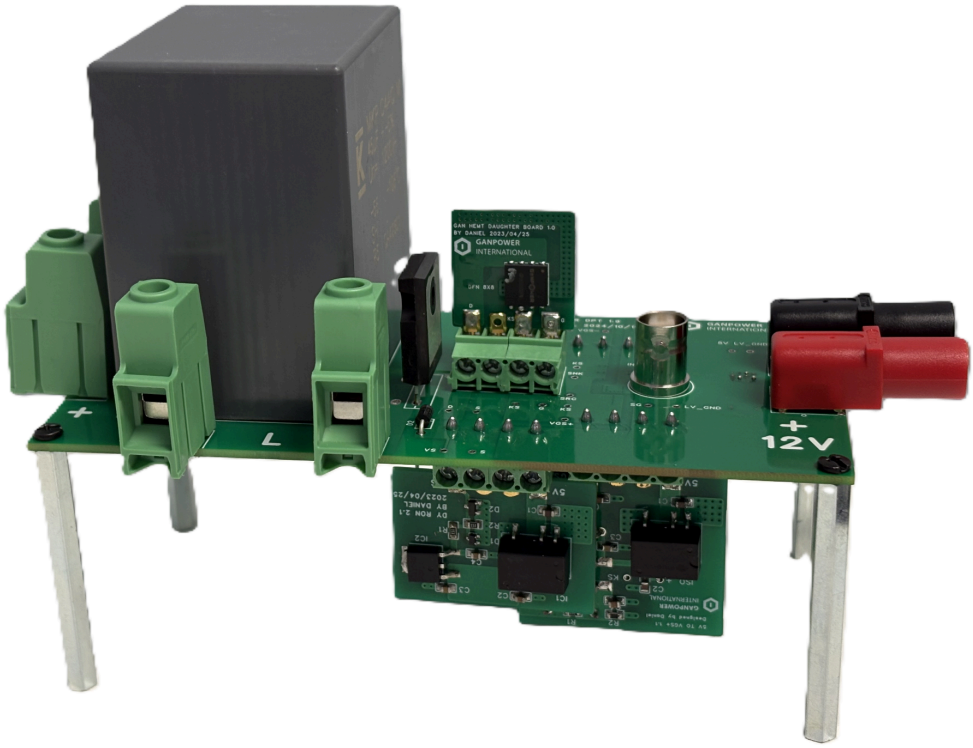
GaNPower Double Pulse Test (DPT) 1.9 Evaluation Board

Technical Manual

By Heemal Parimoo and Daniel Wan



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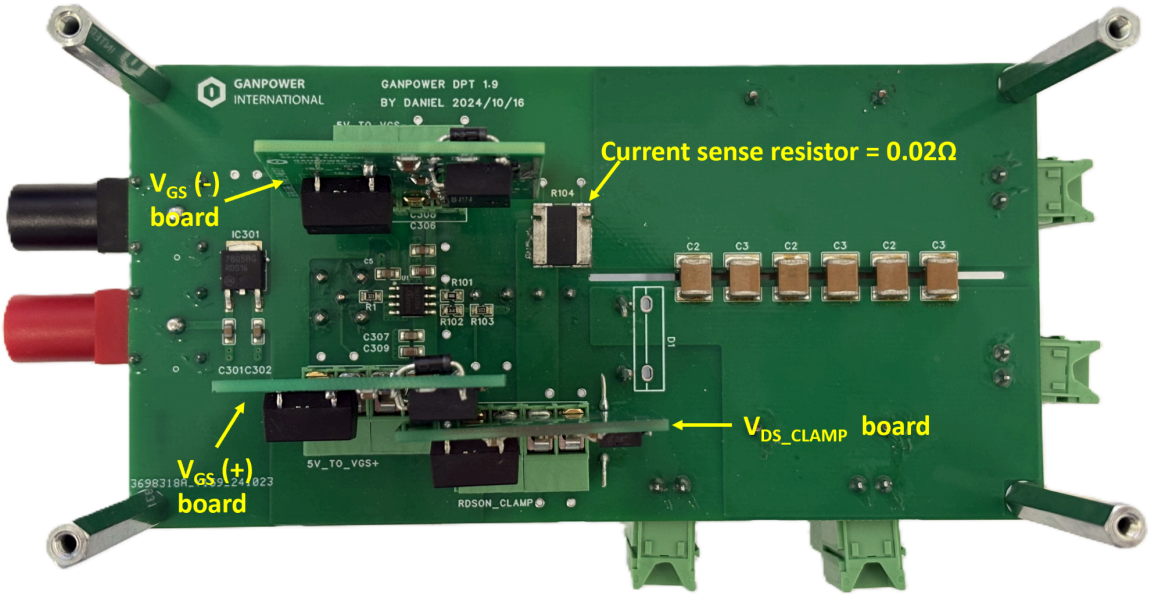

