Strong Rising SEW290 Module Technical User Guide

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Shenzhen Strong Rising Electronics Co.,Ltd

www.strongrising.com

Copyright Statement

Technical Support

Shenzhen Strong Rising Electronics Co.,Ltd. was establised in January 2004.We mainly engage in the research and development, production and sales of communications terminal products,is the earliest into wireless data card in the field of one of the professional manufacturers.

We can provide WCDMA/EDGE/cdma2000 module customers technical support through website,telephone,IM,E-Mail etc,and also onsite supports.

The Strong Rising website www.strongrising.com provides the relevant industry information and module technical documentation.

If you have more requirements, you could send an E-mail to support_module@strongrising.com.

You can also call us at hotline 400-0690-009 for more supports.

EU Regulatory Conformance

Hereby，Shenzhen Strong Rising Electronics Co., Ltd. Declares that this device is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Preface

Summary

This manual is applicable for SEW290 module. This manual takes SEW290 for example to instruct the users how to design the hardware and how to quickly and conveniently design different kinds of wireless terminals based on the modules.

Target Readers

- System designing engineers
- Mechanical engineers
- Hardware engineers
- Software engineers
- Test engineers

Brief Introduction

The manual contains 5 chapters, shown as below:

Chapter	Contents
✓ DESCRIPTION	Introduces SEW290 module's technical specs and relevant documents and abbreviations.
✓ SEW290 MODULE INTRODUCTION	Introduces SEW290 module's principle diagram and relevant standards.
✓ PIN DEFINITIONS	Introduces SEW290 module's PIN names and function.
✓ DESCRIPTIONS OF HARDWARE INTERFACES	Introduces SEW290 module's hardware interfaces.
✓ MECHANICAL DESIGN	Introduces SEW290 module's appearance, assembly diagram and antenna connector's mechanical specifications.

Update History

Document Reversion

V1.0 (2012-11-1) The first version released。

CONTENTS

1 Description

This manual is applicable for SEW290 module. SEW290 module is WCDMA/HSDPA/HSUPA/GSM/GPRS /EDGE manufactured by Strong Rising, which has the functions like voice, SMS and data service. The peak value of forward data rate can reach up to 7.2Mbit/s and reverse data rate can reach up to 5.76Mbit/s. The data service could provide users with economical high-speed Internet access and wireless data service. Using SEW290 can easily help you realize the following: MODEM, U-Modem, Embedded Module, Wileless Phone, Smart Phone, Multimedia Phone and Touch-screen Telecom Device, etc.This manual describes SEW290 module's logic structure, hardware interface and main functions, and provides reference design for the hardware and mechanics.

According to the designer, Shenzhen Strong Rising Electronics Co.,Ltd., we hereby declare that there's no difference between the model SPW270, SPW290, STW290, PCI270, PCI290, SEV550, SEV750, SEV850, MU270, MU290, MC550, MC750, MC850, SEW270, SEW291, SEW702, STV680 and SEW290, they are accordant in both hardware and software.

1.1 Technical Specification

1.1.1 Descriptions of specs.

Please refer to Table 1-1 for the specifications of SEW290.

Table 1-1 Module specification

Module Model	Technical System	Work Frequency
SEW290	WCDMA/HSPA/GSM/GPRS/EDGE	GSM/GPRS/EDGE： GSM850/EGSM900/DCS1800/PCS1900 WCDMA/HSDPA/HSUPA：2100M Hz,/850MHz

1.1.2 Basic Functions

Please refer to Table 1-2 for the module's basic functions.

Table 1-2 Module's basic functions

Basic Functions	Descriptions
Voice	Two input/output differential and single end analog audio,support PCM
Data Service	GSM、GPRS、EDGE、WCDMA(CS、PS UL384kbps)、HSUPA 7.2Mbps
SMS	Support both TEXT and PDU.

1.1.3 Module Interfaces

Please refer to Table 1-3 for the module's Interfaces

Table 1-3 Module's Interfaces

Interface	Descriptions
Power interface	Used to supply the power, reset, and power on-off the module
Audio interface	Two audio input/output, one for diffenrential, one for single-end
USIM interface	Machine and card separation
USB interface	USB2.0 High Speed
UART interface	Support software customization

Antenna interface	Antenna interface,50 ohm input impedance. User can connect an antenna with coxial cable to the antenna connector.Please notice the dimension of the coxial cable should match the module's connector.

1.1.4 Technical Parameters

Please refer to Table 1-4 for the module's technical parameters.,

Table 1-4 Technical parameters

Technical parameters	Descriptions		
Input voltage	3.4V-4.2V		
Maximum current	1800mA @ -102 dBm		
Standby current(Avg.)	10mA @ -75 dBm		
Talk current(Avg.)	230mA @ -75 dBm		
Sleep current(Avg.)	3 mA		
Rx. sensitivity	GSM all bands:＜-102dB,typical testing value:-108dBm		
	WCDMA all bands:＜106.5dBm,typical testing value:-109dBm		
Maximum Tx. power	GSM850&EGSM900		GMSK Mode:31.5±0.5dBm
			8PSK Mode:27.5±0.5dBm
	GSM1800&PCS1900		GMSK Mode:27.9±0.6dBm
			8PSK Mode:24.5±0.5dBm
	WCDMA	Band I(W2100)	22.5±0.5dBm
		Band V(W850)	22.5±0.5dBm
Operating Band	GSM850		X:824~849 MHz
			RX:869~894 MHz
	EGSM900		TX:880~915 MHz
			RX:925~960MHz
	DCS1800		TX:1710~1785MHz
			RX:1805~1880MHz
	PCS1900		TX:1850~1910MHz
			RX:1930~1990MHz
	WCDMA 2100		TX:1920-1980MHz
			RX:2110-2170MHz
	WCDMA 850		TX:824-849MHz
			RX:869-894MHz

1.2Ambient Temperature Parameters

Please refer to Table 1-5 for the module's ambient temperature parameters.

Table 1-4 Ambient temperature parameters

Working Temprrature	Normal Working Temprrature: 20℃~25℃
	Extremely Working Temprrature :-10℃~55℃
Humidity Range	30％～75％HR

