

Singing Very High Speed Integrated Circuit Hardware Description Language Board (S76D)

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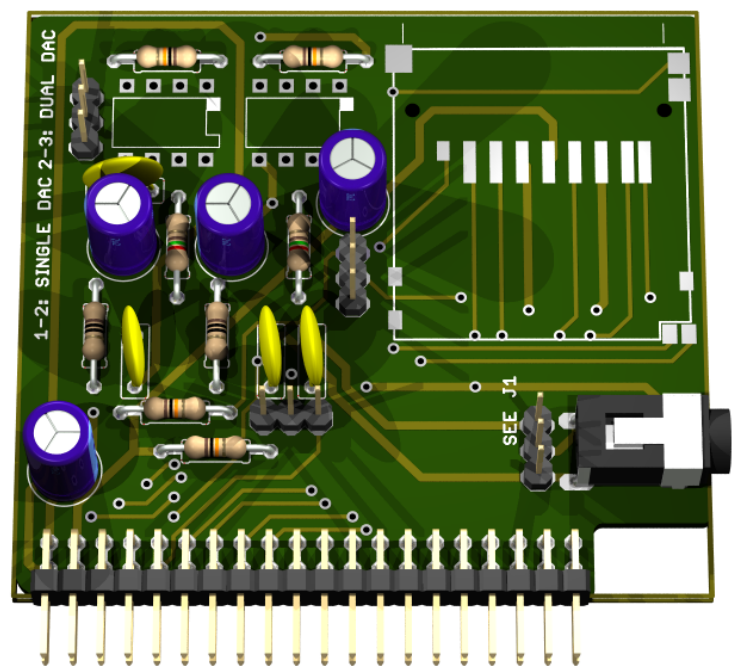


Figure 1: 3D rendered image of the custom extension board used for this music player

Abstract

This is time for all good men to come to the aid of their party! ...

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Pin. No.	Name	Description	Note for our implementation
1	DAT3	MMC: Chip select	Chip IO Pin, mmc_cs, D7
2	CMD	Command	Chip IO Pin, mmc_mosi, D8, (MOSI – master out, slave in)
3	GND	Ground	Board ground
4	VDD	Voltage	Supply Voltage (+3.3 V)
5	CLK	Clock	Chip IO Pin, mmc_clock, D10
6	GND	Ground	Board ground
7	DAT0	Data	Chip IO, mmc_miso, B4, (MISO - master in, slave out)
8	DAT1	Data	Pull up (Voltage via resistor)
9	DAT2	Data	Pull up (Voltage via resistor)

1 Introduction

2 Multimedia Card

2.1 Interface description

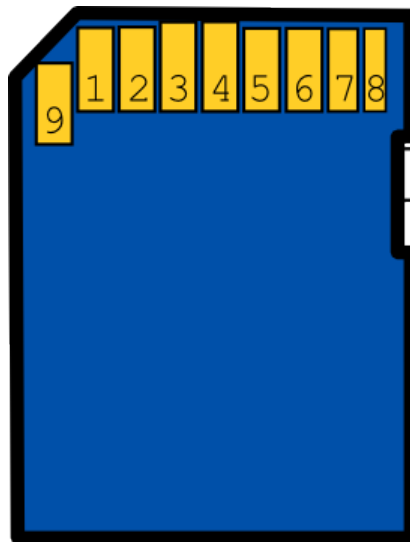


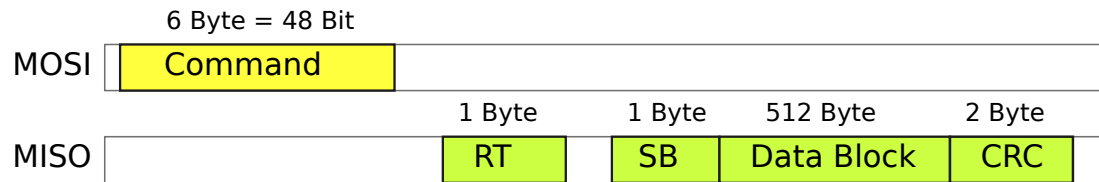
Figure 2: MMC Interface

2.2 SPI Interface

The SPI Interface uses two connections to the MMC. First the *master out, slave in* to send commands to the MMC and the *master in, slave out* to receive the results from the MMC. You can see the pins on the MMC in figure 2.

Sending commands requires you to stick to a predefined protocol that we will describe. A basic sequence for one command can be found in figure 3. In figure 4 and 5 you can find the sequence of commands we have to send to the card in order to initialize it or read a block.

Each command is a binary coded sequence in a format that is defined in the official reference manual. Figure 3 should give you a basic idea of how the communication works. The start byte (SB) consists



RT=Response Token

SB=Start Byte

CRC = Cyclic Redundancy Check

Figure 3: Sending a command to the MMC

of 8 times HI (1). Before that, the card only sends 0s. The response token (RT) consists of 8 bits. Each bit indicates a certain error or a successful command. In case the command finished successfully, the card returns 0000 0001

