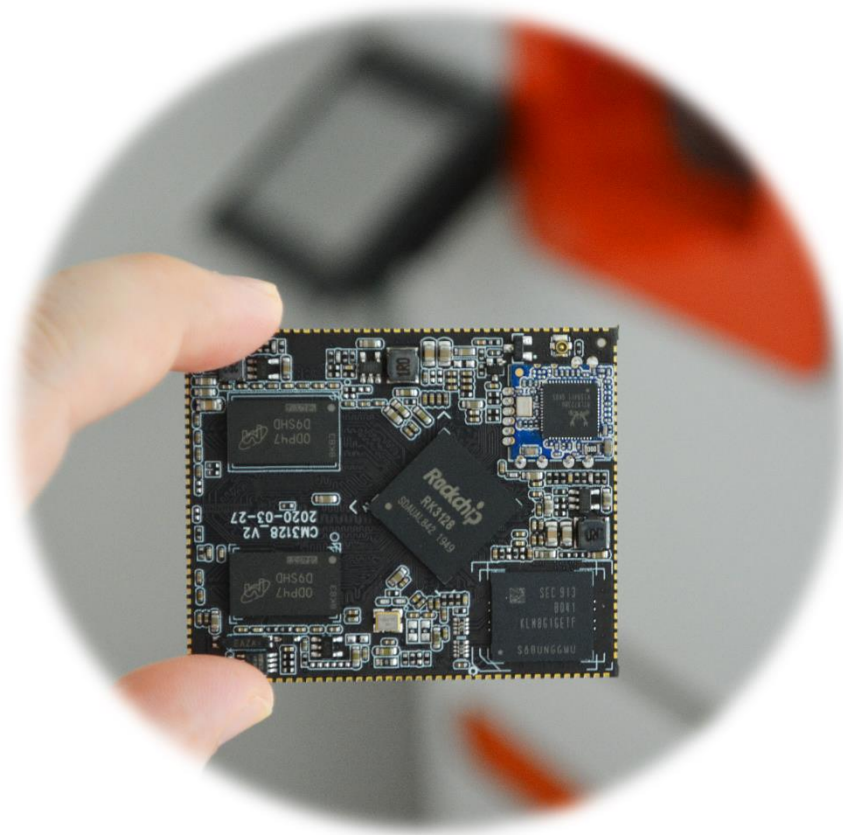


CM3128 Reference User Manual

V2. 202107



Boardcon Embedded Design

www.armdesigner.com

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 lighting 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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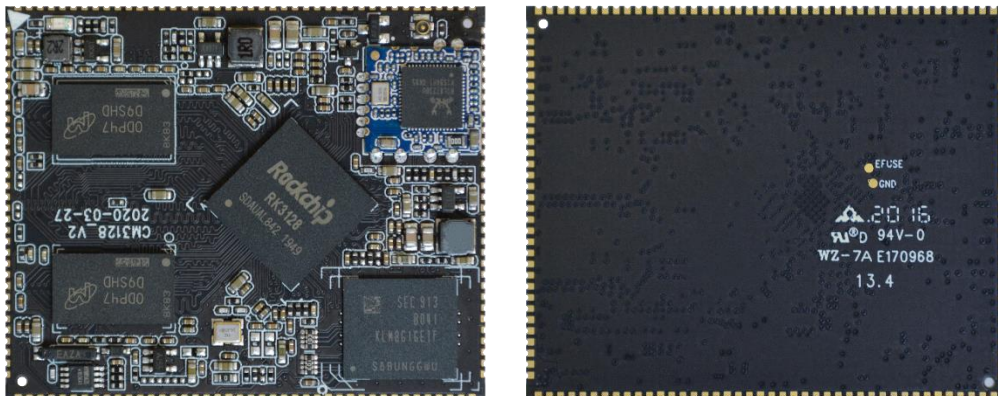


1 CM3128 Introduction

1.1 Summary

The CM3128 system-on-module is equipped with Rockchip's RK3128 it has quad-core Cortex-A7, Mali400 MP2 GPU. WIFI/BT module on board.

