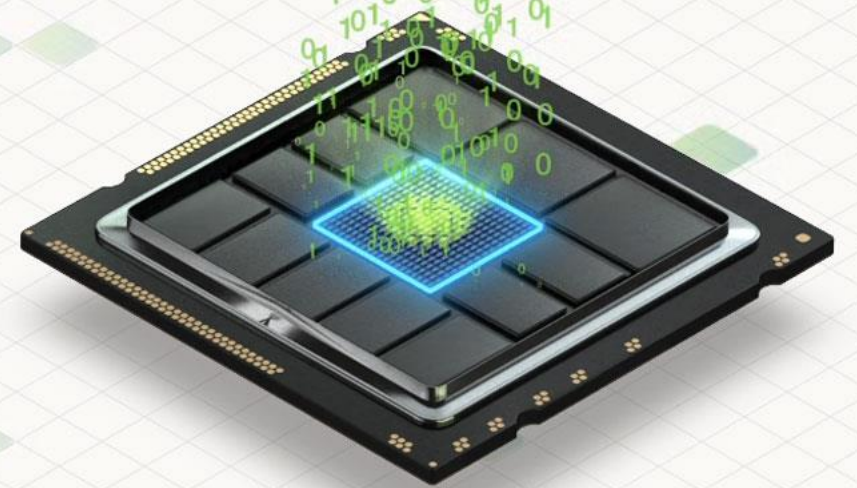


# Embedded NVM for a New Era

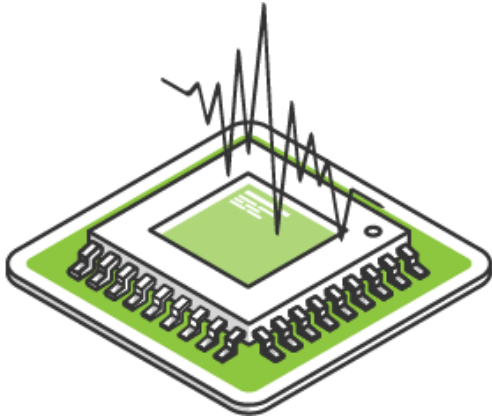
Eran Briman, VP Business Development and Marketing,  
Weebit Nano

*Select Slides*



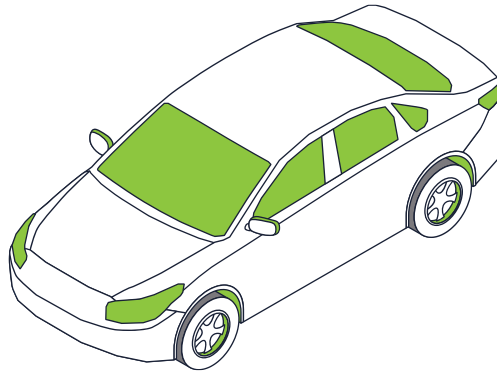
# Embedded NVM for a New Generation of SoCs

Application requirements are placing new **power, performance** and **cost** demands on embedded Non-Volatile Memory (NVM)



