

3.0kW Dual LLC Evaluation Board

EVAL_3KW_2LLC_P7_47
T0247

[Di Domenico Francesco \(IFAT PMM ACDC AE\)](#)
[Zechner Florian \(IFAT PMM ACDC AE\)](#)



Table of Contents

1

General Description

2

Efficiency Results

3

Design Concept

Table of Contents

1

General Description

2

Efficiency Results

3

Design Concept

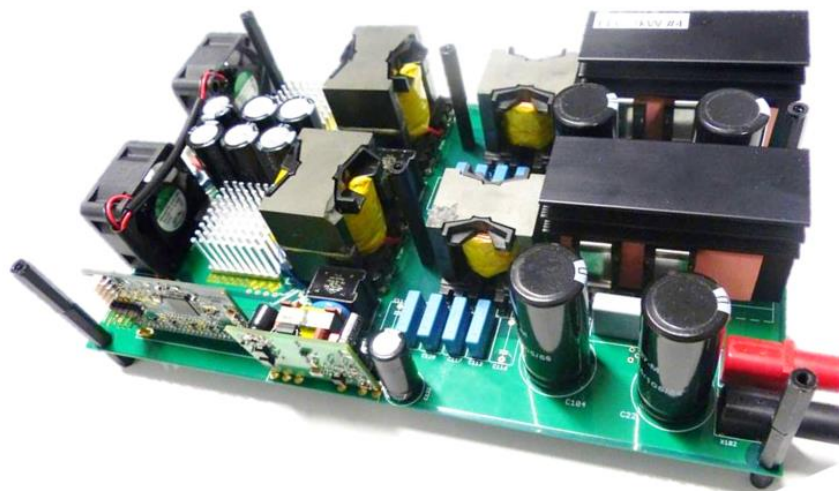
General

Description:

The "EVAL_3KW_2LLC_P7_47" - 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. On this purpose there has been applied latest CoolMOS™ technology [IPP60R037P7](#) 600V Power MOSFET on the primary side and OptiMOS™ Low Voltage Power MOSFET in SuperSO8 [BSC093N15NS5](#) in the synchronous rectification secondary stage, in combination with QR CoolSET™ [ICE2QR2280Z](#), [1EDI60N12AF EiceDRIVER™](#) high voltage, high speed driver ICs for HV [MOSFETs](#), Low Side Gate Driver [2EDN7524R](#) for SR MOSFETs and digital LLC Controller [XMC4400](#).

Summary of Features:

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



The following variants are available:

- › EVAL_3kW_2LLC_P7 version with CoolMOS™ P7 **TO-247**, IPP60R037P7

Ordercode: EVAL_3KW_2LLC_P7_47

Example of System Understanding: Infineon Demo Solution for Titanium HV DC/DC stage

Half Bridge LLC with synchronous rectification in center tap configuration

V_{in}	350 – 400V _{DC}
V_{in_nom}	380V _{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

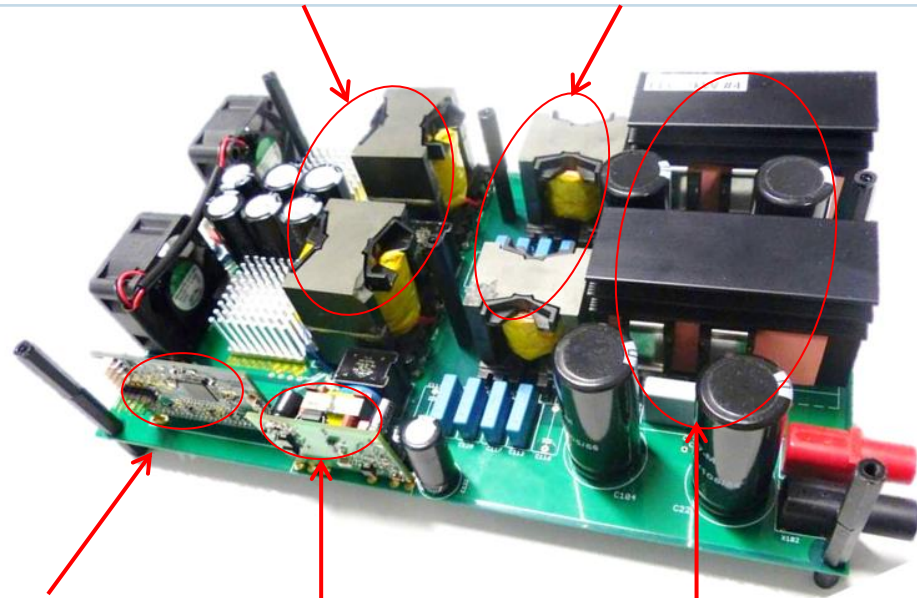
- > **CoolMOS™ IPP60R037P7**
 - Reduced Gate Charge (Q_g)
 - Reduced E_{off}
 - High body diode ruggedness

