

深圳市金逸晨电子有限公司

ShenZhen GoldenMorning Electronic Co.,Ltd

PRODUCT SPECIFICATION

Model No	T320H8-C40-11
Product Name	3.2 TFT LCD Module
Version	V1.0
Date	2025-03-27

- ☐ Preliminary Specification
- ☒ Final Specification

PREPARED BY	CHECKED BY	APPROVED BY

Revision History

Version	Date	Page	Revise record	Remarks
V1.0	2025.03.27	-	First issued	-

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1. General Parameter

NO.	Features	Details	Unit
1	Display Size(Diagonal)	3.2"	Inch
2	LCD type	TN TFT	-
3	Display Mode	Transmissive/Normally White	-
4	Resolution	240 RGB(H) x 320(V)	Pixels
5	Viewing Direction	12 o'clock	-
6	Module size	54.2(W) x 77.2(H) x 2.4(T)	mm
7	Active Area	48.6(W) x 64.8(H)	mm
8	Pixel Size	0.2025(W) x 0.2025(H)	mm
9	Color arrangement	RGB Vvertical stripe	-
10	Interface	8/16-bit parallel, 3/4-Wire SPI	-
11	Display Colors	262K	-
12	Driver IC	ST7789	-
13	With or Without Touch Panel	Without	-
14	Operating Temperature	-20℃~70℃	℃
15	Storage Temperature	-30℃~80℃	℃
16	Weight	-	g

Note 1: Please refer to the mechanical drawing.

2. Physical drawing



[illegible]

4. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	IOVCC	-0.3	4.6	V
Analog Supply Voltage	VCC	-0.3	4.6	V
Operating temperature	Top	-20	70	°C
Storage temperature	Tst	-30	80	°C

Note 1: If tAmbient temperature below 50°C, the maximal humidity is 90%RH, if Ambient temperature over 50°C, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10°C, and the back ground will become darker at high temperature operating.

Note 3: If one of the above items is exceeded its maximum limitation momentarily, the quality of the product may be degraded. Absolute maximum limitation, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the recommend range.

5. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Analog Supply Voltage	VCC	2.4	2.75	3.3	V
Logic Supply Voltage	IOVCC	1.65	1.8	3.3	V
Input high voltage	V _{IN}	0.7*IOVCC	-	IOVCC	V
Input low voltage	V _{IL}	VSS	-	0.3*IOVCC	V
Output high voltage	V _{OH}	0.8*IOVCC	-	IOVCC	V
Output low voltage	V _{OL}	VSS	-	0.2*IOVCC	V
Input Current	I _{IN}	-	20	-	mA

6. Backlight Characteristic

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	V _F	-	3.0	-	V	-
Forward Current	I _F	-	120	-	mA	-
Power dissipation	P _d	-	360	-	mW	-
LED Life Time(25 °C)	-	-	10000	-	Hrs	-

