深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, TD.

TFT-LCD Module Specification

Module NO.: TST024QVHS-34

Version: V1.0

☐ 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	2021-01-19	Initial Release	

CONTENTS

1 General Characteristics

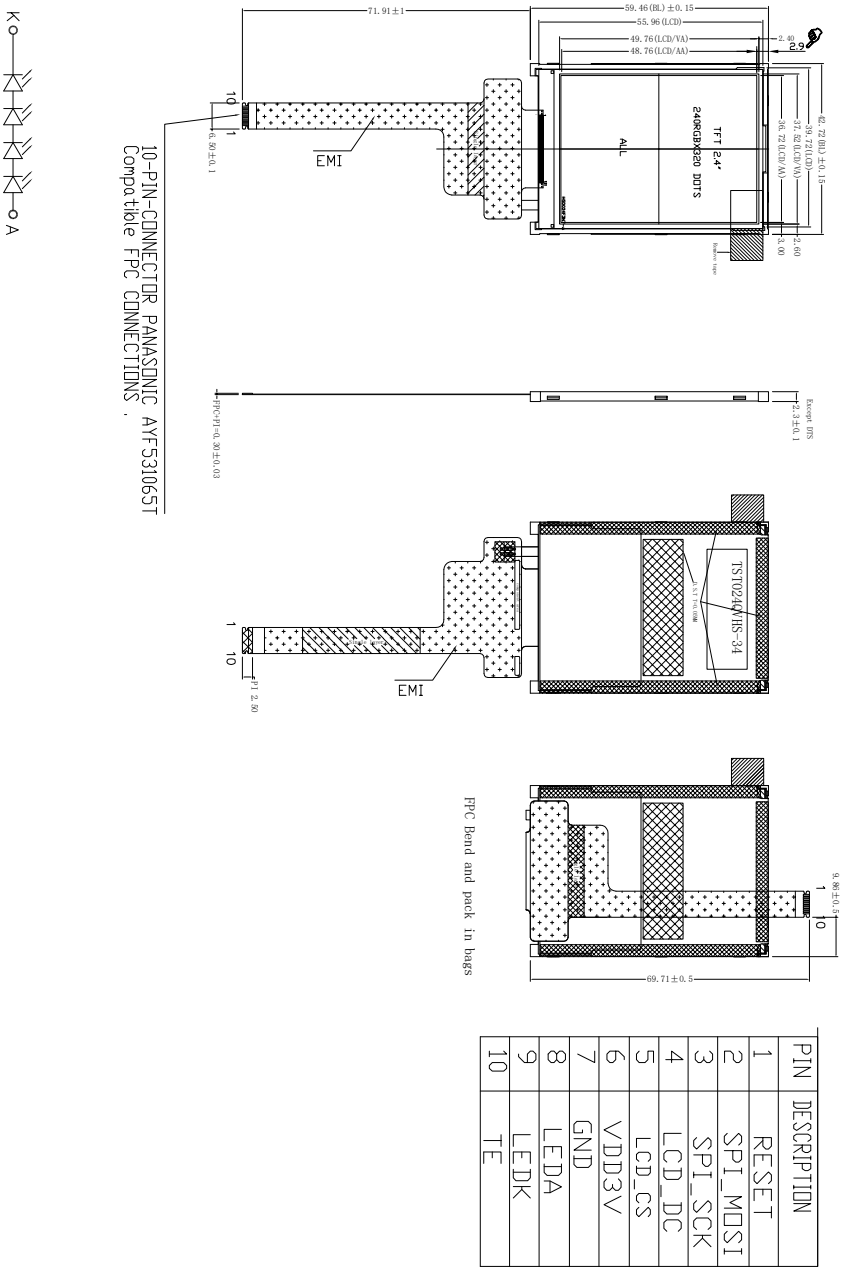
ITEM	Specification	Unit
LCD Type	a-Si TFT,Transmissive,Normally black,IPS	-
LCD Size	2.4	inch
Resolution (W x H)	240 x (RGB) × 320	pixel
LCM (W × H × D)	42.72W) x 59.46(H) x 2.3(D)	mm
Active Area (W × H)	36.72 (W) x 48.96 (H)	mm
Dot Pitch (W × H)	0.051 (W) x 0.153 (H)	mm
Viewing Direction	Free	-
Color Depth	65K/262K	-
Pixel Arrangement	RGB Vertical stripe	-
Backlight Type	4 LEDs	-
Surface Luminance	400	cd/m2
Surface Treatment	Anti-glare	-
Driver IC	ST7789V	-
Interface Type	SPI	-
Input Voltage	2.8	V
With/Without TP	without	-
Weight	TBD.	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

