# DM-STF4BB Base Board

- *Base Board for STM32F4DISCOVERY STM32F4 High-performance Discovery Board*
- *Extended Peripherals including UART, Ethernet, CAN, Camera, LCD/TSP, TF, SPI, I2C…*
- *Supports Optional 3.5 inch LCD Module and 1.3 Megapixel Digital Camera Module*
- *Supports uC/OS-II_v2.86 & UCGUI_v3.90a*
- *Supports FatFs_vR0.08a File System (Used for TF card)*
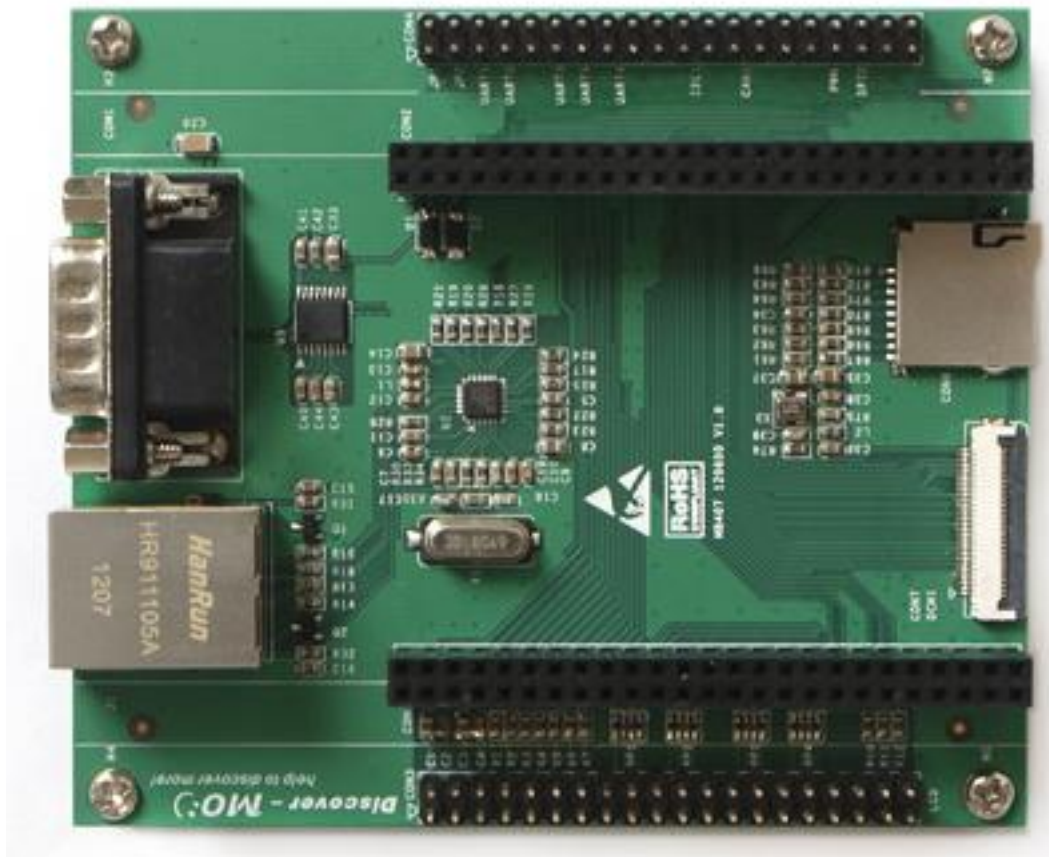- *Supports LwIP_v1.3.2 Protocol Stack*



Figure 1-1 DM-STF4BB Base Board

## *Overview*

The DM-STF4BB Base Board from Embest is an expansion board designed especially for STMicroelectronics' STM32F4DISCOVERY high-performance discovery board which is based on the STM32F407VGT6 ARM Cortex-M4 microcontroller and includes an ST-LINK/V2 embedded debug tool, two ST MEMS, digital accelerometer and digital microphone, one audio DAC with integrated class D speaker driver, LEDs and push buttons and an USB OTG micro-AB connector on board.

