



DEMO-BOARD OPTIMIZATION AND PRE-COMPLIANCE REPORT



NXP [TEA2016DB1519v2](#) 12V - 240W

**High efficiency | Wide input range | Low stand-by power
PFC + LLC resonant power supply**

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Introduction

Producing PCB transformers since 1981, now Itacoil also provides support to SMPS designers and manufacturers for the design and pre-compliance of the converters equipped with Itacoil components. Our support service ranges from a single step to the entire design of the SMPS with tuning and pre-compliance tests, depending on the customer's needs.

This report is intended to be a public non-comprehensive demonstration of Itacoil products and services and does not include all the technical information about the demo board.

Click [here](#) for more info about Itacoil services.

Click [here](#) if you are looking for the NXP TEA2016DB1519v2 demo board technical documents.

Scope

The primary aim of the demo-board optimization shown in this report was **cost saving**, maintaining the same general properties of the original board, along with any possible **efficiency improvement** basically with no other action than the replacement of the following inductive components: LLC resonant transformer, PFC inductor, Common Mode and Differential noise mains filter.

The output inductors L301-L302 have not been processed because they have a minor role in improving efficiency, cost and dimensions.¹

Important note: due to the cost reduction target no expensive materials such as nanocrystalline cores, costly alloy powders cores, etc. have been used, meaning that the improvements obtained on encumbrance and cost is due solely to the optimal design of the components.

Board adaption

The board as supplied requires air cooling to run up to 240W, but we performed the whole test with no air cooling for a better comparison. For this reason the synchronous rectification mosfets Q301-Q302 have been replaced with the same type in a TO-220 case (PSMN2R2-40PS) placed under the board on a flat aluminum heatsink with one of them insulated against the heatsink.

In order to limit the PCB temperature, a short litz wire bridge has been assembled under the PCB, between the LLC transformer secondary central tap pad and the "+" pad of C302.

Both LLC transformers have been mounted slightly raised from the PCB floor to allow pinout adaption and to ensure the same working conditions.

Board optimization

The optimization required a redesign of the resonant tank and related transformer.

No significant changes have been made to the PFC inductor because no relevant advantages were expected at a rough estimate. We maintained the same inductance value and only changed its shape to reduce the footprint.

Then the EMI filter components have been selected with preference for our standard components where possible, considering the noise spectrum and always with an eye on costs and EMI margins.

Besides the inductive components, also C116 and C117 have been replaced with two 100nF-500V MLCC as it turned out to be cost-effective.

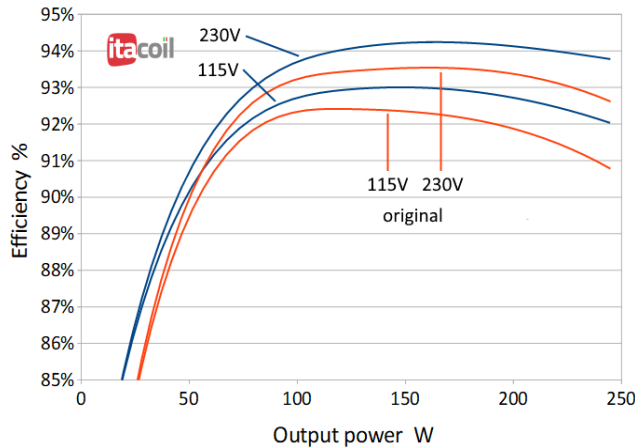
A COMPARISON-FRIENDLY VERSION OF THIS REPORT IS AVAILABLE [HERE](#)

¹ The only possible improvement comes with the replacement of the L301-L302 output inductors with a single larger one.

Results overview

This demo board optimization has led to improvements in the following areas:

Overall efficiency:

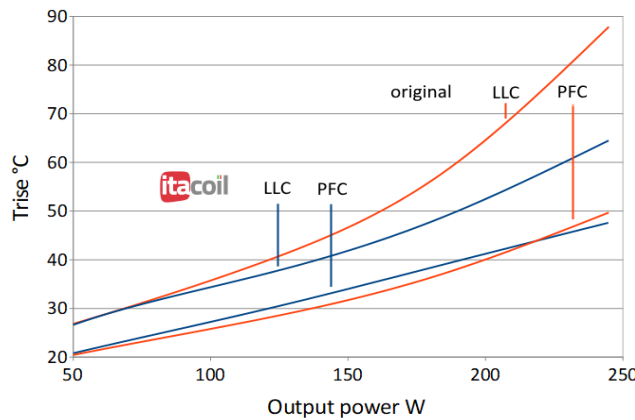


@ 240W

230V: **+1,58%**

115V: **+1,25%**

Temperature rise:



@ 240W

LLC transf. (115-230V): **-21°C**

PFC (115V): **-2°C**

Costs:

The cost saving estimation on the inductive components is in the **10-20%** range.²

Dimensions:

The total footprint and volume of the Itacoil components set is **40%** smaller than the original one while the overall height of the board is maintained.

EMC pre-compliance: We performed:

- ✓ EMI conducted noise test in compliance to EN55022 on both Ph/N lines
- ✓ Harmonics test in compliance to IEC61000-3-2, Class A
- ✓ Power Factor

The worst conducted noise margin with respect to the maximum limits of EN55022 has increased to **11 dBµV**, against 6 dBµV of the original components set.

Stand-by power:

-14% on the worst case no load consumption with Itacoil components set.³

Further improvements:

Further improvements on cost, dimensions, EMI and so on can be achieved. For example:

- **94,2%** (230Vac) efficiency and **50°C** Trise are possible with the sole replacement of the proposed LLC integrated transformer;
- **16 dBµV** EMI margin is achievable with the sole replacement of the Common Mode choke.

[More details on page 40.](#)

The test reports are shown in the following pages.

- 2 This estimate relates to the cost of components hypothetically manufactured by Itacoil with the same characteristics of the original ones, compared to the cost of the optimized components.
- 3 The stand-by power improvement is of 10mW because of the already great performance of the board.



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