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TITLE : HVA35WV1-D02

Product Specification

HYDIS Technologies

HYDIS	PRODUCT GROUP	REV	ISSUE DATE
	TFT PRODUCTS	O	2011.04.06

REVISION HISTORY

REV.	ECN NO.	DESCRIPTION OF CHANGES	DATE	PREPARED
O		Initial Release	11.04.06	H.Son

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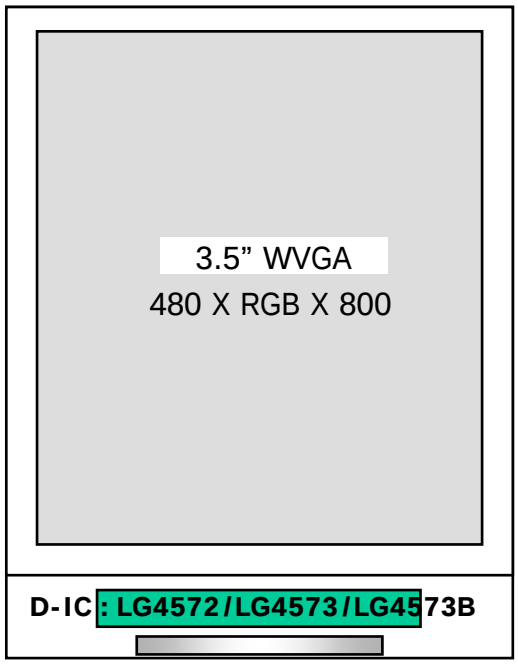
1.0 GENERAL DESCRIPTION

1.1 Introduction

3.5” WVGA is a color active matrix TFT LCD Panel using amorphous silicon TFT's (Thin Film Transistors) as an active switching device. This panel has a 3.5 inch diagonally measured active area with WVGA resolutions (480 horizontal by 800 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this panel can display 16.2M colors.



1.2 Features

- High Resolution & Wide View (HFFS Technology)
- aRD (a-Si Row Driver) Technology
- LCD Driver : LG4572/LG4573/LG4573B
- IF : LG4572-CPU/RGB+SPI/MDDI/MIPI, LG4573/LG4573B : RGB+SPI/MIPI
- Sleep, Moving mode display
- Green Product (RoHS Compliant)

1.3 Application

- Smart/Cell Phone

1.4 General Specifications

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	45.36(H) x 75.6(V)	mm	
Number of pixels	480(H) x 800(V)	pixels	
Pixel pitch	0.0945 x 0.0945	mm	
Pixel arrangement	RGB Vertical stripe		
Color Gamut	69.1%		Only CF (@ Light Source "C")
Display colors	16.2M	colors	Note 1
Display operating mode	Normally Black		
Dimensional outline	48.96±0.2(H)x83.2±0.2(V)x0.45±0.05(D)	mm	
D-IC	LG4572 / LG4573 / LG4573B		

Note 1: 24 bit input with dither driving

2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

<Table 2. Absolute Maximum Ratings>

VSS=GND=0V

Parameter	Symbol	Min	Max	Unit	Remark
LC Operating Voltage *1)	V_{op}		4.4	V	Ta = 25℃
Operating Temperature (Humidity)	T_{OP} RH	-20	+70 90	℃ %	At 60 ℃
Storage Temperature (Humidity)	T_{ST} RH	-30	+80 90	℃ %	At 60 ℃

*1) Liquid Crystal driving voltage
Due to the characteristics of LC Material, this voltage varies with environmental temperature

3.0 ELECTRICAL SPECIFICATIONS

3.1 Electrical Characteristics

<Table 3. Parameters for Electrical Characteristics>

Parameter		Symbol	Value			Unit	Remarks
			Min.	Typ.	Max.		
TFT Gate ON Voltage		VGH	13	15	17	V	Note 1
TFT Gate OFF Voltage		VGL	-13	-10	-9	V	Note 2
TFT Common Electrode Voltage		VCom	-2.0	-1.0	0.0	V	Note 3
TFT Kick-Back Voltage Max		ΔV_p Max	0.7	0.9	1.2	V	
TFT Kick-Back Voltage Min		ΔV_p Min	0.5	0.7	1.0	V	
a-RD control signal		VBIAS	4.5	5.0	6.0	V	
a-RD control signal		LVGL	VGL-VCI			V	Note 4
a-RD control signal (AC)	Low	STP	-13	-10	-9	V	
	High		13	15	17	V	
a-RD control signal (AC)	Low	CK /CKB	-13	-10	-9	V	
	High		13	15	17	V	

Note :

1. VGH is TFT Gate operating voltage.
2. VGL is TFT Gate operating voltage. The low voltage level of VGL signal must be fluctuated with same phase as Vcom.
3. Vcom must be adjusted to optimize display quality, as Crosstalk and Contrast Ratio etc.
4. LVGL depends on VCI setting value

4.0 OPTICAL SPECIFICATIONS

4.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCONE BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of Θ and Φ equal to 0°.
The center of the measuring spot on the Display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement.

