CONFIDENTIAL(B)

SPECIFICATION

OF

LIQUID CRYSTAL DISPLAY MODULE

UNITED RADIANT TECHNOLOGY CORP. 光聯科技 Aug-07-2020 品管部 QC DEPT.

CUSTOMER : URT-STD

Model No. : UMSH-9153MD-1T

Model version : 3

Document Revision : 4

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	Aug-07-2020
APPROVED	CHECKED	PREPARED	Date

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Revision record

Document Revision	Model No. Version No.	Description	Revision by
0	UMSH-9153MD-T Version No. 0		Peggy Ho Fong Jia Su 22-Jun-2016
1	UMSH-9153MD-1T Version No. 0	1. Add the resistive touch panel 2. Modify the module number for UMSH-9153MD-T to UMSH-9153MD-1T.	Peggy Ho Y.C. Lin 30-Nov-2017
2	UMSH-9153MD-1T Version No. 1	Modify the packing mode.	Peggy Ho Y.C. Lin 03-Oct-2018
3	UMSH-9153MD-1T Version No. 2	Add the inspection for TP newton ring.	Peggy Ho Y.C. Lin 28-Aug-2019
4	UMSH-9153MD-1T Version No. 3	Add the operating life of finger touch & pen sliding.	Peggy Ho Y.C. Lin 07-Aug-2020

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1. BASIC SPECIFICATION

1.1 Mechanical specifications

Items	Nominal Dimension	Unit
Active screen size	4.3” diagonal	-
Dot Matrix	480 x RGB x 272	Pixel
Module Size (W x H x T)	105.4 x 67.1 x 3.9	mm.
Active Area (W x H)	95.04 x 53.856	mm.
Pixel Size (W×H)	0.198 x 0.198	mm.
Color depth	16.7M	color
Interface	Parallel 24-bit RGB	-
Driving IC Package	COG	-
Module weight	TBD	g

