MYD-C437X-PRU Development Board

- *MYC-C437X CPU Module as Controller Board*
- *Two 0.8mm pitch 100-pin Connectors for Board-to-Board Connections*
- *Up to 1GHz TI AM437x Series ARM Cortex-A9 Processors*
- *512MB DDR3 SDRAM, 4GB eMMC Flash, 32KB EEPROM*
- *3 x Serial ports, 1 x USB 2.0 Host, 1 x Mini USB 2.0 Device, 1 x CAN, RS485, 1 x Camera, TF, LCD*
- *1 x Gigabit Ethernet, 2 x PRU-ICSS Ethernet ports (AM4377 and AM4379 can support EtherCAT)*
- *Optional 4.3 or 7 inch LCD/TSP*
- *Supports Linux 4.1.18 and SYS/BIOS 6.45 (TI-RTOS) Operating Systems*

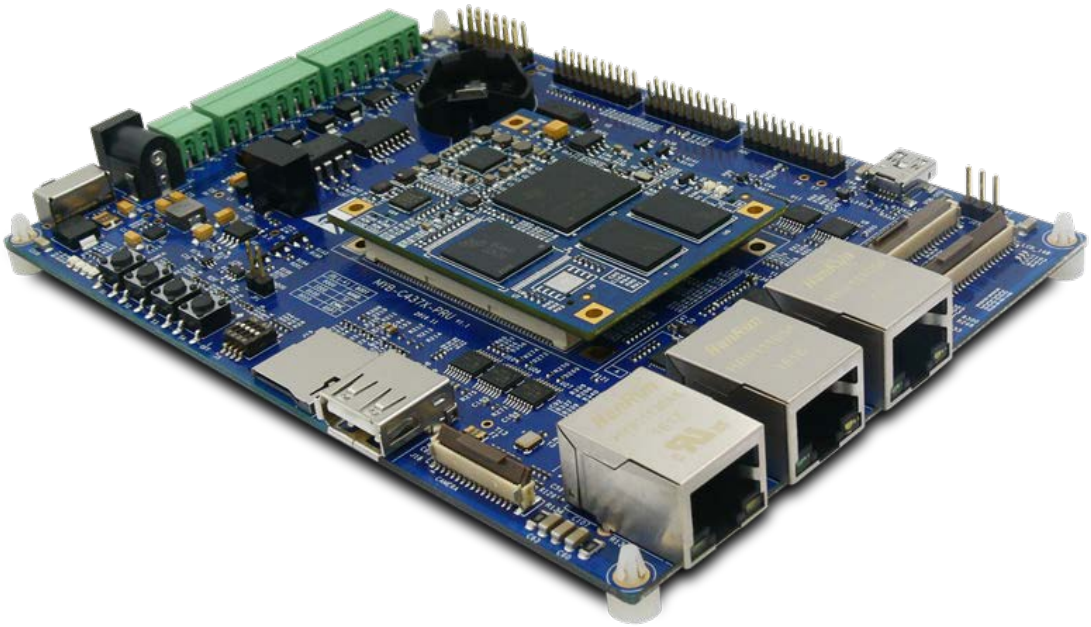


Figure 1-1 MYD-C437X-PRU Development Board

Description

The MYD-C437X-PRU Development Board is a complete evaluation platform especially designed for users to take full advantages of the Programmable Real-time Unit (PRU) as well as the 3D graphics acceleration features from Texas Instruments (TI) Sitara AM437x ARM Cortex-A9 processors. It can support -40 to +85 Celsius extended temperature operation and is ideal for industrial communications, industrial control, and industrial drives applications.

The MYD-C437X-PRU development board employs the MYC-C437X CPU Module as the core controller board which is mounted onto the MYD-C437X-PRU base board through two 0.8mm pitch 2*100-pin board-to-board connectors. The CPU Module has the core components AM437x processor, 512MB DDR3, 4GB eMMC flash, 32KB EEPROM, Ethernet PHY and PMIC integrated on board. The base board has additionally extended a rich set of peripherals through headers and connectors from the SOM and some extended controller chips including three serial ports, one USB Host ports, one Mini USB Device port, one Gigabit Ethernet, two 10/100Mbps Ethernet ports from the PRU-ICSS subsystems, one CAN, one RS485, one Camera interface, one Micro SD, LCD, Touch screen and more others.

