EVAL_2K5W_CCM_4P_V2

Featuring 600V CoolMOS™ C7, 650V thinQ!™ SIC Schottky Diode Generation 5, ICE3 CCM PFC Controller and 1ED EiceDRIVER™.

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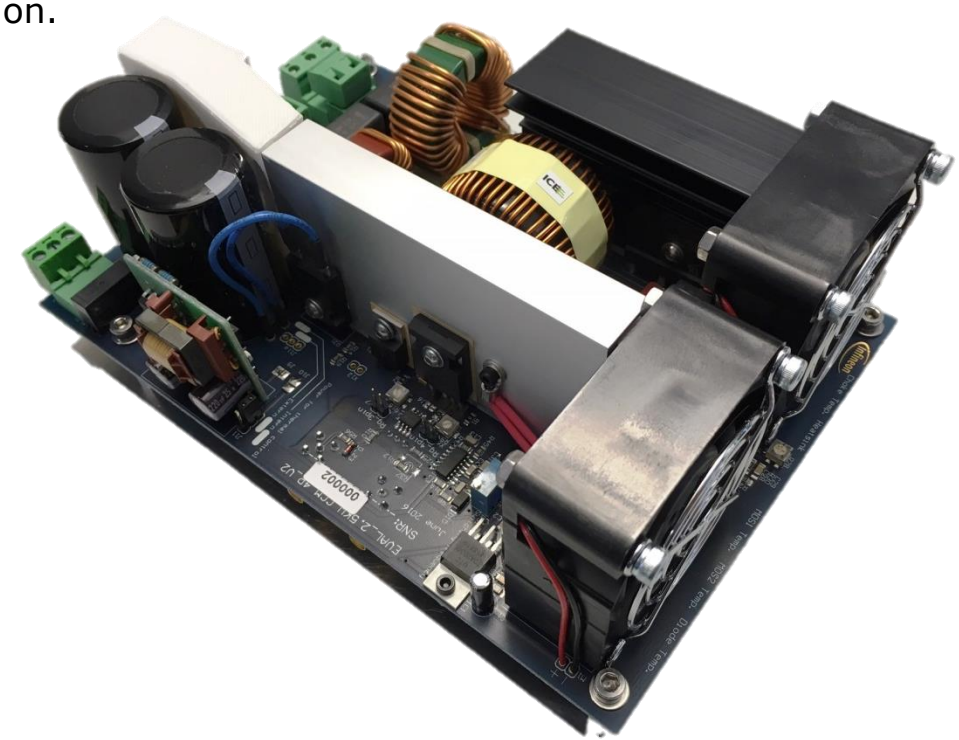
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General

Description:

The **"EVAL_2K5W_CCM_4P_V2" -** Evaluation Board 2.5KW CCM with 600V CoolMOS™ C7 in TO-247 4pin package is designed to evaluate the performance of the CoolMOS™ C7 in TO-247 4pin. The board is developed for the laboratories use only and does not serve for any commercial purpose!

The aim of this Evaluation Board is to help the customers to get familiar with Infineon products and to evaluate different behavior of conventional 3pin devices compared to the high performance CoolMOS™ C7 devices in TO-247 4pin within a PFC application.



Summary of Features:

- Input Voltage: 85–265 V_{ac}
- Output Voltage: 400V
- Output Power: 2.5kW @ $V_{(in)}$ = 230V_{ac}

  1kW @ $V_{(in)}$ = 90V_{ac}
- Variable Switching frequency: 40-200kHz
- Peak Efficiency: <98%

The following variants are available:

- Evaluation Board 2.5KW CCM with 600V CoolMOS™ C7 **EVAL_2K5W_CCM_4P_V2**

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Introduction I

Board components:

