Orca M.2 Accelerator Module Datasheet

Ordering Information

Part Number	Description
DG-ORCA12HP-M81G1-XX	Orca, High Performance, M.2 2280 Module, 1 GB DRAM

Table of Contents

Ordering Information *1*
Description *3*
Features *3*
Hardware Features 3
Specifications *4*
PCIe M.2 Key M Connector Pinout *5*
System Block Diagram and Module Dimensions *6*
Power / Performance *8*
Thermal Management Considerations *9*
Overheating Protection *9*
System Requirements *9*
Compliance Requirements *10*
Installation and Troubleshooting *10*
Revision History *11*
Disclaimer *12*
Copyright Notice 12
General Notice 12

Description

The Orca processor enables developers to effortlessly build sophisticated and powerful edge AI products. Its highly efficient architecture maximizes compute and bandwidth resources by supporting pruned model processing and rapid model multiplexing. This allows you to run larger, more accurate models in real-time, delivering cloud-like performance at the edge.

With DRAM support, Orca efficiently handles multiple ML models, perfect for complex applications beyond simple single-model scenarios. Paired with DeGirum's hardware-agnostic PySDK and AI Hub, you can quickly start developing cutting-edge AI applications optimized for performance and flexibility.

Features

- **Highly efficient and flexible architecture** for edge AI development
- **Power consumption**: 3.5 W (typical), ideal for low-power applications
- **Seamless integration** with a plug-and-play software stack
- **Pruned model support** to optimize compute and bandwidth usage
- **Flexible operation**: Supports both DRAM and DRAM-less configurations
- **Near-lossless model switching**, ensuring efficient multi-model operation
- **Scalability**: Supports multi-chip configurations for more demanding use cases
- **Multi-camera real-time performance**, ensuring smooth and responsive operation

Hardware Features

- Orca Chip
- 1 GB LPDDR4 DRAM
- M.2 M-Key 2280 Form Factor
- PCIe Gen 3 x4 Lanes

Specifications

Physical Specifications (PCIe M.2)	
Form Factor	M.2 M-Key (M.2-2280)
Dimensions[1]	22.00 x 80.00 x 2.30 mm Top-side height: 1.50 mm ± 0.10 mm Bottom-side height: 0.70 mm ± 0.10 mm
Weight	2.5 g
Electrical	
DC Supply	3.3 V ± 5%
Interface	PCIe Gen3 x4 lanes
Power Consumption	2.8 W (typical) (Avg 38 networks)
Thermal	
Thermal Design Power (TDP)	6 W [3]
Environmental	
Storage Temperature	-20 °C to +85 °C
Operating Temperature	-10 °C to +70 °C [2]

[1] For in-depth mechanical specs, refer to the PCIe M.2 Specification documentation.

[2] Heat dissipation methods should be used to ensure Orca chip does not overheat.

[3] For detailed information on cooling solutions, please refer to the Thermal Management Considerations section or visit Heatsink and Thermal Management Guidelines.

