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LIQUID CRYSTAL DISPLAY MODULE

Product Specification

CUSTOMER	Standard
CUSTOMER PART NUMBER	
PRODUCT NUMBER	DET080SVNTCMI-1A

Product Mgr	Design Eng
Bruno Recaldini	Luo Luo
Date: 08-March-13	Date: 08-March-13

Approval for Specification only

Approval for Specification and Sample

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3. Module Numbering System

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	E	T	0	8	0	S	V	N	T	C	M	U	-	1	A

1	D	
2	E	DENSITRON Standard TFT
3	T	
4~6	0 8 0	TFT Size: 035=3.5" , 043=4.3" , 057=5.7" , 070=7" , 080=8" , 101=10.1"
7~8	S V	TFT Resolution: QQ: 480X272 (WQVGA) , VG: 640X480 (VGA) SV: 800X600 (SVGA) , WS: 1024X600 (WSVGA)
9	N	TFT Brightness: N: Normal Brightness , H: High Brightness
10	T	TFT Interface System: T: TTL , L: LVDS
11~13	C M U	Touch Type: NT: Non-Touch , CS: Capacitive Single Touch , CM: Capacitive Multi Touch , RS: Resistive Single Touch , RM: Resistive Multi Touch Touch Interface: 0: No interface , U: USB I/F , I: I2C I/F , S: SPI I/F
14	-	
15~16	1	Revision
	A	A: Standard, W: Wide Viewing Angle

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4. Application

This specification is applied to the 8.0 inch SVGA supported TFT-LCD module With Projected Capacitive Touch (PCT) and can display true 262,144 colors (8 bit/ color). The module is designed for OA, Car TV application and other electronic products which require flat panel display of digital signal interface. This module is composed of 8.0”TFT-LCD panel, a driver circuit and LED backlight unit.

5. Features

- SVGA (800×600 pixels) resolution.
- Digital 24 bit parallel RGB.
- Dot inversion mode with stripe type.
- Projected Capacitive Touch
 - USB Interface
 - Multi Touch (Ten points)

6. General Specifications

Item	Specifications	Unit
Screen Size	8.0 (Diagonal)	inch
Display Format	800RGB(H)×600(V)	dot
Active Area	162.0(H)×121.5(V)	mm
Dot Pitch	0.0675(H)×0.2025(V)	mm
Pixel Configuration	RGB Vertical Stripe	-
Display Mode	TN Type Transmissive Mode Normally White	-
Surface Treatment	Clear(7H)	-
Viewing Direction	6 O'clock (The Gray Inversion will appear at this direction)	-
Outline Dimension	183.0(W)×141.0(H)×7.15(D)	mm
Weight	(TBD)	g
RoHS Compliance	DENSITRON certifies this product to be in compliance with European Union Directive 2002/95/EC on the restriction of certain hazardous substances in electrical and electronic equipment.	-

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7. Absolute Maximum Ratings

7.1 Absolute Ratings of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-30	+80	°C	(1)(2)
Operating Ambient Temperature	T _{OP}	-20	+70	°C	(1)(2)

Note1: Background color changes slightly depending on ambient temperature.

This phenomenon is reversible.

Note2: Please refer to item of RELIABILITY.

7.2 Electrical Absolute Ratings

7.2.1 TFT-LCD Module

(Ta=25±2°C, GND=V_{SS}=0V, Note 1)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Digital Power Supply Voltage	V _{CC}	-0.3	5.0	V	-
Analog Power Supply Voltage	AV _{DD}	-0.5	13.5	V	-
Gate High Voltage	V _{GH}	13.0	19.0	V	-
Gate Low Voltage	V _{GL}	-12.0	-2.0	V	-
Gate High To Gate Low Voltage	V _{GH} - V _{GL}	-	31.0	V	-

7.2.2 LED Driver Absolute Maximum Ratings

(Ta=25±2°C, Note 1)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
LED Reverse Voltage	VR	-	1.2	V	Each LED (2)
LED Forward Current	IF	-	25	mA	Each LED

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed.

Note 2: VR Conditions: Zener Diode 20mA

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8. Electrical Characteristics

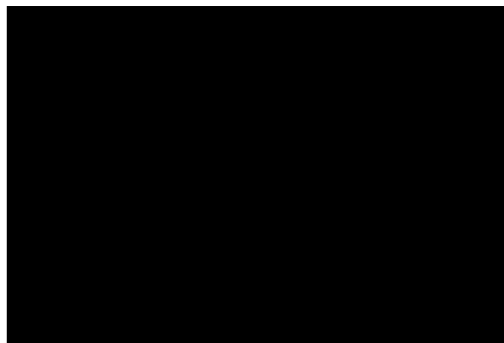
8.1 TFT-LCD Module

(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Digital Power Supply Voltage	V _{CC}	3.0	3.3	3.6	V	-
Analog Power Supply Voltage	AV _{DD}	10.2	10.4	10.6	V	-
Gate High Voltage	V _{GH}	15.3	16.0	16.7	V	-
Gate Low Voltage	V _{GL}	-7.7	-7.0	-6.3	V	-
Input signal voltage	V _{COM}	2.8	3.8	4.8	V	(2)
Digital Power Supply Current	I _{CC}	-	5.5	10.0	mA	(1)
Analog Power Supply Current	I _{A DD}		32.0	50.0	mA	(1)
Gate High Current	I _{GH}		0.2	0.5	mA	(1)
Gate Low Current	I _{GL}		0.2	1.0	mA	(1)
Input High Threshold Voltage	V _{IH}	0.7 V _{CC}	-	V _{CC}	V	-
Input Low Threshold Voltage	V _{IL}	0	-	0.3 V _{CC}	V	-
VSYNC Frequency	F _V	-	60	-	Hz	-
DCLK Frequency	DCLK	-	33.26	-	MHz	-

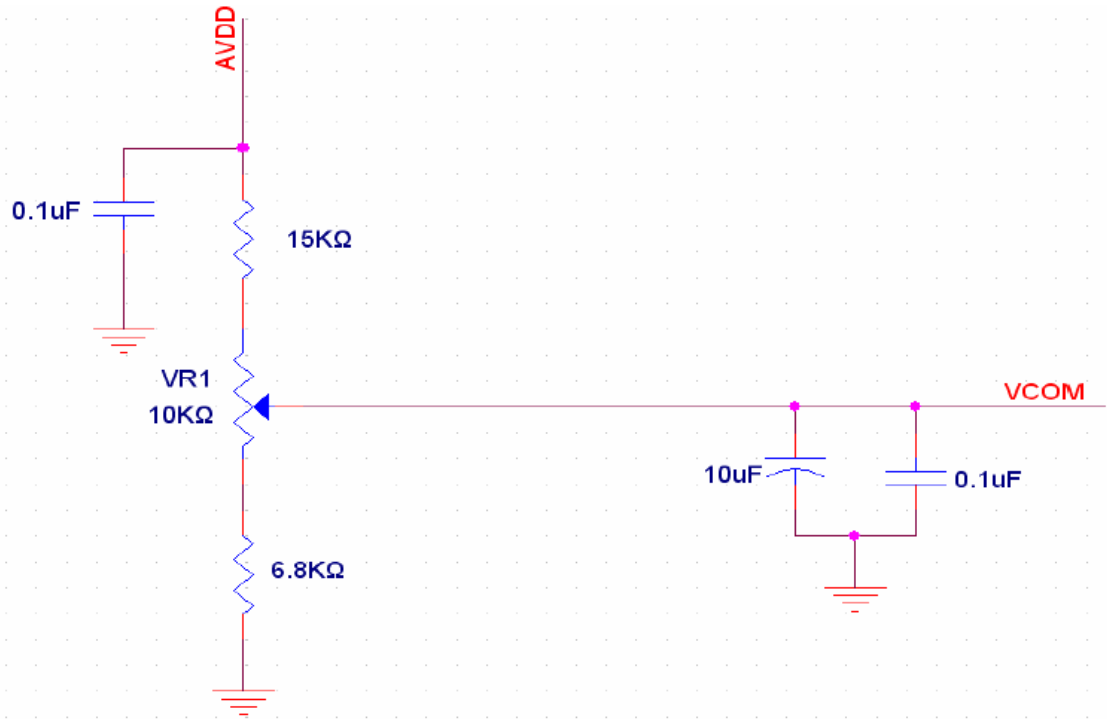
Note (1) The specified power consumption is under the conditions at V_{CC} =3.3V, AV_{DD} =10.4V, V_{GH} =16.0V, V_{GL} =-7.0V, V_{COM} =3.8V, F_V=60Hz, whereas a power dissipation check pattern below is displayed.

