

PRODUCT : **TFT TOUCH MODULE**

MODULE NO. : **WKS70133**

SUPPLIER: **WKS Technology Co., LTD**

DATE: **Oct 11, 2018**

SPECIFICATION

Revision: 0.2

WKS70133

This module uses ROHS material

This specification may change without prior notice in order to improve performance or quality. Please contact WKS R&D department for updated specification and product status before design for this product or release of this order.

<i>WRITTEN BY</i>	<i>CHECKED BY</i>	<i>APPROVED BY</i>
<i>Jason</i>	<i>Eric</i>	<i>Henry</i>

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
0.0	2016-09-11	First release	Preliminary
0.1	2017-04-11	Add the definition of AVDD, VGH, VGL, VCOM	Page 6
0.2	2018-10-11	Change the Backlight circuit	Page 7

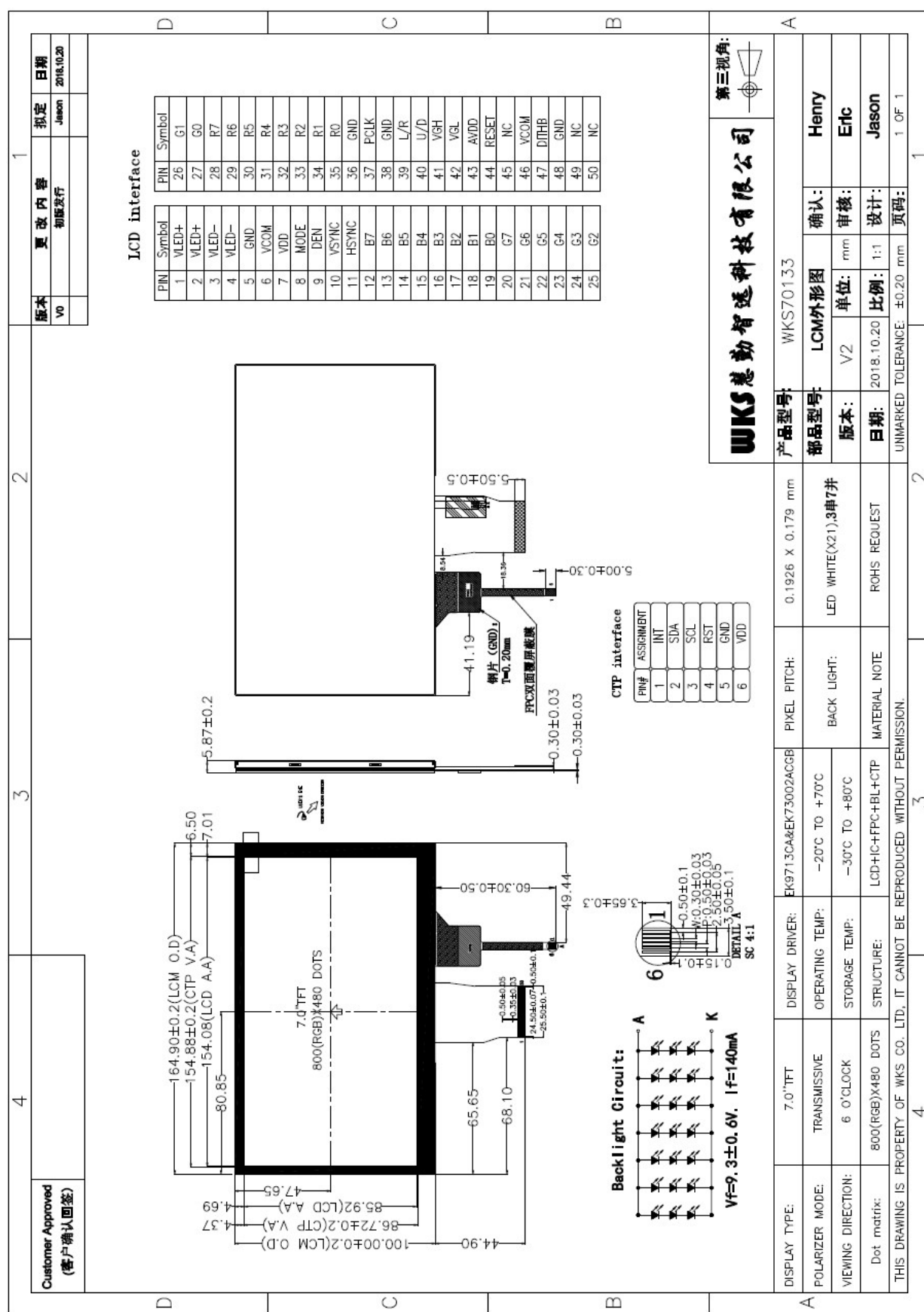
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1、GENERAL INFORMATION

