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Weebit Matrix™ In-Memory Compute Kit

Product Brief

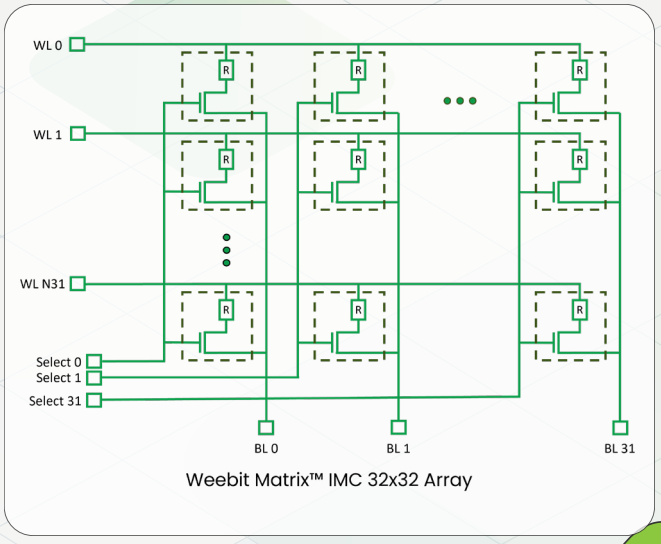
WEEBIT MATRIX™ IMC QUICK-START KIT

Accelerating **In-Memory Compute** for **Next Generation AI**

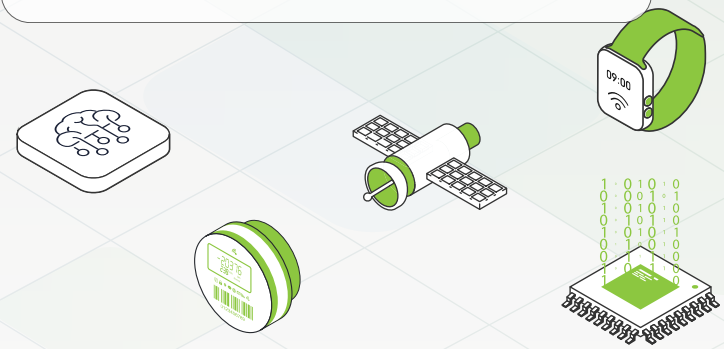
Overview

In traditional computing architectures, moving data between the processor and memory creates performance and bandwidth bottlenecks, and consumes significant power. In-memory computing (IMC) addresses this constraint by performing operations directly within the memory array, minimizing data transfer and enabling higher throughput at significantly lower power.

Weebit ReRAM is well-suited for IMC implementations. It combines ultra-low power operation, back-end-of-line (BEOL) integration, scalable cell architecture, and analog programmability required for efficient vector-matrix computation. Its inherent radiation tolerance also supports deployment in aerospace, defense, and medical environments.



Weebit Matrix™ IMC 32x32 Array



A Broad Range of Applications

The Weebit Matrix IMC platform supports exploration and development of AI and data-centric workloads where data movement and power efficiency are critical, including:

- **AI and Machine Learning (Inference):** Efficient execution of neural networks using in-memory vector–matrix operations
- **Edge and IoT Systems:** Ultra-low-power processing for constrained devices
- **Computer Vision:** Object detection, image classification, and sensor-based perception
- **Natural Language Processing at the Edge:** Keyword spotting and compact language models
- **Autonomous Systems:** Drones, robotics, and industrial automation requiring real-time decision-making
- **Smart Sensors:** Always-on sensing for audio, vision, and environmental monitoring
- **Data Processing Acceleration:** Search, filtering, and pattern-matching workloads

Key Benefits

- ✓ **Performance Gains:** Compute directly in memory, reducing latency and allowing significantly faster and wider parallel processing
- ✓ **Power Savings:** 10x-100x lower energy per inference operation
- ✓ **Parallel Compute Capability:** Native vector-matrix multiply-accumulate (MAC)
- ✓ **Flexible Platform Options:** Supports both device-level characterization and system-level development
- ✓ **Complete Development Kit:** Integrated delivery of chips, boards, FPGA control, and sample code
- ✓ **Engineering Community Impact:** Enabling universities, startups, and enterprises to prototype and publish quickly

Capabilities

- ✓ Apply and control voltages across word-lines, bit-lines, and select-lines
- ✓ Program and read ReRAM cell states, including multiple resistance levels
- ✓ Execute in-memory operations, including vector-matrix MAC and convolution
- ✓ Scale the effective array size by interconnecting multiple boards
- ✓ Perform stress and reliability testing under radiation, high-temperature, and EMI conditions
- ✓ Develop and validate algorithms and architectures, based on real silicon behavior

Features Specifications

Feature	Description
Chip Architecture	32×32 crossbar array (1T1R ReRAM cells)
Package	128-pin QFN
Operating Range	Typical: 25°C, 5.5V supply
Array Functions	Read, Set, Reset
System Functions	ReRAM array address selection, power supply value setting (Input), current measurement (Output)
IMC Operations	Vector-matrix MAC

Getting Started

The Weebit Matrix In-Memory Compute (IMC) program enables engineers and researchers to evaluate and develop ReRAM-based IMC architectures on silicon. It provides a structured platform for implementing, validating, and benchmarking IMC algorithms and system designs.

The platform is intended for both industry and academic users working on AI acceleration, near-memory compute, and emerging architectures. It supports hands-on exploration of ReRAM crossbar behavior. The platform can only be used for research and prototyping purposes, with no commercial use rights.

WEEBIT MATRIX™ IMC EVALUATION KIT WEEBIT MATRIX™ IMC QUICK-START KIT

Integrated development environment for system-level work, supporting matrix-vector operations and neural network inference using the 32×32 ReRAM crossbar array, with onboard FPGA and control logic:

10 Samples

IMC Quick-Start Board

ZEDBOARD (FPGA + CPU)

Software Pack

Documentation

About Weebit Nano

Weebit Nano is a leading developer and licensor of advanced semiconductor memory technology. The company's ground-breaking Resistive RAM (ReRAM) addresses the growing need for significantly higher performance and lower power memory solutions in advanced system-on-chip (SoC) designs for applications such as AI inference, automotive electronics, industrial systems, analog and power ICs, and secure devices.

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