JEWEL HILL ELECTRONIC CO..LTD.

JEWEL HILL ELECTRONIC CO.,LTD.

SPECIFICATIONS FOR
LCD MODULE

Module No. JH35320480C

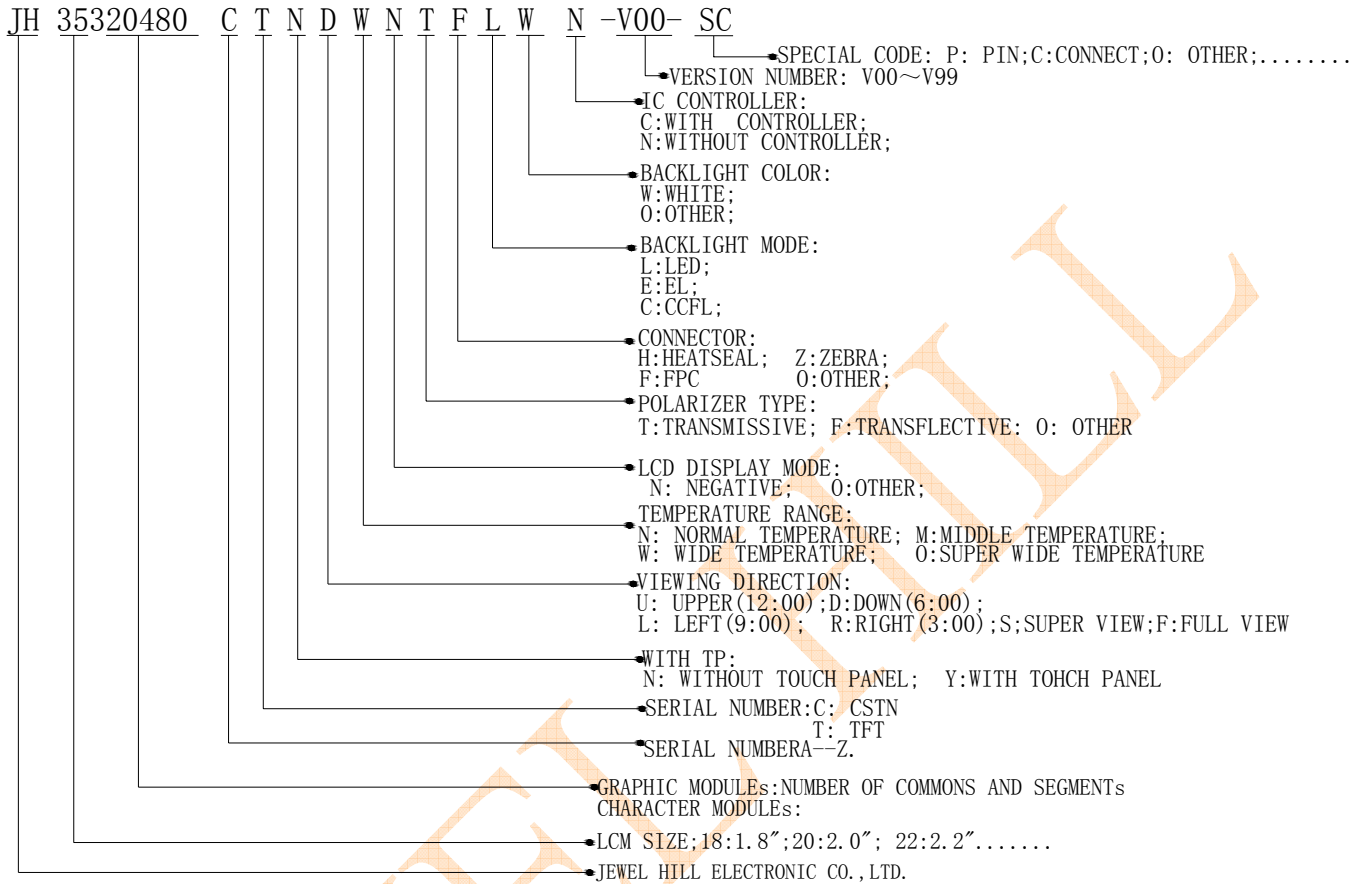E-mail: sales@jhlcd.com   Website: www.jhlcd.com

TABLE OF CONTENTS

JEWEL HILL ELECTRONIC CO..LTD.

LCM Number System

JH 35320480   C T N D W N T F L W   N -V00- SC

- SPECIAL CODE: P: PIN;C:CONNECT;O: OTHER;........
- VERSION NUMBER: V00~V99
- IC CONTROLLER:
  C:WITH CONTROLLER;
  N:WITHOUT CONTROLLER;
- BACKLIGHT COLOR:
  W:WHITE;
  O:OTHER;
- BACKLIGHT MODE:
  L:LED;
  E:EL;
  C:CCFL;
- CONNECTOR:
  H:HEATSEAL; Z:ZEBRA;
  F:FPC   O:OTHER;
- POLARIZER TYPE:
  T:TRANSMISSIVE; F:TRANSFLECTIVE: O: OTHER
- LCD DISPLAY MODE:
  N: NEGATIVE;   O:OTHER;
- TEMPERATURE RANGE:
  N: NORMAL TEMPERATURE; M:MIDDLE TEMPERATURE;
  W: WIDE TEMPERATURE;   O:SUPER WIDE TEMPERATURE
- VIEWING DIRECTION:
  U: UPPER(12:00);D:DOWN(6:00);
  L: LEFT(9:00); R:RIGHT(3:00);S;SUPER VIEW;F:FULL VIEW
- WITH TP:
  N: WITHOUT TOUCH PANEL; Y:WITH TOHCH PANEL
- SERIAL NUMBER:C: CSTN
                T: TFT
- SERIAL NUMBERA--Z.
- GRAPHIC MODULEs:NUMBER OF COMMONS AND SEGMENTs
  CHARACTER MODULEs:
- LCM SIZE;18:1.8″;20:2.0″; 22:2.2″.......
- JEWEL HILL ELECTRONIC CO.,LTD.

