

## ReThink Embedded Memory with ReRAM

### Move your data off the bus

CrossBar Resistive RAM (ReRAM) high-performance memory IP cores are an ideal choice in embedded non-volatile memory applications such as the Internet of Things (IoT), wearables, tablets, smartphones, consumer electronics, artificial intelligence, industrial, automotive and medical.

The high-performance memory non-volatile memory IP cores can be integrated at the same process nodes of microcontrollers (MCU), System-on-Chip (SoC) and Field Programmable Gate Arrays (FPGA) or used as stand-alone memory chip. Starting at 28nm and scaling below 10nm, the high-performance memory enables cost-effective, low latency, high-performance and low energy code execution and data storage memory solutions.

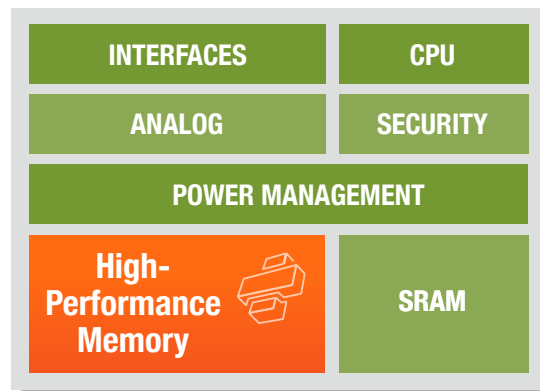
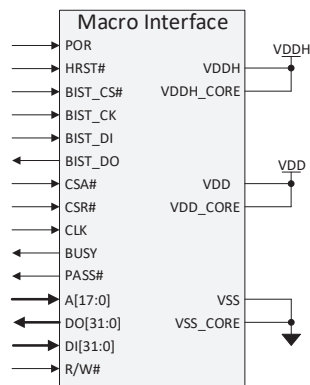
The data integrity and operational characteristics exceed current flash. Depending on the business model, the high-performance memory IP cores can be provided to customers as hard macros or architectural license. Supported densities are from 2M bits (256K Bytes) to 256M bits (32M Bytes), or custom sizes.

In addition to utilizing CrossBar's High-Performance ReRAM technology described above for non-volatile memory applications, this technology can also be used for creating secure cryptographic keys embedded in the semiconductor. These keys are called physical unclonable functions (PUF) keys which are random and unique for every fabricated semiconductor and virtually impossible to reverse engineer or duplicate. The same ReRAM cell technology can be utilized for both memory and cryptographic keys.

### HIGH-PERFORMANCE MEMORY KEY FACTS

- Embedded non-volatile memory array at 2x nm and 1x nm process nodes
- Ultra-low read energy from eNVM array at 0.4 uA/MHz/bit
- 15ns random read access
- 1 M write cycles
- 10 years at 85°C (post 10K cycles)

### TARGETED APPLICATIONS



### Embedded Non-Volatile Memory Array



# High-Performance Memory

256KB to 32MB ReRAM Embedded Macro

2x nm and 1x nm process nodes.

## Features

- **Memory Organization**
  - Device Density 256KB to 32MB
- **Synchronous Primary Interface**
  - Clock: 66MHz
  - x32 to x128 read interface
- **Supply Voltage**
  - VDD=0.9V or 1.1V ( $\pm 10\%$ )
  - VDDH=2.5V ( $\pm 10\%$ )
- **Read Performance**
  - Random Access: 15ns
  - Single Read Mode: up to 1GB/s
- **Write Performance**
  - 32-bit write in 12 $\mu$ s (typical)
  - No erase required prior to write
  - EEPROM Emulation (entire array)
- **Chip Write Command**
  - User defined data value written to entire array
- **Write Protection to Prevent Inadvertent Writes**
- **Two Individually Lockable Secondary Arrays**
  - Chipset Array - 512B
  - Customer Array - 3584B
- **Data Integrity**
  - 10 Years Retention at 85°C (post 10K cycles)
  - 1M Write Cycles
- **Operating Temperature**
  - Extended: -40°C to 125°C

## Product Description

CrossBar Resistive RAM (ReRAM) Code and Data memory “high-performance memory” family provides a cost effective integrated memory solution for embedded applications requiring low power, high performance nonvolatile code execution and data storage. The high-performance memory embedded ReRAM targets on-chip macros in MCU, System on Chip and FPGAs integrated into connected and smart devices of the Internet of Things, wearable and tablet computers, consumer, industrial and automotive electronics.

## Product Consumption

Parameter	Value	Units
Array Read Energy	0.4	$\mu$ A/MHz/bit
Array Write Current	7	mA
Standby Current	4	$\mu$ A