EVAL_3KW_2LLC_CFD7

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

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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 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 sychronous 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)

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

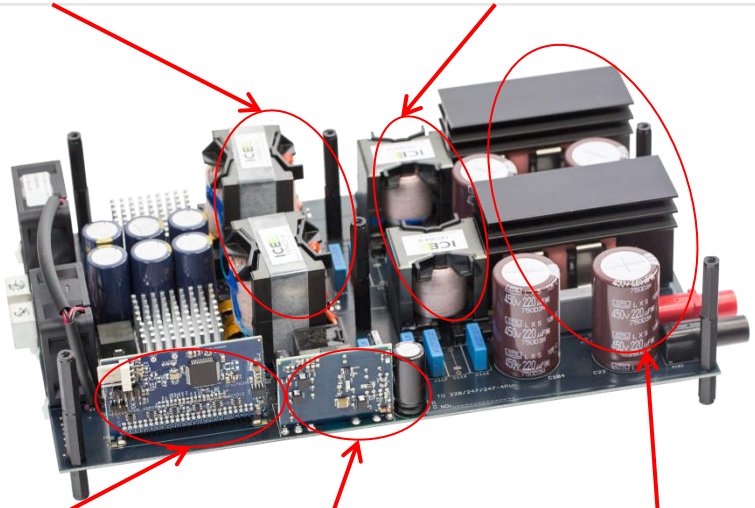
Half-bridge LLC with synchronous rectification in center tap configuration	
V_{in}	350 – 400 V_{DC}
V_{in_nom}	380 V_{DC}
V_{out}	44 - 58 V_{DC}
I_{out}	55 A
P_o	3 kW
C_r	66 nF
L_r	12 uH
L_m	62 uH

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 $R_{DS(on)}$ x Q_g
- Best FOM $R_{DS(on)}$ x 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

HV MOSFETs
IPW60R037P7 TO-247

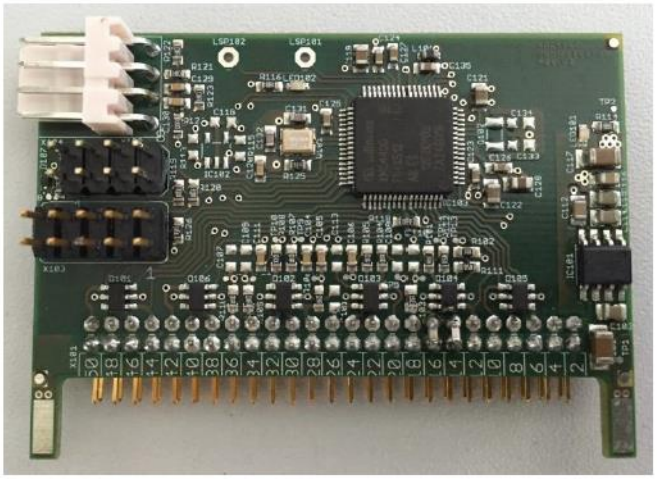
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Digital control card- Infineon's solution to control the 3 kW dual-phase LLC evaluation board

