浙 江 新 力 光 电 科 技 有 限 公 司

Xinli Optronics Co., Ltd

SPECIFICATION

PRODUCT NO. : TCXD040IBLON-20

VERSION　　　: Ver 1.0

ISSUED DATE : 2021-6-10

This module uses ROHS material

FOR CUSTOMER：_____

□：**APPROVAL FOR SPECIFICATION**

■：**APPROVAL FOR SAMPLE**

DATE	APPROVED　BY

Xinli Optronics ：

Presented by	Reviewed by	Organized by
胡　玥	赵春晓	王俊傑

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Record of Revision

Revision	Description	Date
1.0	Initial Release	2021/6/10

* Description

The specification is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT-LCD panel,driver Ics , a touch panel and a backlight unit.

General InformationItems	Specification	Unit	Note
	Main Panel		
Display area(AA)	88.5888(H) * 49.8312(V)	mm	-
Display colors	16.7M	colors	-
Number of pixels	1920(RGB) *1080	dots	-
Pixel arrangement	Pixels RGB stripe	-	-
Pixel pitch	0.04614	Mm	
Viewing angle	ALL	o'clock	-
Display mode	Transmissive/ Normally black	-	-
Operating temperature	-20～+70	℃	-
Storage temperature	-30～+80	℃	-

MechanicalInformation

| Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	91.5888	-	mm	LCD
	Vertical(V)	-	57.8212	-	mm	LCD
	Depth(D)	-	1.3	-	mm	-
Weight		-	TBD	-	g	-

1.OpticalCharacteristics

The following items are measured understableconditions.

The optical characteristicsshouldbe measured in a dark room or equivalentstate

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Transmittance		Tr	θ=0°		5.46	--	%	1. Panel w/o APCF 2. C-LIGHT 3. Note 7
NTSC			θ=0°	40	45	--	%	1. C-LIGHT 2. Note 7
Contrast Ratio		CR	θ=0°	--	1500	--		Note 4, 7
Viewing Angle	Top		CR≥10	80	--	--	deg.	Note 5, 7 θ=0, 90, 180, 270
	Bottom				--	--		
	Left				--	--		
	Right				--	--		
Response Time Rise + Fall		Tr + Tf	θ=0°	--	30	40	ms	Note 3
Chromaticity	White	Wx	θ=0°	--	0.343	--		1. C-LIGHT 2. Note 7
		Wy	θ=0°	--	0.366	--		
	Red	Rx	θ=0°	--	0.610	--		
		Ry	θ=0°	--	0.349	--		
	Green	Gx	θ=0°	--	0.319	--		
		Gy	θ=0°	--	0.529	--		
	Blue	Bx	θ=0°	--	0.149	--		
		By	θ=0°	--	0.141	--		
Cross-talk Ratio			57~63 Hz	--	--	3	%	Note 8
Flicker			57~63 Hz	--	--	-25	dB	Note 6

Note 1: Measured under Ambient temperature =25℃, and LED lightbar current IL = 20mA in thedark room.

