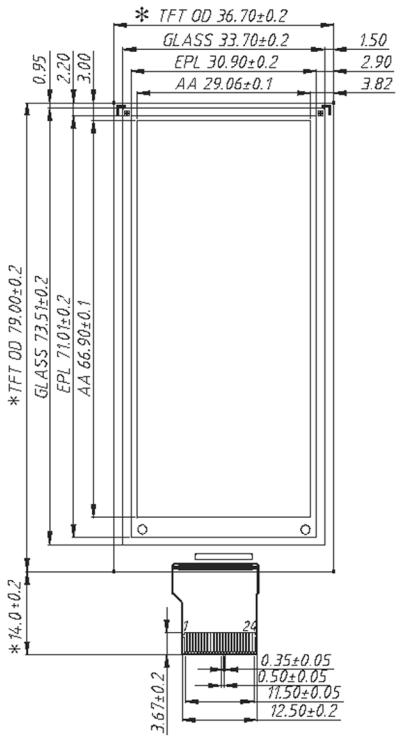
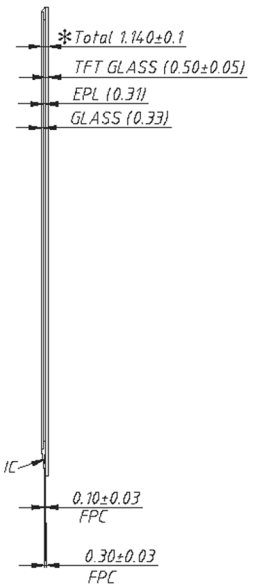
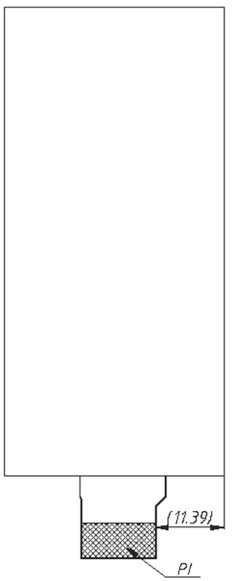
FRONT VIEW



SIDE VIEW



BOTTOM VIEW



NO	Name
1	NC
2	GDR
3	RESE
4	NC
5	VDHR
6	TSCL
7	TSDA
8	BS
9	BUSYN
10	RSTN
11	D/C
12	CSB
13	SCL
14	SDA
15	VDD
16	VDD
17	VSS
18	VDDD
19	VPP
20	VSH
21	VGH
22	VSL
23	VGL
24	VCOM

NOTES:

1.Dispaly mode 2.9" arrey for EPD;

2.Unspecified Tolerance:±0.20;

3.Material conform to the RoHS standard;

4.Mark" * "for control DIM.reference dimension in ( )

5.Product thickness include: GLASS+EPL+TFT.

Compliance: RohS III(2015/863/EU)

Tolerances:			Date	Name
			02/24	dr
Modifications	Date	Name		

YDP EI 290 S

knitter-switch

30 53 35

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PRODUCT SPECIFICATION

OED 2.9″ EPD MODULE
MODEL: YDP EI 290 S Ver: 1.0

ROHS

< ◇> Preliminary Specification

< ◆> Finally Specification

CUSTOMER'S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED BY

Revision History

Revision	Date	Originator	Detail	Remarks
1.0	2020.10.29	ZJW	Initial Release	

Table of Contents

1. General Description

The Product is an Active Matrix Electrophoretic Display(AM EPD), with interface and a reference system design. The 2.9" active area contains 128x296 pixels, and has 2-bit full display capabilities. The module is a TFT-array driving electrophoretic display, with integrated circuits including gate buffer, source buffer, MCU interface, timing control logic, oscillator, DC-DC, SRAM, LUT, VCOM. Module can be used in portable electronic devices, such as Electronic Shelf Label (ESL) System.

2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	2.9"	
LCD type	AM EPD	
Resolution	128 x 296	Pixels
Module Outline	36.7(H) x 79 (V) x 1.14(T) (Note1)	mm
Active Area	29.06(H) x 66.90(V)	mm
Pixel Pitch	227(H) x 226(V)	um
Pixel Arrangement	Rectangle	
Interface	3/4 LINE SPI	
With or Without Touch Panel	Without	
Operating Temperature	**0～50**	ºC
Storage Temperature	**-25～70**	ºC
Weight	6.9	g

Note 1: Exclusive hooks, posts, FFC/FPC tail etc.

