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Date	2008/09/01

Product Specification

4.3" COLOR TFT-LCD MODULE

MODEL NAME: A043FW02 V0

< □ >Preliminary Specification

< >Final Specification

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

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Record of Revision

Version	Revise Date	Page	Content
0.0	2008/05/24		First draft.
0.1	2008/06/11	6	Update drawing
0.2	2008/06/18	6	Update drawing
0.3	2008/07/14	6	Modify the outline dimension of polarizer and bezel opening
0.4	2008/07/21	6	Modify the outline dimension of bezel opening
0.5	2008/09/01	8	Pin assignment revised from 43 pins to 45 pins
		11	Update Suggested Application Circuit
		12	Delete Suggested application circuit (use SPI control)
		17,18,19	Delete Command and Register Map

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Contents:

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A. General Description

A043FW02 V0 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

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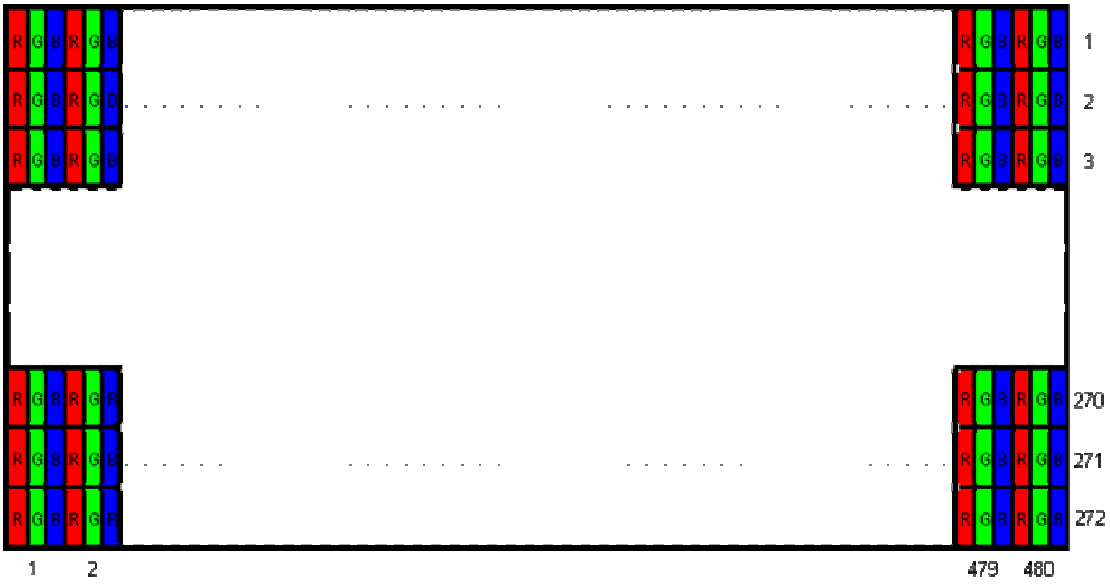
C. Physical Specifications

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.