<i>Item of general information</i>	<i>Contents</i>	<i>Unit</i>
<i>LCD Display Size (Diagonal)</i>	<i>7.0</i>	<i>inch</i>
<i>LCD Display Type</i>	<i>TFT/TRANSMISSIVE</i>	<i>-</i>
<i>LCD Display Mode</i>	<i>Normally White</i>	<i>-</i>
<i>Recommended Viewing Direction</i>	<i>12</i>	<i>o'clock</i>
<i>Gray inversion Direction</i>	<i>6</i>	<i>o'clock</i>
<i>Module size (W×H×T)</i>	<i>164.90×100.00×5.87</i>	<i>mm</i>
<i>Active area (W×H)</i>	<i>154.08×85.92</i>	<i>mm</i>
<i>Number of pixels (Resolution)</i>	<i>800RGB×480</i>	<i>pixel</i>
<i>Pixel pitch (W×H)</i>	<i>0.1926×0.179</i>	<i>mm</i>
<i>Color Pixel Arrangement</i>	<i>RGB Stripe</i>	<i>-</i>
<i>LCD Driver IC</i>	<i>-</i>	<i>-</i>
<i>Interface Type</i>	<i>24bit Parallel RGB interface</i>	<i>-</i>
<i>Color Numbers</i>	<i>16.7M</i>	<i>-</i>
<i>Backlight Type</i>	<i>White LED</i>	<i>-</i>

2. EXTERNAL DIMENSIONS



3、ABSOLUTE MAXIMUM RATINGS

<i>Parameter of absolute maximum ratings</i>	<i>Symbol</i>	<i>Min</i>	<i>Max</i>	<i>Unit</i>
LCD supply voltage		-0.5	5.0	V
Operating temperature	<i>Top</i>	-20	70	°C
Storage temperature	<i>Tst</i>	-30	80	°C
Humidity	<i>RH</i>	-	90%(Max 60°C)	RH

Note: Absolute maximum ratings mean the product can withstand short-term, not more than 120 hours. If it is a long time to withstand these conditions, the life time would be shorter.

4、ELECTRICAL CHARACTERISTICS(DC CHARACTERISTICS)

<i>Parameter of DC characteristics</i>	<i>Symbol</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Unit</i>	<i>Note</i>
LCD Digital operating voltage	<i>VDD</i>	3.0	3.3	3.6	V	
Analog Supply Voltage	<i>AVDD</i>	9.4	9.6	9.8	V	
Gate On Voltage	<i>VGH</i>	17	18	19	V	
Gate Off Voltage	<i>VGL</i>	-5	-6	-7	V	
Common Voltage	<i>VCOM</i>	---	4.1	---	V	Note1
Input voltage 'H' level	<i>VIH</i>	0.7*VDD	-	VDD	V	
Input voltage 'L' level	<i>VIL</i>	VSS	-	0.3*VDD	V	
Output voltage 'H' level	<i>VOH</i>	VDD-0.4	-	VDD	V	
Output voltage 'L' level	<i>VOL</i>	VSS	-	VSS+0.4	V	
Digital current	<i>I_{VDD}</i>	---	10	---	mA	
Analog current	<i>I_{AVDD}</i>	---	30	---	mA	
Gate On current	<i>I_{VGH}</i>	---	0.5	---	mA	
Gate Off current	<i>I_{VGL}</i>	---	0.5	---	mA	

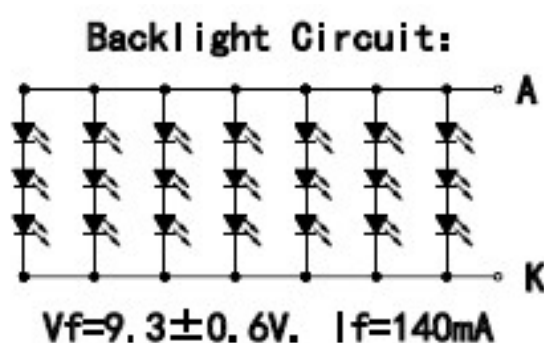
Note 1: Please adjust VCOM voltage to make the flicker level be minimum.