Note 2: To be measured on the center area of panel with a viewing cone of 1° by luminance meter,after15minutesoperation.
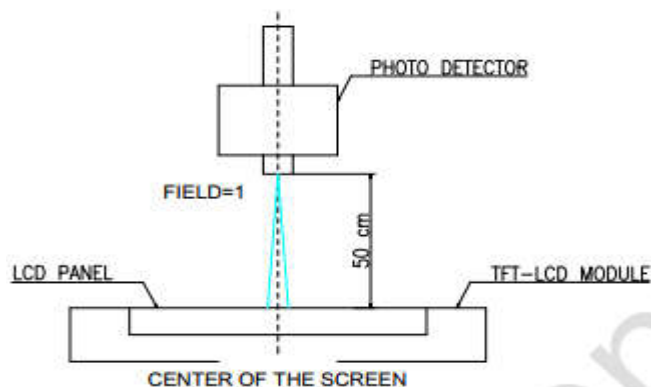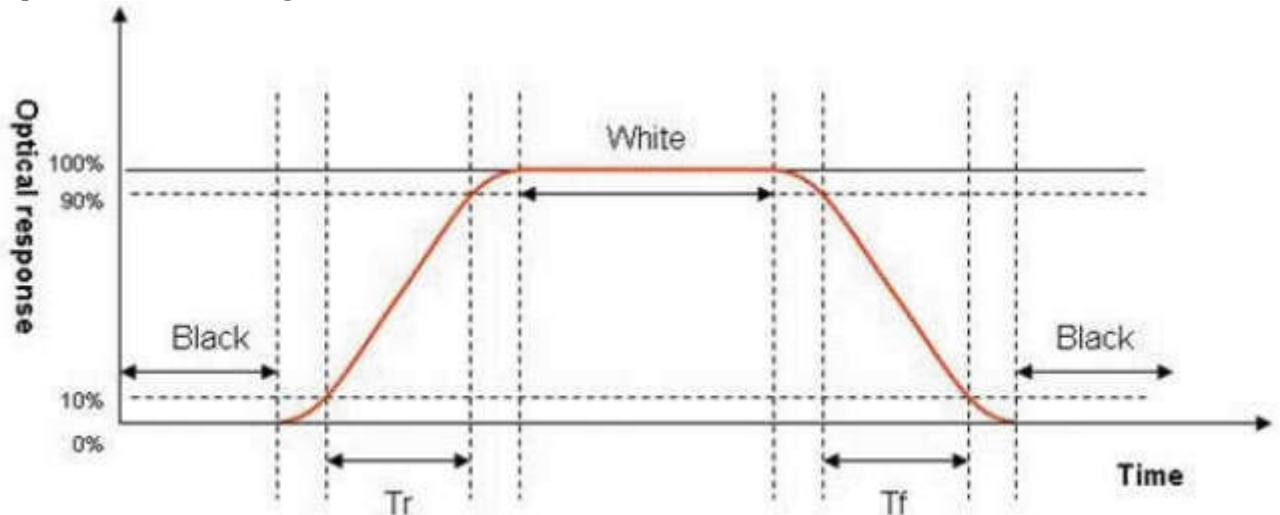
Note 3: Definition of response time
The output signals of photo detector are measured when the input signals are changed from "black" to "white" (rising time) and from "white" to "black" (falling time), respectively.
The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.

Note 4.Definition of contrast ratio:
Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at " White" status}}{\text{Photo detector output when LCD is at "Black" status}}$$

Note 5. Definition of viewing angle, θ, Refer to figure as below.
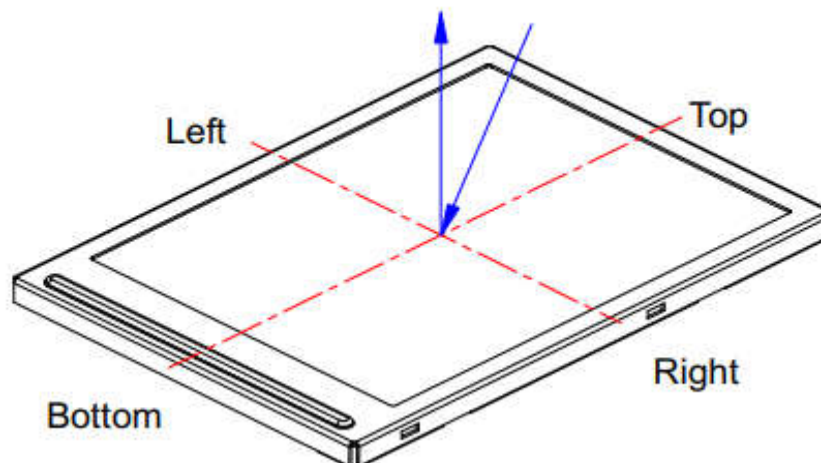
Note 6: It is strongly recommended VCOM setting by piece by piece OTP technology to get best display quality.

Note 7: The spec in table is for reference, different polarizer and APCF would make different performance for it.

