
TFT-LCD Module Specification

Module NO.: TST043WQHS-67C

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

Version No.	Date	Content	Remark
V1.0	2019-4-3	Initial Release	
V1.1	2019-4-12	按实际样品更新亮度	

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1 General Characteristics

ITEM	Specification	Unit
LCD Type	a-Si TFT, Transmissive, Normally black, IPS	-
LCD Size	4.3	inch
Resolution (W x H)	480 x (RGB) x 272	pixel
LCM (W x H x D)	105.50(W) x 67.206(H) x 3.05(D)	mm
Active Area (W x H)	95.04 (W) x 53.866 (H)	mm
Dot Pitch (W x H)	0.051 (W) x 0.153 (H)	mm
Viewing Direction	free o'clock	-
Gray Scale Inversion Direction	free o'clock	-
Color Depth	16.7M	-
Pixel Arrangement	RGB Vertical stripe	-
Backlight Type	16 LEDs, 40mA, 24.8V	-
Surface Luminance	720	cd/m2
Surface Treatment	-	-
Driver IC	ST7282	-
Interface Type	RGB 24bit	-
Input Voltage	3.3	V
With/Without TP	Capacitive Touch Panel	-
Weight	TBD.	g

Note 1: RoHS compliant

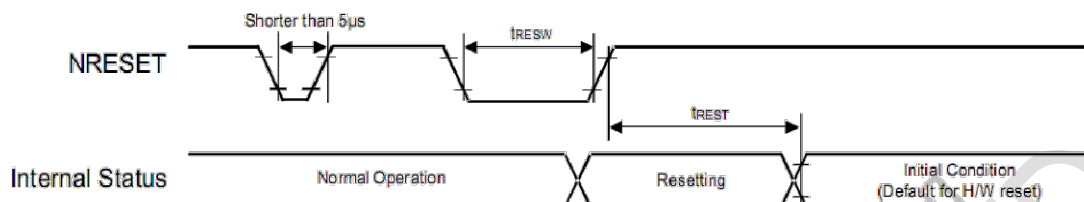
Note 2: LCM weight tolerance: $\pm 5\%$.

3 Interface description

PIN NO.	Symbol	description
1	LED-	Backlight K Cathode input pin.
2	LED+	Backlight A Aothod input pin.
3	GND	System Ground. (0V)
4	VDD	Power supply +2.8V
5-12	R0-R7	Red Data
13-20	G0-G7	Green Data
21-28	B0-B7	Blue Data
29	GND	System Ground. (0V)
30	PCLK	Pixel clock
31	DISP	Display on/off
32	HSYNC	Horizontal sync signal
33	VSNC	Vertical sync signal
34	DE	Data enable
35	NC	NC
36	GND	System Ground. (0V)
37	XR/NC	The touch panel X Right pin
38	YD/NC	The touch panel Y Down pin
39	XL/NC	The touch panel X Left pin
40	YU/NC	The touch panel Y Up pin

