SPECIFICATION

PV03501TYD54C

☐ Preliminary Specification

☐ Final Specification

Made By: **Checked By:** **Approved By:** **Quality:** **Date:** **Note:**	**Approved By:** **Date:** **Note:**

KINGTECH Kingtech Group Co., Ltd. ---- *Lcd Touchscreen Expert*

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Records of Revision

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2015-10-14		V01	First Issue	

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Contents

1. General Specification

Item	Contents	Unit
LCD TYPE	TFT/TRANSMISSIVE	
MODULE SIZE (W*H*T)	76.90*63.90*3.27	MM
ACTIVE SIZE (W*H)	70.08*52.56	MM
PIXEL PITCH (W*H)	0.219*0.219	MM
NUMBER OF DOTS	320*240	
DIVER IC	HX8238D	
INTERFACE TYPE	24BIT RGB+SPI	
TOP POLARIZER TYPE	ANTI-GLARE	
RECOMMEND VIEWING DIRECTION	12	O'CLOCK
GRAY SCALE INVERSION DIRECTION	6	O'CLOCK
COLORS	16.7M	
BACKLIGHT TYPE	6-DIES WHITE LED	
TOUCH PANEL TYPE	WITHOUT	

2. Mechanical Drawing

PIN DESCRIPTION

1	LEDK	29	R1		
2	LEDK	30	R2		
3	LEDA	31	R3		
4	LEDA	32	R4		
5	NC	33	R5		
6	NC	34	R6		
7	NC	35	R7		
8	RESET	36	HSYNC		
9	SPENA	37	VSYNC		
10	SPCLK	38	DCLK		
11	SPDAT	39	NC		
12	B0	40	NC		
13	B1	41	VDD		
14	B2	42	VDD		
15	B3	43	NC		
16	B4	44	NC		
17	B5	45	NC		
18	B6	46	NC		
19	B7	47	NC		
20	G0	48	SEL2		
21	G1	49	SEL1		
22	G2	50	SEL0		
23	G3	51	NC		
24	G4	52	DEN		
25	G5	53	GND		
26	G6	54	GND		
27	G7			
28	R0			

Display Type	TFT
Viewing Angle	TRANSMISSIVE,POSITIVE
Upper Ploarizer Type	12 O'CLOCK
LCD Driver IC	ANTI-GLARE
Operating Voltage	HX8238D
Operation Temperature	VDD=3.3V
Storage Temperature	-20°C TO 70°C
Interface	-30°C TO 80°C
Backlight	24Bit RGB+SPI
Surface luminance	6-LED White
White X/Y	290cd/m²2(TyP)
	X:0.29±0.02 Y:0.31±0.02

DRAWING NO. PV03501TYD54C
UNIT mm SCALE 1:1
3rd Angle SHEET 1 OF 1

TITLE MODULE SPEC.

Kingtech Group Co.,Ltd

DETAIL A 50:1

CIRCUIT DIAGRAM
19.2V @ 20mA

Contact side

NOTES:
1. General Tolerance: ±0.2
2. ( )reference dimension.
3. Recommended Case Open Area Should Be Less Than Module V.A
4. recommended cushion adherent area:TP V.A+1.6mm
5. ROHS MUST BE COMPLIANT

	DRAWN			CUSTOMER'S APPROVAL
	ME.CHECKED			
	EE.CHECKED			
	APPROVED			

VER.	SYMBOL	AMENDMENT	SIGN	DATE
00		First issuance		8.23

DOTS 320XRGBX240

Dimensions: 76.90±0.2(LCM Outline), 72.80±0.2(BZ Open), 70.08(LCD A.A), 52.56(LCD A.A), 55.50±0.2(BZ Open), 63.90±0.2(LCM Outline), 55.72±0.5, 4.00±0.2, 3.27±0.2, (2.05), (3.41), (3.47), (1.70)

39.94, 15.95±0.5, 3.00±0.2, 0.50, 0.35, 27.50±0.1, P0.5(54-1)=26.50, 0.30±0.03, 0.219

3. Block Diagram

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4. Interface Pin Function

Pin No.	Symbol	Description
1	LEDK	Cathode of LED backlight
2	LEDK	Cathode of LED backlight
3	LEDA	Anode of LED backlight
4	LEDA	Anode of LED backlight
5	NC	No connect
6	NC	No connect
7	NC	No connect
8	RESET	RESET PIN
9	SPENA	Chip select of serial interface
10	SPCLK	Clock pin of serial interface
11	SPDAT	Data input pin of serial interface
12~19	B0~B7	Blue data bus
20~27	G0~G7	Green data bus
28~35	R0~R7	Red data bus
36	HSYNC	Horizontal sync signal; negative polarity
37	VSYNC	Vertical sync signal; negative polarity
38	DCLK	Clock signal; latching data at the falling edge
39	NC	Touch panel control PIN: XL
40	NC	Touch panel control PIN: YU
41	VCC	Power supply
42	VCC	Power supply
43	NC	No connect
44	NC	No connect
45	NC	No connect
46	NC	No connect
47	NC	No connect
48	SEL2	
49	SEL1	Interface mode select(note)
50	SEL0	
51	NC	No connect
52	DEN	Display enable pin from controller
53	GND	Power ground
54	GND	Power 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. 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.

