HOLTEK MCU Series HT32 Arm Cortex M Instruction Manual

Contents

HOLTEK

HOLTEK MCU Series HT32 Arm Cortex M

Product Information

Holtek 32-bit MCUs are high-quality solutions that help customers quickly enter the market. They provide customers with advantages of high integration and practicability, achieving an excellent combination of power, price, and performance. The MCUs have features that assist customers in shortening the product development process and seizing market opportunities. The HT32 M0+ Series offers the following major advantages:

- Core: M0+ core
- Power Supply: POR/PDR
- Serial Wire Debug
- Backup Domain Power Management
- Internal Oscillators
- BOD/LVD
- External Oscillators
- Real-Time Clock
- Watchdog Timer
- System Clock PLL
- NVIC
- Best Choice for Price, Power, Performance Interfaces:
    - SPI Master/Slave

    - I2C Master/Slave
    - USART Interface
    - UART Interface
    - USB Interface
- Smart Card Interface 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 The HT32 M3 Series offers the following major advantages:
- Core: M3 core
- Power Supply: POR/PDR Backup Domain Power Management
- BOD/LVD –
- High Efficiency, Abundant Peripherals and Interfaces Interfaces:
- SPI Master/Slave
- I2C Master/Slave
- USART Interface
- UART Interface
- USB Interface
- Smart Card Interface

CMOS Sensor Interface 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 Holtek offers a wide range of flexible 32-bit MCU choices to meet various application needs. The MCU lineup includes different models with varying flash memory sizes, SRAM sizes, power supply voltages, and maximum frequencies.

Product Usage Instructions

1. Choose a proper 32-bit MCU for your product application considering factors like performance, power consumption, package type, tooling, and cost.
2. Familiarize yourself with the specific features and advantages of the HT32 M0+ Series and HT32 M3 Series MCUs.
3. Determine the required interfaces for your application and select the appropriate MCU that supports those interfaces. Consider the memory requirements of your application and choose an MCU with sufficient flash memory and SRAM.
4. Understand the available peripherals and select an MCU that provides the necessary peripherals for your application.
5. Take into account any analog features required for your application, such as A/D converters or comparators.
6. Refer to the HT32 MCU Selection Guide to find the specific part number that matches your desired specifications. Ensure that you have the necessary power supply voltage for the chosen MCU.
7. Follow the recommended operating frequency range for the MCU.
8. If programming is required, refer to the IAP and ISP Programming Methods provided by Holtek.
9. Consult the Holtek website (**www.holtek.com**) for additional resources, documentation, and support for using their 32-bit MCUs.

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 upgrating 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

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

- **Core**

  Arm® Cortex® -M0+ Processor
  - Serial Wire Debug
  - Internal Oscillators
  - External Oscillators
  - Real Time Clock
  - Watchdog Timer
  - System Clock PLL
  - NVIC
- **Memory**
  - 16 ~ 256 KB Flash Memory
  - 4 ~ 32 KB SRAM
  - Multiple Booting Modes
  - Flash Memory Protection
  - IAP and ISP Programming Methods
- **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
- **Analog Features**
  - A/D Converter

    - A/D Converter
- **Peripherals**
    - General Purpose Timer
    - PWM Generator
    - General Purpose
    - Input/Output Ports
    - Reset Control Unit
    - Motor Control Timer
    - Cyclic Redundancy
    - Check Perpherial
    - Direct Memory Access

