



PRODUCT/PROCESS CHANGE NOTIFICATION

PCN CRP/12/7016
Notification Date 02/06/2012

**Qualification of additional suppliers of trays for
LQFP 14x14x1.4mm and PQFP 28x28 packages**

Table 1. Change Implementation Schedule

Forecasted implementation date for change	07-May-2012
Forecasted availability date of samples for customer	30-Jan-2012
Forecasted date for STMicroelectronics change Qualification Plan results availability	30-Jan-2012
Estimated date of changed product first shipment	07-May-2012

Table 2. Change Identification

Product Identification (Product Family/Commercial Product)	Trays for LQFP 14x14x1.4mm and PQFP 28x28 packages
Type of change	Packing
Reason for change	supply chain robustness
Description of the change	New suppliers of trays have been qualified. The key dimensions of these new trays are identical to the ones provided by the current supplier ITW. In addition, trays remain stackable independently of the supplier.
Product Line(s) and/or Part Number(s)	See attached
Description of the Qualification Plan	See attached
Change Product Identification	Change Identification through QA number
Manufacturing Location(s)	Please Refer To The Description Of The Change

Table 3. List of Attachments

Customer Part numbers list	
Qualification Plan results	



Customer Acknowledgement of Receipt		PCN CRP/12/7016
Please sign and return to STMicroelectronics Sales Office		Notification Date 02/06/2012
<input type="checkbox"/> Qualification Plan Denied <input type="checkbox"/> Qualification Plan Approved <input type="checkbox"/> Change Denied <input type="checkbox"/> Change Approved	Name:	
	Title:	
	Company:	
	Date:	
	Signature:	
Remark		

DOCUMENT APPROVAL

Name	Function
Sibille, Marie-Helene	Corporate Quality Manager
Low, Patrick	Process Owner

**Qualification of additional suppliers of trays
for LQFP 14x14x1.4mm and PQFP 28x28 packages**

WHAT:

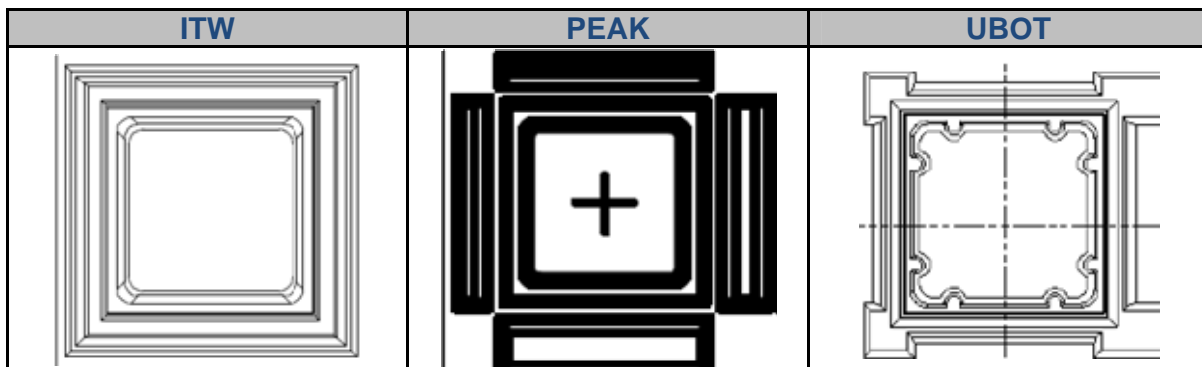
New suppliers of trays have been qualified. The key dimensions of these new trays are identical to the ones provided by the current supplier ITW. In addition, trays remain stackable independently of the supplier.

The trays impacted are:

- Trays for LQFP 14x14x1.4mm packages: the new qualified suppliers are PEAK and UBOT
- Trays for PQFP 28x28 packages: the new qualified supplier is PEAK

It concerns the products whose testing and finishing plants are located in Malta, Malaysia and at our sub-contractors

The only change being introduced is a visual difference as indicated below:

**WHY:**

The purpose of the introduction of new sources is to make robust the supply chain of trays.

WHEN:

Unless specific customer requirements, these new suppliers will be introduced at minimum 3 months after the delivery of this notification.

HOW:

The following documents introduce the qualification results for:

- PEAK supplier for TQFP 14x14x1.4 Tray in Malta plant
- PEAK supplier for TQFP 14x14x1.4 Tray in Malaysia plant
- UBOT supplier for TQFP 14x14x1.4 Tray in Malta plant
- UBOT supplier for TQFP 14x14x1.4 Tray in Malaysia plant
- PEAK supplier for PQFP 28x28 Tray in Malta plant

Qualification of UBOT TQFP 14x14x1.4 Tray

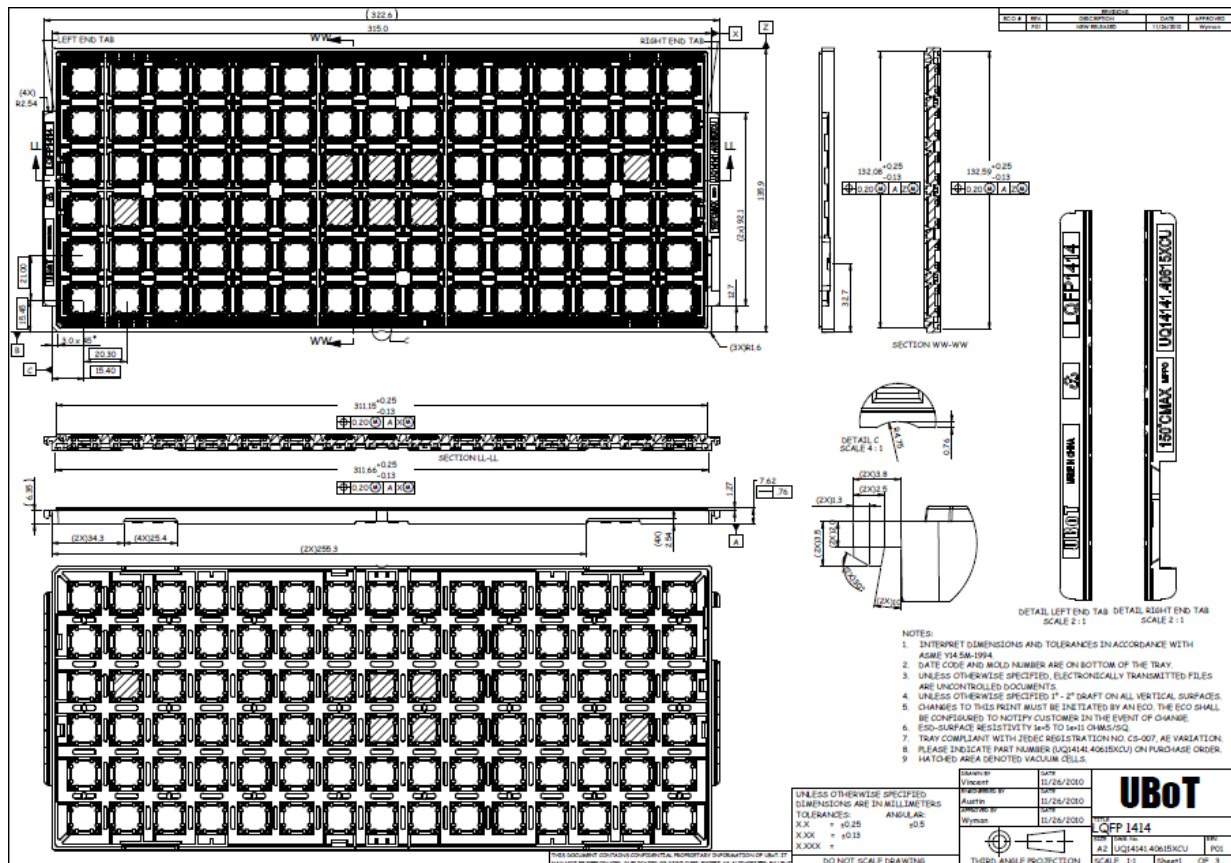
Objective:

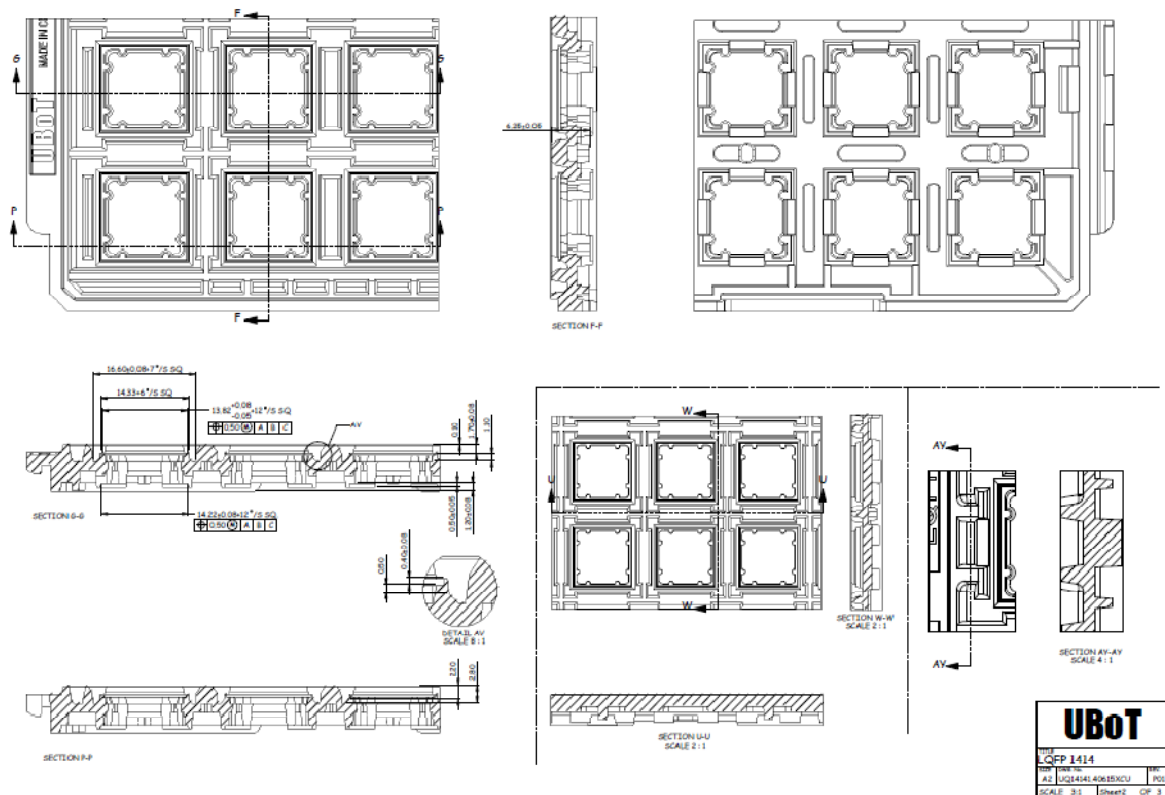
- To evaluate UBOT (UQ14141.40615XCU) trays as tray 2nd source for QFP 14x14x1.4 device packing application at PTM Muar.

Tray Information:

Supplier : UBOT
Supplier Part No : UQ14141.40615XCU
Tray ADCS Reference No : 0004320
Material Code : 3CP20430/1 (Green/Blue Insert)

Tray Drawing:





1. Visual Inspection Report:

Result: Accepted. No Tray Abnormalities.

Items	Visual Inspection	Yes	No	Quantities	Remarks
1	Chip/Crack		X	N/A	
2	Align with ST Specification	X		N/A	
3	Tray Matrix	X		N/A	
4	Full Fence	X		N/A	
5	Meet JEDEC Standard requirement	X		N/A	
6	Contain stain or foreign material		X	N/A	
7	Others (Please defined)		X		

2. Baking Tests (*Bakeable trays only*)

Result: Accepted

2.1. 3 Cycle Baking

Result: Accepted

2.1.1. Methodology

- i) Sample: 10 trays.
- ii) Duration: 24 hrs for each cycle. After each cycle, the tray must leave at production environment for a minimum of 1 hr before starting the second baking.
- iii) Temperature: 125 deg.C (Refer to specification number 0033575)
- iv) Trays must strap using Velcro or PP (Polypropylene) belt. Strapping refers to specification number 0056593.
- v) Baking can be carrying out without units.
- vi) Measure the tray warpage after the 3rd cycle on all 6 corners as indicated in specification 8080190.
- vii) The warpage should not be > 0.5mm for new tray.

2.1.2. Results

Tray warpage after 3 cycle baking test:

Warpage (mm)	Side 1	Side 2	Side 3	Side 4	Side 5	Side 6
Sample 1	0.05	0.05	0.00	0.05	0.05	0.00
Sample 2	0.05	0.05	0.05	0.00	0.05	0.00
Sample 3	0.05	0.05	0.00	0.05	0.00	0.00
Sample 4	0.00	0.00	0.00	0.00	0.05	0.05
Sample 5	0.05	0.05	0.05	0.00	0.00	0.05
Sample 6	0.05	0.05	0.00	0.05	0.05	0.00
Sample 7	0.05	0.00	0.00	0.00	0.00	0.00
Sample 8	0.05	0.00	0.00	0.05	0.00	0.00
Sample 9	0.00	0.00	0.05	0.00	0.00	0.05
Sample 10	0.00	0.00	0.05	0.05	0.00	0.05

All readings are within limits.

2.2. Single Bake Result: Accepted

2.2.1. Methodology

- i) Sample: 6 pieces of single trays not stacked.
- ii) Duration 48 hrs.
- iii) Temperature: Base on the temperature mark on the tray (150 deg.C)
- iv) Without unit and without strapping
- v) After single bake, the tray warpage is measured after leaving the tray to cool to room temperature.
- vi) Measure the tray warpage on all 6 corners as indicated in specification 8080190

2.2.2. Results

Tray warpage after Single Baking test:

Warpage (mm)	Side 1	Side 2	Side 3	Side 4	Side 5	Side 6
Sample 1	0.25	0.00	0.15	0.05	0.00	0.20
Sample 2	0.30	0.15	0.10	0.20	0.25	0.10
Sample 3	0.25	0.00	0.00	0.05	0.15	0.05
Sample 4	0.10	0.25	0.00	0.05	0.15	0.00
Sample 5	0.05	0.00	0.10	0.00	0.25	0.05
Sample 6	0.25	0.05	0.00	0.05	0.00	0.00

The trays were also checked for the below items:

Items	Result
Any melting point on tray	NO
Any shrinkage on overall length	NO
Any shrinkage on overall thickness	NO
Any shrinkage on pocket dimension	NO
Maximum warpage from 6 corners should not be more than 0.76mm	0.30mm

3. Drop Test Result: Accepted

3.1. Methodology

The drop test was performed with the packing methodology described in specification number 0056593. The drop test was carried out according to methodology described in specification number 7416802.

3.2. Results

Drop Test Sequence	Scanning Results for:		Results
	i)	Coplan	
	ii)	Standoff	
	iii)	Pitch	
ABC	0 rejects		Pass
DEF	0 rejects		Pass
GHI	0 rejects		Pass

Note: Drop Test Sequence ABC refers to Face A, Edge B & Corner C.

