# Dynamic Rdson Test: Key Requirements

- Fast, Single Shot Measurement for good Repeatability
- Test is required to detect areas of wafer with highest trapping
- Tester must tolerate bad DUT to avoid Probe Card failures
- Fast Switching Time from OFF to ON State (need <1µs)
- Fast Sampling to see Transients and Settling Time (need >20 MS/s)
- Vds Stress Voltage needs:
  - Controlled Rise Time (no Overshoot)
  - Current must be Limited
  - Accurate Monitoring of Voltage and Leakage Current
- <1µs Measurement Delay after End Vstress and Start 2$^{nd}$ Rdson
  - Minimize Stray Capacitance and Inductance

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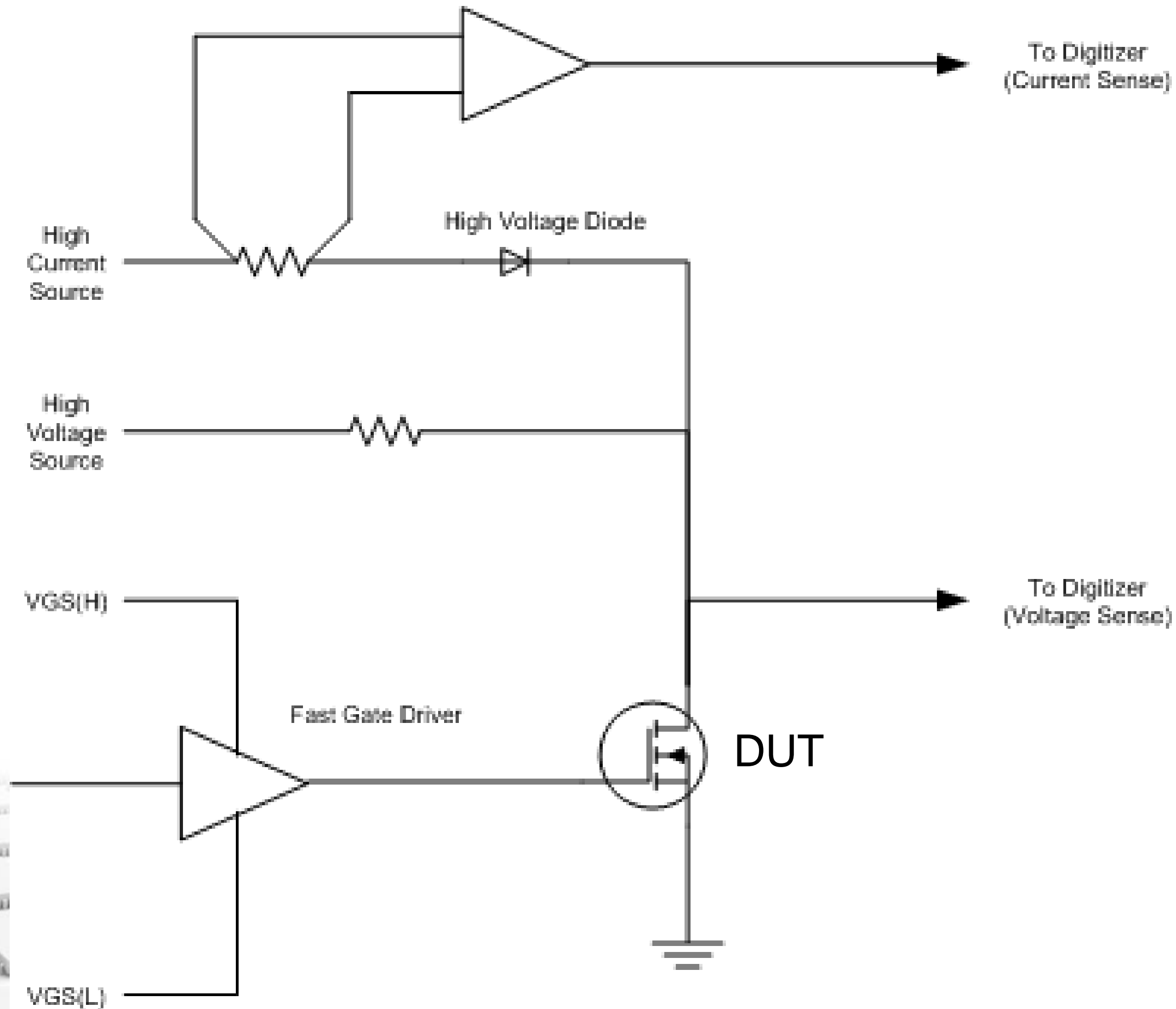
# Dynamic Rdson Test Circuit

