UMC-6270QV
User Guide

Wistron NeWeb Corp.

CONTENTS

Revision history

Revision	Date	Description
V1.0	April 7 2014	Initial release
V2.0	May 13 2014	Modify recommended operating condition

1. INTRODUCTION

This document describes the hardware interface of the WNC Small Form Factor (SFF) module used to connect the device application and the air interface.

Two versions of Small Form Factor (SFF) module are described in this specification document as follows:

- UMC-6270QV - HSDPA

1.1 PRODUCT CONCEPT

The SFF module is one of the smallest available WCDMA HSDPA of the market. The target application is the Machine to Machine (M2M) market including automotive, AMM (Automatic Metering Management), tracking system, Alarm, Healthcare/monitoring, Telematics etc. Despite its small size and cost,

In addition to its size it has the following outstanding characteristics:

- Minimum low power consumption in idle mode: 1.4mA
- High input voltage range: 3.4 V to 4.2 V
- USB High Speed
- Digital Audio PCM
- Full set of AT commands as well as analogue and Digital audio interface.

In addition to the module, a complete development kit can be provided for customers.

1.2 STANDARDS

This product, together with its evaluation board, is in compliance with the directives and standards listed below:

Directives

FCC	
RF : FCC Part 22H (850 Band) FCC Part 24E (for 1900 Band)	FCC Part 22 Subpart H: Cellular Radiotelephone Service; Subpart I: Offshore Radiotelephone Service; FCC Part 24 E: Personal Communications Service; Subpart E: Broadband PCS.
EMI: FCC Part 15B	Subpart B - Radio frequency devices subpart B – Unintentional Radiators
SAR(MPE) : OET65C	

1.3 TERMS AND ABBREVIATION

ADC	Analog to Digital Converter
CODEC	Coder-Decoder
CLIP	Calling Line Identification Presentation
COLP	Connected Line Identification Presentation
CLIR	Calling Line Identification Restriction
COLR	Connected Line Identification Restriction
CTS	Clear To Send
CSD	Circuit Switched Data
CS	Codec Scheme
DCS	Digital Communications System
DSR	Data Set Ready
DTR	Data Terminal Ready
ENS	Enhanced network selection
EONS	Enhanced operator name string
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FAX	Facsimile
HSCSD	High Speed Circuit Switched Data
HSDPA	High Speed Downlink Packet Access
IC	Integrated Circuit
IEEE	Institute of Electrical and Electronics Engineers
I/O	Input / Output
ISO	International Standards Organization
ITU	International Telecommunication Union
JTAG	Joint Test Action Group
Kbps	kilobit per second
LCD	Liquid Crystal Display
LED	Light Emitting Diode
Mbps	Megabit per second
PBCCH	Packet Broadcast Channel
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PCS	Personal Communication System
PWM	Pulse Width Modulation
RAM	Random Access Memory
RF	Radio Frequency
RI	Ring Indication
RMS	Root Mean Square
RTS	Ready To Send
RX	Reception
SIM	Subscriber Identification Module
SMS	Short Message Service
TBC	To Be Confirmed
TBD	To Be Defined
TX	Transmission
UART	Universal Asynchronous Receiver and Transmitter
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
USIM	Universal Subscriber Identity Module
USSD	Unstructured Supplementary Service Data

1.4 CONVENTIONS

Throughout this document, DTE (data terminal equipment) indicates the equipment which masters and controls the module device by sending AT commands via its serial interface.
DCE (data communication equipment) indicates the module device.

1.5 PRODUCT FEATURES OVERVIEW

Temperature range	Normal range: -25°C to +85°C Storage: -40°C to +85°C
Weight	6 g (typ.)
ESD	ESD protection >= 2 kV
Physical dimensions	22.1 x 25.1 x 2.65 mm (typical)
Connection	141 pin LGA type
Power supply	3.4V to 4.2V range, 3.8V nominal
Power consumption*	Off mode: 50 µA typical Registered idle mode: • WCDMA: 1.3 mA (DRX=9) Peak Current • WCDMA: up to 700 mA
Antenna /RF interface	Both GPS and transmitter/receiver RF are LGA Pad.
Frequency bands	WNC module supports UMTS B2 /B5
Transmit power	Class 3 for UMTS 850/1900
Supported SIM cards	3V and 1.8V SIM cards
SIM slot	Signals for the management of the SIM card are provided on LGA pads.
PWM	Signal for LED, vibrating device and Buzzer management is provided on the PWM pin
Digital audio link	A digital audio interface PCM bus is provided. Master mode with 16 bits and a frequency of 2048 KHz.
Data/command multiplexing	Software management of data/command multiplexing on the serial link UART.
USB	Supports USB High speed 480Mbps and full speed 12Mbps, with 3 logical Channels. Battery charging is achieved through USB
USIM	Use USIM controller to achieve USIM connection

Module Hardware Configuration

The SFF LGA module will support the QSC6270/6055 chipset with the configuration described below.

