



CDTech(H.K.)Electronics Limited

Product Specification

Model Name	S024HQ35NN
Description	TFT LCD Module 2.4" QVGA 240(RGB)x320 Dots
Date	2016/10/12
Version	1.0

Approved by/Date	Check by/Date	Prepared by/Date
Sam 2016/10/12	Borger 2016/10/12	Li Huang 2016/10/12

Customer Approval	
Date	



CDTech(H.K.)Electronics Limited

Table of Contents

1. Record of Revision.....	3
2. General Specifications.....	4
3. Input/Output Terminals.....	5
4. Absolute Maximum Rating.....	6
5. Timing characteristics.....	6
6. Interface Timing.....	7
7 Optical Characteristics.....	12
8 Environmental / Reliability Tests.....	16
9 Mechanical Drawing.....	17
10 Packing.....	18
11 TFT-LCD Module Inspection Criteria.....	19
12 Precautions for Use of LCD modules.....	24



2. General Specifications

	Feature	Spec
Characteristics	Size	2.4 inch
	Resolution	240(horizontal)*320(Vertical)
	Interface	SPI+ RGB
	Connect type	Welding
	Display Colors	16.7M
	Technology type	a-Si
	Pixel pitch (mm)	0.153*0.153
	Pixel Configuration	R.G.B.-Stripe
	Display Mode	Normally White
	Driver IC	ILI9341
	Viewing Direction	6 O' clock
Mechanical	LCM (W x H x D) (mm)	42.72*60.26*2.20
	Active Area(mm)	36.72*48.96
	Weight (g)	TBD
	LED Numbers	4 LEDs

Note 1: Requirements on Environmental Protection: RoHs

Note 2: LCM weight tolerance: +/- 5%

3. Input/Output Terminals

No.	Symbol	Description
1	GND	Ground
2	VCI	Analog power supply
3	VDDI	Digital power supply
4	GND	Ground
5	DB17	Data input
6	DB16	
7	DB15	
8	DB14	
9	DB13	
10	DB12	
11	DB11	
12	DB10	
13	DB9	
14	DB8	
15	DB7	
16	DB6	
17	DB5	
18	DB4	
19	DB3	
20	DB2	
21	DB1	
22	DB0	
23	SDA	Serial data input/output signal
24	DOTCLK	Dot clock signal for RGB interface operation
25	DE	Data enable signal for RGB interface operation
26	VSYNC	Frame synchronizing signal for RGB interface operation
27	HSYNC	Line synchronizing signal for RGB interface operation
28	SCL	Serial clock input signal The data is applied on the rising edge of the SCL signal
29	CSX	Chip Select Signal
30	RESX	Reset signal; Must be reset after power is supplied
31	GND	Ground
32	LEDA	Back light anode LEDA
33-36	LEDK1-K4	Back light cathode

4. Absolute Maximum Rating

Item	Symbol	MIN	Typ	MAX	Unit	Remark
Supply Voltage	V _{DD}	2.5	-	4.8	V	-
Operating Temperature	T _{OPR}	-20	-	70	°C	-
Storage Temperature	T _{STG}	-30	-	80	°C	

5. Timing characteristics

5.1 ELECTRICAL CHARACTERISTICS

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Analog Supply Voltage	V _{CC}	2.5	2.8	3.3	V	
Logic Signal Input /Output Voltage	IOVCC	1.65	1.8	3.3	V	
Input Signal Voltage	Low Level	V _{IL}	V _{SS}	-	0.3x IOVCC	V
	High Level	V _{IH}	0.7x IOVCC	-	IOVCC	V
TFT Common Electrode	V _{COMH}	2.5	-	5	V	
TFT Gate ON Voltage	V _{GH}	10	-	16	V	
TFT Gate ON Voltage	V _{GL}	-10	-	-5	V	

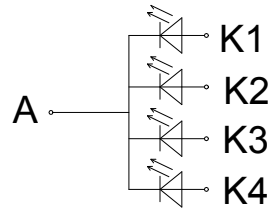
5.2 LED Driving Conditions

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I _F	-	80	-	mA	
Forward Voltage	V _F	-	3.2	3.3	V	
LED Lifetime		-	25000	-	Hrs	

Note 1: Each LED: I_F =20 mA, V_F =3.2±0.2V.

Note 2: Optical performance should be evaluated at T_a=25°C only.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life Time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

