EGX-MXM-A4500

NVIDIA Ampere™ GA104 RTX A4500
Embedded Graphics Module

User's Manual



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LEADING EDGE COMPUTING

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Revision History

Revision	Release Date	Description of Change(s)
1.0	2022-10-16	Initial release

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Preface

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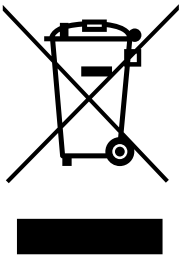
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Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.



Additional information, aids, and tips that help users perform tasks.



Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.



Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.

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1 Introduction

1.1 Overview

The EGX-MXM-A4500 embedded graphics module features the NVIDIA RTX A4500 embedded GPU based on the advanced NVIDIA Ampere GA104 architecture in MXM 3.1 Type B form factor. The EGX-MXM-A4500 brings a new level of performance to visual graphics and computing applications, fully integrating hardware acceleration for both graphics and computing code, enabling hardware acceleration for a wider class of software applications than ever before.

The EGX-MXM-A4500 is equipped with the latest Ampere GPU architecture using the 7 nanometer (nm) chip process, third generation Tensor Cores with structural sparsity to improve AI performance. It is suitable for embedded, ruggedized, or mobile system designs. With its 5888 CUDA core Ampere GPU and additional 184 Tensors Cores and PCIe Gen4 x16 throughput, the EGX-MXM-A4500 supports 4 FHD displays, delivering the latest leading-edge GPU performance for your embedded system with AI capabilities enabled. Its superior graphics performance, GPU computing and video capabilities are the ideal solution for systems such as digital signage, medical imaging, defense and aerospace applications.

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1.2 Features

- MXM 3.1 Type B FF (82 x 105 mm)
- 5888 CUDA cores
- 17.66 TFLOPS SP peak performance
- 8/16 GB GDDR6 memory
- 512 GB/s maximum memory bandwidth
- Support for up to 4 DisplayPort 1.4b displays, 80/115W TGP
- 5 year performance warranty
- NVIDIA RTX A4500 GPU
  - Package 40 x 40 mm
  - Base Clock @930 MHz with 115W TGP
  - Boost Clock @1500 MHz with 115W TGP

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1.3 Specifications

1.3.1 Graphics Module

Graphics Core	
Architecture	NVIDIA® Ampere GA104
GPU	RTX A4500
Display Outputs	4x DisplayPort 1.4. Max. simultaneous display resolution: 2x 7680 x 4320 @60Hz 4x 5120 x 2880 @ 60Hz 4x 4096 x 2160 @ 120Hz
Signal Interface	MXM 3.1, PCI Express Gen4 x16 support
GPGPU Computing	
CUDA Support	5888 CUDA cores, 17.66 TFLOPS SP Peak CUDA Toolkit 8.0, CUDA Compute version 6.1 OpenCL™ 1.2, DirectX® 12.1, OpenGL 4.6, Vulcan 1.0 and above
Memory	
GDDR6 Memory	up to 8GB @12Gbs (6GHz), 16GB @16Gbps (8GHz)
Configuration	256Mb x32
Bandwidth	256-bit 512 GB/s data rate x32 GDDR6 DRAM device data width
Status LED	
Color	Green: Normal Red: Abnormal
Physical	
Dimensions	82 (W) x 105 (D) x 4.8 (H) mm
Locking Mechanism	Standard MXM 3.1 Type B
Environmental	
Operating Temp.	Standard: 0 to 55˚C Extended: -20˚C to 70˚C with 80W TGP
Storage Temp.	-40˚C to 85˚C
Operating Systems	
Supported OS	Windows 10, Windows 11 & Linux Drivers, 64-bit

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1.3.2 Display Support and Options

DisplayPort	▶ 1.2/1.3/1.4 ▶ Max. pixel clock: 1050 MP/s ▶ Max. bandwidth: 25.9 GB/s/connector
HDMI 2.0	Max. resolution: 4096 x 2160 at 60 Hz
HDCP Support	1.3 (DP), 2.2 (DP, HDMI)

1.3.3 Software Support

- CUDA Toolkit 8.0 and higher
- CUDA Compute version 6.1 and higher
- OpenCL™ 1.2
- DirectX® 12
- OpenGL 4.6
- Vulcan 1.0

1.3.4 Graphics Options

The EGX-MXM-A4500 supports a 4x DisplayPort by default, with five display output options as shown below.

