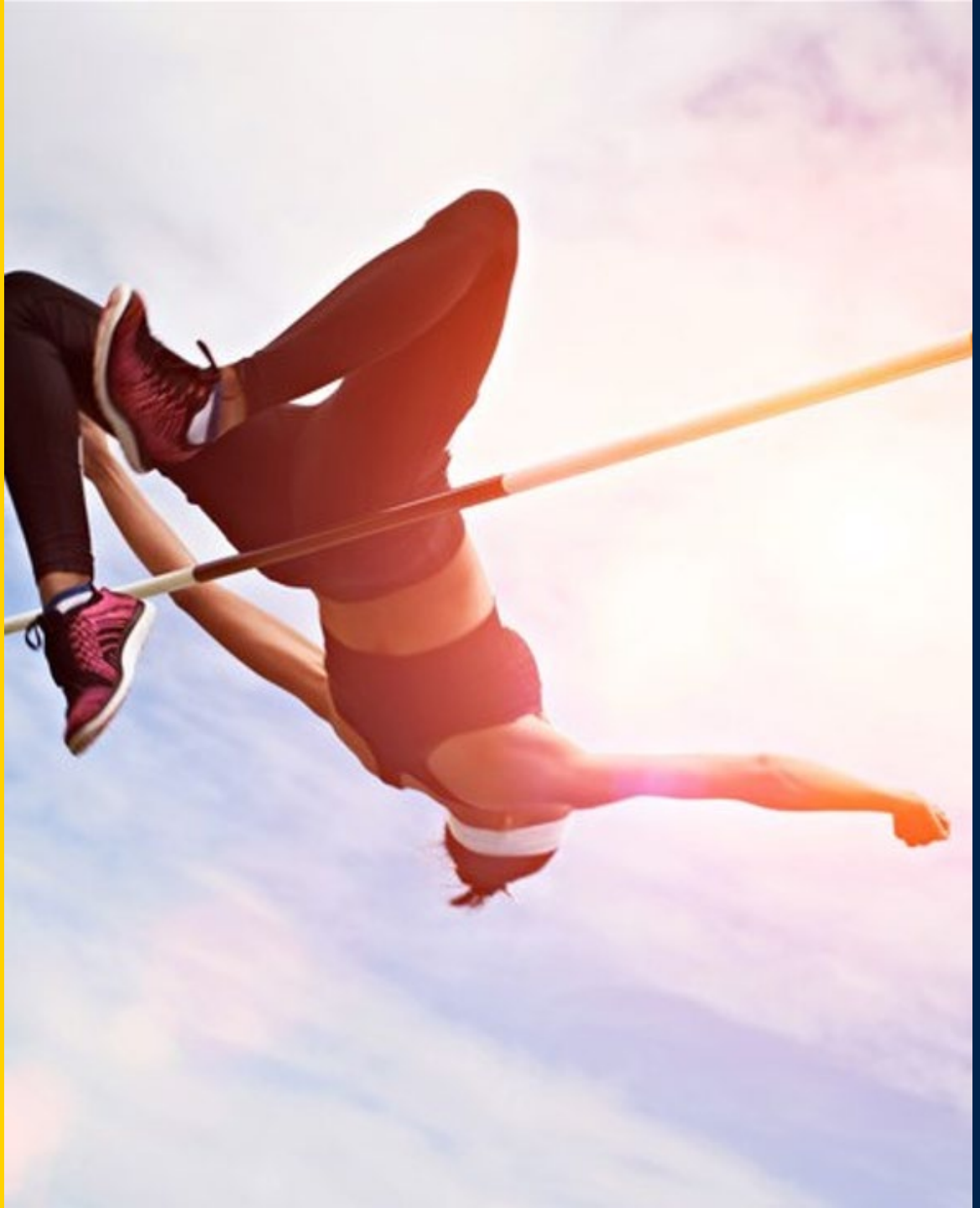


Page EEPROM

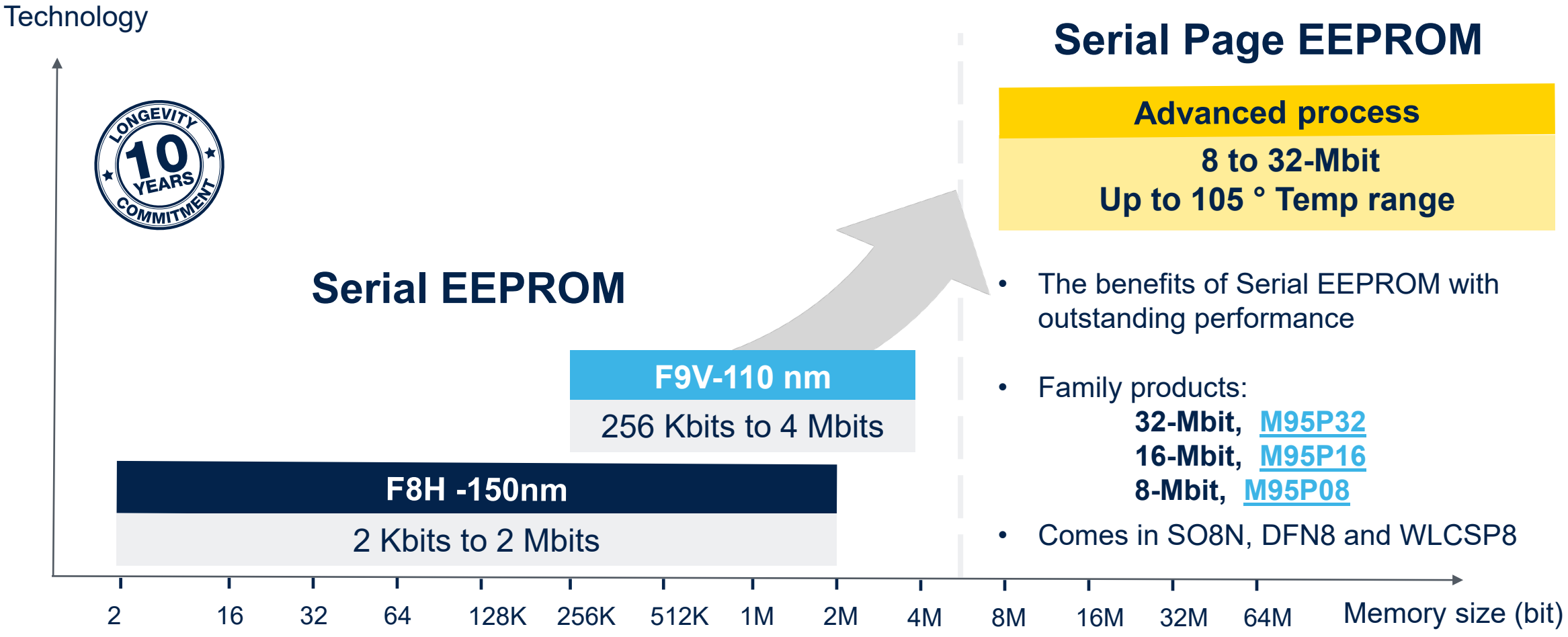
Pushing back the limits of Serial EEPROM