Inspection items	Sample size	Reject quantity for ABC	Reject quantity for DEF	Reject quantity for GHI
Unit chip	540 units	0/540	0/540	0/540
Unit stuck	540 units	0/540	0/540	0/540
Unit misplace	540 units	0/540	0/540	0/540
Chip trays	7 trays	0/7	0/7	0/7

4. ESD Measurements

Result: Accepted.

4.1. Equipment

- i) Prostat PRS-801 Resistance Meter
- ii) Prostat PRV-913 Microprobe Verifier
- iii) Prostat probes PRF-922A-B and PRF914
- iv) Prostat Psychrometer PHT-771

4.2. Methodology

A sample of six trays were used to measure the surface resistance. Each tray was tested at six different points. The accepted limits for the trays should be within $1 \times 10^5 < R_s < 1 \times 10^{11}$.

Every reading was recorded as shown in the table below.

4.3. Results

TESTS	TRAY SAMPLES	SURFACE RESISTANCE MEASUREMENTS (ohms)					
		Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
SURFACE RESISTANCE TEST	Sample 1	1.5E+08	1.2E+08	1.4E+08	1.4E+08	1.2E+08	1E+08
	Sample 2	1.2E+08	2.3E+08	2E+08	9E+08	1.3E+08	1.3E+09
	Sample 3	1.1E+08	1E+08	1.5E+08	1.2E+08	1.2E+08	1.3E+08
	Sample 4	1.2E+08	6.6E+08	2.8E+08	2.9E+08	4.5E+08	1.2E+09
	Sample 5	1E+08	6.1E+08	2.9E+08	3.5E+08	1.7E+08	1.3E+09
	Sample 6	1.4E+08	2.3E+08	2.7E+08	2.5E+08	9.3E+08	1.4E+09
SURFACE RESISTANCE AFTER SCRATCHING	Sample 1 (before scratching)	1.5E+08					
	Sample 1 (After scratching)	1.2E+08					

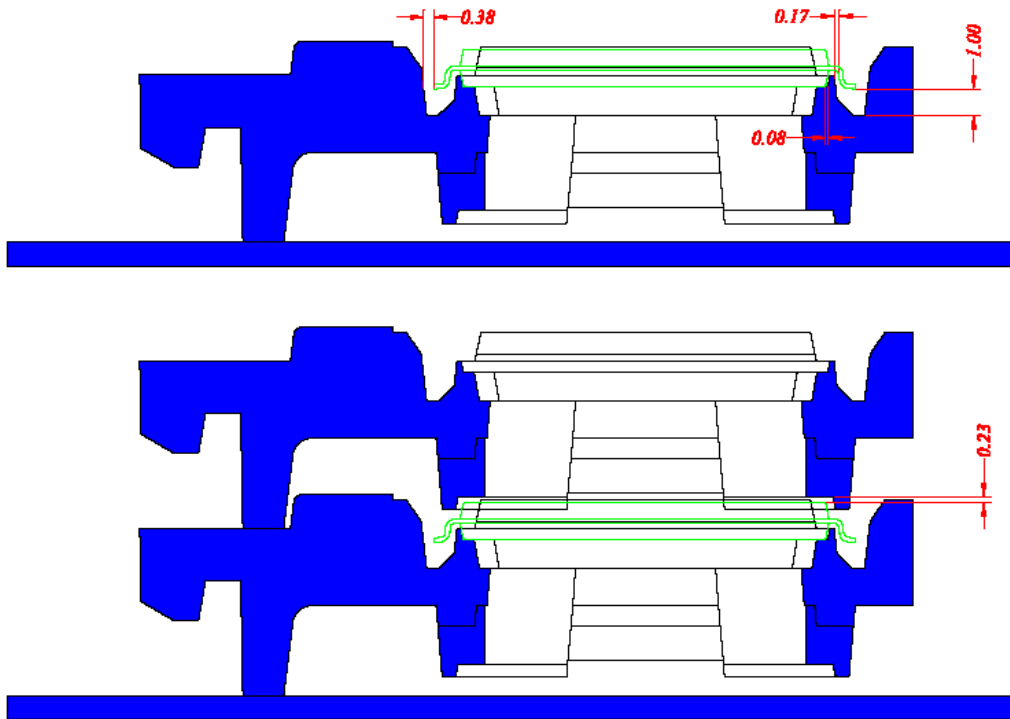
All measurements are within ST Specification Limits.

5. Workability Test:
Result: Accepted

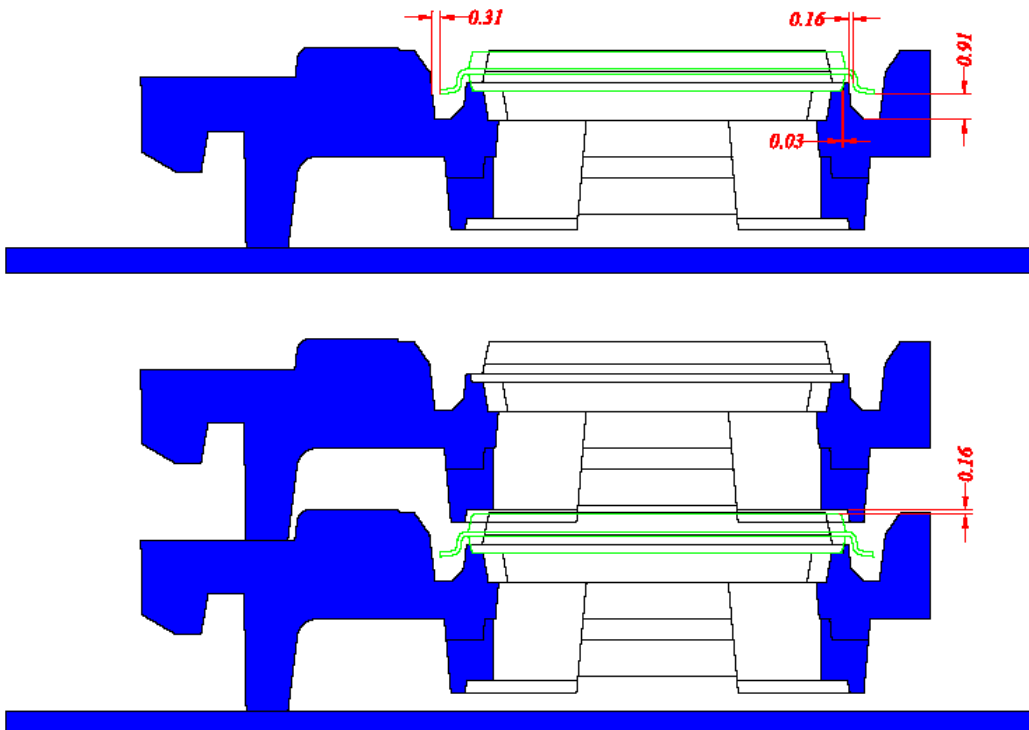
Process Step	Machine	Samples size	Rejection criteria	Result
Cropping	ASM	540 units	Bend lead, package crack, tray is jamming when machine running	Pass
Tester	Synax 141	540 units	Bend lead, package crack, tray is jamming when machine running	Pass
Finishing	STI	540 units	Bend lead, package crack, tray is jamming when machine running	Pass

6. FIT Analysis
Result: Accepted

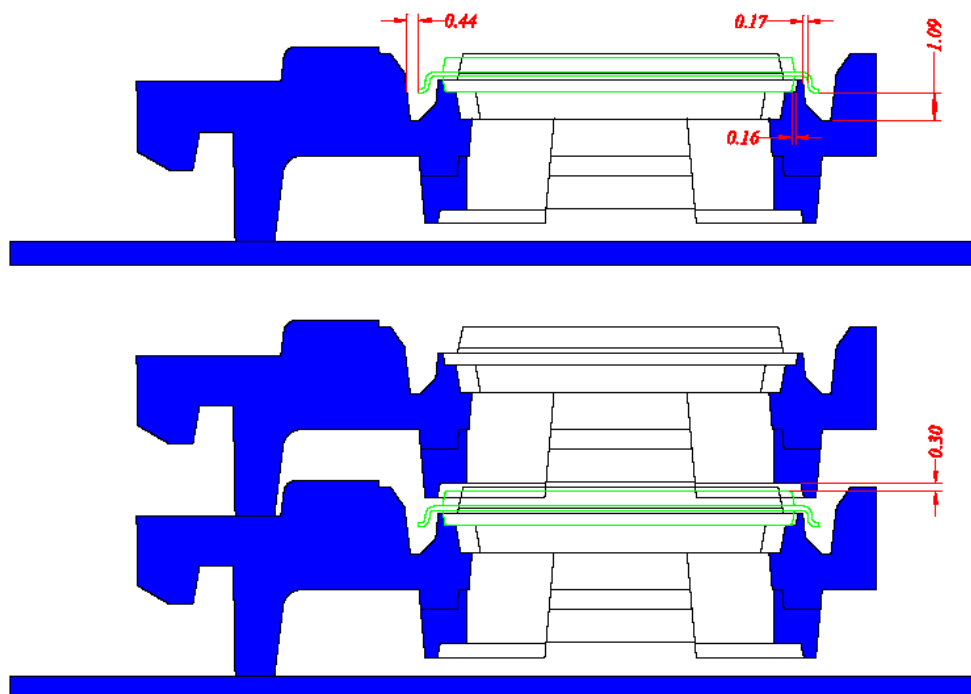
Nominal Case:



Minimum Pocket vs Maximum Package:



Maximum Pocket vs Minimum Package:





7. Additional Items:

7.1. Stackability Validation



A Tray	B Tray	Stackability
UBot	ITW	Yes
ITW	UBot	Yes

- (i) UBOT trays are stackable with current source, ITW trays.

Stacking Combination	Photos	Results
Case 1: 1) PEAK Tray 2) UBOT Tray 3) PEAK Tray		Passed No Gap observed in between trays.
Case 2: 1) UBOT Tray 2) PEAK Tray 3) UBOT Tray		Passed No Gap observed in between trays.

- (ii) UBOT trays are stackable with alternative source, PEAK trays.

Conclusion:

With the above qualification results, UBOT (UQ14141.40615XCU) tray passed all ST tray qualification requirements, thus, qualified for production use.

Qualification of UBOT TQFP 14x14x1.4 Tray

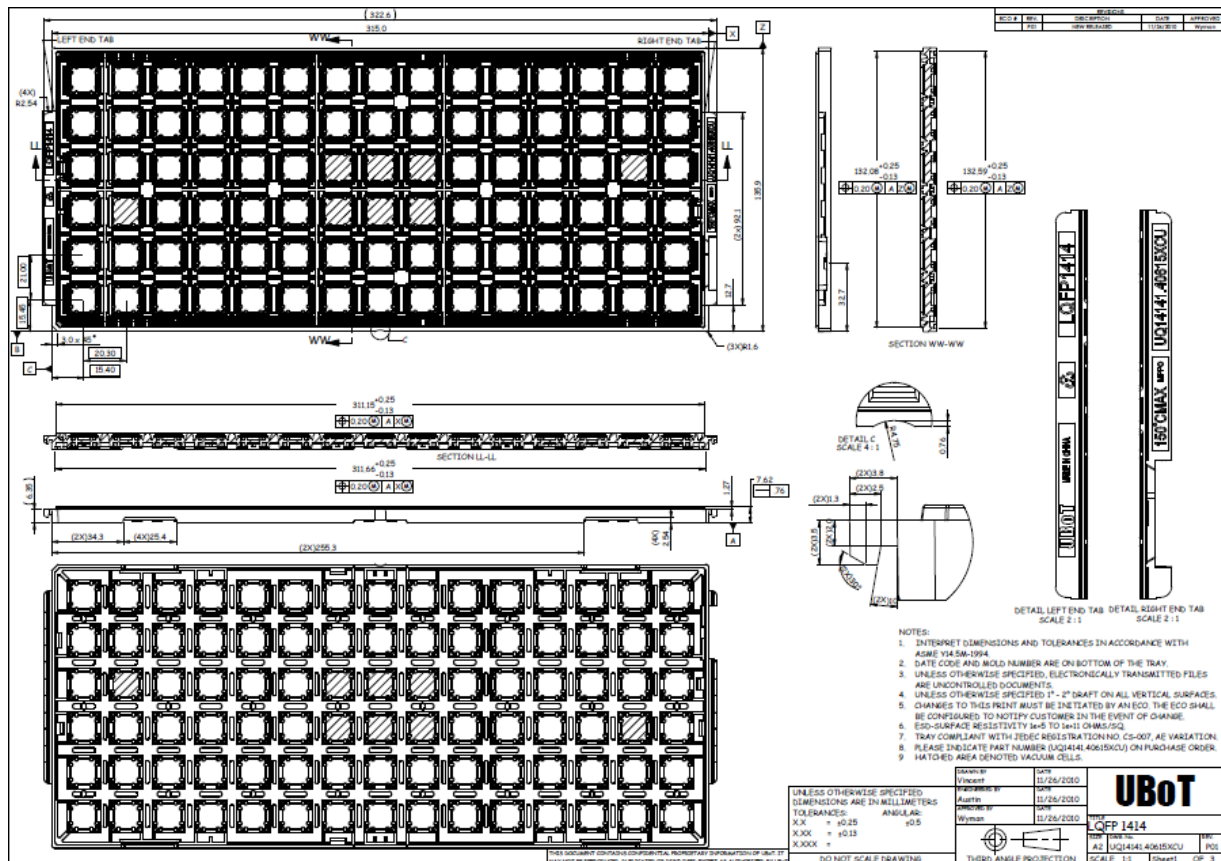
Objective:

- To evaluate UBOT (UQ14141.40615XCU) trays as tray 2nd source for QFP 14x14x1.4 device packing application at PTM Malta.

Tray Information:

Supplier : UBOT
 Supplier Part No : UQ14141.40615XCU
 Tray ADCS Reference No : 0004320
 Material Code : 3CP20430/1 (Green/Blue Insert)

Tray Drawing:



2. Baking Tests (Bakeable trays only)
Result: Accepted

2.1. 3 Cycle Baking
Result: Accepted

2.1.1. Methodology

- i) Sample: 10 trays.
- ii) Duration: 24 hrs for each cycle. After each cycle, the tray must leave at production environment for a minimum of 1 hr before starting the second baking.
- iii) Temperature: 125 deg.C (Refer to specification number 0033575)
- iv) Trays must strap using Velcro or PP (Polypropylene) belt. Strapping refers to specification number 0056593.
- v) Baking can be carrying out without units.
- vi) Measure the tray warpage after the 3rd cycle on all 6 corners as indicated in specification 8080190.
- vii) The war page should not be > 0.5mm for new tray.

2.1.2. Results

Tray warpage after 3 cycle baking test:

Warpage (mm)	Side 1	Side 2	Side 3	Side 4	Side 5	Side 6
Sample 1	0.00	0.25	0.10	0.05	0.05	0.05
Sample 2	0.05	0.25	0.10	0.05	0.15	0.00
Sample 3	0.05	0.20	0.15	0.05	0.05	0.05
Sample 4	0.10	0.15	0.05	0.05	0.15	0.05
Sample 5	0.10	0.25	0.10	0.05	0.25	0.05
Sample 6	0.05	0.25	0.05	0.00	0.20	0.00
Sample 7	0.10	0.25	0.15	0.05	0.15	0.05
Sample 8	0.05	0.25	0.15	0.05	0.00	0.00
Sample 9	0.00	0.25	0.15	0.10	0.00	0.05
Sample 10	0.10	0.25	0.15	0.05	0.00	0.05

All readings are within limits.