5、BACKLIGHT CHARACTERISTICS

<i>Item of backlight characteristics</i>	<i>Symbol</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Unit</i>	<i>Condition</i>
<i>Forward Voltage</i>	<i>V_f</i>	8.7	9.3	9.9	<i>V</i>	<i>Note1</i>
<i>Forward Current</i>	<i>I_f</i>	-	140	-	<i>mA</i>	-
<i>Number of LED</i>	-	-	3*7	-	<i>Piece</i>	-
<i>LED Connection mode</i>	<i>P/S</i>	-	<i>Serial/Parallel</i>	-	-	-
<i>Lifetime of LED</i>	-	-	15000	-	<i>hour</i>	<i>Note2</i>

Note:

- Note1: The LED Supply Voltage is defined by the number of LED at $T_a=25^{\circ}\text{C}$ and $I_f=140\text{mA}$.
- Note2: The LED lifetime define as the estimated time to 50% degradation of initial luminous. The LED lifetime could be decreased if operating I_f is larger than 140mA.
- Backlight circuit:



6、CTP CHARACTERISTICS

<i>Item of CTP characteristics</i>	<i>Specification</i>	<i>Unit</i>	<i>Remark</i>
<i>Panel Type</i>	<i>Glass Cover + Glass Sensor</i>	-	-
<i>Resolution</i>	<i>800 × 480</i>	<i>pixel</i>	-
<i>Surface Hardness</i>	<i>≥6H</i>	-	-
<i>Transparency</i>	<i>>82%</i>	-	-
<i>Driver IC</i>	-	-	-
<i>Interface Type</i>	<i>I2C</i>	-	-
<i>Support Points</i>	<i>5(Max)</i>	-	-
<i>Sampling Rate</i>	<i>20~100</i>	<i>Hz</i>	-
<i>Supply voltage</i>	<i>3.3</i>	<i>V</i>	-

7、ELECTRO-OPTICAL CHARACTERISTICS

Item of electro-optical characteristics		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	Note
Response time		Tr+Tf	$\theta=0$ $\phi=0$ Ta=25°C	-	25	40	ms	FIG 1.	4
Contrast Ratio		CR		-	320	-	-	FIG 2.	1
Luminance uniformity		$\delta WHITE$		-	80	-	%	FIG 2.	3
Surface Luminance		Lv		-	250	-	cd/m2	FIG 2.	2
CIE (x, y) chromaticity	White	White x	$\theta=0$ $\phi=0$ Ta=25°C	-	0.302	-	-	FIG 2.	5
		White y		-	0.338	-			
	Red	Red x		-	0.606	-			
		Red y		-	0.325	-			
	Green	Green x		-	0.303	-			
		Green y		-	0.567	-			
	Blue	Blue x		-	0.147	-			
		Blue y		-	0.161	-			
Viewing angle range	$\phi=90(12\text{ o'clock})$		CR ≥ 10	-	60	-	deg	FIG 3.	6
	$\phi=270(6\text{ o'clock})$			-	70	-	deg		
	$\phi=0(3\text{ o'clock})$			-	60	-	deg		
	$\phi=180(9\text{ o'clock})$			-	60	-	deg		
NTSC ratio		-	-	-	50	-	%	-	-

Note 1. Contrast Ratio(CR) is defined mathematically by the following formula. For more information see FIG 2.:

$$\text{Contrast Ratio(CR)} = \frac{\text{Average Surface Luminance with all white pixels(P1,P2,P3,P4,P5,P6,P7,P8,P9)}}{\text{Average Surface Luminance with all black pixels(P1,P2,P3,P4,P5,P6,P7,P8,P9)}}$$

Note 2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see FIG 2.

L_v =Average Surface Luminance with all white pixels (P1,P2,P3,P4,P5,P6,P7,P8,P9)

Note 3. The uniformity in surface luminance ($\delta WHITE$) is determined by measuring

luminance at each test position 1 through 9, and then dividing the maximum luminance of 9 points luminance by minimum luminance of 9 points luminance. For more information see FIG 2.

$$\delta_{\text{WHITE}} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5, P6, P7, P8, P9)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5, P6, P7, P8, P9)}}$$

Note 4. Response time is the time required for the display to transition from White to black(Rise Time, Tr) and from black to white(Decay Time, Tf). For additional information see FIG 1.

Note 5. CIE (x, y) chromaticity ,The x,y value is determined by screen active area position 5. For more information see FIG 2.

Note 6. Viewing angle is the angle at which the contrast ratio is greater than a specific value. For TFT module, the specific value of contrast ratio is 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

Note 7. For Viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope. Series Instruments. For contrast ratio, Surface Luminance, Luminance uniformity and CIE, the testing data is base on BM-7 photo detector.

Note 8. For TN type TFT transmissive module, Gray scale reverse occurs in the direction of panel viewing angle.

