Test Report
For PMP15016
06/26/2016

1. Design Specifications

Vin Min	**9VDC**
Vin Normal	**24VDC**
Vin Max	**36VDC**
Vout	**5VDC**
Iout	**3A**
Wide Vin DCDC Switching Frequency	**400kHz**

2. Circuit Description

The PMP15016 reference design is a 5V/3A output power supply using the LMR16030 DC/DC buck regulator. This design uses a 4-layer board and is intended for industrial applications with a 24V input bus. LMR23630 is a 4.0V to 36V input, 3A output capable, and 400 kHz fixed synchronous buck regulator. This reference design has an input voltage range of 9V to 36V, covering the widely-varying input voltage condition commonly seen in industrial applications with a loosely-regulated nominal 24V input voltage. The reference board includes an input EMI filter section, and the layout is optimized for improved EMI performance on a 4-layer PCB. The board was tested to the CISPR-22 standard, and the conducted emissions (CE) and radiated emissions (RE) were compliance with the CISPR-22 Class-B requirement with 10dB of margin.

3. Board Photos

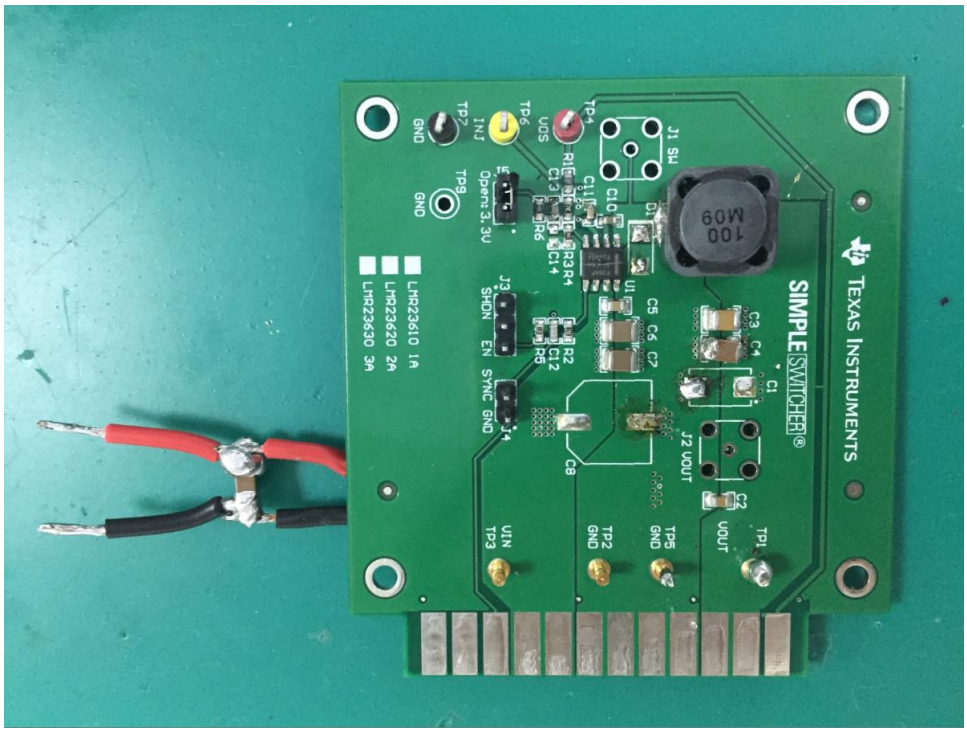


Figure 1. Reference Design Board Top View (67x68mm^2)