2 Product drawings

LCD Type	2.4"TFT, Transmissive, Normally black, IPS
Resolution	240(RGB)*320
View Direction	Free
Driver IC	ST7789V
Color Depth	65K
Interface Types	SPI
Operating voltage	2.8V
TP/Lens	Without
Backlight LEDs	4 LEDs, 20mA,12.4V
Surface luminance	400 cd/m²
Operating temperature	-20 ℃~70 ℃
Storage Temperature	-30 ℃~80 ℃
Storage Humidity	60℃ 90% max



PIN	DESCRIPTION
1	RESET
2	SPI_MOSI
3	SPI_SCK
4	LCD_DC
5	LCD_CS
6	VDD3V
7	GND
8	LEDA
9	LEDK
10	TE

K ○—|>|—○ A

Backlight circuit
20mA, 11.6-12.4V

10-PIN-CONNECTOR PANASONIC AYF531065T
Compatible FPC CONNECTIONS ,

" " Need to pay attention to the key size with *

版本(Version)	变更记录(Change History)	日期(Date)
A0	New issue	2019.08.09
A1		
A2		

东莞市一众显示科技有限公司
DONG GUAN TEAM SOURCE DISPLAY TECH. CO.,LTD.

视 角 (View):	比例(Proportion):	1 : 1	设 计 (DESIGN)	审 核 (AUDITING)	批 准 (APPROVED)
单 位 (Unit):	M M	页 面 (Page):	1 / 1		
产品型号 (Product Type):	TST024QVHS-34		Bill 2019.08.09	Aron 2019.08.09	
图纸版本 (Version):	A0				

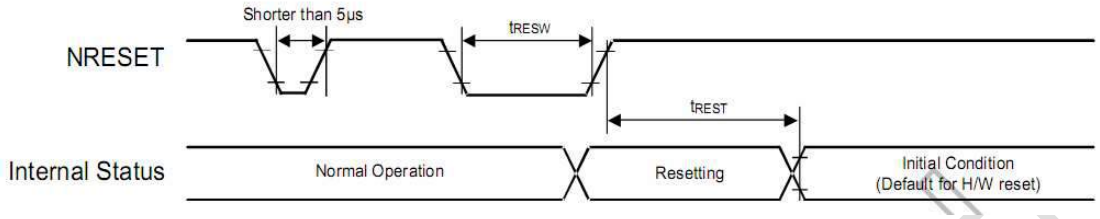
3 Interface description

PIN NO.	Symbol	description
1	RESET	Reset input signal
2	SPI_MOSI	Serial data in/output signal
3	SPI_SCK	Serial clock input signal
4	LCD_DC	Data/Command selection pin
5	LCD_CS	Chip select signal
6	VDD3V	Power supply
7	GND	System Ground
8	LEDA	Backlight A Anode input pin
9	LEDK	Backlight K Cathode input pin
10	TE	Tearing effect output signal

Note: “0”connect to GND; “1”connect to IOVCC.