FIG.1. The definition of Response Time

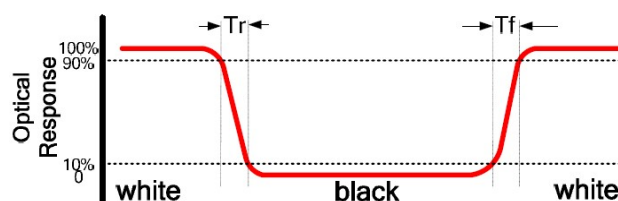


FIG.2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity,

CIE (x , y) chromaticity

$A : H/6 ;$

$B : V/6 ;$

$H, V : \text{Active Area(AA) size}$

Measurement instrument: BM-7; Light spot size=5mm, 350mm distance from the LCD surface to detector lens.

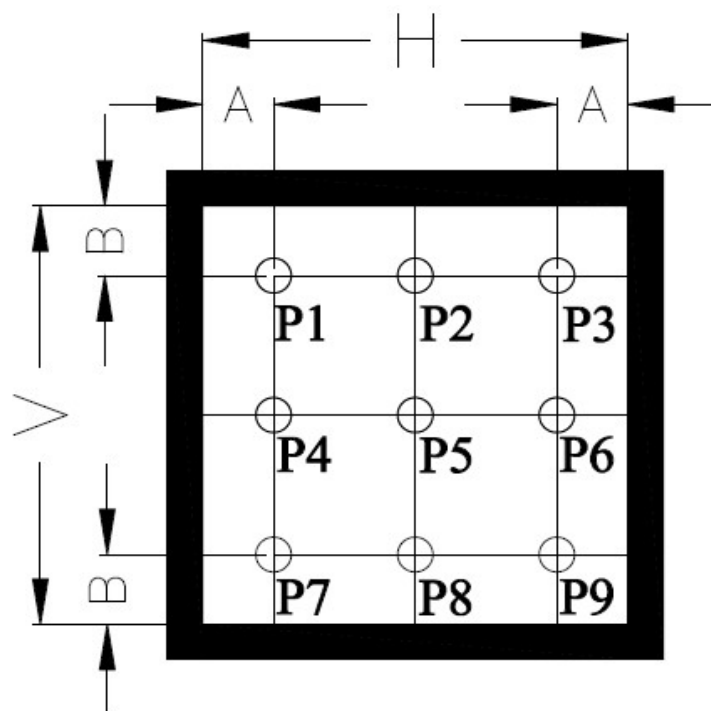
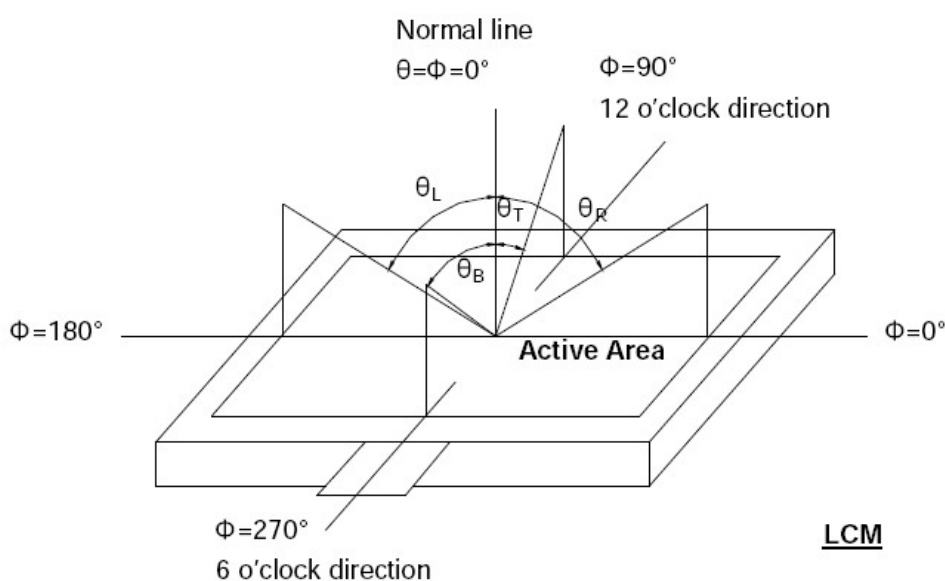


