

EM3566

Hardware User Manual

Rockchip RK3566 Quad-core platform

Boardcon Embedded Design

ODM dedicated to providing high quality
Single Board Computer and System-on-Module



1. Introduction

1.1. About this Manual

This manual is intended to provide the user with an overview of the board and benefits, complete features specifications, and set up procedures. It contains important safety information as well.

1.2. Feedback and Update to this Manual

To help our customers make the most of our products, we are continually making additional and updated resources available on the Boardcon website (www.boardcon.com , www.armdesigner.com). These include manuals, application notes, programming examples, and updated software and hardware. Check in periodically to see what's new!

When we are prioritizing work on these updated resources, feedback from customers is the number one influence, If you have questions, comments, or concerns about your product or project, please no hesitate to contact us at support@armdesigner.com.

1.3. Limited Warranty

Boardcon warrants this product to be free of defects in material and workmanship for a period of one year from date of buy. During this warranty period Boardcon will repair or replace the defective unit in accordance with the following process:

A copy of the original invoice must be included when returning the defective unit to Boardcon. This limited warranty does not cover damages resulting from lightning or other power surges, misuse, abuse, abnormal conditions of operation, or attempts to alter or modify the function of the product.

This warranty is limited to the repair or replacement of the defective unit. In no event shall Boardcon be liable or responsible for any loss or damages, including but not limited to any lost profits, incidental or consequential damages, loss of business, or anticipatory profits arising from the use or inability to use this product.

Repairs make after the expiration of the warranty period are subject to a repair charge and the cost of return shipping. Please contact Boardcon to arrange for any repair service and to obtain repair charge information.

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1 EM3566 Introduction

1.1 Summary

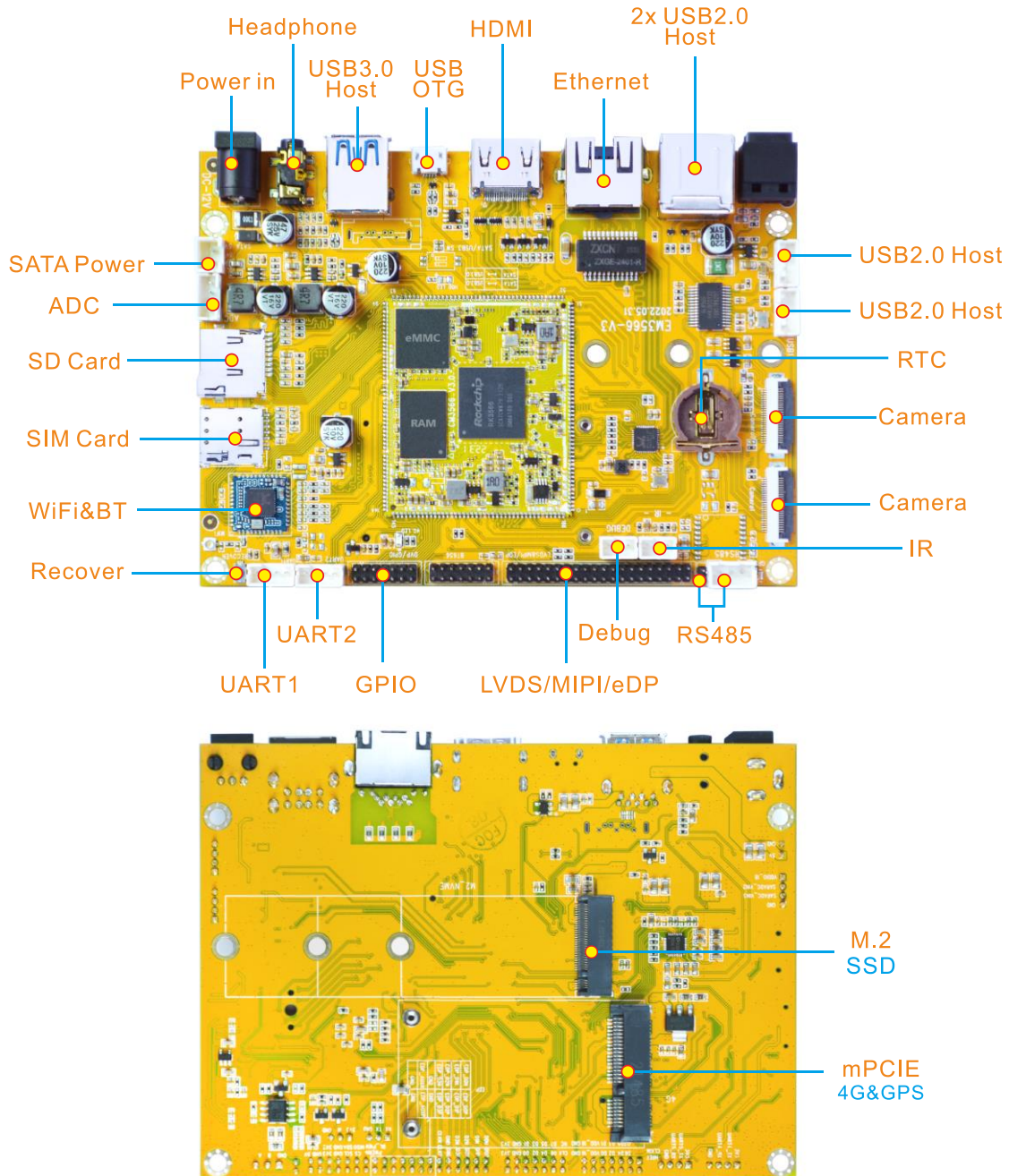
The EM3566 is a single-board computer powered by Rockchip RK3566 processor featuring four ARM Cortex-A55 CPU cores and Mali-G52-2EE graphics and designed for AIoT applications such as AI robot, smart POS machine, face recognition terminal, and business display integrated equipment.

This SBC features 2GB memory (up to 8GB), comes with MIPI/LVDS, HDMI and eDP video out, and offers Gigabit Ethernet port, as well as M.2 socket which enables expansion with a large hard drive and plus a miniPCIe, a Nano SIM card socket for 4G cellular connectivity. Display and camera capabilities with graphics and video hardware acceleration make it suitable for machine vision applications. And built-in independent NPU, computing power of 0.8 TOPS for AI accelerator extend the reach of AI solutions. EM3566 supports microphone array input, with high dynamic noise reduction algorithm, it can accurately recognize human voices even in noisy environments, and achieve precise voice control of the devices.

1.2 RK3566 Specifications

Feature	Specifications
SOC	Rockchip RK3566
CPU	Quad-core 64-bit Cortex-A55, 22nm lithography process, frequency up to 1.8GHz
GPU	ARM G52 2EE Supports OpenGL ES 1.1/2.0/3.2. OpenCL 2.0. Vulkan 1.1 Embedded high-performance 2D acceleration hardware
NPU	1Tops@INT8, integrated high-performance AI accelerator RKNN NPU Supports one-click switching of Caffe/TensorFlow/TFLite/ONNX/PyTorch/Keras/Darknet
VPU	Supports 4K 60fps H.265/H.264/VP9 video decoding Supports 1080P 100fps H.265/H.264 video encoding Supports 8M ISP

