WISMO Pac P5100 series

WISMO Pac P5186 module
Product specification

Reference : **WM_PRJ_P5100_PTS_001**
Level : **001**
Date : **February 2003**

preliminary

Document Information

Revision	Date	History of the evolution	
001	February 2003	First edition	

preliminary

Contents

Cautions

Information provided herein by Wavecom is accurate and reliable. However no responsibility is assumed for its use. Please read carefully the safety precautions for a terminal based on WISMO Pac P5186.

General information about Wavecom and its range of products is available at the following internet address: http://www.wavecom.com

Trademarks

WAVECOM, WISMO are trademarks or registered trademarks of Wavecom S.A. All other company and/or product names mentioned may be trademarks or registered trademarks of their respective owners.

preliminary

Overview

This document defines and specifies the WISMO Pac P5186 module.

An extension to P5186 designation will determine the FLASH memory size available on the module.

Two versions of the WISMO Pac P5186 module are available:

- **P5186B**: E-GSM/GSM - GPRS class 10 **850/900/1800/1900 MHz** version with **32 Mbits** of FLASH memory and **4 Mbits** of SRAM (32/4).

- **P5186D**: E-GSM/GSM - GPRS class 10 **850/900/1800/1900 MHz** version with **64 Mbits** of FLASH memory and **8 Mbits** of SRAM (64/8).

- **P5186E**: E-GSM/GSM - GPRS class 10 **850/900/1800/1900 MHz** version with **64 Mbits** of FLASH memory and **4 Mbits** of SRAM (64/4).

In this document, "P5186" is referring to the products listed here-above.

preliminary

Reference Documents

[1]   Wavecom Acceptance and Verification Plan
        WAVE Plan, Release 1.4

[2]   WISMO Pac P5186 module Manufacturing Guide
        WM_PRJ_P5100_PTS_002

[3]   AT Commands Interface Guide
        WM_SW_OAT_IFS_001

[4]   WISMO Pac P5186 module Customer design Guidelines
        WM_PRJ_P5100_PTS_003

1 General Description

1.1 General information

WISMO Pac P5186 module is a self-contained GSM/E-GSM/DCS/PCS - GPRS 850/E-900/1800/1900 quad band module including the following features:

- 25.4 (+/-0.2) x 32.4 (+/-0.2) x 4.75 (+0.50/-0.25) mm^3 [TBC].
- 2 Watts E-GSM900 and GSM850 radio section running under 3.6 Volts.
- 1 Watt DCS1800 and PCS1900 radio section running under 3.6 Volts.
- Digital section running under 1.8 Volts.
- 1.8 V and 3 V SIM interface.
- Real Time Clock with calendar.
- Battery charge management.
- Echo Cancellation + Noise Reduction.
- Full GSM or GSM/GPRS software stack.
- Hardware GPRS class 10 capable.
- Semi-complete shielding.
- Complete interfacing through an external SMD connection:
  - o Power supply,
  - o Serial link,
  - o Audio,
  - o SIM card interface,
  - o Keyboard,
  - o LCD (available with AT commands only when connected to the parallel bus),
  - o 50 Ω adapted antenna connection.

The WISMO Pac P5186 module is designed to fit in very small terminals and only some custom functions have to be added to make a complete Quad Band solution:

- Keypad and LCD module,
- Earpiece and Microphone,
- Base connector,
- Battery,
- Antenna,
- SIM connector,
- Vibrator,
- External LED.

1.2 Functional description
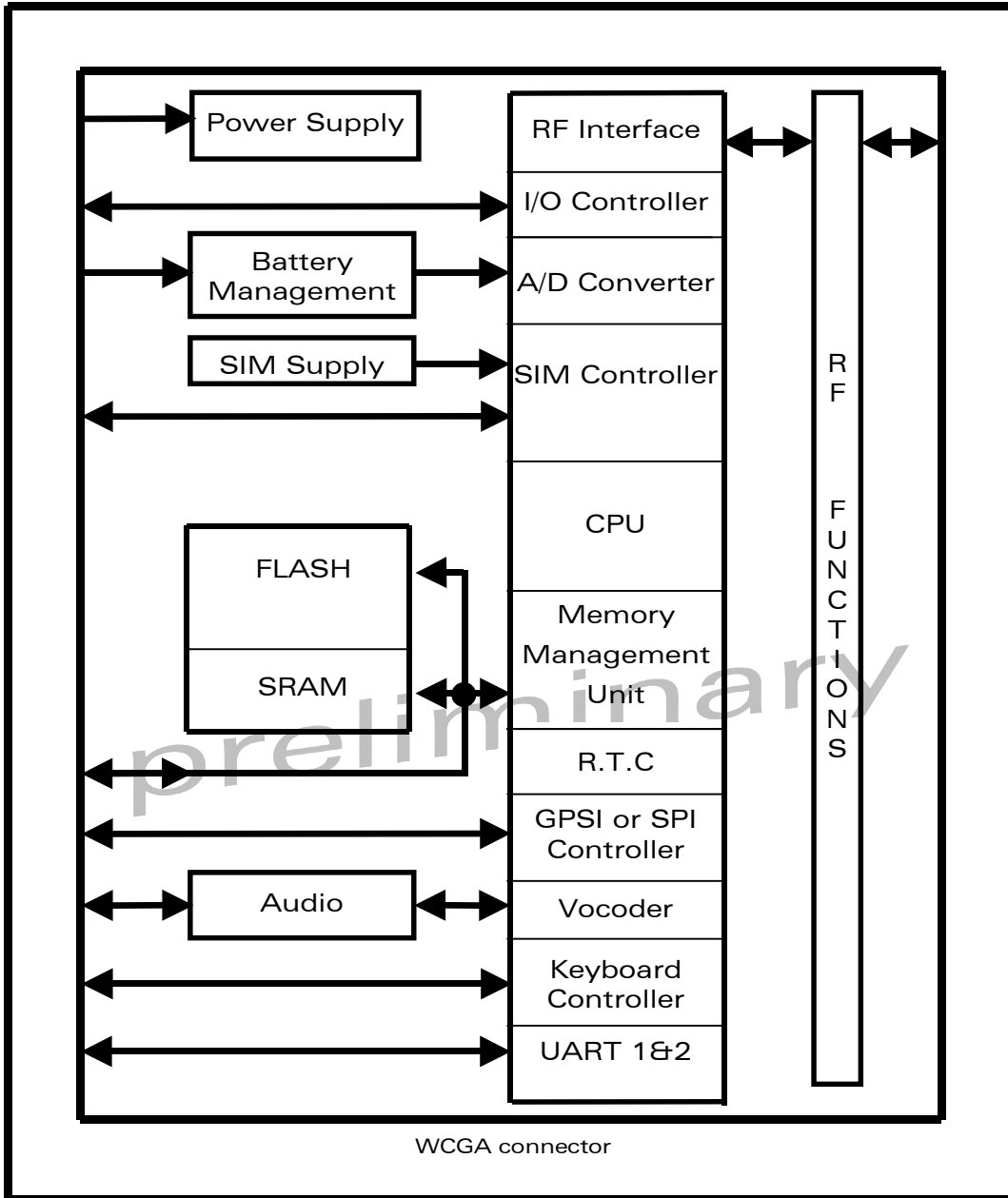
Figure 1: Functional architecture

1.2.1 RF functionalities

1.2.1.1   RF architecture

The RF part is based on a specific quad band chipset including:

- Low Intermediate Frequency (IF) Receiver,

- Offset loop transmitter,

- Quad band PA module including control loop.

1.2.1.2   RF frequencies

The RF functionalities comply with the Phase II E-GSM 900/DCS 1800 and GSM 850/PCS 1900 recommendation.

The frequencies are:

	Transmit band (Tx)	Receive band (Rx)
GSM 850	824 to 849 MHz	869 to 894 MHz
E-GSM 900	880 to 915 MHz	925 to 960 MHz
DCS 1800	1710 to 1785 MHz	1805 to 1880 MHz
PCS 1900	1850 to 1910 MHz	1930 to 1990 MHz

1.2.1.3 RF performances

RF performances are compliant with the ETSI recommendation 05.05.

The main parameters for Transmitter are:

	GSM 850	E-GSM 900	DCS 1800	PCS 1900
Maximal output power	+33 dBm +/-2dB	+33 dBm +/-2 dB	+30 dBm +/-2 dB	+30 dBm +/-2 dB
Minimal output power	+5 dBm +/-5 dB	+5 dBm +/-5 dB	+0 dBm +/-5 dB	+0 dBm +/-5 dB
Frequency error	<90 Hz peak		< 180 Hz peak	
Phase error	<5° rms < 20° peak			
H2 Output harmonic spurious level	< -30 dBm			
H3 Output harmonic spurious level	< -30 dBm			

The main parameters for Receiver are:

		GSM 850	E-GSM 900	DCS 1800	PCS 1900
Reference sensitivity – Static & TuHigh -		-102 dBm	-102 dBm	-102 dBm	-102 dBm
Selectivity	@ 200 kHz	> +9 dBc			
	@ 400 kHz	> +41 dBc			
Linear dynamic range		63 dB			
Co-channel rejection		>= 9 dBc			

1.2.2 Baseband functionalities

The digital part of WISMO Pac P5186 module is based on a Wavecom proprietary chip (WHAT 2). This chipset is using a 0.21 μm mixed technology CMOS, which allows massive integration as well as low current consumption.

1.3 Firmware

WISMO Pac P5186 module is designed to be integrated into various types of applications such as personal communication devices, including Mobile Phones and Personal Digital Assistants.

For applications using an external processor to control the module, the firmware offers a software interface based on AT commands. With this standard software, some interfaces of the module might not be available.

This symbol is used to indicate the interfaces not available with AT commands.

These functions have then to be managed externally i.e using the main processor of the application.

preliminary

2 Interfaces

> **Some of the WISMO interface signals are multiplexed in order to limit number of pins but this architecture implies some limitation.**
>
> **For example, in case of using SPI Bus, the two-wire bus cannot be used.**

> **All external signals must be inactive when the WISMO module is OFF to avoid any damage when starting and allow WISMO module to start correctly.**

2.1 Interface connector

A WCGA (Wavecom Column Grid Array) reflow connector is provided to interface the WISMO Pac P5186 module with a mother board supporting peripherals such as LCD module, keypad, SIM card reader, battery connection…

The WISMO Pac P5186 module WCGA connector supports 204 pins (refer to P5186 footprint, paragraph 3.4).

The antenna connection is available through one pin of the WCGA interface. The RF output impedance is 50 Ω and the mother board design must follow this constraint.

WCGA is a 1.00 mm pitch package.

Caution: the WISMO Pac P5186 module supports:

- a 1.8 V digital parallel interface,
- a 1.8 V and 2.8 V GPIO interface.

2.2 Power supply

2.2.1 General description

The power supply is one of the key issues in the design of a GSM terminal. Due to the bursted emission in GSM or GPRS, the power supply must be able to deliver high current peaks in a short time. During these peaks the ripple (U_{ripp}) on the supply voltage must not exceed a certain limit.

In communication mode:

- a GSM terminal emits one 577 μs radio burst every 4.615 ms,
- a GPRS class 10 terminal emits two 577 μs radio bursts every 4.615 ms.

VBATT

IBATT

t = 577 µs

T = 4.615 ms

Uripp

Uripp
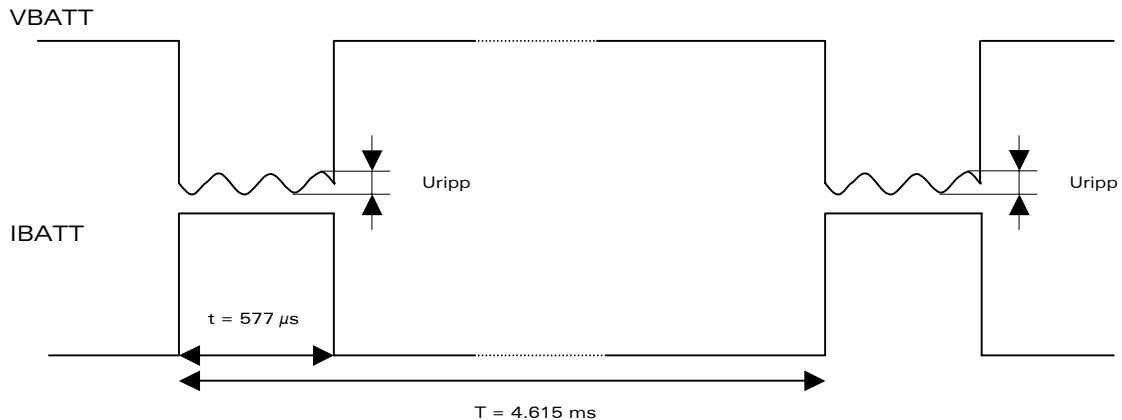
Figure 2: Typical power supply voltage in GSM mode

VBATT is used to supply both Baseband and RF parts. The WISMO Pac P5186 module may be directly connected to a Li-Ion battery. The internal impedance of the battery must be lower than 150 mΩ to limit voltage drop-out within emission burst (max. drop 0.3 V @ 2 W).

Battery internal impedance must take into account:

- the internal impedance of the battery cell,
- the protection circuit impedance,
- the "packaging" impedance (contacts),
- the PCB track impedance up to the module pins.

RF Supply: VBATT supplies directly the RF components with 3.6 V. It is essential to keep a minimum voltage ripple at this connection in order to avoid any phase error. The RF Power Amplifier current (2.0 A peak in GSM or GPRS mode, with a 50Ω RF output) flows with a ratio of 1/8 or 2/8 of the time. The rising time is around 10 µs.

BASEBAND Supply: VBATT supplies the LDO regulators of the module.

Power Supply Voltage

	V_{MIN}	V_{NOM}	V_{MAX}	Ripple max
VBATT	3.3 V (*)	3.6 V	4.5 V	50 mVpp for f<200 kHz
				2 mVpp for f>200 kHz

(*): This value has to be guaranteed during the burst (with 2.0 A Peak in GSM or GPRS mode).

2.2.2 Power consumption

The following information is given assuming a 50 Ω RF output.

Power consumption in OFF mode
(Module supplied, OFF state, no software running)

	Conditions	I_{NOM}	I_{MAX}
VBATT	Off	10μA [TBD]	30μA [TBD]

Power consumption in E-GSM/GPRS 900 MHz and GSM/GPRS 850 MHz mode class 10 (informative values)

	Conditions	I_{NOM}	I_{MAX}
VBATT	During TX bursts @PCL5	[TBD]	1.7 A peak (TBC)
VBATT	During RX bursts	[TBD]	150 mA peak (TBC)
VBATT	Average @PCL5	[TBD]	370 mA (TBC)
VBATT	Average @PCL8	[TBD]	270 mA (TBC)
VBATT	Average @ PCL5 GPRS class 10	[TBD]	740 mA (TBC)
VBATT	Average @ PCL8 GPRS class 10	[TBD]	540 mA (TBC)
VBATT	Average Idle mode	2 mA (TBC)	4 mA (TBC)

Power Control Level: PCL5=2 W typ.; PCL8=0,5 W typ.

Power consumption in GSM/GPRS 1800 MHz and GSM/GPRS 1900 MHz mode class 10 (informative values)

	Conditions	I_{NOM}	I_{MAX}
VBATT	During TX bursts @PCL0	[TBD]	1.3 A peak (TBC)
VBATT	During RX bursts	[TBD]	150 mA peak (TBC)
VBATT	Average @PCL0	[TBD]	310 mA (TBC)
VBATT	Average @PCL3	[TBD]	230 mA (TBC)
VBATT	Average @ PCL0 GPRS class 10	[TBD]	640 mA (TBC)
VBATT	Average @ PCL3 GPRS class 10	[TBD]	460 mA (TBC)
VBATT	Average Idle mode	2 mA (TBC)	4 mA (TBC)

Power Control Level: PCL0=1 W typ.; PCL3=0,25 W typ.

2.3 Electrical information for digital I/O

Some digital I/O are supplied with 2.8 V and comply with 3 V CMOS.