Note 8: Cross-talk ratio is measuring by follow pattern and formula
The test pattern of cross-talk is 128L gary around one white block, size is defined as picture.
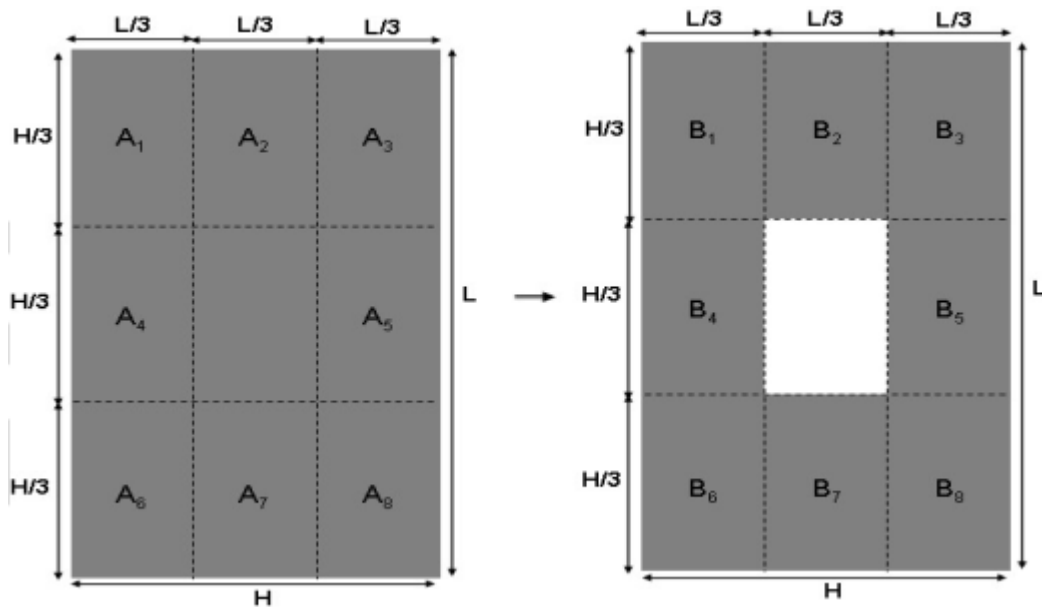
$$\text{Cross talk Ratio} = \underset{i = 1\ to\ 8}{\text{Max}} \frac{|A_i - B_i \text{ (Photo detector output when LCD is at test pattern)}|}{A_i \text{ (Photo detector output when LCD is at 128L gray pattern)}}$$

i

2.ElectricalCharacteristics

ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Absolute Maximum Ratings>

Parameter	Symbol	Condition	Unit
I/O Power Supply Voltage	VDDI	-0.3 ~ 6.0	V
Interface Power supply voltage	VDDRX	-0.3 ~ 6.0	V
Analog Power supply voltage	VDDP	-0.3 ~ 6.0	V
Analog Power supply voltage	VDD_PFM	-0.3 ~ 6.0	V
MTP Power supply voltage	VDD_MTP	-0.3 ~ 12.0	V
LCD Power supply voltage	VGMPHI,VGMPMI,VGMPLI	7.5	V
	VGMNHI,VGMNMI,VGMNLI,VCOM	-7.5	V
	VGH – VGL	32	V
SPI and I2C Interface Input Voltage	VIN	-0.3 ~ VDDI +0.3	V

[1] Liquid Crystal driving voltage

Due to the characteristics of LC Material, this voltage varies with environmental temperature.

1Electrical Specifications

< Table 3. Electrical specifications >

[Ta =25± 2 ℃]

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage	VGH	--	10	--	V	
	VGL	--	-8	--	V	
	VCOM	--	TBD	--	V	

Note : Vcom must be adjusted to optimize display quality:cross-talk, contrast ratio and etc.

Refresh Frame Rate

Item	Symbol	Min.	Typ.	Max.	Unit
Refresh frame rate	Freq	57	60	63	Hz

Note : Refresh frame rate tolerance is +/-5% @25℃ & +/-8% @-30℃~75℃
If we set the operation frame rate to 60Hz, the actual frame rate should be within 57~63Hz

3.Touch Screen Panel Specifications

3.1 Electrical Characteristics
TBD

4.Outlinedimension

Notes：
1. GENERAL TOLERANCE:±0.3mm
2. CONFORMITY WITH ROHS AND HALOGEN FREE;
3. OPERATING TEMPERATURE:Min.-20°C, Max.+70°C;
4. STORAGE TEMPERATURE:Min.-30°C, Max.+80°C;
5. Main Connector Type:FPC05-D060
6. CRITICAL CONTROL POINT ▢ ,IQC CHECK POINT ◯,
7. REFERENCE DIMENSION:( );

RoHS
第三角法
Projection:

版本 Rev: V1
日期 Date:
审核 Check: ——
批准 Approve: ——
设计 Design: Z
2020-12-10
页码 Sheet: 1/2

产品型号 Product model:
客户型号 Cust number: ——

浙江新力光电科技有限公司
Xinli Optronics Co.,Ltd

Pull Tape

91.5888±0.2 (LCD OD)
88.5888 (Active Area)
1920(H)RGB * 1080(V)
1.5 (Border)
1.5 (Border)
49.8312 (Active Area)
54.3312±0.2 (CF OD)
57.8212 (±0.2TFT OD)
60±0.5

