

# SPECIFICATION

## OF

### LIQUID CRYSTAL DISPLAY MODULE



CUSTOMER : URT-STD

Model No. : UMOH-8065MD-9T

Model version : 0

Document Revision : 1

## Preliminary

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  
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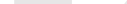
Jenny Wang  
PREPARED

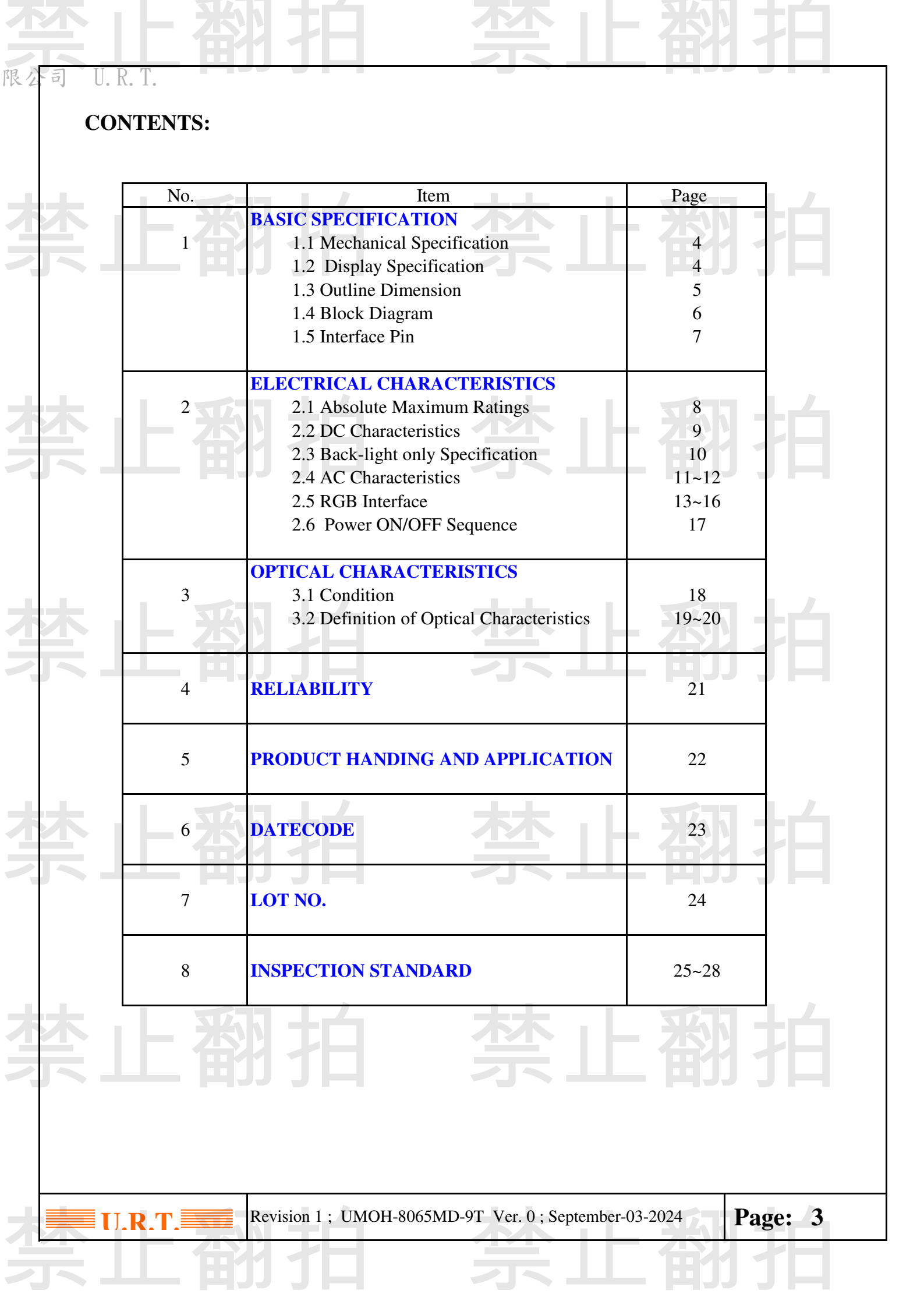
Sep-03-2024  
Date

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## 1. BASIC SPECIFICATION

### 1.1 Mechanical specifications

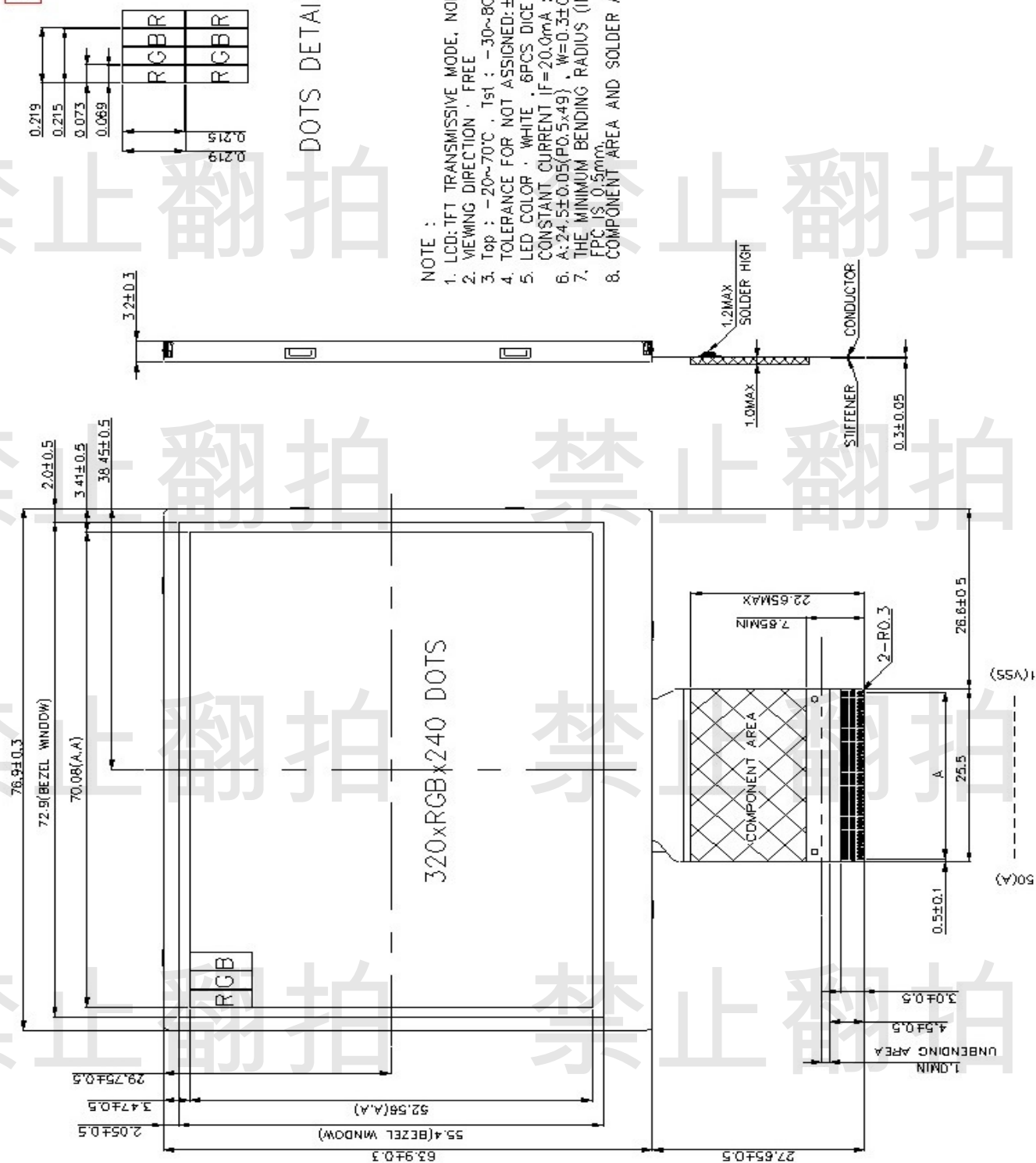
Items	Nominal Dimension	Unit
Active screen size	3.5" diagonal	-
Dot Matrix	320*RGB*240	Pixel
Module Size (W x H x T)	76.9 x 63.9 x 3.2	mm.
Active Area (W x H)	70.08 x 52.56	mm.
Dot Pitch (W x H)	0.219 x 0.219	mm.
Color depth	16.7M	color
Controller	ST7272A	color
Interface	RGB Interface	-
Driving IC Package	COG	-
Module weight	TBD	g