For UMC-6270QV module:

Key Features

- Compliant with 3GPP Rel'5 for WCDMA and HSDPA
- Max. Data Rate: 384Kbps uplink, 384Kbps downlink with WCDMA Rel'99 and 3.6Mbps downlink with HSDPA
- Support OS: Brew Mobile Platform
- ARM9 operating at 230Mhz maximum frequency

* The power consumption is highly dependent on the customer's product design and the module environment.

- Data interface: USB2.0 Host High Speed
- Form Factor: LGA module

Specification

- Communication Interface: (I2C x1/UART x1/USB2.0 x1/SPI x1/ SDIO x2)
- Support HSDPA (DL 3.6Mbps/UL 384Kbps)
- Supported SIM cards (3V and 1.8V SIM cards)
- USIM interface
- General purpose I/O pins (x25)
- Audio Interface (PCM/ I2S)
- MCP (DDR 512Mb + 1Gb NAND)
- Support GPS
- RF interface: 2 RF pads for WCDMA TX/RX, and GPS.

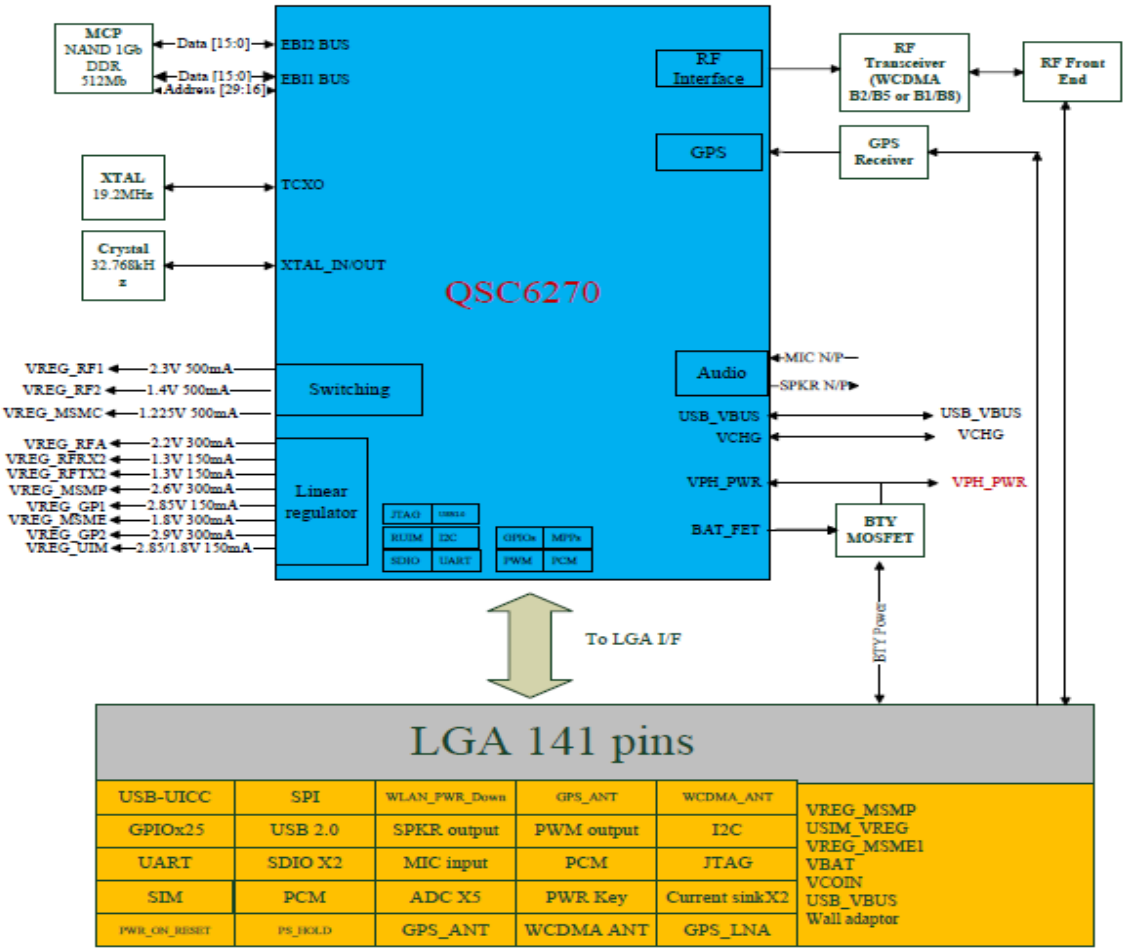
WCDMA/HSDPA Support Bands

- Band 2 and Band 5

WCDMA Power Class

- Class3 (24dBm +1/-3 dB)

2. BLOCK DIAGRAM & PIN ASSIGNMENT



Pin Definition [4]

This section is intended to capture the final LGA pin out for the SFF Module.
The interfaces with a SFF module are all through a 141-pin surface LGA pad, as shown in Figure 2-1.

