

# SPECIFICATION

## OF

### LIQUID CRYSTAL DISPLAY MODULE



CUSTOMER : URT-STD

Model No. : UMOH-9601MD-1T

Model version : 0

Document Revision : 0

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**

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Mar-04-2022  
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## CONTENTS:

No.	Item	Page
1	<b>BASIC SPECIFICATION</b> 1.1 Mechanical Specification 1.2 Display Specification 1.3 Outline Dimension 1.4 Block Diagram 1.5 Interface Pin	4 4 5 6 7
2	<b>ELECTRICAL CHARACTERISTICS</b> 2.1 Absolute Maximum Ratings 2.2 DC Characteristics 2.3 Back-light only Specification 2.4 AC Characteristics 2.5 Power Sequence	8 8 9 10~11 12
3	<b>OPTICAL CHARACTERISTICS</b> 3.1 Condition 3.2 Definition of Optical Characteristics	13 14~15
4	<b>RELIABILITY</b>	16
5	<b>PRODUCT HANDING AND APPLICATION</b>	17
6	<b>DATECODE</b>	18
7	<b>LOT NO</b>	19
8	<b>INSPECTION STANDARD</b>	20~22

## 1. BASIC SPECIFICATION

### 1.1 Mechanical specifications

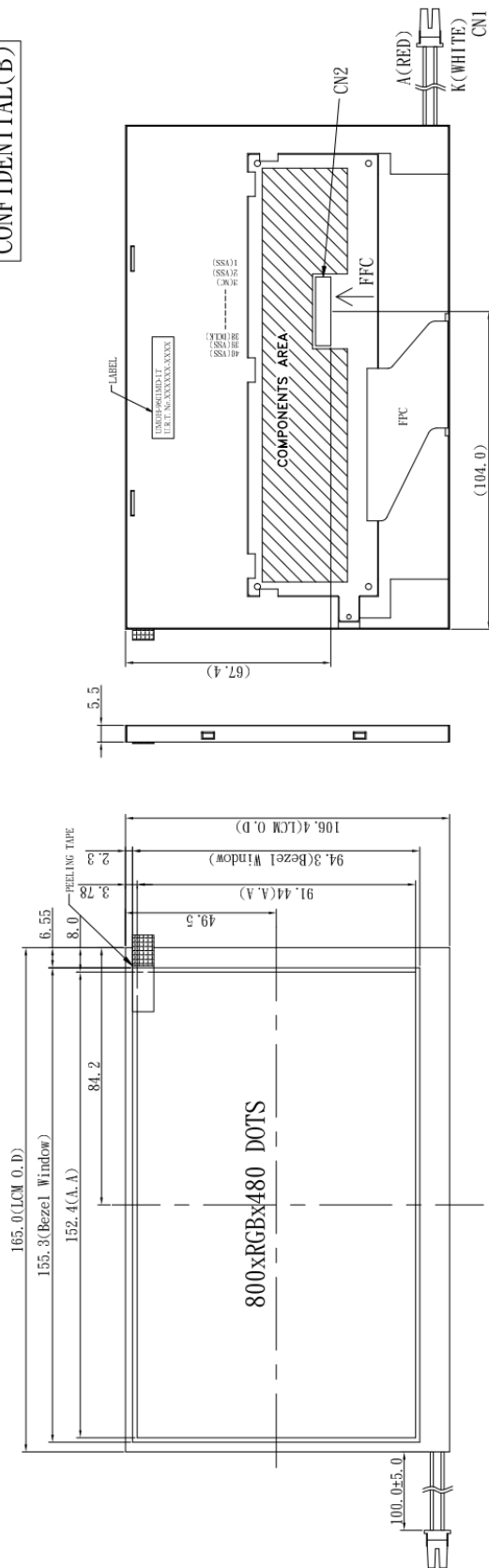
Items	Nominal Dimension	Unit
Active screen size	7.0" Diagonal	-
Dot Matrix	800 x RGB x 480	dots
Module Size (W x H x T)	165.0 x 106.4 x 5.5	mm.
Active Area (W x H)	152.4 x 91.44	mm.
Pixel Size ( W×H )	0.1905 x 0.1905	mm.
Color depth	262K	color
Interface	Parallel 18-bit RGB	-
Driving IC Package	COG	-
Module weight	128±10%	g

### 1.2 Display specification

Display	Descriptions	Note
LCD Type	IPS	-
LCD Mode	Normally Black	-
Polarizer Mode	Transmissive	-
Polarizer Surface	Anti-glare	-
Pixel arrangement	RGB-stripe	-
Backlight Type	LED	-
Viewing Direction	Full	-

1.3 Outline dimension

CONFIDENTIAL(B)