FIG.3. The definition of viewing angle



8、INTERFACE DESCRIPTION

A、LCD Interface Description

NO.	Symbol	I/O	DESCRIPTION
1~2	LED-A	Power supply	Backlight Anode
3~4	LED-K	Power supply	Backlight Cathode
5	GND	Power supply	Power ground
6	VCOM	I	For external VCOM DC input
7	VDD	Power supply	Digital Power supply
8	MODE	I	DE/SYNC mode select. H:DE mode; L:HSD/VSD mode.
9	DEN	I	Data input Enable. Active high to enable the data input Bus.
10	VSYN	I	Vertical Sync input. Negative polarity.
11	HSYN	I	Horizontal Sync input. Negative polarity.
12~19	B7~B0	I	8bit digital Blue data input(B7:MSB; B0:LSB)
20~27	G7~G0	I	8bit digital Green data input(G7:MSB; G0:LSB)
28~35	R7~R0	I	8bit digital Red data input(R7:MSB; R0:LSB)
36	GND	Power supply	Power ground
37	PCLK	I	Clock signal. Data latched at rising/falling edge of this signal.
38	GND	Power supply	Power ground
39	SHLR	I	Source Right or Left sequence control.
40	UPDN	I	Gate Up or Down scan control.
41	VGH	Power supply	Positive Power for TFT
42	VGL	Power supply	Negative Power for TFT
43	AVDD	Power supply	Power supply for analog circuits
44	RESET	I	LCD reset signal, Low is active
45	NC	-	No Connection
46	VCOM		For external VCOM DC input
47	DITHB	I	Dithering function enable control
48	GND	Power supply	Power ground
49~50	NC	-	No Connection

B、CTP Interface Description

NO.	Symbol	I/O	DESCRIPTION
1	INT	O	CTP External interrupt to the host
2	SDA	I/O	CTP I2C data input and output
3	SCL	I	CTP I2C clock input
4	RESET	I	CTP external reset signal, Low is active
5	GND	Power supply	Power ground
6	VDD	Power supply	CTP Power input

9、INPUT TIMING

Horizontal input Timing table

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency	DCLK	-	33.3	50	MHz
Horizontal display area	thd	800			DCLK
1 Horizontal Line	th	862	1056	1200	DCLK
HSD pulse width	thpw	1	-	40	DCLK
HSD Blanking	thb	46	46	46	DCLK
HSD Front Porch	thfp	16	210	354	DCLK