JEWEL HILL ELECTRONIC CO..LTD.

1. GENERAL DESCRIPTION.

The **JH35320480C** model is a Color TFT LCD. This main Module has a **3.5** inch diagonally measured active display area with 320(RGB)×480 resolution. Each pixel is divided into Red, Green and Blue sub-pixels and dots which are arranged in vertical stripes.

The LCD color is determined with 262,000 colors signal for each pixel.

The **JH35320480C** has been designed to apply the interface method that enables low power, high speed, and high contrast.

The **JH35320480C** is intended to support applications where thin thickness, wide viewing angle and low power are critical factors and graphic displays are important.

2. GENERAL FEATURES.

Item	Display Panel	Remark
Display Mode	Normally White, Transmissive LCD	
Viewing Direction	6 O'CLOCK	
Input Signals	SPI-RGB	
Outside Dimensions	54.46(W)*82.94(H)*2.2 (N)	
Effective Area	-	
Active Area	48.96mm(W)×73.44mm(H)	
Number of Pixels	320×RGB×480Pixels	
Pixel Pitch	0.153mm(H)×0.153mm(W)	
Pixel Arrangement	RGB Vertical stripes	
Drive IC	ILI9486L/ILI9487	

3.Absolute Maximum Ratings

The following are maximum values which, if exceeded may cause operation or damage to the unit.

ITEM	Symbol	Min.	Typ.	Max.	Unit	Remark
Power for Circuit Driving	IOVCC	1.65	1.8	3.3	V	
Power for Circuit Logic	VDD	2.5	2.8	4.6	V	
LC Operating Voltage *1)	Vop		-		V	
LED Forward Voltage	V_f	11.8	12.8	14.0	V	
LED Forward Current	Ir	-	15	-	mA	
LED Luminance	B_P	4500	-	-	cd/m^2	
Storage Humidity	H_{ST}	10	-	90	%RH	
Storage Temperature	T_{ST}	-30	-	80	℃	At 25±5℃
Operating Ambient Humidity	H_{OP}	10	-	90	%RH	
Operating Ambient temperature	T_{OP}	-20	-	70	℃	

Note:

*1)   Liquid Crystal driving voltage.

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

*2)   Temp. >60℃, Absolute humidity shall be less than 90%RH at 60℃

*3)   Temp. ≤60℃, 90%RH MAX.

4.Electrical Specification
Main Window Display

(Unless specified, the ambient temperature Ta=25℃)

Properties		Sym.	Min	Typ.	Max	Unit	Note
Power for Circuit Driving		IOVCC	1.65	1.8	3.3	V	Note
Power for Circuit Logic		VDD	2.5	2.8	3.3	V	Note
BLU Driving Logic		Vbat	-	-	-	V	
Logic Input Voltage	Low Voltage	VIL	0	-	0.2VDD	V	
	High Voltage	VIH	0.8VDD	-	VDD	V	
Logic Output Voltage	Low Voltage	VOL	0	-	0.1VDD	V	
	High Voltage	VOH	0.9VDD	-	VDD	V	
Power Consumption	White	P_w	T.B.D	T.B.D	T.B.D	mW	
	Black	P_b	T.B.D	T.B.D	T.B.D	mW	
	Vertical Stripe	P_v	T.B.D	T.B.D	T.B.D	mW	

Note:

The recommended operating conditions refer to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings. Accordingly, please make sure that the module is used within this range. And these current values are measured under the condition that all devices are stopped, each component is stable and logic signal is input.

5.Optical Specification.

Item		Symbol	Conditions	Specifications			Unit	Note
				Min.	Typ.	Max.		
Transmittance		T%			4.7		%	All left side data are based on CMO's following condition -- NTSC: 60% Light : C light (Machine:BM5A) Normal Polarizer Reference Only
Contrast Ratio		CR		150	250	-	-	
Response Time		T_R		-	10	20	ms	
		T_F		-	20	30	ms	
Chromaticity	Red	X_R	Viewing normal angle $\theta_X = \theta_Y$ =0°	0.604	0.634	0.664	-	
		Y_R		0.296	0.326	0.356	-	
	Green	X_G		0.260	0.290	0.320	-	
		Y_G		0.551	0.581	0.611	-	
	Blue	X_B		0.102	0.132	0.162	-	
		Y_B		0.096	0.126	0.156	-	
	White	X_W		0.262	0.292	0.322	-	
		Y_W		0.306	0.336	0.366	-	
Viewing Angle	Hor.	θ_{X+}	Center CR≥10	-	45	-	deg.	
		θ_{X-}		-	45	-		
	Ver.	θ_{Y+}		-	35	-		
		θ_{Y-}		-	15	-		

*Note (1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.

Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°
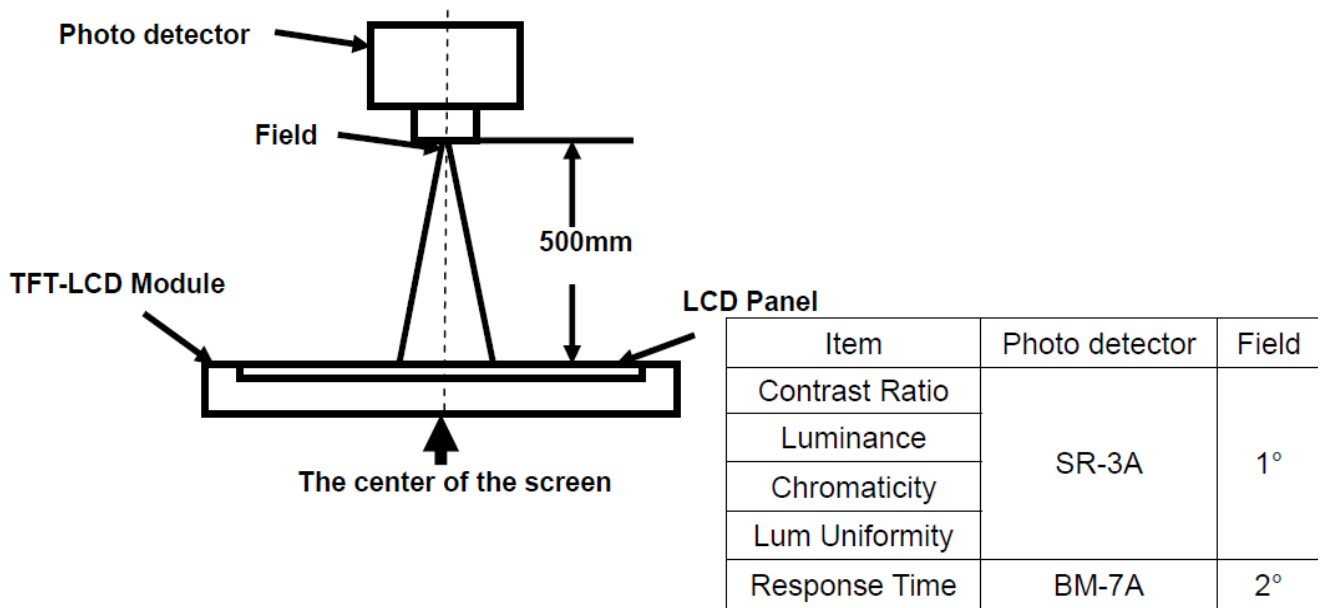
Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。
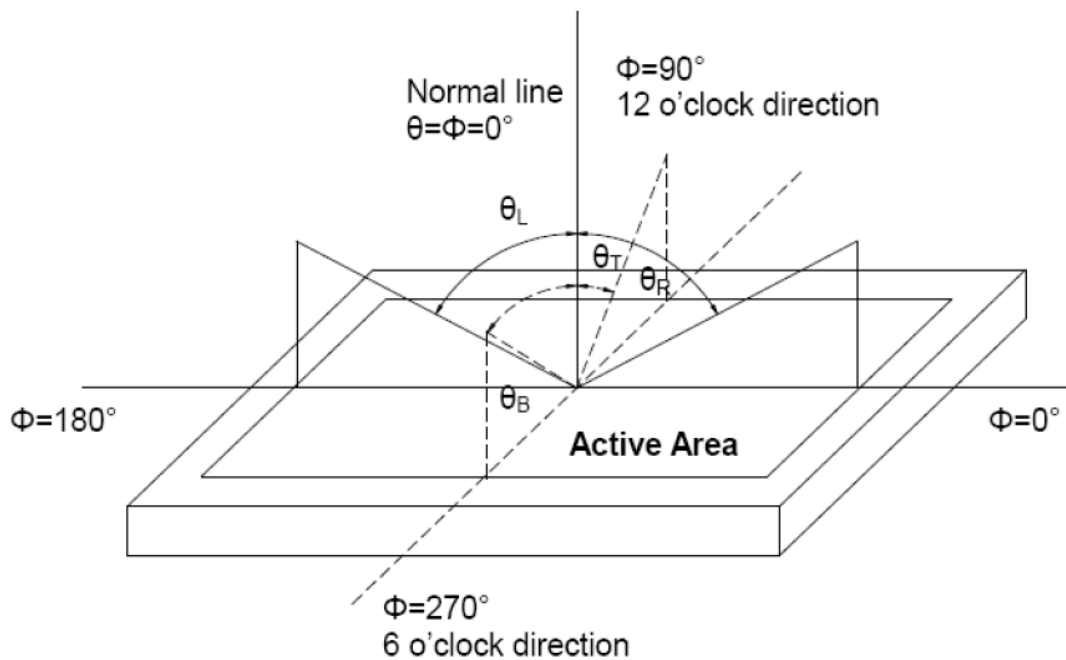
Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

"White state ":The state is that the LCD should driven by Vwhite.

"Black state": The state is that the LCD should driven by Vblack.

