WISMO Pac P3100 series Manufacturing Guide

Reference : **WM_PRJ_WM3-2_PTS_007**
Level : **001**
Date : **18th April 2002**

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Contents

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Reference Documents

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

[2] WISMO Pac P3100 Series Product Specification
WM_PRJ_WM3-2_PTS_002, Release 002

[3] AT Commands Interface Guide
WM_SW_OAT_IFS_001, Release 002

[4] AT Software Release Note
Relnote8c-1

[5] WISMO Pac P3100 Starter Kit
WM_PRJ_WM3-2_PTS_005, Release 002

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Introduction

This document gives guidelines for the industrial mounting of the WISMO Pac P3100 series in production.

Four versions of the WISMO Pac P3100 module are available:

- **P3103A**: EGSM/GPRS 900/1800 MHz version with 16 Mb of Flash memory and 2 Mb of SRAM (16/2).
- **P3103B**: EGSM/GPRS 900/1800 MHz version with 32 Mb of Flash memory and 4 Mb SRAM (32/4).
- **P3113A**: EGSM/GPRS 900/1900 MHz version with 16 Mb of Flash memory and 2 Mb of SRAM (16/2).
- **P3113B**: EGSM/GPRS 900/1900 MHz version with 32 Mb of Flash memory and 4 Mb of SRAM (32/4).

In this document, the words “P3100” or “P3100 series” are referring to the products listed here-above.

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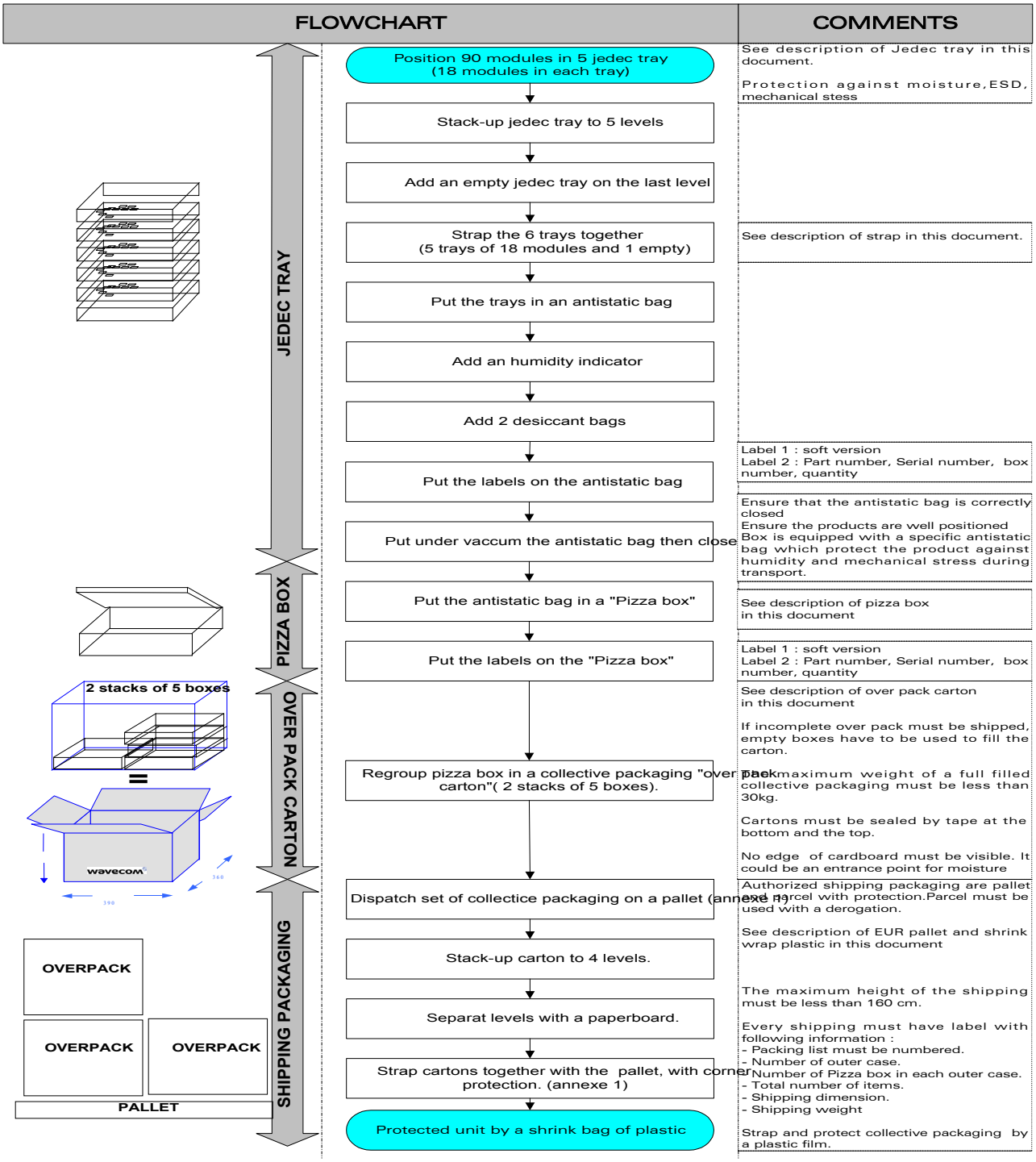
Packaging

1.1 Packaging process flowchart



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1.2 Packaging elements

1.2.1 Tray

Standards:	JEDEC N°95-1
Type :	Injected
Material :	PA 6-6, 30% GF, non ESD generative material
Use temperature :	120°C max
Surface resistivity : humidity	10^6 to 10^9 Ωcm @ 22 ± 2°C and 50 ±10% relative
Dimension :	322.6 x 135.9 x 7.62 mm (see appendix 1)
Capacity :	18 modules (WISMO Pac P3100 series)
Pick-up areas :	2 alveolus (44 x 32 mm)
Wavecom code :	WM13433

Never stack more than 10 full trays.

1.2.2 ESD bag

Material :	Eurostat multi layer bag (PET- aluminium layer – PE)
Type :	Anti humidity and ESD protection
Dimension :	457 x 250 mm
Capacity :	6 trays (5 full and 1 empty) + 2 desiccants + 1 humidity indicator
Wavecom code	WM13478

This packaging is especially intended for packaging of electronic devices. It can be sealed and vacuum-packed.

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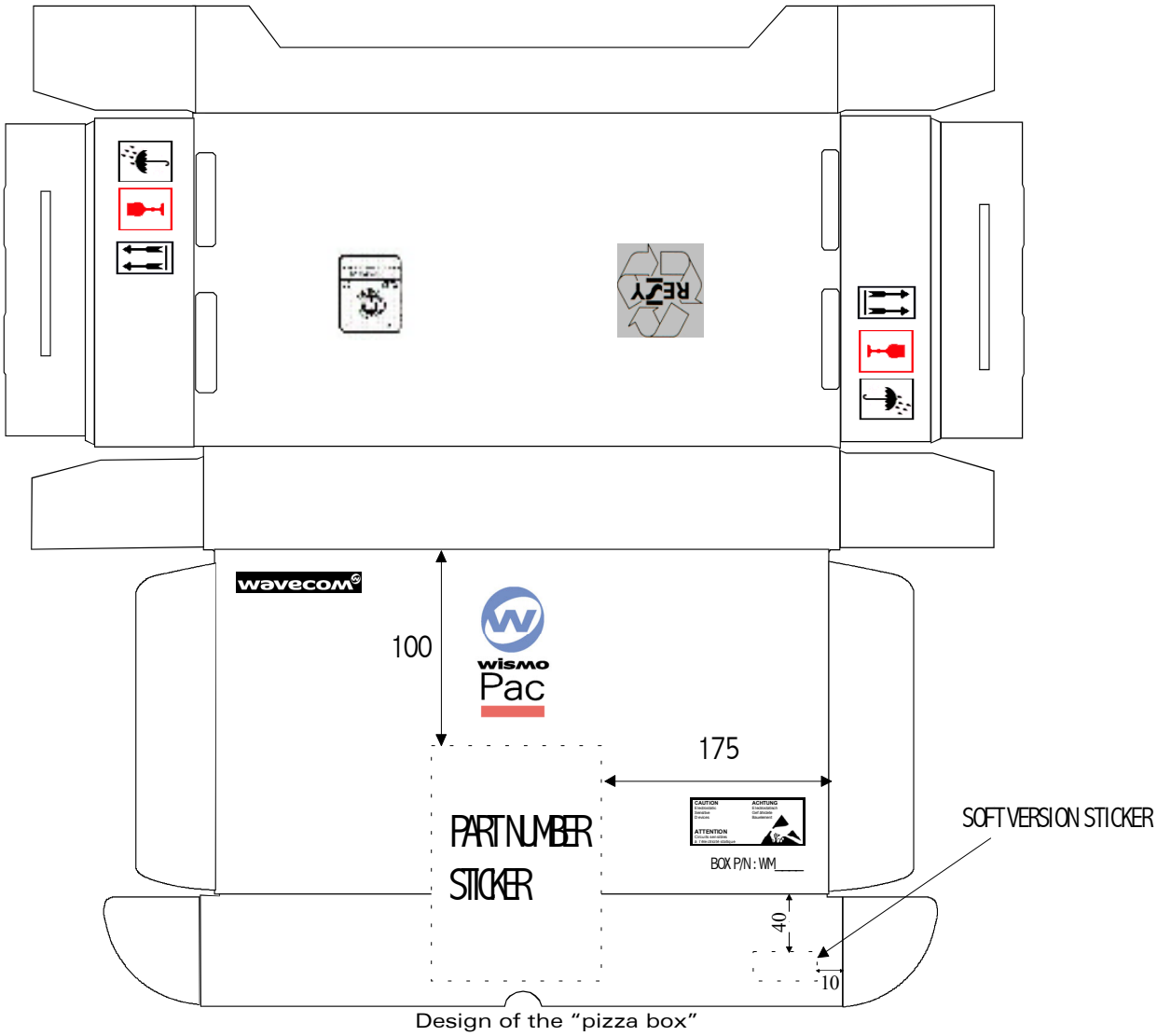
1.2.3 "Pizza" Box

Material :	Collective anti-ESD Box, "pizza box" type
Type :	FEFCO 0427
Dimension :	355 x 170 x 55
Capacity :	90 modules (WISMO Pac P3100 series)

This packaging is stamped with the WISMO logo, with the LNE and the RESY specification compliance stamps and with a warning label for electrostatic sensitive device (see here-below).



Design of the "pizza box"

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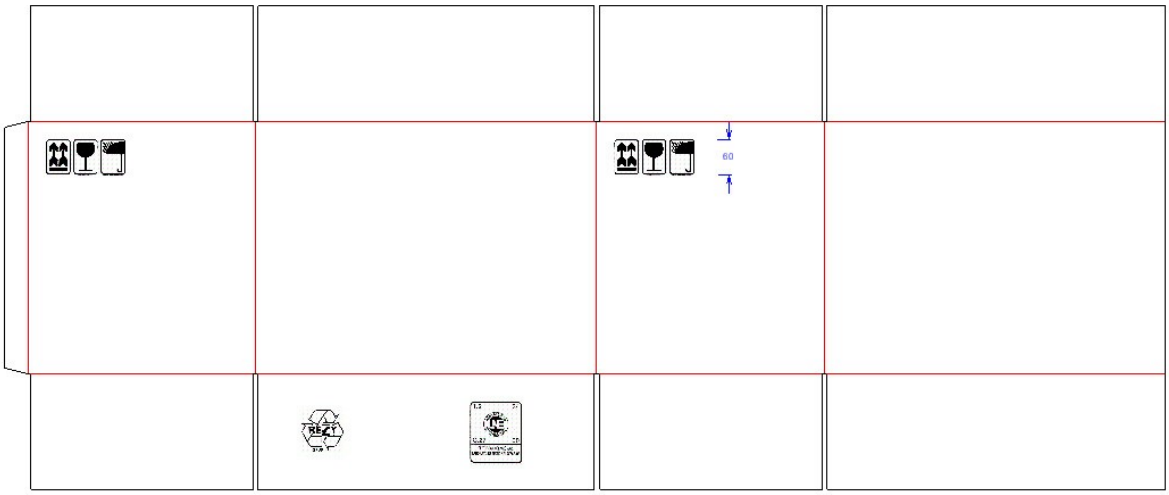
1.2.4 Over pack carton

Material :	Brown Carton with three levels separated by two spacers
Type :	FEFCO 0201
Dimension :	390 x 360 x 300
Capacity :	10 Pizza boxes (2 x 5)

This packaging is stamped with the WAVECOM logo and with the LNE and the RESY specification compliance stamps. The LNE class of this product is DDF 2.3. The dimension is defined to allow the packaging to be fully filled with boxes or with trays (no empty space).



Design of the collective packaging

1.2.5 EUR pallet

Material :	Wood
Weight :	22 kg
Dimensions :	1200 x 800 x 150 mm
Capacity :	From 3 to 12 cartons
Weight :	Up to 350 kg

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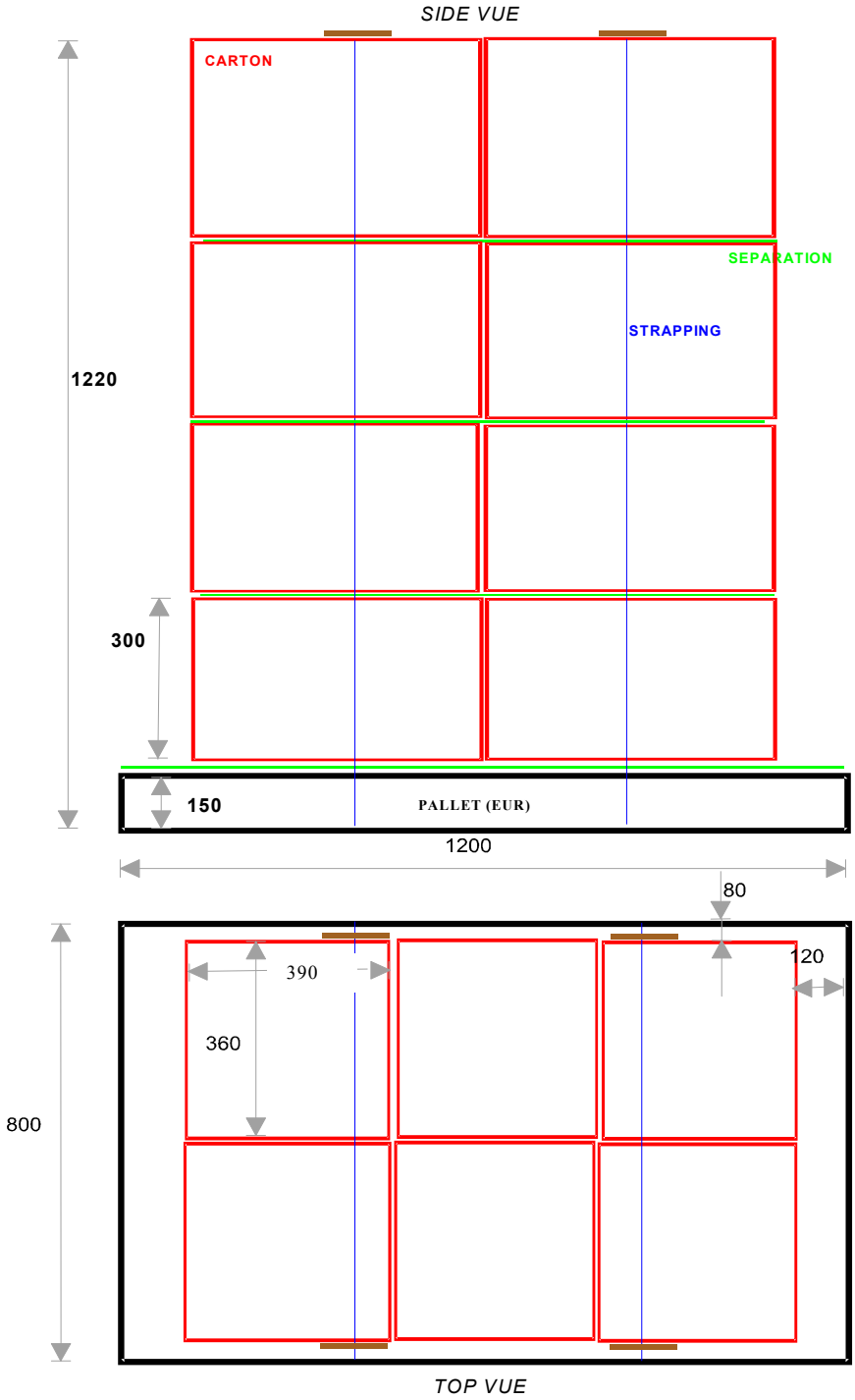

Dimensions of a pallet

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1.2.6 Strap

Material :	Polypropylene
Width :	Minimum 8.0 mm

1.2.7 Shrink-wrap plastic

Material :	Polyethylene
Type :	Shrink-wrap plastic.
Dimension :	At least 20 µm

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2 Baking Instruction

This procedure is applicable if:

- the packaging arrives open at the incoming inspection stage
- the humidity indicator level is higher than 10 % R.H.
- the modules have been stored with no packaging for more than 168 h

In this case, the P3100 modules must be baked at 70°C/12h.