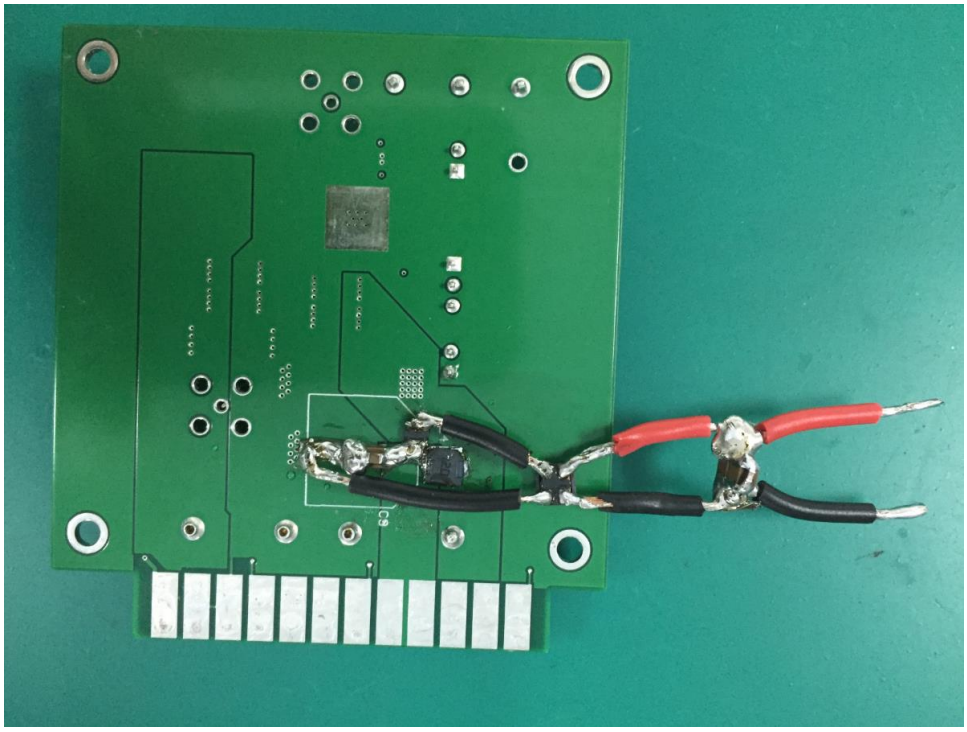


Figure 2. Reference Design Board Bottom View (67x68mm^2)

