MYD-YA157C Development Board

- *MYC-YA157C CPU Module as Controller Board*
- *STMicroelectronics STM32MP1 MPU based on 650MHz Dual Arm Cortex-A7 and 209MHz Cortex-M4 Cores*
- *512MB DDR3, 4GB eMMC Flash, On-board Gigabit Ethernet PHY, Power Management IC (PMIC)*
- *RS232, RS485, 1 x USB Type-C DRP, 1 x USB2.0 HOST, Gigabit Ethernet, CAN, WiFi/Bluetooth, Micro SD Card Slot*
- *Supports RGB888 based LCD/HDMI and MIPI-DSI Display*
- *Supports Running Linux OS*

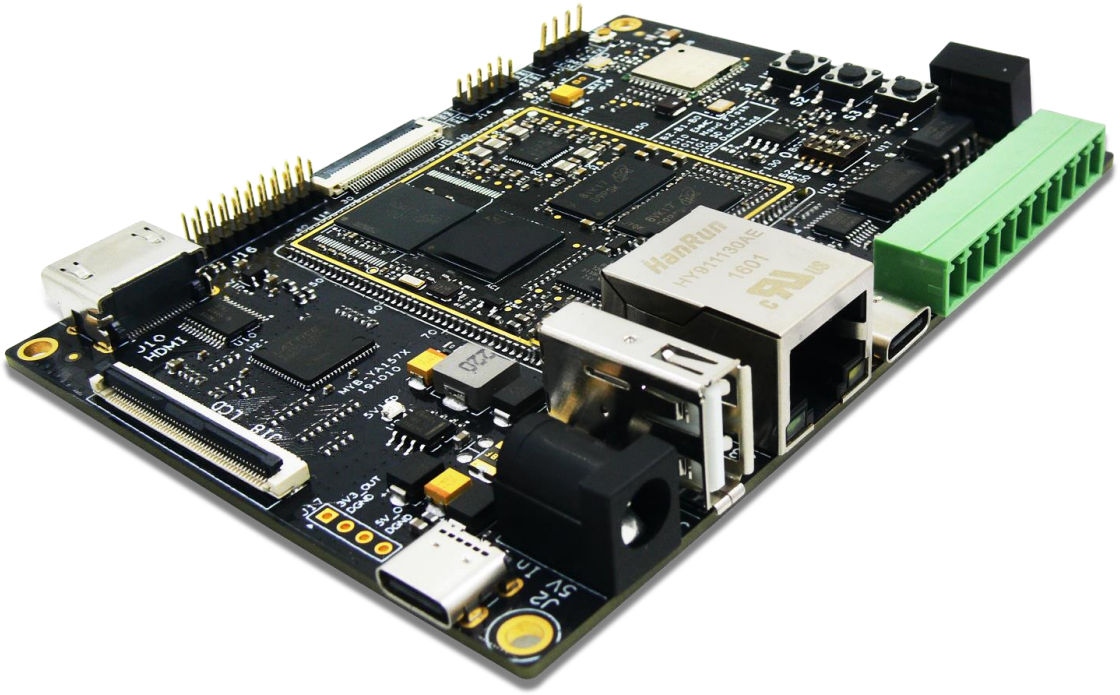

Figure 1-1 MYD-YA157C Development Board

The **MYD-YA157C development board** consists of a compact CPU Module **MYC-YA157C** and a base board to provide a complete evaluation platform for **ST STM32MP1 Processors** which features dual-core Arm Cortex-A7 operating at up to 650 MHz and an embedded Cortex-M4 core operating at up to 209 MHz. Typical applications are industrial control, consumer electronics, smart home, medical and more other energy-efficient applications which require rich performance and low power.

The **MYD-YA157C** has a base board which installed **MYC-YA157C CPU Module** through 1.0mm pitch 164-pin stamp-hole (Castellated-Hole) interface. The MYC-YA157C CPU Module is a highly-integrated SoM which combines the **STM32MP157** processor (**STM32MP157AAC3**), a dedicated Power-Management IC **STPMIC1** also from STMicroelectronics, 512MB DDR3, 4GB eMMC as well as an integrated GigE PHY chip. The base board has brought out rich peripherals through connectors and headers such as RS232, RS485, USB Type-C DRP, USB2.0 HOST, Gigabit Ethernet, WiFi/Bluetooth, CAN, Micro SD Card Slot, JTAG, RGB888 based LCD/HDMI, MIPI-DSI, etc.

The **MYD-YA157C development board** is delivered with one Quick Start Guide, one Type-C cable, one USB to TTL serial cable and one WiFi/Bluetooth antenna to provide user a complete platform for evaluating and prototyping based on STM32MP1 series microprocessors. MYIR also offers **MY-CAM002U Camera Module** and **MY-TFT070CV2 LCD Module** as options for the board.

The **MYD-YA157C** is running Linux OS. MYIR provides abundant software resources for Yocto 3.1 based MYIR MEasy-HMI system (available later), Yocto 3.1 based ST Weston system, Ubuntu 18.04 system and MYIR MEasy-IOT system including kernel and driver source code, STM32CubeProgrammer and STM32CubeMX tools to enable users to start their development rapidly and easily.

