

CONFIDENTIAL(B)

SPECIFICATION

OF

LIQUID CRYSTAL DISPLAY MODULE

CUSTOMER : URT-STDModel No. : UMSH-8586MD-1T(REV1G)Model version : 0Document Revision : 10

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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Revision 10 ; UMSH-8586MD-1T(REV1G) Ver. 0 ; October-17-2023

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Revision record

Document Revision	Model No. Version No.	Description	Revision by
0	UMSH-8586MD-T (UFSH-K054EY-12FT) Version No. 0	1. Modify the Interface from MPU mode to Parallel 18-bit RGB mode. 2. Modify the module number from UMSH-8246MD-2T to UMSH-8586MD-T.	H.F. Kuo Zi Xin Ou 16-May-2011
1	UMSH-8586MD-1T (UFSH-K054EY-12FT) Version No. 0	1. Add the Anti-newton ring(Film) touch panel. 2. Modify the module number from UMSH-8586MD-T to UMSH-8586MD-1T.	H.F. Kuo Zi Xin Ou 16-May-2011
2	UMSH-8586MD-1T (UFSH-K054EY-12FT) Version No. 0	Modify the typ. & min. of viewing angle.	H.F. Kuo Zi Xin Ou 27-Feb-2013
3	UMSH-8586MD-1T (UFSH-K054EY-12FT) Version No. 0	Modify the typ. & min. of Brightness.	H.F. Kuo Zi Xin Ou 1-Apr-2013
4	UMSH-8586MD-1T (UFSH-K054EY-12FT) Version No. 1	Modify the description of the R/L and U/D.	Johnny Wu Dennis Lee 24-Jul-2014
5	UMSH-8586MD-1T (UFSH-K054EY-12FT) Version No. 1	Modify the packing mode.	Design Section 05-Dec-2018
6	UMSH-8586MD-1T(REV1) Version No. 0	1. Change switch regulator IC, PCB is modified for new version. 2. Modify module number from UMSH-8586MD-1T to UMSH-8586MD-1T(REV1).	Peggy Ho George Pan 30-May-2019
7	UMSH-8586MD-1T(REV1) Version No. 0	Correct the module label to UMSH-8586MD-1T(REV1).	Peggy Ho George Pan 08-Jul-2019
8	UMSH-8586MD-1T(REV1) Version No. 1	Modify the lower bezel of backlight with two extra holes.	Peggy Ho George Pan 15-Oct-2021
9	UMSH-8586MD-1T(REV1) Version No. 2	1. Add compatible OP- Amp IC. 2. Add the kapton on PCB board.	Peggy Ho George Pan 29-Jun-2022
10	UMSH-8586MD-1T(REV1G) Version No. 0	1. Change TFT LCD. 2. Modify module number from UMSH-8586MD-1T(REV1) to UMSH-8586MD-1T(REV1G).	Peggy Ho George Pan 17-Oct-2023
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1. BASIC SPECIFICATION

1.1 Mechanical specifications

Items	Nominal Dimension	Unit
Active screen size	5.7" diagonal	-
Dot Matrix	320 x RGB x 240	Pixel
Module Size (W x H x T)	144.0 x 104.6 x 14.7	mm.
Active Area (W x H)	115.2 x 86.4	mm.
Dot Pitch (W x H)	0.36 x 0.36	mm.
Color depth	262K	color
Interface	Parallel 18-bit RGB	-
Driving IC Package	COG	-
Module weight	248 ±10%	g