MXM port	DP_A	DP_B	DP_C	DP_D	LVDS_L
NVIDIA Link	Link C	Link A	Link E	Link F	Link B

Table 1-1: Graphics Module Display Options

Link	**Display Type**
Link A	DisplayPort, DVI (Single Link or Dual Link with Link B)
Link B	DisplayPort, DVI (Dual Link with A)
Link C	DisplayPort, HDMI
Link D	Not supported
Link E	DisplayPort, HDMI
Link F	DisplayPort

Table 1-2: NVIDIA Link Display Types

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1.4 Functional Block Diagram

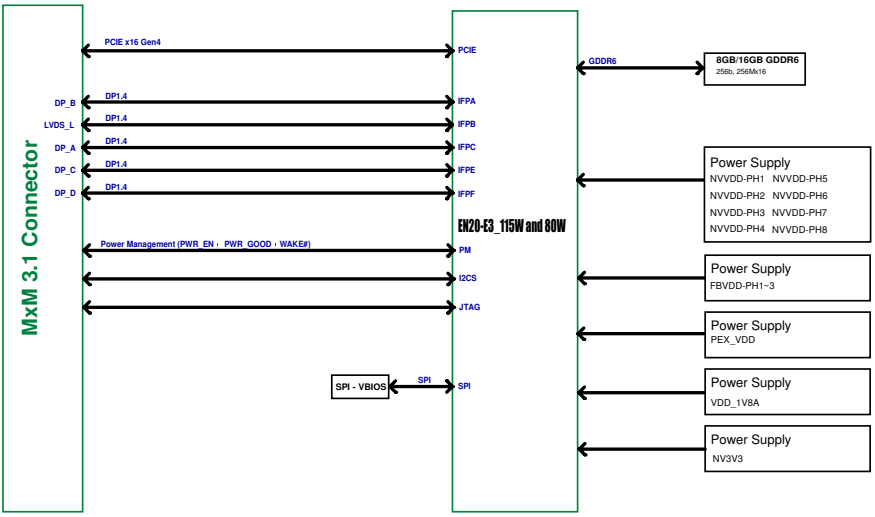


Figure 1-1: EGX-MXM-A4500 Functional Block Diagram

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1.5 Mechanical Layout

NOTE:

All dimensions shown are in mm

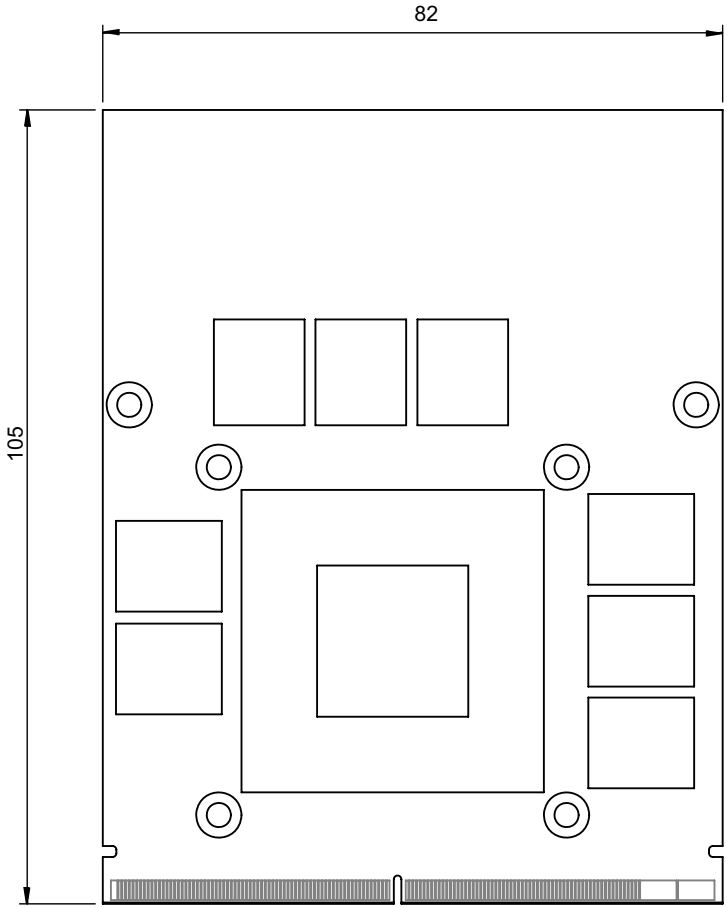


Figure 1-2: EGX-MXM-A4500 Dimensions

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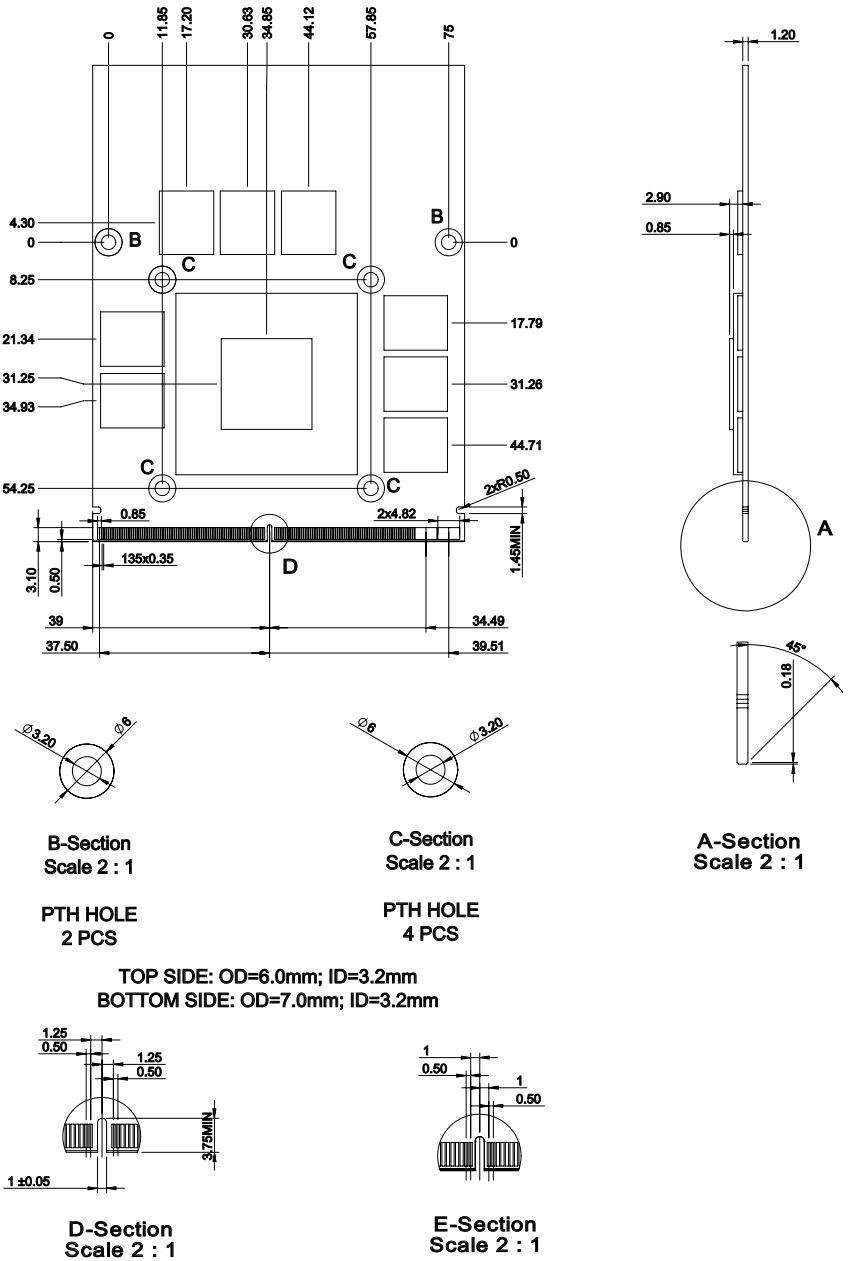


Figure 1-3: EGX-MXM-A4500 Top and Side Views

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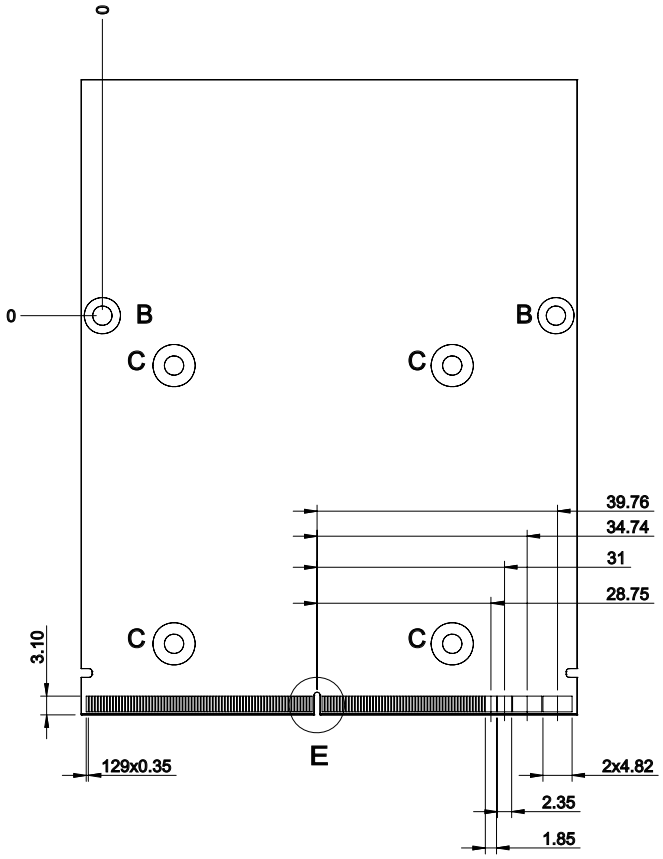


Figure 1-4: EGX-MXM-A4500 Bottom View

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1.6 MXM Connector Pin Definitions