4. Efficiency and Load Regulation

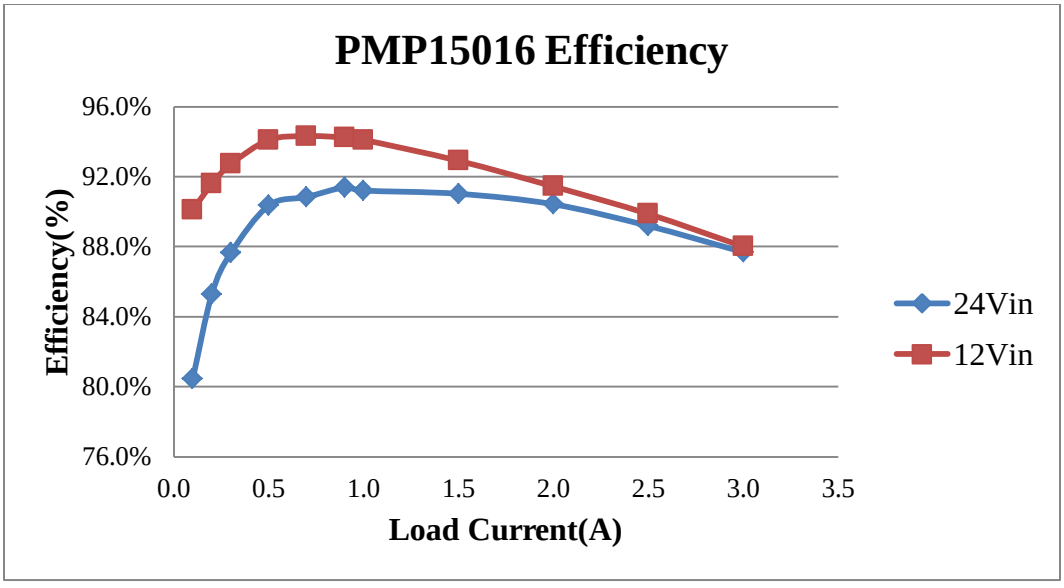


Figure 3. Power Efficiency with 12V/24V Input Voltage

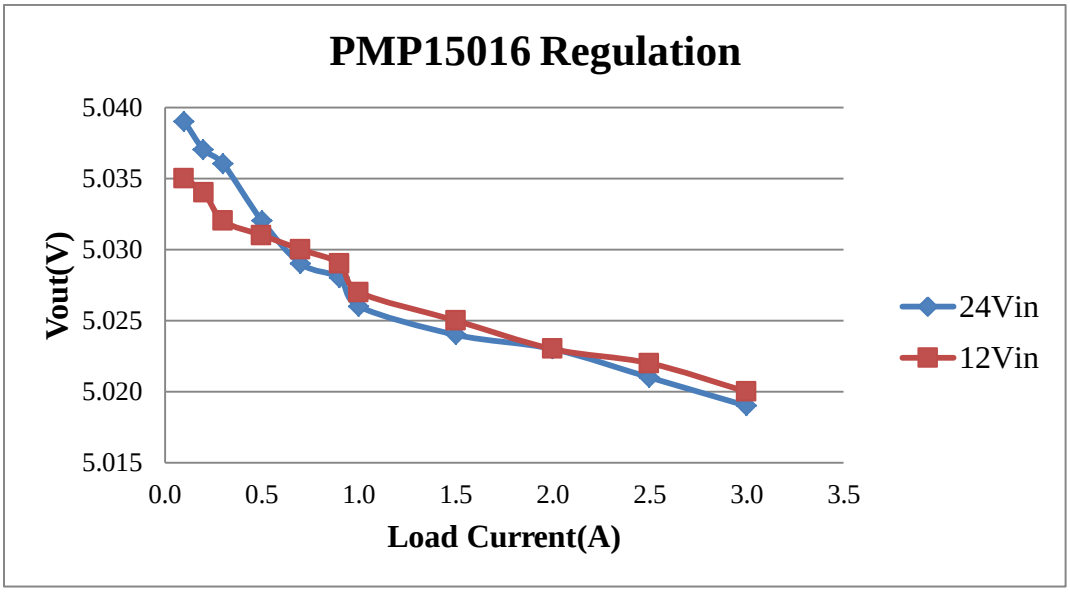


Figure 4. Load Regulation with 12V/24V Input Voltage

5. EMI Test

5.1 Test Setup

The conducted and radiated emissions were tested under the CISPR 22 standards. The test setup is shown in Figure 5 and Figure 6(The test board is PMP15013 Reference design board). A 24V input voltage was from 220VAC and three 5Ohm resistors were soldered on the output terminals of the test board as a 3A load.

