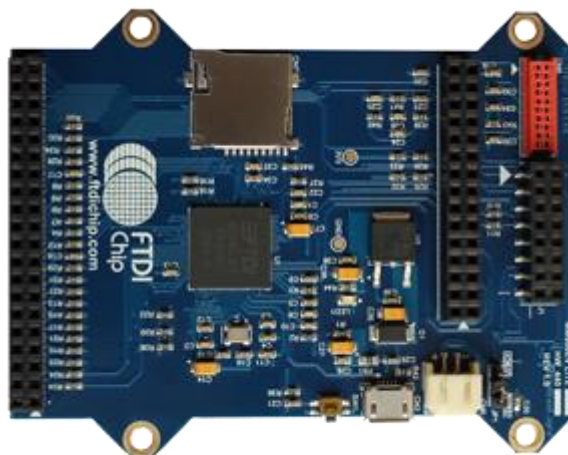


Future Technology Devices International

Datasheet

MM900EV LITE Development Module



FT90X Family is a General Purpose 32-bit Microcontroller

1 Introduction

The MM900EV LITE is a development module for FTDI's 32-bit high performance FT90x Microcontroller family, which is used to develop and demonstrate the functionality of the FT900 Embedded Microcontroller.

This module is ideal for applications including home security systems, home automation systems, USB capability products, embedded multimedia application and other industrial control systems.

1.1 Features

For a full list of the FT90x' features refer to the [FT90x datasheet](#).

In addition, the MM900EV LITE module has the following features:

- FT900 100-pin QFN package microcontroller.
- Micro SD card socket support.
- A Micro-B USB for connecting to a USB host or providing a power supply over USB for the board.
- 2x8 pins 2.54mm pitch dual entry female header and 16 pins 0.5mm pitch FFC/FPC connectors for SPI master to support LCD display modules.
- 2x5 pins 1.27mm pitch female Micro-MaTch connector for software download.
- 2x20 pins 2.54mm pitch female header support for external feature expansions.
- 2x15 pins 2.54mm pitch female header support for external feature expansions.
- +5V alternative power supply DC connector.
- Hardware Reset button provided.

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2 Ordering Information

Part No.	Description
MM900EV LITE	FT900 module, a FT32, 32-bit microcontroller with 256kB flash memory, 64kB data RAM and 256kB program memory embedded. SD3.0, USB2.0 Device, several interface pin headers and connectors included.

Table 2-1 – Ordering information

3 Program Support

Example applications are provided for the MM900EV LITE module by FTDI.

The following documents provide further details for software development.

Other relevant documents and examples exist so please see the [FTDI website](#) for further information.

[AN_324_FT900_User_Manual](#) for system registers information.

[AN_365_FT900_API_Programmers_Manual](#) for using FT90x Peripheral Driver Library.

[AN_360_FT90x_Example_Applications](#) for some simple example applications.

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4 Board Layout

The MM900EV LITE development board is a 55 mm x 85 mm (Not including the 4 mounting holes) six-layer printed circuit board. The layout is as shown in Figure 4-1.

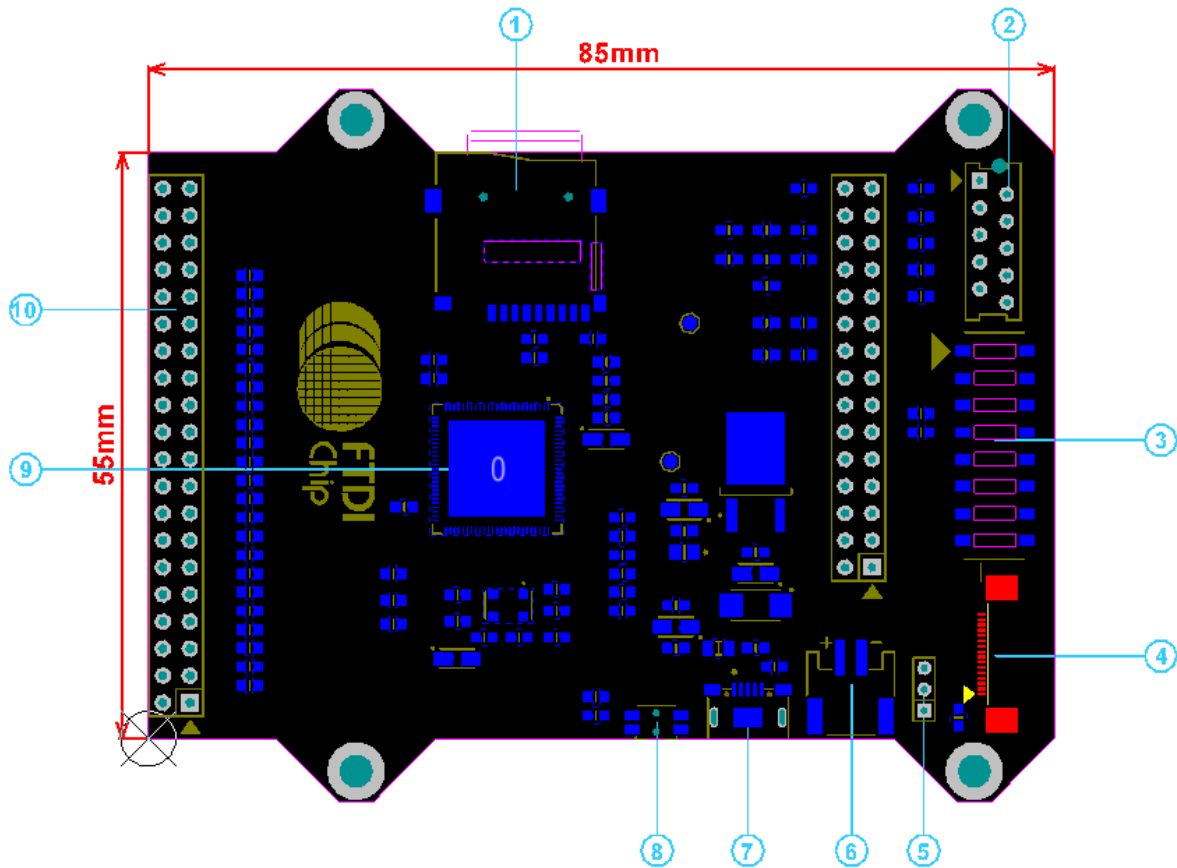


Figure 4-1 – MM900EV LITE Board Layout

Key Features:

- | | |
|-------------------------------------|--|
| 1. Micro SD card socket | 6. DC power socket |
| 2. Program interface | 7. USB Micro-B connector |
| 3. Dual-entry SPI master pin header | 8. H/W Reset button |
| 4. SPI master FPC/FFC connector | 9. FT900 QFN Microcontroller |
| 5. Alternative power supply jumper | 10. External I/O bus female pin header |

4.1 Power Supply

The MM900EV LITE development board provides optional power supply sources with **JP1** jumper:

1. 5V DC power supply, **CN6** right angle connector.
2. Over USB via the Micro-B USB **CN3** port.