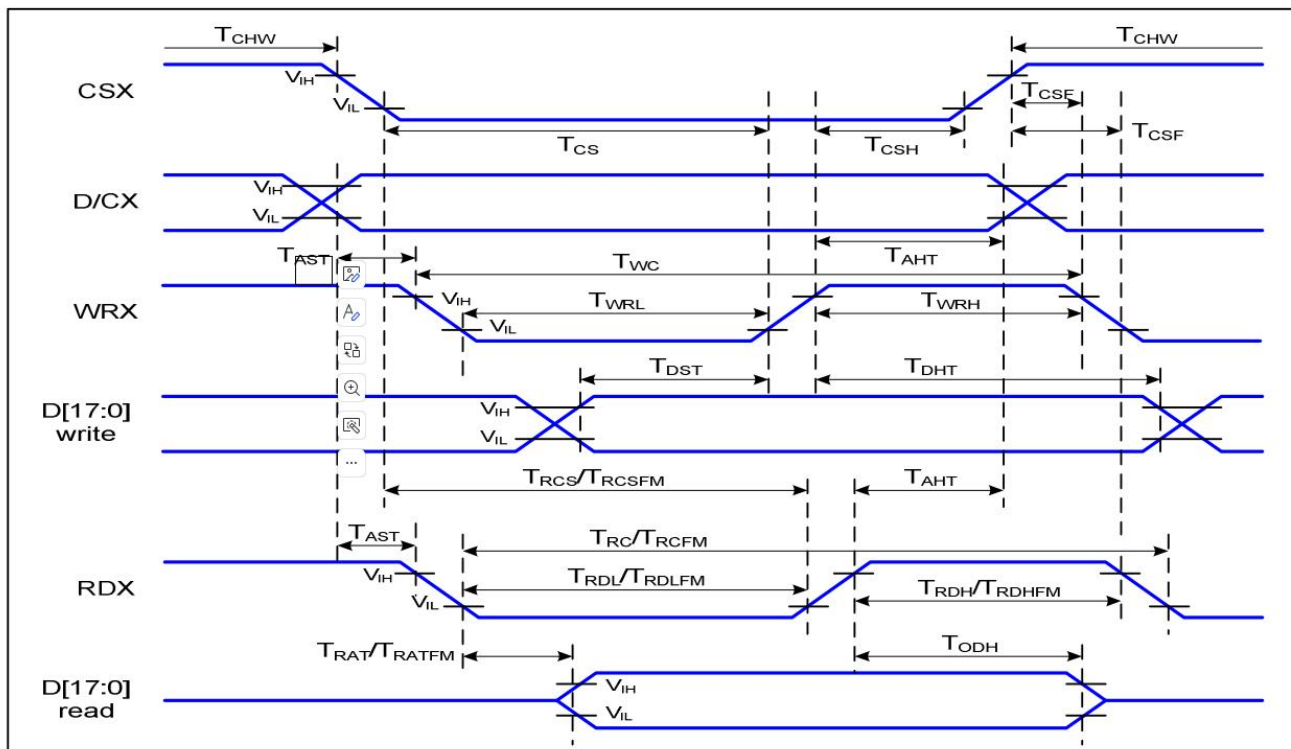
Note: LED life time defined as follows: The final brightness is at 50% of original brightness. Typical operating life time is estimated data.

7. Pins Definitions.

Pin.No	Symbol	Description																									
1-4	NC	NC																									
5	GND	Ground																									
6	VDDI	Power supply for I/O system. VDDI must be lower than or equal to VDD																									
7	VDD	Power supply for Analog																									
8	FMARK	Tearing effect output.																									
9	CSX	-Chip selection pin Low enable. High disable.																									
10	DCX	- Display data/command selection pin in parallel interface. -This pin is used to be serial interface clock. DCX='1': display data or parameter. DCX='0': command data. -If not used, please fix this pin at VDDI or DGND.																									
11	WRX	-Write enable in MCU parallel interface. - Display data/command selection pin in 4-line serial interface. - If not used, please fix this pin at VDDI or DGND level.																									
12	RDX	-Read enable in 8080 MCU parallel interface. -If not used, please fix this pin at VDDI or DGND																									
13	SDA	SPI interface input/output pin.																									
14	SDO	SPI interface output pin.																									
15	RESX	- This signal will reset the device																									
16	GND	Ground																									
17-32	DB0 - DB15	- In MCU 8080 parallel interface 8-bit I/F: DB[7:0] is used. 16-bit I/F: DB[15:0] is used. - If not used, please fix this pin at VDDI or DGND level																									
33	LED-A	Backlit anode																									
34-36	LED-K	Backlit cathode																									
37	GND	Ground																									
38-40	IM0-IM2	The MCU interface mode select.<table><tr><td>IM0</td><td>IM1</td><td>IM2</td><td>Data Pin</td><td>Interface Mode</td></tr><tr><td>0</td><td>0</td><td>0</td><td>DB[0:15]</td><td>8080-16bit parallel</td></tr><tr><td>1</td><td>0</td><td>0</td><td>DB[8:15]</td><td>8080-8bit parallel</td></tr><tr><td>1</td><td>0</td><td>1</td><td>SDA:IN SDO:OUT</td><td>3-line SPI</td></tr><tr><td>0</td><td>1</td><td>1</td><td>SDA:IN SDO:OUT</td><td>4-line SPI</td></tr></table>	IM0	IM1	IM2	Data Pin	Interface Mode	0	0	0	DB[0:15]	8080-16bit parallel	1	0	0	DB[8:15]	8080-8bit parallel	1	0	1	SDA:IN SDO:OUT	3-line SPI	0	1	1	SDA:IN SDO:OUT	4-line SPI
IM0	IM1	IM2	Data Pin	Interface Mode																							
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1	0	1	SDA:IN SDO:OUT	3-line SPI																							
0	1	1	SDA:IN SDO:OUT	4-line SPI																							

