AN4794 MCP2515/MCP25625 EMC Hints

Introduction

This application note covers hints on how to design a PCB for the MCP2515/MCP25625.

Included are recommendations to achieve a low level of emissions and best practices for other parts of the PCB.

A good EMC design requires more knowledge than what can be put into a short application note. Unlike many other design issues, EMC is not an area where it is possible to list a set of rules. EMC compliance cannot be guaranteed by design; it has to be tested.

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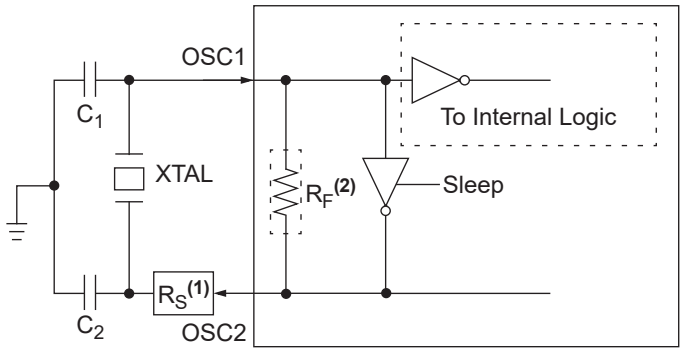
1. Getting Started

Selecting the correct crystal oscillator or ceramic resonator components depends on multiple factors that are application-dependent. Please review Section 6.7 “Clocking Guidelines” of the “PIC32 Family Reference Manual” (DS61112) and refer to the application notes listed in Section Related Documents.

Figure 1-1. Crystal/Ceramic Resonator Operation.



Notes:

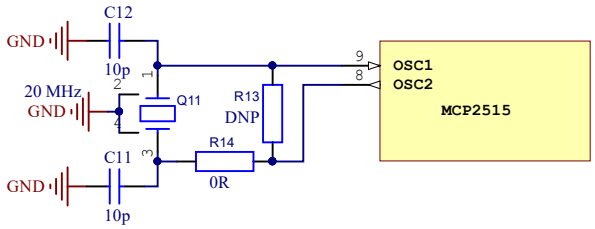
1. A Series Resistor (R_S) may be required for AT strip cut crystals.
2. The Feedback Resistor (R_F) is typically in the range of 2 to 10 MΩ.

2. Examples - Schematic Excerpts MCP2515

There are several sections of the layout that are crucial for a good EMC performance. This chapter gives examples of how to properly implement these.

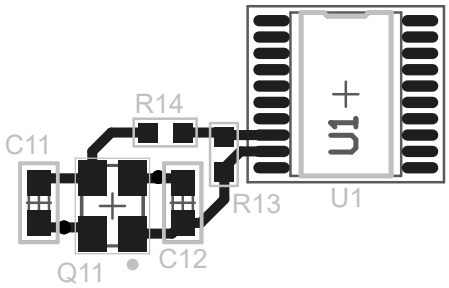
The first section is the external crystal-oscillator. The suggested schematic in the datasheet includes R13 and R14 that may or may not be necessary for stability, depending on the crystal-oscillator being used. If the specific design does not need them, the crystal can be moved closer to the MCP2515.

Figure 2-1. MCP2515 Oscillator Schematic.



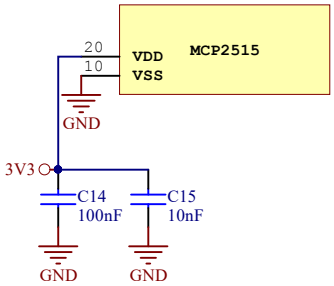
It is important to place the crystal-oscillator as close as possible to the MCP2515. The recommendation is to keep the traces on the same side of the PCB as the crystal-oscillator and the MCP2515.

Figure 2-2. MCP2515 Oscillator Layout.



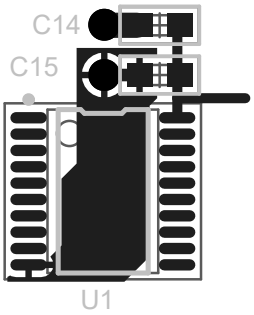
The most crucial section to achieving a low level of emissions is the power supply. The VDD input is blocked with one or two capacitors depending on the requirements of the board. If two capacitors are used, the one with the smaller value should be placed closer to the MCP2515.