4 LCM Interface Timing

4.1 Reset Timing

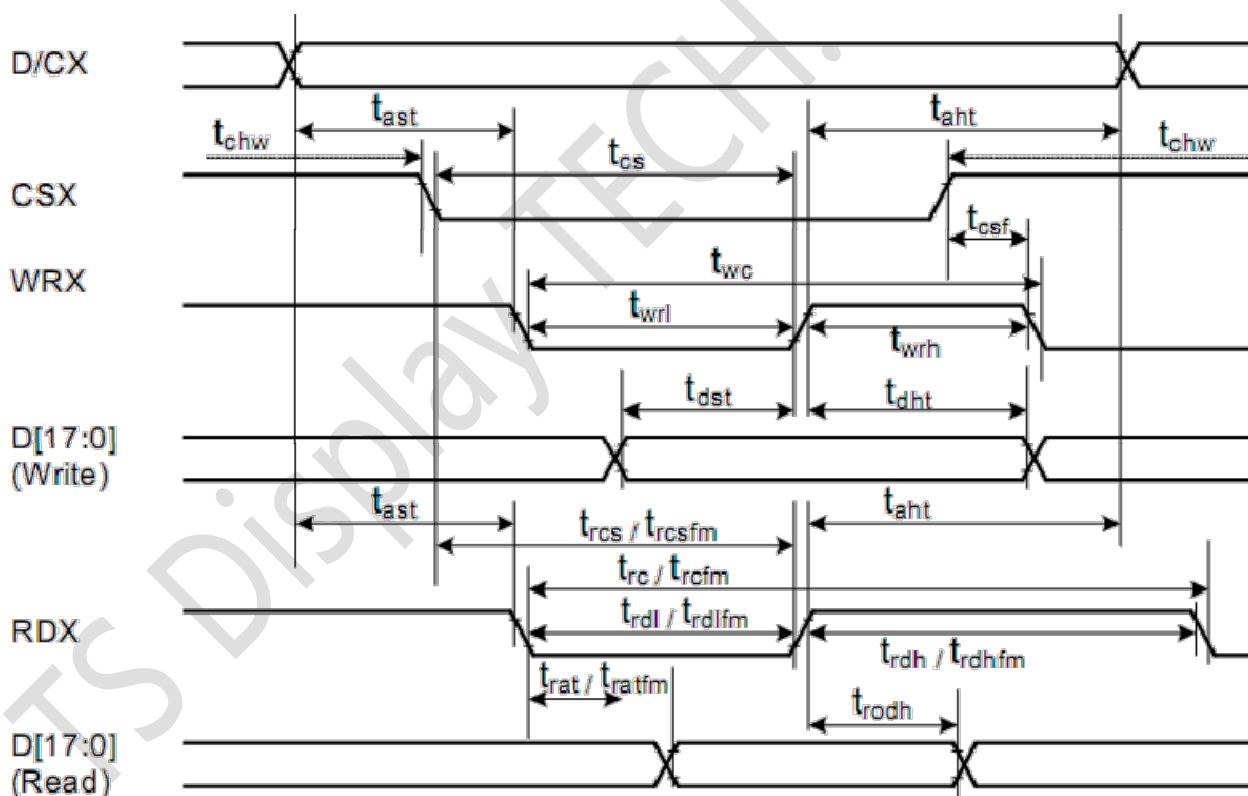


Signal	Symbol	Parameter	Min	Max	Unit
NRESET	tRESW	Reset low pulse width	10	-	us
	tREST	Reset complete time	5 (note 1)	-	ms
			120(note 2)	-	ms

Note: (1) When reset applied during SLPIN mode;

(2) When reset applied during SLPOUT mode.

4.2 MCU Read/Write Timing

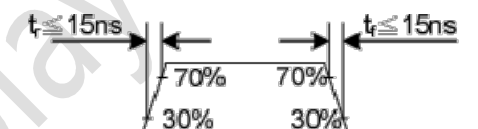


(VSSA=0V, VDD1=1.8V, VDD3=2.8V, TA=25°C)