It is designed specifically for the smart devices such as industrial controller, IoT devices, intelligent interactive devices, TV-box and robots. The high performance and low-cost solution can help customers to introduce new technologies more quickly and enhance the overall solution efficiency.



1.2 Features

- **Microprocessor**
 - Quad-core Cortex-A7 up to 1.2G
 - 32KB I-cache and 32KB D-cache for each core, 256KB L2 cache
 - Mali 400 MP2 up to 0.7G
- **Memory Organization**
 - DDR3 RAM up to 1GB
 - eMMC up to 32GB
- **Boot ROM**
 - Supports system code download through USB OTG or SD
- **Trust Execution Environment system**
 - Supports secure OTP and multiple cipher engine
- **Video Decoder/Encoder**
 - Supports video decoding up to 1080P@60fps
 - Supports H.264 encode
 - H.264 HP encoding up to 1080@25fps
 - Picture size up to 8192x8192
- **Display Subsystem**
 - **Video Output**
 - Supports HDMI 1.4, up to 1080p@60fps



Supports 4 lanes MIPI DSI up to 1280x720

Or LVDS interface up to 1280x720

Or RGB 24bit up to 1024x768

Supports 1 CVBS 480i/576i

- **Image in**

Supports up to 8bit DVP interface

Supports MIPI CSI 4lanes interface

Or 2ch MIPI CSI 2lanes interfaces

Supports TS input

• **Audio Subsystem**

- I2S/PCM interface

- Support 2-CH Mic in and stereo line in.

-Support Mono Speaker and stereo line out.

- One SPDIF output

• **USB interface**

- One USB 2.0 OTG, and one 2.0 USB hosts

• **Ethernet**

- GMAC/EMAC

- Support 10/100/1000Mbit/s data transfer rates

- Support MII/RGMII PHY interface

• **I2C**

- Up to Four I2C

- Support standard mode and fast mode(up to 400kbit/s)