For UMC-6270QV module:

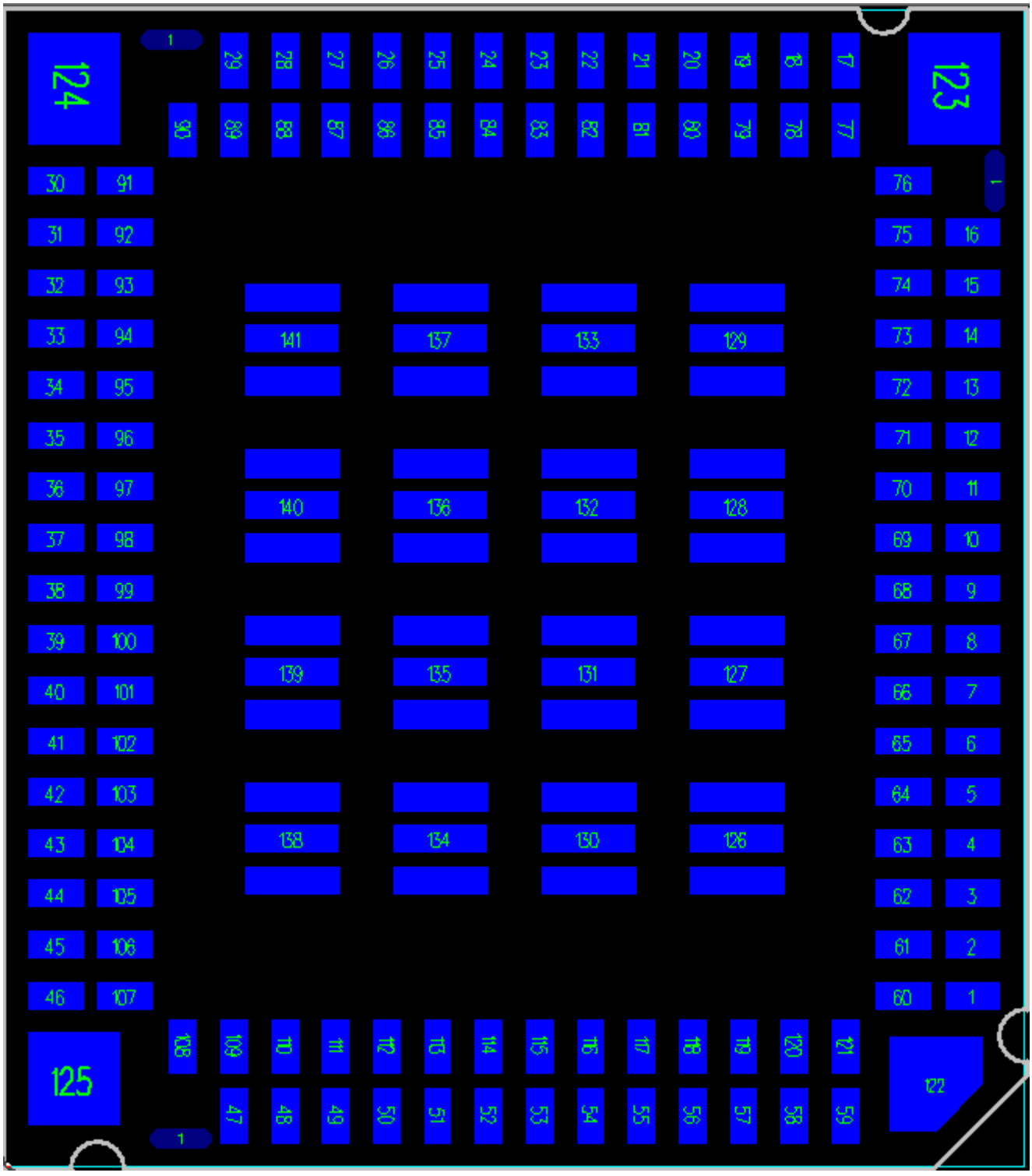


Figure 2-1: UMC-6270QV module

Pin number	Category	pin name	Pad group	Pad type	Description	Driving capacity
1	RF	WCDMA_ANT		AI,AO	WCDMA antenna signal	
2	GND	GND		GND		