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 Serial Read/Write Timing

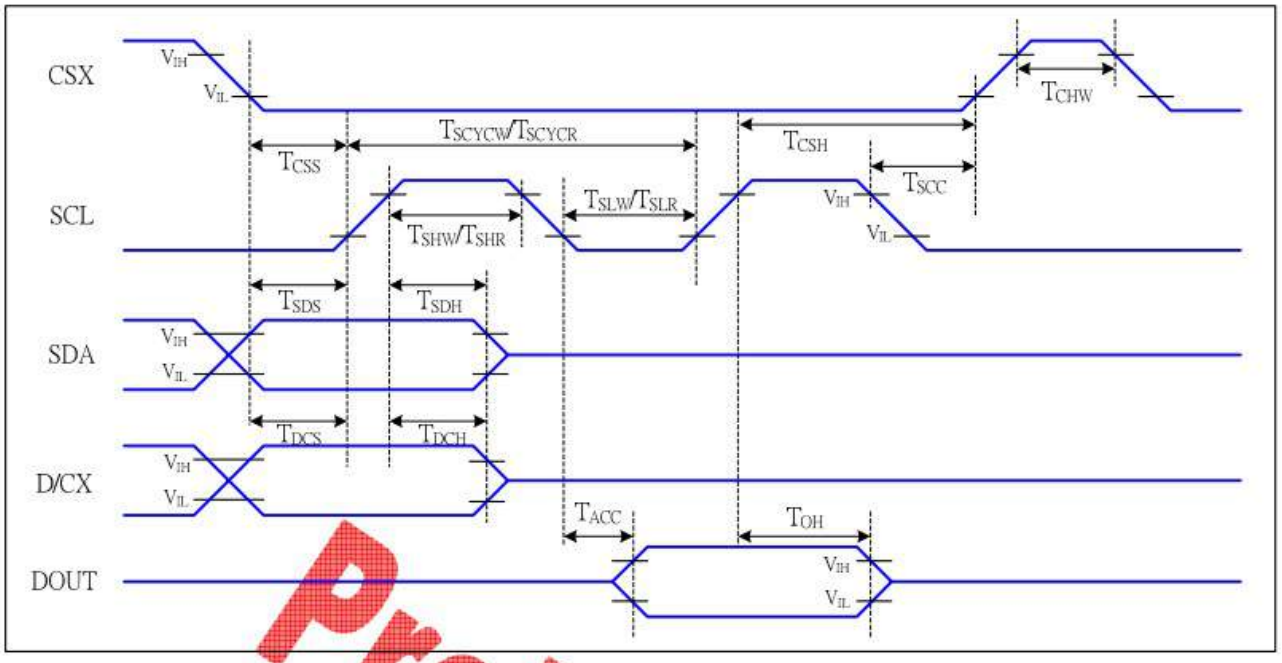


Figure 5 4-line serial Interface Timing Characteristics

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=-30 to 70 ℃

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	65		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	-write command & data ram
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	-read command & data ram
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
D/CX	T_{DCS}	D/CX setup time	10		ns	
	T_{DCH}	D/CX hold time	10		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	
DOUT	T_{ACC}	Access time	10	50	ns	For maximum CL=30pF
	T_{OH}	Output disable time	15	50	ns	For minimum CL=8pF

