GF-RK3399-CM Core Board

Hardware Manual

Version.: V2.0

2020.02

Zhejiang Qiyang Intelligent Technology Co., Ltd

Version Records

Version	Hardware	Description	Date	Reviser
1.0	QY-RK3399-CM-S	Internal released	2019-01	wangwx
2.0	GF-RK3399-S	PCB Screen print change	2020-02	wangwx

Catalogue

Notice: This manual introduce the hardware interface of the GF-RK3399-CM Core Board 4
I. Preface.....4
1.1 Company Profile.....4
1.2 Suggestion for Using GF-RK3399-CM Core board.....5
Ⅱ. Product Introduction.....5
2.1 Product Outline.....5
2.2 Chipset Introduction:.....8
2.3 Parameters.....10
Ⅲ. Connectors' Functions.....12
3.1 Block Diagram.....12
3.2 Pin Definition.....13
Ⅳ. Size & Structure.....26
4.1 Top Layer.....26
4.2 Bottom Layer.....27
V. Software Description.....28
Ⅵ. Remark.....28

Notice: This manual introduces the hardware interface of the GF-RK3399-CM Core Board

I. Preface

1.1 Company Profile

Zhejiang Qiyang Intelligent Technology Co., Ltd., established in 2007, which locates in Hangzhou, Zhejiang, PRC. It is a high-end technological enterprise that specializes in exploitation, fabrication, and selling embedded computer mainboards .With 10 years of experiences, Qiyang has established the completed service chain from the design concept to mass production successfully.

The R&D team is organized by 30 more technical engineers. Qiyang focus on providing functional embedded hardware, software tool and customization solutions. It has been applied to Industrial Control, Internet of Things, New Retail, Smart Medical, Electricity Device, Environmental Surveillance, Charging Pile etc.

With the growth of the business, Qiyang has set up an SMT factory in Zhuji, Zhejiang province, which is 5000 ㎡, with a 2xSMT production line. The SMT factory performs the ISO9001 Quality Management System strictly. Relying on the solid production ability, the SMT factory's annual capacity is about a million sets, which totally guarantee the delivery date.

Qiyang has a thorough sales marketing network, professional sales ,and after-sales team to provide full technical support and service. The business has spread over 120 countries and areas, it helps the clients to introduce the products into the market efficiently and successfully.The combination and extension of research and development, production capacity, and market, that provide a solid foundation for Qiyang to provide specialized, globalized embedded hardware and software.

We offer:

l.Software/Hardware Mainboard

Based on the CPU solution from NXP,Rockchip,MTK,Renesas,TI,Atmel,Cirrus Logic etc, Qiyang provides the ARM development kit/system on module /industrial board and periphery products, paired tools and software for the user do further exploitation.

2.Customization Service

Fully taking the advantage of the technical accumulation on the ARM platform and Linux, Android, Ubuntu OS, Qiyang provides the efficient OEM/ODM service to the users.

Sincerely thanks for using Qiyang's product, we will try our best to offer you the technical supports!

1.2.Suggestion for Using GF-RK3399-CM Core board

1. Please read the instructions firstly, before using the single board computer;
2. Before using, please check the packing list and see whether there is a missing file in the CD;
3. Please understand the basic structure and composition of GF-RK3399-CM core board, including the hardware resource allocation etc.;
4. If you need to develop on Android system and burn program into the development board, in addition to this document, we also suggest reading another document ***GF-RK3399-CM Android User Manual;***
5. GF-RK3399-CM core board supports batch order.

Ⅱ.Product Introduction

2.1.Product Outline

GF-RK3399-CM Core Board, it is launched by Zhejiang Qiyang Intelligent Technology Co., Ltd, it is based on the Rockchip RK3399 processor;

It adopts Big.Little architecture: Dual Cortex-A72 + Quad Cortex-A53, 64-bit CPU, the frequency is 1.8GHz;

It integrates power management unit, onboard with 2GB64bitLPDDR4,8GEMMC/16GEMMC;

It integrates Mali-T860 GPU, and it supports OpenGL ES1.1/2.0/3.0/3.1, OpenVG1.1, OpenCL, DX11, and AFBC;

It owns dual MIPI-CSI and dual ISP, HDMI, EDP, PCIe, USB3.0, USB2.0, TypeC etc.

It supports 4K VP9 and 4K 10bits H265/H264 video decoding, it reaches up to 60fps, USB3.0.

It supports various network port: Gigabit LAN, WIFI, Bluetooth etc.