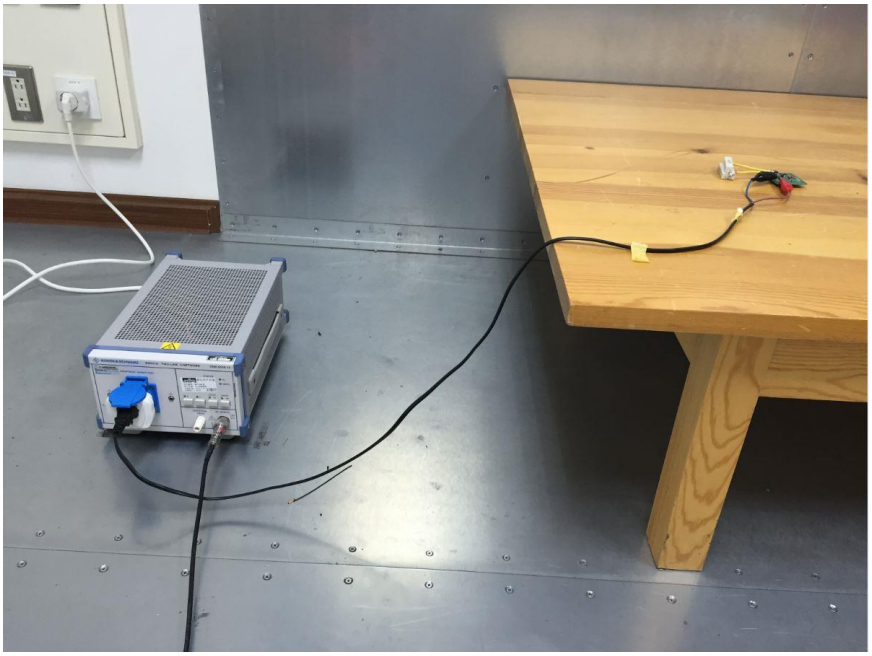


Figure 5. Conducted Emissions Test Setup

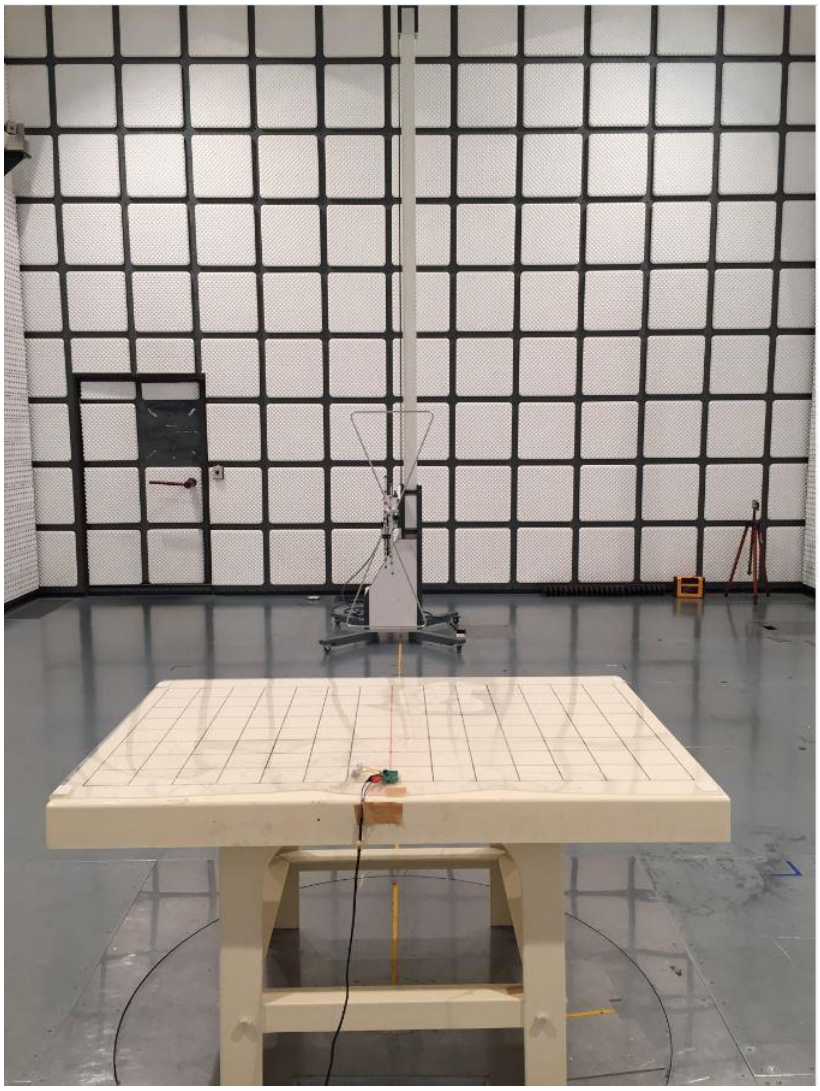


Figure 6. Radiated Emissions Test Setup

On the reference design board, the input EMI filter section (Figure 7) has a common mode filter stage and a differential mode filter stage. The common mode filter section is to further suppress the high frequency EMI noise (>30MHz) while the differential mode is to suppress the fundamental frequency or low-order harmonics. Both CE and RE were tested with and without the common mode filter. The test results show that the reference design board is compliance with CISPR 22 Class B with and without common mode filter (10dB margin). Adding the common mode filter has better CE performance at 30MHz. Note that all the other tests were done with the common mode filter.

