# MYC-YA157C CPU Module

➢ *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*

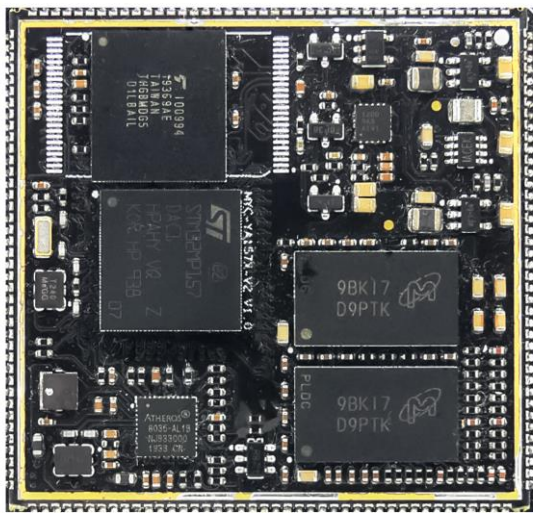➢ *1.0mm pitch 164-pin Stamp Hole Expansion Interface*

➢ *Supports Running Linux OS*



*Figure 1-1 MYC-YA157C CPU Module (delivered with shielding cover by default)*

Measuring only 45mm by 43mm, the **MYC-YA157 CPU Module** is a compact **ST STM32MP1** powered System-on Module (SoM) that combines the **STM32MP157** processor (**STM32MP157AAC3**), 512MB DDR3, 4GB eMMC as well as an integrated GigE PHY chip. A number of peripherals and IO signals are brought out through 1.0 mm pitch 164-pin stamp-hole (Castellated-Hole) expansion interface to make the module an excellent embedded controller for your system integration. Typical applications are industrial control, consumer electronics, smart home, medical and more other energy-efficient applications which require rich performance and low power.
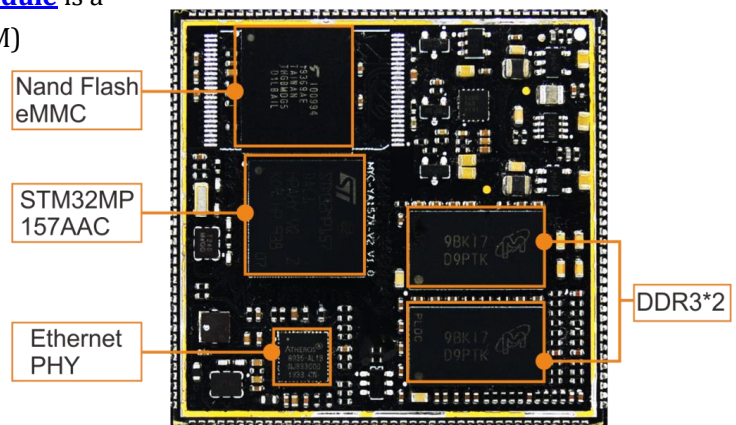


*Figure 1-2 MYC-YA157C CPU Module*

The **MYC-YA157C** is running Linux OS. Based on Linux 5.4.31 kernel, MYIR provides abundant software resources for Yocto 3.1 based MYIR MEasy-HMI system, Yocto 3.1 based ST Weston system, Yocto 3.1 based MYIR MEasy-IOT system and Ubuntu 18.04 system including kernel and driver source code, STM32CubeProgrammer and STM32CubeMX tools to enable users to start their development rapidly and easily.