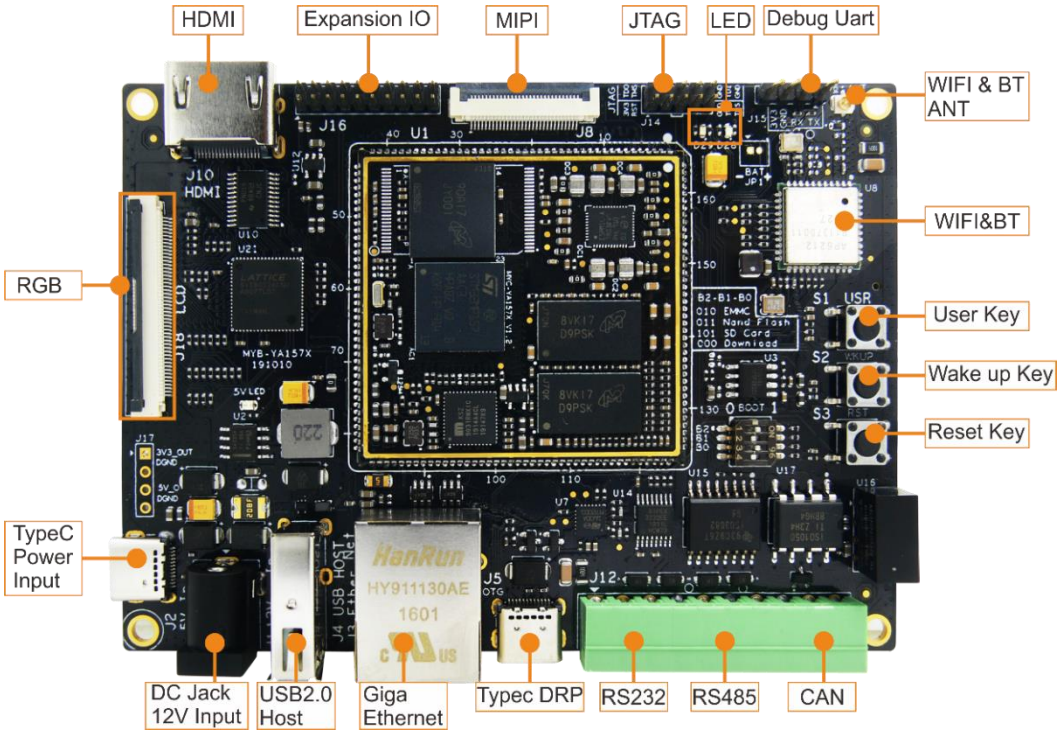

Figure 1-2 MYD-YA157C Development Board Top-view

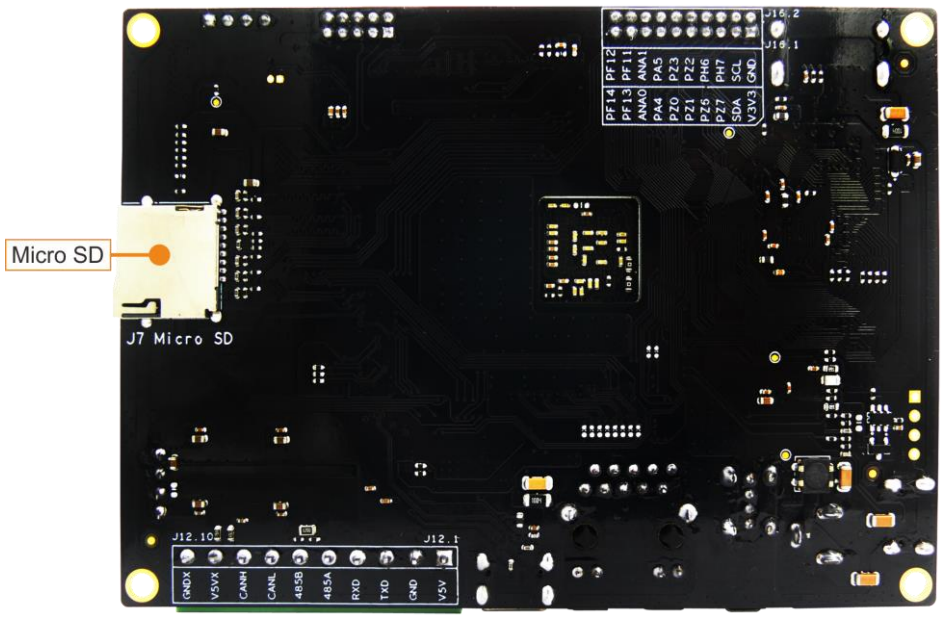

Figure 1-3 MYD-YA157C Development Board Bottom-view

Hardware Specification

The MYC-YA157C CPU Module is using STMicroelectronics STM32MP157AAC3 Microprocessor with 12 x 12 mm, 0.5 mm pitch, TFBGA361 package which is among the STM32MP1 Series. The STM32MP1 series is based on a heterogeneous single or dual Arm Cortex-A7 and Cortex-M4 cores architecture, strengthening its ability to support multiple and flexible applications, achieving the best performance and power figures at any time. The Cortex-A7 core provides access to open-source operating systems (Linux/Android) while the Cortex-M4 core leverages the STM32 MCU ecosystem. It is available in 3 different lines which are pin-to-pin compatible:

- STM32MP157: Dual Cortex-A7 cores @ 650 MHz, Cortex-M4 core @ 209 MHz, 3D GPU, DSI display interface and CAN FD
- STM32MP153: Dual Cortex-A7 cores @ 650 MHz, Cortex-M4 core @ 209 MHz and CAN FD
- STM32MP151: Single Cortex-A7 core @ 650 MHz, Cortex-M4 core @ 209 MHz
  Each line comes with a security option (cryptography & secure boot)

Arm® Cortex®-A7 – 650 MHz

ACCELERATION
- Dual core Arm® Cortex®-A7 processor
- L1 and L2 caches
- 3D Graphic Processing Unit*
- Floating Point Unit + Arm® Neon™
- Arm® Cortex®-M4 209 MHz coprocessor
- MDMA + DMA
- LPDDR2/LPDDR3 16/32**-bit 533 MHz
- DDR3/DDR3L 16/32**-bit 533 MHz

CONNECTIVITY
- 2 x USB2.0 HS Host
- USB2.0 OTG FS/HS
- 3 x SDMMC/SDIO
- USART, UART, SPI, I²C
- 2 x (TT)FD-CAN2.0*
- Gigabit Ethernet IEEE 1588***
- FMC (NAND Flash)
- Camera I/F
- Dual mode Quad-SPI
- DSI 2 Gbit/s*

STM32 MP1 Product lines	Cortex®-A7 core	f_{CPU} (MHz)	Cortex®-M4 core	f_{MCU} (MHz)	3D GPU	f_{GPU} (MHz)	HW Crypto	FD-CAN	MIPI®-DSI
STM32MP151A	1	650	1	209	-	-	-	-	-
STM32MP151C							•		
STM32MP153A	2	650	1	209	-	-	-	2	-
STM32MP153C							•		
STM32MP157A	2	650	1	209	•	533	-	2	•
STM32MP157C							•		

Notes:
* Not available in all product lines
** 16/32-bit for LFBGA448 and TFBGA361 packages, 16-bit only for LFBGA354 and TFBGA257 packages
*** 10/100M Ethernet only for LFBGA354 and TFBGA257 packages

Table 1-4 Features of STM32MP1 Processors

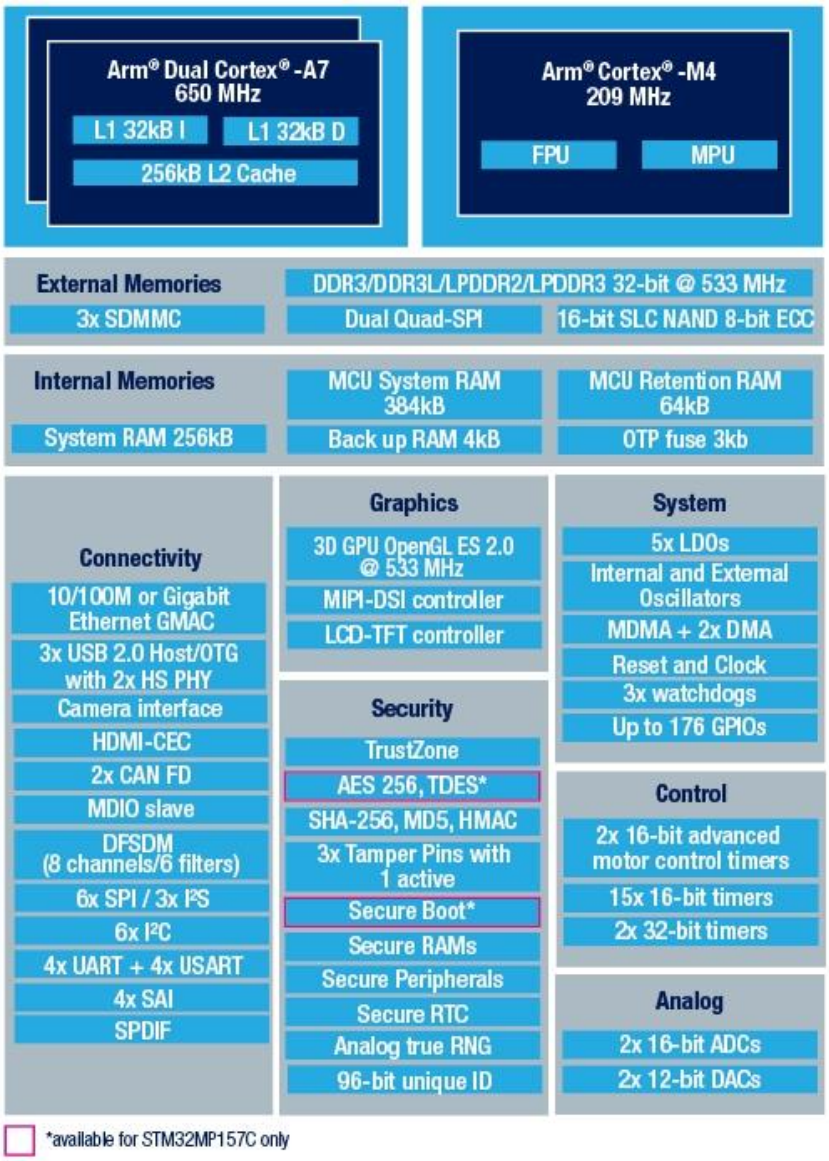

Figure 1-5 STM32MP157 Block Diagram

The MYD-YA157C Development Board is using MYC-YA157C CPU Module as core controller board. It takes full features of STM32MP1 processor and the main features are characterized as below:

Mechanical Parameters

- Dimensions: 110mm x 80mm (base board), 45mm x 43mm (CPU Module)
- PCB Layers: 4-layer design (base board), 8-layer design (CPU Module)
- Power supply: +12V/1.5A or USB Type-C Power supply (base board), 5V/0.5A (CPU Module)
- Working temperature: 0~70 Celsius (commercial grade) or -40~85 Celsius (industrial grade)

The MYD-YA157C Controller Board (MYC-YA157C CPU Module)

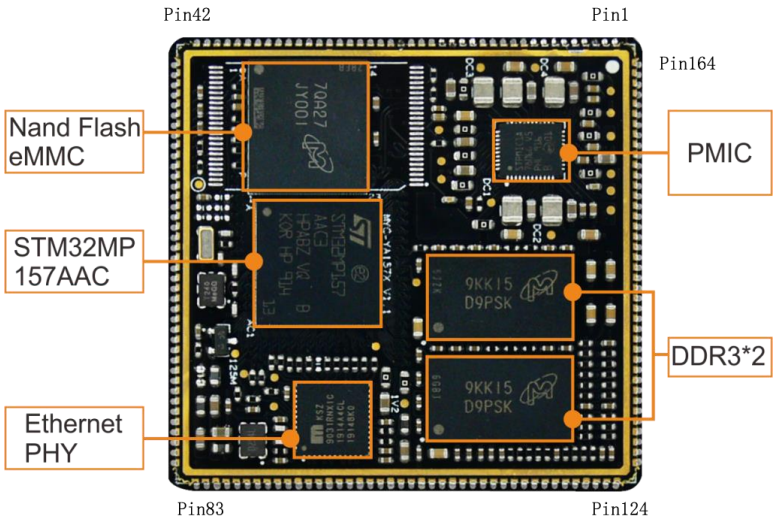

Figure 1-6 MYC-YA157C CPU Module

Processor

- STMicroelectronics STM32MP157AAC3 Microprocessor
  - Up to 650MHz dual-core Arm Cortex-A7 32-bit RISC core
  - Up to 209MHz Arm Cortex-M4 32-bit RISC core with FPU/MPU
  - Integrated 3D GPU

Memory

- 512MB DDR3 (supports up to 1GB DDR3)
- 4GB eMMC Flash (supports up to 64GB eMMC)
- Nand Flash (alternative design with eMMC, supporting 256MB / 512MB /1GB Nand Flash)

Peripherals and Signals Routed to Pins

- One 10/100/1000M Ethernet PHY
- Power Management IC (STPMIC1APQR)
- 1.0mm pitch 164-pin Stamp Hole Expansion Interface
  - 8 x Serial ports
  - 6 x I2C
  - 6 x SPI
  - 1 x SAI
  - 1 x USB 2.0 Host and 1 x USB 2.0 OTG
  - 2 x SDIO
  - 2 x CAN
  - 1 x MIPI-DSI
  - 1 x Digital Camera Interface (DCMI)
  - 1 x RGB Interface (supports RGB888, resolution up to 1366 x 768 @60fps)
  - Up to 97 GPIOs

Note: the peripheral signals brought out to the expansion interface are listed in maximum number. Some signals are reused. Please refer to the processor datasheet and the CPU Module pinout description file.

