

**SPECIFICATION
FOR
LCD Module
KD022C-1 V3**

MODULE:	KD022C-1 V3
CUSTOMER:	

REV	DESCRIPTION	DATE
1.0	FIRST ISSUE	2014.07.09

STARTEK	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		

Contents

General Description	4
1. Block Diagram	5
2. Outline dimension	6
3. Input Terminal Pin Assignment	7
4. LCD Optical Characteristics	9
5. Electrical Characteristics	11
6. AC Characteristic	13
7. LCD Module Out-Going Quality Level	14
8 Reliability Test Result	27
9. Cautions and Handling Precautions	28
10. Packing	29

General Description

* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 2.2" TFT-LCD contains 240x320 pixels, and can display up to 65K colors.

* Features

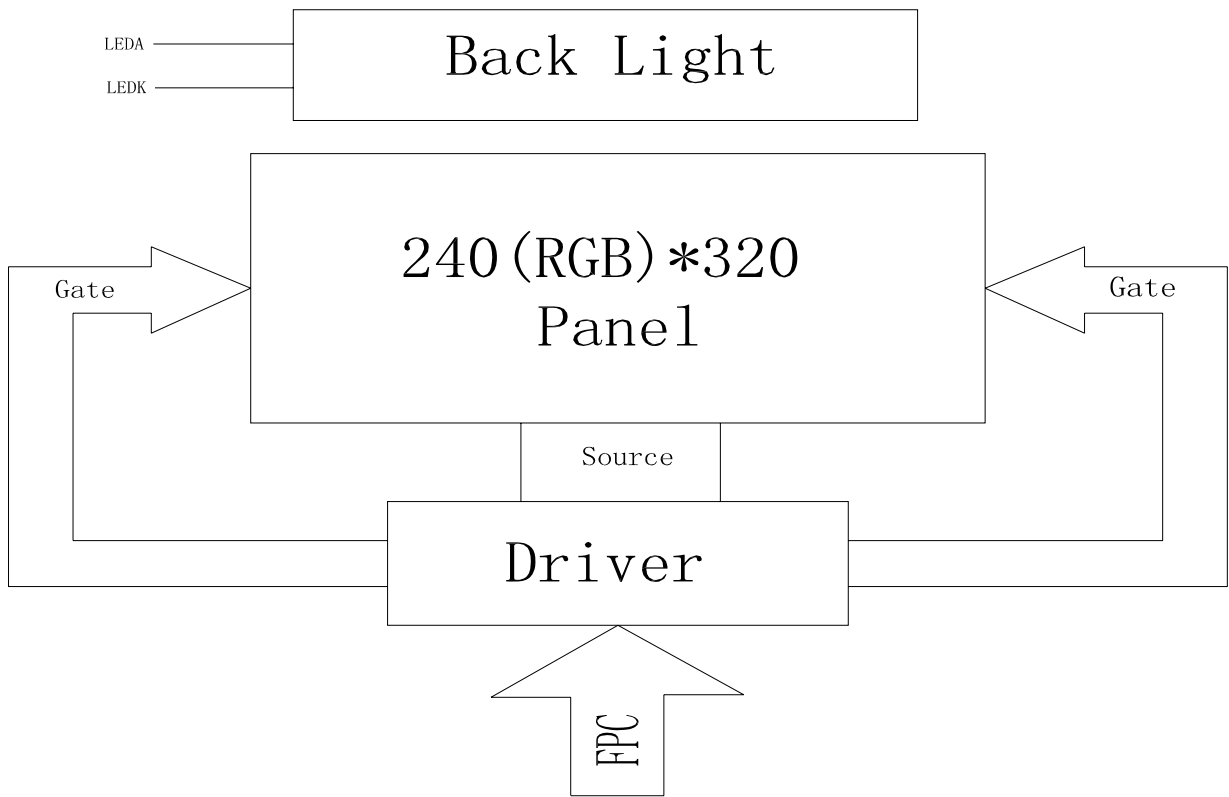
- Input Voltage: 3.3V(TYP)
- Display Colors of TFT LCD: 65Kcolors
- Interface: 8Bit MCU

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	33.48(H)*44.64(V) (2.2inch)	mm	-
Driver element	TFT active matrix	-	-
Display colors	65K	colors	-
Number of pixels	240(RGB)*320	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.1395(H)*0.1395(V)	mm	-
Viewing angle	12:00	o'clock	-
Controller IC	RM68090	-	-
Display mode	Transmissive/ Normally White	-	-
Operating temperature	-20~+70	°C	-
Storage temperature	-30~+80	°C	-