“ If only

My smart device had more storage capacity and could last longer

This is where we come in

Going beyond today's market-standard 4-Mbit EEPROMs



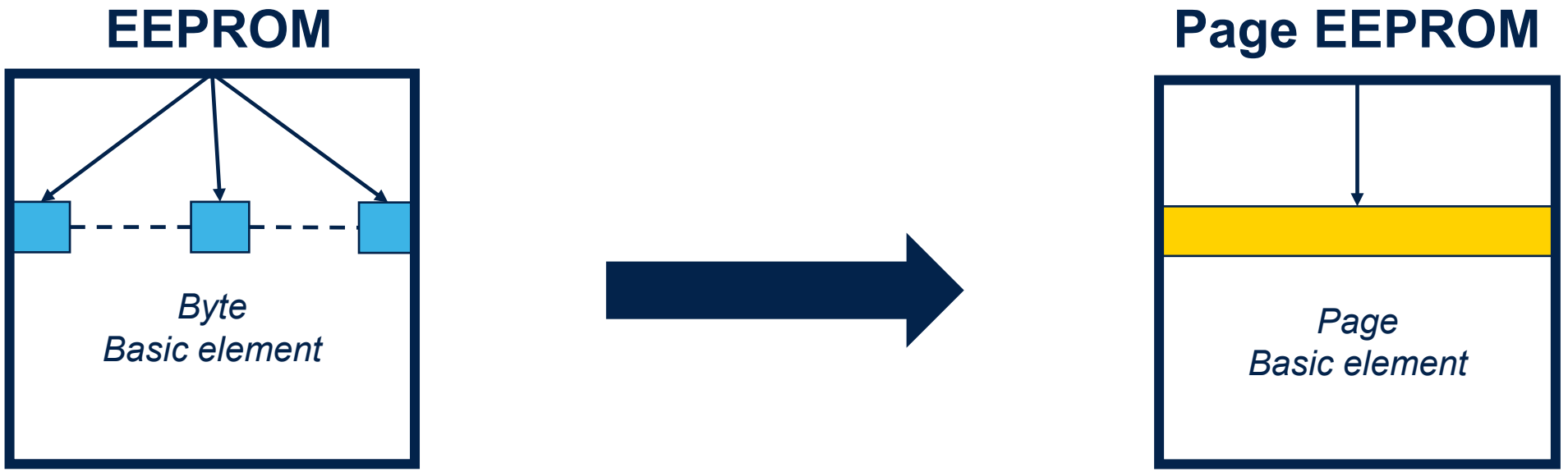
Serial Page EEPROM

Advanced process

8 to 32-Mbit
Up to 105 ° Temp range

- The benefits of Serial EEPROM with outstanding performance
- Family products:
  32-Mbit, M95P32
  16-Mbit, M95P16
  8-Mbit, M95P08
- Comes in SO8N, DFN8 and WLCSP8

Introducing the Page EEPROM family

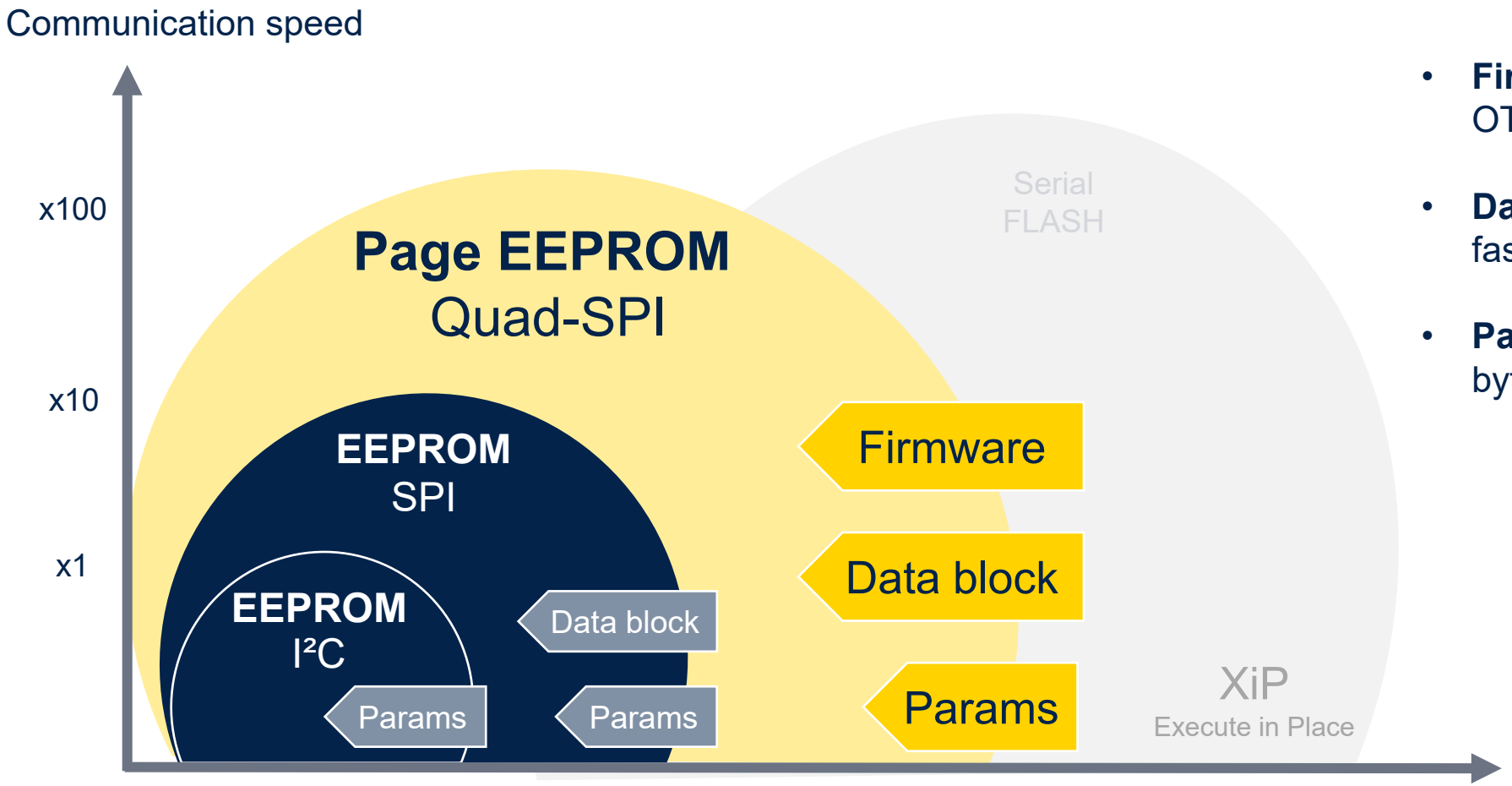


- Byte architecture
- Each byte is independent
- True Byte granularity (except ECCx4)

- **Page architecture for competitive die size on high densities**
- Byte on same page are tied together
- Page granularity & seamless **Byte granularity thanks to smart page internal management**

