Solving computing's energy problem.

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Efficient E1© SoC — Product Brief

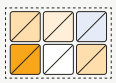
Description

Efficient's E1© is the world's most energy-efficient, general-purpose system-on-chip. E1 enables the next generation of battery-powered devices, achieving ASIC-like efficiency with up to 100x better energy efficiency vs. competition. The E1 achieves this without software modification, a familiar programming interface, and support for a wide variety of applications (e.g., neural networks, digital signal processing, sparse algorithms, graph analytics, compression, and cryptography).

E1's best-in-class efficiency enables unprecedented capabilities on-device, e.g., sophisticated, local interpretation of sensed data to avoid expensive off-device communication. Moreover, E1's general-purpose support means that the entire application benefits, unlike an accelerator which targets a portion of the application.

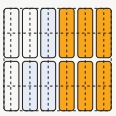
The key to the E1's efficiency is Efficient's proprietary Fabric© processor. The Fabric is a general-purpose, ultra-low-power (100s of µW) and ultra-efficient (1 TOPS/W) dataflow processor with a standard software development flow. Efficient offers a complete compiler stack that is a drop-in replacement for existing compiler toolchains (e.g., GCC/Clang) with support for high-level languages (e.g. C/C++) and frameworks (e.g., TFLite).

Features



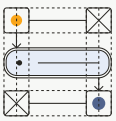
Ultra-efficient operation via Efficient's Fabric

- Class-defining energy efficiency: up to 1 trillion 8-bit integer operations per second per Watt (TOPS/W)
- High performance for the extreme edge:
  - Low Voltage: 6GOPS (25MHz Fabric/75MHz memory)
  - High Voltage: 18-24GOPS (75-100MHz Fabric/225-300MHz memory)
- Ultra-efficient and performance modes:
  - Efficiency mode
  - Performance mode
  - Low-power and sleep and deep-sleep modes



Fast on-chip memory

- Ultra-low-power on-chip memory and storage
- 4 MB of NVM (MRAM) with DMA support
- 3 MB ultra-low-power SRAM
- 128KB (8KB/bank) of ultra-low-power cache



Familiar, general-purpose software programmability

- Runs general-purpose code on Efficient's fabric
- Support for a growing variety of valuable developer on ramps
  - C (available now)
  - TFLite (available end-2024)
  - ONNX (coming first-half 2025)
  - Embedded C++ (coming first-half 2025)
  - CircuitPython (coming first-half 2025)
  - Rust (coming second-half 2025)
- Ultra-fast compilation times
- Exceptional developer experience and compatibility
- Compiler drop-in replacement for GCC/Clang
  - Debugger drop-in replacement for GDB (coming second-half 2025)
  - Integrates seamlessly with most build systems

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Low-power RISC-V scalar core

- 4 µW/MHz active mode power
- Power down mode while fabric runs
- RV32iac+zmmul support

Power Management

- Supply voltage: 1.8V
- Internal logic voltage: 0.55V–08V
- Temperature range: –40°C to 125°C
- Optimal operating point: 25°C
- Programmable power management unit
- Programmable wake-up controller
- Integrated LDO/buck power conversion
- Integrated ultra-low-power clock generation

Ultra-low-power flexible serial peripherals

- 6x QSPI masters for peripherals
- 6x UART with flow control for peripherals
- 6x SPI slave for host communication
- 6x I2C masters for peripheral communication
- 72x GPIO
- 1x RTC

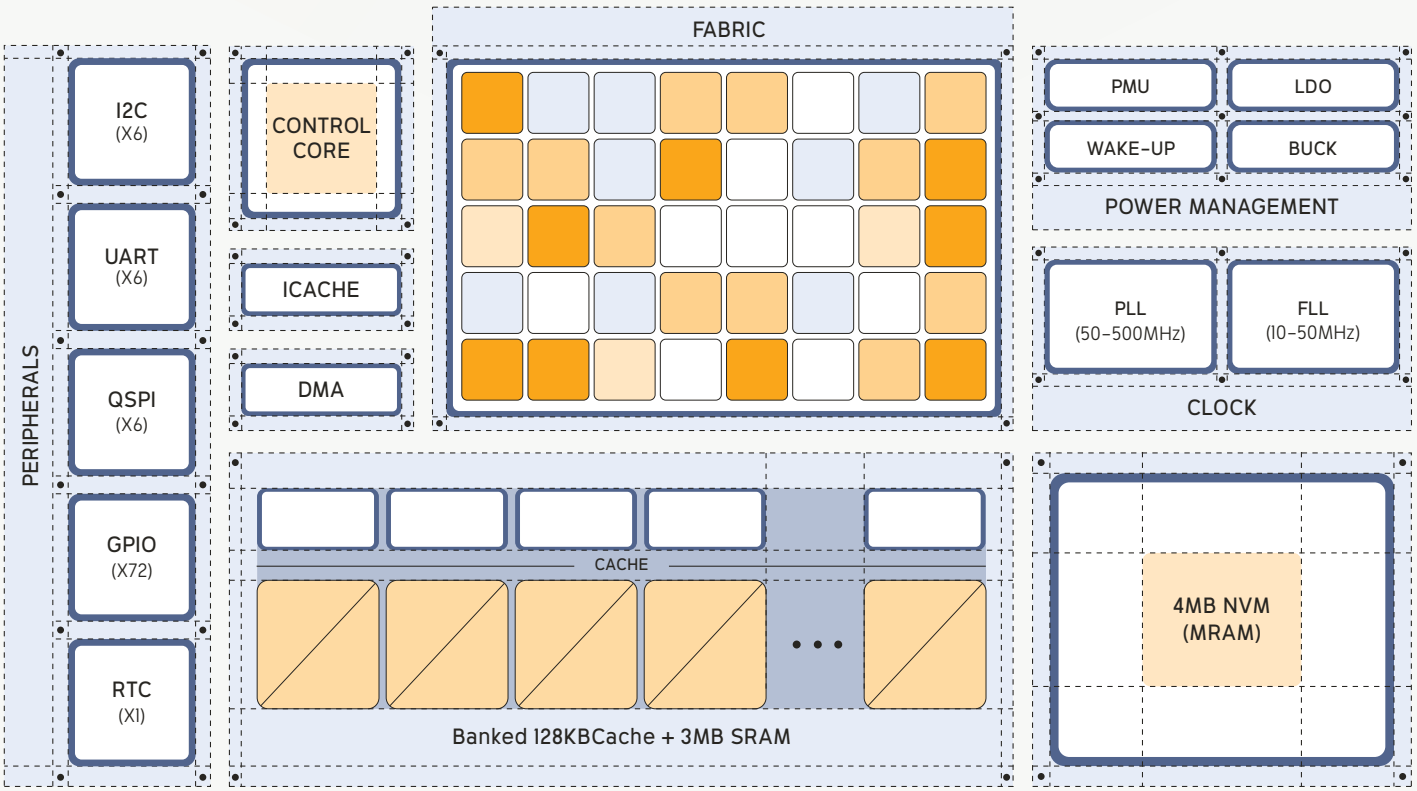
Package

- Standard BGA package
- Onboard clock generation + power conversion

Applications

- Defense and Security Systems
- Wireless Sensors and IoT
- Smart watches/rings
- Activity and Fitness Monitors
- Motion and Tracking Devices
- Consumer Electronics
- Home/Industrial Automation
- Consumer Medical Devices

Block diagram



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