

APPROVAL SHEET

MODELNO: COG-T350KFY-05

Approval option: Specification

Sample

■ Customer' s Confirmation

Customer :
Approved by:
Date:
Note:

■ Center Confirmed:

Approved	Checked by	Made by

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1. Introduction

1.1 Scope of application

This specification applies to the positive type TFT transmissive dot matrix LCD module.

LCD specification: Dots 320xRGBx240.

As to basic specification of the driver IC, refer to the IC (HX8238D) specification and datasheet.

1.2 Structure:

Module display structure:

TFT Module + FPC +BL

16.7M FULL Dithering Color3.5 inch TFT LCD size for main LCD;

One bare chip with gold bump (COG) TECH;

1.3 TFT features:

Structure: TFT PANNEL+IC+FPC+BL;

Transmissive Type LCD

320 dot-source and 240 dot-gate outputs;

White LED back light;

1.4 Applications:

Mobile phone

PSP

PDA

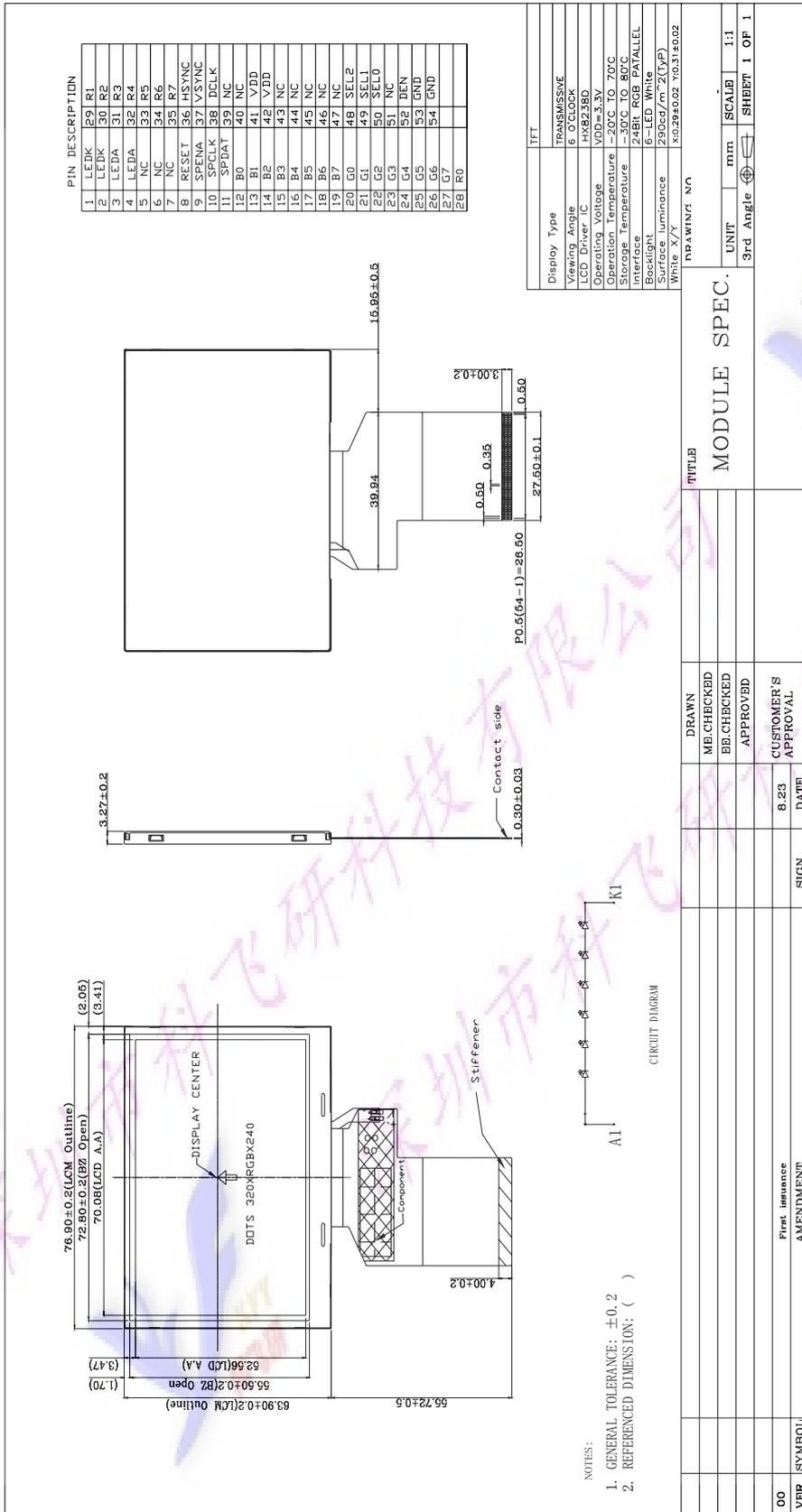
GPS

Etc...

2. General specification

ITEM	Standard value	UNIT
LCD Type	TFT Transmissive	---
Driver element	a-Si TFT Active matrix	
Number of Dots	320*(RGB)*240	Dots
Pixel Arrangement	RGB Vertical Stripe	
Active Area	70.08 *52.56	mm
Viewing Area (W*H)	/	mm
Viewing Direction	12 0' clock	
Driver IC	HX8238D	
Module Size(W*H*T)	76.9x63.9x3.26	mm
Approx. Weight	TBD	g
Back Light	White LED	
System interface	24-bit RGB interface	

3. Mechanical drawing



4. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Supply voltage	V_{CI}	-0.3	4.0	V
Input voltage for logic	V_{DDIO}	-0.5	$V_{cc} + 0.3$	V
Supply current (One LED)	I_{LED}		30	mA
Operating temperature	T_{OP}	-20	+70	°C
Storage temperature	T_{ST}	-30	+80	°C

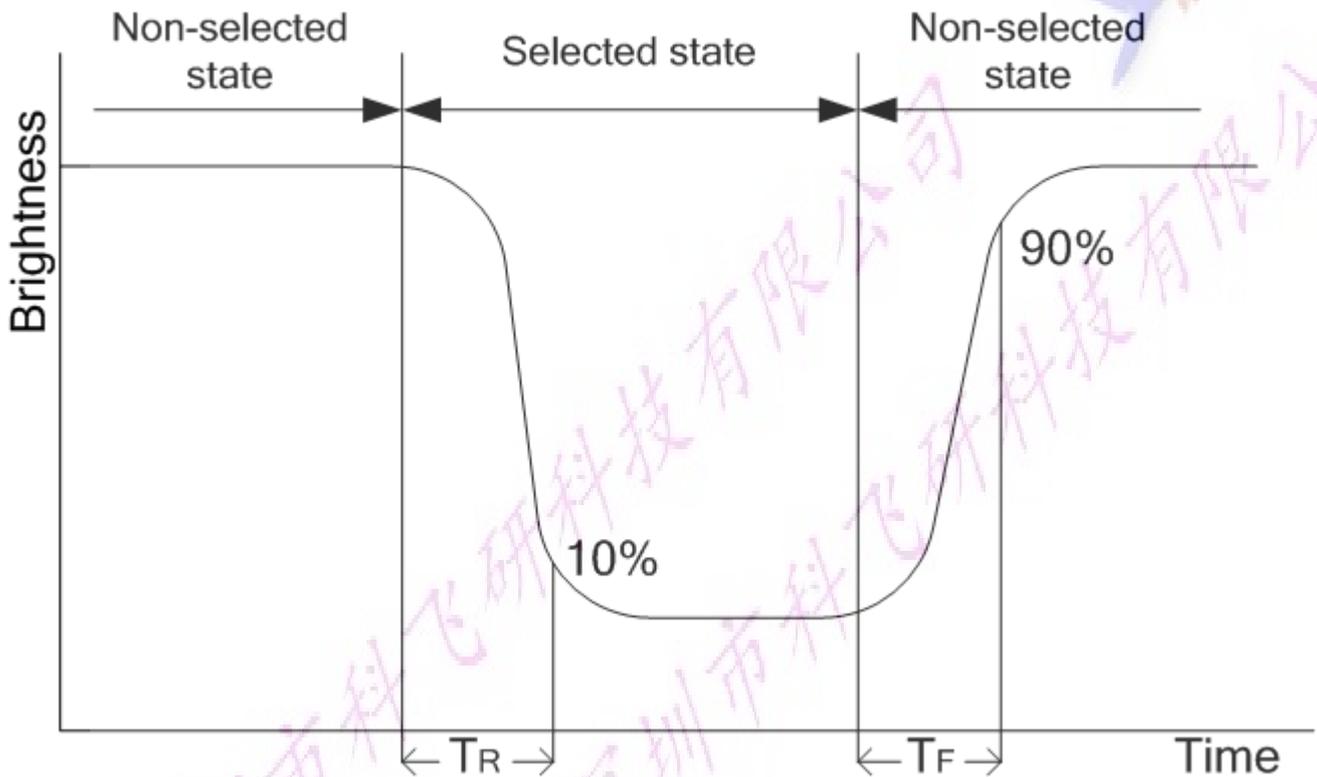
5. ELECTRICAL CHARACTERISTICS

Item	Symbol	Min	Typ	Max	Unit	Applicable terminal
Supply voltage	V_{CI}	2.5	3.3	3.6	V	V_{DD}
Input voltage	V_{IL}	-0.3	-	$0.2 V_{CI}$	V	
	V_{IH}	$0.8 V_{CI}$	-	V_{CI}	V	
Input leakage current	I_{LKG}	-	-	-	μA	
LED Forward voltage	V_f	3.0	3.2	3.4	V	With One LED
Input backlight current	I_{LED}	-	20	25	mA	With One LED
LED life time		20,000			hr	

