一众显示科技有限公司

TEAM SOURCE DISPLAY TECH. CO, LTD.

TFT-LCD Module Specification

Module NO.: TST055HDHI-19C

Version: V1.1

☐ APPROVAL FOR SPECIFICATION ☐ APPROVAL FOR SAMPLE

For Customer's Acceptance:	
Approved by	Comment

Team Source Display:		
Presented by	Reviewed by	Organized by
SAN	ARON	ARON

Version No.	Date	Content	Remark
V1.0	2023-02-23	Initial Release	
V1.1	2024-03-27	加一条导电布	Page 4

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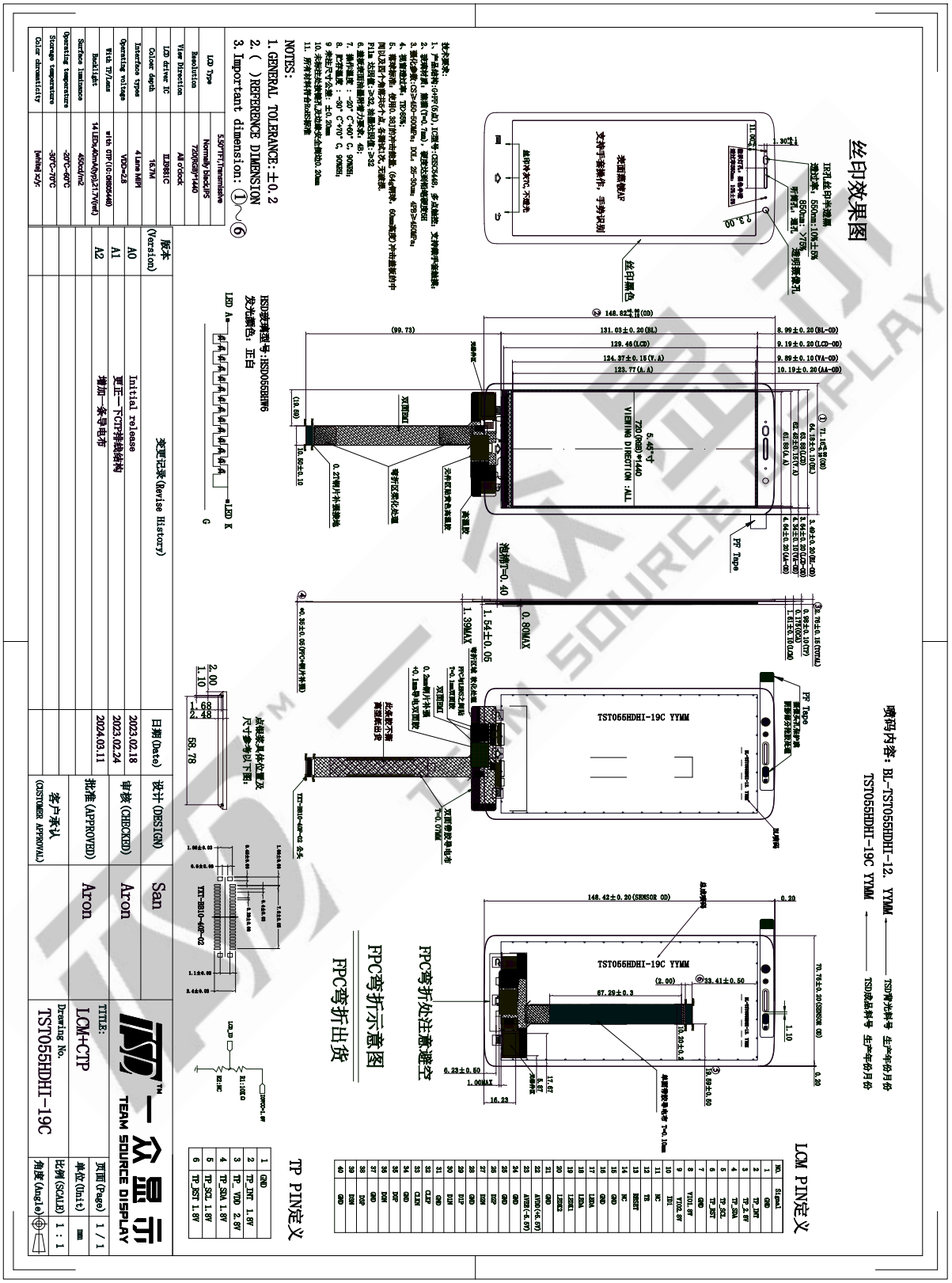
1 General Characteristics

