WISMO

Wireless **S**tandard **Mo**dule

WM2C-G900/G1800
EGSM/DCS DUAL BAND Module
Specifications

PRELIMINARY

Version : 0.7

Date : 23/09/99

Reference : WCOM/GSM/WM2C_07

DOCUMENT AMENDMENTS

Issue	Date	Status	Author	Approval	Comments
0.1	06/05/1999	P	JMB	PBE/PTH	Creation
0.2	16/06/1999	P	JMB	PBE/PTH	Connector Modifications
0.3	18/06/1999	P	PBE		SIM Update
0.4	02/08/1999	P	PJS	PBE	SPK load update
0.5	12/08/1999	P	PBE		SIM and connector update
0.6	15/09/1999	P	JMB	PBE	Battery connection example Boot resistor modification SIM max current update
0.7	23/09/99	P	PBE		General Update

Contents

1. Introduction

1.1. Scope

This document defines and specifies the second generation EGSM/DCS dual band module called WISMO2C and referenced WM2C-G900/G1800.

1.2. Reference documents

GSM ETSI recommendations for Phase I and Phase II

2. WISMO2C functionalities

2.1. General

WISMO2C is a self-contained EGSM/DCS dual band module having the following features :

- 58.3 x 32.2 x 6,0 mm external dimensions
- 2 Watts EGSM radio section running under 3,6 Volts
- 1 Watt DCS radio section running under 3,6 Volts
- Digital section under 2.8 Volts
- 3V SIM interface
- Real Time Clock with calendar
- Battery charger
- Echo Cancellation
- Full GSM software stack
- Complete shielding
- Complete interfacing (LCD, keyboard, audio...)

The WISMO2C module has two external connections, one to the antenna by spring contacts or RF cable soldering, one for Digital, Keyboard, Audio and Supply by 60 pins connector.

WISMO2C has been designed to fit in a very small handset and only some custom functions has to be added to make a complete Dual Band handset :

- Keypad and LCD module
- Earpiece and Microphone
- Base connector
- Battery
- Antenna switch

2.2. RF Functionalities

The RF functionalities are in line with the Phase II GSM900/DCS1800 recommendation. The frequencies are :

- Rx (EGSM) : 925 to 960 MHz
- Tx (EGSM) : 880 to 915 MHz

- Rx (DCS) : 1805 to 1880 MHz
- Tx (DCS) : 1710 to 1785 MHz

The RF switch for car kit connection is not included in WISMO2C. It has to be provided on the mother board on which the module is mounted.

The RF part is based on a specific dual band chip which includes :

◊ 2 dedicated down-converter.

◊ 1 FI demodulator

◊ 1 VCO

◊ Transmit loop (modulator, down mixer, phase frequency comparator)

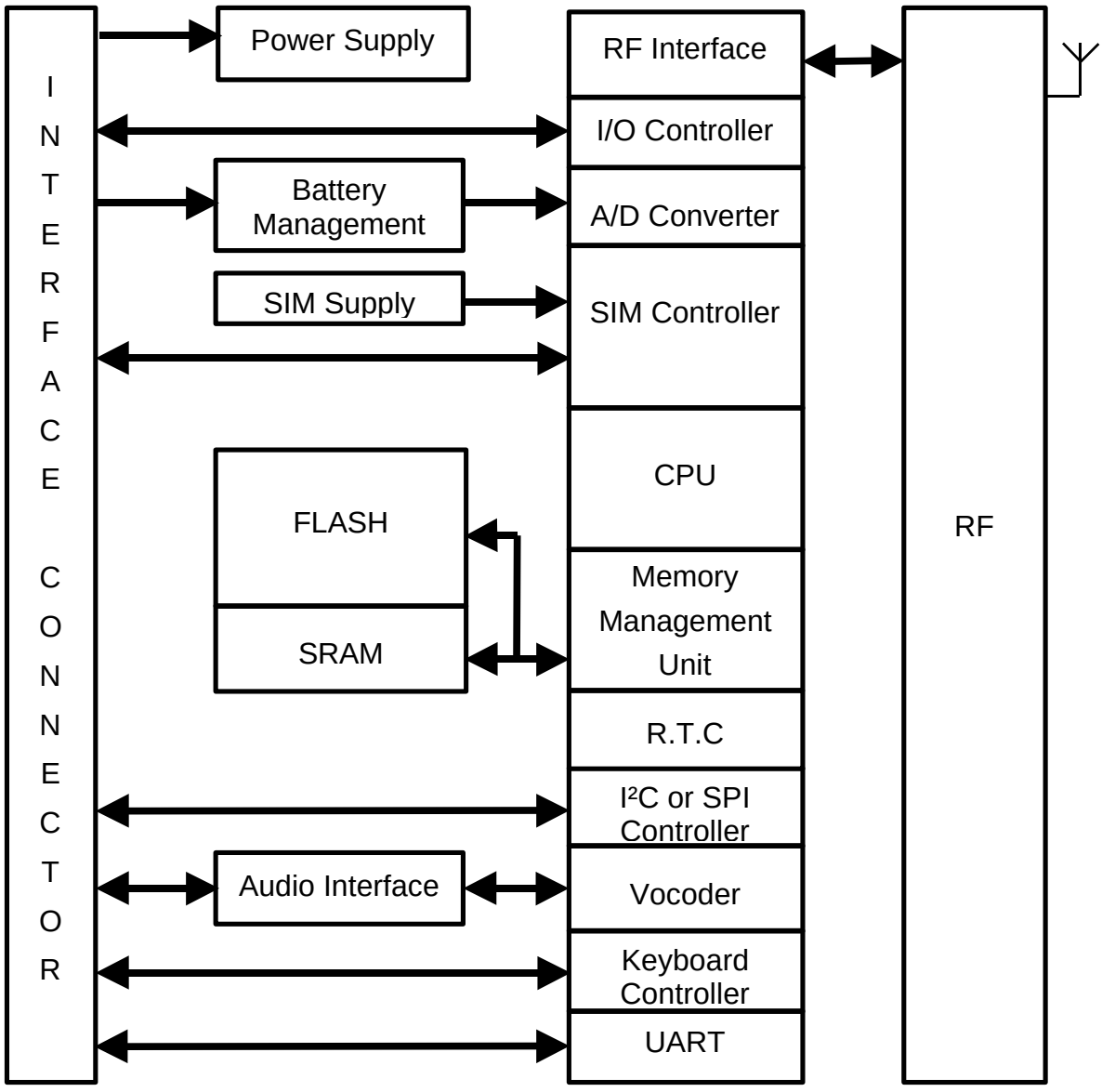
The RF concept has been designed to reduce cost and overall size providing the suppression of the duplexer (for each bandwidth).

2.3. Base-band functionalities

The digital part is designed using VLSI chip (VWS22100 GSM Kernel). This chipset is using 0,35 µm mixed technology CMOS, which leads to massive integration and low current consumption.

3. WISMO2C Interfaces

3.1. Functional Description



3.2. RF interface

The RF connection is allowed through two land patterns defined on the PCB in order to be used by the application with spring contacts or with a RF cable directly soldered.

No antenna switch for car kit is included in WISMO2C. This function must be added externally but can be driven by WISMO2C I/O ports.

3.3. Base-Band interface

A 60 pins connectors is provided to interface WISMO2C to a board which can contain LCD module, keyboard, SIM connector, battery connection... This connector is a 0.5mm pitch connector from KYOCERA / AVX with a stacking height of 3.0mm. The reference of the connector to be mounted on the mother board is :

24 5087 060 000 861

Warning : The digital interface provided by WISMO2C is an **2.8V** interface.

