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Production Custom designs Installation

Mechanical design



TFT-LCD Module Specification

Module NO.: ET042HD01-TS

Version: V1.0

☐ APPROVAL FOR SPECIFICATION

☐ APPROVAL FOR SAMPLE

For Customer' s Acceptance:	
Approved by	Comment

YOURITECH Display:		
Presented by	Reviewed by	Organized by

Version No.	Date	Content	Remark
V1.0	2019-8-3	Initial Release	



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1 General Characteristics

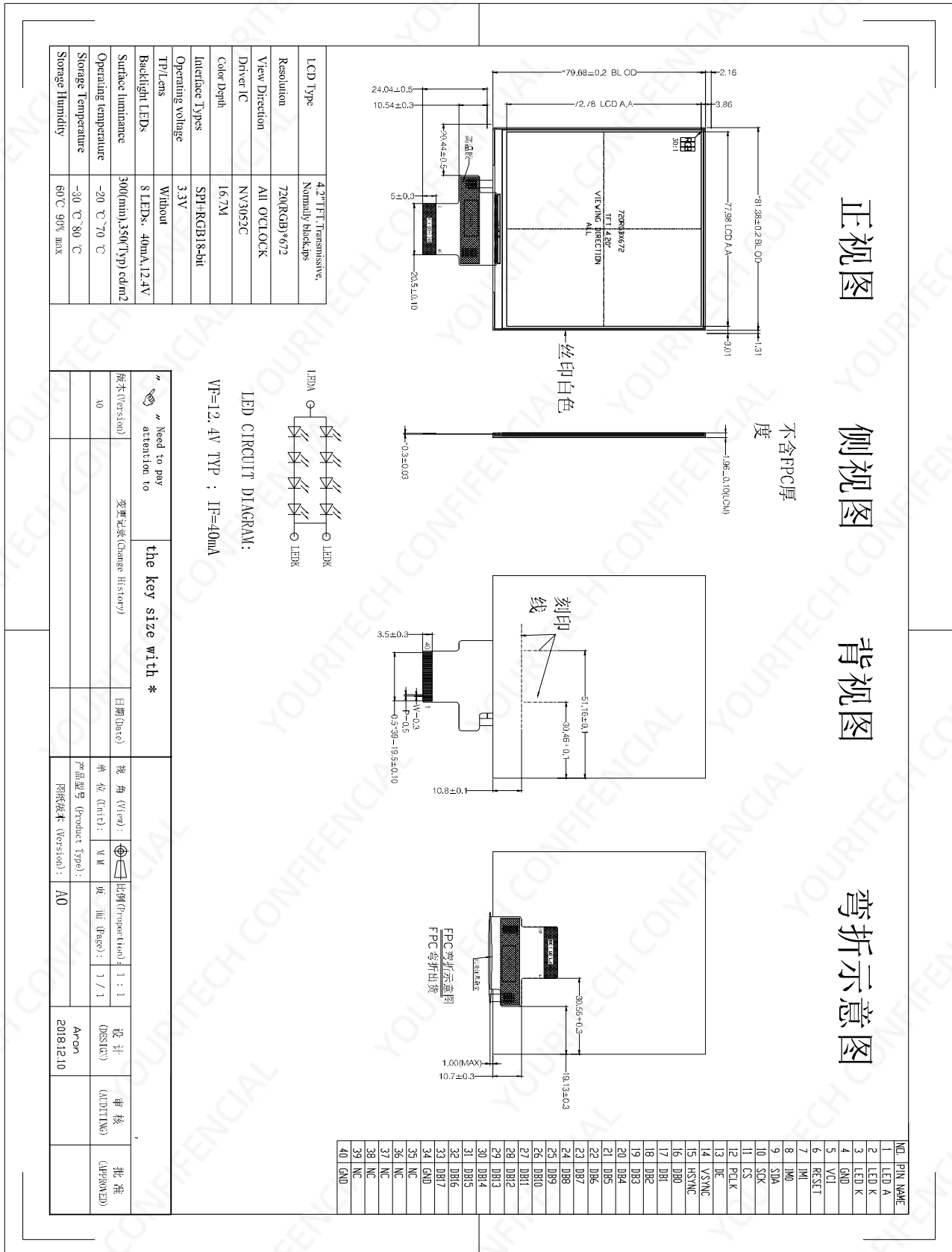
ITEM	Specification	Unit
LCD Type	a-Si TFT, Transmissive, Normally black, IPS	-
LCD Size	4.2	inch
Resolution (W x H)	720x (RGB) × 672	pixel
LCM size	81.38(H) x 79.68(V) x 1.96(D)	mm
Active Area	77.98 (H) x 72.78 (V)	mm
Dot Pitch	0.0361(H)x 0.1083(V)	mm
Viewing Direction	all o'clock	-
Color Depth	16.7M	-
Pixel Arrangement	RGB-stripe	-
Backlight Type	8 LEDs, 40mA	-
Surface Luminance	300min 350typ	cd/m2
Surface Treatment	Clear	-
LCD Driver IC	NV3052C	-
Interface Type	SPI+RGB-18bit	-
Input Voltage	3.3	V
With/Without TP	Without	-
Weight	TBD	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.