Page EEPROM – Functional perimeter

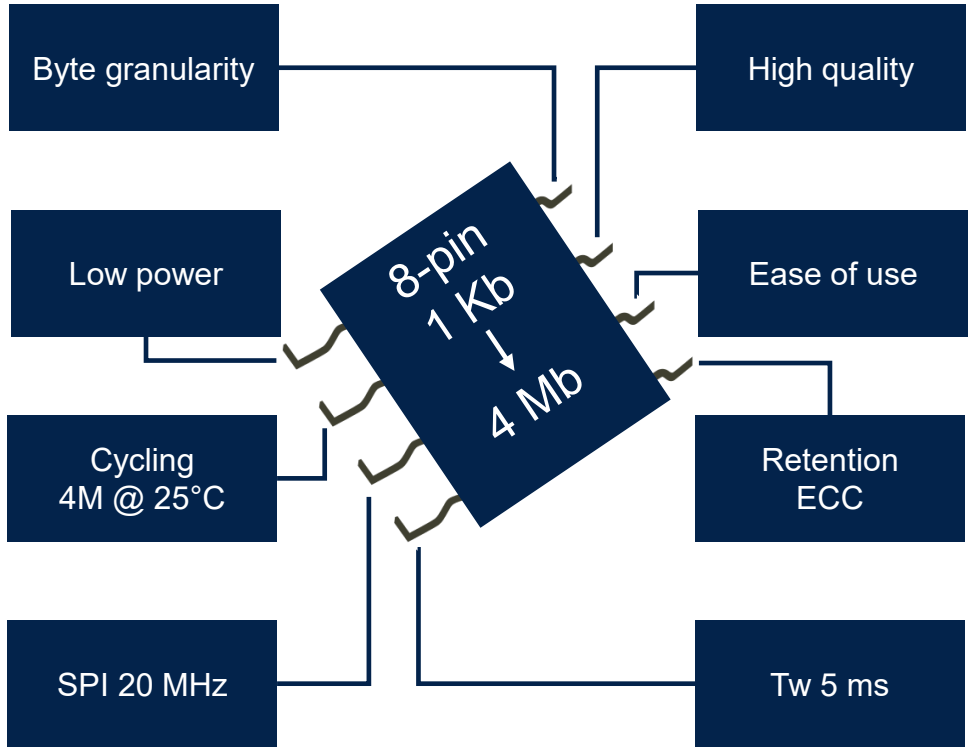
High density & performance for efficient management of mixed high-data quantity



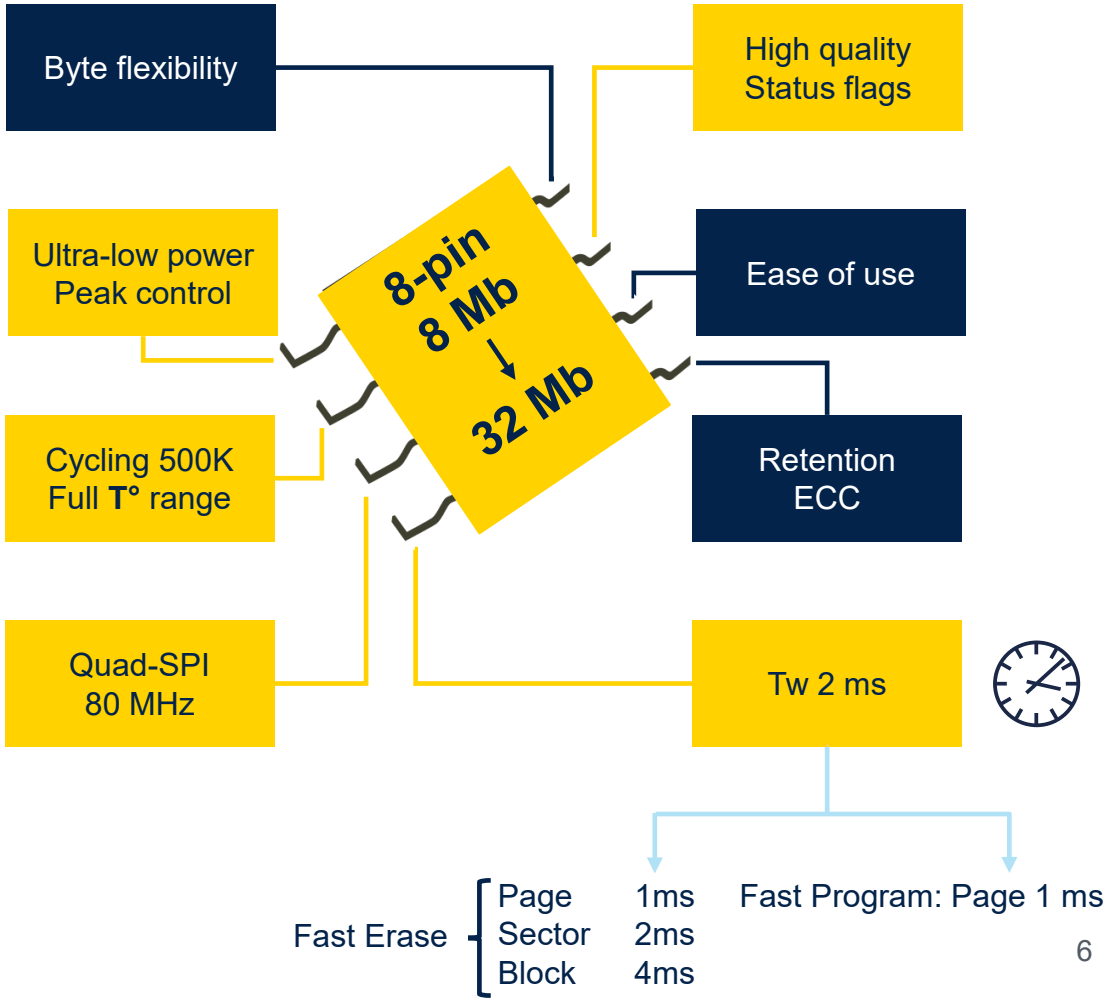
- **Firmware** upload/download for OTA and application start-up
- **Data blocks** and calibration tables fast access with Quad read
- **Parameters** easy to manage with byte flexibility