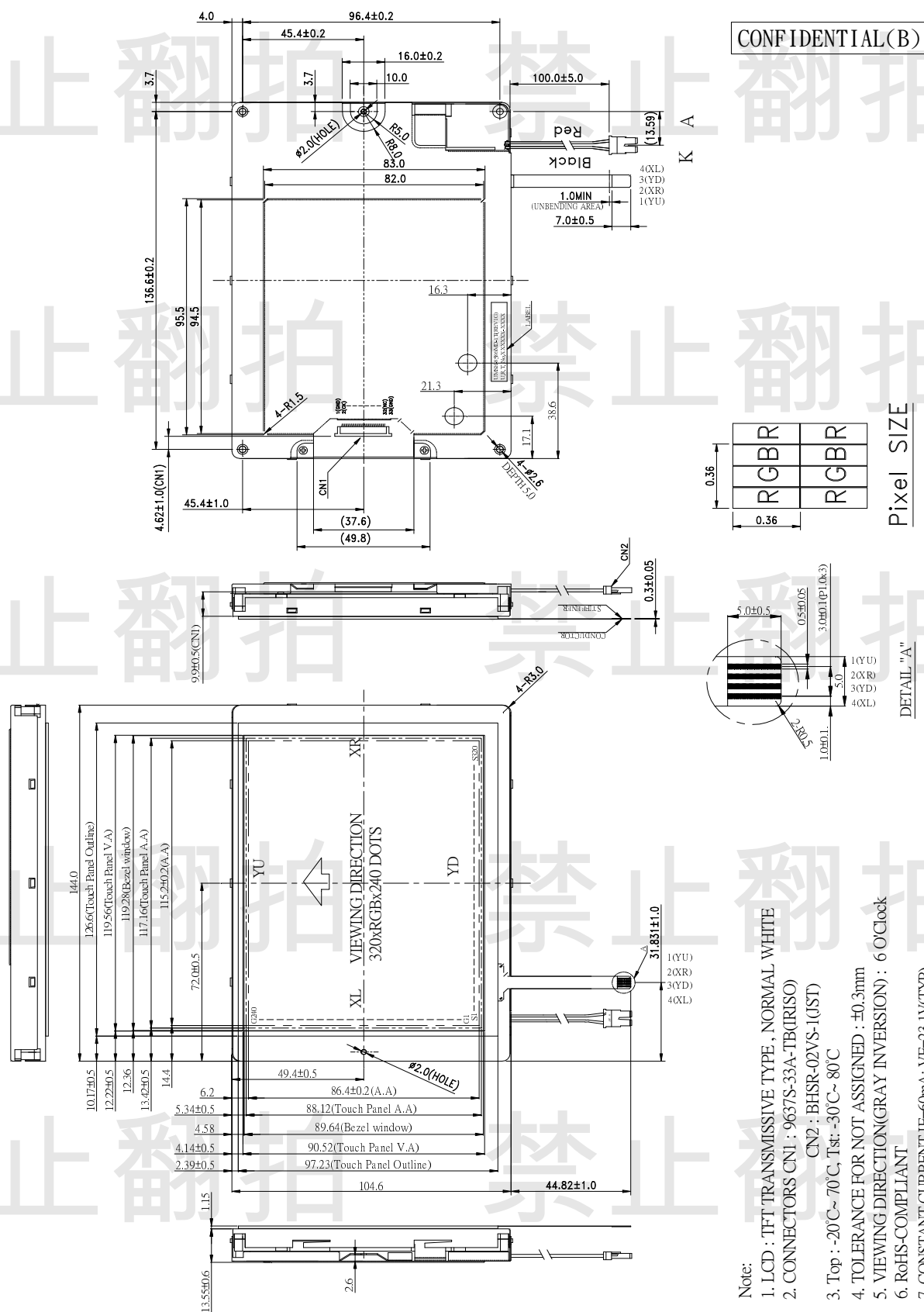
1.2 Display specification

Display	Descriptions	Note
LCD Type	a-Si TFT	-
LCD Mode	TN / Normal white	-
Polarizer Mode	Transmissive	-
Polarizer Surface	Glare	-
Pixel arrangement	RGB-stripe	-
Backlight Type	LED	-
Viewing Direction (Gary scale inversion)	6 O'clock Direction	1

* Color tone is slightly changed by temperature and driving voltage.

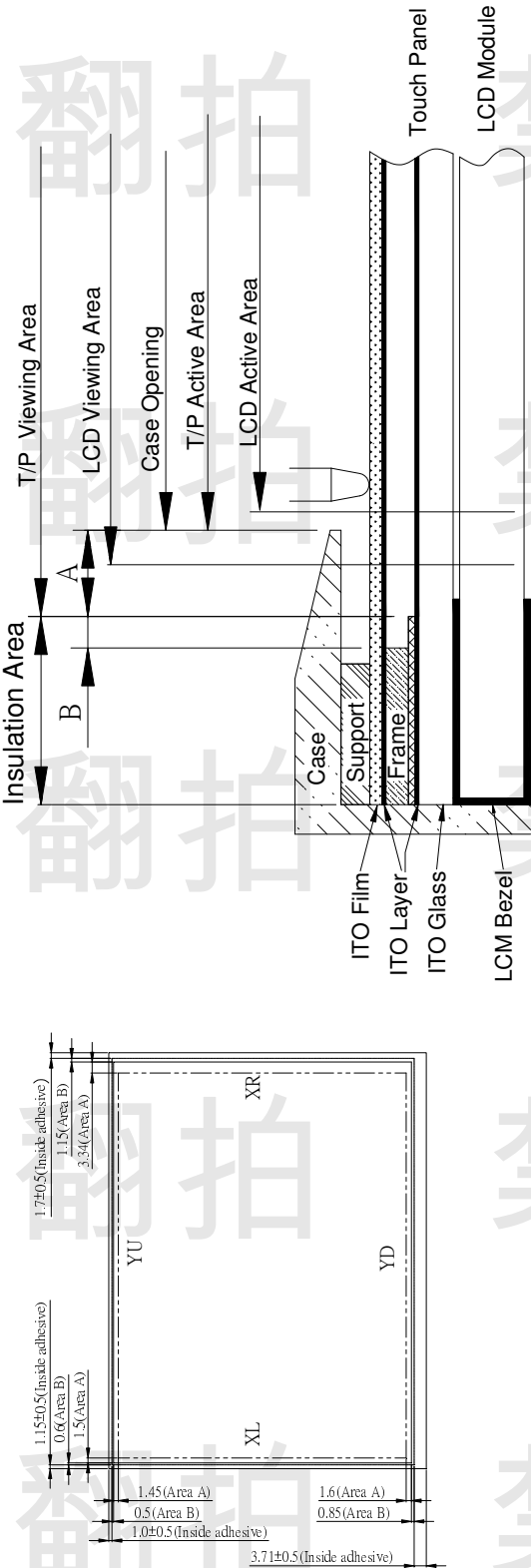
Note 1 : The viewing direction defined in this specification is according to the rubbing direction of its TFT surface treatment by the TFT glass manufacturer. The grayscale inversion is at this direction as well. However, the optimal viewing direction for human view is normally where the color does NOT change to grayscale inversion, and this would be the opposite site of the specified viewing direction in this specification. In any case we advise customers to judge by themselves, and be aware of this phenomenon.

1.3 Outline dimension



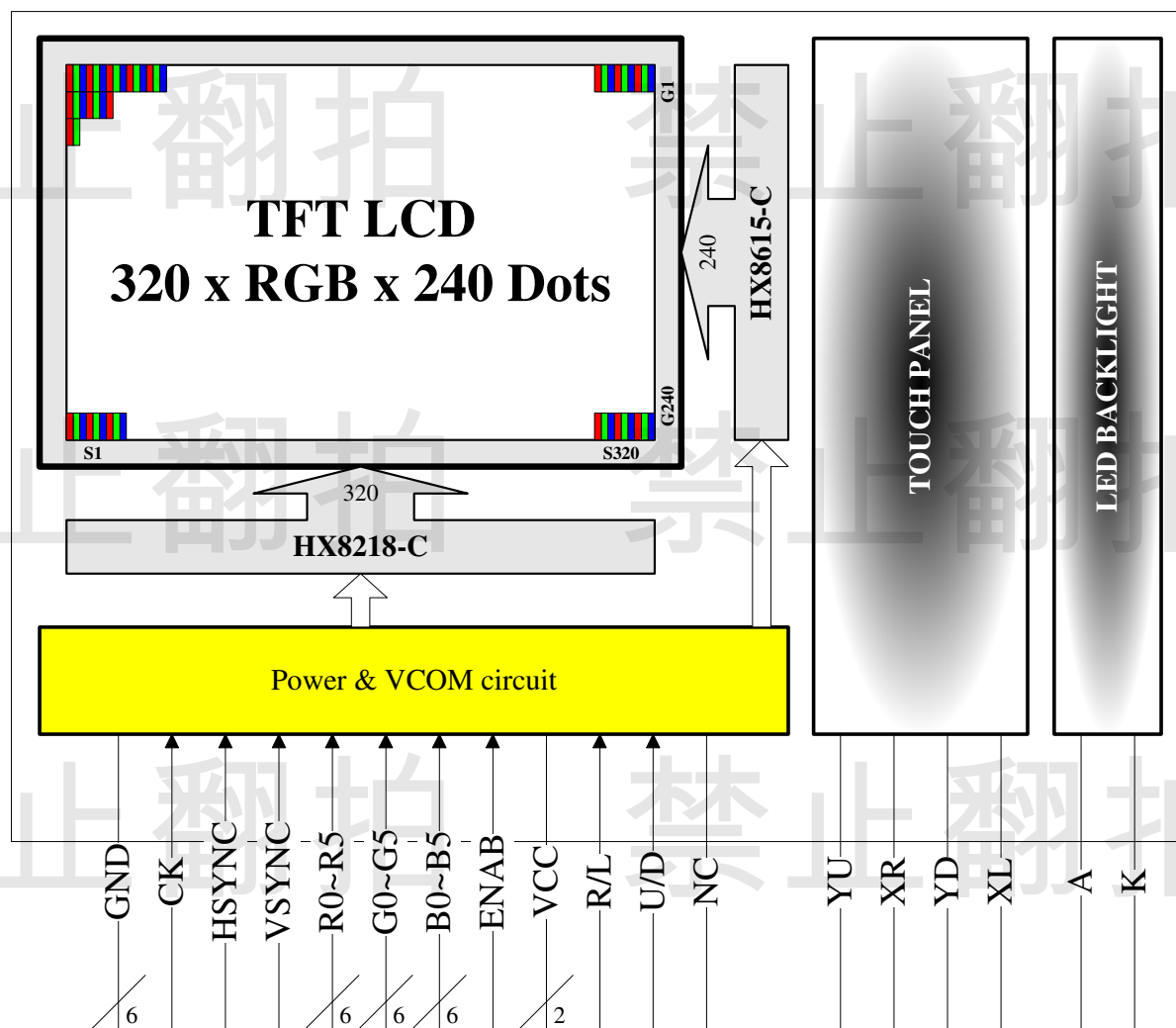
1.3 Outline Dimension (Cont.)