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





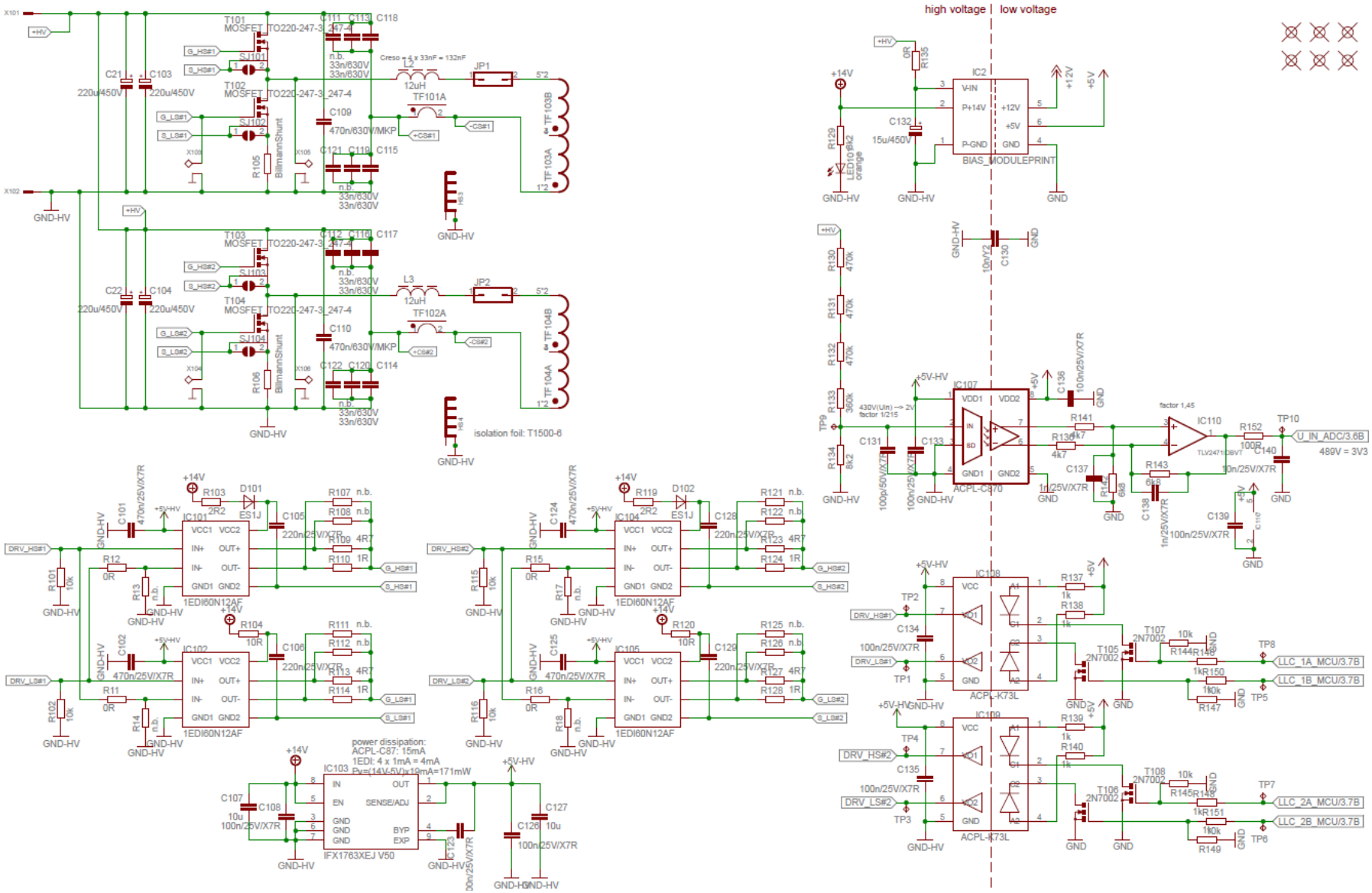
Target applications:

Motor control

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

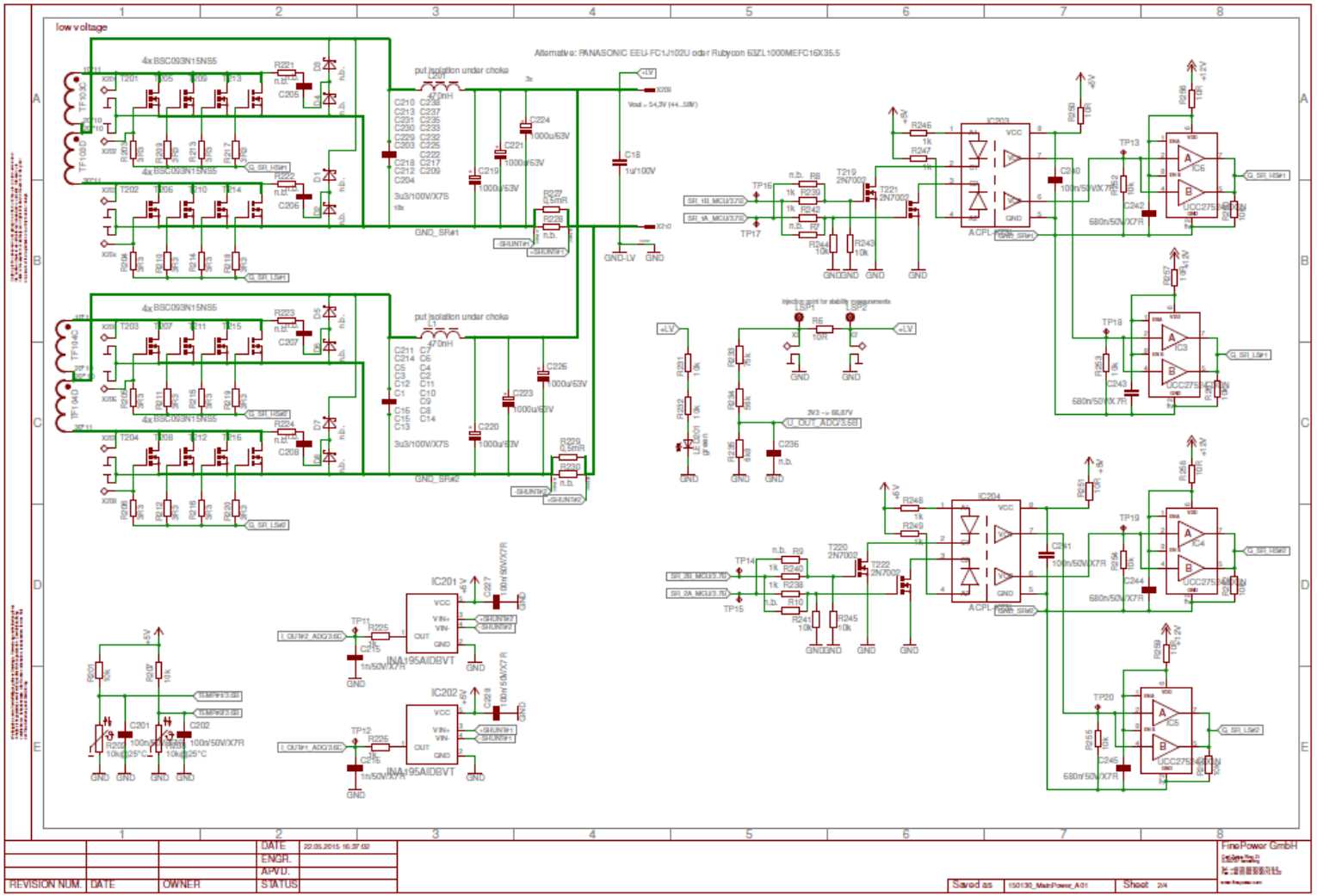
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Main power board schematic_1



