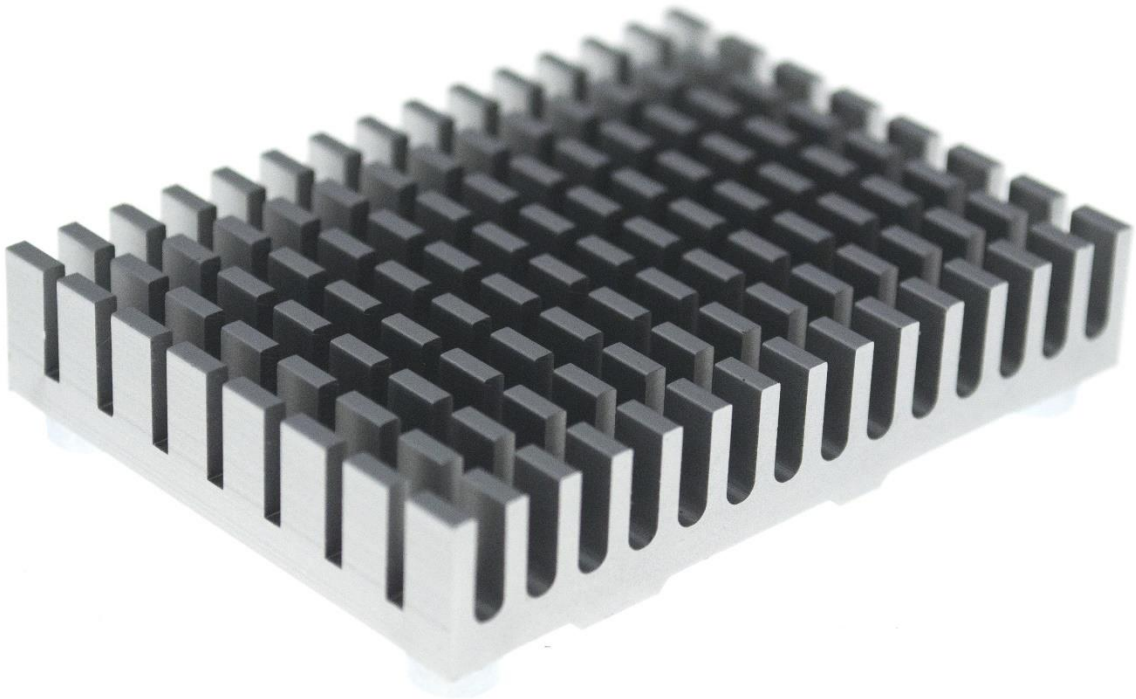
CM4 Cooler

For Raspberry Pi Compute Module 4

Data Sheet

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CM4 Cooler for Raspberry Pi Compute Module 4

1. Introduction:

CM4 Cooler is a heatsink specially designed for Raspberry Pi Compute Module 4.

With more powerful performance and more functionalities of Compute Module 4, its power consumption gets higher than Compute Module 3+. The temperature of CPU is around 80°C when the environment temperature is 25°C and CPU is fully loaded, which is very close to the temperature limit of CPU-85°C. Besides that, PMU and Wireless Module (Compute Module 4 with wireless function) on the module also generate lots of heat.

CM4 Cooler conducts the heat of CPU, PMU & Wireless Module through 3 thermal-conductive pads at the back, the heat is dissipated by 55(L)*40(W)*10(H)mm aluminum heatsink which has 150pcs 3.6(L)*1.7(W)*7(H)mm small teeth. CM4 Cooler can reduce the temperature of Compute Module 4 by maximal 20°C when the room temperature is 25°C and CPU & DDR memory are fully loaded. The actual heat dissipation performance will be variable according to temperature difference between the environment and Compute Module 4. Cooling performance testing data shows that CM4 Cooler can ensure Compute Module 4 works in up to 50°C open environment with full CPU load.

There are 8 nylon washers packed with CM4 Cooler, 4pcs 1.5mm height & 4pcs 3mm height, which are optional for 1.5mm and 3mm height 100pin board to board connector. They are used to support Compute Module 4 and avoid the damage of board-to-board connector or deformation of Compute Module 4 when the screws are used to fix CM4 Cooler on the Compute Module 4. There's no need to solder the stand-off that secures the Compute Module 4 on the PCB when you design your own baseboard, which saves money.