2.1 Goal

The aim of this procedure is to remove humidity from the module.

The module uses components with plastic (BGA type) cases. Any residual humidity inside a plastic case would lead to "popcorn" damage effects during the reflow soldering.

The P3100 module class is 3.

2.2 Baking Process

- Put the trays in the oven (do not stack more than 3 full JEDEC trays per pile)
- Set the temperature at 70 ± 5 °C
- Set the time to 12 -0 +1 hours
- Open the door and remove the trays.

- The module must be baked just before packaging. After the baking, the trays must be packaged within 24 hours.
- Do not open the doors of the oven during baking.
- Once the ESD bag open, the module must be soldered within 168h.
- The maximum number of baking is 3, in addition to the one done by WAVECOM before shipping.
- The lifetime of the shell in the sealed bag is 1 year. Beyond 1 year, check the humidity indicator: if the level is higher than 10 % R.H., the P3100 module must be baked at 70°C/12h.

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3 Assembly Process

This part gives recommendations to assemble the WISMO Pac P3100 module on a mother board.

3.1 Copper land pattern

- Copper land pattern diameter

  NSMD Technology (None Solder Mask Defined) with circular copper land pattern diameter : Ø 0.64 mm

- Copper Land pattern position

  See P3100 drawing in appendix 2

  Presence of fiducial target in close proximity to the device

- Land pattern surface finish

  Nickel Gold recommended

3.2 Solder paste

- Solder paste

  SnPb or SnPbAg class 3 (25-45µm)

3.3 Stencil

- Stencil technology

  INOX laser cut technology minimum requirement.

  Electro-formed technology preferred.

- Stencil aperture geometry

  750 µm ± 10 µm

- Position stencil / Mother board

  Contact (No Gap)

- Stencil thickness

  150 µm recommended

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3.4 Automatic pick and place

- A1 Pin locating

  A1 pin position : given by an indicator on the label (see chapter 7)

- Pick and Place system

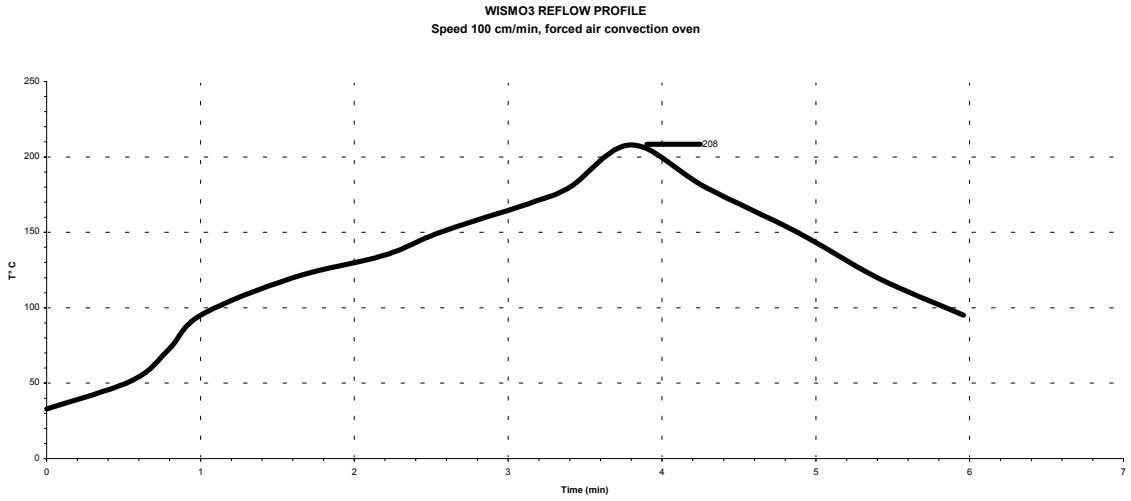
  Aspiration on label surface

  Recognition of the external pins

3.5 Reflow

- Reflow temperature profile

  Forced air convection oven system



- Maximum number of reflow soldering accepted by the module

  Only 1 reflow soldering supported for the assembly of the module on the application board.

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4 Co-planarity Measurement Method

4.1 Introduction

This part describes the method for the manual measurement of the co-planarity on the P3100 module.

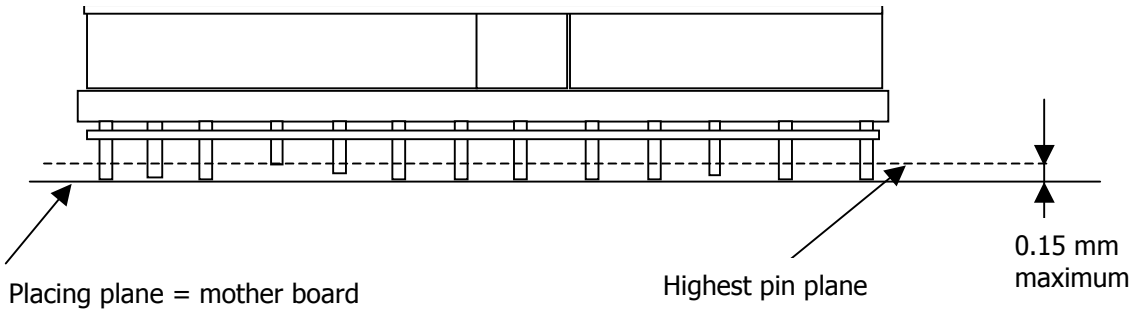

Figure 1 : Co-planarity criteria

To guarantee the correct mounting of the P3100 on a mother board, a 0.15mm max co-planarity between the 214 module pins top ends is required.

Nota:

- The co-planarity is the relative position of the 214 pins top ends between themselves.
- The measurement of the pins height with reference to a zero plane does not directly give the co-planarity result for these points independently to the global module positioning on the bulk.
- The positioning and the height are different on each module due to the module assembly height tolerances, the flatness of the cover and the label, the laying position of the module in space.

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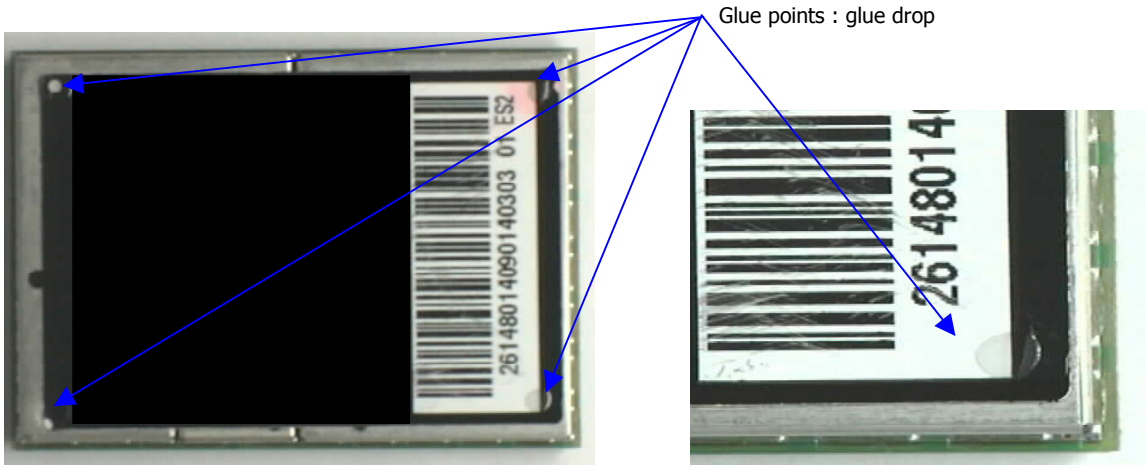
4.2 Co-planarity measurement

4.3 Module setting

- Preparation:
  - 4 little glue drops are put on the 4 corners of the top cover.

The glue used is referenced "LOCTITE 431". It is an instantaneous adhesive cyanoacrylate glue which can be dissolved using an acetone solvent.



Pictures 1 and 2: position of the glue points

  - Then the module top cover is gently stuck (i.e with the column grid array pins up) on a rectified stainless steel bulk.
  - After 5 minutes, the module is fully stuck. The measurement can then be done.
  - Once the measurements done, the module can be detached using acetone to dissolve the glue
- The interposer (column grid array) pins are then face up
- An anti-ESD bracelet must be used to avoid any electrical discharge on the module

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4.4 Co-planarity measurement

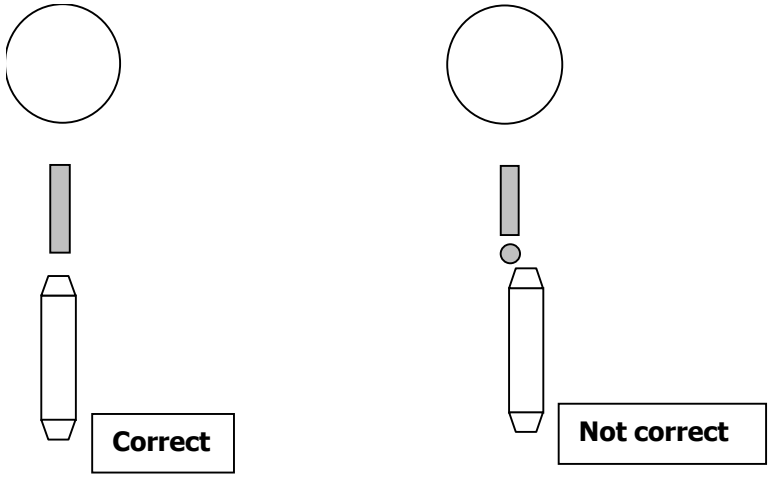
Measurement of the 214 interposer pins height

- Measurement tools

This measurement is done with a Mitutoyo micro-metric comparator.

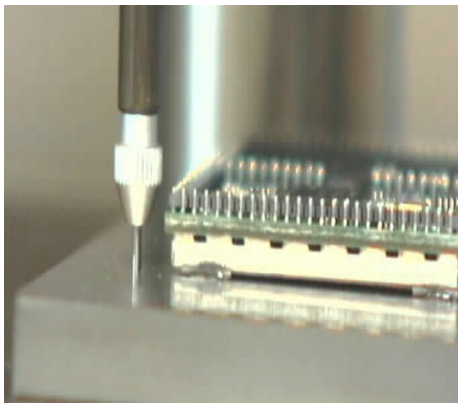
The reference of the Mitutoyo needle touch comparator is H120065.

The head end is flat in order to avoid some measurement errors.



- Start:

The surface of the stainless steel bulk is used to set the zero reference on the comparator.



Pictures 4 and 5 : Zero reference

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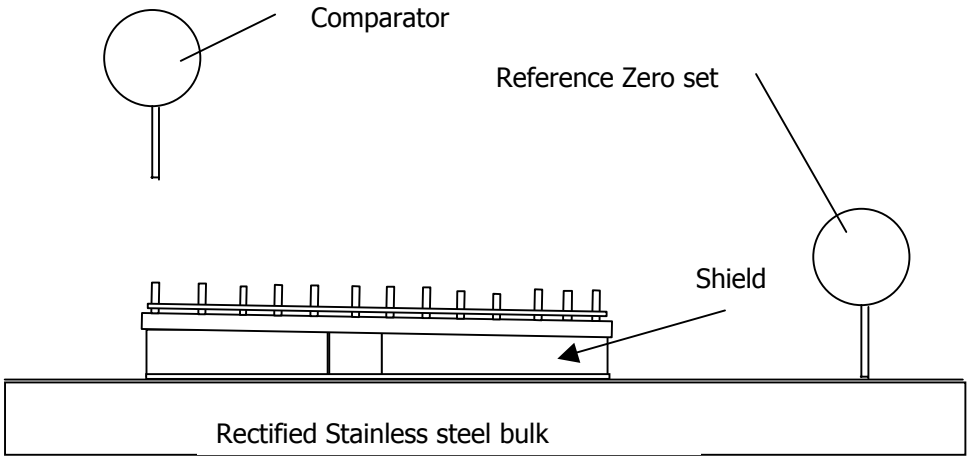
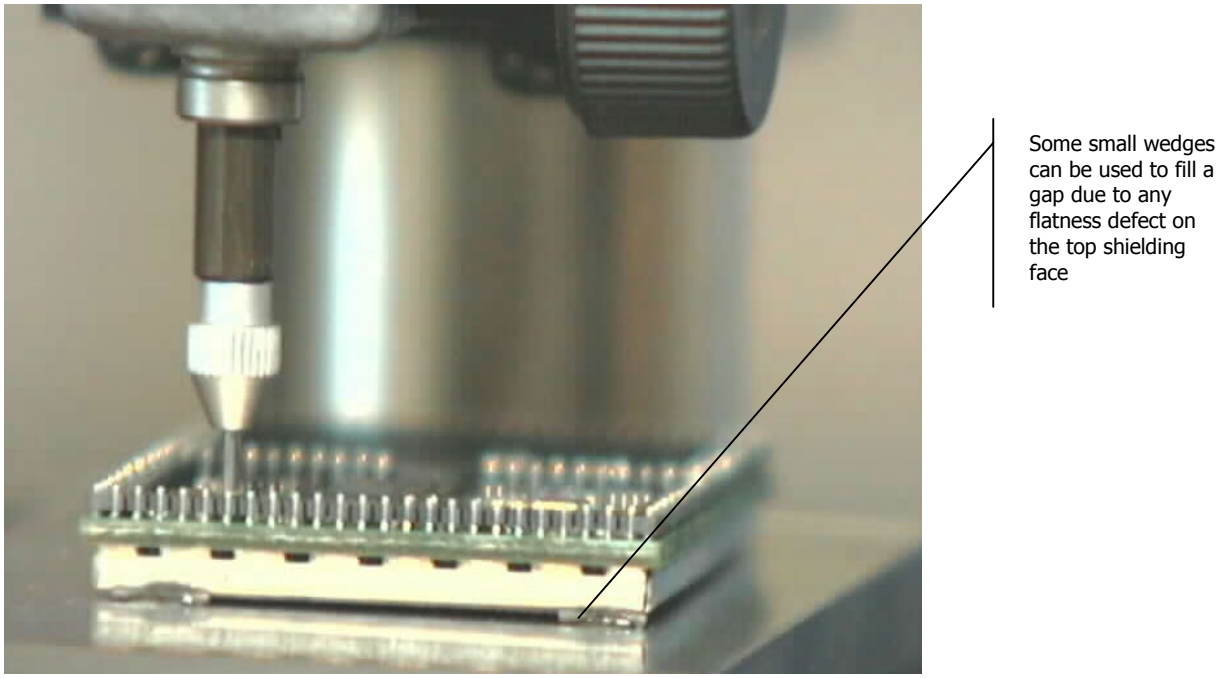
- Real measurement:

The measurement is done on each top end of the interposer 214 pins



Criteria :

All the module pins ends must be located between 2 parallel planes spaced by a gap of 0,15 mm maximum



Picture 6 : Example of measurement on a pin top

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4.5 Co-planarity calculation

All the pins top end positions are listed on an Excel sheet representing the location of the 214 interposer pins.

The co-planarity of the P3100 module interposer pins is determined by the MLS (Method of Least Squares) plane calculation and then by the difference between the highest and the lowest point according to this plane.

The MLS plane is the average geometrical plane cutting a cloud of points (x,y,z) located in a 3D space. This plane characteristics are determined by the arrangement to minimize the square of the perpendicular distance of each point to this plane surface.

A specific software has been developed by WAVECOM to calculate the coefficients of the average plane and determine the relative co-planarity of these points.

