CREDIT DISPLAY CORPORATION

Tel: 0755-82730276 Web: www.crddisplay.com

SPECIFICATION FOR LCD MODULE

Customer : _____

Product Model: CRD013TI01-12NM01

Sample code: _____

Designed by	Checked by	Approved by

Final Approval by Customer

☐ **LCM Machinery OK** Checked By _____ ☐ **LCM Display OK** Checked By _____	☐ **LCM OK** ☐ **NG , Problem survey:** Approved By _____

※The specification of "TBD" should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.

CREDIT DISPLAY CORPORATION

Revision History

Version	Contents	Date	Note
Pre.01	Initial Release	2021.12.21	
Final.02	Update General Specifications	2022.03.18	
Final.03	Update Mechanical Drawing	2023.01.04	

CREDIT DISPLAY CORPORATION

Contents

1. General Specifications 3
2. Pin Assignment 4
3. Operation Specifications 5
3.1. Absolute Maximum Ratings 5
3.2. Typical Operation Conditions 5
4. Timing Characteristics 6
4.1. Serial Interface Characteristics (4-line Serial) 6
4.2. Reset Input Timing 8
5. Optical Specifications 9
6. Reliability Test Items 13
7. General Precautions 14
7.1. Safety 14
7.2. Handling 14
7.3. Static Electricity 14
7.4. Storage 14
7.5. Cleaning 14
8. Mechanical Drawing 15

1. General Specifications

No.	Item	Specification	Remark
1	**LCD size**	**1.3 inch(Diagonal)**	
2	**Driver element**	**a-Si TFT active matrix**	
3	**Resolution**	**128× 3(RGB) × 128**	
4	**Display mode**	**Normally Black, Transmissive**	
5	**Dot pitch**	**182.8(W) ×182.8(H)m**	
6	**Active area**	**23.4(W) ×23.4 (H) mm**	
7	**Module size**	**26.85(W) ×29.55(H) ×1.88(D) mm**	**Note 1**
8	**Driver IC**	**NV3023A**	
9	**Color arrangement**	**RGB- Vertical stripe**	
10	**Interface**	**4-line serial**	
11	**Backlight power consumption**	**TBD**	
12	**Panel power consumption**	**TBD**	
13	**Weight**	**TBD**	

Note 1: Refer to Mechanical Drawing.

2. Pin Assignment

1	GND	Ground
2	LEDK	Power supply for LED-K
3	LEDA	Power supply for LED-A
4	VCC28	Power Supply for Analog, Digital System and Booster Circuit.
5	GND	Ground
6	GND	Ground
7	A0	Display data/command selection pin in 4-line serial interface
8	CS	chip select signal input
9	SCLK	Usef to be serial interface clock
10	SDA	The serial input signal in serial interface mode
11	RESET	A reset pin.
12	GND	Ground

3. Operation Specifications

3.1. Absolute Maximum Ratings

(Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Supply voltage	V_{IN}	-0.3	4.5	V	
Operation Temperature	T_{OP}	-20	70	℃	
Storage Temperature	T_{ST}	-30	80	℃	
LED Reverse Voltage	VR	-	5	V	Each LED Note 2
LED Forward Current	IF	-	25	mA	Each LED

