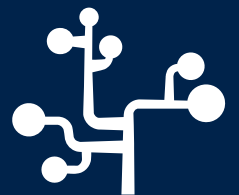




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# Page EEPROM

## Pushing back the limits of Serial EEPROM



EEPROM



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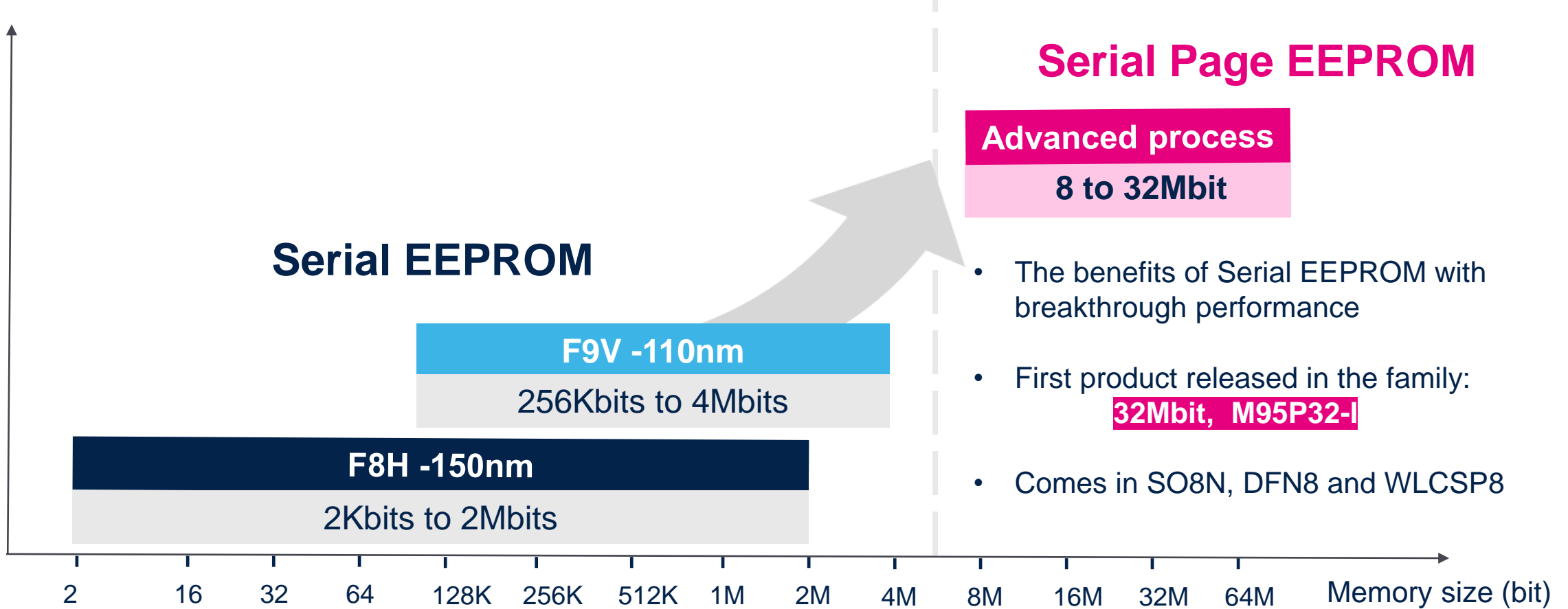
“ If only

