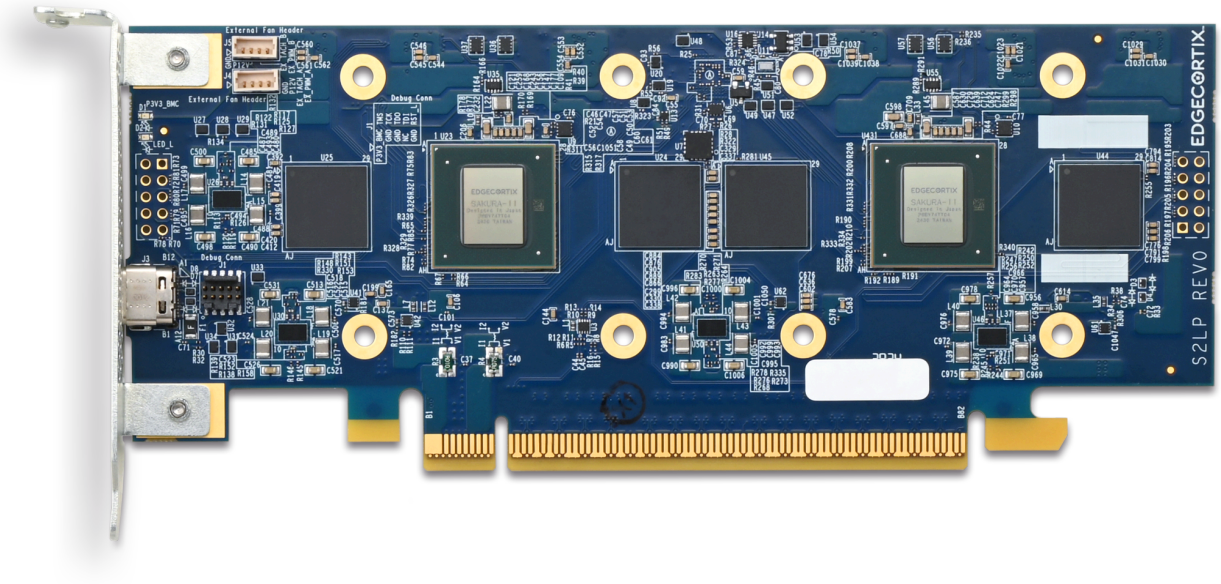
EDGECORTIX

SAKURA-II PCIe Cards

Datasheet



Revision History

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1. OVERVIEW

This datasheet provides information on the EdgeCortix SAKURA-II PCIe Cards. There are two versions of the Cards, one with a single SAKURA-II chip and associated circuitry, and one with dual SAKURA-II chips and circuitry. These evaluation platforms are ready to drop into an Ubuntu host PC slot for software development and AI model evaluation tasks. The SAKURA-II PCIe Cards feature EdgeCortix SAKURA-II chips, an edge AI accelerator that uses the Dynamic Neural Accelerator® (DNA) run-time reconfigurable using the EdgeCortix MERA compiler and software framework.

If you are looking for information on how to install these PCIe Cards, how to install the MERA Compiler, and how to run models and demos, please see the SAKURA-II PCIe Card User Manual available in the Developer Zone.

2. ORDERING INFORMATION

PCIe Card Type	Ordering Part Number	Description
Single PCIe Card	SAKURA-II PCIe Card Part Numbers TBD	PCIe Card with one SAKURA-II device and associated circuitry
Dual PCIe Card	SAKURA-II Dual PCIe Card Part Numbers TBD	PCIe Card with a two SAKURA-II devices and associated circuitry

3. PCIe CARD FEATURES

Specification	Single PCIe Card	Dual PCIe Card
AI Accelerator	Single SAKURA-II	Dual SAKURA-II
Performance	60 TOPS (INT8) 30 TFLOPS (BF16)	120 TOPS (INT8) 60 TFLOPS (BF16)
LPDDR4 DRAM	16GB (2 banks of 8GB)	32GB (4 banks of 8GB)
PCIe Interface	Gen 3.0 x8	Gen 3.0 x8/x8 (bifurcated)
Board Management	Power sequencing, configuration, and reset Voltage, current, and temperature monitoring	

Controller (BMC)	Protection shut-down SPI Interface to SAKURA-II device	
USB Interface	USB-C connector on PCIe bracket Provides access to BMC for monitoring and control	
Cooling Options	Passive Heatsink	
Power Consumption	10W (typical)	20W (typical)
Form Factor	PCIe Add-In Card, Low Profile, Half-Length 167.65mm x 68.90mm, Single Slot	
Bracket Options	Low Profile and Full Height	

