



User Manual

Of GT3GM-M WCDMA Data Module

Status: [] Draft [] Release [] Revise	File Indicator:	GT3GM-M WCDMA Hardware Design Guide
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	Check:	
	Approve:	
	Date:	2012-08-20

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1. OVERVIEW

GT3GM-M WCDMA data modem is a tiny, standards-based, wireless data modem that provides 3G/2G wireless data connectivity for portable and handheld computers, point-of-sale devices, other machine-to-machine and vertical applications.

1.1 Electrical features

Input supply voltage:

- VBAT: DC from Min 3.3 V to Max 4.2V
- Typical DC power consumption:

Standby current: 2 mA—5.6 mA

Data server current: 300 mA—360 mA

1.2 Environmental features

Temperature operating range:

- Working temperature: -20 to +70 degrees C
- Reduced RF performance: -30 to +85 degrees C

1.3 RF features

- 2G band support : 850MHz & 1.9 GHz
- 3G band support:
 - a. Support for B2 (1900MHz)
 - b. Support for B5 (850MHz)
- Adheres to WCDMA authentication.
- Support for 12 class GPRS

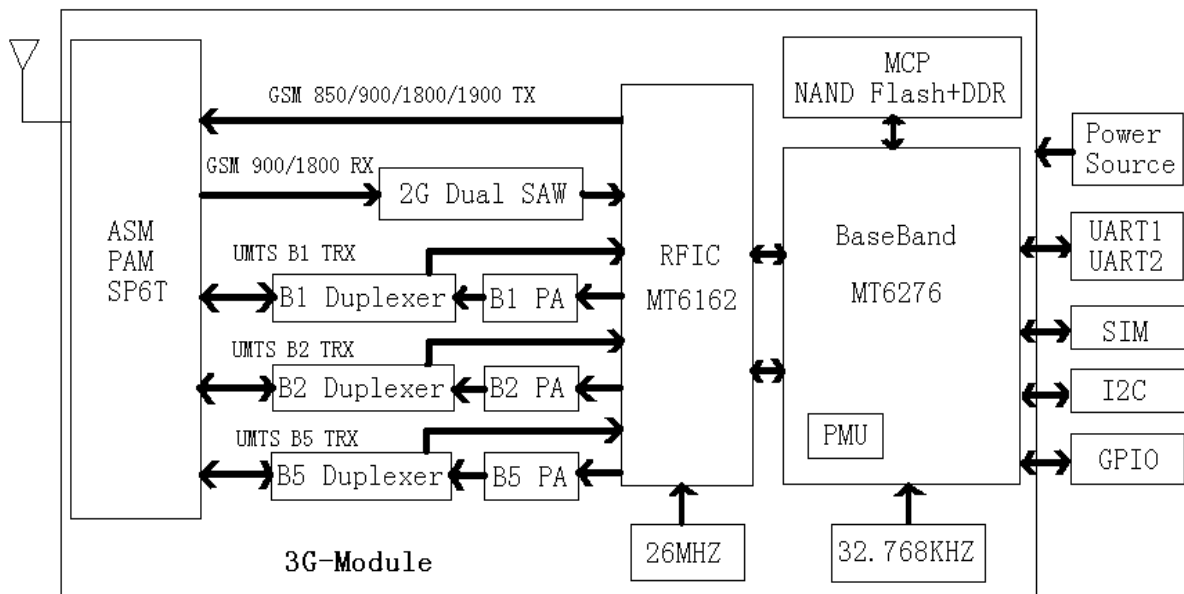
1.4 Modem features

- HSPA R5/R6 7.2Mbps downlink(category 7/8), 5.76Mbps uplink rate(category)
- WCDMA R99
- GPRS Class 12
- GSM Release 4

2. BLOCK DIAGRAM

This diagram is going to address the whole completed module.

- The module is a 3G data modem design to utilize the MTK MT6276 processor and MTK MT6162 RFIC to comprise with major data modem kernel, it's also included UART communication interface.



3. MODULE SCOPE

This document details the electrical requirements for customized form factor design to fit into the embedded application.