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**

Bias QR Flyback controller
ICE2QR2280Z

HV MOSFETs
IPW60R037P7 TO-247

Control Board Digital

Infineon`s solution to control the 3kW dual phase LLC Evaluation Board

Digital

XMC4400-F64K512 AB

Summary of Features:

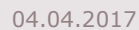
- › ARM® Cortex™-M4, 120MHz, incl. single cycle DSP MAC and floating point unit (FPU)
- › 8-channel DMA + dedicated DMAs for USB and Ethernet
- › USB 2.0 full-speed on-the-go
- › CPU Frequency: 120MHz
- › eFlash: 512kB including hardware ECC
- › 80kB SRAM
- › Package: PG-LQFP-64

Target Applications:

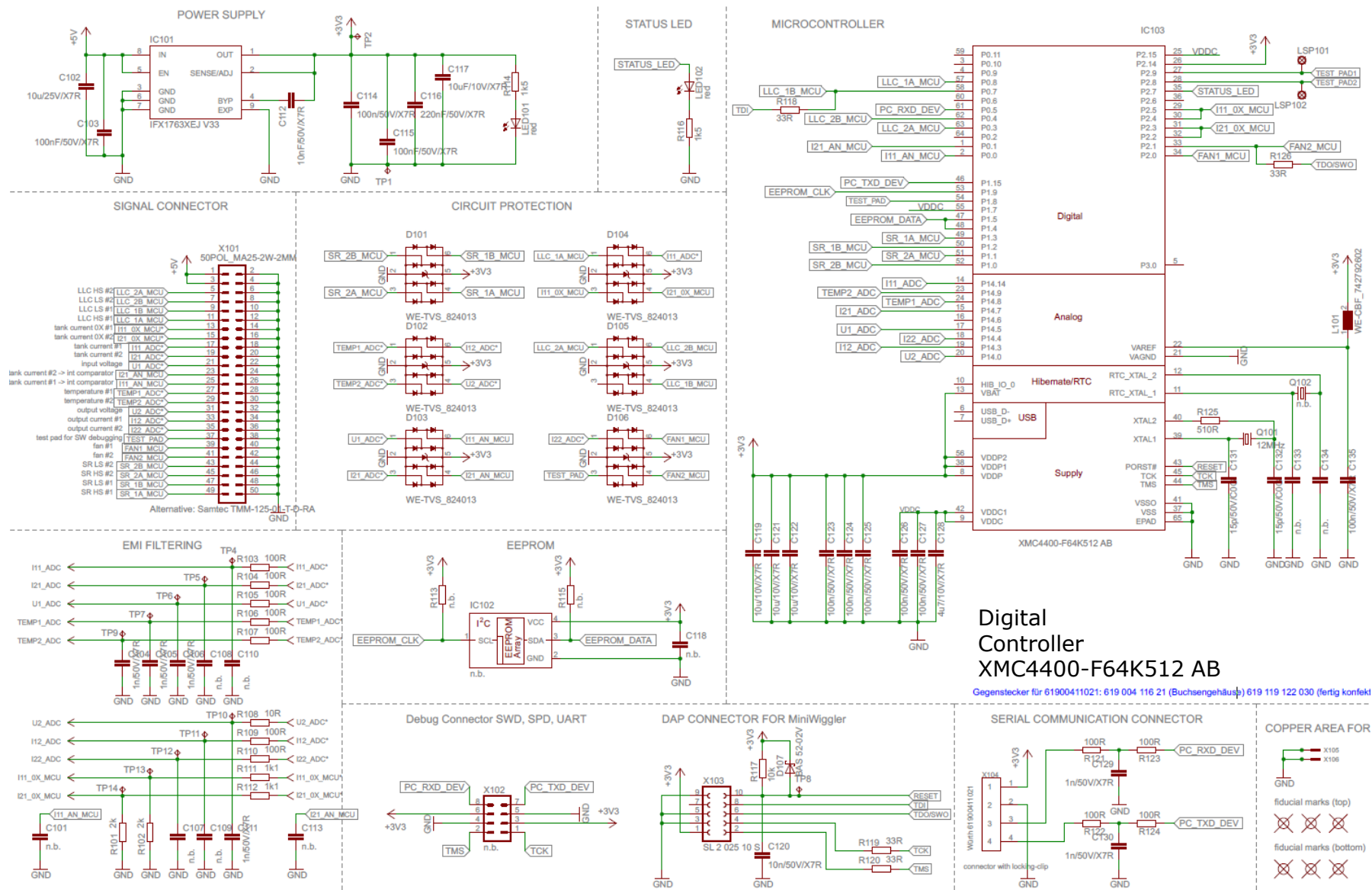
- Motor control
 - › Position detection
 - › IO devices
 - › HMI
 - › Solar inverters
 - › SMPS
 - › Sense & control systems
 - › PLC
 - › UPS
 - › Light networks

