

EVAL_3KW_2LLC_CFD7

3 kW dual-phase LLC evaluation board
with 600 V CoolMOS™ CFD7 SJ MOSFET

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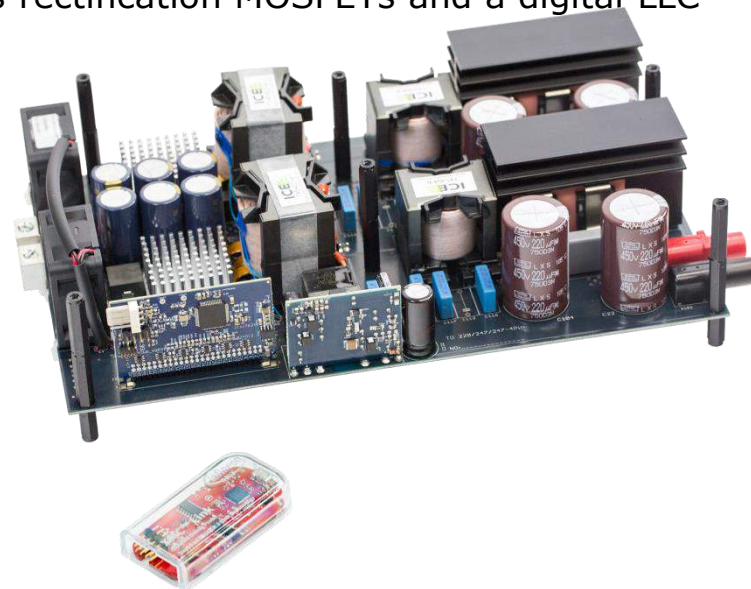
General

Description:

- › The "[EVAL_3kW_2LLC_CFD7](#)" evaluation board shows how to design a dual-phase LLC system solution of a server SMPS with the target to meet **80+ Titanium Standard** efficiency requirements. For this purpose the following technologies have been used: the latest 600 V CoolMOS™ CFD7 SJ MOSFET technology ([IPW60R031CFD7](#)) on the primary side and OptiMOS™ 5 150 V low voltage power MOSFET in SuperSO8 ([BSC093N15NS5](#)) in the synchronous rectification secondary stage, in combination with QR CoolSET™ ([ICE2QR2280Z](#)), high voltage gate driver EiceDRIVER™ 1EDI ([1EDI60N12AF](#)), high speed driver ICs for high voltage MOSFETs, low side gate driver EiceDRIVER™ 2EDN ([2EDN7524R](#)) for synchronous rectification MOSFETs and a digital LLC microcontroller ([XMC4400-F64K512 AB](#)).

Summary of features:

- › Output voltage: 44 – 58 V_{DC}
- › Output current max: 55 A
- › Peak efficiency @ 50% load > 98.4%
- › Efficiency @ 10% load > 97%



The following variants are available:

- › EVAL_3kW_2LLC_CFD7 version with 600 V CoolMOS™ CFD7 in **TO-247** (IPW60R031CFD7)
 - › Order code: EVAL_3kW_2LLC_CFD7 (SP001783688, SA001783696)

Example of system understanding: Infineon demo solution for Titanium high voltage DC-DC stage

Half-bridge LLC with synchronous rectification in center tap configuration

V_{in}	350 – 400 V _{DC}
V_{in_nom}	380 V _{DC}
V_{out}	44 – 58 V _{DC}
I_{out}	55 A
P_o	3 kW
C_r	66 nF
L_r	12 μ H
L_m	62 μ H