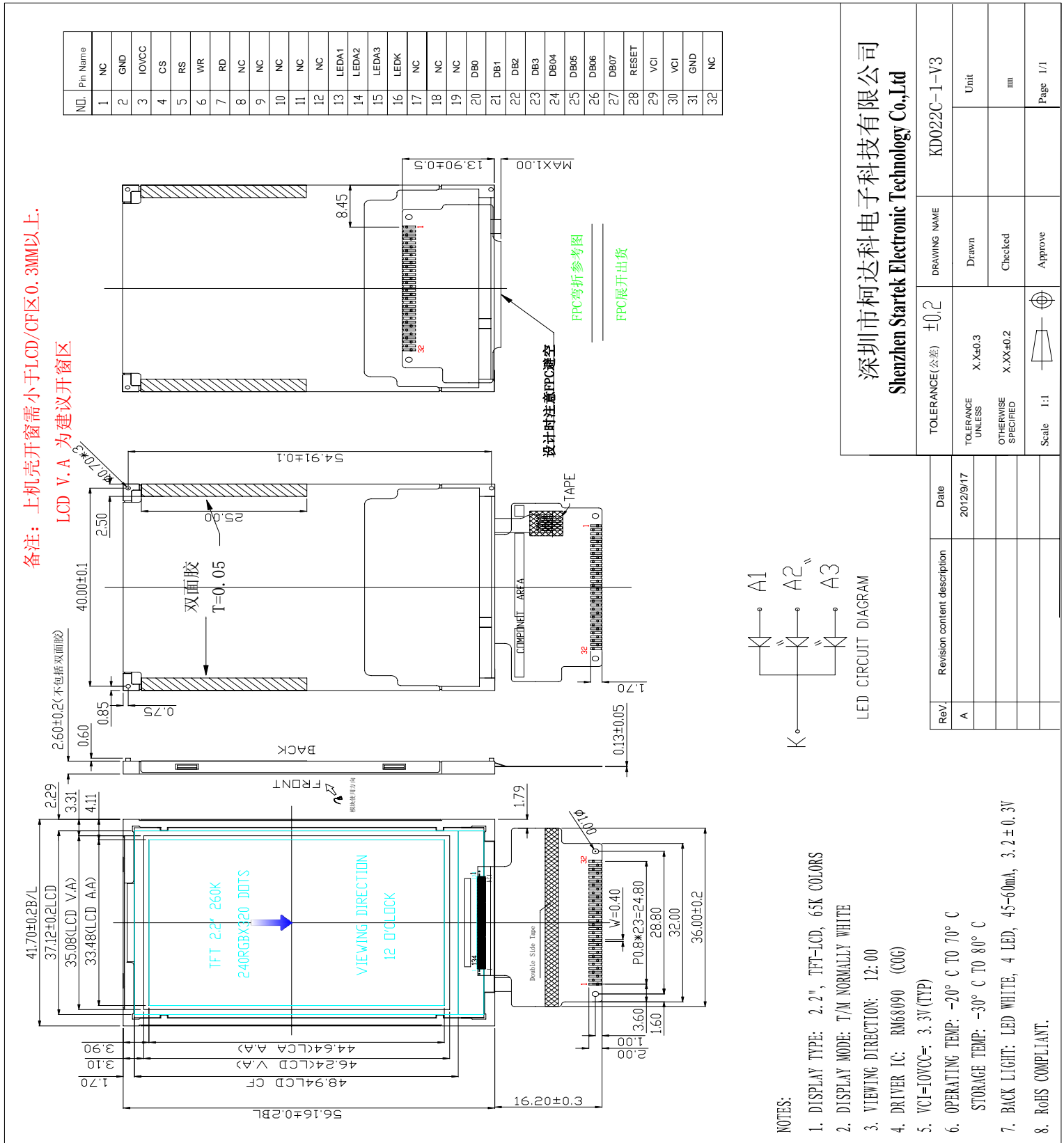
* Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		41.7		mm	-
	Vertical(V)		56.16		mm	-
	Depth(D)		2.60		mm	-
Weight			TBD		g	-

1. Block Diagram



2. Outline dimension



3. Input terminal Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	NC		
2	GND	Ground.	P
3	IOVCC	Supply voltage for I/O(1.8V-3.3V).	P
4	CS	Chip select input pin ("Low" enable).	I
5	RS	This pin is used to select "Data or Command" in the parallel interface. When D/CX = '1', data is selected. When D/CX = '0', command is selected.	I
6	WR	Serves as a write signal and writes data at the rising edge.	I
7	RD	Serves as a read signal and MCU read data at the rising edge.	I
8-12	NC		
13	LEDA1	Anode pin of backlight	P
14	LEDA2	Anode pin of backlight	P
15	LEDA3	Anode pin of backlight	P
16	LEDK	Cathode pin OF backlight	P
17-19	NC		
20-27	DB0-DB7	Data bus.	I/O
28	RESET	This signal will reset the device and must be applied to properly initialize the chip.	I
29	VCI	Supply voltage(3.3V).	P
30	VCI	Supply voltage(3.3V).	P
31	GND	Ground.	P
32	NC		