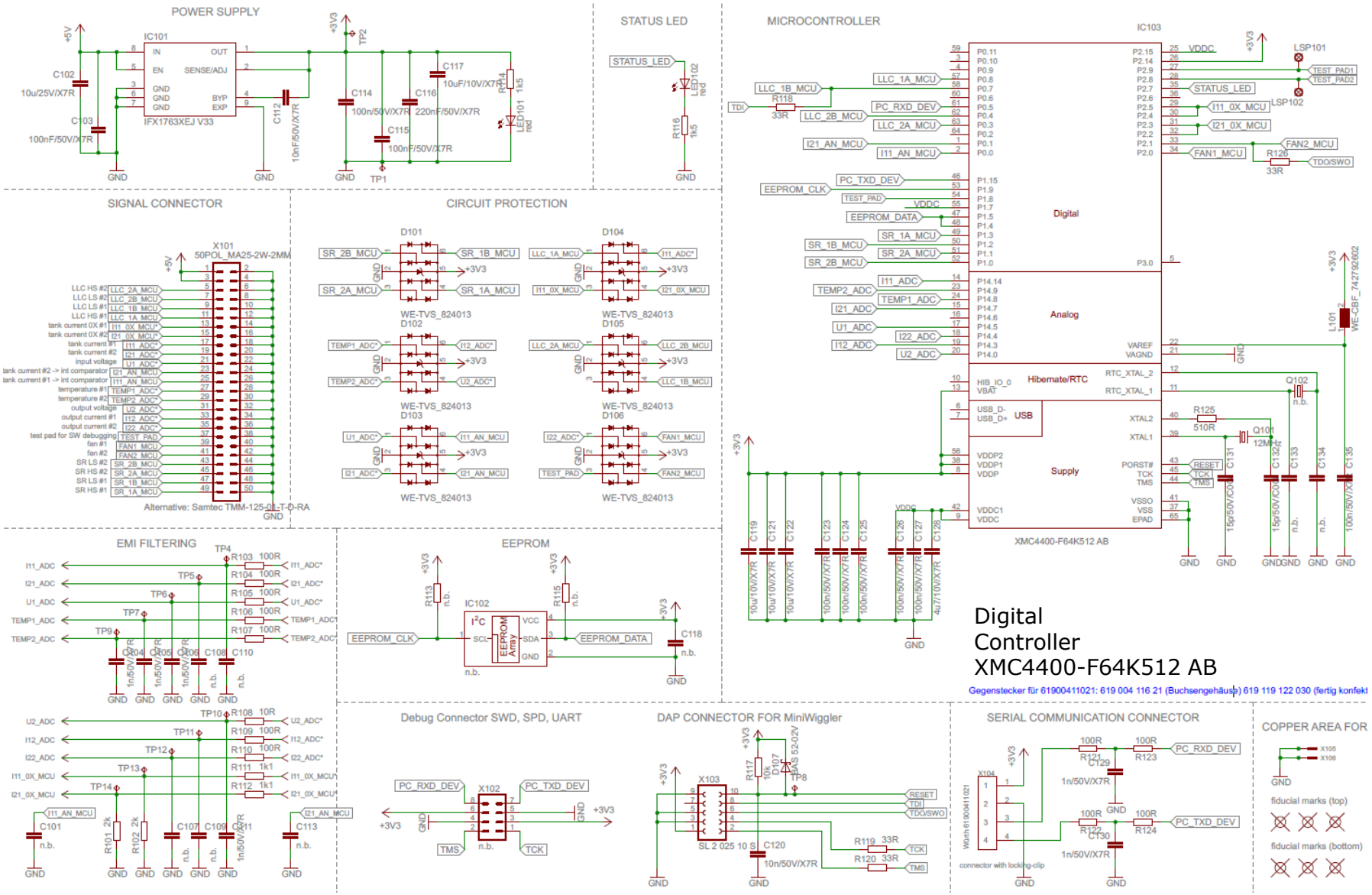
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Main power board schematic_2