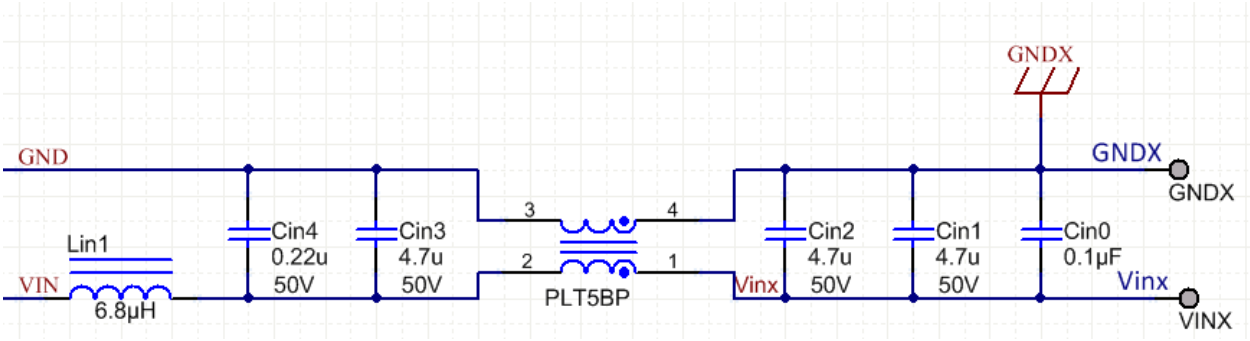


Figure 7. Input filter schematic

5.2 Test Results

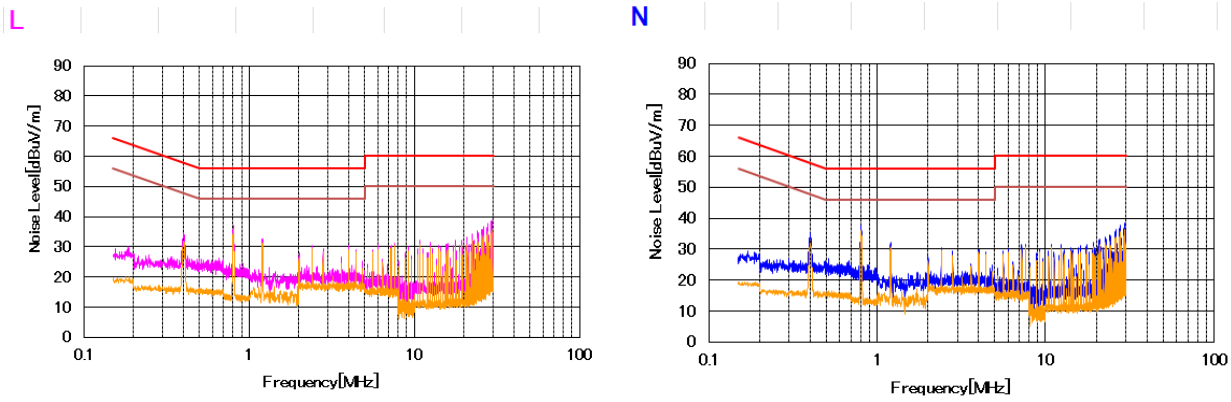


Figure 8. Conducted EMI scan, with common mode filter

