



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.: TST035QVZH-42

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	2018-7-30	Initial Release	

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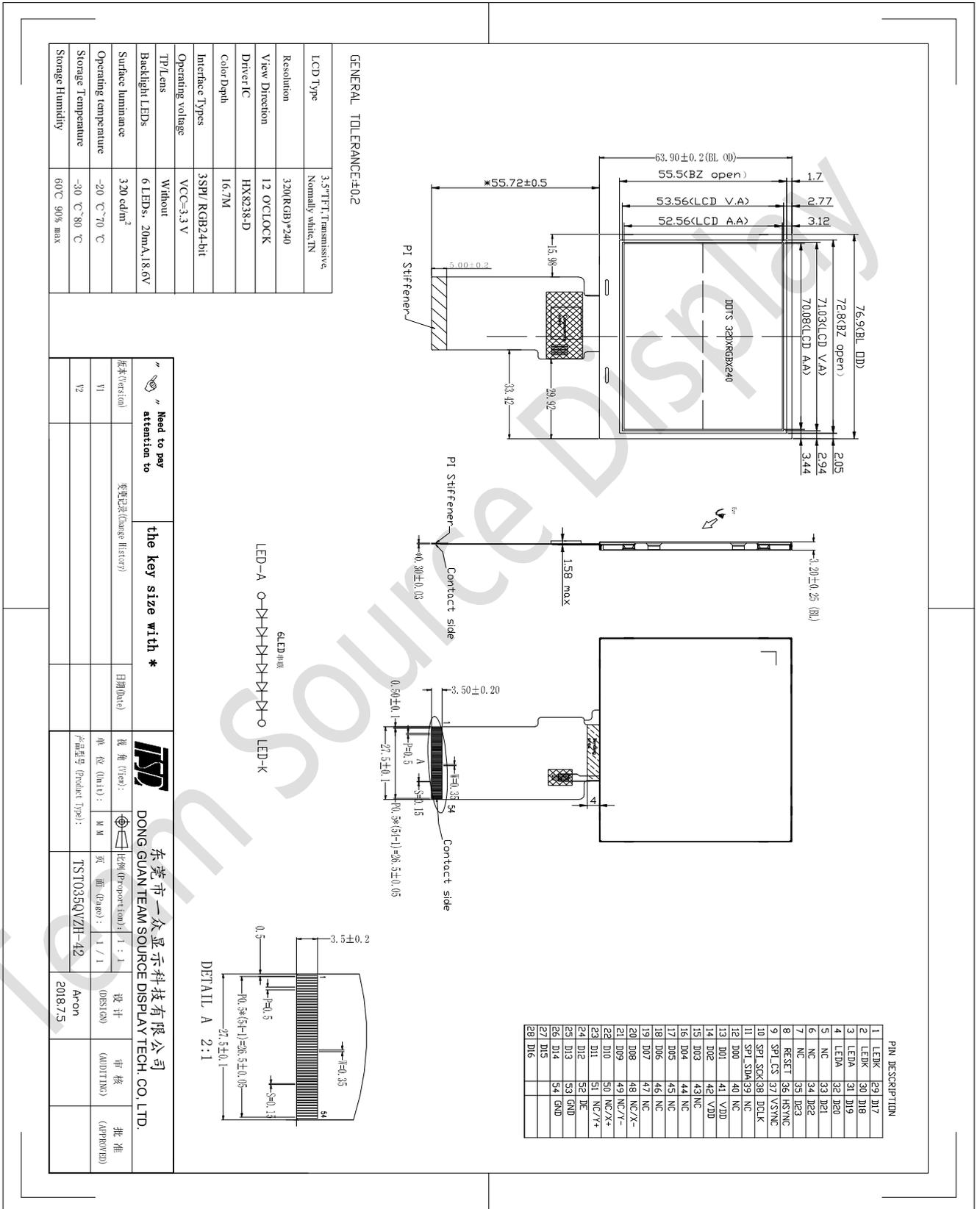
1 General Characteristics