IPZ60R040C7 - High Voltage Power MOSFET 600V CoolMOS™ C7

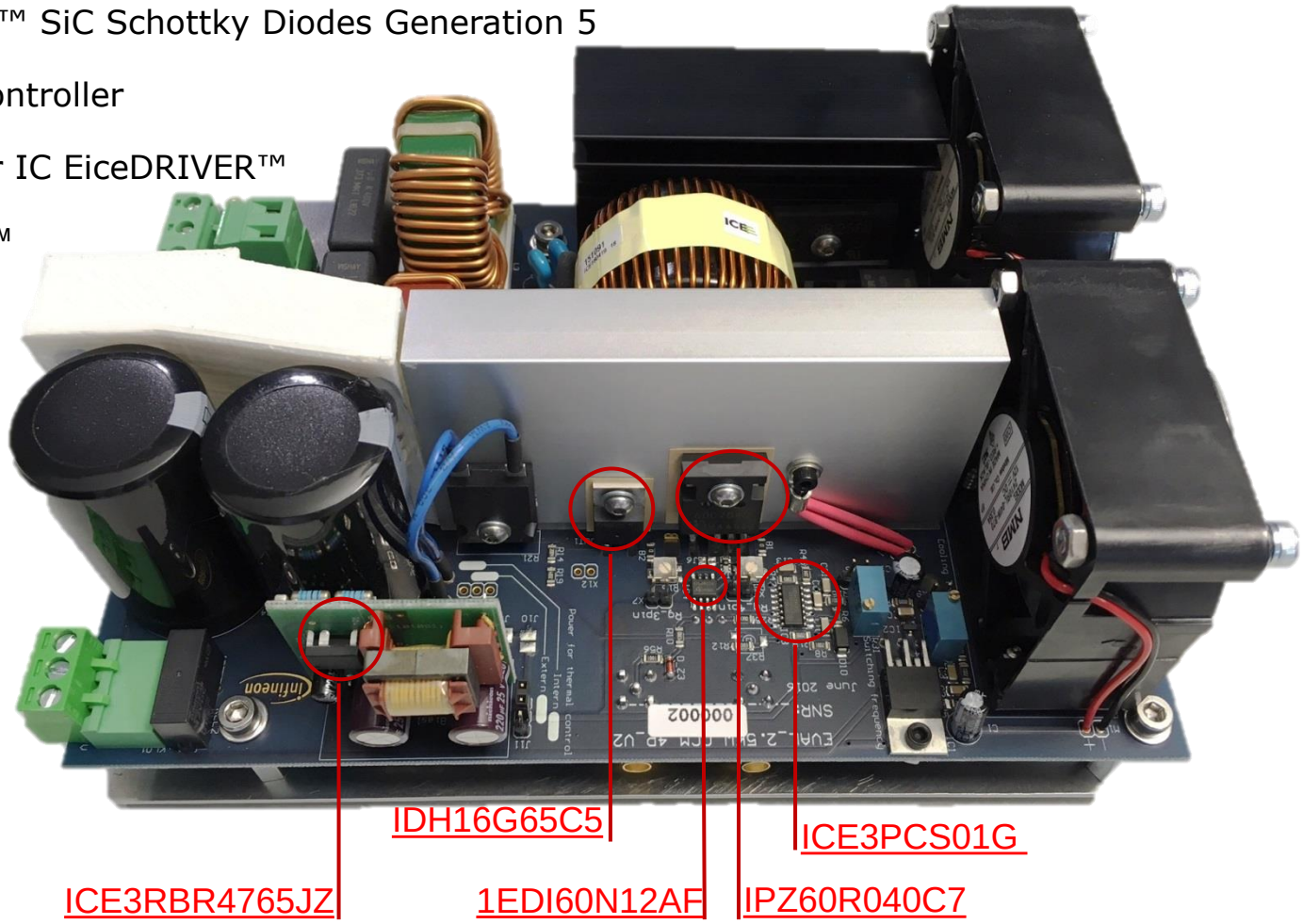
IDH16G65C5 - 650V thinQ!™ SiC Schottky Diodes Generation 5

