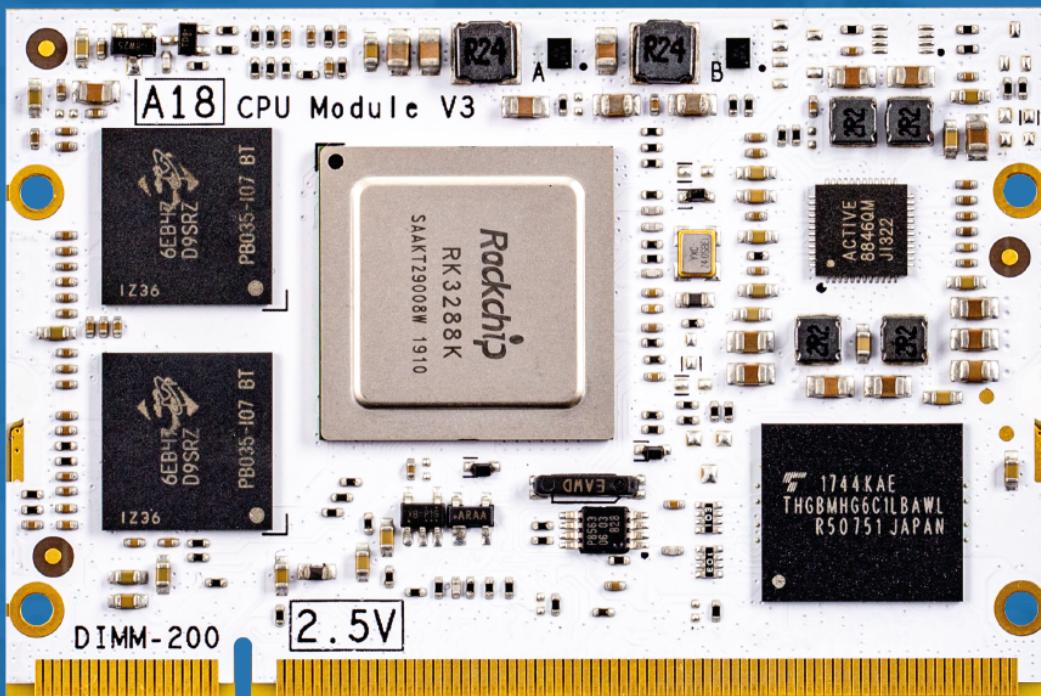




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1.1 Summary

A18-CPU is a Computer-on-Module powered by Rockchip RK3288 Quad-core ARM Cortex-A17 MPCore processor. The RK3288 module is coupled with 1GB/2GB RAM and 8GB eMMC

The module embedded powerful hardware engines provide optimized performance for high-end application, and embedded 3D GPU makes RK3288 completely compatible with OpenGL ES1.1/2.0/3.0, OpenCL 1.1 and DirectX 11.

The A18-CPU is designed for Advertising machine, Vending machine, Commercial display device, Intelligent POS machine, Intelligent robot, Education video terminal, Intelligent control, etc.

1.2 Features

Microprocessor

- Quad-core Cortex-A17 up to 1.8G
- 32KB I-cache, 32KB D-cache, 1MB L2 cache per core

Memory Organization

- LPDDR3 RAM up to 4GB
- EMMC up to 32GB

GPU

- Quad-Core Mali-T7 series, latest powerful graphics processor Architected for GPU computing
- Support OpenGL ES1.1/2.0/3.0, OpenVG1.1, OpenCL1.1 and Renderscript, Directx11

Security ID

- Size up to 2Kbit for security chip ID

Video Decoder/Encoder

- Support MPEG-2, MPEG-4, AVS, VC-1, VP8, MVC with up to 1080p@60fps
- Support multi-format video decoder with up to 4Kx2K
- Support multi-format video encoder with up to 1080p@30fps

Camera/Display Subsystem

- Video Input:
camera, 1-ch 8bits DVP or 24 bit RGB
MIPI-CSI,
- Video display support:
8/10bits LVDS
HDMI2.0,

Audio inputs and outputs

- One Headphone out and two MIC input
- Line in and Line out
- One SPDIF interface

USB

- Three USB interfaces
- One USB 2.0 OTG, and 2 USB hosts

Ethernet

- On board 1000M PHY
- MDI interface

I2C

- 5-ch I2Cs
- Support standard mode and fast mode(up to 400kbit/s)

SDIO

- 2 SD/MMC/SDIO interface

SPI

- Up to 3-ch SPI controllers,
- Full-duplex synchronous serial interface

UART

- Up to 5 UART controllers
- UART2 for debug tools

PS2

- 1-ch PS2 controllers

PWM

- Two PWM out

KEYADC

- Up to two ADC channels for key application
- 8-bit resolution
- Voltage input range between 0V to 1.8V