4.7071±0.3
45.7004±0.5
36.5004±0.5

变折区
元件区
PI补强面

1.3±0.1
MAX1.2(含BK)
0.2±0.02(FPC+PI)

Detail A
(Scale 3:1)
3.5min
60

图纸编号

5:Input Terminal PinAssignment

Pin No.	Pin Name	Pin Description	Pin No.	Pin Name	Pin Description
1	GND	ground	31	GND	ground
2	GND	ground	32	OD1N	- LVDS differential data 1 (ODD)
3	NC	Not connect	33	OD1P	+ LVDS differential data 1 (ODD)
4	VCC	Power +3.3V	34	GND	ground
5	VCC	Power +3.3V	35	OCLKN	- LVDS differential clock (ODD)
6	NC	Not connect	36	OCLKP	+ LVDS differential clock (ODD)
7	STBYB	Standby mode	37	GND	ground
8	RESET	Reset Pin. Low active	38	OD2N	- LVDS differential data 2 (ODD)
9	VSP	VSP	39	OD2P	+ LVDS differential data 2 (ODD)
10	VSN	VSN	40	GND	ground
11	UD	Gate output shift vertical direction select	41	OD3N	- LVDS differential data 3(ODD)
12	LR	Source output shift horizontal direction select	42	OD3P	+ LVDS differential data 3 (ODD)
13	GND	ground	43	GND	ground
14	CS	Chip select signal for SPI interface	44	ED0N	- LVDS differential data 0 (EVEN)
15	SCL	Clock signal for SPI interface	45	ED0P	+ LVDS differential data 0 (EVEN)
16	SDA	Serial address and data input/output for spi	46	GND	ground
17	NC	Not connect	47	ED1N	- LVDS differential data 1 (EVEN)
18	NC	Not connect	48	ED1P	+ LVDS differential data 1 (EVEN)
19	NC	Not connect	49	GND	ground
20	ROM_RLD	MTP reload per 30 frames(NO CONNECT)	50	ECLKN	- LVDS differential clock (EVEN)
21	VDD(MTP)	Power supply for MTP circuit	51	ECLKP	+ LVDS differential clock (EVEN)
22	NC	Not connect	52	GND	ground
23	I2C_SCL	Not connect	53	ED2N	- LVDS differential data 2 (EVEN)
24	I2C_SDA	ground	54	ED2P	+ LVDS differential data 2 (EVEN)
25	NC	Not connect	55	GND	ground
26	IIC/SPI_SET	Serial interface selection	56	ED3N	- LVDS differential data 3 (EVEN)
27	NC	Not connect	57	ED3P	+ LVDS differential data 3 (EVEN)
28	GND	ground	58	GND	ground
29	OD0N	- LVDS differential data 0 (ODD)	59	GND	ground
30	OD0P	+ LVDS differential data 0 (ODD)	60	GND	ground

6:Operating Principle &Methods

6.1.1 Interface Controller Parameter

The single chip or multi chips cascade application, the parameter setting please refer to the mapping table below:

WRBYCID	CID[1:0]	R/W Bit	Function	Active Chip
H	00	"1"	Read	Master
	01			Slave1
	10			Slave2
	11			Reserved
	00	"0"	Write	Master
	01			Slave1
	10			Slave2
	11			Reserved
L	xx	"1"	Read	Master
	xx	"0"	Write	Master and Slave

