AGENEWTECH

M274K

Hardware Design Guide_V1.0

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About the Document

History

Version	Data	Author	Description
-	2023-5-16		Initial

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1 introduction

This document defines the hardware interface specifications, electrical characteristics and mechanical specifications of the M274K module. With the help of this document, combined with the application manual and user guide provided by Sunning Smart, customers can quickly apply the M274K module to wireless applications.

1.1 Safety Instructions

To ensure personal security and protect products and working environments from potential damage, follow the following safety instructions. Product manufacturers need to communicate the following security requirements to end users, and the security instructions are in the user manual of the terminal product. Yunning Smart will not be responsible for the user due to the failure to follow the safety rules or errors.

Road driving, safety first! Do not use the handheld mobile terminal when driving. Even if it is hands-free, please do not use it. Please stop first and then make a call.

Close the mobile terminal device before boarding. The wireless function of the mobile terminal is prohibited on the aircraft to prevent interference from the aircraft communication system. No compliance with this prompt may affect flight safety, even violate the law.

When entering hospital or health care, please note that there is a restriction of mobile terminal devices. RF interference may cause medical devices to operate, so there may be need to close the mobile terminal device.

The mobile terminal device is not guaranteed to be effective in any case, such as when the device arrears or the SIM card is invalid. When you encounter the above situation in an emergency, use the emergency call function, and ensure that the device is turned on and is located in a region where the signal strength is sufficient.

The mobile terminal device receives and transmits RF signals when booting. Radio frequency interference is generated when close to TV, radio, computer or other electronic devices.

Make sure the mobile terminal device is far from flammable and explosive. Close mobile terminal equipment when approaching gas stations, oil depots, chemical plants or explosive workplaces. There is a safety hidden danger in any case-inventory of potential explosion hazards.

2 Product Concept

2.1 Summary

M274K is a module based on Mediatek's octa-core 2*Arm Cortex-A78+6*Arm Cortex-A55 processor, which is equipped with the Android 13 operating system. Its powerful performance, neon engine processing, and 2D/3D graphics acceleration processing capabilities fully meet customers' needs for high-speed and multimedia functions in industrial and consumer applications.

Support Wi-Fi 802.11a/b/g/n/ac/ax ,and BT5.2 short-range wireless communication.

Support multiple audio and video codec.

Possess audio and video input and output interfaces and rich GPIO interfaces.

The M274K is a SMD module with 285 pins, including 208 LCC pins and 77 LGA pins. With a size of only 55.0(±0.15)mm × 55.0(±0.15)mm × 3.7(±0.2)mm, it can be embedded in all kinds of M2M product applications via solder pads, making it widely used in smart cash registers, smart POS, tax controllers, security and surveillance, in-vehicle devices, high-end information collection devices, smart robots, smart homes, smart hardware, and industrial smart handheld devices, drones, high-end police or law enforcement equipment, intelligent intercom equipment, smart wearable, vending machines, logistics cabinets and other equipment applied in different industries.

2.2 Main performance

The following table describes the detailed performance parameters of M274K:

Table 1 Main performance parameters

Performance	Description
application processor	Dual-core ARM Cortex-A78 processor at 2.2GHz Quad-core ARM Cortex-A55 processor at 2.0GHz
Memory	eMMC 5.1 + 64bit LP4X 1866MHz (default) eMMC 5.1 + 64bit DDR4 1600MHz (optional)
Operating system	Android 13
Powered	VSYS Supply Voltage Range: 3.3V~4.5V
WLAN Features	2.4GHz and 5GHz bands, supports 802.11a/b/g/n/ac/ax
Bluetooth Features	BT5.2
LCM Interface	LCD1: MIPI DSI 4Lane or EDP 2 Lane , 2K@60fps LCD2: DP 4Lane or HDMI TX 2.0 , 4K@60fps
Camera Interface	2-way 4-lane MIPI_CSI Can support single camera (32MP @ 30fps) or 2 cameras (16MP + 16MP @ 30fps)
Video codecs	Video encoding 4K @ 30 fps , video decoding 4K @ 75 fps
audio interface	Audio Input: 2 analogue microphone inputs with integrated internal bias Audio Output: Class AB Differential Lineout Output
Audio Codec	Audio encoding: HEVC/H.264 Audio decoding: AV1/VP9HEVC/H.264
USB interface	Support USB 2.0, USB 3.0; Support USB OTG
UART interface	3 serial ports: UART0, UART1, UART2
SD Card Interface	Supports SD 3.0 Support SD card hot-swap
I2C interface	6 sets of I2C for peripherals such as touch screen, camera, sensors, etc.
I2S Interface	2 I2S interfaces to support I2S peripherals
ADC Interface	2 general-purpose ADC interfaces, supporting up to 12-bit sampling precision
SPI interface	3 sets of SPI interfaces, all of which can be used as general-purpose SPIs
charging interface	Used for battery voltage detection, power detection, battery temperature detection, etc.

real time clock	support sth.
physical property	Dimensions: (55.0±0.15)mm × (55.0±0.15)mm × (3.7±0.2)mm Package: LCC + LGA
temperature range	Recommended working temperature: 0°C ~ +60°C Recommended storage temperature: -20°C ~ +80°C
software upgrade	Upgrade via USB Interface
RoHS	All devices are fully compliant with EU RoHS standards

2.3 functional block diagram

The following figure shows the M274K functional block diagram.

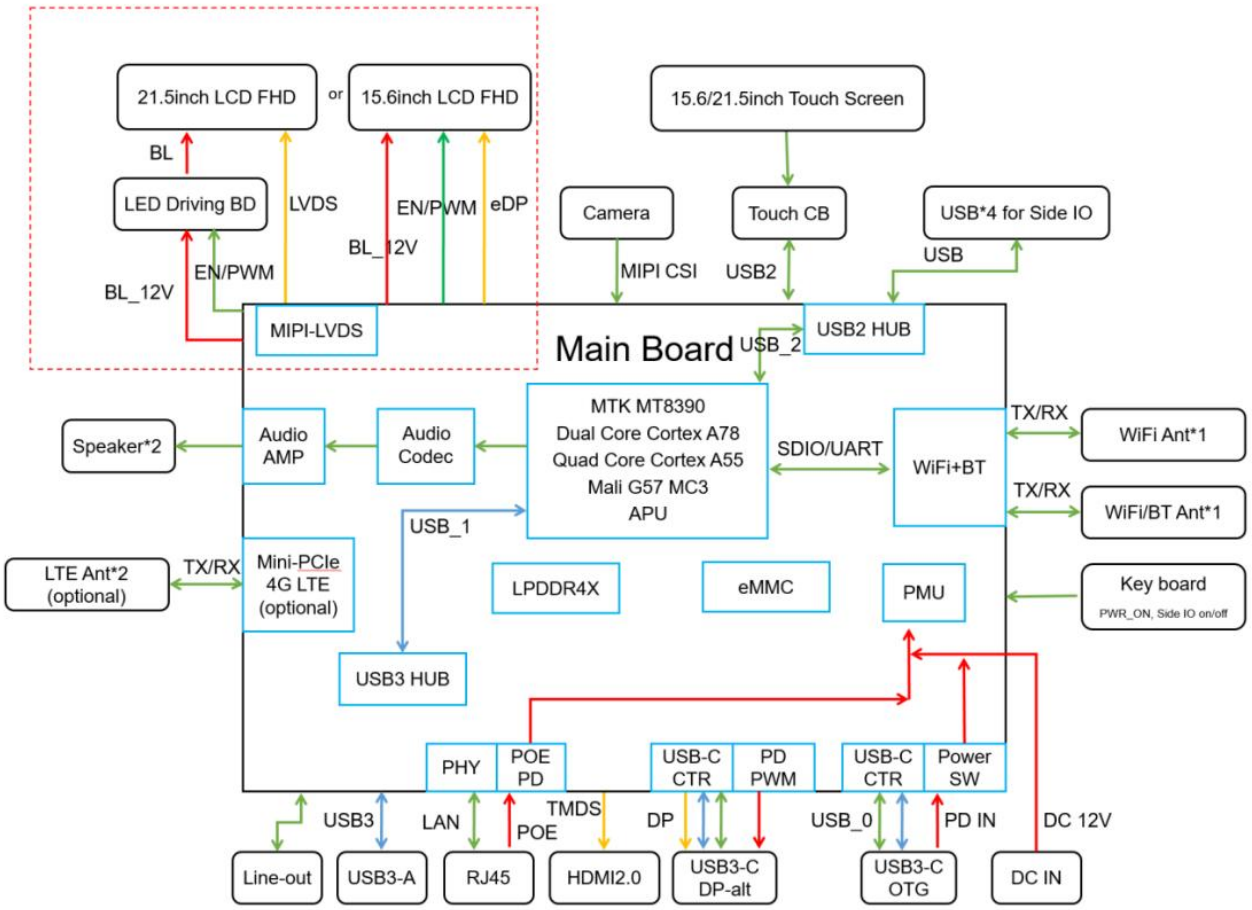


Figure 1 Functional Block Diagram

3 Application interface

3.1 Overview

The M274K module is available in an LCC+LGA package with a total of 285 pins, including 208 LCC pins and 77 LGA pins. The following chapters elaborate on the functions of each group interface of the module:

Power Supply
Startup & Shutdown
VRTC Interface
Charging Interface
USB Interface
UART Interface
SIM Interface
SD 卡Interface
GPIO Interface
I2C Interface
I2S Interface
SPI Interface
ADC Interface
Motor Drive Interface
LCM Interface
Touch Screen Interface
Camera Interface
Flashlight Interface
Sensor Interface
Audio Interface
Mandatory download Interface
LED indication

3.2 Pin Assignment

The pin assignment diagram of the M274Kmodule is as follows:

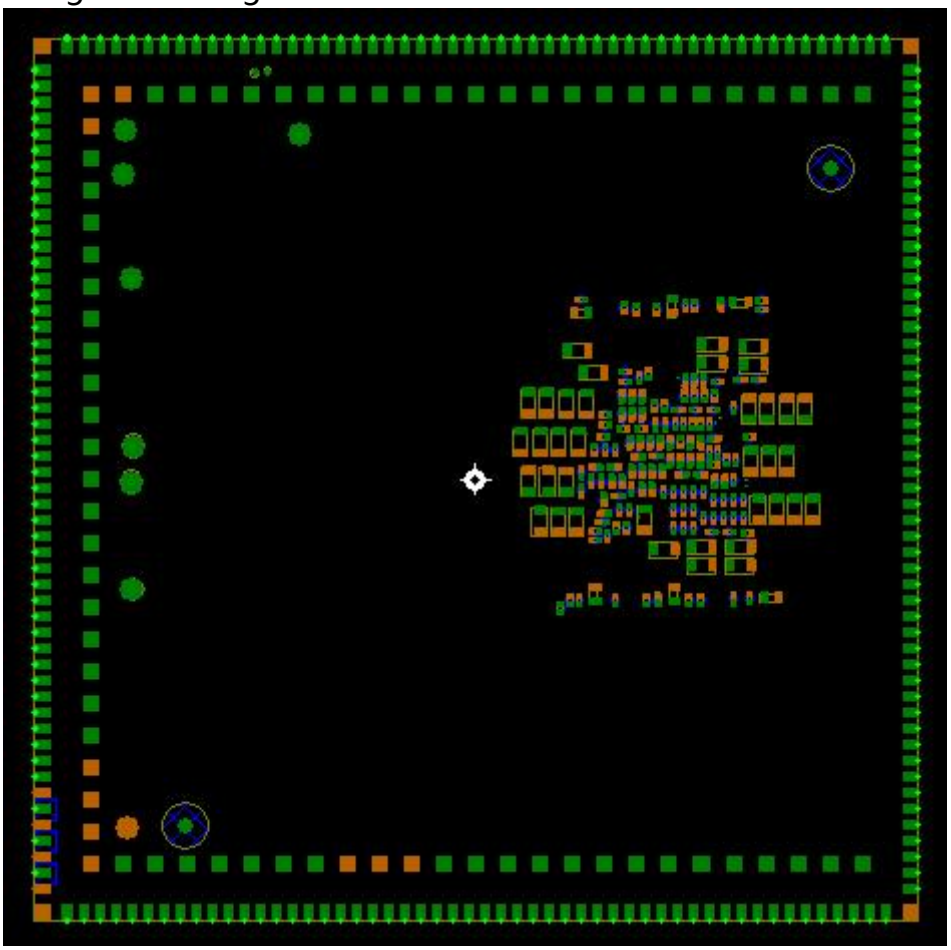


Figure 2 M274K Pin Assignment Diagram (Top View)

3.3 Pin Description

Table 2 I/O Parameter definition

Type	Description
IO	Bidirectional Port
DI	Digital Input
DO	Digital Output
PI	power input
PO	Power Output

AI	Analog Input
AO	Analog Output
OD	Open Drain

The pin functions and electrical characteristics of M274K are described in the following table:

Table 3 I/O Pin description

Power supply					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
VFE28_PMU	222	PI/PO	RF Switching 2.8V Power Supply	Vnorm=2.8V IOmax=50mA	
VRTC28	217	PI/PO	RTC Power Interface	Vnorm=2.8V VOmax=2.98V	
VIO28_PMU	230	PO	Output 2.8V	Vnorm=2.8V IOmax=200mA	To supply power to external sensors and touch screens, add 1.0uF~4.7uF bypass capacitors when in use. If you don't use it, leave it open
VIO18_PMU	41	PO	Output 1.8V	Vnorm=1.8V IOmax=600mA	To supply power to the external camera, LCD, sensor, and I/O port voltage domain, a 1.0uF~2.2uF bypass capacitor should be added when using it. If you don't use it, leave it open
VSYS	26,27	PO	system voltage	Vnorm=3.8V IOmax=500mA	
VRF18_PMU	223	PO	RF Switch 1.8V Power Supply		
VCN18_PMU	227	PO	WIFI/BT/GPS powered		
VCN33_1_PMU	229	PO	RF Switched 3.3V Power Supply		
VCN33_2_PMU	228	PO	RF Switched 3.3V Power Supply		
VCAM_IO	233	PO	Output 1.8V	Vnorm=1.8V	
GND	1,3,5,7 209~216 236~238 269~271		GND		

Audio interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
VMIC	38	DO	MIC Bias Voltage	VO=0V~2.94V	
MICP0	28	DI	Main Mic Input Positive		
MICN0	29	DI	Main Mic Input Negative		
MICP1	30	DI	Headset Mic Input Positive		
MICN1	31	DI	Headset Mic Input Negative		
HP_VMIC	37	DI	Headphone MIC bias voltage		
ACCDET	32	AI	Detecting headset type and keys		
HP_OUTR	36	AO	Headphone right channel		
HP_REFN	35	AI	Headset Reference		
HP_OUTL	34	AO	Headphone left channel		
HP_EINT_PMU	33	AI	Headphone insertion detection		Default high level.
USB interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
USB_DM0	46	IO	USB 2.0 differential data negative	USB 2.0 compliant	Requires differential impedance of 90Ω
USB_DP0	45	IO	USB 2.0 differential data positive		
USB_DM1	55	IO	USB 3.0 differential data negative	USB 3.0 compliant	Requires differential impedance of 90Ω
USB_DP1	54	IO	USB 3.0 differential data positive		
USB_DM2_EXT	189	IO	USB 2.0 differential data negative	USB 2.0 compliant	Requires differential impedance of 90Ω
USB_DP2_EXT	190	IO	USB 2.0 differential data positive		
USB1_IDDIG	51	DI	USB ID Detection Signal		Default high level
USB2_IDDIG	56	DI	USB ID Detection Signal		Default high level
USB0_ID	42	DI	USB ID identification signal		
USB0_DRV_VBUS	43	DI	VBUS Power Enable		
USB0_VBUS_VALID	44	DI	VBUS Valid Inputs		