Interface select table

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)

5. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply voltage for analog	VDD	-0.3	4.5	V
Supply voltage for logic	VDD	-0.3	4.5	V
Supply current (One LED)	I_{LED}		30	mA
Operating temperature	T_{OP}	-20	+70	°C
Storage temperature	T_{ST}	-30	+80	°C

Note: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

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6. Electrical Characteristics

6.1 Input Power

Item	Symbol	Min	Typ.	Max	Unit	Applicable terminal
Supply Voltage for Analog	VDD	3.0	3.3	3.6	V	
Supply Voltage for Logic	VDD	3.0	3.3	3.6	V	
Input Voltage	V_{IL}	GND	-	0.3VCC	V	
	V_{IH}	0.7 VCC	-	VCC		
Input leakage Current	I_{LKG}	-1		1	μA	

6.2 Backlight Driving Conditions

Item	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED Backlight	V_F	-	19.2	-	V	I_L =40mA
Current for LED Backlight	I_L		20	30	mA	
Power Consumption	P		0.384		W	
LED Life Time		30,000	50,000		Hr	Note

Note: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25℃

7. Optical Characteristics

ITEM		SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE
				MIN	TYP.	MAX		
Luminance		L	I_L =20mA		290		Cd/m^2	
Contrast Ratio		CR	θ=0°	200	300			
Response Time		T_{ON}	25℃		15	30	ms	
		T_{OFF}			35	50		
CIE Color Coordinate	Red	X_R	Viewing normal angle					
		Y_R						
	Green	X_G						
		Y_G						
	Blue	X_B						
		Y_B						
	White	X_W			0.29			
		Y_W			0.31			
Viewing Angle	Hor.	θ_{X+}	CR≥10		45		Degree	
		θ_{X-}			45			
	Ver.	θ_{Y+}			15			
		θ_{Y-}			35			
Uniformity		Un		80			%	

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Note 1: Definition of Viewing Angle θx and θy:
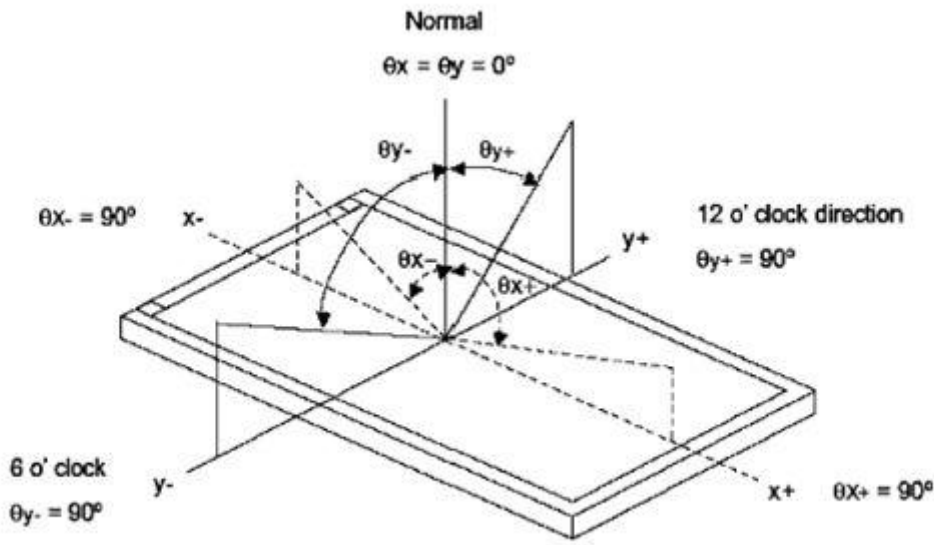
Note 2: Definition of contrast ratio CR:

$$CR= \frac{\text{Luminance of white state}}{\text{Luminance of black state}}$$

Note 3: Definition of Response Time (Tr,Tf)