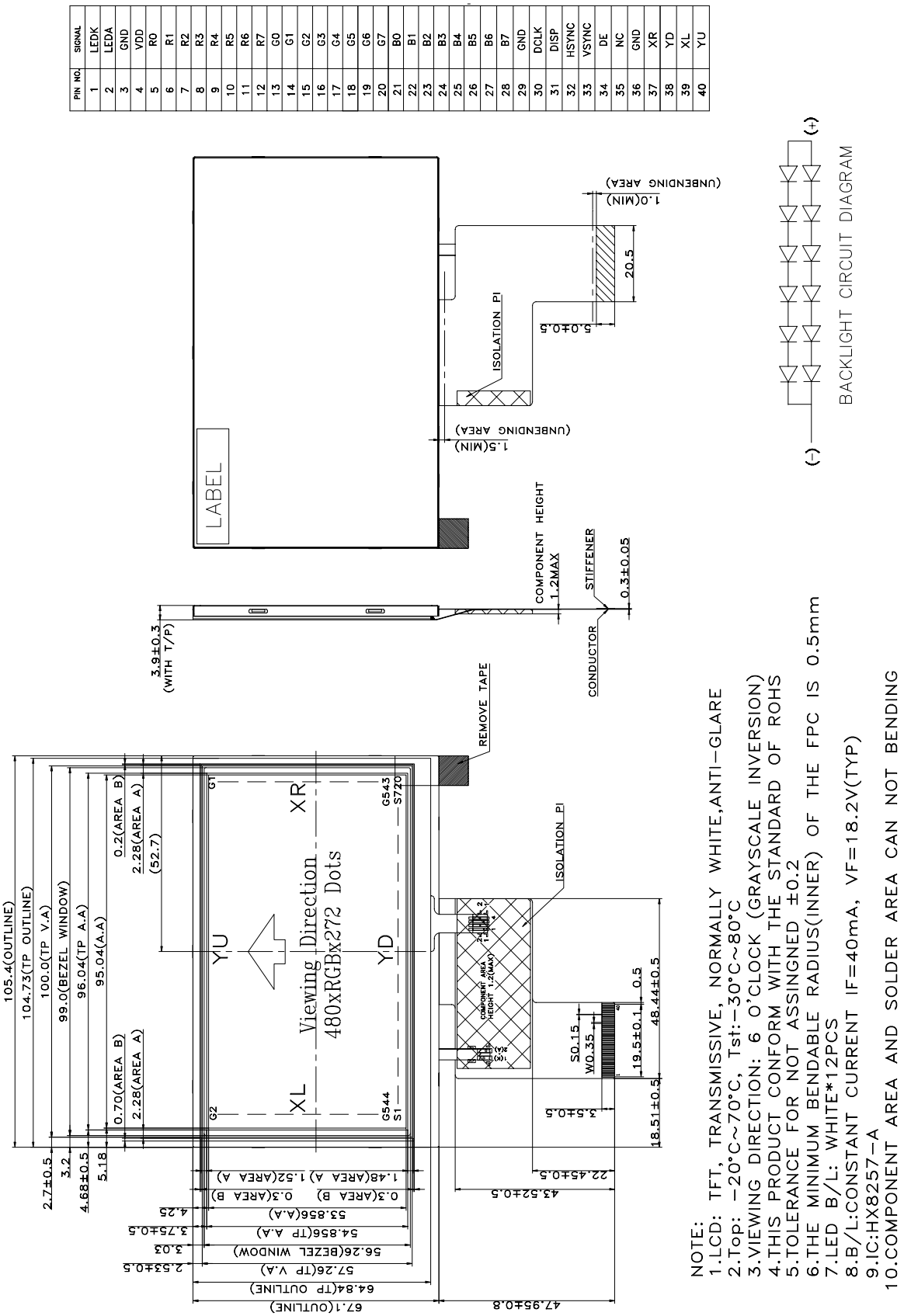
1.2 Display specification

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

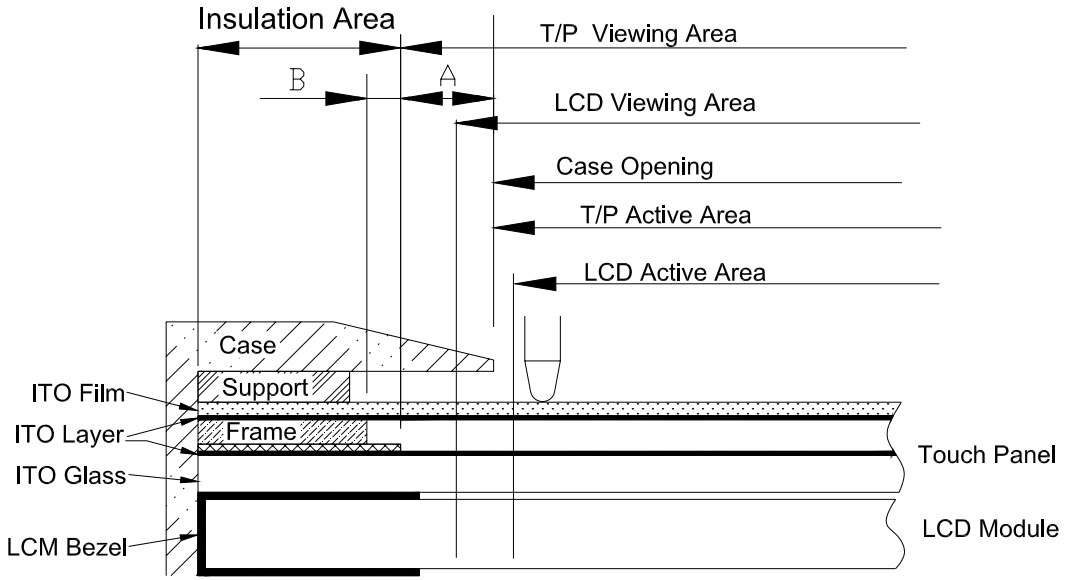
*Color tone is slightly changed by temperature and driving voltage.

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

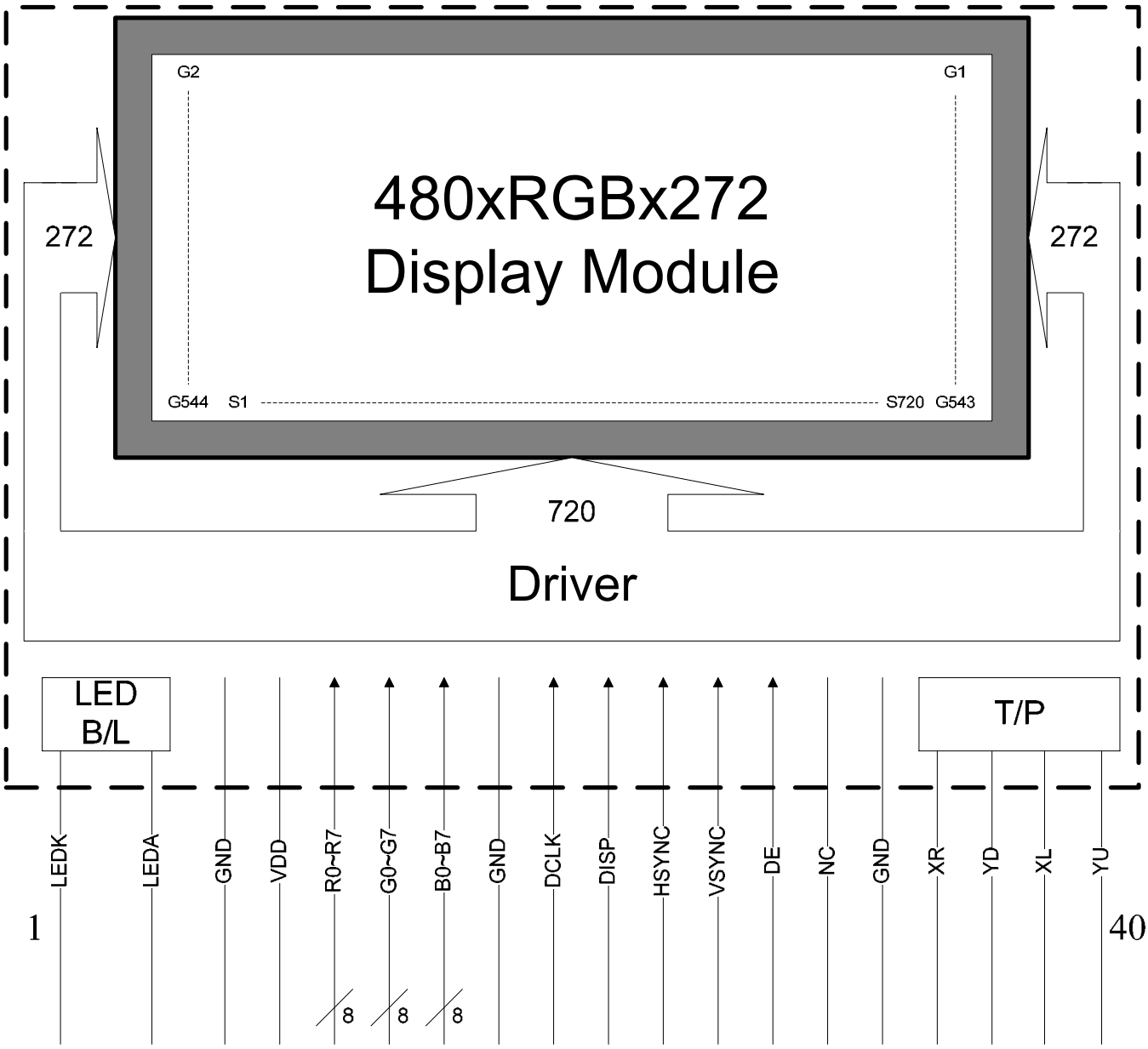


Attention for Assembly and Operation



(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 suggest ed 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 seperate the T/P with the ITO film.

1.4 Block diagram:



1.5 Interface Pin Connection :

Pin No.	Pin Symbol	I/O	Description
1	LEDK	P	Power for LED backlight cathode.
2	LEDA	P	Power for LED backlight anode.
3	GND	P	Power Ground.
4	VDD	P	Power Voltage.
5 ~ 12	R0 ~ R7	I	Red data signal.
13 ~ 20	G0 ~ G7	I	Green data signal.
21 ~ 28	B0 ~ B7	I	Blue data signal.
29	GND	P	Power Ground.
30	DCLK	I	Dot data clock.
31	DISP	I	Display on/off.
32	HSYNC	I	Horizontal sync signal.
33	VSYNC	I	Vertical sync signal.
34	DE	I	Data Enable.
35	NC	-	No connect.
36	GND	P	Power Ground.
37	XR	I/O	RTP XR.
38	YD	I/O	RTP YD.
39	XL	I/O	RTP XL.
40	YU	I/O	RTP YU.

2. ELECTRICAL CHARACTERISTICS

2.1 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit
Power supply voltage	VDD	-0.3	3.96	V
Operate temperature range	TOP	-20	70	℃
Storage temperature range	TST	-30	80	℃

*Note1 :

The operating temperature is for product's functionality, please pay attention to human injury when using the product under extreme temperature.