3. Absolute Maximum Ratings

V_{SS}=0V, Ta=25ºC

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VDD	-0.5	4.0	V
Storage temperature	T_{STG}	**-25**	**+70**	ºC
Operating temperature	T_{OP}	**0**	**+50**	ºC

Note 1: If Ta below 50ºC, the maximal humidity is 90%RH, if Ta over 50ºC, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10℃, and the back ground will become darker at high temperature operating.

4. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Analogr supply Voltage	VDD	2.4	3.0	3.6	V
Logic Low input voltage	V_{IL}	-	-	0.2*VDD	V
Logic High input voltage	V_{IH}	0.8*VDD	-	-	V
Logic Low output voltage	V_{OL}	0	-	0.1*VDD	V
Logic High output voltage	V_{OH}	0.9*VDD	-	-	V
Typical operating current	I_{DD}	-	4	10	mA

5. Optical Characteristics

5.1. Optical Characteristics

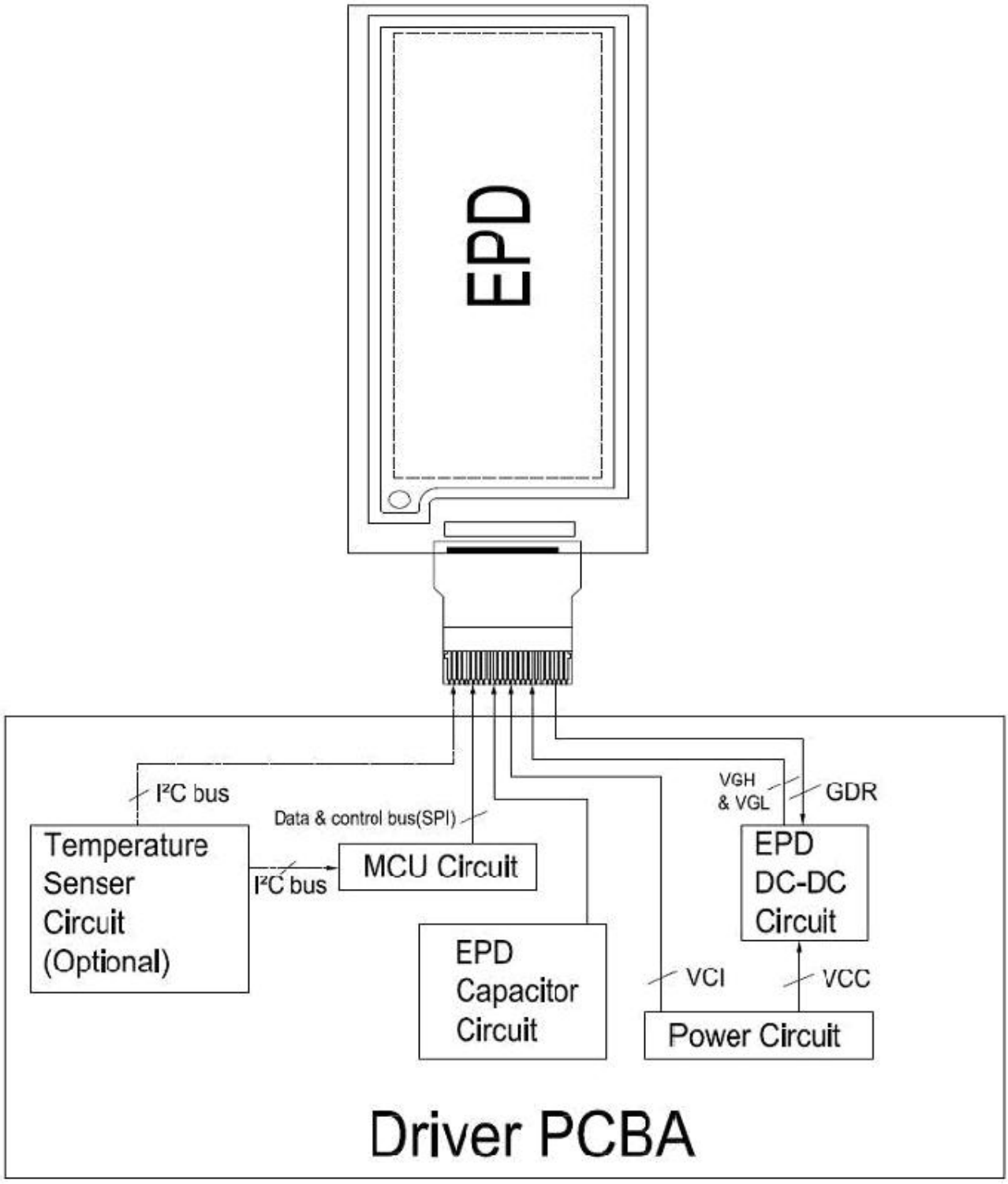
Ta=25ºC, V_{CI}=2.8V

Symbol	Parameter	Conditions	Values			Units	Notes
			Min.	Typ.	Max		
R	White Reflectivity	White	30	35	-	%	5-1
CR	Contrast Ratio		8:1	10:1	-	-	5-2
White△L 24h	Reduce		-	≤4	-	-	-
T_{update}	Image update time	at 25 °C	-	3300	-	ms	-

Notes: 5-1. Luminance meter: Eye-One Pro Spectrophotometer.

5-2. CR=Surface Reflectance with all white pixel/Surface Reflectance with all black pixels.

6. Block Diagram and Power Supply



7. Interface Pins Definition

No.	Symbol	Function	Remark
1	NC	Do not connect with other NC pins	
2	GDR	N-Channel MOSFET Gate Drive Control	
3	RESE	Current Sense Input for the Control Loop	
4	NC	Do not connect with other NC pins	
5	VDHR	Positive Source driving voltage 1	
6	TSCL	I^2C Interface to digital temperature sensor Clock pin	
7	TSDA	I^2C Interface to digital temperature sensor Data pin	
8	BS	Bus Interface selection pin	Note 7-4
9	BUSYN	Busy state output pin	Note 7-3
10	RSTN	Reset signal input. Active Low.	
11	D/C	Data /Command control pin	Note 7-2
12	CSB	Chip select input pin	Note 7-1
13	SCL	Serial Clock pin (SPI)	
14	SDA	Serial Data pin (SPI)	
15	VDD	Power Supply for interface logic pins	
16	VDD	Power Supply for the chip	
17	VSS	Ground	
