BOCEN DISPLAY TECHNOLOGY CO., LTD.

SPECIFICATION

Product Model: BF10140-01(1280800)

DESIGNED	CHECKED	Approved
研发部 2020.05.15 Aleck	研发部 2020.05.15 Hones	研发部 2020.05.15 Peter

Approval by Customer:

Customer name:
Customer model:
Ok NG, Problem survey Approved By_____

Revision Record

REV NO.	REV DATE	CONTENTS	Note
V0	2020.03.20	NEW ISSUE（包边结构）	
V1	2020.05.15	修正 CTP可靠性温度	

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1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by BOCEN TECH.

If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution

2. General Information

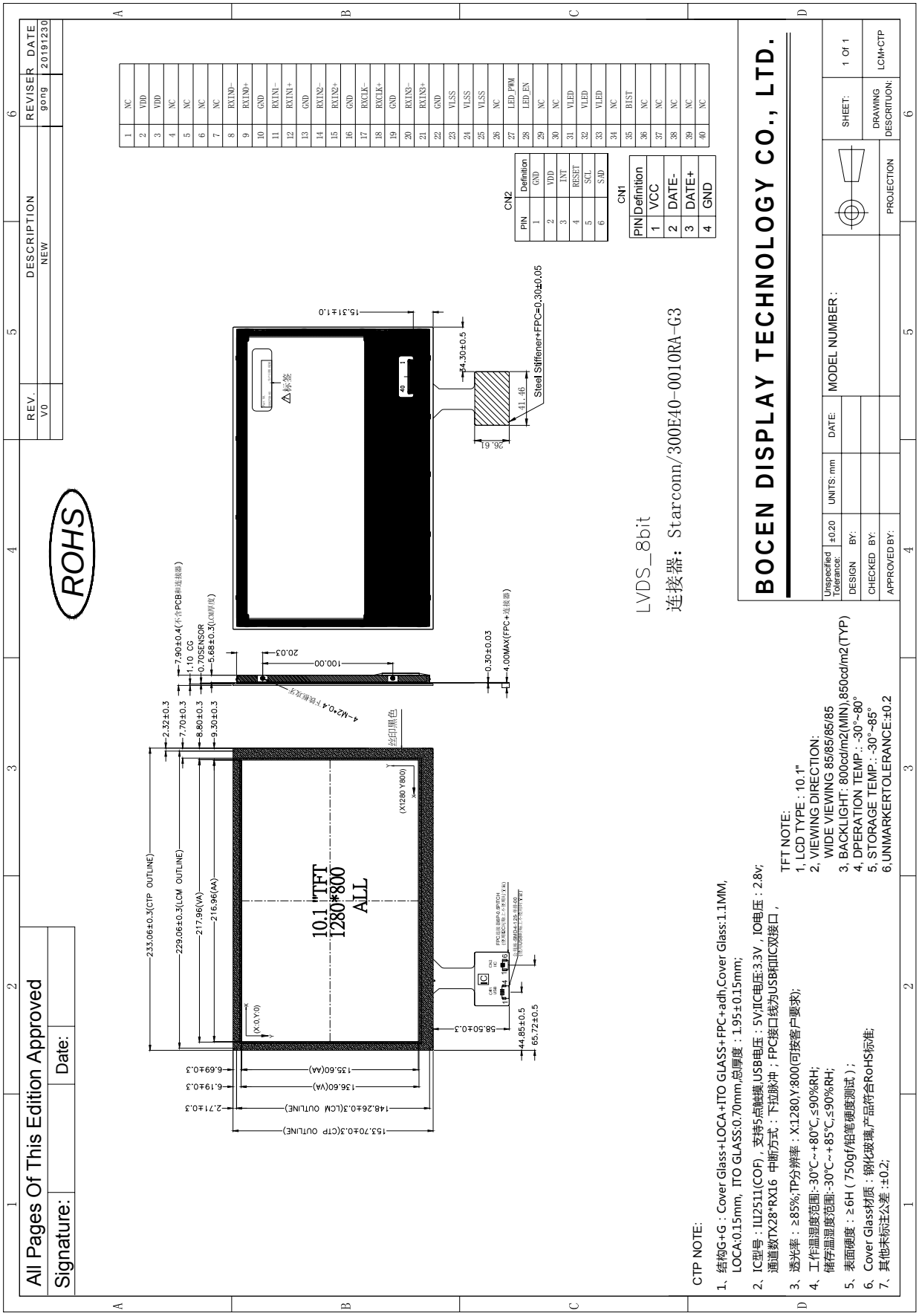
LCM

ITEM	STANDARD VALUES	UNITS
LCD type	10.1”TFT	--
Dot arrangement	1280×3(RGB)×800	dots
Color filter array	RGB vertical stripe	--
Display mode	Normally Black	-
Viewing Direction	85/85/85/85	--
Module size	229.8(W)×149(H)×5.68(T)	mm
Active area	216.96(W)×135.60(H)	mm
Dot pitch	0.1695(W)×0.1695(H)	mm
Interface	LVDS Interface	--
Operating temperature	-30 ~ +80	°C
Storage temperature	-30 ~ +85	°C
Weight	TBD	g