Note: The backlight LED is recommended to be powered independently by constant current drive.

9.1. 8080 Series MCU Parallel Interface Characteristics: 16/8-bit Bus



VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=25°C

Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	T _{AST}	Address setup time	0		ns	-
	T _{AHT}	Address hold time (Write/Read)	10		ns	
CSX	T _{CHW}	Chip select “H” pulse width	0		ns	-
	T _{CS}	Chip select setup time (Write)	15		ns	
	T _{RCS}	Chip select setup time (Read ID)	45		ns	
	T _{RCSFM}	Chip select setup time (Read FM)	355		ns	
	T _{CSF}	Chip select wait time (Write/Read)	10		ns	
	T _{CSH}	Chip select hold time	10		ns	
WRX	T _{WC}	Write cycle	66		ns	
	T _{WRH}	Control pulse “H” duration	15		ns	
	T _{WRL}	Control pulse “L” duration	15		ns	
RDX (ID)	T _{RC}	Read cycle (ID)	160		ns	When read ID data
	T _{RDH}	Control pulse “H” duration (ID)	90		ns	
	T _{RDL}	Control pulse “L” duration (ID)	45		ns	
RDX (FM)	T _{RCFM}	Read cycle (FM)	450		ns	When read from frame memory
	T _{RDHFM}	Control pulse “H” duration (FM)	90		ns	
	T _{RDLFM}	Control pulse “L” duration (FM)	355		ns	
D[17:0]	T _{DST}	Data setup time	10		ns	For CL=30pF

	T_{DHT}	Data hold time	10		ns
	T_{RAT}	Read access time (ID)		40	ns
	T_{RATFM}	Read access time (FM)		340	ns
	T_{ODH}	Output disable time	20	80	ns

