Embedded MXM module

MX2000A-VA Series

USER MANUAL

Document Change History

Version	Date	Description	Authors
V1.0	2024/12/06	Initial Release.	Emily Chou
V1.1	2025/04/02	Revise the MXM pin definition for PIN16.	Emily Chou
V1.2	2025/05/05	Add Section 4.2 and Section 4.3. Updated the Ordering Information.	Emily Chou
V1.3	2025/06/12	Updated the Ordering Information.	Emily Chou

Disclaimer

The information presented in this manual is for informational purposes only and may contain technical inaccuracies, omissions and typographical errors.

The information contained herein is subject to change and may be rendered inaccurate for many reasons, including but not limited to product and roadmap changes, component and motherboard version changes, new model and/or product releases, product differences between differing manufacturers, software changes, BIOS flashes, firmware upgrades, or the like. Aetina assumes no obligation to update or otherwise correct or revise this information. However, the information will be updated from time to time, and the last version shall be binding on you and Aetina.

Aetina makes no representations or warranties with respect to the contents hereof and assumes no responsibility for any inaccuracies, errors or omissions that may appear in this information. Aetina specifically disclaims any implied warranties of merchantability or fitness for any particular purpose. In no event will Aetina be liable to any person for any direct, indirect, special or other consequential damages arising from the use of any information contained herein, even if supplier is expressly advised of the possibility of such damages.

Copyright Notice

Version 1.0

Acknowledgements

Customer Support Overview

Contact your distributor, sales representative, or Aetina's customer service center for technical support if you need additional assistance. Please have the following information ready:

- Product name and serial number
- Description of your peripheral attachments
- Description of your software (operating system, version, application software, etc.)
- A complete description of the problem
- The exact wording of any error messages

Visit the Aetina website at https://www.aetina.com where you can find the latest information about the product.

Contact Information

Aetina Corporation | Headquarters
17F, No.237, Sec.1, Datong Rd., Xizhi Dist., New Taipei City 221, TAIWAN
Phone +886-2-7709 2568
Fax +886-2-7746 1102
Mail sales@Aetina.com

Product Warranty

Aetina warrants the original purchaser, that each of its products will be free from defects in materials and workmanship which refers to “Aetina warranty policy” on Aetina’s official website: https://www.aetina.com/. Aetina warranty policy will be updated from time to time, and the last version shall be binding on the parties.
For out of warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you have a defective product, please follow those steps which refers to “Aetina RMA Service” on Aetina’s official website: https://www.aetina.com/.

ESD Warning

This product, like all electronic products, uses the product that can be damaged by electrostatic discharge (ESD). When handling, care must be taken so that the devices are not damaged. Damage due to inappropriate handling is not covered by Aetina warranty policy. The following precautions must be taken:

- Do not open the protective conductive packaging until you have read the following and are at an approved anti-static workstation.
- If working on a prototyping board, use a soldering iron or station that is marked as ESD-safe.
- Always disconnect the product from the prototyping board when it is being worked on.
- Always discharge yourself by touching a grounded bare metal surface or approved anti-static mat before picking up an ESD - sensitive electronic component.
- Use an approved anti-static mat to cover your work surface.

Safety Precautions

Please read the following safety instructions carefully. It is advised that you keep this manual for future references:

1. All cautions and warnings on the equipment should be noted.
2. Make sure the power source matches the power rating specifications of the device.
3. Position the power cord away from obstructions and avoid stepping on it. Do not place anything over the power cord.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
6. Always completely disconnect the power before working on the system’s hardware.

7. Keep this equipment away from humidity.
8. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
9. The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.
10. Be sure that the room in which you choose to operate your system has adequate air circulation. Ensure that the chassis cover is secure.
11. The chassis design allows cooling air to circulate effectively. An open chassis permits air leaks, which may interrupt and redirect the flow of cooling air from internal components.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
14. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
15. If any of the following situations arises, please the contact Aetina's service personnel:
    - Power cord or plug is damaged
    - Liquid intrusion to the device
    - Exposure to moisture
    - Device is not working as expected or in a manner as described in this manual
    - The device is dropped or damaged
    - Any obvious signs of damage displayed on the device