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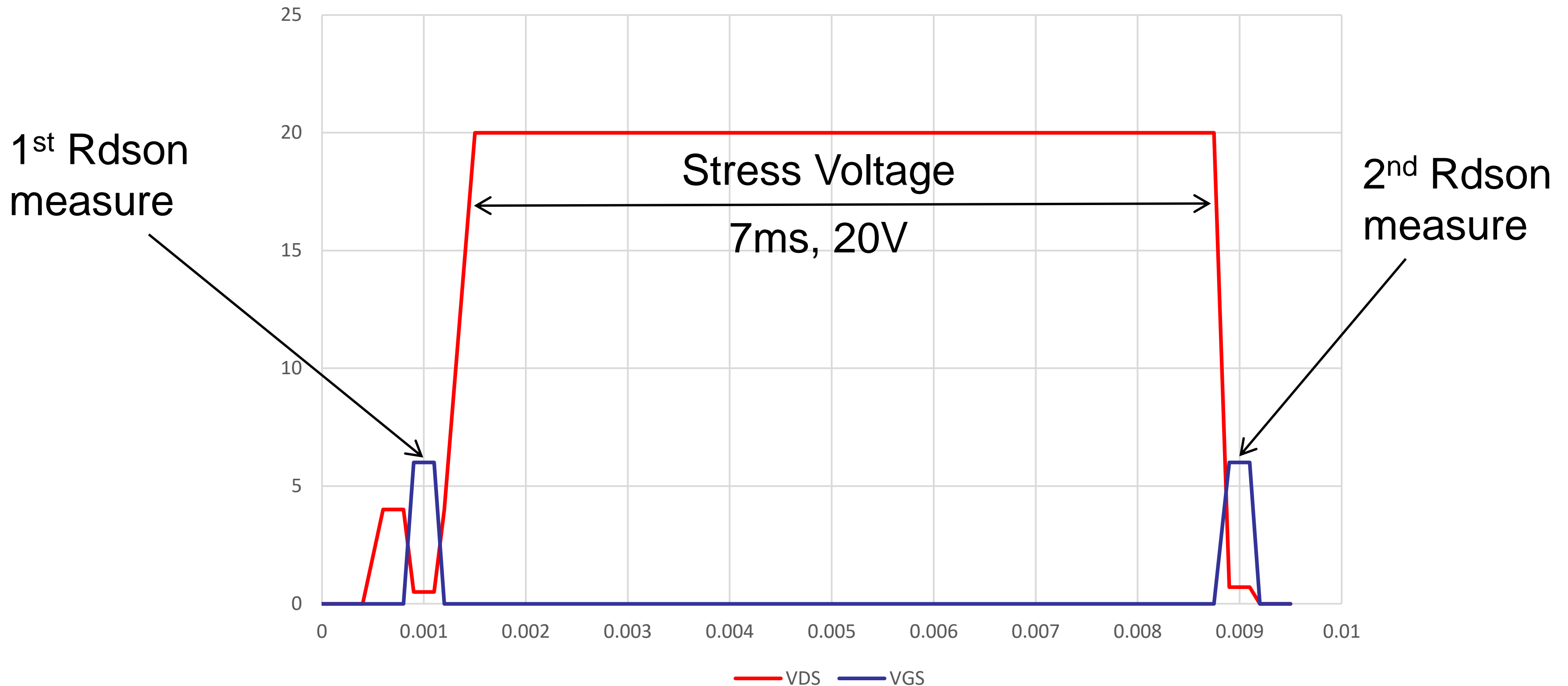
# GaN Dynamic Rdson Test Method