My smart device had more storage  
capacity and could last longer

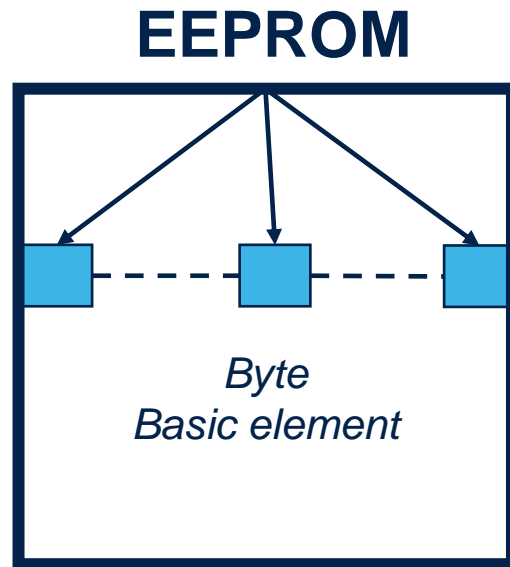
This is where we come in

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

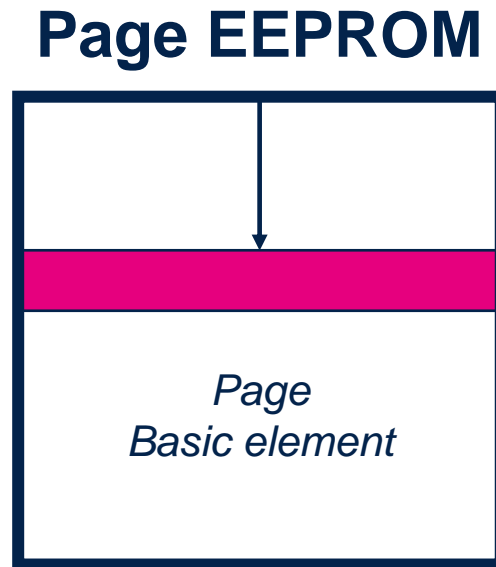
Technology



# Introducing the Page EEPROM family



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

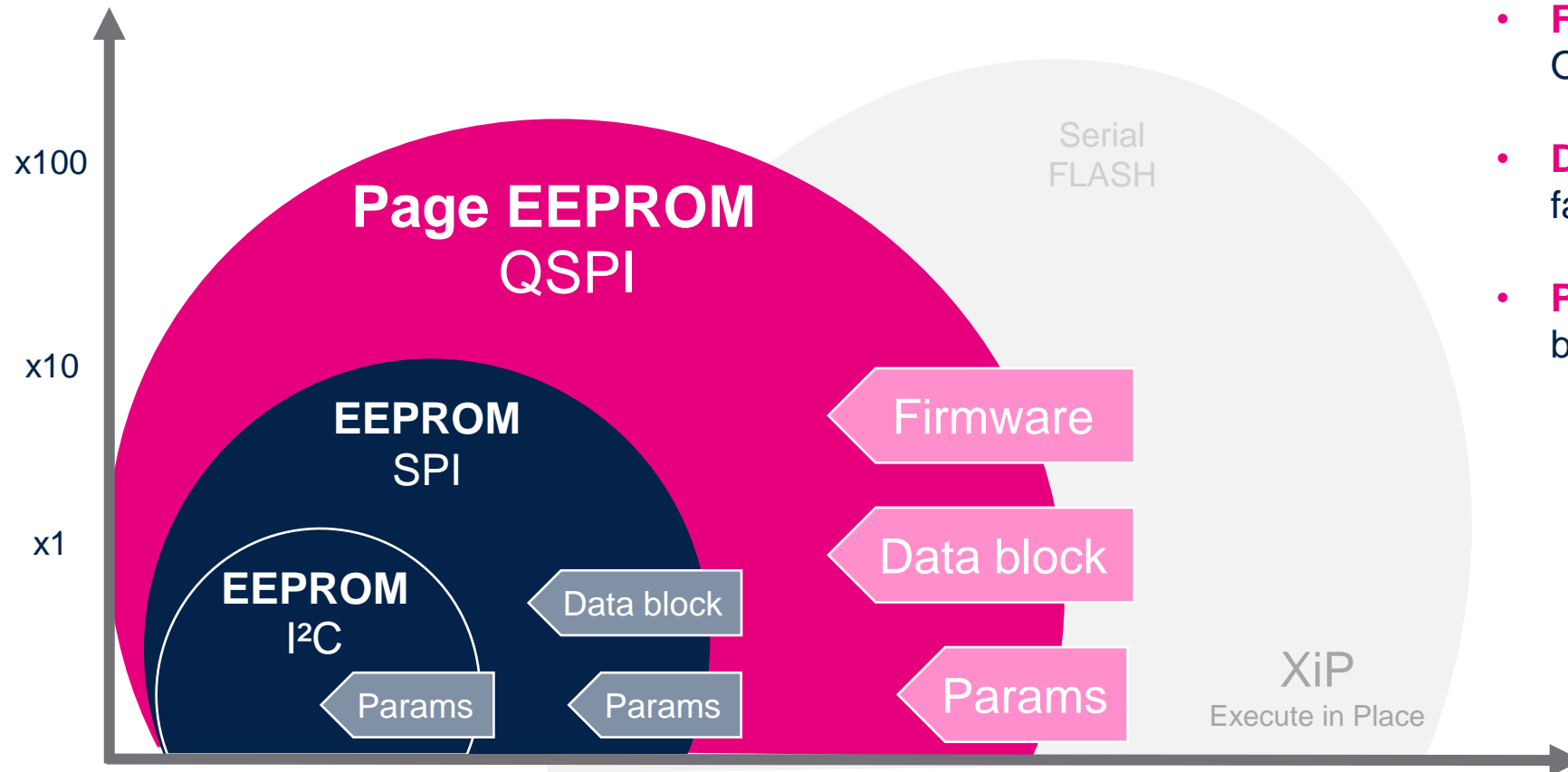


- **Page architecture for competitive die size on high densities**
- Byte on same page are tied together
- Page granularity & seamless **Byte granularity thanks to smart page internal management**