Primary HV MOSFETs

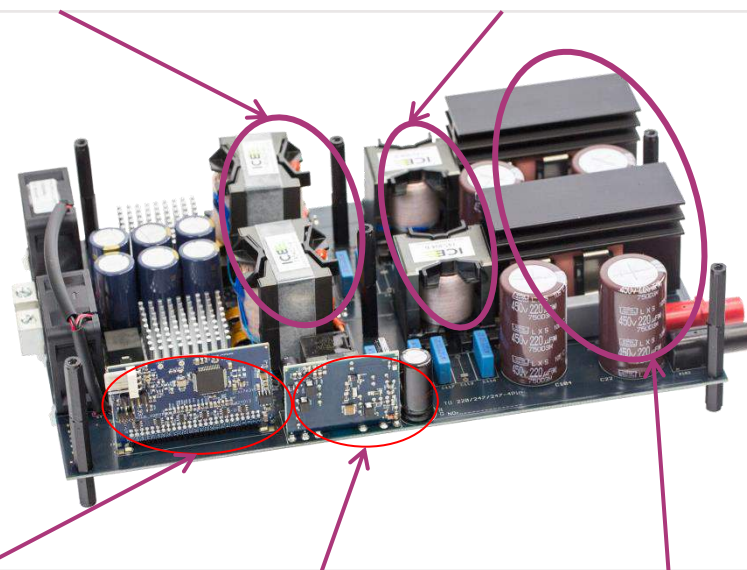
- > 600 V CoolMOS™ CFD7 (IPW60R031CFD7)
- > Reduced gate charge (Q_g)
- > Reduced E_{off}
- > High body diode ruggedness

SR MOSFETs

- > OptiMOS™ (BSC093N15NS5)
- > New generation
- > Best FOM $R_{DS(on)} \times Q_g$
- > Best FOM $R_{DS(on)} \times Q_{oss}$

Transformer
SP-PQ 40/40 core

Resonant inductor
SP-PQ 35/35 core



LLC controller Digital
XMC4400-F64K512 AB

Bias QR flyback controller
ICE2QR2280Z

High voltage MOSFETs
IPW60R037P7 TO-247

Digital control card – Infineon’s solution to control the 3 kW dual-phase LLC evaluation board

[XMC4400-F64K512 AB](#)

Summary of features:

- › ARM® Cortex®-M4, 120 MHz, incl. single cycle DSP MAC and floating point unit (FPU)
- › 8-channel DMA + dedicated DMAs for USB and Ethernet
- › USB 2.0 full-speed on-the-go
- › CPU frequency: 120 MHz
- › eFlash: 512 kB including hardware ECC
- › 80 kB SRAM
- › Package: PG-LQFP-64

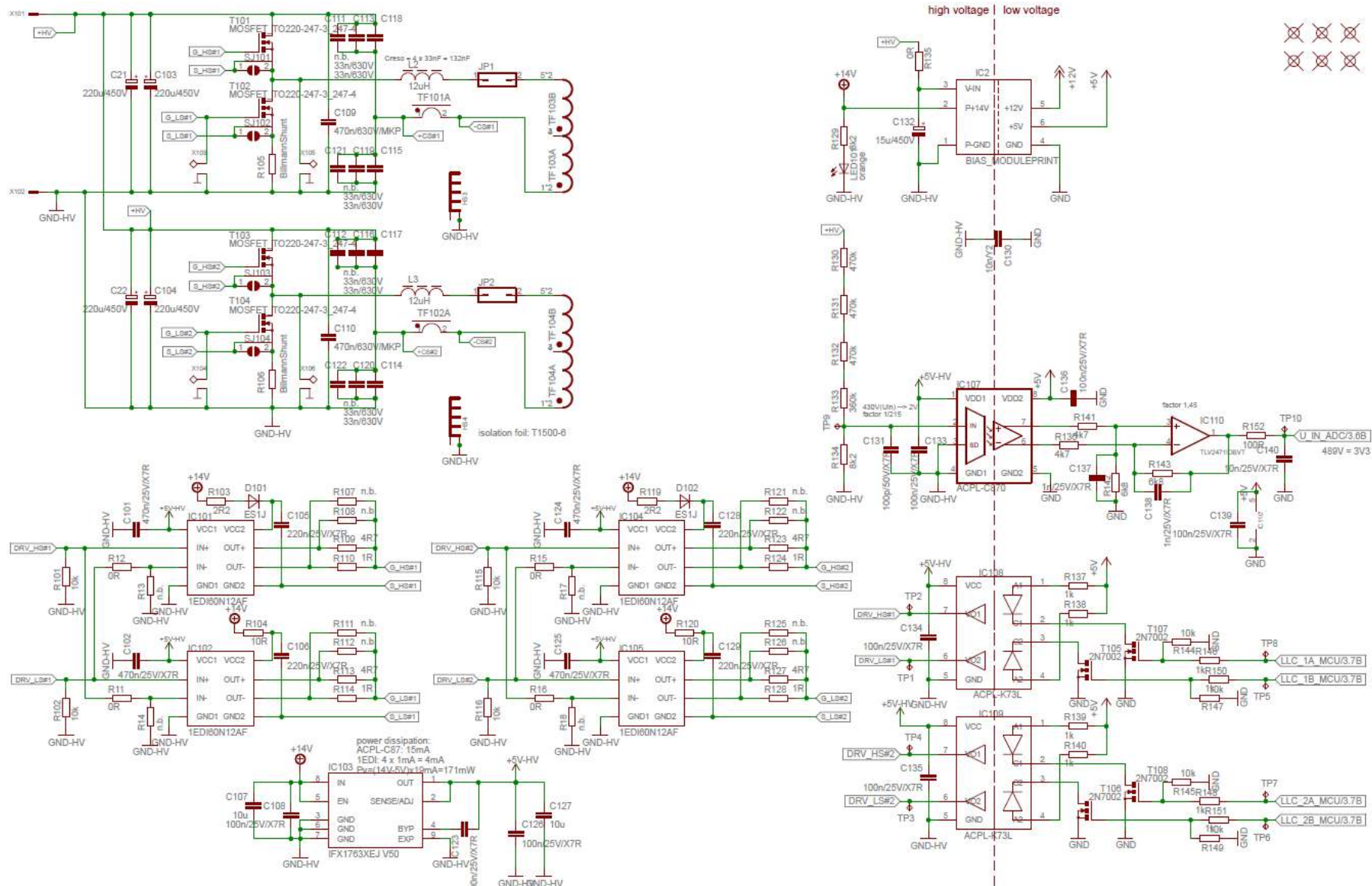
Target applications:

Motor control

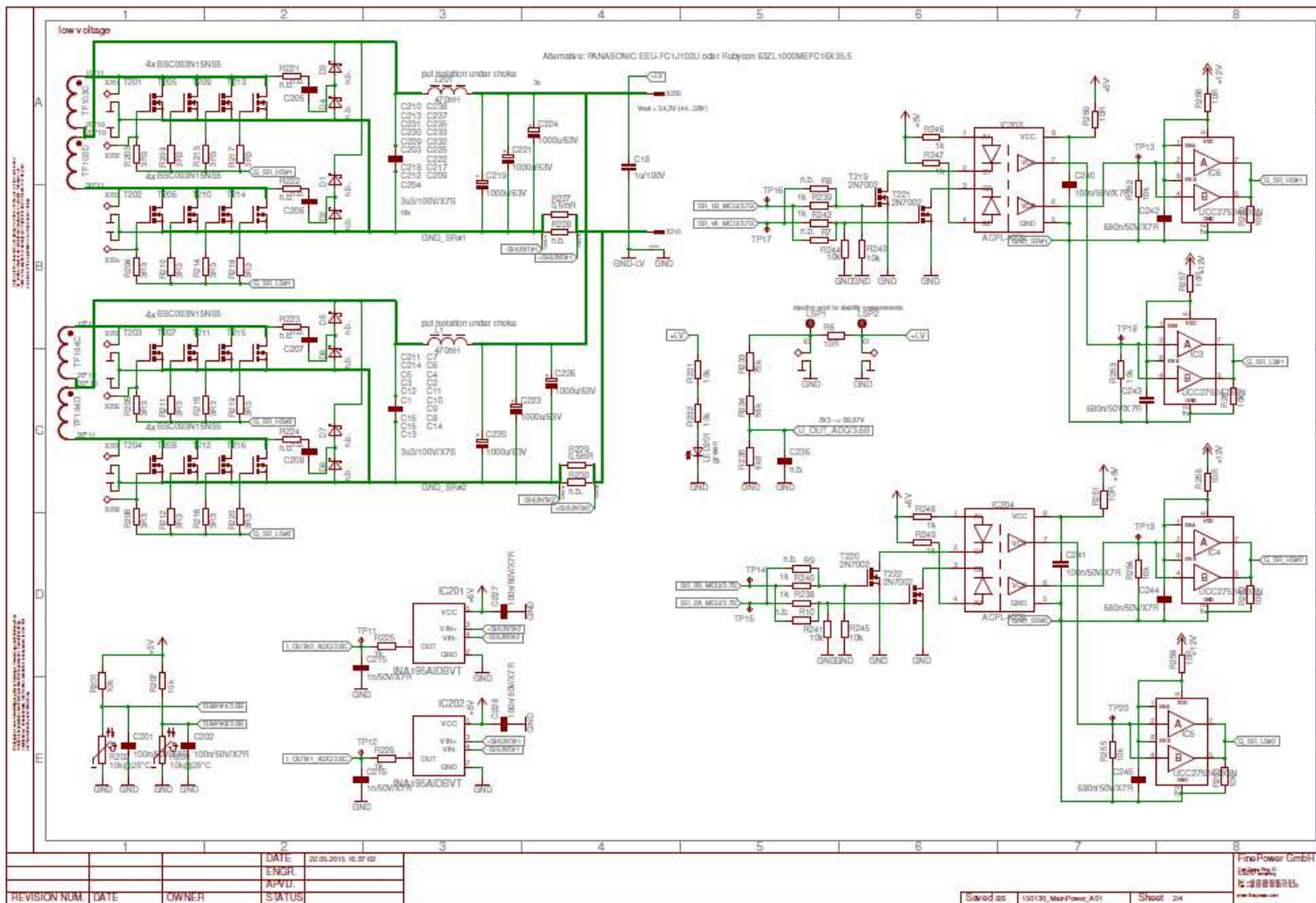
- › Position detection
- › IO devices
- › HMI
- › Solar inverters
- › SMPS
- › Sense and control systems
- › PLC
- › UPS
- › Light networks