ITEM	Specification	Unit
LCD Type	a-si TFT,Transmissive,Normally black,IPS	-
LCD Size	5.5	inch
Resolution (W x H)	720 x (RGB) × 1440	pixel
TP+LCM (W × H × D)	71.16(W) x 148.82(H) x 2.76(D)	mm
Active Area (W × H)	61.88 (W) x 123.77(H)	mm
Pixel Pitch	0.0859 x 0.0859	mm
Viewing Direction	ALL o'clock	-
Color Depth	16.7M	-
Pixel Arrangement	RGB	-
Backlight Type	14 LEDs. 40mA.21.7V	-
Surface Luminance	450	cd/m2
Driver IC	ILI9881C	-
Interface Type	MIPI	-
Input Voltage	2.8	V
With/Without TP	CTP(IC:CHSC5448)	-
Weight	TBD	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

2 Product drawings



3 Interface description

Pin No.	Symbol	Description	Note
1	GND	Ground	
2	TP_INT	CTP interrupt signal output pin	
3	TP_2.8V	CTP Power supply 2.8V	
4	TP_SDA	CTP I²C data input/output	
5	TP_SCL	CTP I²C clock input	
6	TP_RST	CTP reset signal input pin	
7	GND	Ground	
8	VI01.8V	Power supply for I/O interface, 1.8V	
9	VI02.8V	Power supply 2.8V	
10	ID1	LCD Identification pin	
11	NC	Not connect	
12	TE	Frame Sync signal	
13	RESET	Reset signal	
14	NC	Not connect	
15	GND	Ground	
16	GND	Ground	
17	LEDA	Back-light Anode	
18	LEDA	Back-light Anode	
19	LEDK1	Back-light Cathode1	
20	LEDK2	Back-light Cathode2	
21	GND	Ground	
22	AVDD	Power Supply for Analog	
23	AVEE	Power Supply for Analog	
24	GND	Ground	
25	GND	Ground	
26	D2P	Data differential signal input pins.(Data lane 2)	
27	D2N	Data differential signal input pins.(Data lane 2)	
28	GND	Ground	
29	D1P	Data differential signal input pins.(Data lane 1)	
30	D1N	Data differential signal input pins.(Data lane 1)	
31	GND	Ground	
32	CLKP	Clock differential signal input pins	
33	CLKN	Clock differential signal input pins	
34	GND	Ground	
35	D0P	Data differential signal input pins.(Data lane 0)	
36	D0N	Data differential signal input pins.(Data lane 0)	

37	GND	Ground	
38	D3P	Data differential signal input pins.(Data lane 3)	
39	D3N	Data differential signal input pins.(Data lane 3)	
40	GND	Ground	

4 LCM Interface Timing

4.1 Reset Timing

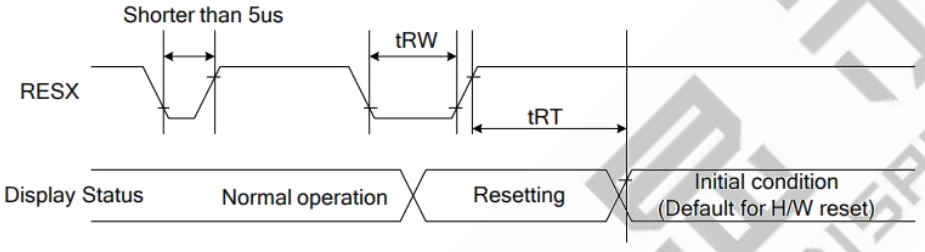


Figure 124: Reset Timing

Table 47: Reset Timing

Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS

Notes:

1. *The reset cancel also includes required time for loading ID bytes, VCOM setting and other settings from EEPROM to registers. This loading is done every time when there is H/W reset cancel time (tRT) within 5 ms after a rising edge of RESX.*
2. *Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the Table 48.*

