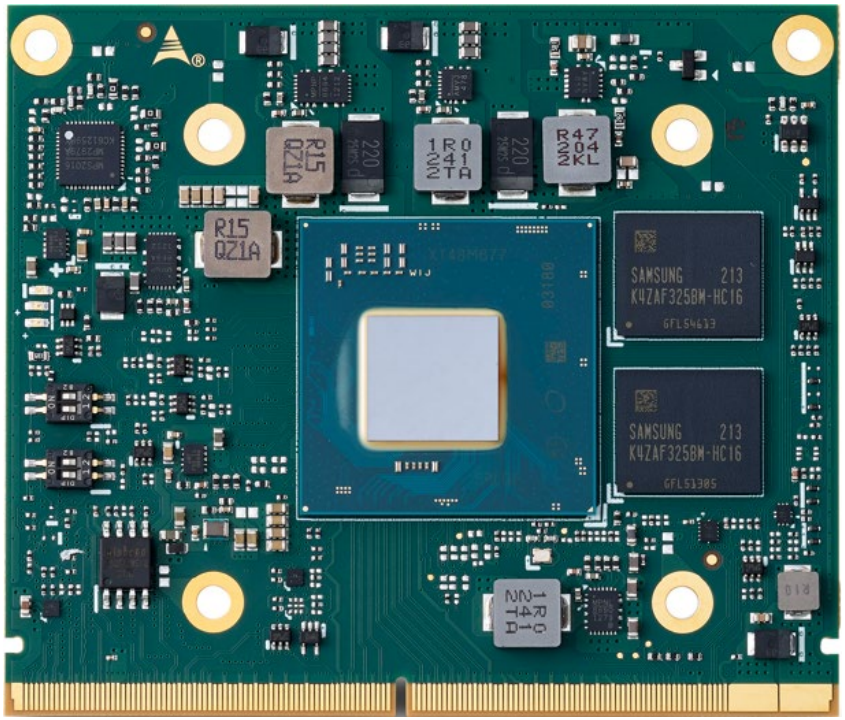
MXM-AXe

User's Guide

intel



MXM

Revision: Rev. 0.1
Date: 2023-07-31
Part Number: 50M-74000-1000

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Revision History

Revision	Description	Date	Author
0.1	Preliminary release	2023-07-31	CC

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Preface

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Safety Instructions

For user safety, please read and follow all Instructions, **WARNING**s, **CAUTION**s, and **NOTE**s marked in this manual and on the associated equipment before handling/operating the equipment.

Read these safety instructions carefully.

- Keep this manual for future reference.
- Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- Turn off power and unplug any power cords/cables when installing/mounting or un-installing/removing equipment.
- To avoid electrical shock and/or damage to equipment:
- Keep equipment away from water or liquid sources;
- Keep equipment away from high heat or high humidity;
- Keep equipment properly ventilated (do not block or cover ventilation openings);
- Make sure to use recommended voltage and power source settings;
- Always install and operate equipment near an easily accessible electrical socket outlet;
- Secure the power cord (do not place any object on/over the power cord);
- Only install/attach and operate equipment on stable surfaces and/or recommended mountings;
- If the equipment will not be used for long periods of time, turn off the power source and unplug the equipment.

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Conventions

The following conventions may be used throughout this manual, denoting special levels of information

Note: This information adds clarity or specifics to text and illustrations.

Caution: This information indicates the possibility of minor physical injury, component damage, data loss, and/or program corruption.

Warning: This information warns of possible serious physical injury, component damage, data loss, and/or program corruption.

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1. Introduction

The MXM-AXe is an MXM 3.1 Type A-compliant module featuring Intel® Arc™ GPU (formerly "Alchemist"). It offers up to 8 X^e HPG, 8 Ray Tracing cores, and 128 Execution Units, along with 4GB GDDR6 at maximum bandwidth of 112 GB/s. Configurable up to 50W TGP and supporting PCIe Gen4 x8 lane connections make it well suit for various graphics-demanding applications, including medical ultrasound, gaming, media streaming, transportation, test and measurement, data analysis, defense, and more.

Graphics outputs include up to four simultaneous displays at DP 2.0 or HDMI 2.0. For graphics decoding and encoding, the MXM-AXe features DX12 Ultimate/DX12, Vulkan1.1, OpenCL 3.0, OpenGL 4.6 support AV1/VC/VC1/MPEG2/HEVC/H.265/VP9/JPEG HW decode and HEVC/AVC/MPEG2/VP9 HW encode.