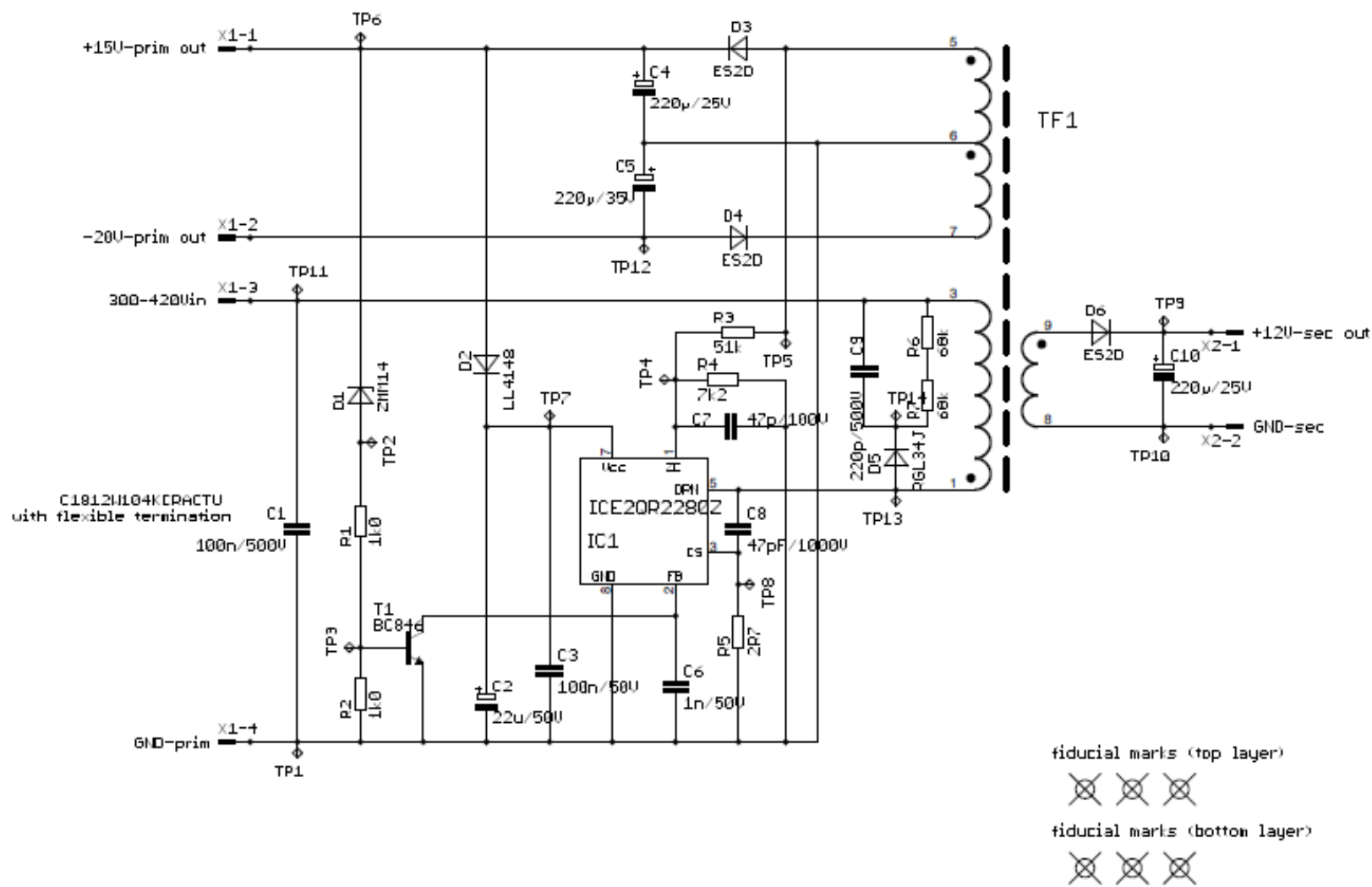
Main power board schematic_1



Main power board schematic_2



Bias board schematic



Connection instruction



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Automated efficiency measurement