Figure 1: GaNPower Evaluation Board Bottom View.

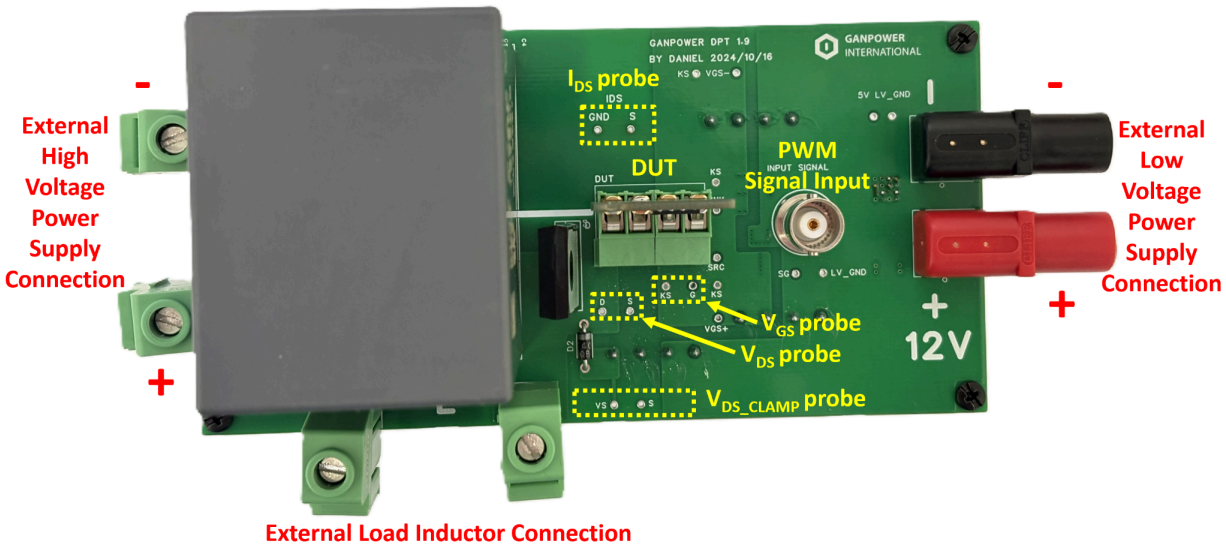

Figure 2: GaNPower Evaluation Board Top View.

Schematic and Details of the DPT Evaluation Board

The schematic and the details of each component are provided in Fig. 3 and Table 1.