Note: When WRBYCID="L" and R/W="1" setting, read only from Master chip

6.1.2 4-Wire Serial Peripheral Interface

The ST5892B supports serial peripheral interface (SPI) to set internal registers. Under write operation, R/W bit equals to "0," and the external controller sends the address and data to the ST5892B by SPI_SDAI. Under read operation, R/W bit equals to "1," and the external controller sends the address to the ST5892B by SPI_SDAI. Then the ST5892B will return the data value by SPI_SDAO. The returned data should be latched at the rising edge of SPI_SCL from the external controller. The ST5892B also supports the burst R/W mode to reduce the programming time. The external controller can just send the R/W and address once, when the ST5892B is in the burst mode. Then the ST5892B will increase address autom3atically to read/write internal registers.
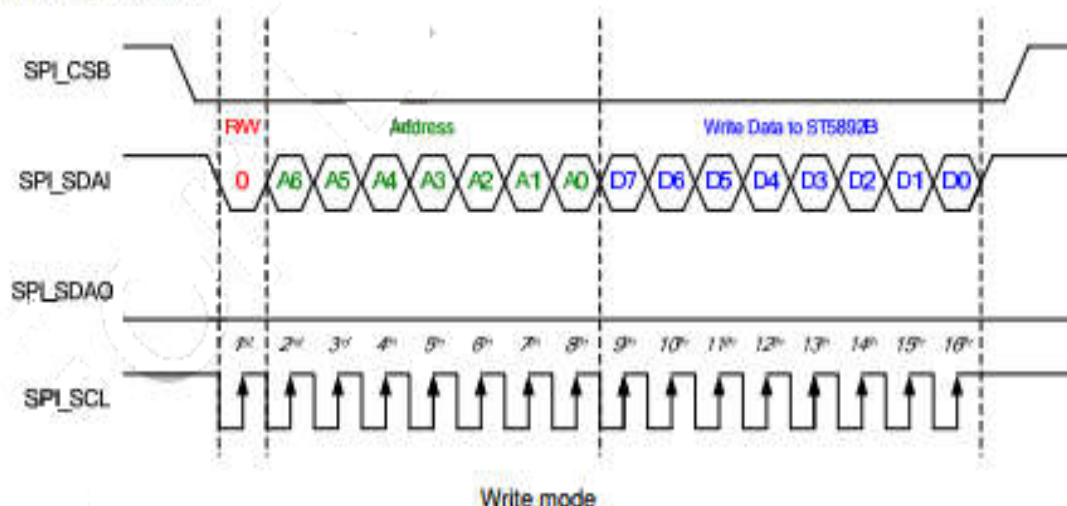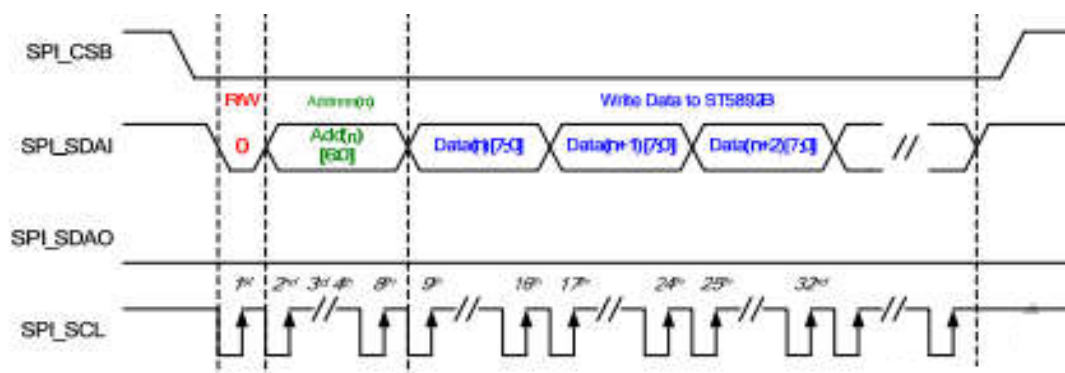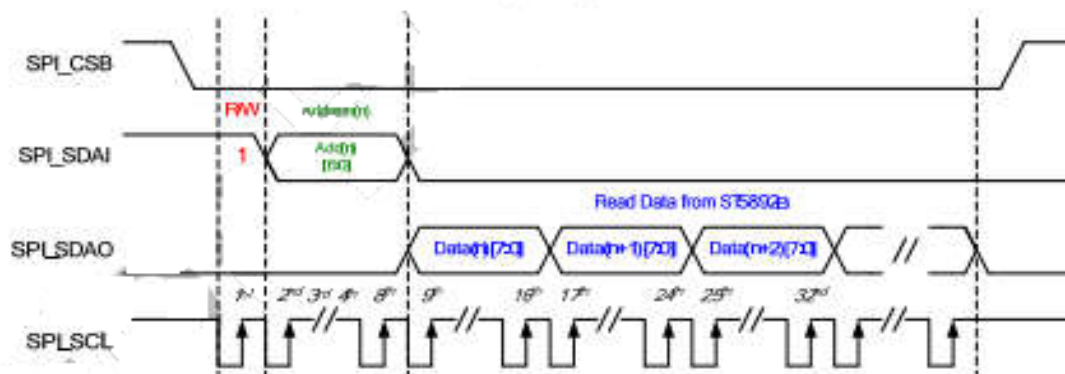
Write mode

