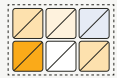# Electron E1© SoC — Product Brief

Description

Electron E1© is the world's most energy-efficient, general-purpose system-on-chip. Electron E1 enables the next generation of battery-powered devices, achieving ASIC-like efficiency with up to 100x better energy efficiency vs. competition. The Electron 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).

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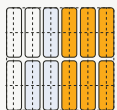
The key to Electron E1's efficiency is Efficient's proprietary Fabric© processor. The Fabric is a general-purpose, ultra-low-power (100s of μW) and ultra-efficient (1 TOPS/W) dataflow processor with a standard software development flow. Efficient offers a complete compiler stack that is a drop-in replacement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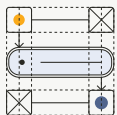
Features

Ultra-efficient operation via Efficient's Fabric

- High performance for the extreme edge:
  - Low voltage: 5.4GOPS (50MHz system clock)
  - High voltage: 21.6GOPS (200MHz system clock)
- Ultra-efficient and performance modes:
  - Efficiency mode
  - Performance mode
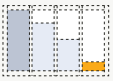 - Low-power and sleep and deep-sleep modes

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
  - Available Now
    - C
  - Coming
    - TFLite
    - ONNX
    - C++
    - Python
    - Rust
- Ultra-fast compilation times
- Exceptional developer experience and compatibility
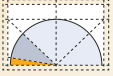- Compiler drop-in replacement for GCC/Clang

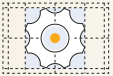|		
Low-power RISC-V scalar core	• 4 µW/MHz active mode power • Power down mode while fabric runs • RV32iac+zmmul support	
Power Management	• Supply voltage: 1.8V • Internal logic voltage: 0.55V–08V • Temperature range: –40°C to 125°C • Optimal operating point: 25°C • Programmable power management unit • 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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