3.3.1. Power supply

Two different inputs are provided for the power supply. The first one VBATT is used to supply the RF part and the other input VDD to supply the base-band part. The module WISMO2C can be connected directly to a 3 NiMH cells battery and to improve standby time it is possible to supply the base-band part through a step-down converter.

VBATT : supplies directly the RF circuitry under 3,6 V. Minimum voltage ripple has to be maintained at this connection to avoid phase error. The RF Power Amplifier current (2.0A peak in GSM mode) flows with a ratio of 1/8 of the time (around 577µs every 4.615ms). The rising time is around 10µs.

VDD : supplies the +2.8V ballast regulators of WISMO2C. The voltage has to be maintained over 3.1 volts or connected to VBATT. Minimum voltage ripple has to be maintained at this connection to avoid phase error.

Ground is provided by the WISMO2C shielding case. The ground has to be connected on the mother board through a complete layer on the PCB.

Power Supply Voltage

	V_{MIN}	V_{NOM}	V_{MAX}	Ripple max
VBATT	3.3 V (*)	3.6 V	5.0 V	
VDD	3.1 V		5.0V	100 mV

(*) : This value has to be guaranted during burst (with 2.0A Peak in GSM mode)

Power consumption in EGSM mode

	Conditions	I_{NOM}	I_{MAX}
VBATT	During TX bursts @ 2W	1.7 A peak	2.0 A peak
VBATT	During RX bursts	75 mA peak	80 mA peak
VBATT	Average @ 2W	270 mA	320 mA
VBATT	Average @ 0.5W	180 mA	200 mA
VBATT	Average Idle mode	100 µA	300 µA
VDD	Average TCH/FS mode	85 mA	100 mA
VDD	Average Idle mode	3 mA	6 mA

Power consumption in DCS mode

	Conditions	I_{NOM}	I_{MAX}
VBATT	During TX bursts @ 1W	1.3 A peak	1.7 A peak
VBATT	During RX bursts	75 mA peak	80 mA peak
VBATT	Average @ 1W	240 mA	270 mA
VBATT	Average @ 0.25W	150 mA	180 mA
VBATT	Average Idle mode	100 µA	300 µA
VDD	Average TCH/FS mode	85 mA	100 mA
VDD	Average Idle mode	3 mA	6 mA

WISMO2C monitors battery voltage to give a rough indication of the battery remaining capacity and to control the battery fast charger.

Power Supply Pinout

Signal	Pin number
VBATT	55, 57, 58, 59 60
VDD	11
GND	Shielding

3.3.2. LCD interface

There are two ways to connect a LCD module driver to WISMO2C. With a SPI bus or through the I²C bus.

3.3.2.1. SPI bus

The SPI bus consists of a CLK signal, a IO signal and a EN signal compatible with a standard SPI bus. This interface is compatible with an industry standard LCD SPI bus. The maximum speed transfer is 3.25Mb/s.

Pin description

Signal	Pin number	I/O	I/O type	Description
SPI_CLK	10	O	1X	SPI Serial Clock
SPI_IO	8	I/O	CMOS / 1X	SPI Data
SPI_EN	28	O	1X	SPI Enable

3.3.2.2. I²C bus

The I²C bus consists of a CLK signal and a DATA signal compatible with a standard 96KHz I²C bus.

Pin description

Signal	Pin number	I/O	I/O type	Description
SCL	10	O	1X	I²C Serial Clock
SDA	8	I/O	CMOS / 1X	I²C Data

3.3.3. SPI Auxiliar bus

To add a SPI peripheral Wismo2C has a second SPI Chip Enable. The maximum speed transfer is 3.25Mb/s.

Pin description

Signal	Pin number	I/O	I/O type	Description
SPI_CLK	10	O	1X	SPI Serial Clock
SPI_IO	8	I/O	CMOS / 1X	SPI Data
SPI_AUX	26	O	1X	SPI Aux. Enable

3.3.4. Keyboard interface

This interface provides 10 connections : 5 rows (R0 to R4) and 5 columns (C0 to C4).

The scanning is digital, and debouncing is done in the WISMO2C. No discrete component like R,C is needed.

Pin description

Signal	Pin number	I/O	I/O type	Description
ROW0	13	I/O	CMOS / 1X	Row scan
ROW1	15	I/O	CMOS / 1X	Row scan
ROW2	17	I/O	CMOS / 1X	Row scan
ROW3	19	I/O	CMOS / 1X	Row scan
ROW4	21	I/O	CMOS / 1X	Row scan
COL0	23	I/O	CMOS / 1X	Column scan
COL1	25	I/O	CMOS / 1X	Column scan
COL2	27	I/O	CMOS / 1X	Column scan
COL3	29	I/O	CMOS / 1X	Column scan
COL4	31	I/O	CMOS / 1X	Column scan

3.3.5. Serial link

A flexible 6 wires serial interface is available complying with V24 protocol signalling but not with V28 (electrical interface) since the level interface is 2.8 Volts.

The signals are Tx data (CT103/TX), Rx data (CT104/RX), Request To Send (CT105/RTS), Clear To Send (CT106/CTS), Data Terminal Ready (CT108-2/DTR) and Data Set Ready (CT107/DSR).

The complete set of RS232 signals can be required for GSM DATA services application and can be generated by general purpose I/O provided by WISMO2C. The 2 additional signals are Data Carrier Detect (CT109/DCD) and Ring Indicator (CT125/RI).

Pin description

Signal	Pin number	I/O	I/O type	Description
CT103 / TX	39	I	CMOS	Transmit serial data
CT104 / RX	32	O	1X	Receive serial data
CT105 / RTS	30	I	CMOS	Ready To Send
CT106 / CTS	37	O	1X	Clear To Send
CT107 / DSR	36	O	1X	Data Set Ready
CT108-2 / DTR	34	I	CMOS	Data Terminal Ready
CT109 / DCD	51	O	CMOS / 2X	Data Carrier Detect
CT125 / RI	54	O	CMOS / 2X	Ring Indicator

3.3.6. SIM interface

5 signals are present :

- SIMVCC : SIM power supply.
- SIMRST : reset.
- SIMCLK : clock.
- SIMDATA : I/O port.
- SIMPRES : SIM card detect.

The SIM interface controls a 3V SIMs only. This interface is fully compliant with GSM 11.11 recommendations concerning SIM functions.

To prevent ElectroStatic Discharge it is recommended to add Transient Voltage Suppressor diodes on the signal connected to the SIM socket. TVS diodes with low capacitance (less than 10pF) have to be connected on SIMCLK and SIMDATA to avoid to disturb the rising and falling edge which are important for the Full Type Approval.

Pin description

Signal	Pin number	I/O	I/O type	Description
SIMCLK	3	O	2X	SIM Clock
SIMRST	5	O	2X	SIM Reset
SIMDATA	7	I/O	CMOS / 3X	SIM Data
SIMVCC	9	O		SIM Power Supply
SIMPRES	50	I	CMOS	SIM Card Detect

Electrical Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
SIMDATA V_{IH}	I_{IH} = ± 20µA	0.7xSIMVCC			V
SIMDATA V_{IL}	I_{IL} = 1mA			0.3xSIMVCC	V
SIMRST, SIMDATA SIMCLK V_{OH}	Source current = 20µA	SIMVCC – 0.1V			V
SIMRST, SIMDATA SIMCLK V_{OL}	Sink current = -200µA			0.1	V
SIMVCC Output Voltage	I_{SIMVCC} <= 6mA	2.70	2.80	2.85	V
SIMCLK Rise/Fall Time	Loaded with 30pF			50	ns
SIMRST, SIMDATA Rise/Fall Time	Loaded with 30pF			1	µs
SIMCLK Frequency	Loaded with 30pF			3.25	MHz

When not used **SIMPRES** has to be tied to VCC.

