3.0kW Dual LLC Evaluation Board
EVAL_3KW_2LLC_P7_47
TO247

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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, 1ED160N12AF 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**, IPW60R037P7

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**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{in}$</td>
<td>350 – 400V&lt;sub&gt;DC&lt;/sub&gt;</td>
</tr>
<tr>
<td>$V_{in_nom}$</td>
<td>380V&lt;sub&gt;DC&lt;/sub&gt;</td>
</tr>
<tr>
<td>$V_{out}$</td>
<td>44 - 58 V&lt;sub&gt;DC&lt;/sub&gt;</td>
</tr>
<tr>
<td>$I_{out}$</td>
<td>55 A</td>
</tr>
<tr>
<td>$P_o$</td>
<td>3 kW</td>
</tr>
<tr>
<td>$C_r$</td>
<td>66 nF</td>
</tr>
<tr>
<td>$L_r$</td>
<td>12 uH</td>
</tr>
<tr>
<td>$L_m$</td>
<td>62 uH</td>
</tr>
</tbody>
</table>

**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

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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
Main Power Board Schematic_2
Connection instruction

- 44 - 58 V_DC

+ 350 - 400 V_DC
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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)

Peak $\eta$: 98.5% at $I_{out} = 29\text{A}$

0.1% Total Accuracy

@ $V_{in\_nom}=380\text{VDC}$, $V_{out\_nom}=54.3\text{VDC}$
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Design Concept

![Diagram showing a design concept with labels for input, primary, resonant tank, secondary, output, and components HB, SR, and uC.](image)
Two Daughter Boards

Microcontroller Board

Auxiliary Converter Board
Support Slides
3KW Dual LLC Evaluation Board

Evaluation Board Page
- Technical Description
- Datasheets
- Parameters
- Related material
- Videos

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

- IPP60R037P7
- BSC093N15NS5
- XMC4400-F64K512 AB
- 2EDN7524R
- ICE2QR2280Z
- 1ED160N12AF
- IFX1763XEJ V50
- IFX1763XEJ V33
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