

# MMR5000B6-16G

MXM graphics card  
USER' Manual V10

## USER'S MANUAL 用户手册

## Statement

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## Safety instructions

<b>1</b>	Before using the product, be sure to carefully read the product manual.
<b>2</b>	or boards that are not ready for installation, they should be stored in anti-static protective bags.
<b>3</b>	Before taking the board from the packaging bag, place your hand on a grounded metal object for a while to release static electricity from your body and hands.
<b>4</b>	When holding the board, it is necessary to wear static protective gloves and develop a habit of only touching the edges.
<b>5</b>	Please confirm the power supply voltage when connecting the motherboard to the power supply.
<b>6</b>	To avoid electric shock to the human body or damage to the product, it is necessary to turn off the AC power or unplug the AC power cord from the power outlet before unplugging or configuring the motherboard or card.
<b>7</b>	Before moving the board, unplug the AC power cord from the power socket.
<b>8</b>	Before connecting or unplugging any device, make sure that all power cords have been unplugged beforehand.
<b>9</b>	To avoid unnecessary damage to the product caused by frequent power on and off, wait at least 30 seconds before turning on the device.
<b>10</b>	If there is any abnormal situation during the use of the device, please seek professional assistance.

# 目录

<b>1.Specifications</b> .....	5
<b>2.Block Diagram</b> .....	7
<b>3.Connector Pinout</b> .....	8
<b>4.MXM Connector</b> .....	10
<b>5.Power Group</b> .....	10
<b>6.Power Sequencing</b> .....	11
<b>7.Module Power Down and Power Up</b> .....	11
<b>8.Reset Requirements</b> .....	12
<b>9.DisplayPort Interface</b> .....	12
<b>10.DVI/HDMI on DP Interface</b> .....	13
<b>11.Thermal</b> .....	14
<b>12.Install Video</b> .....	14
<b>13.Performance</b> .....	15
<b>14.Driver</b> .....	15
<b>15.Dimensions</b> .....	16
<b>16.Photo</b> .....	16
<b>17.Cooling Option</b> .....	17
<b>18.Question</b> .....	17

## 1.Specifications

Model	MMR5000B6-16G
<b>GPU Architecture</b>	NVIDIA Ada Lovelace
<b>Graphics Processing Unit</b>	NVIDIA Quadro RTX5000 Mobility
<b>Bus Type</b>	MXM3 .0 / up to PCI Express 4.0 x16
<b>Graphics Clock</b>	1425MHz / 2115MHz (Boost)
<b>Memory Size</b>	16G 256bit GDDR6
<b>Memory Clock</b>	2250MHz (18.0 Gbps)
<b>Memory Bandwidth</b>	576.0GB/s
<b>Display Features</b>	DP_A: Display Port1.4++ DP_B: Display Port1.4++ DP_C: Display Port1.4++ DP_D: Display Port1.4++
<b>Max Resolution</b>	7680x4320@120Hz
<b>Number of Output Channel</b>	4
<b>Board Power</b>	115W
<b>Board Dimensions</b>	MXM Graphics Module Version 3.1 Type B (105x82mm)
<b>Operation System</b>	Windows 11/10 64bit · Linux
<b>VIN Range</b>	DC 12~19V, 3.3V & 5V; +/-5%
<b>Operating Temperature</b>	0~45°C
<b>Storage Temperature</b>	-20~75°C
<b>Operating Humidity</b>	0~95% (non-condensing)
<b>Storage Humidity</b>	10~90%

Render Config	
<b>Shader Processing Units</b>	9728
<b>Tensor Core</b>	304
<b>RT Core</b>	76
<b>TMUs</b>	304
<b>ROPs</b>	112
<b>SM Count</b>	76
<b>L1 Cache</b>	128KB (per SM)
<b>L2 Cache</b>	64MB

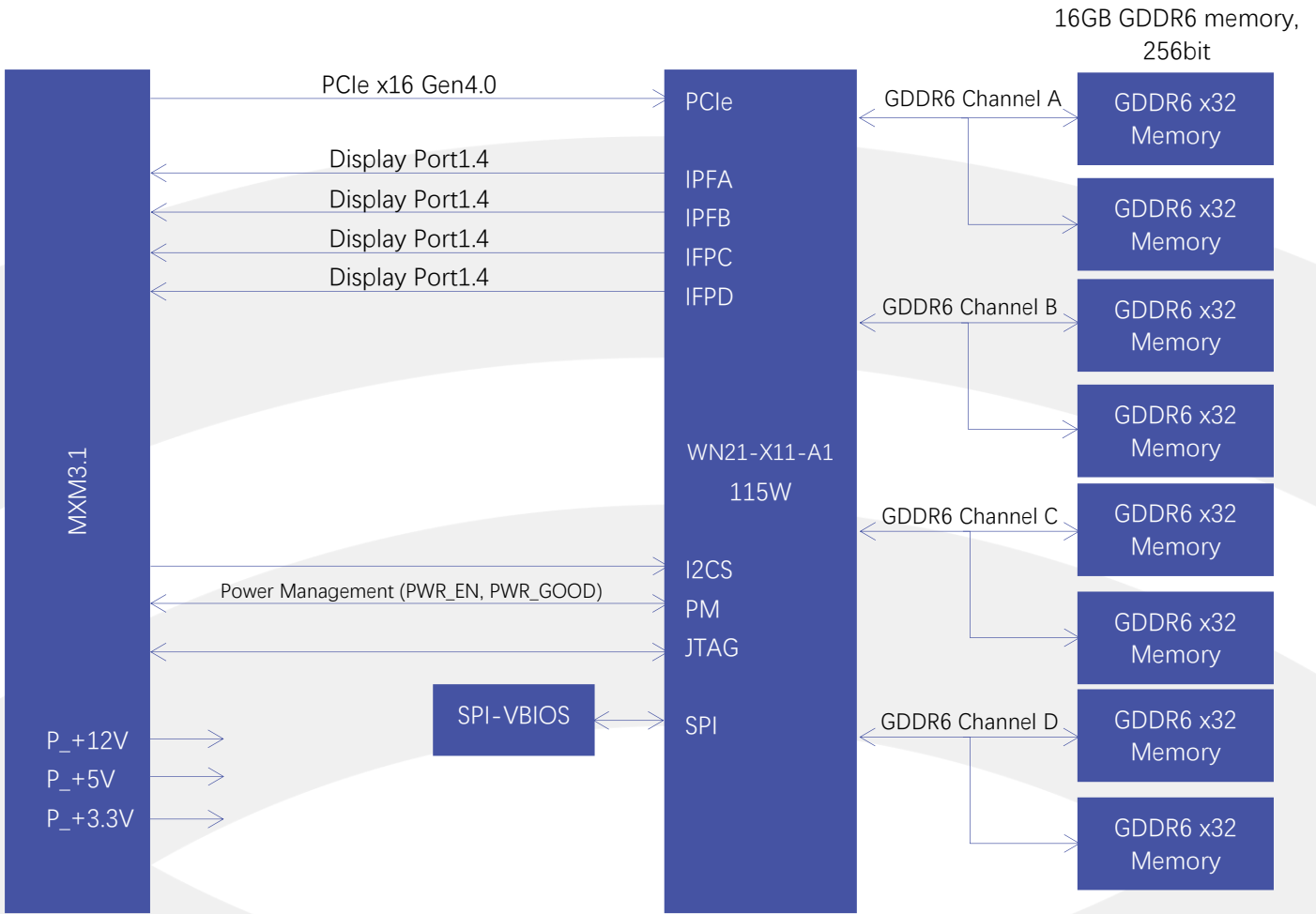
Theoretical Performance	
<b>Pixel Rate</b>	236.9GPixel/s
<b>Texture Rate</b>	643.0GTexel/s
<b>Single Precision FLOPS(AIDA64)</b>	39582GFLOPS
<b>Double Precision FLOPS(AIDA64)</b>	686.6GFLOPS