4.2 Optical Specifications

<Table 4. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Threshold voltage		Vsat		2.9	3.2	3.5	V	Appendix Fig. 1
		Vth		1.2	1.5	1.8	V	
Viewing Angle range	Horizontal	Θ_3	CR > 10	80	85	-	Deg.	Note 1
		Θ_9		80	85	-	Deg.	
	Vertical	Θ_{12}		80	85	-	Deg.	
		Θ_6		80	85	-	Deg.	
Contrast ratio		CR	Θ = 0°	500	800			Note 2
Transmittance		T(%)	Θ = 0°	2.9	3.4			Note 3
White Chromaticity		x_w	Θ = 0°	0.283	0.303	0.324		Note 4
		y_w		0.304	0.324	0.344		
Reproduction Of color	Red	x_R	Θ = 0°	0.631	0.651	0.671		
		y_R		0.311	0.331	0.351		
	Green	x_G		0.278	0.298	0.318		
		y_G		0.584	0.604	0.624		
	Blue	x_B		0.116	0.136	0.156		
		y_B		0.090	0.110	0.130		
Response Time		Tr+Tf	Θ = 0°		33	40	msec	Note 5

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 2 shown in Appendix).
2. Contrast measurements shall be made at viewing angle of Θ= 0° and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIGURE 2 shown in Appendix). Luminance measured with Polarizer. Luminance Contrast Ratio (CR) is defined mathematically

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the value with Polarizer.
4. The color chromaticity coordinates specified in Table 4 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the C/F without Polarizer. Measurement condition is C - light source & Halogen Lamp.
5. The electro-optical response time measurements shall be made as FIGURE 3 shown in Appendix by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

※ Standard Polarizer (Thin Type) : 上 _ HC-Clear , 下 _ Clear (Maker : LGC)

5.0 MECHANICAL CHARACTERISTICS

5.1 Dimensional Requirements

FIGURE 4 shown in appendix shows mechanical outlines for the model.

Parameter	Specification	Unit
Active area	45.36(H) X 75.6(V)	mm
Number of pixels	480 (H) X 800(V)	pixels
	(1 pixel = R + G + B dots)	
Pixel pitch	0.0945(H) X 0.0945(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally Black	
Dimensional outline	48.96±0.2(H)×83.2±0.2(V)×0.45±0.05(D)	mm

5.2 Back-side ITO Specifications

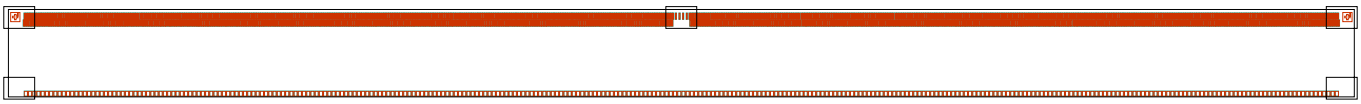
Item	Specification	Unit	Remark
Transmittance	≥90	%	550nm @ 50°C
Hardness	≥ 4	H	
Resistance	≤ 10	KΩ/□	

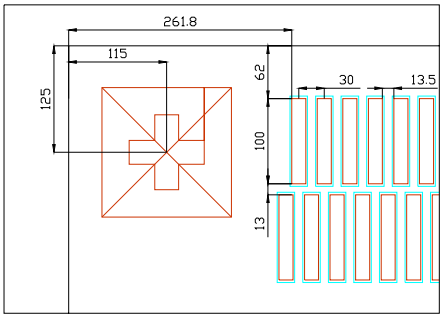
6.0 Data IC PAD & FPC Pin Assignment

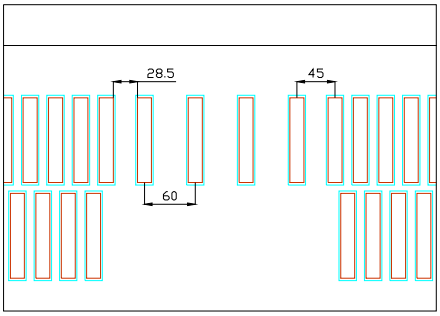
6.1 Data IC PAD (One D-IC)