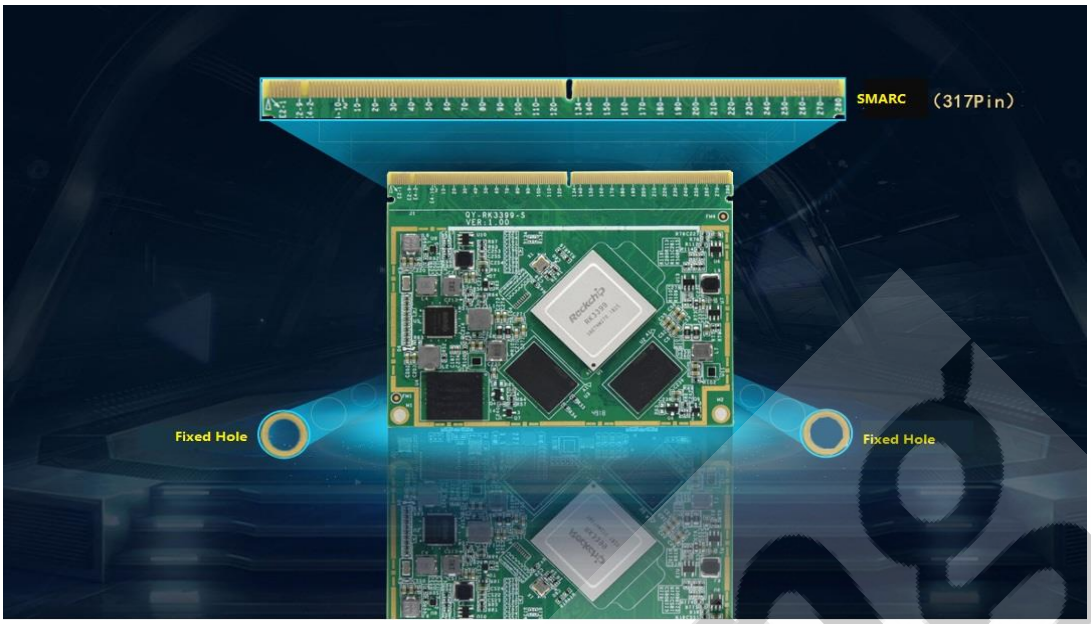
Frontside Picture 1

Backside Picture 2

The Core Board adopts 8-layer PCB, high TG material, size:63mmX82mm.

Picture 3

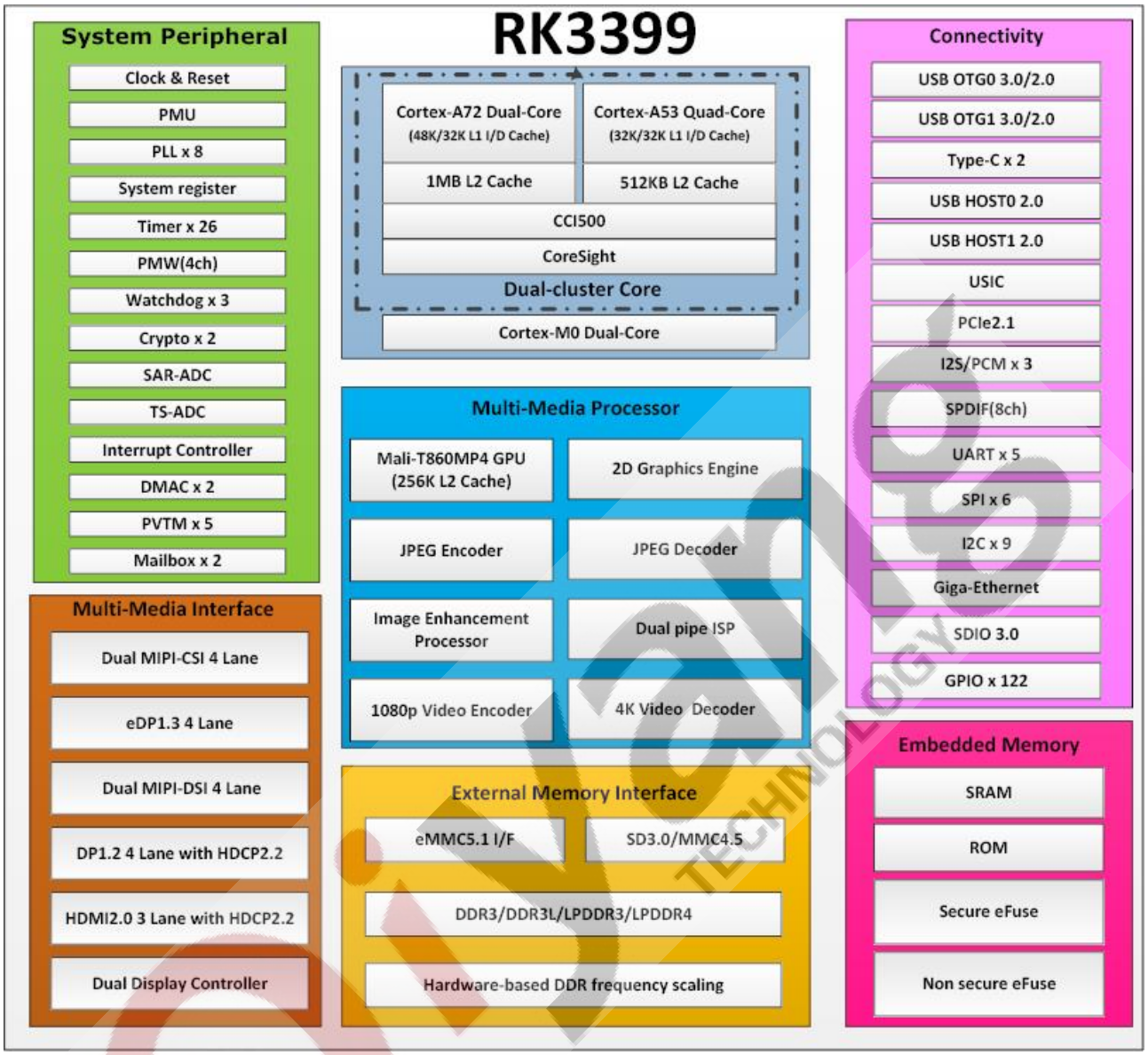
It adopts gold fingers module with 317Pin, the performance is stable, it suits for different application scenarios, it supports Android 7.1.



