

Product Specification

Model Name: SMD567F2560M01

Description : 5.67" WQHD(1440x2560) 16M Colors

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History

Date	<u>Rev.No</u>	<u>Contens</u>	<u>Remark</u>
<u>31/07/'16</u>			

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Product Name : WQHD HMD VR

Issue Date : 2016.04.11

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Proposed by			Customer's Approval
Designed	Checked	Approved	
S.H.Park	-	-	

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TITLE : 5.67" WQHD, AMOLED

Rev No. 0.2

1/51

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1. Scope

This Specification defines general provisions as well as inspection standards for AMOLED module supplied by SAMSUNG Display Co., LTD.,

If the event of unforeseen problems or unspecified items occurs, we naturally shall negotiate and agree to solution with customer.

2. Warranty

Basically, warranty term is 12 months of reliability characteristics of quality level after the outgoing date in SAMSUNG Display Co., LTD., and SAMSUNG Display Co., LTD., could compensate for defectives which happens within warranty term under condition that the products should be stored or be used as specified under normal condition within the contents of specification.

Otherwise, it is impossible to compensate for defectives when they happens by customer's mistake such as careless handling or circuit change, etc.

And after 12 months of warranty term, all replacements for defectives will be charged.

This Specification stipulates the final and comprehensive requirements for the respective products hereof. Beyond this Specification, it is responsibility of the customer to explicitly disclose any additional requirements, information or reservations regarding these requirements to Samsung Display prior to implementation, where any and all disclosures of the customer shall be with an authorized representative of Samsung Display in writing. Samsung Display shall not be responsible for safety, performance, functionality, compatibility of the system with which the SAMSUNG DISPLAY-supplied components are integrated unless such features have been expressly communicated and described in the Specification. SAMSUNG DISPLAY MAKES NO GUARANTY OR WARRANTY, EXPRESS OR IMPLIED , INCLUDING BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, TO ANY PARTY. Moreover, any party should do their own due diligence regarding these requirements prior to implementation.

3. Features

- 1) Display Color : 16M Color
- 2) Display Format : 5.67" WQHD Diamond : 1440x2560
- 3) Interface : DSI Dual 8-lane
- 4) Driver IC : S6E3HA3 (SEC)
- 5) Polarizer : Hard Coating Polarizer

4. Mechanical Specification

Item	Specifications	Unit
Dimensional outline	73.20(W) x 132.76(H) x 0.923(T)	mm
Glass outline	73.20(W) x 132.76(H) x 0.616(T)	mm
Number of dots	1440(W) x RG(BG) x 2560(H)	Dots
Active area	70.56(W) X 125.44(H)	mm
Diagonal Inch	5.67	inch
Pixel pitch	49(W) X 49(H)	um
Glass Thickness (ENCAP/LTPS)	0.3/0.3	mm

5. Maximum Rating

Item		Symbol	Min.	Max.	Unit	Note
Supply voltage (Display)	Driver-IC	VCI	-0.3	5.0	V	(1),(2)
		VDD3	-0.3	2.7	V	(1),(2)
	DCDC	VBAT	-0.3	6.0	V	(3)
Operating temperature		Top	-20	70	℃	-
Storage temperature		Tstg	-30	80	℃	-
Humidity		Hstg	10	90	%RH	

Note 1) Supply voltage should satisfy the below condition of VCI, VDD3 > VSS (GND).

Note 2) If the supplied voltage exceeds the maximum limitation, LSI can be damaged permanently.

Therefore, while operating, it is recommend to use LSI within the maximum electrical limitation.

If not, LSI can cause decreased reliability or operational problems.

Note 3) VBAT is input supply to DCDC IC which is mounted on SET board.

And ELVDD and ELVSS, which are supply voltage for display, are output power from DCDC IC.

13. Quality Level

13-1. Environmental conditions

Item	Test Condition
Ambient light intensity	Function : 0~200 Lux / Appearance : 800~1200 Lux
Viewing angle(tolerance)	$90^{\circ} \pm 1^{\circ}$ (Up/Down/Left/Right) ----- note1
Viewing Distance	$30 \pm 5\text{cm}$ ----- note1
Temperature	$22 \pm 3^{\circ}\text{C}$
Humidity	$65 \pm 20\%\text{RH}$
Light source	D65, Fluorescent lamp

[note1] : Viewing angle and distance

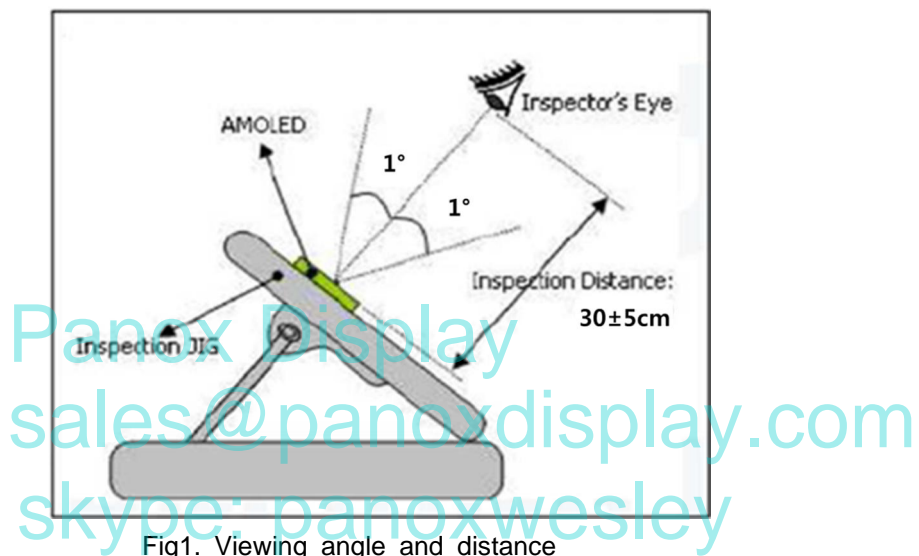


Fig1. Viewing angle and distance

13-2. Sampling Plan for each item's acceptance table

Defect type	Sampling Procedures	AQL
Major Defect	MIL-STD-105D Inspection level I normal inspection single sample inspection	0.65
Minor Defect	MIL-STD-105D Inspection level I normal inspection single sample inspection	1.0

① Major defect

: A major defect refers to a defect which may substantially degrade usability for product applications.