Table 48: Reset Descript

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts

3. During the Resetting period, the display will be blanked (The display enters the blanking sequence, which maximum time is 120 ms, when Reset Starts in the Sleep Out mode. The display remains the blank state in the Sleep In mode.) and then return to Default condition for Hardware Reset.
4. Spike Rejection can also be applied during a valid reset pulse, as shown below:

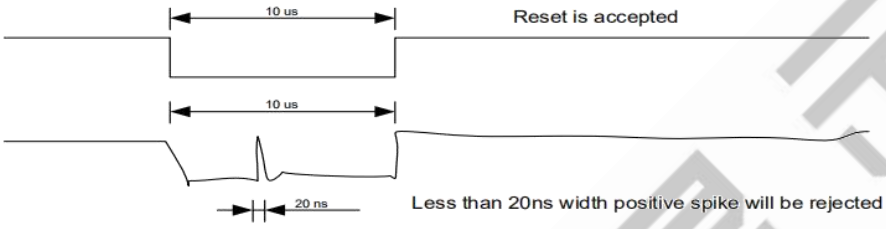


Figure 125: Positive Noise Pulse during Reset Low

5. When Reset applied during Sleep In Mode.
6. When Reset applied during Sleep Out Mode.
7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

4.2 DSI Timing Characteristics

High Speed Mode

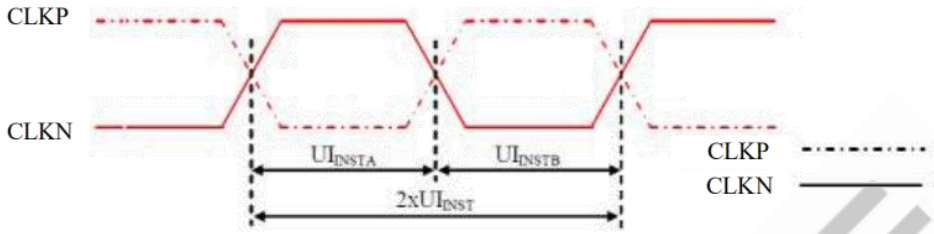


Figure 116: DSI Clock Channel Timing

Table 38: DSI Clock Channel Timing

Signal	Symbol	Parameter	Min	Max	Unit
CLKP/N	$2xUI_{INST}$	Double UI instantaneous	*Note 2*	25	ns
CLKP/N	UI_{INSTA}, UI_{INSTB} (Note 1)	UI instantaneous Half	*Note 2*	12.5	ns

Notes:

1. UI = UIINSTA = UIINSTB

2. Define the minimum value, see Table 39.

Table 39: Limited Clock Channel Speed

Data type	Two Lanes speed	Three Lanes speed	Four Lanes speed
Data Type = 00 1110 (0Eh), RGB 565, 16 UI per Pixel	566 Mbps	466 Mbps	366 Mbps
Data Type = 01 1110 (1Eh), RGB 666, 18 UI per Pixel	637 Mbps	525 Mbps	412 Mbps
Data Type = 10 1110 (2Eh), RGB 666 Loosely, 24 UI per Pixel	850 Mbps	700 Mbps	550 Mbps
Data Type = 11 1110 (3Eh), RGB 888, 24 UI per Pixel	850 Mbps	700 Mbps	550 Mbps