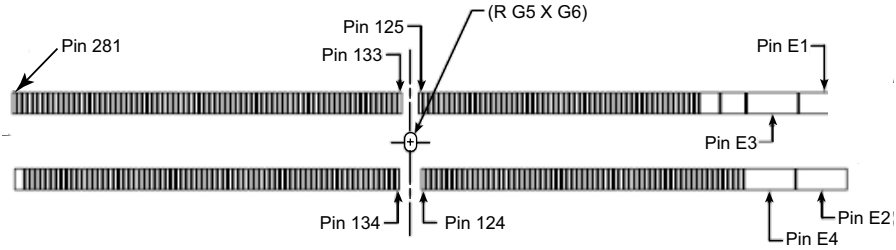


Figure 1-5: MXM Connector

Primary Side (bottom side)			Secondary Side (top side)		
Pin	**Signal**	**PU/PD**	**Pin**	**Signal**	**PU/PD**
E1	PWR_SRC		E2	PWR_SRC	
E3	GND		E4	GND	
1	5V		2	PRSNT_R#	0ohm PD
3	5V		4	RSVD	
5	5V		6	PWR_GOOD	
7	5V		8	PWR_EN	
9	5V		10	27MHZ_REF	
11	GND		12	GND	
13	GND		14	RSVD	
15	GND		16	RSVD	
17	GND		18	PWR_LEVEL	100K PU to 3.3V
19	RSVD		20	TH_OVERT#	100K PU to 3.3V
21	RSVD		22	TH_ALERT#	100K PU to 3.3V
23	RSVD		24	RSVD	
25	RSVD		26	RSVD	
27	RSVD		28	RSVD	
29	RSVD		30	RSVD	

Table 1-3: MXM Connector Pin Definitions

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Primary Side (bottom side)			Secondary Side (top side)		
Pin	**Signal**	**PU/PD**	**Pin**	**Signal**	**PU/PD**
31	RSVD		32	SMB_DAT	100K PU to 3.3V
33	RSVD		34	SMB_CLK	100K PU to 3.3V
35	RSVD		36	GND	
37	GND		38	RSVD	
39	RSVD		40	RSVD	
41	RSVD		42	RSVD	
43	RSVD		44	RSVD	
45	RSVD		46	GND	
47	GND		48	PEX_TX15#	
49	PEX_RX15#		50	PEX_TX15	
51	PEX_RX15		52	GND	
53	GND		54	PEX_TX14#	
55	PEX_RX14#		56	PEX_TX14	
57	PEX_RX14		58	GND	
59	GND		60	PEX_TX13#	
61	PEX_RX13#		62	PEX_TX13	
63	PEX_RX13		64	GND	
65	GND		66	PEX_TX12#	
67	PEX_RX12#		68	PEX_TX12	
69	PEX_RX12		70	GND	
71	GND		72	PEX_TX11#	
73	PEX_RX11#		74	PEX_TX11	
75	PEX_RX11		76	GND	
77	GND		78	PEX_TX10#	
79	PEX_RX10#		80	PEX_TX10	
81	PEX_RX10		82	GND	
83	GND		84	PEX_TX9#	
85	PEX_RX9#		86	PEX_TX9	
87	PEX_RX9		88	GND	

Table 1-3: MXM Connector Pin Definitions

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Primary Side (bottom side)			Secondary Side (top side)		
Pin	**Signal**	**PU/PD**	**Pin**	**Signal**	**PU/PD**
89	GND		90	PEX_TX8#	
91	PEX_RX8#		92	PEX_TX8	
93	PEX_RX8		94	GND	
95	GND		96	PEX_TX7#	
97	PEX_RX7#		98	PEX_TX7	
99	PEX_RX7		100	GND	
101	GND		102	PEX_TX6#	
103	PEX_RX6#		104	PEX_TX6	
105	PEX_RX6		106	GND	
107	GND		108	PEX_TX5#	
109	PEX_RX5#		110	PEX_TX5	
111	PEX_RX5		112	GND	
113	GND		114	PEX_TX4#	
115	PEX_RX4#		116	PEX_TX4	
117	PEX_RX4		118	GND	
119	GND		120	PEX_TX3#	
121	PEX_RX3#		122	PEX_TX3	
123	PEX_RX3		124	GND	
125	GND		126	KEY	
127	KEY		128	KEY	
129	KEY		130	KEY	
131	KEY		132	KEY	
133	GND		134	GND	
135	PEX_RX2#		136	PEX_TX2#	
137	PEX_RX2		138	PEX_TX2	
139	GND		140	GND	
141	PEX_RX1#		142	PEX_TX1#	
143	PEX_RX1		144	PEX_TX1	
145	GND		146	GND	
147	PEX_RX0#		148	PEX_TX0#	