Attribute	Description
Base band	- MTK6276M – 32Bit, ARM1176JZS (typical 3.7V). - 65nm Single chip, MCU processor ,DSP, PMU.
RF IC	- MTK 6162- Single chip RF Transceiver - Quad-band GSM - Muti-band 3G FDD operation
PMU	- Integrate to baseband - 9 low dropout regulators and 2 bucks converters - provide level shifting needs for low voltage GSM control
UART	- Hardware flow control and speeds up to 921600 bps
JTAG	- Reserved for debug

POWER KEY	- To provide a control signal to turn on/off this module
Indicator	- RF signal indication (2G or 3G)
GPIO	-General input or output port
USIM	-Support 3V or 1.8V SIM

The following sections describe in more detail and document design considerations for the high level attributes listed in the above table.

4. ELECTRICAL SPECIFICATION

4.1 SUPPLY VOLTAGE

Symbol	Parameter	Min	Type	Max	Unit
VBAT	PMIC, PA	3.3	3.6	4.2	V
Voltage Ripple	2%, 0~100kHz (Max. values not exceeding operating voltage)				
Input current	VBAT		1.2		A

4.2 RECOMMENDED OPERATION CONDITIONS

4.2.1 TEMPERATURE, HUMIDITY

Symbol	Parameter	Min	Type	Max	Unit
Ta	Ambient Operation Temperature	-20	25	70	C
Ts	Storage Temperature	-40	3.6	85	C
Humidity	Relative Humidity			95%	%

4.2.2 Digital signal DC electrical specifications

Symbol	Parameter	Min	Type	Max	Unit
Supply voltage	VCC Regulated	2.7	2.8	2.9	V
Low level input voltage	VIL	-0.3	0	0.35*VC	V
High level input voltage	VIH	0.65*VC	2.8	VCC+0.3	V

4.3 POWER CONSUMPTION(USB MODE)

The power consumption is typical value measured at 25 C temperature

Operation		Parameters		Min	Type	Max	Unit
		Input Voltage		3.3	3.6	4.2	V
Off mode				500	600	700	uA
2G	GSM	Paging=6		TBD	TBD	TBD	mA
		Paging=8		TBD	TBD	TBD	mA
		Paging=9		TBD	TBD	TBD	mA
			PCL=5,Tx burst	421	414	412	mA
		850MHZ	PCL=5	366	360	354	mA
			PCL=5,Tx burst	401	395	389	mA
			PCL=0,Tx butst	362	359	351	mA
		1900MHZ	PCL=0	332	324	319	mA
			PCL=0,Tx butst	391	389	382	mA
GPRS	Data transfer 1Rx 1Tx	850MHZ	PCL=5,TX=33dBm	382	375	373	mA
			PCL=19,TX=5dBm	162	154	152	mA
			PCL=15,TX=0dBm	165	162	157	mA
		1900MHZ	PCL=0,TX=30dBm	311	308	305	mA
			PCL=15,TX=0dBm	138	131	127	mA
GPRS	Data transfer (clasee1 2) 4RX,1TX	850MHZ	PCL=5	387	385	381	mA
		1900MHZ	PCL=0	339	335	331	mA
	Data transfer (clasee1 2) 3RX,2TX	850MHZ	PCL=5	636	634	631	mA
		1900MHZ	PCL=0	515	513	509	mA
	Data transfer (clasee1 2) 2RX,3TX	850MHZ	PCL=5	819	816	807	mA
		1900MHZ	PCL=0	577	573	567	mA
	Data	850MHZ	PCL=5	1010	1005	1001	mA

	transfer (clasee1 2) 1RX,4TX	1900MHZ	PCL=0	651	647	643	mA
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Operation		Parameters		Min	Type	Max	Unit
		Input Voltage		3.3	3.6	4.2	V
UMTS	Data transfer	Band II	10dBm	TBD	TBD	TBD	mA
			23dBm	TBD	TBD	TBD	mA
		Band V	10dBm	TBD	TBD	TBD	mA
			23dBm	TBD	TBD	TBD	mA
HSDPA	Data transfer	Band II	10dBm	TBD	TBD	TBD	mA
			23dBm	TBD	TBD	TBD	mA
		Band V	10dBm	TBD	TBD	TBD	mA
			23dBm	TBD	TBD	TBD	mA
HSUPA	Data transfer	Band II	10dBm	TBD	TBD	TBD	mA
			23dBm	TBD	TBD	TBD	mA
		Band V	10dBm	TBD	TBD	TBD	mA
			23dBm	TBD	TBD	TBD	mA

