

## 1. Specifications:

<b>Model</b>	MD1660TIB6-6G
<b>GPU Architecture</b>	NVIDIA Turing
<b>Graphics Processing Unit</b>	NVIDIA GeForce GTX1660Ti
<b>NVIDIA CUDA Core</b>	1536SP
<b>Bus Type</b>	MXM3 .1 / up to PCI Express 3.0
<b>Graphics Clock</b>	1500MHz / 1875MHz (Boost)
<b>Single Precision FLOPS</b>	6110GFLOPS
<b>Double Precision FLOPS</b>	188.6GFLOPS
<b>Memory Size</b>	6G 192bit GDDR5
<b>Memory Clock</b>	1500MHz (12.0 Gbps)
<b>Memory Bandwidth</b>	288.0GB/s
<b>Display Features</b>	DP_A: Display Port1.4++ DP_B: Display Port1.4++ DP_C: HDMI2.0 DP_D: Display Port1.4++
<b>Max Resolution</b>	DP:7680x4320@120Hz HDMI:3840x2160@60Hz
<b>Board Power</b>	120W
<b>Board Dimensions</b>	MXM Graphics Module Version 3.1 Type B (105x82mm)
<b>Number of output Channel</b>	4
<b>Operation System</b>	Windows 7/10 64bit · Linux 64bit
<b>VIN Range</b>	DC 12~19V, 3.3V & 5V; +/-5%

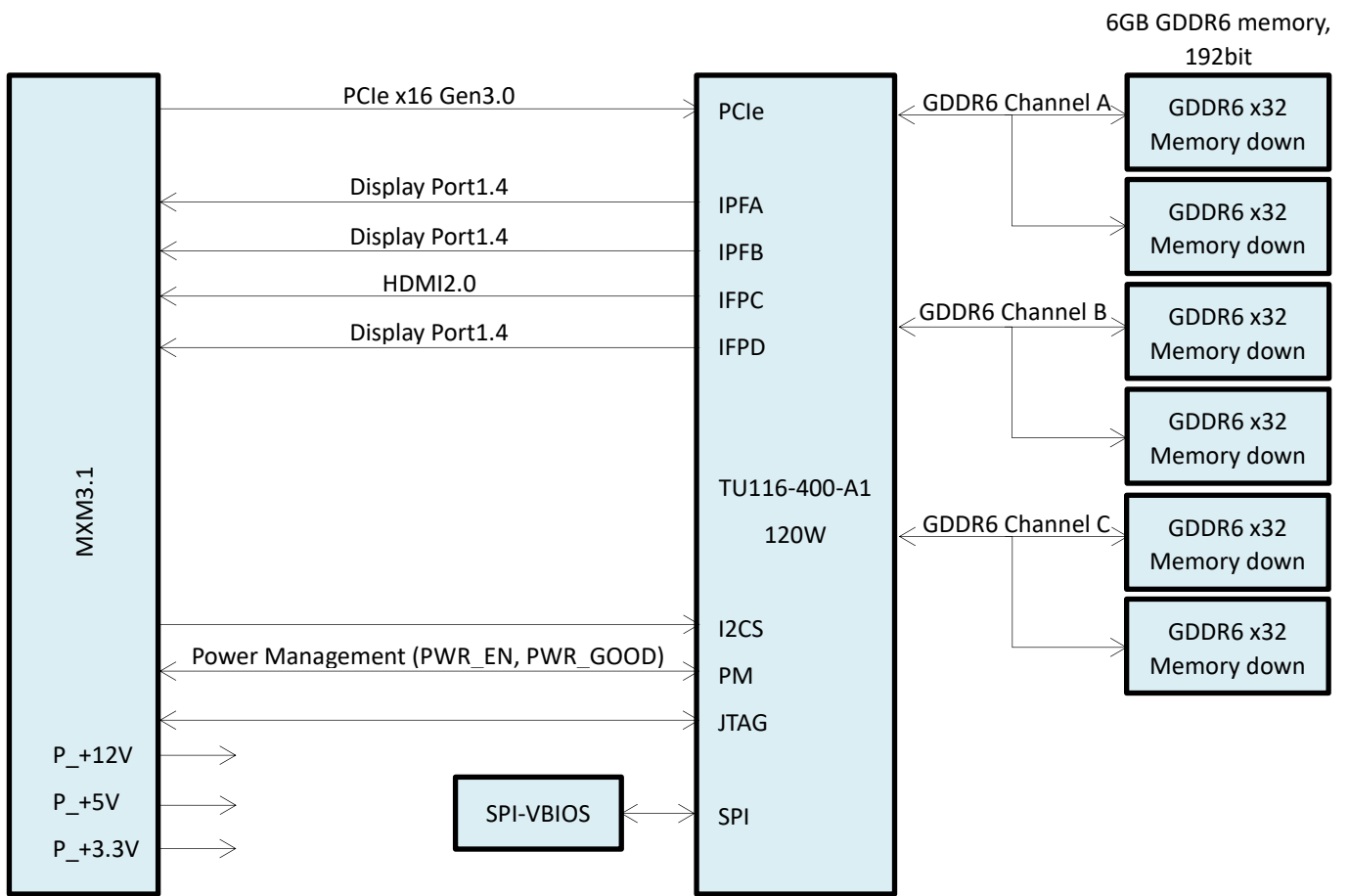
<b>OpenGL</b>	4.6
<b>OpenCL</b>	1.2
<b>DirectX</b>	12
<b>Video Playback</b>	H.265, VC1, MPEG2 1080P

<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%

<b>Surround (Landscape)</b>	<b>Surround (Portrait)</b>
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)	4x1(1080x7680@60Hz)
1x4(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.MXM Board Outlines:

Figure 3.1 shows the board outlines (top side view) for Type B MXM modules. An additional system keep-out of 0.5mm[0.020] per side is allowed on the PCB to accommodate whatever means of production panelization is required. This additional clearance is above and beyond the dimensional limits presented here. The location of these features is not specified or controlled.

