



Shenzhen Hongcai Technology Co. Ltd.

APPROVAL SHEET

Customer	
Part NO.	MZ2D2N301
Remarks	<input type="checkbox"/> Approval For Specification Only <input checked="" type="checkbox"/> Approval For Specification And Simple

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Revision Record

Rev No	Date	Description
V01	2021.8.9	Preliminary Specification Release.

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1. General Specifications

Item	Contents	Unit
Size	2.2TFT	inch
LCM Dimension	38.68 (W) * 55.14 (H) * 2.35(T)	mm
LCD Active Area	33.84* 45.12	mm
Number OfDots	240 * RGB * 320	pixel
LCD Type	a-Si TFT	
Viewing Direction	12 O'CLOCK	
Driver IC	ST7789V2-G4	
Interface Type	RGB/SPI/MCU	
Operating Temperature	-20°C ~ 70°C	
Storage Temperature	-30°C ~ 80°C	
Backlight Type	4 LEDs	
Weight	TBD	

3. Pin Assignments

NO.	Symbol	Description
1-16	DB15-DB0	Data Bus
17	SDA	Serial Data Input
18	RD	Read signal, rising-edge-active.
19	WR	(MCU/ Write signal, rising-edge-trigger.) (SPI/Destination register selection.)
20	DC	(MCU Data/Command register address.) (SPI clock signal, rising-edge-trigger.)
21	CS	Chip Select
22	TE	Frame mark.
23	NC	NC
24	NC	NC
25	IOVCC	I/O POWER SUPPLY
26	VCC	POWER SUPPLY
27	GND	Ground
28	LEDA	BACKLIGHT ANODE
29	LEDK	BACKLIGHT CATHODE
30	LEDK1	BACKLIGHT CATHODE
31	IM0	Interface mode selection.
32	IM1	Interface mode selection.
33	IM2	Interface mode selection.
34	RESET	Reset pin
35	VS	Frame Synchronizing Signal
36	HS	Line Synchronizing Signal
37	PLCK	Dot Clock Signa
38	DE	Data Enable Signal
39	DB17	Data Bus
40	DB16	Data Bus

4. Electrical Specification

4.1 DC Characteristics

Item	Symbol	Min	Typ	Max	Unit
TFT gate on voltage	VGH	--	15	--	V
TFT gate off voltage	VGL	--	-10	--	V
TFT common electrode Voltage	Vcom	--	-1	--	V

4.2 AC Characteristics

Refer to the SPEC of ST7789V2-G4

4.3 Typical Operation Conditions

Item	Symbol	Min.	Typ.	Max.	Unit
Analog Supply Voltage	VCI	2.5	2.8	3.3	V
Digital Supply Voltage	VDD	2.5	2.8	3.3	V
I/O Supply Voltage	IOVCC	1.65	1.8/2.8	3.3	V
Input High Voltage	VIH	0.8*IOVCC	-	IOVCC	V
Input Low Voltage	VIL	0	-	0.2*IOVCC	V
Output High Voltage	VOH	0.8*IOVCC	-	-	V
Output Low Voltage	VOL	-	-	0.2*IOVCC	V

4.4 Backlight Circuit Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
LED Current	IB	--	60	80	mA
LED Voltage	Vf	2.8	3.0	3.2	V
CIE	X	0.265	0.295	0.325	
	Y	0.26	0.29	0.32	
Brightness of LCM	L	--	--	--	cd/m ²

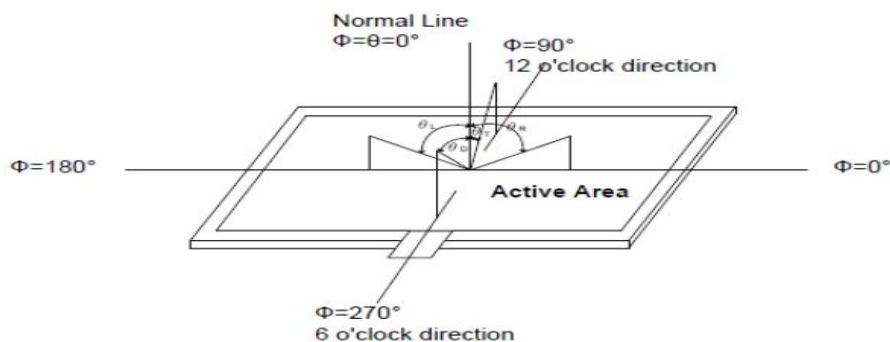
4.5 Electro-Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	θT	$CR \geq 10$	45	50	-	Degree	Note 2
	θB		15	20	-		
	θL		40	45	-		
	θR		40	45	-		
Contrast Ratio	CR	$\theta = 0^\circ$	250	350	-		Note 1 Note 3
Response Time	T_{ON}	$25^\circ C$	-	20	30	ms	Note 1
	T_{OFF}						Note 4
Chromaticity	White	C-light	x	0.253	0.303	0.353	Note 5 Note 1
			y	0.309	0.359	0.409	
	Red		x	0.581	0.631	0.681	
			y	0.265	0.315	0.365	
	Green		x	0.261	0.311	0.361	
			y	0.478	0.528	0.578	
	Blue		x	0.081	0.131	0.181	
			y	0.119	0.169	0.219	
NTSC				48		%	Note 5
Transmittance	T		5.5	6.0		%	Note 1 Note 7