Picture 4

2.2.Chipset Introduction:

Rockchip RK3399 Processor Architecture:



Picture 5

◆ Big.Little architecture: Dual Cortex-A72 + Quad Cortex-A53, 64-bit CPU, with 1.8Ghz

◆Support Mali-T8640GPU, and OpenGL ES1.1/2.0/3.0/3.1, OpenVG1.1, OpenCL, DX11, and AFBC

◆Dual channel DDR3-1866/DDR3L-1866/LPDDR3-1866/LPDDR4, supports eMMC5.1, SDIO3.0;

◆Support 4K VP9 and 4K 10bits H265/H264 video decoding, 60fps,1080P multi-format video decoding (VC-1,MPEG-1/2/4,VP8),1080P video encoding, it supports H.264,VP8 ,video processor; De-crisscrossing, de-noising, edge/detail/color optimization

◆Dual VOP : The resolution supports 4096X2160 and 2560X1600, it support dual channel MIPI-DSI (Each channel 4-wire);

◆Display: eDP 1.3 （4-wire,10.8Gbps）,HDMI 2.0a supports 4K 60Hz, HDCP 1.4/2.2;

◆Support Display Port 1.2 (4-wire, highest 4K 60Hz), support Rec.2020 and Rec.709 color gamut switching;

◆Dual ISP resolution reaches up to 13MPix/s, it supports dual camera signal input;

◆Support dual USB3.0 Type-C , PCIe 2.1 (4 full-duplex lanes);

◆In-built low consumption MCU;

◆Support 8-ch digital microphone array input;

◆Package: FCBGA828 21mmx21mm ， 0.65mm pitch

2.3.Parameters

Core Board Configuration	CPU Model No.	Rockchip RK3399 (28nm HKMG processing)
	CPU	ARM Hexa-core 64 bit processor, up to 1.8GHz Based on the big.LITTLE architecture, Dual Core Cortex-A72(Big Core)+Quad Core Cortex-A53(Little Core)
	GPU	ARM Mali-T860 MP4 Quad Core GPU Support OpenGL ES1.1/2.0/3.0/3.1, OpenVG1.1, OpenCL, DX11 Support AFBC(ARM Frame Buffer Compression)
	VPU	Support 4K VP9 and 4K 10bits H265/H264 video decoding, with 60fps 1080P multiformat video decoding (WMV, MPEG-1/2/4, VP8) 1080P video decoding, support H.264,VP8 format Video anaphase processor: Anti-interlacing, denoising, dege/detail/color optimization
	RAM	2GB (64-bit Data Bus LPDDR4) (2GB/4GB optional)
	Flash	8GBEMMC, EMMC5.1 (8GB/16GB/32GB optional)
	PMU	RK808 Power Management Unit
	Power Input	+5V power input
	Size	63mmx82mm

