SPECIFICATION

FOR LCD MODULE

MODEL NO:	**TM128128M3CCSLGWA**
CUSTOMER:	**Schneider**
CUSTOMER P/N.	P3 plus
VERSION	V1.1
CUSTOMER APPROVED	

□Preliminary specification

■Final specification

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REVISION RECORD

Version	Page	Revision Items	Name	Date
1.0		First release	Zhibin Deng	2025.02.24
1.1	P4 P5 P12	Modify the LCD thickness dimension. Add a note to the IDD: excluding backlight.	Zhibin Deng	2025.11.20

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1 General Specifications

Item	Contents
LCM Structure	LCD+IC+FPC+Backlight
LCD type	FSTN
	Positive
LCD Duty	1/128
LCD Bias	1/11
Polarizer	Transflective
LCD background color	Grey
Segment color	Black
Backlighting	LED
Backlighting type	Edge
Backlighting color	White
Backlighting drive	2 Chip LEDs×2 circuit If=15mA×2,Vf=9.6V×2(TYP)
View direction	9:00
Operating temperature	-25℃~+70℃
Storage temperature	-40℃~+85℃
Controller	UC1638C
Technology	COG
Power supply	VDD=3.3V, VLCD=15.4V
Data Transfer	SPI

Notes:

- Color tone can slightly change with temperature and driving voltage.
- Color tone will be changed by backlight.

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2 Absolute maximum ratings

(Without LED backlighting ,Ta=25℃)

Parameter	Symbol	Min	Max	Unit	Remark
Logic circuit supply voltage	V_{DD}	-0.3	+4.0	V	Only for IC
LCD driving voltage	V_{LCD}	-0.3	+19.8	V	Only for IC
Operating temperature range	Top	-25	+70	℃	No Condensation
Storage temperature range	Tst	-40	+85	℃	

Notes:

- LCD operating voltage V_{LCD}= V_{LCD} – V_{ss}.
- If the module is above these absolute maximum ratings. It may become permanently damaged.
- V_{DD} ≥V_{SS} must be maintained.

3 Mechanical Characteristics

3.1 Mechanical features

Parameter	Standard Value	Unit
Display type	Dot-matrix	--
Number of dots (W×H)	128 x 128	--
View area (W×H)	67.00 x 62.50(Min)	mm
Active Area (W×H)	56.561 x 53.745	mm
Dot Size (W×H)	0.427 x 0.405	mm
Dot Pitch (W×H)	0.442 x 0.420	mm
Module size(W×H×D)	77.55 x 67.90 x 13.9(MAX) *	mm
Module total weight (approx)	44.84	g
Module outline dimensions	Refer to page 5-“Mechanical drawing”	--

Note:

- The values don’t include the length of PIN or FPC.

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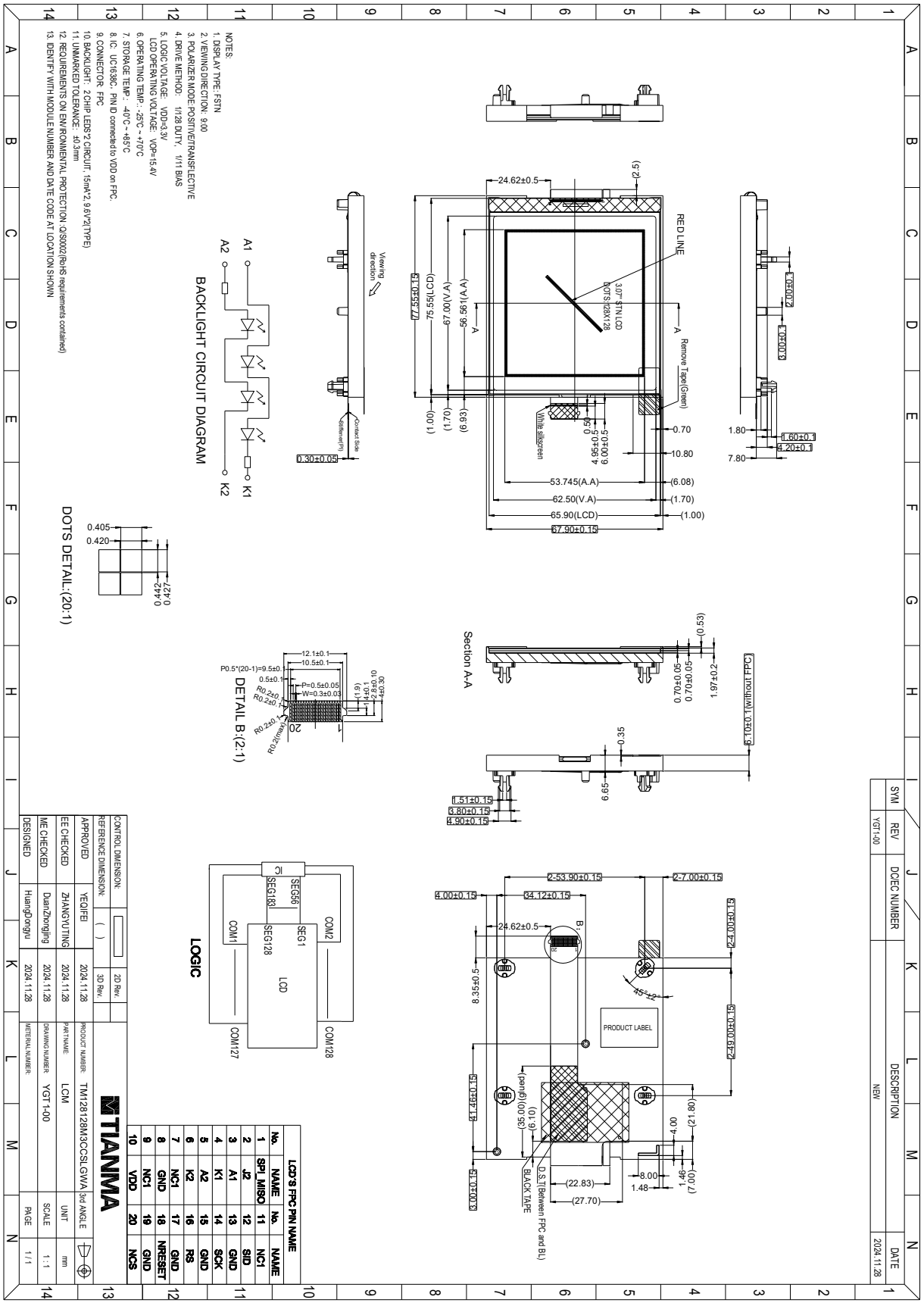
3.2 Mechanical drawing.