Table 4 8080 Parallel Interface Characteristics

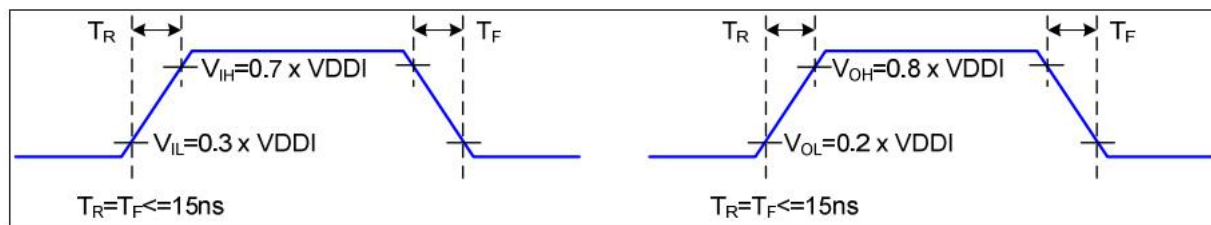


Figure 2 Rising and Falling Timing for I/O Signal

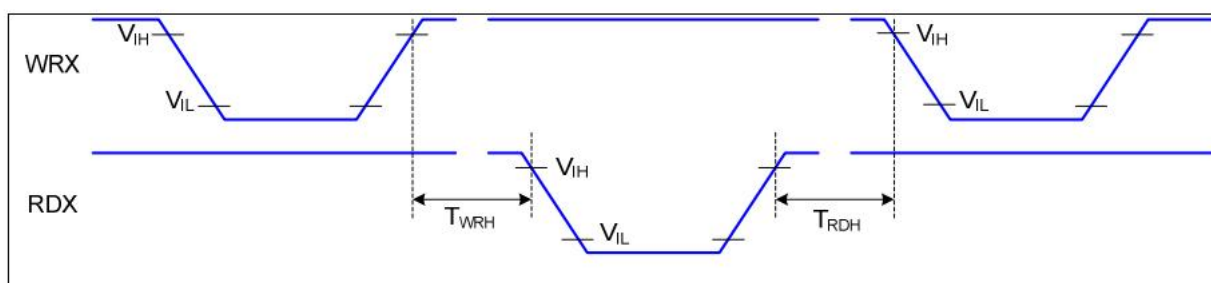


Figure 3 Write-to-Read and Read-to-Write Timing

Note: The rising time and falling time (T_r , T_f) of input signal and fall time are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

9.2. 3-SPI Serial Data Transfer Interface Characteristics:

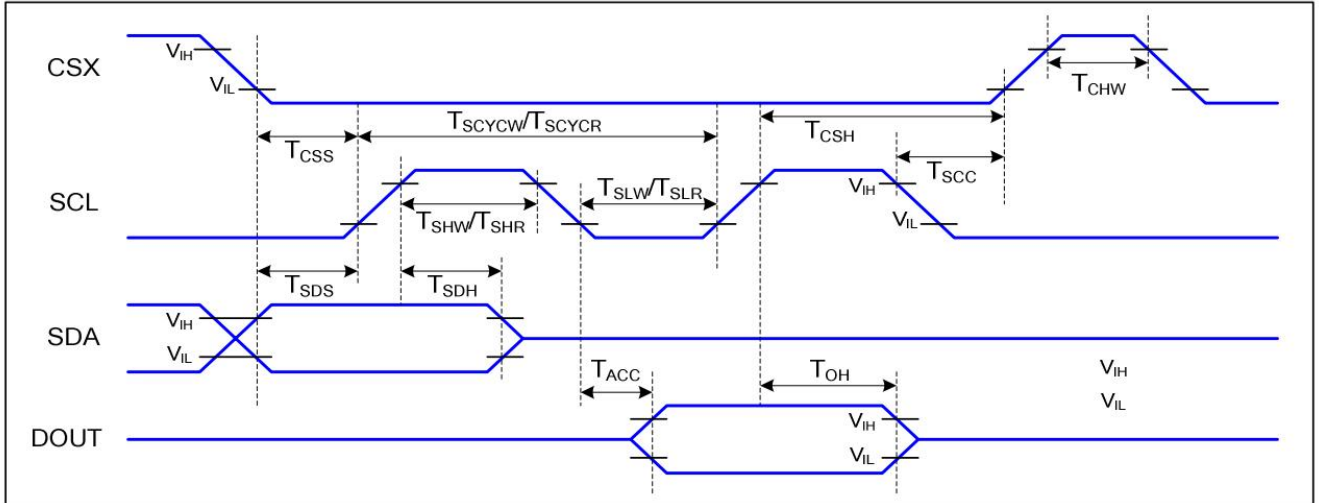


Figure 4 3-line serial Interface Timing Characteristics

$V_{DDI}=1.65$ to $3.3V$, $V_{DD}=2.4$ to $3.3V$, $AGND=DGND=0V$, $T_a=25^{\circ}C$

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)	16		ns	
	T_{SHW}	SCL "H" pulse width (Write)	7		ns	
	T_{SLW}	SCL "L" pulse width (Write)	7		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
SDA (DIN)	T_{SDS}	Data setup time	7		ns	
	T_{SDH}	Data hold time	7		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 5 3-line serial Interface Characteristics

Note : The rising time and falling time (T_r , T_f) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of V_{DDI} for Input signals.