Vwhite: To be determined   Vblack: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.
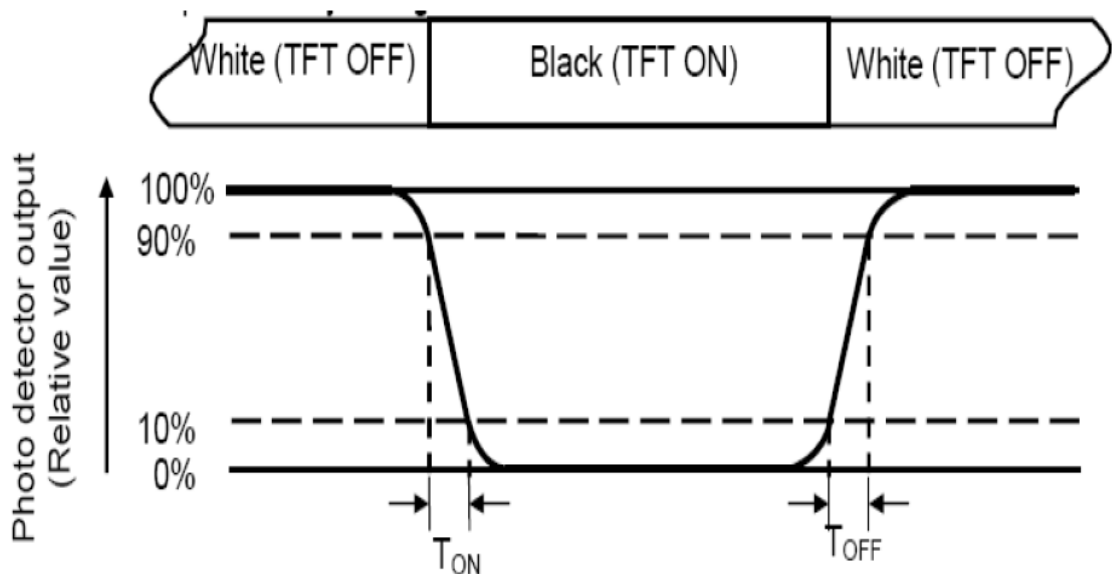
Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

6.Block Diagram.

320×(RGB)×480
Display Panel
(TFT LCD
Transmissive)

Gate
signal
(480)

Source signal (320*3)

Driver & Controller   (All-In-One)
(ILI9486L)/(ILI9847)

CS, SCL, RESET, SDI

Data[(DB17~DB0)],Power(VDD,IOVCC)
Control Signal(SCL, CS, SDI, RESET)

