

**Test Report
For PMP9361
02/07/2014**



Overview

The reference design provides an EMI optimized 1.5W power supply design for automotive applications. This design features the LM34919C, a 50V, 600mA buck regulator, AEC-Q100 qualified, with a switching frequency up to 2.6MHz and in ultra-small 2x2mm DSBGA package, making it suitable for automotive applications. The power supply generates a 3.3V output at 500mA, and the switching frequency is set at 2.1MHz to avoid AM bands interferences. The design comes with the input EMI filter to suppress the conducted emissions. It is tested under the CISPR 25, the automotive EMC standard, and the result is compliant with the Class 5 conducted emissions standard.

Power Specification

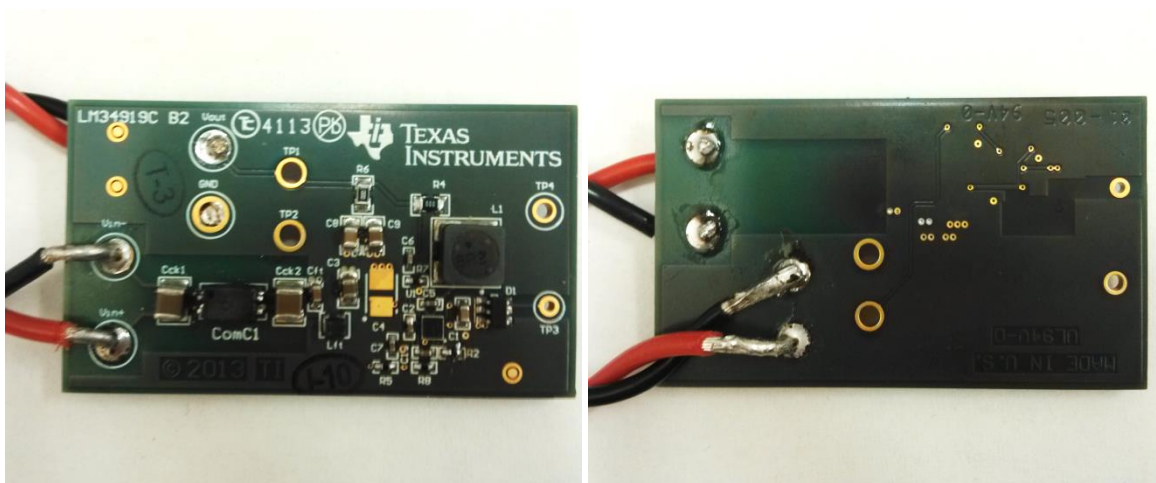
Vin range: 6V – 50V

Nominal Vin: 12V

Outputs: 3.3V@500mA

Fsw: 2.1MHz

Board Photos



Power Board Front

Power Board Back

Figure 1

Size: 50x30mm

Efficiency

The efficiency is measured separately at $V_{in}=6V$, $12V$, $24V$.

