

Neoway Tech

Neo_M590

**Hardware Design
Manual**

Version 1.0

Let's enjoy the wireless life!

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Clarification

This manual applies to M590.

This manual is for system engineer, research engineer and test engineer.

As the upgrading of the product version or someother reason, we'll do some neccessity updating to the content of this specification without advance notice.

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1. Summerization

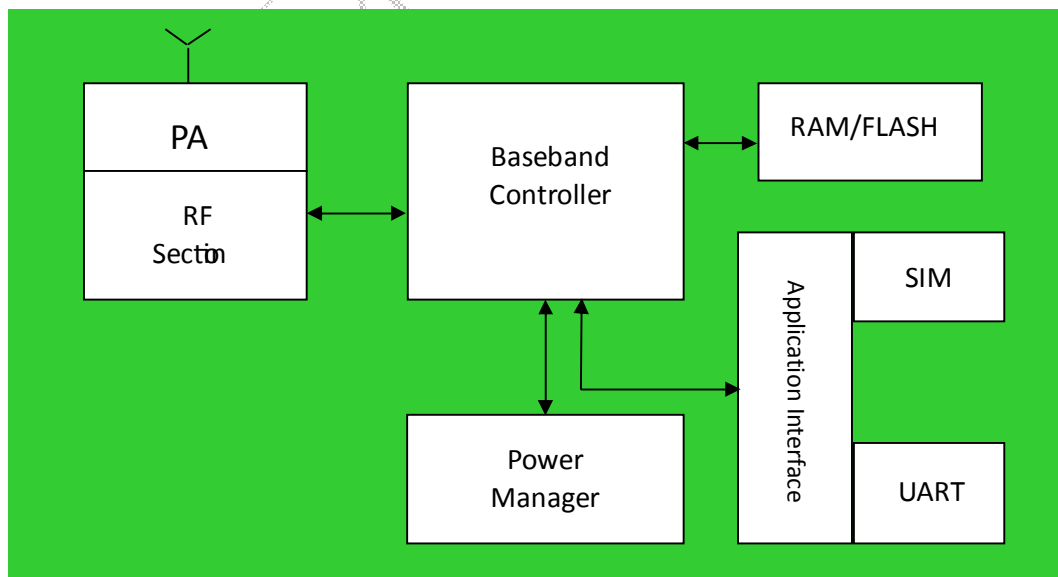
Neo_M590 is a kind of GSM/GPRS industrial wireless module for dual-band. It has high-quality voice, SMS, data service and other functions. It is widely used in different kinds of industrial and commercial fields.

2. Shape

TABLE 1 Shape of M590

SPECIFICATIONS	DESCRIPTION
Dimensions	28mm*24mm*11mm (length*width*height)
Weight	9g
Overview	
Remark: the connector of the module is DIP plug needles, height: 11mm.	

3. Design Diagram



4. Features

TABLE 2 Main Features of M590

SPECIFICATION	DESCRIPTION
Frequency	EGSM900/GSM1800 Dual-band
Sensitivity	-106dBm
The Maximum transmission Power	EGSM900 Class4(2W)
	DCS1800 Class1(1W)
Instantaneous Current	Max 2A
Working Current	210mA
Waiting Current	2.5mA
Working Temperature	-40℃ ~+80℃
Working Voltage	3.3V~4.8V (The recommend value is 3.9V)
Protocol	Compatible with GSM/GPRS Phase2/2+
AT	GSM07.07
	Extended command sets
Connector	Plug needles connector
	GSC RF connector
SMS	TEXT/PDU
	Point to point/cell broadcast
Grouped Data	GPRS CLASS 10
	Coding mode: CS1, CS2, CS3, CS4
Circuit Switched Data	Support CSD data service
	Support USSD