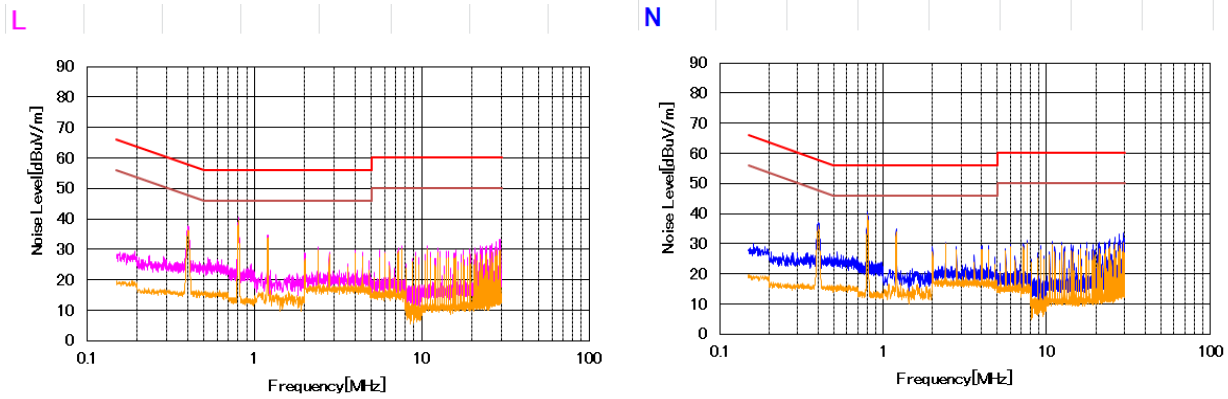


Figure 9. Conducted EMI scan, without common mode filter

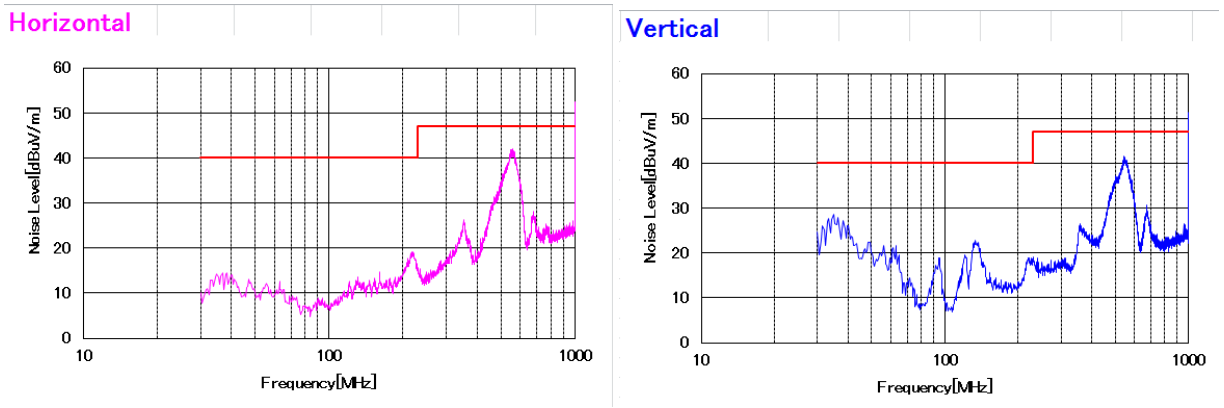


Figure 10. Radiated EMI scan, with common mode filter