2.2. Single Bake Result: Accepted

2.2.1. Methodology

- i) Sample: 6 pieces of single trays not stacked.
- ii) Duration 48 hrs.
- iii) Temperature: Base on the temperature mark on the tray (150 deg.C)
- iv) Without unit and without strapping
- v) After single bake, the tray warpage is measured after leaving the tray to cool to room temperature.
- vi) Measure the tray warpage on all 6 corners as indicated in specification 8080190

2.2.2. Results

Tray warpage after Single Baking test:

Warpage (mm)	Side 1	Side 2	Side 3	Side 4	Side 5	Side 6
Sample 1	0.00	0.05	0.00	0.05	0.25	0.05
Sample 2	0.00	0.05	0.00	0.00	0.00	0.00
Sample 3	0.00	0.00	0.00	0.05	0.05	0.00
Sample 4	0.00	0.00	0.10	0.15	0.05	0.05
Sample 5	0.05	0.40	0.20	0.05	0.05	0.05
Sample 6	0.10	0.30	0.15	0.05	0.15	0.05

The trays were also checked for the below items:

Items	Result
Any melting point on tray	NO
Any shrinkage on overall length	NO
Any shrinkage on overall thickness	NO
Any shrinkage on pocket dimension	NO
Maximum warpage from 6 corners should not be more than 0.76mm	0.4mm

3. Drop Test
Result: Accepted

3.1. Methodology

The drop test was performed with the packing methodology described in specification number 0056593. The drop test was carried out according to methodology described in specification number 7416802.

3.2. Results

Drop Test Sequence	Scanning Results for: i) Coplan ii) Standoff iii) Pitch	Results
ABC	0 rejects	Pass
DEF	0 rejects	Pass
GHI	0 rejects	Pass

Note: Drop Test Sequence ABC refers to Face A, Edge B & Corner C.

Inspection items	Sample size	Reject quantity for ABC	Reject quantity for DEF	Reject quantity for GHI
Unit chip	540 units	0/540	0/540	0/540
Unit stuck	540 units	0/540	0/540	0/540
Unit misplace	540 units	0/540	0/540	0/540
Chip trays	7 trays	0/7	0/7	0/7

4. ESD Measurements

Result: Accepted.

4.1. Equipment

- i) Prostat PRS-801 Resistance Meter
- ii) Prostat PRV-913 Microprobe Verifier
- iii) Prostat probes PRF-922A-B and PRF914
- iv) Prostat Psychrometer PHT-771

4.2. Methodology

A sample of six trays were used to measure the surface resistance. Each tray was tested at six different points. The accepted limits for the trays should be within $1 \times 10^5 < R_s < 1 \times 10^{11}$.

Every reading was recorded as shown in the table below.

4.3. Results

TESTS	TRAY SAMPLES	SURFACE RESISTANCE MEASUREMENTS(ohms)					
		Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
SURFACE RESISTANCE TEST	Sample 1	5.0e06	3.3e06	3.3e07	2.0e06	2.4e07	1.9e07
	Sample 2	1.1e07	1.5e06	1.3e06	5.1e06	1.1e07	4.8e08
	Sample 3	1.1e08	1.7e07	8.8e08	4.5e06	4.1e07	6.1e07
	Sample 4	1.2e07	1.9e06	8.2e08	2.6e07	1.9e08	6.1e07
	Sample 5	2.7e08	3.6e07	1.5e06	4.2e08	3.9e07	6.5e07
	Sample 6	3.7e08	2.4e11	2.3e06	1.5e06	6.0e08	1.3e08
SURFACE RESISTANCE AFTER SCRATCHING	Sample 1 (before scratching)	3.0e10					
	Sample 1 (After scratching)	2.6e10					

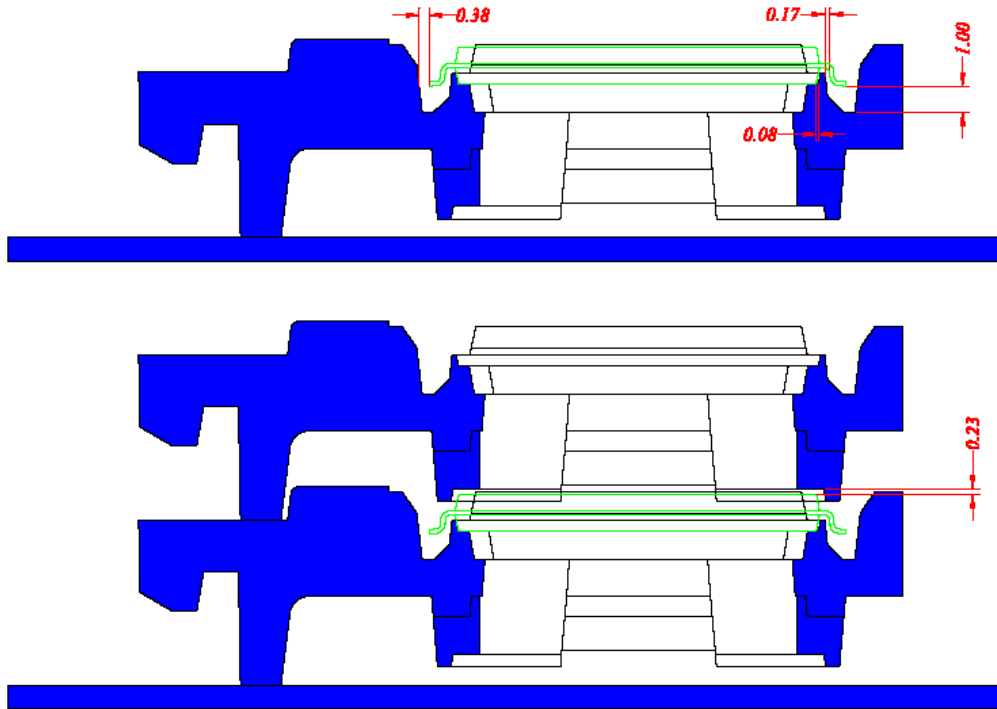
All measurements are within ST Specification Limits.

5. Workability Test:
Result: Accepted

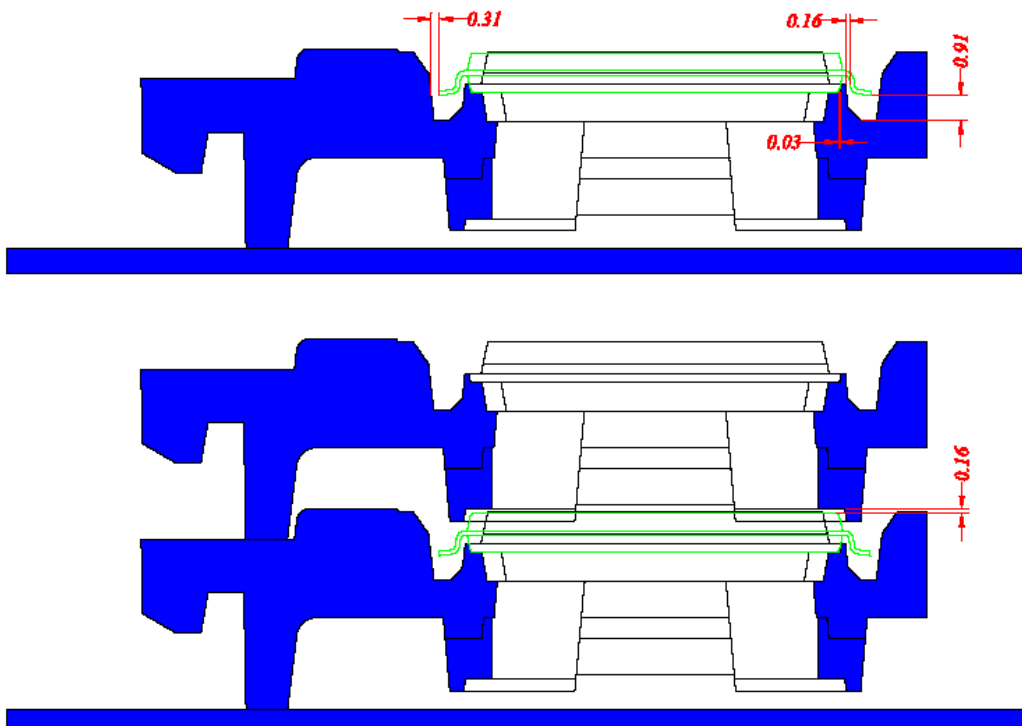
Process Step	Machine	Samples size	Rejection criteria	Result
Cropping	ASM MP209	540 units	Bend lead, package crack, tray is jamming when machine running	Pass
Tester	Multitest 9510	540 units	Bend lead, package crack, tray is jamming when machine running	Pass
Finishing	Hexa Whizz	540 units	Bend lead, package crack, tray is jamming when machine running	Pass

6. FIT Analysis
Result: Accepted

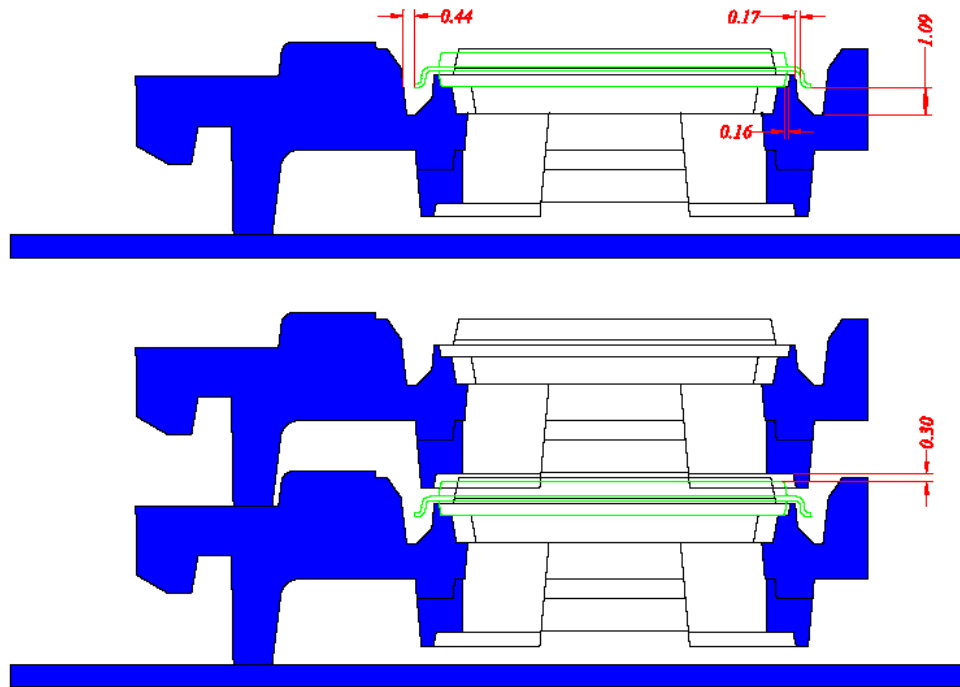
Nominal Case:



Minimum Pocket vs Maximum Package:



Maximum Pocket vs Minimum Package:





7. Additional Items:

7.1. Stackability Validation



A Tray	B Tray	Stackability
UBot	ITW	Yes
ITW	UBot	Yes

(i) UBOT trays are stackable with current source, ITW trays.

Stacking Combination	Photos	Results
Case 1: 1) PEAK Tray 2) UBOT Tray 3) PEAK Tray		Passed No Gap observed in between trays.
Case 2: 1) UBOT Tray 2) PEAK Tray 3) UBOT Tray		Passed No Gap observed in between trays.

(ii) UBOT trays are stackable with alternative source, PEAK trays.

Conclusion:

With the above qualification results, UBOT (UQ14141.40615XCU) tray passed all ST tray qualification requirements, thus, qualified for production use.

Qualification of PEAK TQFP 14x14x1.4 Tray

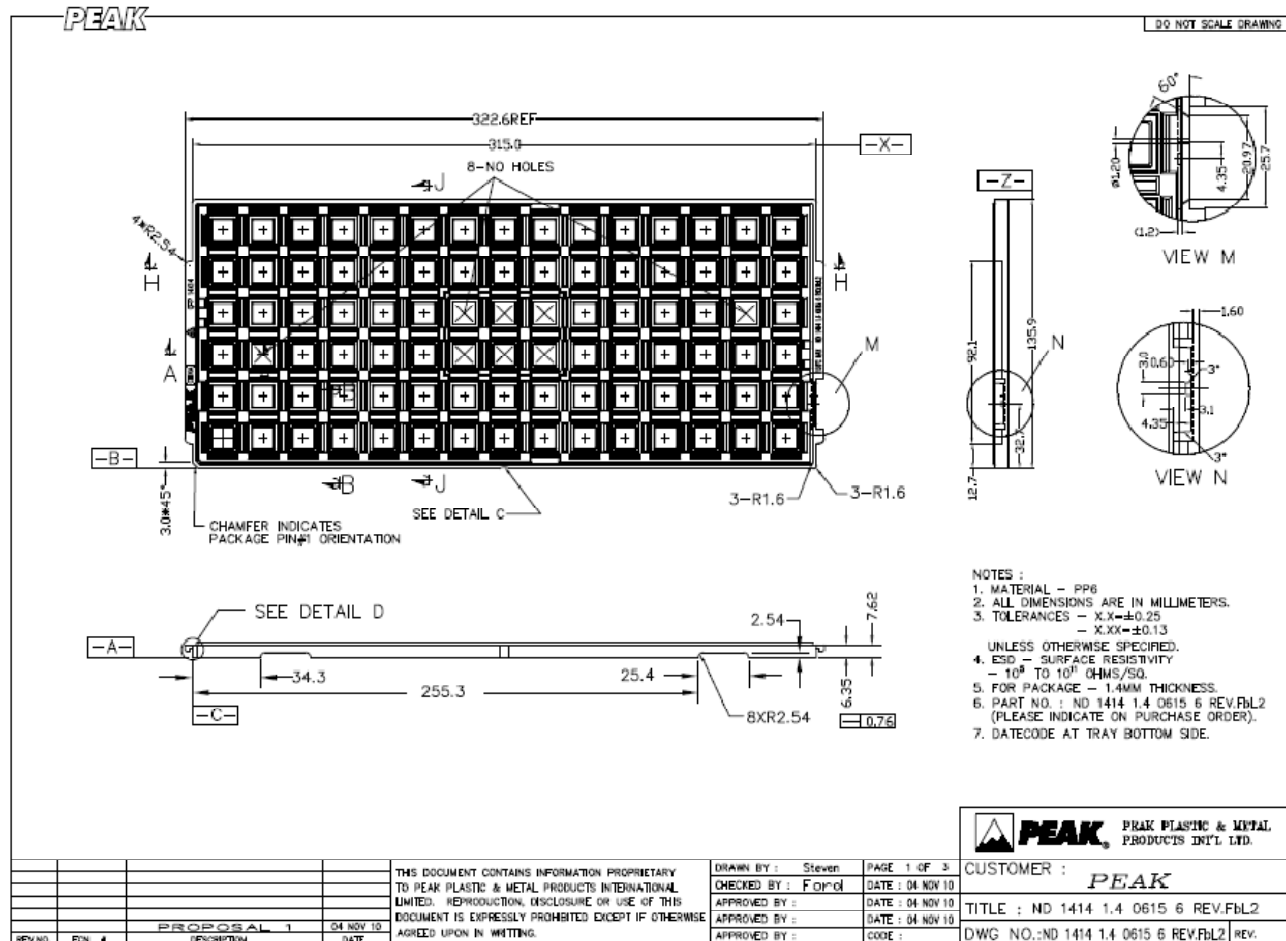
Objective:

- To evaluate PEAK (ND 1414 1.4 0615 6 REV.FbL2) trays as tray 2nd source for QFP 14x14x1.4 device packing application at PTM Muar.