When used, a low to high transition means SIM card is inserted and a high to low transition means SIM card has been removed.

3.3.7. General Purpose Input/Output

WISMO2C provides 5 General Purpose I/O, 3 General Purpose Output and 1 General Purpose Input which can be used to control any external devices such as LCD or Keyboard backlight.

Pin description

Signal	Pin number	I/O	I/O type	Description
GPIO0	24	I/O	CMOS / 2X	General Purpose I/O
GPIO1	52	I/O	CMOS / 2X	General Purpose I/O
GPIO2	54	I/O	CMOS / 2X	General Purpose I/O
GPIO3	51	I/O	CMOS / 2X	General Purpose I/O
GPIO4	26	I/O	CMOS / 2X	General Purpose I/O
GPO0	26	O	3X	General Purpose O
GPO1	22	O	3X	General Purpose O
GPO2	20	O	1X	General Purpose O
GPI	18	I	CMOS	General Purpose I

For AT command application GPIO1 is used to generate a signal which can be connected to a LED (through current driver) and which indicates if the mobile is in idle mode and connected to the GSM network or if it is in communcation mode or disconnected from the GSM network.

3.3.8. Analog to Digital Converter

Analog to Digital converter inputs are provided by WISMO2C. This converter is a 10 bits converter in a range of 0 to 2.5V .

Pin description

Signal	Pin number	I/O	I/O type	Description
AUXV0	33	I	Analog	A/D converter

Electrical Characteristics

Parameter	Min	Max	Unit
Resolution	10		bits
Sampling rate	90.3		Ksps
Input signal range	0	2.5V	V
ADC Reference Accuracy	0.5		%
Integral Accuracy	+/- 1		LSB
Differential Accuracy	+/- 1		LSB
Input Impedance (R)	10		MΩ
Input Impedance (C)		50	pF

3.3.9. Audio

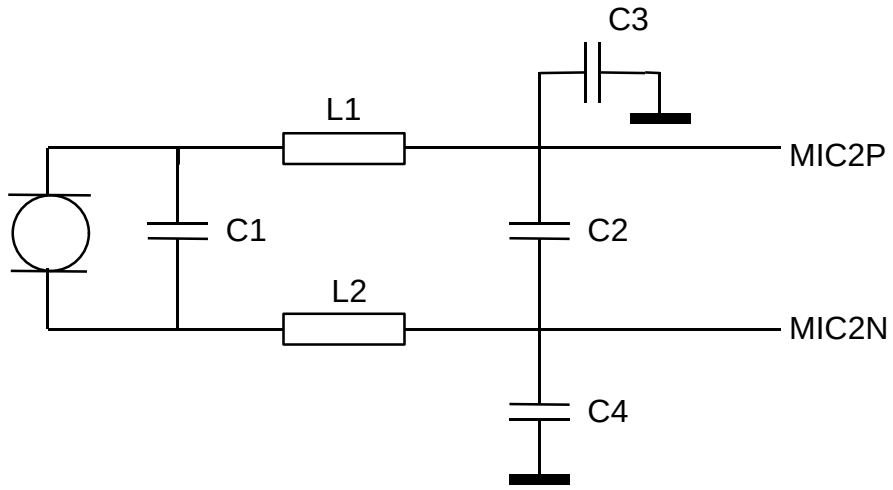
Two different microphone inputs and two different speaker outputs are provided. A buzzer output can be used as Ring Indicator.

WISMO2C included also an echo cancellation features which permits to make a hands-free function.

3.3.9.1. Microphone 2 Inputs

The MIC2 inputs are differential inputs. They already contain the necessary biasing for an electret microphone (0,5 mA and 2 Volts). Connection can be direct. The impedance of the microphone 2 has to be around 2kΩ. These inputs are the standard inputs for a handset design while MIC1 inputs can be connected to an external headset or hands-free kit.

MIC2 inputs gain can be adjusted internally. Gain can be tuned from 30dB to 51dB. The internal preamplifier can also be bypassed to achieve 0dB gain.



C1 = C2 = C3 = C4 = 22pF to 100pF
L1 = L2 = 100nH

C1 has to be as near as possible to the microphone. Microphone manufacturers provide this capacitor soldered directly on the microphone.

C2 has to be very close to the WISMO2C connector.

L1, L2, C3 and C4 has to be connected near the WISMO2C connector. Depending on the environment (ground plane, shielding ...etc) L1, L2, C3 and C4 can be removed. The best way is to foresee all the components and removing those which are not necessary to suppress TDMA noise on the audio path.

Pin description

Signal	Pin #	I/O	I/O type	Description
MIC2P	46	I	Analog	Microphone 2 positive input
MIC2N	48	I	Analog	Microphone 2 negative input

Microphone gain vs Max input voltage

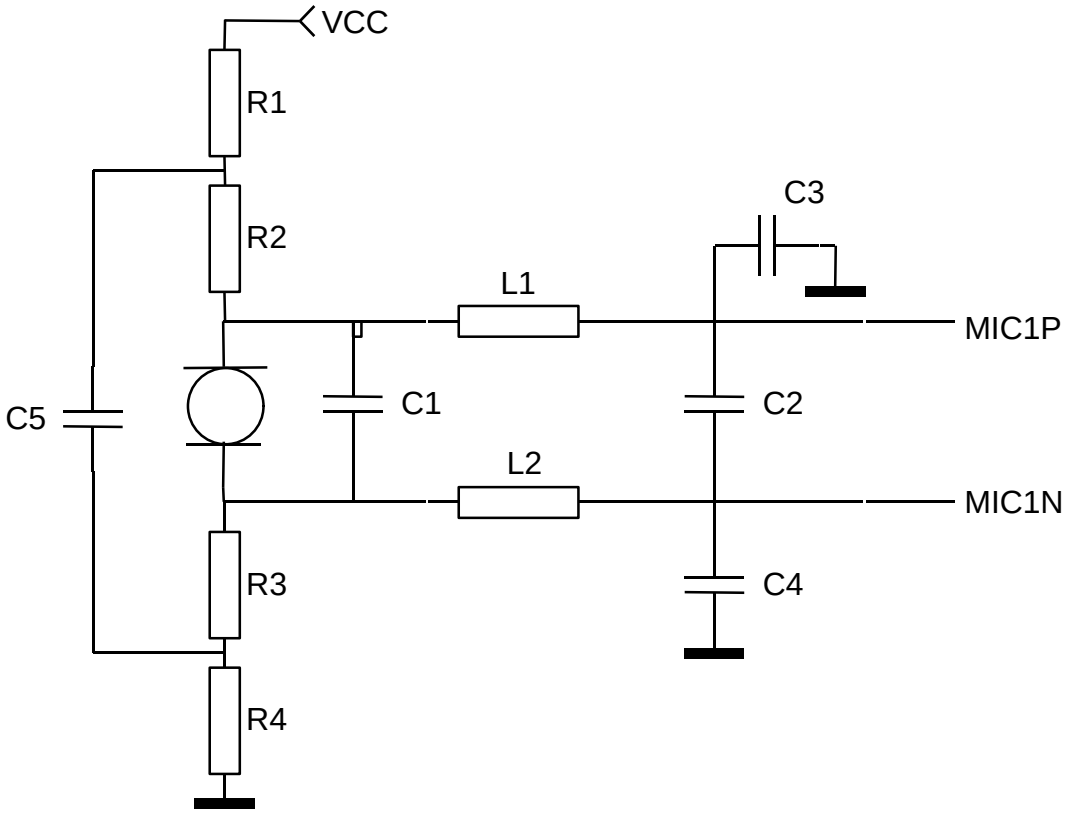
Gain (dB)	Vin (mVrms)
0	**965**
30	**30.5**
33	**21.6**
36	**15.3**
39	**10.9**
42	**7.8**
45	**5.5**
48	**3.9**
51	**2.7**

3.3.9.2. Microphone 1 Inputs

The MIC1 inputs are differential and do not have internal bias. To use these inputs with an electret microphone, bias has to be generated outside WISMO2C module. These inputs are the standard inputs for an external headset or hands-free kit. Connection can be differential or single-ended but it is recommended to use differential connection to reject common mode noise and TDMA noise. Take care to the single-ended connection. Very good ground plane, very good filtering, and shielding are mandatory to be sure to do not disturb audio path.

