



SPECIFICATION

BATRON

12026300

BTHQ42005VSS-FSTF-LEDWHITE (2DIES)

BTHQ42005VSS-35

Version: A

Date: 08.11.2017

Note: This specification is subject to change without prior notice

Supplied by:

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A	2017.11.08	First Release.	SHALLY LIU	LIU BAI CHENG

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**Specification
of
LCD Module Type
Item No.: BTHQ 42005VSS-35**

1. General Description

- 20 characters (5 x 8 dots) x 4 line FSTN Positive Black&White Transflective LCD Character Module.
- Viewing Angle: 6 O'clock.
- Driving scheme: 1/16 Duty, 1/5 bias.
- 'SITRONIX' ST7066U-0A-B (Die form) LCD Controller & Driver or equivalent.
- 'SITRONIX' ST7065C (Die form) LCD Segment Drivers or equivalent.
- White LED05 backlight.
- "RoHS" compliance.

2. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

Parameter	Specifications	Unit
Outline dimensions	98.0(W) x 60.0(H) x 14.0 MAX.(D)	mm
Viewing area	76.0(W) x 25.2(H)	mm
Active area	70.35(W) x 20.74(H)	mm
Display format	20 characters x 4 lines	-
Character size	2.90(W) x 4.697(H) (5 x 8 dots)	mm
Character spacing	0.65(W) x 0.65(H)	mm
Character pitch	3.55(W) x 5.347(H)	mm
Dot size	0.568(W) x 0.574(H)	mm
Dot spacing	0.015(W) x 0.015(H)	mm
Dot pitch	0.583(W) x 0.589(H)	mm
Weight	Approx. 72	grams

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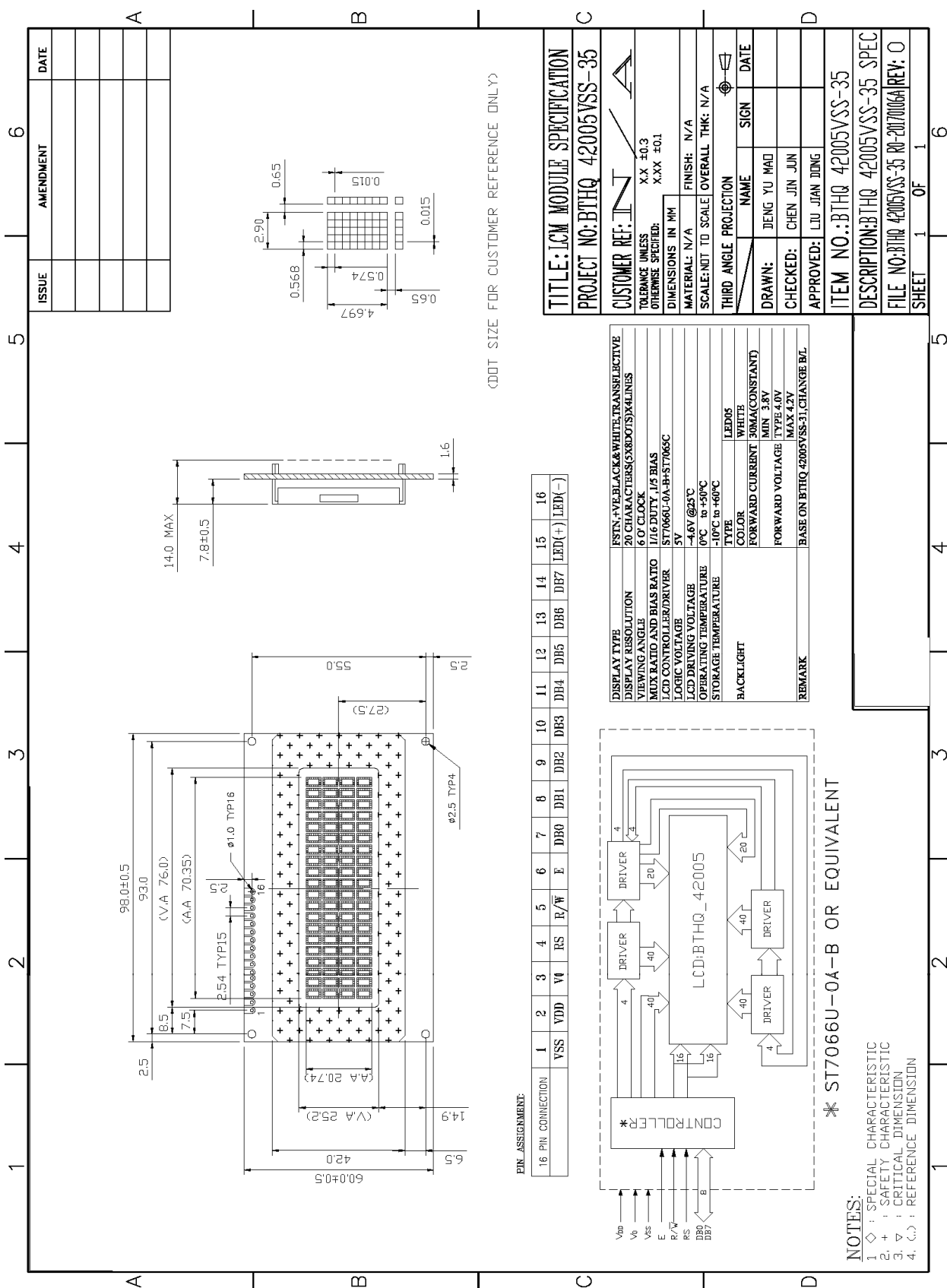


Figure 1: Module Specification

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3. Interface signals

Table 2: Pin assignment

Pin No.	Symbol	Description
1	VSS	Ground (0V)
2	VDD	Power supply for logic (+5V)
3	V0	Power supply for LCD driver
4	RS	Register Select Input: “High” for Data register (for read and write), “Low” for Instruction register (for write), Busy flag, address counter (for read).
5	R/ $\overline{W}$	Read/Write signal: ‘High’ for Read mode. ‘Low’ for Write mode.
6	E	Enable. Start signal for data read /write.
7	DB0	Four low order bi-directional tristate data bus pins. Used for data transfer and receive between the MPU and the ST7066U. These pins are not used during 4-bit operation.
8	DB1	
9	DB2	
10	DB3	
11	DB4	Four high order bi-directional tristate data bus pins. Used for data transfer and receive between the MPU and the ST7066U. DB7 can be used as a busy flag.
12	DB5	
13	DB6	
14	DB7	
15	LED(+)	Anode of LED backlight.
16	LED(-)	Cathode of LED backlight.

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4. Absolute Maximum Ratings

4.1 Electrical Maximum Ratings – for IC Only (At Ta = 25°C)

Table 3

Parameter	Symbol	Min.	Max.	Unit
Power Supply voltage (Logic)	VDD – VSS	-0.3	+7.0	V
Power Supply voltage (LCD drive)	VLCD =VDD- V0	-0.3	+10.0	V
Input voltage	Vin	-0.3	VDD+0.3	V

Note:

The modules may be destroyed if they are used beyond the absolute maximum ratings.

All voltage values are referenced to VSS = 0V.

