



FORMIKE ELECTRONIC CO.,LTD

PRDUCT SPECIFICATON

TFT LCD MODULE

MODEL : KWH035ST12-F01

【 】 Preliminary Specification

【 ♦ 】 Finally Specification

CUSTOMER'S APPROVAL	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWD	PD REVIEWD	PREPARED BY
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Http:// www.wandisplay.com

- This specification is subject to change withouth notice.Please contact FORMIKE or it's representative before designing your product based on this specification.



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Note: For detailed information please refer to IC data sheet:

Primacy (TFT LCD): Himax: HX8238-A



1. SPECIFICATIONS

1.1 Features

Main LCD panel

Item	Standard Value
Display Type	320(R,G,B)*240 Dots
LCD Type	Normally white, Transmissive type
Screen size(inch)	3.5inch
Viewing Direction	6 O'clock
Color configuration	RGB-Strip
Backlight	LED
Interface	Digital 24-bits RGB
Other (controller/driver IC)	Himax: HX8238-A

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	76.9(W)*63.9(L)*3.5(H) (MAX)	mm

LCD panel

Item	Standard Value	Unit
Viewing Area	72.88(W)*55.36(L)	mm
Active Area	70.08(W)*52.56(L)	mm

Note: For detailed information please refer to LCM drawing



1.3 Absolute Maximum Ratings

Module

Item	Symbol	Condition	Min.	Max.	Unit
System Power Supply Voltage	VDDIO	VSS=0	-0.3	4.0	V
Input Voltage	V _i	-	-0.3	5.0	V
Operating Temperature	T _{op}	-	-20	70	°C
Storage Temperature	T _{ST}	-	-30	80	°C

1.4 DC Electrical Characteristics

Module

VSS=0V, Ta=25°C

Item	Symbol	Condition	Min.	Typ.	Max	Unit
Power Supply Voltage1	VDDIO	-	3.0	3.3	3.6	V
Vcom High Voltage	V _{COMH}	-	2.5	(3.6)	4.5	V
Vcom Low Voltage	V _{COML}	-	-3	(-2.4)	0	V
Supply Current	IDD	VDD=3V Pattern=black*1	-	5.5	8.5	mA

Note 1: Maximum Current display



1.5 Optical Characteristics

TFT LCD Module

VDDIO=3.3V, Ta=25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	-
Response time	Tr+Tf	Ta=25°C $\theta X, \theta Y=0^\circ$	-	50	70	ms	Note2
Viewing angle	Top	Θ_{y+}	-	45	-	Deg	Note4
	Bottom	Θ_{y-}	-	50	-		
	Left	Θ_{x-}	-	50	-		
	Right	Θ_{x+}	-	50	-		
Contrast ratio	CR	Ta=25°C $\theta X, \theta Y=0^\circ$	200	250	-	-	Note3
Color of CIE Coordinate (With B/L)	White	X	0.259	0.309	0.359	-	NoteA
		Y	0.274	0.324	0.374		
	Red	X	0.573	0.623	0.673		
		Y	0.310	0.360	0.410		
	Green	X	0.291	0.341	0.391		
		Y	0.547	0.597	0.647		
	Blue	X	0.094	0.144	0.194		
		Y	0.029	0.079	0.129		
Average Brightness Pattern=white display (With LCD)	IV	IF=20mA	220	250	-	cd/m ²	
Uniformity (With LCD)*1	ΔB	IF=20mA	70	-	-	%	

Note A:

*1: $\Delta B = B(\text{min}) / B(\text{max})$

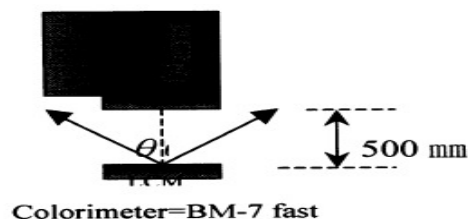
*2: Measurement Condition for Optical Characteristics:

a: Environment 25°C ±5°C / 60±20%R.H, no wind, dark room below 10 Lux at typical lamp current and typical operating frequency.

b: Measurement Distance 500±50mm, ($\theta = 0^\circ$)

c: Equipment: TOPCON BM-7 fast, (field 1°), after 10 minutes operation.

d: The uncertainty of the C.I.E coordinate measurement ±0.01, Average Brightness ±4%



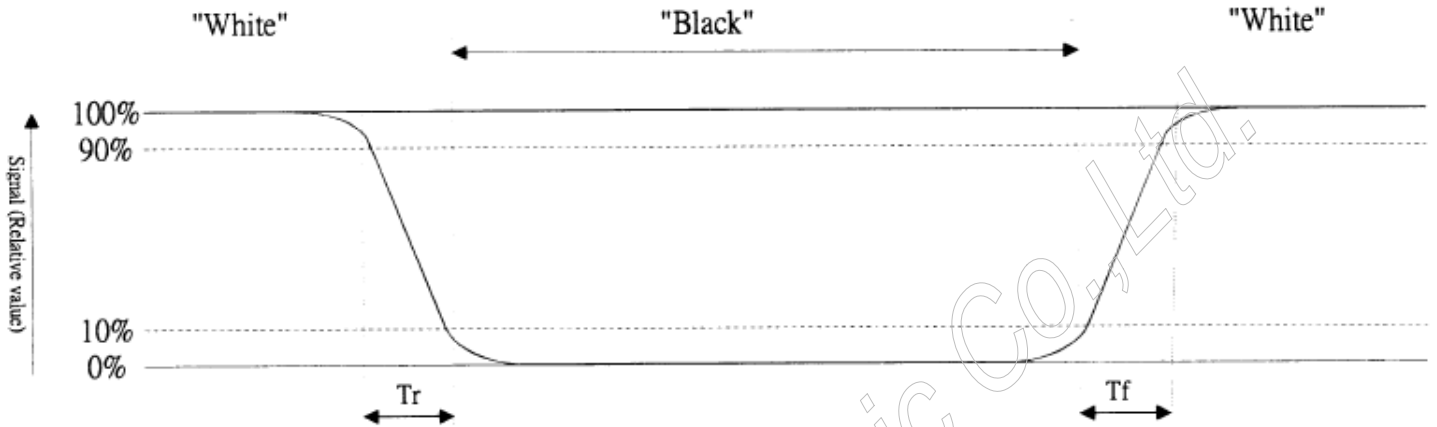
Note 1 : To be measured at the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7, after 10 minutes operation (module)



Note 2: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white” (falling time) and from “white” to “black” (rising time), respectively. The response time is defined as the time interval between the 10% and 90% of Amplitudes.

Refer to figure as below:



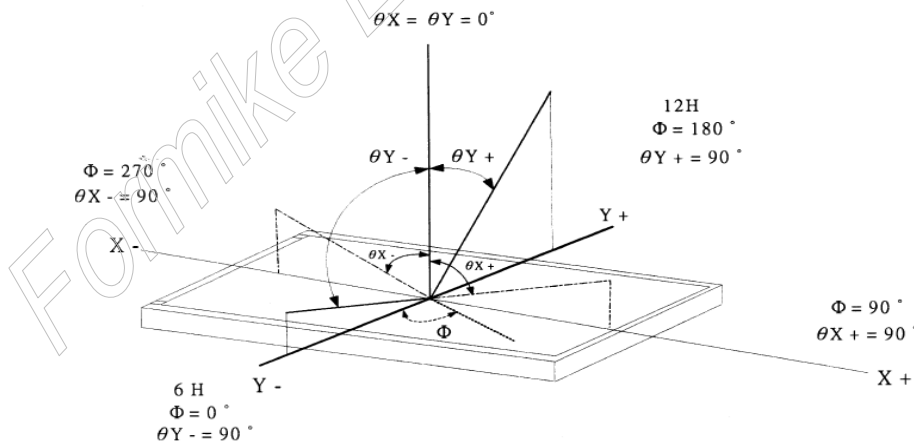
Note 3: Definition of contrast ratio:

Contrast ratio is calculated with the following formula

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 4: Definition of viewing angle

Refer to figure as below:





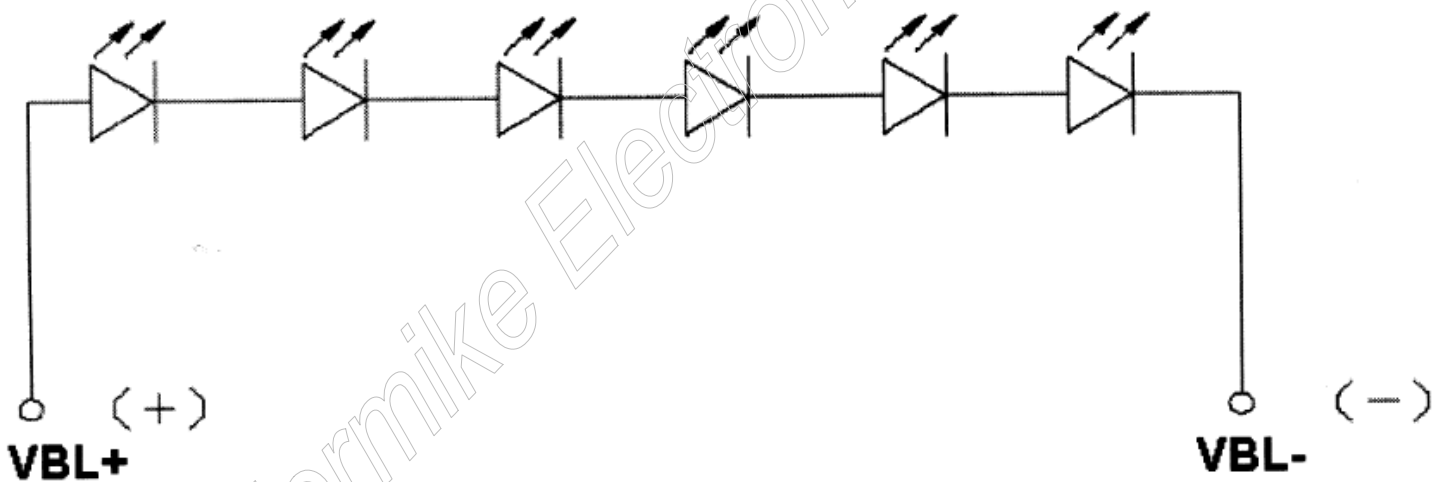
1.6 Backlight Characteristics

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta=25°C	-	30	mA
Reverse Voltage	VR	Ta=25°C	-	5	V
Power Dissipation	PD	Ta=25°C	-	0.720	W

Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF=20mA	18.0	19.8	21.0	V
Average Brightness (without LCD)	IV		3000	3300	-	cd/m ²
CIE Color Coordinate (Without LCD)	X		-	0.30	-	
	Y		-	0.30	-	
Color	White					





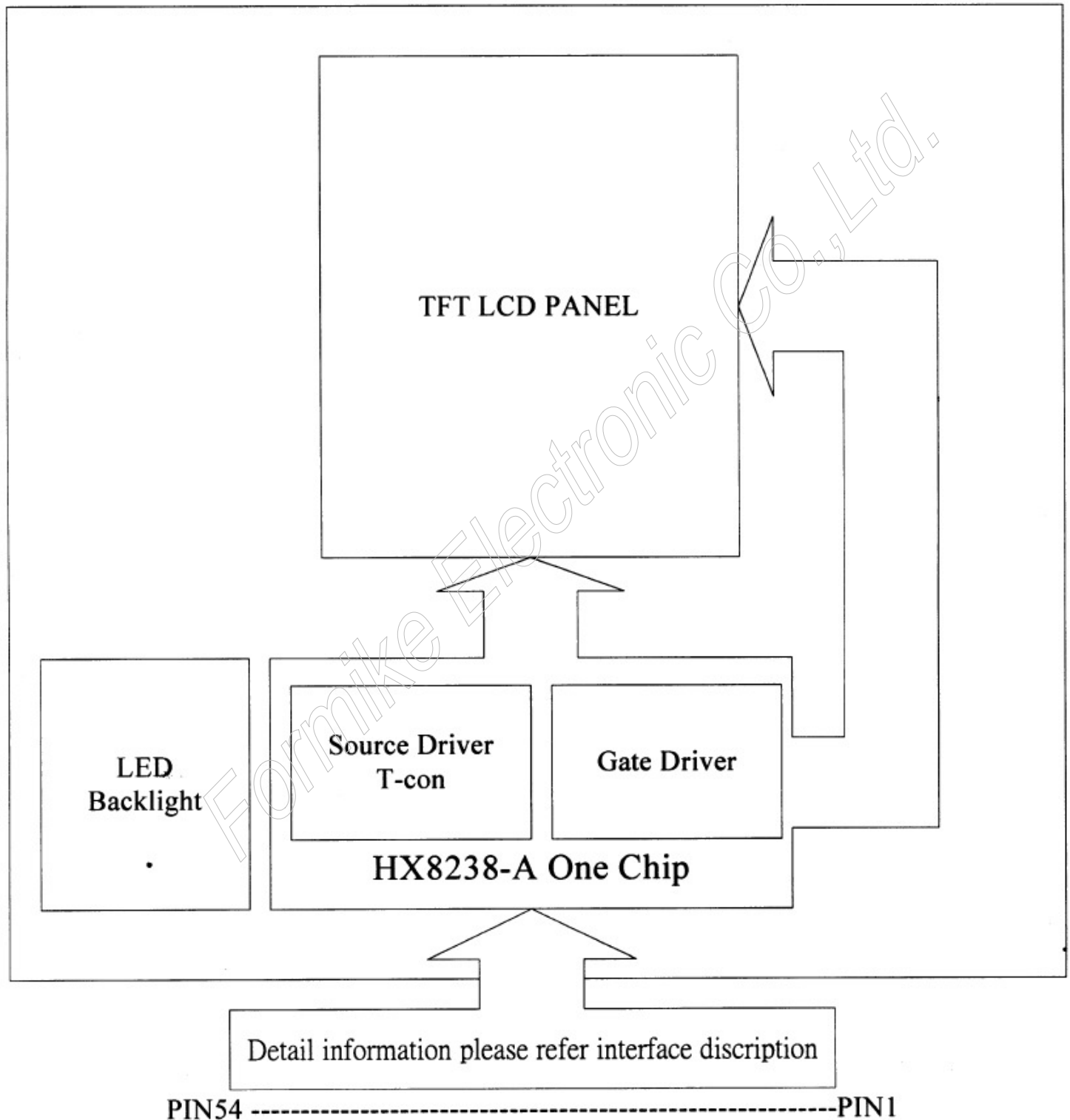
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram





