Quick Start Guide

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TDINV3000W050B-KIT

For evaluation purposes only

Design files and more at

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TDINV3000W050B-KIT

Evaluation Platform

3.0 kW inverter

transphorm

Highest Performance, Highest Reliability GaN

12/2022

Equipment Needed

- The TDINV3000W050B_0v3 board
- Microchip dsPIC33 control card (included)
- Low-voltage DC power supply for auxiliary voltage
  - $12V_{DC}$ power supply (included)
- High-voltage DC power supply
  - $400V_{DC}$ maximum
  - 3000W capable
- Resistor load for $240V_{AC}$/3000W
  - Must be isolated from high-voltage DC Power Supply
- Firmware for programming and advanced configuration (included)

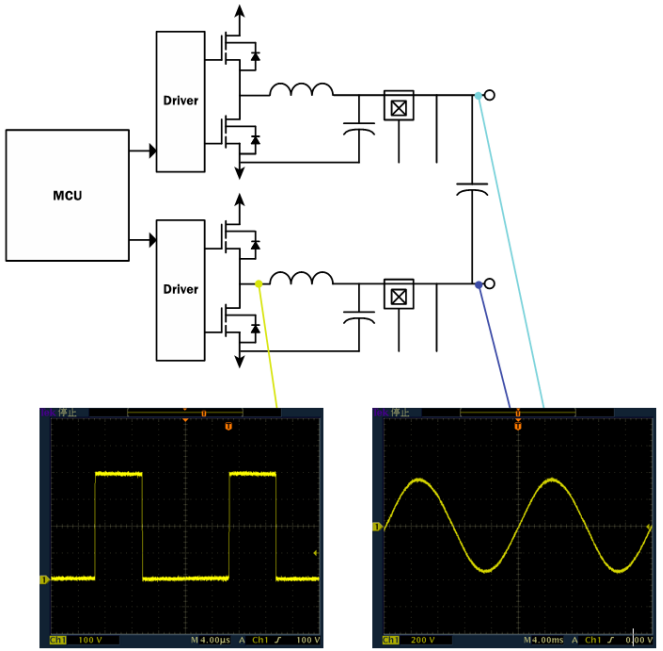
Cautions and Warnings

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

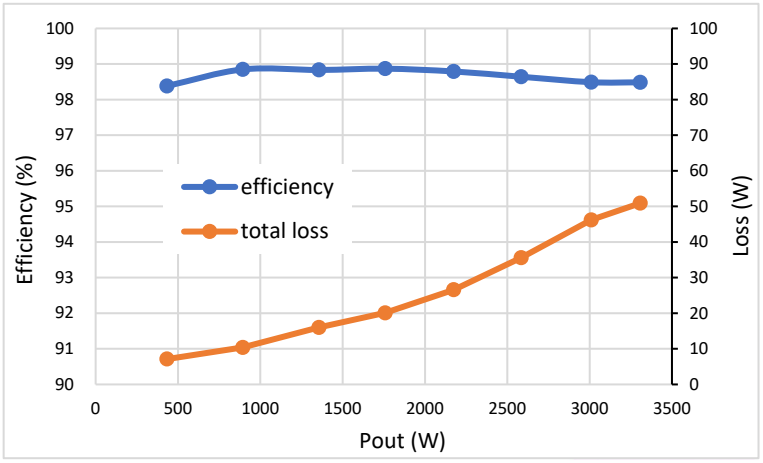
There are areas of this evaluation board that have exposed access to hazardous high voltage levels. Exercise caution to avoid contact with those voltages. Also note that the evaluation board may retain high voltage temporarily after input power has been removed. Exercise caution when handling.

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.