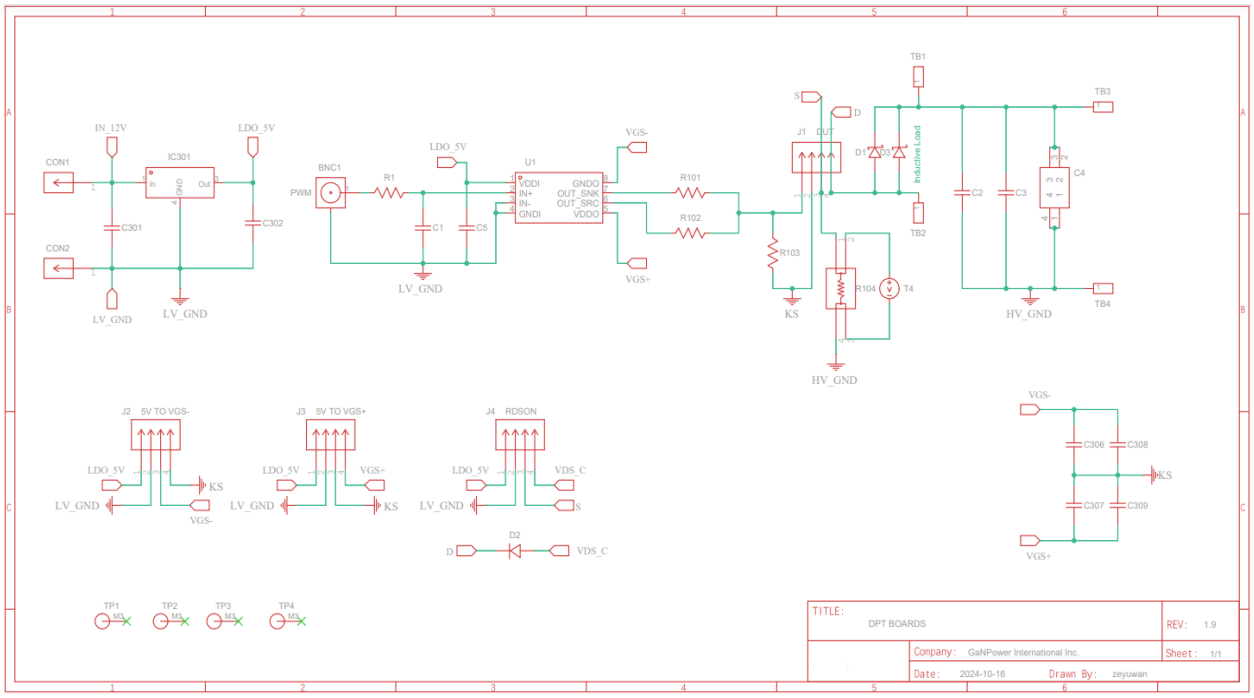

Figure 3: Schematic of GaNPower Double Pulse Testing

Table 1: Bill of Components on the GaNPower DPT Evaluation Board

#ITEM	Designator	Value	Description
1	12V	BNA Socket	12V input for the board
2	Input Signal	BNC Socket	PWM signal input for V_{GS}
3	TB1/TB2 TB3/TB4	1P Socket	Terminal blocks for load inductor Terminal blocks for V_{BUS}
4	D1	1200V/10A	Free-wheeling SiC Diode
5	D2	1000V/1A	Rectifier
6	C4	45 µF	Film Capacitor
7	R104	20 mΩ	Current Sense resistor
8	U1	1EDBX275F series	Isolated Gate Driver
9	R1	300 Ω	SMD Resistor
10	R101	0 Ω	SMD Resistor
11	R102	2 Ω	SMD Resistor
12	R103	10 kΩ	SMD Resistor
13	C5/C306/C307	0.1 µF	MLCC Capacitor
14	C2/C3	0.1 µF	MLCC Capacitor (High Voltage)
15	IC301	12V to 5V	LDO
16	C301	0.33 µF	MLCC Capacitor
17	C302	1 µF	MLCC Capacitor
18	C308/C309	10 µF	MLCC Capacitor

Quick Start Guide

This chapter will guide the user through the evaluation board overview, hardware operation, test setup, and test results.