ITEM	Specification	Unit
LCD Type	a-Si TFT, Transmissive, Normally white, TN	-
LCD Size	3.5	inch
Resolution	320 x (RGB) × 240	pixel
LCM (W × H × D)	76.9(W) x 63.9(H) x 3.2(D)	mm
Active Area (W × H)	70.08(W) x 52.56 (H)	mm
Pixel size (W × H)	0.219*0.219	mm
Viewing Direction	12 o'clock	-
Gray Scale Inversion Direction	6 o'clock	-
Color Depth	16.7M	-
Pixel Arrangement	RGB-stripe	-
Backlight Type	6 LED, 20mA, 18.6V	-
Surface Luminance	280min, 320typ	cd/m ²
Surface Treatment	Anti-Glare	-
Driver IC	HX8238-D	-
Interface Type	3SPI/RGB24-bit	-
Input Voltage	3.3	V
TP/Lens	Without	-
Weight	TBD.	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

2 Product drawings

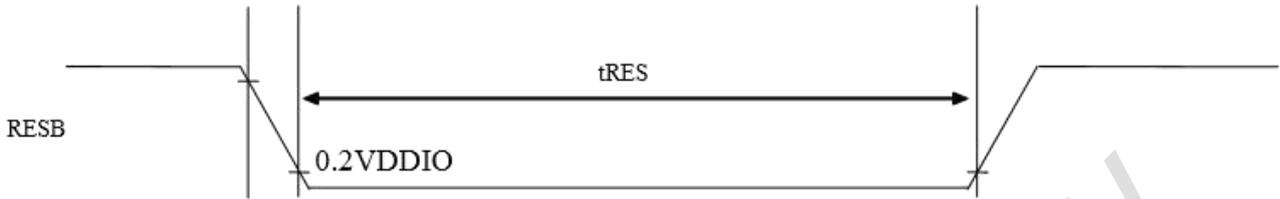


3 Interface description

Pin No.	Symbol	Description
1	LEDK	Cathode of LED backlight.
2	LEDK	Cathode of LED backlight.
3	LEDA	Anode of LED backlight.
4	LEDA	Anode of LED backlight.
5	NC	Not Connection
6	NC	Not Connection
7	NC	Not Connection
8	RESET	System reset pin. - An active low pulse at this pin will reset the IC, Connect to VCC in normal operation
9	SPENA	CS : Chip select pin
10	SPCLK	Serial clock input
11	SPDAT	Data input/output pin in serial interface
12~19	DB0~DB7	Blue Data bus:B0~B7
20~27	DB8~DB15	Green Data bus:G0~G7
28~35	DB16~DB23	Red Data bus:R0~R7
36	HSYNC	Line Synchronization input
37	VSYNC	Frame/Ram Write Synchronization input
38	CLK	Dot-clock signal and oscillator source.
39	NC	Not Connection
40	NC	Not Connection
41	VDD	Power supply for digital voltage
42	VDD	Power supply for digital voltage
43	NC	Not Connection
44	NC	Not Connection
45	NC	Not Connection
46	NC	Not Connection
47	NC	Not Connection
48	NC	Not Connection
49	NC	Not Connection
50	NC	Not Connection
51	NC	Not Connection
52	DEN	Display enable pin from controller.
53	GND	Ground.
54	GND	Ground.