4.6 Location of the 214 interposer pins measurement

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Z	5,14	5,15	5,15	5,16	5,15	5,15	5,16	5,17	5,18	5,19	5,19	5,2	5,2	5,2	5,2	5,2	5,21	5,21	5,2	5,21	5,21	5,2	5,2	5,2	5,2	5,19	5,18	5,18	5,18	5,18	5,17	5,18	5,18	5,19	5,2
Y	5,15	5,16	5,15	5,15	5,15	5,14	5,14	5,16	5,16	5,17	5,17	5,19	5,19	5,19	5,2	5,19	5,21	5,22																	5,19
X	5,14	5,15															5,2	5,19																	5,18
W	5,14	5,14															5,2	5,2																	5,18
V	5,15	5,14															5,2	5,21																	5,18
U	5,15	5,14															5,2	5,21																	5,17
T	5,14	5,16															5,2	5,21																	5,18
S	5,16	5,16															5,2	5,21																5,17	5,18
R	5,16	5,17															5,21	5,21																5,17	5,18
Q	5,16	5,17															5,21	5,22																	5,18
P	5,17	5,17															5,22	5,22																5,18	5,18
O	5,19	5,18																																5,18	5,18
N	5,19	5,19																																	5,18
M	5,2	5,19																																	5,19
L	5,2	5,2																																	5,18
K	5,19	5,19															5,22	5,24																	5,17
J	5,2	5,2															5,23	5,23																	5,18
I	5,21	5,2															5,23	5,23																	5,18
H	5,21	5,21															5,24	5,23																	5,18
G	5,22	5,21															5,24	5,24																	5,19
F	5,22	5,22															5,25	5,24																	5,18
E	5,22	5,22															5,24	5,25																	5,19
D	5,23	5,23															5,25	5,25																	5,19
C	5,24	5,24															5,25	5,25																	5,19
B	5,26	5,27	5,25	5,25	5,25	5,24	5,25	5,27	5,26	5,26	5,26	5,27	5,26	5,26	5,26	5,26	5,28	5,28																	5,21
A	5,26	5,26	5,26	5,27	5,27	5,25	5,25	5,26	5,27	5,27	5,27	5,27	5,27	5,27	5,27	5,27	5,27	5,27	5,27	5,27	5,26	5,25	5,24	5,24	5,24	5,23	5,23	5,22	5,22	5,22	5,22	5,22	5,22	5,22	5,22

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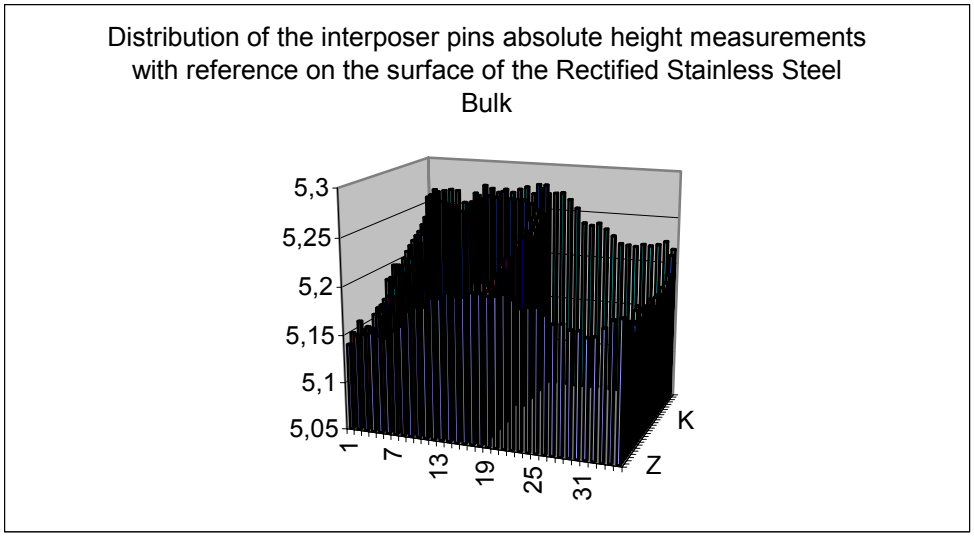
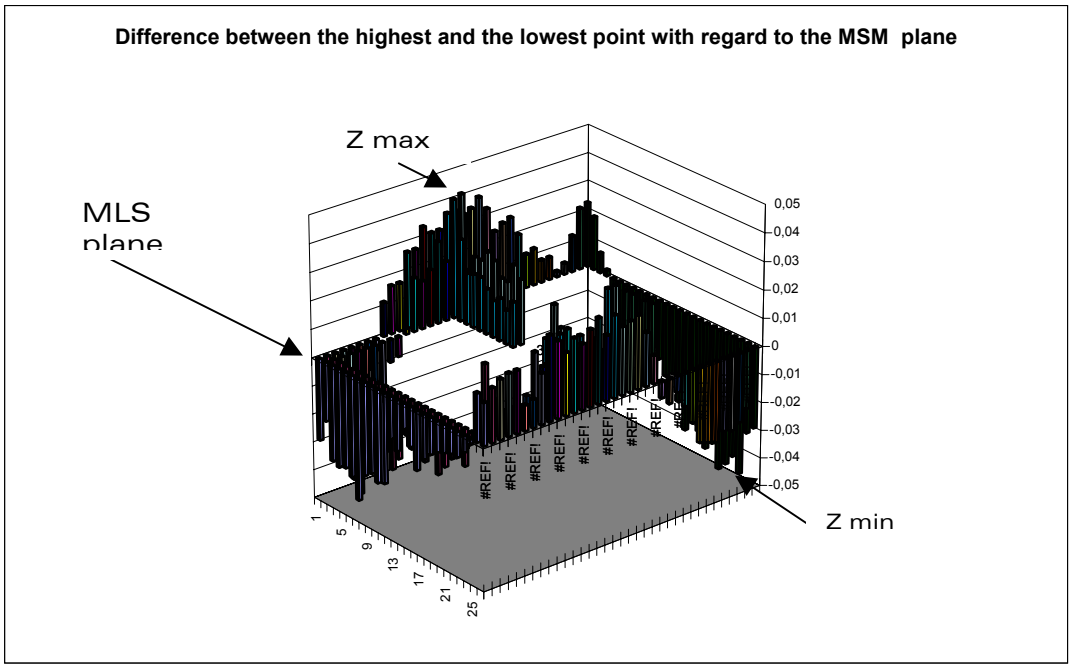


4.7 Example of MLS plane calculation

This graph was plotted after the calculation of the MLS plane



The co-planarity is determined by Zmax –Zmin.

In this example, the co-planarity is 0,092.

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5 Soldering Process Validation

The WISMO Pac P3100 module must be soldered like a SMT component. As for any other small component (using BGA package for example), the soldering process requires precautions. To achieve minimum failure rate, the soldering process must be validated before mass production.

5.1 Principle

A specific P3100 mechanical sample (referenced WM3A-MTSC) is available for test purpose. The WM3A-MTSC has exactly the same package as the real P3100. This mechanical sample must be soldered on a specific PCB (see figure below). Inside the WM3A-MTSC, pins are connected by pair, but no pairs are connected together. All the pin pairs are connected via a specific footprint on a test PCB. If the soldering of the dummy module is correct, zero ohm shall be observed between two test points. Otherwise, the module is not correctly soldered.

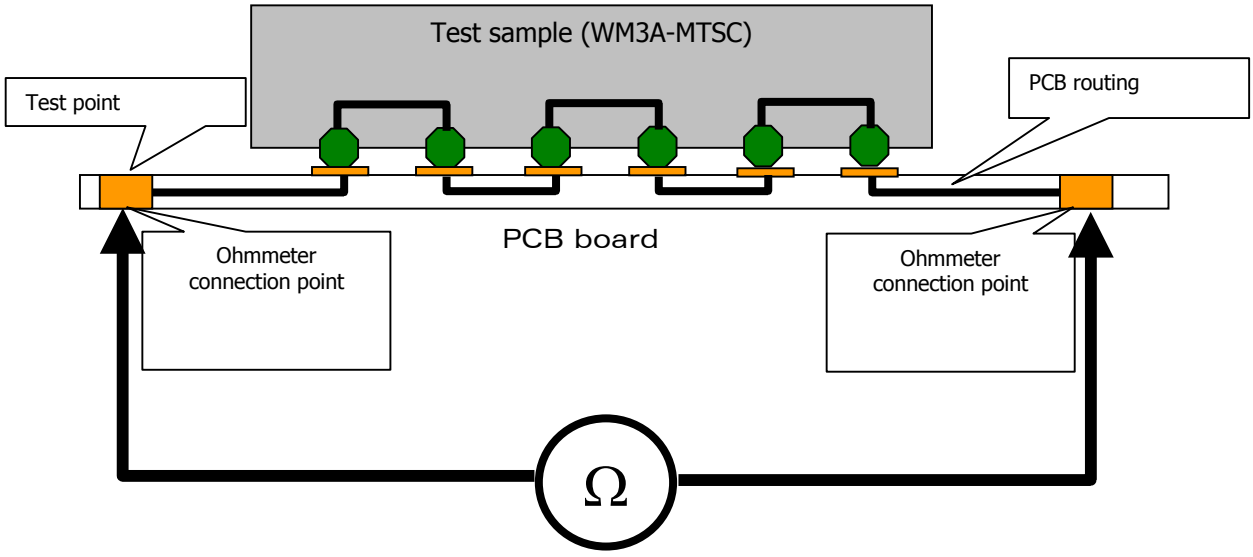

Figure 2 : Continuity test principle

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5.2 Continuity test

To simulate real production conditions, the application board PCB used for continuity test must have the same mechanical features as the one used for application mass production.

To make this easily, it is suggested on your PCB CAD system, to reuse your application board design on which you delete all routing lines around WISMO P3100. Connect WISMO footprint and add 2 test points according to Appendix 3 schematics.

When assembling WM3A-MSTC on this specific board, you will have the correct chain for continuity test measurement.

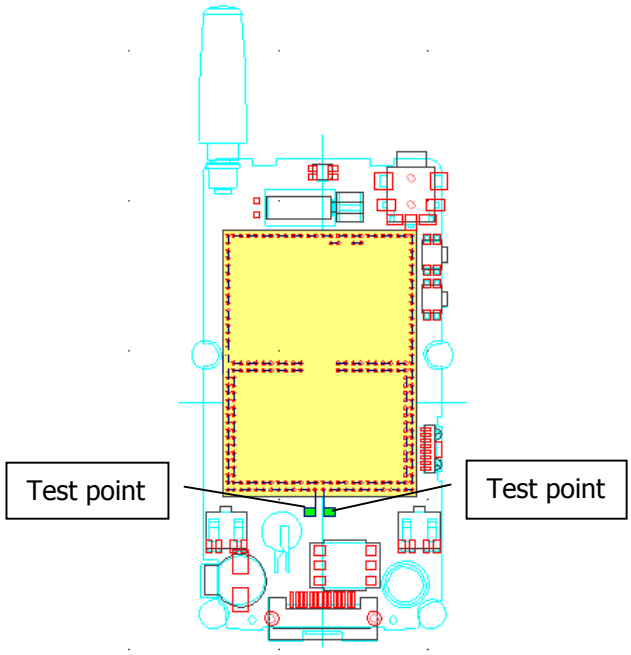

Figure 3 : Typical application PCB for continuity test

The WM3A-MSTC reference is WM12865. Used with a specific PCB designed for continuity test it allows the soldering process to be tested.

Continuity test schematics are available in this document, appendix 3.

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5.3 Visual inspection

This part specifies the acceptance requirements for the assembling of the WISMO Pac on a mother board.

5.3.1 Definition

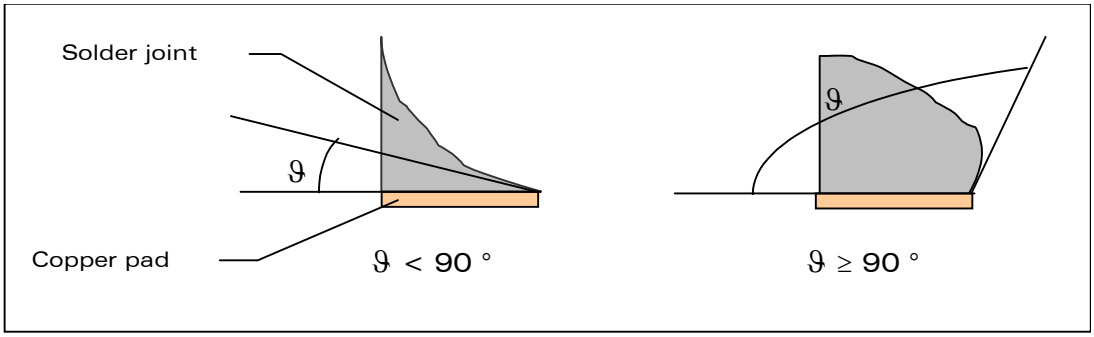
The criteria defined in this document correspond to two classes, which are defined in the IPC-A-610-C.

5.3.2 Applicable documents

IPC-A-610-C: Acceptability for electronics assemblies

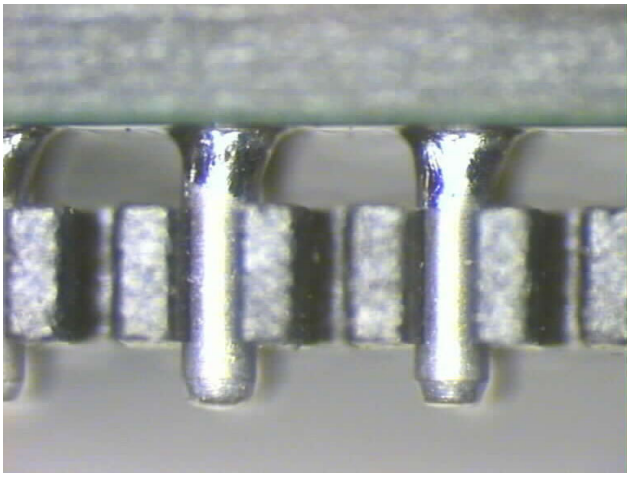
5.3.3 Acceptance criteria

5.3.3.1 Wetting



Target – class 2,3

The solder fillet exhibits good wetting of the solder to the parts being joined. The fillet is concave in shape ($\vartheta < 90$ °).



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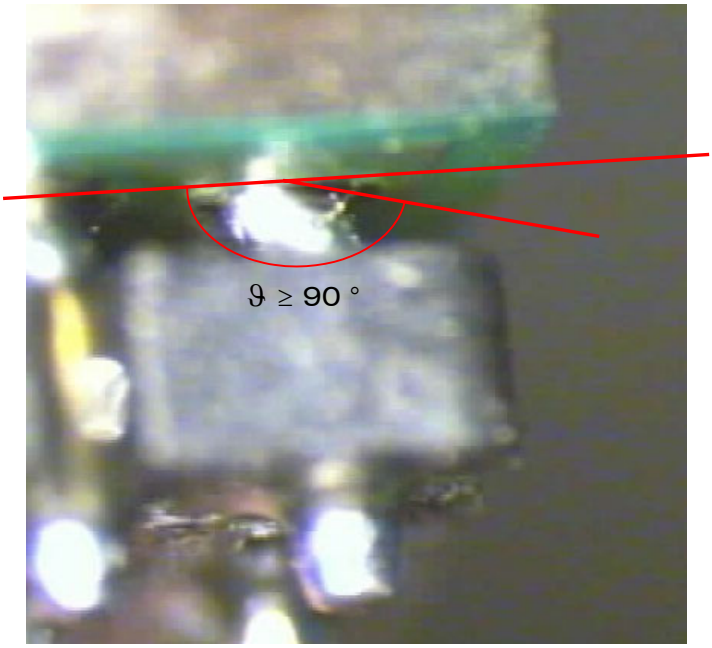
Acceptable – class 2, 3

The solder connection must indicate evidence of wetting and adherence when the solder blends to the soldered surface, making a contact angle of 90° or less, except when the quantity of solder results in contour which extends over the edge of the land or solder resist.

Defect – class 2,3

Non-wetting that results in solder making a ball on the surface, in a similar way as water beads do on a waxed surface.

The fillet will be convex ($\vartheta \geq 90$ °).



