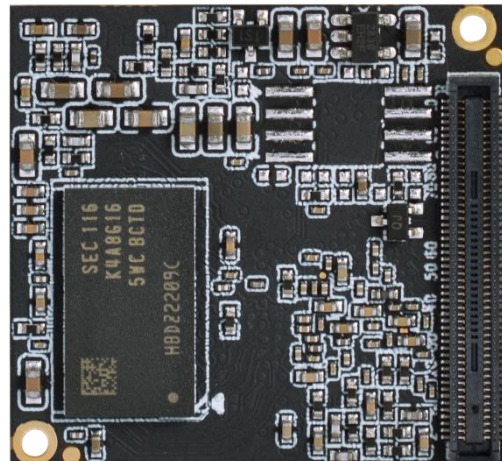
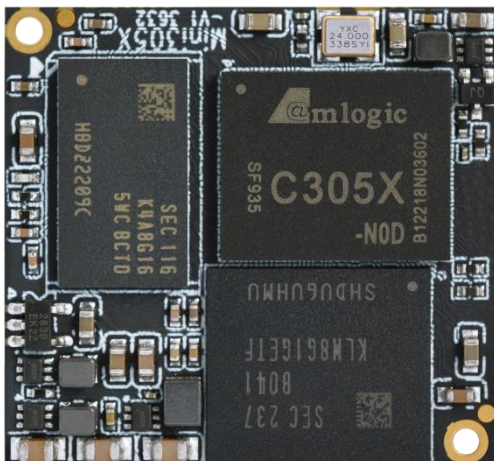


MINI305X Reference User Manual

V1.202609



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 MINI305X Introduction

1.1 Summary

The MINI305X system-on-module is equipped with Amlogic C305X build in Dual-core Cortex-A35, 2.0 TOPs NPU and RISC-V MCU.

It is designed specifically for the IPC/CVR devices, AI Camera devices, intelligent interactive devices, and mini robots. The high performance and low power solution can help customers to introduce new technologies more quickly and enhance the overall solution efficiency.

1.2 Features

- **Microprocessor**

- Dual-core Cortex-A35
- 32KB I/D-cache , 1MB L2 cache
- 2.0 TOPS Neural Process Unit
- RISC-V MCU
- Max 5M ISP

Memory Organization

- DDR4 RAM up to 3.5GB
- EMMC
- SPI Flash

Video/Picture Encoding

- Supports H.265/H.264/JPEG encoding
- Supports video encode up to 2688x1944@30fps + 1080p@30fps
- Supports multi-channel encoding