Note 2: Definition of contrast ratio CR:

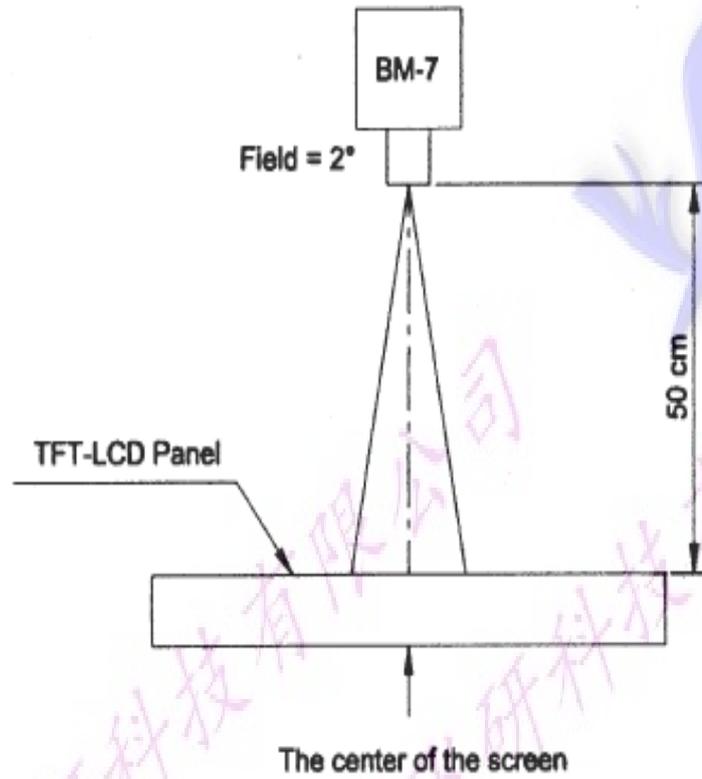
$$CR = \frac{\text{Brightness of non-selected dots (white)}}{\text{Brightness of selected dots (black)}}$$

Note 3: Definition of response time (T_R , T_F)

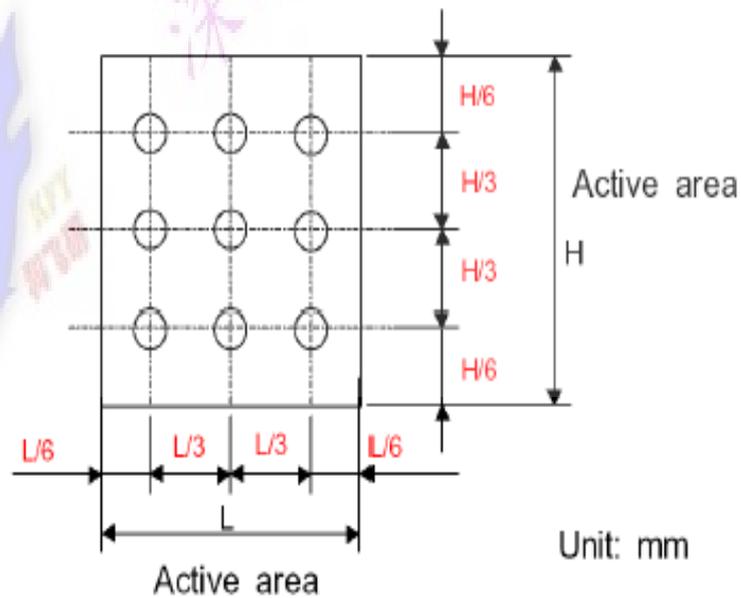


The brightness test equipment setup

20mA Field=2° (As measuring "black" image, field=2° is the best testing condition)



Note 4 :



7. MCU Interface Pin Function

. Table 2: Pin assignment

Pin No.	Symbol	Description
1	LED	Backlight LED Ground
2	LED	Backlight LED Ground
3	LED+	Backlight LED Power
4	LED+	Backlight LED Power
5	NC	Not Use
6	NC	Not Use
7	NC	Not Use
8	/RESET	Hardware Reset
9	SPENA	SPI Interface Data Enable Signal
10	SPCLK	SPI Interface Data Clock
11	SPDAT	SPI Interface Data
12	B0	Blue Data Bit 0
13	B1	Blue Data Bit 1
14	B2	Blue Data Bit 2
15	B3	Blue Data Bit 3
16	B4	Blue Data Bit 4
17	B5	Blue Data Bit 5
18	B6	Blue Data Bit 6
19	B7	Blue Data Bit 7
20	G0	Green Data Bit0
21	G1	Green Data Bit1
22	G2	Green Data Bit2
23	G3	Green Data Bit3
24	G4	Green Data Bit4
25	G5	Green Data Bit5
26	G6	Green Data Bit6
27	G7	Green Data Bit7
28	R0	Red Data Bit0 /DX0
29	R1	Red Data Bit1 /DX1
30	R2	Red Data Bit2 /DX2
31	R3	Red Data Bit3 /DX3
32	R4	Red Data Bit4 /DX4
33	R5	Red Data Bit5 /DX5
34	R6	Red Data Bit6 /DX6

35	R7	Red Data Bit7 /DX7
36	HSYNC	Horizontal Sync Input
37	VSYNC	Vertical Sync Input
38	DCLK	Dot Data Clock
39	NC	Not Use
40	NC	Not Use
41	VCC	Digital Power
42	VCC	Digital Power
43	NC	Not Use
44	NC	Not Use
45	NC	Not Use
46	NC	Not Use
47	NC	Internal test use
48	SEL2	Control the input data format /floating
49	SEL1	Control the input data format
50	SEL0	Control the input data format
51	NC	Not Use
52	DE	Data Enable Input
53	DGND	Ground
54	AVSS	Ground

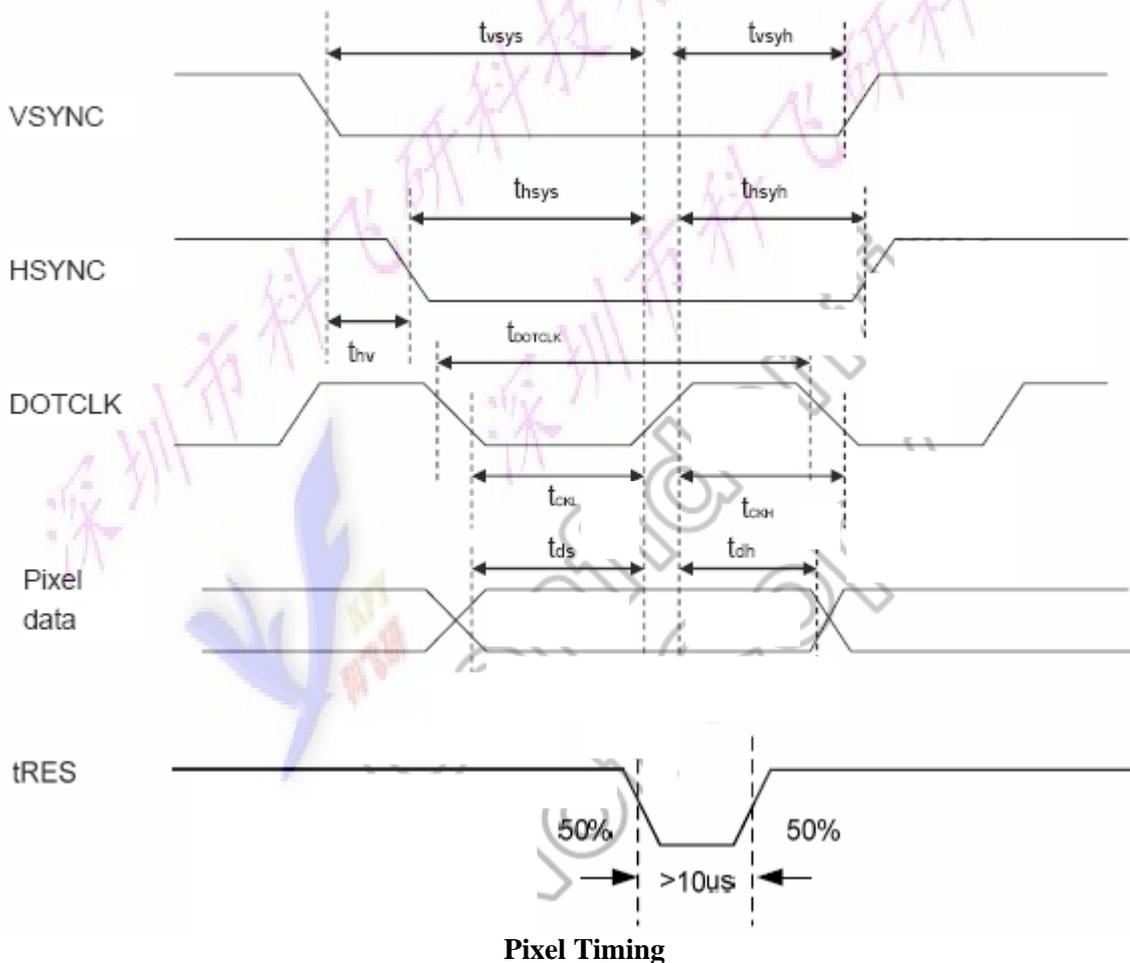
Note:

1. The mode control (SEL2) not use ,it can' t control CCIR601 interface , If not use CCIR601 ,it can floating.
2. For digital RGB input data format, both SYNC mode and DE+SYNC mode are supported. If DE signal is fixed low, SYNC mode is used. Otherwise, DE+SYNC mode is used. Suggest used SYNC mode!!
Suggest the DE signal usually pull low.
3. usually pull high.
4. IF select serial RGB or CCIR601/656 input mode is selected, only DX0-DX7 used, and the other short to GND, Only selected serial RGB、CCIR601/656 interface,DX BUS will enable,Digital input mode DX0 is LSB and DX7 is MSB.

5. Control the input data format

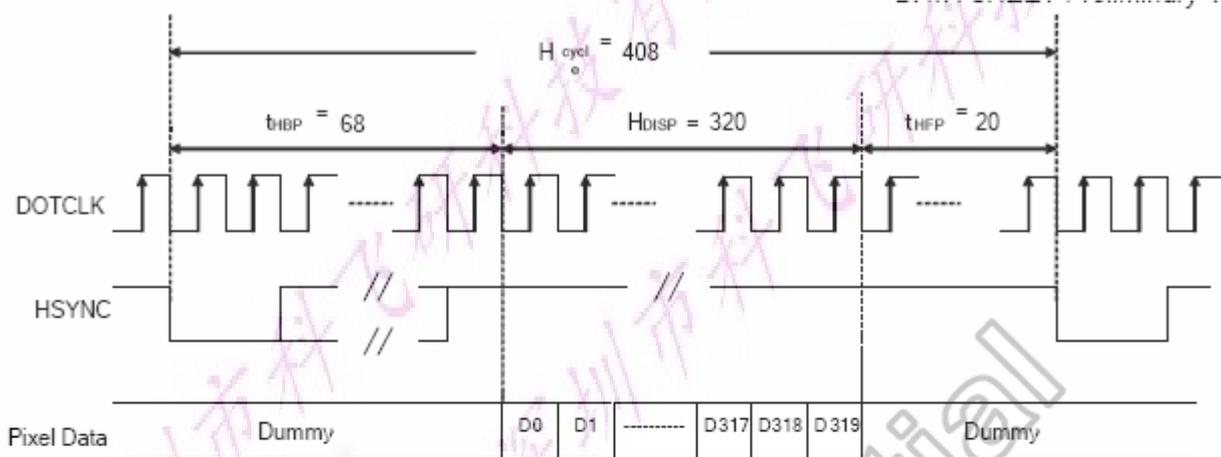
SEL2	SEL1	SEL0	Interface Mode
0	0	0	Parallel-RGB Data format interface (only support stripe type color filter)
0	0	1	Serial-RGB data format
0	1	0	CCIR 656 data format (640RGB)
0	1	1	CCIR 656 data format (720RGB)
1	0	0	YUV mode A data format (Cr-Y-Cb-Y)
1	0	1	YUV mode A data format (Cr-Y-Cb-Y)
1	1	0	YUV mode B data format (Cb-Y-Cr-Y)
1	1	1	YUV mode B data format (Cb-Y-Cr-Y)

Timing characteristics

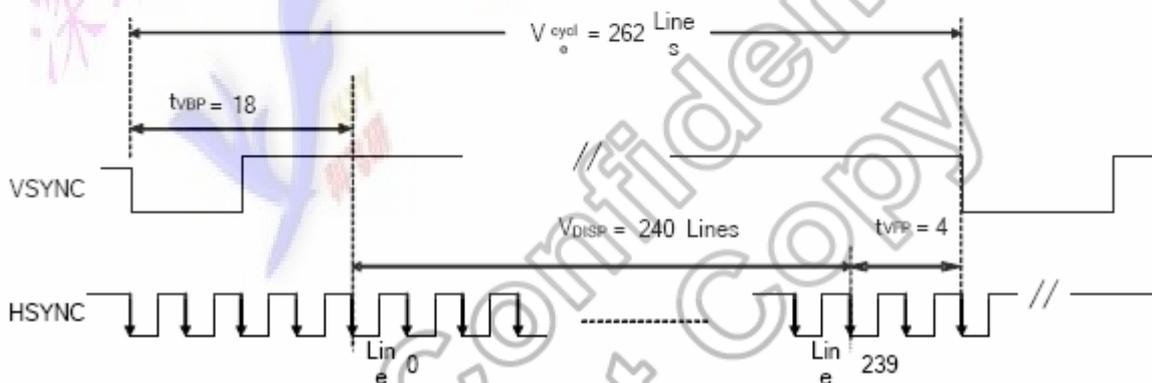


Characteristics	Symbol	Min.		Typ.		Max.		Unit
		24 bit	8 bit	24 bit	8 bit	24 bit	8 bit	
DOTCLK Frequency	fDOTCLK	-	-	6.5	19.5	10	30	MHz
DOTCLK Period	tDOTCLK	100	33.3	154	51.3	-	-	ns
Vertical Sync Setup Time	tvsys	20	10	-	-	-	-	ns
Vertical Sync Hold Time	tvsyh	20	10	-	-	-	-	ns
Horizontal Sync Setup Time	thsys	20	10	-	-	-	-	ns
Horizontal Sync Hold Time	thsyh	20	10	-	-	-	-	ns
Phase difference of Sync Signal Falling Edge	thv	1		-		240		tDOTCLK
DOTCLK Low Period	tCKL	50	15	-	-	-	-	ns
DOTCLK High Period	tCKH	50	15	-	-	-	-	ns
Data Setup Time	tds	12	10	-	-	-	-	ns
Data hold Time	tdh	12	10	-	-	-	-	ns
Reset pulse width	tRES	10		-		-		μs

Note: External clock source must be provided to DOTCLK pin of HX8238-D. The driver will not operate if absent of the clocking signal.