The **MYD-YA157C development board** is built around the **MYC-YA157C CPU Module**. It takes full advantages of the STM32MP157A MPU to explore a rich set of peripherals and interfaces to the base board including 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-TFT070CV2 LCD Module** as an option for the board.
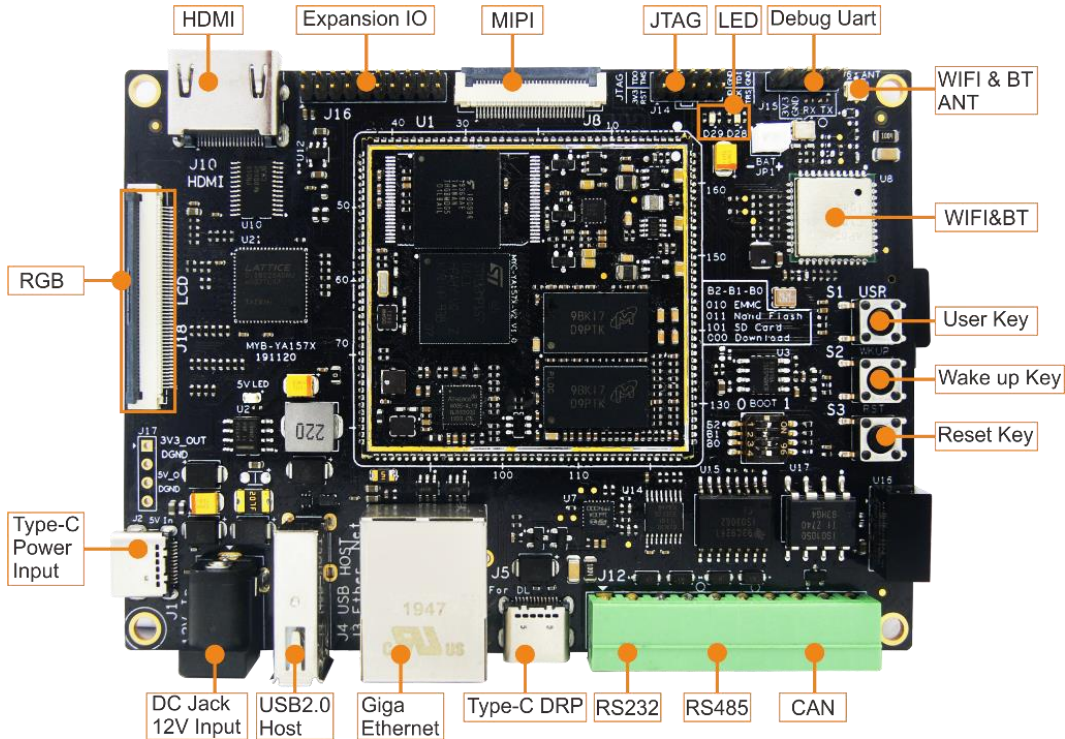


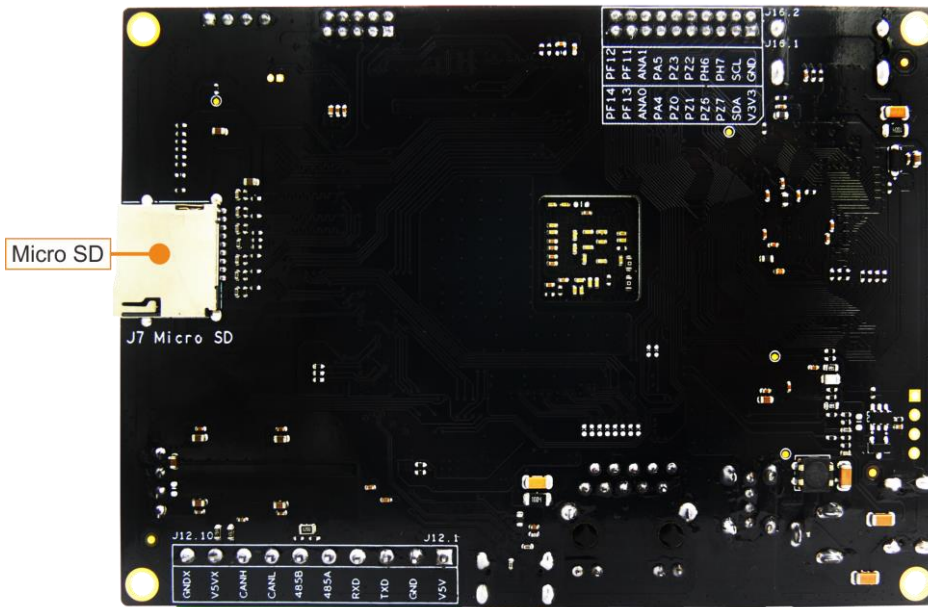*Figure 1-3 MYD-YA157C Development Board Top-view*