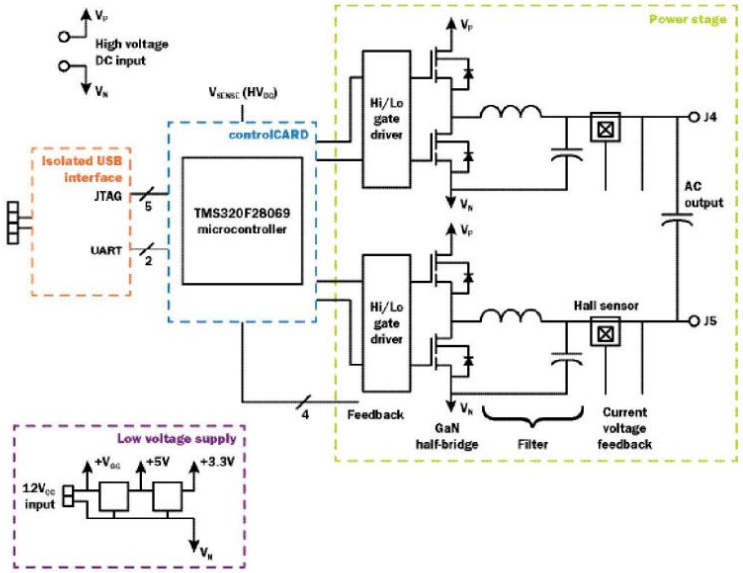
Typical Waveforms with Stock Firmware



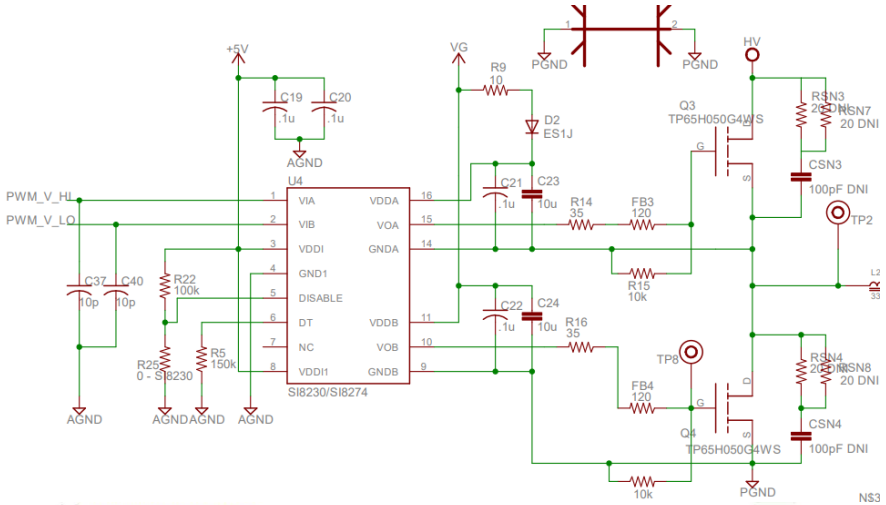
Typical Performance Curves



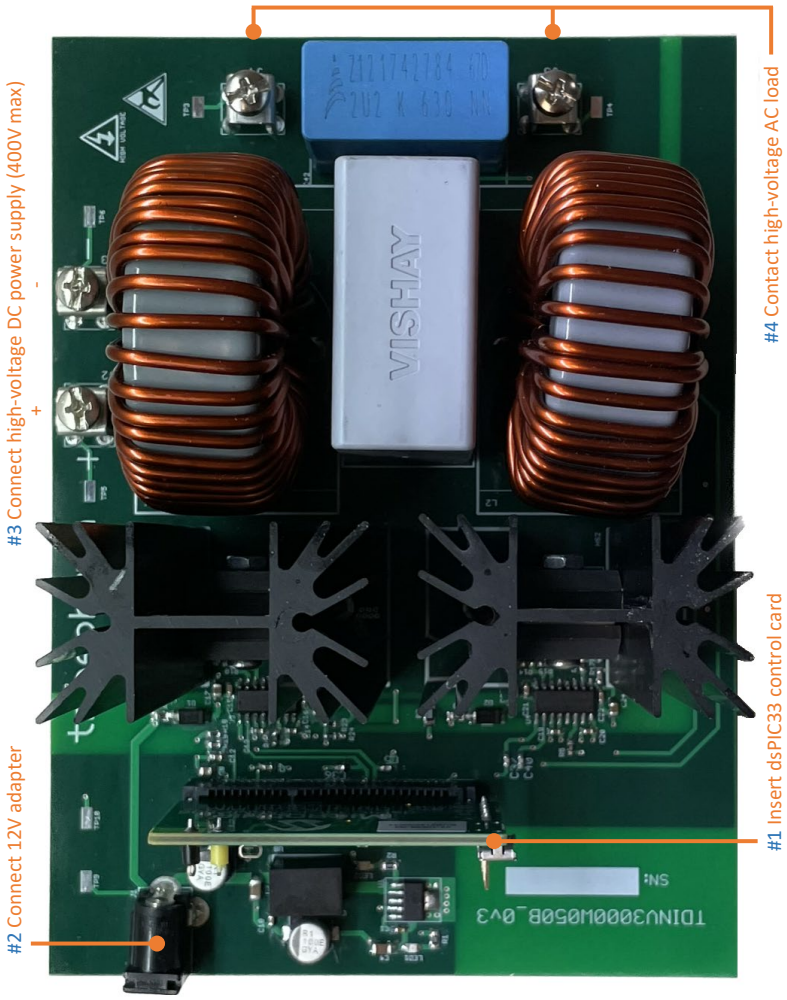
Circuit Diagram



Driver Circuit



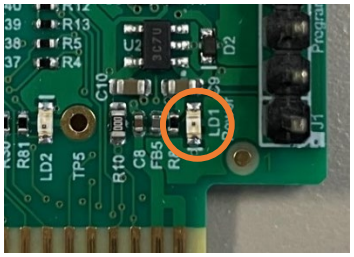
Step 1: Connect the Board



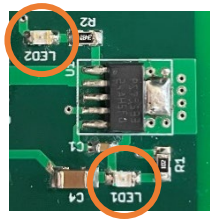
Note:
DO NOT apply too much force to the J2, J3, J4 and J5 connectors, as excessive force may bend and/or crack the PCB.

Step 2: Power-up the Board

- Insert the control card
  - LD1 ON indicates DSP power is on



- Connect high-voltage power supply to the +/- inputs (J2 and J3)
- Set output (J4 and J5) load to handle ~50W
- Insert V_{CC} (12V) plug to J1
  - LED1 and LED2 should illuminate, indicating power is applied to the 5V and 3.3V regulators



- Turn on high-voltage power supply
  - The high-voltage supply may be switched on or raised gradually
  - Gradually increase the input voltage to desired value while monitoring output voltage/waveform

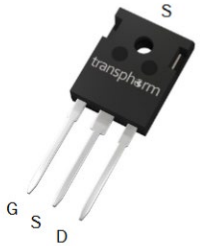
Step 3: Power-down the Board

- Switch off the high-voltage DC supply
- Power off the 12V aux supply

Note:
Normal operation is 400V_{DC} (in) and 240V_{AC} (out) for 3000W power at 50kHz.
Monitor the voltage waveforms – See typical waveform on Page 6.

Transphorm GaN FET

TP65H050G4WS
TO-247
(top view)



Key Specifications	
V_{DSS} (V)	650
$V_{DSS(TR)}$(V)	800
$R_{DS(on)eff}$ (mΩ) max*	60
Q_{RR} (nC) typ	120
Q_G (nC) typ	16

Description

The TP65H050G4WS 650V, 50 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.

Features

- JEDEC qualified GaN technology
- Dynamic $R_{DS(on)eff}$ production tested
- Robust design, defined by
  - Wide gate safety margin
  - Transient over-voltage capability
- Enhanced inrush current capability
- Very low Q_{RR}
- Reduced crossover loss