2.2 DC Characteristics

T_a= 25℃

Items	Symbol	Min.	Typ.	Max.	Unit	Condition
Supply voltage	VDD	3.0	3.3	3.6	V	-
Input Voltage	V_{IL}	0	-	0.3VDD	V	L level
	V_{IH}	0.7VDD	-	VDD	V	H level
Current consumption	I_{VDD}	-	-	40	mA	Note 1

*Note1 :

Measuring Condition:

Standard Value MAX.

Ta = 25℃

VDD -GND = 3.3V

Display Pattern

0 gray black pattern

2.2.1 Back-light only Specification

PARAMETER	SYMBOL	MIN	TYP	MA	nit	Test Condition	NOTE
Supply Current	If	-	40	-	mA	Ta=25℃	-
Supply Voltage	Vf	-	18.2	-	V	Ta=25℃	-
Half-Life Time	Lf	-	50000	-	hrs	Ta=25℃	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℃,60±10% RH condition.**

2.3 AC Characteristics

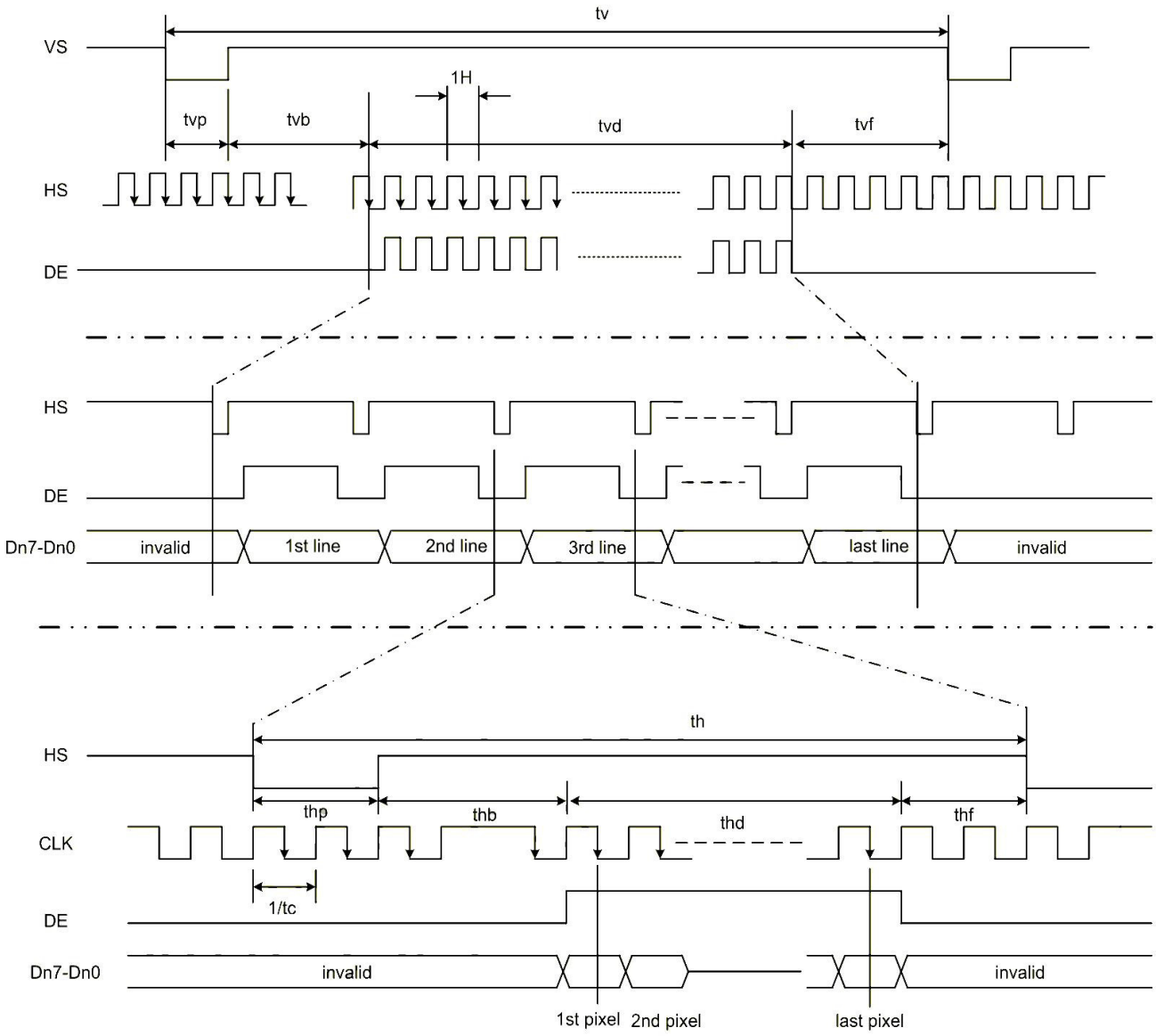
Parallel RGB Input Timing Requirement

Parameter	Symbol	Sepc.			Unit
		Min.	Tpy.	Max.	
Clock cycle	f_{CLK}(1)	-	9	15	MHz
Hsync cycle	1/th	-	17.14	-	KHz
Vsync cycle	1/tv	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th	525	525	605	CLK
Horizontal display period	thd	480	480	480	CLK
Horizontal front porch	thf	2	2	82	CLK
Horizontal pulse width	thp(2)	2	41	41	CLK
Horizontal back porch	thb(2)	2	2	41	CLK
Vertical Signal					
Vertical cycle	tv	285	286	399	H(1)
Vertical display period	tvd	272	272	272	H(1)
Vertical front porch	tvf	1	2	227	H(1)
Vertical pulse width	tvp(2)	1	10	11	H(1)
Vertical back porch	tvb(2)	1	2	11	H(1)

Note: (1) Unit: CLK=1/f_{CLK} , H=th,

(2)It is necessary to keep tvp+tvb=12 and thp+thb=43 in sync mode.