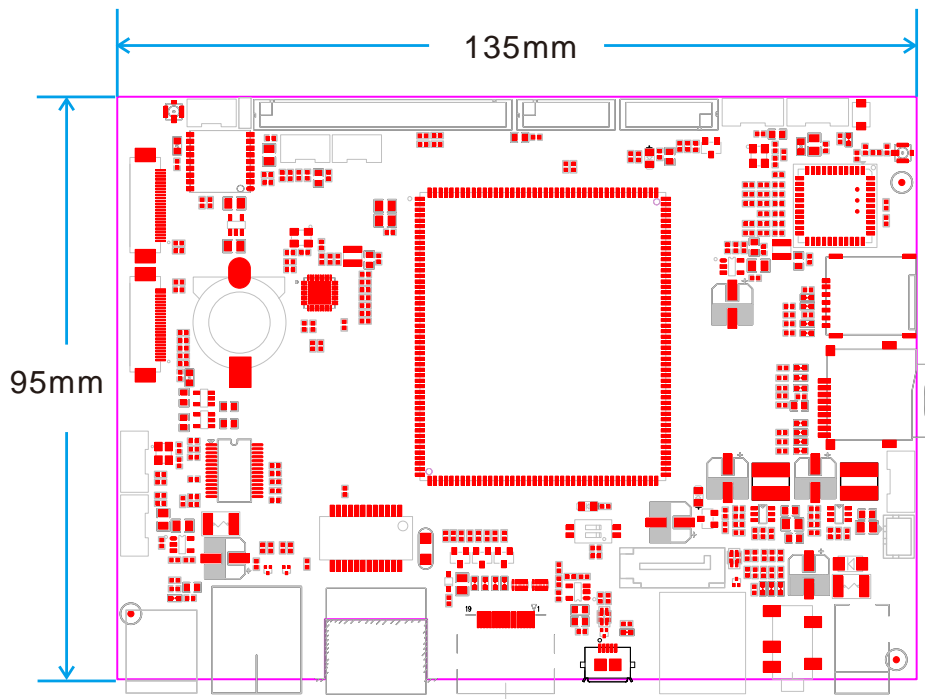
1.3 EM3566 Features



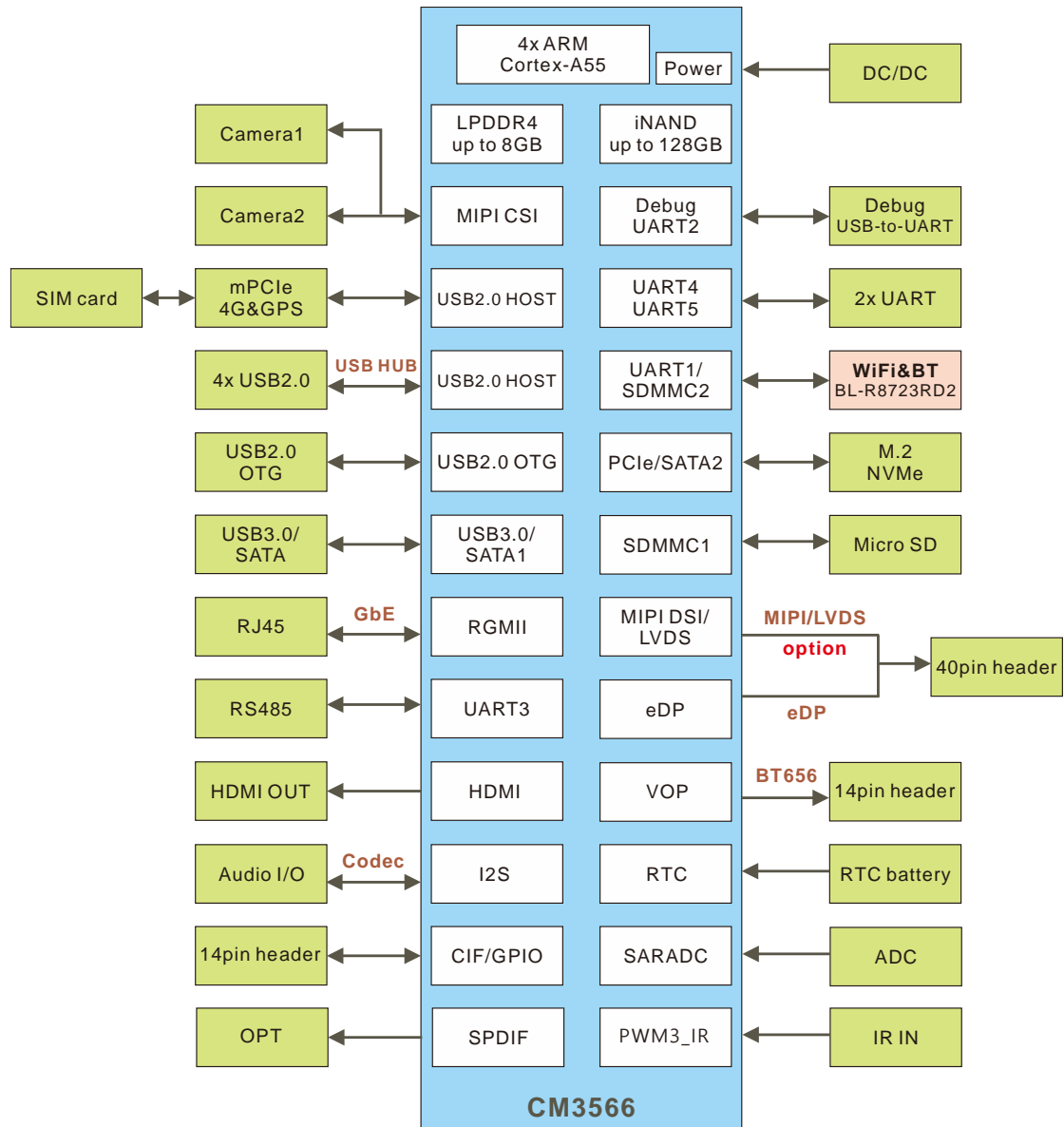
Specifications	
CPU	Rockchip RK3566 quad-core Cortex-A55 @ up to 1.8GHz
Memory	2GB/ 4GB/ 8GB. 32bit, supports all-data-link ECC
Storage	8GB/ 32GB/ 64GB/ 128GB eMMC M.2 PCIe 2.0 socket NVMe SSD (Expand with 2242 NVMe SSD) MicroSD card slot (Expand with TF card)

Power Supply	12V/3A DC input jack
USB	1x USB OTG 2.0 4x USB Host 2.0 (USB-AF or 4-pin connector) 1x USB 3.0
Connectivity	Gigabit Ethernet RJ45 ports via Realtek RTL8211F-CG controller 2.4G WiFi(802.11b/g/n) with Bluetooth 4.0 mPCIe socket with Nano SIM card port to support 4G&GPS module
Serial	1x Serial port for debug, 3-pin connector 2x UART, 4-pin connectors 1x RS485, 2-pin header or 3-pin connector
Video	HDMI 2.0, 4Kp60 MIPI DSI/LVDS, 1080p60 eDP 1.3, 2560x1600@60Hz
Audio	3.5mm audio I/O jack. ES8388 audio codec 8-channel audio via HDMI
Camera(optional)	2x Cameras via MIPI CSI (24pin FPC connector)
Keys & Switch	1x Recover Key
Other features	RTC with battery connector; IR receiver; GPIO; ADC
Dimension	135 x 95 mm

1.4 PCB Dimension



1.5 Block Diagram



1.6 CPU module Introduction

CM3566 specifications

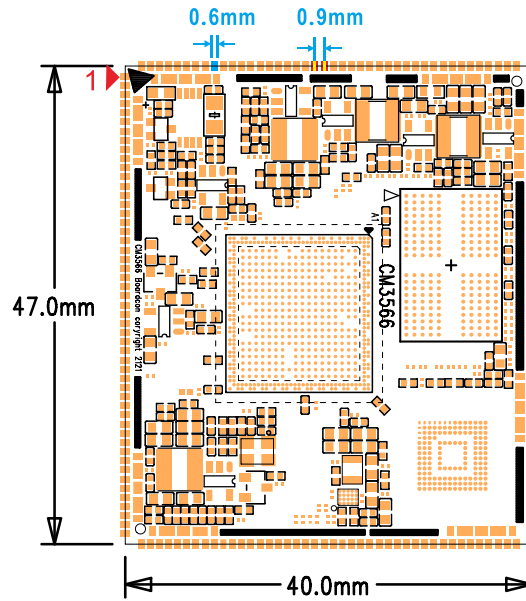
Pin number – 186 pins, 0.9mm pitch

Dimension – 47 x 40mm

Layer – 8 Layers, complying with EMS/EMI

Power supply – DC 3.3V

Application – smart Device, advertising devices, TV box, POS systems, vehicle control terminals, AI robot, business display integrated equipment, etc.