Page EEPROM extended features

EEPROM

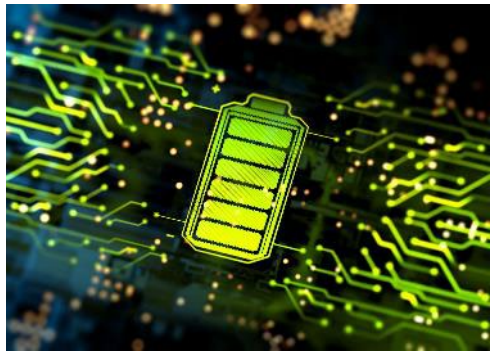


Page EEPROM



Page EEPROM – Application benefits

Ultra-low power

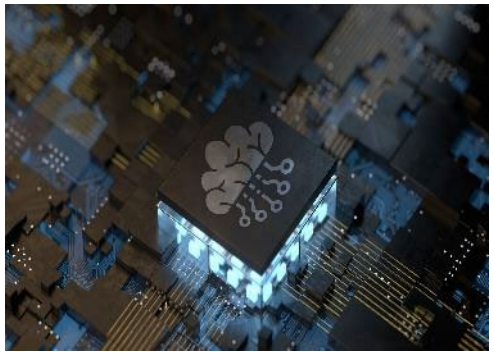


- Very low operating consumption
- Current peak control

Manufacturing

- Program with buffer load
- Quad SPI 80 MHz read

FOTA*



- Ultra-fast erase time
- Fast Program 512 bytes

Data logging & event recording

- High cycling endurance
- Fast byte write granularity

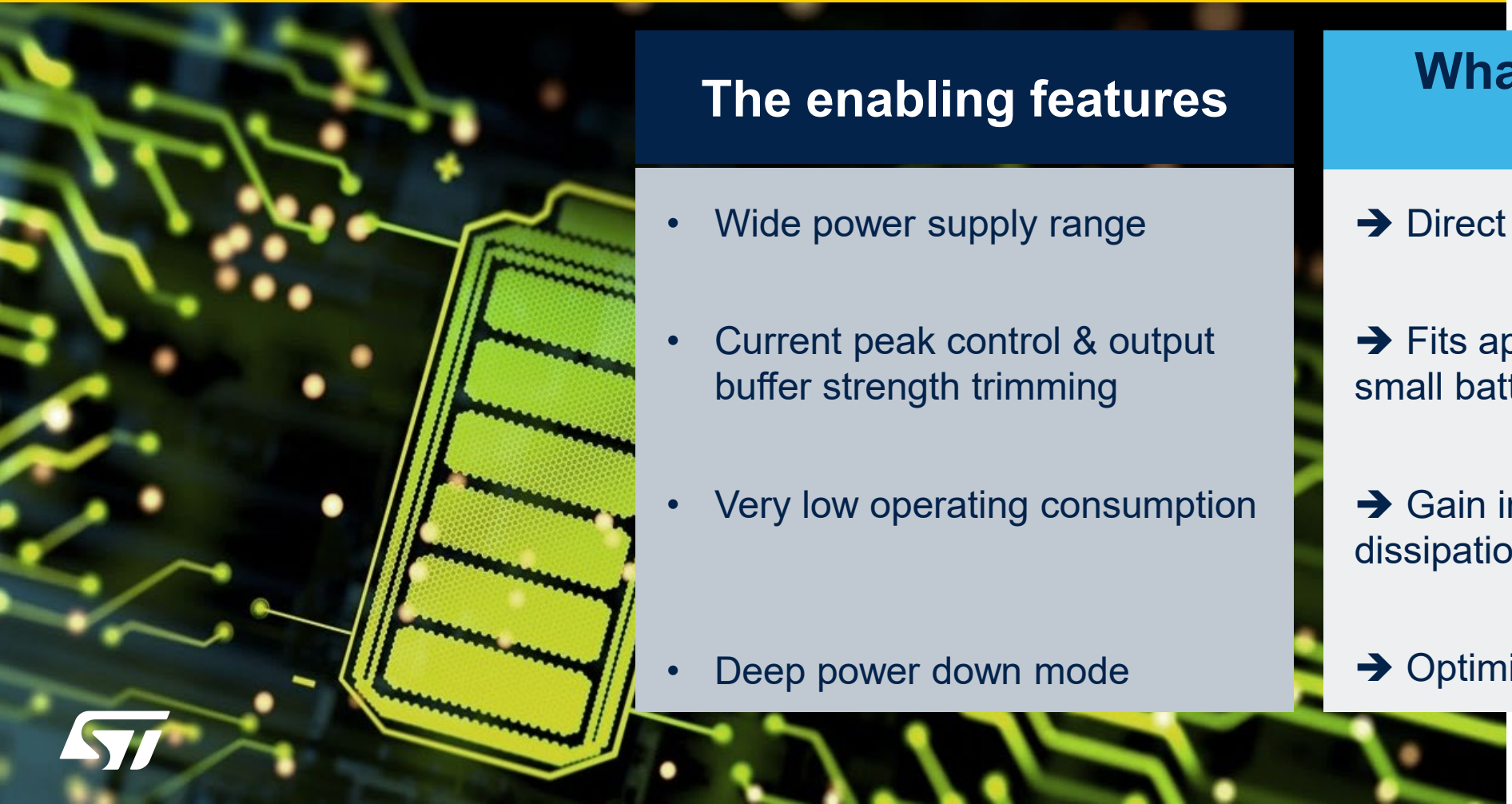
Robustness

- Prog/Erase status flag
- Read ECC flag

(*) Firmware Over The Air

Page EEPROM
ultralow power consumption

A power-saving design for intensive use, ideal for tiny IoT modules



The enabling features

- Wide power supply range
- Current peak control & output buffer strength trimming
- Very low operating consumption
- Deep power down mode

What this means for designers

➔ Direct battery plug-in

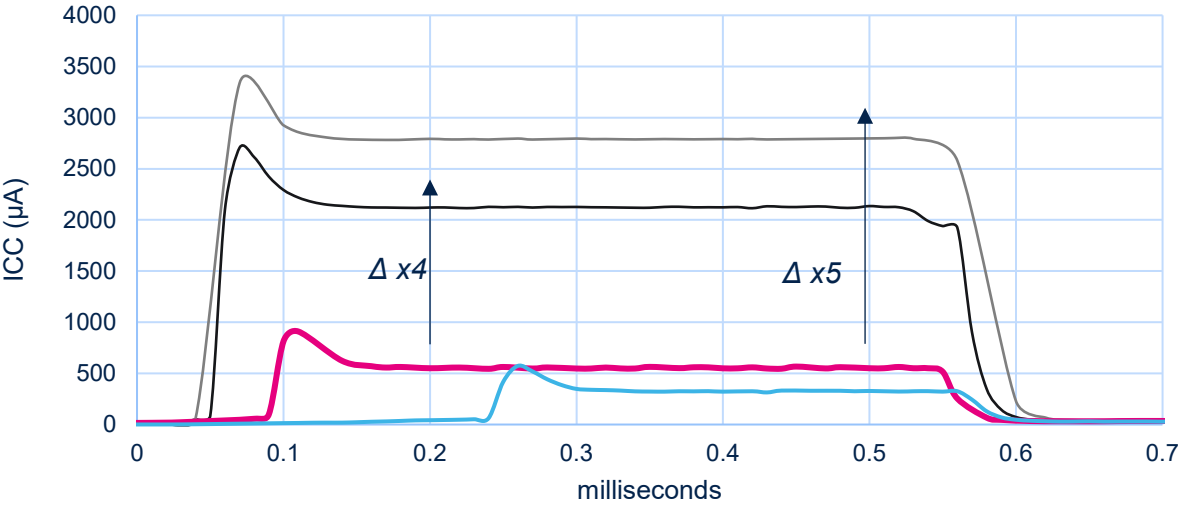
➔ Fits application powered by small battery

➔ Gain in read & write energy dissipation even for intensive use

➔ Optimize idle mode consumption

Ultralow power consumption

READ 256 bytes 1.8v at 4MHz

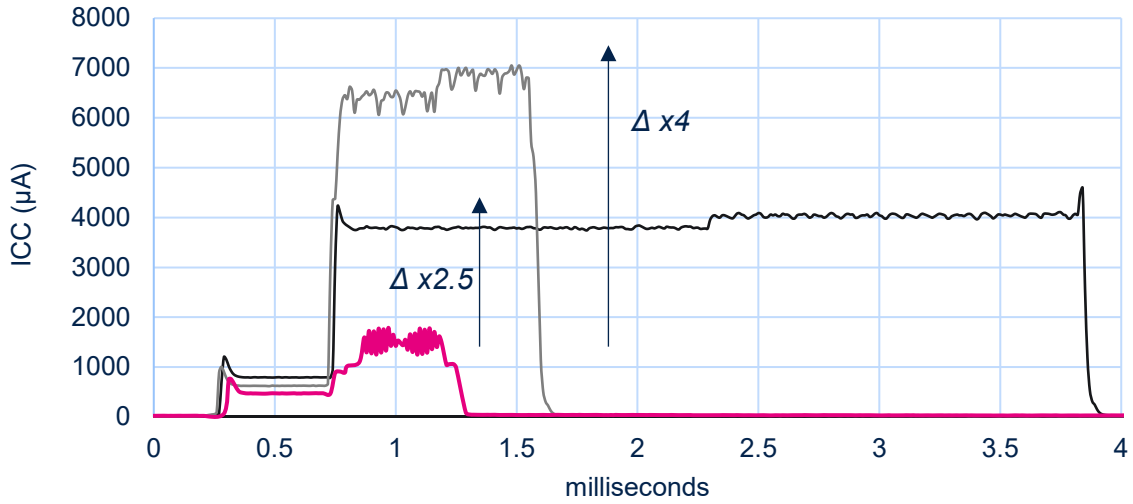


Serial Flash low power Serial Flash High perf. Page EEPROM EEPROM 4 Mbits

- Page EEPROM Read **current = 500µA** (1.8 V 4 Mhz)
  - Consumption **divided by 5 vs Serial FLASH**
- Current peak **< 1mA**