MIC1 inputs gain can be adjusted internally. Gain can be tuned from 30dB to 51dB. The internal preamplifier can also be bypassed to achieve 0dB gain.

Differential connection



R1 = R4 = 100 to 330Ω
R2 = R3 = typically between 1KΩ and 3.3KΩ depending microphone characteristics
C1 = C2 = C3 = C4 = 22pF to 100pF
C5 = 47µF
L1 = L2 = 100nH

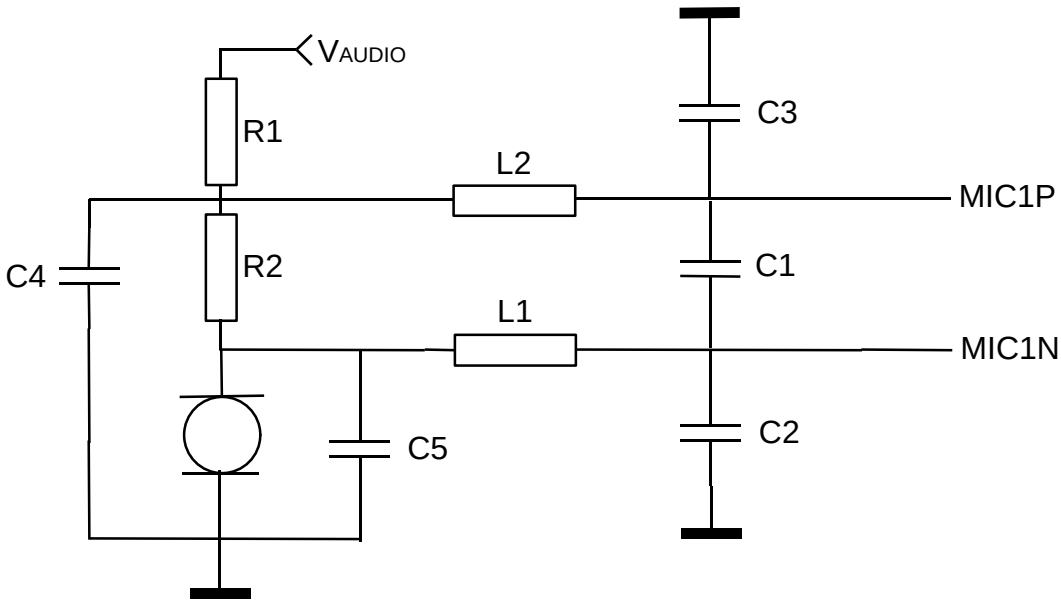
R1 and R4 are used as voltage supply filter with C5.

C1 has to be as near as possible to the microphone. Microphone manufacturers provide this capacitor soldered directly on the microphone.

C2 has to be very close to the WISMO2C connector.

L1, L2, C3 and C4 has to be connected near the WISMO2C connector. Depending on the environment (ground plane, shielding ...etc) L1, L2, C3 and C4 can be removed. The best way is to foresee all the components and removing those which are not necessary to suppress TDMA noise on the audio path.

Single-ended connection



Note : V_{AUDIO} must be very “clean” in single-ended connection (for example, VCC plus filter cell like RC or LC).

R1 = 100 to 330Ω
R2 = typically between 1KΩ and 3.3KΩ depending on V_{AUDIO} voltage level and microphone characteristics
C1 = C2 = C3 = C5 = 22pF to 100pF
C4 = 47µF
L1 = L2 = 100nH

R1 is used as voltage supply filter with C4.

C5 has to be as near as possible to the microphone. Microphone manufacturers provide this capacitor soldered directly on the microphone.

C1, C2, C3 have to be very close to the WISMO2C connector.

L1, and L2 has to be connected near the WISMO2C connector. Depending on the environment (ground plane, shielding ...etc) L1and L2 can be removed. The best way is to foresee all the components and removing those which are not necessary to suppress TDMA noise on the audio path.

Pin description

Signal	Pin #	I/O	I/O type	Description
MIC1P	42	I	Analog	Microphone 1 positive input
MIC1N	44	I	Analog	Microphone 1 negative input

Microphone gain vs Max input voltage

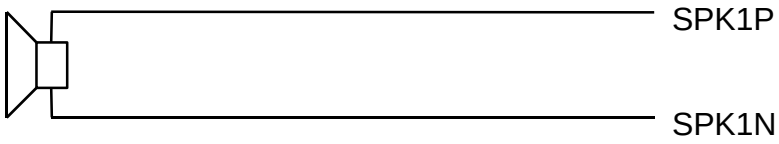
Gain (dB)	Vin (mVrms)
0	965
30	30.5
33	21.6
36	15.3
39	10.9
42	7.8
45	5.5
48	3.9
51	2.7

3.3.9.3. Speaker 1 Outputs

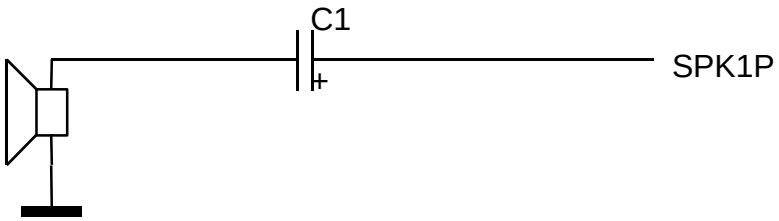
Speaker outputs SPK1 are push-pull amplifier and can drive loads down to 50 Ohms and up to 1nF. These outputs are differential and the output power can be adjusted by step of 2dB. The output can be connected directly to a speaker.

Connection can be differential or single-ended but it is recommended to use differential connection to reject common mode noise and TDMA noise. Take care to the single-ended connection. Very good ground plane is mandatory to be sure to do not disturb audio path.

Differential Connection



Single-ended Connection



C1 = 100nF to 27µF depending on the speaker characteristics.

Using single-ended connection means also losing half of the output power compared to a differential connection.

Pin description

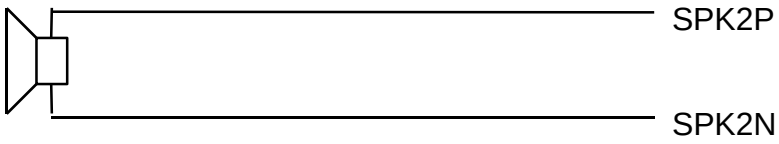
Signal	Pin #	I/O	I/O type	Description
SPK1P	41	O	Analog	Speaker 1 positive output
SPK1N	43	O	Analog	Speaker 1 negative output

3.3.9.4. Speaker 2 Outputs

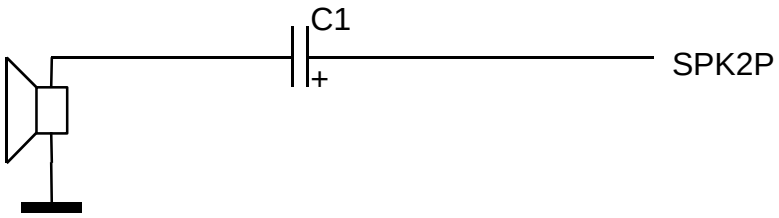
Speaker outputs SPK2 are push-pull amplifier and can drive loads down to 50 Ohms and up to 1nF. These outputs are differential and the output power can be adjusted by step of 2dB. The output can be connected directly to a speaker.