### 1.2 Display specification

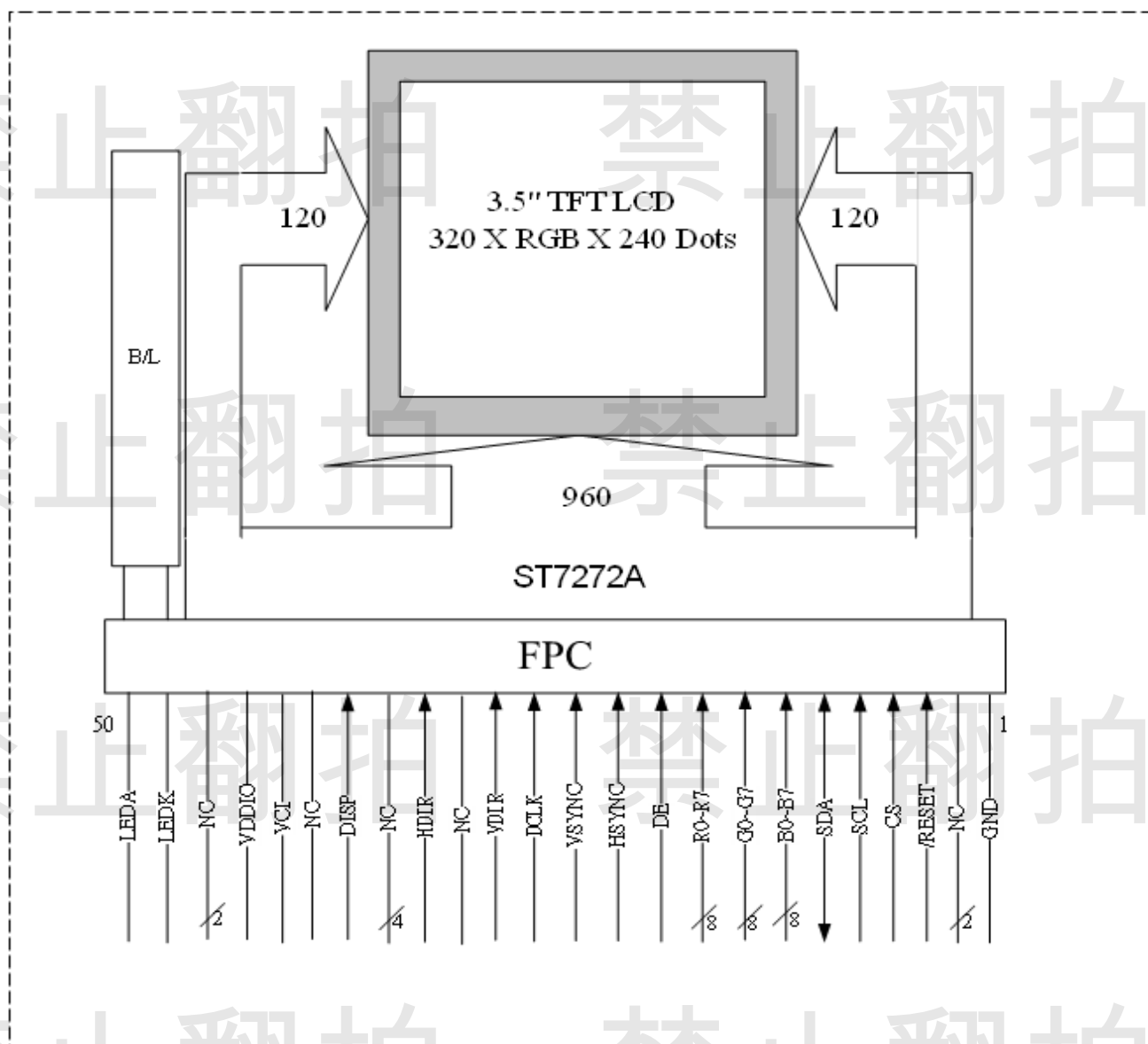
Display	Descriptions	Note
LCD Type	a-Si TFT	-
LCD Mode	Normally Black	-
Polarizer Surface	Glare	-
Pixel arrangement	RGB-stripe	-
Backlight Type	LED	-
Viewing Direction	Free	-
Back Light	6 White LEDS	-

Color tone is slightly changed by temperature and driving voltage.

CONFIDENTIAL(B)



# 1.4 Block diagram:



## 1.5 Interface pin Connection:

Pin No.	Pin Symbol	I/O	Description	
1	GND	P	Ground.	
2~3	NC	-	No Connector	
4	/RESET	I	Reset signal input terminal, active at 'L'	
5	CS	I	SPI interface data enable signal	
6	SCL	I	This pin is used serial interface clock in SPI	
7	SDA	I/O	Serial input signal in SPI I/F.	
8~15	B0~B7	I	Blue data bus	
16~23	G0~G7	I	Green Data bus.	
24~31	R0~R7	I	Red Data bus	
32	DE	I	Data enable input. Active high to enable the input data bus.	
33	HSYNC	I	Horizontal sync input in RGB mode.	
34	VSYNCR	I	Vertical sync input in RGB mode	
35	DCLK	I	Pixel clock input pin	
36	VDIR	I	Vertical scan direction control pin. This pin must be connected to "H" or "L" according to system application.	
			VDIR	Function Description
			L	From down to up.
			H	From up to down.
37	NC	-	No Connector	
38	HDIR	I	Horizontal scan direction control pin. This pin must be connected to "H" or "L" according to system application.	
			HDIR	Function Description
			L	From right to left
			H	From left to right
39~42	NC	-	No Connector	
43	DISP	I	DISP sets the display mode. L Standby mode    H Normal display mode	
44	NC	-	No Connector	
45	VCI	P	Power Supply for Analog Circuits.	
46	VDDIO	P	Voltage input pin for I/O logic.	
47~48	NC	-	No Connector	
49	LEDK	P	Cathode input for LED backlight.	
50	LEDA	P	Anode input for LED backlight.	