Pin No.	Name
1-2	USB VBUS power supply
2-3	5V DC power supply

Table 4-1 – JP1 Pinout

A red LED (Led1) will illuminate after the 5V power supply is applied. This supply will also drive a fixed 3.3V LDO regulator which will provide power to all peripherals of the FT900 microcontroller.

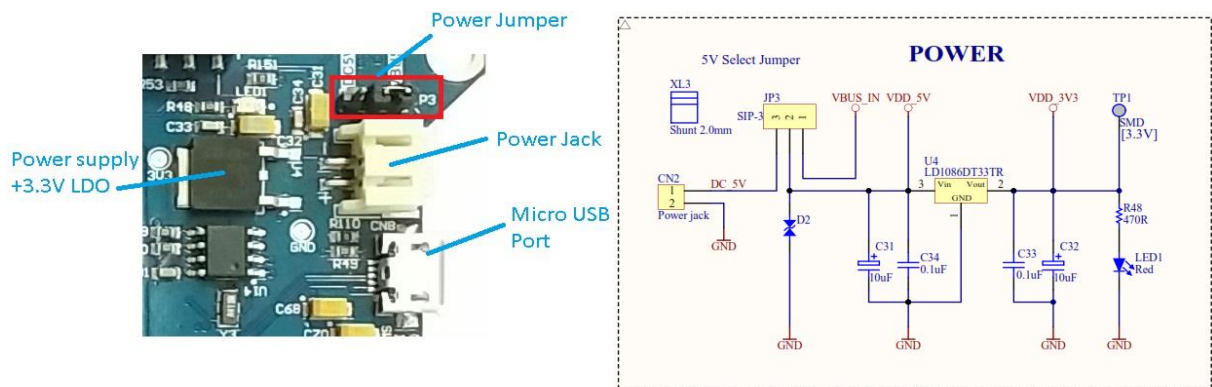


Figure 4-2– Power supply

4.2 Microcontroller

The FT900 100-pin QFN microcontroller (U1) provided on the board belongs to the 32-bit FT90x Microcontroller family from FTDI Chip. For details of the FT900 Microcontroller, refer to the [FT90x datasheet](#).



Figure 4-3– FT900 Microcontroller

There is a crystal used on the MM900EV LITE development board. The 12MHz crystal is the primary system clock frequency supplying the FT900 IC.

The FT900 IC on this board is operated with a single supply of 3.3V. The FT900 Core 1.2V (VOUT1) and Ethernet Regulator 1.2V (VOUT2) sources are unused. These power output pins have decoupling capacitors as specified in the datasheet.

4.3 Micro SD Connector

The FT900 Microcontroller has a SD3.0 controller to support different speed classes, physical sizes and capacities of Secure Digital (SD) cards. There is a Micro SD connector on the MM900EV LITE development module for inserting Micro SD cards (11 x15 x1.0 mm).

There are three standard capacity cards supported:

- Secure Digital (SD) standard – Up to 2GB SD memory card
- Secure Digital High Capacity (SDHC) standard – Over 2GB-32GB SDHC memory card
- Secure Digital eXtended Capacity (SDXC) standard – Over 32GB-2TB SDXC memory card

Standard class speeds 2, 4, 6, 10, and Ultra High Speed (UHS) classes U1 and U3 are all supported. The design of the physical interface supports 4-bit SD bus mode and card detection.

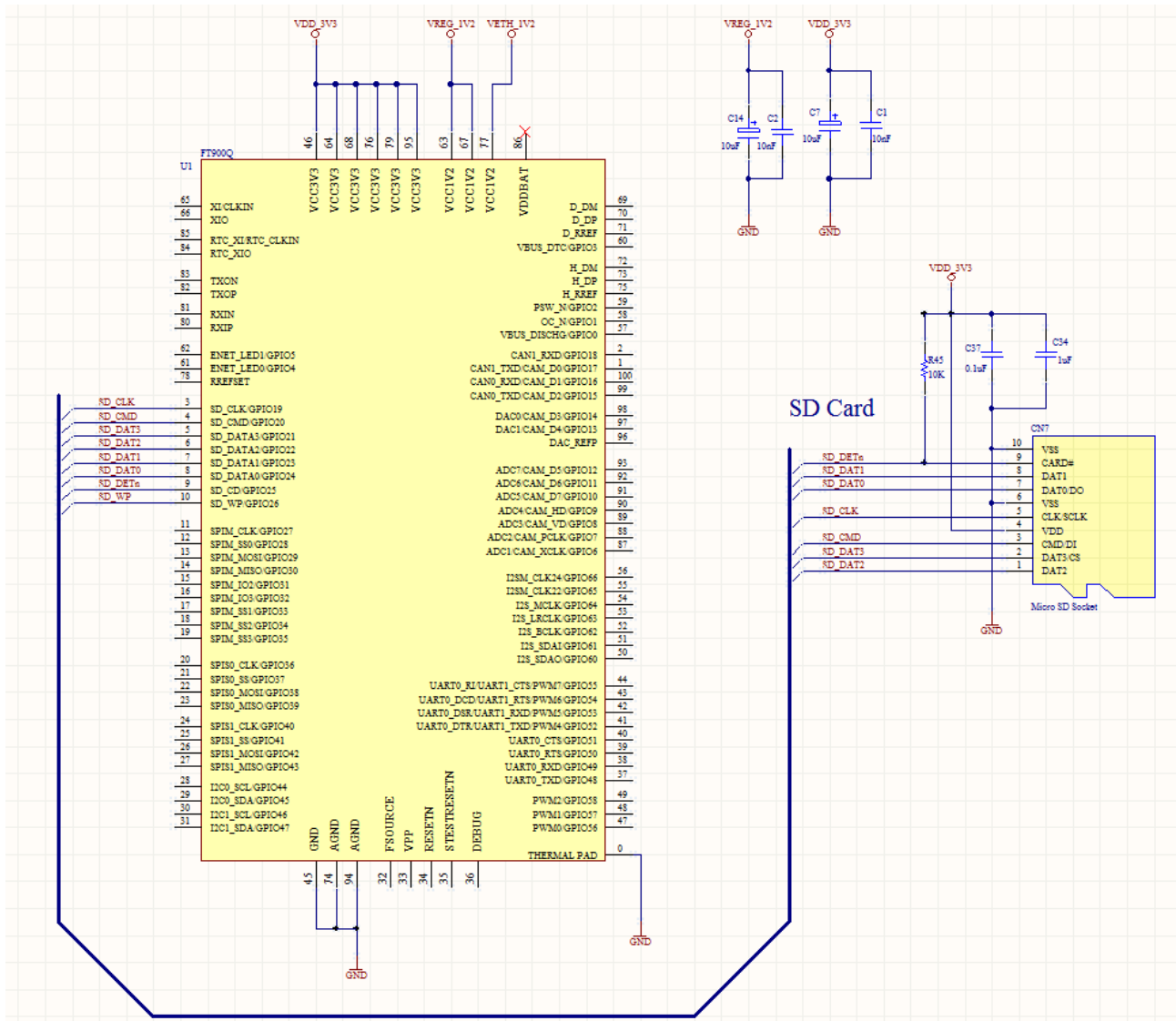


Figure 4-4– Micro SD Connector

4.4 USB Connector

There is a USB connector provided on the MM900EV LITE board. **CN3** is a Micro-B type USB2.0 connector which is used for connecting to a USB device.

