

Quick Start Guide

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TDTP4000W065AN_0v1

For evaluation purposes only

Design files and more at
transphormusa.com/TDTP4000W065AN

TDTP4000W065AN

Evaluation Platform

4kW Analog Bridgeless Totem-Pole PFC

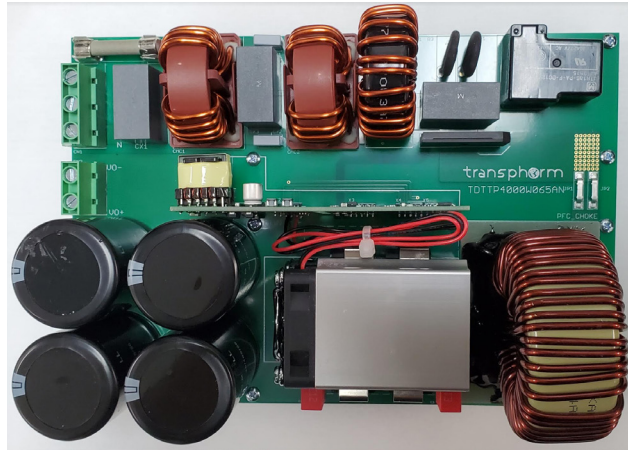
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Highest Performance, Highest Reliability GaN

Equipment Needed

- ➔ The TDTP4000W065AN main board
- ➔ The TDTP4000W065AN controller board
- ➔ High-voltage AC power supply for input
- ➔ Electronic/resistive load
 - Power range: 0W to 4000W

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Cautions and Warnings



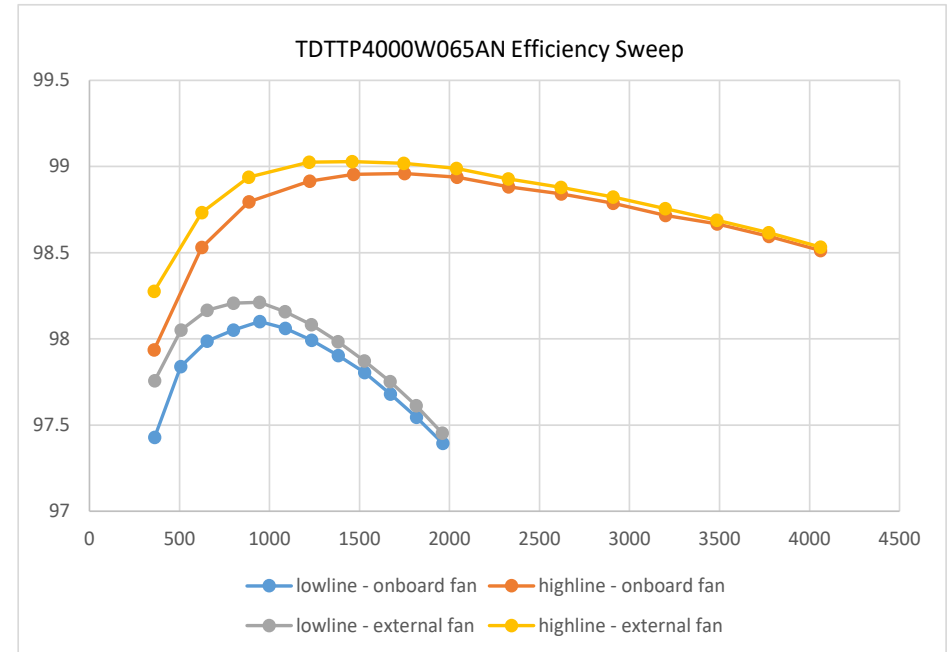
This evaluation board is intended to demonstrate GaN FET technology and is for demonstration purposes only and no guarantees are made for standards compliance.

There are areas of this evaluation board that have exposed access to hazardous high voltage levels. Exercise caution to avoid contact with those voltages. Also note that the evaluation board may retain high voltage temporarily after input power has been removed. Exercise caution when handling.