CTP

ITEM	STANDARD VALUES	UNITS
CTP type	Cover Lens+sensor+FPC	--
CTP Driver IC	ILI2511	--
Transmittance	≥85%	--
The cover hardness	6H	--
CTP size	233.06(W)×153.7(H)×1.95(T)	mm
CTP Viewing area	217.96(W)×136.6(H)	mm
CTP Interface	I2C/USB	
channel number	28*16	
Operating temperature	-30 ~ +80	°C
Storage temperature	-30 ~ +85	°C

3. External Dimensions



4. Interface Description

PIN	PIN NAME	DESCRIPTION	Remark
1	NC	No connection	
2	VDD	Power Supply	
3	VDD		
4	NC	No connection	
5	NC		
6	NC		
7	NC	No connection	
8	RXIN0-	-LVDS Differential Data Input	R0~R5,G0
9	RXIN 0+	+LVDS Differential Data Input	
10	GND	Ground	
11	RXIN 1-	-LVDS Differential Data Input	G1~G5,B0, B1
12	RXIN 1+	+LVDS Differential Data Input	
13	GND	Ground	
14	RXIN 2-	-LVDS Differential Data Input	B2~B5,HS, VS,DE
15	RXIN 2+	+LVDS Differential Data Input	
16	GND	Ground	
17	RXCLK-	-LVDS Differential Clock Input	LVDS CLK
18	RXCLK+	+LVDS Differential Clock Input	
19	GND	Ground	
20	RXIN 3-	-LVDS Differential Data Input	R6,R7,G6,G7, B6,B7
21	RXIN 3+	+LVDS Differential Data Input	
22	GND	Ground	
23	VLSS	Ground	
24	VLSS		
25	VLSS		
26	NC	No connection	
27	LED_PWM	CABC controller signal output for backlight	
28	LED_EN	CABC Enable Input	
29	NC	No connection	
30	NC	No connection	
31	VLED	VIN Voltage	
32	VLED		
33	VLED		
34	NC	No connection	
35	BIST	No connection	
36	NC	No connection	
37	NC	No connection	
38	NC	No connection	
39	NC	No connection	
40	NC	No connection	

I2C 接口

1	GND	Power ground
2	VDD	Power supply.
3	INT	CTP interruption signal.
4	RESET	CTP reset pin. Active low to enter reset state.
5	SCL	CTP I2C_clock.
6	SAD	CTP I2C_data.

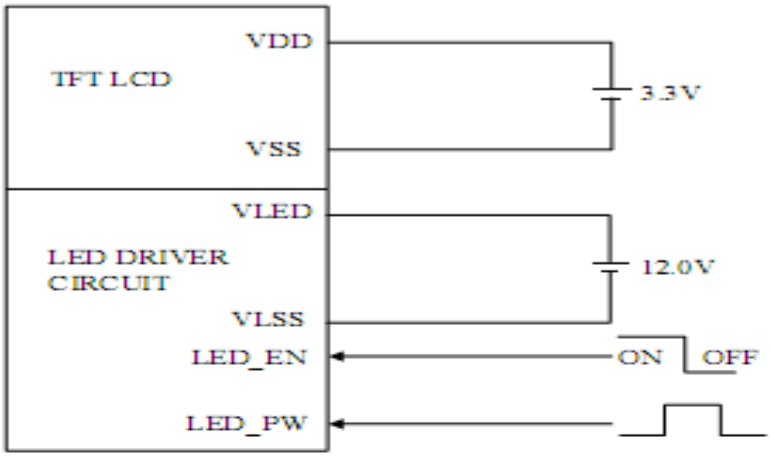
USB 接口

1	VCC	Power supply.
2	DATE-	DATE
3	DATE+	DATE
4	GND	Power ground

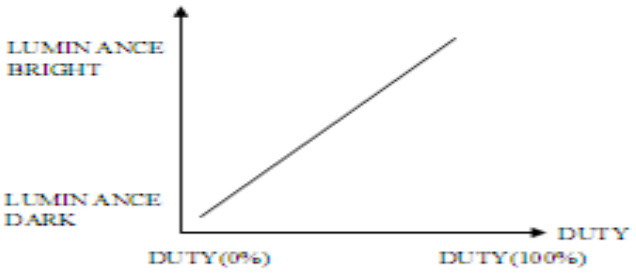
5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remark
Digital Supply Voltage	VDD	-0.3	4.0	V	
VIN Voltage	VLED	-0.3	50	V	
Operating Temperature	TOP	-30	80	°C	
Storage Temperature	TST	-30	85	°C	

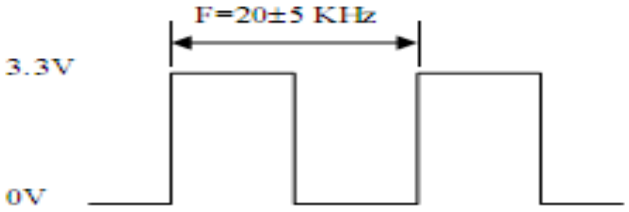
5.1 POWER SUPPLY FOR LCM



NOTE (1) : ADJUST THE PWM SIGNAL IN ORDER TO CONTROL LED BACKLIGHTS BRIGHTNESS. THE HIGHER THE DUTY CYCLE, THE HIGHER THE BRIGHTNESS