M
P
U
&
P
O
W
E
R
I/F

A   K
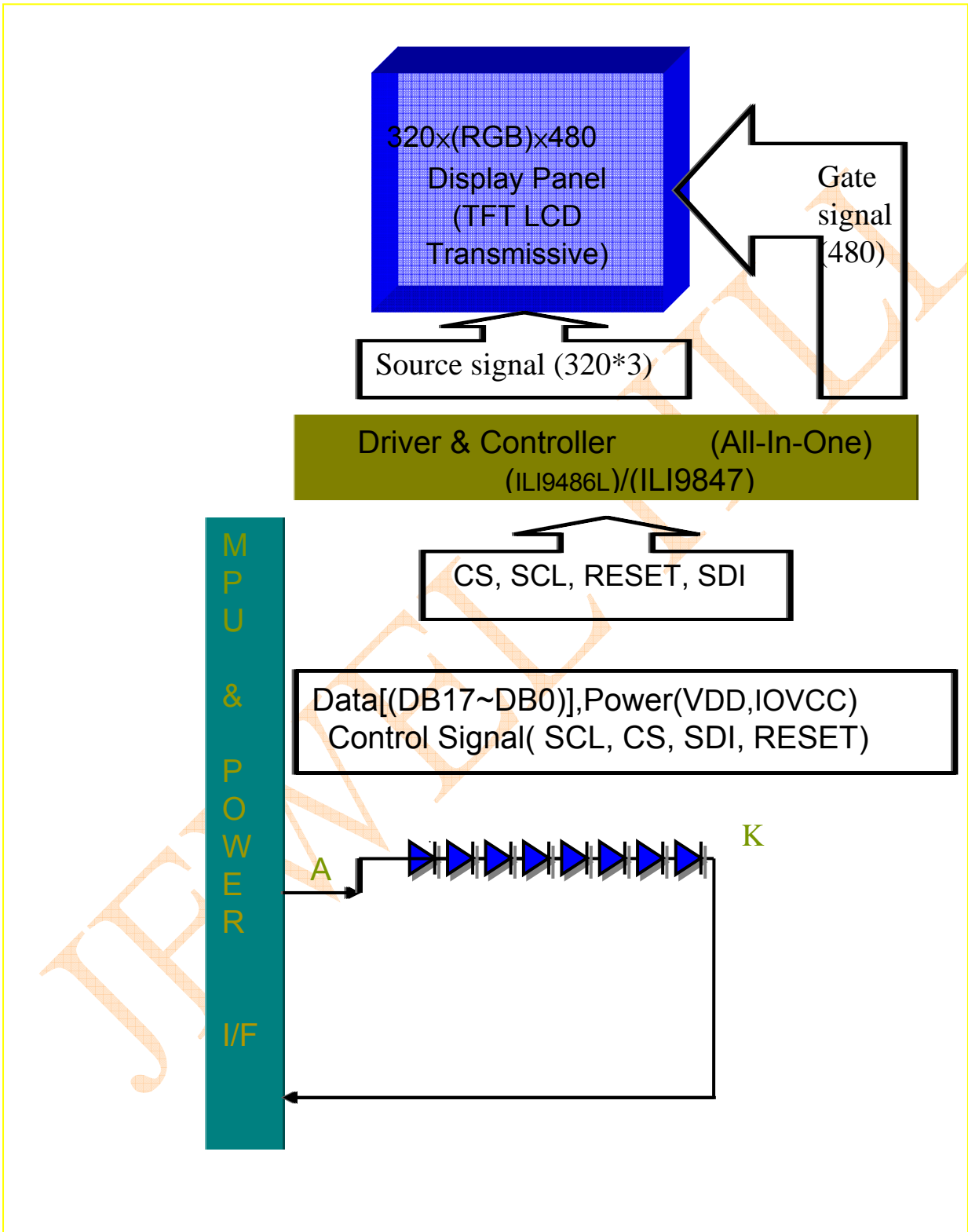
7.Pin Descriptio

Pin NO.	Symbol	Description
1	GND	Ground
2	RESET	System Reset Pin
3	CS	Chip select signal
4	SCLK	Serial Clock pin
5	ID	Identify pin
6	SDI	SPI interface input in
7	SDO	SPI interface 0utput
8-25	DB0-DB17	Data bus
26	GND	Ground
27	VSYNC	Vertical synchronizing signal
28	HSYNC	Horizontal synchronizing signal
29	DOTCLK	Dot clock signal
30	ENABLE	Input data enable control
31	GND	Ground
32	IOVCC	Power Supply1.8V-2.8V)
33	GND	Ground
34	VCC	Power Supply2.8V
35	GND	Ground
36	VLED+	LED Positive
37	VLED-	LED Negative
38	PWM OUT	Back light control pin
39	GND	Ground
40	GND	Ground

8.Outline Dimension
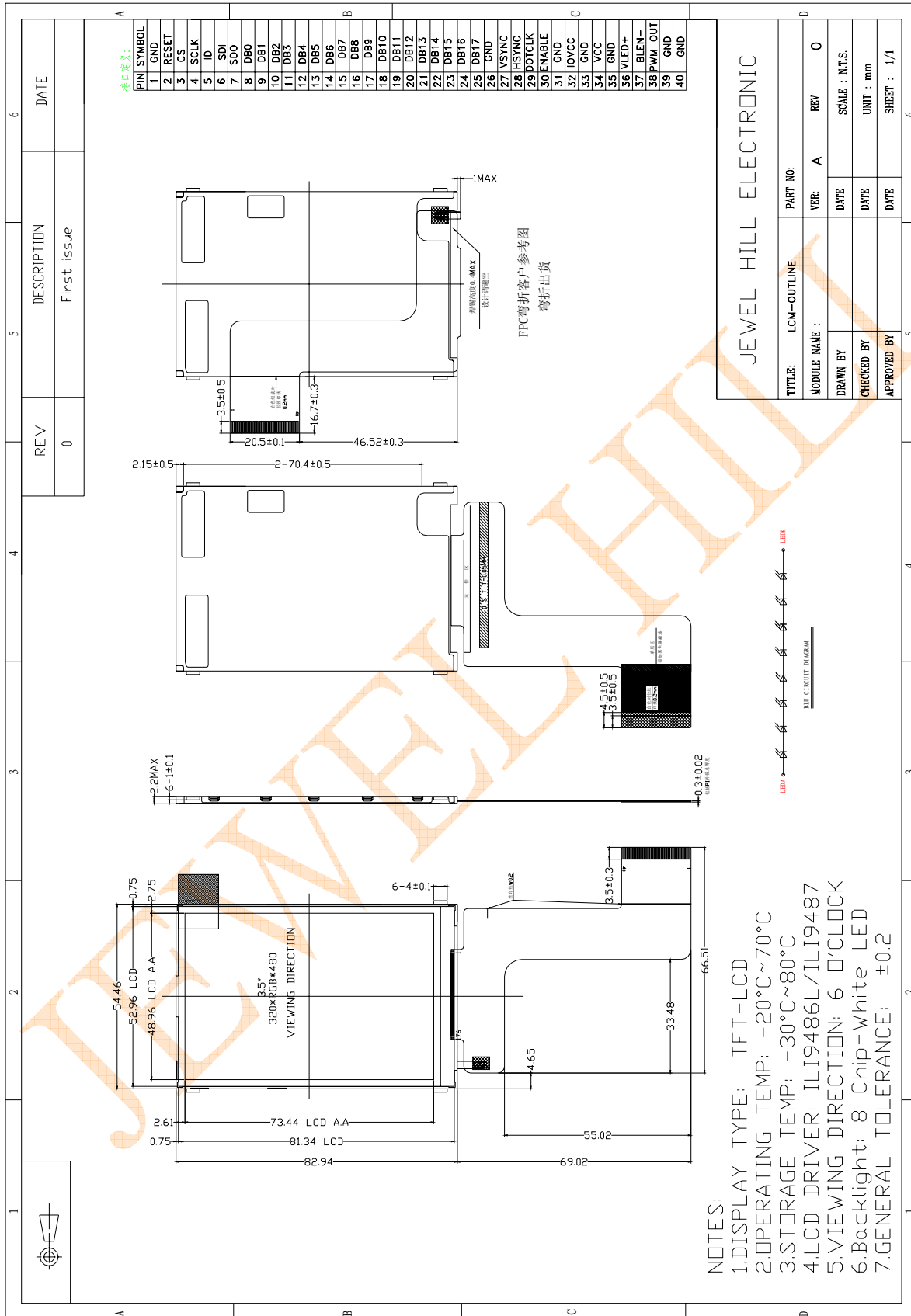
9.Timing Characteristics