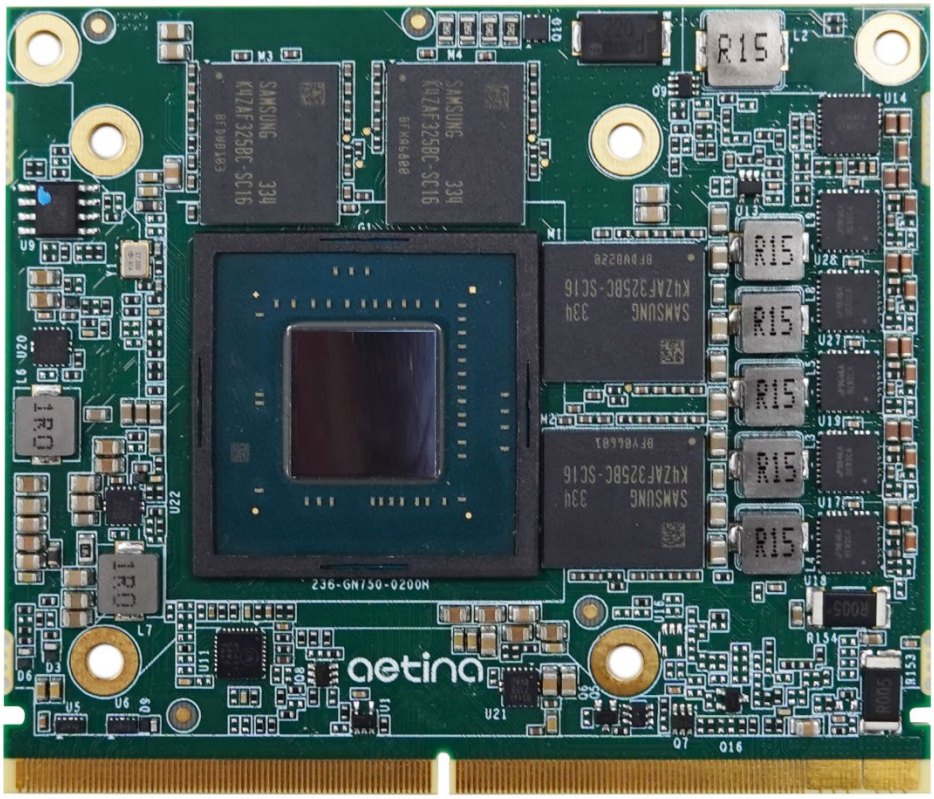
Contents

1. Product Specification

The MXM MX2000A-VA module features advanced NVIDIA RTX 2000 Ada Embedded GUP. It's Ada Lovelace architecture in the MXM 3.1 Type A form factor. With 3072 CUDA core, 24 RT cores and 96 Tensor cores, 8GB GDDR6 memory. The MX2000A-VA support PCIe Gen 4.0 interface is delivers faster sequential data transfer than PCIe Gen 3.0 interface and bringing excellent performance and power efficiency into a wide variety of embedded systems, fully integrating hardware acceleration for both graphics, and computing code, enabling hardware acceleration for a wider class of software applications than ever before.

The Ada GPU architecture has been designed to provide revolutionary performance for AI-based neural graphics. It delivers a dramatically higher baseline of GPU performance and marks the tipping point for neural graphics. It delivers outstanding gaming and creating, professional graphics, AI, and compute performance.

The NVIDIA RTX 2000 ADA support ECC (Error Correction Code) and provides graphics intensive acceleration and real time ray-tracing capability for applications like scientific and medical visualization, digital content creation (DCC), artificial intelligence (AI) and machine learning (ML).



1.1 Features

- Powered by NVIDIA Ada Lovelace architecture
- 3072 CUDA cores, 24 RT cores and 96 Tensor cores, 8GB GDDR6
- 12.99 TFLOPS peak FP32 performance
- PCIe Gen 4.0 x16 interface
- 5 years longevity product supply service

  - **GPU**
    - NVIDIA RTX 2000 Ada Embedded GPU
    - Stream Processing Unites: 3072
    - Voltage: Variable

  - **Board**
    - 10-layer printed circuit board (PCB)
    - 16-lanes PCI Express 4.0 capable[1]
    - Physical dimensions: 70mm x 82mm
    - Board power: 60 W

  - **Connectors**
    - MXM 3.1 Connector Interoperability

  - **Memory Configuration**
    - Memory clock: 8000 MHz (16.0 Gbps)
    - Interface: 128-bit
    - Local frame buffer: 8GB (4 pieces 512M x 32 GDDR6, FBGA-180 package)

  - **Display Support**
    - DisplayPort
      Maximum resolution: 7680 x 4320 at 60 Hz

  - **Cooling System**
    - N/A

  - **Operating System Support**
    - Windows® 10-11 64-bit
    - Linux 64-bit

1. Aetina provides PCI Express 4.0 x16 mechanism while data transmission via PCI-Express 4.0 x8.

1.2 Configuration

Lists the SKU configuration currently available for the NVIDIA RTX 2000 ADA graphics board.

Board configuration

Specification	MX2000A-VAA-A1	MX2000A-VAW-A1	MX2000A-VAW-A2
Chip	NVIDIA RTX 2000 Ada Embedded GPU		
Core clock(MHz)	Base= 1635 / Boost= 2115		Base= 930 Boost= 1455
Memory speed	16.0 Gbps		
Frame buffer	8GB GDDR6		
Memory interface	128-bit		
Memory type	512M x 32 GDDR6 FBGA-180 package		
Memory AVL	Samsung K4ZAF325BC-SC16		
Maximum board power	60 W		35W
PCI Express interface	PCIE Gen4.0 x8		
Connectors	DisplayPort 1.4 output via MXM golden finger is supported		
Supplementary Power Connector	N/A		
Maximum output	3		
HDCP support	Yes		
Operating Temperature	0 to +55°C		
Wide Temperature	N/A	-40°C to +85°C	
Operating Humidity	40°C @ 95%, Non-condensing		