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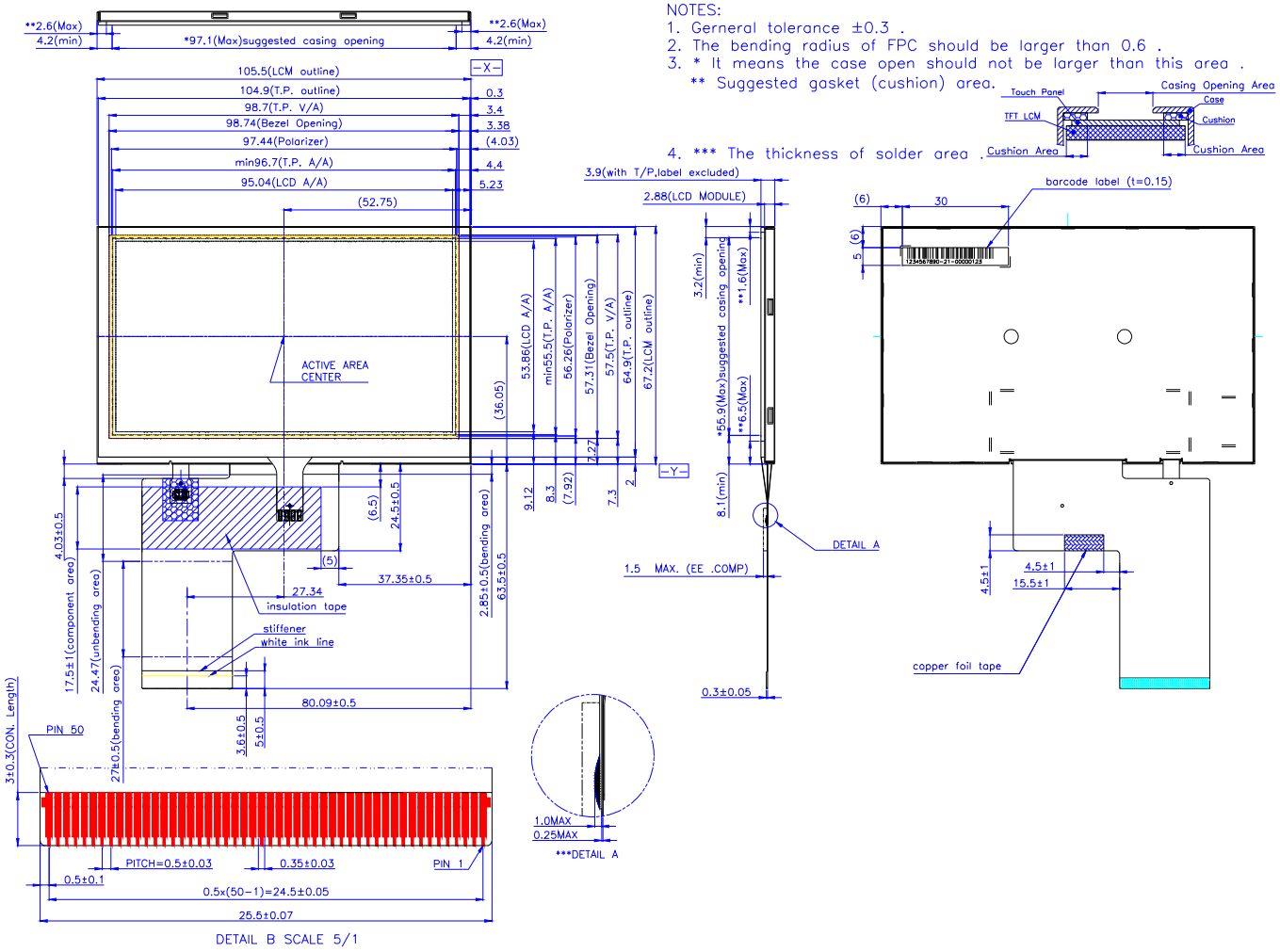
D. Outline Dimension (Tentative)



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E. Electrical Specifications

1. Pin Assignment

No.	Pin Name	I/O	Description	Remarks
1	GND	G	GND	
2	GND	G	GND	
3	VDD	PI	Power supply for analog circuit	
4	VDDIO	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	

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34	DE	I	Data enable	
35	U/D	-	Scan direction selection	
36	NC	-	NC	
37	GND	G	GND	
38	GND	G	GND	
39	TP_R	I/O	X Right	
40	TP_B	I/O	Y Bottom	
41	TP_L	I/O	X Left	
42	TP_U	I/O	Y Up	
43	GND	G	GND	
44	GND	G	GND	
45	GND	G	GND	
46	VLED-	PI	LED backlight cathode	
47	VLED+	PI	LED backlight anode	
48	GND	G	GND	
49	GND	G	GND	
50	GND	G	GND	

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

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2. Absolute Maximum Ratings

Items	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Supply Voltage	VDD	-0.3	4.5	V	
Interface Supply Voltage	VDDIO	-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}	-30	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.

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3. Electrical Characteristics

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

a. TFT- LCD Panel

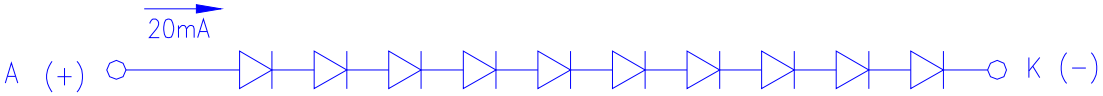
Parameter	Symbol	Min	Typ	Max	Unit	Notes
Power Supply Voltage	VDD	3	3.3	3.6	V	
Interface Supply Voltage	VDDIO	1.7	3.3	VDD	V	
Input Signal Voltage	V_{ih}	0.7* VDDIO	--	VDDIO	V	
	V_{il}	GND	--	0.3* VDDIO	V	
Power Supply Current	I_{VDD}	TBD	TBD	TBD	mA	
Frame Frequency	f_{Frame}	--	60	70	Hz	
Dot Data Clock	DCLK	--	9.2	--	MHz	

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

b. Backlight Driving Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Supply	I_L		20		mA	single serial
LED Supply	V_L		32		V	single serial
LED Life Time	L_L	10,000	---	---	Hr	Note 2

Note 1: LED backlight is 10 LEDs serial type.