• **SDIO**

- Support SDIO 3.0 protocol

• **SMART Card**

- Support card activation and deactivation

-Support cold/warm reset

• **SPI**

- Full-duplex synchronous serial interface

• **UART**

- Support up to 3-CH UARTs

- UART2 with 2 wires for debug tools

- Embedded two 64byte FIFO

• **ADC**

- Up to Three ADC channels

- 10-bit resolution

- Voltage input range between 0V to 3.3V

- Sample rate Fs is 200KHz

• **PWM0**

- Support 32bit time/counter facility

• **Power unit**

- Discrete Power on board

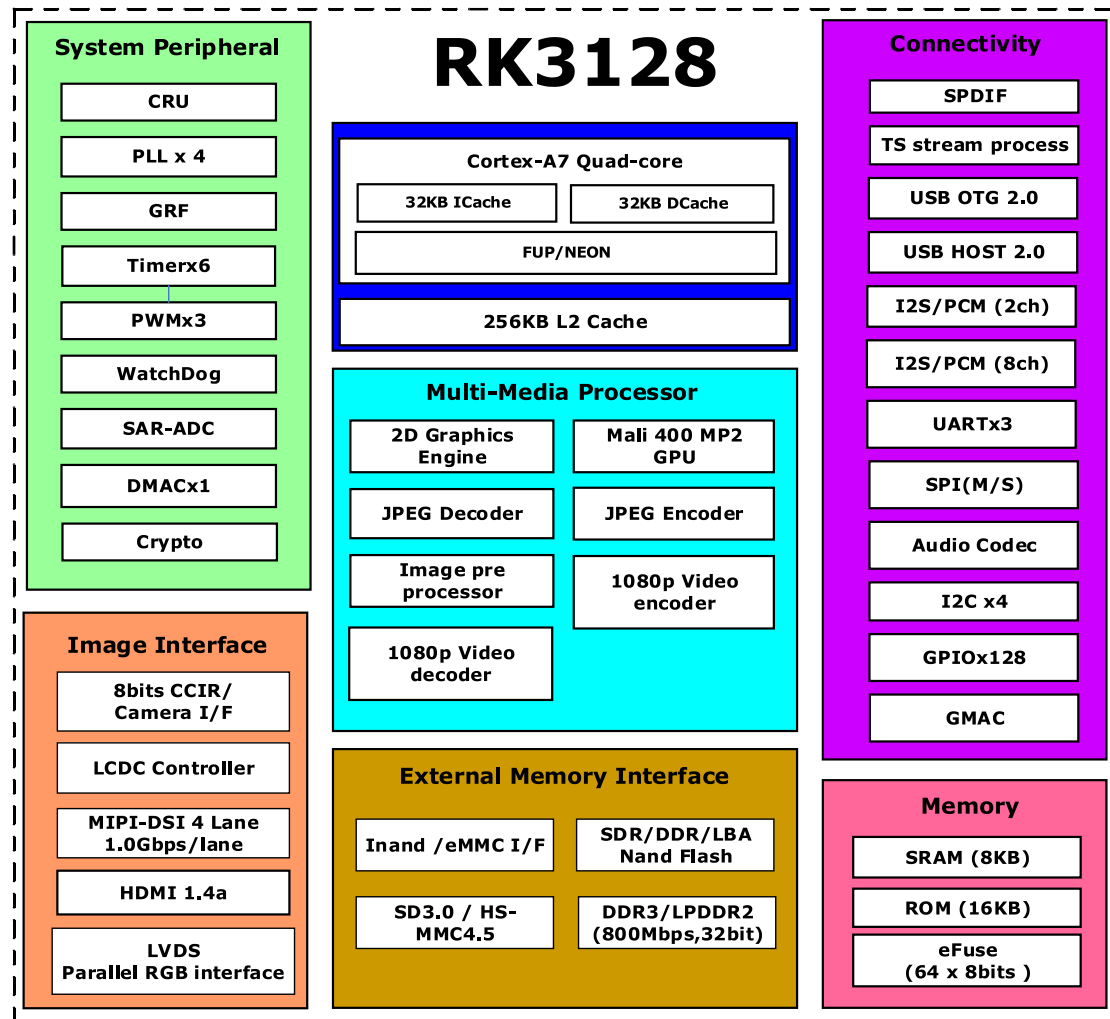
- Single 3.3V input



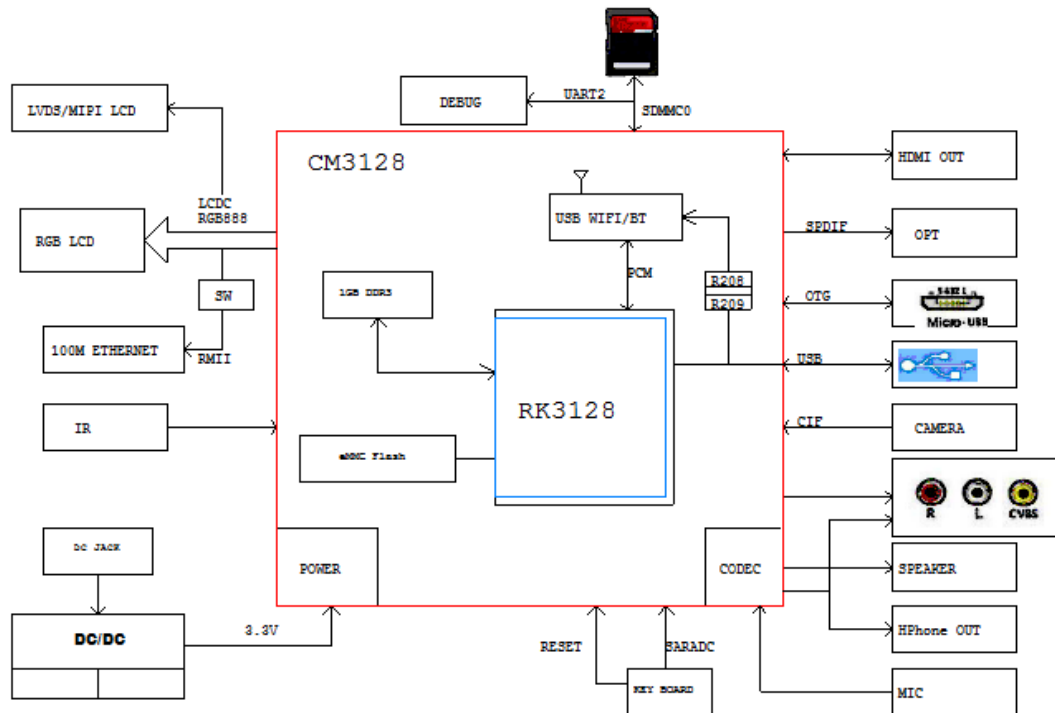
- Very low RTC consume current, less 5uA at 3V button Cell
- **Temperature**
 - Industrial grade, Operating temperature: -20 - 85°C