Figure 3.1: Board Outlines

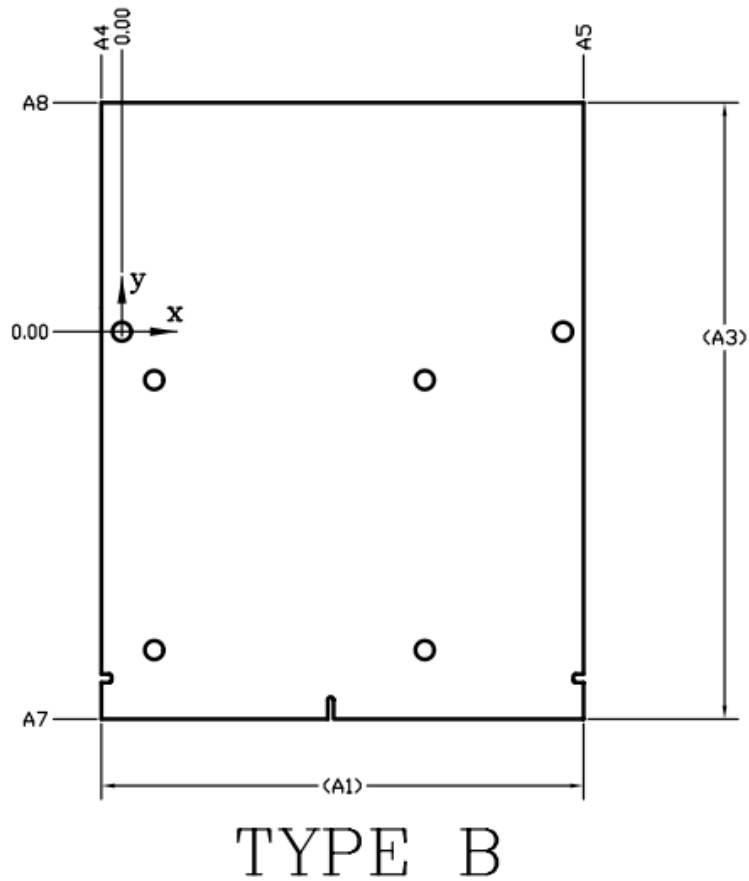


Table 3.1: Board Outline Dimensions

Symbol	[mm]			[in]		
	min	nom	max	min	nom	max
A1		82.00			3.228	
A3		105.00			4.134	
A4	3.37	3.50	3.63	0.133	0.138	0.143
A5	78.37	78.50	78.63	3.085	3.091	3.096
A7	65.87	66.00	66.13	2.593	2.598	2.604
A8	38.87	39.00	39.13	1.530	1.535	1.541