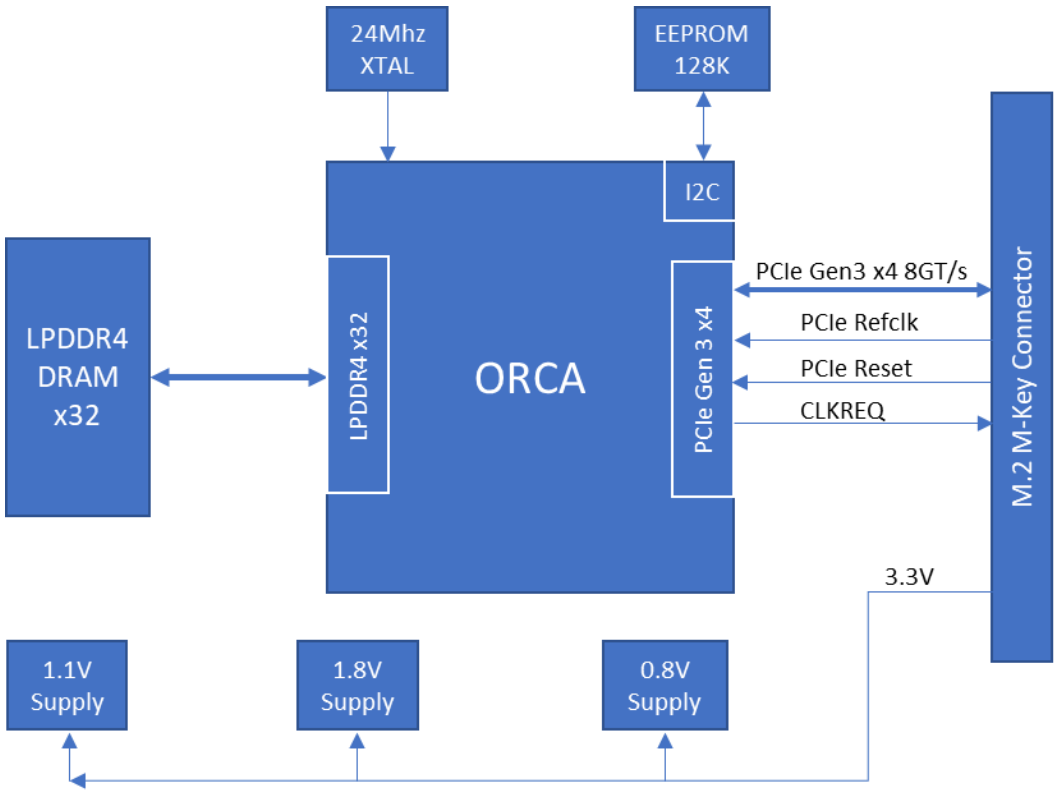
PCIe M.2 Key M Connector Pinout

The following table shows the pinout details for the Orca M.2 Accelerator Module's PCIe connector.

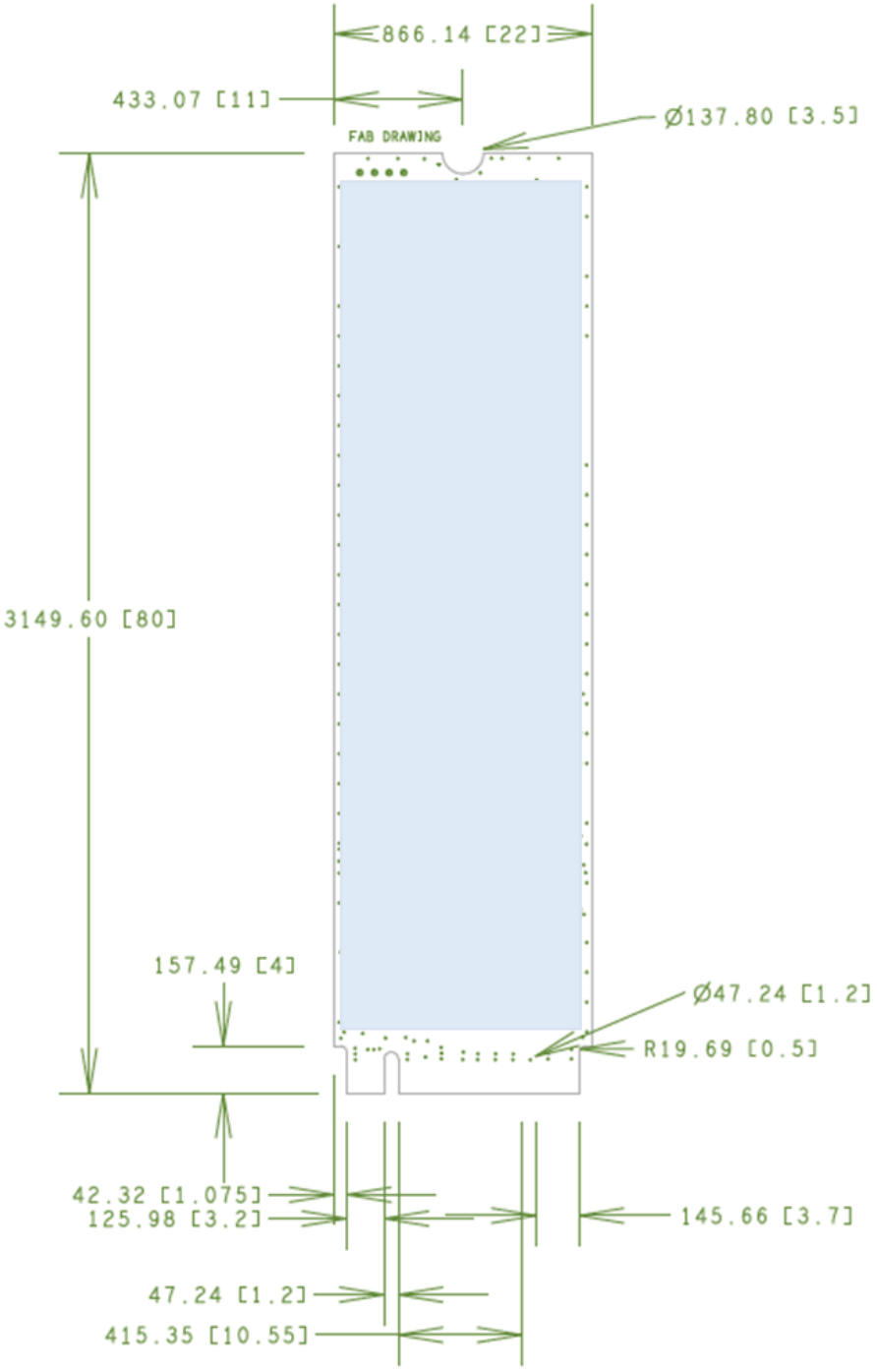
Pin Number	Signal	Type
2, 4, 12, 14, 16, 18, 70, 72, 74	Power_3.3 V	Power
1, 3, 9, 15, 21, 27, 33, 39, 45, 51, 57, 57, 71, 73, 75	GND	Ground
21	Config_0 (GND)	Module Type Definition: PCIe - SSD
69	Config_1 (NC)	
75	Config_2 (GND)	
1	Config_3 (GND)	
50	PERST#	Input
52	CLKREQ#	I/O (1 kΩ to GND)
54	PEWAKE#	Not Connected
53, 55	REFCLK[n/p]	Input
5, 7	PET[n/p]3	Output
17, 19	PET[n/p]2	Output
29, 31	PET[n/p]1	Output
41, 43	PET[n/p]0	Output
11, 13	PER[n/p]3	Input
23, 15	PER[n/p]2	Input
35, 37	PER[n/p]1	Input
47, 49	PER[n/p]0	Input
All Others	-	Not Connected