3	GPIO	GPIO9	1.8V	I/O, PD	Configurable I/O	1-8mA
4	GPIO	GPIO2	1.8V	I/O, PD	Configurable I/O	1-8mA
5	GPIO	GPIO5	1.8V	I/O, PD	Configurable I/O	1-8mA
6	GPIO	GPIO8	1.8V	I/O, PD	Configurable I/O	1-8mA
7	I2C	I2C_SCL	1.8V	I/O	I2C clock	
8	PCM	PCM_BCLK	1.8V	DO	Clock for the PCM interface	
9	PCM	PCM_SYNC	1.8V	DO	PCM interface sync	
10	PCM	PCM_DIN	1.8V	DI	PCM I/F data in (if UMC-6270QV master)	
11	PCM	PCM_DOUT	1.8V	DO	PCM I/F data out (if UMC-6270QV master)	
12		GPS_LNA_EN	1.8V	I/O, PU	Configurable I/O	1-8mA
13	SPI	SPI_CS_N	1.8V	DO	Serial peripheral interface chip-select	
14	SPI	SPI_CLK	1.8V	DO	Serial peripheral interface clock	
15	GND	GND		GND		
16	GND	GND		GND		
17	RF	GPS_ANT		AI	GPS antenna signal	
18	GND	GND		GND		
19	GPIO	GPIO21	1.8V	I/O, PU	Configurable I/O	
20	GND	GND		GND		
21	GPIO	GPIO20	1.8V	I/O, PU	Configurable I/O	1-8mA
22	GPIO	GPIO16	1.8V	I/O, PU	Configurable I/O	1-8mA
23	GPIO	GPIO17	1.8V	I/O, PU	Configurable I/O	1-8mA
24	SDIO2	SDCC2_DATA2	2.6V	I/O	SDIO2 data bit 2	2-16mA
25	SDIO2	SDCC2_DATA3	2.6V	I/O	SDIO2 data bit 3	2-16mA
26	SDIO1	SDCC1_CMD	2.6V	I/O	SDIO1 command bit	2-16mA
27	SDIO1	SDCC1_DATA3	2.6V	I/O	SDIO1 data bit 3	2-16mA
28	SDIO1	SDCC1_DATA2	2.6V	I/O	SDIO1 data bit 2	2-16mA
29	GPIO	GPIO10	1.8V	I/O, PU	Configurable I/O	1-8mA
30	GND	GND		GND		
31	UICC	USIM_CLK	1.8V/2.85V	DO	USIM clock	
32	USB	USB_ID		AI	High-speed USB identification line	
33	power input/output	VBAT_BB	3.7V~4.2V	P	Input power for BB section, could connect this pin with VBAT_RF	

34	JTAG	JTAG_TMS	1.8V	DI, PU	JTAG test mode select	
35	JTAG	JTAG_RTCK	1.8V	DO	JTAG return clock	
36	JTAG	JTAG_TCK	1.8V	DI, PU	JTAG clock input	
37	UICC	USIM_DAT	1.8V/2.85V	I/O	USIM data	
38	power input	USB_VBUS		P	External supply voltage; connect directly to the external USB power supplier	
39	power output	USIM_VREG	1.8V/2.85V	P	Output of the linear regulators	150mA
40	GND	GND		GND		
41	GND	GND		GND		
42	power input	VCHG		P	External supply voltage; connect both pins directly to the external power supply (such as a wall charger).	
43	power input	VCHG		P	External supply voltage; connect both pins directly to the external power supply (such as a wall charger).	
44	power output	VREG_MSME	1.8V	300mA	Output of the linear regulators	
45	GND	GND		GND		
46	power input/output	VCOIN		P	Used as an analog input from the 3 V coin cell for SMPL, RTC,and crystal oscillator backup; a capacitor (rather than a coin cell) can be used if only SMPL is supported	
47	GND	GND		GND		
48	ADC in	MPP3		AI,AO, DI, DO	multipurpose pin	
49	other	PON_REST_N	1.8V	DO	Connected internally to RESIN_N; logic low causes the baseband circuits to reset.	
50	GND	GND		GND		
51	ADC in	BATT_THERM		AI	connect to battery package thermal pin	
52	GND	GND		GND		
53	microphone	MIC_P		AI	Microphone #1 input (+)	
54	microphone	MIC_M		AI	Microphone #1 input (-)	
55	GND	GND		GND		
56	GPIO	GPIO4	1.8V	I/O, PD	Configurable I/O	1-8mA
57	GPIO	GPIO6	1.8V	I/O, PU	Configurable I/O	1-8mA

58	GPIO	GPIO11	1.8V	I/O, PD	Configurable I/O	1-8mA
59	GPIO	GPIO24	1.8V	I/O, PD	Configurable I/O	1-8mA
60	GND	GND		GND		
61	GPIO	GPIO18	1.8V	I/O, PD	Configurable I/O	1-8mA
62	GPIO	GPIO15	1.8V	I/O, PD	Configurable I/O	1-8mA
63	GPIO	GPIO7	1.8V	I/O, PD	Configurable I/O	1-8mA
64	GPIO	GPIO1	1.8V	I/O, PD	Configurable I/O	1-8mA
65	I2C	I2C_SDA	1.8V	I/O	I2C data	
66	UART	UART_TX	1.8V	DO	High-speed UART transmit data output	
67	UART	UART_RFR	1.8V	DO	High-speed UART ready for receive signal	
68	UART	UART_RX	1.8V	DI	High-speed UART receive data input	
69	UART	UART_CTS	1.8V	DI	High-speed UART clear to send signal	
70	power input	VBAT_RF	3.7V~ 4.2V	P	Input power for RF section, could connect this pin with VBAT_BB	
71	power input	VBAT_RF	3.7V~ 4.2V	P	Input power for RF section, could connect this pin with VBAT_BB	
72	SPI	SPI_MOSI	1.8V	DO	SPI (master only) master out/slave in data	
73	SPI	SPI_MISO	1.8V	DI	SPI (master only) master in/slave out data	
74	GND	GND		GND		
75	GND	GND		GND		
76	GND	GND		GND		
77	GND	GND		GND		
78	GND	GND		GND		
79	GPIO	GPIO22	1.8V	I/O, PU	Configurable I/O	
80	GPIO	GPIO23	1.8V	I/O, PU	Configurable I/O	1-8mA
81	GPIO	GPIO19	1.8V	I/O, PU	Configurable I/O	1-8mA
82	GPIO	GPIO14	1.8V	I/O, PU	Configurable I/O	1-8mA
83	SDIO2	SDCC2_DATA0	2.6V	I/O	SDIO2 data bit 0	2-16mA
84	SDIO2	SDCC2_CMD	2.6V	I/O	SDIO2 command bit	2-16mA
85	SDIO2	SDCC2_DATA1	2.6V	I/O	SDIO2 data bit 1	2-16mA
86	SDIO2	SDCC2_CLK	2.6V	DO	Output clock for SDIO2 device	2-16mA
87	SDIO1	SDCC1_DATA0	2.6V	I/O	SDIO1 data bit 0	2-16mA