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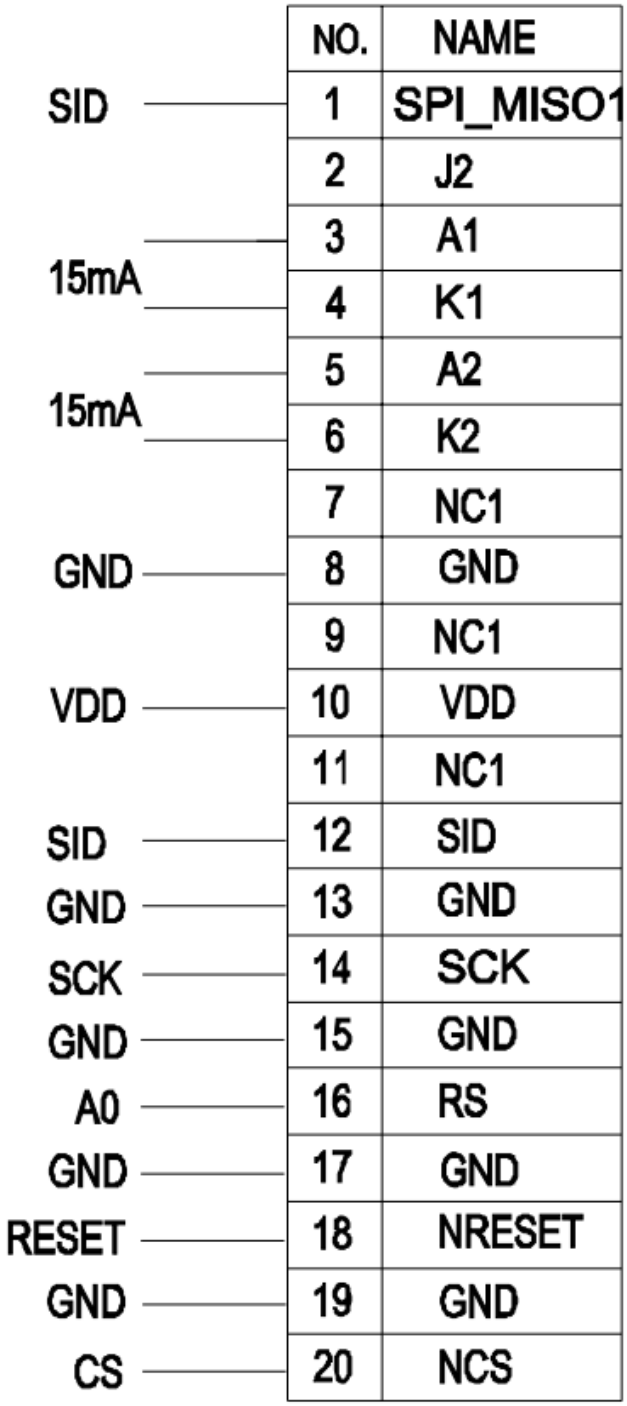
4 Circuit

Recommend interface circuit is for your reference only.



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5 Interface descriptions

Pin No.	Symbol	I/O	Description
1	SPI_MISO	O	SPI data output
2	J2	-	No connection
3	A1	PWR	LED circuit 1 anode
4	K1	PWR	LED circuit 1 cathode
5	A2	PWR	LED circuit 2 anode
6	K2	PWR	LED circuit 2 cathode
7	NC1	-	No connection
8	GND	PWR	Ground
9	NC1	-	No connection
10	VDD	PWR	Power supply voltage
11	NC1	-	No connection
12	SID	I/O	SPI data input
13	GND	PWR	Ground
14	SCK	I	SPI clock input
15	GND	PWR	Ground
16	RS	I	Register select ,High for Display data, Low for control data
17	GND	PWR	Ground
18	NRESET	I	Reset signal, Low active
19	GND	PWR	Ground
20	NCS	I	Chip select. Low active.

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6 Instruction Code & Timing characteristics

6.1 COMMAND

The TM128128M3CCSLGWA module uses a UC1638C controller. When indirect mode is selected for the system interface use the following commands to set up the display. The table below lists the command type and code for each command. For more details please refer to the UC1638C datasheet.

COMMAND SUMMARY

The following is a list of host commands supported by UC1638c:

C/D: 0: Control, 1: Data W/R: 0: Write Cycle, 1: Read Cycle D7-D0: # : Useful Data bits –: Don't Care

No	Command	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0	Action	Default
1.	Write Data Byte (multiple-byte command)	0	0	0	0	0	0	0	0	0	1	Write byte by byte	N/A
		1	0	#	#	#	#	#	#	#	#		
		:	:	:	:	:	:	:	:	:	:		
2.	Read Data Byte (multiple-byte command)	0	0	0	0	0	0	0	0	1	0	Read byte by byte	N/A
		1	1	#	#	#	#	#	#	#	#		
		:	:	:	:	:	:	:	:	:	:		
3.	Get Status (triple-byte command)	0	0	0	0	0	0	0	0	1	1	Get Status	N/A
		1	1	POR	MX	MY	PID	DE	WS	MD	MS		
		1	1	Ver[1:0]		PMO[5:0]							
4.	Set Column Address (double-byte command)	0	0	0	0	0	0	0	1	0	0	Set CA[7:0]	00H
		1	0	#	#	#	#	#	#	#	#		
5.	Set Temp. Compensation	0	0	0	0	1	0	0	#	#	#	Set TC[2:0]	100b
6.	Set Pump Control	0	0	0	0	1	0	1	1	0	#	Set PC	1b
7.	Set Adv. Program Control (double-byte command)	0	0	0	0	1	1	0	R	R	R	R = 0~5, Set APC[R][7:0]	N/A
		1	0	#	#	#	#	#	#	#	#		
8.	Set Scroll Line LSB	0	0	0	1	0	0	#	#	#	#	Set SL[3:0]	0H
	Set Scroll Line MSB	0	0	0	1	0	1	#	#	#	#	Set SL[7:4]	0H
9.	Set Page Address LSB	0	0	0	1	1	0	#	#	#	#	Set PA[3:0]	0H
	Set Page Address MSB	0	0	0	1	1	1	0	0	#	#	Set PA[5:4]	0H
10.	Set V_{BIAS} Potentiometer (double-byte command)	0	0	1	0	0	0	0	0	0	1	Set PM[7:0]	54H
		1	0	#	#	#	#	#	#	#	#		
11.	Set Partial Display Control	0	0	1	0	0	0	0	1	0	#	Set LC[8]	0: Disable
12.	Set COM Scan Function	0	0	1	0	0	0	0	1	1	#	Set CSF	0b
13.	Set RAM Address Control	0	0	1	0	0	0	1	#	#	#	Set AC[2:0]	001b
14.	Set Display mode	0	0	1	0	0	1	0	1	#	#	Set DC[5:4]	00b
15.	Set Line Rate	0	0	1	0	1	0	0	0	#	#	Set LC[3:2]	10b
16.	Set All-Pixel-ON	0	0	1	0	1	0	0	1	0	#	Set DC[1]	0b
17.	Set Inverse Display	0	0	1	0	1	0	0	1	1	#	Set DC[0]	0b
18.	Set LCD Mapping Control	0	0	1	1	0	0	0	#	#	0	Set LC[1:0]	00b
19.	Set N-Line Inversion (double-byte command)	0	0	1	1	0	0	1	0	0	0	Set NIV[6:0]	00H
		1	0	0	#	#	#	#	#	#	#		
20.	Set Display Enable (double-byte command)	0	0	1	1	0	0	1	0	0	1	Set DC[3:2]	10b
		1	0	1	0	1	0	1	1	#	#		
21.	Set LCD Gray Shade 1	0	0	1	1	0	1	0	0	#	#	Set LC[5:4]	01b
22.	Set LCD Gray Shade 2	0	0	1	1	0	1	0	1	#	#	Set LC[7:6]	10b
23.	System Reset (double-byte command)	0	0	1	1	1	0	0	0	0	1	System Reset	N/A
		1	0	1	1	1	0	0	0	1	0		
24.	NOP	0	0	1	1	1	0	0	0	1	1	No operation	N/A
25.	Set Test Control (double-byte command)	0	0	1	1	1	0	0	1	TT		For testing only. Do not use.	N/A
		1	0	#	#	#	#	#	#	#	#		
26.	Set LCD Bias Ratio	0	0	1	1	1	0	1	0	#	#	Set BR[1:0]	11b: 12
27.	Reset Cursor Update Mode	0	0	1	1	1	0	1	1	1	0	AC[4]=0, CA=CR	N/A
28.	Set Cursor Update Mode	0	0	1	1	1	0	1	1	1	1	AC[4]=1, CR=CA	N/A
29.	Set COM End (double-byte command)	0	0	1	1	1	1	0	0	0	1	Set CEN[7:0]	159
		1	0	#	#	#	#	#	#	#	#		
30.	Set Partial Display Start (double-byte command)	0	0	1	1	1	1	0	0	1	0	Set DST[7:0]	0
		1	0	#	#	#	#	#	#	#	#		
31.	Set Partial Display End (double-byte command)	0	0	1	1	1	1	0	0	1	1	Set DEN[7:0]	159
		1	0	#	#	#	#	#	#	#	#		