Graphics Features	
<b>DirectX</b>	12 Ultimate (12_2)
<b>OpenGL</b>	4.6
<b>OpenCL</b>	3.0
<b>Vulkan</b>	1.3
<b>Shader Model</b>	6.7
<b>CUDA</b>	8.9
<b>Video Playback</b>	H.265, VC1, MPEG2 1080P

Surround(Landscape)	Surround(Portrait)
2x1(3840x1080@60Hz)	2x1(2160x1920@60Hz)
1x2(1920x2160@60Hz)	1x2(1080x3840@60Hz)
3x1(5760x1080@60Hz)	3x1(3240x1920@60Hz)
1x3(1920x3240@60Hz)	1x3(1080x5760@60Hz)
4x1(7680x1080@60Hz)	1x4(1080x7680@60Hz)
2x2(3840x2160@60Hz)	2x2(2160x3840@60Hz)

*\*Total resolution based on every display resolution is 1920\*1080@60Hz.*

## 2. Block Diagram



### 3.Connector Pinout

Table 3.1 and Table 3.2 list the connector pinout.

Table 3.1 Connector Pinout

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
E1	PWR_SRC	E2	PWR_SRC	75	PEX_RX11	76	GND
E3	GND	E4	GND	77	GND	78	PEX_TX10#
1	5V	2	PRSNT_R#	79	PEX_RX10#	80	PEX_TX10
3	5V	4	WAKE#	81	PEX_RX10	82	GND
5	5V	6	PWR_GOOD	83	GND	84	PEX_TX9#
7	5V	8	PWR_EN	85	PEX_RX9#	86	PEX_TX9
9	5V	10	27MHZ_REF	87	PEX_RX9	88	GND
11	GND	12	GND	89	GND	90	PEX_TX8#
13	GND	14	LVDS_U_HPD	91	PEX_RX8#	92	PEX_TX8
15	GND	16	JTAG_TESTEN	93	PEX_RX8	94	GND
17	GND	18	PWR_LEVEL	95	GND	96	PEX_TX7#
19	PEX_STD_SW#	20	TH_OVERT#	97	PEX_RX7#	98	PEX_TX7
21	VGA_DISABLE#	22	TH_ALERT#	99	PEX_RX7	100	GND
23	N/A	24	TH_PWM	101	GND	102	PEX_TX6#
25	N/A	26	GPIO0	103	PEX_RX6#	104	PEX_TX6
27	N/A	28	GPIO1	105	PEX_RX6	106	GND
29	HDMI_CEC	30	GPIO2	107	GND	108	PEX_TX5#
31	LVDS_L_HPD	32	SMB_DAT	109	PEX_RX5#	110	PEX_TX5
33	LVDS_DDC_DAT	34	SMB_CLK	111	PEX_RX5	112	GND
35	LVDS_DDC_CLK	36	GND	113	GND	114	PEX_TX4#
37	GND	38	OEM0	115	PEX_RX4#	116	PEX_TX4
39	OEM1	40	OEM2	117	PEX_RX4	118	GND
41	OEM3	42	OEM4	119	GND	120	PEX_TX3#
43	OEM5	44	OEM6	121	PEX_RX3#	122	PEX_TX3
45	OEM7	46	GND	123	PEX_RX3	124	GND
47	GND	48	PEX_TX15#	125	GND	126	KEY
49	PEX_RX15#	50	PEX_TX15	127	KEY	128	KEY
51	PEX_RX15	52	GND	129	KEY	130	KEY
53	GND	54	PEX_TX14#	131	KEY	132	KEY
55	PEX_RX14#	56	PEX_TX14	133	GND	134	GND
57	PEX_RX14	58	GND	135	PEX_RX2#	136	PEX_TX2#
59	GND	60	PEX_TX13#	137	PEX_RX2	138	PEX_TX2
61	PEX_RX13#	62	PEX_TX13	139	GND	140	GND
63	PEX_RX13	64	GND	141	PEX_RX1#	142	PEX_TX1#
65	GND	66	PEX_TX12#	143	PEX_RX1	144	PEX_TX1
67	PEX_RX12#	68	PEX_TX12	145	GND	146	GND
69	PEX_RX12	70	GND	147	PEX_RX0#	148	PEX_TX0#
71	GND	72	PEX_TX11#	149	REX_RX0	150	PEX_TX0
73	PEX_RX11#	74	PEX_TX11	151	GND	152	GND



Table 3.2 Connector Pinout(continued)