4.2 Environmental Condition

Table 4

Item	Operating Temperature (Topr)		Storage Temperature (Tstg) (Note 1)		Remark
	Min.	Max.	Min.	Max.	
Ambient Temperature	0°C	+50°C	-10°C	+60°C	Dry
Humidity (Note 1)	90% max. RH for Ta ≤ 40°C <50%RH for 40°C < Ta ≤ Maximum operating temperature				no condensation
Vibration (IEC 68-2-6) cells must be mounted on a suitable connector	Frequency: 10 ~ 55 Hz Amplitude: 0.75 mm Duration: 20 cycles in each direction.				3 directions
Shock (IEC 68-2-27) Half-sine pulse shape	Pulse duration: 11 ms Peak acceleration: 981 m/s ² = 100 g Number of shocks: 3 shocks in 3 mutually perpendicular axes.				3 directions

Note 1: Product cannot sustain at extreme storage conditions for long time.

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5. Electrical Specifications

5.1 Typical Electrical Characteristics

At $T_a = 25^\circ\text{C}$, $V_{DD} = 5V \pm 5\%$, $V_{SS} = 0V$.

Table 5

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (Logic)	$V_{DD}-V_{SS}$		4.75	5.0	5.25	V
Supply voltage (LCD)	$V_{LCD} = V_{DD} - V_0$	$T_a = 0^\circ\text{C}$, $V_{DD} = 5V$, Character mode, Note1	-	4.8	-	V
		$T_a = +25^\circ\text{C}$, $V_{DD} = 5V$, Character mode, Note1	4.3	4.6	4.9	V
		$T_a = +50^\circ\text{C}$, $V_{DD} = 5V$, Character mode, Note1	-	4.3	-	V
Input signal voltage for E,DB0-DB7, R/ $\overline{W}$,RS.	V_{IH}	“H” level	0.7VDD	-	VDD	V
	V_{IL}	“L” level	-0.3	-	0.6	V
Supply Current (Logic & LCD)	IDD	$V_{DD} = 5V$, Character mode	-	1.0	1.5	mA
		$V_{DD} = 5V$, Note1 Checkerboard mode	-	1.2	1.8	mA
Supply Current (LCD)	ILCD	$V_{DD} = 5V$, Note1 Character mode	-	0.2	0.3	mA
		$V_{DD} = 5V$, Note1 Checkerboard mode	-	0.2	0.3	mA
Supply voltage of white LED05 backlight	VLED	Forward current = 30mA(Note 2)	3.8	4.0	4.2	V
Luminance (on LCD surface)		Number of LED chips = $1 \times 2 = 2$ (dies).	30	56	-	cd/m2

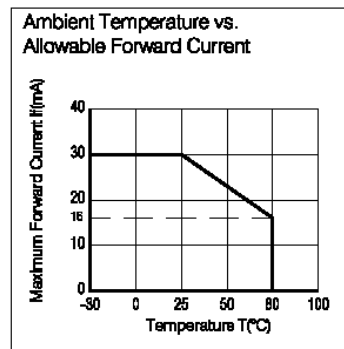
Note 1: There is tolerance in optimum LCD driving voltage during production. Minimum and maximum LCD driving voltages indicate the range of optimum LCD driving voltage shift due to production tolerance.

Please adjust LCD driving voltage manually to obtain the best module performance.

Note 2: The backlight is recommended to be driven at constant current 30 mA, otherwise maybe cause luminance and color to shift or damage the LED.

Note 3: Do not display a fixed pattern for more than 30 min. because it may cause image sticking due to LCD characteristics. It is recommended to change display pattern frequently. If customer must fix display pattern on the screen, please consider to Activate screen saver.

Note 4: Backlight temperature & current curve:



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5.2 Timing Specifications

At $T_a = +25^\circ\text{C}$, $V_{DD} = +5\text{V} \pm 5\%$, $V_{SS} = 0\text{V}$.

Refer to Fig. 2, the write mode timing diagram.

Table 6

Symbol	Parameter	Test Condition	Min.	Max.	Unit
T_C	Enable Cycle Time	Pin E	1200	-	ns
T_{PW}	Enable Pulse Width	Pin E	140	-	ns
T_R, T_F	Enable Rise/Fall Time	Pin E	-	25	ns
T_{AS}	Address Setup Time	Pins: RS, $R/\bar{W}$, E	0	-	ns
T_{AH}	Address Hold Time	Pins: RS, $R/\bar{W}$, E	10	-	ns
T_{DSW}	Data Setup Time	Pins: DB0-DB7	40	-	ns
T_H	Data Hold Time	Pins: DB0-DB7	10	-	ns

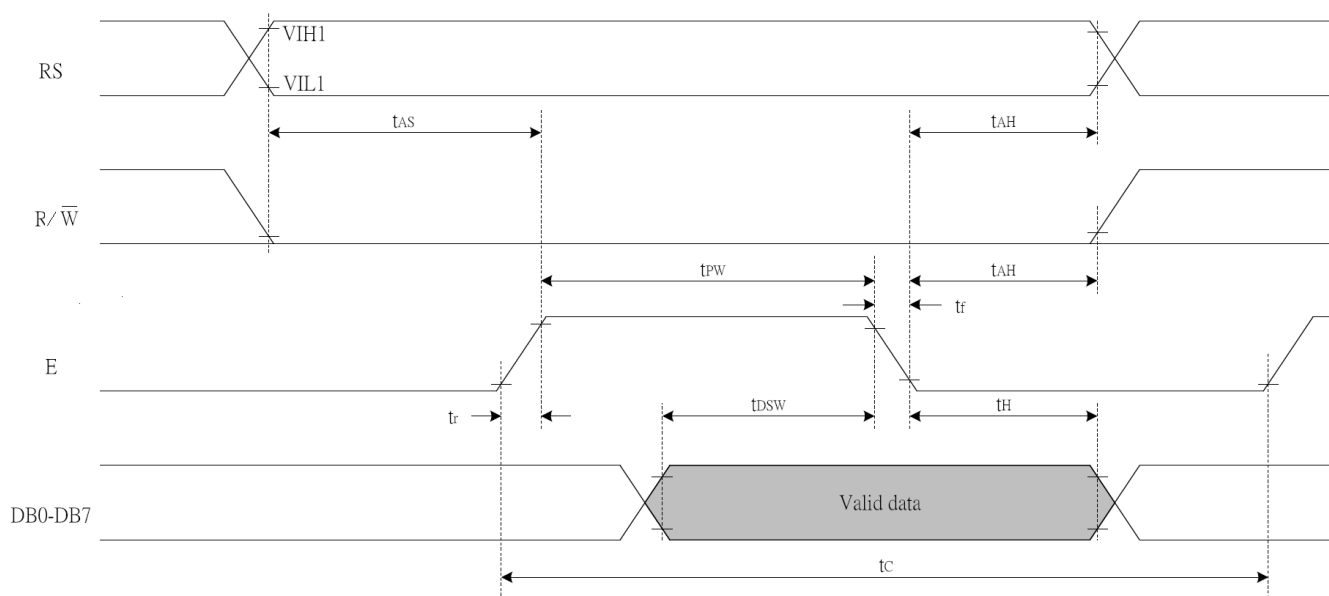


Figure 2: Write Mode Timing Diagram

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Refer to Fig. 3, the bus timing diagram for read mode.