By leveraging the well-established Intel graphics ecosystems, such as Intel OpenVINO for AI, Intel oneAPI (Media SDK inside) management tools, that edge developers have enjoyed and relied on for years, the MXM-AXe allows you to migrate from integrated to discrete graphics, and up to scale, smoothly and effortlessly.

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2. Specifications

2.1. Core System

GPU

Intel® Arc™ GPU Mobile (formerly codenamed "Alchemist")

- Intel® Arc™ A370M 8 Xe cores, 8 Ray Tracing units, 128 Matrix Engines, 128 Vector Engines, 35W (configurable to 50W TGP)
- Intel® Arc™ A350M 6 Xe cores, 6 Ray Tracing units, 96 Matrix Engines, 96 Vector Engines, 25W (configurable to 35W TGP)

Memory

GDDR6 4GB, 112 GB/s bandwidth, 64-bit interface width

2.2. Display Output

4 independent display outputs in varied combinations (4x 4K or 2x 8K, TBC)

- DP 2.0, up to 5K@120Hz or 8K@60Hz
- HDMI 2.0, up to 4K@60Hz (specific VBIOS settings and switch setting on module required; also dependent on carrier board design)

2.3. Hardware Acceleration

- AV1, VC/VC1/MPEG2/HEVC/VP9/JPEG hardware decoding
- HEVC/AVC/MPEG2/VP9/JPEG hardware encodeing
- Ray tracing units and AI engines

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2.4. Application Programming Interface — API

- DirectX 12 Ultimate, DirectX 12
- Vulkan 1.1
- OpenCL 3.0, OpenGL 4.6

2.5. Operation System

Microsoft Windows 11 / 10, Linux

2.6. Debug

MIPI20 on-board debug connector (additional specific fixture and cable required)

2.7. Mechanical and Environmental

Form Factor and Specification

MXM 3.1 Type A: 82mm x 70mm

Operating Temperature

Standard	0°C to 55°C	Storage: -40°C to 85°C
Industrial (TBC)	-20°C to 70°C	Storage: -40°C to 85°C

Humidity

5-90% RH operating, non-condensing 5-95% RH storage (and operating with conformal coating)