Connection can be differential or single-ended but it is recommended to use differential connection to reject common mode noise and TDMA noise. Take care to the single-ended connection. Very good ground plane is mandatory to be sure to do not disturb audio path.

Differential Connection



Single-ended Connection



C1 = 100nF to 27µF depending on the speaker characteristics and the output power.

Using single-ended connection means also losing half of the output power compared to a differential connection.

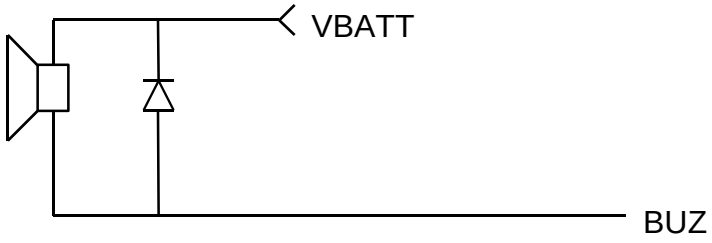
Pin description

Signal	Pin #	I/O	I/O type	Description
SPK2P	45	O	Analog	Speaker 2 positive output
SPK2N	47	O	Analog	Speaker 2 negative output

3.3.9.5. Alerter Output

The buzzer output is a digital output. A buzzer can be directly connected between this output and the ground. The maximum current is 80 mA (PEAK).

Buzzer Connection



Pin description

Signal	Pin #	I/O	I/O type	Description
BUZ	49	O		Buzzer output

Operating conditions

Parameter	Condition	Min	Max	Unit
V_{OL}	Imoy = 40mA		0.6	V
I_{PEAK}	VBATT = VBATTmax		80	mA
$I_{AVERAGE}$	VBATT = VBATTmax		40	mA

3.3.10. Battery charging interface

WISMO2C module has on board two different battery charging circuitry. One is to proceed fast charge for NiMH or NiCd batteries and the other to proceed fast charge for Li-ion batteries. These two circuitry uses the same interface which consists of a current source inputs (CHG_IN) where the constant current has to flow to charge the battery. This current value depends on the battery capacity. It is recommended to provide a current equal to the value of the capacity plus 50mA. For a 550mAh battery the current will be 600mA. The maximum current is 800mA.

The WISMO2C module monitors the battery voltage to detect the end of the charge. WISMO2C monitors also the battery temperature through the BAT_TEMP pin which has to be connected to a temperature sensor inside the battery (NTC resistor for example).

Pin description

Signal	Pin number	I/O	I/O type	Description
CHG_IN	1, 2, 4	I	Analog	Current source input
BAT_TEMP	38	I	Analog	A/D converter

Electrical Characteristics

Parameter	Min	Max	Unit
BAT_TEMP resolution	10		bits
BAT_TEMP sampling rate	90.3		Ksps
BAT_TEMP Input Impedance (R)	4.7		kΩ
BAT_TEMP Input Impedance (C)		100	nF
CHG_IN Voltage (for I=Imax)	+VBATT max + 0.7V	TBD	V
CHG_IN Current		800	mA

3.3.10.1. NiMH charging procedure

To charge NiMH battery a constant current source has to be provided through **CHG_IN** input and **BAT_TEMP** input has to be connected to a battery temperature sensor. During the procedure battery voltage and temperature are monitoring. End of charge is detected by different criteria.

1) $\Delta\theta/\Delta T$. When the battery temperature variation is increasing over 1°C/min (this value can be changed and depends on the battery manufacturer) the fast charge is stopped and a trickle charge can be started. This criteria is the main criteria.

2) $-\Delta V$. When the battery voltage is decreasing more than 5mV per cell the fast charge is stopped. This criteria is a safety criteria for NiMH battery but it is the main criteria for NiCd battery.

3) **Max Time**. When the battery is charged for more than 90min (this value can be changed) the fast charge is stopped. This criteria is a safety criteria.

4) **Max Voltage**. When the battery voltage reaches a maximum voltage which depends on the number of battery cells (between 4.8V and 5.1V for a 3 cells NiMH battery depending on the battery manufacturer. This value can be modified) the fast charge is stopped. This criteria is a safety criteria.

5) **Max Temperature**. When the battery temperature reaches 50°C (this value can be modified) the fast charge is stopped. This criteria is a safety criteria.

Electrical Characteristics

Parameter	Min	Typ	Max	Unit
BAT_TEMP Input signal range		2.5		Vpp

3.3.10.2. Li-ion charging procedure

To charge Li-ion battery a constant current source has to be provided through **CHG_IN** input, and **BAT_TEMP** input can be connected to a battery temperature sensor. During the procedure battery voltage is monitoring very accurately.

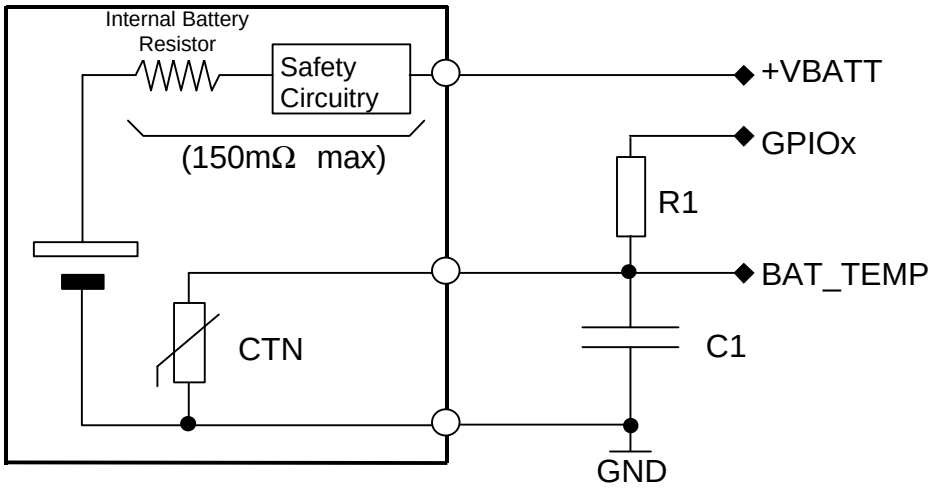
The Li-ion charging is shared in two phases. During the first phase battery is charging with a constant current until battery voltage reaches 4.1V or 4.2V depending on the battery manufacturer. In the second phase the constant current is pulsed. The width of the pulse and the frequency are modified during this phase to make a safety charge. The battery is considered charged when after a pulse the voltage stays at 4.1V (or 4.2V) during more than 10s (this time can be tuned).

The Li-ion battery must have an in-board safety circuitry to avoid complete discharge and overcharge. This circuitry is delivered by the manufacturer inside the battery pack. The impedance of this safety board has to be lower as possible to reduce the drop-out of the voltage due to RF Power Amplifier current (up to 2.0A). A maximum of 150mΩ is required.

Electrical Characteristics

Parameter	Min	Typ	Max	Unit
BAT_TEMP Input signal range		2.5		Vpp

3.3.10.3.Li-ion connection example



How to choose CTN :

To have a good stability on the GPIOx voltage, (CTN + R1) must be always bigger than 40KΩ .