Burst Write mode
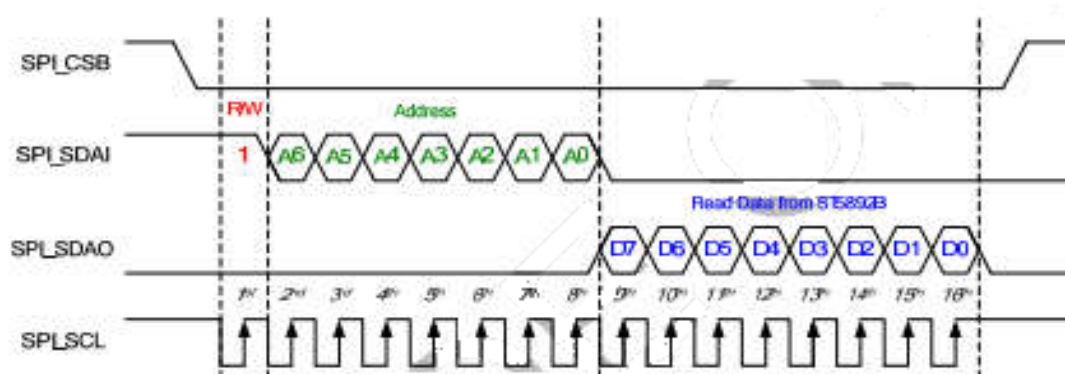
Read mode

Burst Read mode

6.1.3 I2C

The I2C Compatible Interface is for bi-directional, two-line communication between different ICs or modules. The two lines are a Serial Data line (I2C_SDA) and a Serial Clock line (I2C_SCL). Both lines must be connected with a pull-up resistor which drives I2C_SDA and I2C_SCL to high when the bus is not busy. Data transfer can be initiated only when the bus is not busy.

6.1.3.1 Bit Transfer

One data bit is transferred during each clock pulse. The data on the I2C_SDA line must remain stable during the HIGH

period of the clock pulse because changes of I2C_SDA line at this time will be interpreted as START or STOP. Bit transfer is illustrated in Fig. 1.
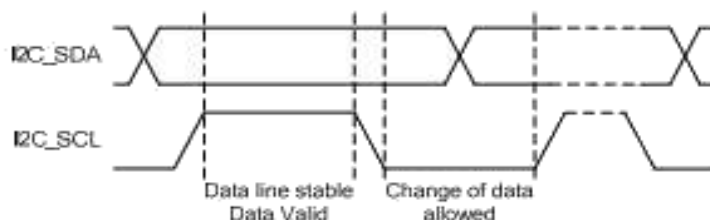
Fig. 1 Bit Transfer

6.1.3.2 START and STOP Conditions

Both I2C_SDA and I2C_SCL lines remain HIGH when the bus is not busy. A HIGH-to-LOW transition of I2C_SDA while I2C_SCL is HIGH, is defined as the START condition (S). A LOW-to-HIGH transition of I2C_SDA while I2C_SCL is HIGH, is defined as the STOP condition (P). The START and STOP conditions are illustrated in Fig. 2.
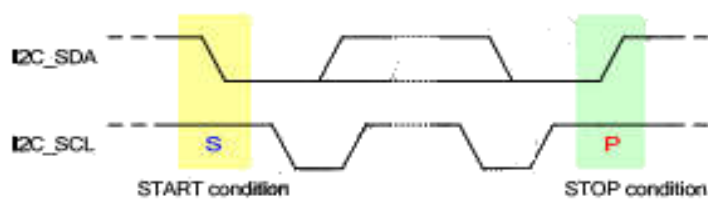
Fig. 2 Definition of START and STOP Condition