- **I2S/TDM**

- Two I2S/TDM interface

- **PDM**

- One PDM interface
- Support up to 2 DMICs

Audio DAC

- 2 CH audio DAC

- **USB**

- One USB 2.0 OTG

- **Ethernet**

- including a 10/100/1000M Ether net MAC with RGMII

- **I2C**

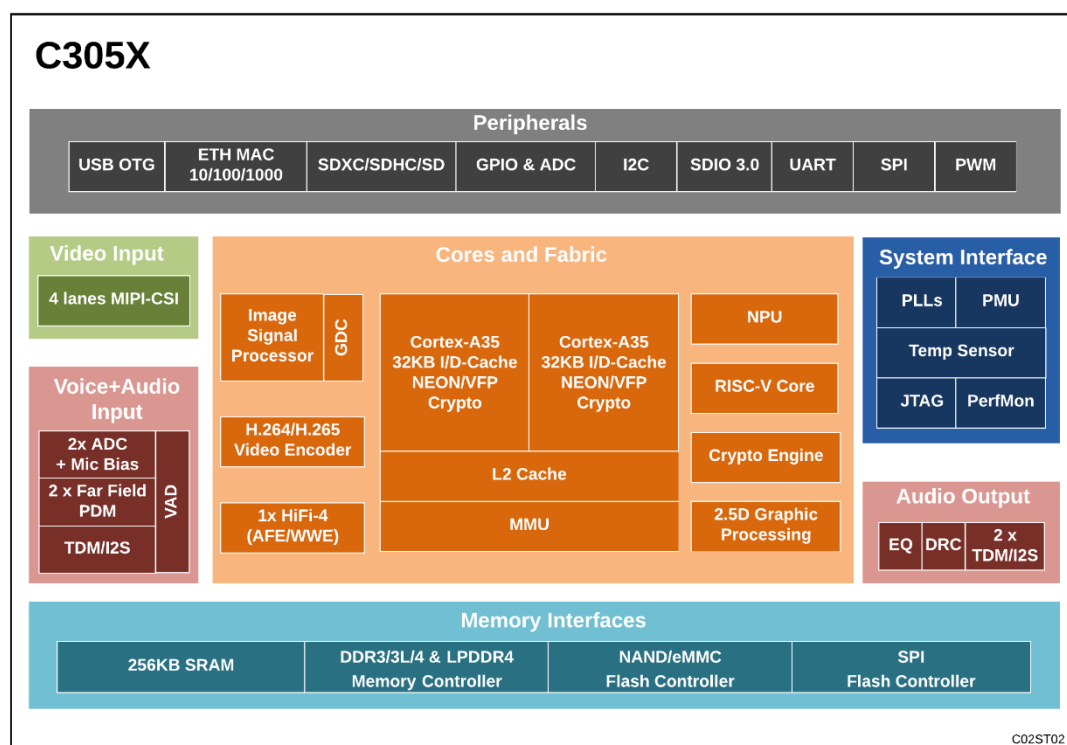
- Up to five I2Cs



- Support standard mode and fast mode (up to 400kbit/s)
- **SDIO**
 - Support 2 CH SDIO 3.0 protocol
- **SPI**
 - Up to two SPI controllers
 - Full-duplex synchronous serial interface
- **UART**
 - Support up to 5 UART
 - UART_B with 2 wires for debug tools
 - Support auto flow control mode for UART1-5
- **ADC**
 - Up to four ADC channels
 - 12-bit resolution
 - Voltage input range between 0V to 1.8V
- **PWM**
 - 10 on-chip PWM
- **Power unit**
 - 5V power input