1.3 GPU feature

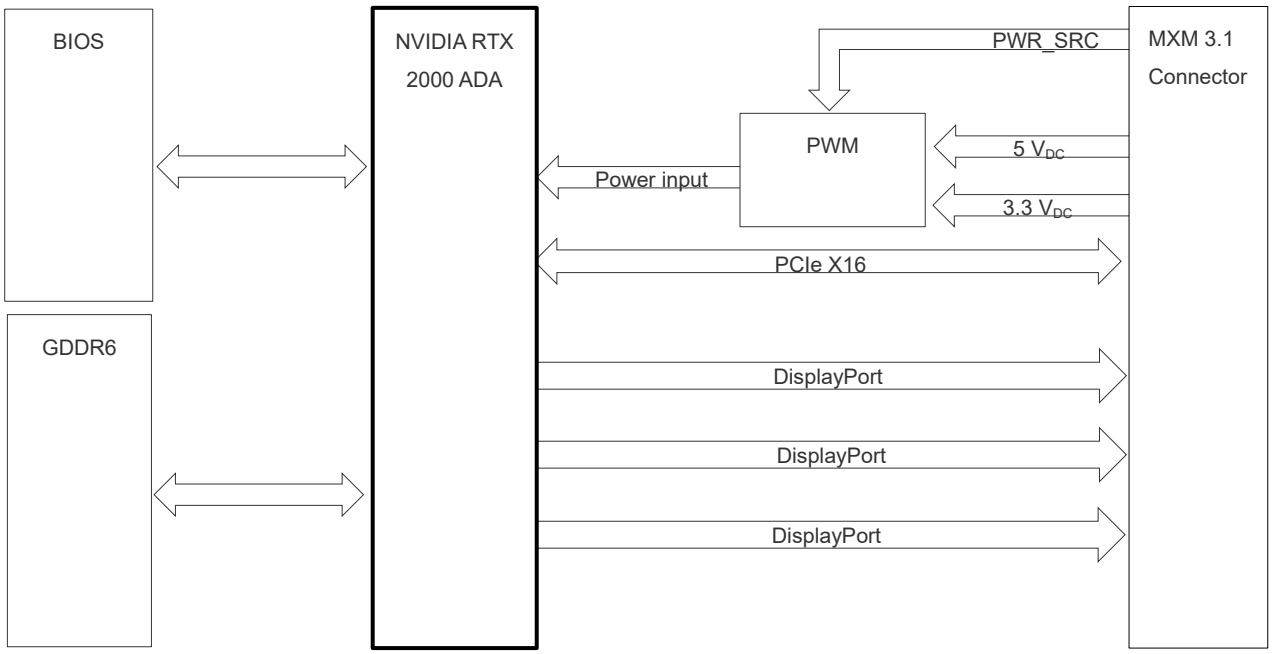
Power-Saving Features

GPU feature	Guidance
GC6 3.0	Not supported
GC OFF 1.0	Not supported
ASPM	Not supported
Advanced Optimus	Not supported
Optimus/Hybrid-only Configuration	Supported
Modern Standby	Not supported
S0iX State	Not supported

2. Hardware Information

2.1 Block Diagram

The Aetina MX2000A-VA is based on PCI Express 4.0 form factor.



MX2000A-VA Block diagram

2.2 General Purpose Graphics Processing Unit

The Aetina MX2000A-VA is based on NVIDIA RTX 2000 Ada Embedded GPU. The 2000 ADA is compliant with NVIDIA's CUDA computing capability 8.9.

- **GPU Resources**
  - GDDR6 SDRAM
    - 4 pieces 512M x 32 GDDR6, total capacity of 8192 Mbytes
    - 128bit data bus width
    - 16.0 Gbps clock frequency
  - BIOS ROM
    - 16Mbit SPI FLASH for BIOS image

2.3 Display Interface

The MX2000A-VA supports four digital output channels, all of which can operate simultaneously.

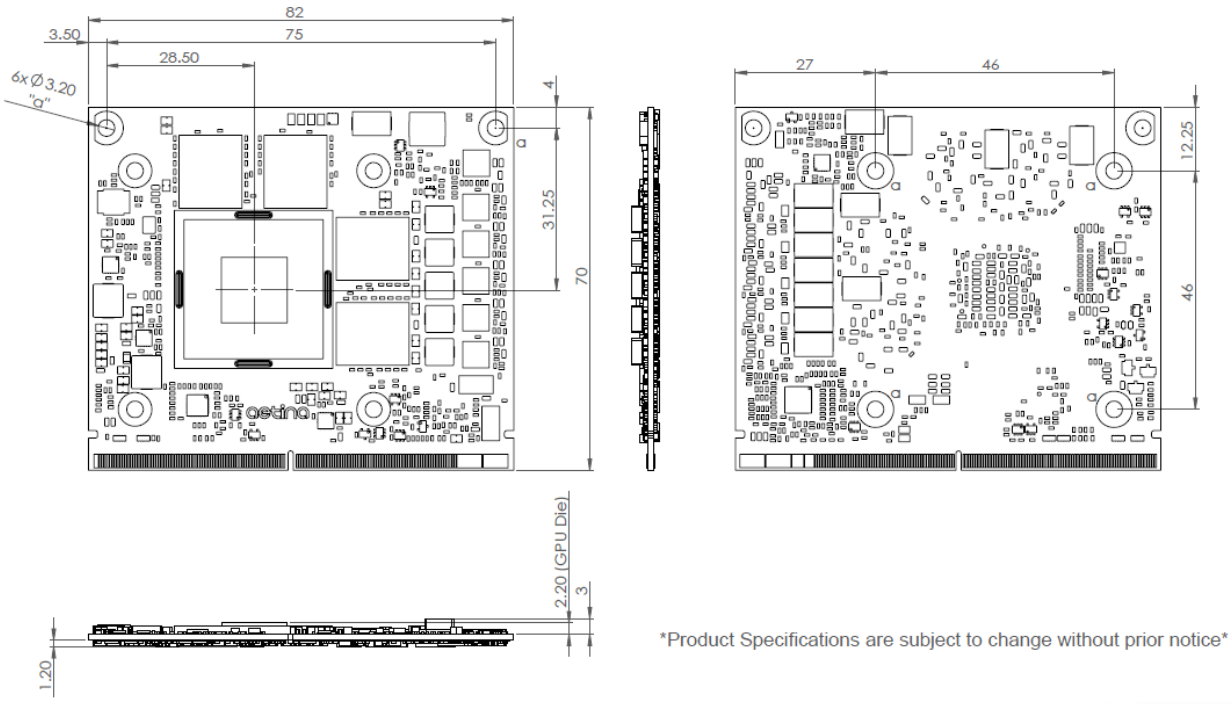
- Digital Output
  - The MX2000A-VA supports DisplayPort output.
- Analog Output
  - This model does not support Analog output.
- Display Options
  - The following list is MX2000A-VA graphics module display options.

Display Supported for Each Interface		
DP_A	DP_B	DP_C
DisplayPort	DisplayPort	DisplayPort

2.4 PCIE Express

The MX2000A-VA provides PCI Express x16 mechanism while data transmission via PCI Express 4.0 x8.