The MYD-YA157C Development Board Base Board

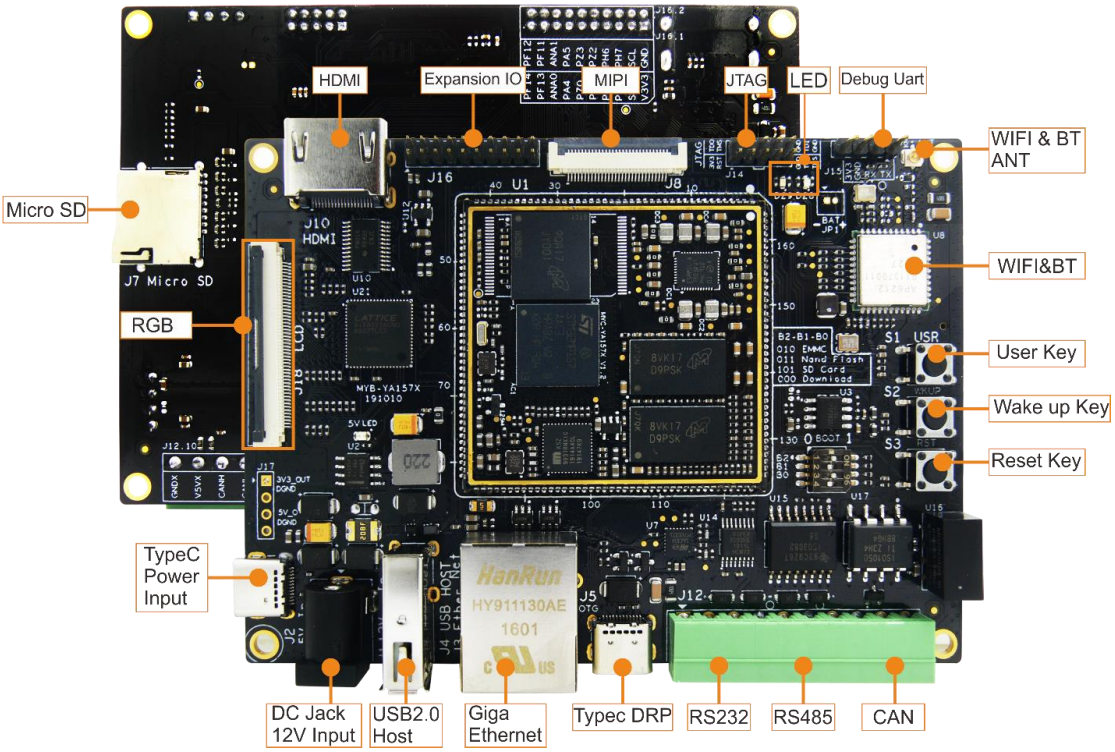

Figure 1-7 MYD-YA157C Development Board

- Serial ports
  - Debug UART
  - 1 x RS485, isolated power signal
  - 1 x RS232
- USB
  - 1 x USB2.0 Host port
  - 1 x USB Type-C DRP
- 1 x CAN, isolated power signal
- 1 x JTAG Interface (2.0mm pitch 2 x 5-pin headers)
- 1 x 10/100/1000 Mbps Ethernet interface (RJ45)
- WiFi/Bluetooth Module (complies with IEEE 802.11 b/g/n standard and supports Bluetooth V4.2)
- 1 x External antenna connector (simultaneous BT/WLAN receive with single antenna)
- 1 x Micro SD card slot
- RGB888 based LCD/HDMI (supports resolution up to 1366 x 768 pixels at 60Hz)
- 1 x MIPI-DSI Display Interface (supports display resolution up to 1366 x 768 pixels at 60Hz)
- 3 x Buttons (one for Wake up, one for Reset and one for USER)
- 1 x 2.0mm 2*10-pin male expansion header

