Date: 11.04.2019

Attendees: Mesut Uğur, Furkan Karakaya

Location: Electrical Machines Laboratory

Target: V1.3 Gate Driver Board (#1)

Test type: Double Pulse Test

Aims before the test:

1. To test the new version Gate Driver Board (GDB) for the first time

2. To verify the design of new GDB with Double Pulse Test (DPT) applied to each phase

3. To observe the potential improvements on Vds and Vgs overshoots and oscillations with the new layout design

Conditions: All-phases, 22 Ohm Ron, 2 Ohm Roff. 0-300V VDC. Load: Stage-2

Steps:

1. Electrical and functional tests are applied to the board step by step. All VCC voltages and gate driver circuits are verified and the board is prepared for the DPT tests.

2. DPT is applied by observing Vds (turn-off) and Vgs (false-turn-on region) separately. The load is connected to bottom switch and Vds and Vgs are observed from the bottom switch for all tests.

3. On each phase, Vds is observed from 0V to 100V first.

4. On each phase, Vgs is observed from 0V to 200V.

5. On each phase, Vds is observed from 100V to 200V. Vds overshoots are quite similar to each other, and very low compared to the old GDB version (until 200V).

6. On phase-a, Vgs is observed from 200V to 300V. False-turn-on performance is promising.

7. On phase-c, Vgs is observed from 200V to 300V. False-turn-on performance is also promising. However, a weird peak emerges for 260VDC and higher, 100 ns after the first false-turn-on moment (where top switch is turned-off). Its emergence, number of peaks and amplitude (max 2.2V) changes from trial to trial, showing a probabilistic behaviour.

8. Phase-A and Phase-C are indirectly tested for isolation, and no problem occured.

What to do next:

1. The remaining DPTs will be applied.

a. Phase-B Vgs 200V-300V, Phase-B Vds 200V-300V, Phase-A Vds 200V-300V, Phase-C Vds 200V-300V

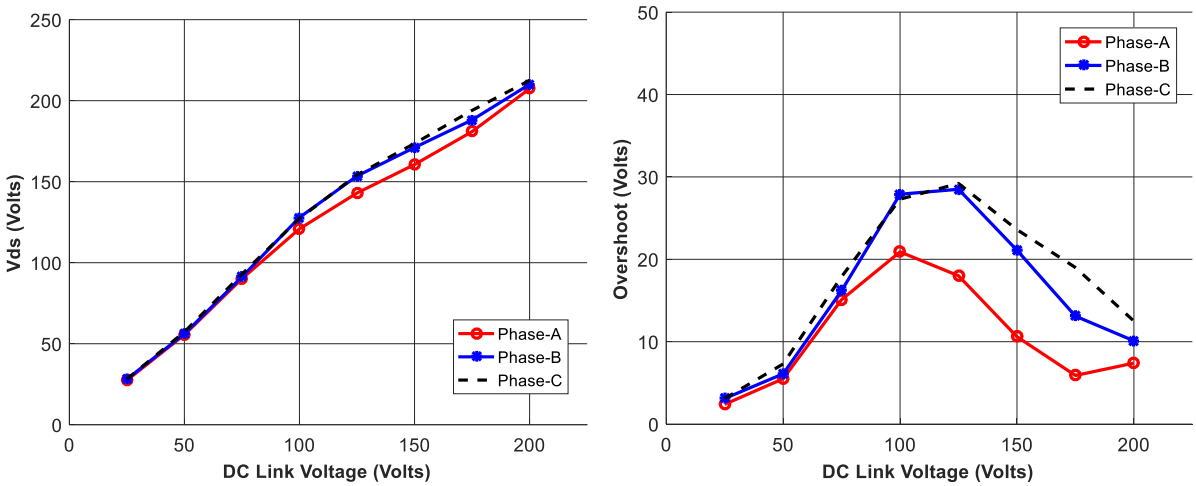
2. The new peak on the Vgs will be analyzed thoroughly. PWM signal, top switch gate (by changing the load connection) and/or N3V voltage will be observed on those moments to get an idea.