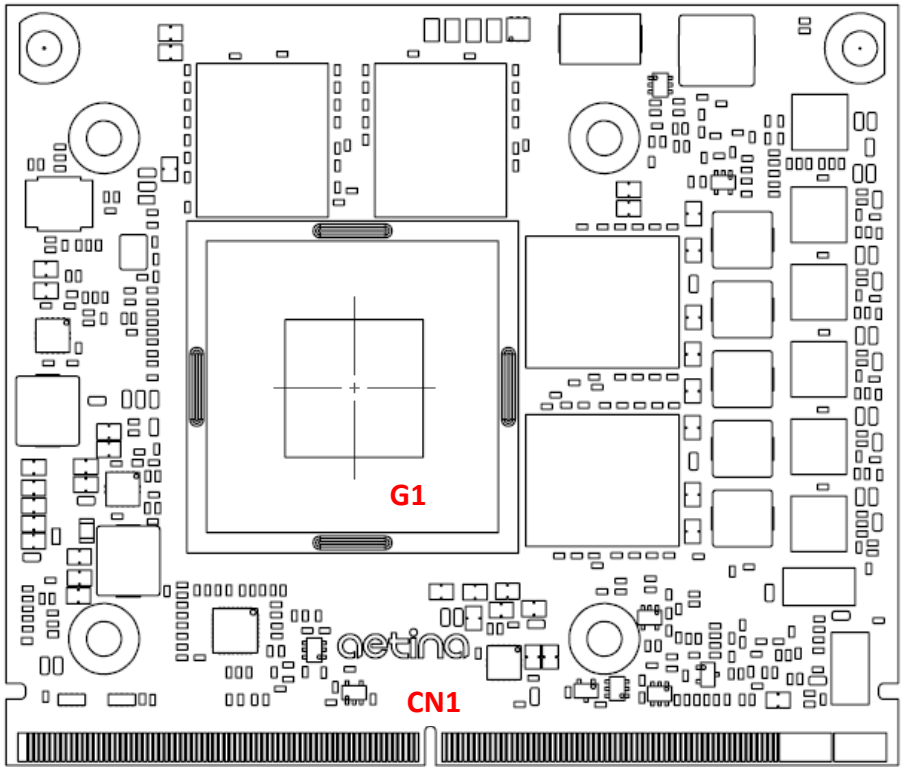
2.5 Mechanical Dimensions



Dimensions of MX2000A-VA

2.6 Pin Definition

- Board Interface

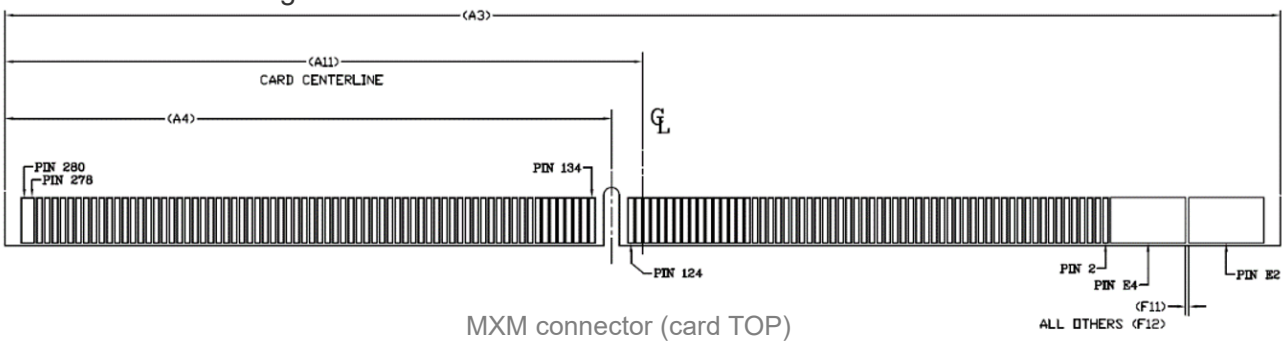


MXM Board layout

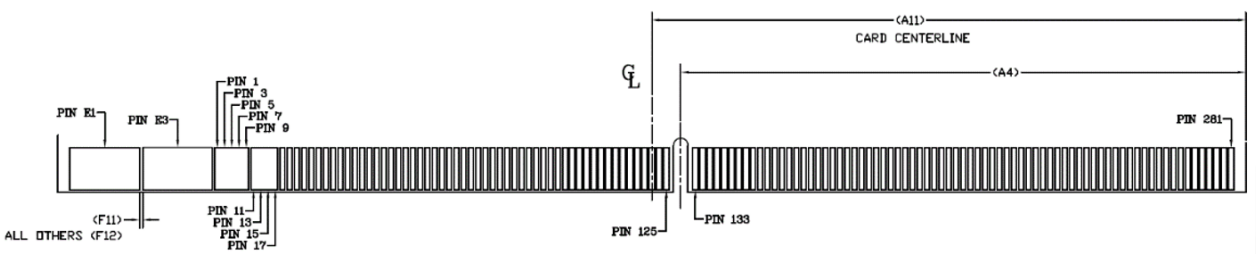
Specification	Describe
G1	NVIDIA RTX 2000 Ada Generation Embedded GPU
CN1	MXM connector (Golden Finger)

Board layout and connectors

- MXM Pin Assignments



MXM connector (card TOP)



MXM connector (card BOTTOM)