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No	Command	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0	Action	Default
32.	Set Window Programming Starting Column Address	0	0	1	1	1	1	0	1	0	0	Set WPC0[7:0]	0
		1	0	#	#	#	#	#	#	#	#		
33.	Set Window Programming Starting Page Address	0	0	1	1	1	1	0	1	0	1	Set WPP0[5:0]	0
		1	0	0	0	#	#	#	#	#	#		
34.	Set Window Programming Ending Column Address	0	0	1	1	1	1	0	1	1	0	Set WPC1[7:0]	239
		1	0	#	#	#	#	#	#	#	#		
35.	Set Window Programming Ending Page Address	0	0	1	1	1	1	0	1	1	1	Set WPP1[5:0]	39
		1	0	0	0	#	#	#	#	#	#		
36.	Enable Window Program	0	0	1	1	1	1	1	0	0	#	Set AC[3]	0: Disable
37.	Set MTP Operation control (double-byte command)	0	0	1	0	1	1	1	0	0	0	Set MTPC[4:0]	10H
		1	0	0	0	0	#	#	#	#	#		
38.	Set MTP Write Mask (double-byte command)	0	0	1	0	1	1	1	0	0	1	Set MTPM[5:0]	00H
		1	0	0	0	#	#	#	#	#	#		
39.	Set MTP Read Potentiometer	0	0	1	1	1	1	1	0	1	0	Set RV[7:0] (BR=00b)	00H
		1	0	#	#	#	#	#	#	#	#		
40.	Set MTP Program/Erase Potentiometer	0	0	1	1	1	1	1	0	1	1	Set WV[7:0] (BR=10b)	46H
		1	0	#	#	#	#	#	#	#	#		
41.	Set MTP Write Timer (double-byte command)	0	0	1	1	1	1	1	1	0	0	Set WT[7:0]	40H
		1	0	#	#	#	#	#	#	#	#		
42.	Set MTP Read Timer (double-byte command)	0	0	1	1	1	1	1	1	0	1	Set RT[7:0]	03H
		1	0	#	#	#	#	#	#	#	#		

Warning: Any bit patterns other than the commands listed above may result in undefined behavior.

Notes:

(1) Any bit patterns other than the commands listed above may result in undefined behavior.

(2) The interpretation of commands (37)~(42) depends on register MTPC[3].

(3) After MTP-ERASE or MTP-PROGRAM operation, before resuming normal operation, please always
a) Remove TST4 power source,
b) Do a full VDD ON-OFF-ON cycle.

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6.2 Interface Timing characteristics

Note: Please refer to IC: UC1638C data sheet for more details.

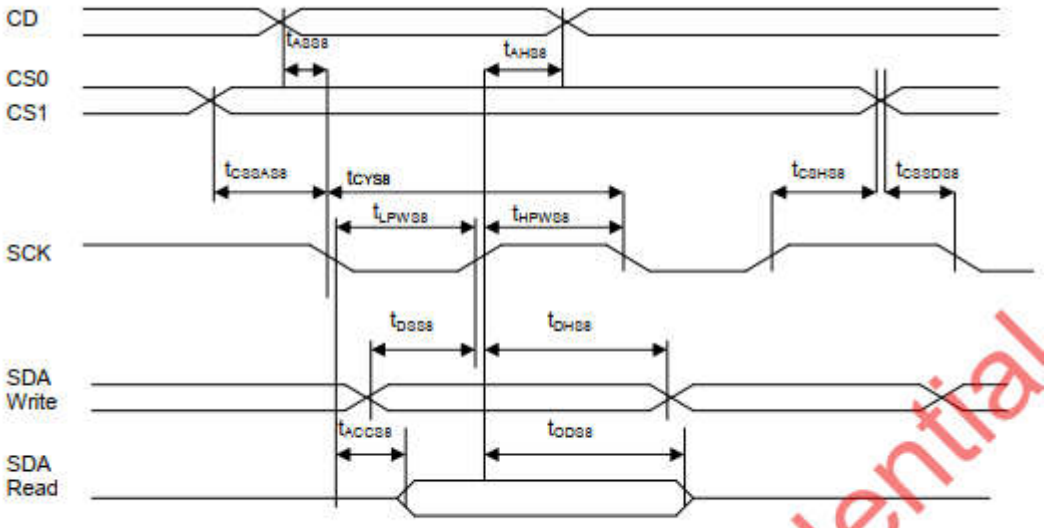

FIGURE 18: Serial Bus Timing Characteristics (for S8)

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Symbol	Signal	Description	Condition	Min.	Max.	Unit
(2.7V ≤ V_{DD} ≤ 3.6V, Ta= –30 to +85°C)				(read / write)		
t_{ASS}	CD	Address setup time		0	–	nS
t_{AHS}		Address hold time		15		
t_{CSSAS}	CS1/CS0	Chip select setup time		5	–	nS
t_{CSHS}		Chip select hold time		15		
t_{CYS}	SCK	System cycle time		430 / 220	–	nS
t_{LPWS}		Low pulse width		200 / 95		
t_{HPWS}		High pulse width		200 / 95		
t_{DSS}	SDA (Write)	Data setup time		-- / 25	–	nS
t_{DHS}		Data hold time		-- / 15		
t_{ACCS}	SDA (Read)	Read access time	C_L = 100pF	– / --	200	nS
t_{ODS}		Output disable time		30 / --	–	

Note: tr (rising time), tf (falling time) : ≤ 15nS

6.3 Power on/off Sequence

POWER-UP SEQUENCE

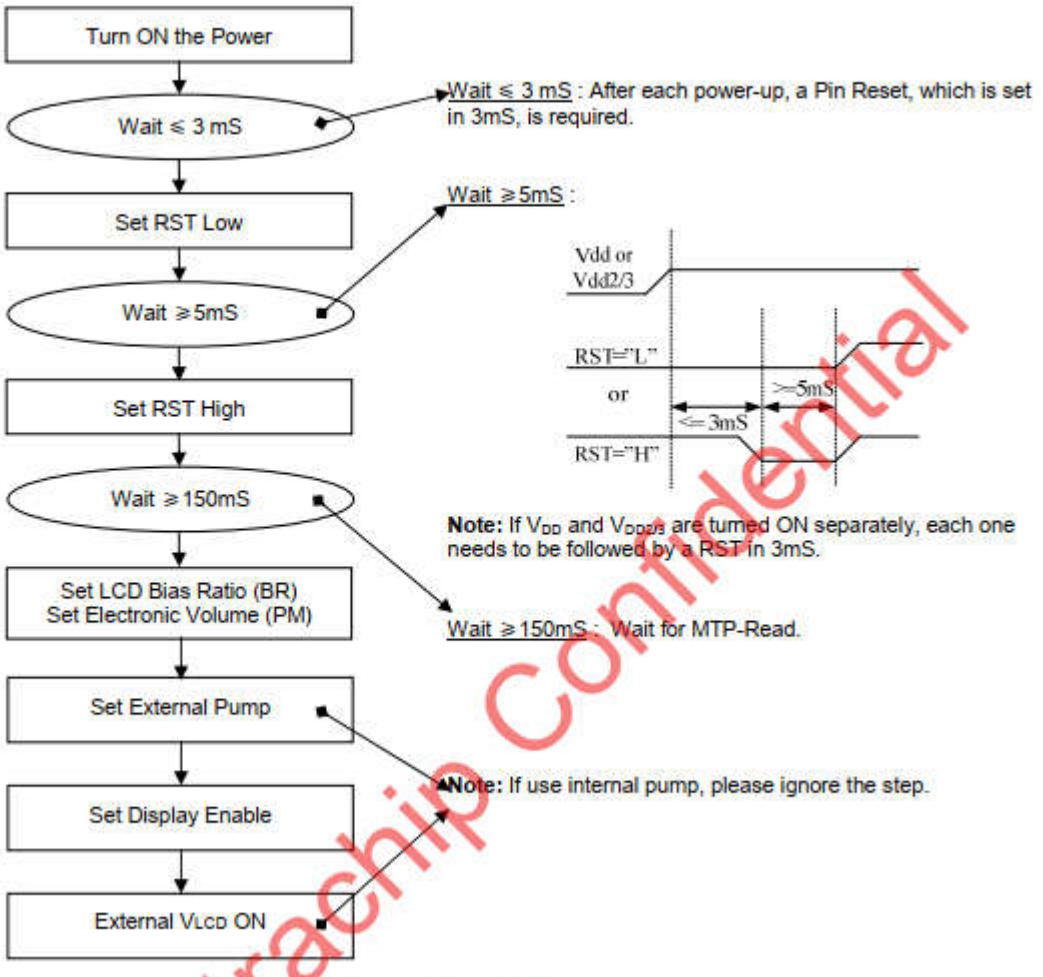

Figure 12: Reference Power-Up Sequence

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There's no delay needed while turning ON V_{DD} and $V_{DD2/3}$, and either one can be turned on first:

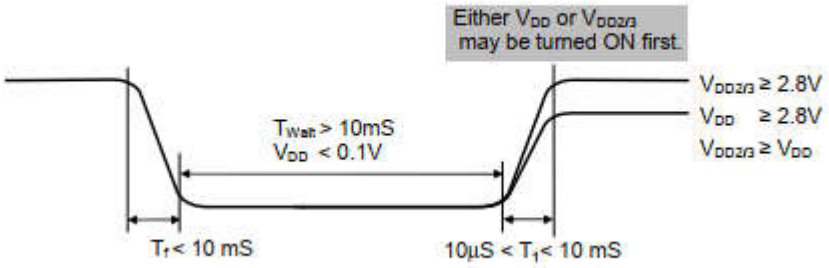
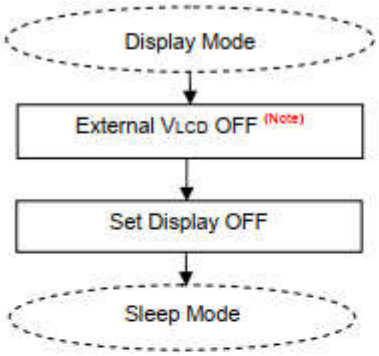


Figure 13: Power Off-On Sequence

Enter/Exit Sleep Mode Sequence

UC1638c enters Sleep mode from Display mode by issuing Set Display Disable command.



To exit Sleep mode, issue Set Display Enable.

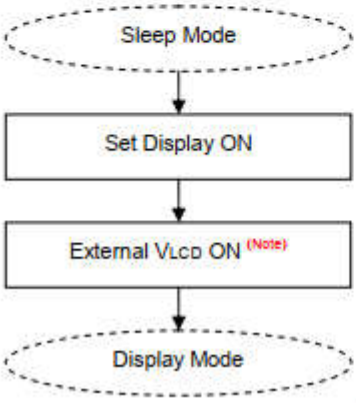


Figure 14: Reference Enter/Exit Sleep Mode Sequence

Power-Down Sequence

To prevent the charge stored in capacitor C_L from causing abnormal residue horizontal line on display when V_{DD} is switched off, use Reset mode to enable the built-in charge draining circuit to discharge these external capacitors.

When internal V_{LCD} is not used, UC1638c will *NOT* drain V_{LCD} during RESET. System designers need to make sure external V_{LCD} source is properly drained off before turning off V_{DD}.

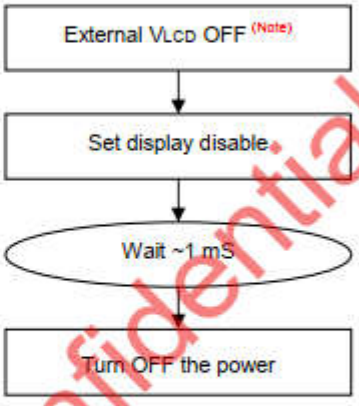


Figure 15: Reference Power-Down Sequence

Note: When using internal pump, ignore the "External V_{LCD} OFF" step.

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7 Electrical characteristics

V_{SS}=0V, Ta=23±5℃

Parameter		Symbol	Condition	MIN	TYP	MAX	UNIT
Logic circuit supply voltage		V_{DD}	--	3.1	3.3	3.5	V
Input voltage for logic circuit	"H"level	V_{IH}	V_{DD}=3.3V	0.8VDD	-	-	
	"L"level	V_{IL}		-	-	0.2VDD	
Output voltage for logic circuit	"H"level	V_{OH}		0.8VDD	-	-	
	"L"level	V_{OL}		-	-	0.2VDD	
Normal Current Consumption (Excluding backlight)		I_{DD}		-	2.1	4.2	mA
Standby current consumption		I_{SB}		-	-	50.0	uA
Used driver IC		UC1638C of Ultrachip					

8 Optical Characteristics

8.1 Optical Characteristics

Parameter		Symbol	Ratings			Unit	Measuring Temp.	Reference
			Min	Type	Max.			
Operating voltage		V_o	15.1	15.4	15.7	V	23±5℃	〔Note8-1〕
Frame frequency		f	-	137	-	Hz	23±5℃	〔Note8-2〕
Contrast ratio		Cr(θ=0°, Φ=0°)	-	4.3	-		23±5℃	〔Note8-3〕
Response time	Turn on	t_{on}	-	132	-	ms	23±5℃	〔Note8-4〕
	Turn off	t_{off}	-	228	-	ms	23±5℃	
Viewing angle (Cr≥2)	Up	θ1 (Φ=90°)	-	39	-	deg	23±5℃	〔Note8-5〕
	Down	θ2 (Φ=270°)	-	27	-	deg	23±5℃	
	Left	θ3 (Φ=180°)	-	35	-	deg	23±5℃	
	Right	θ4 (Φ=0°)	-	26	-	deg	23±5℃	

〔Note 8-1〕The maximum and minimum ratings don't mean the LCD works well in the whole range of V_{LCD}. V_{LCD} must be adjusted to optimize the viewing angle and contrast. Refer to definition of drive voltage, refer to 8.2.

〔Note 8-2〕The frequency shouldn't be too low to avoid flicker. Refer to definition of drive voltage, refer to 8.2.

〔Note 8-3〕Data for the module. Refer to 8. 5.

〔Note 8-4〕Data for LCD. The selected state is dark and non-selected state is white (or bright) with positive

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type, reversely the selected state is white (or bright) and non-selected state is dark with negative type. Refer to 8.6 definition of response time.

〔Note 8-5〕Data for the module. Generally the viewing direction is 6:00 or12:00, sometimes 3:00 or 9:00 and so on. Viewing angle range isn't the range of defects inspection. Refer to 8.4.

8.2 Definition of drive voltage

(1) Definition of drive voltage and waveform

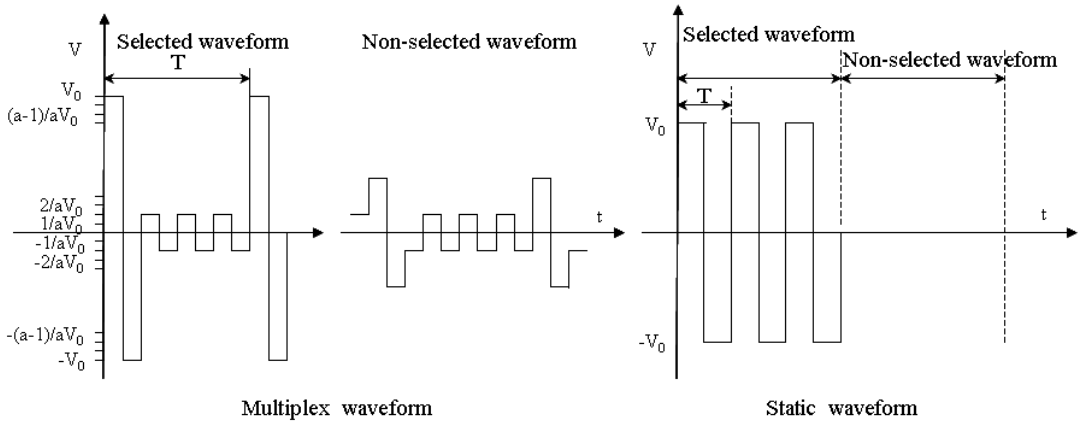

Fig.1 Definition of drive voltage and waveform

Operating voltage：V_o	Frame frequency: f=1/T
Duty: 1/N	Bias: 1/a

(2) Operating voltage: V_{LCD}

TIANMA can evaluate whether the LCD can be redesigned to obtain customer preferable performance if customer's LCD drive voltage isn't adjustable.