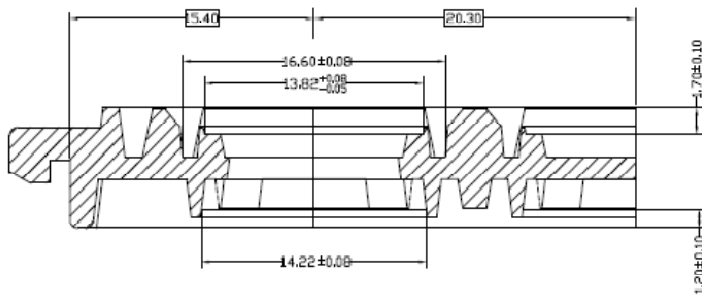
Tray Information:

Supplier : PEAK
Supplier Part No : ND 1414 1.4 0615 6 REV.FbL2
Tray ADCS Reference No : 0004320
Material Code : 3CP20430/1 (Green/Blue Insert)

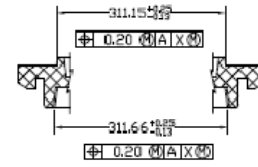
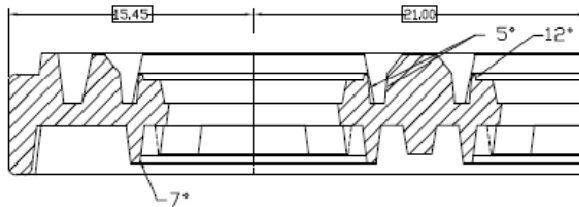
Tray Drawing:



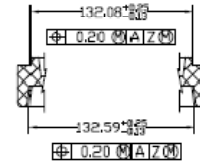
SECTION A-A



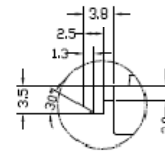
SECTION B-B



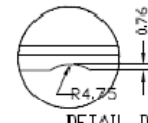
SECTION H-H




SECTION J-J



DETAIL C
M41



DETAIL D
M41

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REV. NO.	EDN #	DESCRIPTION	DATE	CHECKED BY : Ford	DATE : 04 NOV 10	
		PROPOSAL 1	04 NOV 10	APPROVED BY :	DATE : 04 NOV 10	
				APPROVED BY :	CODE :	

1. **Visual Inspection Report:**
Result: Accepted. No Tray Abnormalities.

Items	Visual Inspection	Yes	No	Quantities	Remarks
1	Chip/Crack		X	N/A	
2	Align with ST Specification	X		N/A	
3	Tray Matrix	X		N/A	
4	Full Fence	X		N/A	
5	Meet JEDEC Standard requirement	X		N/A	
6	Contain stain or foreign material		X	N/A	
7	Others (Please defined)		X		

2. **Baking Tests (*Bakeable trays only*)**

Result: Accepted

2.1. **3 Cycle Baking**

Result: Accepted

2.1.1. **Methodology**

- i) Sample: 10 trays.
- ii) Duration: 24 hrs for each cycle. After each cycle, the tray must leave at production environment for a minimum of 1 hr before starting the second baking.
- iii) Temperature: 125 deg.C (Refer to specification number 0033575)
- iv) Trays must strap using Velcro or PP (Polypropylene) belt. Strapping refers to specification number 0056593.
- v) Baking can be carrying out without units.
- vi) Measure the tray warpage after the 3rd cycle on all 6 corners as indicated in specification 8080190.
- vii) The warpage should not be > 0.5mm for new tray.

2.1.2. **Results**

Tray warpage after 3 cycle baking test:

Warpage (mm)	Side 1	Side 2	Side 3	Side 4	Side 5	Side 6
Sample 1	0.05	0.25	0.15	0.00	0.00	0.10
Sample 2	0.05	0.15	0.15	0.00	0.25	0.05
Sample 3	0.00	0.20	0.20	0.15	0.05	0.15
Sample 4	0.25	0.05	0.05	0.05	0.25	0.10
Sample 5	0.25	0.00	0.20	0.10	0.05	0.10
Sample 6	0.10	0.00	0.10	0.00	0.10	0.10
Sample 7	0.05	0.05	0.00	0.20	0.05	0.00
Sample 8	0.10	0.20	0.00	0.00	0.10	0.10
Sample 9	0.15	0.00	0.05	0.10	0.05	0.20
Sample 10	0.05	0.25	0.10	0.00	0.10	0.00

All readings are within limits.

2.2. Single Bake Result: Accepted

2.2.1. Methodology

- i) Sample: 6 pieces of single trays not stacked.
- ii) Duration 48 hrs.
- iii) Temperature: Base on the temperature mark on the tray (150 deg.C)
- iv) Without unit and without strapping
- v) After single bake, the tray warpage is measured after leaving the tray to cool to room temperature.
- vi) Measure the tray warpage on all 6 corners as indicated in specification 8080190

2.2.2. Results

Tray warpage after Single Baking test:

Warpage (mm)	Side 1	Side 2	Side 3	Side 4	Side 5	Side 6
Sample 1	0.00	0.25	0.25	0.20	0.00	0.00
Sample 2	0.25	0.70	0.45	0.30	0.50	0.00
Sample 3	0.20	0.25	0.00	0.40	0.20	0.35
Sample 4	0.60	0.35	0.30	0.15	0.30	0.15
Sample 5	0.20	0.00	0.15	0.45	0.10	0.30
Sample 6	0.15	0.35	0.70	0.15	0.70	0.10

The trays were also checked for the below items:

Items	Result
Any melting point on tray	NO
Any shrinkage on overall length	NO
Any shrinkage on overall thickness	NO
Any shrinkage on pocket dimension	NO
Maximum warpage from 6 corners should not be more than 0.76mm	0.7mm

3. Drop Test Result: Accepted

3.1. Methodology

The drop test was performed with the packing methodology described in specification number 0056593. The drop test was carried out according to methodology described in specification number 7416802.

3.2. Results

Drop Test Sequence	Scanning Results for:		Results
	i)	Coplan	
	ii)	Standoff	
	iii)	Pitch	
ABC	0 rejects		Pass
DEF	0 rejects		Pass
GHI	0 rejects		Pass

Note: Drop Test Sequence ABC refers to Face A, Edge B & Corner C.

Inspection items	Sample size	Reject quantity for ABC	Reject quantity for DEF	Reject quantity for GHI
Unit chip	540 units	0/540	0/540	0/540
Unit stuck	540 units	0/540	0/540	0/540
Unit misplace	540 units	0/540	0/540	0/540
Chip trays	7 trays	0/7	0/7	0/7

4. ESD Measurements

Result: Accepted.

4.1. Equipment

- i) Prostat PRS-801 Resistance Meter
- ii) Prostat PRV-913 Microprobe Verifier
- iii) Prostat probes PRF-922A-B and PRF914
- iv) Prostat Psychrometer PHT-771

4.2. Methodology

A sample of six trays were used to measure the surface resistance. Each tray was tested at six different points. The accepted limits for the trays should be within $1 \times 10^5 < R_s < 1 \times 10^{11}$.

Every reading was recorded as shown in the table below.

4.3. Results

TESTS	TRAY SAMPLES	SURFACE RESISTANCE MEASUREMENTS (ohms)					
		Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
SURFACE RESISTANCE TEST	Sample 1	1.1E+06	8.6E+07	1.2E+08	1.6E+06	5.8E+07	1.1E+08
	Sample 2	1.0E+07	1.3E+06	1.4E+08	1.2E+08	1.3E+09	2.3E+07
	Sample 3	1.3E+08	5.4E+06	1.1E+06	2.2E+06	8.6E+07	6.1E+07
	Sample 4	1.0E+08	6.2E+07	6.1E+07	9.6E+07	3.2E+07	3.6E+06
	Sample 5	1.2E+07	9.8E+07	6.8E+06	7.8E+07	3.5E+06	6.2E+07
	Sample 6	4.1E+07	7.7E+06	9.9E+06	2.1E+06	7.7E+07	9.5E+06
SURFACE RESISTANCE AFTER SCRATCHING	Sample 1 (before scratching)	1.1E+08					
	Sample 1 (After scratching)	2.8E+08					

All measurements are within ST Specification Limits.

5. Workability Test:
Result: Accepted

Process Step	Machine	Samples size	Rejection criteria	Result
Cropping	ASM	540 units	Bend lead, package crack, tray is jamming when machine running	Pass
Tester	Synax 141	540 units	Bend lead, package crack, tray is jamming when machine running	Pass
Finishing	STI	540 units	Bend lead, package crack, tray is jamming when machine running	Pass

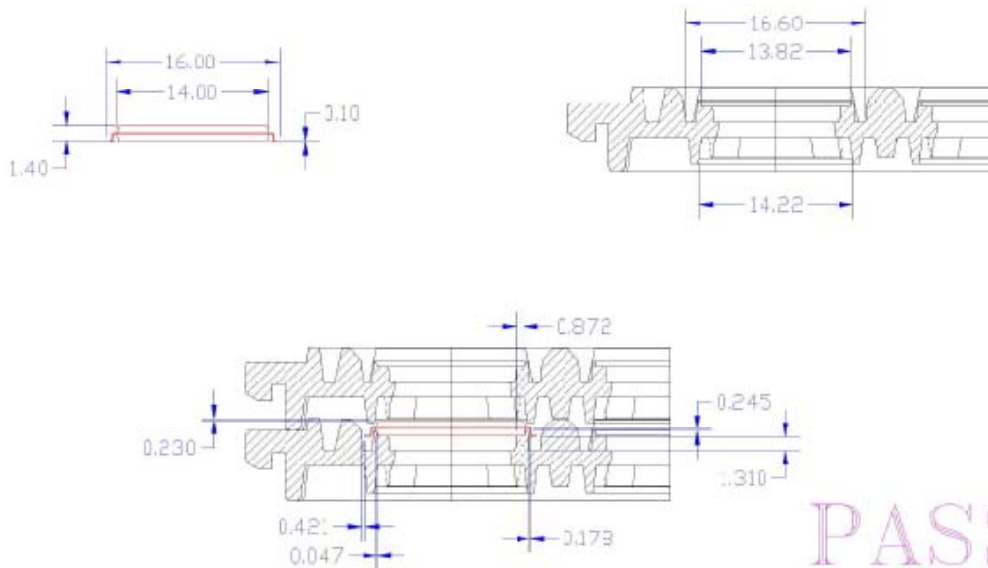
6. **FIT Analysis**
Result: Accepted

Nominal Case:

PKG. : STMicro(1L,8V,1B,4S,1S,TC,OS,HG,FV,1R,9H,GF,MT)

TRAY : ND 1414 1.4 0615 6 REV.EbL2

TRAY - NOMINAL
PKG - NOMINAL] TYPICAL CONDITIONS

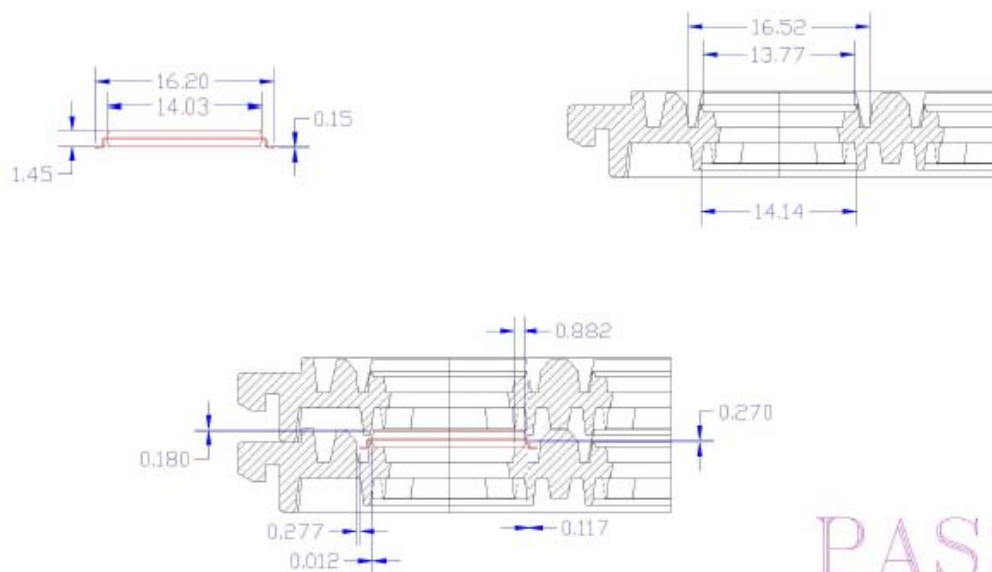


Minimum Pocket vs Maximum Package:

PKG. : STMicro(1L,8V,1B,4S,1S,TC,OS,HG,FV,1R,9H,GF,MT)

TRAY : ND 1414 1.4 0615 6 REV.EbL2

TRAY - MINIMUM
PKG - MAXIMUM] WORST CONDITIONS (A)

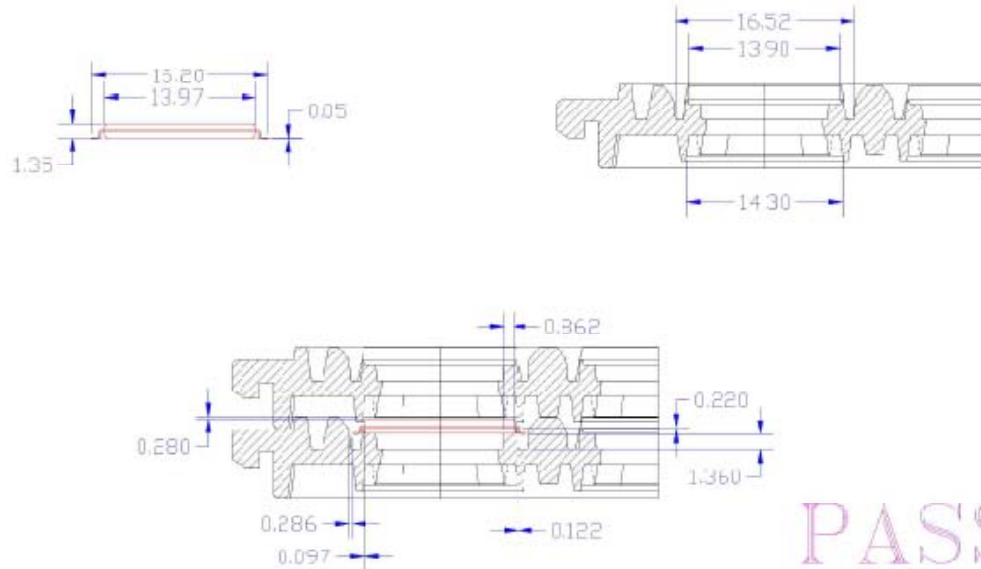


Maximum Pocket vs Minimum Package:

PKG. : STMicro(1L,8V,1B,4S,1S,TC,0S,HG,FV,1R,9H,GF,MT)

TRAY : ND 1414 1.4 0615 6 REV.EbL2

TRAY - MAXIMUM
PKG - MINIMUM } - WORST CONDITIONS (B)





7. Additional Items:

7.1. Stackability Validation



A Tray	B Tray	<u>Stackability</u>
PEAK	ITW	Yes
ITW	PEAK	Yes

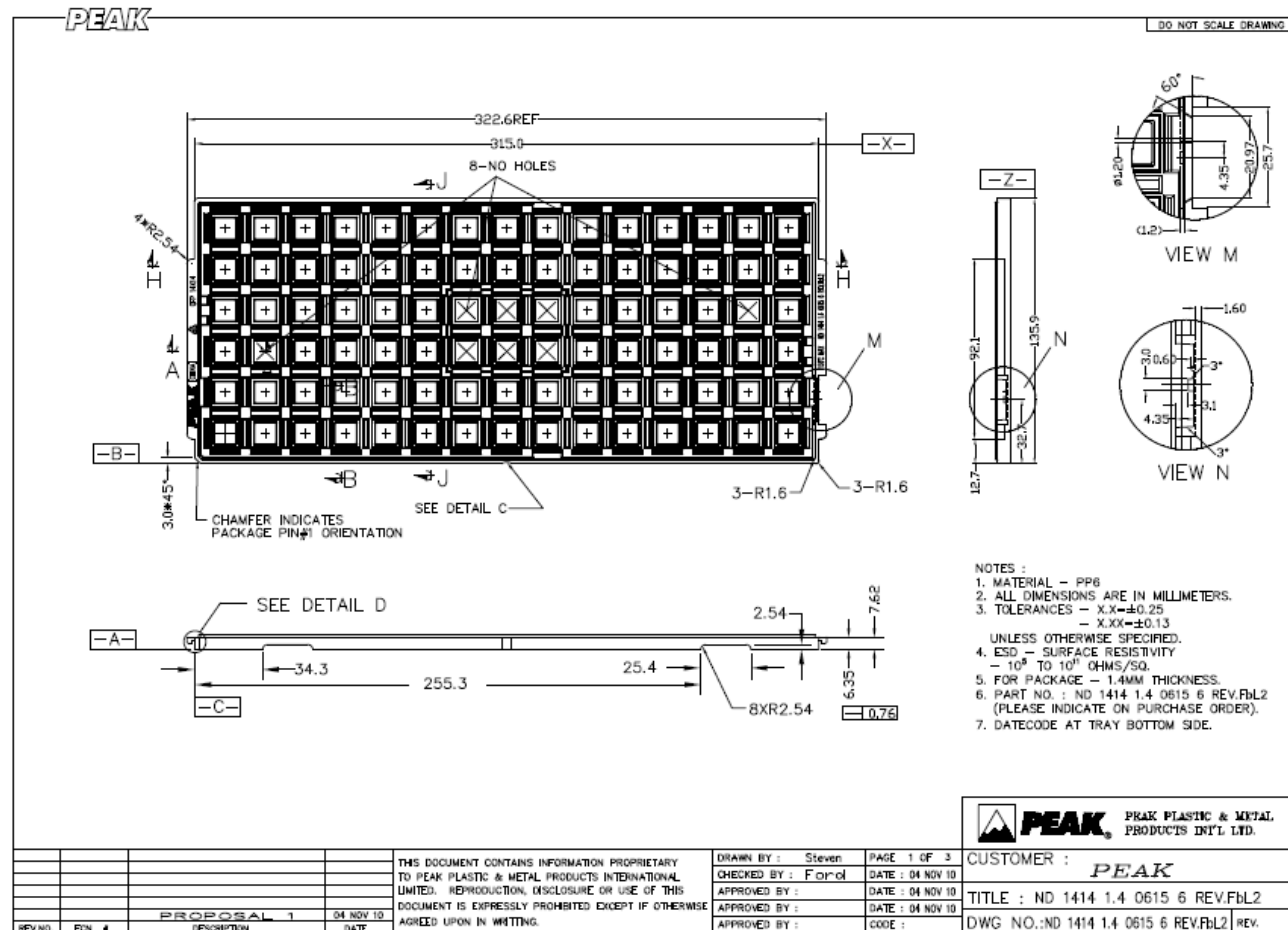
- (i) PEAK trays are stackable with current source, ITW trays.

Stacking Combination	Photos	Results
<u>Case 1:</u> 1) PEAK Tray 2) UBOT Tray 3) PEAK Tray		Passed No Gap observed in between trays.
<u>Case 2:</u> 1) UBOT Tray 2) PEAK Tray 3) UBOT Tray		Passed No Gap observed in between trays.

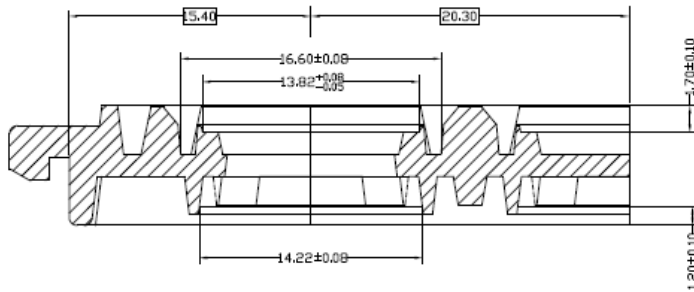
- (ii) PEAK trays are stackable with alternative source, UBOT trays.

Conclusion:

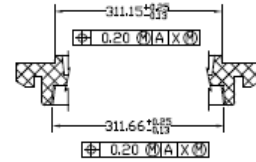
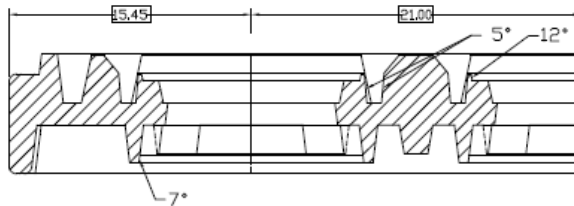
With the above qualification results, PEAK (ND 1414 1.4 0615 6 REV.FbL2) tray passed all ST tray qualification requirements, thus, qualified for production use.



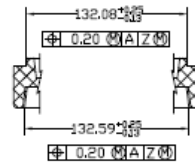
SECTION A-A



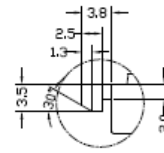
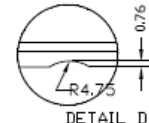
SECTION B-B



SECTION H-H



SECTION J-J

DETAIL C
M4:1DETAIL D
M4:1

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				CHECKED BY : Ford	DATE : 04 NOV 10	
				APPROVED BY :	DATE : 04 NOV 10	
				APPROVED BY :	DATE : 04 NOV 10	
REV. NO.	EDN #	DESCRIPTION	DATE			
		PROPOSAL 1	04 NOV 10			

1. Visual Inspection Report:**Result: Accepted.** No Tray Abnormalities.

Items	Visual Inspection	Yes	No	Quantities	Remarks
1	Chip/Crack		X	N/A	
2	Align with ST Specification	X		N/A	
3	Tray Matrix	X		N/A	
4	Full Fence	X		N/A	
5	Meet JEDEC Standard requirement	X		N/A	
6	Contain stain or foreign material		X	N/A	
7	Others (Please defined)		X		

2. Baking Tests (Bakeable trays only)
Result: Accepted

2.1. 3 Cycle Baking
Result: Accepted

2.1.1. Methodology

- i) Sample: 10 trays.
- ii) Duration: 24 hrs for each cycle. After each cycle, the tray must leave at production environment for a minimum of 1 hr before starting the second baking.
- iii) Temperature: 125 deg.C (Refer to specification number 0033575)
- iv) Trays must strap using Velcro or PP (Polypropylene) belt. Strapping refers to specification number 0056593.
- v) Baking can be carrying out without units.
- vi) Measure the tray warpage after the 3rd cycle on all 6 corners as indicated in specification 8080190.
- vii) The war page should not be > 0.5mm for new tray.

2.1.2. Results

Tray warpage after 3 cycle baking test:

Warpage (mm)	Side 1	Side 2	Side 3	Side 4	Side 5	Side 6
Sample 1	0.05	0	0.05	0.05	0.05	0.05
Sample 2	0.05	0.05	0.05	0.05	0.05	0.05
Sample 3	0.05	0	0.05	0.05	0	0
Sample 4	0.05	0.05	0.05	0.05	0	0.05
Sample 5	0.1	0.05	0.05	0.05	0	0.05
Sample 6	0.05	0.05	0.1	0.1	0.05	0.05
Sample 7	0.1	0.05	0.1	0.1	0.05	0.05
Sample 8	0.05	0.05	0.1	0.2	0.05	0.05
Sample 9	0	0.1	0.1	0.05	0.1	0.45
Sample 10	0	0.1	0.05	0.1	0.1	0.55

All measurements were found to be below the 0.5mm (*maximum acceptable warpage as declared in document 8080190 rev E*), except for the 0.55mm, which was considered as limit case..

2.2. Single Bake Result: Accepted

2.2.1. Methodology

- i) Sample: 6 pieces of single trays not stacked.
- ii) Duration 48 hrs.
- iii) Temperature: Base on the temperature mark on the tray (150 deg.C)
- iv) Without unit and without strapping
- v) After single bake, the tray warpage is measured after leaving the tray to cool to room temperature.
- vi) Measure the tray warpage on all 6 corners as indicated in specification 8080190

2.2.2. Results

Tray warpage after Single Baking test:

Warpage (mm)	Side 1	Side 2	Side 3	Side 4	Side 5	Side 6
Sample 1	0.05	0.15	0.05	0.05	0.05	0.05
Sample 2	0.1	0	0.1	0.05	0	0.05
Sample 3	0	0.5	0.1	0	0.1	0.05
Sample 4	0.1	0.05	0.05	0.05	0.05	0
Sample 5	0.1	0	0.05	0.05	0.05	0.05
Sample 6	0.15	0.05	0.05	0.05	0.05	0.1

The trays were also checked for the below items:

Items	Result
Any melting point on tray	NO
Any shrinkage on overall length	NO
Any shrinkage on overall thickness	NO
Any shrinkage on pocket dimension	NO
Maximum warpage from 6 corners should not be more than 0.76mm	0.5mm

3. Drop Test
Result: Accepted

3.1. Methodology

The drop test was performed with the packing methodology described in specification number 0056593. The drop test was carried out according to methodology described in specification number 7416802.

3.2. Results

Drop Test Sequence	Scanning Results for: i) Coplan ii) Standoff iii) Pitch	Results
ABC	0 rejects	Pass
DEF	0 rejects	Pass
GHI	0 rejects	Pass

Note: Drop Test Sequence ABC refers to Face A, Edge B & Corner C.

Inspection items	Sample size	Reject quantity for ABC	Reject quantity for DEF	Reject quantity for GHI
Unit chip	540 units	0/540	0/540	0/540
Unit stuck	540 units	0/540	0/540	0/540
Unit misplace	540 units	0/540	0/540	0/540
Chip trays	7 trays	0/7	0/7	0/7

4. ESD Measurements

Result: Accepted.

4.1. Equipment

- i) Prostat PRS-801 Resistance Meter
- ii) Prostat PRV-913 Microprobe Verifier
- iii) Prostat probes PRF-922A-B and PRF914
- iv) Prostat Psychrometer PHT-771

4.2. Methodology

A sample of six trays were used to measure the surface resistance. Each tray was tested at six different points. The accepted limits for the trays should be within $1 \times 10^5 < R_s < 1 \times 10^{11}$.

Every reading was recorded as shown in the table below.

4.3. Results

TESTS	TRAY SAMPLES	SURFACE RESISTANCE MEASUREMENTS (ohms)					
		Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
SURFACE RESISTANCE TEST	Sample 1	1.3E+08	6.0E+07	8.2E+07	5.7E+07	2.8E+07	1.1E+07
	Sample 2	9.2E+07	5.8E+07	9.8E+07	5.1E+07	8.9E+06	3.1E+07
	Sample 3	7.9E+07	5.4E+07	2.6E+08	3.5E+06	4.2E+06	1.4E+07
	Sample 4	9.6E+07	1.1E+08	1.6E+08	2.4E+06	5.0E+07	1.3E+07
	Sample 5	1.1E+08	1.2E+08	7.1E+07	4.2E+07	5.5E+06	7.5E+06
	Sample 6	5.1E+07	1.7E+08	2.4E+08	1.1E+07	1.0E+07	2.6E+07
SURFACE RESISTANCE AFTER SCRATCHING	Sample 1 (before scratching)	1.6E+08					
	Sample 1 (After scratching)	2.8E+08					

All measurements are within ST Specification Limits.