# Page EEPROM – Functional perimeter

High density & performances for efficient management of mixed high data quantity

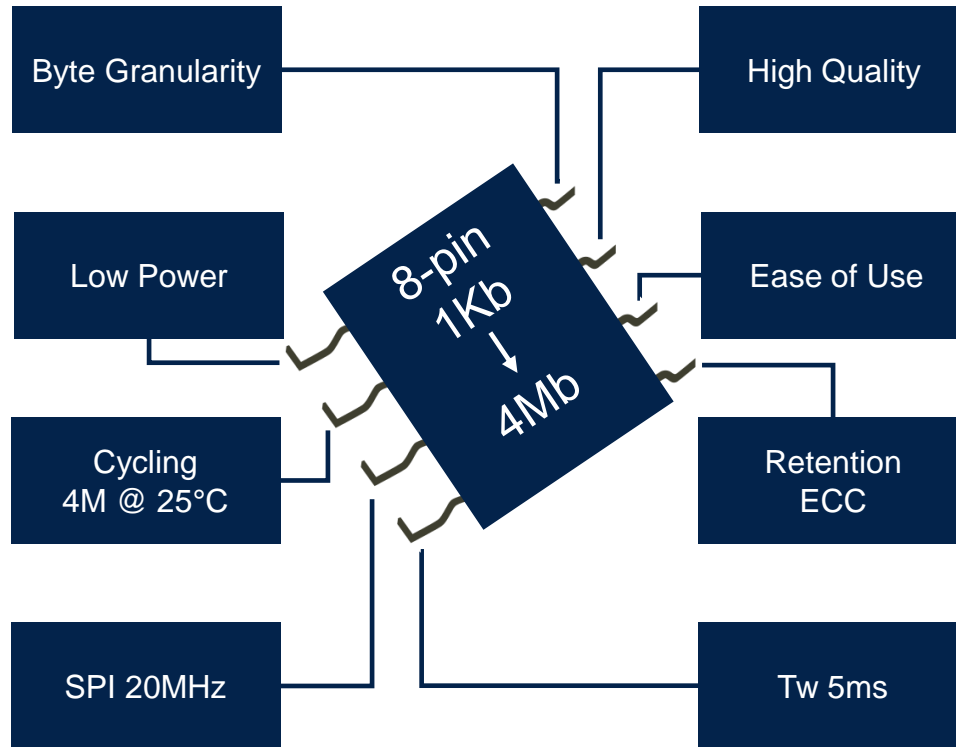
Communication speed



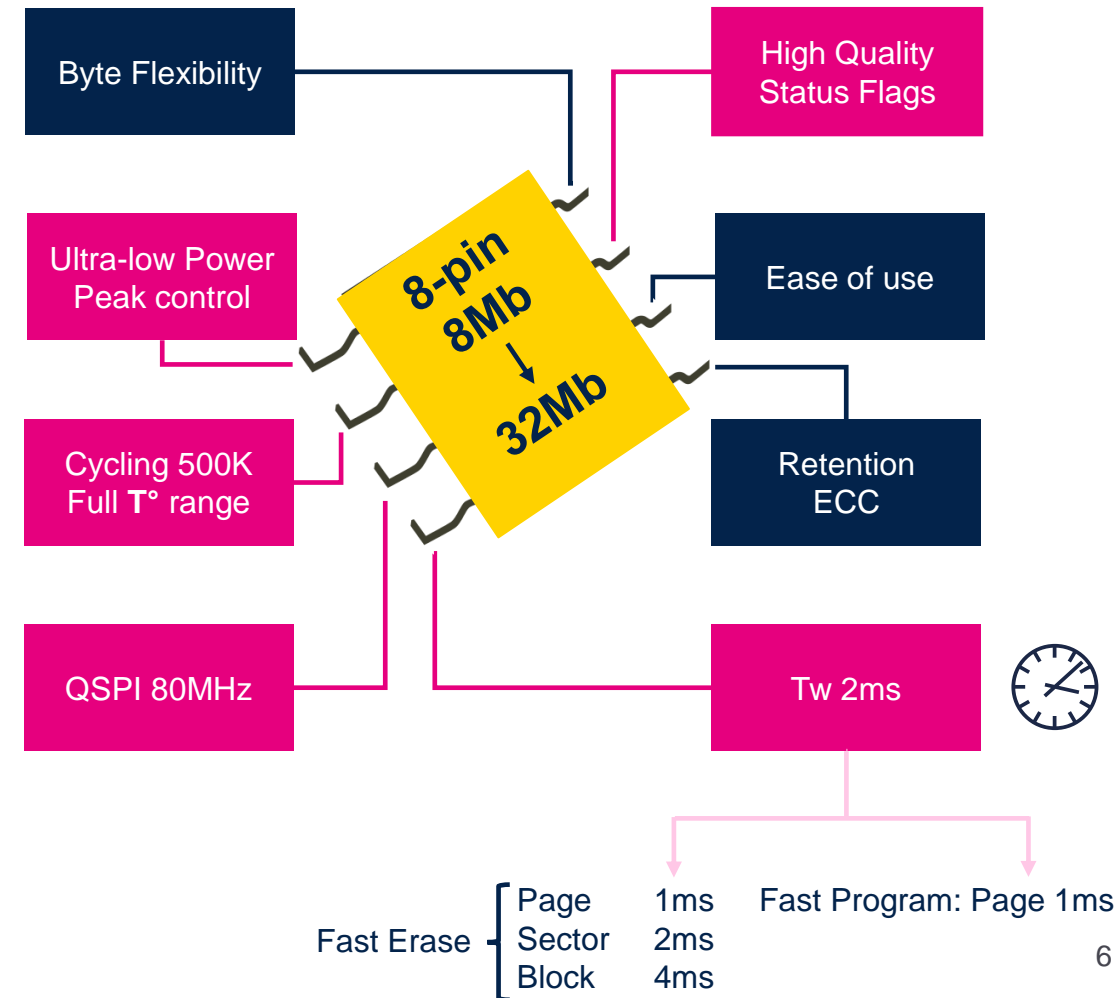
- **Firmware** upload/download for OTA and application start-up
- **Data blocks** and calibration tables fast access with Quad read