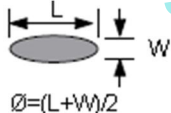
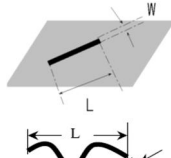

② Minor defect

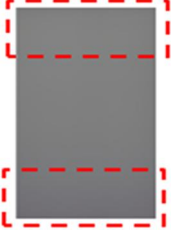
: A minor defects refers to a defect which is not considered to substantially degrade product application, or a defect which deviates from existing standards almost unrelated to the effective use of the product or its operation.

13-3. Function Inspection

: The following defect items are inspected with a display on.

※ From Polarizer edge to 1mm area should not be judged.

No.	Item	Criterion of Defect	Type																			
1	No display	Not allowable	Major																			
2	Abnormal display	Not allowable	Major																			
3	Line Defect	Not allowable (Vertical line/ Horizontal line)	Major																			
4	Dot Defect (Bright Dot, Dark Dot)	<div>< QHD Resolution ></div> <table><tr><th>Defect</th><th>Acceptable number</th></tr><tr><td>Bright dot</td><td>0</td></tr><tr><td>Dark dot</td><td>5</td></tr></table> <div>distance between each dot: > 5mm</div> <div>* Bright dot : Judgment condition Black pattern</div> <div>* Dark dot : Dead dot of 0% brightness</div>	Defect	Acceptable number	Bright dot	0	Dark dot	5	Minor													
Defect	Acceptable number																					
Bright dot	0																					
Dark dot	5																					
5	Foreign Material Circular type 	<table><tr><th>Size (mm)</th><th>Acceptable number</th></tr><tr><td>Ø ≤ 0.1</td><td>Ignore</td></tr><tr><td>0.10 < Ø ≤ 0.2</td><td>2</td></tr><tr><td>0.2 < Ø</td><td>0</td></tr></table> <div>※ If the foreign material is removed with a soft cloth, it is allowable.</div>	Size (mm)	Acceptable number	Ø ≤ 0.1	Ignore	0.10 < Ø ≤ 0.2	2	0.2 < Ø	0	Minor											
Size (mm)	Acceptable number																					
Ø ≤ 0.1	Ignore																					
0.10 < Ø ≤ 0.2	2																					
0.2 < Ø	0																					
6	Foreign Material Linear type 	<table><tr><th>Width (mm)</th><th>Length (mm)</th><th>Acceptable number</th></tr><tr><td>W ≤ 0.03</td><td>Ignore</td><td>Ignore</td></tr><tr><td rowspan="2">0.03 < W ≤ 0.05</td><td>L ≤ 2.0</td><td>Ignore</td></tr><tr><td>2.0 < L ≤ 5.0</td><td>1</td></tr><tr><td rowspan="2">0.05 < W ≤ 0.08</td><td>L ≤ 1.0</td><td>Ignore</td></tr><tr><td>1.0 < L ≤ 4.0</td><td>2</td></tr><tr><td>0.08 < W</td><td colspan="2">considered as spot particle</td></tr></table> <div>※ If the foreign material is removed with a soft cloth, it is allowable.</div>	Width (mm)	Length (mm)	Acceptable number	W ≤ 0.03	Ignore	Ignore	0.03 < W ≤ 0.05	L ≤ 2.0	Ignore	2.0 < L ≤ 5.0	1	0.05 < W ≤ 0.08	L ≤ 1.0	Ignore	1.0 < L ≤ 4.0	2	0.08 < W	considered as spot particle		Minor
Width (mm)	Length (mm)	Acceptable number																				
W ≤ 0.03	Ignore	Ignore																				
0.03 < W ≤ 0.05	L ≤ 2.0	Ignore																				
	2.0 < L ≤ 5.0	1																				
0.05 < W ≤ 0.08	L ≤ 1.0	Ignore																				
	1.0 < L ≤ 4.0	2																				
0.08 < W	considered as spot particle																					
7	ELA Stain 	Follow the limit sample. (Judgment condition : 142Gray)	Minor																			

8	Uneven color stain 	Follow the limit sample. (Judgment condition : 142Gray)	Minor
9	WAD	Ignore ----- Note 2	Minor
10	Flicker	Ignore ----- Note 3	Minor

[Note 2] WAD(White Angular Dependency)

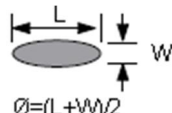
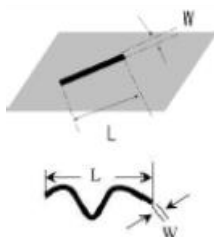
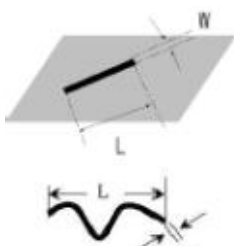
: Luminance and color coordination variation according to viewing angle
in full white pattern

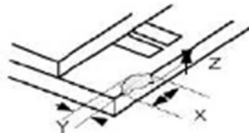
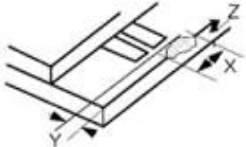
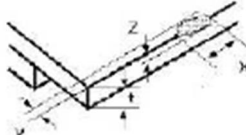
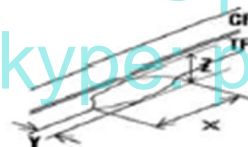
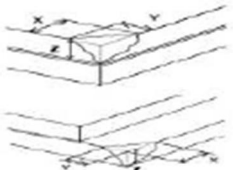
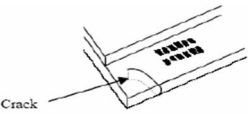
[Note 3] By AID (AMOLED Impulse Driving) 1cycle

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13-4. Appearance Inspection

: The following defect items are inspected with a display off.

