User Manual/Specification

LTE/HSPA+/WCDMA/EDGE/GPRS Data Module

3RN13

07/28/2012

REVISION HISTORY

REV	ECO	CHANGE DESCRIPTION	APPROVED BY	DATE
1.0		Initial release		07/28/12

1. GENERAL SPECIFICATIONS OF MODULE.

PARAMETERS	EXPLAINATIONS				
Air Interfaces	WCDMA Band I, II, V, VIII				
	GPRS / EDGE 850, 900, 1800, 1900				
	LTE Band IV, XVII				
Protocols	LTE: Rel 8, Cat 3 WCDMA / HSDPA / HSUPA: Rel 7 GSM / GPRS / EDGE : Rel 6				
Max Data Rate	LTE	100 Mbps Down (64QAM) / 50 Mbps Up (16QAM)			
	HSDPA Cat 14	21.1 Mbps Down			
	HSUPA Cat 6	5.76 Mbps Up			
	WCDMA	384 Kbps Down / Up			
	GPRS	Multi slot class 10, CS-4 80 Kbps Down / 20 Kbps Up			
	EDGE	MCS-9, 236.8 Kbps Down / 59.2 Kbps Up			
RX / TX Frequency Interval	LTE Band IV	400 MHz			
	LTE Band XVII	30 MHz			
	WCDMA / HSPA 850	45 MHz			
	WCDMA / HSPA 1900	80 MHz			
	WCDMA / HSPA 2100	190 MHz			
	WCDMA / HSPA 900	45 MHz			
	GPRS / EDGE 850	45 MHz			
	GPRS / EDGE 900	45 MHz			
	GPRS / EDGE 1800	95 MHz			
	GPRS / EDGE 1900	80 MHz			
Max Output Power (single slot)	LTE Band IV	24 dBm (Power class 3)			
	LTE Band XVII	23 dBm (Power class 3)			
	WCDMA / HSPA	23 dBm (Power class: 3)			
	GPRS 850 / 900	32 dBm (Power class: 4)			
	GPRS 1800 / 1900	29.5 dBm (Power class: 1)			
	EDGE 850 / 900	26.5 dBm (Power class: E2)			
	EDGE 1800 / 1900	25.5 dBm (Power class: E2)			
Operating Voltage	VBATT 3.4V ~ 4.2V				
Sleep / Off Current	Off Leakage	5uA			
	Rock Bottom [Sleep]	2mA			
Standby Current (single cell, no neighbors)	LTE standby	128 Frames			
		5.15mA			
	WCDMA standby	64 Frames	128 Frames	256 Frames	512 Frames
		5.51mA	4.15mA	3.05mA	2.90mA
	GPRS standby	MFRMS = 2			
		5.8mA			
Peak Current	2.0A max, 600µs, 12.5 % Duty Cycle				
Operating Temperature Range	-10°C ~ +55°C				
Storage Temperature Range	-30°C ~ +80°C				

PARAMETERS	EXPLAINATIONS	
Frequency Stability	WCDMA / HSDPA 800	±0.1ppm
	WCDMA / HSDPA 900	±0.1ppm
	WCDMA / HSDPA 1800	±0.1ppm
	WCDMA / HSDPA 1900	±0.1ppm
	WCDMA / HSDPA 2100	±0.1ppm
	LTE Band IV	±0.1ppm
	LTE Band XVII	±0.1ppm
	GSM / GPRS	±0.1ppm
Physical Dimensions[1]	48.00 x 28.00 x 2.1 mm	
Weight	6.9g	

2. TRANSMIT SPECIFICATIONS.

(A) LTE

PARAMETERS	EXPLAINATIONS	
Frequency Range	Band IV	[AWS] Up: 1710 ~ 1755 MHz
	Band XVII	[700] Up: 704 ~ 716 MHz
Max Output Power	23dBm ±2 dBm	
Min Output Power	Below -40dBm	
Error Vector Magnitude	17.5%	QPSK or BPSK
	12.5%	16QAM
ACLR1	30dB	1.4, 3, 5, 10, 15, 20 MHz bandwidth
ACLR2	33dB	1.4, 3, 5, 10, 15, 20 MHz bandwidth