*Figure 1-4 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)

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

**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*

Arm® Cortex®-A7 – 650 MHz
STM32 MP1
Product lines

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

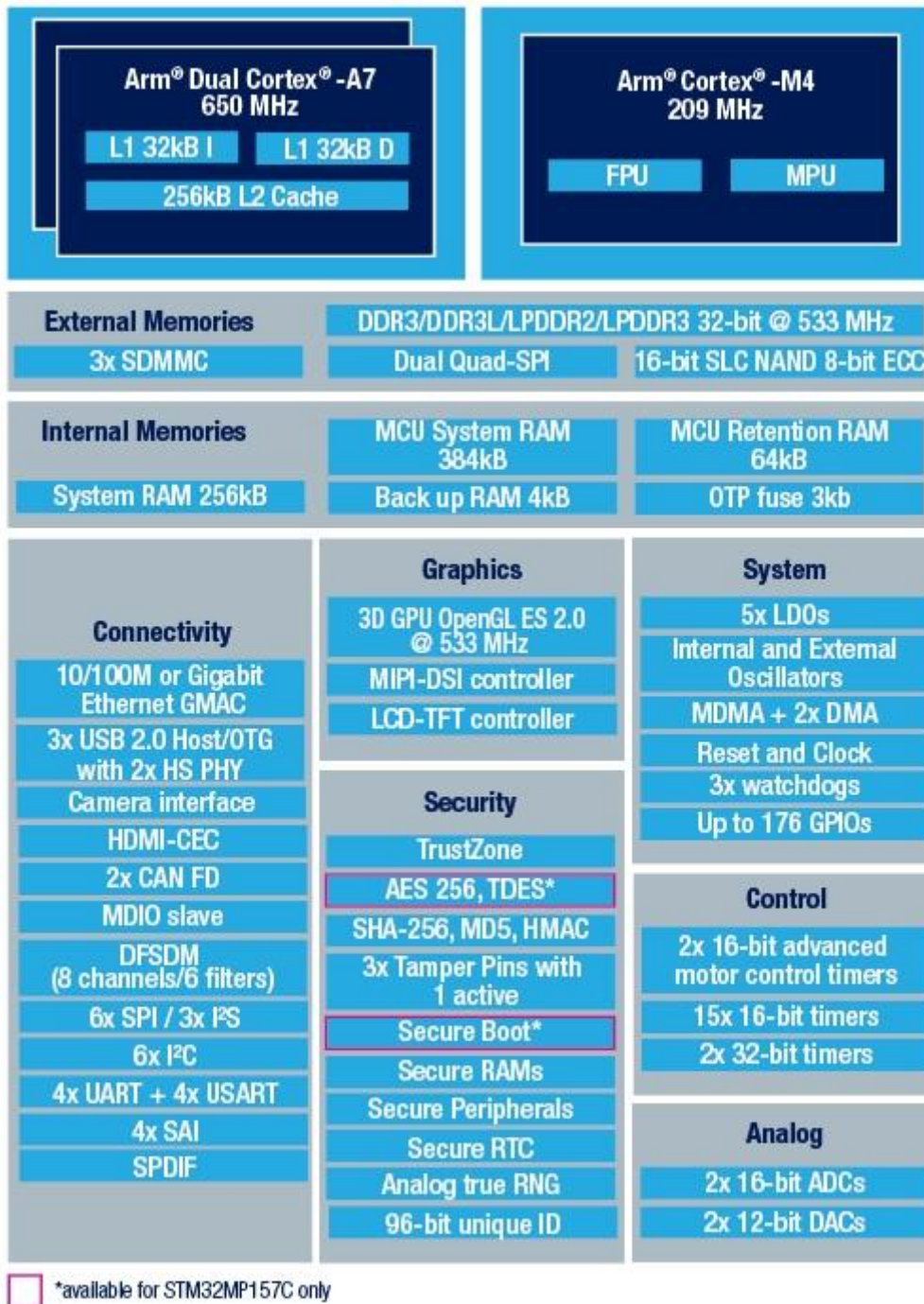*Figure 1-5 STM32MP1 Series Processors*

| Arm® Dual Cortex®-A7 650 MHz | Arm® Cortex®-M4 209 MHz |
|---|---|
| L1 32kB I   L1 32kB D | FPU   MPU |
| 256kB L2 Cache | |

| External Memories | DDR3/DDR3L/LPDDR2/LPDDR3 32-bit @ 533 MHz | |
|---|---|---|
| 3x SDMMC | Dual Quad-SPI | 16-bit SLC NAND 8-bit ECC |

| Internal Memories | MCU System RAM 384kB | MCU Retention RAM 64kB |
|---|---|---|
| System RAM 256kB | Back up RAM 4kB | OTP fuse 3kb |

**Connectivity**
- 10/100M or Gigabit Ethernet GMAC
- 3x USB 2.0 Host/OTG with 2x HS PHY
- Camera interface
- HDMI-CEC
- 2x CAN FD
- MDIO slave