USB1_DRV_VBUS	52	DI	VBUS Power Enable		
USB1_VBUS_VALID	53	DI	VBUS Valid Inputs		
USB2_DRV_VBUS	57	DI	VBUS Power Enable		
USB2_VBUS_VALID	58	DI	VBUS Valid Inputs		
SSUSB_TXP	47	O	USB3.0 data transmission signal positive	Standard USB3.0 port reserved for backward compatibility.	Internal NC of the Module
SSUSB_TXN	48	O	USB3.0 data transmission signal negative		Internal NC of the Module
SSUSB_RXP	49	I	USB3.0 Data Receiving Signal Positive		Internal NC of the Module
SSUSB_RXN	50	I	USB3.0 Data Receive Signal Negative		Internal NC of the Module
UARsendT interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
UTXD0	64	DO	UART0 s data; default is Debug port	VOLmax=0.45V VOHmin=1.35V	1.8V voltage domain no user no connection
URXD0	65	DI	UART0 Receive data; default is Debug port	VILmax=0.63V VIHmin=1.17V	
URXD1	67	DI	UART1 Receive data	VOLmax=0.45V VOHmin=1.35V	
UTXD1	66	DO	UART1 Transmit data	VILmax=0.63V VIHmin=1.17V	
URXD2	69	DI	UART2 Receive Data	VOLmax=0.45V VOHmin=1.35V	
UTXD2	68	DO	UART2 Transmit Data	VILmax=0.63V VIHmin=1.17V	
SD Card Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
SD1_CLK	99	DO	SD Card High Speed Digital Clock	VOLmax=0.41V VOHmin=2.1V	
SD1_CMD	100	IO	SD card control signal	VILmax=0.85V VIHmin=1.75V VOLmax=0.41V VOHmin=2.1V	
SD1_DAT0	101	IO	High-speed bi-directional digital signals	VILmax=0.85V VIHmin=1.75V VOLmax=0.41V VOHmin=2.1V	
SD1_DAT1	102	IO			
SD1_DAT2	103	IO			

SD1_DAT3	104	IO			
SDIO2_CLK	14	DO	SD Card High Speed Digital Clock	VOLmax=0.41V VOHmin=2.1V	
SDIO2_CMD	15	IO	SD card control signal	VILmax=0.85V VIHmin=1.75V VOLmax=0.41V VOHmin=2.1V	
SDIO2_DAT0	16	IO	High-speed bi-directional digital signals	VILmax=0.85V VIHmin=1.75V VOLmax=0.41V VOHmin=2.1V	
SDIO2_DAT1	17	IO			
SDIO2_DAT2	18	IO			
SDIO2_DAT3	19	IO			
VSD	98	PO	SD Card Power Supply	Vnorm=3.0V IOmax=800mA	
Touch Screen Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
TP_RST	168	DO	Touch panel reset signal	VOLmax=0.45V VOHmin=1.35V	1.8V voltage domain Active low
TP _EINT0	167	DI	Touch screen interrupt signal	VOLmax=0.45V VOHmin=1.35V	1.8V voltage domain
TP_SCL0	210	IO	Touch Screen I2C Clock	VOLmax=0.45V VOHmin=1.35V	
TP_SDA0	209	IO	Touch Screen I2C Data	VOLmax=0.45V VOHmin=1.35V	
LCM Interface					
DSI0_LCM_RST	157	DO	LCD reset signal	VOLmax=0.45V VOHmin=1.35V	1.8V voltage domain
DSI0_DSI_TE	158	DI	LCD rip signal	VOLmax=0.45V VOHmin=1.35V	1.8V voltage domain
DSI1_LCM_RST	273	DO	LCD reset signal	VOLmax=0.45V VOHmin=1.35V	1.8V voltage domain
DSI1_DSI_TE	274	DI	LCD rip signal	VOLmax=0.45V VOHmin=1.35V	1.8V voltage domain
ADC Interface					
ID_ADC2	59	DI	ADC Detection Channel	VOLmax=0.45V VOHmin=1.35V	
ID_ADC3	60	DI	ADC Detection Channel	VOLmax=0.45V VOHmin=1.35V	
TP Interface					
TP_SCL0	86	IO	Touch Screen I2C Clock	VOLmax=0.45V VOHmin=1.35V	

TP_SDA0	87	IO	Touch Screen I2C Clock	VOLmax=0.45V VOHmin=1.35V	
VBIR_TP_3V3	234	IO	Touch Screen Power Supply	VOLmax=0.45V VOHmin=1.35V	
Camera Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
CMMCLK0	114	DO	Rear camera clock signal	VOLmax=0.45V VOHmin=1.35V	1.8V voltage domain
CMMCLK1	113	DO	Reserved camera clock signal	VOLmax=0.45V VOHmin=1.35V	
CMMRST0	110	DO	Rear camera reset signal	VOLmax=0.45V VOHmin=1.35V	
CMMPDN0	112	DO	Rear camera off signal	VOLmax=0.45V VOHmin=1.35V	
CMMRST1	109	DO	Reserve camera reset signal	VOLmax=0.45V VOHmin=1.35V	
CMMPDN1	111	DO	Reserve camera shutdown signal	VOLmax=0.45V VOHmin=1.35V	
CAM1_SCL5	94	DO	Rear camera I2C clock signal	VOLmax=0.45V VOHmin=1.35V	
CAM1_SDA5	95	DO	Rear camera I2C data signal	VOLmax=0.45V VOHmin=1.35V	
CAM0_SCL6	96	DO	Reserved camera I2C clock signal	VOLmax=0.45V VOHmin=1.35V	
CAM0_SDA6	97	DO	Reserved camera I2C data signal	VOLmax=0.45V VOHmin=1.35V	
Key Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
PWRKEY	39	DI	on/off switch	Vmax=0.7*VSYS Vmin=0.3*VSYS	Low level effective
KCOL0	70	DI	Volume + key and forced download key	VOLmax=0.45V VOHmin=1.35V	If not, hang.
KCOL1	71	DO	Volume-Key	VOLmax=0.45V VOHmin=1.35V	If not, hang.
KPRWO0	72	DI	Key matrix input 0	VOLmax=0.45V VOHmin=1.35V	If not, hang.
KPRWO1	73	DI	Key matrix input 1	VOLmax=0.45V VOHmin=1.35V	If not, hang.
HOMEKEY	224	DI	return key	Vmax=0.7*VSYS Vmin=0.3*VSYS	If not, hang.
SYSRSTB	40	DI	reset button	VOLmax=0.45V VOHmin=1.35V	If not, hang.
Battery Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**

CS_P	225	AI	Battery current detection+		
CS_N	226	AI	Battery Current Detection -		
CHRDETB	231	AI	Battery insertion detection		
BAT_ON	232	AI	Battery Temperature Detection		
SPI interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
SPIM0_CS	75	DO	chip select signal	VOLmax=0.45V VOHmin=1.35V	
SPIM0_CLK	74	DO	clock signal	VOLmax=0.45V VOHmin=1.35V	
SPIM0_MOSI	76	DO	Module Data Output	VOLmax=0.45V VOHmin=1.35V	
SPIM0_MISO	77	DI	Module Data Entry	VOLmax=0.45V VOHmin=1.35V	
SPIM0_MIO2	250	DI	Module Data Entry	VOLmax=0.45V VOHmin=1.35V	
SPIM0_MISO3	251	DI	Module Data Entry	VOLmax=0.45V VOHmin=1.35V	
WB_PMU_EN	218	DO	chip select signal	VOLmax=0.45V VOHmin=1.35V	
WB_BT_STEREO	219	DO	clock signal	VOLmax=0.45V VOHmin=1.35V	
WB_TIME_SYNC	220	DO	Module Data Output	VOLmax=0.45V VOHmin=1.35V	
WB_BT_INT	221	DI	Module Data Entry	VOLmax=0.45V VOHmin=1.35V	
SPMI2_CLK	108	DO	chip select signal	VOLmax=0.45V VOHmin=1.35V	
SPMI2_CS	107	DO	clock signal	VOLmax=0.45V VOHmin=1.35V	
SPMI2_MOSI	106	DO	Module Data Output	VOLmax=0.45V VOHmin=1.35V	
SPMI2_MISO	105	DI	Module Data Entry	VOLmax=0.45V VOHmin=1.35V	
PWM Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
DISP_PWM0	159	IO	PWM0 output	VILmax=0.63V VIHmin=1.17V	
DISP_PWM1	275	IO	PWM1 output	VILmax=0.63V VIHmin=1.17V	
GPIO Interface					

Pin Name	Pin Number	I/O	Descriptions	DC Characteristics	Remark
GPIO1	13	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO12	239	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO13	240	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO14	241	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO15	242	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO17	243	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO11	252	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO8	255	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO7	256	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO6	257	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO2	258	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO3	259	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO4	260	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO5	261	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO10	187	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO9	188	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
DSI Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
DSI0_CKN_T1C	169	IO	DSI0 Clock signal negative	VOLmax=0.45V VOHmin=1.35V	
DSI0_CKP_T1B	168	IO	DSI0 Clock signal positive	VOLmax=0.45V VOHmin=1.35V	
DSI0_D0N_T1A	167	IO	DSI0 Data Signal 0 negative	VOLmax=0.45V VOHmin=1.35V	
DSI0_D0P_T0C	166	IO	DSI0 Data Signal 0 positive	VOLmax=0.45V VOHmin=1.35V	
DSI0_D2N_T0B	165	IO	DSI0 Data Signal 2 negative	VOLmax=0.45V VOHmin=1.35V	
DSI0_D2P_T0A	164	IO	DSI0 Data Signal 2 positive	VOLmax=0.45V VOHmin=1.35V	

DSI0_D3P_T2C	163	IO	DSI0 Data Signal 3 positive	VOLmax=0.45V VOHmin=1.35V	
DSI0_D3N	162	IO	DSI0 Data Signal 3 negative	VOLmax=0.45V VOHmin=1.35V	
DSI0_D1N_T2B	161	IO	DSI0 Data Signal 1 negative	VOLmax=0.45V VOHmin=1.35V	
DSI0_D1P_T2A	160	IO	DSI0 Data Signal 1 positive	VOLmax=0.45V VOHmin=1.35V	
DSI1_D2P_T0A	285	IO	DSI1 Data Signal 2 positive	VOLmax=0.45V VOHmin=1.35V	
DSI1_D2N_T0B	284	IO	DSI1 Data Signal 2 Negative	VOLmax=0.45V VOHmin=1.35V	
DSI1_D0P_T0C	283	IO	DSI1 Data Signal 0 positive	VOLmax=0.45V VOHmin=1.35V	
DSI1_D0N_T1A	282	IO	DSI1 Data Signal 0 negative	VOLmax=0.45V VOHmin=1.35V	
DSI1_CKP_T1B	281	IO	DSI1 Clock signal positive	VOLmax=0.45V VOHmin=1.35V	
DSI1_CKN_T1C	280	IO	DSI1 Clock signal negative	VOLmax=0.45V VOHmin=1.35V	
DSI1_D1P_T2A	279	IO	DSI1 Data Signal 1 positive	VOLmax=0.45V VOHmin=1.35V	
DSI1_D1N_T2B	278	IO	DSI1 Data Signal 1 negative	VOLmax=0.45V VOHmin=1.35V	
DSI1_D3P_T2C	277	IO	DSI1 Data Signal 3 positive	VOLmax=0.45V VOHmin=1.35V	
DSI1_D3N	276	IO	DSI1 Data Signal 3 negative	VOLmax=0.45V VOHmin=1.35V	
HDMI Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
HDMITX_SDA	8	IO	HDMI I2C Data	VOLmax=0.45V VOHmin=1.35V	
HDMITX_SCL	9	IO	HDMI I2C Clock	VOLmax=0.45V VOHmin=1.35V	
HDMITX21_CLK_P	208	IO	HDMI clock signal positive	VOLmax=0.45V VOHmin=1.35V	
HDMITX21_CLK_M	207	IO	HDMI clock signal negative	VOLmax=0.45V VOHmin=1.35V	
HDMITX21_CH0_P	206	IO	HDMI data signal 0 positive	VOLmax=0.45V VOHmin=1.35V	
HDMITX21_CH0_M	205	IO	HDMI data signal 0 negative	VOLmax=0.45V VOHmin=1.35V	
HDMITX21_CH1_P	204	IO	HDMI data signal 1 positive	VOLmax=0.45V VOHmin=1.35V	
HDMITX21_CH1_M	203	IO	HDMI data signal 1 negative	VOLmax=0.45V VOHmin=1.35V	
HDMITX21_CH2_P	202	IO	HDMI data signal 2 positive	VOLmax=0.45V VOHmin=1.35V	
HDMITX21_CH2_M	201	IO	HDMI data signal 2 negative	VOLmax=0.45V VOHmin=1.35V	
HDMITX_PWR5V	200	IO	HDMI Power Supply	VOLmax=0.45V VOHmin=1.35V	

HDMITX_HTPLG	199	IO	HDMI Hot Swap Signal	VOLmax=0.45V VOHmin=1.35V	
HDMITX_CEC	198	IO	HDMI Consumer Electronics Control Signals	VOLmax=0.45V VOHmin=1.35V	
EDP Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
EDP_LN0_TXP	20	IO	EDP data channel 0 positive output	VOLmax=0.45V VOHmin=1.35V	
EDP_LN0_TXN	21	IO	EDP data channel 0 negative output	VOLmax=0.45V VOHmin=1.35V	
EDP_LN1_TXP	22	IO	EDP data channel 1 positive output	VOLmax=0.45V VOHmin=1.35V	
EDP_LN1_TXN	23	IO	EDP data channel 1 negative output	VOLmax=0.45V VOHmin=1.35V	
EDPAUXP	24	IO	EDP CH-AUX positive differential outputs	VOLmax=0.45V VOHmin=1.35V	
EDPAUXN	25	IO	EDP CH-AUX negative differential outputs	VOLmax=0.45V VOHmin=1.35V	
DP interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
DP_LN0_TXP	186	IO	DP data channel 0 positive output	VOLmax=0.45V VOHmin=1.35V	
DP_LN0_TXN	185	IO	DP data channel 0 negative output	VOLmax=0.45V VOHmin=1.35V	
DP_LN1_TXP	184	IO	DP data channel 1 positive output	VOLmax=0.45V VOHmin=1.35V	
DP_LN1_TXN	183	IO	DP data channel 1 negative output	VOLmax=0.45V VOHmin=1.35V	
DP_LN2_TXP	182	IO	DP data channel 2 positive output	VOLmax=0.45V VOHmin=1.35V	
DP_LN2_TXN	181	IO	DP data channel 2 negative output	VOLmax=0.45V VOHmin=1.35V	
DP_LN3_TXP	180	IO	DP data channel 3 positive output	VOLmax=0.45V VOHmin=1.35V	
DP_LN3_TXN	179	IO	DP data channel 3 negative outputs	VOLmax=0.45V VOHmin=1.35V	
DPAUXP	178	IO	DP CH-AUX positive differential outputs	VOLmax=0.45V VOHmin=1.35V	
DPAUXN	177	IO	DP CH-AUX Negative Differential Outputs	VOLmax=0.45V VOHmin=1.35V	
DPTX_HPD	176	IO	DP Hot Swap Detection	VOLmax=0.45V VOHmin=1.35V	
PCM Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
PCM_CLK	194	IO	Data Clock Signal	VOLmax=0.45V VOHmin=1.35V	