Operating conditions

Parameter	Input type	Output type	Min	Max	Condition
VDD	Digital I/O supply		2.8 V +/-3%		
V_{IL}	CMOS		-0.3 V [TBC]	0.8V [TBD]	
V_{IH}	CMOS		2.1 V [TBC]	3.0 V [TBC]	
V_{OL}				0.2 V [TBC]	
V_{OH}			2.6 V [TBC]		

Some digital I/O are supplied with 1.8 V.

Operating conditions

Parameter	Input type	Output type	Min	Max	Condition
VDD	Digital I/O supply		1.8 V		
V_{IL}	CMOS		-0.3 V	0.5 V	
V_{IH}	CMOS		1.4 V	2 V	
V_{OL}			0 V	0.2 V	
V_{OH}			1.6 V	1.8 V	

Input Thresholds

Parameter	Min	Max	Condition
VIH: Logic high input threshold	0.7 VDD	VDD	Guaranteed input high
VIL: Logic Low input threshold	0 V (Vss)	0.3 VDD	Guaranteed input low

2.4 SPI Bus

The WISMO Pac P5186 module offers two SPI bus.

The two SPI bus include:

- a clock signal (SPIx_CLK)
- a data signal (SPIx_DATA).

The Chip Enable signal is usually defined by a GPIO.

The different transfer speeds are: 6.5 Mbits/s, 4.33 Mbits/s, 3.25 Mbits/s, 2.166 Mbits/s.

This bus can typically be used to drive a serial LCD, or a MIDI synthesizer.

Pin description

Signal	Pin number	I/O	Input type	Output Type	Description
SPI2_CLK[*]	X6	O		2V8	SPI2 Serial Clock
SPI2_DATA[*]	X4	I/O	CMOS	2V8	SPI2 Data
SPI3_CLK[*]	Q1	O		2V8	SPI3 Serial Clock
SPI3_DATA[*]	P1	I/O	CMOS	2V8	SPI3 Data

[*]Multiplexed with other signals (refer to3.3 External pinout).

When the SPI2 is used signals DTR and DSR of UART1 are lost.
When the SPI3 is used signals RI and DCD are lost.

2.5 Two-wire Bus Interface

The 2-wire bus (also called I2C bus) includes a CLK signal (SCL) and a DATA signal (SDA) complying with a standard 400 kHz 2-wire bus.

As SPI bus, it can be used to drive a LCD.

Pin description

Signal	Pin number	I/O	Input Type	Output Type	Description
SCL[(*)]	P1	O		2V8	Serial Clock
SDA[(*)]	Q1	I/O	CMOS	2V8	Serial Data

[(*)]Multiplexed with other signals (refer to paragraph 3.3 External pinout).

Running speed: 54, 65, 81.3, 216, 325 and 433 kHz.

2.6 Parallel Bus

2.6.1 General description

The WISMO Pac P5186 modules offer a 16-bit parallel bus supported with 22 wires.

In addition to the 16 data bits, the parallel bus includes the control signals (/RD, /WR, A2, A3, LCDEN, USR0N). The parallel bus is 1V8 compliant.

LCDEN signal is a Chip Enable dedicated to drive a peripheral with parallel bus such as, for example, a LCD.

The following LCDEN signal timing characteristics are configurable:

- Setup time,
- Hold time,
- Enable time.

USR0N is a Chip Select signal which can be used to drive any [TBC] standard parallel peripheral device.

2.6.2 Parallel bus Pinout

Pin description

Signal	Pin Number	I/O	Input type	Output type	Description
/RD	A6	O		1V8	Read operation
/WR	A16	O		1V8	Write operation
A2	A4	O		1V8	Address bit 2
A3	A7	O		1V8	Address bit 3
LCDEN[*]	A2	O		1V8	LCD Enable
USR0N[*]	O2	O		1V8	Chip Select User 0
D0	B3	I/O	CMOS 1V8	1V8	Data Bus 0
D1	A3	I/O	CMOS 1V8	1V8	Data Bus 1
D2	B4	I/O	CMOS 1V8	1V8	Data Bus 2
D3	B9	I/O	CMOS 1V8	1V8	Data Bus 3
D4	B10	I/O	CMOS 1V8	1V8	Data Bus 4
D5	A9	I/O	CMOS 1V8	1V8	Data Bus 5
D6	B7	I/O	CMOS 1V8	1V8	Data Bus 6
D7	A10	I/O	CMOS 1V8	1V8	Data Bus 7
D8	B6	I/O	CMOS 1V8	1V8	Data Bus 8
D9	B12	I/O	CMOS 1V8	1V8	Data Bus 9
D10	A12	I/O	CMOS 1V8	1V8	Data Bus 10
D11	A15	I/O	CMOS 1V8	1V8	Data Bus 11
D12	A13	I/O	CMOS 1V8	1V8	Data Bus 12
D13	B13	I/O	CMOS 1V8	1V8	Data Bus 13
D14	B15	I/O	CMOS 1V8	1V8	Data Bus 14
D15	B16	I/O	CMOS 1V8	1V8	Data Bus 15

[*]Multiplexed with other signals (refer to paragraph 3.3 External pinout).

2.7 PWM Outputs

Two PWM interfaces are available on WISMO Pac P5186 modules.

The PWM features are the following:

- Frequency range: 397 Hz to 101563 Hz,

- Duty cycle mode 1: 0 % to 99.2 % by 1/128 step,

- Duty cycle mode 2: 0 % to 99.6 % by 1/256 step,

- Output voltage: 1V8.

Pin description

Signal	Pin number	I/O	Input type	Output type	Description
PWM0^(*)	O1	O		1V8	PWM0 output
PWM1^(*)	C1	O		1V8	PWM1 output

(*)Multiplexed with other signals (refer to paragraph 3.3External pinout).

2.8 Keyboard interface

This interface provides 10 connections:

- 5 rows (ROW0 to ROW4),

- 5 columns (COL0 to COL4).

Digital scanning and debouncing are done within the P5186 module. No discrete components like R,C (Resistor, Capacitor) are needed.

Pin description

Signal	Pin number	I/O	Input type	Output Type	Description
ROW0	M1	I/O	CMOS		Row scan
ROW1	J2	I/O	CMOS		Row scan
ROW2	M2	I/O	CMOS		Row scan
ROW3	L1	I/O	CMOS		Row scan
ROW4	I1	I/O	CMOS		Row scan
COL0	L2	I/O	CMOS		Column scan
COL1	K1	I/O	CMOS		Column scan
COL2	I2	I/O	CMOS		Column scan
COL3	J1	I/O	CMOS		Column scan
COL4	H1	I/O	CMOS		Column scan

2.9 Serial Link, UART1

2.9.1 General description

A flexible 6-wire serial interface is available complying with V24 protocol signaling but not with V28 (electrical interface) due to a 2.8 Volt interface.

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).
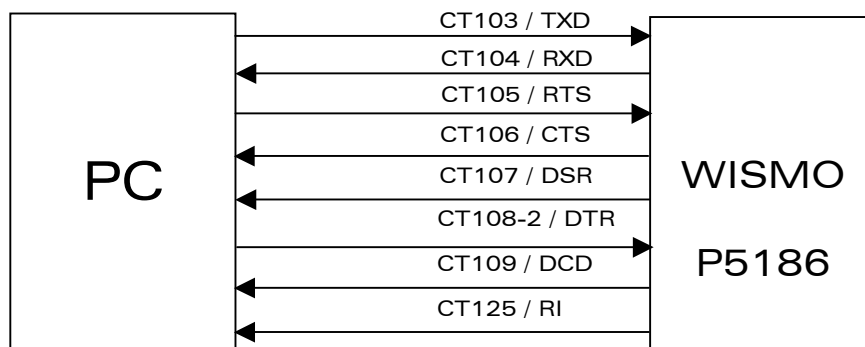
Figure 3: Serial Link signals for UART1

The set of serial link signals can be required for GSM DATA service application and is generated by the general purpose I/O provided by the WISMO Pac P5186 module.

The WISMO Pac P5186 module is fully software compatible with standard product 16C750 by using additional registers to control extended functions.

Pin description

Signal	Pin number	I/O	Input type	Output type	Description
CT103 / TXD1(*)	X3	I	CMOS 2V8		Transmit serial data
CT104 / RXD1(*)	W4	O		2V8	Receive serial data
CT105 / RTS1(*)	W6	I	CMOS 2V8		Request To Send
CT106 / CTS1(*)	X2	O		2V8	Clear To Send
CT107 / DSR1(*)	X6	O		2V8	Data Set Ready
CT108-2 / DTR1(*)	X4	I	CMOS 2V8		Data Terminal Ready

(*)Multiplexed with other signals (refer to paragraph 3.3External pinout).

UART 1 is according to PC view and is a 2V8 interface.

The 2 additional signals, Data Carrier Detect (CT109/DCD) and Ring Indicator (CT125/RI), can be simulated by GPIO in 2V8. Usually, GPIO6 is used for RI and GPIO7 is used for DCD.

The rising time and falling time of the reception signals (mainly CT103) have to be less than 100 ns.

The WISMO P5186 module has been designed to be operated using all the serial interface signals. In particular, it is necessary to use RTS and CTS for hardware flow control in order to avoid data corruption during transmission.

Warning:

The application must allow the WISMO serial link signals + the BOOT, the RESET and the ON/OFF module signals to be easily accessed thus allowing the module firmware to be upgraded.

2.9.2 Main features

- Fully software compatibility with standard 16C750
- 64-byte FIFOs for TX/RX buffering
- Programmable serial interface :
    o 5, 6, 7 or 8 bit characters
    o Even, odd, stick or no parity bit generation
    o 1, 1.5 or 2 stop bit generation
- Line break generation and detection
- Line error detection (parity, framing, overrun)
- Modem control functions (CTS, RTS, DSR, DTR)
- Programmable auto RTS and auto CTS
- Auto flow control with programmable XOFF/XON characters
- Automatic special character recognition
- Automatic baud rate selection
- Automatic format recognition (autoframing)
- Programmable baud rate generator (50 to 1Mb/s)
- Full status reporting capabilities with prioritised interrupts
- Loop back mode capability for diagnostic

2.10 Serial link, UART2

Not available in the current version (X.40), but planned for the future version (X.50) X= 6, 5 or 4

For future applications (e.g. Bluetooth connectivity) the second serial interface will be available.

UART2 is according to PC view, and is a 1V8 interface.

Pin description

Signal	Pin number	I/O	Input type	Output type	Description
CT103 / TXD2[(*)]	O2	I	CMOS 1V8		Transmit serial data
CT104 / RXD2[(*)]	P2	O		1V8	Receive serial data
CT105 / RTS2[(*)]	G2	I	CMOS 1V8		Request To Send
CT106 / CTS2[(*)]	O1	O		1V8	Clear To Send

[(*)]Multiplexed with other signals (refer to paragraph 3.3External pinout).

2.11 SIM interface

2.11.1 General description

5 signals are available:

- SIM_VCC: SIM power supply,
- SIM_RST: reset,
- SIM_CLK: clock,
- SIM_DATA: I/O port,
- SIM_PRES: SIM card detect.

The SIM interface controls 3V or 1V8 SIM cards. This interface is fully compliant with GSM 11.11 and 11.12 recommendations concerning SIM functions.

2.11.2   Signal description

Pin description

Signal	Pin number	I/O	Input type	Output Type	Description
SIM_CLK	E1	O		1V8 / 3V	SIM Clock
SIM_RST	F2	O		1V8 / 3V	SIM Reset
SIM_DATA	G1	I/O	CMOS	1V8 / 3V	SIM Data
SIM_VCC	F1	O		1V8 / 3V	SIM Power Supply
SIM_PRES(*)	G2	I	CMOS 1V8 max**		SIM Card Detect

(*)Multiplexed with other signals (refer to paragraph 3.3External pinout).

(**)For either 1V8 or 3V SIM cards.

preliminary

Electrical Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
SIM_DATA V_{IH}	I_{IH} = ± 20 μA	0.7xSIM_VCC			V
SIM_DATA V_{IL}	I_{IL} = 1 mA			0.3xSIM_VCC	V
SIM_RST, SIM_DATA SIM_CLK V_{OH}	Source current = 20 μA	SIM_VCC – 0.1V			V
SIM_RST, SIM_DATA SIM_CLK V_{OL}	Sink current = -200 μA			0.1	V
SIM_VCC* Output Voltage	I_{SIM_VCC} <= 6 mA	2.70	2.80	2.90	V
SIM_VCC** Output Voltage	I_{SIM_VCC} <= 6 mA	1.70	1.80	1.90	V
SIM_PRES V_{IH}		1.40		2.0	V
SIM_CLK Rise/Fall Time	Loaded with 30 pF			50	ns
SIM_RST, SIM_DATA Rise/Fall Time	Loaded with 30 pF			1	μs
SIM_CLK Frequency	Loaded with 30 pF			3.25	MHz

*assuming a 3V interface.

** assuming a 1V8 interface.

Note for SIM_PRES connection:

- When not used it has to be tied to V-CORE (1V8).

- When used, a low to high transition means that the SIM card is inserted and a high to low transition means that the SIM card is removed.

2.11.3   SIM 1V8/3V management

It is possible to manage dual voltage (1V8/3V) or 3V only SIM cards with a WISMO Pac P5186 module using the internal level shifter.

2.12   SCI interface

2.12.1   General description

5 signals are available:

- SCI_PWR: SCI power supply command (SCI_PWR is not a power supply source but a command for an external 3 V SCI power supply),

- SCI_RST: reset,

- SCI_CLK: clock,

- SCI_DATA: I/O port,

- SCI_PRES: SCI card detect.

The SCI interface controls 3 V SCI cards. This interface is fully compliant with GSM 11.11 and 11.12 recommendations concerning SIM functions.

2.12.2   Signal description

Pin description

Signal	Pin number	I/O	Input type	Output Type	Description
SCI_CLK(*)	V1	O		3V	SCI Clock
SCI_RST(*)	W1	O		3V	SCI Reset
SCI_DATA(*)	V2	I/O	CMOS	3V	SCI Data
SCI_PWR(*)	U2	O		3V	SCI Power Supply command
SCI_PRES(*)	U1	I	CMOS 1V8 max.**		SCI Card Detect

(*)Multiplexed with other signals (refer to paragraph 3.3External pinout).

(**)For either 1V8 or 3V SIM cards.

The SCI electrical characteristics are the same as the SIM electrical characteristics.

2.13   General Purpose Input/Output

The WISMO Pac P5186 module provides:

- 17 General Purpose I/O,
- 5 General Purpose Outputs.

They are used to control any external device such as backlight or LED.

Signal	Pin number	I/O	Input type	Output Type	Description General Purpose I/O
GPIO0(*)	A2	I/O	CMOS	1V8	
GPIO1(*)	C1	I/O	CMOS	1V8	
GPIO2(*)	C2	I/O	CMOS	1V8	Internal 100 kΩ pull up
GPIO3(*)	G2	I/O	CMOS	1V8	
GPIO4	N1	I/O	CMOS	1V8	
GPIO5(*)	O2	I/O	CMOS	1V8	
GPIO6(*)	P1	I/O	CMOS	2V8	
GPIO7(*)	Q1	I/O	CMOS	2V8	
GPIO8(*)	U1	I/O	CMOS	1V8	
GPIO9(*)	U2	I/O	CMOS	2V8	
GPIO10(*)	V1	I/O	CMOS	2V8	
GPIO11(*)	V2	I/O	CMOS	2V8	
GPIO12(*)	W1	I/O	CMOS	2V8	
GPIO13(*)	X3	I/O	CMOS	2V8	
GPIO14(*)	X4	I/O	CMOS	2V8	
GPIO15(*)	W6	I/O	CMOS	2V8	
IO_AUDIO	R2	I/O	CMOS	2V8	Only when Audio is activated
GPO0(*)	O1	O	CMOS	1V8	
GPO1(*)	P2	O	CMOS	1V8	
GPO2(*)	X2	O	CMOS	2V8	
GPO3(*)	W4	O	CMOS	2V8	
GPO4(*)	X6	O	CMOS	2V8	

(*)Multiplexed with other signals (refer to paragraph 3.3External pinout).