Table 6 4-line serial Interface Characteristics

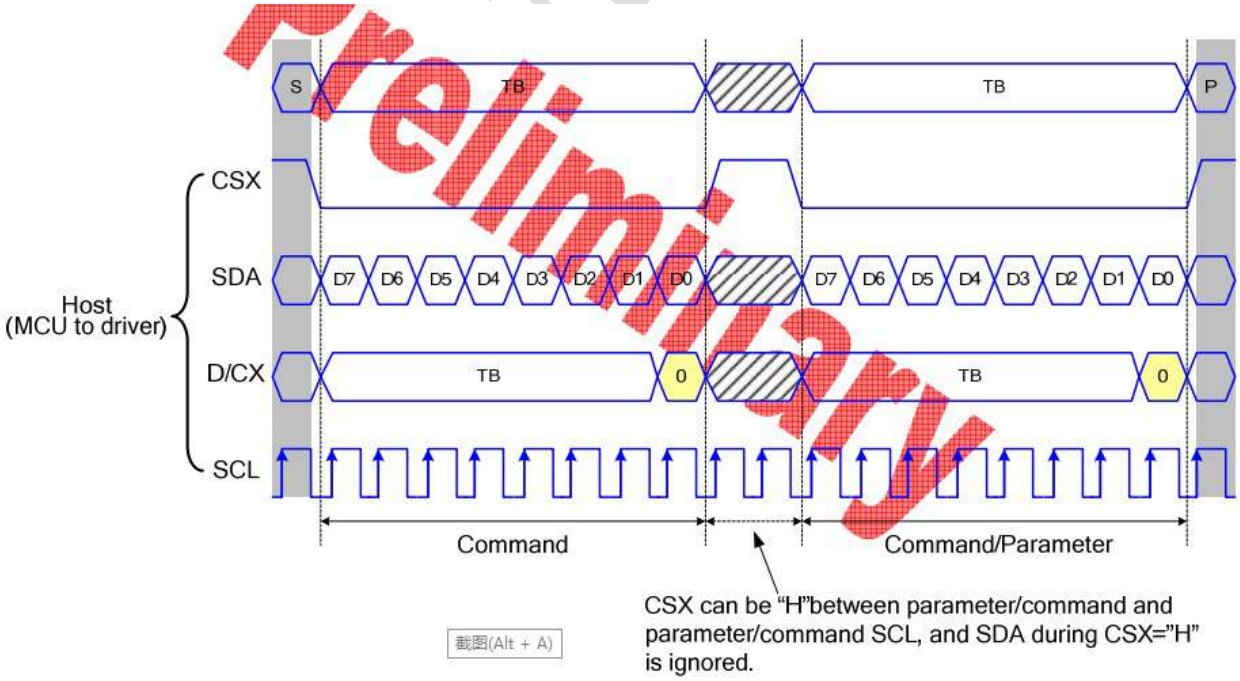