- DFSDM (8 channels/6 filters)
- 6x SPI / 3x I²S
- 6x I²C
- 4x UART + 4x USART
- 4x SAI
- SPDIF

**Graphics**
- 3D GPU OpenGL ES 2.0 @ 533 MHz
- MIPI-DSI controller
- LCD-TFT controller

**Security**
- TrustZone
- AES 256, TDES*
- SHA-256, MD5, HMAC
- 3x Tamper Pins with 1 active
- Secure Boot*
- Secure RAMs
- Secure Peripherals
- Secure RTC
- Analog true RNG
- 96-bit unique ID

**System**
- 5x LDOs
- Internal and External Oscillators
- MDMA + 2x DMA
- Reset and Clock
- 3x watchdogs
- Up to 176 GPIOs

**Control**
- 2x 16-bit advanced motor control timers
- 15x 16-bit timers
- 2x 32-bit timers

**Analog**
- 2x 16-bit ADCs
- 2x 12-bit DACs

☐ *available for STM32MP157C only

*Figure 1-6 STM32MP157 Block Diagram*

## Mechanical Parameters

- Dimensions: 45mm x 43mm
- PCB Layers: 8-layer design
- Power supply: +5V/0.5A
- Working temperature: 0~70 Celsius (commercial grade) or 40~85 Celsius (industrial grade)

