CUSTOMER APPROVAL SHEET

Company Name	
MODEL	A043FW02 V1
CUSTOMER APPROVED	Title : Name :

☐ **APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver. 1.0)**

☐ **APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver. 1.0)**

☐ **APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver. 1.0)**

☐ **CUSTOMER REMARK :**

Doc. Version	1.0
Total Page	26
Date	2009/06/23

Product Specification

4.3" COLOR TFT-LCD MODULE

MODEL NAME: A043FW02 V1

< >Preliminary Specification

< □ >Final Specification

Note: The content of this specification is subject to change.

Record of Revision

Version	Revise Date	Page	Content
0.0	2008/05/23		First draft.
0.1	2008/06/17	6	Update drawing
0.2	2008/07/14	6	Modify the outline dimension of polarizer and bezel opening
0.3	2008/09/23	8	Update Pin Assignment Description (Pin38~Pin 40)
0.4	2008/11/27	6	Modify the outline dimension of bezel opening
		8	Update Pin assignment
		9	Update Absolute Maximum Ratings (Storage Temperature -30℃=> -40℃)
		10	Update Electrical Characteristics
		12	Update Power on/off sequence
		13	Update Timing Condition
		16	Update Optical specifications
		18~20	Update Touch Screen Panel Specifications
		20	Update Low Temperature Storage test condition (-30℃=> -40℃)
0.5	2008/12/30	12	Modify Power on/off sequence
		13	Modify Timing Condition
0.6	2009/02/12	16	Add RGB Chromaticity
0.7	2009/03/06	6	Update drawing (change label outline)
		23	Add Module/Panel Label Information
0.8	2009/04/20	20	Modify Reliability Test Items
0.9	2009/04/24	15	Modify Brightness spec
		18,19	Update Touch Screen Panel Specifications
1.0	2009/06/2	20,21	Add Touch Panel Identification Method
		25	Update Panel Label Information

Contents:

A. General Description

A043FW02 V1 is an amorphous transmissive type Thin Film Transistor Liquid crystal Display (TFT-LCD). This model is composed of a TFT-LCD, a driver, an FPC (flexible printed circuit), a backlight unit and a touch panel.

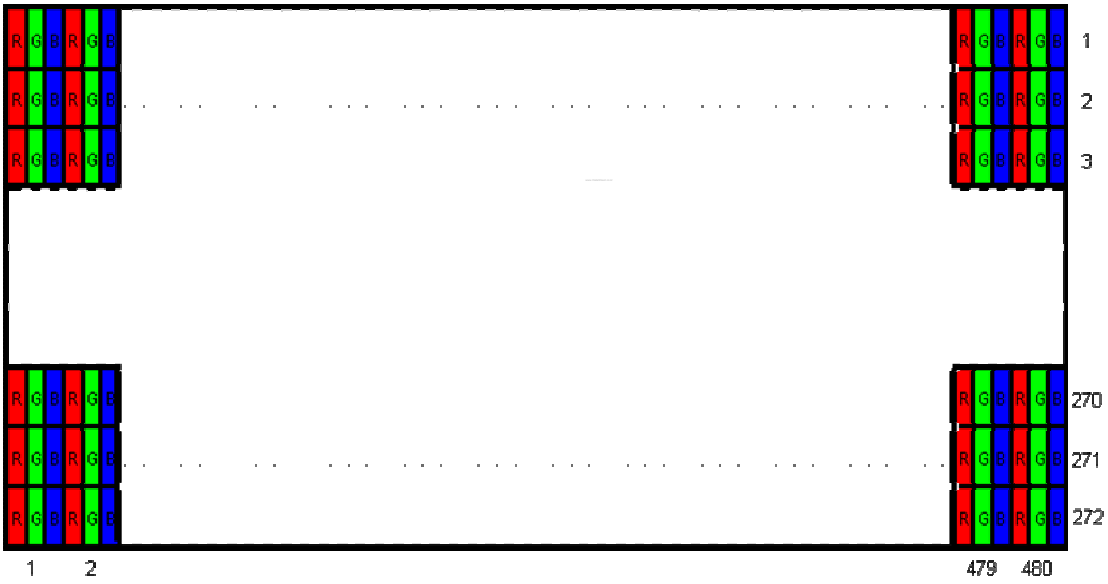
B. Features

- 4.3-inch display with touch panel
- WQVGA resolution in RGB stripe dot arrangement
- DC/DC integrated
- High brightness
- Interfaces: parallel RGB 24-bit
- Wide viewing angle
- Integrated touch screen panel (resistive type)
- 3-in-1 FPC for LCD signals, backlight LED power and touch panel
- Green design

C. Physical Specifications

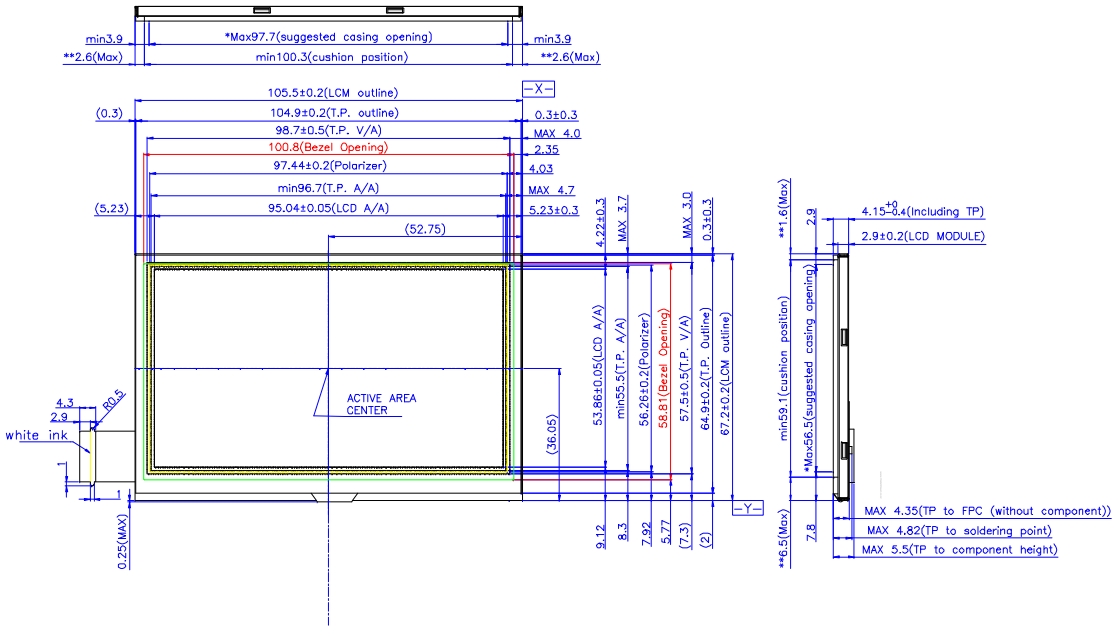
NO.	Item	Unit	Specification	Remark
1	Display Resolution	dot	480 RGB (H)×272(V)	
2	Active Area	mm	95.04(H)×53.856(V)	
3	Screen Size	inch	4.3(Diagonal)	
4	Dot Pitch	mm	0.066(H)×0.198(V)	
5	Color Configuration	--	R. G. B. Stripe	Note 1
6	Color Depth	--	16.7M Colors	
7	Overall Dimension	mm	105.5(H) × 67.2(V) × 3.9(T)	Note 2
8	Weight	g	56.8	
9	Touch panel surface treatment	--	Hard coating (AG Haze 8%) 3H	
10	Display Mode	--	Normally White	
11	Gray Level Inversion Direction		6 O'clock	