Consumption close to EEPROM 4 Mbits

PROGRAM 256 bytes 1.8v at 4 MHz



Serial Flash low power Serial Flash High perf. Page EEPROM

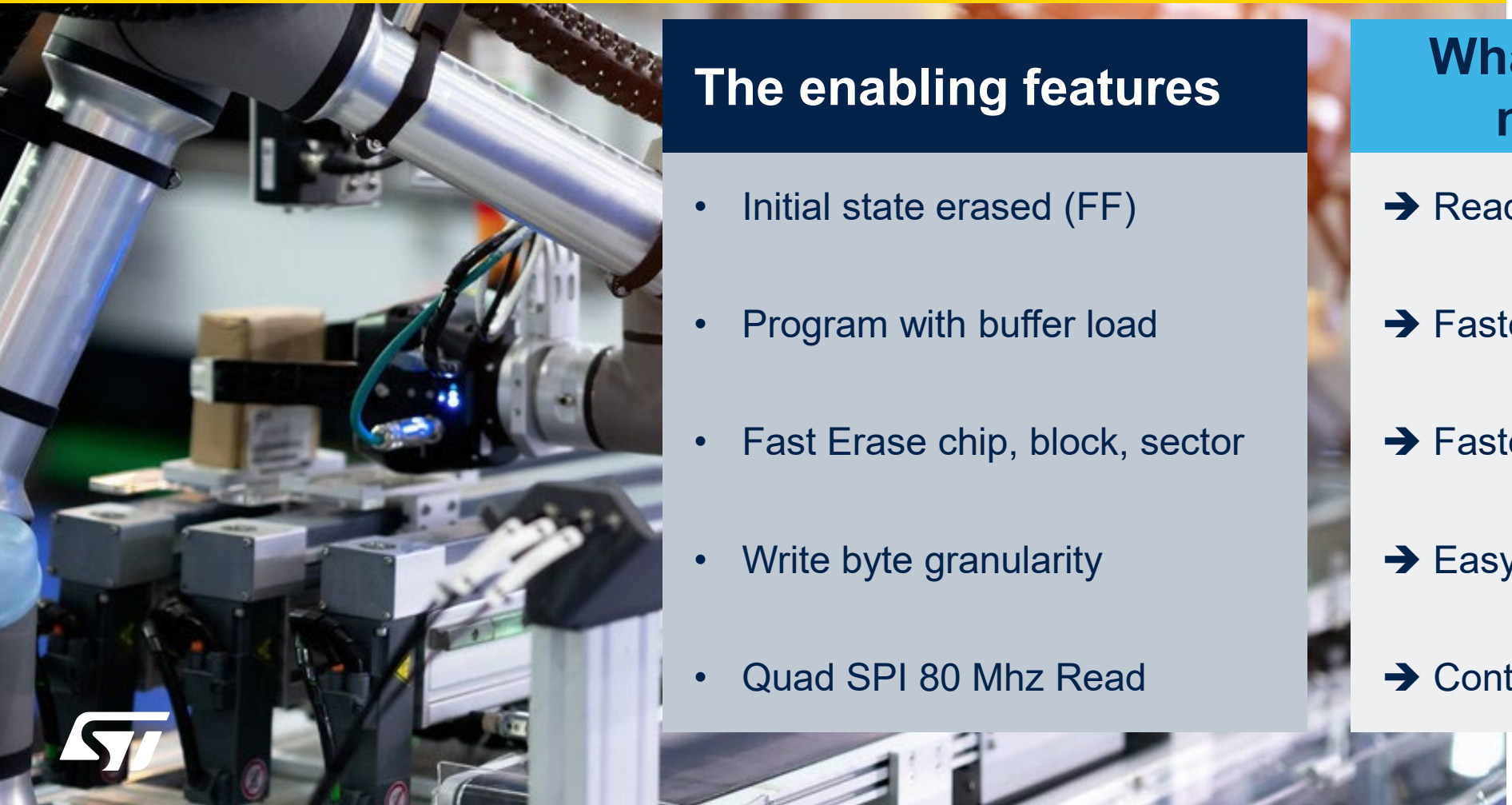
- Page Program consumption and peak **< 2 mA**
- Page Program instruction **faster than Serial Flash**

High energy* reduction (x6 to x12)

*Voltage x Current x Time

Page EEPROM - Manufacturing

Page EEPROM helps save time & costs in the manufacturing process



The enabling features

- Initial state erased (FF)
- Program with buffer load
- Fast Erase chip, block, sector
- Write byte granularity
- Quad SPI 80 Mhz Read