- **Parameters** easy to manage with byte flexibility

# Page EEPROM extended features

## EEPROM

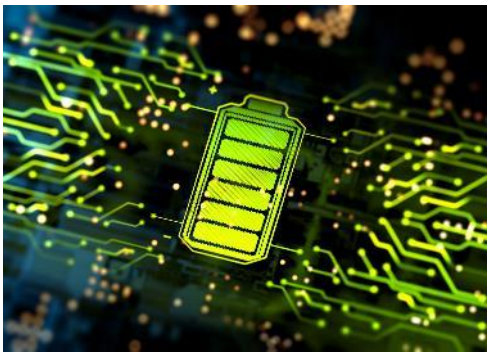


## Page EEPROM



# Page EEPROM – Application benefits

## Ultra-low power



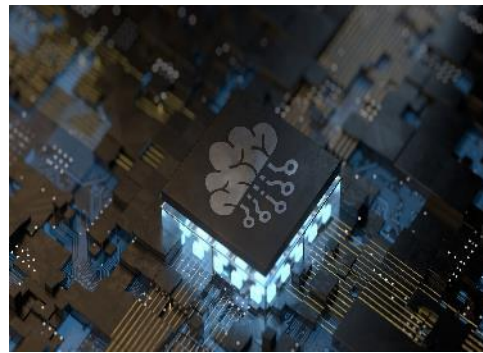
- Very low operating consumption
- Current Peak Control