Legend:

Free GPIOs managed by AT command.

Not free if the parallel bus is used .

Not free if the UART2 is used (valid only in the future versions X.50).

The GPIOs and GPOs that are not used are set to 0 by reset [TBC].

2.14 Analog to Digital Converter (ADC)

Two Analog to Digital Converters (ADC) are available on the WISMO Pac P5186 module. Those converters have a 10-bit resolution, ranging from 0.2 to 2.2 V.

Pin description

Signal	Pin number	I/O	I/O type	Description
AUX_ADC	X18	I	Analog	A/D converter
BAT_TEMP	W18	I	Analog	A/D converter

Electrical Characteristics

Parameter	Min	Max	Unit
Resolution	10		bits
Sampling Rate	100 [TBC]		Ksps/s
Input signal range	0	2.7	V
ADC range	0.2	2.2	V
ADC Accuracy	- 1.0	1.0	%
Input Impedance (R)	10		MΩ
Input Impedance (C)		10	nF

Note: to reduce noise perturbations, AUX_ADC input is protected by an internal RC filter (R = 4.7 kΩ, C = 10 nF)

BAT_TEMP signal is fully describe in the battery charging interface chapter.

2.15 Audio interface

2.15.1 General description

Two different microphone inputs (MIC and MIC_AUX) and two different speaker outputs (SPK and SPK_AUX) are supported.

Auxiliary audio interface made up of MIC_AUX inputs and SPK_AUX outputs is appropriate for a hands-free system or a handset with biasing external to the module.

An echo cancellation feature for hands-free application is also available.

2.15.2   Microphone inputs

The main microphone inputs (MIC) already include the biasing for an electret microphone allowing an easy connection to a handset.

The auxiliary microphone inputs (MIC_AUX) do not include an internal bias.

2.15.2.1 Common microphone inputs characteristics

2.15.2.1.1   Connection

The connection can be either differential or single-ended but using a differential connection, in order to reject common mode noise and TDMA noise, is strongly recommended.

When using a single-ended connection, be sure to have a very good ground plane, a very good filtering as well as shielding in order to avoid any disturbance on the audio path.

Internal audio filter characteristics

Frequency	Gain
0-150 Hz	< -22 dB [TBC]
150-180 Hz	< -11 dB [TBC]
180-200 Hz	< -3 dB [TBC]
200-3700 Hz	0 dB [TBC]
>4000 Hz	< -60 dB [TBC]

2.15.2.1.2   Main Microphone gain

The gain of the main microphone inputs is internally adjusted through AT+VGT command.(refer to AT commands documentation [3]).

Microphone gain vs Max input voltage (using controller 1[(*)])

Transmit Gain (dB)	Max Vin (mVrms)
[TBD]	[TBD]

Microphone gain vs Max input voltage (using controller 2[(*)])

Transmit Gain (dB)	Max Vin (mVrms)
[TBD]	[TBD]

[(*)] For more details, refer to AT documentation [3]

2.15.2.2 Main Microphone inputs (MIC)

The MIC inputs are differential ones and they include the convenient biasing for an electret microphone (0.5 mA and 2 Volts).

This electret microphone can be directly connected on these inputs. AC coupling is embedded within the module.

The impedance of the connected microphone has to be around 2 kΩ. These inputs are the standard ones for a handset design while the auxiliary microphone inputs (MIC_AUX) can be connected to an external headset or a hands-free kit.

Pin description

Signal	Pin number	I/O	I/O type	Description
MIC_P	X13	I	Analog	Main Microphone positive input
MIC_N	W13	I	Analog	Main Microphone negative input

2.15.2.3 Auxiliary Microphone inputs

The MIC_AUX inputs are differential ones and they do not include internal bias. To use these inputs with an electret microphone, bias has to be generated outside the P5186 module according to the characteristics of this electret microphone. These inputs are the standard ones used for an external headset or a hands-free kit.

Pin description

Signal	Pin number	I/O	I/O type	Description
MIC_AUX_P	X12	I	Analog	Auxiliary Microphone positive input
MIC_AUX_N	W12	I	Analog	Auxiliary Microphone negative input

2.15.3   Speaker outputs

2.15.3.1 Common speaker output characteristics

The speaker output connections can be either differential or single-ended but using a differential connection, to reject common mode noise and TDMA noise, is strongly recommended.

When using a single-ended connection, be sure to have a very good ground plane, a very good filtering as well as shielding in order to avoid any disturbance on the audio path.

2.15.3.2 Speaker gain

The gain of SPK and SPK_AUX outputs is internally adjusted.

In case of an application based on AT commands, the gain can be tuned using AT+VGR command (refer to AT commands documentation [3]).

Speaker gain vs Max output voltage

Receive Gain (dB) (*)	Max output level (Vrms)	Max.speaker load (Ω)
[TBD]	[TBD]	

(*) analog gain

2.15.3.3 Auxiliary speaker outputs

It is a 20 mW/32 ohms type.

Pin description

Signal	Pin Number	I/O	I/O type	Description
SPK_AUX_P	X15	O	Analog	Auxiliary Speaker positive output
SPK_AUX_N	W15	O	Analog	Auxiliary Speaker negative output

2.15.3.4 Main speaker outputs

It is a 100 mW/8 ohms type.

Pin description

Signal	Pin number	I/O	I/O type	Description
SPK_P	W16	O	Analog	Main Speaker positive output
SPK_N	X16	O	Analog	Main Speaker negative output

2.16   Buzzer Output

The buzzer output (BUZ) is an open drain output. A buzzer can be directly connected between this output and VBATT. The maximum peak current is 150 mA and the maximum average current is 100 mA.

Pin description

Signal	Pin number	I/O	I/O type	Description
BUZ	B18	O	Open Drain	Buzzer output

Operating conditions

Parameter	Condition	Min	Max	Unit
V_{OL}	I_{PEAK} = 100 mA		0.4 [TBC]	V
I_{PEAK}	VBATT = VBATT max		100 [TBC]	mA
$I_{AVERAGE}$			50 [TBC]	mA

2.17   Battery charging interface

2.17.1   Hardware description

The WISMO Pac P5186 module includes the necessary hardware and signals to manage the battery charge.

For this, a current generator must be connected on the CHG_IN pins. The generator current intensity depends on the battery capacity. It is recommended to provide a current equal to the value of the capacity plus 50 mA.

For a 550 mA battery the current will be 600 mA. The maximum accepted current is 800 mA.

The WISMO Pac P5186 module also monitors the temperature of the battery (for security matters) through the BAT_TEMP pin which has to be connected to a temperature sensor inside the battery pack (a 100 kΩ NTC resistor for instance).

The module is also able to monitor the battery voltage to detect the end of the charge.

Associated with AT standard software or a customized software (e.g.: handset application), these hardware functions permit to manage entirely the battery charge operation.

Pin description

Signal	Pin number	I/O	I/O type	Description
CHG_IN	D1, D2	I	Supply	Current source input
BAT_TEMP	W18	I	Analog	A/D converter

Electrical Characteristics [TBC]

Parameter	Min	Max	Unit
BAT_TEMP Resolution	10		bits
BAT_TEMP Sampling rate	100		Ksps/s
BAT_TEMP Input signal range	0	2.7	V
BAT_TEMP ADC range	0.2	2.2	V
BAT_TEMP Accuracy	-1.0	1.0	%
BAT_TEMP Input Impedance (R)	10		MΩ
BAT_TEMP Input Impedance (C)		10	nF
CHG_IN Voltage (for I=Imax)	4.8*	5.2	V
CHG_IN Current		1	A

* For a 4.2 V Li-Ion battery .

2.17.2   Software description

The charging algorithm depends on the battery type. In both situations (AT commands or customized software such as handset application), designer must develop his own charging algorithm and battery charge management (charge start and stop, temperature check, etc). Standard Wavecom AT software offers basic functions to completely control the charging operation.

The WISMO P5186 module includes a hardware pre-charge system. In case of a battery voltage below 3.1 V, battery is charged with pre-charge system that limits current below 50 mA. When battery voltage reaches 3.1 V, standard charge starts. During the pre-charging phase, the LED_OUT output indicates the pre-charging phase of the battery, by flashing (100 ms ON, 900 ms OFF).

WARNING:

**Wrong battery charging management and/or algorithm
may cause battery and/or module damage.**

Example: typical Li-ion battery charging procedure

A constant current source has to be provided through CHG_IN input in order to charge the Li-ion battery, and BAT_TEMP input has to be connected to a battery temperature sensor (within the battery or on the application board). During this procedure the voltage of the battery is accurately monitored.

The Li-ion charging involves two phases:

▪ During the first phase, the battery is charged with a constant current until its voltage reaches 4.1 V (value depending on the battery type; recommended in battery specification),

▪ During the second phase, the constant current is pulsed by the module; the width and the frequency of the pulse change during this phase in order to ensure a safety charge.

The battery is considered as fully charged when, after a pulse, the voltage remains at 4.1 V (refer to battery manufacturer recommendation) during more than 10 s.

The Li-ion battery must have an included safety circuit to avoid any discharge or overcharge. This circuit is delivered by the manufacturer inside the battery pack. The impedance of this safety circuit has to be the lowest possible in order to reduce the voltage drop-out. This drop-out is due to the RF Power Amplifier current (up to 2.0 A). A maximum of 150 mΩ is required. The timer within the battery safety circuit must be designed (by the battery manufacturer) with a delay of 1.2 s minimum between over-voltage measurements before safety cut-out.

2.18   ON / ~OFF

2.18.1   General description

This input is used to switch ON or OFF the WISMO Pac P5186 module.

A high level signal has to be provided on the pin ON/~OFF to switch ON the module. The level of the voltage of this signal has to be maintained between 2.4 V and VBATT during a minimum of 1 s. This signal can be left at high level until switch off.

Pin description

Signal	Pin number	I/O	I/O type	Description
ON/~OFF	A18	I	CMOS - Schmitt	Power control signal

Operating conditions

Parameter	I/O type	Min	Max	Unit
V_{IL}	CMOS - Schmitt		VBATT x 0.2	V
V_{IH}		VBATT x 0.8	VBATT + 0.3	V

2.18.2 Operating sequences

2.18.2.1 Power ON

Once the module is supplied by the power source, the application must set the ON/~OFF signal to high in order to start the module power ON sequence.

The ON/~OFF signal must be held for 1 s minimum. After this time, an internal mechanism keeps it on hold.

During the power ON sequence, an internal reset is automatically performed by the module for 40 ms (typical). During this phase, any external reset should be avoided.
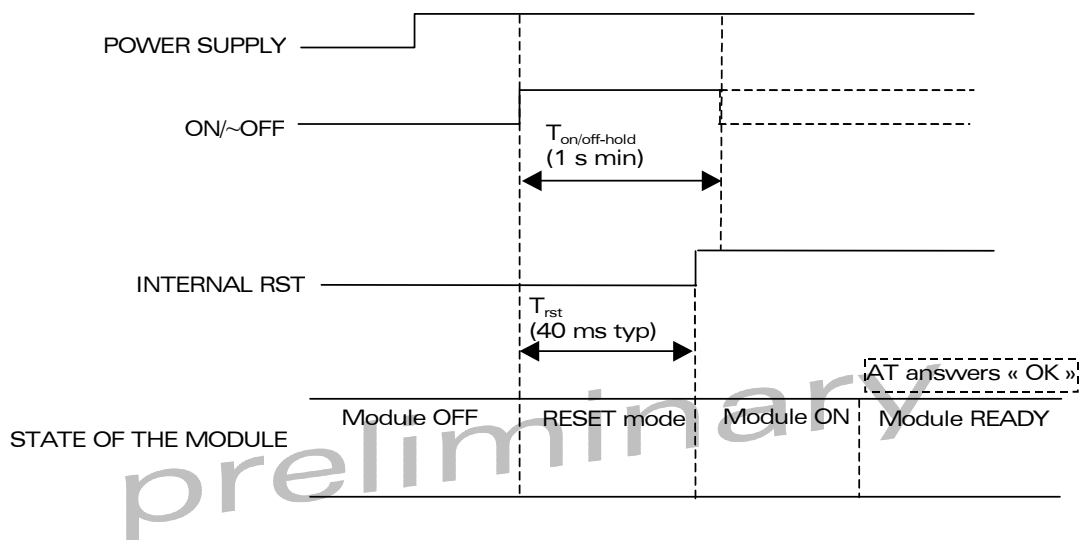

Figure 4: Power ON sequence diagram

In case of an AT application which sends an "AT" request, the AT interface answers « OK » to the application once the initialization is complete.

Another solution is to use the AT+WIND command to get an unsolicited status from the module.

For further details, please refer to the AT commands manual (AT+WIND).

2.18.2.2 Power OFF

To properly power OFF the module, the AT command application must set the ON/~OFF signal to low or release it (high impedance) and then send the AT+CPOF command to de-register from the network and switch off the module. Once the « OK » response is issued by the module, the power supply can be switched off.
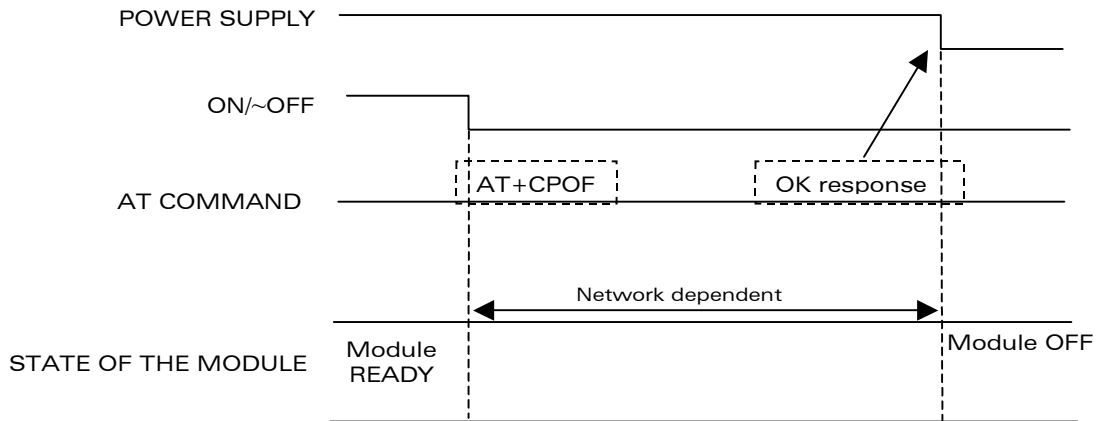

Figure 5: Power OFF sequence diagram

2.19   BOOT input

This input must be used to download the software in the Flash memory of the module.

The internal boot procedure is started when this pin is low during the reset of the module.

- Boot pin = 0 ⇨ Download mode.
- Boot pin = 1 ⇨ Normal mode.

Pin description

Signal	Pin number	I/O	I/O type	Description
BOOT	C2	I	CMOS 1V8	Enable for Flash downloading

After configuration, BOOT pin can be use as a GPIO with an internal 100 kΩ pull-up resistor.

2.20   Reset signal (~RESET)

2.20.1   General description

This signal is used to force a reset procedure by providing low level during at least 500 µs. This signal has to be considered as an emergency reset only: a reset procedure is automatically driven by an internal hardware during the power-up sequence.

This signal can also be used to provide a reset to an external device (it then behaves as an output). If no external reset is necessary, this input can be left open. If used (emergency reset), it has to be driven by an open collector or an open drain output.

