深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, LTD.

TFT-LCD Module Specification

Module NO.: TST350FPQI-02P

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	2020-02-24	Initial Release	
V1.1	202-02-26	Correction of glass type	

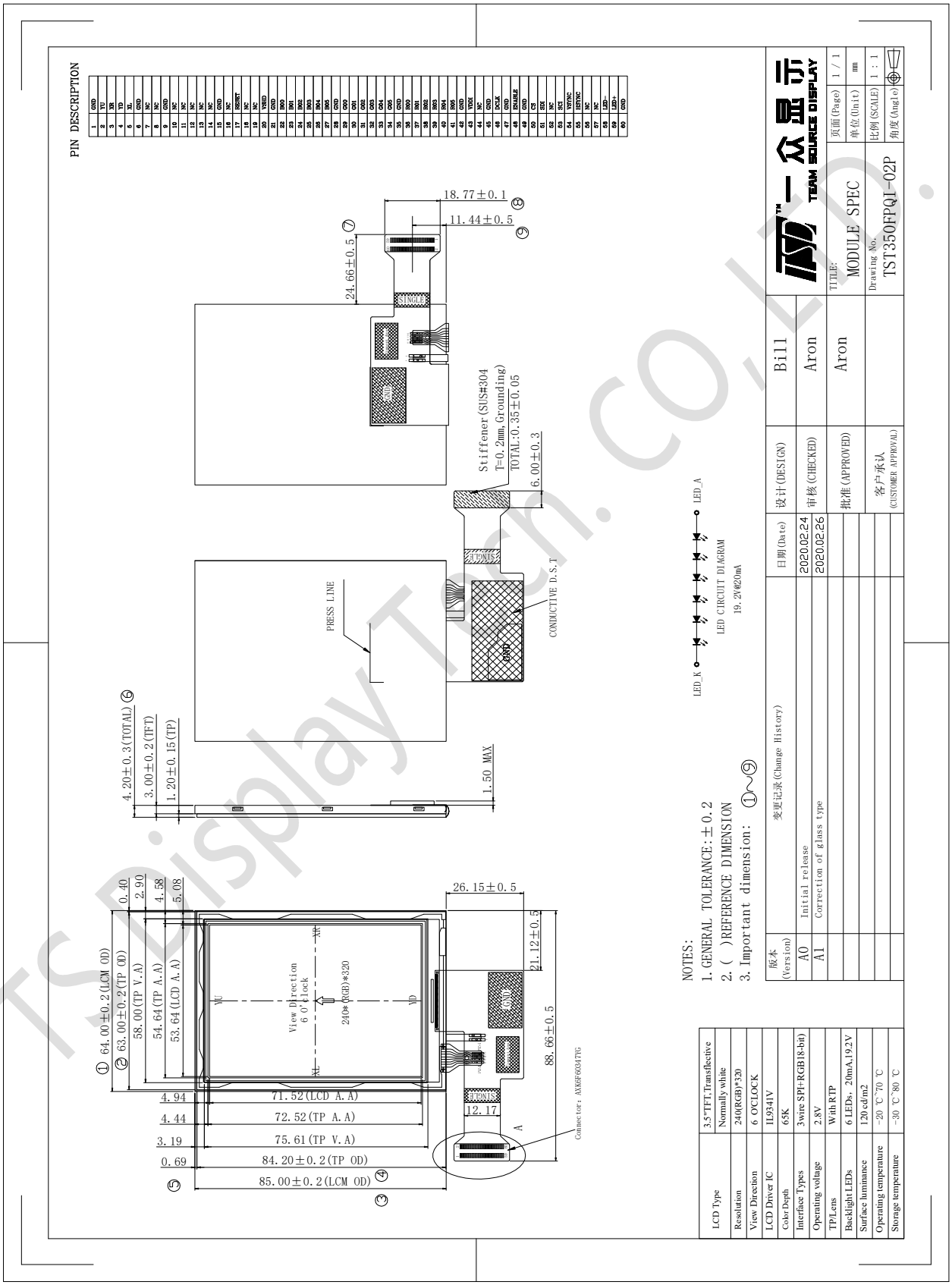
CONTENTS

1 General Characteristics

ITEM	Specification	Unit
LCD Type	a-si TFT,Transflective,Normally white	-
LCD Size	3.5	inch
Resolution (W x H)	240 x (RGB) × 320	pixel
LCM (W × H × D)	64(W) x85(H) x 4.2(D)	mm
Active Area (W × H)	53.64 (W) x 71.52(H)	mm
Pixel Pitch	0.2235 x 0.2235	mm
Viewing Direction	6 o'clock	-
Color Depth	65K	-
Pixel Arrangement	RGB-stripe	-
Backlight Type	6 LEDs	-
Surface Luminance	120	cd/m2
Surface Treatment	-	-
Polarizer	-	-
Driver IC	ILI9341V	-
Interface Type	3wire SPI+RGB18-bit	-
Input Voltage	2.8	V
With/Without TP	With RTP	-
Weight	TBD	g

Note 1: RoHS compliant
Note 2: LCM weight tolerance: ± 5%.

2 Product drawings



3 Interface description

Pin No.	Symbol	Description
1	GND	Power ground
2	YU	Tp pin
3	XR	Tp pin
4	YD	Tp pin
5	XL	Tp pin
6	GND	Power ground
7	NC	No connect
8	NC	No connect
9	GND	Power ground
10	NC	No connect