Table 1-3: MXM Connector Pin Definitions

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Primary Side (bottom side)			Secondary Side (top side)		
Pin	**Signal**	**PU/PD**	**Pin**	**Signal**	**PU/PD**
149	PEX_RX0		150	PEX_TX0	
151	GND		152	GND	
153	PEX_REFCLK#		154	PEX_CLK_REQ#	
155	PEX_REFCLK		156	PEX_RST#	
157	GND		158	RSVD	
159	RSVD		160	RSVD	
161	RSVD		162	RSVD	
163	RSVD		164	RSVD	
165	RSVD		166	GND	
167	RSVD		168	RSVD	
169	RSVD		170	RSVD	
171	RSVD		172	RSVD	
173	GND		174	GND	
175	RSVD		176	RSVD	
177	RSVD		178	RSVD	
179	GND		180	GND	
181	RSVD		182	RSVD	
183	RSVD		184	RSVD	
185	GND		186	GND	
187	RSVD		188	RSVD	
189	RSVD		190	RSVD	
191	GND		192	GND	
193	RSVD		194	RSVD	
195	RSVD		196	RSVD	
197	GND		198	GND	
199	DP_C_L0#		200	RSVD	
201	DP_C_L0		202	RSVD	
203	GND		204	GND	
205	DP_C_L1#		206	DP_D_L0#	
207	DP_C_L1		208	DP_D_L0	

Table 1-3: MXM Connector Pin Definitions

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Primary Side (bottom side)			Secondary Side (top side)		
Pin	**Signal**	**PU/PD**	**Pin**	**Signal**	**PU/PD**
209	GND		210	GND	
211	DP_C_L2#		212	DP_D_L1#	
213	DP_C_L2		214	DP_D_L1	
215	GND		216	GND	
217	DP_C_L3#		218	DP_D_L2#	
219	DP_C_L3		220	DP_D_L2	
221	GND		222	GND	
223	DP_C_AUX#		224	DP_D_L3#	
225	DP_C_AUX		226	DP_D_L3	
227	RSVD		228	GND	
229	RSVD		230	DP_D_AUX#	
231	RSVD		232	DP_D_AUX	
233	RSVD		234	DP_C_HPD	PD 100K
235	RSVD		236	DP_D_HPD	PD 100K
237	RSVD		238	RSVD	
239	RSVD		240	3V3	
241	RSVD		242	3V3	
243	RSVD		244	GND	
245	RSVD		246	DP_B_L0#	
247	RSVD		248	DP_B_L0	
249	RSVD		250	GND	
251	GND		252	DP_B_L1#	
253	DP_A_L0#		254	DP_B_L1	
255	DP_A_L0		256	GND	
257	GND		258	DP_B_L2#	
259	DP_A_L1#		260	DP_B_L2	
261	DP_A_L1		262	GND	
263	GND		264	DP_B_L3#	
265	DP_A_L2#		266	DP_B_L3	
267	DP_A_L2		268	GND	

Table 1-3: MXM Connector Pin Definitions

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Primary Side (bottom side)			Secondary Side (top side)		
Pin	**Signal**	**PU/PD**	**Pin**	**Signal**	**PU/PD**
269	GND		270	DP_B_AUX#	
271	DP_A_L3#		272	DP_B_AUX	
273	DP_A_L3		274	DP_B_HPD	PD 100K
275	GND		276	DP_A_HPD	PD 100K
277	DP_A_AUX#		278	3V3	
279	DP_A_AUX		280	3V3	
281	PRSNT_L#	0 ohm PD			

Table 1-3: MXM Connector Pin Definitions

1.7 Thermal Policy

The GPU core clock throttles at temperatures (T_J) past the thresholds shown with the behaviors as listed. Thermal throttling ensures that the highest temperature on the die does not exceed the sense temperature for prolonged periods of time.

Parameter	Value	Units
Thermal Resistance (Junction to Case, RJC)	0.0196	°C/W
Thermal Resistance (Junction to PCB Board, RJB)	1.437	°C/W
GPU Maximum Operating Temperature1	89	°C
GPU Slowdown Temperature (THERM_ALERT)2	98	°C
GPU Shutdown Temperature (OVERT)3	100	°C

Table 1-4: Thermal Policy

NOTE:

- Max.GPU operating temperature is the maximum at which the GPU is guaranteed to operate at target performance (base clock) under total board power level
- THERM_ALERT generates a 50% (÷2) hardware clock slowdown.
- OVERT generates a 87.5% (÷8) hardware clock slowdown

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1.8 Unpacking Checklist

Before unpacking, check the shipping carton for any damage. If the shipping carton and/or contents are damaged, inform your dealer immediately. Retain the shipping carton and packing materials for inspection. Obtain authorization from your dealer before returning any product to ADLINK. Ensure that the following items are included in the package.

- EGX-MXM-A4500 embedded graphics module

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2 System Requirements

2.1 Power Sequencing

For initial power on, or to Resume from S3 and S4, this sequence must be followed.