Table 7

Symbol	Parameter	Test Condition	Min.	Max.	Unit
T_C	Enable Cycle Time	Pin E	1200	-	ns
T_{PW}	Enable Pulse Width	Pin E	140	-	ns
T_R, T_F	Enable Rise/Fall Time	Pin E	-	25	ns
T_{AS}	Address Setup Time	Pins: RS, $R/\overline{W}$, E	0	-	ns
T_{AH}	Address Hold Time	Pins: RS, $R/\overline{W}$, E	10	-	ns
T_{DDR}	Data Setup Time	Pins: DB0-DB7	-	100	ns
T_H	Data Hold Time	Pins: DB0-DB7	10	-	ns

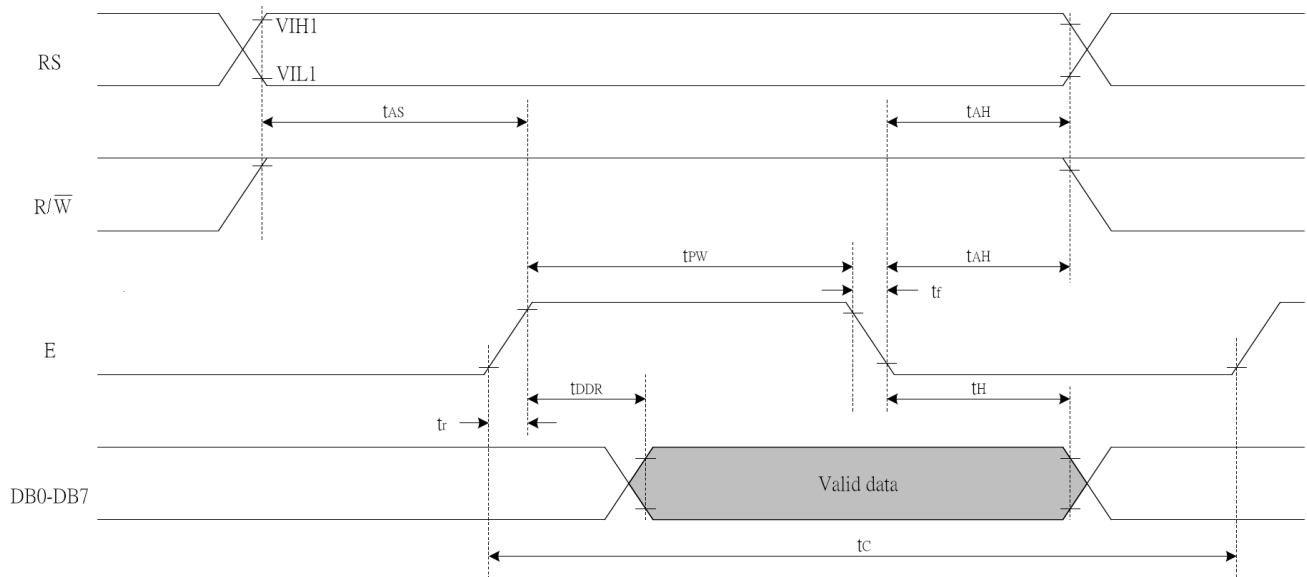


Figure 3: Read Mode Timing Diagram

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5.3 Timing Diagram of VDD Against V0.

Power on sequence shall meet the requirement of Figure 4, the timing diagram of VDD against V0.

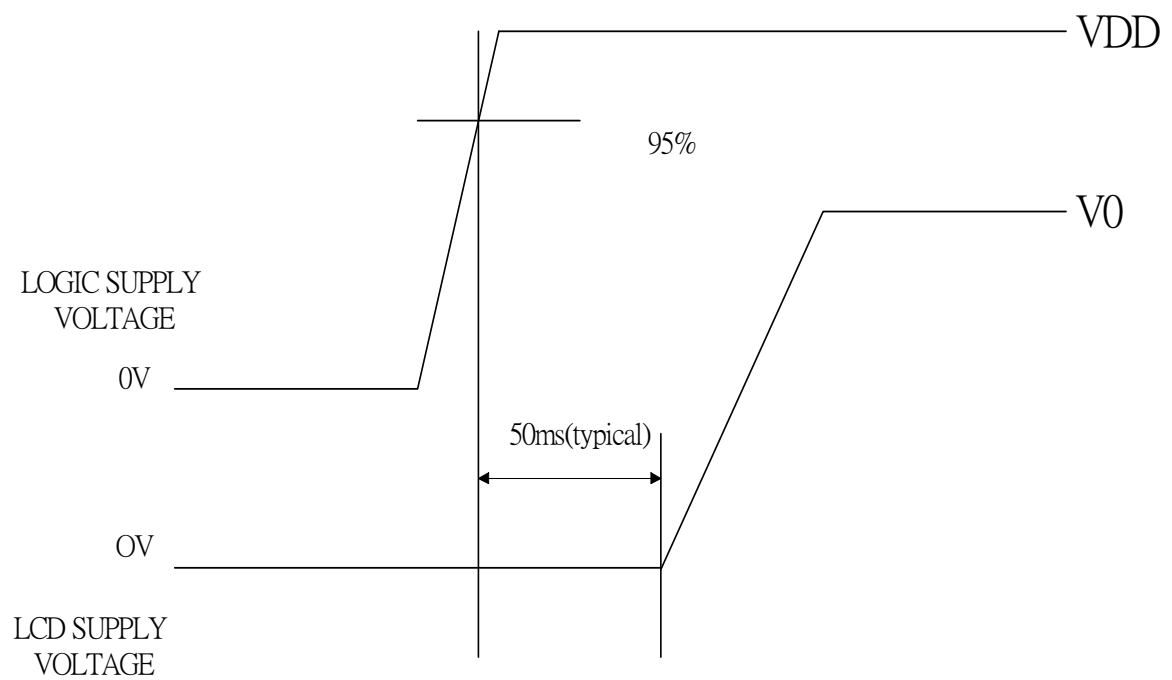


Figure 4: Timing Diagram of VDD Against V0.

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5.4 Character Generator ROM (ST7066-0A)

b7-b4 b3-b0	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0000	CG RAM (1)			0	1	2	3	4	5	6	7	8	9	A	B	C
0001	(2)			D	E	F	G	H	I	J	K	L	M	N	O	P
0010	(3)			Q	R	S	T	U	V	W	X	Y	Z	[	\	]
0011	(4)			^	_	`	a	b	c	d	e	f	g	h	i	j
0100	(5)			k	l	m	n	o	p	q	r	s	t	u	v	w
0101	(6)			x	y	z	{	}	~							
0110	(7)															
0111	(8)															
1000	(1)															
1001	(2)															
1010	(3)															
1011	(4)															
1100	(5)															
1101	(6)															
1110	(7)															
1111	(8)															