4. LCD Optical Characteristics

4.1 Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (without Polarizer)	T(%)	—	—	13.5%	—	—	
Contrast Ratio	CR	$\Theta=0$	400	500	—	—	(1)(2)
Response time	Rising	T_R	—	2	4	msec	(1)(3)
	Falling	T_F	—	6	12		
Color gamut	S(%)			60		%	
Color chromaticity (CIE1931)	White	W_x		0.283	0.303	0.323	(1)(4) CF glass
		W_y		0.305	0.325	0.345	
	Red	R_x		0.606	0.626	0.646	
		R_y		0.314	0.334	0.354	
	Green	G_x		0.257	0.277	0.297	
		G_y		0.529	0.549	0.569	
	Blue	B_x		0.122	0.142	0.162	
		B_y		0.102	0.122	0.142	
Viewing angle	Hor.	Θ_L	CR>10	60	70	—	Viewing Angle base on using EWV Polarizer , Reference Only
		Θ_R		60	70	—	
	Ver.	Θ_U		60	70	—	
		Θ_D		45	55	—	
Optima View Direction	12 O'clock						(5)

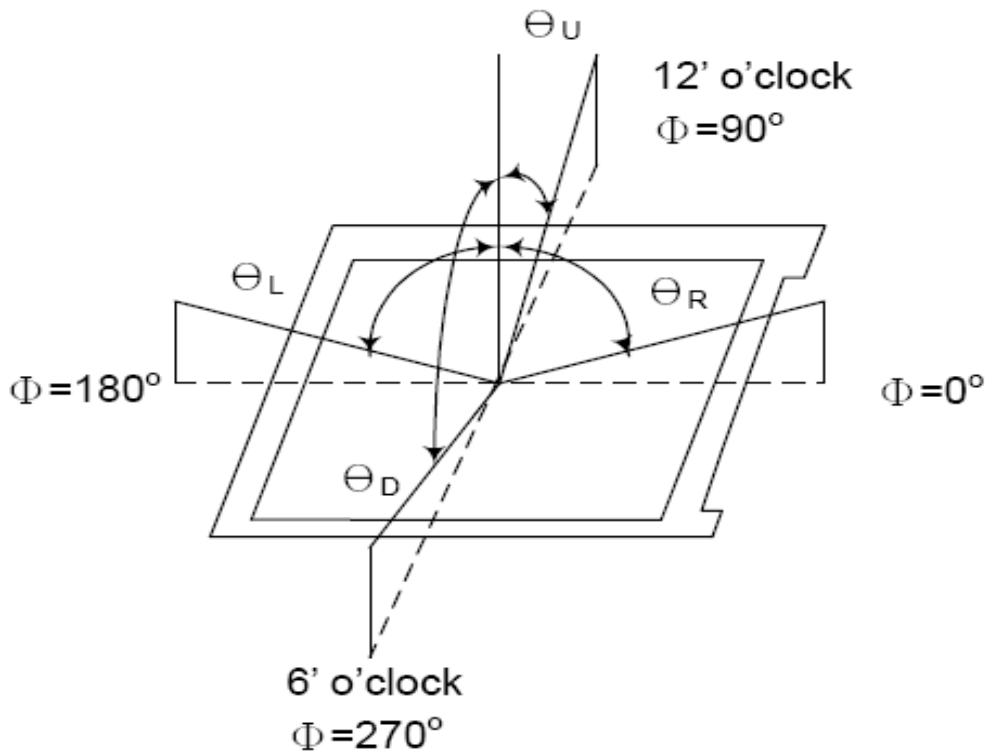
4.2 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : $25 \pm 2^{\circ}\text{C}$
- 15min. warm-up time

4.3 Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

Note (1) Definition of Viewing Angle :



Note (2) Definition of Contrast Ratio(CR) :