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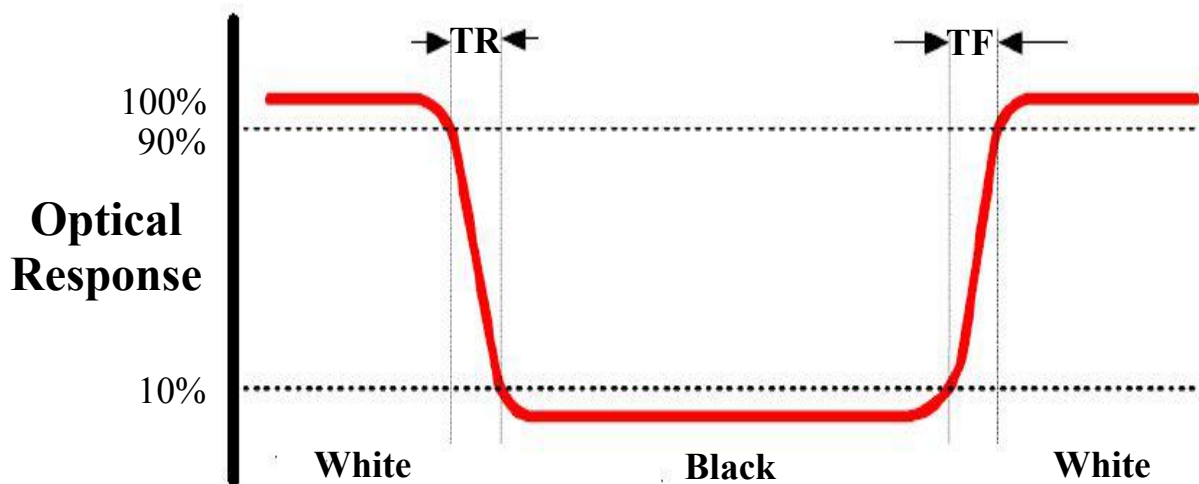
Note 4: Definition of Luminance
①The Brightness Test Equipment Setup
　　Field=2° (As measuring "black" image, field=2° is the best testing condition)

```
                    BM-7

        Field=2°

                              50cm
      TFT-LCD Panel

              The center of the screen
```
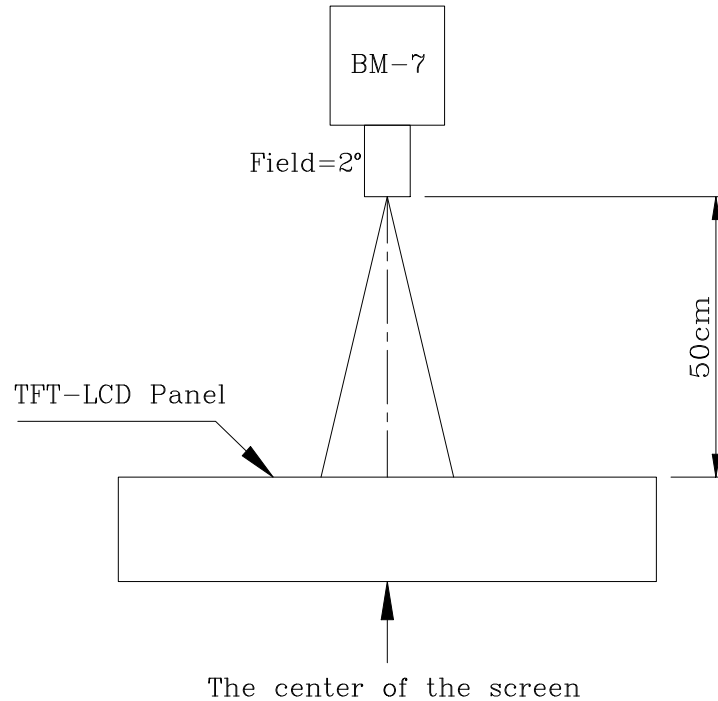
②The Brightness Test Point Setup

```
                    H/6

                    H/3        Active area
                               H
                    H/3

                    H/6

   L/6    L/6  L/6     L/6
                               Unit: mm
          L
      Active area
```

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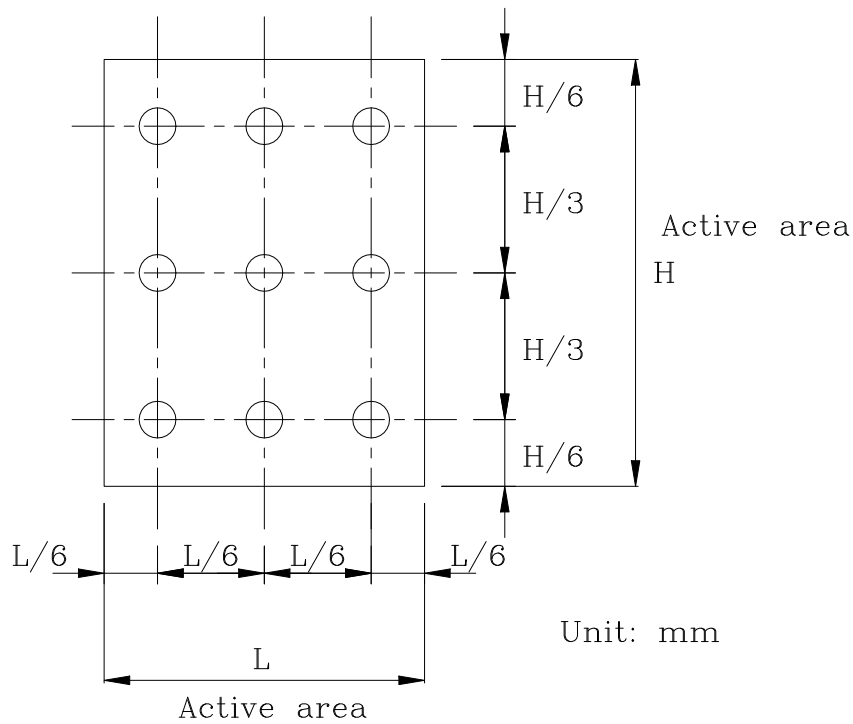
8. Timing Characteristics