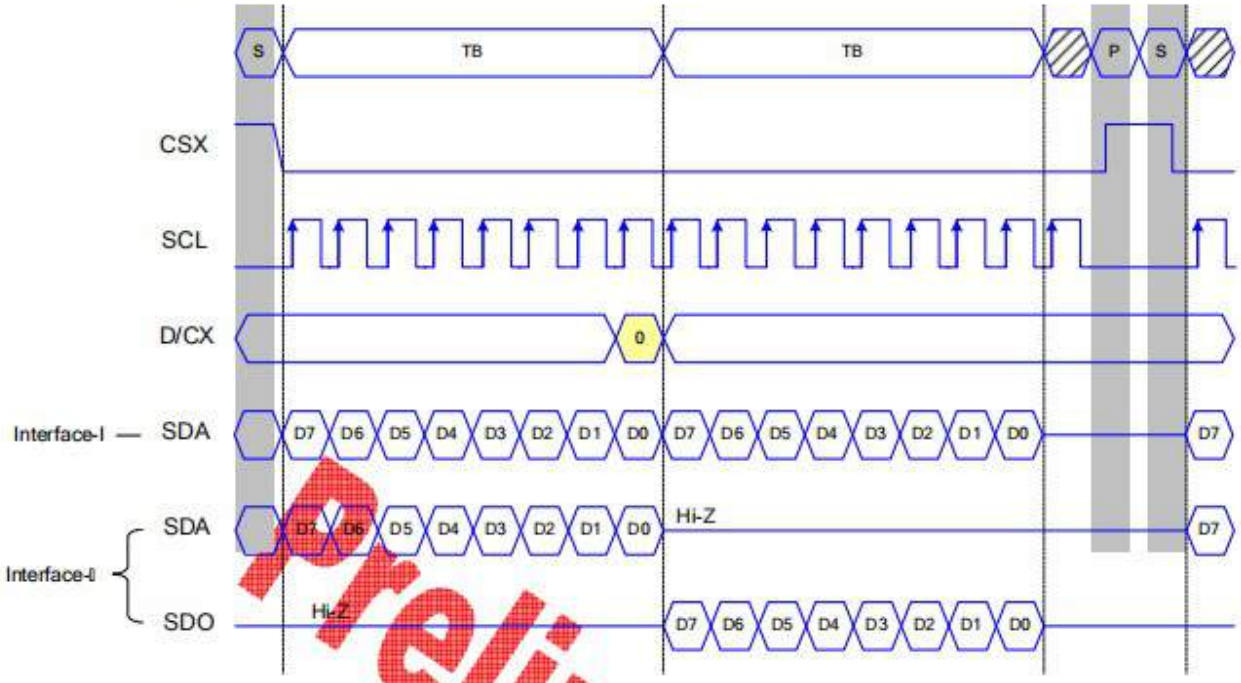
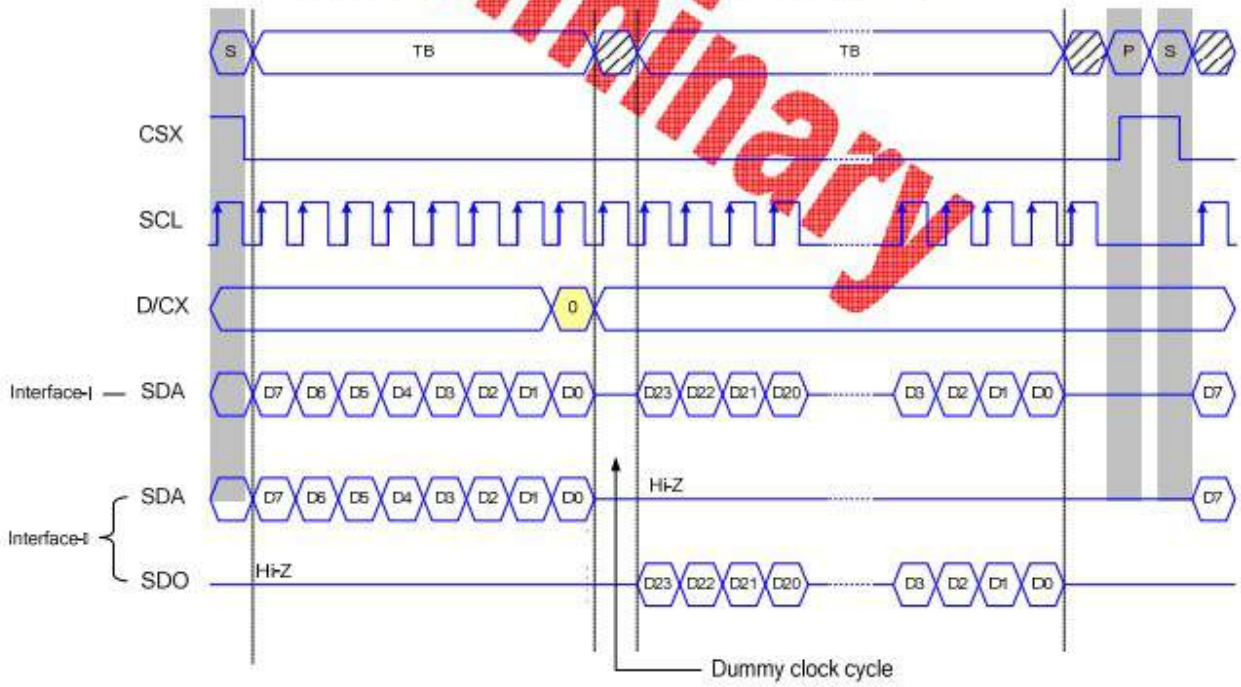


