life.augmented

Meeting review ST-CNES

STRH12P10 dynamic test

2022, May 12th

Giuseppe CAMONITA

Hi-Rel Space Power Transistor Marketing Manager
ADG - Low Voltage Integrated Power Division

STRH12P10
dynamic test

The Trr and switching times provided at the qualification time (~15 years ago) were defined without sufficient margin vs. the limits. As consequence ESCC and data-sheet are not aligned with the real characteristics.

REVERSE RECOVERY TIME (Trr)

The actual ESCC detailed spec and ST data-sheet are:

- ISD = 12A, di/dt = 40 A/µs, VDD = 60V, Tj = 25 °C max 258 ns.
- ISD = 12 A, di/dt = 40 A/µs, VDD = 60 V, Tj = 150°C max 335 ns

Since long time no parts have been tested and, in a recent characterization, values above the max limit have been found.

Also the condition of ISD = 12A shows some abnormal instability due to the high value of the reverse recovery current (IRRM) of about 20A required to achieve ISD = 12A.

To avoid mismatch and solve the issue, Trr has been characterized at different conditions and the best trade-off have been found as follows. As consequence ST is proposing to modify the test according to.

ISD = 6A, di/dt = 50A/µs, VDD = 50 V, Tj = 25°C max 310 ns.
ISD = 6A, di/dt = 50 A/µs, VDD = 50 V, Tj = 150°C max 400 ns

> At ISD = 6A the correspondent IRRM is about 11A which is a more stable condition for the device.

life.augmented

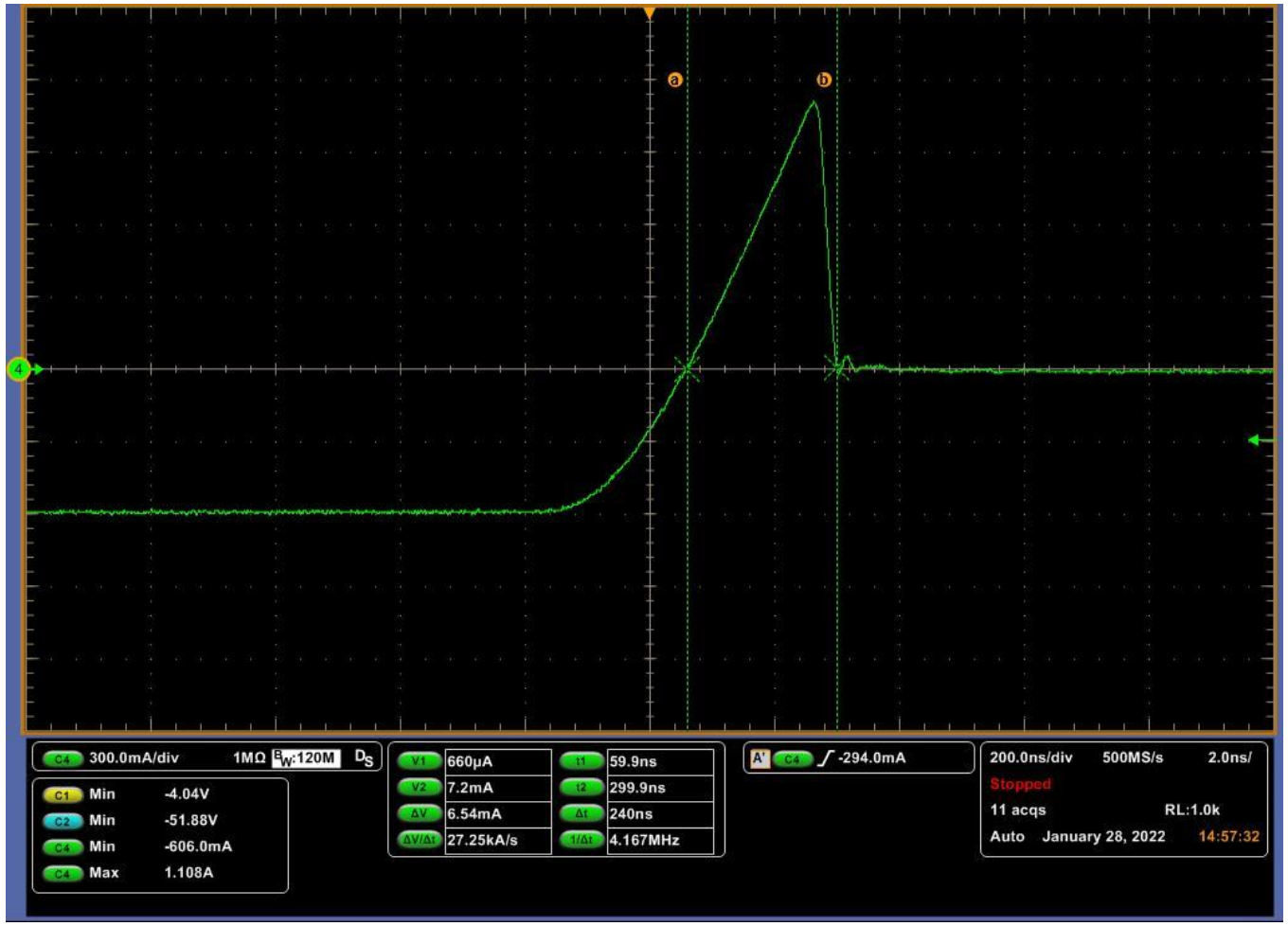
STRH12P10
Reverse Recovery Time waveform