Pin Definition

Pin	Signal	Description or functions	GPIO serial	IO Voltage
1	VCC3V3_SYS	3.3V Main Power input		3.3V
2	VCC3V3_SYS	3.3V Main Power input		3.3V
3	VCC3V3_SYS	3.3V Main Power input		3.3V
4	VCC_RTC	RTC button Cell Power input		3.0V
5	PMIC_32KOUT	32.768khz OD output(PU 10K)		3.3V
6	GND	Ground		0V
7	HDMITX_CEC_M0		GPIO4_D1_u	3.3V
8	HDMITX_SDA	Pull up 2.2K onboard	GPIO4_D0_u	3.3V
9	HDMITX_SCL	Pull up 2.2K onboard	GPIO4_C7_u	3.3V
10	GMAC1_RXER_M0	RMI receive error(V3 changed)	GPIO3_B4_d	3.3V
11	GMAC1_MCLKINOUT_M0	RGMII reference clock input(125Mhz)	GPIO3_C0_d	3.3V
12	GND	Ground		0V
13	GMAC1_TXD0_M0		GPIO3_B5_d	3.3V
14	GMAC1_TXD1_M0		GPIO3_B6_d	3.3V
15	GMAC1_TXEN_M0		GPIO3_B7_d	3.3V
16	GMAC1_RXDV_CRS_M0		GPIO3_B3_d	3.3V
17	GMAC1_RXD1_M0		GPIO3_B2_d	3.3V
18	GMAC1_RXD0_M0		GPIO3_B1_d	3.3V
19	GMAC1_RXD3_M0		GPIO3_A5_d	3.3V



Pin	Signal	Description or functions	GPIO serial	IO Voltage
20	GMAC1_RXD2_M0		GPIO3_A4_d	3.3V
21	GMAC1-RXCLK_M0		GPIO3_A7_d	3.3V
22	GMAC1_TXD2_M0		GPIO3_A2_d	3.3V
23	GMAC1_TXD3_M0		GPIO3_A3_d	3.3V
24	GMAC1_TXCLK_M0		GPIO3_A6_d	3.3V
25	MIPI_DSI_TX0_D3N/LVDS_TX0_D3N	MIPI DSI or LVDS TXD3N		1.8V
26	MIPI_DSI_TX0_D3P/LVDS_TX0_D3P	MIPI DSI or LVDS TXD3P		1.8V
27	MIPI_DSI_TX0_D2N/LVDS_TX0_D2N	MIPI DSI or LVDS TXD2N		1.8V
28	MIPI_DSI_TX0_D2P/LVDS_TX0_D2P	MIPI DSI or LVDS TXD2P		1.8V
29	MIPI_DSI_TX0_D1N/LVDS_TX0_D1N	MIPI DSI or LVDS TXD1N		1.8V
30	MIPI_DSI_TX0_D1P/LVDS_TX0_D1P	MIPI DSI or LVDS TXD1P		1.8V
31	MIPI_DSI_TX0_D0N/LVDS_TX0_D0N	MIPI DSI or LVDS TXD1N		1.8V
32	MIPI_DSI_TX0_D0P/LVDS_TX0_D0P	MIPI DSI or LVDS TXD1P		1.8V
33	MIPI_DSI_TX0_CLKN/LVDS_TX0_CLKN	MIPI DSI or LVDS TXD1N		1.8V
34	MIPI_DSI_TX0_CLKP/LVDS_TX0_CLKP	MIPI DSI or LVDS TXD1P		1.8V
35	HDMI_TX_HPDIN	HDMI HPD input		3.3V
36	HDMI_TXCLKN			1.8V
37	HDMI_TXCLKP			1.8V
38	HDMI_TX0N			1.8V
39	HDMI_TX0P			1.8V
40	HDMI_TX1N			1.8V
41	HDMI_TX1P			1.8V
42	HDMI_TX2N			1.8V
43	HDMI_TX2P			1.8V
44	MIPI_CSI_RX_CLK1N	MIPI CSI1 CLKN		1.8V
45	MIPI_CSI_RX_CLK1P	MIPI CSI1 CLKP		1.8V



Pin	Signal	Description or functions	GPIO serial	IO Voltage
	K1P			
46	MIPI_CSI_RX_D3 N	CSI0 RXD3N or CSI1 RXD1N		1.8V
47	MIPI_CSI_RX_D3 P	CSI0 RXD3P or CSI1 RXD1P		1.8V
48	MIPI_CSI_RX_D2 N	CSI0 RXD2N or CSI1 RXD0N		1.8V
49	MIPI_CSI_RX_D2 P	CSI0 RXD2P or CSI1 RXD0P		1.8V
50	MIPI_CSI_RX_D1 P	CSI0 RXD1P		1.8V
51	MIPI_CSI_RX_D1 N	CSI0 RXD1N		1.8V
52	MIPI_CSI_RX_D0 N	CSI0 RXD0N		1.8V
53	MIPI_CSI_RX_D0 P	CSI0 RXD0P		1.8V
54	MIPI_CSI_RX_CL K0N	MIPI CSI0 CLKN		1.8V
55	MIPI_CSI_RX_CL K0P	MIPI CSI0 CLKP		1.8V
56	GND	Ground		0V
57	PWM5		GPIO0_C4_d	3.3V
58	LCD_BL_PWM	PWM4	GPIO0_C3_d	3.3V
59	PWM3_IR		GPIO0_C2_d	3.3V
60	PCIE20_SATA2_R XP	PCIE or SATA2 RXP		1.8V
61	PCIE20_SATA2_R XN	PCIE or SATA2 RXN		1.8V
62	PCIE20_SATA2_T XN	PCIE or SATA2 TXN		1.8V
63	PCIE20_SATA2_T XP	PCIE or SATA2 TXP		1.8V
64	PCIE20_REFCLKP			1.8V
65	PCIE20_REFCLKN			1.8V
66	USB3_HOST1_SS TXP	USB3.0 or SATA1 TXP		1.8V
67	USB3_HOST1_SS TXN	USB3.0 or SATA1 TXN		1.8V
68	USB3_HOST1_SS RXP	USB3.0 or SATA1 RXN		1.8V
69	USB3_HOST1_SS	USB3.0 or SATA1 RXP		1.8V



Pin	Signal	Description or functions	GPIO serial	IO Voltage
	RXN			
70	USB_OTG0_DM			1.8V
71	USB_OTG0_DP			1.8V
72	USB3_HOST1_DP			1.8V
73	USB3_HOST1_DM			1.8V
74	EDP_TX_D2N			1.8V
75	EDP_TX_D2P			1.8V
76	EDP_TX_D1N			1.8V
77	EDP_TX_D1P			1.8V
78	EDP_TX_D0N			1.8V
79	EDP_TX_D0P			1.8V
80	EDP_TX_D3N			1.8V
81	EDP_TX_D3P			1.8V
82	EDP_TX_AUXN			1.8V
83	EDP_TX_AUXP			1.8V
84	SDMMC0_DET_L		GPIO0_A4_u	3.3V
85	SDMMC0_CLK	UART5_TX_M0	GPIO2_A2_d	3.3V
86	GND	Ground		0V
87	SDMMC0_CMD	UART5_RX_M0	GPIO2_A1_u	3.3V
88	SDMMC0_D3	UART5_RTSn_M0	GPIO2_A0_u	3.3V
89	SDMMC0_D2	UART5_CTSn_M0	GPIO1_D7_u	3.3V
90	SDMMC0_D1	UART6_RX_M1	GPIO1_D6_u	3.3V
91	SDMMC0_D0	UART6_TX_M1	GPIO1_D5_u	3.3V
92	USB_OTG0_ID			3.3V
93	USB_OTG0_VBUS DET	USB OTG VBUS input		3.3V
94	UART1_RX_M0		GPIO2_B3_u	1.8V
95	UART1_TX_M0		GPIO2_B4_u	1.8V
96	UART1_RTSn_M0		GPIO2_B5_u	1.8V
97	UART1_CTSn_M0		GPIO2_B6_u	1.8V
98	<u>BT_REG_ON_H</u>	I2S2_SCLK_RX_M0	GPIO2_B7_d	1.8V
99	BT_WAKE_HOST_ H	I2S2_LRCLK_RX_M0	GPIO2_C0_d	1.8V
100	HOST_WAKE_BT_ H	I2S2_MCLK_M0	GPIO2_C1_d	1.8V
101	<u>WIFI_WAKE_HOS T_H</u>	I2C4_SCL_M1	GPIO2_B2_d	1.8V
102	<u>WIFI_REG_ON_H</u>	UART8_RX_M0	GPIO2_C6_d	1.8V
103	I2S2_SCLK_TX_M 0	SPI2_MISO_M0	GPIO2_C2_d	1.8V
104	I2S2_LRCK_TX_M 0	SPI2_MOSI_M0	GPIO2_C3_d	1.8V