What this means for manufacturers

➔ Ready to upload new data

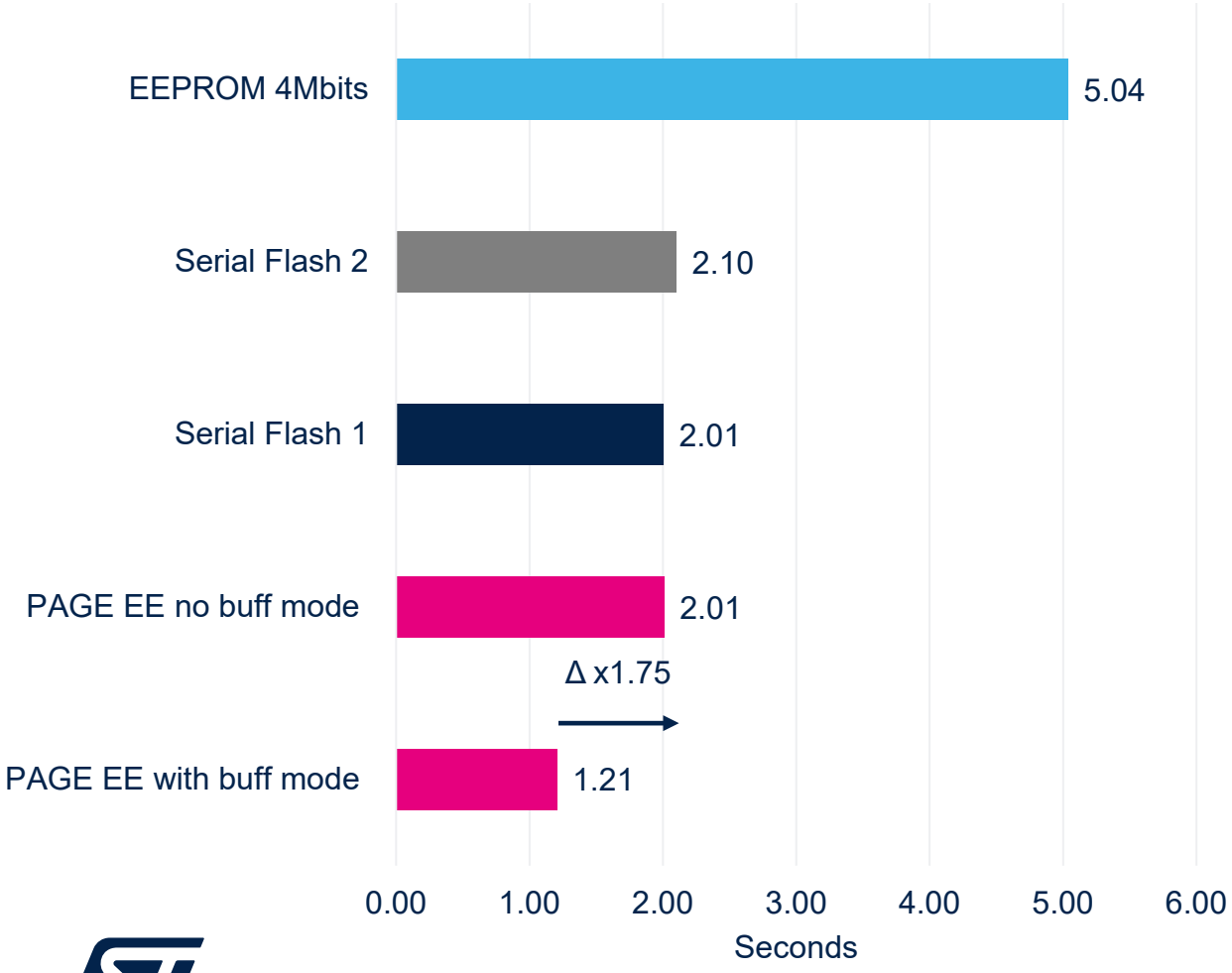
➔ Faster initial data upload

➔ Faster rework

➔ Easy update of traceability

➔ Content verification

Manufacturing

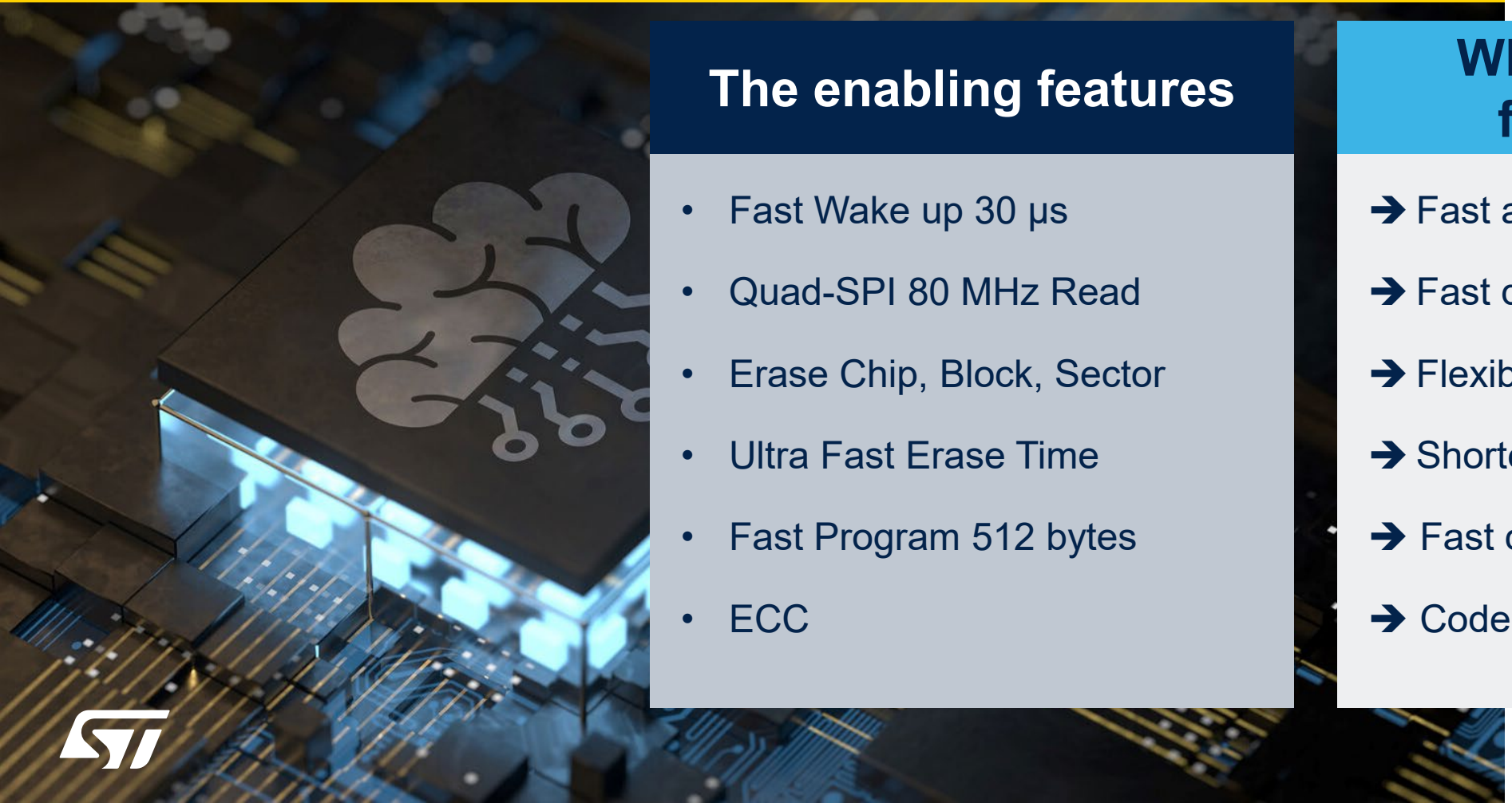


- **Fast** Page Program: **512 bytes in 1.2ms**
- Buffer mode is **x1.75 faster** than Serial flash
  - Buffer mode hides SPI communication
  - Very efficient between 4 MHz to 40 MHz
- To program 100k parts, it takes:
  - ~ 33 h with Page EEPROM
  - ~ 55 h with serial Flash

One production day less

Page EEPROM
Firmware over-the-air

Reduced downtime, fast device availability



The enabling features

- Fast Wake up 30 µs
- Quad-SPI 80 MHz Read
- Erase Chip, Block, Sector
- Ultra Fast Erase Time
- Fast Program 512 bytes
- ECC