Attention for Assembly and Operation



- (1) T/P Active Area : Means T/P guaranteed active area , where the feature and function of the T/P can be assured.
- (2) Area A : Where the T/P can be operated but the feature and function are not guaranteed.
- (3) Area B : This area is prohibited to contact , it is easy to hurt the ITO film and lose function once be touched .
- (4) a. Customer should design the "Support " in between the case and T/P ,with sufficient thickness to ensure once the case was deformed or pressed unintendedly , the T/P can still work normally .
b. Support need to be designed within the frame size.
c. We suggest to the support thickness as 0.5mm , but customer should adapt suitable thickness according to the case deformation.
- (5) The best design of customer's case opening is suggested to cover the LCD Viewing area and aligned with the T/P Active Area , or in between the dimension of LCD Viewing area and T/P Active Area . But once if the LCD Viewing area was smaller than T/P Active Area , then the case opening should be aligned with LCD Viewing area .
- (6) Never use double sided tape or glue in between the support the ITO film , it will cause harm to ITO film or separate the T/P with the ITO film.

1.4 Block diagram:



1.5 Interface Pin Connection:

Pin No.	Pin Symbol	I/O	Description
1	GND	P	Ground. (0V)
2	CK	I	Clock signal for sampling each data signal.
3	Hsync	I	Horizontal synchronous signal (Negative)
4	Vsync	I	Vertical synchronous signal (Negative)
5	GND	P	Ground. (0V)
6-11	R0-R5	I	RED data signal.
12	GND	P	Ground. (0V)
13-18	G0-G5	I	GREEN data signal.
19	GND	I	Ground. (0V)
20-25	B0-B5	I	BLUE data signal.
26	GND	I	Ground. (0V)
27	ENAB	I	Signal to settle the horizontal display position (Positive).
28,29	VCC	P	+ 3.3V power supply.
30	R/L	I	Horizontal display mode select signal H: Normal, L: Left / Right reverse mode.
31	U/D	I	Vertical display mode select signal L: Normal, H: Up / Down reverse mode.
*32	NC	-	No connect.
33	GND	P	Ground. (0V)

1	YU	-	Touch screen.
2	XR	-	Touch screen.
3	YD	-	Touch screen.
4	XL	-	Touch screen.

BACKLIGHT PIN :

1	K	P	Ground pin for backlight.
2	A	P	Power supply input pin for backlight.

2. ELECTRICAL CHARACTERISTICS

2.1 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit
Power supply voltage	VCC	-0.3	7.0	V
Input voltage	Vin	-0.3	VCC+0.3	V
Operate temperature range	Top	-20	70	°C
Storage temperature range	Tst	-30	80	°C

2.2 DC Characteristics

 $T_a = 25^{\circ}\text{C}$

Items	Symbol	Min.	Typ.	Max.	Unit	Condition
Supply voltage	V_{CC}	3.0	3.3	3.6	V	-
Input Voltage	V_{IL}	0	-	$0.3V_{CC}$	V	L level
	V_{IH}	$0.7V_{CC}$	-	V_{CC}	V	H level
Current consumption	I_{CC}	-	80	160	mA	Note 1

*Note1 :

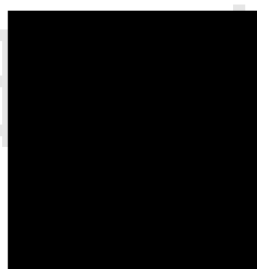
Measuring Condition:

Standard Value MAX.

$T_a = 25^{\circ}\text{C}$

$V_{CC} - GND = 3.3V$

Display Pattern



0 gray black pattern

2.2.1 Back-light Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	Unit	Test Condition	NOTE
Supply Current	I_f	-	-	60	mA	$T_a = 25^{\circ}\text{C}$	-
Supply Voltage	V_f	-	23.1	-	V	$T_a = 25^{\circ}\text{C}$	-
Half-Life Time	L_f	-	50000	-	hrs	$T_a = 25^{\circ}\text{C}$	1

Note 1 : The “ Half-Life Time ” is defined as the module brightness decrease to 50% original brightness. Base on $T_a 25 \pm 2^{\circ}\text{C}$, $60 \pm 10\%$ RH condition.