WatchDog

- One watchdog to generate reset signal or interrupt

Interrupt Controller

- Support 87 interrupts or GPIO

Power unit

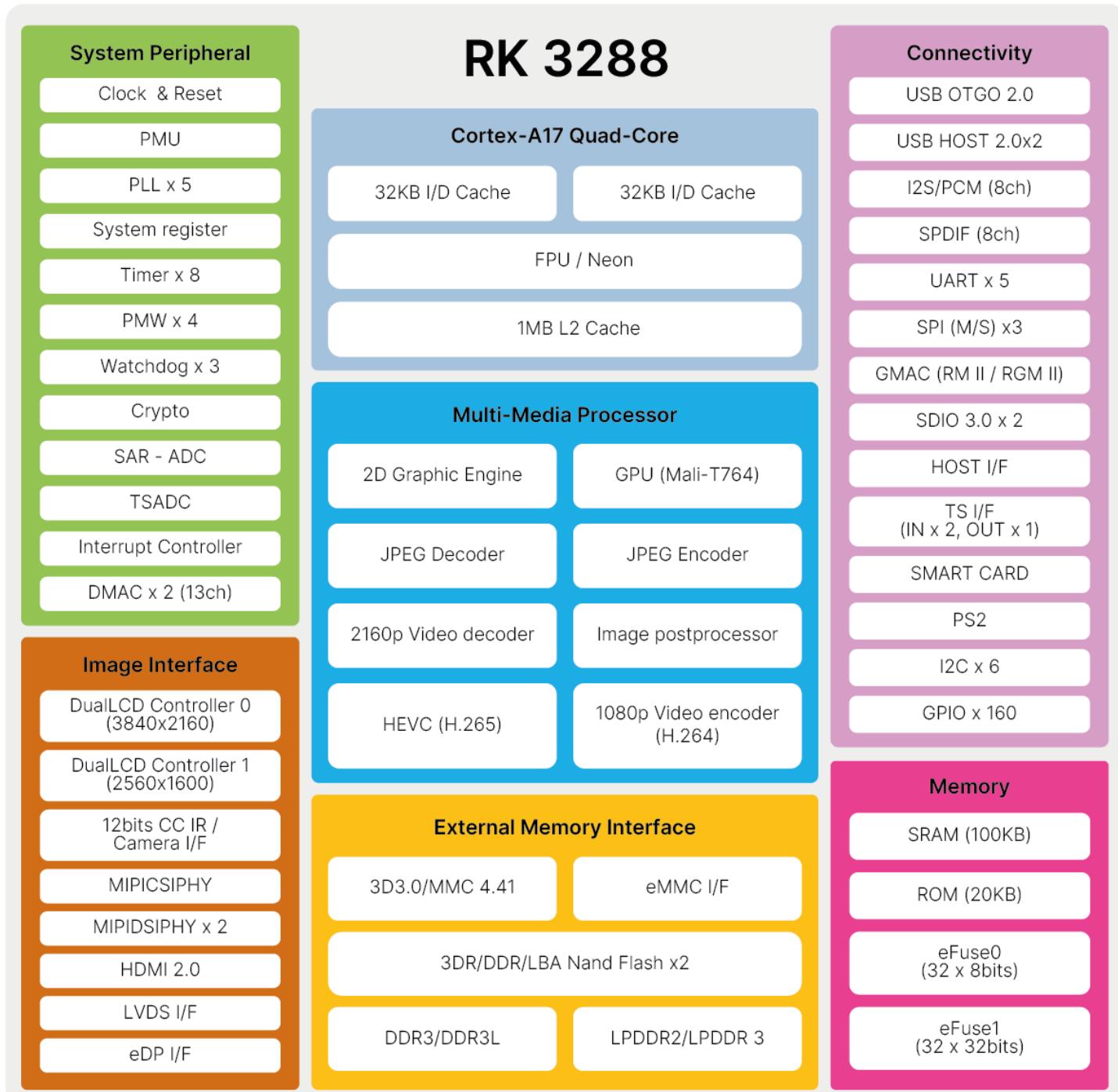
- ACT8846Q on board
- UVP/OTP/OCP protections
- Very low RTC consume current, less 5uA at 3V button Cell