1.3 CM3128 Block Diagram

1.3.1 RK3128 Block Diagram



1.3.2 Development board (EM3128) Block Diagram



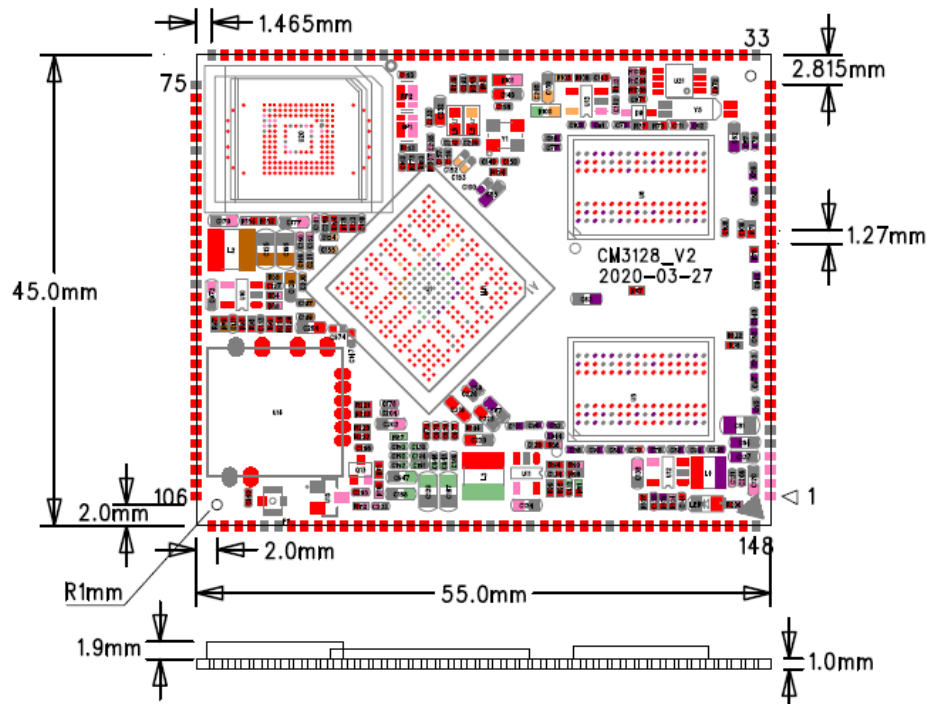
1.4 CM3128 Specifications

Feature	Specifications
CPU	Quad-core Cortex-A7
DDR	512MB/1GB
eMMC FLASH	4GB (up to 32GB)
Power	DC 3.3V
WIFI/BT Module	RTL8723BU or RTL8188ETV
LVDS/MIPI DSI	4-Lane
I2S	1-CH
HDMI out	1-CH
Camera	1-CH(DVP)
USB	1-CH (HOST2.0) (WiFi/BT module used), 1-CH(OTG 2.0)
Ethernet	1000M RGMII
SDMMC	2-CH
SMART Card	1-CH
SPDIF TX	1-CH
I2C	4-CH
SPI	1-CH
UART	3-CH, 1-CH(DEBUG)