The DM-STF4BB Base Board enables the STM32F4DISCOVERY board users to further discover more features of the STM32F4. It has incorporated additional functionalities to the STF32F4DISCOVERY providing Serial ports, USB, Ethernet, CAN, SPI, I2C, GPIO, Camera, TF Card, LCD and Touch Screen interfaces on board. The combination of the DM-STF4BB and the STM32F4DISCOVERY forms an ideal evaluation board Devkit407 for evaluating the STM32F4xx series ARM Cortex-M4 microcontrollers and allows easy prototyping of third party solutions with STM32F4DISCOVERY board or STM32F4xx series microcontrollers.

Embest has ported uC/OS-II to the DevKit407 board and the software also features the GUI support on uC/OS-II and LwIP_v1.3.2 protocal support. Meanwhile, Embest has offered rich software examples for DevKit407 besides those provided by STM32F4DISCOVERY kit. Along with the goods deliveries, Embest provides a CD containing the uC/OS-II BSP and plenty of software examples, board schematic and user manual to help customer better understanding this board and develop their own applications.

Moreover, Embest offers one 3.5 inch LCD Module DM-LCD35RT (including touch screen) and one 1.3 megapixel Digital Camera Modules for options to implement the video input and output performance on DevKit407
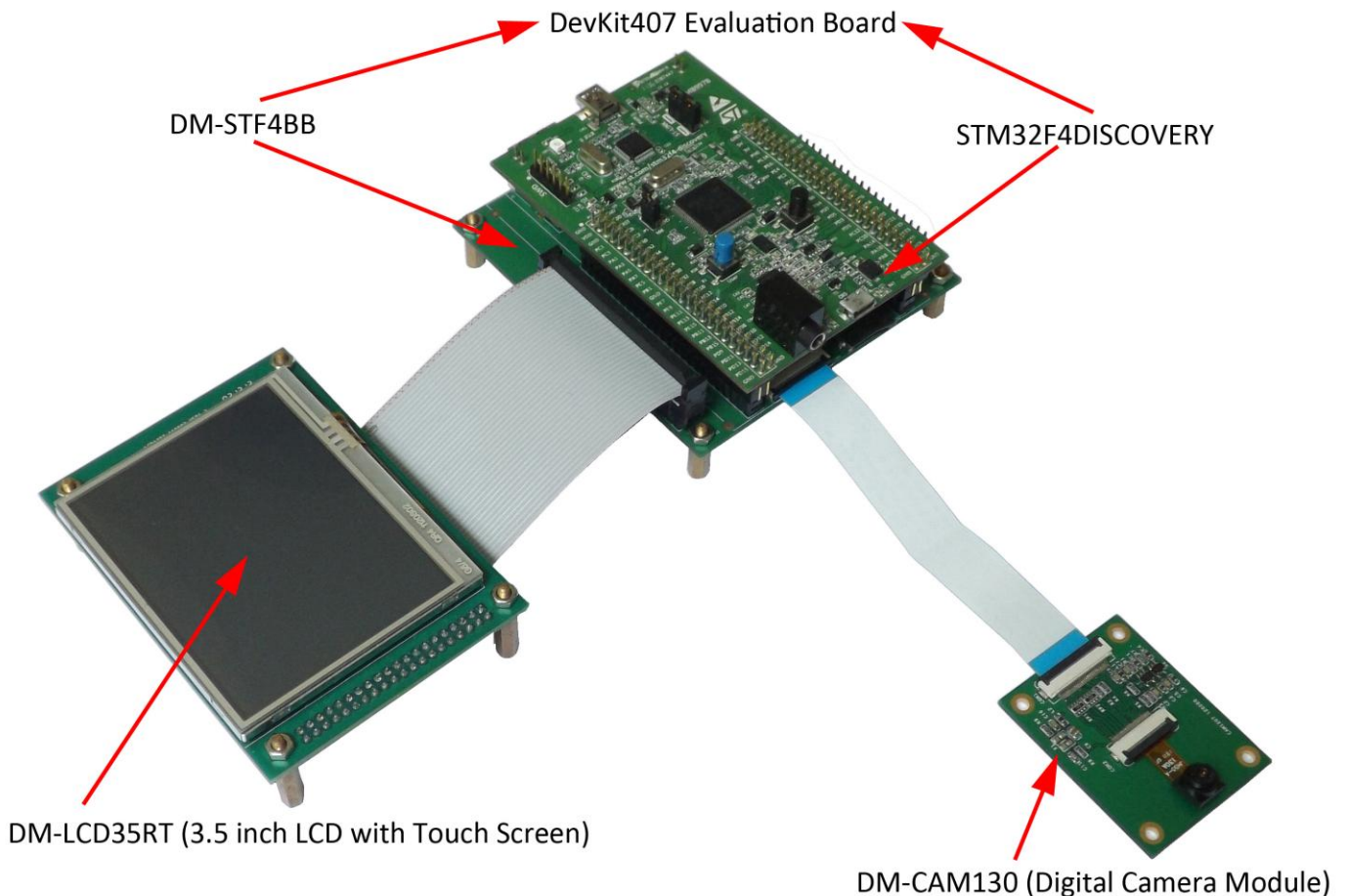
Figure 1-2 DevKit407 connects with 3.5" LCD Module and Digital Camera Module