1.2 Abbreviations

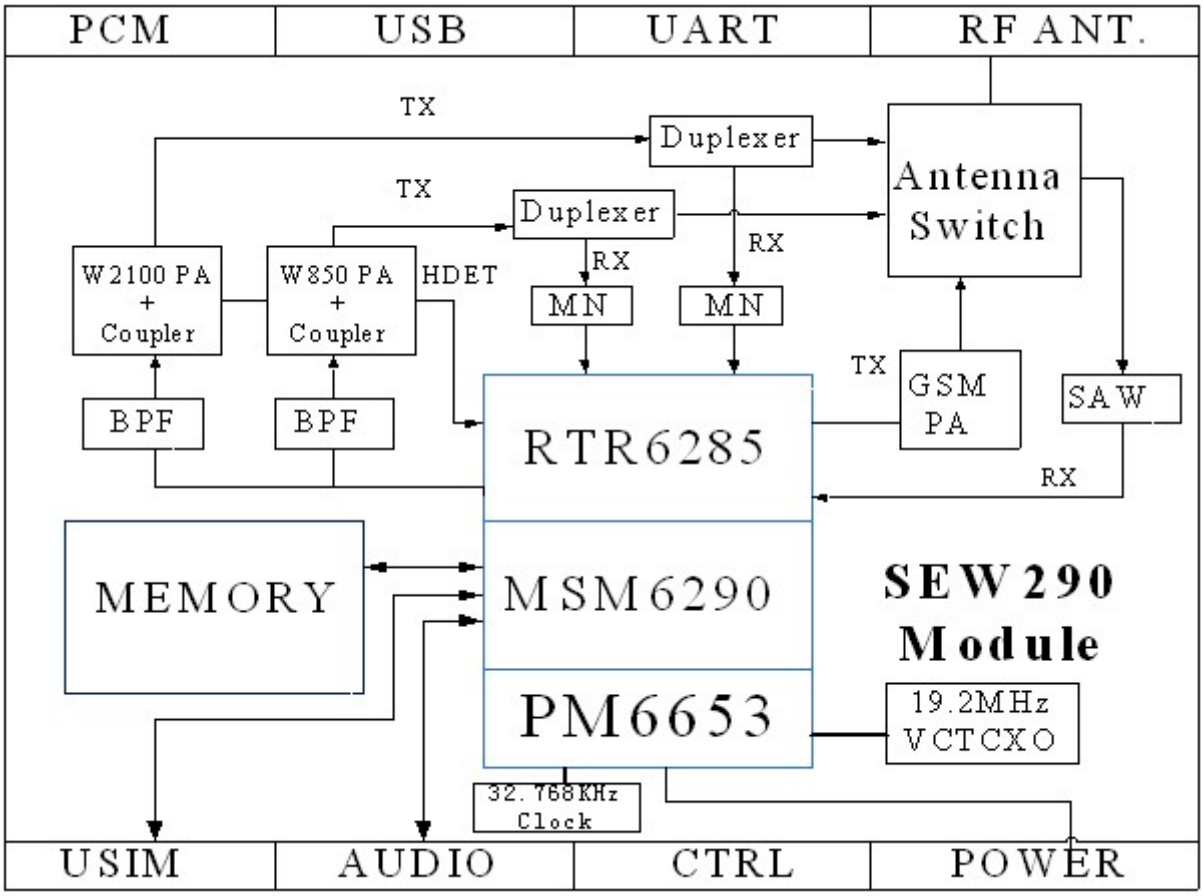
ADC	Analog-Digital Converter
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
ARFCN	Absolute Radio Frequency Channel Number
ARP	Antenna Reference Point
ASIC	Application Specific Integrated Circuit
BER	Bit Error Rate
BTS	Base Transceiver Station
CDMA	Code Division Multiple Access
CDG	CDMA Development Group
CS	Coding Scheme
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
HR	Half Rate
HSDPA	High Speed Downlink Packet Access
IC	Integrated Circuit

IMEI	International Mobile Equipment
ISO	International Standards Organization
ITU	International Telecommunications
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MCU	Machine Control Unit
MMI	Man Machine Interface
MS	Mobile Station
PCB	Printed Circuit Board
PCL	Power Control Level
PCS	Personal Communication System
PDU	Protocol Data Unit
PLL	Phase Locked Loop
PPP	Point-to-point protocol
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
TE	Terminal Equipment also referred it as
TIS	Total Isotropic Sensitivity
UART	Universal asynchronous
UIM	User Identifier Management
UMTS	Universal Mobile Telecommunications
USB	Universal Serial Bus
VSWR	Voltage Standing Wave Ratio
WCDMA	Wide band Code Division Multiple

2 Module Introduction

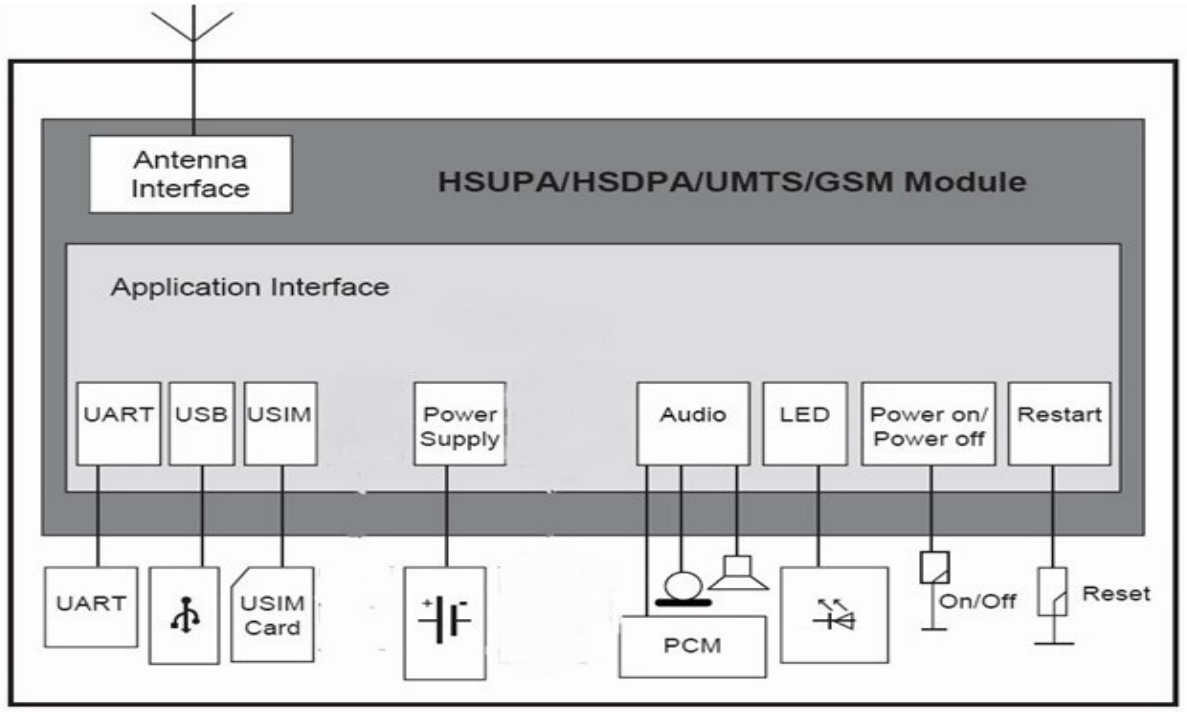
Please refer to Figure 2-1 for SEW290 module's principle diagram and Figure 2-2 SEW290 Module's application diagram

Figure 2-1 SEW290 Module's principle diagram



SEW290 module is WCDMA wireless 3G module based on Qualcomm's MSM6290 platform.The module adopts 37PIN stampt-hole, it applies for WCDMA and GSM network and supports GSM850/GSM900/GSM1800/GSM1900/WCDMA2100MHz/WCDAM850MHz

Figure 2-2 SEW290 Module's application diagram



3 PIN Definitions

SEW290 module adopts stamp-hole welding method, totally 37 PINs. The distance among the pins is 0.5mm. See the descriptions of PINs in figure 3-1. Please refer to table 3-1 for the key voltage of each pin.