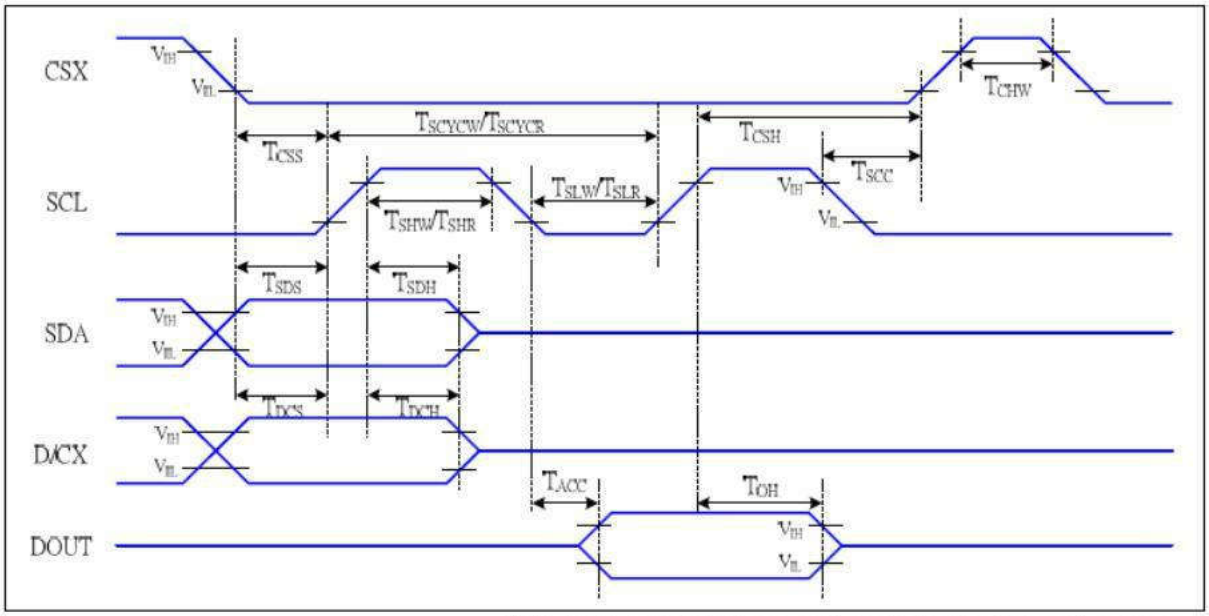
Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings
exceeded, the characteristics of the module may not be recovered, or in an extreme
case, the module may be permanently destroyed.
Note 2: V_R Conditions: Zener Diode 20mA

3.2. Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ	Max.		
Power voltage	V_{DD}	2.6	2.8	3.2	V	Note 2
Current for Driver	IV_{DD}	-	10	-	mA	
Input logic high voltage	V_{IH}	$0.7V_{DD}$	-	V_{DD}	V	Note 3
Input logic low voltage	V_{IL}	0	-	$0.3V_{DD}$	V	
Output high voltage	V_{oh}	0.8_{DD}	-	V_{DD}	V	
Output low voltage	V_{ol}	0	-	$0.2V_{DD}$	V	
LED Forward voltage	V_{LED}	2.8	3.0	3.3	V	
LED Current	I_{LED}	-	40	-	mA	

4. Timing Characteristics

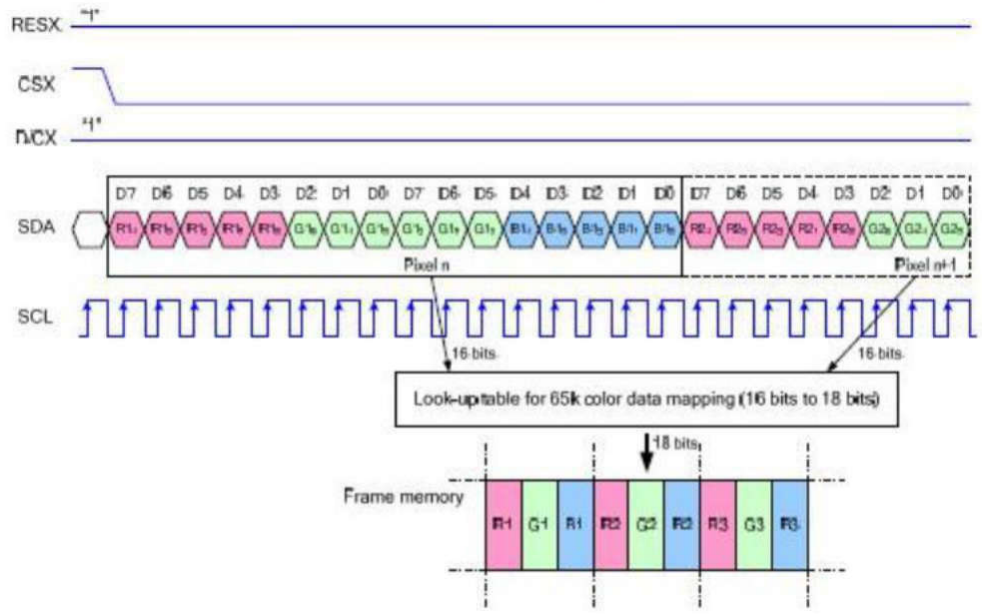
4.1. Serial Interface Characteristics (4-line Serial)