8.1 Pixel Timing Diagram
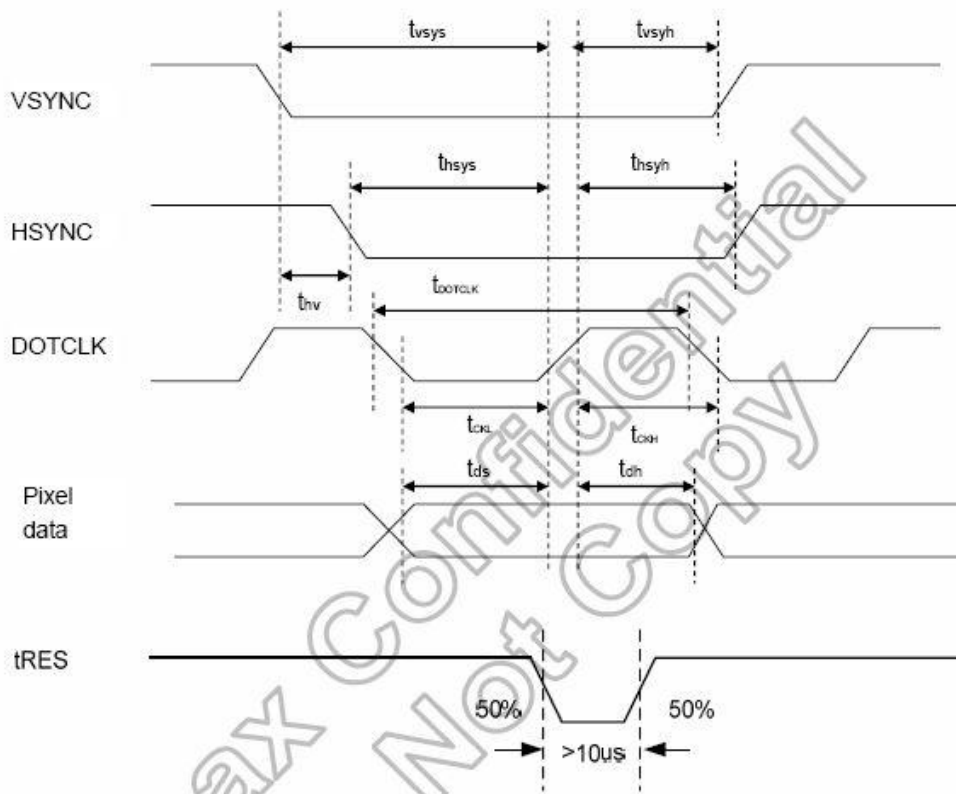
Characteristics	Symbol	Min. 24 bit	Min. 8 bit	Typ. 24 bit	Typ. 8 bit	Max. 24 bit	Max. 8 bit	Unit
DOTCLK Frequency	fDOTCLK	-	-	6.5	19.5	10	30	MHz
DOTCLK Period	tDOTCLK	100	33.3	154	51.3	-	-	ns
Vertical Sync Setup Time	tvsys	20	10	-	-	-	-	ns
Vertical Sync Hold Time	tvsyh	20	10	-	-	-	-	ns
Horizontal Sync 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.

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8.2 SYNC mode Timing Diagram
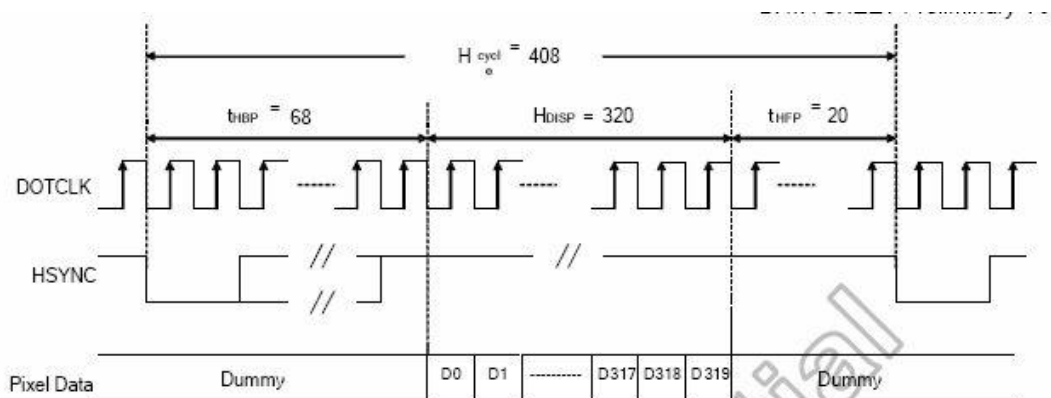
(a) Horizontal Data Transaction Timing
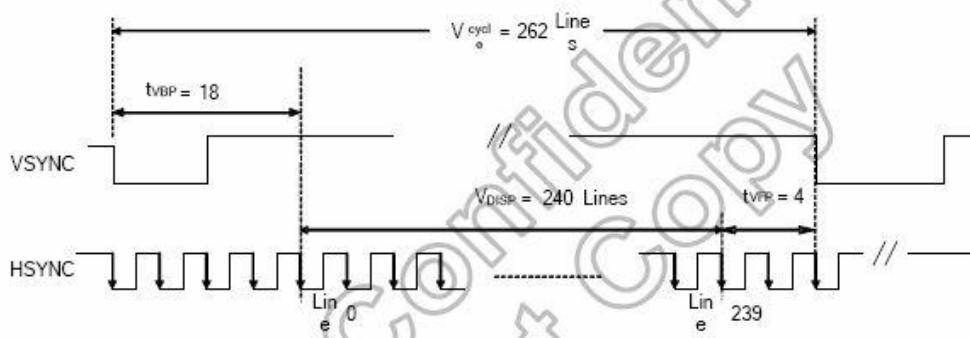
(b) Vertical Data Transaction Timing