## Manufacturing



- Program with buffer load
- Quad SPI 80Mhz Read

## Boot code & 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



**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

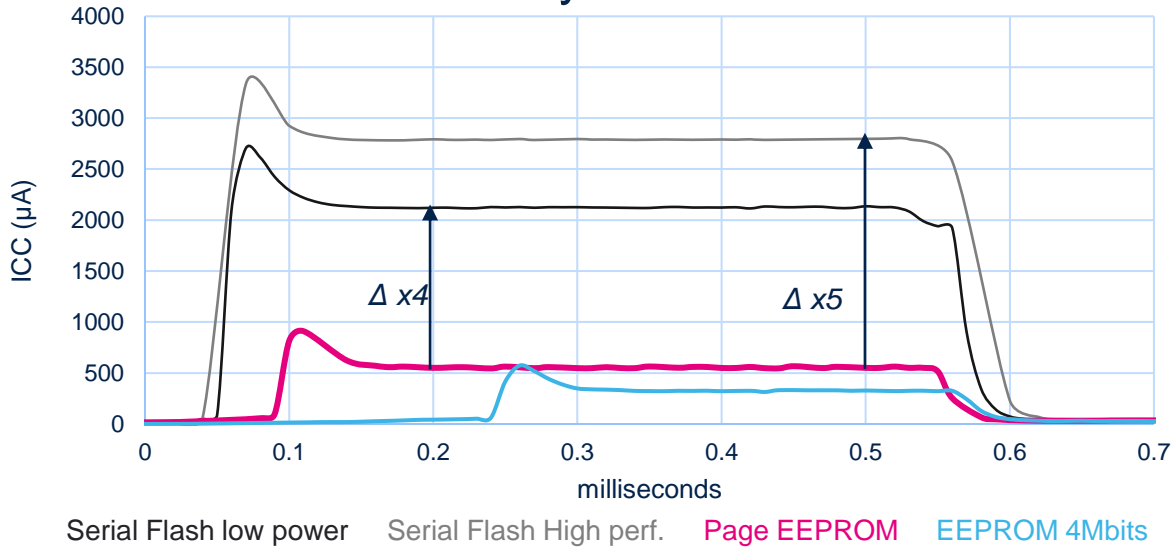
### What this means for designers

- ➔ Direct battery plug-in
- ➔ Fits application powered by small battery
- ➔ Gain in read & write energy dissipation even for intensive use
- ➔ Optimize idle mode consumption