8.3 Optical characteristics measurement equipment and method

The setup and test method are showed in Fig.2. Test methods are different according to different illumination mode.

Transmissive mode: light resource is placed at the back of LCD.

Reflective mode and transflective mode: light resource is placed at the front side of LCD.

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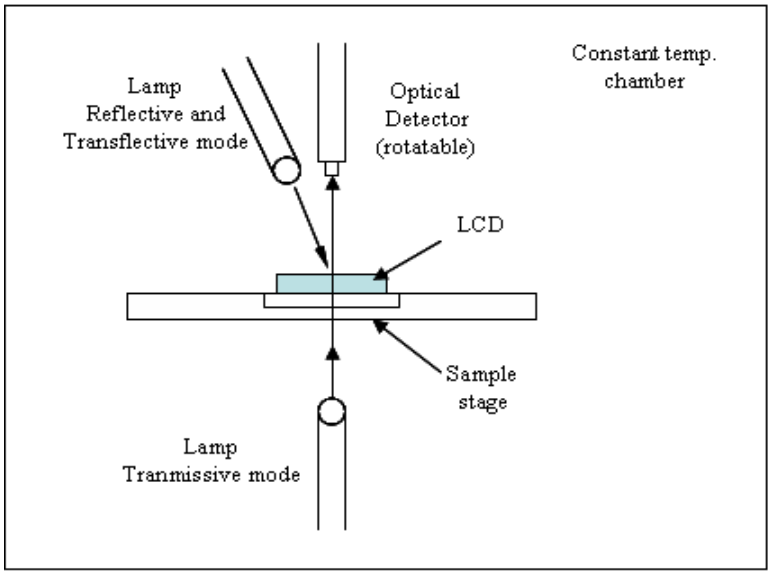

Fig.2 Optical characteristics measurement equipment

The chamber temperature, light resource and driving signal should be stable before testing. If test the characteristics under high or low temperature, the test system should be stable for more than 10 minutes before testing.

8.4 Definition of viewing direction

Refer to the graph below marked by θ and Φ

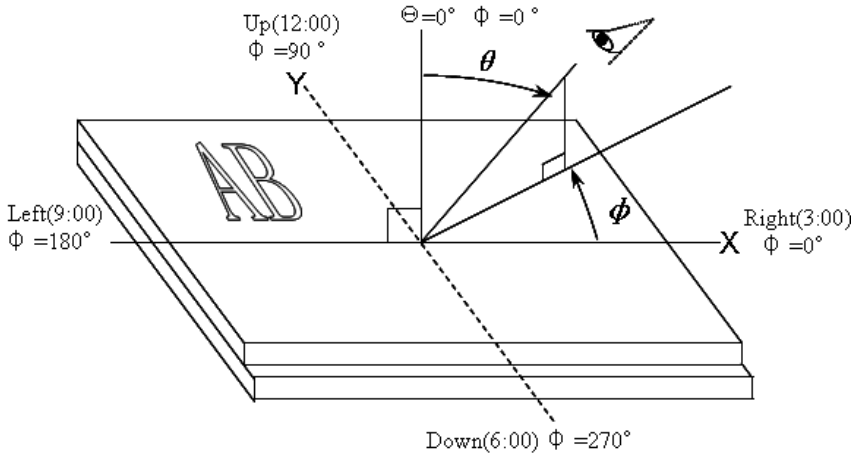

Fig.3 Definition of viewing direction

8.5 Definition of contrast ratio

Contrast ratio can be calculated by the formula (8-1) below for positive type. If the LCD is negative type, Cr (θ, Φ) is equal to luminance (θ, Φ, non-selected state) divided by luminance (θ, Φ, selected state). Fig.4 shows the relationship between selected state, non-selected state and bright state, dark state.

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$$Cr(\theta,\phi) = \frac{L_2}{L_1} = \frac{Luminance(\theta,\phi)\ (Bright\ state)}{Luminance(\theta,\phi)\ (Dark\ state)} \quad (8\text{-}1)$$

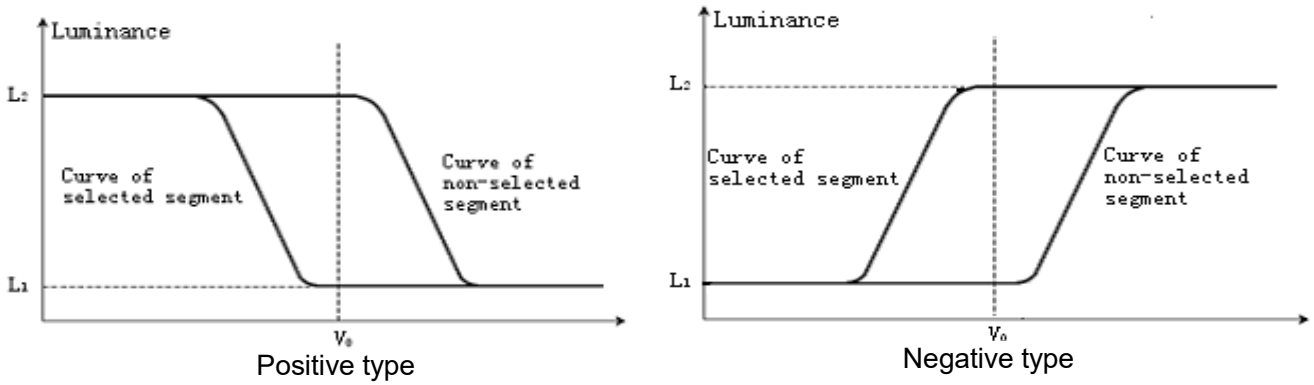

Fig.4 Electro-optical characteristic (EOC) graph

8.6 Definition of response time

Turn on time (rise time): $t_{on} = t_d + t_r$ (from non-selected state to selected state)

Turn off time (fall time): $t_{off} = t_D + t_R$ (from selected state to non-selected state)