HALT tested

Thermal Stress, and Thermal Shock

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3. Block Diagram

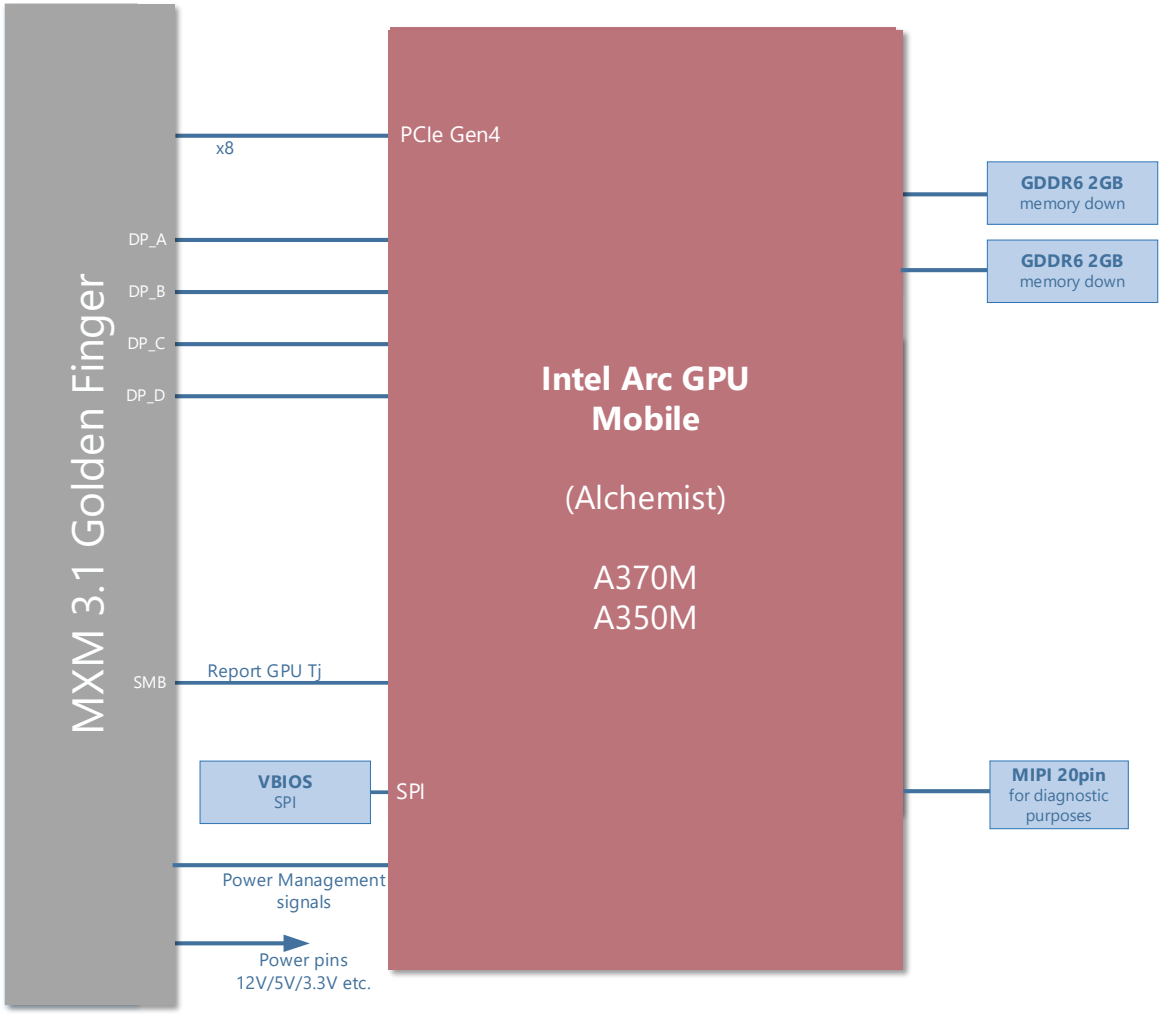


Figure 1 – Module function diagram

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4. Pinout and Signal Descriptions

The table below is a comprehensible list of all signal pins supported as defined by MXM version 3.1 specification. Signals described in the specification but not supported on the MXM-AXe are marked with ~~strike-through.~~

Pin	Signal Name		Pin	Signal Name		Pin	Signal Name		Pin	Signal Name
E1	PWR_SRC		E2	PWR_SRC		55	~~PEX_RX14#~~		56	~~PEX_TX14~~
E3	GND		E4	GND		57	~~PEX_RX14~~		58	GND
1	5V		2	PRSNT_R#		59	GND		60	~~PEX_TX13#~~
3	5V		4	WAKE#		61	~~PEX_RX13#~~		62	~~PEX_TX13~~
5	5V		6	PWR_GOOD		63	~~PEX_RX13~~		64	GND
7	5V		8	PWR_EN		65	GND		66	~~PEX_TX12#~~
9	5V		10	~~27MHZ_REF~~		67	~~PEX_RX12#~~		68	~~PEX_TX12~~
11	GND		12	GND		69	~~PEX_RX12~~		70	GND
13	GND		14	~~LVDS_U_HPD~~		71	GND		72	~~PEX_TX11#~~
15	GND		16	~~JTAG_TESTEN~~		73	~~PEX_RX11#~~		74	~~PEX_TX11~~
17	GND		18	PWR_LEVEL		75	~~PEX_RX11~~		76	GND
19	PEX_STD_SW#		20	TH_OVERT#		77	GND		78	~~PEX_TX10#~~
21	~~VGA_DISABLE#~~		22	TH_ALERT#		79	~~PEX_RX10#~~		80	~~PEX_TX10~~
23	~~PNL_PWR_EN~~		24	TH_PWM		81	~~PEX_RX10~~		82	GND
25	~~PNL_BL_EN~~		26	GPIO0		83	GND		84	~~PEX_TX9#~~
27	~~PNL_BL_PWM~~		28	GPIO1		85	~~PEX_RX9#~~		86	~~PEX_TX9~~
29	HDMI_CEC		30	GPIO2		87	~~PEX_RX9~~		88	GND
31	~~LVDS_L_HPD~~		32	SMB_DAT		89	GND		90	~~PEX_TX8#~~
33	~~LVDS_DDC_DAT~~		34	SMB_CLK		91	PEX_RX8#		92	~~PEX_TX8~~
35	~~LVDS_DDC_CLK~~		36	GND		93	PEX_RX8		94	GND
37	GND		38	OEM0		95	GND		96	PEX_TX7#
39	OEM1		40	OEM2		97	PEX_RX7#		98	PEX_TX7
41	OEM3		42	OEM4		99	PEX_RX7		100	GND
43	OEM5		44	OEM6		101	GND		102	PEX_TX6#
45	OEM7		46	GND		103	PEX_RX6#		104	PEX_TX6
47	GND		48	~~PEX_TX15#~~		105	PEX_RX6		106	GND
49	~~PEX_RX15#~~		50	~~PEX_TX15~~		107	GND		108	PEX_TX5#
51	~~PEX_RX15~~		52	GND		109	PEX_RX5#		110	PEX_TX5
53	GND		54	~~PEX_TX14#~~		111	PEX_RX5		112	GND