Temperature

- Industrial grade, Operating temperature: -20 - 85°C

Block Diagram

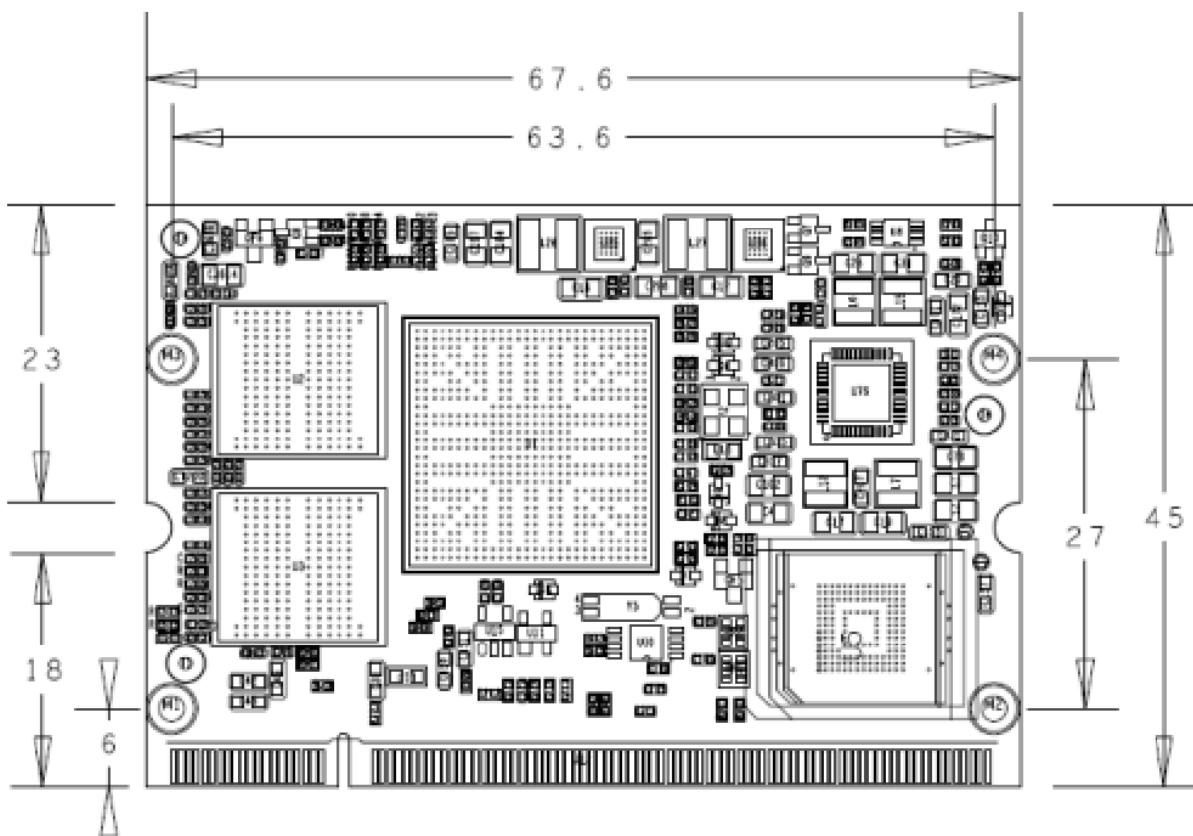
RK3288 Block Diagram



1.4 A18-CPU specifications

Feature	Specifications
CPU	RK3288 Quad-core ARM Cortex-A17 MPCore processor
DDR	2GB LPDDR3 (up to 4GB)
eMMC FLASH	4GB (up to 32GB)
Power	DC 3.3V-5V power supply
PMU	ACT8846
LVDS/RGB	1-CH 10bit Dual-LVDS or 24bit RGB
HDMI out	1-CH
Camera	1-CH(DVP) and 1-CH MIPI(4Lane)
USB	2-CH (USB HOST2.0), 1-CH(OTG 2.0)
Ethernet	1000M
SDMMC	2-CH
SPDIF TX	1-CH
I2C	5-CH
SPI	3-CH
UART	4-CH, 1-CH(DEBUG)
PWM	2-CH
ADC IN	2-CH
Board Dimension	45 x 67.6mm

A18-CPU PCB Dimension



1.4 A18-CPU specifications

Pin	Signal	Function	Description / Alternate functions	IO Level
1	MIC1P	L-CH MIC input		3.3V
2	ADC_IN0	ADC input		1.8V
3	MIC1N	R-CH MIC input		3.3V
4	ADC-IN1_RECVER	ADC input or Recover key		1.8V
5	LIN1	L-CH Line input		0V
6	ADC_IN2	ADC input		1.8V
7	RIN1	R-CH Line input		0V
8	GND	Ground		0V
9	LINE_LO	L-CH Line output		0V
10	SPI0_CSn0	SPI0 chip select signal	GPIO5_B5_u (165)	3.3V
11	LINE_RO	R-CH Line output		0V
12	SPI0_CLK	SPI0 clock signal output	GPIO5_B4_u (164)	3.3V
13	AGND	Audio Ground		0V
14	SPI0_UART4_RXD	SPI0 or UART4 data input	GPIO5_B7_u (167)	3.3V
15	HP_LO	Headphone L-CH output		1.8V
16	SPI0_UART4_TXD	SPI0 or UART4 data output	GPIO5_B6_u (166)	3.3V
17	HP_RO	Headphone R-CH output		1.8V
18	I2C2_SDA	I2C2 data for Camera(PU4.7K)		3.3V
19	UART3_RX	UART serial data input	GPIO7_A7_U (223)	3.3V
20	I2C2_SCL	I2C2 clock for Camera(PU4.7K)		3.3V
21	UART3_TX	UART serial data output	GPIO7_B0_D (224)	3.3V
22	PMIC_SLEEP	PMIC sleep signal (H ACT)		3.3V
23	UART0_RTS	UART0 request to send	GPIO4_C3_u(VCCA_IO) (139)	3.3/1.8
24	PWR_KEY	Power key		3.3V
25	UART0_CTS	UART0 clear to send	GPIO4_C2_u(VCCA_IO) (138)	3.3/1.8