Black Pattern / 0 Gray



Active Area

Note 2: Typ. Vcom is only a reference value, it must be optimized according to each LCM.
Be sure to use VR;



8.2 Backlight Unit

(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Current of Backlight Unit	I _L	162	180	198	mA	-
Voltage of Backlight Unit	V _L	9.3	9.9	10.5	V	(1)
Power Consumption	P _L	-	(1.782)	-	W	-
LED Life Time(25°C)	-	20000	-	-	hr	(2)

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and I_L =180mA.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and I_L =180mA. The LED lifetime could be decreased if operating I_L is larger than 180 mA.

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8.3 Projected Capacitive Touch

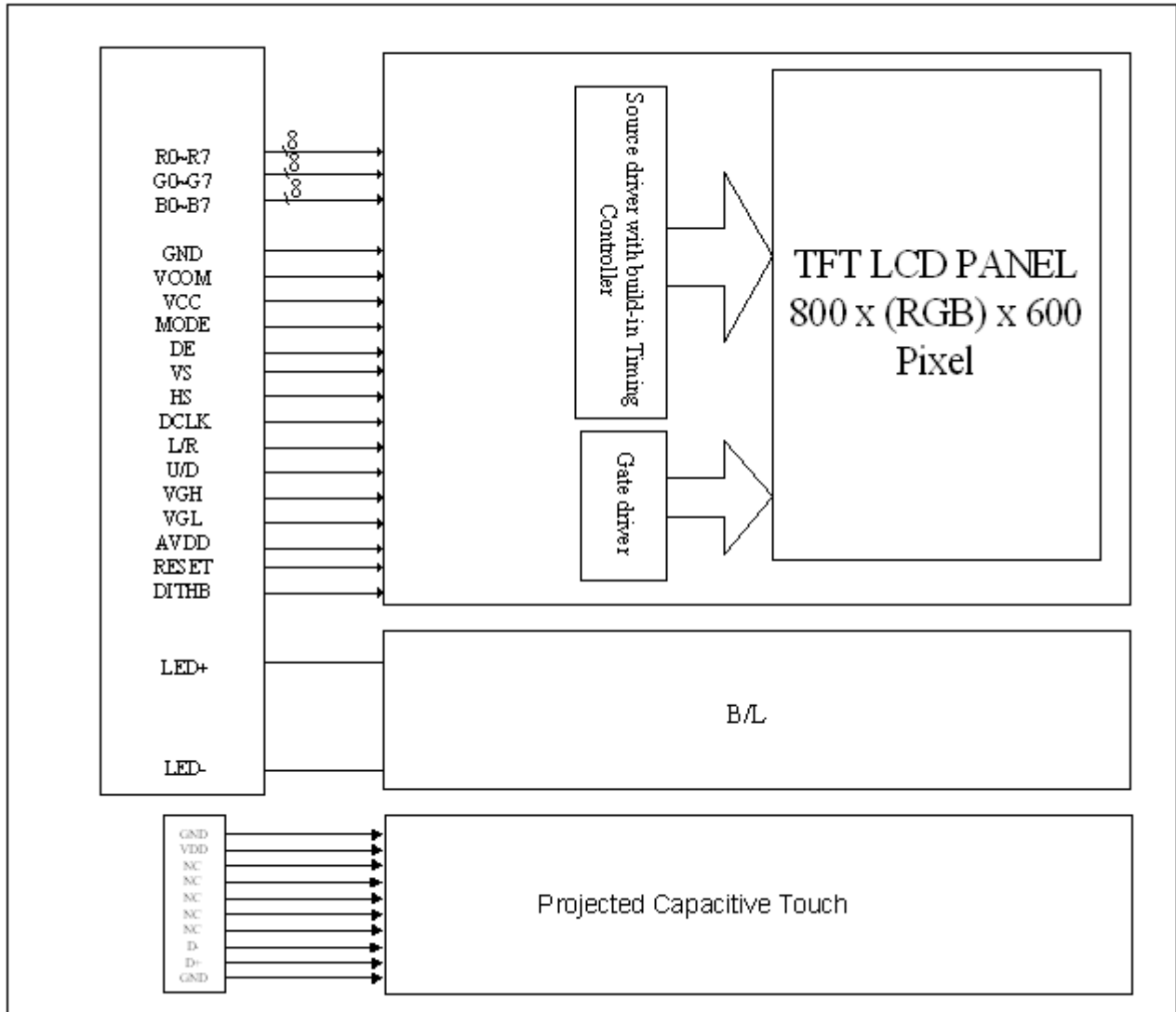
Item	Value			Unit	Note
	Min.	Typ.	Max.		
Operating Voltage	4.8	5.0	5.2	V	-
Power Supply Current	-	TBD	TBD	mA	(1)
Power Consumption	-	TBD	TBD	mW	@5.0V
Interface	USB				-
Function	Multi Touch				-

Note (1) This test condition is touched with 10 points.

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9. Block Diagram

9.1 TFT-LCD Module with Backlight Unit



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10. Input / Output Terminals Pin Assignment

10.1 TFT-LCD Module

FPC Connector is used for the module electronics interface. The recommended model is FH12A-50S-0.5SH manufactured by Hirose.

Pin No.	Symbol	I/O	Function	Remark
1	LED +	P	LED Anode	
2	LED +	P	LED Anode	
3	LED -	P	LED Cathode	
4	LED -	P	LED Cathode	
5	GND	P	Power ground	
6	V _{COM}	I	Common voltage	
7	V _{CC}	P	Power for Digital circuit	
8	MODE	I	DE/SYNC mode select	Note3
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	B7	I	Blue data(MSB)	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	
19	B0	I	Blue data(LSB)	
20	G7	I	Green data (MSB)	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	
25	G2	I	Green data	
26	G1	I	Green data	
27	G0	I	Green data (LSB)	
28	R7	I	Red data (MSB)	
29	R6	I	Red data	
30	R5	I	Red data	
31	R4	I	Red data	

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32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	
35	R0	I	Red data (LSB)	
36	GND	P	Power ground	
37	DCLK	I	Sample clock	
38	GND	P	Power ground	
39	L/R	I	Right/ left selection	Note2,5
40	U/D	I	Up/down selection	Note2,5
41	V _{GH}	P	Gate ON voltage	
42	V _{GL}	P	Gate OFF voltage	
43	AV _{DD}	P	Power for Analog circuit	
44	RESET	I	Global reset pin.	Note1
45	NC	-	No connection	
46	V _{COM}	I	Common voltage	
47	DITHB	I	Dithering function	Note 4
48	GND	P	Power ground	
49	NC	-	No connection	
50	NC	-	No connection	

I: input, O: output, P: Power

Note 1: Global reset pin. Active Low to enter Reset State. Suggest to connecting with an RC reset circuit for stability. Normally pull high.