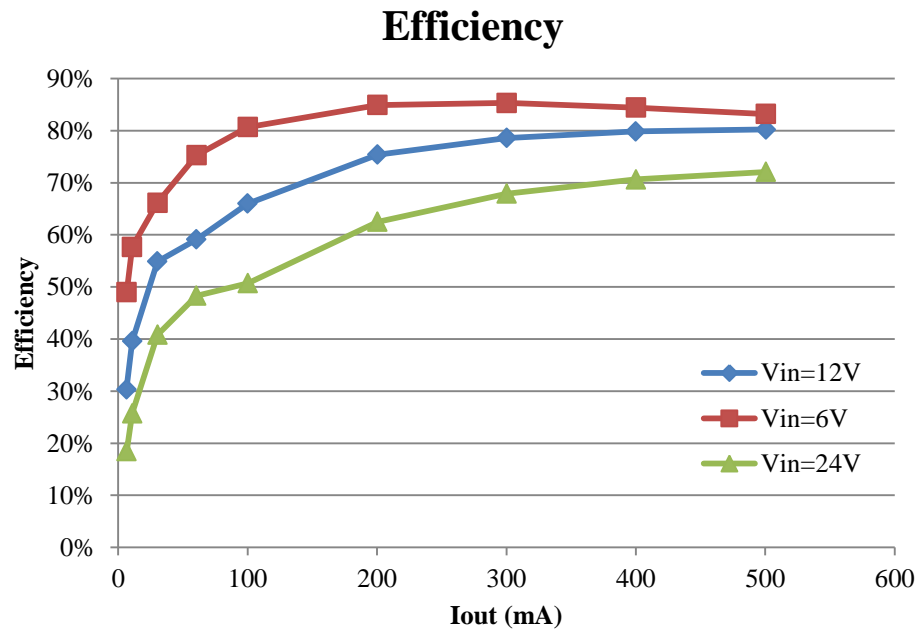


Figure 2

Test condition: The input voltage was set at 12V, and the output is set at full load.
Ch2 - V_{in} , Ch3 - V_{out} , Ch4 - I_{out}



Switch Node Waveform

Test condition: The input voltage was set at 12V, 6V and 48V, and the output is set at full load. The switching frequency is stable at 2.1MHz around nominal Vin 12V, but it would decrease at high Vin above 24V as the minimal on-time is reached.

Ch3 – Vsw (switch node voltage).