9.1. SPI-RGB System bus interface operation
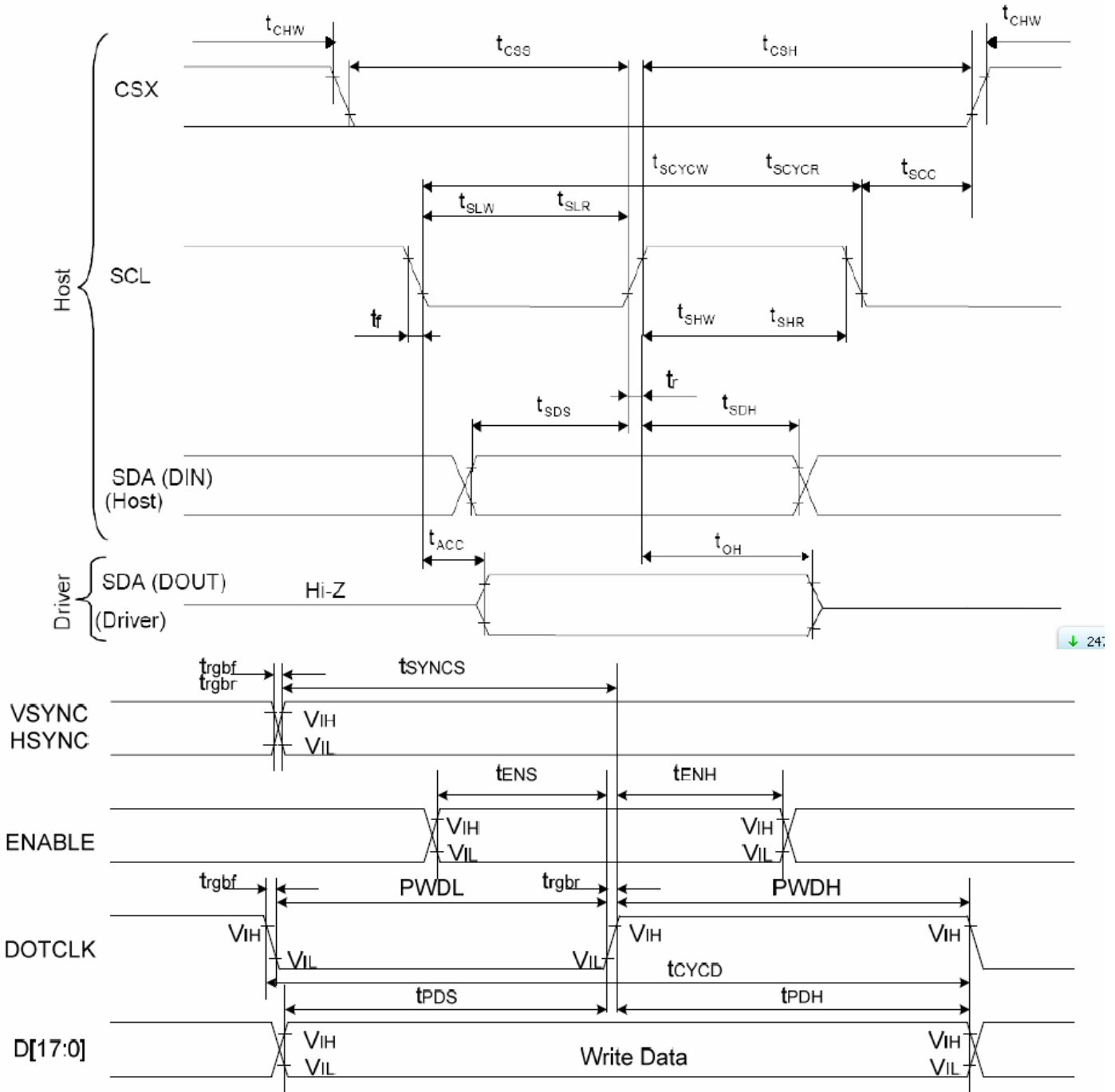
9.2. Timing Characteristics

Normal Write Mode, IOVcc=1.65V~3.3V, Vcc=2.5V~3.3V

Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	66	-	ns	
	tshw	SCL "H" Pulse Width (Write)	15	-	ns	
	tslw	SCL "L" Pulse Width (Write)	15	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA / SDI (Input)	tsds	Data setup time (Write)	10	-	ns	
	tsdh	Data hold time (Write)	10	-	ns	
SDA / SDO (Output)	tacc	Access time (Read)	10	50	ns	
	toh	Output disable time (Read)	15	50	ns	
CSX	tscc	SCL-CSX	15	-	ns	
	tchw	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tcsh		65	-	ns	

Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	18/16-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
ENABLE	t_{ENS}	ENABLE setup time	15	-	ns	
	t_{ENH}	ENABLE hold time	15	-	ns	
DB[17:0]	t_{POS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level period	15	-	ns	
	PWDL	DOTCLK low-level period	15	-	ns	
	t_{CYCD}	DOTCLK cycle time	66	-	ns	
	t_{rgbr} , t_{rgbf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	

9. 3 Reset Operation

(VCC=1.65~3.1 V)

Table 13-6

Item	Symbol	Unit	Min.	Typ.	Max.
Reset low-level width	tRES	ms	1	—	—
Reset rise time	trRES	µs	—	—	10

10.Reliability and Inspection Standard

No.	Test Item		Test Conditions	Remark
1	High Temperature	Storage	80℃, 120Hr	Note
		Operation	70℃, 120Hr	Note
2	Low Temperature	Storage	-30℃, 120Hr	Note
		Operation	-20℃, 120Hr	
3	High Temperature and High Humidity		60℃, 90%RH, 120Hr	Note
4	Temperature Cycle	Storage	-10℃(1Hr)→25℃(5min)→60℃(1Hr) 32 Cycles	Note
		Operation	-20℃(1Hr)→25℃(5min)→60℃(1Hr) 25 Cycles	
5	Peeling Off (Storage)		≧500gf/cm	Note
6	FPC Bending Test		≧6,000 times, 2/sec	Note
7	Vibration Test(Storage)		50HZ, 30min, Amplitude: 2 cm, X/Y/Z directions	Note
8	Drop Test		60cm/ 3Corner/ 8Face, 1Cycle	Note

Note:
1) The test samples should be applied to only one test item.
2) Sample size for each test item is 5~10pcs.
3) For Damp Proof Test, pure water(Resistance>1MΩ) should be used.
4) In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
5) EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and fluorescence EL has.
6) After the reliability test, the test samples should be inspected after 2 hours at least.
7) Functional test is OK. Missing segment, shorts, unclear segment, non display, display abnormally, liquid crystal leak are not allowed.
8) After testing, the current Idd should be within initial value ±20%.
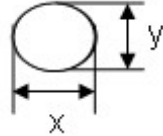9) No low temperature bubbles ,end seal loose and fall, frame rainbow, ACF bubble growing are allowable in the appearance test.

11.Inspection Criterion
11.1. Sampling Method

Unless otherwise agreed upon in writing, the sampling inspection shall be applied to the Customer's incoming inspection.

1) Lot size: Quantity per shipment lot
2) Sampling type: Normal inspection , single sampling
3) Inspection level: Ⅱ
4) Sampling table: MIL-STD-105D
5) Acceptable Quality Level(AQL): Major=0.65 Minor=1.5

11.2. Inspection Method

1) Ambient Condition:
   a. Temperature: Room temperature 25±5℃
   b. Illumination: Single fluorescent lamp non-directive(300 to 700 Lux)
2) Viewing distance

   The distance between the LCD and the inspector's eyes shall be at least 30-50cm.
3) Viewing Angle

   The inspection shall be conducted within normal viewing angle range.
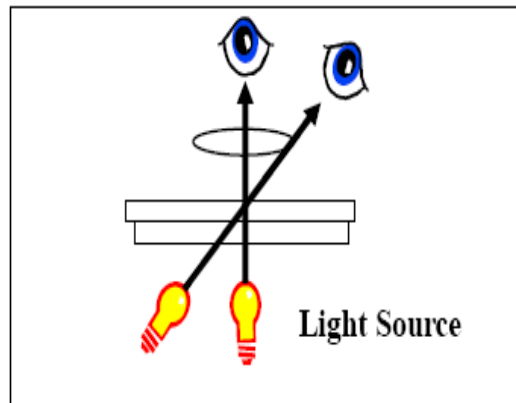
11.3. Inspection Criteria
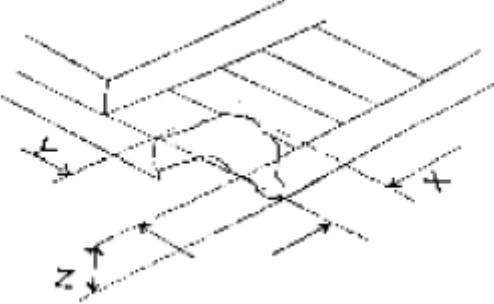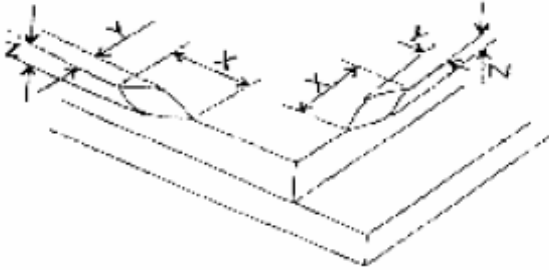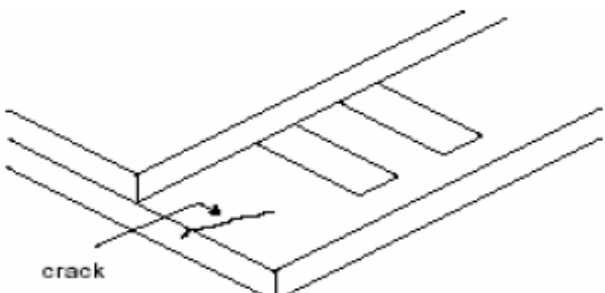
11.3.1. Major defect