Pin description

Signal	Pin number	I/O	I/O type	Description
~RESET	B1	I/O	Schmitt	Reset

Electrical Characteristics

Parameter	Min	Typ	Unit
Input Impedance (R)	2.2	4.7	kΩ
Input Impedance (C)		10	nF

Operating conditions [TBC]

Parameter	Min	Typ	Max	Condition
*V_{T-}	0.90 V		0.97 V	
*V_{T+}	1.0 V		1.2 V	
V_{OL}	0V		0.2 V	
V_{OH}	1.75V		2V	
Tdelay (time between VBATT ON and Reset=1.8 V)	20 ms	40ms	100 ms	

* V_{T-}, V_{T+} : Hysteresis thresholds

Additional comments on RESET:

The Reset process is activated either by external ~RESET signal OR by an internal signal (coming from a RESET generator). This automatic reset is activated at Power-up.

The module remains in Reset mode as long as the ~RESET signal is held low. This signal should be used only for "Emergency" reset.

A software reset is always preferred to a hardware reset.

2.20.2   Reset Sequence

To activate the "emergency" reset sequence, the ~RESET signal has to be set at low level for 500 µs minimum.
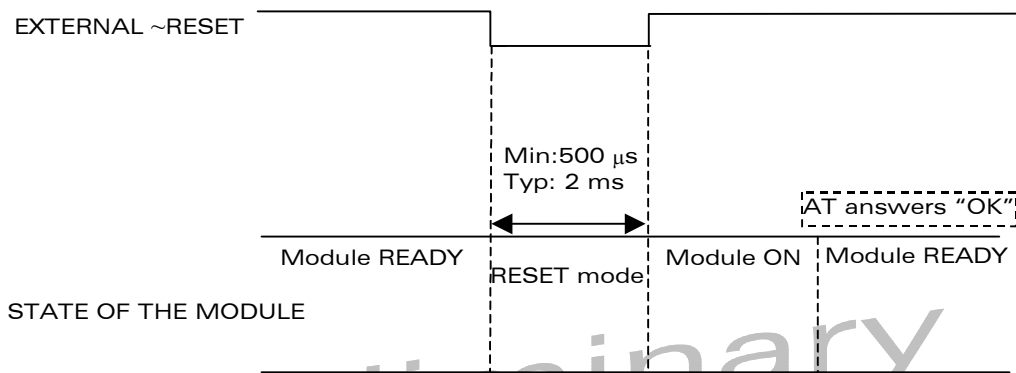
Figure 6: Reset sequence diagram

In case of an AT application which sends an "AT" request, the AT interface answers « OK » to the application once the reset procedure is complete.

Another solution is to use the AT+WIND command to get an unsolicited status from the module.

For further details, please refer to the AT commands manual (AT+WIND).

2.21 External Interrupts

The WISMO Pac P5186 module provides two external interrupt inputs:

- EXTINT1,
- EXTINT3.

An interrupt is activated on low to high edge and detection of a transition is very sensitive.

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 output.

Pin description

Signal	Pin number	I/O	I/O type	Description
EXTINT1	C1	I	CMOS 1V8	External Interrupt
EXTINT3	U1	I	CMOS 1V8	External Interrupt

Electrical characteristics [To be confirmed]

Parameter	Min	Max	Unit
V_{IL}	-0.3	0.2 [TBC]	V
V_{IH}	1.6	1.8	V

2.22 VCC and V-CORE outputs

Those outputs can be used to power some external functions. VCC and V-CORE has to be used as digital power supplies. Those power supplies are available when the module is ON.

Pin description

Signal	Pin number	I/O	I/O type	Description
VCC	W3	O	Supply	Digital supply for external 2V8 digital devices
V-CORE	A19	O	Supply	Digital supply for external 1V8 digital devices

Operating conditions

Parameter	Condition	Min	Max	Unit
VCC Output voltage	I = 10 mA	2.8 V +/-3%		V
VCC Output Current			10 [TBC]	mA
V-CORE Output Voltage	Normal mode: I = 50 mA [TBC]	1.9 ± 3 %		V
	Idle mode: I = 10 mA [TBC]	1.8 ± 3 %		V
V-CORE Output Current			50 [TBC]	mA

2.23 Real time clock supply

BAT_RTC is used to provide a back-up power supply for the internal Real Time Clock.

The RTC is supported by the WISMO Pac P5186 module when powered on but a back-up power supply is needed to save date and time information when the module is no more supplied (for example when battery is removed).

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

Pin description

Signal	Pin number	I/O	I/O type	Description
BAT_RTC	W10	I/O	Supply	RTC Back-up supply

Operating conditions [TBC]

Parameter	Condition	Min	Max	Unit
Input voltage	BAT_RTC=2.5 V	2.4	2.9	V
Input current	BAT_RTC=2.5 V		5	μA
Output voltage		2.4	2.5	V
Output current		0.5	2	mA

BAT_RTC cannot be used as an external power supply.

2.24 Vibrator Output

The vibrator output is a regulator output. A vibrator can be directly connected between this output and GND. The maximum peak current is 80 mA on 2.8 V.

Pin description

Signal	Pin number	I/O	I/O type	Description
VIBRATOR	X10	O		Vibrator output

Recommended characteristics for the vibrator:

Operating conditions

Parameter	Condition	Min	Max	Unit
V_{OH}			2.8	V
I_{MAX}	VBATT = VBATT max		80	mA

2.25 LED_OUT output

LED_OUT output is an open drain output. A LED and a resistor can be directly connected between this output and VBATT.

When VBATT < 3.1 V, this output indicates, by flashing (100 ms ON, 900 ms OFF), the pre-charging phase of the battery and a current generator is connected on CHG_IN inputs.

When VBATT > 3.1 V, this output can be used as a LED driver.

Pin description

Signal	Pin number	I/O	I/O type	Description
LED_OUT	X9	O		Open Drain output

2.26   USB interface

Not available in the current versions (X.40), but planned for the future versions (X.50) with X= 6, 5 or 4.

A 4-wire USB interface is available, complying with USB 1.1 protocol signalling, but not with the electrical interface, due to the not complying 5 V of V-USB. The USB interface signals are: D+, D-, V-USB and GND.

A 5 V to 3.3 V voltage regulator is needed between the external interface power in line (V-USB) and the module power in line (V-BUS).

The WISMO Pac P5186 module is connected to a USB host through one or several hubs.

Pin description

Signal	Pin number	I/O	I/O type	Description
V-USB	W9	I	Power	USB power in
D+	X7	I/O		Differential data interface positive line
D-	W7	I/O		Differential data interface negative line

2.27   PCM bus

A 4-wire serial PCM interface is available.

Typical use for Bluetooth.

Pin description

Signal	Pin number	I/O	I/O type	Description
PCM_IN	S2	I	CMOS 2V8	
PCM_OUT	R1	O	2V8	
PCM_CLK	S1	O	2V8	Clock 128 kHz
CODEC_8K	T1	O	2V8	Clock 8 kHz
IO_AUDIO	R2	I/O	CMOS 2V8	GPIO available when audio is activated

2.28 Digital Audio Interface (DAI)

A 4-wire serial DAI interface is available.

Typical use for Audio FTA.

Pin description

Signal	Pin number	I/O	I/O type	Description
DAI_IN(*)	S2	I	CMOS 2V8	
DAI_OUT(*)	R1	O	2V8	
DAI_CLK(*)	S1	O	2V8	Clock 104 kHz
DAI_RST(*)	R2	I/O	CMOS 2V8	DAI Reset

(*)Multiplexed with other signals (refer to paragraph 3.3External pinout).

2.29 32 kHz clock output

A 32kHz clock is available.

Pin description

Signal	Pin number	I/O	I/O type	Description
CLK32K(*)	N1	O	1V8	Clock 32 kHz

(*)Multiplexed with other signals (refer to paragraph 3.3External pinout).

2.30 RF interface

2.30.1 RF connection

The RF connection is allowed through a pin of the WCGA connector.

Pin description

Signal	Pin number	I/O	I/O type	Description
ANT	F31		RF 50 Ω	RF output pin (internally AC coupled)
GND			GND	GND pins for RF 50 Ω adaptation.

The impedance is 50 Ohms nominal within GSM 850, E-GSM 900, DCS 1800 and PCS 1900 RF bandwidth. The DC impedance is 0 Ohm.

The WISMO Pac P5186 module does not include any antenna switch for a car kit but this function can be implemented externally and driven through a GPIO.

2.30.2   Antenna specifications

The antenna must fulfill the following requirements:

- Frequency bands: quad band GSM 850 MHz, E-GSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz.

	GSM 850	E-GSM 900	DCS 1800	PCS 1900
Frequency RX (MHz)	869 to 894	925 to 960	1805 to 1880	1930 to 1990
Frequency TX (MHz)	824 to 849	880 to 915	1710 to 1785	1850 to 1910

- Impedance: 50 Ω

- VSWR TX max = 2 :1 / RX max = 2 :1 (within specified VBATT range, see § 2.2).

- Typical radiated gain: 0 dBi.

3 Pin out description

3.1 GND pins

A1, A5, A8, A11, A14, A17, A20 to A31

B2, B5, B8, B11, B14, B17, B20, B26 to B31

E2, H2, K2, N2, Q2, T2

W2, W5, W8, W11, W14, W17, W19, W22, W28 to W31

X1, X5, X8, X11, X14, X17, X19, X22 to X31

C30 to J30, L30 to V30

C31 to E31, G31 to V31

3.2 Not connected pins

B21, B22, B23, B24, B25

W23, W24, W25, W26, W27

K30

3.3 External pinout

Due to the high integration of the WISMO Pac P5186 module, some external pins are multiplexed.

Pin #	Multiplex 1	Multiplex 2	Multiplex 3	Comments
A19	V-CORE			External power supply
B19	VPP*			Connect to V-CORE
A18	ON-OFF			
B18	BUZ			Open drain
A16	/WR			
B16	D15			
A15	D11			
B15	D14			
A13	D12			
B13	D13			
A12	D10			
B12	D9			
A10	D7			
B10	D4			
A9	D5			
B9	D3			
A7	A3			
B7	D6			
A6	/RD			
B6	D8			
A4	A2			
B4	D2			
A3	D1			
B3	D0			
A2	LCDEN	GPIO0		
B1	/RESET			
C1	EXTINT1	PWM1	GPIO1	
C2	BOOT	GPIO2		Internal 100 kΩ pull up
D1, D2	CHG_IN			

Pin #	Multiplex 1	Multiplex 2	Multiplex 3	Comments
E1	SIM_CLK			
F1	SIM_VCC			
F2	SIM_RST			
G1	SIM_DATA			
G2	SIM_PRES	GPIO3	RTS2	
H1	COL4			
I1	ROW4			
I2	COL2			
J1	COL3			
J2	ROW1			
K1	COL1			
L1	ROW3			
L2	COL0			
M1	ROW0			
M2	ROW2			
N1	GPIO4	CLK32K		
O1	GPO0	PWM0	CTS2	
O2	GPIO5	USR0N	TXD2	
P1	GPIO6	SCL	SPI3_DATA	
P2	GPO1	RXD2		
Q1	GPIO7	SDA	SPI3_CLK	
R1	PCM_OUT	DAI_OUT		
R2	IO_AUDIO	DAI_RST		IO AUDIO is Available when audio is activated
S1	PCM_CLK	DAI_CLK		
S2	PCM_IN	DAI_IN		
T1	CODEC_8K			
U1	GPIO8	SCI_PRES	EXTINT3	
U2	GPIO9	SCI_PWR		
V1	GPIO10	SCI_CLK		
V2	GPIO11	SCI_DATA		
W1	GPIO12	SCI_RST		
X2	CTS1	GPO2		
X3	TXD1	GPIO13		

Pin #	Multiplex 1	Multiplex 2	Multiplex 3	Comments
W3	VCC			External power supply
X4	DTR1	GPIO14	SPI2_DATA	
W4	RXD1	GPO3		
X6	DSR1	GPO4	SPI2_CLK	
W6	RTS1	GPIO15		
X7	D+			
W7	D-			
X9	LED_OUT			
W9	V-USB			
X10	VIBRATOR			
W10	BAT_RTC			
X12	MIC_AUX_P			
W12	MIC_AUX_N			
X13	MIC_P			
W13	MIC_N			
X15	SPK_AUX_P			
W15	SPK_AUX_N			
X16	SPK_N			
W16	SPK_P			
X18	AUX_ADC			
W18	BAT_TEMP			
X20,W20	VBATT			
X21,W21	VBATT			
F31	ANT			

* Use reserved to WAVECOM S.A.

3.4 WISMO Pac P5186 module Footprint

Drawing on following page shows the WISMO Pac P5186 module Footprint.

BUMP SIDE VIEW
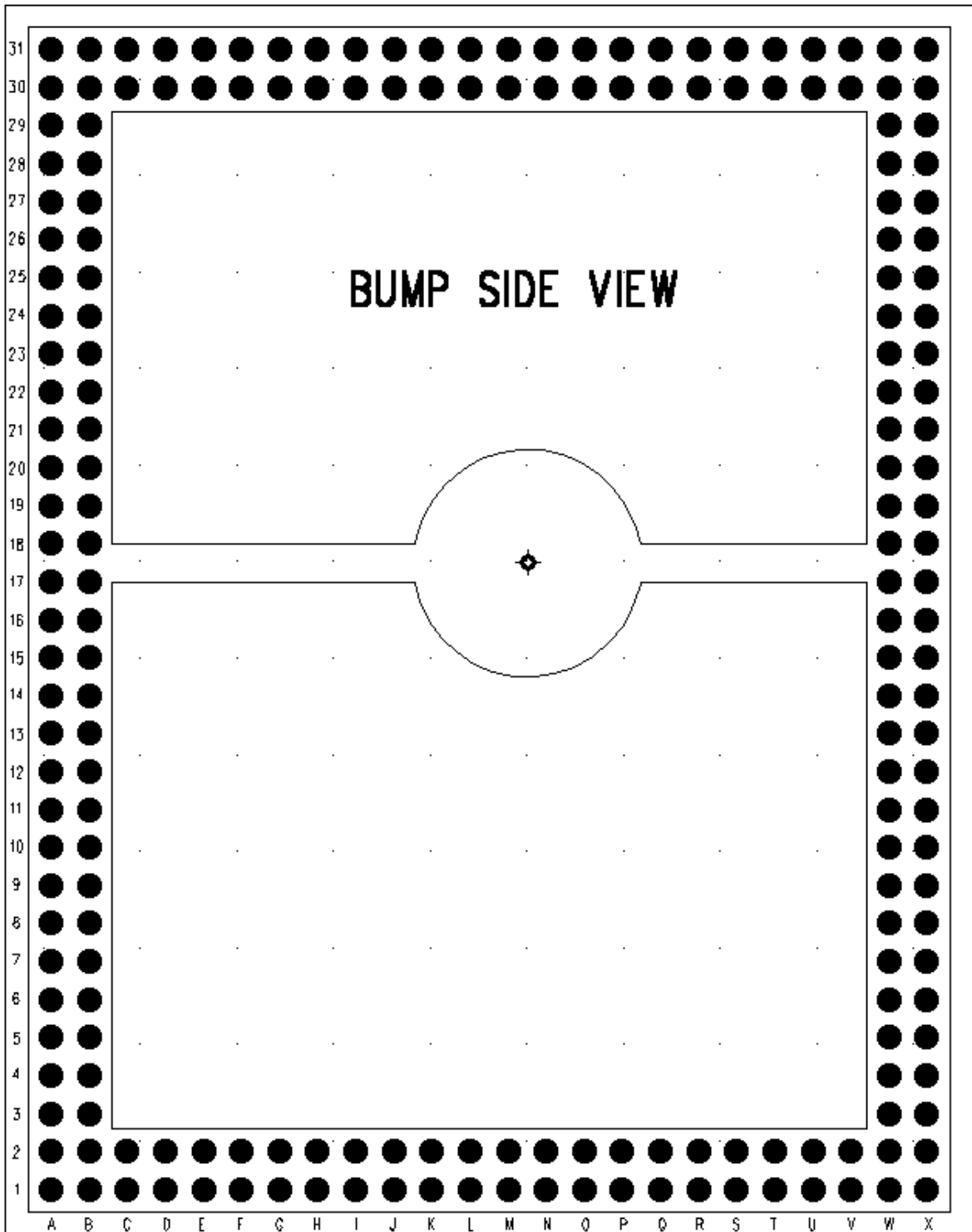
4 Mechanical specifications

4.1 Physical characteristics

<u>Dimensions</u> (typ.)	: 32.4 x 25.4 x 4.75 mm^3
<u>Weight</u>	: 5.2 g +/- 0.1 g
<u>Co-planarity</u>	: 0.15 mm maximum

The next page shows a mechanical overview with the WISMO Pac P5186 module pin-out. For detailed information, please refer to the mechanical drawing.