Figure 3-1 Descriptons of PINs

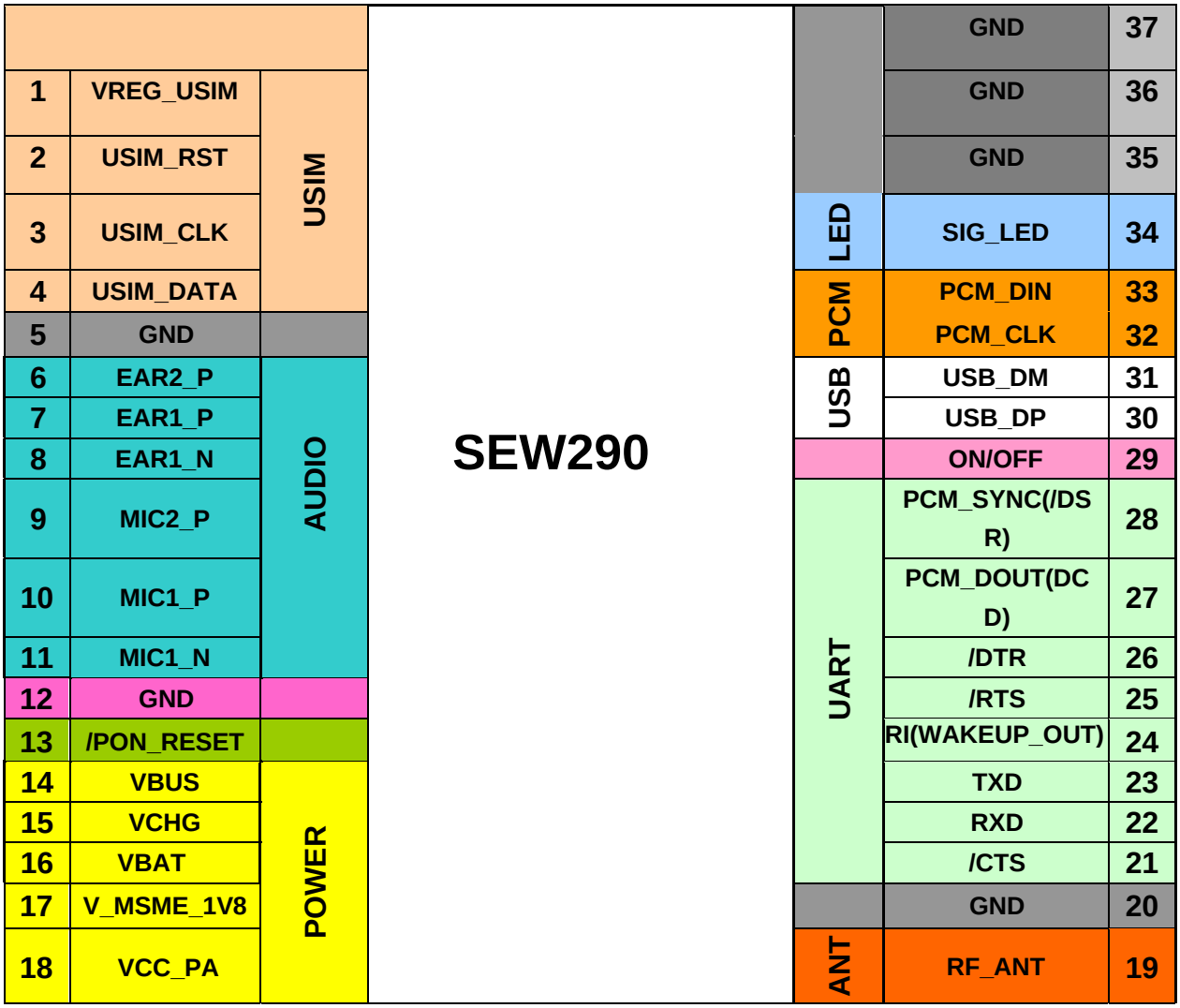


Table 3-1 36PIN Definitions

Function	PIN Number	Signal Name	I/O	Basic Function	Remark
USIM interface	1	VREG_USIM	O	USIM card power3V/1.8V	
	2	USIM_RST	O	USIM card reset	
	3	USIM_CLK	O	USIM card clock	
	4	USIM_DATA	I/O	USIM card data	
Audio	6	EAR2_P	O	Audio output 2+	
	7	EAR1_P	O	Audio output 1+	
	8	EAR1_N	O	Audio output 1-	
	9	MIC2_P	I	Audio input 2+	

	10	MIC1_P	I	Audio input 1+	
	11	MIC1_N	I	Audio input 1-	
Reset	13	/PON_RESET	I	Module reset	Active low
Power	14	VBUS	I	USB power	3.4V-5V
	15	VCHG	I	Charge power	
	16	V_MAIN	I	Work power 1	3.4V-4.2V
	17	V_MSME_1V8	O	Refer to 1.8V outout for	1.8V
	18	V_MAIN	I	Work power 2	3.4V-4.2V
	29	ON/OFF	I	Power on/off enabled	1.8V,Active low
UART	21	/CTS	I	UART clear to send	1.8V,Active low
	22	RXD	I	UART receive data input	1.8V
	23	TXD	O	UART transmit output	1.8V
	24	RI	O	Module wake up signal	1.8V , same with the wake_up pin
	25	RTS	O	UART ready for receive	1.8V,Active low
	26	/DTR	I	UART data terminal ready	1.8V,Active low
PCM	27 27	PCM_DOUT （DCD）	O	PCM data output	1.8V,same with the DCD Pin
	28 28	PCM_SYNC （/DSR）	O	PCM sync	1.8V, same with the /DSR Pin
	32	PCM_CLK	O	PCM clock	1.8V
	33	PCM_DIN	I	PCM data input	1.8V
USB interface	30	USB_DP	I/O	USB data+	
	31	USB_DM	I/O	USB data-	
WAKE UP	24	WAKEUP_OUT	O	Module to wake up the host	1.8V, same with the RI pin
LED	34	SIG_LED	O	Module working status indicator	
Antenna	19	RF_ANT	I/O	Antenna interface	
Ground	5、12、20、35、36、37	GND			

4 Descriptions of Hardware Interfaces

4.1 Description

This section describes the function interfaces and usage of SEW290 module in details, and provides the designing sample.

- Power and Reset
- UART
- USIM
- Audio
- PCM
- USB2.0
- Antenna

Remarks: I*n the system, the module layout should be far away from high-speed circuit, switch power, power transformer, large power inductor, or single chip microcomputer's clock circuit.*

4.2 Power and Reset

4.2.1 Power Design

The module could work under two modes: 1. powered by power adaptor; 2. powered by battery.
The EUT was suppliped by a special supply unit,which is connected to a pc via a usb port ,this supply unit could be recognised as a power supply.The EUT worked at 3.4~4.2V DC.