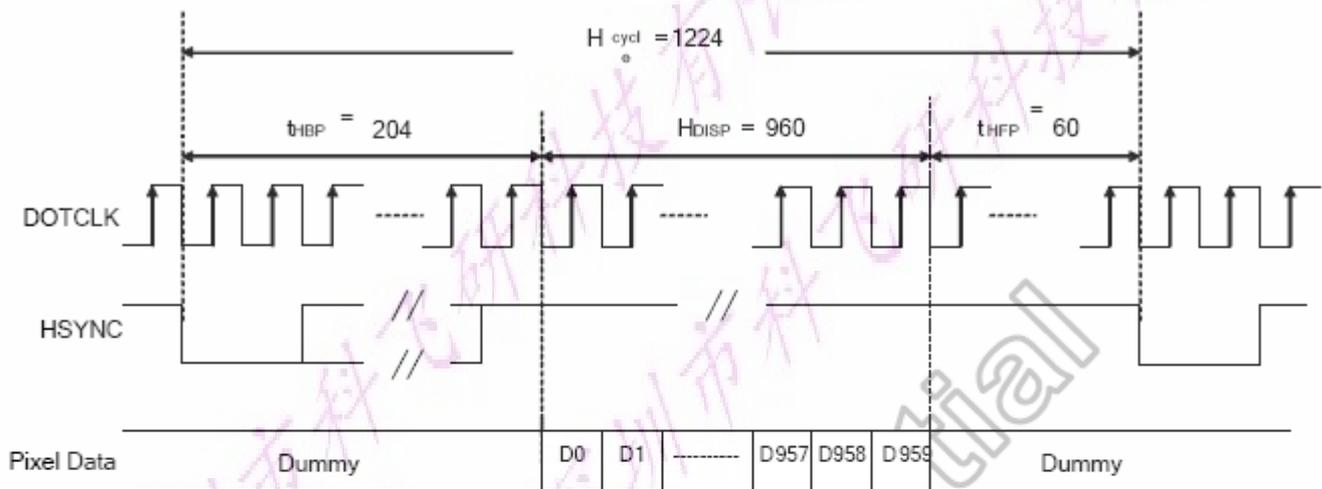


(a) Horizontal Data Transaction Timing

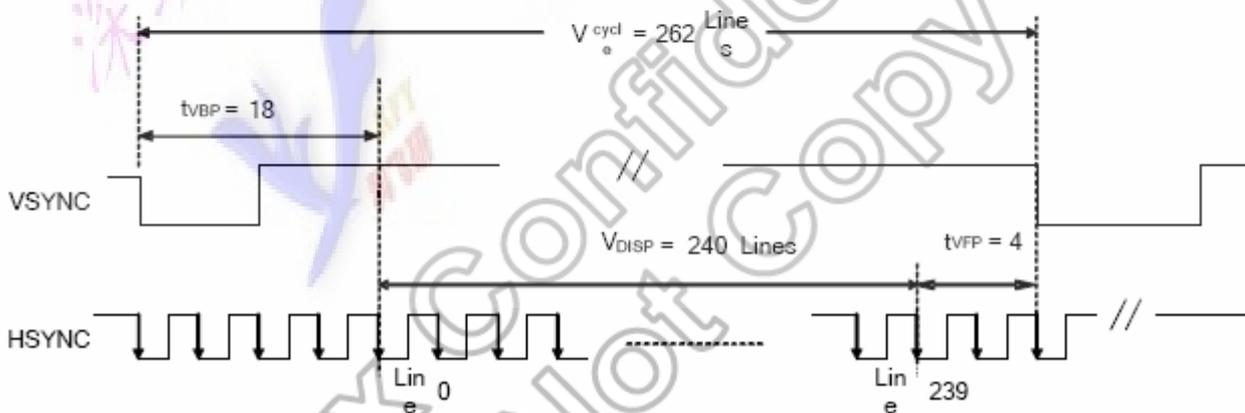


Data transaction Timing in parallel RGB(24bit) Interface (SYNC MODE)

Characteristics	Symbol	Min.		Typ.		Max.		Unit
		24 bit	8 bit	24 bit	8 bit	24 bit	8 bit	
DOTCLK Frequency	fDOTCLK	-	-	6.5	19.5	10	30	MHz
DOTCLK Period	tDOTCLK	100	33.3	154	51.3	-	-	ns
Horizontal Frequency (Line)	fH	-		14.9		22.35		KHz
Vertical Frequency (Refresh)	fV	-		60		90		Hz
Horizontal Back Porch	tHBP	-	-	68	204	-	-	tDOTCLK
Horizontal Front Porch	tHFP	-	-	20	60	-	-	tDOTCLK
Horizontal Data Start Point	tHBP	-	-	68	204	-	-	tDOTCLK
Horizontal Blanking Period	tHBP + tHFP	-	-	88	264	-	-	tDOTCLK
Horizontal Display Area	HDISP	-	-	320	960	-	-	tDOTCLK
Horizontal Cycle	Hcycle	-	-	408	1224	450	1350	tDOTCLK
Vertical Back Porch	tVBP	-		18		-		Lines
Vertical Front Porch	tVFP	-		4		-		Lines
Vertical Data Start Point	tVBP	-		18		-		Lines
Vertical Blanking Period	tVBP + tVFP	-		22		-		Lines
Vertical Display Area	NTSC	-		240		-		Lines
	PAL			280(PALM=0)				
	PAL			288(PALM=1)				
Vertical Cycle	NTSC	-		262		350		Lines
	PAL			313				

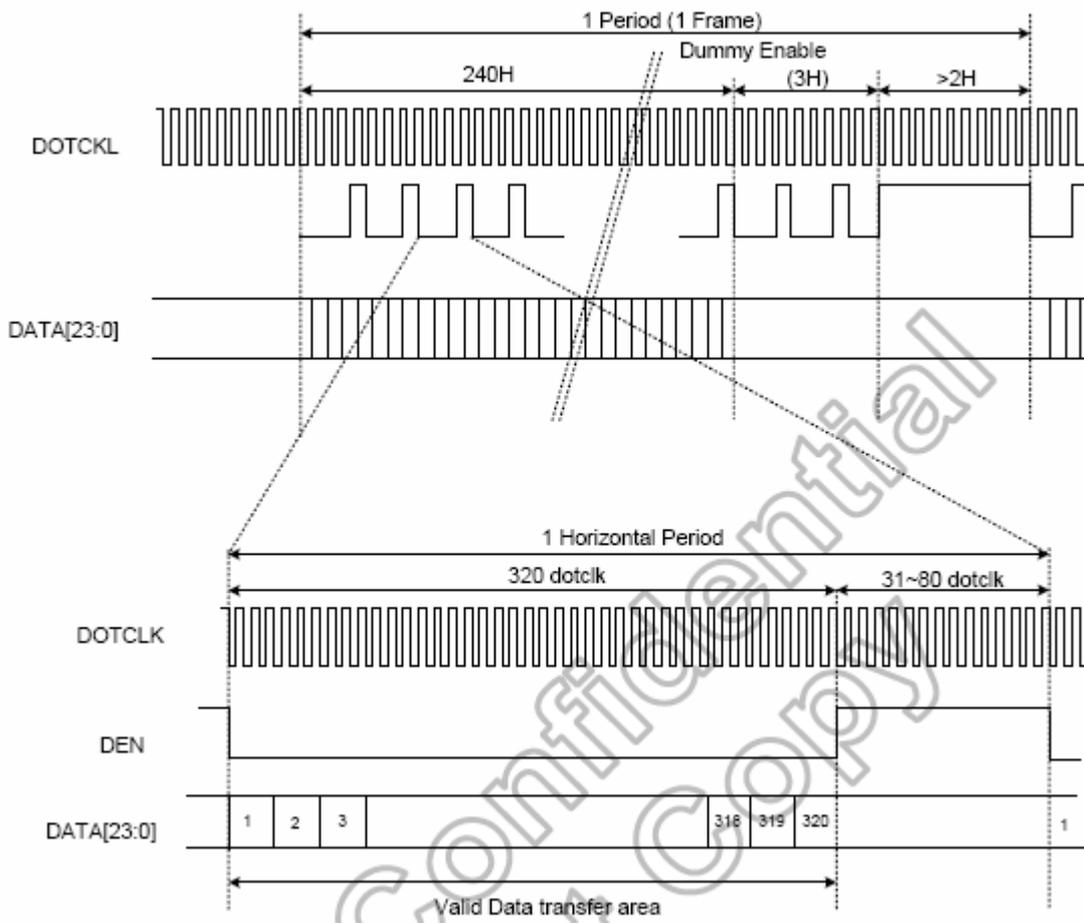


(1) Horizontal Data Transaction Timing

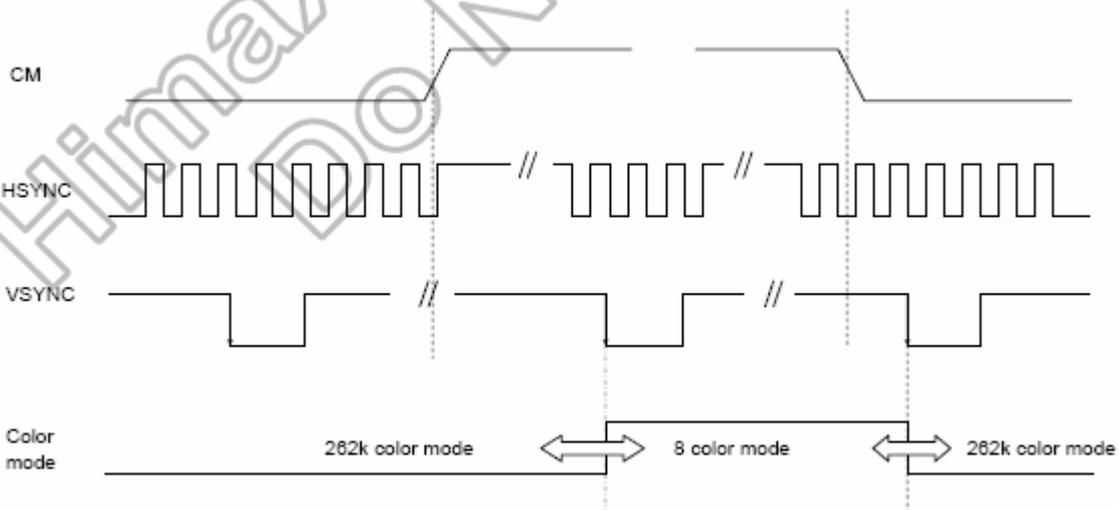


(2) Vertical Data Transaction Timing

Data transaction Timing in serial RGB(8BIT) interface (SYNC MODE)