No.	Item	Criterion of Defect	Type																			
1	Foreign Material Circular type  Ø=(L+W)/2	<table><tr><th>Size Ø (mm)</th><th>Acceptable number</th></tr><tr><td>Ø ≤ 0.1</td><td>Ignore</td></tr><tr><td>0.10 < Ø ≤ 0.2</td><td>2</td></tr><tr><td>0.2 < Ø</td><td>0</td></tr></table> <p>※ If the foreign material is removed with a soft cloth, it is allowable.</p>	Size Ø (mm)	Acceptable number	Ø ≤ 0.1	Ignore	0.10 < Ø ≤ 0.2	2	0.2 < Ø	0	Minor											
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2	Foreign Material Linear type 	<table><tr><th>Width (mm)</th><th>Length (mm)</th><th>Acceptable number</th></tr><tr><td>W ≤ 0.03</td><td>Ignore</td><td>Ignore</td></tr><tr><td rowspan="2">0.03 < W ≤ 0.05</td><td>L ≤ 2.0</td><td>Ignore</td></tr><tr><td>2.0 < L ≤ 5.0</td><td>1</td></tr><tr><td rowspan="2">0.05 < W ≤ 0.08</td><td>L ≤ 1.0</td><td>Ignore</td></tr><tr><td>1.0 < L ≤ 4.0</td><td>1</td></tr><tr><td>0.08 < W</td><td>Refer to circular foreign material spec</td><td>-</td></tr></table> <p>※ If the foreign material is removed with a soft cloth, it is allowable.</p>	Width (mm)	Length (mm)	Acceptable number	W ≤ 0.03	Ignore	Ignore	0.03 < W ≤ 0.05	L ≤ 2.0	Ignore	2.0 < L ≤ 5.0	1	0.05 < W ≤ 0.08	L ≤ 1.0	Ignore	1.0 < L ≤ 4.0	1	0.08 < W	Refer to circular foreign material spec	-	Minor
Width (mm)	Length (mm)	Acceptable number																				
W ≤ 0.03	Ignore	Ignore																				
0.03 < W ≤ 0.05	L ≤ 2.0	Ignore																				
	2.0 < L ≤ 5.0	1																				
0.05 < W ≤ 0.08	L ≤ 1.0	Ignore																				
	1.0 < L ≤ 4.0	1																				
0.08 < W	Refer to circular foreign material spec	-																				
3	Scratch 	<table><tr><th>Width (mm)</th><th>Length (mm)</th><th>Acceptable number</th></tr><tr><td>W ≤ 0.03</td><td>Ignore</td><td>Ignore</td></tr><tr><td rowspan="2">0.03 < W ≤ 0.05</td><td>L ≤ 2.0</td><td>Ignore</td></tr><tr><td>2.0 < L ≤ 5.0</td><td>3</td></tr><tr><td rowspan="2">0.05 < W ≤ 0.08</td><td>L ≤ 1.0</td><td>Ignore</td></tr><tr><td>1.0 < L ≤ 6.0</td><td>2</td></tr><tr><td>0.08 < W</td><td>Refer to Dent/Bubble spec</td><td>-</td></tr></table> <p>* Ignore the scratch on front cover film</p>	Width (mm)	Length (mm)	Acceptable number	W ≤ 0.03	Ignore	Ignore	0.03 < W ≤ 0.05	L ≤ 2.0	Ignore	2.0 < L ≤ 5.0	3	0.05 < W ≤ 0.08	L ≤ 1.0	Ignore	1.0 < L ≤ 6.0	2	0.08 < W	Refer to Dent/Bubble spec	-	Minor
Width (mm)	Length (mm)	Acceptable number																				
W ≤ 0.03	Ignore	Ignore																				
0.03 < W ≤ 0.05	L ≤ 2.0	Ignore																				
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0.05 < W ≤ 0.08	L ≤ 1.0	Ignore																				
	1.0 < L ≤ 6.0	2																				
0.08 < W	Refer to Dent/Bubble spec	-																				
4	Dent / Bubble	<table><tr><th>Size Ø (mm)</th><th>Acceptable number</th></tr><tr><td>Ø ≤ 0.1</td><td>Ignore</td></tr><tr><td>0.10 < Ø ≤ 0.2</td><td>2</td></tr><tr><td>0.2 < Ø</td><td>0</td></tr></table>	Size Ø (mm)	Acceptable number	Ø ≤ 0.1	Ignore	0.10 < Ø ≤ 0.2	2	0.2 < Ø	0	Minor											
Size Ø (mm)	Acceptable number																					
Ø ≤ 0.1	Ignore																					
0.10 < Ø ≤ 0.2	2																					
0.2 < Ø	0																					
5	Cover-IC Tape/Tuffy	IC cover tape and tuffy shall not overlap the polarizer and can cover encap glass. IC cover tape shall cover fully D-IC.	Minor																			

6	Panel PAD Chipping (No pattern area)	 <table><tr><th>Z</th><th>X</th><th>Y</th></tr><tr><td>≤ t</td><td>≤ 5.0mm</td><td>≤ 0.5mm</td></tr></table>	Z	X	Y	≤ t	≤ 5.0mm	≤ 0.5mm	Minor						
Z	X	Y													
≤ t	≤ 5.0mm	≤ 0.5mm													
7	Panel PAD Chipping (pattern area)	 <table><tr><th>Z</th><th>X</th><th>Y</th></tr><tr><td>≤ t</td><td>≤ 5.0mm</td><td>≤ 0.4mm</td></tr></table>	Z	X	Y	≤ t	≤ 5.0mm	≤ 0.4mm	Minor						
Z	X	Y													
≤ t	≤ 5.0mm	≤ 0.4mm													
8	Panel PAD Chipping (PAD rear side)	 <table><tr><th>Z</th><th>X</th><th>Y</th></tr><tr><td>≤ t</td><td>≤ 5.0mm</td><td>≤ 0.6mm</td></tr></table>	Z	X	Y	≤ t	≤ 5.0mm	≤ 0.6mm	Minor						
Z	X	Y													
≤ t	≤ 5.0mm	≤ 0.6mm													
9	Panel Chipping (No pad area)	 <table><tr><th>Z</th><th>X</th><th>Y</th></tr><tr><td>≤ t</td><td>≤ 2.0mm</td><td>≤ 0.5mm</td></tr></table>	Z	X	Y	≤ t	≤ 2.0mm	≤ 0.5mm	Minor						
Z	X	Y													
≤ t	≤ 2.0mm	≤ 0.5mm													
10	Panel Chipping (Corners)	 <table><tr><th>Z</th><th>X</th><th>Y</th><th>a</th></tr><tr><td>≤ t</td><td>≤ 1.0mm</td><td>≤ 1.0mm</td><td>No pad area</td></tr><tr><td>≤ t</td><td>≤ 2.0mm</td><td>≤ 1.2mm</td><td>Pad area</td></tr></table>	Z	X	Y	a	≤ t	≤ 1.0mm	≤ 1.0mm	No pad area	≤ t	≤ 2.0mm	≤ 1.2mm	Pad area	Minor
Z	X	Y	a												
≤ t	≤ 1.0mm	≤ 1.0mm	No pad area												
≤ t	≤ 2.0mm	≤ 1.2mm	Pad area												
11	Panel Crack	 <p>Crack</p> <p>Not allowable</p>	Minor												