Pin	Signal	Description or functions	GPIO serial	IO Voltage
105	I2S2_SDO_M0	SPI2_CS0_M0	GPIO2_C4_d	1.8V
106	I2S2_SDI_M0	UART8_TX_M0	GPIO2_C5_d	1.8V
107	SDMMC1_D3	UART7_TX_M0	GPIO2_A6_u	1.8V
108	SDMMC1_D2	UART7_RX_M0	GPIO2_A5_u	1.8V
109	SDMMC1_D1	UART6_TX_M0	GPIO2_A4_u	1.8V
110	SDMMC1_D0	UART6_RX_M0	GPIO2_A3_u	1.8V
111	SDMMC1_CMD	UART9_RX_M0	GPIO2_A7_u	1.8V
112	SDMMC1_CLK	UART9_TX_M0	GPIO2_B0_d	1.8V
113	GND	Ground		0V
114	SARADC_VIN3			1.8V
115	SARADC_VIN2_H P_HOOK			1.8V
116	SARADC_VIN0_K EY/RECOVERY	Pull up 10K onboard		1.8V
117	GND	Ground		0V
118	PCIE20_PERSTn_ M2	PDM_SDI1_M0	GPIO1_B2_d	3.3V
119	PCIE20_WAKEn_ M2	PDM_SDI2_M0	GPIO1_B1_d	3.3V
120	PCIE20_CLKREQn_ M2	PDM_SDI3_M0	GPIO1_B0_d	3.3V
121	UART3_RX_M0	AudioPWM_LOUT_P/I2C3_S A_M0	GPIO1_A0_u	3.3V
122	UART3_TX_M0	AudioPWM_LOUT_N/I2C3_S CL_M0	GPIO1_A1_u	3.3V
123	UART4_RX_M0	PDM_CLK1_M0/SPDIF_TX_M 0	GPIO1_A4_d	3.3V
124	UART4_TX_M0	AudioPWM_ROUT_P /PDM_CLK0_M0	GPIO1_A6_d	3.3V
125	I2S1_LRCK_TX_M 0_PMIC		GPIO1_A5_d	3.3V
126	I2S1_SDI0_M0/PD M_SDI0_M0_PMIC	PDM_SDI0_M0	GPIO1_B3_d	3.3V
127	I2S1_SCLK_TX_M 0_PMIC	UART3_CTSn_M0	GPIO1_A3_d	3.3V
128	I2S1_SDO0_M0_P MIC	AudioPWM_ROUT_N/UART4_ CTSn_M0	GPIO1_A7_d	3.3V
129	I2S1_MCLK_M0_P MIC	UART3_RTSn_M0	GPIO1_A2_d	3.3V
130	GND	Ground		0V
131	SPI0_CS0_M0	PWM7	GPIO0_C6_d	3.3V
132	SPI0_MISO_M0	PWM6	GPIO0_C5_d	3.3V



Pin	Signal	Description or functions	GPIO serial	IO Voltage
133	SPI0_MOSI_M0	I2C2_SDA_M0	GPIO0_B6_u	3.3V
134	SPI0_CLK_M0	I2C2_SCL_M0	GPIO0_B5_u	3.3V
135	SPI3_CS0_M1	I2S3_SDI_M1	GPIO4_C6_d	3.3V
136	SPI3_MISO_M1	I2S3_SDO_M1	GPIO4_C5_d	3.3V
137	SPI3_MOSI_M1	I2S3_SCLK_M1	GPIO4_C3_d	3.3V
138	SPI3_CLK_M1	I2S3_MCLK_M1	GPIO4_C2_d	3.3V
139	LCD_PWREN_H		GPIO0_C7_d	3.3V
140	PWM0_M0		GPIO0_B7_d	3.3V
141	UART5_RX_M1		GPIO3_C3_d	3.3V
142	UART5_TX_M1		GPIO3_C2_d	3.3V
143	UART2DBG_RX	UART2 for Debug	GPIO0_D0_u	3.3V
144	UART2DBG_TX	UART2 for Debug	GPIO0_D1_u	3.3V
145	SPDIF_TX_M2	I2S3_LRCK_M1/EDP_HPDI M0	GPIO4_C4_d	3.3V
146	GPIO0_A6_d			3.3V
147	GPIO0_A3_u			3.3V
148	GPIO0_A0_d			3.3V
149	CAMERAF_RST_L	CAM_CLKOUT1	GPIO4_B0_d	1.8V
150	CAMERAB_RST_L		GPIO4_B1_d	1.8V
151	<u>CIF_8BIT_D7</u>	CIF_D15	GPIO4_A5_d	1.8V
152	<u>CIF_8BIT_D6</u>	CIF_D14	GPIO4_A4_d	1.8V
153	<u>CIF_8BIT_D5</u>	CIF_D13	GPIO4_A3_d	1.8V
154	<u>CIF_8BIT_D4</u>	CIF_D12	GPIO4_A2_d	1.8V
155	<u>CIF_8BIT_D3</u>	CIF_D11	GPIO4_A1_d	1.8V
156	<u>CIF_8BIT_D2</u>	CIF_D10	GPIO4_A0_d	1.8V
157	<u>CIF_8BIT_D1</u>	CIF_D9	GPIO3_D7_d	1.8V
158	<u>CIF_8BIT_D0</u>	CIF_D8	GPIO3_D6_d	1.8V
159	GND	Ground		0V
160	USB2_HOST2_DM	HOST2_DM		1.8V
161	USB2_HOST2_DP	HOST2_DP		1.8V
162	USB2_HOST3_DP	HOST3_DP		1.8V
163	USB2_HOST3_DM	HOST3_DM		1.8V
164	<u>CIF_8BIT_VSYNC</u>		GPIO4_B7_d	1.8V
165	<u>CIF_8BIT_HREF</u>		GPIO4_B6_d	1.8V
166	<u>CIF_8BIT_CLKIN</u>		GPIO4_C1_d	1.8V
167	GND	Ground		0V
168	CIF_CLKOUT		GPIO4_C0_d	1.8V
169	VOP- BT656_D7_M1	CIF_D7	GPIO3_D5_d	1.8V
170	VOP- BT656_D6_M1	CIF_D6	GPIO3_D4_d	1.8V
171	VOP-	CIF_D5	GPIO3_D3_d	1.8V



Pin	Signal	Description or functions	GPIO serial	IO Voltage
	BT656_D5_M1			
172	VOP- BT656_D4_M1	CIF_D4	GPIO3_D2_d	1.8V
173	VOP- BT656_D3_M1	CIF_D3	GPIO3_D1_d	1.8V
174	VOP- BT656_D2_M1	CIF_D2	GPIO3_D0_d	1.8V
175	VOP- BT656_D1_M1	CIF_D1	GPIO3_C7_d	1.8V
176	VOP- BT656_D0_M1	CIF_D0	GPIO3_C6_d	1.8V
177	VOP_BT656_CLK_ M1		GPIO4_B4_d	1.8V
178	GPIO4_B5_d_1V8			1.8V
179	I2C4_SDA_M0_1V 8	Pull up 2.2K onboard	GPIO4_B2_d	1.8V
180	I2C4_SCL_M0_1V 8	Pull up 2.2K onboard	GPIO4_B3_d	1.8V
181	GND	Ground		0V
182	I2C1_SDA	Pull up 2.2K onboard	GPIO0_B4_u	3.3V
183	I2C1_SCL	Pull up 2.2K onboard	GPIO0_B3_u	3.3V
184	GPIO0_A5_d	PCIE20_CLKREQn_M0		3.3V
185	GMAC1_MDIO_M0		GPIO3_C5_d	3.3V
186	GMAC1_MDC_M0		GPIO3_C4_d	3.3V
<p>Note: <i>I2C1 can't be used for exclusive bus, Such as CTP. RGMII default is 3.3V IO, but can change to 1.8V.</i></p>				

2 Peripherals Introduction

2.1 Power (P1)

The DC JACK is 5.5 x 2.1mm, 3-pin plug Type. Typical 12V/3A DC adapter.



