

GigaDevice Semiconductor Inc.

**Precautions for GD32H77x_H78x
Check_BootLoader Operation**

Application Note

AN315

Revision 1.0

(Oct. 2026)

Table of Contents

Table of Contents	2
List of Tables	3
1. Introduction	4
2. OTA / CNVM Firmware Update	5
2.1. OTA / CNVM Firmware Update Procedure	5
2.2. Precautions for OTA / CNVM Firmware Update	6
3. Other Operations for Using Check_BootLoader	7
4. Revision history	8

List of Tables

Table 2-1. GD32H77x_H78x series OTA function support list table	5
Table 4-1. Revision history	8

1. Introduction

This application note is specifically designed for the GD32H77x_H78x series MCUs, introducing the operational steps and precautions related to the Check_BootLoader.

The Check_BootLoader of the GD32H77x_H78x series is equipped with functions to assist OTA upgrades. Its corresponding functions depend on the specific model, as the firmware update with different ECVN capacities and addresses. Users can enable OTA / CNVM firmware updates, by configuring the relevant option bytes.

Note: This application note is for reference only. In case of any conflict with the user manual or datasheet, the user manual or datasheet shall prevail.

2. OTA / CNVM Firmware Update

The GD32H77x_H78x models feature different CNVM and ECNVM configurations. Some models support OTA functions, while others only support CNVM firmware updates. The specific distinctions are listed below [Table 2-1. GD32H77x H78x series OTA function support list table](#).

Table 2-1. GD32H77x_H78x series OTA function support list table

Model	Function	Update Address
GD32H77xxW (2 MB + 7.5 MB) GD32H78xxW (2 MB + 7.5 MB)	Supports OTA	Bank0 start address 0x08700000. Bank1 start address 0x0850 0000.
GD32H77xxP (2 MB + 3.5 MB) GD32H78xxP (2 MB + 3.5 MB)	Supports the CNVM Firmware Update	Only Bank0 start address 0x08300000.
GD32H77xxL (1.625 MB + 0) GD32H78xxL (1.625 MB + 0)	Do Not Support OTA or CNVM Firmware Update	Not Supported

2.1. OTA / CNVM Firmware Update Procedure

For the complete OTA process and description, refer to the [<GD32H77x/H78x User Manual>](#) chapter on NVMC, specifically section 7.3.8 OTA. The option bytes used for OTA / CNVM Firmware Update are as follows:

- Option Byte SWAP bit: Used to select the source for the CNVM update. When the SWAP bit is set to 0 or 1, the contents of Bank 0 or Bank 1 of the ECNVM, respectively, are copied to the CNVM during an OTA update.
- Option Byte COPYSZ bit: Used to select the block size for OTA verification. When set to 0x00, the block size is 32KB. When set to 0x3F, the block size is 2MB.
- Option Byte OTA_CHECK bit: Enables hardware OTA verification.
- FW_UPDATE bit: Firmware update bit. When set, after a hardware reset, the system will copy the data from the Bank corresponding to the SWAP bit to CNVM.

The operations related to OTA / CNVM firmware are as follows:

1. First, download the new firmware to the corresponding Bank. Then configure COPYSZ (OTA/firmware check size) and the OTA_CHECK bit (to select whether to verify). Finally, set the FW_UPDATE bit and perform a system reset to trigger the firmware update.
2. After the hardware reset completes and the CPU is released, execution jumps to the Check_BootLoader. It checks if the updated data is valid or is not performed. Check_BootLoader sends a reset command and starts the new firmware.
3. If OTA verification fails, or the update fails: Check_BootLoader selects the legacy record or executes a reset to try again or restore. If it still fails, Check_BootLoader restores the SWAP bit to its original value, sets OTAFAIL to 1 to point to the old firmware, and resets again. This achieves a rollback mechanism.

GD32H77xxP / GD32H78xxP has only one Bank and no SWAP bit. Its firmware upgrade

involves copying the content of this Bank to CNVM. Other functions are similar to OTA.

2.2. Precautions for OTA / CNVM Firmware Update

1. During OTA / CNVM firmware updates, check the write protection(WP) for CNVM and ECNVM. The copy area in CNVM should not have WP protection, and the security settings of CNVM and ECNVM backup should match.
2. OTA / CNVM firmware updates are supported execution at a low security protection level. Due to security mechanism, the debugger must be disconnected; otherwise, Check BootLoader may not start.
3. When security protection is set to the high level, OTA / CNVM features are unavailable.
4. OTA / CNVM firmware updates can be supported update from CNVM, ECNVM, sram, and BootLoader. It is recommended to initiate OTA from CNVM code. When booting from sram, the Check_BootLoader still requires some sram space. To avoid memory conflict, the BOOT_ADDR in option bytes should be set to 0x24010000 or a higher address.
5. If large amounts of data (e.g., 2MB) need to be copied to CNVM, the MCU hardware copy operation takes several seconds. Refer to the relevant sections of the chip [GD32H77x / GD32H78x Datasheet](#) for timing details.

3. Other Operations for Using Check_BootLoader

Check_BootLoader has mis-entry prevention mechanisms. If BOOT_ADDR is set to Check_BootLoader's address but no OTA is pending, it jumps to the BootLoader. If the MCU is a low-level read protected, BOOT_ADDR can still point to Check_BootLoader to jumps to Bootloader and allowed GD32AllInOneProgrammer programmer connection or unlocking operations.

If using software logic to jump to Check_BootLoader: When OTA are not required, it will execute the jump to the address configured in BOOT_ADDR.

The GD32H77x_H78x OTP control bit USER_CTL1 can disable certain functions:

- FLBAK_DISABLE : Disable backup functionality.
- SWAP_DISABLE : Disable Bank area switch functionality.
- COPY_DISABLE : Disable upgrade copy functionality

When the corresponding control bits are set, the MCU will neither perform related operations nor enter Check_BootLoader for processing.

4. Revision history

Table 4-1. Revision history

Revision No.	Description	Date
1.0	Initial Release	Oct.20, 2026

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