2 Product drawings



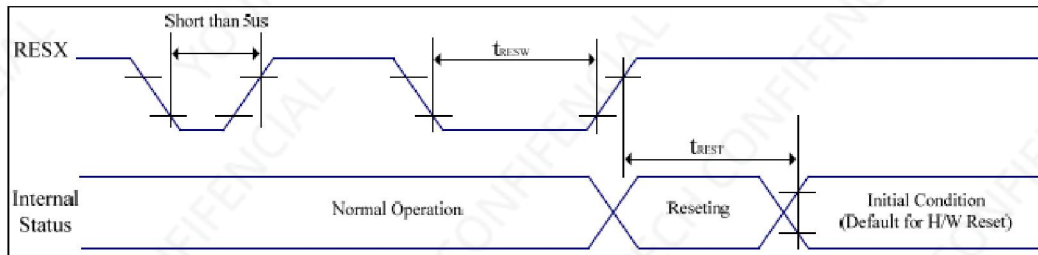
3 Interface description

PIN NO.	Symbol	description
1	LEDA	Backlight A Anode input pin.
2-3	LEDK	Backlight K Cathode input pin.
4	GND	Ground. (0V)
5	VCI	Power supply
6	RESET	Global Reset Signal. Active Low.
7	NC	
8	NC	
9	SDA	Serial interface DATA Input/Output.
10	SCK	Serial interface Clock Input.
11	CS	Chip select signal for SPI interface operation. " 0 " : the NV3052C is accessible " 1 " : the NV3052C is not accessible
12	PCLK	Dot clock signal for RGB interface operation.
13	DE	Data enable pin for RGB interface operation.
14	VSYN	Vertical synchronizing input signal for RGB interface operation.
15	HSYN	Horizontal synchronizing input signal for RGB interface operation.
16-33	DB0-DB17	Data bus
34	GND	Ground. (0V)
35	NC	
36	NC	
37	NC	
38	NC	
39	NC	
40	GND	Ground. (0V)



4 Interface characteristics

4.1 Reset timing characteristics



VSS=0V, IOVCC=1.65V to 3.6V, VCI=2.5V to 6.0V, Ta = -30°C to 70°C

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
t_{RESW}	*1) Reset low pulse width	RESX	10	-	-	-	us
t_{REST}	*2) Reset complete time	-	-	-	5	When reset applied during Sleep in mode	ms
		-	-	-	120	When reset applied during Sleep out mode	ms