Figure 3.2: Board Slots Detail

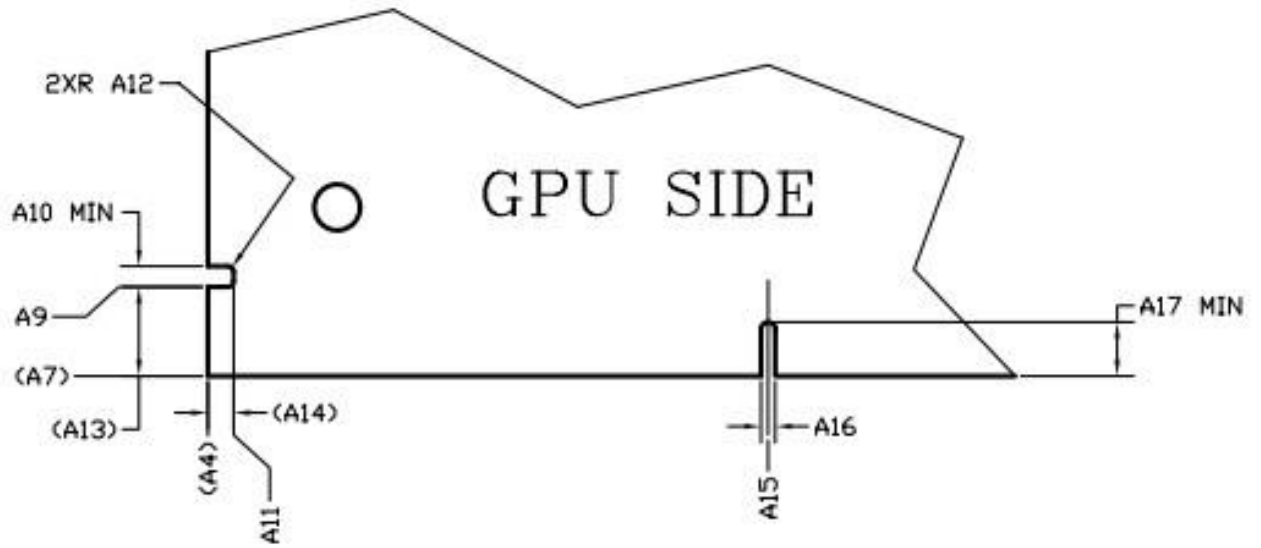


Table 3.2: Board Slots Dimensions

Symbol	[mm]			[in]		
	min	nom	max	min	nom	max
A4		3.50			0.138	
A7		66.00			2.598	
A9	59.67	59.80	59.93	2.349	2.354	2.359
A10	1.45			0.057		
A11	1.57	1.70	1.83	0.062	0.067	0.072
A12	0.32	0.50	0.58	0.013	0.020	0.023
A13		6.20			0.244	
A14		1.80			0.071	
A15	35.37	35.50	35.63	1.393	1.398	1.403
A16	0.95	1.00	1.05	0.037	0.039	0.041
A17	3.75			0.148		

#### 4.MXM PCB Mounting Holes:

All MXM version 3.1 modules have 6 holes. Two are used to secure the board to the system and the other four to fasten the thermal solution to the module.

Figure 4.1: Mounting Holes

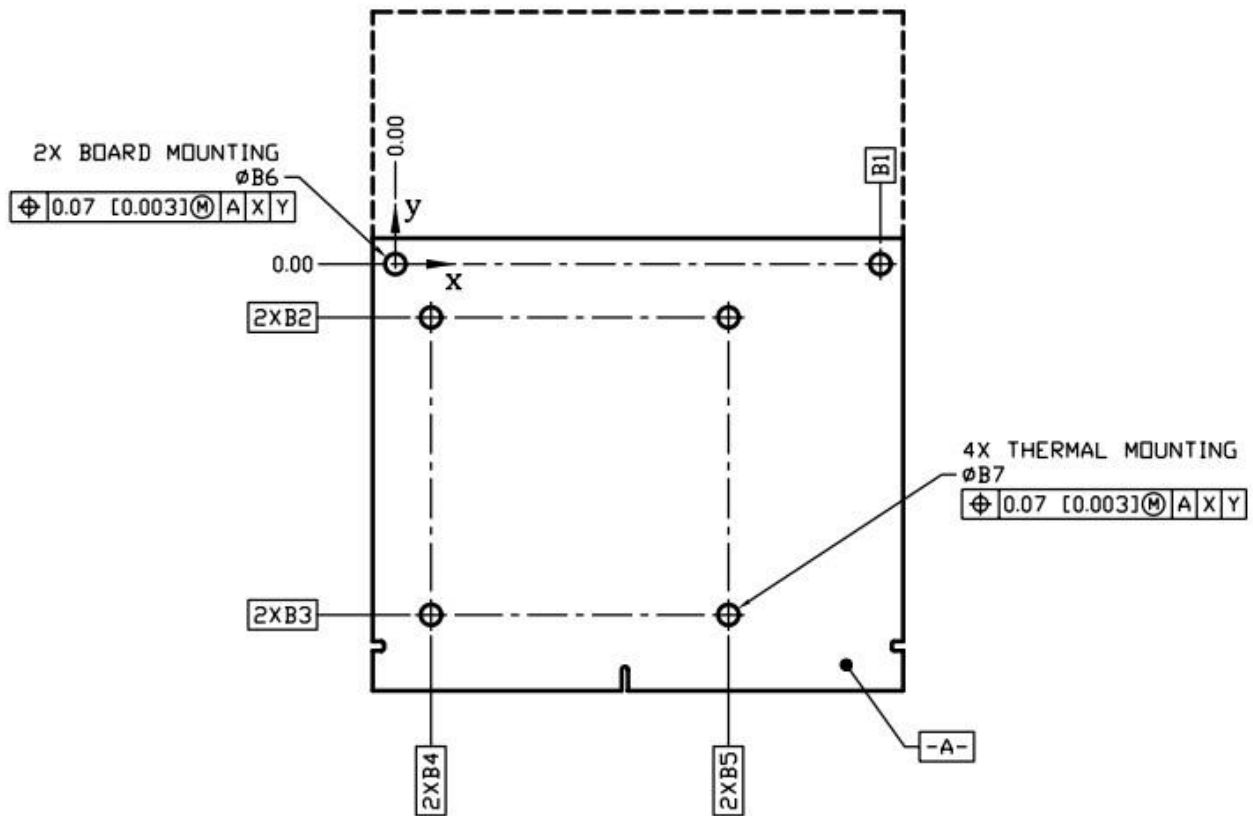


Table 4.1: Mounting Holes Dimensions

Symbol	[mm]			[in]		
	min	nom	max	min	nom	max
B1		75.00			2.953	
B2		8.25			0.325	
B3		54.25			2.136	
B4		5.50			0.217	
B5		51.50			2.028	
B6	3.07	3.20	3.33	0.121	0.126	0.131
B7	3.07	3.20	3.33	0.121	0.126	0.131

## 5.Connector Pinout:

Table 5.1, Table 5.2 and Table 5.3 list the connector pinout.