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	VDISP	-		240		-		Lines
	PAL				280(PALM=0)				
	PAL				288(PALM=1)				
Vertical Cycle	NTSC	Vcycle	-		262		350		Lines
	PAL				313				

8.3 DE mode Timing Diagram
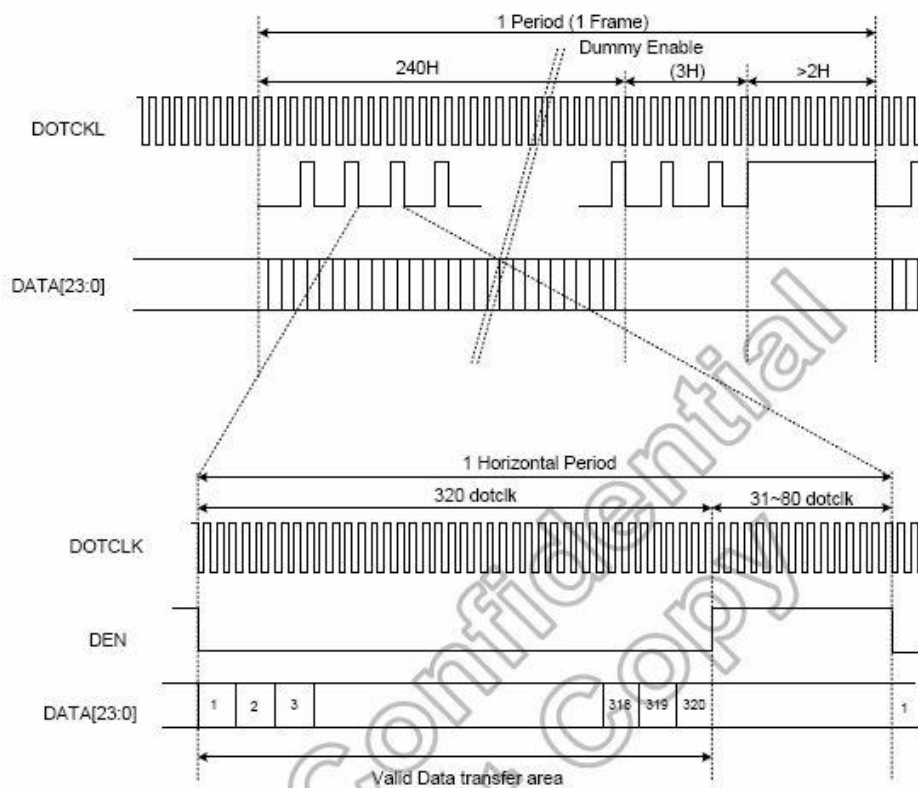
Characteristics	Symbol	Min.		Typ.		Max.		Unit
		24-bit	8-bit	24-bit	8-bit	24-bit	8-bit	
DOTCLK Frequency	fDOTCLK	-	-	6.5	19.5	10	30	MHz
DOTCLK Period	tDOTCLK	100	33.3	154	51.3	-	-	ns
Horizontal Blanking Period	tHBP + tHFP	52	146	88	264	180	960	tDOTCLK
Horizontal Display Area	HDISP	-	-	320	960	-	-	tDOTCLK
Horizontal Cycle	Hcycle	372	1106	408	1224	500	1920	tDOTCLK
Vertical Blanking Period	tVBP + tVFP	2		-		47		Lines
Vertical Display Area	VDISP	-		240		-		Lines
Vertical Cycle	Vcycle	242		-		287		Lines

Note: The above parallel RGB interface timing sequence is for reference only. For the other interface timing sequence, please refer to the driver IC (HX8238D) data sheet.

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9. Standard Specification for Reliability

9.1 Standard Specification for Reliability of LCD Module

No.	Item	Description
01	High temperature operation	The sample should be allowed to stand at 70℃ for 120 hours under driving condition and then returning it to normal temperature condition, and allowing it stand for 2 hours.
02	Low temperature operation	The sample should be allowed to stand at -20℃ for 120 hours under driving condition and then returning it to normal temperature condition, and allowing it stand for 2 hours.
03	High temperature storage	The sample should be allowed to stand at 80℃ for 240 hours under no-load condition, and then returning it to normal temperature condition and allowing it stand for 2 hours.
04	Low temperature storage	The sample should be allowed to stand at -30℃ for 240 hours under no-load condition, then returning it to normal temperature condition, and allowing it stand for 2 hours.
05	Moisture storage	The sample should be allowed to stand at 60℃, 90%RH MAX for 240 hours under no-load condition, then taking it out and drying it at normal temperature for 2 hours.
06	Thermal shock storage	The sample should be allowed to stand the following 10 cycles : -30℃ for 30 minutes → normal temperature for 5 minutes → +80℃ for 30 minutes → normal temperature for 5 minutes, as one cycle.
07	Packing vibration	Frequency range : 10Hz ~ 55Hz Amplitude of vibration : 1.5mm Sweep time: 12 min X, Y, Z 2 hours for each direction.
08	Packing drop test	According to ASTM-D-5327.
09	Electrical Static Discharge	Air: ±4KV 150pF/330Ω 5 times
		Contact: ±2KV 150pF/330Ω 5 time