*Hardware Features*

The STMicroelectronics' STM32F4DISCOVERY board is mounted directly on top of the DM-STF4BB base board to form an evaluation board DevKit407 for STM32F4xx series microcontrollers. The features of the DevKit407 are as following:
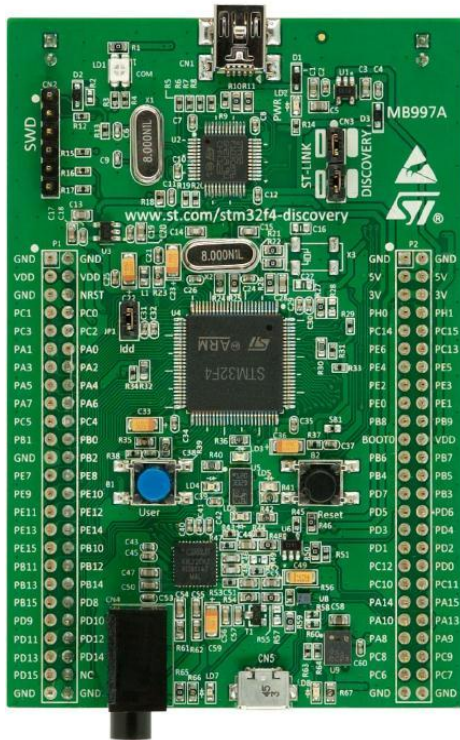


Figure 1-3 STM32F4DISCOVERY Board          Figure 1-4 DM-STF4BB Base Board

**STM32F4DISCOVERY Board (CPU board of DevKit407)**

- STM32F407VGT6 microcontroller featuring 32-bit ARM Cortex-M4F core, 1 MB Flash, 192KB RAM in an LQFP100 package
- On-board ST-LINK/V2 with selection mode switch to use the kit as a standalone STLINK/ V2 (with SWD connector for programming and debugging)
- Board power supply: through USB bus or from an external 5 V supply voltage
- External application power supply: 3 V and 5 V
- LIS302DL, ST MEMS motion sensor, 3-axis digital output accelerometer
- MP45DT02, ST MEMS audio sensor, omni-directional digital microphone
- CS43L22, audio DAC with integrated class D speaker driver
- Eight LEDs:
  – LD1 (red/green) for USB communication
  – LD2 (red) for 3.3 V power on
  – Four user LEDs, LD3 (orange), LD4 (green), LD5 (red) and LD6 (blue)
  – 2 USB OTG LEDs LD7 (green) VBus and LD8 (red) over-current
- Two push buttons (user and reset)
- USB OTG FS with micro-AB connector
- Extension header for all LQFP100 I/Os for quick connection to prototyping board and easy probing.