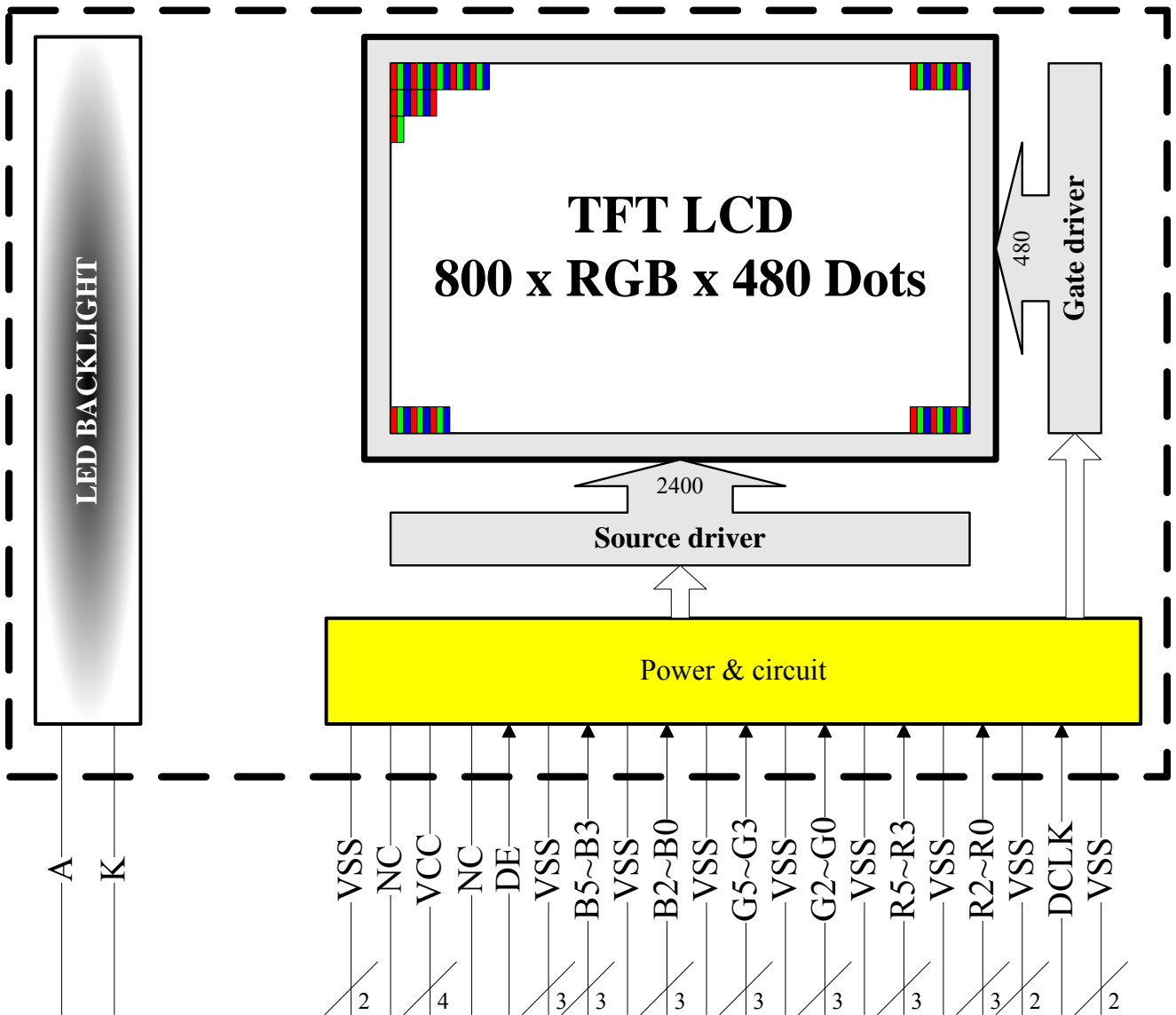


- NOTE :
- 1. LCD : TFT TRANSMISSIVE TYPE , NORMAL BLACK
  - 2. VIEWING DIRECTION : FULL
  - 3. Top : -20~70 °C , Tst : -30~80 °C
  - 4. LED COLOR : WHITE , 27 PCS DICE  
CONSTANT CURRENT : 210mA ; Vled=9.9V(TYP)
  - 5. GENERAL TOLERANCE:±0.3
  - 6. CN1:BHSR-02VS-1(JST) OR EQUIVALENT
  - 7. CN2:04-6299-640-020-846+(KYOCERA) OR EQUIVALENT

0.0635	R	G	B	R
0.1905	R	G	B	R

DOTS DETAIL

## 1.4 Block diagram:



## 1.5 Interface Pin Connection:

Pin No.	Pin Symbol	I/O	Description
1~2	VSS	P	GND
3	NC	-	No connection
4~7	VCC	P	Power supply for Module (+3.3V)
8	NC	-	No connection
9	DE	I	Data enable
10~12	VSS	P	GND
13~15	B5~B3	I	Blue data input
16	VSS	P	GND
17~19	B2~B0	I	Blue data input
20	VSS	P	GND
21~23	G5~G3	I	Green data input
24	VSS	P	GND
25~27	G2~G0	I	Green data input
28	VSS	P	GND
29~31	R5~R3	I	Red data input
32	VSS	P	GND
33~35	R2~R0	I	Red data input
36~37	VSS	P	GND
38	DCLK	I	Dot clock
39~40	VSS	P	GND