Note 2: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	R/L	
GND	V _{CC}	Up to down, left to right
V _{CC}	GND	Down to up, right to left
GND	GND	Up to down, right to left
V _{CC}	V _{CC}	Down to up, left to right

Note 3: DE/SYNC mode select, Normally pull high.

H: DE mode.

L: HS/VS mode.

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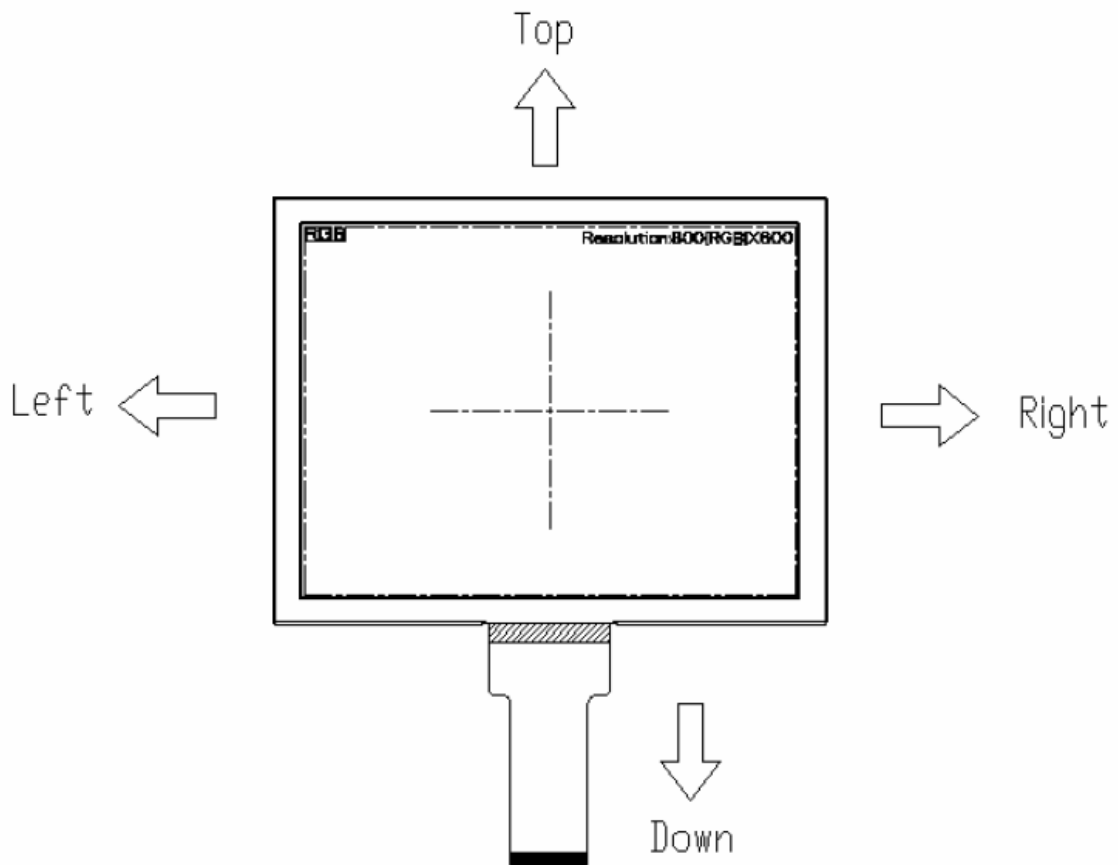
Note4: Dithering function enable control. Normally pull high.

DITHB="1", Disable internal dithering function. For 18bit RGB interface, connect two LSB bits of all the R/G/B data buses to GND.

DITHB="0", Enable internal dithering function, For TTL 24bit parallel RGB image data input.

Note 5: Definition of scanning direction.

Refer to the figure as below:



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10.2 Projected Capacitive Touch

Connector: CVILUX CF25101D0R0-05

No.	Symbol	Functions
1	GND	Ground
2	VDD	+5.0V power supply.
3	NC	Not Connected
4	NC	Not Connected
5	NC	Not Connected
6	NC	Not Connected
7	NC	Not Connected
8	D-	Data-
9	D+	Data+
10	GND	Ground

10.3 Color Data Input Assignment

The brightness of each primary color (red, green and blue) is based on the 8 bit gray scale data input for the color. The higher the binary input, the brighter the color. The table provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Gray Scale Of RED	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(1)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0		
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0		
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0		
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0		
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0		
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1		

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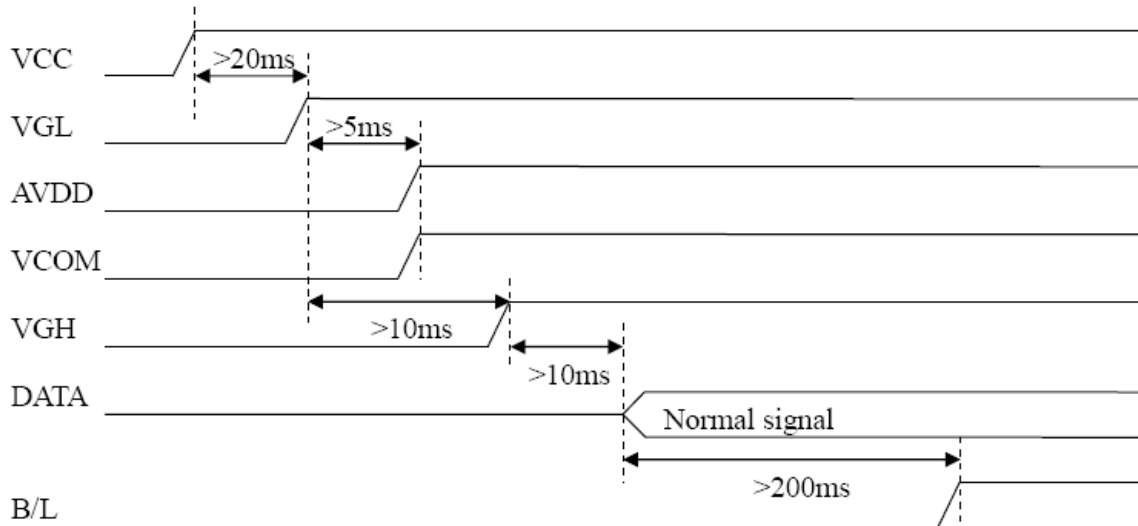
11. Interface Timing