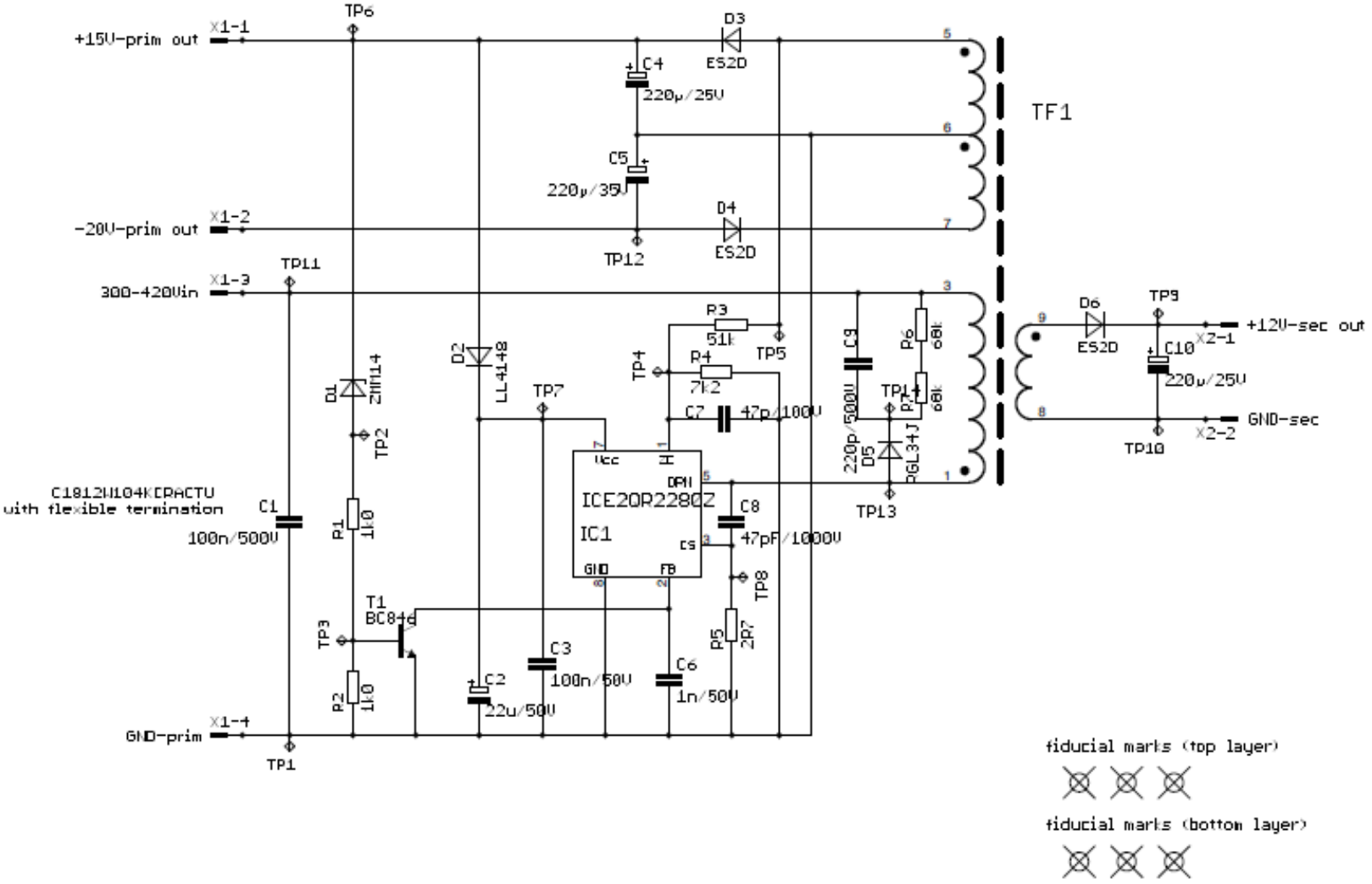
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Digital control board schematic