2.2 Interface Pin Description

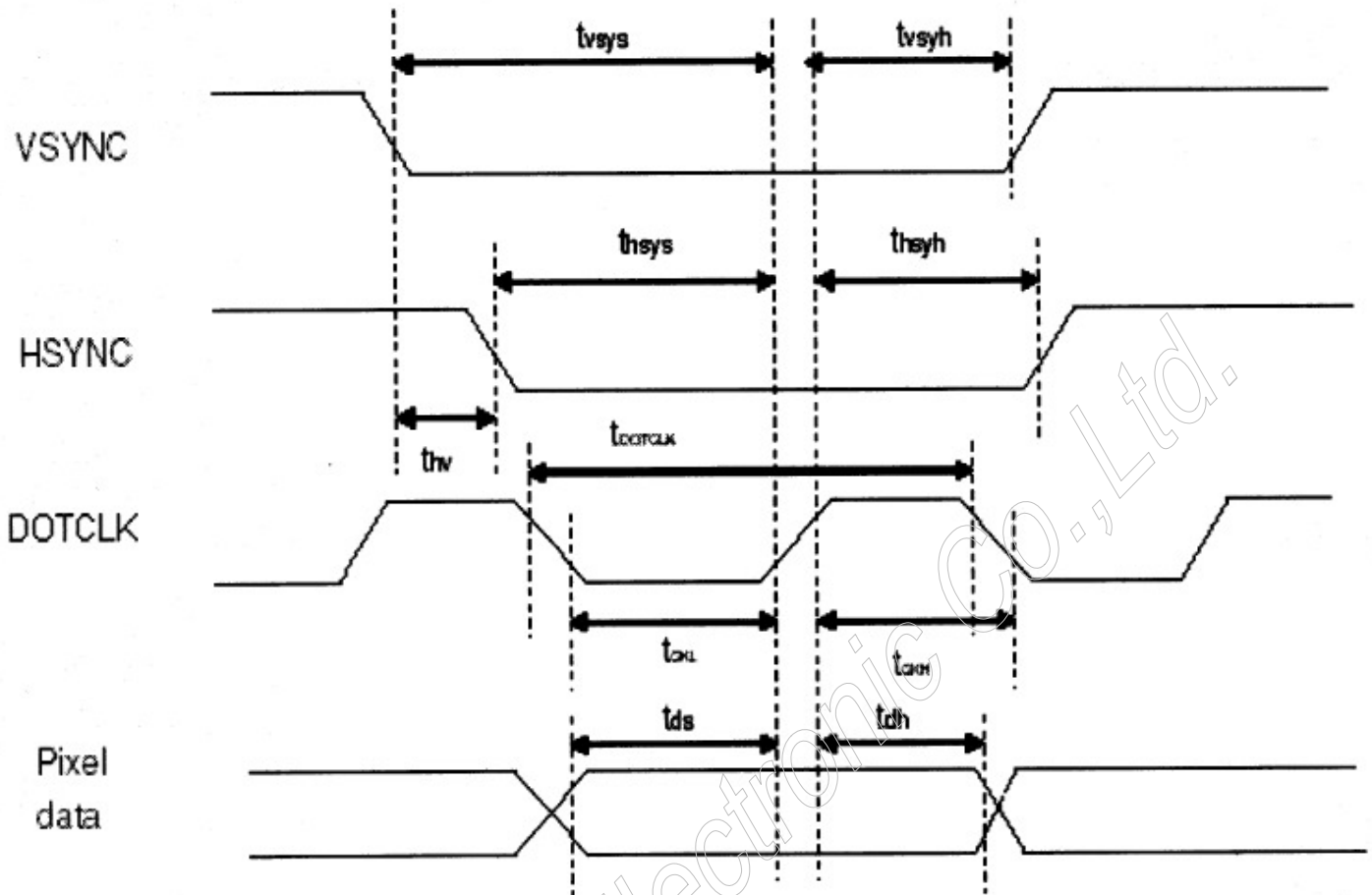
Pin No	Symbol	Function
1	VBL-	Power supply for LED Backlight cathode input
2	VBL-	Power supply for LED Backlight cathode input
3	VBL+	Power supply for LED Backlight anode input
4	VBL+	Power supply for LED Backlight anode input
5	NC	Not used, Must be open
6	NC	Not used, Must be open
7	NC	Not used, Must be open (Output Pin POL output)
8	/RESET	Hardware reset
9	SPENA	Serial port data enable signal
10	SPCLK	Serial data clock
11	SPDAT	Serial 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 bit 0
21	G1	Green data bit 1
22	G2	Green data bit 2
23	G3	Green data bit 3
24	G4	Green data bit 4
25	G5	Green data bit 5
26	G6	Green data bit 6
27	G7	Green data bit 7
28	R0	Red data bit 0
29	R1	Red data bit 1
30	R2	Red data bit 2



31	R3	Red data bit 3
32	R4	Red data bit 4
33	R5	Red data bit 5
34	R6	Red data bit 6
35	R7	Red data bit 7
36	HSYNC	Horizontal sync input
37	VSYNC	Vertical sync input
38	DOTCLK	Dot data clock
39	VDDIO	Digital power
40	VDDIO	Digital power
41	VDDIO	Digital power
42	VDDIO	Digital power
43	NC	Not used, Must be open
44	NC	Not used, Must be open
45	NC	Not used, Must be open (Output Pin VGL , Gate off power)
46	NC	Not used, Must be open
47	NC	Not used, Must be open (Output Pin VGH, Gate on power)
48	NC	Not used, Must be open
49	NC	Not used, Must be open
50	NC	Not used, Must be open
51	NC	Not used, Must be open (Output Pin, VCOM power)
52	ENB	Data enable control
53	VSS	Ground
54	VSS	Ground



2.3 Timing Characteristics



Pixel 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
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	t _{ds}	12	10	-	-	-	-	ns
Data hold Time	t _{dh}	12	10	-	-	-	-	ns
Reset pulse width	tRES	10		-		-		us

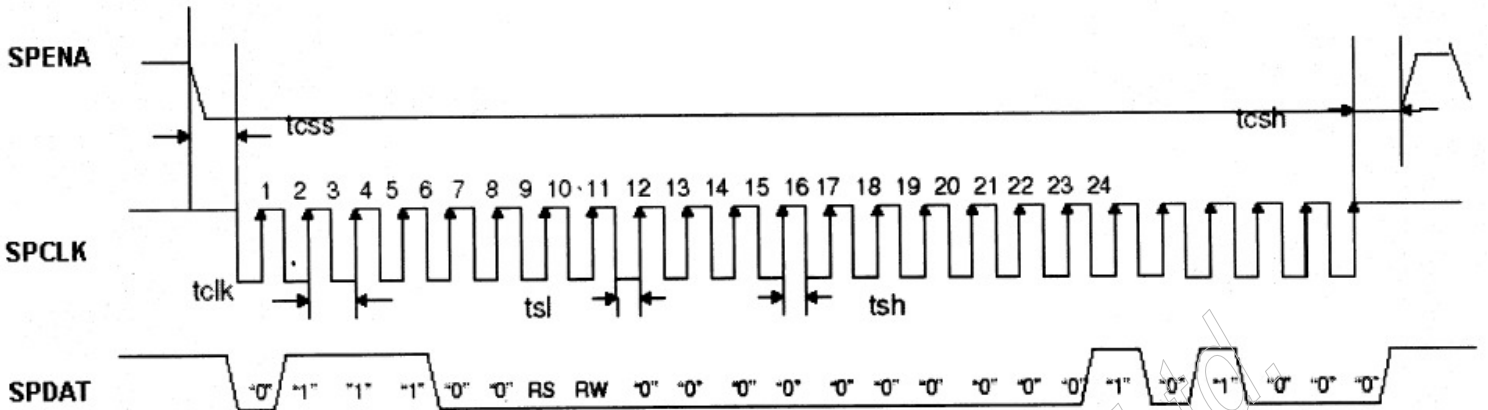
Note: External clock source must be provided to DOTCLK pin of HX8238-A. The driver will not operate if absent of the clocking signal.

Pixel timing

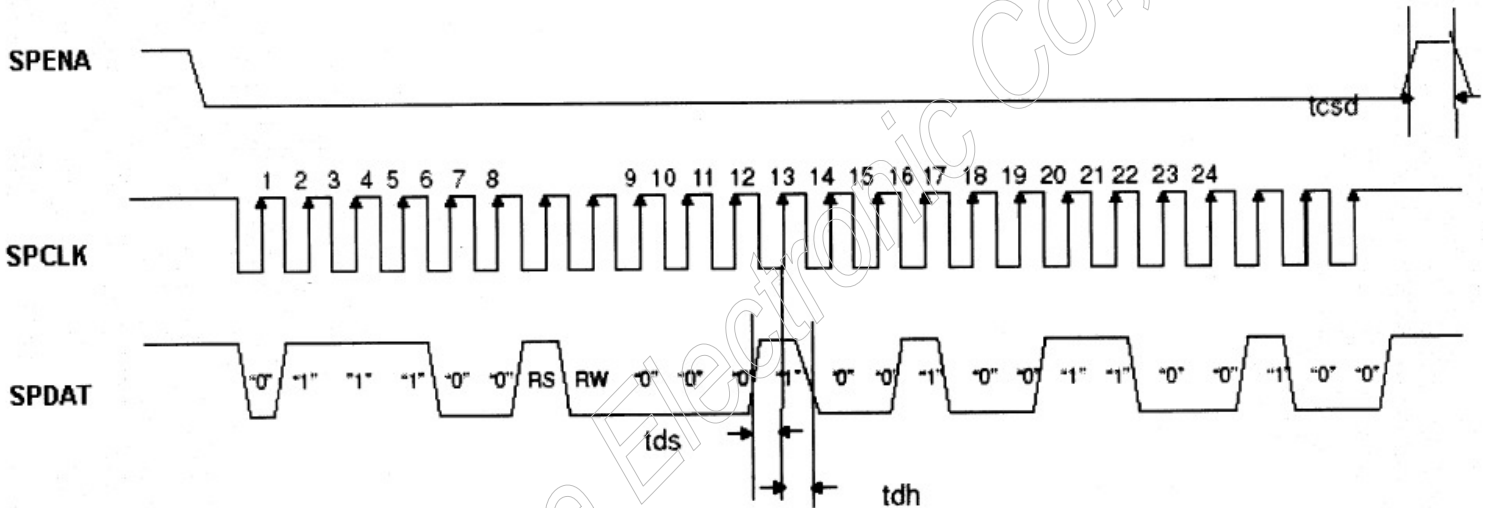
Note : The interface of this module can drive by digital 24-bit data.