B/L interface pin :

Pin No.	Pin Symbol	I/O	Description
1	A	P	Power supply for LED+
2	K	P	Power supply for LED-

## 2. ELECTRICAL CHARACTERISTICS

### 2.1 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit
Power supply voltage	VCC	-0.3	4.5	V
Input voltage	V <sub>in</sub>	-0.3	4.5	V
Operate temperature range	T <sub>OP</sub>	-20	70	°C
Storage temperature range	T <sub>ST</sub>	-30	80	°C

### 2.2 DC Characteristics:

T<sub>a</sub> = 25°C

Items	Symbol	Min.	Typ.	Max.	Unit	Condition
Supply voltage	VCC	3.0	3.3	3.6	V	-
Input Voltage	V <sub>IL</sub>	0	-	0.3*VCC	V	Note 1
	V <sub>IH</sub>	0.7*VCC	-	VCC	V	Note 1
Current consumption	I <sub>VCC</sub>	-	130	250	mA	Note 2

\*Note1 :

HSYNC, VSYNC, DE, Digital Data.

\*Note2 :

Measuring Condition:

Standard Value MAX.

T<sub>a</sub> = 25°C

VCC -GND = 3.3V

Display Pattern = Check pattern

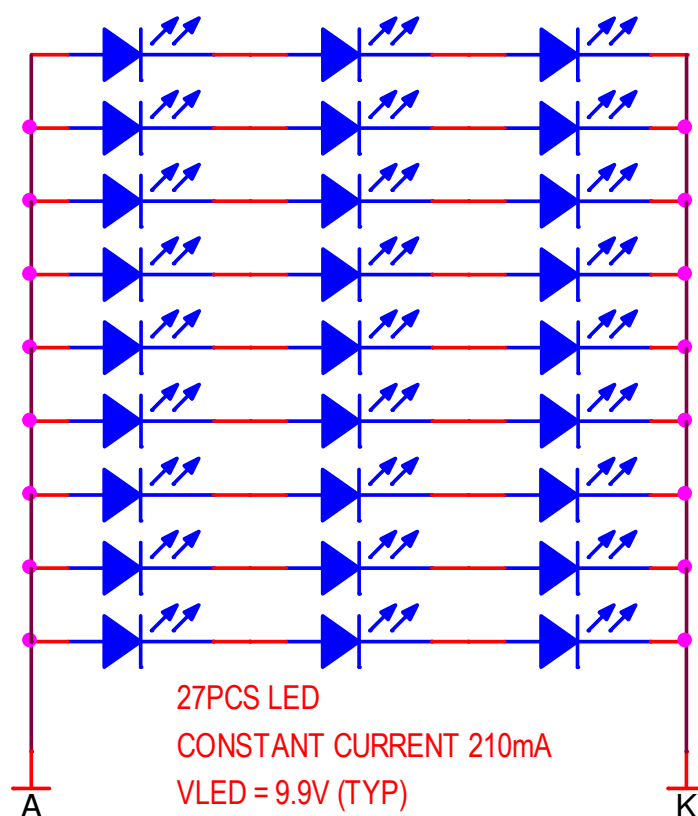


## 2.3 Back-light only Specification :

PARAMETER	SYMBOL	MIN	TYP	MAX	Unit	Test Condition	NOTE
Supply Current	If	-	210	-	mA	Ta=25°C	-
Supply Voltage	Vf	7.95	9.9	10.35	V	Ta=25°C	-
Half-Life Time	Lf	-	50000	-	hrs	Ta=25°C	1

Note 1 : The "Half-Life Time" is defined as the LED chip brightness decreases to 50% than original brightness, Based on Ta 25±2°C, 60±10% RH condition.

Note 2 : LED backlight is 27 LEDs.

