SPECIFICATION

OF

LIQUID CRYSTAL DISPLAY MODULE

UNITED RADIANT TECHNOLOGY CORP. 光聯科技 30-Oct-2019 品管部 QC DEPT.

CUSTOMER : URT STD

Model No. : UMOH-9379MD-1T

Model version : 0

Document Revision : 1

CUSTOMER APPROVED SIGNATURE			

This specification need to be signed by purchaser or customer as a specification of products production and delivery from URT. Without signature of this specification , any purchase order for this model no. will be treated and considered that this specification is automatically acknowledged and accepted by purchaser or customer.

U.R.T. UNITED RADIANT TECHNOLOGY CORPORATION

Joe Wu	Ashin Chiu	Jenny Wang	Oct-30-2019
APPROVED	CHECKED	PREPARED	Date

COMPANY : No. 2,Fu-hsing Road,Taichung Econamic Processing Zone,Tantzu,Taichung,Taiwan,R.O.C.
TEL: 886-4-25314277 FAX: 886-4-25313067

Revision record

Document Revision	Model No. Version No.	Description	Revision by
0	UMOH-9379MD-T Version No. 0	5.0” TFT.	William Don Ryan Chen 06-Jun-2019
1	UMOH-9379MD-1T Version No. 0	1. Change backlight. 2. Modify the Module number from UMOH-9379MD-T to UMOH-9379MD-1T.	William Don George Pan 30-Oct-2019

CONTENTS:

1. BASIC SPECIFICATION

1.1 Mechanical specifications

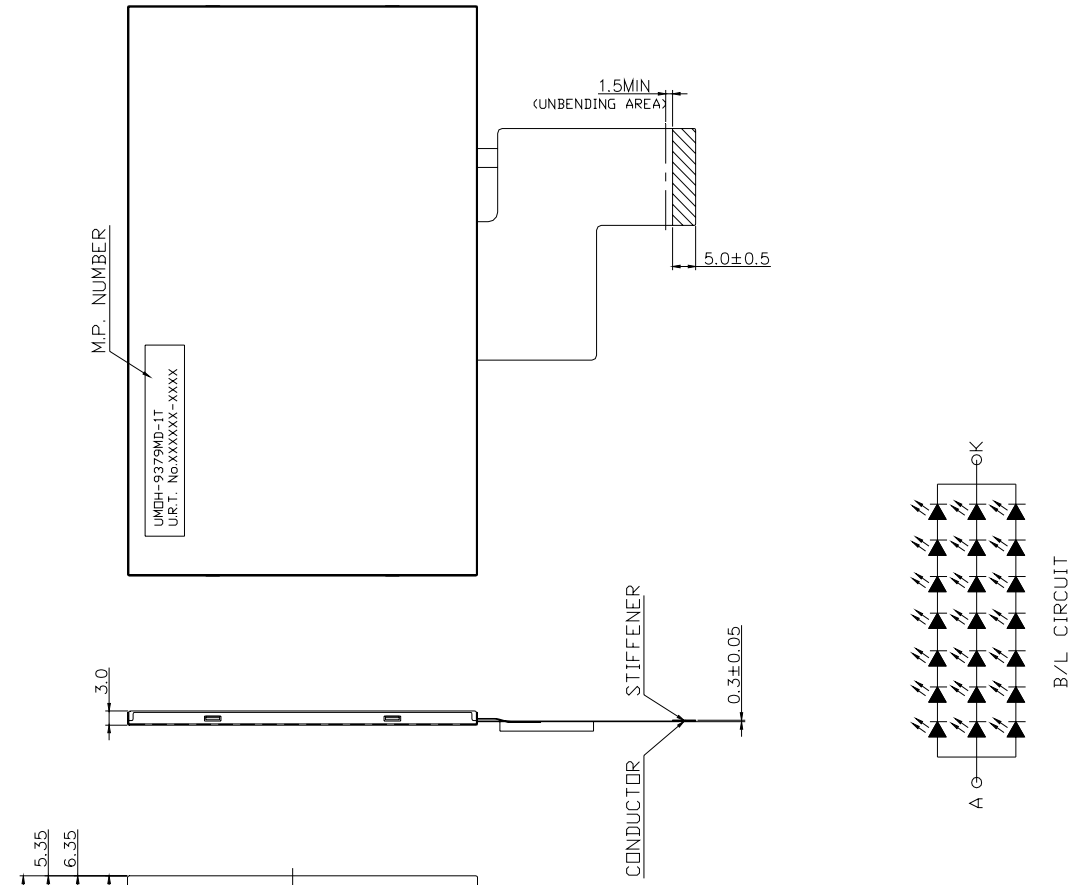
Items	Nominal Dimension	Unit
Active screen size	5” diagonal	--
Dot Matrix	800 x RGB x 480	Pixel
Module Size (W x H x T)	120.7 x 75.8 x 3.0	mm.
Active Area (W x H)	108.0 x 64.8	mm.
Pixel Size (W×H)	0.135 x 0.135	mm.
Color depth	16.7M	color
Interface	Parallel 24-bit RGB	--
Driving IC	ST7262	--
Driving IC Package	COG	--
Module weight	56±10%	g