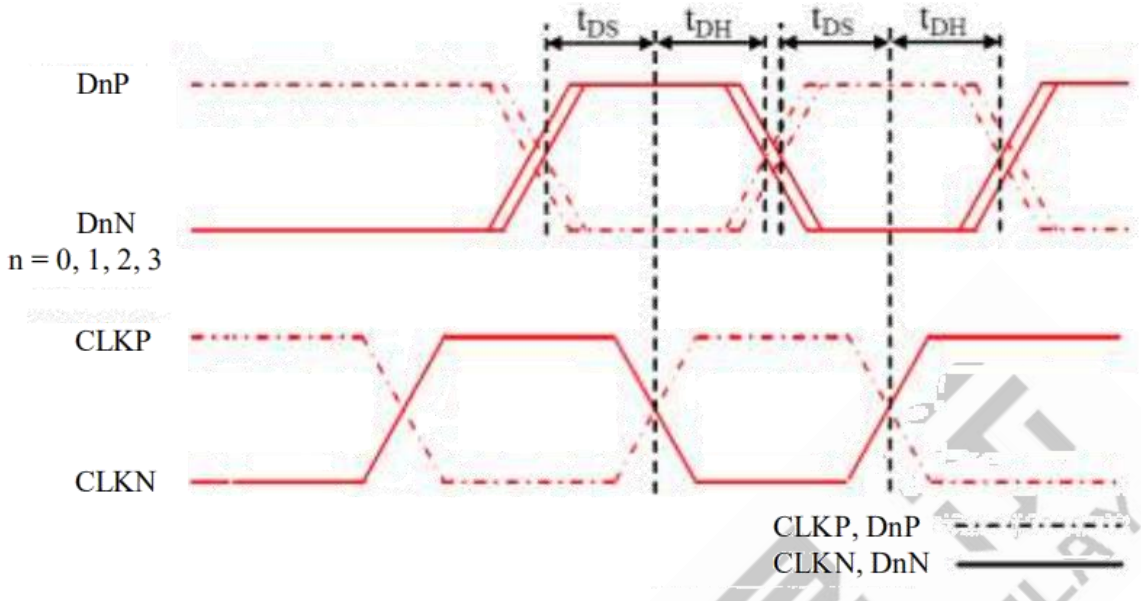
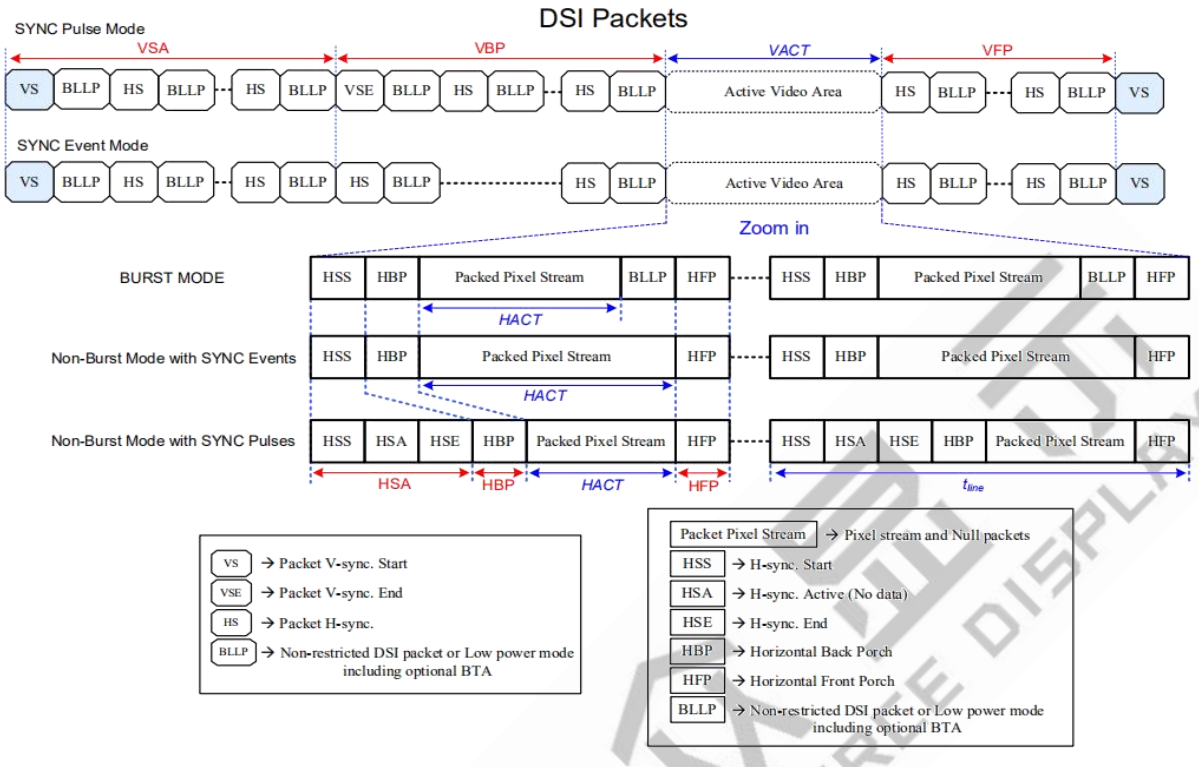