Pin	Signal	Description	Pin	Signal	Description
1	VCC12V_DCIN	Main power supply. DC 12V power in	2	GND	Ground
3	GND	Ground			

2.2 Audio I/O

Headphone (J7, 3.5mm jack)



The EM3566 adopts audio codec ES8388 to provide stereo audio output/input.

Feature

- Low power
- Integrated ADC and DAC
- IIS transfer audio data
- Stereo output, support recording

Pin	Signal	Description	Pin	Signal	Description
1	GND	Ground	2	HP_RO	Headphone amplifier output _Right channel
3	HP_LO	Headphone amplifier output _Left channel	4	PHE_DET	Headphone Detect
5	MIC2P	Single-end input for microphone			

2.3 HDMI OUT (J4)



EM3566 supports HDMI 2.0 transmitter with HDCP 1.4/2.2, up to 4K@60fps.

- HPD input analog comparator
- 13.5–600MHz input reference clock
- Up to 10-bit Deep Color modes
- Up to 18Gbps aggregate bandwidth
- Up to 1080p at 120Hz and 4kx2k at 60Hz HDTV display resolutions and up to QXGA graphic display resolutions
- 3-D video formats
- Link controller flexible interface with 30-, 60- or 120-bit SDR data access

Pin	Signal	Description	Pin	Signal	Description
1	HDMI_TX2P	HDMI data 2 pair	2	GND	Ground
3	HDMI_TX2N		4	HDMI_TX1P	HDMI data 1 pair
5	GND	Ground	6	HDMI_TX1N	
7	HDMI_TX0P	HDMI data 0 pair	8	GND	Ground
9	HDMI_TX0N		10	HDMI_TXCLKP	HDMI clock pair
11	GND	Ground	12	HDMI_TXCLKN	
13	HDMITX_CEC_M0	Consumer electronics control	14	NC	Not connect
15	HDMI_SCL	HDMI serial clock	16	HDMI_SDA	HDMI serial data
17	GND	Ground	18	HDMI_VCC	5V power supply
19	HDMI_TX_HPDIIN	Hot Plug Detect			

2.4 USB OTG (J29)



EM3566 OTG is a Micro USB2.0 port, it is used to download image and ADB transfer file.

Feature

- Compatible with USB OTG2.0 specification
- Supports USB 2.0 High Speed (480Mbps), Full Speed (12Mbps) and Low Speed (1.5Mbps) operation in host mode

- Supports USB 2.0 High Speed (480 Mbps) and Full Speed (12 Mbps) operation in peripheral mode.
- Hardware support for OTG signaling, session request protocol, and host negotiation protocol.

Pin	Signal	Description	Pin	Signal	Description
1	VCC_OTG	USB OTG Power	2	USB_OTG0DM	USB OTG0 data -
3	USB_OTG0DP	USB OTG0 data+	4	USB_OTG0ID	USB OTG0 ID indicator
5	GND	Ground			

2.5 USB HOST (P3, J6, J17)



EM3566 provides 4x USB2.0 - one dual-USB (P3) and two 4-pin connector (J6, J17).

The 4-ch USB HOST interfaces are extended by GL850G which is a fully compliant with the USB 2.0 hub specification and is designed to work with USB host as a high-speed hub. It is used to connect USB mouse, U disk, USB camera, and other USB devices. Support hot-plug.

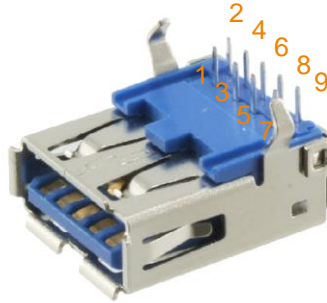
Feature

- Supports high-speed (480Mbps), full-speed (12Mbps) and low-speed (1.5Mbps) mode
- Supports automatic switching between bus- and self-powered modes
- Provides 16 host mode channels
- Support periodic out channel in host mode

P3 (dual-USB)					
Pin	Signal	Description	Pin	Signal	Description
1	VCC_USB	USB Power. DC 5V	2	USB_DM1	USB data-
3	USB_DP1	USB Data+	4	GND	Ground
5	VCC_USB	USB Power. DC 5V	6	USB_DM2	USB data-
7	USB_DP2	USB Data+	8	GND	Ground
J6 / J17 (4-pin connector)					
Pin	Signal	Description	Pin	Signal	Description
1	VDD5V0_HOST	5V power supply	2	USB_DM4(J6)/ USB_DM3(J17)	USB data-
3	USB_DP4(J6)/	USB Data+	4	GND	Ground

USB_DP3(J17)				
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2.6 USB3.0 (J25)



USB3.0(J25)					
Pin	Signal	Description	Pin	Signal	Description
1	VCC5V0_HOST1	USB Power. DC 5V	2	USB3_DM	USB data-
3	USB3_DP	USB Data+	4	GND	Ground
5	USB3_SSRXN	USB SSRX Data-	6	USB3_SSRXP	USB SSRX Data+
7	GND	Ground	8	USB3_SSTXN	USB SSTX Data-
9	USB3_SSTXP	USB SSTX Data+			

2.7 Ethernet (JP1)



EM3566 adopts RTL8211F as the Ethernet chip. RJ45 connector.

Feature

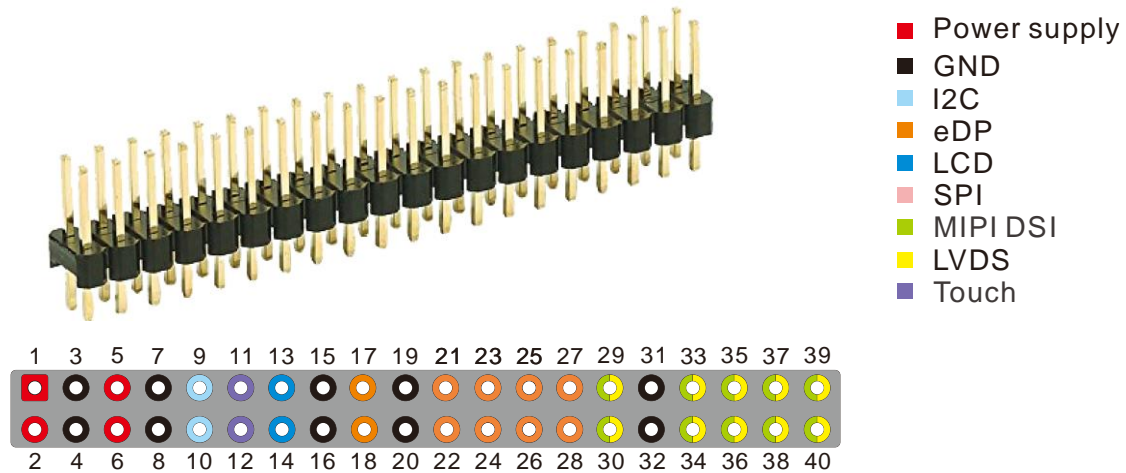
- Supports 10/100/1000 Mbps data transfer rates with the MII/RGMII interfaces
- Supports both full-duplex and half-duplex operation
- Implements the full 802.3 specification