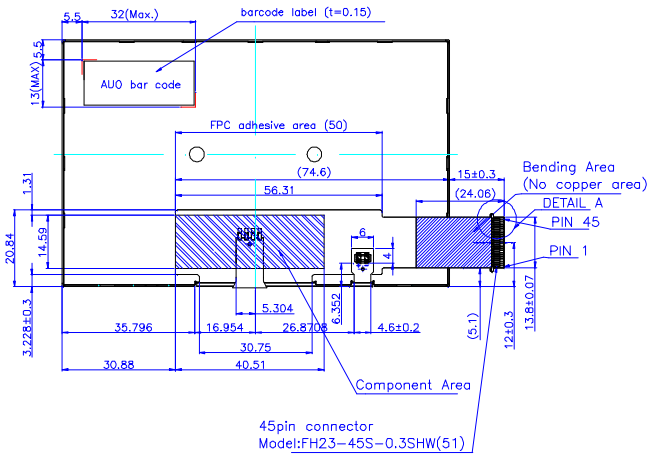
Note 1: Below figure shows dot stripe arrangement.



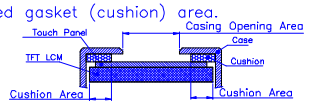
Note 2: Not including FPC. Refer to the drawing next page for further information.

D. Outline Dimension

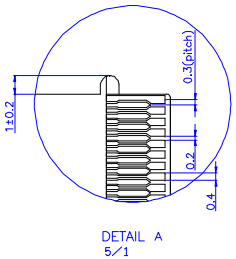




NOTES:
1. Gerneral tolerance ±0.3 .
2. The bending radius of FPC should be larger than 0.6 .
3. * It means the case open should not be larger than this area .
   ** Suggested gasket (cushion) area.



4. FPC golden finger design need fully compatiable Hirose FH23-45S-03SHW
5. Barcode label position to be check EMI/ESD solution compatibility.



DETAIL A
5/1

E. Electrical Specifications

1. Pin Assignment (Hirose FH23-45S-0.3SHW compatible)

No.	Pin Name	I/O	Description	Remarks
1	GND	G	GND	
2	GND	G	GND	
3	VDD	PI	Power supply for analog circuit	
4	VDD	PI	Power supply for digital interface	
5	R0	I	Red Data Signal (LSB)	
6	R1	I	Red Data Signal	
7	R2	I	Red Data Signal	
8	R3	I	Red Data Signal	
9	R4	I	Red Data Signal	
10	R5	I	Red Data Signal	
11	R6	I	Red Data Signal	
12	R7	I	Red Data Signal (MSB)	
13	G0	I	Green Data Signal (LSB)	
14	G1	I	Green Data Signal	
15	G2	I	Green Data Signal	
16	G3	I	Green Data Signal	
17	G4	I	Green Data Signal	
18	G5	I	Green Data Signal	
19	G6	I	Green Data Signal	
20	G7	I	Green Data Signal (MSB)	
21	B0	I	Blue Data Signal (LSB)	
22	B1	I	Blue Data Signal	
23	B2	I	Blue Data Signal	
24	B3	I	Blue Data Signal	
25	B4	I	Blue Data Signal	
26	B5	I	Blue Data Signal	
27	B6	I	Blue Data Signal	
28	B7	I	Blue Data Signal (MSB)	
29	GND	G	GND	
30	DCLK	I	Pixel clock	
31	DISP	I	Display on/off signal	
32	HSYNC	I	Horizontal synchronizing signal	
33	VSYNC	I	Vertical synchronizing signal	

34	DE	I	Data enable	
35	PWR_SEL	I	VDD Power select; Low : 2.5V, High : 3.3V	
36	GND	G	GND	
37	TP_U	I/O	Y Up	
38	TP_L	I/O	X Left	
39	TP_B	I/O	Y Bottom	
40	TP_R	I/O	X Right	
41	GND	G	GND	
42	VLED-	PI	LED backlight cathode	
43	VLED+	PI	LED backlight anode	
44	NC	-	NC	
45	Identification Pin	-	Pull low 18K ohm 1%	

I: Digital signal input, O: Digital signal output, G: GND, PI: Power input, C: Capacitor

2. Absolute Maximum Ratings

Items	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Voltage	V_{DD}	-0.3	4.5	V	
LED Reverse Voltage	V_r	--	3.5	V	One LED
LED Forward Current	I_f	--	25	mA	One LED
Operation Temperature	T_{op}	-20	70	°C	
Storage Temperature	T_{st}	-40	80	°C	

Note 1.If the operating condition exceeds the absolute maximum ratings, the TFT-LCD module may be damaged permanently. Also, if the module operated with the absolute maximum ratings for a long time, its reliability may drop.

3. Electrical Characteristics

The following items are measured under stable condition and suggested application circuit.

a. TFT- LCD Panel

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Power Supply Voltage	V_{DD}	3	3.3	3.6	V	PWR_SEL=H
	V_{DD}	2.25	2.5	3	V	PWR_SEL=L
Input Signal Voltage	V_{ih}	0.8* VDD	--	VDD	V	
	V_{il}	GND	--	0.2* VDD	V	
Frame Frequency	f_{Frame}	--	60	70	Hz	
Dot Data Clock	DCLK	5	9.2	12	MHz	

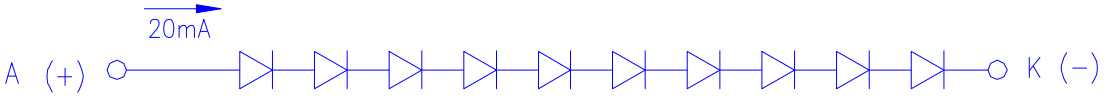
Note 1. Panel surface temperature should be kept less than content of section E.2. “Absolute maximum ratings"

Note 2. I_{VDD} Typ is in color bar pattern. I_{VDD} Max is in black pattern.

b. Backlight Driving Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Supply Current	I_L		20	25	mA	single serial
Power Consumption	P_{BL}		640	875	mW	
LED Life Time	L_L	10,000	---	---	Hr	Note 2

