



Technical Product Specification

“Moonstone” 4 x 4 System

CBM3r9MS

CBM3r7MS

CBM3r5MS

Version 1.5

Revision Date: 11/01/2023

Preface

The purpose of this document is to provide technical reference for customers and developers for the Moonstone family of products. Moonstone SKUs include CBM3R9MS, CBM3r7MS, and CBM3r5MS.

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1. Description

The Moonstone is a small form factor powered by an AMD 7000 series mobile processor. This is great for everyday use in office environments, lite CAD development and video editing, and mid tier gaming.

1.1. Overview

Moonstone has the following features

- AMD 7940HS, 7735U, and 7535U
- AMD 7000 Series (Phoenix & Rembrandt)
- Two JEDEC Standard DDR5- SO-DIMM Sockets
- M.2 slot for PCIe Gen4
- One 10/100/1000/2500Mbps Ethernet Port
- M.2 slot for Wi-Fi / Bluetooth Radio
- Two HDMI Ports (4k, 60Hz)
- Two USB-C 3.2
- One Front USB 2.0 Gen 2 Type-A Port
- One Front USB 3.2 Gen 2 Type-A Port
- Two Rear USB 3.2 Gen 2 Type-A Port
- 3.5mm Combination Microphone/Headphone Jack
- 90W(R7 and R5) Power Supply Adapter
- 12V – 19V Input Power Supply Range

1.2. Processor

Moonstone has the following features

Table 1: APU Features

Moonstone	CBM3r9MS	CBM3r7MS	CBM3r5MS
Architecture	AMD Ryzen 9 Pro	AMD Ryzen 7	AMD Ryzen
AMD APU	7940HS	7735U	7535U
Cores	8	8	6
Threads	16	16	12
L1 Cache	8MB	8 x 32KB + 8 x 32KB	6 x 32KB + 6 x 32KB
L2 Cache	8MB	8 x 512KB	6 X 256KB
L3 Cache	16MB	16MB	16MB
Base Speed (Turbo / MHz]	4.0GHz / 5.2GHz	2.7GHz / 4.75GHz	2.9GHz / 4.55GHz
TDP [W]	54 Watts	28 Watts	28 Watts
Integrated Graphics	Radeon 680M	Radeon 680M	Radeon 660M

1.3. Integrated Graphics Processing Unit

Moonstone CPU has an integrated AMD graphics processing unit with the following features;

Table 2: Graphics Features

Features	R9	R7	R5
Integrated Graphics	AMD Radeon™ 780M	AMD Radeon™ 680M	AMD Radeon™ 660M
Graphics Max Dynamic Freq. GHz	2.8 Mhz	2.4 MHz	1.9 MHz
Graphics Core Count	12	12	6
Graphics Output	HDMI 2.1, USB-C Alt DP		
Max Resolution (HDMI)	3840 x 2160		
Max Resolution (DP)	3840 x 2160 @ 30Hz Or 60Hz / 7680 x 4320 @ 30Hz Or 60Hz		
DirectX Support	12		
DisplayPort	2.1		
HDCP Version support	2.1		
Maximum Number of Displays	4		

1.4. Memory

Moonstone has two 262-Pin 1.1V DDR5 SDRAM SO-DIMMS sockets:

- Support for DDR5 4800
- Support for minimum 8GB single channel
- Support for maximum 64GB dual channel (32GB SODIMM per socket)

Note: ECC memory is not supported...

1.5. Storage

One M.2 PCIe Gen3/4 connector supporting M.2 22x80 (“M” key) for Nvme Only. One SATA 6.0 Gb/s combined data and power connector for 2.5 inch SSD

1.5.1. SATA Interface

The SATA III port has a theoretical maximum transfer rate of 8Gbps.

Noite: SATA support applies to only the the CBM3r9MS / 7940HS SKU...