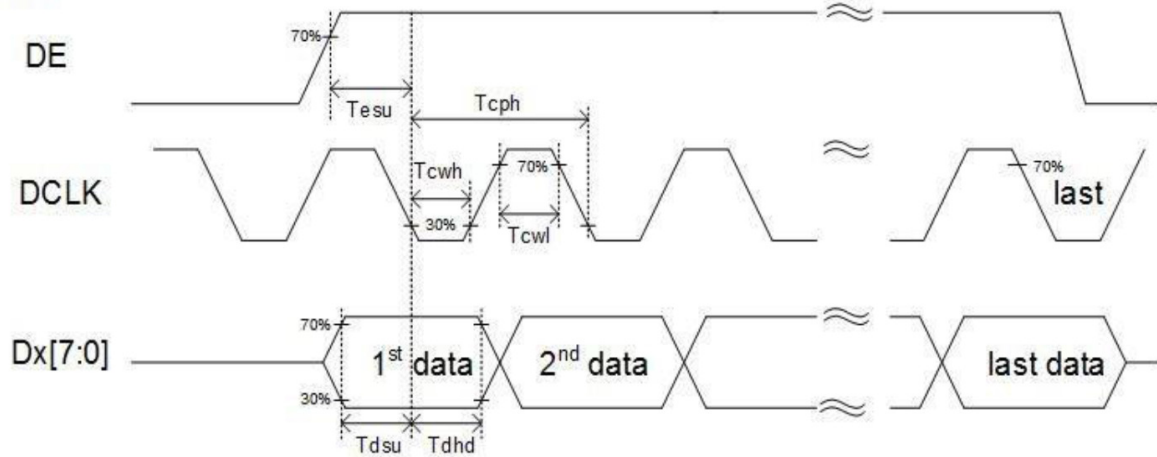


## 2.4 AC Characteristics

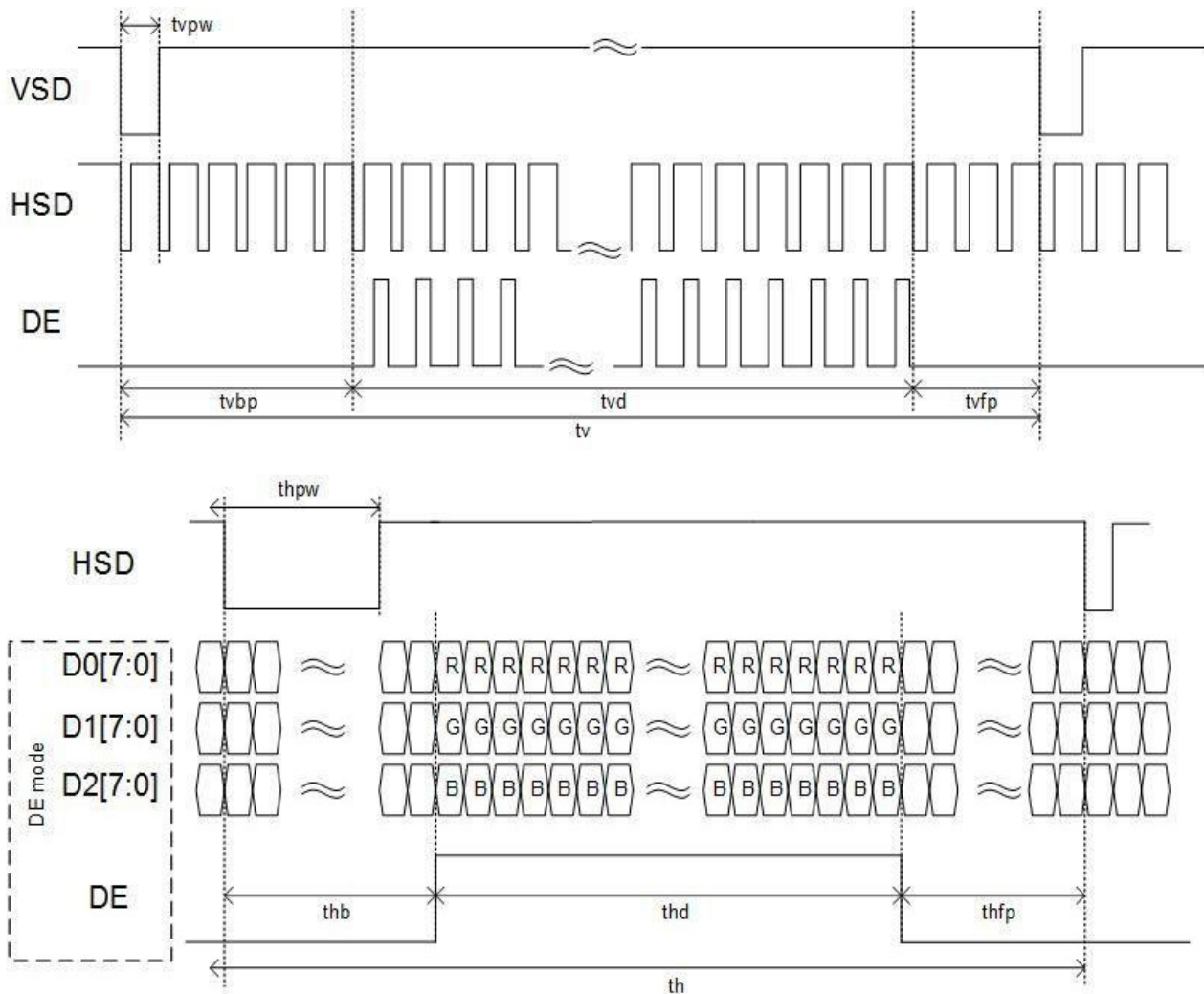
Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK cycle time	Tcph	20		220	ns	
DCLK pulse duty	Tcwh	35	50	65	%	
VSD setup time	Tvst	8			ns	
VSD hold time	Tvhd	8			ns	
HSD setup time	Thst	8			ns	
HSD hold time	Thhd	8			ns	
Data setup time	Tdsu	8			ns	
Data hold time	Tdhd	8			ns	
DE setup time	Tesu	8			ns	
DE hold time	Tehd	8			ns	
DCLK frequency	fclk	28	30	32	MHz	
Horizontal display area	thd	800			Tcph	
HSD period time	th	889	902	915	Tcph	
HSD pulse width	thpw	5	10	15	Tcph	
HSD back porch	thb	32			Tcph	
HSD front porch	thfp	52	60	68	Tcph	
Vertical display area	tvd	480			th	
VSD period time	tv	546	555	564	th	
VSD pulse width	tvpw	6	10	14	Th	
VSD back porch	tvb	5			th	
VSD front porch	tvfp	55	60	65	th	