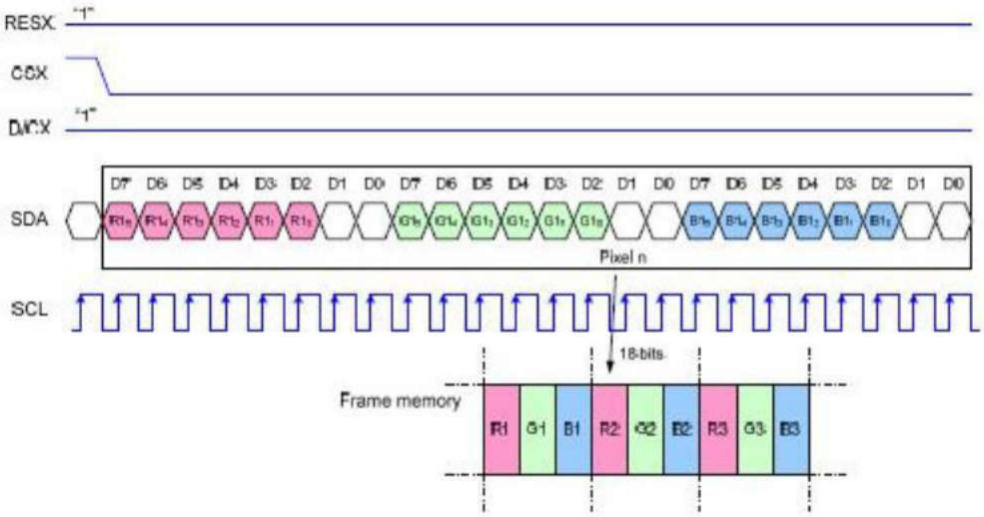
VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=-30 to 70 ℃

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)	66		ns	-write command & data ram
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		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	10		ns	
	T_{SDH}	Data hold time	10		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

8.8.42 Write data for 16-bit/pixel (RGB-5-6-5-bit input), 65K-Colors, 3Ah="05h"



8.8.43 Write data for 18-bit/pixel (RGB-6-6-6-bit input), 262K-Colors, 3Ah="06h"



4.2. Reset Input Timing

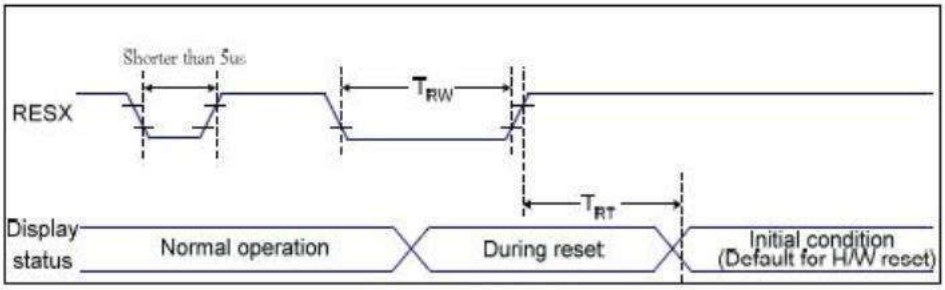


Figure 7 Reset Timing

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=-30 – 70 ℃

Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120 (Note 1, 6, 7)	ms

Table 8 Reset Timing

5. Optical Specifications

Test Conditions:

1. V_{DD}=2.8V, the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	Φ=180°(9 o'clock)	80	-	-	degree	Note 1
	θ_R	Φ=0°(3 o'clock)	80	-	-		
	θ_T	Φ=90°(12 o'clock)	80	-	-		
	θ_B	Φ=270°(6 o'clock)	80	-	-		
Response time	T_{ON+} T_{OFF}	Normal θ=Φ=0°	-	35	40	msec	Note 3
Contrast ratio	CR		800	1000	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		280	300	-	cd/m²	Note 6
Luminance uniformity	Y_U		80	-	-	%	Note 7

Note 1: Definition of viewing angle range

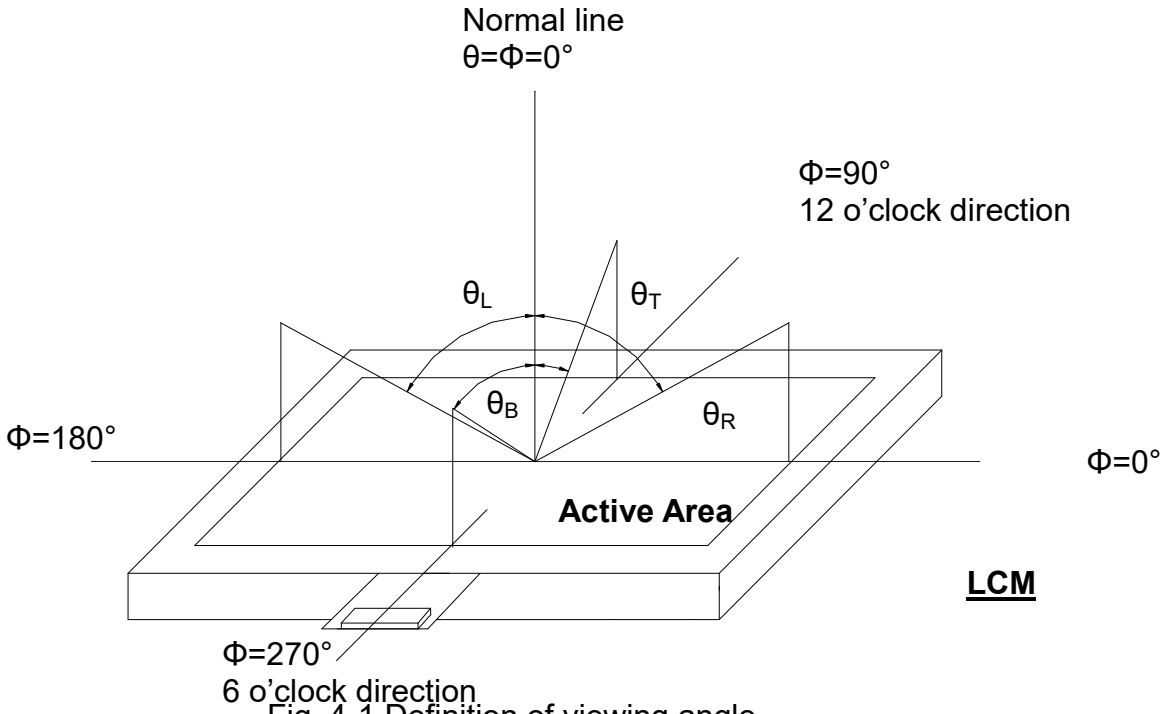


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

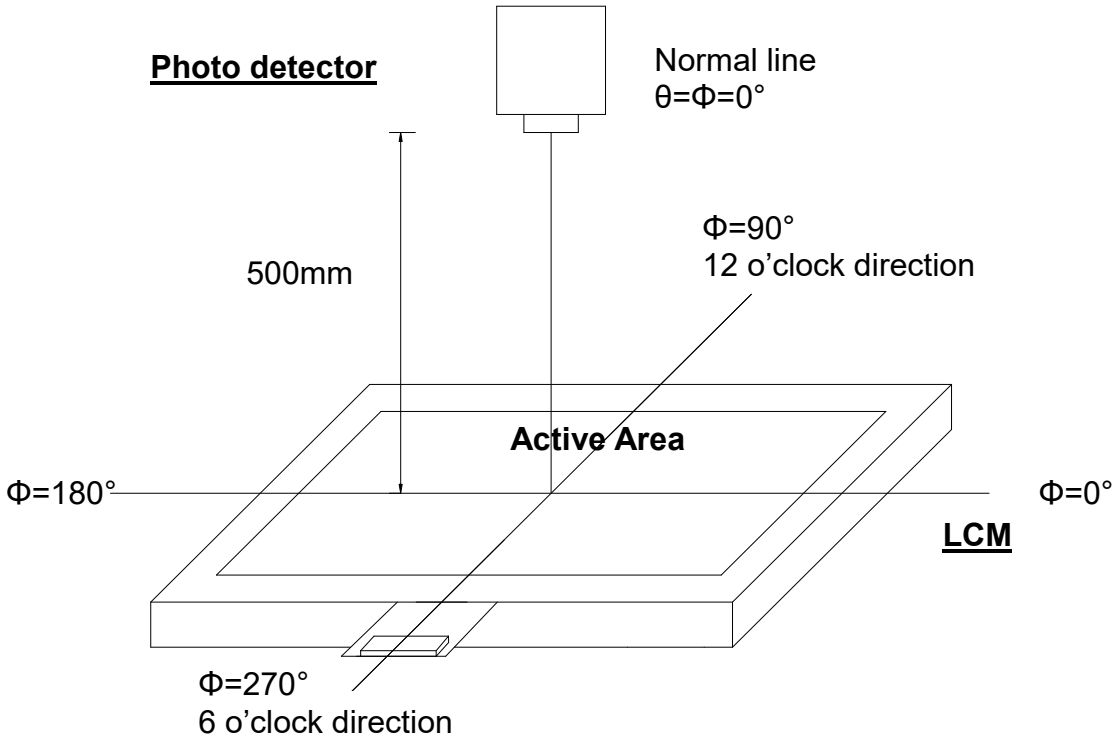


Fig. 4-2 Optical measurement system setup

Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

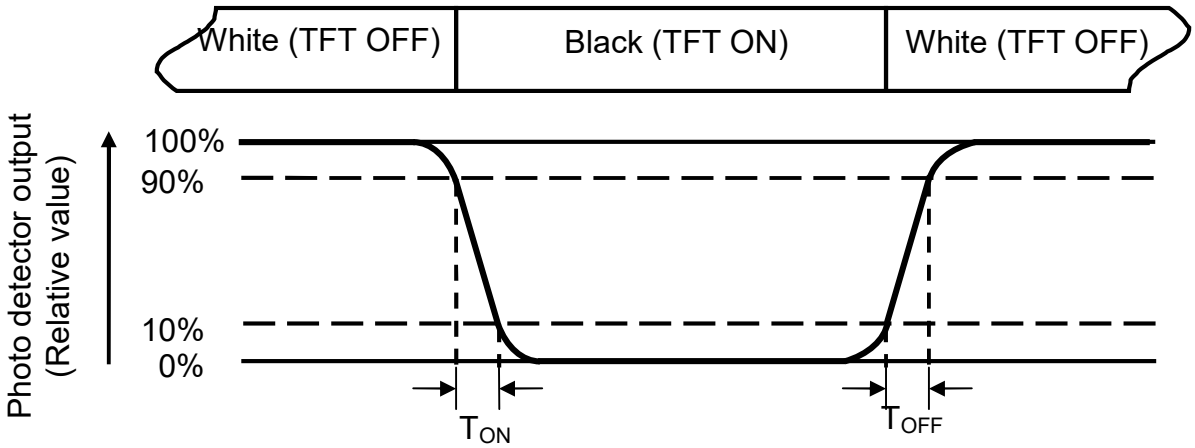


Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel.