4.2 Interface Connector

The WISMO Pac P5186 module connector is a custom connector designed by Wavecom.

This connector has been designed to interface the module with the application, supporting a reflow soldering for the assembly on the application board.

A specific application note describes the process constraints for the assembly on a board (refer to document [2]).

4.3 Mechanical drawings

The following pages present the WISMO Pac P5186 module mechanical drawings:

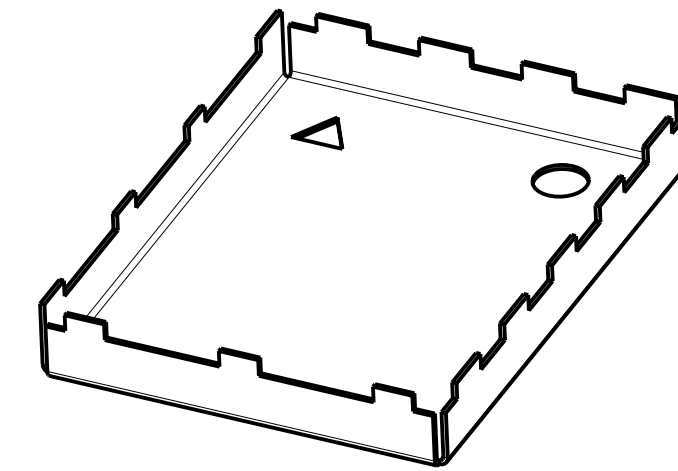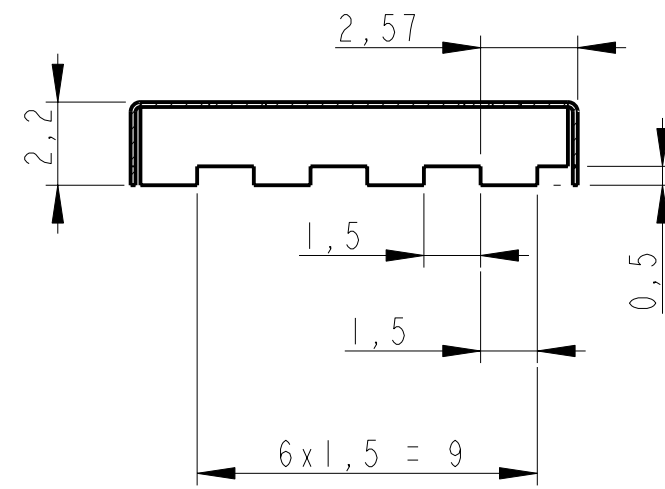- P5186 module general mechanical drawing,
- P5186 module assembly mechanical constraints,
- P5186 module dismantling mechanical constraints,
- P5186 module shielding mechanical drawings.

25,4±0,2

32,4±0,2

WISMO Pac

4,75 +0,50 -0,25 TBC

SEE DETAIL B

SEE DETAIL A

23

30

16,5

12,5

PITCH : I

PITCH : I

PITCH : I

PITCH : I

0,6

⌖ 0,I A B

1,2

1,2

0,6

DETAIL A
SCALE 20,000

Ø0,4

1,5

DETAIL B
SCALE 20,000

A

B

SCALE I,000

SCALE I,000

Connector details

					TOL.GEN.:±0,I	SCALE 4,000
				MODULE	FOLIO: I/I	FORMAT : A2
					WM-2-1048-X-013-A	

wavecom

AUTEUR : JPM

RESPONS : JJO

01
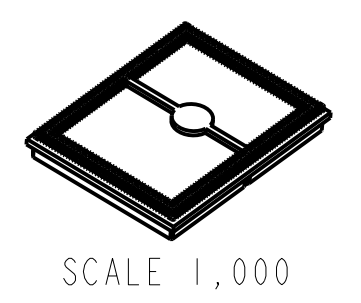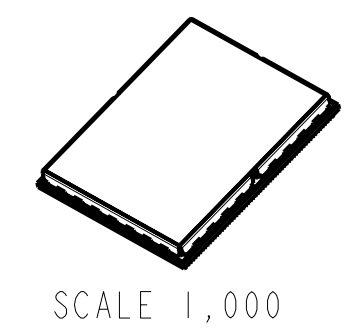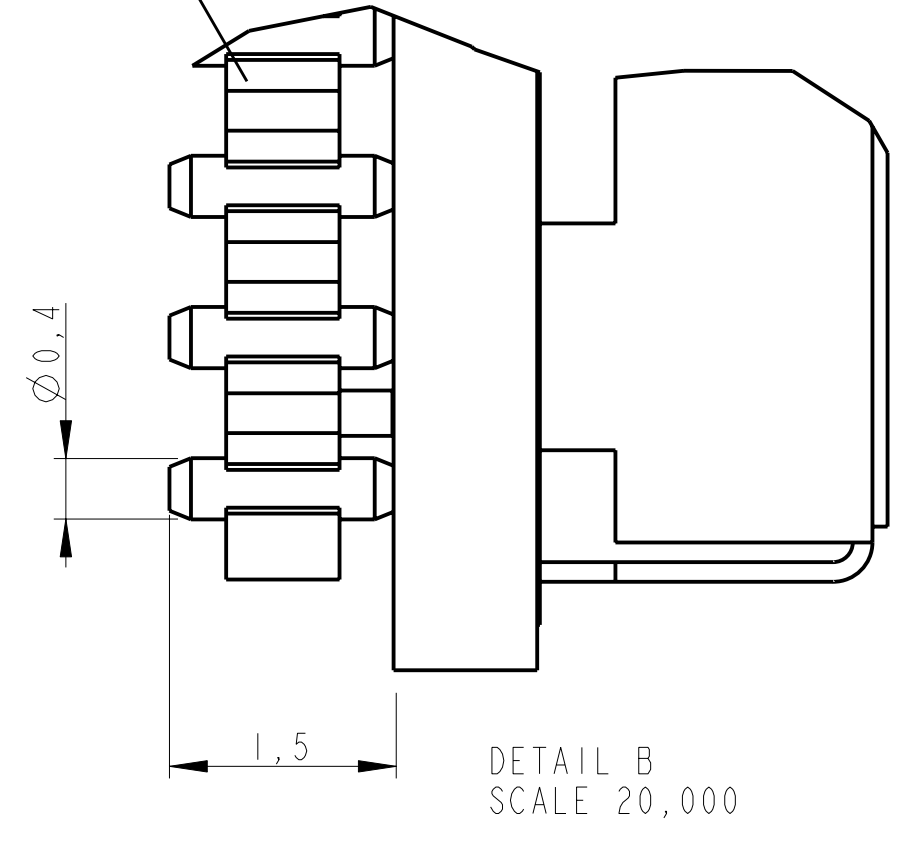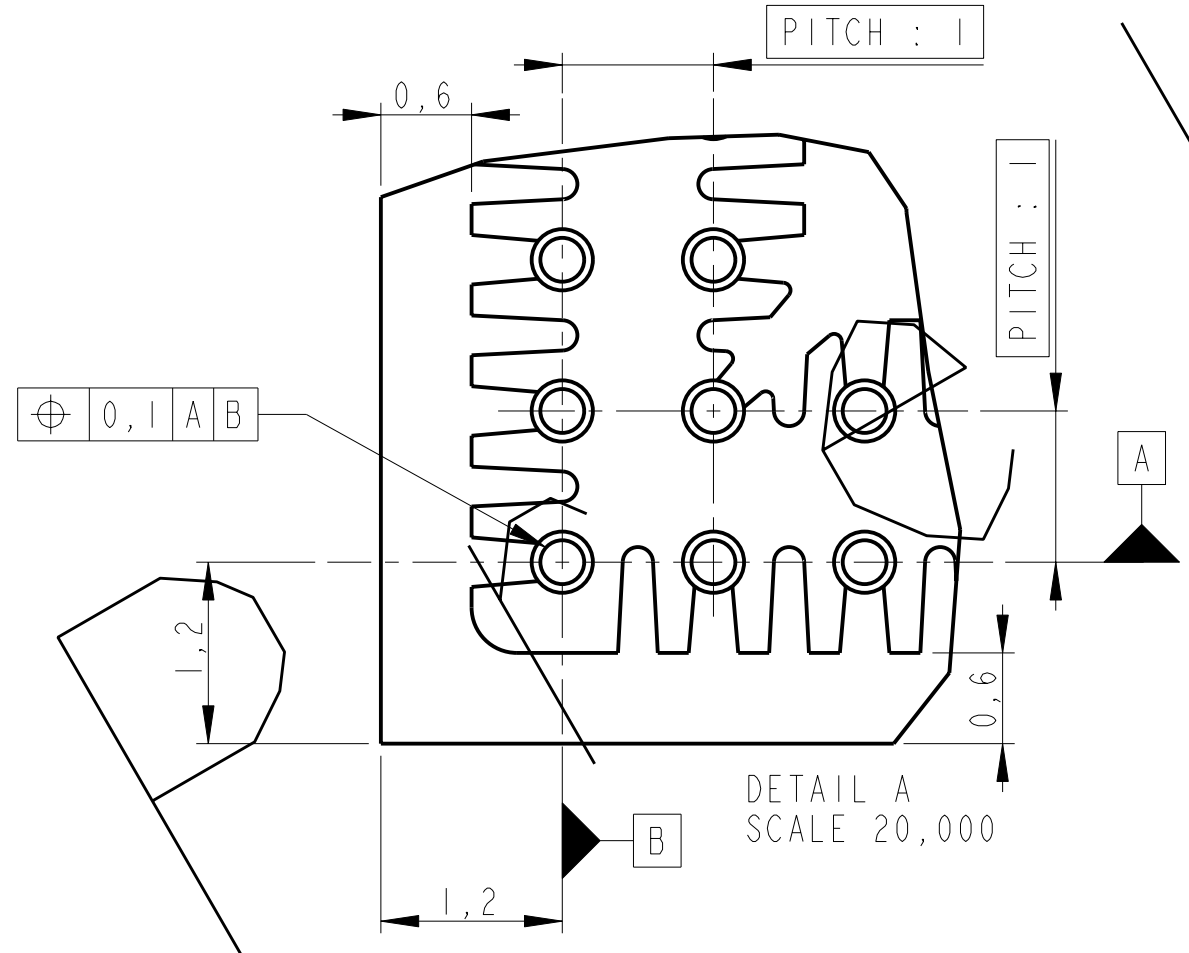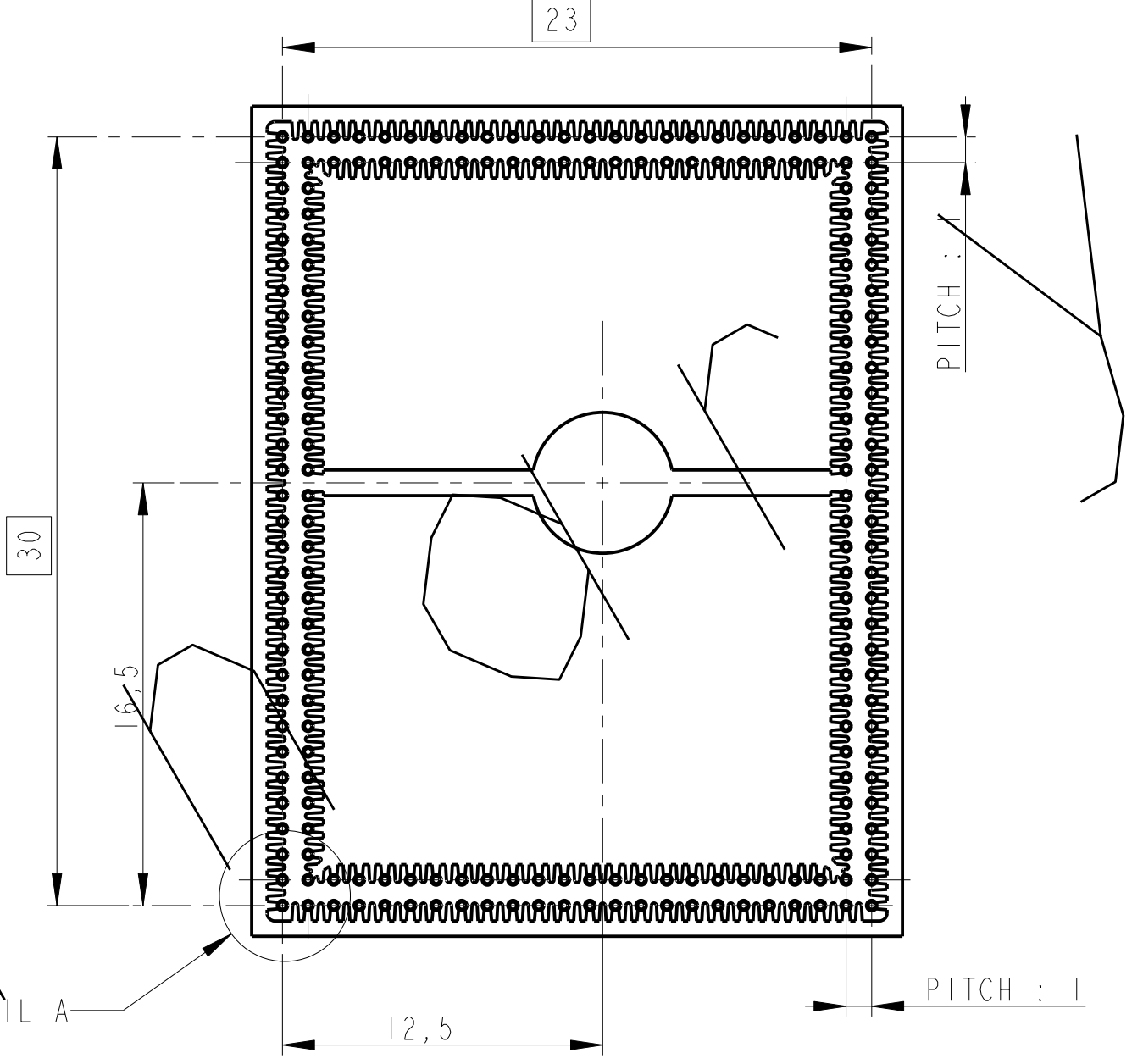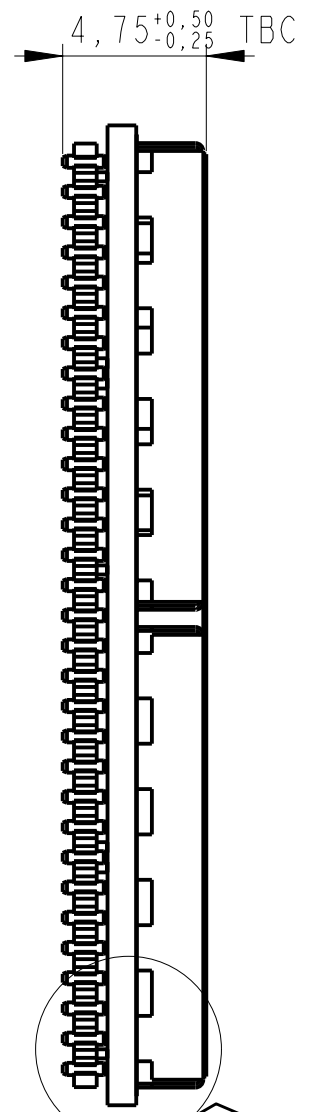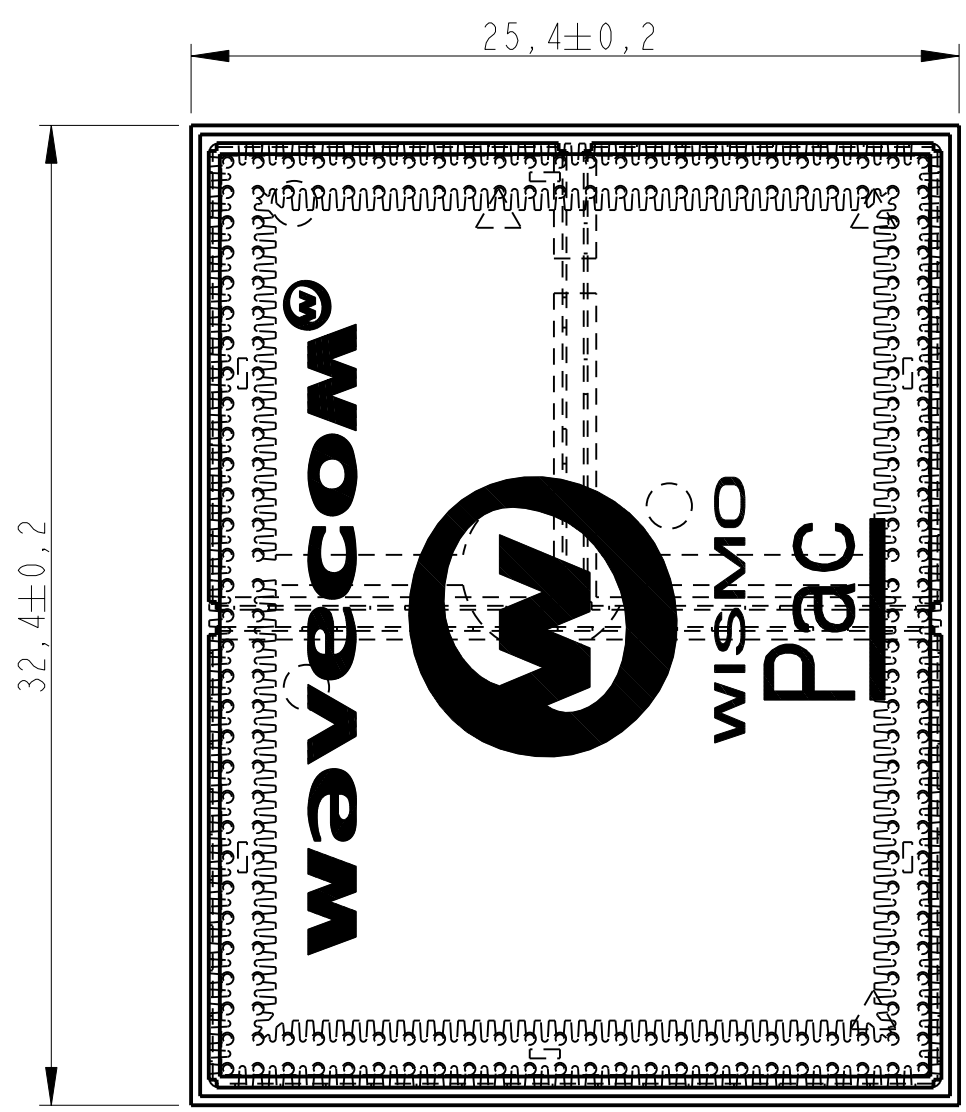
PRO/ENGINEER | WM5_MODULE | | IND.