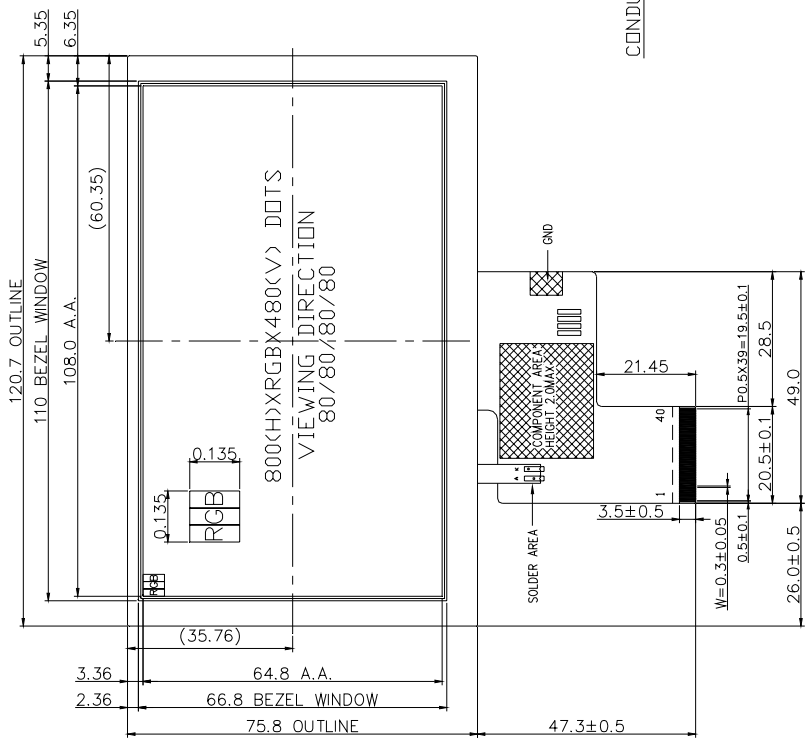
1.2 Display specification

Display	Descriptions	Note
LCD Type	a-Si TFT	--
LCD Mode	IPS / Normal Black	--
Polarizer Mode	Transmissive	--
Polarizer Surface	Glare	--
Pixel arrangement	RGB- Stripe	--
Backlight Type	7s x 3p LEDs	--
Viewing Direction	Free viewing Direction	--

1.3 Outline dimension

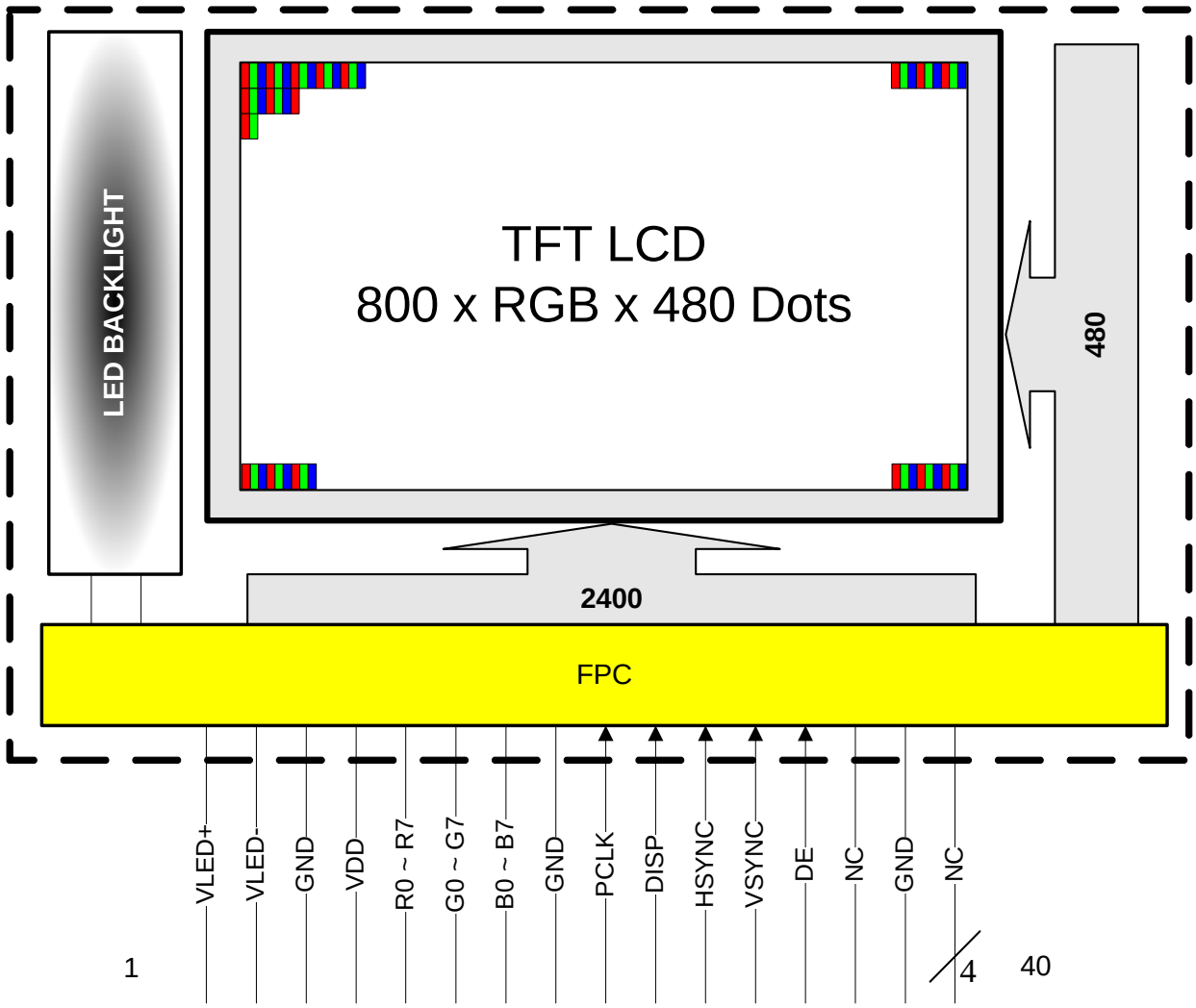
PIN	SYMBOL
1	VLED-
2	VLED+
3	GND
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	PCLK
31	DISP
32	HSYNC
33	VSYNC
34	DE
35	NC
36	GND
37	(NC)
38	(NC)
39	(NC)
40	(NC)





NOTE:
1. DISPLAY TYPE : 5"TFT IPS/NORMAL BLACK
2. VIEWING DIRECTION : ALL
3. Top : -20~70°C , Tst : -30~80°C
4. LED COLOR : WHITE , LEDX21 pcs
5. CONSTANT CURRENT IF=60mA , VLED : 21.7V(TYP)
6. RoHS-COMPLIANT
7. TOLERANCE FOR NOT ASSIGNED : ±0.3mm
8. THE BENDING RADIUS OF FPC SHOULD BE LARGE THAN 1.0R
9. COMPONENT AREA AND SOLDER AREA CAN NOT BE BENDING
10. LCD DRIVER : ST7262