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Pin	Signal Name		Pin	Signal Name		Pin	Signal Name		Pin	Signal Name
113	GND		114	PEX_TX4#		183	~~LVDS_UTX2~~		184	~~LVDS_LTX3~~
115	PEX_RX4#		116	PEX_TX4		185	GND		186	GND
117	PEX_RX4		118	GND		187	~~LVDS_UTX1#~~		188	~~LVDS_LTX2#~~
119	GND		120	PEX_TX3#		189	~~LVDS_UTX1~~		190	~~LVDS_LTX2~~
121	PEX_RX3#		122	PEX_TX3		191	GND		192	GND
123	PEX_RX3		124	GND		193	~~LVDS_UTX0#~~		194	~~LVDS_LTX1#~~
125	GND		126	KEY		195	~~LVDS_UTX0~~		196	~~LVDS_LTX1~~
127	KEY		128	KEY		197	GND		198	GND
129	KEY		130	KEY		199	DP_C_L0#		200	~~LVDS_LTX0#~~
131	KEY		132	KEY		201	DP_C_L0		202	~~LVDS_LTX0~~
133	GND		134	GND		203	GND		204	GND
135	PEX_RX2#		136	PEX_TX2#		205	DP_C_L1#		206	DP_D_L0#
137	PEX_RX2		138	PEX_TX2		207	DP_C_L1		208	DP_D_L0
139	GND		140	GND		215	GND		216	GND
141	PEX_RX1#		142	PEX_TX1#		217	DP_C_L3#		218	DP_D_L2#
143	PEX_RX1		144	PEX_TX1		219	DP_C_L3		220	DP_D_L2
145	GND		146	GND		221	GND		222	GND
147	PEX_RX0#		148	PEX_TX0#		223	DP_C_AUX#		224	DP_D_L3#
149	PEX_RX0		150	PEX_TX0		225	DP_C_AUX		226	DP_D_L3
151	GND		152	GND		227	RSVD		228	GND
153	PEX_REFCLK#		154	PEX_CLK_REQ#		229	RSVD		230	DP_D_AUX#
155	PEX_REFCLK		156	PEX_RST#		231	RSVD		232	DP_D_AUX
157	GND		158	~~VGA_DDC_DAT~~		233	RSVD		234	DP_C_HPD
159	~~JTAG_TDO~~		160	~~VGA_DDC_CLK~~		235	RSVD		236	DP_D_HPD
161	~~JTAG_TDI~~		162	~~VGA_VSYNC~~		237	RSVD		238	RSVD
163	~~JTAG_TCLK~~		164	~~VGA_HSYNC~~		239	RSVD		240	3V3
165	~~JTAK_TMS~~		166	GND		241	RSVD		242	3V3
167	~~JTAG_TRST#~~		168	~~VGA_RED~~		243	RSVD		244	GND
169	~~JTAG_UCLK#~~		170	~~VGA_GREEN~~		245	RSVD		246	DP_B_L0#
171	~~JTAG_UCLK~~		172	~~VGA_BLUE~~		247	RSVD		248	DP_B_L0
173	GND		174	GND		249	RSVD		250	GND
175	~~LVDS_UTX3#~~		176	~~LVDS_LCLK#~~		251	GND		252	DP_B_L1#
177	~~LVDS_UTX3~~		178	~~LVDS_LCLK~~		253	DP_A_L0#		254	DP_B_L1
179	GND		180	GND		255	DP_A_L0		256	GND
181	~~LVDS_UTX2#~~		182	~~LVDS_LTX3#~~		257	GND		258	DP_B_L2#