5. Definition of the Signal

TABLE 3 Definition of M590 Interface Signal

PIN	SIGNAL NAME	I/O	SPECIFICATION DESCRIPTION	REMARK
1	GND	PWR	Ground	
2-3	VCC_MAIN	PWR	Main Power	
4	GND	PWR	Ground	
5	VCCIO//RUN	O	Module power supply 2.85V output//Indicate the module is running normal	
6	DCD	O	Data Carrier Detect	Not support
7	RXD	I	Receiving Data	
8	TXD	O	Sending Data	
9	DTR	I	User Circuit Ready	
10	RING	O	Ring	
11	SIMIO	I/O	SIM card data	
12	SIMCLK	O	SIM card clock	
13	SIMRST	O	SIM card reset	
14	SIMVCC	PWR	SIM card power output	
15	GND	PWR	Ground	
16	LIGHT	O	Indicate working status	
17	DSR	O	The module ready	Not support
18	EMERG OFF	I/O	Emergency power OFF	
19	ON/OFF	I	ON/OFF control	
20	GND	PWR	Ground	

Remark: The max voltage of all IO interface can not exceed 3.15V.

6 Interface Design Reference

6.1 Power Supply and Reset Interface

TABLE 4 Power Supply and Reset Interface

PIN	SIGNAL NAME	I/O	SPECIFICATION DESCRIPTION	REMARK
1\4\15\20	GND	PWR	Ground	
2-3	VCC_MAIN	PWR	Main Power Supply Output	
5	VCCIO/RUN	O	Module power supply 2.85V output//Indicate the module is running normal	IO reference Level, load capacity<30mA

18	EMERGOFF	I/O	Emergency Power OFF	
19	ON/OFF	I	ON/OFF control	

6.1.1 Power Supply

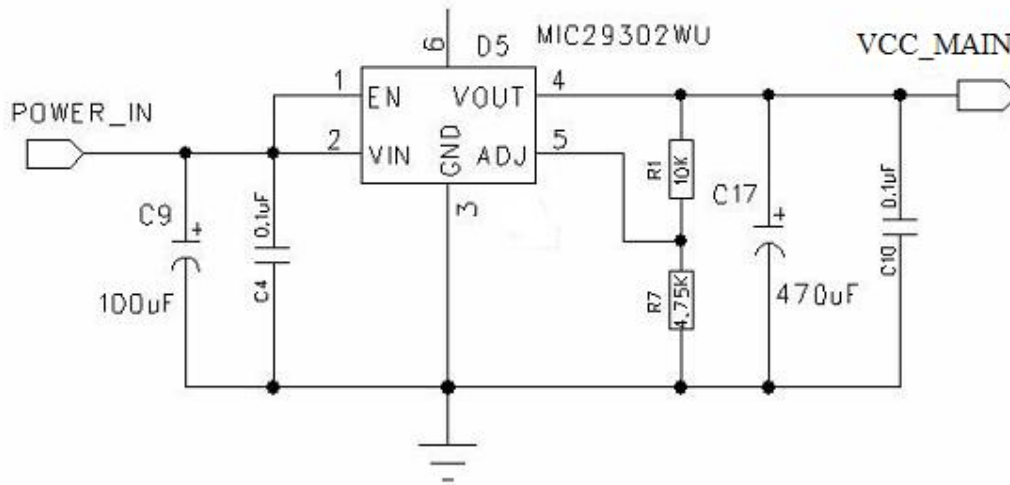
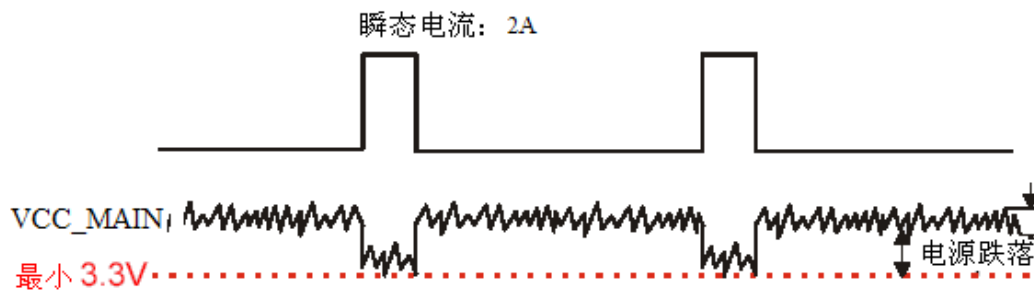


FIGURE 1 Power Supply Interface Reference

Note: In the user's system, the layout of the module should be far away from the high-speed circuits, switching power supply, power transformers, large inductance and MCU clock circuit.