## 2. ELECTRICAL CHARACTERISTICS

### 2.1 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Note
Power Supply voltage	VCI	-0.3	+4.0	V	1,2
IO Supply voltage	VDDIO	-0.3	+4.0	V	1,2
Operating temperature range	T <sub>OP</sub>	-20	+70	°C	4,5
Storage temperature range	T <sub>ST</sub>	-30	+80	°C	

#### Notes:

1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.
2. VCI & VDDIO>GND must be maintained.
3. Please be sure users are grounded when handing LCD Module
4. The response time will become lower when operated at low temperature.
5. Background color changes slightly depending on ambient temperature.  
The phenomenon is reversible.



## 2.2 DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Power Supply voltage	VCI	3.0	3.3	3.6	V	
IO Supply voltage	VDDIO	1.65	3.3	3.6	V	
Input high level voltage	V <sub>IH</sub>	0.7VDDIO	-	VDDIO	V	-
Input low level voltage	V <sub>IL</sub>	GND	-	0.3 VDDIO	V	-
Output high level voltage	V <sub>OH</sub>	VDDIO -0.4		VDDIO		
Output low level voltage	V <sub>OL</sub>	GND		GND+0.4		
Power supply current	I <sub>VCI+VDDIO</sub>	-		TBD	mA	NOTE

NOTE :

Measuring Condition :

Standard Value MAX.

T<sub>a</sub> = 25°C

VCI=VDDIO = +3.3V

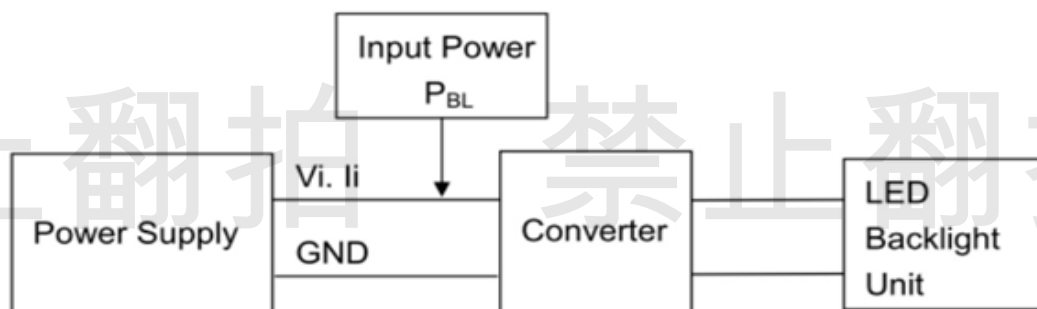
Display Pattern

## 2.3 Back-light only Specification:

PARAMETER	SYMBOL	MIN	TYP	MAX	Unit	Test Condition	NOTE
Supply Current	If	-	20	-	mA	Ta=25°C	1
Supply Voltage	Vf	18.6	20.4	22.2	V	Ta=25°C If=20mA	
Half-Life Time	Lf	-	50000	-	Hr	Ta=25°C	2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and If=20mA.

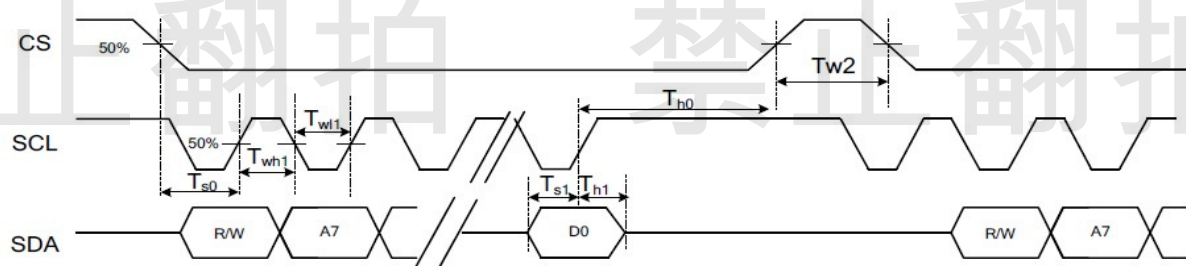
Note 2: LED current is measured by utilizing a high frequency current meter as shown below:



Note3: 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 ..

## 2.4 AC Characteristics

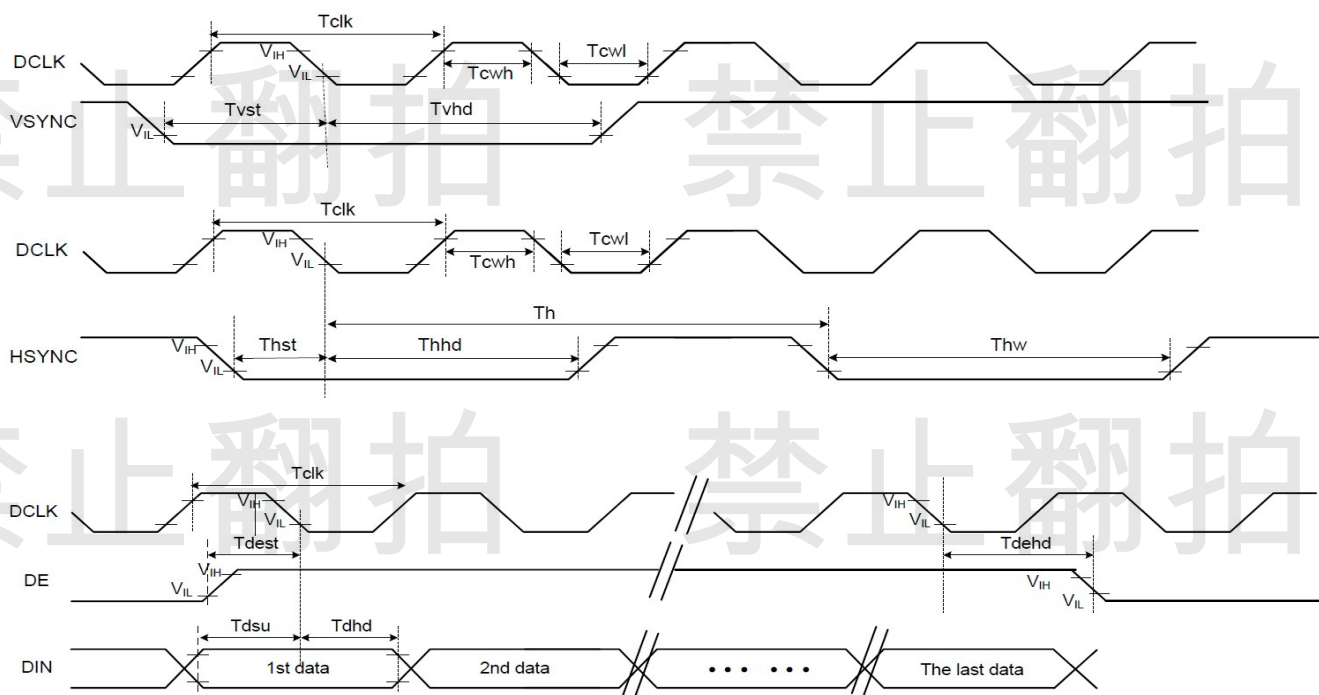
### 2.4.1 3-line serial Interface Timing Characteristics.



Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CS Input Setup Time	$T_{s0}$	50	-	-	ns	
Serial Data Input Setup Time	$T_{s1}$	50	-	-	ns	
CS Input Hold Time	$T_{h0}$	50	-	-	ns	
Serial Data Input Hold Time	$T_{h1}$	50	-	-	ns	
SCL Write Pulse High Width	$T_{wh1}$	50	-	-	ns	
SCL Write Pulse Low Width	$T_{wl1}$	50	-	-	ns	
SCL Read Pulse High Width	$T_{rh1}$	300			ns	
SCL Read Pulse Low Width	$T_{rl1}$	300			ns	
CS Pulse High Width	$T_{w2}$	400	-	-	ns	

3-line serial Interface Timing Characteristics

## 2.4.2 System Bus Timing for RGB Interface

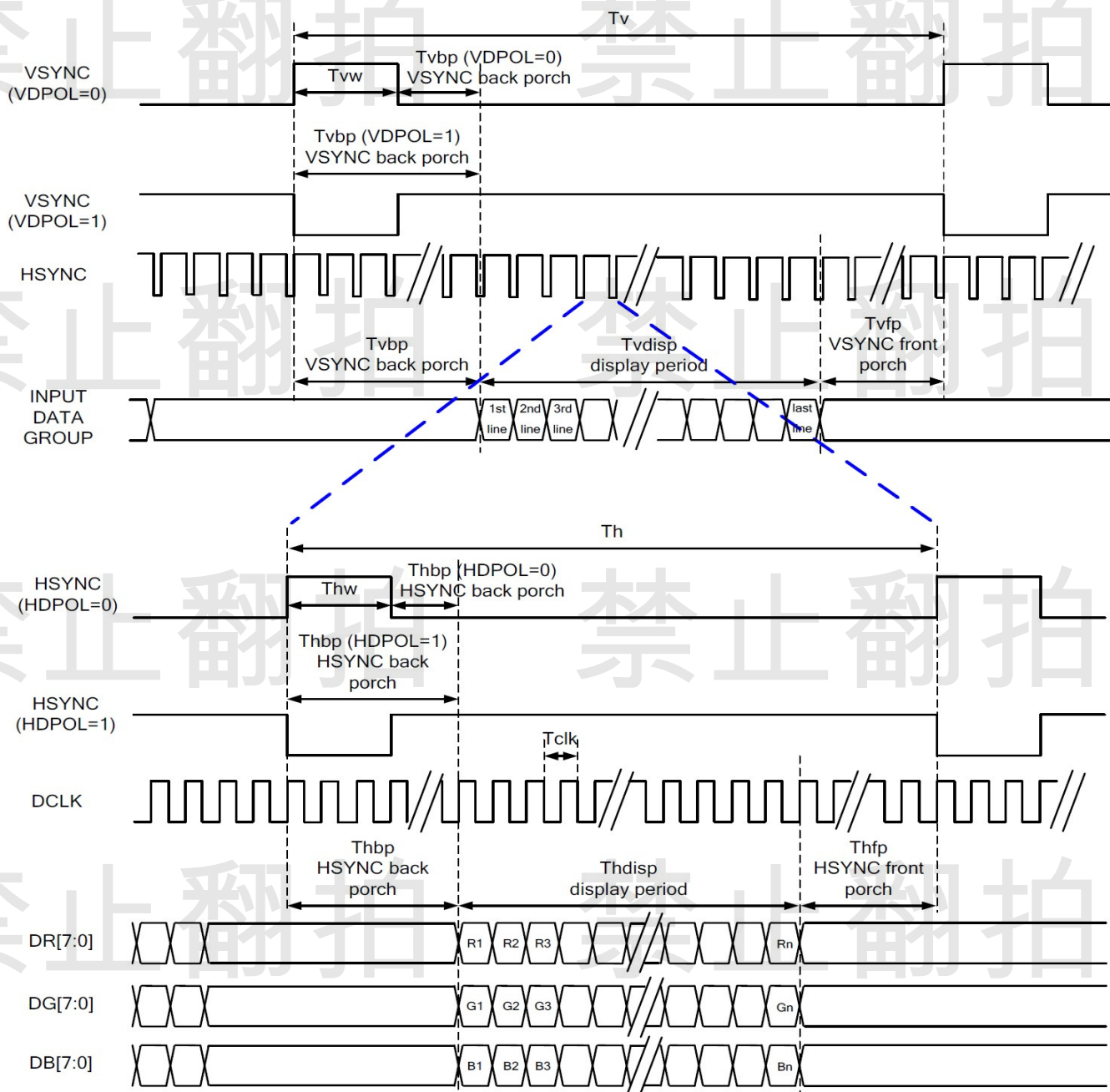


Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	$T_{clk}$	40	50	60	%	
HSYNC Width	$T_{hw}$	2	-	-	DCLK	
HSYNC Period	$T_h$	55	60	65	us	
VSYNC Setup Time	$T_{vst}$	12	-	-	ns	
VSYNC Hold Time	$T_{vhhd}$	12	-	-	ns	
HSYNC Setup Time	$T_{hst}$	12	-	-	ns	
HSYNC Hold Time	$T_{hhhd}$	12	-	-	ns	
Data Setup Time	$T_{dsu}$	12	-	-	ns	
Data Hold Time	$T_{dhhd}$	12	-	-	ns	
DE Setup Time	$T_{dest}$	12	-	-	ns	
DE Hold Time	$T_{dehd}$	12	-	-	ns	