CM4 Cooler is available in black and silver color, It also supports full series of Compute Module 4 including Wireless version.

All of materials used on CM4 Cooler are RoHS compliant.

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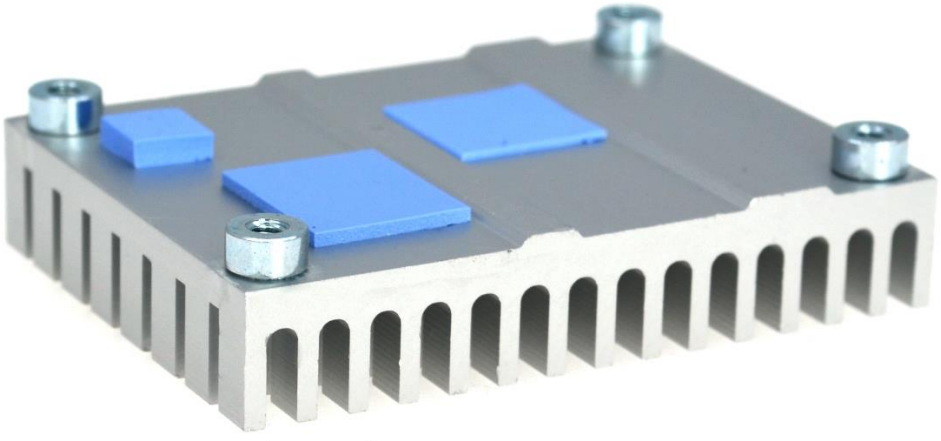
2. Main Parameters:

- Size: 55*40*13.5mm
- Weight: 40g
- Color: black and silver (optional)
- Nylon washers: 1.5mm & 3mm height
- Screws: M2.5 * 6mm & 8mm length

3. Product Images:



Front view of CM4 Cooler (Silver)

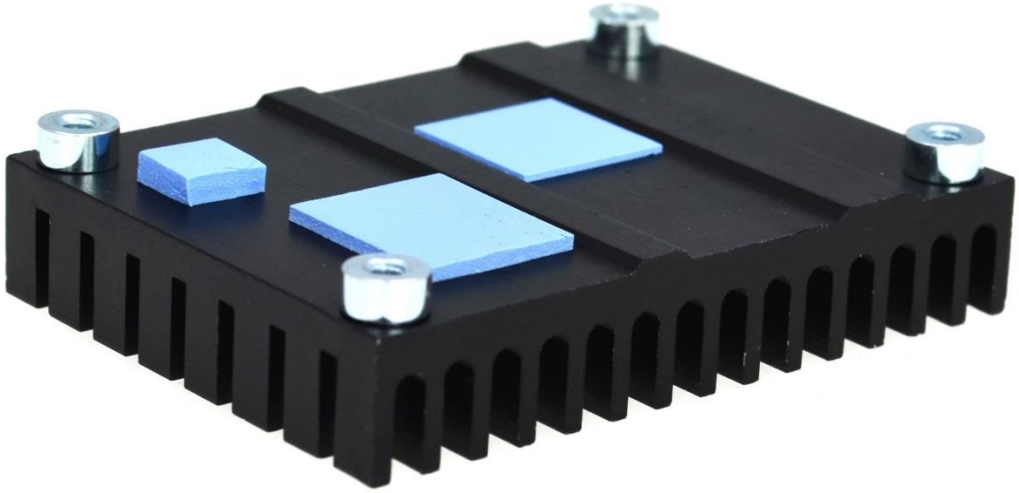


Back view of CM4 Cooler (Silver)

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Front view of CM4 Cooler (Black)



Back view of CM4 Cooler (Black)