Pin	Signal	Description	Pin	Signal	Description
1	DA+	Bi-directional transmit/receive pair A	2	DA-	Bi-directional transmit/receive pair A
3	DB+	Bi-directional transmit/receive pair B	4	DC+	Bi-directional transmit/receive pair C
5	DC-	Bi-directional transmit/receive pair C	6	DB-	Bi-directional transmit/receive pair B
7	DD+	Bi-directional	8	DD-	Bi-directional

		transmit/receive pair D			transmit/receive pair D
9	GND	Ground	10	GND	Ground
11	LED2/CFG_L DO1	LED2	12	GND	Ground
13	LED1/CFG_L DO0	LED1	14	GND	Ground

2.8 eDP/LVDS/MIPI Panel (CON1)

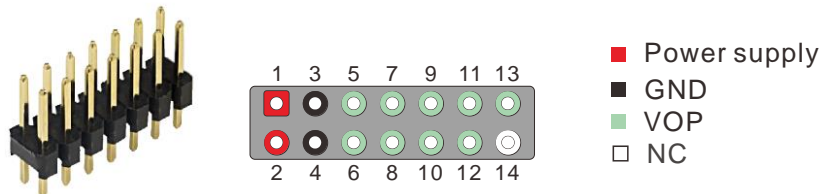
EM3566 supports 10.1-inch HD capacitive LCD, up to 1280 x 800 resolution.



Pin	Signal	Description	Pin	Signal	Description
1	VDD5V	5V power supply	2	VDD5V	5V power supply
3	GND	Ground	4	GND	Ground
5	VCC3V3_LCD	3.3V power supply	6	VCC3V3_LCD	3.3V power supply
7	GND	Ground	8	GND	Ground
9	I2C2_SCL_TP	TP I2C serial clock line	10	I2C2_SDA_TP	TP I2C data line
11	TOUCH_RST	Touch screen reset	12	TOUCH_INT	Touch screen Interrupt
13	LCD_PWREN_H	LCD Power enable high	14	LCD_BL_PWM	LCD Backlight PWM output
15	GND	Ground	16	GND	GND
17	EDP_TX_AUXP	eDP CH-AUX positive differential output	18	EDP_TX_AUXP	eDP CH-AUX negative differential output
19	GND	Ground	20	GND	Ground
21	EDP_TX_D3P	eDP data lane positive output	22	EDP_TX_D3N	eDP data lane negative output
23	EDP_TX_D2P	eDP data lane positive output	24	EDP_TX_D2N	eDP data lane negative output
25	EDP_TX_D1P	eDP data lane	26	EDP_TX_D1N	eDP data lane

		positive output			negative output
27	EDP_TX_D0P	eDP data lane positive output	28	EDP_TX_D0N	eDP data lane negative output
29	MIPI_DSI_TX0_CLKP/LVDS_TX0_CLKP	MIPI/LVDS clock positive	30	MIPI_DSI_TX0_CLKN/LVDS_TX0_CLKN	MIPI/LVDS clock negative
31	GND	Ground	32	GND	Ground
33	MIPI_DSI_TX0_D3P/LVDS_TX0_D3P	MIPI/LVDS data lane positive output	34	MIPI_DSI_TX0_D3N/LVDS_TX0_D3N	MIPI/LVDS data lane negative output
35	MIPI_DSI_TX0_D2P/LVDS_TX0_D2P	MIPI/LVDS data lane positive output	36	MIPI_DSI_TX0_D2N/LVDS_TX0_D2N	MIPI/LVDS data lane negative output
37	MIPI_DSI_TX0_D1P/LVDS_TX0_D1P	MIPI/LVDS data lane positive output	38	MIPI_DSI_TX0_D1N/LVDS_TX0_D1N	MIPI/LVDS data lane negative output
39	MIPI_DSI_TX0_D0P/LVDS_TX0_D0P	MIPI/LVDS data lane positive output	40	MIPI_DSI_TX0_D0N/LVDS_TX0_D0N	MIPI/LVDS data lane negative output

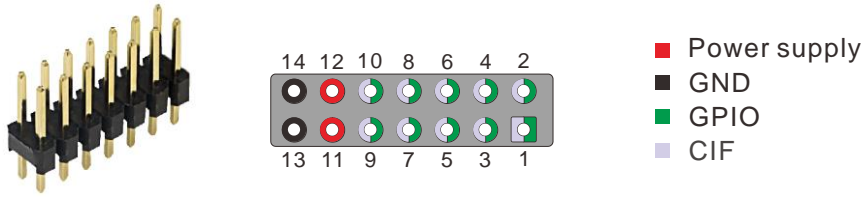
2.9 BT656 (J26)



J26 is used to connect MEMS module for Video output.

Pin	Signal	Description	Pin	Signal	Description
1	VCC3V3_SYS	3.3V power supply	2	VCC3V3_SYS	3.3V power supply
3	GND	Ground	4	GND	Ground
5	VOP_BT656_D0_M1	BT656 data	6	VOP_BT656_D1_M1	BT656 data
7	VOP_BT656_D2_M1	BT656 data	8	VOP_BT656_D3_M1	BT656 data
9	VOP_BT656_D4_M1	BT656 data	10	VOP_BT656_D5_M1	BT656 data
11	VOP_BT656_D6_M1	BT656 data	12	VOP_BT656_D7_M1	BT656 data
13	VOP_BT656_CLK_M1	BT656 clock	14	NC	Not connect

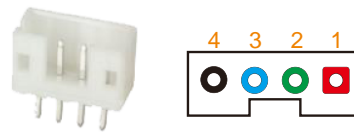
2.10 GPIO (CON4)



The GPIO is a 14-pin header connector. The pins can be defined as data input / output.

Pin	Signal	Description	Pin	Signal	Description
1	CIF_8BIT_CLKIN	CIF 8BIT clock/GPIO	2	CIF_8BIT_HREF	GPIO
3	CIF_8BIT_D7	CIF 8BIT data/GPIO	4	CIF_8BIT_D6	CIF 8BIT data/GPIO
5	CIF_8BIT_D5	CIF 8BIT data/GPIO	6	CIF_8BIT_D4	CIF 8BIT data/GPIO
7	CIF_8BIT_D3	CIF 8BIT data/GPIO	8	CIF_8BIT_D2	CIF 8BIT data/GPIO
9	CIF_8BIT_D1	CIF 8BIT data/GPIO	10	CIF_8BIT_D0	CIF 8BIT data/GPIO
11	VDDIO_18	1.8V IO voltage	12	VDDIO_18	1.8V IO voltage
13	GND	Ground	14	GND	Ground

2.11 ADC (J18)



4pin connector. It is used to connect the ADC device.

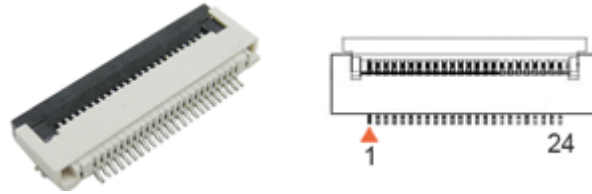
Pin	Signal	Description	Pin	Signal	Description
1	VDDIO_18	1.8V power supply	2	SARADC_VIN2_HP_HOOK	ADC signal
3	SARADC_VIN3	ADC signal	4	GND	Ground

2.12 MIPI Camera (J30, J31)

EM3566 features two 26-pin MIPI connectors for camera (OV13850).

Features

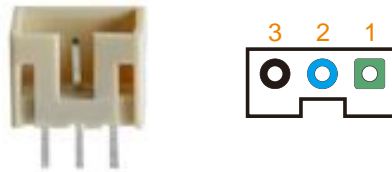
- Support 4 data lane, providing up to 6Gbps data rate
- Support 1080p@60fps output
- Lane operation ranging from 80 Mbps to 1.5Gbps in forward direction.



