

BX Series MCU Selection Guide Application Note

D/N: AN0665EN

Introduction

The BX series is One-Time Programmable (OTP) MCU series. This series uses an 8-bit architecture with a RISC core to provide users with the advantages of excellent performance, superior operating experience and low power standby abilities. This new MCU series has an OTP (One-Time Programmable) function, which are widely used in general purpose 8-bit MCUs for fixed programs or data storage. The BX series not only supports simple I/O control, but also includes functions such as ORPP (OTP ROM Parameter Program), PWM outputs, LCD driver, ADC, etc. This allows the product range to be more flexible and selective in the process of implementing the innovation and marketing of electronic products.

Additionally, the BX series self-developed evaluation kits, development tools and other free software provide additional convenience for users to easily evaluate, develop and debug their applications thus shortening the development to market time. The general purpose 8-bit MCUs are widely used in simple applications which require low power consumption and low cost. This application note will introduce the OTP MCU series features in detail to assist readers to further understand potential applications and features of the BX series.

Functional Description

The following table lists the main differences between the three types of BX series of MCUs. This will assist users to more easily select the OTP device most suitable for their application requirements.

Category	Part No.	Features	Applications
High Accuracy HIRC MCU	BX68R2420	High accuracy frequency and includes a carrier generator	IR remote control transmitters
I/O MCUs	BX68R002 BX68R003 BX68R004	Programmable PWM outputs, low cost and high performance control functions	General consumer and controlled products such as small home appliances, timers, electronic toys, etc.
A/D MCUs	BX66R002 BX66R0025 BX66R003 BX66R004 BX66R006	Includes all the features of the I/O types, but also has an analog to digital convertor for analog signal acquisition and analysis.	Industrial grade products such as LED lighting, personal care products, charge and discharge management, meter monitoring, home security monitoring, etc.

The following sections will give a detailed introduction to the main features and related applications of these three BX series of MCUs.

High Accuracy HIRC OTP MCU

The BX68R2420 is a high accuracy HIRC OTP MCU. Its key features include an integrated high accuracy RC oscillator, which does not require an external resonator. This allows products to save on the cost of an external 4MHz resonator and two external capacitors. It also has an integrated IR LED driver circuit, which requires no external drive transistor, thus offering further product cost saving and reducing the PCB area. This device also includes an integrated adjustable IR carrier frequency generator with a frequency range of 4kHz to 1MHz. By using Holtek's IR remote controller workshop, four common IR carrier frequency options of 36kHz, 38kHz, 40kHz and 56kHz can be selected. The high accuracy HIRC OTP MCU, the BX68R2420 is suitable for IR remote control related products, which can provide an enhanced ratio of cost/performance to customer products.

Note: The product picture shown here is not from Holtek and is provided for reference only.



Infrared (IR) Remote Control

I/O OTP MCUs

The BX68R00x is the I/O OTP MCU series. These devices have the key feature of using an advanced OTP process to ensure the best optimisation between cost and performance. The detailed features can be summaries by the following.

- This series provides an 8-bit timer for functions such as timing, external event counting and generating PWM outputs. The BX68R002 provides a PWM output signal. The BX68R003 and BX68R004 provide three independent PWM output signals with adjustable period and duty cycle.
- The VPP pin is a programming pin. It has a general I/O function, namely VPPIO. When this pin is setup as a CMOS output, no pull-high resistor is required.
- This series supports OTP ROM parameter program function, namely ORPP. This is convenient for product parameter programming. It should be noted that the BX68R002 is suitable for low pin count applications as it is a cost-effective MCU which does not support the ORPP function.
- The BX68R004 has an integrated SCOM LCD driver circuit to directly drive LCD panels.

Note: Refer to the ORPP related documents on the Holtek website for the ORPP and VPPIO functional applications.

The above BX68R00x series of MCUs are suitable for various LED lighting control products and small home appliances, such as waffle makers, automatic fragrance diffusers, timers and filter status displays.

Note: The product pictures shown here are not from Holtek and are provided for reference only.



Waffle Maker



Automatic Fragrance Diffuser



Timer



Filter Status Display

A/D OTP MCUs

The BX66R00x series of A/D OTP MCUs have a similar design to the BX68R00x series. However this device range include an SAR-ADC function which can be used to interface to sensors and measure analog signals.