System Block Diagram and Module Dimensions

The diagram below illustrates the key components of the Orca M.2 Accelerator Module.



The diagram below provides detailed mechanical specifications. For further information, please refer to the Specifications section.



Power / Performance

Power consumption adjusts based on workload demands. The maximum power draw (average) of 5 W ensures performance efficiency. Below are examples of sustained power consumption for different workloads at 25 °C ambient temperature.

Example:

Workload Configuration	Power Consumption
YoloV5s 512x512 Face Detection Model	3.3 W (7.9 ms @ 126 fps)
mobilenet_v2_imagenet—224x224	2.7 W (2.8 ms @ 360 fps)
yolov8n_relu6_age—256x256_quant	2.0 W

Thermal Management Considerations

To ensure optimal performance, the Orca M.2 Accelerator Module requires proper thermal management.

- **For Ambient Temperatures up to 50 °C**: Passive cooling with a heatsink is generally sufficient.
- **For Higher Ambient Temperatures or Sustained Workloads**: Active cooling, such as a fan, is recommended to prevent overheating.

Effective thermal solutions help maintain system stability and extend the module's lifespan. For detailed thermal management guidelines, visit Heatsink and Thermal Management Guidelines for the Orca M.2 Accelerator Module.

Overheating Protection

To ensure reliable operation, the Orca chip will automatically reduce its operating frequency if it detects overheating. Restoring proper thermal management allows the chip to return to full performance.

System Requirements

Hardware	Operating System	CPU Architectures	Supported Python Versions
X86-64 ARM Aarch-64 M-Key M.2 Slot required	Ubuntu Linux 20.04, 22.04	X86-64	3.8 … 3.11
	Ubuntu Linux 20.04, 22.04	ARM AArch64	3.8 … 3.11
	Raspberry Pi OS (64-bit)	ARM AArch64	3.9
	Windows 10/11	X86-64	3.8 … 3.11

Compliance Requirements

This product is shipped as a component. Customers are responsible for final system-level certification and compliance.

Installation and Troubleshooting

- Orca M.2 Setup
- Orca Thermal Management
- PySDK Installation

Revision History

Version	Date	Description of Changes
1.0	11/25/24	Initial release of the datasheet.
1.1	2/4/25	Updated Installation and Troubleshooting links.
1.2	3/6/25	Updated Installation and Troubleshooting links.
1.3	3/28/25	Revised Table of Contents.

Disclaimer

Copyright Notice

General Notice

This document is provided by DeGirum “as-is,” without any warranties, express or implied. DeGirum disclaims all warranties, including but not limited to, the implied warranties of merchantability, non-infringement of third-party rights, and fitness for a particular purpose.

DeGirum shall not be liable for any errors, omissions, or inaccuracies contained in this document, or for any damages, direct or indirect, that may result from its use. This includes, but is not limited to, any loss of data or profits arising from the use or reliance on this document.

Content within this document is subject to change without prior notice. DeGirum reserves the right to make adjustments or improvements at any time, without the obligation to notify users.