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
153	PEX_REFCLK#	154	PEX_CLK_REQ#	219	DP_C_L3	220	DP_D_L2
155	PEX_REFCLK	156	PEX_RST#	221	GND	222	GND
157	GND	158	VGA_DDC_DAT	223	DP_C_AUX#	224	DP_D_L3#
159	JTAG_TDO	160	VGA_DDC_CLK	225	DP_C_AUX	226	DP_D_L3
161	JTAG_TDI	162	VGA_VSYNC	227	RSVD	228	GND
163	JTAG_TCLK	164	VGA_HSYNC	229	RSVD	230	DP_D_AUX#
165	JTAG_TMS	166	GND	231	RSVD	232	DP_D_AUX
167	JTAG_TRST#	168	VGA_RED	233	RSVD	234	DP_C_HPD
169	LVDS_UCLK#	170	VGA_GREEN	235	RSVD	236	DP_D_HPD
171	LVDS_UCLK	172	VGA_BLUE	237	RSVD	238	RSVD
173	GND	174	GND	239	RSVD	240	3V3
175	LVDS_UTX3#	176	LVDS_LCLK#	241	RSVD	242	3V3
177	LVDS_UTX3	178	LVDS_LCLK	243	RSVD	244	GND
179	GND	180	GND	245	RSVD	246	DP_B_L0#
181	LVDS_UTX2#	182	LVDS_LTX3#	247	RSVD	248	DP_B_L0
183	LVDS_UTX2	184	LVDS_LTX3	249	RSVD	250	GND
185	GND	186	GND	251	GND	252	DP_B_L1#
187	LVDS_UTX1#	188	LVDS_LTX2#	253	DP_A_L0#	254	DP_B_L1
189	LVDS_UTX1	190	LVDS_LTX2	255	DP_A_L0	256	GND
191	GND	192	GND	257	GND	258	DP_B_L2#
193	LVDS_UTX0#	194	LVDS_LTX1#	259	DP_A_L1#	260	DP_B_L2
195	LVDS_UTX0	196	LVDS_LTX1	261	DP_A_L1	262	GND
197	GND	198	GND	263	GND	264	DP_B_L3#
199	DP_C_L0#	200	LVDS_LTX0#	265	DP_A_L2#	266	DP_B_L3
201	DP_C_L0	202	LVDS_LTX0	267	DP_A_L2	268	GND
203	GND	204	GND	269	GND	270	DP_B_AUX#
205	DP_C_L1#	206	DP_D_L0#	271	DP_A_L3#	272	DP_B_AUX
207	DP_C_L1	208	DP_D_L0	273	DP_A_L3	274	DP_B_HPD
209	GND	210	GND	275	GND	276	DP_A_HPD
211	DP_C_L2#	212	DP_D_L1#	277	DP_A_AUX#	278	3V3
213	DP_C_L2	214	DP_D_L1	279	DP_A_AUX	280	3V3
215	GND	216	GND	281	PRSNT_L#	-	
217	DP_C_L3#	218	DP_D_L2#				

## 4.MXM Connector

Figure 4.1 MXM Connector (Card Top)

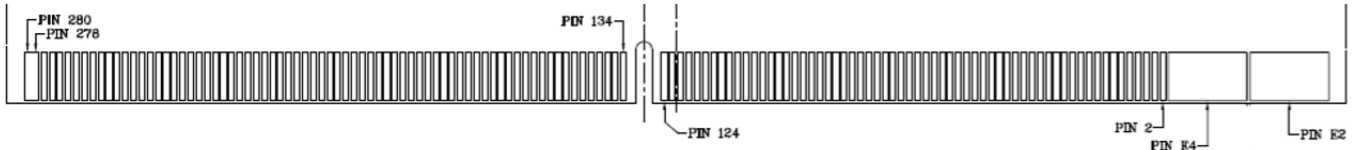
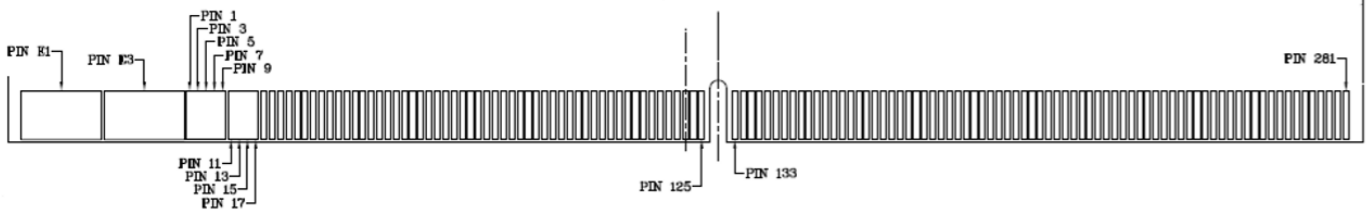


Figure 4.2 MXM Connector (Card Bottom)



## 5.Power Group

Table 5.1 shows the MXM module power requirements. The voltage tolerances in the table are specified as measured on module edge finger. The system must be able to supply the full specified current on rails (except PWR\_SRC) at all times. The current capability of the PWR\_SRC rail must be defined by the system in the MXM system information structure.

Table 5.1 MXM Power Rails

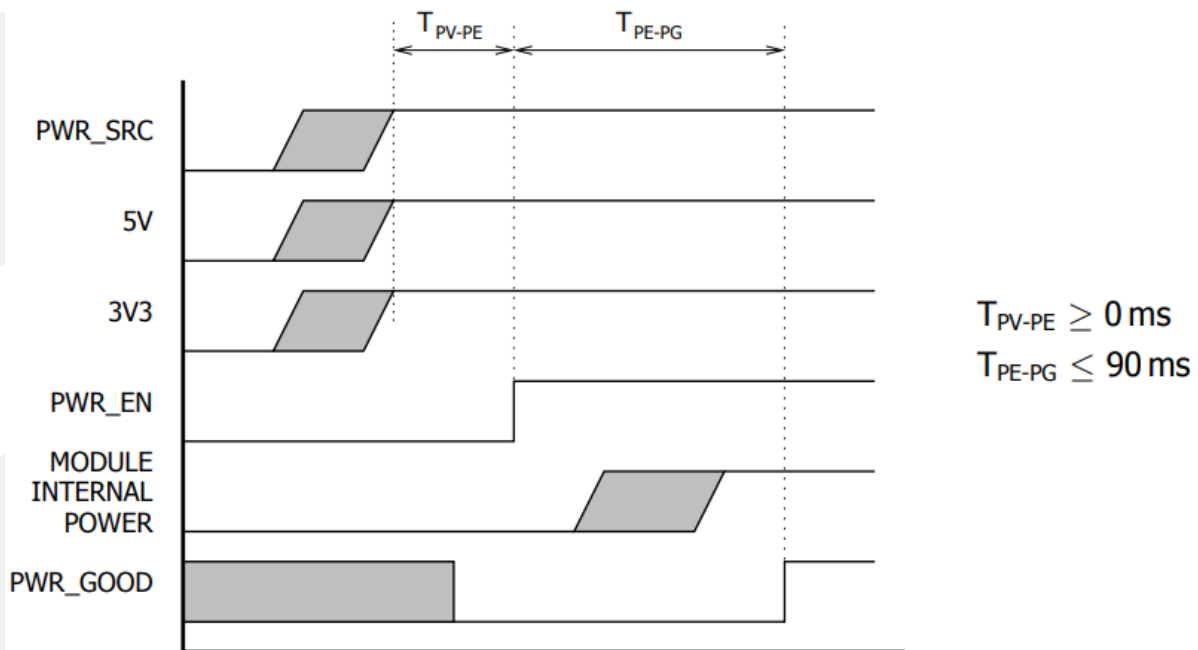
Signal Name	I/O	Type	Impedance	Voltage	Current
PWR_SRC	I	Power	N/A	12-19V	up to 10A
5V	I	Power	N/A	5.0V $\pm$ 6%	2.5A
3.3V	I	Power	N/A	3.3V $\pm$ 6%	2.0A