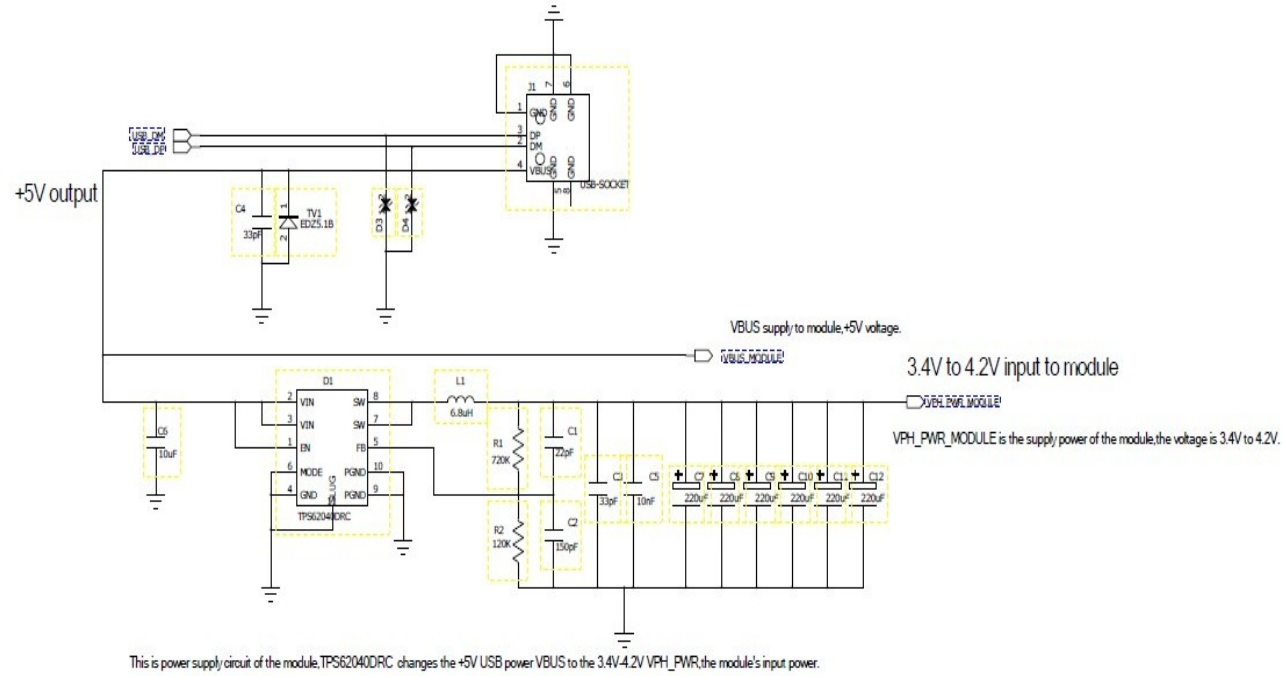
The power could be directly supplied by external power, which is directly added to V_MAIN and satisfy the voltage in the table 4-1. The external power could be power adaptor, battery, USB power convertor, etc. It's recommended that the safe power current is 2A to satisfy the GSM and GPRS mode.

Charge input: For some application with Li-battery, the Li-battery charge manage was embedded in Module, please note the input charge voltage should be DC :5V±0.5V

Table 4-1 Voltage Features

Classification	Min.	Typical	Max.
Input voltage	3.4 V	3.8 V	4.2 V

The supply power of Module should be DC from 3.3V to 4.2V,please refer to the following schematic to design the power of Module:



- Power-on

The module could be turned on in the following method.

After the module is powered off, and then provide a 3000-4000ms low level pulse to ON/OFF PIN.

- Power-off

To turn off the module, provide a 3000-4000ms low level pulse to ON/OFF PIN as the module is powered on.

- V_MSME_1V8

SEW290 contains V_MSME_1V8 pin with limiting regulator function to supply power to the module external circuit. The voltage of this pin with the BSP and Memory comes from the same voltage regulator.Only when the module is powered on,this pin has voltage output.the normal output voltage is 1.8V. User should active the current of this pin as little as possible(usually less than 10mA).

Generally,it's suggested that this pin used for Chip pins level matching demand pullup.

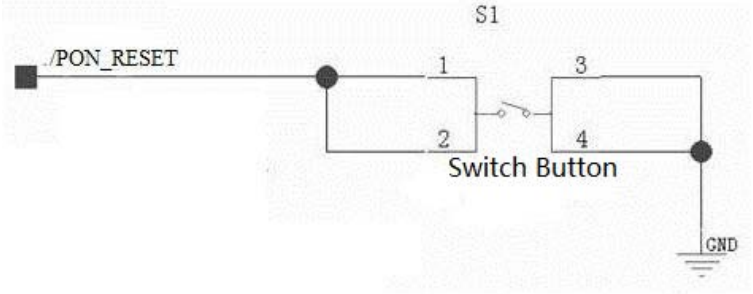
In order to ensure that the module data can be kept safely and for module data security, do not Cut off the power supply when module is running.User should use the ON/OFF pin or AT commands for ON/FF operation.

4.2.2 Reset

You could turn off the module firstly and then turn it on to reset the module when the module software stops responding. Provide a 50~200ms low level pulse to the /PON_RESET pin as the module can reset.

Please refer to figure 4-1 for the module reset external circuit.

figure 4-1 Module reset external reference design circuit



Remarks:*this pin is sensitive to interference.The external circuit line length of this pin should no longer than 2cm,otherwise the interference may active the reset pin.*

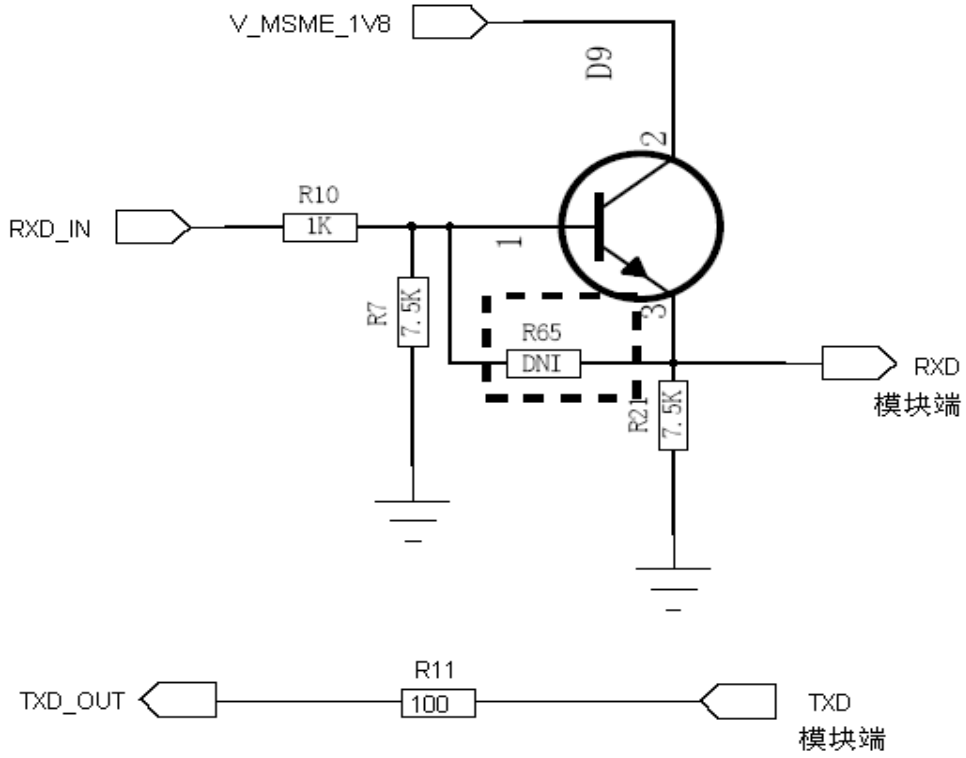
4.3 UART

The module provides an integrated full duplex full flow control UART interface, whose maximal data rate is 230.4kbps, typical value is 11.5kbps. External interface is 1.8V CMOS level signal, input is compatible.

Remarks:*to support the UART function the module software needs update.*

When using SEW290 module's URAT interface to communicate with PC or MCU,please pay attention to TX and RX direction, especially, note that SEW290 UART interface only supports 1.8V. Therefore, the triode is usually used to realize level conversion for non 1.8V external UART. See figure 4-2, the resistance is just for reference. Please recalculate when designing it.