## 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
- 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.*
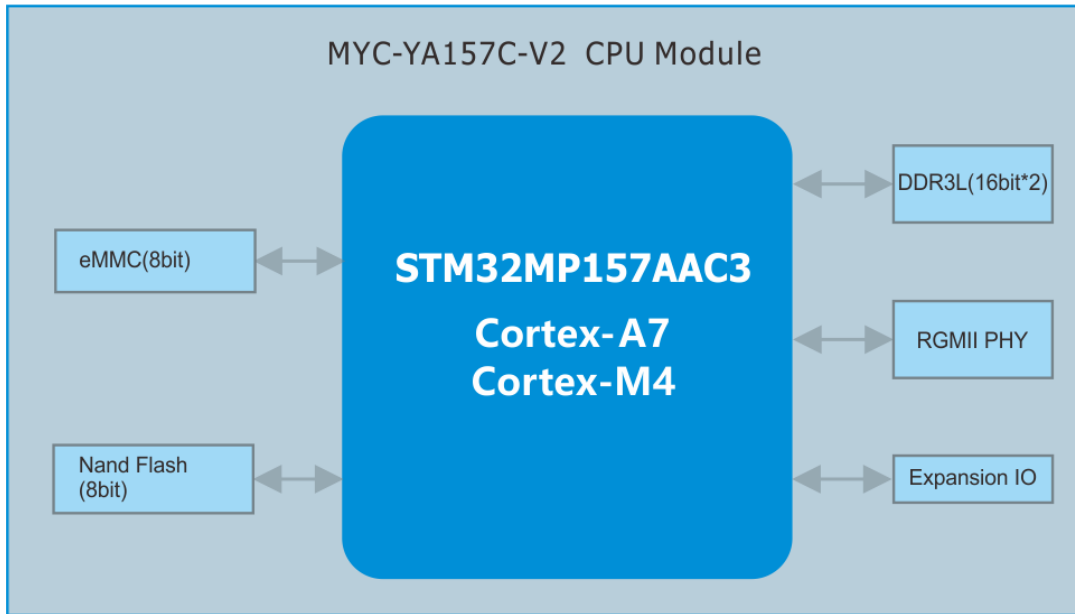
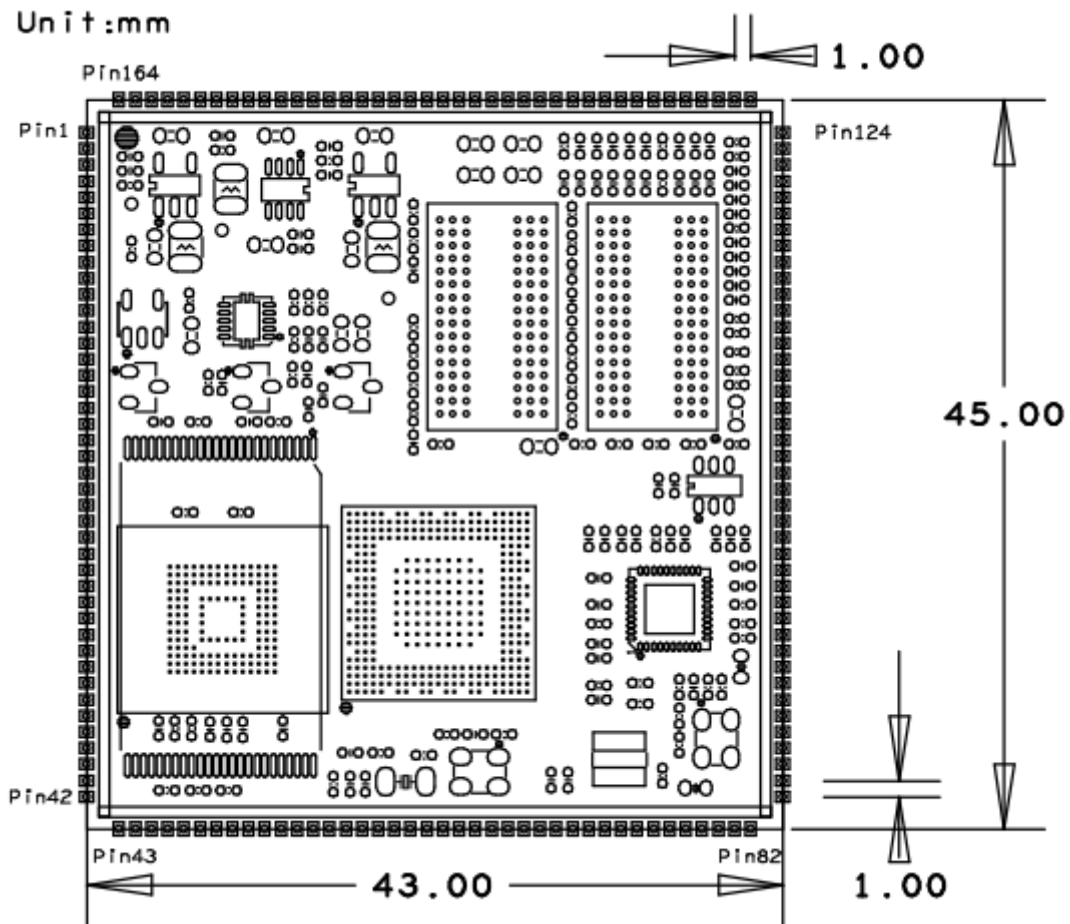*Figure 1-7 MYC-YA157C CPU Module Function Block Diagram*