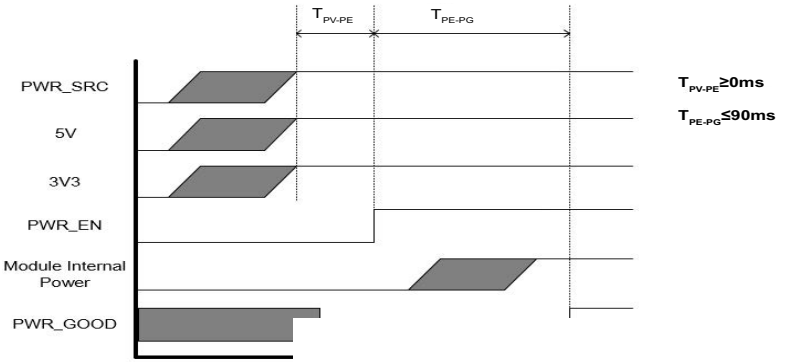


Figure 2-1: Power Sequencing

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2.2 Module Power Up and Down

Issuing the PWR_EN signal powers the MXM module down, and the system designer can decide whether to keep the module input power when the MXM module is powered down.

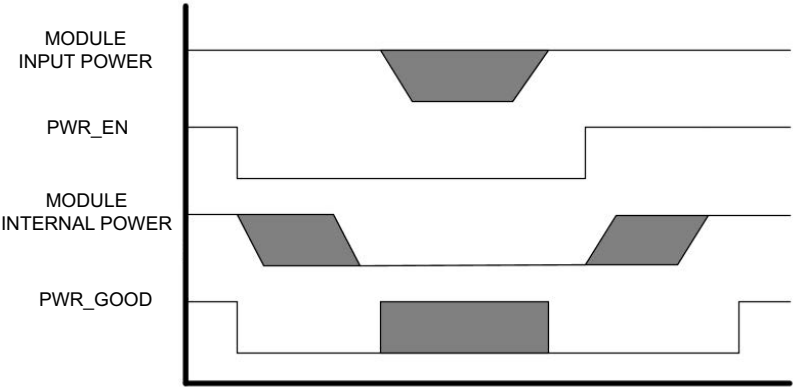


Figure 2-2: Module Power Down

2.3 Reset Requirements

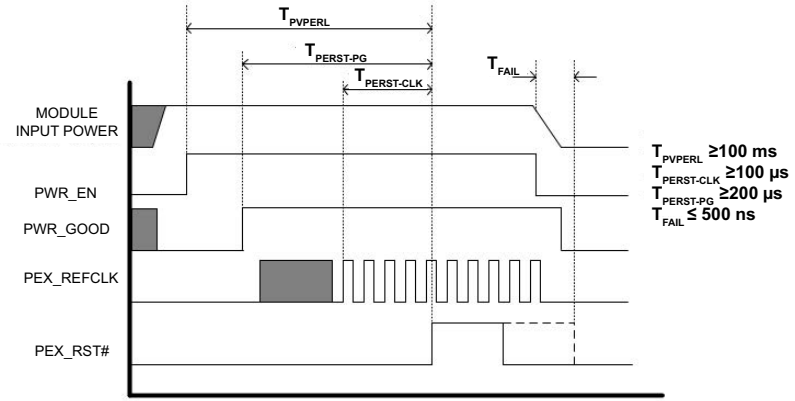


Figure 2-3: Reset Sequencing

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2.4 System BIOS Settings

The system BIOS must meet the following criteria:

- SBIOS must support the "Above 4G decoding" feature to support a resizable BAR1 size.
- SBIOS must enable "Above 4G decoding" as the default configuration.

The following is a sample BIOS menu setting for reference. The actual menu setting can vary depending on the specific SBIOS design.