3. Successive DPT tests may be applied.

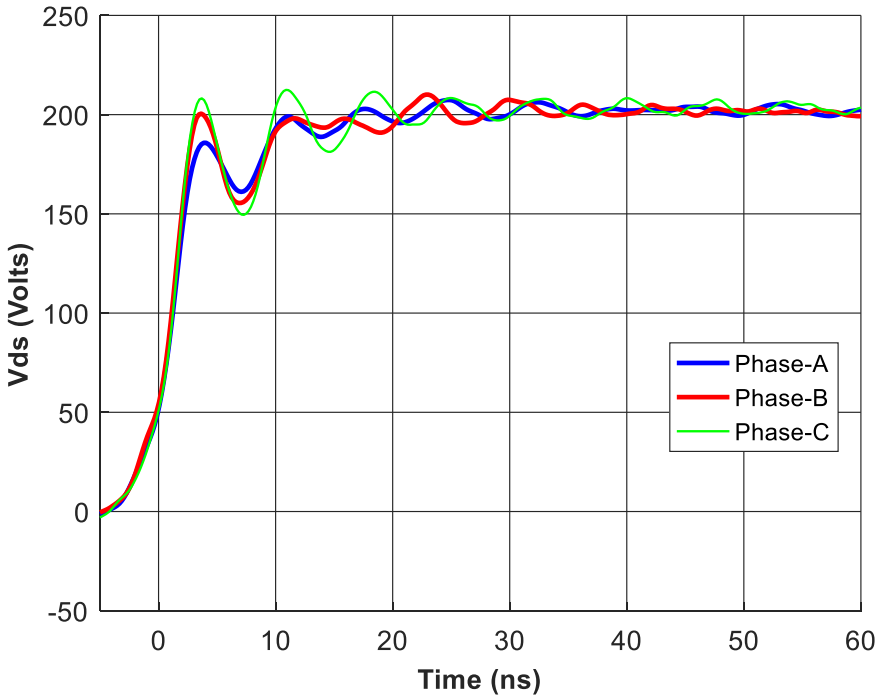
4. If no problem occurs, 3-phase inverter test with light load will be applied from 0V to 300V by increasing the voltage slowly.

Results:

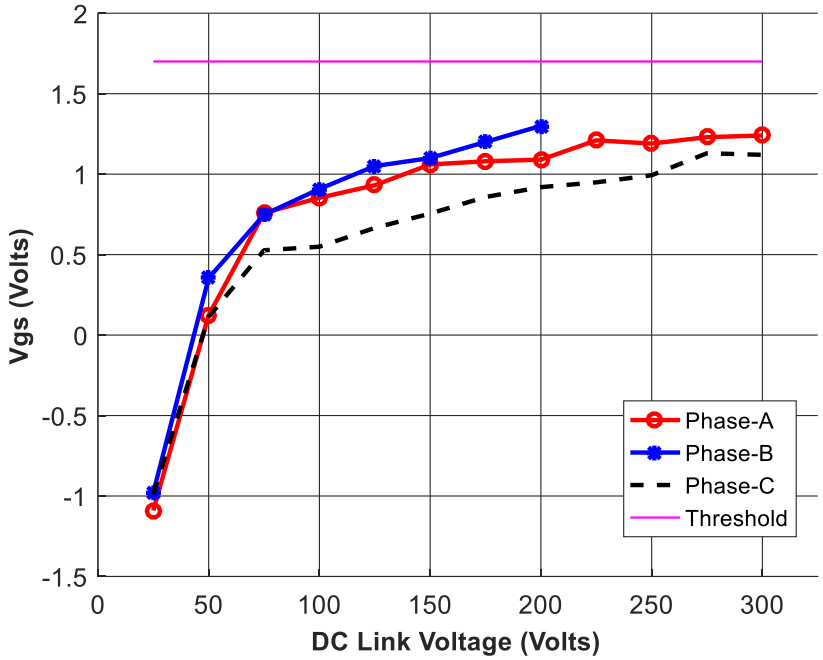
1. Vds Overshoot



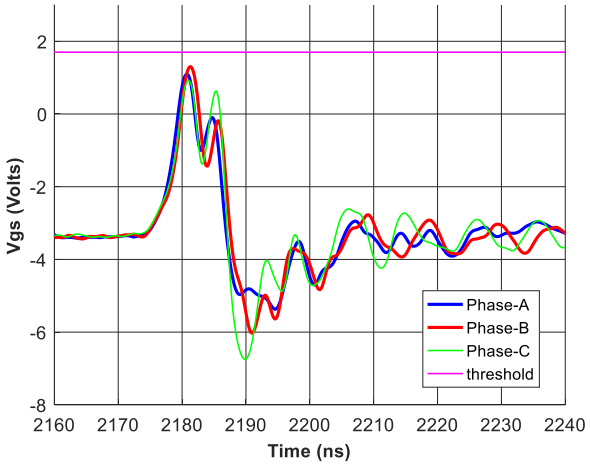
200V



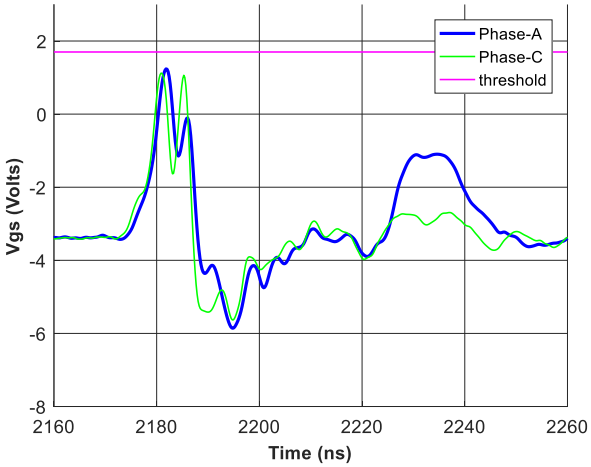
2. Vgs False-Turn-On



200V



300V



3. Gariplikler