4.4 WIRELESS SPECIFICATIONS

The GT3GM-M module complies with the following features and standards:

Features	Description
WWAN Standards	3GPP
Antenna Port	One antenna port support
Frequency Band	850MHz, 1900MHz

4.5 RADIO PERFORMANCE

Over full range of values specified in the “Recommended Operation Condition”

Features	Description
Frequency Band	GSM/GPRS: Quad band, 850/1900
	UMTS: 1900/850
	HSUPA /HSDPA: 1900/850

4.6 Throughput

Features	Description
GSM/GPRS (Conducted)	PS data rate: DL TBD Mbps / UL TBD Mbps CS data rate: DL TBD Mbps / UL TBD Mbps GPRS: Class 12, DL TBD Mbps / UL TBD Mbps
UMTS (Conducted)	HSPA data rate: DL TBD Mbps / UL TBD Mbps
HSPA (Conducted)	TBD

5. INTERFACE

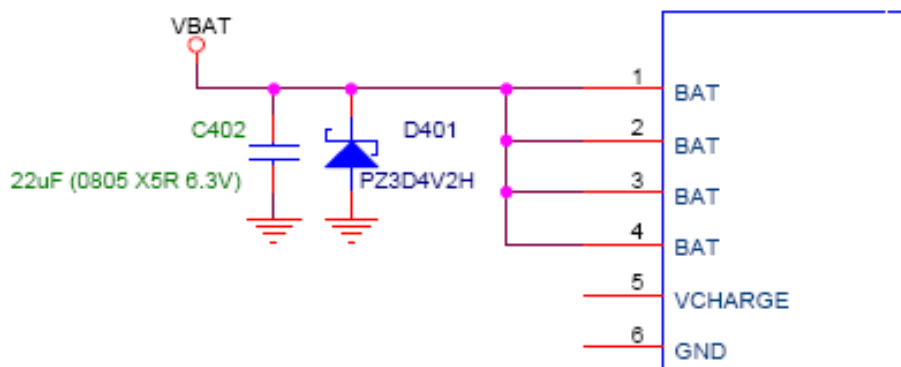
5.1 PIN ASSIGNMENT

Pin NO.	Pin name	Type	Function
1	VBAT	POWER	Module Supply voltage (range: DC from 3.3V to 4.2V)
2	VBAT	POWER	
3	VBAT	POWER	
4	VBAT	POWER	
5	VCharge	POWER	Charge input (DC:5.5V+/-0.5V)
6	GND	GND	GND
7	VDD28	POWER	DC output voltage 2.8V(Max 100mA)
8	LED_3G	I	Indicating the 2G/3G status
9	PWRKEY	I	Turn on or turn off the module
10	ADC4	I	Analog to digital converter
11	USB_DM	I/O	USB data bus
12	USB_DP	I/O	USB data bus
13	EINT1	I	Interrupt 1(Level triggered)
14	KCOL1	I	Key column 1
15	KCOL0	I	Key column 0
16	SCL	O	IIC clock
17	SDA	I/O	IIC data
18	GND	GND	GND
19	3G_ANT	I/O	RF antenna connect
20	GND	GND	GND
21	GND	GND	GND
22	KROW1	O	Key row 1
23	KROW0	O	Key row 0
24	PWM0	O	Pulse wave modulate 0
25	GPIO15	I/O	General input/output port, can controllable pull-up or pull-down
26	GPIO16	I/O	General input/output port, can controllable pull-up or pull-down
27	GPIO17	I/O	General input/output port, can controllable pull-up or pull-down
28	UTXD1	O	UART 1 transmit
29	URXD1	I	UART 1 receive
30	GPIO8	I/O	General input/output port, can controllable pull-up or pull-down
31	GND	GND	GND
32	UTXD2	O	UART 2 transmit
33	URXD2	I	UART 2 receive
34	GPIO19	I/O	General input/output port, can controllable pull-up or pull-down