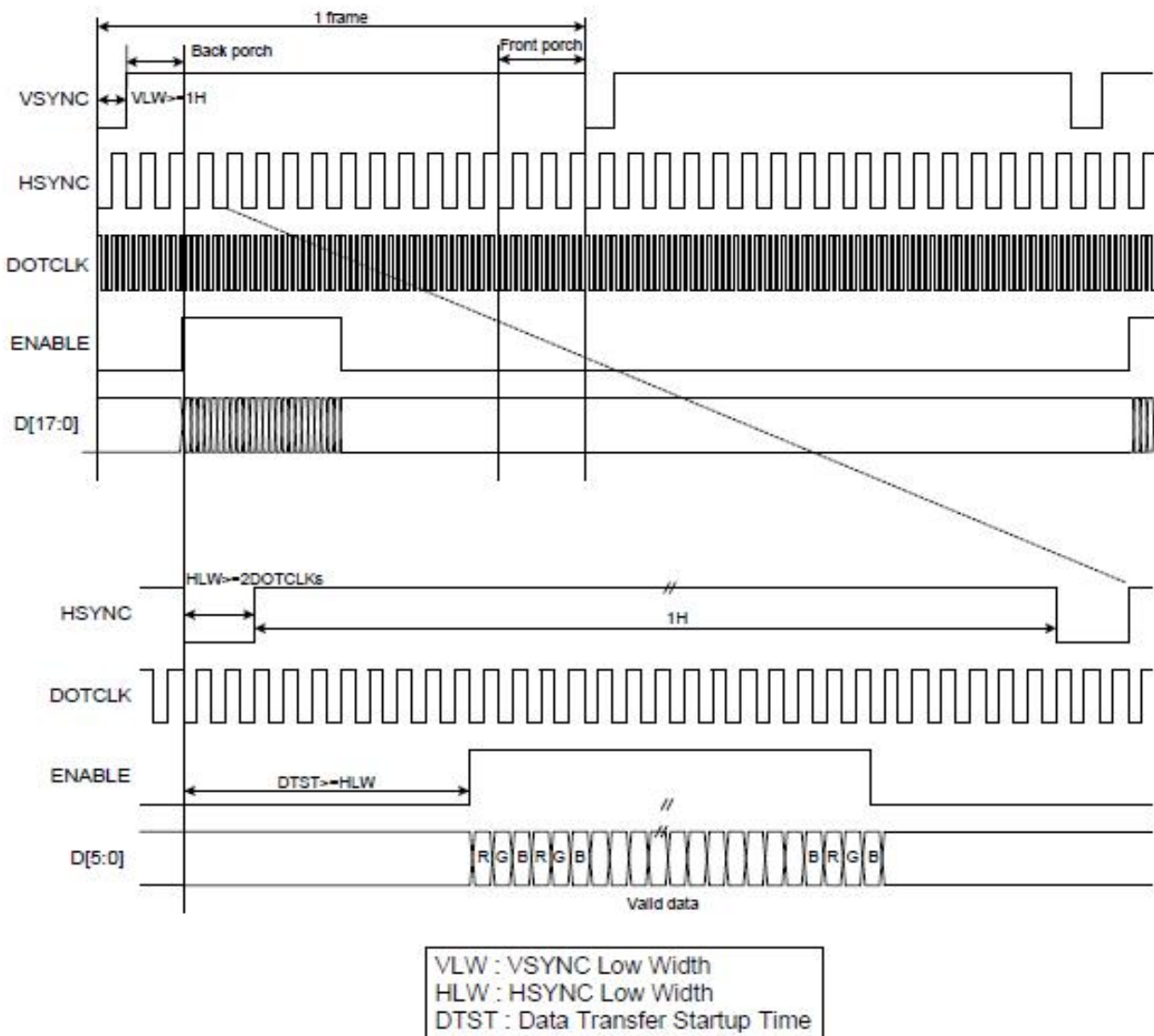


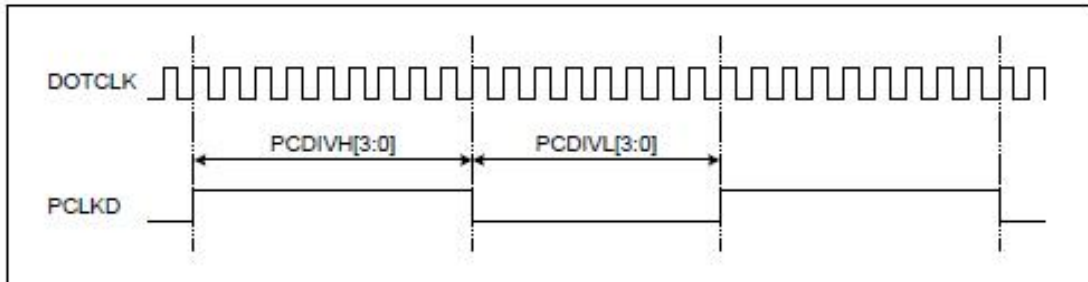
CIRCUIT DIAGRAM

Figure: LED connection of backlight(Constant Current)

6 Interface Timing

The timing chart of 18-/16-bit RGB interface mode is shown as below.

