



# HT32 Arm<sup>®</sup> Cortex<sup>®</sup>-M MCU Series

Holtek 32-bit MCUs

Provide high-quality solutions to assist customers to quickly enter the market



**HOLTEK SEMICONDUCTOR INC.**



[www.holtek.com](http://www.holtek.com)



Singel 3 | B-2550 Kontich | Belgium | Tel. +32 (0)3 458 30 33 | [info@alcom.be](mailto:info@alcom.be) | [www.alcom.be](http://www.alcom.be)

Rivium 1e straat 52 | 2909 LE Capelle aan den IJssel | The Netherlands | Tel. +31 (0)10 288 25 00 | [info@alcom.nl](mailto:info@alcom.nl) | [www.alcom.nl](http://www.alcom.nl)

# Innovative and All-round General Purpose HT32

Provide customers with advantages of high integration and practicability, so as to achieve an excellent combination of power, price and performance, with features that can assist customers to shorten the product development process and to quickly seize the market opportunities.



## HT32 M0+ Series

The HT32 M0+ MCUs feature an excellent energy-efficient Arm® Cortex®-M0+ processor core, with an optimal balance between price, power and performance. This makes the MCUs suitable for use in the Internet of Things (IoT), wearable device products, and other similar applications. With the advantages in terms of code density, power consumption and price, the M0+ core-based MCUs are not only the first choice for new product design and development, but also the best choice for upgrading traditional products based on an 8-bit MCU to 32-bit MCU-based products with higher performance.

### Major Advantages:

- 32-bit Arm® Cortex®-M0+ processor core
- Up to 60 MHz operating frequency
- Up to 256 KB on-chip Flash memory and 32 KB on-chip SRAM
- Flash memory protection
- Multiple booting modes
- 24-bit SysTick timer
- ISP and IAP programming methods
- 3 power domains
- 12-bit SAR A/D converter with a conversion rate of up to 1 Msps
- Real time clock
- I²C, SPI, USART and USB interfaces
- Smart card interface
- Serial wire debug port

### Core

#### Arm® Cortex® -M0+ Processor

Serial Wire Debug  
Internal Oscillators  
External Oscillators  
Real Time Clock  
Watchdog Timer  
System Clock PLL  
NVIC

### Power Supply

POR/PDR

Backup Domain Power Management

BOD/LVD

### Interfaces

SPI Master/Slave

I²C Master/Slave

USART Interface

UART Interface

USB Interface

Smart Card Interface

**HT32 Arm® Cortex®-M0+**  
**Best Choice for Price,**  
**Power, Performance**

### Memory

16 ~ 256 KB Flash Memory

4 ~ 32 KB SRAM

Multiple Booting Modes

Flash Memory Protection

IAP and ISP Programming Methods

### Peripherals

General Purpose Timer

PWM Generator

General Purpose Input/Output Ports

Reset Control Unit

Motor Control Timer

Cyclic Redundancy Check

Peripheral Direct Memory Access

### Analog Features

A/D Converter

Comparator



## HT32 M3 Series

The Holtek HT32 M3 core series of MCUs, based on the Arm® Cortex®-M3 processor, are specially designed for high performance and low power consumption applications, such as automotive systems, industrial control systems, wireless networks and sensors, etc., which require a 32-bit MCU solution of high performance, low-dynamic and static power consumption specifications. Features such as configurable interrupts and memory protection provide even more outstanding performance and flexibility for this series of MCUs.

### Major Advantages:

- 32-bit Arm® Cortex®-M3+ processor core
- Up to 96 MHz operating frequency
- Up to 256 KB on-chip Flash memory and 128 KB on-chip SRAM
- Flash memory protection
- Multiple booting modes
- 24-bit SysTick timer
- ISP and IAP programming methods
- 3 power domains
- 12-bit SAR A/D converter with a conversion rate of up to 1 Msp/s
- Real time clock
- I²C, SPI, USART and USB interfaces
- Smart card interface
- Serial wire debug port
- External Bus Interface

### Core

#### Arm® Cortex® -M3 Processor

Serial Wire Debug  
Internal Oscillators  
External Oscillators  
Real Time Clock  
Watchdog Timer  
System Clock PLL  
NVIC

### Power Supply

POR/PDR  
Backup Domain Power Management  
BOD/LVD

### Interfaces

SPI Master/Slave  
I²C Master/Slave  
USART Interface  
UART Interface  
USB Interface  
Smart Card Interface  
**CMOS Sensor Interface**

**HT32 Arm® Cortex®-M3**  
**High Efficiency, Abundant**  
**Peripherals and Interfaces**

### Memory

**16 ~ 256 KB Flash Memory**  
**16 ~ 128 KB SRAM**  
Multiple Booting Modes  
Flash Memory Protection  
IAP and ISP Programming Methods

### Peripherals

General Purpose Timer  
PWM Generator  
General Purpose Input/Output Ports  
Reset Control Unit  
Motor Control Timer  
Cyclic Redundancy Check  
Peripheral Direct Memory Access

### Analog Features

A/D Converter  
Comparator  
**Operational Amplifier**

# HT32 MCU Lineup for Wide Application Ranges

Choosing a proper 32-bit MCU for your product application should focus not only on performance, but also on power consumption, package type, tooling, and cost. From the energy-efficient M0+ core series to the higher performing M3 core series, Holtek offers a wide range of flexible 32-bit MCU choices to meet your 32-bit application needs.

|   | 16 KB      | 32 KB                    | 64 KB                    | 128 KB                   | 256 KB                   |                 |
|---|------------|--------------------------|--------------------------|--------------------------|--------------------------|-----------------|
| <b>5V</b><br><b>16 MHz</b><br><b>HT32F500xx</b>       | HT32F50020 | HT32F50030               |                          |                          |                          | General Purpose |
| <b>5V</b><br><b>20 MHz</b><br><b>HT32F502xx</b>       | HT32F50220 | HT32F50230<br>HT32F50231 | HT32F50241               |                          |                          |                 |
| <b>5V</b><br><b>60 MHz</b><br><b>HT32F504xx</b>       |            |                          | HT32F50442               | HT32F50452               |                          |                 |
| <b>3.3V</b><br><b>40 MHz</b><br><b>HT32F522xx</b>     | HT32F52220 | HT32F52230<br>HT32F52231 | HT32F52241<br>HT32F52243 | HT32F52253               |                          |                 |
| <b>3.3V USB</b><br><b>48 MHz</b><br><b>HT32F523xx</b> |            | HT32F52331               | HT32F52341<br>HT32F52342 | HT32F52352               |                          | USB             |
| <b>3.3V USB</b><br><b>60 MHz</b><br><b>HT32F523xx</b> |            |                          | HT32F52344               | HT32F52354<br>HT32F52357 | HT32F52367               |                 |
| <b>5V USB</b><br><b>60 MHz</b><br><b>HT32F503xx</b>   |            |                          | HT32F50343               |                          |                          |                 |
| <b>3.3V LCD</b><br><b>60 MHz</b><br><b>HT32F573xx</b> |            | HT32F57331               | HT32F57341<br>HT32F57342 | HT32F57352               |                          | LCD             |
| <b>5V Touch</b><br><b>60 MHz</b><br><b>HT32F542xx</b> |            | HT32F54231               | HT32F54241<br>HT32F54243 | HT32F54253               |                          | Touch           |
| <b>5V CAN</b><br><b>60 MHz</b><br><b>HT32F532xx</b>   |            |                          | HT32F53242               | HT32F53252               |                          | CAN             |
| <b>3.3V</b><br><b>72 MHz</b><br><b>HT32F123xx</b>     |            |                          |                          |                          | HT32F12364               | General Purpose |
| <b>3.3V</b><br><b>96 MHz</b><br><b>HT32F123xx</b>     |            |                          | HT32F12345               |                          | HT32F12365<br>HT32F12366 |                 |
|   |            |                          |                          |                          |                          |                 |