4. PCIe CARD DIMENSIONS

Specification*	Single and Dual PCIe Cards
PCB Length	167.65 mm max
PCB Height	68.90 mm max
PCB Thickness	1.57 mm +/- 0.13 mm
Top-Side Component Height	14.47 mm max
Bottom-Side Component Height	2.67 mm max
PCB Mass Examples	Dual PCIe Card with passive heatsinks and Low Profile bracket attached - 150g Dual PCIe Card with fan assembly and Low Profile bracket attached - 94g

*For in-depth mechanical specs, refer to the PCIe electromechanical specification.

5. PCIe CARD IMAGES

Figure 1 shows an annotated image of the SAKURA-II single PCIe Card, with important components identified:

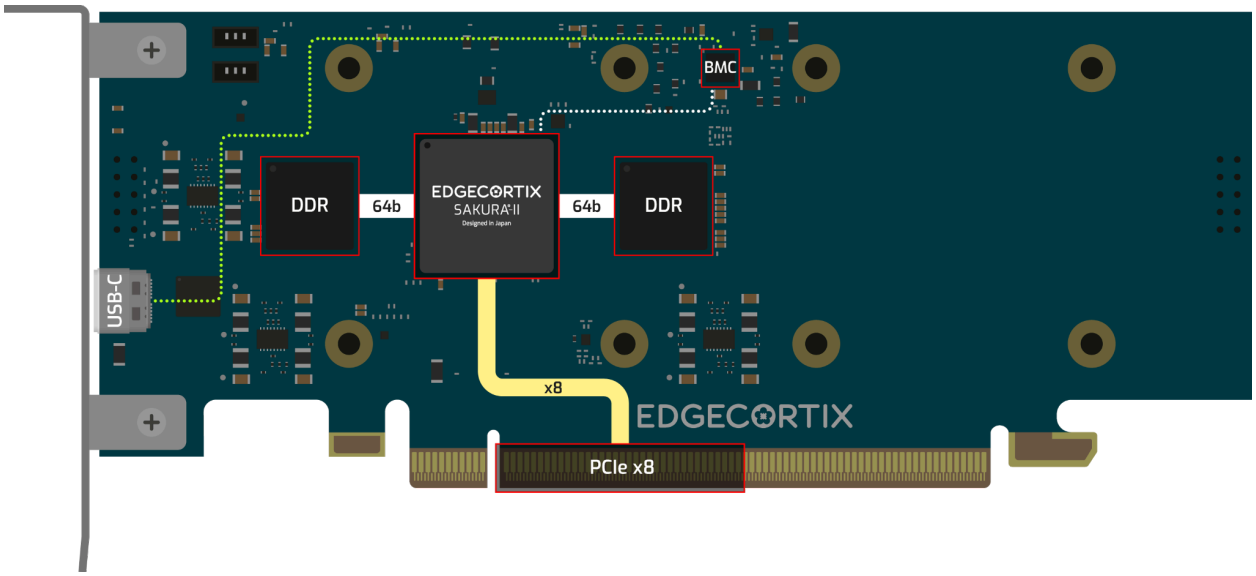

FIGURE 1: SAKURA-II single PCIe Card Annotated Image

Figure 2 shows an annotated image of the SAKURA-II dual PCIe Card:

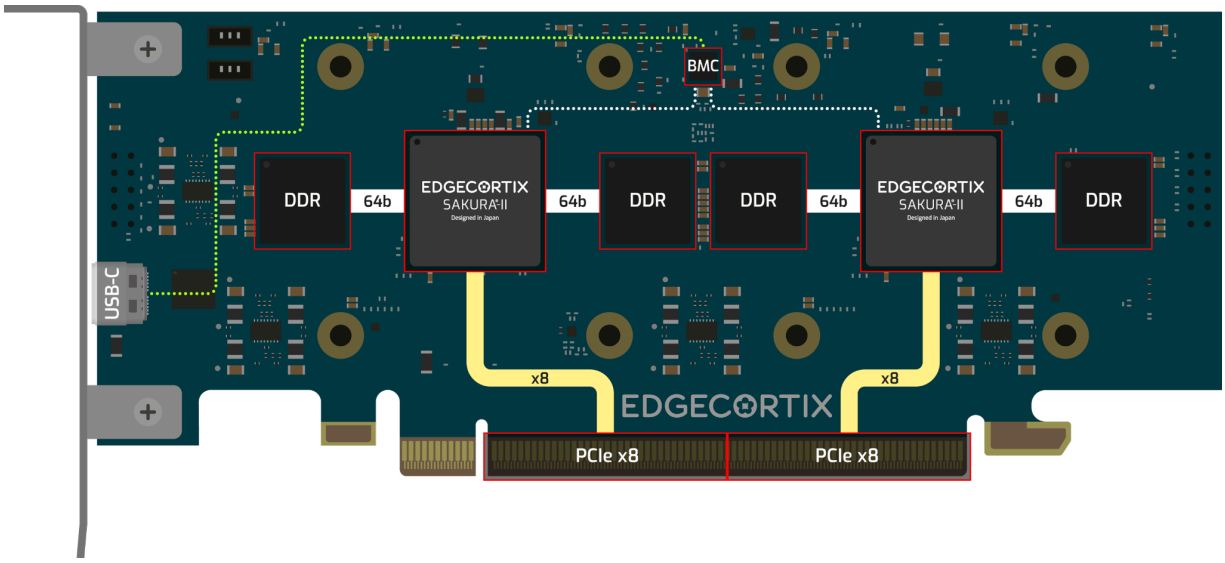

FIGURE 2: SAKURA-II dual PCIe Card Annotated Image

6. PCIe CARD APPLICATIONS

The SAKURA-II PCIe Cards are intended for use in a wide range of applications across a variety of market sectors. Primarily targeted at next generation AI functionality integrated into new and existing systems, the SAKURA-II PCIe Cards can be easily added to any system with a PCIe backplane.

Efficient Edge AI processing can provide many additional features, including:

- Natural language processing
- Object/person recognition
- Segmentation and Identification
- Obstacle Identification and Avoidance
- Advanced Signal Processing

Some of the markets that SAKURA-II is well suited for:

Smart City: For critical city management applications like traffic control, image recognition and identification, SAKURA-II can operate cost-effectively throughout the city environment, in applications like traffic control, image recognition and identification, SAKURA-II can operate cost-effectively throughout the city environment.

Smart Retail: Retailers can use SAKURA-II at the edge for inventory management, personalized recommendations, customer behavior analysis, smart shelving, checkout systems, and supply chain optimization.

Smart Appliances: Using SAKURA-II to manage appliances and choose ideal operation in real time can lead to significant energy use reduction and cost savings using AI.

Smart Manufacturing: In factories, edge AI solutions optimize production lines, predict equipment failures, and enhance quality control. Real-time analysis of sensor data helps improve efficiency and reduce downtime (and product quality) using SAKURA-II.

Smart Agriculture: Using SAKURA-II in the fields to manage irrigation and fertilization usage can increase yields and reduce costs with real-time soil and weather analysis.

Security: Surveillance cameras equipped with SAKURA-II can detect anomalies, recognize faces, and identify potential threats. This technology enhances public safety and reduces response time.

Autonomous Vehicles: Edge AI decision making is critical for human safety and SAKURA-II can use real-time processing to support accurate analysis and decision making for safe vehicle operation.

Robotics: Robots and autonomous machines rely on SAKURA-II capabilities for real-time perception, navigation, and decision-making. This is crucial for applications like warehouse automation and delivery drones.

Space/Aviation: SAKURA-II can assist in aircraft maintenance, engine performance, component wear prediction and improved safety and reliability. SAKURA-II's radiation survivability allows operation in Space environments.

AI-RAN and 5G/MEC (Multi-access Edge Computing): SAKURA-II can be leveraged to improve network management, predict network congestion, and enhance user experience, and can enable faster decision-making in complex telecom environments – and delivers new capabilities in the 5G/MEC space.

7. SAKURA-II PCIe CARD SPECIFICATIONS

7.1 ABSOLUTE MAXIMUM RATINGS

Stresses outside the AMR may cause permanent damage; extended operation at AMR may degrade performance and affect reliability.

ABSOLUTE MAXIMUM RATINGS	Minimum	Maximum	Units
Storage Temperature	-40	+85	ºC
Operating Temperature	-20	+85	ºC
3.3V Power Supply	3.00	3.60	V
12V Power Supply	11.04	12.96	V

7.2 ELECTRICAL AND ENVIRONMENTAL SPECIFICATIONS

All electrical specifications for the PCIe Cards comply with the PCIe specification, which can be found on the PCI-SIG website at Specifications | PCI-SIG..