## Timing Controller Timing Chart

DE mode

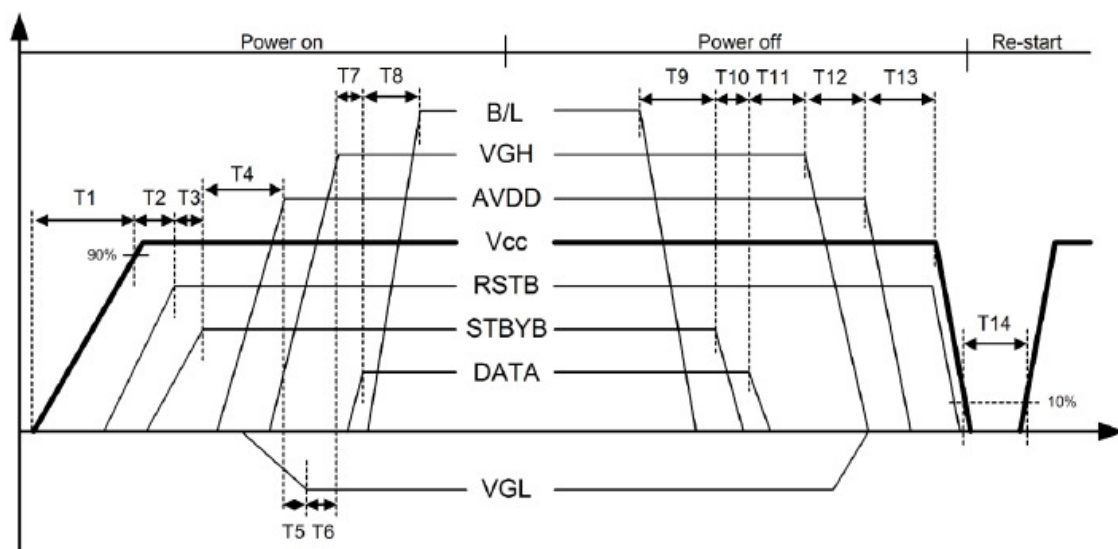


Input clock and timing diagram.



Data Input Format.

## 2.5 Power Sequence :



Item	Min	Typ.	Max.	Unit
T1	--	--	20	ms
T2	1	--	--	ms
T3	1	--	--	ms
T4	50	--	--	ms
T5	32	--	--	ms
T6	16	--	--	ms
T7	16	--	--	ms
T8	32	--	--	ms
T9	32	--	--	ms
T10	32	--	--	ms
T11	50	--	--	ms
T12	16	--	--	ms
T13	32	--	--	ms
T14	1000	--	--	ms

The Data are included in the R0~R7, G0~G7, B0~B7, HSD, VSD, DCLK, DE, **MODE**, SHLR, and UPDN.

### 3. OPTICAL CHARACTERISTICS

#### 3.1 Characteristics

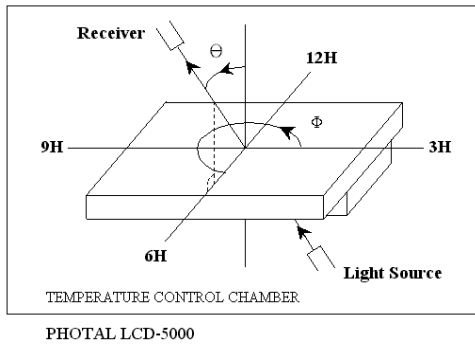
Electrical and Optical Characteristics

Electrical and Optical Characteristics										
No.	Item			symbol / temp.		Min.	Typ.	Max.	Unit	Note
1	Response Time			Tr+Tf	25 °C	-	30	40	ms	2
2	Viewing Angle	Hor.	Cr≥10	θ <sub>2+</sub>	Φ= 0°	80	85	-	degree	3
				θ <sub>2-</sub>	Φ= 180°	80	85	-		
		Ver.		θ <sub>1+</sub>	Φ= 270°	80	85	-		
				θ <sub>1-</sub>	Φ= 90°	80	85	-		
3	Contrast Ratio			Cr	25 °C	700	1000	-	-	4
4	Red x-code			Rx	25 °C	0.59	0.64	0.69	-	5
	Red y-code			Ry		0.29	0.34	0.39		
	Green x-code			Gx		0.28	0.33	0.38		
	Green y-code			Gy		0.58	0.63	0.68		
	Blue x-code			Bx		0.10	0.15	0.20		
	Blue y-code			By		0.00	0.05	0.10		
	White x-code			Wx		0.26	0.31	0.36		
	White y-code			Wy		0.29	0.34	0.39		
	Brightness			Y		400	500	-	cd/m <sup>2</sup>	
5	Brightness Uniformity			U	25 °C	80	-	-	%	6