ICE3PCS01G - CCM PFC Controller

1EDI60N12AF - Gate Driver IC EiceDRIVER™

ICE3RBR4765JZ - CoolSET™

IFX91041 - Buck Controller



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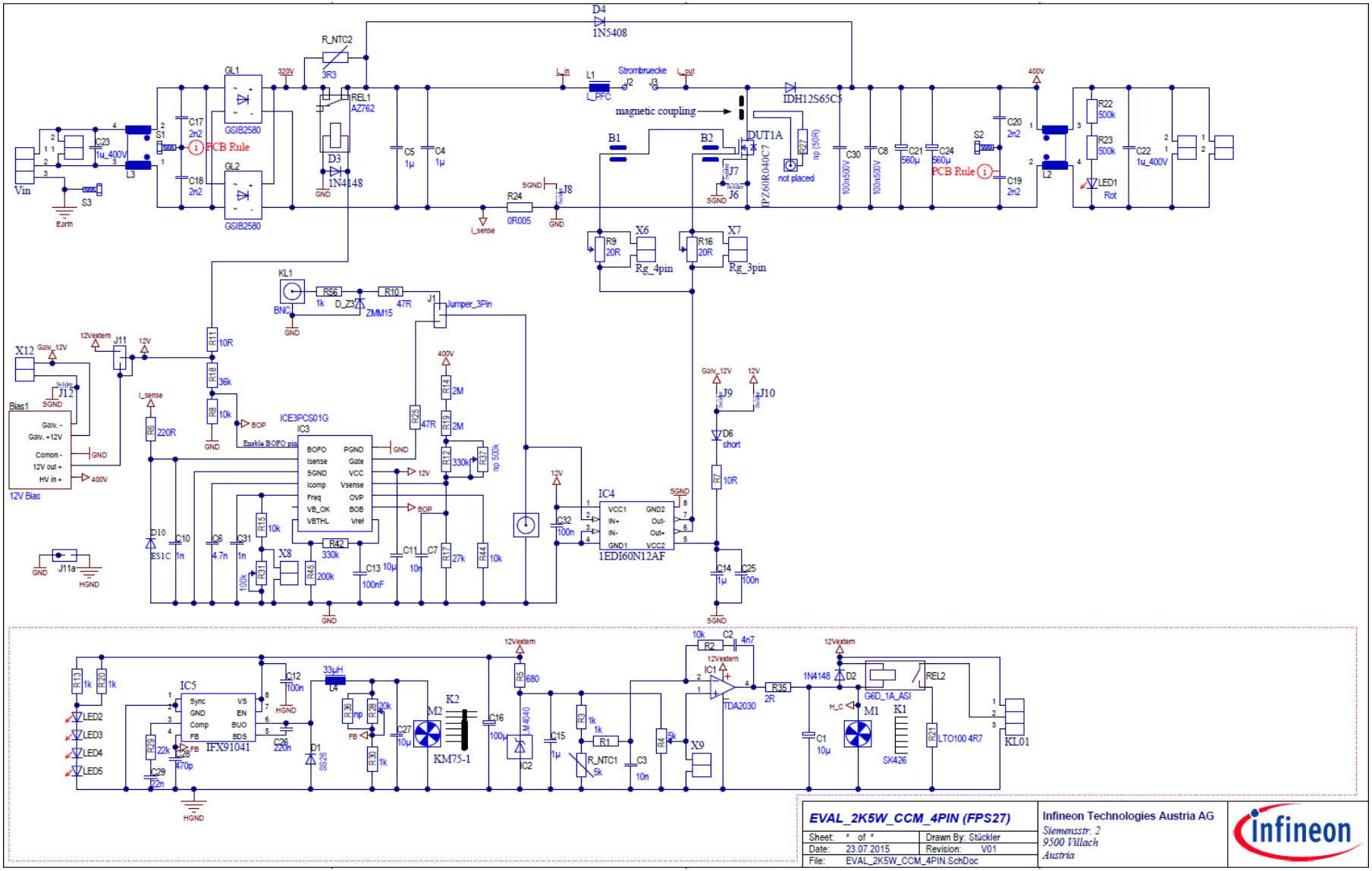
Introduction II

- This evaluation board is designed to evaluate the performance of the TO-247 4pin CoolMOS™ C7 family. The board is developed for laboratory use only and does not serve any commercial purpose! Before operating the evaluation board, please read the general safety instruction section!
- The aim of this document is to help the customers to get familiar with the evaluation board EVAL_2K5W_CCM_4P_V2, to investigate the different behavior of conventional 3pin devices compared to the high performance TO-247 4pin CoolMOS™ devices within a PFC application.
- The following table gives the main technical specifications of the evaluation board:

Technical specifications	
Input voltage	85 V_{AC}~265 V_{AC}
Input current	14 A_{eff}
Input frequency	47~63 Hz
Output voltage and current	400 V_{DC}, 6.25 A
Output power	~ 2.5 kW (at V_{in}=230 V_{AC})
Average efficiency	>95% at 115 V_{AC}
Switching frequency	Possible range: 40 kHz~250 kHz; Board frequency is set to 65 kHz; Changeable by R20
Power switch	4pin and 3pin MOSFET