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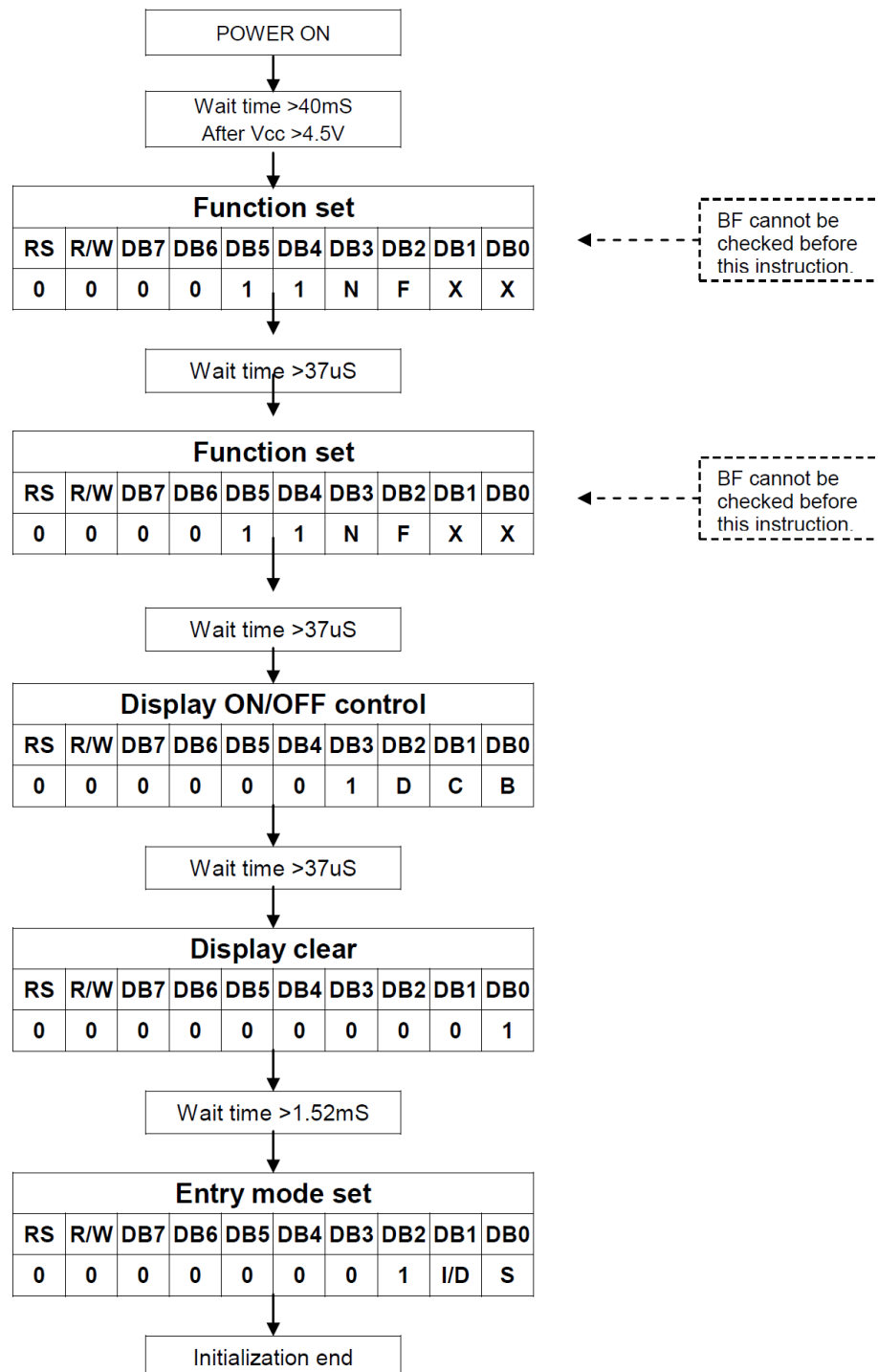
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5.5 Initializing by Instruction

5.5.1 8-bit Interface



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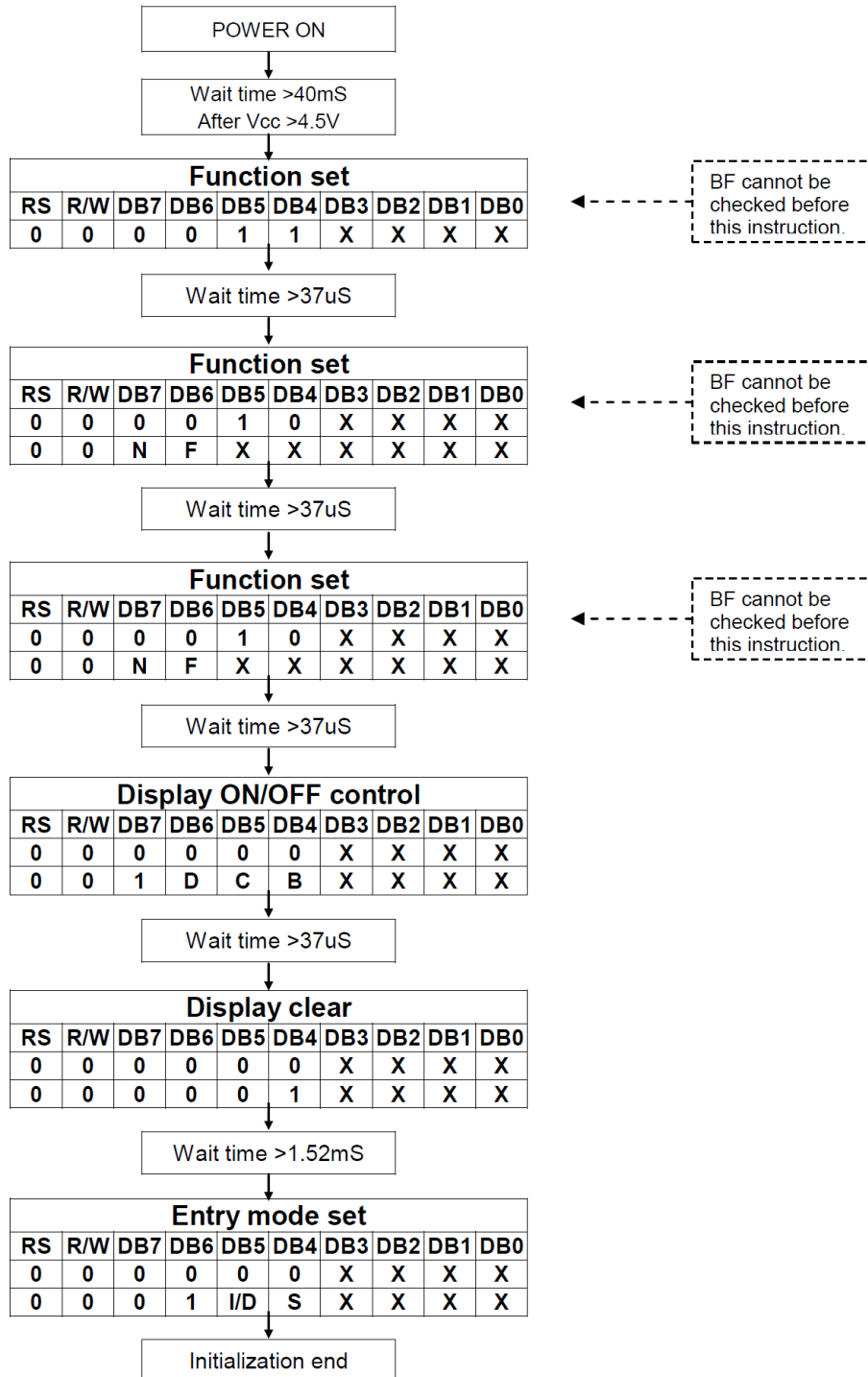
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5.5.2

4-bit Interface



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6. Reliability Conditions

Table 8

Test items	Test Condition	Sample Qty.	Sample No.
Temperature shock	Low storage temperature (-10°C)/1hrs To High storage temperature (+60°C)/1hrs, Total 32cycles	10PCS	1#~10#
Low temperature operating	Low operating temperature (0°C) Operating 240hrs	10PCS	11#~20#
High temperature operating	High temperature (+50°C) operating 240hrs	10PCS	21#~30#
HTHH operating	40°C, 93%RH, operating 240hrs	10PCS	31#~40#
Temperature cycling Operating	Low operating temperature (0°C)/1hr To High temperature (+50°C)/1hr 2.5hrs per cycle Total 60 cycles. Operating	10PCS	41#~50#
Vibration test	D=1.5mm;F=10~50Hz; 20 cycles, 2hrs;X/Y/Z directions	10PCS	51#~60#
ESD Test	150pF,330 Ohm; Air :±10KV,10mm distance; contact: ±6KV. Only for display area, if display can resume after program was reset, it's OK	5+5PCS	51#~60#
Low temperature storage	Low temperature (-10°C) storage 240hour	10PCS	51#~60#

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7. LCD Cosmetic Conditions

- a.) Reference document follow VL-QUA-012A.
- b.) LCD size of the product is small.