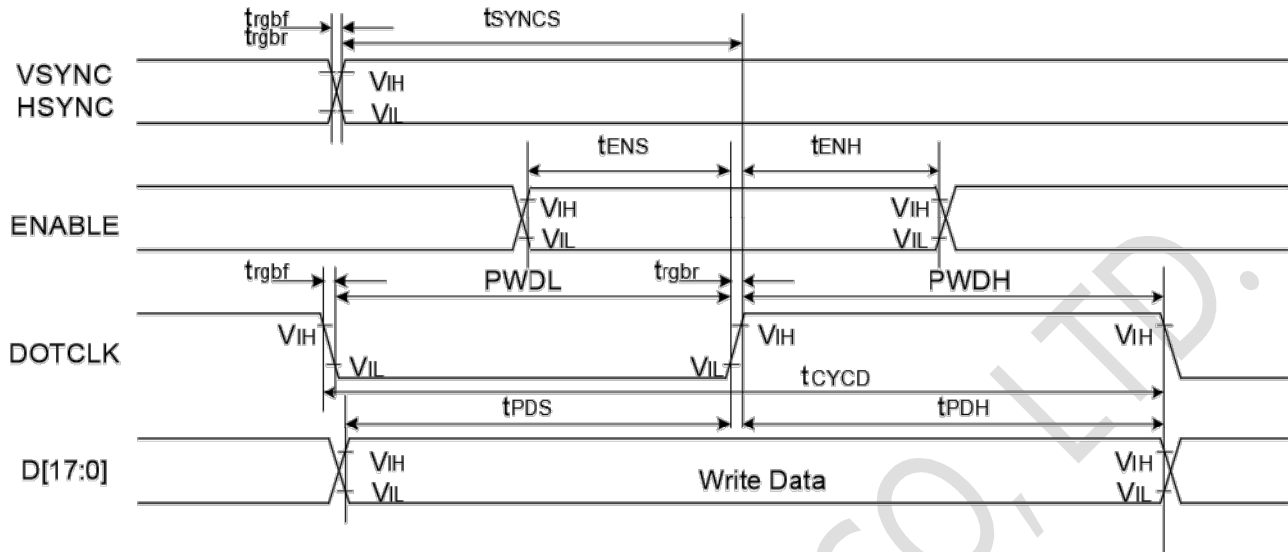
Signal	Symbol	Parameter	Min.	Max.	Unit	Description
DCX	tAST	Address setup time	0	-	ns	-
	tAHT	Address hold time (Write/Read)	0	-		
CSX	tCS	Chip select setup time (Write)	15	-	ns	-
	tRCS	Chip select setup time (Read register)	45	-		
	tRCSFM	Chip select setup time (GRAM)	355	-		
	tCSF	Chip select wait time (Write/Read)	10	-		
WRX	tWC	Write cycle (write register)	66	-	ns	-
	tWRH	Control pulse "H" duration	15	-		
	tWRL	Control pulse "L" duration	15	-		
RDX	tRC	Read cycle (read register)	160	-	ns	-
	tRC	Read cycle (GRAM)	450	-		
	tRDH	Control pulse "H" duration	90	-		
	tRDL	Control pulse "L" duration(read register)	45	-		
	tRDL	Control pulse "L" duration(GRAM)	355	-		
DB[23:0]	tDST	Data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	tDHT	Data hold time	10	-		
	tRAT	Read access time(read register)	-	40		
	tRAT	Read access time(GRAM)	-	340		
	tODH	Output disable time	20	80		

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

Logic high and low levels are specified as 30% and 70% of VDD1 for Input signals.