18	VDDD	Core logic power pin VDDD can be regulated internally from VDD. A capacitor should be connected between VDDD and VSS under all circumstances	
19	VPP	Power Supply for OTP Programming	
20	VSH	Positive Source driving voltage 2	
21	VGH	Positive Gate driving voltage	
22	VSL	Negative Source driving voltage	
23	VGL	Negative Gate driving voltage	
24	VCOM	VCOM driving voltage	

I = Input Pin, O =Output Pin, I/O = Bi-directional Pin (Input/Output), P = Power Pin, C = Capacitor Pin

Note 7-1: This pin is the chip select input connecting to the MCU. The chip is enabled for MCU communication only when CS# is pulled LOW.

Note 7-2: This pin is Data/Command control pin connecting to the MCU in 4-wire SPI mode. When the pin is pulled HIGH, the data at D1 will be interpreted as data. When the pin is pulled LOW, the data at D1 will be interpreted as command.

Note 7-3: This pin is Busy state output pin. When Busy is High, the operation of chip should not be interrupted, command should not be sent, e.g., The chip would put Busy pin High when

- Outputting display waveform
- Programming with OTP
- Communicating with digital temperature sensor

Note 7-4: Bus interface selection pin

BS1 State	MCU Interface
L	4-lines serial peripheral interface(SPI)
H	3- lines serial peripheral interface(SPI) - 9 bits SPI

8. MCU Interface

1) MCU Interface Selection

MCU interface consist of 2 data/command pins and 3 control pins. The pin assignment at different interface mode is summarized in Table 8-4-1. Different MCU mode can be set by hardware selection on BS pins. The display panel only supports 4-wire SPI or 3-wire SPI interface mode.

Pin Name	Data/Connnand Interface		Control Signal		
Bus interface	**SDA**	**SCL**	**CSB**	**D/C**	**RSTN**
4-wire SPI	SDIN	SCLK	CSB	D/C	**RSTN**
3-wire SPI	SDIN	SCLK	CSB	L	**RSTN**

8-4-1: **MCU interface assignment under different bus interface mode**

2) MCU Serial Interface (4-wire SPI)

The serial interface consists of serial clock SCLK, serial data SDIN, D/C, CSB. In 4-wire SPI mode, SCL acts as SCLK, SDA acts as SDIN.