11.1 Input Signal Characteristics

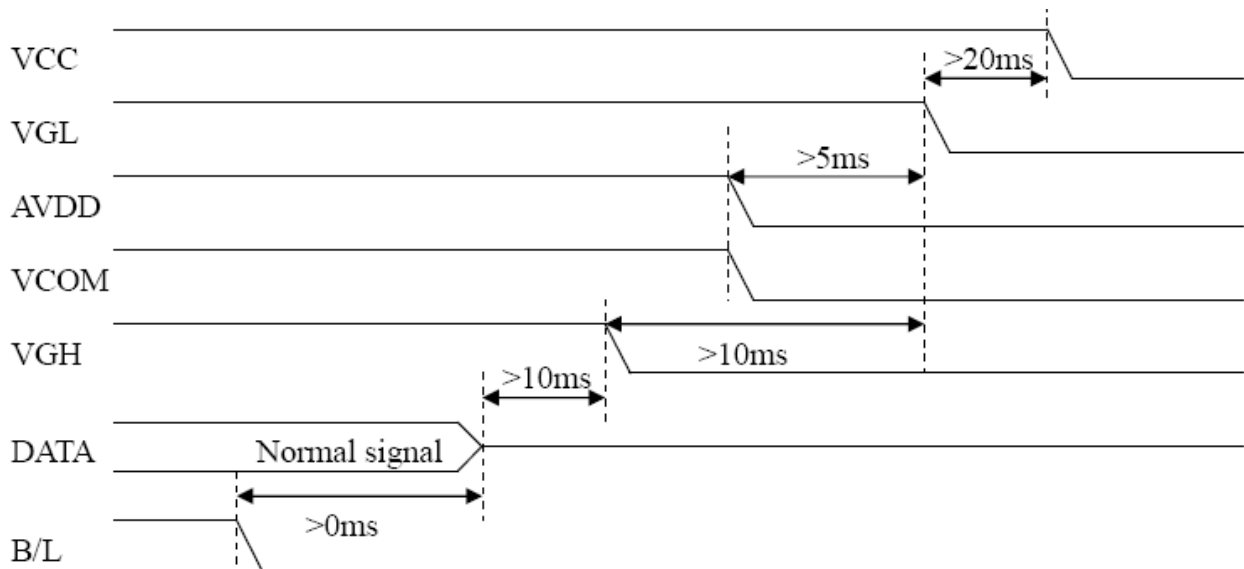
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	T_{hst}	8	-	-	Ns	
HS hold time	T_{hhd}	8	-	-	Ns	
VS setup time	T_{vst}	8	-	-	Ns	
VS hold time	T_{vhd}	8	-	-	Ns	
Data setup time	T_{dsu}	8	-	-	Ns	
Data hole time	T_{dhd}	8	-	-	Ns	
DE setup time	T_{esu}	8	-	-	Ns	
DE hole time	T_{ehd}	8	-	-	Ns	
VDD Power On Slew rate	T_{POR}	-	-	20	ms	
RSTB pulse width	T_{Rst}	10	-	-	us	
CLKIN cycle time	T_{coh}	20	-	-	Ns	
CLKIN pulse duty	T_{cwh}	40	50	60	%	
Output stable time	T_{sst}	-	-	6	us	

11.2 Power Sequence

Power on:



Power off:



Note: Data include R0~R7, B0~B7, GO~G7, STLR,UPDN, DCLK, HS,VS,DE.

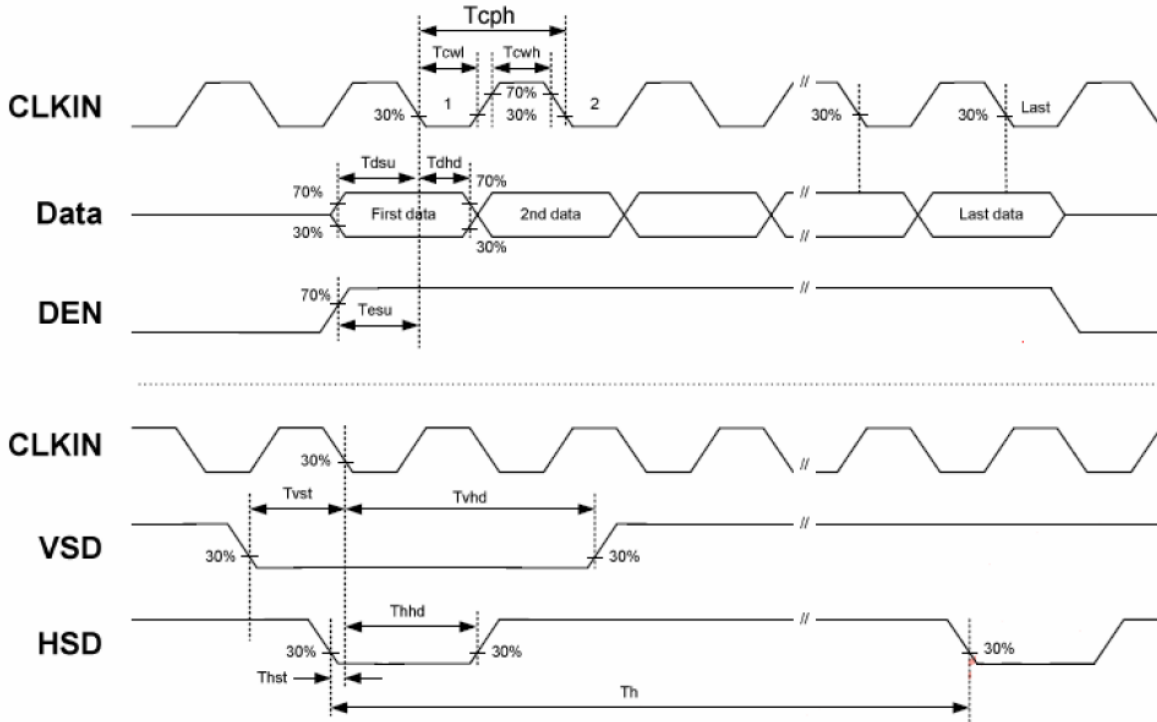
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11.3 Timing

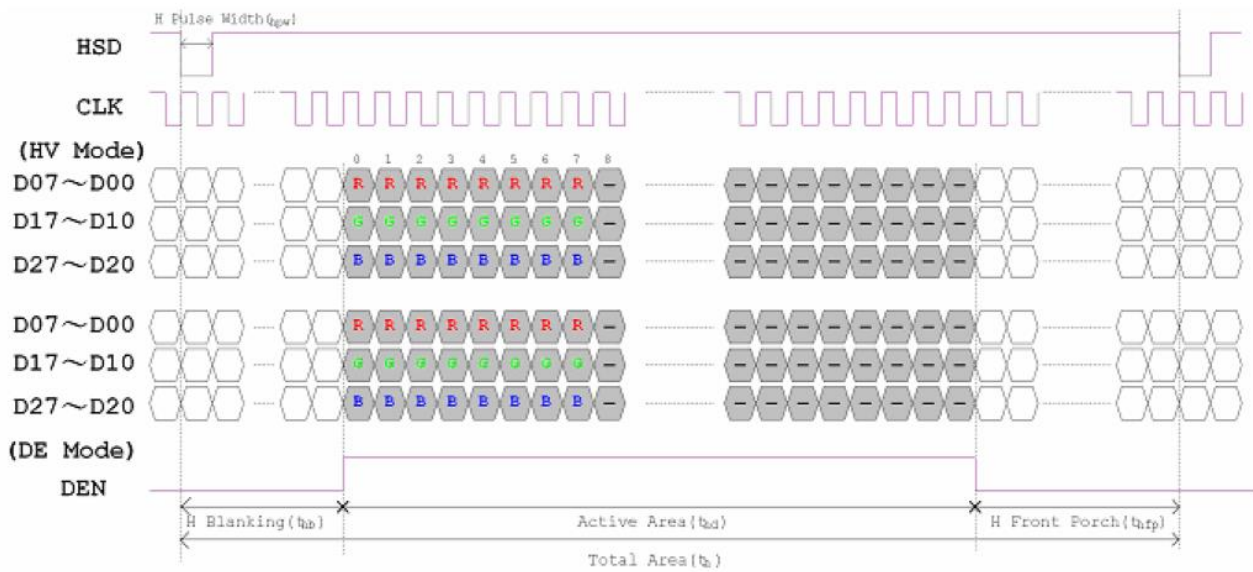
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	-	40	50	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Back Porch(Blanking)	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	600	-	TH	
VS period time	tv	624	635	700	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Back Porch(Blanking)	tvb	23	23	23	TH	
VS Front Porch	tvfp	1	12	77	TH	