4. Installation Guide:

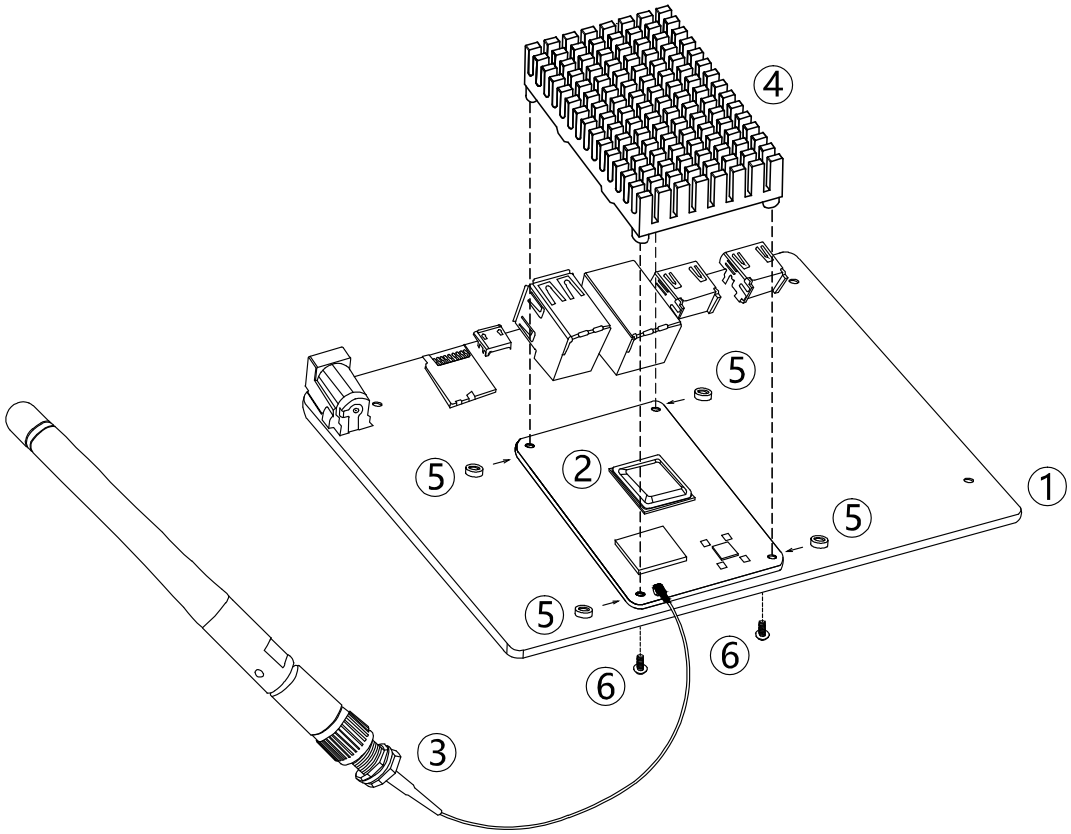
Special Notes：

Please follow the below guide when installing CM4 Cooler, wrong operation may not be able to fix CM4 Cooler on the Compute Module 4 and base board reliably, may even damage Compute Module 4 or Baseboard.

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Part list in the package:

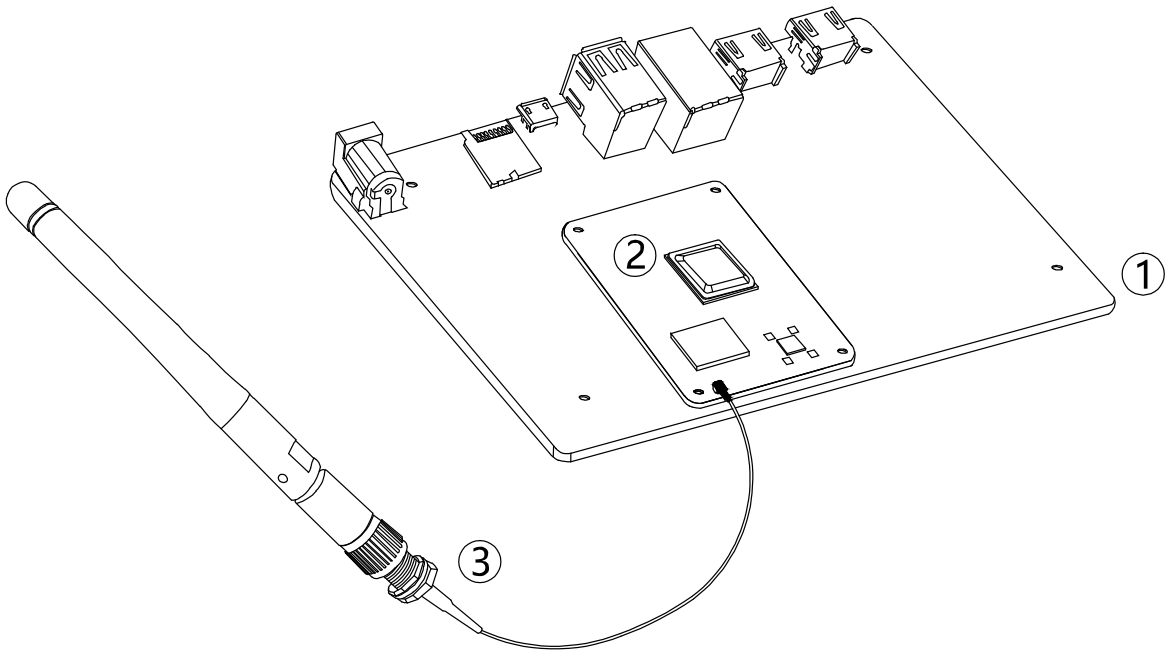
NO.	Name of Parts	Quantity
①	Base Board (not provided)	1
②	CM4 Module (not provided)	1
③	Antenna (optional)	1
④	CM4 Cooler	1
⑤	Nylon washers- 6mm*1.5mm/3mm	4
⑥	Screws -M2.5*6/8mm	4



Assembly Chart:

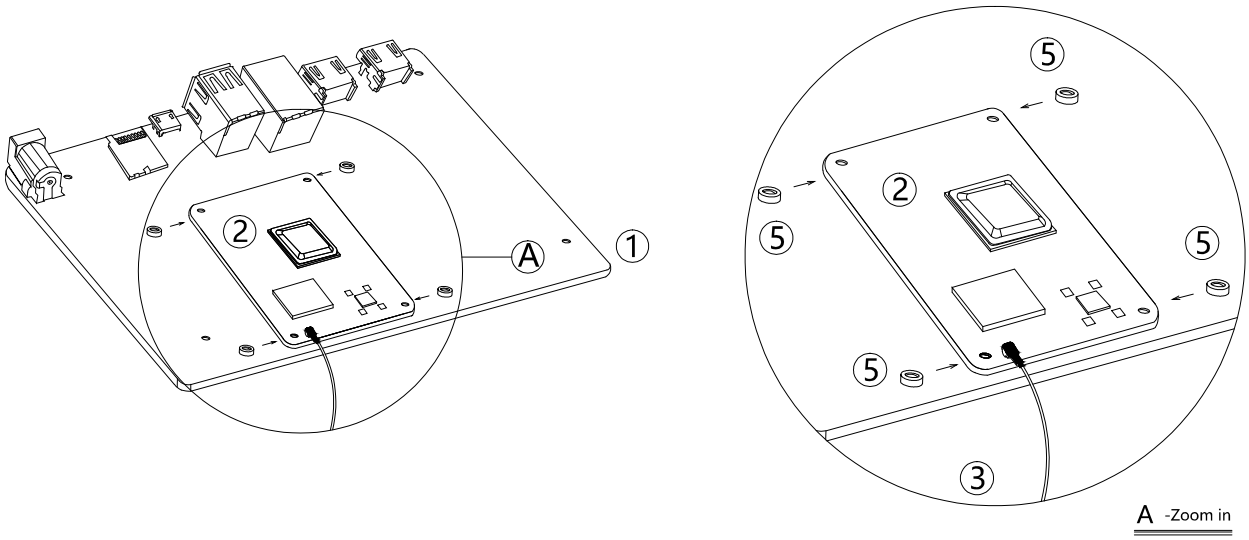
a). Install the Compute Module 4 on the baseboard, plug the antenna on the socket of RF connector.

