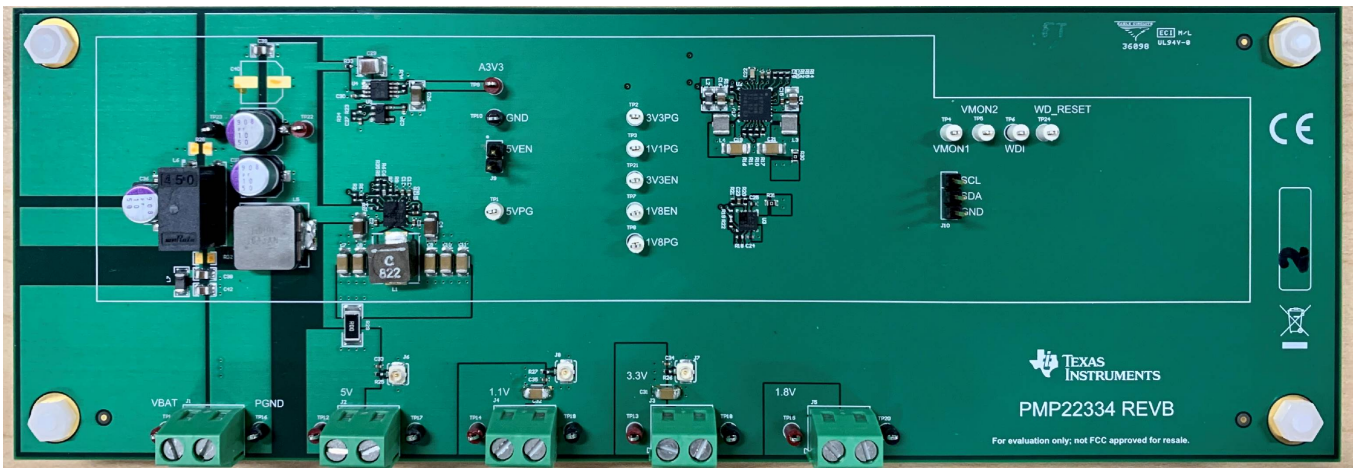
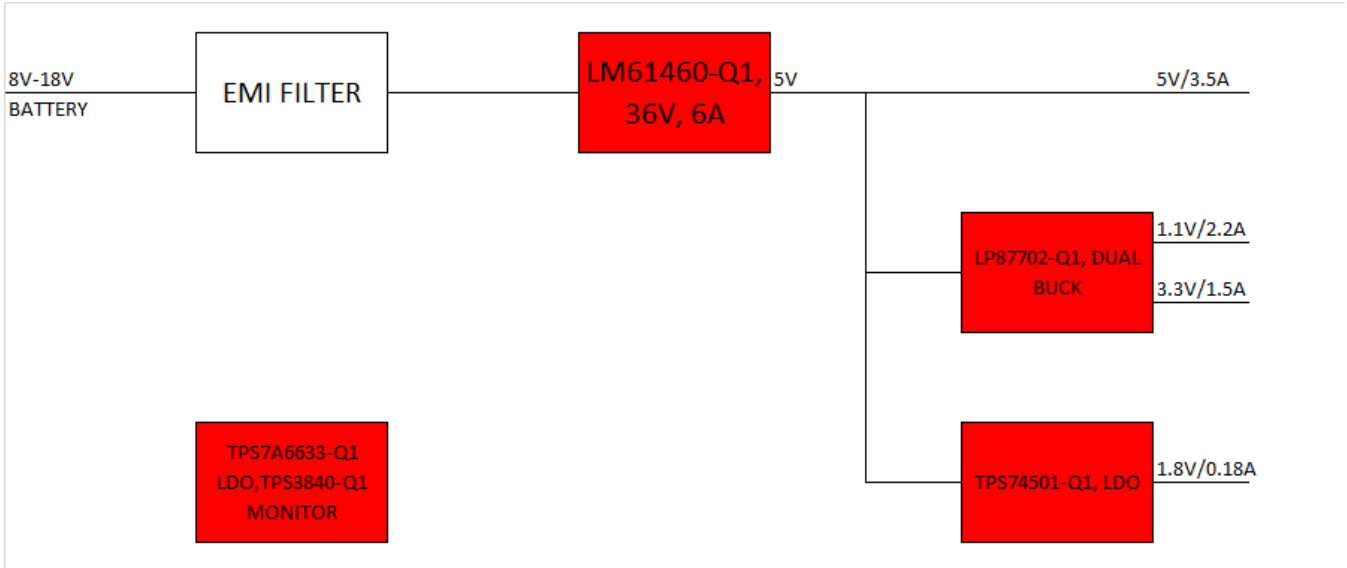
Test Report: PMP22334
High Efficiency, Low-Noise 5-V/3.3-V/1.8-V/1.1-V Automotive Display Reference Design