# HT32 MCU Selection Guide

## Arm® Cortex®-M0+ General Purpose Series

| Cortex-M0+ 32-Bit MCU |            |             |       |      |      |                  |                                      |                           |                        |     |  |            |     |         |
|-----------------------|------------|-------------|-------|------|------|------------------|--------------------------------------|---------------------------|------------------------|-----|--|------------|-----|---------|
| Part No.              | Max. Freq. | VDD         | Flash | SRAM | PDMA | ADC              | Timers <sup>*1</sup>                 | Cap. <sup>*2</sup> or PWM | Cpm. PWM <sup>*3</sup> | RTC | Interface  | Others     | I/O | Package |
| HT32F52220            | 40MHz      | 2.0V ~ 3.6V | 16KB  | 4KB  | —    | 1Msps 12-bit x8  | BFTM×1<br>SCTM×2<br>GPTM×1           | 6                         | —                      | —   | USART×1<br>UART×1<br>SPI×1, I <sup>2</sup> C×1   | —          | 19  | 24SSOP  |
| HT32F52230            |            |             | 32KB  | 4KB  |      |                  |                                      |                           |                        |     |  |            | 23  | 28SSOP  |
| HT32F52231            | 40MHz      | 2.0V ~ 3.6V | 32KB  | 4KB  | —    | 1Msps 12-bit x12 | BFTM×2<br>SCTM×4<br>GPTM×1<br>MCTM×1 | 12                        | 3                      | √   | USART×1<br>UART×2<br>SPI×2<br>I <sup>2</sup> C×2 | CRC        | 19  | 24SSOP  |
| HT32F52241            |            |             | 64KB  | 8KB  |      |                  |                                      |                           |                        |     |  |            | 23  | 28SSOP  |
| HT32F52243            | 40MHz      | 2.0V ~ 3.6V | 64KB  | 8KB  | 6CH  | 1Msps 12-bit x12 | BFTM×2<br>SCTM×4<br>GPTM×1<br>MCTM×1 | 12                        | 3                      | √   | USART×2<br>UART×4<br>SPI×2<br>I <sup>2</sup> C×3 | CRC<br>DIV | 26  | 33QFN   |
| HT32F52253            |            |             | 128KB | 16KB |      |                  |                                      |                           |                        |     |  |            | 38  | 46QFN   |
|                       |            |             |       |      |      |                  |                                      |                           |                        |     |  |            | 40  | 48LQFP  |
|                       |            |             |       |      |      |                  |                                      |                           |                        |     |  |            | 52  | 64LQFP  |

## Arm® Cortex®-M0+ 5V General Purpose Series

| Cortex-M0+ 32-Bit 5V MCU |            |             |       |      |      |                  |     |   |                          |                        |     |                   |  |                    |     |         |
|--------------------------|------------|-------------|-------|------|------|------------------|-----|---|--------------------------|------------------------|-----|-------------------|--|--------------------|-----|---------|
| Part No.                 | Max. Freq. | VDD         | Flash | SRAM | PDMA | ADC              | CMP | Timers <sup>*1</sup>                    | Cap. <sup>*2</sup> / PWM | Cpm. PWM <sup>*3</sup> | RTC | EBI <sup>*6</sup> | Interface  | Others             | I/O | Package |
| HT32F50020               | 16MHz      | 2.5V ~ 5.5V | 16KB  | 2KB  | —    | 1Msps 12-bit x12 | —   | BFTM×1<br>SCTM×3                        | 3 / 6                    | —                      | √   | —                 | UART×2<br>SPI×1<br>I <sup>2</sup> C×1                | LEDC               | 18  | 24QFN   |
| HT32F50030               |            |             | 32KB  | 2KB  |      |                  |     |   |                          |                        |     |                   |  |                    | 19  | 24SSOP  |
| HT32F50220               | 20MHz      | 2.5V ~ 5.5V | 16KB  | 4KB  | —    | 1Msps 12-bit x12 | —   | BFTM×1<br>PWM×2<br>GPTM×1               | 12 / 12                  | —                      | √   | —                 | UART×2<br>SPI×2<br>I <sup>2</sup> C×1                | DIV                | 18  | 24QFN   |
| HT32F50230               |            |             | 32KB  | 4KB  |      |                  |     |   |                          |                        |     |                   |  |                    | 19  | 24SSOP  |
| HT32F50231               |            |             | 32KB  | 4KB  |      |                  |     |   |                          |                        |     |                   |  |                    | 22  | 28SOP   |
| HT32F50241               |            |             | 64KB  | 8KB  |      |                  |     |   |                          |                        |     |                   |  |                    | 26  | 33QFN   |
| HT32F50442*              | 60MHz      | 2.5V ~ 5.5V | 64KB  | 8KB  | 6CH  | 1Msps 12-bit x12 | 2   | BFTM x2<br>PWM x2<br>GPTM x1<br>MCTM x1 | 16 / 16                  | 3                      | √   | √                 | USART x2<br>UART x2<br>SPI x2<br>I <sup>2</sup> C x2 | CRC<br>DIV<br>LEDC | 26  | 32QFN   |
| HT32F50452*              |            |             | 128KB | 16KB |      |                  |     |   |                          |                        |     |                   |  |                    | 38  | 46QFN   |
|                          |            |             |       |      |      |                  |     |   |                          |                        |     |                   |  |                    | 40  | 48LQFP  |
|                          |            |             |       |      |      |                  |     |   |                          |                        |     |                   |  |                    | 54  | 64LQFP  |

## Arm® Cortex®-M0+ USB Series

| Cortex-M0+ 32-Bit USB MCU |            |              |       |      |      |                  |     |                   |   |                           |                        |     |                   |                   |                   |                  |  |                   |     |         |
|---------------------------|------------|--------------|-------|------|------|------------------|-----|-------------------|---|---------------------------|------------------------|-----|-------------------|-------------------|-------------------|------------------|--|-------------------|-----|---------|
| Part No.                  | Max. Freq. | VDD          | Flash | SRAM | PDMA | ADC              | CMP | DAC               | Timers <sup>*1</sup>                          | Cap. <sup>*2</sup> or PWM | Cpm. PWM <sup>*3</sup> | RTC | SCI <sup>*4</sup> | USB <sup>*5</sup> | EBI <sup>*6</sup> | I <sup>2</sup> S | Inter-<br>face   | Others            | I/O | Package |
| HT32F52331                | 48MHz      | 2.0V ~ 3.6V  | 32KB  | 4KB  | —    | 1Msps 12-bit x12 | —   | —                 | BFTM×2<br>SCTM×4<br>GPTM×1<br>MCTM×1          | 12                        | 3                      | √   | 1                 | √                 | —                 | —                | USART×1<br>UART×2<br>SPI×2<br>I <sup>2</sup> C×2             | CRC               | 24  | 33QFN   |
| HT32F52341                |            |              | 64KB  | 8KB  |      |                  |     |                   |   |                           |                        |     |                   |                   |                   |                  |  |                   | 38  | 48LQFP  |
| HT32F52342                | 48MHz      | 2.0V ~ 3.6V  | 64KB  | 8KB  | 6CH  | 1Msps 12-bit x12 | 2   | —                 | BFTM×2<br>SCTM×2<br>GPTM×2<br>MCTM×1          | 14                        | 3                      | √   | 2                 | √                 | √                 | √                | USART×2<br>UART×2<br>SPI×2<br>I <sup>2</sup> C×2             | CRC               | 26  | 33QFN   |
| HT32F52352                |            |              | 128KB | 16KB |      |                  |     |                   |   |                           |                        |     |                   |                   |                   |                  |  |                   | 39  | 48LQFP  |
| HT32F52344                | 60MHz      | 1.65V ~ 3.6V | 64KB  | 8KB  | 6CH  | 1Msps 12-bit x12 | 2   | —                 | BFTM×2<br>SCTM×2<br>GPTM×1<br>MCTM×1          | 10                        | 3                      | √   | —                 | √                 | √                 | —                | UART×2<br>SPI×2<br>I <sup>2</sup> C×1                        | CRC<br>DIV        | 26  | 33QFN   |
| HT32F52354                |            |              | 128KB | 8KB  |      |                  |     |                   |   |                           |                        |     |                   |                   |                   |                  |  |                   | 38  | 46QFN   |
| HT32F52357                | 60MHz      | 1.65V ~ 3.6V | 128KB | 16KB | 6CH  | 1Msps 12-bit x12 | 2   | 500Ksps 12-bit x2 | BFTM×2<br>SCTM×2<br>PWM×2<br>GPTM×1<br>MCTM×1 | 18                        | 3                      | √   | 2                 | √                 | √                 | √                | USART×2<br>UART×4<br>SPI×2<br>QSPI×1*8<br>I <sup>2</sup> C×2 | AES<br>CRC<br>DIV | 37  | 46QFN   |
| HT32F52367                |            |              | 256KB | 32KB |      |                  |     |                   |   |                           |                        |     |                   |                   |                   |                  |  |                   | 39  | 48LQFP  |
|                           |            |              |       |      |      |                  |     |                   |   |                           |                        |     |                   |                   |                   |                  |  |                   | 53  | 64LQFP  |
|                           |            |              |       |      |      |                  |     |                   |   |                           |                        |     |                   |                   |                   |                  |  |                   | 67  | 80LQFP  |