12	Surface Contamination	Ignore if defect is cleaned by soft cloth .	Minor
13	Cushion/Back Tape (Bubble, Dent, lifting, Scratch, Wrinkle, etc.)	Ignore if defect is not visible at the viewing area of front side.	Minor-

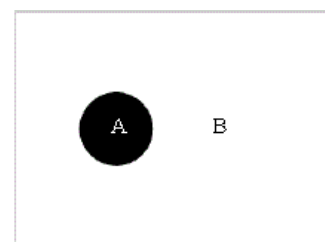
14. Reliability

No	Item		Condition	Qt'y	Remark
1	High Temperature Operating Life test		70°C, 120hr	5	
2	Low Temperature Operating Life test		-20°C, 120hr	5	
3	High Temperature High Humidity Operating Life test		60°C/93%RH, 120hr	5	
4	High Temperature Storage test		75°C, 120hr	5	
5	Low Temperature Storage test		-30°C, 120hr	5	
6	High Temperature High Humidity Storage test		60°C/ 93%RH, 120hr	5	
7	Thermal Cycle Storage test		-30°C ~ 70°C, 50 Cycles	5	
8	Life Time		Life Time(B10 ≥93%) @ 120cd/m2: 240hr	5	Note 1
9	Electrical Static Discharge	Contact	±4kV(1Center, 4Corner), 150pF/330Ω	5	
		Air	±6kV(1Center, 4Corner), 150pF/330Ω	5	
10	Box Vibration / Drop		Random Vibration (6~200Hz, 1.047Grms, 1hr/XYZ axis) 1 corner, 3 Edges, 6 Surfaces	1box	

[Note 1]

Life time = (A luminance @240hr) – (B luminance drop @240hr)

(A : Non aging area, B : aging area)



15. Handling Precautions

15-1. Mounting Method

The AMOLED panel of SAMSUNG Display CO.,LTD. module consists of two slim glasses with polarizer which can easily get damaged. Since the module is constructed as to be fixed by utilizing fitting holes in the printed circuit board. Extreme care should be used when handling the AMOLED modules.

15-2. Caution of AMOLED Handling and Cleaning

When cleaning the display surface, use soft cloth solvent as recommended below and wipe gently.

- ◎ Isopropyl alcohol
- ◎ Ethyl alcohol
- ◎ Trichlorotrifluoroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent.

- ◎ Water
- ◎ Ketone
- ◎ Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns.

Do not use the following solvent on the pad and prevent it from being contaminated.

- ◎ HCFC (Other area except ITO pad can use the HCFC for cleaning process)
- ◎ Soldering flux
- ◎ Chlorine(Cl), Sulfur(S)
- ◎ Spittle, Fingerprint

If the product is not wrapped with a desiccant added pad, ITO pattern can be damaged by corrosion. SAMSUNG Display CO.,LTD. suggests wrapping a product with a desiccant unless customers particularly indicate that they do not want it. In case ITO pattern corrodes due to the usage of chlorine, sulfur or customer's mishandling of the product, the responsibility lies with the customer.

15-3. Caution Against Static Charge

For AMOLED module, use C-MOS LSI drivers, therefore we recommend that you ;

Connect any unused input terminal to VCI or VSS, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity. It could occur static electricity when taping off the film which protects AMOLED.

Against static charge, you should make sure that the product is safe or not by experiment in advance.

15-4. Packing

- ◎ The packing principle is that AMOLED module should keep its packing condition at the time of delivery.
- ◎ For safety & avoiding the module damage, Carton box must stack the below 4 boxes. When storing the AMOLED after unpacking, note the followings.
- ◎ AMOLED module is consisted of GLASS and assemblies. It should avoid pressure, strong impact, and being dropped from a height.
- ◎ To prevent modules from degradation, do not operate or store them in a place where they are directly exposed to sunlight or high temperature/humidity.

15-5. Caution for Operation

- ◎ If you do not follow normal POWER ON , OFF sequence or abnormal operating, then AMOLED module can be damaged electro-optically and does not recover.
Do not change software without Samsung Display confirmation.
- ◎ Response time may extremely delay at a temperature lower than operating range, AMOLED does not normally operate at a high temperature. But this may recover at a proper temperature.
- ◎ When you set optimal operating voltage to AMOLED module, you can see the optimal contrast of AMOLED. So, add voltage controllable function at SET Module.
- ◎ AMOLED module may not display normally when twisting power or pressing power is added. Therefore you should secure AMOLED module maximum thickness at set assembly not to have any pressure affect AMOLED module.
- ◎ Electro-chemical reaction may occur when there is humidity on pad, therefore, you should use AMOLED Module below maximum operating humidity.
- ◎ AMOLED Module Power Vdd should be designed to protect surge current at SET Module.
- ◎ You should not damage connector and cable for AMOLED module assembly by force folding or by applying extreme power.
- ◎ AMOLED may not display normally when it is interfered by surrounding elements, therefore you should consider setting design not to damage AMOLED module by surrounding elements.
- ◎ To satisfy EMI standards, you should plan your design after considering emitting energy.
- ◎ We can not guarantee display characteristics outside viewing area, therefore your set window should be fixed into viewing area.
- ◎ Image-sticking may occur if AMOLED displays same image for a long time, so you need to make a change for AMOLED.
- ◎ When remove the window protective film, Necessarily need to apply as a way to prevent Cushion and conductive tape Delamination.
 - As a upper Figure,the handler take off the direction of the arrow to remove the protective film.

15-6. Storage

- ◎ Place in a dark place where neither exposure to direct sunlight or any fluorescent light is permitted and keep at room temperature & room humidity.
- ◎ Store with no contact with polarizer surface.
[It is recommended to store them as they have been contained in the inner container when we delivered them.]

15-7. Safety Precautions

- ◎ Disassembly or modification may cause electric shock, damages to sensitive part inside of the AMOLED module, dust adhesion, or scratches on the display part.
- ◎ In the event that the contents of AMOLED module are on skin, wipe them with a paper towel or gauge and wash the part well, and receive medical attention if necessary.
- ◎ Do not use the AMOLED module for the special purpose besides display units.
- ◎ Be careful of the glass chips that may cause injury to fingers of skin, when the display part is broken.
- ◎ For keeping safe quality from outer exposure or contamination, modules should be consumed within 2 months after unpacking.