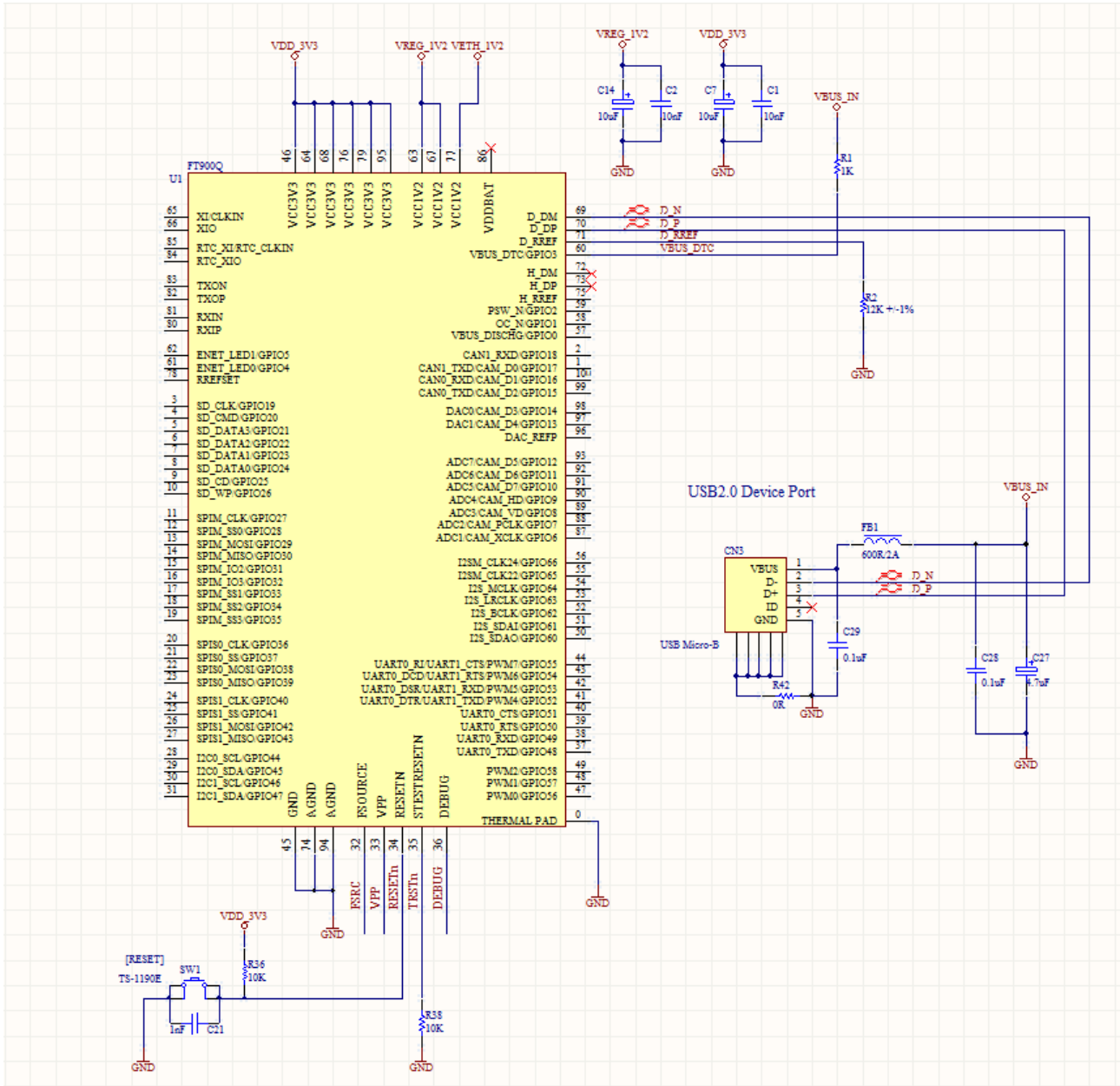


Figure 4-5– USB Connectors

4.5 Programmer Interface

The programmer interface **CN5**, 2x5 pins 1.27mm pitch female Micro-Match header supports software application download, GDB debugging and EFUSE programming on the MM900EV LITE development board with the [UMFTPD2A module](#). For details of the tool operation, please refer to [AN_325_FT900_Tool_Chain_Installation_Guide_document](#).

4.5.1 CN5 – 10-pin Micro-Match Program Interface Signals

Pin No.	Name	Type	Description
1	SPIO_SCK	I	SPI Slave 0 clock input
2	SPIO_SS _n	I	SPI Slave 0 chip select, active low
3	SPIO_MOSI	I	SPI Slave 0 data input
4	SPIO_MISO	O	SPI Slave 0 data output
5	VPP	P	EFUSE program power supply. If unused, keep floating.
6	FRSC	P	EFUSE program power supply. If unused, tied to GND through 10Kohm resistor.
7	GND	P	Ground
8	DEBUG	I/O	FT90x One-Wire Interface
9	GDB_5V	P	External 5V power supply
10	RESET _n	P	H/W Reset, active low