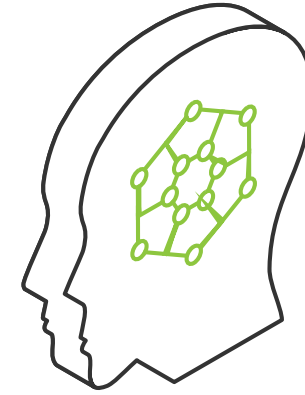
## Mixed-Signal ICs

Integration of analog + MCU + NVM in a **cost-effective manner**



## Automotive

Robust (**high-temp**) NVM that can **scale to advanced nodes** <28nm

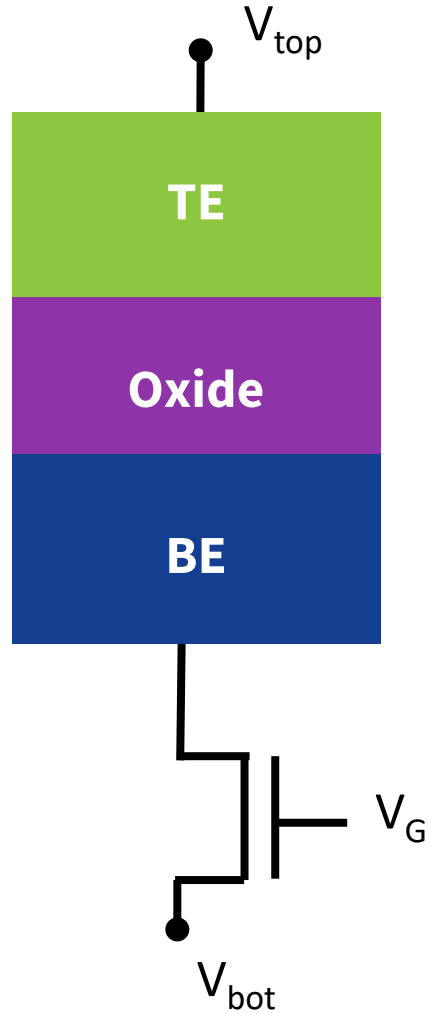


## Edge AI

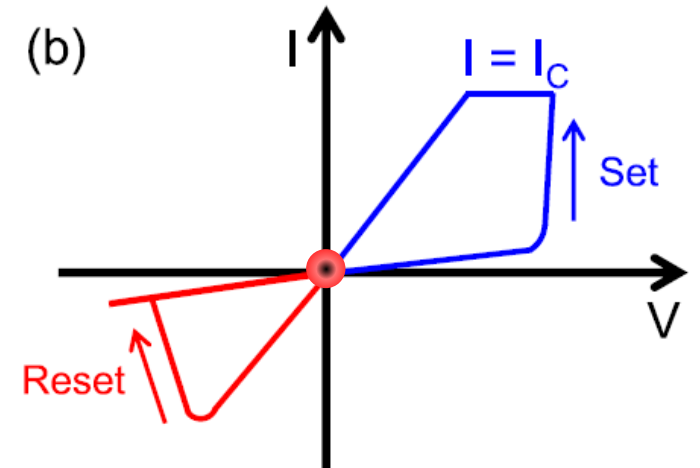
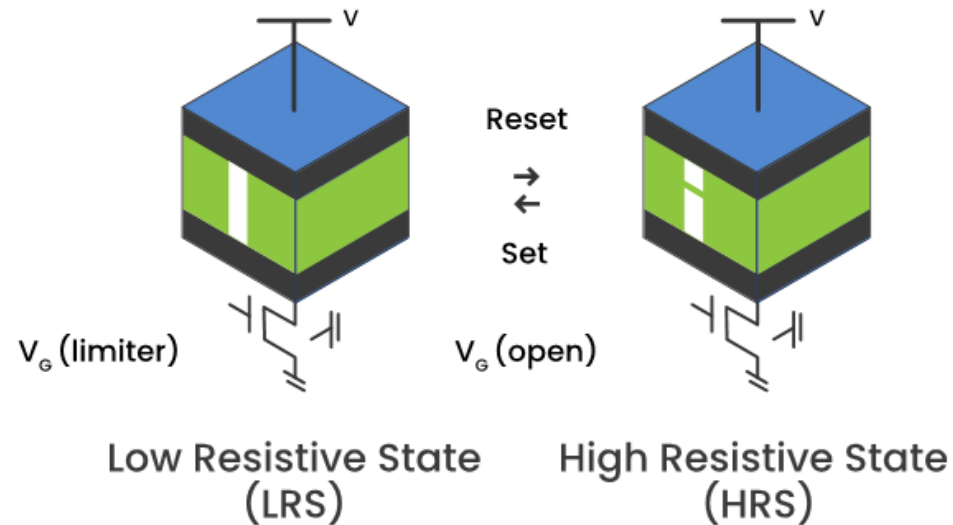
**Large-density** NVM for near-memory-compute to **reduce power and cost**

**Alternatives include traditional NVMs (e.g., OTP, MTP, EEPROM, Flash), and emerging NVMs (e.g., PCM, MRAM, ReRAM)**

# What is ReRAM? ReRAM Basic Operation



- ❖ BEOL technology, between metal layers
- ❖ Changing the resistance of a oxide layer by applying certain voltages:
  - ❖ SET: HRS  $\rightarrow$  LRS
  - ❖ RESET: LRS  $\rightarrow$  HRS
- ❖ Low voltage, <3V for programming