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

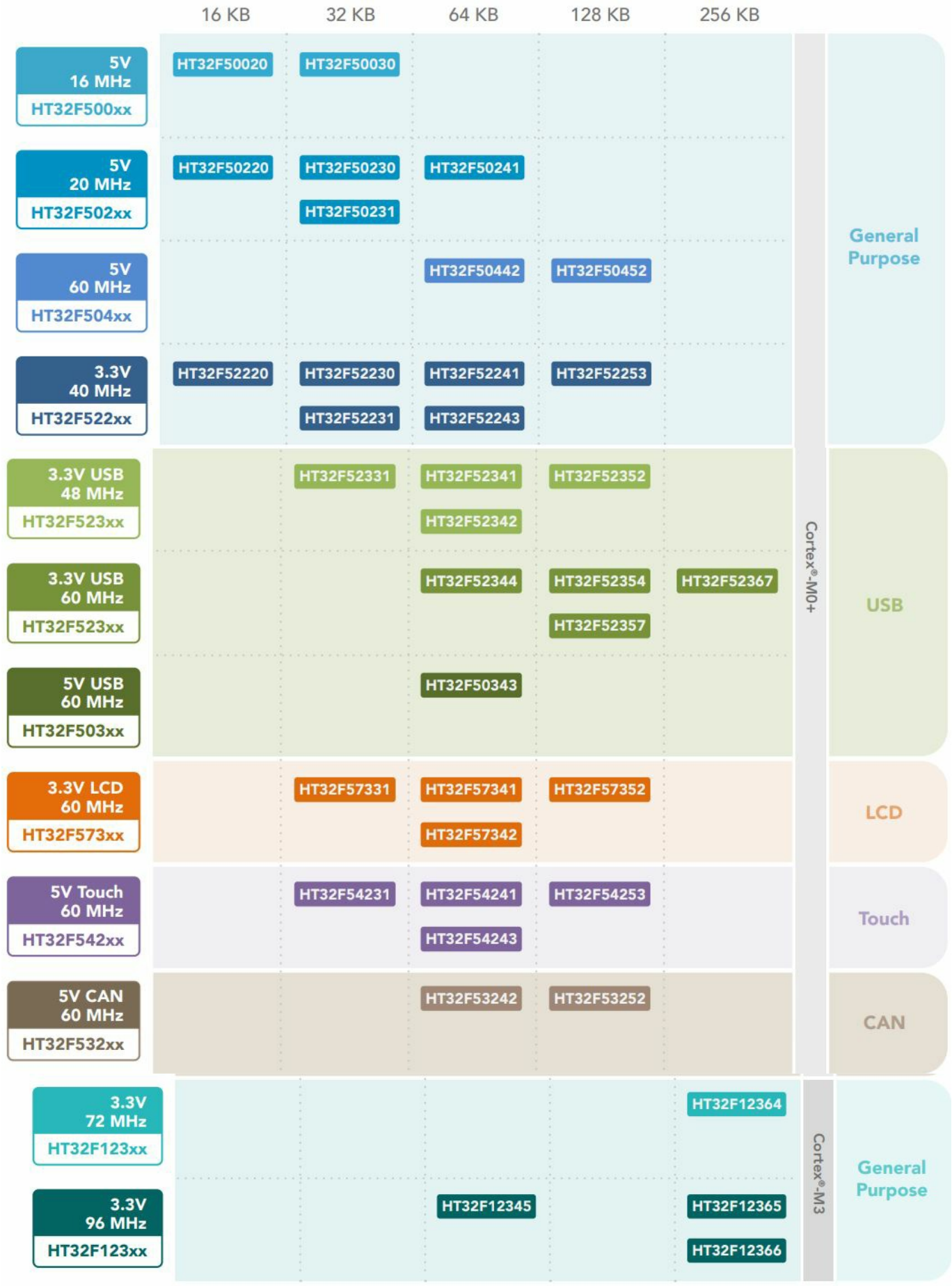
- 32-bit Arm® Cortex®-M3+ processor core
- Up to 96 MHz operating frequency
- Up to 256 KB on-chip Flash memory and 128 KB on-chip SRAM
- Flash memory protection
- Multiple booting modes
- 24-bit SysTick timer
- ISP and IAP programming methods
- 3 power domains
- 12-bit SAR A/D converter with a conversion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

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

- **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
- **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 Perpherial
    - 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.



HT32 MCU Selection Guide

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[*1]	Cap.[*2] or PWM	Cpm. PWM[*3]	RTC	Interface	Others	I/O	Package
HT32F52220	40MHz	2.0V ~ 3.6V	16KB	4KB	—	1Msps 12-bit ×8	BFTM×1 SCTM×2 GPTM×1	6	—	—	USART×1 UART×1 SPI×1, I²C×1	—	19	24SSOP
													23	28SSOP
HT32F52230			32KB	4KB									23	33QFN
HT32F52231	40MHz	2.0V ~ 3.6V	32KB	4KB	—	1Msps 12-bit ×1	BFTM×2 SCTM×4 GPTM×1 MCTM×1	12	3	√	USART×1 UART×2 SPI×2 I²C×2	CRC	19	24SSOP
													23	28SSOP
													26	33QFN
													40	48LQFP

HT32F52241			64KB	8KB		2									
HT32F52243	40MHz	2.0V ~ 3.6V	64KB	8KB	6CH	1Msps 12-bit ×12	BFTM×2 SCTM×4 GPTM×1 MCTM×1	12	3	√	USART×2 UART×4 SPI×2 I^2C×3	CRC DIV	26 38 40 52	33QFN 46QFN 48LQFP 64LQFP
HT32F52253			128KB	16KB										

Arm® Cortex®-M0+ 5V General Purpose Series																
Cortex-M0+ 32-Bit	5V MCU															
Part No.	Max. Freq.	VDD	Flash	SRAM	PDMA	ADC	CMP	Timers*1	Cap.*2 / PWM	Cpm. PWM*3	RTC	EBI*6	Interface	Others	I/O	Package
HT32F50020	40MHz	2.5 ~ 3.6V	16KB	2KB				BFTM					UART×2		18 19 23	24QFN 24SSOP 28SSOP