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4).Every measuring point is placed at the center of each measuring area.

$$Luminance\ \ Uniformity\ (Yu) = \frac{B_{min}}{B_{max}}$$

L-------Active area length W----- Active area width

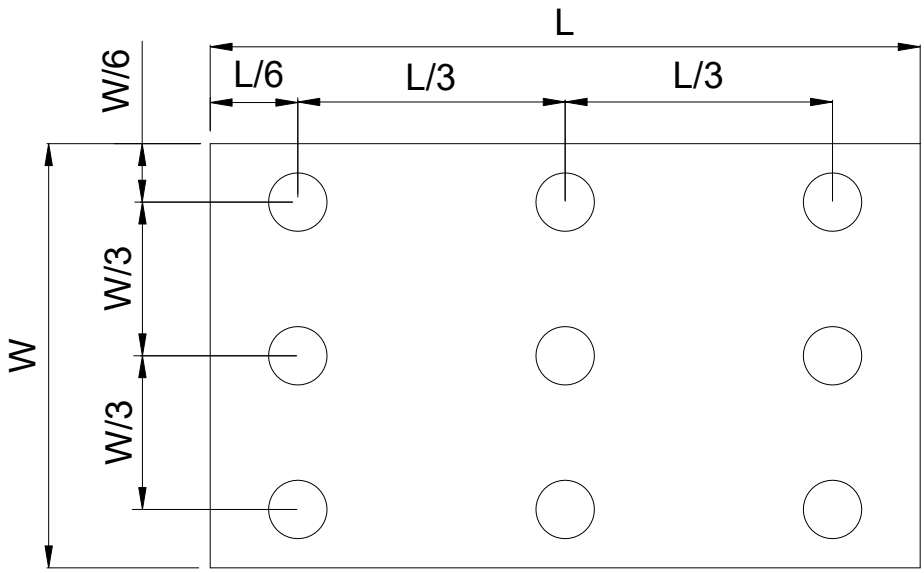


Fig. 4-4 Definition of measuring points

$\mathbf{B_{max}}$: The measured maximum luminance of all measurement position.
$\mathbf{B_{min}}$: The measured minimum luminance of all measurement position.

6. Reliability Test Items

(Note3)

Item	Test Conditions	Remark
High Temperature Storage	Ta = 80℃ 96hrs	Note 1，Note 4
Low Temperature Storage	Ta = -30℃ 96hrs	Note 1，Note 4
High Temperature Operation	Ts = 70℃ 96hrs	Note 2，Note 4
Low Temperature Operation	Ta = -20℃ 96hrs	Note 1，Note 4
Operate at High Temperature and Humidity	+60℃, 90%RH 96hrs	Note 4
Thermal Shock	-30℃/30 min ~ 25℃/5 min ~ +80℃/30 min for a total 10 cycles, Start with cold temperature and end with high temperature.	Note 4
Vibration Test	10Hz~150Hz, 100m/s2, 120min	
Mechanical Shock	Half-sinewave,300m/s2,11ms	
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	

Note 1: Ta is the ambient temperature of samples.
Note 2: Ts is the temperature of panel's surface.
Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.
Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