NOTE (2) : PWM SIGNAL=0~3.3V，OPERATION FREQUENCY ：20±5KHz

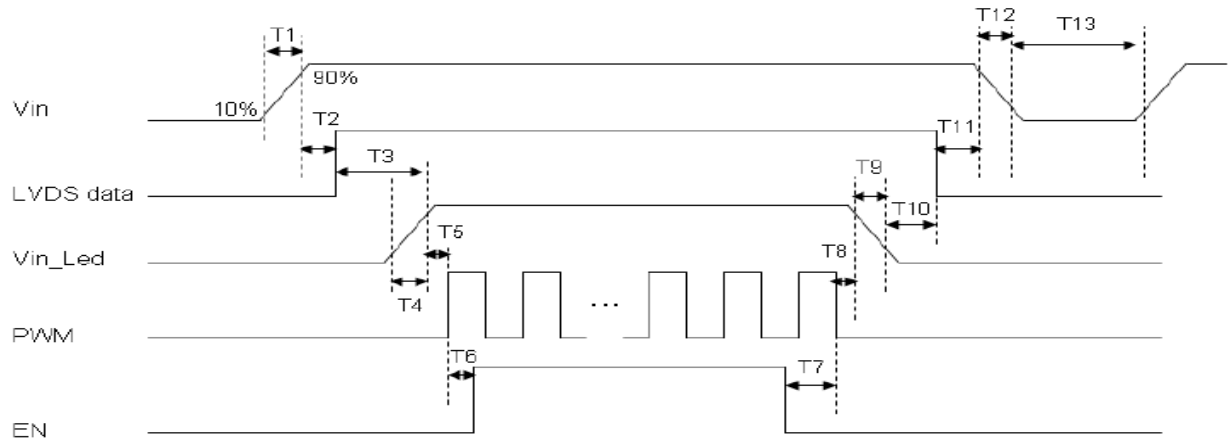


6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Digital Supply Voltage	VDD	2.75	3.3	3.6	V	
VIN Voltage	VLED	4.5	-	40		
Input logic high voltage	V_{IH}	0.7*VDD	-	VDD	V	
Input logic low voltage	V_{IL}	GND	-	0.3*VDD	V	

7. Timing Characteristics

7.1 Power On and Reset Timing



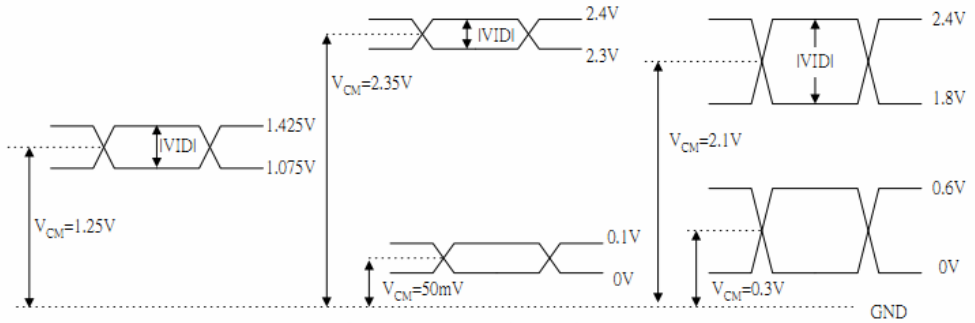
Parameter	Symbol	Unit	Min	Typ.	Max
VIN Rise Time	T1	ms	0.5	--	10
VIN Good to Signal Valid	T2	ms	30	--	90
Signal Valid to Backlight On	T3	ms	200	--	--
Backlight Power On Time	T4	ms	0.5	--	--
Backlight VDD Good to System PWM On	T5	ms	10	--	--
System PWM ON to Backlight Enable ON	T6	ms	10	--	--
Backlight Enable Off to System PWM Off	T7	ms	0	--	--
System PWM Off to B/L Power Disable	T8	ms	10	--	--
Backlight Power Off Time	T9	ms	0.5	10	30
Backlight Off to Signal Disable	T10	ms	200	--	--
Signal Disable to Power Down	T11	ms	0	--	50
VIN Fall Time	T12	ms	0.5	10	30
Power Off	T13	ms	500	--	--

7.2 LVDS Signal Timing Characteristics

7.2.1 DC Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max	Unit
V_{TH}	Differential Input High Threshold	V_{CM} =+1.2V	-	-	100	mV
V_{TL}	Differential Input Low Threshold		-100	-	-	mV
I_{CC}	Average Supply Current		-	TBD	-	mA

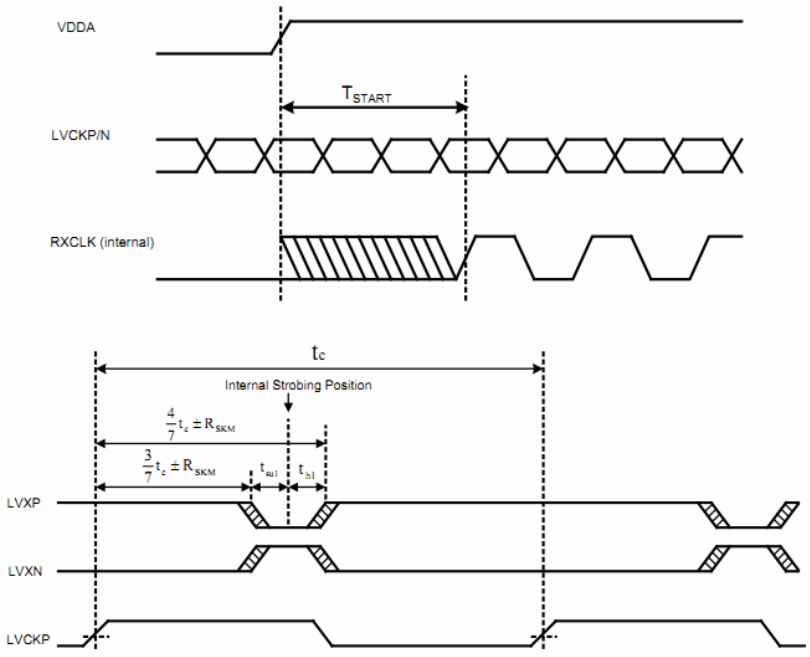
Typical Input Swim Minimum Input Swim Maximum Input Swim