Note : Color chromaticity is for LCD only.

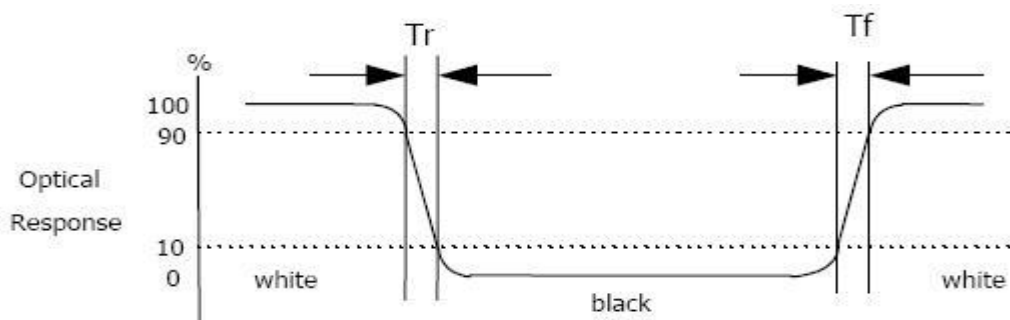
5. Measurement system

5.1 LCM Viewing Angle



Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface

5.2 Response time



Response time is the time required for the display to transition from white to black (Rising time, Tr) and from black to white (Falling time, Tf) for additional information.

5.3 Contrast Ratio (CR)

Contrast Ratio (CR) is defined mathematically as:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white.

6. Reliability Test Items

Test Item	Test Condition	Test result determinant gist
High temperature storage	$80\pm 3^{\circ}\text{C}$, 48H;	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1. Air bubble in the LCD; 2. Non-display; 3. Glass crack; 4. The electrical characteristics requirements shall be satisfied.
Low temperature storage	$-30\pm 3^{\circ}\text{C}$, 48H;	
High temperature operation	$70\pm 3^{\circ}\text{C}$, 48H;	
Low temperature operation	$-20\pm 3^{\circ}\text{C}$, 48H;	
High temperature /humidity	$60^{\circ}\text{C} \pm 3^{\circ}\text{C}$, $90\% \pm 3\% \text{RH}$, 48H;	
Thermal Shock	$-20^{\circ}\text{C}/0.5\text{h} \sim +70^{\circ}\text{C}/0.5\text{h}$ for a total 24 cycles;	
Vibration Test	Frequency 10Hz~55Hz~10Hz Amplitude: 1.5mm, X, Y, Z direction for total 1H; (Packing condition)	
ESD test	$\pm 4\text{KV}$, Human Body Mode, 150pF/330 Ω ; $\pm 8\text{KV}$, Air Mode, 150pF/330 Ω ;	

Remark:

1. The test samples should be applied to only one test item.
2. Sample size for each test item is 2pcs.
3. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

7. Suggestions for using LCD modules

- 7.1 The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
- 7.2 If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- 7.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
- 7.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to contact with room temperature air.
- 7.5 If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
 - Isopropyl alcohol
 - Ethyl alcoholDo not scrub hard to avoid damaging the display surface.
- 7.6 Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.

- Water
- Ketone
- Aromatic solvents

Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contact with oil and fats. 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.

7.8 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.

7.9 Do not attempt to disassemble or process the LCD module.

7.10 NC terminal should be open. Do not connect anything.

7.11 If the logic circuit power is off, do not apply the input signals.

7.12 Electro-Static Discharge Control, Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Before removing LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.
- Tools required for assembling, such as soldering irons, must be properly grounded. Make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dry. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.
- 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.

7.13 Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- Do not alter, modify or change the shape of the tab on the metal frame. -
- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

- Do not damage or modify the pattern writing on the printed circuit board. -
- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

- Do not drop, bend or twist the LCM.