# | The Most Cost-Effective NVM Solution

## ❖ 2-mask adder

- ◆ Very few added steps compared to other NVM technologies
- ◆ Lower wafer cost than competing NVM technologies

## ❖ Fab-friendly materials

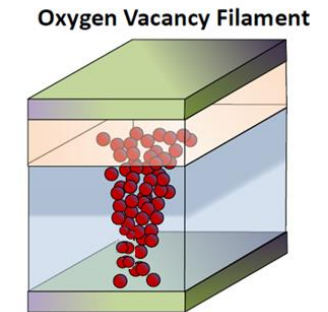
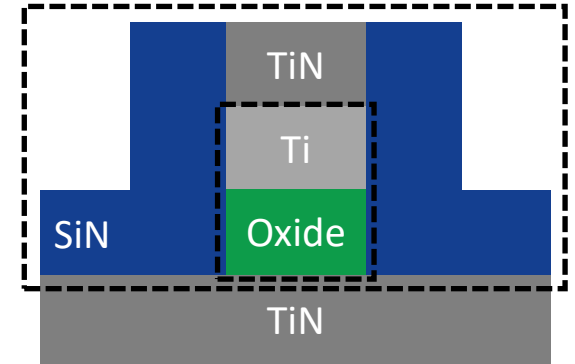
- ◆ No contamination risk, low-cost materials

## ❖ Using existing deposition techniques and tools

- ◆ Easy to integrate into any CMOS fab

## ❖ BEOL technology

- ◆ Stack between any 2 metal layers
- ◆ No interference with FEOL – Easier to embed with existing Analog and MS processes
- ◆ Easy to scale from one process variation to another



# The Transformation of the Embedded NVM Market

The market has transitioned over the last 3-4 years, and today it is clear to everyone that ReRAM is it!

## 2020-2022 – The Transformation Begins

### Automotive

MCU @ 28nm

Infineon & TSMC

ReRAM for power  
mgmt. @ 40nm  
TSMC

Trusted supplier  
ReRAM qualified  
Weebit & SkyWater



## 2023 – Broadening Applications and Market Momentum

IoT & mobile MCU  
NVM @ 22nm  
TSMC; UMC

MP shipment @ 40nm  
TSMC: STMicro, others

Power mgmt. NVM  
Weebit &  
DB HiTek



## 2024 – A Clear Shift

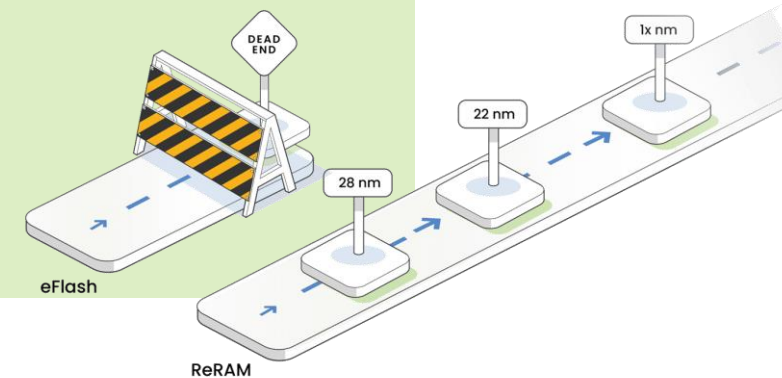
TSMC roadmap  
moving from **MRAM**  
to **ReRAM**

Shipping to more  
customers @ 22nm  
TSMC: Nordic, BRCM,  
Nuvoton, others



## 2025 Onwards

ReRAM becoming  
the **de-facto**  
embedded NVM  
standard



\* Source: Emerging Non-Volatile Memory report, Yole Intelligence, 2023 and 2024; Internal company information