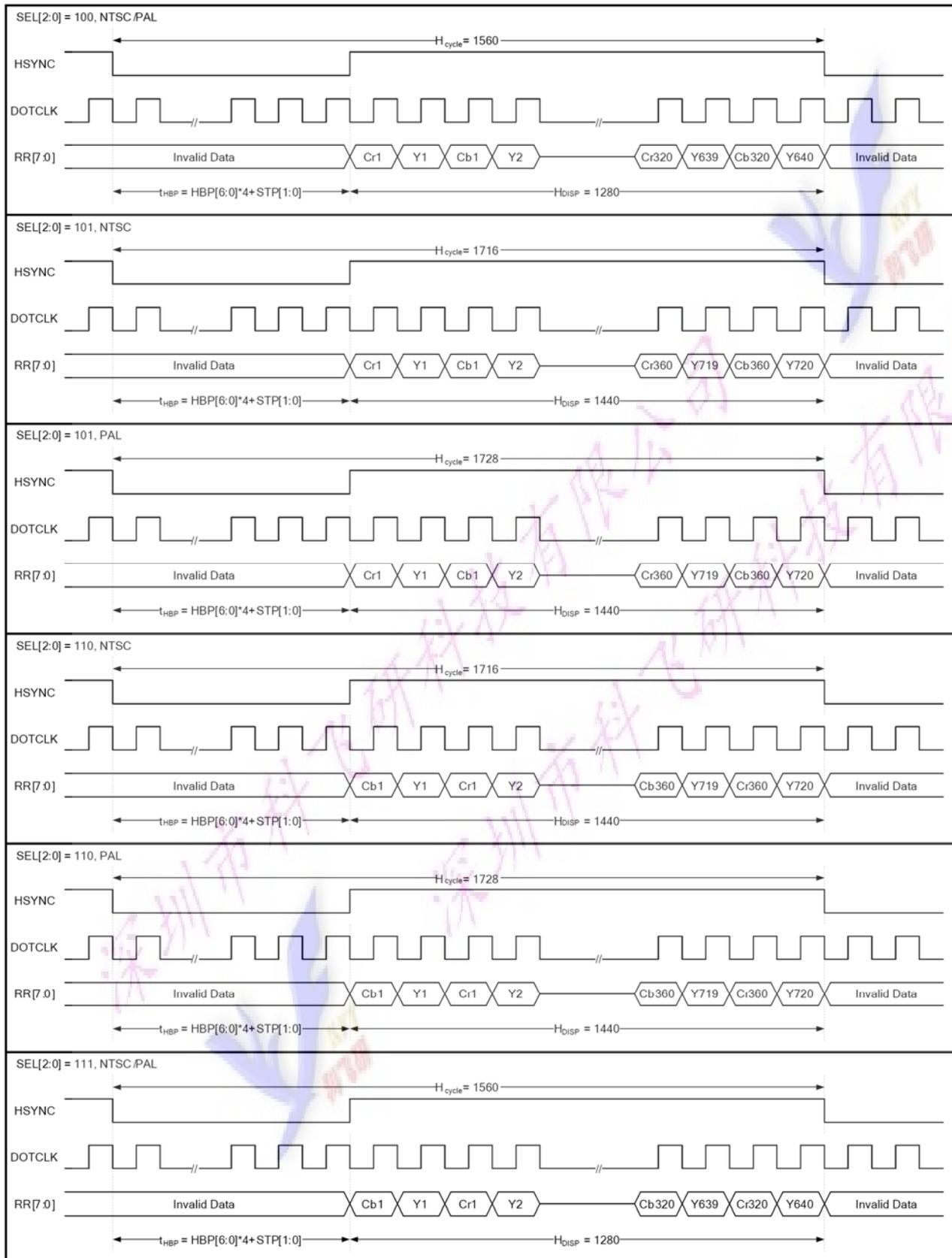


Signal Timing in DE mode

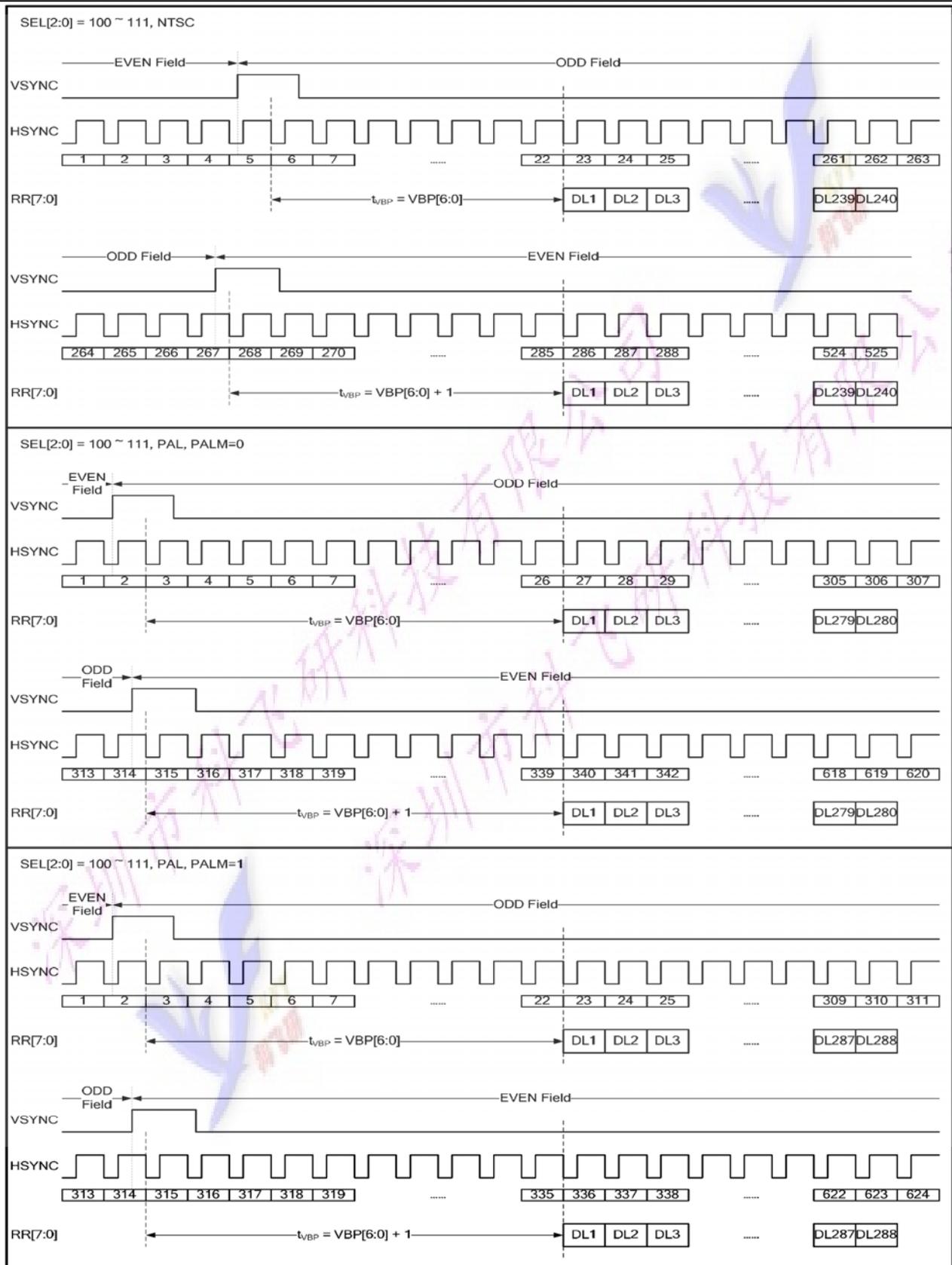


Note: The color mode conversion starts at the first falling edge of VSYNC after stage change of CM.