4.3 RGB interface characteristics

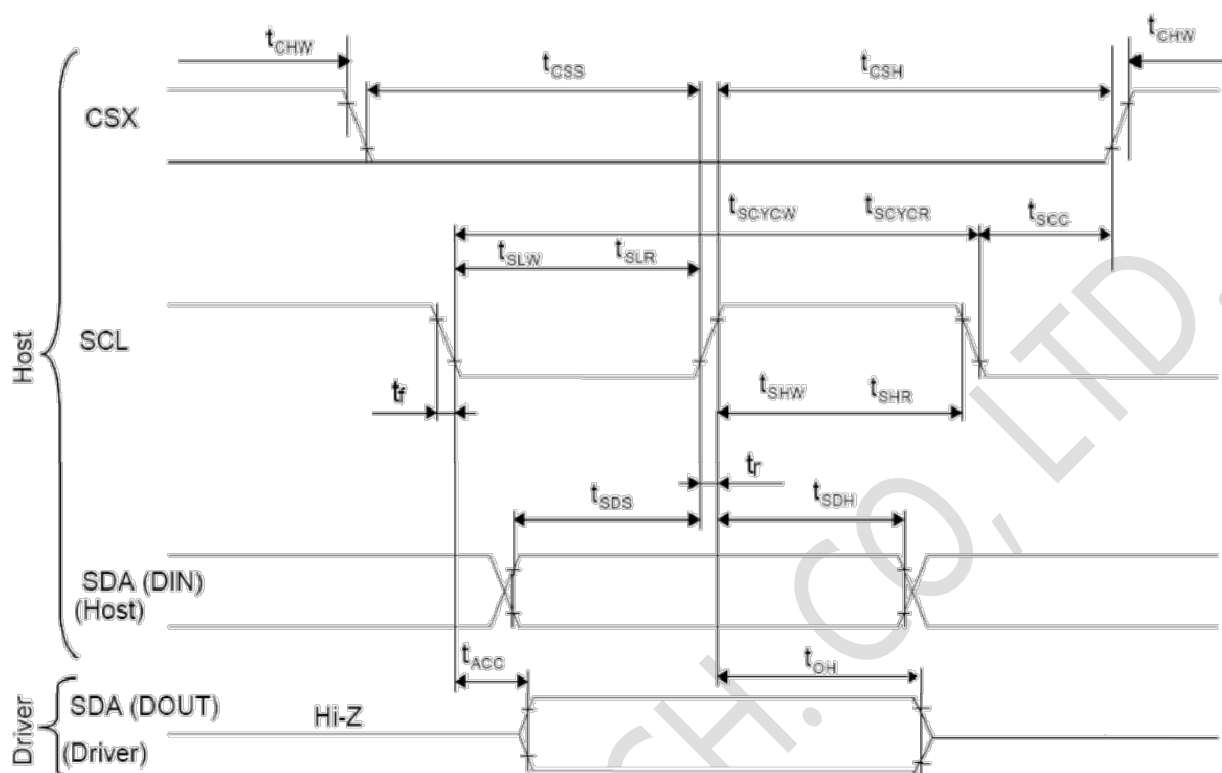


Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	18/16-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{POS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	$PWDH$	DOTCLK high-level period	15	-	ns	
	$PWDL$	DOTCLK low-level period	15	-	ns	
	t_{CYCD}	DOTCLK cycle time	100	-	ns	
	t_{rgb}, t_{bgr}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	6-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{POS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	$PWDH$	DOTCLK high-level pulse period	15	-	ns	
	$PWDL$	DOTCLK low-level pulse period	15	-	ns	
	t_{CYCD}	DOTCLK cycle time	50	-	ns	
	t_{rgb}, t_{bgr}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	

Note: $T_a = -30$ to $70\text{ }^{\circ}\text{C}$, $V_{DDI}=1.65\text{V}$ to 3.3V , $V_{CI}=2.5\text{V}$ to 3.3V , $AGND=VSS=0\text{V}$

Parameters	Symbols	Condition	Min.	Typ.	Max.	Units
Horizontal Synchronization	Hsync		2	10	16	DOTCLK
Horizontal Back Porch	HBP		2	20	24	DOTCLK
Horizontal Address	HAdr		-	240	-	DOTCLK
Horizontal Front Porch	HFP		2	10	16	DOTCLK
Vertical Synchronization	Vsync		1	2	4	Line
Vertical Back Porch	VBP		1	2	-	Line
Vertical Address	VAdr		-	320	-	Line
Vertical Front Porch	VFP		3	4	-	Line