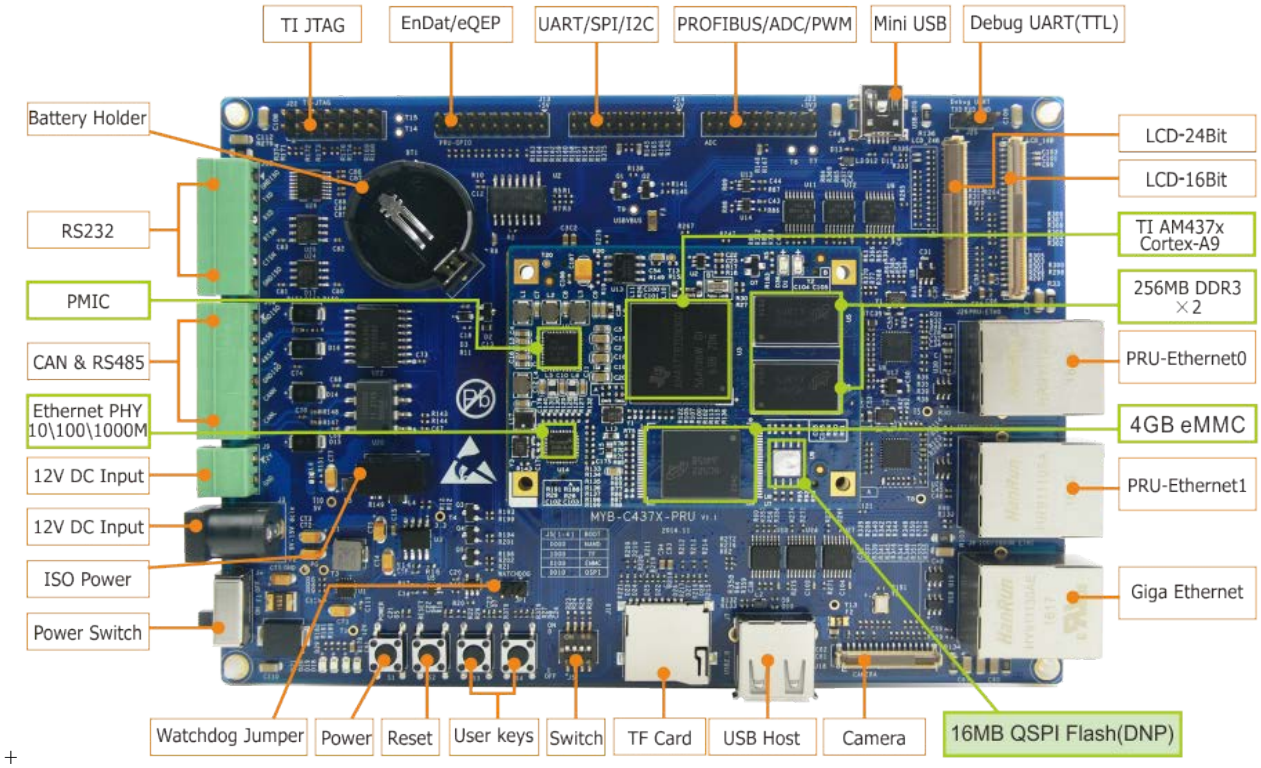


Figure 1-2 MYD-C437X-PRU Development Board

The AM437x processor family consists of 4 pin-pin compatible devices (AM4376, AM4377, AM4378 and AM4379) with various options including speed grades, packages, graphics and peripherals. MYIR delivers the MYD-C437X-PRU board with AM4377 processor by default which is able to support EtherCAT through two PRU-ICSS Ethernet ports and run TI SYS/BIOS v6.45 Real-time Operating System.