HT32F500300	16MHz	V ~ 5.5V	32KB	2KB	—	1Msps 12-bit ×12	—	×1 SCTM×3	3 / 6	—	√	—	SPI×1 I²C×1	LEDC	26 40 42	32QFN 46QFN 48LQFP
HT32F500220	20MHz	2.5V ~ 5.5V	16KB	4KB	—	1Msps 12-bit ×12	—	BFTM×1 PWM×2 GPTM×1	12 / 12	—	√	—	UART×2 SPI×2 I²C×1	DIV	18 19 23 22 26 36 38 40	24QFN 24SSOP 28SSOP 28SOP 33QFN 44LQFP 46QFN 48LQFP
HT32F500230			32KB	4KB												
HT32F500231			32KB	4KB				BFTM×2 PWM×2 GPTM×1 MCTM×1	16 / 16	3			USART×1 UART×2 SPI×2 I²C×2	CRC DIV		
HT32F500241			64KB	8KB												

HT32F50442*	60MHz	2.5V ~ 5.5V	64KB	8KB	6CH	1Msps 12-bit ×12	2	BFTM x2 PWM x2 GPTM x1 MCTM x1	16 / 16	3	√	√	USART x2 UART x2 SPI x 2 I2C x2	CRC DIV LEDC	26 38 40 54	32QFN 46QFN 48LQFP 64LQFP
HT32F50452*			128KB	16KB												

Arm® Cortex®-M0+ USB Series

Cortex-M0+ 32-Bit			USB MCU																	
Part No.	Max. Freq.	VDD	Flash	SRAM	PDMA	ADC	CMP	DAC	Timers*1	Cap.*2 or PWM	Cpm. PWM*3	RTC	SCI*4	USB*5	EBI*6	I2S	Inter- face	Others	I/O	Package
HT32F52331	48M	2.0V ~	32KB	4KB	—	1Msps 12-bi	—	—	BFTM ×2 SCTM ×4 G	12	3	√	1	√	—	—	USART×1 UART×2 SPI×	CR	24	33QFN 4

HT32F52341	Hz	3.6V	64KB	8KB		t×12			PTM×1MCTM×1								2 I²C×2	C	38	8LQFP
HT32F52342	48MHz	2.0V ~ 3.6V	64KB	8KB	6CH	1Msps 12-bit ×12	2	—	BFTM×2SCTM×2GPTM×2MCTM×1	14	3	√	2	√	√	√	USART×2 UART×2 SPI×2 I²C×2	CRC	26 39 51	33QFN 48LQFP 64LQFP
HT32F52352			128KB	16KB																
HT32F52344	60MH	1.65V ~ 3	64KB	8KB	6CH	1Msps 12-bit	2	—	BFTM×2SCTM×2GP	10	3	√	—	√	√	—	UART×2 SPI×2 I²C×1	CRC DIV	26 38 40 54	33QFN 46QFN 48L

HT32F52354	z	.6V	128KB	8KB		×12			TM×1 MCTM×1															QFP64 LQFP
HT32F52357	60MHz	1.65V ~3.6V	128KB	16KB	6CH	1Msps 12-bit ×12	2	500Ksps 12-bit×2	BFTM×2 SCTM×2 PWM×2 GPTM×1 MCTM×1	18	3	√	2	√	√	√	USART×2 UART×4 SPI×2 QSPI×1*8 I^2C×2	AES CRC DIV	37 39 53 67	46QFN 48LQFP 64LQFP 80LQFP
HT32F52367			256KB	32KB																				
Arm® Cortex®-M0+ USB 5V Series																								
Cortex-M0+ 32-Bit		5V USB MCU																						
Part No.	Max. Freq.	VDD	Flash	SRAM	PDMA		ADC	Timers*1	Cap.*2 or PWM*3	RTC	USB*5	Interface	Others	I/O	Package									

HT32F50343	60MHz	2.5V ~ 5.5V	64KB	12KB	6CH	1Msps 12-bit×12	BFTM×2 SCTM×2 8-PWM×3 GPTM×1	30	√	√	UART×2 SPI×2 I^2C×2 SLED×8[*][7]	CRC DIV	23 35 37 51	32QFN 46QFN 48LQFP 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[*1]	Cap. or PWM[*2]	RTC	SCI[*4]	USB[*5]	I²S	LCD	Inter-face	Others	I/O	Package
HT32F57331	60MHz	1.65V ~ 3.6V	32KB	4KB	—	1Msps 12-bit ×10	—	—	BFTM×2 PWM×2 GPTM×1	12	√	1	√	—	29×4 ~ 25×8	USART×1 UART×2 SPI×2 I²C×2	CRC DIV	37 39 53	46QFN 48LQFP 64LQFP
HT32F57341			64KB	8KB															
HT32F57342	60MHz	1.65V ~ 3.6V	64KB	8KB	6CH	1Msps 12-bit ×10	2	500Ksps 12-bit×2	BFTM×2 SCTM×2 PWM×2 GPTM×1	14	√	2	√	√	37×4 ~ 33×8	USART×1 UART×2 SPI×2 I²C×2	AES CRC DIV	37 39 53 67	46QFN 48LQFP 64LQFP 80LQFP
HT32F57352			128KB	16KB															
Arm® Cortex®-M0+ Touch Series																			