- MXM connector Pinout

Pin	Signal	Location	Y/N	Pin	Signal	Location	Y/N
1	5V	Bottom	Y	73	PEX_RX11#	Bottom	N
2	PRSNT_R#	Top	Y	74	PEX_TX11	Top	N
3	5V	Bottom	Y	75	PEX_RX11	Bottom	N
4	WAKE#	Top	N	76	GND	Top	Y
5	5V	Bottom	Y	77	GND	Bottom	Y
6	PWR_GOOD (3.3V)	Top	Y	78	PEX_TX10#	Top	N
7	5V	Bottom	Y	79	PEX_RX10#	Bottom	N
8	PWR_EN	Top	Y	80	PEX_TX10	Top	N
9	5V	Bottom	Y	81	PEX_RX10	Bottom	N
10	27MHZ_REF	Top	N	82	GND	Top	Y
11	GND	Bottom	Y	83	GND	Bottom	Y
12	GND	Top	Y	84	PEX_TX9#	Top	N
13	GND	Bottom	Y	85	PEX_RX9#	Bottom	N
14	LVDS_U_HPD	Top	N	86	PEX_TX9	Top	N
15	GND	Bottom	Y	87	PEX_RX9	Bottom	N
16	PCH_RST*	Top	Y	88	GND	Top	Y
17	GND	Bottom	Y	89	GND	Bottom	Y
18	PWR_LEVEL	Top	Y	90	PEX_TX8#	Top	N
19	PEX_STD_SW#	Bottom	Y	91	PEX_RX8#	Bottom	N
20	TH_OVERT#	Top	Y	92	PEX_TX8	Top	N
21	VGA_DISABLE#	Bottom	N	93	PEX_RX8	Bottom	N
22	TH_ALERT#	Top	Y	94	GND	Top	Y
23	PNL_PWR_EN	Bottom	N	95	GND	Bottom	Y
24	TH_PWM	Top	N	96	PEX_TX7#	Top	Y
25	PNL_BL_EN	Bottom	N	97	PEX_RX7#	Bottom	Y
26	GPIO0	Top	N	98	PEX_TX7	Top	Y
27	PNL_BL_PWN	Bottom	N	99	PEX_RX7	Bottom	Y
28	GPIO1	Top	N	100	GND	Top	Y
29	HDMI_CEC	Bottom	N	101	GND	Bottom	Y
30	GPIO2	Top	N	102	PEX_TX6#	Top	Y
31	LVDS_L_HPD	Bottom	N	103	PEX_RX6#	Bottom	Y
32	SMB_DAT	Top	Y	104	PEX_TX6	Top	Y
33	LVDS_DDC_DAT	Bottom	N	105	PEX_RX6	Bottom	Y
34	SMB_CLK	Top	Y	106	GND	Top	Y
35	LVDS_DDC_CLK	Bottom	N	107	GND	Bottom	Y

MXM connector pinout (continued)

Pin	Signal	Location	Y/N	Pin	Signal	Location	Y/N
36	GND	Top	Y	108	PEX_TX5#	Top	Y
37	GND	Bottom	Y	109	PEX_RX5#	Bottom	Y
38	OEM0	Top	N	110	PEX_TX5	Top	Y
39	OEM1	Bottom	N	111	PEX_RX5	Bottom	Y
40	OEM2	Top	N	112	GND	Top	Y
41	OEM3	Bottom	N	113	GND	Bottom	Y
42	OEM4	Top	N	114	PEX_TX4#	Top	Y
43	OEM5	Bottom	N	115	PEX_RX4#	Bottom	Y
44	OEM6	Top	N	116	PEX_TX4	Top	Y
45	OEM7	Bottom	N	117	PEX_RX4	Bottom	Y
46	GND	Top	Y	118	GND	Top	Y
47	GND	Bottom	Y	119	GND	Bottom	Y
48	PEX_TX15#	Top	N	120	PEX_TX3#	Top	Y
49	PEX_RX15#	Bottom	N	121	PEX_RX3#	Bottom	Y
50	PEX_TX15	Top	N	122	PEX_TX3	Top	Y
51	PEX_RX15	Bottom	N	123	PEX_RX3	Bottom	Y
52	GND	Top	Y	124	GND	Top	Y
53	GND	Bottom	Y	125	GND	Bottom	Y
54	PEX_TX14#	Top	N	126	*KEY*	Top	
55	PEX_RX14#	Bottom	N	127	*KEY*	Bottom	
56	PEX_TX14	Top	N	128	*KEY*	Top	
57	PEX_RX14	Bottom	N	129	*KEY*	Bottom	
58	GND	Top	Y	130	*KEY*	Top	
59	GND	Bottom	Y	131	*KEY*	Bottom	
60	PEX_TX13#	Top	N	132	*KEY*	Top	
61	PEX_RX13#	Bottom	N	133	GND	Bottom	
62	PEX_TX13	Top	N	134	GND	Top	Y
63	PEX_RX13	Bottom	N	135	PEX_RX2#	Bottom	Y
64	GND	Top	Y	136	PEX_TX2#	Top	Y
65	GND	Bottom	Y	137	PEX_RX2	Bottom	Y
66	PEX_TX12#	Top	N	138	PEX_TX2	Top	Y
67	PEX_RX12#	Bottom	N	139	GND	Bottom	Y
68	PEX_TX12	Top	N	140	GND	Top	Y
69	PEX_RX12	Bottom	N	141	PEX_RX1#	Bottom	Y
70	GND	Top	Y	142	PEX_TX1#	Top	Y
71	GND	Bottom	Y	143	PEX_RX1	Bottom	Y
72	PEX_TX11#	Top	N	144	PEX_TX1	Top	Y

MXM connector pinout (continued)