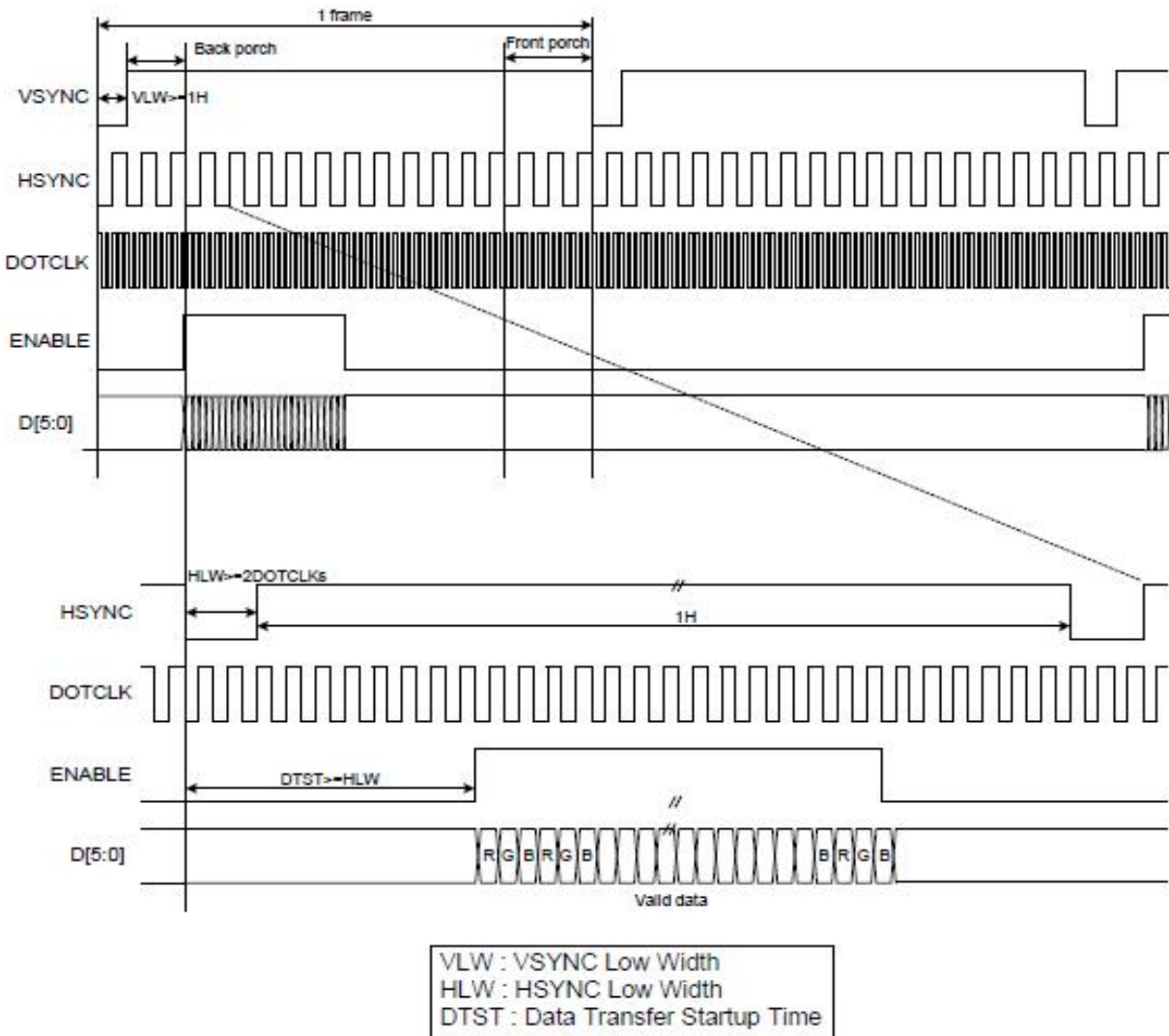


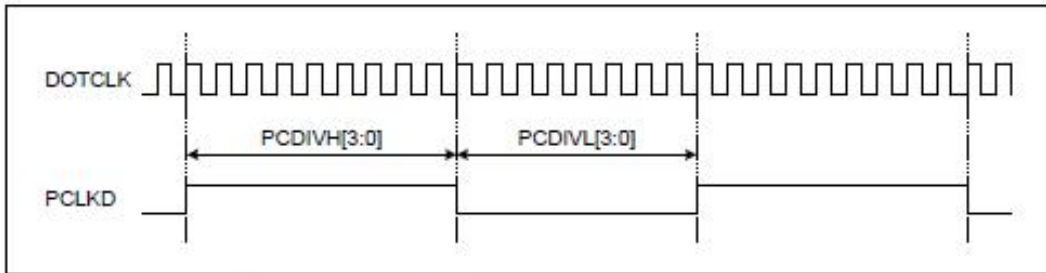


Note 1: The DE signal is not needed when RGB interface SYNC mode is selected.

Note 2: VSPL='0', HSPL='0', DPL='0' and EPL='0' of "Interface Mode Control (B0h)" command.

The timing chart of 6-bit RGB interface mode is shown as below:



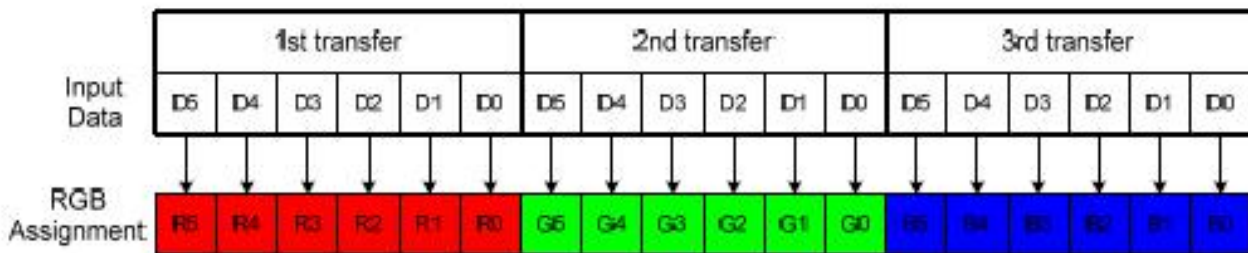


Note 1: The DE signal is not needed when RGB interface SYNC mode is selected.

Note 2: VSPL='0', HSPL='0', DPL='0' and EPL='0' of "Interface Mode Control (B0h)" command.

Note 3: In 6-bit RGB interface mode, each dot of one pixel (R, G and B) is transferred in synchronization with DOTCLK.