35	GPIO18	I/O	General input/output port, can controllable pull-up or pull-down
36	SIMVCC	POWER	SIM VCC
37	SIMCLK	O	SIM clock
38	SIMRST	O	SIM reset
39	SIMDATA	I/O	SIM data
40	GND	GND	GND
41	GND	GND	GND
42	GND	GND	GND
43	GND	GND	GND
44	GND	GND	GND

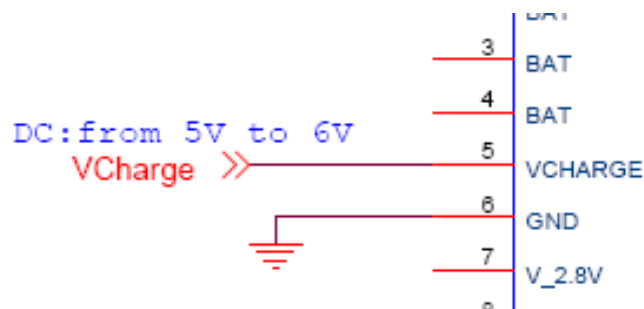
5.2 Supply Power (Pin 1,2,3,4)

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:



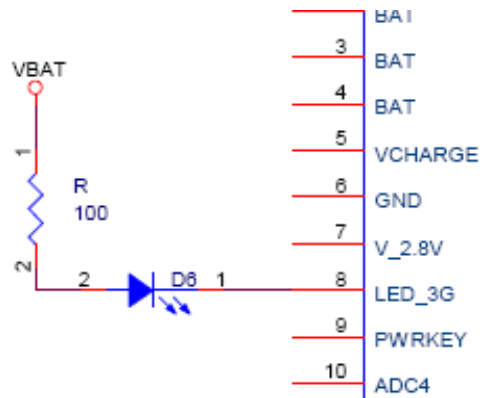
5.3 Charge input (Pin 5)

For some application with Li-battery, the Li-battery charge manage was embedded in Module, please note the input charge voltage should be DC:5.5V+/-0.5V, and maximum Current 300mA.



5.4 LED indicator(Pin 8)

GT3GM-M module has 1 LED driver pin, it's only for indicating 2G/3G status, please ref. the following schematic.(the sink current is about 10mA)



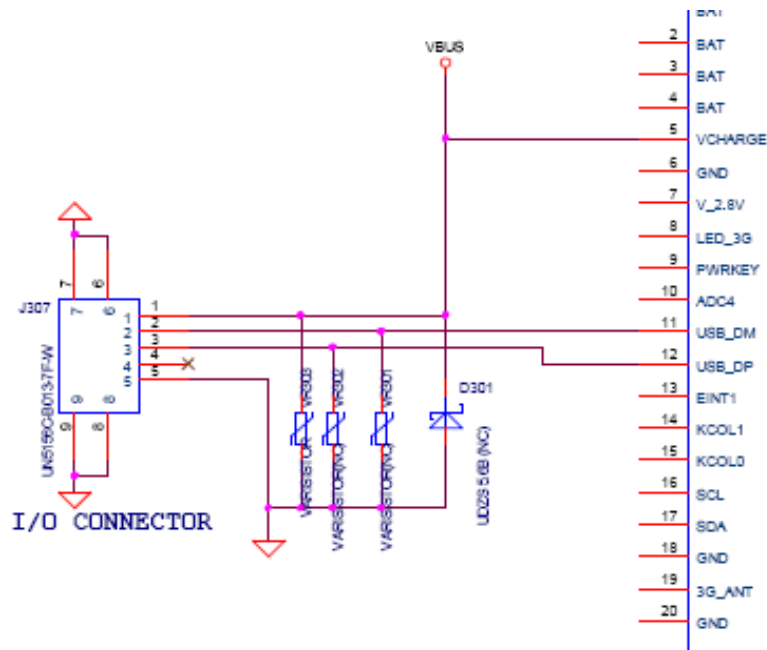
5.5 PWRKEY(Pin9)

The power key function is turn on/off the power source of module. The default setting is low for the module in operation mode

5.6 USB(Pin5,11,12)

The USB interface is compliant with Version 2.0 of the USB standard for high speed operation.