Description

This reference design is for an automotive display application with a customized form factor. The design demonstrates the excellent thermal performance of LM61460-Q1 with its HotRod(TM) QFN package as well as the low EMI aided by its spread spectrum feature. It generates four 5-V/3.3-V/1.1-V/1.8-V rails. It is designed for high efficiency and low noise applications where thermal performance and EMI performance are needed.





1 Test Prerequisites

1.1 Voltage and Current Requirements

Table 1. Voltage and Current Requirements

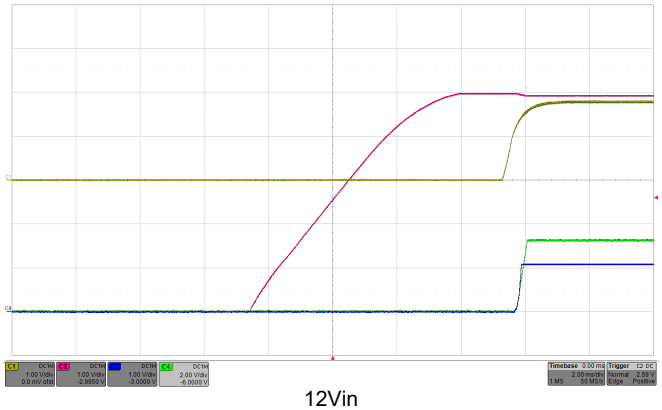
PARAMETER	SPECIFICATIONS
Input voltage, Vin	9V~16V
Output Voltage, Vo	5V/3.5A, 1.1V/2.2A, 3.3V/1.5A, 1.8V/0.18A

1.2 Required Equipment

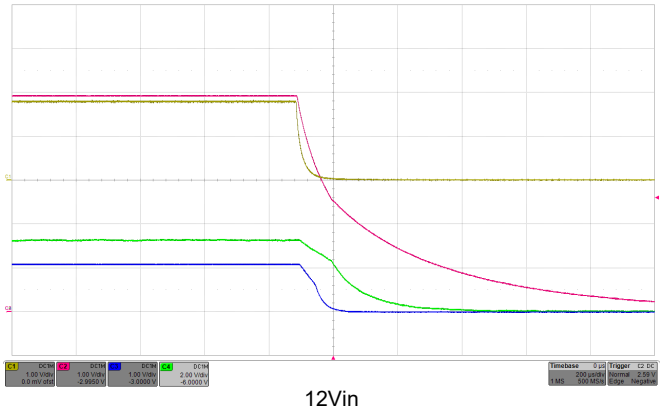
- Power Supply, 0~20V, 0~3A
- Load1: 5V/3.5A
- Load2: 1.1V/2.2A
- Load3: 3.3V/1.5A
- Load4: 1.8V/0.18A

2 Startup and shutdown

Trace1: 1.8Vout, Yellow, 1V/div
Trace2: 5.0Vout, Pink, 1V/div
Trace3: 1.1Vout, Blue, 1V/div
Trace4: 3.3Vout, Green, 2V/div

