Introduction

This document provides EMC design guidelines for semiconductor PWM interfaces to ensure compliance with CISPR 14-1 and IEC 61000-6-4 standards.

1. EMC Standards and Test Conditions

EMC measurements have been performed according to the standards listed in Table 1, Table 2, and Table 3 for industrial environment conditions.

Table 1. Emission

Standard	Test Method	Frequency Range	Limit	Notes
CISPR 14-1	Radiated Emission – ALSE method	30 MHz – 1 GHz	QP 30 / 37 dBuV	SAC, 3m distance
CISPR 14-1	Radiated Emission – ALSE method	1 GHz – 6 GHz	QP 50 / 54 dBuV	SAC, 3m distance

Table 2. Immunity - Radiated

Standard	Test Method	Frequency Range	Test Level	Modulation
IEC 61000-6-4	Radiated Immunity-ALSE method	80 MHz - 1 GHz	30 V/m	Amplitude Modulation
IEC 61000-6-4	Radiated Immunity-ALSE method	1 – 3 GHz	30 V/m	Amplitude Modulation
IEC 61000-6-4	Radiated Immunity-ALSE method	3 – 6 GHz	20 V/m	Amplitude Modulation

Table 3. Immunity - Fast Transients

Standard	Test Method	Repetition rate	Test Level
IEC 61000-6-4	Fast Transients (Burst)	100kHz	1kV Harness
			2kV Supply

1. IEC 61000-6-4: Fast Transients (Burst) is only applicable for harness length >3m.

2. System Level EMC

Figure 1 shows recommended schematic for PWM interface.

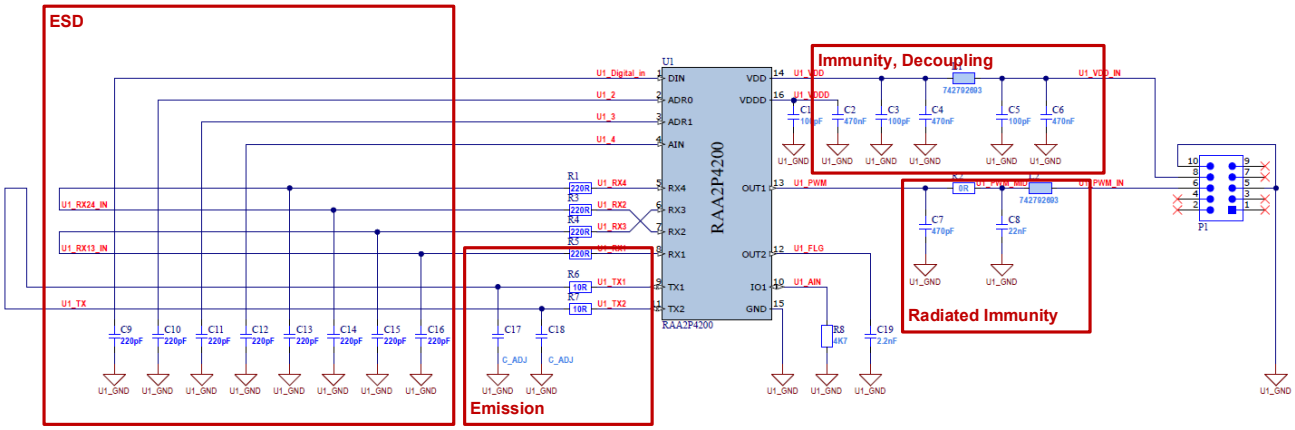

Figure 1. EMC Schematic

3. System Level EMC Remarks

The schematics on Figure 1 are provided as a reference only. EMC requirements must be evaluated individually for each end-application. Depending on the specific system architecture, additional components may need to be added or certain components may be omitted without affecting compliance.

Important: responsibility for meeting all applicable EMC standards rests solely with the system integrator.

Capacitors C17 and C18 are part of the transmitter LC circuit and must be dimensioned according to the following equation:

$$C_{17} = C_{18}$$

$$C_{17/18} = \frac{2}{(2\pi f_r)^2 L_{TX}}$$

Where:

- f_r : LC circuit resonance frequency, range: 2MHz to 5.6MHz (3MHz is preferred)
- L_{TX}: transmitter coil inductance, calculate the values (for example, tools listed on Renesas Electronics Corporation | Renesas) or directly measure them with an LC-meter an unpopulated PCB

Use C0G or NP0 capacitors for C17 and C18 to ensure a low temperature drift and a high Q factor. The values must be adjusted to reach the desired TX frequency.

For all other caps X7R or even lower quality is recommended.

4. Revision History

Revision	Date	Description
1.00	Oct 3, 2025	Initial release.

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