(B) WCDMA/HSDPA

PARAMETERS	EXPLAINATIONS		
Frequency Range	2100 (Band I)	Up: 1920 ~ 1980 MHz	
	1900 (Band II)	Up: 1850 ~ 1910 MHz	
	850 (Band V)	Up: 824 ~ 849 MHz	
	900 (Band VIII)	Up: 880 ~ 915 MHz	
Max Output Power	24dBm +1/-3 dBm		
Min Output Power	Below -50dBm		
Spectrum Emission Mask	Below -35 dBc	2.5 – 3.5 MHz	Offset 30KHz
	Below -35 dBc	3.5 – 7.5 MHz	Offset 1MHz
	Below -39 dBc	7.5 – 8.5 MHz	Offset 1MHz
	Below -49 dBc	8.5 – 12.5 MHz	Offset 1MHz
Occupied Bandwidth	Below 5MHz		
ACLR	±5MHz 33dB, ±10MHz 43dB		

(C) GPRS / EDGE

PARAMETERS	EXPLAINATIONS				
Frequency Range	GPRS / EDGE 850	Up: 824 ~ 849 MHz			
	GPRS / EDGE 900	Up: 880 ~ 915 MHz			
	GPRS / EDGE 1800	Up: 1710 ~ 1785 MHz			
	GPRS / EDGE 1900	Up: 1850 ~ 1910 MHz			
Transmitter output power	Band	Power Level	Output Power (dBm)	Tolerance (dB)	
	GPRS 850 / 900	5	33	±2	
		6	31	±3	
		7	29	±3	
	GPRS / EDGE / 850 / 900	8	27	±3 (GPRS), ±2 (EDGE)	
		9	25	±3	
		10	23	±3	
		11	21	±3	
		12	19	±3	
		13	17	±3	
		14	15	±3	
		15	13	±3	
		16	11	±5	
		17	9	±5	
		18	7	±5	
		19	5	±5	
	Band	Power Level	Output Power (dBm)	Tolerance (dB)	
	GPRS 1800 / 1900	0	30	±2	
		1	28	±3	
	GPRS / EDGE / 1800 / 1900	2	26	±3 (GPRS), ±2 (EDGE)	
		3	24	±3	
		4	22	±3	
		5	20	±3	
		6	18	±3	
		7	16	±3	
		8	14	±3	
		9	12	±4	
		10	10	±4	
		11	8	±4	
		12	6	±4	
		13	4	±4	
		14	2	±5	
		15	0	±5	

ORFS @ Spectrum due to modulation	GSM / GPRS 850 / 900	Power (dBm)	Frequency offset (KHz)			
			±400	±600	±1200	±1800
		33	-19	-21	-21	-24
		31	-21	-23	-23	-26
		29	-23	-25	-25	-28
		27	-23	-26	-27	-30
		25	-23	-26	-29	-32
		23	-23	-26	-31	-34
		≤20	-23	-26	-32	-36

PARAMETERS	EXPLANATIONS					
ORFS @ Spectrum due to switching transient	GSM / GPRS 1800 / 1900	Power (dBm)	Frequency offset (KHz)			
			±400	±600	±1200	±1800
		30	-22	-24	-24	-27
		28	-23	-25	-26	-29
		26	-23	-26	-28	-31
		24	-23	-26	-30	-33
		22	-23	-26	-31	-35
		≤20	-23	-26	-32	-36

3. RECEIVE SPECIFICATIONS.

(A) LTE

PARAMETERS	EXPLANATIONS			
Frequency Range	Band IV	[AWS] Down: 2110 ~ 2155 MHz		
	Band XVII	[700] Down: 734 ~ 746 MHz		
Reference Sensitivity Level	Band IV	BW (MHz)	Reference Sensitivity (dBm)	Modulation
		5	-100	QPSK
		10	-97	QPSK
	Band XVII	BW (MHz)	Reference Level (dBm)	Modulation
		5	-97	QPSK
		10	-94	QPSK
Adjacent Channel Selectivity	BW (MHz)	Adjacent Channel Selectivity (dB)		
	5	33 dB		
	10	33 dB		