First Transmission (Register)



Second Transmission (Data)



Note: The example transmit "0x1264h" to register R28h.

SPID connected to VSS.

SPI interface timing diagram & transaction example

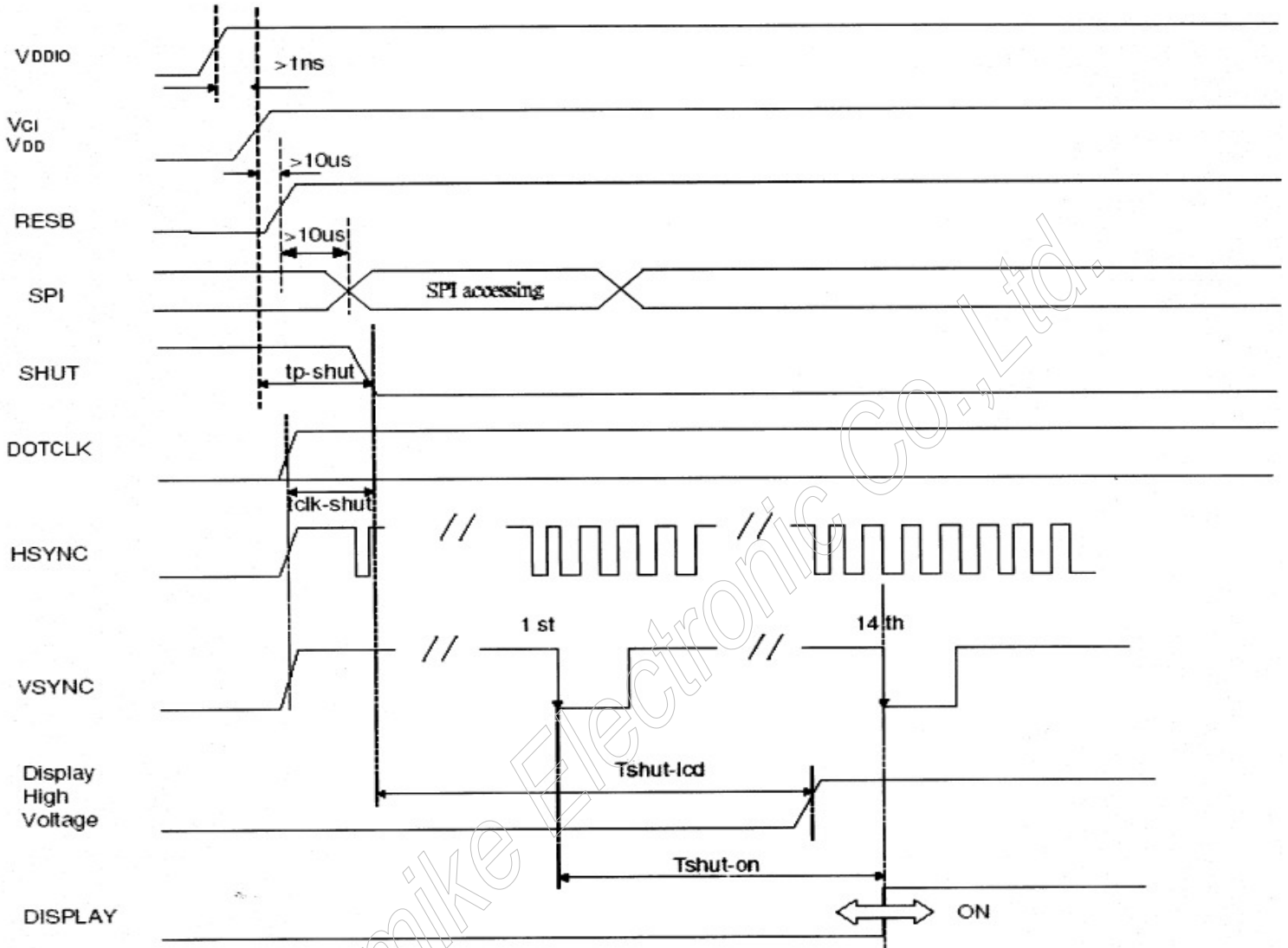
Characteristics	Symbol	Min	Typ	Max	Unit
Serial Clock Frequency	fclk	-	-	20	MHz
Serial Clock Cycle Time	tclk	50	-	-	ns
Clock Low Width	tsl	25	-	-	ns
Clock High Width	tsh	25	-	-	ns
Chip Select Setup Time	tcss	0	-	-	ns
Chip Select Hold Time	tcsd	10	-	-	ns
Chip Select High Delay Time	tcsd	20	-	-	ns
Data Setup Time	tds	5	-	-	ns
Data Hold Time	tdh	10	-	-	ns

SPI timing



2.4 Power Sequence

2.4.1 Power up sequence



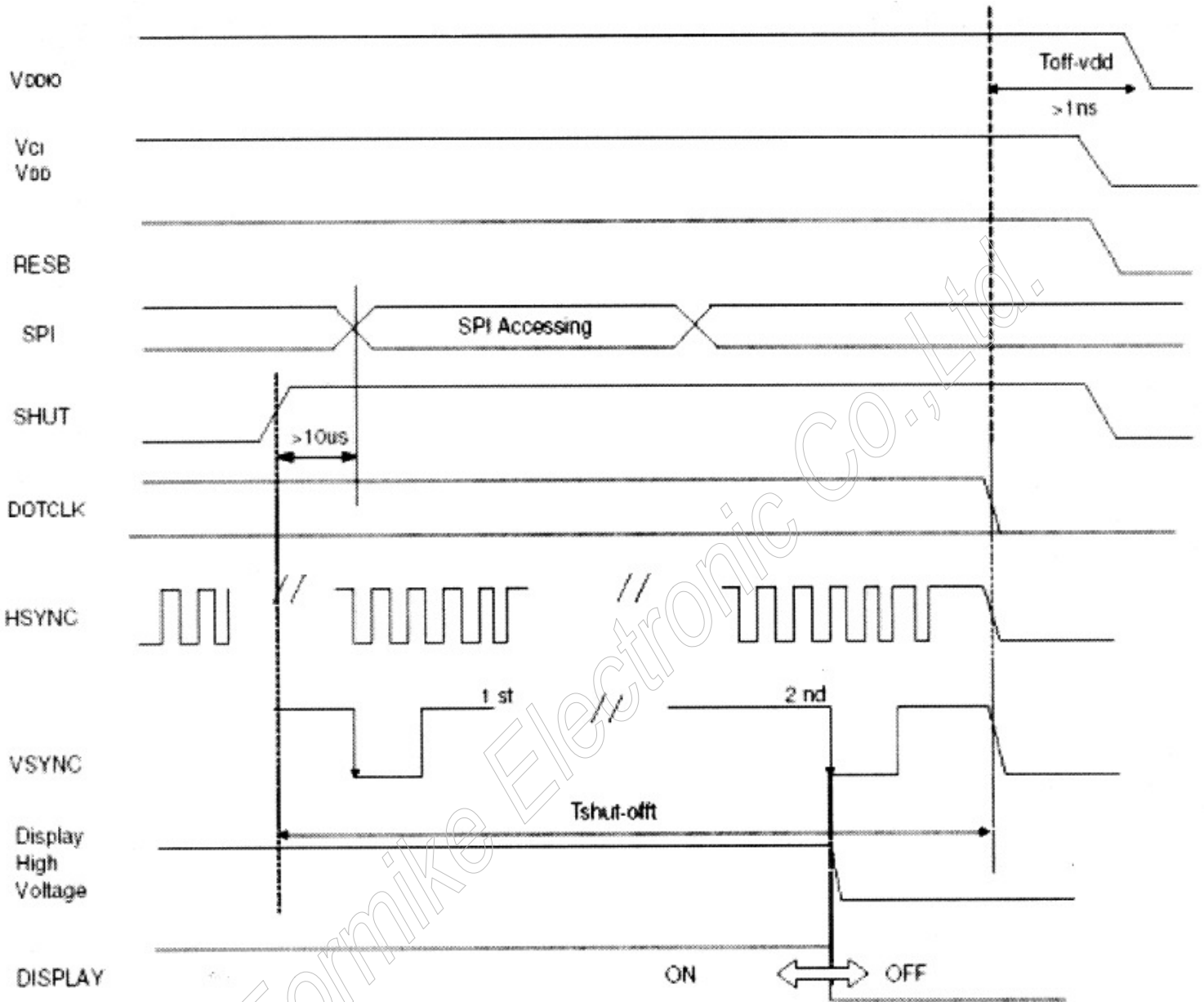
Characteristics	Symbol	Min	Typ	Max	Units
VDDD / VDDIO on to falling edge of SHUT	tp-shut	1	-	-	us
DOTCLK	tclk-shut	1	-	-	clk
Falling edge of SHUT to LCD power on	tshut-lcd	-	-	128	ms
Falling edge of SHUT to display start	tshut-on	-	-	14	frame
- 1 line: 408 clk - 1 frame: 262 line - DOTCLK = 6.5MHz		-	166	232.4	ms

