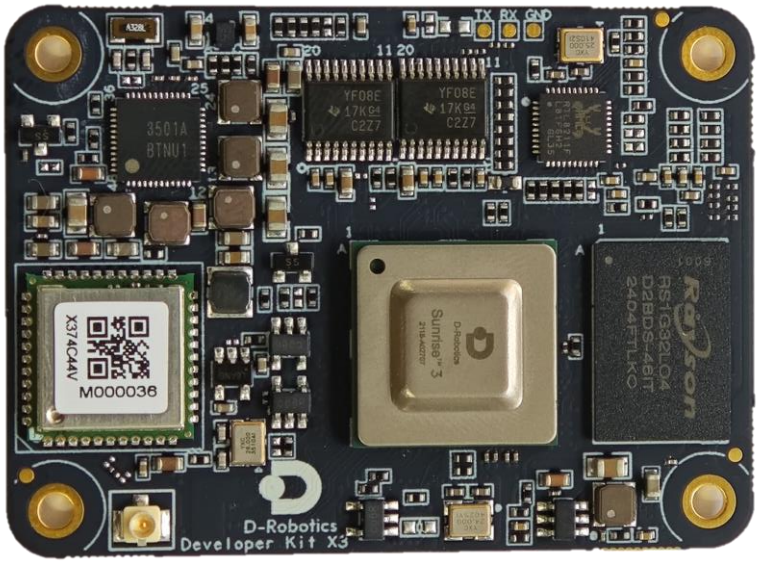
RDK X3 Module Product Brief

v1.2

RDK X3 Module, equipped with the powerful D-Robotics Sunrise® 3 series high-performance intelligent chip, delivers robust edge computing and artificial intelligence capabilities.

Overview



RDK X3 Module include a quad-core Cortex® A53 processor, 5 TOPS computing power, up to 4GB of memory, and support for 4K@60fps video encoding and decoding. Its primary interfaces include HDMI, Gigabit Ethernet, USB 3.0, MIPI CSI, MIPI DSI, and more.

Some models of the module are equipped with dual-band 2.4/5.0GHz Wi-Fi and Bluetooth 4.2 modules. When used with an external antenna kit, they can achieve wireless connectivity, reducing user development and testing costs, and shortening time to market.

The optional onboard RAM capacities for the RDK X3 Module include 2GB and 4GB, while the onboard eMMC capacities range from 16GB, 32GB, to 64GB.

Specifications

Size： 55 mm x 40 mm

CPU： Quad-core Arm® Cortex® A53 64-bit @ 1.5GHz

BPU： 5Tops

Memory： 2GB or 4GB LPDDR4

Storage： NA、16GB、32GB、64GB

Peripheral Interfaces:

- Optional on-board 2.4 GHz and 5 GHz IEEE 802.11a/b/g/n/ac WLAN, Bluetooth 4.2 module, and external antenna.
- 1 x Gigabit Ethernet PHY
- 1 x USB 3.0 Port
- 32 GPIOs
- 1 x Micro SD card slot

Imaging:

- 1 x 4-lane MIPI CSI Port
- 2 x 2-lane MIPI CSI Port

Display:

- 1 x HDMI port supporting up to 1080p60
- 1 x MIPI DSI port supporting up to 1080p60

Multimedia:

- Supports H.265/H.264 encoding and decoding, max 4K@60fps
- Supports MJPEG encoding and decoding Power Input: 5V/3A DC Operating