Evaluation Board Overview

- Connect both the high voltage ($0V_{DC} < V_{IN} < 1200V_{DC}$) and low voltage ($12V_{DC}$) power supplies.
    - **Note: Ensure correct polarity when connecting power supplies**
- Connect your PWM/function generator at the INPUT SIGNAL location.
- Always connect the external load inductor (L-load = 360 µH in this manual)
- Plug-in $V_{GS}(+)$, $V_{GS}(-)$ and V_{DS_CLAMP} daughter boards.
- Connect the oscilloscope probes for V_{GS}, V_{DS}, I_{DS}, dynamic R_{DSON} measurements, and other performance verifications.

Double Pulse Test Step-by-Step Guide & Evaluation results

The general guidelines for operating the evaluation board for double pulse testing (DPT) are listed in this section. Follow the steps to configure the hardware properly.

1. Pre-set the PWM frequency and the duty cycle on the function generator. Figure 4 shows the input signal configuration used in this manual for DPT.

Figure 4: Configuration for the PWM pulse signal using the RIGOL waveform generator.

2. Apply the low-voltage power (V_{DC}=12V) supply.

3. For double pulse measurements, probe the DUT drain (D) and source terminal (S) for V_{DS} measurements and the GND (I_{DS}) terminal and DUT source terminal (S) for I_{DS} measurements. For dynamic R_{DSON} measurement, probe V_S and S.

4. Apply the PWM pulse signal to INPUT SIGNAL and check the V_{GS} waveform and V_{DS_CLAMP} waveform. To set-up for the dynamic R_{DSON} measurements, note the **baseline** of V_{DS_CLAMP} **(0.873 V)** as seen in Figure 5 .