## Arm® Cortex®-M0+ USB 5V Series

| Cortex-M0+ 32-Bit 5V USB MCU |            |             |       |      |      |                  |                                       |   |     |                   |   |            |     |         |  |  |
|------------------------------|------------|-------------|-------|------|------|------------------|---------------------------------------|---|-----|-------------------|---|------------|-----|---------|--|--|
| Part No.                     | Max. Freq. | VDD         | Flash | SRAM | PDMA | ADC              | Timers <sup>*1</sup>                  | Cap. <sup>*2</sup> or PWM <sup>*3</sup> | RTC | USB <sup>*5</sup> | Interface   | Others     | I/O | Package |  |  |
| HT32F50343                   | 60MHz      | 2.5V ~ 5.5V | 64KB  | 12KB | 6CH  | 1Msps 12-bit x12 | BFTM×2<br>SCTM×2<br>8-PWM×3<br>GPTM×1 | 30                                      | √   | √                 | UART×2<br>SPI×2<br>I <sup>2</sup> C×2<br>SLED×8 <sup>*7</sup> | CRC<br>DIV | 23  | 32QFN   |  |  |
|                              |            |             |       |      |      |                  |                                       |   |     |                   |   |            | 35  | 46QFN   |  |  |
|                              |            |             |       |      |      |                  |                                       |   |     |                   |   |            | 37  | 48LQFP  |  |  |
|                              |            |             |       |      |      |                  |                                       |   |     |                   |   |            | 51  | 64LQFP  |  |  |

\* Under development, available in 1Q, 2023

Note: 1. BFTM: Basic Function Timer, SCTM: Single-Channel Timer, 8-PWM: 8 Output channel PWM Timer, GPTM: General-Purpose Timer, MCTM: Motor Control Timer.

2. Cap.: Input Capture.

3. Cpm. PWM: Complementary PWM for 3-phase motor control or inverter application.

4. SCI: ISO7816-3 Smart Card Interface.

5. USB 2.0 Full Speed Device.

6. EBI: External Bus Interface for NOR Flash / SRAM / LCD.

7. SLED: Strip LED Controller.

8. QSPI Flash ROM.

## Arm® Cortex®-M0+ LCD Series

| Cortex-M0+ 32-Bit LCD MCU |            |              |       |      |      |                  |     |                  |                                     |                          |     |                  |                  |                  |             |  |                   |     |         |
|---------------------------|------------|--------------|-------|------|------|------------------|-----|------------------|-------------------------------------|--------------------------|-----|------------------|------------------|------------------|-------------|--|-------------------|-----|---------|
| Part No.                  | Max. Freq. | VDD          | Flash | SRAM | PDMA | ADC              | CMP | DAC              | Timers <sup>1</sup>                 | Cap. <sup>2</sup> or PWM | RTC | SCI <sup>4</sup> | USB <sup>5</sup> | I <sup>2</sup> S | LCD         | Interface  | Others            | I/O | Package |
| HT32F57331                | 60MHz      | 1.65V ~ 3.6V | 32KB  | 4KB  | —    | 1Msps 12-bit ×10 | —   | —                | BFTM×2<br>PWM×2<br>GPTM×1           | 12                       | √   | 1                | √                | —                | 29x4 ~ 25x8 | USART×1<br>UART×2<br>SPI×2<br>I <sup>2</sup> C×2 | CRC<br>DIV        | 37  | 46QFN   |
| HT32F57341                |            |              | 64KB  | 8KB  |      |                  |     |                  |                                     |                          |     |                  |                  |                  |             |  |                   | 39  | 48LQFP  |
| HT32F57342                | 60MHz      | 1.65V ~ 3.6V | 64KB  | 8KB  | 6CH  | 1Msps 12-bit ×10 | 2   | 500Ksps 12-bit×2 | BFTM×2<br>SCTM×2<br>PWM×2<br>GPTM×1 | 14                       | √   | 2                | √                | √                | 37x4 ~ 33x8 | USART×1<br>UART×2<br>SPI×2<br>I <sup>2</sup> C×2 | AES<br>CRC<br>DIV | 37  | 46QFN   |
| HT32F57352                |            |              | 128KB | 16KB |      |                  |     |                  |                                     |                          |     |                  |                  |                  |             |  |                   | 39  | 48LQFP  |
|                           |            |              |       |      |      |                  |     |                  |                                     |                          |     |                  |                  |                  |             |  |                   | 53  | 64LQFP  |
|                           |            |              |       |      |      |                  |     |                  |                                     |                          |     |                  |                  |                  |             |  |                   | 53  | 80LQFP  |

## Arm® Cortex®-M0+ Touch Series

| Cortex-M0+ 32-Bit 5V Touch MCU |            |            |       |      |      |                  |     |                                      |                                       |                       |     |           |                |  |                    |     |         |    |        |
|--------------------------------|------------|------------|-------|------|------|------------------|-----|--------------------------------------|---------------------------------------|-----------------------|-----|-----------|----------------|--|--------------------|-----|---------|----|--------|
| Part No.                       | Max. Freq. | VDD        | Flash | SRAM | PDMA | ADC              | CMP | Timers <sup>1</sup>                  | Cap. <sup>2</sup> or PWM <sup>3</sup> | Cpm. PWM <sup>3</sup> | RTC | Touch Key | LED Controller | Interface  | Others             | I/O | Package |    |        |
| HT32F54231                     | 60MHz      | 2.5V~ 5.5V | 32KB  | 4KB  | —    | 1Msps 12-bit ×10 | —   | BFTM×2<br>SCTM×2<br>GPTM×1<br>MCTM×1 | 10                                    | 3                     | √   | 24        | 8×8            | USART×1<br>UART×2<br>SPI×2<br>I <sup>2</sup> C×2 | CRC<br>DIV<br>LEDC | 23  | 28SSOP  |    |        |
| HT32F54241                     |            |            | 64KB  | 8KB  |      |                  |     |                                      |                                       |                       |     |           |                |  |                    | 26  | 32QFN   |    |        |
| HT32F54243                     | 60MHz      | 2.5V~ 5.5V | 64KB  | 8KB  | 6CH  | 1Msps 12-bit ×10 | 2   | BFTM×2<br>SCTM×4<br>GPTM×1<br>MCTM×1 | 12                                    | 3                     | √   | 28        | 12×8           | USART×2<br>UART×4<br>SPI×2<br>I <sup>2</sup> C×3 | CRC<br>DIV<br>LEDC | 26  | 32QFN   |    |        |
| HT32F54253                     |            |            | 128KB | 16KB |      |                  |     |                                      |                                       |                       |     |           |                |  |                    | 38  | 46QFN   |    |        |
|                                |            |            |       |      |      |                  |     |                                      |                                       |                       |     |           |                |  |                    |     |         | 40 | 48LQFP |
|                                |            |            |       |      |      |                  |     |                                      |                                       |                       |     |           |                |  |                    |     |         | 54 | 64LQFP |

## Arm® Cortex®-M0+ CAN Series

| Cortex-M0+ 32-Bit CAN MCU |            |             |       |      |      |                 |     |   |                         |                       |     |                  |     |   |                    |     |         |    |        |
|---------------------------|------------|-------------|-------|------|------|-----------------|-----|---|-------------------------|-----------------------|-----|------------------|-----|---|--------------------|-----|---------|----|--------|
| Part No.                  | Max. Freq. | VDD         | Flash | SRAM | PDMA | ADC             | CMP | Timers <sup>1</sup>                     | Cap. <sup>2</sup> / PWM | Cpm. PWM <sup>3</sup> | RTC | EBI <sup>6</sup> | CAN | Interface   | Others             | I/O | Package |    |        |
| HT32F53242*               | 60MHz      | 2.5V ~ 5.5V | 64KB  | 8KB  | 6CH  | 1Msps 12-bit×12 | 2   | BFTM x2<br>PWM x2<br>GPTM x1<br>MCTM x1 | 16 / 16                 | 3                     | √   | √                | 1   | USART x2<br>UARTx2<br>SPI x2<br>I <sup>2</sup> C x2 | CRC<br>DIV<br>LEDC | 26  | 32QFN   |    |        |
| HT32F53252*               |            |             | 128KB | 16KB |      |                 |     |   |                         |                       |     |                  |     |   |                    | 38  | 46QFN   |    |        |
|                           |            |             |       |      |      |                 |     |   |                         |                       |     |                  |     |   |                    |     |         | 40 | 48LQFP |
|                           |            |             |       |      |      |                 |     |   |                         |                       |     |                  |     |   |                    |     |         | 54 | 64LQFP |