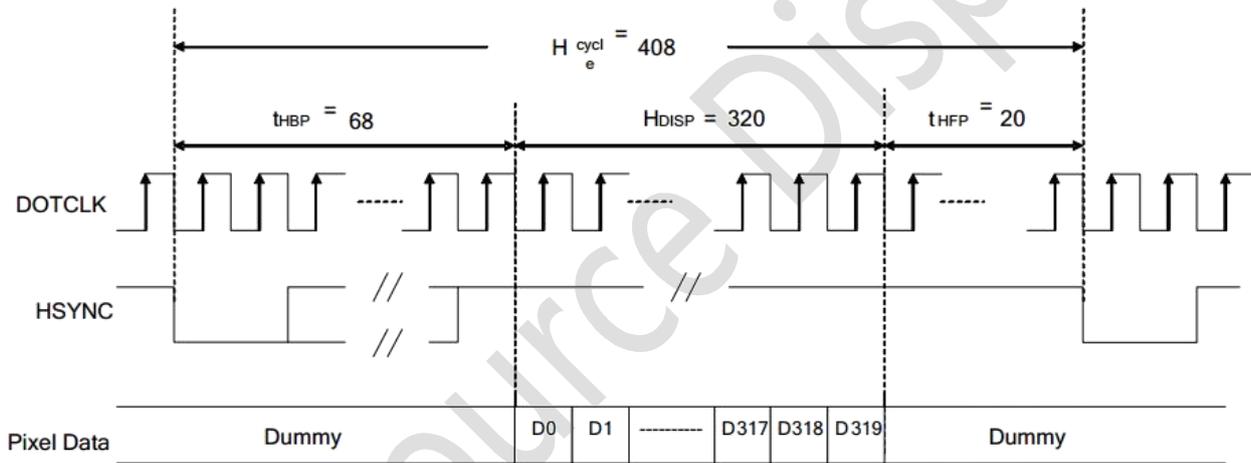
4 LCM Interface Timing

4.1 Reset Timing

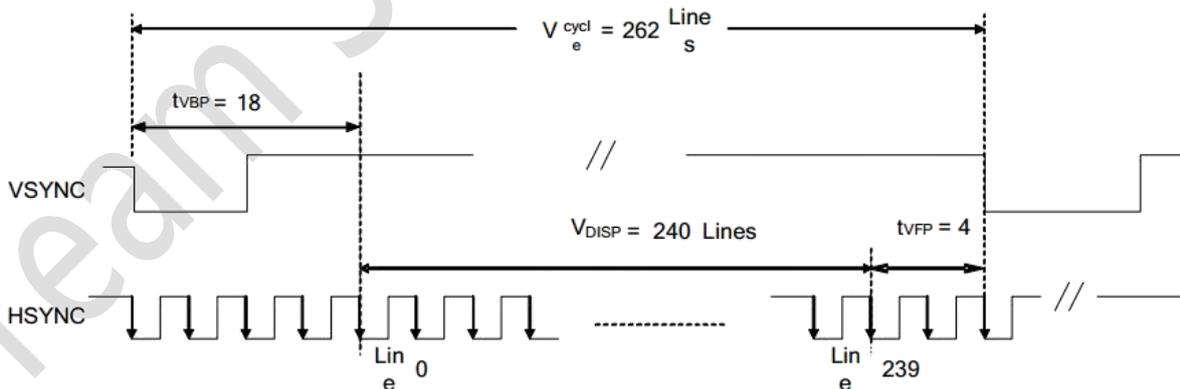


Signal	Parameter	Min	Typ	Max	Unit
nRES	Reset pulse duration	15	-	-	us

4.2 RGB interface Timing



(a) Horizontal Data Transaction Timing



(b) Vertical Data Transaction Timing

Figure Data Transaction Timing in Parallel RGB (24 bit) Interface (SYNC Mode)