LVDS Receiver Input Signal Operation Range

7.2.2 AC Characteristics

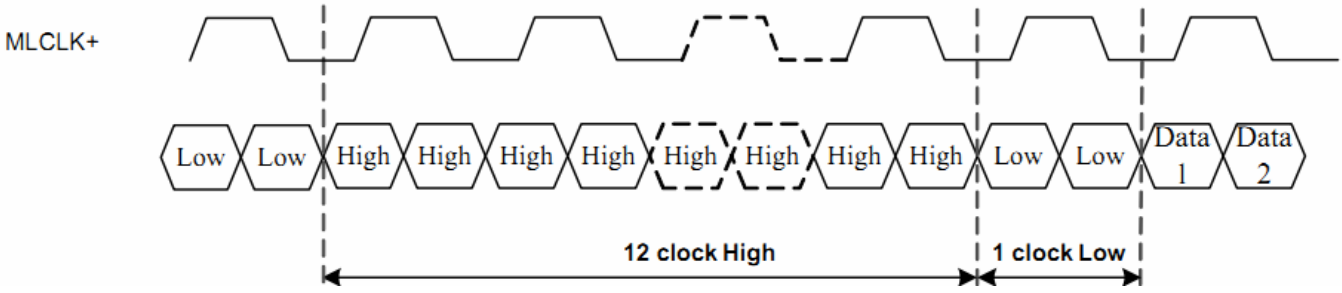
Symbol	Parameter	Conditions	Min.	Typ.	Max	Unit
F_{OP}	Input Operating Frequency range	RX_HF=0	25	-	100	MHz
		RX_HF=1	100	-	170	MHz
R_{SKM}	Receiver Skew Margin	85MHz, |VID|=400mV, V_{CM}=1.2V	450	-	-	pS
		150MHz, |VID|=400mV, V_{CM}=1.2V	267	-	-	pS
T_{STRAT}	Receiver startup time (after a valid LVDS clock is applied)		-	-	10	mS



NOTE: LVCK is advanced or delayed with respect to data until errors are observed at the receiver outputs. The advance or delay is then reduced until there are no data errors observed. The magnitude of the advance or delay is RSKM.

7.2.3 mini-LVDS Output Timing

mini-LVDS Reset Pules Timing

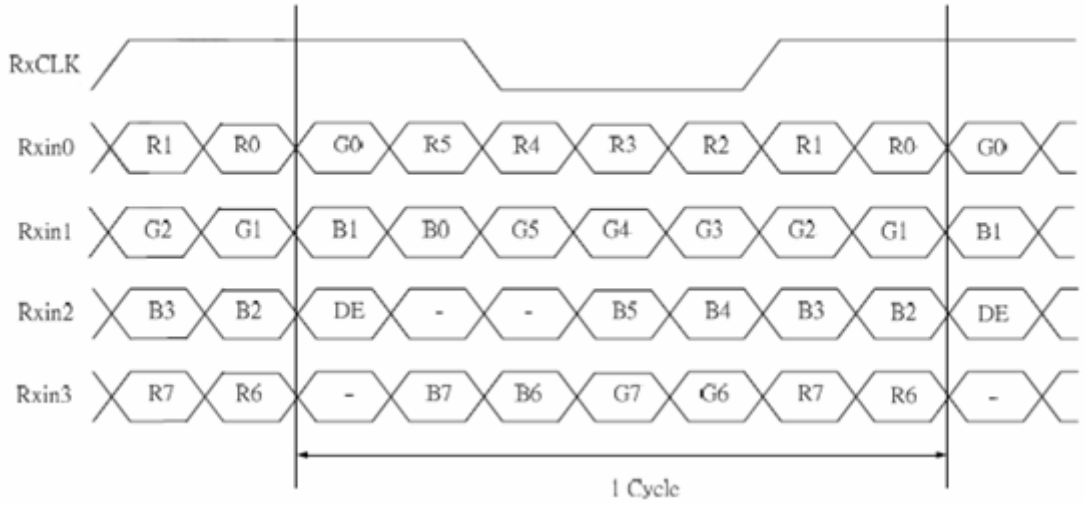


7.2.3 Interface Timings

Parameter	Symbol	Unit	Min.	Typ.	Max.
Frame Rate	--	Hz	-	60	-
Frame Period	tV	line	(815)	(823)	(1023)
Vertical Display Time	tVD	line		800	
Vertical Blanking Time	tVW+tVBP+tVFP	line	(15)	(23)	(33)
1 Line Scanning Time	tH	clock	(1410)	(1440)	(1470)
Horizontal Display Time	tHD	clock		1280	
Horizontal Blanking Time	tHW+tHBP+tHFP	clock	(60)	(160)	(190)
Clock Rate	1/Tc	MHz	(68.9)	(71.1)	(73.4)