2.3 AC Characteristics

Digital Parallel RGB interface

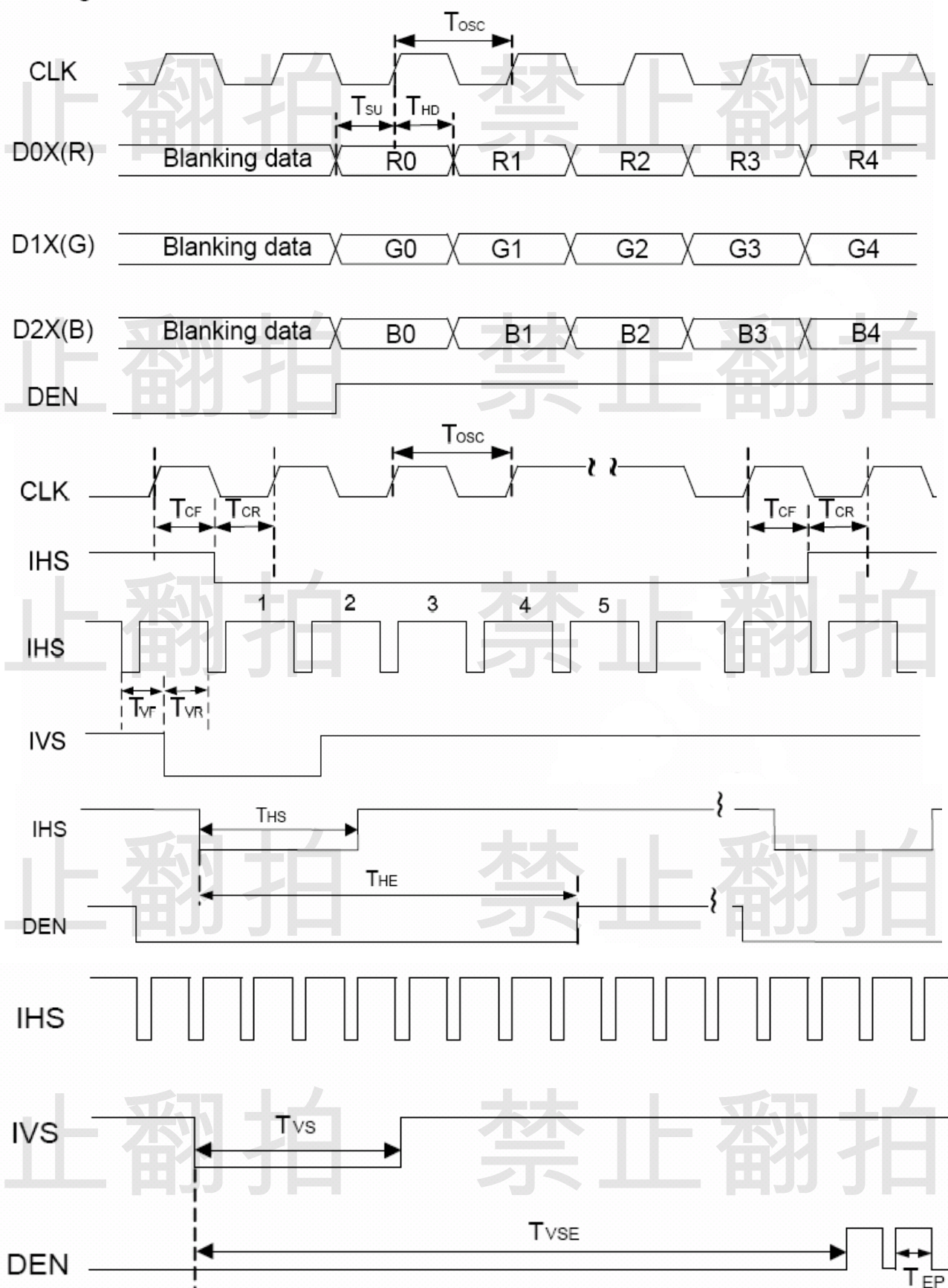
PARAMETER		Symbol	Spec.			Unit
			Min.	Typ.	Max.	
CLK period		T_{OSC}	-	156	-	ns
Data setup time		T_{SU}	12	-	-	ns
Data hold time		T_{HD}	12	-	-	ns
IHS period		T_H	-	408	-	T_{OSC}
IHS pulse width		T_{HS}	5	30	-	T_{OSC}
IHS setup time		T_{Cr}	12	-	-	ns
IHS hold time		T_{Cf}	12	-	-	ns
IVS pulse width		T_{VS}	1	3	5	T_H
IVS setup time		T_{Vr}	12	-	-	ns
IVS hold time		T_{Vf}	12	-	-	ns
IVS-DEN time	NTSC	T_{VSE}	-	18	-	T_H
	PAL	T_{VSE}	-	26	-	T_H
IHS-DEN time		T_{HE}	36	68	88	T_{OSC}
DEN pulse width		T_{EP}	-	320	-	T_{OSC}
IVS period	NTSC	-	-	262.5	-	T_H
	PAL	-	-	312.5	-	T_H

Note: When SYNC mode is used, 1st data start from 68th CLK after IHS falling.

Note : CLK = CK 、 IHS = Hsync 、 IVS = Vsync 、 DEN = ENAB

2.4 Interface Timing Chart

● Digital Parallel RGB



2.5 Touch Panel Specifications

Display	Descriptions	Note
Type	4-wires Analog Resistive Touch Panel	-
Structure	ITO Film : T=0.188mm	-
	ITO Glass : T=0.7mm	-
Surface Hardness	$\geq 3H$	3H pencil, pressure 500g/45° (JIS-K5600)
Input mode	Stylus or Finger	-
Operating Force (Minimum Active Force)	$\leq 100gf$	Stylus R0.8mm (Active Area toward inner 2mm)
Connector Type	FPC	-