1.4 Block diagram:



1.5 Interface Pin Connection:

Pin No.	Pin Symbol	I/O	Description
1	VLED-	P	Power for LED backlight cathode.
2	VLED+	P	Power for LED backlight anode.
3	GND	P	Ground.
4	VDD	P	Power supply. (+3.3V)
5 ~ 12	R0 ~ R7	I	8 bit data bus display red data.
13 ~ 20	G0 ~ G7	I	8 bit data bus display green data.
21 ~ 28	B0 ~ B7	I	8 bit data bus display blue data.
29	GND	P	Ground.
30	PCLK	I	Pixel clock input pin.
31	DISP	I	DISP sets the display mode. When DISP =L, Standby mode. When DISP =H, Normal display mode.
32	HSYNC	I	Horizontal sync signal applied to the RGB interface, default is negative polarity.
33	VSYNC	I	Vertical sync signal applied to the RGB interface, default is negative polarity.
34	DE	I	Data input enable applied to the RGB interface. Display access is enabled when DE is “H”.
35	NC	-	No connect.
36	GND	P	Ground.
37~40	NC	-	No connect.

2. ELECTRICAL CHARACTERISTICS

2.1 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit
Power supply voltage	VDD	-0.3	+4.0	V
Input voltage	Vin	-0.3	VDD+0.3	V
Operate temperature range	TOP	-20	70	℃
Storage temperature range	TST	-30	80	℃

2.2 DC Characteristics:

T_a= 25℃

Items	Symbol	Min.	Typ.	Max.	Unit	Condition
Supply voltage	V_{DD}	3.0	3.3	3.6	V	-
Input Voltage	V_{IL}	GND	-	$0.3V_{DD}$	V	L level
	V_{IH}	$0.7V_{DD}$	-	V_{DD}	V	H level
Current consumption	I_{DD}	-	-	190	mA	Note 1

*Note1 :

Measuring Condition:

Standard Value MAX.

Ta = 25℃

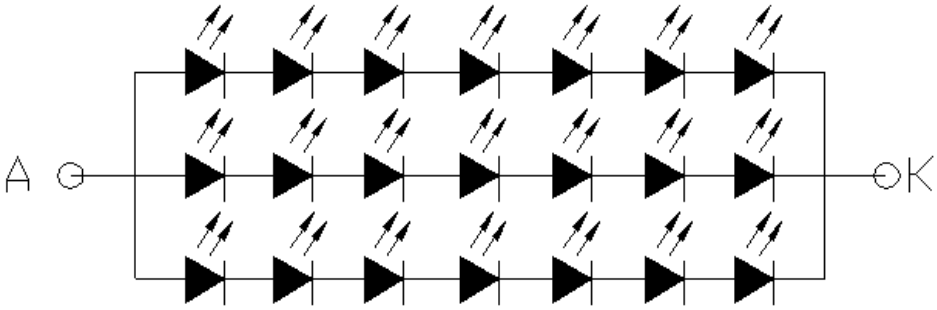
VDD -GND = 3.3V

Display Pattern = Check pattern

2.3 Back-light Characteristics:

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	Unit	Test Condition	NOTE
LED B/L Forward Current	I_F	-	60	-	mA	Ta=25℃	-
LED B/L Forward Voltage	V_F	-	21.7	-	V	I_F=60mA Ta=25℃	-
Half-Life Time	Lf	-	50000	-	hrs	Ta=25℃	1

Note 1：The " Half-Life Time "is defined as the module brightness decrease to 50% original brightness.