1.0 TITLE: final QA inspection for LCD products (G1);

2.0 PURPOSE:
to define the final QA inspection procedures and criteria for LCD product;

3.0 Scope:
This document applies to mass production of all G1 LCD after electrical test and before polarizer sticking process, LCD final inspection and ready for final QA sampling inspection, except of those with special requirements from customer;

4.0 DEFINITION:

4.1 ZONE definition

ZONE A: EAA: Effective Active Area;

ZONE B: EVA/VA: Viewing Area;

ZONE C: Outside V.A;

4.2 Inspection environment definition

environment temperature: 20-25°C

environment humidity: 45%--75%RH

environment luminance: 600 LUX (min)

backlight color and luminance:

- 1, If product include backlight, follow product's backlight color and luminance to test.
- 2, If product without backlight, priority to use backlight color and luminance offered by customer to test.
- 3, if backlight information can not be obtained from customer, we will use white backlight with colour coordinate($X=0.295\pm0.035$, $Y=0.295\pm0.035$) according to following luminance condition to test.
 - a.) Transmissive mode: luminance is 350 ± 50 cd/m².
 - b.) Transflective mode: luminance is 500 ± 50 cd/m².
 - c.) IBN mode: luminance is 1000 ± 100 cd/m²

4.3 Inspection method definition:

Distance: 30 cm between operator and the product.

Viewing angle: refer to specification description direction, about 45 degree between observer position and perpendicular direction.

Time: each pattern keep at least 2.5S for large size and middle size, small size keep at least 1.8S.

- a.) For reflective mode, use naked eyes to inspection.
- b.) For transflective and transmissive mode, use eyeshade with specified backlight to inspection.

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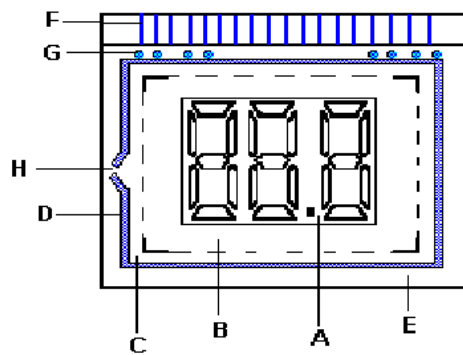
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5.0 Reference documents:

5.1 VL-QUA-084A

6.0 Applicable equipment: LCD tester;

7.0 Definition of LCD parts:



A : Effective Activated Area;

B : Viewing Area;

C : Outside V.A.;

D : Perimeter Seal;

E : Out Perimeter Seal;

F : Contact Leads;

G : Silver Dot;

H : End Seal;

7.2 Unless specified, LCD background color will refer to standard color sample;

7.3 Inspection Specification:

7.3.1 Patterned glass inspection criteria:

Defect category	Defect description	Scope	Criterion	Drawing Specification
Short	Photo-resist coated pattern connected	Patterned area	Can't accept	
Open	Photo-resist coated pattern disconnected	Patterned area	Can't accept	
Misalignment	Fish eyes misaligned	N/A	Can't accept	
Pinhole	Pinhole on photo-resist coating	Patterned area	Can't accept pinhole under sodium lamp with naked eyes	
Excess pattern	Excess photo-resist	Patterned area	Can't accept	
Missing pattern	Incomplete photo-resist	Patterned area	Can't accept	
Rainbow	Uneven photo-resist coating	ITO surface	Can't accept colorific defect under sodium lamp with naked eyes	
Black spot	Contaminated by foreign materials	Patterned area	Can't accept foreign material under sodium lamp with naked eyes	
Scratch	Scratch on glass surface	Patterned area	Can't accept scratch on EAA	
Chip	Mechanical damage on glass edge/ corner	Patterned area	Can't accept damage on EAA	

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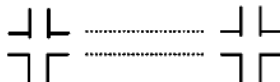
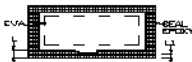
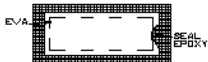
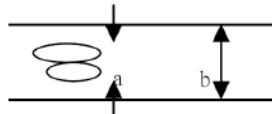
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7.3.2 Sodium lamp inspection criteria

Defect category	Defect description	Scope	Inspection criterion	Drawing Specification
Black spot/ foreign material	Foreign material in glass cell	A,B,C,D	Can't accept Newton ring found by naked eyes under sodium lamp	
Scratch	Scratch on glass surface	A,B,C,D	Can't accept glass scratch within EAA zone when it's observed under dark background with naked eyes;	
Perimeter sealing problem	Sealing broken	D	Can't accept	
	Wider sealing width	D	Can't accept sealing exceed scribing line. Refer to the drawing, sealing shouldn't bleed into where between two broken lines.	
	Narrow sealing width	D	If $L1 < 2/3L$, reject; L =normal width of sealing; $L1$ =min width of sealing;	
	Hair going into EVA through perimeter sealing	A,B,C,D	Can't accept	
	Seal epoxy bleeds into EVA	A,B	Can't accept	
	Bubble in sealing epoxy	D	If $a \leq 1/3b$, Accept; a =bulb diameter; b =width of seal epoxy	
Bag broken	Vacuum bag broken	N/A	For STN or Self-short DOT product, can't accept; For TN/HTN or silver dot product, no requirement;	

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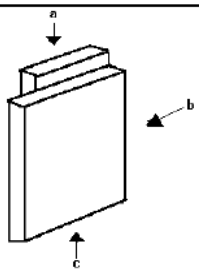
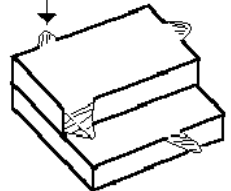
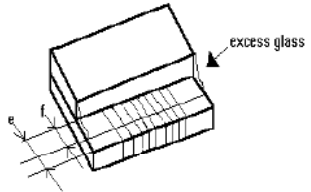
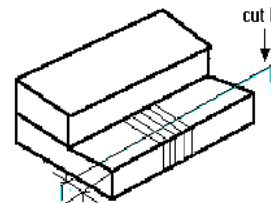
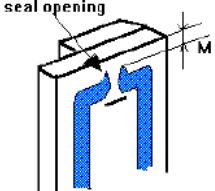
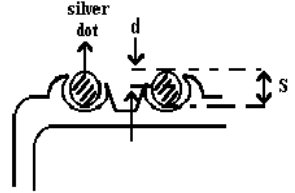
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7.3.3 Inspection criteria after filling (zone A):

Defect category	Defect description	Scope	Inspection criteria	Drawing Specification
Scribing defect	Anomalous shape is observed on the edge viewing from direction a, b & c	F,E	Reject if mechanical dimension out of specification	
	Excess glass within mechanical dimension	F,E	Rework to abrade away the excess glass if possible	
	Excess glass on ITO contact edge	F	Accept if $f < 1/10e$	 e = width of electrical contact area. f = width of excess glass.
	Scribing on ITO contact lead	F	Cutting line must within specification;	
	Wrong scribing	E	Accept if $M \leq 0\text{mm}$; M= distance between glass edge and seal opening	
	Silver dot exposed by cutting	F,E	Accept if $d < 1/10s$; d= exposed width of silver dot; s= diameter of silver dot.	