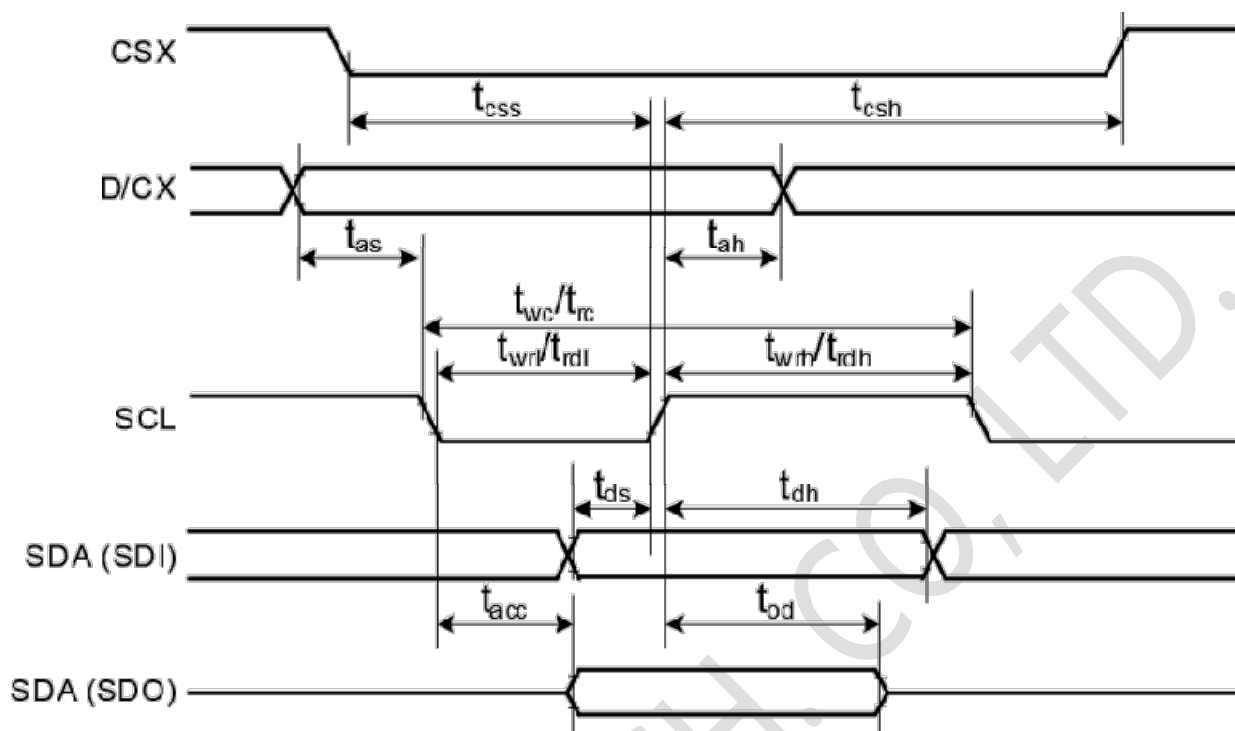
4.4 3-line SPI Timing Characteristics



Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA / SDI (Input)	tsds	Data setup time (Write)	30	-	ns	
	tsdh	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	tacc	Access time (Read)	10	-	ns	
	toh	Output disable time (Read)	10	50	ns	
CSX	tsc	SCL-CSX	20	-	ns	
	tch	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tch		65	-	ns	

Note: $T_a = 25\text{ }^{\circ}\text{C}$, $V_{DDI}=1.65\text{V to }3.3\text{V}$, $V_{CI}=2.5\text{V to }3.3\text{V}$, $AGND=VSS=0\text{V}$

4.5 4-line SPI Timing Characteristics



Signal	Symbol	Parameter	min	max	Unit	Description
CSX	t_{css}	Chip select time (Write)	40	-	ns	
	t_{csh}	Chip select hold time (Read)	40	-	ns	
SCL	t_{wc}	Serial clock cycle (Write)	100	-	ns	
	t_{wrh}	SCL "H" pulse width (Write)	40	-	ns	
	t_{wr}	SCL "L" pulse width (Write)	40	-	ns	
	t_{trc}	Serial clock cycle (Read)	150	-	ns	
	t_{trh}	SCL "H" pulse width (Read)	60	-	ns	
	t_{trdl}	SCL "L" pulse width (Read)	60	-	ns	
D/CX	t_{as}	D/CX setup time	10	-		
	t_{ah}	D/CX hold time (Write / Read)	10	-		
SDA / SDI (Input)	t_{ds}	Data setup time (Write)	30	-	ns	
	t_{dh}	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	t_{acc}	Access time (Read)	10	-	ns	For maximum CL=30pF
	t_{od}	Output disable time (Read)	10	50	ns	For minimum CL=8pF