5. Workability Test:
Result: Accepted

Process Step	Machine	Samples size	Rejection criteria	Result
Cropping	ASM MP209	540 units	Bend lead, package crack, tray is jamming when machine running	Pass
Tester	Multitest 9510	540 units	Bend lead, package crack, tray is jamming when machine running	Pass
Finishing	Hexa Whizz	540 units	Bend lead, package crack, tray is jamming when machine running	Pass

6. FIT Analysis

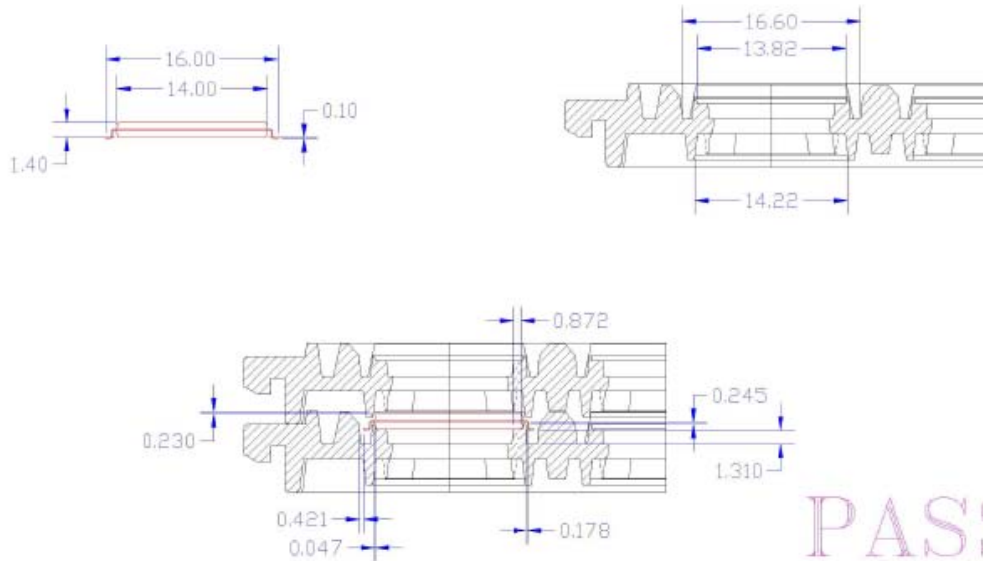
Result: Accepted

Nominal Case:

PKG. : STMicro(1L,8V,1B,4S,1S,TC,OS,HG,FV,1R,9H,GF,MT)

TRAY : ND 1414 1.4 0615 6 REV.EbL2

TRAY - NOMINAL
PKG - NOMINAL } TYPICAL CONDITIONS



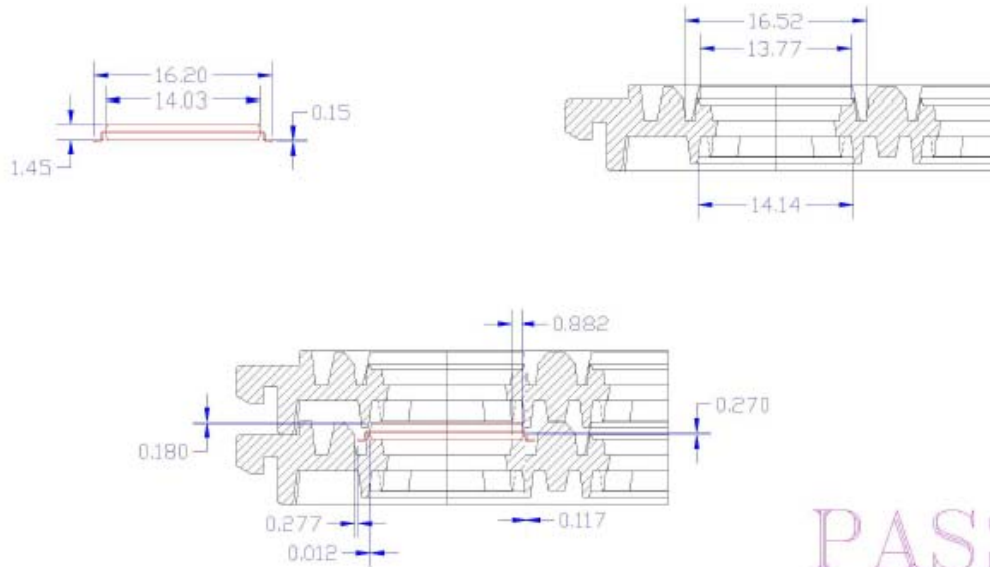
PASS

Minimum Pocket vs Maximum Package:

PKG. : STMicro(1L,8V,1B,4S,1S,TC,OS,HG,FV,1R,9H,GF,MT)

TRAY : ND 1414 1.4 0615 6 REV.EbL2

TRAY - MINIMUM
PKG - MAXIMUM } WORST CONDITIONS (A)



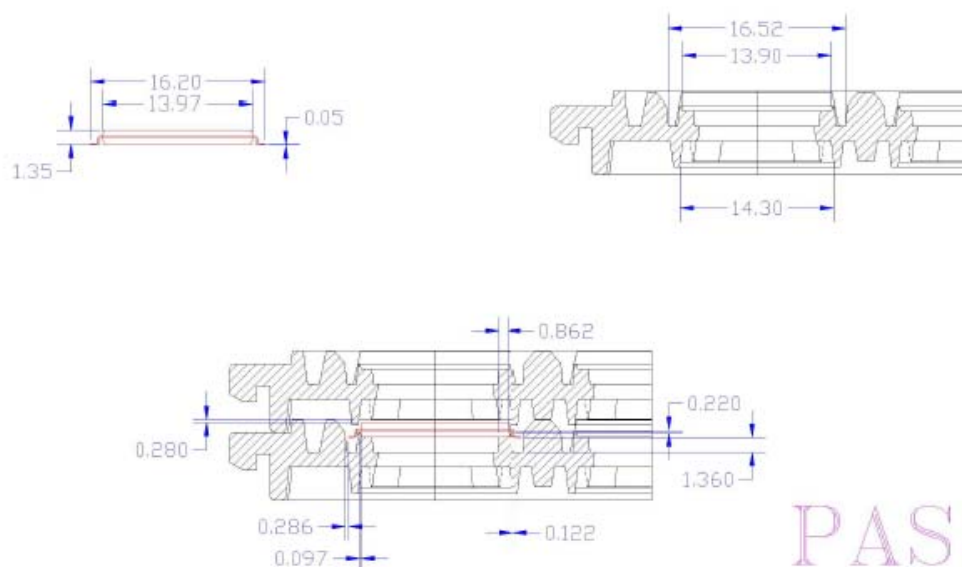
PASS

Maximum Pocket vs Minimum Package:

PKG. : STMicro(1L,8V,1B,4S,1S,TC,OS,HG,FV,1R,9H,GF,MT)

TRAY : ND 1414 1.4 0615 6 REV.EbL2

TRAY - MAXIMUM
PKG - MINIMUM } WORST CONDITIONS (B)



PASS



7. Additional Items:

7.1. Stackability Validation



A Tray	B Tray	<u>Stackability</u>
PEAK	ITW	Yes
ITW	PEAK	Yes

- (i) PEAK trays are stackable with current source, ITW trays.

Stacking Combination	Photos	Results
Case 1: 1) PEAK Tray 2) UBOT Tray 3) PEAK Tray		Passed No Gap observed in between trays.
Case 2: 1) UBOT Tray 2) PEAK Tray 3) UBOT Tray		Passed No Gap observed in between trays.

- (ii) PEAK trays are stackable with alternative source, UBOT trays.

Conclusion:

With the above qualification results, PEAK (ND 1414 1.4 0615 6 REV.FbL2) tray passed all ST tray qualification requirements, thus, qualified for production use.

Qualification of PEAK PQFP 28x28 Tray

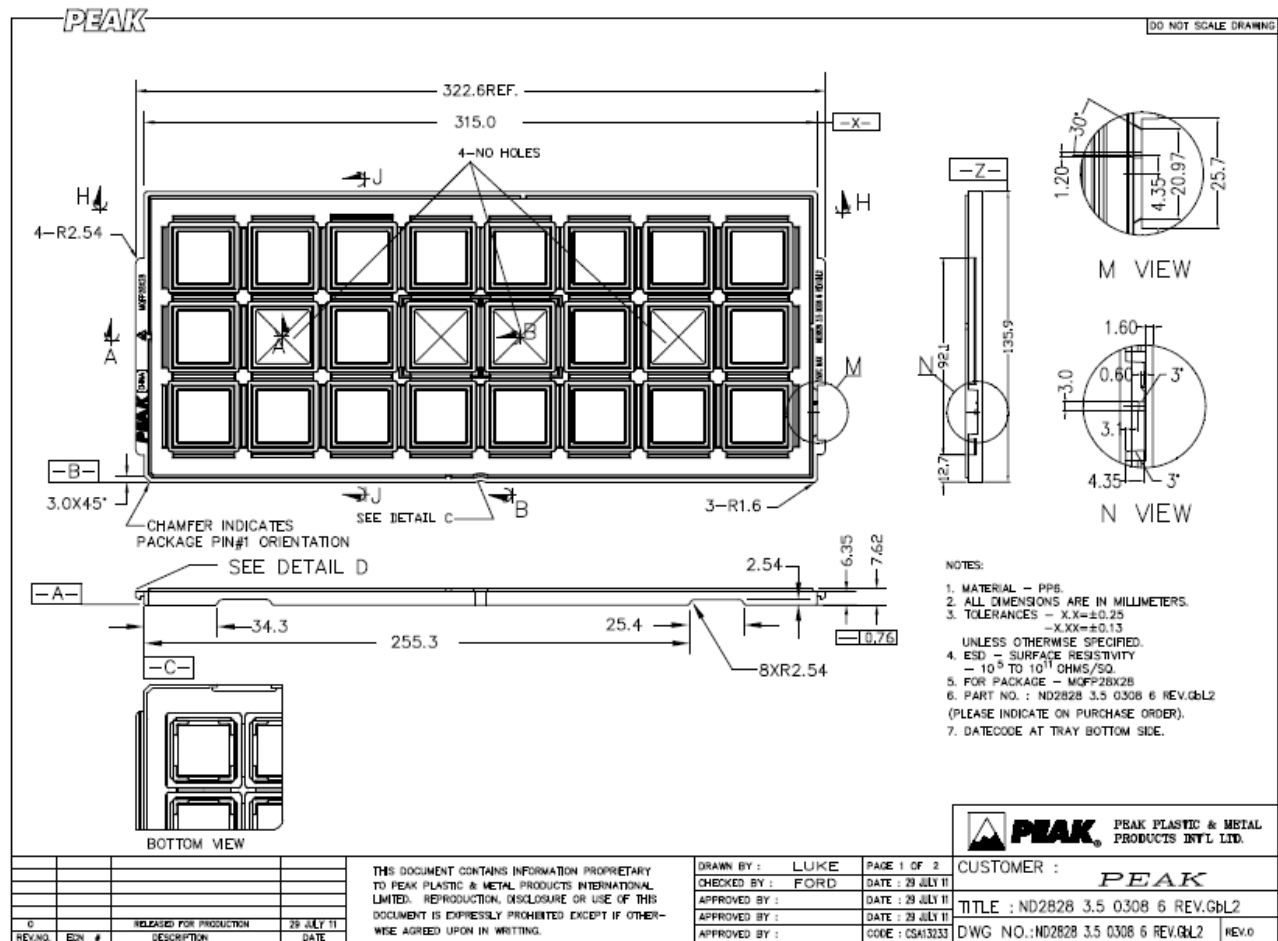
Objective:

- To evaluate PEAK (ND2828 3.5 0308 6 REV.GbL2) trays as tray 2nd source for PQFP 28x28 device packing application at PTM Malta.

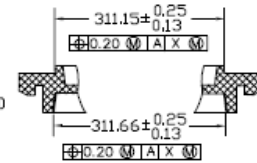
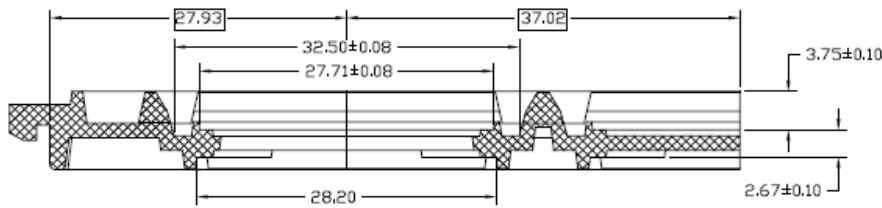
Tray Information:

Supplier : PEAK
Supplier Part No : ND2828 3.5 0308 6 REV.GbL2
Tray ADCS Reference No : 0105455
Material Code : 3CP10251/3CP70910 (Green/Blue Insert)

Tray Drawing:

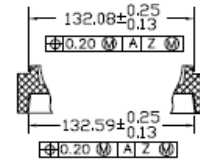
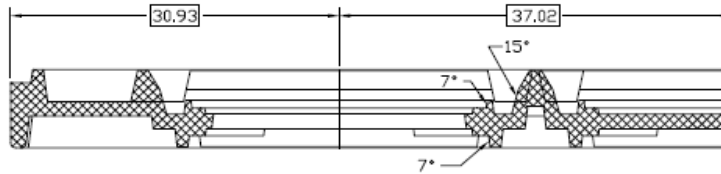


SECTION A-A

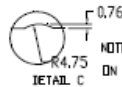


SECTION H-H

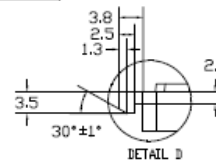
SECTION B-B



SECTION J-J



NOTE SCALLOP IS CENTERED
ON SIDE OF TRAY



PEAK PLASTIC & METAL
PRODUCTS INT'L. LTD.

REV. NO.	EDN. #	DESCRIPTION	DATE
0		RELEASED FOR PRODUCTION	29 JULY 11

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DRAWN BY :	LUKE	PAGE 2 OF 2
CHECKED BY :	FORD	DATE : 28 JULY 11
APPROVED BY :		DATE : 28 JULY 11
APPROVED BY :		DATE : 28 JULY 11
APPROVED BY :		CODE : CSA13233

CUSTOMER :	PEAK
TITLE :	ND2828 3.5 0308 6 REV.GBL2
DWG. NO.:	ND2828 3.5 0308 6 REV.GBL2
REV.0	

1. **Visual Inspection Report:**

Result: Accepted. No Tray Abnormalities.

Items	Visual Inspection	Yes	No	Quantities	Remarks
1	Chip/Crack		X	N/A	
2	Align with ST Specification	X		N/A	
3	Tray Matrix	X		N/A	
4	Full Fence	X		N/A	
5	Meet JEDEC Standard requirement	X		N/A	
6	Contain stain or foreign material		X	N/A	
7	Others (Please defined)		X		

2. Baking Tests (Bakeable trays only)

Result: Accepted

2.1. 3 Cycle Baking

Result: Accepted

2.1.1. Methodology

- i) Sample: 10 trays.
- ii) Duration: 24 hrs for each cycle. After each cycle, the tray must leave at production environment for a minimum of 1 hr before starting the second baking.
- iii) Temperature: 125 deg.C (Refer to specification number 0033575)
- iv) Trays must strap using Velcro or PP (Polypropylene) belt. Strapping refers to specification number 0056593.
- v) Baking can be carrying out without units.
- vi) Measure the tray warpage after the 3rd cycle on all 6 corners as indicated in specification 8080190.
- vii) The warpage should not be > 0.5mm for new tray.

2.1.2. Results

Tray warpage after 3 cycle baking test:

Warpage (mm)	Side 1	Side 2	Side 3	Side 4	Side 5	Side 6
Sample 1	0	0.3	0	0	0.3	0
Sample 2	0	0.3	0	0	0.2	0
Sample 3	0	0.2	0	0	0.15	0.05
Sample 4	0	0.15	0	0	0.15	0
Sample 5	0	0.2	0	0	0.15	0
Sample 6	0	0.2	0	0	0.2	0
Sample 7	0	0.25	0	0	0.15	0
Sample 8	0	0.3	0	0	0.15	0
Sample 9	0	0.2	0	0	0.15	0
Sample 10	0	0.2	0	0	0.15	0

All readings are within limits

2.2. Single Bake

Result: Accepted

2.2.1. Methodology

- i) Sample: 6 pieces of single trays not stacked.
- ii) Duration 48 hrs.
- iii) Temperature: Base on the temperature mark on the tray (150 deg.C)
- iv) Without unit and without strapping
- v) After single bake, the tray warpage is measured after leaving the tray to cool to room temperature.
- vi) Measure the tray warpage on all 6 corners as indicated in specification 8080190

2.2.2. Results

Tray warpage after Single Baking test:

Warpage (mm)	Side 1	Side 2	Side 3	Side 4	Side 5	Side 6
Sample 1	0	0.55	0	0	0.3	0.05
Sample 2	0	0.4	0	0	0.2	0
Sample 3	0	0.4	0	0	0.4	0
Sample 4	0	0.5	0	0	0.45	0
Sample 5	0	0.5	0	0	0.45	0
Sample 6	0	0.5	0	0.05	0.45	0

The trays were also checked for the below items:

Items	Result
Any melting point on tray	NO
Any shrinkage on overall length	NO
Any shrinkage on overall thickness	NO
Any shrinkage on pocket dimension	NO
Maximum warpage from 6 corners should not be more than 0.76mm	0.55mm

3. Drop Test
Result: Accepted

3.1. Methodology

The drop test was performed with the packing methodology described in specification number 0056593. The drop test was carried out according to methodology described in specification number 7416802.