Note: It is necessary to input DOTCLK before the falling edge of SHUT.
Display starts at 10th falling edge of VSTNC after the falling edge of SHUT.

Note: 1 The pin, SHUT be fixed to VSS. 2 The voltage of VDD be boost from VDDIO



2.4.2 Power down sequence



Characteristics	Symbol	Min.	Typ	Max	Unit
Rising edge of SHUT to display off -1 line:408clk -1 frame: 262line -DOTCLK-6.5MHz	Tshul-off	2	-	-	Frame
		33.4	-	-	ms
Input-signal-off to VDDD / VDDIO off	Toff-vdd	1	-	-	us

Note: DOTCLK must be maintained at least 2 frames after the rising edge of SHUT

Display become off at the 2nd falling edge of VSTNC after the falling edge of SHUT

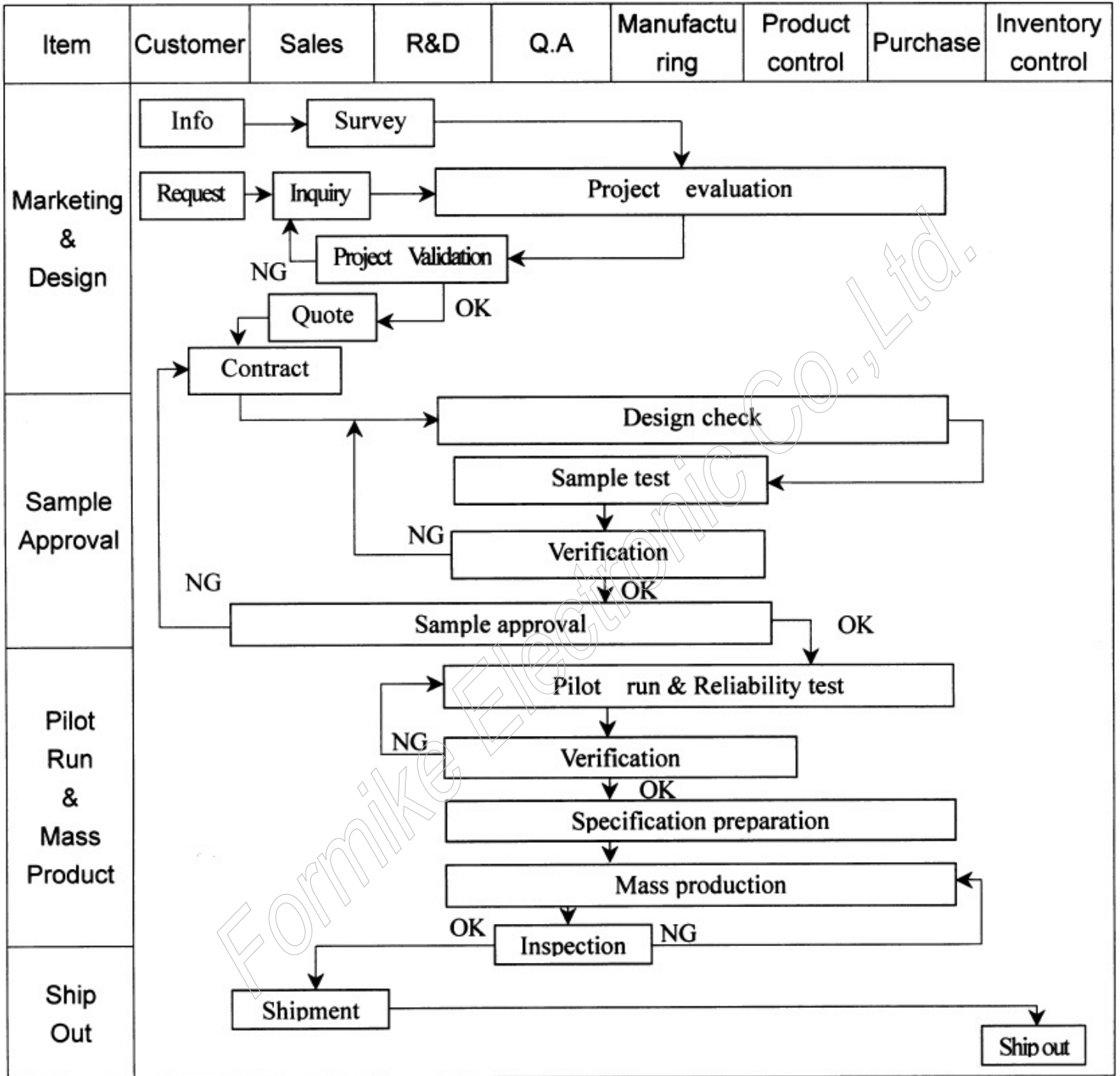
If RESET signal is necessary for power down, provide it after the 2-frames-cycle of the SHUT period.

Note 1: The pin, SHUT be fixed to VSS. 2: The voltage of VDD be boost from VDDIO.



3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart





Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service	<pre> graph TD Info[Info] --> Claim[Claim] Claim --> Failure[Failure analysis] Failure --> Report[Analysis report] Failure --> Action[Corrective action] Action --> Tracking[Tracking] </pre>							
Q.A Activity	1. ISO 9001 Maintenance Activities 3. Equipment calibration 5. Standardization Management				2. Process improvement proposal 4. Education And Training Activities			