88	SDIO1	SDCC1_DATA1	2.6V	I/O	SDIO1 data bit 1	2-16mA
89	SDIO1	SDCC1_CLK	2.6V	DO	Output clock for SDIO1 device	2-16mA
90	GPIO	GPIO3	1.8V	I/O, PU	Configurable I/O	1-8mA
91	GND	GND		GND		
92		WLAN_PWR_DOWN	2.6V	I/O, PU	Configurable I/O	2-16mA
93	UICC	USIM_RST	1.8V/2.85V	DO	USIM reset	
94	JTAG	JTAG_TDO	1.8V	Z	JTAG test data output	
95	JTAG	JTAG_TDI	1.8V	DI, PU	JTAG test data input	
96	power output	VREG_MSMP	2.6V		Output of the linear regulators	300mA
97	JTAG	JTAG_TRST_N	1.8V	DI, PD	JTAG reset	
98	USB UICC	USIM_D_P	1.8V/2.85V	I/O	USB-UICC data plus line	
99	USB UICC	USIM_D_M	1.8V/2.85V	I/O	USB-UICC data minus line	
100	GND	GND		GND		
101	USB	USB_D_M		AI,AO	High-speed USB differential data, (-) side	
102	USB	USB_D_P		AI,AO	High-speed USB differential data, (+) side	
103	GND	GND		GND		
104	power on key	MSM_PON	1.8V	AI.PU	Connect to the keypad power button. This signal is pulled up internally to dVDD. When the QSC device is off, pulling this pin low initiates a powerup and generates an interrupt.	
105	ADC in	MPP4		AI,AO, DI, DO	multipurpose pin	
106	other	D2D_PS_HOLD		DI	Baseband circuits drive this input high to keep power on, low to shut down	
107	GND	GND		GND		
108	GND	GND		GND		
109	Speaker	SPKR_OUT_P		AO	Speaker driver (+) output. Connect directly to the speaker	500mW
110	Speaker	SPKR_OUT_M		AO	Speaker driver (-) output. Connect directly to the speaker	500mW
111	power output	VREG_GP1	2.85V	P	Output of the linear regulators	150mA
112	power output	VREG_GP2	2.9V	P	Output of the linear regulators	300mA
113	ADC in	MPP2		AI,AO,	multipurpose pin	

				DI, DO		
114	current sink	VIB_DRV_N		AI	Connect to the vibration motor (-) terminal. The (+) terminal of the motor connects to VDD	
115	ADC in	HKAIN1		AI	ADC input	
116	current sink	LCD_DRV_N		AI	Connect to the LCD backlight (-) terminal. The (+) terminal of the LCD backlight connects to VDD	150mA
117	GND	GND		GND		
118	GPIO	GPIO13	1.8V	I/O, PD	Configurable I/O	1-8mA
119	GPIO	GPIO0	1.8V	I/O, PD	Configurable I/O	1-8mA
120	GPIO	GPIO12	1.8V	I/O, PD	Configurable I/O	1-8mA
121	PDM	GP_PDM_0	2.6V	DO,PD	12-bit Pulse-density modulation output	2-16mA
122	GND	GND		GND		
123	GND	GND		GND		
124	GND	GND		GND		
125	GND	GND		GND		
126	GND	GND		GND		
127	GND	GND		GND		
128	GND	GND		GND		
129	GND	GND		GND		
130	GND	GND		GND		
131	GND	GND		GND		
132	GND	GND		GND		
133	GND	GND		GND		
134	GND	GND		GND		
135	GND	GND		GND		
136	GND	GND		GND		
137	GND	GND		GND		
138	GND	GND		GND		
139	GND	GND		GND		
140	GND	GND		GND		
141	GND	GND		GND		

3. RF AIR INTERFACES AND PERFORMANCE

3.1 RF AIR INTERFACE AND BAND CONFIGURATION

3.1.1 Air interfaces

UMC-6270QV module supports WCDMA R99, HSDPA and GPS

3.2 RF PERFORMANCE

The UMC-6270QV modules RF transmitter/receiver is fully compliant with the applicable standards. The sensitivity and max output power are listed in Table 3-2-1 and Table 3-2-2