Cortex-M0+ 32-Bit 5V Touch MCU																
Part No.	Max. Freq.	VDD	Flash	SRAM	PDMA	ADC	CMP	Timers*1	Cap.*2 or PWM*3	Cpm.PWM*3	RTC	Touch Key	LED Controller	Interface	Others	I/O	Package
HT32F54231	60MHz	2.5V ~ 5.5V	32KB	4KB	—	1Msps 12-bit ×10	—	BFTM×2 SCTM×2 GPTM×1 MCTM×1	10	3	√	24	8×8	USART×1 UART×2 SPI×2 I2C×2	CRC DIV LEDC	23 26 38 40	28SSOP 32QFN 46QFN 48LQFP
HT32F54241			64KB	8KB													
HT32F54243	60MH	2.5V ~ 5.	64KB	8KB	6CH	1Msps 12-bit	2	BFTM×2 SCTM×4 GPT	12	3	√	28	12×8	USART×2 UART×4 SPI	CRC DIV LEDC	26 38 40 54	32QFN 46QFN 48LQFP

HT32F54253	z	5V	128KB	16KB		×10		M×1 MCTM×1							×2 I2C×3			64L QFP

Arm® Cortex®-M0+ CAN Series

Cortex-M0+ 32-Bit CAN MCU																	
Part No.	Max. Freq.	VDD	Flash	SRAM	PDMA	ADC	CMP	Timers*1	Cap.*2 / PWM	Cpm. PWM*3	RTC	EBI*6	CAN	Interface	Others	I/O	Package
HT32F53242*	60MHz	2.5V ~ 5.5V	64KB	8KB	6CH	1Msps 12-bit×12	2	BFTMx2 PWMx2 GPTMx1 MCTMx1	16 / 16	3	√	√	1	USART x2 UARTx2 SPI x2 I2C x2	CRC DIV LEDC	26 38 40 54	32QFN 46QFN 48LQFP 64L QFP
HT32F53252*			128KB	16KB													

Arm® Cortex®-M3 General Purpose Series

Cortex-M3 32-Bit MCU																		
Part No.	Max. Freq.	VDD	Flash	SRAM	PDMA	ADC	CMP	Timers[*1]	Cap.[*2] or PWM	Cpm. PWM[*3]	RTC	SCI[*4]	USB[*5]	EBI[*6]	I^2S	Inter-face	Others	I/O	Package
HT32F12345	96MHz	2.0V ~ 3.6V	64KB	16KB	12CH	1Msps 12-bit ×12	2	BFTM×2 GPTM×2 MCTM×2	16	6	√	—	√	√	√	SDIO×1 USART×2 UART×2 SPI×2, I^2C×2	CRC	37 37 51	46QFN 48LQFP 64LQFP
HT32F12365	96MHz	2.0V ~ 3.6V	256KB	64KB	12CH	1Msps 12-bit ×16	2	BFTM×2 GPTM×2 MCTM×2	16	6	√	2	√	√	√	SDIO×1 USART×2 UART×2 SPI×2, I^2C×2	AES CRC	37 37 51 80	46QFN 48LQFP 64LQFP 100LQFP
HT32F12366	96MHz	2.0V ~ 3.6V	256KB	128KB	12CH	1Msps 12-bit ×16	2	BFTM×2 GPTM×2 MCTM×2	16	6	√	2	√	√	√	SDIO×1 USART×2 UART×2 SPI×2, I^2C×2	AES CRC	37 37 51 80	46QFN 48LQFP 64LQFP 100LQFP
HT32F12364	72MHz	1.65V ~ 3.6V	256KB	128KB	6CH	1Msps 12-bit ×8	—	BFTM×2 SCTM×2 PWM×1 GPTM×1	10	—	√	1	√	√	—	USART×1 UART×2 SPI×2, I^2C×2	AES CRC	32 38 52	40QFN 48LQFP 64LQFP
Arm® Cortex®-M3 Fingerprint Recognition Purpose																			

Cortex-M3 32-Bit Fingerprint MCU																		
Part No.	Max. Freq.	VDD	Flash	SRAM	PDMA	ADC	CMP	Timers*1	Cap. *2 or PWM	Cpm. PWM *3	RTC	SCI*4	USB*5	EBI *6	CSIF *7	Inter-face	Others	I/O	Package
HT32F2366	96MHz	2.0V ~ 3.6V	256KB	128KB	12CH	1Msps 12-bit ×16	2	BFTM×2 GPTM×2 MCTM×2	16	6	√	2	√	√	√	SDIO×1 USART×2 UART×2 SPI×2 I²C×2 I²S×1	AES CRC CSIF	37 37 51 80	46QFN 48LQFP 64LQFP 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.

