



RAAAM Memory Technologies

Company Overview

RAAAM Memory Technologies Ltd. is an innovative embedded memory solutions provider, that delivers the most cost-effective on-chip memory technology in the semiconductor industry. RAAAM's silicon-proven CMOS memory solutions can significantly reduce the area footprint and cost of almost any VLSI SoC or boost its on-chip storage capacity that can enable industry growth for applications in the areas of AR/VR, Machine Learning (ML), Internet-of-Things (IoT), Automotive and more.

Problem

Important industry growth drivers, such as ML, IoT, Automotive and AR/VR, operate on ever-growing amounts of data that is typically stored off-chip in an external DRAM. Unfortunately, off-chip memory accesses are up-to 1000x more costly in latency and power compared to on-chip data movement. This limits the bandwidth and power efficiency of modern systems. In order to reduce these off-chip data movements, almost all SoCs incorporate large amounts of on-chip embedded memory caches that are typically implemented with SRAM and often constitute over 50% of the silicon area. This memory bottleneck is further aggravated since SRAM scaling has been increasingly difficult in recent nodes, shrinking only at a rate of 20%-25% compared to almost 50% scaling for logic.

Solution

RAAAM's patented Gain-Cell RAM (GCRAM) technology relies on a high-density bitcell that requires only 2-3 transistors (depending on priorities on area or performance). This structure offers up-to 2X area reduction over high-density 6T SRAM designs with no power or performance penalties. Furthermore, the memory bitcell is composed of decoupled write and read ports, providing a native two ported operation, thus offering higher bandwidth. Unlike conventional 1T-1C eDRAM, GCRAM does not rely on delicate charge sharing to read the data. Instead, GCRAM provides an active read transistor that provides an amplified bit-line current, offering low-latency non-destructive readout without the need for large storage capacitors. As a result, GCRAM does not require any changes or additional costs to the standard CMOS fabrication process and scales well with technology.

RAAAM's GCRAM technology enables a significant chip fabrication cost reduction or highly improved performance, resolving the memory bottleneck for semiconductor companies in various application fields. Since GCRAM is directly compatible with any standard CMOS process and uses an SRAM-like interface, it can easily be integrated into existing SoC designs.

Market Size

The on-chip embedded memory market is a submarket of the digital SoC market, and it is valued at over \$500M, with a CAGR of 12.3% over the period 2021-2026 (ResearchAndMarkets.com).

Business Model

RAAAM follows an IP vendor licensing model. Semiconductor companies can license RAAAM's GCRAM technology for a fee and production unit royalties. RAAAM implements the front-end memory controller and GCRAM-based hard memory macros according to the customer specifications and delivers a soft RTL wrapper (using a standard SRAM interface), which instantiates the GCRAM hard macros (GDS) and the soft refresh control (RTL).



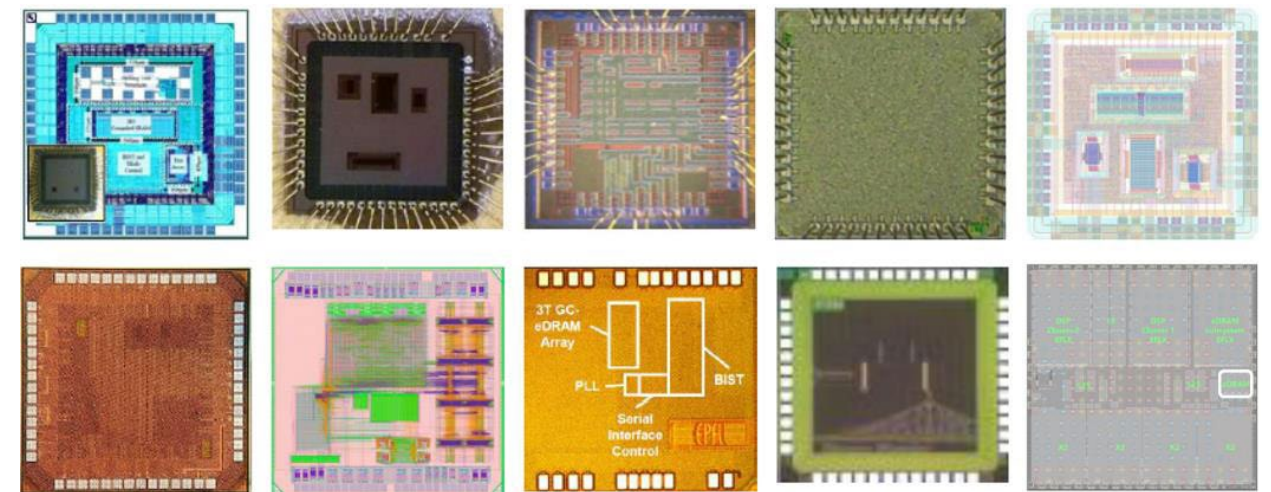
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Competition

The volatile embedded memory market is mostly dominated by SRAM-type embedded memories, which are based on foundry bitcells, and are provided by IP companies such as Arm, Synopsys, etc. RAAAM's technology offers a competitive advantage over SRAM-based solutions due to GCRAM's significant density advantage over SRAM, inherent two-ported operation (vs. 1-port for high-density SRAM) offering higher bandwidth, and lower leakage power consumption. Compared to 1T-1C eDRAM and emerging memory technologies, RAAAM's GCRAM requires no additional process steps or cost and it is fully compatible with the standard CMOS fabrication process.

Feasibility Demonstrations and Patents

In the course of a decade of world-leading academic research, GCRAM technology has already been demonstrated on silicon using 10 silicon prototypes of leading semiconductor foundries (e.g., TSMC, Samsung, ST, etc.) in a wide range of process nodes ranging from 16nm to 180nm, including Planar Bulk, FD-SOI and FinFET processes. RAAAM's GCRAM technology is protected by 10 granted patents.



Recent Achievements

- Silicon demonstrations with 10 test-chips in standard CMOS processes of various foundries (TSMC, ST, Samsung, UMC).
- Demonstrated technology scaling from 180nm – 16nm (Bulk CMOS, FD-SOI, FinFET).
- Engagement with very large semiconductor company on a long-term co-development project.
- Received \$450K in R&D funding from various grants (Innosuisse, Bridge PoC, EPFL Innogrant).

Silicon Catalyst Start Date: November, 2021

Team

The five members of the founding team, led by CEO Dr. Robert Giterman, bring over 100+ combined years of semiconductor experience and a decade of experience with the development of RAAAM's GCRAM technology.

Ask

RAAAM is in the process of raising Seed funding to fully qualify our GCRAM technology in selected nodes of leading semiconductor foundries and to accelerate our company's overall business growth.