PCM_SYNC	193	IO	frame synchronisation clock signal	VOLmax=0.45V VOHmin=1.35V	
PCM_OUT	192	IO	Transmit Data Signal	VOLmax=0.45V VOHmin=1.35V	
PCM_IN	191	IO	Receive data signals	VOLmax=0.45V VOHmin=1.35V	
DMIC Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
DMIC1_CLK	61	IO	Digital MIC1 clock signal	VOLmax=0.45V VOHmin=1.35V	
DMIC1_DAT	62	IO	Digital MIC1 data signal L	VOLmax=0.45V VOHmin=1.35V	
DMIC1_DAT_R	63	IO	Digital MIC1 data signal R	VOLmax=0.45V VOHmin=1.35V	
DMIC2_CLK	10	IO	Digital MIC2 clock signal	VOLmax=0.45V VOHmin=1.35V	
DMIC2_DAT	11	IO	Digital MIC2 data signal L	VOLmax=0.45V VOHmin=1.35V	
DMIC2_DAT_R	12	IO	Digital MIC2 data signal R	VOLmax=0.45V VOHmin=1.35V	
PCIE Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
PCIE_CKP_EXT	175	IO	PCIE clock signal positive	VOLmax=0.45V VOHmin=1.35V	
PCIE_CKN_EXT	174	IO	PCIE Clock Signal Negative	VOLmax=0.45V VOHmin=1.35V	
PCIE_TXP_EXT	173	IO	PCIE Data Transmit Signal Positive	VOLmax=0.45V VOHmin=1.35V	
PCIE_TXN_EXT	172	IO	PCIE Data Transmit Signal Negative	VOLmax=0.45V VOHmin=1.35V	
PCIE_RXP_EXT	171	IO	PCIE Data Receive Signal Positive	VOLmax=0.45V VOHmin=1.35V	
PCIE_RXN_EXT	170	IO	PCIE Data Receive Signal Negative	VOLmax=0.45V VOHmin=1.35V	
MT7921_WAKE	197	IO	PCIE wake-up signal	VOLmax=0.45V VOHmin=1.35V	
MT7921_CLKREQ	196	IO	PCIE Clock Request Signal	VOLmax=0.45V VOHmin=1.35V	
MT7921_RESET	195	IO	PCIE reset signal	VOLmax=0.45V VOHmin=1.35V	
SENSOR Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
S_SCL2	88	IO	External Sensor I2C Clock	VOLmax=0.45V VOHmin=1.35V	
S_SDA2	89	IO	External Sensor I2C Clock	VOLmax=0.45V VOHmin=1.35V	

I2C interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
EXT_SCL3	90	IO	Reserved for extended I2C clock	VOLmax=0.45V VOHmin=1.35V	
EXT_SDA3	91	IO	Reserved for extended I2C data	VOLmax=0.45V VOHmin=1.35V	
EXT_SCL4	92	IO	Reserved for extended I2C clock	VOLmax=0.45V VOHmin=1.35V	
EXT_SDA4	93	IO	Reserved for extended I2C data	VOLmax=0.45V VOHmin=1.35V	
I2S Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
I2SIN_BCK	79	IO	I2SIN Bit Clock Output	VOLmax=0.45V VOHmin=1.35V	
I2SIN_D0	81	DI	I2SIN Serial data input 0	VOLmax=0.45V VOHmin=1.35V	
I2SIN_D1	244	DI	I2SIN Serial data input 1	VOLmax=0.45V VOHmin=1.35V	
I2SIN_D2	245	DI	I2SIN Serial Data Input 2	VOLmax=0.45V VOHmin=1.35V	
I2SIN_D3	246	DI	I2SIN Serial Data Input 3	VOLmax=0.45V VOHmin=1.35V	
I2SIN_MCK	78	IO	I2SIN Master Clock Output	VOLmax=0.45V VOHmin=1.35V	
I2SIN_WS	80	IO	I2SIN Frame Clock Output	VOLmax=0.45V VOHmin=1.35V	
I2SO2_BCK	83	IO	I2SO2 bit clock output	VOLmax=0.45V VOHmin=1.35V	
I2SO2_D0	85	DO	I2SO2 Serial data output 0	VOLmax=0.45V VOHmin=1.35V	
I2SO2_D1	247	DO	I2SO2 Serial data input 0	VOLmax=0.45V VOHmin=1.35V	
I2SO2_D2	248	DO	I2SO2 Serial data input 1	VOLmax=0.45V VOHmin=1.35V	
I2SO2_D3	249	DO	I2SO2 Serial Data Input 2	VOLmax=0.45V VOHmin=1.35V	
I2SO2_MCK	82	DO	I2SO2 Serial Data Input 3	VOLmax=0.45V VOHmin=1.35V	
I2SO2_WS	84	IO	I2SO2 Frame Clock Output	VOLmax=0.45V VOHmin=1.35V	
DPI Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
DPI_CK	156	IO	DPI Clock Signal	VOLmax=0.45V VOHmin=1.35V	
DPI_DE	155	IO	DPI Data Present Signal	VOLmax=0.45V VOHmin=1.35V	
GBE_COL	154	IO	DPI line synchronisation signal	VOLmax=0.45V VOHmin=1.35V	

GBE_INTR	153	IO	DPI Column Synchronisation Signal	VOLmax=0.45V VOHmin=1.35V	
GBE_TXD3	152	IO	GBE Transmit Data Signal 3	VOLmax=0.45V VOHmin=1.35V	
GBE_TXD2	151	IO	GBE Transmit Data Signal 2	VOLmax=0.45V VOHmin=1.35V	
GBE_TXD1	150	IO	GBE Transmit data signal 1	VOLmax=0.45V VOHmin=1.35V	
GBE_TXD0	149	IO	GBE Transmit data signal 0	VOLmax=0.45V VOHmin=1.35V	
GBE_RXD3	148	IO	GBE Receive Data Signal 3	VOLmax=0.45V VOHmin=1.35V	
GBE_RXD2	147	IO	GBE Receive Data Signal 2	VOLmax=0.45V VOHmin=1.35V	
GBE_RXD1	146	IO	GBE Receive data signal 1	VOLmax=0.45V VOHmin=1.35V	
GBE_RXD0	145	IO	GBE Receive data signal 0	VOLmax=0.45V VOHmin=1.35V	
GBE_TXC	144	IO	GBE Transmit reference clock signal	VOLmax=0.45V VOHmin=1.35V	
GBE_RXC	143	IO	GBE Receive reference clock signal	VOLmax=0.45V VOHmin=1.35V	
GBE_RXDV	142	IO	GBE Receive control signal	VOLmax=0.45V VOHmin=1.35V	
GBE_TXEN	141	IO	GBE Transmit control signal	VOLmax=0.45V VOHmin=1.35V	
GBE_MDC	140	IO	GBE Data Clock Signal	VOLmax=0.45V VOHmin=1.35V	
GBE_MDIO	139	IO	GBE Data input and output signals	VOLmax=0.45V VOHmin=1.35V	
GBE_TXER	138	IO	GBE Transmit data error signal	VOLmax=0.45V VOHmin=1.35V	
GBE_RXER	137	IO	GBE Receive data error signal	VOLmax=0.45V VOHmin=1.35V	
CSI0A_L0P_T0A	125	IO	CSI0A Data signal 0 positive	VOLmax=0.45V VOHmin=1.35V	
CSI0A_L0N_T0B	126	IO	CSI0A Data signal 0 negative	VOLmax=0.45V VOHmin=1.35V	
CSI0A_L1P_T0C	127	IO	CSI0A Data signal 1 positive	VOLmax=0.45V VOHmin=1.35V	
CSI0A_L1N_T1A	128	IO	CSI0A Data signal 1 negative	VOLmax=0.45V VOHmin=1.35V	
CSI0A_L2P_T1B	129	IO	CSI0A Data signal 2 positive	VOLmax=0.45V VOHmin=1.35V	
CSI0A_L2N_T1C	130	IO	CSI0A Data signal 2 negative	VOLmax=0.45V VOHmin=1.35V	
CSI0B_L0P_T0A	131	IO	CSI0B Data signal 0 positive	VOLmax=0.45V VOHmin=1.35V	
CSI0B_L0N_T0B	132	IO	CSI0B Data signal 0 negative	VOLmax=0.45V VOHmin=1.35V	
CSI0B_L1P_T0C	133	IO	CSI0B Data signal 1 positive	VOLmax=0.45V VOHmin=1.35V	

CSI0B_L1N_T1A	134	IO	CSI0B Data signal 1 negative	VOLmax=0.45V VOHmin=1.35V	
CSI0B_L2P_T1B	135	IO	CSI0B Data signal 2 positive	VOLmax=0.45V VOHmin=1.35V	
CSI0B_L2N_T1C	136	IO	CSI0B Data Signal 2 Negative	VOLmax=0.45V VOHmin=1.35V	
CSI1A_L0P_T0A	115	IO	CSI1A Data signal 0 positive	VOLmax=0.45V VOHmin=1.35V	
CSI1A_L0N_T0B	116	IO	CSI1A Data Signal 0 Negative	VOLmax=0.45V VOHmin=1.35V	
CSI1A_L1P_T0C	117	IO	CSI1A Data Signal 1 Positive	VOLmax=0.45V VOHmin=1.35V	
CSI1A_L1N_T1A	118	IO	CSI1A Data Signal 1 Negative	VOLmax=0.45V VOHmin=1.35V	
CSI1A_L2P_T1B	119	IO	CSI1A Data Signal 2 Positive	VOLmax=0.45V VOHmin=1.35V	
CSI1A_L2N_T1C	120	IO	CSI1A Data Signal 2 Negative	VOLmax=0.45V VOHmin=1.35V	
CSI1B_L0P_T0A	121	IO	CSI1B Data signal 0 positive	VOLmax=0.45V VOHmin=1.35V	
CSI1B_L0N_T0B	122	IO	CSI1B Data Signal 0 Negative	VOLmax=0.45V VOHmin=1.35V	
CSI1B_L1P_T0C	123	IO	CSI1B Data Signal 1 Positive	VOLmax=0.45V VOHmin=1.35V	
CSI1B_L1N_T1A	124	IO	CSI1B Data Signal 1 Negative	VOLmax=0.45V VOHmin=1.35V	
Other interfaces					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
BT_ANT	6	IO	Bluetooth antenna on/off control	VOLmax=0.45V VOHmin=1.35V	
WF0_ANT	4	IO	WIFI antenna on/off control	VOLmax=0.45V VOHmin=1.35V	
WF1_ANT	2	IO	WIFI antenna on/off control	VOLmax=0.45V VOHmin=1.35V	

3.4 Power supply

The M274K provides two VSYS pins and one VFE28 pin. The VSYS pin is used to connect an external battery to power the module; the VFE28 pin is used for RF switching power.

The power supply voltage input range of M274K is 3.3V~4.5V, and the recommended value is 4V. The performance of the VSYS power supply, such as the load capacity, ripple size, etc., will directly affect the performance and stability of the module. Under extreme conditions, the current consumption of the module may reach an instantaneous peak of about 3A, and the voltage will drop if the power supply is not enough. If the voltage drops below 3.1V, the module will shut down.

In order to suppress the impact of power fluctuations and ensure the stability of the output power, it is recommended to add a surge tube at the front of the power supply and place it close to the VSYS of the module to play a role of surge protection. Customers can add protection devices according to their own project design requirements.

Remark

1. When the module fails to shut down normally due to an abnormality, it is recommended to disconnect the power supply to turn off the module, and then power on again to restart the module.

2. The module supports charging function by default. If the customer design the power supply, it is necessary to turn off the charging function through software, or connect a Schottky diode in series on the VSYS path to prevent the current from flowing into the power chip in reverse.

3. When the power drops to 0%, the system will trigger an automatic shutdown; therefore, the power supply design should be consistent with the drive configuration of the fuel gauge.

3.5 Switch on and off

3.5.1 Module power on

After the VSYS is powered up, the module turns on with the following reference circuit:

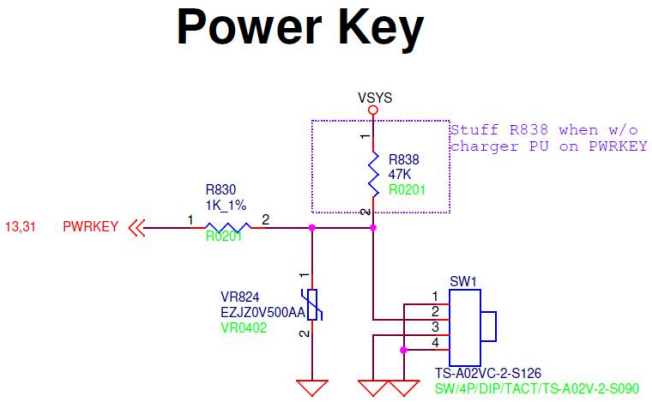
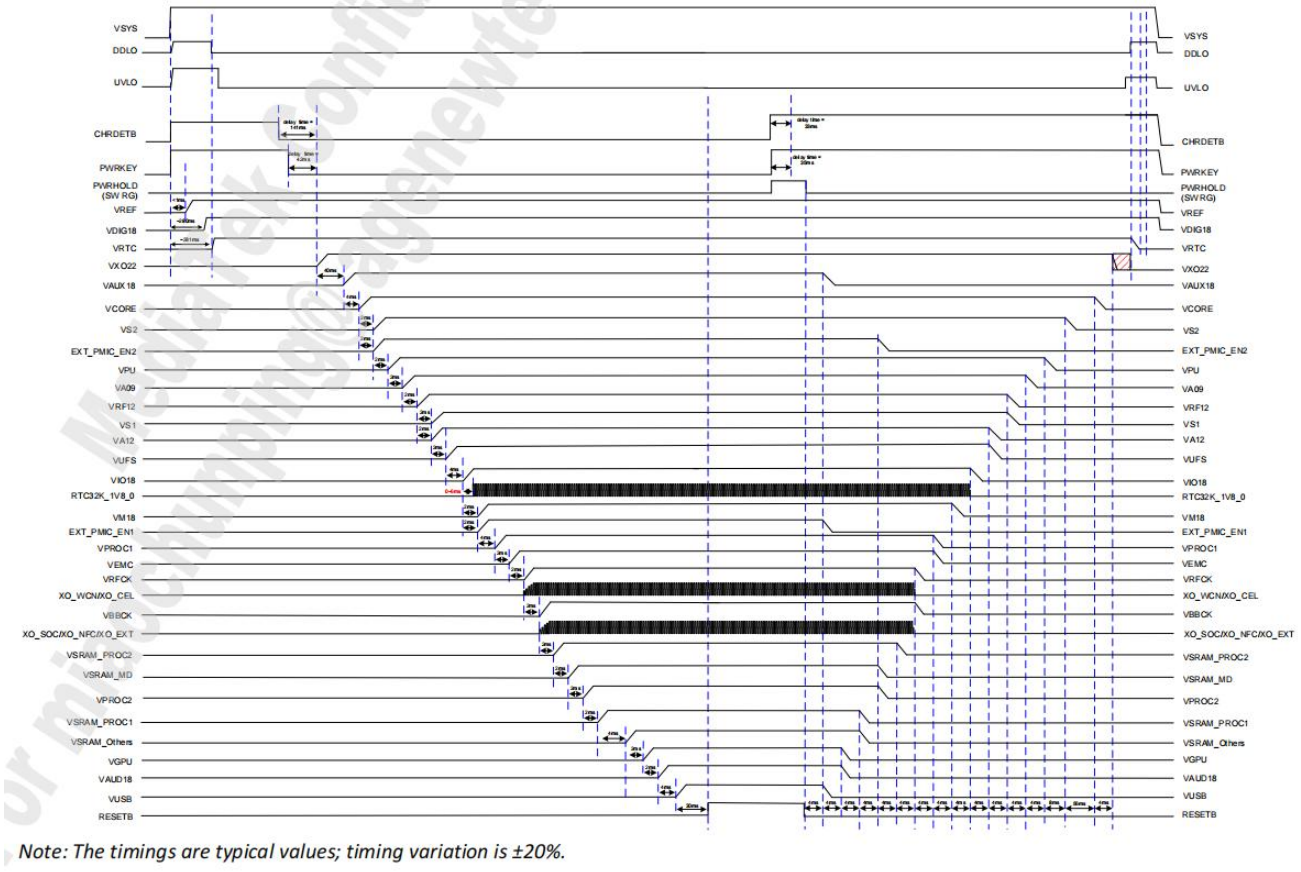


Figure 3 Reference power-on circuit

The Boot timing diagram is shown below:



Note: The timings are typical values; timing variation is ±20%.