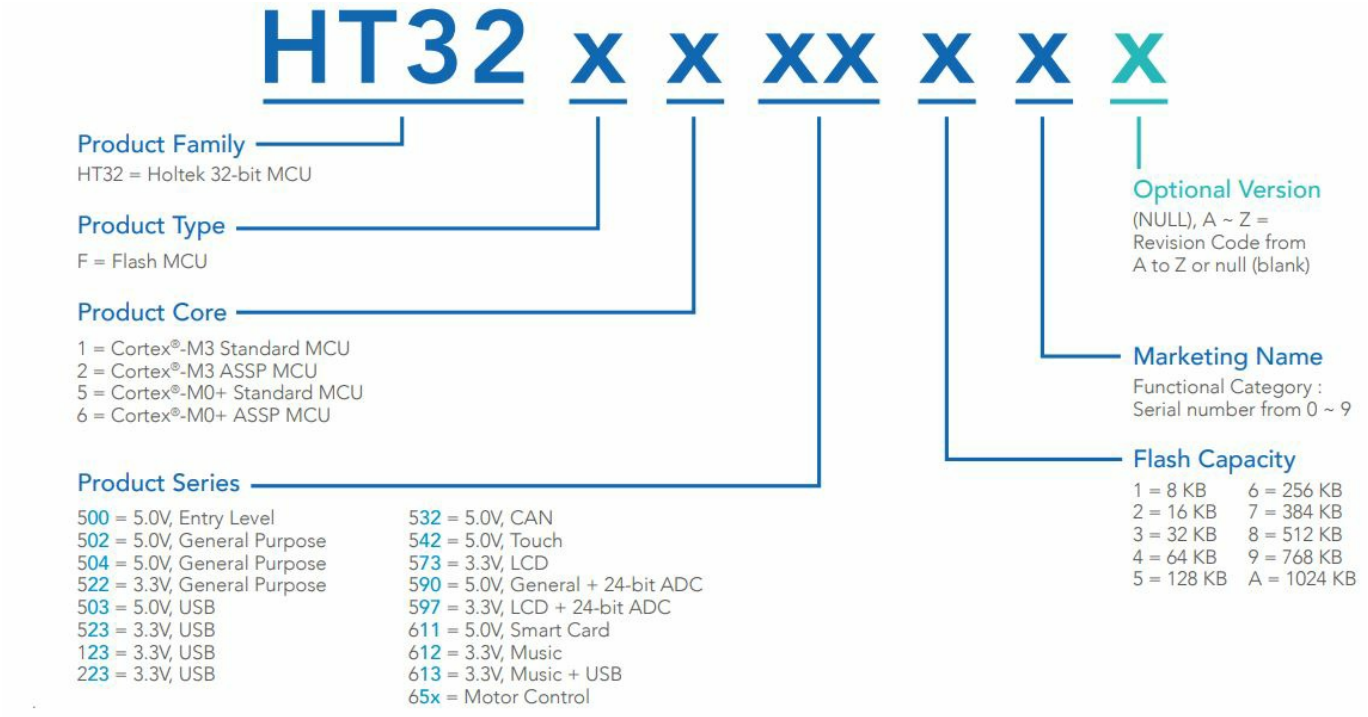
Package Size

	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, potentionmeter, 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.

https://www.bestmodulescorp.com/

Development Resources

Development Resources	Firmware Library	Development Environment
• Support multiple development environments and free Keil (Cortex®-M0+ series) • HT32 firmware, application examples • Datasheet, user manuals, application notes • ISP/IAP/Writer tools	CMSIS COMPLIANT • Peripheral Drivers • Examples • Board Support Driver	arm KEIL IAR SYSTEMS SEGGER It simply works! GCC

USB Debug Adapter

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

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

Expansion Boards

Functional extension of starter kit

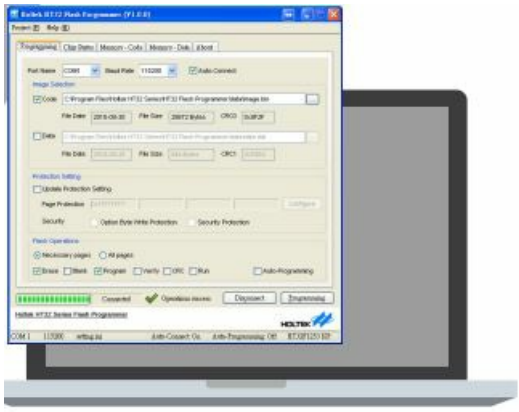
Model	Features
ESK32-20001 ESK32-20001A	The basic expansion board is designed for use with the ESK-30xxx series of starter kits. Expansion board functions include: • User interfaces: 8080/SPI LCD connectors, buzzer, LEDs, potentionmeter, keys, touch keys • Communication: RS232 and multiple interfaces for module expansion • Storage: EEPROM, SPI Flash, SD card slot
ESK32-21001 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