11.4 Waveform



Input Clock and Data Timing Diagram



Horizontal input timing diagram.

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11.5 USB Interface

11.5.1 Single Touch Function

Single Touch Function works with plug'n play under system Windows 2000, Windows XP and Windows7 and Windows8.

For other operating systems like Linux a driver must be programmed.

11.5.2 Multi Touch Function

The Multi Touch Function works with plug'n play under system Windows7 and Windows8.

For older Windows systems or other operating systems a driver must be programmed.

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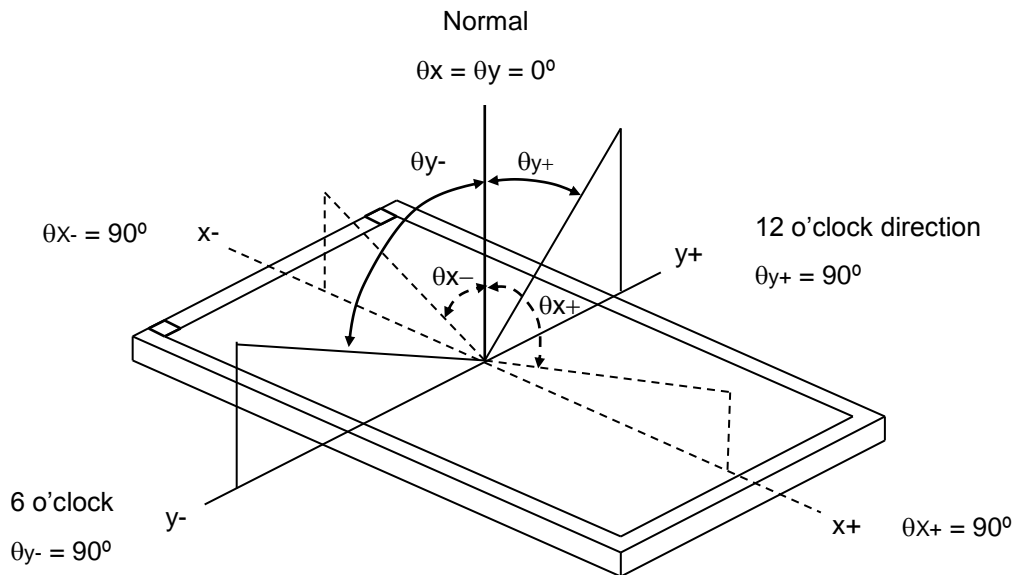
12. Optical Characteristics

The optical characteristics should be measured in a dark environment (≤ 1 lux) or equivalent state with the methods shown in Note (4).

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing Normal Angle	400	(500)	-	-	(2)
Response Time		T_R		-	10	20	ms	(3)
		T_F		-	15	30	ms	
Luminance(Center)		Y		170	(210)	-	cd/m ²	(4)
Brightness uniformity		BUNI		70	(75)	-	%	(5)
Color Chromaticity	White	W_x	0.26	0.31	0.36	-	(1),(4)	
		W_y	0.28	0.33	0.38	-		
Viewing Angle	Horizontal	θ_{x+}	CR \geq 10	60	(70)	-	deg.	
		θ_{x-}		60	(70)	-		
	Vertical	θ_{y+}		40	(50)	-		
		θ_{y-}		60	(70)	-		

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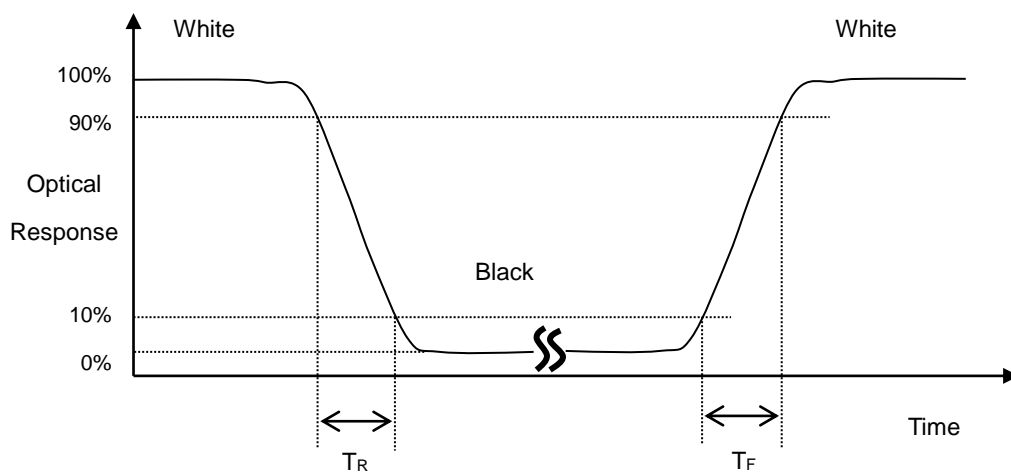
Note (1) Definition of Viewing Angle (θ_x , θ_y):



Note (2) Definition of Contrast Ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