1.5.2. PCIe Interface

The M.2 slot is a key-M slot for an PCIe 2280 M.2 module, up to 8TB in density. The PCIe 4.0 x4 interface on the port has a theoretical maximum transfer rate of 8GBps.

1.6. Networking

Moonstone has an Intel i225v 2.5 gigabit ethernet controller that interfaces to the onboard RJ-45 connector that provides a 2.5 gigabit ethernet connection. The i225v controller features:

- Integrated MAC + BASE-T PHY.
- MDI (Copper) standard IEEE 802.3 Ethernet interface for 2500BASE-T, 1000BASE-T, 100BASE-TX, and 10BASE-TE applications (802.3, 802.3u, 802.3bz, and 802.3ab).
- MDI lane swap.
- IEEE 802.3 auto-negotiator.
- IEEE 802.3x and IEEE 802.3z compliant flow control support with software-controllable Rx thresholds and Tx pause frames.
- Automatic crossover detection function (MDI/ MDI-X).
- IEEE 1588 protocol and 802.1AS implementation.
- Supporting Time Sensitive Networking (TSN) Capabilities (IEEE 802.1Qbu, 802.3br, 802.1Qbv, 802.1AS-REV, 802.1p, Q, and 802.1Qav).
- Supports IEEE 802.3az – Energy Efficient Ethernet (EEE).
- Smart Power Down (SPD) at S0 no link/Sx no link.
- Full wake up support (APM and ACPI).
- MAC Power Management controls.
- Power Management Protocol Offload (Proxying).
- Latency Tolerance Reporting (LTR.)
- TCP/UDP, Ipv4 checksum offloads (Rx/ Tx).
- Transmit Segmentation Offloading (TSO) (Ipv4, Ipv6).
- Legacy, Message Signal Interrupt (MSI) and Message Signal Interrupt Extension (MSI-X).
- Support for packets up to 9.5 KB (Jumbo Frames).
- Descriptor ring management hardware for Transmit and Receive.

1.6.1. Wireless Networking Interface

Moonstone as an AX210 Wi-Fi card that supports:

- 2.4Ghz, 5Ghz, and 6E support.
- Maximum bandwidth of 2.4Gbps
- 2x2 transmit/receive streams.
- Supports IEEE WLAN standards IEEE 802.11a/b/d/e/g/h/i/k/n/r/u/v/w/ac/ax
- Supports authentications WPA and WPA2, 802.1X EAP-TLS, EAP-TTLS/MSCHAPv2, PEAPv0-MSCHAPv2 (EAP-SIM, EAP-AKA, EAP-AKA')
- 64-bit and 128-bit WEP,TKIP, 128-bit AES-CCMP, 256-bit AES-GCMP encryption supported
- Bluetooth® 5.2, BLE.

2. Technical Reference

2.1.1. Headers – Top of Board

Figure 1: Top Side Header Locations

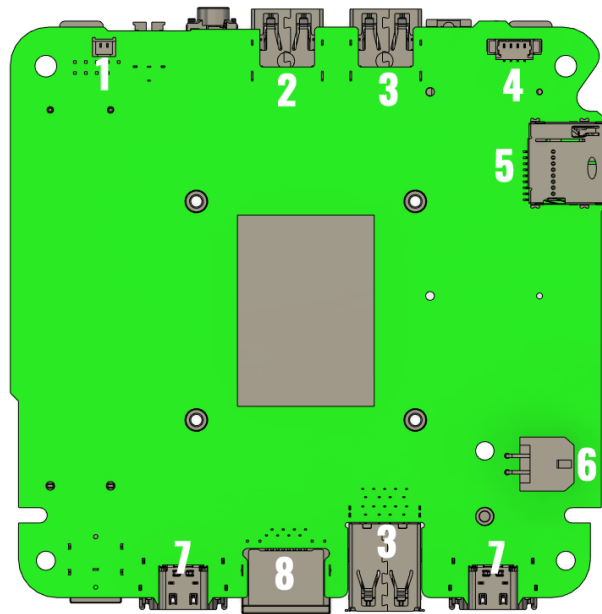


Table 3: Top Side Header Definitions

Identifier	Header
1	CMOS header
2	USB 2.0 Type A
3	USB 3.2 Type A
4	Fan Header
5	SD Card Reader
6	4 pin Power connector
7	USB 3.2 Type C
8	Ethernet