11	NC	No connect
12	NC	No connect
13	NC	No connect
14	NC	No connect
15	GND	Power ground
16	NC	No connect
17	RESET	Reset(Low active)
18	NC	No connect
19	NC	No connect
20	VSHD	Power supply for digital
21	GND	Power ground
22	B00	Blue data bus
23	B01	Blue data bus
24	B02	Blue data bus
25	B03	Blue data bus
26	B04	Blue data bus
27	B05	Blue data bus
28	GND	Power ground
29	G00	Green data bus
30	G01	Green data bus
31	G02	Green data bus
32	G03	Green data bus
33	G04	Green data bus
34	G05	Green data bus
35	GND	Power ground
36	R00	Red data bus
37	R01	Red data bus
38	R02	Red data bus
39	R03	Red data bus

40	R04	Red data bus
41	R05	Red data bus
42	GND	Power ground
43	VDDI	Power supply
44	NC	No connect
45	GND	Power grounf
46	DCLK	Pixel clock signal in RGB mode
47	GND	Power ground
48	ENABLE	Display enable pin from controller
49	GND	Power ground
50	CS	Chip select input(Low enable)
51	SDI	Serial data input
52	NC	No connect
53	SCI	Serial interface clock
54	VSYNC	Vertical sync. in RGB mode
55	HSYNC	Horizontal sync. in RGB mode
56	NC	No connect
57	NC	No connect
58	LED-	Cathode of LED backlight
59	LED+	Anode of LED backlight
60	GND	Power ground