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Schematic



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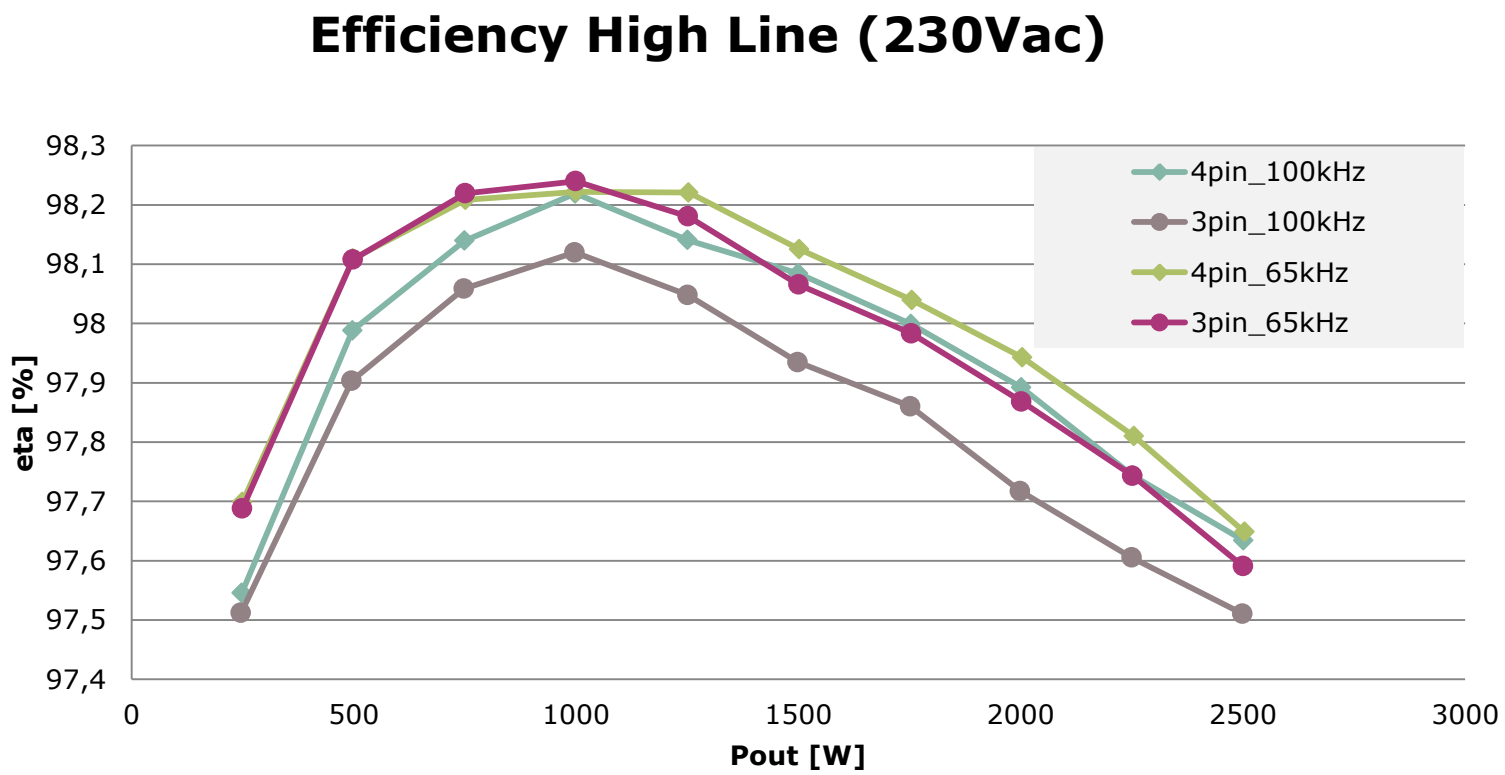
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Efficiency I

› For the efficiency test it is important to take the voltage sensing on the input and output power with the V_{in_sense} and V_{out_sense} right beside the power connections.