- **e-Writer32**
  - 1 Site Programming
  - Online/Offline Modes

- **Gang-Writer32-8**
  - 8 Sites Parallel Programming
  - Offline Mode

- **IAP Reference Examples**
  - USB HID, Mass Storage, DFU UART
  - I2C Slave
  - SPI Slave



- **e-Link32 Pro**
  - IDE/Offline/CMD Modes

HT32 MCU Development Resources and Download Website
The development resources include datasheet, reference documents, schematics, HT32 firmware library, PC driver, tools, etc. **https://mcu.holtek.com/ht32/resource/**

Application Products

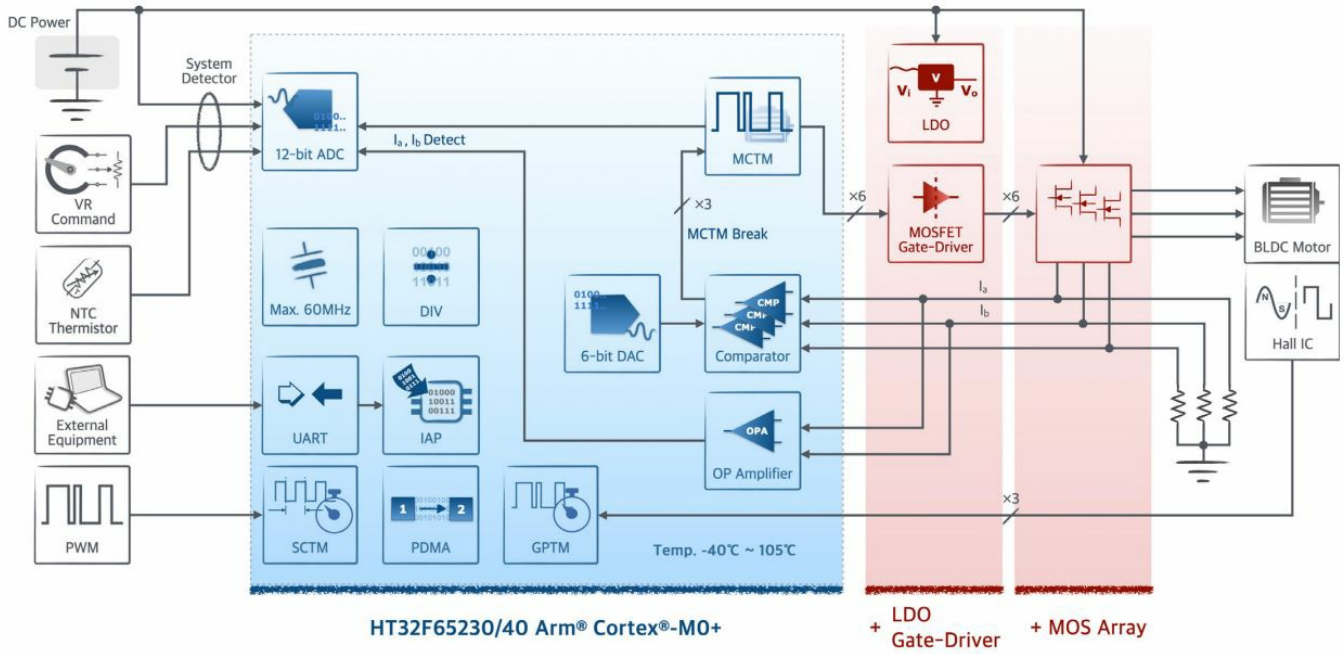
- **Smart Home**
  More and more household appliances such as smart and connection type of products require 32-bit processing.
- **IoT/Wearable Devices**
  The demand for a low power consumption 32-bit MCU in wearable devices is growing.
- **USB Peripherals**
  USB is still the most versatile interface and an essential feature of PC-related products.
- **Intelligent Leisure Products**
  Higher-level leisure products require a 32-bit MCU in terms of computing power and cost efficiency.
- **Data Processors/Recoders**
  32-bit processing capabilities are required for enhanced data processing.

HT32 BLDC Motor Control Applications

BLDC MCUs with integrated intellengent 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 intellegent 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 prducts 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 applicances, ceiling fans, range hoods, gargen tools, robots, electric scooters, quadcopters, etc.