## Arm® Cortex®-M3 General Purpose Series

| Cortex-M3 32-Bit MCU |            |              |       |       |      |                  |     |                                     |                          |                       |     |                  |                  |                  |                  |  |            |     |         |
|----------------------|------------|--------------|-------|-------|------|------------------|-----|-------------------------------------|--------------------------|-----------------------|-----|------------------|------------------|------------------|------------------|--|------------|-----|---------|
| Part No.             | Max. Freq. | VDD          | Flash | SRAM  | PDMA | ADC              | CMP | Timers <sup>1</sup>                 | Cap. <sup>2</sup> or PWM | Cpm. PWM <sup>3</sup> | RTC | SCI <sup>4</sup> | USB <sup>5</sup> | EBI <sup>6</sup> | I <sup>2</sup> S | Interface  | Others     | I/O | Package |
| HT32F12345           | 96MHz      | 2.0V ~ 3.6V  | 64KB  | 16KB  | 12CH | 1Msps 12-bit ×12 | 2   | BFTM×2<br>GPTM×2<br>MCTM×2          | 16                       | 6                     | √   | —                | √                | √                | √                | SDIO×1<br>USART×2<br>UART×2<br>SPI×2, I <sup>2</sup> C×2 | CRC        | 37  | 46QFN   |
| HT32F12365           | 96MHz      | 2.0V ~ 3.6V  | 256KB | 64KB  | 12CH | 1Msps 12-bit ×16 | 2   | BFTM×2<br>GPTM×2<br>MCTM×2          | 16                       | 6                     | √   | 2                | √                | √                | √                | SDIO×1<br>USART×2<br>UART×2<br>SPI×2, I <sup>2</sup> C×2 | AES<br>CRC | 37  | 46QFN   |
| HT32F12366           |            |              | 256KB | 128KB |      |                  |     |                                     |                          |                       |     |                  |                  |                  |                  |  |            | 51  | 48LQFP  |
| HT32F12364           | 72MHz      | 1.65V ~ 3.6V | 256KB | 128KB | 6CH  | 1Msps 12-bit ×8  | —   | BFTM×2<br>SCTM×2<br>PWM×1<br>GPTM×1 | 10                       | —                     | √   | 1                | √                | √                | —                | USART×1<br>UART×2<br>SPI×2, I <sup>2</sup> C×2           | AES<br>CRC | 32  | 40QFN   |
|                      |            |              |       |       |      |                  |     |                                     |                          |                       |     |                  |                  |                  |                  |  |            | 38  | 48LQFP  |
|                      |            |              |       |       |      |                  |     |                                     |                          |                       |     |                  |                  |                  |                  |  |            | 52  | 64LQFP  |

## Arm® Cortex®-M3 Fingerprint Recognition Purpose

| Cortex-M3 32-Bit Fingerprint MCU |            |             |       |       |      |                  |     |                            |                          |                       |     |                  |                  |                  |                   |  |                    |     |         |
|----------------------------------|------------|-------------|-------|-------|------|------------------|-----|----------------------------|--------------------------|-----------------------|-----|------------------|------------------|------------------|-------------------|--|--------------------|-----|---------|
| Part No.                         | Max. Freq. | VDD         | Flash | SRAM  | PDMA | ADC              | CMP | Timers <sup>1</sup>        | Cap. <sup>2</sup> or PWM | Cpm. PWM <sup>3</sup> | RTC | SCI <sup>4</sup> | USB <sup>5</sup> | EBI <sup>6</sup> | CSIF <sup>7</sup> | Interface  | Others             | I/O | Package |
| HT32F22366                       | 96MHz      | 2.0V ~ 3.6V | 256KB | 128KB | 12CH | 1Msps 12-bit ×16 | 2   | BFTM×2<br>GPTM×2<br>MCTM×2 | 16                       | 6                     | √   | 2                | √                | √                | √                 | SDIO×1<br>USART×2<br>UART×2<br>SPI×2<br>I <sup>2</sup> C×2<br>I <sup>2</sup> S×1 | AES<br>CRC<br>CSIF | 37  | 46QFN   |
|                                  |            |             |       |       |      |                  |     |                            |                          |                       |     |                  |                  |                  |                   |  |                    | 51  | 48LQFP  |
|                                  |            |             |       |       |      |                  |     |                            |                          |                       |     |                  |                  |                  |                   |  |                    | 80  | 64LQFP  |
|                                  |            |             |       |       |      |                  |     |                            |                          |                       |     |                  |                  |                  |                   |  |                    | 80  | 100LQFP |

\* Under development, available in 1Q, 2023

Note: 1. BFTM: Basic Function Timer, SCTM: Single-Channel Timer, GPTM: General-Purpose Timer, MCTM: Motor Control Timer.

2. Cap.: Input Capture.

3. Cpm. PWM: Complementary PWM for 3-phase motor control or inverter application.

4. SCI: ISO7816-3 Smart Card Interface.

5. USB 2.0 Full Speed Device.

6. EBI: External Bus Interface for NOR Flash / SRAM / LCD.

7. CSIF: CMOS Sensor Interface.

# Package Size

|            | 24 SSOP   | 28 SSOP   | 28 SOP  |  |  |  |  |  |  |
|------------|---|---|---|--|--|--|--|--|--|
|            |  |  |  |  |  |  |  |  |  |
| Size       | 3.9 × 8.6 mm  | 3.9 × 9.9 mm  | 7.5 × 17.9 mm   |  |  |  |  |  |  |
| Lead Pitch | 0.64 mm   | 0.64 mm   | 1.27 mm   |  |  |  |  |  |  |
| Thickness  | 1.75 mm   | 1.75 mm   | 2.65 mm   |  |  |  |  |  |  |

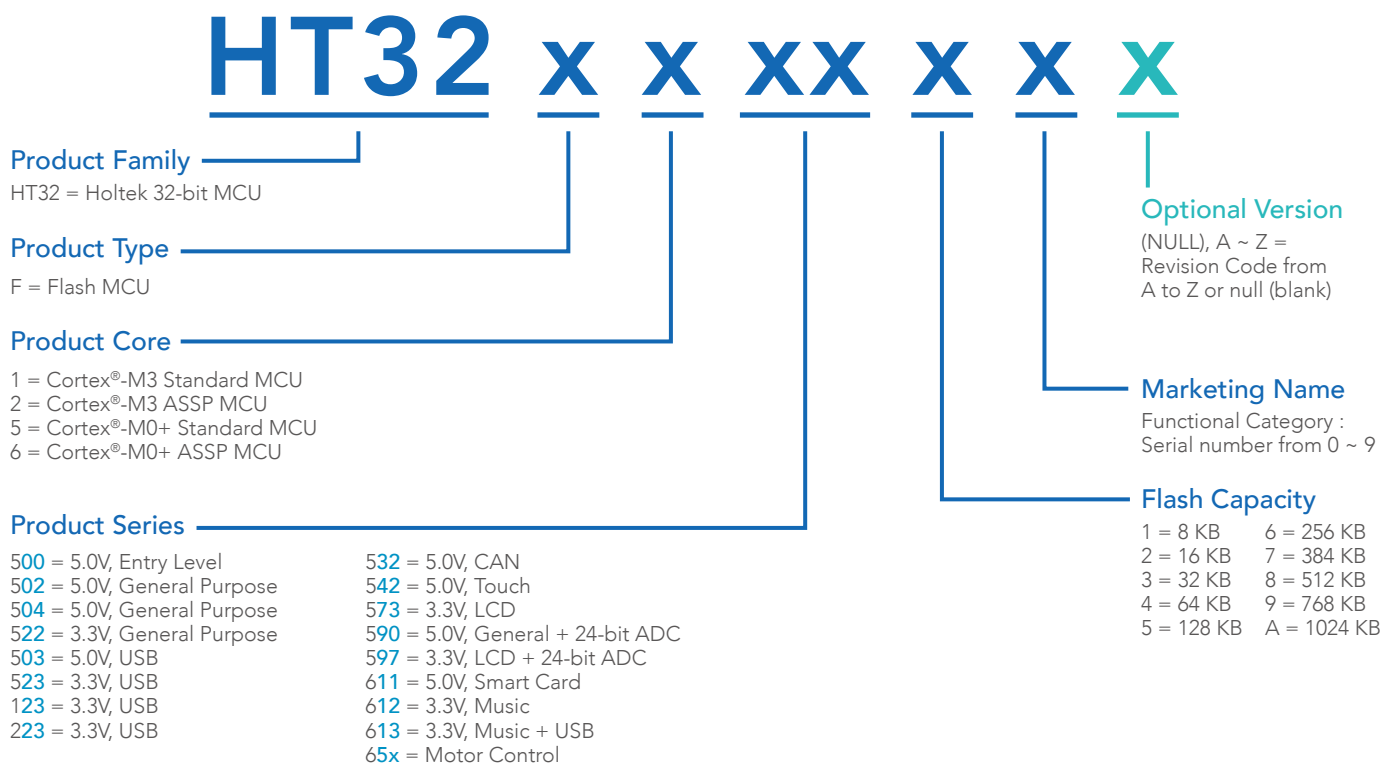
  

|            | 24 QFN  | 32/33 QFN   | 40 QFN  | 46 QFN  |  |  |
|------------|---|---|---|---|--|--|
|            |  |  |  |  |  |  |
| Size       | 3.0 × 3.0 mm  | 4.0 × 4.0 mm  | 5.0 × 5.0 mm  | 4.5 × 6.5 mm  |  |  |
| Lead Pitch | 0.40 mm   | 0.40 mm   | 0.40 mm   | 0.40 mm   |  |  |
| Thickness  | 0.55 mm   | 0.75 mm   | 0.75 mm   | 0.75 mm   |  |  |