PWM	1-CH
ADC IN	3-CH
Board Dimension	44 x 55mm

1.5 CM3128 PCB Dimension



1.6 CM3128 Pin Definition

Pin	Signal	Description or functions	GPIO serial	IO Voltage
1	VCC_IO	3.3V Main Power input		3.3V
2	VCC_IO	3.3V Main Power input		3.3V
3	VCC_IO	3.3V Main Power input		3.3V
4	VCC_IO	3.3V Main Power input		3.3V
5	GND	Ground		0V
6	GND	Ground		0V
7	GPIO2_A3			3.3V
8	GPIO2_A4			3.3V
9	GPIO1_C6			3.3V
10	GPIO2_A0			3.3V
11	GPIO1_B6	SDMMC0_PWR		3.3V



Pin	Signal	Description or functions	GPIO serial	IO Voltage
12	GPIO3_C7			3.3V
13	GPIO3_C4			3.3V
14	GPIO0_A2	I2C1_SCL		3.3V
15	GPIO0_D6	SDMMC1_PWR		3.3V
16	GPIO0_D0	UART2_RTSn		3.3V
17	GPIO0_D1	UART2_CTSn		3.3V
18	GPIO3_C5			3.3V
19	GPIO3_C6			3.3V
20	HDMI_CEC		GPIO0_C4_u	3.3V
21	HDMI_HPD		GPIO0_B7_d	3.3V
22	I2C0_SCL	Pull up 10K	GPIO0_A0_u	3.3V
23	I2C0_SDA	Pull up 10K	GPIO0_A1_u	3.3V
24	GND	Ground		0V
25	ADCIN0			3.3V
26	ADCIN2			3.3V
27	RECOVER	Pull up 10K	ADCIN1	3.3V
28	GND	Ground		0V
29	OTG_ID	Pull up 10K		3.3V
30	OTG_DET			3.3V
31	RTC	RTC button Cell Power input		3.0V-1.8V
32	32.768KHz	RTC clock(32.768khz) output		3.3V
33	GND	Ground		0V
34	PHY_RST	LCDC_D22/GPS_CLK	GPIO2_D0_d	3.3V
35	PHY_TXD3	LCDC_D21/GPS_MAG	GPIO2_C7_d	3.3V
36	PHY_TXD2	LCDC_D20/GPS_SIGN	GPIO2_C6_d	3.3V
37	MAC_RXD3	LCDC_D18/I2C2_SDA	GPIO2_C4_d	3.3V
38	MAC_RXD2	LCDC_D19/I2C2_SCL	GPIO2_C5_d	3.3V
39	MAC_CSR_DV	LCDC_CLK/	GPIO2_B0_d	3.3V
40	PHY_PMEB	LCDC_VSYNC	GPIO2_B2_d	3.3V
41	PHY_INT	LCDC_D13	GPIO2_B7_d	3.3V
42	MAC_MDC	LCDC_D23	GPIO2_D1_d	3.3V
43	PHY_TXD1	LCDC_D16	GPIO2_C2_d	3.3V
44	PHY_TXD0	LCDC_D17	GPIO2_C3_d	3.3V
45	MAC_RXD1	LCDC_D14	GPIO2_C0_d	3.3V
46	MAC_RXD0	LCDC_D15	GPIO2_C1_d	3.3V
47	MAC_RXCLK	LCDC_DEN	GPIO2_B3_d	3.3V
48	MAC_CLK	LCDC_D12	GPIO2_B6_d	3.3V
49	PHY_TXEN	LCDC_D11	GPIO2_B5_d	3.3V
50	MAC_MDIO	LCDC_D10	GPIO2_B4_d	3.3V
51	PHY_TXCLK	LCDC_HSYNC	GPIO2_B1_d	3.3V
52	GND	Ground		0V
53	TX_C-	HDMI OUT TXC-		1.8V