Electrical Specification	Connector	Core Board: Gold Fingers interface Carrier Board: MXM Connector (**PN: AS0B826-S78B-7H**)
	Pins' Pitch	1.1mm
	Bonding Pads	1.3mm*0.7mm
	Pin Numbers	317pins, to meet various expansion needs
	Craft	Adopts 8-layer PCB,
	Material	High TG PCB material
Connector Resources	Display	Support MIPI (4-Lane)
		Support EDP (4-Lane)
		Support HDMI 2.0, HD video and audio output
	UART	5-ch UART, support UART with fluid control
	USB	2-ch USB HOST 2.0
		1-ch USB HOST 3.0
		1-ch USB Type-C
	Ethernet	Support Gigabit Ethernet
	PWM	Support 3-ch PWM port
	I2C	6-ch I2C port
	ADC	4-ch ADC port
	SPI	1-ch SPI port
	SDIO	SDIO port
	PCIE	1-ch PCIE 2.0 port
	I2S	I2S port support 8-ch digital voice input
	CAMERA	MIPI CSI port
	GPIO	Reserve partial GPIO
	Power input	+5V power input

Electronic	Operation temperature	0℃ ~ +60℃
	Humidity	5%-95%, Non-condensation
Software	OS	Support Android
	Data	Provide BSP, DEMO, and testing APK
	Application	Facial recognition, IoT, Intelligent appliances, Advertising machine, POS, Vehicle control terminal

Ⅲ.Connectors' Functions

3.1.Block Diagram

Core Board's Picture

Picture 6

3.2.Pin Definition

J1A:

Pin No.	Signal Name	Function	IO
E1-1	VCC_SYS_5V0	5V power input(must connect)	
E1-2	VCC_SYS_5V0		
E1-3	VCC_SYS_5V0		
E1-4	VCC_SYS_5V0		
E1-5	VCC_SYS_5V0		
E1-6	VCC_SYS_5V0		
E1-7	VCC_SYS_5V0		
E1-8	VCC_SYS_5V0		
E1-9	VCC_SYS_5V0		
E3-2	GND		
E3-3	MAC_CLK		GPIO3_B3
E3-4	GPIO3_B7_u		
E3-5	GPIO0_A1_u		
E3-6	MAC_MDIO		GPIO3_B5
E3-7	MAC_MDC		GPIO3_B0
E3-8	GPIO3_B2_u		
E3-9	GND		
E3-10	MAC_TXEN		GPIO3_B4
1	MAC_TXD3		GPIO3_A1
3	MAC_TXD2		GPIO3_A0
5	MAC_TXD1		GPIO3_A5
7	MAC_TXD0		GPIO3_A4

9	MAC_TXCLK	Ethernet signal	GPIO3_C1
11	GND		
13	MAC_RXDV		GPIO3_B1
15	MAC_RXD0		GPIO3_A6
17	MAC_RXD1		GPIO3_A7
19	MAC_RXD2		GPIO3_A2
21	MAC_RXD3		GPIO3_A3
23	MAC_RXCLK		GPIO3_B6
25	GND		
27	GPIO2_B4_u		
29	I2C2_SDA	I2C signal	GPIO2_A0
31	I2C2_SCL		GPIO2_A1
33	GPIO2_A2_d		
35	GPIO2_A3_d		
37	GPIO2_A4_d		
39	GPIO2_A5_d	GPIO signal	
41	GPIO2_A6_d		
43	I2C7_SDA		GPIO2_A7
45	I2C6_SDA		GPIO2_B1
47	I2C7_SCL		GPIO2_B0
49	GND	I2C signal	
51	I2C6_SCL		GPIO2_B2
53	CIF_CLKOUT		GPIO2_B3
55	GND		
57	VCC_DVP_1V8		
59	VCC_DVP_2V8		

61	VCCA		
63	SPI1_RXD	SPI signal	GPIO1_A7
65	SPI1_TXD		GPIO1_B0
67	SPI1_CLK		GPIO1_B1
69	SPI1_CSN0		GPIO1_B2
71	GND		
73	PCIE_RCLK_100M_P	PCIe signal	
75	PCIE_RCLK_100M_N		
77	GND		
79	PCIE_TX0_N		
81	PCIE_TX0_P		
83	GND		
85	PCIE_RX0_N		
87	PCIE_RX0_P		
89	GND		
91	PCIE_TX1_N		
93	PCIE_TX1_P		
95	GND		
97	PCIE_RX1_N		
99	PCIE_RX1_P		
101	GND		
103	PCIE_TX2_N		
105	PCIE_TX2_P		
107	GND		
109	PCIE_RX2_N		
111	PCIE_RX2_P		