|            | 44 LQFP  | 48 LQFP  | 64 LQFP  | 80 LQFP  | 100 LQFP   |
|------------|--|--|--|--|--|
|            |  |  |  |  |  |
| Size       | 10.0 × 10.0 mm   | 7.0 × 7.0 mm   | 7.0 × 7.0 mm   | 10.0 × 10.0 mm   | 14.0 × 14.0 mm   |
| Lead Pitch | 0.80 mm  | 0.50 mm  | 0.40 mm  | 0.40 mm  | 0.50 mm  |
| Thickness  | 1.60 mm  | 1.60 mm  | 1.60 mm  | 1.60 mm  | 1.60 mm  |

# Naming Rules



# HT32 MCU Development Tools

Good MCU development tools are a necessary requirement for any design process. In order to support the Holtek 32-bit M0+ and M3 core series of MCUs, Holtek and external vendors offer a complete set of software and hardware tools to assist users with easy prototyping and debugging. Holtek's starter kit contains all the basic hardware, including an embedded e-Link32 Pro that provides a simple connection to a PC, allowing users to develop products quickly.

Holtek's expansion boards contain a variety of common electronic components such as switches, LEDs, potentiometer, buzzers, IR components, etc., providing a flexible and complete system to ensure that users can quickly and easily learn how to use Holtek's 32-bit MCUs. A complete software library and comprehensive graphic documents ensure that customers can quickly develop 32-bit MCU-based products.



Holtek development tools can be purchased at Best Modules online shop

## Development Resources

### Development Resources

- Support multiple development environments and free Keil (Cortex®-M0+ series)
- HT32 firmware, application examples
- Datasheet, user manuals, application notes
- ISP/IAP/Writer tools

### Firmware Library



- Peripheral Drivers
- Examples
- Board Support Driver

### Development Environment

arm KEIL



## USB Debug Adapter

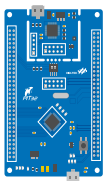
HT32 series online debug / programming tool



| Model        | Features   |
|--------------|--|
| e-Link32 Pro | Arm® SWD USB debug adapter for the HT32 MCUs, CMSIS-DAP compliant. |

## Starter Kit

MCU I/O target board for prototyping, including an on-chip USB debug adapter



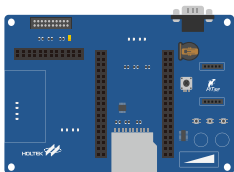
| M0+ Series       | Model       | M0+ Series       | Model       |
|------------------|-------------|------------------|-------------|
| HT32F52342/52352 | ESK32-30501 | HT32F52344/52354 | ESK32-30509 |
| HT32F52331/52341 | ESK32-30502 | HT32F52357/52367 | ESK32-30510 |
| HT32F52231/52241 | ESK32-30503 | HT32F57342/57352 | ESK32-30511 |
| HT32F52220/52230 | ESK32-30504 | HT32F57331/57341 | ESK32-30512 |
| HT32F52243/52253 | ESK32-30505 | HT32F50343       | ESK32-30515 |
| HT32F50220/50230 | ESK32-30506 | HT32F54231/54241 | ESK32-30518 |
| HT32F50231/50241 | ESK32-30507 | HT32F54243/54253 | ESK32-30519 |

| M3 Series        | Model       | M3 Series  | Model       |
|------------------|-------------|------------|-------------|
| HT32F12365/12366 | ESK32-30105 | HT32F12364 | ESK32-30107 |
| HT32F12345       | ESK32-30106 |            |             |

## Expansion Boards

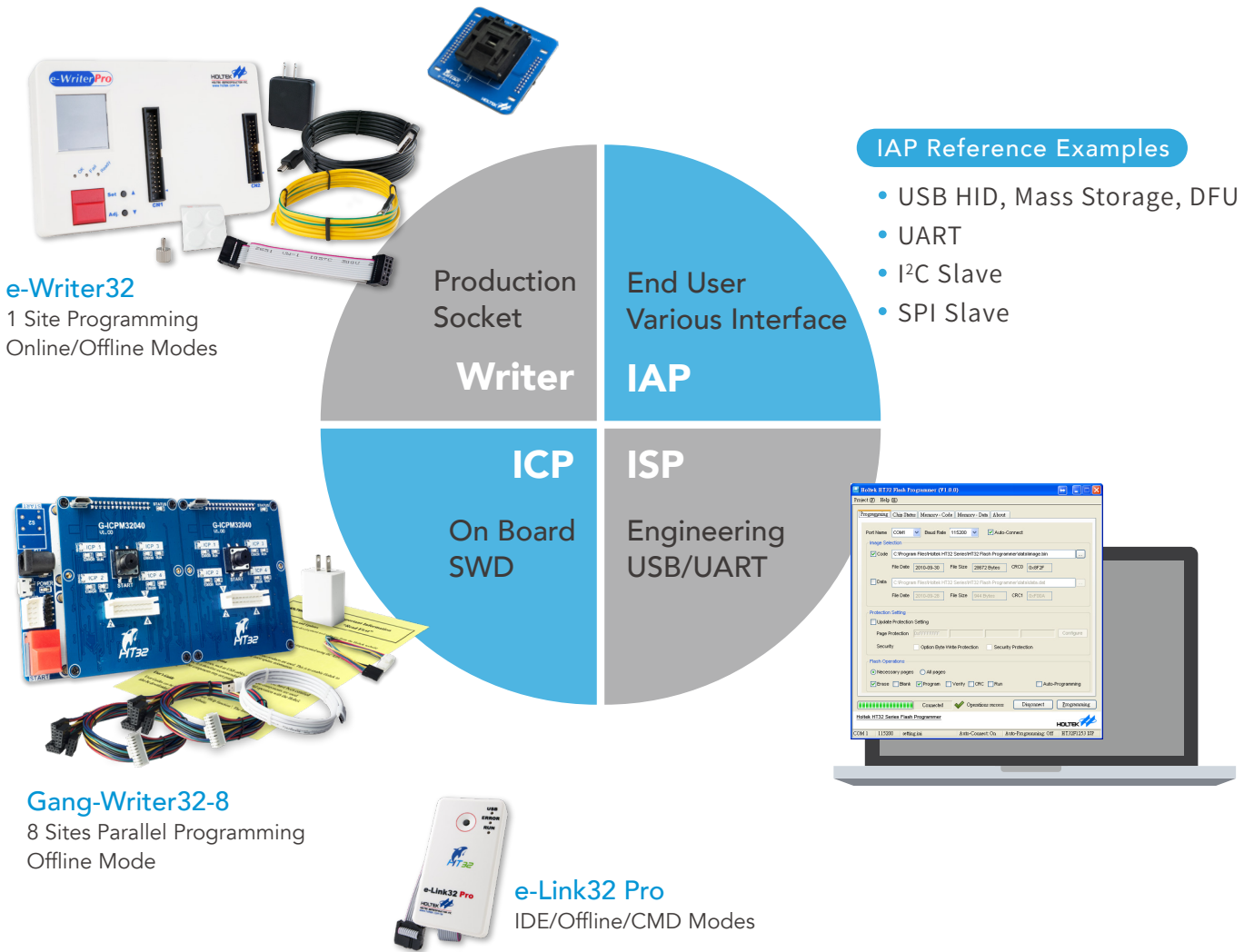
Functional extension of starter kit



| Model                       | Features   |
|-----------------------------|--|
| ESK32-20001<br>ESK32-20001A | The basic expansion board is designed for use with the ESK-30xxx series of starter kits. Expansion board functions include: <ul style="list-style-type: none"> <li>• User interfaces: 8080/SPI LCD connectors, buzzer, LEDs, potentiometer, keys, touch keys</li> <li>• Communication: RS232 and multiple interfaces for module expansion</li> <li>• Storage: EEPROM, SPI Flash, SD card slot</li> </ul> |
| ESK32-21001<br>ESK32-21001A | Enhanced version of expansion board with added functions such as smart card connector, audio encoder/decoder, CMOS sensor interface, etc.  |



# HT32 MCU Programming Methods



# HT32 MCU Development Resources and Download Website

The development resources include datasheet, reference documents, schematics, HT32 firmware library, PC driver, tools, etc.