9.3. 4-SPI Serial Data Transfer Interface Characteristics:

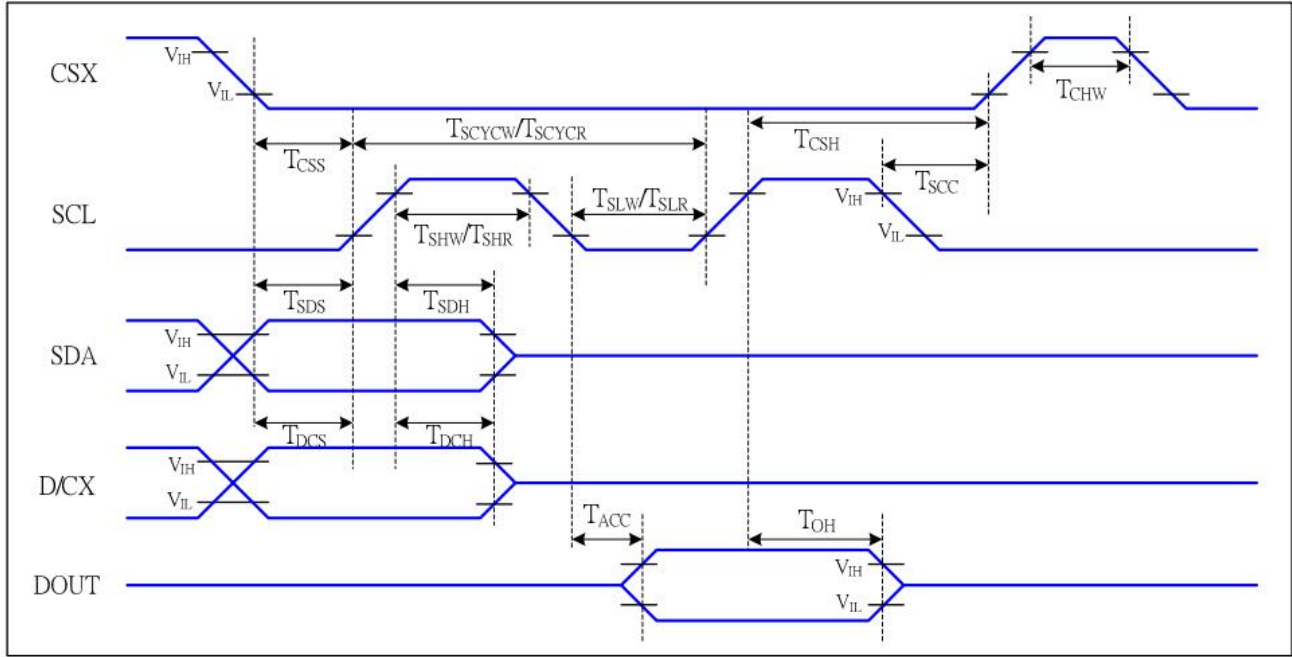


Figure 5 4-line serial Interface Timing Characteristics

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=25°C

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)	16		ns	-write command & data ram
	T_{SHW}	SCL "H" pulse width (Write)	7		ns	
	T_{SLW}	SCL "L" pulse width (Write)	7		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	7		ns	
	T_{SDH}	Data hold time	7		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

Note : The rising time and falling time (T_r , T_f) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

10. Optical Characteristics.

10.1.Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (without Polarizer)		T(%)	—	—	18.0	—	—	
Contrast Ratio		CR	$\Theta=0$	400	500	—	—	(1)(2)
Response time	Rising	T _R	Normal viewing angle — —	—	4	8	msec	(1)(3)
	Falling	T _F		—	12	24		
				—				
Color gamut		S(%)			60		%	
Color chromaticity (CIE1931)	White	W _x		0.283	0.303	0.323		(1)(4) CF glass (C-light)
		W _y		0.305	0.325	0.345		
	Red	R _x		0.606	0.626	0.646		
		R _y		0.314	0.334	0.354		
	Green	G _x		0.257	0.277	0.297		
		G _y		0.529	0.549	0.569		
	Blue	B _x		0.122	0.142	0.162		
		B _y		0.102	0.122	0.142		
Viewing angle	Hor.	Θ_L	CR>10	35	45	—		
		Θ_R		35	45	—		
	Ver.	Θ_U		35	50	—		
		Θ_D		10	20	—		
View Direction		12 O'clock						(5)