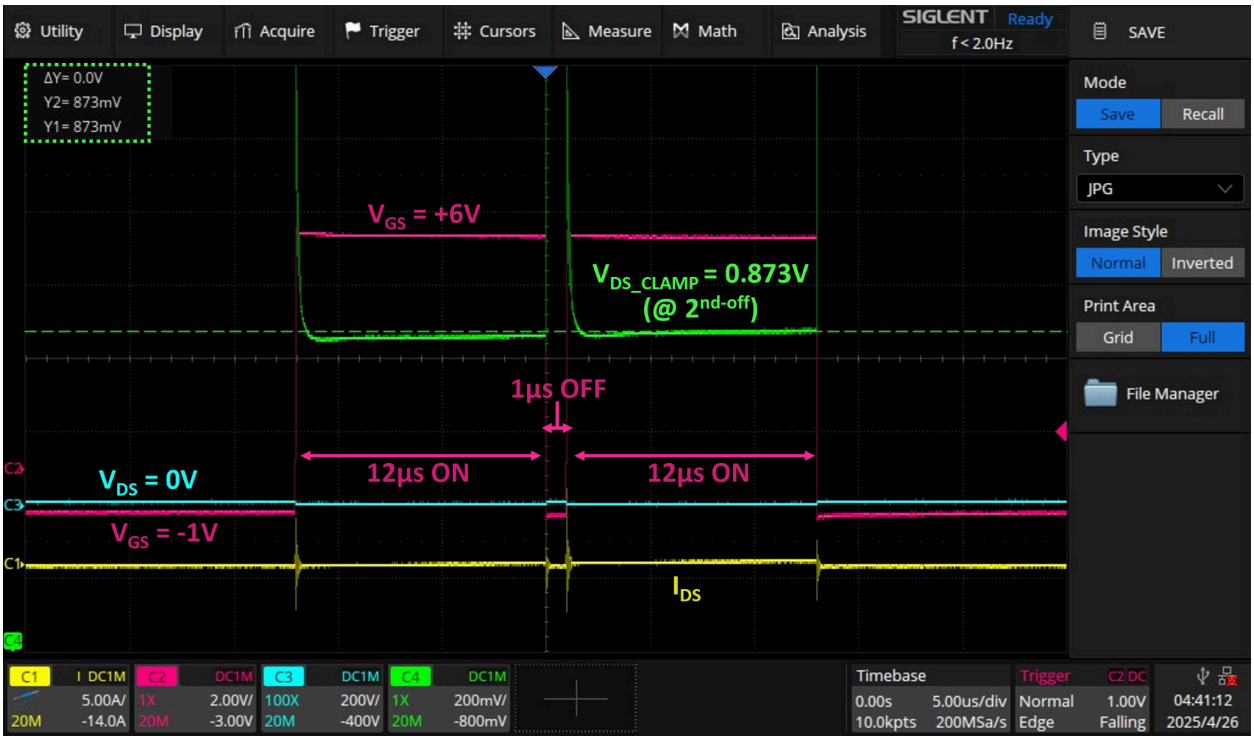

Figure 5: DPT of GPI65030DF88 at V_{BUS} = 0V, showing V_{DS_CLAMP} baseline.

5. Apply the high-voltage power supply ($0V_{DC} < V_{IN} < 1200V_{DC}$).

6. Apply the PWM pulse signal to INPUT SIGNAL and monitor the DUT drain voltage, current and dynamic R_{DSON}. Figure 6 shows the DPT of GPI65030DF88 without the R_{DSON} waveform at V_{BUS} = 650V.

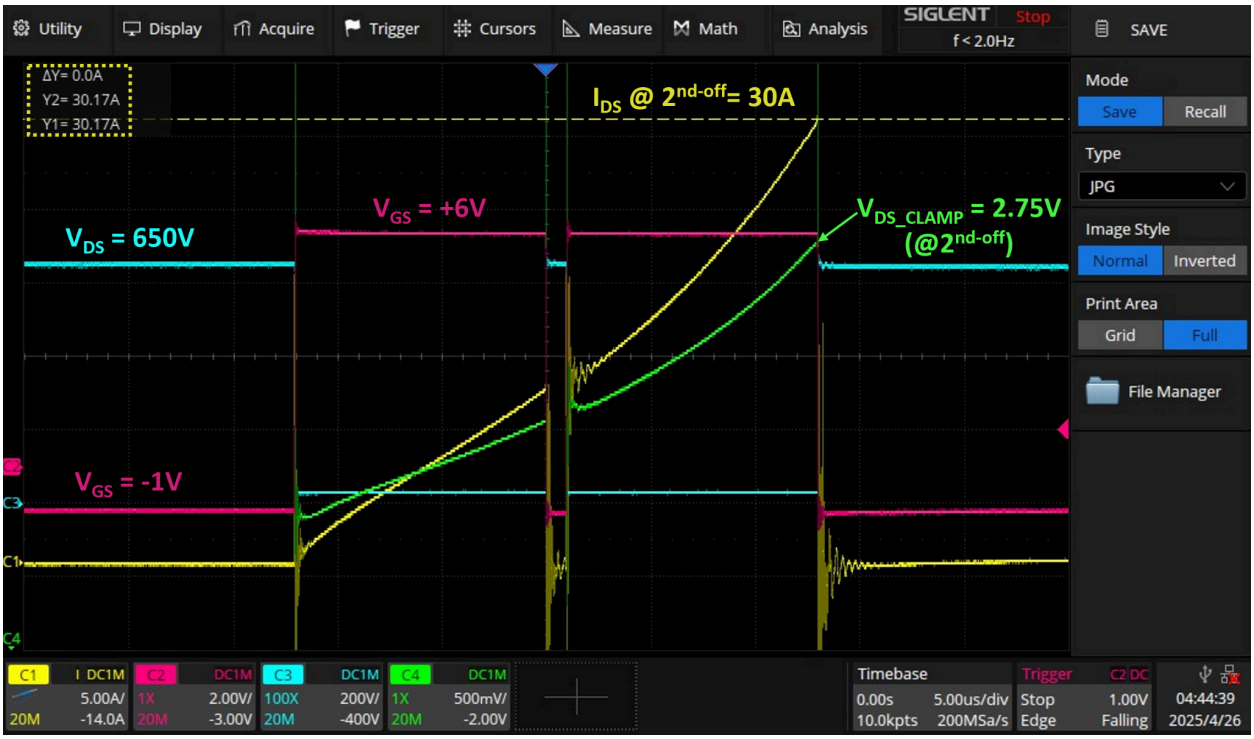

Figure 6: DPT of GPI65030DF88 at V_{BUS} = 650V, with L-load = 360 µH.