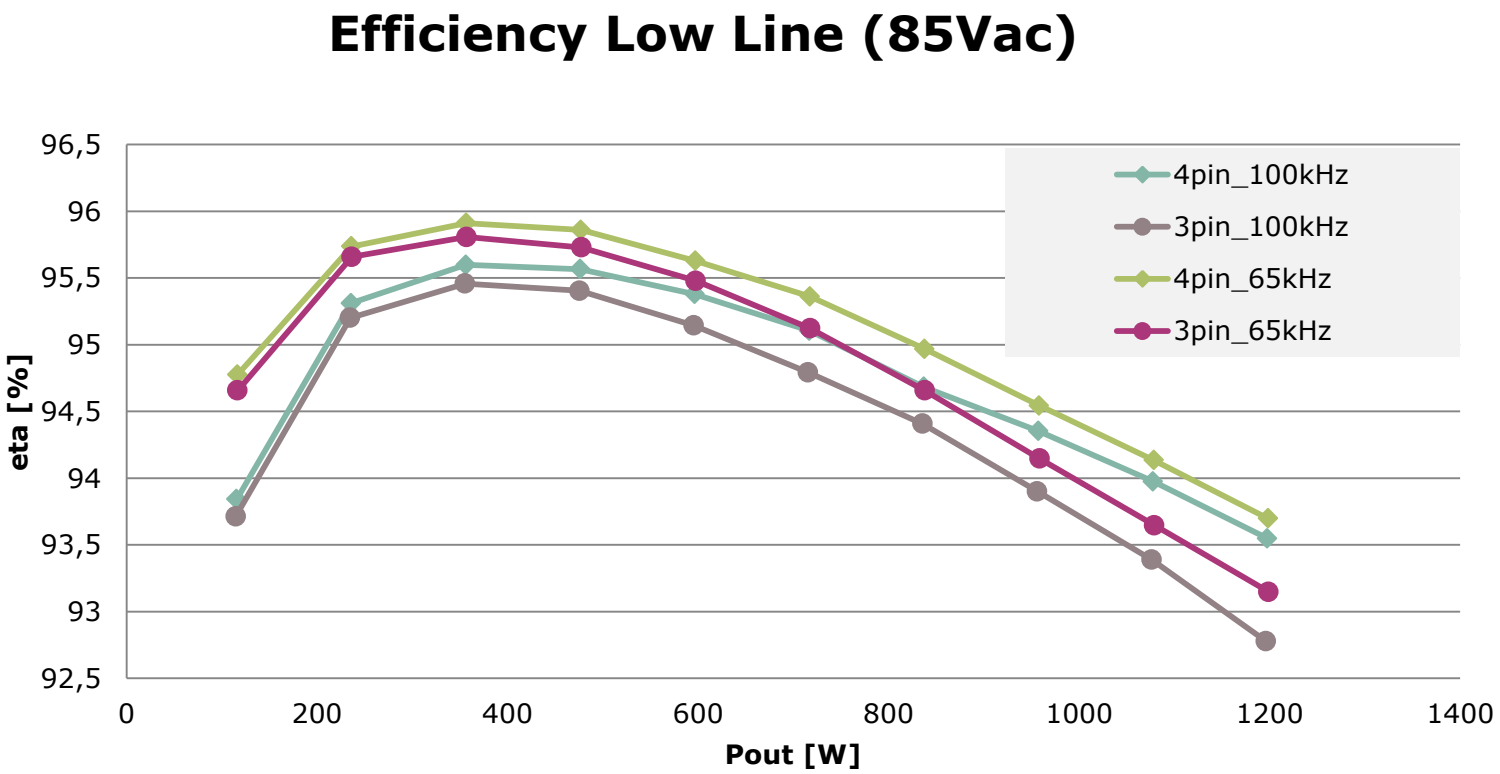


*All test conditions are based on 60°C heat sink temperature.

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Efficiency II

› For the efficiency test it is important to take the voltage sensing on the input and output power with the V_{in_sense} and V_{out_sense} right beside the power connections.