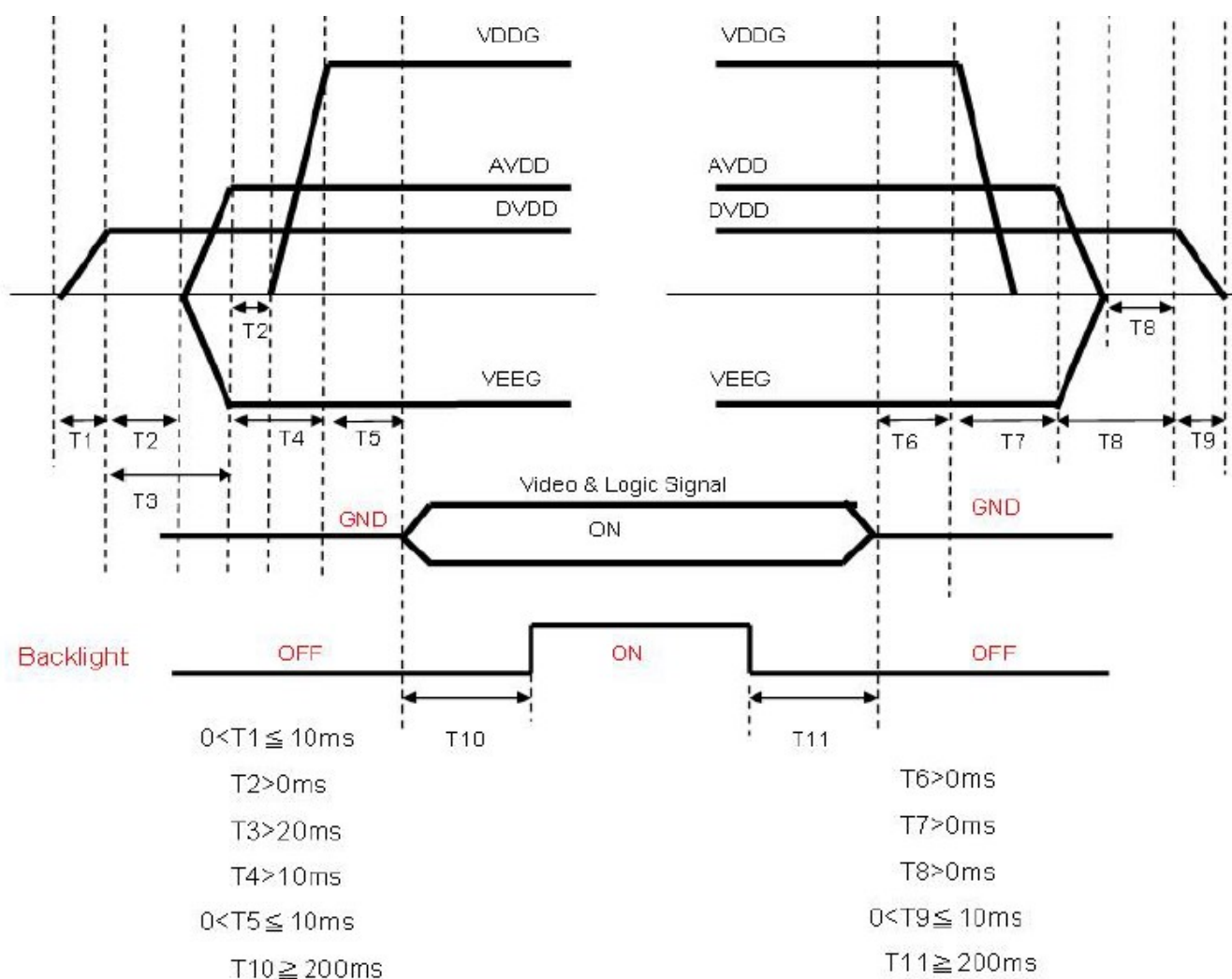
Vertical input Timing table

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	480			H
VSD period time	tv	510	525	650	H
VSD pulse width	typw	1	-	20	H
VSD Blanking	tvb	23	23	23	H
VSD Front Porch	tvfp	7	22	147	H

10、POWER ON/OFF SEQUENCE

Power On: $VDD \rightarrow AVDD/VGL \rightarrow VGH \rightarrow \text{Video \& Logic Signal}$

Power Off: $\text{Video \& Logic Signal} \rightarrow VGH \rightarrow AVDD/VGL \rightarrow VDD$



11、RELIABILITY TEST CONDITIONS

No.	Test Item	Test Condition
1	High Temperature Storage	80°C/120 hours
2	Low Temperature Storage	-30°C/120 hours
3	High Temperature Operating	70°C/120 hours
4	Low Temperature Operating	-20°C/120 hours
5	Temperature Cycle Storage	-20°C(30min.)~25(5min.)~70°C(30min.)×10cycles

A、Inspection after test:

Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects:

- Air bubble in the LCD;
- Sealleak;
- Non-display;
- Missing segments;
- Glass crack;
- Current is twice higher than initial value.

B、Remark:

- The test samples should be applied to only one test item.
- Sample size for each test item is 5~10pcs.
- Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

12、INSPECTION CRITERION

This specification is made to be used as the standard of acceptance/rejection criteria for TFT-LCD/IPS TFT-LCD module product, and this specification is applicable only in the case that the size of module equal to or exceed than 3.5 inch.

12.1 Sample plan

Sampling plan according to GB/T2828.1-2003/ISO 2859-1: 1999 and ANSI/ASQC

Z1.4-1993,normal level 2 and based on:

Major defect: AQL 0.65

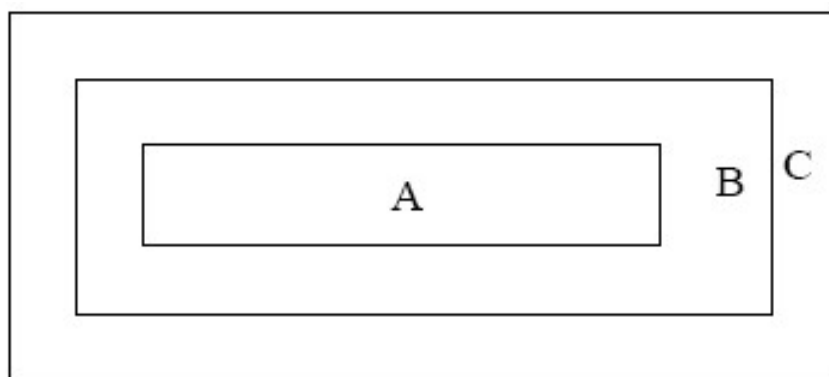
Minor defect: AQL 1.5

12.2 Inspection condition

Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45° against perpendicular line. (Normal temperature 20~25 °C and normal humidity 60 ±15%RH)

12.3 Definition of Inspection Item.

A、Definition of inspection zone in LCD.



Zone A: character/Digit area

Zone B: viewing area except Zone A (Zone A + Zone B=minimum Viewing area)

Zone C: Outside viewing area (invisible area after assembly in customer's product)

Fig.1 Inspection zones in an LCD

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.