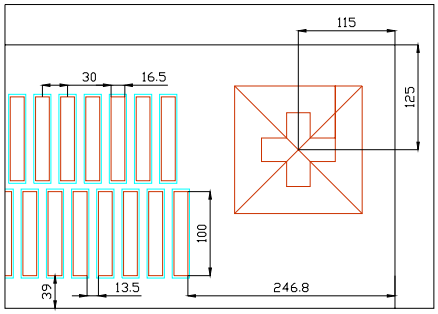
* D-IC : LG4572

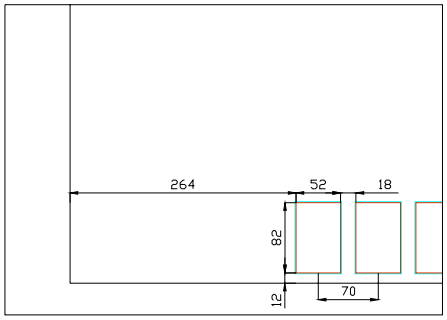
-. Chip Size : 22.35(H) X 1.45(V) mm

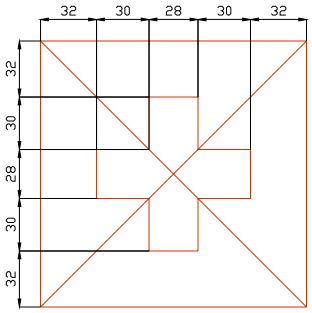


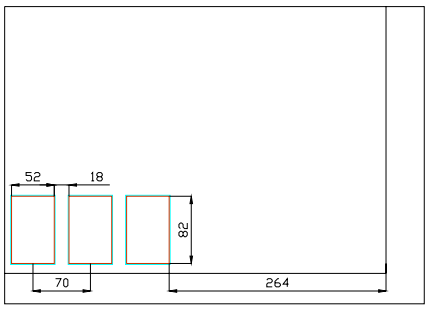










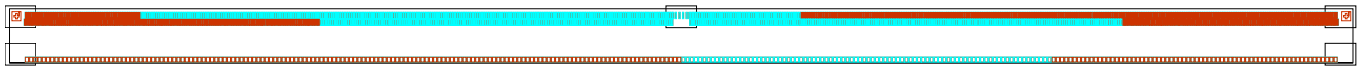


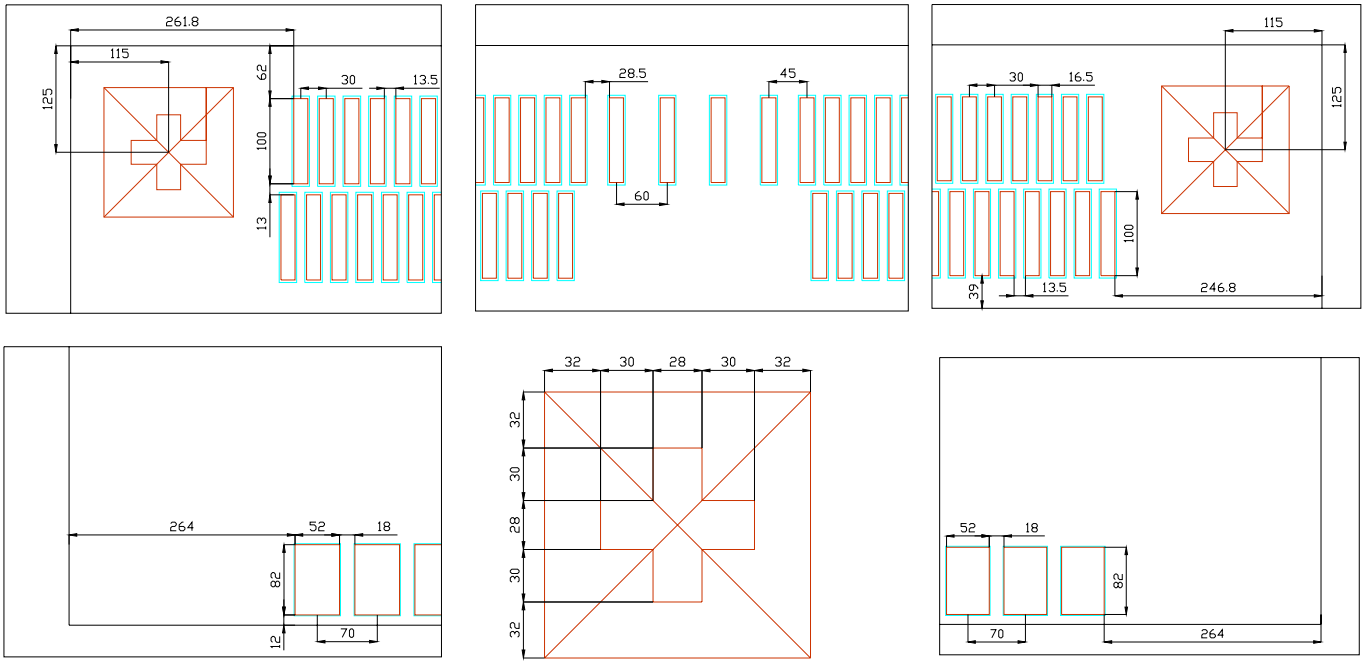
* Bump Top View
* Unit : um

6.2 Gate/Data IC PAD (One D-IC)

* D-IC : LG4573/ LG4573B

-. Chip Size : 22.35(H) X 0.9(V) mm



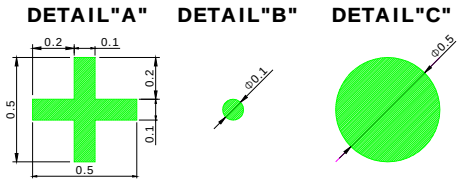


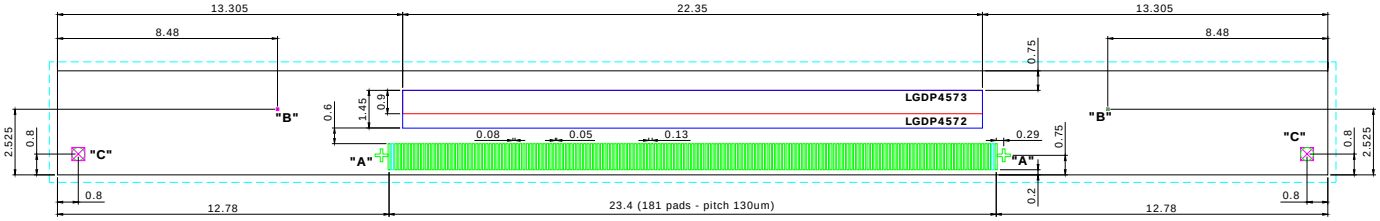
* Bump Top View
* Unit : um

6.3 FPC Pin Assignment

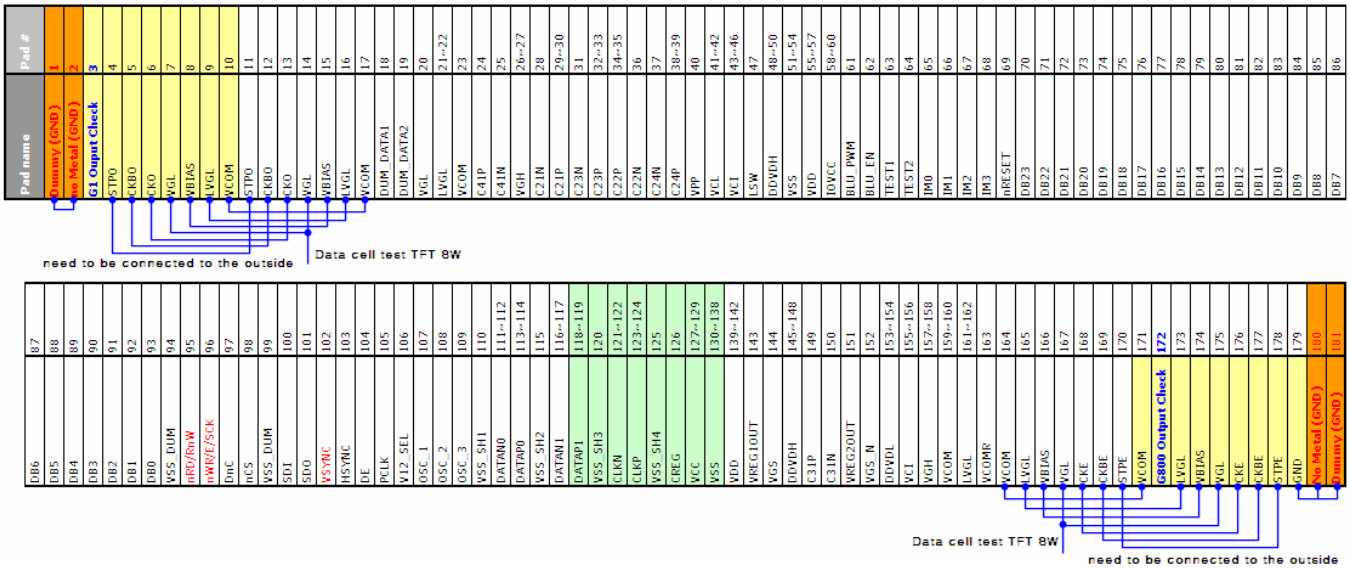
6.3.1 FPC Pin Outline

* Unit : mm





6.3.2 FPC Pin Assignment



7.0 RELIABLITY TEST

No	Test Items	Conditions	
1	High temperature storage test	Ta = 80 °C, 240 hrs	