Table: Reset input timing

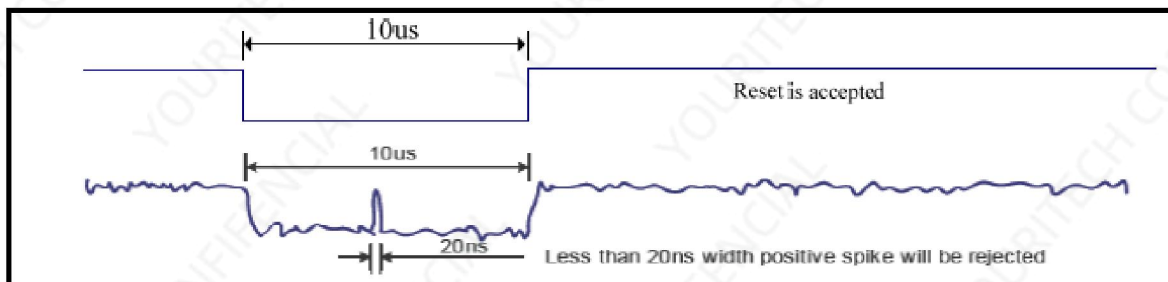
Note 1: Due to an electrostatic discharge on RESX line, spike does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts (It depends on voltage and temperature condition.)

Note 2: During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120ms, when Reset Starts in Sleep Out mode. The display remains the blank state in Sleep In mode), then return to default condition for H/W reset.

Note 3: During Reset Complete Time, ID1/ID2/ID3 and VCOM value in OTP will be latched to internal register. After a rising edge of RESX, there is a H/W reset complete time (Trest) which lasted 5ms. The loading operation will be done every time during this reset.

Note 4: Spike Rejection also applies during a valid reset pulse as shown below:



Note 5. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120 msec.