Table 4-2 – CN5 Pinout

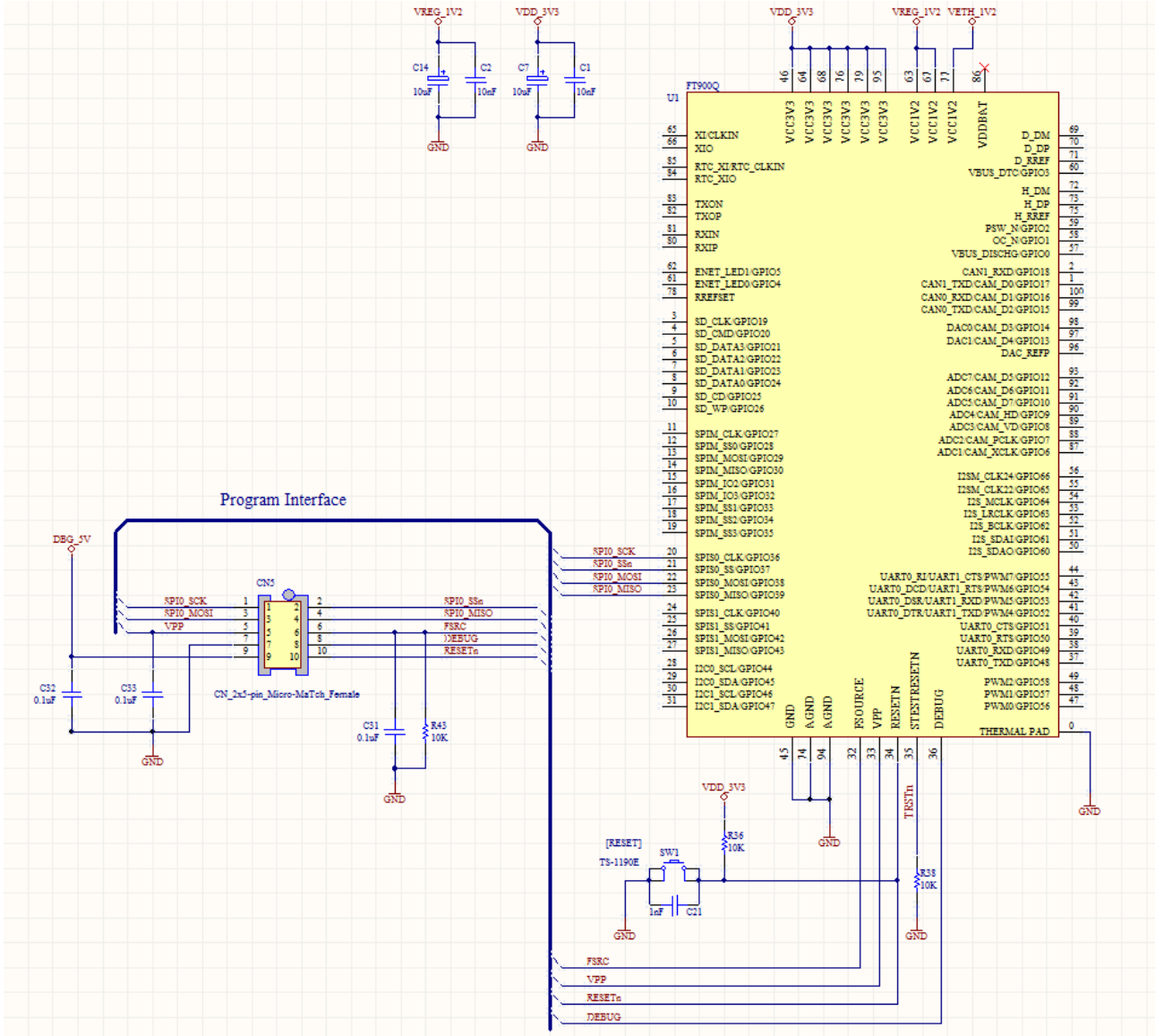


Figure 4-6 – Program Interface

4.6 SPI Master Interface

The FT900 microcontroller has a SPI master interface that supports single, dual and quad SPI data transfer modes. There are two alternative connectors for supporting different LCD display module as SPI slave devices.

- The **J1** dual-entry 2x8 pins 2.54mm pitch, female header (**Error! Reference source not found.**) is designed for FT80x and FT81x Embedded Video Engine (EVE) family LCD display modules. As an example the [ME810A-HV35R module](#), can connect directly to the MM900EV LITE development board on the bottom side with a male pin header.
- The **CN4** 16 pins 0.5mm pitch, bottom contact FFC/FPC connector (**Error! Reference source not found.**) provides an alternative connection for LCD display modules that meet FT80x or FT81X chip technical specifications and use a 16-pin 0.5mm pitch flexible flat cable to link to the board.