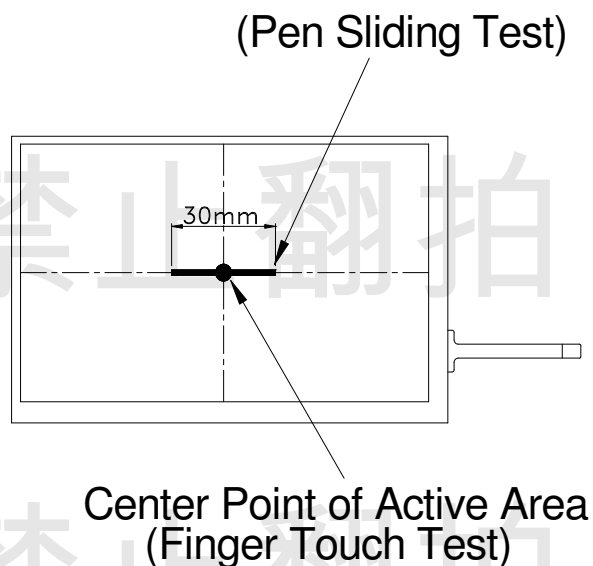
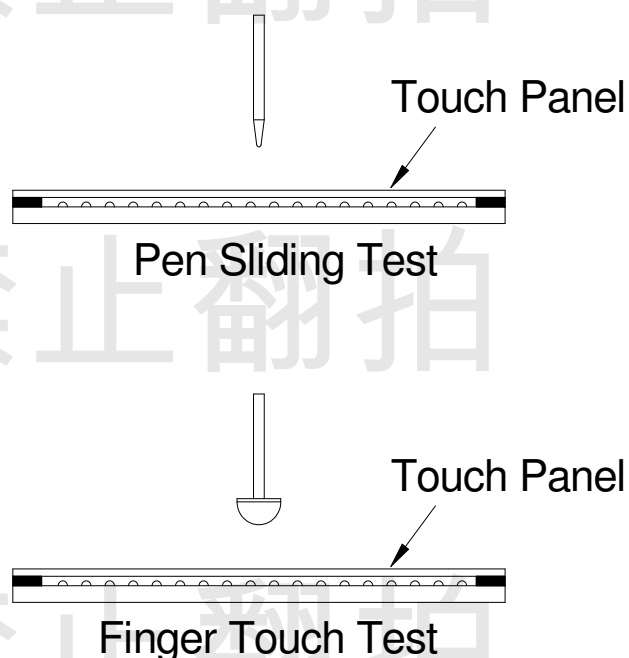
2.5.1 Electric Characteristics

Items	Descriptions	Note
Linearity	X-axis $\leq 1.5\%$	Active Area toward inner 2mm
	Y-axis $\leq 1.5\%$	
Terminal Resistance	X-axis : 350 ~ 950 Ω	-
	Y-axis : 100 ~ 700 Ω	-

2.5.2 Durability Test

Items	Condition
Finger Touch Test	Repeating impact the surface of touch panel 1,000k times by R8.0 silicon rubber under 250g loading and 2 times/sec speed.
Pen Sliding Test	Drawing line in 30mm length at same location of touch panel surface 100k times by R0.8mm plastic stylus under 250g loading and 60mm/sec moving speed.

(Durability Test Position)



3. OPTICAL CHARACTERISTICS

3.1 Characteristics

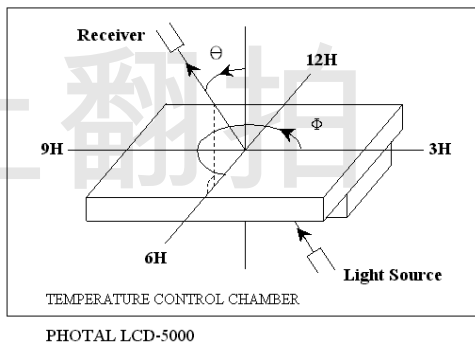
Electrical and Optical Characteristics

No.	Item			symbol / temp.		Min.	Typ.	Max.	Unit	Note
1	Response Time			Tr+Tf	25 °C	-	25	-	ms	2
2	Viewing Angle	Hor.	Cr≥10	θ ₂₊	Φ = 0°	-	60	-	degree	3
				θ ₂₋	Φ = 180°	-	60	-		
		Ver.		θ ₁₊	Φ = 270°	-	70	-		
				θ ₁₋	Φ = 90°	-	70	-		
3	Contrast Ratio			Cr	25 °C	400	600	-	-	4
4	Red x-code			R _x	25 °C	0.582	0.632	0.682	-	5
	Red y-code			R _y		0.310	0.360	0.410		
	Green x-code			G _x		0.297	0.347	0.397		
	Green y-code			G _y		0.554	0.604	0.654		
	Blue x-code			B _x		0.101	0.151	0.201		
	Blue y-code			B _y		0.070	0.120	0.170		
	White x-code			W _x		0.276	0.326	0.376		
	White y-code			W _y		0.321	0.371	0.421		
	Brightness			Y		350	450	-	cd/m ²	
5	Brightness Uniformity				25 °C	80	-	-	%	6

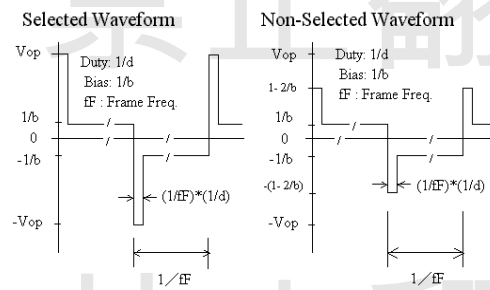
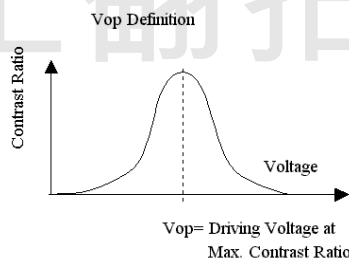
3.2 Definition of optical characteristics

Measurement condition :

Transmissive and Transflective type

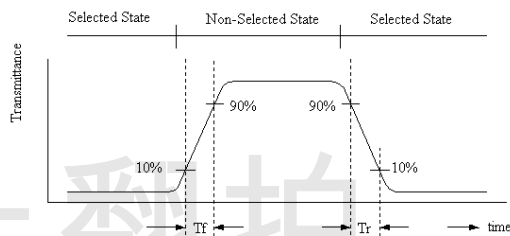


[Note 1] Definition of LCD Driving Vop and Waveform :



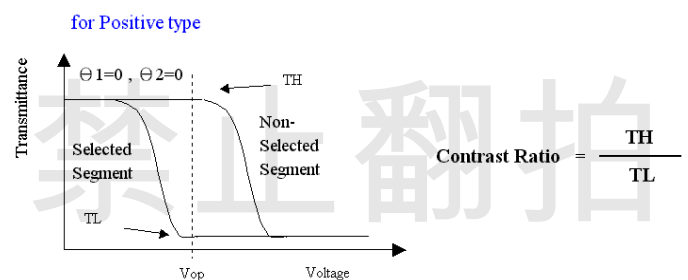
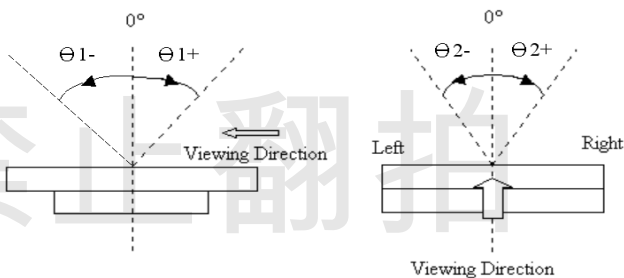
[Note 2] Definition of Response Time

for Positive type :

