
PRODUCT SPECIFICATION

Model No	T147B7-E13-04
Product Name	1.47 TFT LCD Module
Version	V1.0
Date	2022-06-06

- ☐ Preliminary Specification
☒ Final Specification

PREPARED BY	CHECKED BY	APPROVED BY

Revision History

Version	Date	Page	Revise record	Remarks
V1.0	2022.06.06	-	First issued	-

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1. General Parameter

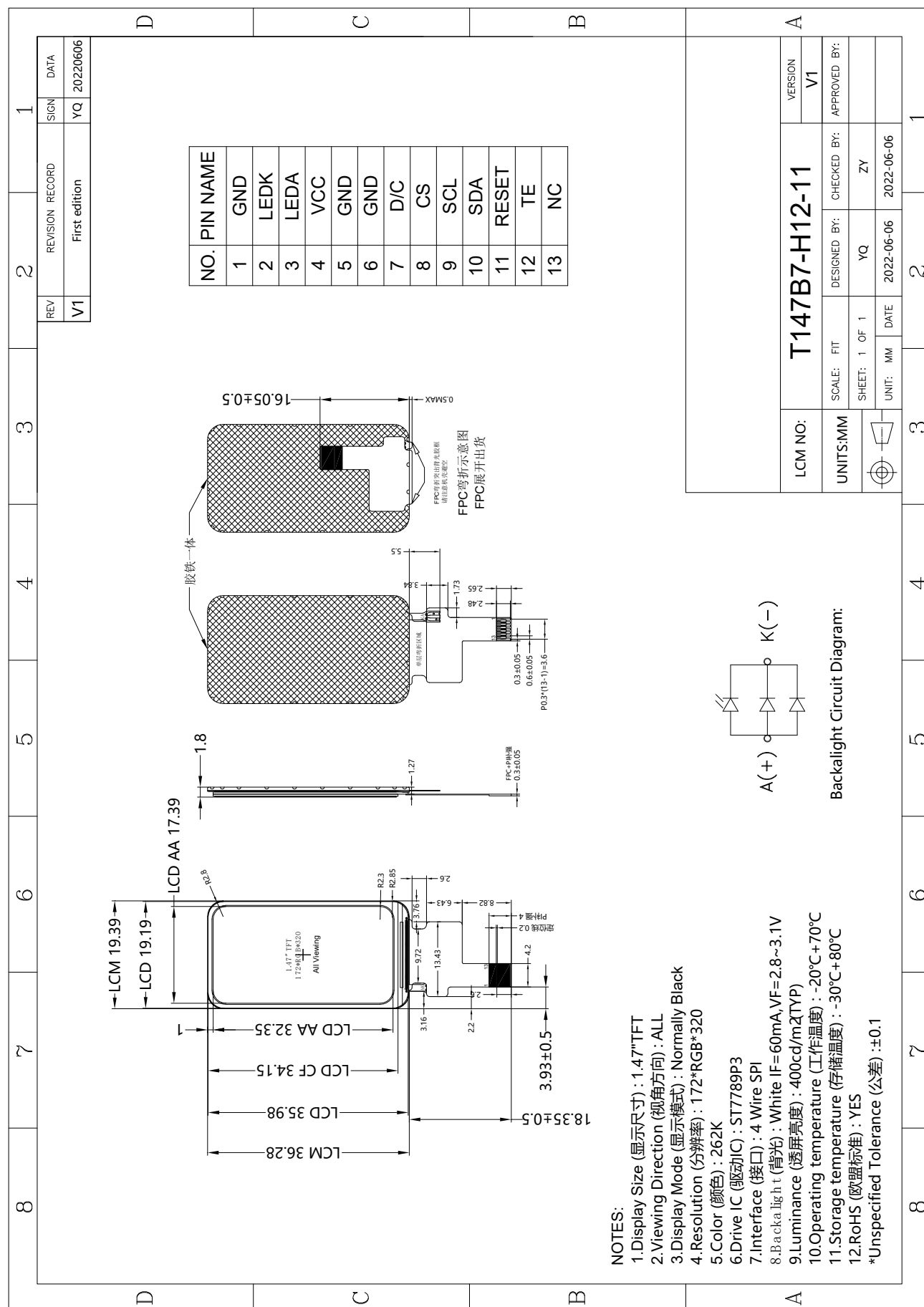
NO.	Features	Details	Unit
1	Display Size(Diagonal)	1.47"	Inch
2	LCD type	IPS TFT	-
3	Display Mode	Normally black	-
4	Resolution	172 RGB(H) x 320(V)	Pixels
5	Viewing Direction	ALL	-
6	Module size	19.39(W) x 36.28(H) x 1.51(T)	mm
7	Active Area	17.39(W) x 32.35(H)	mm
8	Pixel Size	0.0337(W) x 0.1011(H)	mm
9	Color arrangement	RGB Vvertical stripe	-
10	Interface	4 Wire SPI	-
11	Display Colors	262K	-
12	Driver IC	ST7789P3	-
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