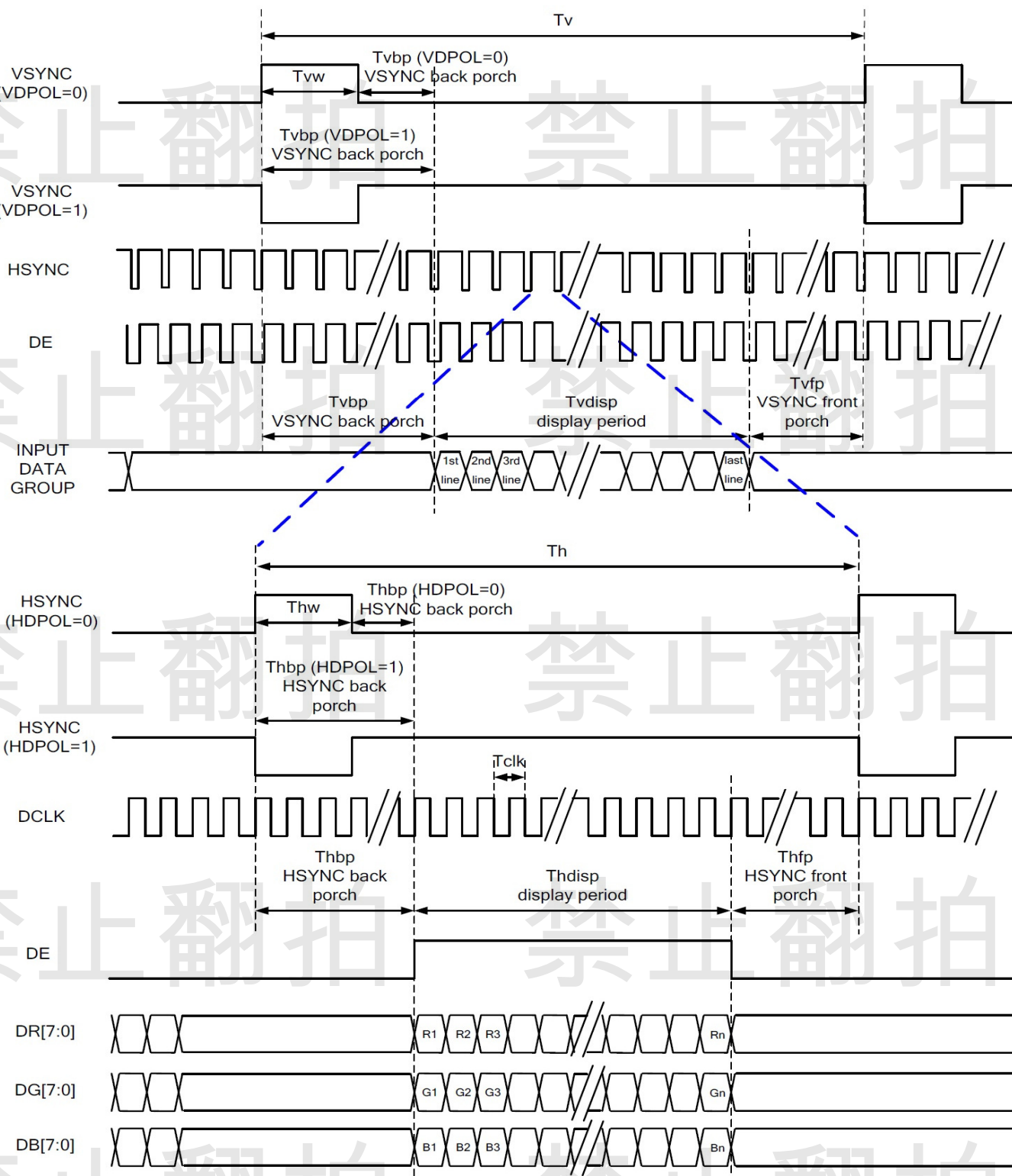
Figure. Mode shift flow chart

## 2.5 RGB Interface

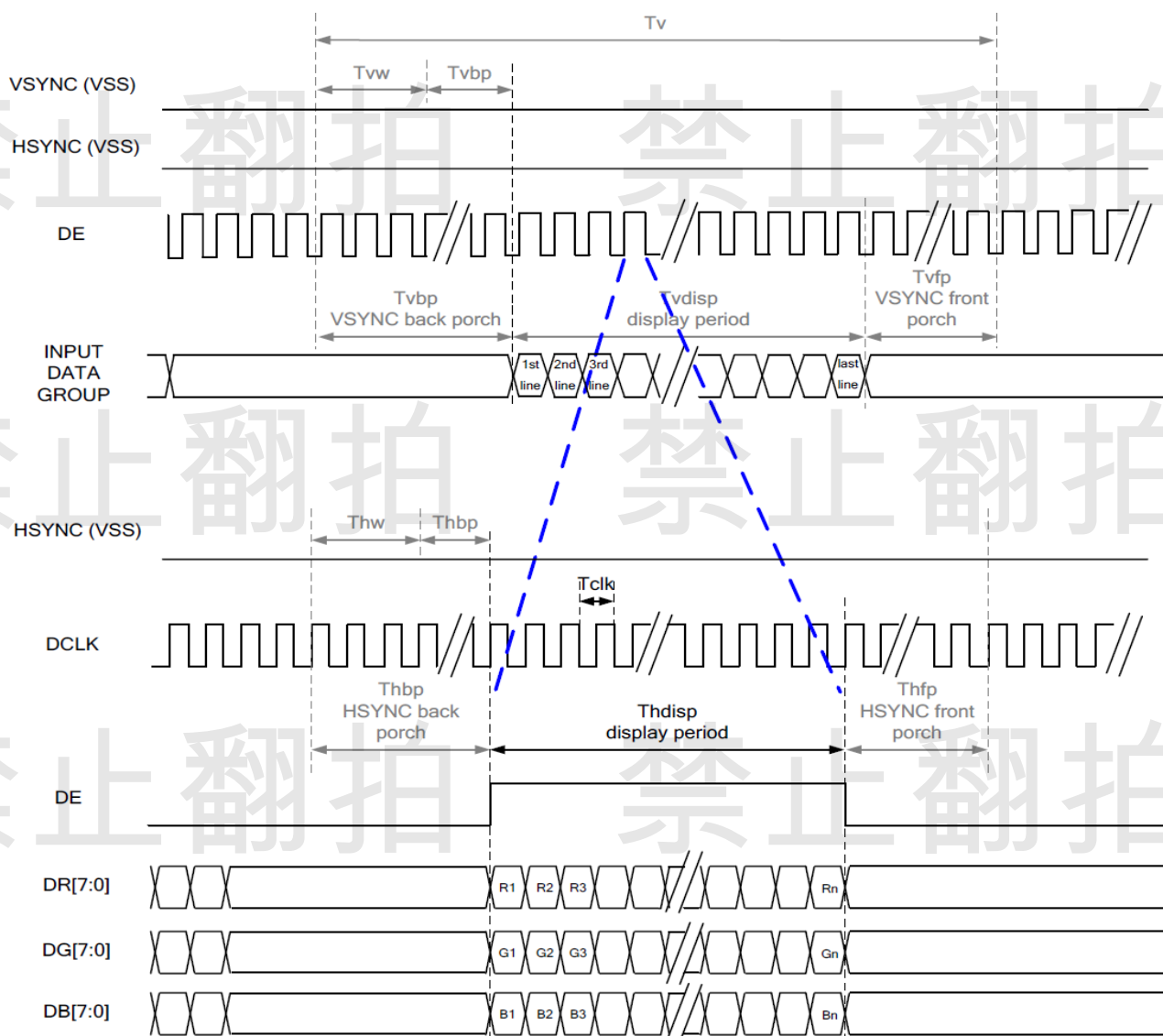
### 2.5.1 SYNC MODE



## 2.5.2 SYNC-DE Mode



## 2.5-3 DE Mode



RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC - DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

Note: "Input" means these signals are driven by host side.