Note 2: The LED lifetime could be decreased if operating I_L is larger than 25mA

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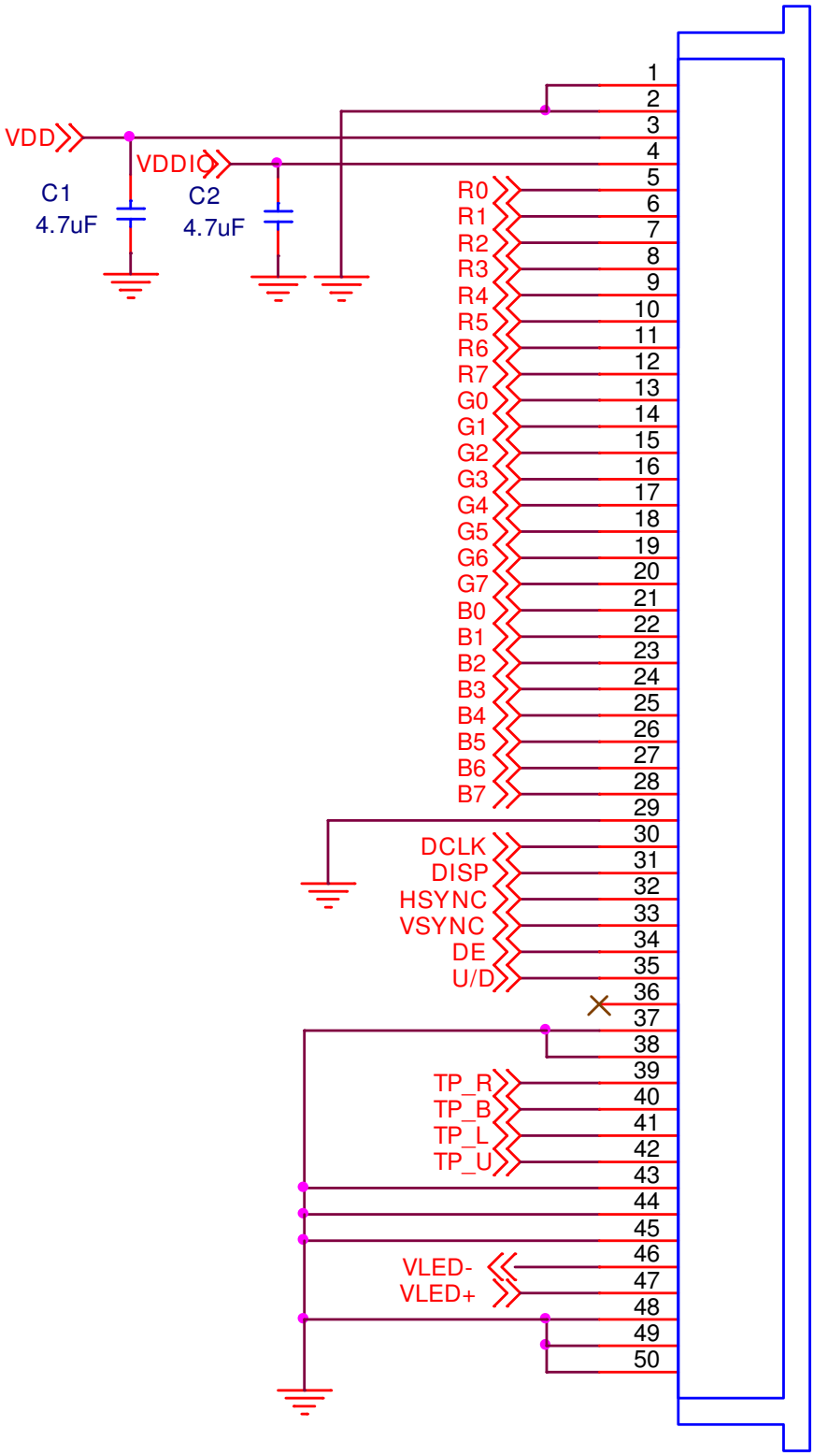
4. Suggested Application Circuit