**DM-STF4BB Base Board (Expansion Board of DevKit407)**

- Working and Storage Temp.: 0~45 ℃
- Power consumption: +5V@80mA (working without LCD)
- Dimensions: 97.03mm x 83mm
- LCD parallel interface, 16-bit, 8080 mode
- 4-wire resistive touch screen interface
- Camera interface (support 1.3 megapixel Digital Camera, multiplex with UART6)
- One RS232 Serial port (UART6, DB9 connector, multiplex with Camera interface, can be selected by jumpers JP1 and JP2)
- One USB2.0 FS OTG/device/host port (12Mbps, Micro-AB type connector)
- One 10/100Mbps Ethernet Interface
- One 2.54mm pitch 2*20-pin expansion connector brought out below hardware peripherals:
  - 5 Serial ports, TTL voltage (multiplex with some functions)
  - 4-channel PWM
  - 1-channel SPI
  - 1-channel I2C
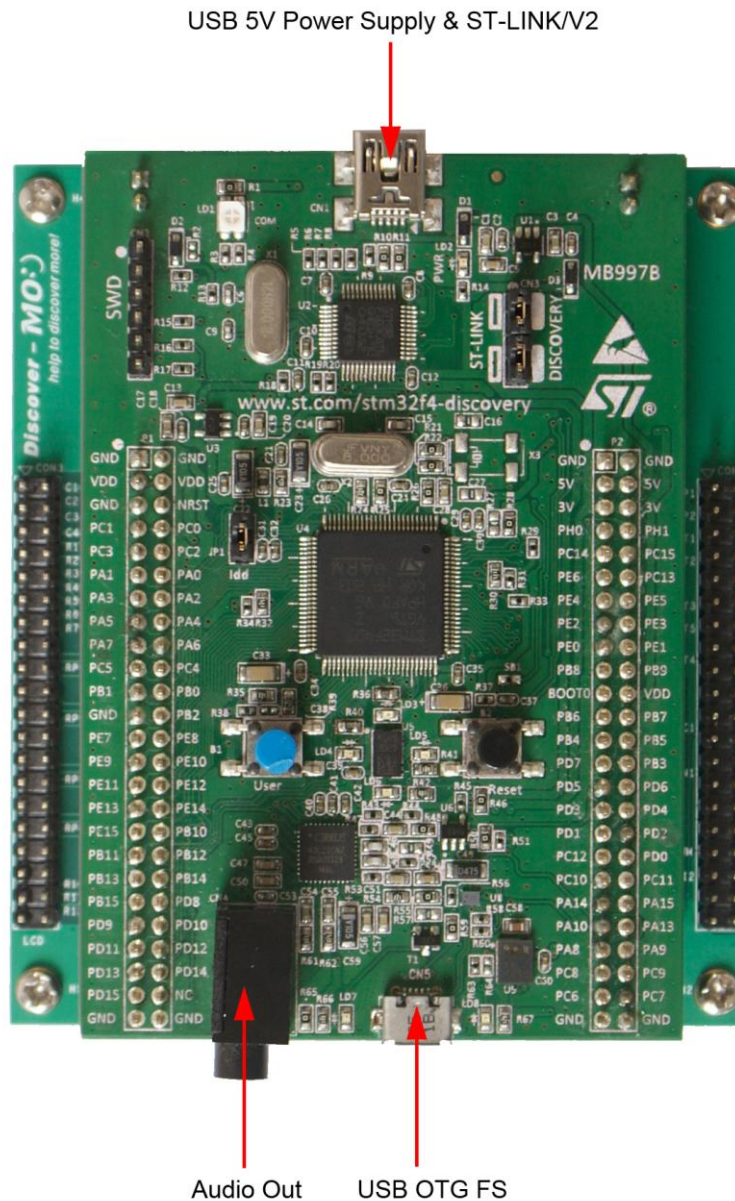  - 1 CAN2.0B interface (need to extend CAN transceivers)
  - 6 GPIOs