(B) WCDMA/HSDPA

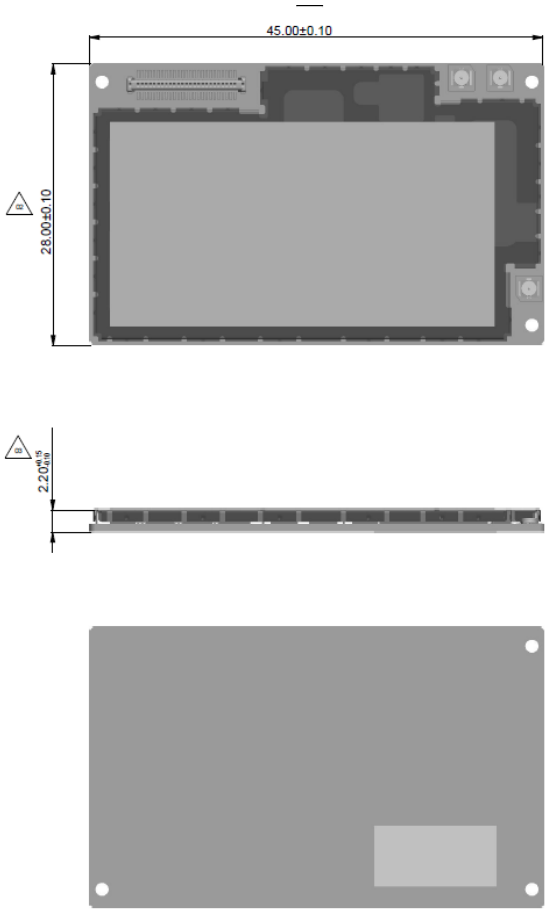
PARAMETERS	EXPLANATIONS		
Frequency Range	Band I	[2100] Down: 2110 ~ 2170 MHz	
	Band II	[1900] Down: 1930 ~ 1990 MHz	
	Band V	[850] Down: 869 ~ 894 MHz	
	Band VIII	[900] Down: 925 ~ 960 MHz	
Reference Sensitivity Level	WCDMA Band I	-106.7 dBm	
	WCDMA Band II	-104.7 dBm	
	WCDMA Band V	-104.7 dBm	
	WCDMA Band VIII	-103.7 dBm	
Adjacent Channel Selectivity	Band I	-92.7 dBm	-52dBm @ ±5MHz
	Band II	-90.7 dBm	
	Band V	-90.7 dBm	
	Band VIII	-89.7 dBm	
Intermodulation	Band I	-103.7 dBm	-46dBm ±10MHz, ±20MHz
	Band II	-101.7 dBm	
	Band V	-101.7 dBm	
	Band VIII	-100.7 dBm	
Spurious Response	Band I	-103.7 dBm	-44 dBm
	Band II	-101.7 dBm	
	Band V	-101.7 dBm	
	Band VIII	-100.7 dBm	
In-Band Blocking	Band I	-103.7 dBm	-56 dBm @ ±10MHz, -44 dBm @ ±15MHz
	Band II	-101.7 dBm	

PARAMETERS	EXPLAINATIONS		
	Band V	-101.7 dBm	
	Band VIII	-100.7 dBm	
Peak throughput	HSDPA	21Mbps	Category 6

(C) GSM / GPRS

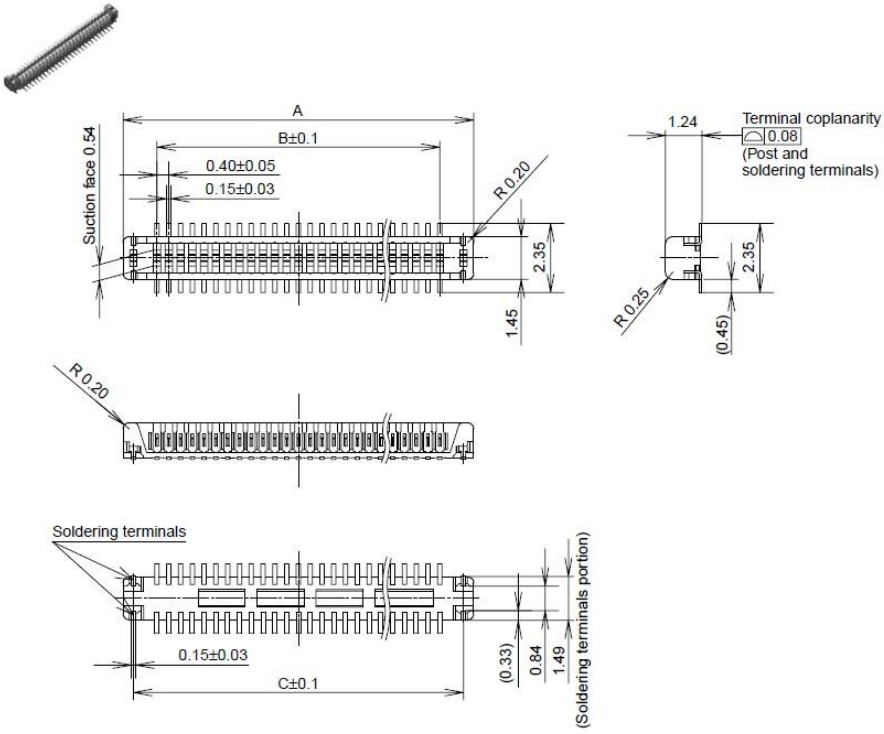
PARAMETERS	EXPLAINATIONS		
Frequency Range	GPRS / EDGE 850	Down: 869 ~ 894 MHz	
	GPRS / EDGE 900	Down: 925 ~ 960 MHz	
	GPRS / EDGE 1800	Down: 1805 ~ 1880 MHz	
	GPRS / EDGE 1900	Down: 1930 ~ 1990 MHz	
Minimum Input level for Reference Performance	GPRS 850/900/1800/1900	Type of Channel	Propagation Condition: BLER < 10%, Static
		PDTCH/CS-1	-104 dBm
		PDTCH/CS-2	-104 dBm
		PDTCH/CS-3	-104 dBm
		PDTCH/CS-4	-101 dBm
	EDGE 850/900/1800/1900	PDTCH/MCS-5	-98 dBm
		PDTCH/MCS-6	-96 dBm
		PDTCH/MCS-7	-93 dBm
		PDTCH/MCS-8	-90.5 dBm
		PDTCH/MCS-9	-86 dBm