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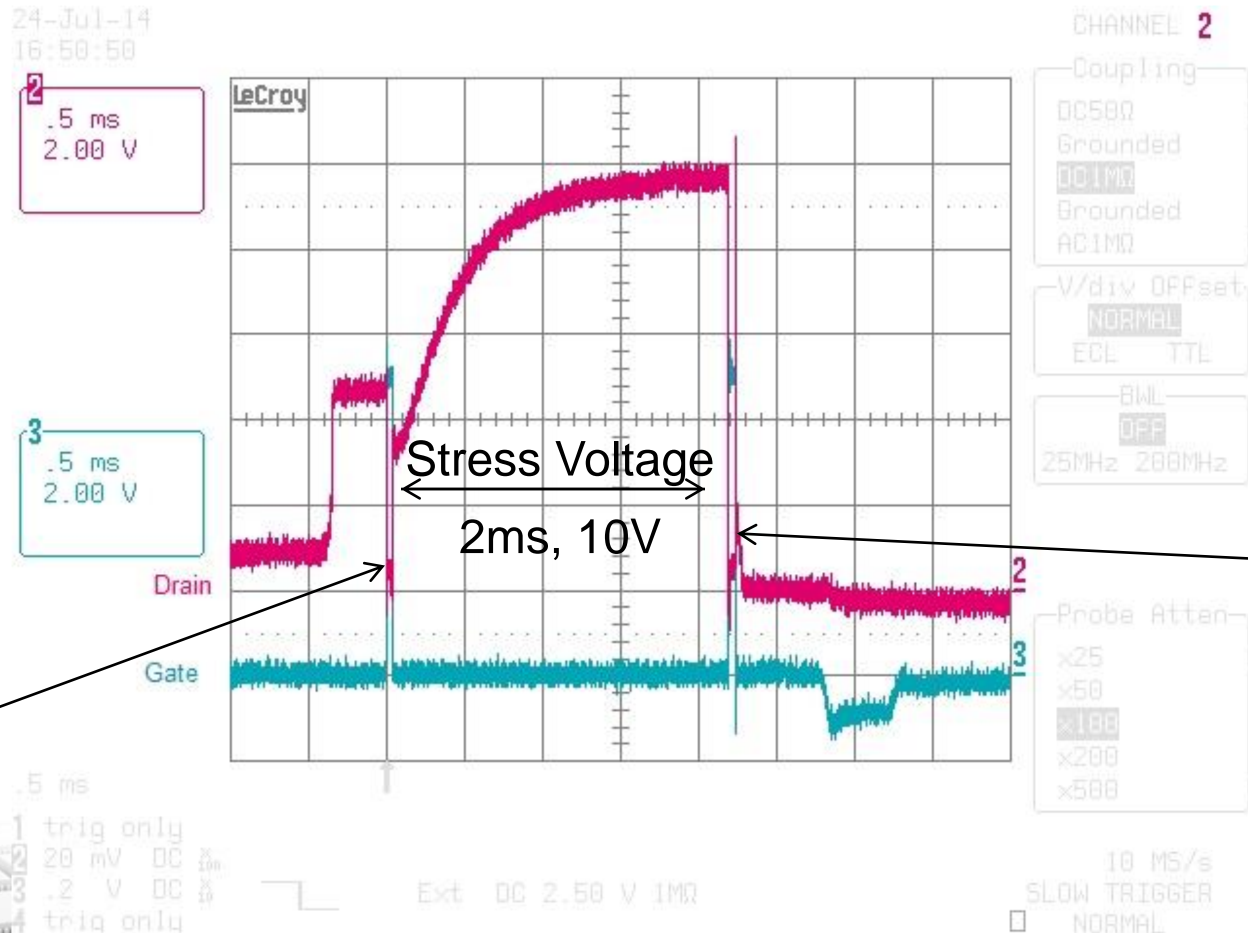
# GaN Dynamic Rdson Test Method

E-Mode Device




1st Rdson measure

2nd Rdson measure

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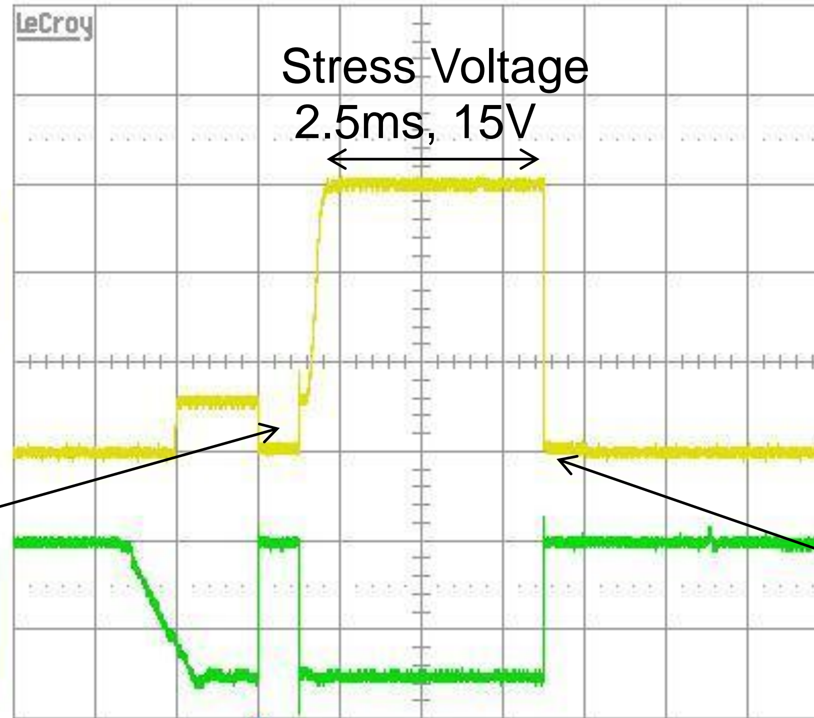
# GaN Dynamic Rdson Test Method