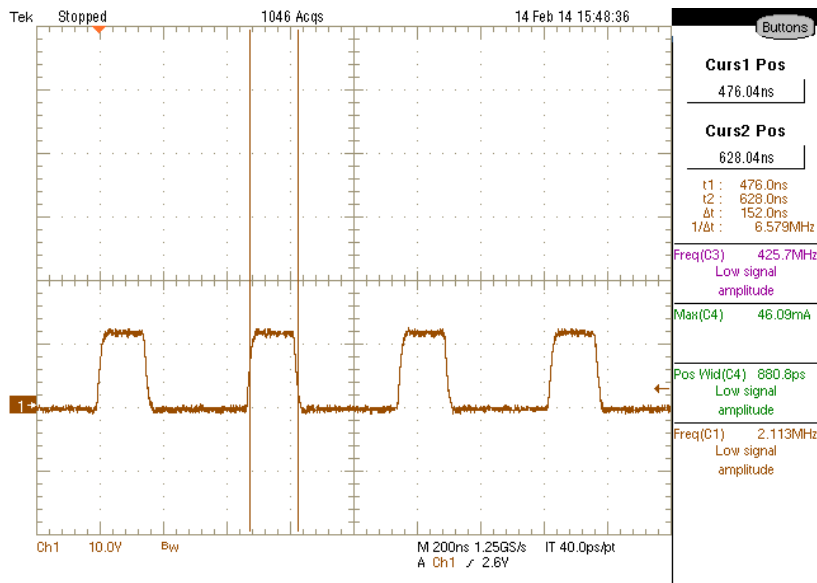


Figure 4 Vin=12V

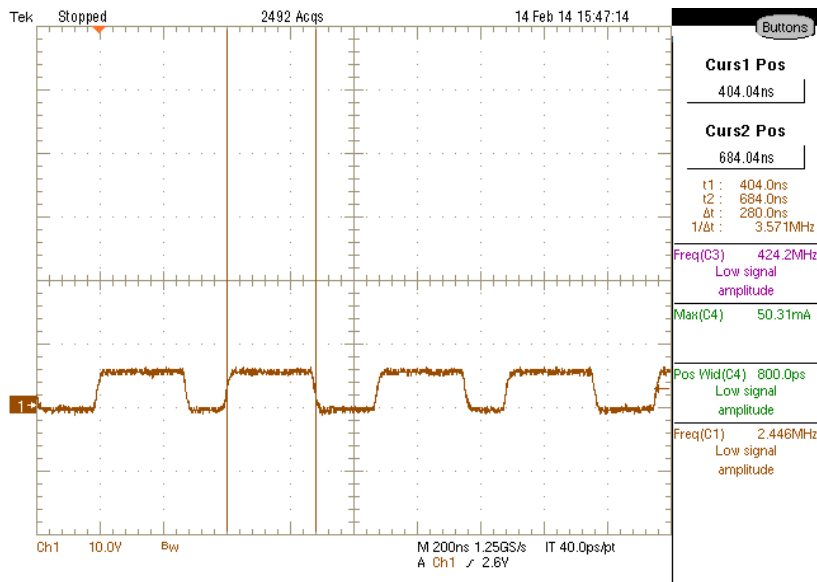


Figure 5 Vin=6V

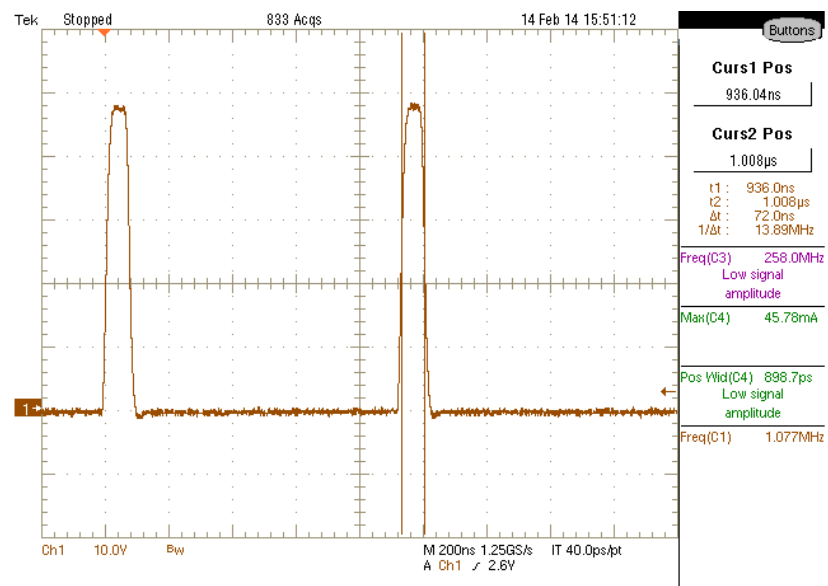


Figure 6 Vin=48V

Load transients

Test condition: $V_{in} = 12V$, I_{o1} from 0.0A to 0.5A

Ch3- V_{out} (AC coupled) Ch4- I_{out}

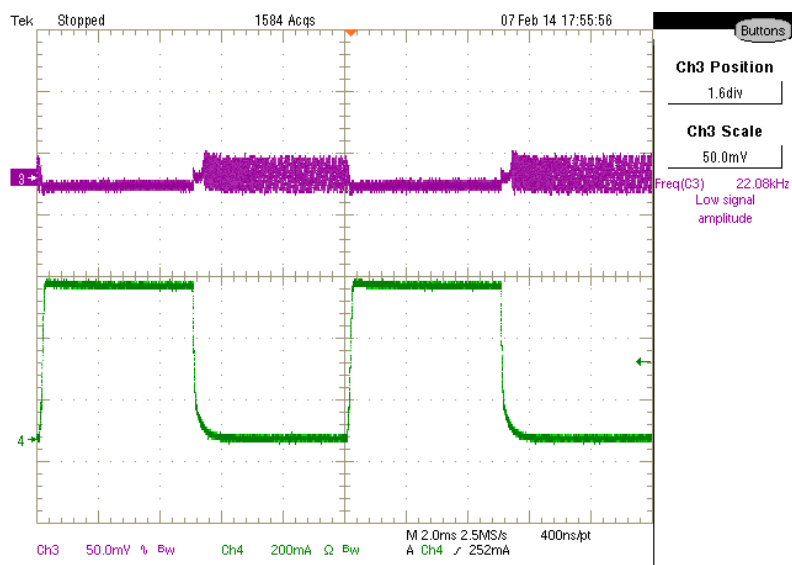


Figure 7

Output Voltage Ripples

Test condition: The input voltage is set at 12V, and the output is set at full load.