Figure 1-5 DevKit407 Evaluation Board

*Interface Introduction*

The DM-STF4BB base board offers features in addition to those provided by STM32F4DISCOVERY board that has exposed more features of the STMicroelectronics' STM32F407VGT6 microcontroller through connectors or headers.
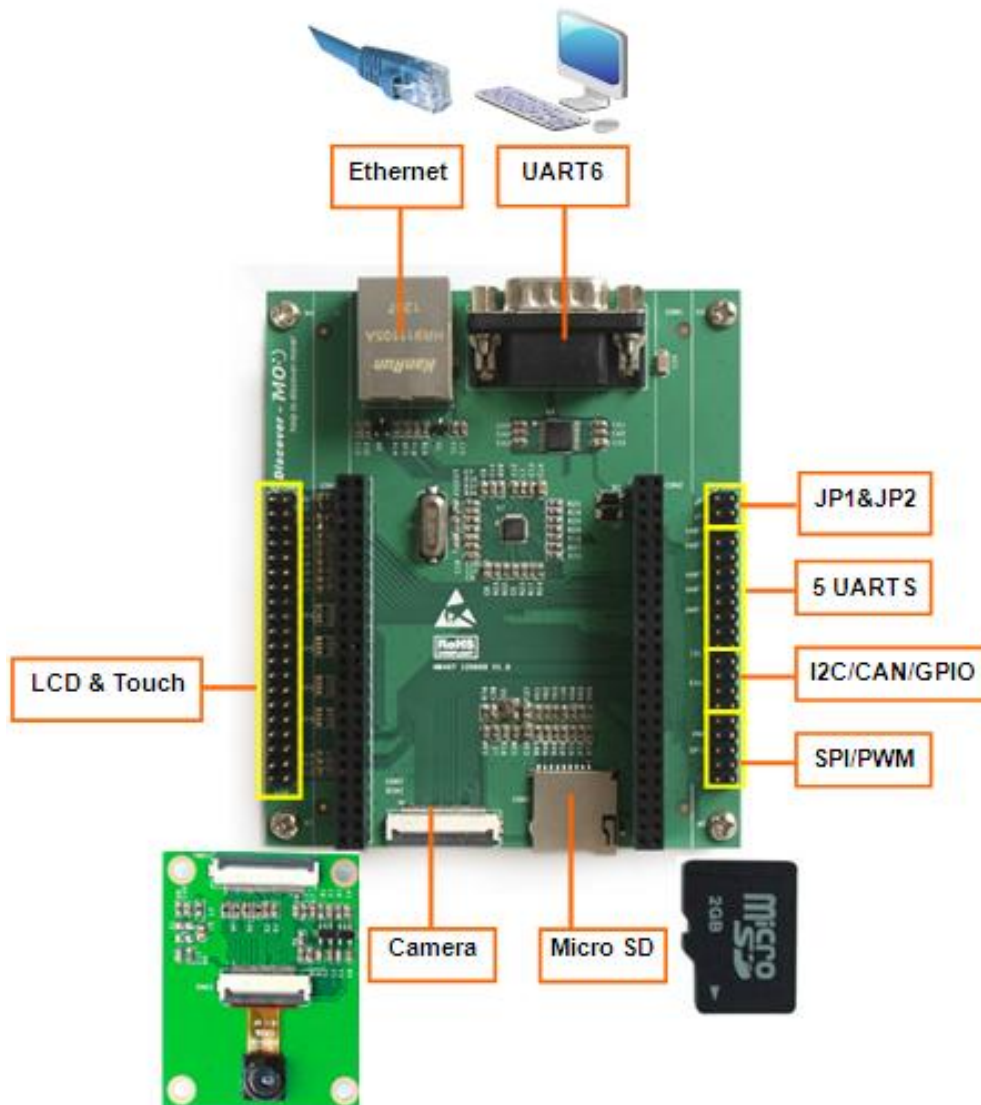