Specification	Min	Typ	Max	Units
UMTS Sensitivity				
BC2(PCS) (1930-1990MHz Rx)	-104.7	-108		dBm
BC5(Cell) (869-894MHz Rx)	-106.7	-110		dBm
GPS Sensitivity		-155		dBm

Table 3-2-1 Conducted Receiver Sensitivity

Specification	Min	Typ	Max	Units
UMTS Max Output Power				
BC2(PCS) (1850-1910MHz Tx)		23.5		dBm
BC5(Cell) (824-849MHz Tx)		23.5		dBm
GPS Sensitivity		-155		dBm

Table 3-2-2 Conducted Transmitter Max Output Power

3.3 TRANSMITTER POWER CLASS

The UMC-6270QV Modules support the power classes listed in Table 3-3

Mode	Band	Power Class
WCDMA/HSDPA	B2/B5	3

Table 3-3 Supported Power Classes

4. OPERATING CONDITIONS

4.1 ABSOLUTE MAXIMUM RATINGS

Operating UMC-6270QV Modules under conditions beyond its absolute maximum ratings (Table 4-1) may damage the device. Absolute maximum ratings are limiting values to be considered individually when all other parameters are within their specified operating ranges. Functional operation and specification compliance under any absolute maximum condition, or after exposure to any of these conditions, is not guaranteed or implied. Exposure may affect device reliability.

Symbol	Parameter	Min	Max	Unit
Ts	Storage temperature	-40	85	C
USB_VBUS	DC power supply voltage	4.5	5.5	V
VBAT	Battery input voltage	3.4	4.2	V
VESD_HBM	Eletrostatic discharging voltage rating (human body model)	*		V
VESD_CDM	Electrostatic discharge voltage rating (charge device model)	*		V
RH_Operating	Operating humidity range	10	90	%
RH_Non-OP	Nonoperating humidity range	5	95	%

*NOTE: ESD protection should be provided external to the module.

Table 4-1 : Absolute maximum ratings

4.2 RECOMMENDED OPERATING CONDITION

The devices meet all performance specifications when used within the recommended operating conditions as described in Table 4-2

Symbol	Parameter	Min	Typ.	Max	Unit
T	Operating Temperature	-25		+85	℃
	Normal operating temperature range See section 4.2.1	-20		+65	℃
	Extended operating temperature range 1 See section 4.2.2	-25		-20	℃
	Extended operating temperature range 2 See section 4.2.3	+65		+85	℃
USB_VBUS	DC Power Supply Voltage	4.75	5	5.25	V
VBAT (Battery)	DC Power Supply Voltage	3.4	3.8	4.2	V

Table 4-2

4.2.1 Normal operating temperature range

The wireless module is fully functional and meets the 3GPP specification across the specified temperature range.

4.2.2 Extended operating temperature range 1

The wireless module is fully functional across the specified temperature range. Occasional deviations from the 3GPP specification may occur.

4.2.3 Extended operating temperature range 2

The wireless module is functional across the specified temperature range. Occasional deviations from the 3GPP specification may occur. Thermal protection including automatic shutdown is implemented for protection against overheating.

5. CURRENT CONSUMPTION

The specified supply currents in Table 5-1 are based operation at room temperature. Current measurements are taken with default parameter settings, nominal supply voltage. The DUT is mounted on a module test board and the accelerometer on, unless otherwise noted.

Operating Modes	**Description**	**Conditions**	Average Current			
			Min	Typ	Max	Unit
Power Down(OFF)	VBAT voltage applied	Power Down*1,2		22		µA
WCDMA	Between Rx wakeups	Sleep*1,2		1		mA
	Rx awake current	Rx Idle		57		mA
	Average Sleep and Rx	Standby*3		1.6		mA
	Average GPS only	Average GPS only		30		mA
		HSDPA 3.6MbpsDL/384Kbps UL (0dBm)		180		mA
		WCDMA Tx/Rx (23.5dBm)		550		mA

Table 5-1 Typical Power Consumption

Note 1 Measurement taken without Test Board
Note 2 Measurement taken without Accelerometer
Note 3 Value calculated from measured IUSB_AVG subtacted from ITOTAL_GPS_AVG, I-GPS = I-Total_GPS_AVG – IUSB_AVG

6. APPLICATION DESIGN NOTES

6.1 Layout Notes

6.1.1 RF Pin Input Impedance Matching

Applications utilizing the module must ensure that a 50Ω controlled impedance trace is used. Shown in the accompanying table are example calculations for a four- layer FR4 stack up and the resulting trace width for Bluetooth RF input. The figure below illustrates the layer stack up for a four- layer board according to the Description column in the table below.