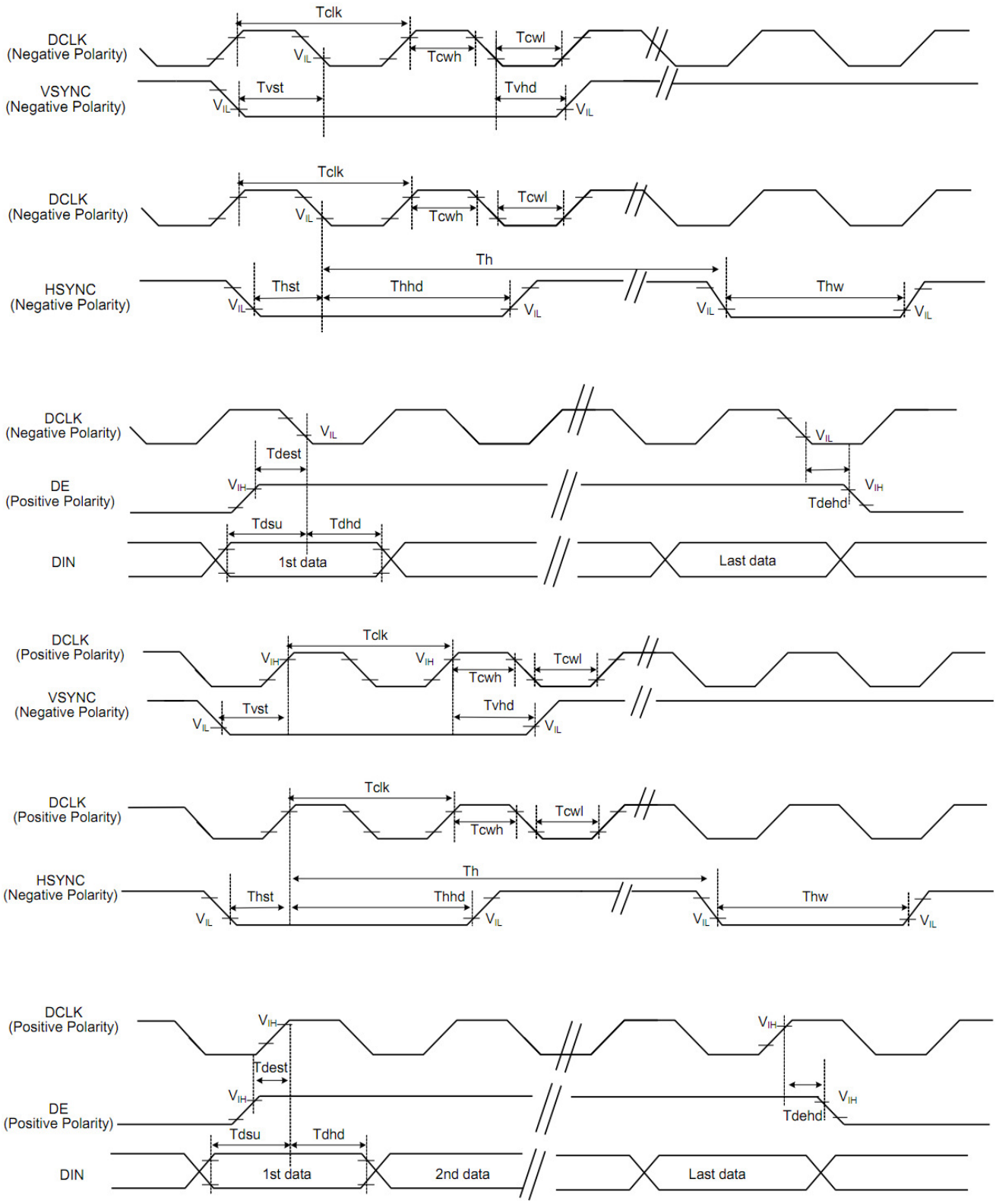
B/L CIRCUIT

2.4 AC Characteristics:

2.4.1 AC Electrical Characteristics：

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
VDD Power Source Slew Time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB Pulse Width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
SD Output Stable Time	Tst	-	-	TBD	us	Output settled within +20mV Loading = 6.8k+28.2pF.
GD Output Rise and Fall Time	Tgst	-	-	TBD	us	Output settled (5%~95%), Loading = 4.7k+29.8pF

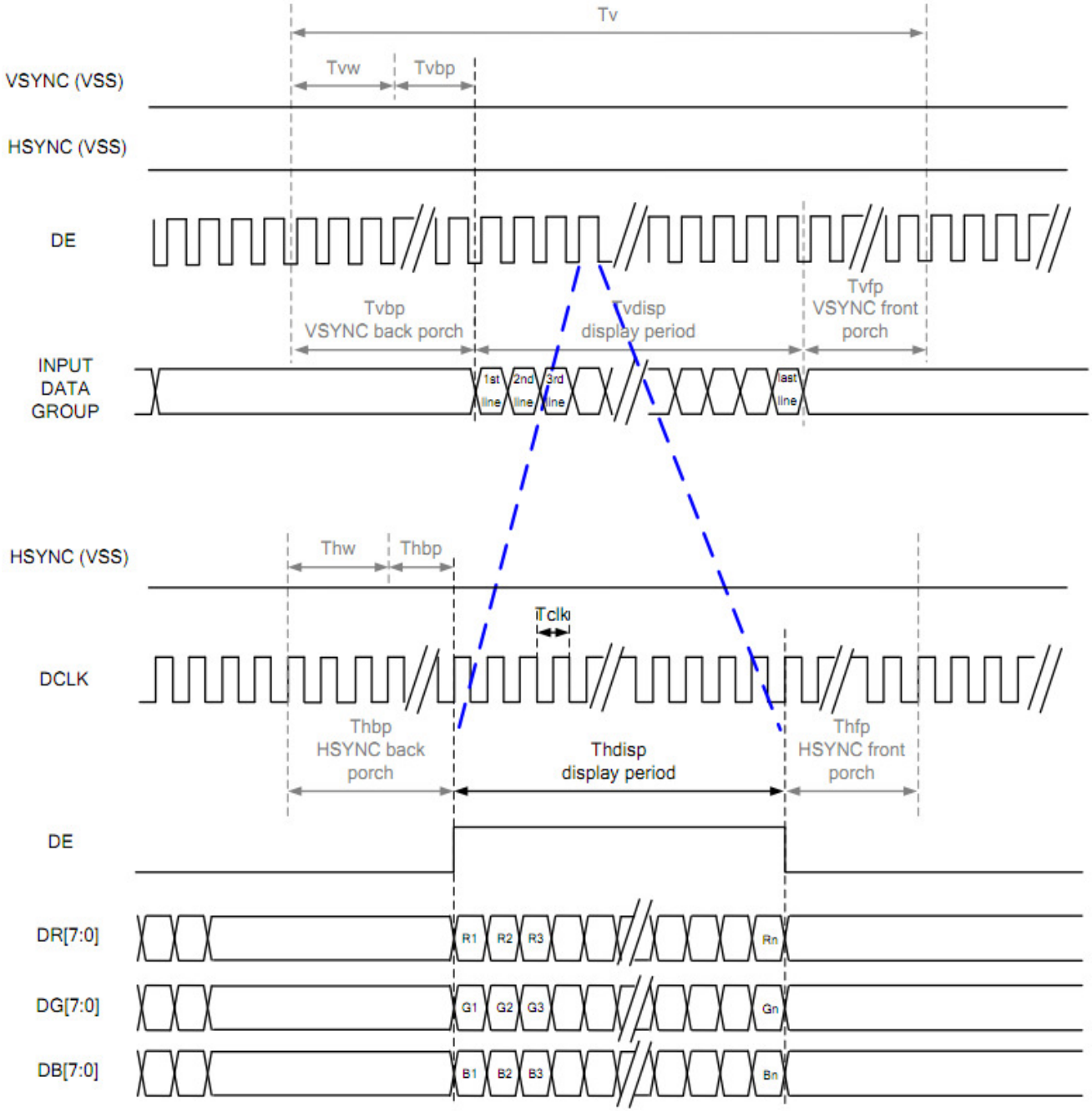
2.4.2 System Bus Timing for RGB Interface



2.4.2 System Bus Timing for RGB Interface (Cont.)

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	Tcw	40	50	60	%	
HSYNC Width	Thw	2	-	-	DCLK	
HSYNC Period	Th	55	60	65	us	
VSYNC Setup Time	Tvst	12	-	-	ns	
VSYNC Hold Time	Tvhd	12	-	-	ns	
HSYNC Setup Time	Thst	12	-	-	ns	
HSYNC Hold Time	Thhd	12	-	-	ns	
Data Setup Time	Tdsu	12	-	-	ns	
Data Hold Time	Tdhd	12	-	-	ns	
DE Setup Time	Tdest	12	-	-	ns	
DE Hold Time	Tdehd	12	-	-	ns	