BLDC Motor Control Application Block Diagram



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

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[*1]	Cap.[*2] or PWM	Cpm. PWM[*3]	RTC	Interface	Others	I/O	Package
HT32F65232	60 MHz	2.5 V~ 5.5 V	32KB	4KB	6CH	2Msps×1 12-bit×12	2	1	BFTM×2 SCTM×4 GPTM×1 MCTM×1 LSTM×1	12	3	—	USART×1 UART×1 SPI×1 I²C×1	CRC DIV	20 28 44	24 SSOP 32 QFN 48LQFP
HT32F65230			64KB	8KB		1Msps×2 12-bit×8	3	2	BFTM×2 SCTM×4 GPTM×1 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[*1]	Cap.[*2] or PWM	Cpm. PWM[*3]	RTC	Interface	Others	I/O	Package
HT32F65432A		6V ~ 36 V		3P3N				2Msps×									16 29	32 QFN

HT32F65532G	60MHz	6V ~ 48V	5V	6N	32KB	4KB	6CH	12-bit×12	2	1	BFTM×2 SCTM×4 GPTM×1 MCTM×1 LSTM×1	8	3	√	USART×1 UART×1 SPI×1 I²C×1	CRC DIV	12 28	48LQFP-EP
HT32F65732G*		6V ~ 20V		6N				2Msps×1 12-bit×11									22 26	46QFN 48LQFP-EP
HT32F65440A		6V ~ 36V		3P3N	64KB	8KB		1Msps×2 12-bit×7	3	2							28	48LQFP-EP
HT32F65540G		6V ~ 48V		6N													26	
HT32F65740G*		6V ~ 20V		6N													26	

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*1	Cap.*2 or PWM	Cpm. PWM*3	RTC	Interface	Others	I/O	Package
HT32F65C32F	60MH	6V ~ 32	5V	3.5A	32KB	4KB	6CH	2Msps×1 12-bit×12	2	1	BFTM×2 SCTM×4 GPTM×1 MCTM×1	8	3	√	USART×1 UART×1 SPI×1 I²C×1	CRC DIV	28 14	32QFN 48LQFP-EP

HT32F65C40F	z	V			64KB	8KB		1Msps×2 12-bit×7	3	2	LSTM×1							26	48LQFP-EP

* Under development, available in 2Q, 2023.

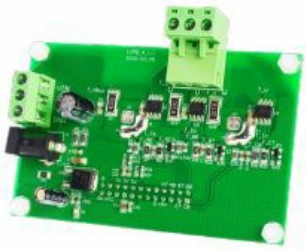
Note: 1. BFTM: Basic Function Timer, SCTM: Single-Channel Timer, GPTM: General-Purpose Timer, MCTM: Motor Control Timer.

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

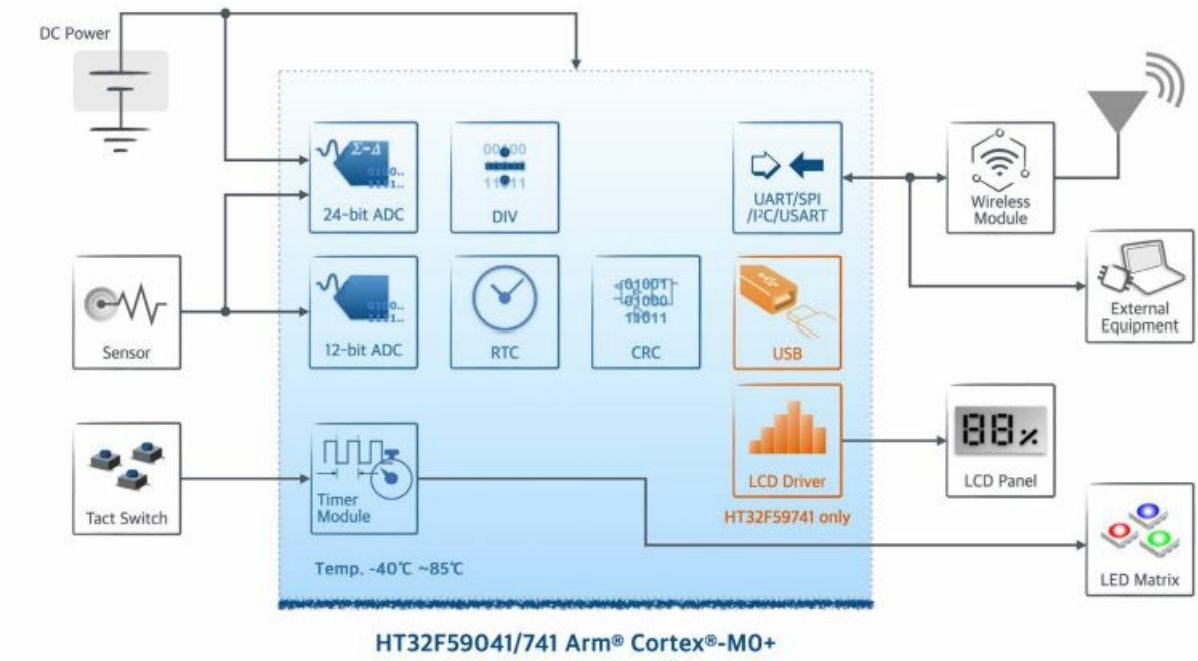
https://www.bestmodulescorp.com/

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 *1	Cap.*2 or PWM	Cpm. PWM* 3	RTC	Interface	Others	I/O	Package