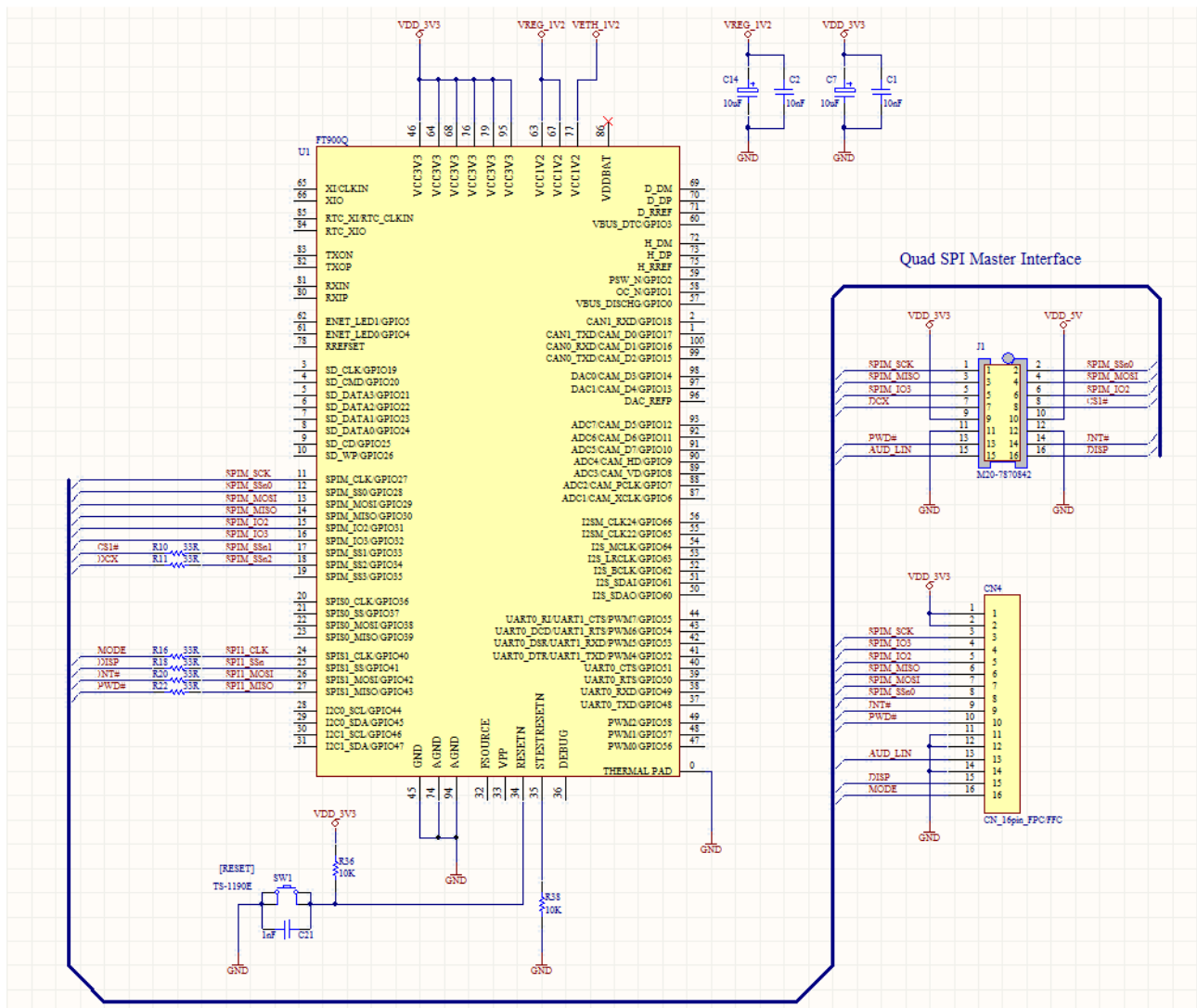


Figure 4-7– SPI Master Interface

4.6.1 J1 – 16-pin Dual Entry Header, SPI Master and Control Signals

Pin No.	Name	Type	Description
1	SPIM_SCK	O	SPI Master clock output
2	SPIM_SSn0	O	SPI Master chip select 0, active low
3	SPIM_MISO	I/O	SPI Master input, Slave output Data 1 for Quad SPI
4	SPIM_MOSI	I/O	SPI Master output, Slave input Data 0 for Quad SPI
5	SPIM_IO3	I/O	General I/O, data 3 for Quad SPI
6	SPIM_IO2	I/O	General I/O, data 2 for Quad SPI
7	DCX	O	Data / command selection pin for LCD controller Low: Command High: Parameter
8	CS1#	O	SPI Master chip select 1, active low for LCD controller
9	VDD_3V3	P	3.3V power supply
10	VDD_5V	P	5V power supply
11	GND	P	Ground
12	GND	P	Ground
13	PWD#	O	FT80X power down control, active low
14	INT#	I	Interrupt input from FT80X, active low
15	AUD_LIN	I	Audio PWM input from FT80X
16	DISP	O	LCD display enable

Table 4-3 – J1 Pinout

4.6.2 CN4 – 16-pin FPC/FFC connector

Pin No.	Name	Type	Description
1,2	VDD_3V3	P	3.3V Power supply
3	SPIM_SCK	O	SPI Master clock output
4	SPIM_IO3	I/O	General I/O, data 3 for Quad SPI
5	SPIM_IO2	I/O	General I/O, data 2 for Quad SPI
6	SPIM_MISO	I/O	SPI Master input, Slave output Data 1 for Quad SPI
7	SPIM_MOSI	I/O	SPI Master output, Slave input Data 0 for Quad SPI
8	SPIM_SSn0	O	SPI Master chip select 0, active low
9	INT#	I	Interrupt input from FT80X, active low
10	PWD#	O	FT80X power down control, active low
11,12,14	GND	P	Ground
13	AUD_LIN	I	Audio PWM input from FT80X
15	DISP	O	LCD display enable
16	MODE	O	Serial interface selection for FT80X Low: SPI interface High: I2C interface

Table 4-4 – CN4 Pinout

4.7 External I/O Bus

There are 32 multiple function GPIOs provided on **CN1** 2x20 pins, 2.54mm pitch female header, and 14 multiple function GPIOs and 8 control signals provided on **CN2** 2x15 pins, 2.54mm pitch female header. External feature boards may connect via UART, PWM, ADC, DAC, SPI, I2C and Camera interfaces on these IO connectors.

Table 4- and Table 4-6 lists all features assigned for each GPIO pin.

4.7.1 CN1 – 40-pin Dual Entry Header, Multiple function GPIO & Control Signals

Pin No.	Function 1	Function 2	Function 3	Function 4
1,2,15,24	GND	-	-	-
3	GPIO54	UART0_DCD	UART1_RTS	PWM6
4	GPIO48	UART0_TXD	-	-
5	NC	-	-	-
6	GPIO49	UART0_RXD	-	-
7	GPIO53	UART0_DSR	UART1_RXD	PWM5
8	GPIO50	UART0_RTS	-	-
9	GPIO52	UART0_DTR	UART1_TXD	PWM4
10	GPIO51	UART0_CTS	-	-
11	GPIO55	UART0_RI	UART1_CTS	PWM7
12	GPIO58	-	-	PWM2
13	GPIO56	-	-	PWM0
14	GPIO57	-	-	PWM1
16	5V	-	-	-
17	GPIO35	SPIM_SS3	-	-
18	GPIO27	SPIM_CLK	-	-
19	GPIO30	SPIM_MISO	-	-
20	GPIO29	SPIM_MOSI	-	-
21	GPIO32	SPIM_IO3	-	-
22	GPIO31	SPIM_IO2	-	-
23	3V3	-	-	-
25	GPIO46	I2C1_SCL	-	-
26	GPIO47	I2C_SDA	-	-
27	GPIO08	CAM_VD	ADC3	-
28	GPIO09	CAM_HD	ADC4	-
29	GPIO07	CAM_PCLK	ADC2	-
30	GPIO06	CAM_XCLK	ADC1	-
31	GPIO10	CAM_D7	ADC5	-
32	GPIO11	CAM_D6	ADC6	-
33	GPIO12	CAM_D5	ADC7	-

Pin No.	Function 1	Function 2	Function 3	Function 4
34	GPIO13	CAM_D4	DAC1	-
35	GPIO14	CAM_D3	DAC0	-
36	GPIO15	CAM_D2	CAN0_TXD	-
37	GPIO16	CAM_D1	CAN0_RXD	-
38	GPIO17	CAM_D0	CAN1_TXD	-
39	RESETn	-	-	-
40	GPIO18	-	CAN1_RXD	-

Table 4-5 – CN1 External I/O Bus

4.7.2 CN2 – 30-pin Dual Entry Header, Multiple function GPIO & Control Signals

Pin No.	Function 1	Function 2	Function 3	Function 4
1,2,15,16	GND	-	-	-
3	TXON	-	-	-
4	GPIO36	SPIS0_CLK	-	-
5	TXOP	-	-	-
6	GPIO37	SPIS0_SS	-	-
7	RXIN	-	-	-
8	GPIO38	SPIS0_MOSI	-	-
9	RXIP	-	-	-
10	GPIO39	SPIS0_MISO	-	-
11	GPIO5	ENET_LED1	-	-
12	GPIO66	I2SM_CLK24	-	-
13	GPIO4	ENET_LED0	-	-
14	GPIO65	I2SM_CLK22	-	-
17	GPIO44	I2C0_SCL	-	-
18	GPIO64	I2S_MCLK	-	-
19	GPIO45	I2C0_SDA	-	-
20	GPIO63	I2S_LRCLK	-	-
21	GPIO2	PSW_N	-	-
22	GPIO62	I2S_BCLK	-	-
23	GPIO1	OC_N	-	-
24	GPIO61	I2S_SDAI	-	-
25	GPIO0	VBUS_DISCHG	-	-
26	GPIO60	I2S_SDAO	-	-
27	FT800_AUDL	-	-	-
28	RESETN	-	-	-
29	3V3	-	-	-
30	5V	-	-	-