Pin	Signal	Location	Y/N	Pin	Signal	Location	Y/N
145	GND	Bottom	Y	217	DP_C_L3#	Bottom	Y
146	GND	Top	Y	218	DP_D_L2#	Top	N
147	PEX_RX0#	Bottom	Y	219	DP_C_L3	Bottom	Y
148	PEX_TX0#	Top	Y	220	DP_D_L2	Top	N
149	PEX_RX0	Bottom	Y	221	GND	Bottom	Y
150	PEX_TX0	Top	Y	222	GND	Top	Y
151	GND	Bottom	Y	223	DP_C_AUX#	Bottom	Y
152	GND	Top	Y	224	DP_D_L3#	Top	N
153	PEX_REFCLK#	Bottom	Y	225	DP_C_AUX	Bottom	Y
154	PEX_CLK_REQ#	Top	Y	226	DP_D_L3	Top	N
155	PEX_REFCLK	Bottom	Y	227	RSVD	Bottom	IFPA_DP_HPD_R
156	PEX_RST#	Top	Y	228	GND	Top	Y
157	GND	Bottom	Y	229	RSVD	Bottom	IFPB_DP_HPD_R
158	VGA_DDC_DAT	Top	N	230	DP_D_AUX#	Top	N
159	JTAG_TDO	Bottom	N	231	RSVD	Bottom	IFPC_DP_HPD_R
160	VGA_DCC_CLK	Top	N	232	DP_D_AUX	Top	N
161	JTAG_TDI	Bottom	N	233	RSVD	Bottom	N
162	VGA_VSYNC	Top	N	234	DP_C_HPD	Top	Y
163	JTAG_TCLK	Bottom	N	235	RSVD	Bottom	N
164	VGA_HSYNC	Top	N	236	DP_D_HPD	Top	N
165	JTAG_TMS	Bottom	N	237	RSVD	Bottom	N
166	GND	Top	Y	238	RSVD	Top	N
167	JTAG_TRST#	Bottom	N	239	RSVD	Bottom	N
168	VGA_RED	Top	N	240	3V3	Top	Y
169	LVDS_UCLK#	Bottom	N	241	RSVD	Bottom	N
170	VGA_GREEN	Top	N	242	3V3	Top	Y
171	LVDS_UCLK	Bottom	N	243	RSVD	Bottom	N
172	VGA_BLUE	Top	N	244	GND	Top	Y
173	GND	Bottom	Y	245	RSVD	Bottom	N
174	GND	Top	Y	246	DP_B_L0#	Top	Y
175	LVDS_UTX3#	Bottom	N	247	RSVD	Bottom	MXM_THERMDP_GPU
176	LVDS_LCLK#	Top	N	248	DP_B_L0	Top	Y
177	LVDS_UTX3	Bottom	N	249	RSVD	Bottom	MXM_THERMDN_GPU
178	LVDS_LCLK	Top	N	250	GND	Top	Y
179	GND	Bottom	Y	251	GND	Bottom	Y

MXM connector pinout (continued)

Pin	Signal	Location	Y/N	Pin	Signal	Location	Y/N
180	GND	Top	Y	252	DP_B_L1#	Top	Y
181	LVDS_UTX2#	Bottom	N	253	DP_A_L0#	Bottom	Y
182	LVDS_LT3#	Top	N	254	DP_B_L1	Top	Y
183	LVDS_UTX2	Bottom	N	255	DP_A_L0	Bottom	Y
184	LVDS_LT3	Top	N	256	GND	Top	Y
185	GND	Bottom	Y	257	GND	Bottom	Y
186	GND	Top	Y	258	DP_B_L2#	Top	Y
187	LVDS_UTX1#	Bottom	N	259	DP_A_L1#	Bottom	Y
188	LVDS_LT2#	Top	N	260	DP_B_L2	Top	Y
189	LVDS_UTX1	Bottom	N	261	DP_A_L1	Bottom	Y
190	LVDS_LT2	Top	N	262	GND	Top	Y
191	GND	Bottom	Y	263	GND	Bottom	Y
192	GND	Top	Y	264	DP_B_L3#	Top	Y
193	LVDS_UTX0#	Bottom	N	265	DP_A_L2#	Bottom	Y
194	LVDS_LT1#	Top	N	266	DP_B_L3	Top	Y
195	LVDS_UTX0	Bottom	N	267	DP_A_L2	Bottom	Y
196	LVDS_LT1	Top	N	268	GND	Top	Y
197	GND	Bottom	Y	269	GND	Bottom	Y
198	GND	Top	Y	270	DP_B_AUX#	Top	Y
199	DP_C_L0#	Bottom	Y	271	DP_A_L3#	Bottom	Y
200	LVDS_LT0#	Top	N	272	DP_B_AUX	Top	Y
201	DP_C_L0	Bottom	Y	273	DP_A_L3	Bottom	Y
202	LVDS_LT0	Top	N	274	DP_B_HPD	Top	Y
203	GND	Bottom	Y	275	GND	Bottom	Y
204	GND	Top	Y	276	DP_A_HPD	Top	Y
205	DP_C_L1#	Bottom	Y	277	DP_A_AUX#	Bottom	Y
206	DP_D_L0#	Top	N	278	3V3	Top	Y
207	DP_C_L1	Bottom	Y	279	DP_A_AUX	Bottom	Y
208	DP_D_L0	Top	N	280	3V3	Top	Y
209	GND	Bottom	Y	281	PRSNT_L#	Bottom	Y
210	GND	Top	Y	E1	PWR_SRC	Top	Y
211	DP_C_L2#	Bottom	Y	E2	PWR_SRC	Bottom	Y
212	DP_D_L1#	Top	N	E3	GND	Top	Y
213	DP_C_L2	Bottom	Y	E4	GND	Bottom	Y
214	DP_D_L1	Top	N				
215	GND	Bottom	Y				
216	GND	Top	Y				

MXM connector pinout

Notes:

1. KEY = Key (or notch) on the PCB edge finger
2. PD = Pull-down resister on module
3. n.c. = Not Connect
4. Reserved = Reserved pin and do NOT connect on system
5. Y= Yes (Functional) / N= No Connection

3. Software Installation

Before you begin installing your new graphics card, please make sure you have the proper system requirements and have completed the required pre-installation tasks as outlined in this chapter.

3.1 System Recommended

- AMD Ryzen 7 or Intel Core i7 processor or latest.
- 16GB of system memory; 24GB or more recommended for better performance.
- Motherboard with available PCI Express® 4.0 ×16 lane MXM connection slot.
- Internet access for software installation.
- NVIDIA RTX 2000 Ada Embedded GPU supports resizable BAR1. User can optionally support resizable BAR1 with BAR1 size same as frame buffer size or greater than and must be power of two for the best performance.

Below is criteria must meet:

- SBIOS must support "Above 4GB decoding" feature to support resizable BAR1 size
- SBIOS must **enable** "Above 4G decoding" at default shipping configuration

- User should run full functional and stability test with resizable BAR1 VBIOS and SBIOS at DVT and PVT
- Operating System:
  - Windows® 10 - 11 64-bit
  - Linux® 64-bit

*Notes: The memory resource does not mean the system memory, 8G Bar1 size means 8G memory address resource and this memory access (PCI MMIO access) will be decoded to GPU, not system memory.