4.2 Serial interface characteristics

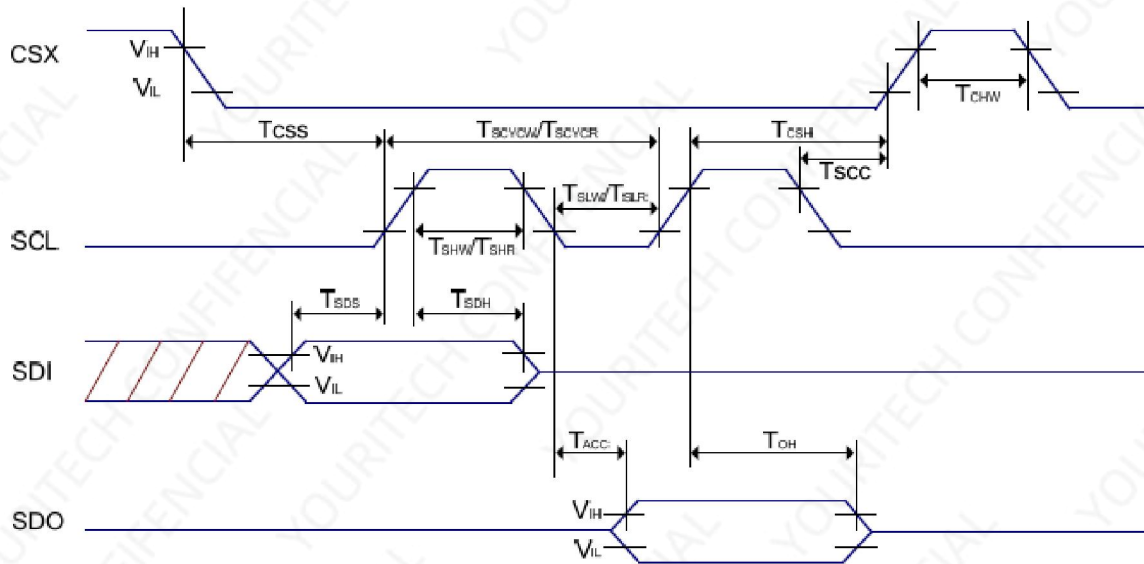


Figure: 3-pin Serial Interface Characteristics

Signal	Symbol	Parameter	MI N	MA X	Unit	Description
CSX	T_{CSS}	Chip select setup time	15	-	ns	-
	T_{SCH}	Chip select hold time	15	-	ns	
	T_{SCC}	Chip select setup time	20	-	ns	
	T_{CHW}	Chip "H" pulse width	40	-	ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66	-	ns	-
	T_{SCHW}	SCL "H" pulse width (Write)	10	-	ns	
	T_{SLW}	SCL "L" pulse width (Write)	10	-	ns	
	T_{SCYCR}	Serial clock cycle (Read)	150	-	ns	-
	T_{SHR}	SCL "H" pulse width (Read)	60	-	ns	
	T_{SLR}	SCL "L" pulse width (Read)	60	-	ns	
SDI	T_{SDS}	Data setup time	10	-	ns	-
	T_{SDH}	Data hold time	10	-	ns	
	T_{ACC}	Access time	10	50	ns	For maximum $C_L=30pF$ For minimum $C_L=8pF$
	T_{OH}	Output disable time	15	50	ns	

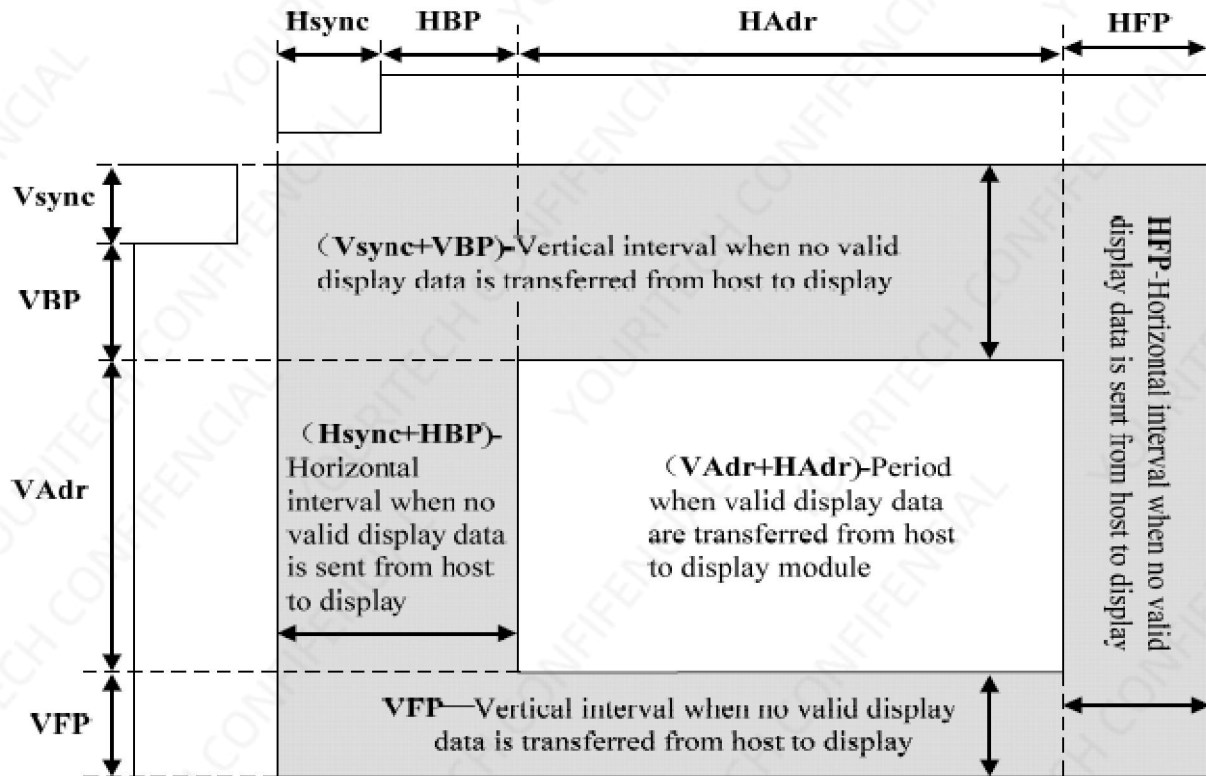
Note 1: IOVCC=1.65 to 3.6V, VCI=2.5 to 6V, VSSA=VSS=0V, Ta=-30 to 70℃

Note 2: The rise time and fall time (tr, tf) of input signal is specified at 15 ns or less.