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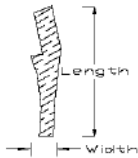
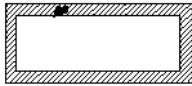
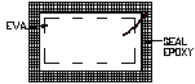
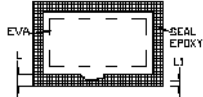
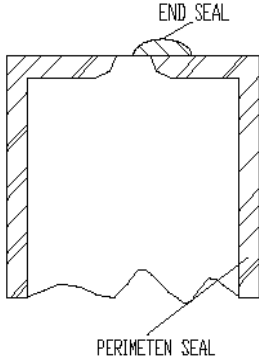
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Defect category	Defect description	Scope	Inspection criterion	Drawing Specification
Scratch on glass	Scratch on glass surface	A,B	<u>Length</u> (mm) <u>width</u> (mm) <u>accepted QTY</u>	
			/ <0.02 any	
			<3.0 <0.03 2	
			<5.0 ≤0.05 1	
			/ >0.05 0	
Bubble	LC does not fulfill the glass cell	A,B,C	Can't accept	
Sealing defect	White/ color mark on perimeter seal	D	Can't accept	
	Hair going into EVA through perimeter seal	A,B,C,D	Can't accept	
	Seal epoxy bleeds into EVA zone	A,B	Can't accept	
	Narrow seal width	D	Reject if $L1 < 2/3L$; L =width of seal epoxy; $L1$ =min width of seal epoxy;	
	Rainbow near to end seal	H	Can't accept	
	End seal epoxy does not entirely cover LC filling window;	H	Can't accept	
	End seal depth exceed limits	H	accept if depth $\geq 0.2\text{mm}$ and shall not go into V.A.;	

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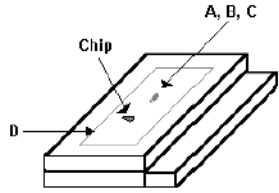
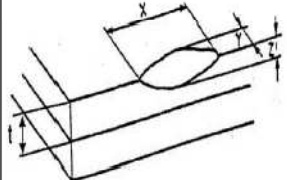
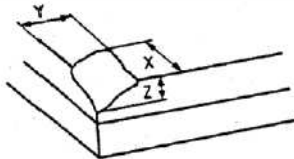
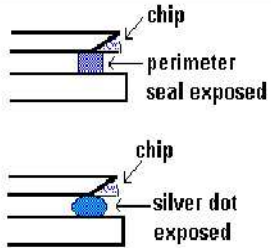
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Defect category	Defect description	Scope	Inspection criterion	Drawing Specification
Rainbow (RB)	Arches, circular or parallel colorful spread	A,B	Refer to golden samples	
Fingerprint	Fingerprint on PI coating;	A,B,C	Can't accept	
Scratch on PI coating	PI coating scratched	A,B	Refer to black spot/ foreign material criteria hereinabove	
Reverse twist	Visual radialized spots	A,B	Can't accept	
		C	Reverse twist can be accept if it happened in zone c without PI coat.	
Mechanical damage	Glass chip on corner, edge or surface	A,B,C	Can't accept	
		D,E	Reject if beyond any of following requirements; 1. $X \leq 1/8L$ (L= LCD length of direction X); 2. Y does not extend into EVA; 3. $Z < t$ (t= thickness of LCD glass); Notes: accept $Z = t$ if glass thickness $t \leq 0.7\text{mm}$;	
			Reject if beyond any of following requirements; 1. $X/Y \leq 1/8L$ (L= LCD length of direction X/Y); 2. X/Y does not extend into EVA; 3. $Z < t$ (t= thickness of LCD glass); Notes: accept $Z = t$ if glass thickness $t \leq 0.7\text{mm}$;	
		D,G	Reject if beyond any of following requirements; 1. Silver dot cannot be exposed; 2. $\geq 50\%$ of sealing frame must remain;	

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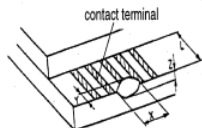
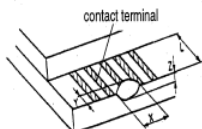
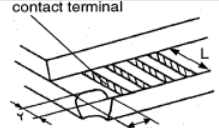
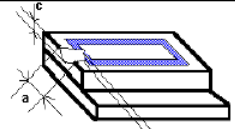
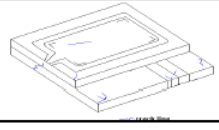
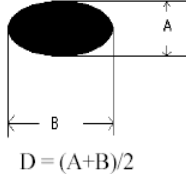
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Defect category	Defect description	Scope	Inspection criterion	Drawing Specification								
Mechanical damage	Glass chip on ITO ledge (for non-pin and COG model);	F	Reject if beyond any of following requirements; 1. $X \leq 1/8L$ (L= LCD length of direction X); 2. Can't exceed 4 ITO lead along direction X; 3. $Y \leq 1/4l$ (l= the length of ITO lead); 4. $Z < 1/2t$ (t= thickness of LCD);									
	Glass chip on ITO ledge (for pin and COG model);	F	Reject if beyond any of following requirements; 1. $X \leq 1/8L$ (L= LCD length of direction X); 2. Can't exceed 4 ITO lead along direction X; 3. $Y \leq 1/10l$ (l= the length of ITO lead); 4. $Z < 1/2t$ (t= thickness of LCD);									
	Glass chip on LCD ledge without ITO leads;	F	Reject if beyond any of following requirements; 1. $X \leq 1/8L$ (L= LCD length of direction X); 2. Can't extend onto ITO lead or pattern (mark or code); 3. $Y < 1/2l$ (l= the length of ITO lead);									
	Glass chip on end seal	H	Can't accept;									
	Glass crack	A,B,C,D,E,F,G,H	Inspector should remove the chip with tweezers; Re-evaluate if the remaining defect is still a crack or a chip, reject any crack;									
Ink printing defect	Glass chip or foreign material affix on ink of glass surface and can't be wiped away	A,B	If find out of ink pattern, can scrape away by using blade but can't accept any light leakage (refer to definition of light leakage); If find dirt within ink pattern: <table><tr><th>diameter (D)</th><th>accepted QTY</th></tr><tr><td>$D \leq 0.15\text{mm}$</td><td>any</td></tr><tr><td>$0.15 < D \leq 0.3\text{mm}$</td><td>1</td></tr><tr><td>$D > 0.3\text{mm}$</td><td>0</td></tr></table>	diameter (D)	accepted QTY	$D \leq 0.15\text{mm}$	any	$0.15 < D \leq 0.3\text{mm}$	1	$D > 0.3\text{mm}$	0	
	diameter (D)	accepted QTY										
	$D \leq 0.15\text{mm}$	any										
	$0.15 < D \leq 0.3\text{mm}$	1										
	$D > 0.3\text{mm}$	0										
Ink line/ pattern broken	A,B	Can't accept										
<u>Light leakage:</u> When activated with current white light appears in the position of pinhole or scratch due to ink printing misalignment	A,B	Can't accept any light leakage due to misalignment; <u>For light leakage of pinhole :</u> <table><tr><th>Diameter (mm)</th><th>accepted QTY</th></tr><tr><td>$D \leq 0.15$</td><td>any</td></tr><tr><td>$0.15 < D \leq 0.3$</td><td>1</td></tr><tr><td>$D > 0.3$</td><td>0</td></tr></table> Space between any 2 points of light leakage $\geq 1\text{mm}$.	Diameter (mm)	accepted QTY	$D \leq 0.15$	any	$0.15 < D \leq 0.3$	1	$D > 0.3$	0		
Diameter (mm)	accepted QTY											
$D \leq 0.15$	any											
$0.15 < D \leq 0.3$	1											
$D > 0.3$	0											
<u>Ink printing misalignment:</u> Position of ink printing can't match to drawing	A,B,C,D,E,F,G,H	Accept if the shift of ink printing within tolerance and dimension specified in drawing, otherwise reject; Unless otherwise specified, tolerance of ink printing should be $\pm 0.5\text{mm}$;										
<u>Thick or thin ink:</u> Ink printing pattern/ line are thicker or thinner than that specified in drawing	A,B,C	(a)accept if the thick or thin part is no more than 10% or $\leq 0.15\text{mm}$; (b)reject if the thick or thin part is more than 10% or $> 0.15\text{mm}$; for thicker ink printing pattern outside EVA, remove away with blade; reject if the thicker ink pattern within EVA;										