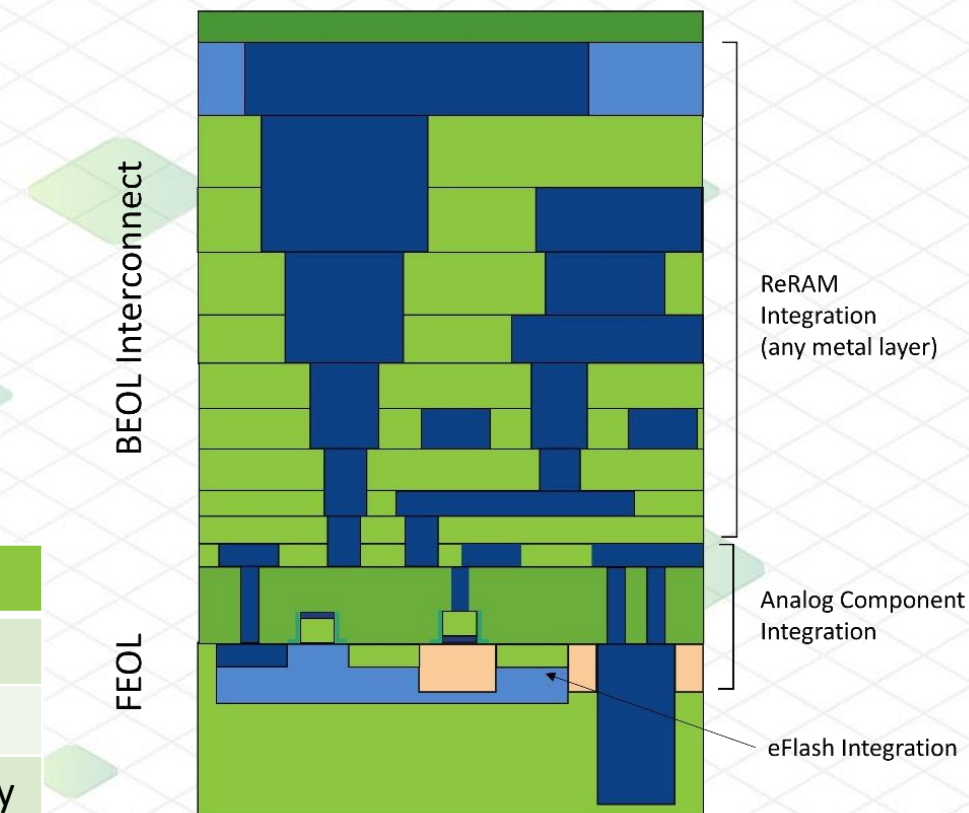


# ReRAM: Best Positioned NVM for BCD Process

## Growing interest and opportunities for ReRAM in BCD processes – used for PMICs

- ❖ >35 companies manufacturing BCD processes\*, and growing
- ❖ TSMC already shipping ReRAM in 40nm BCD
  - ◆ Weebit ReRAM has faster programming time, faster access time, and lower read/program energy consumption
- ❖ DB HiTek selected Weebit ReRAM for BCD
  - ◆ Progressing on schedule, to be available mid 2025

	Weebit ReRAM	Embedded flash
Added masks	2	7-10
Added wafer cost	<10%	>25%
Ease of integration	BEOL; very simple	FEOL; very difficult, risky
Voltage levels	1V-3V	3V-12V

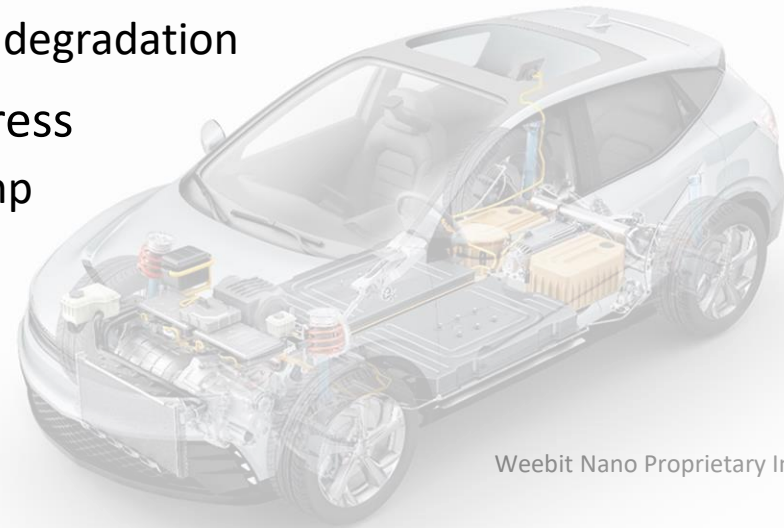
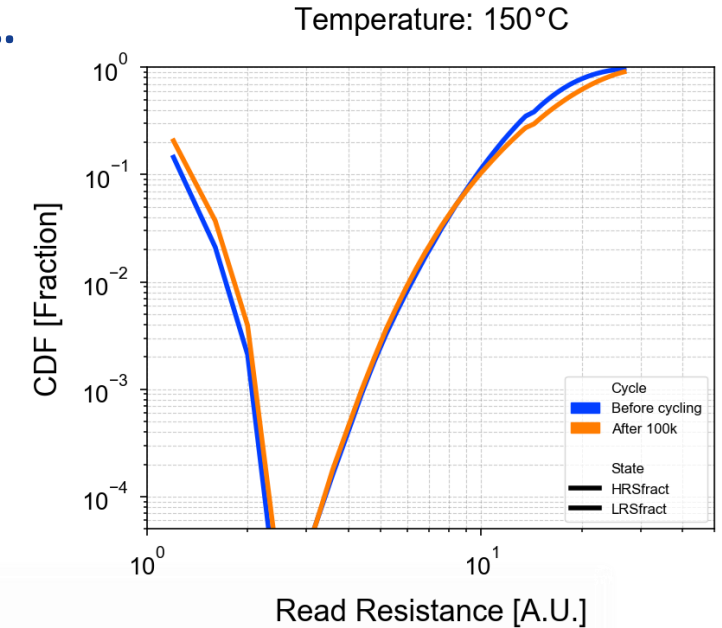