Test conditions

Vdd = -50V
Id = -6A
di/dt = 50A/µs
Tj = 25°C

Measurements

Irm (A)	TIrm (ns)	Trr (ns)	Qrr (nC)
11.1	206	242	1345



- Id (ch4) = 3A/div
- t = 200ns/div

STRH12P10
switching times

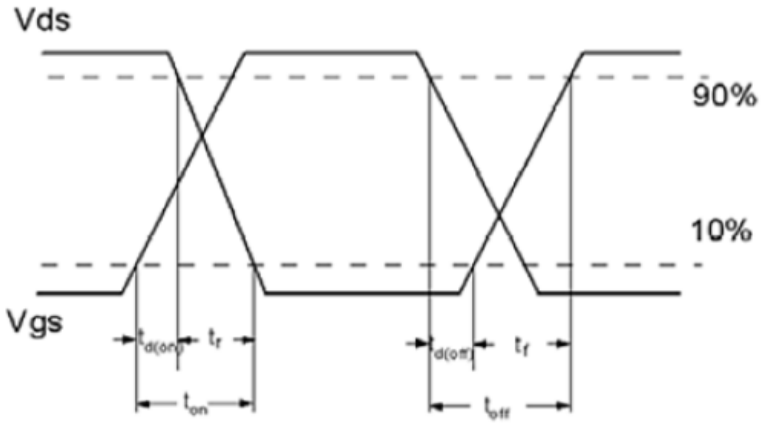
- During the characterization also Tdon and Tdoff has been noted with values too close to the max limit.
- To reduce marginality, new limits are proposed with an increase of 20%.

Test	value	Actual max	New max
t_{don} (ns)	12.5	13	15.6
t_{doff} (ns)	41.0	42	50.4