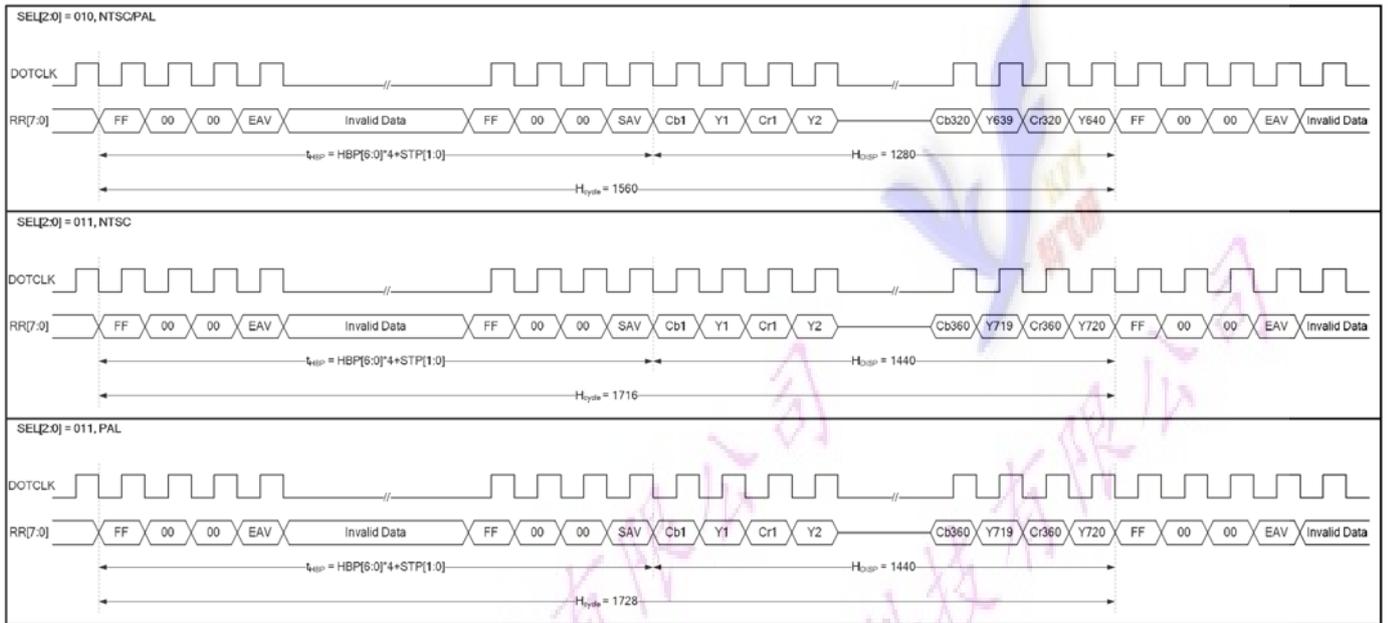
Color mode conversion Timing



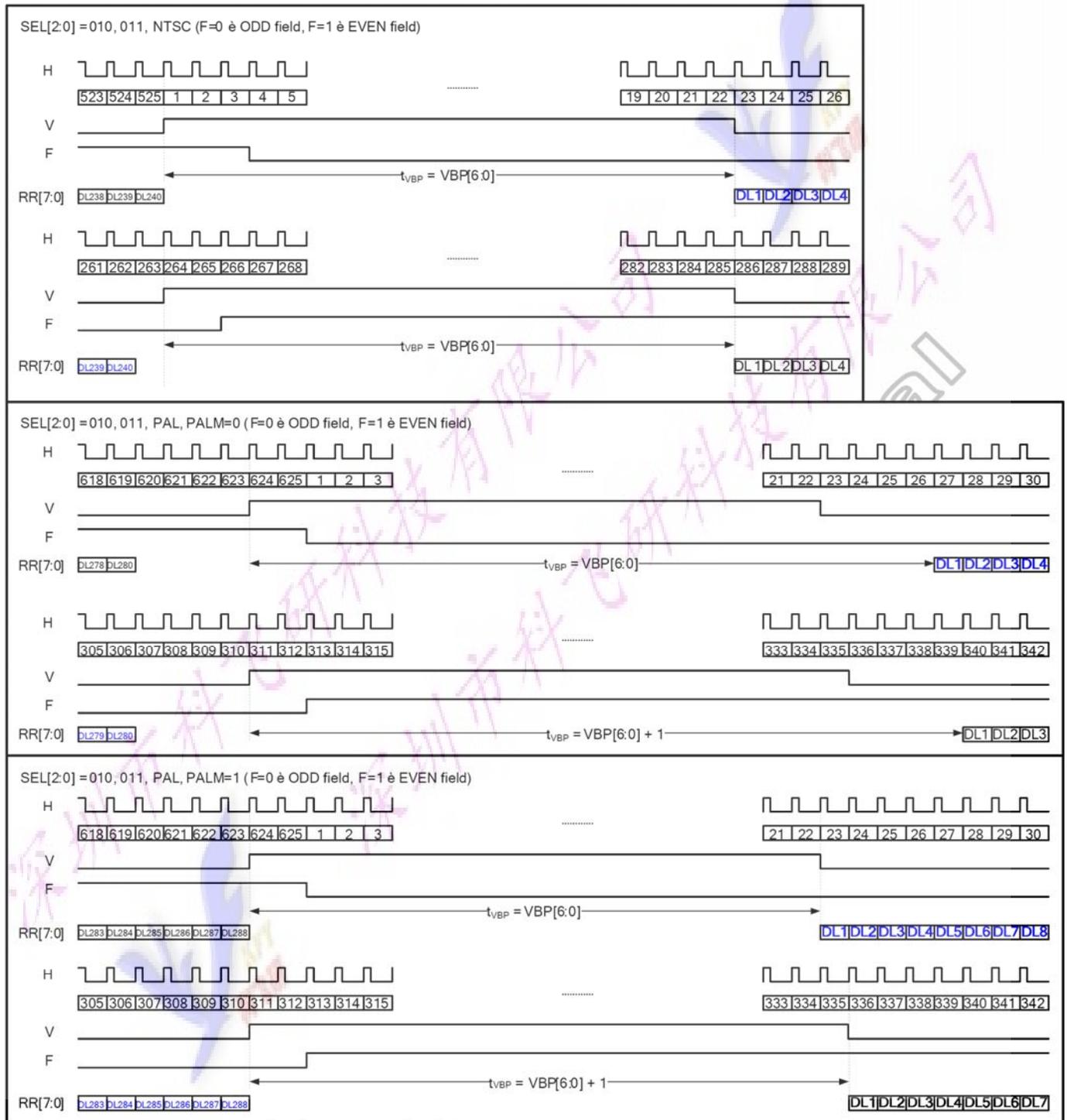
CCIR6011 HORIZONTAL TIMING



CCIR6011 VERTICAL TIMING



CCIR656 HORIZONTAL TIMING

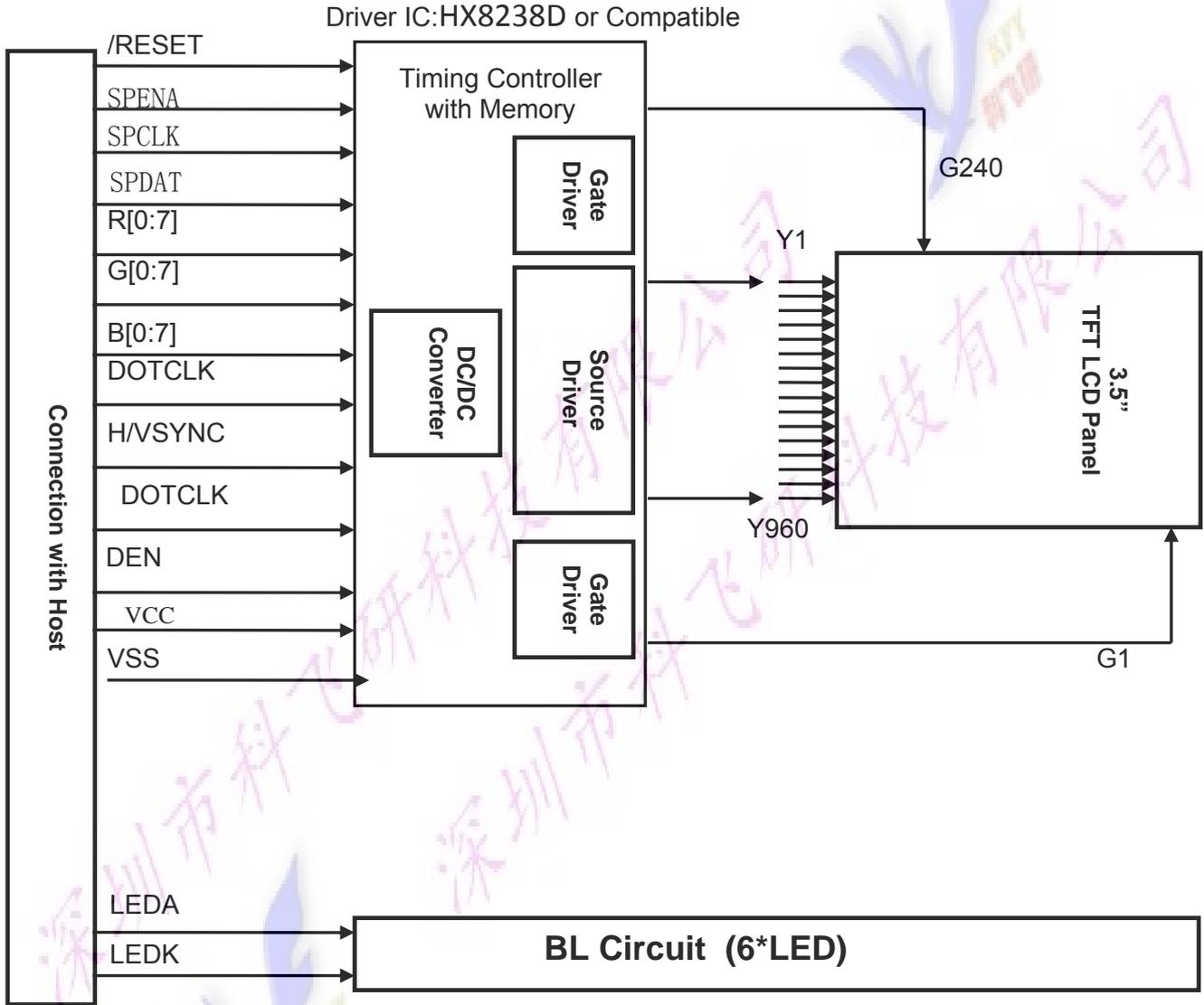


CCIR565 VERTICAL TIMING

HX8238D INITIAL CODE

```
Set_LCD_16B_REG(0x0001, 0x6300) ;  
Set_LCD_16B_REG(0x0002, 0x0200) ;  
Set_LCD_16B_REG(0x0003, 0x7164) ;  
Set_LCD_16B_REG(0x0004, 0x044F) ;  
Set_LCD_16B_REG(0x0005, 0xB4D4) ;  
Set_LCD_16B_REG(0x000A, 0x4008) ;  
Set_LCD_16B_REG(0x000B, 0xD400) ;  
Set_LCD_16B_REG(0x000D, 0x123A) ;  
Set_LCD_16B_REG(0x000E, 0x2d00) ;  
Set_LCD_16B_REG(0x000F, 0x0000) ;  
Set_LCD_16B_REG(0x0016, 0x9F80) ;  
Set_LCD_16B_REG(0x0017, 0x2212) ;  
Set_LCD_16B_REG(0x001E, 0x00d0) ;  
Set_LCD_16B_REG(0x0030, 0x0507) ;  
Set_LCD_16B_REG(0x0031, 0x0004) ;  
Set_LCD_16B_REG(0x0032, 0x0707) ;  
Set_LCD_16B_REG(0x0033, 0x0000) ;  
Set_LCD_16B_REG(0x0034, 0x0000) ;  
Set_LCD_16B_REG(0x0035, 0x0307) ;  
Set_LCD_16B_REG(0x0036, 0x0700) ;  
Set_LCD_16B_REG(0x0037, 0x0000) ;  
Set_LCD_16B_REG(0x003A, 0x140B) ;  
Set_LCD_16B_REG(0x003B, 0x140B) ;
```

8. BLOCK DIAGRAM



9. LCM Quality Criteria

9.1 VISUAL & FUNCTION INSPECTION STANDARD

9.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

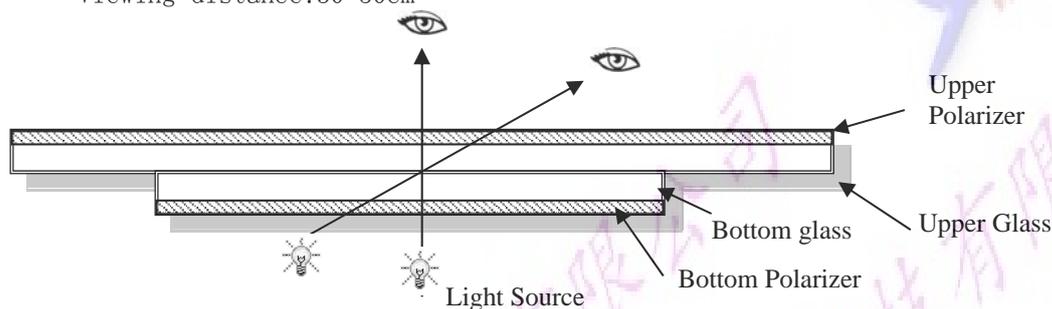
Temperature : $25 \pm 5^\circ\text{C}$

Humidity : $65\% \pm 10\% \text{RH}$

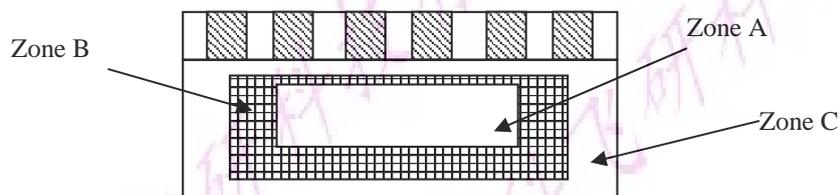
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