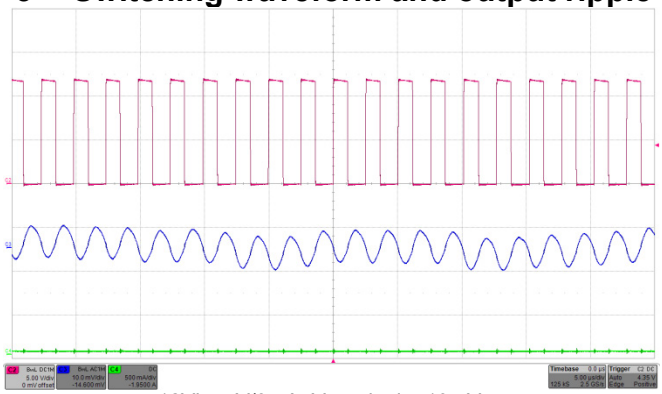


12Vin

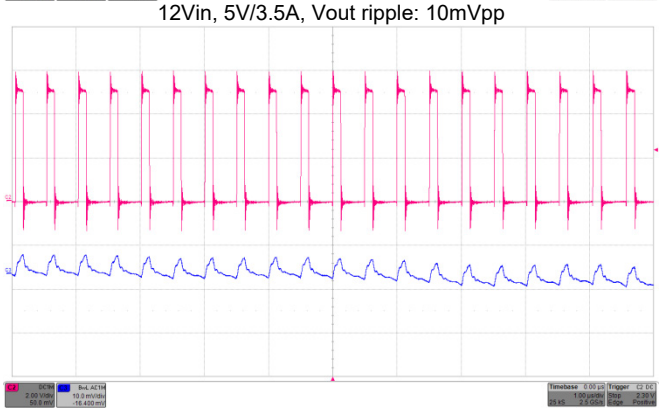


12Vin

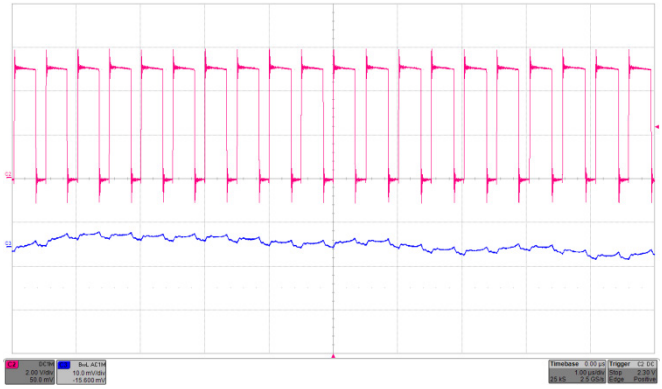
3 Switching waveform and output ripple



12Vin, 5V/3.5A, Vout ripple: 10mVpp

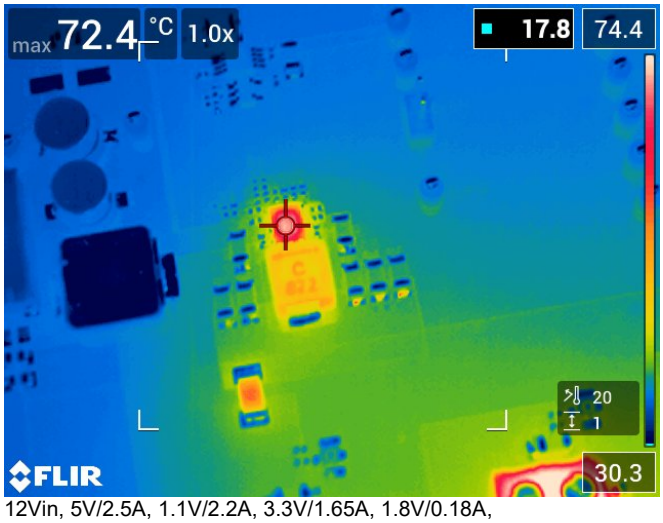


5Vin, 1.1V/2.2A, Vout ripple: 5mVpp

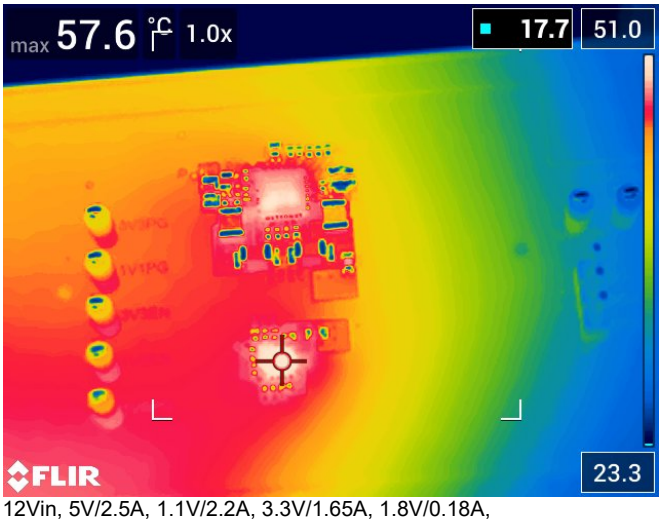


5Vin, 3.3V/1.5A, Vout ripple: 3mVpp

4 Thermal



12Vin, 5V/2.5A, 1.1V/2.2A, 3.3V/1.65A, 1.8V/0.18A, Tmax(U1)=72.4C, Room Temp, Natural Convection