Conditions remain unchanged

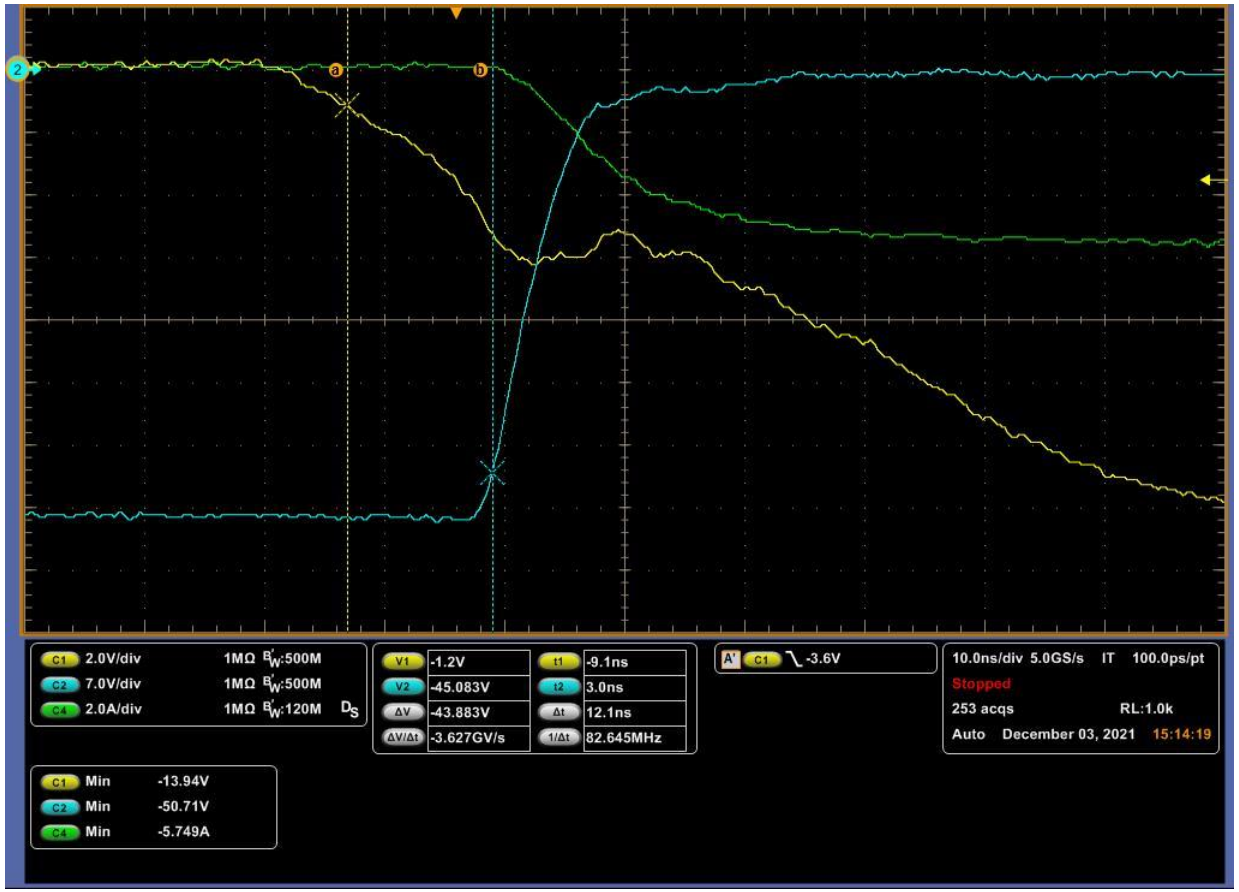
Vdd = -50V
Id = -6A
Vgs = -12V
Rg = 4.7Ω
Tc = 25°C