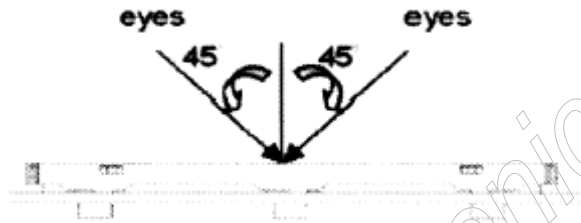
3.2 Inspection Specification

1. Inspection Specification

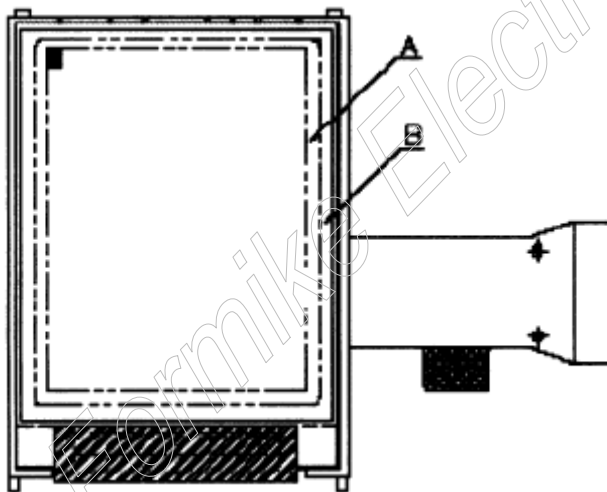
- ◆ Scope: The document shall be applied to TFT-LCD Module for 3.5”~10” (Ver.02)
- ◆ Inspection Standard: MIL-STD-105E Table Normal Inspection Single Sampling Level II.
- ◆ Equipment: Gauge, MIL-STD Powertip Tester, Sample
- ◆ Defect Level: Major Defect AQL: 0.4 Minor Defect AQL:1.5
- ◆ OUT Going Defect Level: Sampling
- ◆ Standard of the product appearance test:

a: Manner of appearance test:

- (1) The test best be under 20W*2 fluorescent light, and distance of view must be at 30cm.
- (2) The test direction is base on about around 45° of vertical line.



(3) Definition of area.



A area: viewing area

B area: Outside of viewing area

(4) Standard of inspection: (Unit: mm)



Specification For TFT-LCD Module 3.5"~10"
Specification For TFT-LCD Module 3.5"~10"

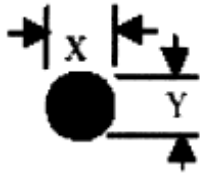

(Ver.02)
(Ver.02)

NO	Item	Criterion	Level												
01	Product condition	1.1 The part number is inconsistent with work order of production.	Major												
		1.2 Mixed product types.	Major												
		1.3 Assembled in inverse direction.	Major												
02	Quantity	2.1 The quantity is inconsistent with work order of production.	Major												
03	Outling dimension	3.1 Product dimension and structure must conform to structure diagram.	Major												
04	Electrical Testing	4.1 Missing line character and icon.	Major												
		4.2 No function or no display.	Major												
		4.3 Display malfunction.	Major												
		4.4 LCD viewing angle defect.	Major												
		4.5 Current consumption exceeds product specifications.	Major												
05	Dot defect (Bright dot, Dark dot) On-display	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Item</th> <th>Acceptance(Q'ty)</th> </tr> </thead> <tbody> <tr> <td rowspan="4" style="text-align: center;">Dot Defect</td> <td style="text-align: center;">Bright Dot</td> <td style="text-align: center;">≤ 4</td> </tr> <tr> <td style="text-align: center;">Dark Dot</td> <td style="text-align: center;">≤ 5</td> </tr> <tr> <td style="text-align: center;">Joint Dot</td> <td style="text-align: center;">≤ 3</td> </tr> <tr> <td style="text-align: center;">Total</td> <td style="text-align: center;">≤ 7</td> </tr> </tbody> </table> <p>5.1 Inspection pattern: full white, full black, Red, Green and blue screens. 5.2 It is defined as dot defect if defect area > 1/2 dot. 5.3 The distance between two dot defect ≥ 5mm.</p>	Item		Acceptance(Q'ty)	Dot Defect	Bright Dot	≤ 4	Dark Dot	≤ 5	Joint Dot	≤ 3	Total	≤ 7	Minor
Item		Acceptance(Q'ty)													
Dot Defect	Bright Dot	≤ 4													
	Dark Dot	≤ 5													
	Joint Dot	≤ 3													
	Total	≤ 7													



Specification For TFT-LCD Module 3.5"~10"

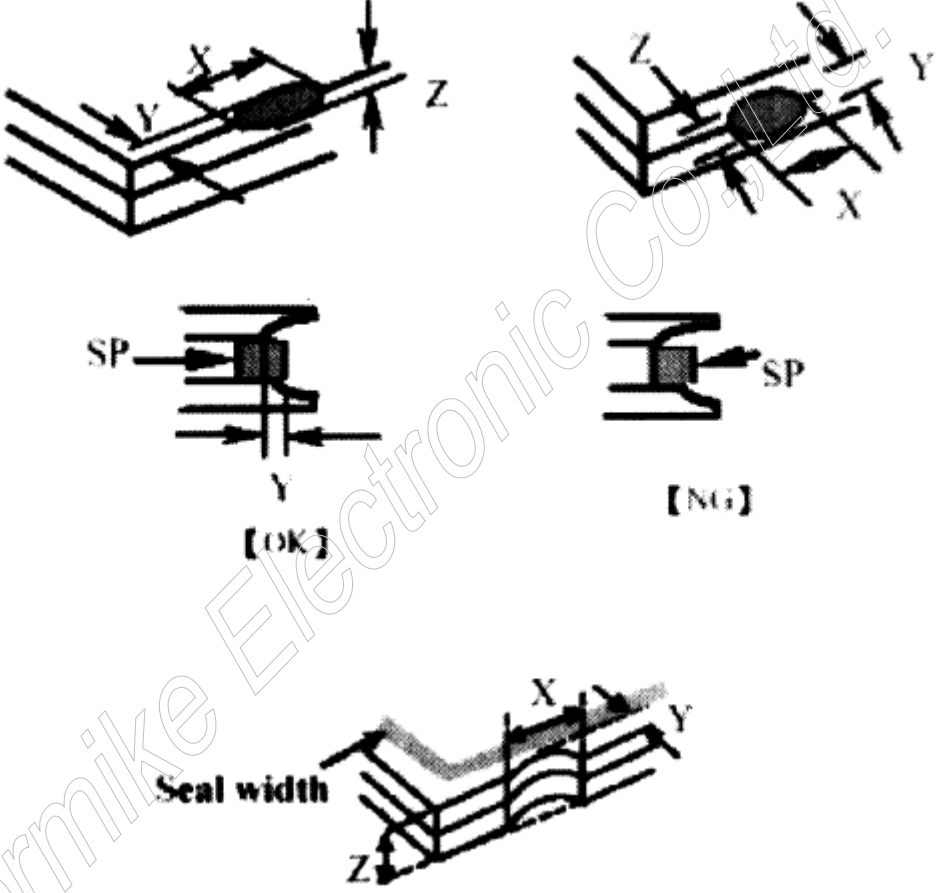
(Ver.02)

NO	Item	Criterion	Level																												
06	Black or white dot, scratch, contamination Round type  $\varnothing = (x+y)/2$ Line type 	6.1 Round type (Non-display or display) <table border="1" data-bbox="555 465 1326 712"> <thead> <tr> <th>Dimension(diameter: Φ)</th> <th>Acceptance(Q'ty)</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.25$</td> <td>Ignore</td> </tr> <tr> <td>$0.25 < \Phi \leq 0.50$</td> <td>5</td> </tr> <tr> <td>$\Phi > 0.50$</td> <td>0</td> </tr> <tr> <td>Total</td> <td>5</td> </tr> </tbody> </table> 6.2 Line type(Non-display or display) <table border="1" data-bbox="507 840 1310 1122"> <thead> <tr> <th>Length(L)</th> <th>Width(W)</th> <th>Acceptance(Q'ty)</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.03$</td> <td>Ignore</td> </tr> <tr> <td>$L \leq 10.0$</td> <td>$0.03 < W \leq 0.05$</td> <td>4</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.05 < W \leq 0.10$</td> <td>2</td> </tr> <tr> <td>---</td> <td>$W > 0.10$</td> <td>As round type</td> </tr> <tr> <td colspan="2">Total</td> <td>5</td> </tr> </tbody> </table>	Dimension(diameter: Φ)	Acceptance(Q'ty)	$\Phi \leq 0.25$	Ignore	$0.25 < \Phi \leq 0.50$	5	$\Phi > 0.50$	0	Total	5	Length(L)	Width(W)	Acceptance(Q'ty)	---	$W \leq 0.03$	Ignore	$L \leq 10.0$	$0.03 < W \leq 0.05$	4	$L \leq 5.0$	$0.05 < W \leq 0.10$	2	---	$W > 0.10$	As round type	Total		5	Minor
Dimension(diameter: Φ)	Acceptance(Q'ty)																														
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$0.25 < \Phi \leq 0.50$	5																														
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$L \leq 10.0$	$0.03 < W \leq 0.05$	4																													
$L \leq 5.0$	$0.05 < W \leq 0.10$	2																													
---	$W > 0.10$	As round type																													
Total		5																													
07	Polarizer Bubble	<table border="1" data-bbox="507 1216 1302 1509"> <thead> <tr> <th>Dimension(diameter: Φ)</th> <th>Acceptance (Q'ty)</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.25$</td> <td>Ignore</td> </tr> <tr> <td>$0.25 < \Phi \leq 0.50$</td> <td>4</td> </tr> <tr> <td>$0.50 < \Phi \leq 0.80$</td> <td>1</td> </tr> <tr> <td>$\Phi > 0.80$</td> <td>0</td> </tr> <tr> <td>Total</td> <td>5</td> </tr> </tbody> </table>	Dimension(diameter: Φ)	Acceptance (Q'ty)	$\Phi \leq 0.25$	Ignore	$0.25 < \Phi \leq 0.50$	4	$0.50 < \Phi \leq 0.80$	1	$\Phi > 0.80$	0	Total	5	Minor																
Dimension(diameter: Φ)	Acceptance (Q'ty)																														
$\Phi \leq 0.25$	Ignore																														
$0.25 < \Phi \leq 0.50$	4																														
$0.50 < \Phi \leq 0.80$	1																														
$\Phi > 0.80$	0																														
Total	5																														