How to choose R1:

R1 is choosen to have a full range of BAT-TEMP (0V to 2.5V) when the CTN value changes from the minimum to the maximum temperature

Ex : CTN(25°C) = 47K; CTN(55°C) = 10K ; CTN(-10°C) = 300K

CTN(-10°C) x VCC = (CTN(-10°C) + R1) x BAT-TEMP (full range)

R1= 47K ➔ BAT-TEMP(-10°C) = 2.42V ;BAT-TEMP(55°C) = 0.49V

How to choose C1:

C1 is choosen to have a RC filter with a time constant less than 2ms.

Ex : R(-10°C) = R1//CTN(-10°C) = 40K R(+55°C) = 8K

With C= 10nF :: RC(-10°C) = 400µs RC(+55°C) = 80µs

3.3.11. Miscellaneous

3.3.11.1. ON / ~OFF

This input is used to switch ON or OFF the WISMO2C module. To switch ON the module a high level signal has to be provided. The voltage level of this signal has to be hold between 2.4V and VDD during a minimum of 500ms. This signal can be left at high level until switch off.

The module can be switched OFF by using the keyboard interface or in using an AT command.

To switch OFF the module with AT command the Power OFF command has to be sent through the serial port and the pin ON/OFF has to be released. When the module is ready to switch OFF it cut itself its power supply. That means that even if pin ON/OFF is low the module can be still worked until the end of network disallocating procedure.

Another way to switch OFF the module is through the keyboard in maintaining an electrical contact between ROW0 and COL0. In this case the ON/OFF signal has to be released before the key is pressed.

Pin description

Signal	Pin number	I/O	I/O type	Description
ON/~OFF	6	I		Module Power ON

Electrical Characteristics

Parameter	Min	Max	Unit
Input Impedance (R)	10		kΩ
Input Impedance (C)		50	pF

Operating conditions

Parameter	I/O type	Min	Max	Unit
V_{IL}		0 V	0.6 V	V
V_{IH}		2.4 V	VDD+0.5V	V

3.3.11.2. BOOT

This input is used to download software in the Flash ROM of the WISMO2C module. When this pin is low during reset of the module, the internal boot procedure is started. In normal mode this pin has to be left open. In Internal boot mode low level has to be set through a 1K resistor. If used this input has to be driven by an open collector or an open drain.

Pin description

Signal	Pin number	I/O	I/O type	Description
BOOT	12	I	CMOS	Flash Loading

3.3.11.3. Reset

This signal is used to force a reset procedure by providing low level during at least 100µs. This signal has to be considered as an emergency reset only. A reset procedure is already driven by an internal hardware during the power-up sequence.

At power ON the module generates itself a reset so this signal can be used also to provide a reset to an external device.

If no external reset is necessary this input can be left open.

If external reset module is used (emergency reset), it may be driven by an open collector or open drain.

Pin description

Signal	Pin number	I/O	I/O type	Description
~**RST**	14	I/O		Module Reset

Electrical Characteristics

Parameter	Min	Max	Unit
Input Impedance (R)	4.7		kΩ
Input Impedance (C)		10	nF

Operating conditions

Parameter	I/O type	Min	Max	Condition
V_{T-}		1.1V	1.2 V	
V_{T+}		1.7V	1.9 V	
V_{OL}			0.4 V	I_{OL} = -50 µA
V_{OH}		2.0 V		I_{OH} = 50 µA

3.3.11.4. External Interrupt

WISMO2C provides an external interrupt input which can be used to detect accessory in a handset for example. This input is edge sensitive and an interrupt is detected when this signal goes from high to low (internally pull-up to VCC). If this signal is not used it can be left open. If used this input has to be driven by an open collector or an open drain.

Pin description

Signal	Pin number	I/O	I/O type	Description
~INTR	16	I	CMOS	External Interrupt

3.3.11.5. VCC output

This output can be used to supply some external functions like LCD, to indicate that the module is ON and to switch ON an external device. **VCC** has to be used as a digital power.

This output can be used also to determine if the WM2C module is powered up or not.

Pin description

Signal	Pin number	I/O	I/O type	Description
VCC	40	O		Digital External supply

Operating conditions

Parameter	Condition	Min	Max	Unit
Ouput voltage	I = 10mA	2.74	2.86	V
Output Current			10	mA

3.3.11.6.VCC_RTC

This pin is used as a back-up power supply for the internal Real Time Clock. The RTC is supplied by the module when it is powered up but it needs a back-up power supply to save date and hour when the module is switched off.

If the RTC is not used this pin can be left open.

Pin description

Signal	Pin number	I/O	I/O type	Description
VCC_RTC	56	I/O		RTC Back-up supply

Operating conditions

Parameter	Condition	Min	Max	Unit
Input voltage		2	2.8	V
Input Current	VCC=0V; t°C = 25°C VCC_RTC=2.5V ;		3	µA
Input Current	VCC=0V; t°:-10°C / 55°C VCC_RTC=2.5V ;		10	µA

4. Technical Specifications

4.1. Electrical specifications

4.1.1. RF connection

The impedance is 50 Ohms nominal and the DC impedance is 0 Ohm.

4.1.2. Digital I/O

All digital I/O are CMOS 3 Volts compatible.

Operating conditions

Parameter	I/O type	Min	Max	Condition
V_{IL}	CMOS	-0.5 V	0.8 V	
V_{IH}	CMOS	2.1 V	3.0 V	
V_{OL}	1X		0.2 V	I_{OL} = -1 mA
	2X		0.2 V	I_{OL} = -2 mA
	3X		0.2 V	I_{OL} = -3 mA
V_{OH}	1X	2.6 V		I_{OH} = 1 mA
	2X	2.6 V		I_{OH} = 2 mA
	3X	2.6 V		I_{OH} = 3 mA

4.2. RF performances

RF performances are compliant with REC 05.05 and REC 11.10.

The main parameters are :

- Receiver:
    - EGSM Sensitivity : < -104 dBm
    - DCS Sensitivity : < -100 dBm
    - Selectivity @ 200 kHz : > +9 dBc
    - Selectivity @ 400 kHz : > +41 dBc
    - Dynamic range : 62 dB
    - Intermodulation : > -43 dBm
    - Co-channel rejection : >= 9 dBc
- Transmitter :
    - Maximum output power (EGSM) : 33 dBm +/- 2 dB
    - Maximum output power (DCS) : 30 dBm +/- 2 dB
    - Minimum output power (EGSM) : 5 dBm +/- 5 dB
    - Minimum output power (DCS) : 0 dBm +/- 5 dB
    - H2 level : < -30 dBm
    - H3 level : < -30 dBm
    - Noise in 925 - 935 MHz : < -67 dBm
    - Noise in 935 - 960 MHz : < -79 dBm
    - Noise in 1805 - 1880 MHz : < -71 dBm
    - Phase error at peak power : < 5 ° RMS
    - Frequency error : +/- 0.1 ppm max