Figure 1-6 DM-STF4BB Interface Diagram

*Note: JP1 and JP2 are for selecting UART6 or Camera function;*
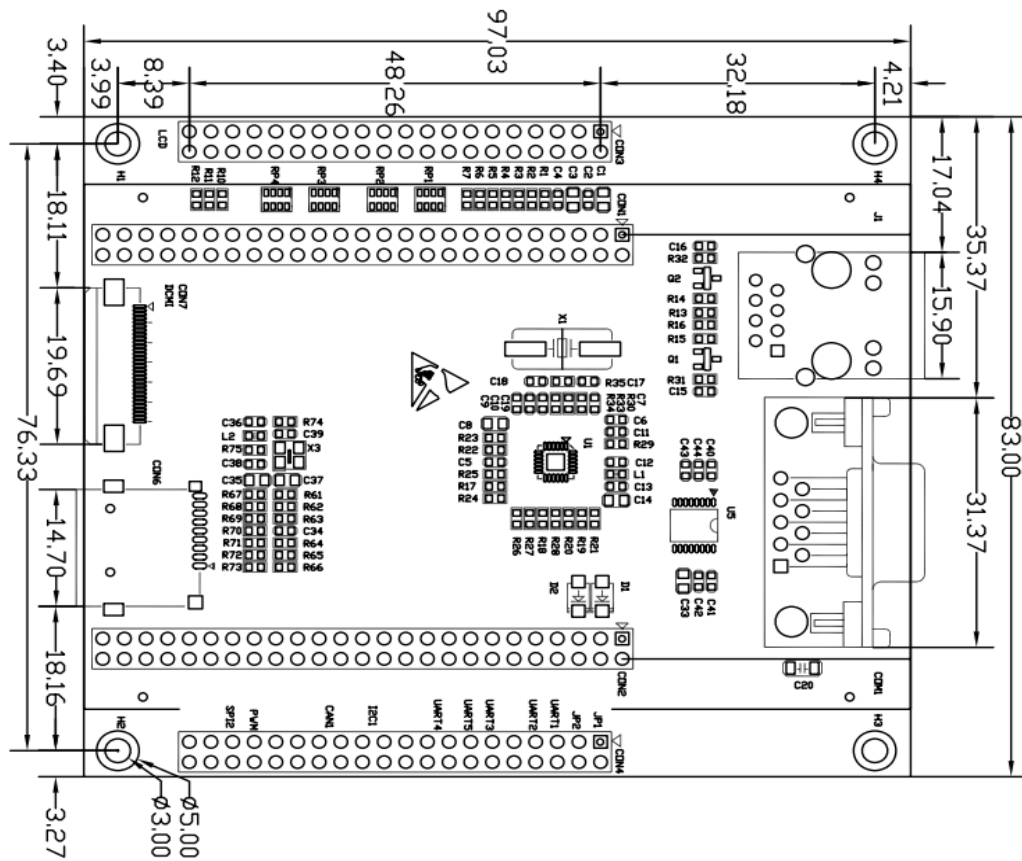*these