8.Storage Method

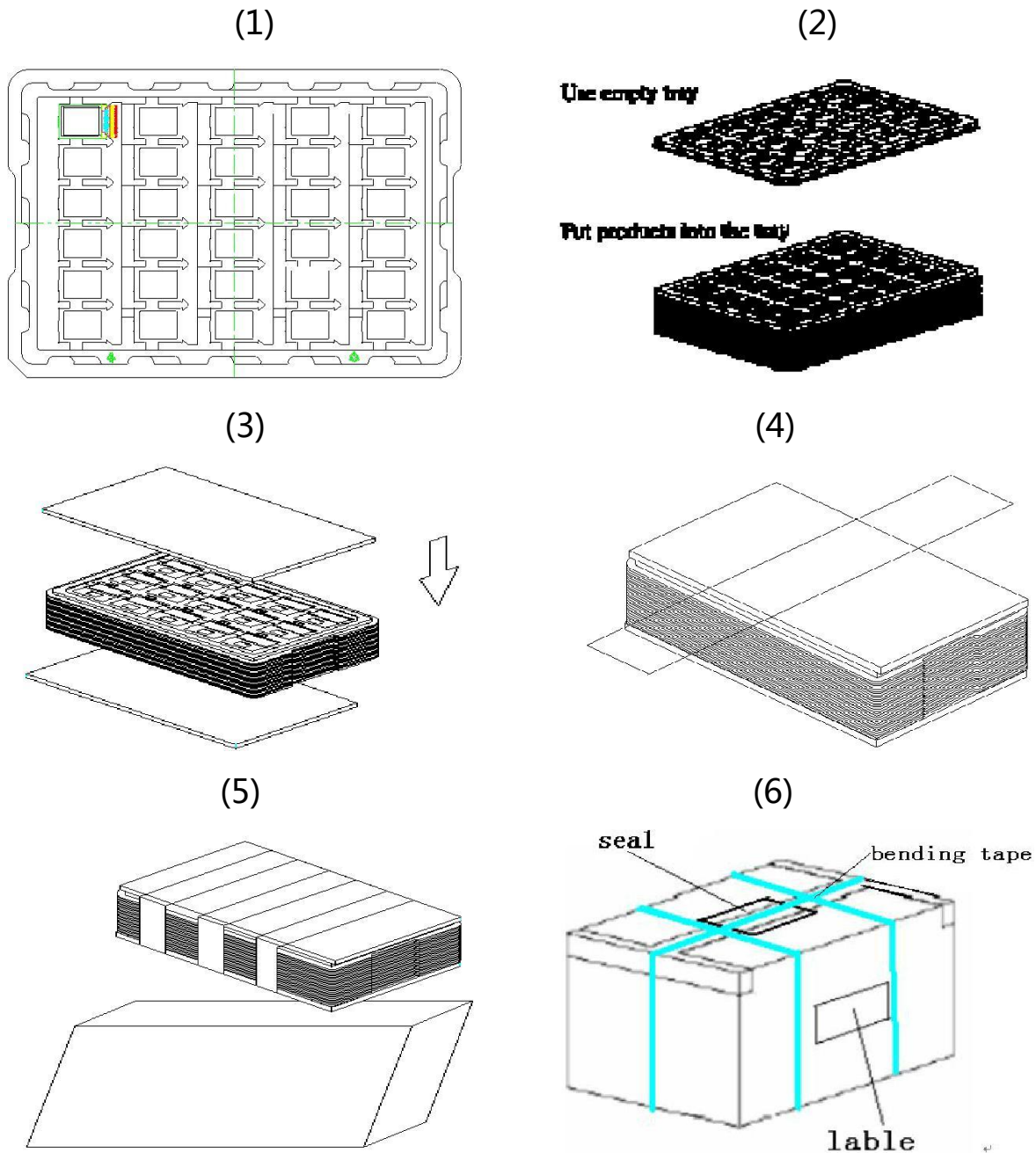
8.2.1.Store in an ambient temperature of $23\text{ }^{\circ}\text{C}\pm 5\text{ }^{\circ}\text{C}$, and in a relative humidity of $55\%\pm 15\%$. Don't exceed 12 months and expose to sunlight or fluorescent light.

8.2.2.Store in a clean environment, free from dust, active gas, and solvent.

8.2.3 LCM module is stored in warehouse, Store in antistatic container, There may be air bubbles between the protective film on the surface of polarizer and polarizer。 It can only be found under LED light, Before production, IQC should be inspected directly by LED light, If residual traces are found, alcohol should be used to wipe them。

9.Packing and Storage Specification(Reference Only)

9.1 Packing Method



1. Put module into tray cavity.
2. Tray stacking.
3. Put 1 foam under the tray stack and 1 foam above.
4. Fix the cardboard to the tray stack with adhesive tape.
5. Put the tray stack into carton.
6. Carton sealing with adhesive tape.