No.	Item	Inspection Standard	Classification of defects
1	All functional defects	1) No display 2) Display abnormally 3) Open or missing segment 4) Short circuit 5) Excess power consumption 6) Backlight no lighting, flickering and abnormal lighting	Major
2	Missing	Missing component	Major
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	Major

11.3.2. Cosmetic Defect

No.	Item	Inspection Standard		Classification of defects
1	(spot defect) Black and White spot pinhole	For dark/white spot, size Φ is defined as Φ=(x+y)/2 		Minor
		Size Φ (mm)	Acceptable Quantity	
		Φ≤0.1	Ignore	
		0.10≤Φ≤0.15	2	
		0.15≤Φ≤0.2	1	
		0.2<Φ	0	
2	(line defect) Black and White line Polarizer scratch	Define: Width W ↓ Length L		Minor
		Width(mm)	Length(mm);Acceptable Qty	
		Φ≤0.03	Ignore	
		0.03<W≤0.05	L≤3.0; N≤2	
		0.05<W≤0.1	L≤2.0; N≤2	
		0.1<W	Define as spot defect	
3	Polarizer defect	Dent or bubble(between the polarizer and glass)		Minor
		Size Φ(mm)	Acceptable Qty	
		Φ≤0.10	Ignor	
		0.10<Φ≤0.20	2	
		0.20<Φ≤0.30	1	
		0.30<Φ	0	

11.3.3. Cosmetic Defect

No.	Item	Inspection Standard	Classification of defects
1	Glass defect	1) Chip on the corner | X	Y	Z
≤3.0	≤S	≤T | Remark: S=contact pad length; 　　　　　T=the thickness of glass Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal. Acceptable Quantity N≤2.	Minor
		2) Chip on the edge of glass | X	Y	Z
Ignore	≤0.5	≤T | Acceptable Quantity: N≤2	Minor
		3) Creak 　Creaks tend to break are not allowed. crack	Minor

12. PACKAGE INFORMATION.

13.ROHS COMPLIANT WARRANTY.

RoHs Hazardous substances including:
- Cd< 100 ppm
- Pb< 1000 ppm
- Hg< 1000 ppm
- Cr +6 < 1000 ppm
- PBDE < 1000 ppm
- PBB < 1000 ppm

14.PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

(1) The display panel is made of glass and polarizer. As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).

(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
   - Isopropyl alcohol
   - Ethyl alcohol
   Do not scrub hard to avoid damaging the display surface.

(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
   - Water
   - Ketone
   - Aromatic solvents
   Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.

(7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

(8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- Do not alter, modify or change the shape of the tab on the metal frame.

- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

- Do not damage or modify the pattern writing on the printed circuit board.

- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

- Do not drop, bend or twist LCM.

Storage Precautions

When storing the LCD modules, the following precaution is necessary.

(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.

(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.

(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped).

Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.

-Terminal electrode sections.

15. REVISION HISTORY.

Version	Revise record	Date
1.0	Original version	13-08-12

SAMPLE APPROVED REPORT

JEWEL HILL ELECTRONIC CO.,LTD.

(样品确认单)

SAMPLE MODEL NO. (样品型号)	JH35320480C
SAMPLE SERIES NUMBER NO. (样品序号)	
SAMPLE QUANTITY (样品数量)	
COLOR/TYPE (底色/类型)	TFT/NEGATIVE
VIEWING DIRECTION (视角)	6H
DRIVING METHOD (驱动参数)	1/480DUTY
LOGIC VOLTAGE (工作电压)	2.8V
LCD VOP (LCD 驱动电压)	
OPERATING TEMP. (操作温度) ℃	-20 ~ 70℃
STORAGE TEMP. (储存温度) ℃	-30 ~ 80℃
POLARIZER----FRONT (首偏光片)	
POLARIZER----BACK (后偏光片)	TRANSMISSIVE
CONTROLLER/DRIVER IC(控制/驱动 IC)	ILI9846/ILI9487(COG)
BACKLIGHT COLOR/TYPE (背光源类型/颜色)	WHITE
DRAWING REV/NO./QUANTITY (图纸版本/数量)	
SPECIFICATION (规格书　份数)	

REMARKS：

(备注)

WRIT BY：_____ 　DATE：_____ 　APROV BY：_____ 　DATE：_____

CUSTOMER'S APPROVAL (客户确认)：

1) 　FUNCTION 　（功能）： 　□ OK 　□ N.G.

2) 　DRIVER CONDITION 　（驱动条件）： □ OK 　□ N.G.

3) 　DISPLAY MODE 　（显示模式）： □ OK 　□ N.G.

4) 　VIEWING ANGLE 　（视角）： □ OK 　□ N.G.

5) 　BACKLIGHT 　（背光源）： □ OK 　□ N.G.

6) 　DISPLAYING PATTERN （显示效果）： □ OK 　□ N.G.

CUSTOMER'S CONCLUSIONS 　(客户意见)：_____

_____

_____

CUSTOMER'S SIGNATURE（客户签名）：_____ 　DATE (日期)：_____