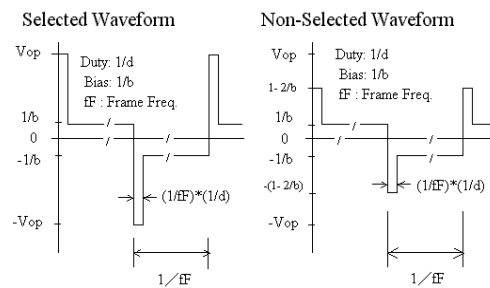
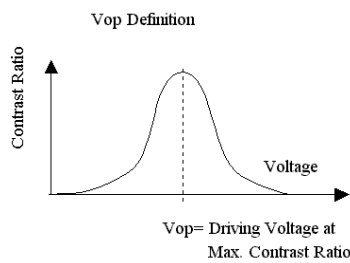
## 3.2 Definition of optical characteristics

### Measurement condition :

#### Transmissive and Transflective type

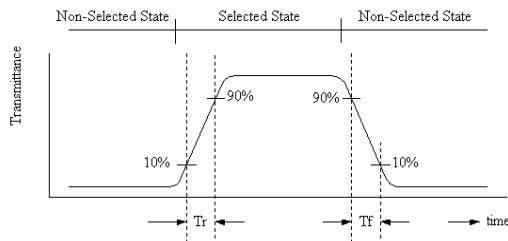


### [Note 1] Definition of LCD Driving Vop and Waveform :

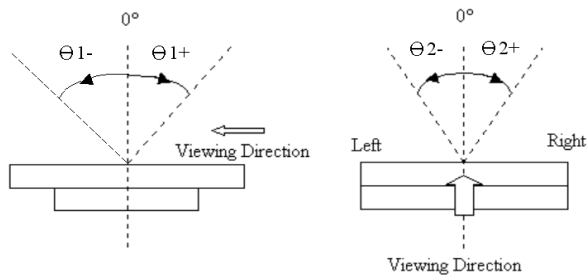


### [Note 2] Definition of Response Time

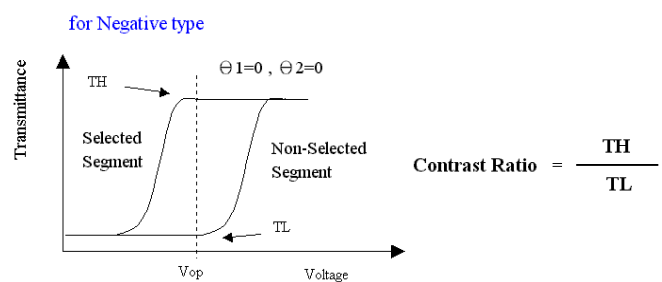
#### for Negative type :



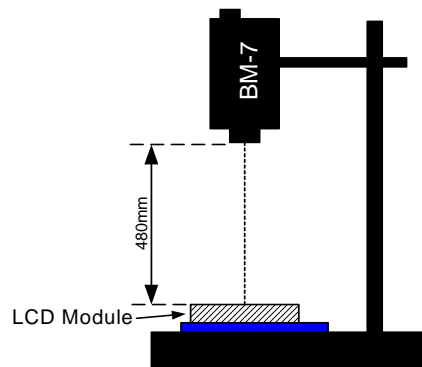
### [Note 3] Definition of Viewing Angle :



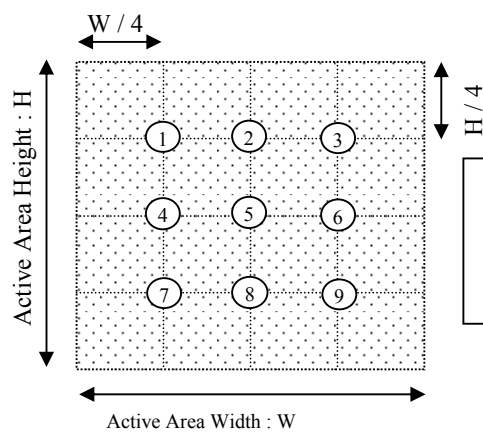
### [Note 4] Definition of Contrast Ratio :



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

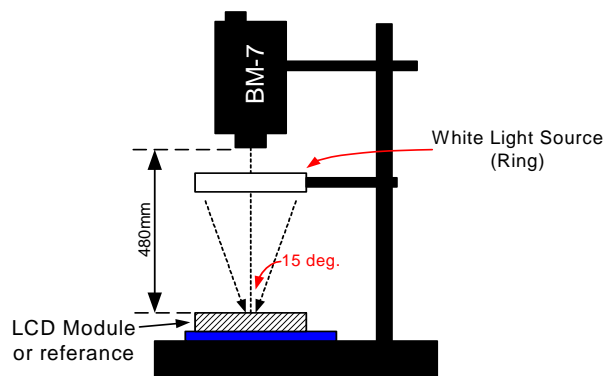


**[Note 6] Definition of Brightness Uniformity**



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

**[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	-30 , 30min.<=> 80 , 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	
9	Life time	50,000 hours 25 , 60%RH , specification condition driving	

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 equipment 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  $\pm$  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 wipe 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 expose LCM to organic solvent.