Figure 4-2 UART interface external reference design circuit



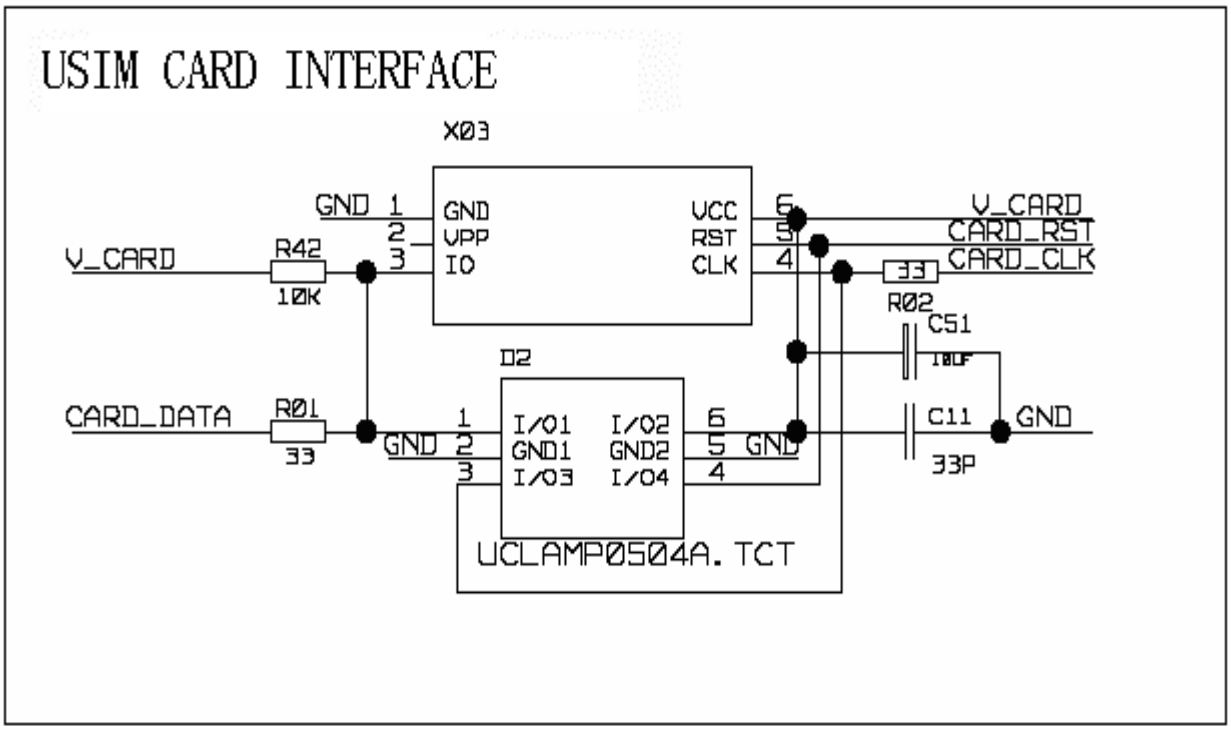
4.4 4.4 USIM Card

SEW290 module supports the ClassB-3V and ClassC-1.8V USIM card, which includes 4 pins at the end.

USIM card PCB layout should be close to the module as much as possible to avoid the interference of reading/writing USIM card from other sources.It's strongly recommended to add ESD protection component when designing UIM circuit. See ESD protection component D2 in figure 4-3.

NOTE: *Considering the difference on the output current from DATA pin of different cards, a 10K resistor should be used to pull up DATA pin to V_CARD(VREG_USIM).*

Figure 4-3 USIM card circuit reference design diagram



4.5 Audio

The module provides two audio inputs and two audio outputs through stamp-hole PIN. The module also provides 2 microphone interfaces and only one pair I/O works at the same time. Two audio outputs include 1 receiver differential output and 1 headset single-end output.

- Microphone

It provides two microphone interfaces MIC1 and MIC_P, among which MIC2_P is differential interface. These two microphone inputs are internally coupled in AC domain and added a 1.8V offset voltage to directly connect the microphone.

- Earpiece

It provides two earpieces: EAR1 & EAR2_P, and EAR1 is differential interface with 32Ω resistance;while EAR2_P is single-ended interface with 32Ω resistance.

- Design of audio interface on the receiver

Select the microphone with the sensitivity lower than -52dB since the output power for EAR1 is 50mW and the max. gain in MIC1 can reach up to 52dB. The level of MIC_1P is about 1.8V.

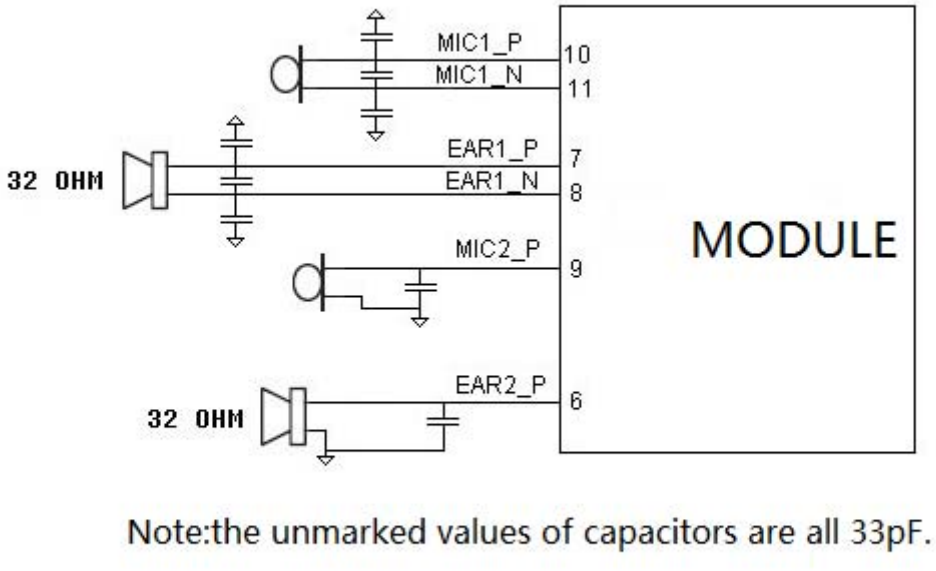
Note: *if other kind of audio input method is adopted, the input signal should be within 2V. If the signal voltage is lower than 2V, then the pre-amplifier should be added. If the signal voltage is higher than 2V, then network attenuation should be added.*

- Design of audio interface on the earpiece

Select the microphone with the sensitivity lower than -52dB since the output power for EAR2_P is 8.8mW and the max. gain in MIC2_P can reach up to52dB. The level of MIC_P is about 1.8V. The design is almost the same.

If EAR2_P is used for hands-free speaker output, an audio power amplifier should be added.