Pin2-3 VCC_MAIN is the main power supply of the module, the power input range is 3.3V to 4.8V, the recommended value is 3.9V. The instantaneous current does not exceed 2A. When the current is 2A, the power current shouldn't be less than 3.3V, details as the following picture.



The reference design of the power supply is as Picture 1. MIC29302WU is the conversion chip of the power. Due to the PA part of the module directly use the VCC_MAIN supply power, you'd better place large volumes of low ESR capacitor near the pin location of the module power, such as 470uF Tantalum Capacitor or 1000uF Aluminum Electrolytic

Capacitor, other wise, the current of the VCC_MAIN may instantaneously drop too large and make the module reset or restart.

6.1.2. Power-timing

Pin18 EMERGOFF is the emergency OFF pin of the module. The detail Power-timing of the EMERGOFF signal is as Picture 2. After the module power ON, when VCCRTC stability reach to 2.0V4ms, EMERGOFF is at the High impedance state, the duration is 14ms. After,

EMERGOFF output 22ms low level to make the module reset.

VCCRTC is RTC power supply, the pin doesn't lead to the module. When VCC_MAIN reach to 2.5V 135uS, VCCRTC output 2.0V voltage.

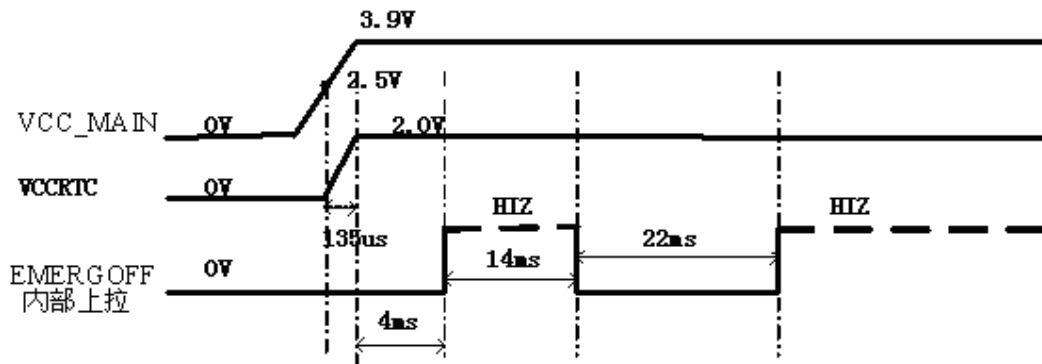


FIGURE 2 Power-timing of the Module

6.1.3.ON/OFF Pin Description

Pin19 ON/OFF is an input pin, the startup and shutdown of the module can be controlled externally and effective on low level. There is a weak internal pull-up to the VCCRTC in the module. The users need output OC. The internal resistance which drives the signal can't exceed 1K Ohmic, the input current should be less than 0.5mA.

1) Use ON/OFF to Startup

If there is a external CPU, use ON/OFF control to startup.

Using ON/OFF control the power timing as the following Picture 3. Maintain high level or high impedance state with 200ms when the module supply power, then input low level to

ON/OFF Pin at any time and maintain at least 600ms. Then input high level or suspended.

VCCIO Timing

In the current which use ON/OFF to startup, VCCIO signal output 2.85V stably after ON/OFF falling 10ms.