2.4.3 DE Mode :


Tv
Tvw
Tvbp
VSYNC (VSS)
HSYNC (VSS)
DE
Tvbp
VSYNC back porch
Tvdisp
display period
Tvfp
VSYNC front
porch
INPUT
DATA
GROUP
1st line
2nd line
3rd line
last line
HSYNC (VSS)
Thw
Thbp
Tclk
DCLK
Thbp
HSYNC back
porch
Thdisp
display period
Thfp
HSYNC front
porch
DE
DR[7:0]
R1
R2
R3
Rn
DG[7:0]
G1
G2
G3
Gn
DB[7:0]
B1
B2
B3
Bn

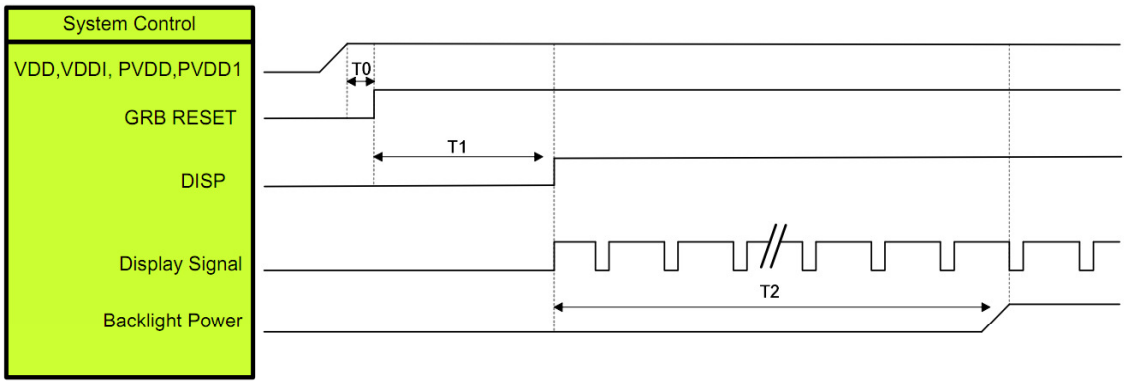
2.4.4 Parallel 24-bit RGB Input Timing Table :

Parallel 24-bit RGB Input Timing (VDD= 3.3V, GND= 0V, TA=25°C)

Parallel 24-bit RGB Interface Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	23	25	27	MHz	
HSYNC	Period Time	Th	808	816	896	DCLK	
	Display Period	Thdisp		800		DCLK	
	Back Porch	Thbp	4	8	48	DCLK	
	Front Porch	Thfp	4	8	48	DCLK	
	Pulse Width	Thw	2	4	8	DCLK	
VSYNC	Period Time	Tv	488	496	504	HSYNC	
	Display Period	Tvdisp		480		HSYNC	
	Back Porch	Tvbp	4	8	12	HSYNC	
	Front Porch	Tvfp	4	8	12	HSYNC	
	Pulse Width	Tvw	2	4	8	HSYNC	

2.5 Power ON/OFF Sequence

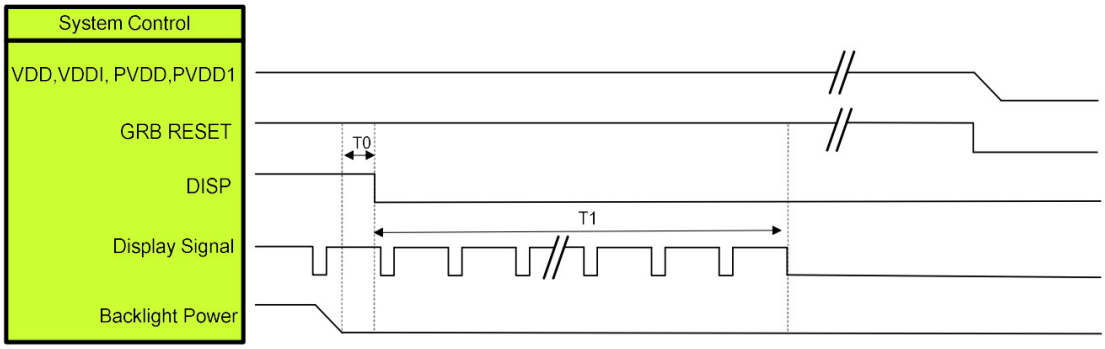
Power On Sequence



Symbol	Description	Min. Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET= “High” to DISP=”High”	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

Power OFF Sequence



Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP=”Low”	5	ms
T1	DISP=”Low” to IC internal voltage discharge complete	100	ms

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

3. OPTICAL CHARACTERISTICS

3.1 Characteristics

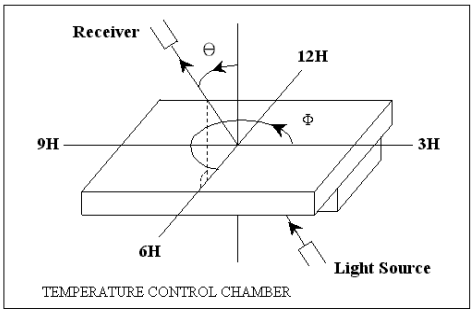
Electrical and Optical Characteristics

No.	Item			symbol / temp.		Min.	Typ.	Max.	Unit	Note
1	Response Time			Tr+Tf	θ=Φ=0°	-	30	40	ms	2
2	Viewing Angle	Hor.	Cr≧10	θ_{2+}	Φ= 0°	70	80	-	degree	3
				θ_{2-}	Φ= 180°	70	80	-		
		Ver.		θ_{1+}	Φ= 270°	70	80	-		
				θ_{1-}	Φ= 90°	70	80	-		
3	Contrast Ratio			Cr	25 ℃	800	1000	-	-	4
4	Red x-code			Rx	25 ℃	0.560	0.610	0.660	-	5
	Red y-code			Ry		0.296	0.346	0.396		
	Green x-code			Gx		0.331	0.381	0.431		
	Green y-code			Gy		0.526	0.576	0.626		
	Blue x-code			Bx		0.098	0.148	0.198		
	Blue y-code			By		0.062	0.112	0.162		
	White x-code			Wx		0.282	0.332	0.382		
	White y-code			Wy		0.308	0.358	0.408		
	Brightness			Y		-	1000	-	cd/m^2	
5	Brightness Uniformity				25 ℃	75	80	-	%	6