Figure 4-4 Audio external circuit reference design diagram

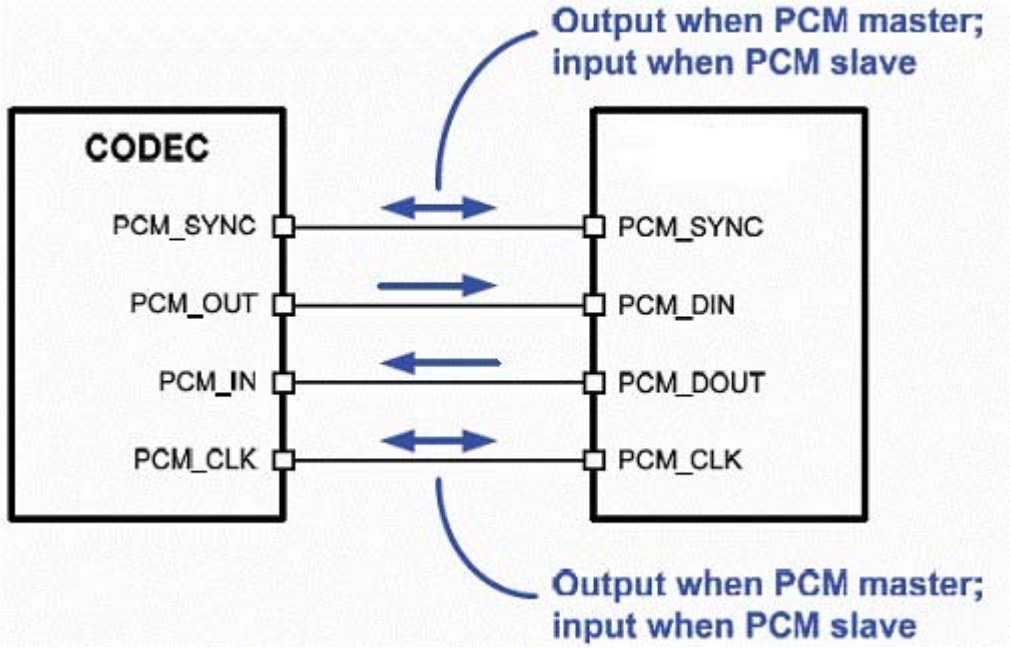


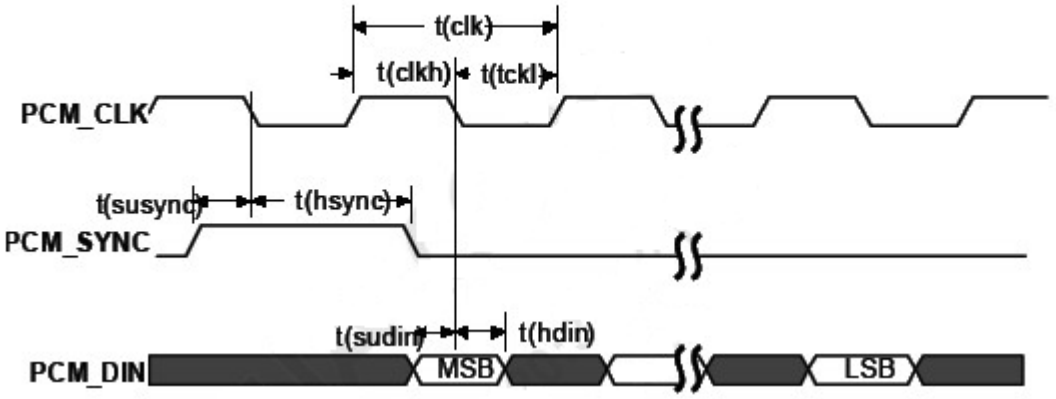
4.5 PCM

SEW290 Module's PCM interface provides PCM_CLK, PCM_SYNC, PCM_DIN, PCM_DOUT four pins,supports 2.048MHz clock rate and 8K frame rate. PCM clock in the module will stop when the module go into a sleep mode. PCM interface provides signal transmission application such as voice for an external Bluetooth device.

The module must work on the Master state cause the PCM_SYNC signal and PCM_CLK signal must output when PCM master.The PCM device connected to module PCM can only work on Slave state.

Figure 4-5 Module PCM working mode diagram





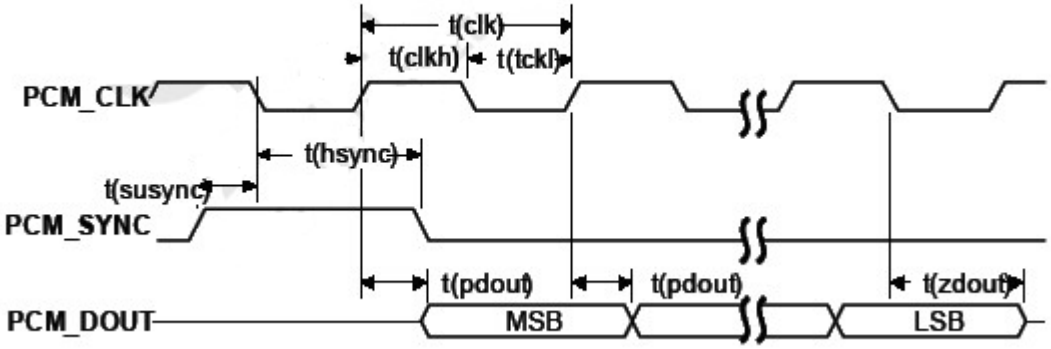


Figure 4-6 Module PCM working time sequence diagram

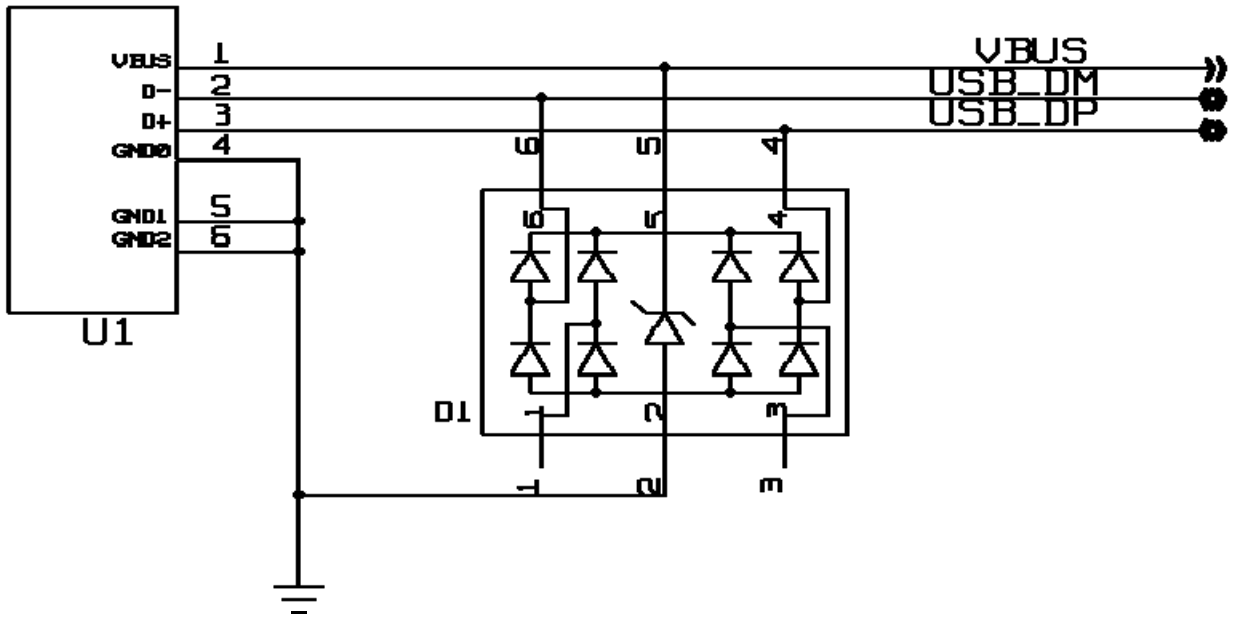
Parameter	Description	Min	Typ	Max	Unit
T(sync)	PCM_SYNC cycle time		125		μs
T(synch)	PCM_SYNC high time	400	500		ns
T(syncl)	PCM_SYNC low time		124.5		μs
T(clk)	PCM_CLK cycle time		488		ns
T(clkh)	PCM_CLK high time		244		ns
T(clkl)	PCM_CLK low time		244		ns
T(susync)	PCM_SYNC setup time high before falling edge of PCM_CLK	60			ns
T(hsync	PCM_SYNC Hold time after falling edge of PCM_CLK	60			ns