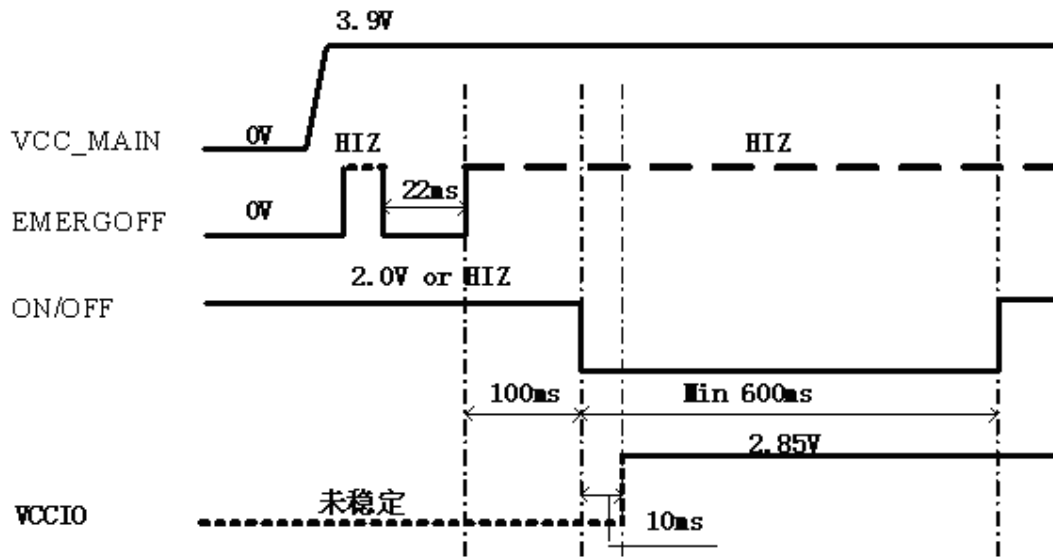


FIGURE 3 Startup Timing (ON/OFF control startup)

2) Not use ON/OFF to startup

ON/OFF Pin in the absence of CPU-controlled circuit can be directly grounded. After the EMERG OFF signal is rising, the VCCIO signal will output 2.85V stably.

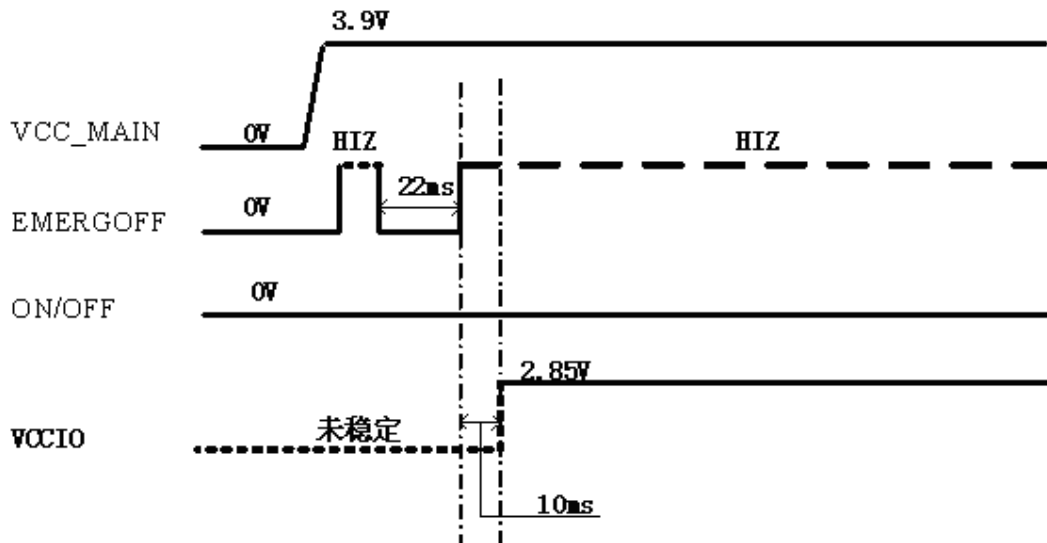


FIGURE 4 Power ON Timing (ON/OFF grounding)

3) Use ON/OFF to Shutdown

After startup the module, if input low level to the ON/OFF pin and maintain at least 600ms, then input high level or suspended can make the module shutdown.