4 LCM Interface Timing

4.1 Reset Timing

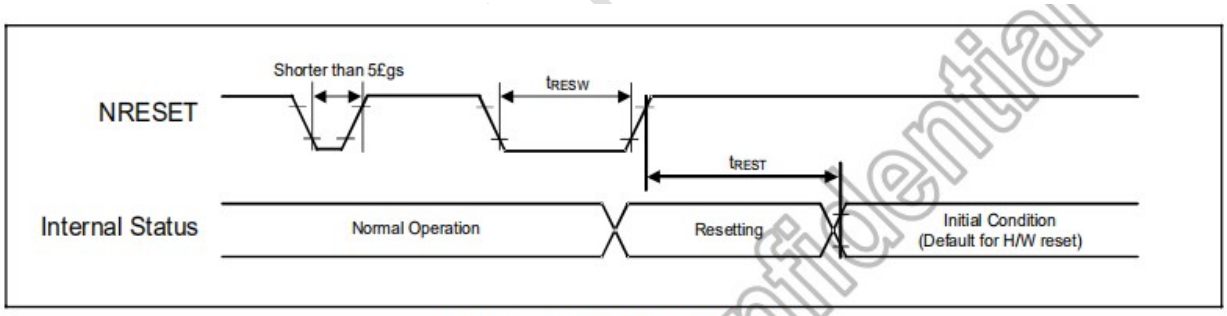


Figure 7.8: Reset input timing

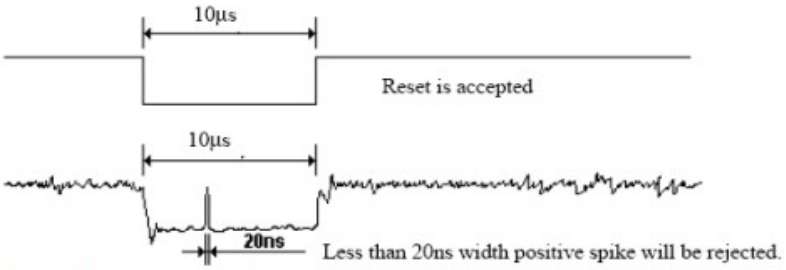
Symbol	Parameter	Related Pins	Spec. Min.	Spec. Typ.	Spec. Max.	Note	Unit
tRESW	Reset low pulse width(1)	NRESET	10	-	-	-	µs
tREST	Reset complete time(2)	-	15	-	-	When reset applied during SLPIN mode	ms
		-	120	-	-	When reset applied during SLPOUT mode	ms

Table 7.8: Reset Input Timing

Note: (1) Spike due to an electrostatic discharge on NRESET line does not cause irregular system reset according to the following table.

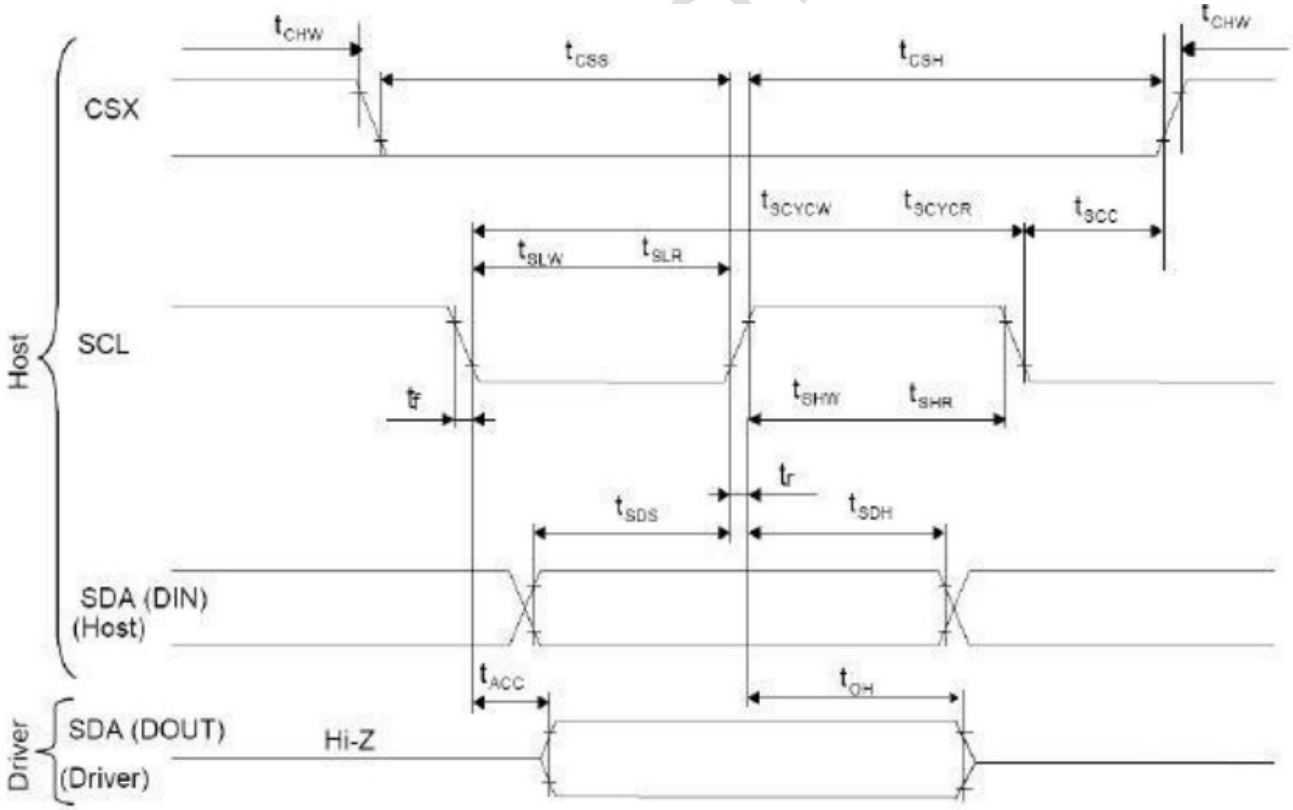
NRESET Pulse	Action
Shorter than 5 μs	Reset Rejected
Longer than 10 μs	Reset
Between 5 μs and 10 μs	Reset Start