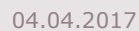






Digital Control Board Schematic





Connection instruction



Table of Contents

1

General Description

2

Efficiency Results

3

Design Concept

Automated Efficiency Measurement

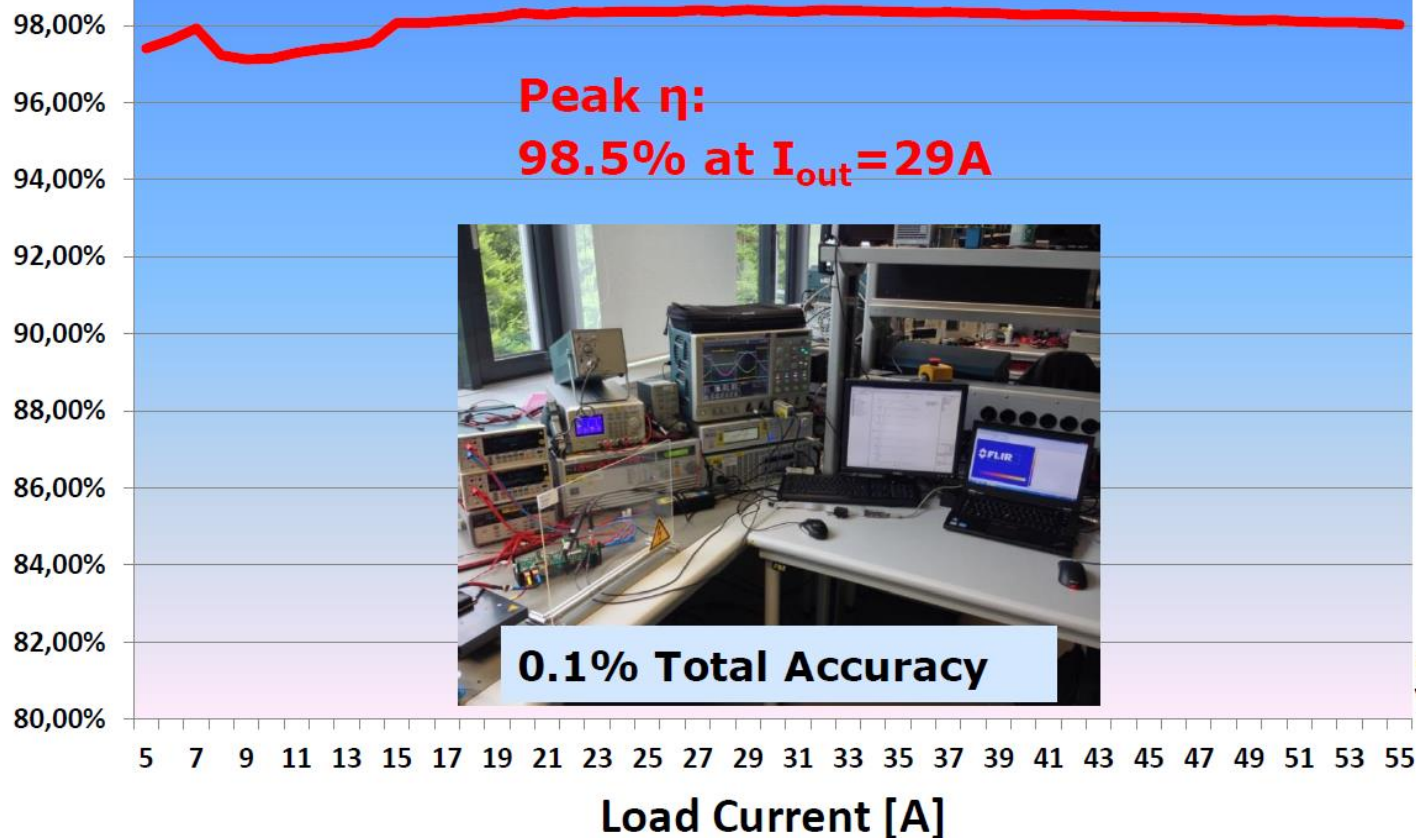
Combination of converter design (resonant tank, transformer) and proper HV device election

Proper selection of SR LV device and secondary side design

3kW Dual Phase LLC Efficiency

(without Bias & fans absorption)