4.3. Climatic and mechanical environments

WM2C-G900/G1800		ENVIRONNEMENTAL CLASSES		
TYPE OF TEST	STANDARDS	STORAGE Class 1.2	TRANSPORTATION Class 2.3	OPERATING (PORT USE) Class 7.3
Cold	IEC 68-2.1 Ab test	-25° C 72 h	-40° C 72 h	-20° C (GSM) 16 h -10° C (DCS) 16 h
Dry heat	IEC 68-2.2 Bb test	+70° C 72 h	+70° C 72 h	+55° C 16 h
Change of temperature	IEC 68-2.14 Na/Nb test		-40° / +30° C 5 cycles t1 = 3 h	-20° / +30° C (GSM) 3 cycles -10° / +30° C (DCS) 3 cycles t1 = 3 h
Damp heat cyclic	IEC 68-2.30 Db test	+30° C 2 cycles 90% - 100% RH variant 1	+40° C 2 cycles 90% - 100% RH variant 1	+40° C 2 cycles 90% - 100% RH variant 1
Damp heat	IEC 68-2.56 Cb test	+30° C 4 days	+40° C 4 days	+40° C 4 days
Sinusoidal vibration	IEC 68-2.6 Fc test	5 - 62 Hz : 5 mm / s 62 - 200Hz : 2 m / s2 3 x 5 sweep cycles		
Random vibration wide band	IEC 68-3.36 Fdb test		5 - 20 Hz : 0.96 m2 / s3 20 - 500Hz : - 3 dB / oct 3 x 10 min	10 -12 Hz : 0.96 m2 / s3 12 - 150Hz : - 3 dB / oct 3 x 30 min

4.4. Interfaces

Pin #	*Name*	*I/O*	*I/O type*	*Description*	*Comment*
1	CHG_IN	I	Supply	Supply for battery charging	High current
2	CHG_IN	I	Supply	Supply for battery charging	High current
3	SIMCLK	O	2 X	Clock for SIM interface	
4	CHG_IN	I	Supply	Supply for battery charging	High current
5	SIMRST	O	2 X	Reset for SIM interface	
6	ON/~OFF	I		Power ON/OFF control	
7	SIMDATA	I/O	CMOS / 3X	I/O for SIM interface	
8	SDA/SPI_IO	I/O	CMOS/1X	I²C Data or SPI Data	
9	SIMVCC	O		SIM card supply	6mA max
10	SCL/SPI_CLK	O	1X	I²C clock or SPI clock	
11	VDD	I	Supply	Low power supply	3.1V minimum or connected to VBATT
12	BOOT	I	CMOS	BOOT	Pull down through 1K for Flash downloading
13	ROW0	I/O	CMOS/1X	Keyboard Row	
14	~RST	I/O	SCHMITT	Module Reset	Active low
15	ROW1	I/O	CMOS/1X	Keyboard Row	
16	~INTR	I	CMOS	External interrupt	Active low. 100K Pull-up inside
17	ROW2	I/O	CMOS/1X	Keyboard Row	
18	GPI	I	CMOS	General Purpose Input	100K Pull-down inside
19	ROW3	I/O	CMOS/1X	Keyboard Row	
20	GPO2	O	1X	General Purpose Output	
21	ROW4	I/O	CMOS/1X	Keyboard Row	
22	GPO1	I/O	3X	General Purpose Output	
23	COL0	I/O	CMOS/1X	Keyboard Column	
24	GPIO0	I/O	CMOS/2X	General Purpose I/O	
25	COL1	I/O	CMOS/1X	Keyboard Column	
26	GPO0/SPI_AUX	O	3X	General Purpose Output or SPI Aux enable	
27	COL2	I/O	CMOS/1X	Keyboard Column	
28	SPI_EN	O	1X	SPI enable	
29	COL3	I/O	CMOS/1X	Keyboard Column	
30	CT105/RTS	I	CMOS	RS232 interface Request To Send	Pull up to VCC with 100KΩ when not used
31	COL4	I/O	CMOS/1X	Keyboard Column	
32	CT104/RX	O	1X	RS232 interface - Receive	
33	AUXV0	I	Analog	Auxiliar ADC input 0	
34	CT108-2/DTR	I	CMOS	RS232 interface Data Terminal Ready	Pull up to VCC with 100KΩ when not used
35	*Reserved*				

36	CT107/DSR	O	1X	RS232 interface Data Set Ready	
37	CT106/CTS	O	1X	RS232 interface Clear To Send	
38	BAT_TEMP	I	Analog	ADC input for battery temperature measurement	
39	CT103/TX	I	CMOS	RS232 interface - Transmit	Pull up to VCC with 100 KΩ when not used
40	VCC	O	Supply	2.8V digital supply output	10mA max.
41	SPK1P	O	Analog	Speaker 1 positive output	
42	MIC1P	I	Analog	Microphone 1 positive input	
43	SPK1N	O	Analog	Speaker 1 negative output	
44	MIC1N	I	Analog	Microphone 1negative input	
45	SPK2P	O	Analog	Speaker 2 positive output	
46	MIC2P	I	Analog	Microphone 2 positive input	
47	SPK2N	O	Analog	Speaker 2 negative output	
48	MIC2N	I	Analog	Microphone 2 negative input	
49	BUZ	O		Buzzer output	80mA max
50	SIMPRES	I	CMOS	SIM Card Detect	
51	GPIO3 or CT109 / DCD	I/O O	CMOS/2X	General Purpose I/O RS232 - Data Carrier Detect	
52	GPIO1 FLASH LED	I/O	CMOS/2X	General Purpose I/O Module State	Handset application AT command appl.
53	GPIO4	I/O	CMOS/2X	General Purpose I/O	
54	GPIO2 or CT125 / RI	I/O O	CMOS/2X	General Purpose I/O RS232 - Ring Indicator	
55	+VBATT		Supply	Battery Input	High current
56	VCC_RTC	I/O	Supply	RTC back-up supply	
57	+VBATT		Supply	Battery Input	High current
58	+VBATT		Supply	Battery Input	High current
59	+VBATT		Supply	Battery Input	High current
60	+VBATT		Supply	Battery Input	High current

4.5. Mechanical specifications

4.5.1. Physical Features

The WISMO2C module comes in a complete self-contained shield.

Dimensions : 58.3 x 32.2 x 6.0 mm

Weight : 20 g

4.5.2. Interface Connectors

The communication interface connector is a 60 pins connector with 0.5mm pitch coming from KYOCERA / AVX group with the reference :

14 5087 060 930 861.

The one used by the OEM side has the reference :

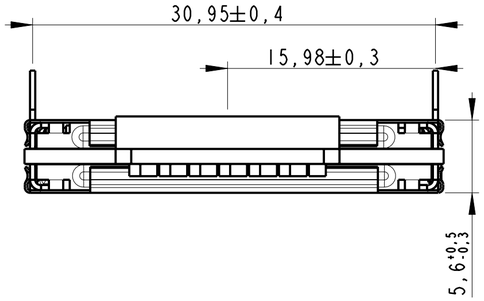
24 5087 060 000 861.

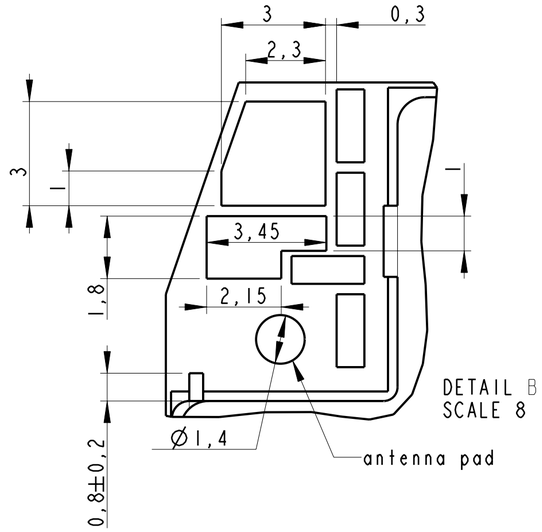
The stacking height is 3.0 mm.