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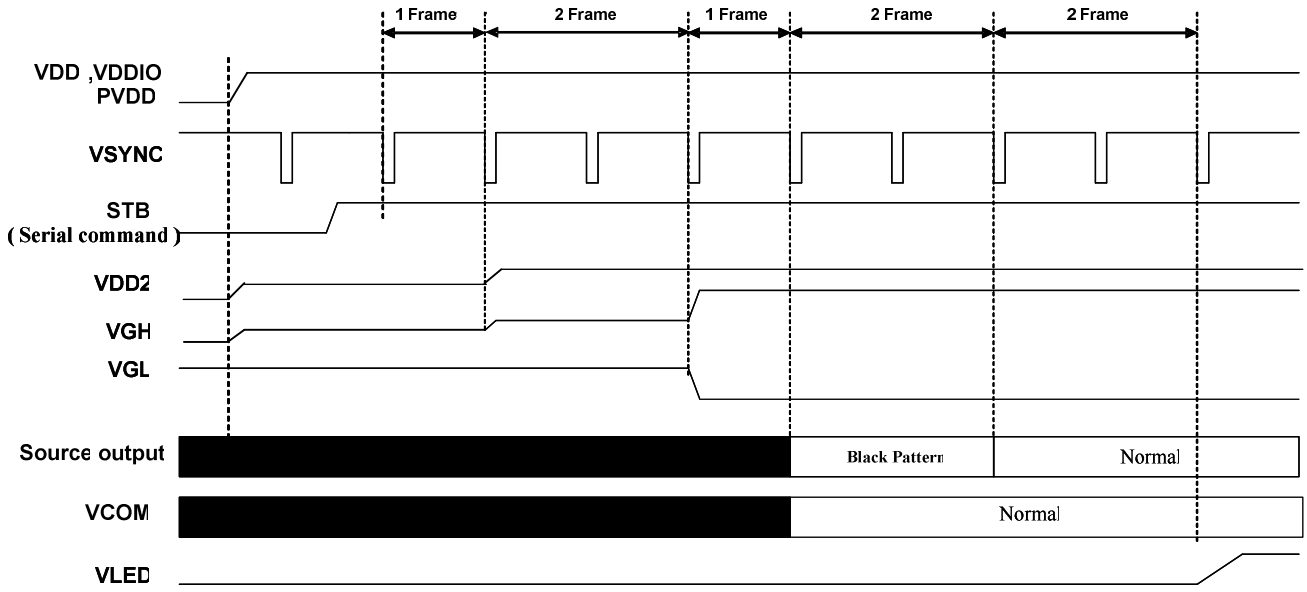
5. AC Timing

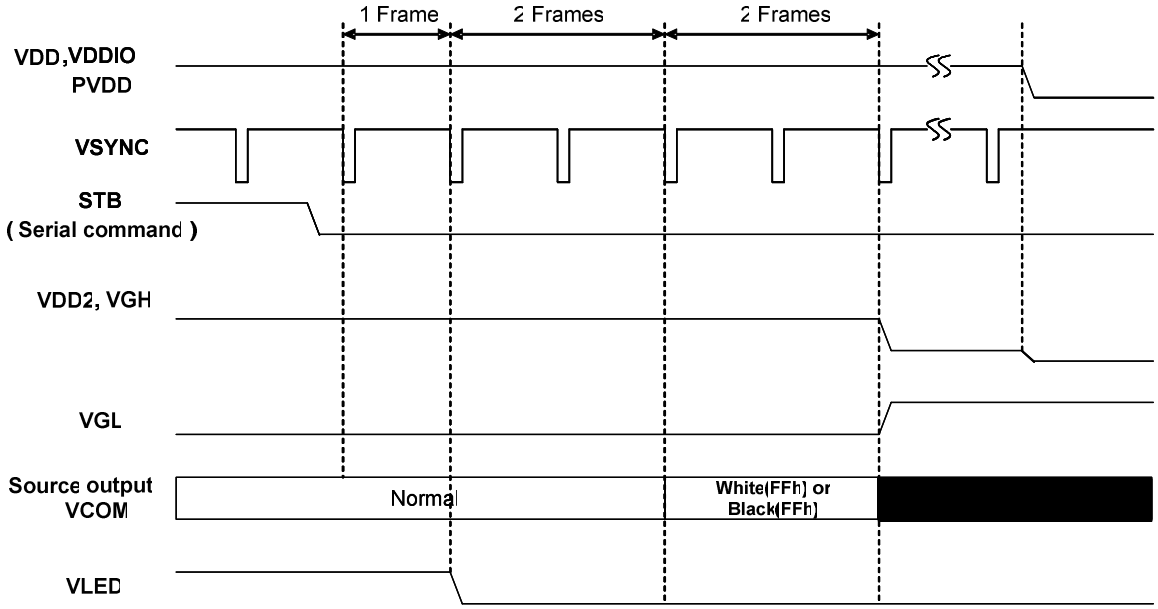
a. Power on/off sequence

Power On (Display ON; Standby Disabling)



STB(DISP): The driver IC default is on standby mode. It can be changed to normal operation by using DISP hard pin or serial command.