NOTE: ON/OFF pin have startup and shutdown function, pay attention to avoid duplication trigger lead to the failure of the boot or shutdown. For example, the user want to startup the module, but giving twice 600ms Low Pulse lead to the module shutdown.

The shutdown function of ON/OFF pin is identified through the software of the module. If the

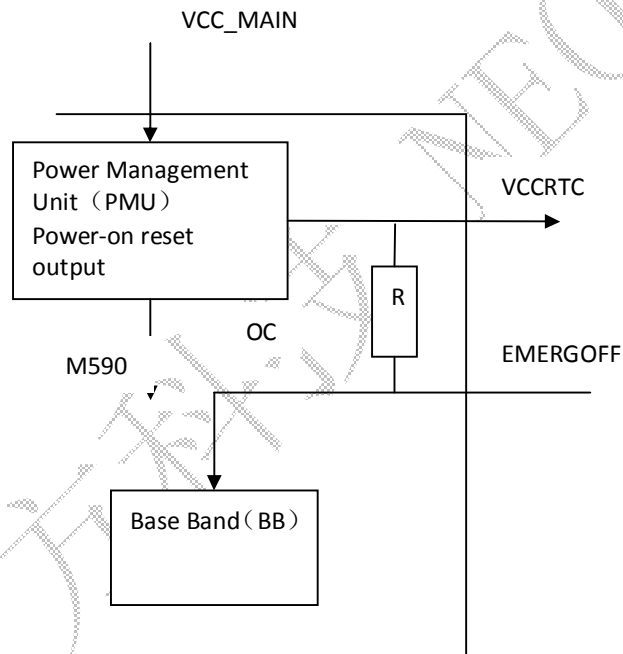
software of the module doesn't work normally, the module can't be shutdown normally.

6.1.4. EMERGOFF Pin Description

Pin18 EMERGOFF is to emergency off. When the module power on, it has a short-term output state.

NOTE: the user using EMERGOFF to shutdown belongs to forced shutdown. There is no need the software identification of the module, like shutdown the power directly. If the module performs the writing operation of FLASH when it is shutdown, the FLASH might be damaged. Therefore, the user is suggested to shutdown the module by using EMERGOFF and AT Command.

The diagram of internal connection of EMERGOFF in the module as follows:



When the module is power-on, the power of the base-band will reset by the internal Power Management Unit (PMU). See the EMERGOFF signal in the above picture, the width of this power-on reset output pulse is about 22ms. The reset output of PMU is OC output, internal pull-up to VCCRTC (2.0V), the resistance range of the Pull-up resistor is about 10~15K.

EMERGOFF circuit design suggestion:

- 1) EMERGOFF should be OC output. If there is no need, EMERGOFF can be suspended.
- 2) If EMERGOFF can't be OC output, it's better to maintain the control pin input before the module finishing the internal power reset. When the users need

emergency OFF, output low level. Maintain input at other times.

- 3) If the control pin only can be output and can't be OC, it's suggested to link a 2K resistor between the control pin and the EMERGOFF pin of the module, to ensure that the module doesn't absorb too large current when the power reset.
- 4) The pulse width of the effective EMERGOFF should be at least 1mS. The effective low level can't be more than 0.4V.

6.1.5.VCCIO Pin Description

Pin5 VCCIO is the reference voltage the module supplies, amplitude to 2.85V, loading capacity is 3mA. It is suggested to use for switching interface level only. When power off, VCCIO output shut.

Moreover, this pin can be used to indicate the running of the module. When it's running normal or sleeping, the pin is high level; when it's power off, the pin is low level.

6.1.6. The module ON, OFF or RESET

ON:

- 1) supply power to VCC_MAIN;
- 2) input low level to ON/OFF pin, maintain at least 600ms, then input high level or suspended;
- 3) input corresponding AT commands, estimate whether the module works or not according to the back code.