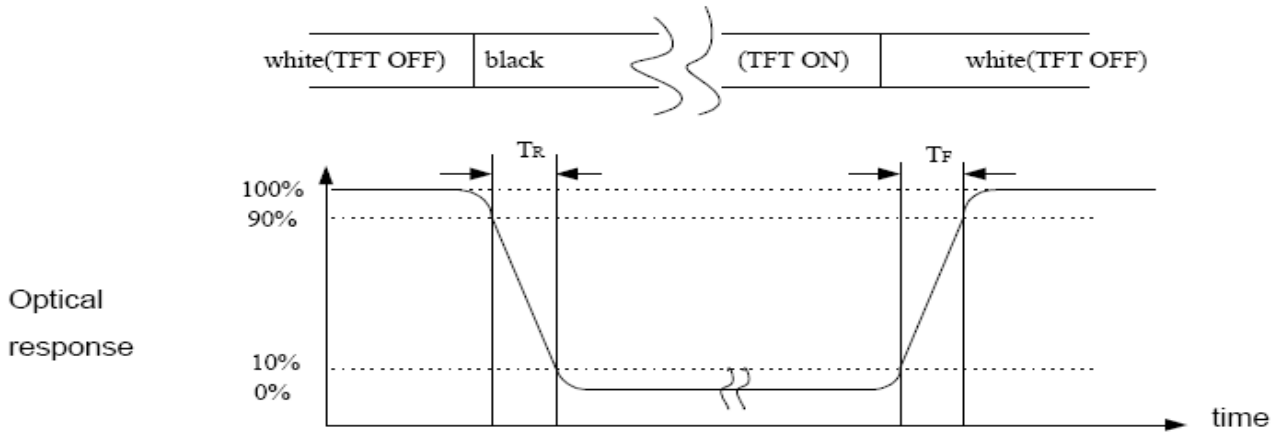
measured at the center point of panel

$$\text{CR} = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

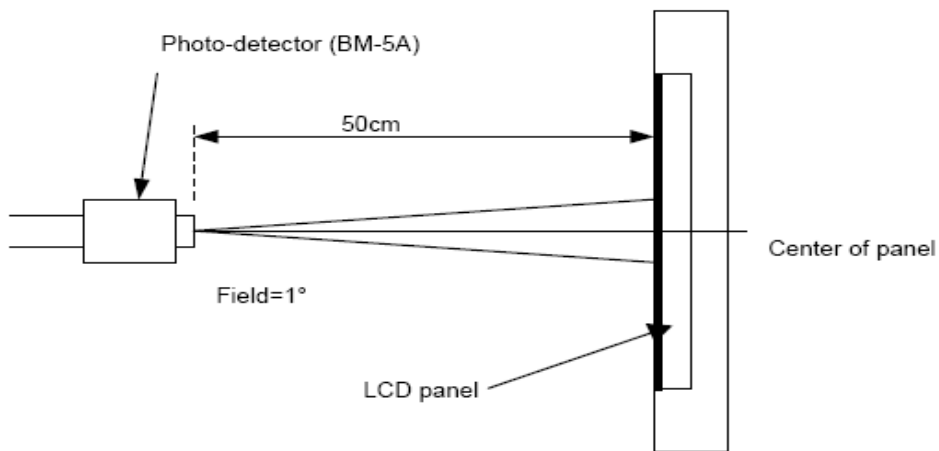
Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



5. Electrical Characteristics

5.1 Absolute Maximum Rating (Ta=25 VSS=0V)

Characteristics	Symbol	Min.	Max.	Unit
Digital Supply Voltage	VDD	-0.3	4.6	V
Digital interface supply Voltage	VDDIO	-0.3	4.6	V
Operating temperature	T _{OP}	-20	+70	°C
Storage temperature	T _{ST}	-30	+80	°C

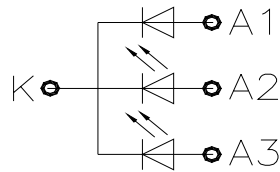
5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VDD	2.6	3.3	4.2	V	
Digital interface supply Voltage	VDDIO	1.65	1.8	4.2	V	
Normal mode Current consumption	IDD	--	8	--	mA	
Level input voltage	V _{IH}	0.7V _{DDIO}		V _{DDIO}	V	
	V _{IL}	GND		0.3V _{DDIO}	V	
Level output voltage	V _{OH}	0.8V _{DDIO}		V _{DDIO}	V	
	V _{OL}	GND		0.2V _{DDIO}	V	

5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 3 chips White LED

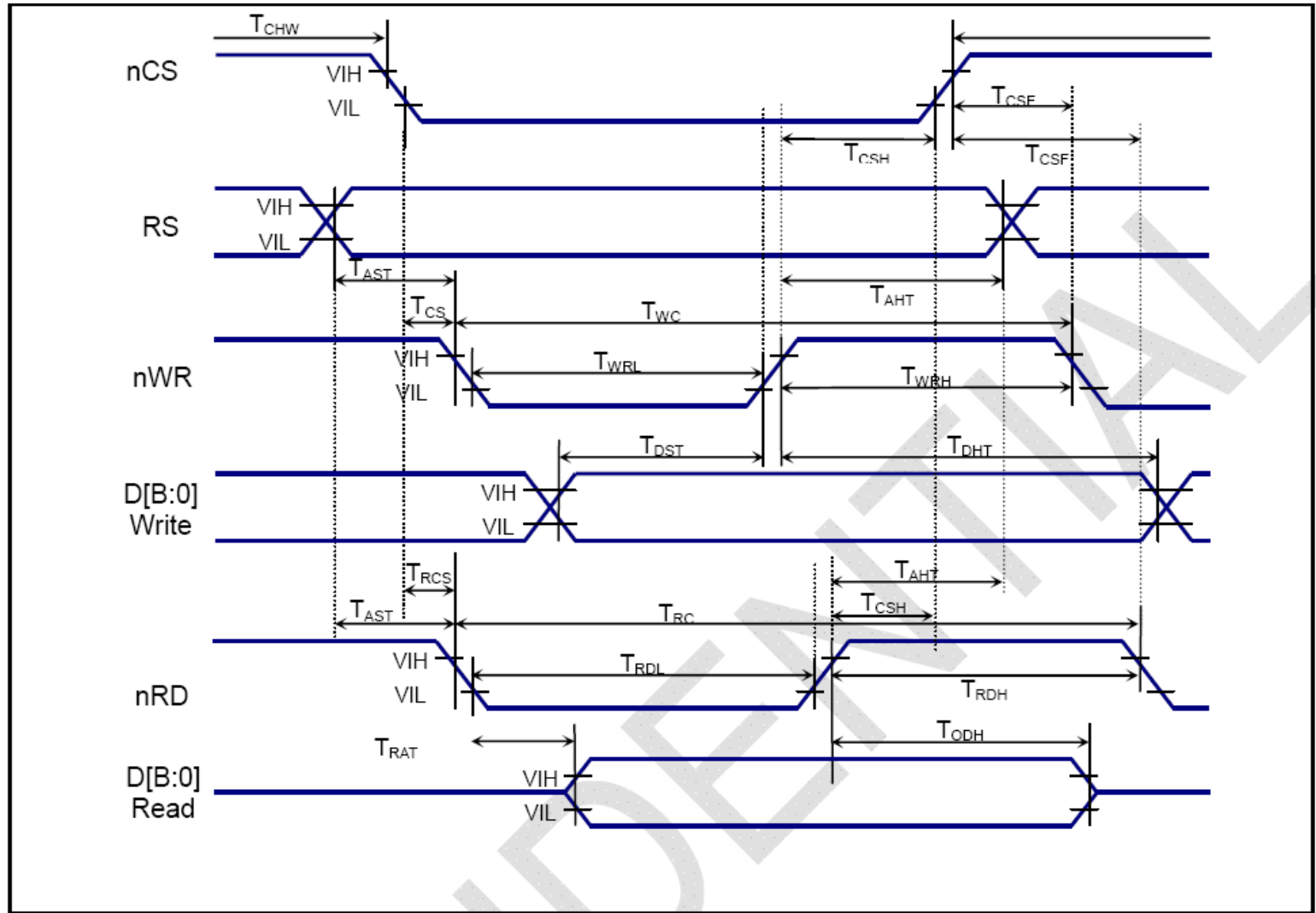
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	45	60	--	mA	
Forward Voltage	V_F	--	3.2	--	V	
LCM Luminance	L_V	200	--	--	cd/m ²	
Uniformity	AVg	80	--	--	%	