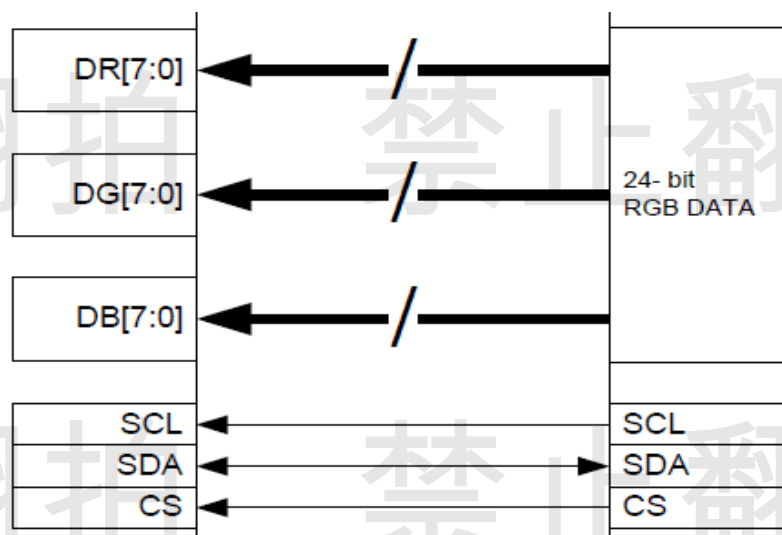


## 2.5.4 Parallel 24-bit RGB Input Timing Table

Parallel 24-bit RGB Input Timing (VCC3.3V, AGND= 0V, TA=25°C)

Parallel 24-bit RGB Input Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	5	6	8	MHz	
DCLK Period		Tclk	125	167	200	ns	
HSYNC	Period Time	Th	325	371	438	DCLK	
	Display Period	Thdisp		320		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	By H_BLANKING setting
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	244	260	289	HSYNC	
	Display Period	Tvdisp		240		HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	By V_BLANKING setting
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

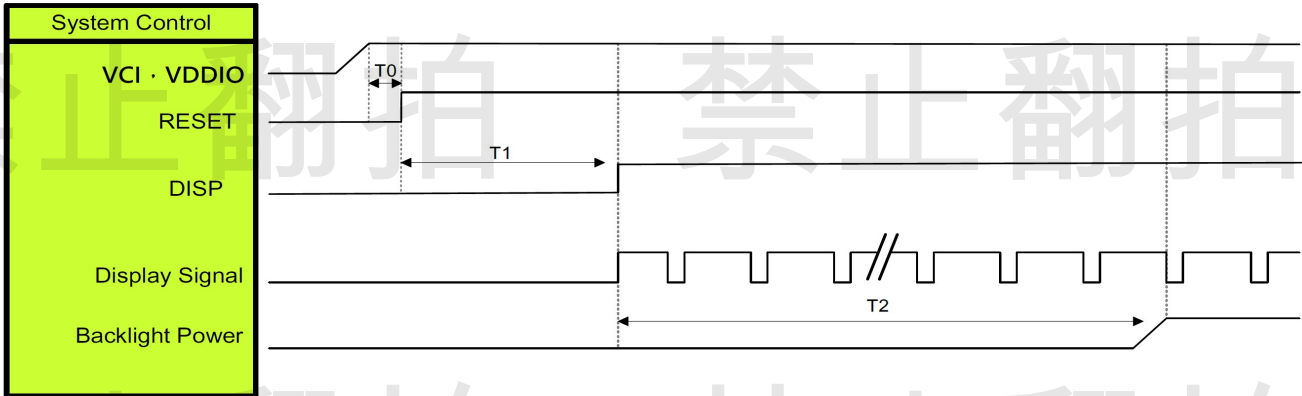
Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.