Figure 117: DSI Data to Clock Channel Timings

Table 40: DSI Data to Clock Channel Timings

Signal	Symbol	Parameter	Min	Max
DnP/N , n=0 and 1	t_{DS}	Data to Clock Setup time	0.15xUI	-
	t_{DH}	Clock to Data Hold Time	0.15xUI	-

4.3 Timing for DSI eideo mode



Parameters	Symbols	MIN	TYP	MAX	Units
Vertical sync.active	VSA	2(note6)	-	-	Line
Vertical Back Porch	VBP	18(note6)	30	-	Line
Vertical Front Porch	VFP	8(note6)	20	-	Line
Active lines per frame	VACT	-	1280	-	Line
Horizntal sync.active	HSA	2	33	-	Pixel
Horizntal Back Porch	HSA+HBP	1.88	133	-	us
Horizntal Front Potch	HFP	0.94	100	-	us
Active pixels per line	HACT	-	720	-	Pixel
Bit rate	BR_{bps}	435	475	note5	Mbps/lane

1 UI=1/Bit rate

HAS(pixel)= (tHSA*lane number) / (UI* pixel format)

HBP(pixel)= (tHBP*lane number) / (UI* pixel format)

HFP(pixel)= (tHFP*lane number) / (UI* pixel format)

$$\text{Frame Rate} = \frac{BR_{bps} \times Lane_{num}}{(VACT+VSA+VBP+VFP) \times (HACT+HSA+HBP+HFP) \times \text{Pixel Format}}$$

Example : BR_{bps} = 457Mbps/lane, 1UI=2.1883ns, Frame rate=60Hz, VACT=1280, VSA=2, VBP=30, VFP=20, HACT=720, HSA=33, HBP=100, HFP=100, $Lane_{num}$=4(lane), Pixel Format=24(bit).

Note:

1. $Lane_{num}$: Date lane of MIPI-DSI.
2. Pixel Format: Please reference to “4.1DSI System Interface”.
3. The formula exists slightly error because of the host-transmission way.
4. The best frame rate setting： 2 data lanes：50~60 Hz / 3 data lanes：50~70 Hz / 4 data lanes：50~70 Hz.
5. Please reference to “Table 39: Limited Clock Channel Speed”.
6. The min. value of VSA, VBP and VFP are match most case, but maybe change by different panel GIP setting.

5 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage (Analog)	VCC~GND	-0.3	4.6	V
Logic signal voltage(I/O)	IOVCC~GND	-0.3	4.6	V
Operating Temperature	TOP	-20	70	° C
Storage Temperature	TST	-30	80	° C
Humidity	RH	-	90%(Max 60° C)	RH

6 Electrical Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Analog operating voltage	VCC	2.5	2.8	3.3	V
Logic operating voltage	IOVCC	1.65	1.8	3.3	V
Input Current	IDD	-	TBD	-	mA
Input Voltage ' H ' level	VIH	0.7IOVCC	-	IOVCC	V
Input Voltage ' L ' level	VIL	GND	-	0.3IOVCC	
Output Voltage ' H ' level	VOH	0.8IOVCC	-	IOVCC	
Output Voltage ' L ' level	VOL	GND	-	0.2IOVCC	

7 Backlight Characteristics

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V_f	-	21.7	-	V
Current for LED backlight	I_f	-	40	-	mA
Power consumption	Wbl	-	868	-	mW
Uniformity	Avg	80	-	-	%
LED Life Time	-	20000	30000	-	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	θ = 0°	-	25	35	ms	Note 5
Contrast ratio	CR	θ = 0°	800	1000	-		Note 2,6
Luminance of white (Center point)	L_w	B/L on	-	450	-	cd/m²	BM-7
Viewing angle	Top	CR≧10	70	80	-	Deg.	Note 2,6,7
	Bottom	CR≧10	70	80	-		
	Left	CR≧10	70	80	-		
	Right	CR≧10	70	80	-		
Color chromaticity (CF only with ITO, light source is C light, CIE 1931)	Wx	θ = 0°	-0.03	0.2935	+0.03		Note 3
	Wy			0.2955			
	Rx			0.6228			
	Ry			0.3428			
	Gx			0.3204			
	Gy			0.6056			
	Bx			0.1568			
	By			0.0465			
NTSC			65%	70%	-		Note 3
Cross talk	Ct		-	-	2%		Note 9
Transmittance	Trans		3.15%	3.5%	-		Note 4

Note 1: Ambient temperature = 25°C.