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Bias board schematic



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Connection instruction



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Agenda

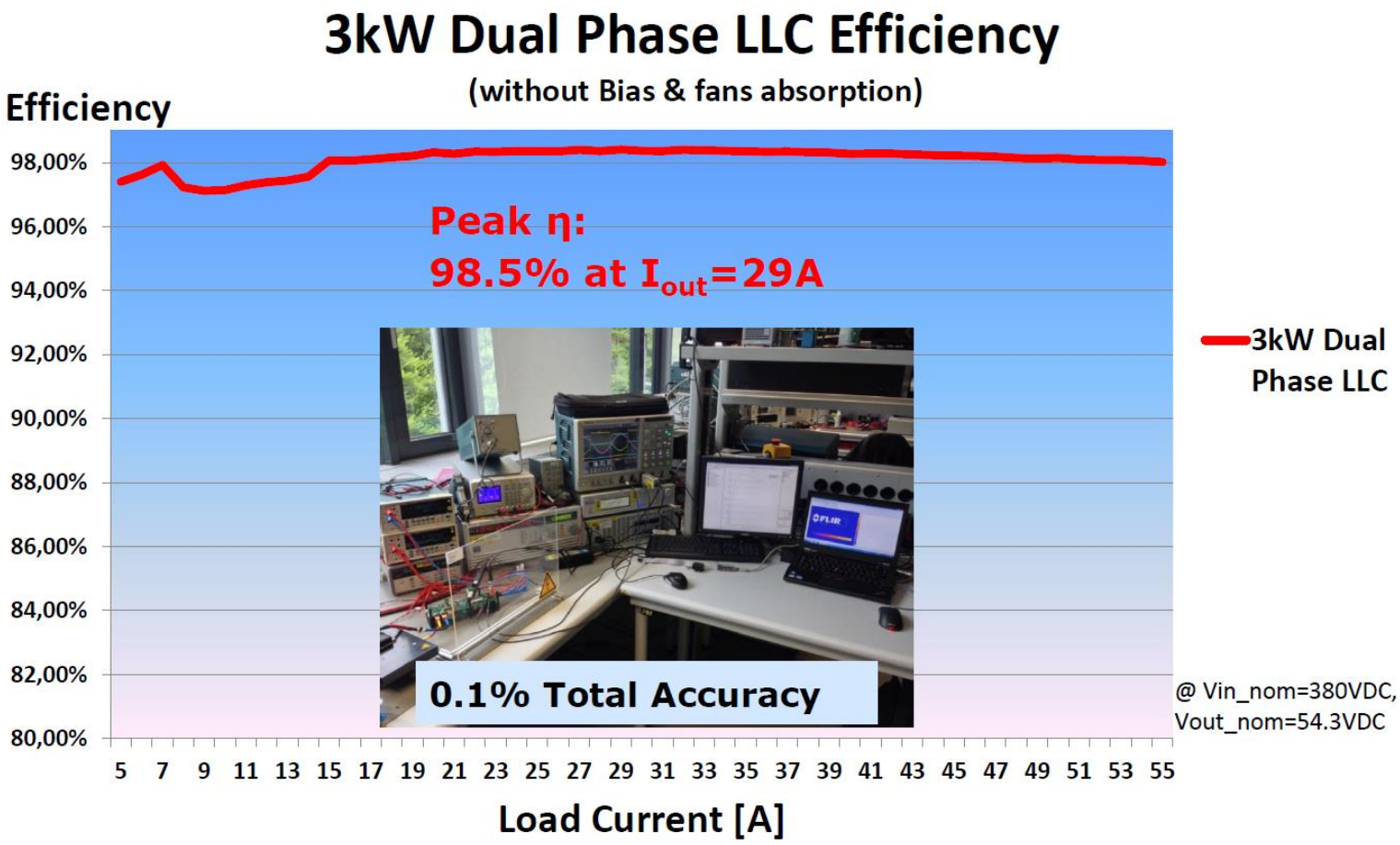
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Automated efficiency measurement