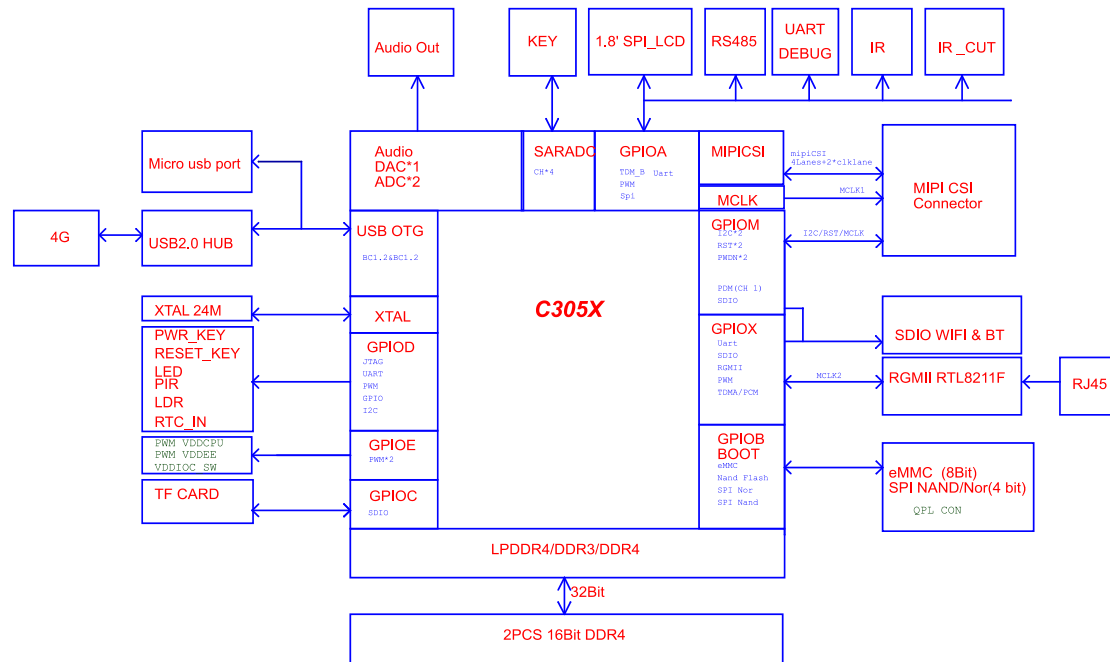
1.3 MINI305X Block Diagram

1.3.1 C305X Block Diagram





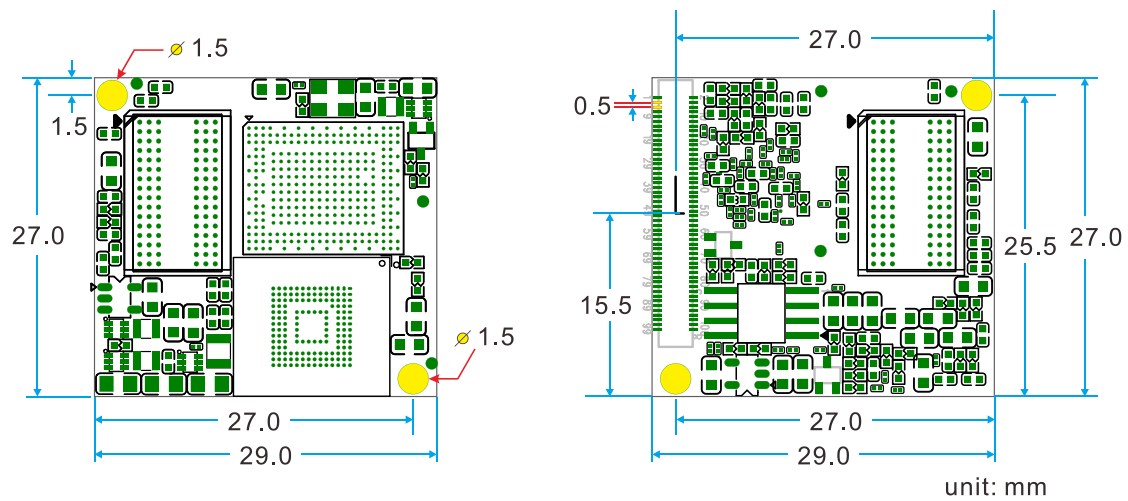
1.3.2 Development board (EM305X) Block Diagram



1.4 MINI305X specifications

Feature	Specifications
CPU	Dual-core Cortex-A35
DDR	2GB DDR4 (up to 3.5GB)
EMMC FLASH	4GB
Power	DC 5V
I2S/TDM	2-CH
PDM	1-CH
Audio DAC	2-CH
MIPI CSI	1-CH 4-Lane
USB	1-CH (USB2.0 OTG)
Ethernet	10/100/1000M GMAC
SDIO	2-CH
I2C	5-CH
SPI	2-CH
UART	5-CH, 1-CH(DEBUG)
JTAG	2-CH
PWM	10-CH
ADC IN	4-CH
Board Dimension	27 x 29mm

1.5 MINI305X PCB Dimension



1.6 MINI305X Pin Definition

J1	Signal	Description or functions	GPIO serial	IO Voltage
1	CARD_DET	Must be used for SD Card	GPIOC_6_UP	3.3V
2	UART_D_RX	UART_D_RX/I2CM_A_SDA/I2C S_A_SDA	GPIOD_3_UP	3.3V
3	SD_CLK	SD_CLK/JTAG_B_CLK/PDM_D CLK	GPIOC_4_UP	3.3V
4	UART_D_TX	UART_D_TX/I2CM_A_SCL/I2C S_A_SCL	GPIOD_2_UP	3.3V
5	GND	Ground	GND	
6	TDI	JTAG_A_TDI/IR_IN/UART_D_TX/PWM_I	GPIOD_8_UP	3.3V
7	SD_D0_B	SD_D0/JTAG_B_TDO/SPI_A_M OSI/PDM_DIN0	GPIOC_0_UP	3.3V
8	PWR_KEY_DET	IR_OUT	GPIOD_4_UP	3.3V
9	SD_D1_B	SD_D1/JTAG_B_TDI/SPI_A_MISO	GPIOC_1_UP	3.3V
10	CLK_32K_IN	CLK_32K_IN/CLK12_24/CLK25/PWM_G	GPIOD_12_D	3.3V
11	SD_D2_B	SD_D2/UART_B_RX/SPI_A_SS0	GPIOC_2_UP	3.3V
12	OTG_ID_1V8	USBOTG_ID		1.8V
13	SD_D3_B	SD_D3/UART_B_TX/SPI_A_SCLK	GPIOC_3_UP	3.3V
14	GND	Ground	GND	