Pin	Signal	Description or functions	GPIO serial	IO Voltage
54	TX_C+	HDMI OUT TXC+		1.8V
55	TX_0-	HDMI OUT TX0-		1.8V
56	TX_0+	HDMI OUT TX0+		1.8V
57	TX_1-	HDMI OUT TX1-		1.8V
58	TX_1+	HDMI OUT TX1+		1.8V
59	TX_2-	HDMI OUT TX2-		1.8V
60	TX_2+	HDMI OUT TX2+		1.8V
61	GND	Ground		0V
62	VDAC_OUTP	CVBS OUT		1.8V
63	GND	Ground		0V
64	LVDS_CLKN/MIPI_CLKN	LCDC_D9		1.8V/3.3V
65	LVDS_CLKP/MIPI_CLKP	LCDC_D8		1.8V/3.3V
66	LVDS_TX3N/MIPI_D3N	LCDC_D7		1.8V/3.3V
67	LVDS_TX3P/MIPI_D3P	LCDC_D6		1.8V/3.3V
68	LVDS_TX2N/MIPI_D2N	LCDC_D5		1.8V/3.3V
69	LVDS_TX2P/MIPI_D2P	LCDC_D4		1.8V/3.3V
70	LVDS_TX1N/MIPI_D1N	LCDC_D3		1.8V/3.3V
71	LVDS_TX1P/MIPI_D1P	LCDC_D2		1.8V/3.3V
72	LVDS_TX0N/MIPI_D0N	LCDC_D1		1.8V/3.3V
73	LVDS_TX0P/MIPI_D0P	LCDC_D0		1.8V/3.3V
74	GND	Ground		0V
75	GND	Ground		0V
76	GPIO3_C1			3.3V
77	GPIO3_D3	SPDIF_OUT		3.3V
78	OTG_DM			3.3V
79	OTG_DP			3.3V
80	GND	Ground		0V
81	CIF_CLKOUT	TS_CLKO		3.3V
82	CIF_D0	TS_D0		3.3V
83	CIF_D1	TS_D1		3.3V
84	CIF_D2	TS_D2		3.3V
85	CIF_D3	TS_D3		3.3V



Pin	Signal	Description or functions	GPIO serial	IO Voltage
86	CIF_D4	TS_D4		3.3V
87	CIF_D5	TS_D5		3.3V
88	CIF_D6	TS_D6		3.3V
89	CIF_D7	TS_D7		3.3V
90	GND	Ground		0V
91	HOST_DP	Can use If no WIFI/BT module.		3.3V
92	HOST_DM	Can use If no WIFI/BT module.		3.3V
93	CIF_HREF	TS_FAIL		3.3V
94	CIF_PDN1		GPIO3_B3_u	3.3V
95	CIF_CLKI	TS_VALID		3.3V
96	CIF_VSYNC	TS_VSYNC		3.3V
97	CIF_PDN0		GPIO3_D7_d	3.3V
98	IR_RX		GPIO3_D2_u	3.3V
99	PWM0		GPIO0_D2_d	3.3V
100	HDMI_DSCK	I2C3_SCL	GPIO0_A6_u	3.3V
101	HDMI_DSDA	I2C3_SDA	GPIO0_A7_u	3.3V
102	I2S_LRCK_TX		GPIO0_B4_u	3.3V
103	I2S_MCLK		GPIO0_B0_u	3.3V
104	SDMMC_CMD		GPIO1_B7_u	3.3V
105	SDMMC_DET		GPIO1_C1_u	3.3V
106	SDMMC_D0/UART2_TX		GPIO1_C2_u	3.3V
107	SDMMC_D1/UART2_RX		GPIO1_C3_u	3.3V
108	SDMMC_D2/JTAG_TCK		GPIO1_C4_u	3.3V
109	SDMMC_D3/JTAG_TMS		GPIO1_C5_u	3.3V
110	SDMMC_CLK	UART6_RX_M0	GPIO1_C0_u	3.3V
111	GND	Ground		0V
112	GND	Ground		0V
113	SDMMC1_D3	I2S_SDI	GPIO1_A5_d	3.3V
114	SDMMC1_D2	I2S_SDO	GPIO1_A4_d	3.3V
115	SDMMC1_D1	I2S_LRCK_RX	GPIO1_A2_u	3.3V
116	SDMMC1_D0	I2S_SCLK	GPIO1_A1_d	3.3V
117	SDMMC1_CMD	I2C1_SDA	GPIO0_A3_u	3.3V
118	SDMMC1_CLK	I2S_MCLK	GPIO1_A0_d	3.3V
119	RESET	System Reset output		3.3V
120	SPI_CLK	UART1_CTSn	GPIO1_B0_u	3.3V
121	UART1_TX	SPI_TXD	GPIO1_B1_u	3.3V
122	UART1_RX	SPI_RXD	GPIO1_B2_u	3.3V
123	SPI_CS0	UART1_RTSn	GPIO1_B3_u	3.3V