Figure 3-2. (MT6365VPW/B) Power-on/off control sequence by charger plug-in or pressing PWRKEY

Figure 4 Power-up Timing Diagram

3.5.2 Module turn off

Module shutdown can be achieved by pulling down pwrkey for at least 1 second. After the module detects the shutdown action, a prompt window will pop up on the screen to confirm whether to continue the shutdown action.

Forced shutdown can also be realized by pulling down pwrkey for a long time (at least 8s). The sequence diagram of forced shutdown is as follows:

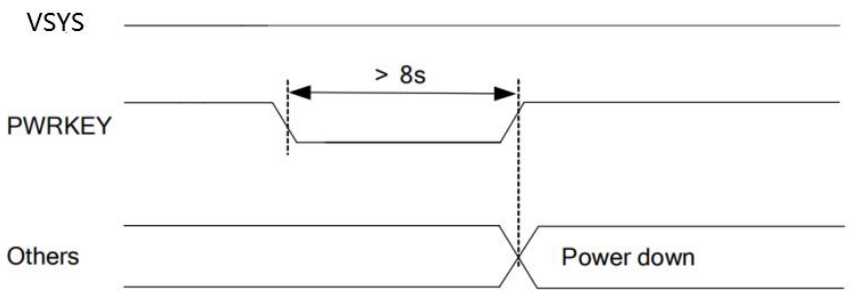


Figure 5 Forced shutdown timing diagram

3.6 VRTC Interface

VRTC is the external power supply pin of the RTC inside the module. When the user needs to save the real-time clock after the VSYS is disconnected, the VRTC pin cannot be suspended and can be powered by connecting an external battery to the VRTC pin. When the RTC power supply is powered by an external battery, the reference circuit is as follows:

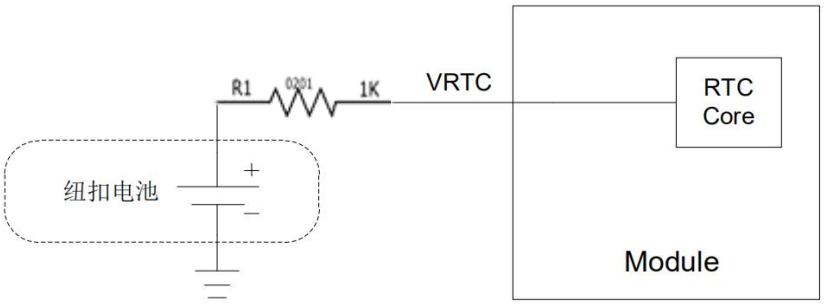


Figure 6 Rechargeable Coin Cell Battery Powering the RTC

If RTC fails, time synchronization can be carried out through the network after the module is powered on.

The input voltage range of VRTC power supply is 0V~2.98V, and the typical value is 2.8V;

When powered by VBAT, the RTC error is 50ppm; when powered by VRTC, the RTC error is 200ppm;

When an external rechargeable button battery is required, the ESR of the button battery is required to be less than 2K.

3.7 Power output

M274K has multiple power outputs for power supply of peripheral circuits.

Table 4 Power Supply Description

power supply					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
VFE28_PMU	222	PI/PO	RF Switching 2.8V Power Supply	Vnorm=2.8V IOmax=50mA	
VRTC28	217	PI/PO	RTC Power Interface	Vnorm=2.8V VOmax=2.98V	
VIO28_PMU	230	PO	Output 2.8V	Vnorm=2.8V IOmax=200mA	Supply power to external sensors, touch screen, add 1.0uF~4.7uF bypass capacitor when using it. If you don't use it, please turn it on
VIO18_PMU	41	PO	Output 1.8V	Vnorm=1.8V IOmax=600mA	Power supply for external camera, LCD, sensor, I/O port voltage domain, 1.0uF~2.2uF bypass capacitor is needed when using it. If you do not use it, please turn it on.
VSYS	26,27	PO	modular power supply	Vnorm=3.8V IOmax=500mA	
VRF18_PMU	223	PO	RF Switch 1.8V Power Supply		
VCN18_PMU	227	PO	WIFI/BT/GPS powered		
VCN33_1_PMU	229	PO	RF Switched 3.3V Power Supply		
VCN33_2_PMU	228	PO	RF Switched 3.3V Power Supply		

VCAM_IO	233	PO	Output 1.8V	Vnorm=1.8V	

3.8 Charging and battery management

The M274K module has a programmable switch-mode lithium battery charging function, which can charge single-cell lithium batteries and polymer batteries. The charging process includes trickle charging, precharging, constant current charging, constant voltage charging and other states.

Trickle charging: When the battery voltage is lower than 2.0V, the system is in trickle charging mode, the charging current is 100mA, In this state, the current and voltage cannot be modified by programming;

Pre-charge: When the battery voltage is between 2.0V~3.5V (programmable cut-off voltage range: 2.0V~3.5V, default 3.0V), the module precharge mode, the default charging current is 150mA (programmable range of charging current: 100mA~850mA, the default is 150mA);

Constant current charging: When the battery voltage is between the pre-charge cut-off voltage and 4.2V (programmable range of constant current charge cut-off voltage: 3.6V~4.7V, default 4.2V), the module enters the constant current charging mode, and the charging current software can Set to 500mA~5000mA (software default setting: USB charging current is 500mA, adapter charging current is 2A);

Constant voltage charging: when the battery voltage is greater than or equal to the constant current charging cut-off voltage (default 4.2V), constant voltage charging starts, and charging at this time.The current gradually decreases, when the charging current decreases to the cut-off charging current (the programmable range of the cut-off charging current: 100mA~850mA,The default is 250mA), the charging is cut off.

Recharge at full charge: When the battery is fully charged and the charging stops, and the battery voltage is lower than the constant current charge cut-off voltage-recovery charge voltage (programmable range of recovery charge voltage: 100mV~400mV, default 100mV), the system returns to the constant current charge mode.

Table 5 Charging Interface Pin Definitions

Battery interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
CS_P	225	AI	Battery current detection+		
CS_N	226	AI	Battery Current Detection -		
CHRDETB	231	AI	Battery insertion detection		
BAT_ON	232	AI	Battery Temperature Detection		

The M274K module comes with a Fuel Gauge function; it accurately estimates the real-time battery level, which not only protects the battery from over-discharge, but also allows the user to know exactly how much power is left to estimate how long the battery can be used, and to save important data in a timely manner.

Mobile devices such as handheld devices and handheld POS machines are powered by batteries. For different types of batteries, the charging and discharging curves of the batteries need to be modified in the software to achieve the best application results.

If the battery used by the customer does not have a thermistor, or if the customer uses a power adapter to power the module, only VSYS and GND need to be connected.CS_P and CS_N are used to detect the battery charge/discharge current, and the internal current detection mechanism is currently used by default.

3.9 USB interface

The M274K provides three USB ports, two ports are compliant with USB 2.0 specification, one port is compliant with USB 3.0 specification, and all of them support USB OTG. USB 2.0 supports up to 480 Mbps, and the USB ports can be used for AT commands transfer, data transfer, software debugging, and software upgrades.

The following table shows the pin definitions for the USB interface:

Table 6 USB Interface Pin Definitions

USB Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
USB_DM0	46	IO	USB 2.0 differential data negative	USB 2.0 compliant	Requires differential impedance of 90Ω
USB_DP0	45	IO	USB 2.0 differential data positive		
USB_DM1	55	IO	USB 3.0 differential data negative	USB 3.0 compliant	Requires differential impedance of 90Ω
USB_DP1	54	IO	USB 3.0 differential data positive		
USB_DM2_EXT	189	IO	USB 2.0 differential data negative	USB 2.0 compliant	Requires differential impedance of 90Ω
USB_DP2_EXT	190	IO	USB 2.0 differential data positive		
USB1_IDDIG	51	DI	USB ID Detection Signal		Default is high
USB2_IDDIG	56	DI	USB ID Detection Signal		Default is high
USB0_ID	42	DI	USB ID identification signal		
USB0_DRV_VBUS	43	DI	VBUS Power Enable		
USB0_VBUS_VALID	44	DI	VBUS Valid Inputs		
USB1_DRV_VBUS	52	DI	VBUS Power Enable		
USB1_VBUS_VALID	53	DI	VBUS Valid Inputs		
USB2_DRV_VBUS	57	DI	VBUS Power Enable		
USB2_VBUS_VALID	58	DI	VBUS Valid Inputs		
SSUSB_TXP	47	O	USB3.0 data transmission signal positive	Standard USB3.0 port reserved for backward compatibility.	Internal NC of the Module
SSUSB_TXN	48	O	USB3.0 data transmission signal negative		Internal NC of the Module
SSUSB_RXP	49	I	USB3.0 Data Receiving Signal Positive		Internal NC of the Module
SSUSB_RXN	50	I	USB3.0 Data Receive Signal Negative		Internal NC of the Module

USB_VBUS is the USB or adapter charging power input, which can charge the battery through the internal charging circuit of the module, and can also be used for USB insertion detection; the power input voltage range is 4.0V~14.0V, and the recommended value is 5.0V. The module supports single-cell lithium battery charging

management. Different capacity types of batteries need to be set with different charging parameters, up to 3A charging current. At the same time, the OTG device in the Micro-USB solution uses the USB_ID pin to distinguish: When USB_ID is floating (the default is high), M274K is a USB Device; when USB_ID is grounded, M274K is a USB HOST, and USB_VBUS is the OTG power output and its maximum output It is 5V/2.4A, and the default output is 5V/0.5A. In the USB Type-C solution, CC1 and CC2 are used to determine OTG devices.

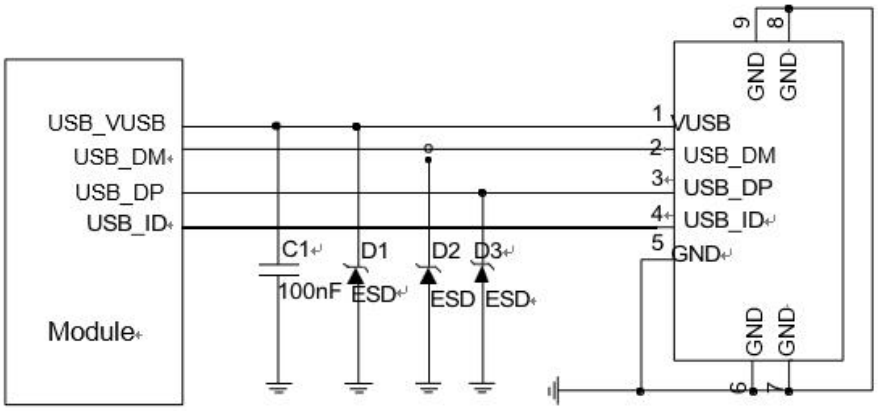


Figure 7 Mirco-USB Interface Reference Design

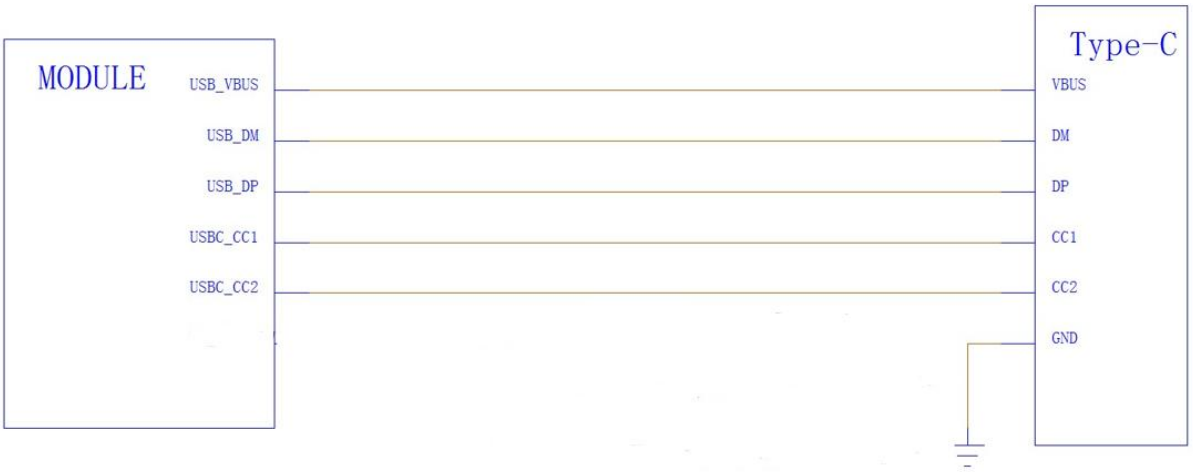


Figure 8 USB Type-C Interface Reference Design

In the circuit design of the USB interface, in order to ensure the performance of the USB, it is recommended to follow the following design principles in the circuit design:

Envelope processing is needed around the USB data wiring, and use a 90Ω impedance differential line;

Reserve ESD protection devices close to the USB interface, and place the ESD devices as close as possible to the USB interface; the parasitic capacitance of the USB 2.0 ESD protection device must not exceed 2pF;

Do not run USB cables under crystal oscillators, oscillators, magnetic devices and RF signals. It is recommended to use the inner layer and a three-dimensional ground.

Layout routing requirements: USB 2.0 differential signal lines must be equal in length, and the total length difference between the differential signal lines should not exceed 8 inches, and there can only be two through holes/layer changes at most.