Specification	Single and Dual PCIe Cards
Electrical	Onboard power derived from PCIe slot (12V and 3.3V)
Environmental	-20C to +85C (component operating range) 0 to 95% humidity (non-condensing)

7.3 PEAK PERFORMANCE

Peak Performance	Single PCIe Card	Dual PCIe Card
Trillion Operations per Second (TOPS) using INT8	60	120
Tera Floating-point Operations per Second (TFLOPS) using BF16	30	60

7.4 POWER CONSUMPTION

The power consumed by the PCIe Cards can vary depending on the model used, the number of inferences per second, and the operating frequency being run. The single PCIe Card and the dual PCIe Card will have different power profiles due to the increased functionality and components on the dual PCIe Card.

7.5 POWER AND THERMAL MANAGEMENT

Users must consider the effects of the operation of the PCIe Cards on the system it is inserted into. Peak currents must be handled properly by the host system so as to not cause damage to other boards or components in the system. Current are highly variable depending on the models used and spikes can occur. Your host system must be able to tolerate these higher currents, and your power supply must provide fast transient response performance.

The PCIe Cards consume power and the heat generated must be actively handled with some force airflow to ensure excessive board and component temperatures are avoided.

7.6 ESD PROTECTION

SAKURA-II PCIe Cards are populated with electrostatic discharge (ESD) sensitive devices which can be damaged by static charges that can build up on people, tools, and other surfaces. Proper care must be taken in handling these devices and proper grounding must be maintained to ensure that any ESD does not damage any devices on the PCIe Card. It is beyond the scope of this document to explain and provide specific ESD protection schemes, but users should be familiar with these processes that apply to all ESD-sensitive semiconductor devices. No warranty is provided for improper handling of the SAKURA-II PCIe Card and damage to any devices on the Card is the full responsibility of the user.

8. PCIe CARD CONNECTOR PINOUT

All connector pinout specifications for the PCIe Cards comply with the PCIe specification, which can be found on the PCI-SIG website at Specifications | PCI-SIG.

9. TOOLS, DOCUMENTATION, AND SUPPORT

9.1 INCLUDED COMPONENTS

This evaluation kit includes the following components:

- SAKURA-II single or dual PCIe Card
- PCIe Brackets - Low Profile and/or Full Height
- Associated software:
    - MERA Compiler and Software Framework
        - Refer to the MERA Installation Manual for instructions
    - Installation script to automatically prepare a Python virtual environment suitable to run all the provided scripts and demos
    - Demos showcasing how to get detections from models that perform monocular depth estimation and object detection. A demo of how to take two models and fuse them into a single model, compile them, and get detections from hardware and use them to benchmark this model.
    - NOTE: All items are available in the EdgeCortix Developer Zone.

9.2 PRODUCT CERTIFICATIONS AND SPECIFICATIONS

Category	Single and Dual PCIe Cards
Product Certifications	FCC, CE, UKCA Japanese/Korean versions UL
Manufacturing Specifications	RoHS IPC-A-610 Class 2

9.3 HOST AND SOFTWARE REQUIREMENTS

Host Platform	x86-64 or ARM*
Operating System	Ubuntu 22.04 LTS or 24.04 LTS
Development Platform	MERA-II Compiler Framework including the MERA

	Quantizer
ML Frameworks	PyTorch, ONNX, TensorFlow Lite
Compiler Framework	Apache TVM MLIR
Models	Source from Hugging Face or EdgeCortix Model Library

* For compiling and generating run-time files (for deployment), users should use x86 systems only. Run-time files can be generated for both x86 or Arm architectures. Arm systems can then be used to deploy the Arm architecture generated runtime files.

9.4 OTHER DOCUMENTATION

In addition to this datasheet, other available documentation includes:

- SAKURA-II PCIe Card User Manual
  - Includes installation and usage details for the PCIe Cards
- SAKURA-II Device Datasheet (requires NDA)
  - Provides detailed information on the SAKURA-II device

9.5 SOFTWARE DOWNLOAD AND TECHNICAL SUPPORT

To get access to the MERA Compiler framework and get technical support from EdgeCortix, users should first join the Developer Zone. You can put in a request for access here. In the Developer Zone, you will find:

1. MERA Compiler Software download
2. MERA Tutorials
3. Documentation listed above in Section 9.4
4. Ticket System for technical support

10. REVISION HISTORY

Revision	Date	Summary
0.7	February2025	Initial Release

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