Ch2 - Vout (AC coupled)

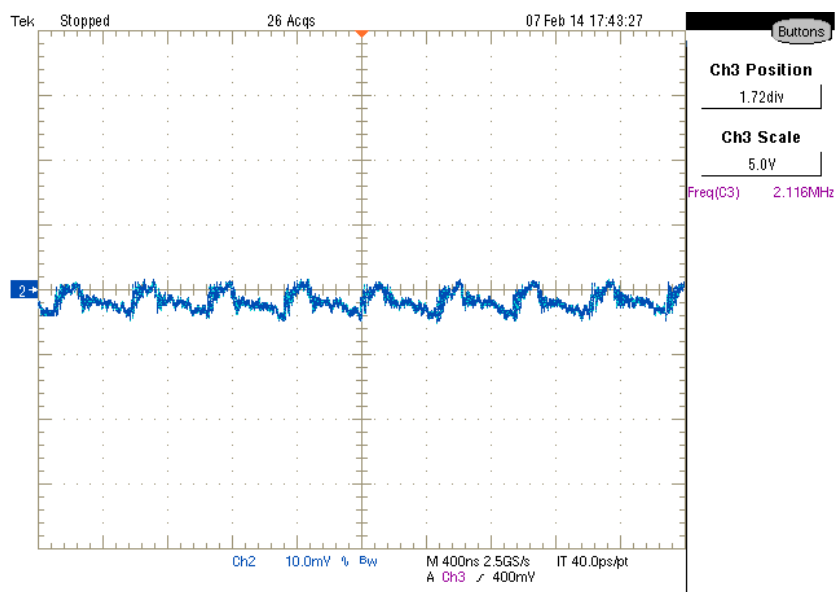


Figure 8

Conducted Emissions

The conducted emissions test follows the of CISPR 25 standards. The examined frequency bands spans from 150 kHz to 108 MHz covering the AM, FM radio bands, VHF band, and TV band specified in the CISPR 25.

The reference board operates at 500mA load. The test results are shown in Figure 9-12. The Figure 9 and Figure 10 show the test result using peak detector measurement, and the Figure 11 and Figure 12 show the test result using average detector measurement. The limit lines shown in red are the Class 5 limits for conducted disturbances specified in the CISPR 25; and the yellow trace is the test result. It can be seen that the power supply operates quietly and the noise is below the Class 5 limits under all the frequency bands.