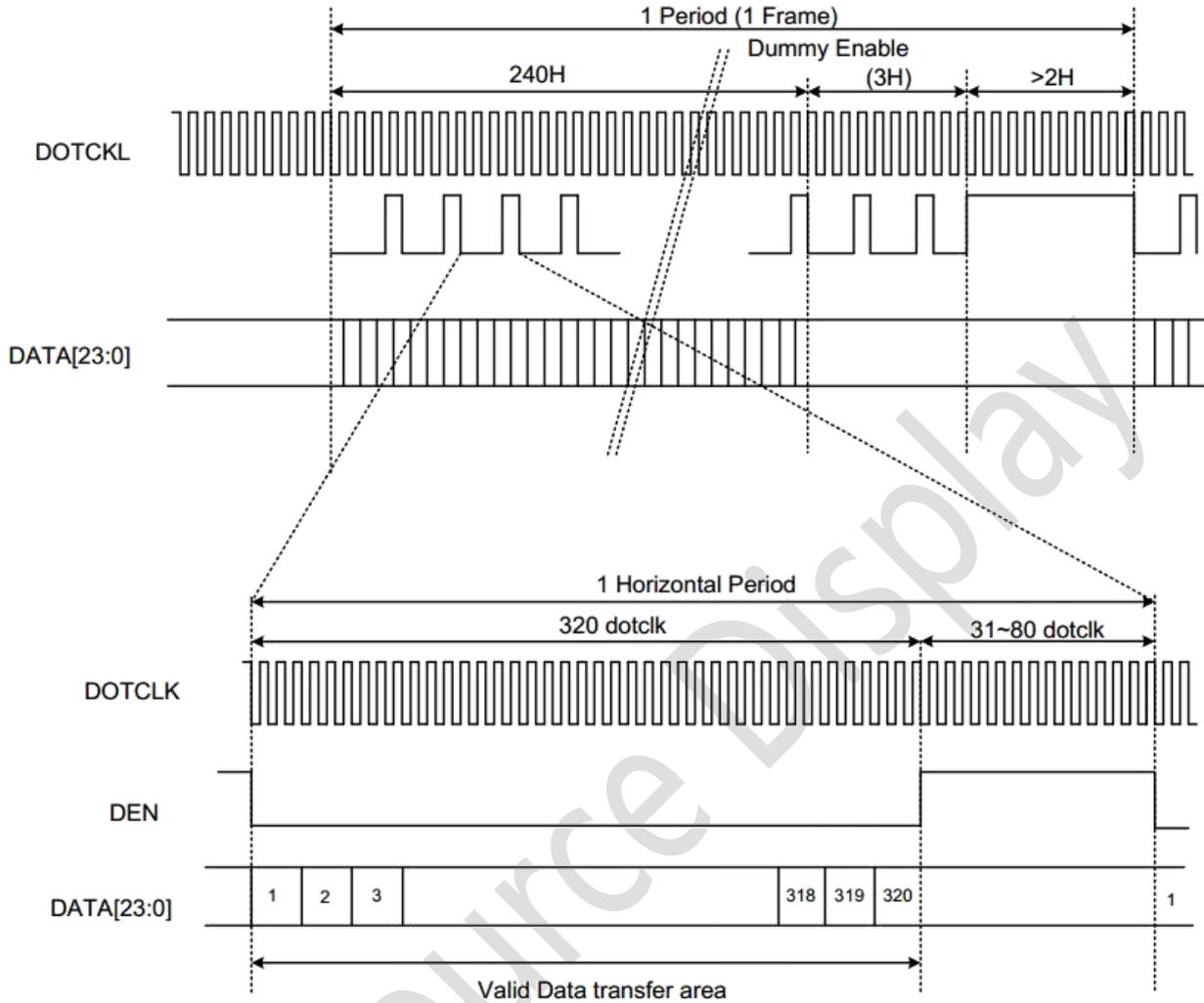
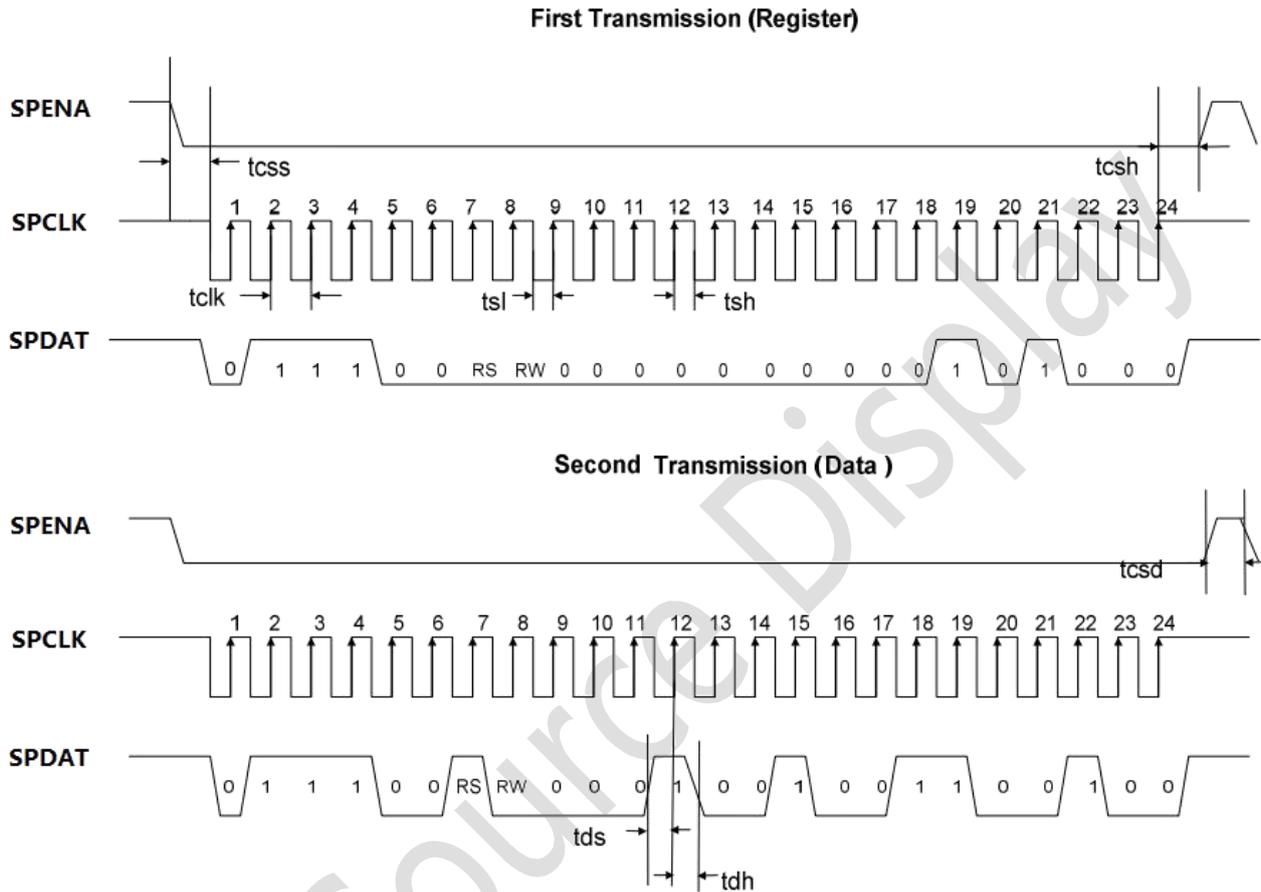