*Note: PWR\_SRC voltage range is assumed to be DC or RMS. However under any circumstances the maximum peak voltage shall not exceed 22V and minimum voltage shall not fall below 6.5V.*

## 6. Power Sequencing

There is no power sequencing requirement for the input voltages to the MXM module. However the PWR\_EN signal may be asserted only after all power rails are within specified tolerance. The state of PWR\_GOOD is undefined until all rails are fully ramped. Refer to Figure 6.1 for details

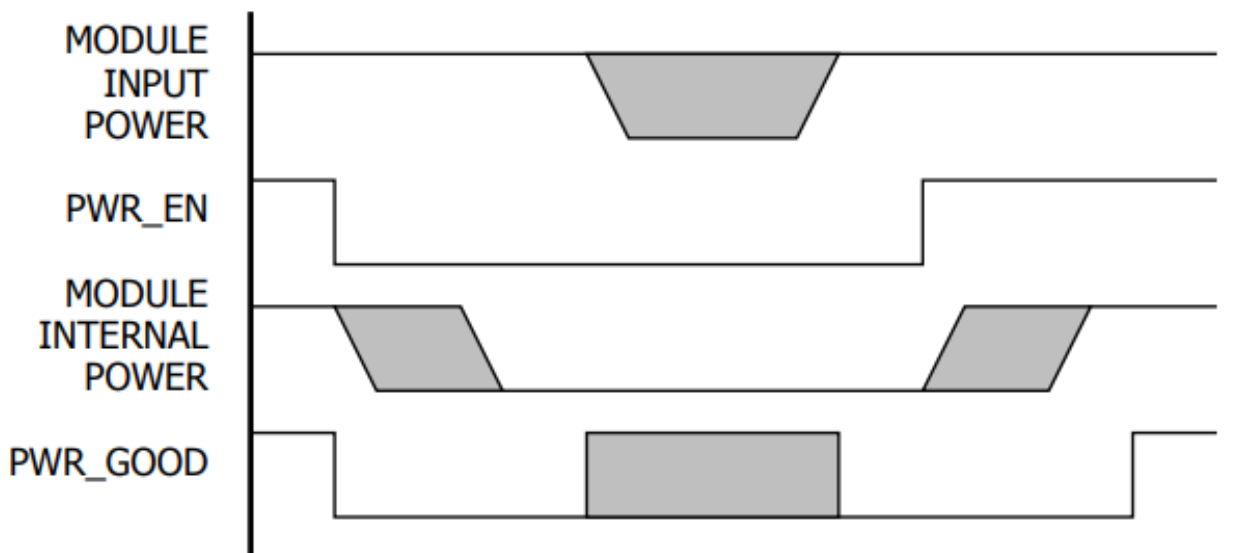
Figure 6.1 Power Sequencing



## 7. Module Power Down and Power Up

The MXM module may be powered down using the PWR\_EN signal. The system designer may choose to shut down or keep the input power while the module is powered down. Refer to Figure 7.1 for details.

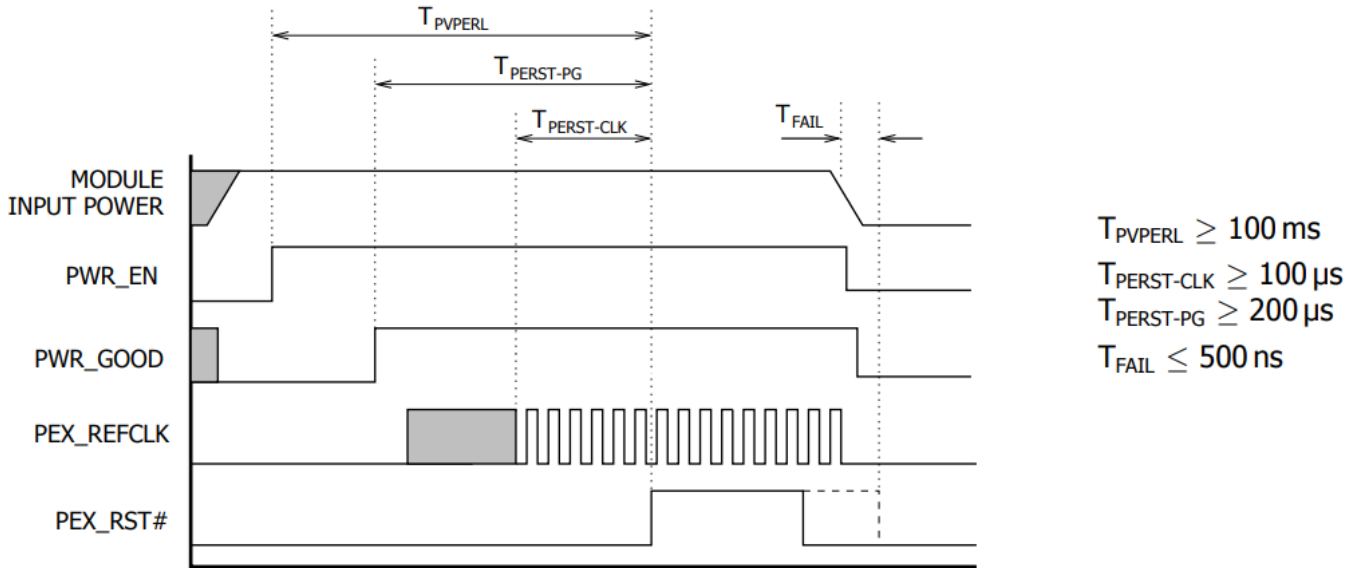
Figure 7.1 Module Power Down



### 8.Reset Requirements

System reset may be deasserted only after the assertion of the PWR\_GOOD signal. Figure 8.1 shows the reset requirements relative to the PWR\_EN and PWR\_GOOD signals. This sequence must be followed on initial power on, system reset and resume from suspend/hibernate.