1.4 A18-CPU specifications

Pin	Signal	Function	Description / Alternate functions	IO Level
26	RST_KEY	Reset key		3.3V
27	UART0_TX	UART0 serial data output	GPIO4_C1_d(VCCA_IO) (137)	3.3/1.8
28	LVDS_PWM	LCD Data13 or LVDS OD0-		3.3V
29	UART0_RX	UART0 serial data input	GPIO4_C0_u(VCCA_IO) (136)	3.3/1.8
30	SPDIF_TX		GPIO6_B3_d (195)	3.3V
31	UART3_CTSn	UART3 CTS or GPS RECLK	GPIO7_B1_u (225)	3.3V
32	UART1_CTS	UART1 clear to send	GPIO5_B2_u (162)	3.3V
33	UART2_RX	UART2 RX Debug input	GPIO7_C6_u (238)	3.3V
34	UART1_RTS	UART1 request to send	GPIO5_B3_u (163)	3.3V
35	UART2_TX	UART2 TX Debug output	GPIO7_C7_u (239)	3.3V
36	UART1_RX	UART1 serial data input	GPIO5_B0_u (160)	3.3V
37	UART3_RTSn	UART3 request to send	GPIO7_B2_d (226)	3.3V
38	UART1_TX	UART1 serial data output	GPIO5_B1_d (161)	3.3V
39	GND	Ground		0V
40	VCC_RTC	RTC power input		1.8-3.3
41	GND	Ground		0V
42	VCCA_33	Analog 3.3V power(Max:100mA)		3.3V
43	SDMMC_DET	SDMMC card detect signal	GPIO6_C6_u (206)	3.3V
44	LCD_DEN	LCD RGB interface data enable	GPIO1_D2_d (50)	3.3V
45	HDMI_CEC	HDMI ground reference for the hot plug detect signal	GPIO7_C0_u (232)	3.3V
46	LCD_D13_LD5N	LCD Data13 or LVDS OD0-		3.3V
47	SDMMC_CLK	SDMMC card clock	GPIO6_C4_d (204)	3.3V
48	LCD_D12_LD5P	LCD Data12 or LVDS OD0+		3.3V
49	SDMMC_D1	SDMMC card data	GPIO6_C1_u (201)	3.3V
50	LCD_D22_LCK1P	LCD Data22 or LVDS OCLK+		3.3V

1.4 A18-CPU specifications

Pin	Signal	Function	Description / Alternate functions	IO Level
51	SDMMC_D2	SDMMC card data	GPIO6_C2_u (202)	3.3V
52	LCD_D23_LCK1N	LCD Data23 or LVDS OCLK-		3.3V
53	SDMMC_D3	SDMMC card data	GPIO6_C3_u (203)	3.3V
54	LCD_D16_LD7P	LCD Data16 or LVDS OD2+		3.3V
55	GPIO0_B3_D		PMU_GPIO0_B3_d (11)	3.3V
56	LCD_D17_LD7N	LCD Data17 or LVDS OD2-		3.3V
57	CIF_D7	Camera interface D7 input	GPIO2_A5_d(VCCA_IO) (61)	3.3/1.8
58	LCD_CLK	LCD RGB interface display clock	GPIO1_D3_d (51)	3.3V
59	LCD_D20_LD9P	LCD Data20 or LVDS OD4+		3.3V
60	LCD_D14_LD6P	LCD Data14 or LVDS OD1+		3.3V
61	LCD_D21_LD9N	LCD Data21 or LVDS OD4-		3.3V
62	LCD_D15_LD6N	LCD Data15 or LVDS OD1-		3.3V
63	GPIO0_B5_D	CLK 27M input	PMU_GPIO0_B5_d (13)	3.3V
64	LCD_D18_LD8P	LCD Data18 or LVDS OD3+		3.3V
65	CIF_D9	Camera interface D9 input	GPIO2_A7_d(VCCA_IO) (63)	3.3/1.8
66	LCD_D19_LD8N	LCD Data19 or LVDS OD3-		3.3V
67	CIF_D6	Camera interface D6 input	GPIO2_A4_d(VCCA_IO) (60)	3.3/1.8
68	LCD_HSYNC	LCD RGB horizontal sync signal	GPIO1_D0_d (48)	3.3V
69	CIF_D10	Camera interface D10 input	GPIO2_B6_d(VCCA_IO) (70)	3.3/1.8
70	LCD_D8_LD4P	LCD Data8 or LVDS ED4+		3.3V
71	CIF_D0	Camera interface D0 input	GPIO2_B4_d(VCCA_IO) (68)	3.3/1.8
72	LCD_D9_LD4N	LCD Data9 or LVDS ED4-		3.3V
73	CAN_INT		GPIO7_A6_u (222)	3.3V
74	LCD_D6_LD3P	LCD Data6 or LVDS ED3+		3.3V