## Resource Download

<https://mcu.holtek.com/ht32/resource/> 



**HT32F5 Series (Cortex<sup>®</sup>-M0+)**

HT32\_M0p\_vxxxxxxxx.zip

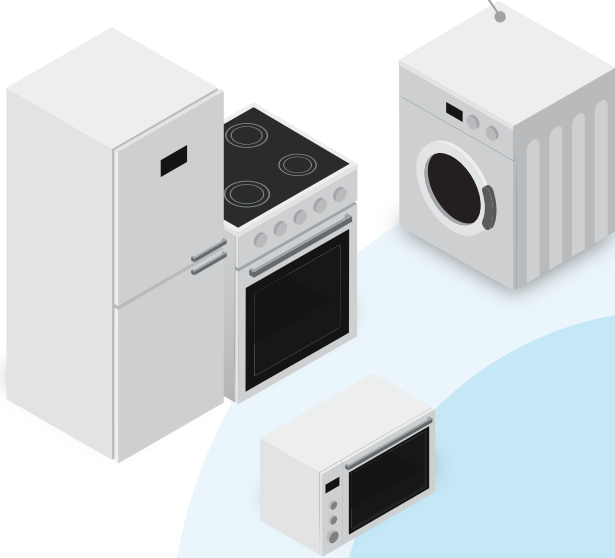
**HT32F1 Series (Cortex<sup>®</sup>-M3)**

HT32\_M3\_vxxxxxxxx.zip

# Application Products

## Smart Home

More and more household appliances such as smart and connection type of products require 32-bit processing.



## IoT/Wearable Devices

The demand for a low power consumption 32-bit MCU in wearable devices is growing.



## USB Peripherals

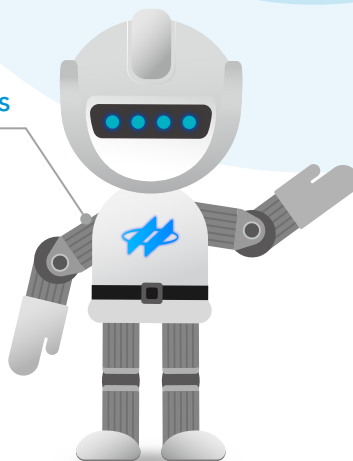
USB is still the most versatile interface and an essential feature of PC-related products.



# Smart Products HT32 MCU Solutions

## Intelligent Leisure Products

Higher-level leisure products require a 32-bit MCU in terms of computing power and cost efficiency.



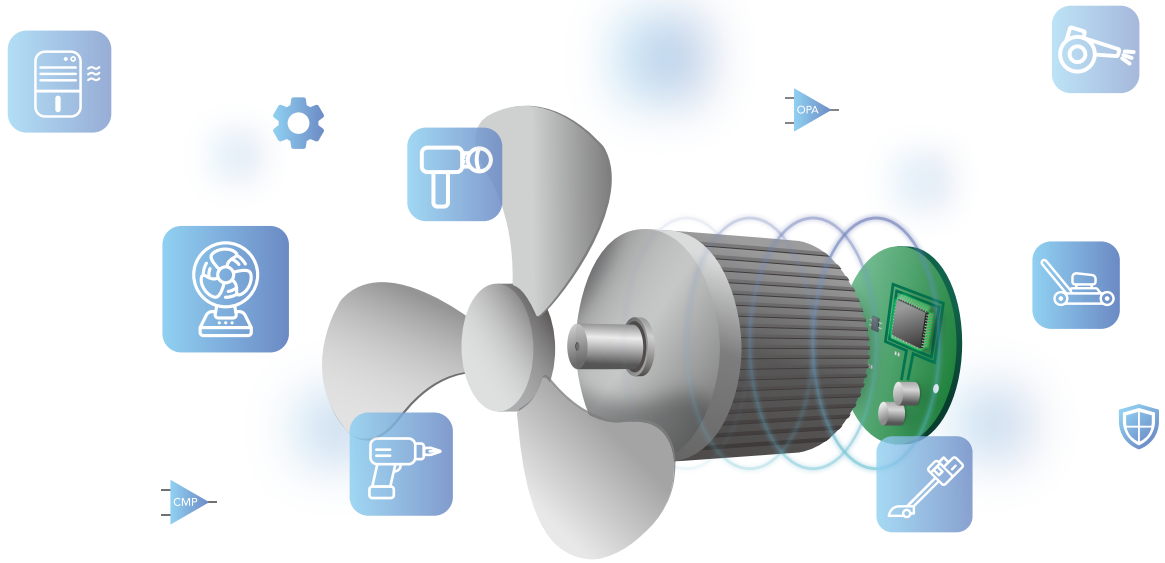
## Data Processors/Recorders

32-bit processing capabilities are required for enhanced data processing.



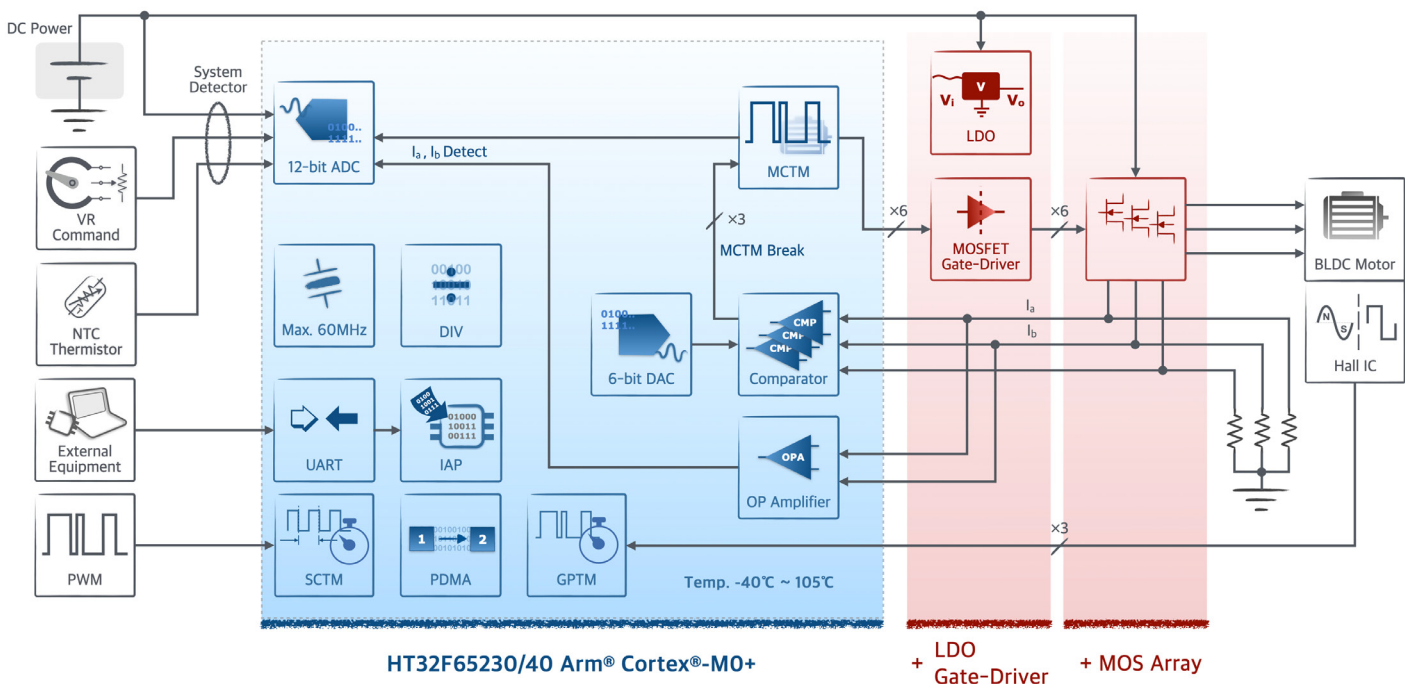
# HT32 BLDC Motor Control Applications

BLDC MCUs with integrated intelligent gate-driver and driver



Under the global energy saving and carbon reduction requirements, the use of BLDC motor design for motor products has become a market trend. Its advantages are small size, high efficiency, low noise, long service life, high power density, etc., but the disadvantages lie in higher cost and high complexity of design techniques. Holtek has released a series of Arm® Cortex®-M0+ core BLDC microcontrollers, which support Hall sensor or sensorless FOC controls. For BLDC motor loads with different voltages and power, BLDC SoC MCUs with integrated intelligent gate-driver and driver are also introduced, which effectively reduces the hardware volume and the complexity of the PCB design. In addition, Holtek also provides a Workshop for motor parameter adjustment and software secondary development, assisting customers to rotate motor smoothly in a short period of time, and to mass-produce the finished BLDC products and introduce them into the market in time. With the IEC/UL 60730-1 software certification, the HT32F65xxx series can be widely used in applications such as the fast-growing industrial controls, household appliances, ceiling fans, range hoods, gargetn tools, robots, electric scooters, quadcopters, etc.