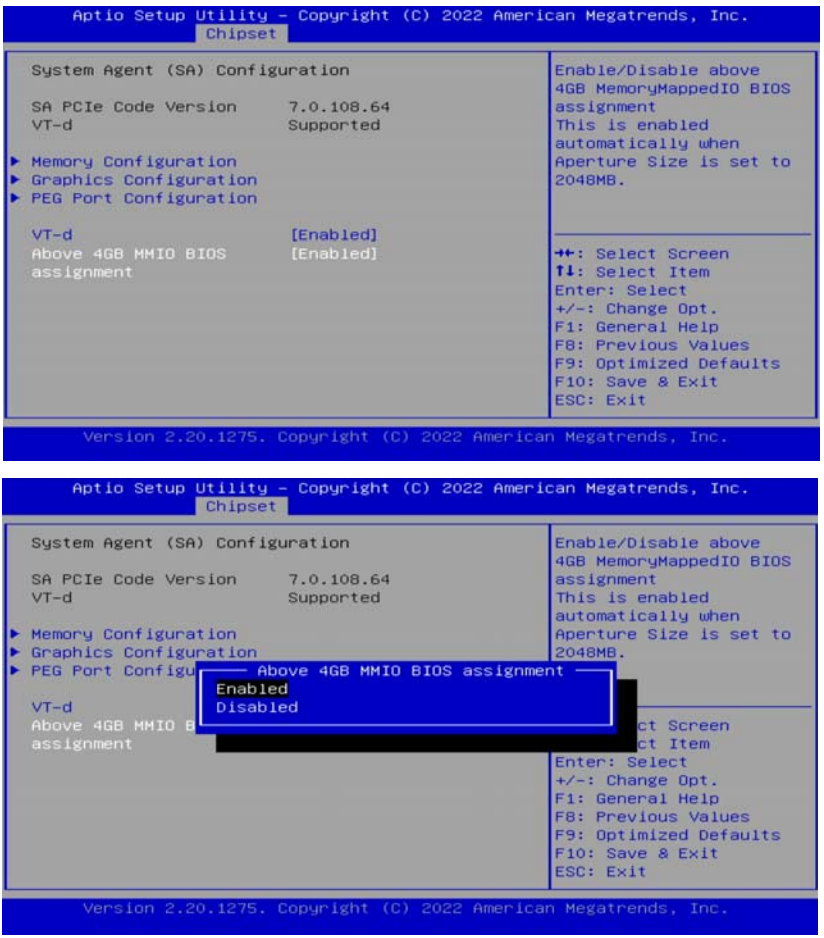


Figure 2-4: Sample BIOS Menu Settings

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2.5 Dual Mode DisplayPort Implementation

The EGX-MXM-A4500 supports four dual mode DisplayPorts by default. HDMI can be supported via dongle (see “Display Support and Options” on page 4). The system requires a switch circuit to determine whether the AUX or DDC signal is output from the MXM module, and AC coupling capacitors should be placed on the system board.

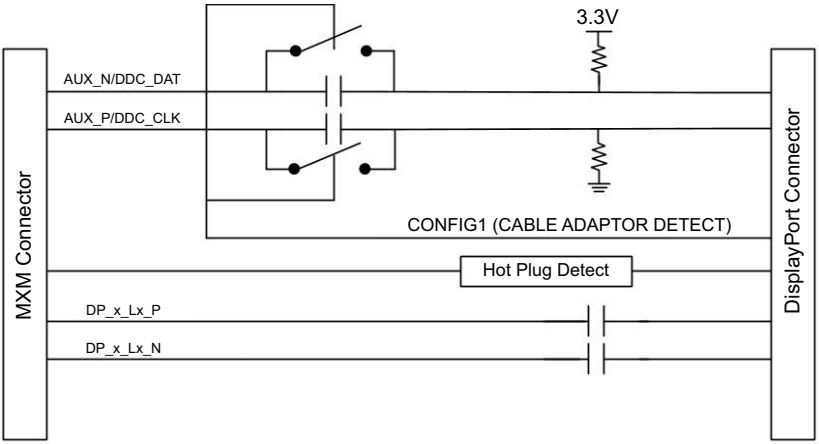


Figure 2-5: Dual Mode DisplayPort Implementation

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2.6 DVI/HDMI on DisplayPort Interface

DVI and HDMI connectors can both be implemented through the DisplayPort interface. To support HDMI display from MXM, the HDMI port needs to be routed from DP_C and/or DP_A. To support DVI from MXM, the DVI port needs to be routed from DP_B and/ or LVDS_L. Dual Link DVI must use DP_B and LVDS_L together (see “Graphics Options” on page 4). Circuits required on the system board are as shown. 499Ω with 1% pulldown resistors to the ground on the DP lanes must placed on the DVI/HDMI connector side of the AC coupling, gated by a MOSFET to limit leakage.

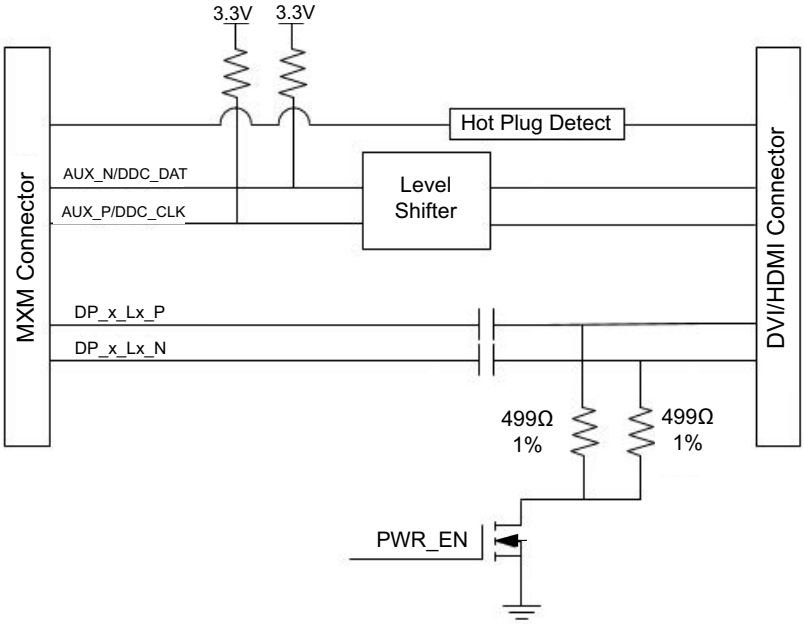


Figure 2-6: DVI/HDMI on DisplayPort Interface

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For resolutions higher than 1080P, contact an ADLINK FAE for customized service, or use an active IC for the circuit design.