(2) During the resetting period, the display will be blanked (The display is entering blanking sequence, which Maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then return to Default condition for H/W reset.
(3) During Reset Complete Time, ID and VCOM value in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (tREST) within 15ms after a rising edge of NRESET.
(4) Spike Rejection also applies during a valid reset pulse as shown as below:



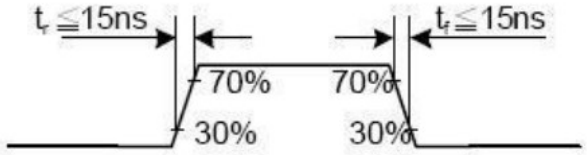
(5) It is necessary to wait 15msec after releasing NRESET before sending commands. Also Sleep Out command cannot be sent for 120msec.

4.2 3-Wire SPI Timing Diagram

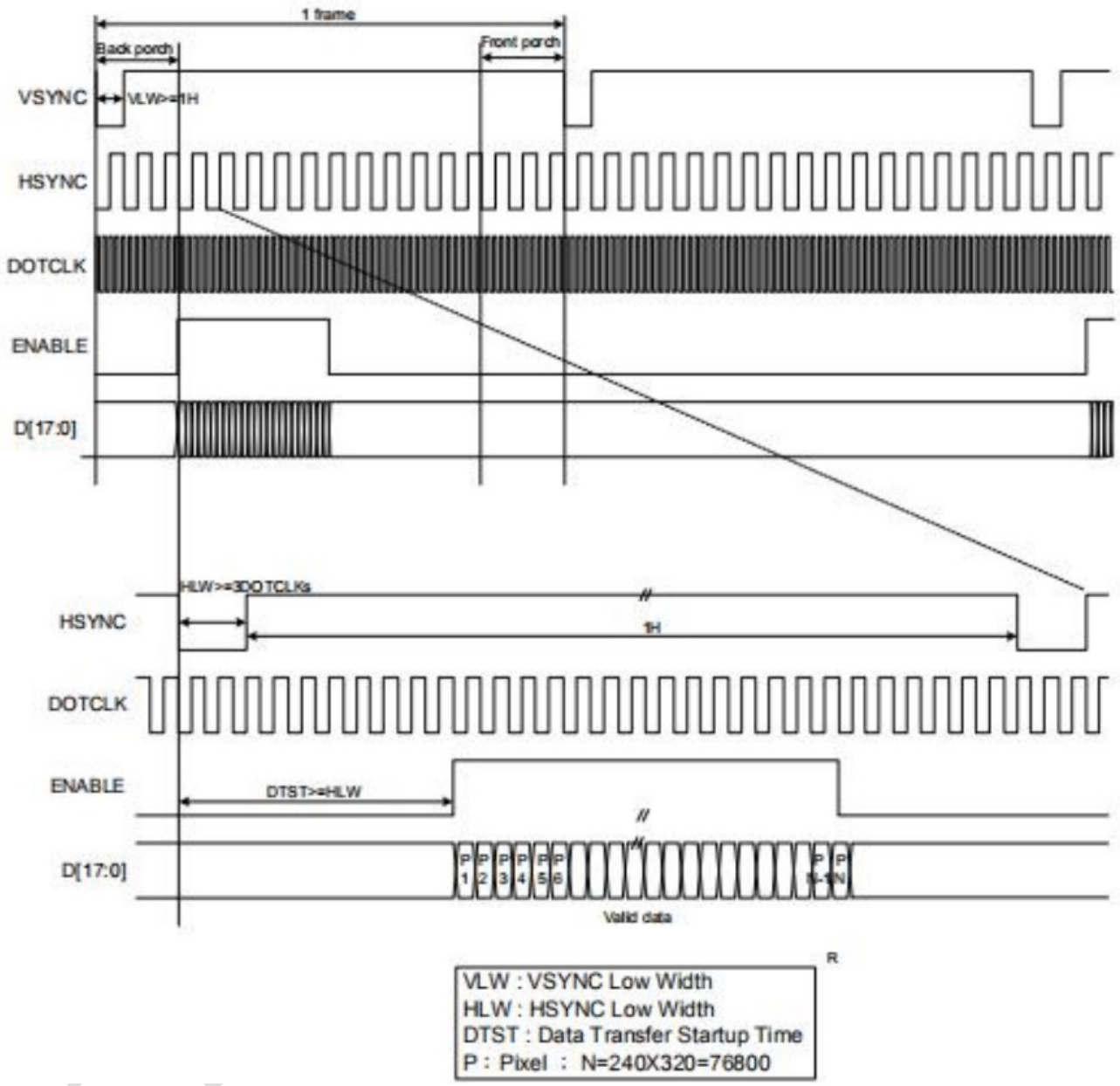


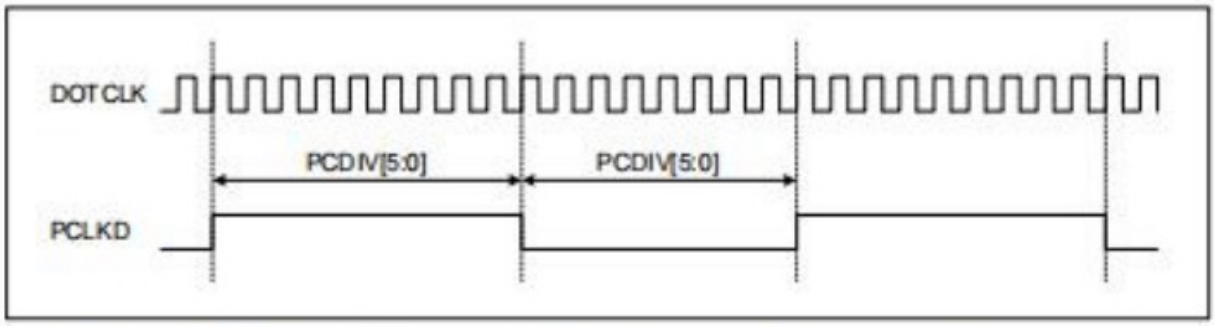
Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	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	tscc	SCL-CSX	20	-	ns	
	tchw	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tcsh		65	-	ns	

Note: Ta = 25 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V



4.3 RGB Timing





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.

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