Table 5.1: Connector Pinout

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
E1	PWR_SRC	E2	PWR_SRC	51	PEX_RX15	52	GND
E3	GND	E4	GND	53	GND	54	PEX_TX14#
1	5V	2	PRSNT_R	55	PEX_RX14#	56	PEX_TX14
3	5V	4	WAKE	57	PEX_RX14	58	GND
5	5V	6	PWR_GOOD	59	GND	60	PEX_TX13#
7	5V	8	PWR_EN	61	PEX_RX13#	62	PEX_TX13
9	5V	10	27MHZ_REF	63	PEX_RX13	64	GND
11	GND	12	GND	65	GND	66	PEX_TX12#
13	GND	14	LVDS_U_HPD DP_F_HPD	67	PEX_RX12#	68	PEX_TX12
15	GND	16	RSVD	69	PEX_RX12	70	GND
17	GND	18	PWR_LEVEL	71	GND	72	PEX_TX11#
19	PEX_STD_SW#	20	TH_OVERT#	73	PEX_RX11#	74	PEX_TX11
21	VGA_DISABLE#	22	TH_ALERT#	75	PEX_RX11	76	GND
23	PNL_PWR_EN	24	TH_PWM	77	GND	78	PEX_TX10#
25	PNL_BL_EN	26	GPIO0	79	PEX_RX10#	80	PEX_TX10
27	PNL_BL_PWM	28	GPIO1	81	PEX_RX10	82	GND
29	HDMI_CEC	30	GPIO2	83	GND	84	PEX_TX9#
31	LVDS_L_HPD DP_E_HPD	32	SMB_DAT	85	PEX_RX9#	86	PEX_TX9
33	LVDS_DDC_DAT NC	34	SMB_CLK	87	PEX_RX9	88	GND
35	LVDS_DDC_CLK NC	36	GND	89	GND	90	PEX_TX8#
37	GND	38	OEM0	91	PEX_RX8#	92	PEX_TX8
39	OEM1	40	OEM2	93	PEX_RX8	94	GND
41	OEM3	42	OEM4	95	GND	96	PEX_TX7#
43	OEM5	44	OEM6	97	PEX_RX7#	98	PEX_TX7
45	OEM7	46	GND	99	PEX_RX7	100	GND
47	GND	48	PEX_TX15#	101	GND	102	PEX_TX6#
49	PEX_RX15#	50	PEX_TX15	103	PEX_RX6#	104	PEX_TX6

Table 5.2: Connector Pinout(continued)

Pin	Signal Name	Pin	Signal Name
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#
149	REX_RX0	150	PEX_TX0
151	GND	152	GND

Pin	Signal Name	Pin	Signal Name
153	PEX_REFCLK#	154	CLK_REQ#
155	PEX_REFCLK	156	PEX_RST#
157	GND	158	N/A
159	JTAG_TDO	160	N/A
161	JTAG_TDI	162	N/A
163	JTAG_TCLK	164	N/A
165	JTAG_TMS	166	GND
167	JTAG_TRST#	168	N/A
169	DP_F_L3 LVDS_UCLK#	170	N/A
171	DP_F_L3 LVDS_UCLK	172	N/A
173	GND	174	GND
175	DP_F_AUX LVDS_UTX3#	176	DP_E_L3 LVDS_LCLK#
177	DP_F_AUX LVDS_UTX3	178	DP_E_L3 LVDS_LCLK
179	GND	180	GND
181	DP_F_L0 LVDS_UTX2#	182	DP_E_AUX LVDS_LTX3#
183	DP_F_L0 LVDS_UTX2	184	DP_E_AUX LVDS_LTX3
185	GND	186	GND
187	DP_F_L1 LVDS_UTX1#	188	DP_E_L0 LVDS_LTX2#
189	DP_F_L1 LVDS_UTX1	190	DP_E_L0 LVDS_LTX2
191	GND	192	GND
193	DP_F_L2 LVDS_UTX0#	194	DP_E_L1 LVDS_LTX1#
195	DP_F_L2 LVDS_UTX0	196	DP_E_L1 LVDS_LTX1
197	GND	198	GND
199	DP_C_L0#	200	DP_E_L2 LVDS_LTX0#



Table 5.3: Connector Pinout(continued)

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
201	DP_C_L0	202	DP_E_L2 LVDS_LTX0	243	RSVD	244	GND
203	GND	204	GND	245	RSVD	246	DP_B_L0#
205	DP_C_L1#	206	DP_D_L0#	247	RSVD	248	DP_B_L0
207	DP_C_L1	208	DP_D_L0	249	RSVD	250	GND
209	GND	210	GND	251	GND	252	DP_B_L1#
211	DP_C_L2#	212	DP_D_L1#	253	DP_A_L0#	254	DP_B_L1
213	DP_C_L2	214	DP_D_L1	255	DP_A_L0	256	GND
215	GND	216	GND	257	GND	258	DP_B_L2#
217	DP_C_L3#	218	DP_D_L2#	259	DP_A_L1#	260	DP_B_L2
219	DP_C_L3	220	DP_D_L2	261	DP_A_L1	262	GND
221	GND	222	GND	263	GND	264	DP_B_L3#
223	DP_C_AUX#	224	DP_D_L3#	265	DP_A_L2#	266	DP_B_L3
225	DP_C_AUX	226	DP_D_L3	267	DP_A_L2	268	GND
227	RSVD	228	GND	269	GND	270	DP_B_AUX#
229	RSVD	230	DP_D_AUX#	271	DP_A_L3#	272	DP_B_AUX
231	RSVD	232	DP_D_AUX	273	DP_A_L3	274	DP_B_HPDP
233	RSVD	234	DP_C_HPDP	275	GND	276	DP_A_HPDP
235	RSVD	236	DP_D_HPDP	277	DP_A_AUX#	278	3V3
237	RSVD	238	RSVD	279	DP_A_AUX	280	3V3
239	RSVD	240	3V3	281	PRSNT_L	-	
241	RSVD	242	3V3				