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

Proper selection of SR low voltage device and secondary side design



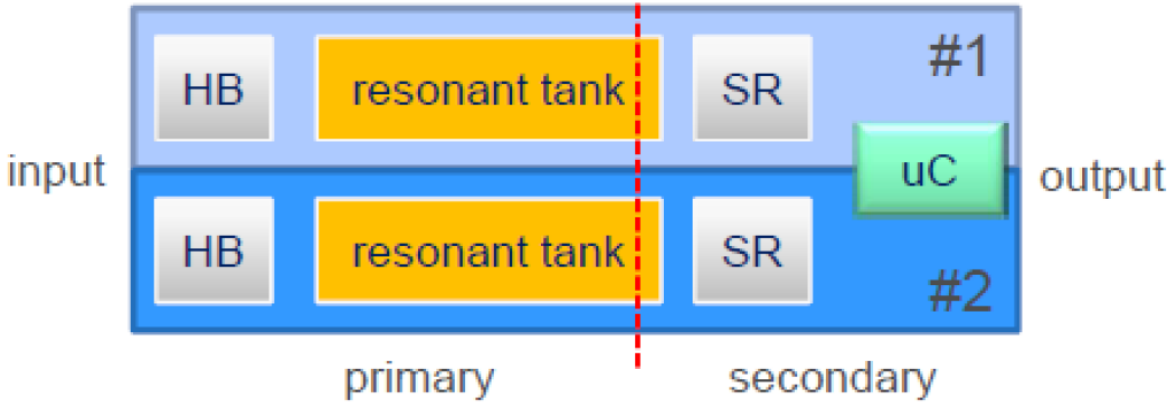
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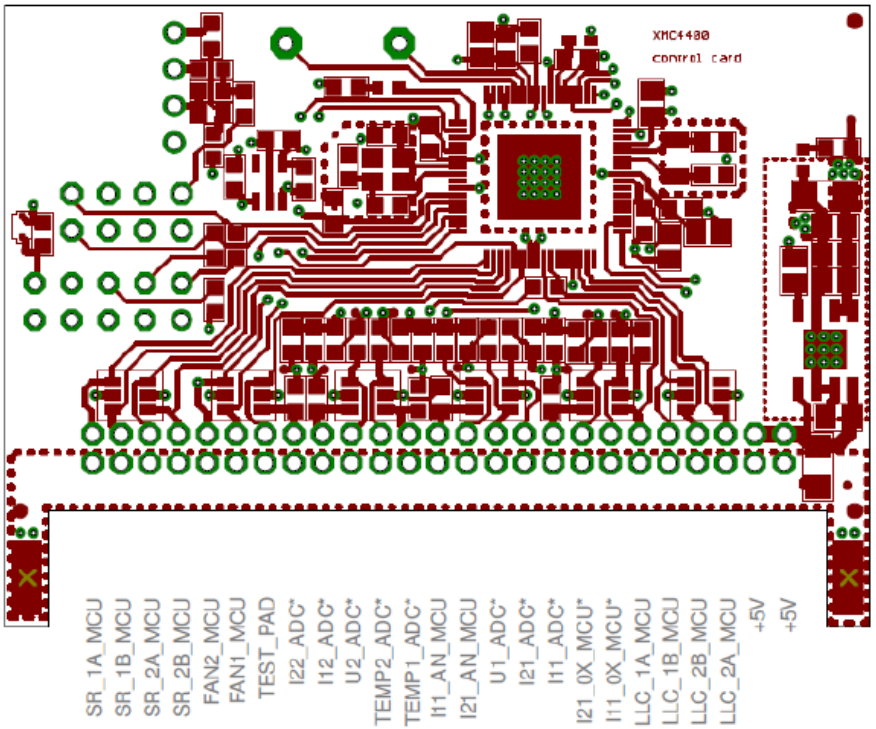
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Design concept