7. General Precautions

7.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

7.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

7.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

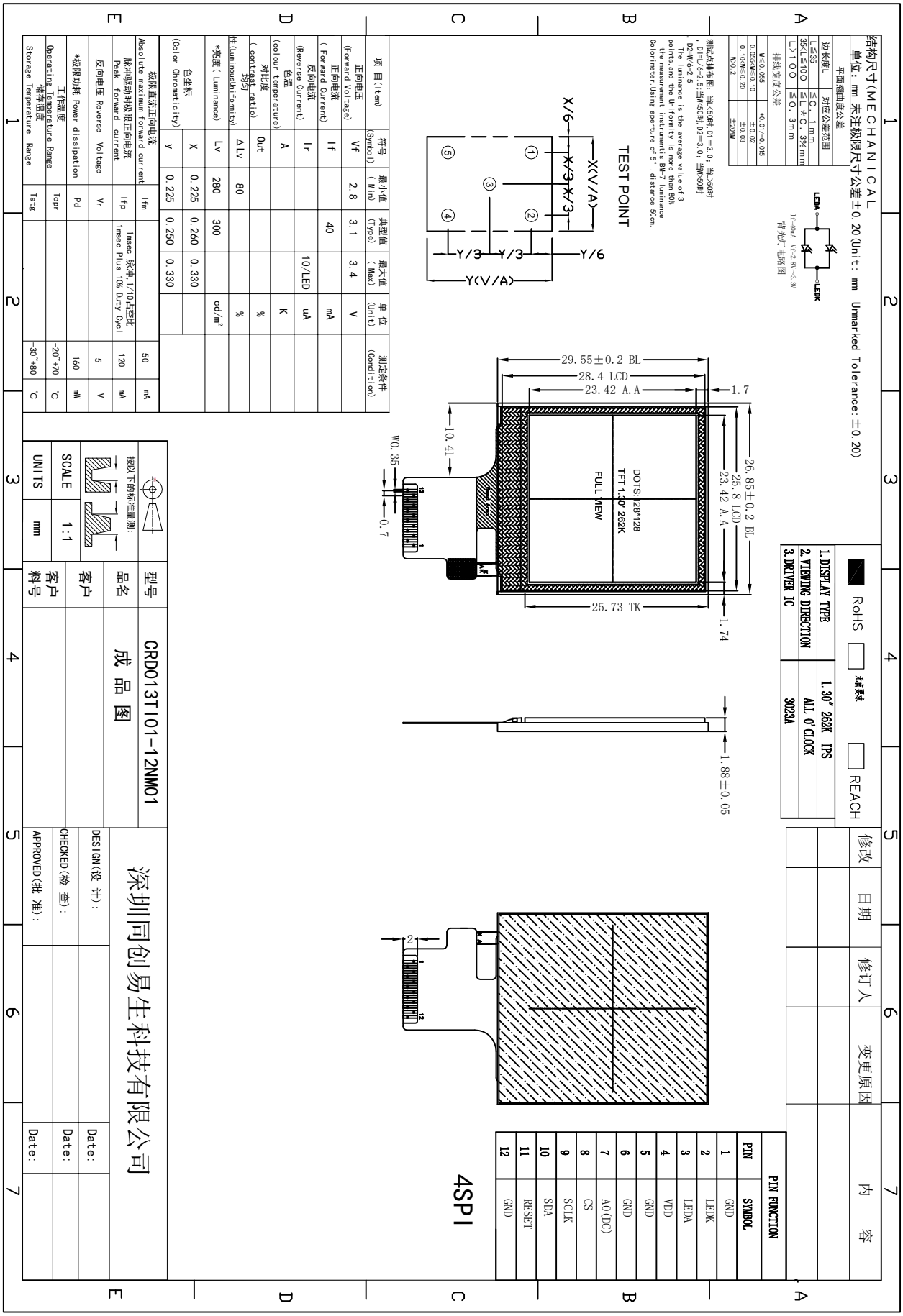
7.4. Storage

1. Store the module in a dark room where must keep at 25±10℃ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

7.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

8. Mechanical Drawing



项 目(Item)	符号(Symbol)	最小值(Min)	典型值(Type)	最大值(Max)	单 位(Unit)	测定条件(Condition)
正向电压(Forward Voltage)	Vf	2.8	3.1	3.4	V	
正向电流(Forward Current)	If		40		mA	
反向电流(Reverse Current)	Ir			10/LED	uA	
色温(colour temperature)	A				K	
对比度(contrast ratio)	Dut				%	
均匀性(Luminoushiformity)	ΔLv	80			%	
*亮度(Luminance)	Lv	280	300		cd/m²	
色坐标(Color Chromaticity)	X	0.225	0.260	0.330		
	y	0.225	0.250	0.330		

极限直流正向电流 Absolute maximum forward current	Ifm		50	mA
脉冲驱动时极限正向电流 Peak forward current	Ifp	1msec 脉冲,1/10占空比 1msec Plus 10% Duty Cycl	120	mA
反向电压 Reverse Voltage	Vr		5	V
*极限功耗 Power dissipation	Pd		160	mW
工作温度 Operating Temperature Range	Topr		-20~+70	℃
储存温度 Storage Temperature Range	Tstg		-30~+80	℃