2.2. Battery Header

Figure 2: Top Side Header Locations

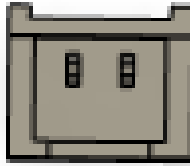


Table 4: Top Side Header Definitions

Pin	Signal
1	3V Positive(right)
2	Ground

2.3. COM Header

Figure 3: COM Header



Table 5: COM Header Pinout

Pin	Signal
1	DCD_1
2	RxD1
3	TxD1
4	DTR_1

Pin	Signal
5	GROUND
6	DSR_1
7	RTS_1
8	CTS_1
9	RI_1

Note: The COMs header only outputs in “RS-232 / TTL” level signaling...

2.4. APU Fan Header

Figure 4: APU Fan Header Pinout

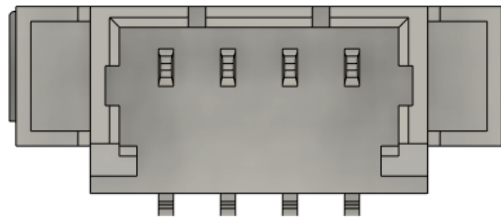


Table 6: APU Fan Header Pinout

Pin	Signal Definition
1	5V
2	FAN_TAC2
3	FAN_CRL2
4	GROUND

2.5. Headers – Bottom Of Board

Figure 5: Bottom Side Header Locations

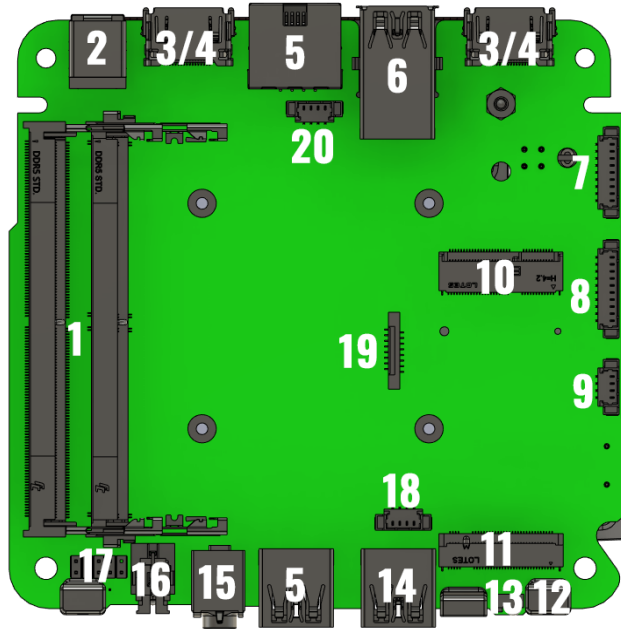


Table 7: Bottom-Side Header Definitions

Identifier	Header	Header	Identifier
1	SO DIMM Socket	M.2 2280 M Key	11
2	19V Power Plug	Microphone Array	12
3	HDMI 2.1 Port	Drive Activity LED	13
4	USB 3.2 Type C	USB 2.0 Type A	14
5	Ethernet	3.5mm Combination Jack	15
6	USB 3.2 Type A	Power Button	16
7	COMs Header	Front Panel Header	17
8	USB 3.0 Header	RGB Header	18
9	USB 2.0 Header	SATA Connector	19
10	M.2 2230 B Key	N/A	20