15-8. Precautions before Use

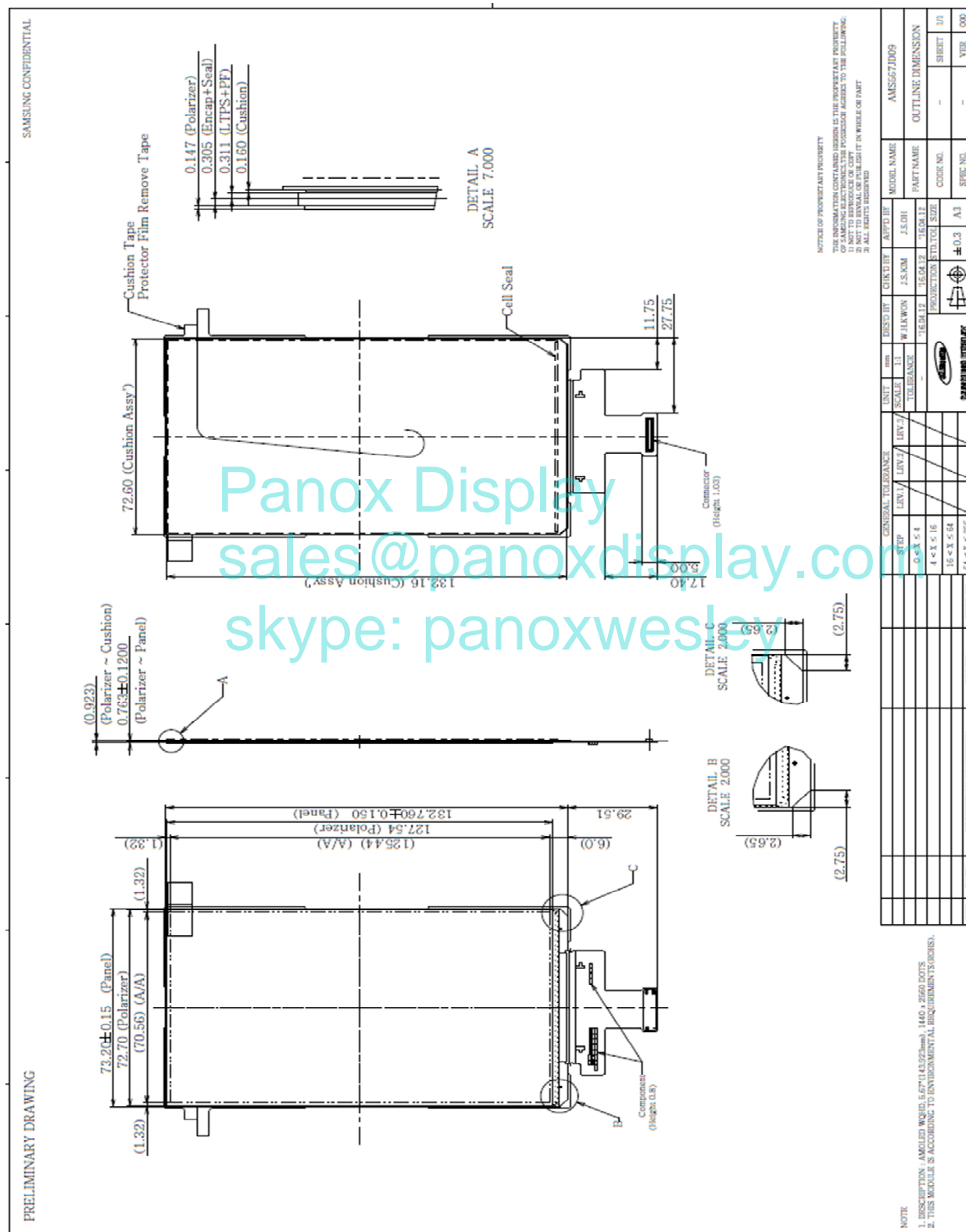
You should discuss the following case with SAMSUNG Display CO., LTD.

- ◎ in case of any questions about contents of this "Specification For Approval".
- ◎ in case of occurring new problems not mentioned at this "Specification For Approval".
- ◎ in case of your request about income inspection specification change.
- ◎ in case of occurring new problem at your driving test.

※ If SAMSUNG Display CO., LTD has to change the conditions specified in the specification, previously the negotiation shall be held and decided.