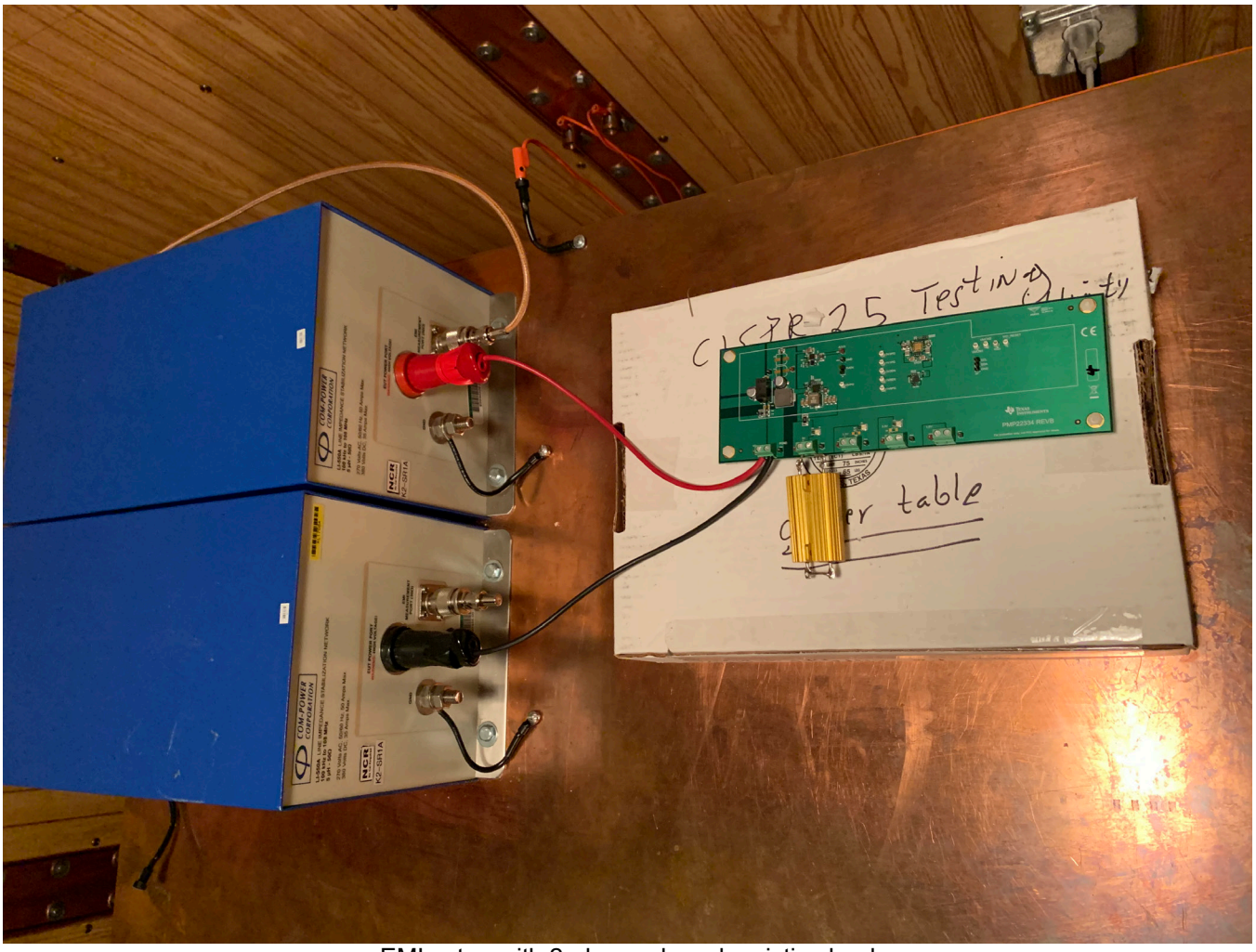


12Vin, 5V/2.5A, 1.1V/2.2A, 3.3V/1.65A, 1.8V/0.18A, Tmax(U2)=52.2C, Tmax(U3)=57.6C Room Temp, Natural Convection