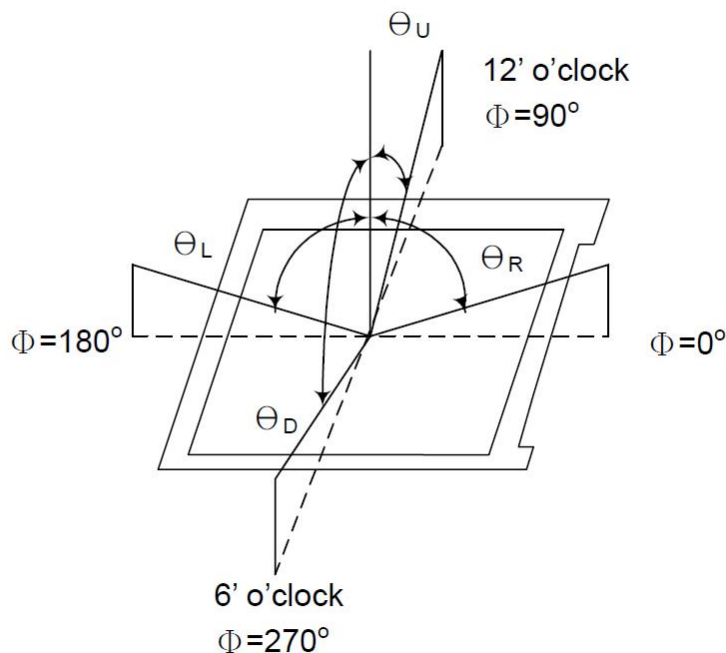
10.2.Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : $25\pm 2^\circ\text{C}$
- 15min. warm-up time.

10.3.Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

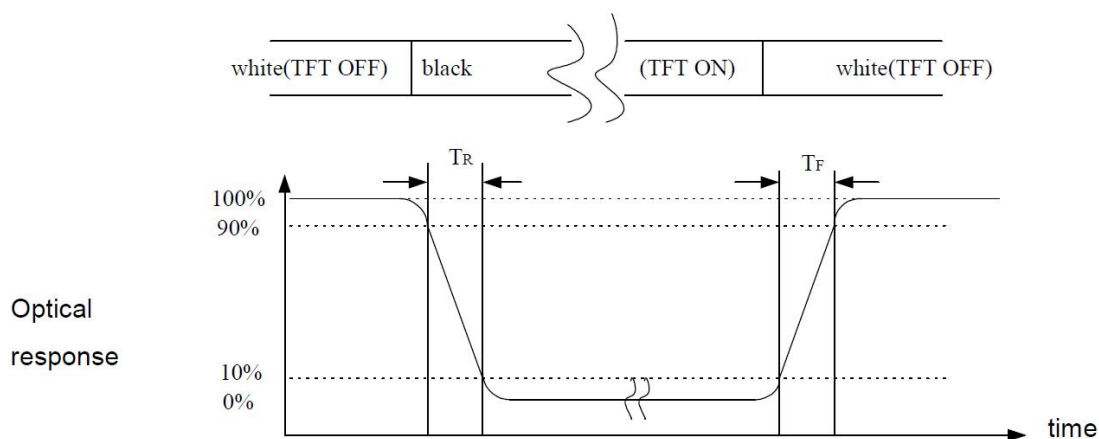
Note (1) Definition of Viewing Angle :



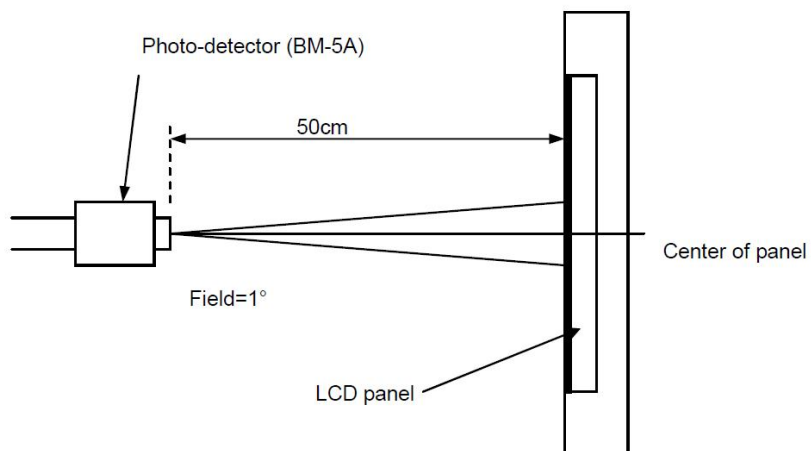
Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