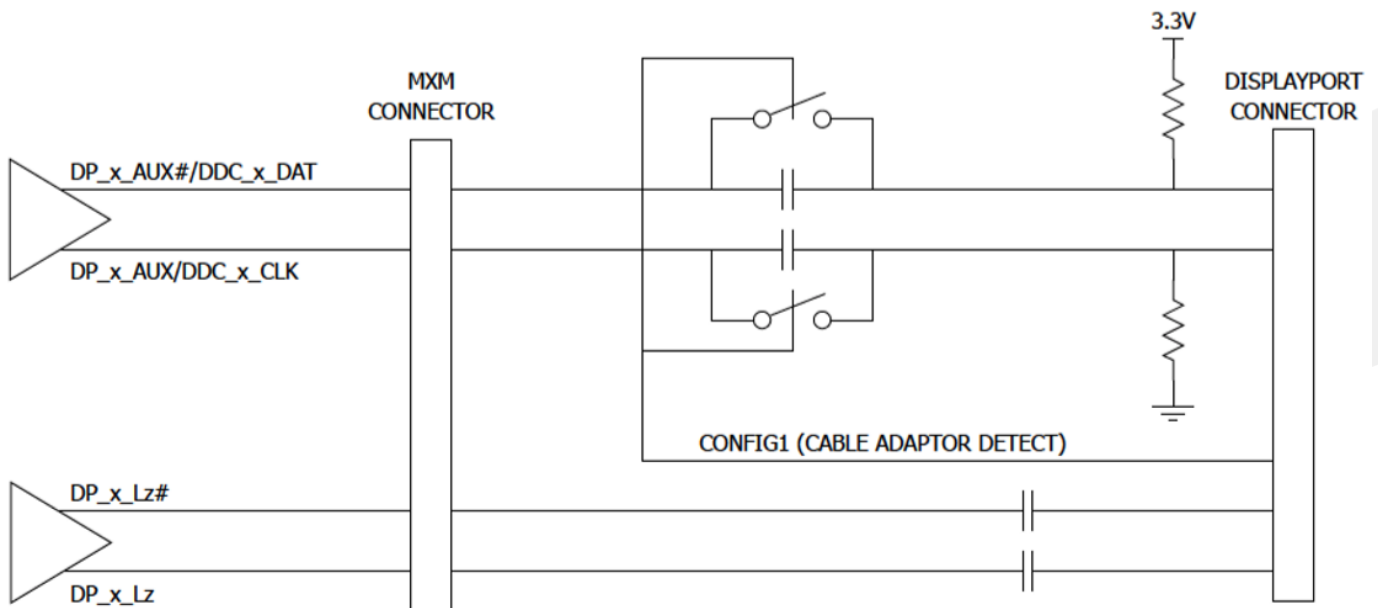
Figure 8.1 Reset Sequencing



### 9.DisplayPort Interface

DC blocking capacitors of DisplayPort must be placed on the system board. In addition to the MXM implementation of Dual-mode DisplayPort requires the circuit in Figure 9.1 on the AUX lines for proper dongle detection. The HPD signal conditioning must also be placed on the system board.

Figure 9.1 Dual-mode DisplayPort Implementation



## 10.DVI/HDMI on DP Interface

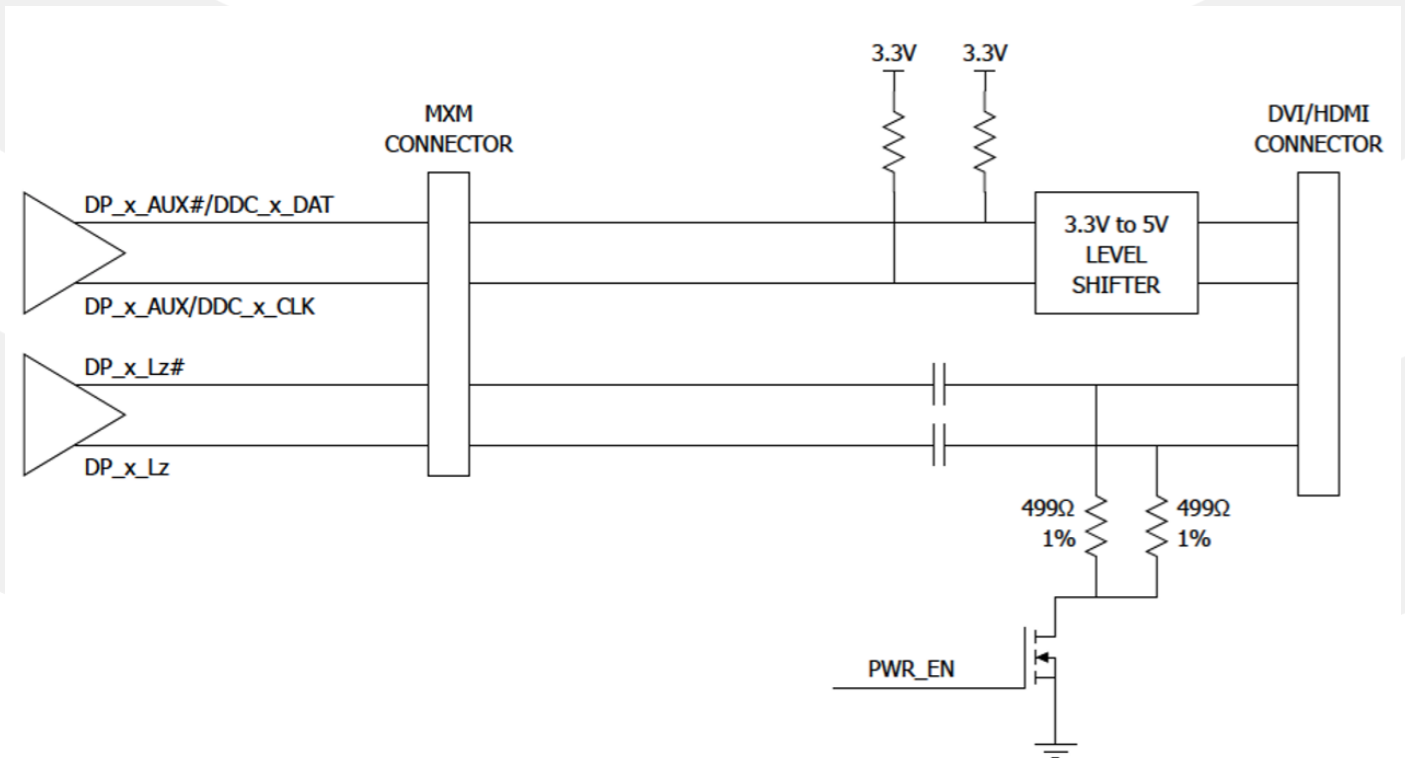
Native DVI or HDMI connector support can be implemented using a DisplayPort interface. Additional circuitry is required on the system and the proper signal mapping must be observed. As Figure 10.1 shows,  $499\Omega$  1% pull-down resistors to ground on the DP lane signals must be placed on the connector side of AC coupling capacitors gated by a FET to limit the leakage. Additionally level shifting circuits must also be implemented on DDC Data and Clock.