Figure 2-3. MCP2515 Power Schematic.



It is highly recommended that a direct and low-impedance connection from the Ground pin 10 to the blocking capacitor is implemented and that the ground vias are placed close to the blocking capacitor. Simply connecting pin 10 to a large Ground plane and placing a via close-by significantly increases unwanted emissions.

Figure 2-4. MCP2515 Power Layout.

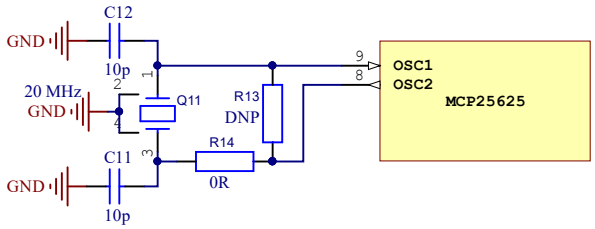


3. Examples - Schematic Excerpts MCP25625

There are several sections of the layout that are crucial for a good EMC performance. This chapter gives examples of how to properly implement these.

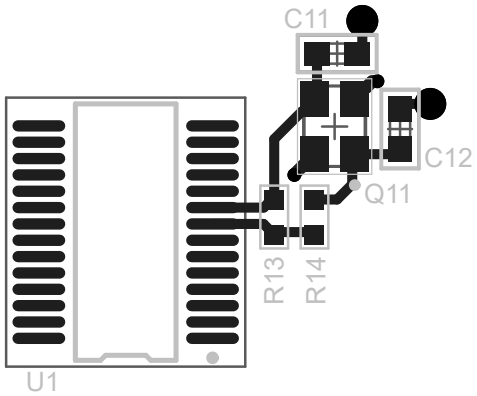
The first section is the external crystal-oscillator. The suggested schematic in the datasheet includes R13 and R14. These may or may not be necessary for stability, depending on the crystal-oscillator being used. If the design does not need them, the crystal can be moved closer to the MCP25625.

Figure 3-1. MCP25625 Oscillator Schematic.



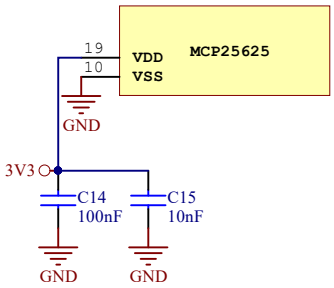
It is important to place the crystal-oscillator as close as possible to the MCP25625. The recommendation is to keep the traces on the same side of the PCB as the crystal-oscillator and the MCP25625.

Figure 3-2. MCP25625 Oscillator Layout.



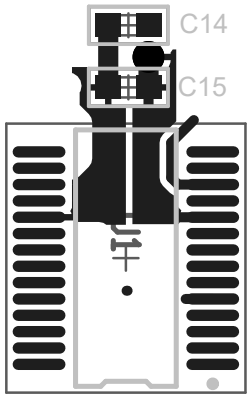
The most crucial section to achieving a low level of emissions is the power supply. The VDD input is blocked with one or two capacitors depending on the requirements of the board. If two capacitors are used, the one with the smaller value should be placed closer to the MCP25625.

Figure 3-3. MCP25625 Power Schematic.



It is highly recommended that a direct and low-impedance connection from the Ground pin 10 to the blocking capacitor is implemented. Connecting pin 10 to a large Ground plane and placing a via close-by significantly increases unwanted emissions.

Figure 3-4. MCP25625 Power Layout.



4. Related Documents

MCP2515 webpage

MCP25625 webpage

PIC32 Family Reference Manual, Section 6. "Oscillators"

Basic PICmicro Oscillator Design

Practical PICmicro® Oscillator Analysis and Design

CISPR standards: 16, 22 and 25

5. Revision History

Revision A (November 2022)

Initial release of this document.

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