Figure 14 4-line serial interface write protocol (write to register with control bit in transmission)

4-line serial protocol (for RDID1/RDID2/RDID3/0Ah/0Bh/0Ch/0Dh/0Eh/0Fh command: 8-bit read):



4-line serial protocol (for RDDID command: 24-bit read)



4-line Serial Protocol (for RDDST command: 32-bit read)

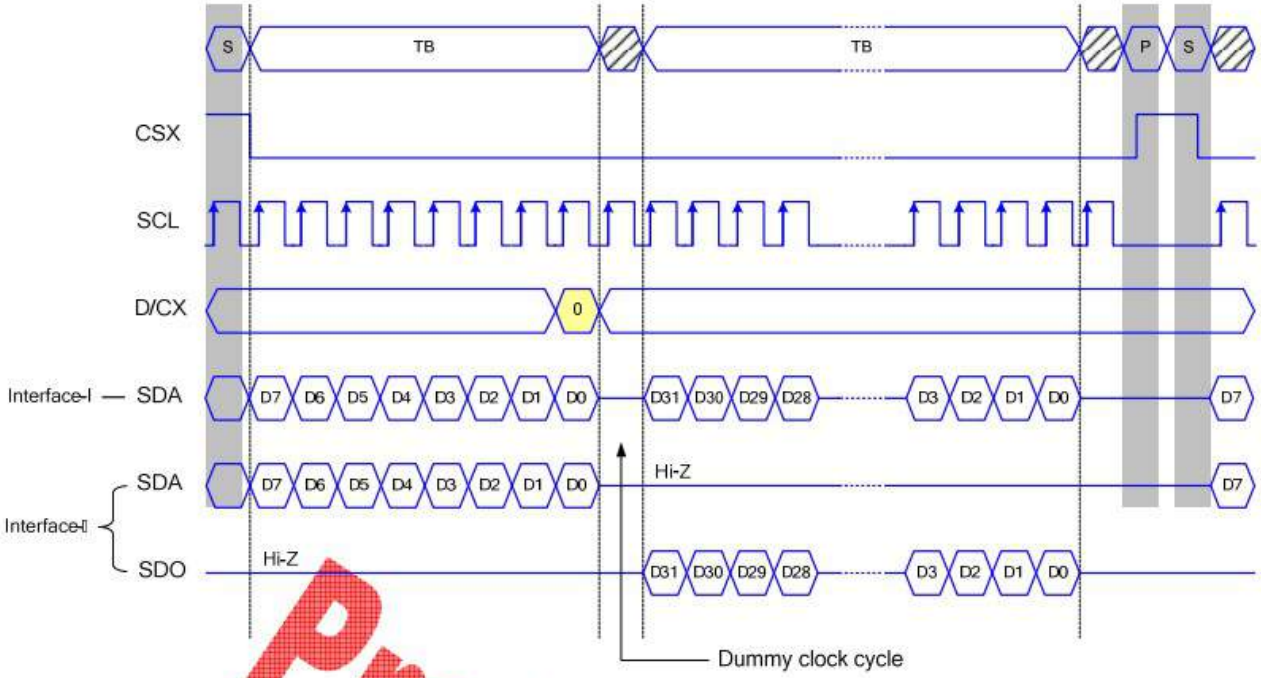


Figure 16 4-line serial interface read protocol

5 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage (Analog)	VDD3V~GND	-0.3	3.3	V
Logic signal voltage(I/O)	VDD3V~GND	-0.3	3.3	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	VDD3V	2.5	2.8	3.3	V
Logic operating voltage	-	-	-	-	V
Input Current	IDD	-	TBD	-	mA
Input Voltage ' H ' level	VIH	0.7VDD3V	-	VDD3V	V
Input Voltage ' L ' level	VIL	GND	-	0.3VDD3V	
Output Voltage ' H ' level	VOH	0.8VDD3V	-	VDD3V	
Output Voltage ' L ' level	VOL	GND	-	0.2VDD3V	

7 Backlight Characteristics

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V_f	-	12	12.4	V
Current for LED backlight	I_f	-	20	-	mA
Power consumption	Wbl	-	240	-	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	θ = 0°	-	35	-	ms	Note 5
Contrast ratio	CR	θ = 0°	-	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	θ = 0°	0.290	0.310	0.330		Note 3
	Wy		0.316	0.336	0.356		
	Rx		0.627	0.647	0.667		
	Ry		0.297	0.317	0.337		
	Gx		0.255	0.275	0.295		
	Gy		0.562	0.582	0.602		
	Bx		0.120	0.140	0.160		
	By		0.068	0.088	0.108		
NTSC				60%			Note 3
Transmittance (with Polarizer)	T(%)	θ = 0°	-	4.65	-	%	

Note 1: Ambient temperature = 25°C.

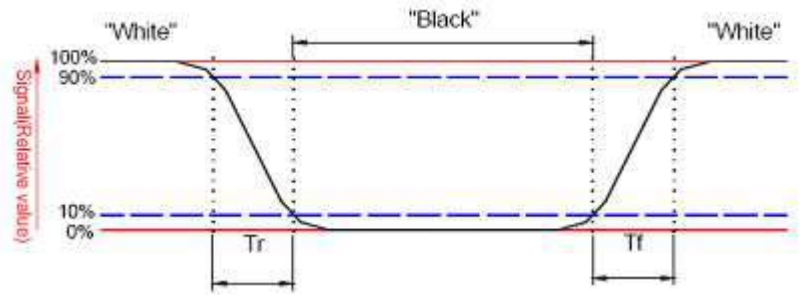
Note 2: To be measured with a viewing cone of 2°by Topcon luminance meter BM-5A.