HT32F59041	20MHz	2.5V~5.5V	64KB	8KB	SAR ADC 1Msps 12-bit×12	Delta Sigma ADC 24-bit×4	BFTM×2 PWM×2 GPTM×1 MCTM×1	16	3	√	USART×1 UART×2 SPI×1 I^2C×1	CRC DIV	30	48LQFP

Enhanced 24-Bit A/D Cortex-M0+ 32-Bit LCD MCU

Part No.	Max. Freq.	VDD	Flash	SRAM	ADC		Timers[*1]	Cap.[*2] or PWM	RTC	SCI[*4]	USB[*5]	LCD	Inter- face	Others	I/O	Package
HT32F59741	60MHz	1.65V~3.6V	64KB	8KB	SAR ADC 1Msps 12-bit×10	Delta Sigma ADC 24-bit×4	BFTM×2 PWM×2 GPTM×1	12	√	1	√	29×4 ~ 25×8	USART×1 UART×2 SPI×2, I^2C×2	CRC DIV	43 53	64LQFP 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.

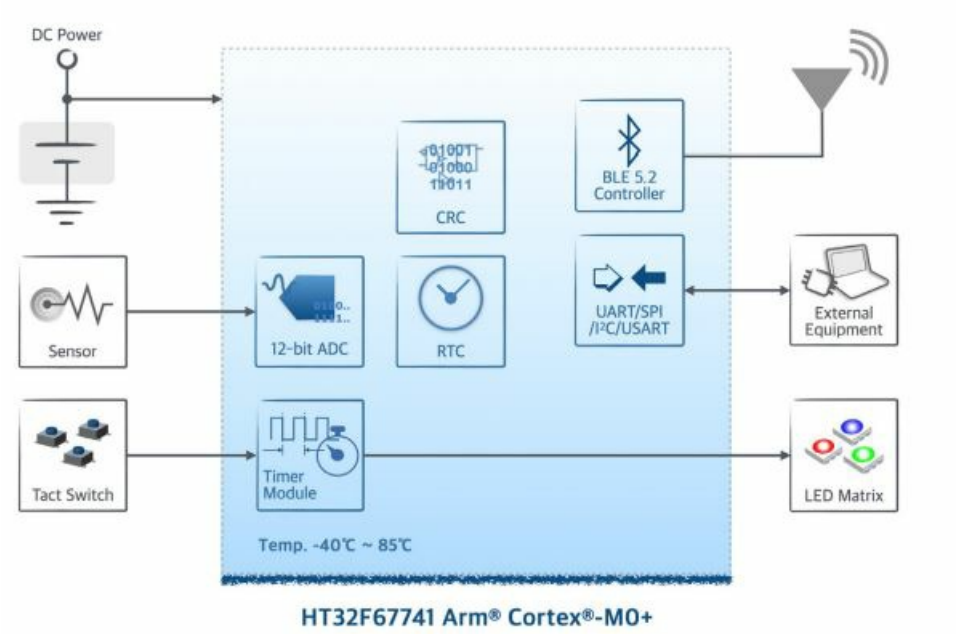
5. USB 2.0 Full Speed Device.

HT32 BT5.2 Low Power Bluetooth Applications

BThluinegtoso(tIohTL)oawppElniceartgiyonwsireless data transmission technology that meets the needs of Internet of

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 12-bit ×6	RTC×1 WDT×1 BFTM×2 SCTM×4 GPTM×1 MCTM×1	5.2	1/2Mbps	+3.5dBm	-94/-91dBm	USART×1 UART×2 SPI×2 I2C×2	CRC×1 TRNG×1	25	46QFN
Note: # BFTM: Basic Function Timer, SCTM: Single-Channel Timer, GPTM: General-Purpose Timer, MCTM: Motor Control Timer.														

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Documents / Resources

	**HOLTEK MCU Series HT32 Arm Cortex M** [pdf] Instruction Manual MCU Series HT32 Arm Cortex M, MCU Series, HT32 Arm Cortex M, Arm Cortex M, Cortex M

References

- **HT32 Development Resource Download**
- **Best Modules: Holtek eStore - Best Modules**