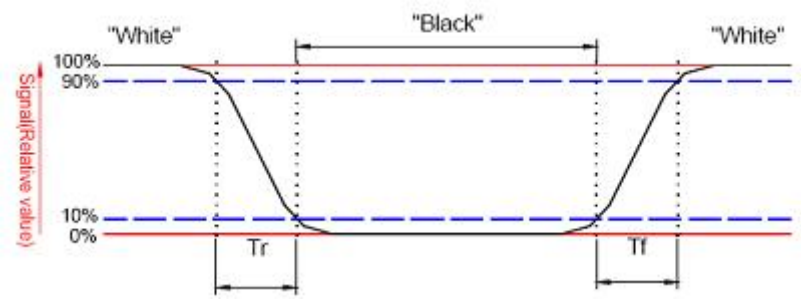
Note 2: To be measured with a viewing cone of 2°by Topcon luminance meter BM-7A.

Note 3: To be measured with Otsuta chromaticity meter LCF-2100M, CF only measure under C light simulation.

Note 4: CTC shipping status is cell without polarizer. Transmittance of Specification is cell with polarizer. The tolerance of Transmittance is ±10%.

Note 5: 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.

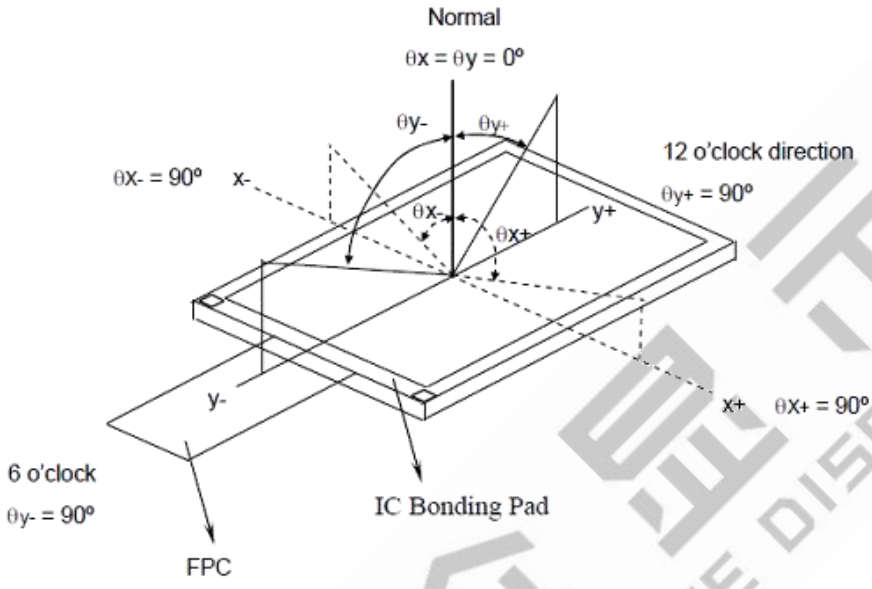


Note 6: Definition of contrast ratio:

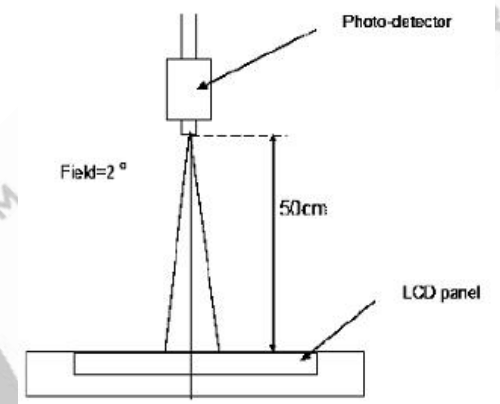
Contrast ratio is calculated by the following formula.