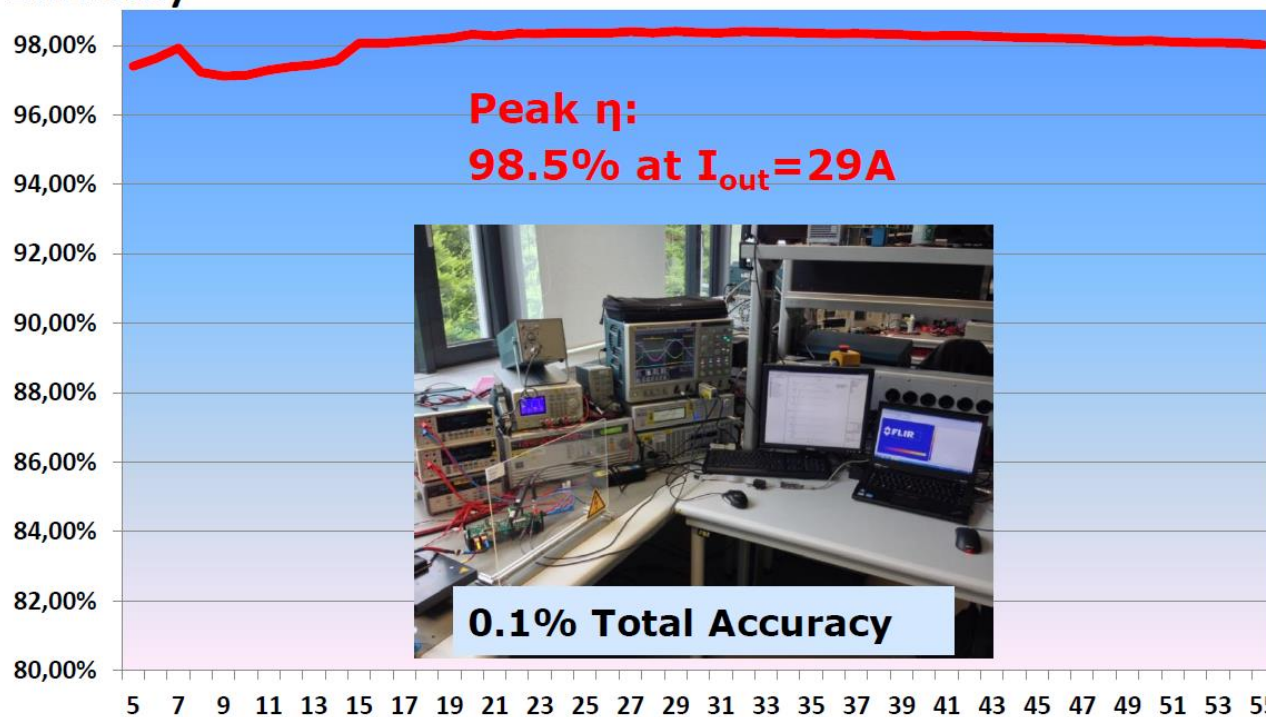
Combination of converter design (resonant tank, transformer) and proper high voltage device selection

Proper selection of SR low voltage device and secondary side design

3kW Dual Phase LLC Efficiency

(without Bias & fans absorption)