What this means for end users

➔ Fast application setup

➔ Fast download for Firmware

➔ Flexible code erase for FOTA

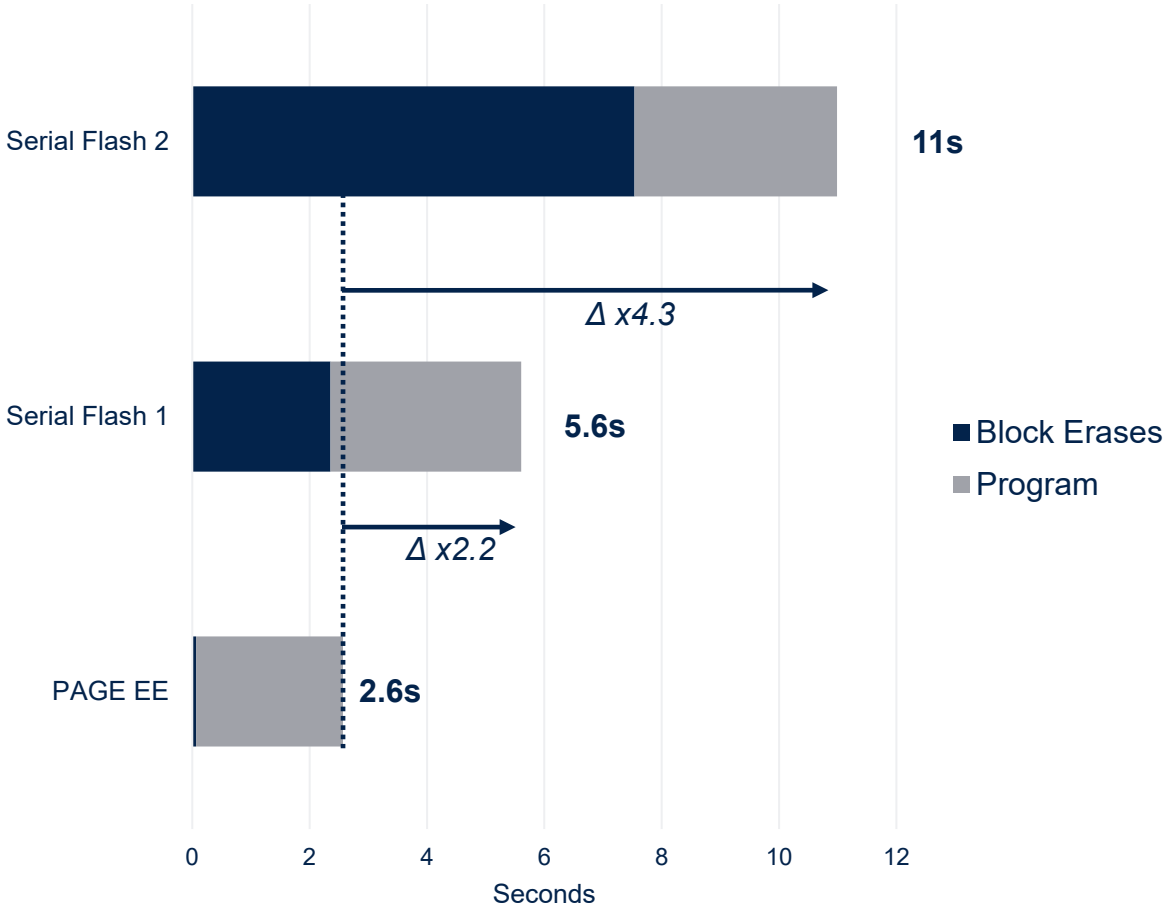
➔ Shorter downtime during FOTA

➔ Fast code upload for FOTA

➔ Code integrity & high reliability

Firmware over-the-air

FOTA scenario: 8 Mbits uploaded at 80 MHz

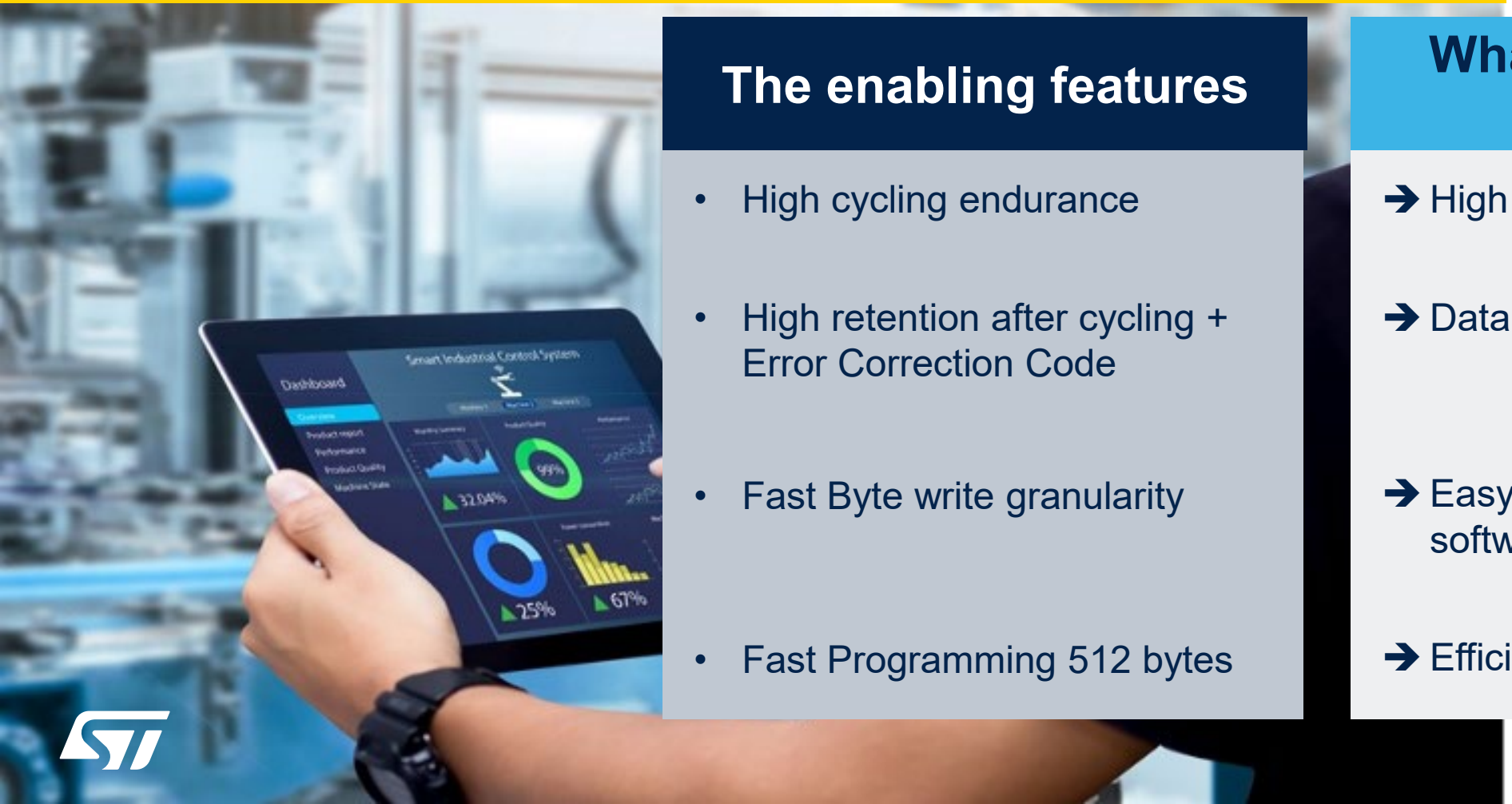


- **Ultra-fast erase:**
  - Page erase in 1.1 ms
  - Sector erase in 1.3 ms
  - Block erase in 4 ms
  - Chip erase in 15 ms
- **Program** and **Erases** are both **faster** than Serial Flash