Power Input： 5V/3A DC

Temperature: from -20 to 60°C

Lifecycle: Maintained in production status until at least 2028

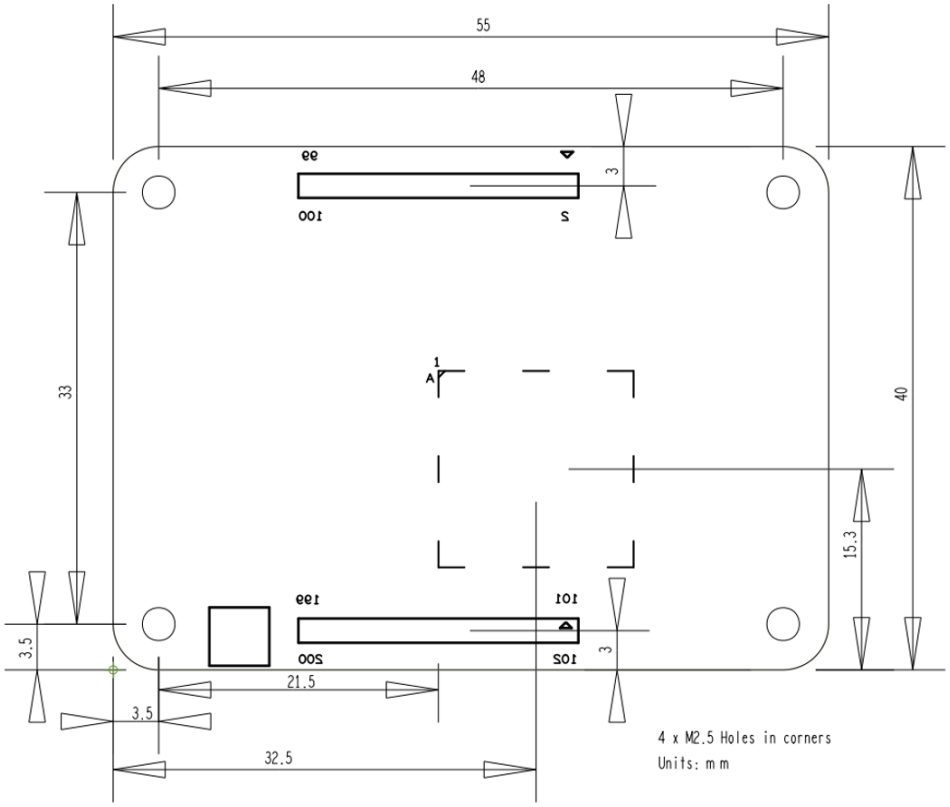
Model

Part Number	Wireless	RAM	eMMC
RDK X3 MD 002016	N	2GB	16GB
RDK X3 MD 102016	Y	2GB	16GB
RDK X3 MD 002032	N	2GB	32GB
RDK X3 MD 102032	Y	2GB	32GB
RDK X3 MD 004032	N	4GB	32GB
RDK X3 MD 104032	Y	4GB	32GB
RDK X3 MD 004064	N	4GB	64GB
RDK X3 MD 104064	Y	4GB	64GB

Part Number explain

RDK X3 MD NUM[1-6]		
wireless module, NUM[1]	DDR capacity, NUM[2-3]	eMMC capacity, NUM[4-6]
1=YES	02 = 2GB	016 = 16 GB
0=NO	04 = 4GB	032 = 32 GB

Shape


55
48
3
33
40
15.3
A
1
3.5
21.5
3.5
32.5
4 x M2.5 Holes in corners
Units: mm

Pinout definition

Pin	Signal	Description
1	GND	Ground (0V)
2	GND	Ground (0V)
3	Ethernet_Pair3_P	Ethernet pair 3 positive (connect to transformer or MagJack)
4	Ethernet_Pair1_P	Ethernet pair 1 positive (connect to transformer or MagJack)
5	Ethernet_Pair3_N	Ethernet pair 3 negative (connect to transformer or MagJack)
6	Ethernet_Pair1_N	Ethernet pair 1 negative (connect to transformer or MagJack)
7	GND	Ground (0V)
8	GND	Ground (0V)
9	Ethernet_Pair2_N	Ethernet pair 2 negative (connect to transformer or MagJack)
10	Ethernet_Pair0_N	Ethernet pair 0 negative (connect to transformer or MagJack)
11	Ethernet_Pair2_P	Ethernet pair 2 positive (connect to transformer or MagJack)
12	Ethernet_Pair0_P	Ethernet pair 0 positive (connect to transformer or MagJack)
13	GND	Ground (0V)
14	GND	Ground (0V)
15	Ethernet_nLED3	Active-low Ethernet speed indicator (3.3V signal): typically a yellow LED is connected to this pin. A low state indicates the 1Gbit or 100Mbit link: IOL = 8mA @ VOL < 0.4V
16	Debug_Uart0_RX	Uart Data RX pin:Debug,a 1.8V signal
17	Ethernet_nLED2	Active-low Ethernet speed indicator (3.3V signal): typically a yellow LED is connected to this pin. A low state indicates the 1Gbit or 100Mbit link: IOL = 8mA @ VOL < 0.4V
18	Debug_Uart0_TX	Uart Data TX pin:Debug,a 1.8V signal
19	NC	
20	NC	NC
21	Pi_nLED_Activity	Active-low Pi activity LED. 20mA Max 5V tolerant (VOL < 0.4V).
22	GND	Ground (0V)
23	GND	Ground (0V)
24	GPIO26	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
25	GPIO21	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
26	GPIO19	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
27	GPIO20	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
28	GPIO13	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
29	GPIO16	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
30	GPIO6	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
31	GPIO12	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
32	GND	Ground (0V)
33	GND	Ground (0V)
34	GPIO5	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
35	ID_SC	(BCM2711 GPIO 1) GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
36	ID_SD	(BCM2711 GPIO 0) GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
37	GPIO7	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
38	GPIO11	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
39	GPIO8	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
40	GPIO9	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
41	GPIO25	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
42	GND	Ground (0V)
43	GND	Ground (0V)
44	GPIO10	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V