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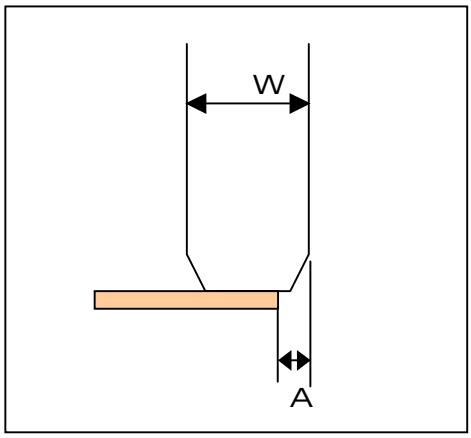
5.3.3.2 Maximum overhang

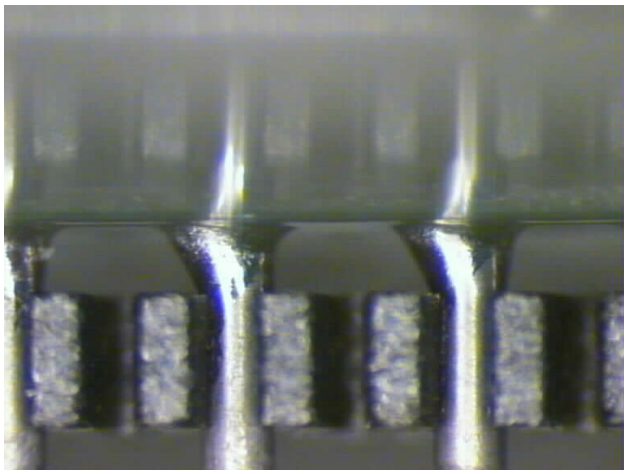


Target – class 2, 3

No side overhang

Acceptable – class 2

Overhang (A) less that 25% lead width (W) (ie 130 µm for P3100)



(overhang100 µm)

Defect – class 2

Overhang (A) exceeds 25% lead width (W)

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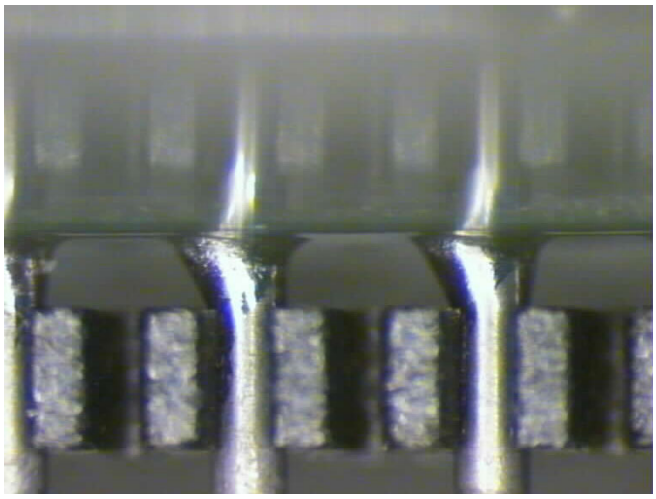
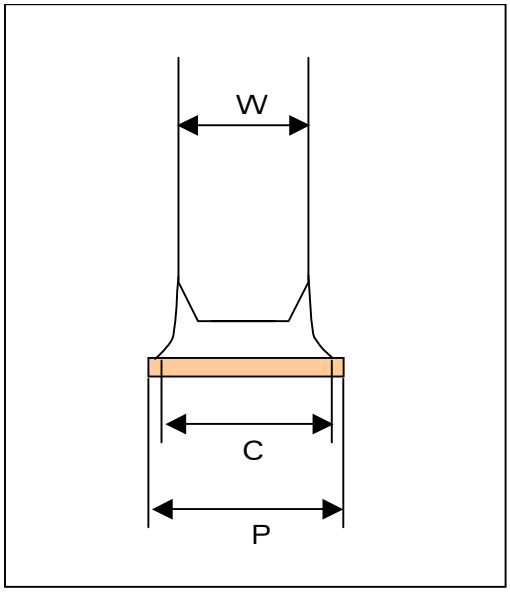
Defect – class 3

Any side overhang (A)



5.3.3.3 Minimum end joint width



Target – class 2,3

End joint width (C) is equal to P

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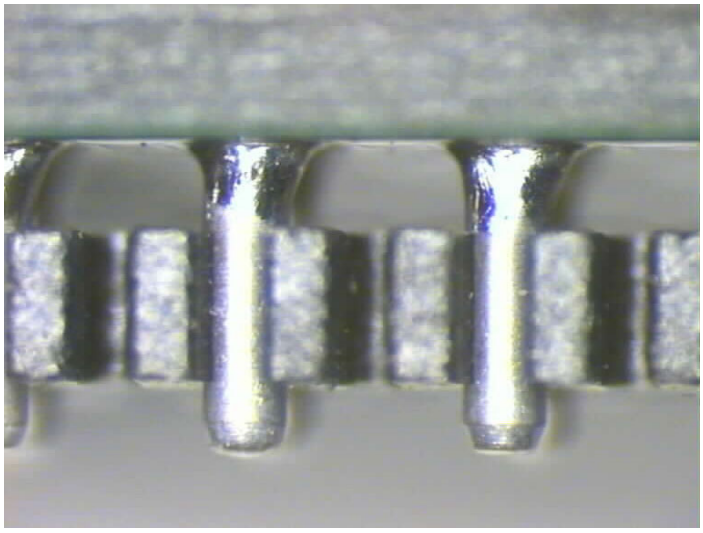
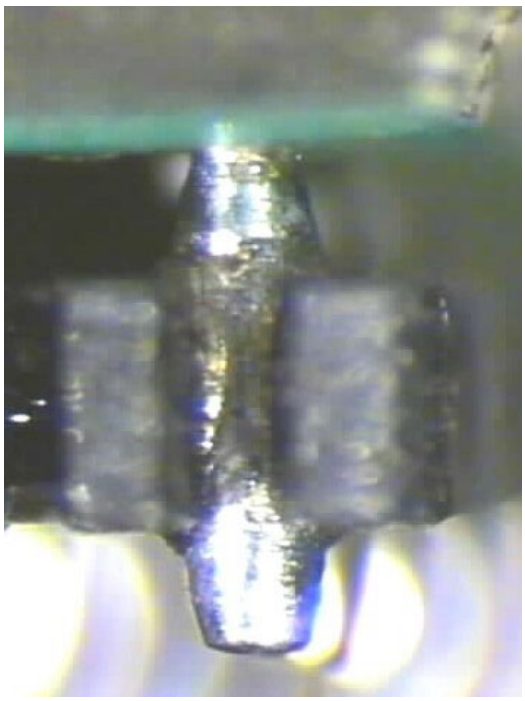


Acceptable – class 2,3

End joint width (C) is greater than width (W)

Defect – class 2,3

End joint width (C) is less than width (W)



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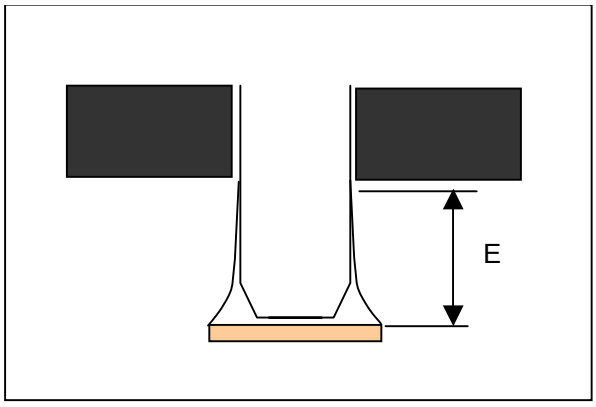
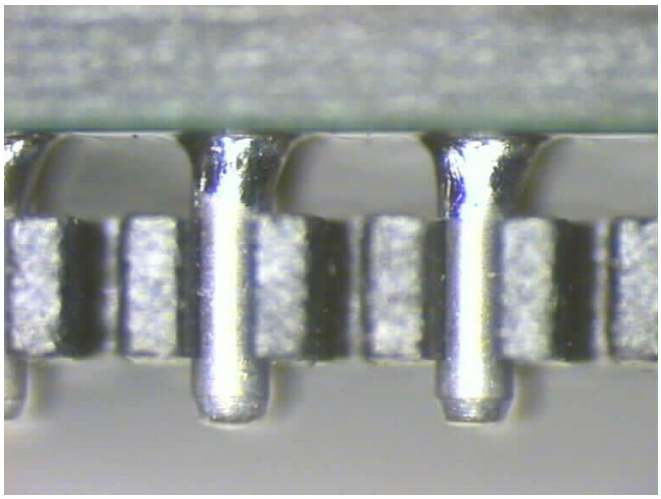
5.3.3.4 Maximum fillet height



Acceptable – class 2,3

Properly wetted fillet evident

Solder touches the package body



Defect – class 2,3

Fillet not properly wetted.

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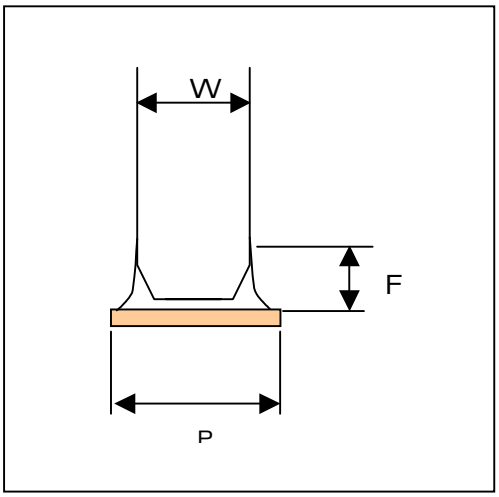
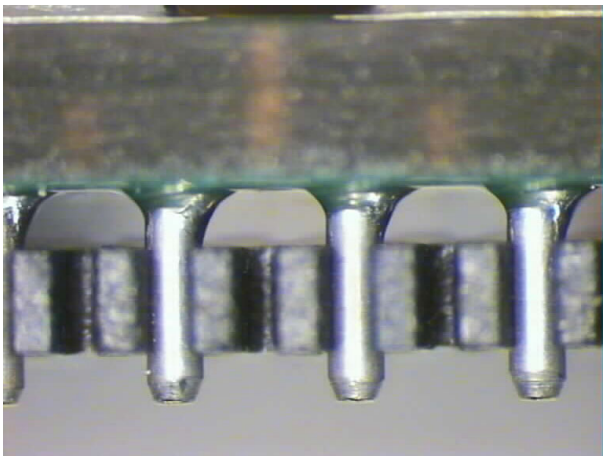
5.3.3.5 Minimum fillet height



Acceptable – class 2

Fillet height (F) is minimum $\frac{P-W}{2}$ (ie 120 µm for P3100) (isosceles triangle)



(fillet 140 µm)

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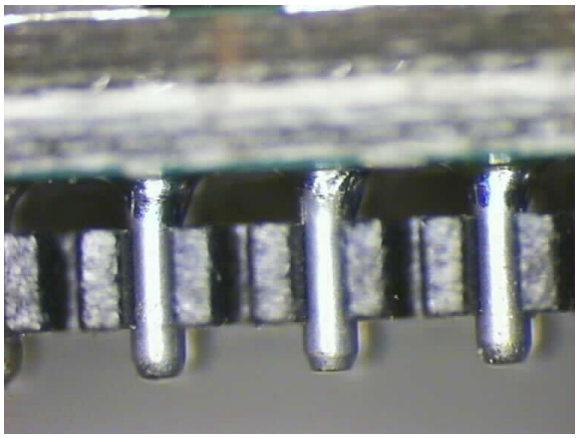
Acceptable – class 3

Fillet height (F) is minimum (P-W) (ie 240 µm for P3100)



(fillet 240µm)

Defect – class 2

Fillet height (F) is lower than $\frac{P-W}{2}$ (ie 120 µm for P3100)

Defect – class 3

Fillet height (F) is lower than (P-W) (ie 240 µm for P3100)

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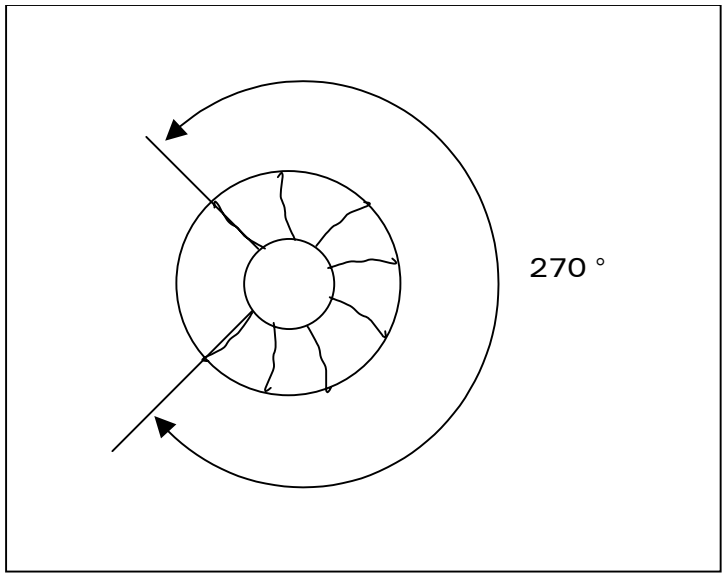
5.3.3.6 Circumferential fillet



Target – class 2,3

360° wetting present on pin and land

Acceptable – class 2, 3

Minimum 270° wetting present on pin and land

Defect – class 2, 3

Less than 270° wetting present on pin and land

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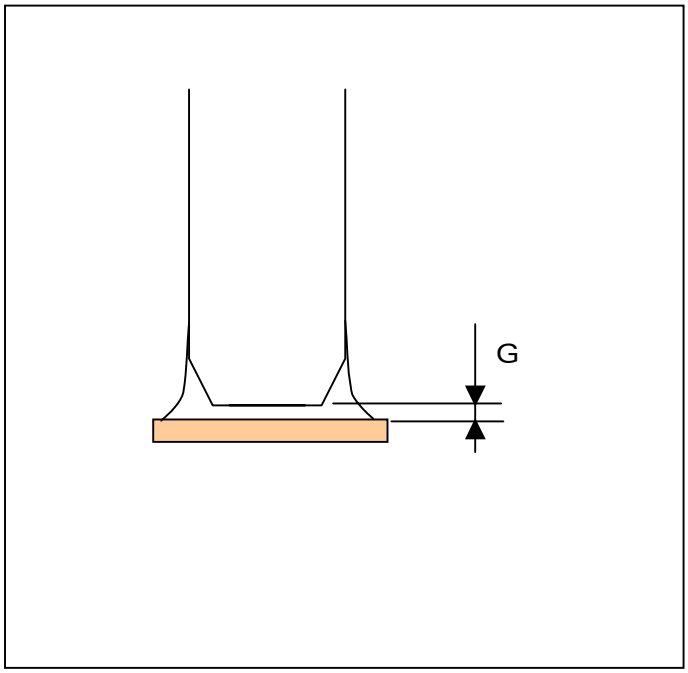
5.3.3.7 Solder thickness



Acceptable – class 2,3

Properly solder evident.

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6 WISMO Pac P3100 Removal

6.1 Object

The object of this chapter is explain how to remove WISMO Pac P3100 from Application PCB, using a laser-beam technology.

Having firstly placed the clip together with the P3100 module, a vacuum nozzle is used to automatically remove the module from the mother board.

6.2 Material Used

- Dyamant Laser LS200 (130Watts)
- P3100 Dismounting Clip delivered by WAVECOM with the reference WM12878
- Support and insulation template for the mother board
- COBAR Flux (Reference :94-N2M LO-VOC NOC N2 FLX)

Nota : Dyamant Laser LS200 has now been replaced by new reference LS120.

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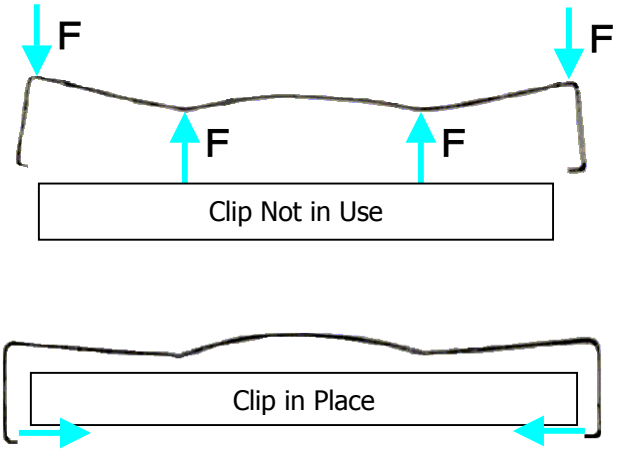
6.3 Description and Application of the Clip

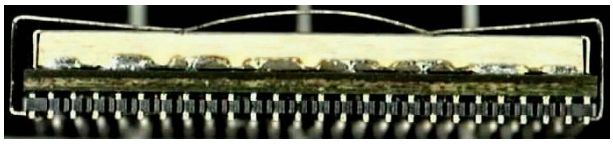
The aim of the clip is to keep the different layers of the WISMO Pac module (interposer, shielding and PCB) in place, during its extraction, by the tension created by the spring effect of the clip.

6.3.1 Physical Properties of the Clip

By applying a force F as shown in the diagram below (Clip not in Use) the aim is to bring the end of the clip inwards (Clip in Place).