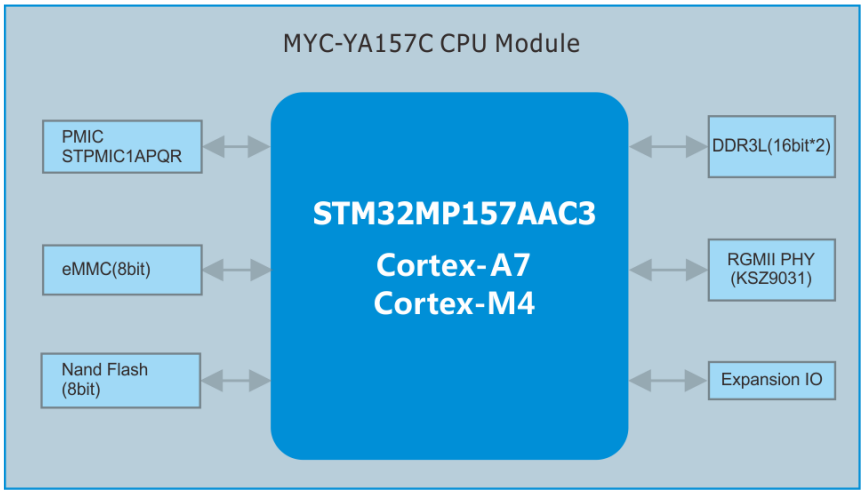

Figure 1-8 MYC-YA157C CPU Module Function Block Diagram

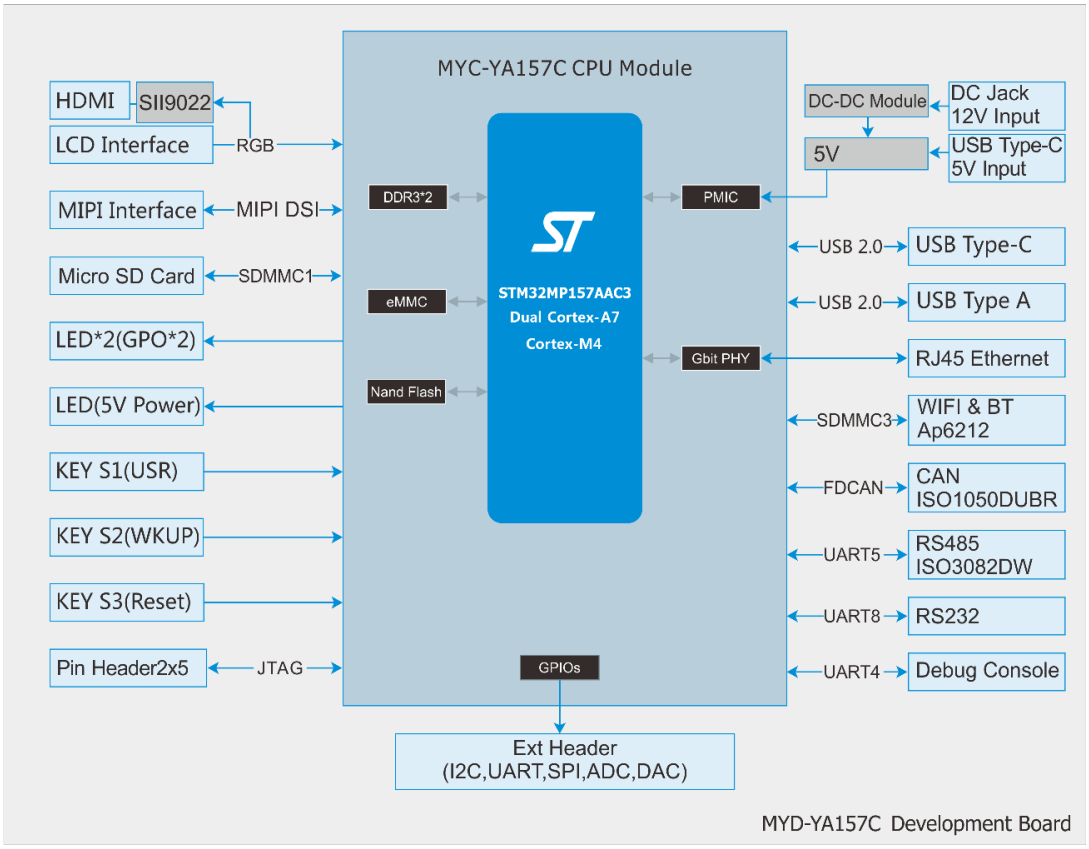

Figure 1-9 MYD-YA157C Development Board Function Block Diagram

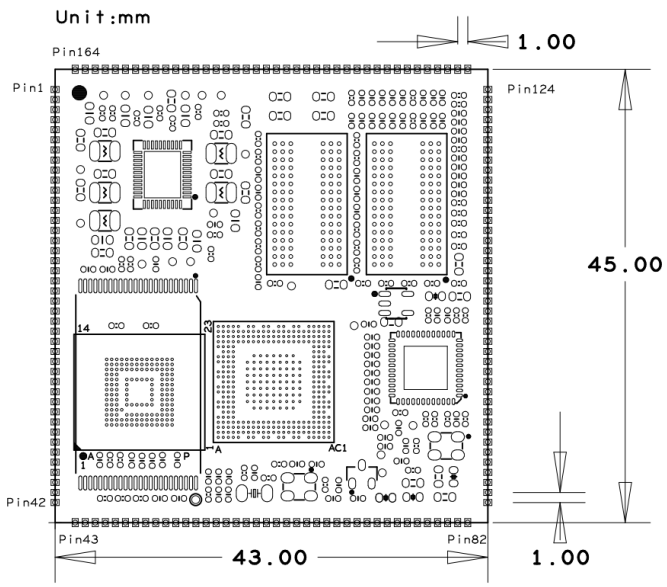

Figure 1-10 MYC-YA157C Dimensions Chart

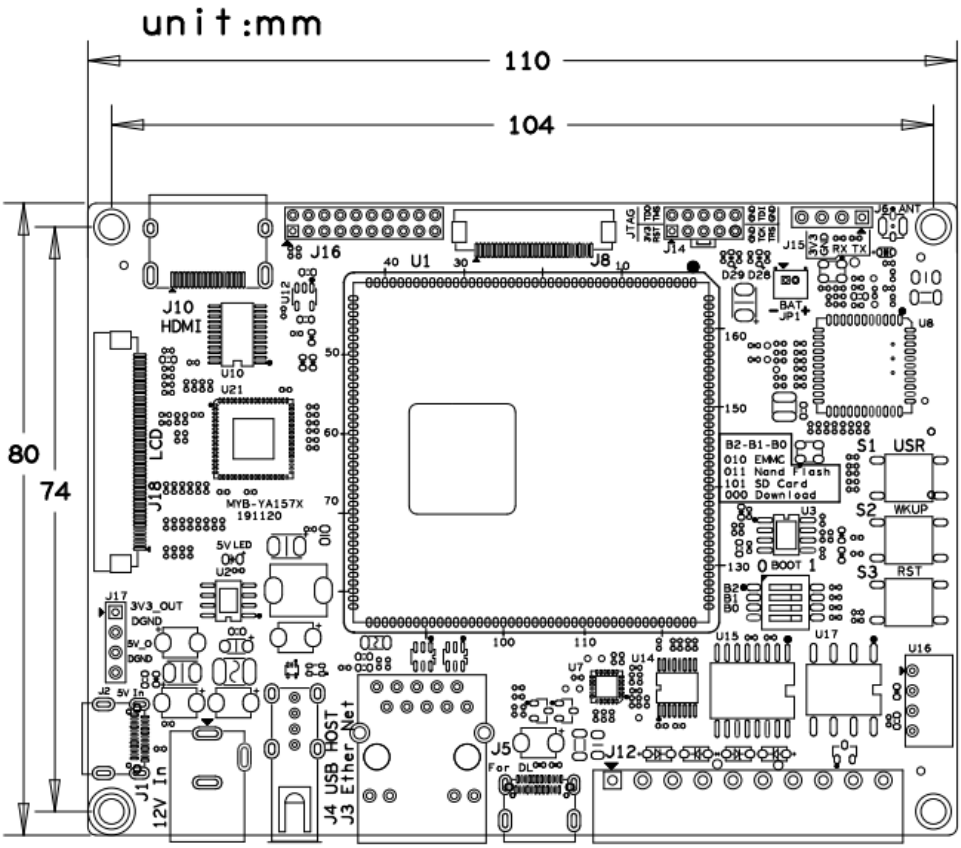

Figure 1-11 MYD-YA157C Dimensions Chart

Software Features

Item	Features	Description	Source Code
Bootstrap program	TF-A-2.2	Arm Trusted Firmware	YES
Bootloader	U-boot-2020.01	Kernel bootstrap	YES
Linux kernel	Linux-5.4.31	Customized based on ST kernel_5.4.31 version for MYD-YA157C	YES
Drivers	Nand Flash	Nand Flash driver	YES
	PMIC	STPMIC driver	YES
	USB Host	USB Host driver	YES
	USB OTG	USB OTG driver	YES
	I2C	I2C driver	YES
	SPI	SPI driver	YES
	Ethernet	10M/100M/1000M Ethernet driver	YES
	MMC	eMMC/TF card driver	YES
	LCD	LCD driver, supports MYIR's 7-inch LCD with 800 x 480 pixels resolution	YES
	HDMI	HDMI driver	YES
	Touch	Capacitive touch screen driver	YES
	PWM	PWM driver	YES
	RTC	RTC driver	YES
	GPIO	GPIO driver	YES
	UART/USART	Serial port driver	YES
	CAN	FDCAN Bus driver	YES
	RS485	RS485 driver	YES
	Camera	USB Camera driver (OV2659)	YES
	WiFi & BT	AP6212 WiFi/BT driver (SDIO)	YES