113	GND		
115	PCIE_TX3_N		
117	PCIE_TX3_P		
119	GND		
121	PCIE_RX3_N		
123	PCIE_RX3_P		
125	GND		

J1C:

PIN No.	Signal Name	Function	IO
133	GPIO1_C2_u		
135	GPIO1_C4_u		
137	I2C4_SDA	I2C signal	
139	I2C4_SCL		
141	PWR_EN	Switch enable	
143	PWR_KEY	Switch control	
145	GPIO1_D0_d		
147	GPIO0_A6_d		
149	GPIO0_B5_d		
151	MPU_RESET	System reset	
153	GPIO0_A2_d	GPIO signal	
155	GPIO0_B0_u		
157	GPIO0_A5_u		
159	GPIO2_D3_d		
161	HDMI_CEC		GPIO4_C7
163	HDMI_HPD		

165	HDMI_I2C3_SCL	HDMI signal	GPIO4_C1
167	HDMI_I2C3_SDA		GPIO4_C0
169	GPIO1_A2_d		
171	RTC_CLK_OUT		
173	GND		
175	GPIO0_A4_d		
177	GPIO2_D2_u		
179	UART0_RTSn	UART No.0	GPIO2_C3
181	UART0_CTSn		GPIO2_C2
183	UART0_TXD		GPIO2_C1
185	UART0_RXD		GPIO2_C0
187	GPIO0_B1_d		
189	SDIO0_D1	SDIO signal	GPIO2_C5
191	SDIO0_D0		GPIO2_C4
193	SDIO0_D2		GPIO2_C6
195	SDIO0_D3		GPIO2_C7
197	SDIO0_CLK		GPIO2_D1
199	SDIO0_CMD		GPIO2_D0
201	GPIO0_A3_d		
203	GPIO0_B2_d		
205	GND		
207	RTC_CLKO_WIFI		
209	PMIC_EXT_PWR_EN		
211	OTP_RST_CTRL		
213	TYPEC1_ID	Typec-ID	
215	TYPEC0_ID		

217	GPIO4_D4_d		
219	GPIO4_D5_d		
221	UART2DBG_TXD	UART-NO.2	GPIO4_C4
223	UART2DBG_RXD		GPIO4_C3
225	GPIO4_D3_d		
227	GPIO4_D0_u		
229	GPIO4_D1_d		
231	GPIO4_D2_d		
233	GPIO4_C6_d		
235	GPIO4_C2_d		
237	VCCA_CODEC_3V0	3.0V output	
239	VCCA_CODEC_3V0		
241	VCCA_CODEC_1V8	1.8V output	
243	VCCA_CODEC_1V8		
245	GND		
247	I2S0_SCLK	I2S signal	GPIO3_D0
249	I2S0_LRCK_RX		GPIO3_D1
251	I2S0_LRCK_TX		GPIO3_D2
253	I2S0_SDI0		GPIO3_D3
255	GPIO3_D4_d		GPIO3_D4
257	GPIO3_D5_d		GPIO3_D5
259	GPIO3_D6_d		GPIO3_D6
261	I2S0_SDO0	I2S signal	GPIO3_D7
263	I2S_CLK		GPIO4_A0
265	GPIO4_A3_d		
267	GPIO4_A4_d		

269	GPIO4_A5_d		
271	GPIO4_A6_d		
273	GPIO4_A7_d		
275	GND		
277	I2C1_SDA		GPIO4_A1
279	I2C1_SCL		GPIO4_A2
281	GPIO4_C5_d		GPIO4_C5

J1D：

Pin No.	Signal Name	Function	IO
E2-1	GND		
E2-2	GND		
E2-3	GND		
E2-4	GND		
E2-5	GND		
E2-6	GND		
E2-7	GND		
E2-8	GND		
E2-9	GND		
E4-2	VCC_SYS_3V3		
E4-3	VCC_SYS_3V3		
E4-4	VCC_SYS_3V3		
E4-5	VCC_S3_3V3		
E4-6	VCC_S3_3V3		
E4-7	VCC_S3_3V3		
E4-8	GND		

E4-9	VCC_3V0		
E4-10	VCC_3V0		
2	VCC_1V8		
4	VCC_1V8		
6	VCC_RTC		
8	VCC_S3_1V8		
10	GND		
12	EDP_AUXN	DEP signal	
14	EDP_AUXP		
16	GND		
18	EDP_TX0N		
20	EDP_TX0P		
22	GND		
24	EDP_TX1N		
26	EDP_TX1P		
28	GND		
30	EDP_TX2N		
32	EDP_TX2P		
34	GND		
36	EDP_TX3N		
38	EDP_TX3P		
40	GND		
42	SPDIF_TX		GPIO3_C0
44	GND		
46	GPIO0_B4_d		
48	SDMMC0_DET		GPIO0_A7