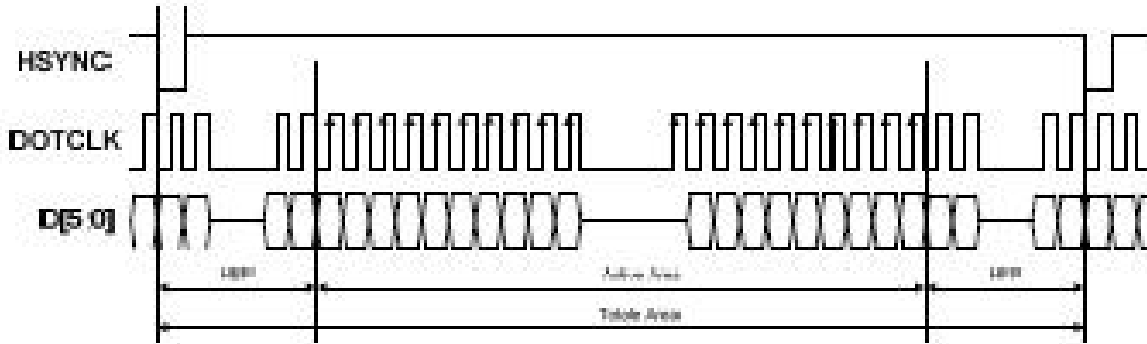
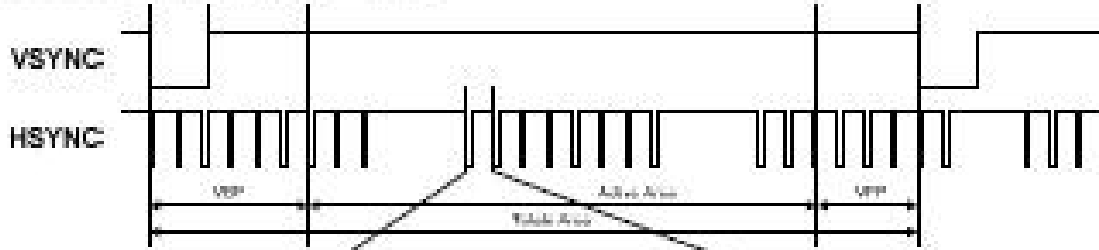
262K color: 18-bit/pixel (RGB 6-6-6 bits input)



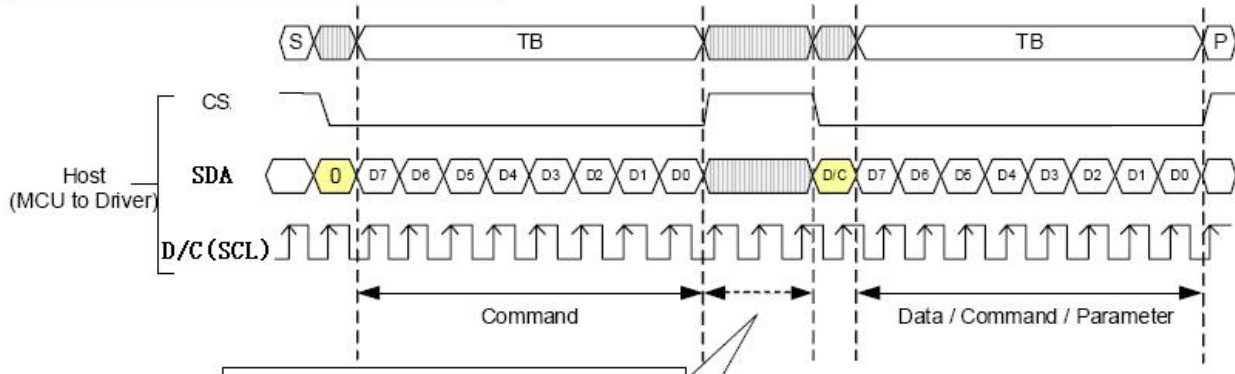
ILI9341 has data transfer counters to count the first, second, third data transfer in 6-bit RGB interface mode. The transfer counter is always reset to the state of first data transfer on the falling edge of VSYNC. If a mismatch arises in the number of each data transfer, the counter is reset to the state of first data transfer at the start of the frame (i.e. on the falling edge of VSYNC) to restart data transfer in the correct order from the next frame. This function is expedient for moving picture display, which requires consecutive data transfer in light of minimizing effects from failed data transfer and enabling the system to return to a normal state.

Note that internal display operation is performed in units of pixels (RGB: taking 3 inputs of DOTCLK). Accordingly, the number of DOTCLK inputs in one frame period must be a multiple of 3 to complete data transfer correctly. Otherwise it will affect the display of that frame as well as the next frame.

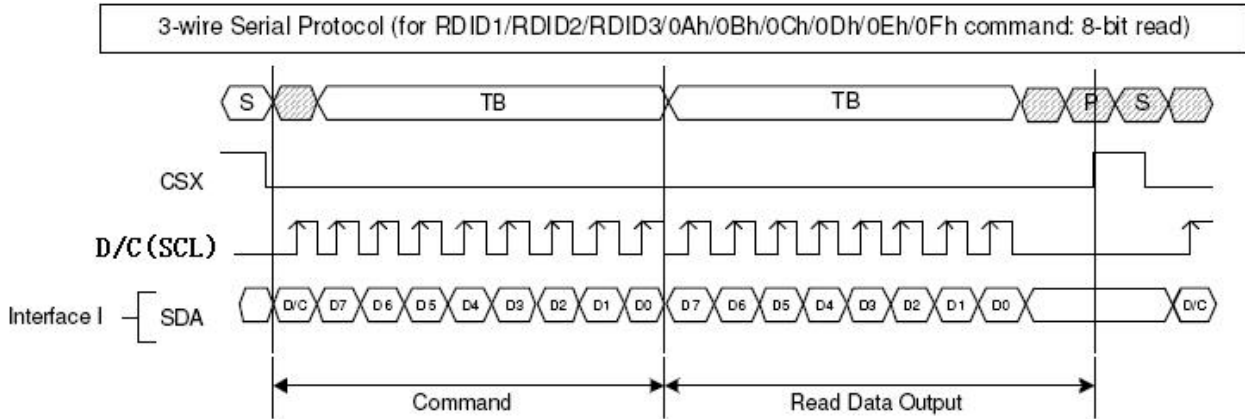
SYNC Mode, RCM[1:0] = "11"