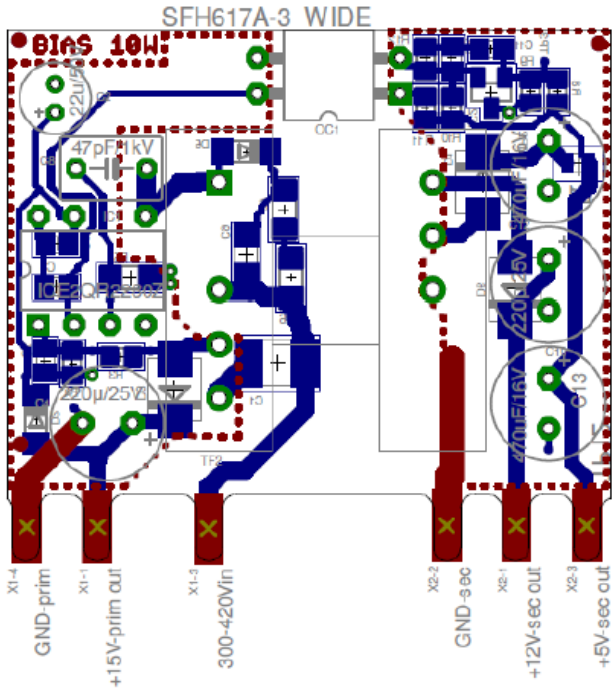


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Two daughter boards



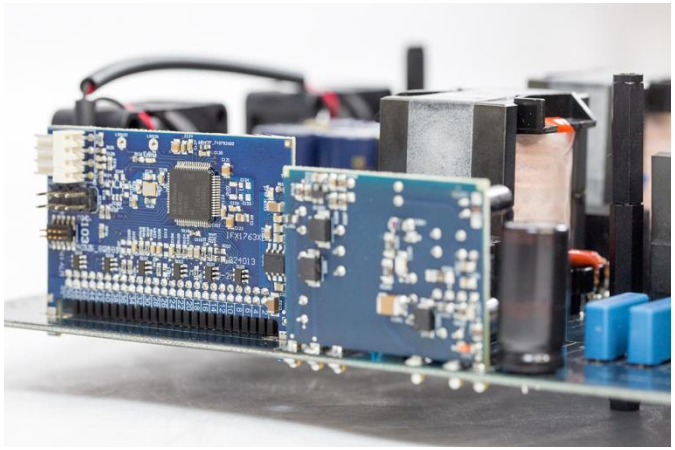
Microcontroller Board

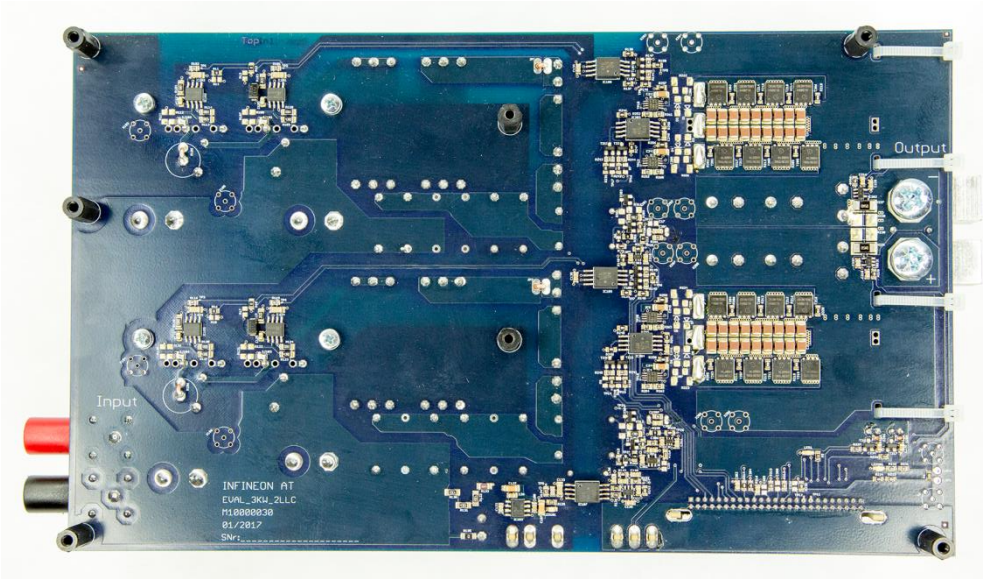


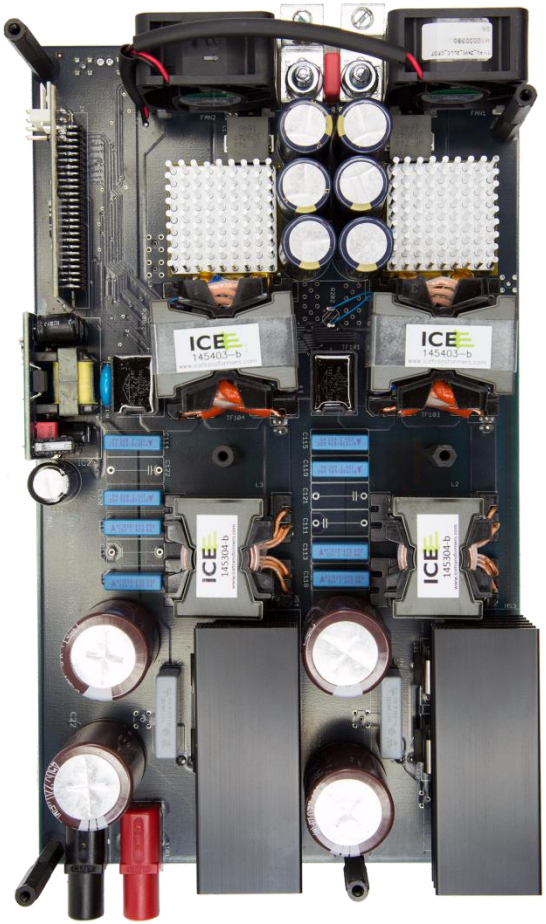
Auxiliary Converter Board

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Evaluation board EVAL_3KW_2LLC_CFD7