9.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn' t effect product function

or appearance after assembly by customer.

9.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class II

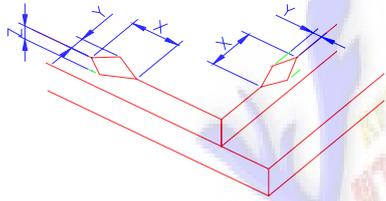
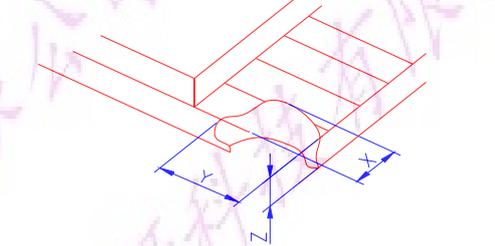
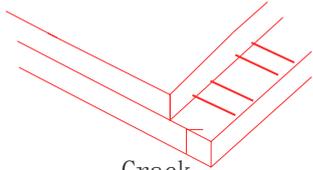
AQL:

Major defect	Minor defect
0.65	1.5

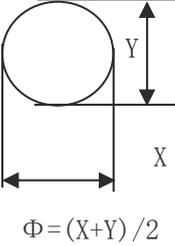
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Soldering appearance	Good soldering , Peeling off is not allowed.	
6	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

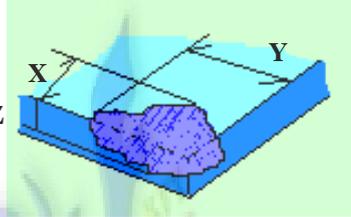
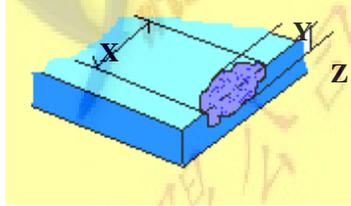
9.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of ITO, T: Height of LCD	(1) The edge of LCD broken	 <table border="1" data-bbox="852 595 1398 748"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq 3.0\text{mm}$</td> <td><Inner border line of the seal</td> <td>$\leq T$</td> </tr> </tbody> </table>	X	Y	Z	$\leq 3.0\text{mm}$	<Inner border line of the seal	$\leq T$
X	Y	Z						
$\leq 3.0\text{mm}$	<Inner border line of the seal	$\leq T$						
	(2) LCD corner broken	 <table border="1" data-bbox="912 1039 1337 1115"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq 3.0\text{mm}$</td> <td>$\leq L$</td> <td>$\leq T$</td> </tr> </tbody> </table>	X	Y	Z	$\leq 3.0\text{mm}$	$\leq L$	$\leq T$
X	Y	Z						
$\leq 3.0\text{mm}$	$\leq L$	$\leq T$						
	(3) LCD crack	 <p style="text-align: center;">Crack Not allowed</p>						