Power-Off (Display Off; Standby Enabling)



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b. Timing Condition

Parameter		Symbol	Min.	Typ.	Max.	Unit.	Remark
Clock	Frequency	1/Tc	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	531	605	DCLK	
	Display Period	Thdisp	480			DCLK	
	Front porch	Thfp	2	8	--	DCLK	
	Pulse width	Thw	1	1	--	DCLK	
	Back porch	thbp	8	43	--	DCLK	

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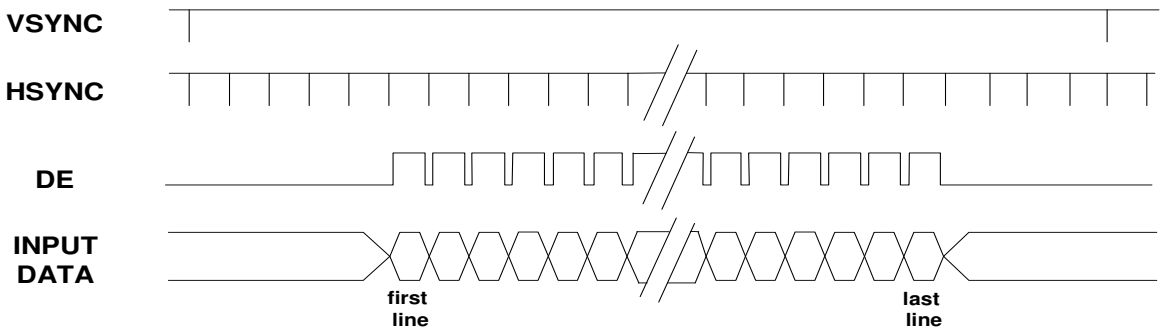
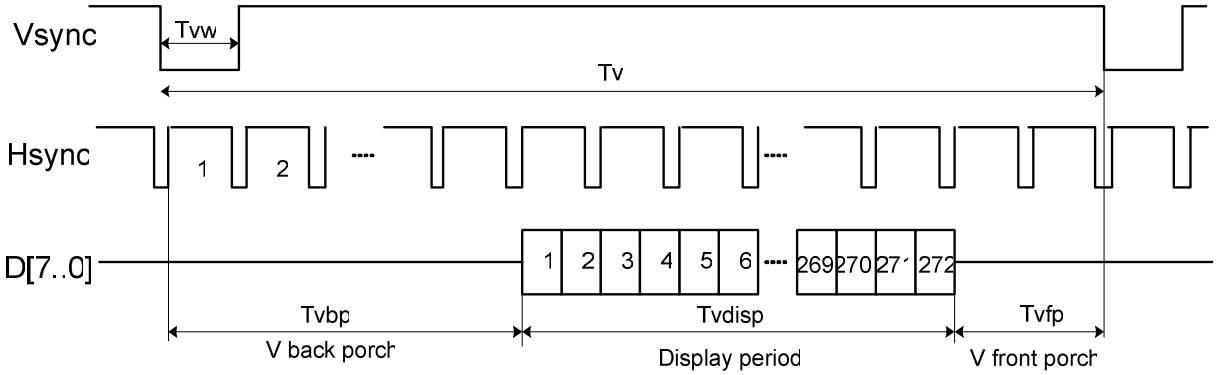
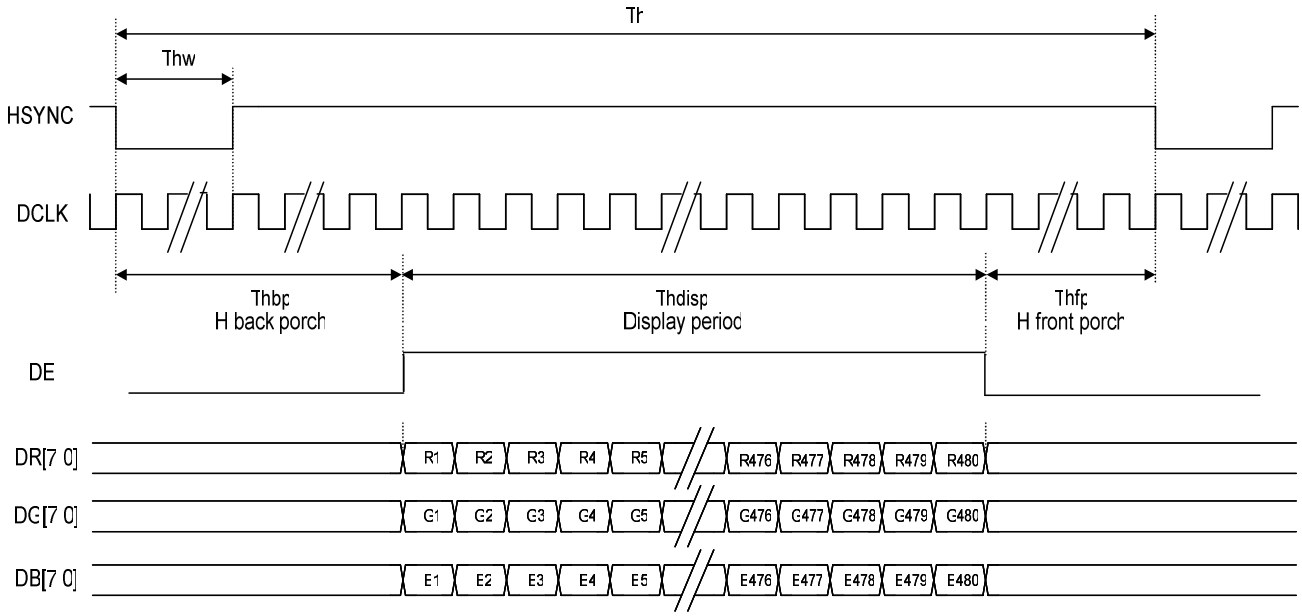
c. Timing Diagram