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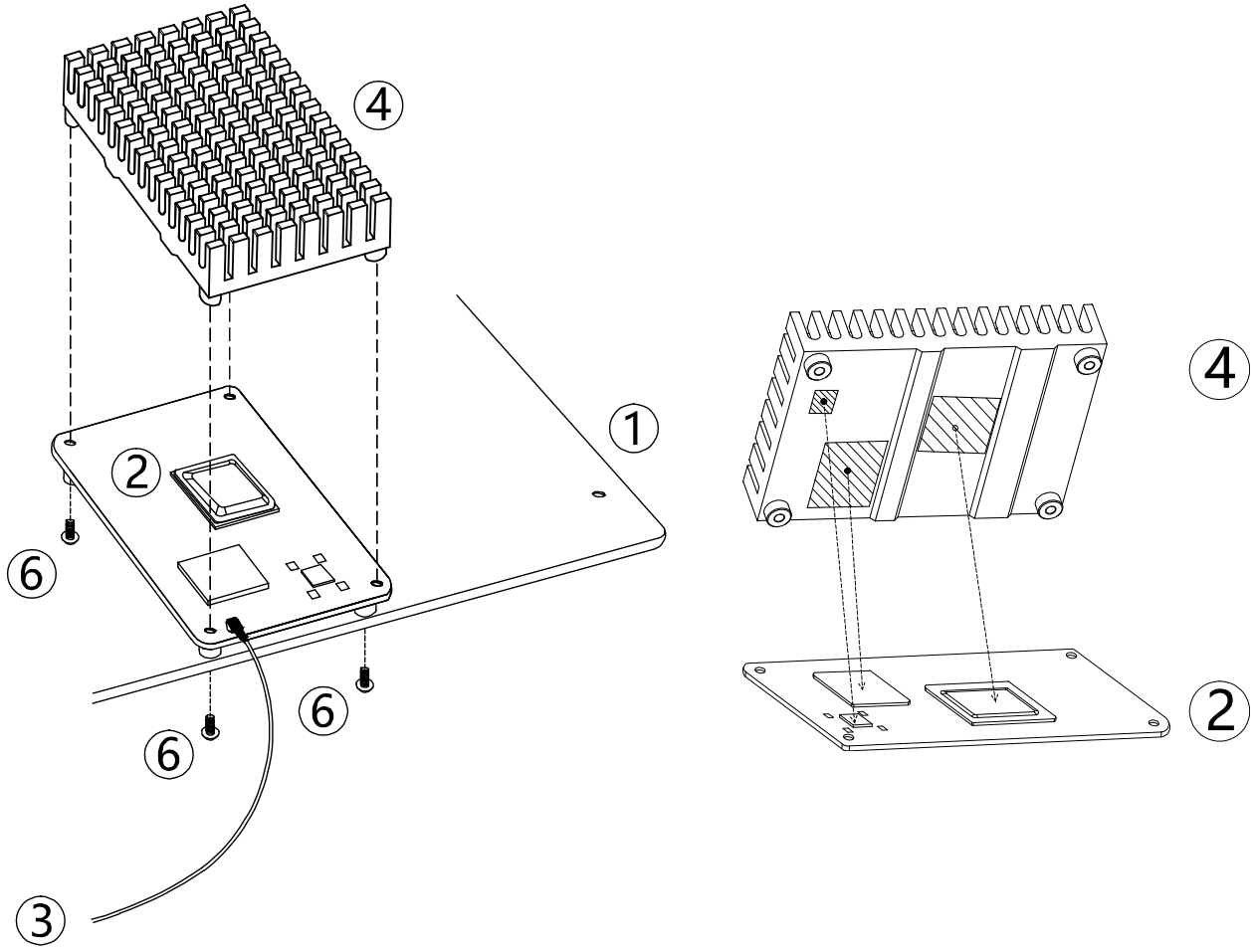
b). Insert the four black nylon washers from the side of the gap between the four corners of the Compute Module 4 and the PCB. The mounting holes of the four nylon washers should be aligned with the four mounting holes of the Compute Module 4.