Creation	02/07/02	JPM	JJO	Preliminary	01
MODIFICATION	DATE	AUTHOR	RESP.	STATUS	IND

4.3.2 P5186 module assembly mechanical constraints

To be completed.

4.3.3 P5186 module dismantling mechanical constraints

To be completed.

SECTION A-A

2,57
2,2
1,5
1,5
0,5
6x1,5 = 9

SCALLE 5,000

2,2
0,5

11,83
9,58

Ø1,5
60°0

15,43
13,43
12,63

9x1,5 = 13,5
2,47
1,5
1,5

SECTION C-C

3,5
3,35
1,5
3,35
1,48

2,83
0,26
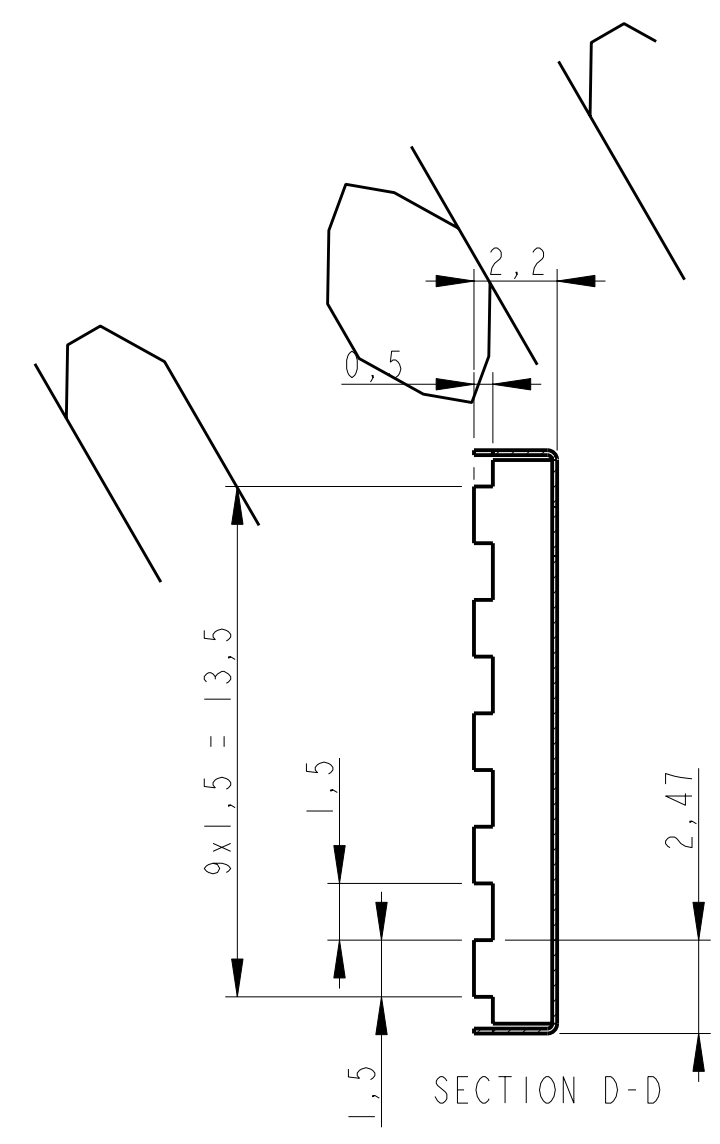0,26
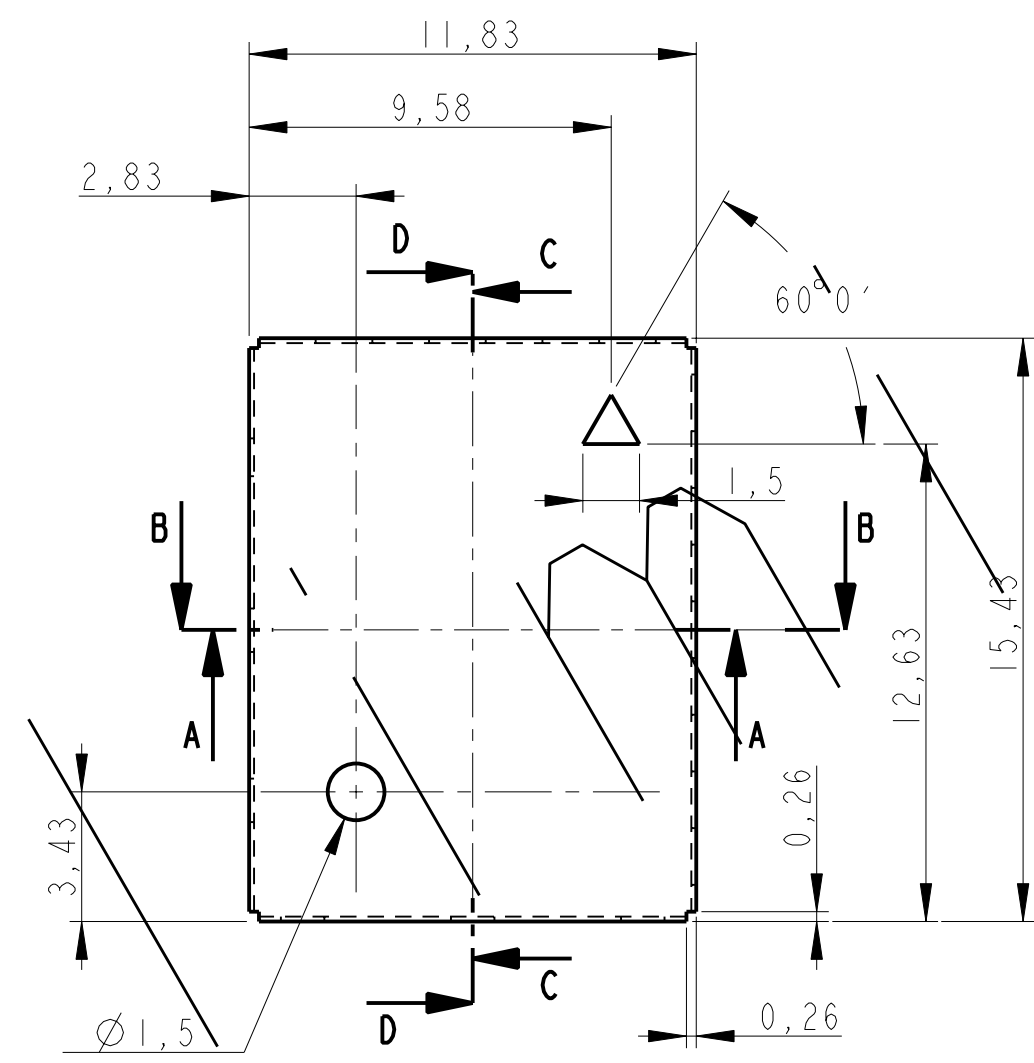
1,5

D
C
B
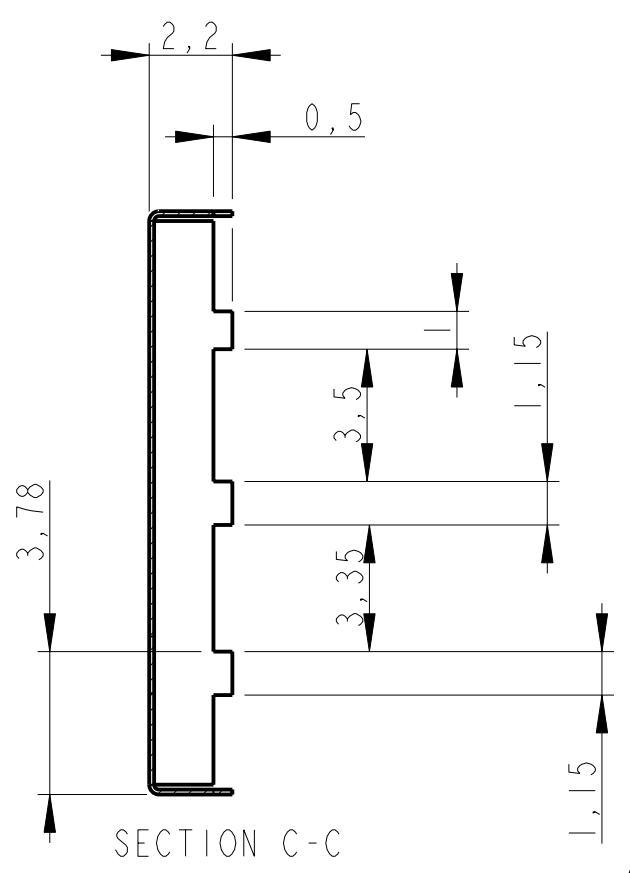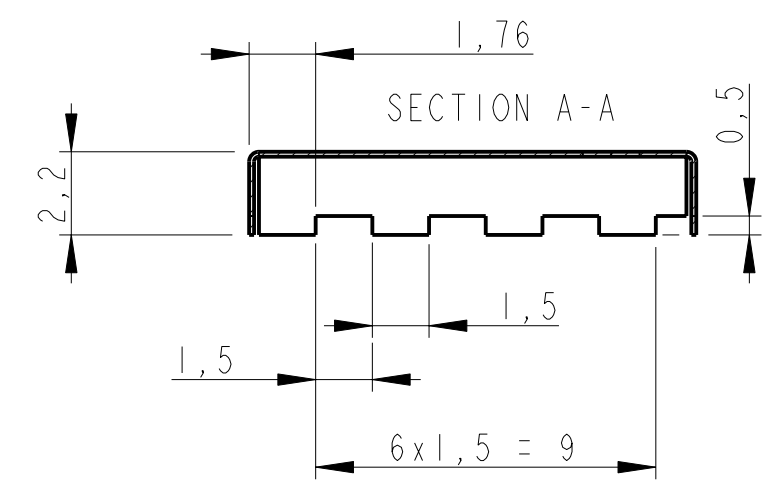A
A
B
C
D