2.6. M.2 For Storage

Table 8: M.2 Key-M SSD Pinout

Pin	Signal	Signal	Pin
74	3.3V	GND	75
72	3.3V	GND	73
70	3.3V	GND	71
68	N/A	PEDET	69
66	CONNECTOR KEY	N/A	67
64	CONNECTOR KEY	CONNECTOR KEY	65
62	CONNECTOR KEY	CONNECTOR KEY	63
60	CONNECTOR KEY	CONNECTOR KEY	61
58	N/A	CONNECTOR KEY	59
56	N/A	GND	57
54	WAKE#	PEFCLKp	55
52	CLKREQ#	PEFCLKn	53
50	PERST#	GND	51
48	N/A	PETp0	49
46	N/A	PETn0	47
44	N/A	GND	45
42	SMB_DATA	PERp0	43
40	SMB_CLK	PERn0	41
38	N/A	GND	39
36	N/A	PETp1	37
34	N/A	PETn1	35
32	N/A	GND	33

30	N/A	PERp1	31
28	N/A	PERn1	29
26	N/A	GND	27
24	N/A	PETp2	25
22	N/A	PETn2	23
20	N/A	GND	21
18	3.3V	PERp2	19
16	3.3V	PERn2	17
14	3.3V	GND	15
12	3.3V	PETp3	13
10		PETn3	11
8	N/A	GND	9
6	N/A	PERp3	7
4	3.3V	PERn3	5
2	3.3V	GND	3
		GND	1

2.7. Front Panel Header Pinout

Figure 6: Front Panel Header

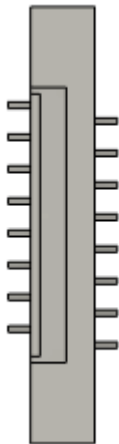


Table 9: Front Panel Header Pinout

Pin	Signal	Signal	Pin
1	5V	Ground	9
2	5V	Ground	10
3	5V	SATA_RXOP	11
4		SATA_RXON	12
5		Ground	13
6		SATA_TXOP	14
7		SATA_TXON	15
8	SATA_DEVSLP0	Ground	16

2.8. DDR5 SO-DIMM Socket

Moonstone has two JEDEC Standard 262-pin 1.2V DDR5 SDRAM SODIMMS sockets:

- Support for DDR5 / 4800 & 5600 Speeds
- Support for minimum 8GB single channel
- Support for maximum 64GB dual channel (32GB SODIMM per socket)

2.9. M.2 For Radio

Table 10: M.2 Key-E Pinout

Pin	Signal	Signal	Pin
74	3.3V	GND	75
72	3.3V	GND	73
70	3.3V	GND	71
68	N/A	PEDET	69
66	CONNECTOR KEY	N/A	67
64	CONNECTOR KEY	CONNECTOR KEY	65
62	CONNECTOR KEY	CONNECTOR KEY	63
60	CONNECTOR KEY	CONNECTOR KEY	61
58	N/A	CONNECTOR KEY	59
56	N/A	GND	57
54	WAKE#	PEFCLKp	55
52	CLKREQ#	PEFCLKn	53
50	PERST#	GND	51
48	N/A	PETp0	49
46	N/A	PETn0	47
44	N/A	GND	45
42	SMB_DATA	PERp0	43
40	SMB_CLK	PERn0	41
38	N/A	GND	39
36	N/A	PETp1	37
34	N/A	PETn1	35
32	N/A	GND	33

Pin	Signal	Signal	Pin
30	N/A	PERp1	31
28	N/A	PERn1	29
26	N/A	GND	27
24	N/A	PETp2	25
22	N/A	PETn2	23
20	N/A	GND	21
18	3.3V	PERp2	19
16	3.3V	PERn2	17
14	3.3V	GND	15
12	3.3V	PETp3	13
10		PETn3	11
8	N/A	GND	9
6	N/A	PERp3	7
4	3.3V	PERn3	5
2	3.3V	GND	3
		GND	1