# Automotive in Need of New NVM Technologies

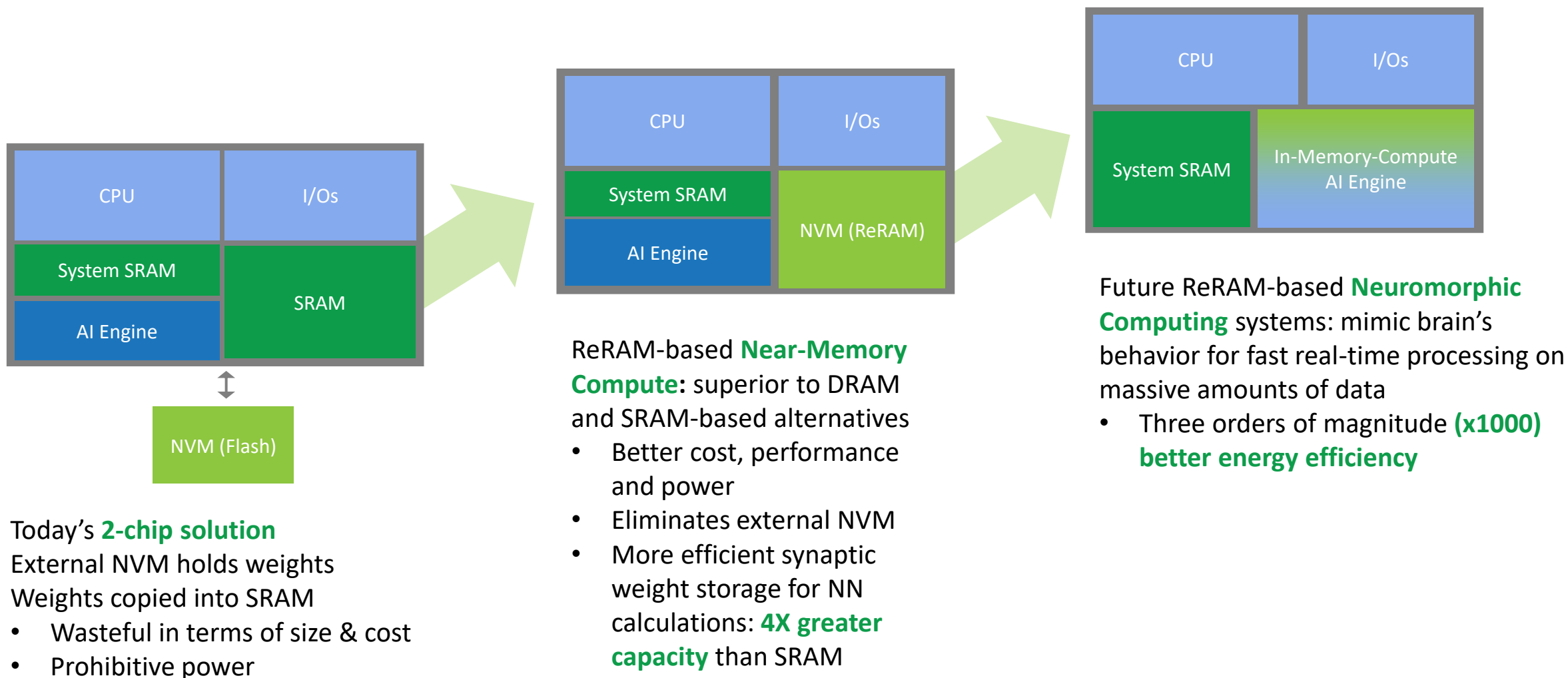
Growing needs for emerging NVM: code storage, trimming, data logging...