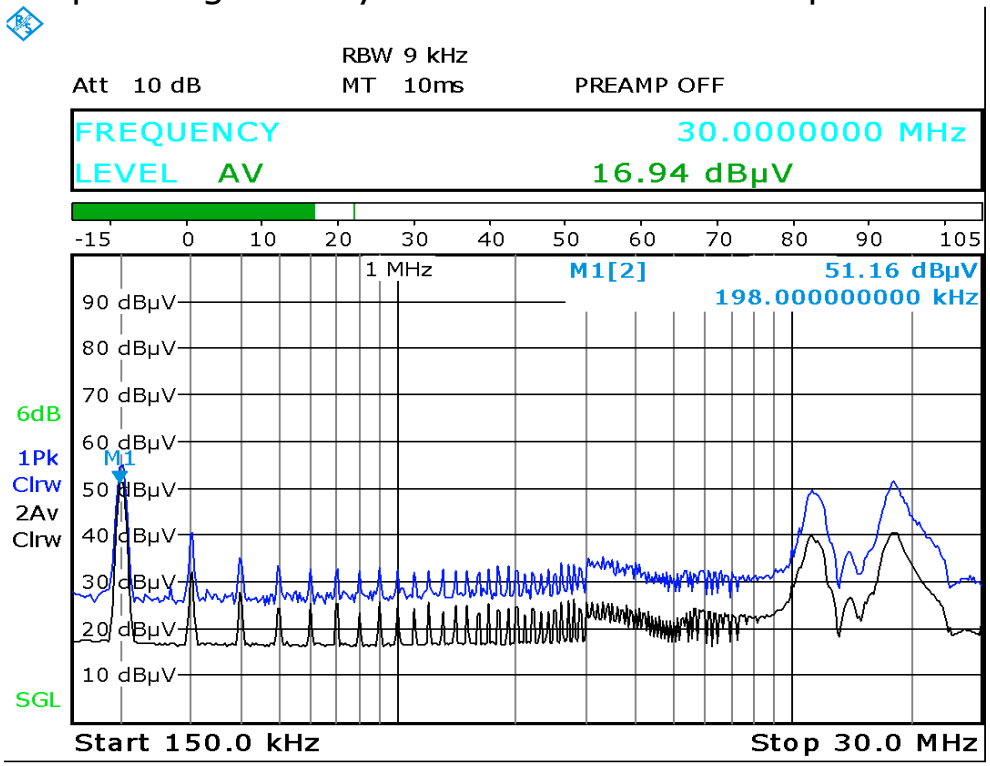


*All test conditions are based on 60°C heat sink temperature.

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Conductive EMI test

› EMI is a very important quality factor for a power supply. The EMI data includes the whole spectrum of the SMPS behavior and is split into radiated and conductive EMI. It is most important to investigate on the conducted EMI behavior, for the described evaluation PFC board, since it is the input stage of any SMPS below a certain power range.

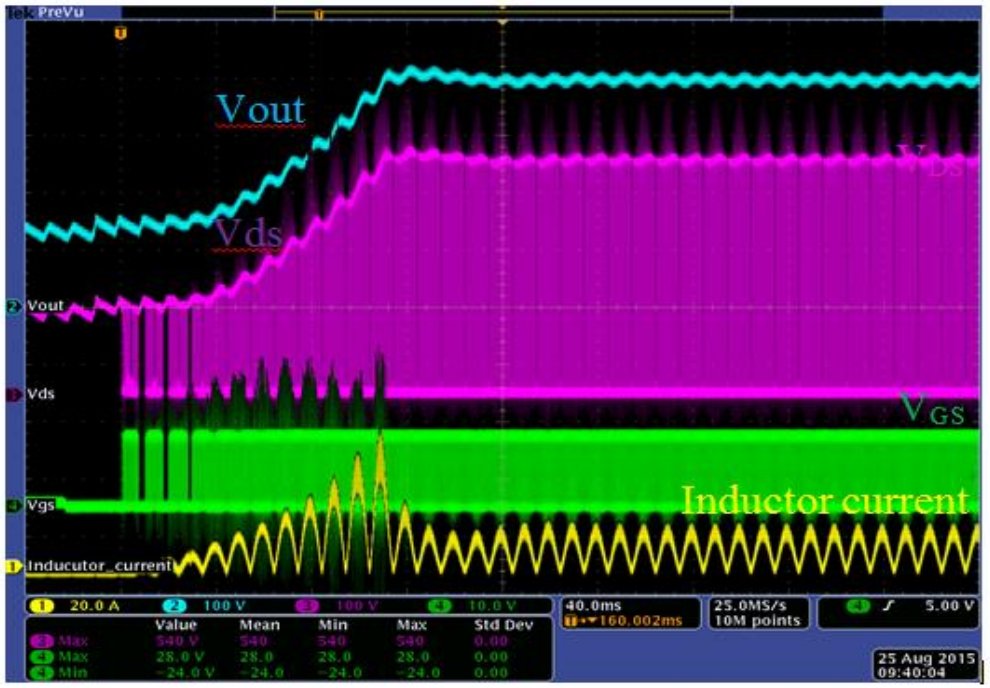


*Conductive EMI measurement of the evaluation board at 100 kHz with a resistive load (4 pin configuration)

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Startup behavior

› During power up, when the V_{OUT} is less than 96% of the rated level, internal voltage loop of the IC increases from the initial voltage under the soft-start control. This results in a controlled linear increase of the input current from 0 A, thus reducing the current stress in the power components as can be seen on the yellow wave shape.