Liquid in LCM is hazardous substance. In case a contact with liquid crystal material is occurred, be sure to immediately wash such material away by soap and water.

The polarizer is easily damaged and should be handled 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 decompose and cause permanent damage on display !!

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

For the application in medical care, safety and hazardous products or systems, an authorization from URT is required. URT will not be responsible for any damage or loss which is 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 Strategic 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 :

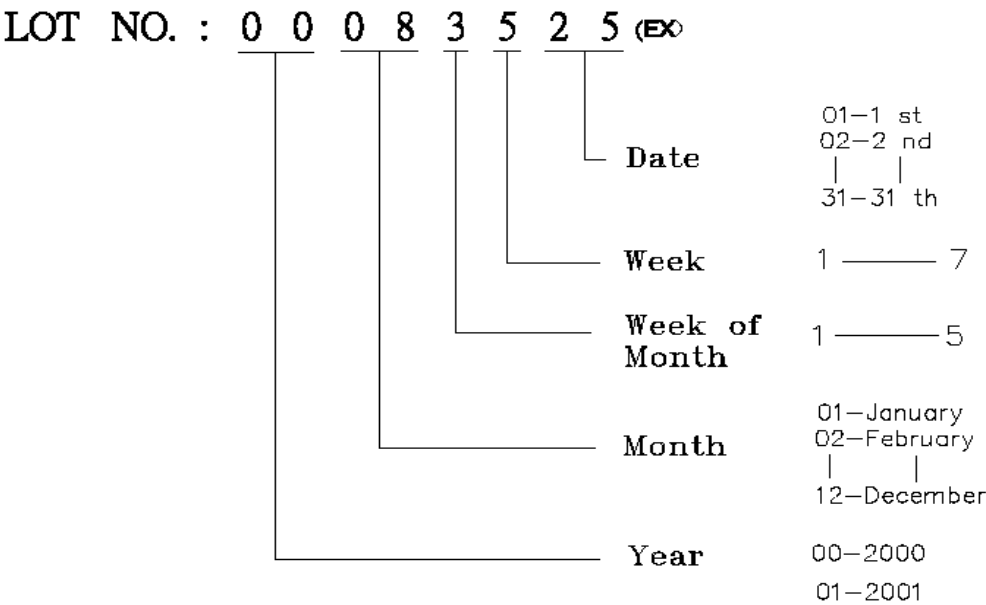
**YY MM DD - XXXX**  
|   |   |   |  
Year Month Day - Production Lot No.

Example: 121108 - 0003 ==> Year 2012, November,8th , Production Lot No. 0003

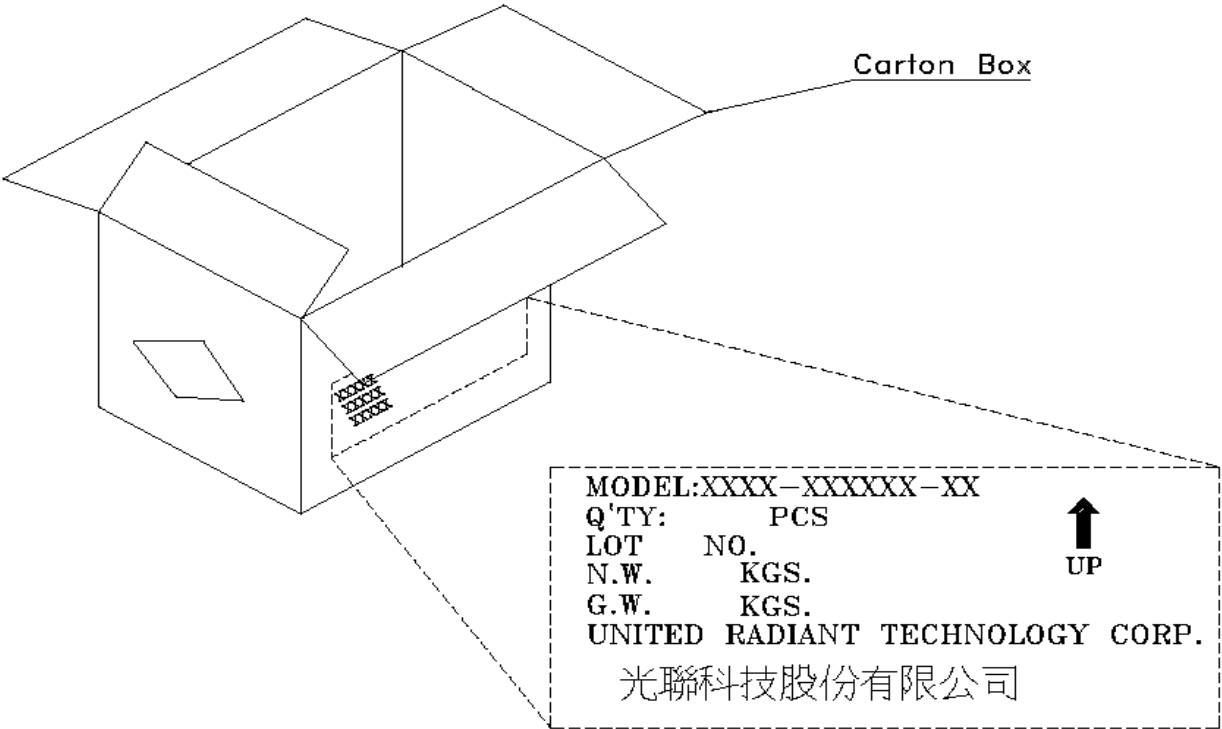
Note : The lot no. attached on the packing box will be used for tracking once the part is too small to print the date code.