Vertical Timing of Input



Horizontal Timing of Input



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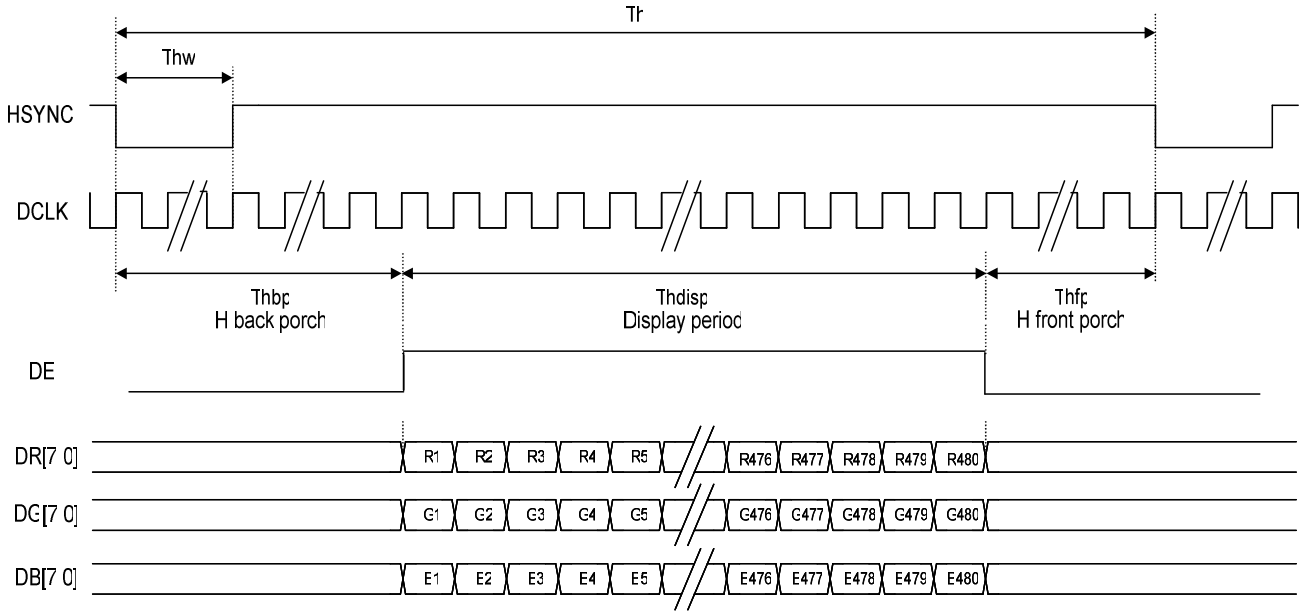
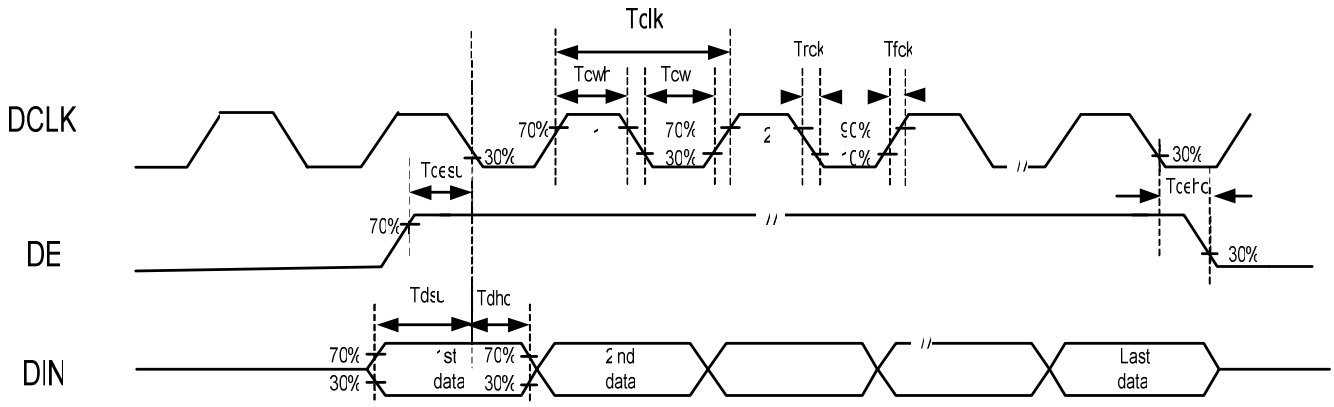
Horizontal Timing of Input (Sync-DE mode)