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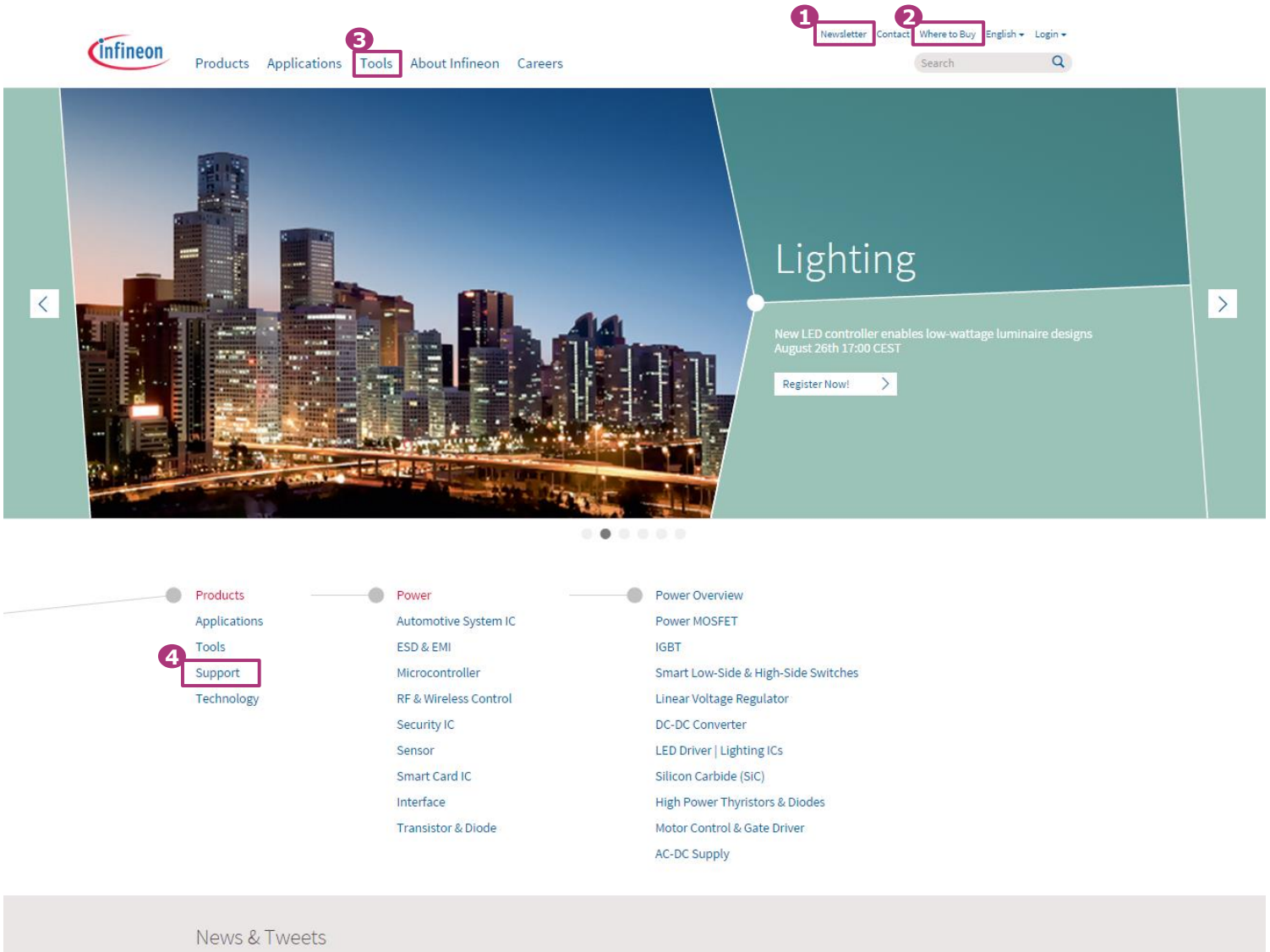
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