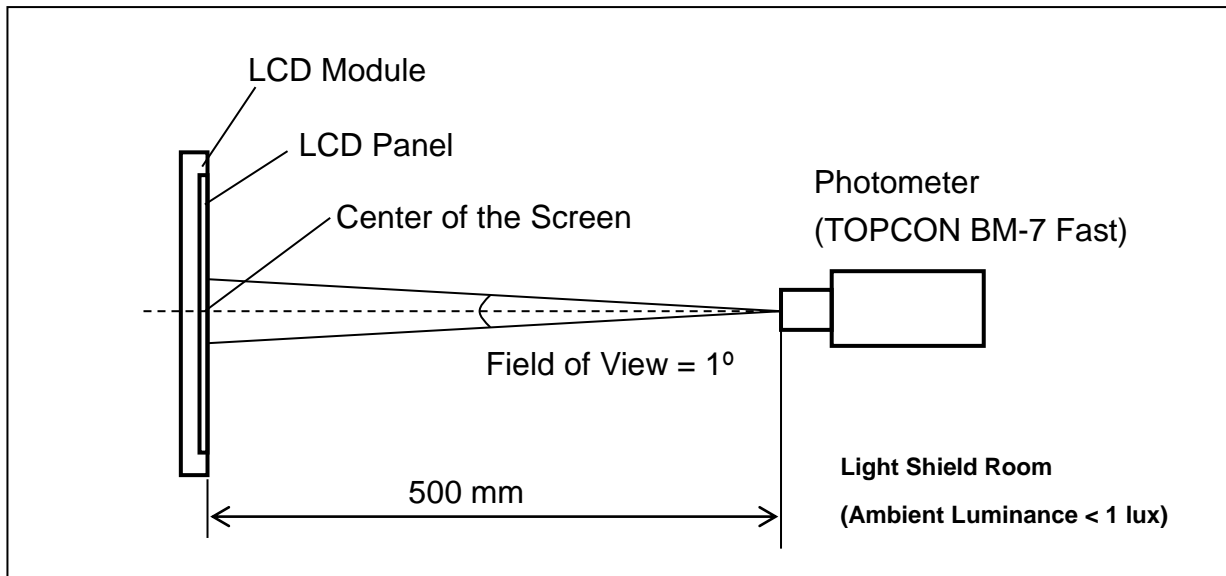
Note (3) Definition of Response Time (T_R , T_F):



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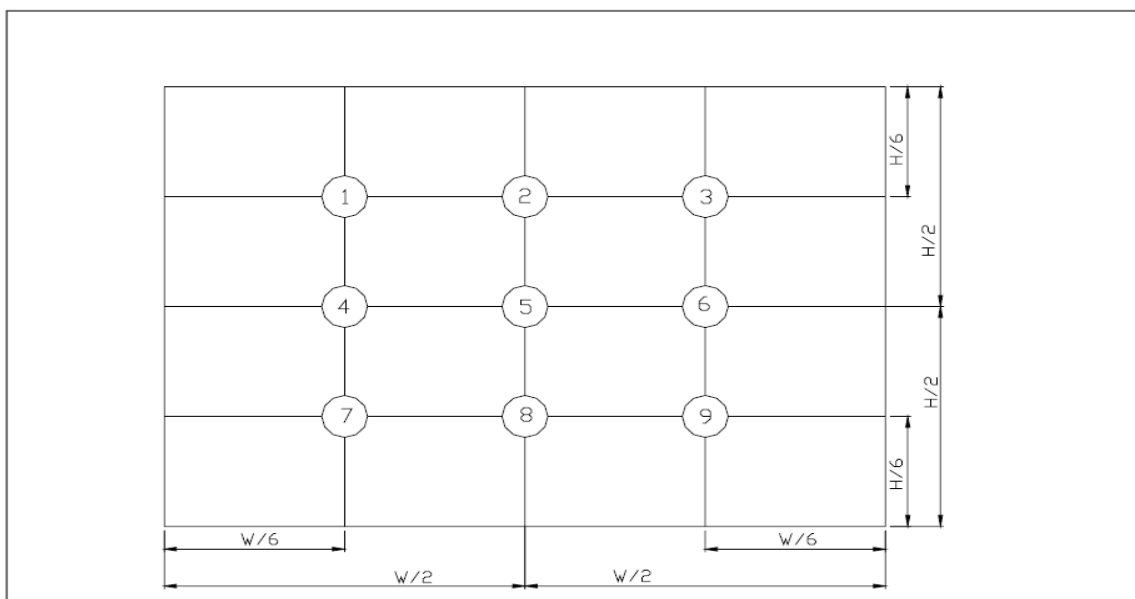
Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a windless room.



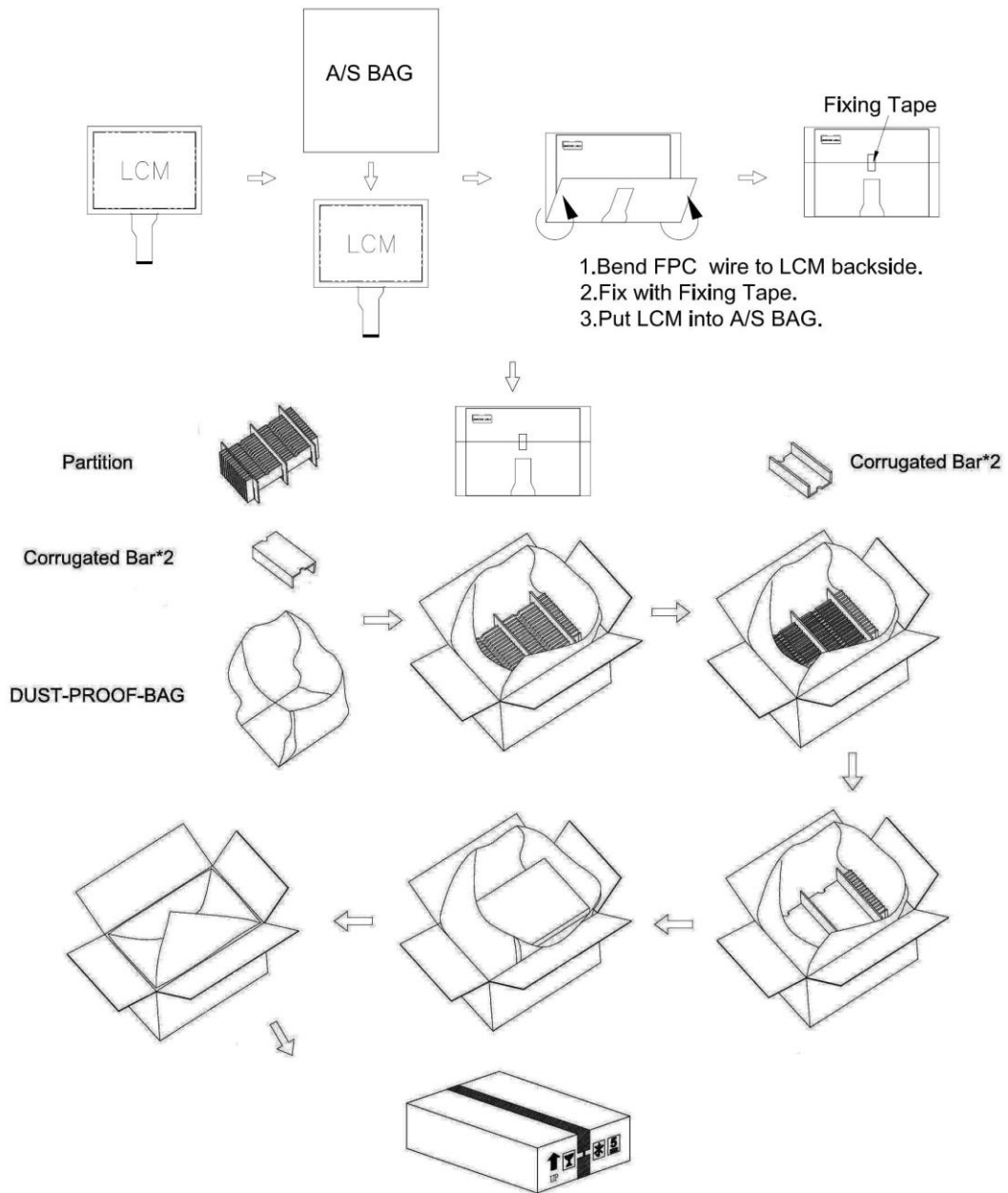
Note (5) Definition of brightness uniformity

$$\text{Brightness uniformity} = (\text{Min Luminance of 9 points}) / (\text{Max Luminance of 9 points}) \times 100\%$$