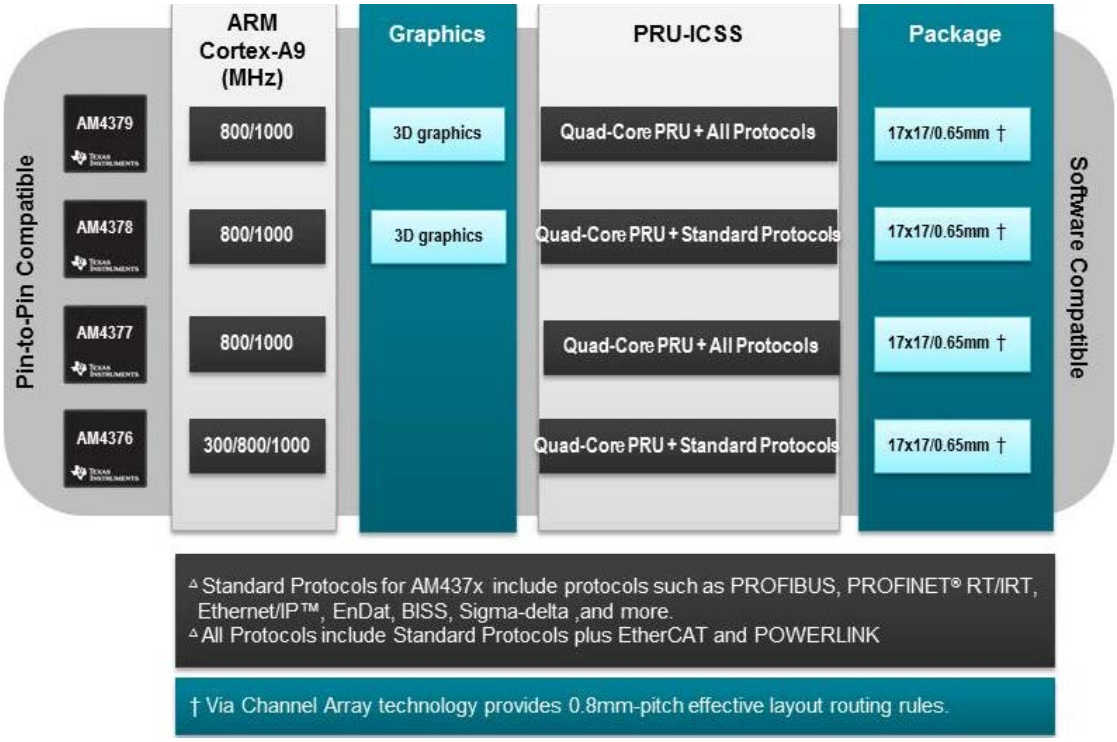
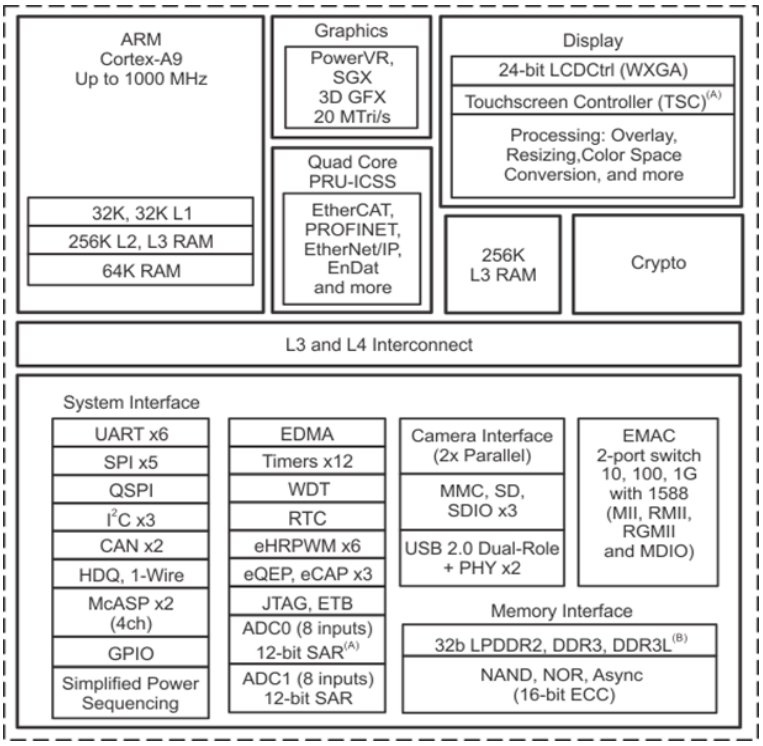


Figure 1-3 AM437x Devices Comparison

The MYD-C437X-PRU board comes with necessary cable accessories and a product disk containing the Linux 4.1.18 and TI RTOS (SYS/BIOS 6.45) software packages and detailed documents. The complete platform provides a quick AM437x starter kit for users when getting the goods out-of-the-box right away.