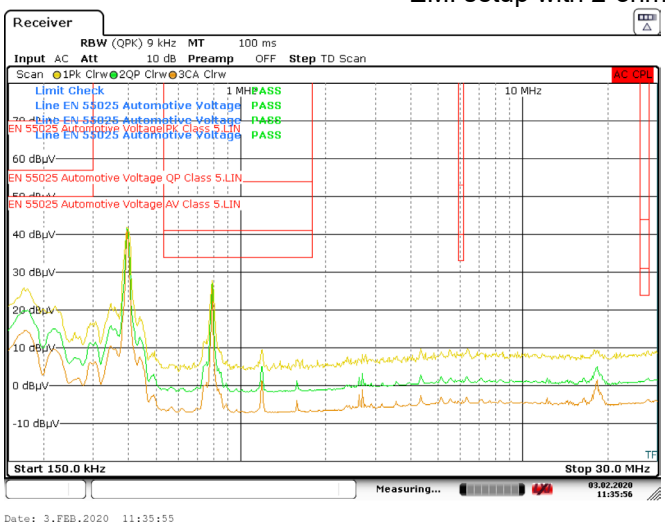
U1 temperature rise is 47.4C at full load, excellent thermal performance for the HotRod package.

5 EMI

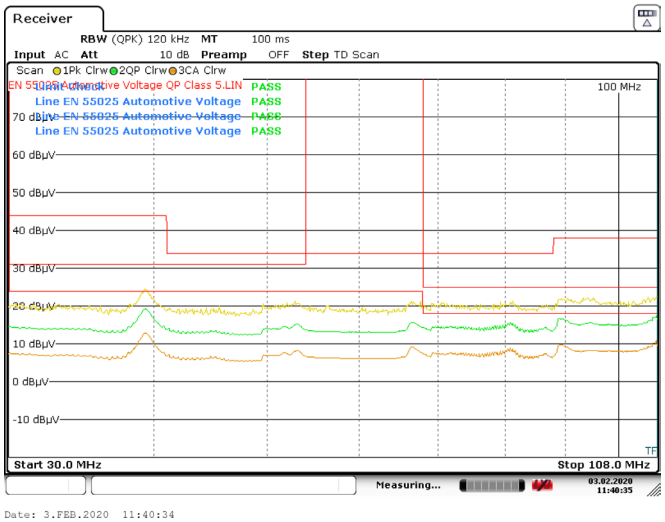
The system was first tested for U1--LM61460 only. U2 was not installed. It passed CISPR-25 Class 5 conducted emission specifications.



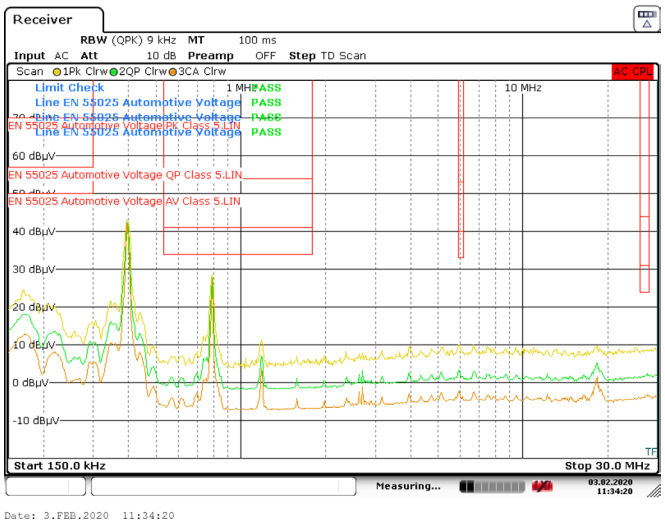
EMI setup with 2-ohm on board resistive load