*Sample size for each test item is 3~5pcs

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9.2 Testing Conditions and Inspection Criteria

For the final test, the testing sample must be stored at room temperature for 24 hours. After the tests listed in Table 9.2, standard specifications for reliability will be executed in order to ensure stability.

No.	Item	Test Model	In section Criteria
01	Current Consumption	Refer To Specification	The current consumption should conform to the product specification.
02	Contrast	Refer To Specification	After the tests have been executed, the contrast must be larger than half of its initial value prior to the tests.
03	Appearance	Visual inspection	Defect free.

9.3 MTBF

MTBF	Functions, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature (25±5℃), normal humidity (50±10% RH), and in area not exposed to direct sun light.

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10. Specification of Quality Assurance

This standard of Quality Assurance confirms to the quality of LCD module products supplied by Kingtech.

10.1 Quality Test

Before delivering, the supplier should conduct the following tests to confirm the quality of products.

- Electrical-Optical Characteristics: According to the individual specification to test the product.
- Appearance Characteristics: According to the individual specification to test the product.
- Reliability Characteristics: According to the definition of reliability on the specification for testing products.

10.2 Delivery Test

Before delivering, the supplier should conduct the delivery test.

- Test method: According to MIL-STD105E.General Inspection Level Ⅱ take a single time.
- The defects classify of AQL as following:
  Major defect: AQL = 0.65
  Minor defect: AQL = 2.5
  Total defects: AQL = 2.5

10.3 Non-conforming Analysis & Deal with Manners

10.3.1 Non-conforming Analysis

- Purchaser should provide the data detail of non-conforming sample and the non-conforming.
- After receiving the data detail from purchaser, the analysis of non-conforming should be finished within two weeks.
- If the analysis can't be finished on time, supplier must notice purchaser 3 days in advance.

10.3.2 Disposition of non-conforming

- If any product defect be found during assembling, supplier must change the good for every defect after confirmation.
- Both supplier and customer should analyze the reason and discuss the disposition of non-conforming when the reason of nonconforming is not sure.

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10.4 Agreement items

Both parties should negotiate together when the following problems happen.

- There is any problem of standard of quality assurance, and both sides should agree that it must be modified.
- There is any argument item which does not record in the standard of quality assurance.
- Any other special problem.

10.5 Standard of the Product Appearance Test

10.5.1 Manner of appearance test

- The test must be under 20W × 2 or 40W fluorescent light, and the distance of view must be at 30±5cm.
- When test the model of transmissive product must add the reflective plate.
- The test direction is base on around 10° of vertical line.
- Temperature: 25±5℃   Humidity: 60±10%RH
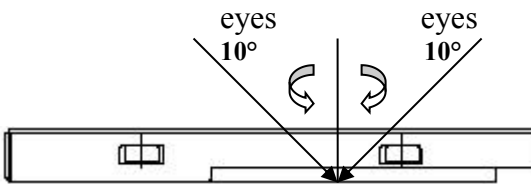
- Definition of area:
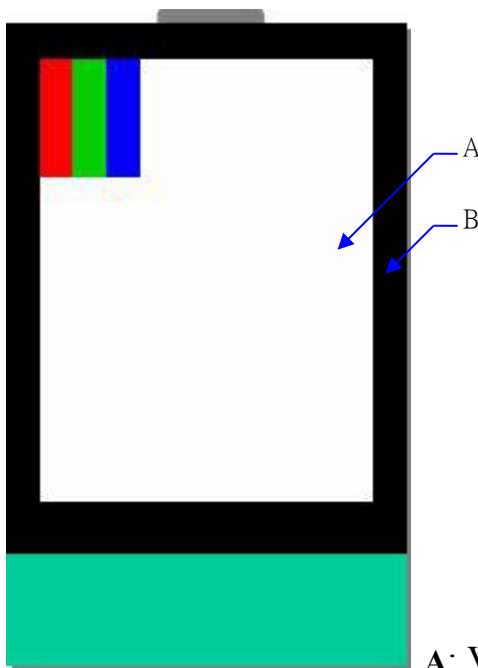
A: Viewing area B: Outside viewing area