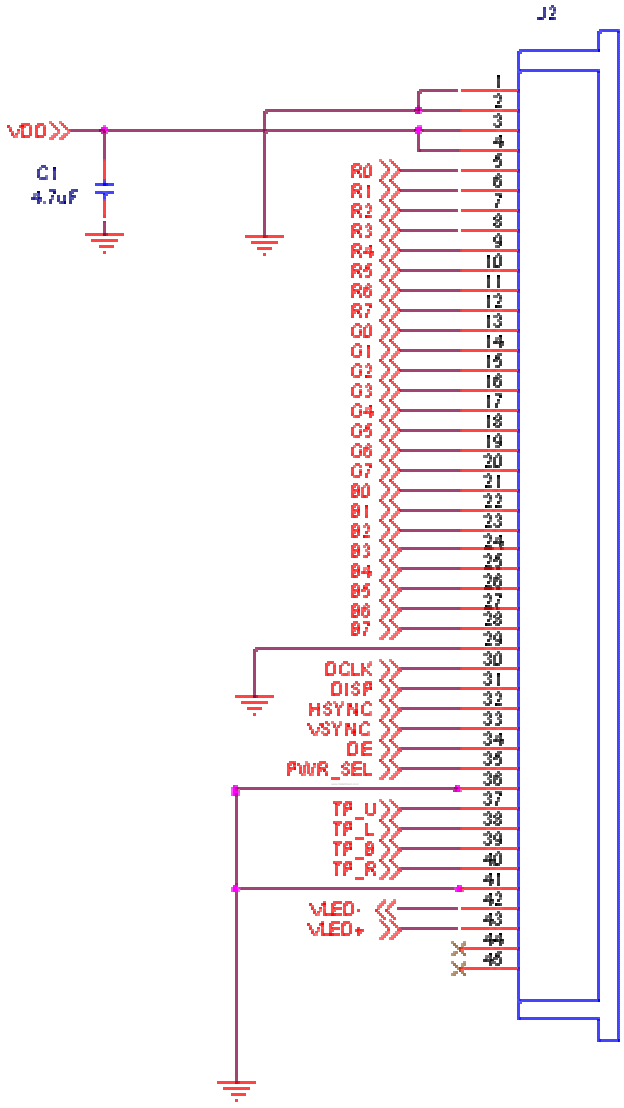
Note 1: LED backlight is 10 LEDs serial type. Suggestion is driven by current 20mA for each LED string.



Note 2: Define “LED Lifetime”: brightness is decreased to 50% of the initial value. LED Lifetime is restricted under normal condition, ambient temperature = 25℃ and LED lightbar current = 20 mA.

Note 3: If it uses larger LED lightbar voltage/ current more than 20mA, it maybe decreases the LED lifetime

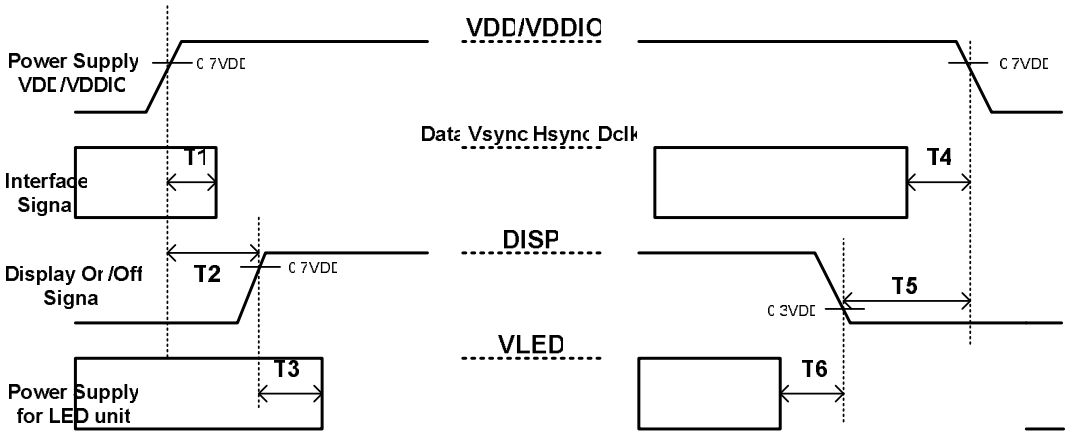
4. Suggested Application Circuit



5. AC Timing

a. Power on/off sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should Be as the diagram below.



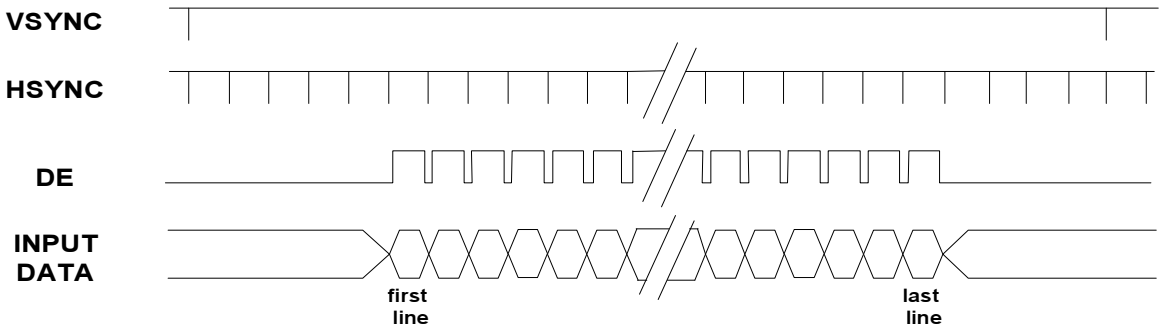
Symbol	Specification	Note
T1	1ms≦T1＜T2	
T2	10ms＜T2	
T3	10 frames＜T3	
T4	10 ms＜T4＜T5	
T5	(5 frames +T4)＜T5	
T6	10frames＜T6	

