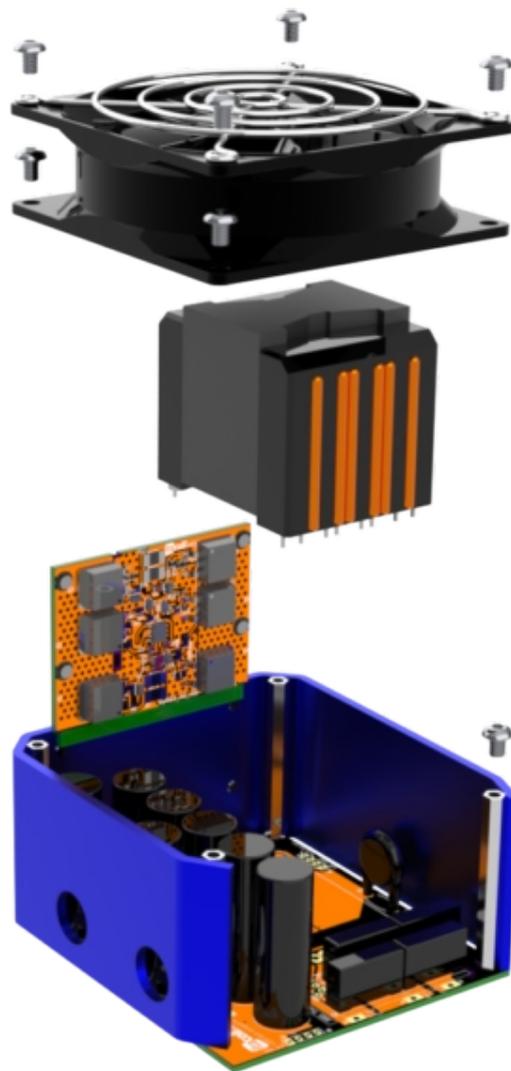


SBD-TnK03: 24V – 2kW LLC resonant tank demo board

Data brief



1. INTRODUCTION

The SBD-TnK03 demo board is intended for demonstrating two ITACOIL products:

- **SRLPQ4040001** [integrated resonant transformer](#);
- **STB-SyR03** [synchronous rectification module](#).

The board includes a complete rectified tank and is designed to be powered by an external half-bridge within the 380-420Vdc range.

The controlled half-bridge must be connected through 3 power outlets (V_{bulk} , GND and half-bridge mid-node) and with the +/- 24V output voltage directed toward the feedback network.