6.1.3.3 Acknowledgement

Each byte of eight bits is followed by an acknowledge-bit. The acknowledge-bit is a HIGH signal put on I2C_SDA by the transmitter when the master generates an extra acknowledge-related clock pulse. A slave receiver addressed must generate an acknowledge-bit after the reception of each byte. The device that acknowledges must pull-down the I2C_SDA line during the acknowledge-clock pulse, so that the I2C_SDA line stays LOW during the HIGH period of the acknowledge-related clock pulse (set-up and hold times must be taken into consideration). Acknowledgement on the I2C Interface is illustrated in Fig. 3.
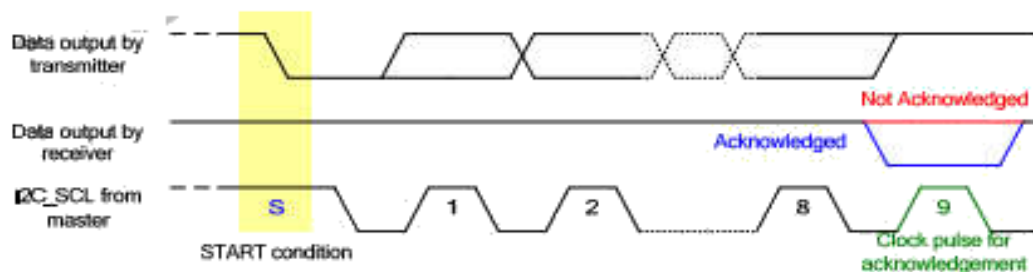

Fig. 3 Acknowledgement of I2C Interface

7:ReliabilityTestResult

Item	Condition	Sample Size	Test Result	Note
Low Temperature Operating Life test	-20℃, 96HR	3ea	pass	-
Thermal Humidity Operating Life test	40℃, 90%RH, 96HR	3ea	pass	-
Temperature CycleON/OFF test	-20℃ ↔ 70℃, ON/OFF, 20CYC	3ea	pass	(1)
High Temperature Storage test	80℃, 96HR	3ea	pass	-
Low Temperature Storage test	-30℃, 96HR	3ea	pass	-
Thermal Shock Resistance	The sample should be allowed to stand the following 5 cycles of operation: TSTL for 30minutes -> normal temperature for 5 minutes -> TSTH for 30 minutes -> normal temperature for 5 minutes, as one cycle, then taking it out and drying it at normal temperature, and allowing it stand for 24 hours	3ea	pass	
Box Drop Test	1 Corner 3 Edges 6 faces, 66cm(MEDIUM BOX)	1box	pass	-

Note (1) ON Time over 10 seconds, OFF Time under 10 seconds

8:Packing
   TBD

9:Cautions and HandlingPrecautions

Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system

firmly. Do not warp or twist the module duringassemblywork.

(2) Protect the module from physical shock or any force. In addition to damage, this may

cause improperoperationordamagetothemoduleandback-lightunit.

(3) Note that polarizer is very fragile and could be easily damaged. Do not press or

scratch the surface.

(4) Do not allow drops of water or chemicals to remain on the display

surface.

Ifyouhavethedropletsforalongtime,staininganddiscolorationmayoccur.

(5) Ifthesurfaceofthepolarizerisdirty,cleanitusingsomeabsorbentcottonorsoftcloth.

(6) Thedesirablecleanersarewater,IPA(IsopropylAlcohol)orHexane.

Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or

Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or

mouth. Incaseofcontactwithhands,legs,orclothes,itmustbewashedawaythoroughlywithsoap.

(8) ProtectthemodulefromStatic;itmaycausedamagetotheCMOSICs.

(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming

inspection and assemblyprocess.

(10) Do not disassemblethemodule.

(11) Protection film for polarizer on the module shall be slowly peeled off just before use

so that theelectrostaticchargecanbeminimized.

(12) PinsofI/Fconnectorshallnotbetoucheddirectlywithbarehands.

(13) Donotconnect,disconnectthemoduleinthe "PowerON" condition.

(14) Power supply should always be turned on/off by the item 6.1 Power On Sequence &6.2 Power

OffSequence

Storage and Transportation.

(1) Donotleavethepanelinhightemperature,andhighhumidityforalongtime.

It is highly recommended to store the module with temperature from 0 to 35 ℃ and

relative humidity of less than 70%

(2) DonotstoretheTFT-LCDmoduleindirectsunlight.

(3) The module shall be stored in a dark place. When storing the modules for a long time, be

sure to adopt effective measures for protecting the modules from strong ultraviolet radiation,

sunlight, or fluorescentlight.