Typical values are setting example when used with panel resolution 240 x 320 (QVGA), clock frequency 6.35MHz and frame

5 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply voltage for analog	VSHD	-0.3	4.5	V
Supply voltage for logic	VSHD	-0.3	4.5	V
Supply current (One LED)	I_{LED}		30	mA
Operating temperature	T_{OP}	-20	+70	°C
Storage temperature	T_{ST}	-30	+80	°C

Note: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

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	16.8	19.2	20.4	V
Current for LED backlight	I_f	-	20	30	mA
Power consumption	Wbl	-	384	-	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°	-	20	30	ms	Note 5
Contrast ratio	CR	θ = 0°	100	150	-		Note 2,6
Viewing angle	Top	CR≧10	-	60	-	Deg.	Note 2,6,7
	Bottom	CR≧10	-	60	-		
	Left	CR≧10	-	55	-		
	Right	CR≧10	-	60	-		
Color chromaticity (CF only with ITO, light source is C light, CIE 1931)	Wx	θ = 0°	-0.03	0.315	+0.03		Note 3
	Wy			0.0.357			
	Rx			TBD			
	Ry			TBD			
	Gx			TBD			
	Gy			TBD			
	Bx			TBD			
	By			TBD			
NTSC			57%	60%	-		Note 3

Cross talk	Ct		-	-	2%		Note 9
Transmittance	Trans		-	3.43%	-		Note 4

Note 1: Ambient temperature = 25°C.

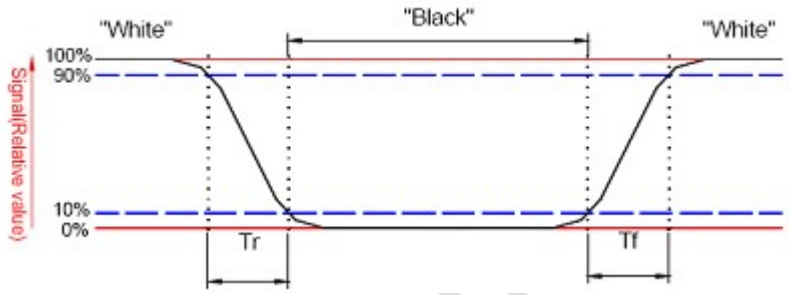
Note 2: To be measured with a viewing cone of 2°by Topcon luminance meter BM-5A.