7. LOT NO.

Instruction of lot number:



Lable of carton:



## 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 SINGLE PLAN.

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.

#### 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 NEW PRODUCTS FOR THESE DEFECT PRODUCT WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF U.R.T.

## 8.2. CHECKING CONDITION

**8.2.1.** VIEWING DISTANCE IS APPROXIMATELY :  $30 \pm 5$  CM.

**8.2.2.** VIEWING ANGLE IS NORMAL TO THE LCD PANEL WITH  $45^\circ$ .

**8.2.3.** AMBIENT ILLUMINANCE : 2 PCS OF 20W FLUORESCENT LAMPS( DISTANCE TO THE SAMPLE  $>100$ CM) OR  $1000 \pm 200$  LUX.

### 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. VIEWING AREA	POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA .....REJECTED	Minor
	6. CANNOT BE REMOVED, BLEMISH BLACK SPOTS, WHITE SPOTS, ON 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

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

NO.	CLASS	ITEM	JUDGEMENT																				
8.4.1	MINOR	BLACK AND WHITE SPOT FOREIGN MATERIEL DUST IN THE CELL BLEMISH SCRATCH	<div>(A) ROUND TYPE: <span>unit : mm.</span><table><tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>0.1</td><td>DISREGARD</td></tr><tr><td>0.1 &lt; 0.30</td><td>3 (Distance&gt;5mm)</td></tr><tr><td>0.30 &lt;</td><td>0</td></tr></table><p>NOTE: =(LENGTH+WIDTH)/2</p><div>(B) LINEAR TYPE: <span>unit : mm.</span><table><tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>-----</td><td>W 0.05</td><td>DISREGARD</td></tr><tr><td>L 10.0</td><td>0.05 &lt; W 0.10</td><td>3 (Distance&gt;5mm)</td></tr><tr><td>-----</td><td>0.10 &lt; W</td><td>FOLLOW ROUND TYPE</td></tr></table></div></div>	DIAMETER (mm.)	ACCEPTABLE Q'TY	0.1	DISREGARD	0.1 < 0.30	3 (Distance>5mm)	0.30 <	0	LENGTH	WIDTH	ACCEPTABLE Q'TY	-----	W 0.05	DISREGARD	L 10.0	0.05 < W 0.10	3 (Distance>5mm)	-----	0.10 < W	FOLLOW ROUND TYPE
DIAMETER (mm.)	ACCEPTABLE Q'TY																						
0.1	DISREGARD																						
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LENGTH	WIDTH	ACCEPTABLE Q'TY																					
-----	W 0.05	DISREGARD																					
L 10.0	0.05 < W 0.10	3 (Distance>5mm)																					
-----	0.10 < W	FOLLOW ROUND TYPE																					
8.4.2	MINOR	BUBBLE IN POLARIZER DENT ON POLARIZER	<div><span>unit : mm.</span><table><tr><th>DIAMETER</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>0.2</td><td>DISREGARD</td></tr><tr><td>0.2 &lt; 0.5</td><td>3 (Distance&gt;5mm)</td></tr><tr><td>0.5 &lt;</td><td>0</td></tr></table></div>	DIAMETER	ACCEPTABLE Q'TY	0.2	DISREGARD	0.2 < 0.5	3 (Distance>5mm)	0.5 <	0												
DIAMETER	ACCEPTABLE Q'TY																						
0.2	DISREGARD																						
0.2 < 0.5	3 (Distance>5mm)																						
0.5 <	0																						
8.4.3	MINOR	DOT DEFECT	<table><tr><th>Items</th><th>ACC. Q'TY</th></tr><tr><td>Bright dot</td><td>N 4 (Distance &gt; 5mm)</td></tr><tr><td>Dark dot</td><td>N 4 (Distance &gt; 5mm)</td></tr></table> <div><div>Pixel Define :</div><div><div><div>Pixel</div><div><div>R</div><div>G</div><div>B</div></div><div><div>Dot</div><div>Dot</div><div>Dot</div></div></div></div><div><p>Note 1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.</p><p>Note 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.</p><p>Note 3: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green ,blue pattern.</p></div></div>	Items	ACC. Q'TY	Bright dot	N 4 (Distance > 5mm)	Dark dot	N 4 (Distance > 5mm)														
Items	ACC. Q'TY																						
Bright dot	N 4 (Distance > 5mm)																						
Dark dot	N 4 (Distance > 5mm)																						