J30					
Pin	Signal	Description	Pin	Signal	Description
1	GND	Ground	2	GND	Ground
3	NC	Not connect	4	AF_2V8	AF 2.8V power supply
5	I2C4_SDA_M0_1V8	I2C data line	6	I2C4_SCL_M0_1V8	I2C clock line
7	NC	Not connect	8	AVDD2V8_DVP	DVP 2.8V power supply
9	CAMERAB_RST_L	Camera reset	10	CIF_8BIT_VSYNC	GPIO4_B7_d
11	GND	Ground	12	MIPI_CSI_RX_D3P	MIPI CSI positive differential data line transceiver output
13	MIPI_CSI_RX_D3N	MIPI CSI negative differential data line transceiver output	14	GND	Ground
15	MIPI_CSI_RX_D2P	MIPI CSI positive differential data line transceiver output	16	MIPI_CSI_RX_D2N	MIPI CSI negative differential data line transceiver output
17	GND	Ground	18	MIPI_CSI_RX_CLK1P	MIPI CSI positive differential data line transceiver output
19	MIPI_CSI_RX_CLK1N	MIPI CSI negative differential data line transceiver output	20	GND	Ground
21	DVDD1V2	VDD 1.2V	22	VCC1V8_DVP	VCC 1.8V
23	GND	Ground	24	MIPI_MCLK1	MIPI clock
J31					
Pin	Signal	Description	Pin	Signal	Description
1	GND	Ground	2	GND	Ground
3	NC	Not connect	4	AF_2V8	AF 2.8V power supply
5	I2C4_SDA_M0_1V8	I2C data line	6	I2C4_SCL_M0_1V8	I2C clock line
7	NC	Not connect	8	AVDD2V8_DVP	DVP 2.8V power supply
9	CAMERAF_RST_L	Camera reset	10	GPIO4_B5_d_1V8	GPIO
11	GND	Ground	12	MIPI_CSI_RX_D1P	MIPI CSI positive differential data line

					transceiver output
13	MIPI_CSI_RX_D1N	IMIPI CSI negative differential data line transceiver output	14	GND	Ground
15	MIPI_CSI_RX_D0P	MIPI CSI positive differential data line transceiver output	16	MIPI_CSI_RX_D0N	MIPI CSI negative differential data line transceiver output
17	GND	Ground	18	MIPI_CSI_RX_CLK0P	MIPI CSI positive differential data line transceiver output
19	MIPI_CSI_RX_CLK0N	MIPI CSI negative differential data line transceiver output	20	GND	Ground
21	DVDD1V2	VDD 1.2V	22	VCC1V8_DVP	VCC 1.8V
23	GND	Ground	24	MIPI_MCLK0	MIPI clock

2.13 IR (J24)



3-pin connector. It is used to connect the IR receiver.

Pin	Signal	Description	Pin	Signal	Description
1	VCC3V3_SYS	3.3V Power supply	2	PWM3_IR	IR in
3	GND	Ground			

2.14 UART (J10, J11, J12)

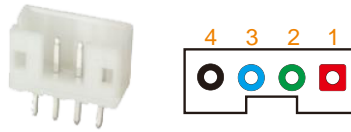
- UART2 with 2 wires for debug tools
- Embedded two 64byte FIFO
- Support auto flow control mode for UART1-5



The J10 is 3-pin connector. The debug serial port baud rate is 1500000.

Pin	Signal	Description	Pin	Signal	Description
1	UART2DBG_RX	Serial data input	2	UART2DBG_TX	Serial data output

3	GND	Ground	
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The J11 J12 used for RS232.

J11					
Pin	Signal	Description	Pin	Signal	Description
1	VCC3V3_SYS	3.3V power supply	2	UART4_TX_M0	Transmit Data
3	UART4_RX_M0	Receive Data	4	GND	Ground
J12					
Pin	Signal	Description	Pin	Signal	Description
1	VCC3V3_SYS	3.3V power supply	2	UART5_TX_M1	Transmit Data
3	UART5_RX_M1	Receive Data	4	GND	Ground

2.15 RS485 (J32, JP2)

SN75176B Differential bus transceiver.

- Bidirectional Transceivers
- $\pm 200\text{mV}$ Receiver Input Sensitivity
- 50mV Type Receiver Input Hysteresis



J32					
Pin	Signal	Description	Pin	Signal	Description
1	GND	Ground	2	RS485_B	RS-485 Data Line
3	RS485_A	RS-485 Data Line			



JP2					
Pin	Signal	Description	Pin	Signal	Description
1	RS485_A	RS-485 Data Line	2	RS485_B	RS-485 Data Line

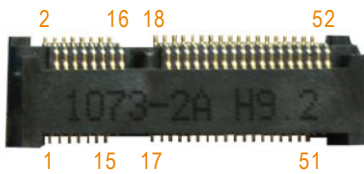
2.16 Button (K3)



Pin	Signal	Description	Pin	Signal	Description
1	GND	Ground	2	SARADC_VINO_KEY/RECOVERY	RECOVERY

2.17 4G Module (CON2, P4)

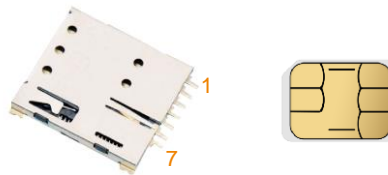
EM3566 adopts the standard PCI Express® MiniCard form factor (MiniPCIe) and provides global network coverage on the connectivity of 4G. It delivers 50Mbps-up and 100Mbps-down data rates on 4G FDD networks and can also be fully backward compatible with existing UMTS and GSM/GPRS networks.



CON2					
Pin	Signal	Description	Pin	Signal	Description
1	4G_OUT_P	Line output +	2	3GVCC	DC 3.3V
3	4G_OUT_N	Line output -	4	GND	Ground
5	MIC1P	MIC +	6	NC	Not connect
7	MIC1N	MIC -	8	SIM_VCC	SIM power
9	GND	Ground	10	SIM_DATA	SIM data
11	NC	Not connect	12	SIM_CLK	SIM Clock
13	NC	Not connect	14	SIM_RST	SIM Reset
15	GND	Ground	16	NC	Not connect
17	NC	Not connect	18	GND	Ground
19	NC	Not connect	20	3GVCC	DC 3.3V
21	GND	Ground	22	PERST	GPIO0_A0_d
23	NC	Not connect	24	3GVCC	DC 3.3V

25	NC	Not connect	26	GND	Ground
27	GND	Ground	28	NC	Not connect
29	GND	Ground	30	NC	Not connect
31	NC	Not connect	32	NC	Not connect
33	NC	Not connect	34	GND	Ground
35	GND	Ground	36	USB2_HOST2_DM	Host data DN
37	GND	Ground	38	USB2_HOST2_DP	Host data DP
39	3GVCC	DC 3.3V	40	GND	Ground
41	3GVCC	DC 3.3V	42	LED_WWAN	LED
43	GND	Ground	44	NC	Not connect
45	NC	Not connect	46	NC	Not connect
47	NC	Not connect	48	NC	Not connect
49	NC	Not connect	50	GND	Ground
51	NC	Not connect	52	3GVCC	DC 3.3V

P4 is an auto pop-up SIM card slot which is compatible to the standard SIM Card and can be used for wireless transmission with a 3G/4G module.



SIM Card slot (P4)					
Pin	Signal	Description	Pin	Signal	Description
1	SIM_CLK	Clock	2	SIM_DATA	send/receiver data I/O control
3	SIM_RST	Reset	4	SIM_VCC	SIM power supply
5	SIM_VCC	SIM power supply	6	GND	Ground
7	NC	Not connect			

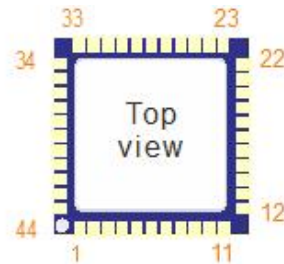
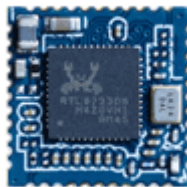
2.18 Micro SD (J3)

The Micro SD card is used as an external storage device. The MMC controller interface supports up to 4-bit transfer modes. MMC is always accessible through the carrier board interface.



