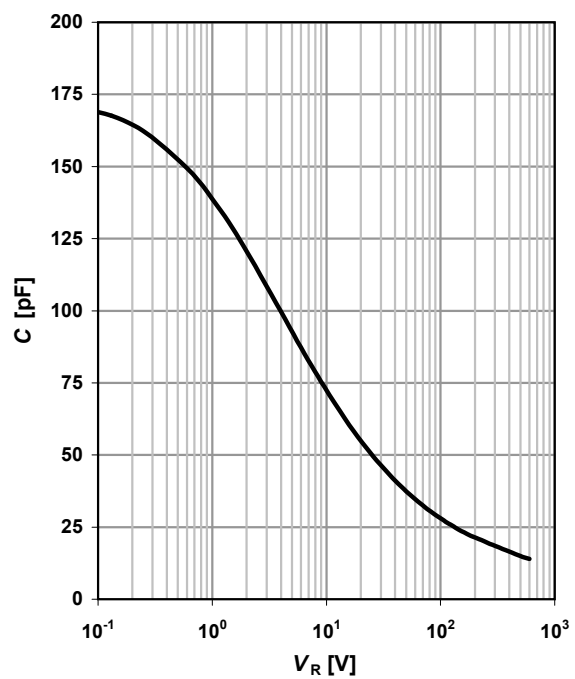
$Z_{thJC}=f(t_p)$

parameter: $D=t_p/T$



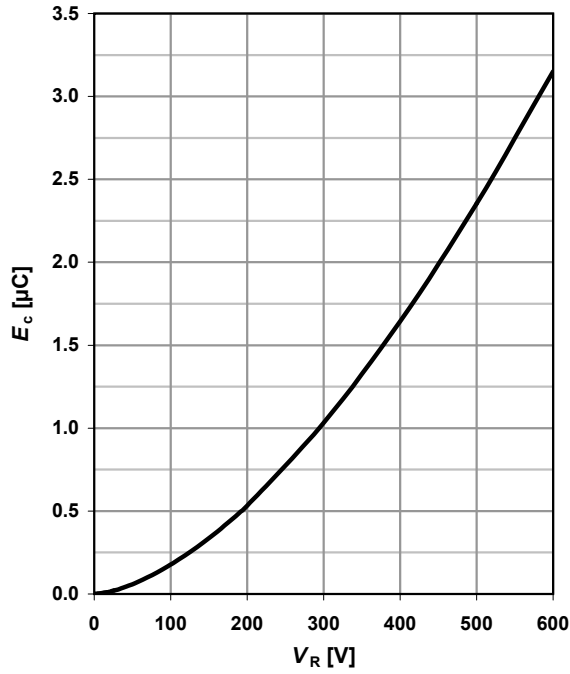
8 Typ. capacitance vs. reverse voltage

$C=f(V_R)$; $T_C=25\text{ }^\circ\text{C}$, $f=1\text{ MHz}$



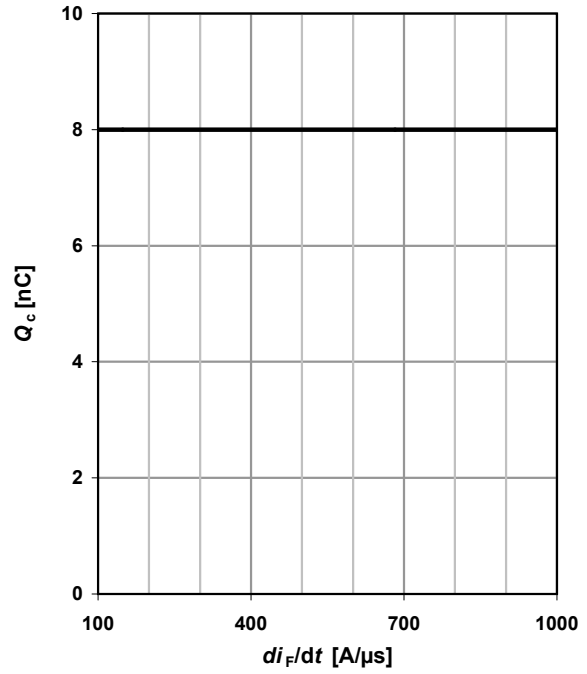
9 Typ. C stored energy

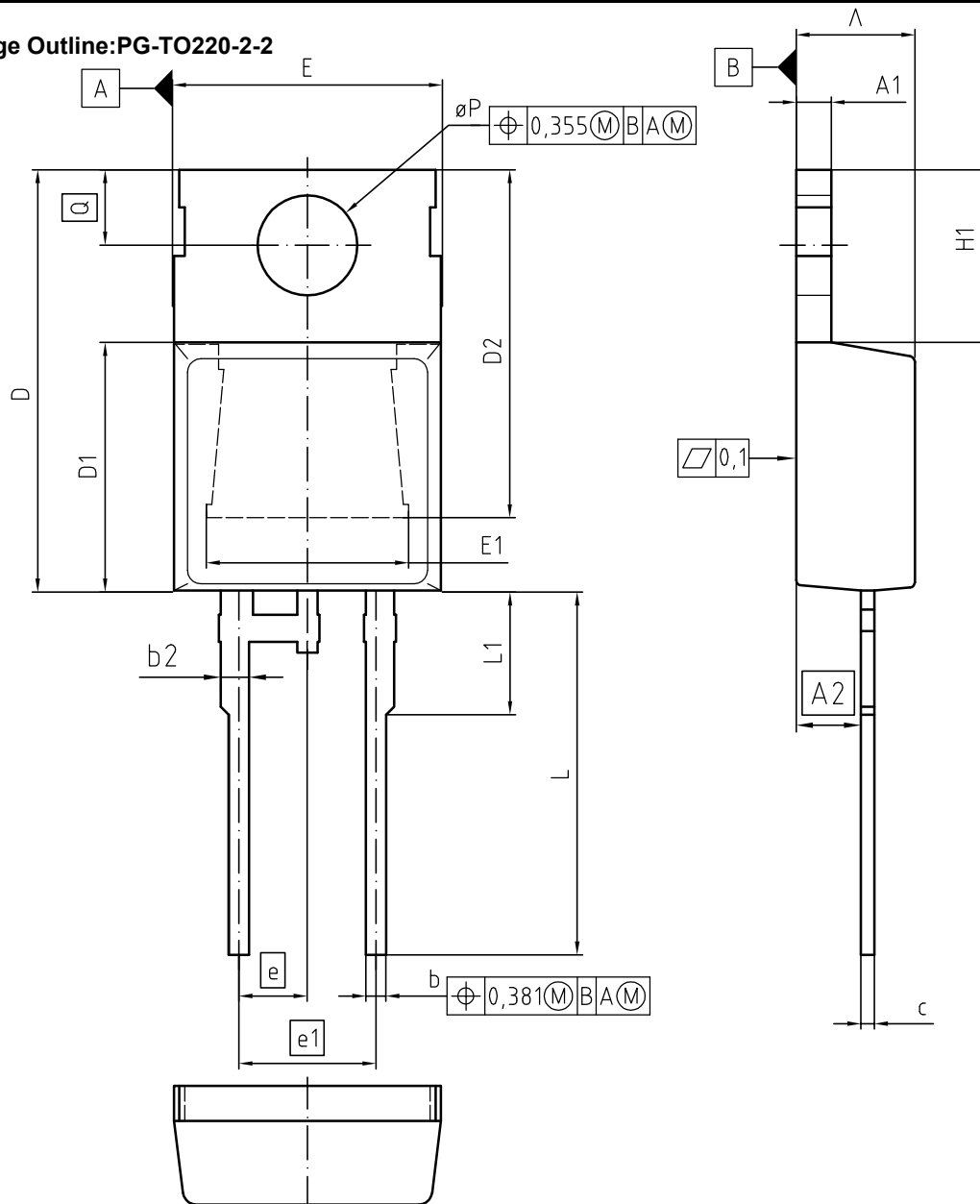
$$E_C = f(V_R)$$



10 Typ. capacitance charge vs. current slope

$$Q_C = f(di_F/dt)^4; T_J = 150\text{ }^\circ\text{C}; I_F \leq I_{F,max}$$



Package Outline:PG-TO220-2-2


| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|--------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 4.191 | 4.699 | 0.165 | 0.185 |
| A1 | 1.170 | 1.400 | 0.046 | 0.055 |
| A2 | 2.215 | 2.718 | 0.087 | 0.107 |
| b | 0.635 | 0.889 | 0.025 | 0.035 |
| b2 | 0.950 | 1.651 | 0.037 | 0.065 |
| c | 0.330 | 0.635 | 0.013 | 0.025 |
| D | 14.808 | 15.950 | 0.583 | 0.628 |
| D1 | 8.509 | 9.450 | 0.335 | 0.372 |
| D2 | 12.850 | 14.245 | 0.506 | 0.561 |
| E | 9.677 | 10.363 | 0.381 | 0.408 |
| E1 | 6.500 | 8.788 | 0.256 | 0.346 |
| e | 2.540 | | 0.100 | |
| e1 | 5.080 | | 0.200 | |
| N | 2 | | 2 | |
| H1 | 5.900 | 6.900 | 0.232 | 0.272 |
| L | 12.700 | 14.000 | 0.500 | 0.551 |
| L1 | 3.048 | 4.800 | 0.120 | 0.189 |
| øP | 3.550 | 3.886 | 0.140 | 0.153 |
| Q | 2.540 | 3.048 | 0.100 | 0.120 |

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