1.4 A18-CPU specifications

Pin	Signal	Function	Description / Alternate functions	IO Level
75	CIF_CLKOUT	Camera main CLK output	GPIO2_B3_d(VCCA_IO) (67)	3.3/1.8
76	LCD_D7_LD3N	LCD Data7 or LVDS ED3-		3.3V
77	CIF_D11	Camera interface D11 input	GPIO2_B7_d(VCCA_IO) (71)	3.3/1.8
78	LCD_D4_LD2P	LCD Data4 or LVDS ED2+		3.3V
79	CIF_D4	Camera interface D4 input	GPIO2_A2_d(VCCA_IO) (58)	3.3/1.8
80	LCD_D5_LD2N	LCD Data5 or LVDS ED2-		3.3V
81	CIF_VSYNC	Camera vertical sync signal	GPIO2_B0_d(VCCA_IO) (64)	3.3/1.8
82	LCD_VSYNC	LCD RGB vertical sync signal	GPIO1_D1_d (49)	3.3V
83	GND	Ground		0V
84	VCC_18	System 1.8V output(Max100mA)		1.8V
85	CIF_D8	Camera interface D8 input	GPIO2_A6_d(VCCA_IO) (62)	3.3/1.8
86	SPI1_CSn0	SPI1 chip select signal	GPIO7_B5_u (229)	3.3V
87	nRESET	System Reset output(Can N.C)		3.3V
88	SPI1_CLK	SPI1 serial clock	GPIO7_B4_d (228)	3.3V
89	GND	Ground		0V
90	SPI1_RXD	SPI1 serial data input	GPIO7_B6_d (230)	3.3V
91	I2C3_SDA	I2C3 data for Camera(PU1.5K)	GPIO2_C1_u(VCCA_IO) (73)	3.3/1.8
92	SPI1_TXD	SPI1 serial data output	GPIO7_B7_d (231)	3.3V
93	I2C3_SCL	I2C3 clock for Camera(PU1.5K)	GPIO2_C0_u(VCCA_IO) (72)	3.3/1.8
94	CIF_HREF	Camera interface horizontal sync signa	GPIO2_B1_d(VCCA_IO) (65)	3.3/1.8
95	SPI2_CSn1	SPI2 chip select1 signal	GPIO8_A3_u (251)	3.3V
96	CIF_CLKIN	Camera interface CLK input	GPIO2_B2_d(VCCA_IO) (66)	3.3/1.8
97	CIF_D5	Camera interface D5 input	GPIO2_A3_d(VCCA_IO) (59)	3.3/1.8
98	CIF_D1	Camera interface D1 input	GPIO2_B5_d(VCCA_IO) (69)	3.3/1.8
99	HDMI_HPD	HDMI hot plug detect signal		3.3V

1.4 A18-CPU specifications

Pin	Signal	Function	Description / Alternate functions	IO Level
100	RTC_CLKOUT	RTC clock output		3.3V
101	CIF_D2	Camera interface D2 input	GPIO2_A0_d(VCCA_IO) (56)	3.3/1.8
102	PS2_DATA	GPIO	GPIO7_C5_d (237)	3.3V
103	CIF_D3	Camera interface D3 input	GPIO2_A1_d(VCCA_IO) (57)	3.3/1.8
104	PS2_CLK	P2S clock signal	GPIO8_A0_u (248)	3.3V
105	I2C4_SDA	I2C4 data(need to pull up)	GPIO7_C1_u (233)	3.3V
106	GND	Ground		0V
107	I2C4_SCL	I2C4 clock(need to pull up)	GPIO7_C2_u (234)	3.3V
108	VCCA_IO	DVP and WIFI GPIO Power output(Max:200mA)	Setting by software	3.3/1.8
109	GND	Ground		0V
110	SDIO0_D0	SDIO card data	GPIO4_C4_u(VCCA_IO) (140)	3.3/1..8
111	MIPI_TX/RX _D0P	MIPI RX1 negative differential data line transceiver input		1.8V
112	SDIO0_D1	SDIO card data	GPIO4_C5_u(VCCA_IO) (141)	3.3/1.8
113	MIPI_TX/RX _D0N	MIPI RX1 negative data input		1.8V
114	SDIO0_D2	SDIO card data	GPIO4_C6_u(VCCA_IO) (142)	3.3/1.8
115	MIPI_TX/RX _D1P	MIPI RX1 negative differential data line transceiver input		1.8V
116	SDIO0_D3	SDIO card data	GPIO4_C7_u(VCCA_IO) (143)	3.3/1.8
117	MIPI_TX/RX _D1N	MIPI RX1 negative differential data line transceiver input		1.8V
118	SDIO0_CMD	SDIO card command output and response input	GPIO4_D0_u(VCCA_IO) (144)	3.3/1.8
119	GND	Ground		0V
120	SDIO0_CLK	SDIO card clock	GPIO4_D1_d(VCCA_IO) (145)	3.3/1..8
121	MIPI_TX/RX _CLKP	MIPI RX1 positive differential clock line transceiver input		1.8V
122	PWM1	LCD Backlight PWM used	GPIO7_A1_d (217)	3.3V
123	MIPI_TX/RX _CLKN	MIPI RX1 negative differential clock line transceiver input		1.8V
124	BT_WAKE	BT wake CPU in	GPIO4_D2_u(VCCA_IO) (146)	3.3/1..8