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 ±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.

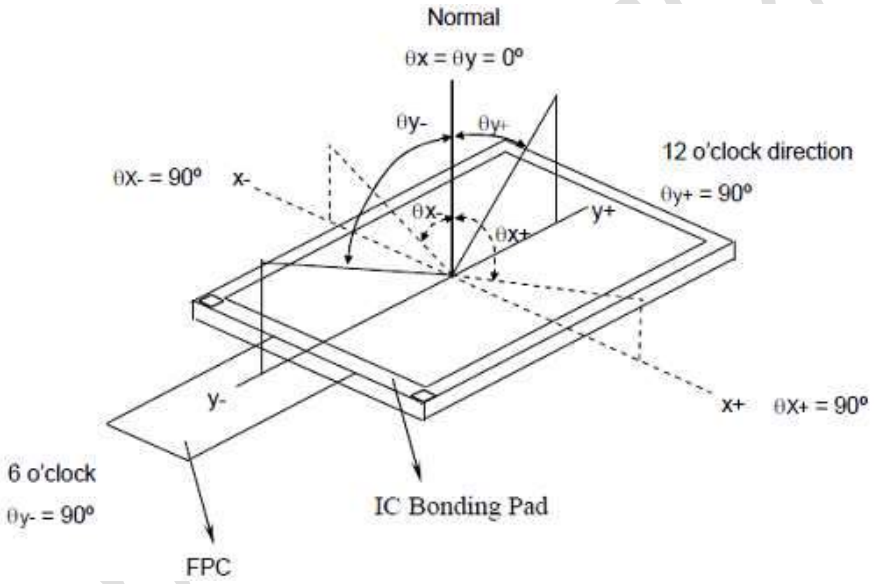


Note 6: Definition of contrast ratio:

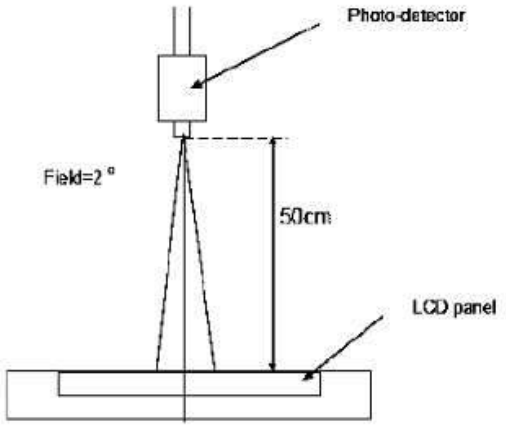
Contrast ratio is calculated by the following formula.

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

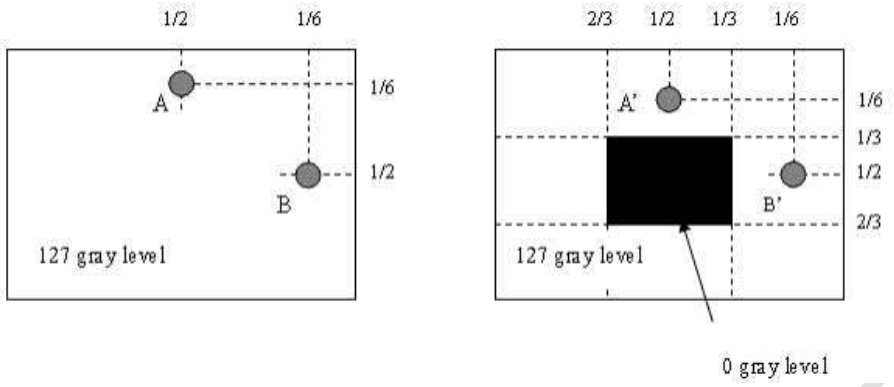
Note 7: Definition of viewing angle



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 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	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	

9.1 Others

1. Issues that are not defined in this document shall be discussed and agreed with both parties. (Customer and supplier)
2. Unless otherwise agreed upon in writing, the criteria shall be applied to both parties. (Customer and supplier)

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.