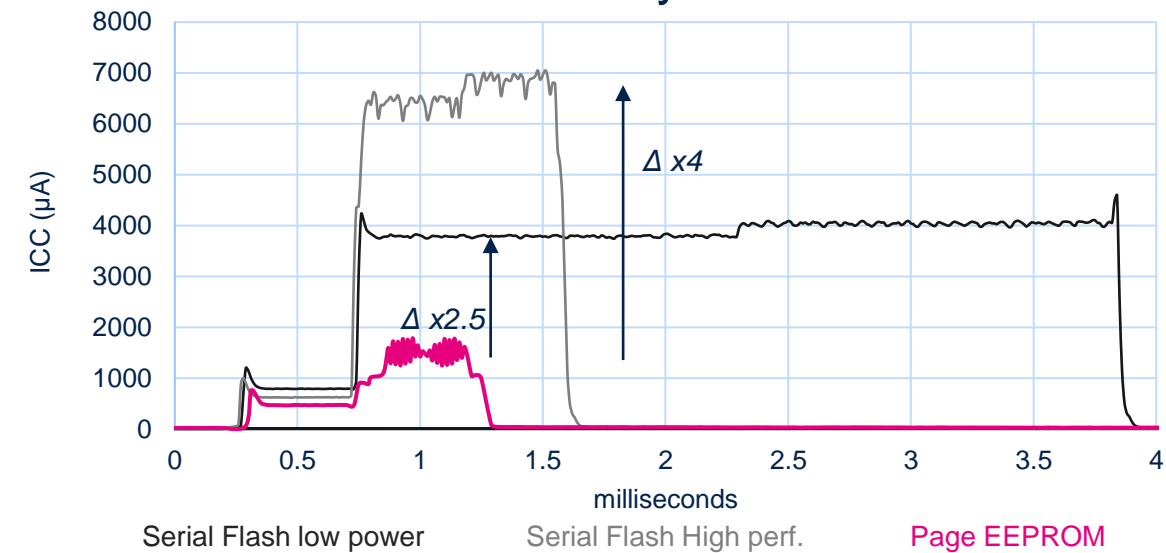


# Ultra-low power consumption

## READ 256 bytes 1.8v at 4MHz



## PROGRAM 256 bytes 1.8v at 4MHz



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

**Consumption close to EEPROM 4Mbits**

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

**High energy\* reduction (x6 to x12)**

# Page EEPROM - Manufacturing

**Page EEPROM helps save time & costs in the manufacturing process**

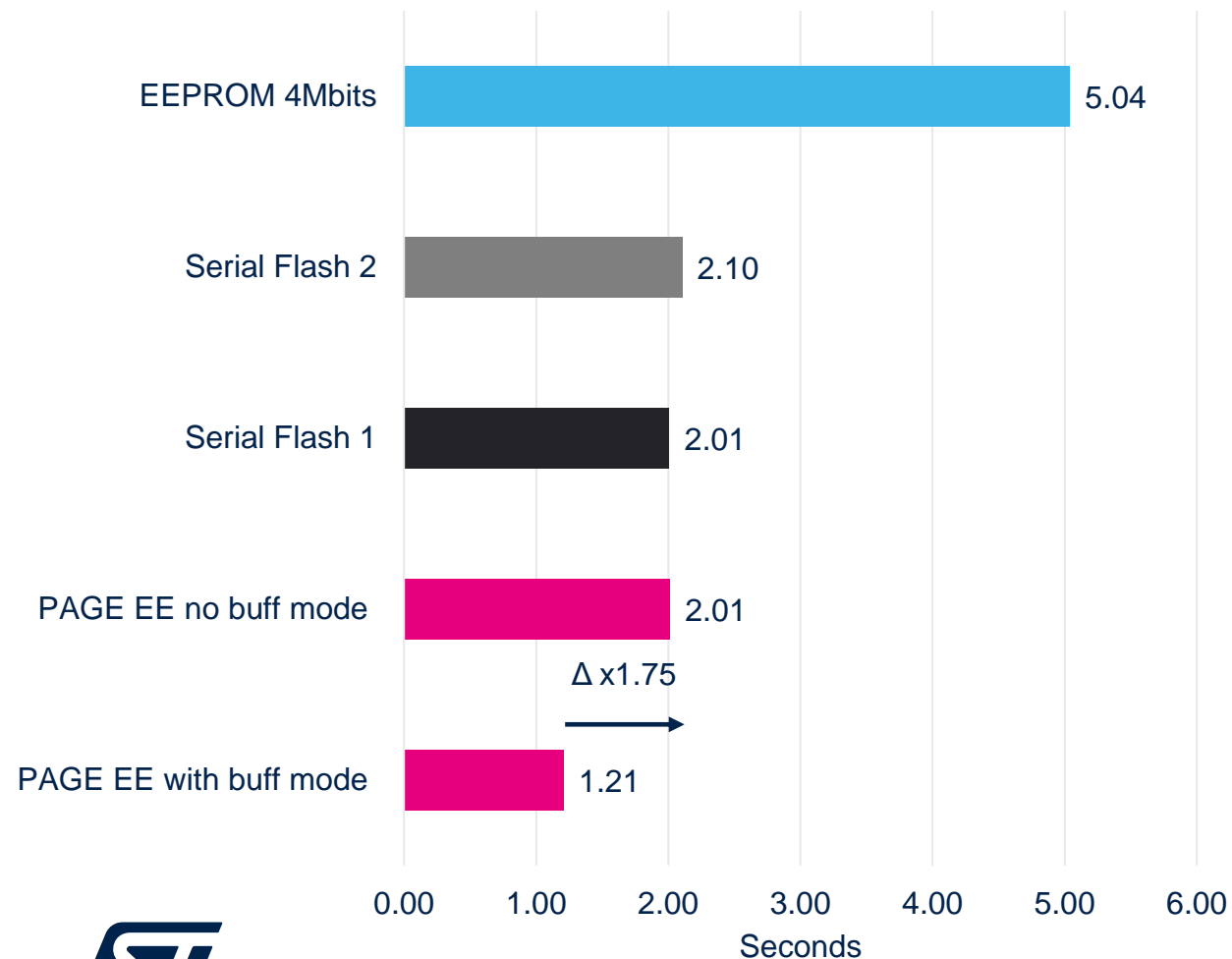
## The enabling features

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

## What this means for manufacturers

- ➔ Ready to upload new data
- ➔ Faster initial data upload
- ➔ Faster rework
- ➔ Easy update of traceability
- ➔ Content verification