Parameter	Description	Min	Typ	Max	Unit
T(sudin)	PCM_DIN setup time before falling edge of PCM_CLK	50			ns
T(hdin)	PCM_DIN hold time after falling edge of PCM_CLK	10			ns
T(pdout)	Delay from PCM_CLK rising to PCM_DOUT valid			350	ns
T(zdout)	Delay from PCM_CLK falling to PCM_DOUT HIGH-Z		160		ns

4.6 USB 2.0

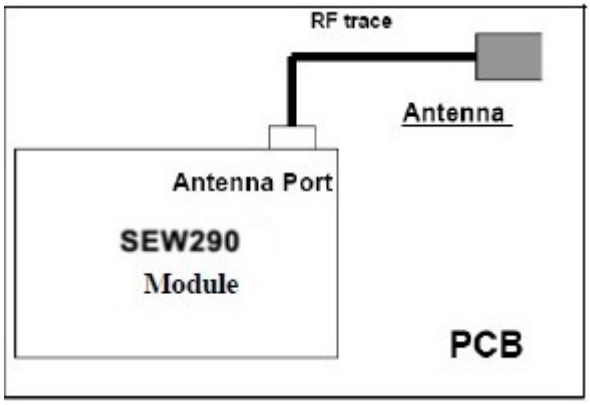
The module provides a USB2.0 high speed (480Mbps)interface, which is composed of VBUS, D+ and D-. The module's external circuit could connect directly with USB signal connector, but during the design process, try to add ESD protection component to avoid damage. D12 in Figure 4-7 shows USB2.0 ESD protection component with the junction capacitance is smaller than 3pF. VBUS could connect directly with VBUS at external host end. The USB recommended voltage is: 3.0-5.6V, typical 5V.

Figure 4-7 USB2.0 external circuit reference design diagram



4.7 Antenna Interface

In this module， we have one antenna port for signal transfer. To reduce the RF trace loss, the antenna port in the module had better be as close as close as possible to the antenna pad in the PCB. For maximum transmitter power and receiver sensitivity , a 50Ω transmission line is suggested to connect the antenna pad and the antenna port of the module. In addition, the RF signal will be impacted by high data rate. We strongly suggest USIM signal trace to be short as possible and as far away as possible from the RF trace and power line. To prevent cross coupling , signal traces on your PCB must not be routed through the module backside.



User can connect an antenna with coxial cable to the antenna connector. Please notice the dimension of the coxial cable should match the module's connector. The external antenna must be matched properly to achieve best performance regarding radiated power, DC-power consumption, modulation accuracy and harmonic suppression. Antenna matching networks are not included on the SEW290 Module PCB and should be placed in the host application.

4.7.1 Antenna Design Requirements

The Module's antenna applies to mobile equipment standards, 1＜VSWR＜2, input impedance is 50 ohm. Under different environments, the antenna gain requirements are also different, in general, in-band gain is larger, with external gain is small, the performance of the antenna is better.

Our FCC Grant imposes a maximum gain for the antenna subsystem: 2dBi for the cellular band and 2dBi for the PCS band.

Warning: Excessive gain could damage sensitive RF circuits and void the warranty.

4.7.2 Interference

Besides the antenna performance, the interference on the user board also affects the radio performance (especially the TIS) of the module. To guarantee high performance of the module, the interference sources on the user board must be properly controlled.

On the user board, there are various interference sources, such as the LCD, CPU, audio circuits, and power supply. All the interference sources emit interference signals that affect the normal operation of the module. For example, the module sensitivity can be decreased due to interference signals. Therefore, during the design, you need to consider how to reduce the effects of interference sources on the module. You can take the following measures: Use an LCD with optimized performance; shield the LCD interference signals; shield the signal cable of the board; or design filter circuits.

4.8 LED Status Indicator

SEW290 provides a SIG_LED pin as LED status indicator. The interface can be configured as a programmable current source, to drive the external indicator LED. Tune the resistance of R to tune LED's brightness.

Figure 4-8 LED citcuit reference design diagram

4.9 Sleep and Wake_up

4.9.1 Sleep

When SEW290 module is used in the MID, the MID and module can set module to sleep mode by the USB protocol such as hang up the USB,the module will enter into deep sleep mode, and the sleep current consumption is about 3mA.

4.9.2 WAKEUP_OUT

The 24th pin of SEW290 module is WAKEUP_OUT, the default high level of this pin is 1.8V.
When there is an incoming call, according to the call ring reporting period (the period is 6000ms),module will divide this period apart to 5900ms and 100ms two periods. The WAKEUP_OUT pin will output a 5900ms low level and a 100ms high level, along with ring period the level falling edge is reported.
After users answer a call, the WAKEUP_OUT pin will output a high level; If the call is not answered, and after the call is hanged up, WAKEUP_OUT will output a high level to wake up the MID next time.
About the SMS/MMS, before the module receives a messages and reports to CMTI, the WAKEUP_OUT pin will output a 2000ms low level, then output a high level.
Note: This wake up function is mainly used in MID and PAD these tablet pcs. in other end devices embedded SEW290 module，this function may not work cause the software needs update.

5 Mechanical Design

5.1 Appearance

See SEW290 module’s appearance in figure 5-1.