SECTION D-D
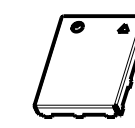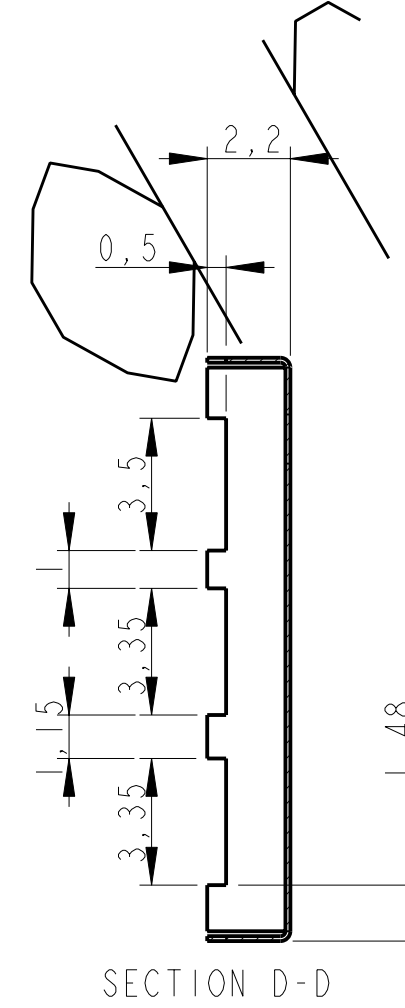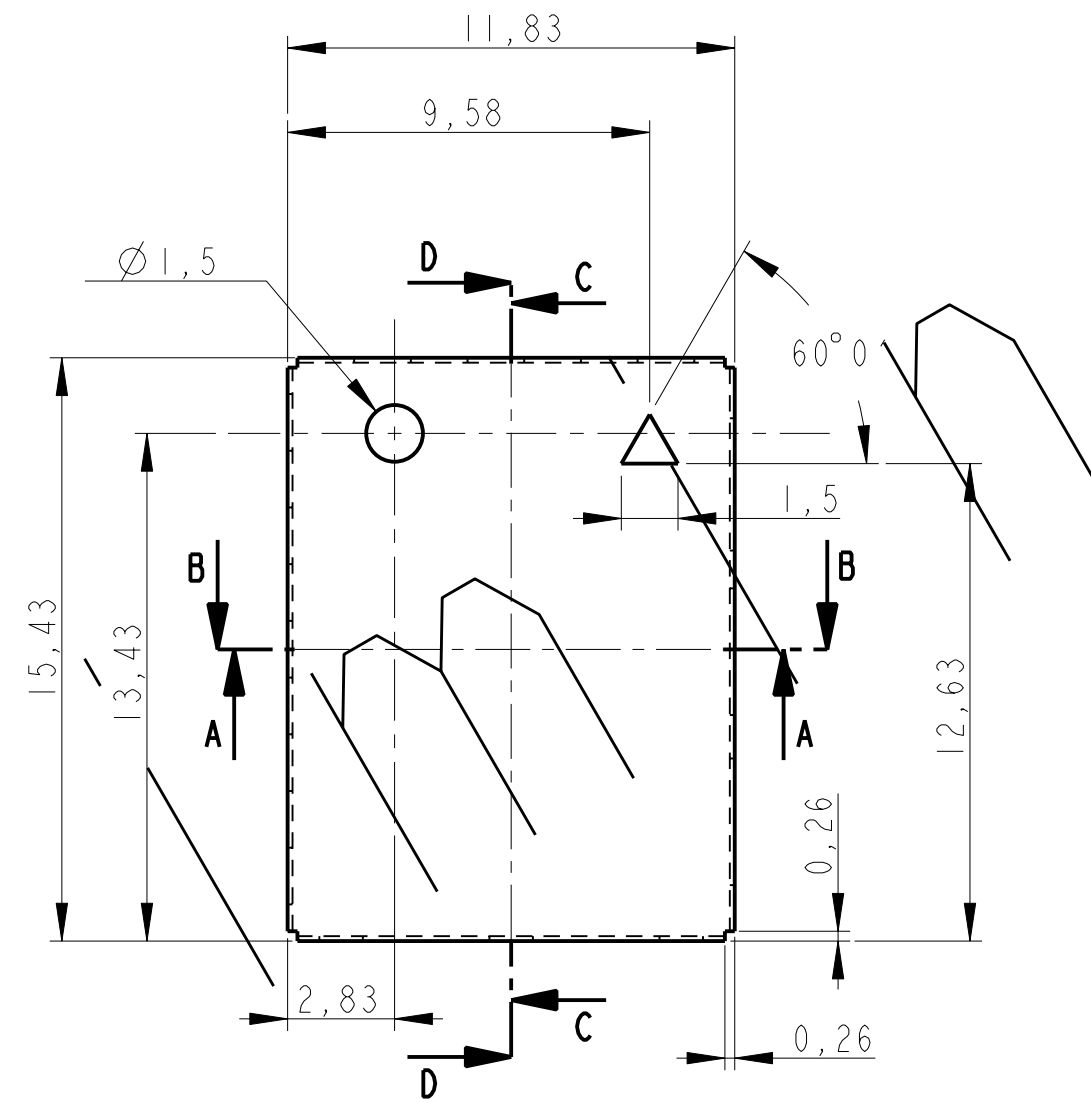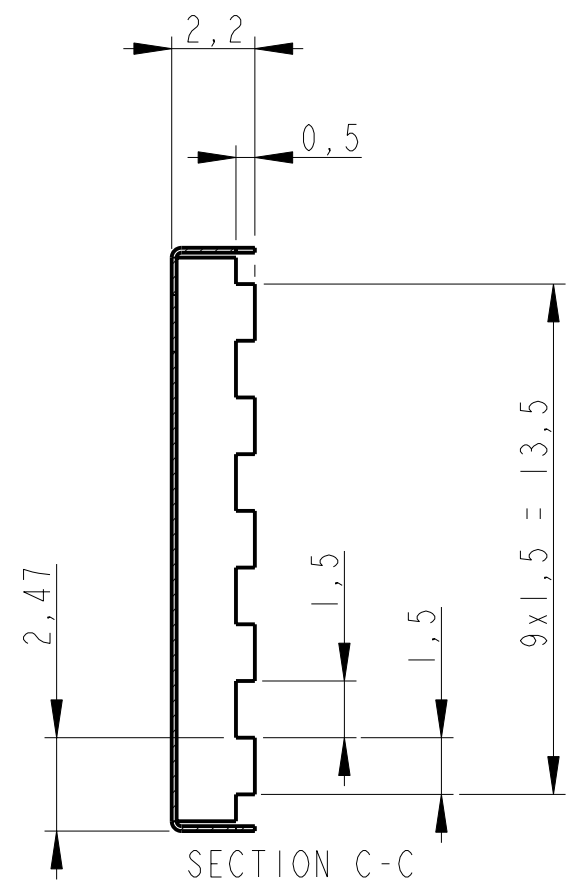
SCALE 1,000

MATERIAL SPECIFICATIONS :
A. MATERIAL :
   THICKNESS = 0,13mm ±0,013
   TYPE : CRS, ROCKWELL B70-B85
B. SURFACE FINISH :
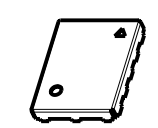   1,25 - 3,75 MICRONS ELECTRLYTIC 100% MATTE TIN

1,15
1,15
1,15
3,35
3,35
0,5
2,2

⬭ 0,1
ALL SURFACES

SECTION B-B

1,99

INSIDE RADIUS = THICKNESS

NOTA : General tolerances
Bending dimensions : +/- 0.1mm
Other dimensions : +/- 0.05mm

MATERIAL:	SEE NOTE		MASS	GEN.TOL. SEE NOTE	RUGOSITY
TREATMENT:	SEE NOTE				SCALE 5,000
CAPOTI				FOLIO: 1/1	FORMAT: A2
	WM14011			WM-2-1048-B-009-P	

AUTHOR JPM

01
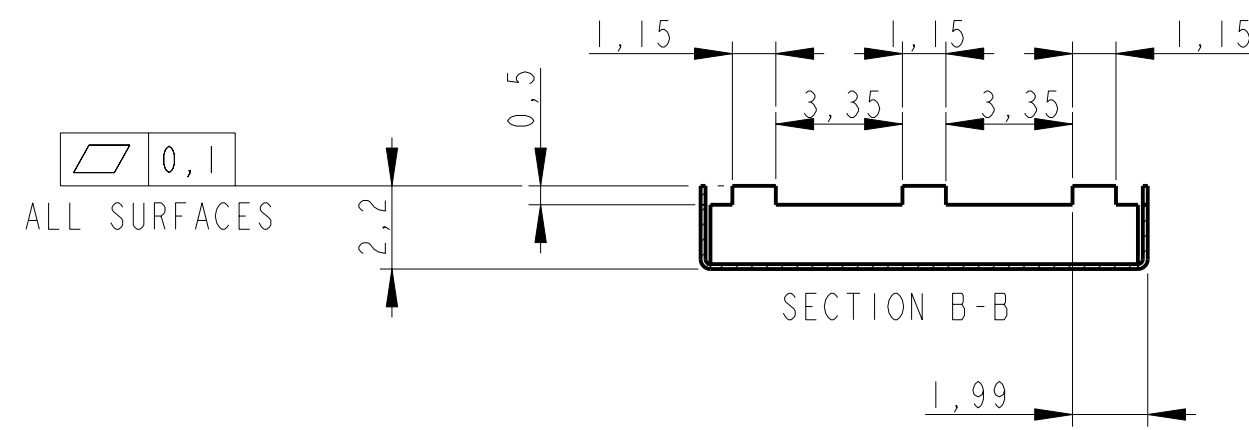
.	.	.	.	.	.
Creation	05/06/02	JPM	JJO	Preliminary	01
MODIFICATION	DATE	AUTHOR	RESP.	STATUS	IND

PRO/ENGINEER

IND.

SECTION A-A

1,76
0,5
2,2
1,5
1,5
6x1,5 = 9

SECTION C-C

2,2
0,5
1
1,15
3,5
3,78
3,35
1,15

11,83
9,58
2,83
D C
60°0'
1,5
B B
15,43
12,63
A A
3,43
0,26
Ø1,5
D C
0,26

9x1,5 = 13,5
2,2
0,5
1,5
2,47
1,5

SECTION D-D
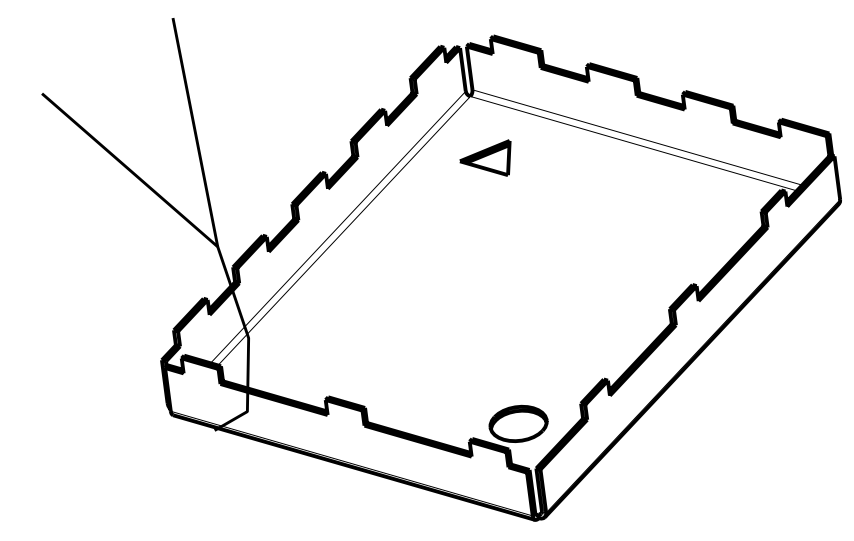
ECHELLE 5,000

ECHELLE 1,000

SECTION B-B

1,15 1,15 1,15
3,35 3,35
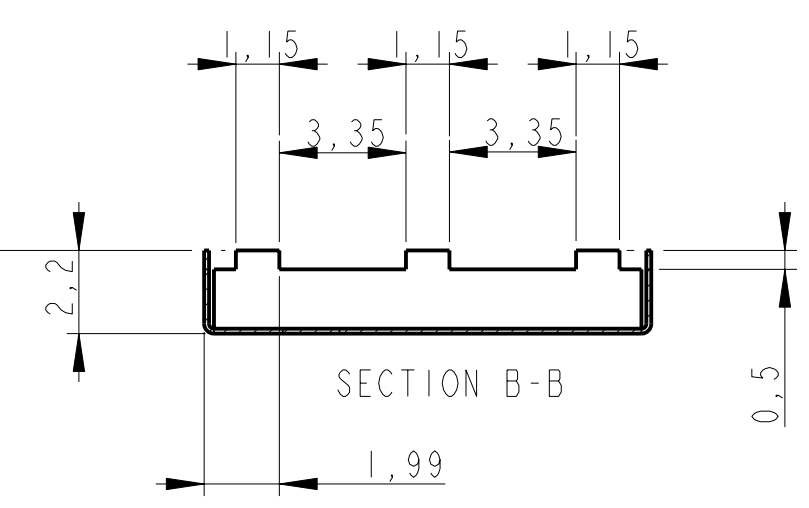0,1
ALL SURFACES
2,2
0,5
1,99

MATERIAL SPECIFICATIONS :
A. MATERIAL :
   THICKNESS = 0,13mm ±0,013
   TYPE : CRS, ROCKWELL B70-B85
B. SURFACE FINISH :
   1,25 - 3,75 MICRONS ELECTRLYTIC 100% MATTE TIN

INSIDE RADIUS = THICKNESS

NOTA : General tolerances
Bending dimensions : +/- 0.1mm
Other dimensions : +/- 0.05mm

ECHELLE 5,000

SECTION A-A

4,24
0,5
2,2
3,35 2,8 2,8 3,35
5 x 1,15
18,05

24,23
21,98

2,2
0,5
3,23
2
Ø1,5
D
C
B
B
15,23
A
A
9x1,5 = 13,5
1,5
60°0'
0,26
0,26
1,5
1,93
D
C

SECTION C-C
2,37
1,5
1,5

2,2
0,5
9x1,5 = 13,5
1,5
2,37
1,5
SECTION D-D

ECHELLE 1,000

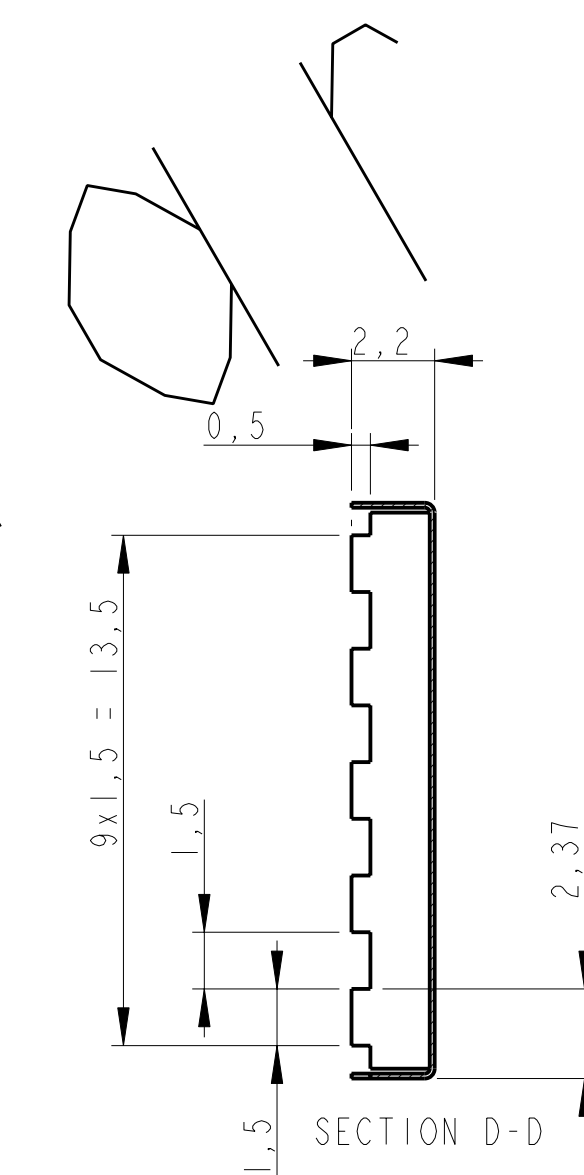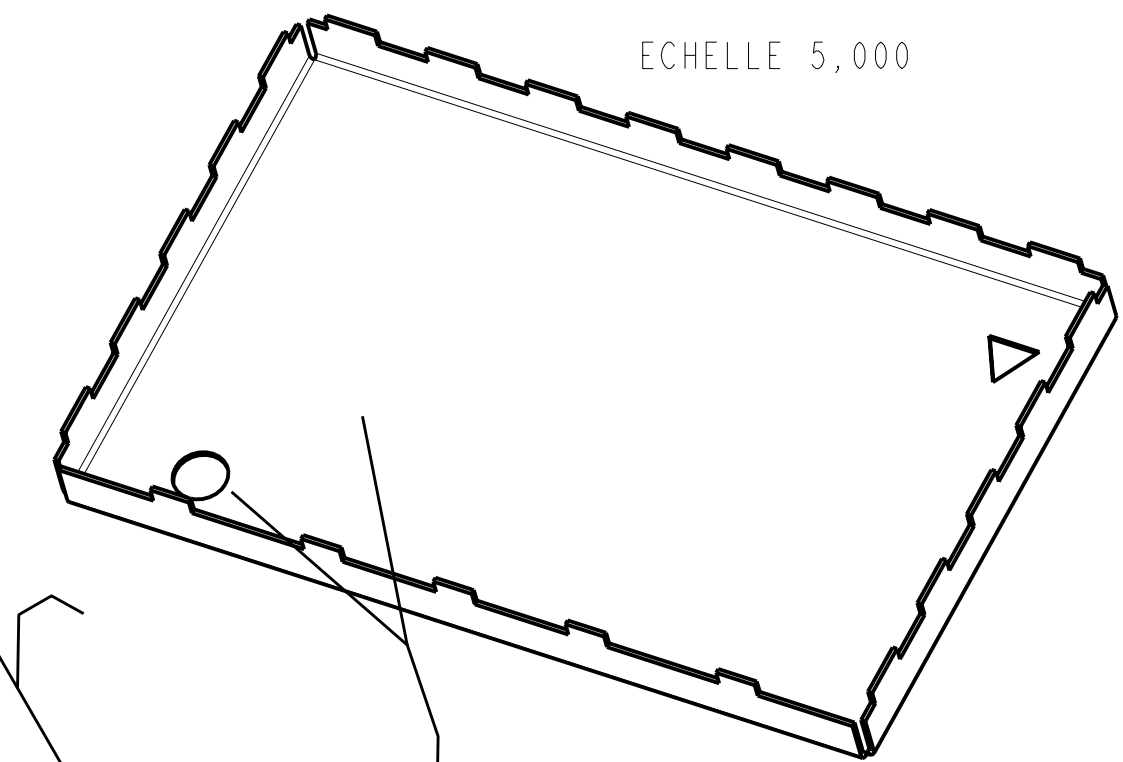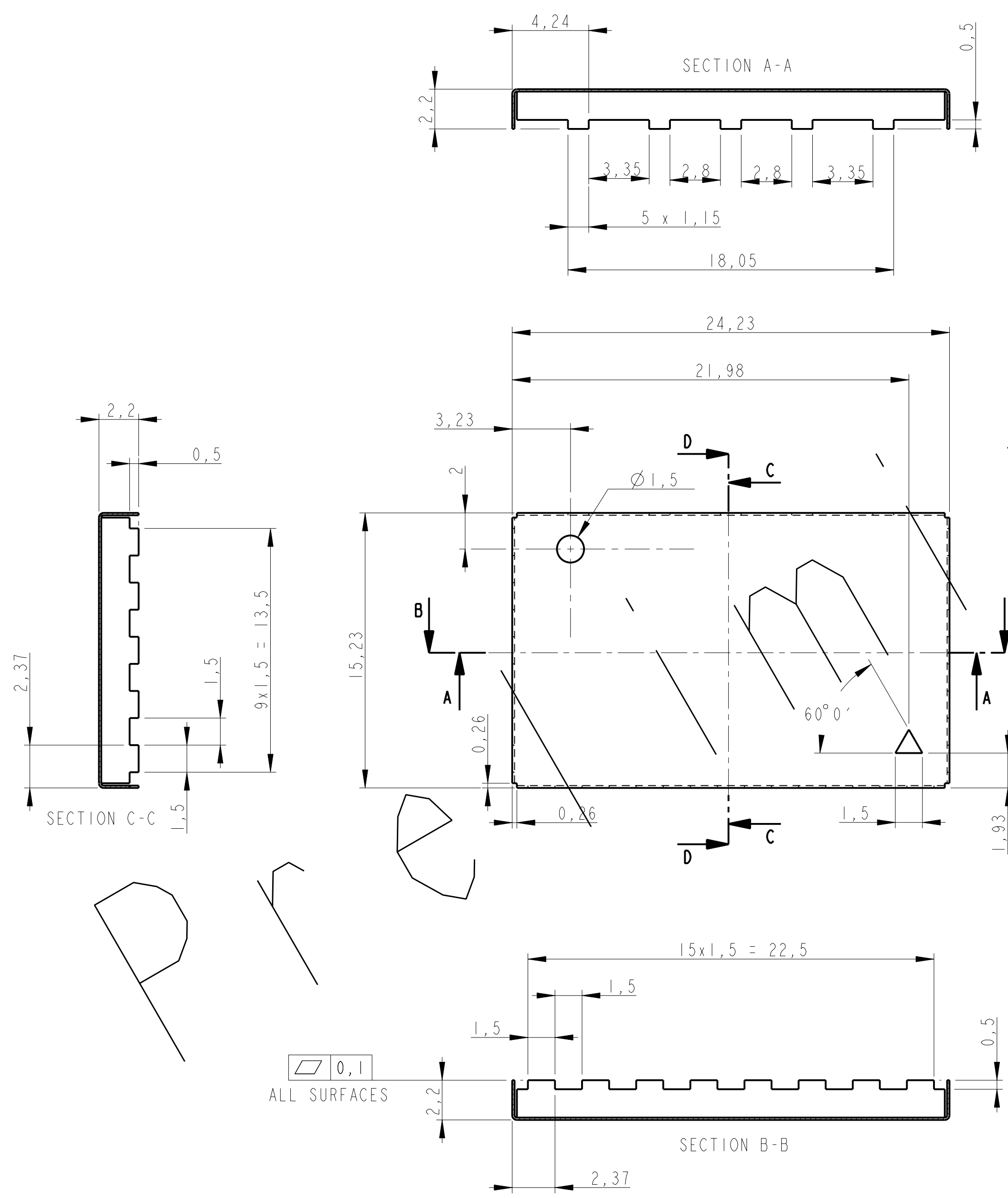15x1,5 = 22,5
1,5
1,5
0,5
0,1
ALL SURFACES
2,2
SECTION B-B
2,37