2	Low temperature storage test	Ta = -30 °C, 240 hrs	
3	High temperature operation Test	Ta = 70 °C, 240 hrs	
4	Low temperature operation test	Ta = -20 °C, 240 hrs	
5	High Temp. and High Humidity Storage	T = 60℃ /90% for 240hr (But no condensation dew)	
6	High temperature & high humidity operation test	Ta = 60 °C, 90 %RH, 240 hrs	
7	Thermal shock	Ta = -30 °C(30min) ↔ 80 °C(30min) , 100 cycle	
8	Pressure Cooker Test	2atm, 120℃, 100%, 24h (Cell Type)	
9	Altitude Test (non – operating)	25°C, 24h, 40000ft	
10	Electrostatic discharge test	Air Contact	: 150 pF, 330Ω, 8KV 5times/4Corner : 150 pF, 330Ω, 6KV 5times/4Corner

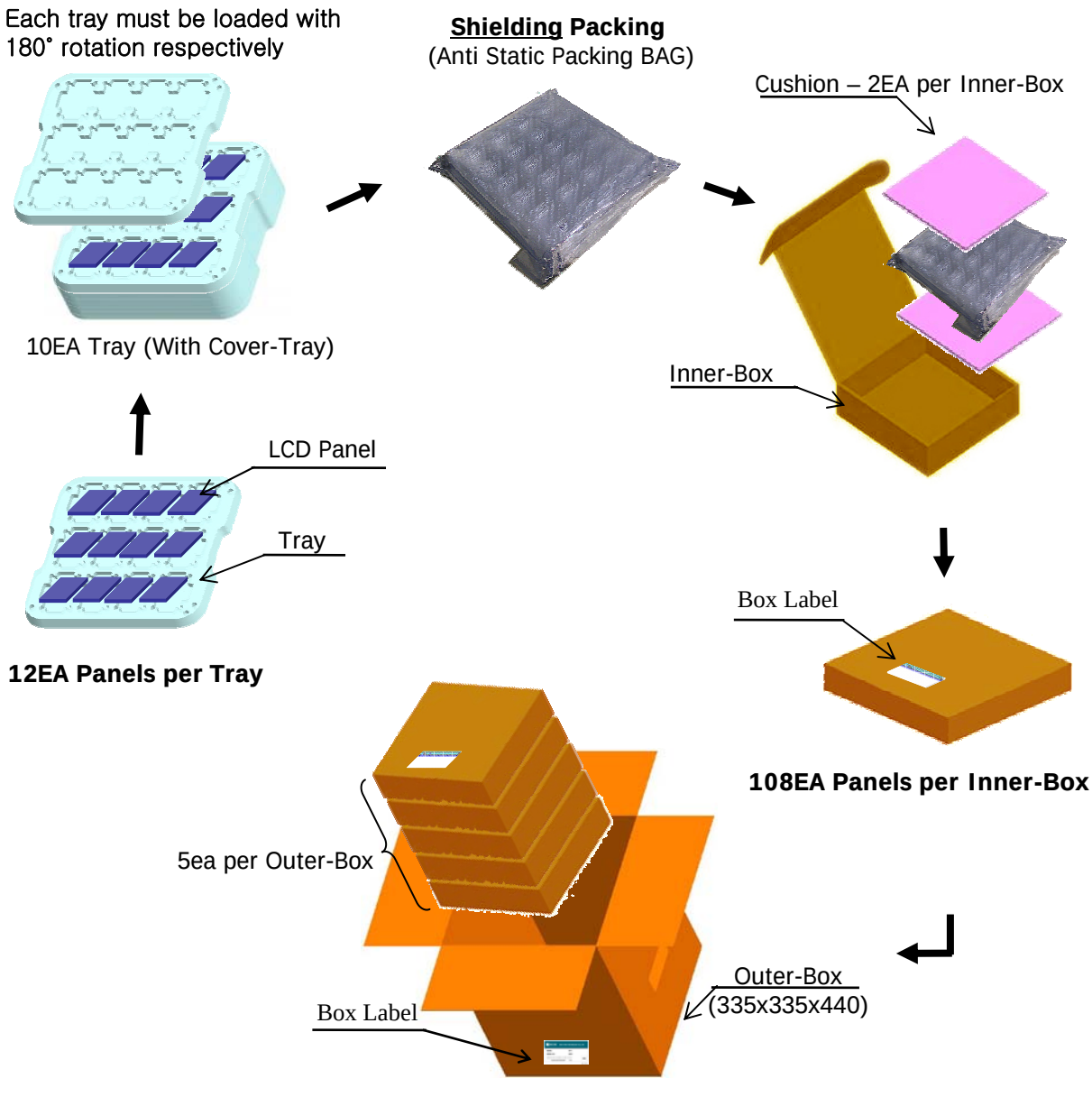
Note : All tests are based on Module type. Except for Pressure Cooker Test.