*Figure 1-8 MYC-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 | 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, 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.
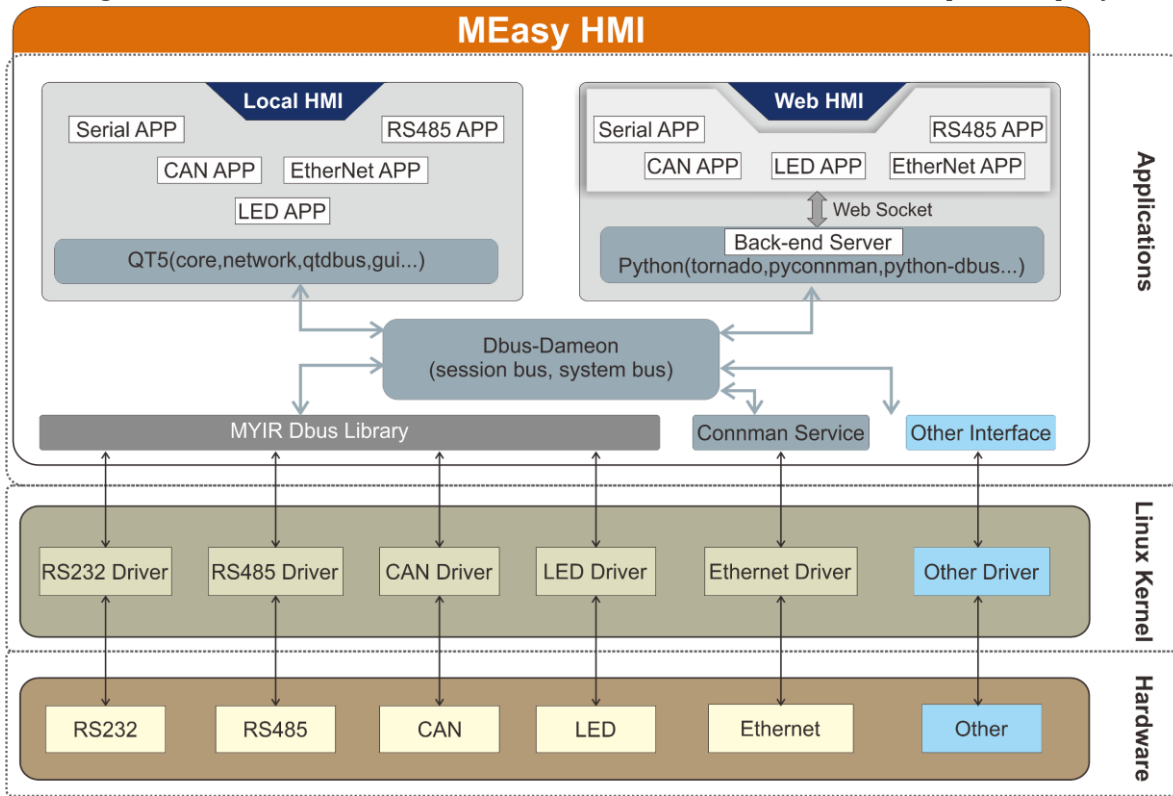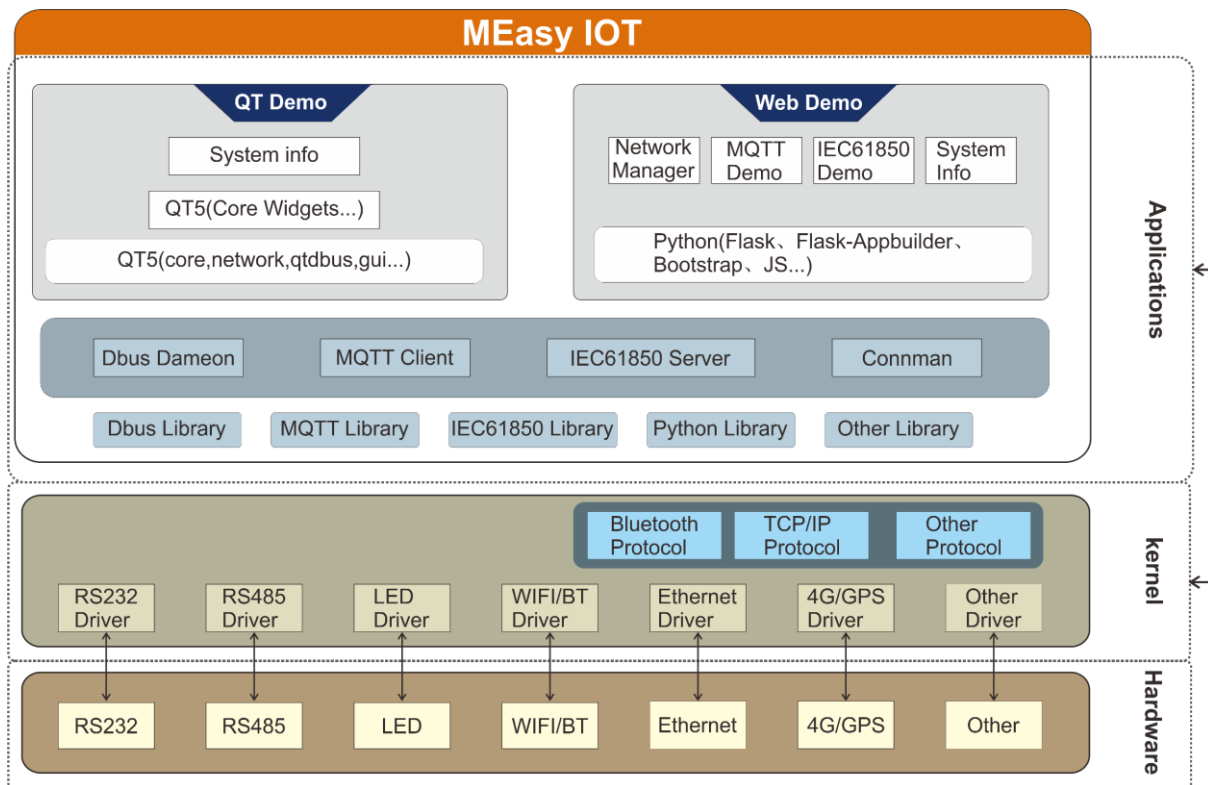


*Figure 1-7 MEasy-HMI System Structure*



*Figure 1-8 MEasy-IOT System Structure*

**Order Information**

| Product Item | Part No. | Packing List |
|---|---|---|
| MYC-YA157C CPU Module | MYC-YA157C-V2-4E512D-65-C | ➢ One MYC-YA157C CPU Module |
| | MYC-YA157C-V2-4E512D-65-I | |
| MYD-YA157C Development Board | MYD-YA157C-V2-4E512D-65-C | ➢ One MYD-YA157C Development Board (including MYC-YA157C CPU Module)<br>➢ One USB Type-C cable<br>➢ One USB to UART Serial cable<br>➢ One WiFi/Bluetooth Antenna<br>➢ One Quick Start Guide |
| | MYD-YA157C-V2-4E512D-65-I | |

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