## BLDC Motor Control Application Block Diagram



## Arm® Cortex®-M0+ BLDC Motor Control Purpose Selection Guide

| Cortex-M0+ 32-Bit BLDC Flash MCU |            |           |       |      |      |                      |     |     |  |                          |                       |     |  |            |                |                           |  |
|----------------------------------|------------|-----------|-------|------|------|----------------------|-----|-----|--|--------------------------|-----------------------|-----|--|------------|----------------|---------------------------|--|
| Part No.                         | Max. Freq. | VDD       | Flash | SRAM | PDMA | ADC                  | CMP | OPA | Timer <sup>1</sup>                             | Cap. <sup>2</sup> or PWM | Cpm. PWM <sup>3</sup> | RTC | Interface  | Others     | I/O            | Package                   |  |
| HT32F65232                       | 60MHz      | 2.5V~5.5V | 32KB  | 4KB  | 6CH  | 2Msps×1<br>12-bit×12 | 2   | 1   | BFTM×2<br>SCTM×4<br>GPTM×1<br>MCTM×1<br>LSTM×1 | 12                       | 3                     | —   | USART×1<br>UART×1<br>SPI×1<br>I <sup>2</sup> C×1 | CRC<br>DIV | 20<br>28<br>44 | 24SSOP<br>32QFN<br>48LQFP |  |
| HT32F65230                       |            |           | 64KB  | 8KB  |      | 1Msps×2<br>12-bit×8  | 3   | 2   | BFTM×2<br>SCTM×4<br>GPTM×4<br>MCTM×1           |                          |                       | √   |  |            | 40             | 48LQFP                    |  |
| HT32F65240                       |            |           |       |      |      |                      |     |     |  |                          |                       |     |  |            |                |                           |  |

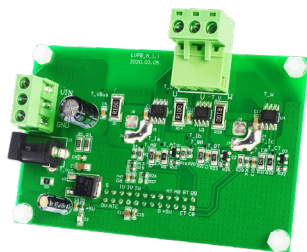
Note: 1. BFTM: Basic Function Timer, SCTM: Single-Channel Timer, GPTM: General-Purpose Timer, MCTM: Motor Control Timer, LSTM: Low Speed Timer.  
 2. Cap.: Input Capture.  
 3. Cpm. PWM: Complementary PWM for 3-phase motor control or inverter application.  
 4. Operating Temperature: -40 °C ~ 105 °C.

| Cortex-M0+ 32-Bit BLDC Flash MCU with Gate-Driver |            |          |     |             |       |      |      |                      |     |     |  |                          |                       |     |  |            |           |                    |
|---|------------|----------|-----|-------------|-------|------|------|----------------------|-----|-----|--|--------------------------|-----------------------|-----|--|------------|-----------|--------------------|
| Part No.  | Max. Freq. | VCC (HV) | LDO | Gate-Driver | Flash | SRAM | PDMA | ADC                  | CMP | OPA | Timer <sup>1</sup>                             | Cap. <sup>2</sup> or PWM | Cpm. PWM <sup>3</sup> | RTC | Interface  | Others     | I/O       | Package            |
| HT32F65432A                                       | 60MHz      | 6V~36V   | 5V  | 3P3N        | 32KB  | 4KB  | 6CH  | 2Msps×1<br>12-bit×12 | 2   | 1   | BFTM×2<br>SCTM×4<br>GPTM×1<br>MCTM×1<br>LSTM×1 | 8                        | 3                     | √   | USART×1<br>UART×1<br>SPI×1<br>I <sup>2</sup> C×1 | CRC<br>DIV | 16<br>29  | 32QFN<br>48LQFP-EP |
| HT32F65532G                                       |            | 6V~48V   |     | 6N          |       |      |      | 2Msps×1<br>12-bit×11 |     |     |  |                          |                       |     |  |            | 22<br>26  | 46QFN<br>48LQFP-EP |
| HT32F65732G*                                      |            | 6V~20V   |     | 6N          |       |      |      | 1Msps×2<br>12-bit×7  |     |     |  |                          |                       |     |  |            | 28        | 48LQFP-EP          |
| HT32F65440A                                       |            | 6V~36V   |     | 3P3N        | 64KB  | 8KB  |      | 3                    | 2   | 26  |  |                          |                       |     |  |            | 48LQFP-EP |                    |
| HT32F65540G                                       |            | 6V~48V   |     | 6N          |       |      |      |                      |     |     |  |                          |                       |     |  |            |           |                    |
| HT32F65740G*                                      |            | 6V~20V   |     | 6N          |       |      |      |                      |     |     |  |                          |                       |     |  |            |           |                    |

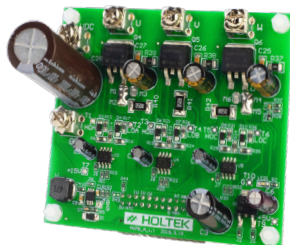
| Cortex-M0+ 32-Bit BLDC Flash MCU with Driver |            |          |     |              |       |      |      |                      |     |     |  |                          |                       |     |  |            |          |                    |
|--|------------|----------|-----|--------------|-------|------|------|----------------------|-----|-----|--|--------------------------|-----------------------|-----|--|------------|----------|--------------------|
| Part No.                                     | Max. Freq. | VCC (HV) | LDO | Peak Current | Flash | SRAM | PDMA | ADC                  | CMP | OPA | Timer <sup>1</sup>                             | Cap. <sup>2</sup> or PWM | Cpm. PWM <sup>3</sup> | RTC | Interface  | Others     | I/O      | Package            |
| HT32F65C32F                                  | 60MHz      | 6V~32V   | 5V  | 3.5A         | 32KB  | 4KB  | 6CH  | 2Msps×1<br>12-bit×12 | 2   | 1   | BFTM×2<br>SCTM×4<br>GPTM×1<br>MCTM×1<br>LSTM×1 | 8                        | 3                     | √   | USART×1<br>UART×1<br>SPI×1<br>I <sup>2</sup> C×1 | CRC<br>DIV | 28<br>14 | 32QFN<br>48LQFP-EP |
| HT32F65C40F                                  |            |          |     |              | 64KB  | 8KB  |      | 1Msps×2<br>12-bit×7  |     |     |  |                          |                       |     |  |            | 3        | 2                  |

\* Under development, available in 2Q, 2023.  
 Note: 1. BFTM: Basic Function Timer, SCTM: Single-Channel Timer, GPTM: General-Purpose Timer, MCTM: Motor Control Timer.  
 2. Cap.: Input Capture.  
 3. Cpm. PWM: Complementary PWM for 3-phase motor control or inverter application.  
 4. Operating Temperature: -40 °C ~ 105 °C.