7.2.5 LVDS Data MApping

Figure 9 LVDS Data Mapping



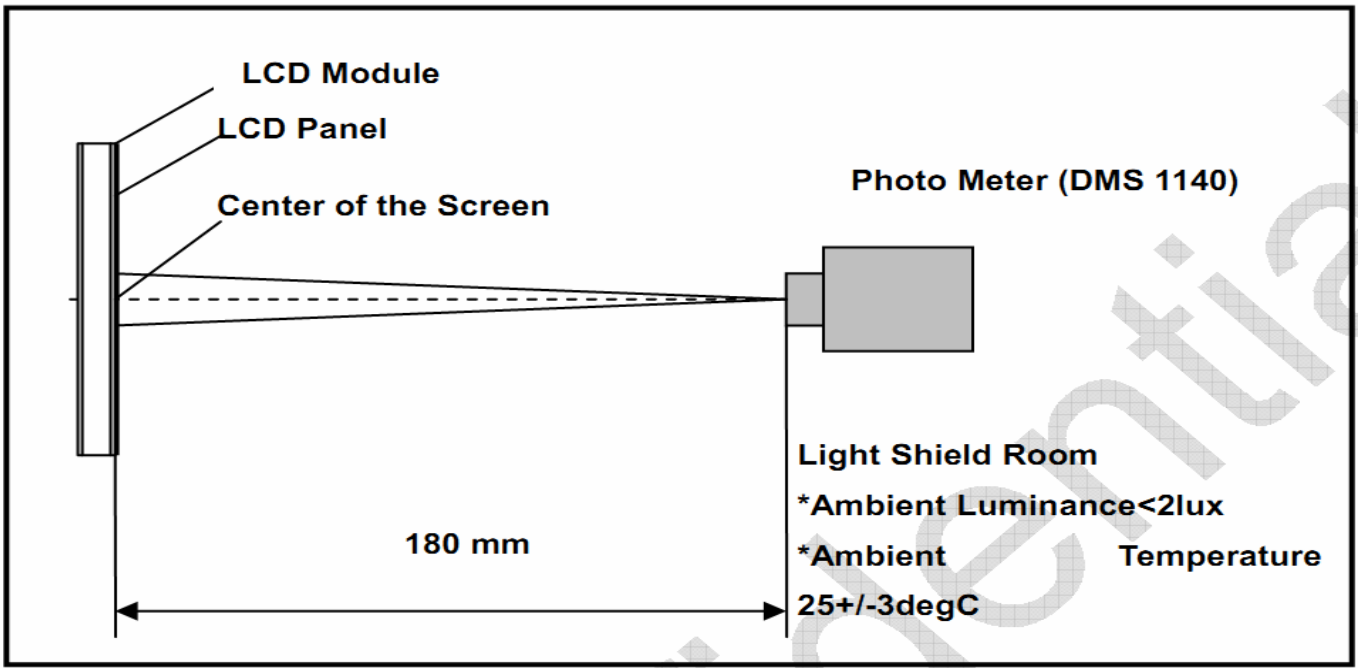
8. Backlight Characteristic

Item		Symbol	MIN	TYP	MAX	UNIT	NOTE
Backlight Power		VLED	8	12	15	V	Ta = 25°C
Backlight Power		I-VLED	-	0.4	0.7	A	VLED=12V
EN Signal Voltage	VIH	LED_EN	1.65		5.25	V	
	VIL		GND		0.4	V	
Luminous Intensity for LCM	VIH	LED_PWM	0.8Ven		5.25	V	
	VIL		GND		0.2Ven	V	
PWM Frequency		LED_PWM	100		20000	Hz	
Lifetime			50000	-	-	Hr	
Color		White					
Average Brightness		-	800	850	-	Cd/cm2	
Luminance uniformity		-	80	-	-	%	