2.6 Power ON/OFF Sequence

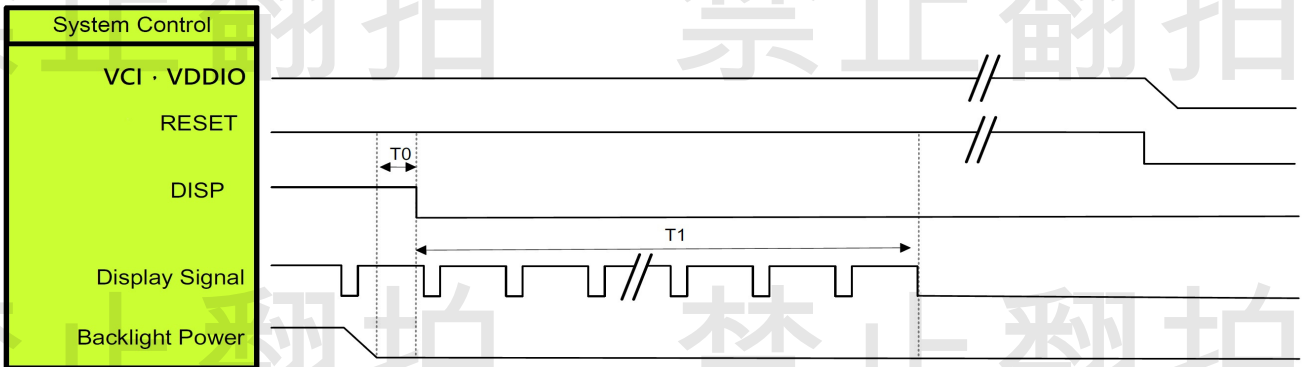
Power On Sequence



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

Note: 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	80	ms

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



3. OPTICAL CHARACTERISTICS

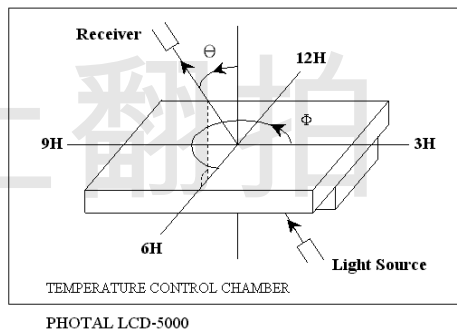
3.1 Characteristics

Electrical and Optical Characteristics

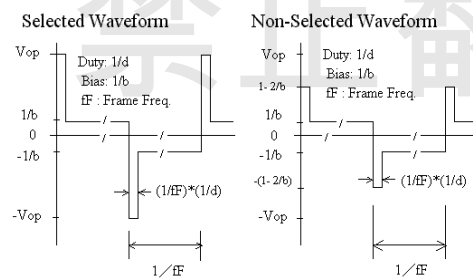
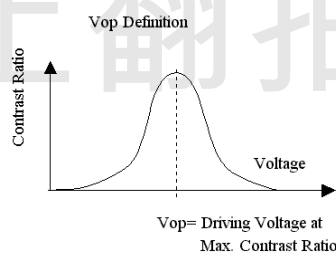
No.	Item			symbol / temp.		Min.	Typ.	Max.	Unit	Note
1	Response Time			Tr+TF	25 °C	-	TBD	-	ms	2
2	Viewing Angle	Hor.	Cr≥10	$\theta_{2+}$	$\Phi = 0^{\circ}$	-	TBD	-	degree	3
				$\theta_{2-}$	$\Phi = 180^{\circ}$	-	TBD	-		
		Ver.		$\theta_{1+}$	$\Phi = 270^{\circ}$	-	TBD	-		
				$\theta_{1-}$	$\Phi = 90^{\circ}$	-	TBD	-		
3	Contrast Ratio			Cr	25 °C	-	TBD	-	-	4
4	Red x-code			Rx	25 °C	-	TBD	-	-	5
	Red y-code			Ry		-	TBD	-		
	Green x-code			Gx		-	TBD	-		
	Green y-code			Gy		-	TBD	-		
	Blue x-code			Bx		-	TBD	-		
	Blue y-code			By		-	TBD	-		
	White x-code			Wx		-	TBD	-		
	White y-code			Wy		-	TBD	-		
	Brightness			Y		-	TBD	-	cd/m <sup>2</sup>	
5	Brightness Uniformity				25 °C	-	TBD	-	%	6

Measurement condition :

Transmissive and Transflective type

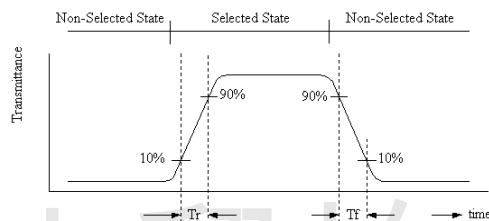


[Note 1] Definition of LCD Driving Vop and Waveform :



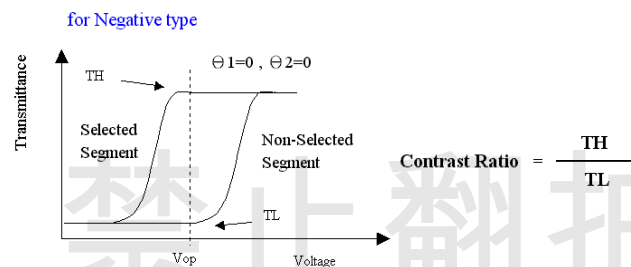
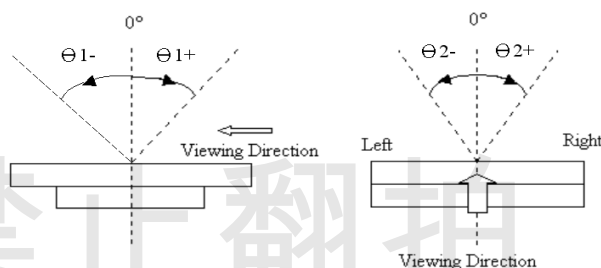
[Note 2] Definition of Response Time

for Negative type :



[Note 3] Definition of Viewing Angle :

[Note 4] Definition of Contrast Ratio :





#### 4. RELIABILITY :

Item No	Items	Condition	Remark
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 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

### 5.1 PRECAUTION FOR HANDLING LCM

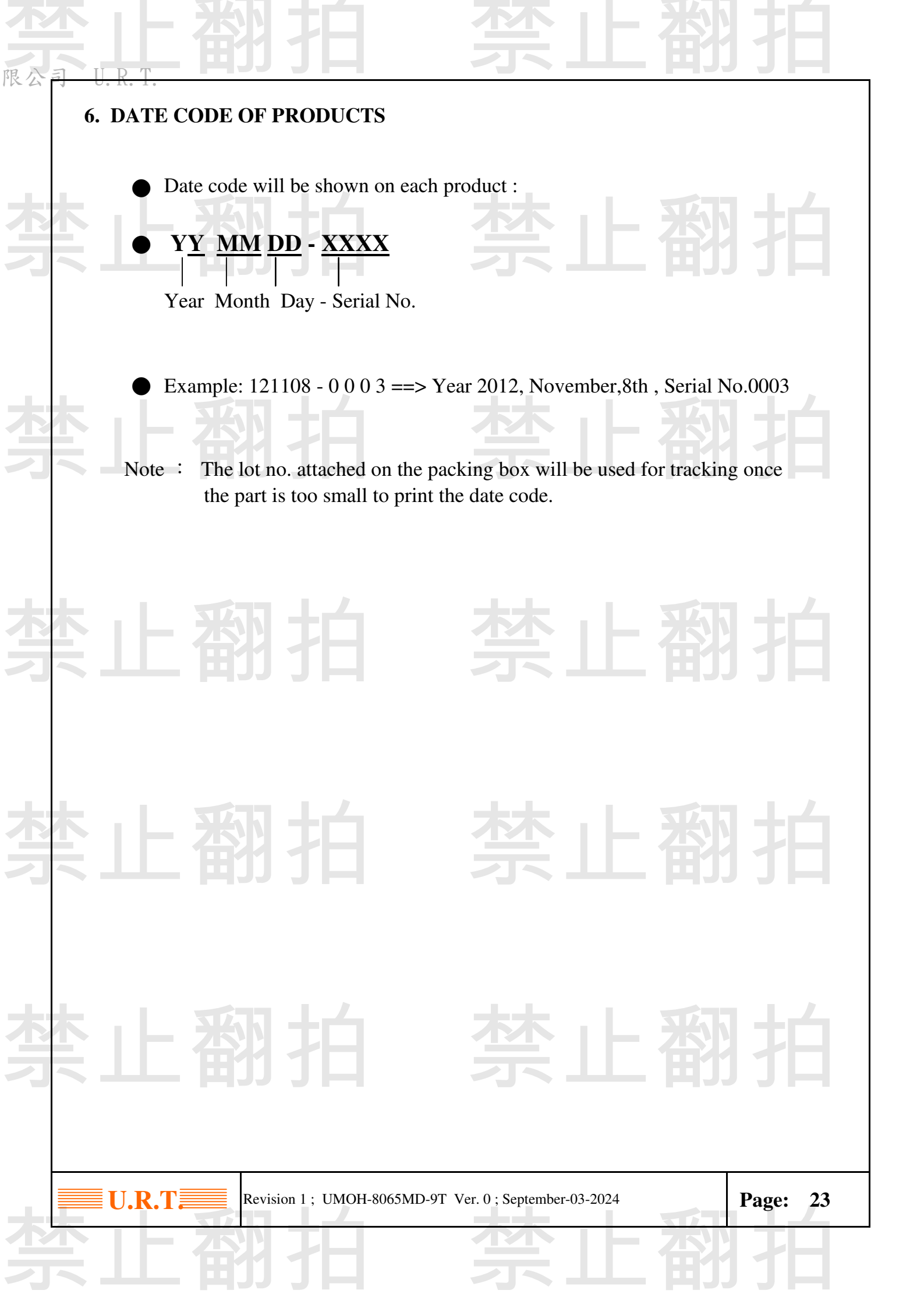
- The LCD module contains a C-MOS LSI. People who operate the LCM should wear ESD protection equipment to prevent ESD hurt on products.
- Do not input any signal before power is turned on.
- Do not take LCM from its packaging bag until it is assembled.
- Peel off the LCM protective film slowly since static electricity may be generated.
- Use a non-leak iron for soldering LCM, soldering Temperature at iron tip : $350^{\circ}\text{C} \pm 20^{\circ}\text{C}$ .
- Do not touch the display surface or connection terminals area with bare hands. Smudges on the display surface reduce the insulation between terminals.
- Do not twist or bend the modules and also avoid any inappropriate external force on display surface during assembly.
- Do not expose LCM to organic solvent. IF 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 or fluorescent light, also avoid them in high-temperature & high humidity environment for a long period.
- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
- Do not drive LCM by DC voltage & avoid displaying at certain pattern for a long time otherwise it might cause image sticking.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Never use the LCD, LCM under 45 Hz, the liquid crystal will decomposition and cause permanently damage on display !!
- 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.

