Reflow and X-ray processes make device programming of large memories no longer feasible

In-system programming of UFS, eMMC, NAND and NOR flash using XDM in line cycle without loss of quality

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Advantages at a glance

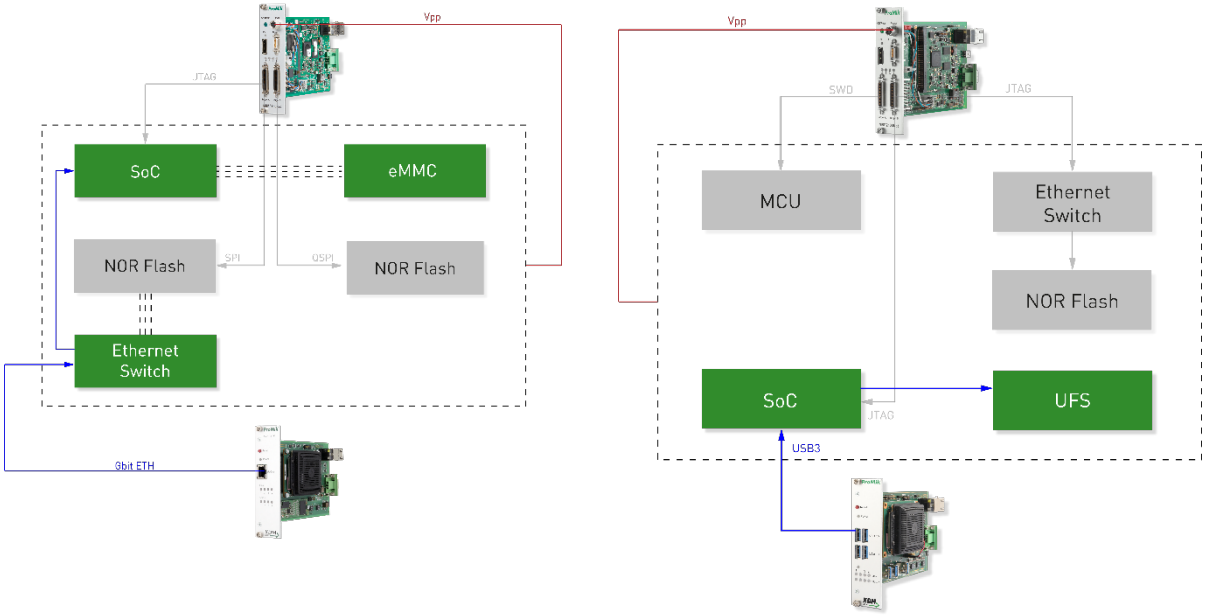
- Programming times are halved
- No risk of damage
- Only one programming station required
- Universal hardware
- Fewer revisions
- Less personnel and maintenance

This application note highlights the potential risks of X-ray and soldering processes after flash programming of semiconductor components and their minimization through post-flash using the XDM programmer.

It has been proven that X-ray radiation and reflow processes can lead to data damage of integrated semiconductor components. X-ray tests are used to evaluate hidden and defective solder joints. Although in most cases a low level of ionized X-ray radiation is used so that no component failure occurs, latent damage can arise. This manifests itself in an increase in leakage current, which can affect critical parameters. Reflow soldering, on the other hand, results in very high temperatures with peak values of 245 degrees CelsiusIf data is already written to the memory at this moment, its integrity can be impaired and permanent cell damage can occur - also known as the charge loss mechanism. Due to such X-ray and reflow processes, device programming is not advisable, especially for large amounts of data. With corresponding memories such as eMMC, UFS or large NAND or NOR memories, data damage can otherwise result in complex repairs or reprogramming and additional costs, which is why flash programming must be carried out later. This is also recommended by semiconductor manufacturers for their components. In the course of such programming after the reflow and X-ray process, it is not necessary to subject components to preparation, as the data is only written after the tested assembly. This does not only protect the written data from X-ray and soldering processes, but also eliminates the need for single lifecycle modes (SLM). Devices are inserted into these during device programming so that a backup is available in the event of damage. The full memory capacity is not available during SLM, which is why programming often has to be repeated at the end of the process. SLMs are not required for post-flash programming, which simplifies the process as the flashing does not have to be carried out twice.

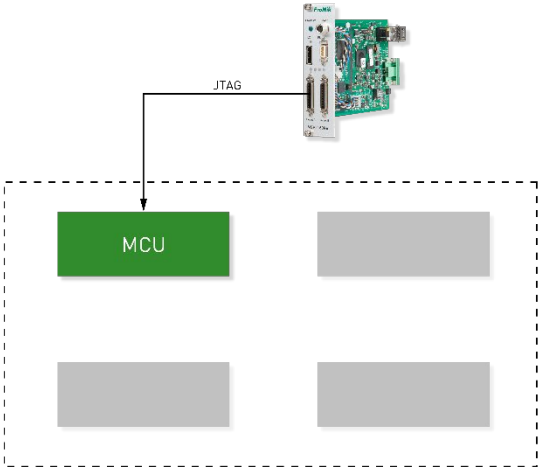
The XDM-ETH and -USB were developed specifically for high-speed programming of large memories. They are considered ProMik's fastest solution for flash programming. Depending on the production concept, the modules can be flashed using needle bed adapters or end-of-line (EoL) via plug-in connections.

Use-Cases: High-speed programming via Ethernet (left) and USB (right)



Use-Case: Two-stage High-speed programming process via JTAG and Ethernet

Step 1: Needle Flash Station



Flash programming of the ProMik Bootloader

and test software for the FCT

Step 2: EoL Flash Station

Start of the ProMik

Bootloader and Download

of the application software via ETH

The advantages of downstream flash programming are therefore that data retention and shorter programming times are guaranteed even with large amounts of data. While the average device programming speed of eMMCs is around 41.6MB/s, ProMik achieves around 100MB/s with the XDM series for data volumes of around 5GB, which means that the physical limit of the device is reached. There is also the option of reprogramming in the event of repairs or short-term software updates and writing serial numbers and dynamic data. Cyber security functions can also be carried out effectively. This shows that the XDM series can be used to program large volumes of data more quickly, significantly reduce cycle times and guarantee many other benefits.

Sources:

Infineon: AN98527. X-Ray Inspection Test Conditions for NOR/SPI/NAND Flash

Infineon: B179-I1220-V5-7600-EU-EC. General recommendations for board assembly of Infineon packages

Micron: TN-00-32: Effect of X-Ray Radiation on Integrated Circuits Introduction

Micron: TN-31-02: Automotive UFS Production Programming Introduction

Micron: TN-31-29: Embedded UFS 2.1 Production Programming Introduction

Micron: TN-FC-45: e.MMC Factory Programming Introduction