2.10. Front Panel Header

Figure 7: Front Panel Header

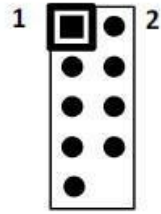


Table 11: Front Panel Header Pinout

Pin	Signal
1	HLED+
2	PWR_BTN_LED+
3	HLED-
4	PWR_BTN_LED-
5	GROUND/RESET
6	PANSHW
7	SYS_RST
8	GROUND
9	NOT USED
10	INTENTIONALLY BLANK

2.11. USB 3.0 Header

Figure 8: USB 3.0 Header



Table 12: USB 3.0 Pinout

Pin	Signal
1	USB_VBUS
2	USB1_N
3	USB1_P
4	GROUND
5	USBSS1_TX_N
6	USBSS1_TX_P
7	GROUND
8	USBSS1_RX_N
9	USBSS1_RX_P

2.12. RGB Header

Figure 9: RGB Header

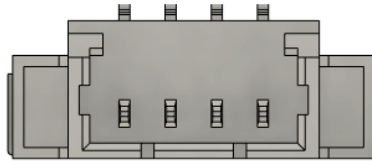


Table 13: RGB Pinout

Pin	Signal
1	12V Power (Left)
2	Red
3	Green
4	Blue (Right)

2.13. Chassis I/O Connectors

Figure 8: Front Side Connections

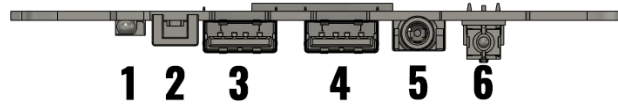


Table 14: Front Side Connections Defined

Identifier	Connector
1	Drive Indicator LED
2	Microphone Array
3	USB 2.0 Type A
4	USB 3.2 Type A
5	3.5mm Combination Jack
6	Power Button

Figure 9: Back Side I/O Connections & Power Input Jack

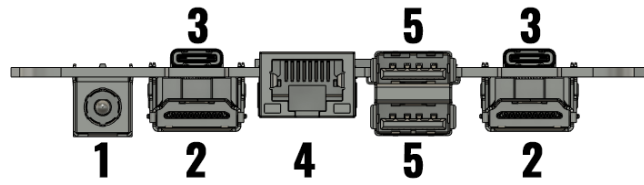


Table 15: Back Side Connections Defined

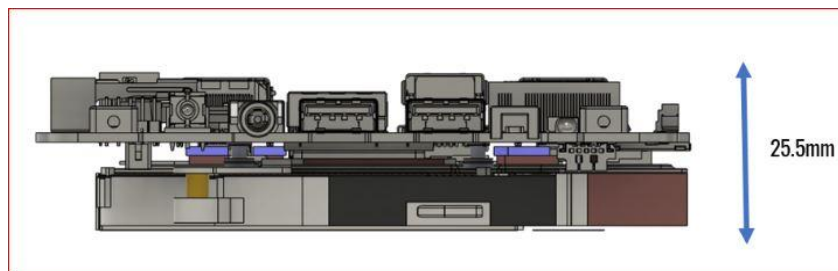
Identifier	Connector
1	5.5mm Barrel Power connector
2	HDMI 2.1
3	USB 3.2 Type C
4	Ethernet
5	USB 3.2 Type A

3. Mechanical Dimensions

Figure 10: Motherboard Height Dimensions



Figure 11: Motherboard w/ Cooler Height Dimensions (Max)



4. Version History

Version	Date	Comments
1.0	6/12/2023	Initial Creation of R9 TPS (internal review only)
1.1	-	Formatting Changes and update Technical information
1.2	-	Additional Formatting Changes
1.3	10/19/23	Formatting changes, removed references to CEC, SATA and clarified that COMs header function in RS-232 / TTL signaling mode.
1.4	10/20/23	Added additional specification details for 7940HS processor variant, further clarify other Processor SKU features
1.5	11/01/23	Added further clarification on Max Resolution for DP output. See section # 1.3