4. MECHANICAL DIMENSIONS.



5. CONNECTORS.

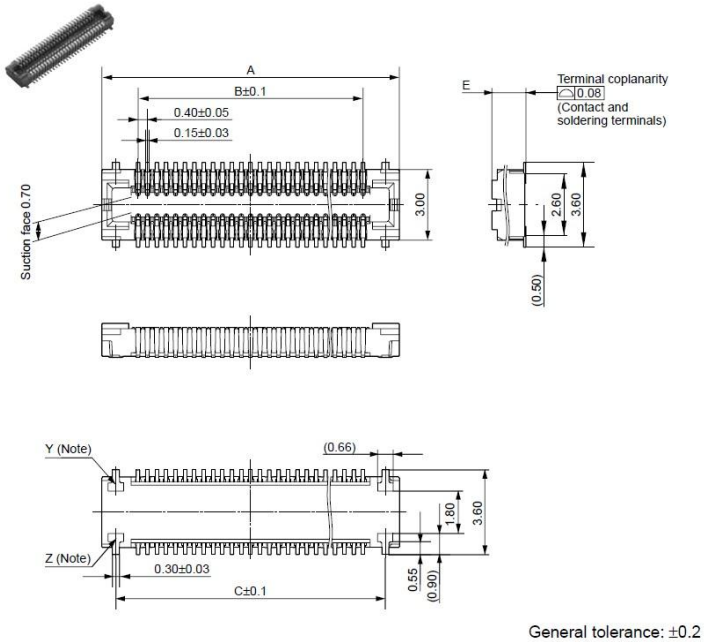
5.1 Supplier Part – Header (50 contacts) on module