Clock and data input timing diagram



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F. Optical specifications (Note 1, 2)

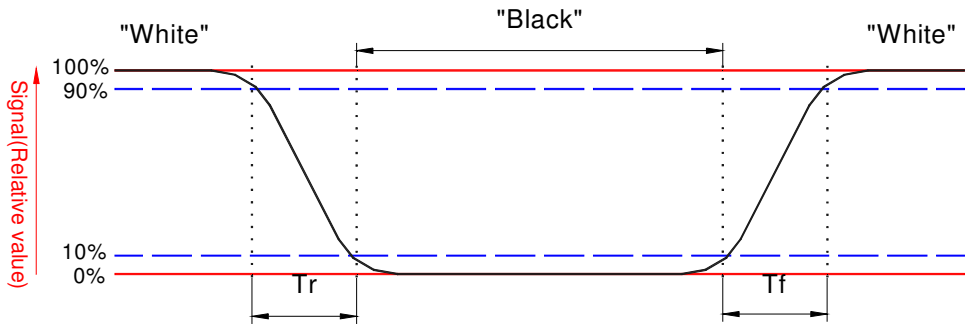
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time							
Rise	Tr	θ =0°	-	15		ms	Note 3
Fall	Tf		-	20		ms	
Contrast ratio	CR	At optimized viewing angle	200	300	-		Note 5, 6
Viewing Angle							
Top				50	-		
Bottom		CR≧10		60	-	deg.	Note 7, 8
Left				70	-		
Right				70	-		
Brightness	Y_L	θ =0°	320	400		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		

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.

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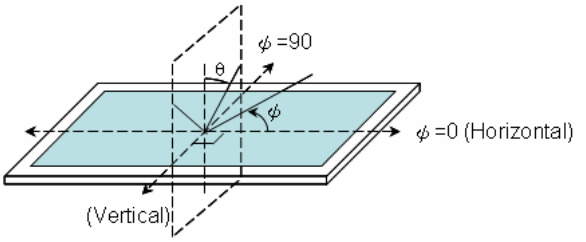

Note 7. The viewing angles are measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