3. Mechanical Dimension



4. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	IOVCC	-0.3	4.0	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	2.5	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}	GND	-	0.3*IOVCC	V
Output high voltage	V _{OH}	0.8*IOVCC	-	IOVCC	V
Output low voltage	V _{OL}	GND	-	0.2*IOVCC	V
Input Current	I _{IN}	-	20	-	mA

6. Backlight Characteristic

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	V _F	2.8	-	3.1	V	-
Forward Current	I _F	-	60	-	mA	-
Power dissipation	P _d	-	-	-	mW	-
LED Life Time(25 °C)	-	-	10000	-	Hrs	-

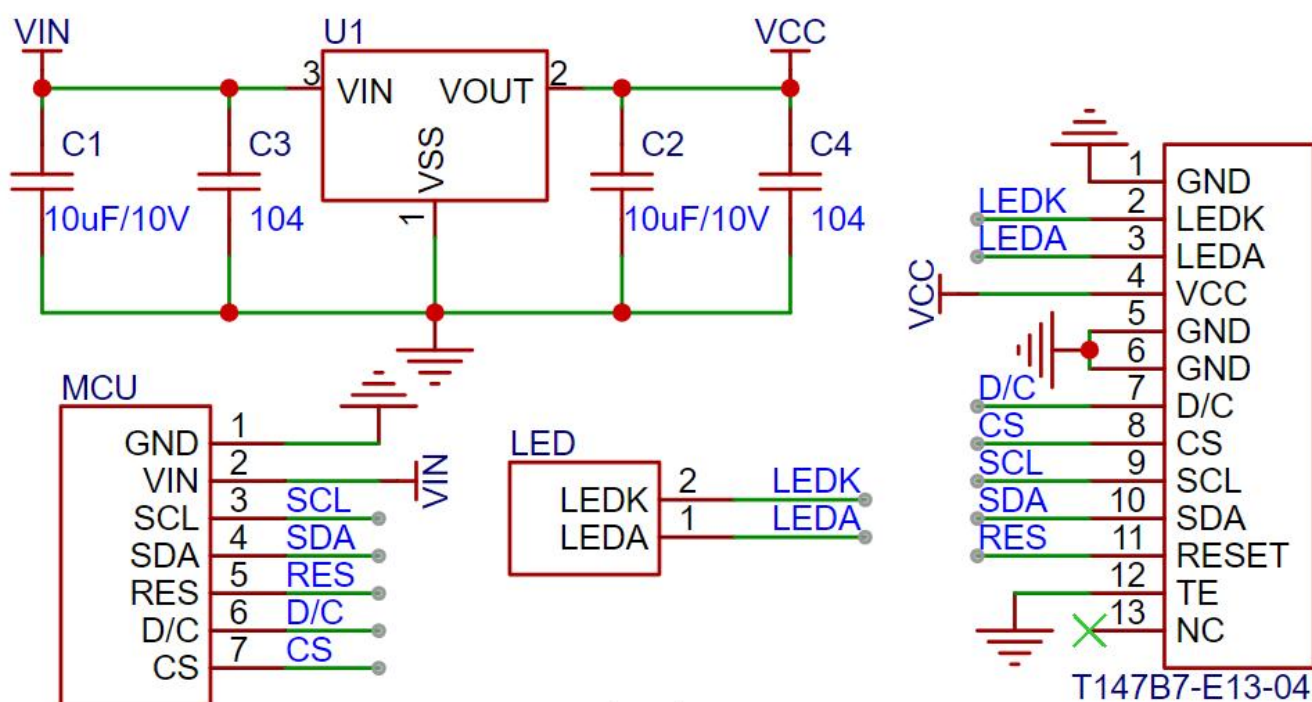
Note: LED life time defined as follows: The final brightness is at 50% of original brightness. Typical operating life time is estimated data.