Figure Signal Timing in DE Mode

Characteristics	Symbol	Min.		Typ.		Max.		Unit
		24 bit	8 bit	24 bit	8 bit	24 bit	8 bit	
DOTCLK Frequency	fDOTCLK	-	-	6.5	19.5	10	30	MHz
DOTCLK Period	tDOTCLK	100	33.3	154	51.3	-	-	ns
Horizontal Frequency (Line)	fH	-	-	14.9		22.35		KHz
Vertical Frequency (Refresh)	fV	-	-	60		90		Hz
Horizontal Back Porch	tHBP	-	-	68	204	-	-	tDOTCLK
Horizontal Front Porch	tHFP	-	-	20	60	-	-	tDOTCLK
Horizontal Data Start Point	tHBP	-	-	68	204	-	-	tDOTCLK
Horizontal Blanking Period	tHBP + tHFP	-	-	88	264	-	-	tDOTCLK
Horizontal Display Area	HDISP	-	-	320	960	-	-	tDOTCLK
Horizontal Cycle	Hcycle	-	-	408	1224	450	1350	tDOTCLK
Vertical Back Porch	tVBP	-	-	18		-		Lines
Vertical Front Porch	tVFP	-	-	4		-		Lines
Vertical Data Start Point	tVBP	-	-	18		-		Lines
Vertical Blanking Period	tVBP + tVFP	-	-	22		-		Lines
Vertical Display Area	NTSC	-	-	240		-	-	Lines
	PAL			280(PALM=0)				
	PAL			288(PALM=1)				
Vertical Cycle	NTSC	-	-	262		350	-	Lines
	PAL			313				