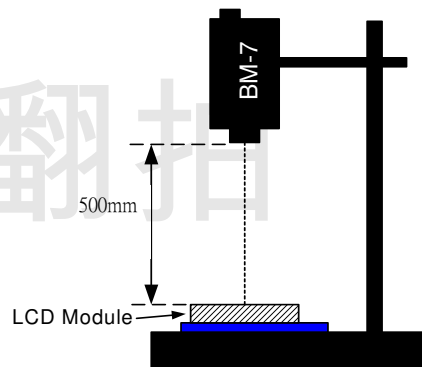


[Note 3] Definition of Viewing Angle :

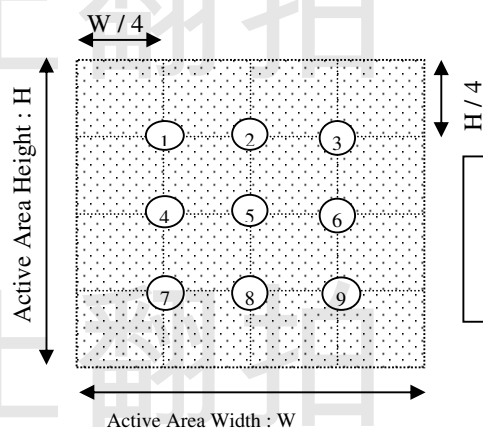
[Note 4] Definition of Contrast Ratio :



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

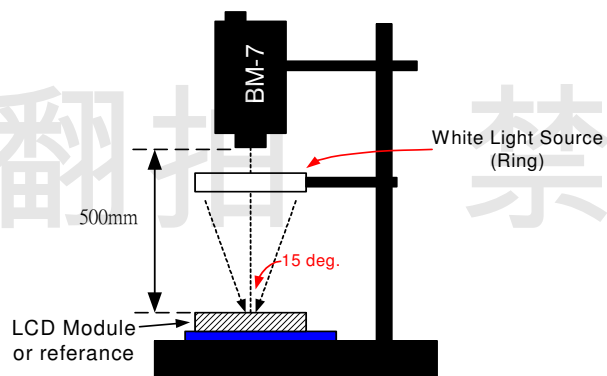


[Note 6] Definition of Brightness Uniformity



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

[Note 7] Definition of Measurement of Reflectance



4. RELIABILITY :

Item No	Items	Condition	Note
1	High temperature operating	70 °C , 200 hours	1
2	Low temperature operating	-20 °C , 200 hours	1
3	High temperature storage	80 °C , 200 hours	1
4	Low temperature storage	-30 °C , 200 hours	1
5	High temperature & humidity storage	60°C , 90%RH, 100 hours	2
6	Thermal Shock storage	-30°C, 30min.<=> 80°C , 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°C , 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.

* 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 : $350^{\circ}\text{C} \pm 15^{\circ}\text{C}$.
Soldering time : 3~4sec./ terminals.
Type of solder : Lead(Pb)-free solder.

☐ 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 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 occurred, 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°C)
- Never use the LCD, LCM under 45 Hz, the liquid crystal will decomposition and cause permanently 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 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 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 lots

- Example: 121108 - 0003 ==> Year 2012, November, 8th , Batch 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:

LOT NO. : 0 0 0 8 3 5 2 5 (EX)

Date

01-1st
02-2^{ed}
|
31-31th

Week

1 — 6

Week of
Month

1 — 5

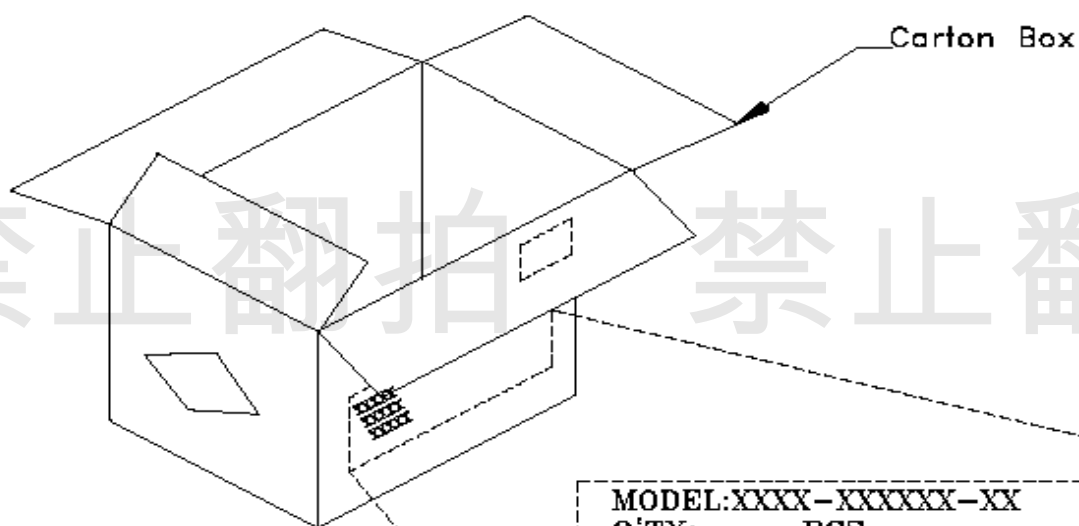
Month

01-January
02-February
|
12-December

Year

00-2000
01-2001

Label of carton:



MODEL:XXXX-XXXXXX-XX

Q'TY: PCS

LOT NO.

N.W. KGS.

G.W. KGS.

UNITED RADIANT TECHNOLOGY CORP.

光聯科技股份有限公司



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 °C TO 40 °C ,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

ISO-2859-1 (SAME AS MIL-STD-105E) , LEVEL II 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 PRODUCTS WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF U.R.T.