J1	Signal	Description or functions	GPIO serial	IO Voltage
15	SD_CMD_B	SD_CMD/JTAG_B_TMS/I2CM_E_SDA	GPIOC_5_UP	3.3V
16	OTG_DM	USBOTG_DM		3.3V
17	TMS	JTAG_A_TMS/SWDIO/PWM_F	GPIOD_7_UP	3.3V
18	OTG_DP	USBOTG_DP		3.3V
19	TCK	JTAG_A_CLK/SWCLK/PWM_C	GPIOD_6_D	3.3V
20	USB_CC1	USB_CC1		3.3V
21	IR_IN	IR_IN/PWM_D/PWM_D_HIZ	GPIOD_5_UP	3.3V
22	USB_CC2	USB_CC2		3.3V
23	UART_B_RX_DBG	For debug	GPIOD_1_UP	3.3V
24	nRESET_OUT	POR reset output pin		3.3V
25	UART_B_TX_DBG	For debug	GPIOD_0_UP	3.3V
26	TDO	JTAG_A_TDO/IR_OUT/UART_D_RX	GPIOD_9_D	3.3V
27	I2CM_B_SDA	I2CM_B_SDA/PWM_G/SPI_A_SCLK/UART_D_CTS	GPIOA_7_D	3.3V
28	GND_AUDIO	GND_AUDIO		
29	I2CM_B_SCL	I2CM_B_SCL/PWM_H/SPI_A_SS0/UART_D_RTS	GPIOA_8_UP	3.3V
30	AU_LOL	Audio DAC line-out left		3.3V
31	UART_C_TX	UART_C_TX/TDM_B_SCLK/TDM_B_SLV_SCLK/PWM_G/TDM_VAD_SCLK	GPIOA_1_D	3.3V
32	AU_LOR	Audio DAC line-out right		3.3V
33	UART_C_RX	UART_C_RX/TDM_B_FS/TDM_B_SLV_FS/PWM_H/TDM_VAD_FS	GPIOA_2_D	3.3V
34	ADC2_KEY_1V8	SARADC_CH2		1.8V
35	UART_C_CTS	UART_C_CTS/TDM_B_D0/TDM_B_DIN0/PWM_I	GPIOA_3_D	3.3V
36	ADC3_1V8	SARADC_CH3		1.8V
37	UART_C_RTS	UART_C_RTS/TDM_B_D1/TDM_B_DIN1/PWM_J	GPIOA_4_D	3.3V
38	GND	Ground		
39	SPI_B_SS0	SPI_B_SS0/I2CM_D_SDA/UART_E_TX	GPIOA_14_UP	3.3V
40	MCLK_0	MCLK_0/MCLK_VAD	GPIOA_0_D	3.3V
41	SPI_B_SS1	SPI_B_SS1/I2CM_D_SCL/UART_E_RX	GPIOA_15_UP	3.3V
42	CSI_CLKB_N	CSI_CLKB_N		1.8V
43	SPI_B_MOSI	SPI_B_MOSI/CLK12_24	GPIOA_11_D	3.3V
44	CSI_CLKB_P	CSI_CLKB_P		1.8V