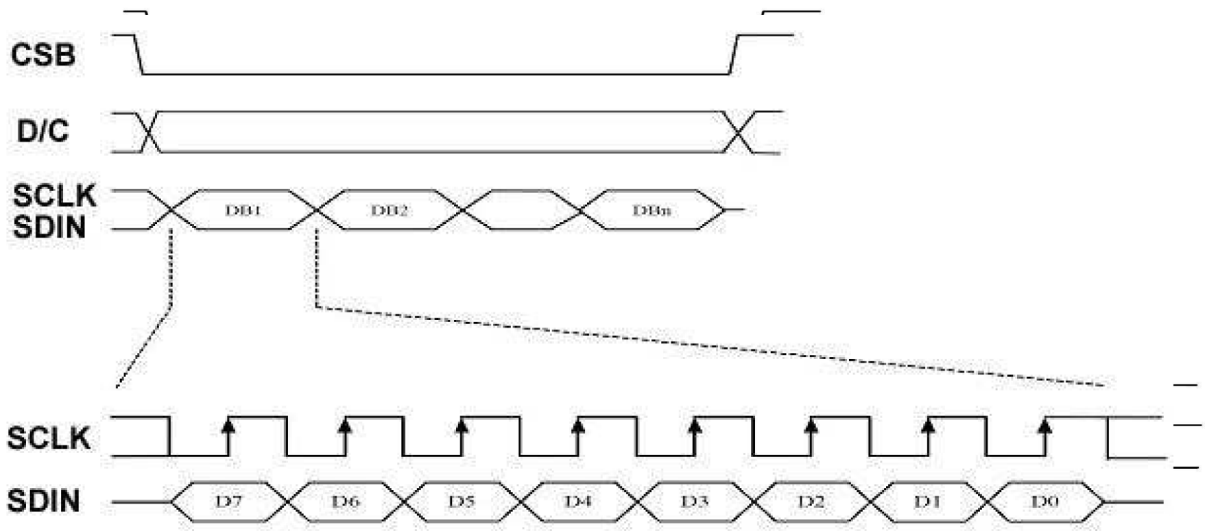
Function	CSB	D/C	SCLK
Write command	L	L	↑
Write data	L	H	↑

Note: ↑ stands for rising edge of signal

Control pins of 4-wire Serial interface

SDIN is shifted into an 8-bit shift register on every rising edge of SCLK in the order of D7, D6, ... D0. D/C is sampled on every eighth clock and the data byte in the shift register is written to the Graphic Display Data RAM (RAM) or command register in the same clock.

Under serial mode, only write operations are allowed.



4-wire SPI mode

3) MCU Serial Interface (3-wire SPI)

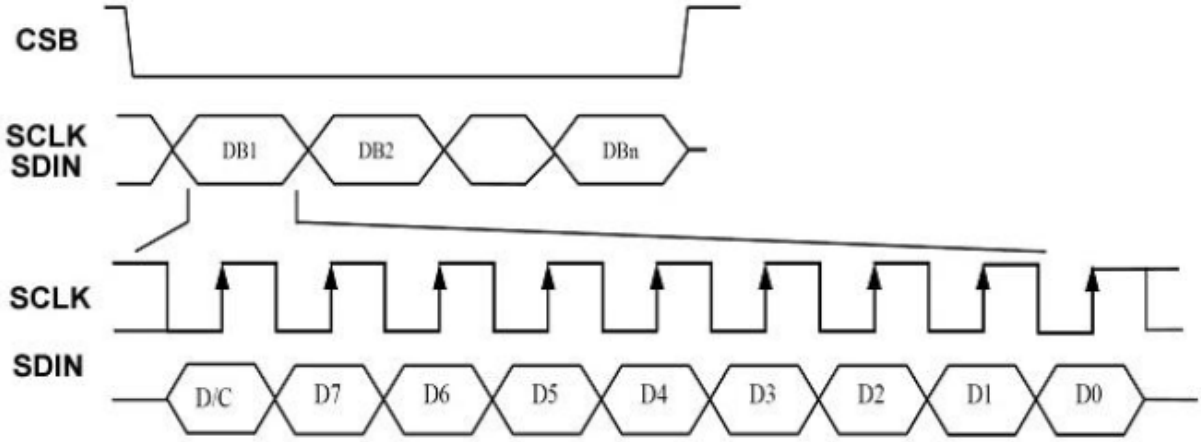
The 3-wire serial interface consists of serial clock SCLK, serial data SDIN and CSB. In 3-wire SPI mode, SCL acts as SCLK, SDA acts as SDIN.