1.4 A18-CPU specifications

Pin	Signal	Function	Description / Alternate functions	IO Level
125	MIPI_TX/RX _D2P	MIPI RX1 negative differential data line transceiver input		1.8V
126	WIFI_REG_ON	WIFI Regulators power EN	GPIO4_D4_d(VCCA_IO) (148)	3.3/1.8
127	MIPI_TX/RX _D2N	MIPI RX1 negative differential data line transceiver input		1.8V
128	BT_RST	Bluetooth reset	GPIO4_D5_d(VCCA_IO) (149)	3.3/1.8
129	MIPI_TX/RX _D3P	MIPI RX1 positive differential data line transceiver input		1.8V
130	WIFI_HOST_WAKE	WIFI to wake-up HOST	GPIO4_D6_u(VCCA_IO) (150)	3.3/1.8
131	MIPI_TX/RX _D3N	MIPI RX1 negative differential data line transceiver input		1.8V
132	BT_HOST_WAKE	Bluetooth device to wake-up HOST	GPIO4_D7_u(VCCA_IO) (151)	3.3/1.8
133	GND	Ground		0V
134	GND	Ground		0V
135	OTG_ID	OTG ID detection		3.3V
136	LCD_D11_LCK0N	LCD Data11 or LVDS ECLK-		3.3V
137	OTG_DET	USB OTG 2.0 detect		3.3V
138	LCD_D10_LCK0P	LCD Data10 or LVDS ECLK+		3.3V
139	HOST1_DP	USB HOST 2.0 Data signal DP		3.3V
140	LCD_D3_LD1N	LCD Data3 or LVDS ED1-		3.3V
141	HOST1_DM	USB HOST 2.0 Data signal DM		3.3V
142	LCD_D2_LD1P	LCD Data2 or LVDS ED1+		3.3V
143	OTG_DP	USB OTG 2.0 Data signal DP		3.3V
144	LCD_D1_LD0N	LCD Data1 or LVDS ED0-		3.3V
145	OTG_DM	USB OTG 2.0 Data signal DM		3.3V
146	LCD_D0_LD0P	LCD Data0 or LVDS ED0+		3.3V
147	GND	Ground		0V
148	VCC_IO	GPIO power output(Max 500mA)		3.3V
149	HOST2_DP	USB HOST 2.0 Data signal DP		3.3V

1.4 A18-CPU specifications

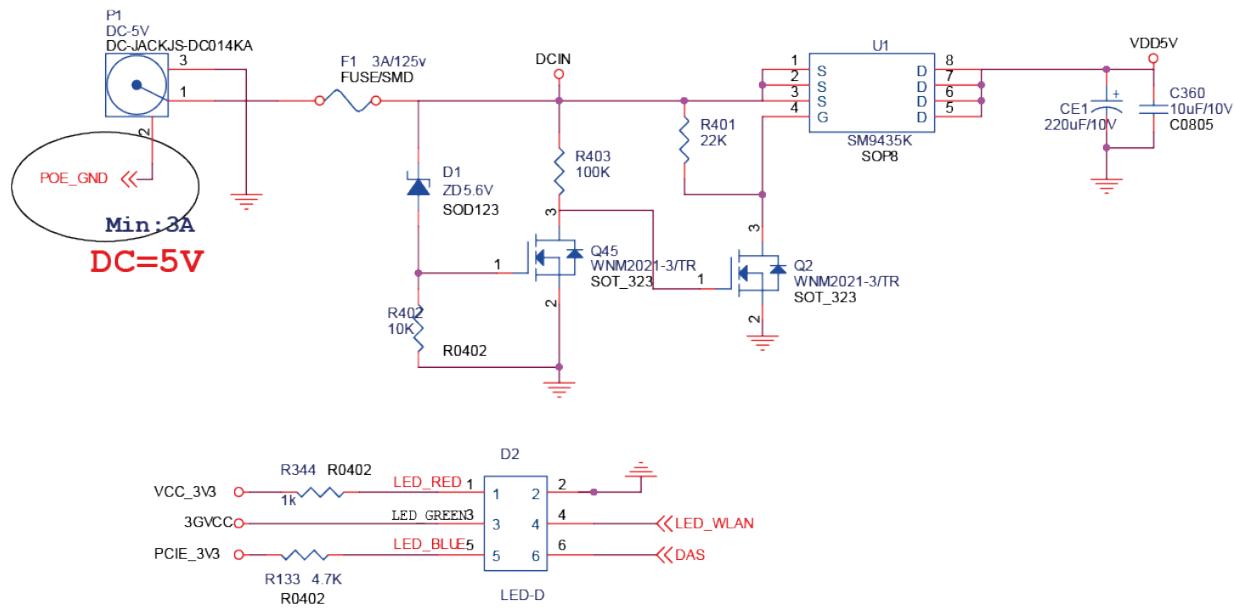
Pin	Signal	Function	Description / Alternate functions	IO Level
150	SPI2_CLK	SPI2 serial clock	GPIO8_A6_d (254)	3.3V
151	HOST2_DM	USB HOST 2.0 Data signal DM		3.3V
152	SPI2_CSn0	SPI2 chip select0 signal	GPIO8_A7_u (255)	3.3V
153	GND	Ground		0V
154	SPI2_RXD	SPI2 serial data input	GPIO8_B0_d (256)	3.3V
155	TX_C+	HDMI TXC+		1.8V
156	SPI2_TXD	SPI2 serial data output	GPIO8_B1_d (257)	3.3V
157	TX_C-	HDMI TXC-		1.8V
158	TS0_SYNC	TSI sync signal	GPIO5_C0_u (168)	3.3V
159	TX_0+	HDMI TXD0+		1.8V
160	TS0_VALID	TSI valid signal	GPIO5_C1_d (169)	3.3V
161	TX_0-	HDMI TXD0-		1.8V
162	TS0_ERR	TSI fail signal	GPIO5_C3_d (171)	3.3V
163	TX_1+	HDMI TXD1+		1.8V
164	TS0_CLK	TSI reference Clock signal	GPIO5_C2_d (170)	3.3V
165	TX_1-	HDMI TXD1-		1.8V
166	GND	Ground		0V
167	TX_2+	HDMI TXD2+		1.8V
168	MIPI_RX_D0P	MIPI RX0 negative differential data line transceiver input		1.8V
169	TX_2-	HDMI TXD2-		1.8V
170	MIPI_RX_D0N	MIPI RX0 positive differential data line transceiver input		1.8V
171	GND	Ground		0V
172	MIPI_RX_D1P	MIPI RX0 positive differential data line transceiver input		1.8V
173	MDI3-	Ethernet MDI3-		3.3V
174	MIPI_RX_D1N	MIPI RX0 negative differential data line transceiver input		1.8V