Table 10.1 shows the mapping to connect the signals from the MXM connector to the HDMI/DVI connector.

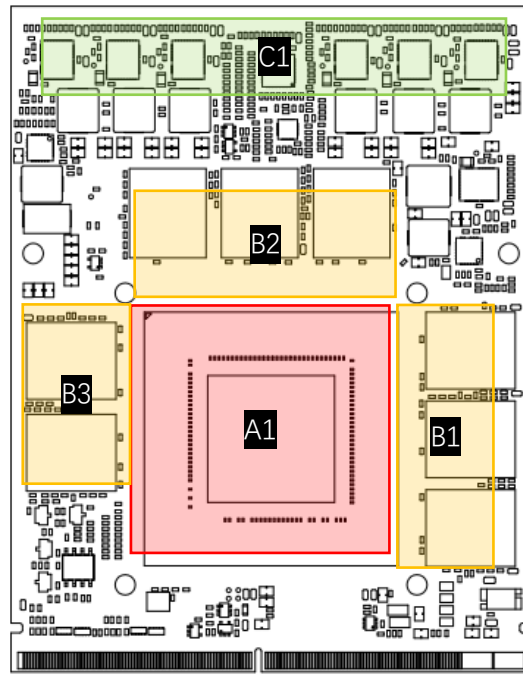
Table 10.1 DisplayPort Multiplexed Signal Definition

Pin Name	DVI/HDMI
DP_xL0	TX_x_D2
DP_xL0#	TX_x_D2#
DP_x_L1	TX_x_D1
DP_x_L1#	TX_x_D1#
DP_x_L2	TX_x_D0
DP_x_L2#	TX_x_D0#
DP_x_L3	TX_x_CLK
DP_x_L3#	TX_x_CLK#
DP_x_AUX	DDC_x_CLK
DP_x_AUX#	DDC_x_DAT

Figure 10.1 DVI/HDMI Implementation Using DP Interface



## 11.Thermal



Components	Area	TDP	Height
GPU	A1	90W	3.0mm
Memory	B1、B2	2W*3	0.9mm
Memory	B3	2W*2	0.9mm
Mosfet	C1	1.5W*6	0.75mm

Chipset		Specification
Dimensions		25*16*3.0mm
Stress	Maximum	75 PSI
	Normal	30-40 PSI

### Cooling Suggestion:

- 1、 The card should be fixed onto cooling fan first, the cooling fan. The external diameter of cooling fan screw is 4mm, M2 size.
- 2、 The weight of cooling fan should be supported and fixed by chassis.
- 3、 videl memory and MOS should be added thermal pad.

Components	Temp. limit when chassis temp. is fully loaded (environment temp. 45°C)
GPU	86°C
Memory	85°C
Mosfet	105°C

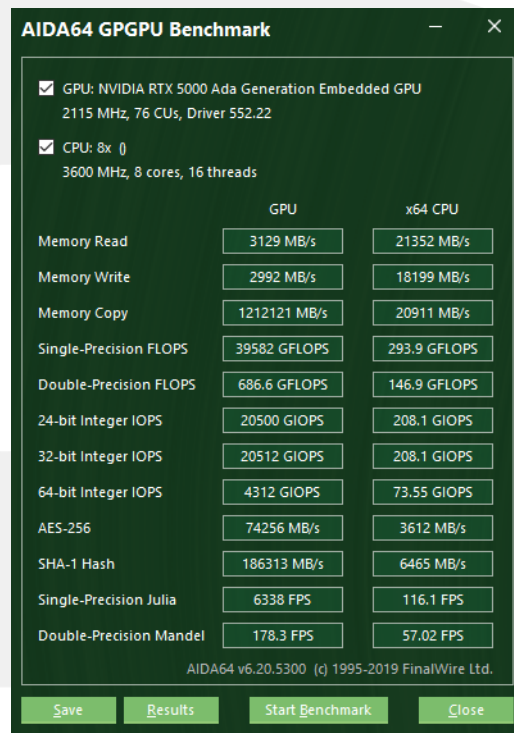
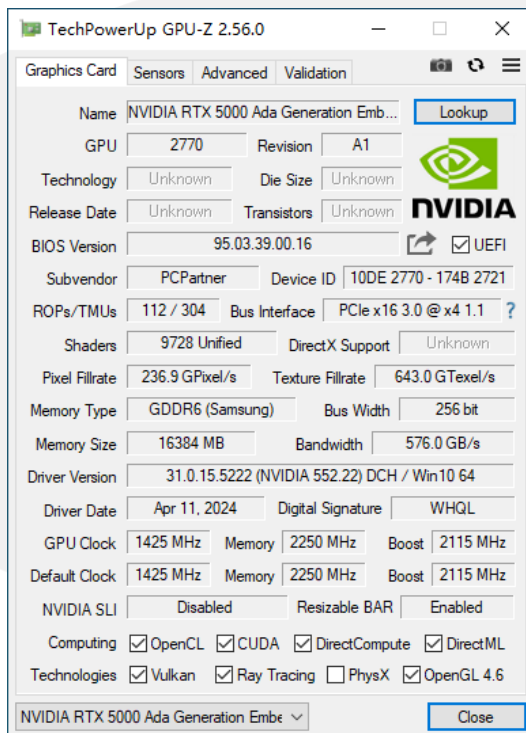
\*Vmemory and MOS be monitored by probe, GPU be monitored by "Furmark (1920\*1080)".