(單位 : mm)

14. Packaging



PARTS LIST					
	ITEM	SIZE(LxWxH) unit:mm	MATERIAL	Q.T.Y	NOTE
1	PARTITION	512.0x349.0x226.0	CORRUGATED PAPER	1	
2	CORRUGATED BAR	349.0x186.0x38.0	CORRUGATED PAPER	4	
3	DUST-PROOF BAG	700.0x530.0	PE	1	
4	A/S BAG	220.0x200.0x0.2	PE	30	
5	CARTON	530.0x355.0x255.0	CORRUGATED PAPER	1	
6	PRODUCT	183.0x141.0x7.15		30	

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15. Precautions

15.1 Assembly and Handling Precautions

- (1) Do not apply rough force such as bending or twisting to the module during assembly.
- (2) It's recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- (3) Don't apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.
- (4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.
- (5) Do not plug in or pull out the I/F connector while the module is in operation.
- (6) Do not disassemble the module.
- (7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- (8) Moisture can easily penetrate into LCD module and may cause the damage during operation.
- (9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD module in the specified storage conditions.
- (10) When ambient temperature is lower than 10°C, the display quality might be reduced. For example, the response time will become slow.

15.2 Safety Precautions

- (1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- (2) After the module's end of life, it is not harmful in case of normal operation and storage.

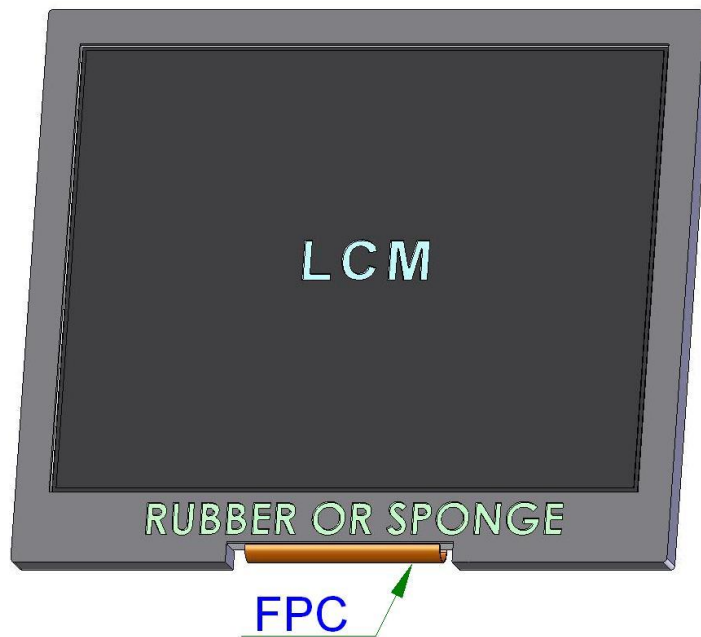
15.3 Terms of Warrant

- (1) Acceptance inspection period
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- (2) Applicable warrant period
The period is within twelve months since the date of shipping out under normal using and storage conditions.

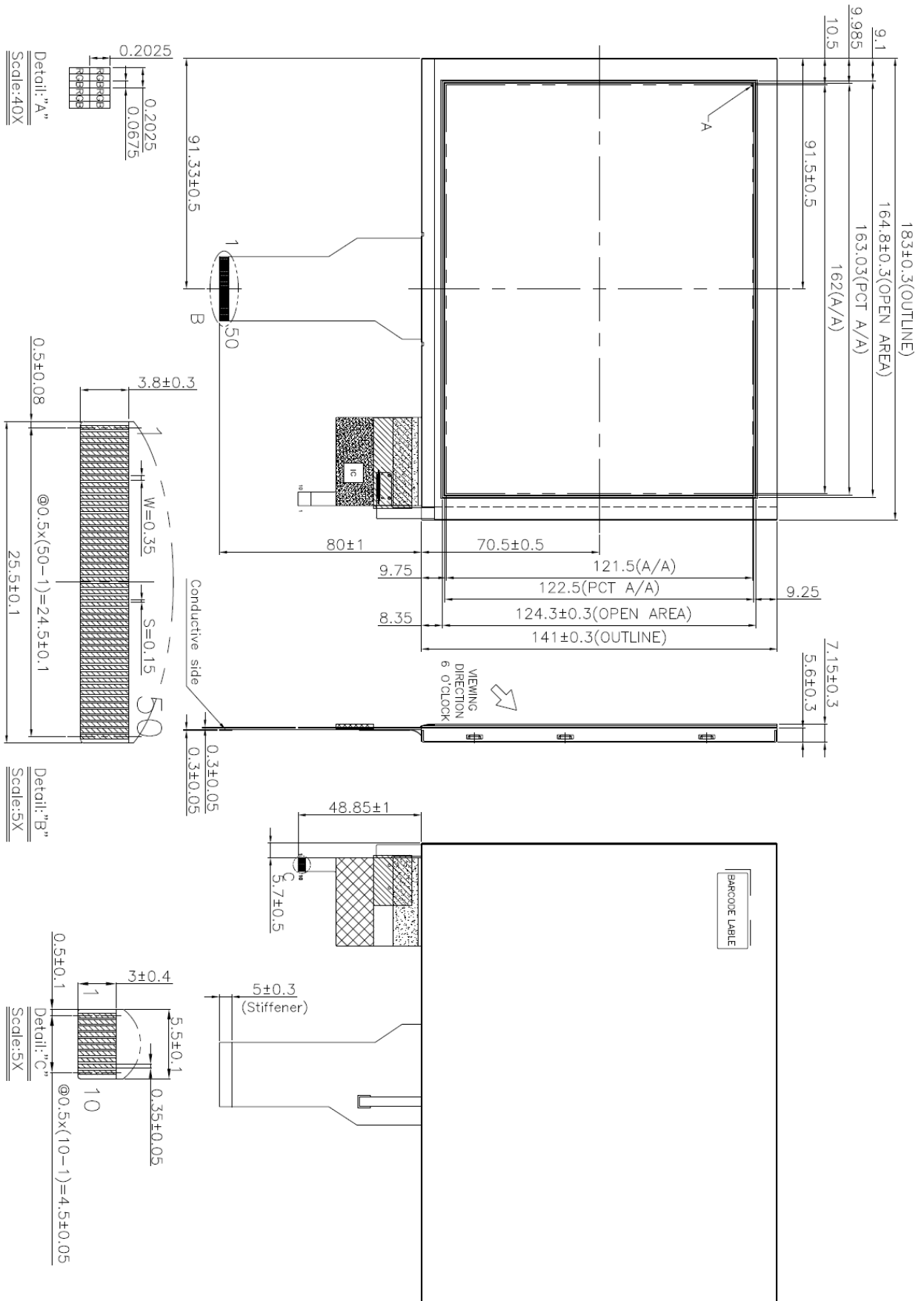
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15.4 Cautions for LCM's installing and assembling

Please keep away the FPC while assembling or fixing the LCM to avoid FPC being damaged or extruded or other related problems. Please see below picture.



16. Outline Drawing



17. Incoming Inspection Standards

17.1 The environmental condition of inspection

The environmental condition and visual inspection shall be conducted as below.