3.2. Results

Drop Test Sequence	Scanning Results for: i) Coplan ii) Standoff iii) Pitch	Results
ABC	0 rejects	Pass
DEF	0 rejects	Pass
GHI	0 rejects	Pass

Note: Drop Test Sequence ABC refers to Face A, Edge B & Corner C.

Inspection items	Sample size	Reject quantity for ABC	Reject quantity for DEF	Reject quantity for GHI
Unit chip	240 units	0/240	0/240	0/240
Unit stuck	240 units	0/240	0/240	0/240
Unit misplace	240 units	0/240	0/240	0/240
Chip trays	11 trays	0/11	0/11	0/11

4. ESD Measurements

Result: Accepted.

4.1. Equipment

- i) Prostat PRS-801 Resistance Meter
- ii) Prostat PRV-913 Microprobe Verifier
- iii) Prostat probes PRF-922A-B and PRF914
- iv) Prostat Psychrometer PHT-771

4.2. Methodology

A sample of six trays were used to measure the surface resistance. Each tray was tested at six different points. The accepted limits for the trays should be within $1 \times 10^5 < R_s < 1 \times 10^{11}$.

Every reading was recorded as shown in the table below.

4.3. Results

TESTS	TRAY SAMPLES	SURFACE RESISTANCE MEASUREMENTS (ohms)			
		Point 1	Point 2	Point 3	Point 4
SURFACE RESISTANCE TEST	Sample 1	2.9e9	2.8e6	1.2e9	3.9e9
	Sample 2	2.2e9	4.0e7	2.6e9	1.9e9
	Sample 3	2.0e9	5.4e6	1.4e9	2.8e9
	Sample 4	7.6e8	6.9e6	2.7e9	2.8e9
	Sample 5	1.3e9	1.9e7	3.1e9	3.2e9
	Sample 6	1.3e9	5.3e6	2.2e9	3.8e9
SURFACE RESISTANCE AFTER SCRATCHING	Sample 1 (before scratching)	1.8e8			
	Sample 1 (After scratching)	9.8e7			

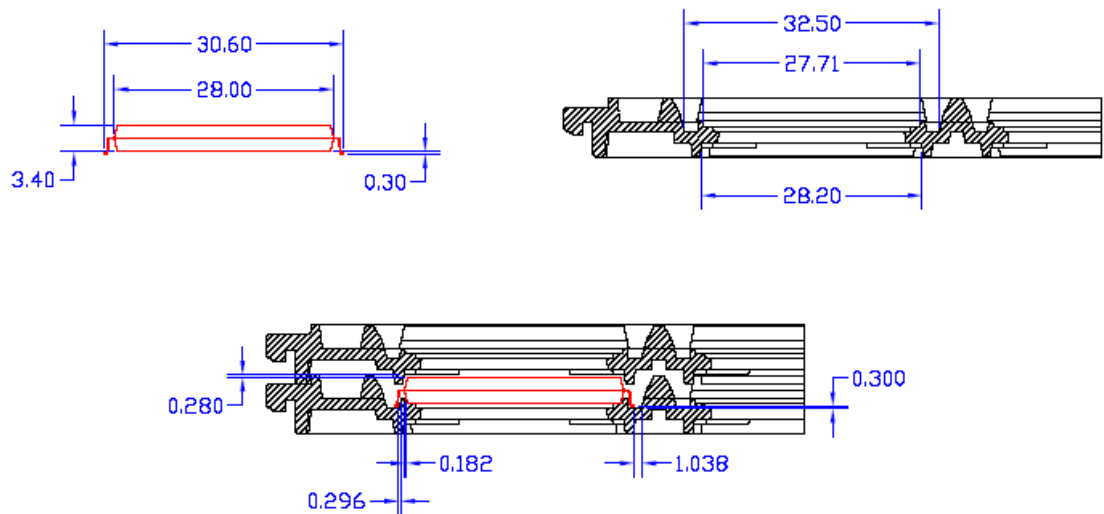
All measurements are within ST Specification Limits.

5. **Workability Test:**
Result: Accepted

Process Step	Machine	Samples size	Rejection criteria	Result
Cropping	Fico TFM UF	240 units	Bend lead, package crack, tray is jamming when machine running	Pass
Tester	Multitest 9510	240 units	Bend lead, package crack, tray is jamming when machine running	Pass
Finishing	Hexa Whizz	240 units	Bend lead, package crack, tray is jamming when machine running	Pass

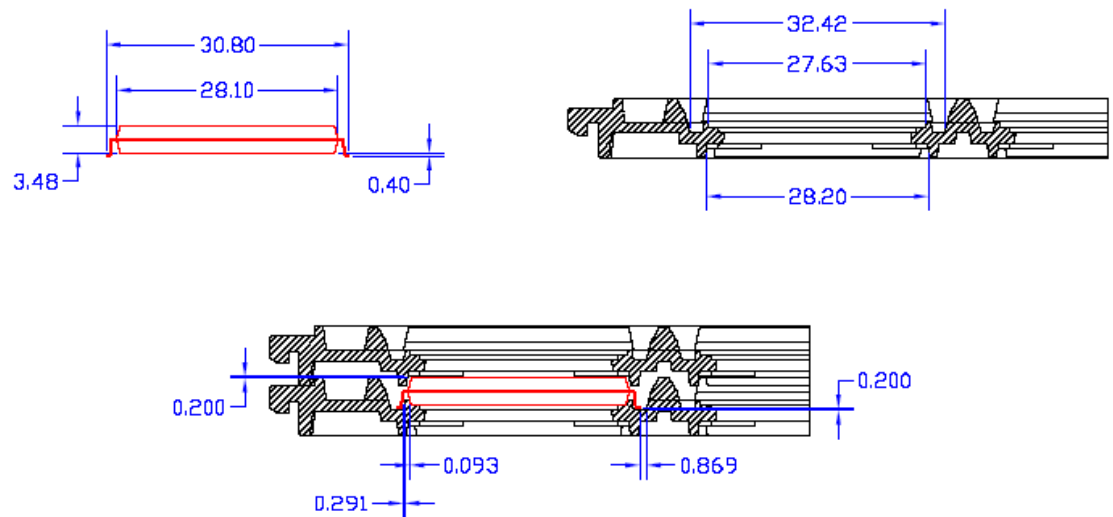
6. **FIT Analysis**
Result: Accepted

PKG. : ST-Micro 0120082 CODE 5R
TRAY : DAEWON NEW 1st DESIGN (MQFP 28X28mm)
TRAY - NOMINAL
PKG - NOMINAL] TYPICAL CONDITIONS



PASS

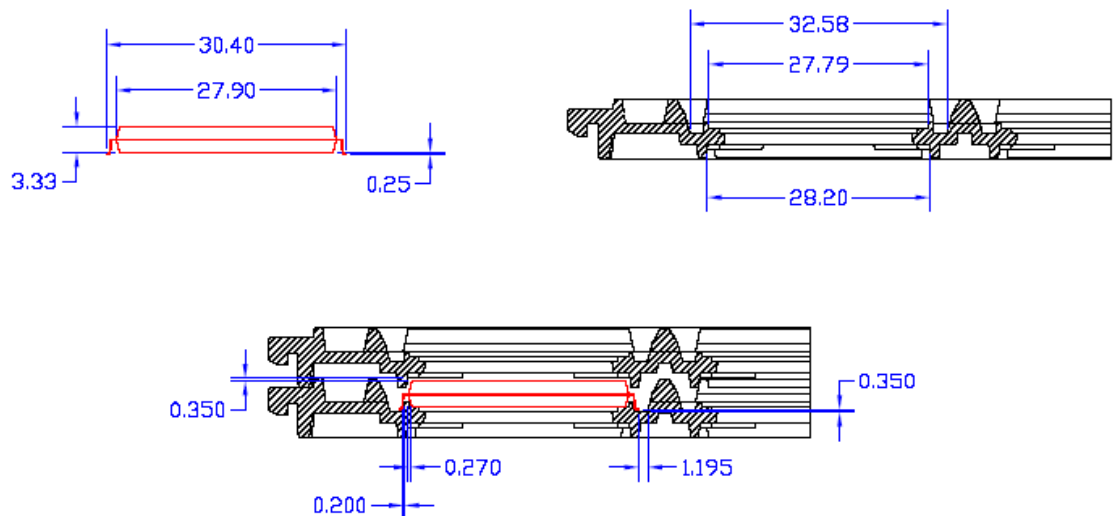
PKG. : ST-Micro 0120082 CODE 5R
 TRAY : DAEWON NEW 1st DESIGN (MQFP 28X28mm)
 TRAY - MINIMUM
 PKG - MAXIMUM } WORST CONDITIONS (A)



PASS

PKG. : ST-Micro 0120082 CODE 5R
 TRAY : DAEWON NEW 1st DESIGN (MQFP 28X28mm)
 TRAY - MAXIMUM
 PKG - MINIMUM } WORST CONDITIONS (B)

Date : Nov 08 2010
 Simulated by Haley



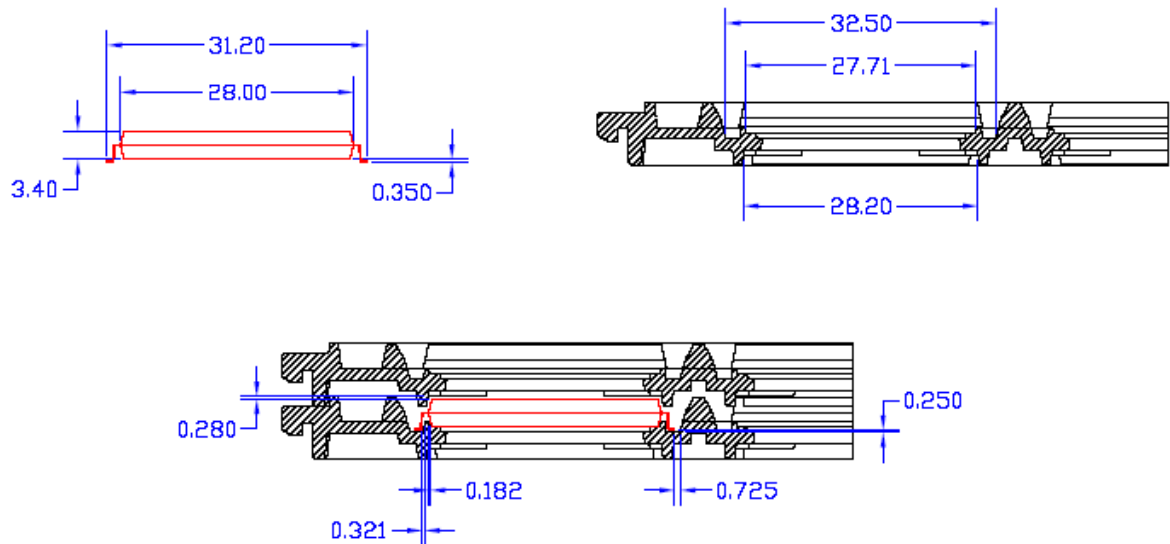
PASS

PKG. : ST-Micro 0060668/C CODE 5M

TRAY : DAEWON NEW 1st DESIGN (MQFP 28X28mm)

TRAY - NOMINAL
PKG - NOMINAL

TYPICAL CONDITIONS



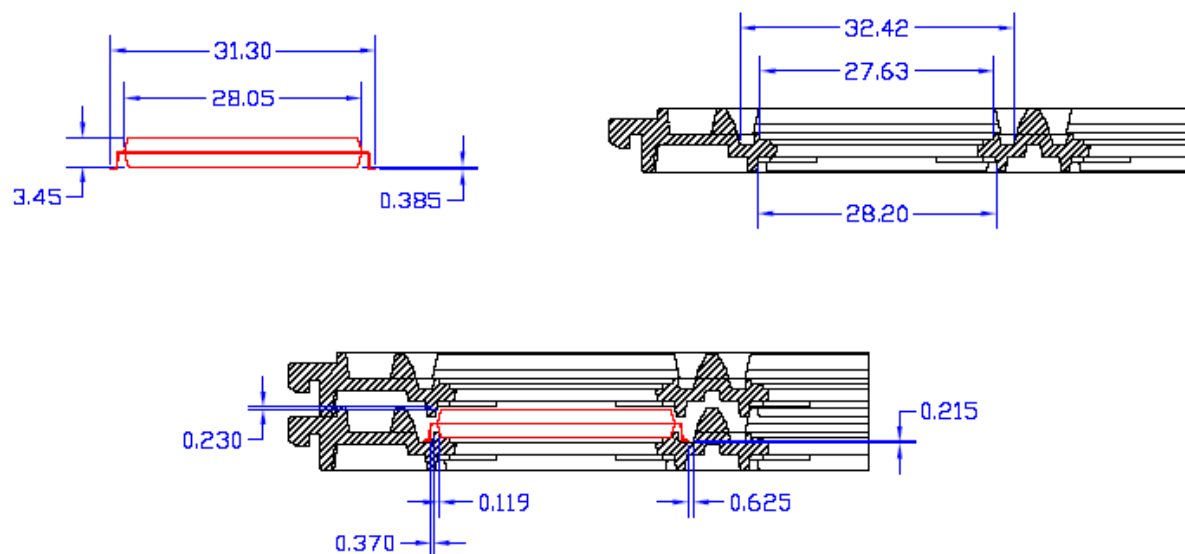
PASS

PKG. : ST-Micro 0060668/C CODE 5M

TRAY : DAEWON NEW 1st DESIGN (MQFP 28X28mm)

TRAY - MINIMUM
PKG - MAXIMUM

WORST CONDITIONS (A)

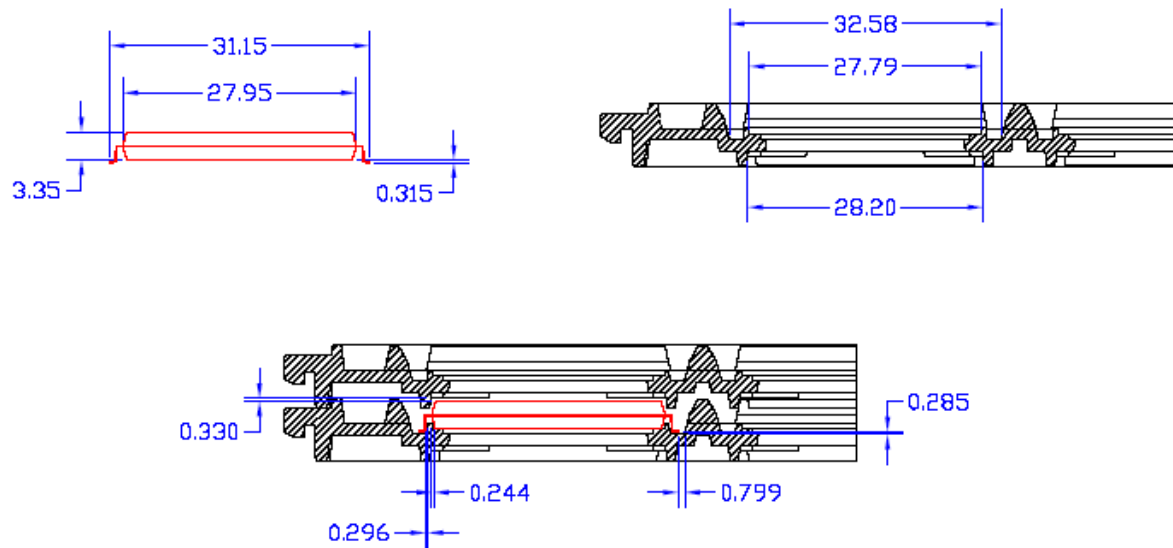


PASS

PKG. : ST-Micro 0060668/C CODE 5M
TRAY : DAEWON NEW 1st DESIGN (MQFP 28X28mm)