BLU CIRCUIT DIAGRAM

6. AC Characteristic

6.1. Display Parallel 18/16/9/8-bit Interface Timing Characteristics (8080- I system)



Signal	Symbol	Parameter	MIN	MAX	Unit	Description
RS	T_{AST}	Address setup time	10		ns	-
	T_{AHT}	Address hold time (Write/Read)	5		ns	-
nCS	T_{CHW}	Chip select "H" pulse width	0		ns	-
	T_{CS}	Chip select setup time (Write)	10		ns	-
	T_{RCS}	Chip select setup time (Read)	10		ns	-
nWR	T_{CSH}	Chip select hold time	10		ns	-
	T_{WC}	Write cycle	75		ns	-
	T_{WRH}	Control pulse "H" duration	30		ns	-
	T_{WRL}	Control pulse "L" duration	40		ns	-
nRD (ID)	T_{CSH}	Chip select hold time	10		ns	-
	T_{RC}	Read cycle	300		ns	-
	T_{RDH}	Control pulse "H" duration	150		ns	-
	T_{RDL}	Control pulse "L" duration	150		ns	-
D[17:0]	T_{DST}	Data setup time	10		ns	-
	T_{DHT}	Data hold time	15		ns	-
	T_{RAT}	Read access time		100	ns	-
	T_{ODH}	Output disable time	5		ns	-

6.2 Reset Timing Characteristics

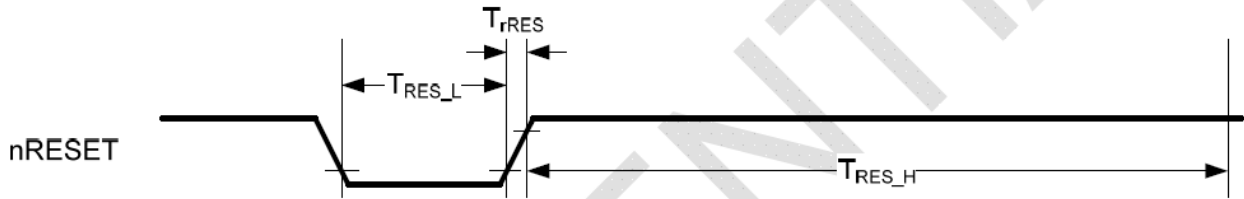


Figure 49 Reset Operation

Reset Timing Characteristics (VCI = 2.5 ~ 3.3 V, VDDI = 1.65 ~ 3.3 V)

Item	Symbol	MIN	MAX	Unit	Description
Reset low-level width	T_{RES_L}	1		ms	-
Reset rise time	T_{RES}		10	us	-
Reset high-level width	T_{RES_H}	50		ms	-

Note: After nRESET releasing, the host processor have to wait 10 milliseconds before sending any command.