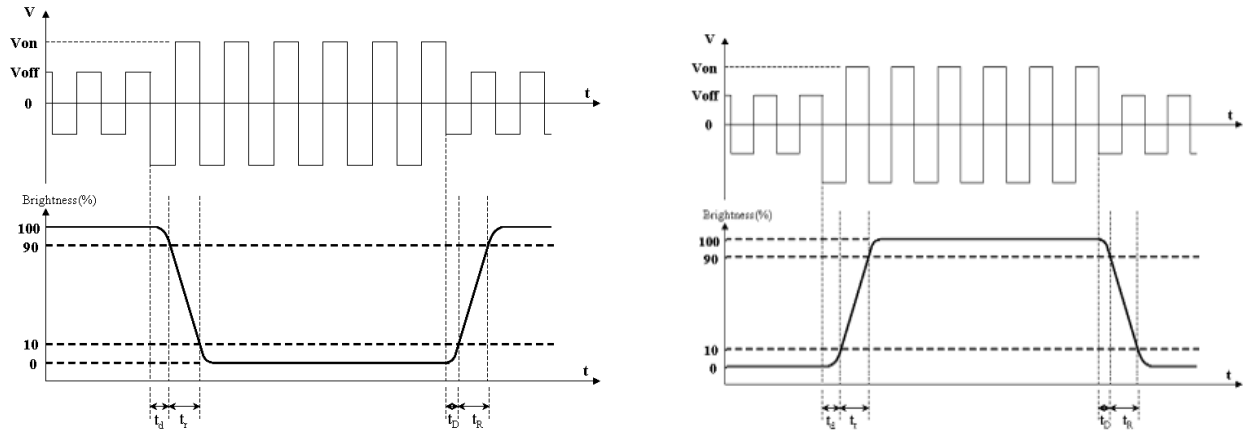

Fig.5 Definition of response time

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9 Reliability

9.1 Environmental / Reliability Test

<table>
<tr><th>No</th><th>Test Item</th><th>Test condition</th><th>Sample quantity</th><th>Standard</th></tr>
<tr><td>1</td><td>High Temperature Storage</td><td>85℃±2℃ 500H
Power off</td><td>5pcs</td><td>IEC60068-2-1:2007
GB2423.2-2008</td></tr>
<tr><td>2</td><td>Low Temperature Storage</td><td>-40℃±2℃ 500H
Power off</td><td>5pcs</td><td>IEC60068-2-1:2007
GB2423.1-2008</td></tr>
<tr><td>3</td><td>High Temperature Operation</td><td>70℃±2℃ 500H
Power on</td><td>5pcs</td><td>IEC60068-2-1:2007
GB2423.2-2008</td></tr>
<tr><td>4</td><td>Low Temperature Operation</td><td>-25℃±2℃ 500H
Power on</td><td>5pcs</td><td>IEC60068-2-1:2007
GB2423.1-2008</td></tr>
<tr><td>5</td><td>High Temperature & Humidity Operation</td><td>60℃±2℃ 90%RH 500H
Power on</td><td>5pcs</td><td>IEC60068-2-78 :2001
GB/T2423.3-2016</td></tr>
<tr><td>6</td><td>Temperature Cycle Storage</td><td>-40℃ 30 min~+85℃ 30 min
Change time: 5min, 10 Cycles, Power off</td><td>5pcs</td><td>Start with cold temperature, End with high temperature, IEC60068-2-14:2009, GB2423.22-2012</td></tr>
<tr><td>7</td><td>Vibration Test (package state)</td><td><table><tr><th>ASD</th><th>Time</th><th>Direction</th></tr><tr><td rowspan="3">10Hz 0.0001g2/Hz
40Hz 0.01g2/Hz
100Hz 0.01g2/Hz
200Hz 0.001g2/Hz</td><td>30Mins</td><td>Z</td></tr><tr><td>10Mins</td><td>X</td></tr><tr><td>10Mins</td><td>Y</td></tr><tr><td colspan="3">Notes:
1. ASD:Acceleration Spectral Density
2. Applicable to land transportation and air transportation</td></tr></table></td><td>1 box</td><td>GB/T 2423.56-2018</td></tr>
<tr><td>8</td><td>Drop Test (package state)</td><td>800mm, concrete floor,1 corner, 3 edges, 6 sides each time</td><td>1 box</td><td>GB/T 4857.5-1992</td></tr>
</table>

Notes:

1. Each test item applies for a test sample only once, The test sample can not be used again in any other test item.
2. The test sample is inspected after 2 hours or more storing at room temperature（around 23±5℃）,and room humidity（around 45±20%RH） after each test item is finished.
3. The inspection criteria refer to 9.2.

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9.2 Inspection criteria

Remark NO.	Content
1	Functional test is OK. Missing Segment, shorts, unclear segment, non-display, display abnormally, liquid crystal leak are unallowable.
2	After testing, cosmetic defects should not happen, no low temperature bubbles, seal loose and fall, frame rainbow, ACF bubble growing are unallowable in the appearance test.
3	Total current consumption should not be over twice of initial value.
4	After tests being executed, for EBN mode, Contrast ratio must meet the specification or be more than 50% of the initial value; the other mode larger than 70%.
5	No glass crack, chipped glass, end seal loose frame crack and so on.
6	No structure loose and fall.
7	For Drop Test, 1. After testing, cosmetic and electrical defects should not happen. 2. The product should remain at initial place 3. Product uncovered or package broken is not permitted.

9.3 LCD module service life

Functions, performance, appearance, etc. shall be free from remarkable deterioration within 100,000 hours under ordinary operating and storage conditions room temperature: around 23±5°C, normal humidity: around （45±20）%RH）。

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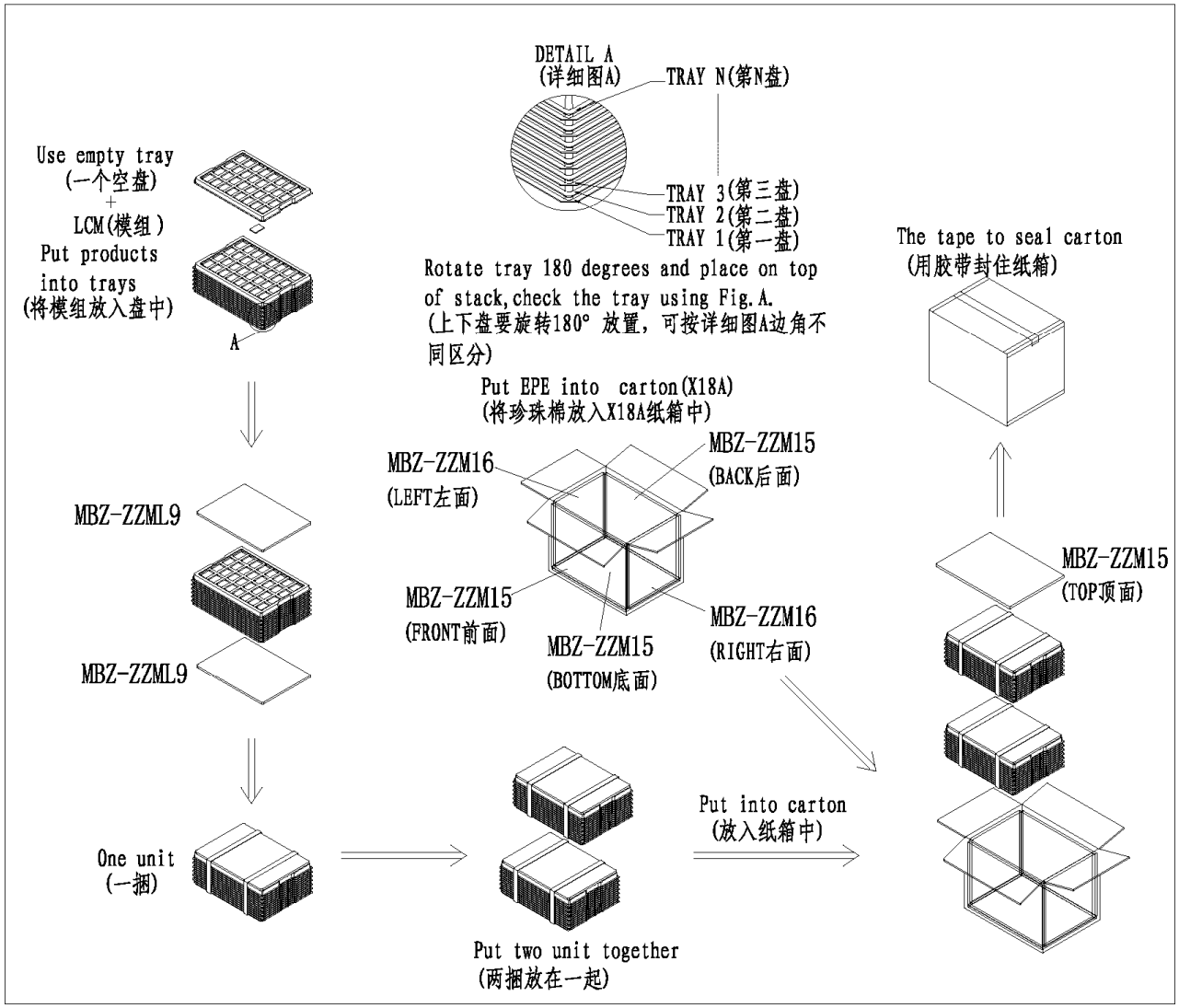
10 Packaging

10.1 Packaging sketch



10.2 Packaging Specification and Quantity

(1) LCM quantity per tray（每盘模组数量）：6 Pcs
(2) Total LCM quantity per group（每组模组总数量）：36Pcs（6 Tray盘+1 Cover tray盖盘）
(3) Total LCM quantity per Carton（每箱模组总数量）：quantity per group（每组模组总数量）36 Pcs × group quantity per Carton（每箱组数量）2 = 72 Pcs

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11 Quality level

11.1 Classification of defects

Major defects (MA): A major defect refers to a defect that may substantially degrade usability for product applications, including all functional defects (such as no display, abnormal display, open or missing segment, short circuit, missing component), outline dimension beyond the drawing, progressive defects and those affecting reliability.