3-line Serial Interface Protocol



The CSX can be high level between the data and next command. The SDA and SCL are invalid during CSX is high level



7 Optical Characteristics

Items		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	Note
Response time		Tr+Tf	-	-	45	65	ms	FIG.1	Note4
Contrast Ratio		CR		300	350	-	-	FIG.2	Note1
Surface luminance		LV	$\theta = 0^\circ$	-	300	-	cd/m ²	FIG.2	Note2
Luminance uniformity		Yu	$\theta = 0^\circ$	80	-	-	%	FIG.2	Note3
NTSC		-	$\theta = 0^\circ$	-	50	-	%	FIG.2	Note5
Viewing angle		θ Cr>10	$\phi = 90^\circ$	-	65	-	deg	FIG.3	Note6
			$\phi = 270^\circ$	-	55	-	deg	FIG.3	
			$\phi = 0^\circ$	-	65	-	deg	FIG.3	
			$\phi = 180^\circ$	-	65	-	deg	FIG.3	
Chromaticity	Red	R _X	$\theta = 0^\circ$ $\phi = 0^\circ$ Ta=25°	-	-	-	-	FIG.2 CIE1931	Note5
		R _Y		-	-	-	-		
	Green	G _X		-	-	-	-		
		G _Y		-	-	-	-		
	Blue	B _X		-	-	-	-		
		B _Y		-	-	-	-		
	White	W _X		0.261	0.311	0.361	-		
		W _Y		0.300	0.353	0.400	-		

Note1. Definition of contrast ratio

Contrast ratio(Cr) is defined mathematically by the following formula. For more information see FIG.2.

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

For contrast ratio, Surface Luminance, Luminance uniformity and CIE,the testing data is base on TOPCON' s BM-5 or BM-7 photo detector or compatible.

Note2. Definition of surface luminance.

Surface luminance is the luminance with all pixels displaying white. For more information see FIG.2.

Lv = Average Surface Luminance with all white pixels(P1,P2,P3,,Pn)

Note3. Definition of luminance uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance.For more information see FIG.2.

$$YU = \frac{\text{Minimum surface luminance with all white pixels (P1,P2,P3,.....,Pn)}}{\text{Maximum surface luminance with all white pixels (P1,P2,P3,.....,Pn)}}$$

Note4. Definition of response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black"state.Rise time (Tr) is the time between photo detector output intensity changed from 90% to 10%. And fall time (Tf) is the time between photo detector output intensity changed from 10% to 90%.

For additional information see FIG1.

Note5. Definition of color chromaticity (CIE1931)

CIE (x,y) chromaticity,The x,y value is determined by screen active area center position P5.For more information see FIG.2.

Note6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 10. Angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG.3.

For viewing angle and response time testing, the testing data is base on Autronic-Melchers' s ConoScope or DMS series Instruments or compatible.

FIG.1.The definition of response Time

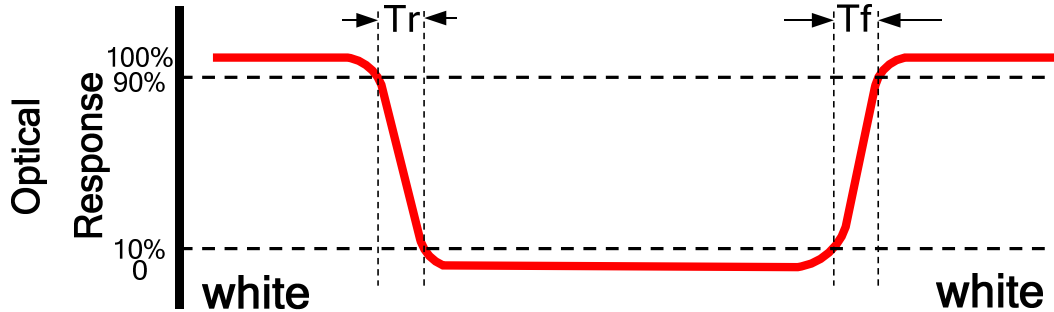


FIG.2. Measuring method for contrast ratio, surface luminance,

luminance uniformity, CIE (x,y) chromaticity

Size : $S \leq 5''$ (see Figure a) A : 5 mm B : 5 mm

H,V : Active area

Light spot size $\varnothing=5\text{mm}$ (BM-5) or $\varnothing=7.7\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure a.

measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

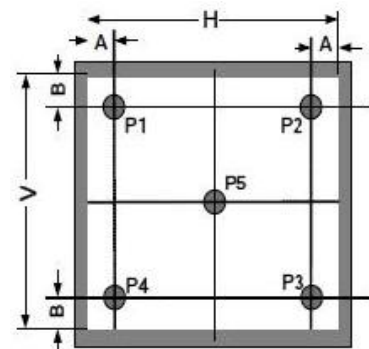


Figure a

Size : $5'' < S \leq 12.3''$ (see Figure b) H,V : Active area

Light spot size $\varnothing=5\text{mm}$ (BM-5) or $\varnothing=7.7\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure b.

measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

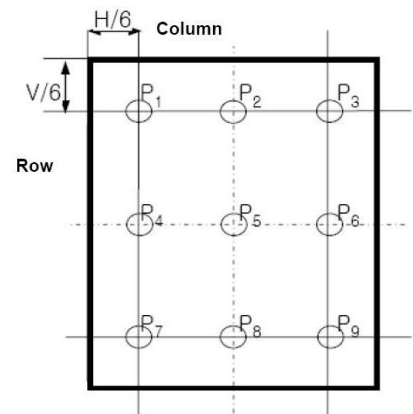


Figure b

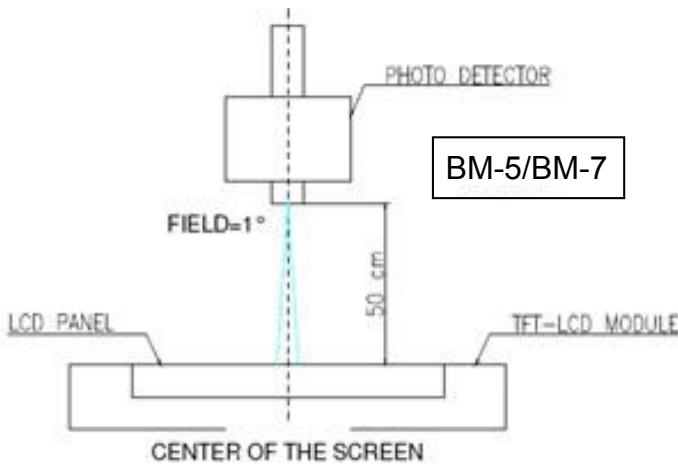
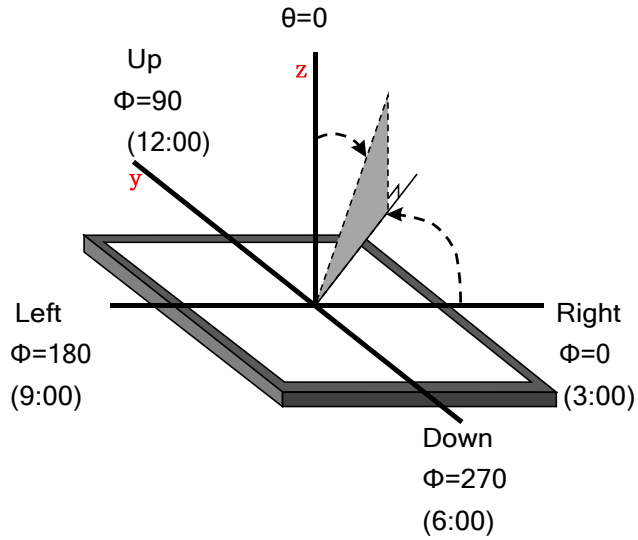


Figure c

FIG.3.The definition of viewing angle



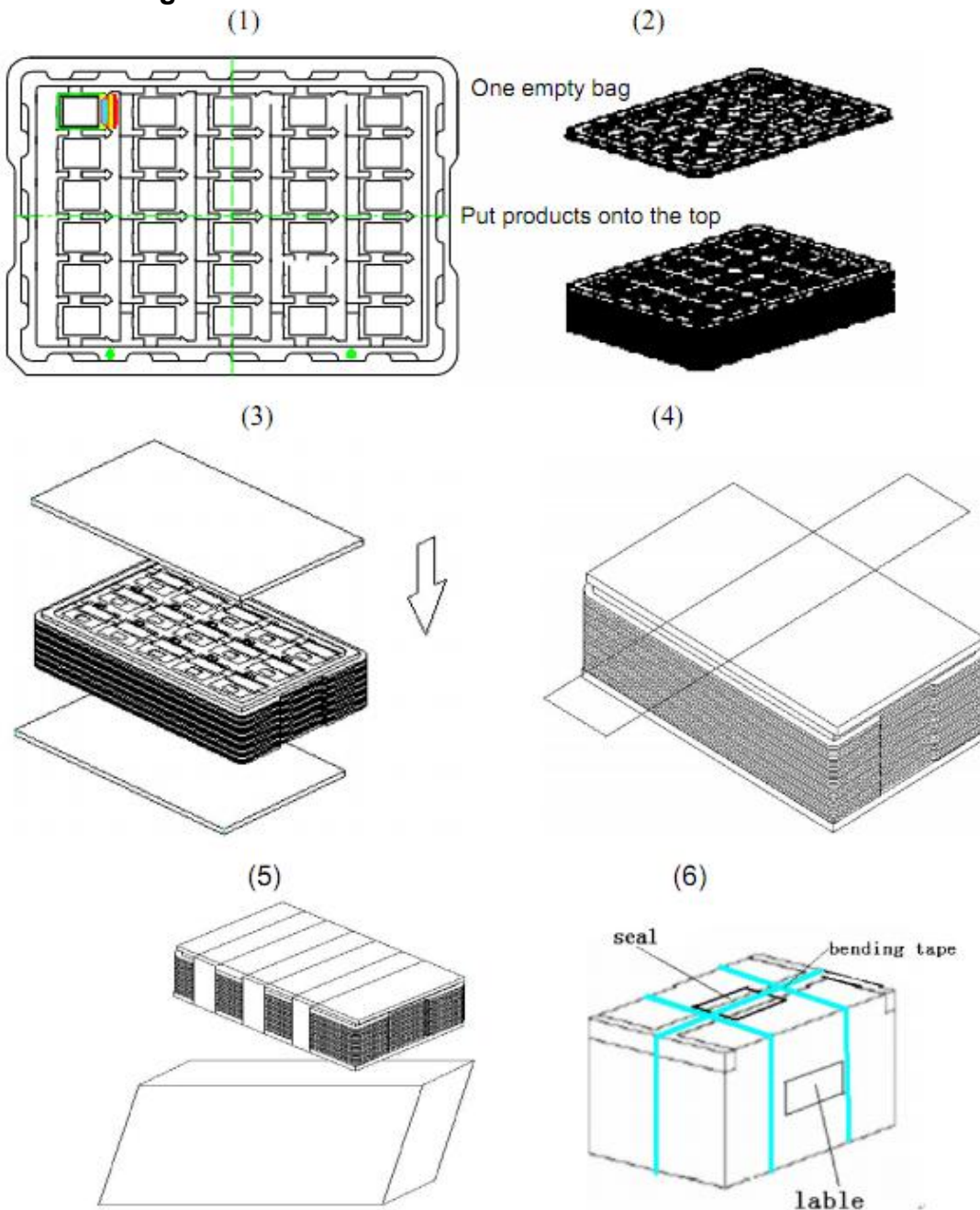
8 Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts= +70°C, 96hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	Ta= -20°C, 96hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +80°C, 120hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -30°C, 120hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	Ta= +60°C, 90% RH max,120 hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-20°C 30 min ~ +60°C 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Electro Discharge (Operation) Static	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15°C ~ 35°C, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2 GB/T17626.2-1998
8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition)	IEC60068-2-6 GB/T2423.5-1995
9	Shock (Non-operation)	60G 6ms, ± X, ±Y , ± Z 3 times for each direction	IEC60068-2-27 GB/T2423.5-1995
10	Package Drop Test	Height: 80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8-1995