3.2 Definition of optical characteristics

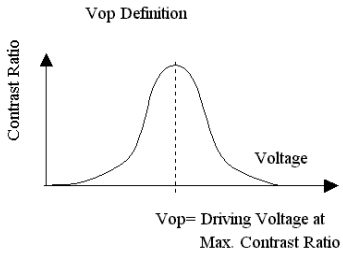
Measurement condition :

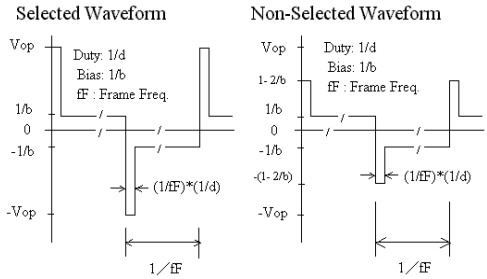
Transmissive and Transflective type



PHOTAL LCD-5000

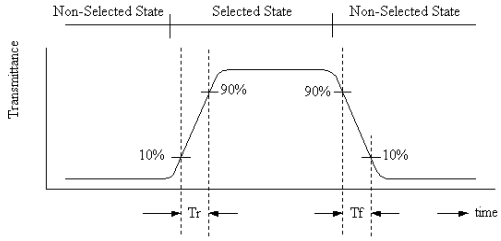
[Note 1] Definition of LCD Driving Vop and Waveform :



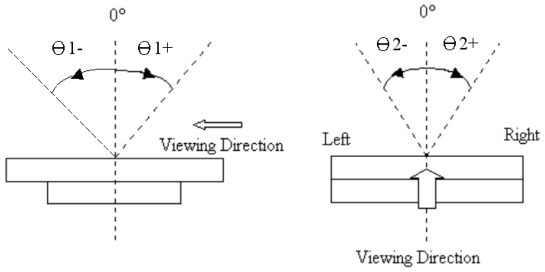


[Note 2] Definition of Response Time

for Negative type :

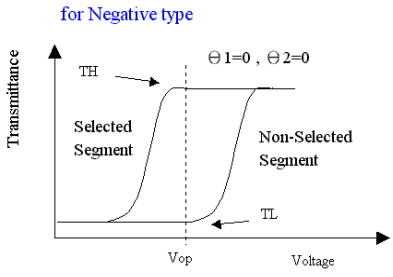


[Note 3] Definition of Viewing Angle :



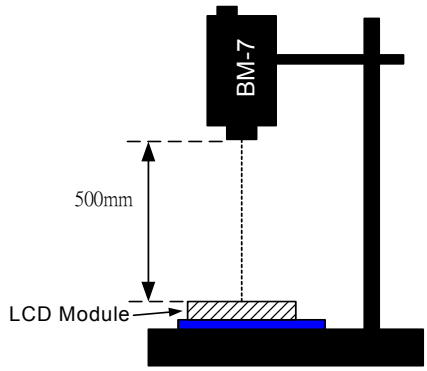
[Note 4] Definition of Contrast Ratio :

for Negative type

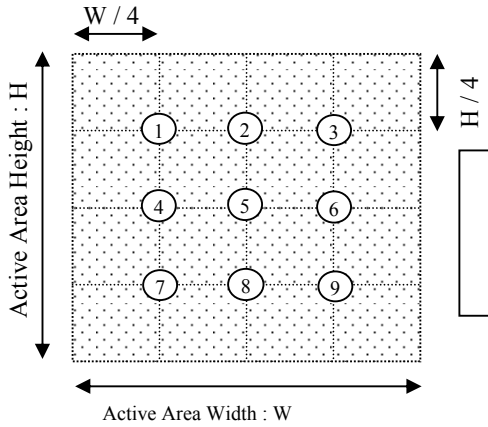


$$\text{Contrast Ratio} = \frac{TH}{TL}$$

[Note 5] Definition of measurement of Color Chromaticity and Brightness

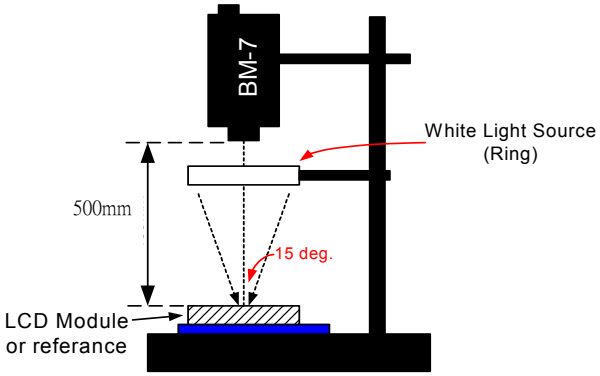


[Note 6] Definition of Brightness Uniformity



$$\text{Brightness Uniformity} = \frac{\text{Minimum Brightness of Point 1~9}}{\text{Maximum Brightness of Point 1~9}}$$

[Note 7] Definition of Measurement of Reflectance



4. RELIABILITY :

Item No	Items	Condition	Note
1	High temperature operating	70 ℃ , 200 hours	1
2	Low temperature operating	-20 ℃ , 200 hours	1
3	High temperature storage	80 ℃ , 200 hours	1
4	Low temperature storage	-30 ℃ , 200 hours	1
5	High temperature & humidity storage	60℃, 90%RH, 100 hours	2
6	Thermal Shock storage	-20℃, 30min.<=> 70℃, 30min. 10 Cycles	1
7	Vibration test	10 => 55 =>10 => 55 => 10 Hz , within 1 minute Amplitude : 1.5mm. 15 minutes for each Direction (X,Y,Z)	
8	Drop test	Packed, 100CM free fall, 6 sides, 1 corner, 3edges	

Note 1：The product move into the room temperature for at least 2 hours with no condensation.

Note 2：The product move into the room temperature for at least 24 hours with no condensation.

Note 3 : Please change the display picture (autorun) during operating mode. Avoid displaying static images to avoid image sticking , and the image sticking is accelerated by temperature.

* One single product test for only one item.

* Judgment after test : keep in room temperature for more than 2 hours.