*Soft startup at low line with 1 kW output power

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Summary I

- The present 2.5 kW evaluation board is a great example of a full Infineon solution, including PFC Controller, MOSFET Driver and Silicon Carbide Diode in order to evaluate the 4pin functionality with its advantages for efficiency and signal quality.

- Furthermore the reader will get additional information how to use the evaluation board. Beside this he will get the information how the 600 V CoolMOS™ C7 behaves in this PFC board and what benefits will be achieved by the usage of the TO-247 4pin package.



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Summary II

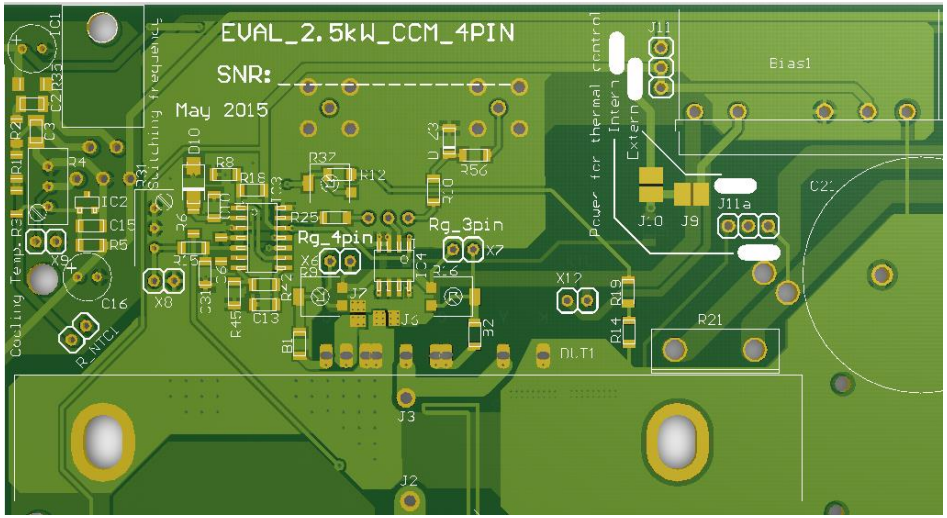
- The 2.5 kW PFC evaluation board described in this document is aimed at analyzing the switching performance of different variants of packages in a very common used PFC topology. It helps to understand the switching behavior and parasitic influences. With the various option settings via “solder jumper” it is possible to modify the circuit without changing any layout. Therefore the evaluation board offers plenty investigation variants. Furthermore, it shows how to boost the efficiency in a standard PFC topology.



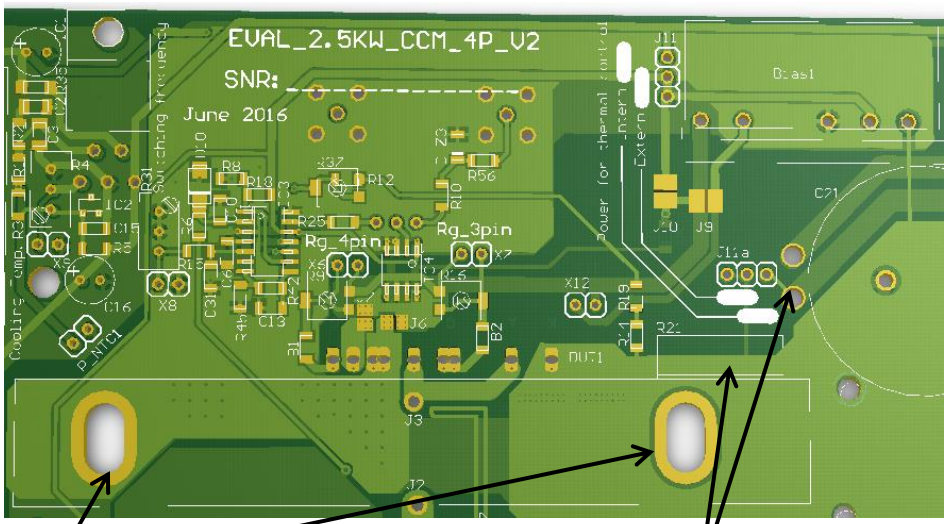
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History
Differences V2 towards first version