The operation is similar to 4-wire serial interface while D/C pin is not used. There are altogether 9-bits will be shifted into the shift register on every ninth clock in sequence: D/C bit, D7 to D0 bit. The D/C bit (first bit of the sequential data) will determine the following data byte in the shift register is written to the Display Data RAM (D/C bit = 1) or the command register (D/C bit = 0).

Under serial mode, only write operations are allowed.

Function	CSB	D/C	SCLK
Write command	CSB	D/C	SCLK
Write data	CSB	D/C	SCLK

Control pins of 3-wire Serial interface

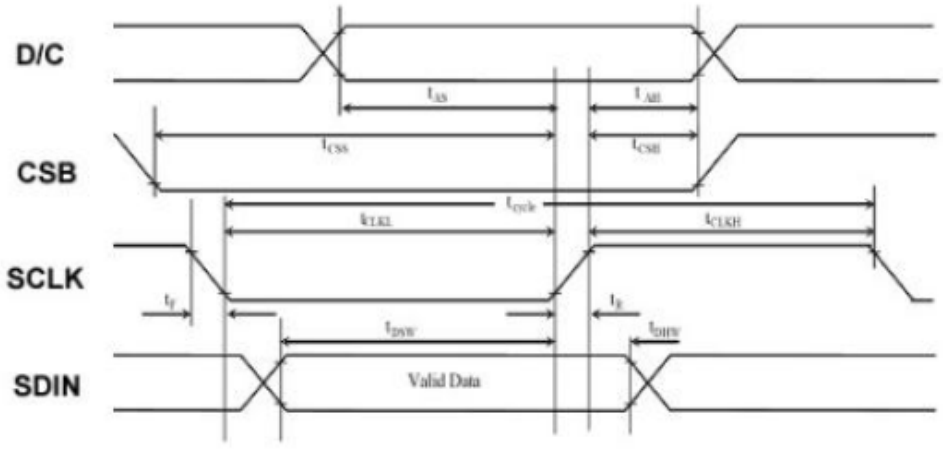


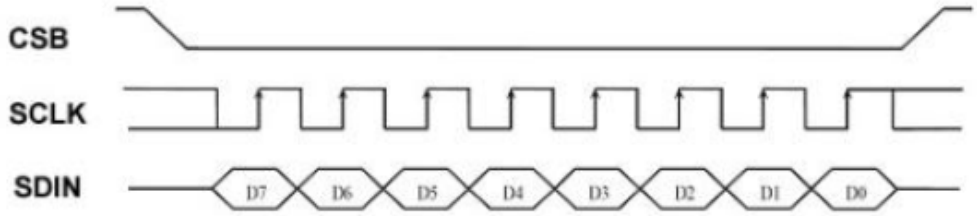
3-wire SPI mode

4) Interface Timing

The following specifications apply for: VSS=0V, VDD =3.0V, T_{OPR} =25°C.

Symbol	Parameter	Test Condition	Applicable pin	Min.	Typ.	Max.	Unit
Fosc	Internal Oscillator frequency	VDD =2.4 to 3.3V	CL	0.95	1	1.05	MHz





(V_{dd} - VSS = 2.4V to 3.3V, T_{OPR} = 25°C, CL=20pF)

Symbol	Parameter	Min.	Typ.	Max.	Unit
t_{cycle}	Clock Cycle Time	250	-	-	ns
t_{AS}	Address Setup Time	150	-	-	ns
t_{AH}	Address Hold Time	150	-	-	ns
t_{CSS}	Chip Select Setup Time	120	-	-	ns
t_{CSH}	Chip Select Hold Time	60	-	-	ns
t_{DSW}	Write Data Setup Time	50	-	-	ns
t_{DHW}	Write Data Hold Time	15	-	-	ns
t_{CLKL}	Clock Low Time	100	-	-	ns
t_{CLKH}	Clock High Time	100	-	-	ns
t_R	Rise Time [20% ~ 80%]	-	-	15	ns
t_F	Fall Time [20% ~80%]	-	-	15	ns