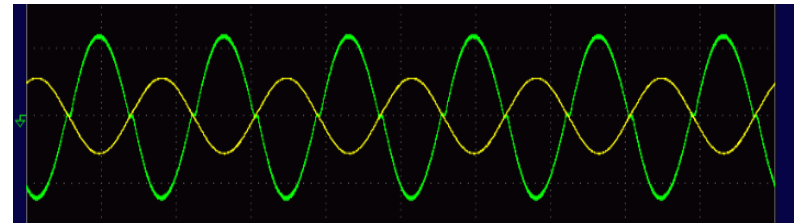
When testing converters on an evaluation board, ensure adequate cooling. Apply cooling air with a fan blowing across the converter or across a heatsink attached to the converter. Monitor the converter temperature to ensure it does not exceed the maximum rated per the datasheet specification.

See page 5 for operating guidelines.

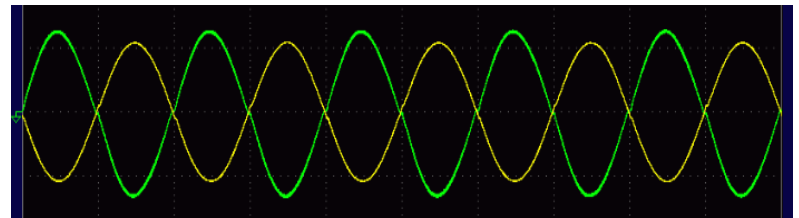
Typical Performance Curves



Input Voltage and Current Operating Waveforms:



Lowline - 2kW

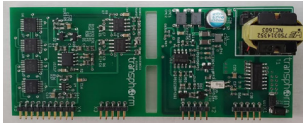


Highline - 4kW

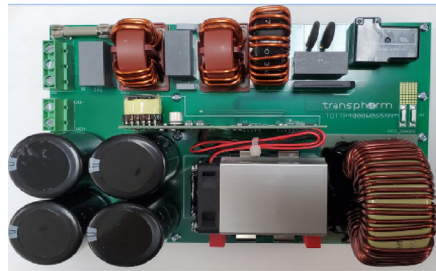
VOLTAGE WAVEFORM
CURRENT WAVEFORM

Step 2: Power-up the Board

- ➔ Insert the TDTP4000W065AN controlcard to the connector slot.
- ➔ Connect an electronic/resistive load to the corresponding marking (CN2). The requirements for the resistive load are:
 - At 115V_{AC} input: 0W and ≤2000W
 - At 230V_{AC} input: 0W and ≤4000W
- ➔ With high-voltage power off, connect the high-voltage AC power input to the corresponding marking (CN1) on the PCB; N and L (PE: potential ground)
- ➔ Turn on the AC power input (85V_{AC} to 265V_{AC}, 50Hz to 60Hz); minimum power load for turn-on sequence is 400W.
- ➔ Monitor CN2 output voltage with V_{DC} meter to verify that 385V ±5V is generated
- ➔ Load can be increased when AC supply is on and board is functional



TDTP4000W065AN controlcard



TDTP4000W065AN mainboard

Step 3: Power-down the Board

- ➔ Switch off the high-voltage AC power input.
- ➔ Power off the Auxiliary Supply
- ➔ Verify Input and Output voltage = 0.

Note:

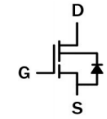
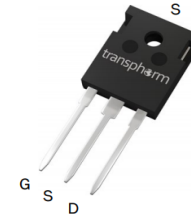
See page 5 for important operating guidelines

TRANSPHORM GAN FET

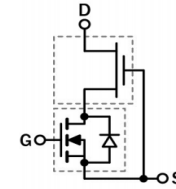
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TP65H035G4WS
TO-247
(top view)



Cascode Schematic Symbol



Cascode Device Structure

Key Specifications	
V _{DSS} (V)	650
V _{(TR)DSS} (V)	725
R _{DS(on)eff} (mΩ) max*	41
Q _{RR} (nC) typ	150
Q _G (nC) typ	22

The TP65H035G4WS 650V, 35 mΩ gallium nitride (GaN) FET is a normally-off device using Transphorm's Gen IV platform. It combines a state-of-the-art high voltage GaN HEMT with a low voltage silicon MOSFET to offer superior reliability and performance.