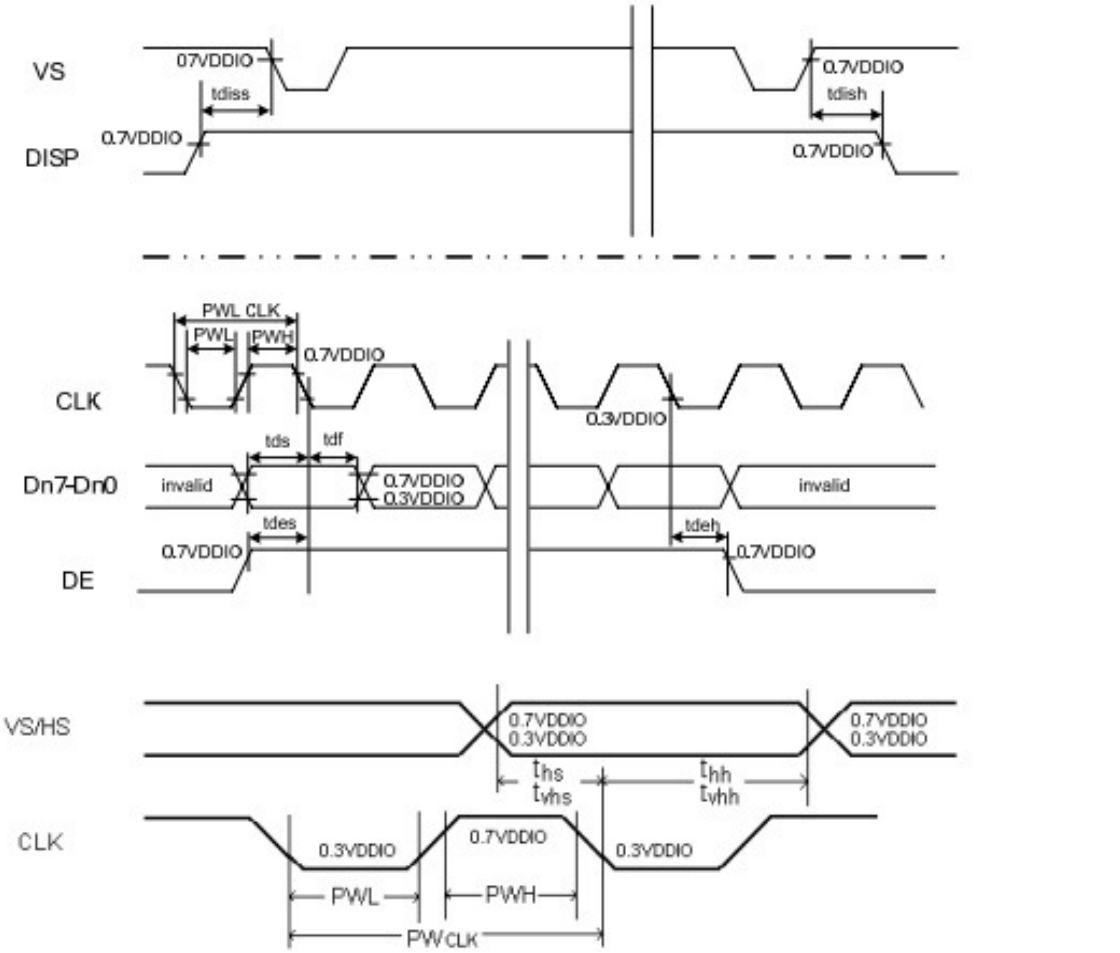
Interface Timing Chart



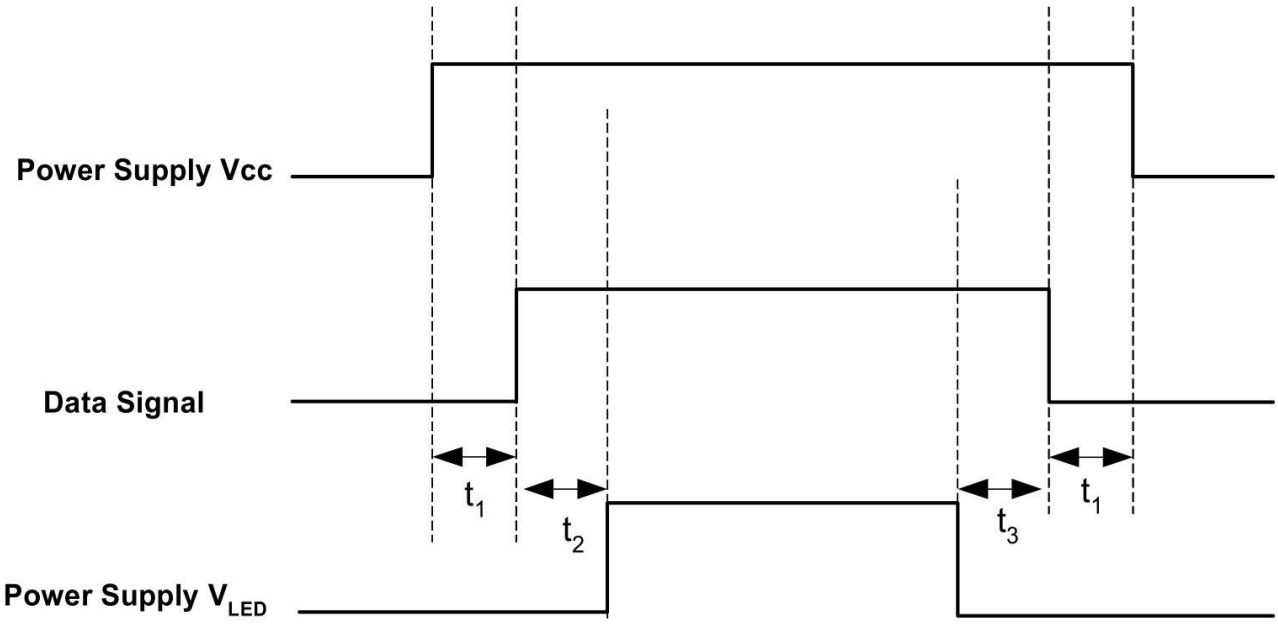
Input Setup Timing Requirement

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DISP setup time	t_{diss}	10	-	-	ns
DISP hold time	t_{dish}	10	-	-	ns
Clock period	PW_{CLK} (1)	66.7	-	-	ns
Clock pulse high period	PWH (1)	26.7	-	-	ns
Clock pulse low period	PWL (1)	26.7	-	-	ns
Hsync setup time	t_{hs}	10	-	-	ns
Hsync hold time	t_{hh}	10	-	-	ns
Data setup time	t_{ds}	10	-	-	ns
Data hold time	t_{dh}	10	-	-	ns
DE setup time	t_{des}	10	-	-	ns
DE hold time	t_{deh}	10	-	-	ns
Vsync setup time	t_{vhs}	10	-	-	ns
Vsync hold time	t_{vhh}	10	-	-	ns

Note: (1) For parallel interface, maximum clock frequency is 15MHz.



Power Sequence Timing



$t_1 > 50$ mSec
$t_2 \geqq 200$ mSec
$t_3 \geqq 200$ mSec

Note: Data Signal includes DCLK, HS, VS, R0~ R5, G0~ G5, B0~ B5.