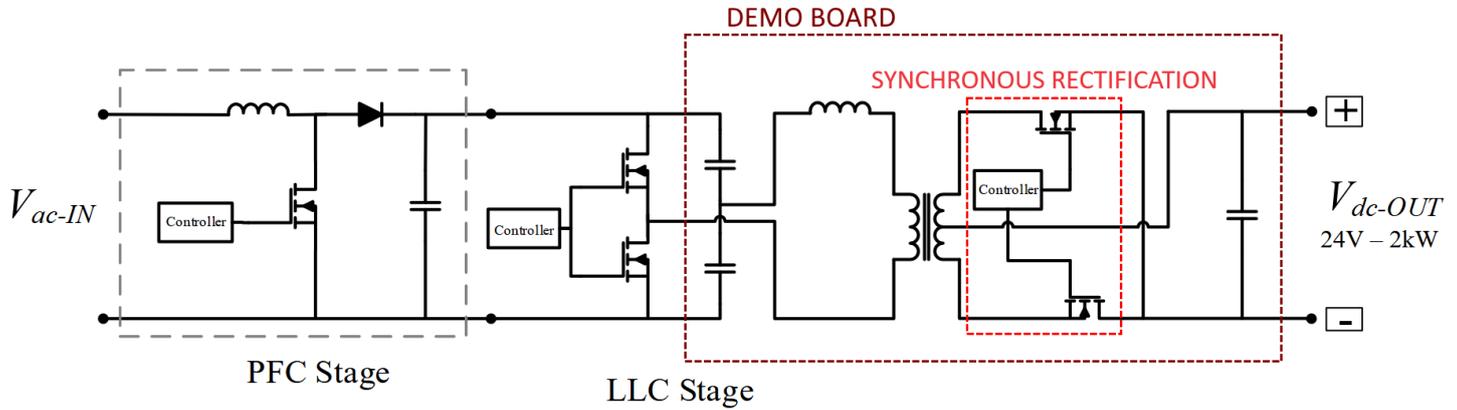


Figure 1: Demo board principle schematic

2. RATINGS AND DIMENSIONS

	Air cooling fan assembled	Without air cooling fan	Notes
Input voltage (V_{bulk} from the PFC stage)	410Vdc		Admissible range: 380-420Vdc including the PFC output ripple. Suggested range: 395-410Vdc.
Rated output voltage	24Vdc		
Rated output current	41,7A	83,3A	Subject to derating at $T_{amb} > 40^{\circ}C$
Continuous power	2000W	1000W	Subject to derating at $T_{amb} > 40^{\circ}C$
Peak power	2300W		Influenced by the half-bridge MOSFET parasitics and controller type. Up to 3kW under ideal conditions.
Dimensions	88 x 94 x 80 mm	88 x 94 x 50 mm	

Table 1: Demo board ratings and dimensions

3. LLC STAGE EFFICIENCY

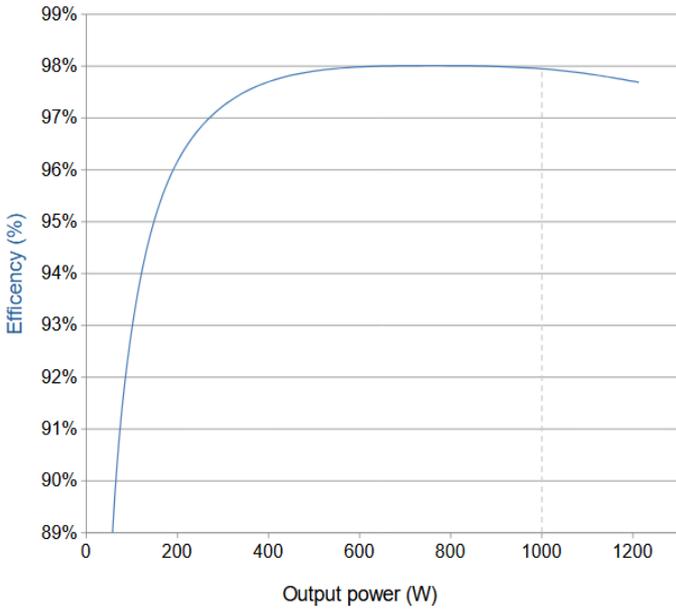


Figure 2: LLC stage efficiency without air cooling (fan removed)

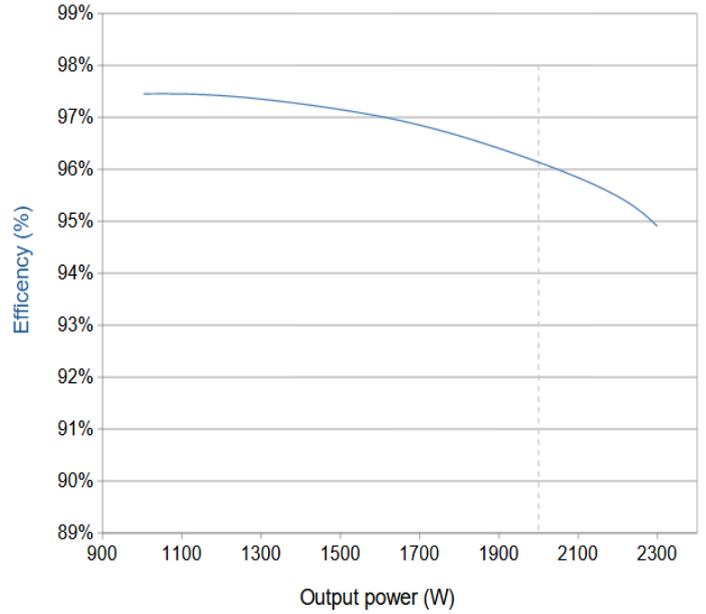


Figure 3: LLC stage efficiency with air cooling

Referred to half-bridge MOSFETs with $R_{ds_on} = 60m\Omega$ and $V_{bulk} = 410Vdc$.