Efficiency



— 3kW Dual Phase LLC

@ $V_{in_nom} = 380VDC$,
 $V_{out_nom} = 54.3VDC$

Load Current [A]

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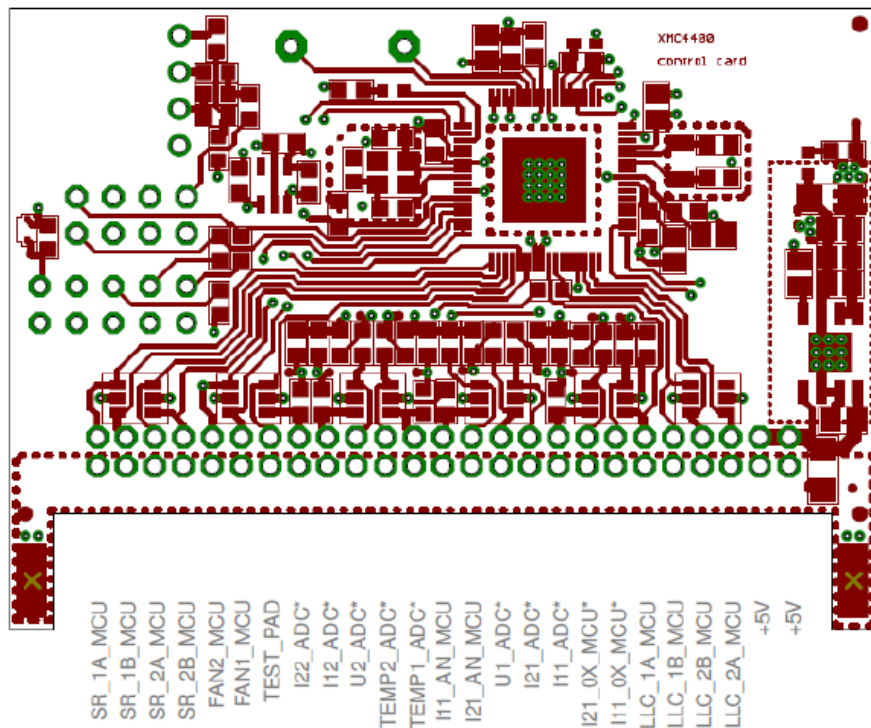
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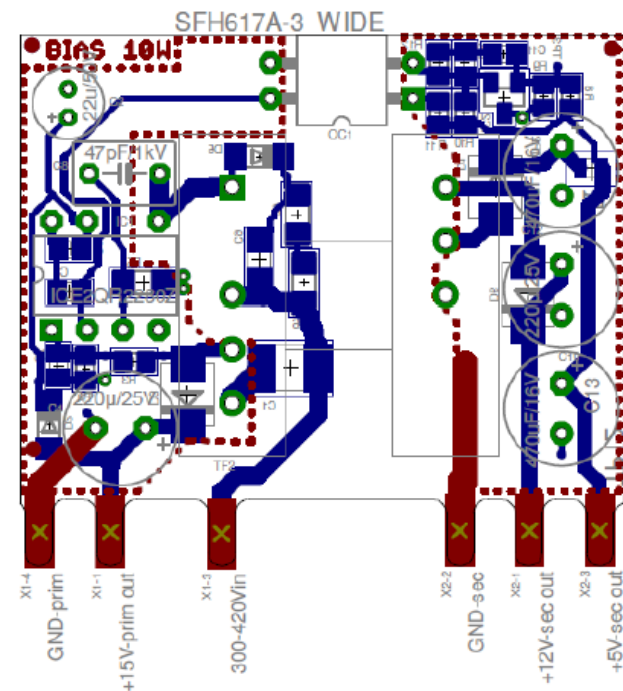
Design concept