3.2 Performing a Quick Installation

Experienced users and system administrators can follow these brief instructions for installing Aetina graphics card. Other users should refer to the detailed installation instructions.

1. Uninstall the drivers and software for any installed graphics card(s).
2. Shut down and disconnect your computer system.
3. Remove any installed graphics card(s).
4. Install your new Aetina graphics card.
5. Reassemble and connect your computer system.
6. Install the Aetina graphics drivers from the Aetina official website.

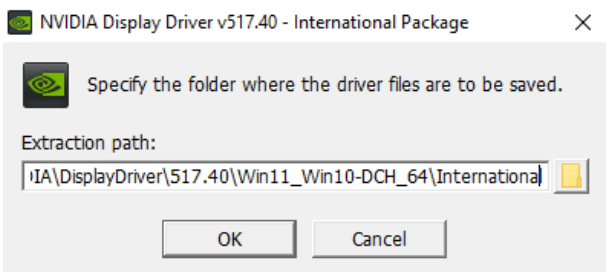
*Note: If you are using a motherboard containing an on-board graphics solution and do not intend to use it as part of a multiple monitor display, disable it.

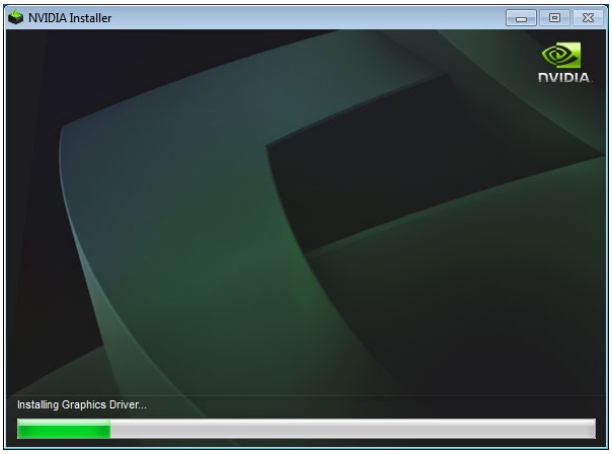
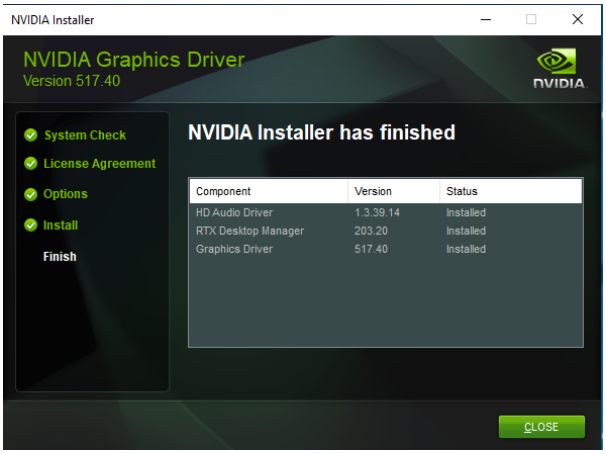
3.3 Install Graphics Driver

Notice the following guidelines before installing the drivers:

1. First uninstall previous graphics card driver.
2. Make sure your system has installed DirectX 11 or later version.
3. Make sure your system has installed the appropriate motherboard drivers (for the motherboard drivers, please contact the motherboard manufacturer).

After installing the operating system, download driver from Aetina official website. Then, go to My Computer, double-click the Download folder and execute the setup.exe program.

	● Click the “OK” button to install driver.
	● Click the “AGREE AND CONTINUE”
	● Choose “Express (Recommended)” or “Custom (Advanced)” then click “NEXT”

	• The system is installing the components
	• Click the “RESTART NOW” button to restart the computer. Then the driver installation is done

4. Initial Setup

4.1 Thermal Specifications

■ Thermal Specification

Parameter	Value
Thermal Resistance (Junction to Case, R_{JC})	0.048°C/W
Thermal Resistance (Junction to PCB, R_{JB})	1.45°C/W
GPU shutdown temperature (OVERT) (Note 1)	100°C
GPU slowdown temperature (THERM_ALERT) (Note 2)	97°C
GPU maximum operating temperature (Note 3)	89°C
GPU target temperature	87°C (default). 75°C (minimum)

Thermal Design Power (TDP)	Value	
Total Graphics Power (TGP)	60W	35W
GPU TDP (Note 4)	45W	25W
Memory TDP (Note 5)	14W	14W

Notes:

1. OVERT results in an 87.5% (÷8) hardware clock slowdown.
2. THERM_ALERT results in a 50% (÷2) hardware clock slowdown.
3. The GPU max operating temperature is the max GPU temperature at which the GPU is guaranteed to operate at the target performance (Base Clock) under worst case TDP test conditions

* Depending on the workload, the shutdown may be triggered at a higher temperature than the specified shutdown temperature.

*The GPU clock slowdown temperature trigger points in the specifications may vary depending on the workload. Additionally, the data may differ based on the thermal solution.

4. GPU TDP = GPU core + GPU FBIO + PCIe + IO/PLLVDD + Other. TDP is achievable when running GPU Heater if the system meets the GPU max operating temperature specification.
5. Memory TDP = Memory core + Memory IO. These values are with nominal memory and are taken without temperature control on memory. Refer to memory manufacturer for absolute ratings.
6. Power is based on PCI Express Gen4 x16 / Gen3 x16, ASPM disabled.