OFF:

- 1) input corresponding AT commands, ensure the software of the module shut safely.
- 2) Use EMERGOFF to shutdown the module.

RESET:

- 1) Carry out shutdown process as above;
- 2) Carry out startup process as above.

More details please see <the module ON, OFF and RESET operation Manual>

6.2. Serial Interfaces

TABLE 5 Description of Serial Interface

PIN	SIGNAL NAME	I/O	SPECIFICATION DESCRIPTION	REMARK
6	DCD	O	Data Carrier Detect	Not support
7	RXD	I	The module receiving data	
8	TXD	O	The module sending data	

9	DTR	I	The user's circuit ready	Series connect 3K resistor grounding when not in use
10	RING	O	Ring	
17	DSR	O	The module ready	Not support

As a DCE device, the module and the terminal device(DTE) connect signals as the following picture:

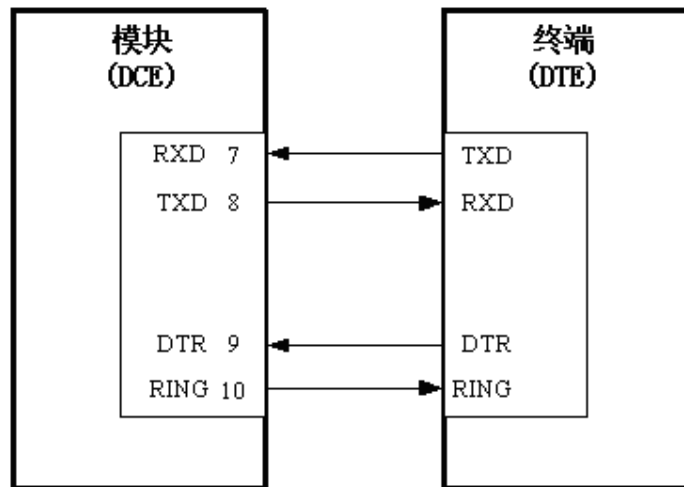


TABLE 6 DCE and DTE signal connection diagram

The CMOS Level signal which interface is 2.85V, input at most 3.15V, the maximum rate if 230400bps.

The interface is usually used for AT commands, data services, updating software and so on. To remind: not support DCD/DSR function currently.

RING signal indication:

- 1) Call: When there is a call, it will output a low pulse which cycle is 5s and width is 30ms. When the call is connected, it will restore to be high level.
- 2) SMS: when getting a SMS, it will output a 35ms wide low pulse.
- 3) Data: as long as GPRS receiving data, it will continuously output a low pulse which cycle is 2s and width is 24ms.

6.3. SIM-card interface

TABLE 7 SIM-card Interface

PIN	SIGNAL NAME	I/O	SPECIFICATION DESCRIPTION	REMARK
11	SIMIO	I/O	SIM card data	There is 33.2K pull-up resistor in the module