two functions are multiplex with each other.*
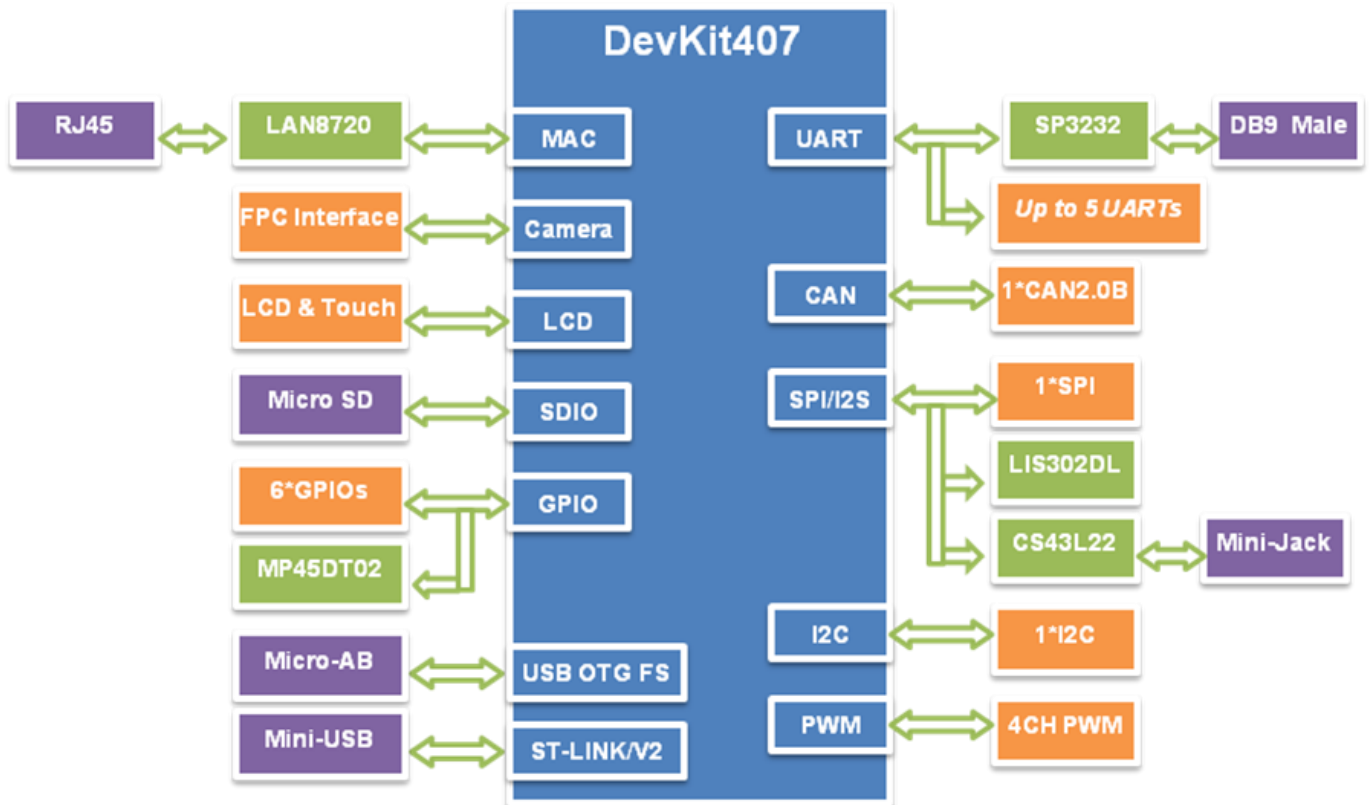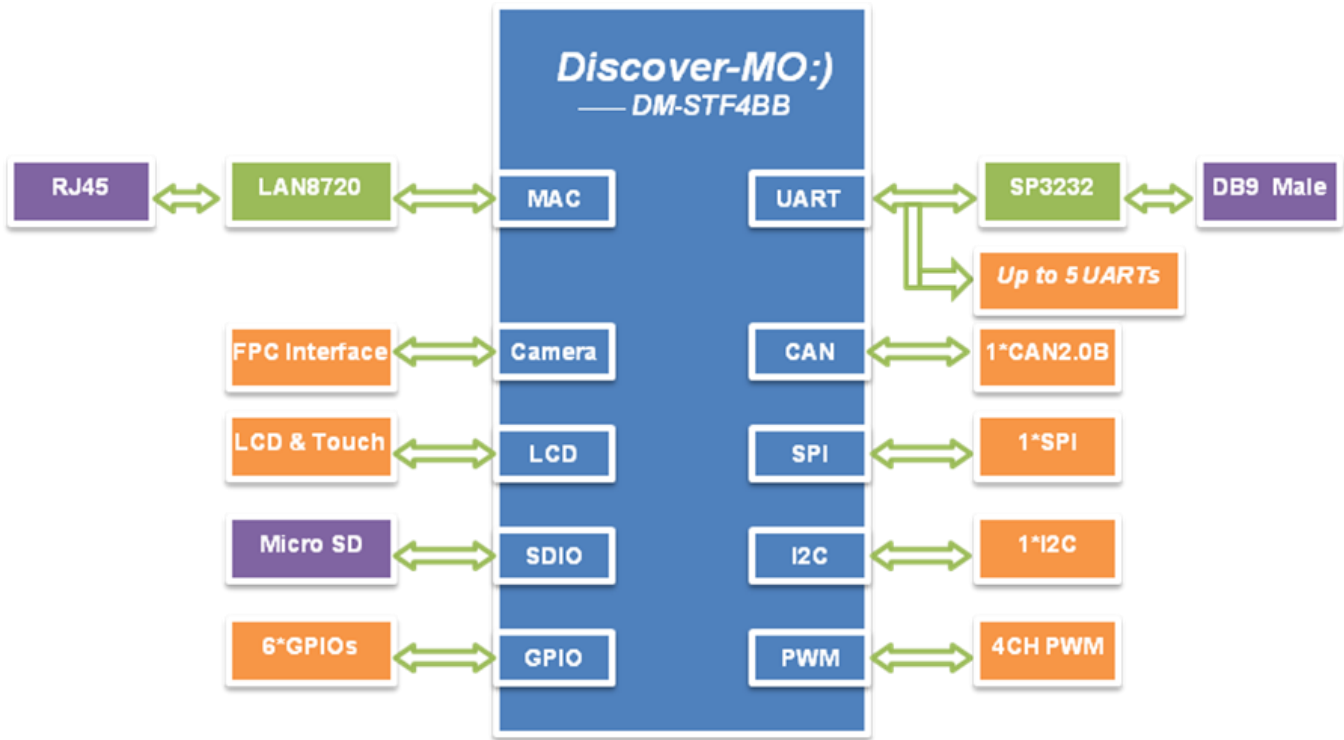
*Dimensions (Unit: mm)*