- (1) Ambient temperature $25 \pm 5^{\circ}\text{C}$
- (2) Humidity: $60 \pm 5\%$ RH
- (3) Viewing distance is approximately 35 ~ 40 cm
- (4) Viewing angle is normal to the LCD panel as Fig _1(10°)
- (5) Ambient Illumination: 300 ~ 500 Lux for external appearance inspection

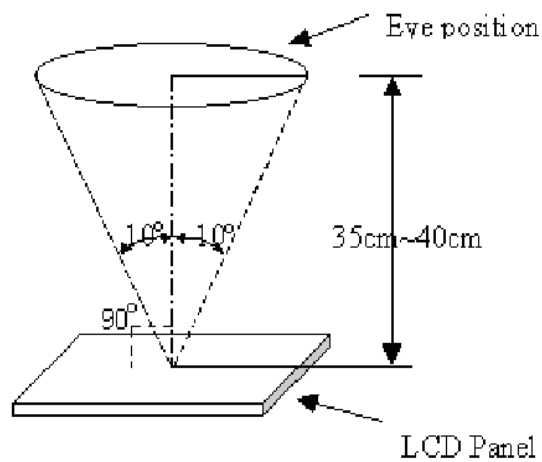


Fig _ 1

17.2 The defects classify of AQL as following:

- (1) Test method :According to [ANSI/ASQC Z 1.4](#) .General Inspection Level II take a single time
- (2) The defects classify of AQL as following:

Class of defects	AQL	Definition
Major	0.65%	It is defect that is likely to result in failure or to reduce materially the usability of the intended function.
Minor	1.5%	It is a defect that will not result in functioning problem with deviation classified.

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17.3 Inspection Parameters

Item		Specification/Description			Note	
Display	Function	No Display			-	
		Malfunction			-	
Operating	Contrast ratio	Out of Spec			-	
	Line defect	No obvious Vertical and Horizontal line defect in bright , dark and colored.			-	
Operating	Point Defect (red,green,blue,dark, white)	Item	Acceptable number		Note: 1、4、 5、6	
			A	B		Total
		BRIGHT DOT	$N \leq 0$	$N \leq 2$		$N \leq 6$
		DARK DOT	$N \leq 2$	$N \leq 4$		
		TOTAL DOT	$N \leq 2$	$N \leq 4$		
		TWO ADJACENT DOT	NOT ALLOWED			
THREE OR MORE ADJACENT DOT	NOT ALLOWED					
External Inspection (non-operating)	Scratch on the polarizer	L(mm)	W(mm)	Acceptable number	Note:2	
		$L \leq 2.5$	$W \leq 0.1$	3		
		$L > 2.5$	$W > 0.1$	0		
	Dent or bubble on the polarizer	Dimension(mm)		Acceptable number	Note:3	
		$D \leq 0.3$		3		
		$D \leq 0.15$		Disregard		
	Line Criteria or Dot Criteria on the polarizer	Inactive dot		Acceptable number	Note:2 、3	
		$D \leq 0.2$		Disregard		
		$0.2 \leq D \leq 0.3\text{mm}$		Line & dot number $N \leq 6$		
		$L \leq 1.8\text{mm}, W \leq 0.1\text{mm}$				

Incoming Inspection Touch Panel

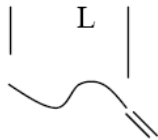
Circular Defects
Linear Defects
Scratch
Air Bubble
Crack

(1) Circular Defects

$$\phi = (L+W)/2$$

Diameter(mm)	Spec
$\phi \leq 0.2$	No quantity limit
$0.2 < \phi < 0.4$	Max 5 defect
$0.4 \leq \phi$	Reject

(2) Linear Defects



Length	Width	Acceptable
$6.0 \geq L$	$0.06 \geq W$	Accept
$L \geq 6.0$	$W \geq 0.06$	Reject

(3) Scratch

Length	Width	Acceptable
$12.0 \geq L$	$0.06 \geq W$	Accept
$L \geq 12.0$	$W \geq 0.06$	Reject

The Min distance of defects must be above 5.0mm.

(4) Air Bubble

Diameter(mm)	Spec
$\phi \leq 0.2$	No quantity limit
$0.2 < \phi \leq 0.6$	Max 5 defect

The Min distance of defects must be above 5.0mm.

(5) Crack **Reject**

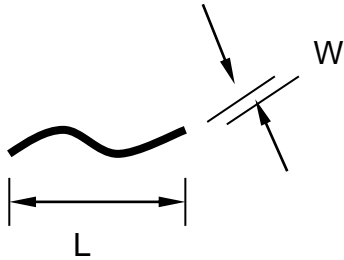


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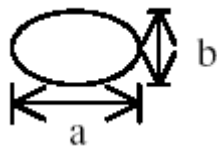
Note1. The definition of dot defect :

The dot defect was judged after repair and the size of a defective dot over 1/2 of whole dot is regarded as one defective dot.

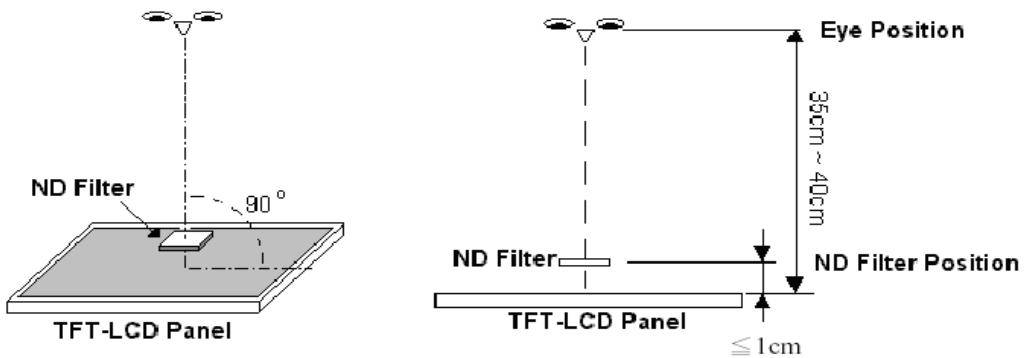
Note2.



Note3. D : Diameter $D=(a+b)/2$



Note4. Bright dot is defined through 6% transmission ND Filter as following.

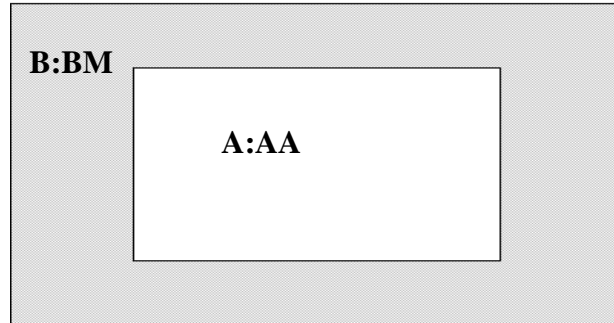


Note5. ADJACENT DOT



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Note6.



17.4 Handling of LCM

- (1) Don't give external shock.
- (2) Don't apply excessive force on the surface.
- (3) Liquid in LCD is hazardous substance. Must not lick and swallow. when the liquid is attach to your hand, skin, cloth etc. Wash it out thoroughly and immediately.
- (4) Don't operate it above the absolute maximum rating.
- (5) Don't disassemble the LCM.