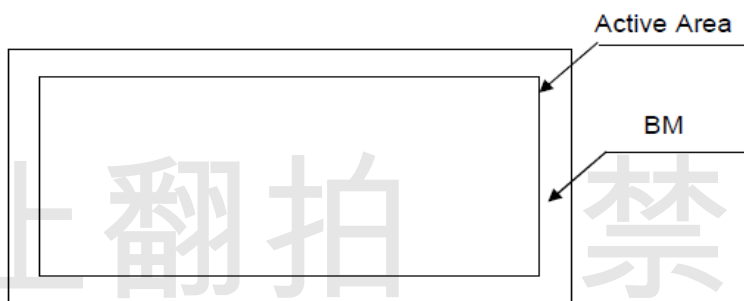
8.2. CHECKING CONDITION

8.2.1. VIEWING DISTANCE IS APPROXIMATELY : 30 ± 5 CM.

8.2.2. VIEWING ANGLE IS NORMAL TO THE LCD PANEL WITH 45°.

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

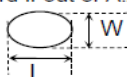
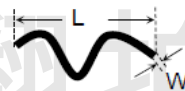
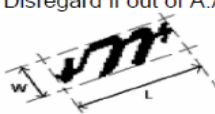
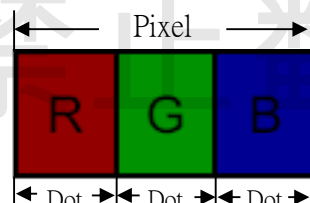
8.2.4. DEFINITION OF INSPECTION A.A.(ACTIVE AREA)

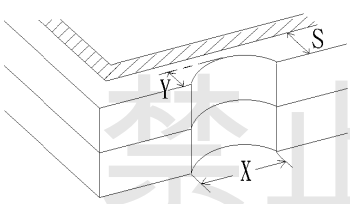
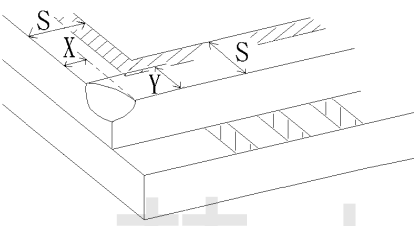
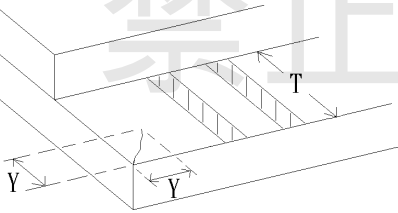
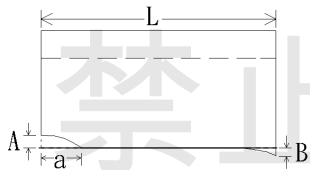
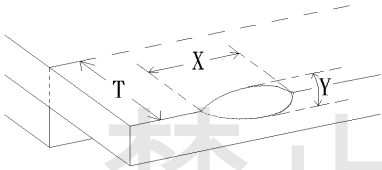
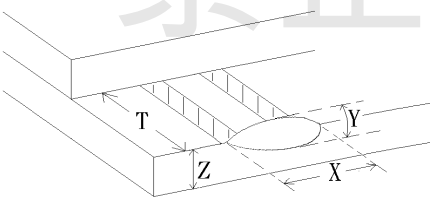
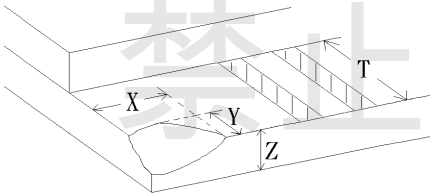


8.3. INSPECTION PLAN :

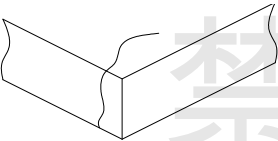
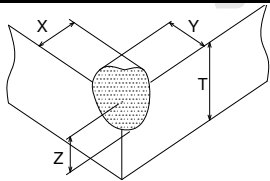
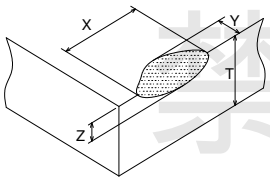
CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO.", "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED	Critical
	3. PRODUCT INDICATION	"MODEL NO." SHOULD INDICATE 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 AREAREJECTED	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、CHARACTERREJECTED	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

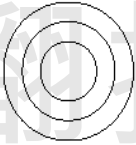
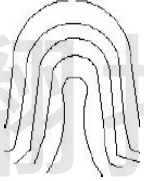
8.4. STANDARD OF VISUAL INSPECTION