Table 7 Module Internal USB Cable Lengths

Pin Number	Signal	Length (mm)	Length difference (mm)
46	USB_DM0	60.32	1.64
45	USB_DP0	58.68	
55	USB_DM1	67.20	0.61
54	USB_DP1	66.59	

3.10 UART interface

The M274K module provides the following three UART interfaces:

UART0: 2-wire serial port, default for debugging;

UART1: 2-wire serial port;

UART2: 2-wire serial port;

The USYS interface pins are defined in the following table:

Table 8 UART Interface Pin Definitions

UART interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
UTXD0	64	DO	UART0 Transmit data; default is Debug port	VOLmax=0.45V VOHmin=1.35V	1.8V voltage domain.no use no connection.
URXD0	65	DI	UART0 Receive data; default is Debug port	VILmax=0.63V VIHmin=1.17V	
UTXD1	66	DO	UART1 Transmit data;	VOLmax=0.45V VOHmin=1.35V	
URXD1	67	DI	UART1 Receive data;	VILmax=0.63V VIHmin=1.17V	
UTXD2	68	DO	UART2 Transmit data;	VOLmax=0.45V VOHmin=1.35V	
URXD2	69	DI	UART2 Receive data;	VILmax=0.63V VIHmin=1.17V	

UART1 is a 2-wire serial port with 1.8V serial voltage domain, when communicating with a 3.3V serial port, it is necessary to add a level conversion circuit in the middle. WILLSEMI's WNM3019-3/TR is recommended, and the corresponding reference design is shown below:

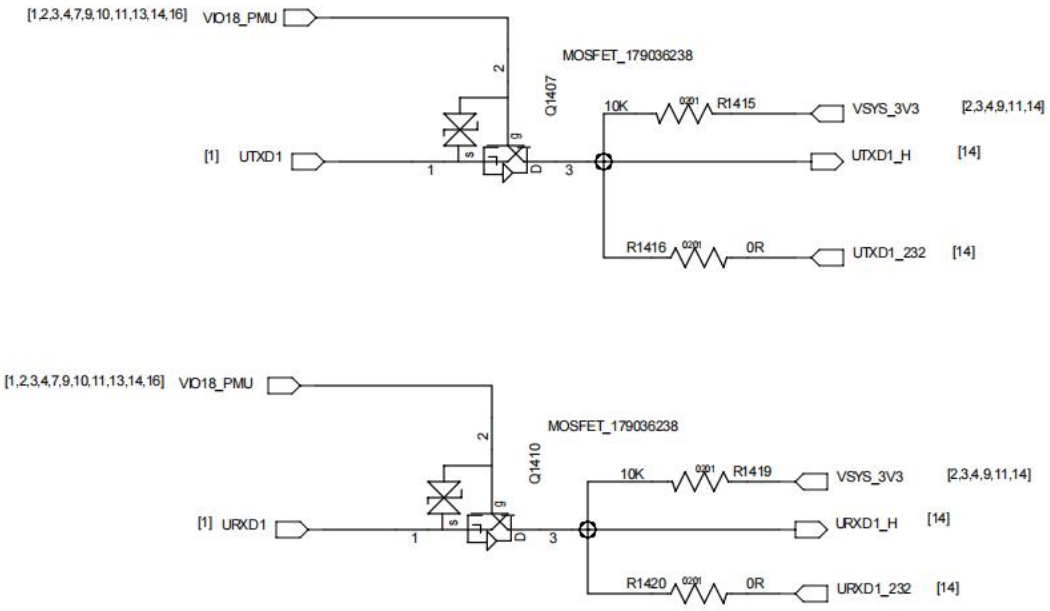


Figure 9 Level Shift Reference Circuit (UART1)

3.11 SD Card Interface

The SD card interface of the module supports SD 3.0 protocol. The pin definition of the interface is as follows:

Table 9 SD Card Interface Pin Definitions

SD Card Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
SD1_CLK	99	DO	SD Card High Speed Digital Clock	VOLmax=0.41V VOHmin=2.1V	
SD1_CMD	100	IO	SD card control signal	VILmax=0.85V VIHmin=1.75V VOLmax=0.41V VOHmin=2.1V	
SD1_DAT0	101	IO	High-speed bi-directional digital signals	VILmax=0.85V VIHmin=1.75V VOLmax=0.41V VOHmin=2.1V	
SD1_DAT1	102	IO			
SD1_DAT2	103	IO			
SD1_DAT3	104	IO			
SDIO2_CLK	14	DO	SD Card High Speed Digital Clock	VOLmax=0.41V VOHmin=2.1V	
SDIO2_CMD	15	IO	SD card control signal	VILmax=0.85V VIHmin=1.75V VOLmax=0.41V VOHmin=2.1V	
SDIO2_DAT0	16	IO	High-speed bi-directional digital signals	VILmax=0.85V VIHmin=1.75V VOLmax=0.41V VOHmin=2.1V	
SDIO2_DAT1	17	IO			
SDIO2_DAT2	18	IO			
SDIO2_DAT3	19	IO			
VSD	98	PO	SD Card Power Supply	Vnorm=3.0V IOmax=800mA	

Taking the JAE brand ST11S008V4H T-card holder as an example, the reference circuit for the SD card interface is shown below.

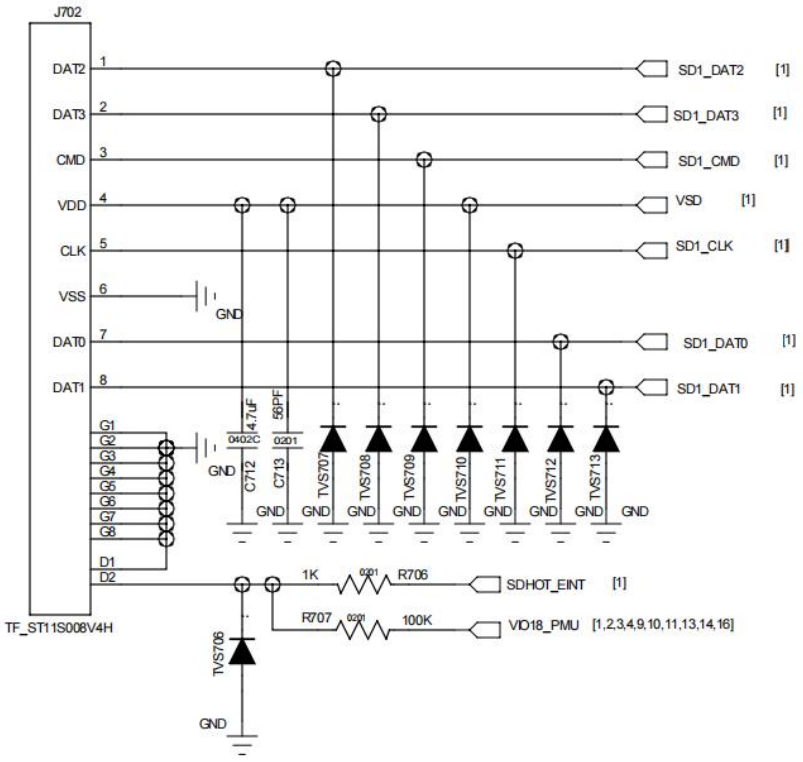


Figure 10 SD Card Interface Reference Circuit Diagram

Remark

If you need to support T card hot plugging, SDHOT_EINT can be connected to 13 pin of the module. If you don't need to support T card hot plugging, SDHOT_EINT in the reference circuit can be left floating.

VSD is the power supply for SD card peripherals, which can provide a maximum current of about 800mA; due to the large power supply current, it is recommended that the trace width be 0.5mm or more; to ensure the stability of the power supply current, 4.7uF and 56pF capacitors need to be connected in parallel on the SD card socket side.

CMD, CLK, DATA0, DATA1, DATA2, and DATA3 are all high-speed signal lines. These signal lines should not cross other traces during the PCB design process, and the traces should be placed on the inner layer as much as possible. CLK, CMD, DATA0, DATA1, DATA2, DATA3 are recommended to be processed with equal length.

Layout line length requirements:

CMD/CLK needs to be covered with ground to reduce interference;

The total length of the trace does not exceed 101.6mm. When the trace length L, 50.8mm<L<101.6mm, a damping resistor needs to be reserved.

The length difference between CMD, DATA and CLK traces cannot exceed 7.62mm.

10 Module Internal SDIO Cable Lengths

Pin Number	Signal	Length (mm)	Remark
99	SD1_CLK	23.0568	
100	SD1_CMD	22.0743	
101	SD1_DAT0	25.0054	
102	SD1_DAT1	23.61703	
103	SD1_DAT2	25.89257	
104	SD1_DAT3	25.84041	

3.12 GPIO Interface

M274K has a wealth of GPIO interfaces, the interface voltage domain is 1.8V, and the pin definitions are as follows:

Table 11 GPIO Interface List

GPIO Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
GPIO1	13	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO12	239	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO13	240	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO14	241	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO15	242	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO17	243	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO11	252	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO8	255	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO7	256	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	

GPIO6	257	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO2	258	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO3	259	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO4	260	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO5	261	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO10	187	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	
GPIO9	188	IO	GPIO	VOLmax=0.45V VOHmin=1.35V	

3.13 I2C interface

M274K provides 6 sets of I2C for peripherals such as touch screens, cameras, sensors, and more. The interface reference voltage domain is 1.8 V. Only master device mode is supported.

12 I2C Interface Pin Definitions

Pin Name	Pin Number	I/O	Descriptions	DC Characteristics	Remark
TP_SCL0	86	IO	Touch Screen I2C Clock		
TP_SDA0	87	IO	Touch Screen I2C Data		
S_SCL2	88	IO	External Sensor I2C Clock		
S_SDA2	89	IO	External Sensor I2C Data		
EXT_SCL3	90	DO	Reserved for extended I2C clock		
EXT_SDA3	91	DO	Reserved for extended I2C data		
EXT_SCL4	92	IO	Reserved for extended I2C clock		
EXT_SDA4	93	IO	Reserved for extended I2C data		
CAM1_SCL5	94	DO	Rear camera I2C clock signal		

CAM1_SDA5	95	DO	Rear camera I2C data signal		
CAM0_SCL6	96	IO	Reserved camera I2C clock signal		
CAM0_SDA6	97	IO	Reserved camera I2C data signal		

3.14 I2S Interface

M274K opens up two sets of I2S interfaces (one input, one output), which can be used for designs such as I2S peripheral devices.

Table 13 I2S Interface Pin Definitions

Pin name	Pin Number	I/O	Descriptions	Remark
I2SIN_BCK	79	IO	I2SIN Bit Clock Output	
I2SIN_D0	81	DI	I2SIN Serial data input 0	
I2SIN_D1	244	DI	I2SIN Serial data input 1	
I2SIN_D2	245	DI	I2SIN Serial Data Input 2	
I2SIN_D3	246	DI	I2SIN Serial Data Input 3	
I2SIN_MCK	78	IO	I2SIN Master Clock Output	
I2SIN_WS	80	IO	I2SIN Frame Clock Output	
I2SO2_BCK	83	IO	I2SO2 bit clock output	
I2SO2_D0	85	DO	I2SO2 Serial data output 0	
I2SO2_D1	247	DO	I2SO2 Serial data input 0	
I2SO2_D2	248	DO	I2SO2 Serial data input 1	
I2SO2_D3	249	DO	I2SO2 Serial Data Input 2	
I2SO2_MCK	82	DO	I2SO2 Serial Data Input 3	
I2SO2_WS	84	IO	I2SO2 Frame Clock Output	

The I2S reference design circuit is shown below:

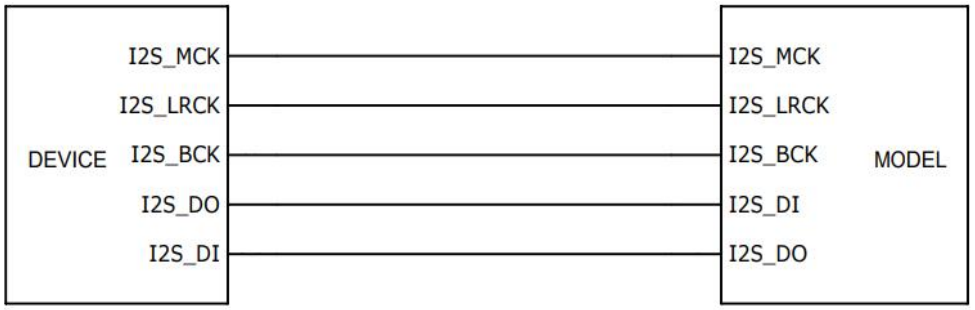


Figure 11 I2S reference design circuit

3.15 SPI interface

M274K opens 3 SPI interfaces by default, which can be used for fingerprint recognition and other designs.

Table 14 SPI Interface Pin Definitions

Pin name	Pin Number	I/O	Descriptions	Remark
SPIM0_CS	75	DO	chip select signal	
SPIM0_CLK	74	DO	clock signal	
SPIM0_MOSI	76	DO	Module Data Output	
SPIM0_MISO	77	DI	Module Data Entry	
SPIM0_MIO2	250	DI	Module Data Entry	
SPIM0_MIO3	251	DI	Module Data Entry	
WB_PMU_EN	218	DO	chip select signal	SPIM1_CLK
WB_BT_STEREO	219	DO	clock signal	SPIM1_CSB
WB_TIME_SYNC	220	DO	Module Data Output	SPIM1_MOSI
WB_BT_INT	221	DI	Module Data Entry	SPIM1_MISO
SPMI2_CLK	108	DO	chip select signal	
SPMI2_CS	107	DO	clock signal	

SPMI2_MOSI	106	DO	Module Data Output	
SPMI2_MISO	105	DI	Module Data Entry	

3.16 ADC Interface

M274K provides two ADC channels for ID identification with the following pin definitions:

Table 15 ADC Interface Pin Definitions

ADC interface				
Pin name	**Pin Number**	**I/O**	**Descriptions**	**Remark**
ID_ADC2	59	AI	ADC Detection Channel	
ID_ADC3	60	AI	ADC Detection Channel	

The ADC pins support a maximum of 12 bit accuracy resolution.

3.17 LCM Interface

M274K device display output interfaces include MIPI_DSI, eDP, DP and HDMI.

LCD1: MIPI DSI 4Lane or EDP 2 Lane , 2K@60fps

LCD2: DP 4Lane or HDMI TX 2.0 , 4K@60fps

The LCM interface pins are defined as follows:

Table 16 LCM Interface Pin Definitions

LCM Interface					
DSI0_LCM_RST	157	DO	LCD reset signal	VOLmax=0.45V VOHmin=1.35V	1.8V Voltage Domain. Active Low.
DSI0_DSI_TE	158	DI	LCD rip signal	VOLmax=0.45V VOHmin=1.35V	1.8V Voltage Domain.
DSI1_LCM_RST	273	DO	LCD reset signal	VOLmax=0.45V VOHmin=1.35V	1.8V Voltage Domain. Active Low.
DSI1_DSI_TE	274	DI	LCD rip signal	VOLmax=0.45V VOHmin=1.35V	1.8V Voltage Domain.