9VIN, 5V/2.5A, 150kHz to 30MHz



9VIN, 5V/2.5A, 30MHz to 108MHz



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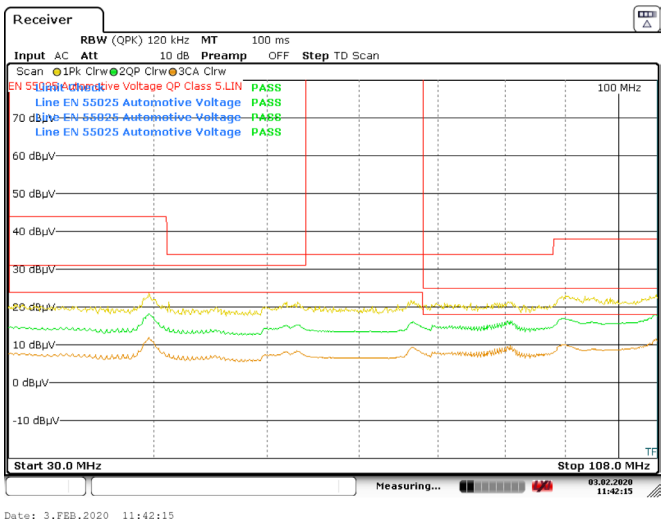
12VIN, 5V/2.5A, 150kHz to 30MHz



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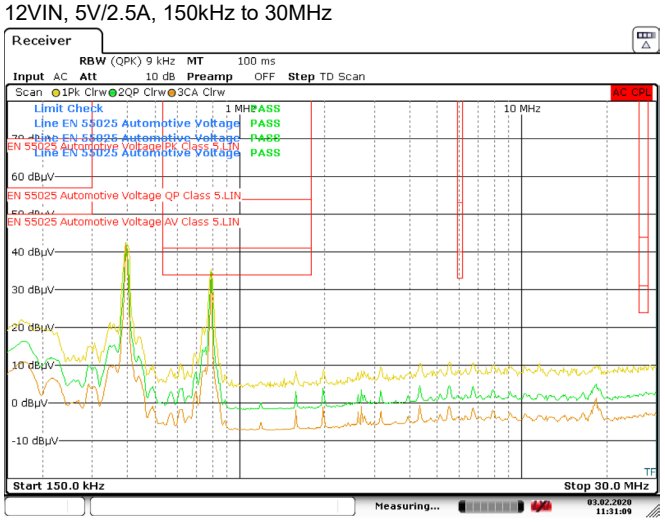
12VIN, 5V/2.5A, 30MHz to 108MHz



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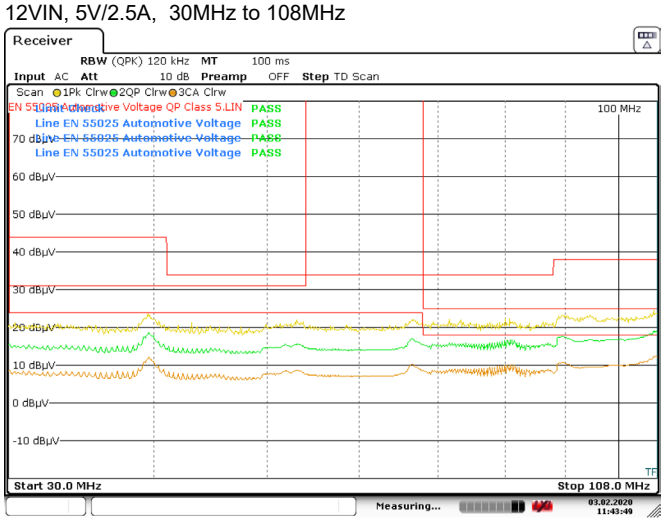
16VIN, 5V/2.5A, 150kHz to 30MHz



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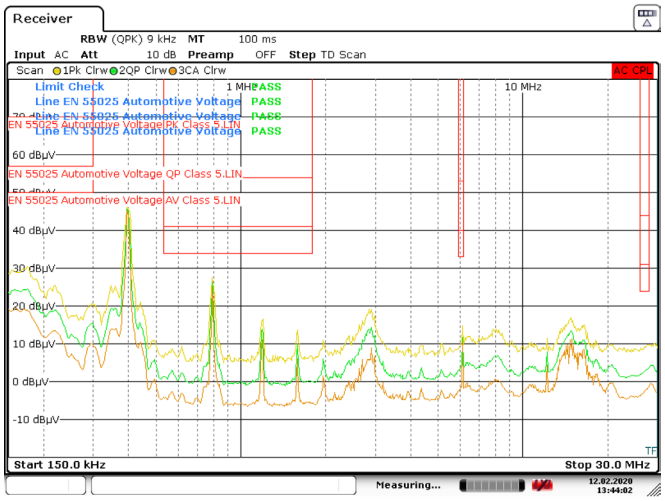
16VIN, 5V/2.5A, 30MHz to 108MHz

The system was further tested for EMI with all output fully loaded, 5V with 2-ohm, 1.1V with 0.5-ohm, 3.3V with 2-ohm and 1.8V with 10-ohm. . It passed CISPR-25 Class 5 conducted emission specifications.