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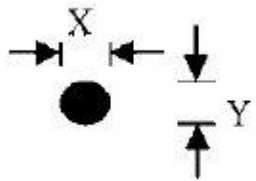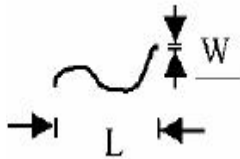
10.5.2 Basic principle
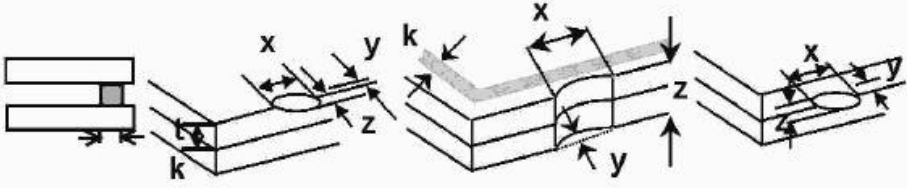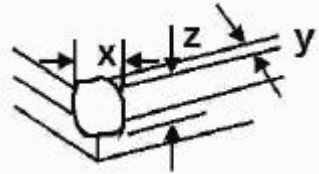
- When the standard cannot be described, AQL will be applied.
- The sample of the lowest acceptable quality level must be negotiated by both supplier and customer when any dispute happened.
- New item must be added on time when it is necessary.

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10.6 Inspection Specification

NO.	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Flicker	**0.65**
02	Black or White spots or Bright spots or Color spots on LCD (Display only)	2.1 White and black or color spots on display $\leqq$ 0.25mm, no more than Five spots. 2.2 Densely spaced: No more than three spots within 3mm.	**2.5**
03	LCD and Touch Panel black spots, white spots, contamination (non – display)	3.1 Round type: As following drawing $\Phi = (X+Y) / 2$ <table><tr><td>Size(mm)</td><td>Acceptable Q'ty</td></tr><tr><td>$\Phi \leqq 0.10$</td><td>Accept no dense</td></tr><tr><td>$0.10< \Phi \leqq 0.20$</td><td>2</td></tr><tr><td>$0.20< \Phi \leqq 0.25$</td><td>2</td></tr><tr><td>$0.25< \Phi \leqq 0.30$</td><td>1</td></tr><tr><td>$0.30< \Phi$</td><td>0</td></tr></table> * Densely spaced: No more than two spots within 3mm. 3.2 Line type: (As following drawing) <table><tr><td>Length(mm)</td><td>Width(mm)</td><td>Acceptable Q'ty</td></tr><tr><td>---</td><td>$W \leqq 0.02$</td><td>Accept no dense</td></tr><tr><td>$L \leqq 3.0$</td><td>$0.02<W \leqq 0.05$</td><td rowspan="2">2</td></tr><tr><td>$L \leqq 2.5$</td><td>$0.03<W \leqq 0.08$</td></tr><tr><td>---</td><td>$0.08<W$</td><td>Rejection</td></tr></table> * Densely spaced: No more than two lines within 3mm.	**2.5** **2.5**

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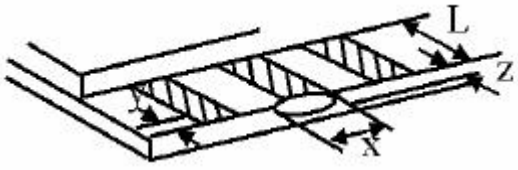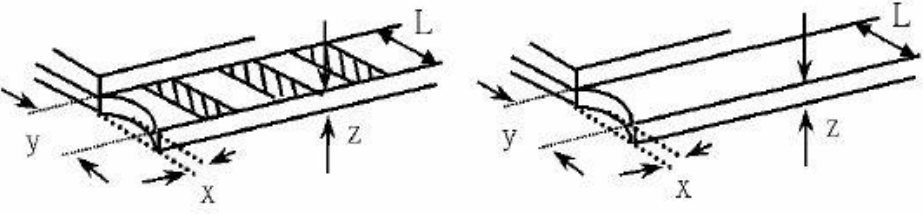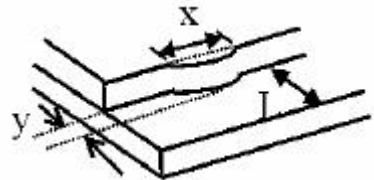
NO.	Item	Criterion				AQL
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction	Size Φ(mm)		Acceptable Q'ty	2.5
			Φ≦0.20		Accept no dense	
			0.20< Φ≦0.50		3	
			0.50< Φ≦1.00		2	
			1.00< Φ		0	
			Total Q'ty		3	
05	Scratches	Follow NO.3 -2 Line Type.				
06	Chipped glass	Symbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length 6.1 General glass chip: 6.1.1 Chip on panel surface and crack between panels: 				2.5

6.1.1 table:

z: Chip thickness	y: Chip width	x: Chip length
Z≦1/2t	Not over viewing area	x≦1/8a
1/2t< z≦2t	Not exceed 1/3k	x≦1/8a

⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length of each chip
6.1.2 Corner crack:

6.1.2 table:

z: Chip thickness	y: Chip width	x: Chip length
Z≦1/2t	Not over viewing area	x≦1/8a
1/2t< z≦2t	Not exceed 1/3k	x≦1/8a

⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length of each chip

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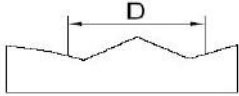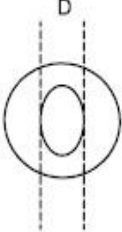| NO.	Item	Criterion	AQL
08	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
09	Backlight elements	9.1 Illumination source flickers when lit. 9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. 9.3 Backlight doesn't light or color is wrong.	2.5 2.5 0.65
10	Bezel	Bezel must comply with product specifications.	2.5
11	PCB、COB	11.1 COB seal may not have pinholes larger than 0.2mm or contamination. 11.2 COB seal surface may not have pinholes through to the IC. 11.3 The height of the COB should not exceed the height indicated in the assembly diagram. 11.4 There may not be more than 2mm of sealant outside the seal area on PCB. And there should be no more than three places. 11.5 Parts on PCB must be the same as on the production characteristic chart, There should be no wrong parts, missing parts or excess parts. 11.6 The jumper on the PCB should conform to the product characteristic chart.	2.5 2.5 2.5 2.5 0.65 0.65
12	FPC	12.1 FPC terminal damage ≦ 1/2 FPC terminal width and can not affect the function, we judge accept. 12.2 FPC alignment hole damage ≦ 1/2 alignment area and can not affect the function, we judge accept.	2.5 2.5
13	Soldering	13.1 No cold solder joints, missing solder connections, oxidation or icicle. 13.2 No short circuits in components on PCB or FPC.	2.5 0.65

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NO.	Item	Criterion	AQL
07	Glass crack	Symbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length 7.2 Protrusion over terminal: 7.2.1 Chip on electrode pad: 7.2.2 Non-conductive portion: ⊙ If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications. ⊙ If the product will be heat sealed by the customer, the alignment mark must mot be damaged. 7.2.3 Substrate protuberance and internal crack	2.5

7.2.1 Chip on electrode pad:

y: Chip width	x: Chip length	z: Chip thickness
y ≦ 0.5mm	x ≦ 1/8a	0< z ≦ t

7.2.2 Non-conductive portion:

y: Chip width	x: Chip length	z: Chip thickness
y ≦ L	x ≦ 1/8a	0< z ≦ t

7.2.3 Substrate protuberance and internal crack

y: width	x: length
y ≦ 1/3L	X ≦ a

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NO.	Item	Criterion	AQL
14	Touch Panel Chipped glass	Symbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Touch Panel Total thickness a: LCD side length L: Electrode pad length 14.1 General glass chip: 14.1.1 Chip on panel surface and crack between panels: (see table below) ⊙ Unit: mm ⊙ If there are 2 or more chips, x is the total length of each chip 14.1.2 Corner crack: (see table below) ⊙ Unit: mm ⊙ If there are 2 or more chips, x is the total length of each chip	2.5

14.1.1 table:

z: Chip thickness	y: Chip width	x: Chip length
$Z \leqq t$	$\leqq 1/2\,k$ and not over viewing area	$x \leqq 1/8a$

14.1.2 table:

z: Chip thickness	y: Chip width	x: Chip length
$z \leqq t$	$\leqq 1/2\,k$ and not over viewing area	$x \leqq 1/8a$

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NO.	Item	Criterion	AQL
15	Touch Panel(Fish eye、dent and bubble on film)	<table><tr><td>SIZE(mm)</td><td>Acceptable Q'ty</td></tr><tr><td>Φ≦0.2</td><td>Accept no dense</td></tr><tr><td>0.2< D ≦0.4</td><td>5</td></tr><tr><td>0.4< D ≦0.5</td><td>2</td></tr><tr><td>0.5< D</td><td>0</td></tr></table>	2.5
16	Touch Panel Newton ring	Newton ring dimension ≦ 1/2 touch panel area and not affect font and line distortion (≦2.5%) , it is acceptable.	2.5
17	Touch Panel Linearity	Less than 2.5% is acceptable.	2.5
18	LCD Ripple	Touch the touch panel, cannot see the LCD ripple. Pen: R 1.0mm silicon rubber. Operation Force: 80g	2.5
19	General appearance	19.1 Pin type must match type in specification sheet. 19.2 LCD pin loose or missing pins. 19.3 Product packaging must the same as specified on packaging specification sheet. 19.4 Product dimension and structure must conform to product specification sheet.	0.65 0.65 0.65 0.65

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11. Handling Precaution

11.1 Handling of LCM

- Avoid external shock.
- Don't apply excessive force on the surface.
- Liquid in LCD is hazardous substance, do not lick or swallow. When the liquid is attaching to your hand, skin, cloth, etc., wash it thoroughly and immediately.
- Don't operate it above the absolute maximum rating.
- Don't disassemble the LCM.
- The operators should wear protections whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.
- The modules should be kept in antistatic bags or other containers resistant to static for storage.
- The module is coated with a film to protect the display surface, be careful when peeling off this protective film since static electricity may be generated.

11.2 Storage

- Store it in an ambient temperature of 25±10℃, and in a relative humidity of 50±10%RH. Don't expose to sunlight or fluorescent light.
- Store it in a clean environment, free from dust, active gas, and solvent.
- Store it in anti-static electricity container.
- Store it without any physical load.

11.3 Soldering

- Use only soldering irons with proper grounding and no leakage.
- Iron: no higher than 280±10℃ and less than 3 sec during hand soldering.
- Rewiring: no more than 2 times.

12. Packing Method

----TBD