**6.MXM Connector:**

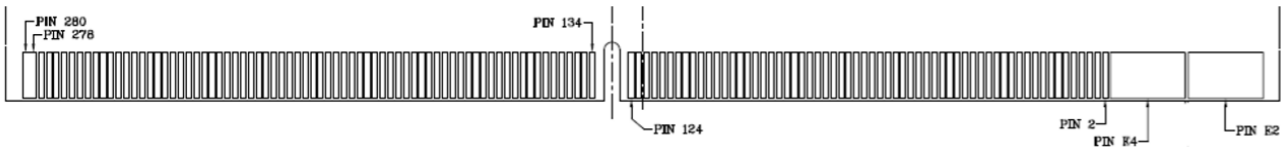


Figure 6.1 MXM Connector (Card Top)

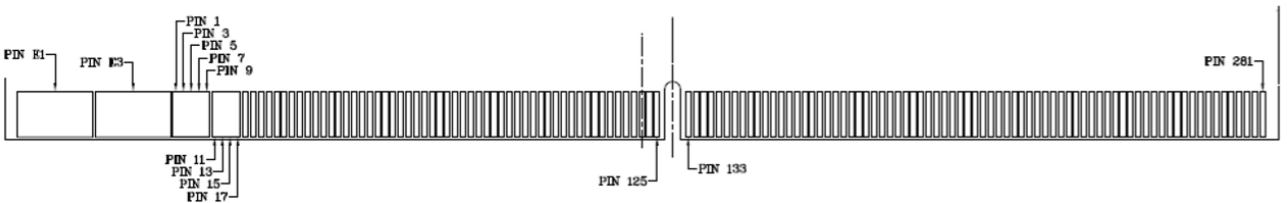


Figure 6.2 MXM Connector (Card Bottom)