	Watchdog	Watchdog driver	YES
File system	rootfs	Yocto 3.1 for ST Weston system	YES
	rootfs	Yocto 3.1 for QT5.12 system (available later)	YES
	rootfs	MEasy_IOT 1.0 & MEasy_HMI 2.0 demo system developed by MYIR	YES
	Ubuntu core system	Based on ubuntu18.04	YES
Tools	STM32CubeProgrammer	ST programmer software	BIN
	STM32CubeMX	ST configuration integration tool	BIN
Applications	GPIO LED	LED example	YES
	GPIO KEY	KEY example	YES
	NET	TCP/IP Socket C/S example	YES
	RTC	RTC example	YES
	RS232	RS232 example	YES
	RS485	RS485 example	YES
	CAN	CAN example	YES
	LCD	LCD Display example	YES
	Camera	Camera Display example	YES
	UART	UART example	YES
Compiler Tool Chain	Cross compiler	arm-openstlinux_weston-linux-gnueabi	BINARY

Table 1-1 MYD-YA157C Software Features

The MYD-YA157C runs Linux OS and is provided with software packages. Based on Linux 5.4.31 kernel, MYIR has provided abundant software resources for Yocto 3.1 based MYIR MEasy-HMI system (available later), Yocto 3.1 based ST Weston system, Ubuntu 18.04 system and MYIR MEasy-IOT system including kernel and driver source code, STM32CubeProgrammer and STM32CubeMX tools to enable users to start their development rapidly and easily.