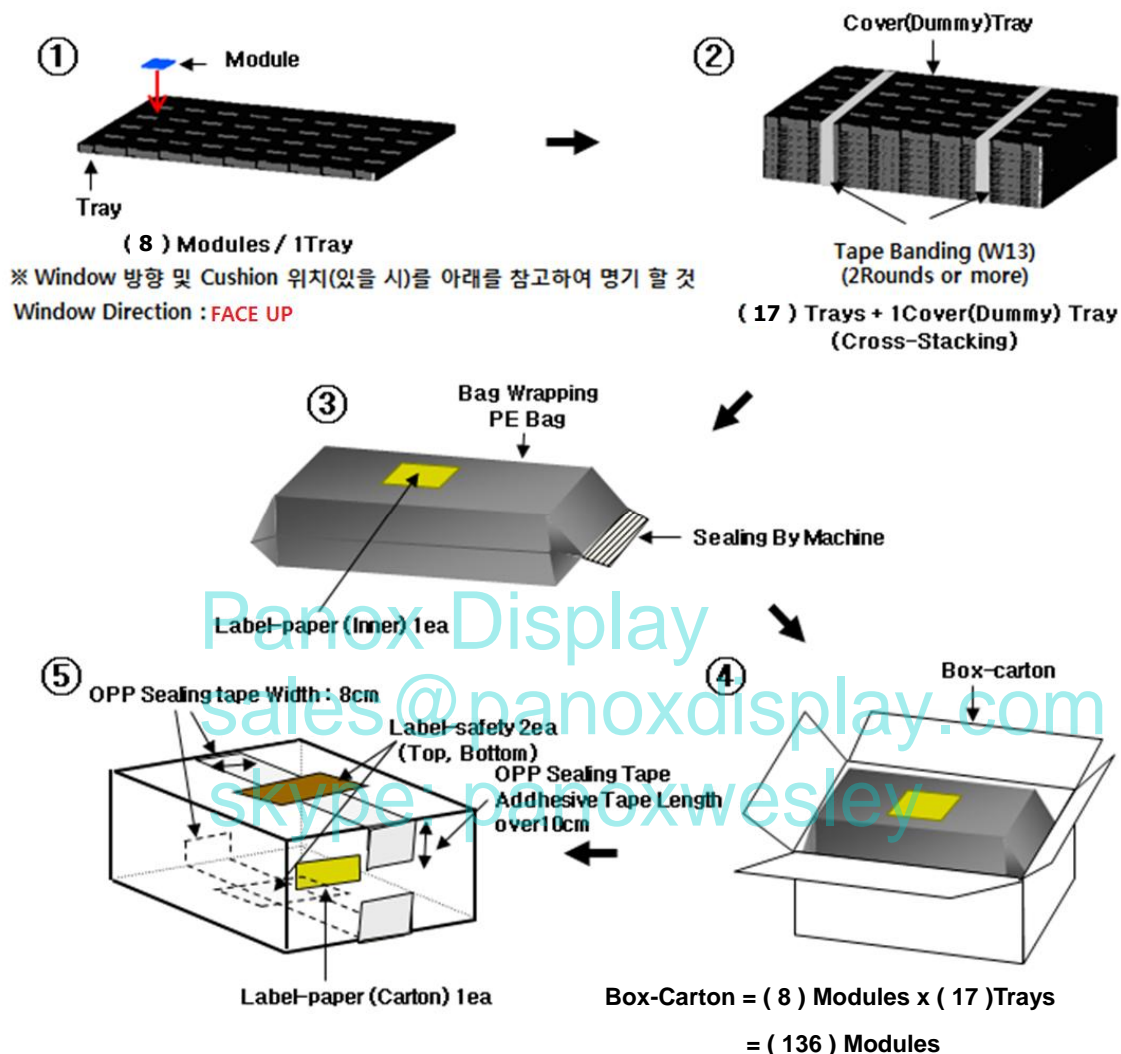
16. Drawings

16-1. Product Drawing



17. Packing Specification

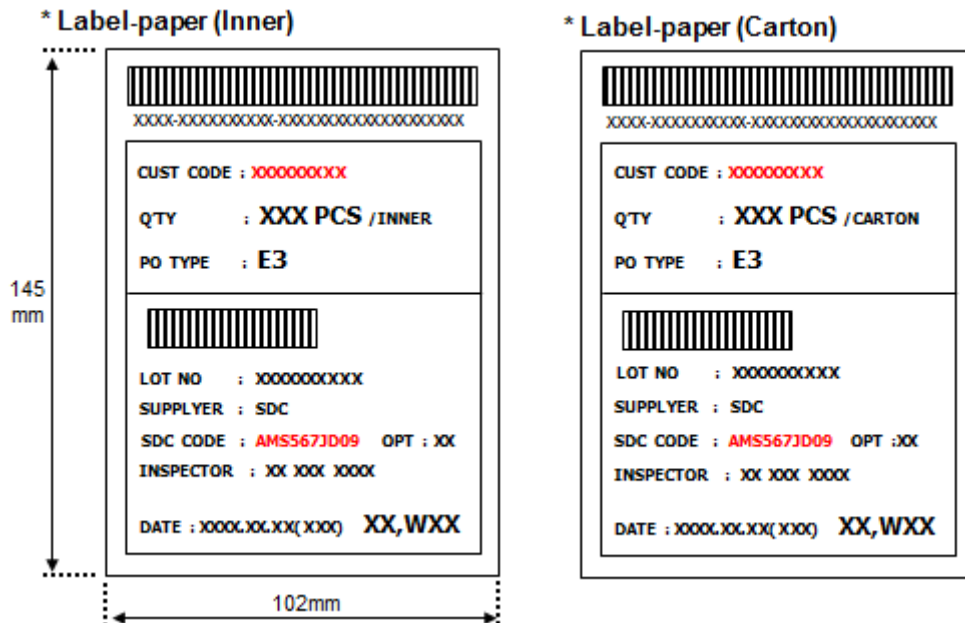
17.1 Box Pack



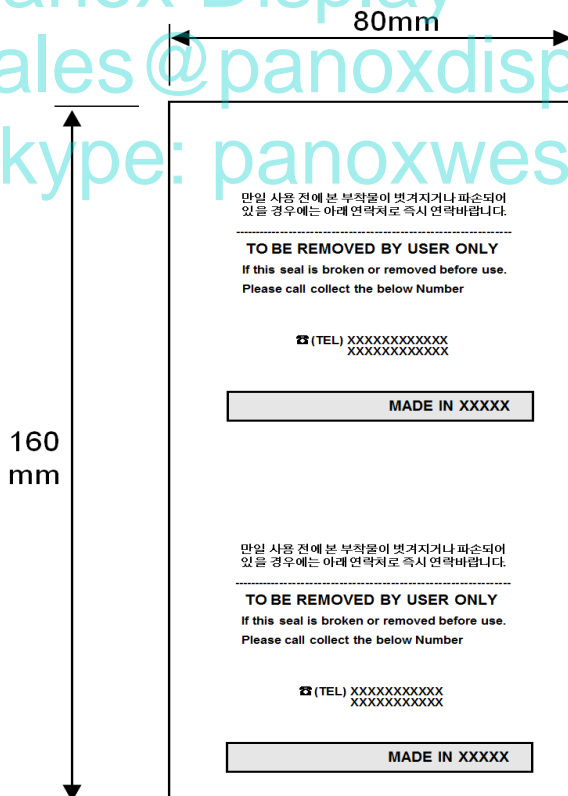
Note

- (1) Total :Box-carton approx. : (8.4)kg
- (2) Size : 583(L) x 388(W) x 210(H)
- (3) Place the Module in the tray facing the active area direction.
- (4) Stack the trays and cover (dummy) tray.
- (5) Resistance of tray surface : $1 \times 10^5 \sim 1 \times 10^9 \Omega$
- (6) Triboelectric Charge of tray surface : Max 100V
(Measurement condition : $22 \pm 3^\circ \text{C} / 50 \pm 5\%$, measure on antistatic mats)
- (7) Wrap the PE bag by packing machine and affix the Label-Paper on Bag.
- (8) Put the bag in the Box-carton .
- (9) Seal the Box-carton and affix the Label-safety & Label-paper.