Hardware Specification

The TI AM437x high-performance processors are based on the ARM Cortex-A9 core. Customers using this next generation solution will see an increase in performance, as well as extensive reuse from the ARM Cortex-A8 offerings.



A. Use of TSC will limit available ADC0 inputs.

B. Max clock: LPDDR2 = 266 MHz; DDR3/DDR3L = 400 MHz

Figure 1-4 AM437x Function Block Diagram

Increasing performance and peripheral support

Sitara AM437x processors deliver the right balance of:

Performance

- Up to 1GHz of processing power
- 3D graphics accelerator
- On-chip quad-core PRU co-processor for real-time processing
- Improved vector floating-point unit

Interfaces

- LPDDR2/DDR3
- QSPI
- Display subsystem

Connectivity

- Two parallel camera ports
- Dual-port 1Gb Ethernet switch
- Two independent, eight-channel ADCs

- WiLink connectivity drivers
- Industrial protocols via PRU-ICSS

	AM4379	AM4378	AM4377	AM4376
ARM Cortex-A9 MHz (Max.)	800/1000	800/1000	800/1000	300/800/1000
Graphics Acceleration	3D graphics	3D graphics		
PRU-ICSS for Industrial Communication*	Quad-Core PRU + All Protocols	Quad-Core PRU + Standard Protocols	Quad-Core PRU + All Protocols	Quad-Core PRU + Standard Protocols
Security	Crypto available on all AM437x devices. Secure boot option available on AM437xS devices			
	Software and pin-for-pin compatible across devices			

Figure 1-5 AM437x Processors

* PRU-ICSS is a programmable real-time core for industrial communication protocols.

* Standard Protocols for AM437x processors include protocols such as Ethernet/IP, PROFINET™ RT/IRT, PROFIBUS™, Sercos III, EnDat, Sigma Delta and more.

* All Protocols for AM437x processors include standard protocols plus EtherCAT® and POWERLINK

The MYD-C437X-PRU Development Board takes full features of the AM437x processor and has a CPU Module MYC-C437X mounted directly onto the base board through two 0.8mm pitch 100-pin expansion connectors. This board is characterized as follows:

Mechanical Parameters

- Dimensions: 150mm x 105mm (base board), 60mm x 45mm (CPU Module)
- PCB Layers: 4-layer design (base board), 8-layer design (CPU Module)
- Power supply: +12V/1.5A (base board), 5V/0.33A (CPU module)
- Working temperature: -40~85 Celsius (industrial grade)

The MYD-C437X-PRU Controller Board (MYC-C437X CPU Module)