Thanks to this clip, the different elements are all kept exactly in place (as seen on the picture here-below):



6.3.2 Clips drawing

Please see appendix 4

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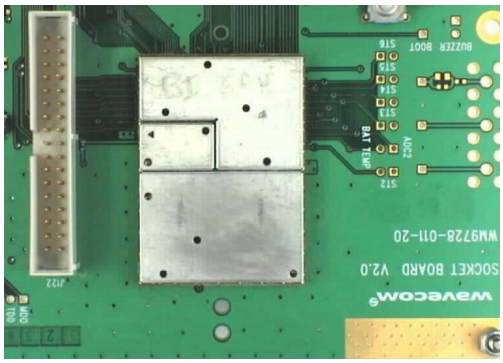
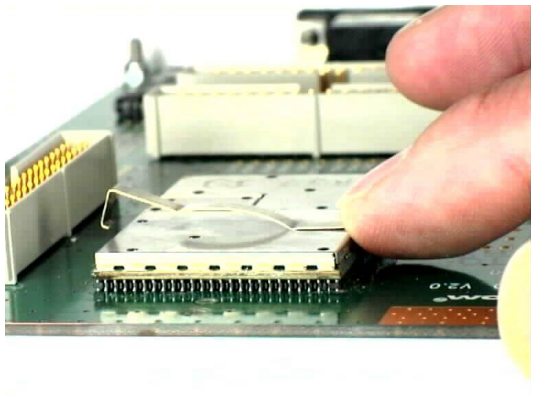
6.3.3 Steps to be followed to place a Clip on a P3100 Module

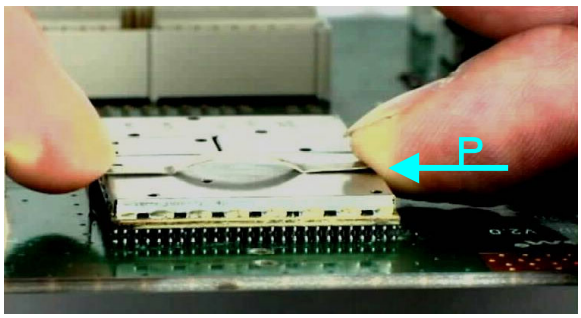
1) Remove the sticker from the module.



2) Place the clip on one side of the module : . The tips of the finger should be flat against the mother board.



3) By adding more pressure in the direction of the arrow P with the tip of the finger already in place the other end of the clip can be moved into place between the PCB and the module.



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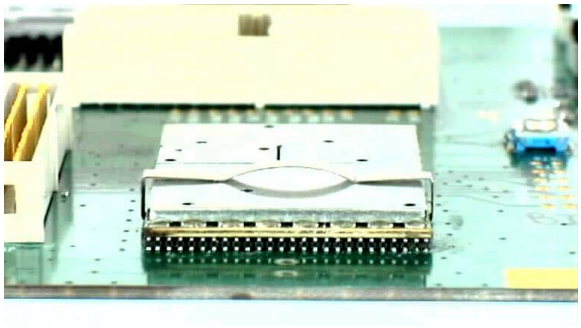
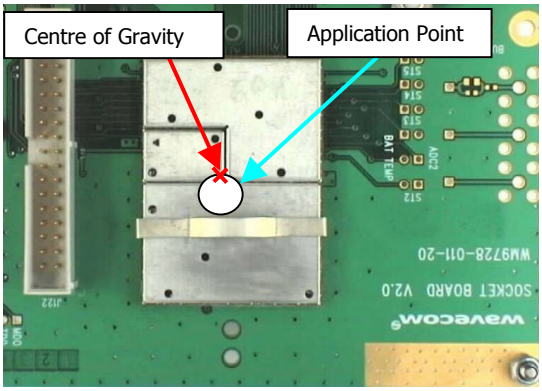
4) At this point it is possible to release both sides of the clip.



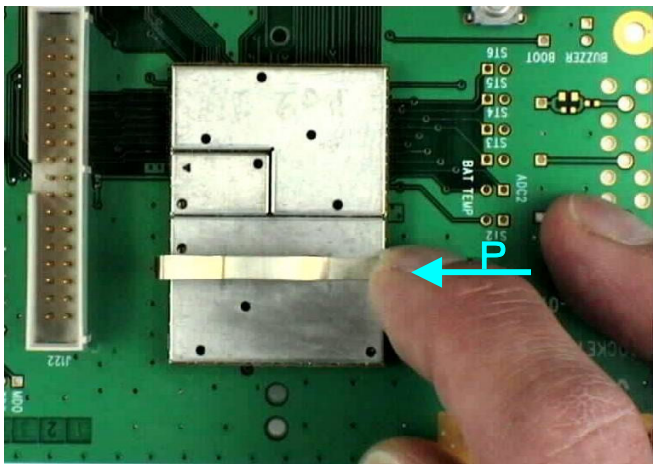


The application point shows the point at which the vacuum nozzle must be placed on the module during its extraction from the mother board.

The clip must be placed in such a way that the distance between the clip and the module's centre of gravity is less than half the distance between the edge of the module and its centre of gravity. The application point must be as close as possible to the centre of gravity.

6.3.4 Removing the Clip

1) In order to remove the clip, push gently on one of the arms of the clip in the direction of the arrow P. This will cause the second arm to disengage automatically.



Under no circumstances should the clip be removed in any other way as this, in order to be sure that the interposer is not damaged.

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6.4 Thermal Process

6.4.1 Dyamant LS200 Laser Parameters of Use

6.4.1.1 Parameters

- Type of laser : YAG
- Power of laser : 130 Watts
- Scan Speed : 300
- Required Temperature of laser : 230 °C
- Diameter of beam : 4 mm
- Starting Temperature of cycle : 50 °C
- Zone number of preheat zone : 3
- T° zone 1 : 300 °C
- T° zone 2 : 330 °C
- T° zone 3 : 300 °C
- Distance from pre-heat casket : 30 mm
- Waiting temperature of pre-heat caskets : 100 °C
- Temperature ramp up cycle : none
- Pressure of contact of the vacuum nozzle : 50 gr
- Diameter of the vacuum nozzle : 5 mm
- Duration of laser sweep: 6 minutes
- Cooling time : minimum 50 seconds

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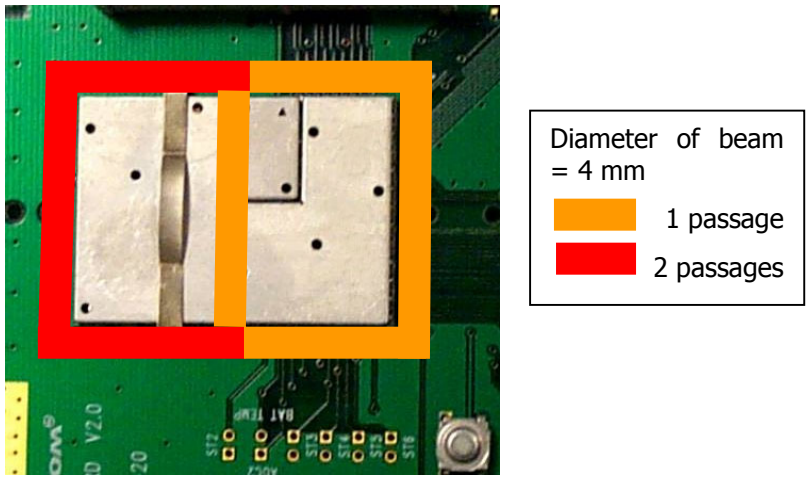
6.4.1.2 Sweep Zone of Laser beam



Aside from the central part of the module the sweep of the beam must be tangential to the circumference of the module.

Because of the thermal diffusion of the mother board, it has been necessary to create a template.

This support is also used to ensure that the module is always placed in the same position which allows the process to start. The template must be made from a non-metallic material which diffuses electrical charges (ESD).

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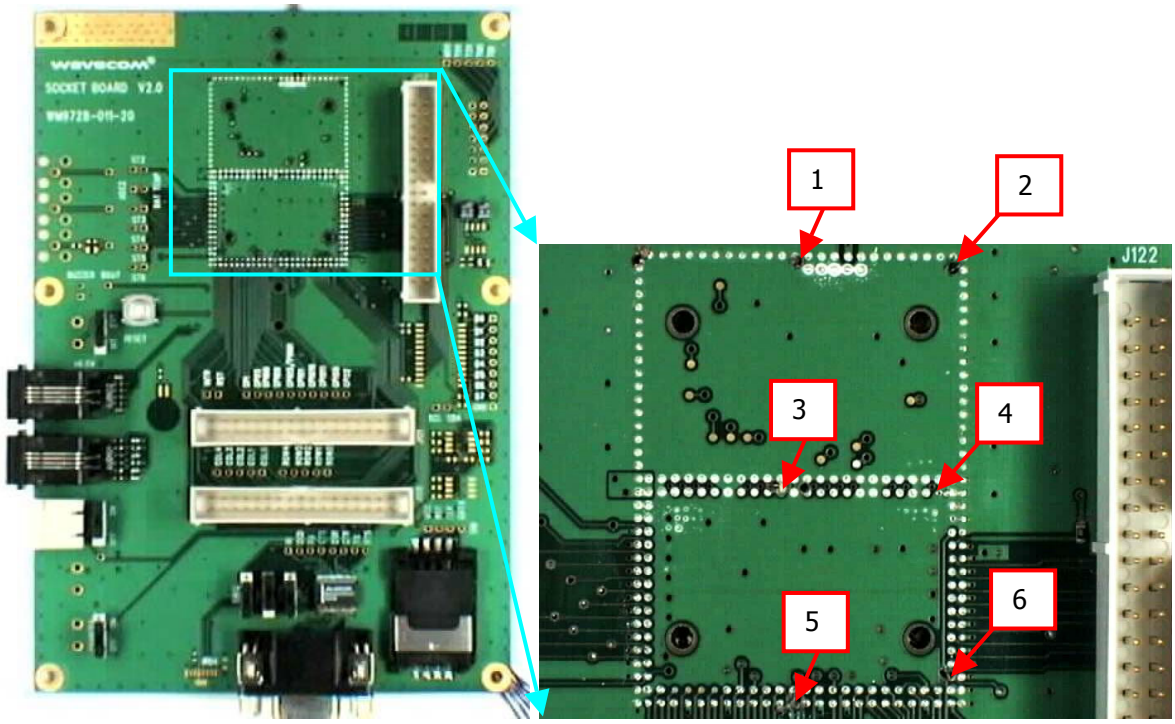
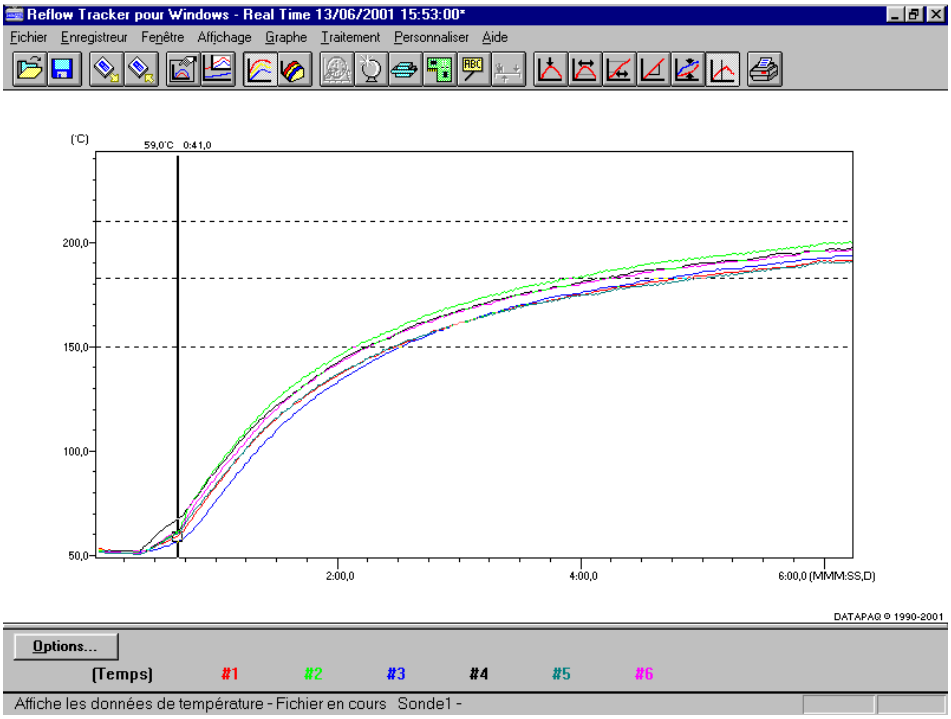
6.4.2 Temperature Profile taken from the P3100 module

6.4.2.1 Placement of Probes



6.4.2.2 Thermal Readings



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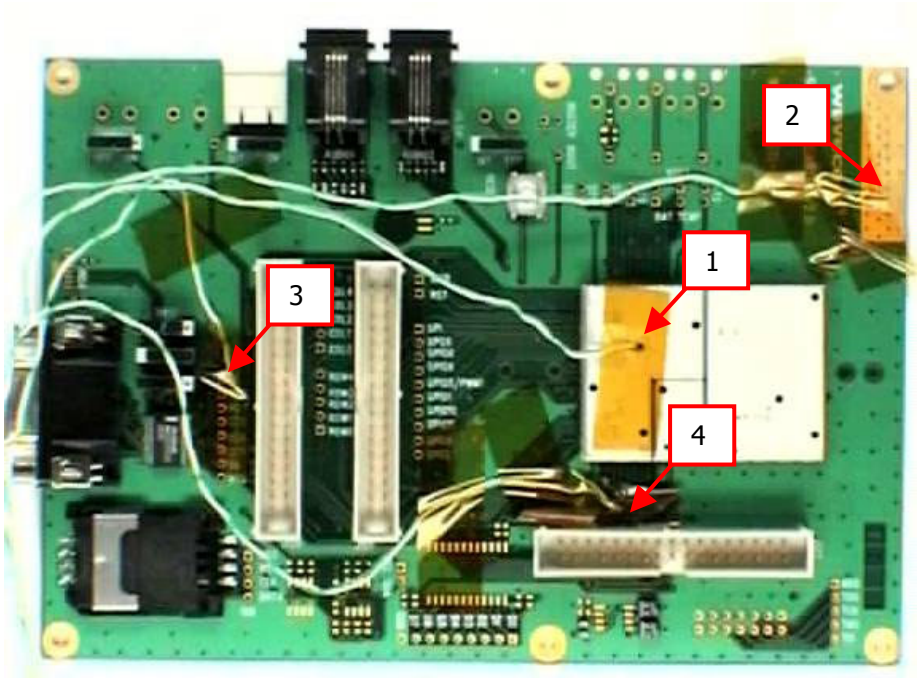
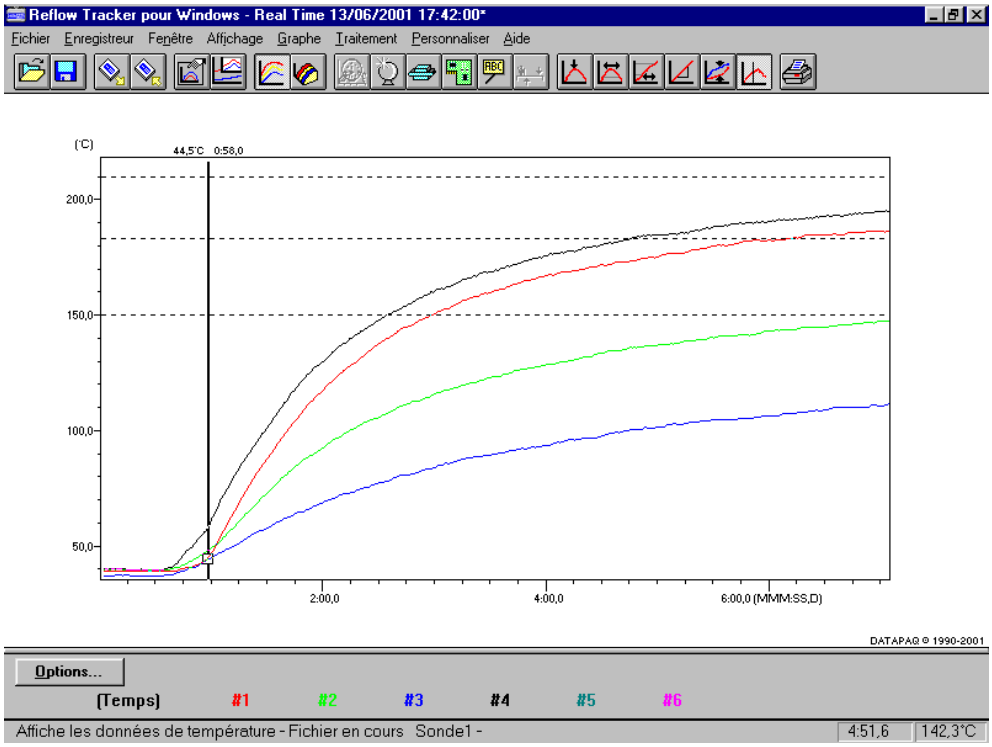
6.4.3 Temperature Profile taken from mother board