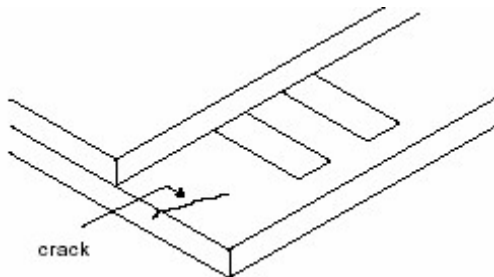
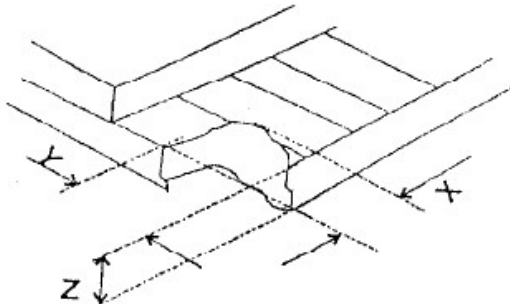
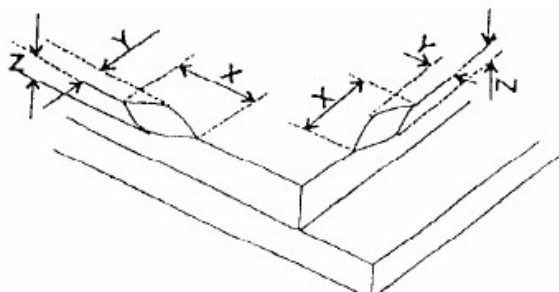
B、 Definition of some visual defect

<i>Bright dot</i>	<i>Because of losing all or part function, bad pixel dots appear bright and the size is more than 50% of one dot in which LCD panel is displaying under black pattern.</i>
<i>Dark dot</i>	<i>Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture, or pure whiter picture.</i>


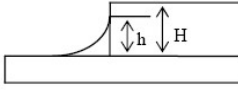
12.4 Major Defect

Item No.	Items to be inspected	Inspection standard	Classification of defects
1	Functional defects	1) No display 2) Display abnormally 3) Missing vertical, horizontal segment 4) Short circuit 5) Excess power consumption 6) Backlight no lighting, flickering and abnormal lighting	major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	

4	Polarizer defect	5.4.1 Polarizer Position (i) Shifting in position should not exceed the glass outline dimension. (ii) Incomplete covering of the viewing area due to shifting is not allowed.	Minor																															
		5.4.2 Dirt on polarizer Dirt which can be wiped easily should be acceptable.																																
		5.4.3 Polarizer Dent & Air bubble																																
		<table><tr><th colspan="2" rowspan="2">Zone Size(mm)</th><th colspan="3">Acceptable Qty</th><th rowspan="2">C</th></tr><tr><th colspan="3">A+B</th></tr><tr><th colspan="2"></th><th>3.5"~7"</th><th>7~10.1"</th><th>>10.1"</th><th rowspan="3">Acceptable</th></tr><tr><td colspan="2">$\Phi \leq 0.2$</td><td>Acceptable</td><td>Acceptable</td><td>Acceptable</td></tr><tr><td colspan="2">$0.2 < \Phi \leq 0.5$</td><td>4</td><td>5</td><td>6</td></tr><tr><td colspan="2">$\Phi > 0.5$</td><td>0</td><td>0</td><td>0</td><td></td></tr></table>		Zone Size(mm)		Acceptable Qty			C	A+B					3.5"~7"	7~10.1"	>10.1"	Acceptable	$\Phi \leq 0.2$		Acceptable	Acceptable	Acceptable	$0.2 < \Phi \leq 0.5$		4	5	6	$\Phi > 0.5$		0	0	0	
		Zone Size(mm)				Acceptable Qty				C																								
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		$\Phi \leq 0.2$		Acceptable	Acceptable	Acceptable																												
		$0.2 < \Phi \leq 0.5$		4	5	6																												
		$\Phi > 0.5$		0	0	0																												
5.4.4 Polarizer scratch (i) If the polarizer scratch can be seen after cover assembling or in the operating condition, judge by the linear defect of 5.3. (ii) If the polarizer scratch can be seen only in non-operating condition or some special angle, judge by the following:																																		
<table><tr><th colspan="2" rowspan="2">Zone Size (mm)</th><th colspan="3">Acceptable Qty</th><th rowspan="2">C</th></tr><tr><th colspan="3">A+B</th></tr><tr><th>Length</th><th>Width</th><th>3.5"~7"</th><th>7~10.1"</th><th>>10.1"</th><th rowspan="3">Acceptable</th></tr><tr><td>Ignore</td><td>$W \leq 0.05$</td><td>Acceptable</td><td>Acceptable</td><td>Acceptable</td></tr><tr><td>$1.0 < L \leq 5.0$</td><td>$0.05 < W \leq 0.20$</td><td>4</td><td>5</td><td>6</td></tr><tr><td>$L > 5.0$</td><td>$W > 0.2$</td><td>0</td><td>0</td><td>0</td><td></td></tr></table>	Zone Size (mm)		Acceptable Qty			C	A+B			Length	Width	3.5"~7"	7~10.1"	>10.1"	Acceptable	Ignore	$W \leq 0.05$	Acceptable	Acceptable	Acceptable	$1.0 < L \leq 5.0$	$0.05 < W \leq 0.20$	4	5	6	$L > 5.0$	$W > 0.2$	0	0	0				
Zone Size (mm)			Acceptable Qty				C																											
		A+B																																
Length	Width	3.5"~7"	7~10.1"	>10.1"	Acceptable																													
Ignore	$W \leq 0.05$	Acceptable	Acceptable	Acceptable																														
$1.0 < L \leq 5.0$	$0.05 < W \leq 0.20$	4	5	6																														
$L > 5.0$	$W > 0.2$	0	0	0																														
5	MURA	Using 3% ND filter, it's NG if it can be seen in R,G,B picture.	Minor																															
	White/Black dot (MURA)	Visible under: ND3%; $D \leq 0.15\text{mm}$, Acceptable; $0.15\text{mm} < D \leq 0.5\text{mm}$, $N \leq 4$; $D > 0.5\text{mm}$, Not allowable.																																