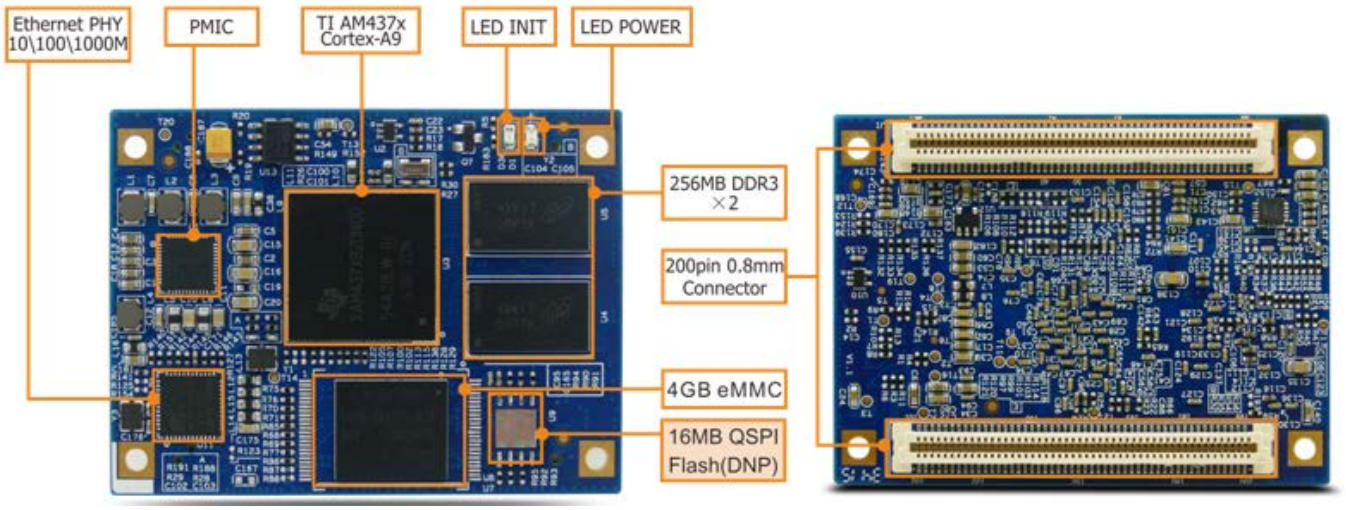


Figure 1-6 MYC-C437X CPU Module

Processor

- TI AM437x (AM4376, AM4377, AM4378, AM4379)
  - Up to 1GHz Sitara ARM Cortex-A9 32-Bit RISC processor
  - POWERVR SGX Graphics Accelerator subsystem for 3D graphics acceleration to support display and gaming effects
  - Single-cycle vector floating point (VFP)
  - Dual camera and display processing subsystem
  - Cryptographic acceleration and secure boot
  - PRU-ICSS enables simultaneous industrial Ethernet protocols and motor feedback protocols
  - Support for 32 bit LPDDR2/DDR3/DDR3L
  - Low power: ~5mW deep sleep and < 0.1mW RTC-only
  - Simplified power sequence for flexible power design

Memory

- 512MB DDR3 SDRAM
- 4GB eMMC Flash
- 16MB QSPI Flash (reserved design, not soldered)
- 32KB EEPROM

Peripherals and Signals Routed to Pins

MYC-C437x Pinouts Description

- Power Management IC (TPS65218)
- Gigabit Ethernet PHY
- One power indicator (Red LED)
- One user LED (Green)
- Two 0.8mm pitch 100-pin board-to-board expansion connectors can carry out interfaces below
  - 1 x Gigabit Ethernet
  - 2 x Ethernet from PRU-ICSS subsystems
  - 2 x USB OTG 2.0
  - 6 x Serial ports
  - 2 x I2C
  - 1x 24-bit LCD
  - 2 x CAN
  - 2 x SPI
  - 14 x ADC (8 channels from ADC1 and 6 channels from ADC0)
  - 3 x SDIO
  - 2 x Camera
  - 2x EnDAT2.2
  - 2x MCASP
  - GPIO

The MYD-C437X-PRU Base Board

Figure 1-7 MYD-C437X-PRU Base Board

- Serial ports
  - 1 x 3-wire Debug serial port
  - 1 x 5-wire RS232 serial port (J12)
  - 1 x 3-wire RS232 series port (J14)
  - 1 x RS485 (with signal and power isolation)
- USB
  - 1 x USB2.0 Host port
  - 1 x Mini USB2.0 Device port
- 1 x Gigabit Ethernet interface
- 2 x 10/100Mbps PRU-ICSS Ethernet interfaces
- 1 x CAN interface (with signal and power isolation)
- 1 x TF card slot
- 1 x 16-bit LCD interface
- 1 x 24-bit LCD interface
- 1 x Camera interface (0.5mm pitch 30-pin FPC connectors)
- 1 x 2.54mm pitch 14-pin JTAG interface
- 4 x Buttons (1 x Reset button, 1 x PMIC, 2 x User buttons)
- 1 x Power indicator (Red LED)
- 3 x User LEDs (Blue)
- Three 2.0mm 20-pin expansion connectors
  - 8 x ADC, 2 x SPI, 1 x I2C, 2 x UART, PRU-UART (supports PROFIBUS), 2 x EnDat, 2 x eQEP, eHRPWM

* The LCD display function cannot be used with the EtherCAT function at the same time due to reused signals.

* The LCD interface can be either selected to use the 16-bit LCD interface or 24-bit LCD interface.