Logic high and low levels are specified as 30% and 70% of IOVCC for Input signals.



4.3 RGB interface characteristics



Parameters	Symbols	Min.	Typ	Max.	Unit
MIPI Vedio data-rate (4 lane)	-	-	382	-	Mbps
PCLK Frequency	FPCLK	-	63.61	-	MHz
Horizontal Synchronization	Hsync	2	2	-	PCLK
Horizontal Back Porch	HBP	4	42	-	PCLK
Horizontal Front Porch	HFP	4	44	-	PCLK
Hsync+ HBP+ HFP	-	58*Note1	88*Note1	-	PCLK
Horizontal Address (Display area)	HAdr	-	720	-	PCLK
Horizontal cycle	-	778	808	-	PCLK
Vertical Synchronization	Vsync	1	2	-	Line

Vertical Back Porch	VBP	4	14	-	Line
Vertical Front Porch	VFP	4	16	-	Line
Vsync+ VBP+ VFP	-	-	32	-	Line
Vertical Address (Display area)	VAdr	-	672	-	Line
Vertical cycle	-	-	804	-	Line
Frame-Rate			60		Hz



5 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Power supply voltage	VCI	-0.3	6.6	V
	IOVCC	-0.3	4.5	V
Operating Temperature	TOP	-20	+60	° C
Storage Temperature	TST	-30	+70	° C
Humidity	RH	-	90%(Max 60° C)	RH

6 Electrical Characteristics

Parameter	Symbol	Conditions	Specification			Unit	Notes
			MIN	TYP	MAX		
Power & Operation Voltage							
Analog Operating voltage	VCI	Operating Voltage	2.5	2.8	6.0	V	
Logic Operating voltage	IOVCC	I/O supply voltage	1.65	1.8	3.6	V	
MIPI interface operating voltage	VDDAM	MIPI supply voltage	1.75	-	6.0	V	Note1
Input/Output							
Logic High level input voltage	VIH	-	0.7*IOVCC	-	IOVCC	V	
Logic Low level input voltage	VIL	-	VSS	-	0.3*IOVCC	V	
Logic High level output voltage	VOH	IOH = -0.1mA	0.8*IOVCC	-	IOVCC	V	
Logic Low level output voltage	VOL	IOL = +0.1mA	VSS	-	0.2*IOVCC	V	
Logic Input leakage current	IIL	Vin=IOVCC or VSS	-0.1	-	+0.1	uA	

7 Backlight Characteristics

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V _f	-	12.4	-	V
Current for LED backligt	I _f	-	40	-	mA
Uniformity	Avg	80	-	-	%
LED Life Time	-	30000	40000	-	Hrs

Note:

- 1.The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C, 60%RH ±5 %.
2. The life time of LED will be reduced if LED is driven by high current, high ambient temperature and humidity conditions.
3. Typical operating life time is an estimated data.
4. Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded .Functional operation should be restricted to the conditions described under normal operating conditions.