Note: $T_a = 25^\circ\text{C}$, $V_{DDI}=1.65\text{V to }3.3\text{V}$, $V_{CI}=2.5\text{V to }3.3\text{V}$, $AGND=VSS=0\text{V}$

5 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage (Analog)	VCC~GND	-0.3	3.3	V
Logic signal voltage(I/O)	IOVCC~GND	-0.3	3.3	V
Operating Temperature	TOP	-20	70	$^\circ\text{C}$
Storage Temperature	TST	-30	80	$^\circ\text{C}$
Humidity	RH	-	90%(Max 60°C)	RH

6 Electrical Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Analog operating voltage	VCC	2.8	3.3	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	24	24.8	25.6	V
Current for LED backlight	I _f	30	40	40	mA
Power consumption	W _{bl}	-	232.5	320	mW
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	$\theta = 0^\circ$	-	30	-	ms	Note 5
Contrast ratio	CR	$\theta = 0^\circ$	-	800	-		Note 2,6
Viewing angle	Top	CR ≥ 10	-	80	-	Deg.	Note 2,6,7
	Bottom	CR ≥ 10	-	80	-		
	Left	CR ≥ 10	-	80	-		
	Right	CR ≥ 10	-	80	-		
Color chromaticity (CF only with ITO, light source is C light, CIE 1931)	Wx	$\theta = 0^\circ$	0.30	0.32	0.34		Note 3
	Wy		0.36	0.38	0.40		
	Rx			TBD			
	Ry			TBD			
	Gx			TBD			
	Gy			TBD			

	Bx			TBD			
	By			TBD			
NTSC				60%			Note 3
Transmittance (with Polarizer)	T(%)	$\theta = 0^\circ$	4.5	5.0	-	%	

Note 1: Ambient temperature = 25°C.

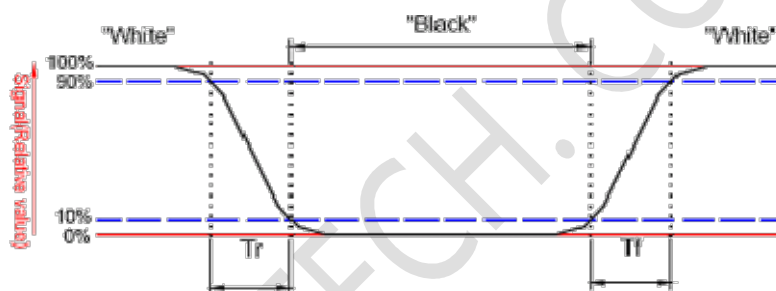
Note 2: To be measured with a viewing cone of 2°by Topcon luminance meter BM-5A.

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 $\pm 10\%$.

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.