50	SDMMC0_D2	SDMMC signal	GPIO4_B2
52	SDMMC0_D3		GPIO4_B3
54	SDMMC0_CMD		GPIO4_B5
56	SDMMC0_CLK		GPIO4_B4
58	SDMMC0_D0		GPIO4_B0
60	SDMMC0_D1		GPIO4_B1
62	GPIO1_A1_d		
64	GPIO1_A4_d		
66	GPIO1_A3_d		
68	GPIO1_A0_d		
70	TYPEC0_U2VBUSDET		
72	TYPEC1_U2VBUSDET		
74	GPIO1_C6_d		
76	GPIO1_C7_d		
78	GPIO2_D4_d		
80	ADC_IN4	AD signal	
82	ADC_IN3		
84	ADC_IN0		
86	ADC_IN1		
88	ADC_IN2		
90	GND		
92	HOST1_DN	USB-HOST signal	
94	HOST1_DP		
96	GND		
98	HOST0_DN		
100	HOST0_DP		

102	GND		
104	TYPEC1_AUXP	USB Type-c signal	
106	TYPEC1_AUXN		
108	GND		
110	TYPEC1_TX2N		
112	TYPEC1_TX2P		
114	GND		
116	TYPEC1_RX2P		
118	TYPEC1_RX2N		
120	GND		
122	TYPEC1_AUXP_PD_PU		
124	TYPEC1_AUXP_PU_PD		

J1F：

Pin No.	Signal Name	Function	IO
134	TYPEC1_RX1N		
136	TYPEC1_RX1P		
138	TYPEC1_TX1P		
140	TYPEC1_TX1N		
142	TYPEC1_DP		
144	TYPEC1_DN		
146	TYPEC0_TX2N		
148	TYPEC0_TX2P		
150	TYPEC0_RX2P		
152	TYPEC0_RX2N	USB Type-C signal	
154	TYPEC0_DN		

156	TYPEC0_DP		
158	TYPEC0_TX1N		
160	TYPEC0_TX1P		
162	TYPEC0_RX1P		
164	TYPEC0_RX1N		
166	TYPEC0_AUXP		
168	TYPEC0_AUXN		
170	TYPEC0_AUXN_PU_PD		
172	TYPEC0_AUXN_PU_PU		
174	GND		
176	HDMI_TX2P		
178	HDMI_TX2N		
180	HDMI_TX1P		
182	HDMI_TX1N		
184	HDMI_TX0P	HDMI signal	
186	HDMI_TX0N		
188	HDMI_TXCP		
190	HDMI_TXCN		
192	GND		
194	MIPI_TX0_D0P		
196	MIPI_TX0_D0N		
198	GND		
200	MIPI_TX0_D1P		
202	MIPI_TX0_D1N		