b. Timing Condition

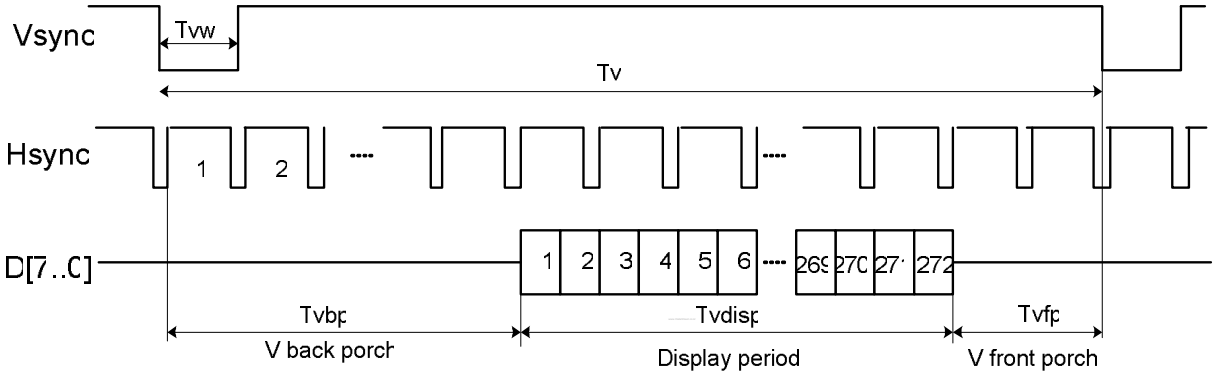
Parameter		Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK	Frequency	1/Tdclk	5	9.2	12	MHz	
	CLK pulse duty	Tcwh	40	--	--	ns	
	CLK pulse duty	Tcwl	40	--	--	ns	
Data	Setup Time	Tdsu	12	--	--	ns	
	Hold Time	Tdhd	12	--	--	ns	
DE	Setup Time	Tdesu	12	--	--	ns	
	Hold Time	Tdehd	12	--	--	ns	
Frame Frequency	Cycle	tv		16.7		ms	
1 Frame Scanning Time	Cycle	tv	275	288	335	H	
	Display Period	tvdisp	272			H	
	Front porch	Tvfp	1	4	--	H	
	Pulse width	Tvw	1	10	--	H	
	Back porch	Tvbp	2	12	--	H	
1 Line Scanning Time	Cycle	Th	490	533	605	DCLK	
	Display Period	Thdisp	480			DCLK	
	Front porch	Thfp	2	8	--	DCLK	
	Pulse width	Thw	1	41	--	DCLK	
	Back porch	thbp	8	45	--	DCLK	

Note 1: Sync mode just can be used on the typical timing setting.