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

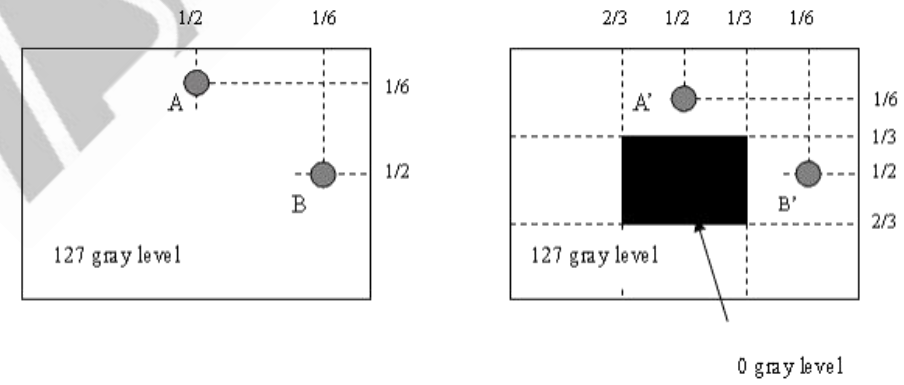
Note 7: Definition of viewing angle



Note 8: Optical characteristic measurement setup.



Note 9:



l LA-LA' l / LA x 100%= 2% max., LA and LA' are brightness at location A and A'.

l LB-LB' l / LB x 100%= 2% max., LB and LB' are brightness at location B and B'.

9 Touch Panel specifications

9.1 Mechanical characteristics

DESCRIPTION	INL SPECIFICATION	REMARK
Touch Panel Size	5.5	
Outline Dimension (OD)	71.16(H) x148.82(V) mm	Cover Lens Outline
Product Thickness	0.98mm(±0.1)	
Glass Thickness	0.7mm	
Ink View Area	62.48x124.37mm	
Input Method	5 Fingers	
Activation Force	Touch	
Surface Hardness	≥6H	

9.2 Electrical characteristics

DESCRIPTION		SPECIFICATION
Operating Voltage		DC 2.8~3.6V
Power Consumption (IDD)	Active Mode	12~4.5mA
	Sleep Mode	TBD
Interface		I^2C
Controller IC		CHSC5448
I^2C address		-
Resolution		720*1440

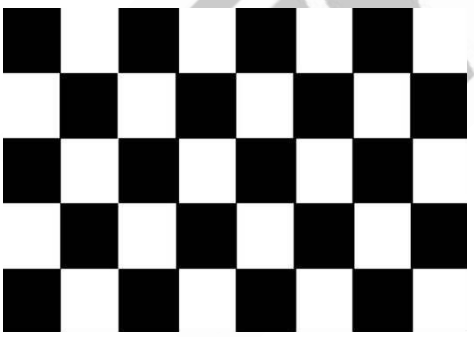
9.3 Interface timing characteristics

PARAMETER	MIN	MAX	UNIT
SCL Frequency	-	400K	Hz
Bus Free Time Between a STOP and START Condition	1.3	-	uS
Hold Time (repeated) START Condition	0.6	-	uS
Data Setup Time	100	-	nS
Setup Time for Repeated START Condition	0.6	-	uS
Setup Time for STOP Condition	0.6	-	uS

10 RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION	INSPECTION AFTER TEST
1	High Temperature Storage	60±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	-20±2°C/96 hours	
3	High Temperature Operating	70±2°C/96 hours	
4	Low Temperature Operating	-30±2°C/96 hours	
5	Temperature Cycle	-30±2°C ~ 25~ 70± 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	Shock Test	Half-sine, wave, 300m/s	
9	Packing Drop Test	Height: 80 cm 1 corner, concrete floor	
10	Electrostatic Discharge Test	C=150pF, R=330 Ω Air: ±8KV 150pF/330Ω 30 times Contact: ±4KV,20 times	
11	Image Sticking	25℃,60%RH (ref.to Remark(1))/30 minutes	

Remark (1): Switch the image to Grey 127 after displaying the 5*8 chess pattern for 30 minutes, the afterimage disappears within 10 seconds.



5*8 chess pattern

Gray127

11 Suggestions for using LCD modules

11.1 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.

11.2 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.