2.4 Touch Panel Specifications

2.4.1 Mechanical specifications

Items	Nominal Dimension	Unit
Module Size (W×H×T)	104.73±0.3 × 64.84±0.3	mm.
Viewing Area (W×H)	100.0±0.3 × 57.26±0.3	mm.
Active Area (W×H)	96.04±0.3 × 54.86±0.3	mm.
Thickness	1.15±0.2(without protective film)	mm.

2.4.2 Touch Panel Specifications

Display	Descriptions	Note
Type	4-wires Analog Resistive Touch Panel	-
Structure	Anti-glare ITO Film：T=0.188mm	-
	ITO Glass：T=0.7mm	-
Environment Characteristic	Operation Temperature：-20℃ 70℃	-
	Storage Temperature：-30℃ 80℃	-
Surface Hardness	＞3H	3H pencil, pressure 500g/45° (JIS-K5600)
Input mode	Stylus or Finger	-
Operation force	100g Max.	Stylus R0.8mm
Connector Type	FPC	-

2.4.3 Optical Characteristics:

Items	Descriptions	Note
Optical Characteristics	Haze Value：＜10%	-
Light Transmittance	Typ： ＞78%	Active Area

2.4.4 Mechanical Characteristics

Items	Descriptions	Note
FPC Strength (Vertical)	Strength≧500g/cm； Pull Rate：50mm/min	-
Steel Ball Drop Test	Φ9mm Steel Ball, 50cm height	No damage
Finger Touch	1,000K times	Operating life
Pen Sliding	100K times	Operating life

2.4.5 Electric Characteristics

Items	Descriptions	Note
(1) Linearity	X-axis≦±1.5% Y-axis≦±1.5%	Active Area toward inner 2mm
(2) Insulation Resistance	DC25V、≧20 MΩ	-
(3) Terminal Resistance	X-axis：350～1100Ω	-
	Y-axis：100～450Ω	-
(4) Response Time	≦10ms	-

2.4.6 Reliability Test

Items	Condition	Note
High Temperature Storage	80℃ ，200hrs	1
Low Temperature Storage	-30℃ ，200hrs	1
High Temperature and High Humidity Storage	60℃ 、90%RH ，100hrs	2
Thermal Shock	-20℃ ，30min←→ 70℃ ，30min 10Cycles	1

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 ; Function : Fulfill item Fulfill item (1),(2),(3) .

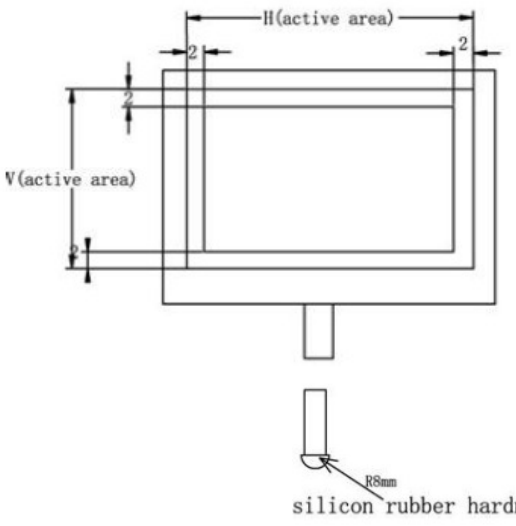
2.4.7 Durability Test

Items	Nominal Dimension
Finger Touch Test	Test position：any point in each side interval 2mm within active area. Test jig：R8.0mm silicon rubber, hardness 60° Test force：250gf Frequency：2 times/sec No function fail after 1000K times.
Pen Sliding Test	Test area：each side interval 3mm within active area. Test jig：R 0.8mm polyacetal pen. Input force：150gf. Freauencv：60 mm/sec. No function fail after 100K times. 1 time means sliding from A to B or B to A.

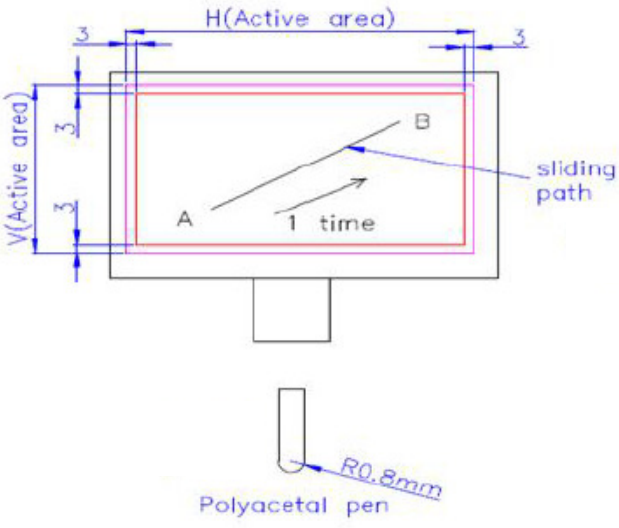
※ One single product test for only one item ; Function : Fulfill item Fulfill item (1),(2),(3) .

Durability Test Position：

(Finger Touch Test)



(Pen Sliding Test)



3. OPTICAL CHARACTERISTICS

3.1 Characteristics

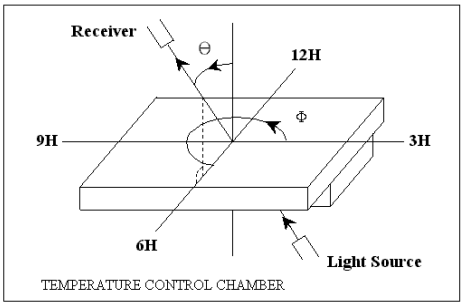
Electrical and Optical Characteristics

No.	Item			symbol / temp.		Min.	Typ.	Max.	Unit	Note
1	Response Time			Tr	25 ℃	5	7	-	ms	2
				Tf	25 ℃	20	28	-		
2	Viewing Angle	Hor.	Cr≧10	θ_{2+}	Φ = 0°	60	80	-	degree	3
				θ_{2-}	Φ = 180°	60	80	-		
		Ver.		θ_{1+}	Φ = 270°	60	80	-		
				θ_{1-}	Φ = 90°	45	80	-		
3	Contrast Ratio			Cr	25 ℃	400	500	-	-	4
4	Red x-code			Rx	25 ℃	0.56	0.61	0.66	-	5
	Red y-code			Ry		0.31	0.36	0.41		
	Green x-code			Gx		0.30	0.35	0.40		
	Green y-code			Gy		0.53	0.58	0.63		
	Blue x-code			Bx		0.10	0.15	0.20		
	Blue y-code			By		0.05	0.10	0.15		
	White x-code			Wx		0.25	0.30	0.35		
	White y-code			Wy		0.28	0.33	0.38		
	Brightness			Y		350	450	-	cd/m^2	
5	Brightness Uniformity				25 ℃	80	-	-	%	6