6.4.3.1 Placement of Probes



6.4.3.2 Thermal Readings



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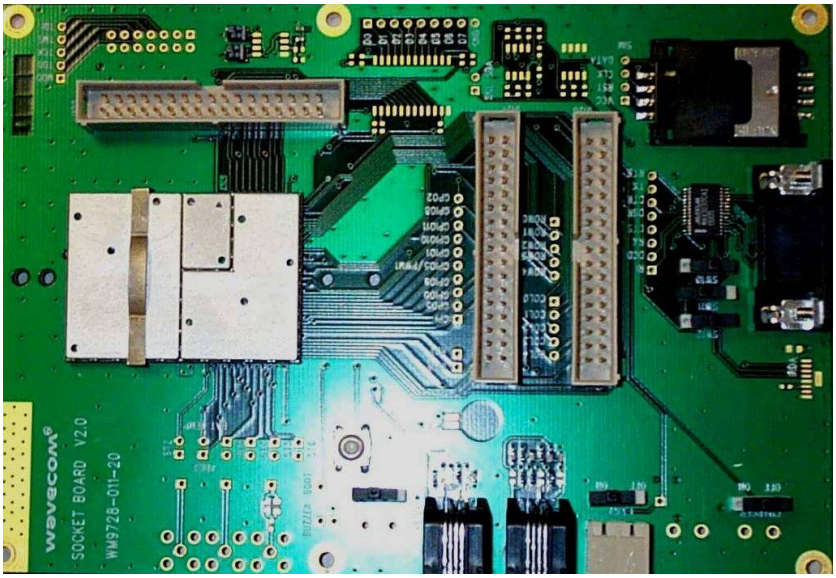
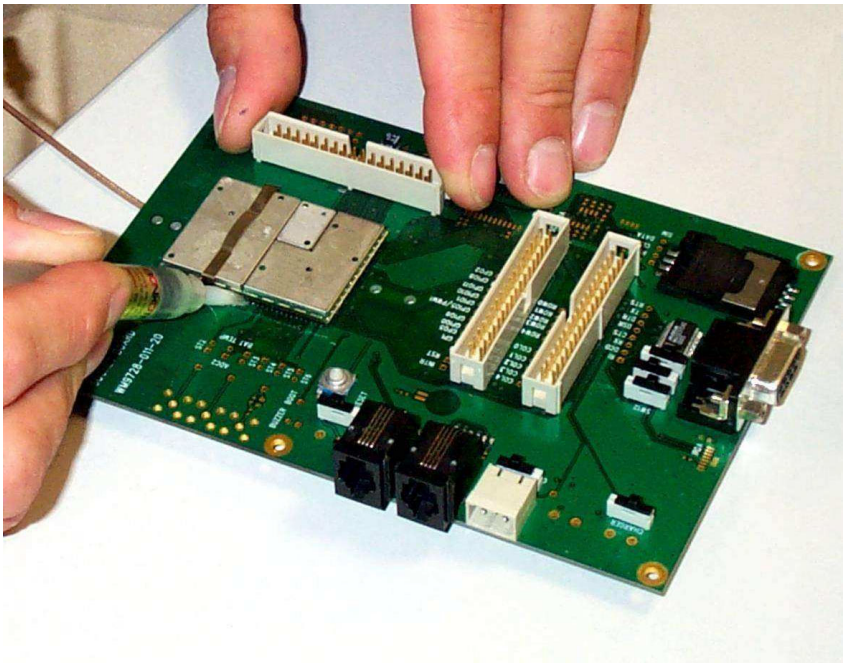
6.5 Steps to be followed to remove a P3100 module

1) Remove the sticker from the module and place the clip on the module as previously described.



2) Apply the COBAR flux (reference : 94-N2M LO-VOC NOC N2 FLX) round the pins of the module.



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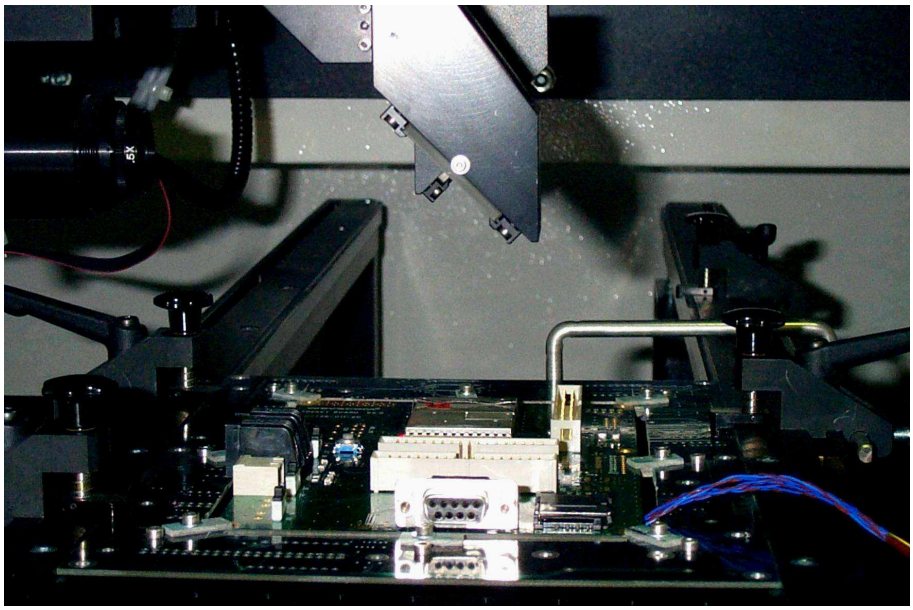
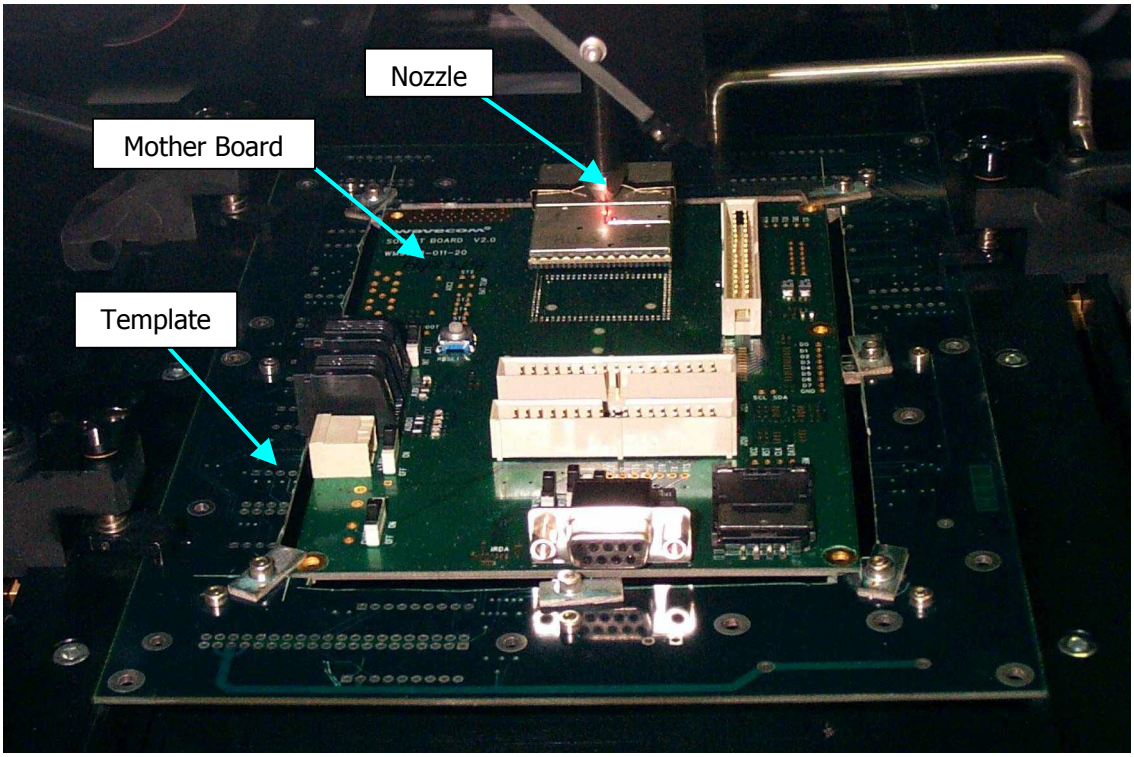
3) Place the mother board in the LS200



4) Start the thermal cycle

5) After the modules has been extracted by the vacuum, wait a minimum of 50 seconds for the system to cool.



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6) After the module has been removed ensure that the label is replaced on the module.

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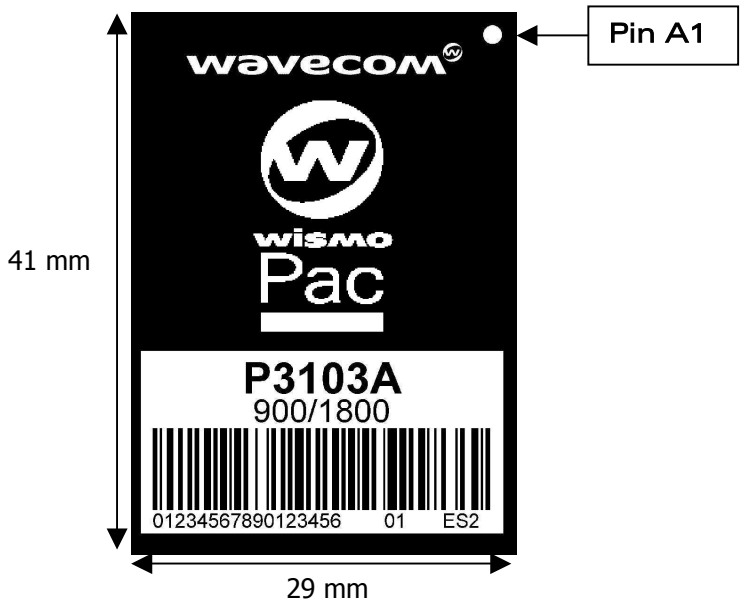
7 LABELING

7.1 WISMO Pac label layout



7.2 Possible references

- **P3103A**: GSM/GPRS 900/1800 MHz – 16/2 Mb memory
- **P3113A**: GSM/GPRS 900/1900 MHz – 16/2 Mb memory
- **P3103B**: GSM/GPRS 900/1800 MHz – 32/4 Mb memory
- **P3113B**: GSM/GPRS 900/1900 MHz – 32/4 Mb memory

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7.3 Tracking number specifications

	Module	Unit of the year	Week	Serial Number	Base-band test bench ID	PCB version + Nomencl.	Retrofit version
Format	2 digits 0-99	1 digit 0-9	2 digits 1-53	5 digits 0-99999	2 digits 0-32	3 digits (xxx) 0-999	2 digits (xx) 0-99
Ex.	xx for Q2403 yy for Q2486	1 for y.2001	01	00170	01	402 for hw version V402	02 (V402, no retrofit)

Digits printed but not encoded in the bar code

	RF test bench ID	Production site ID	Status
Format	2 digits 0-xx	Blank or 2 digits 0-99	Blank or 3 digits (letters)
Ex.		Blank for WM internal 03 for SLR TIM	ES1 ES2

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7.4 WISMO Pac P3103A

GSM/GPRS 900/1800 – 16/2 Mb

7.5 WISMO Pac P3113A

GSM/GPRS 900/1900 – 16/2 Mb

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7.6 WISMO Pac P3103B

GSM/GPRS 900/1800 – 32/4 Mb

7.7 WISMO Pac P3113B

GSM/GPRS 900/1900 – 32/4 Mb

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APPENDIX

- APPENDIX 1 :WISMO Pac P3100 Tray drawing
- APPENDIX 2 :WISMO Pac P3100 footprint
- APPENDIX 3 :WISMO Pac P3100 continuity test schematics
- APPENDIX 4 :WISMO Pac P3100 removal clip schematics
- APPENDIX 5 :WISMO Pac P3100 mechanical drawing

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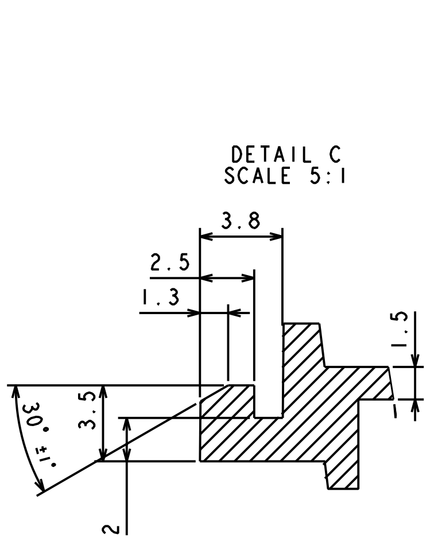
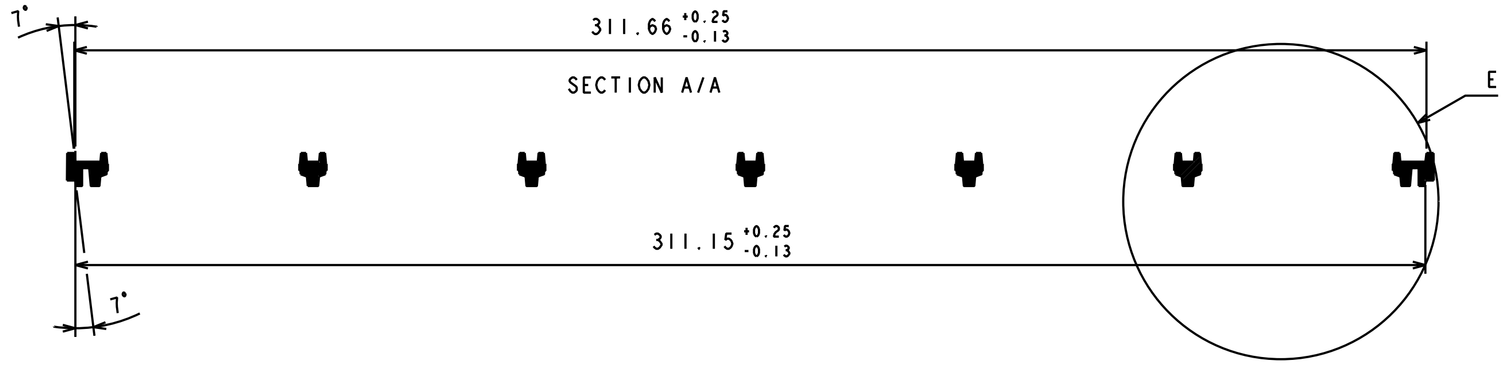
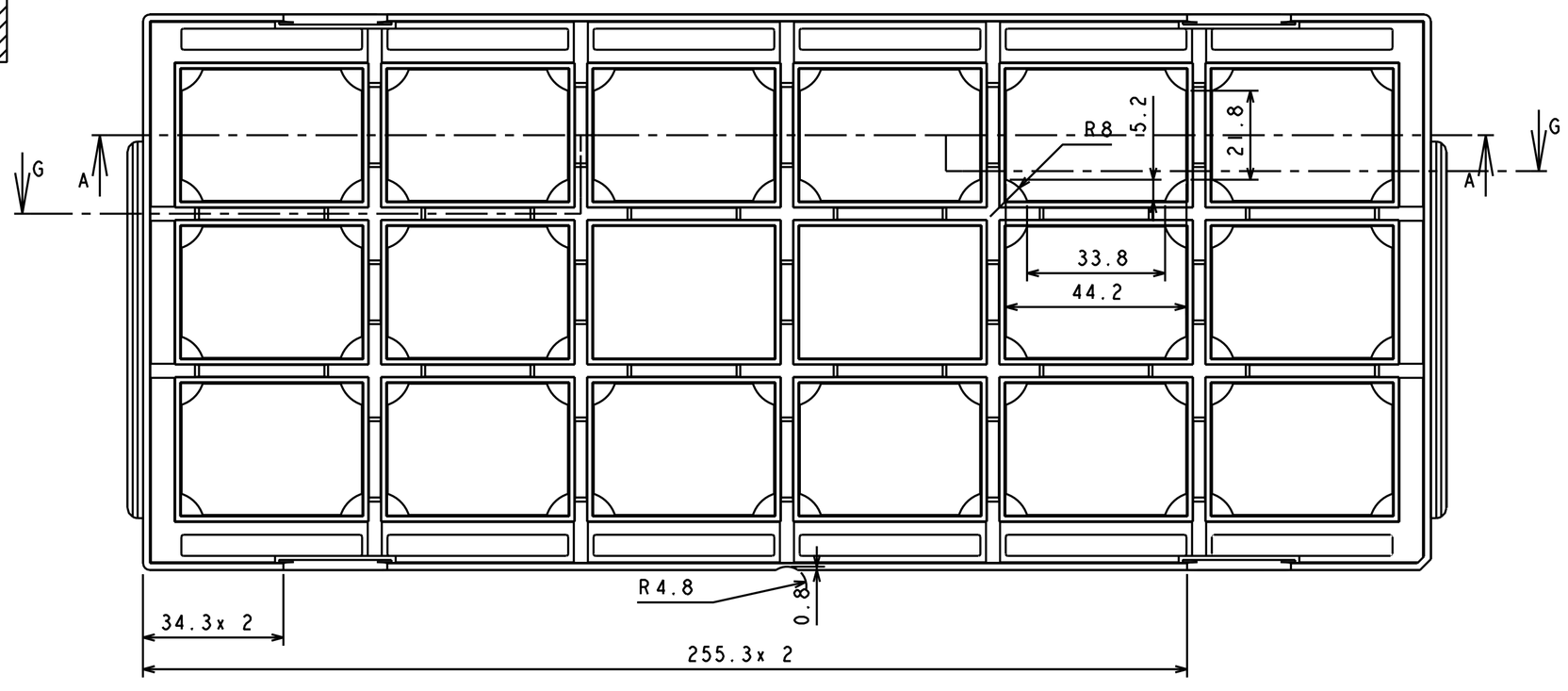
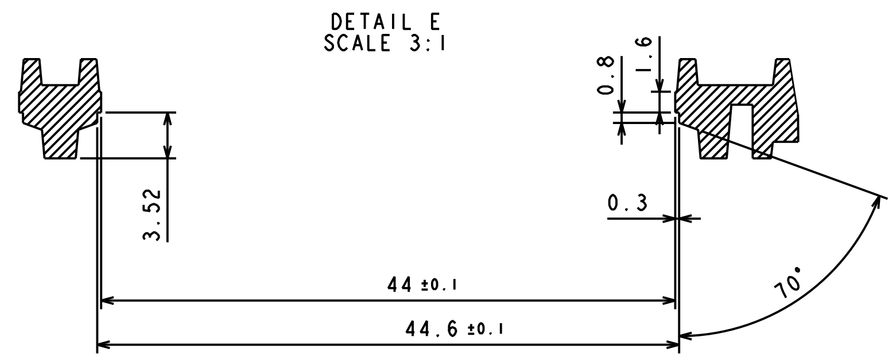
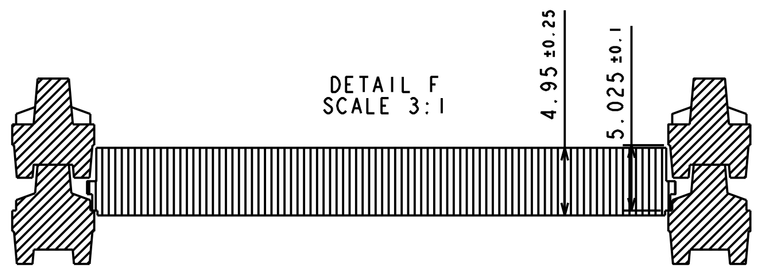
NOTA