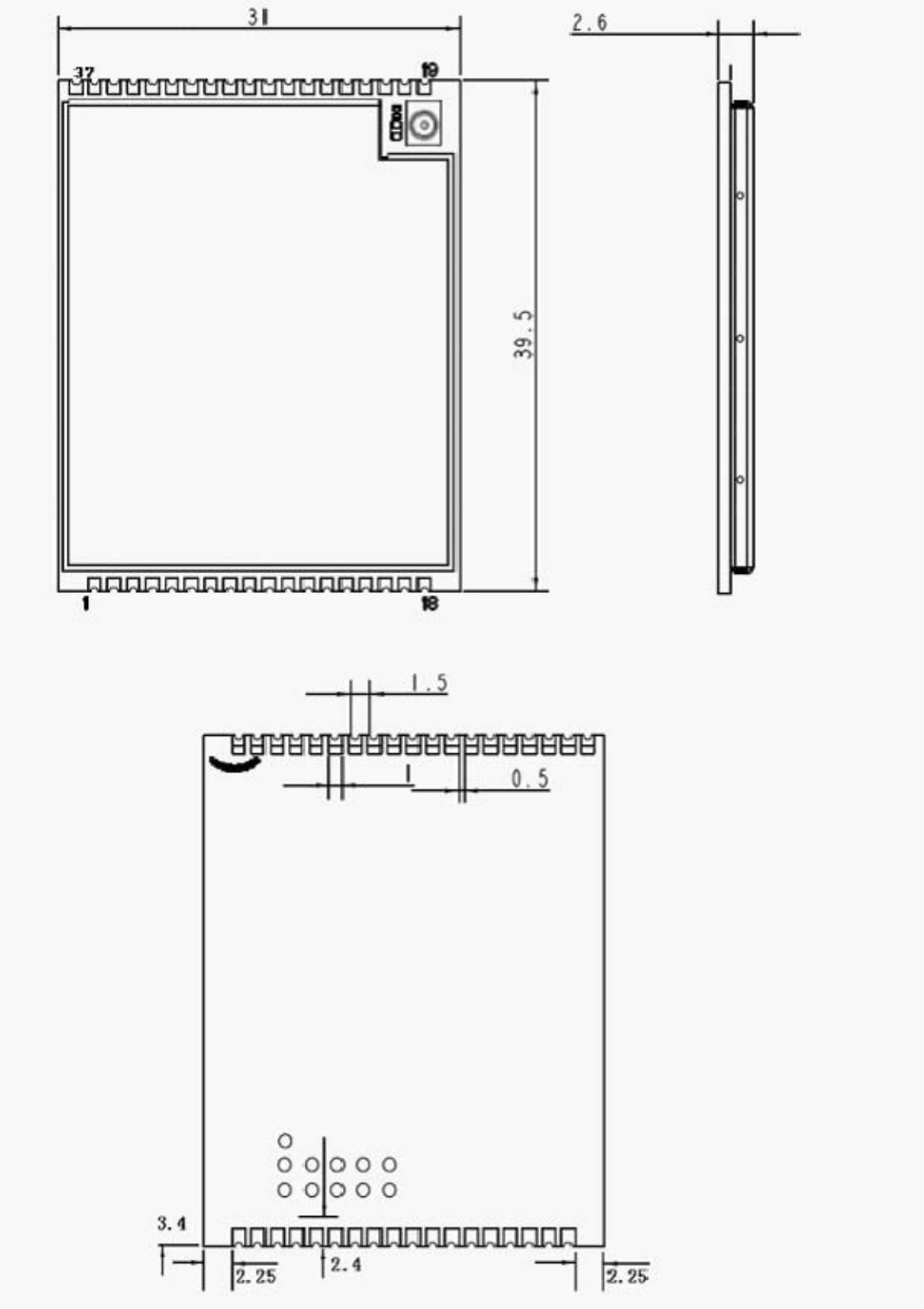
Figure 5-1 SEW290 module’s appearance

- Dimensions（L x W x H）: 39.5mm*31mm*2.6mm
- Weight: 7g

5.2 1.1 Module Main board PCB Layout Diagram

See the module main board PCB layout diagram in figure 5-2.(Unit: mm)

Figure 5-2 PCB sealing diagram



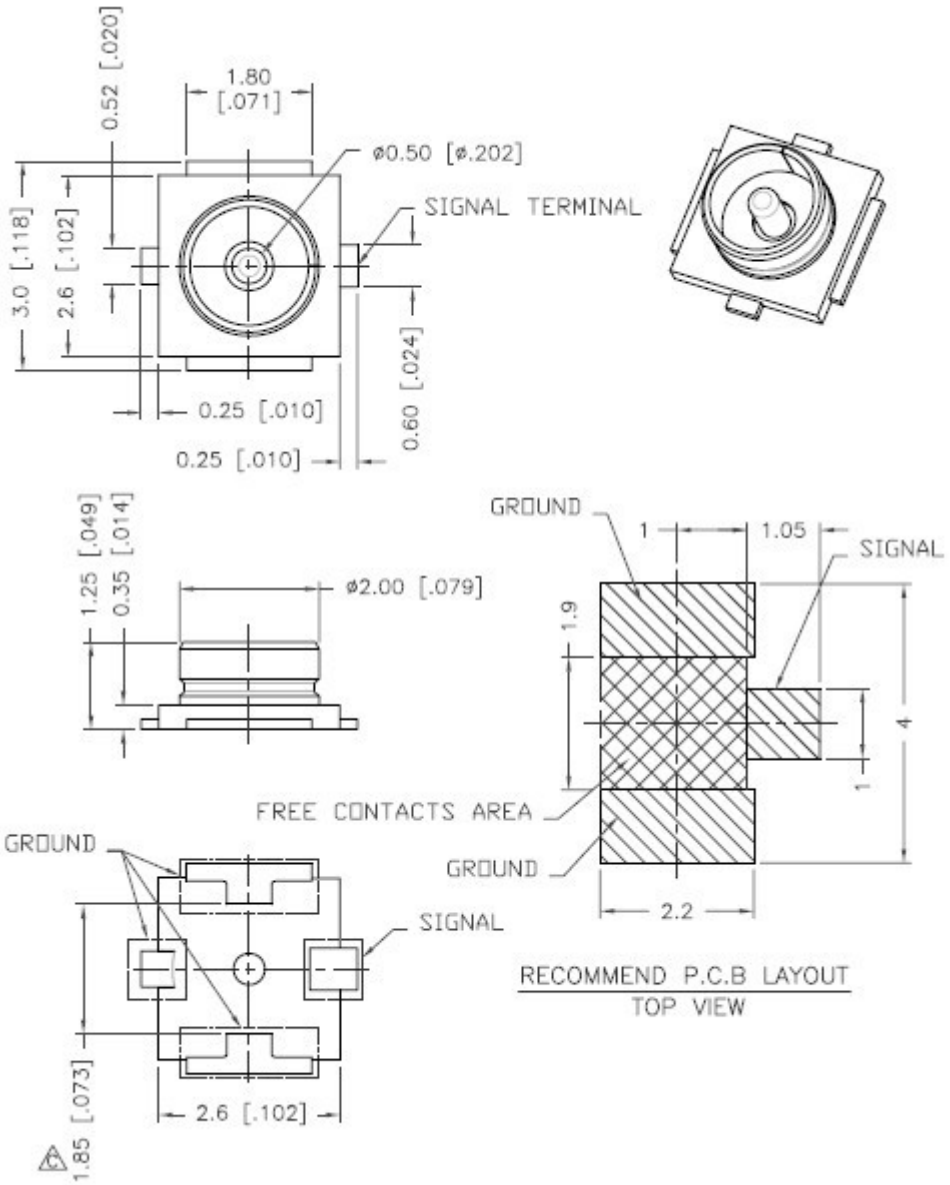
5.2 Antenna Connector Mechanical Dimensions

SEW290 has one main antenna interface,the antenna or coxial cable connected to module should match the impedance to 50 ohm.There is a RF connector on the module PCB board,see the connector mechanical dimensions in figure 5-3.

User can connect an antenna with coxial cable to the antenna connector.

The RF connector's part number is MM9329-2700TB1,manufactured by MURUTA.

Figure 5-3 RF connector mechanical dimensions diagram



5.3 Module's Fastening Method

The module's fastening method adopts direct manual soldering to avoid second-time soldering. It's strongly recommend to use the manual soldering because SEW290 module board is just 0.8mm thick and MSM6290 BGA space is too small. The second-time soldering would cause the melting of soldering tin and lead to short circuit of MSM6290 main chip, such as USB disconnected, large current, etc.

6 Important announcement

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module.

20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

To make sure the compliance of the RF Exposure, ERP/EIRP, Spurious Emission requirement, the antenna used for this module must not exceed 2dBi antenna gain for 850MHz band and 2dBi antenna gain for 1900MHz band to the GSM/WCDMA operating configurations. However, even though a lower antenna gain is used, the Spurious Emission should still comply with the limit of FCC part 22/24 requirement, or else another separate approval is required.

A user manual with the end product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

The end product with an embedded SEW290 Module may also need to pass the FCC Part 15 unintentional emission testing requirements and be properly authorized per FCC Part 15.

Note: If this module is intended for use in a portable device, you are responsible for separate approval to satisfy the SAR requirements of FCC Part 2.1093.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " contains TX FCC ID: SKH-SCV123 ". If the size of the end product is larger than 8x10 cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undedired operation.