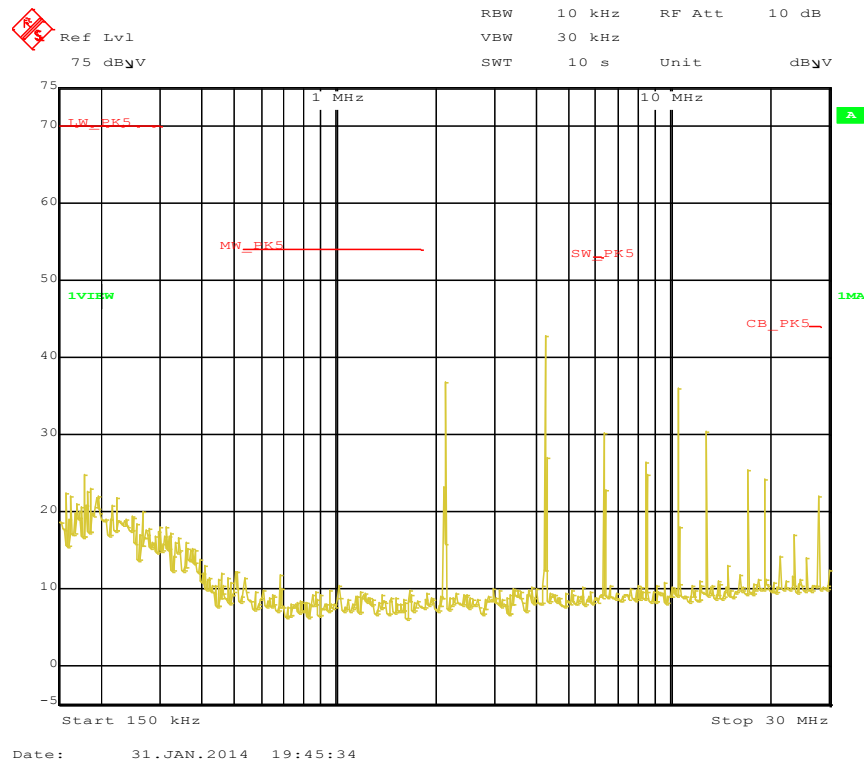


Figure 9 Peak detect, 150kHz – 30MHz

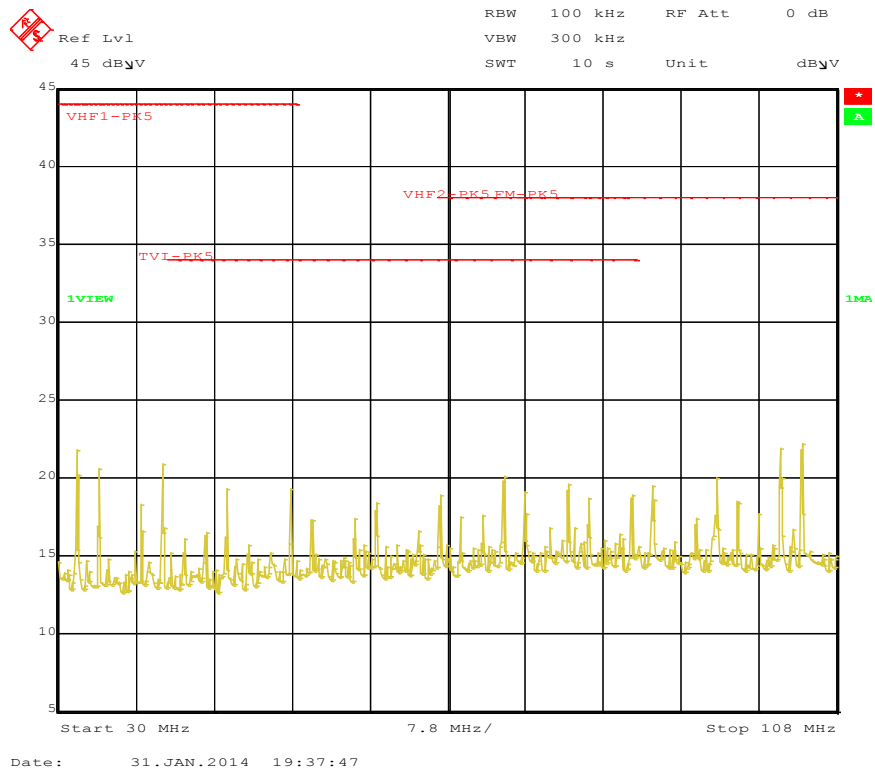


Figure 10 Peak detect, 30MHz – 108MHz

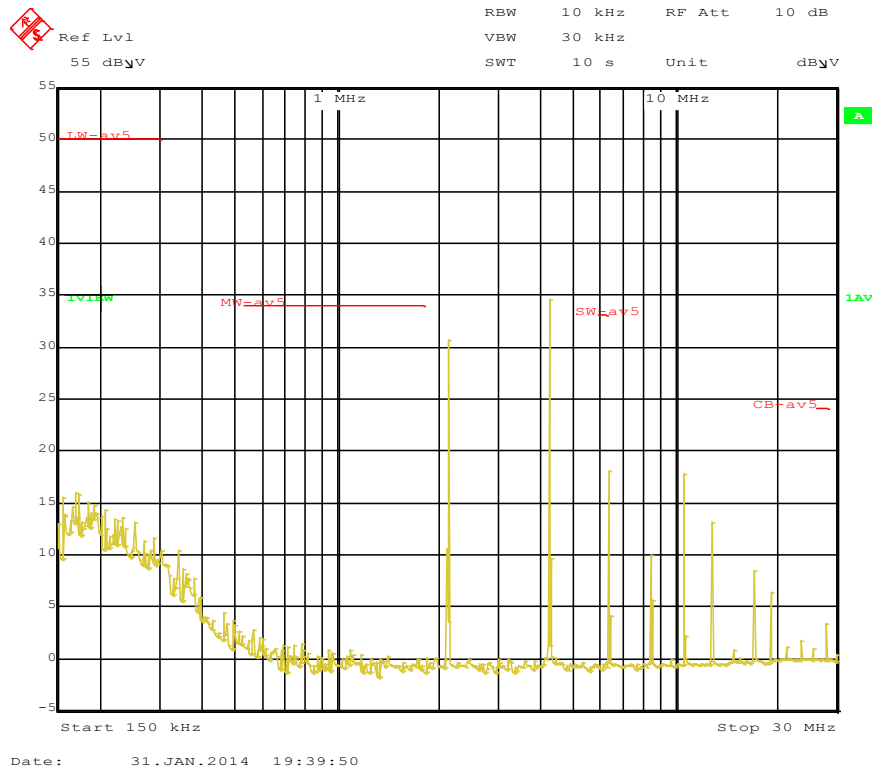
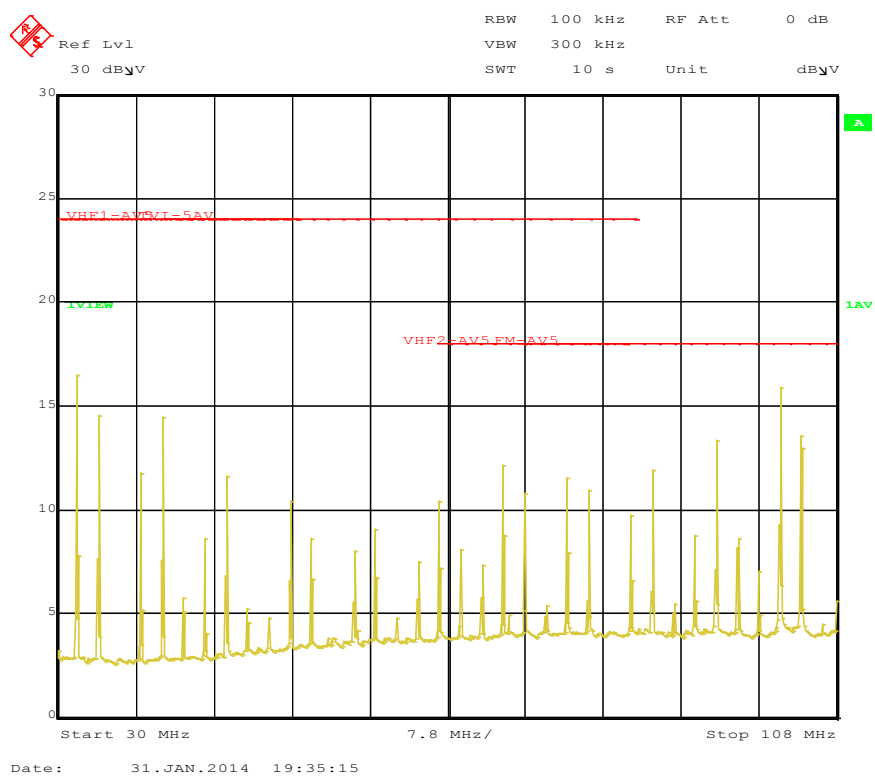


Figure 11 Average detect, 150kHz – 30MHz

**Figure 12 Average detect, 30MHz – 108MHz**

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale (<https://www.ti.com/legal/termsofsale.html>) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2021, Texas Instruments Incorporated