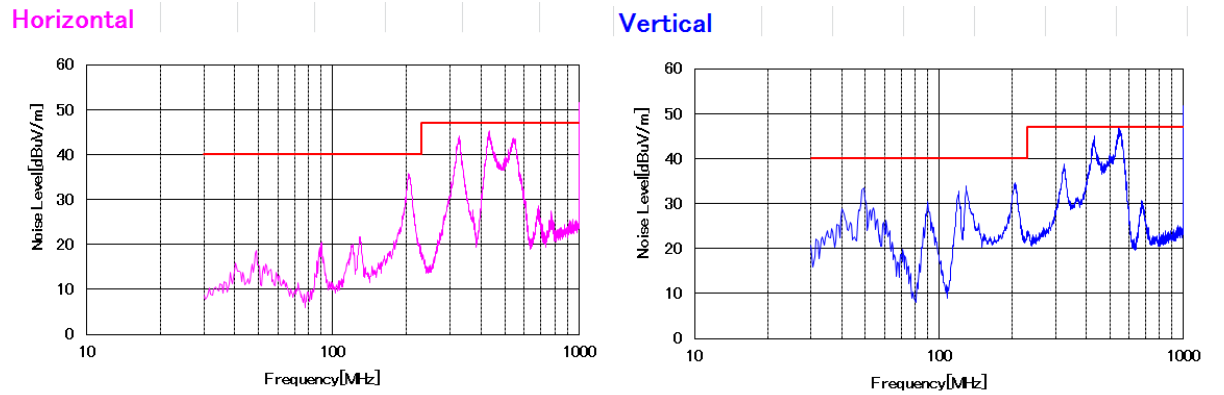
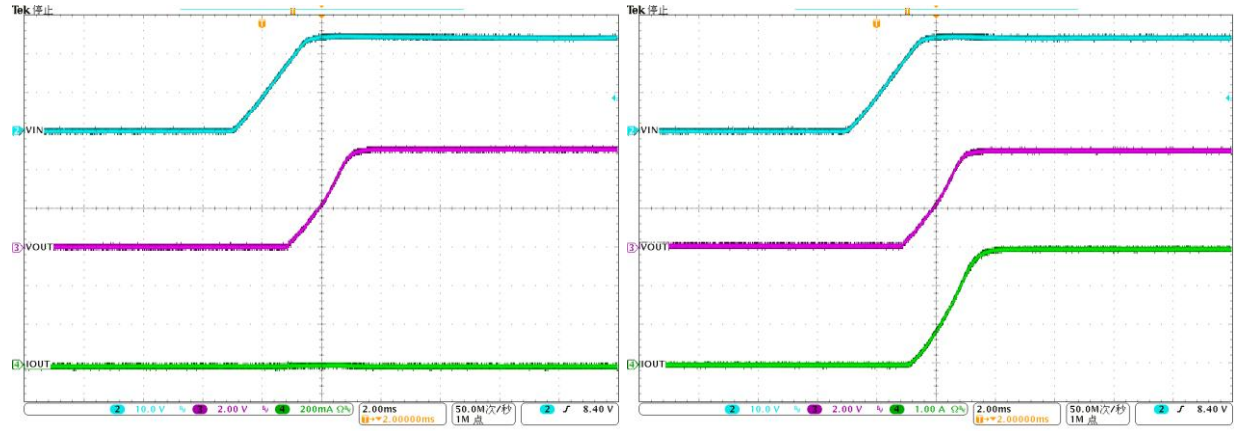


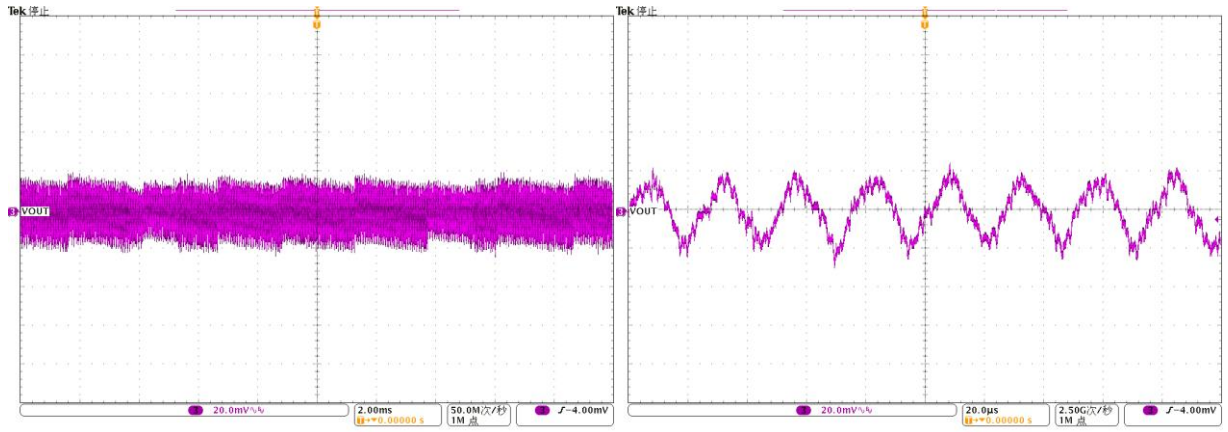
Figure 11. Radiated EMI scan, without common mode filter