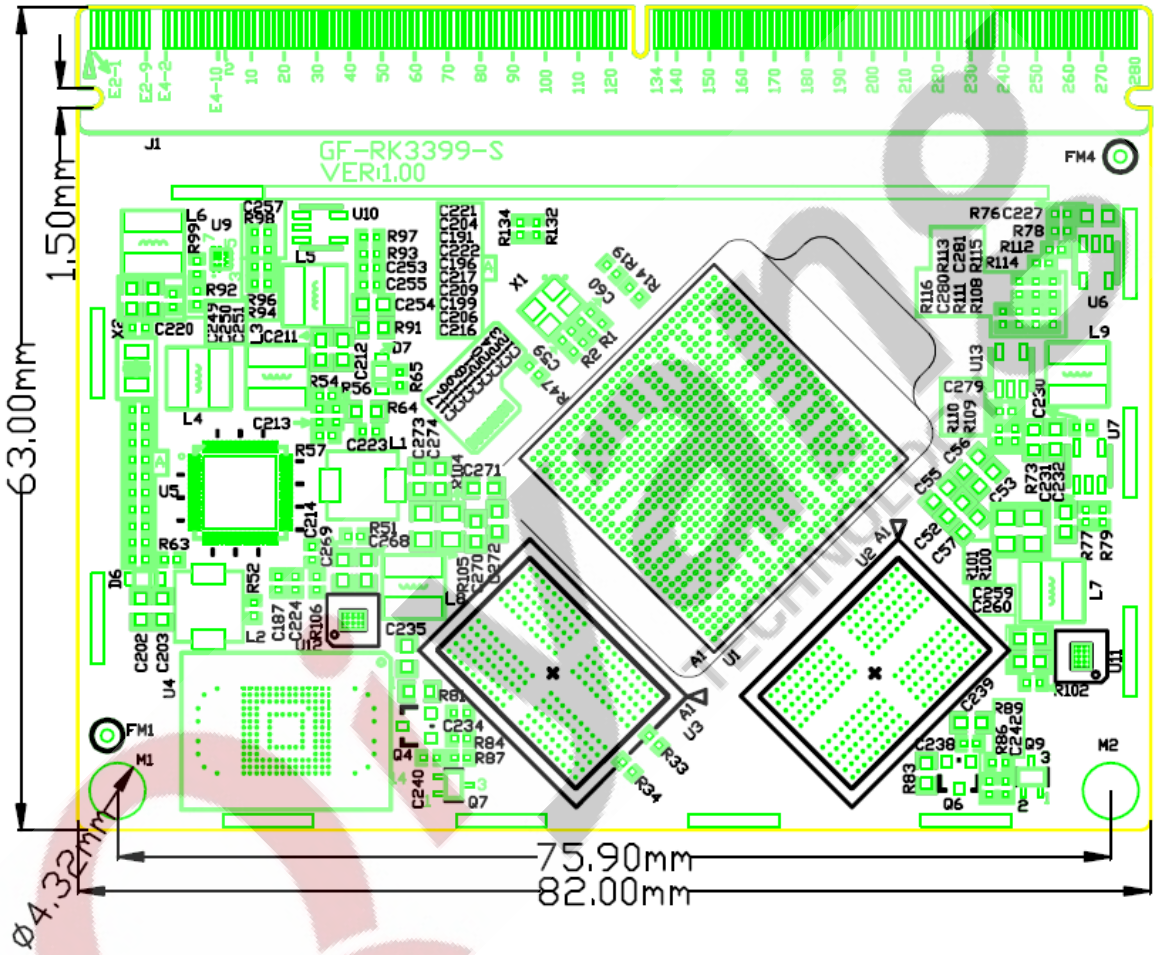
204	GND	MIPI-TX signal	
206	MIPI_TX0_CLKP		
208	MIPI_TX0_CLKN		
210	GND		
212	MIPI_TX0_D2P		
214	MIPI_TX0_D2N		
216	GND		
218	MIPI_TX0_D3P		
220	MIPI_TX0_D3N		
222	GND	MIPI-RX signal	
224	MIPI_RX0_D0P		
226	MIPI_RX0_D0N		
228	GND		
230	MIPI_RX0_D1P		
232	MIPI_RX0_D1N		
234	GND		
236	MIPI_RX0_CLKP		
238	MIPI_RX0_CLKN		
240	GND		
242	MIPI_RX0_D2P		
244	MIPI_RX0_D2N		
246	GND		
248	MIPI_RX0_D3P		
250	MIPI_RX0_D3N		
252	GND		
254	MIPI_TX1/RX1_D3P		

256	MIPI_TX1/RX1_D3N	MIPI-RX/TX signal	
258	GND		
260	MIPI_TX1/RX1_D2P		
262	MIPI_TX1/RX1_D2N		
264	GND		
266	MIPI_TX1/RX1_CLKP		
268	MIPI_TX1/RX1_CLKN		
270	GND		
272	MIPI_TX1/RX1_D1P		
274	MIPI_TX1/RX1_D1N		
276	GND		
278	MIPI_TX1/RX1_D0P		
280	MIPI_TX1/RX1_D0N		