Minor defects (MI): A minor defect refers to a defect which is not considered to be able to substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation, such as black spot, white spot, bright spot, pinhole, black line, white line, contrast variation, glass defect, polarizer defect, etc.

11.2 Definition of inspection range

For LCD defects, dividing two areas to make a judgment (according Fig.7).

A zone : Inside Viewing Area（VA） B zone : Outside Viewing Area（VA）

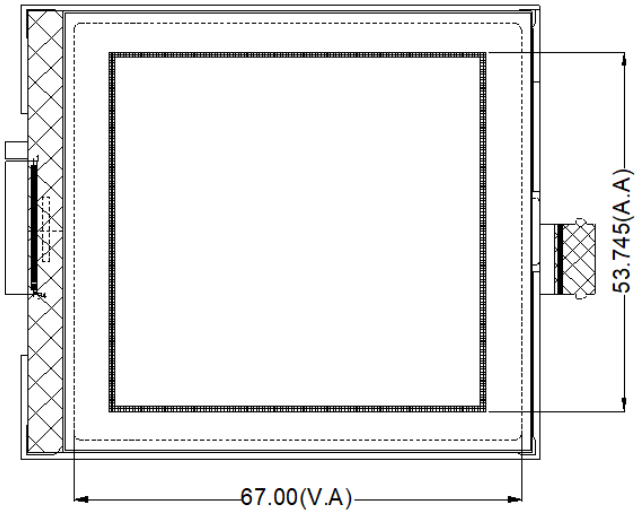

Fig.7

11.3 Inspection items and general notes

General notes	① Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and TIANMA. ② Viewing area should be the area which TIANMA guarantees. ③ Limit sample should be prior to this Inspection standard. ④ Viewing judgment should be under static pattern. ⑤ Inspection conditions Inspection distance: 350 mm (from the sample) Temperature : 23±5 ºC Inspection angle : 45 degrees in 9 o′clock direction (all defects in viewing area should be inspected from this direction) ⑥Attention: If the surface defects of the bottom polarizer don't affect the display effect of the product, and the defects will be neglected.

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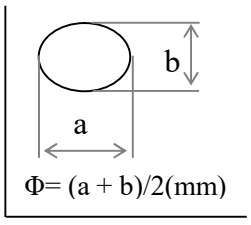
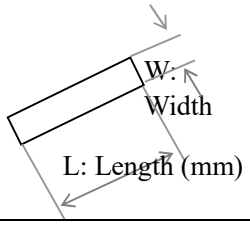
Inspection items	Pinhole, Bright spot, Black spot, White spot, Black line, White Line, Foreign particle, Bubble	The color of a small area is different from the remainder. The phenomenon doesn't change with voltage
	Contrast variation	The color of a small area is different from the remainder. The phenomenon changes with voltage
	Polarizer defect	Scratch, Dirt, Particle, Bubble on polarizer or between polarizer and glass
	Functional defect	No display, Abnormal display, Open or missing segment, Short circuit, False viewing direction
	Glass defect	Glass crack, Shaved corner of glass, Surplus glass
	Segment defect	Pin holes, cracks, transformation of segment
	PCB defect	Components assembly defect

11.4 Outgoing Inspection level

Outgoing Inspection standard	Inspection conditions	Inspection				
		Min.	Max.	Unit	IL	AQL
Major Defects	See 11.3 general notes	See 11.5			II	0.4
Minor Defects	See 11.3 general notes	See 11.5			**II**	1.5
Note：Sampling standard conforms to GB2828						

11.5 Inspection Items and Criteria

Inspection items			Judgment standard			
			Category		Acceptable number	
					A zone	B zone
1	Black spot, White spot, Bright Spot, Pinhole, Foreign Particle, Particle in or on glass, Scratch on glass		A	Φ≦0.10	Neglected	Neglected
			B	0.10<Φ≦0.20	2	
			C	0.20<Φ	0	
2	Black line, White line, Particle Between Polarizer and glass, Scratch on glass		A	W≦0.02	Neglected	Neglected
			B	0.02<W≦0.05 L≦3.0	2	
			C	W＞0.05 or L＞3.0	0	
3	Bubble inside cell		any size		none	none

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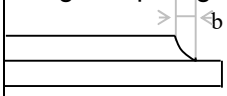
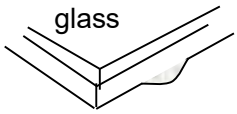
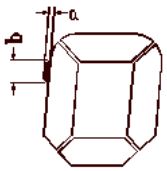
<table>
<tr><td rowspan="4">4</td><td rowspan="4">Polarizer defect</td><td>Scratch ,damage on polarizer, Particle on polarizer or between polarizer and glass.</td><td colspan="4">Refer to item 1 and item 2.</td></tr>
<tr><td rowspan="3">Bubble, dent and convex</td><td>A</td><td>Φ≦0.15</td><td>Neglected</td><td rowspan="3">Neglected</td></tr>
<tr><td>B</td><td>0.15<Φ≦0.3</td><td>2</td></tr>
<tr><td>C</td><td>0.3<Φ</td><td>0</td></tr>
<tr><td>5</td><td colspan="2">Film warp</td><td colspan="4">Does not count inside the border</td></tr>
<tr><td>6</td><td colspan="2">Imprints, water marks, glue drops, dirty films</td><td colspan="4">Do not enter the window without judgment</td></tr>
<tr><td colspan="7">Note: The distance between the above two defects should be more than 5 mm.</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">Surplus glass</td><td>Stage surplus glass  </td><td colspan="4">b≦0.3mm</td></tr>
<tr><td>Surrounding surplus glass  </td><td colspan="4">Should not influence outline dimension and assembling.</td></tr>
<tr><td>8</td><td colspan="2">Open segment or open common</td><td colspan="4">Not permitted</td></tr>
<tr><td>9</td><td colspan="2">Short circuit</td><td colspan="4">Not permitted</td></tr>
<tr><td>10</td><td colspan="2">False viewing direction</td><td colspan="4">Not permitted</td></tr>
<tr><td>11</td><td colspan="2">Contrast ratio uneven</td><td colspan="4">According to the limit specimen</td></tr>
<tr><td>12</td><td colspan="2">Crosstalk</td><td colspan="4">According to the limit specimen</td></tr>
<tr><td>13</td><td colspan="2">Black /White spot(display)</td><td colspan="4">Refer to item 1</td></tr>
<tr><td>14</td><td colspan="2">Black /White line(display)</td><td colspan="4">Refer to item 2</td></tr>
<tr><td>15</td><td colspan="2">Uneven display</td><td colspan="4">According to the limit specimen if necessary</td></tr>
<tr><td>16</td><td colspan="2">Display depth/shallow</td><td colspan="4">According to the limit specimen if necessary</td></tr>
<tr><td rowspan="3">17</td><td rowspan="3">Transformation of segment</td><td rowspan="3">  </td><td colspan="2">not counted</td><td colspan="2">Max.1 defect allowed each segment</td><td rowspan="3">Max.2 defects allowed</td></tr>
<tr><td colspan="2">x<0.1mm</td><td colspan="2">0.1mm≤x≤0.2mm</td></tr>
<tr><td colspan="4">x= (a + b)/2</td></tr>
</table>