45	GPIO24	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
46	GPIO22	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
47	GPIO23	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
48	GPIO27	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
49	GPIO18	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
50	GPIO17	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
51	GPIO15	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
52	GND	Ground (0V)
53	GND	Ground (0V)
54	GPIO4	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
55	GPIO14	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V
56	GPIO3	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V. Internal 1.8kΩ pull up to GPIO_VREF
57	SD_CLK	SD card clock signal
58	GPIO2	GPIO: typically a 3.3V signal, but can be a 1.8V signal by connecting GPIO_VREF to 1.8V. Internal 1.8kΩ pull up to GPIO_VREF
59	GND	Ground (0V)
60	GND	Ground (0V)
61	SD_DAT3	SD card/eMMC Data3 signal
62	SD_CMD	SD card/eMMC Command signal
63	SD_DAT0	SD card/eMMC Data0 signal
64	UART2_TXD	Uart Data TX pin: Internal 4kΩ pull up to GPIO_VREF
65	GND	Ground (0V)
66	GND	Ground (0V)
67	SD_DAT1	SD card/eMMC Data1 signal
68	UART2_RXD	Uart Data RX pin: Internal 4kΩ pull up to GPIO_VREF
69	SD_DAT2	SD card/eMMC Data2 signal
70	SENSOR0_MCLK	GPIO: typically a 1.8V signal
71	GND	Ground (0V)
72	SENSOR1_MCLK	GPIO: typically a 1.8V signal
73	NC	NC
74	GND	Ground (0V)
75	SD_PWR_ON	Output to power-switch for the SD card. The module sets this pin high (3.3V) to signal that power to the SD card should be turned on.defaults Output low. If booting from the SD card is required then a pullup should also be fitted so the power-switch defaults to on.
76	SD0_DET_N	GPIO: typically a 1.8V signal
77	+5V (Input)	4.75V-5.25V. Main power input
78	GPIO_VREF	Must be connected to MD_3.3V (pins 84 and 86) for 3.3V GPIO or MD_1.8V (pins 88 and 90) for 1.8V GPIO. This pin cannot be floating or connected to ground.
79	+5V (Input)	4.75V-5.25V. Main power input
80	SCL1	I2C clock pin: typically used for Camera and Display. Internal 4kΩ pull up to MD_3.3V
81	+5V (Input)	4.75V-5.25V. Main power input
82	SDA1	I2C Data pin: typically used for Camera and Display. Internal 4kΩ pull up to MD_3.3V
83	+5V (Input)	4.75V-5.25V. Main power input
84	MD_3.3V (Output)	3.3V ± 2.5%. Power Output max 300mA per pin for a total of 600mA. This will be powered down during power-off or GLOBAL_EN being set low
85	+5V (Input)	4.75V-5.25V. Main power input
86	MD_3.3V (Output)	3.3V ± 2.5%. Power Output max 300mA per pin for a total of 600mA. This will be powered down during power-off or GLOBAL_EN being set low
87	+5V (Input)	4.75V-5.25V. Main power input
88	MD_1.8V (Output)	1.8V ± 2.5%. Power Output max 300mA per pin for a total of 600mA. This will be powered down during power-off or GLOBAL_EN being set low
89	WL_nDisable	Can be left floating; if driven low the wireless interface will be disabled. Internally pulled up via