This test result is for the back-side ITO coated product.

8.0 PACKING SPECIFICATION

8.1 Packing Method

Hydis provides the standard shipping container for customers, unless customer specifies their packing information. The standard packing method is shown in below.



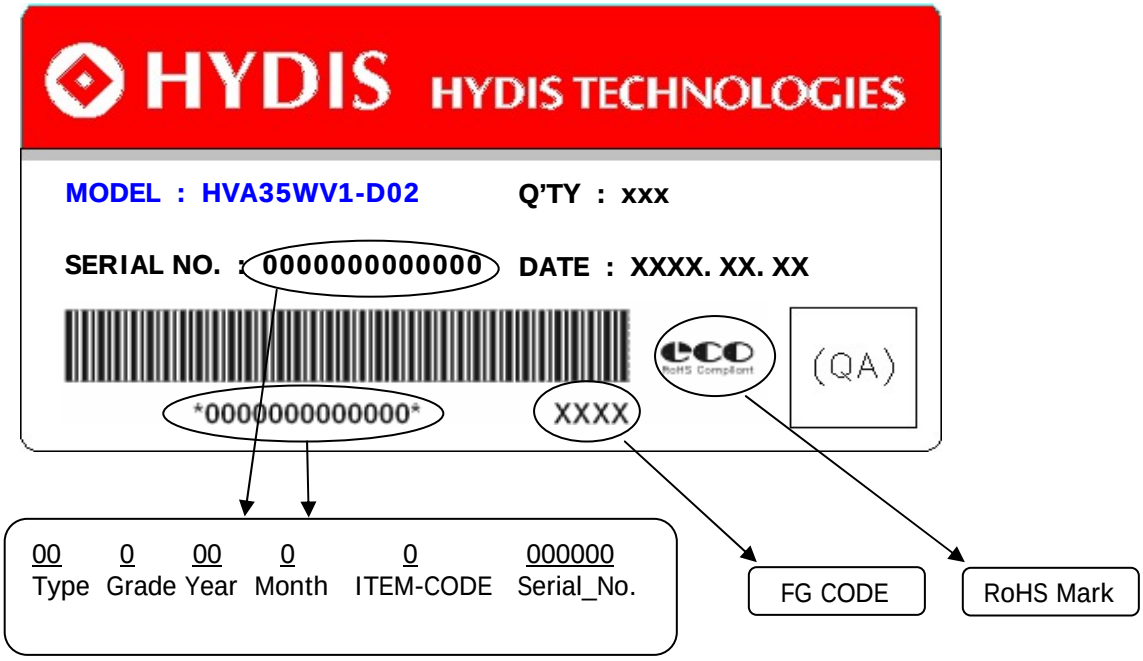
540EA LCD Panels Per Outer-Box

8.2 Box label

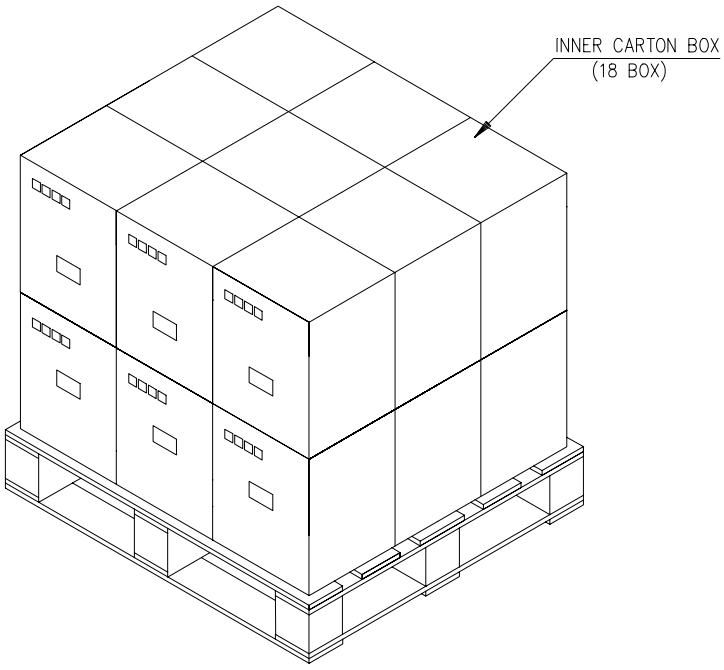
The box label followed by is affixed to a shipped product at the specified location on each packing box.