14-Oct-13
21:05:50

MEASURE

D-Mode
Device

DRAIN



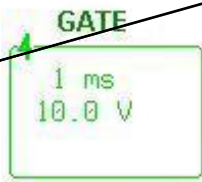

Cursors

Parameters

Pass / Fail

Disk Failure
Analysis

GATE




1st Rdson
measure

2nd Rdson
measure

1 ms

1 1 V DC
2 trig only
3 trig only
4 1 V DC

3 DC 2.24 V

5 MS/s
SLOW TRIGGER
NORMAL

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# GaN Drdson Before Stress

VDS ( V) IDS (A)

Resistance (ohms)

Time (usec)

Vds Initial — Ids Initial — Rds Initial

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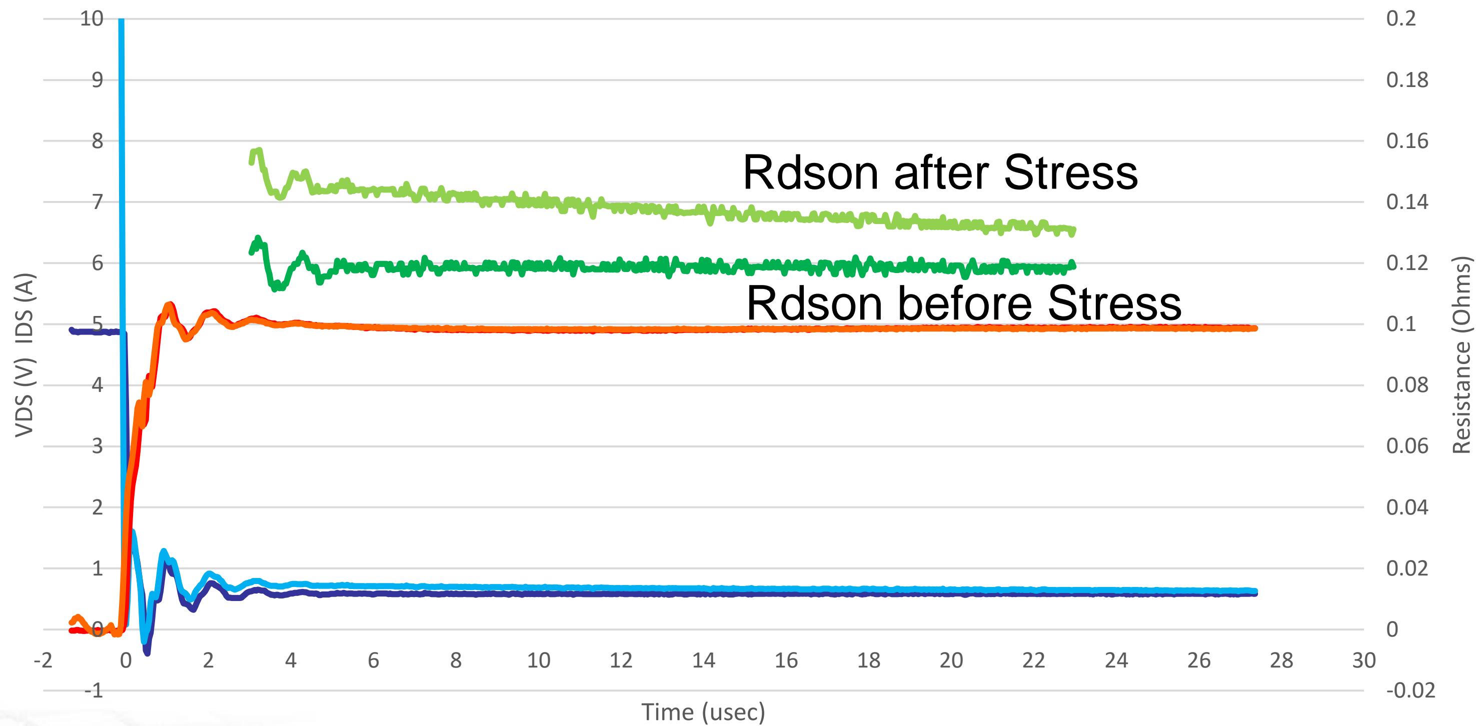
# GaN DRdson after Stress: 500V for 5ms