J1	Signal	Description or functions	GPIO serial	IO Voltage
45	SPI_B_SCLK	SPI_B_SCLK/UART_C_RX/I2C_M_E_SCL	GPIOA_13_D	3.3V
46	CSI_D3_N	CSI_D3_N		1.8V
47	SPI_B_MISO	SPI_B_MISO/UART_C_TX/I2C_M_E_SDA	GPIOA_12_UP	3.3V
48	CSI_D3_P	CSI_D3_P		1.8V
49	GPIOA_9_u	GPIOA_9/PWM_I/SPI_A_SS1/I2CM_C_SDA	GPIOA_9_UP	3.3V
50	CSI_D2_N	CSI_D2_N		1.8V
51	TDM_VAD_SCLK	TDM_VAD_SCLK/TDM_B_D2/TDM_B_DIN2/SPI_A_MOSI/UART_D_TX	GPIOA_5_UP	3.3V
52	CSI_D2_P	CSI_D2_P		1.8V
53	TDM_VAD_FS	TDM_VAD_FS/TDM_B_D3/TDM_B_DIN3/SPI_A_MISO/UART_D_RX	GPIOA_6_D	3.3V
54	CSI_CLKA_N	CSI_CLKA_N		1.8V
55	GPIOM_7_d_1V8	PWM_F/MIC_MUTE_LED	GPIOM_7_D	1.8V
56	CSI_CLKA_P	CSI_CLKA_P		1.8V
57	CMA_RST_L_1V8	PWM_G/PWM_G_HIZ/I2CM_D_SDA	GPIOM_8_D	1.8V
58	CSI_D1_N	CSI_D1_N		1.8V
59	CMB_RST_L_1V8	PWM_H/PWM_H_HIZ/I2CM_D_SCL/GEN_CLK	GPIOM_9_D	1.8V
60	CSI_D1_P	CSI_D1_P		1.8V
61	GPIOX_17_d_1V8	GPIOX_17/PWM_F	GPIOX_17_D	1.8V
62	CSI_D0_N	CSI_D0_N		1.8V
63	I2CM_C_SDA_1V8	I2CM_C_SDA	GPIOM_12 (HI-Z)	1.8V
64	CSI_D0_P	CSI_D0_P		1.8V
65	I2CM_C_SCL_1V8	I2CM_C_SCL	GPIOM_13 (HI-Z)	1.8V
66	GND	Ground		
67	ETH_REFCLK_1V8	Multiple clock frequency2		1.8V
68	CMA_MCLK_1V8	Multiple clock frequency1		1.8V
69	GND	Ground		
70	BOOT_SEL	Power on config. H: USB/SD Boot enabled		1.8-3.3V
71	WIFI_SD_CLK_1V8	SDIO_CLK/I2CM_B_SDA/UART_E_TX	GPIOM_4_UP	1.8V
72	RGMII_RXDV/SDIO_D3_1V8	SDIO_D3/ETH_RX_DV	GPIOX_3_UP	1.8V
73	WIFI_SD_D0_1V8	SDIO_D0/PWM_I/I2CM_E_SDA	GPIOM_0_UP	1.8V
74	RGMII_RX_CLK/SD	SDIO_D2/ETH_RX_CLK	GPIOX_2_UP	1.8V