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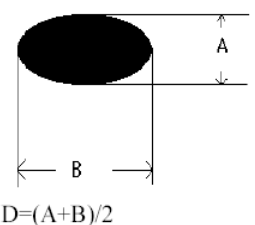
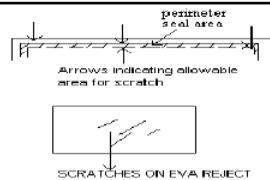
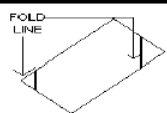
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Defect category	Defect description	Scope	Inspection criterion	Drawing Specification
Ink printing defect	Ink pattern/ line jagged;	A,B	(a) accept if the thick or thin part is less than 10% or $\leq 0.15\text{mm}$; (b) reject if the thick or thin part is more than 10% or $> 0.15\text{mm}$;	
	<u>Uneven printing ink color:</u> Color of ink darker or lighter;	A,B	Reject if printing color is darker or lighter than limits samples;	
	<u>Stencil dilapidation:</u> Dilapidation result in ink leakage;	A,B	<u>Point outline:</u> <u>diameter</u> <u>accepted QTY</u> $D \leq 0.15\text{mm}$ any $0.15 < A \leq 0.3\text{mm}$ 1 $D > 0.3\text{mm}$ 0	 $D = (A+B)/2$
Date code printing defect	Date code defect of printed pattern : wrong pattern, fuzzy pattern, misalignment, etc.;	Printing area	Reject if any wrong pattern and misalignment; Reject if any fuzzy pattern being difficult to identify;(Pls. Refer to limit sample if there is.)	
Polarizer defect	Scratch on transmissive polarizer	A,B	Reject if scratch within EVA;	 SCRATCHES ON EVA REJECT
		C	Accept if scratch outside EVA;	
	Scratch on reflective polarizer	A,B	Accept if scratch length $< 2\text{mm}$; Accept if QTY of scratch ≤ 2 ; Accept if scratch can't be viewed from the top of transmissive polarizer side;	
		C	Accept if scratch outside EVA;	
	Scratch on transfective polarizer	A,B	Reject if scratch can be viewed from front light source	
		C	Accept if scratch outside EVA;	
	Folding line	A,B	Reject if folding line on transmissive polarizer; Invisible folding line on transfective or reflective polarizer is acceptable;	
	Mechanical damage	A,B	Reject any mechanical damage, like as dent mark, through pinhole, polarizer debonding, etc.;	
		C,D	Accept minor dent mark; polarizer debonding Reject serious dent mark, like as through hole, etc.;	
	Discoloration	A,B,C	Can't accept	
	Wrong or reversed polarizer;	N/A	Can't accept	

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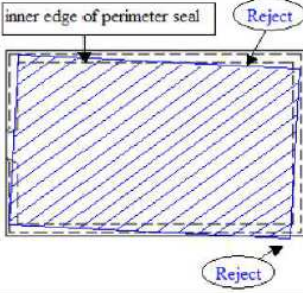
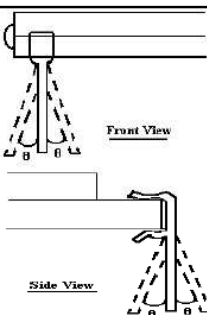
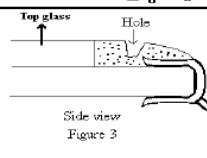
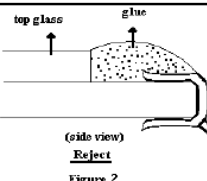
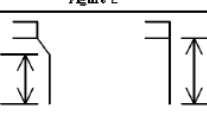
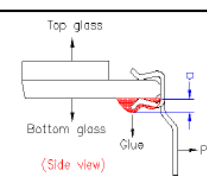
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Defect category	Defect description	Scope	Inspection criterion	Drawing Specification
Polarizer defect	Polarizer shift or protrude from the edge of glass;	N/A	Reject if polarizer protruding and out of glass; For polarizer shift, It is not accepted if the inner edge of perimeter seal cannot be covered completely by the polarizer.	
	Polarizer lamination	N/A	Can't accept	
	Wrong type applied	N/A	Can't accept	
	Missing protective film	N/A	Reject if missing protective film after polarizer applied (except specified requirement from customer)	
Pin attachment defect	<u>Pin incoming defect:</u> Oxidized, damage (including pins plating damaged);	N/A	Can't accept	
	Distorted pins;	N/A	Reject if the bend/ twist angle $\theta > 5^\circ$	
	Pin epoxy cracked;	N/A	Can't accept if hole as illustration	
	Pin epoxy be over the to polarizer surface;	N/A	Can't accept	
	Pin epoxy that flows onto pins;	N/A	Reject if epoxy extend onto the area pointed by arrows as in illustration;	
	Epoxy on polarizer	N/A	Can't accept	
	Excess epoxy on bottom glass	N/A	Reject if the thickness of bottom epoxy more than 1.0mm. If D>1.0mm, it should be reject.	

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Defect category	Defect description	Scope	Inspection criterion	Drawing Specification
Pin attachment defect	Insufficient top epoxy	N/A	Epoxy must fully flow onto lead in the vertical direction of glass; Showing as in right illustration, reject top 2 and accept bottom 3;	Top glass glue (side view) Reject Figure 2a Top glass glue (Side view) Reject Figure 2b Top glass Glue Bottom glass (Side View) Accept Figure 1 Top glass (Side view) Accept Figure 1a (Side view) Accept Figure 1b
	Pins overhang; Pin located out of designed position;	N/A	Lead must be located on ITO lead; Reject if pins overhang is more than 20% of width of ITO contactor;	$\leq 20\%$ Inserted pin ITO lead Top View
	Pin is not well contacted with ITO leads;	N/A	Lead must be fully inserted and fix LCD tightly	pin Glass Side View pin is fully inserted
	Pin displaced	N/A	Rejected if any pin displacement as illustration;	Correct Pin Displaced Pin Top View
	Incorrect pin length;	N/A	Reject if pin length can't match to spec in drawing	

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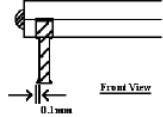
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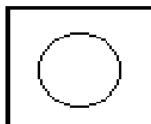
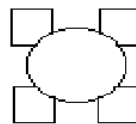
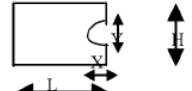
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Defect category	Defect description	Scope	Inspection criterion	Drawing Specification
Pin attachment defect	Burr	N/A	Reject if the length of protrusion is more than 0.1mm;	
	Incorrect pins quantity	N/A	Reject any more or less than requirement in drawing	
	Bent angle and outline can't meet specification	N/A	Reject any no bent or bent lead can't meet specification (available to where pin bending is required);	
	Incorrect pin type;	N/A	Can't accept	