4. WAVEFORMS AT RATED POWER

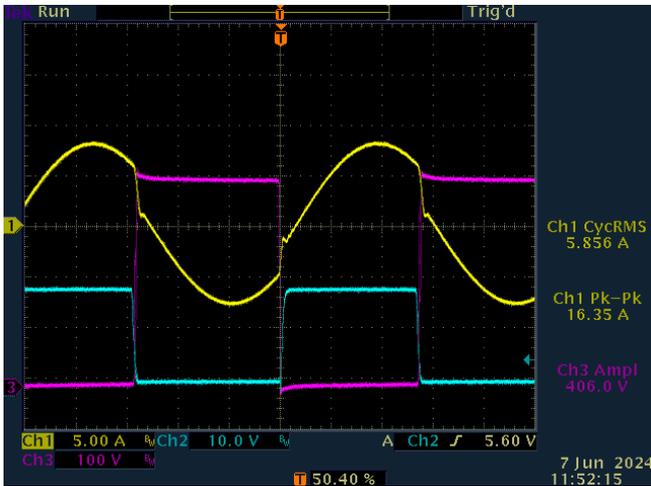


Figure 4: 410Vdc input - 1000W load (no air cooling)

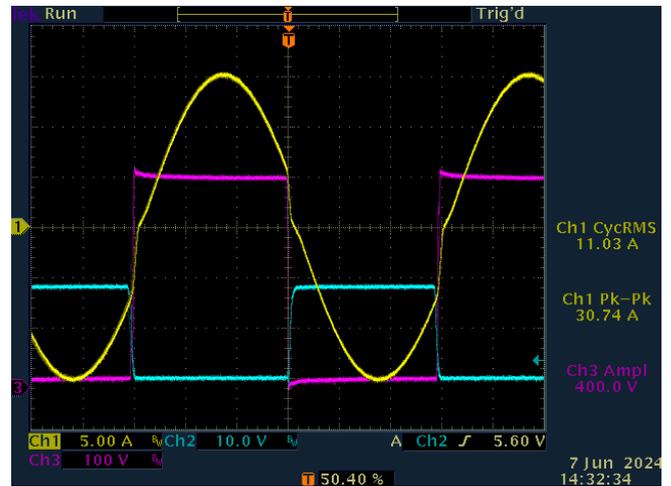


Figure 5: 410Vdc input - 2000W load (with air cooling)