		4kΩ to 3.3V
90	MD_1.8V (Output)	1.8V ± 2.5%. Power Output max 300mA per pin for a total of 600mA. This will be powered down during power-off or GLOBAL_EN being set low
91	BT_nDisable	Can be left floating; if driven low the Bluetooth interface will be disabled. Internally pulled up via4kΩ to 3.3V
92	RUN_PG	Bidirectional pin. Can be driven low (via a 220Ω resistor) to reset the CPU. As an output, a high signals that power is good and CPU is running. Internally pulled up to 3.3V via 2kΩ
93	nRPIBOOT	A low on this pin forces booting from an RPI server (e.g. PC); if not used leave floating. Internally pulled up via 4kΩ to 3.3V
94	NC	NC
95	PI_LED_nPWR	Active-low output to drive Power On LED. This signal needs to be buffered.
96	NC	NC
97	Camera_GPIO	Typically used to shut down the camera to reduce power. Reassigning this pin to another function isn't recommended. MD_3.3V signalling
98	GND	Ground (0V)
99	GLOBAL_EN	Input. Drive low to power off Module. Internally pulled up with a 47kΩ to +5V
100	nEXTRST	Output. Driven low during reset; Driven high (MD_3.3V) once Module CPU has started to boot. Internally pulled up via4kΩ to 3.3V
101	USB_OTG_ID	Input (3.3V signal) USB OTG Pin. Internally pulled up 4K to 3V3. When grounded the Module becomes a USB host but the correct OS driver also needs to be used
102	NC	NC
103	USB_N	USB D-
104	5V	4.75V-5.25V. Main power input
105	USB_P	USB D+
106	5V	4.75V-5.25V. Main power input
107	GND	Ground (0V)
108	GND	Ground (0V)
109	NC	NC
110	NC	NC
111	NC	NC
112	NC	NC
113	GND	Ground (0V)
114	GND	Ground (0V)
115	CAM1_D0_N	Input Camera1 D0 negative
116	USB_RX_P	USB3.0 RX positive
117	CAM1_D0_P	Input Camera1 D0 positive
118	USB_RX_N	USB3.0 RX negative
119	GND	Ground (0V)
120	GND	Ground (0V)
121	CAM1_D1_N	Input Camera1 D1 negative
122	USB_TX_P	USB3.0 TX positive
123	CAM1_D1_P	Input Camera1 D1 positive
124	USB_TX_N	USB3.0 TX negative
125	GND	Ground (0V)
126	GND	Ground (0V)
127	CAM1_C_N	Input Camera1 clock negative
128	CAM0_D0_N	Input Camera0 D0 negative
129	CAM1_C_P	Input Camera1 clock positive
130	CAM0_D0_P	Input Camera0 D0 positive
131	GND	Ground (0V)
132	GND	Ground (0V)
133	CAM1_D2_N	Input Camera1 D2 negative
134	CAM0_D1_N	Input Camera0 D1 negative