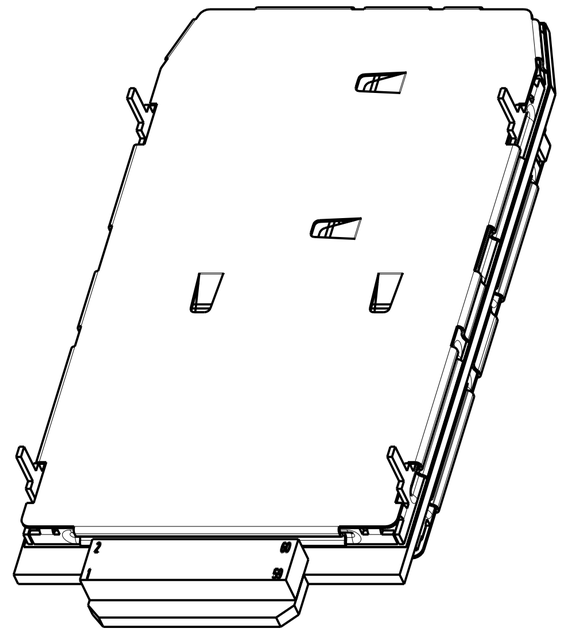
AVX group which is a part of KYOCERA group is the sales organisation to contact worlwide except for Japan where KYOCERA group is in charge of the sales.

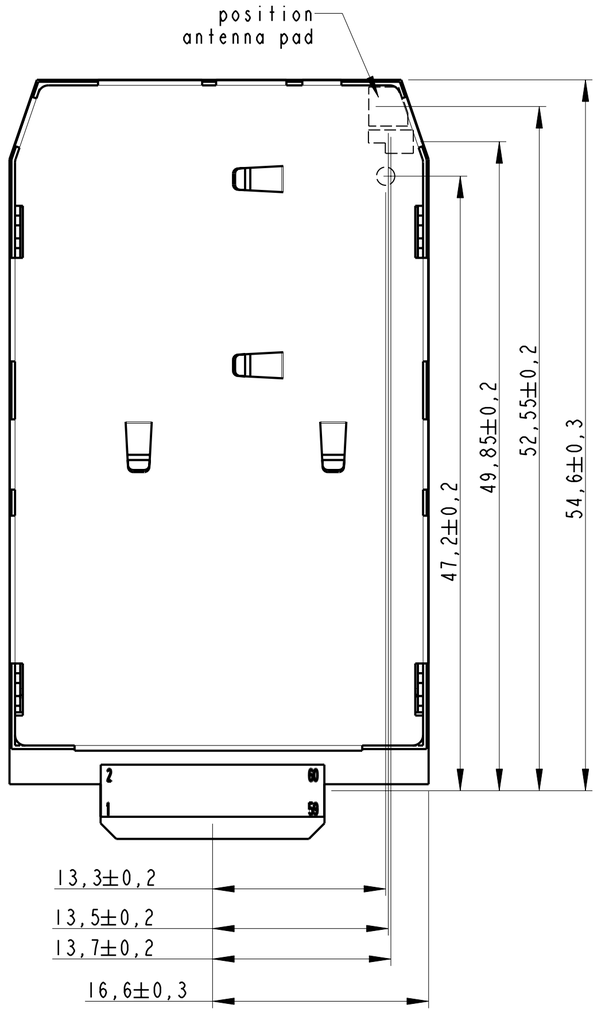
The RF connection is allowed through two land patterns defined on the PCB in order to be used by the application with spring contacts or with a RF cable directly soldered.

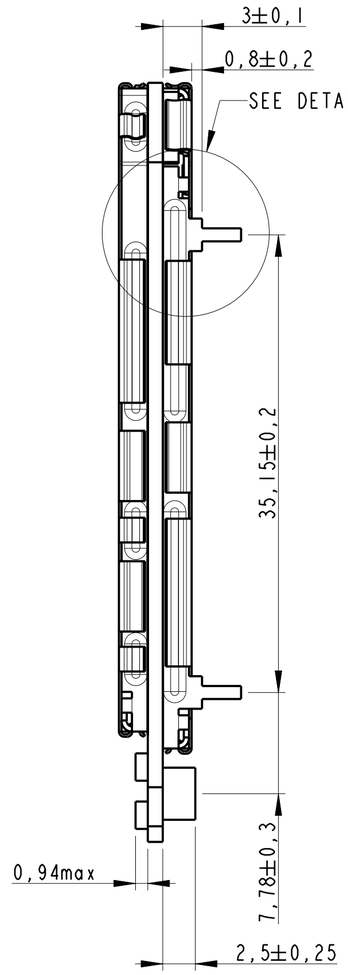
4.5.3. Mechanical drawings

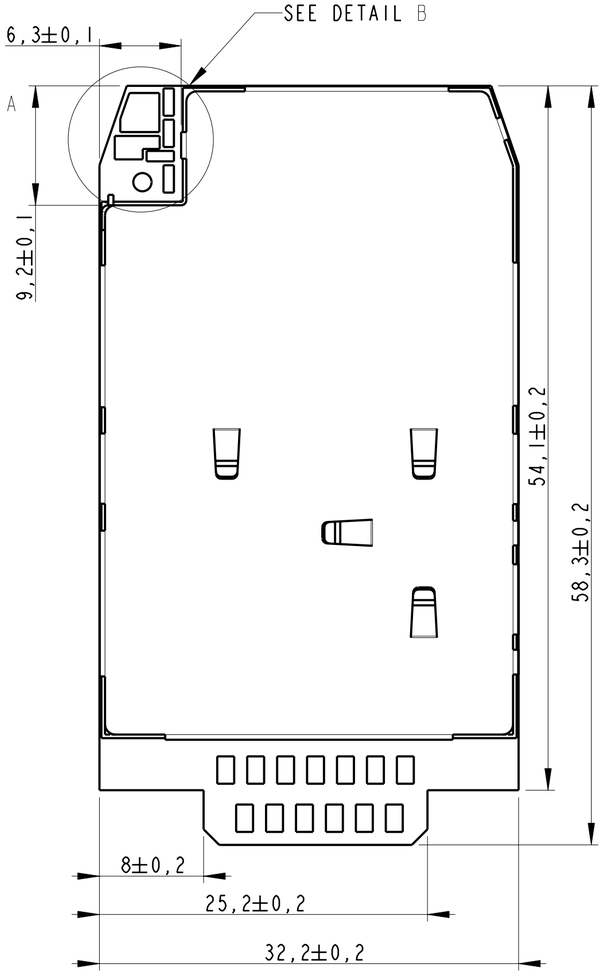


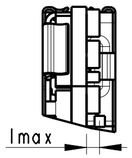


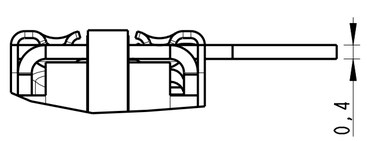


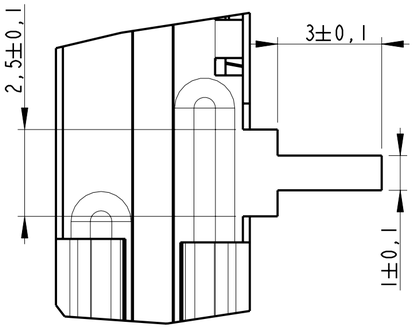












Creation	09 - 15 - 99	T. OGER	Preliminary
MODIFICATION	DATE	AUTHOR	STATUS

WM2C_AUTOMOTIVE		SCALE:3,000	FORMAT: A2	
	WM-2-9826-B-002-A			00
WAVECOM	AUTHOR T.OGER	FOLIO: 1/1		IND.