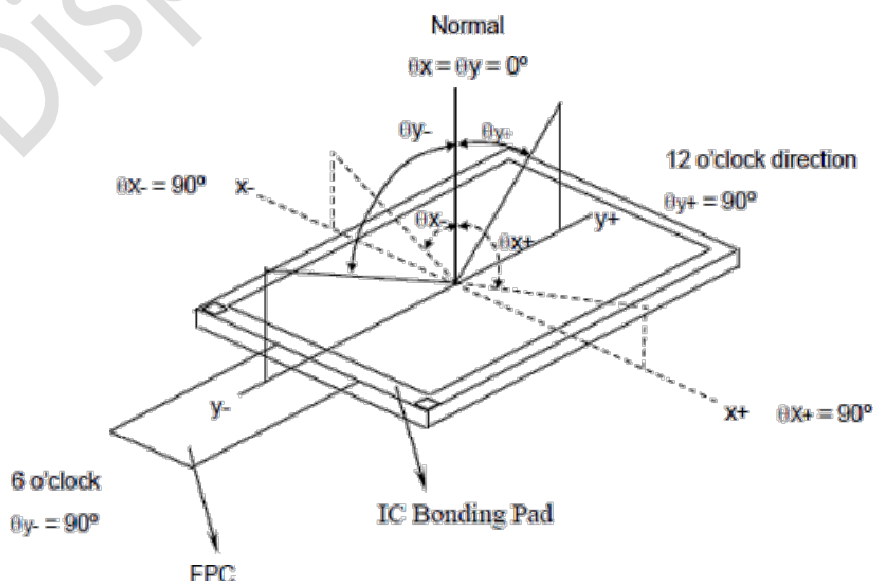


Note 6: Definition of contrast ratio:

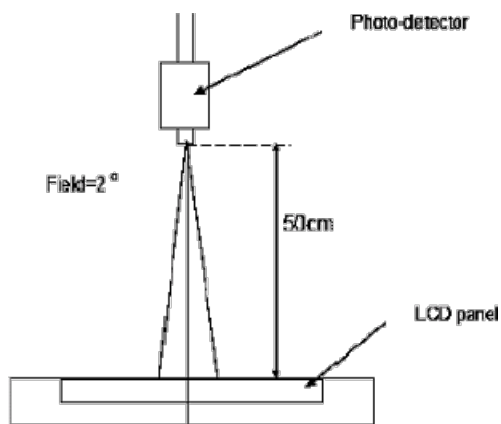
Contrast ratio is calculated by the following formula.

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

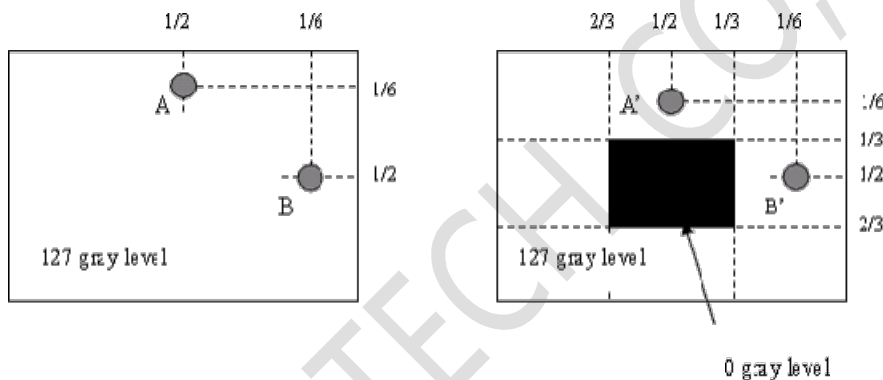
Note 7: Definition of viewing angle



Note 8: Optical characteristic measurement setup.



Note 9:



$1 \text{ LA-LA}' / \text{LA} \times 100\% = 2\% \text{ max.}$, LA and LA' are brightness at location A and A'.

$1 \text{ LB-LB}' / \text{LB} \times 100\% = 2\% \text{ max.}$, LB and LB' are brightness at location B and B'.

9 Touch Panel specifications

ITEM	VALUE			UNIT	REMARK
	Min.	Typ.	Max.		
Linearity	-	-	1.5	%	Analog X and Y directions
Terminal Resistance	200	-	600	Ω	x
	300	-	900		y
Insulation Resistance	10	-	-	M Ω	DC 25V
Voltage	-	3	10	V	DC
Chattering	-	-	15	ms	100k Ω pull-up
Transparency	80	-	-	%	-
Operation Force	60	-	100	g	-
Endurance	1,000,000	-	-	Touches	100g Operation Force
	-	-	30,000	Slides	
Surface Hardness	3	-	-	H	-

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.