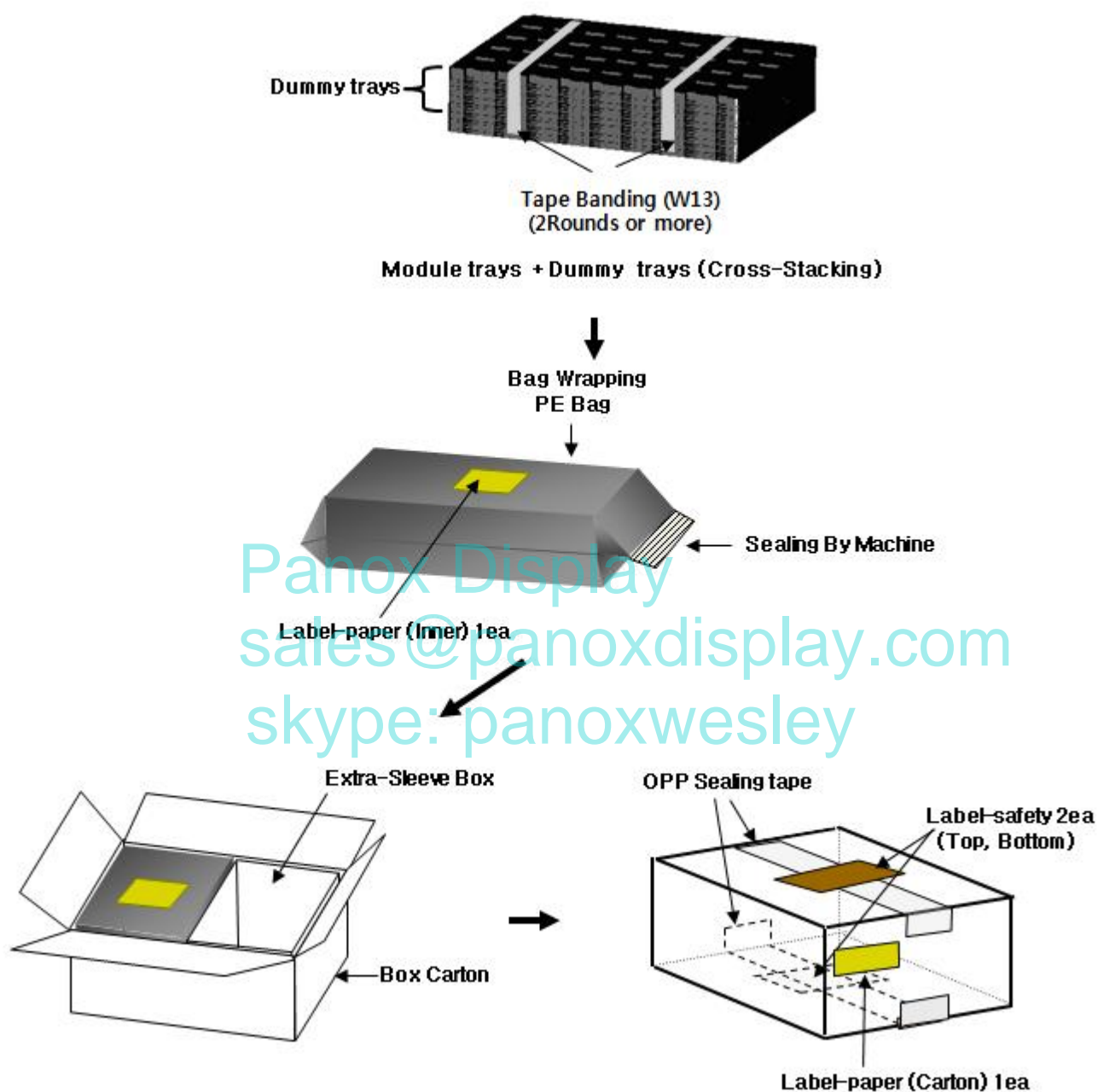
17.2 Label



- Label Safety



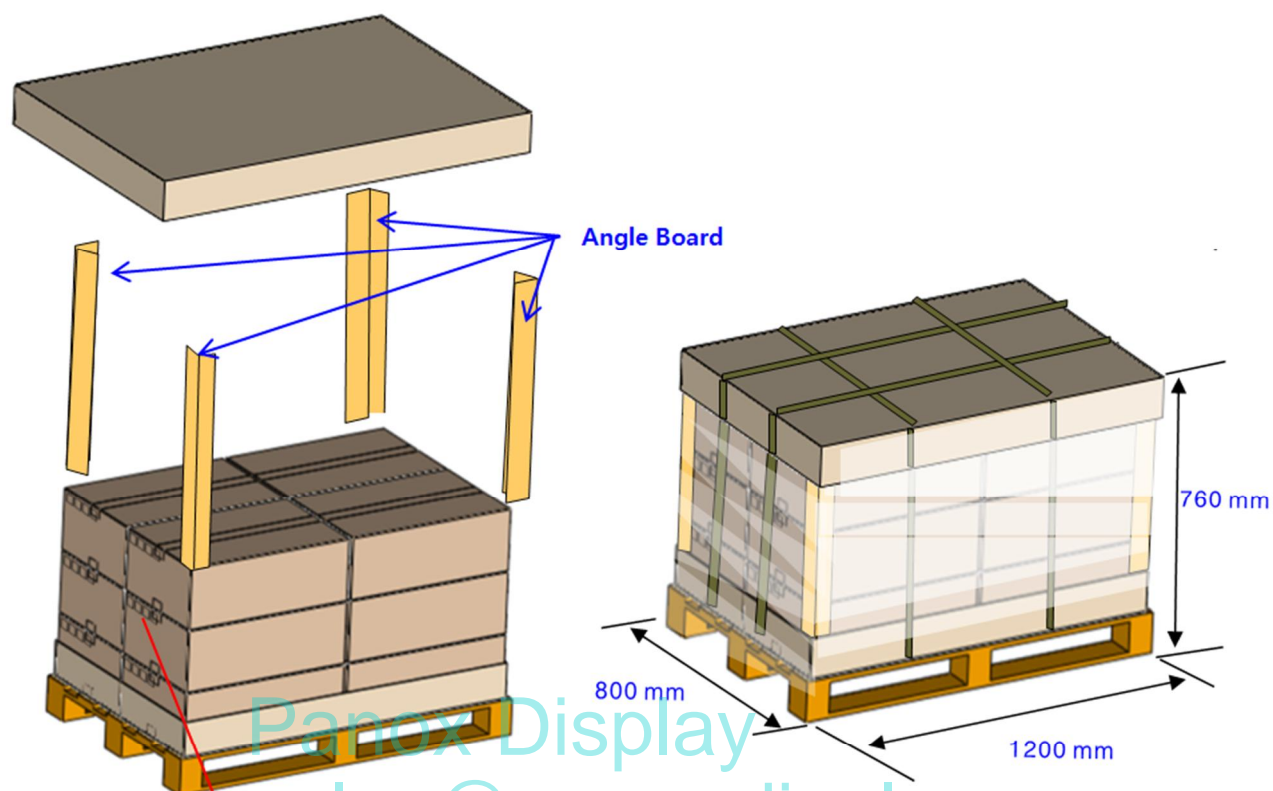
17.3 Packing for Small Quantities



Note

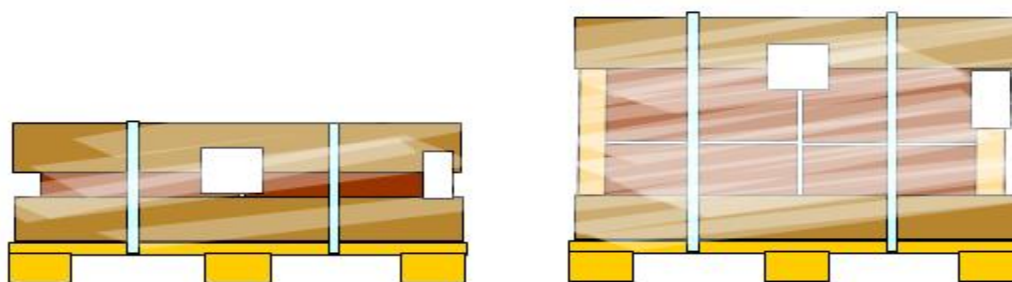
When package quantity is small, Modules containing trays are stacked the bottom, and dummy trays are stacked at the top of package, then wrap the AI coating bag by Packing machine and affix the Label-Paper on Bag. Put the Bag in the Box-carton Seal the Box-carton and affix the Label-safety & Label-Paper.

17.4 Over Pack



[Carton-box level : Max. 7 box stacking]