## 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.

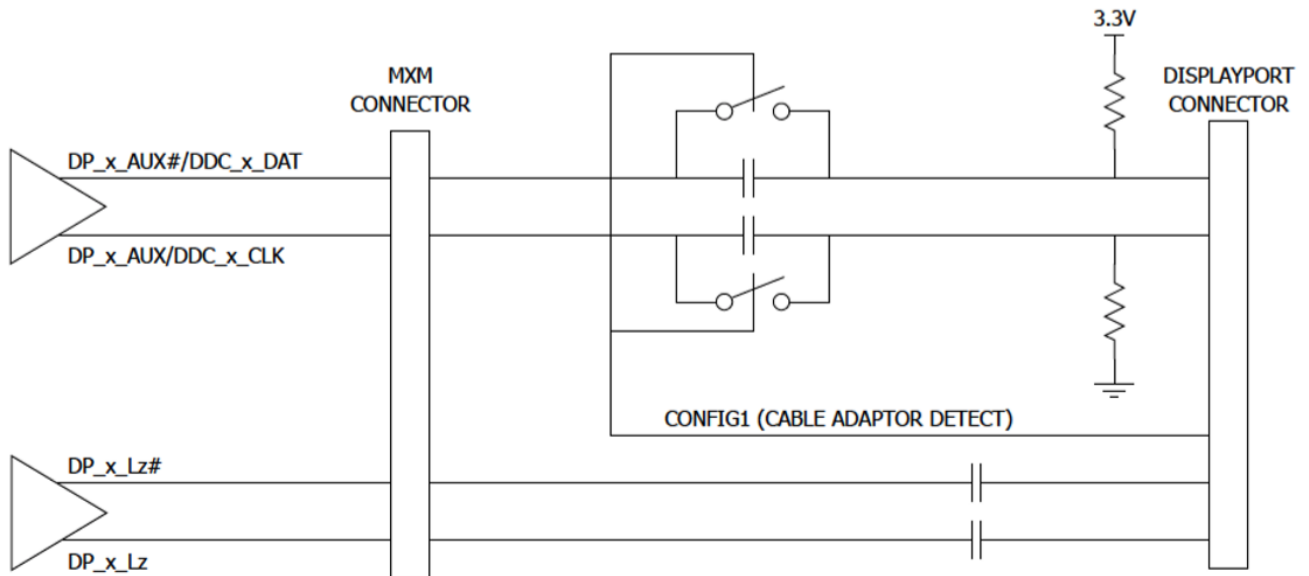


Figure 9.1 Dual-mode DisplayPort Implementation

## 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

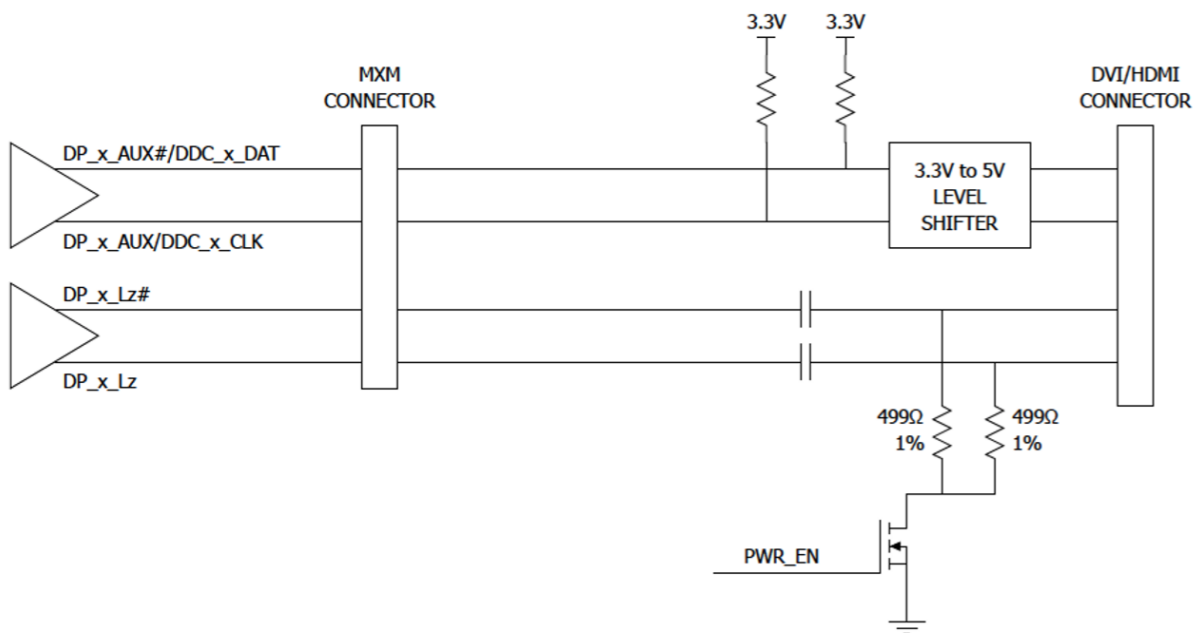
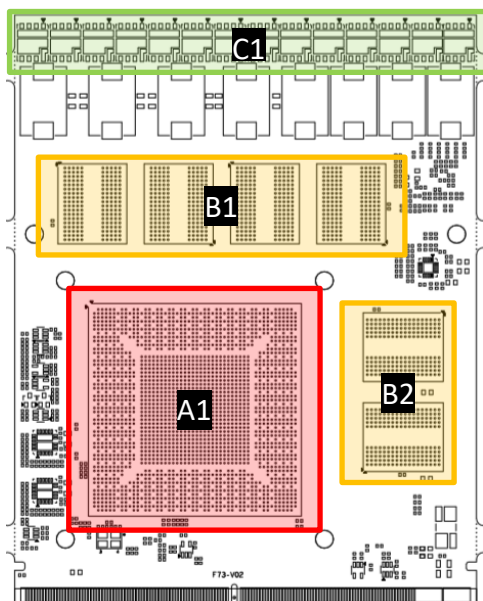


Figure 10.1 DVI/HDMI Implementation Using DP Interface

## 11.Thermal:



Components	Area	TDP	Height
GPU	A1	120W	2.4mm
Memory	B1	1.5W*4	0.9mm
Memory	B2	1.5W*2	0.9mm
Mosfet	C1	120W	0.75mm

Chipset		Specification
Dimensions		13*22.7mm
Stress	Maximum	75 PSI
	Normal	30-40 PSI

### Cooling Suggestion:

- 1、显卡建议先固定在散热器上，散热器外径为 4mm，M2 的螺柱。
- 2、散热器的重量要用箱体来支撑固定。
- 3、显存和 MOS 要加导热垫。

Components	亮温满载限温（环温 45℃）
GPU	95℃
Memory	85℃
Mosfet	105℃

\*显存和 MOS 由“探针”监测；GPU 由“Furmark (1920\*1080)”监测。

## 12.Performance:

3Dmark13	15943	Cuda	
3Dmark11	E11824 P11416 X6343	single kernels	3167.09/ 186.589
3Dmark Vantage	45576	N=10 w/o streams	5545.52 / 190.981
Heaven	5258	N=10 with streams	5484.5 / 190.799
鲁大师	175766	N=10 batched	5670.51 / 190.498

TechPowerUp GPU-Z 2.30.0

显卡 传感器 高级 验证

名称: NVIDIA GeForce GTX 1660 Ti

GPU: TU116 修订: A1

工艺: 12 nm 芯片大小: 284 mm²

发布日期: Feb 22, 2019 晶体管数: 6600M

BIOS 版本: 90.16.29.00.F2

子供应商: MSI 设备 ID: 10DE 2182 - 1462 375A

光栅纹理: 48 / 96 总线接口: PCIe x16 3.0 @ x16 1.1

着色器: 1536 单元 DirectX 支持: 12 (12\_1)