12	SIMCLK	O	SIM card clock	Junction Capacitance <20pF
13	SIMRST	O	SIM card reset	
14	SIMVCC	PWR	SIM card	

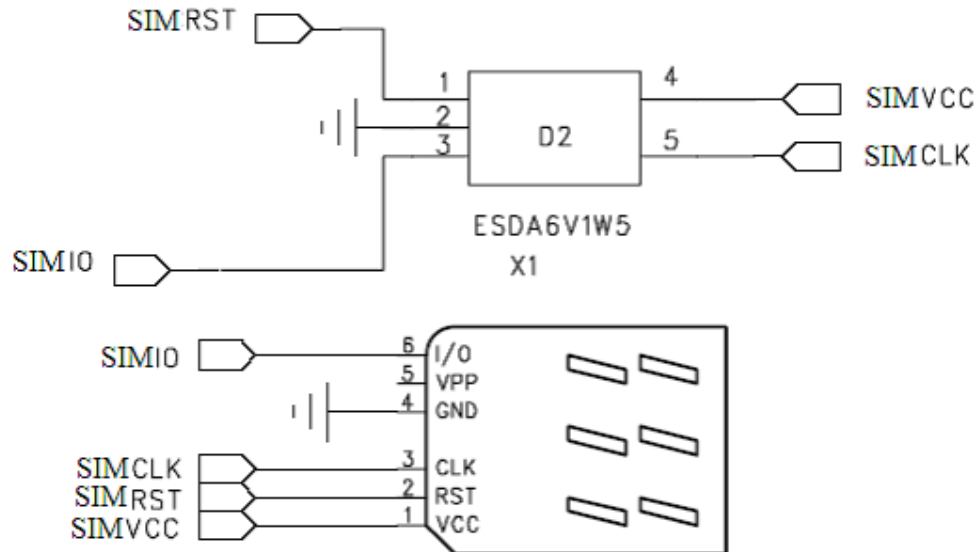


TABLE 8 SIM-card Interface Design Reference

The module supports 3V and 1.8V SIM card.

Pin14 SIMVCC is the power supply of SIM card, 2.85V and load capacity is 30mA. This power output only when operating on the SIM card. In harsh environment, it must be combined with ESD protection card. The D2 in Figure 6 is the ESD protection device.

Pin12 SIMCLK is the clock line of SIM card, it require the PCB cabling can't be forked and tubby. It should far away from antenna and RF, the Junction capacitance can't exceed 20pF.

M590 doesn't support VPP input, VPP is the signal that the SIM card whether installed or not.

6.4. Light Indicator

TABLE 9 Light Indicator Interface

PIN	SIGNAL NAME	I/O	SPECIFICATION DESCRIPTION	REMARK
16	LIGHT	O	Indicate working state	

When the module is operating, the indicator light will shine every one second if there is no card or no signal.

6.5. Signal Connector and PCB packing

The signal connector of M590 is constituted by DIP Pin, the distance between two pins is 2.54mm.

DIP Pin connector, the recommended PCB packing of the module as Picture 7.

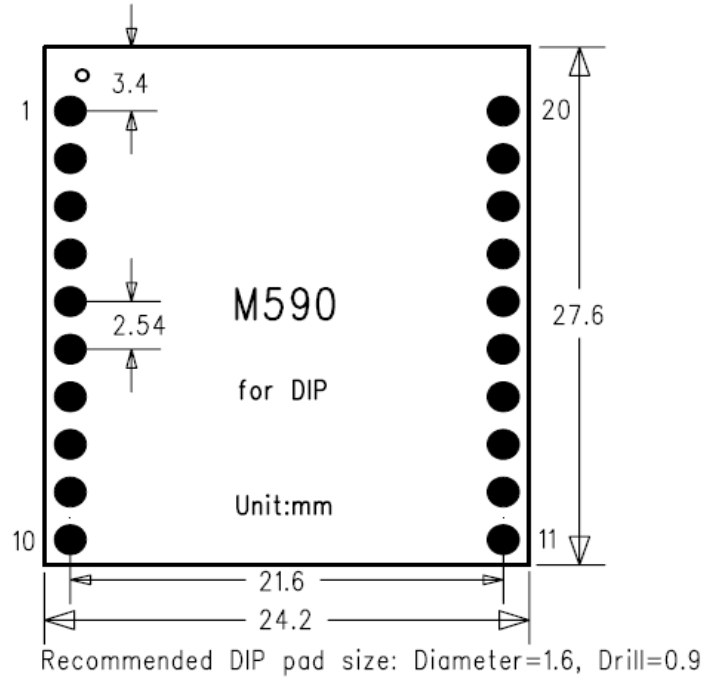
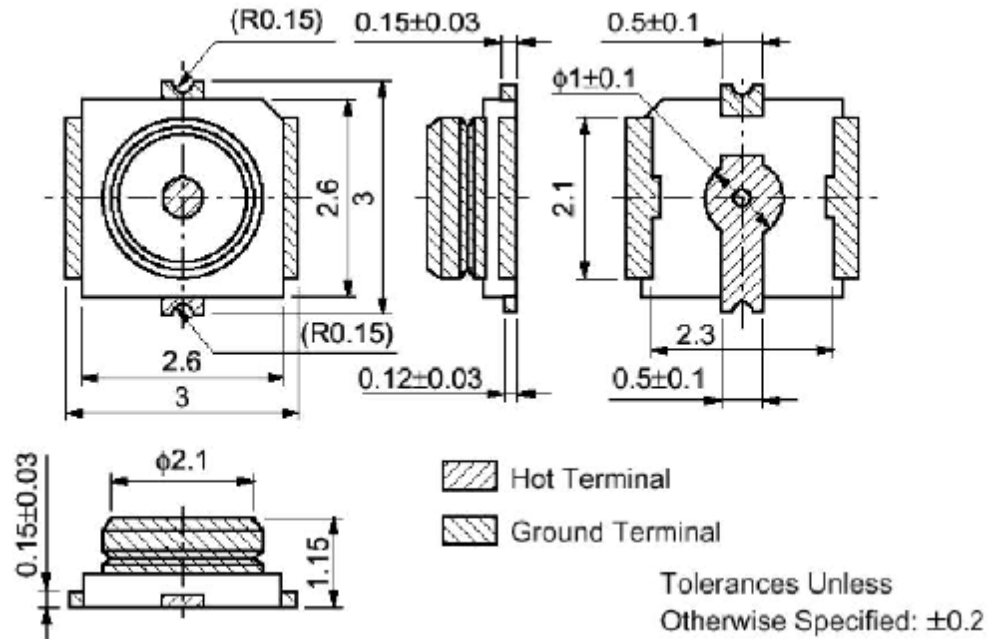