Table 4-6 – CN2 External I/O Bus

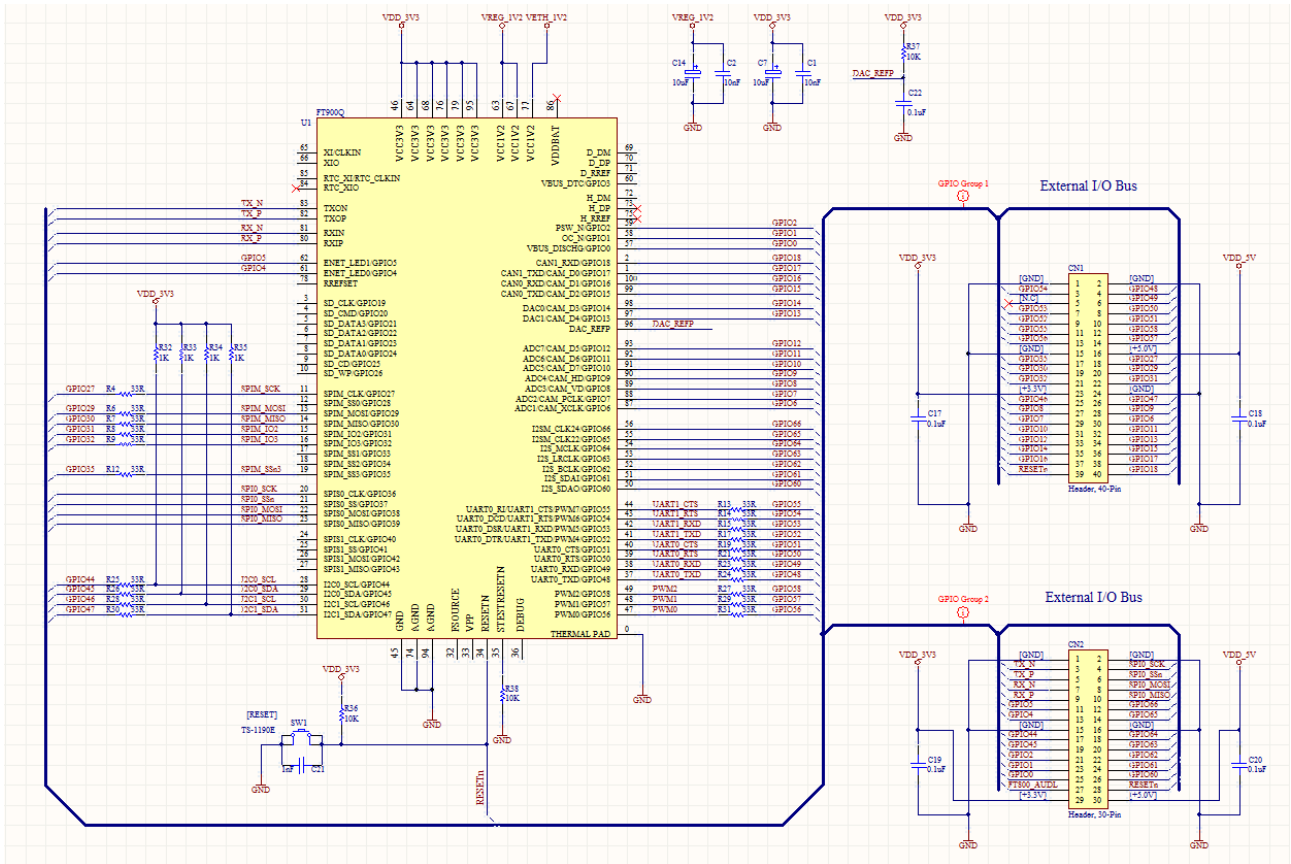


Figure 4-8– External I/O Bus

5 Board Schematic

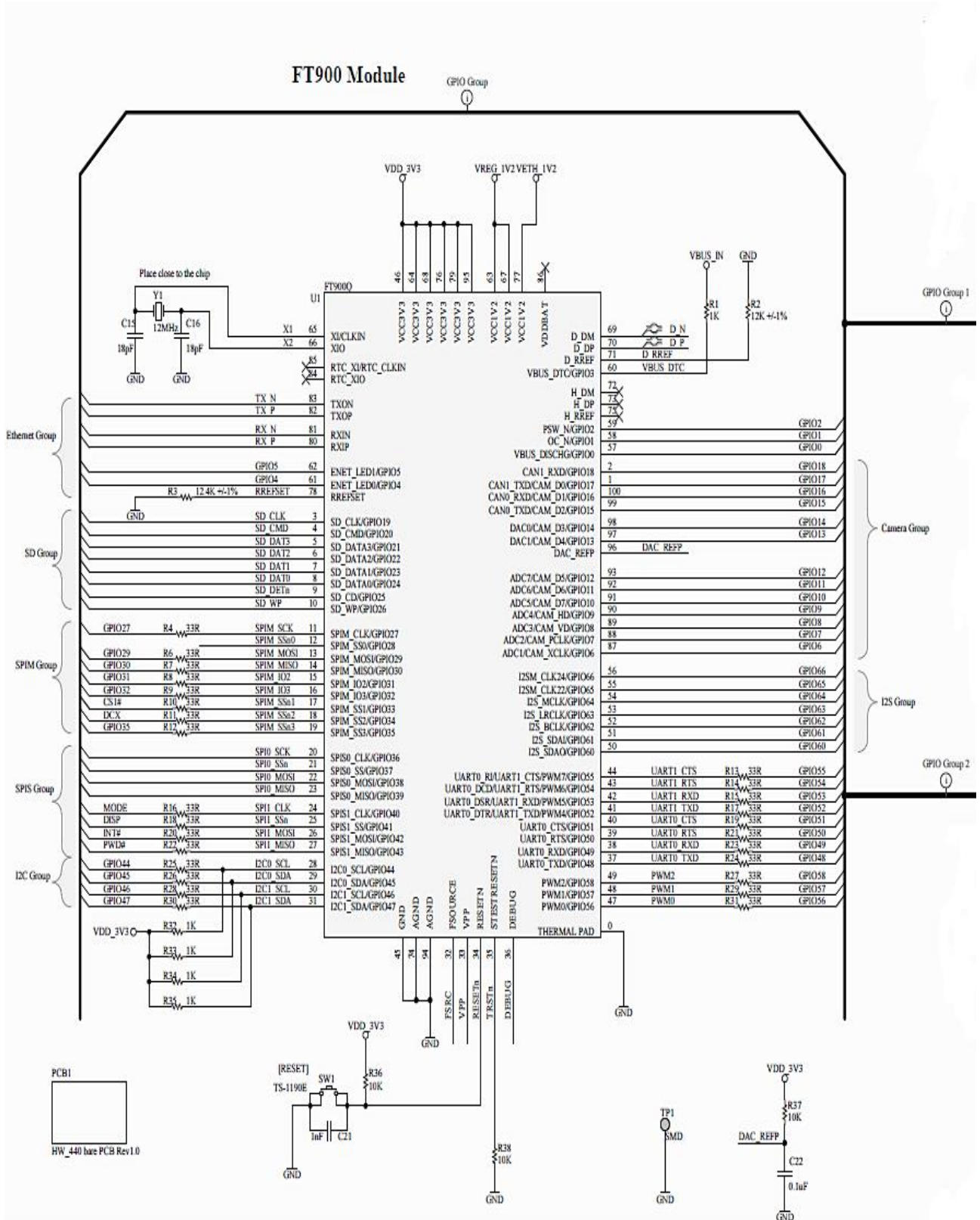


Figure 5-1 – Sheet 1a-FT900 MCU

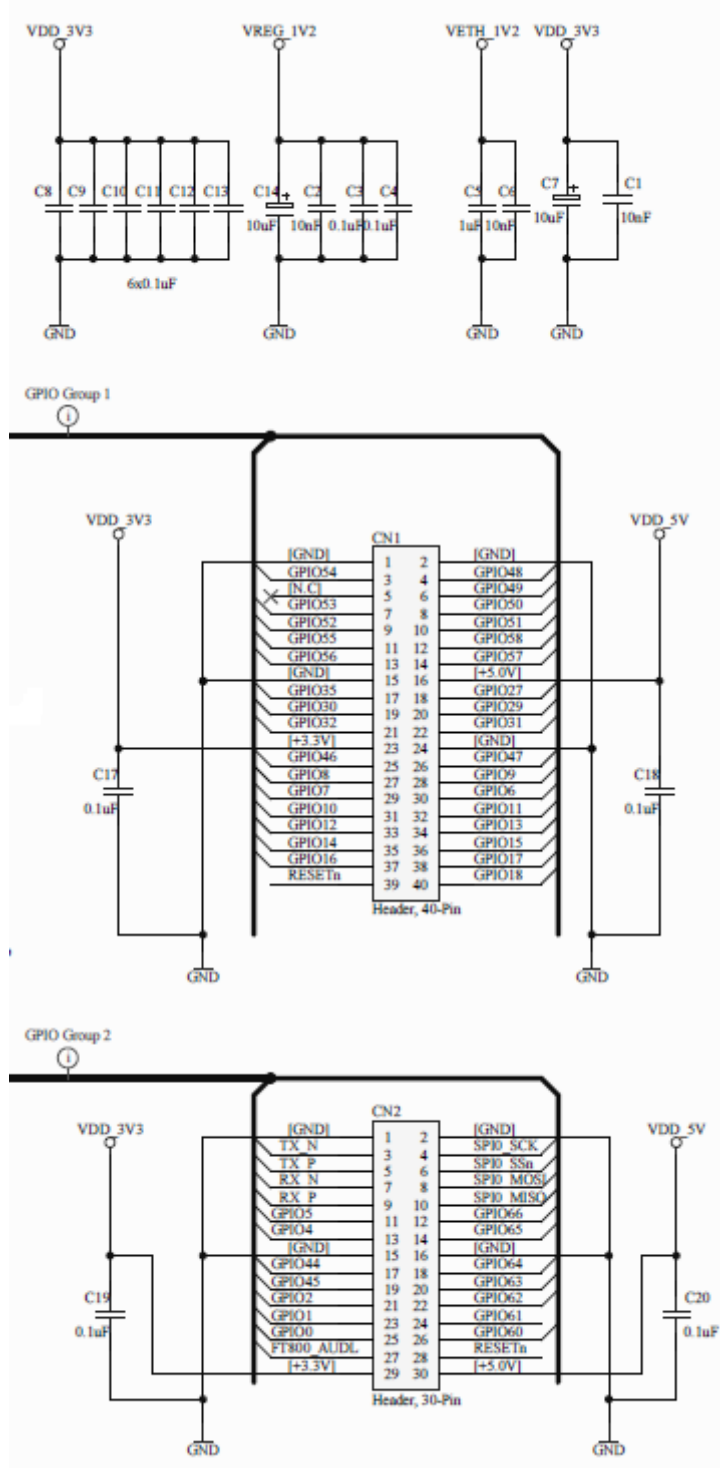
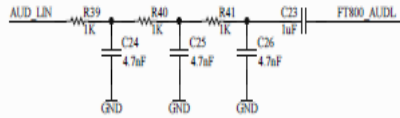