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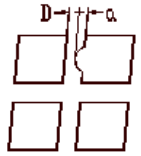
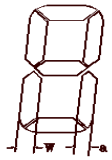
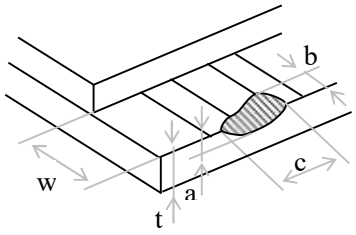
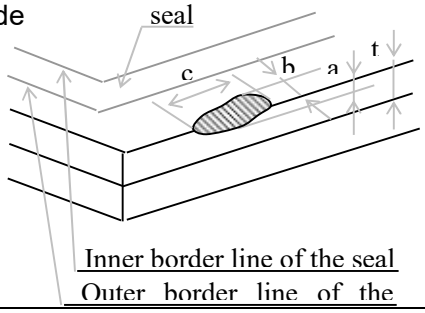
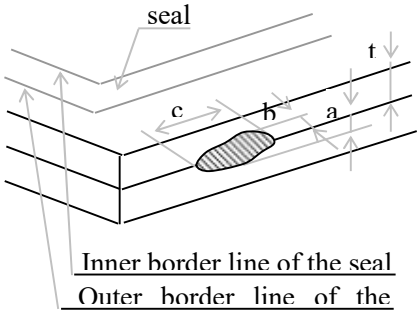
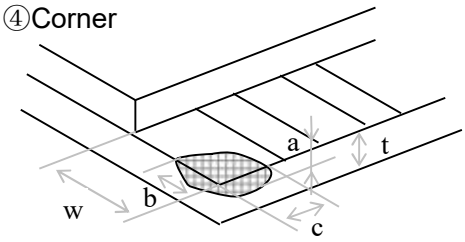
			not counted	Max.1 defect allowed each segment	
			a<0.1mm	0.1mm≤a≤0.2mm D>0	
			0.8W≤a≤1.2W a=measured value of width W=nominal value of width		Max.2 defects allowed

Inspection items			Judgment standard		
			Category(application: B zone)		Acceptable number
18	Glass defect crack	①The front of lead terminals 	A	a≤ t, b≤1/5W, c≤3mm	Max.3 defects allowed
			B	Crack at two sides of lead terminals should not cover patterns and alignment mark	
		②Surrounding crack—non-contact side 	b < Inner borderline of the seal		
		③ Surrounding crack— contact side 	b < Outer borderline of the seal ,		
		④Corner 	A	a ≦ t, b ≦ 3.0, c ≦ 3.0	
			B	Glass crack should not cover patterns u and alignment mark and patterns.	

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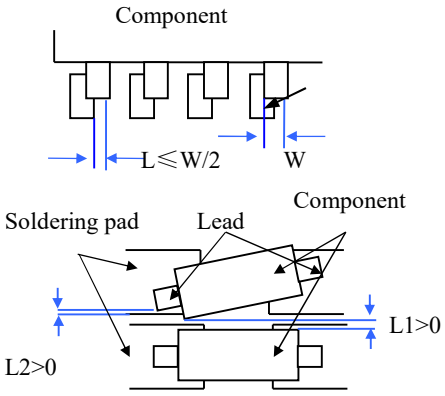
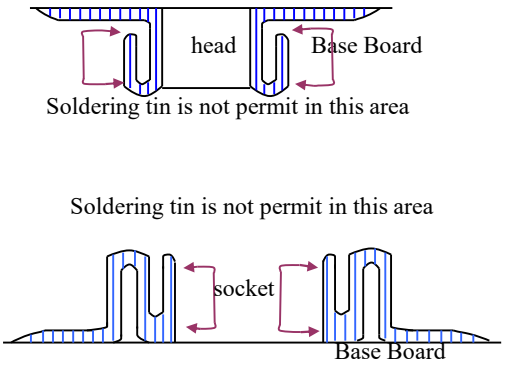
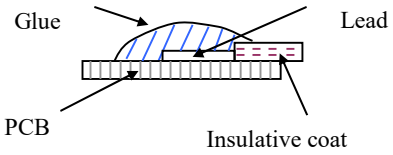
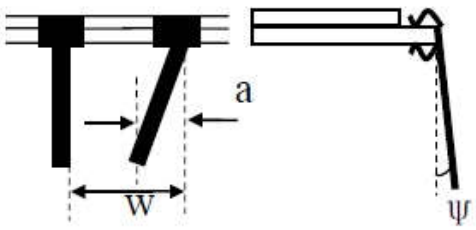
Inspection items			Judgment standard Category(application: B zone)
19	PCB defect	Component soldering: No cold soldering、short、open circuit、burr、tin ball The flat encapsulation component position deviation must be less than 1/3 width of the pin (Pic.1)； the sheet component deviation: Pin deviates from the pad and contact with the near components is not permitted（Pic.2）	
		lead defect: The lead lack must be less than 1/3 of its width; The lead burr must be less than 1/3 of the seam; Impurities connect with the near leads is not permitted	
		Connector soldering: Soldering tin is at contact position of the plug and socket is not permitted No foundation is scald Serious cave distortion on plug and socket contact pin is not permitted	
		Glue on root of the speaker receiver and motor lead: The insulated coat of the lead must join into the PCB; the protected glue must envelop to the insulated coat.	
20	Pin position, length, and angle		Refer to the drawing
21	Deformation		See the left picture When a≤w/3 and ψ≤±50 , accepted; Please refer to the drawing for the unmarked parts.

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	Number of PIN inconsistent	Reject extra or insufficient PIN

11.6 Note

11.6.1 When the semi-transmissive polarizer, scratches, gored, irregularities point, the sewage can not see the measuring determining eligibility

11.6.2 Protective film bubbles are not controlled

12 Precautions for Use of LCD Modules

12.1 Handling Precautions

12.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

12.1.2 Liquid in LCD is hazardous substance, if the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, thoroughly and promptly wash it off using soap and water.

12.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

12.1.4 Don't touch, push or rub the exposed polarizer covering the display surface of the LCD module with anything harder than an HB pencil lead, the polarizer is soft and easily scratched, handle it carefully.

12.1.5 Don't put or attach anything on the display area to avoid leaving any marks on.

12.1.6 If the display surface is contaminated or becomes dusty, breathe on the surface and gently wipe it with a soft dry cloth. do not scrub hard to avoid damage the surface. If still not completely clear, moisten cloth with one of the following solvents:

— Isopropyl alcohol
— Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

— Water
— Ketone
— Aromatic solvents

12.1.7 Do not attempt to disassemble the LCD Module.

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

12.1.9 Avoid using the same display pattern long time (continuous ON segment).Software must be prepared so that the pattern will be changed

12.1.10 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

a. Be sure to ground the body and electric appliances when handling the LCD Modules. It is preferable to use conductive mat on table and wear cotton clothes or conductive processed fibre. Synthetic fibre is not recommended.

b. Tools required for assembly, such as soldering irons, must be properly ground.

c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

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d. The LCD Module is coated with a film to protect the display surface. Be careful and slow when peeling off this protective film since static electricity may be generated. It is recommended to use ionic fan or machine when operating. It is recommended to remove the protection foil slowly (> 3 sec.).

e. It is preferable to wear gloves etc., to avoid damaging the LCD. Please do not touch electrodes with bare hands or avoid any other contamination.

12.2 Storage precautions

12.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

12.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 5℃ ～ 40℃

Relatively humidity: ≤80%

12.2.3 The LCD modules should be stored in a clean environment or room, free from acid, alkali and harmful gas.

12.2.4 Store the module in anti-static electricity container and without any physical load.

12.3 Transportation precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

12.4 Soldering

12.4.1 Use the high quality solders, only solder the I/O terminals.

12.4.2 No higher than Ta and time less than 3-4 second during soldering.

For metal PIN, FFC, FPC, Ta=340±20℃;

For backlight, Ta=300±10℃;

For TCP, Ta=330-340℃.

12.4.3 Rewiring: no more than 3 times.

12.4.4 When you remove connector or cable soldered to I/O terminals, please confirm that solder is fully melted. If you remove by force, electrodes at I/O terminals may be damaged (or stripped off). It is recommended to use solder suction machine.

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