Ⅳ.Size & Structure

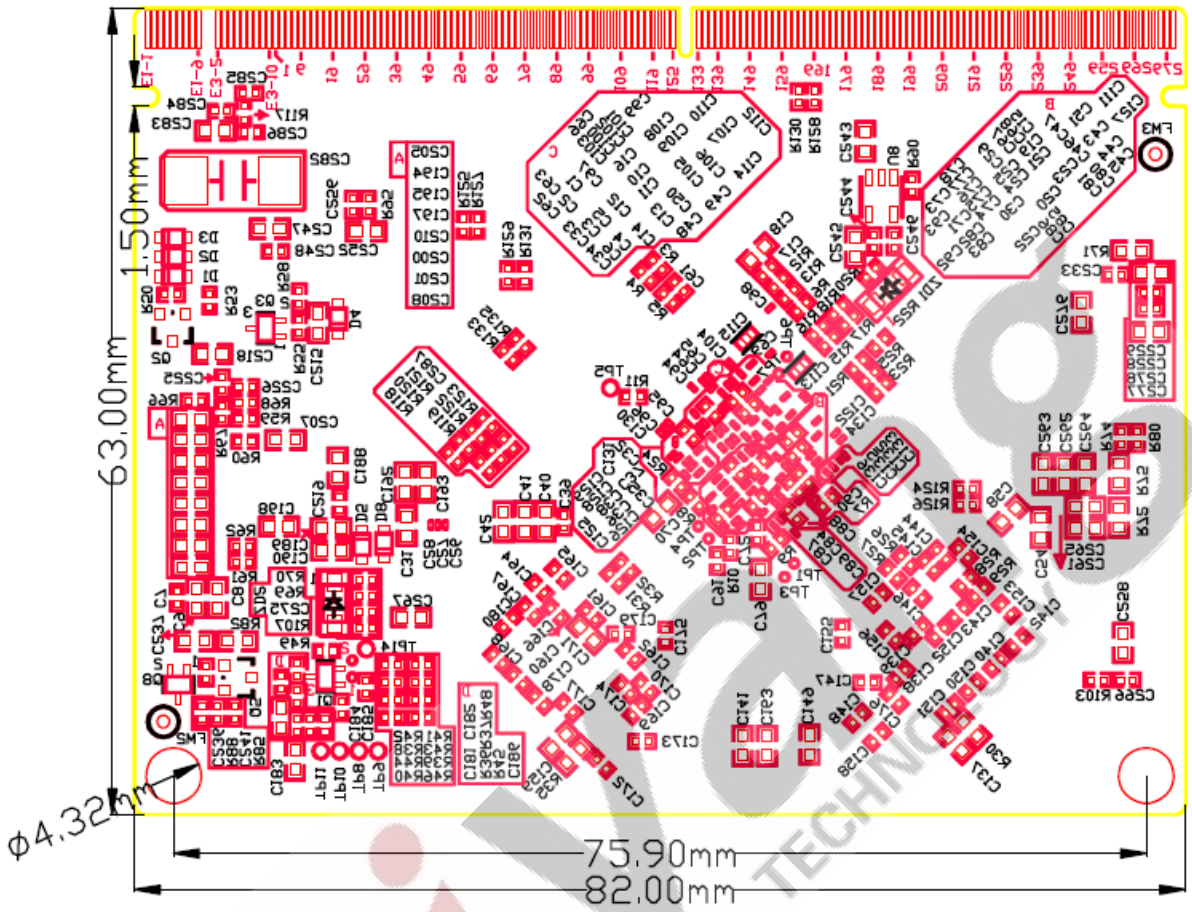
Unit:mm, if needs the connector's size, please email: supports@qiyangtech.com

4.1.Top Layer



Picture 7

4.2.Bottom Layer



Picture 8

V.Software Description

GF-RK3399-CM provides the software support for Android 7.1.

The ***GF-RK3399-CM Android User Manual*** will introduce the GF-RK3399-CM mainboard's setting up and using in Android developing environment. The detailed content could refer to the relative documentation.

Ⅵ.Remark

1. Before connecting to LCD, please confirm the power specification of LCD module.
2. Please use the original connecting accessories to avoid damaging the main board.
3. We ensure offering communication technology support through E-mail, telephone for lifelong technical support service.
4. We ensure offering 6 months repair service for free, if malfunction occurs in warranty because of quality problem, contact our retailer or our company with purchase receipt in warranty period, we will repair or replace it.
5. Under these circumstances, we do not offer repair for free:

- Over warranty time;
- Do not have purchase receipt;
- Liquid inlet, Damp or Mold;
- Malfunction and damage is not due to product quality but drops, intense sharking, arbitrarily modify, disoperation after purchase;
- Damage of force majeure.

6. We reserve intellectual property for the software and hardware technical data of GF-RK3399-CM; users can only use them for teaching, testing, researching. Shall not be engaged in any commercial purpose. Shall not distribute them on the Internet. Shall not intercept, modify them to tamper copyright.
7. We accept batch order; we can offer comprehensive technical support and service.

Zhejiang Qiyang Intelligent Technology Co., Ltd

Tel: 86-571-87858811 / 87858822

Fax: 86-571-89935912

Technical Support： 0571-87858811 ext.805

E-MAIL： supports@qiyangtech.com

Website： http://www.qiytech.com or http://www.qiyangtech.com

ADD: 3rd Floor, Building A, WSCG Building, NO.6 Xiyuan 8th Road, Sandun Town, Xihu District, Hangzhou City, Zhejiang China

Postal Code： 310013