The MIPI screen interface reference circuit is as follows:

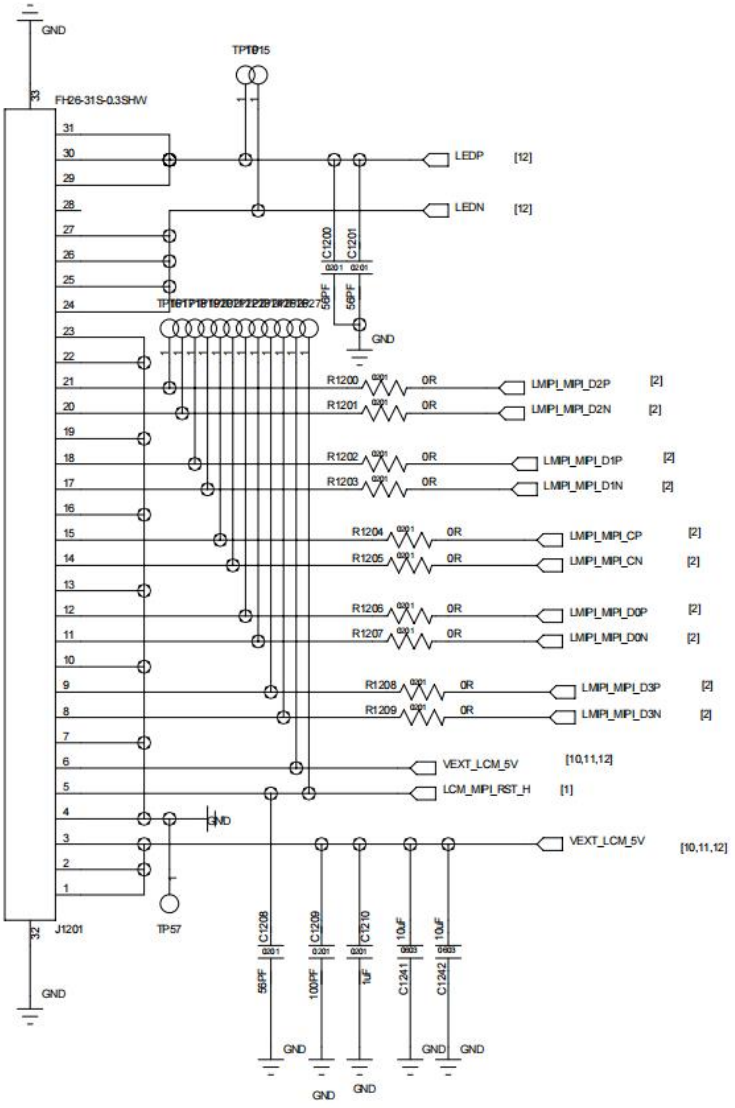


Figure 12 MIPI screen circuit reference design

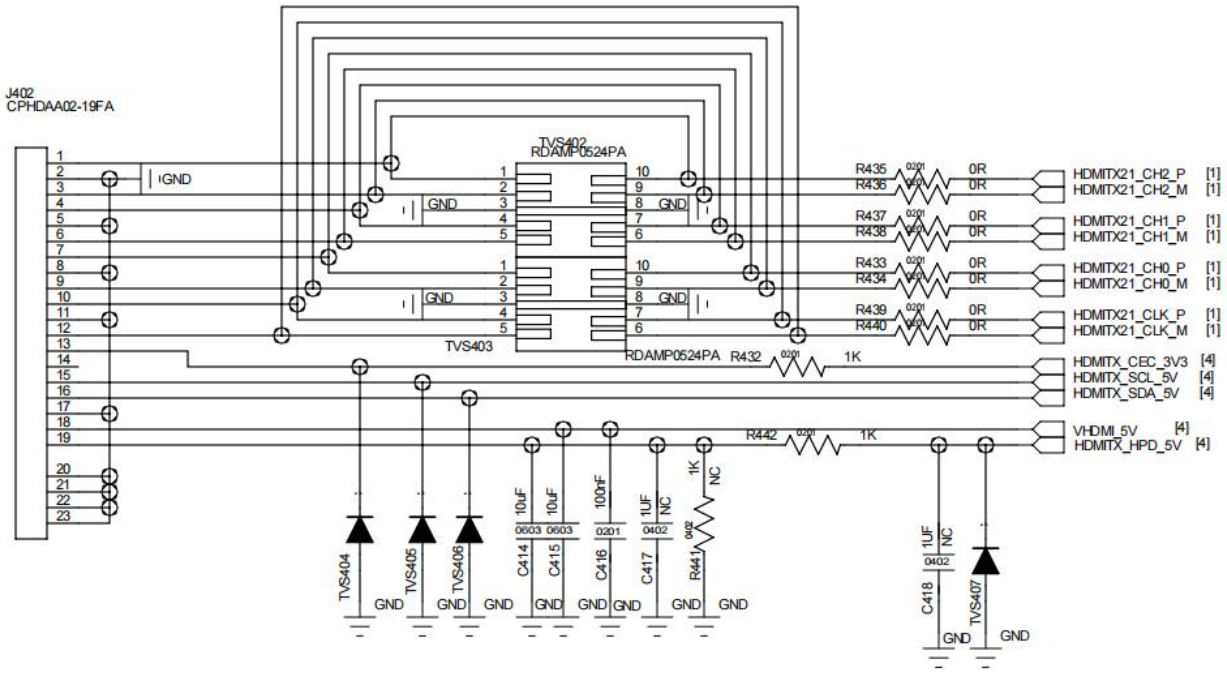


Figure 17 HDMI Screen Circuit Reference Design

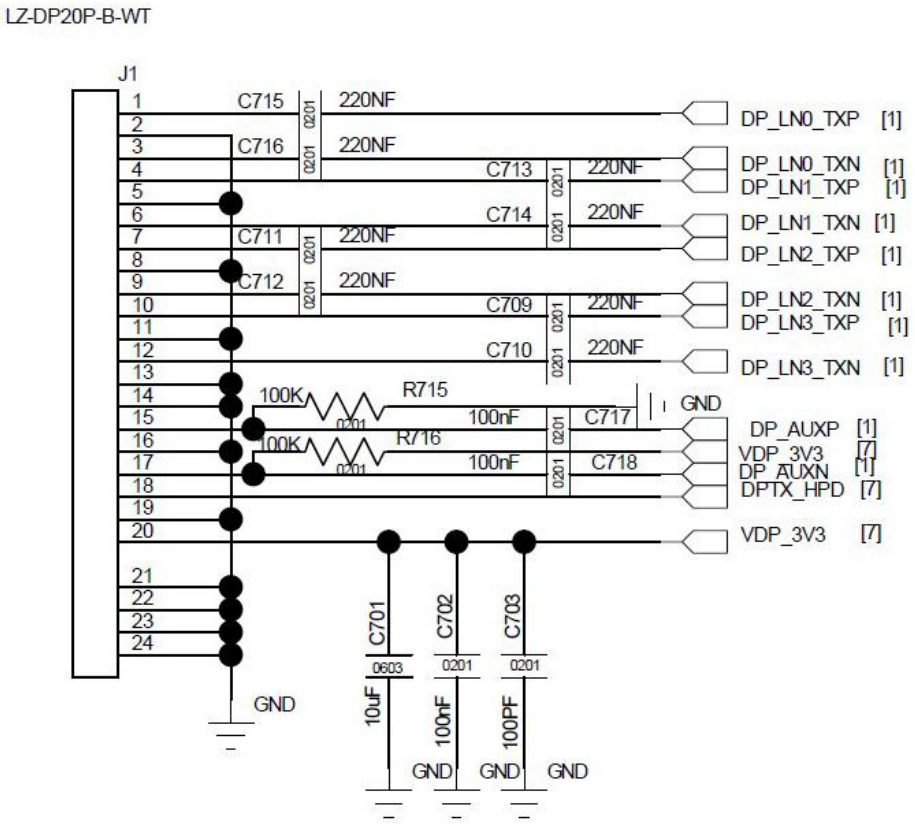


Figure 18 DP Screen Circuit Reference Design

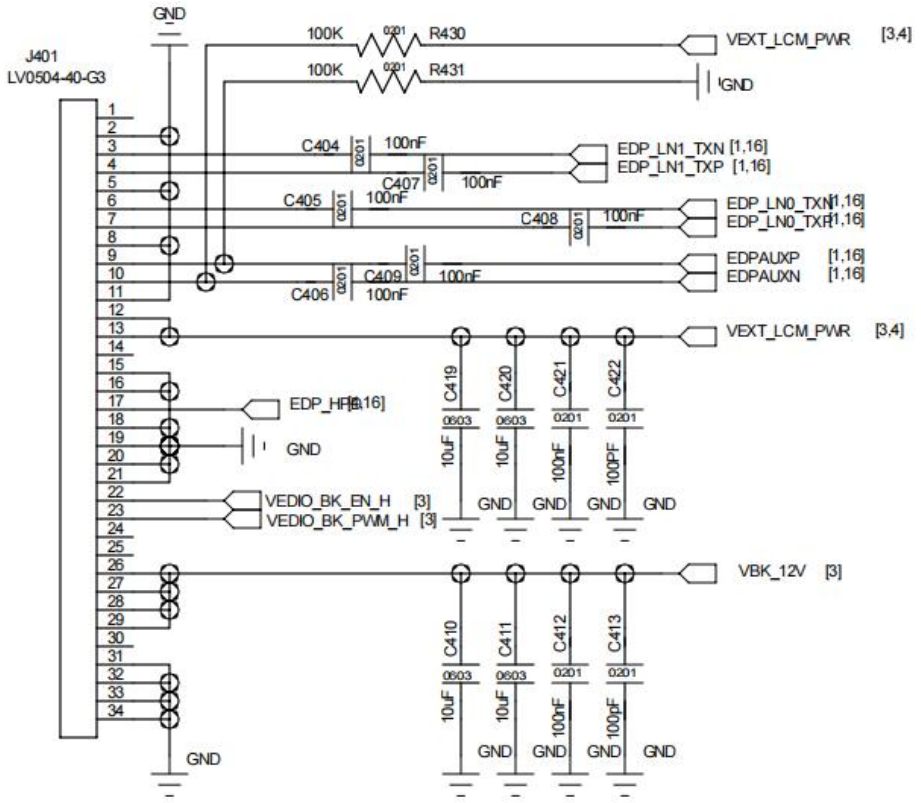


Figure 19 EDP Screen Circuit Reference Design

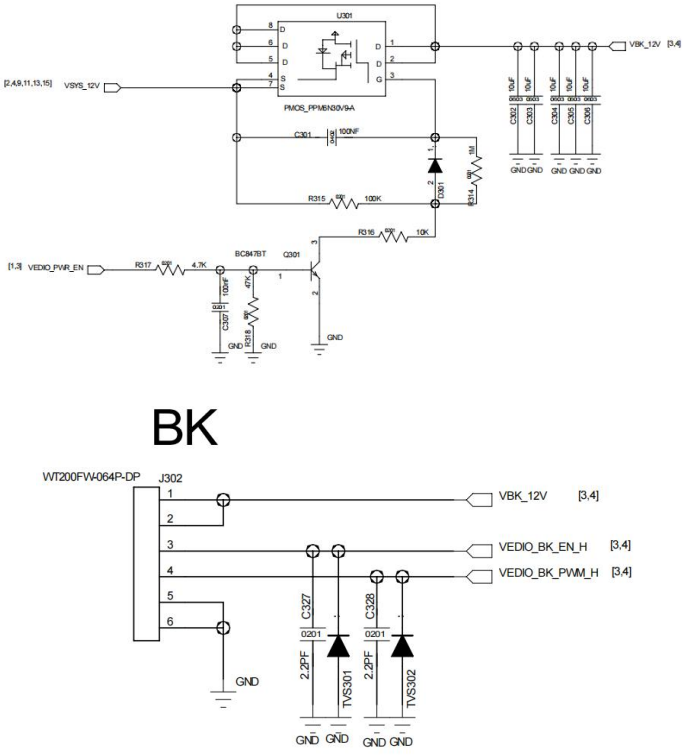


Figure 13 Backlight Driver Reference Circuit

3.18 Touch Screen Interface

M274K provides a set of I2C interfaces by default to connect to the touch screen (TP), and at the same time provides the required power and interrupt pins. The touch screen interface pins of the module are defined as follows:

Table 17 Touch screen interface pin definition

Touch Screen Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
TP_SCL0	86	IO	Touch Screen I2C Clock	VOLmax=0.45V VOHmin=1.35V	1.8V Voltage Domain.
TP_SDA0	87	IO	Touch Screen I2C Data	VOLmax=0.45V VOHmin=1.35V	

The touch screen interface reference circuit is shown below:

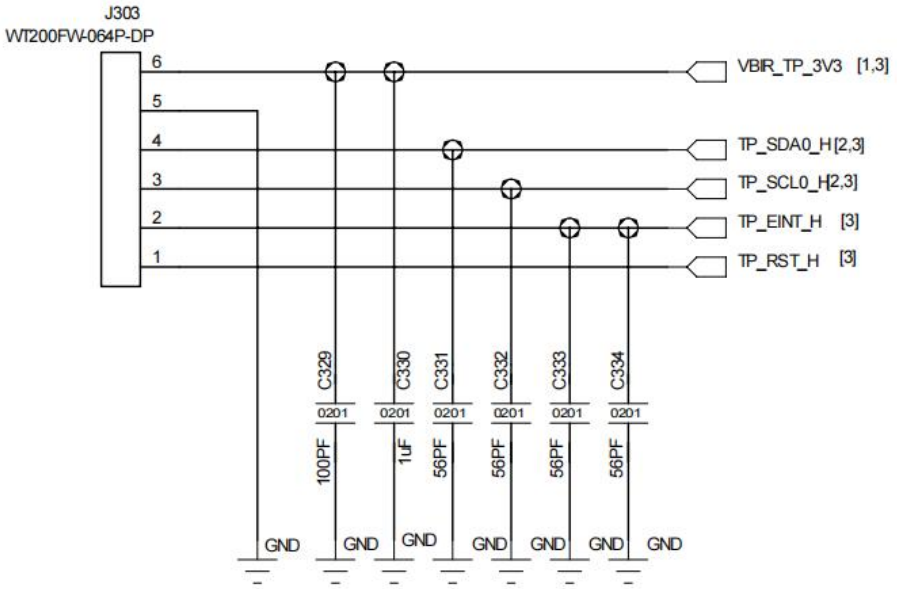


Figure 14 Touch Screen Interface Reference Circuit

3.19 Camera Interface

M274K video input interface is based on MIPI_CSI standard, supporting dual cameras working at the same time, 16MP+16MP (4 lane+4 lane); M274K supports up to 32MP pixel camera; camera and photo quality is determined by a variety of factors such as camera sensor, lens specification parameters and so on.

3.19.1 Rear Camera

Table 18 Rear Camera Interface Pin Definitions

Camera Interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
CMMCLK0	114	DO	Rear camera clock signal	VOLmax=0.45V VOHmin=1.35V	1.8V Voltage Domain.
CMMCLK1	113	DO	Reserved camera clock signal	VOLmax=0.45V VOHmin=1.35V	
CMMRST0	110	DO	Rear camera reset signal	VOLmax=0.45V VOHmin=1.35V	
CMMPDN0	112	DO	Rear camera off signal	VOLmax=0.45V VOHmin=1.35V	
CMMRST1	109	DO	Reserve camera reset signal	VOLmax=0.45V VOHmin=1.35V	
CMMPDN1	111	DO	Reserve camera shutdown signal	VOLmax=0.45V VOHmin=1.35V	
CAM1_SCL5	94	DO	Rear camera I2C clock signal	VOLmax=0.45V VOHmin=1.35V	
CAM1_SDA5	95	DO	Rear camera I2C data signal	VOLmax=0.45V VOHmin=1.35V	
CAM0_SCL6	96	DO	Reserved camera I2C clock signal	VOLmax=0.45V VOHmin=1.35V	
CAM0_SDA6	97	DO	Reserved camera I2C data signal	VOLmax=0.45V VOHmin=1.35V	

The rear camera reference circuit is shown below:

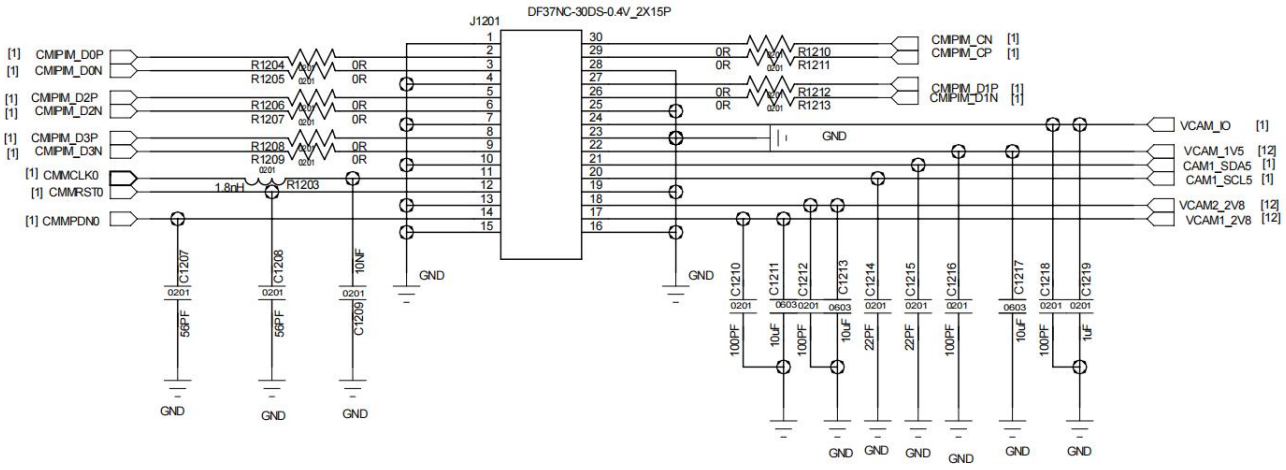


Figure 15 Rear Camera Interface Reference Circuit

Remark

MIPI is a high-speed signal line. According to the needs of the project, customers can add industrial mode inductors in series on the MIPI signal line to improve electromagnetic radiation interference.