Function Block Diagram

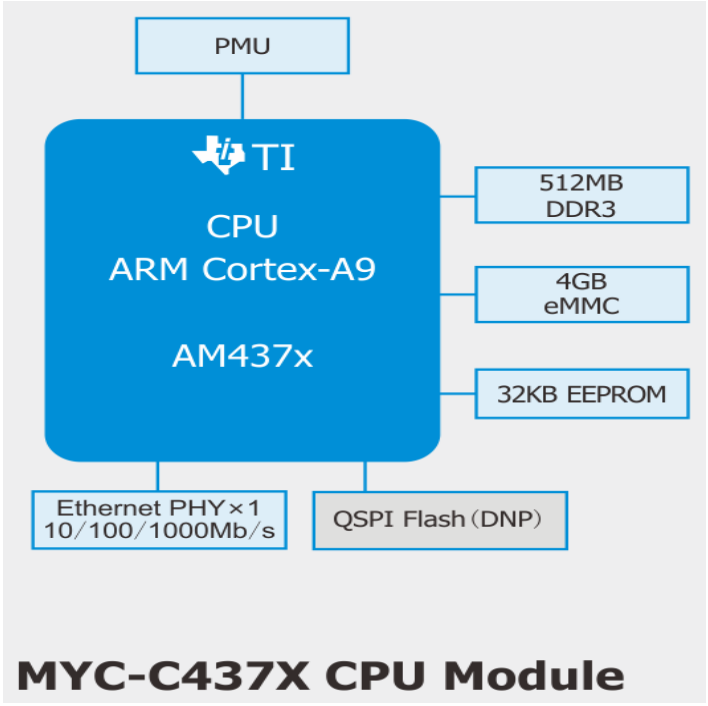


Figure 1-8 MYC-C437X Function Block Diagram

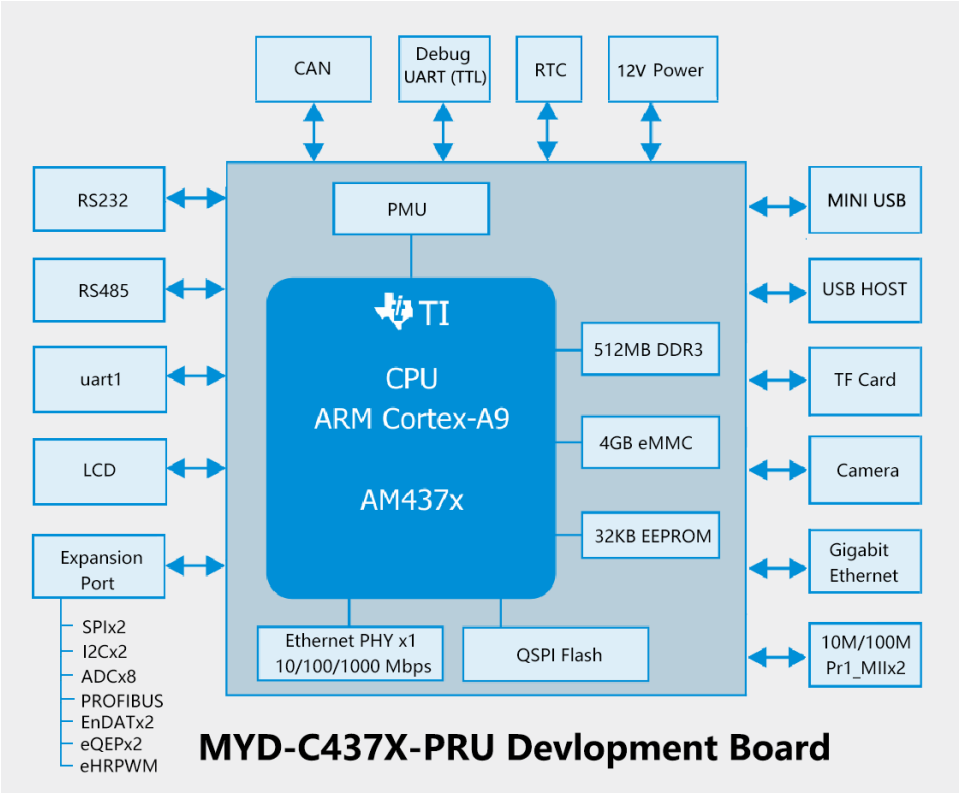


Figure 1-9 Function Block Diagram of MYD-C437X-PRU

Dimension Chart

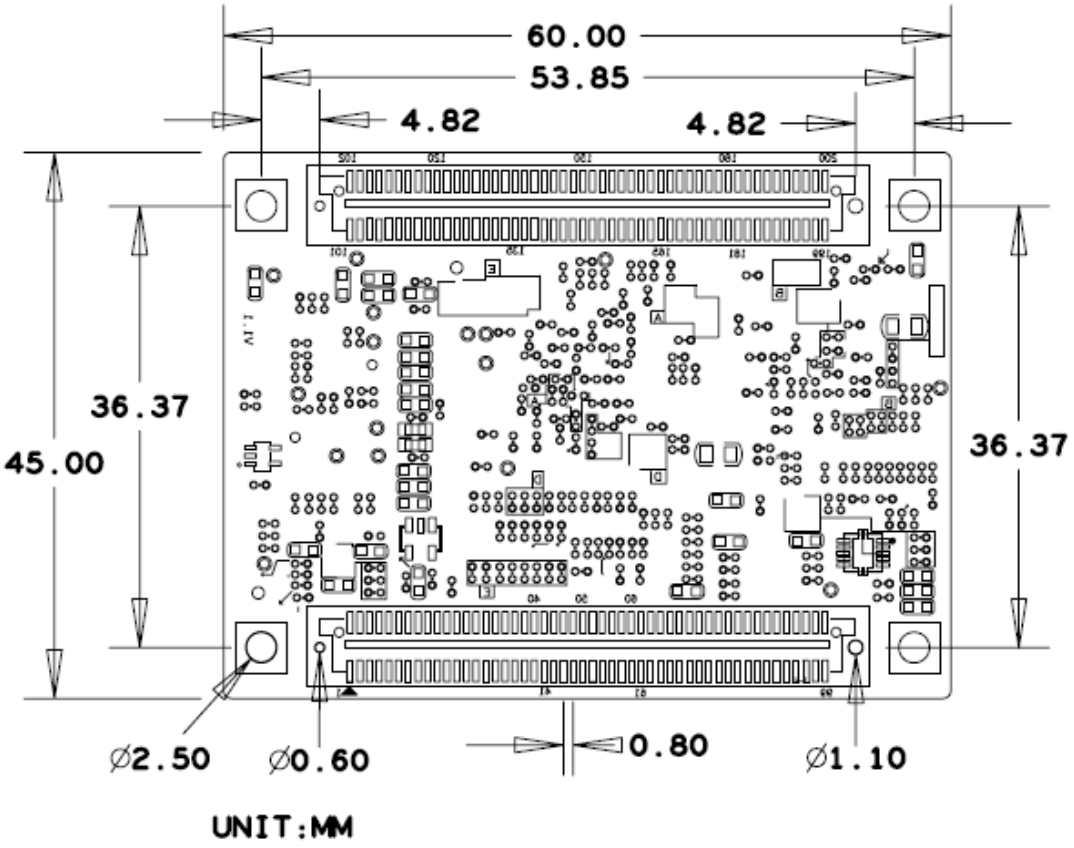


Figure 1-10 Dimension Chart of MYC-C437X CPU Module

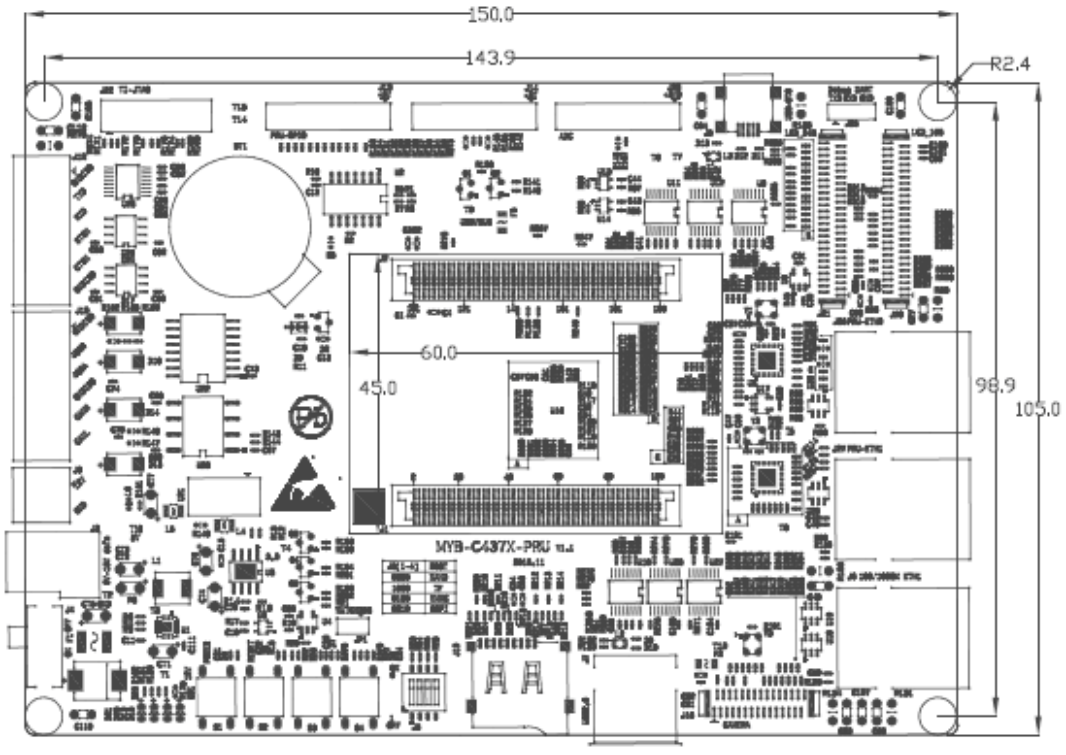


Figure 1-11 Dimension Chart of MYD-C437X-PRU

Software Features

OS	Item	Features	Description
Linux	**Bootstrap program**	u-boot-201605	Bootstrap (source code)
	Kernel	Version	Linux 4.1.18 (especially designed for MYD-C437X-PRU, source code)
	Drivers	USB Host	USB Host driver (source code)
		USB OTG	USB OTG driver (source code)
		Ethernet	Gigabit Ethernet driver (source code)
		PRU Ethernet	Industrial Ethernet driver (source code)
		MMC/SD/TF	MMC/SD/TF card driver (source code)
		Nand Flash	Nand Flash driver (source code)
		eMMC	eMMC driver (source code)
		CAN	CAN driver (source code)
		RS485	RS485 driver (source code)
		LCD Controller	LCD driver (source code, supports 4.3, 7-inch LCD)