## Weebit ReRAM

- ❖ High-temp reliability, EMI immunity, high endurance, fast switching speed, longevity, secure
- ❖ Can effectively scale to the most advanced process nodes, <28nm
- ❖ Demonstrating high performance under extended automotive conditions
  - ◆ High-temp stability: **150°C lifetime operation**, including cycling & retention
  - ◆ **100K Endurance** with good BER throughout; no significant degradation
- ❖ AEC-Q100 qualification (150°C and 100K cycles) in progress
  - ◆ Excellent results achieved, showing robustness at high-temp

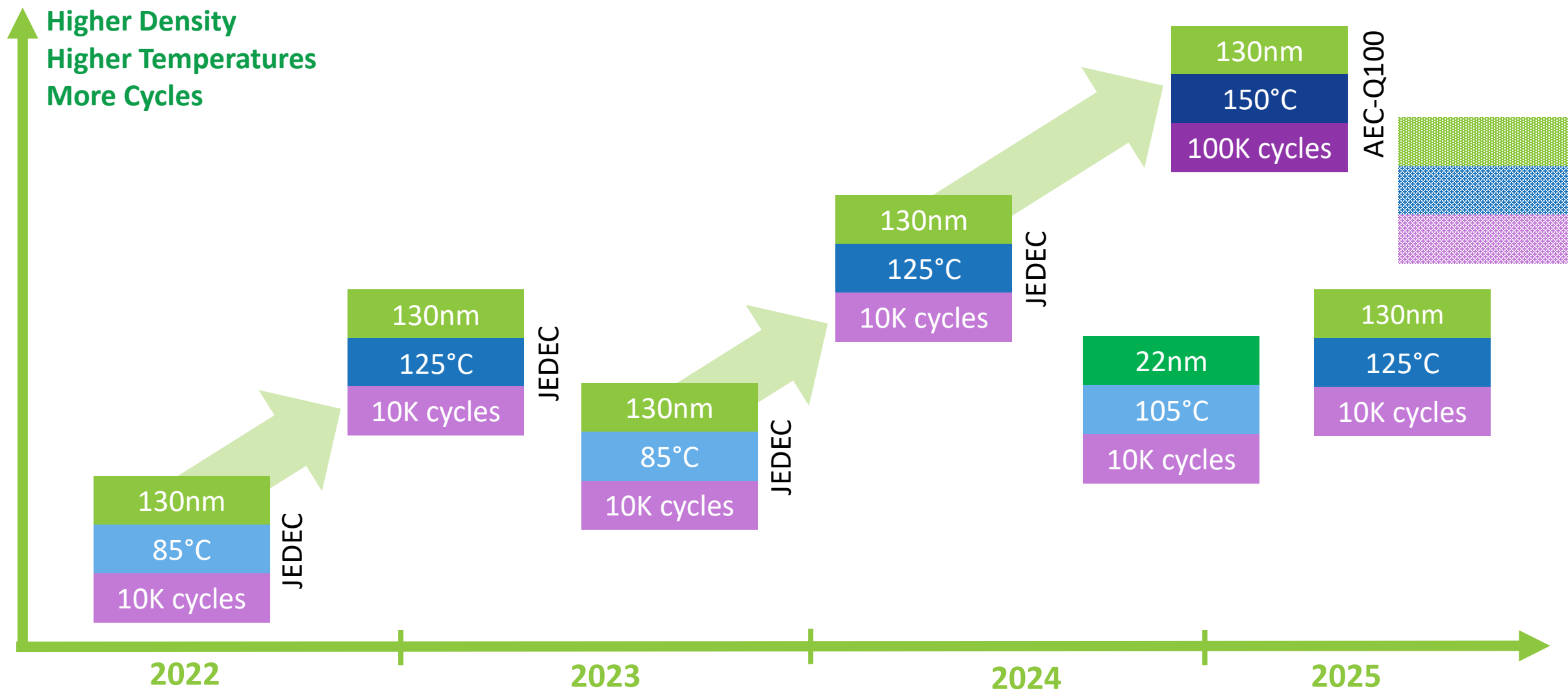


# ReRAM to Drive Innovation for Edge AI and Future Neuromorphic Compute



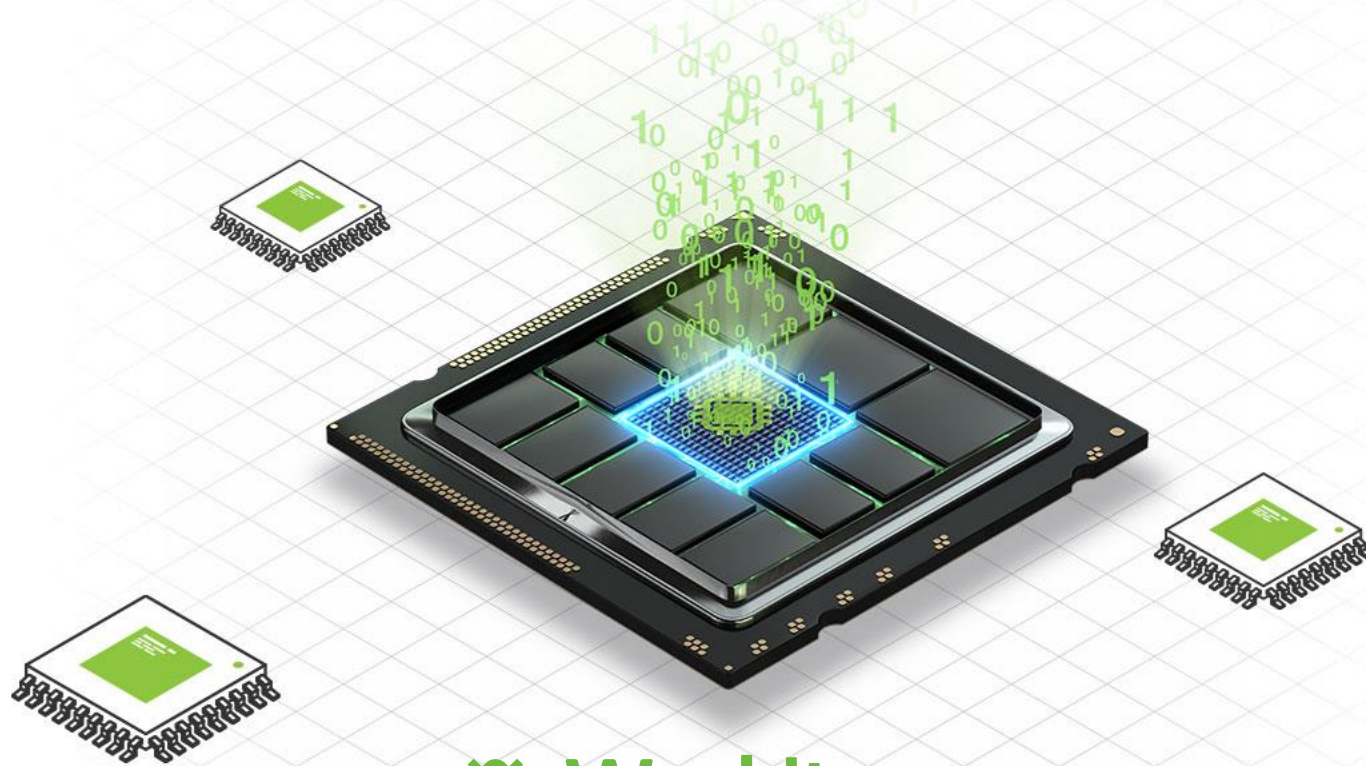


# Weebit ReRAM Qualification Progress



# Stop by our booth to see a live demo of Weebit ReRAM!

[www.weebit-nano.com](http://www.weebit-nano.com)



 **Weebit**nano  
THE NEXT NVM IS HERE