135	CAM1_D2_P	Input Camera1 D2 positive
136	CAM0_D1_P	Input Camera0 D1 positive
137	GND	Ground (0V)
138	GND	Ground (0V)
139	CAM1_D3_N	Input Camera1 D3 negative
140	CAM0_C_N	Input Camera0 clock negative
141	CAM1_D3_P	Input Camera1 D3 positive
142	CAM0_C_P	Input Camera0 clock positive
143	NC	NC
144	GND	Ground (0V)
145	NC	NC
146	NC	NC
147	NC	NC
148	NC	NC
149	NC	NC
150	GND	Ground (0V)
151	HDMI0_CEC	Input HDMI0 CEC. 5V tolerant (It can be connected directly to a HDMI connector; a small amount of ESD protection is provided on the Module by an on-board HDMI05-CL02F3)
152	NC	NC
153	HDMI0_HPD	Input HDMI0 hotplug. 5V tolerant. (It can be connected directly to a HDMI connector; a small amount of ESD protection is provided on the Module by an on-board HDMI05-CL02F3)
154	NC	NC
155	GND	Ground (0V)
156	GND	Ground (0V)
157	CAM2_D0_N	Input Camera2 D0 negative
158	NC	NC
159	CAM2_D0_P	Input Camera2 D0 positive
160	NC	NC
161	GND	Ground (0V)
162	GND	Ground (0V)
163	CAM2_D1_N	Input Camera2 D1 negative
164	NC	NC
165	CAM2_D1_P	Input Camera2 D1 positive
166	NC	NC
167	GND	Ground (0V)
168	GND	Ground (0V)
169	CAM2_C_N	Input Camera2 clock negative
170	HDMI0_TX2_P	Output HDMI0 TX2 positive
171	CAM2_C_P	Input Camera2 clock positive
172	HDMI0_TX2_N	Output HDMI0 TX2 negative
173	GND	Ground (0V)
174	GND	Ground (0V)
175	DSI1_D0_N	Output Display1 D0 negative
176	HDMI0_TX1_P	Output HDMI0 TX1 positive
177	DSI1_D0_P	Output Display1 D0 positive
178	HDMI0_TX1_N	Output HDMI0 TX1 negative
179	GND	Ground (0V)
180	GND	Ground (0V)
181	DSI1_D1_N	Output Display1 D1 negative
182	HDMI0_TX0_P	Output HDMI0 TX0 positive
183	DSI1_D1_P	Output Display1 D1 positive

184	HDMI0_TX0_N	Output HDMI0 TX0 negative
185	GND	Ground (0V)
186	GND	Ground (0V)
187	DSI1_C_N	Output Display1 clock negative
188	HDMI0_CLK_P	Output HDMI0 clock positive
189	DSI1_C_P	Output Display1 clock positive
190	HDMI0_CLK_N	Output HDMI0 clock negative
191	GND	Ground (0V)
192	GND	Ground (0V)
193	DSI1_D2_N	Output Display1 D2 negative
194	DSI1_D3_N	Output Display1 D3 negative
195	DSI1_D2_P	Output Display1 D2 positive
196	DSI1_D3_P	Output Display1 D3 positive
197	GND	Ground (0V)
198	GND	Ground (0V)
199	HDMI0_SDA	Bidirectional HDMI0 SDA. Internally pulled up with a 2kΩ. 5V tolerant. (It can be connected directly to a HDMI connector; a small amount of ESD protection is provided on the Module by an on-board HDMI05-CL02F3)
200	HDMI0_SCL	Bidirectional HDMI0 SCL. Internally pulled up with a 2kΩ. 5V tolerant. (It can be connected directly to a HDMI connector; a small amount of ESD protection is provided on the Module by an on-board HDMI05-CL02F3)

Warnings

- The external power supply used for RDK X3 Module must comply with relevant regulations in the area.
- This product should be used in a well-ventilated environment. When used in an enclosed space, proper heat dissipation measures must be taken.
- During use, place the product on a stable, flat, non-conductive surface.
- In case of connecting incompatible devices to RDK X3 Module resulting in device damage, repair will not be supported.
- All peripheral devices used in conjunction with this product should meet the relevant standards of the country where they are used and be appropriately marked to ensure safety and performance requirements. These peripherals include but are not limited to keyboards, displays, and mice when used with RDK X3 Module.
- Cables and connectors for all peripheral devices used with this product must have sufficient insulation to meet the necessary safety requirements.

Safety Guidelines

To prevent malfunction or damage to this product, observe the following:

- Avoid contact with water or moisture or placing the device on conductive surfaces during operation.
- Do not expose the device to any heat sources; RDK X3 Module operates reliably at normal ambient temperatures.
- When assembling, avoid mechanical or electrical damage to the printed circuit board and connectors.
- While the device is powered on, avoid touching the printed circuit board and edges to minimize the risk of electrostatic discharge damage.

Revision History

Version	Date	Description
v1.0	2023.04.23	Initial Release
v1.1	2023.04.27	Update specifications, product models
v1.2	2023.05.24	Update product model