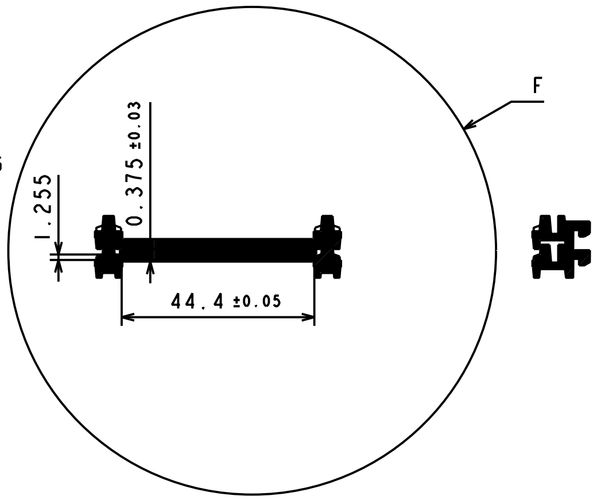


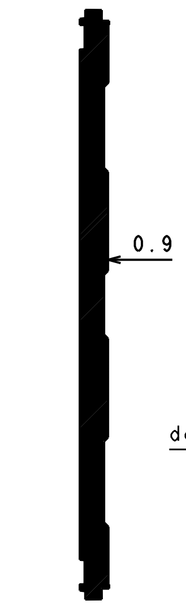


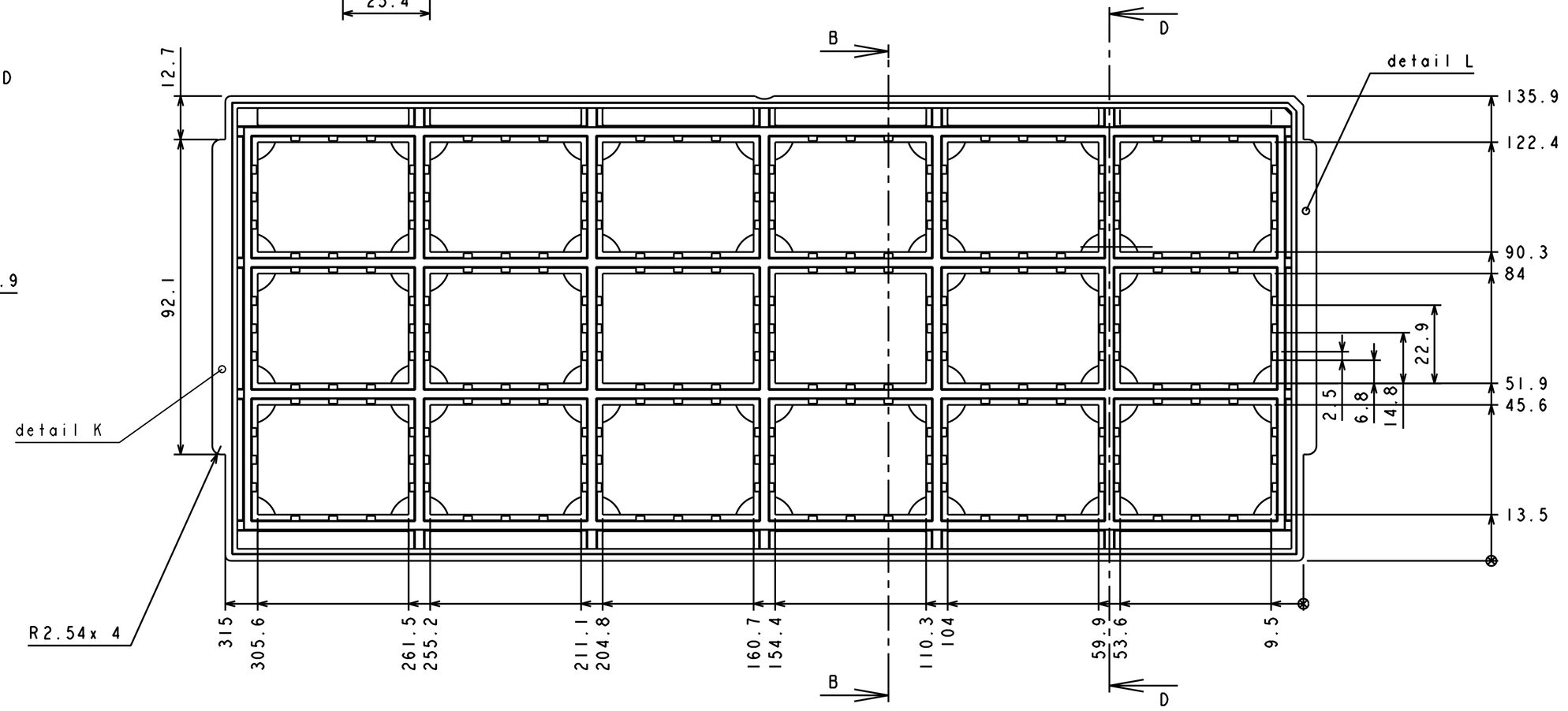






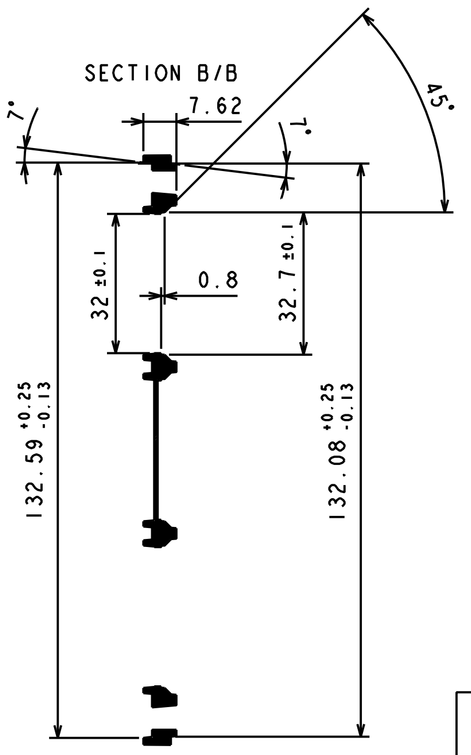






DETAIL K

WAVECOM WISMO PAC R-PBMA-Bx45.2x4.95



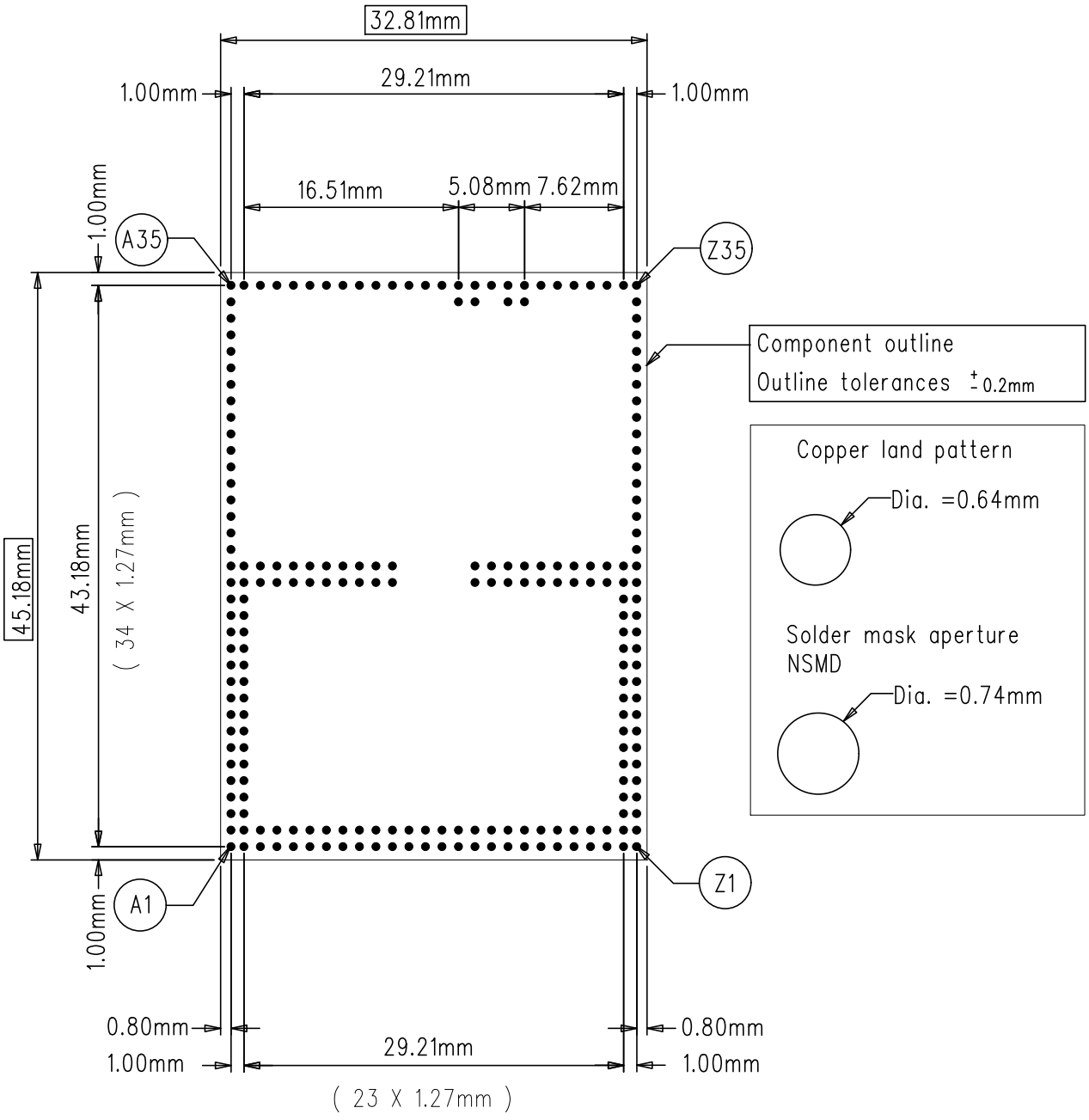
DETAIL L

WM13433 120°C MAX PA6 6 +GF

PLATEAU DE CONDITIONNEMENT WAVECOM

nouvelle solution

		PLANCHE X/X Ech. 1/x	N° PIECE



WISMO PAC P3100 series

FOOT PRINT

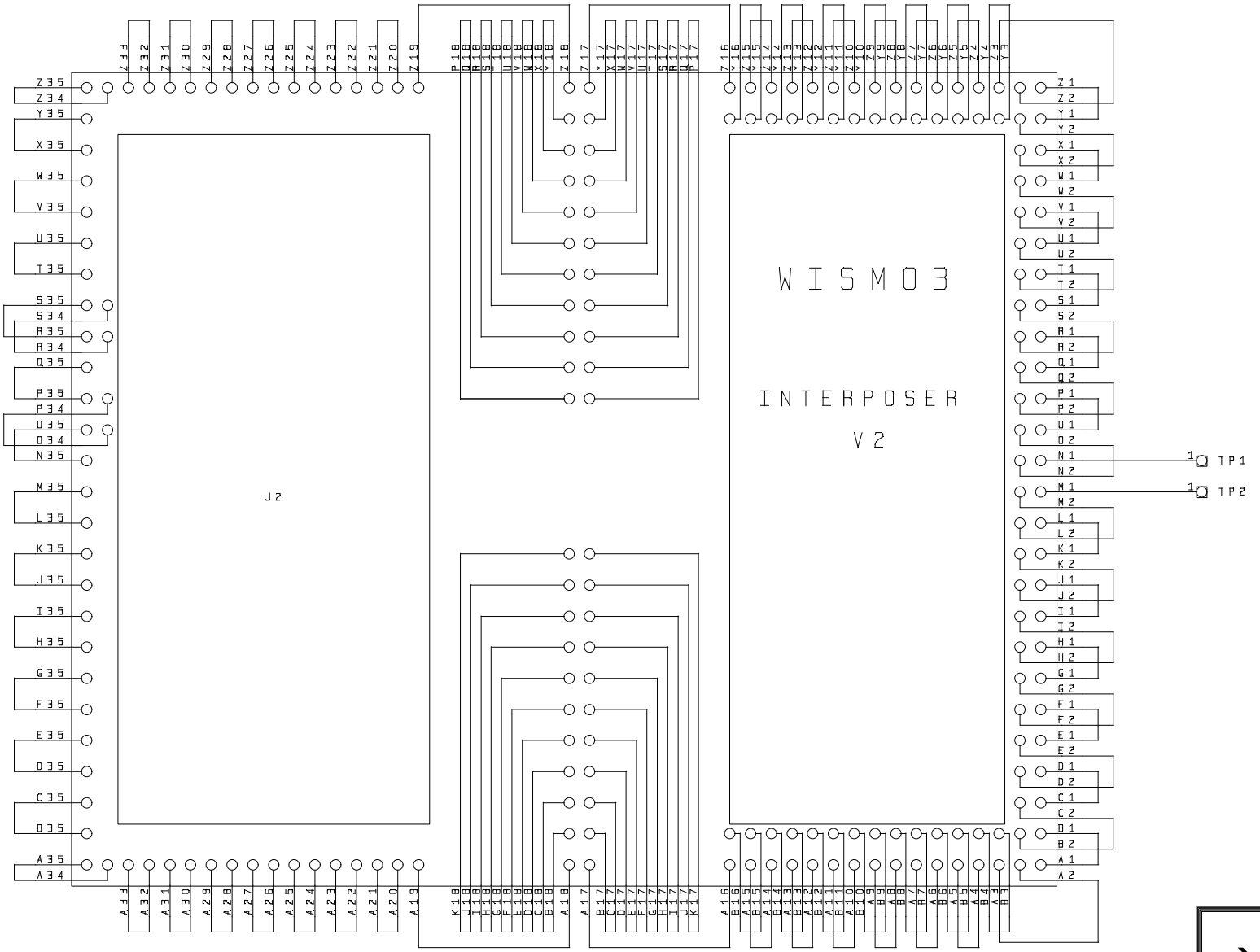
DATE : 14/02/02

ETABLI : HER / ASC

APPROUVE : FFE

wavecom

SCALE : 2



WAVECOM

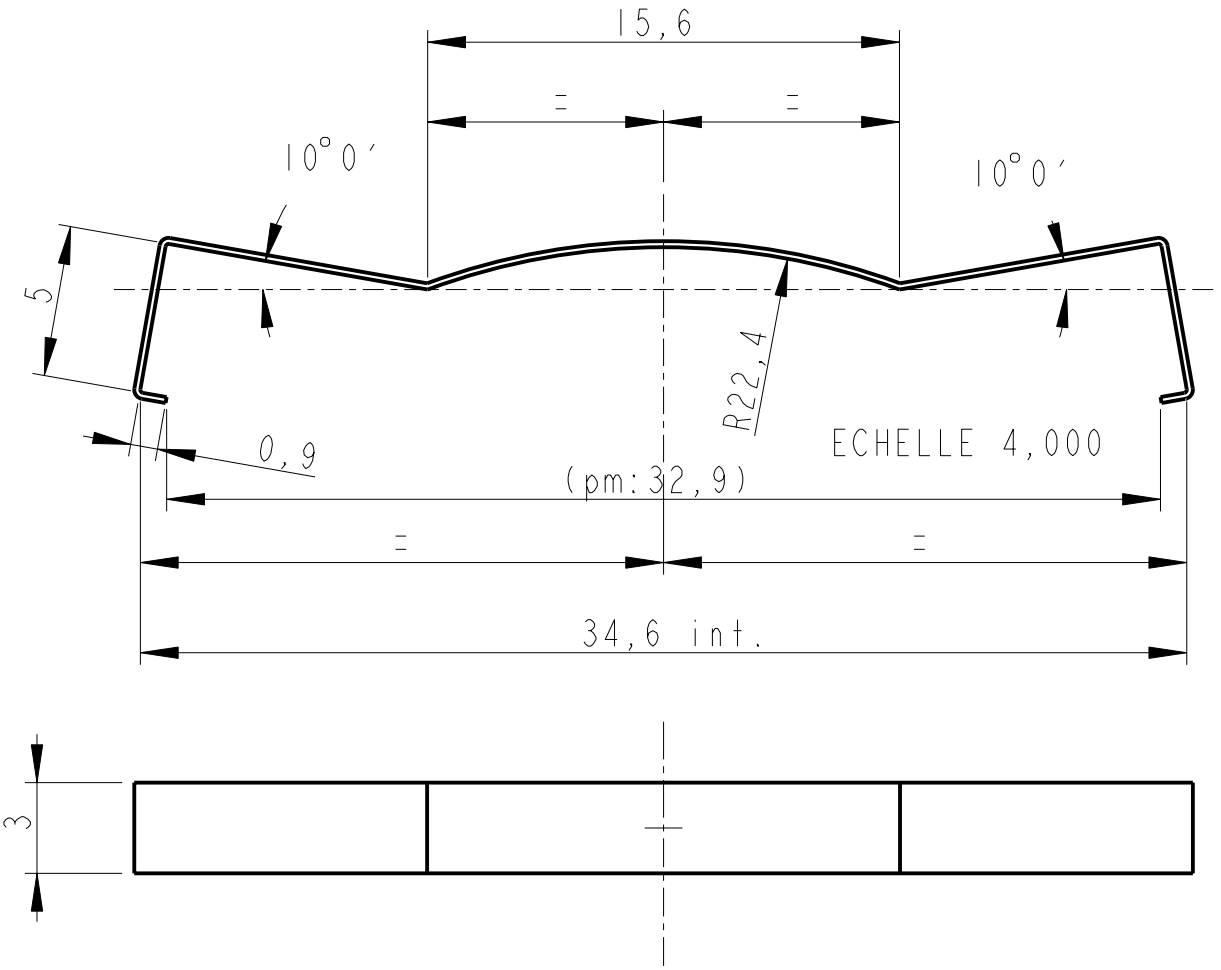
The shock wave in the wireless world

PROJECT: WISMO3A BI-BANDE	Sheet: 1/1
SCHEMATIC: CARD APPLICATION	
WAVECOM 39 Rue du Gouverneur Eboue 92130 ISSY LES MOULINEAUX FRANCE	Date: 02/08/2001
	Version: 1.0
	Eng: LGU

Creation	27/07/01	JPM	JJO	Préliminary	01