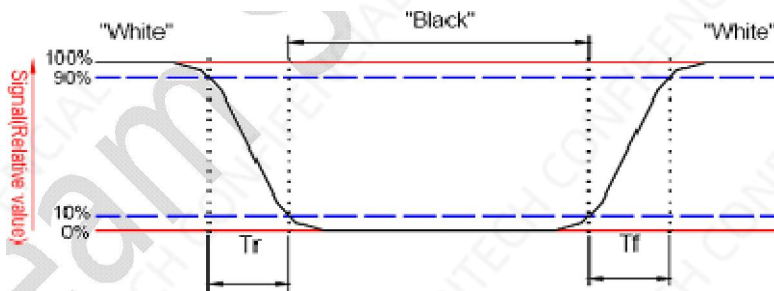
8 LCD Optical specifications

Item	Symbol	Condition	Specification			Unit	Remark
			Min	Typ	Max		
Response time (By Quick)	Tr+Tf	-	-	25	35	ms	Note 2
Contrast ratio	CR	-	800	1000	-	-	Note 3
Surface luminance	Lv	$\theta = 0^\circ$	300	350	-	Cd/m ²	Note 4
Luminance uniformity	Yu	$\theta = 0^\circ$	65	70	-	%	Note 6
NTSC	-	$\theta = 0^\circ$	45	50	-	%	Note 6
Viewing angle	Top	$CR \geq 10$	70	80	-	Deg.	Note 7
	Bottom	$CR \geq 10$	70	80	-		
	Left	$CR \geq 10$	70	80	-		
	Right	$CR \geq 10$	70	80	-		
CIE(x,y) chromaticity	Wx	$\theta = 0^\circ$	Typ -0.04	0.307	Typ +0.04		Note 5
	Wy			0.335			
	Rx			0.660			
	Ry			0.324			
	Gx			0.296			
	Gy			0.601			
	Bx			0.139			
	By			0.105			

Note 1: Ambient temperature = 25°C.

Note 2: Definition of response time:

The output signals of TRD-100 are measured when the input signals are changed to "White" (falling time) and from "White" to "Black" (rising time), respectively. The interval is between the 10% and 90% of amplitudes. Refer to figure as below.



Note 3: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

Measured at the center area of the LCD.

Note 4: Definition of surface luminance

Surface luminance is the luminance with all pixels displaying white



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

Size : $S \leq 4.3''$ (see Figure A B)

H,V : Active area

Light spot size=7.7mm (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-7 or compatible.

Size : $4.3 < S \leq 12.3''$ (see Figure A C)

H,V : Active area

Light spot size=7.7mm (BM-7)50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure C.

measurement instrument : TOPCON' s luminance meter BM-7 or compatible.

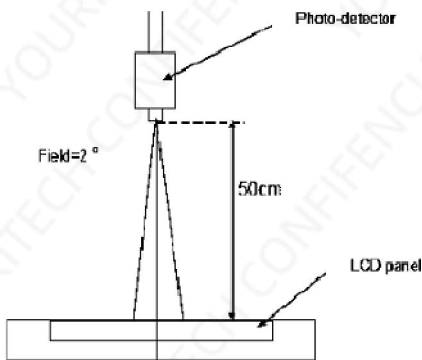


Figure A

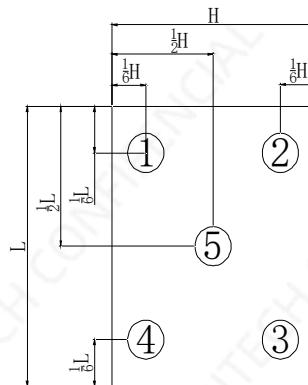


Figure B

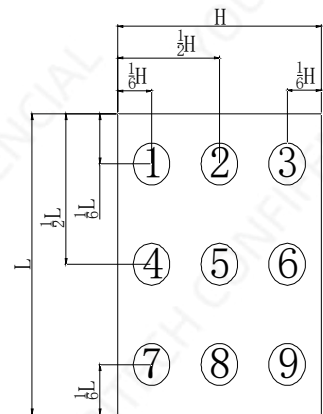


Figure C

Note 6:Definition of Luminance Uniformity

Active area is divided into 5 or 9 measuring areas,Every measuring point is placed at the center of each measuring area