7.3.4 Criteria for functional test after LC filling:

Defect category	Defect description	Scope	Inspection criterion	Drawing Specification
Fake zero	Black dot/ spot disappear at activated state;		Refer to cosmetics criteria of black spot/ foreign material hereinabove;	
Black spot/ pinhole at activated state	White spot at activated state. (for negative mode)	A	<u>Large size LCD:</u> <u>diameter (mm)</u> <u>accepted QTY</u> $D \leq 0.2$ Any $0.2 < D \leq 0.25$ 3 $0.25 < D \leq 0.3$ 2 $0.3 < D$ 0	 white spot  black (dark) spot  
			<u>Middle size LCD:</u> <u>diameter (mm)</u> <u>accepted QTY</u> $D \leq 0.15$ Any $0.15 < D \leq 0.2$ 3 $0.2 < D \leq 0.25$ 2 $0.25 < D$ 0	
			<u>Small size LCD:</u> <u>diameter (mm)</u> <u>accepted QTY</u> $D \leq 0.1$ Any $0.1 < D \leq 0.15$ 3 $0.15 < D \leq 0.2$ 2 $0.2 < D$ 0	
		B	1.5 times of diameter requirement of A area	
		C	Accept any quantity and size appearance defect	
	Black spot/pin hole at activated state. (for positive mode)	A	<u>Large size LCD:</u> <u>diameter (mm)</u> <u>accepted QTY</u> $D \leq 0.15$ any $0.15 < D \leq 0.3$ 5 $0.3 < D \leq 0.4$ 2 $0.4 < D$ 0	
			<u>Middle size LCD:</u> <u>diameter (mm)</u> <u>accepted QTY</u> $D \leq 0.15$ any $0.15 < D \leq 0.25$ 2 $0.25 < D \leq 0.35$ 1 $0.35 < D$ 0	
			<u>Small size LCD:</u> <u>diameter (mm)</u> <u>accepted QTY</u> $D \leq 0.15$ any $0.15 < D \leq 0.3$ 1 $0.3 < D$ 0	
		B	1.5 times of diameter requirement of A area	
		C	Accept any quantity and size appearance defect	
	Dot matrix	A	Accept if $X/Y \leq 2/3L/H$ or $\leq 0.2\text{mm}$ (judge as max. 1 of X/Y); X/Y: length/ height of pinhole; L/H: length/ height of matrix dot;	

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Defect category	Defect description	Affect area	Inspection criteria	illustration
COMMON open	Part or all pattern do not light up;	N/A	Can't accept	
SEGMENT open	1 or few pattern segment do not light up;	N/A	Can't accept	
Pattern deformation	Segment fatter or smaller;	N/A	Reject if $ (a-b) / b > 20\%$	
	Pattern deformation	N/A	Reject if A or B > 0.1mm, or; Reject if A or B > 20%W; A/B: width of missing or excess pattern; W: width of designed pattern; Reject if C > 0.2mm, or; Reject if C > 1/8H; C: height of missing or excess pattern; H: height of designed pattern;	
	The gap width between patterns out of limit;	N/A	Reject if a < 0.1mm; Reject if a > 0.3mm; a: gap between pattern;	
	Black line between segments	N/A	Reject if black line is found at distance of 30cm; For game application, accept if it does not affect the visibility;	
COM-COM short	COM-COM electrode connected	N/A	Can't accept	
SEG-SEG short	SEG-SEG electrode connected	N/A	Can't accept	
COM-SEG short	COM-SEG electrode connected	N/A	Can't accept	
Darker/ lighter	Pattern darker or lighter than standard sample at activated state;	N/A	Ref.to standard or limit sample	
High current	Current exceed designed value;	N/A	When power on, the pointer of short-circuit tester swing to max and then back, while the indicator lights up then goes out;	
Black & white mark	Black & white mark etc. at activated state	N/A	Refer to standard or limit sample	
Black & white Line	Black & white line at activated state	N/A	Refer to above related black&/white line criteria on cosmetic defect	
bevel wave	spraying/bevel wave etc. at activated state	N/A	Refer to standard or limit sample	

Remark: for dot defect, D is defect size ,d is the distance

1. $D > 0.1\text{mm}$, $d \geq 20\text{mm}$;
2. $0.05\text{mm} < D < 0.1\text{mm}$, reject if defect quantity exceed $2/ \text{cm}^2$
3. $D \leq 0.05\text{mm}$
 - a. $d > 0.1\text{mm}$, dot accept any
 - b. $d \leq 0.1\text{mm}$, the cluster dot should be treated as ONE dot

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8. Packing Removal and Handling Requirement

Requirement	Wrong	Correct
Get one package each times & hold the package by both hands with proper ESD shielding	 Without ESD gloves and ESD belt Hold the modules by one hand and without proper ESD shielding (Fail)	 Anti ESD gloves Anti ESD belt Hold the modules by both hands (Pass)
Prohibit to stack inner package over 3 layers	 Over 3 layers (Fail)	 Not exceed 3 layers (Pass)
Total packing tray height must within 40 cm	 packing tray over 40 cm Over 40 cm (Fail)	 40 CM Lower than 40 cm (Pass)

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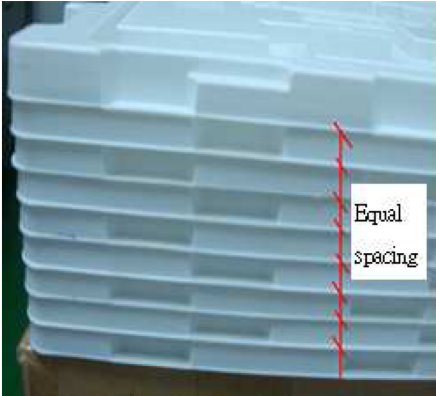
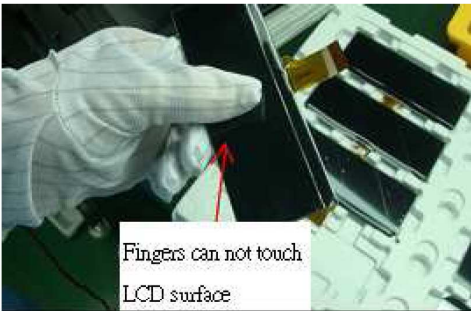
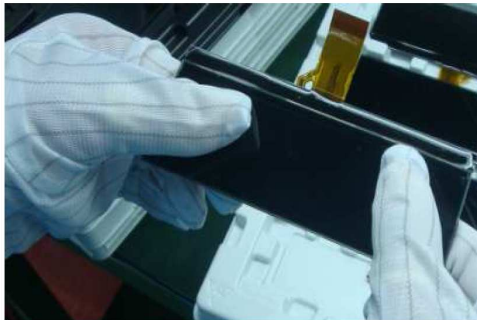
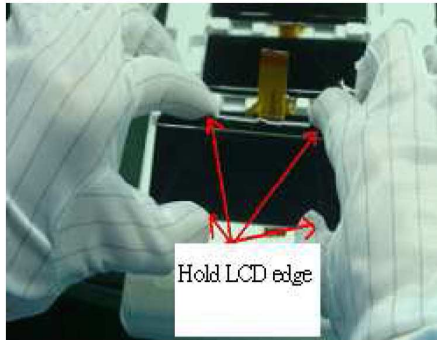
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Requirement	Wrong	Correct
Packing tray must rotate 180° in each layer when stack together	 Tray without 180° rotation between each layer Tray without 180° rotation, It will have pressure on the module (Fail)	 Equal spacing Tray with 180° rotation (Pass)
Prohibit to touch LCD surface by fingers	 Fingers can not touch LCD surface Hold LCD and touch its surface (Fail)	 Hold LCD edge by hand (Pass)
During assembly, prohibit to press on LCD surface by fingers, Must hold the LCD edges by both hands	 During assembly, press on LCD surface (Fail)	 Hold LCD edge During assembly, use both hands to hold LCD edge only (Pass)

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