MODIFICATION	DATE	AUTHOR	RESP.	STATUS	IND

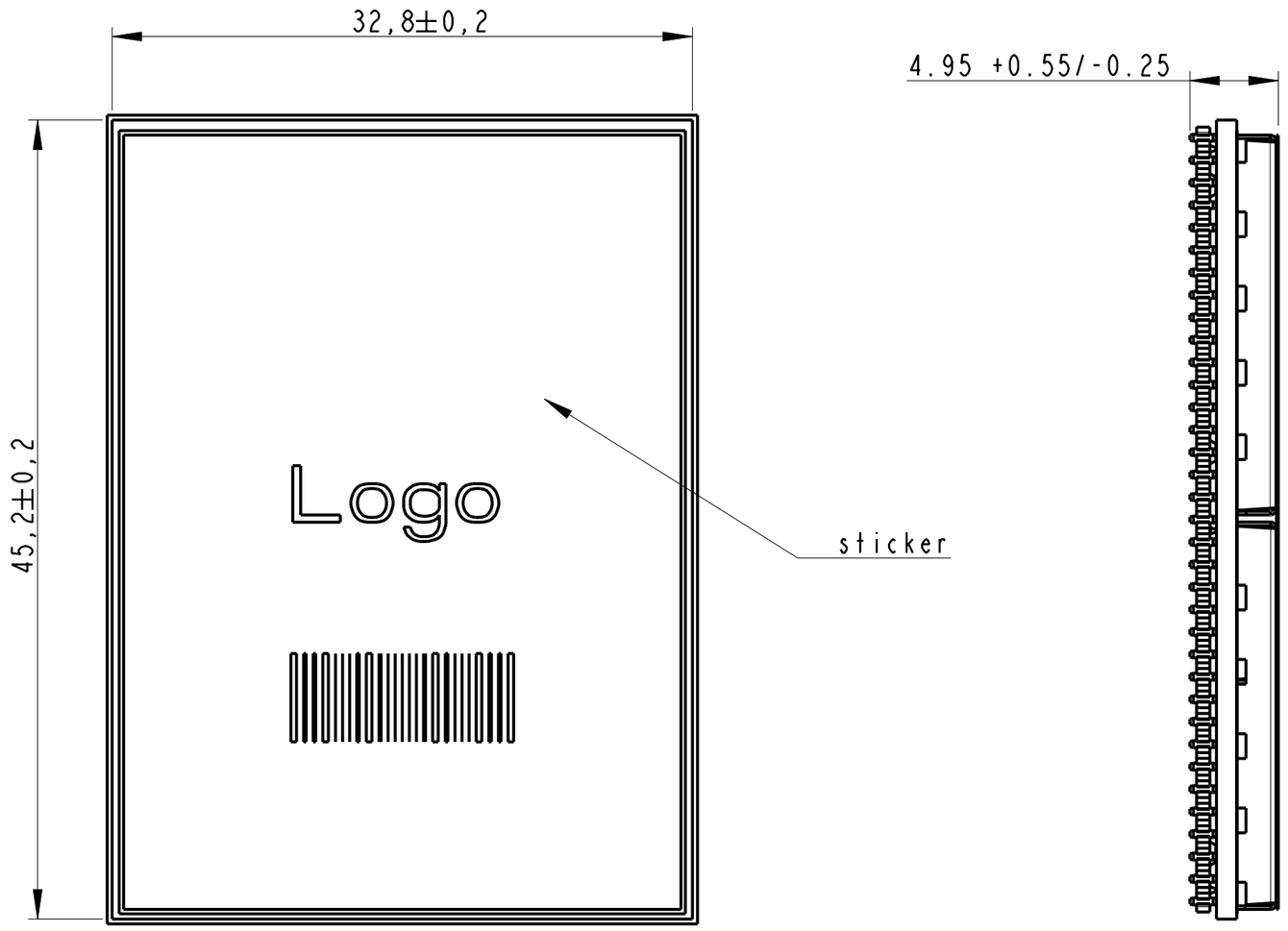
ECHELLE 1,000

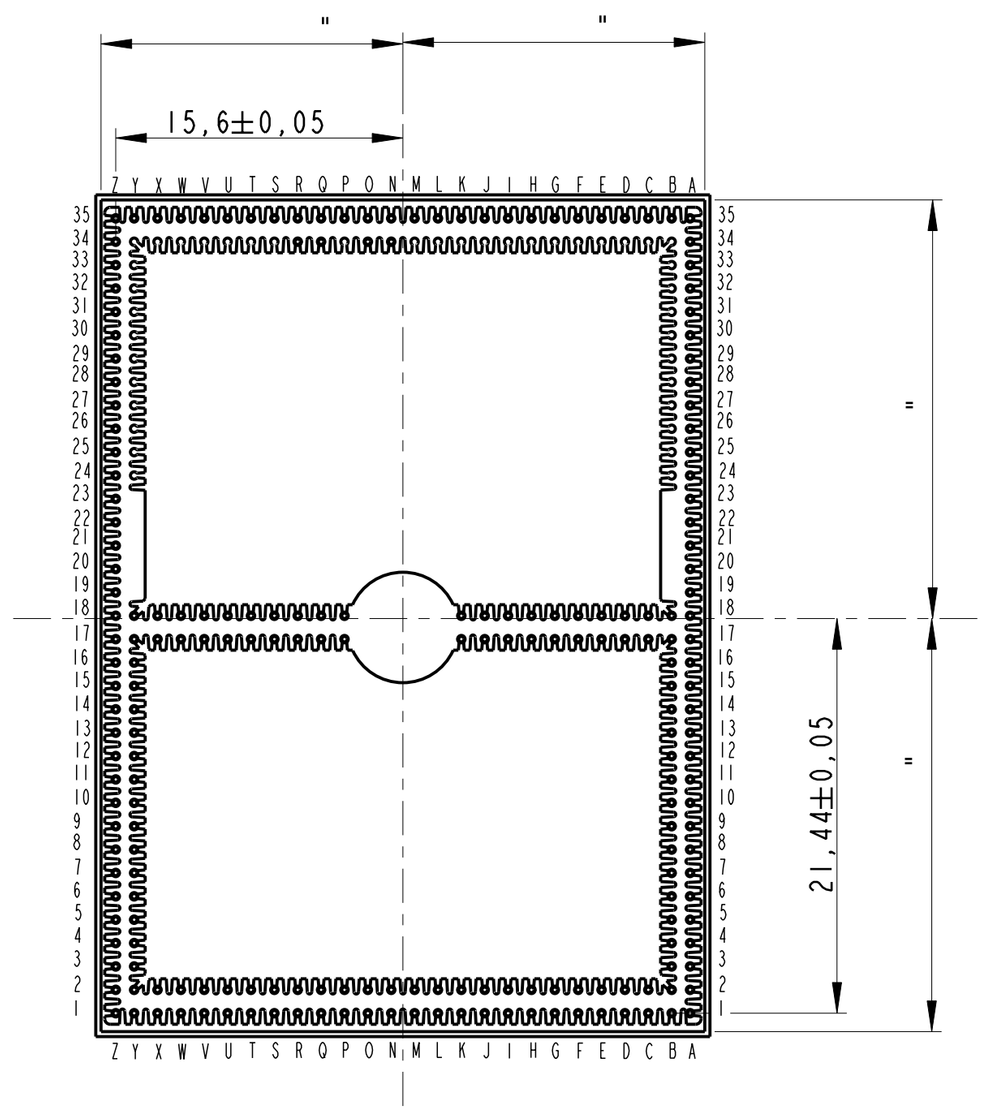
THICKNESS = 0.2mm
INSIDE RADIUS = THICKNESS

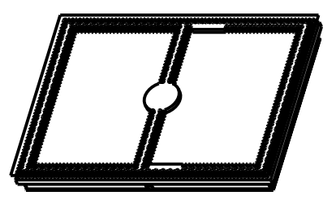


NOTA: general tolerances
bending dimensions: +/-0.1mm
other dimensions: +/-0.05mm

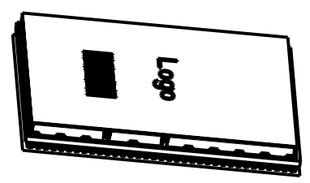
MATERIAL: stainless steel			
TREATMENT: -	FORMAT:A4		SCALE:4,000
RESSORT-LI WMI2878	DOC. ICO	FOLIO: 1/1	
	WM-4-9728 - X - 006 - P		
WAVECOM	Author: JPM		01
PRO/ENGINEER			IND.





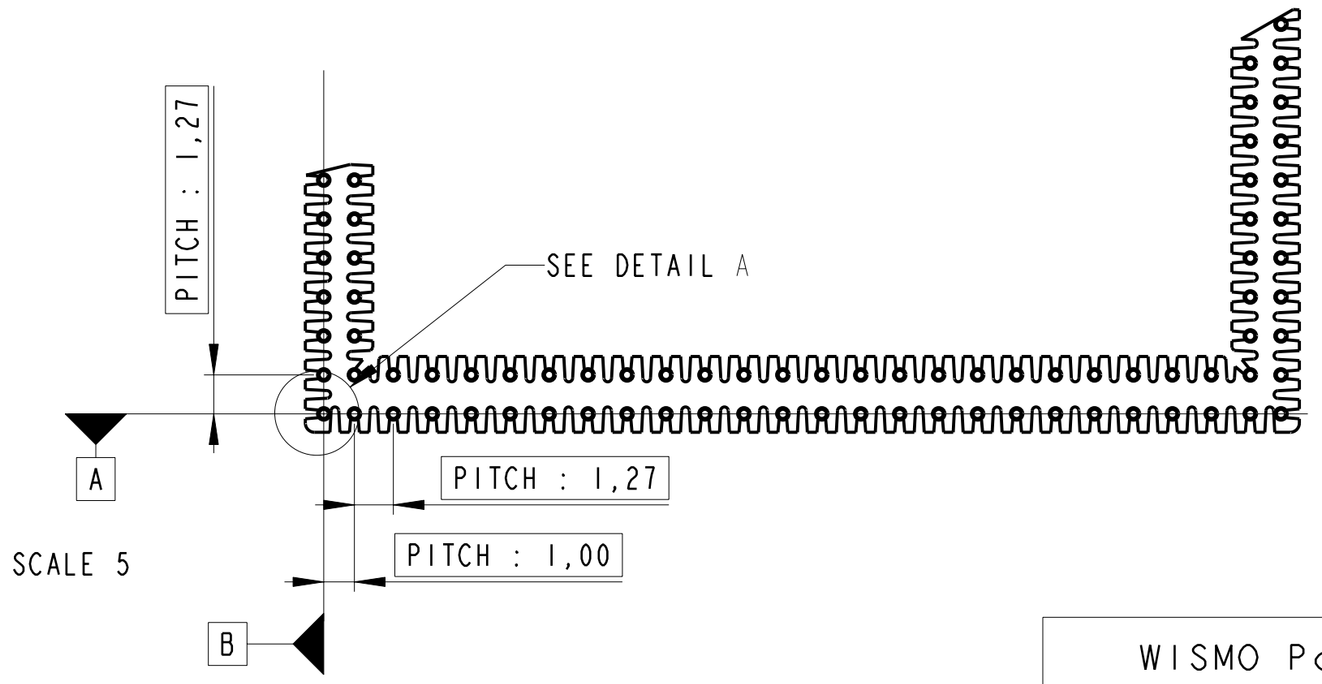


ECHELLE 1

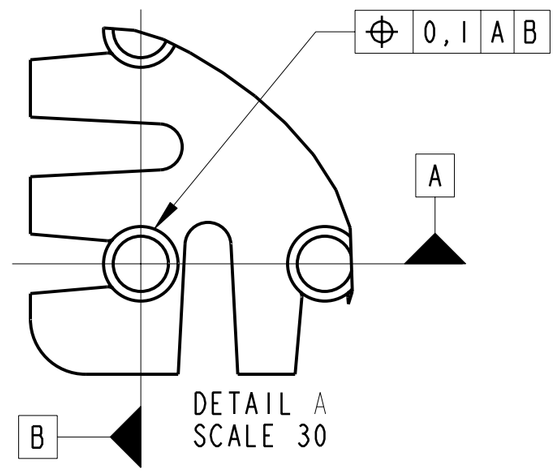


ECHELLE 1,000

connector details



SCALE 5



DETAIL A
SCALE 30

Creation	08/03/02	JPM	JJO	Production	A
MODIFICATION	DATE	AUTHOR	RESP.	STATUS	IND

WISMO Pac P3100		SCALE:3,000	FORMAT: A2
MODULE	WM-2-9728-X-004-A		A
WAVECOM	AUTHOR MLC	FOLIO:	IND.