MATERIAL SPECIFICATIONS :
A. MATERIAL :
   THICKNESS = 0,13mm ±0,013
   TYPE : CRS, ROCKWELL B70-B85
B. SURFACE FINISH :
   1,25 - 3,75 MICRONS ELECTRLYTIC 100% MATTE TIN

INSIDE RADIUS = THICKNESS

NOTA : General tolerances
Bending dimensions : +/- 0.1mm
Other dimensions : +/- 0.05mm

MATERIAL:	SEE NOTE		MASS	GEN.TOL. SEE NOTE	RUGOSITY
TREATMENT:	SEE NOTE				SCALE 5,000
CAPOT3				FOLIO: 1/1	FORMAT: A2
	WM14013			WM-2-1048-B-011-P	

wavecom

AUTHOR JPM

Creation	jj-mm-aa	JPM	JJO	Preliminary
MODIFICATION	DATE	AUTHOR	RESP.	LEVEL

PRO/ENGINEER

01
IND.

4.3.5 Environmental constraints

Conditions	Temperature range
Operating / Full GSM specifications compliant	-20 °C to +55 °C
Storage	-30 °C to +85 °C

TYPE OF TEST	STANDARDS	ENVIRONMENTAL CLASSES		
		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

Electro-Static Discharge (ESD):

According to the norm **IEC 1000–4-2 Part 4**, the maximum ESD level supported by the P5186 module is 1 kV for all the pins including the antenna connector.

Humidity:

According to **IPC/JEDEC J-STD-033**, the moisture class of the P5186 module is **level 3**. The floor life from the opening of the sealed bag is 168 hours.

Reflow soldering:

The WISMO Pac P5186 module supports only 1 [TBC] reflow soldering.

5 Appendix

5.1 Wavecom acceptance tests

The WISMO Pac P5186 module complies with Wavecom standard acceptance test plan (Refer to document [1]).

5.2 GSM standard and recommendations

The WISMO Pac P5186 module is compliant with the following GSM ETSI, 3GPP, GCF and NAPRD03 recommendations for Phase II:

Specification Reference	Title
3GPP TS 45.005 v5.5.0 (2002-08) Release 5	Technical Specification Group GSM/EDGE. Radio Access Network; Radio transmission and reception
GSM 02.07 V8.0.0 (1999-07)	Digital cellular telecommunications system (Phase 2+); Mobile Stations (MS) features (GSM 02.07 version 8.0.0 Release 1999)
GSM 02.60 V8.1.0 (1999-07)	Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description, Stage 1 (GSM 02.60 version 8.1.0 Release 1999)
GSM 03.60 V7.9.0 (2002-09)	Technical Specification Group Services and System Aspects; Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description; Stage 2 (Release 1998)
3GPP TS 43.064 V5.0.0 (2002-04)	Technical Specification Group GERAN; Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Overall description of the GPRS radio interface; Stage 2 (Release 5)
3GPP TS 03.22 V8.7.0 (2002-08)	Technical Specification Group GSM/EDGE. Radio Access Network; Functions related to Mobile Station (MS) in idle mode and group receive mode; (Release 1999)
3GPP TS 03.40 V7.5.0 (2001-12)	Technical Specification Group Terminals; Technical realization of the Short Message Service (SMS) (Release 1998)
3GPP TS 03.41 V7.4.0 (2000-09)	Technical Specification Group Terminals; Technical realization of Cell Broadcast Service (CBS) (Release 1998)
ETSI EN 300 903 V8.1.1	Digital cellular telecommunications system (Phase 2+);

Specification Reference	Title
(2000-11)	Transmission planning aspects of the speech service in the GSM
	Public Land Mobile Network (PLMN) system (GSM 03.50 version 8.1.1 Release 1999)
3GPP TS 04.06 V8.2.1 (2002-05)	Technical Specification Group GSM/EDGE Radio Access Network; Mobile Station - Base Station System (MS - BSS) interface; Data Link (DL) layer specification (Release 1999)
3GPP TS 04.08 V7.18.0 (2002-09)	Technical Specification Group Core Network;
	Digital cellular telecommunications system (Phase 2+);
	Mobile radio interface layer 3 specification (Release 1998)
3GPP TS 04.10 V7.1.0 (2001-12)	Technical Specification Group Core Networks;
	Mobile radio interface layer 3 Supplementary services specification; General aspects (Release 1998)
3GPP TS 04.11 V7.1.0 (2000-09)	Technical Specification Group Core Network; Digital cellular telecommunications system (Phase 2+); Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface
	(Release 1998)
3GPP TS 45.005 v5.5.0 (2002-08)	Technical Specification Group GSM/EDGE. Radio Access Network; Radio transmission and reception (Release 5)
3GPP TS 45.008 V5.8.0 (2002-08)	Technical Specification Group GSM/EDGE
	Radio Access Network; Radio subsystem link control (Release 5)
3GPP TS 45.010 V5.1.0 (2002-08)	Technical Specification Group GSM/EDGE
	Radio Access Network; Radio subsystem synchronization (Release 5)
3GPP TS 46.010 V5.0.0 (2002-06)	Technical Specification Group Services and System Aspects;
	Full rate speech; Transcoding (Release 5)
3GPP TS 46.011 V5.0.0 (2002-06)	Technical Specification Group Services and System Aspects;
	Full rate speech; Substitution and muting of lost frames for
	full rate speech channels (Release 5)
3GPP TS 46.012 V5.0.0 (2002-06)	Technical Specification Group Services and System Aspects;
	Full rate speech; Comfort noise aspect for full rate speech traffic channels (Release 5)

Specification Reference	Title
3GPP TS 46.031 V5.0.0 (2002-06)	Technical Specification Group Services and System Aspects; Full rate speech; Discontinuous Transmission (DTX) for full rate speech traffic channels (Release 5)
3GPP TS 46.032 V5.0.0 (2002-06)	Technical Specification Group Services and System Aspects; Full rate speech; Voice Activity Detector (VAD) for full rate speech traffic channels (Release 5)
TS 100 913V8.0.0 (1999-08)	Digital cellular telecommunications system (Phase 2+); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS) (GSM 07.01 version 8.0.0 Release 1999)
GSM 09.07 V8.0.0 (1999-08)	Digital cellular telecommunications system (Phase 2+); General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN) (GSM 09.07 version 8.0.0 Release 1999)
3GPP TS 51.010-1 v5.0.0 (2002-09)	Technical Specification Group GSM/EDGE ; Radio Access Network ;Digital cellular telecommunications system (Phase 2+);Mobile Station (MS) conformance specification; Part 1: Conformance specification (Release 5)
3GPP TS 51.011 V5.0.0 (2001-12)	Technical Specification Group Terminals; Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface (Release 5)
ETS 300 641 (1998-03)	Digital cellular telecommunications system (Phase 2); Specification of the 3 Volt Subscriber Identity Module - Mobile Equipment (SIM-ME) interface (GSM 11.12 version 4.3.1)
GCF-CC V3.7.1 (2002-08)	Global Certification Forum – Certification criteria
NAPRD03 V2.6.0 (2002-06)	North America Permanent Reference Document for PTCRB tests

5.3 Safety recommendations (for information only)

<div style="border:1px solid red">

IMPORTANT
FOR THE EFFICIENT AND SAFE OPERATION OF
YOUR APPLICATION BASED ON THE P5186 MODULE
PLEASE READ THIS INFORMATION CAREFULLY

</div>

5.3.1 RF safety

5.3.1.1   General

Your application using the WISMO Pac P5186 module is based on the GSM standard for cellular technology. The GSM standard is spread all over the world. It covers Europe, Asia and some parts of America and Africa. This is the most used telecommunication standard.

Your GSM terminal is actually a low power radio transmitter and receiver. It sends out and receives radio frequency energy. When you use your GSM application, the cellular system which handles your calls controls both the radio frequency and the power level of your cellular modem.

5.3.1.2   Exposure to RF energy

There has been some public concern about possible health effects of using GSM terminals. Although research on health effects from RF energy has focused on the current RF technology for many years, scientists have begun research regarding newer radio technologies, such as GSM. After existing research had been reviewed, and after compliance to all applicable safety standards had been tested, it has been concluded that the product was fitted for use.

If you are concerned about exposure to RF energy there are things you can do to minimize exposure. Obviously, limiting the duration of your calls will reduce your exposure to RF energy. In addition, you can reduce RF exposure by operating your cellular terminal efficiently by following the guidelines below.

5.3.1.3   Efficient terminal operation

For your GSM terminal to operate at the lowest power level, consistent with satisfactory call quality :

If your terminal has an extendible antenna, extend it fully. Some models allow you to place a call with the antenna retracted. However your GSM terminal operates more efficiently with the antenna fully extended.

Do not hold the antenna when the terminal is « IN USE ». Holding the antenna affects call quality and may cause the modem to operate at a higher power level than needed.

5.3.1.4 Antenna care and replacement

Do not use the GSM terminal with a damaged antenna. If a damaged antenna comes into contact with the skin, a minor burn may result. Replace a damaged antenna immediately. Consult your manual to see if you may change the antenna yourself. If so, use only a manufacturer-approved antenna. Otherwise, have your antenna repaired by a qualified technician.

Use only the supplied or approved antenna. Unauthorized antennas, modifications or attachments could damage the terminal and may contravene local RF emission regulations or invalidate type approval.

5.3.2 General safety

5.3.2.1 Driving

Check the laws and the regulations regarding the use of cellular devices in the area where you have to drive as you always have to comply with them. When using your GSM terminal while driving, please:

- give full attention to driving,

- pull off the road and park before making or answering a call if driving conditions so require.

5.3.2.2 Electronic devices

Most electronic equipment, for example in hospitals and motor vehicles is shielded from RF energy. However RF energy may affect some improperly shielded electronic equipment.

5.3.2.3 Vehicle electronic equipment

Check your vehicle manufacturer representative to determine if any on-board electronic equipment is adequately shielded from RF energy.

5.3.2.4 Medical electronic equipment

Consult the manufacturer of any personal medical devices (such as pacemakers, hearing aids, etc...) to determine if they are adequately shielded from external RF energy.

Turn your terminal **OFF** in health care facilities when any regulations posted in the area instruct you to do so. Hospitals or health care facilities may be using RF monitoring equipment.

5.3.2.5 Aircraft

Turn your terminal OFF before boarding any aircraft.

- Use it on the ground only with crew permission.

- Do not use it in the air.

To prevent possible interference with aircraft systems, Federal Aviation Administration (FAA) regulations require you to have permission from a crew member to use your terminal while the aircraft is on the ground. To prevent interference with cellular systems, local RF regulations prohibit using your modem while airborne.

5.3.2.6 Children

Do not allow children to play with your GSM terminal. It is not a toy. Children could hurt themselves or others (by poking themselves or others in the eye with the antenna, for example). Children could damage the modem, or make calls that increase your modem bills.

5.3.2.7 Blasting areas

To avoid interfering with blasting operations, turn your unit **OFF** when in a « blasting area » or in areas posted : « turn off two-way radio ». Construction crew often use remote control RF devices to set off explosives.

5.3.2.8 Potentially explosive atmospheres

Turn your terminal **OFF** when in any area with a potentially explosive atmosphere. It is rare, but your modem or its accessories could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injuries or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas such as petrol stations ; below decks on boats ; fuel or chemical transfer or storage facilities ; and areas where the air contains chemicals or particles, such as grain, dust, or metal powders.

Do not transport or store flammable gas, liquid, or explosives, in the compartment of your vehicle which contains your terminal or accessories.

Before using your terminal in a vehicle powered by liquefied petroleum gas (such as propane or butane) ensure that the vehicle complies with the relevant fire and safety regulations of the country in which the vehicle is to be used.