Layer	Material Type	**Dielectric Thickness**	**Trace Width**	**Copper Thickness**	**Dielectric Constant**	**Char.** Impedance	Description
1	Conductive	-	27	2.1	-	50	Microstrip
	Dielectric	16	-	-	4.3	-	Prepreg
2	Conductive	-	-	1.4		-	Plane
	Dielectric	20			4.3	-	Prepreg
3	Conductive	-	-	1.4	-	-	Plane
	Dielectric	16	-	-	4.3	-	Prepreg
4	Conductive	-	27	2.1	-	50	Microstrip

Table 6-1-1-1 Application Board Characteristic Impedance

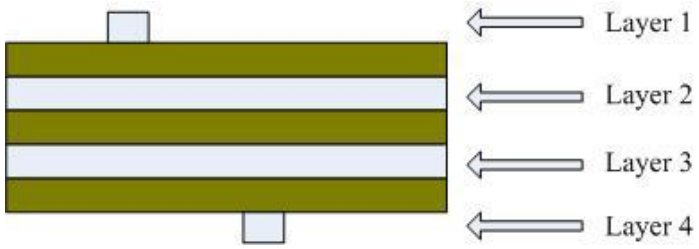


Figure 6-1-1-1 Application Board Layer Stack Up

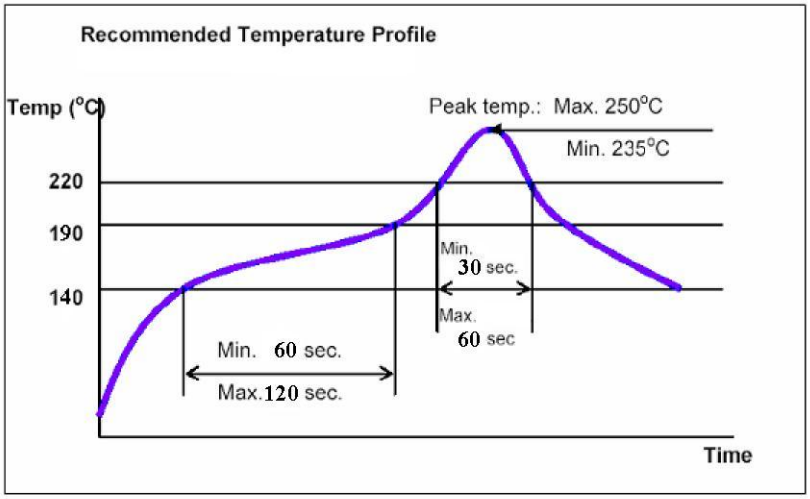
6.1.2 Handling Requirements

DO NOT TOUCH ANY Pad OF BTI MODULE WHILE ASSEMBLYING.

6.1.3 Soldering Requirements

Soldering Iron Soldering
Solder Temperature: 350oC
Immersion Duration: 2 ~ 3 seconds

6.1.4 Reflow Profile



Peak Temperature: 235 ~ 250 Degree Celcius
Reflow Zone (above 220°C): 30~60 sec.
Preheat Zone (140 to 190°C): 60~120 sec.

7. MECHANICAL REQUIREMENTS

7.1 Module Dimension and Footprint

The dimension of this module:

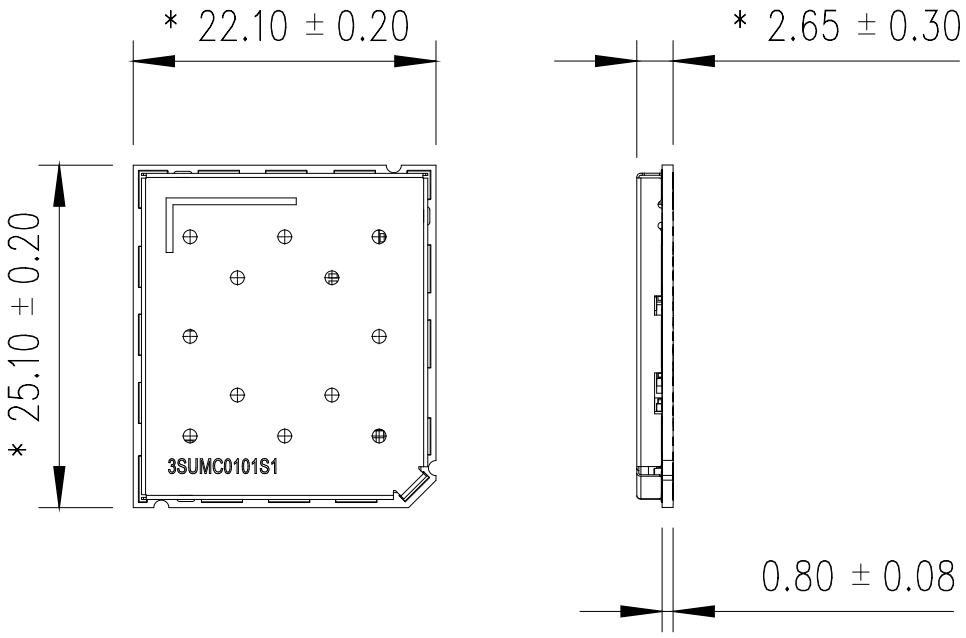
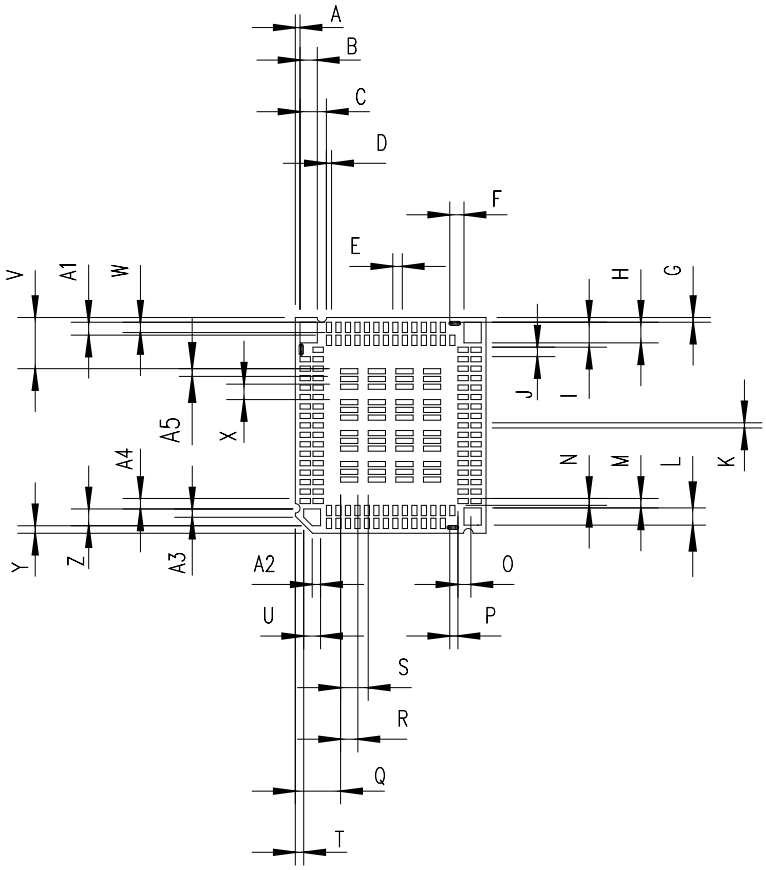