3.2 Definition of optical characteristics

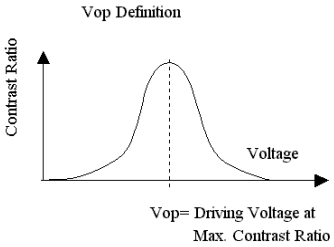
Measurement condition :

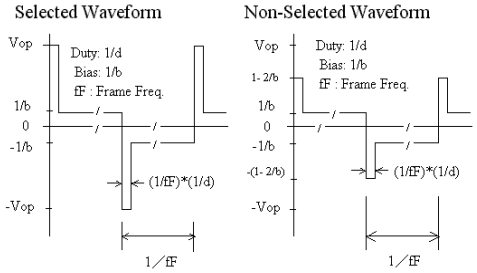
Transmissive and Transflective type



PHOTAL LCD-5000

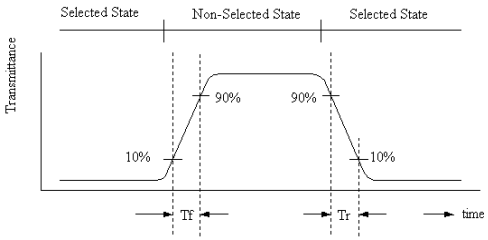
[Note 1] Definition of LCD Driving Vop and Waveform :



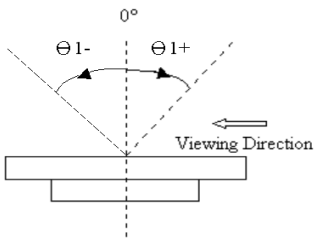


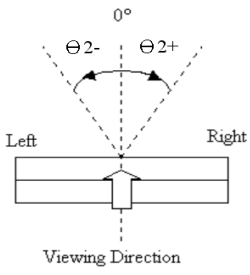
[Note 2] Definition of Response Time

for Positive type :



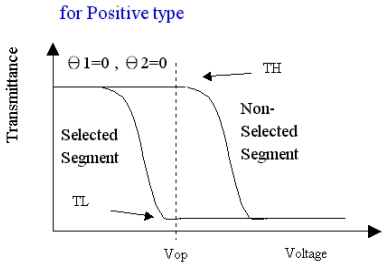
[Note 3] Definition of Viewing Angle :





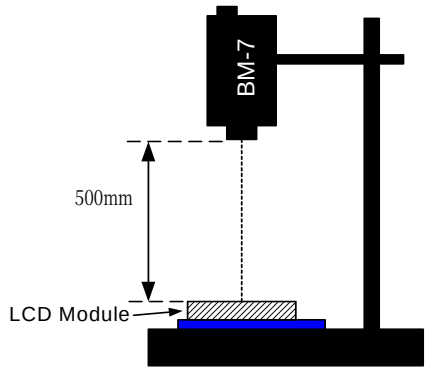
[Note 4] Definition of Contrast Ratio :

for Positive type

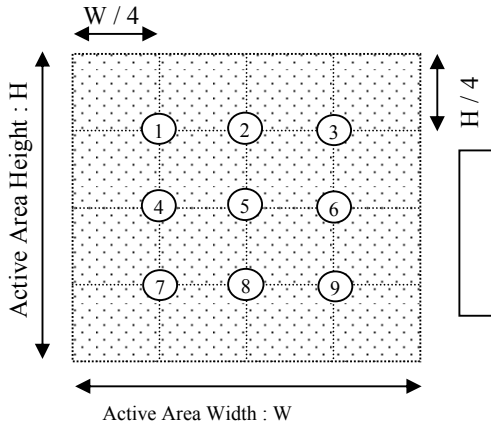


$$\text{Contrast Ratio} = \frac{TH}{TL}$$

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



[Note 6] Definition of Brightness Uniformity



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

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.

Note 3 : Please change the display picture (autorun) during operating mode. Avoid displaying static images

* One single product test for only one item.
* 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 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**

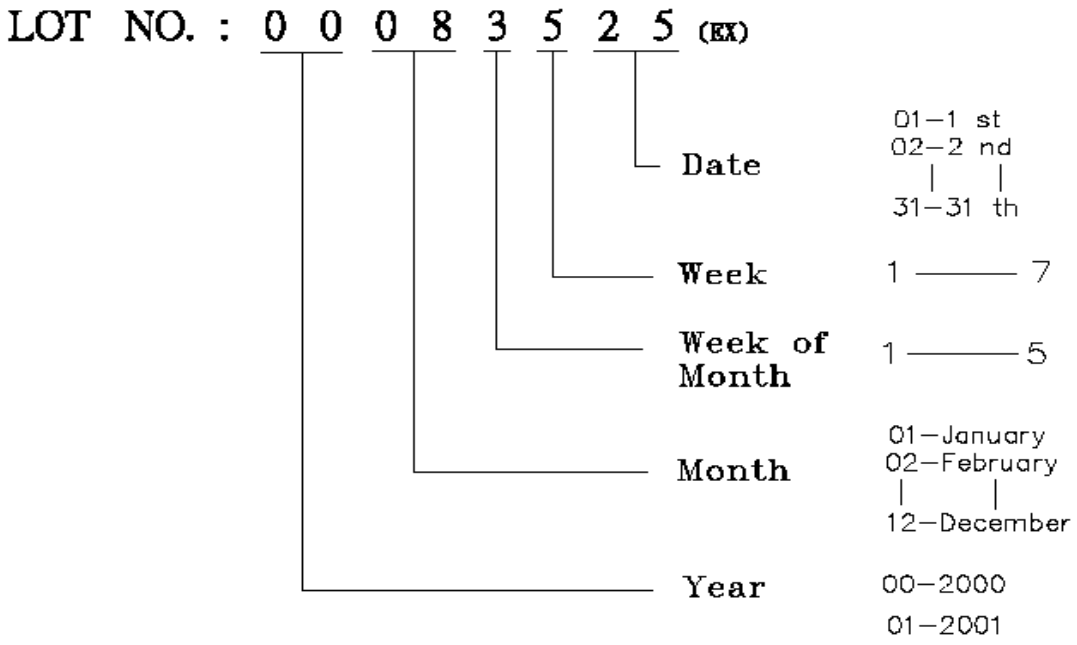
  Year Month Day - Serial No.