6	Glass defect	<p>(i) Crack</p> <p>Cracks are not allowed.</p> 	Minor								
		<p>(ii) TFT chips on corner</p>  <table><tr><th>X</th><th>Y</th><th>Z</th><th>Acceptable</th></tr><tr><td>≤ 3.0</td><td>≤ 3.0</td><td>Not more than the thickness of glass</td><td>$N \leq 3$</td></tr></table> <p>Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal.</p>	X	Y	Z	Acceptable	≤ 3.0	≤ 3.0	Not more than the thickness of glass	$N \leq 3$	Minor
		X	Y	Z	Acceptable						
≤ 3.0	≤ 3.0	Not more than the thickness of glass	$N \leq 3$								
<p>(iii) Usual surface crack</p>  <table><tr><th>X</th><th>Y</th><th>Z</th><th>Acceptable</th></tr><tr><td>≤ 1.5</td><td>≤ 1.5</td><td>Not more than the thickness of glass</td><td>$N \leq 4$</td></tr></table> <p>It is only applicable to the upper glass of LCD.</p>	X	Y	Z	Acceptable	≤ 1.5	≤ 1.5	Not more than the thickness of glass	$N \leq 4$	Minor		
X	Y	Z	Acceptable								
≤ 1.5	≤ 1.5	Not more than the thickness of glass	$N \leq 4$								

12.6 Module Cosmetic Criteria

Item No.	Items to be inspected	Inspection Standard	Classification of defects
1	Difference in Spec.	Not allowable	Major
2	Pattern peeling	No substrate pattern peeling and floating	Major
3	Soldering defects	No soldering missing	Major
		No soldering bridge	Major
		No cold soldering	Minor
4	Resist flaw on PCB	Visible copper foil ($\Phi 0.5$ mm or more) on substrate pattern is not allowed	Minor
5	FPC gold finger	No dirt, breaking, oxidation lead to black	Major
6	Backlight plastic frame	No deformation, crack, breaking, backlight positioning column breaking, obvious nick.	Minor
7	Marking printing effect	No dark marking, incomplete, deformation lead to unable to judge	Minor
8	Accretion of metallic Foreign matter	No accretion of metallic foreign matter (Not exceed $\Phi 0.2$ mm)	Minor
9	Stain	No stain to spoil cosmetic badly	Minor
10	Plate discoloring	No plate fading, rusting and discoloring	Minor
11	1. Lead parts	a. Soldering side of PCB Solder to form a 'Filet' all around the lead. Solder should not hide the lead form perfectly.	Minor
		b. Components side(In case of 'Through Hole PCB') Solder to reach the Components side of PCB.	Minor
	2. Flat packages	Either 'Toe'(A) or 'Seal'(B) of the lead to be covered by "Filet". Lead form to be assume over Solder. 	Minor
	3. Chips	$(3/2) H \geq h \geq (1/2) H$ 	Minor
	4. Solder ball/Solder splash	a. The spacing between solder ball and the conductor or solder pad $h \geq 0.13$ mm. The diameter of solder ball $d \leq 0.15$ mm.	Minor
		b. The quantity of solder balls or solder splashes isn't beyond 5 in 600 mm ² .	Minor
		c. Solder balls/Solder splashes do not violate minimum electrical clearance.	Major