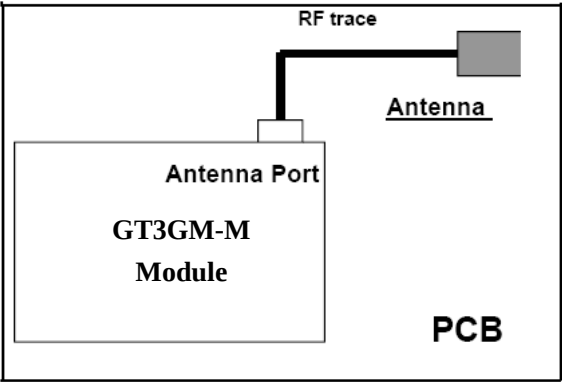
*Download mode: Short KCOL0 and KROW1 together for USB upgrade/download image.



5.7 Antenna Port(Pin19)

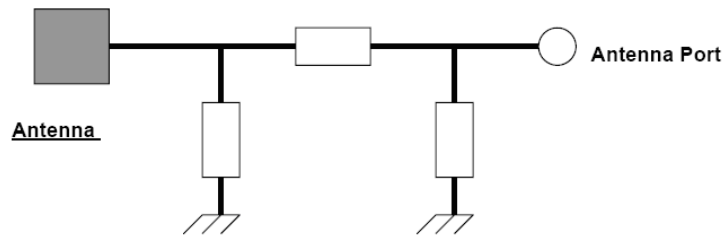
In this module, we have one antenna port for signal transfer. To reduce the RF trace loss, the antenna port in the module had better be as close as possible to the antenna pad in the PCB. For maximum transmitter power and receiver sensitivity, a 50Ω transmission line is suggested to connect the antenna 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.



Antenna Pad

The antenna pad in your PCB should be 3~5mm wide and there must not be any other traces and ground under the pad. If needed, the matching network can be added between the antenna pad and antenna port. The recommended circuit is shown as below:



5.8 UART interface

This module can support baud rate from 9600 to 9121600.

The UART1 used as debug 、 software download or as AT command control

Pin name	DIR	Pin	Function unit
TXD1	O	28	UART 1 data transmitting port
RXD1	I	29	UART 1 data receiving port

The UART2 used as transmitting DATA between the module from user:

Pin name	DIR	Pin	Function unit
TXD2	O	32	UART 2 data transmitting port
RXD2	I	33	UART 2 data receiving port

5.9 ADC(Pin10)

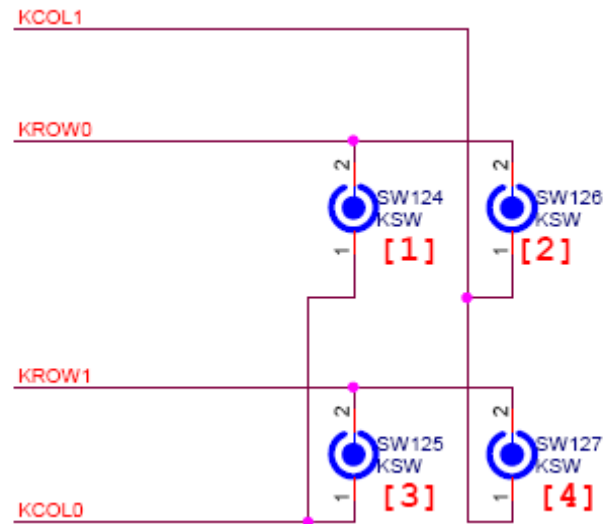
The GT3GM-M module has 1 analog to digital converter, the functional specifications of

the auxiliary ADC are listed in the following table:

Symbol	Parameter	Min	Typical	Max	Unit
N	Resolution		12		Bit
FC	Clock Rate		3.84		MHz
FS	Sampling Rate @ N-Bit		$3.84/(N+4)$		MSPS
	Input Swing	0.0		AVDD	V
CIN	Input Capacitance Unselected Channel Selected Channel			50 4	fF pF
RIN	Input Resistance Unselected Channel Selected Channel	400 1			MΩ MΩ
	Clock Latency		(N+4)		1/FC
DNL	Differential Nonlinearity		+1.0/-1.0		LSB
INL	Integral Nonlinearity		+1.0/-1.0		LSB
OE	Offset Error		+/- 10		mV
FSE	Full Swing Error		+/- 10		mV
SINAD	Signal to Noise and Distortion Ratio (10-KHz Full Swing Input & 13-MHz Clock Rate)	62	68		dB
DVDD	Digital Power Supply	1.08	1.2	1.32	V
AVDD	Analog Power Supply	2.4	2.5	2.6	V
T	Operating Temperature	-20		80	°C
	Current Consumption Differential Mode(with TP driver) Single-ended Mode:		440 280		μA μA

5.10 Key pad

There are 4 pin for the Keypad interface: PIN14, PIN15, PIN22, PIN23. User can use this interface to extend Keypad input as following:



5.11 GPIOs

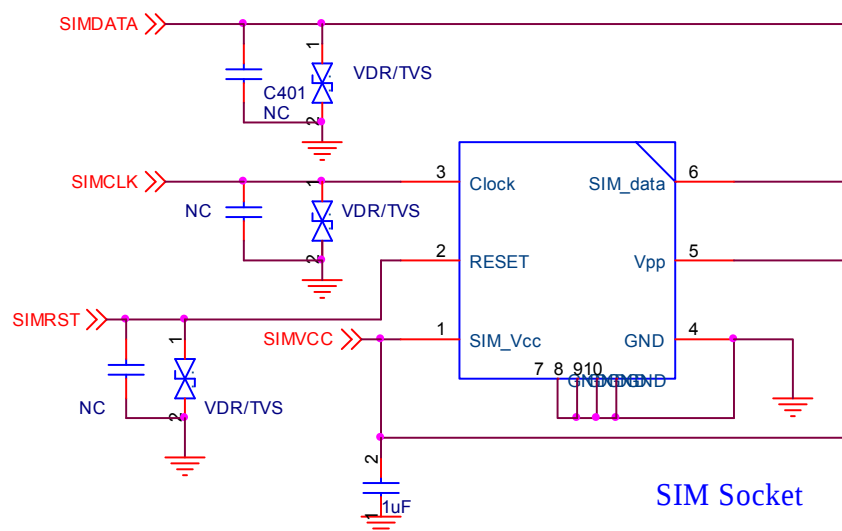
The GT3GM-M module has 6 GPIOs (PIN25,PIN26,PIN27,PIN30,PIN34, PIN35,): Please refer to corresponding programming application for details as to all the GPIO ports.