7. Pins Definitions

Pin.No	Symbol	Description
1	GND	Ground
2	LEDK	Backlit cathode
3	LEDA	Backlit anode
4	VCC	Power supply for Analog
5	GND	Ground
6	GND	Ground
7	D/C	Register select pin.
8	CS	Chip select pin ("Low" enable)
9	SCL	Serial clock pin.
10	SDA	SPI interface input/output pin
11	RESET	LCM Reset pin
12	TE	Tearing effect signal is used to synchronize MCU to frame memory writing.
13	NC	Ground

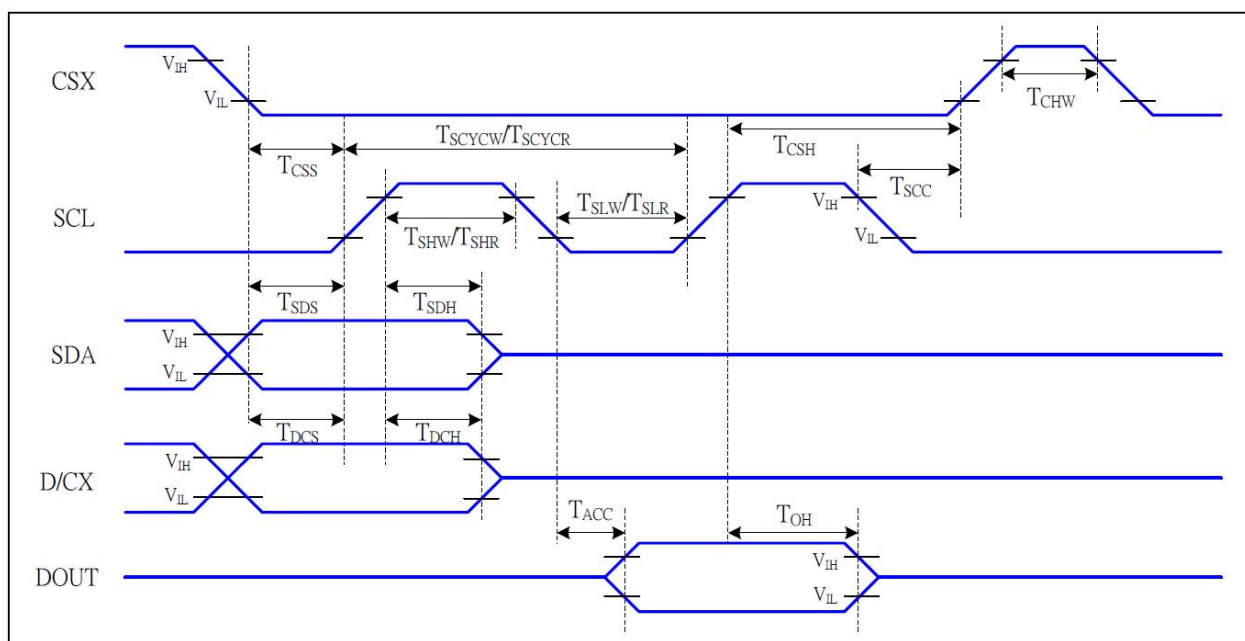
Note: The backlight LED is recommended to be powered independently by constant current drive.

8. Schematic Diagram



4SPI 参考原理图

9. Timing Characteristics



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)	TBD	-	ns	
	T_{CSH}	Chip select hold time (write)	TBD	-	ns	
	T_{CSS}	Chip select setup time (read)	TBD	-	ns	
	T_{SCC}	Chip select hold time (read)	TBD	-	ns	
	T_{CHW}	Chip select "H" pulse width	TBD	-	ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	TBD	-	ns	-write command & data ram
	T_{SHW}	SCL "H" pulse width (Write)	TBD	-	ns	
	T_{SLW}	SCL "L" pulse width (Write)	TBD	-	ns	
	T_{SCYCR}	Serial clock cycle (Read)	TBD	-	ns	-read command & data ram
	T_{SHR}	SCL "H" pulse width (Read)	TBD	-	ns	
	T_{SLR}	SCL "L" pulse width (Read)	TBD	-	ns	
D/CX	T_{DCS}	D/CX setup time	TBD	-	ns	
	T_{DCH}	D/CX hold time	TBD	-	ns	
SDA (DIN)	T_{SDS}	Data setup time	TBD	-	ns	
	T_{SDH}	Data hold time	TBD	-	ns	
DOUT	T_{ACC}	Access time	TBD	TBD	ns	For maximum CL=30pF
	T_{OH}	Output disable time	TBD	TBD	ns	For minimum CL=8pF

4-line serial Interface Characteristics

Note1 : 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. Overview

The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = $25 \pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0° . We refer to $\theta\phi=0$ ($=\theta 3$) as the 3 o'clock direction (the "right"), $\theta\phi=90$ ($=\theta 12$) as the 12 O'clock direction ("upward"), $\theta\phi=180$ ($=\theta 9$) as the 9 O'clock direction ("left") and $\theta\phi=270$ ($=\theta 6$) as the 6 O'clock direction ("bottom"). While scanning θ and/or ϕ , the center of the measuring spot on the Display surface shall stay fixed.