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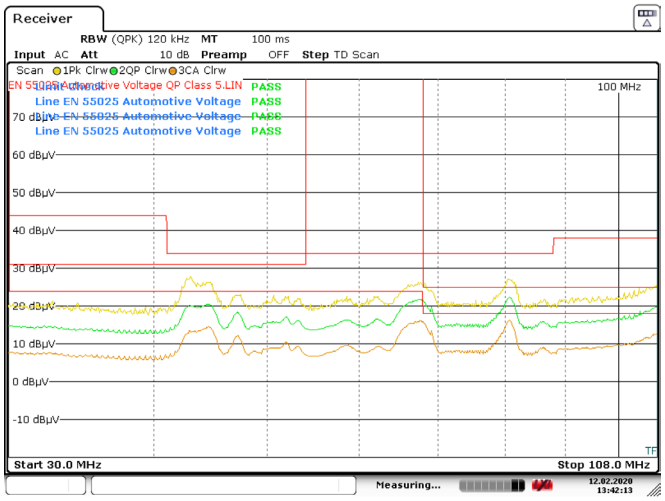
13VIN, 5V/2.5A, 1.1V/2.2A, 3.3V/1.65A, 1.8V/0.18A, 150kHz to 30MHz (measured at high side LISN)



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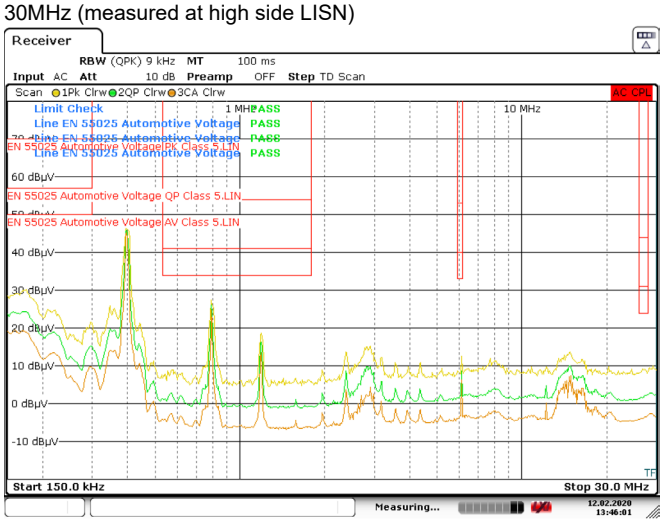
13VIN, 5V/2.5A, 1.1V/2.2A, 3.3V/1.65A, 1.8V/0.18A, 30MHz to 108MHz (measured at high side LISN)



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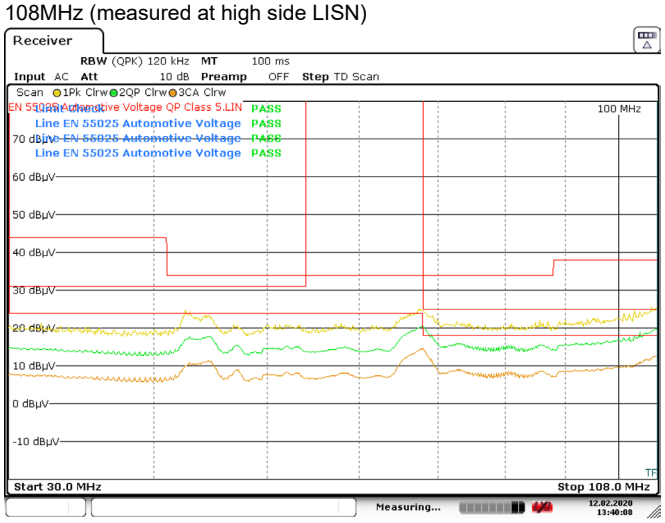

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13VIN, 5V/2.5A, 1.1V/2.2A, 3.3V/1.65A, 1.8V/0.18A, 30MHz to 108MHz (measured at low side LISN)

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