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Pin	Signal Name		Pin	Signal Name		Pin	Signal Name		Pin	Signal Name
259	DP_A_L1#		260	DP_B_L2		269	GND		270	DP_B_AUX#
261	DP_A_L1		262	GND		271	DP_A_L3#		272	DP_B_AUX
263	GND		264	DP_B_L3#		273	DP_A_L3		274	DP_B_HPD
265	DP_A_L2#		266	DP_B_L3		275	GND		276	DP_A_HPD
267	DP_A_L2		268	GND		277	DP_A_AUX#		278	3V3

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5. Additional Features

This chapter describes connectors, switches, and additional items located on the module and not necessarily included in the MXM standard specification. The locations of these items are as below:

5.1. Module Feature Locations

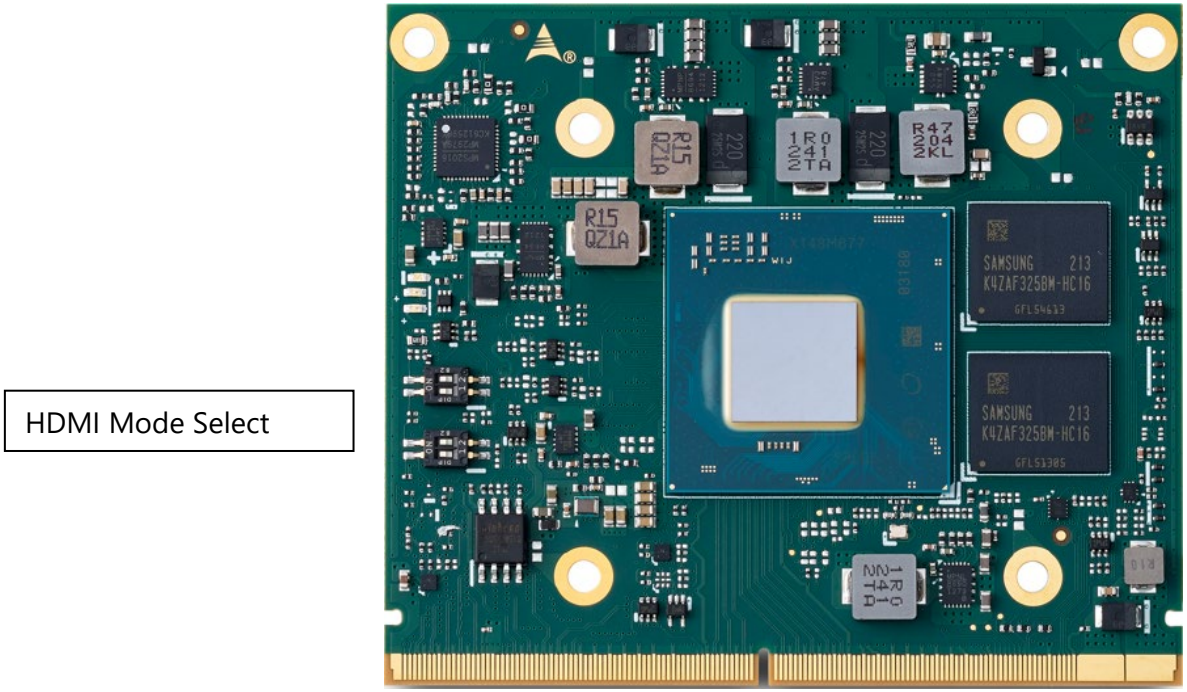


Figure 2 – Module feature locations (top side)