7. Calculate dynamic R_{DSON} using the following formula:

   Dynamic R_{DSON} = (V_{DS_CLAMP} - baseline) / I_{DS}

   In Figure 7, the "Math" function was used on the oscilloscope to generate the dynamic R_{DSON} waveform using the V_{DS_CLAMP} and I_{DS} waveform → R_{DSON} @ 2nd-off = (2.75 V - 0.873 V) / 30A = 62 mΩ

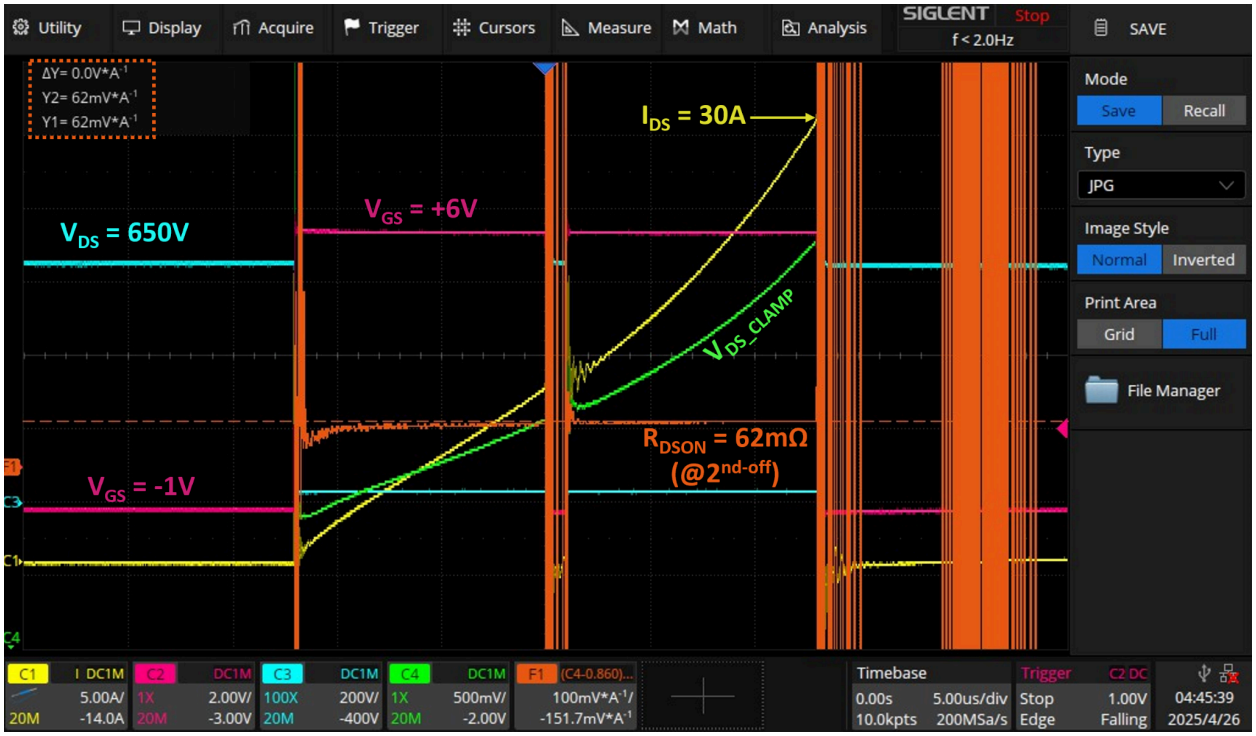

Figure 7: DPT of GPI65030DF88 at V_{BUS} = 650V, illustrating the calculation of dynamic R_{DSON}.

8. After testing, turn off the high-voltage power supply first, followed by the low-voltage power supply.