- First version



- Changes on V2



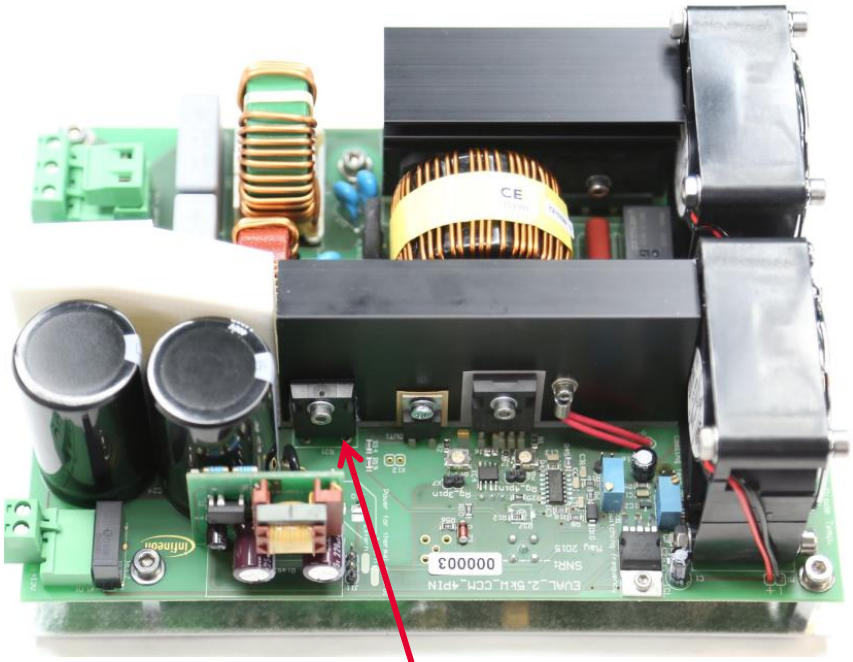
Increased long hole: Better adjustment for TOLL kit.

Heater assembled by cable: More flexibility for heat sink → adjustment for TOLL kit.

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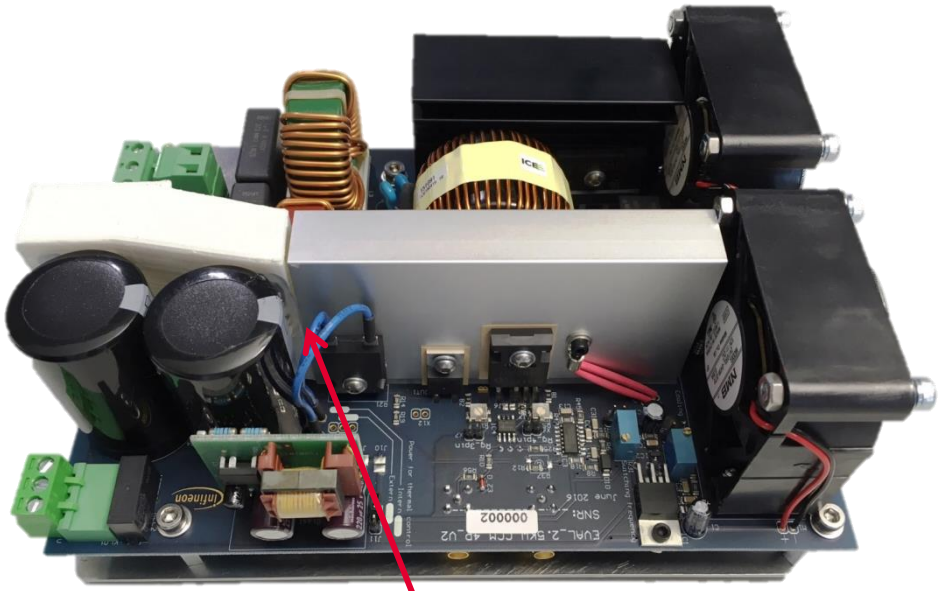
History
Differences V2 towards first version

› First version



Heater soldered in the PCB: Limited flexibility for heat sink → adjustment for TOLL kit is difficult.

› Changes on V2



Heater connected by cable: More flexibility for heat sink → adjustment for TOLL kit.

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