- Current consumption < 2 times of initial value
- Function : work normally

5. PRODUCT HANDLING AND APPLICATION

☐ PRECAUTION FOR HANDLING LCM

- The LCD module contains a C-MOS LSI. People who operate the LCM should wear ESD protection eguipement to prevent ESD hurt on products.
- Do not input any signal before power is turned on.
- Do not take LCM from its packaging bag until it is assembled.
- Peel off the LCM protective film slowly since static electricity may be generated.
- Pay attention to the humidity of the work shop, 50~60%RH is satisfactory.
- Use a non-leak iron for soldering LCM.
- Do not touch the display surface or connection terminals area with bare hands.Smudges on the display surface reduce the insulation between terminals.
- Cautions for soldering to LCM:

  Condition for soldering I/O terminals:
  Temperature at iron tip :350℃±15℃.
  Soldering time : 3~4sec./ terminals.
  Type of solder : Eutectic solder(rosin flux filled).

☐ PRECAUTION IN USE OF LCM

- Do not contact or scratch the front surface and the contact pads of a LCM with hard materials such as metal or glass or with one's nail.
- To clean the surface , wipe it gently with soft cloth dampened by alcohol.
- Do not attempt to wiped off the contact pads.
- Keep LCM panels away from direct sunlight , also avoid them in high-temperature & high humidity environment for a long period.
- Do not drive LCM by DC voltage.
- Do not expose LCM to organic solvent.
- Liquid in LCM is hazardous substance. In case a contact with liquid crystal material is occured, be sure to immediately wash such material away by soap and water.
- The polarizer is easily damaged and should be handle with special care. Don't press or rub it with hard objects.

☐ PRECAUTION FOR STORING AND USE OF LCM

- To avoid degradation of the device , do not store the module under the conditions of direct sunlight , high temperature or high humidity . Keep the module in bags designed to prevent static electricity charging under low temperature / normal humidity conditions(avoid high temperature / high humidity and low temperature below 0℃)
- Never use the LCD , LCM under 45 Hz , the liquid crystal will decomposition and cause permently damage on display !!

☐ USING ON MEDICAL CARE , SAFETY OR HAZARDOUS APPLICATION OR SYSTEM

- For the application in medical care, safety and hazardous prodcuts or systems, an authorization from URT is required. URT will not responsible for any damage or loss which caused by the products without any authorization given by URT.
- This product is not allowed to be designed and used for military application and/or purpose.
- The delivery of this product to the countries and/or regions where the embargoes are imposed by U.N. is prohibited.
- The application and delivery of this product must comply with Startegic High-Tech Commodities (SHTC) export control and the sales to the embargoed and/or sanctioned countries or regions are strictly prohibited.

6. DATE CODE OF PRODUCTS

- Date code will be shown on each product :

- **YY MM DD - XXXX**

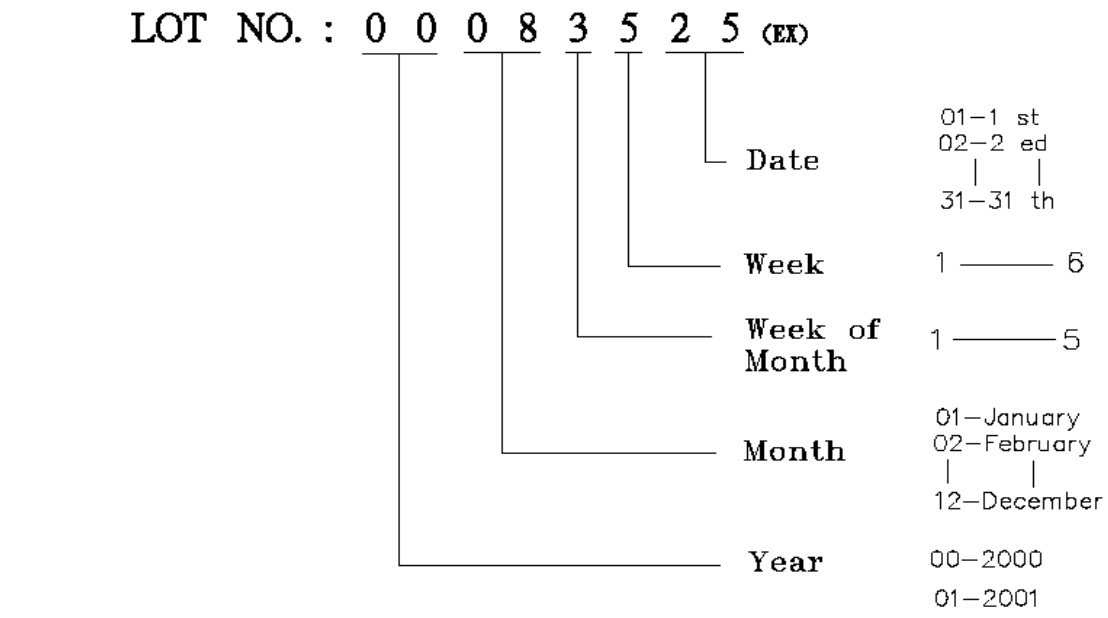
  Year Month Day - Serial no.