There are two types of nylon washers & two types of screws in the package, 1.5mm & 3mm height nylon washers, 6mm & 8mm length screws, 1.5mm height nylon washers & 6mm length screws are used for 1.5mm height 100pin Board to Board connector, and 3mm height nylon washers & 8mm length screws are used for 3mm height Board to Board connector.



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c). When the three thermal conductive silicon pads on the CM4 Cooler are aligned correctly with the three components on the Compute Module 4, attach CM4 Cooler with Compute Module 4. Fix them on the baseboard by screwing 4 screws from the bottom of baseboard.



5. Cooling Performance:

The below data is to give a reference about cooling performance of CM4 Cooler under different environmental temperature and different level of CPU load.

The testing was done on 2pcs Raspberry Pi Compute Module 4 IO Boards in a temperature- controlled oven, CM4 Cooler was installed on one of boards, another board without CM4 Cooler, the boards were open in the air inside the oven.

The temperature in below table was read by testing software from the temperature sensor inside CPU.

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a). When CPU runs at 750 MHz (Unit: °C):

Environmental Temperature	Without CM4 Cooler		With CM4 Cooler		Temperature Difference	
	Normal ①	Fully loaded②	Normal ①	Fully loaded ②	Normal ①	Fully loaded②
25	47.2~48.7	62.3~63.7	39~41	50~51	6.2~9.7	11.3~13.7
30	53.8~55	68.1~69.6	43~44	56~58	9.8~12	10.3~13.6
35	57.4~59.4	73~74.5	52~53	60~61	4.4~7.4	12~14.5
40	62.3~64.2	78.4~79.3	56~57	65~66	5.3~8.2	12.4~14.3
45	68.1~69.6	81.3~82.7	62~64	69~71	4.1~7.6	10.3~13.7
50	72.5~74.5	84.2~85.2	63~64	72~73	8.5~11.5	11.2~12.2

b). When CPU runs at 1GHz (Unit: °C):

Environmental Temperature	Without CM4 Cooler		With CM4 Cooler		Temperature Difference	
	Normal ①	Fully loaded②	Normal ①	Fully loaded ②	Normal ①	Fully loaded②
25	47.7~48.2	68.6~70.1	39~41	53~54	6.7~9.2	14.6~17.1
30	52.1~53.5	73~74	43~45	57~59	7.1~10.5	14~17
35	56.9~58.4	78.8~80.3	48~49	64~66	7.9~10.4	12.8~16.3
40	61.8~63.3	83.7~84.7	54~54	66~67	7.8~9.3	16.7~17.7
45	66.7~68.6	84.7~85.2	58~59	71~73	7.7~10.6	11.7~14.2
50	72~74	84.2~86.6	63~64	76~78	8~10	6.2~8.6

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c).When CPU runs at 1.5GHz (Unit: °C):

Environmental Temperature	Without CM4 Cooler		With CM4 Cooler		Temperature Difference	
	Normal ①	Fully loaded②	Normal ①	Fully loaded ②	Normal ①	Fully loaded②
25	49.1~51.1	79.8-80.8	42~43	59~60	6.1~9.1	19.8~21.8
30	54~55	81.3~82.3	45~47	63~64	7~10	17.3~19.3
35	58.9~59.9	81.3~82.3	52~53	68~70	5.9~7.9	11.3~14.3
40	64.2~64.7	82.7~83.7	55~57	73~75	7.2~9.7	7.7~10.7
45	69.1~70.6	84.2~85.7	61~62	79~81	7.1~9.6	3.2~6.7③
50	73~74.5	84.7~86.2	65~66	82~83	7~9.5	1.7~4.2③

Note:

① Normal: CPU and memory are not loaded with any additional application code after the system booted up.

② Fully loaded: CPU is fully loaded and memory works at full capacity by the stress command on standard Raspbian system.

③ The maximal temperature of CPU without CM4 Cooler is about 85°C, may the stress test command actually does not fully load the CPU and memory due to the over-temperature protection on the software to prevent CPU damage.

④ Above data may not be accurate, those just give the board designers some reference when they design the cooling system.

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