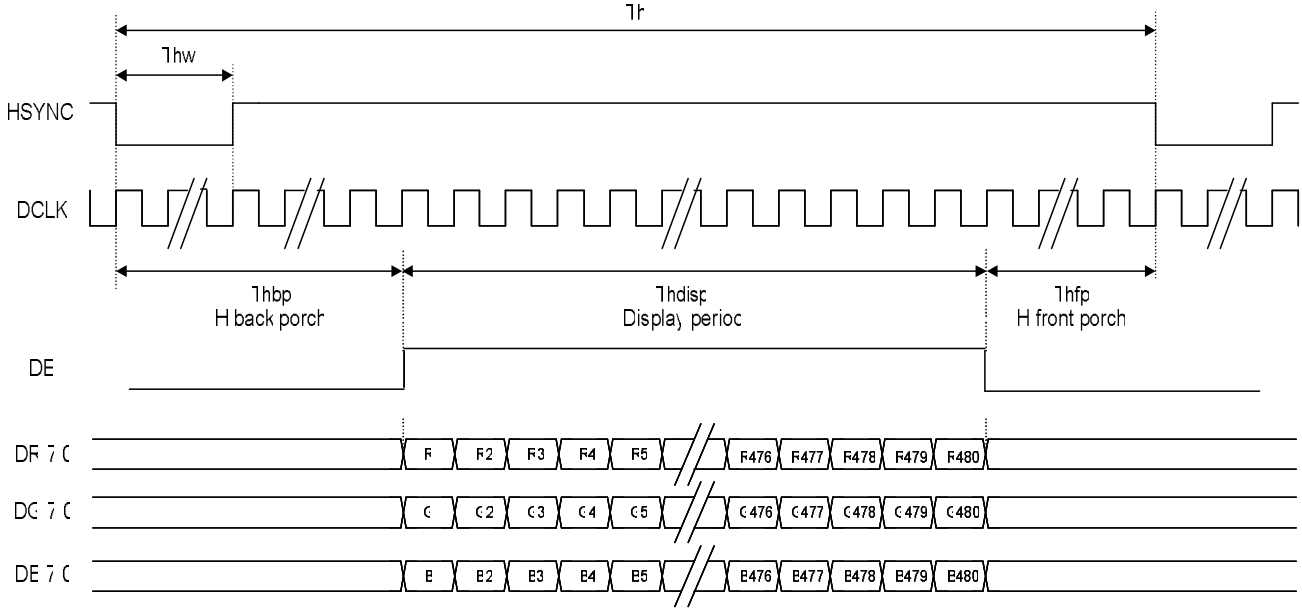
c. Timing Diagram



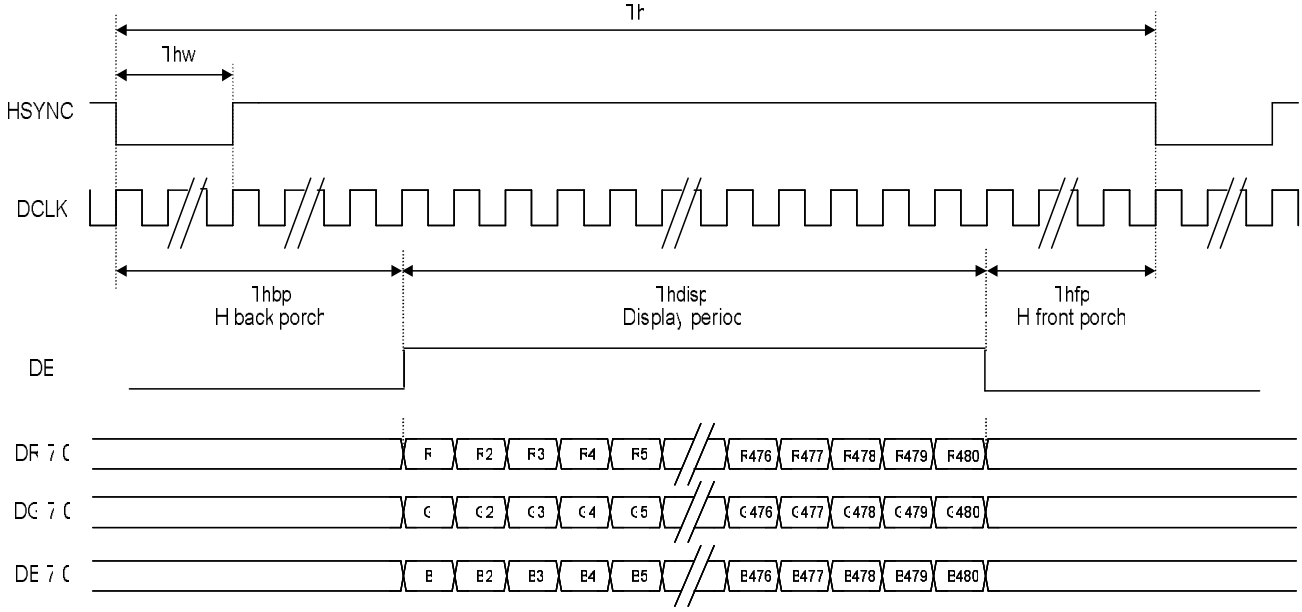
Vertical Timing of Input



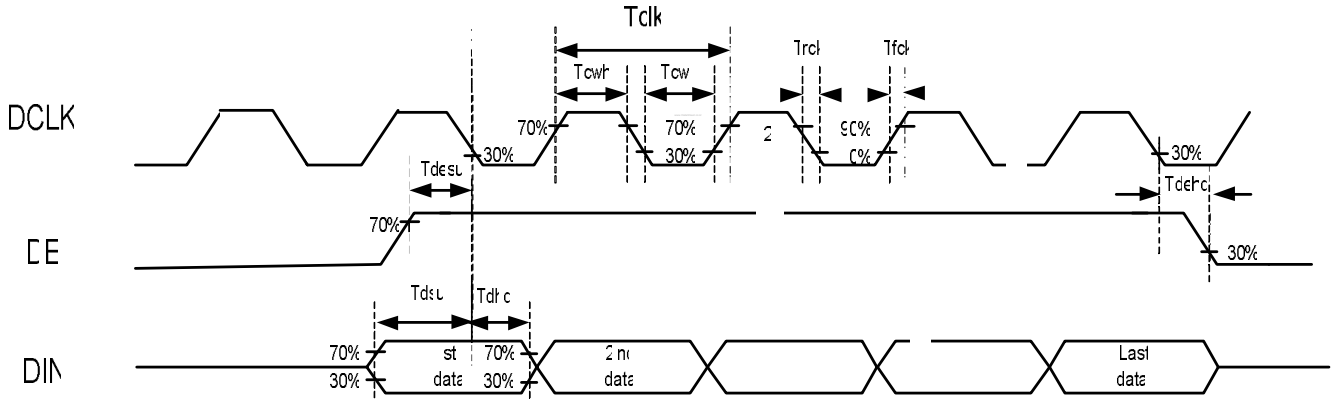
Horizontal Timing of Input



Horizontal Timing of Input (Sync-DE mode)



Clock and data input timing diagram

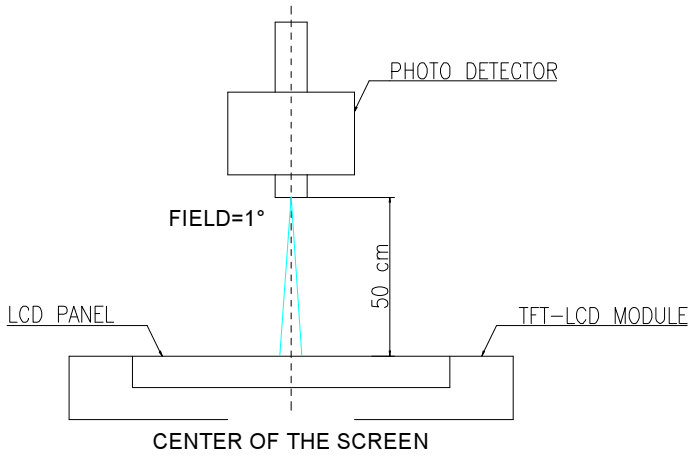


F. Optical specifications (Note 1, 2)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time							
Rise	Tr	θ =0°	-	15		ms	Note 3
Fall	Tf		-	20		ms	
Contrast ratio	CR	At optimized viewing angle	400	700	-		Note 5, 6
Viewing Angle							
Top			35	50	-		
Bottom		CR≧10	45	60	-	deg.	Note 7, 8
Left			55	70	-		
Right			55	70	-		
Brightness	Y_L	θ =0°	340	420		cd/m^2	Note 9
White Chromaticity	X	θ =0°	0.27	0.32	0.37		
	y	θ =0°	0.29	0.34	0.39		
Red Chromaticity	X	θ =0°	0.55	0.6	0.65		
	Y	θ =0°	0.31	0.36	0.41		
Green Chromaticity	X	θ =0°	0.32	0.37	0.42		
	Y	θ =0°	0.52	0.57	0.62		
Blue Chromaticity	X	θ =0°	0.1	0.15	0.2		
	Y	θ =0°	0.07	0.12	0.17		

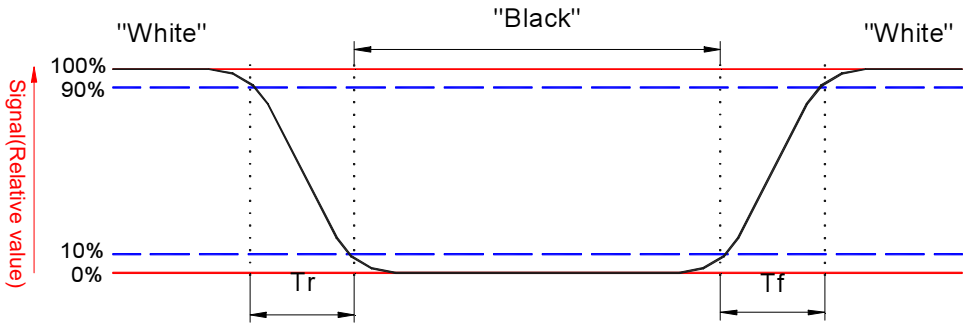
Note 1: Measurement should be performed in the dark room, optical ambient temperature =25°C, and backlight current I_L=20 mA

Note 2: To be measured on the center area of panel with a field angle of 1°by Topcon luminance meter BM-7, after 10 minutes operation.



Note 3: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black”(rising time), respectively.

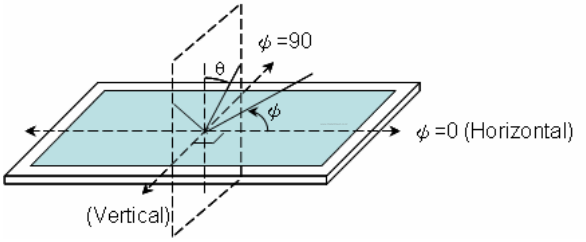


Note 4. From liquid crystal characteristics, response time will become slower and the color of panel will become darker when ambient temperature is below 25℃.

Note 5. Contrast ratio is calculated with the following formula.

$$\text{Contrastratio} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 6. Definition of viewing angle: refer to figure as below.



Note 7. The viewing angles are measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

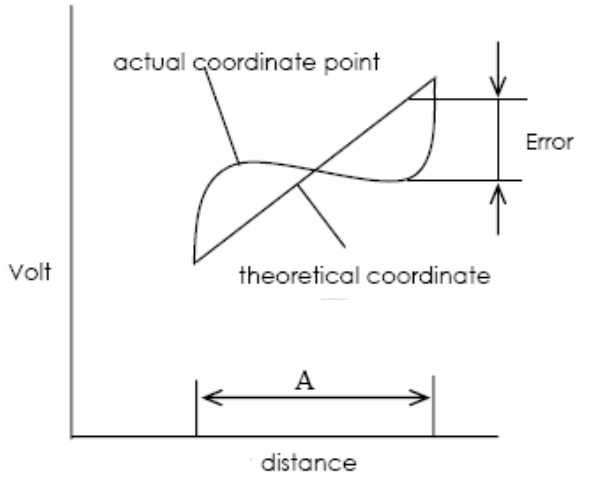
Note 8. Brightness is measured at the center of the display perpendicular to the panel surface.

