

# Product Document

# **AS72xx**

## **External Flash program and update**

## Content Guide

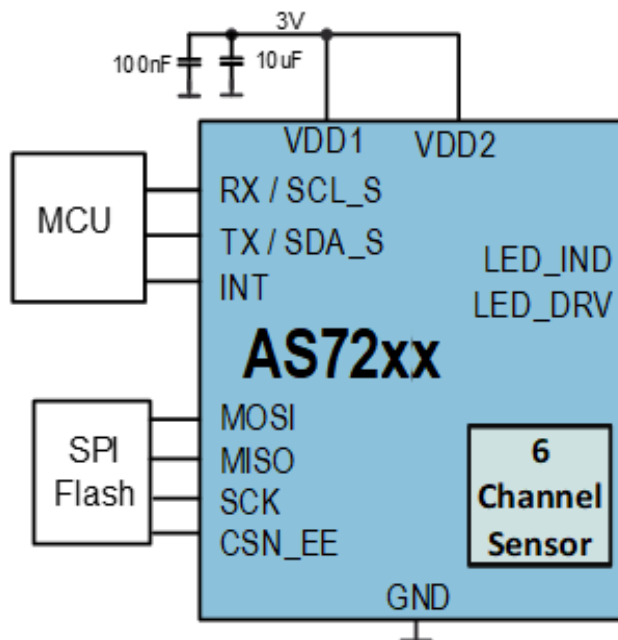
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## 1. General Description

AS72xx products use a serial Flash memory programmed with a pre-designed firmware of ams (part of the product delivery) for standard sensor operations like register configuration, measurement, calibration and matching, communication and networking. After power on and during the boot operation, the Scotty internal firmware checks the availability of the Flash and then it works with the Flash firmware. Note, not all Flash types are can be used and the Flash's must have defined technical parameters to work.

This Application Note describes using the AS72xx UART interface for updating the external program Flash. This app note applies to UART capable AS72xx devices: AS7211, AS7220, AS7221, AS7225, AS7261, AS7262, AS7263 and AS7265x.

**Figure 1: Block diagram AS72xxx with connected MCU, Flash and power supply**



## 2. First Time Flash Programing

Get the latest “\*.bin” file (512KB) from ams for the specific AS72xx device. Have the ams approved serial Flash manufacturer (see figure 3) or one of their distributors<sup>1</sup> use the “\*.bin” file to program the Flash for first time. This is a service they routinely provide. Or, use a Programming setup as to

<sup>1</sup> See for [adesto\\_3rd.Party.Memory.Device.Programmer.Sources\\_11.22.16.pdf](#)

program the Flash (assumes programming tool access to the Flash is available. e.g. FlashCatUSB - see application note “AN\_AS72xx How to Program Firmware with FlashCatUSB”).

In figure 2 *ams* proofed Flash’s are listed which are recommend to use. They are characterized by the following properties<sup>2</sup>, among others:

- Flash size: at minimum 4Mbit,
- Address Bits: 24,
- SPI clock: 16MHz.

**Figure 2: Flash and manufacturer approved by ams**

Serial Flash	Manufacturer	Comment
M95M02-XXXX	ST Micro (Serial EEPROM <sup>2</sup> , not Flash)	only for firmware version v3.x and 4.0.xx
AT25SF041xx AT25DF041xx	Adesto Technologies	no firmware restrictions
MX25L4006ExxI-12G	Macronix	no firmware restrictions
SST25PF040C	Microchip Technology	no firmware restrictions
W25X40CLSNIG	Winbond Electronics	no firmware restrictions
LE25U40CMD	ON Semiconductor	no firmware restrictions

(xx = alternative packages)

After the programming for first time, an update for firmware will be possible also by a special GUI function in the test software. More details are given in the document later or see the details in the user manuals for the test software.

<sup>2</sup> EEPROMs are not supported longer for Scotty firmware version higher than v3.x and 4.0.xx – for more details see the application note “EEPROM Updating using I2C”

### 3. Flash Updating

Several methods are possible to update a new firmware release to a programmed Flash memory in the ams test systems and evaluation boards (or similar customer boards). It is depending on the used hardware, the pro-programmed firmware version and the available tools. The following table gives an overview for possible programming methods for each AS72xx type depending on the re-programmed firmware version.