(4) Itisrecommendedthatthemodulesshouldbestoredunderaconditionwherenocondensationis allowed.
Formation of dewdrops may cause an abnormal operation or a failure of the module. In particular,
the greatest possible care should be taken to prevent any module from being operated where
condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order
not to bestressed

12. BHL&BMDT Customer Quality Service Process

In order to provide better service to Customer, BHL&BMDT shall apply the after-sales product quality service process as below:

1. According to the P/O from Customer, BHL&BMDT should deliver required product to the place appointed by Customer.
2. Customer will do IQC for the incoming procuct.
3. Inspection standard should be provided by BHL&BMDT, and it will be valid after confirmed by Customer.Inspection and Defects determination should be carried out according to the standard agreed by both Parties.
4. In order to guarantee in-time communication of product quality information and effective service, QA staff on Customer side should send Weekly Quality Report to the appointed CS staff in BHL&BMDT.
5. After BHL&BMDT get related information, both sides should arrange time and place to determin the defects found by Customer.
6. BHL&BMDT should cooperate with Customer for special quality requirement.
7. After confirmed by both side, BHL&BMDT should be responsible for the defect products which caused by its quality problem. BHL&BMDT should take back the confirmed defect product and return the good product to the place required by customer.
8. BHL&BMDT agree to provide related training of LCD product technology and usage.
9. Customer should use the LCD product according to the instruction. BHL&BMDT will not be responsible for the defect product caused by violation of Users' Instruction.
10. Both parties should deal with the quality problem with friendly cooperative policy. And both parties should negotiate to deal with the defect products of which the responsibility is not very clear.

11:LCD Module OperationInstruction

13. LCD Module Operation Instruction

BHL&BMDT
Part I. How to use the LCD Module

1. Don't hit the LCD Panel in any way because the LCD is made of glass.
2. Don't clean the surface of LCD with hard things. Please clean LCD with Air-gun or very soft cloth when necessary. The protective film on the POL can be removed just before assembly, otherwise, dust, spit or other foreign matter may attached on the LCD under the protective film. After the protective film is removed, only air-gun can be used to remove any dust or foreign matter. Fingure or cloth MUST NOT be used in such cases.
3. No chemical liquid is allowed to clean the LCD, such as alcohol, acetone and IPA. All of these can damage the LCD. Water on the LCD must be cleaned as soon as possible, for it will cause POL color change or other defect.
4. Please move and assemble LCD very carefully during assembly, and don't push or twist it.
5. Don't damage the FPC of LCD module. It will cause permanent defect.
6. Don't disassemble LCD module. It will cause permanent defect.
7. Don't expose LCD module under sunshine, strong fluorescence or ultraviolet radiation.
8. Please make sure that operators wear static-protective bands effectively and working tables are effectively earthing during operation.
9. Please place LCD module on the tray provided by BHL&BMDT while moving it, in order to avoid mechanical damage. Hold the module's side frames to avoide damage during moving.
10. Don't twist, disassemble, squeeze or hit the PCB. It will damage the circuit or component on PCB and cause functional defect.
11. Please use the connector according to the instruction provided by BHL&BMDT.
12. Please place dual module with the sub-panel upward. Trays should be placed in contrary direction. An empty tray should be placed on the top.
13. Sealing operation on PCB must be very careful to avoid short or cut the original circuit on PCB. Otherwise, it will cause permenant damage to the LCD.
14. Don't add direct DC or high voltage to LCD panel. It will cause functional damage to the LCD or shorten the life of LCD product.
15. LCD may respond slowly or display abnormally in extrem temperature (lower than -20℃ or higher than 50℃). But this doesn't mean LCD functional defect. LCD will display normally in regular temperature. Therefore, don't use LCD product in extrem temperature.
16. Don't push the display area of LCD panel, it will cause abnormal display. This doesn't mean LCD functional defect, neither. LCD will display normally in regular temperature.
17. Electrical test of LCD product is made by using mobile phone provided by Customer. We can use special test equipment to do the test, also.
18. The black band on IC on LCD product is used to protect the IC from light. Please do NOT remove it.
19. Please take great care to use connector. Customer should be responsible for connector defect caused by operation on Customer side.

Part II Storage

1. Physical status of liquid crystal will change in extrem temperature, and it can not be resumed when the temperature returns to be normal. So LCD module should be stored in required temperature.
2. LCD module should be stored in required humidity. Low hymidity may add static, while high humidity may corrode the ITO circuit of LCD product. The suitable storage environment is: temperature: 22±5℃, humidity: 55%±10%.
3. Don't expose LCD module under sunshine, strong fluorescence or ultraviolet radiation for a long time. It should be stored in dark area.
4. LCD should be stored in static-protective polythene bag. Don't expose it in the air for a long time.

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