G. Touch Screen Panel Specifications

1. Electrical Characteristics

Item		Min.	Max.	Unit	Remark
Rate DC Voltage		--	7	V	
Resistance	X (Film)	500	1400	Ω	At connector
	Y (Glass)	100	700		
Linearity		-1.5%	1.5%	--	Note 1, test by 250 gf
Chattering		--	--	ms	At connector pin
Insulation Resistance		20	--	MΩ	DC 25V

Note 1: Measurement condition of Linearity: difference between actual voltage & theoretical voltage is an error at any points. Linearity is the value max. error voltage divided by voltage difference on active area.

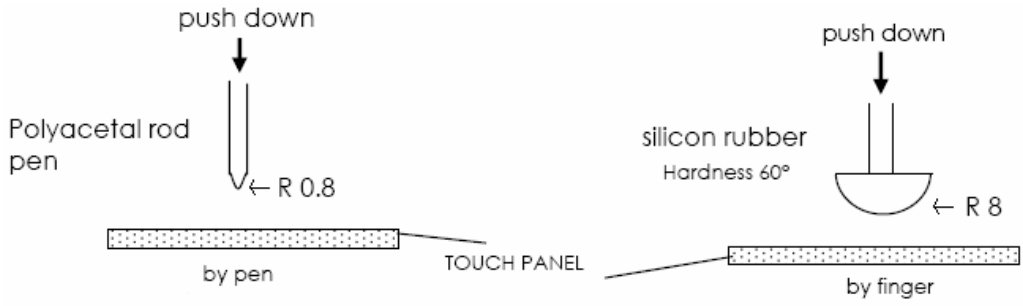


2. Mechanical Characteristics

Item	Min.	Max.	Unit	Remark
Hardness of Surface	3	--	H	JIS K-5400
Activation Force (Pen or Finger)	--	100	g	Note 1, 2

Note 1: Within ”guaranteed active area”, but not on the edge and dot-spacer.

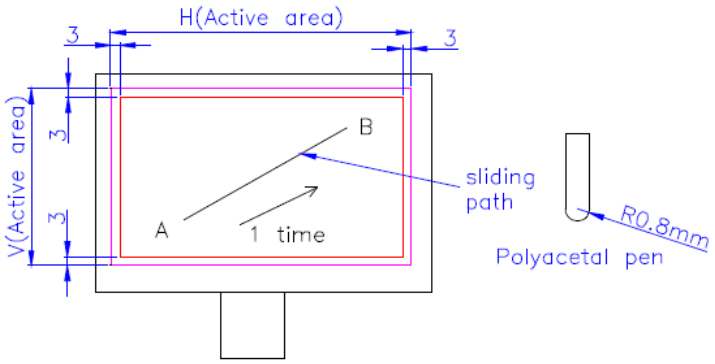
Note 2: Operation force measurement is under test condition as figure below.



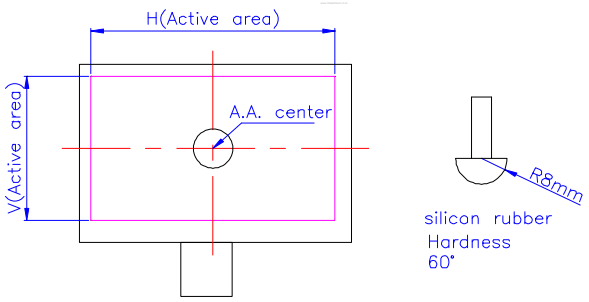
3. Life test Condition

Item	Min.	Max.	Unit	Remark
Notes Life	10^5	-	times	Note 1
Input Life	10^6	-	times	Note 2

Note 1: Life test condition (by pen): From active area edge toward the center at 3 mm distance, slide on active area and use R 0.8mm polyacetal pen, input force : 250gf, frequency : 60mm/sec. Sliding from A to B complete 1 time. shown as figure.



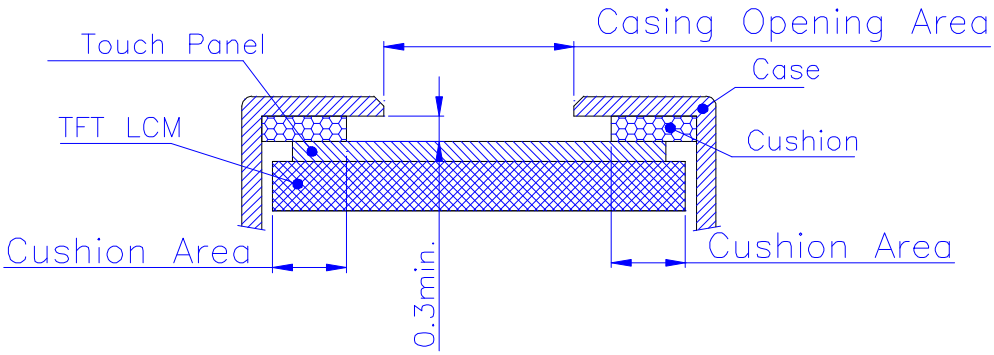
Note 2: Input Life test condition (by finger): test position on active area center and use R8.0mm silicon rubber (hardness 60°), test force: 250gf, frequency : 2times/sec. shown as figure.



4. Attention

Please pay attention for below matters at mounting design of touch panel of LCD module.

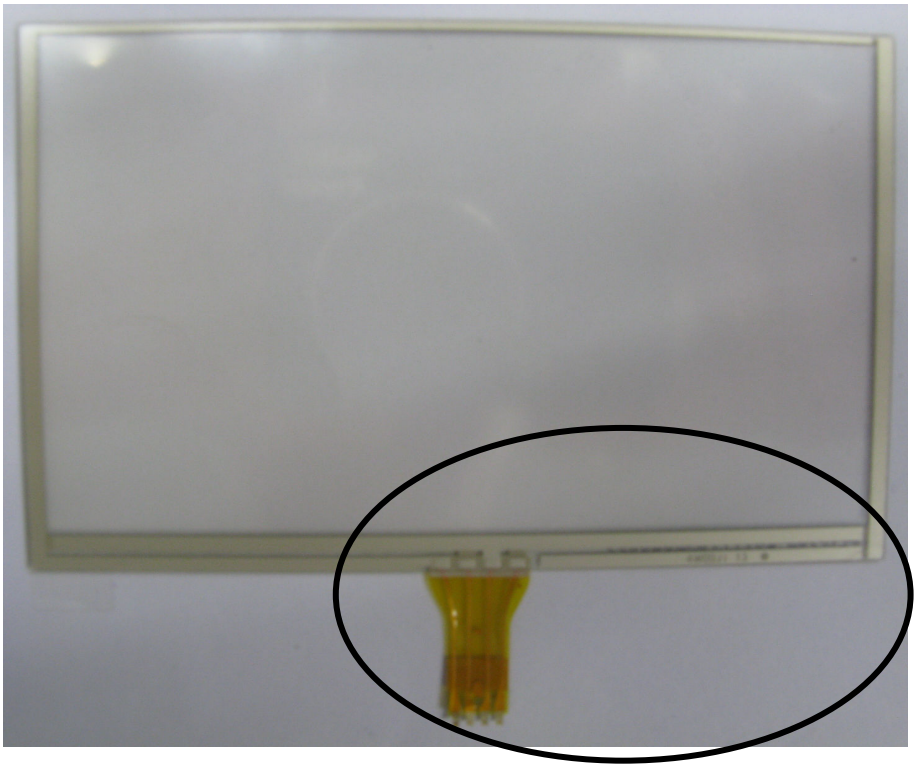
1. Do not design enclosure pressing the view area to prevent from miss input.
2. Enclosure support must not touch with view area.
3. Use elastic or non-conductive material to enclosure touch panel.
4. Do not bond film of touch panel with enclosure.
5. The touch panel edge is conductive. Do not touch it with any conductive part after mounting.