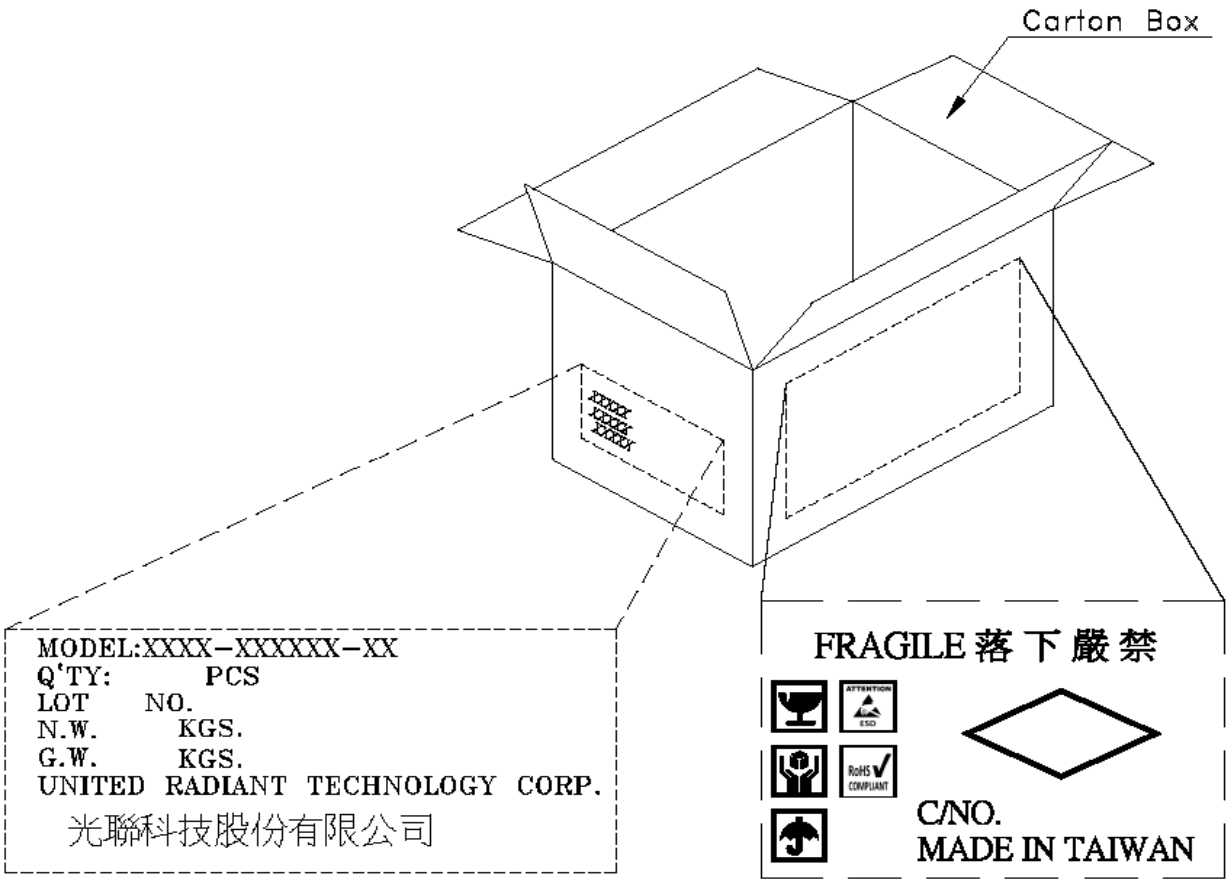
- Example: 141108 - 0003 ==> Year 2014, November,8th , Serial no. 0003

Note ： The lot no. attached on the packing box will be used for tracking once the part is too small to print the date code.

7. Lot No.

Instruction of lot number:





8. INSPECTION STANDARD

8.1. QUALITY :

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

8.1.1. THE METHOD OF PRESERVING GOODS

AFTER DELIVERY OF GOODS FROM U.R.T. 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.

8.1.2. 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

ISO2859-1 (SAME AS MIL-STD-105E) , LEVEL Ⅱ SINGLE PLAN.

CLASS	AQL(%)
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.

8.1.3. WARRANTY POLICY

U.R.T. WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS. U.R.T. WILL REPLACE GOOD PRODUCTS FOR THESE DEFECT PRODUC′ WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF U.R.T.

8.2. CHECKING CONDITION

8.2.1. CHECKING VIEWING DIRECTION SHALL BE IN THE 45 DEGREE AREA TO THE SAMPLE.

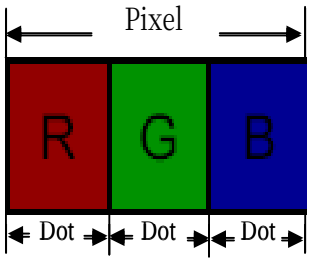
8.2.2. CHECKER SHALL SEE OVER 350±50 mm. WITH BARE EYES FAR FROM SAMPLE AND USING 2 PCS. OF 20W FLUORESCENT LAMP.

8.3. 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. POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA.	ACCORDING TO DRAWING REJECTED.	Minor
	6. BLEMISH、BLACK SPOT、 WHITE SPOT IN THE LCD AND LCD GLASS CRACKS (INSIDE VIEWING AREA)	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	7. BLEMISH、BLACK SPOT WHITE SPOT AND SCRATCH ON THE POLARIZER (INSIDE VIEWING AREA)	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	8. BUBBLE IN POLARIZER (INSIDE VIEWING AREA)	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	9. LCD'S RAINBOW COLOR (INSIDE VIEWING AREA)	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

Note: If Viewing Area (VA) have the same dimension with Active Area(AA), then only Active Area will be defined in the drawing , use the AA as VA for inspection judgement

8.4. STANDARD OF VISUAL INSPECTION

<table>
<tr><th>NO.</th><th>CLASS</th><th>ITEM</th><th>JUDGEMENT</th></tr>
<tr><td>8.4.1</td><td>MINOR</td><td>BLACK AND WHITE SPOT
FOREIGN MATERIEL
DUST IN THE CELL
BLEMISH
SCRATCH
(IN THE VIEWING AREA)</td><td>(A) ROUND TYPE: unit : mm.
<table>
<tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>Φ ≦ 0.10</td><td>DISREGARD</td></tr>
<tr><td>0.10 < Φ ≦ 0.25</td><td>3(Distance>5mm)</td></tr>
<tr><td>0.25 < 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>DISREGARD</td></tr>
<tr><td>L ≦ 5.0</td><td>0.03 < W ≦0.07</td><td>3(Distance>5mm)</td></tr>
<tr><td>------</td><td>0.07 < W</td><td>FOLLOW ROUND TYPE</td></tr>
</table></td></tr>
<tr><td>8.4.2</td><td>MINOR</td><td>BUBBLE IN POLARIZER
DENT ON POLARIZER
(IN THE VIEWING AREA)</td><td>unit : mm.
<table>
<tr><th>DIAMETER</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>Φ ≦0.2</td><td>DISREGARD</td></tr>
<tr><td>0.2 < Φ ≦ 0.5</td><td>2 (Distance>5mm)</td></tr>
<tr><td>0.5 < Φ</td><td>0</td></tr>
</table></td></tr>
<tr><td>8.4.3</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≦ 4 (Distance>5mm)</td></tr>
<tr><td>Dark dot</td><td>N≦ 4 (Distance>5mm)</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.
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>
</table>