2.2.1 Initializing the card

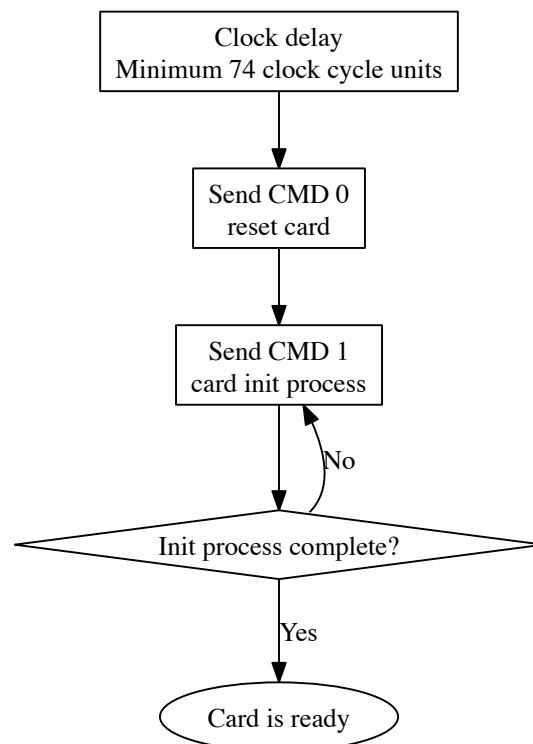


Figure 4: Flow for initializing

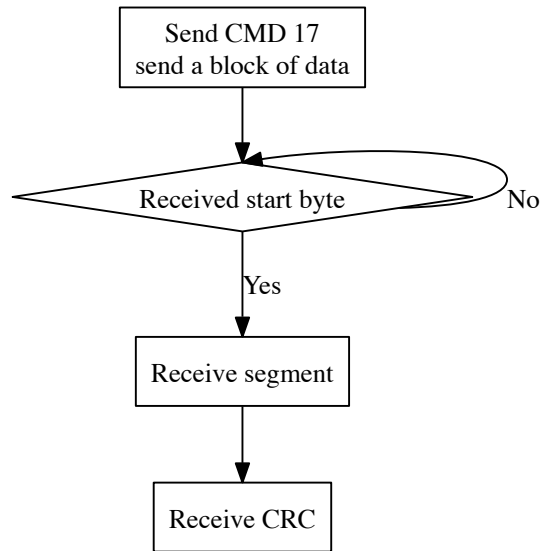


Figure 5: Flow for reading

2.2.2 Reading data

2.3 Implementation of Communication

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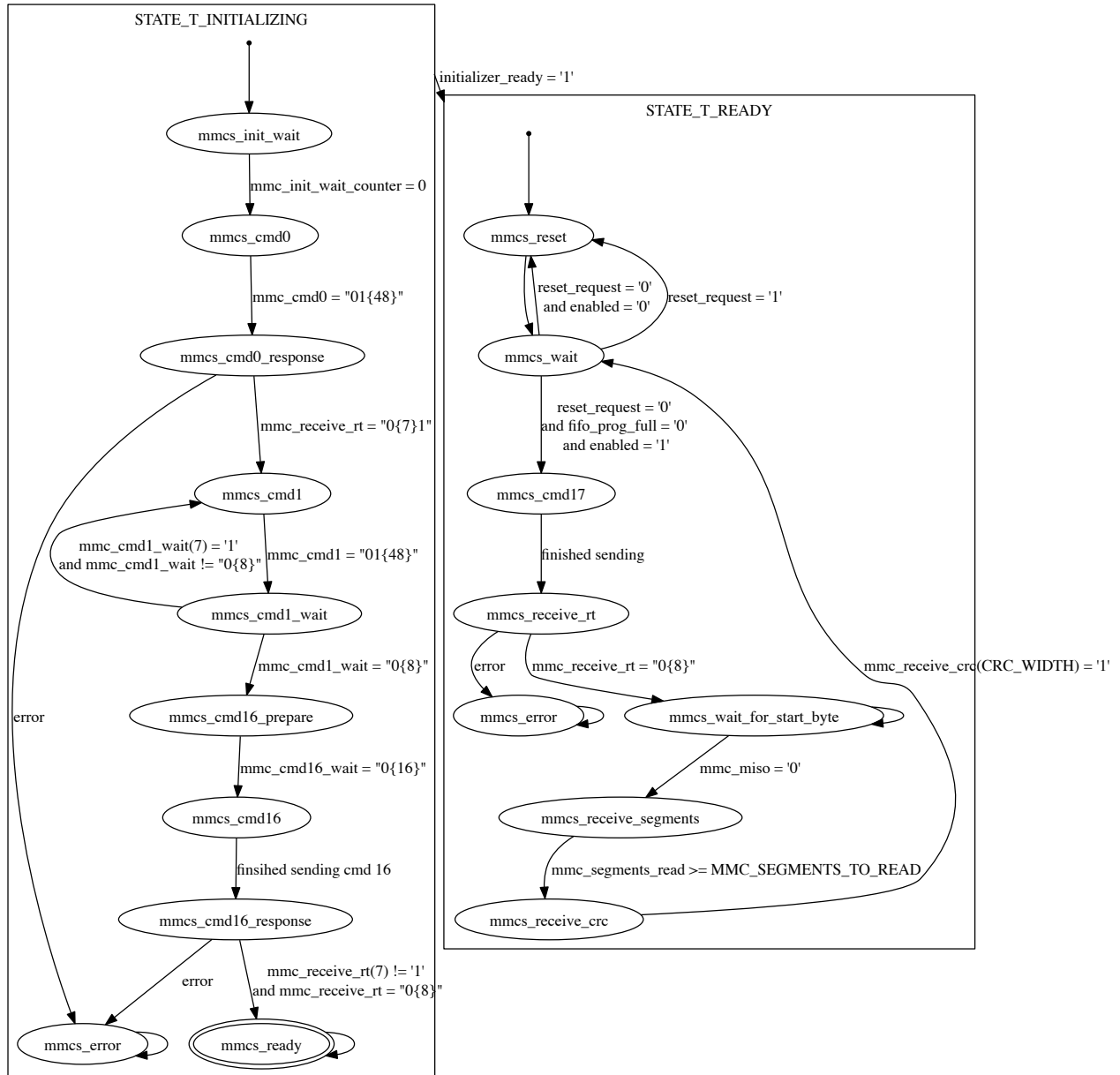


Figure 6: Controller VHDL FSM