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

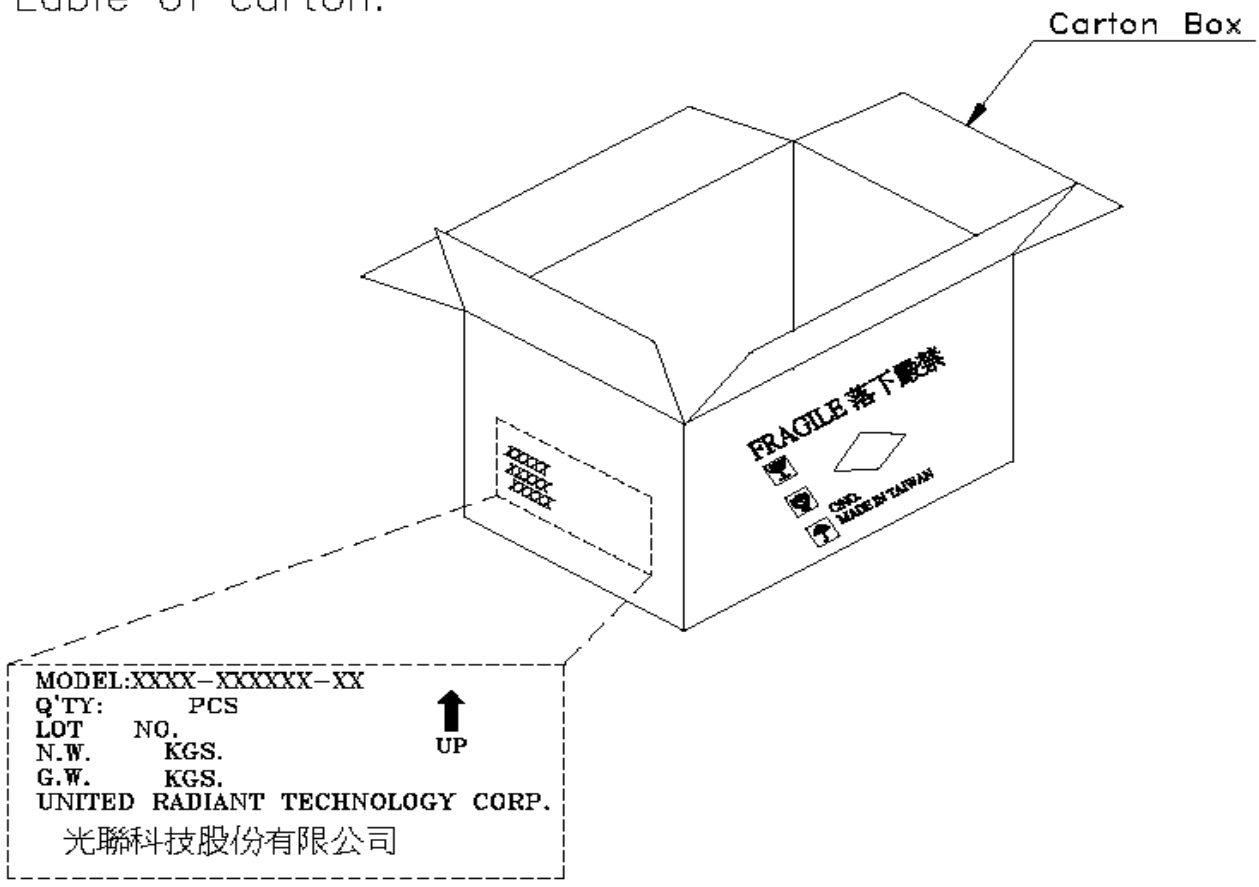
Note ： The lot no. attached on the packing box will be used for tracking once the part is too small to print the date code.

7. PACKING & LOT NO

Instruction of lot number:



Lable of carton:



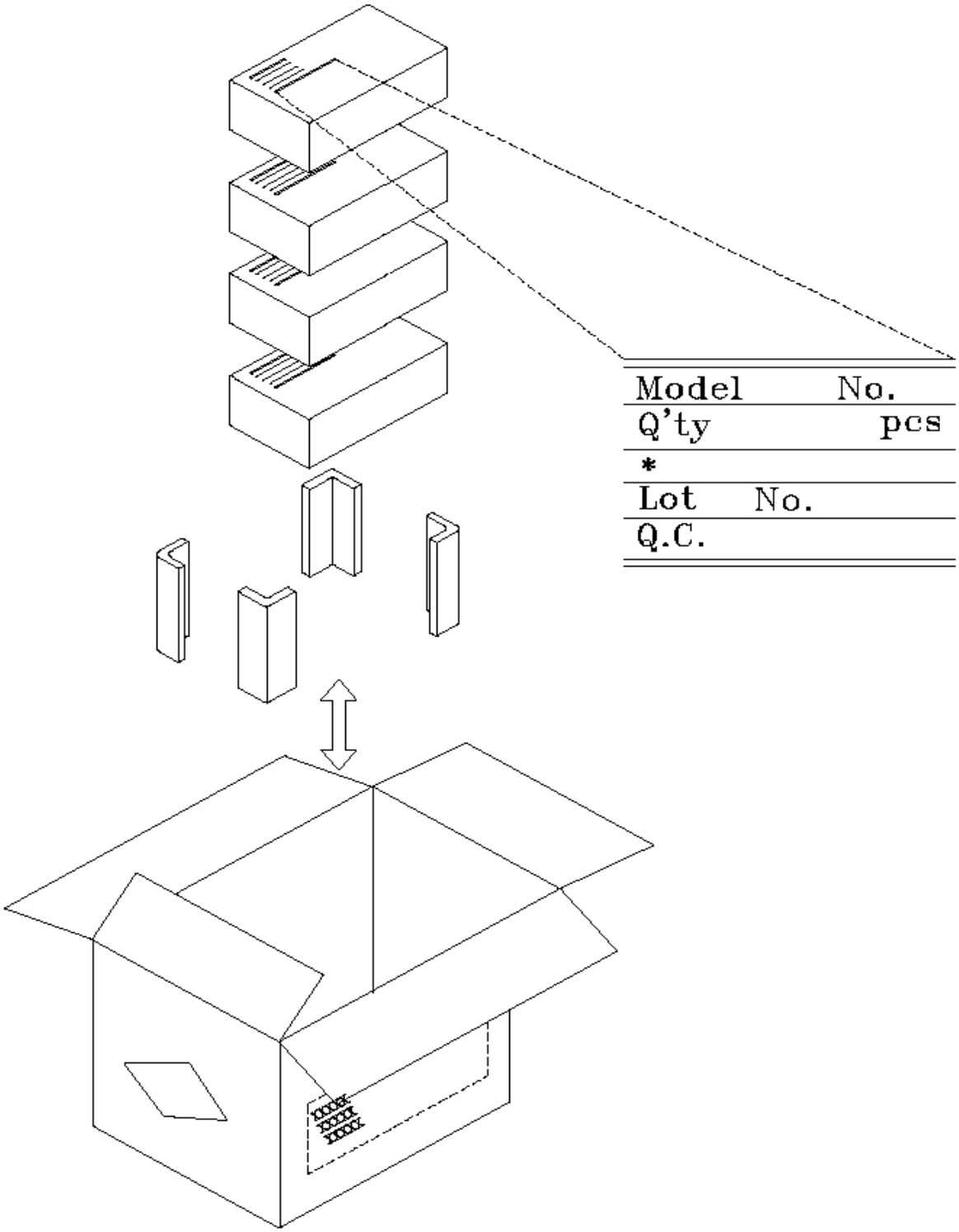
MODEL NO: UMSH-9153MD-1T

60 PCS/INDEX BOX

4 INDEX BOX/STACK

240 PCS/CARTON

NOTE:



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 (B) LINEAR TYPE:

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

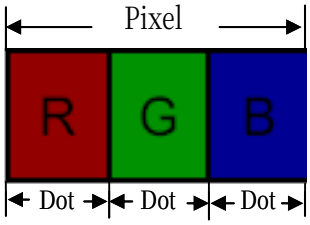
8.2.1. CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA FROM VIEWING DIRECTION.

8.2.2. CHECKER SHALL SEE OVER 300±25 mm. WITH BARE EYES FAR FROM SAMPLE AND USING 2 PCS. OF 20W FLUORESCENT LAMP.

8.3. INSPECTION PLAN :

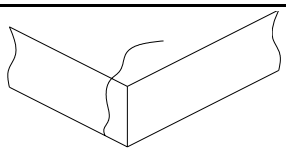
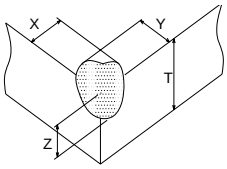
CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED	Critical
	3. PRODUCT INDICATION	(B) LINEAR TYPE: THE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

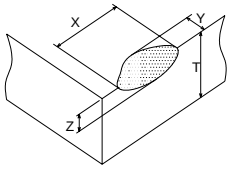
8.4. STANDARD OF VISUAL INSPECTION

<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</td><td>(A) ROUND TYPE: unit : mm.
<table>
<tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>Φ ≦ 0.1</td><td>DISREGARD</td></tr>
<tr><td>0.1 < 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</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 :
 

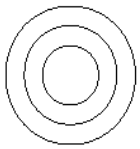
Note 1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
Note 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.
Note 3: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green ,blue pattern.</td></tr>
</table>

8.5 INSPECTION STANDARD OF TOUCH PANEL

<table>
<tr><th>NO.</th><th>CLASS</th><th colspan="2">ITEMS</th><th colspan="3">JUDGEMENT</th></tr>
<tr><td>8.5.1</td><td>MAJOR</td><td colspan="2">Touch Panel
Crack</td><td colspan="3"> 
Reject</td></tr>
<tr><td rowspan="2">8.5.2</td><td rowspan="2">MINOR</td><td rowspan="2">Touch Panel
Chipping</td><td>Corner</td><td colspan="3"> 

<table>
<tr><td>Not CNC Products</td><td>X≦2mm, Y≦2mm, Z＜1/2T</td><td>Accept</td></tr>
<tr><td>CNC Products</td><td>For CNC Outline Dimension</td><td>Accept</td></tr>
</table></td></tr>
<tr><td>Edge</td><td colspan="3"> 

<table>
<tr><td>Not CNC Products</td><td>X≦3mm, Y≦3mm, Z＜1/2T</td><td>Accept</td></tr>
<tr><td>CNC Products</td><td>For CNC Outline Dimension</td><td>Accept</td></tr>
</table></td></tr>
<tr><td rowspan="3">8.5.3</td><td rowspan="3">MINOR</td><td colspan="2" rowspan="3">Scratch
Dust and Foreign Material
(Linear Type)</td><td>W≦0.05, L≦10mm</td><td>Accept</td></tr>
<tr><td>0.05mm<W≦0.07mm；L≦5.0mm
Distance between seratch＞5.0mm</td><td>Accept
3 ea Max.</td></tr>
<tr><td>W>0.07mm</td><td>Reject</td></tr>
<tr><td rowspan="3">8.5.4</td><td rowspan="3">MINOR</td><td colspan="2" rowspan="3">Scratch
Dust and Foreign Material
(Round Type：Φ=(Length+Width)/2)</td><td>Φ≦0.15mm</td><td>Accept</td></tr>
<tr><td>0.15mm＜Φ≦0.25mm
Distance between seratch＞5.0mm</td><td>Accept
5 ea Max.</td></tr>
<tr><td>Φ＞0.25mm</td><td>Reject</td></tr>
<tr><td rowspan="3">8.5.5</td><td rowspan="3">MINOR</td><td colspan="2" rowspan="3">Touch Panel
Dent / Fish Eyes
(Φ=(Length+Width)/2)</td><td>Φ≦0.35mm</td><td>Accept</td></tr>
<tr><td>0.35mm＜Φ≦1.0mm
Distance ＞5.0mm</td><td>Accept
3 ea Max.</td></tr>
<tr><td>Φ＞1.0mm</td><td>Reject</td></tr>
<tr><td rowspan="3">8.5.6</td><td rowspan="3">MINOR</td><td colspan="2" rowspan="3">Touch Panel
Air Bubble
(Φ=(Length+Width)/2)</td><td>Φ≦0.15mm</td><td>Accept</td></tr>
<tr><td>0.15mm＜Φ≦0.25mm
Distance between bubbles＞5.0mm</td><td>Accept
3 ea Max.</td></tr>
<tr><td>Φ＞0.25mm</td><td>Reject</td></tr>
<tr><td rowspan="3">8.5.7</td><td rowspan="3">MINOR</td><td colspan="2" rowspan="3">Touch Panel
Printing area Scratch</td><td>W≦0.03, L≦10mm</td><td>Accept</td></tr>
<tr><td>0.03mm＜W≦0.05mm, L≦5mm</td><td>Accept
3 ea Max.</td></tr>
<tr><td>W＞0.05mm or L＞5mm
(W>0.05 Follow 8.5.4 Round type)</td><td>Reject</td></tr>
<tr><td>8.5.8</td><td>MINOR</td><td colspan="2">Touch Panel
White Haze Mark / Dust</td><td>Can not be removed</td><td>Reject</td></tr>
</table>

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