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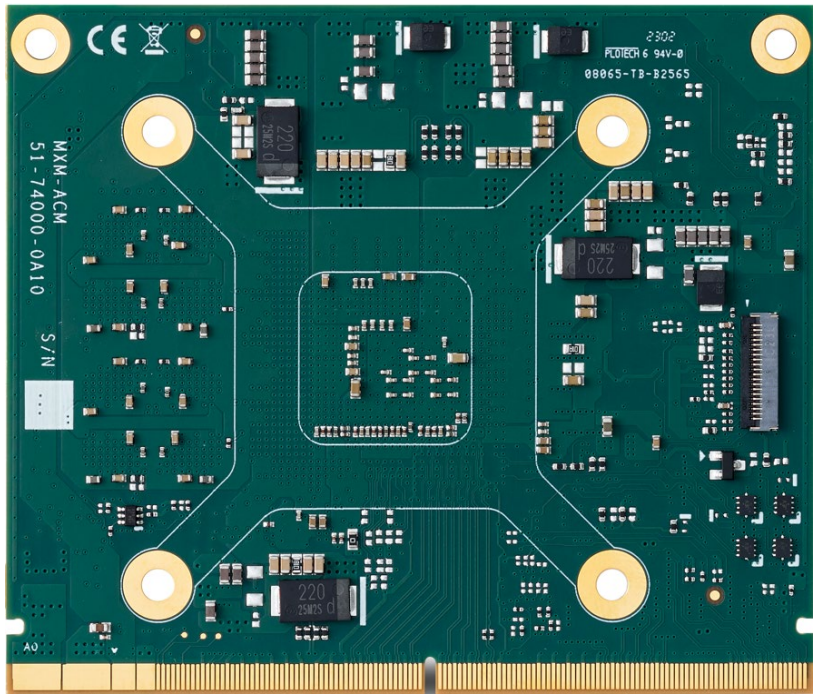
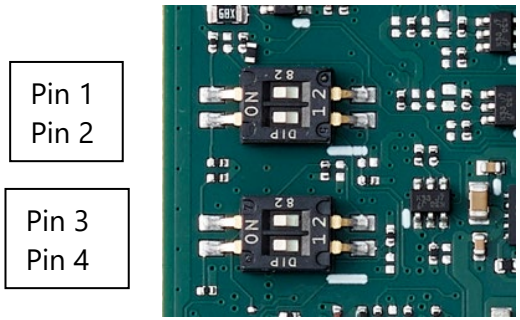


Figure 3 – Module feature locations (bottom side)

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5.2. HDMI Mode Select

The HDMI Mode Select Switch allows you to configure the display outputs to be HDMI signals. A specific VBIOS setting and level shift for HDMI usage on carrier board are also required



Mode	Pin 1 (DP_A Port)	Pin 2 (DP_B Port)	Pin 3 (DP_C Port)	Pin 4 (DP_D Port)
DP (default)	On	On	On	On
HDMI	Off	Off	Off	Off

5.3. MIPI20 Debug Connector

This connector is particular useful during bring up phase. It will require additional MIPI20 to MIPI60 cable and a dedicated debug card with specific SW tool. This is only for ADLINK internal debug usage.

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6. Mechanical

All dimensions are shown in millimetres, with a tolerance of ± 0.25mm unless otherwise noted.

6.1. Module Dimensions – Top View

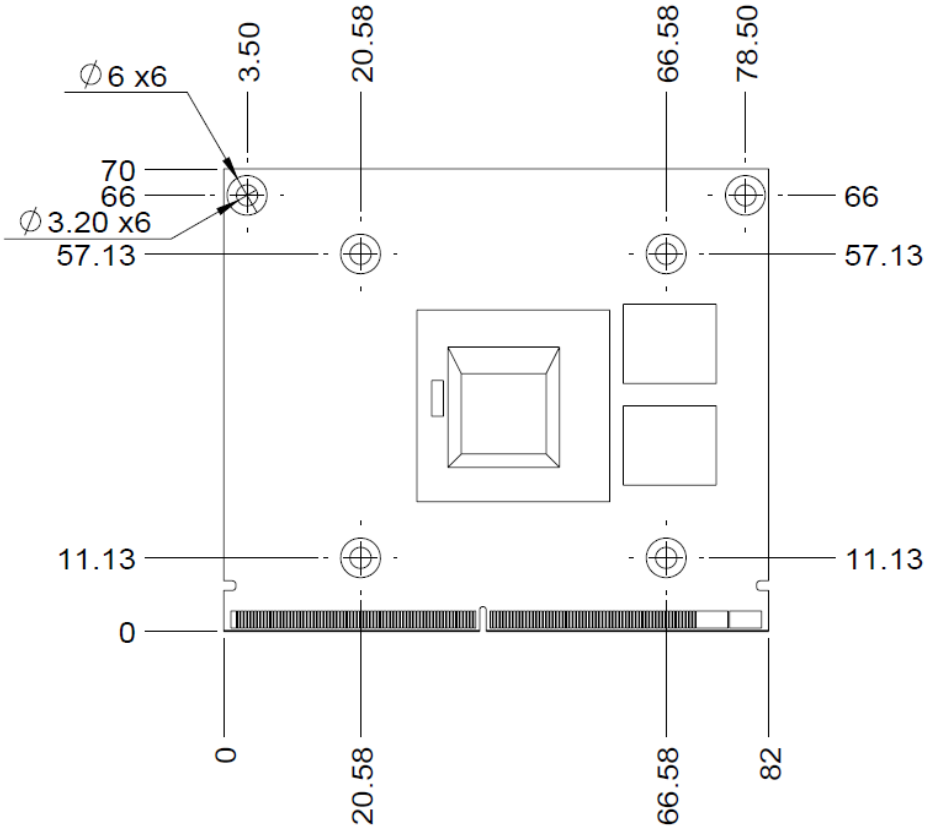


Figure 4 – Module dimensions (top view)