Specification For TFT-LCD Module 3.5"~10"

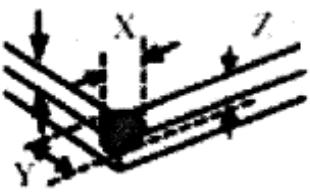
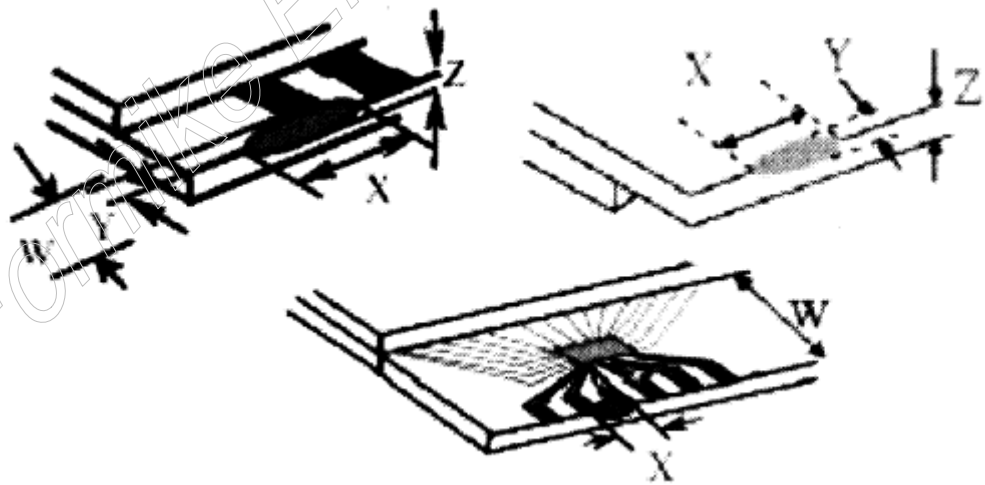
(Ver.02)

NO	Item	Criterion	Level									
08	The crack of glass	<p>Symbols: X: The length of crack Z: The thickness of crack t : The thickness of glass Y: The width of crack. W: terminal length a : LCD side length</p> <p>8.1 General glass chip: 8.1.1 Chip on panel surface and crack between panels:</p>  <p>Seal width</p> <table border="1" data-bbox="459 1639 1302 1859"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq a$</td> <td>Crack can't enter viewing area</td> <td>$\leq 1/2t$</td> </tr> <tr> <td>\leq</td> <td>Crack can't exceed the half of SP width</td> <td>$1/2t < Z \leq 2t$</td> </tr> </tbody> </table>	X	Y	Z	$\leq a$	Crack can't enter viewing area	$\leq 1/2t$	\leq	Crack can't exceed the half of SP width	$1/2t < Z \leq 2t$	Minor
X	Y	Z										
$\leq a$	Crack can't enter viewing area	$\leq 1/2t$										
\leq	Crack can't exceed the half of SP width	$1/2t < Z \leq 2t$										



Specification For TFT-LCD Module 3.5"~10"

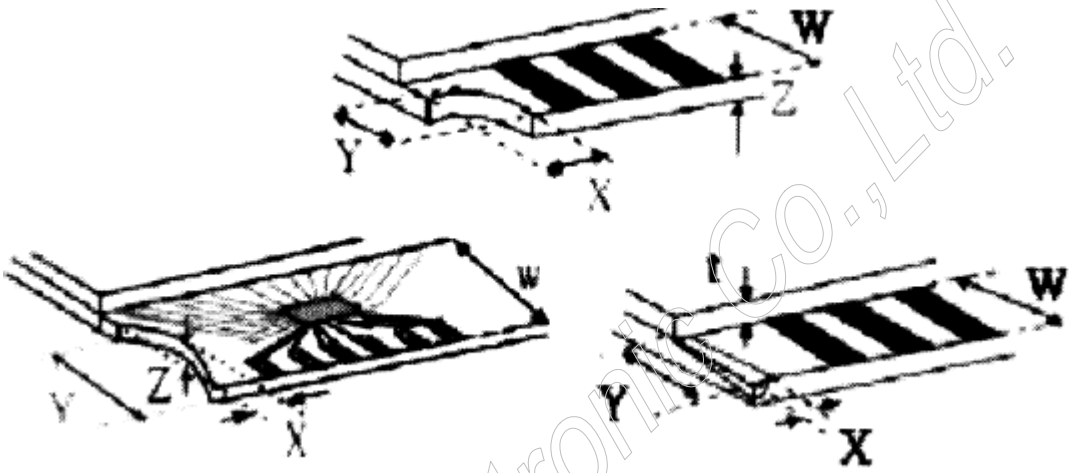
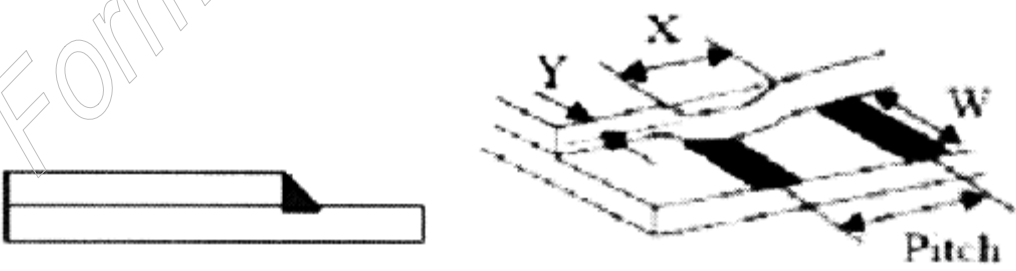
(Ver.02)