10.2. Optical Specifications

< Optical Specifications >

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range	Horizontal	Θ3	CR>10	80	85	-	Deg.	Note1
		Θ9		80	85	-	Deg.	
	Vertical	Θ12		80	85	-	Deg.	
		Θ6		80	85	-	Deg.	
Contrast ratio		CR	Θ = 0°	1000	1500	-	-	Note2
Transmittance		Tr	-	3.5	4.1	-	%	Note3 POL HC +Clear
Color Gamut		CG	-	67	72	-	%	CF@C-Li ght
Reproduction of color	Red	Rx	Θ = 0°	0.640	0.670	0.700	-	Note4 (CF@C Light Wi thout B- ITO)
		Ry		0.293	0.323	0.353	-	
	Green	Gx		0.243	0.273	0.303	-	
		Gy		0.557	0.587	0.617	-	
	Blue	Bx		0.103	0.133	0.163	-	
		By		0.087	0.117	0.147	-	
White Chromaticity		Wx	Θ = 0°	0.261	0.291	0.321	-	(CF@C Light With out B-ITO)
		Wy		0.304	0.334	0.364	-	
Response Time (Rising + Falling)		T _r + T _f	Ta= 25° C Θ = 0°	-	30	40	ms	Note 5

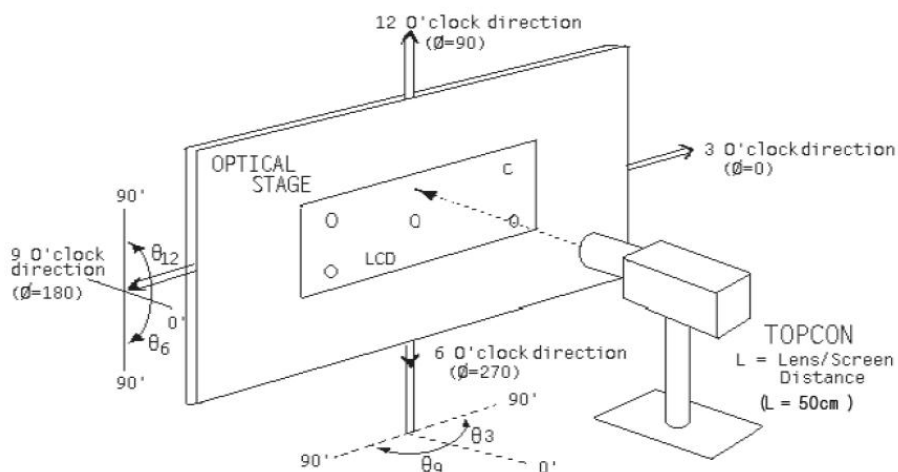
Note:

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 8).
 2. Contrast measurements shall be made at viewing angle of $\Theta = 0$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (see FIGURE 1)
- Luminance Contrast Ratio (CR) is defined mathematically.

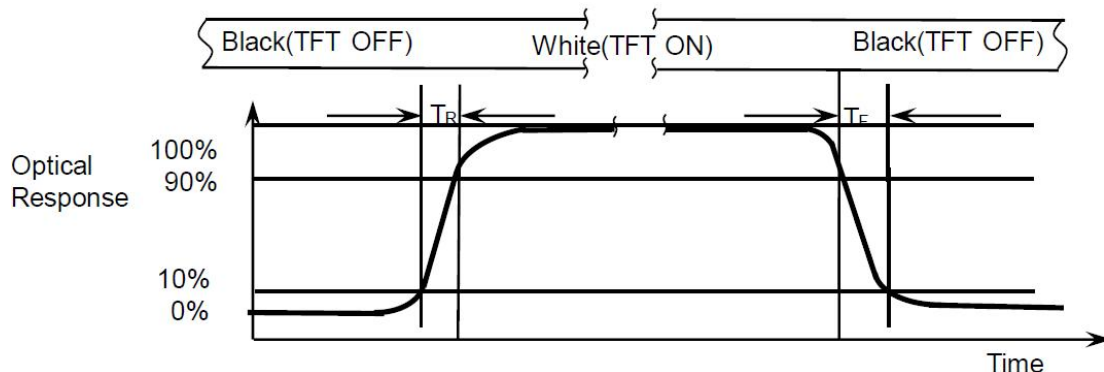
$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the Value with without APF and without CG.
4. The color chromaticity coordinates specified in the above table shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
5. The electro-optical response time measurements shall be made as FIGURE 9. The times needed for the luminance to change from 10% to 90% is T_r , and 90% to 10% is T_f .

<Measurement Set Up>



<Response Time Testing>



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°C*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°C*24Hrs	
3	High Humidity Storage	50°C*90%RH*24Hrs	
4	High Temperature Storage	80°C*24Hrs	
5	Low Temperature Storage	-30°C*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 $45\pm20\%\text{RH}$.
- 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.