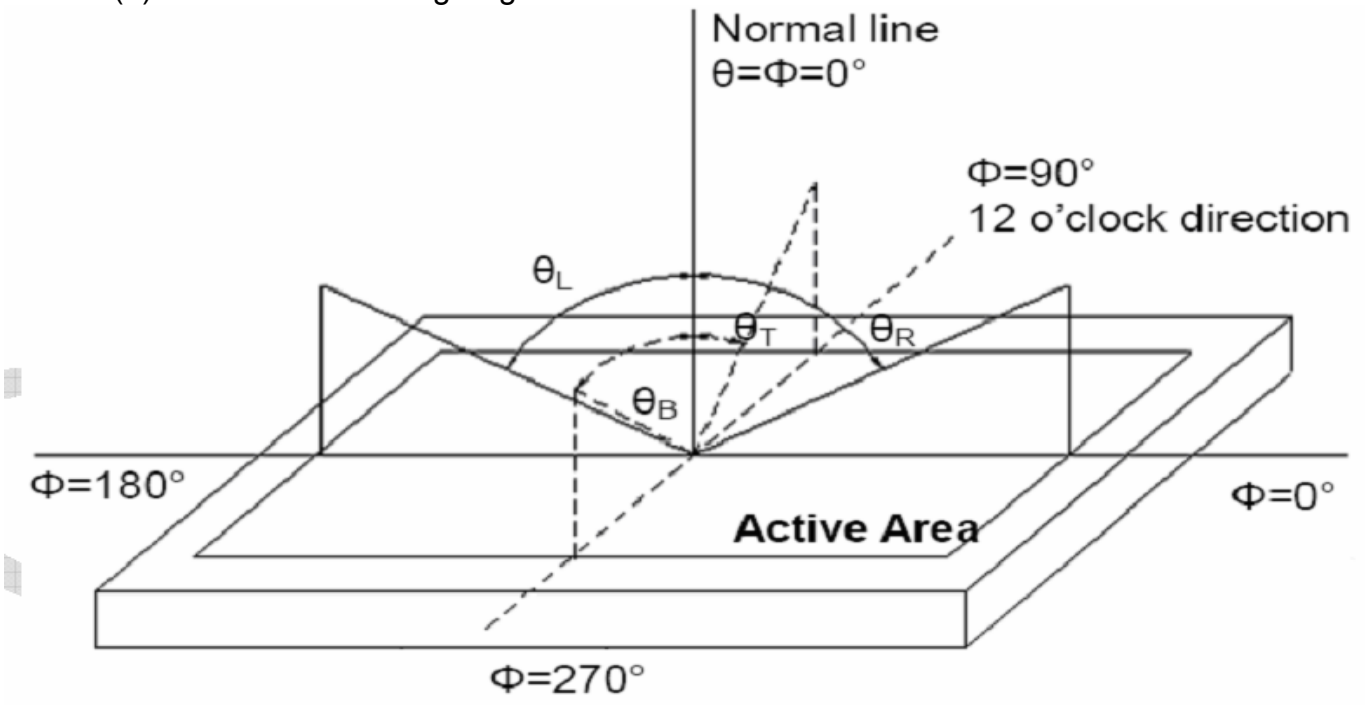
9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θ_L	-	85	-	degree	(1),(2),(6)
		θ_R	-	85	-		
	Vertical	θ_T	-	85	-		
		θ_B	-	85	-		
Contrast Ratio	Center		600	800	-	-	(1),(3),(6)
Response Time	Rising		-	25	35	ms	(1),(4),(6)
	Falling						
CF Color Chromaticity (CIE1931)	Red x		Typ. −0.05	TYP	Typ. +0.05	-	(1), (6)
	Red y			TYP		-	
	Green x			TYP		-	
	Green y			TYP		-	
	Blue x			TYP		-	
	Blue y			TYP		-	
	White x			TYP		-	
	White y			TYP		-	

Note (1) Measurement Setup: The LCD module should be stabilized at given temp. 25°C for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.



Note (2) Definition of Viewing Angle



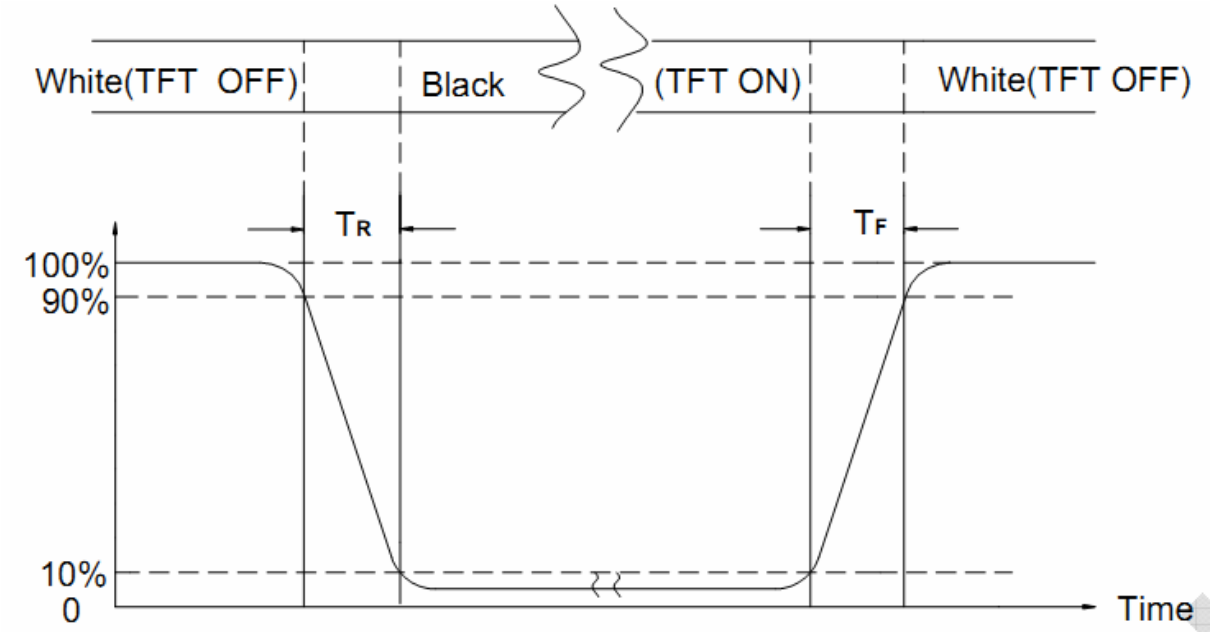
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63, L0: Luminance of gray level 0

Note (4) Definition of response time



Note (5) Definition of Transmittance (Module is without signal input)
Transmittance = Center Luminance of LCD / Center Luminance of Back Light x 100%