Ch1: Primary current
 Ch2: Low side gate voltage
 Ch3: half-bridge node voltage

5. SCHEMATIC

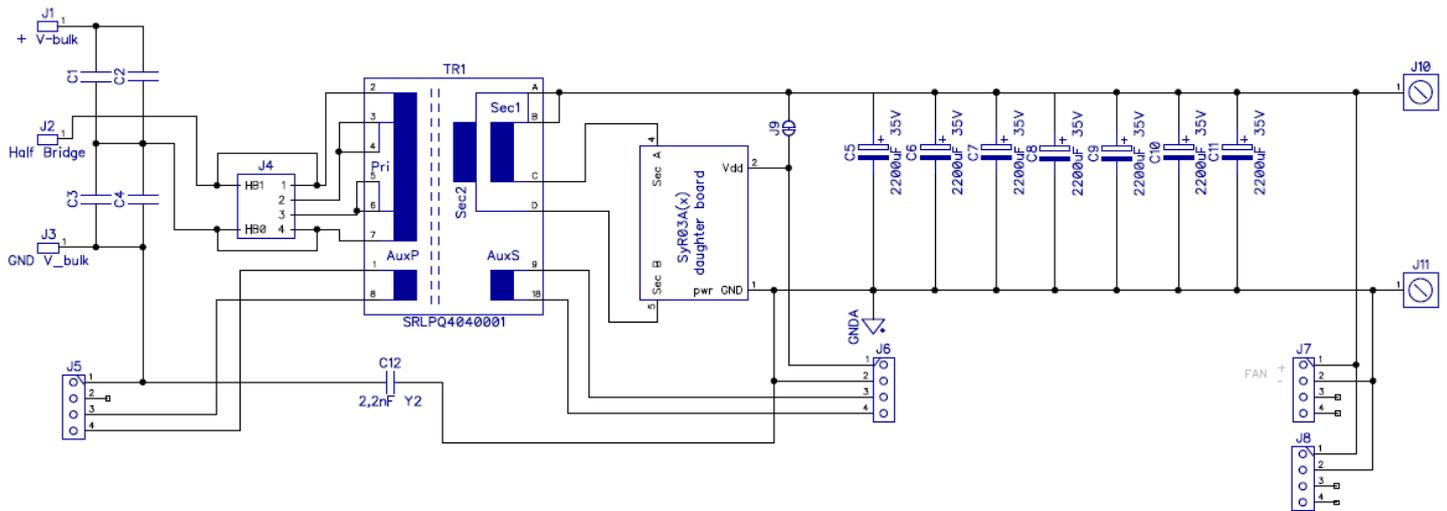


Figure 6: Demo board schematic

6. CONNECTIONS AND JUMPERS

Connector	Description	Notes
J1	V_bulk(+) input (410Vdc)	
J2	Half-bridge mid node input	
J3	V_bulk(-) input (primary side GND)	
J4	Custom tank primary connector	On PCB bottom, HB1 shorted to pad 1 and HB0 shorted to pad 4. J4 connections can be modified for custom tanks (see Table 3).
J5	Primary aux connector. Providing up to around 50mA, it is used for powering the LLC controller or for other purposes.	1-V_bulk(-) 2-NC 3-Primary aux winding (pin 1 of the transformer) 4-Primary aux winding (pin 8 of the transformer)
J6	SyR03 power supply connector. Providing up to around 50mA, it is used for powering the synchronous rectification module through sources other than the 24Vdc output voltage.	1-Vdd for synchronous rectification module with custom tank having Vdc_output exceeding the 12-34 Vdc range. It requires cutting J9 on bottom of the PCB. 2-Output GND 3-Secondary aux winding (pin 9 of the transformer) 4-Secondary aux winding (pin 18 of the transformer)
J7	Connector used for powering the cooling fan through the output voltage	1-24Vdc(+) output 2-Output GND 3-NC 4-NC
J8	Used to connect the output to the feedback network	1-24Vdc(+) output 2-Output GND 3-NC 4-NC
J9	Connection between 24Vdc(+) output and Vdd of the synchronous rectification module	Shorted on PCB bottom. The use of connector J6 requires the cutting of J9.
J10	+24Vdc output	M5x0,8 screw terminal
J11	Output GND	M5x0,8 screw terminal

Table 2: Demo board connections and jumpers

7. CUSTOMIZATION

SRLPQ4040001 is a standard, off-the-shelf resonant transformer designed for flexibility.

ITACOIL offers a customized tank design service upon request. The tank is customized considering specific design requirements and the actual operating conditions, in order to optimize the use of the standard transformer. This service includes ensuring zero-voltage switching (ZVS) while considering the main parasitic characteristics of the chosen MOSFET type.

Examples include power supplies without a power factor correction (PFC) stage, directly powered by rectified AC mains, or battery chargers requiring variable output voltage during charging.

After customizing the tank, we will provide the corresponding primary configuration ID (A, B, C or D). Table 3 below provides the instructions to adjust J4 for the correct connection.

Primary ID	Action on J4	Transformer pins
A	Standard connection already on the PCB. No actions required.	2 / 7
B	Cut HB1-1 trace on PBC bottom – Short HB1-2	[3-4] / 7
C	Cut HB0-4 trace on PBC bottom – Short HB0-3	2 / [5-6]
D	Cut HB1-1 and HB0-4 traces on PBC bottom - Short HB1-2 and HB0-3	[3-4] / [5-6]

Table 3: Instructions for each primary configuration ID

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