4.3 Serial Timing Characteristics

- Write SPI



Note: The example writes “0x1264h” to register R28h.
 SPID connected to VSS.

Figure SPI interface Timing Diagram & Write SPI Example

Characteristics	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Serial Clock Frequency	fclk	-	-	20	MHz
Serial Clock Cycle Time	tclk	50	-	-	ns
Clock Low Width	tsl	25	-	-	ns
Clock High Width	tsh	25	-	-	ns
Clock Rising Time	trs	-	-	30	ns
Clock Falling Time	tfl	-	-	30	ns
Chip Select Hold Time	tcsh	10	-	-	ns
Chip Select High Delay Time	tcshd	20	-	-	ns
Data Setup Time	tds	5	-	-	ns
Data Hold Time	tdh	10	-	-	ns

5 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage (Analog)	VCC~GND	-0.3	5.0	V
Logic signal voltage(I/O)	IOVCC~GND	-0.3	4.0	V
Supply current (One LED)	I _{LED}	-	20	mA
Operating Temperature	Top	-20	70	° C
Storage Temperature	Tst	-30	80	° C
Operating Ambient Humidity	Hop	10	90%(Max 60° C)	RH

6 Electrical Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Analog operating voltage	VCC	3.0	3.3	3.6	V
Logic operating voltage	IOVCC	3.0	3.3	3.6	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	-	18.6	-	V
Current for LED backlight	I _f	-	20	-	mA
Power consumption	W _{bl}	-	372	-	mW
Uniformity	Avg	80	-	-	%
LED Life Time	-	30000	40000	-	

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	$\theta = 0^\circ$	-	25	40	ms	Note 5
Contrast ratio	CR	$\theta = 0^\circ$	300	350	-		Note 2,6
Viewing angle	Top	$CR \geq 10$	-	50	-	Deg.	Note 2,6,7
	Bottom	$CR \geq 10$	-	70	-		
	Left	$CR \geq 10$	-	70	-		
	Right	$CR \geq 10$	-	70	-		
Color Filter Chromaticity with C light	Wx	$\theta = 0^\circ$	Typ -0.02	0.305	Typ +0.02		Note 3
	Wy			0.334			
	Rx			0.608			
	Ry			0.316			
	Gx			0.305			
	Gy			0.556			
	Bx			0.135			
	By			0.137			
NTSC			-	50	-	%	Note 3
Transmittance	Trans		6.7	7.2	-	%	Note 4

Note 1: Ambient temperature = 25°C.

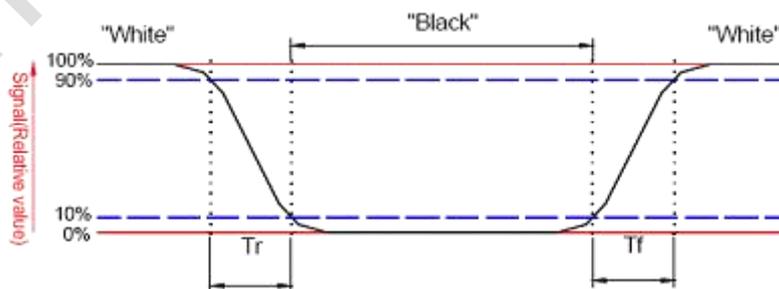
Note 2: To be measured with a viewing cone of 2° by Topcon luminance meter BM-5A.