3.19.2 Design considerations

Please pay attention to the correct video equipment interface definition when designing the schematic diagram. Different video components have different definitions of the connector, and you need to pay attention to the correct connection of the connector and the component.

MIPI is a high-speed signal line with a transmission rate of up to 2.5Gbps; the wiring adopts 100Ω differential impedance; the wiring is recommended to be placed on the inner layer and not cross other signal lines. For the MIPI traces of the same video component, equal length control is required; it is recommended to maintain 1.5 times the line width spacing between MIPI signal lines to prevent crosstalk; when doing 100Ω differential impedance matching, in order to ensure the consistency of impedance, please do not cross-connect Different GND planes.

MIPI wiring requirements are as follows:

a) The total length of the trace does not exceed 76.2mm;

b) It is required to control the differential impedance to be 100Ω, with an error of ±15%.

19 Module Internal MIPI Trace Lengths

Pin Name	Pin Number	Chip Pin Name	Length (mm)	Length difference (P-N)
CSI0A_L0P_T0A	125	CMIPIM_D2P	8.98093	-0.99376
CSI0A_L0N_T0B	126	CMIPIM_D2N	9.97469	
CSI0A_L1P_T0C	127	CMIPIM_D0P	10.47005	-1.23128
CSI0A_L1N_T1A	128	CMIPIM_D0N	11.70133	
CSI0A_L2P_T1B	129	CMIPIM_CP	12.62961	-0.37753
CSI0A_L2N_T1C	130	CMIPIM_CN	13.00714	

CSI0B_L0P_T0A	131	CMIPIM_D1P	12.22409	-0.30873
CSI0B_L0N_T0B	132	CMIPIM_D1N	12.53282	
CSI0B_L1P_T0C	133	CMIPIM_D3P	13.9609	-1.07761
CSI0B_L1N_T1A	134	CMIPIM_D3N	15.03851	

3.20 Audio interface

Audio interface pins are defined in the following table:

Table 20 Audio Interface Pin Definitions

Audio interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
VMIC	38	DO	MIC Bias Voltage	VO=0V~2.94V	
MICP0	28	DI	Main Mic Input Positive		
MICN0	29	DI	Main Mic Input Negative		
MICP1	30	DI	Headset Mic Input Negative		
MICN1	31	DI	Headset Mic Input Positive		
HP_VMIC	37	DI	Headphone MIC Bias Voltage		
ACCDET	32	AI	Detecting headset type and keys		
HP_OUTR	36	AO	Headphone right channel		
HP_REFN	35	AI	Headset Reference		
HP_OUTL	34	AO	Headphone left channel		
HP_EINT_PMU	33	AI	Headphone insertion detection		Default high level

The module has 2 sets of audio inputs, both differential input channels.

The receiver interface output adopts differential output;

If external speakers are required, an audio amplifier needs to be added outside the module.

The headphone jack output is stereo left and right channel output, and the headphone has a plug-in detection function.

3.20.1 Microphone Interface reference circuit

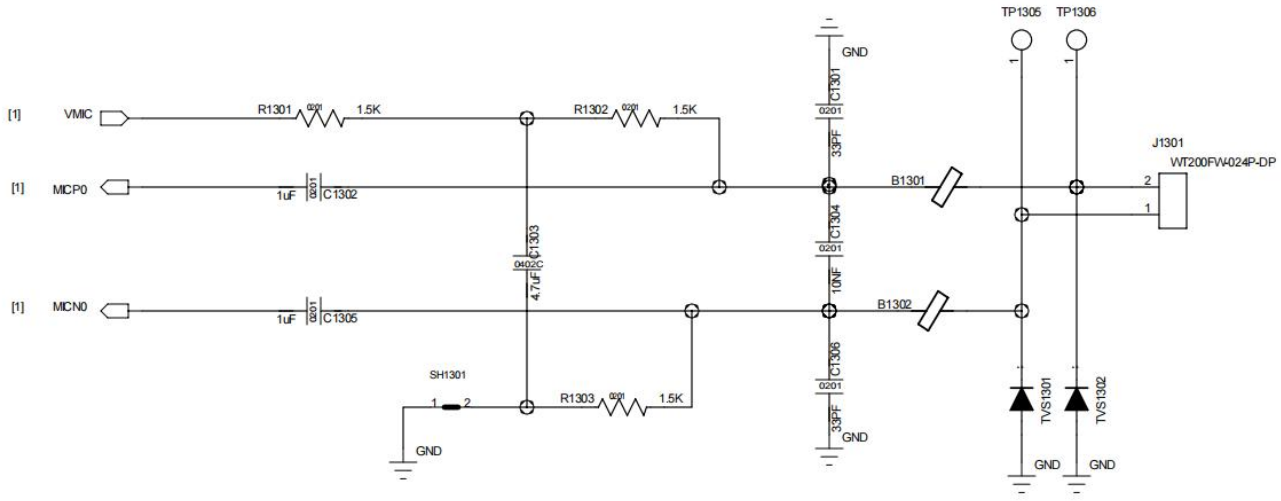


Figure 16 Microphone Reference Circuit

3.20.2 Headphone Interface reference circuit

If the headphone jack is used, the reference design is as follows:

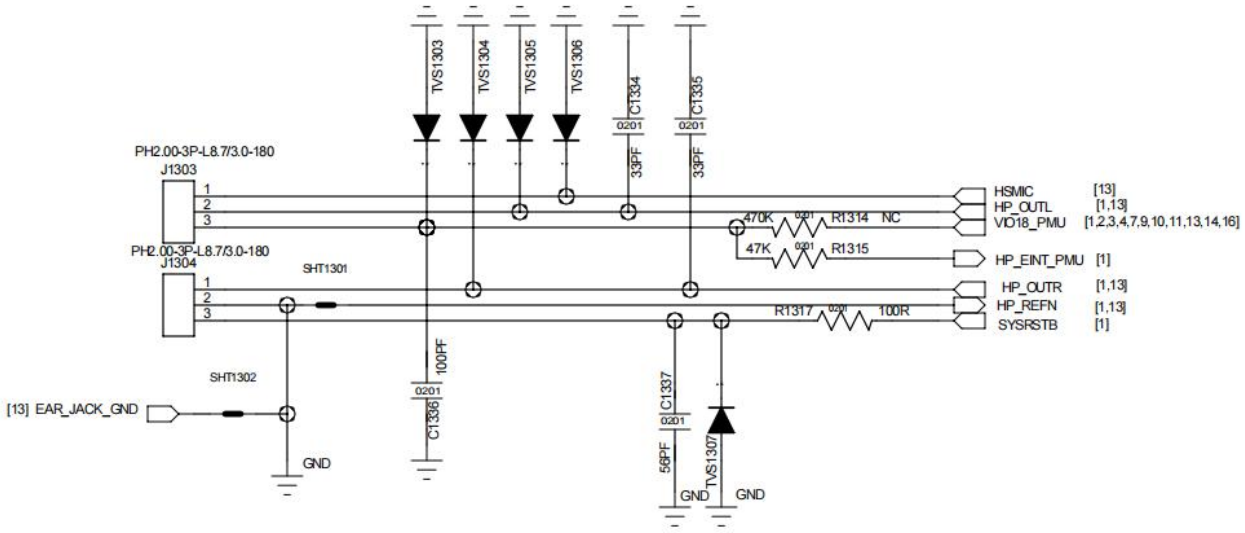


Figure 17 Headphone interface reference circuit

3.20.3 Speaker interface reference circuit

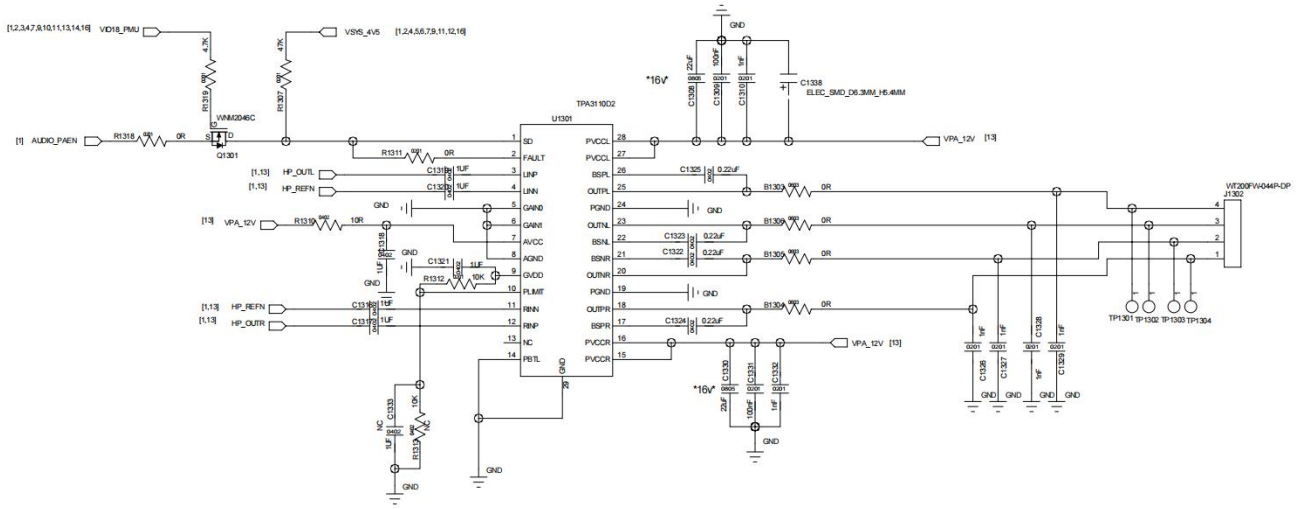


Figure 18 Speaker Interface Reference Circuit

M274K need to use external PA to drive the loudspeaker.

3.20.4 Notes on audio signal design

Hand-held handsets and hands-free microphones are recommended to use electret microphones with built-in radio frequency filter double capacitors (such as 10pF and 33pF); filtering out radio frequency interference from the source of interference will greatly reduce the coupled TDD noise. Among them, the 33pF capacitor is used to filter high frequency interference when the module is working in EGSM900. If this capacitor is not added, TDD noise may be heard during a call. At the same time, the 10pF capacitor is used to filter out high-frequency interference when working in DCS1800. It should be noted that since the resonance point of a capacitor largely depends on the material and manufacturing process of the capacitor, when choosing a capacitor, you need to consult the supplier of the capacitor and choose the most suitable capacitor value to filter out high-frequency noise during operation.

Differential audio traces must follow the layout rules of differential signals.

3.21 Mandatory download interface

Table 21 Mandatory download interface pin definition

Mandatory interface					
Pin Name	**Pin Number**	**I/O**	**Descriptions**	**DC Characteristics**	**Remark**
KCOL0	70	DI	Volume + key and forced download key	VOLmax=0.45V VOHmin=1.35V	No use,no connection

KPCOL0 is the emergency download interface. Pull down the KPCOL0 pin to ground when shutting down, and the module can enter the forced download mode, which is used for the final processing method when the product cannot start normally due to a fault. At the same time, the interface can be reused as the volume "-" key. In order to facilitate the subsequent software upgrade and debugging of the product, please reserve this reference circuit.

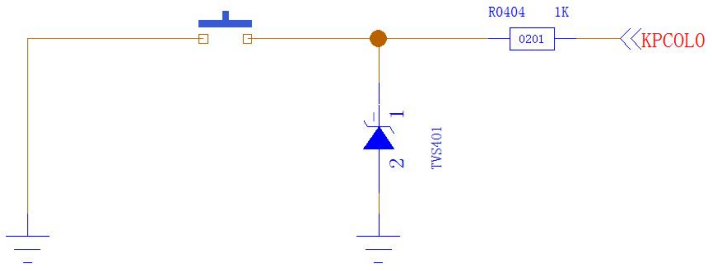


Figure 19 Mandatory download interface reference circuit

3.22 LED Indicating Interface

Table 22 LED Indication Interface Pin Definitions

LED Indication Interface				
Pin Name	**Pin Number**	**Chip Pin Name**	**Descriptions**	**Remark**
GPIO10	187	LED_RED_PWM0	LED Indicator PWM	Input current range: 4mA~24mA
GPIO9	188	LED_GRN_PWM1	LED Indicator PWM	

The LED indication interface reference circuit is as follows:

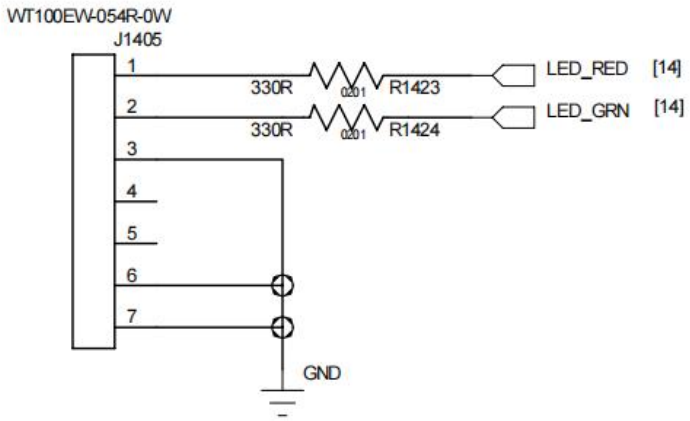


Figure 20 LED indication interface reference circuit

4 Electrical, reliability and radio frequency performance

4.1 Limit parameters

The following table lists the maximum withstand values of the voltage/current of some pins of the module:

Table 23 Limit parameters

Parameter	Min	Max	Unit
VSYS	-0.5	5.5	V
USB_VBUS	0	15.5	V
VSYS Maximum Current	0	3	A
Digital Pin Voltage	-0.3	2.3	V

4.2 Power rating

Table 24 Module power rating

Parameter	Descriptions	Condition	Min	Typical	Max	Unit
VSYS	Battery supply voltage	Voltage must be within the range, including voltage dips, ripple and spikes	3.5	3.8	4.4	V

4.3 Working and storage temperature

The following table lists the working and storage temperature ranges of the module:

Table 25 Operating and Storage Temperatures

Parameter	Min	Typical	Max	Unit
normal working temperature	0	+25	+60	ºC
Storage temperature range	-20		+80	ºC

4.4 Electrostatic protection

In the application of modules, the static electricity generated by human body static electricity and charged friction between microelectronics can be discharged to the module through various means, which may cause certain damage to the module, so ESD protection should be paid attention to. In the process of R&D, production, assembly and testing, especially in product design, ESD protection measures should be taken. For example, at the interface of the circuit design and the points that are easily damaged or affected by electrostatic discharge, anti-static protection should be added; anti-static gloves should be worn during production.