- This series provides an 8-bit timer for the functions of timing, external event counting and generating PWM outputs. The BX66R002 and BX66R0025 provide PWM output signals. The BX66R003 and BX66R004 provide three independent PWM output signals with adjustable period and duty cycle. The BX66R006 provides five groups of 16-bit independent PWM output signals with adjustable period and duty cycle.
- The VPP pin is a programming pin. It has a general I/O function, namely VPPIO. When this pin is setup as a CMOS output, no pull-high resistor is required.
- This series supports OTP ROM parameter program function, namely ORPP. This is convenient for users to implement product parameter programming. It should be noted that the BX66R002 is suitable for low pin count applications. It is a cost-effective MCU which does not support the ORPP function.
- The BX66R004/BX66R006 include an integrated SCOM LCD driver circuit to directly drive LCD panels.
- In addition to the BX66R006 which includes a 12-bit SAR-ADC, all others include an 8-bit SAR-ADC function with different external input pins. Refer to the selection table.
- The BX66R006 internally provides V_{BG} voltage to A/D converter as the analog input signal, which can be used to deduce external AV_{DD} voltage.

Note: Refer to the ORPP related documents on the Holtek website for the ORPP and VPPIO functional applications.

The above BX66R00x series of MCUs are suitable for various LED lighting control products, personal care products and small home appliances such as chargers, hair straighteners, electric toothbrushes and electric blankets.

Note: The product pictures shown here are not from Holtek and are provided for reference only.



Charger



Hair Straightener



Electric Toothbrush



Electric Blanket

Reference Catalog

The specifications of the three OTP series of MCUs are different. Figure 1 compares the main differences among the three series of MCUs. The horizontal axis shows the maximum number of pins and the vertical axis shows the ROM capacity.

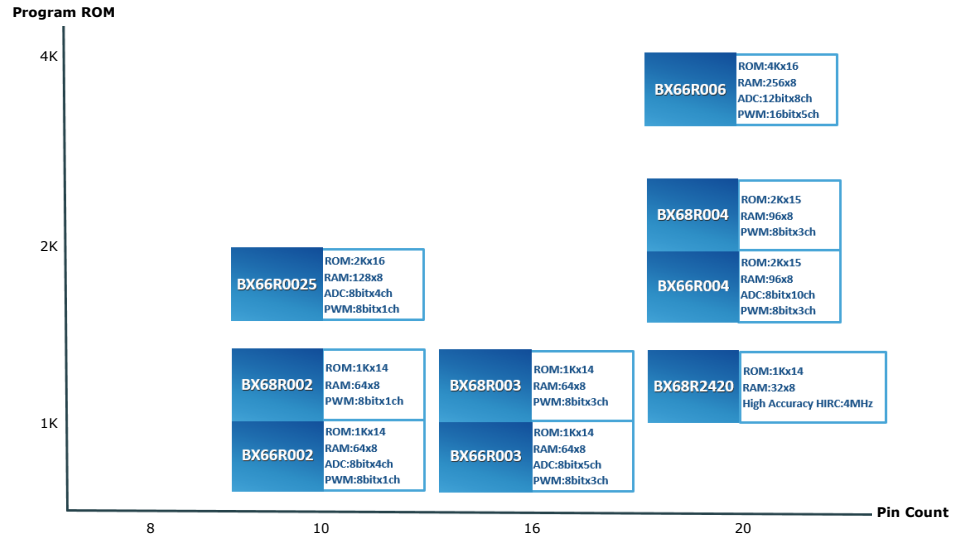


Figure 1

The following selection guide shows the specifications and features of these three series of MCUs.

High Accuracy HIRC OTP MCU									
Part No.	Max. Freq.	V _{DD}	Program Memory	Data Memory	Stack	I/O	Timer	IR Driver	Package
BX68R2420	4MHz	2.0V~5.5V	1K×14	32×8	2	16	9-bit ×1	√	8SOP, 16NSOP, 20NSOP/SSOP
Features									
<ul style="list-style-type: none"> ➢ Integrated high accuracy RC oscillators ➢ Integrated IR LED driver circuit, requires no external transistor thus saving on external component costs ➢ Integrated adjustable IR carrier frequency generator with a frequency range of 4kHz to 1MHz ➢ Four common IR carrier frequency options, namely 36kHz, 38kHz, 40kHz and 56kHz ➢ Applications: IR remote control related products 									