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

Note 4: this shipping status is cell without polarizer. Transmittance of Specification is cell with ofilm 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.

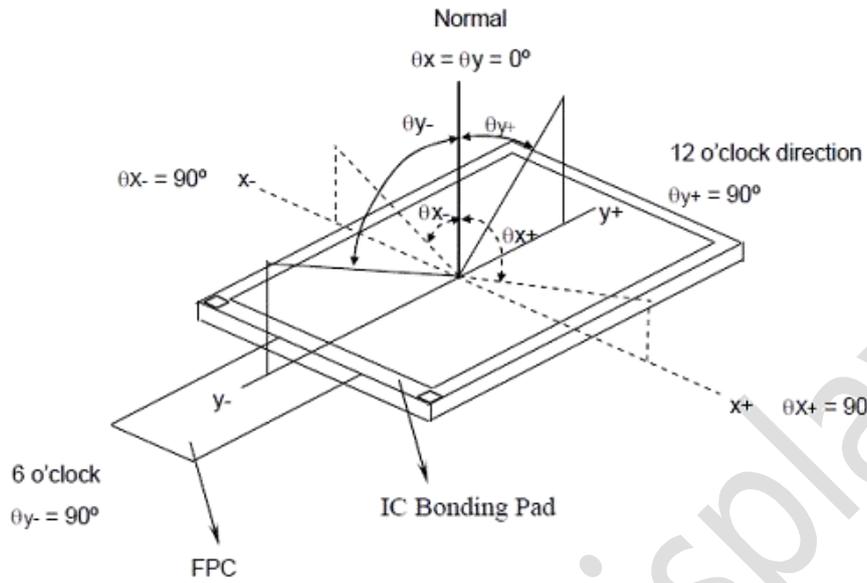


Note 6: Definition of contrast ratio:

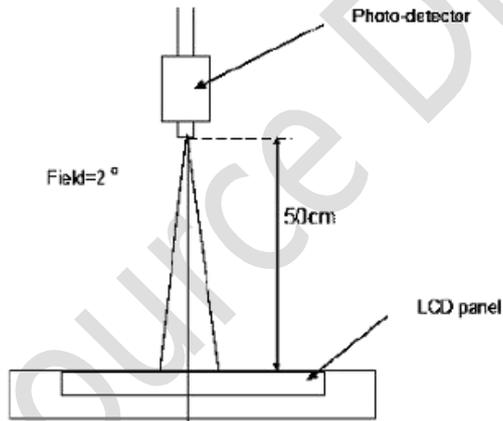
Contrast ratio is calculated by the following formula.

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

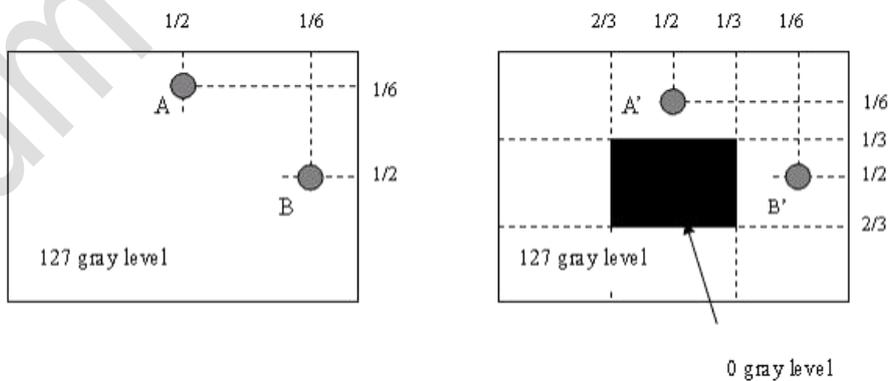
Note 7: Definition of viewing angle



Note 8: Optical characteristic measurement setup.



Note 9:



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

$1 LB-LB' / LB \times 100\% = 2\% \text{ max.}$, 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	

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.