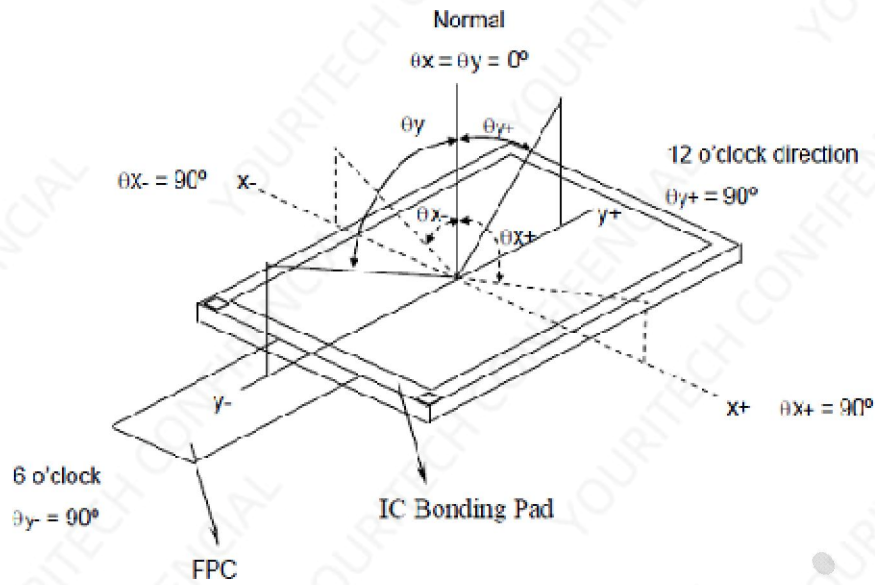
Bmax: The measured maximum luminance of all measurement position.

Bmin: The measured minimum luminance of all measurement position.

Luminance Uniformity (Yu)= $(Bmin/Bmax) \times 100\%$



Note 7: Definition of viewing angle



9 RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION	INSPECTION AFTER TEST
1	High Temperature Storage	80±2°C/96 hours	Inspection after 2~4 hours storage at room temperature and humidity. The condensation is not accepted. The sample shall be free from defects: 1. Air bubble in the LCD 2. Seal leak 3. Non-display 4. Missing segments 5. Glass crack
2	Low Temperature Storage	-30±2°C/96 hours	
3	High Temperature Operating	70±2°C/96 hours	
4	Low Temperature Operating	-20±2°C/96 hours	
5	Temperature Cycle	-30±2°C ~ 25~ 80± 2°C × 10 cycles (30 min.) (5min.) (30min.)	
6	Damp Proof Test	60°C ±5°C × 90%RH/96 hours	
7	Vibration Test	Frequency 10Hz~55Hz Stroke: 1.5mm Sweep: 10Hz~150 Hz~10Hz 2 hours For each direction of X, Y, Z	
8	Packing Drop Test	Height: 50 cm 1 corner, concrete floor	
9	Electrostatic Discharge Test	C=150pF, R=330 Ω Air: ±8KV 150pF/330Ω 30 times Contact: ±4KV,20 times	



10 Suggestions for using LCD modules

10.1 Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.
2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.
3. Don't apply excessive force on the surface of the LCM.
4. If the surface is contaminated, clean it with soft cloth. If the LCM is severely contaminated, use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer. The following solvents is especially prohibited: water , ketone Aromatic solvents etc.
5. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
7. Don't disassemble the LCM.
8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - Be sure to ground the body when handling the LCD modules.
 - Tools required for assembling, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
 - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
9. Do not alter, modify or change the the shape of the tab on the metal frame.
10. Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
11. Do not damage or modify the pattern writing on the printed circuit board.
12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector
13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
14. Do not drop, bend or twist LCM.

10.2 Storage

1. Store in an ambient temperature of 5 to 45 °C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.
2. Storage in a clean environment, free from dust, active gas, and solvent.
3. Store in antistatic container.