9. Reliability Specification

No	Item	Condition	Quantity	Criteria
1	High Temperature Operating	**50℃, 96Hrs**	2	IEC 60 068-2-2Bp
2	Low Temperature Operating	**0℃, 96Hrs**	2	IEC 60 068-2-2Ab
3	High Humidity Storage	**60℃, 80%RH, 96Hrs**	2	IEC 60 068-2-3CA
4	High Temperature Storage	**70℃, 96Hrs**	2	IEC 60 068-2-2Bp
5	Low Temperature Storage	**-25℃, 96Hrs**	2	IEC 60 068-2-1Ab
6	Thermal Cycling Test Storage	**-25℃, 30min~70℃, 30min, 50 cycles.**	2	IEC 60 068-2-14
7	Packing vibration	Frequency range:10Hz~500Hz Acceleration of gravity:1.04G X, Y, Z 60 min for each direction.	-	Full packed for shipment
8	**Drop Test (Packaged)**	Height:122 cm,1 corner, 3 edges, 6 surfaces.	-	IEC 62179, IEC 62180

Note1. No defection cosmetic and operational function allowable.

Note2. Total current Consumption should be below double of initial value.

10. Precautions and Warranty

10.1. Safety

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

10.1.2. Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

10.2. Handling

10.2.1. Reverse and use within ratings in order to keep performance and prevent damage.

10.2.2. 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.

10.3. Storage

10.3.1. Do not store the LCD module beyond the specified temperature ranges.

10.3.2. Strong light exposure causes degradation of polarizer and color filter.

10.4. Metal Pin (Apply to Products with Metal Pins)

10.4.1. Pins of LCD and Backlight

10.4.1.1. Solder tip can touch and press on the tip of Pin LEAD during the soldering

10.4.1.2. Recommended Soldering Conditions

Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1

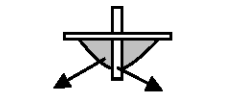
Maximum Solder Temperature: 370℃

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20℃

Typical Soldering Time: ≤3s

10.4.1.3. Solder Wetting



Recommended

Not Recommended

10.4.2. Pins of EL

10.4.2.1. Solder tip can touch and press on the tip of EL leads during soldering.

10.4.2.2. No Solder Paste on the soldering pad on the motherboard is recommended.

10.4.2.3. Recommended Soldering Conditions

Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm

Recommended Solder Temperature: 270～290℃

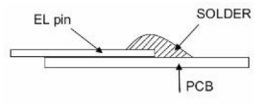
Typical Soldering Time: ≤2s

Minimum solder distance from EL lamp (body):2.0mm

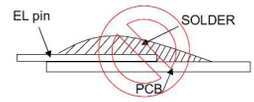
10.4.2.4. No horizontal press on the EL leads during soldering.

10.4.2.5. 180° bend EL leads three times is not allowed.

10.4.2.6. Solder Wetting

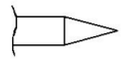


Recommended

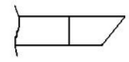


Not Recommended

10.4.2.7. The type of the solder iron:

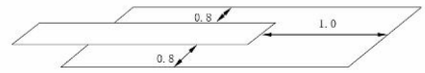


Recommended



Not Recommended

10.4.2.8. Solder Pad



10.5. Operation

10.5.1. Do not drive LCD with DC voltage

10.5.2. Response time will increase below lower temperature

10.5.3. Display may change color with different temperature

10.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear “fractured”.

10.5.5. Do not connect or disconnect the LCM to or from the system when power is on.

10.5.6. Never use the LCM under abnormal condition of high temperature and high humidity.

10.5.7. Module has high frequency circuits. Sufficient suppression to the electromagnetic interface shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

10.5.8. Do not display the fixed pattern for long time（we suggest the time not longer than one hour） because it may develop image sticking due to the TFT structure.

10.6. Static Electricity

10.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.

10.6.2. The normal static prevention measures should be observed for work clothes and benches.

10.6.3. The module should be kept into anti-static bags or other containers resistant to static for storage.

10.7. Limited Warranty

10.7.1. Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.

10.7.2. If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.

10.7.3. After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

11. Packaging

TBD