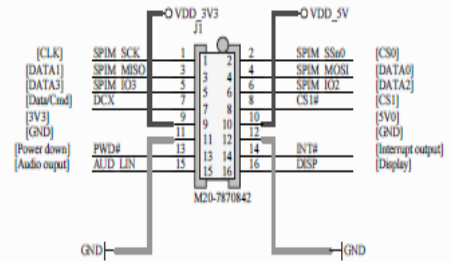


Figure 5-2 – Sheet 1b-FT900 MCU

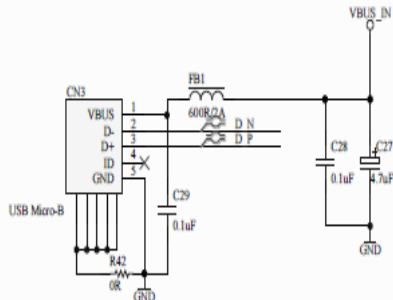
[FT800 Audio Output]



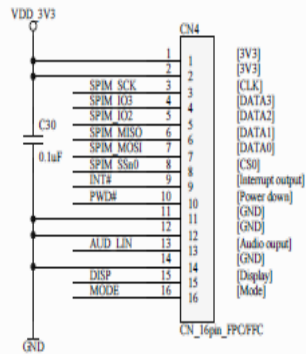
[Display I/F]



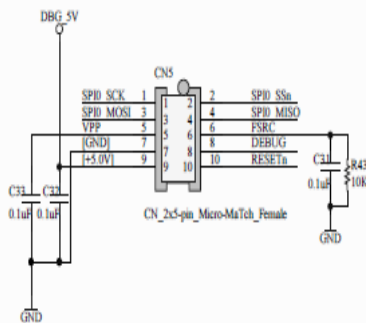
[USB2.0 Device]