General tolerance: ±0.2

A = 11.9mm, B = 9.6mm, C =11.2mm, D = 13.4mm

5.2 Supplier Part – Socket (50 contacts) on Host device (1.5mm stacking height)



General tolerance: ±0.2

A = 12.7mm, B = 9.6mm, C = 11.5mm, E = 1.45mm

5.3 RF CONNECTOR Supplier Part

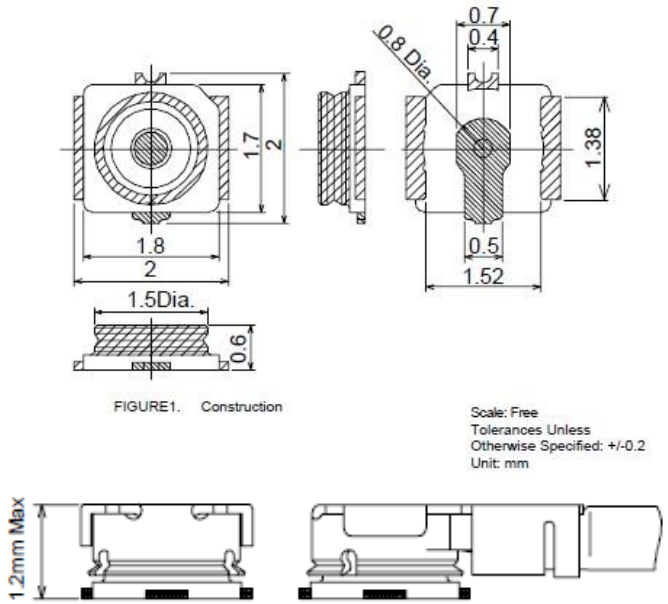
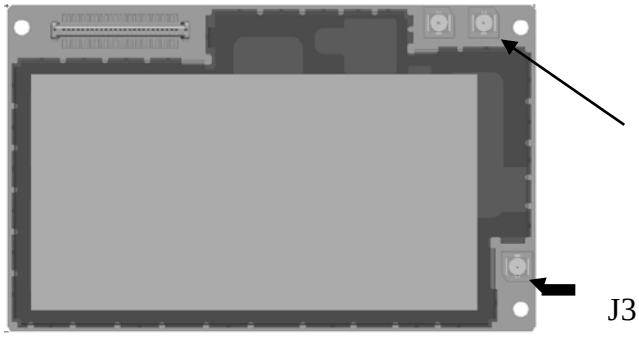


FIGURE1. Construction

Scale: Free
Tolerances Unless
Otherwise Specified: +/-0.2
Unit: mm

6. MODULE INTERFACES.

6.1 RF Ports



6.2 PIN Descriptions

PIN	Name	Description	PIN	Name	Description
1	GND	Ground	2	VBAT	Battery
3	GND	Ground	4	VBAT	Battery
5	GND	Ground	6	VBAT	Battery
7	GND	Ground	8	VBAT	Battery
9	GND	Ground	10	VBAT	Battery
11	GND	Ground	12	VBAT	Battery
13	GND	Ground	14	VBAT	Battery
15	GND	Ground	16	VBAT	Battery
17	GND	Ground	18	VBAT	Battery
19	RSVD	Reserved	20	RSVD	Reserved

PIN	Name	Description	PIN	Name	Description
21	PS_HOLD	Power Supply Hold Up	22	UART_RX_AP	Serial Receive
23	GPIO1	GPIO 1	24	UART_TX_AP	Serial Transmit
25	FW_RDY	Firmware Ready	26	JTAG_TDI	JTAG Data In
27	SIM_PRST_N	SIM card detect	28	JTAG_TDO	JTAG Data Out
29	GND	Ground	30	JTAG_TMS	JTAG Select
31	USB_DN	USB Data -	32	JTAG_TCK	JTAG Clock
33	USB_DP	USB Data +	34	JTAG_RTCK	JTAG Return Clock
35	GND	Ground	36	JTAG_TRST_N	JTAG Test Reset
37	USB_EN	USB Enable	38	JTAG_SRST_N	JTAG System Reset
39	HOSTWAKE	HOSTWAKE	40	RSVD	Reserved
41	I2C_CLK_HMI	Host to Modem Interrupt I2C Clock	42	GSM_TX	GSM Blanking signal
43	I2C_DATA_HMI	Modem to Host Interrupt I2C Data	44	UICC_DATA	SIM DATA
45	RESTIN_N	Hard Reset	46	UICC_CLK	SIM Clock
47	GPIO2	GPIO 2	48	UICC_RST	SIM Reset
49	PWR_ON_OFF	Modem ON/OFF	50	VREG_SIM_2P85	SIM Voltage

6.3 Factory Test Points

Testpoint	Name	Testpoint	Name
TP1	VBAT	TP10	GND
TP2	VBAT	TP11	GND
TP3	VBAT	TP12	GND
TP4	VBAT	TP13	GND
TP5	UART_TX_AP	TP7	USB_EN
TP6	UART_RX_AP	TP14	USB_DN
TP20	PS_HOLD	TP15	USB_DP
TP27	PMIC_GPIO3	TP8	UICC_CLK
TP19	PWR_ON_OFF	TP9	UICC_RST
T17	RESETIN_N	TP16	UICC_DATA
		TP18	VREG_SIM_2P85

6.4 Signal Description

(A) Power Management

PIN	Name	Direction	Voltage	Description
21	PS_HOLD	Modem → Host	1.8V	Connect to 1.8V(VREG_MSME) to enable JTAG debug mode
49	PWR_ON_OFF	Host → Modem	1.8V	Pulling LOW for 500ms toggles power ON/OFF. Must be driven open collector (has internal pull up).
37	USB_EN	Host → Modem	1.8V / 3.3V	Enable/Disable USB PHY. Enable only during USB data transfer to minimize power consumption.
45	RESETIN_N	Host → Modem	1.8V	Active Low, Hard reset. Resets PMIC when asserted.
25	FW_READY	Modem → Host	1.8V	Pin goes HIGH when the module has competed boot sequence.