### 5.2 PRECAUTION FOR STORING

- Store the module in a dark room where must keep at  $25 \pm 10^{\circ}\text{C}$  and 65%RH or less.
- Do not store the module in surroundings containing organic solvent or corrosive gas
- Store the module in an anti-electrostatic container or bag.

### 5.3 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 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: 121108 - 0 0 0 3 ==> Year 2012, 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.

Instruction of lot number:

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

Date

01-1<sup>st</sup>  
02-2<sup>nd</sup>  
31-31<sup>th</sup>

Week

1 — 7

Week of  
Month

1 — 5

Month

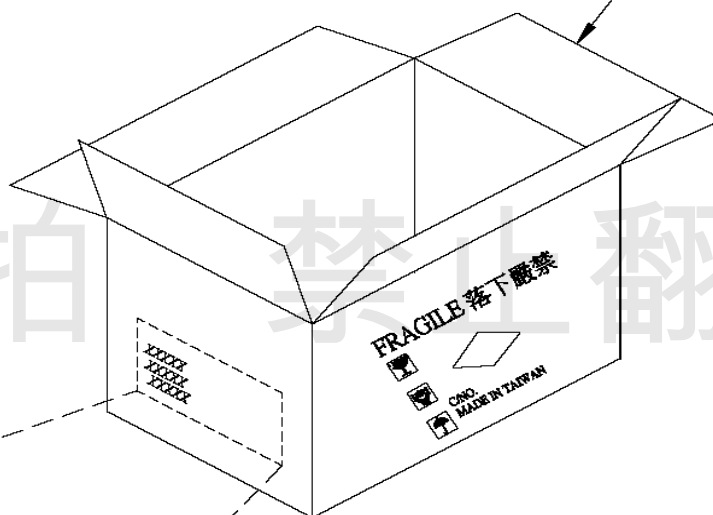
01-January  
02-February  
12-December

Year

00-2000  
01-2001

Lable of carton:

Carton Box



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

ISO2859-1 ( 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 :  $30 \pm 5$  CM.**

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

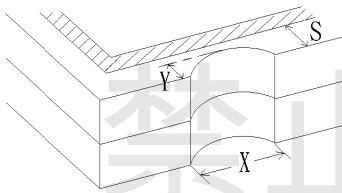
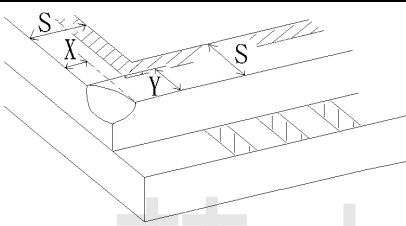
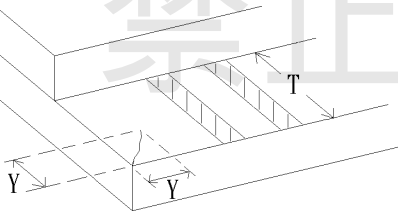
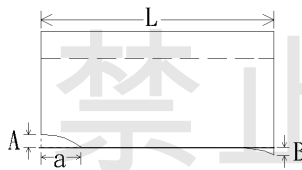
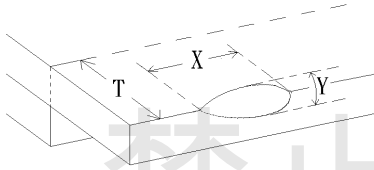
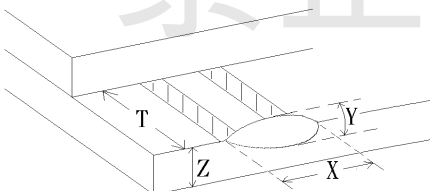
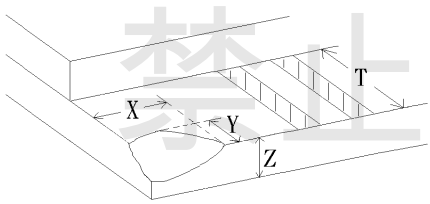
**8.2.3. AMBIENT ILLUMINANCE :** 2 PCS OF 20W FLUORESCENT LAMPS( DISTANCE TO THE SAMPLE >100CM)  
OR 1000±200 LUX.

### 8.3. 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



NO.	CLASS	ITEM	JUDGEMENT
8.4.4	MINOR	LCD GLASS CHIPPING	 $Y > S$ Reject
8.4.5	MINOR	LCD GLASS CHIPPING	 $X \text{ or } Y > S$ Reject
8.4.6	MAJOR	LCD GLASS GLASS CRACK	 $Y > (1/2) T$ Reject
8.4.7	MAJOR	LCD GLASS SCRIBE DEFECT	 <ol style="list-style-type: none"> <li><math>a &gt; L/3</math>, <math>A &gt; 1.5\text{mm}</math>. Reject</li> <li>B : ACCORDING TO DIMENSION</li> </ol>
8.4.8	MINOR	LCD GLASS CHIPPING ( ON THE TERMINAL AREA )	 $\Phi = (x+y)/2 > 3.0 \text{ mm}$ Reject
8.4.9	MINOR	LCD GLASS CHIPPING ( ON THE TERMINAL SURFACE )	 $Y > (1/3) T$ Reject
8.4.10	MINOR	LCD GLASS CHIPPING	 $Y > T$ Reject