The Gen IV SuperGaN™ platform uses advanced epi and patented design technologies to simplify manufacturability while improving efficiency over silicon via lower gate charge, output capacitance, crossover loss, and reverse recovery charge.

TP65H035G4WS datasheet is available at TRANSPHORMUSA.COM

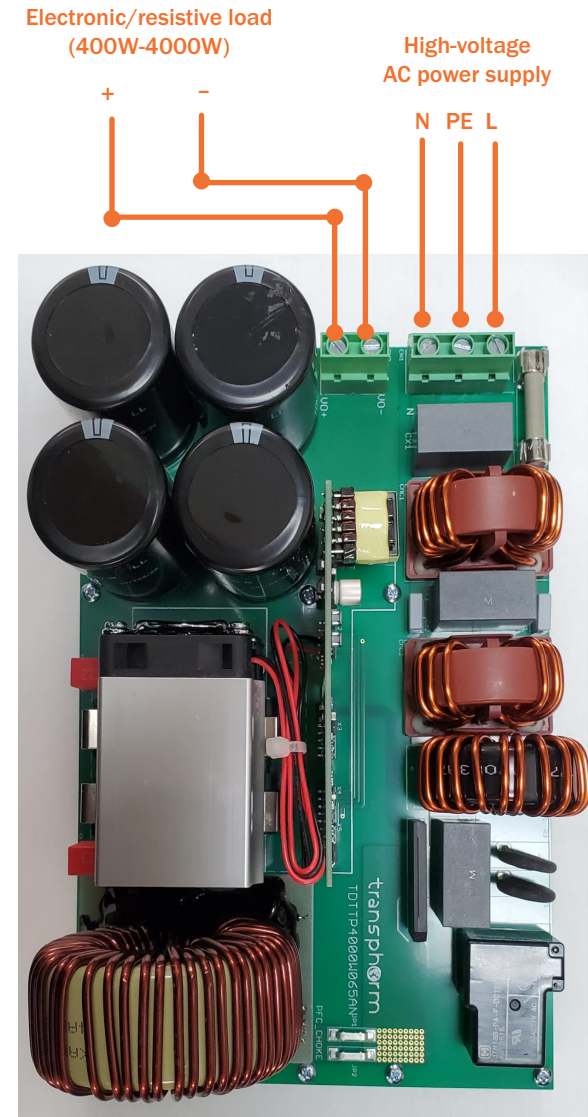
Important Operating Guidelines

The TDTP400065AN is for evaluation purposes only and is not intended to be a finished product and does not include all protection features found in commercial power supplies. Additional warnings to keep in mind:

- ➔ An isolated AC source should be used as input.
- ➔ Float the oscilloscope by using an isolated oscilloscope or by disabling the PE (Protective Earth) pin in the power plug. Float the current probe power supply (if any) by disabling the PE pin in the power plug.
- ➔ Use a resistive load only: 400W to 2000W lowline, 400W to 4000W highline.
- ➔ The evaluation board is not fully-tested at large load steps. **DO NOT** apply a very large step in the load (>1000W) when it is running.
- ➔ **DO NOT** manually probe the waveforms when the board is running. Set up probing before powering up the demo board.
- ➔ **DO NOT** touch any part of the evaluation board when it is running.
- ➔ When plugging the controlcard into the socket, make sure the control card is fully pushed down.
- ➔ If the evaluation circuit goes into protection mode it will work as a diode bridge by shutting down all PWM functions. Turn AC supply off and verify output voltage is at 0V before restarting the system.
- ➔ **DO NOT** use a passive probe to measure control circuit signals and power circuit signals at the same time. GND1 and AGND are not the same ground.
- ➔ To get clean V_{GS} of the low side GaN FET, it is not recommended to measure the V_{DS} at the same time.
- ➔ It is not recommended to use a passive voltage probe for V_{DS} and V_{GS} measurements while simultaneously using a differential voltage probe for V_{IN} measurements, unless the differential probe has very good dv/dt immunity.

Step 1: Connect the Board

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