像素填充率: 90.0 G 像素/秒 纹理填充率: 180.0 G 纹理/秒

显存类型: GDDR6 (美光) 总线宽度: 192 位

显存大小: 6144 MB 显存带宽: 288.0 GB/s

驱动版本: 26.21.14.4108 (NVIDIA 441.08) / Win10 64

驱动日期: Oct 22, 2019 数字签名: WHQL

GPU 频率: 1500 MHz 显存频率: 1500 MHz 超频: 1875 MHz

默认频率: 1500 MHz 显存频率: 1500 MHz 超频: 1875 MHz

NVIDIA SLI: 已禁用

计算能力:  OpenCL  CUDA  直接计算  DirectML

技术:  Vulkan  光线跟踪  PhysX  OpenGL 4.6

NVIDIA GeForce GTX 1660 Ti 关闭

AIDA64 GPGPU Benchmark

GPU: nVIDIA GeForce GTX 1660 Ti (TU116)  
1875 MHz, 1536 cores, 24 CUs, Driver 441.08

CPU: Intel Core i3-6100 (Skylake-S)  
3700 MHz, 2 cores, 4 threads

	GPU	x64 CPU
Memory Read	12177 MB/s	15783 MB/s
Memory Write	12071 MB/s	15623 MB/s
Memory Copy	229555 MB/s	14890 MB/s
Single-Precision FLOPS	6110 GFLOPS	236.0 GFLOPS
Double-Precision FLOPS	188.6 GFLOPS	118.0 GFLOPS
24-bit Integer IOPS	6035 GIOPS	105.6 GIOPS
32-bit Integer IOPS	6031 GIOPS	105.3 GIOPS
64-bit Integer IOPS	1374 GIOPS	14.75 GIOPS
AES-256	16098 MB/s	8409 MB/s
SHA-1 Hash	52002 MB/s	2116 MB/s
Single-Precision Julia	1833 FPS	78.34 FPS
Double-Precision Mandel	54.31 FPS	42.19 FPS

AIDA64 v6.00.5157 Beta (c) 1995-2019 FinalWire Ltd.

Save Results Start Benchmark Close

### 13.Driver:

Windows 10 64bit: <https://cn.download.nvidia.com/Windows/466.77/466.77-desktop-win10-64bit-international-dch-whql.exe>

Windows 7 64bit: <https://cn.download.nvidia.com/Windows/466.77/466.77-desktop-win7-64bit-international-whql.exe>

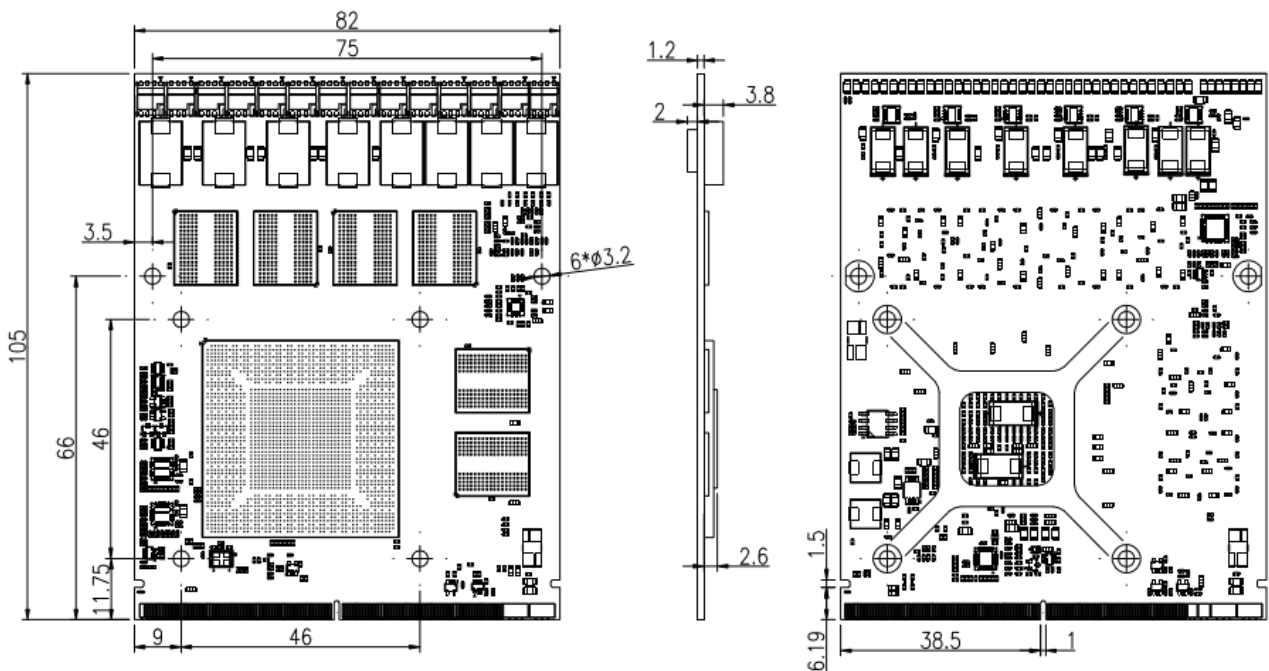
Linux Aarch64: <https://cn.download.nvidia.com/XFree86/aarch64/460.84/NVIDIA-Linux-aarch64-460.84.run>

Linux 64bit: [https://cn.download.nvidia.com/XFree86/Linux-x86\\_64/460.84/NVIDIA-Linux-x86\\_64-460.84.run](https://cn.download.nvidia.com/XFree86/Linux-x86_64/460.84/NVIDIA-Linux-x86_64-460.84.run)