Pin	Signal	Description	Pin	Signal	Description
1	SDMMC0_D2	SD/MMC data2	2	SDMMC0_D3	SD/MMC data3
3	SDMMC0_CMD	SD/MMC command signal	4	VCC3V3_SD	3.3V
5	SDMMC0_CLK	SD/MMC clock	6	GND	Ground
7	SDMMC0_D0	SD/MMC data0	8	SDMMC0_D1	SD/MMC data1
9	SDMMC0_DET_L	SD/MMC detect signal			

2.19 WiFi&Bluetooth (U20)



The Realtek RTL8723DS is a low-power consumption module which has incorporated Wi-Fi and Bluetooth into one chip. The integrated module provides SDIO interface for WiFi, UART / PCM for Bluetooth.

- The WIFI throughput can go up to 150Mbps in theory by using 1x1 802.11n b/g/n MIMO
- Full-featured software utility for easy configuration and management
- RTL8723DS with shared antenna between WLAN and Bluetooth

RTL8723BS Module Specifications

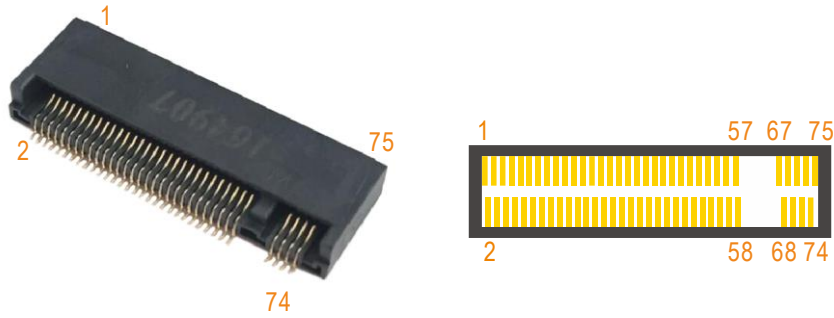
Standard	WiFi: IEEE 802.11b/g/n BT: V2.1+EDR/BT v3.0+BT LE4.2
Host Interface	SDIO 2.0 and UART
Frequency Range	2.4GHz~2.4835GHz
Power Consumption	DC 3.3±0.2V(main power and VDIO power) @ 350 mA (Max)
Dimension	12x12x1.6mm
Working Temp.	-10°C to +70°C
Power supply	DC 3.3V (±0.2V)

Pin	Signal	Description	Pin	Signal	Description
1	GND	Ground	2	WL_BT_ANT	RF I/O (Connect to IPEX)
3	GND	Ground	4	NC	Not connect
5	NC	Not connect	6	HOST_WAKE_B T_H	HOST wake-up Bluetooth device
7	BT_WAKE_HO	Bluetooth device to	8	NC	Not connect

	ST_H	wake-up HOST			
9	VBAT_WL	3.3V power supply	10	XTAL_IN	Crystal input(NC)
11	XTAL_OUT	Crystal output(NC)	12	WIFI_REG_ON_H	Internal regulators power enable/disable
13	WIFI_WAKE_HOST_H	WLAN to wake-up HOST	14	WIFI_D2	WiFi data
15	WIFI_D3	WiFi data	16	WIFI_CMD	WiFi command
17	WIFI_CLK	WiFi clock	18	WIFI_D0	WiFi data
19	WIFI_D1	WiFi data	20	GND	Ground
21	VIN_LDO_OUT	Internal Buck voltage generation pin	22	VCCIO_WL	1.8 V power supply
23	VIN_LDO	Internal Buck voltage generation pin	24	PMIC_32KOUT_SOC	LPO
25	I2S2_SDI_M0	PCM Data output	26	I2S2_LRCK_TX_M0	PCM clock
27	I2S2_SDO_M0	PCM data input	28	I2S2_SCLK_TX_M0	PCM sync signal
29	NC	Not connect	30	TCXO_IN	NC
31	GND	Ground	32	NC	Not connect
33	GND	Ground	34	BT_REG_ON_H	Enable PIN for WLAN Device ON: Pull high
35	NC	Not connect	36	GND	Ground
37	NC	Not connect	38	NC	Not connect
39	NC	Not connect	40	NC	Not connect
41	UART1_CTSn_M0	Bluetooth UART interface	42	UART1_RX_M0	Bluetooth UART interface
43	UART1_TX_M0	Bluetooth UART interface	44	UART1_RTsn_M0	Bluetooth UART interface

2.20 SSD (CON3)

M.2 M key socket (PCIe) for NVMe SSD.



PCIe (for SSD module)					
Pin	Signal	Description	Pin	Signal	Description
1	GND	Ground	2	PCIE_3V3	3.3V power supply
3	GND	Ground	4	PCIE_3V3	3.3V power supply
5	NC	Not connect	6	NC	Not connect
7	NC	Not connect	8	NC	Not connect
9	GND	Ground	10	DAS	PCIE DAS
11	NC	Not connect	12	PCIE_3V3	3.3V power supply
13	NC	Not connect	14	PCIE_3V3	3.3V power supply
15	GND	Ground	16	PCIE_3V3	3.3V power supply
17	NC	Not connect	18	PCIE_3V3	3.3V power supply
19	NC	Not connect	20	NC	Not connect
21	GND	Ground	22	NC	Not connect
23	NC	Not connect	24	NC	Not connect
25	NC	Not connect	26	NC	Not connect
27	GND	Ground	28	NC	Not connect
29	NC	Not connect	30	NC	Not connect
31	NC	Not connect	32	NC	Not connect
33	GND	Ground	34	NC	Not connect
35	NC	Not connect	36	NC	Not connect
37	NC	Not connect	38	PCIE_DEVSLP	PCIE Device Sleep
39	GND	Ground	40	NC	Not connect
41	PCIE20_SATA2_RXN	PCle RX -	42	NC	Not connect
43	PCIE20_SATA2_RXP	PCle RX +	44	NC	Not connect
45	GND	Ground	46	NC	Not connect
47	SATA2_TXN	PCle TX -	48	NC	Not connect
49	SATA2_TXP	PCle TX +	50	PCIE20_RESETn_M2	PCle reset
51	GND	Ground	52	PCIE20_CLKREQn_M2	Clock Request

53	PCIE20_REFCLKN	PCIe Reference Clock signals -	54	PCIE20_WAKEn_M2	PCIe PME Wake
55	PCIE20_REFCLKP	PCIe Reference Clock signals +	56	NC	Not connect
57	GND	Ground	58	NC	Not connect
67	NC	Not connect	68	PMIC_32KOUT_SOC	Suspend Clock (32KHz)
69	NC	Not connect	70	PCIE_3V3	3.3V power supply
71	GND	Ground	72	PCIE_3V3	3.3V power supply
73	GND	Ground	74	PCIE_3V3	3.3V power supply
75	GND	Ground			

2.21 RTC (BT1)



The backup battery (3V) is used to ensure the RTC (frequency 32.768KHz) is still able to work after power off. Lithium cell model: CR1220.

Pin	Signal	Description	Pin	Signal	Description
1	VBuck	3V battery	2	GND	Ground

3 Product Configurations

3.1 Standard Contents

NO.	Item	Qty. (PCS)	Description
1	EM3566 board	1	Standard Content (2GB RAM, 8GB eMMC)
2	TF card / CD-ROM	1	Android/ Debian/ Buildroot BSP, Documents, tools, Schematic Drawing, datasheets
3	Ethernet cable	1	1.5m Crossover cable
4	Serial Cable	1	CH9102X
5	USB Cable	1	USB OTG
6	Power adaptor	1	12V/3A DC

3.2 Optional Parts

- MIPI camera Module (OV13850)
- LCD Module (10.1-inch MIPI panel, 10.1-inch LVDS panel, 7-inch LVDS panel)
- 4G Module
- SSD