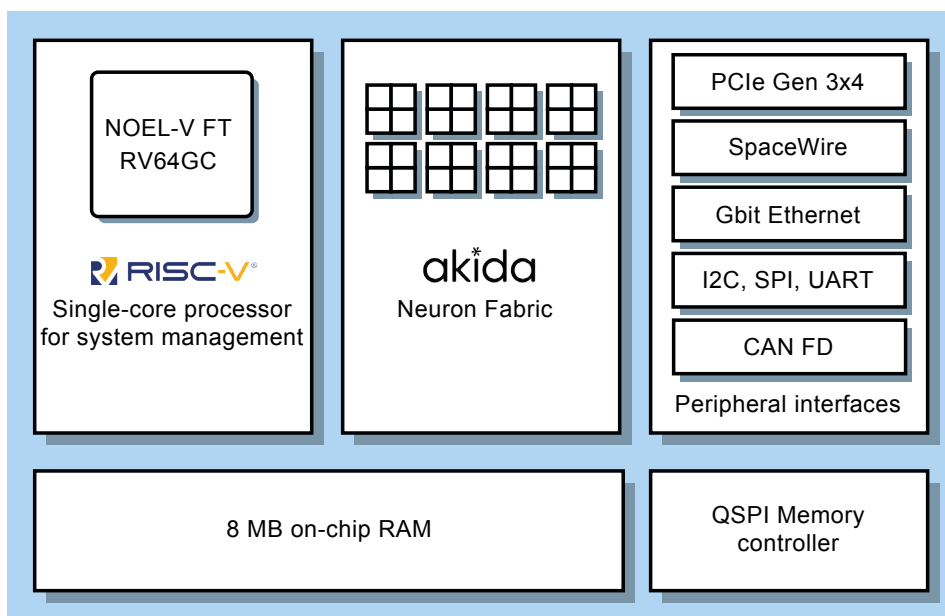
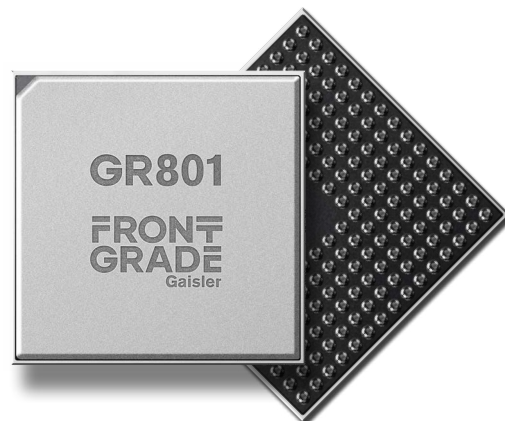


GR801

GR801 is a radiation-hardened SoC designed to enable reliable artificial intelligence (AI) applications in space. The architecture consists of a neuromorphic processing engine (Brainchip Akida™ 1.0), a single-core RISC-V RV64GC processor (NOEL-V) for system management, and several digital interfaces.

GR801 is a reliable computing platform for AI applications such as image recognition, autonomous navigation, and data analysis. The neuromorphic engine provides fast and energy-efficient inference, enabling fast on-board decisions.



Akida™ neuromorphic processing accelerator

Akida provides acceleration of AI models using event-based computing to minimize power consumption.

- Eight neural processing nodes connected in a mesh network
- Each node consisting of four convolutional or fully connected engines
- Hardware support for 1, 2, or 4-bit hybrid quantized weights
- Multi-Pass Processing enables execution of large neural networks

NOEL-V RISC-V Processor

- General-purpose RISC-V processor (RV64GC)
- High-performance processing for traditional computing tasks
- System management and configuration of the neuromorphic engine

Memory

- 8 MB on-chip RAM
- QSPI memory controller (2 chip selects)
- 3.2MB RAM private for the Akida unit

GR801

Radiation tolerance

GR801 will be implemented on STMicroelectronics's 28nm FDSOI node that has a well-established resilience against radiation effects.

The NOEL-V processor, on-chip memory, and all buffers are protected against radiation effects with error correction mitigation. The Akida accelerator is implemented with fault-detection on all memories, allowing flexibility in handling detected faults.

Interfaces

- PCIe Gen 3, 1 port x4, with capability to act both as a root port and as an endpoint
- 10/100/1000 Mbit Ethernet (GMII)
- Camera Parallel Interface (CPI) - 8 data bits
- SpaceWire router - 4x external ports (200 Mbps)
- 2x ports CAN FD
- 1x SPI (2 chip selects)
- 2x I2C
- 16x GPIO
- 3x UARTs

Software development and deployment

- Akida leverages standard frameworks and development platforms such as TensorFlow/Keras, and Edge Impulse
- Akida is model-, network-, and OS-agnostic
- BrainChip MetaTF™ supports model development and optimization for Akida hardware
- Akida models zoo offers a set of pre-built Akida-compatible models, pre-trained weights and training scripts



TensorFlow



Keras



ONNX



PyTorch

	GR801-AS	GR801-CP
Product class	Radiation hardened flight model	Engineering model
Qualification level	ESCC9030 screening and lot acceptance test	Not applicable
Package	Space grade thermally enhanced BGA, 23x23mm, 441 balls, 1mm pitch	Space grade thermally enhanced BGA, 23x23mm, 441 balls, 1mm pitch
TID	50 krad(Si) (guaranteed by platform) 100 krad(Si) (testing/screening to be performed)	N/A
SEL	TBC	N/A
Technology	STM 28nm FDSOI	STM 28nm FDSOI