7. LCD Module Out-Going Quality Level

7.1 VISUAL & FUNCTION INSPECTION STANDARD

7.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

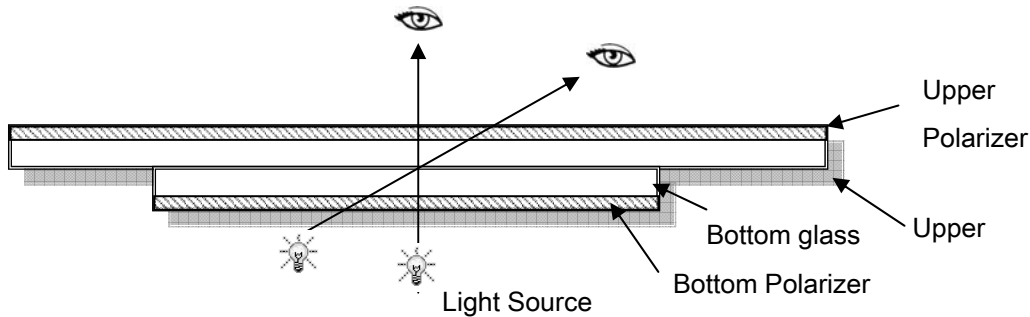
Temperature : $25 \pm 5^\circ\text{C}$

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

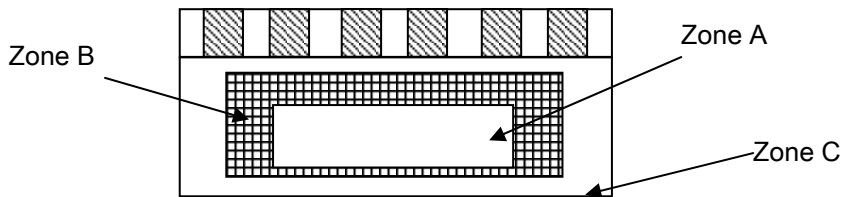
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance: 30–50cm



7.1.2 Definition



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

Zone B : Viewing Area except Zone A

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

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer.

7.1.3 Sampling Plan

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

AQL:

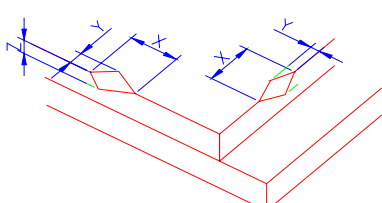
Major defect	Minor defect
0.65	1.5

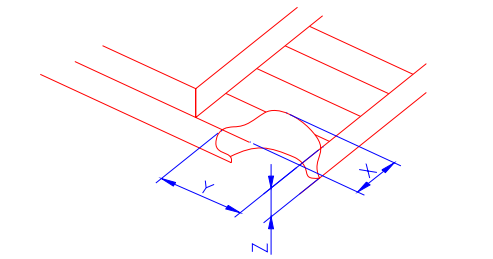
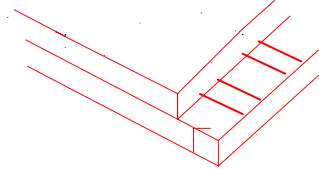
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

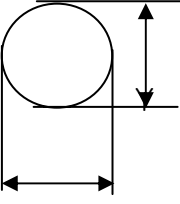
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing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

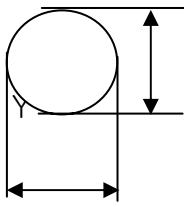
7

7.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken	(1) The edge of LCD broken	 <table border="1" data-bbox="861 1747 1388 1904"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>≤3.0mm</td> <td><Inner border line of the seal</td> <td>≤T</td> </tr> </table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
X	Y	Z						
≤3.0mm	<Inner border line of the seal	≤T						
NOTE: X: Length Y: Width								

<p>Z: Height L: Length of ITO, T: Height of LCD</p>	<p>(2)LCD corner broken</p>	 <table border="1" data-bbox="922 548 1332 649"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>≤3.0mm</td> <td>≤L</td> <td>≤T</td> </tr> </table>	X	Y	Z	≤3.0mm	≤L	≤T
	X	Y	Z					
≤3.0mm	≤L	≤T						
<p>(3) LCD crack</p>	 <p>Crack Not allowed</p>							

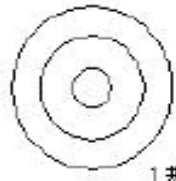
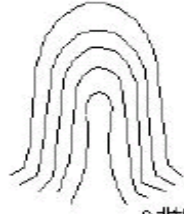