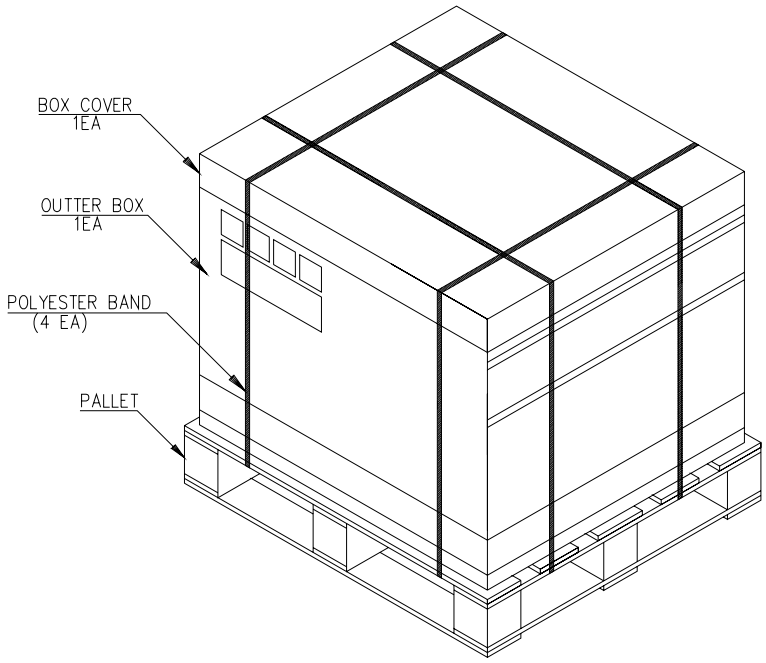
1) Label Size: 108 mm (L) × 56 mm (W)

2) Contents
- Model : HVA35WV1-D02
- Q`ty : Quantity in one box
- Serial No. : Refer the description as below.
- Date : Packing Date
- FG Code : FG Code of Product



8.3 Pallet Packing





*** Note**

- Pallet Dimension : : 1100 mm (L) × 1100 mm (W) × 120 mm (H)
- Package Quantity in one Box : **540**pcs
- Box Quantity in one Pallet : 18box

9.0 HANDLING & CAUTIONS

9.1 Mounting Method

- The panel of the LCD consists of two thin glasses with polarizer which easily get damaged. So extreme care should be taken when handling the LCD.
- Excessive stress or pressure on the glass of the LCD should be avoided. Care must be taken to insure that no torsional or compressive forces are applied to the LCD unit when it is mounted.
- If the customer's set presses the main parts of the LCD, the LCD may show the abnormal display. But this phenomenon does not mean the malfunction of the LCD and should be processed by the way of mutual agreement.
- To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Mount a LCD module with the specified mounting parts.

9.2 Caution of LCD Handling and Cleaning

- Since the LCD is made of glass, do not apply strong mechanical impact or static load onto it. Handle with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass may be broken.
- The polarizers on the surface of the panel are made from organic substances. Be very careful for chemicals not to touch the polarizers or it leads the polarizers to be deteriorated.
- If the use of a chemical is unavoidable, use soft cloth with solvent (recommended below) to clean the LCD's surface and wipe lightly.
  - IPA(Isopropyl Alcohol), Ethyl Alcohol, Trichlorotriflorothane
- Do not wipe the LCD's surface with dry or hard materials that will damage the polarizers and others. Do not use the following solvent.
  - Water, Ketone, Aromatics
- It is recommended that the LCD be handled with soft gloves during assembly, etc. The polarizers on the LCD's surface are vulnerable to scratches and thus to be damaged by sharp particles.
- Do not drop water or any chemicals onto the LCD's surface.
- A protective film is supplied on the LCD and should be left in place until the LCD is required for operation.
- The ITO pad area needs special careful caution because it could be easily corroded. Do not contact the ITO pad area with HCFC, Soldering flux, Chlorine, Sulfur, saliva or fingerprint. To prevent the ITO corrosion, customers are recommended that the ITO pad area would be covered by UV or silicon.

9.3 Caution Against Static Charge

- The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd 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.
- Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, if possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
- Avoid the use of work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- In handling the LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

9.4 Caution for Operation

- It is indispensable to drive the LCD within the specified voltage limit since the higher voltage than the limit causes the shorter LCD's life. An electro-chemical reaction due to DC causes undesirable deterioration of the LCD so that the use of DC drive should avoid.
- Do not connect or disconnect the LCD to or from the system when power is on.
- Never use the LCD under abnormal conditions of high temperature and high humidity.
- When exposed to drastic fluctuation of temperature (hot to cold or cold to hot), the LCD may be affected; specifically, drastic temperature fluctuation from cold to hot, produces dew on the LCD's surface which may affect the operation of the polarizer and the LCD.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD may turn black at temperature above its operational range. However those phenomena do not mean malfunction or out of order with the LCD. The LCD will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.
- Do not display the fixed pattern for a long time because it may develop image sticking due to the LCD structure. If the screen is displayed with the fixed pattern, use a screen saver.

9.5 Packaging

- Modules use LCD elements, and must be treated as such.
  - Avoid intense shock and falls from a height.
  - To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity for long periods.

9.6 Storage

- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Relative humidity of the environment should therefore be kept below 60%RH.
- Original protective film should be used on LCD's surface (polarizer). Adhesive type protective film should be avoided, because it may change color and/or properties of the polarizers.
- Do not store the LCD near organic solvents or corrosive gasses.
- Keep the LCD safe from vibration, shock and pressure.
- Black or white air-bubbles may be produced if the LCD is stored for long time in the lower temperature or mechanical shocks are applied onto the LCD.
- In the case of storing for a long period of time for the purpose or replacement use, the following ways are recommended.
  - Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.
  - Store in a dark place where neither exposure to direct sunlight nor light is.
  - Keep temperature in the specified storage temperature range.
  - Store with no touch on polarizer surface by the anything else. If possible, store the LCD in the packaging situation LCD when it was delivered.