**Figure 3: Methods for Flash updating ams test systems**

Sensor Name	FlashCat USB programmer tool	Special Firmware Update GUI (UART Communication)	Sensor Test Software <sup>3</sup> (I <sup>2</sup> C or UART depending the used software)
<b>AS7261</b>	All version (*.bin 512 or 256KB)	2Vx.x – 11vx.x (*.bin 56KB)	≥11Vx.x (*.bin 56KB)
<b>AS7262</b>	All version (*.bin 512 or 256KB)	2Vx.x – 11Vx.x (*.bin 56KB)	≥11Vx.x (*.bin 56KB)
<b>AS7263</b>	All version (*.bin 512 or 256KB)	2Vx.x – 11Vx.x (*.bin 56KB)	≥11Vx.x (*.bin 56KB)
<b>AS7265 FW - Gen 1</b>	All versions till 10Vx.x (*.bin 512 or 256KB)	V1.2.8 – 10Vx.x (*.bin 56KB)	V1.2.8 – ≥10Vx.x (*.bin 56KB)
<b>AS7265 FW - Gen 2<sup>4</sup></b>	AS7265_Complete_moonlight.bin (Hardware until 1Vx) Greater than or equal to 11Vx.x supported	At least one time flashing with FlashCat USB 11Vx.x or higher, then it will support update with 11Vx.x or higher in this method	At least one time flashing with FlashCat USB ≥11Vx.x or higher, then it will support update with ≥11Vx.x
<b>AS7221</b>	All version (*.bin 256 KB)	4V0.x – 11Vx.x (*.bin 56KB)	4V0.x – ≥11Vx.x (*.bin 56KB)
<b>AS7225</b>	All version (*.bin 256 KB)	-----	≥12Vx.x

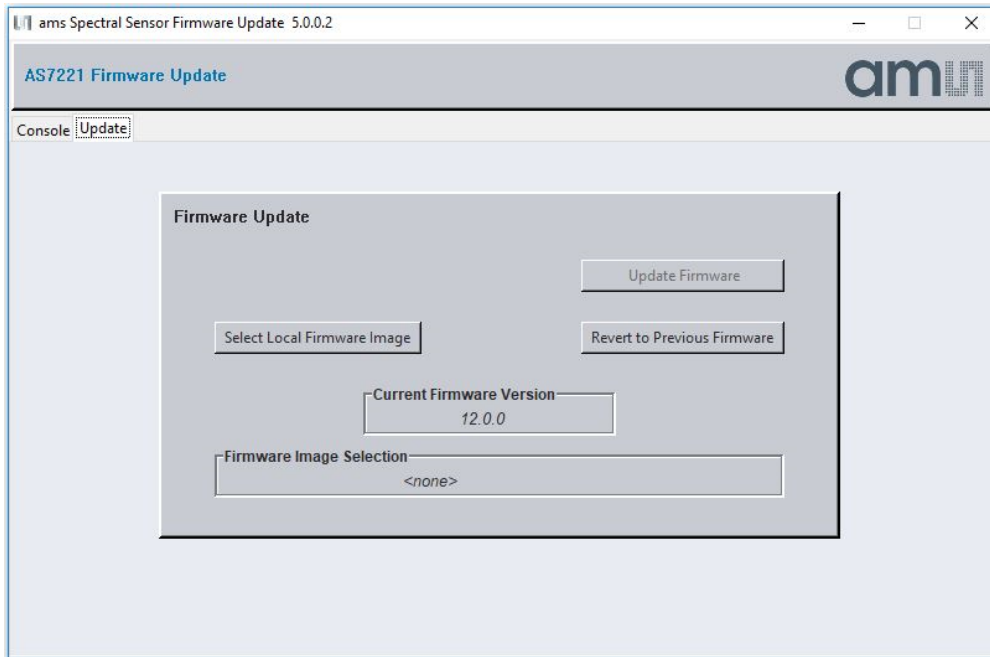
<sup>3</sup> AS726x iSPI software v3.3.x for spectral sensor and Dashboard v4.2.x for AS7265 (via I<sup>2</sup>C) and AS72xx smart lighting manager sensors (via UART)

<sup>4</sup> Change in the pinning of AS7265, Please refer release-notes.txt of AS7265 for details

#### 4. Flash Updating using the special Update GUI

AS72xx devices with UART can use the **ams** AS72xx Firmware Update GUI for updating the Flash. This GUI is described in an special application note “Firmware Update GUI”.

Figure 4: ams AS72xxx Firmware Update GUI



#### 5. Flash Updating using the GUI UART

AS72xx devices can use defined AT commands for updating the Flash via standard programmer devices with UART interface. The latest 56KB “\*.bin” file from ams for the specific AS72xx device must be available.

Figure 5 describes the AT commands for Flash Updating via UART. In this table, text appearing between angle brackets (‘<’ and ‘>’) are commands or response arguments. A carriage return character, a linefeed character, or both may terminate commands and responses. Note that any command that encounters an error will generate an “ERROR” response.