Date : Nov 08 2010
Simulated by Haley

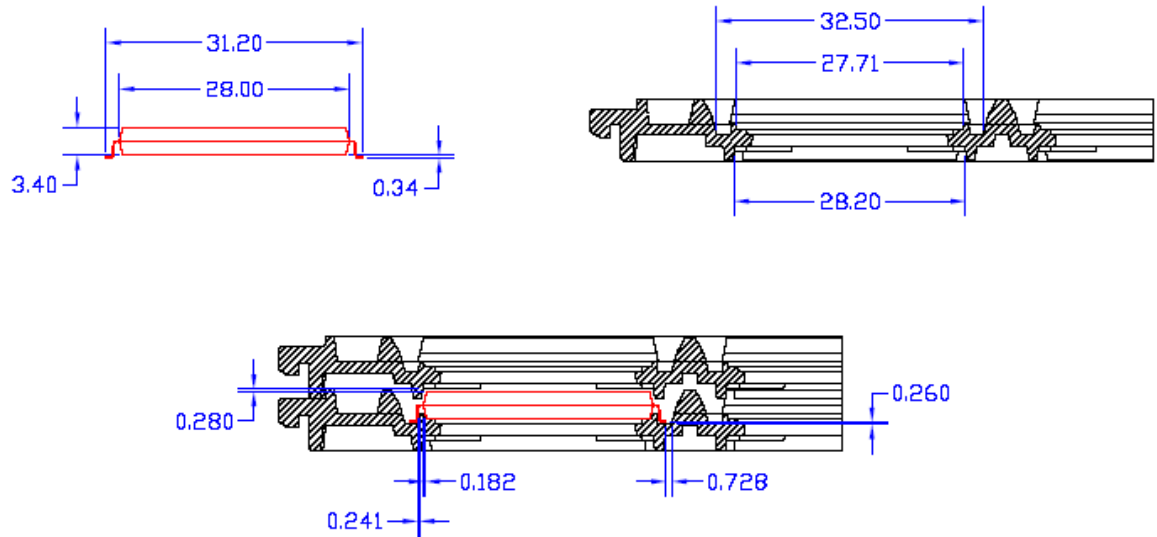
TRAY - MAXIMUM
PKG - MINIMUM } WORST CONDITIONS (B)



PASS

PKG. : ST-Micro 0060667/C CODE 5L
 TRAY : DAEWON NEW 1st DESIGN (MQFP 28X28mm)
 TRAY - NOMINAL
 PKG - NOMINAL

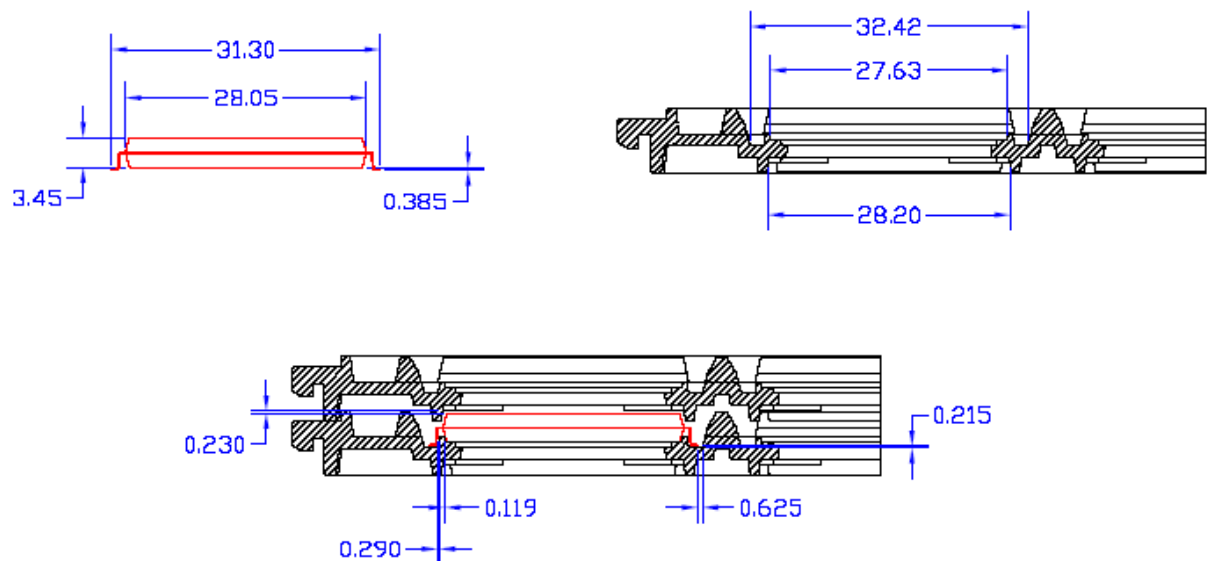
TYPICAL CONDITIONS



PASS

PKG. : ST-Micro 0060667/C CODE 5L
 TRAY : DAEWON NEW 1st DESIGN (MQFP 28X28mm)
 TRAY - MINIMUM
 PKG - MAXIMUM

WORST CONDITIONS (A)

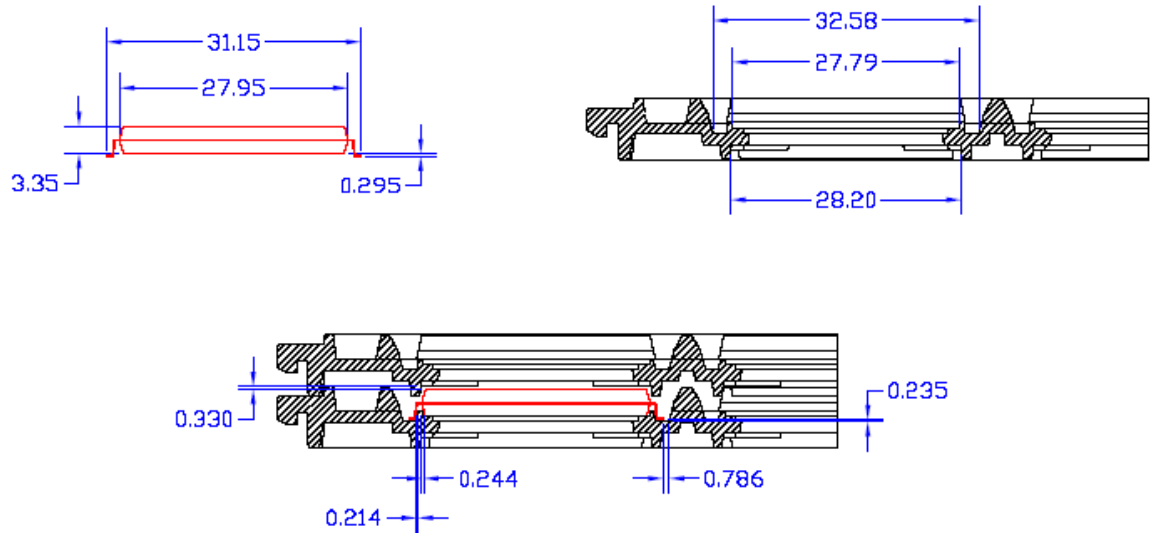


PASS

PKG. : ST-Micro 0060667/C CODE 5L
TRAY : DAEWON NEW 1st DESIGN (MQFP 28X28mm)

Date : Nov 08 2010
Simulated by Haley

TRAY - MAXIMUM
PKG - MINIMUM]— WORST CONDITIONS (B)



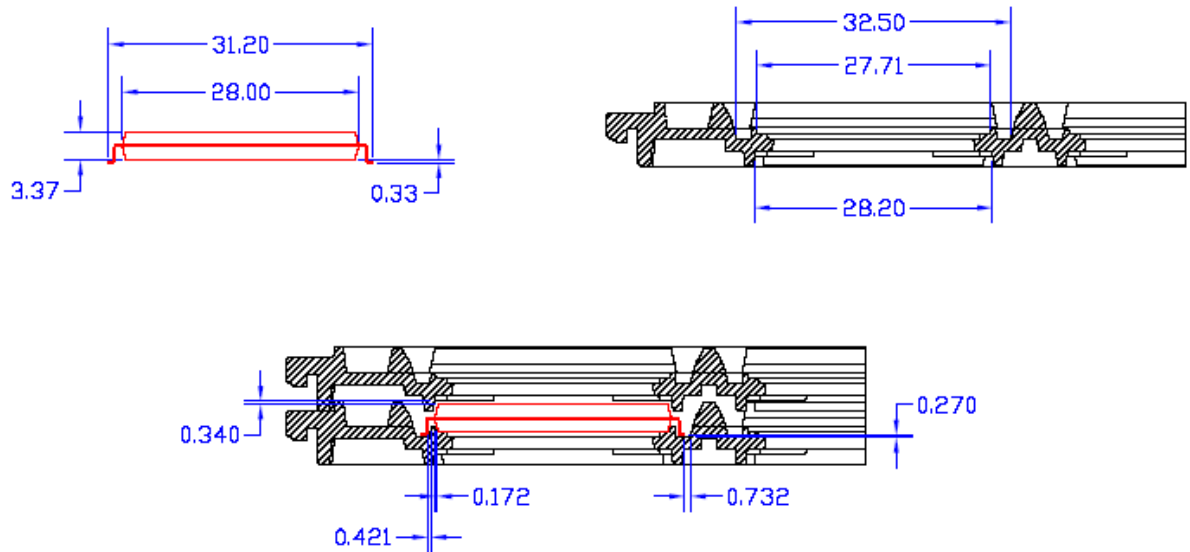
PASS

PKG. : ST-Micro 0060665/B

TRAY : DAEWON NEW 1st DESIGN (MQFP 28X28mm)

TRAY - NOMINAL
PKG - NOMINAL

TYPICAL CONDITIONS



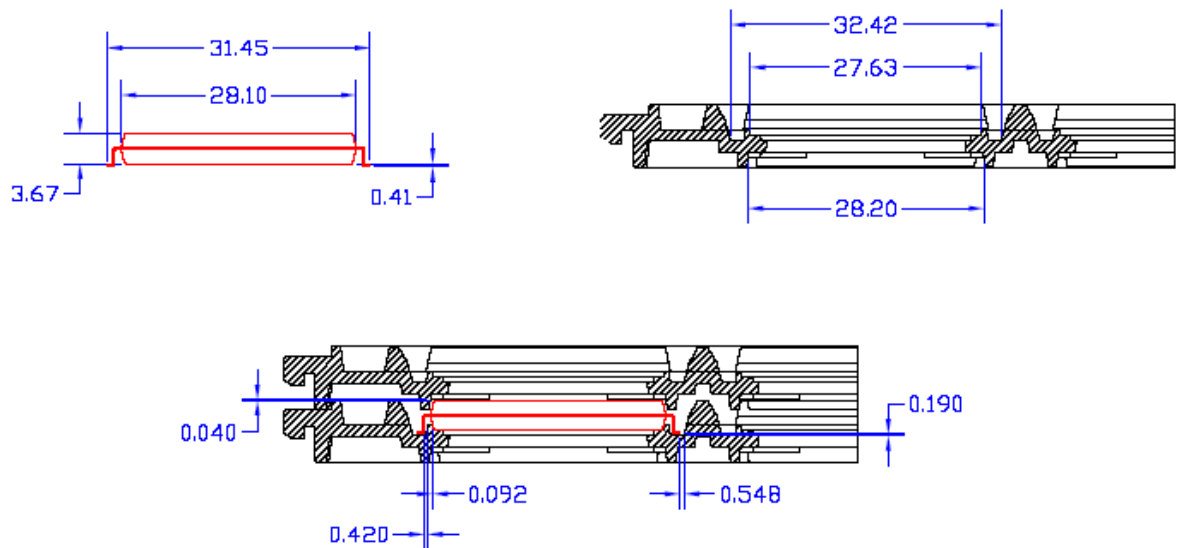
PASS

PKG. : ST-Micro 0060665/B

TRAY : DAEWON NEW 1st DESIGN (MQFP 28X28mm)

TRAY - MINIMUM
PKG - MAXIMUM

WORST CONDITIONS (A)



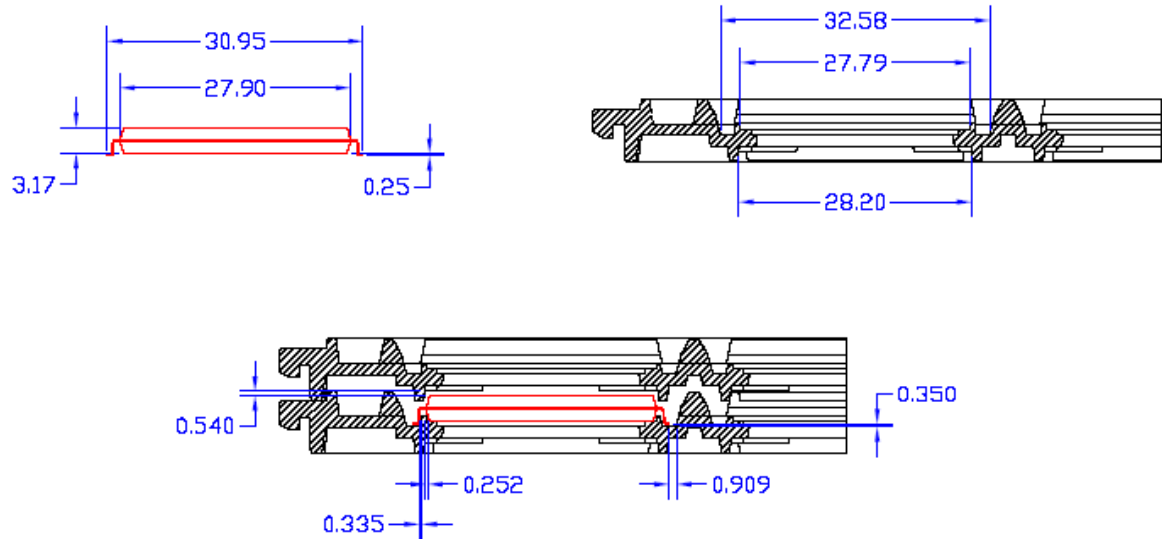
PASS

PKG. : ST-Micro 0060665/B

TRAY : DAEWON NEW 1st DESIGN (MQFP 28X28mm)

Date : Nov 08 2010
Simulated by Haley

TRAY - MAXIMUM
PKG - MINIMUM] — WORST CONDITIONS (B)



PASS

Conclusion:

With the above qualification results, PEAK (ND2828 3.5 0308 6 REV.GbL2) tray passed all ST tray qualification requirements, thus, qualified for production use.

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