1.4 A18-CPU specifications

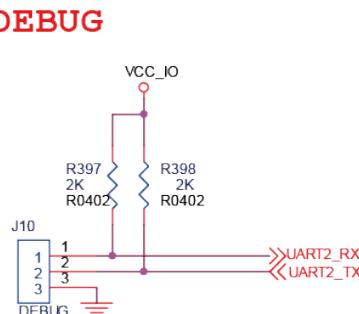
Pin	Signal	Function	Description / Alternate functions	IO Level
175	MDI3+	Ethernet MDI3+		3.3V
176	GND	Ground		0V
177	MDI2-	Ethernet MDI2-		3.3V
178	MIPI_RX_CLKP	MIPI RX0 positive differential clock line transceiver input		1.8V
179	MDI2+	Ethernet MDI2+		3.3V
180	MIPI_RX_CLKN	MIPI RX0 negative CLK input		1.8V
181	GND	Ground		0V
182	VCC_SYS	Main power input		3.3-5V
183	LEDO_ADO	Ethernet Link LED out(L ACT)		3.3V
184	VCC_SYS	Main power input		3.3-5V
185	LED1_AD1	Ethernet Speed LED out(H ACT)		3.3V
186	I2C5_SDA	I2C5 data(need to pull up)	GPIO7_C3_u (235)	3.3V
187	MDI0-	Ethernet MDI0-		3.3V
188	I2C5_SCL	I2C5 clock (need to pull up)	GPIO7_C4_u (236)	3.3V
189	MDI0+	Ethernet MDI0+		3.3V
190	SDMMC_CMD	SDMMC card command output and response input	GPIO6_C5_u (205)	3.3V
191	GND	Ground		0V
192	SDMMC_D0	SDMMC card data	GPIO6_C0_u (200)	3.3V
193	MDI1-	Ethernet MDI1-		3.3V
194	I2C1_SDA	I2C1 data(need to pull up)	GPIO8_A4_u (252)	3.3V
195	MDI1+	Ethernet MDI1+		3.3V
196	I2C1_SCL	I2C1 clock (need to pull up)	GPIO8_A5_u (253)	3.3V
197	GND	Ground		0V
198	VCC_SYS	Main power input		3.3-5V
199	GND	Ground		0V
200	VCC_SYS	Main power input		3.3-5V

2.1 Peripheral Circuit Reference

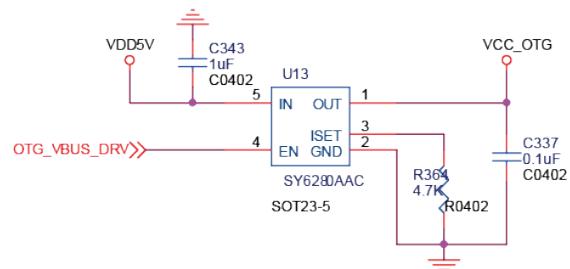
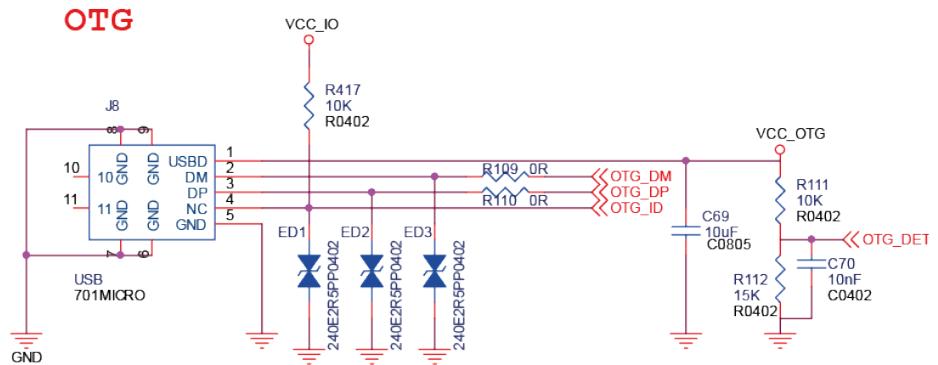
2.1.1 External Power