Two daughter boards

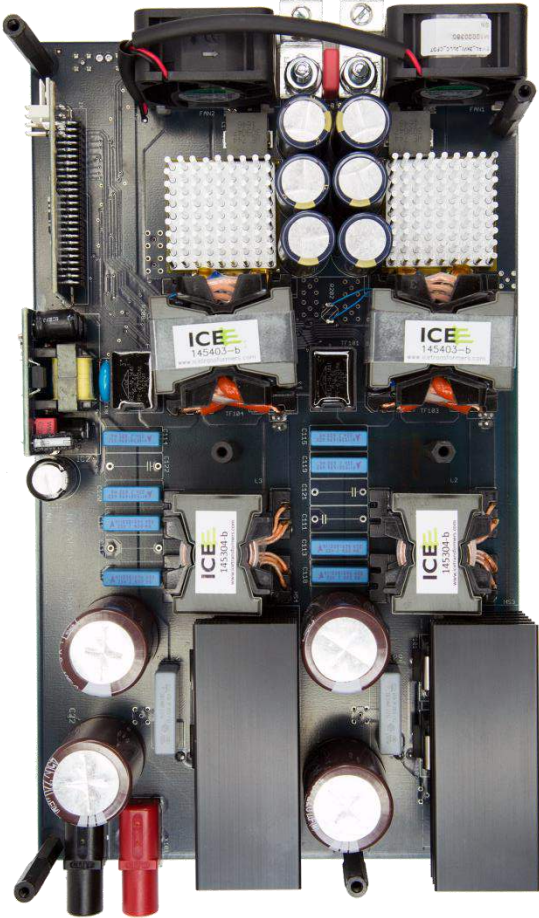
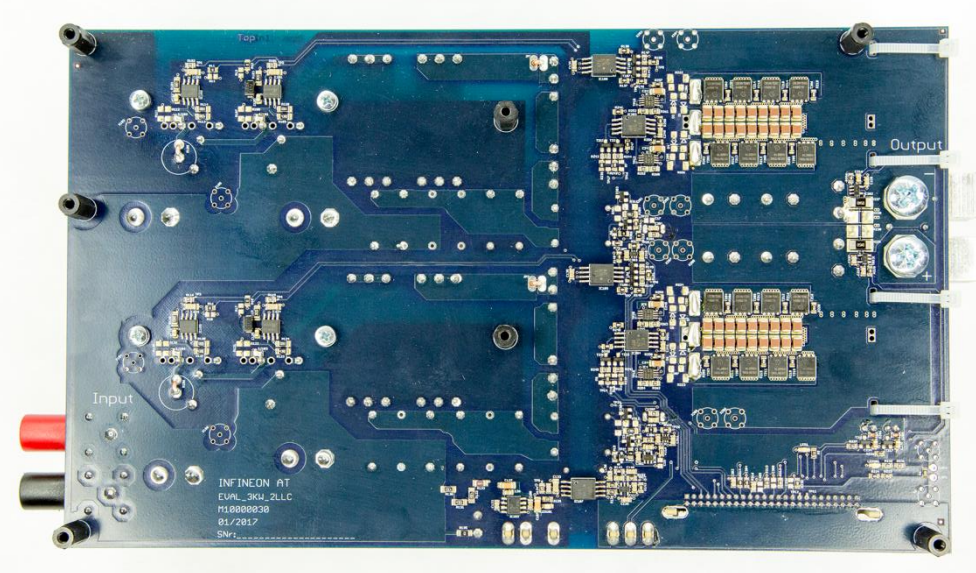
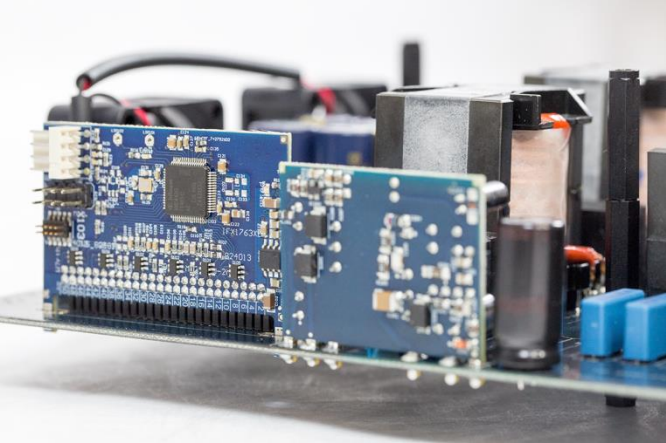


Microcontroller Board



Auxiliary Converter Board

Evaluation board EVAL_3KW_2LLC_CFD7





Technical Material

- > Application Notes
- > Simulation Models
- > Datasheets
- > PCB Design Data

- > www.infineon.com/3kw-llc-eval-cfd7
- > www.infineon.com/cfd7

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