Efficiency



— 3kW Dual Phase LLC

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

Table of Contents

1

General Description

2

Efficiency Results

3

Design Concept

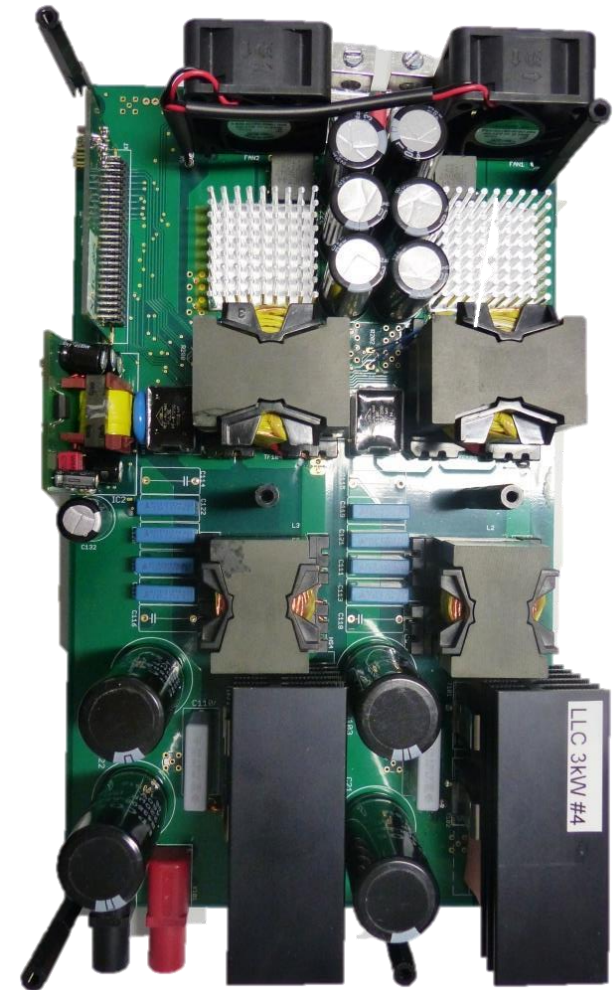
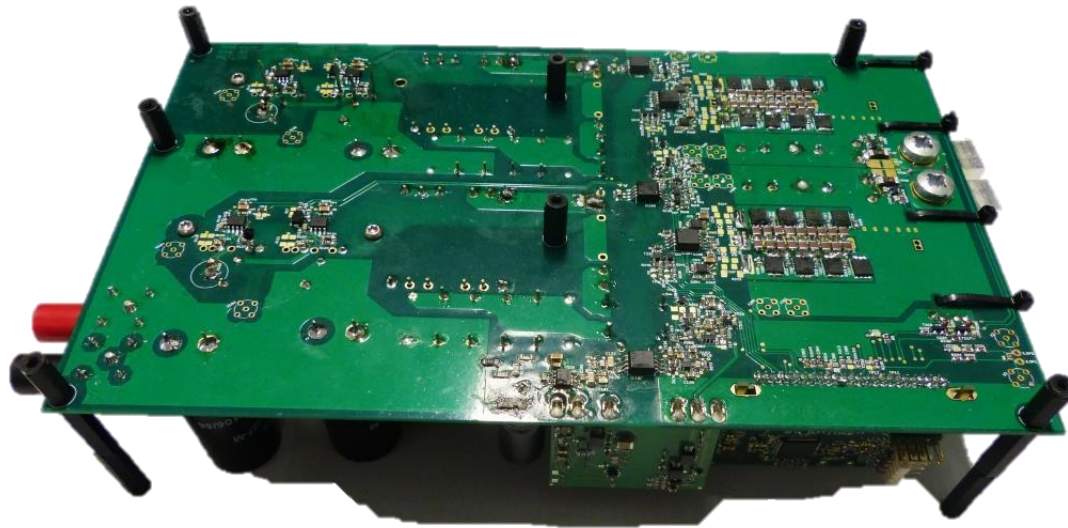
Design Concept





Evaluation Board

EVAL_3KW_2LLC_P7_47



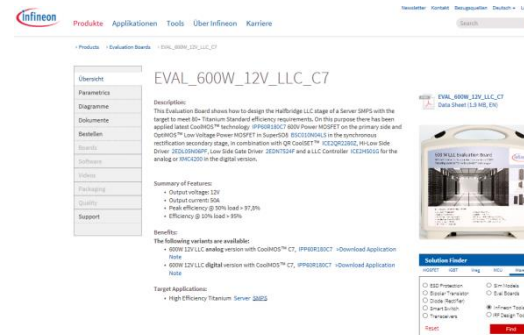
Support Slides

3KW Dual LLC Evaluation Board



Evaluation Board Page

- Technical Description
- Datasheets
- Parameters
- Related material
- Videos



- EVAL_3KW_2LLC_P7_47

Product Family Pages

- Product Brief
- Application Notes
- Selection Guides
- Datasheets and Portfolio
- Videos
- Simulation Models



- IPP60R037P7
- BSC093N15NS5
- XMC4400-F64K512 AB
- 2EDN7524R
- ICE2QR2280Z
- 1EDI60N12AF
- IFX1763XEJ V50
- IFX1763XEJ V33



Part of your life. Part of tomorrow.