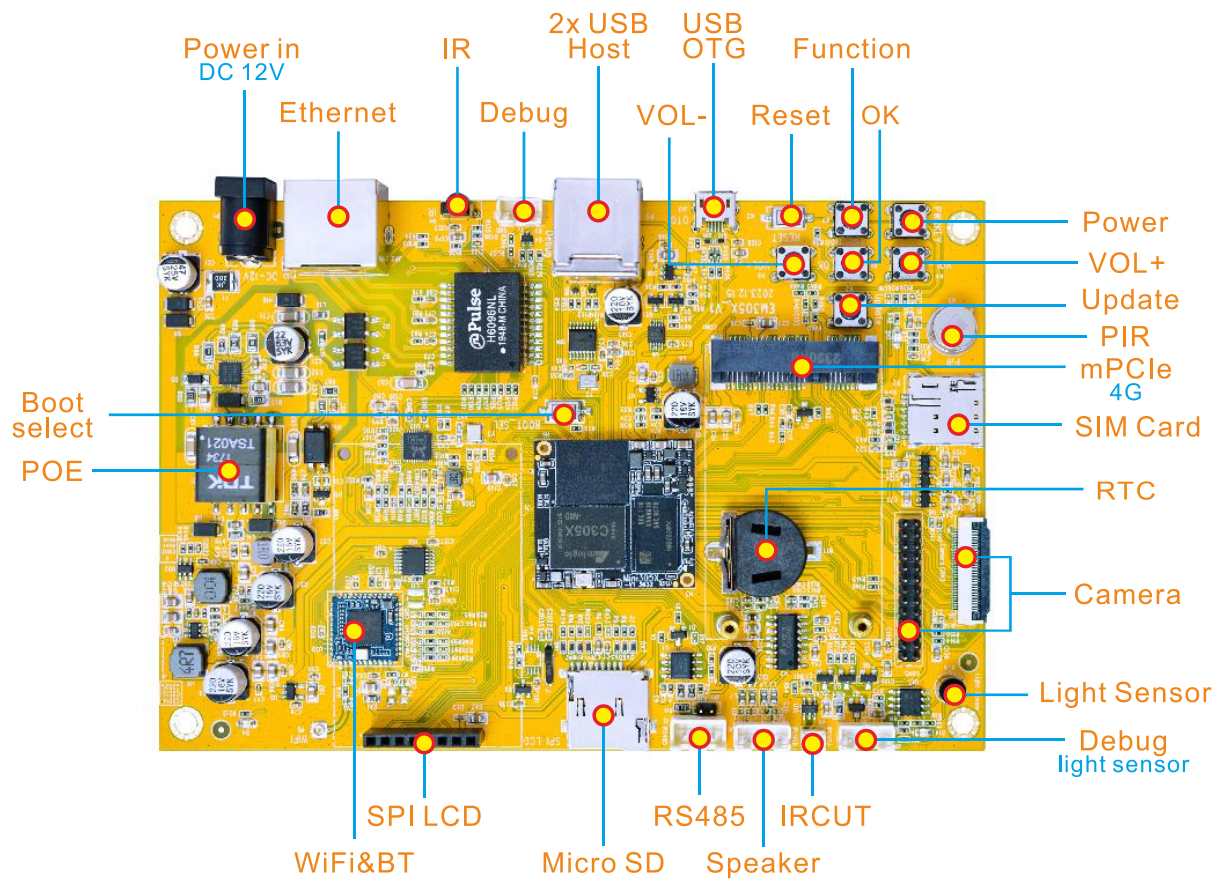


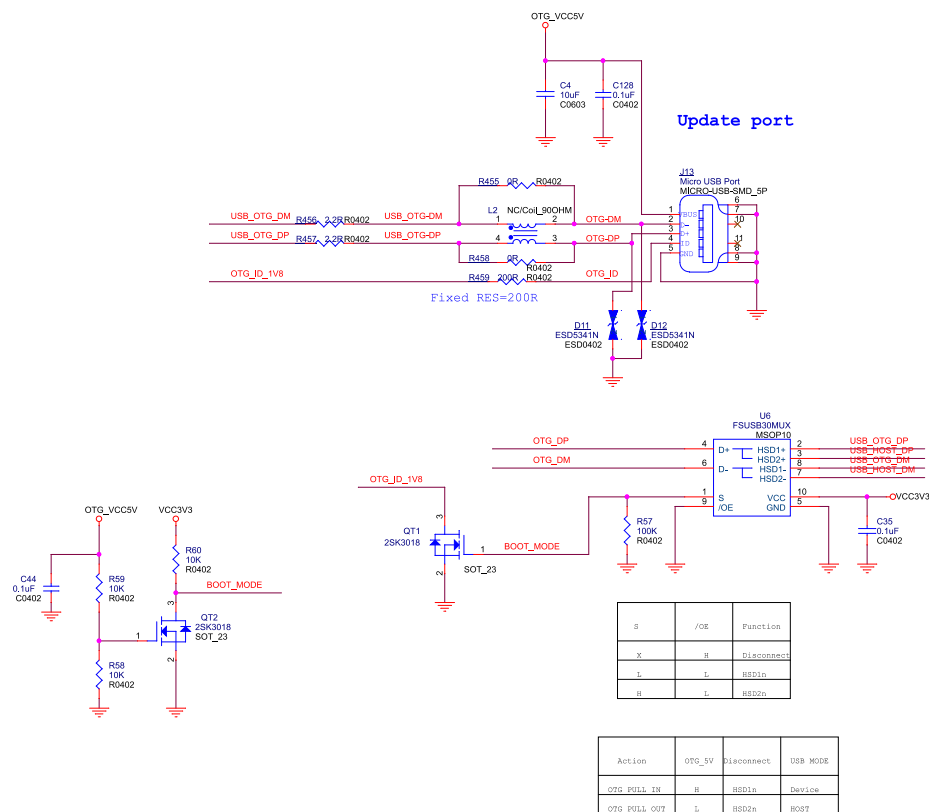
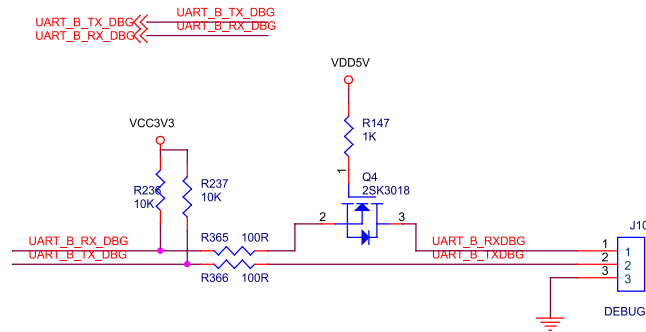
J1	Signal	Description or functions	GPIO serial	IO Voltage
	IO_D2_1V8			
75	WIFI_SD_D1_1V8	SDIO_D1/PWM_J/I2CM_E_SCL	GPIOM_1_UP	1.8V
76	RGMII_MDC/SDIO_D1_1V8	SDIO_D1/ETH_MDC	GPIOX_1_UP	1.8V
77	WIFI_SD_D2_1V8	SDIO_D2/PDM_CLK/UART_E_CTS	GPIOM_2_UP	1.8V
78	RGMII_MDIO/SDIO_D0_1V8	SDIO_D0/ETH_MDIO	GPIOX_0_UP	1.8V
79	WIFI_SD_D3_1V8	SDIO_D3/PDM_DIN0/UART_E_RTS	GPIOM_3_UP	1.8V
80	RGMII_RXD0/SDIO_CLK_1V8	SDIO_CLK/ETH_RXD0	GPIOX_4_UP	1.8V
81	WIFI_SD_CMD_1V8	SDIO_CMD/I2CM_B_SCL/UART_E_RX	GPIOM_5_UP	1.8V
82	GND	Ground		1.8V
83	BTUART_A_CTS_1V8	UART_A_CTS/I2CM_D_SDA/UART_A_TX/PWM_H	GPIOX_14(HI-Z)	1.8V
84	RGMII_RXD1/SDIO_CMD_1V8	SDIO_CMD/ETH_RXD1	GPIOX_5_UP	1.8V
85	BTUART_A_RTS_1V8	UART_A_RTS/I2CM_D_SCL/UART_A_RX/PWM_G	GPIOX_15(HI-Z)	1.8V