Application downtime highly reduced with Page EEPROM

Page EEPROM
Robust data logging & event recording

Smarter, more accurate end applications



The enabling features

- High cycling endurance
- High retention after cycling + Error Correction Code
- Fast Byte write granularity
- Fast Programming 512 bytes

What this means for designers

➔ High monitoring rate

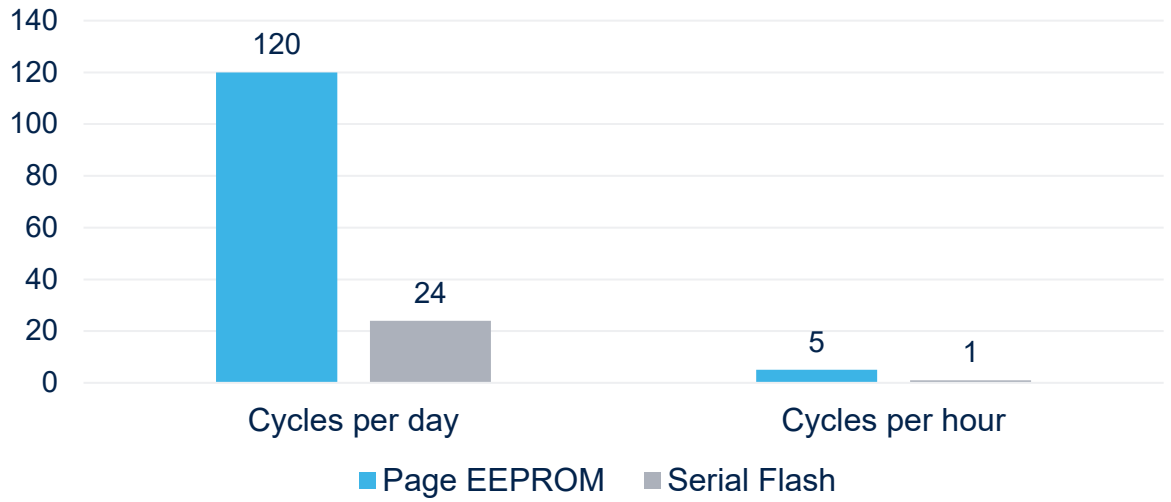
➔ Data integrity for intensive use

➔ Easy datalogging without software emulation

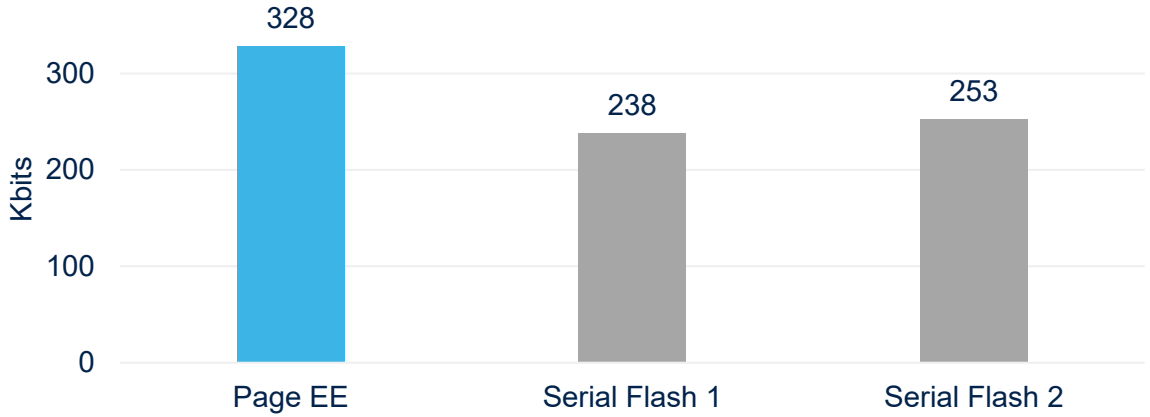
➔ Efficient event recording

Data logging & event recording

Datalogging frequency over a page for 10 years



Event recording: 100 ms of programming at 80 MHz



- Page EEPROM **high endurance:**
  - **500k** cycles per page (full T°)
  - **x5 more cycling** than Serial Flash

Easy update with page write instruction

- Fast program **512 bytes in 1.2 ms**

+25% data stored VS Serial Flash

Page EEPROM – Robustness

Product monitoring & data protection

Operation status

- Prog/Erase status flag
- Power up flag

Data integrity

- Read ECC flag

Anti-intrusion

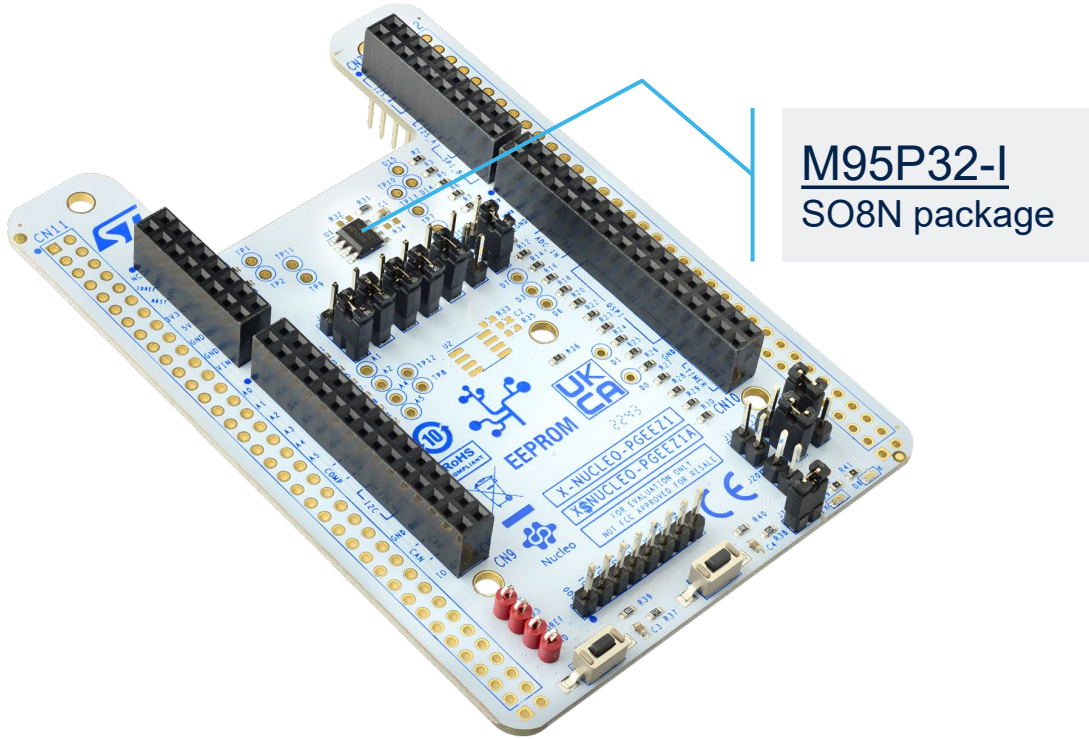
- Protected area flag

Page EEPROM development tool

STM32 Nucleo expansion board X-NUCLEO-PGEEZ1

- Based on M95P32-I in SO8 package
- Compatible with 64-or 144-pin Nucleo board
- Possibility to add a second memory
- Documentation & Drivers available

Read more



Our technology starts with You

Find out more at st.com/page-eeprom