Figure 7-1-1 Dimension of SFF Module



FOOTPRINT

Parameter	Description	Min.	Typ.	Max.	Units
A	Edge to Pin	TBD	0.5	TBD	mm
B	Pin width	TBD	2.0	TBD	mm
C	Pin to Pin Pitch	TBD	3.05	TBD	mm
D	Pin width	TBD	0.6	TBD	mm
E	Pin to Pin Pitch	TBD	1.10	TBD	mm
F	Pin to Pin Pitch	TBD	1.65	TBD	mm
G	Edge to Pin	TBD	0.50	TBD	mm
H	Edge width	TBD	2.40	TBD	mm
I	Pin to Pin Pitch	TBD	2.30	TBD	mm
J	Pin to Pin Pitch	TBD	1.10	TBD	mm
K	Pin width	TBD	0.6	TBD	mm
L	Pin width	TBD	2.0	TBD	mm
M	Pin to Pin Pitch	TBD	1.10	TBD	mm
N	Pin to Pin Pitch	TBD	0.80	TBD	mm
O	Pin to Pin Pitch	TBD	1.50	TBD	mm
P	Pin to Pin Pitch	TBD	0.95	TBD	mm
Q	Edge to Pin	TBD	5.20	TBD	mm
R	Pin width	TBD	2.0	TBD	mm
S	Pin to Pin Pitch	TBD	3.20	TBD	mm
T	Edge to Pin	TBD	0.925	TBD	mm
U	Pin width	TBD	1.95	TBD	mm
V	Edge to Pin	TBD	5.90	TBD	mm
W	Pin width	TBD	1.20	TBD	mm
X	Pin to Pin Pitch	TBD	1.80	TBD	mm
Y	Edge to Pin	TBD	0.825	TBD	mm
Z	Pin width	TBD	1.95	TBD	mm
A1	Pin to Pin Pitch	TBD	1.50	TBD	mm
A2	Pin to Pin Pitch	TBD	0.96	TBD	mm
A3	Pin to Pin Pitch	TBD	0.96	TBD	mm
A4	Pin to Pin Pitch	TBD	1.225	TBD	mm
A5	Pin to Pin Pitch	TBD	0.90	TBD	mm

Figure 7-1-2 Recommended Footprint of SFF Module

8 Certification Requirements

8.1 Carrier Certification Requirements

The SFF Development Kit will be used to demonstrate Safe for Network (SFN) compliance for the SFF module on selected cellular carriers.

8.2 Regulatory Compliance [5]

Specification	Support	Comments
UL Listed	Yes	Only for DC adapter and battery. Not required for Rigel, Orion and Bellatrix.
RoHS Compliant	Yes	
FCC CFR 47 Part 2 Compliant	Yes	(Subparts C, I & J)
FCC CFR 47 Part 15 Compliant	Yes	(Subparts B & C)
ESD Certified	Yes	EC 61000-4-2 HBM

8.3 FCC warning statement

FCC Regulations:

This device complies with Part 15 of the 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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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.

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and the antenna gain allowed for use with this device is 2 dBi.

2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling
This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: **NKRUMC-6270Q**". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Manual Information To the End User
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.