6. Waveforms



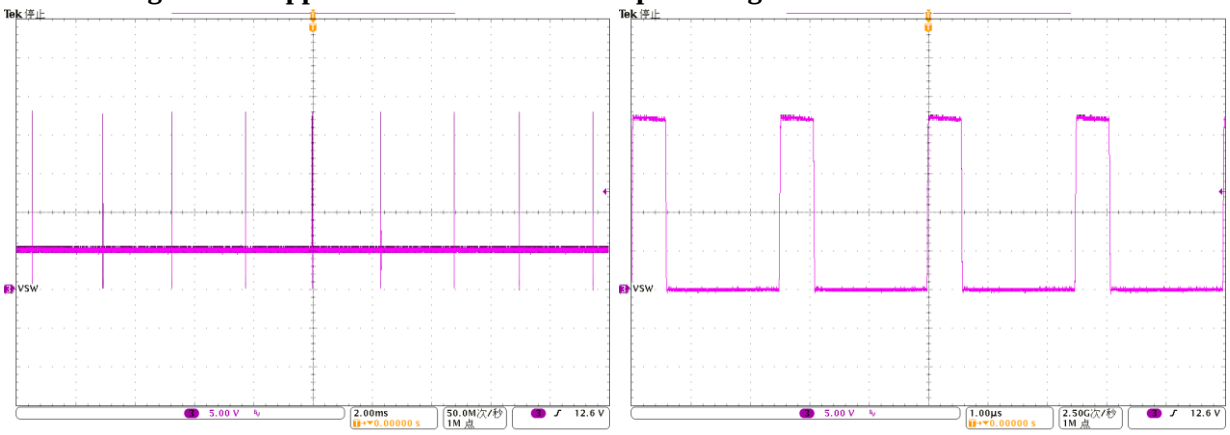
(a)V_{IN}=24V, no load (b) V_{IN}=24V, Io=3A

Figure 12. Start up waveforms with 24V input voltage and different load current



(a)V_{IN}=24V, no load (b) V_{IN}=24V, Io=3A

Figure 13. Ripple waveforms with 24V input voltage and different load current



(a)V_{IN}=24V, no load (b) V_{IN}=24V, Io=3A

Figure 14. Switching waveforms with 24V input voltage and different load current

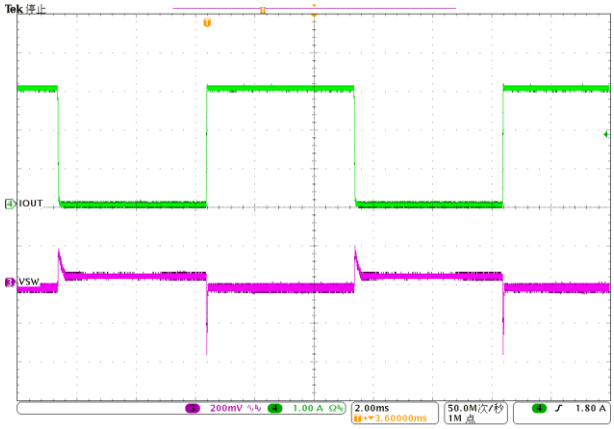


Figure 15. Load transient with 24V input voltage (0A-3A-0A, 0.1A/us)

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