- Note:1. Ts is the temperature of panel's surface.
 2. Ta is the ambient temperature of sample.
 3. The size of sample is 5pcs.

10 Packing

Packing Method



1. Put module into tray cavity:
2. Tray stacking
3. Put 1 cardboard under the tray stack and 1 cardboard above:
4. Fix the cardboard to the tray stack with adhesive tape:
5. Put the tray stack into carton.
6. Carton sealing with adhesive tape.



CDTech(H.K.)Electronics Limited

11 TFT-LCD Module Inspection Criteria

11.1 Scope

The incoming inspection standards shall be applied to TFT - LCD Modules (hereinafter Called "Modules") that supplied by CDTech Technology LTD.

11.2 Incoming Inspection

The customer shall inspect the modules within twenty calendar days of the delivery date (the "inspection period") at its own cost. The result of the inspection (acceptance or rejection) shall be recorded in writing, and a copy of this writing will be promptly sent to The seller, If the results of the inspecting from buyer does not send to the seller within twenty Calendar days of the delivery date. The modules shall be regards as acceptance. Should the customer fail to notify the seller within the inspection period, the buyers Right to reject the modules shall be lapsed and the modules shall be deemed to have Been accepted by the buyer

11.3 Inspection Sampling

- 3.1. Lot size: Quantity per shipment lot per model
 - 3.2. Sampling type: Normal inspection, Single sampling
 - 3.3. Inspection level: II
 - 3.4. Sampling table: MIL-STD-105E
 - 3.5. Acceptable quality level (AQL)
- Major defect: AQL=0.65 Minor defect: AQL=1.00

11.4 Inspection Conditions

4.1 Ambient conditions:

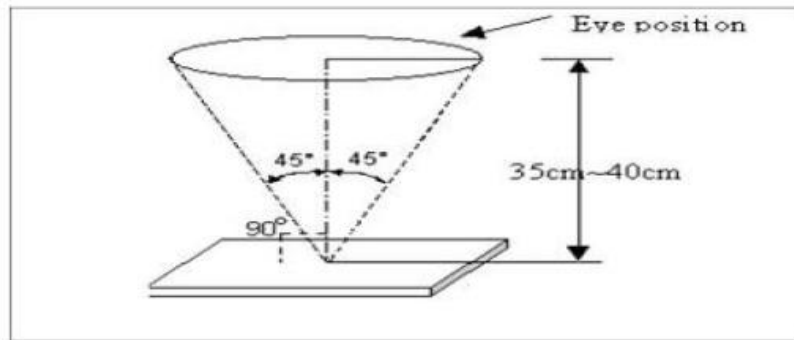
- a. Temperature: Room temperature $25 \pm 5^{\circ}\text{C}$
- b. Humidity: $(60 \pm 10) \% \text{RH}$
- c. Illumination: Single fluorescent lamp non-directive (300 to 700 Lux)

4.2 Viewing distance

The distance between the LCD and the inspector's eyes shall be at least 35 ± 5 cm.

4.3 Viewing Angle

U/D: $45^{\circ} / 45^{\circ}$, L/R: $45^{\circ} / 45^{\circ}$



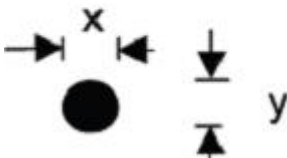
11.5 Inspection Criteria

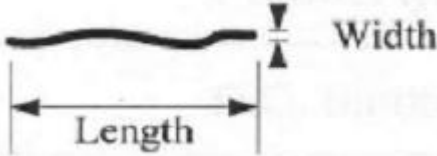

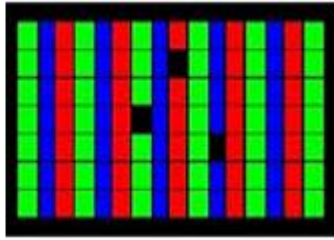
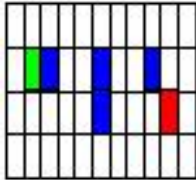
Defects are classified as major defects and minor defects according to the degree of Defectiveness defined herein.