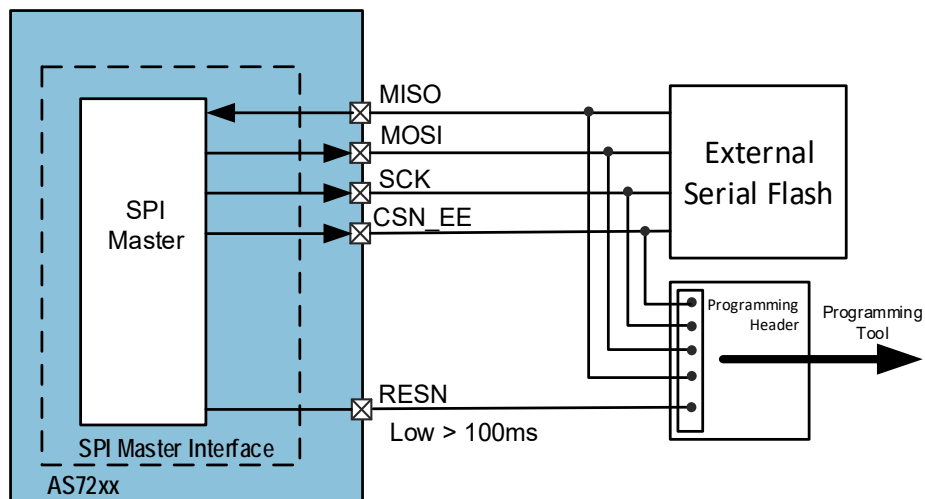
Figure 5: AT Commands for Flash Updating

Command	Response	Description/Parameters
<b>Firmware Update</b>		
ATFWU=<value>	OK	<value>= 16-bit checksum. Initializes the firmware update process. Number of bytes that follow are always 56 kBytes
ATFW=<value>	OK	Download new firmware Up to 7 bytes represented as hex chars with no leading or trailing 0x. Repeat command till all 56Kbytes of firmware are downloaded
ATFWA	OK	Causes target address for FW updates to advance. Should be called after every successful "OK" returned after "ATFW=<value>" command usage.
ATFWS	OK	Causes the active image to switch between the two possible current images and then resets the IC

Refer to the appropriate AS72xx datasheet for more AT Command information.

Make sure to the RESN signal is kept low during programming as shown in Figure 6.

Figure 6: Direct SPI Programming of Flash after System Assembly

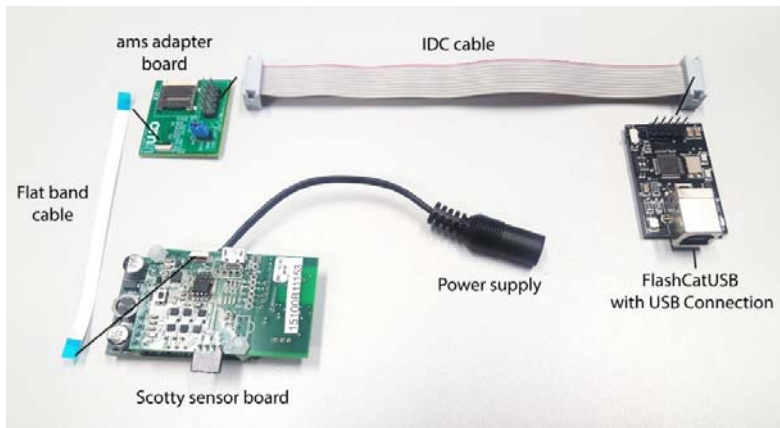




## 6. Flash Updating using the FlashCatUSB programmer

The FlashCATUSB is a commercial programming tool that can be used to program the firmware to the Flash in conjunction with ams test boards AS72xx Demo kits. See an example here for flash updating using the FlashCatUSB programmer. For more details and alternative setups please see the application note “How to program AS72xx firmware with FlashCatUSB”.

**Figure 5: Demo board with FlashCatUSB programmer and ams adapter board**



The system and procedure is described in an additional application note “AN\_AS72xx How to Program AS72xx Firmware with FlashCatUSB”.

## 7. Contact Information

For further information and requests, e-mail us at:

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For sales offices, distributors and representatives, please visit:

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## 9. Revision Information

- Initial version V1-01 was for serial EEPROM
- V1-02 was first version for serial Flash
- V1-03 add the serial Flash part numbers that have been tested by ams
- V1-04 add a new Flash part number
- V1-05 updated different chapters with new details
- V1-06 updated different chapters with new details
- V1-07-08 new figures and new GUI update