86	RGMII_RXD2_1V8	UART_E_TX/ETH_RXD2	GPIOX_6_D	1.8V
87	GPIOX_18_d_1V8	GPIOX_18/PWM_J	GPIOX_18_UP	1.8V
88	RGMII_RXD3_1V8	UART_E_RX/ETH_RXD3	GPIOX_7_UP	1.8V
89	GPIOX_16_d_1V8	GPIOX_16/PWM_E	GPIOX_16_D	1.8V
90	ETH_TX_CLK_1V8	TDM_A_D1/TDM_A_DIN1/ETH_TX_CLK/SPI_B_MOSI/CLK25	GPIOX_8_UP	1.8V
91	GPIOM_6_d_1V8	GPIOM_6/MIC_MUTE_KEY	GPIOM_6_D	1.8V
92	RGMII_TXEN_1V8	TDM_A_D0/TDM_A_DIN0/ETH_TXEN/SPI_B_MISO	GPIOX_9_UP	1.8V
93	GND	Ground		
94	RGMII_TXD0_1V8	TDM_A_FS/TDM_A_SLV_FS/ETH_TXD0/SPI_B_SS0	GPIOX_10_UP	1.8V
95	VCC_SYS	5V Main Power input		5V
96	RGMII_TXD1_1V8	TDM_A_SCLK/TDM_A_SLV_SCLK/ETH_TXD1/SPI_B_SCLK	GPIOX_11_UP	1.8V
97	VCC_SYS	5V Main Power input		5V
98	RGMII_TXD2_1V8	UART_A_TX/ETH_TXD2	GPIOX_12_UP	1.8V
99	VCC_SYS	5V Main Power input		5V
100	RGMII_TXD3_1V8	UART_A_RX/ETH_TXD3	GPIOX_13_UP	1.8V