9.7 Safety

- For the crash damaged or unnecessary LCD, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol and should be burned up later.
- In the case the LCD is broken, watch out whether liquid crystal leaks out or not. If your hands touch the liquid crystal, wash your hands cleanly with water and soap as soon as possible.
- If you should swallow the liquid crystal, first, wash your mouth thoroughly with water, then drink a lot of water and induce vomiting, and then, consult a physician.
- If the liquid crystal should get in your eyes, flush your eyes with running water for at least fifteen minutes.
- If the liquid crystal touches your skin or clothes, remove it and wash the affected part of your skin or clothes with soap and running water.

10.0 APPENDIX

Figure 1. The definition of Vth & Vsat

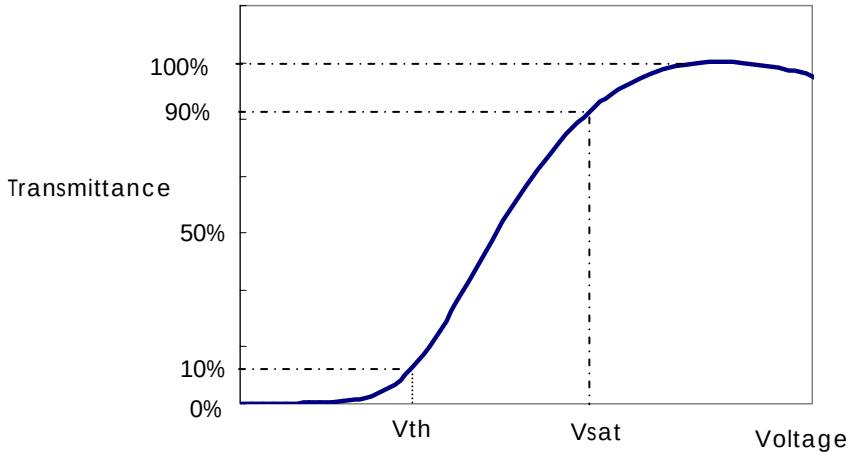


Figure 2. Measurement Set Up

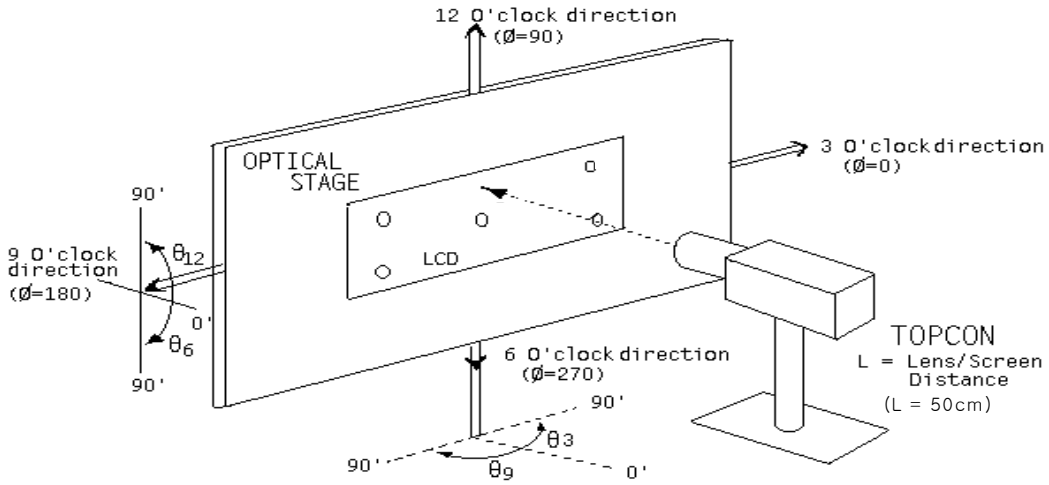


Figure 3. Response Time Testing

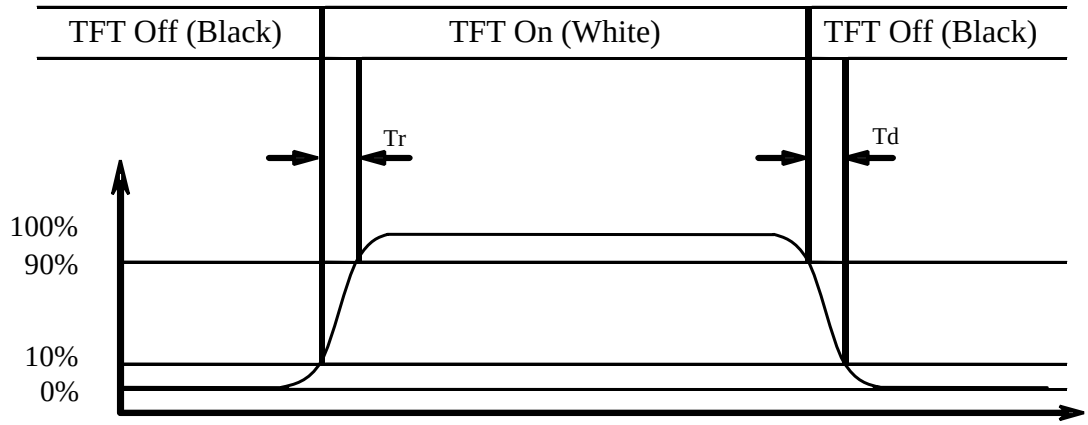
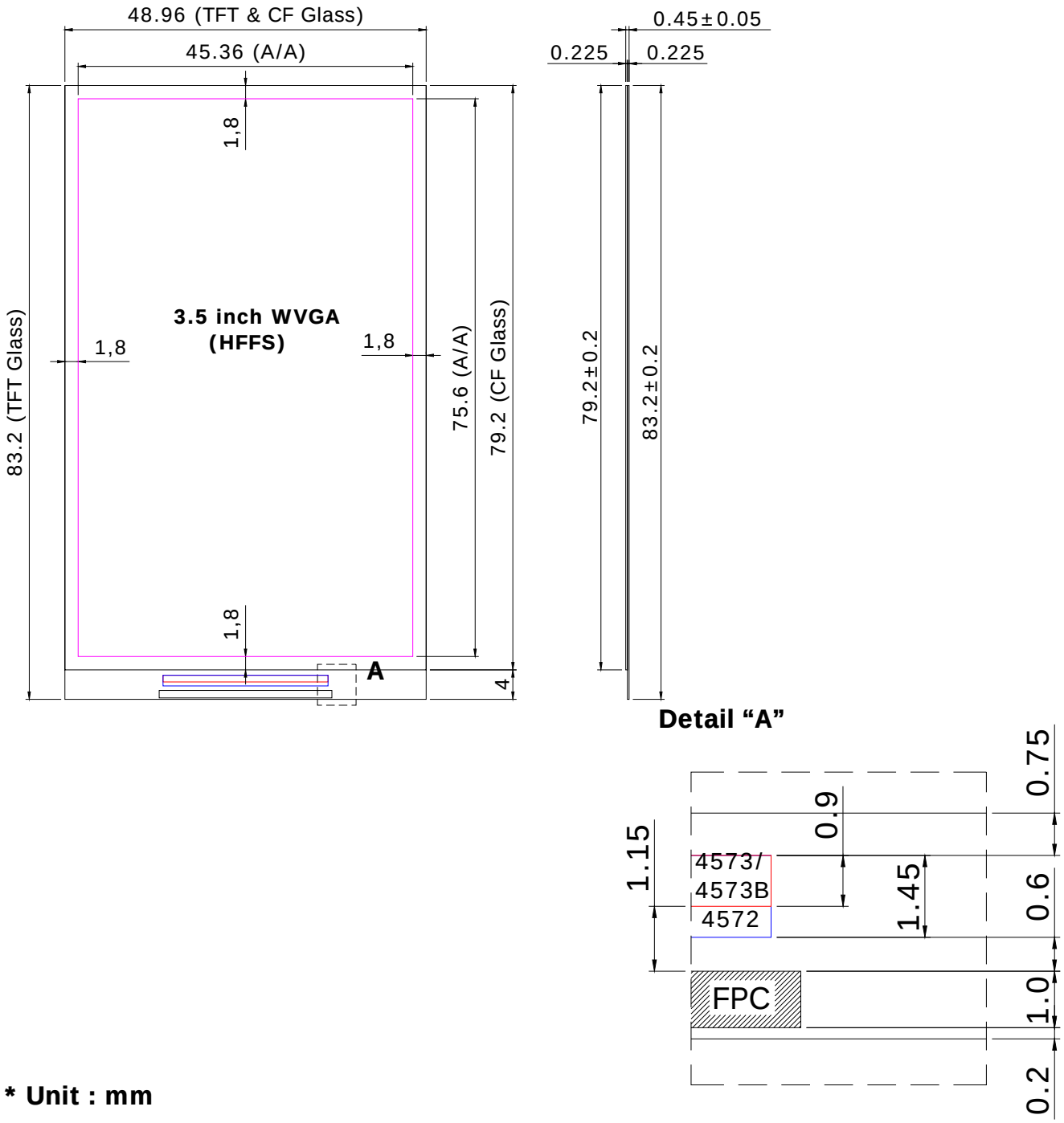
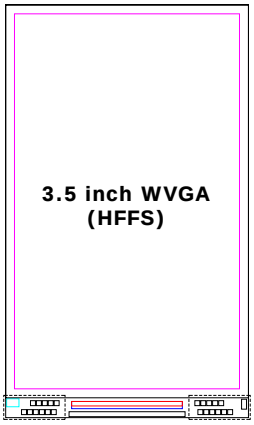


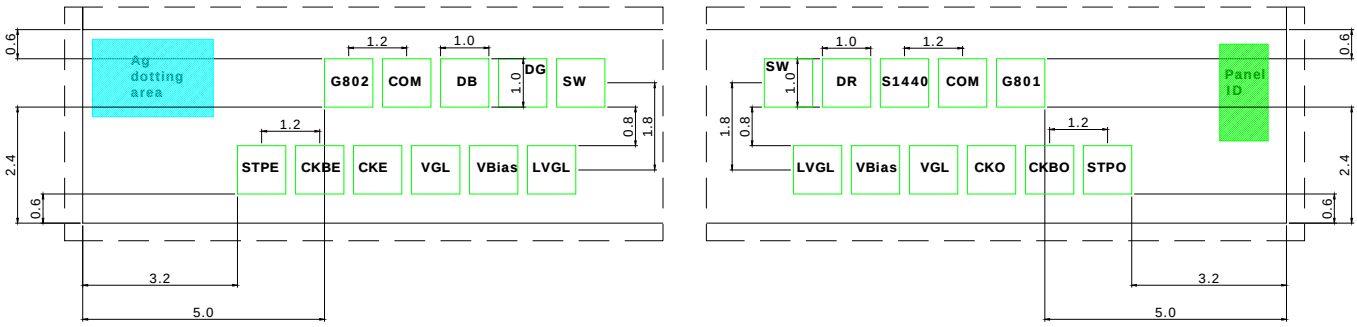
Figure 4. TFT-LCD Panel Outline Dimension (LG4572 / LG4573 / LG4573B D-IC)



*** Unit : mm**

Figure 5. Test Pad In Panel





*** Unit : mm**