## Programming: 4Mbits of data at 5MHz



- **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 4MHz to 40Mhz
- To program 100k parts it takes:
  - ~ 33h with Page EEPROM
  - ~ 55h with serial Flash

**One production day less**

# Page EEPROM

## Boot code & Firmware Over The Air

**Reduced downtime, fast device availability**

### The enabling features

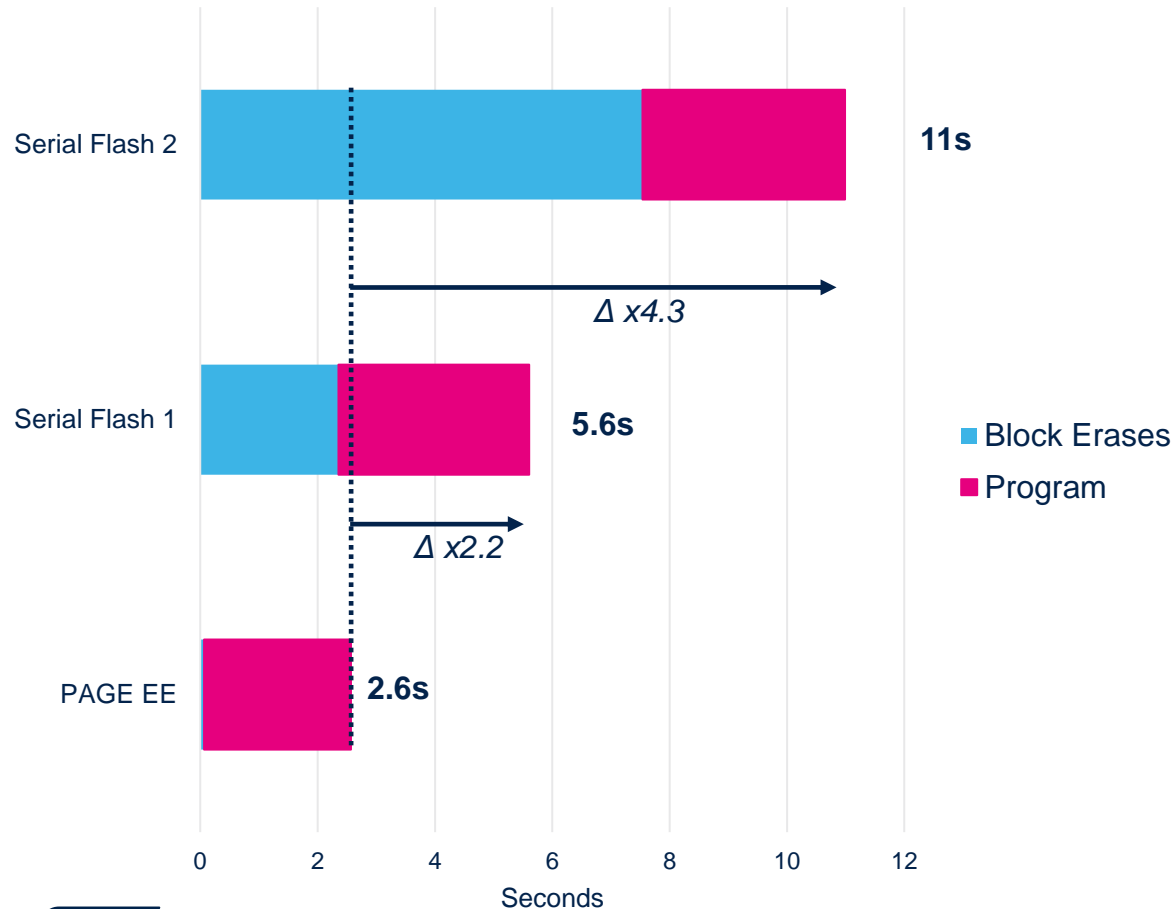
- Fast Wake up 30 $\mu$ s
- QSPI 80Mhz Read
- Erase Chip, Block, Sector
- Ultra Fast Erase Time
- Fast Program 512 bytes
- ECC

### What this means for end users

- ➔ Fast application setup
- ➔ Fast download for Boot code
- ➔ Flexible code erase for FOTA
- ➔ Shorter downtime during FOTA
- ➔ Fast code upload for FOTA
- ➔ Code integrity & high reliability

# Boot code & Firmware Over The Air

## FOTA scenario: 8Mbits uploaded at 80MHz



- **Ultra fast erase:**

- Page erase in 1.1ms
- 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 512bytes