Note (6) Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD

10. Reliability Test Conditions and Methods

NO.	TEST ITEMS	TEST CONDITION	
①	High Temperature Storage	Keep in 85°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs.	
②	Low Temperature Storage	Keep in -30°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs.	
③	High Temperature Operating Test	Keep in 80°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs.	
④	Low Temperature Operating Test	Keep in -30°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs.	
⑤	High Temperature / High Humidity Storage Test	Keep in 60 ℃ / 90% R.H duration for 96 hrs Surrounding temperature, then storage at normal condition 4hrs.	
⑥	Temperature Cycling Storage Test	-30°C → +25℃ → 85°C → +25℃ (30mins) (5mins) (30mins) (5mins) 30 Cycle Surrounding temperature, then storage at normal condition 4hrs.	
⑦	ESD Test	Air Discharge: Apply 6 KV with 5 times Discharge for each polarity +/-	Contact Discharge: Apply 250 V with 5 times discharge for each polarity +/-
		1. Temperature ambiance : 15℃～35℃ 2. Humidity relative : 30%～60% 3. Energy Storage Capacitance(Cs + Cd) : 150pF±10% 4. Discharge Resistance(Rd) : 330Ω±10% 5. Discharge, mode of operation : Single Discharge (time between successive discharges at least 1 sec) (Tolerance if the output voltage indication : ±5%)	

11. Inspection Standard

11.1. QUALITY :

THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.

11.1.1. THE METHOD OF PRESERVING GOODS

AFTER DELIVERY OF GOODS FROM AMSON TO PURCHASER. PURCHASER SHALL CONTROL THE LCM AT -10 TO 40 ,AND IT MIGHT BE DESIRABLE TO KEEP AT THE NORMAL ROOM TEMPERATURE AND HUMIDITY UNTIL INCOMING INSPECTION OR THROWING INTO PROCESS LINE.

11.1.2. INCOMING INSPECTION

(A) THE METHOD OF INSPECTION

IF PURCHASER MAKE AN INCOMING INSPECTION , A SAMPLING PLAN SHALL BE APPLIED ON THE CONDITION THAT QUALITY OF ONE DELIVERY SHALL BE REGARDED AS ONE LOT.

(B) THE STANDARD OF QUALITY

ISO-2859-1 (SAME AS MIL-STD-105E) ,LEVEL:II

CLASS	AQL(%)
CRITICAL	0.4 %
MAJOR	0.65 %
MINOR	1.5 %

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.

(C) MEASURE

IF AS THE RESULT OF ABOVE RECEIVING INSPECTION , A LOT OUT IS DISCOVERED. PURCHASER SHALL BE INFORM SELLER OF IT WITHIN SEVEN DAYS. BUT FIRST SHIPMENT WITHIN FOURTEEN DAYS.

11.1.3. WARRANTY POLICY

AMSON WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS. AMSON WILL REPLACE NEW PRODUCTS FOR THESE DEFECT PRODUCTS WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF AMSON.

11.2. CHECKING CONDITION

11.2.1.CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA TO FACE THE SAMPLE.

11.2.2.CHECKER SHALL SEE OVER 300±25 mm. WITH BARE EYES FAR FROM SAMPLE

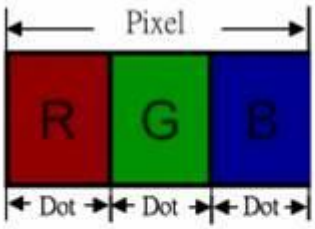
Ambient Illumination:

Functional detection in 1000 nits backlight environment

Appearance detection in 800~1000 Lux external environment

11.3. INSPECTION PLAN :

CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED	Critical
	3. PRODUCT INDICATION	"MODEL NO." SHOULD INDICATE ON THE PRODUCT	Major
ASSEMBLY	4. DIMENSION, LCD GLASS SCRATCH AND SCRIBE DEFECT.	ACCORDING TO SPECIFICATION OR DRAWING.	Major
APPEARANCE	5. VIEWING AREA	POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA .....REJECTED	Minor
	6. BLEMISH、BLACK SPOT、 WHITE SPOT IN THE LCD AND LCD GLASS CRACKS	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	7. BLEMISH、BLACK SPOT WHITE SPOT AND SCRATCH ON THE POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	8. BUBBLE IN POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	9. LCD'S RAINBOW COLOR	STRONG DEVIATION COLOR (OR NEWTON RING) OF LCD.....REJECTED. OR ACCORDING TO LIMITED SAMPLE (IF NEEDED, AND INSIDE VIEWING AREA)	Minor
ELECTRICAL	10. ELECTRICAL AND OPTICAL CHARACTERISTICS (CONTRAST、VOP、 CHROMATICITY ... ETC)	ACCORDING TO SPECIFICATION OR DRAWING . (INSIDE VIEWING AREA)	Critical
	11.MISSING LINE	MISSING DOT、LINE、CHARACTER ....REJECTED	Critical
	12.SHORT CIRCUIT、 WRONG PATTERN DISPLAY	NO DISPLAY、WRONG PATTERN DISPLAY、CURRENT CONSUMPTION OUT OF SPECIFICATION..... REJECTED	Critical
	13. DOT DEFECT (FOR COLOR AND TFT)	ACCORDING TO STANDARD OF VISUAL INSPECTION	Minor