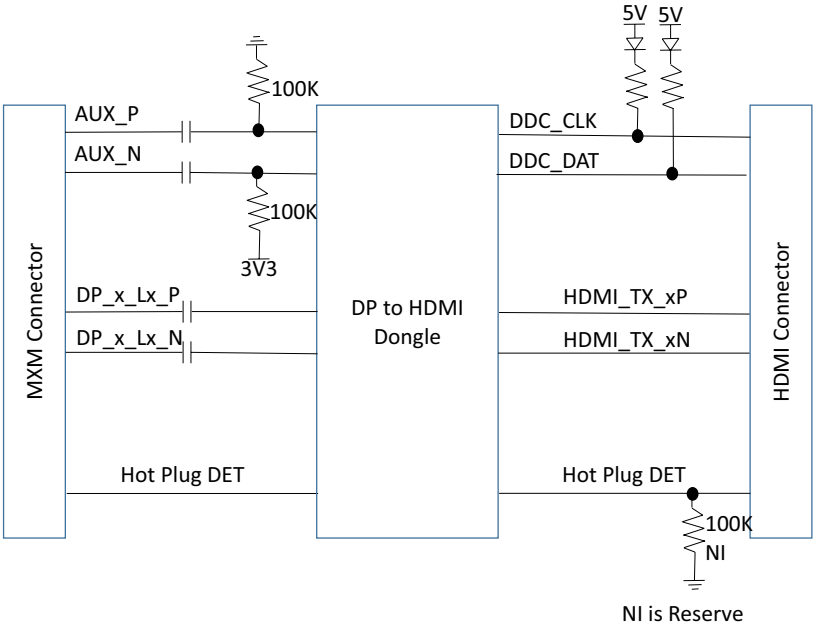


Figure 2-7: Active IC for HDMI Dongle

2.7 Driver Installation

Drivers can be downloaded from:

https://www.adlinktech.com/Products/Embedded_Graphics/embedded-graphics-solutions/EGX-MXM-A4500

2.8 Certifications & Agencies

- Windows Hardware Quality Lab (WHQL) certified for Windows 10 and Windows 11
- EU Reduction of Hazardous Substances (EU-RoHS)
- Conformité Européenne (CE)
- Federal Communications Commission (FCC)

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Important Safety Instructions

For user safety, please read and follow all instructions, Warnings, Cautions, and Notes marked in this manual and on the associated device before handling/operating the device, to avoid injury or damage.

S'il vous plaît prêter attention stricte à tous les avertissements et mises en garde figurant sur l'appareil , pour éviter des blessures ou des dommages.

- Read these safety instructions carefully
- Keep the User's Manual for future reference
- Read the Specifications section of this manual for detailed information on the recommended operating environment
- The device can be operated at an ambient temperature of 50ºC
- When installing/mounting or uninstalling/removing device; or when removal of a chassis cover is required for user servicing:
  - Turn off power and unplug any power cords/cables
  - Reinstall all chassis covers before restoring power
- To avoid electrical shock and/or damage to device:
  - Keep device away from water or liquid sources
  - Keep device away from high heat or humidity
  - Keep device properly ventilated (do not block or cover-ventilation openings)
  - Always use recommended voltage and power source settings
  - Always install and operate device near an easily accessible electrical outlet
  - Secure the power cord (do not place any object on/over the power cord)
  - Only install/attach and operate device on stable surfaces and/or recommended mountings
- If the device will not be used for long periods of time, turn off and unplug from its power source

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- Never attempt to repair the device, which should only be serviced by qualified technical personnel using suitable tools
- The device must be serviced by authorized technicians when:
  - The power cord or plug is damaged
  - Liquid has entered the device interior
  - The device has been exposed to high humidity and/or moisture
  - The device is not functioning or does not function according to the User's Manual
  - The device has been dropped and/or damaged and/or shows obvious signs of breakage
- Disconnect the power supply cord before loosening the thumbscrews and always fasten the thumbscrews with a screwdriver before starting the system up
- It is recommended that the device be installed only in a server room or computer room where access is:
  - Restricted to qualified service personnel or users familiar with restrictions applied to the location, reasons therefor, and any precautions required
  - Only afforded by the use of a tool or lock and key, or other means of security, and controlled by the authority responsible for the location.

	**BURN HAZARD** Touching this surface could result in bodily injury. To reduce risk, allow the surface to cool before touching. ***RISQUE DE BRÛLURES*** *Ne touchez pas cette surface, cela pourrait entraîner des blessures.* *Pour éviter tout danger, laissez la surface refroidir avant de la toucher.*

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Getting Service

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Please visit the Contact page at www.adlinktech.com for information on how to contact the ADLINK regional office nearest you.

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