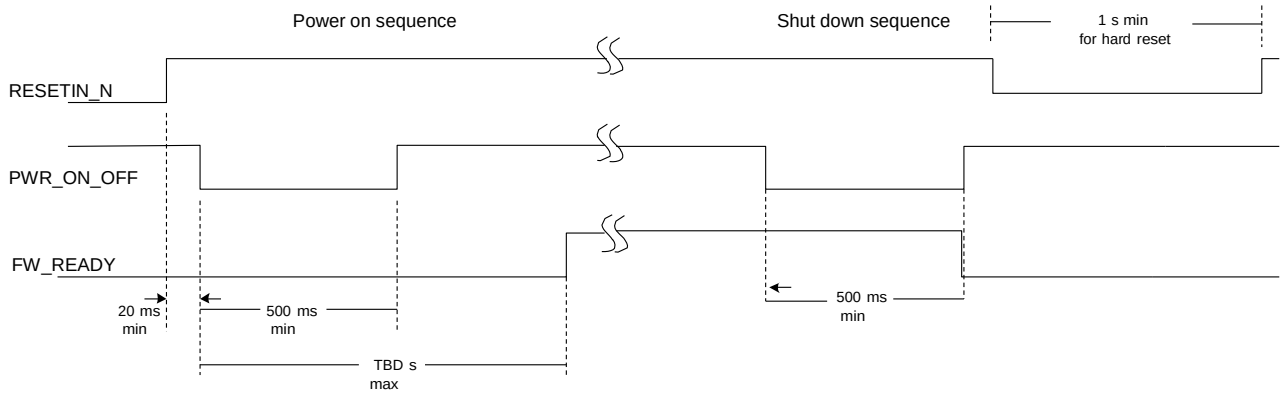


Figure 1 - Power ON/OFF Sequence

(B) SIM Card Detection

PIN	Name	Direction	Voltage	Description
23	SIM_PRST_N	Host -> Modem	1.8V	Host Device MCU pulls this signal to high when SIM card is present. Low when the SIM card is absent.

(C) UART

PIN	Name	Direction	Voltage	Description
22	UART_RX_AP	Host → Modem	1.8V	Receive Data
24	UART_TX_AP	Modem → Host	1.8V	Transmit Data

The UART operates at 115,200 Baud with no Flow Control.

(D) USB

PIN	Name	Direction	Description
31	USB_DM	Bidirectional	USB Data -
33	USB_DP	Bidirectional	USB Data +

(E) GSM Blanking

PIN	Name	Direction	Voltage	Description
42	GSM_TX	Modem → Host	1.8V	Logic High during GSM transmits.

(F) Host Wake & Interrupts

PIN	Name	Direction	Voltage	Description
41	HMI	Host → Modem	1.8V	Host to Modem Interrupt
43	MHI	Modem → Host	1.8V	Modem to Host Interrupt
39	HOSTWAKE	Modem → Host	1.8V	Modem wake Host signal

(G) Spare GPIO

PIN	Name	Direction	Voltage	Description
23	GPIO 1	Bidirectional	1.8V / 2.85V	Spare GPIO
47	GPIO 2	Bidirectional	1.8V	Spare GPIO

Notes (unless otherwise specified):

1. All parts and materials must be ROHS compliant and Halogen Free.
2. The module's RF specifications are complaint with 3GPP
3. All specifications under normal temperature, normal voltage conditions

FCC ID: CO2-2105

- 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 device 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 radiated 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 or more 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.
  Changes or modifications not expressly approved by the party responsible for compliance could void the user‘s authority to operate the equipment.

- The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

- Changes or modifications not expressly approved by the party responsible for compliance could void the user‘s authority to operate the equipment.

This device meets the government’s requirements for exposure to radio waves.
This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission of the U.S. Government.

- This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

Maximum antenna gain allowed for use with this device is +2 dBi.

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text:

“Contains FCC ID: CO2-2105”

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

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 cannot 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 cannot 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: **CO2-2105**”. 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.