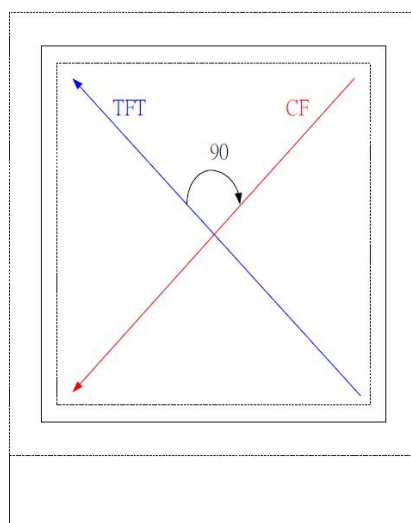
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Rubbing Direction (The different Rubbing Direction will cause the different view direction).



TFT Face up

11. Reliability

11.1. MTBF

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal.

11.2. Test Condition

No	Item	Condition	Criteria
1	High Temperature Operating	70℃*24Hrs	1. No Defect Of Operational Function In Room Temperature Are Allowable. 2. IDD of LCM in Pre-and Post-Test Should Follow Specification.
2	Low Temperature Operating	-20℃*24Hrs	
3	High Humidity Storage	50℃*90%RH*24Hrs	
4	High Temperature Storage	80℃*24Hrs	
5	Low Temperature Storage	-30℃*24Hrs	
6	Thermal Cycling Test Storage	-	
7	Packing vibration	-	
8	Electrical Static Discharge	-	
		-	
9	Drop Test (Packaged)	-	

Note1. The test samples should be applied to only one test item.

Note2. Sample size for each test item is 2pcs.

Note3. No defection function allowable.

12. Precautions

12.1. Storage Conditions

- 12.1.1. Store the panel or module in a dark place where the temperature is $23\pm5^{\circ}\text{C}$ and the humidity is below $45\pm 20\%\text{RH}$.
- 12.1.2. Store in anti-static electricity container.
- 12.1.3. Store in clean environment, free from dust, active gas, and solvent.
- 12.1.4. Do not place the module near organics solvents or corrosive gases.
- 12.1.5. Do not crush, shake, or jolt the module.
- 12.1.6. Strong light exposure causes degradation of polarizer and color filter.

12.2. Handling Precautions

- 12.2.1. Avoid static electricity, which can damage the CMOS LSI.
- 12.2.2. The polarizing plate of the display is very fragile, please handle it very carefully.
- 12.2.3. Do not give external shock.
- 12.2.4. Do not apply excessive force on the surface.
- 12.2.5. Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.
- 12.2.6. Reverse and use within ratings in order to keep performance and prevent damage
- 12.2.7. Do not remove the panel or frame from the module.
- 12.2.8. Except for soldering the interface, do not make any alterations or modifications with a soldering iron; Ensure welding temperature at 320°C to 350°C , the welding time control within the 10 s, welding note don't stay too long in the same place to avoid scald FPC.

12.3. Limited Warranty

- 12.3.1. Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss. (我们的保证责任仅限于修理和/或更换。我们将不负任何相应的损失。)
- 12.3.2. If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used. (如果可能，我们建议客户在6个月内用完所有模块。如果模块存放时间超过12个月，我们建议在使用模块前重新检查。)
- 12.3.3. The warranty period is twelve months from the date of delivery. Buyer shall complete the assembly of all processes within twelve months of validity. During the warranty period, if the product quality problems, our company will be responsible for repair and replacement. All products must be stored and handled in accordance with regulations. Under warranty. When the goods do not comply with the above terms, we do not provide warranty services. (保修期为交货之日起十二个月。买方应在12个月内完成所有流程的组装。在保修期内，如果产品出现质量问题，我公司将负责维修和更换。所有产品必须按照规定储存和处理。在保修期内。当货物不符合上述条款时，我们不提供保修服务。)