The following table shows the ESD withstand voltage of the important pins of the module:

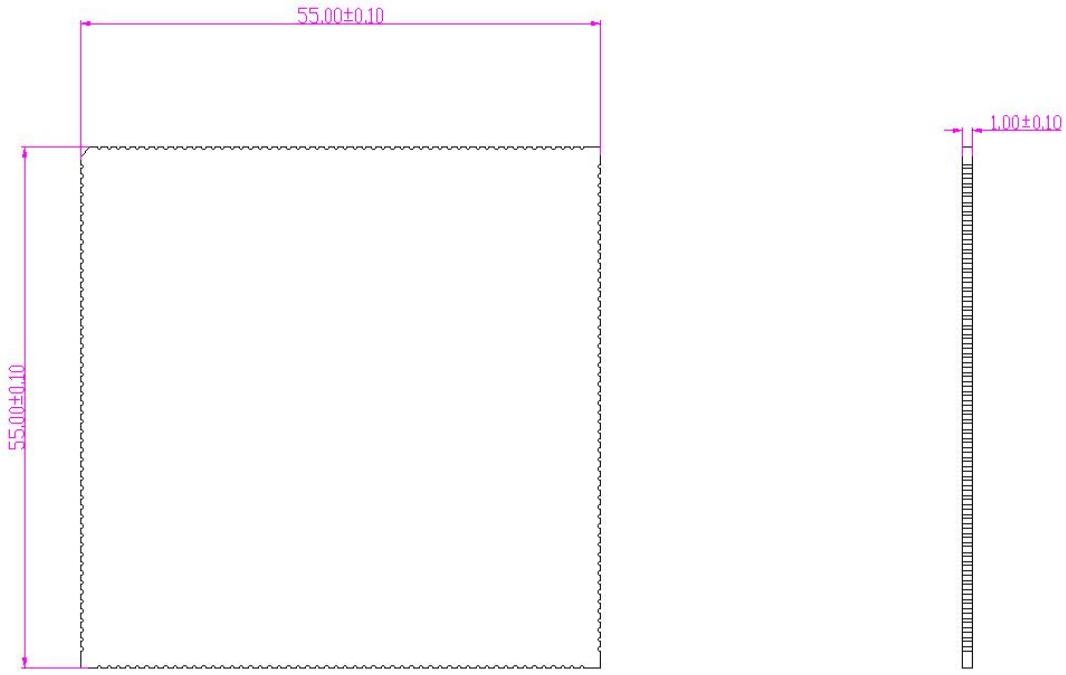
Table 26 ESD performance parameters (temperature：25 ° C, humidity：45%)

Test Point	Contact Discharge	Air Discharge	Unit
power and ground connections	+/-5	+/-10	KV
Antenna Interface	+/-5	+/-10	KV
Other interfaces	+/-0.5	+/-1	KV

5 Mechanical dimensions

This chapter describes the mechanical dimensions of the module, all dimensions Unit are millimeters. For all dimensions without tolerance, the tolerance is ±0.05mm.

5.1 Module mechanical dimensions



Top view Side view

Figure 21 M274K Top and Side View Dimensions

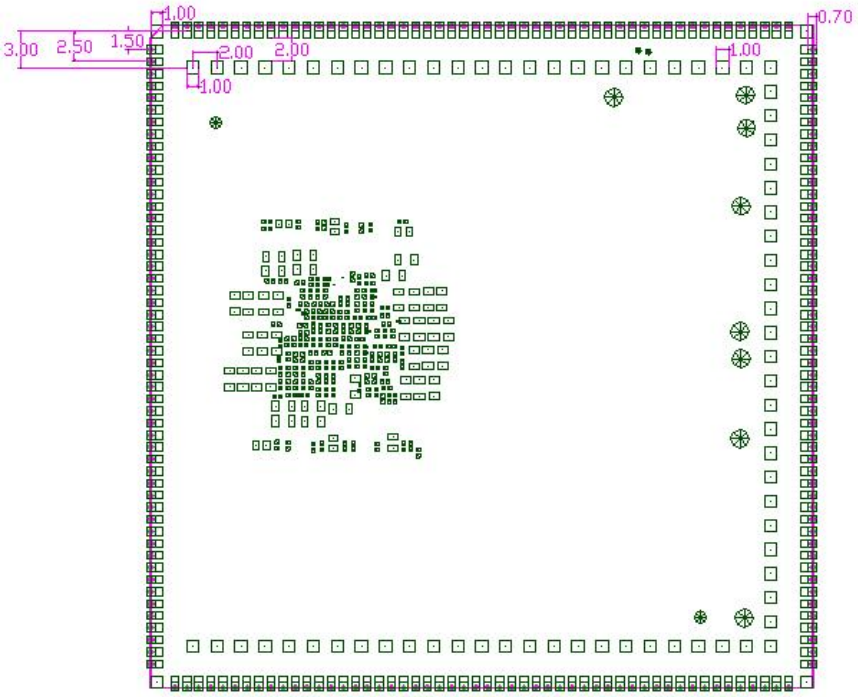


Figure 22 M274K Module Package (top perspective view)

5.2 Top and bottom views of the module

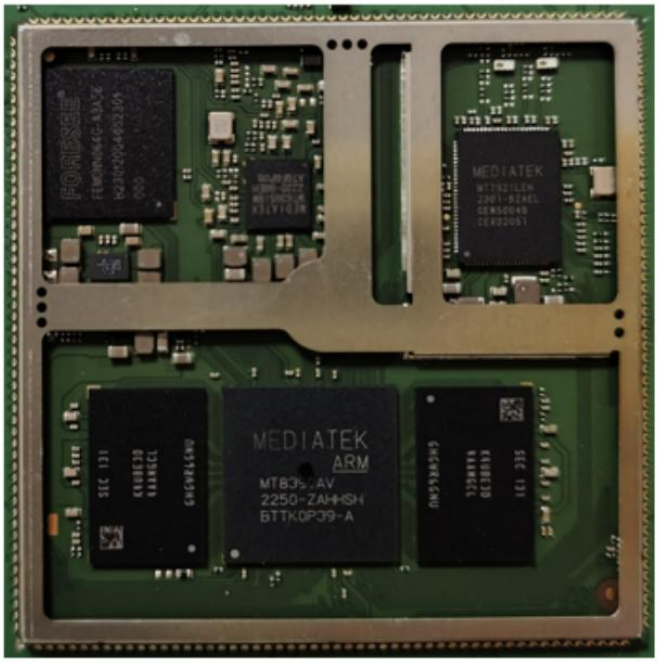


Figure 23 Top view of the module

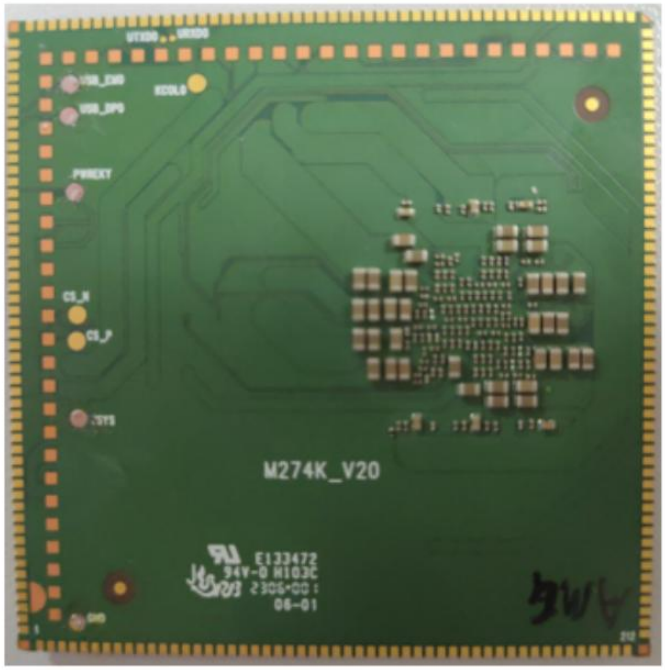


Figure 24 Bottom view of the module

Remark

The above is the design rendering of the M274K module. For more accurate product appearance and label information, please refer to the actual module of Wuxi Sunning Smart Devices Co., Ltd..

6 Storage, production and packaging

6.1 Storage

M274K is shipped in a vacuum sealed bag. The humidity sensitivity level of the module is 3 (MSL 3), and its storage must comply with the following conditions:

1. When the ambient temperature is lower than 40 degrees Celsius and the air humidity is lower than 90%, the module can be stored in a vacuum sealed bag for 12 months.

2. After the vacuum sealed bag is opened, if the following conditions are met, the module can be directly subjected to reflow soldering or other high temperature processes:

Module storage air humidity is less than 10%.

The module ambient temperature is lower than 30 degrees Celsius, the air humidity is lower than 60%, and the factory can complete the patching within 168 hours.

3. If the module is in the following conditions, it needs to be baked before placement:

When the ambient temperature is 23 degrees Celsius (5 degrees Celsius fluctuations are allowed), the humidity indicator card shows that the humidity is greater than 10%.

When the vacuum sealed bag is opened, the ambient temperature of the module is lower than 30 degrees Celsius, and the air humidity is lower than 60%.Finish the patch within hours

4. If the module needs to be baked, please bake it at 120 degrees Celsius (5 degrees Celsius fluctuation is allowed) for 8 hours.

Remark

The packaging of the module cannot withstand high-temperature baking. Therefore, please remove the module packaging before baking the module. If you only need a short baking, please refer to the IPC/JEDECJ-STD-033 specification.

6.2 Production welding

Use a printing squeegee to print the solder paste on the screen, so that the solder paste leaks onto the PCB through the opening of the screen. The strength of the printing squeegee needs to be adjusted appropriately. To ensure the quality of the module printing paste, the thickness of the stencil corresponding to the land part of the M274K module It is recommended to be 0.18mm~0.20mm. For LGA pads, it is recommended to reduce the amount of solder paste to avoid short circuits. Please refer to document for details.

The recommended reflow soldering temperature is 240ºC~245ºC, and the maximum should not exceed 245ºC. In order to avoid damage to the module due to repeated heating, it is strongly recommended that customers re-attach the module after completing the reflow soldering on the first side of the PCB board. The recommended furnace temperature curve (lead-free SMT reflow soldering) and related parameters are shown in the following chart:

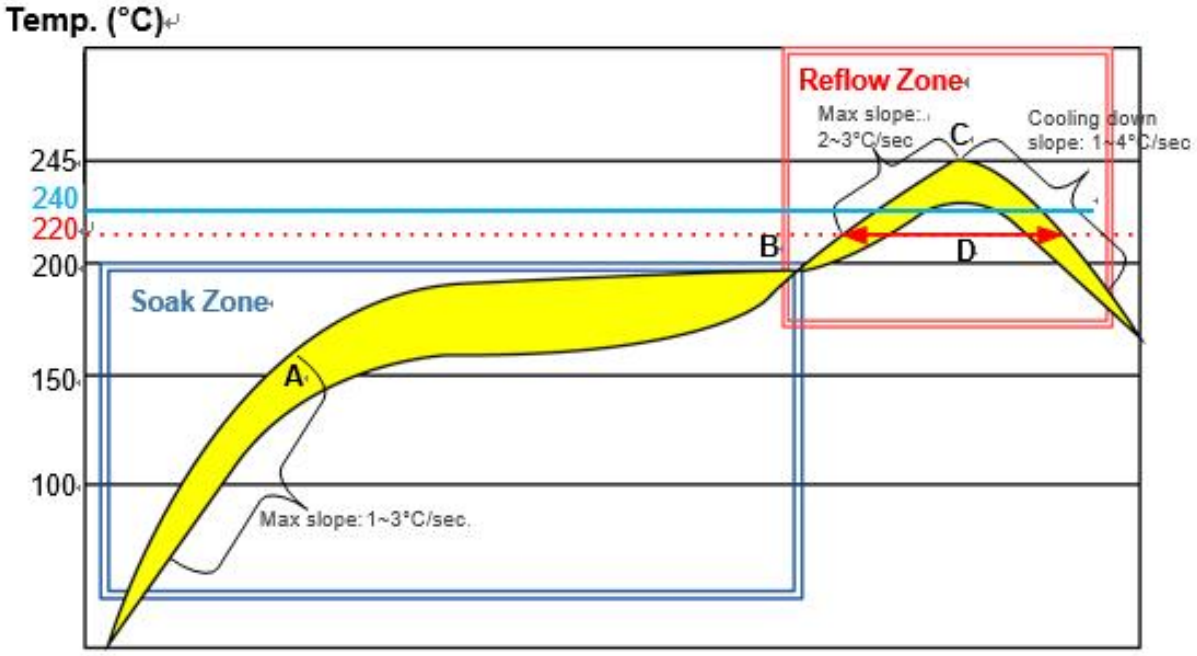


Figure 25 Recommended reflow soldering temperature profile

Table 27 Recommended furnace temperature test control requirements

Item	Recommended value
Endothermic zone (Soak Zone)	
Max heating slope	1°C/sec ~ 3°C/sec
Constant temperature time (the time between A and B: 150°C~200°C)	60 sec ~ 120 sec
Reflow soldering area (Reflow Zone)	
Max heating slope	2°C/sec ~ 3°C/sec
Reflow time (D: the period over 220°C)	40 sec ~ 60 sec
Maximum temperature	240°C ~ 245°C
Cooling slope	1°C/sec ~ 4°C/sec
Number of reflows	
Max reflow times	1 time

7 Appendix A

Table 28 Abbreviations

Technical Term	Description
ADC	Analog-to-Digital Converter
AMR	Adaptive Multi-rate
bps	Bits per Second
CS	Coding Scheme
CSD	Circuit Switched Data
CTS	Clear to Send

DRX	Discontinuous Reception
EFR	Enhanced Full Rate
EGSM	Extended GSM900 band (includes standard GSM900 band)
ESD	Electrostatic Discharge
FR	Full Rate
GMSK	Gaussian Minimum Shift Keying
GPS	Global Positioning System
GPU	Graphics Processing Unit
GSM	Global System for Mobile Communications
HR	Half Rate
HSDPA	High Speed Down Link Packet Access
HSPA	High Speed Packet Access
I/O	Input/Output
IQ	Inphase and Quadrature
LCD	Liquid Crystal Display
LCM	LCD Module
LED	Light Emitting Diode
LNA	Low Noise Amplifier
LRA	Linear Resonant Actuator
MIPI	Mobile Industry Processor Interface
PCB	Printed Circuit Board
PDU	Protocol Data Unit
PMI	Power Management Interface
PMU	Power Management Unit
PSK	Phase Shift Keying
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RTC	Real Time Clock
Rx	Receive

SMS	Short Message Service
TE	Terminal Equipment
TX	Transmitting Direction
UART	Universal Asynchronous Receiver & Transmitter
UMTS	Universal Mobile Telecommunications System
SIM	(Universal) Subscriber Identity Module
Vmax	Maximum Voltage Value
Vnorm	Normal Voltage Value
Vmin	Minimum Voltage Value
VI	Voltage Input
VIHmax	Maximum Input High Level Voltage Value
VIHmin	Minimum Input High Level Voltage Value
VILmax	Maximum Input Low Level Voltage Value
VILmin	Minimum Input Low Level Voltage Value
VImax	Absolute Maximum Input Voltage Value
VImin	Absolute Minimum Input Voltage Value
VO	Voltage Output
VOHmax	Maximum Output High Level Voltage Value
VOHmin	Minimum Output High Level Voltage Value
VOLmax	Maximum Output Low Level Voltage Value
VOLmin	Minimum Output Low Level Voltage Value
WCDMA	Wideband Code Division Multiple Access