Note:

1: Most GPIO voltage is 1.8V, but some pins marked 3.3V

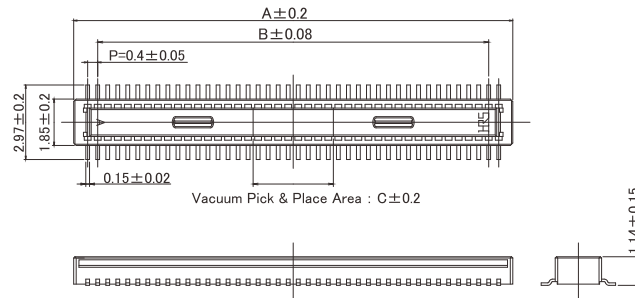
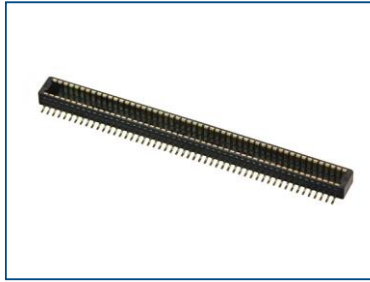
1.7 Development Kit (EM305X)



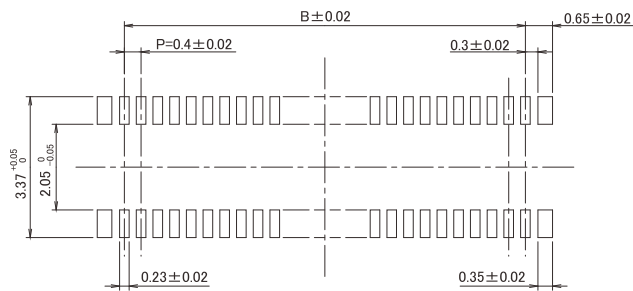




Plug



Recommended PCB Pattern

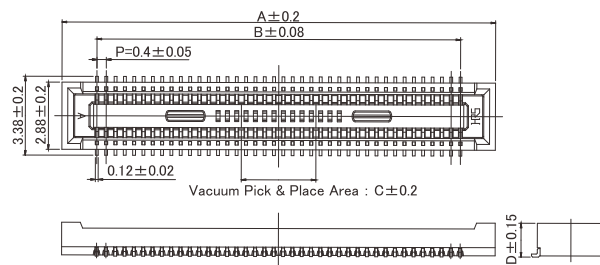


Unit : mm

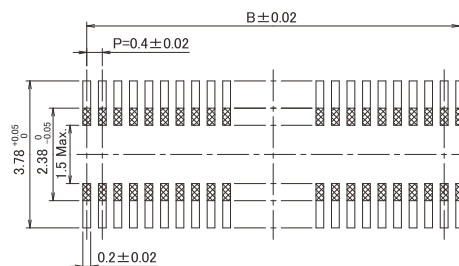
Part No.	HRS No.	No. of Pos.	A	B	C	Purchase Unit (#): (51)	Purchase Unit (#): (58)
DF40C-100DP-0.4V(##)	CL0684-4032-1-##	100	21.52	19.6	3.2	○	○

Receptacle

Stacking Height 1.5mm



Recommended PCB Pattern



DF40C (No Retention Tab)

Unit : mm

Part No.	HRS No.	No. of Pos.	A	B	C	D	Purchase Unit (#): (51)	Purchase Unit (#): (58)
DF40C-100DS-0.4V(##)	CL0684-4033-4-##	100	22.6	19.6	3.2	1.45	○	○



3 Product Electrical Characteristics

3.1 Dissipation and Temperature

Symbol	Parameter	Min	Typ	Max	Unit
VCC5V_SYS	System IO Voltage		5	5.5	V
I _{sys_in}	VCC5V_SYS input Current		250		mA
T _a	Operating Temperature	-20		70	°C
T _{stg}	Storage Temperature	-40		85	°C

3.2 Reliability of Test

High Temperature Operating Test		
Contents	Operating 8h in high temperature	
Result	TBD	

Operating Life Test		
Contents	Operating in room	
Result	TBD	