Number	Items	Criteria (mm)
--------	-------	---------------

<p>2.0</p>	<p>Spot defect</p>  <p>$\Phi = (X+Y)/2$</p>	<p>① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)</p> <table border="1"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.10$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.15$</td> <td colspan="3">3 (distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.2$</td> <td colspan="3">1</td> </tr> <tr> <td>$0.2 < \Phi$</td> <td colspan="3">0</td> </tr> </tbody> </table> <p>②Dim spot (LCD/TP/Polarizer dim dot, light leakage, dark spot)</p> <table border="1"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td colspan="3">2 (distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td colspan="3">1</td> </tr> <tr> <td>$\Phi > 0.3$</td> <td colspan="3">0</td> </tr> </tbody> </table> <p>③ Polarizer accidented spot</p> <table border="1"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td colspan="3">2 (distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$\Phi > 0.5$</td> <td colspan="3">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.10$	Ignore			$0.10 < \Phi \leq 0.15$	3 (distance $\geq 10\text{mm}$)			$0.15 < \Phi \leq 0.2$	1			$0.2 < \Phi$	0			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	2 (distance $\geq 10\text{mm}$)			$0.2 < \Phi \leq 0.3$	1			$\Phi > 0.3$	0			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi \leq 0.5$	2 (distance $\geq 10\text{mm}$)			$\Phi > 0.5$	0		
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	<p>Line defect (LCD/TP /Polarizer black/white line, scratch, stain)</p>	<table border="1"> <thead> <tr> <th rowspan="2">Width (mm)</th> <th rowspan="2">Length (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.03$</td> <td>Ignore</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.03 < W \leq 0.05$</td> <td>$L \leq 3.0$</td> <td colspan="3">$N \leq 2$</td> </tr> <tr> <td>$0.05 < W \leq 0.08$</td> <td>$L \leq 2.0$</td> <td colspan="3">$N \leq 2$</td> </tr> <tr> <td>$0.08 < W$</td> <td colspan="4">Define as spot defect</td> </tr> </tbody> </table>	Width (mm)	Length (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.03$	Ignore	Ignore			$0.03 < W \leq 0.05$	$L \leq 3.0$	$N \leq 2$			$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$			$0.08 < W$	Define as spot defect																																								
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$\Phi \leq 0.03$	Ignore	Ignore																																																																	
$0.03 < W \leq 0.05$	$L \leq 3.0$	$N \leq 2$																																																																	
$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$																																																																	
$0.08 < W$	Define as spot defect																																																																		

<p>3.0</p>	<p>Polarizer Bubble</p>	<table border="1"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.4$</td> <td colspan="3">2 (distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.4 < \Phi \leq 0.6$</td> <td colspan="3">1</td> </tr> <tr> <td>$0.6 < \Phi$</td> <td colspan="3">0</td> </tr> </tbody> </table>			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi \leq 0.4$	2 (distance $\geq 10\text{mm}$)			$0.4 < \Phi \leq 0.6$	1			$0.6 < \Phi$	0		
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<p>5.0</p>	<p>TP Related</p>	<p>TP bubble/ accidented spot</p>	<table border="1"> <thead> <tr> <th rowspan="2">Size Φ (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td colspan="3">2</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td colspan="3">1</td> </tr> <tr> <td>$0.3 < \Phi$</td> <td colspan="3">0</td> </tr> </tbody> </table>		Size Φ (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	2			$0.2 < \Phi \leq 0.3$	1			$0.3 < \Phi$	0		
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	TP corner broken X: length Y: width Z: height	<table border="1"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>X≤3.0mm</td> <td>Y≤3.0mm</td> <td>Z<LCD thickness</td> </tr> </table>	X	Y	Z	X≤3.0mm	Y≤3.0mm	Z<LCD thickness	
		X	Y	Z					
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X≤6.0mm	Y≤2.0mm	Z<LCD thickness							
* Circuitry broken is not allowed.									

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

9.2 RELIABILITY TEST

NO	ITEM	CONDITION	STANDARD
1	High Temp. Storage	80°C, 240 hours	1. Functional test is OK. Missing Segment, short, unclear segment, non-display, display abnormally and liquid crystal leak are un-allowed.
2	Low Temp. Storage	-30°C, 240 hours	
3	High Temp. Operation	70°C, 240 hours	
4	Low Temp. Operation	-20°C, 240 hours	
5	High temperature and high Humidity storage	40°C, 90%RH , 240 hours	2. No low temperature bubbles, end seal loose and fall, frame rainbow.
6	Thermal and cold shock	Static state, -20°C (30 Min) ~70°C (30 Min) ~ -20°C (30Min) , packaging, 10 cycles	
7	Vibration test	Packaging, Frequency : 10-55Hz Amplitude : 1.0mm, Each direction on X,Y axe 0.5 houre, circle 2 hours	1. Function test is OK. 2. No glass crack, chipped glass, end seal loose and fall.

8	Dropping test	Pack products into the carton box. Drop it from 80cm height to ground. Once for each side of the carton	
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NOTE:

9.2.1 The reliability items will be fully performed in new sample qualification,

9.2.2 The reliability status will be tested as monitor during mass production. Individual reliability test shall be

performed by lot , Moreover, the individual reliability item shall be decided according to reliability plan.

9.2.3 All samples are inspected after keeping in the room with normal temperature and humidity for 2 hours or above.

9.2.4 Vibration test: It is not necessary to test for those products without assembly frame , back light ,PCB and so on.

9.2.5 Dropping test : It is necessary for affirming new package.

9.2.6 For the high temperature and high humidity test, pure water of over 10 MΩ.cm should be used.

9.2.7 Each test item applies for test LCM only once .Then tested LCM cannot be used again in any other test item.

9.2.8 The quantity of LCM examination for each test item is 5pcs to 10pcs.

9.3 Safety instructions

9.3.1 If the LCD panel breaks, be careful not to get any liquid crystal substance in your mouth.

9.3.2 If the liquid crystal substance touches your skin or clothes, please wash it off immediately by using soap and water.

9.4 Handling Precautions

9.4.1 Avoid static electricity damaging the LSI.

9.4.2 Do not remove the panel or frame from the module .

9.4.3 The polarizing plate of the display is very fragile . So, please handle it very carefully.

9.4.4 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of the plate.

9.4.5 The color tone of display and background of LCM has the possibility to be changed in the storage temperature range.

9.4.6 Pay attention to the working environment, as the element may be destroyed by static electricity.

--Be sure to ground human body and electric appliance during work.

--Avoid working in a dry environment to minimize the generations of static electricity.

--Static electricity may be generated when the protective film is fast peeled off.

9.4.7 When soldering the terminal of LCM, make certain the AC power source of soldering iron does not leak.

10.4.8 If the display surface becomes contaminated ,breathe on the surface and gently wipe it with a soft-dry- clean cloth .If it is heavily contaminated ,moisten cloth with the following solvent(ex:Ethyl alcohol).Solvents other than those above-mentioned may damage the polarizer(Especially ,do not use them .ex: Warter / Ketone)

9.5 Operation instructions

- 9.5.1 It is recommended to drive the LCD within the specified voltage limits, try to adjust the operating voltage for the optimal contrast, the color and contrast of LCD panel will varies at different temperature.
- 9.5.2 Response time is greatly delayed at low operating temperature range. However, this does not mean the LCD will be out of the order, It will recover when it returns to the specified temperature range.
- 9.5.3 If the display area is pushed hard during operation, the display will become abnormal.
- 9.5.4 Do not operate the LCD at the environments over the specified conditions, this may cause damage on the LCD and shorten the lifetime.

9.6 Storage instructions:

- 10.6.1 Store LCDs in a sealed polyethylene bag.
- 10.6.2 Store LCDs in a dark place, Do not expose to sunlight or fluorescent light. Keep the temperature between 0°C and 35°C.
- 10.6.3 Avoid the polarizer touch any other object, (It is recommended to store them in the container in which they were shipped.)

9.7 Limited Warranty

- 9.7.1 will replace or repair any of its LCD modules, which are found to be defective, when inspected in accordance with LCM acceptance standards (copies available upon request) for a period of 12 months from ink- print date on product
- 9.7.2 Any defects must be returned to within 60 days since ship-out. Confirmation of such date shall be based on freight documents. The warranty liability of wasam limited to repair and/or replacement on defects above (7.1, 7.2)
- 9.7.3 No warranty can be granted if the precautions stated above have been disregarded. The typical samples are as below:
- LCD glass crack/break
 - PCB outlet is damaged or modified.
 - PCB conductors damaged.
 - Circuit modified with by grinding, engraving or painting varnish.
 - FPC crack

9.7.4 Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB outlet, conductors and terminals. Modules must be packed with the container in which they were shipped.



10. Packing method

-----TBD