NO	Item	Criterion	Level									
08	The crack of glass	<p>Symbols: X: The length of crack Z: The thickness of crack t : The thickness of glass</p> <p>Y: The width of crack. W: terminal length a : LCD side length</p> <p>8.1.2 Corner crack:</p>  <table border="1" data-bbox="478 884 1276 1153"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq 1/5a$</td> <td>Crack can't enter viewing area</td> <td>$Z \leq 1/2t$</td> </tr> <tr> <td>$\leq 1/5a$</td> <td>Crack can't exceed the half of SP width</td> <td>$1/2t < Z \leq 2t$</td> </tr> </tbody> </table>	X	Y	Z	$\leq 1/5a$	Crack can't enter viewing area	$Z \leq 1/2t$	$\leq 1/5a$	Crack can't exceed the half of SP width	$1/2t < Z \leq 2t$	Minor
		X	Y	Z								
$\leq 1/5a$	Crack can't enter viewing area	$Z \leq 1/2t$										
$\leq 1/5a$	Crack can't exceed the half of SP width	$1/2t < Z \leq 2t$										
<p>8.2 Protrusion over terminal: 8.2.1 Chip on electrode pad:</p>  <table border="1" data-bbox="430 1859 1348 2004"> <thead> <tr> <th></th> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>Front</td> <td>$\leq a$</td> <td>$\leq 1/2W$</td> <td>$\leq t$</td> </tr> <tr> <td>Back</td> <td>$\leq a$</td> <td>$\leq W$</td> <td>$\leq 1/2t$</td> </tr> </tbody> </table>		X	Y	Z	Front	$\leq a$	$\leq 1/2W$	$\leq t$	Back	$\leq a$	$\leq W$	$\leq 1/2t$
	X	Y	Z									
Front	$\leq a$	$\leq 1/2W$	$\leq t$									
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08	The crack of glass	<p>Symbols: X: The length of crack Y: The width of crack. Z: The thickness of crack W: terminal length t: The thickness of glass a : LCD side length</p> <p>8.2.2 Non- conductive portion:</p>  <table border="1" data-bbox="478 1187 1228 1288"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>$\leq 1/3a$</td> <td>$\leq W$</td> <td>$\leq t$</td> </tr> </table> <p>If the chipped area touches the ITO terminal , over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.</p> <p>8.2.3 Glass remain:</p>  <table border="1" data-bbox="478 1848 1228 1948"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>$\leq a$</td> <td>$\leq 1/3W$</td> <td>$\leq t$</td> </tr> </table>	X	Y	Z	$\leq 1/3a$	$\leq W$	$\leq t$	X	Y	Z	$\leq a$	$\leq 1/3W$	$\leq t$	Minor
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NO	Item	Criterion	Level
09	Backlight Elements	9.1 Backlight can't work normally.	Major
		9.2 Backlight doesn't light or color is wrong.	Major
		9.3 Illumination source flickers when lit.	Major
10	General appearance	10.1 Pin type, quantity, dimension must match type in structure diagram.	Major
		10.2 No short circuits in components on PCB or FPC.	Major
		10.3 Parts on PCB or FPC must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts.	Major
		10.4 Product packaging must the same as specified on packaging specification sheet.	Minor
		10.5 The folding and peeled off in polarizer are not acceptable.	Minor
		10.6 The PCB or FPC between B/L assembled distance (PCB or FPC) is $\leq 1.5\text{mm}$.	Minor



5. PRECAUTION RELATING PRODUCT HANDLING

5.1 SAFETY

- 5.1.1 If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.
- 5.1.2 If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

5.2 HANDLING

- 5.2.1 Avoid any strong mechanical shock which can break the glass.
- 5.2.2 Avoid static electricity which can damage the CMOS LSI-When working with the module, be sure to ground your body and any electrical equipment you may be using.
- 5.2.3 Do not remove the panel or frame from the module.
- 5.2.4 The polarizing plate of the display is very fragile. So, please handle it very carefully, do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass, tweezers, etc.)
- 5.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- 5.2.6 Do not touch the display area with bare hands, this will stain the display area.
- 5.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.
- 5.2.8 To control temperature and time of soldering is $320\pm 10^{\circ}\text{C}$ and 3-5 sec.
- 5.2.9 To avoid liquid (include organic solvent) stained on LCM.

5.3 STORAGE

- 5.3.1 Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$ and the humidity is below 65% RH.
- 5.3.2 Do not place the module near organics solvents or corrosive gases.
- 5.3.3 Do not crush, shake, or jolt the module.

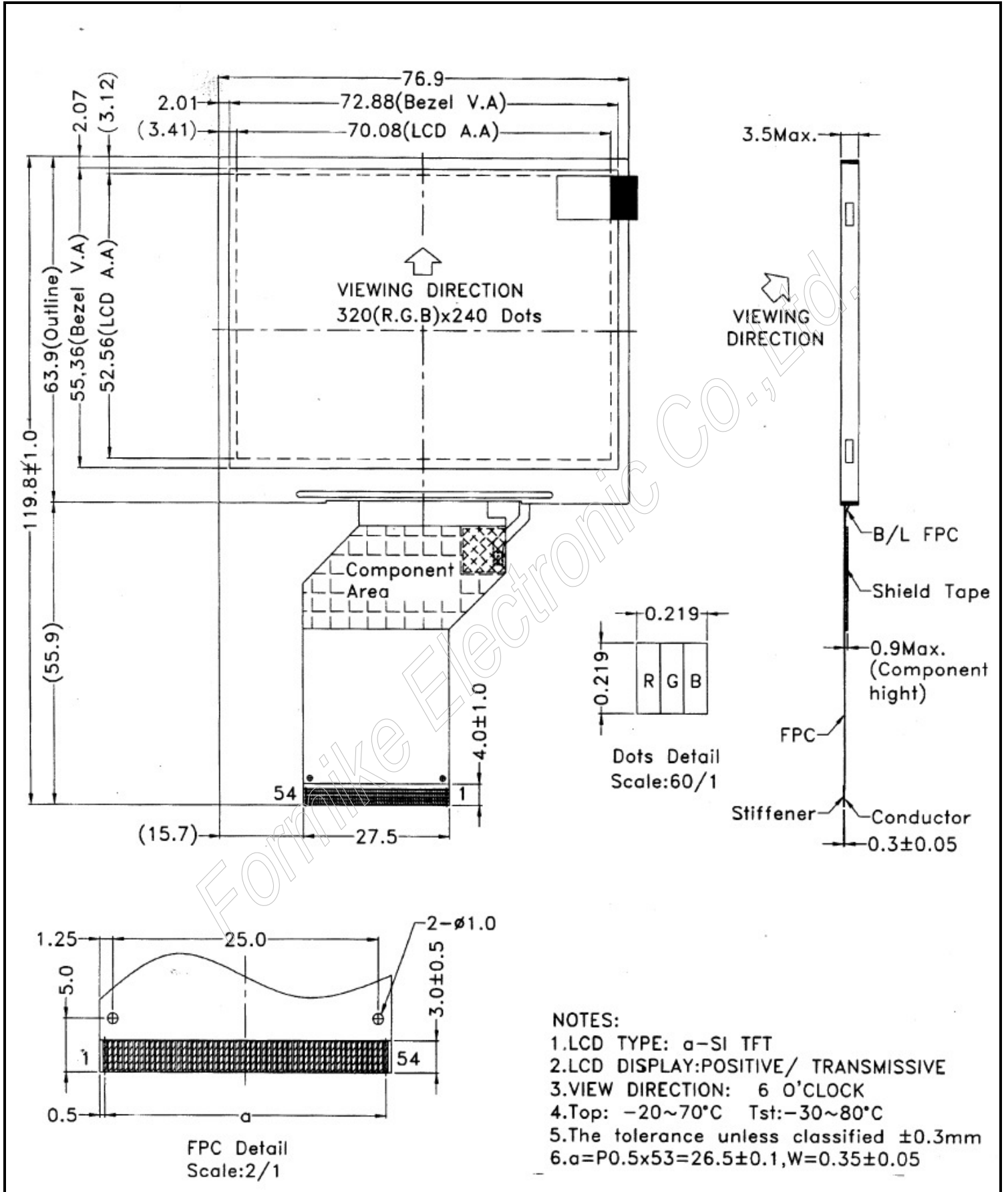
5.4 TERMS OF WARRANTY

5.4.1 Applicable warrant period

The period is within thirteen months since the date of shipping out under normal using and storage conditions.

5.4.2 Unaccepted responsibility

This product has been manufactured to your company' s specification as a part for use in your company' s general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in nuclear power control equipment, aerospace equipment, fire and security systems or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required.



- NOTES:**
- 1.LCD TYPE: a-SI TFT
 - 2.LCD DISPLAY: POSITIVE/ TRANSMISSIVE
 - 3.VIEW DIRECTION: 6 O'CLOCK
 - 4.Top: -20~70°C Tst: -30~80°C
 - 5.The tolerance unless classified ±0.3mm
 - 6.a=P0.5x53=26.5±0.1, W=0.35±0.05