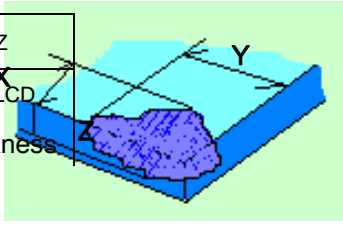
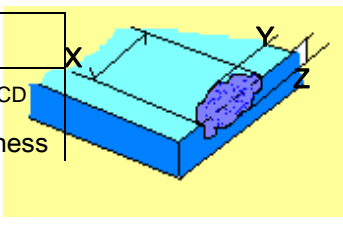
Number	Items	Criteria (mm)																																																																	
2.0	Spot defect  $\Phi = (X+Y)/2$	<p>① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)</p> <table border="1" data-bbox="416 360 1345 712"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.10$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.15$</td> <td colspan="3">3(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.2$</td> <td colspan="3">1</td> </tr> <tr> <td>$0.2 < \Phi$</td> <td colspan="3">0</td> </tr> </tbody> </table> <p>② Dim spot (LCD/TP/Polarizer dim dot, light leakage、 dark spot)</p> <table border="1" data-bbox="416 808 1370 1167"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td colspan="3">2(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td colspan="3">1</td> </tr> <tr> <td>$\Phi > 0.3$</td> <td colspan="3">0</td> </tr> </tbody> </table> <p>③ Polarizer accidented spot</p> <table border="1" data-bbox="416 1263 1370 1547"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td colspan="3">2(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$\Phi > 0.5$</td> <td colspan="3">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.10$	Ignore			$0.10 < \Phi \leq 0.15$	3(distance $\geq 10\text{mm}$)			$0.15 < \Phi \leq 0.2$	1			$0.2 < \Phi$	0			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	2(distance $\geq 10\text{mm}$)			$0.2 < \Phi \leq 0.3$	1			$\Phi > 0.3$	0			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi \leq 0.5$	2(distance $\geq 10\text{mm}$)			$\Phi > 0.5$	0		
Zone Size (mm)	Acceptable Qty																																																																		
	A	B	C																																																																
$\Phi \leq 0.10$	Ignore																																																																		
$0.10 < \Phi \leq 0.15$	3(distance $\geq 10\text{mm}$)																																																																		
$0.15 < \Phi \leq 0.2$	1																																																																		
$0.2 < \Phi$	0																																																																		
Zone Size (mm)	Acceptable Qty																																																																		
	A	B	C																																																																
$\Phi \leq 0.1$	Ignore																																																																		
$0.1 < \Phi \leq 0.2$	2(distance $\geq 10\text{mm}$)																																																																		
$0.2 < \Phi \leq 0.3$	1																																																																		
$\Phi > 0.3$	0																																																																		
Zone Size (mm)	Acceptable Qty																																																																		
	A	B	C																																																																
$\Phi \leq 0.2$	Ignore																																																																		
$0.2 < \Phi \leq 0.5$	2(distance $\geq 10\text{mm}$)																																																																		
$\Phi > 0.5$	0																																																																		
	Line defect (LCD/TP /Polarizer black/white line, scratch, stain)	<table border="1" data-bbox="416 1599 1362 1962"> <thead> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Length(mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.03$</td> <td>Ignore</td> <td colspan="2">Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$0.03 < W \leq 0.05$</td> <td>$L \leq 3.0$</td> <td colspan="2">$N \leq 2$</td> </tr> <tr> <td>$0.05 < W \leq 0.08$</td> <td>$L \leq 2.0$</td> <td colspan="2">$N \leq 2$</td> </tr> <tr> <td>$0.08 < W$</td> <td colspan="4">Define as spot defect</td> </tr> </tbody> </table>	Width(mm)	Length(mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.03$	Ignore	Ignore		Ignore	$0.03 < W \leq 0.05$	$L \leq 3.0$	$N \leq 2$		$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$		$0.08 < W$	Define as spot defect																																										
Width(mm)	Length(mm)	Acceptable Qty																																																																	
		A	B	C																																																															
$\Phi \leq 0.03$	Ignore	Ignore		Ignore																																																															
$0.03 < W \leq 0.05$	$L \leq 3.0$	$N \leq 2$																																																																	
$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$																																																																	
$0.08 < W$	Define as spot defect																																																																		

Items	Criteria (mm)																																																									
Spot defect  $\Phi = (X+Y)/2$	<p>① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)</p> <table border="1" data-bbox="406 743 1342 1093"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.10$</td> <td colspan="2">Ignore</td> <td rowspan="4">Ignore</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.15$</td> <td colspan="2">3(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.2$</td> <td colspan="2">1</td> </tr> <tr> <td>$0.2 < \Phi$</td> <td colspan="2">0</td> </tr> </tbody> </table> <p>② Dim spot (LCD/TP/Polarizer dim dot, light leakage, dark spot)</p> <table border="1" data-bbox="406 1189 1369 1541"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="2">Ignore</td> <td rowspan="4">Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td colspan="2">2(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td colspan="2">1</td> </tr> <tr> <td>$\Phi > 0.3$</td> <td colspan="2">0</td> </tr> </tbody> </table> <p>③ Polarizer accidented spot</p> <table border="1" data-bbox="406 1637 1228 1942"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="2">Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td colspan="2">2(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$\Phi > 0.5$</td> <td colspan="2">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.10$	Ignore		Ignore	$0.10 < \Phi \leq 0.15$	3(distance $\geq 10\text{mm}$)		$0.15 < \Phi \leq 0.2$	1		$0.2 < \Phi$	0		Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore		Ignore	$0.1 < \Phi \leq 0.2$	2(distance $\geq 10\text{mm}$)		$0.2 < \Phi \leq 0.3$	1		$\Phi > 0.3$	0		Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore		Ignore	$0.2 < \Phi \leq 0.5$	2(distance $\geq 10\text{mm}$)		$\Phi > 0.5$	0	
Zone Size (mm)	Acceptable Qty																																																									
	A	B	C																																																							
$\Phi \leq 0.10$	Ignore		Ignore																																																							
$0.10 < \Phi \leq 0.15$	3(distance $\geq 10\text{mm}$)																																																									
$0.15 < \Phi \leq 0.2$	1																																																									
$0.2 < \Phi$	0																																																									
Zone Size (mm)	Acceptable Qty																																																									
	A	B	C																																																							
$\Phi \leq 0.1$	Ignore		Ignore																																																							
$0.1 < \Phi \leq 0.2$	2(distance $\geq 10\text{mm}$)																																																									
$0.2 < \Phi \leq 0.3$	1																																																									
$\Phi > 0.3$	0																																																									
Zone Size (mm)	Acceptable Qty																																																									
	A	B	C																																																							
$\Phi \leq 0.2$	Ignore		Ignore																																																							
$0.2 < \Phi \leq 0.5$	2(distance $\geq 10\text{mm}$)																																																									
$\Phi > 0.5$	0																																																									