Test method and measurement points



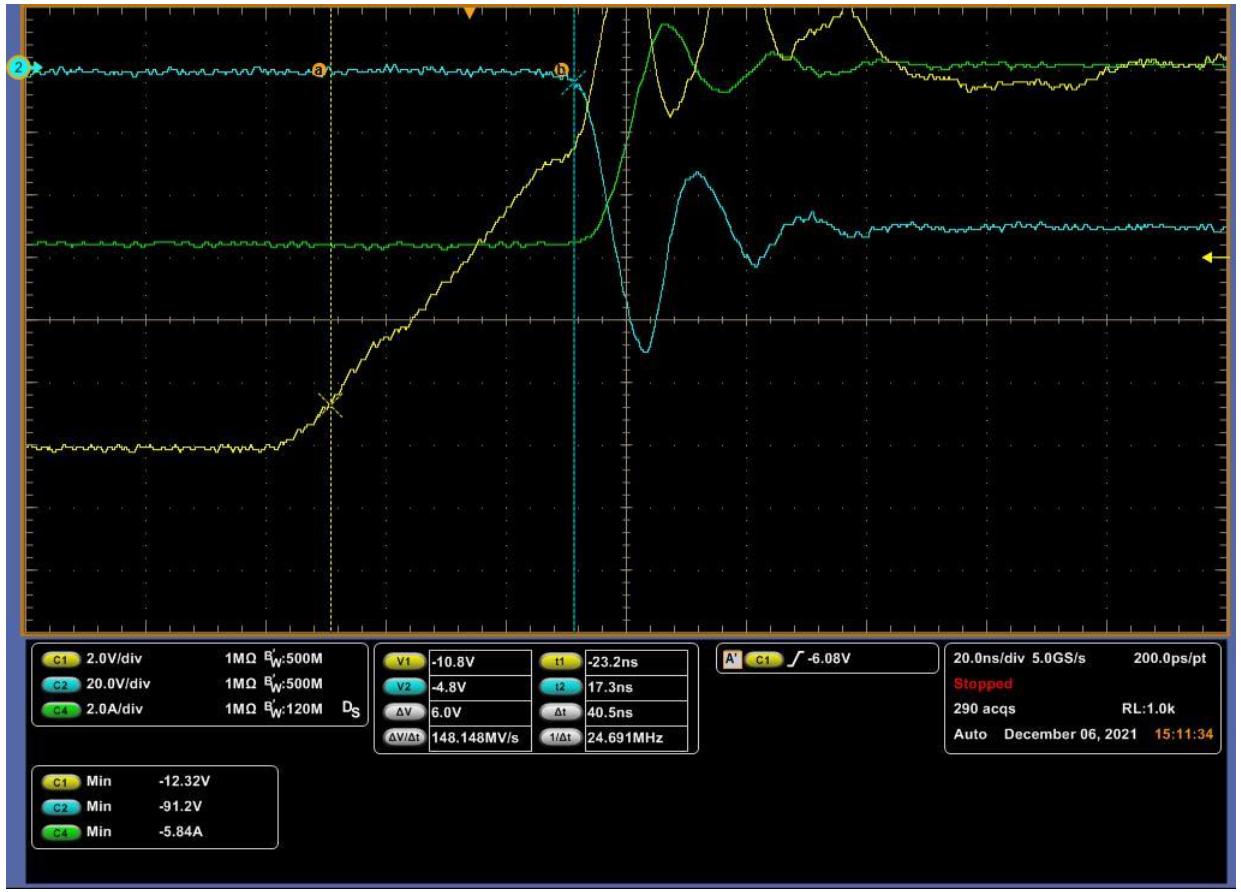
life.augmented

STRH12P10
switching times waveforms



t_{don}

- Id (ch4) = 2A/div
- Vds (ch2) = 7V/div
- Vgate (ch1) = 2V/div
- t = 10ns/div



t_{doff}

- Id (ch4) = 2A/div
- Vds (ch2) = 20V/div
- Vgate= ch1=2V/div
- t=20ns/div

STRH12P10
Conclusions

- Recent dynamic characterization has been performed on a significant number of devices.
- It has been detected poor marginality and unstable mesaurements vs. the actual conditions and limits.
- No diffusion process has been changed since the qualification.
- New limits and conditions have been defined to reflect the product’s characteristics.
- From application and reliability perspective there is no impact in terms of performance or stability.
- Formal notification will be provided to Agencies (DCR) and customers.

Thank you

life.augmented