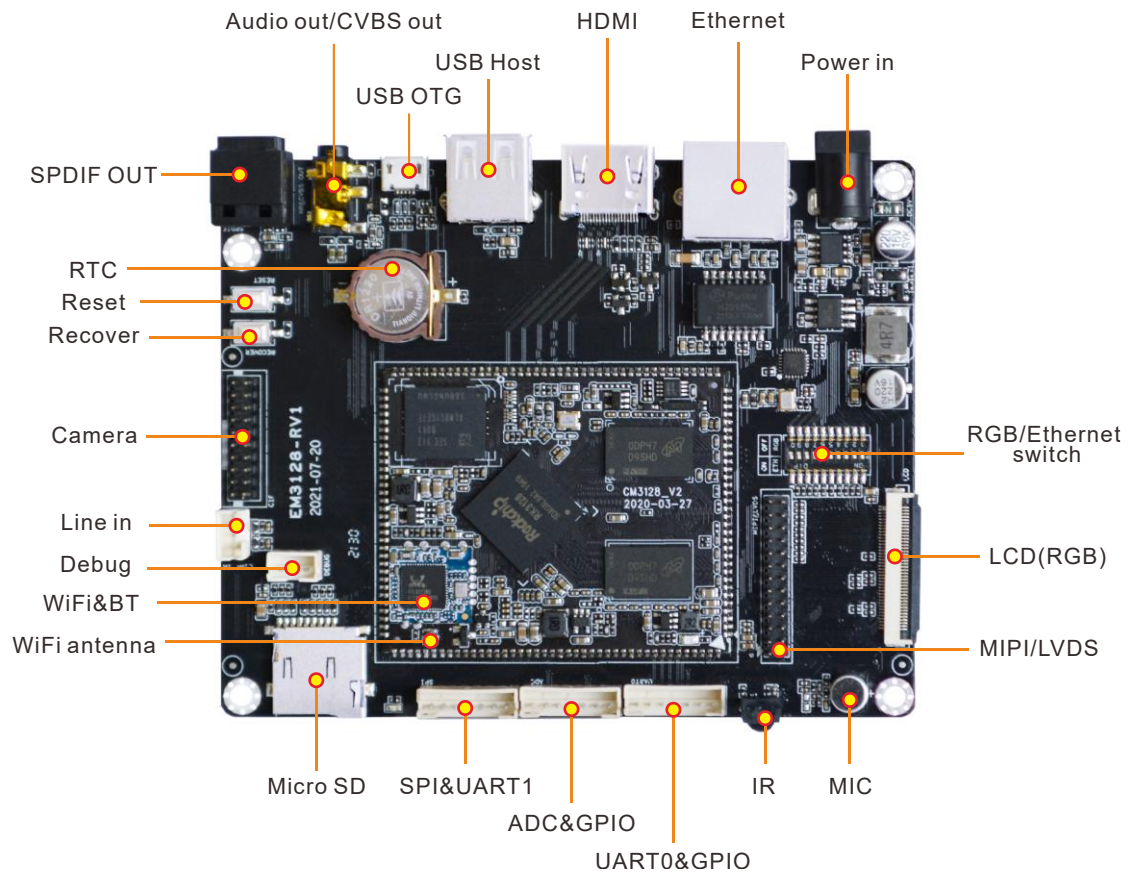


Pin	Signal	Description or functions	GPIO serial	IO Voltage
124	SPI_CS1		GPIO1_B4_u	3.3V
125	GND	Ground		0V
126	CODEC_MICR	MIC0 input		
127	CODEC_MICL	MIC1 input		
128	GND	Ground		0V
129	CODEC_AIR	Line R input		
130	CODEC_AIL	Line L input		
131	GND	Ground		0V
132	AOL	Line L out(Need coupling CAP)		
133	AOR	Line R out(Need coupling CAP)		
134	CODEC_GND	Audio Ground		0V
135	CODEC_AOM	16-32R Head speaker out P		
136	CODEC_AOMS	16-32R Head speaker out N		
137	GND	Ground		0V
138	MICBIAS			
139	HP_DET			3.3V
140	UART0_RTS	Card_IO	GPIO0_C1_u	3.3V
141	UART0_RX	Card_CLK	GPIO2_D3_d	3.3V
142	UART0_CTS	Card_DET	GPIO2_D5_d	3.3V
143	UART0_TX	Card_RST	GPIO2_D2_d	3.3V
144	GPIO2_A2			3.3V
145	GPIO1_C7			3.3V
146	GPIO2_A1			3.3V
147	GPIO1_A7	SDMMC0_WP		3.3V
148	GND	Ground		0V

Note:

All GPIO is 3.3V level.

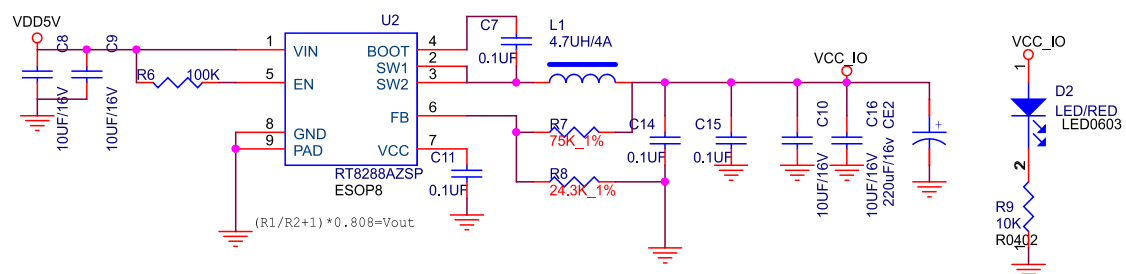
1.7 Development Kit (EM3128)



2 Hardware Design Guide

2.1 Peripheral Circuit Reference

2.1.1 External Power





3 Product Electrical Characteristics

3.1 Dissipation and Temperature

Symbol	Parameter	Min	Typ	Max	Unit
VCC_IO	System IO Voltage	3.3-5%	3.3	3.3+5%	V
Iio_in	VCC_IO input Current		1000	1500	mA
VCC_RTC	RTC Voltage	1.8	3	3.4	V
Irtc	RTC input Current		5	8	uA
Ta	Operating Temperature	0		70	°C
Tstg	Storage Temperature	-40		85	°C

3.2 Reliability of Test

High Temperature Operating Test		
Contents	Operating 8h in high temperature	55°C±2°C
Result		

Operating Life Test		
Contents	Operating in room	120h
Result		