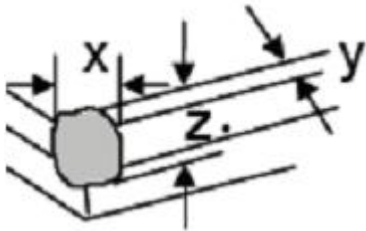
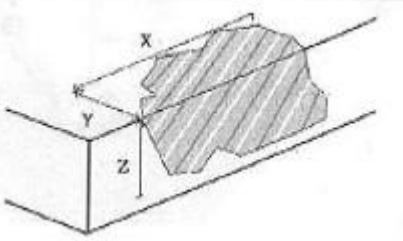
11.5.1 Major defect

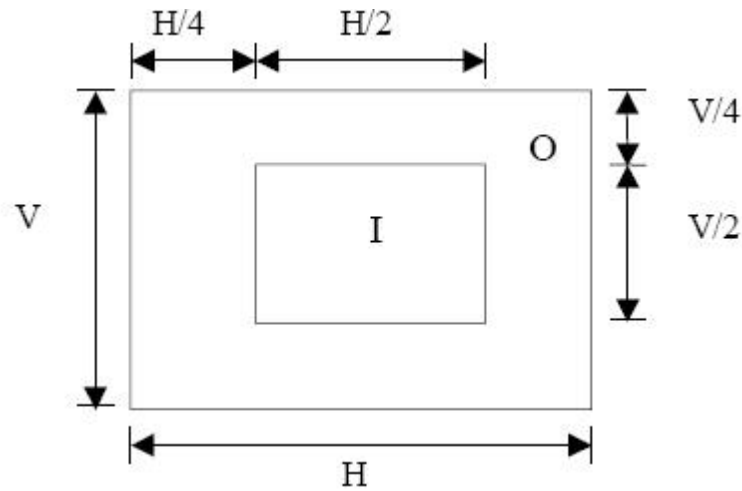
Item No	Items to be inspected	Inspection Standard
5.1.1	All functional defects	1) No display 2) Display abnormally 3) Short circuit 4) line defect
5.1.2	Missing	Missing function component
5.1.3	Crack	Glass Crack

11.5.2 Minor defect

Item No	Items to be inspected	Inspection standard								
5.2.1	Spot Defect Including Black spot White spot Pinhole Foreign particle Polarizer dirt	For dark/white spot is defined $\phi = (x+y) / 2$ 								
		<table border="1"> <thead> <tr> <th>Size ϕ(mm)</th> <th>Acceptable Quantity</th> </tr> </thead> <tbody> <tr> <td>$\phi \leq 0.05$</td> <td>Ignore</td> </tr> <tr> <td>$0.05 < \phi \leq 0.15$</td> <td>2</td> </tr> <tr> <td>$0.15 < \phi$</td> <td>Not allowed</td> </tr> </tbody> </table>	Size ϕ (mm)	Acceptable Quantity	$\phi \leq 0.05$	Ignore	$0.05 < \phi \leq 0.15$	2	$0.15 < \phi$	Not allowed
		Size ϕ (mm)	Acceptable Quantity							
		$\phi \leq 0.05$	Ignore							
$0.05 < \phi \leq 0.15$	2									
$0.15 < \phi$	Not allowed									

5.2.2	Polarizer dirt, particle	Size ϕ (mm)	Acceptable Quantity	
		$\phi \leq 0.15$	1	
		$\phi > 0.15$	Not allowed	
5.2.3	Line Defect Including Black line White line Scratch	Define:		
				
		Width(mm) Length(mm)	Acceptable Quantity	
		$W \leq 0.05$	Ignore	
		$0.05 < W \leq 0.1$ $L \leq 1.5$	1	
$0.1 < W$, or $L > 1.5$	Not allowed			
5.2.4	Polarizer Dent/Bubble	Not allowed		
5.2.5	Electrical Dot Defect	Bright and Black dot define:		
				
				
				
		Two Adjacent Dot		
Inspection pattern: Full white, Full black, Red, green and blue screens				
Item		Acceptable Quantity		
		I	O	Note
Black dot defect		1		(5mm \leq Distance)
Bright dot defect		1		
Two Adjacent Dot		Not allow		

5.2.6	Glass defect		
		1. Corner Fragment:	
		Size(mm)	Acceptable Quantity
		$X \leq 2\text{mm}$ $Y \leq 1\text{mm}$ $Z \leq T$	Ignore T: Glass thickness X: Length Y: Width Z: thickness
		2. Side Fragment: 	
		Size(mm)	Acceptable Quantity
$X \leq 5.0\text{mm}$ $Y \leq 1\text{mm}$ $Z \leq T$	T: Glass thickness X: Length Y: Width Z: thickness		



I area & O area

- Note:
- 1). Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area.
 - 2). The distance between two bright dot defects (red, green, blue, and white) should be larger than 15mm.
 - 3). The distance between black dot defects or black and bright dot defects should be more than 5mm apart.
 - 4). Polarizer bubble is defined as the bubble appears on active display area. The defect of polarizer bubble shall be ignored if the polarizer bubble appears on the outside of active display area.

11.6 Mechanics specification

As for the outside dimension, weight of the modules, please refer to product specification
For more details

12 Precautions for Use of LCD modules

12.1 Handling Precautions

12.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

12.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

12.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

12.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

12.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketene
- Aromatic solvents

12.1.6. Do not attempt to disassemble the LCD Module.

12.1.7. If the logic circuit power is off, do not apply the input signals.

12.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

12.1.8.1. Be sure to ground the body when handling the LCD Modules.

12.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

12.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

12.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

12.2 Storage Precautions

12.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

12.2.2. The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0°C ~ 40°C Relatively humidity: ≤80%

12.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.



CDTech(H.K.)Electronics Limited

12.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.