17.5 Packing for Small Quantities

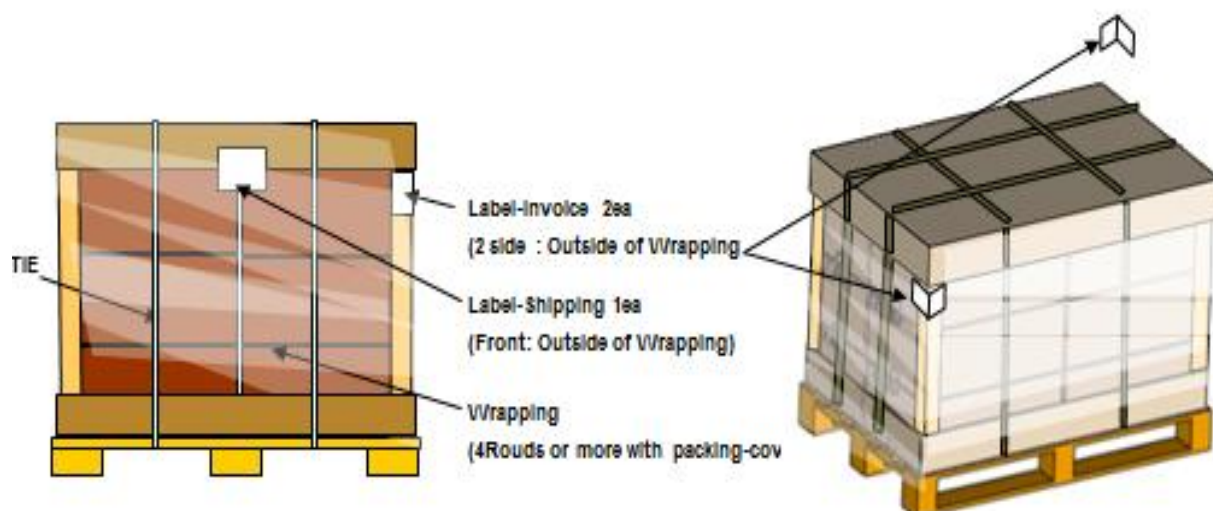


1 step
[Carton Box : 1~4 Box]

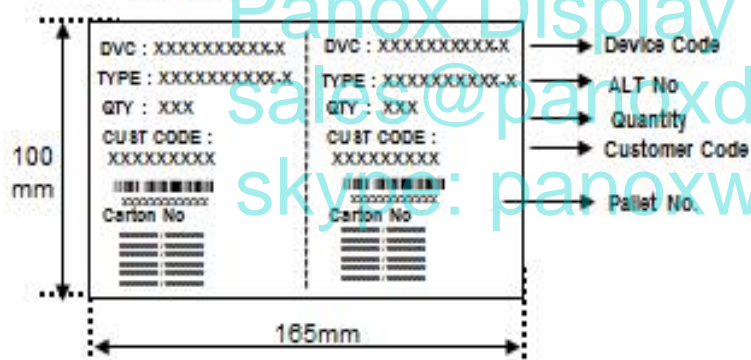
2 step
[Carton Box : 5~8 Box]

- Small Quantities (1 step ,2 step) must stack on the Top.

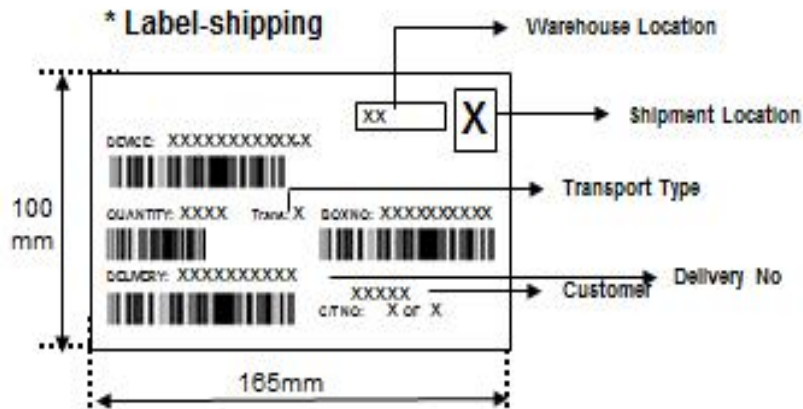
17.6 Over Pack Attach



* Label-invoice



* Label-shipping



*** Reference Image (Except Label and Wrap)**

Carton Box		
Pallet		

Caution

For keeping safe quality from outer exposure of contamination,
Modules should be consumed within 2 months after unpacking