## 12.Installation Video

[https://www.douyin.com/user/MS4wLjABAAAfV567Mcp9KjHrjFWngJgFG8h7XMSWsqH55hBlryutm?modal\\_id=7306824293789207843](https://www.douyin.com/user/MS4wLjABAAAfV567Mcp9KjHrjFWngJgFG8h7XMSWsqH55hBlryutm?modal_id=7306824293789207843)

### 13.Performance

Benchmark	Score
<b>3Dmark13</b>	FS:42345
	FSE:20514
	FSU:10449
<b>3Dmark11</b>	E30603
	P29592
	X17349
<b>3Dmark Vantage</b>	106696
<b>Heaven</b>	10030
<b>鲁大师</b>	516264
<b>glmark2</b>	18125
<b>Single-Precision FLOPS(CUDA-Z)</b>	43.933TFLOPS
<b>Double-Precision FLOPS(CUDA-Z)</b>	678.858GFLOPS



### 14.Driver

Windows 11: <https://www.nvidia.cn/download/driverResults.aspx/224224/cn/>

Windows 10 64bit: <https://www.nvidia.cn/download/driverResults.aspx/224224/cn/>

Linux aarch64: <https://www.nvidia.cn/download/driverResults.aspx/224453/cn/>

Linux 64bit: <https://www.nvidia.cn/download/driverResults.aspx/224357/cn/>

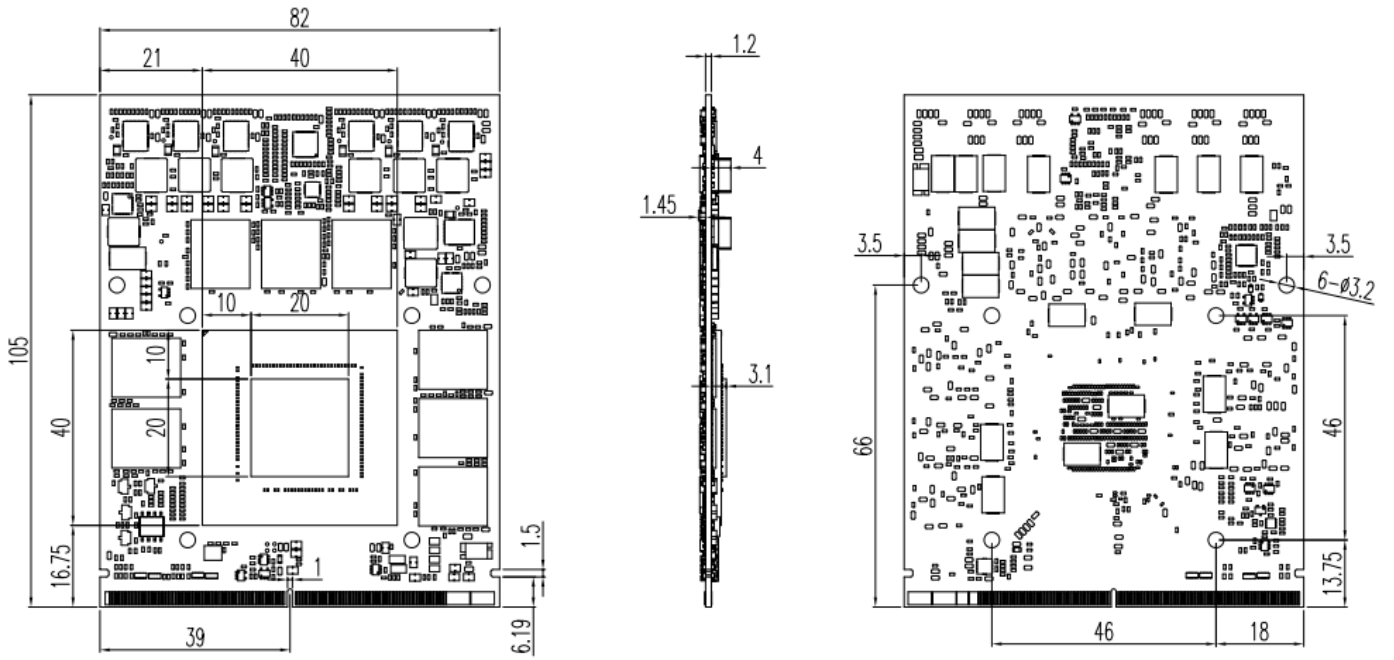
Solaris x86/x64: <https://www.nvidia.cn/download/driverResults.aspx/224389/cn/>

FreeBSD x64: <https://www.nvidia.cn/download/driverResults.aspx/224421/cn/>

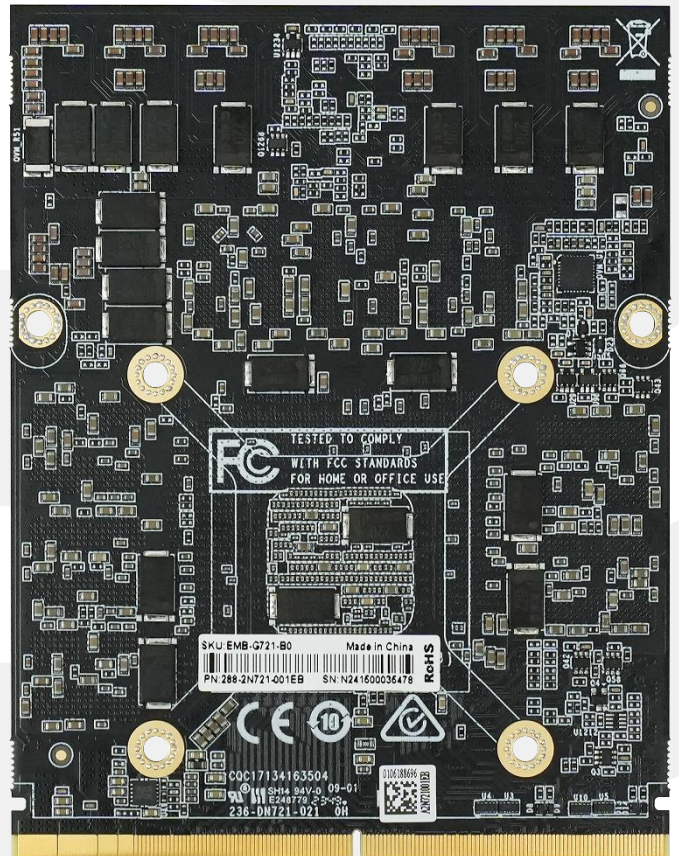
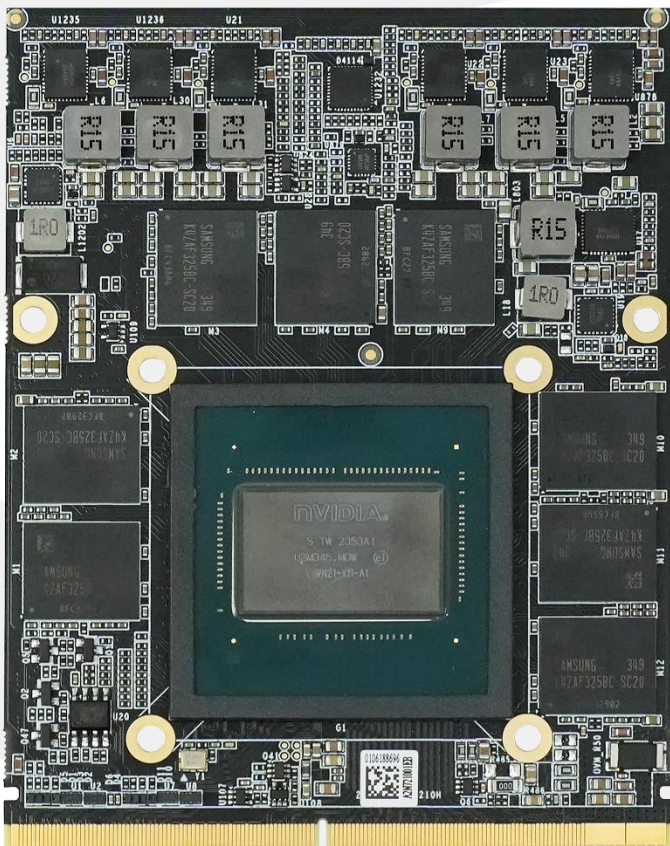
Uninstall Driver Video:

[https://www.douyin.com/user/MS4wLjABAAAAfv567McP9KjHrjFWngJgFG8h7XMSWsqH55hBlryutm?modal\\_id=7321980490926279951](https://www.douyin.com/user/MS4wLjABAAAAfv567McP9KjHrjFWngJgFG8h7XMSWsqH55hBlryutm?modal_id=7321980490926279951)

### 15.Dimensions

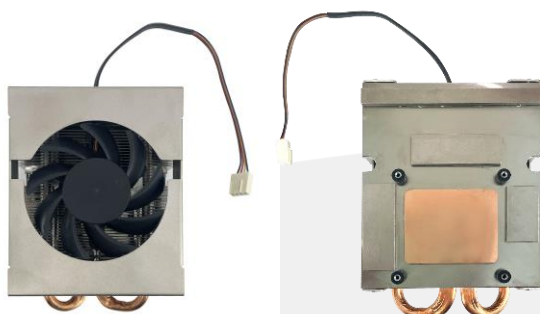


### 16.Photo





## 17.Cooling Option



### 1.ZRT.48-6327-00-A00

<b>Dimension</b>	130*80*49.9mm
<b>Rated Speed</b>	4500
<b>Out of Frame Lead Wires</b>	200mm
<b>Connector</b>	4Pin 2.54

## 18.Fault Diagnosis

Fault	Diagnosis
不开机	1、更改 pgood 信号。(部份主板) 2、确认 PCIE 复位信号。 3、主板 BIOS 更改为 UEFI BIOS。
不显示	<b>Windows 10:</b> (需 1809 版本之后) 在主板 BIOS 下, 将 CSM 中 CSM Support 设置由 Enabled 更改为 Disabled。
设备管理员出现惊叹号	1、原系统显卡驱动删除干净。(请使用 Display Driver Uninstaller 删除, <a href="https://www.wagnardsoft.com/">https://www.wagnardsoft.com/</a> ) 2、Windows 10 版本 16299 不支持, 需更新至最新版 (17763、17134 均可)。 3、确认核显驱动是否已安装。(不需独立显卡显示)
不显示 (HDMI 输出)	1、4K 60Hz 显示屏, 确认 HDMI 线材是否为 HDMI2.0。 2、将显示器分辨率降为 2K 60Hz。
显卡不工作	量下 3V3/5V/2V/Reset 信号是否有电/短路? 若有电, 显卡就会工作。
安装 Linux 系统, 图形界面异常/无限循环登陆界面, 无法登录系统	装驱动的时, 加上--no-opengl-files。 (禁用 opengl, 若系统上有用到这套组件, 将无法使用)
控制面板无法正常开启	仅可在独显显示时, 才能正常开启; 若使用集显显示, 将无法正常开启。
X86 在中标麒麟系统下, 显卡驱动后集显输出不能进系统	将 xorg.conf 文件内容清空。
显卡无法辨视	检查 PCIE LANE Numbering Reversal 设置。 主要关注下上电和 pcie, 确认下 1、PCIE 的连接 (是否 0-15 反、差分正负反、x16 是否拆分, bios 可修改, 软硬件要一致), 耦合电容是否少以及容值; 协议兼容性 (降 gen1, 或用 x1 试试, 显卡都能支持 x1) 2、信号质量, 100MHz clk (示波器看下抖动, bios 是否有展频), pcie 的信号质量 (看实际距离不长, 概率不大, 可以 bios 调不同的去加重、预加重值试试, 能测试眼图最好) 3、上电主要是给显卡的 enable 信号, 其他的不影响开机, 时序 (主板启动比显卡快, bios 可以对 reset 信号延时试试)

故障	排除
设备管理器显示设备安装成功，但 GPU-Z 显存容量与主频显示为 0	开机时按 DEL 键进 BIOS 设置中选择 Chipset→System Agent (SA) Configuration→PCI Express Configuration→PCI Express Root Port 中的 ASPM 选着 Disabled (注：PCI Express Root port 所有选项中的 ASPM 都选着 Disabled.)
Win11 系统下安装驱动会报缺少 clb.dll 文件	clb.dll 档案拷贝放到 Win11 系统对应目录下 (如下) →重启系统→再安装显卡驱动。 C:\windows\SysWOW64 -- (32bit) C:\Windows\WinSxS\wow64_microsoft-windows-registry-editor_31bf3856ad364e35_10.0.19041.746_none_dc7caa836f08ad57 --(32bit) C:\windows\system32 --(64bit) C:\Windows\WinSxS\amd64_microsoft-windows-registry-editor_31bf3856ad364e35_10.0.19041.746_none_d22800313aa7eb5c --(64bit)

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