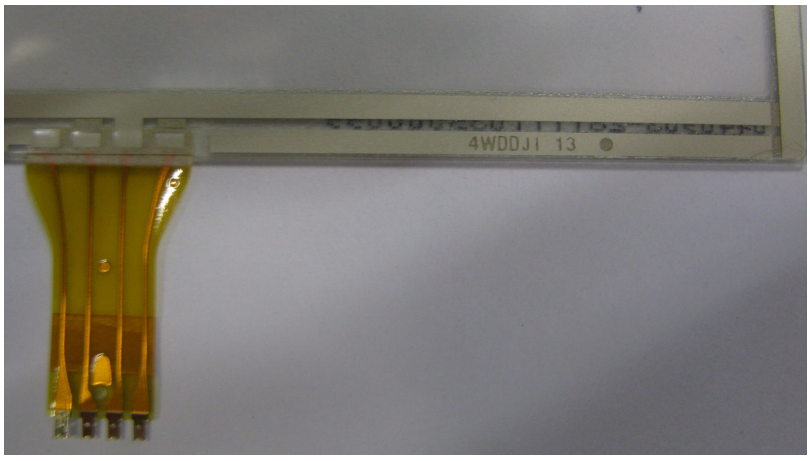


6. If user wants to clean touch panel by air gun, pressure 2kg/cm2 below is suggested. Not to blow glass from FPC site to prevent FPC peeled off.
7. Do not put a heavy shock or stress on touch panel and film surface. Ex. Don't lift the panel by film face with vacuum.
8. Do not lift LCD module by FPC.
9. Please use dry cloth or soft cloth with neutral detergent (after wring dry) or one with ethanol at cleaning. Do not use any organic solvent, acid or alkali liquor.
10. Do not pile touch panel. Do not put heavy goods on touch panel.

5. Touch Panel Identification Method

a. Without AR Touch panel :





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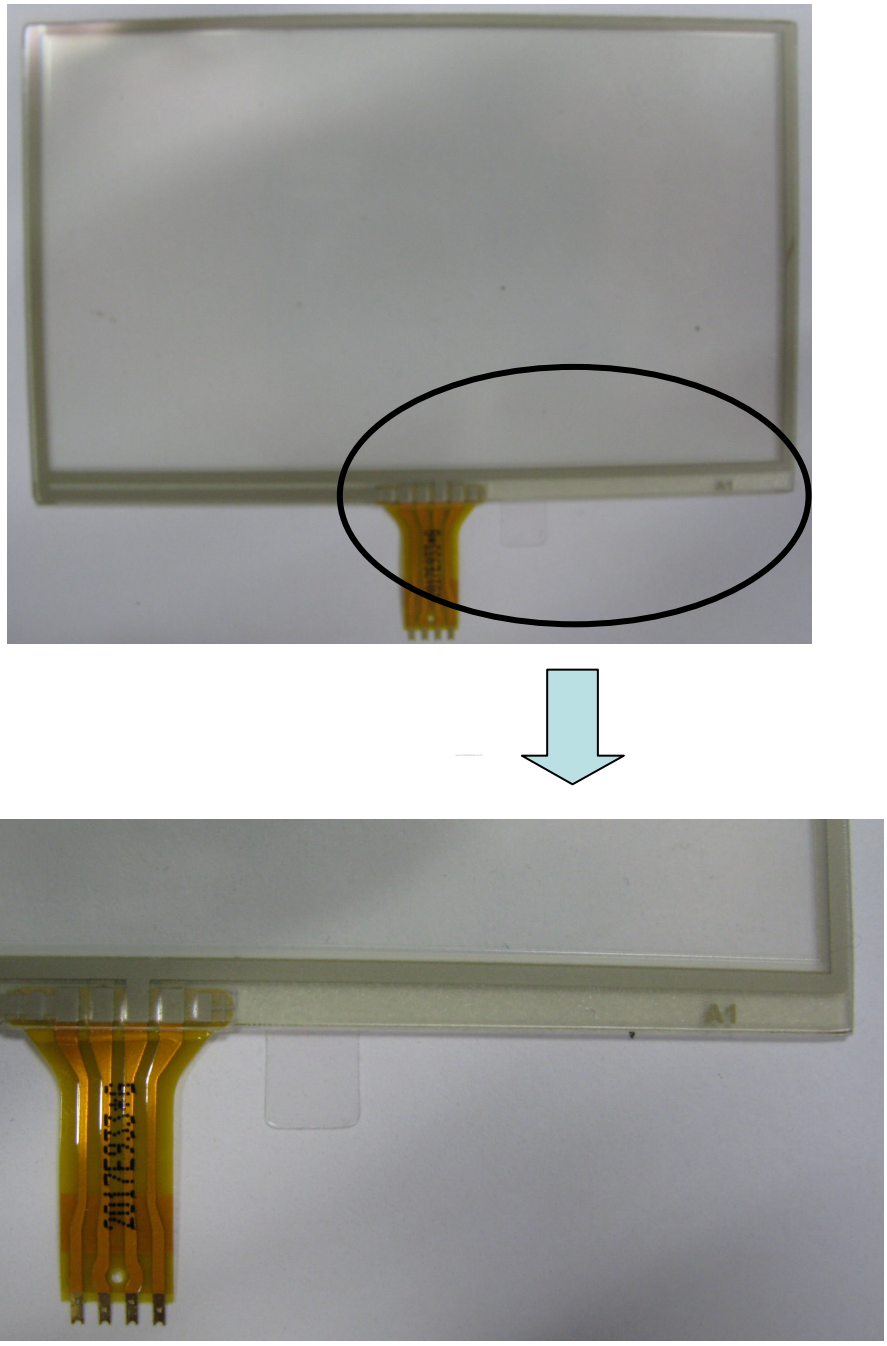
b. With AR Touch panel :



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H. Reliability Test Items

No.	Test items	Conditions		Remark
1	High Temperature Storage	Ta= 80°C	240Hrs	
2	Low Temperature Storage	Ta= -40°C	240Hrs	
3	High Temperature Operation	Ta= 70°C	240Hrs	
4	Low Temperature Operation	Ta= -20°C	240Hrs	
5	High Temperature & High Humidity	Ta= 60°C. 90% RH	240Hrs	Operation
6	Heat Shock	-25°C ~70°C, 50 cycle, 2Hrs/cycle		Non-operation
7	Vibration (With Carton)	Random vibration: 0.015G^2/Hz from 5~200Hz –6dB/Octave from 200~500Hz		IEC 68-34
8	Drop (With Carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces		

Note 1: Ta: Ambient temperature.