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

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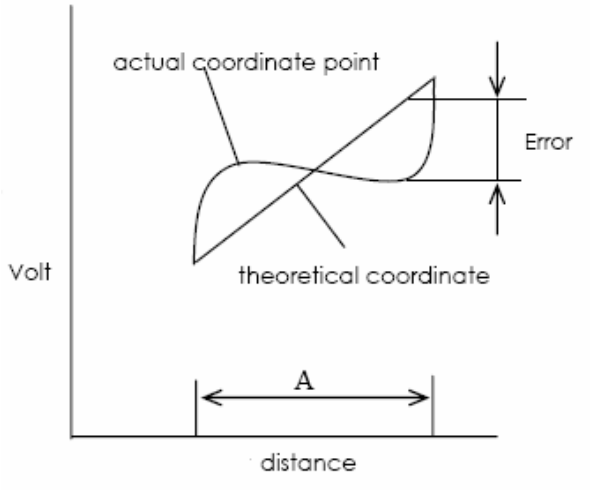
G. Touch Screen Panel Specifications

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
Operation Force (Pen or Finger)	--	100	g	Note 1

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

3. Life test Condition

Item	Min.	Max.	Unit	Remark
Notes Life	10^5	--	times	Note 1, 2
Input Life	10^6	--	times	Note 1, 3

Note 1: Measurement condition of Operation Force: Within ”guaranteed active area”. Resistance, Insulation resistance, and operation force should be under H.2 & H.3 condition.

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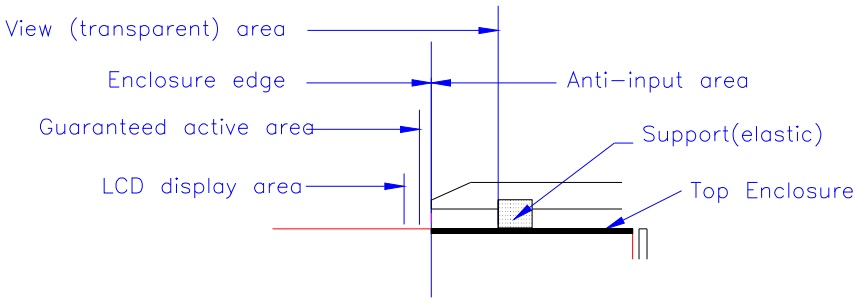
4. Attention

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.

Recommendation of the cushion area:



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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= -30°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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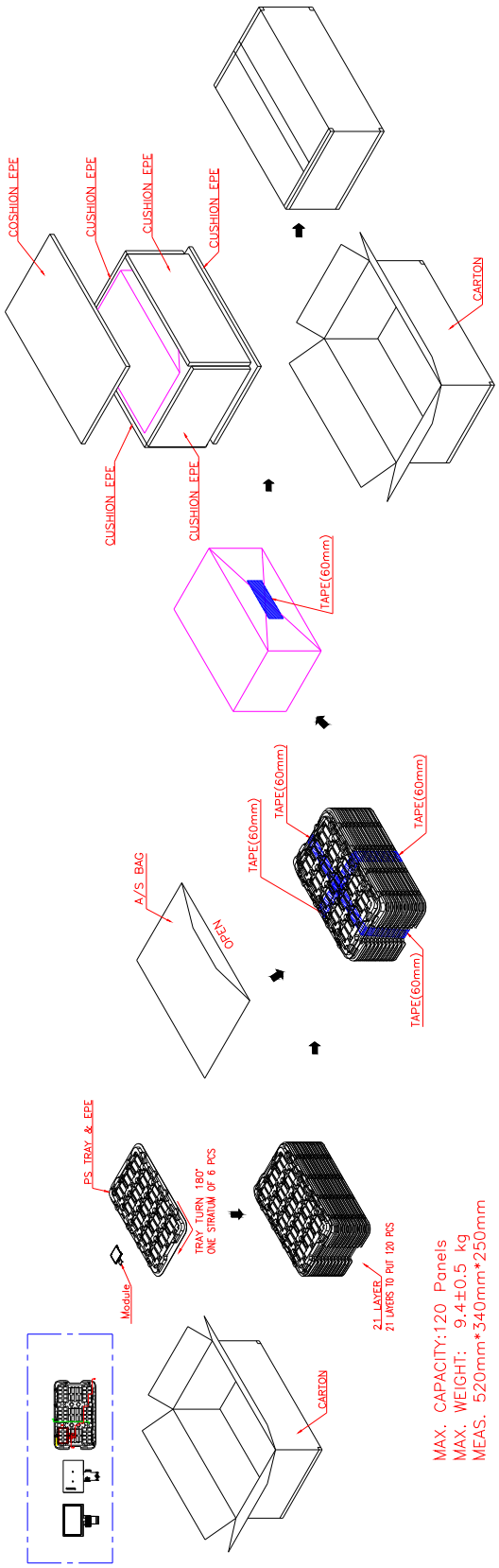
I. Packing Form



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