## BLDC Motor Control Development Boards



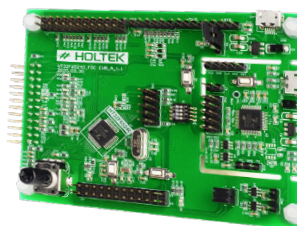
LVPB-A  
DC 8V~26V/2.5A



MVPB-A  
DC 15V~60V/20A



HVPB-A  
AC 85V~265V/2.5A



FOC-EVB



Best Modules Online Shop

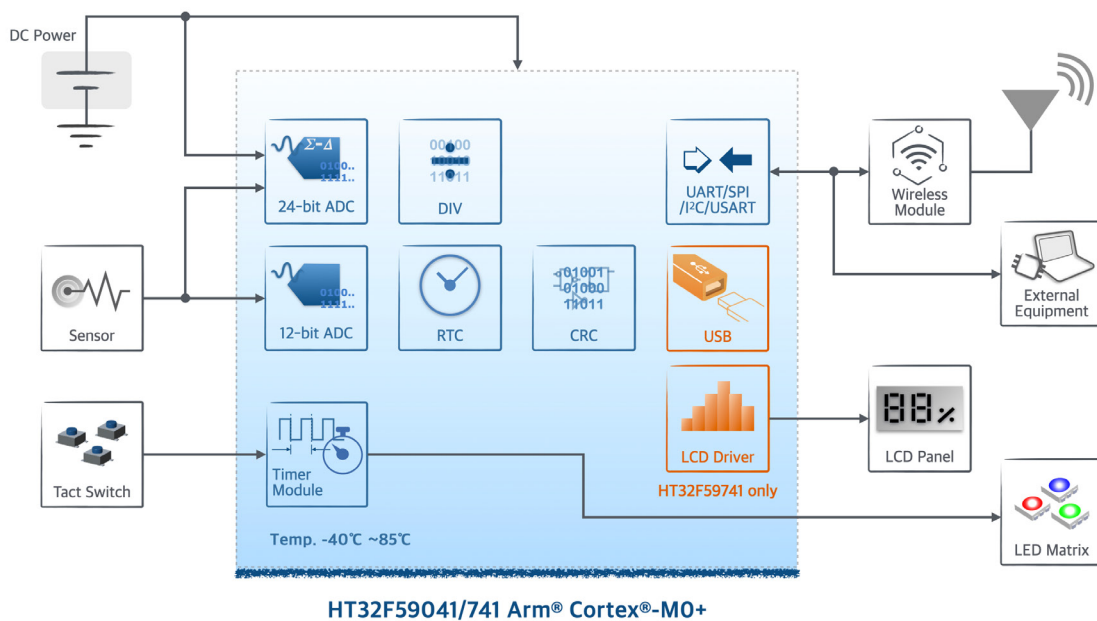
# HT32 High Accuracy Measurement Applications

24-bit Delta Sigma ADC for high accuracy measurements



Holtek has released its new Arm® Cortex®-M0+ MCUs, the HT32F59xxx series, which are specially designed for high accuracy measurement applications. The integrated A/D converter has an Effective Number of Bits (ENOB) of up to 20.7 and has a conversion rate of up to 1.6 kHz, which combined with the 12-bit SAR A/D converter that has a conversion rate of 1 MHz, allows users to implement fast and accurate measurements. Other resources include an LCD display driver, USB, UART and other commonly used serial transmission interfaces. These make the devices suitable for a diversified range of applications including electronic scales, blood pressure meters, temperature meters, high accuracy industrial controls or instrumentation etc.

## High Accuracy Measurement Application Block Diagram



## Arm® Cortex®-M0+ High Accuracy Measurement Purpose Selection Guide

| Enhanced 24-Bit A/D Cortex-M0+ 32-Bit MCU     |            |            |       |      |                            |                          |                                     |                          |                       |                  |  |                   |  |            |          |                  |
|---|------------|------------|-------|------|----------------------------|--------------------------|-------------------------------------|--------------------------|-----------------------|------------------|--|-------------------|--|------------|----------|------------------|
| Part No.                                      | Max. Freq. | VDD        | Flash | SRAM | ADC                        |                          | Timers <sup>1</sup>                 | Cap. <sup>2</sup> or PWM | Cpm. PWM <sup>3</sup> | RTC              | Interface  | Others            | I/O  | Package    |          |                  |
| HT32F59041                                    | 20MHz      | 2.5V~5.5V  | 64KB  | 8KB  | SAR ADC 1MSPS<br>12-bit×12 | Delta Sigma ADC 24-bit×4 | BFTM×2<br>PWM×2<br>GPTM×1<br>MCTM×1 | 16                       | 3                     | √                | USART×1<br>UART×2<br>SPI×1<br>I <sup>2</sup> C×1 | CRC<br>DIV        | 30   | 48LQFP     |          |                  |
| Enhanced 24-Bit A/D Cortex-M0+ 32-Bit LCD MCU |            |            |       |      |                            |                          |                                     |                          |                       |                  |  |                   |  |            |          |                  |
| Part No.                                      | Max. Freq. | VDD        | Flash | SRAM | ADC                        |                          | Timers <sup>1</sup>                 | Cap. <sup>2</sup> or PWM | RTC                   | SCI <sup>4</sup> | USB <sup>5</sup>                                 | LCD               | Inter-<br>face                                 | Others     | I/O      | Package          |
| HT32F59741                                    | 60MHz      | 1.65V~3.6V | 64KB  | 8KB  | SAR ADC 1MSPS<br>12-bit×10 | Delta Sigma ADC 24-bit×4 | BFTM×2<br>PWM×2<br>GPTM×1           | 12                       | √                     | 1                | √  | 29×4<br>~<br>25×8 | USART×1<br>UART×2<br>SPI×2, I <sup>2</sup> C×2 | CRC<br>DIV | 43<br>53 | 64LQFP<br>80LQFP |

Note: 1. BFTM: Basic Function Timer, SCTM: Single-Channel Timer, GPTM: General-Purpose Timer, MCTM: Motor Control Timer.  
 2. Cap.: Input Capture.  
 3. Cpm. PWM: Complementary PWM for 3-phase motor control or inverter application.  
 4. SCI: ISO7816-3 Smart Card Interface.  
 5. USB 2.0 Full Speed Device.

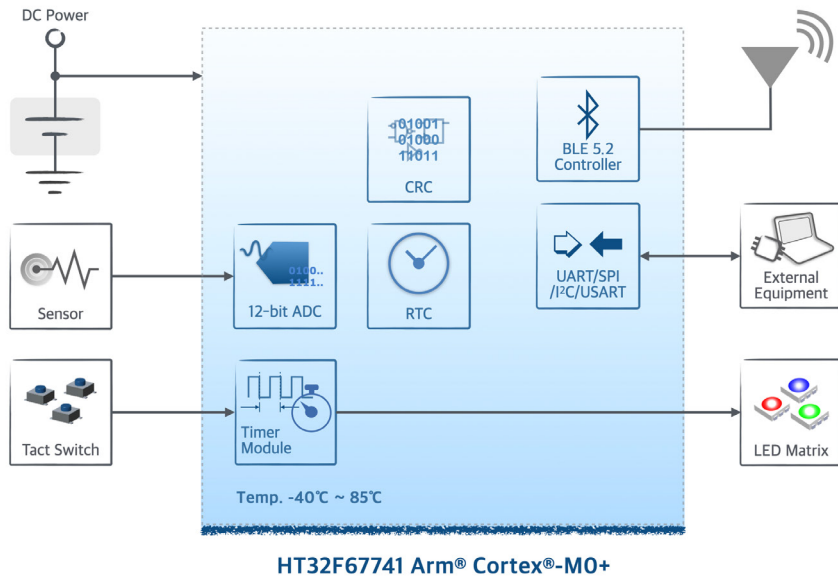
# HT32 BT5.2 Low Power Bluetooth Applications

Bluetooth Low Energy wireless data transmission technology that meets the needs of Internet of Things (IoT) applications



Smart phones have led to the widespread popularity of Bluetooth devices. Audio transmission is a larger application of Bluetooth peripherals, following are data transmission (e.g., wearable devices or healthcare) and location services (e.g., indoor guidance or dissemination of point-of-interest information). For the latter two applications, Holtek has released a Bluetooth low energy Arm® Cortex®-M0+ dual-core SoC MCU, the HT32F67741, which has passed the BLE5.2 BQB (Bluetooth Qualification Body) certification. The device is suitable for use in health care products, home appliances, beacons, intelligent leisure products, data loggers, human interface devices (HID) service, etc.

## BT5.2 BLE Low Power Bluetooth Application Block Diagram



## Arm® Cortex®-M0+ BLE Bluetooth Purpose Selection Guide

| Cortex-M0+ 32-Bit BLE MCU |            |           |       |      |                   |  |      |           |              |             |                                     |                 |     |         |
|---------------------------|------------|-----------|-------|------|-------------------|--|------|-----------|--------------|-------------|-------------------------------------|-----------------|-----|---------|
| Part No.                  | Max. Freq. | VDD       | Flash | SRAM | ADC               | Timers #   | Ver. | Data Rate | Output Power | Sensitivity | Interface                           | Others          | I/O | Package |
| HT32F67741                | 40MHz      | 2.0V~3.6V | 64KB  | 8KB  | 1Msps<br>12-bit×6 | RTC×1<br>WDT×1<br>BFTM×2<br>SCTM×4<br>GPTM×1<br>MCTM×1 | 5.2  | 1/2Mbps   | +3.5dBm      | -94/-91dBm  | USART×1<br>UART×2<br>SPI×2<br>I²C×2 | CRC×1<br>TRNG×1 | 25  | 46QFN   |

Note: # BFTM: Basic Function Timer, SCTM: Single-Channel Timer, GPTM: General-Purpose Timer, MCTM: Motor Control Timer.