Note 2: In the standard condition, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

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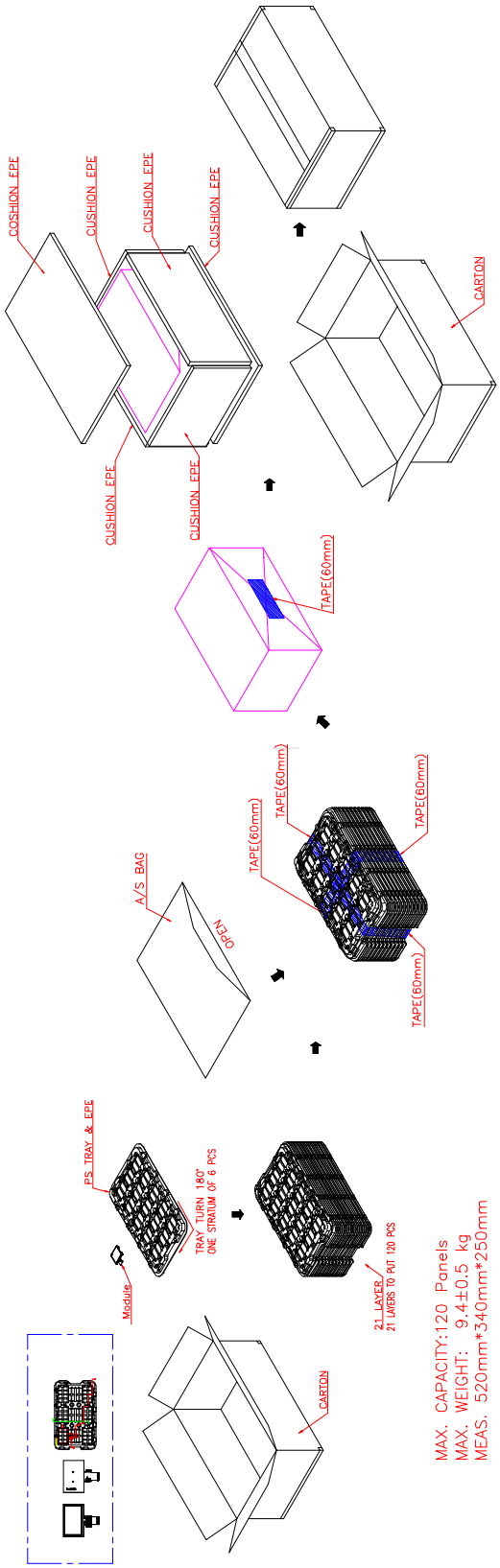
I. Packing and Marking

1. Packing Form



2. Module/Panel Label Information

The module/panel (collectively called as the “Product”) will be attached with a label of Shipping Number which represents the identification of the Product at a specific location. Refer to the Product outline drawing for detailed location and size of the label. The label is composed of a 9-digit serial number with the following definition:

- For internal system usage and production serial numbers .
- AUO A043FW02 V1 Module Code.
- Year Code , the production week when the product is finished at its production process
- Week Code , the production week when the product is finished at its production process

Example:

1690012AB:

Product Manufacturing Week Code: WK16

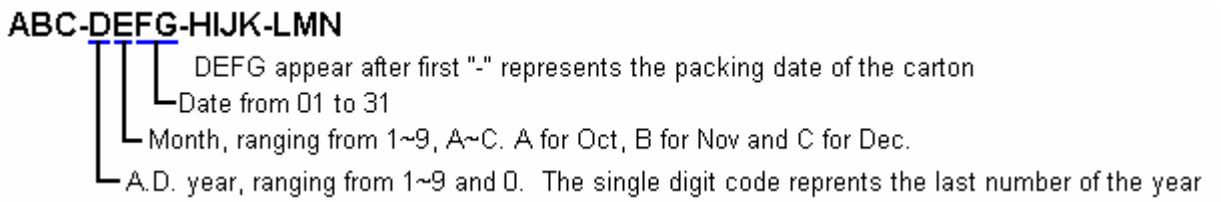
Product Manufacturing Year Code: Year 2009

Product Identification code : 00 (A043FW02 V1 Without AR Touch Panel)

07 (A043FW02 V1 With AR Touch Panel)

3. Carton Label Information

The packing carton will be attached with a carton label where packing Q’ty, AUO Model Name, AUO Part Number, Customer Part Number (Optional) and a series of Carton Number in 13 or 14 digits are printed. The Carton Number is apparing in the following format:



Refer to the drawing of packing format for the location and size of the carton label.

J. Precautions

1. Do not twist or bend the module and prevent the unsuitable external force for display module during assembly.
2. Adopt measures for good heat radiation. Be sure to use the module with in the specified temperature.
3. Avoid dust or oil mist during assembly.
4. Follow the correct power sequence while operating. Do not apply the invalid signal, otherwise, it will cause improper shut down and damage the module.
5. Less EMI: it will be more safety and less noise.
6. Please operate module in suitable temperature. The response time & brightness will drift by different temperature.
7. Avoid to display the fixed pattern (exclude the white pattern) in a long period, otherwise, it will cause image sticking.
8. Be sure to turn off the power when connecting or disconnecting the circuit.
9. Polarizer scratches easily, please handle it carefully.
10. Display surface never likes dirt or stains.
11. A dewdrop may lead to destruction. Please wipe off any moisture before using module.
12. Sudden temperature changes cause condensation, and it will cause polarizer damaged.
13. High temperature and humidity may degrade performance. Please do not expose the module to the direct sunlight and so on.
14. Acetic acid or chlorine compounds are not friends with TFT display module.
15. Static electricity will damage the module, please do not touch the module without any grounded device.
16. Do not disassemble and reassemble the module by self.
17. Be careful do not touch the rear side directly.
18. No strong vibration or shock. It will cause module broken.
19. Storage the modules in suitable environment with regular packing.
20. Be careful of injury from a broken display module.
21. Please avoid the pressure adding to the surface (front or rear side) of modules, because it will cause the display non-uniformity or other function issue.