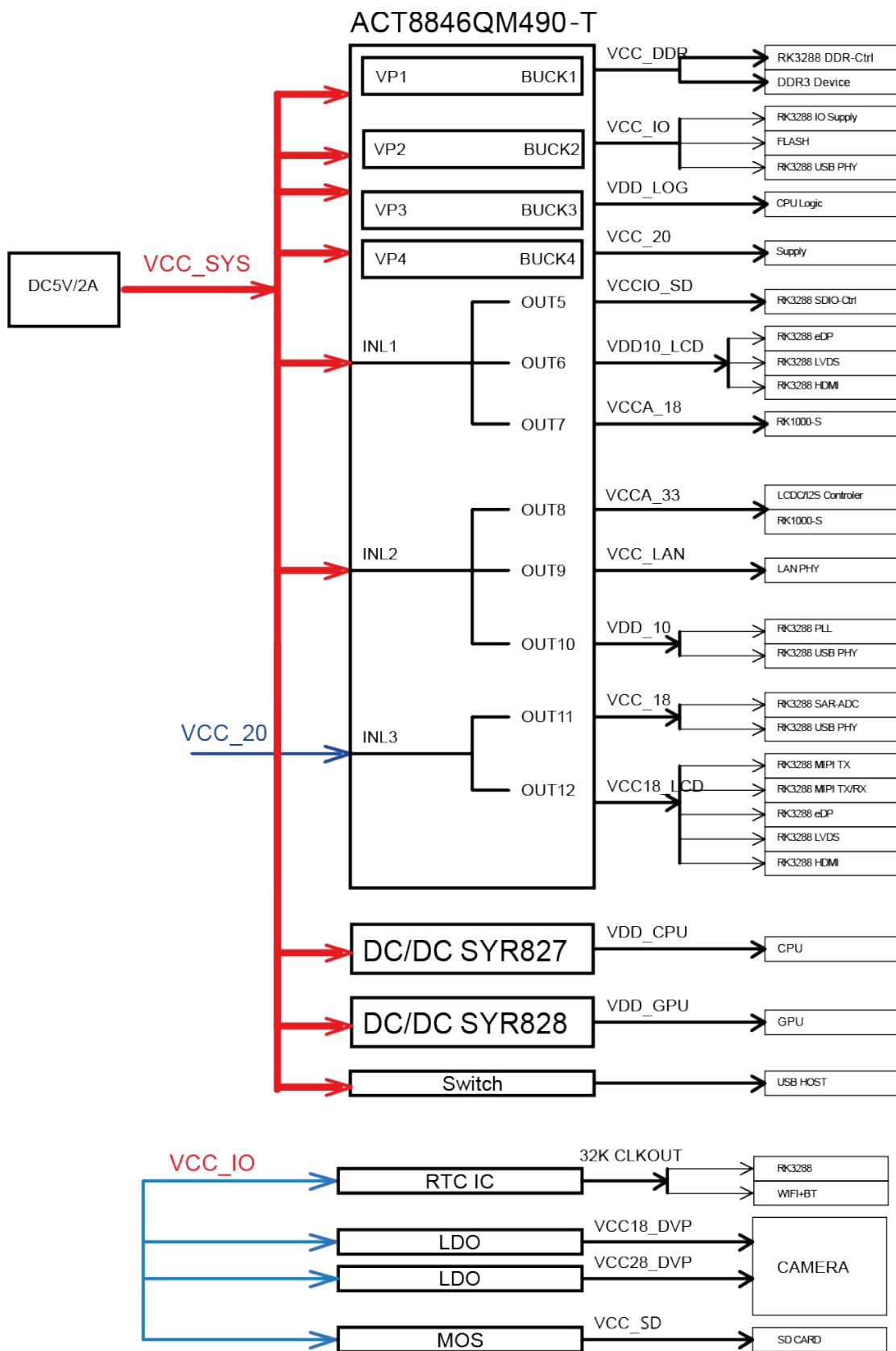
2.1.2 Debug Circuit



2.1.3 USB OTG Interface Circuit



2.2 Power Tree



3.1 Dissipation and Temperature

Symbol	Parameter	Min	Typ	Max	Unit
VCC_SYS	System Voltage	3.3	5	5.3	V
Isys_in	VSYS, input Current		800	1600	mA
VCC_RTC	RTC Voltage	1.8	3	5.5	V
Irtc	RTC input, Current		5	8	uA
VCC_IO	System IO, Voltage Out		3.3		V
Ivio_out	VCC_IO output, Current		400	500	mA
VCCA_IO	CAM_IO Voltage, Out		1.8/3.3		V
Icamio_out	CAM_IO output, Current		200		mA
VCCA_33	Analog Voltage, Out		3.3		V
Icca_out	Analog output, Current		100		mA