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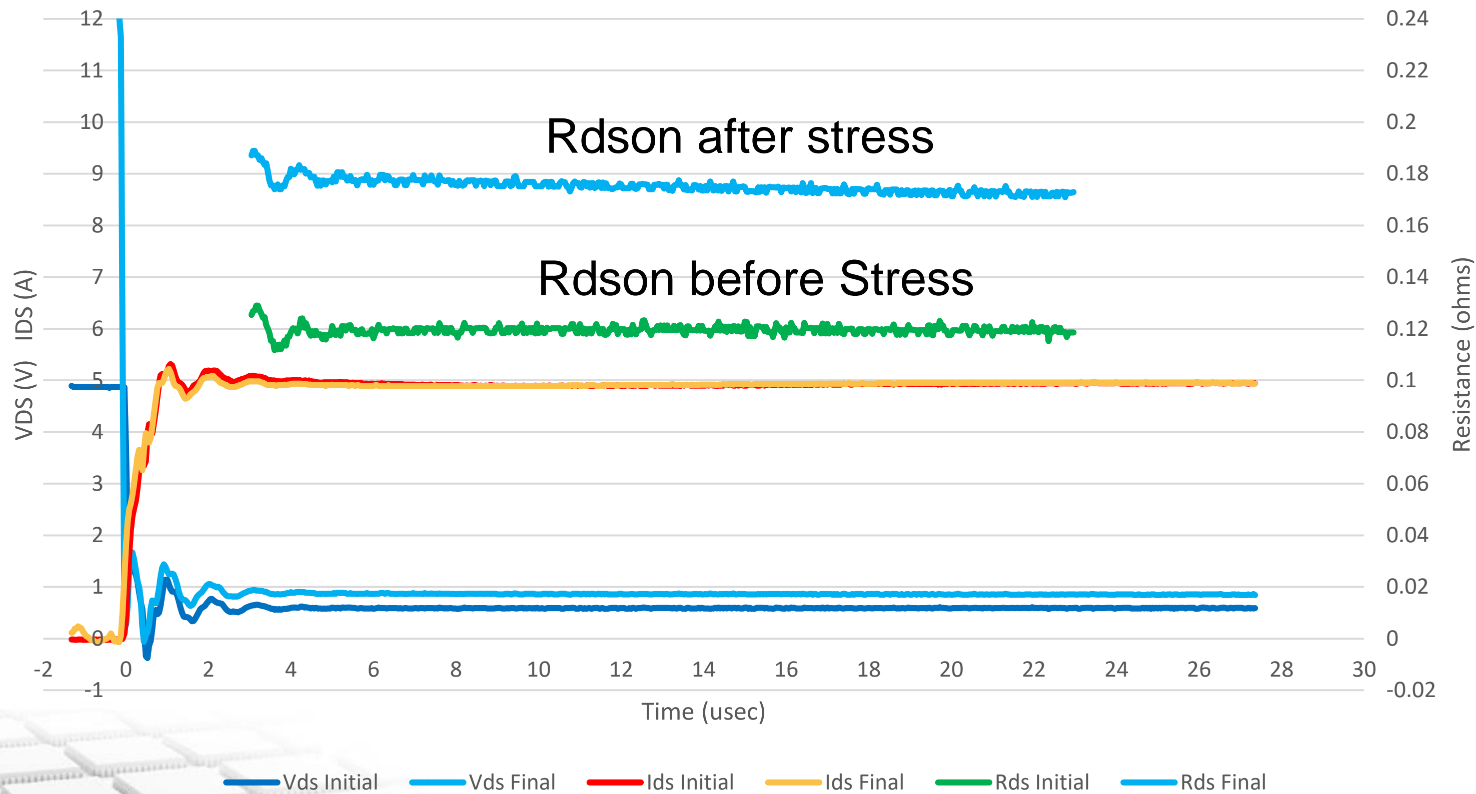
# GaN DRdson after Stress: 500V for 5s

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# FTI 1000 with Dynamic RDson Test Station

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# FAQ's

- Can Hard Switching be used?
  - Yes – add inductance in series with current sensor.
- Need to measure DRdson immediately after Stress to emulate real-life conditions
  - Agreed , but the worst case needs to be measured in a few µs after stress, which is effectively the same measurement as Dynamic Rdson.
- Why test 100% of devices in production test?
  - Trapping varies across the wafer, and so there is no other way to know if a specific die has higher Rdson
- What are minimum practical test times?
  - Measure time 10 µs (5 µs settling, 5 µs averaging), Stress Time 50 – 100 msec for wafer sort.
  - It is possible to test faster, maybe as low as 1 µs settling and < 10 msec stress, for packaged part test.

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