		RTC	RTC driver (source code)
		Touch driver	Resistive and Capacitive touch screen driver (source code)
		Button	Button driver (source code)
		LED	LED driver (source code)
		Watchdog	Watchdog driver (source code)
		Camera	Camera driver (source code)
		UART	UART driver (source code)
		SPI	SPI driver (source code)
		ADC	ADC driver (source code)
		I2C	I2C driver (source code)
	File system	Buildroot	Provide image file
		Arago	Provide image file
SYS/BIOS	Kernel	Version	SYS/BIOS 6.45
	Evaluation environment		Code Composer Studio Version 6.2.x
	ARM compiler		GNU V4.9.3 (Linaro)
	PRU compiler		PRU 2.1.13
	Application Examples		Bootloader, EtherCAT Slave Application, EtherNet/IP Adapter Application, EtherNet MAC Application, Example Utils Application

Table 1-1 Software Features of MYD-C437X-PRU

Order Information

<table>
<tr><th>Product Item</th><th>Packing List</th></tr>
<tr><td>MYD-C4377-PRU Development Board
(Part No.: MYD-C4377-4E512D-100-I-PRU)</td><td rowspan="3">➢ One MYD-C437X-PRU Development Board (including the base board and CPU module)
➢ One Net cable
➢ One USB cable
➢ One 12V/1.5A Power adapter
➢ One Product DVD
(including user manual, datasheet, base board schematic in PDF format and software packages)

Add-on Options
➢ MY-LCD70TP-C 7-inch LCD Module
➢ MY-CAM002U USB Camera Module</td></tr>
<tr><td>MYC-C4377 CPU Module
(Part No.: MYC-C4377-4E512D-100-I)</td></tr>
<tr><td>MY-LCD70TP-C 7-inch LCD Module
(Part No.: MY-TFT070CV2)

MY-CAM002U USB Camera Module
(Part No.: MY-CAM002U)</td></tr>
<tr><td colspan="2">Remark:
1. One MYD-C437X-PRU Development Board includes one CPU module MYC-C437X mounted on the base board. If you need more CPU module, you can order extra ones.
2. MYIR offers MYD-C4377-PRU by default; if you need other CPU model or other RAM/Flash configuration, please contact MYIR for availabilities.
3. For Price information, please contact MYIR.
4. We accept custom design based on the MYD-C437X-PRU, whether reducing, adding or modifying the existing hardware according to customer's requirement.</td></tr>
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