Figure 1-7 DM-STF4BB Base Board Dimensions Chart

Figure 1-8 DevKit407 Function Block Diagram

Figure 1-9 DM-STF4BB Function Block Diagram

**Features**

The DevKit407 software mainly features as below:
- Supports for uC/OS-II_v2.86 operating system
- Supports UCGUI_v3.90a
- Supports FatFs_vR0.08a file system
- Supports LWIP _v1.3.2 protocol stack

**Development Environment Support**
- IAR EWARM
  All drivers support IAR EWARM, the EWARM version should be V6.40 or above.
  uC/OS-II and uC-GUI Demos do not support IAR EWARM at present.

- Keil MDK-ARM
  All drivers and applications support Keil MDK-ARM, the MDK-ARM version should be V4.22a or above.

**Debug Tools Support**
- ULINK2
  It would be best to use with Keil MDK-ARM.

- JLINK-V8
  It would be best to use with IAR EWARM.

- ST-LINK/V2
  It can be used with either Keil MDK-ARM or IAR EWARM.

**Drivers and Software examples**

Embest has offered rich software examples for DevKit407 besides those provided by STM32F4DISCOVERY kit such as examples for USB, Ethernet and so on. Meanwhile, Embest has provided some system-level application demos which can help customers get into the second development rapidly to reduce the development time. Please check from below table to know more about the drivers and software examples provided by Embest.

Table 1-1 Drivers and Application Demos

| 01-USART | USART_Printf | Hyper-Terminal Input/Output example |
|---|---|---|
| 02-SDIO | uSDCard | Read and write, erase of TF card example |
| | FatFs | Port FatFs file system to TF card example |
| 03-LCD | LCD_35T | 3.5 inch TFT LCD driver testing example |
| | LCD_Touch | Touch screen testing example |
| 04-DCMI | OV9655_Camera | DM-CAM130 module demo, can take photos |
| 05-ETH_LwIP | | |
| Standalone | httpserver | Webserver application demo |
| | tcp_echo_client | Simple echo application demo of tcp customer end |

| | tcp_echo_server | Simple echo application demo of tcp server end |
|---|---|---|
| | udp_echo_client | Simple echo application demo of udp customer end |
| | udp_echo_server | Simple echo application demo of udp server end |
| FreeRTOS | httpserver_netconn | Webserver application demo based on netconn |
| | Httpserver_socket | Webserver application demo based on socket |
| | udptcp_echo_server _netconn | Echo application demo based on TCP/UDP server of netconn |
| 06-USB | | |
| USB_Device_ Examples | DFU | Use DevKit407 as DFU equipment, user can use it for system firmware upgrading |
| | MSC | Use DevKit407 as MSC (Mass Storage Device) to implement the data exchange between Host and evaluation board. |
| | VCP | Use DevKit407 as VCP (Virtual COM Port) and user can regard the evaluation board as USB-to-UART converter module |
| USB_Host_ Examples | HID | Use DevKit407 as HID (Human Interaction Device) Host, it can recognize USB mouse and USB keyboard two HID devices. |
| | MSC | Use DevKit407 as MSC (Mass Storage Device) Host, it can recognize U disc and some other mobile storage devices. |

Table 1-2 RTOS & GUI BSP

| STM32F4xx-uCOS-II | uC/OS-II-v2.86 BSP Drive |
|---|---|
| STM32F4xx-uCOSII-uCGUI | uC/OS-II-v2.86 & uC/GUI-v3.90a BSP Drive |

*Order Information*

| Order No. | T5000148 |
|---|---|
| Item | DM-STF4BB Base Board |
| Deliveries | • One DM-STF4BB Base Board<br>• One Product CD (including user manual, schematic in PDF format, datasheet, uC/OS-II BSP and software examples) |
| Order No. | T6010227 |
| Item | DevKit407 Evaluation Board |
| Deliveries | • One DevKit407 Evaluation board (including STM32F4DISCOVERY board and DM-STF4BB base board)<br>• One USB cable<br>• One Product CD (including user manual, schematic in PDF format, datasheet, uC/OS-II BSP and software examples) |
| Options | • DM-LCD35RT Module<br>(3.5 inch LCD with touch screen, resolution 320*240 pixels)<br>• DM-CAM130 Module<br>(1.3 megapixel Digital Camera Module) |
| Price | Please contact us. |

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