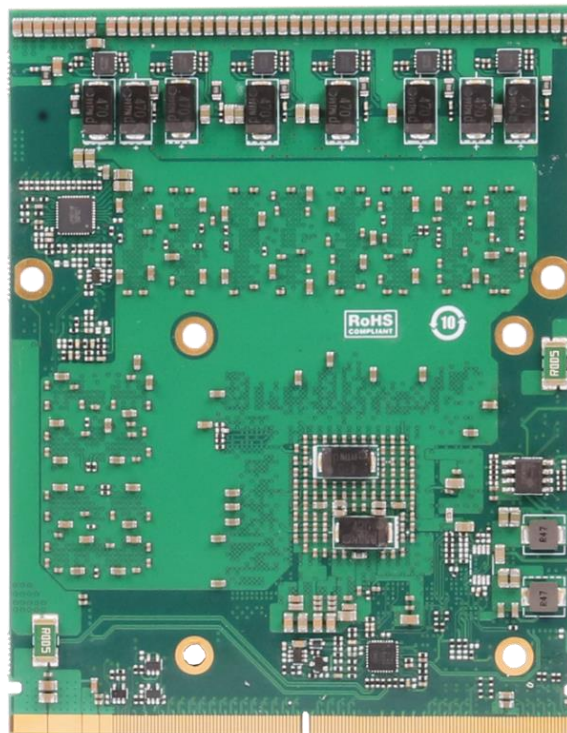
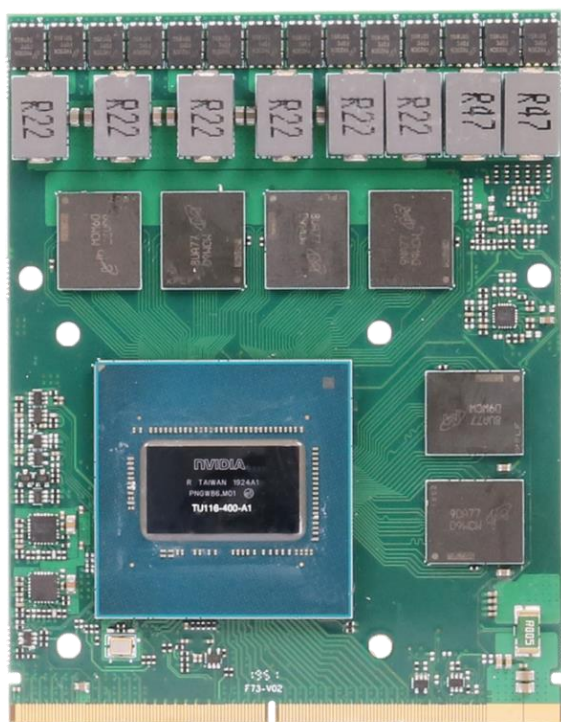
FreeBSD x64: [https://cn.download.nvidia.com/XFree86/FreeBSD-x86\\_64/460.84/NVIDIA-FreeBSD-x86\\_64-460.84.tar.gz](https://cn.download.nvidia.com/XFree86/FreeBSD-x86_64/460.84/NVIDIA-FreeBSD-x86_64-460.84.tar.gz)

The latest drive or the drive cannot be downloaded here, please log on the official website to download: <https://www.nvidia.cn/geforce/drivers/>

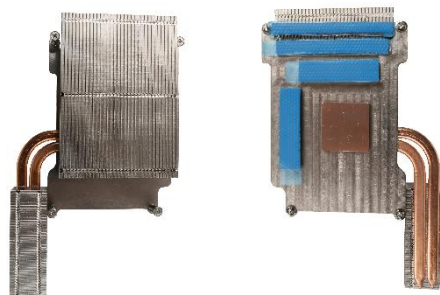
### 14.Dimensions:



15.Photo:



16.Cooling Option:



\*需搭配风扇辅助散热。

1.ZRT.48-6243-00-A00	
Dimension	190*124.5*37.5mm
Rated Speed	N/A
Out of Frame Lead Wires	N/A
Connector	N/A



1.ZRT.48-6233-00-A00	
Dimension	96*80.2*25.05mm
Rated Speed	4500
Out of Frame Lead Wires	200mm
Connector	4Pin 2.54



## 17.Question:

故障	排除
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。
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、Windows 7 打补丁 KB2685811。 4、确认核显驱动是否已安装。(不需独立显卡显示) 5、安装在移动平台上，主板 BIOS 需关闭电池管理。
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。
显卡无法辨视	检查 PCIE LANE Numbering Reversal 设置。
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。
集显及独显在 Win7 下，无法同时开启 3D 启动	打系统补丁 (KB2685811)，解压后，把所有文件 COPY 到 C 盘 根目录下运行 BAT 文件。
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。

## 18.Part Number:

Model	Part Number	Specification
MD1660TIB6-6G	8.ZRT.80-6325-02-LFF	F73 GTX1660Ti 6G 192bit GDDR6 256*32 DP+DP+HDMI+DP MXM Type B 14L-工包六十入
	8.ZRT.80-6325-05-LFF	F73 GTX1660Ti 6G 192bit GDDR6 256*32 DP+DP+HDMI+DP MXM Type B 14L-ZRT 彩包二十八