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6.2. Module Dimensions – Bottom View

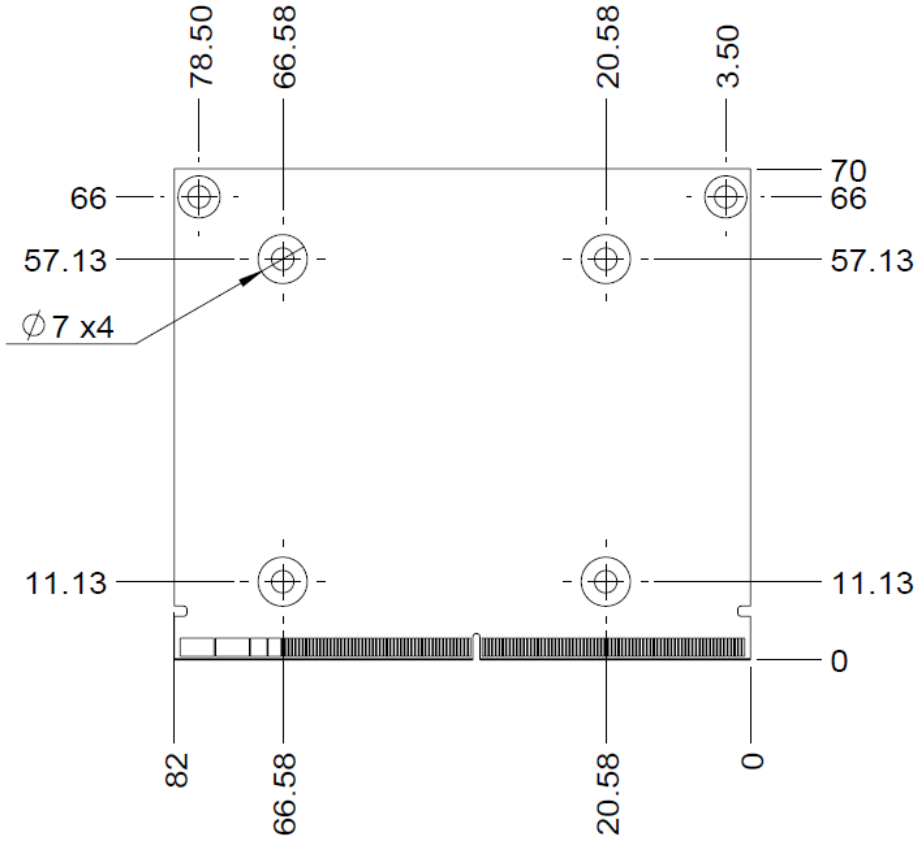


Figure 5 – Module dimensions (bottom view)

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6.3. Module Dimensions – Side View

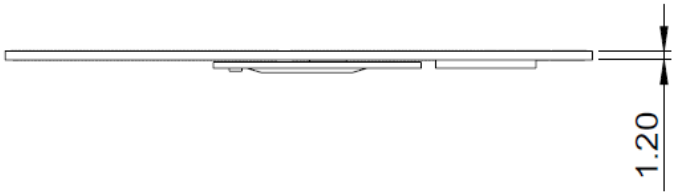
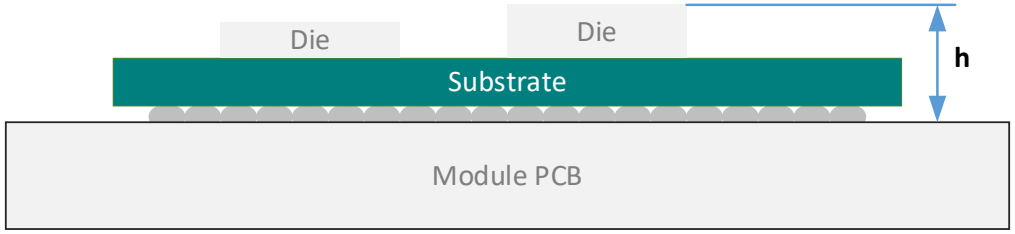


Figure 6 – Module dimensions (side view)

6.4. GPU Height

The tolerance of GPU or CPU height should be taken into consideration for the design of your thermal solution. A preliminary illustration is shown below. Please contact your local ADLINK representative for details.