<table>
<tr><th>NO.</th><th>CLASS</th><th>ITEM</th><th>JUDGEMENT</th></tr>
<tr><td>11.4.1</td><td>MINOR</td><td>BLACK AND WHITE SPOT
FOREIGN MATERIEL
DUST IN THE CELL
BLEMISH
SCRATCH</td><td>(A) ROUND TYPE: unit : mm.
<table>
<tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>Φ ≦ 0.15</td><td>Distance≥1mm</td></tr>
<tr><td>0.15 < Φ ≦ 0.4</td><td>3 (Distance>15mm)</td></tr>
<tr><td>0.4 < Φ</td><td>0</td></tr>
</table>
NOTE: Φ=(LENGTH+WIDTH)/2
(B) LINEAR TYPE: unit : mm.
<table>
<tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>------</td><td>W ≦0.03</td><td>Distance≥1mm</td></tr>
<tr><td>L ≦ 4.0</td><td>0.03 < W ≦0.05</td><td>3 (Distance>15mm)</td></tr>
<tr><td>------</td><td>0.05 < W</td><td>FOLLOW ROUND TYPE</td></tr>
</table></td></tr>
<tr><td>11.4.2</td><td>MINOR</td><td>BUBBLE IN POLARIZER
DENT ON POLARIZER</td><td>unit : mm.
<table>
<tr><th>DIAMETER</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>Φ ≦ 0.2</td><td>Distance≥1mm</td></tr>
<tr><td>0.2 < Φ ≦ 0.5</td><td>3 (Distance>15mm)</td></tr>
<tr><td>0.5 < Φ</td><td>0</td></tr>
</table></td></tr>
<tr><td>11.4.3</td><td>MINOR</td><td>Dot Defect</td><td>
<table>
<tr><th>Items</th><th>ACC. Q'TY</th></tr>
<tr><td>Bright dot</td><td>N≦2 (Distance≥15mm)</td></tr>
<tr><td>Dark dot</td><td>N≦3 (Distance≥15mm)</td></tr>
</table>
Pixel Define :
 

Note 1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
Definittion:<1/2dot and visible by 5% ND filter N≦5
Note 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.
Note 3: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green ,blue pattern.</td></tr>
<tr><td>11.4.4</td><td>MINOR</td><td>Mura</td><td>Not visible thriugh 5% ND filter in 50% gray or judge by limit sample if necessary</td></tr>
</table>

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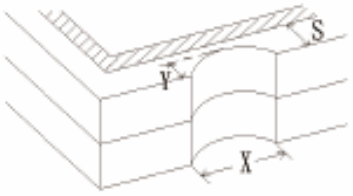
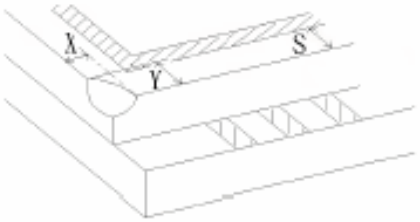
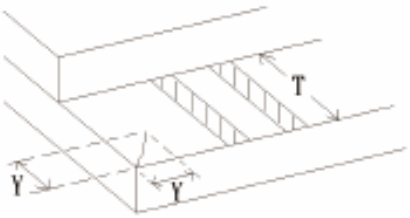
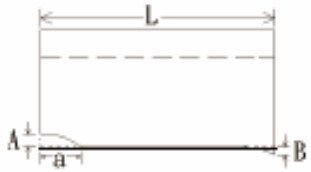
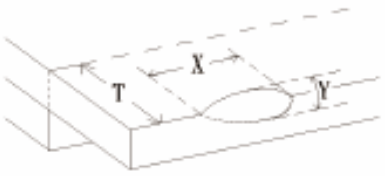
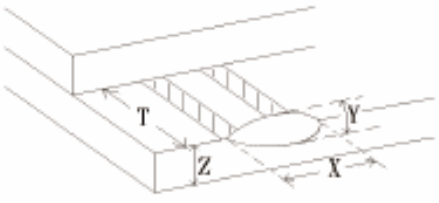
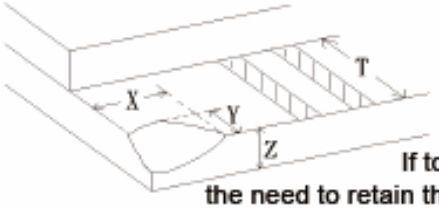
NO.	CLASS	ITEM	JUDGEMENT
11.4.5	MINOR	LCD GLASS CHIPPING	 X ≥ 3mm Y > S Reject
11.4.6	MINOR	LCD GLASS CHIPPING	 X or Y > S Reject
11.4.7	MAJOR	LCD GLASS GLASS CRACK	 Continuous burst NG Reject
11.4.8	MAJOR	LCD GLASS SCRIBE DEFECT	 ACCORDING TO DIMENSION
11.4.9	MINOR	LCD GLASS CHIPPING (ON THE TERMINAL AREA)	 Y<1/2Z Y ≥ 0.5mm Reject X ≥ 3mm
11.4.10	MINOR	LCD GLASS CHIPPING (ON THE TERMINAL SURFACE)	 Y<1/2Z Y ≥ 0.5mm Reject X ≥ 3mm
11.4.11	MINOR	LCD GLASS CHIPPING	 X ≥ 3mm Y ≥ T Reject If touch the electrode lines, the need to retain the two-thirds electrode lines

12. Handling Precautions

12.1 Mounting method

The LCD panel of BOCEN TFT module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

12.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent

[Recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happen by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

12.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

Connect any unused input terminal to Power or Ground, do not input any signals before power is turned on, and ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

12.4 packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

12.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

12.6 storing

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.
  [It is recommended to store them as they have been contained in the inner container at the time of delivery from us

12.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

13. Precaution for Use

13.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

13.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to BOCEN TFT, and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

14. Packing Method

TBD