5.12 PWM(Pin24)

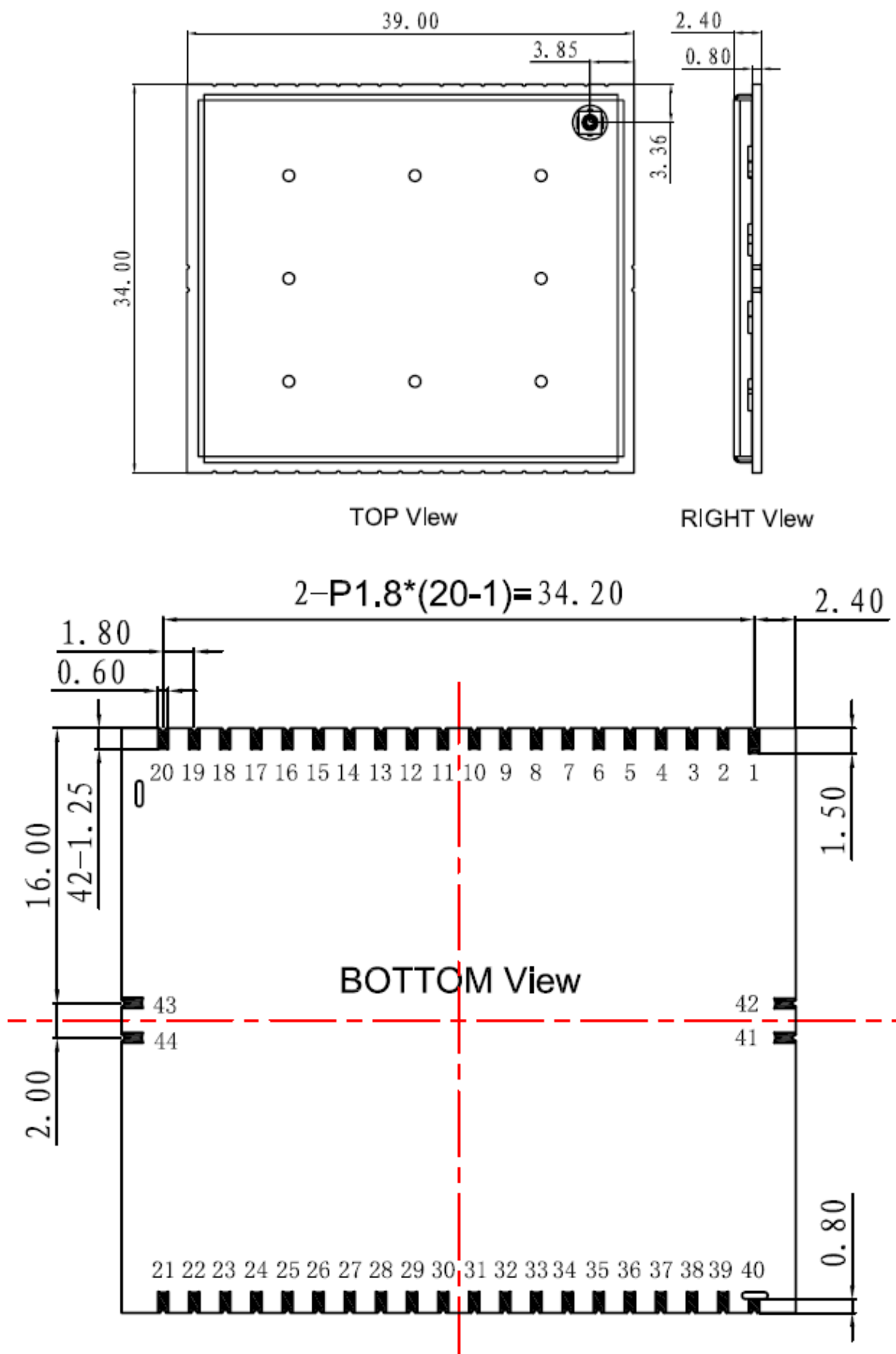
The GT3GM-M module has one PWM(pulse width modulation) output port, the default frequency is 200Hz,and the duty can be programmed.

5.13 USIM card interface

The USIM pins provide the connections necessary to interface to a USIM socket located on the host device. Voltage levels over this interface comply with 3GPP standards. Module output a VSIM_PMU power rail for 3V or 1.8V.



6 Mechanical Structure(mm)



7 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following "Contains TX FCC ID: N69-715100". If the size of the end product is larger than 8x10cm, 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 undesired operation.

8 Construction and setup

The Module test is comprised of two basic steps. The first is to put the DUT into module test jig and the second is to connect the PC terminal emulator and start the measurement tool:

- 
- 1) Type ATD112 on the terminal emulator attached to the DUT
 - 2) Wait for data to begin to be sent to the terminal emulator by the DUT
 - 3) Disconnect the terminal emulator using the onscreen button