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.

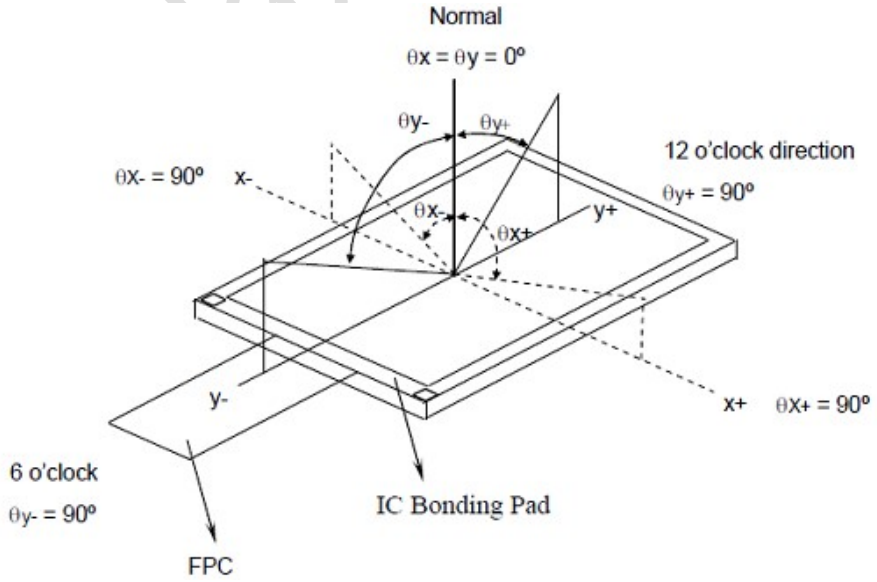


Note 6: Definition of contrast ratio:

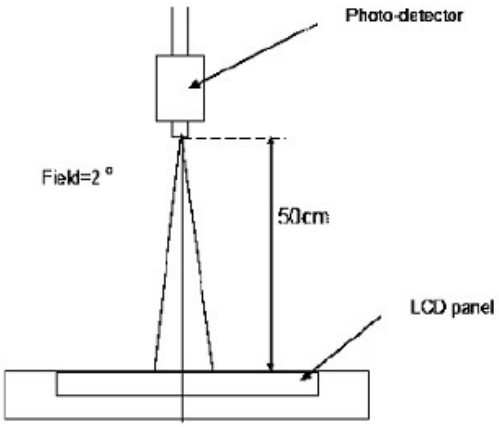
Contrast ratio is calculated by the following formula.

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

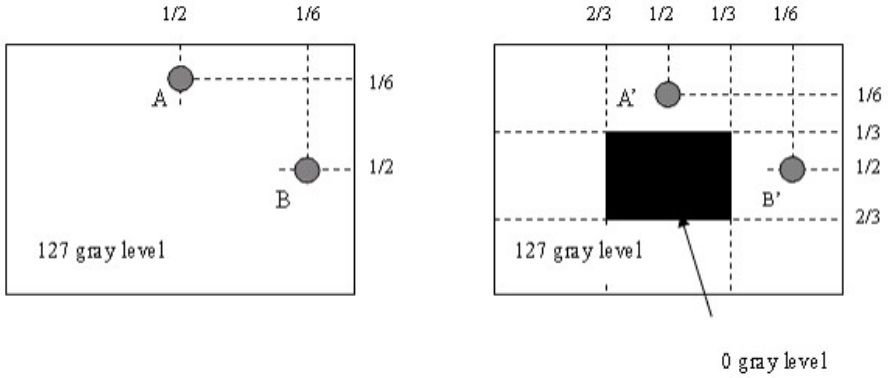
Note 7: Definition of viewing angle



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 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	-	-	MΩ	DC 25V
Voltage	-	3	10	V	DC
Chattering	-	-	15	ms	100kΩ 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 RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION	INSPECTION AFTER TEST
1	High Temperature Storage	70±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	60±2°C/96 hours	
4	Low Temperature Operating	-10±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 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.