NO.	CLASS	ITEM	JUDGEMENT																				
8.4.1	MINOR	<div>BLACK AND WHITE SPOT FOREIGN MATERIEL DUST IN THE CELL BLEMISH SCRATCH</div> <div>ROUND TYPE: Disregard if out of A.A.</div> <div></div> <div>LINER TYPE: Disregard if out of A.A.</div> <div></div>	<div>(A) ROUND TYPE: unit : mm.</div> <table><tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>$\Phi \leq 0.15$</td><td>DISREGARD</td></tr><tr><td>$0.15 < \Phi \leq 0.50$</td><td>3</td></tr><tr><td>$0.50 < \Phi$</td><td>0</td></tr></table> <div>NOTE: $\Phi = (\text{LENGTH} + \text{WIDTH}) / 2$</div> <div>(B) LINER TYPE: unit : mm.</div> <table><tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>-----</td><td>$W \leq 0.03$</td><td>DISREGARD</td></tr><tr><td>$L \leq 10$</td><td>$0.03 < W \leq 0.07$</td><td>4</td></tr><tr><td>$L > 10$</td><td>$0.07 < W$</td><td>0</td></tr></table>	DIAMETER (mm.)	ACCEPTABLE Q'TY	$\Phi \leq 0.15$	DISREGARD	$0.15 < \Phi \leq 0.50$	3	$0.50 < \Phi$	0	LENGTH	WIDTH	ACCEPTABLE Q'TY	-----	$W \leq 0.03$	DISREGARD	$L \leq 10$	$0.03 < W \leq 0.07$	4	$L > 10$	$0.07 < W$	0
DIAMETER (mm.)	ACCEPTABLE Q'TY																						
$\Phi \leq 0.15$	DISREGARD																						
$0.15 < \Phi \leq 0.50$	3																						
$0.50 < \Phi$	0																						
LENGTH	WIDTH	ACCEPTABLE Q'TY																					
-----	$W \leq 0.03$	DISREGARD																					
$L \leq 10$	$0.03 < W \leq 0.07$	4																					
$L > 10$	$0.07 < W$	0																					
8.4.2	MINOR	<div>FIBER</div> <div>1. L: Length, W: Width 2. Disregard if out of A.A.</div> <div></div>	<div>unit : mm.</div> <table><tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>$L \leq 1.5$</td><td>$W \leq 1.0$</td><td>4</td></tr><tr><td>$L > 1.5$</td><td>$W > 1.0$</td><td>0</td></tr></table>	LENGTH	WIDTH	ACCEPTABLE Q'TY	$L \leq 1.5$	$W \leq 1.0$	4	$L > 1.5$	$W > 1.0$	0											
LENGTH	WIDTH	ACCEPTABLE Q'TY																					
$L \leq 1.5$	$W \leq 1.0$	4																					
$L > 1.5$	$W > 1.0$	0																					
8.4.3	MINOR	BUBBLE IN POLARIZER	<div>unit : mm.</div> <table><tr><th>DIAMETER</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>$\Phi \leq 0.2$</td><td>DISREGARD</td></tr><tr><td>$0.2 < \Phi \leq 0.5$</td><td>3</td></tr><tr><td>$0.5 < \Phi$</td><td>0</td></tr></table>	DIAMETER	ACCEPTABLE Q'TY	$\Phi \leq 0.2$	DISREGARD	$0.2 < \Phi \leq 0.5$	3	$0.5 < \Phi$	0												
DIAMETER	ACCEPTABLE Q'TY																						
$\Phi \leq 0.2$	DISREGARD																						
$0.2 < \Phi \leq 0.5$	3																						
$0.5 < \Phi$	0																						
8.4.4	MINOR	Dot Defect	<table><tr><th>Items</th><th>ACC. Q'TY</th></tr><tr><td>Bright dot</td><td>$N \leq 4$</td></tr><tr><td>Dark dot</td><td>$N \leq 4$</td></tr></table> <div>Pixel Define</div> <div></div> <div>Not 1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.</div> <div>Not 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.</div> <div>Not 3: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green ,blue pattern.</div>	Items	ACC. Q'TY	Bright dot	$N \leq 4$	Dark dot	$N \leq 4$														
Items	ACC. Q'TY																						
Bright dot	$N \leq 4$																						
Dark dot	$N \leq 4$																						
8.4.5	MINOR	MURA	By 2% ND filter invisible																				

NO.	CLASS	ITEM	JUDGEMENT
8.4.6	MINOR	LCD GLASS CHIPPING	 $Y > S$ Reject
8.4.7	MINOR	LCD GLASS CHIPPING	 $X \text{ or } Y > S$ Reject
8.4.8	MAJOR	LCD GLASS GLASS CRACK	 $Y > (1/2) T$ Reject
8.4.9	MAJOR	LCD GLASS SCRIBE DEFECT	 <ol style="list-style-type: none"> $a > L/3$, $A > 1.5\text{mm}$. B : ACCORDING TO DIMENSION Reject
8.4.10	MINOR	LCD GLASS CHIPPING (ON THE TERMINAL AREA)	 $\Phi = (x+y)/2 > 2.5 \text{ mm}$ Reject
8.4.11	MINOR	LCD GLASS CHIPPING (ON THE TERMINAL SURFACE)	 $Y > (1/3) T$ Reject
8.4.12	MINOR	LCD GLASS CHIPPING	 $Y > T$ Reject

8.5 INSPECTION STANDARD OF TOUCH PANEL

NO.	CLASS	ITEMS		JUDGEMENT	
8.5.1	MAJOR	Touch Panel Crack			Reject
8.5.2	MINOR	Touch Panel Chipping	Corner		$X \leq 2\text{mm}, Y \leq 2\text{mm}, Z < 1/2T$ Accept
			Edge		$X \leq 3\text{mm}, Y \leq 3\text{mm}, Z < 1/2T$ Accept
8.5.3	MINOR	Touch Panel Scratch		$W \leq 0.05, L \leq 12\text{mm}$ Distance between scratch $> 5.0\text{mm}$	Accept
				$W > 0.05\text{mm}$ or $L > 12\text{mm}$	Reject
8.5.4	MINOR	Touch Panel Black / White Spot		$D \leq 0.25\text{mm}$ Distance between spots $> 5.0\text{mm}$	Accept
				$0.25\text{mm} < D \leq 0.50\text{mm}$ Distance between spots $> 5.0\text{mm}$	Accept 5 particles Max.
				$D > 0.50\text{mm}$	Reject
8.5.5	MINOR	Touch Panel Linear Object		$W \leq 0.10\text{mm}, L \leq 5\text{mm}$	Accept
				$W > 0.10\text{mm}$ or $L > 5\text{mm}$	Reject
8.5.6	MINOR	Touch Panel Air Bubble		$D \leq 0.20\text{mm}$	Accept
				$0.20\text{mm} < D \leq 0.5\text{mm}$ Distance between bubbles $> 5.0\text{mm}$	Accept 3 ea Max.
				$D > 0.5\text{mm}$	Reject
8.5.7	MINOR	Touch Panel Scratch (Printing area)		$W \leq 0.05\text{mm}, L \leq 5\text{mm}$	Accept
				$W > 0.05\text{mm}$ or $L > 5\text{mm}$	Reject
8.5.8	MINOR	Touch Panel White Haze Mark / Dust		Can not be removed	Reject
8.5.9	MINOR	Touch Panel Dent / Fish Eye		$D \leq 0.35\text{mm}$	Accept
				$0.35\text{mm} < D \leq 1.0\text{mm}$ Distance $> 5.0\text{mm}$	Accept 3 ea Max.
				$D > 1.0\text{mm}$	Reject

NO.	CLASS	ITEMS	JUDEGMENT
8.5.10	MINOR	<p>Inerratic Newton ring (For Resistive Touch Panel)</p> 	<p>1.Dimension of Newton ring > 1/3 V.A. area. Reject</p> <p>2.Dimension of Newton ring < 1/3 V.A. area, not affect font effect and line distortion. Accept</p>
		<p>Atactic Newton ring (For Resistive Touch Panel)</p> 	<p>1.Dimension of Newton ring > 1/2 V.A. area. Reject</p> <p>2.Dimension of Newton ring < 1/2 V.A. area, not affect font effect and line distortion. Accept</p>
8.5.11	MINOR	<p>Touch Panel Film Bulge</p>	<p>Not affect the transmittance and clarity under lighting ambient. Accept</p>