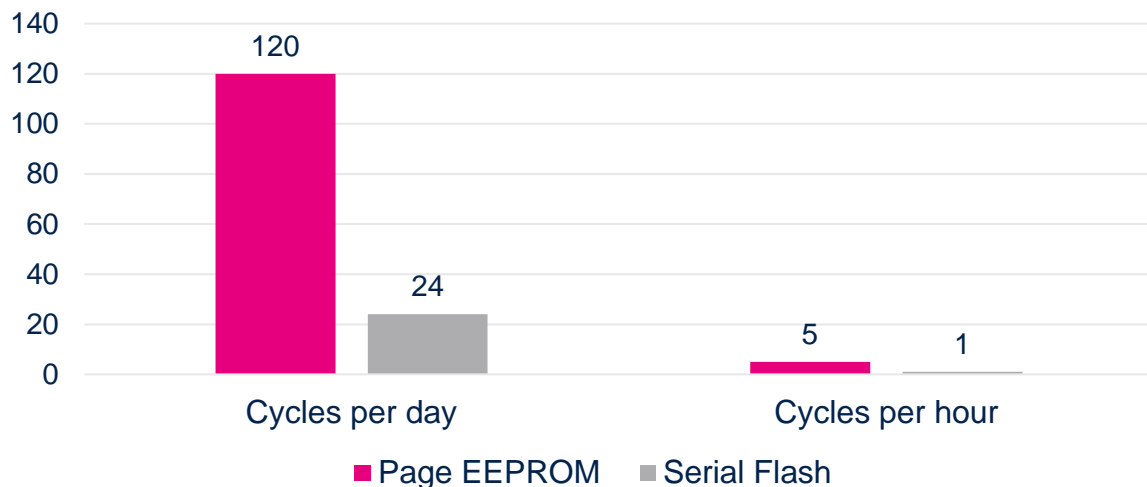
### What this means for designers

- ➔ High monitoring rate
- ➔ Data integrity for intensive use
- ➔ Easy datalogging without software emulation
- ➔ Efficient event recording



# Data logging & event recording

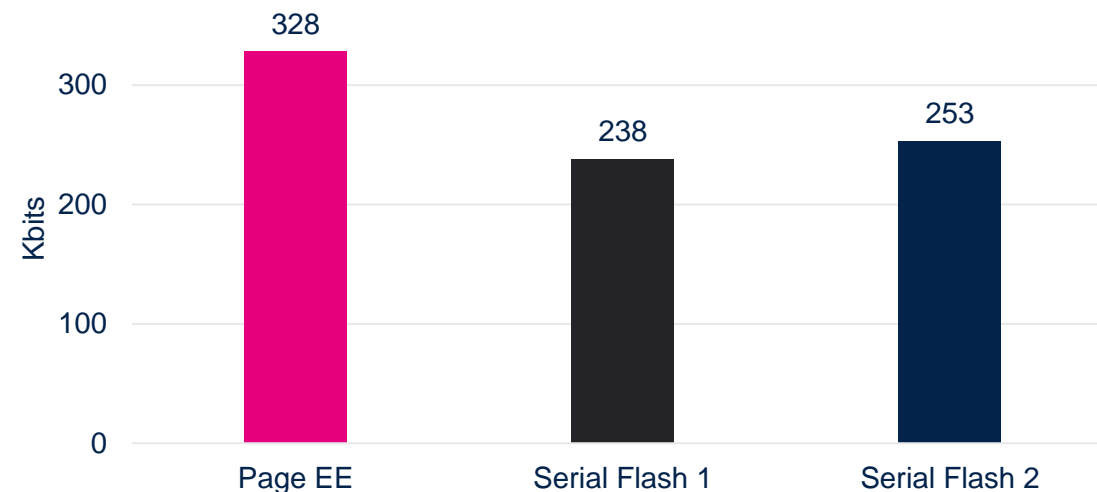
## Datalogging frequency over a page for 10 years



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

**Easy update with page write instruction**

## Event Recording : 100 ms of programming at 80MHz



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

**+25% data stored VS Serial Flash**

## Product monitoring & data protection

### Operation status

- Prog/Erase status flag
- Power up flag



### Data integrity

- Read ECC flag



### Anti-corruption

- Protected area flag



# Our technology starts with You



Find out more at [st.com/page-EEPROM](https://www.st.com/page-EEPROM)

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