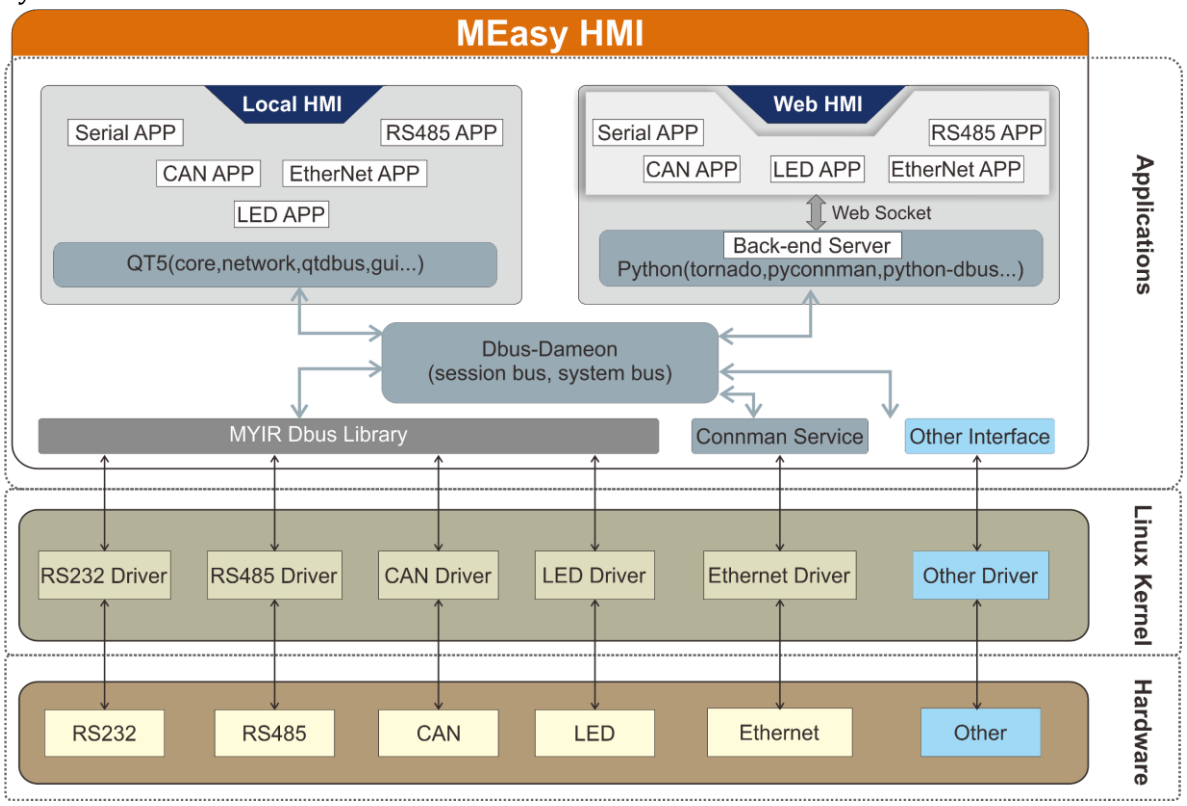

Figure 1-12 MEasy-HMI System Structure

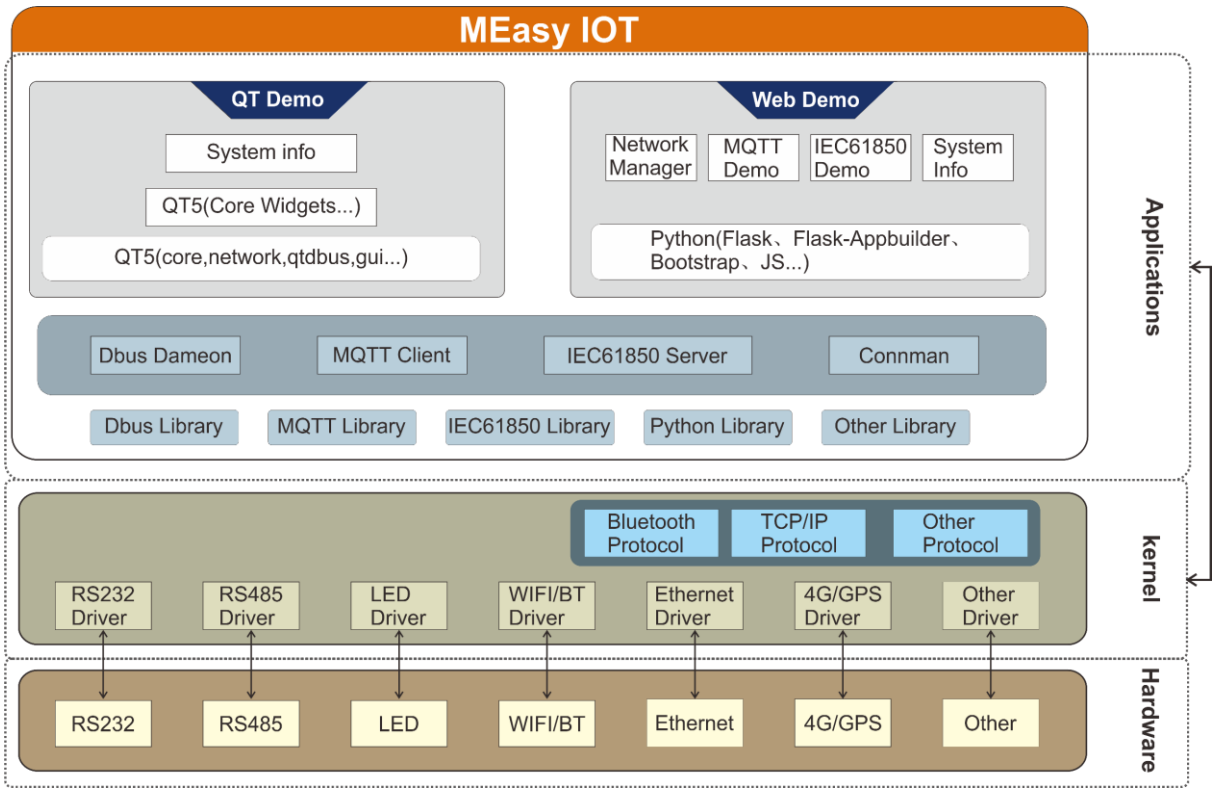

Figure 1-13 MEasy-IOT System Structure