[ADAM Display I/F]



[Program I/F]



[Micro-SD Card]

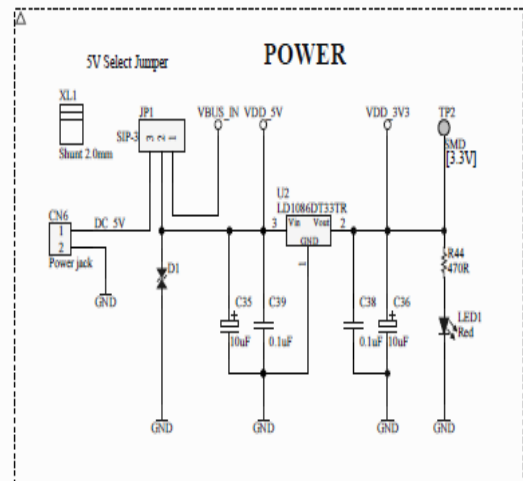
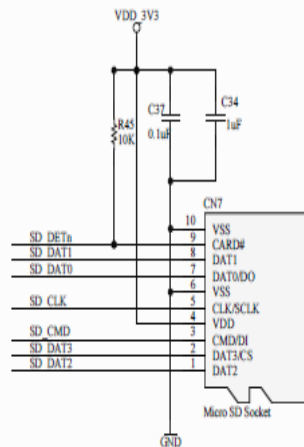


Figure 5-3 – Sheet 2-FT900 Interfaces and Connectors

6 Mechanical Dimensions

6.1 MM900EV LITE PCB Dimensions

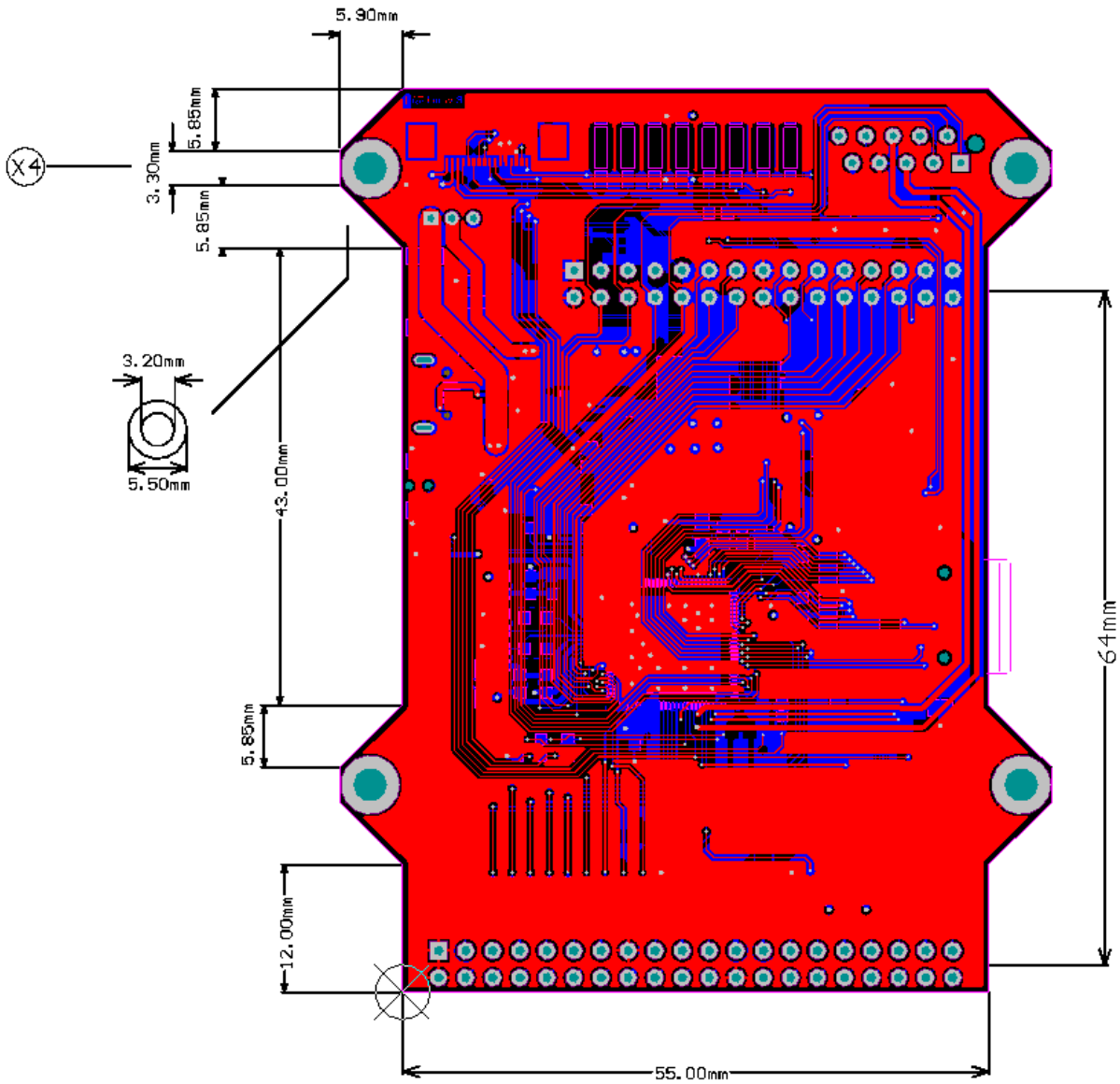


Figure 6-1 – MM900EV LITE PCB Dimensions

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Appendix A - References

Document References

FT90X webpage: <http://www.ftdichip.com/Products/ICs/FT90x.html>

FT90X datasheet: [FT900/FT901/FT902/FT903 Datasheet](#)

FT900 tool chain installation guide document: [AN_325 FT900 Tool Chain Installation Guide](#)

FT90X system registers: [AN_324 FT900 User Manual](#)

FT90x Peripheral Driver Library: [AN_365 FT900 API Programmers Manual](#)

FT90x Example Applications: [AN_360 FT90x Example Applications](#)

UMFTPD2A program module datasheet: [DS_UMFTPD2A](#)

ME800A-HV35R LCD display module document: [DS_ME810A_HV35R](#)

Acronyms and Abbreviations

Terms	Description
DC	Direct Current
DFU	Device Firmware Update
EVE	Embedded Video Engine
FCC/CE	North American EMI Verification/European Union EMC & Safety Compliance Declaration
FFC/FPC	Flexible Flat Cable/Flexible Printed Circuit
GPU	Graphics Processing Unit
HVGA	Half Size Video Graphics Array
IO	Input/output

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