	Typical	Tolerance
h	1.776 mm	±0.109 mm

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7. Thermal Solution

7.1. Heatsink with Fan: THSF

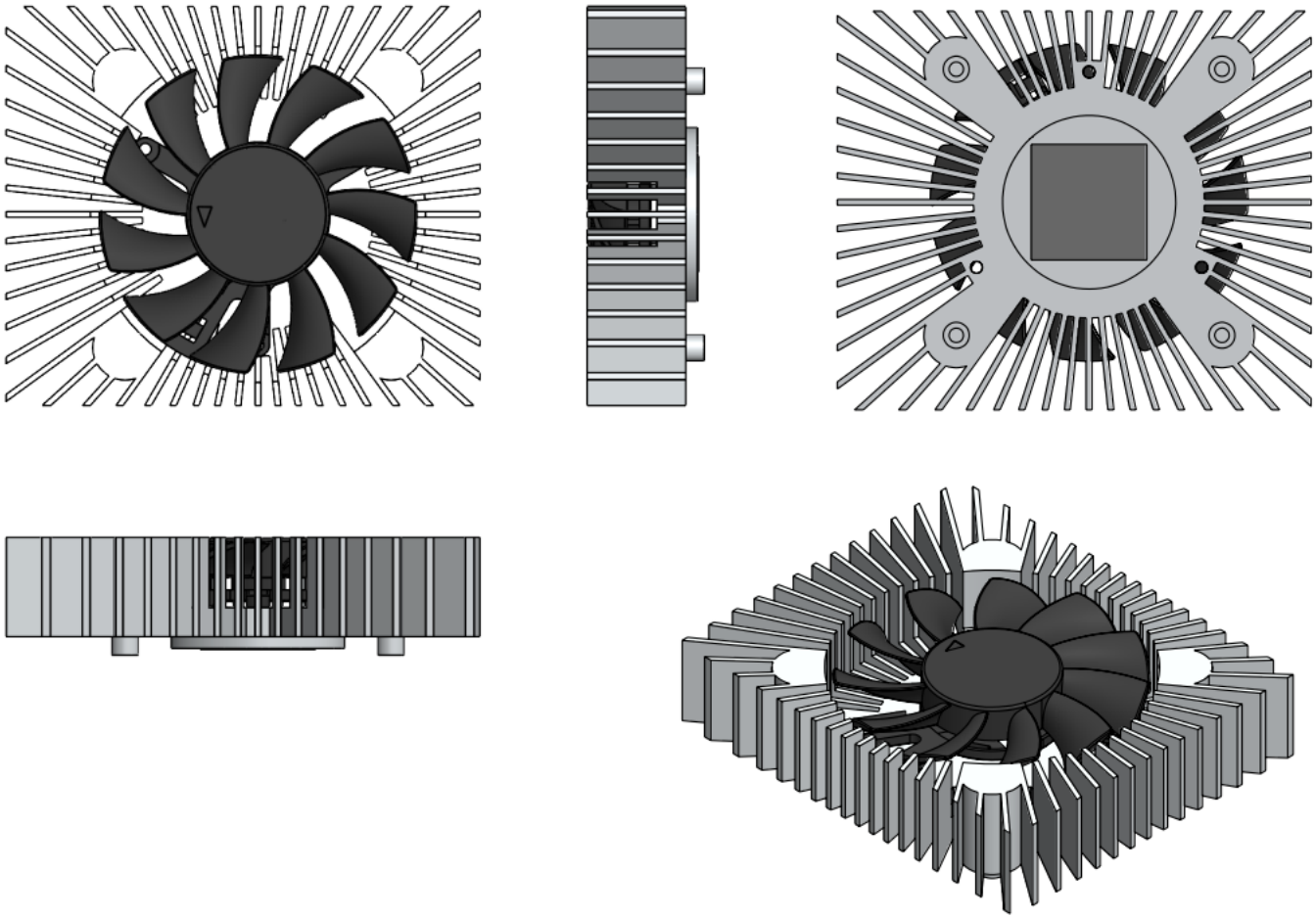


Figure 7 – Heatsink with Fan (THSF)

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