Table 1

I/O OTP MCUs									
Part No.	Max. Freq.	V _{DD}	Program Memory	Data Memory	Stack	I/O	Timer	PWM	Package
BX68R002	8MHz	2.0V~5.5V	1K×14	64×8	2	8	8-bit×1 16-bitx1	8-bit×1	8/10SOP
BX68R003	8MHz	2.0V~5.5V	1K×14	64×8	2	14	8-bit×1 16-bitx1	8-bit×3	8SOP, 16NSOP
BX68R004	8MHz	2.0V~5.5V	2K×15	96×8	4	18	8-bit×1 16-bitx1	8-bit×3	16/20NSOP, 20SOP/SSOP
Features									
<ul style="list-style-type: none"> ➢ Uses an advanced OTP process and has a high cost-effective advantage ➢ The programming pin VPP has an I/O function, namely VPPIO ➢ The BX68R003/004 provide three programmable PWM outputs which can be independently controlled ➢ The BX68R004 contains an integrated SCOM LCD driver to directly drive LCD displays ➢ The BX68R003/004 contain an OTP ROM parameter program function (ORPP) which provides convenience for parameter programming ➢ Can be used in various small home appliances: LED lighting control, waffle makers, automatic fragrance diffusers, timers, filter status displays, etc. 									

Table 2

A/D OTP MCUs										
Part No.	Max. Freq.	VDD	Program Memory	Data Memory	Stack	I/O	Timer	ADC	PWM	Package
BX66R002	8MHz	2.0V~5.5V	1K×14	64×8	2	8	8-bit×1 16-bit×1	8-bit×4	8-bit×1	8/10SOP
BX66R0025			2K×16	128×8	4					
BX66R003	8MHz	2.0V~5.5V	1K×14	64×8	2	14	8-bit×1 16-bit×1	8-bit×5	8-bit×3	8SOP 16NSOP
BX66R004	8MHz	2.0V~5.5V	2K×15	96×8	4	18	8-bit×1 16-bit×1	8-bit×10	8-bit×3	16/20NSOP 20SOP/SSOP
BX66R006	16MHz	1.8V~5.5V	4K×16	256×8	8	18	10-bit STM ×1 16-bit PTM ×1	12-bit×8	16-bit×5	16/20NSOP 20SOP/SSOP/QFN
Features										
<ul style="list-style-type: none"> ➢ Uses an advanced OTP process and has a high cost-effective advantage ➢ The programming pin VPP has an I/O function, namely VPPIO ➢ The BX66R006 provides a multi-channel 12-bit A/D converter function, all others provide a multi-channel 8-bit A/D converter function ➢ The BX66R003/004 provide three programmable PWM outputs which can be independently controlled ➢ The BX66R006 provides five groups of 16-bit programmable PWM outputs which can be independently controlled ➢ The BX66R004/006 contains an integrated SCOM LCD driver to directly drive LCD displays ➢ The BX66R003/004/006/0025 contain an OTP ROM parameter program function (ORPP) which provides convenience for parameter programming ➢ Can be used in various small home appliances: LED lighting control, chargers, hair straighteners, electric toothbrushes, electric blankets, etc. 										

Table 3

The corresponding EV devices for this Holtek BX series of MCUs are shown in the following table.

Part No.	EV Chip
BX68R2420	BX68V2420
BX68R002	BX6XV002
BX68R003	BX6XV003
BX68R004	BX68V004
BX66R002	BX6XV002
BX66R0025	BX66V0025
BX66R003	BX6XV003
BX66R004	BX66V004
BX66R006	BX66V006

Table 4

Conclusion

This application note has introduced how the BX OTP MCUs can be used in the right solution for the user's product requirements. Whether users are looking for high accuracy, cost effectiveness or superior functions, this application note will allow users to make a more informed device selection. With their excellent performance, these MCUs are suitable for various electronic products and control applications from LED lighting control products to home appliance and various application solutions such as smart homes and IoT devices, thus providing users with an important reference when selecting suitable MCUs.

Reference Material

Reference files: BX68R2420, BX68R002/3/4, BX66R002/25/3/4/6 datasheets.

For more information, consult the Holtek official website: <https://www.holtek.com>.

Revision and Modification Information

Date	Author	Issue	Modification Information
2025.03.24	張淙宸	V1.20	Change the MCU type, the MCU functions of the new is the same with the previous type.
2024.12.18	張淙宸	V1.10	Add HT66R006 description
2023.09.18	蔡俊男	V1.00	First Version

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