TABLE 10 Recommended PCB Packing Diagram (topview)

6.6. RF connector

The antenna interface of M590 is GSC RF connector, the external antenna is connected by RF cable. This connector is supplied by Murata Company, its Part Number is MM9329-2700RA1, packing information as the following picture.



The impedance of RF interface is 50Ω, the antenna part of the module should take necessary measures to avoid the useful band interfere signals. There should have good shielding between the external antenna and RF connector. Moreover, the external RF cable should be far away from all interfere source, especially the high-speed data signal and ON/OFF power.

The antenna used in the module should be in accordance with the standard of mobile device. VSWR should between 1.1 and 1.5, input impedance is 50Ω. Different using environment has different requirement to the plus of the antenna. Normally, the bigger the inside gain, the smaller the outside gain and the better the function of the antenna. When using multi-port antenna, the distance between each port should be more than 30dB. Such as the two different polarization ports of the dual-polarized antenna, the distance between the two different band ports of dual-band antenna and the four ports of dual-band dual-polarized antenna should be more than 30dB.

7. Assemblage

The connector of M590 is DIP needle inserted connector, using DIP Socket Pin to connect.

8. Abbreviations

ADC	Analog-Digital Converter
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
AMR	Acknowledged multirate (speech coder)
CSD	Circuit Switched Data

CPU	Central Processing Unit
DAI	Digital Audio interface
DAC	Digital-to-Analog Converter
DCE	Data Communication Equipment
DSP	Digital Signal Processor
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi-Frequency
DTR	Data Terminal Ready
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EMC	Electromagnetic Compatibility
EMI	Electro Magnetic Interference
ESD	Electronic Static Discharge
ETS	European Telecommunication Standard
FDMA	Frequency Division Multiple Access
FR	Full Rate
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
HR	Half Rate
IC	Integrated Circuit
IMEI	International Mobile Equipment Identity
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MS	Mobile Station
PCB	Printed Circuit Board
PCS	Personal Communication System
RAM	Random Access Memory
RF	Radio Frequency
ROM	Read-only Memory
RMS	Root Mean Square
RTC	Real Time Clock
SIM	Subscriber Identification Module
SMS	Short Message Service
SRAM	Static Random Access Memory
TA	Terminal adapter
TDMA	Time Division Multiple Access
UART	Universal asynchronous receiver-transmitter
VSWR	Voltage Standing Wave Ratio