4.2 Power Delivery Design Requirement

For given design conditions such as ambient temperature, derating requirement, thermal solution, space constraint, cost target, and so on, the aim of power supply design can be categorized into two main areas:

- To sustain continuous (DC) current (EDPc) with the target efficiency and thermal performance.
- To achieve a target output voltage overshoot/undershoot spec (or generally referred to noise or peak-to-peak noise spec) under a specified large load transient event (EDPp)

The following are EDP currents available per GPU SKU for regulator design:

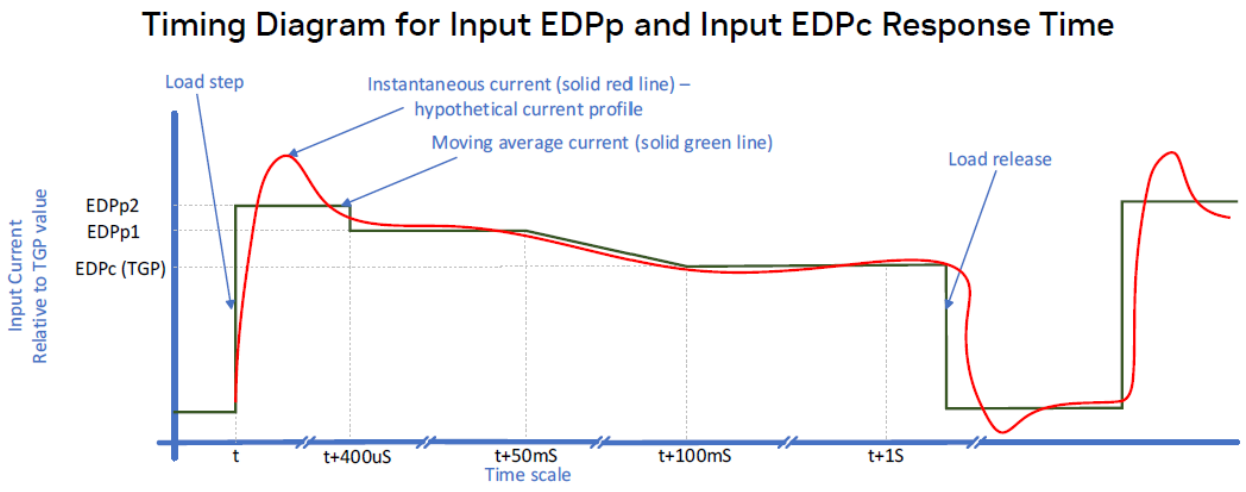
- Input EDP continuous (Input EDPc)

Input EDPc is the average input current consumption of the graphics subsystem, measured at a 1 second moving average. Thus, input EDPc is the maximum sustained DC current that the system power supply needs to provide.

- Input EDP peak (Input EDPp)

Input EDP peak is defined as the maximum input current for the graphics subsystem, measured at 400 µs and at 50 ms moving average. For MXM designs, the input current is measured at the MXM connector's PWR_SRC pin.

The maximum duration of the input EDPp current is 50 ms. After 50 ms worst case, the software power-capping mechanism will kick in and reduce power by lowering the VF (voltage-frequency) operating point until the EDPc average current levels are restored.



Note: Two power control mechanisms are used to limit the input current:

- Hardware power control (ICL) is used to limit the input EDP peak magnitude and duration. The maximum duration of the input EDPp is 50 ms.
- Software power control is used to restore the input power consumption back to the input EDP continuous (average power) level. The input EDPc value is restored within 100 ms.

4.3 Electrical Specifications

The NVIDIA RTX 2000 Ada Embedded GPUs specify the Input EDP (Electrical Design Point) parameters for system level power supply design purposes. Two parameters are provided, Input EDP continuous (EDPc) and Input EDP-peak (EDPp). These two parameters are part of an input power control system consisting of hardware power control to limit Input EDPp levels and a software power-capping control to limit Input EDPc levels.

■ GPU Input EDP Specifications

Input EDPp and Input EDPc Specifications

GPU	Power Source and Input Voltage (V)	Input EDPp (400 µs)[2] (A)	Input EDPp (1 ms)[2,3] (A)	Input EDPp (50 ms)[2,3] (A)	Input EDPc (1 sec)[1] (W)
RTX 2000 Ada Embedded	AC adapter (19V)	22	19	13	135 to 150
	AC adapter (19V)	19	15	10	110 to 134
	AC adapter (19V)	12	11	8	35 to 109

Notes:

[1] Input EDPc current can be calculated with the following equation.

$$Input\ EDPc\ Current\ (A) = \frac{\text{Input EDPc Power (W)}}{\text{Input Voltage (V)}}$$

[2] Input EDPp current at different input voltage can be calculated with the following equation:

$$Input\ EDPp\ (A) at\ V_{new} = Input\ EDPp(A) at\ 19Vx\ \frac{19\text{V}}{V_{new}(\text{V})}$$

[3] Optionally, partners can lower the Input EDPp limit for 1 ms and 50 ms to meet the AC adapter requirements. Contact your NVIDIA AE for VBIOS updates.

5. Appendix

5.1 Ordering Information

- **Models available**

Model Number	Description
MX2000A-VAA-A1	MXM GPU Module Type A, NVIDIA RTX 2000 Ada, 8GB GDDR6, 3x DP, 60W, 0°C to +55°C
MX2000A-VAA-A2	MXM GPU Module Type A, NVIDIA RTX 2000 Ada, 8GB GDDR6, 3x DP, 35W, 0°C to +55°C
MX2000A-VAW-A1	MXM GPU Module Type A, NVIDIA RTX 2000 Ada, 8GB GDDR6, 3x DP, 60W, -40°C to +85°C
MX2000A-VAW-A2	MXM GPU Module Type A, NVIDIA RTX 2000 Ada, 8GB GDDR6, 3x DP, 35W, -40°C to +85°C
MX2000A-VAX-A1	MXM GPU Module Type A, NVIDIA RTX 2000 Ada, 8GB GDDR6, 3x DP, 60W, Coating, -40°C to +85°C

Aetina Corporation | Headquarters
17F, No.237, Sec.1, Datong Rd., Xizhi Dist., New Taipei City 221, TAIWAN
Phone: +886-2-7709 2568
Fax : +886-2-7746 1102
Mail : sales@Aetina.com
www.Aetina.com