Line defect (LCD/TP /Polarizer black/white line, scratch, stain)	<table border="1"> <thead> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Length(mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.03$</td> <td>Ignore</td> <td colspan="2">Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$0.03 < W \leq 0.05$</td> <td>$L \leq 3.0$</td> <td colspan="2">$N \leq 2$</td> </tr> <tr> <td>$0.05 < W \leq 0.08$</td> <td>$L \leq 2.0$</td> <td colspan="2">$N \leq 2$</td> </tr> <tr> <td>$0.08 < W$</td> <td colspan="4">Define as spot defect</td> </tr> </tbody> </table>	Width(mm)	Length(mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.03$	Ignore	Ignore		Ignore	$0.03 < W \leq 0.05$	$L \leq 3.0$	$N \leq 2$		$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$		$0.08 < W$	Define as spot defect			
	Width(mm)			Length(mm)	Acceptable Qty																						
A		B	C																								
$\Phi \leq 0.03$	Ignore	Ignore		Ignore																							
$0.03 < W \leq 0.05$	$L \leq 3.0$	$N \leq 2$																									
$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$																									
$0.08 < W$	Define as spot defect																										
Polarizer Bubble	<table border="1"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="2">Ignore</td> <td rowspan="4">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.4$</td> <td colspan="2">2(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.4 < \Phi \leq 0.6$</td> <td colspan="2">1</td> </tr> <tr> <td>$0.6 < \Phi$</td> <td colspan="2">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore		Ignore	$0.2 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)		$0.4 < \Phi \leq 0.6$	1		$0.6 < \Phi$	0							
Zone Size (mm)	Acceptable Qty																										
	A	B	C																								
$\Phi \leq 0.2$	Ignore		Ignore																								
$0.2 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)																										
$0.4 < \Phi \leq 0.6$	1																										
$0.6 < \Phi$	0																										
SMT	According to IPC-A-610C class II standard . Function defect and missing part are major defect ,the others are minor defect.																										

TP bubble/ accidented spot	<table border="1"> <thead> <tr> <th rowspan="2">Size Φ(mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="2">Ignore</td> <td rowspan="4">Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td colspan="2">2</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td colspan="2">1</td> </tr> <tr> <td>$0.3 < \Phi$</td> <td colspan="2">0</td> </tr> </tbody> </table>	Size Φ (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore		Ignore	$0.1 < \Phi \leq 0.2$	2		$0.2 < \Phi \leq 0.3$	1		$0.3 < \Phi$	0	
	Size Φ (mm)		Acceptable Qty																		
A		B	C																		
$\Phi \leq 0.1$	Ignore		Ignore																		
$0.1 < \Phi \leq 0.2$	2																				
$0.2 < \Phi \leq 0.3$	1																				
$0.3 < \Phi$	0																				
Assembly deflection	beyond the edge of backlight $\leq 0.15\text{mm}$																				

5.0	TP Related	Newton Ring	Newton area > 1/3 TP NG	Ring area	 <p>1 规律性</p>						
			Newton area ≤ 1/3 TP OK	Ring area	 <p>2 非规律性</p>						
					 <p>似牛顿环</p>						
		TP corner broken X : length Y : width Z : height	<table border="1"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>X ≤ 3.0mm</td> <td>Y ≤ 3.0mm</td> <td>Z < LCD thickness</td> </tr> </table>	X	Y	Z	X ≤ 3.0mm	Y ≤ 3.0mm	Z < LCD thickness		<p>* Circuitry broken is not allowed.</p>
X	Y	Z									
X ≤ 3.0mm	Y ≤ 3.0mm	Z < LCD thickness									
		TP edge broken X : length Y : width Z : height	<table border="1"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>X ≤ 6.0mm</td> <td>Y ≤ 2.0mm</td> <td>Z < LCD thickness</td> </tr> </table>	X	Y	Z	X ≤ 6.0mm	Y ≤ 2.0mm	Z < LCD thickness		<p>* Circuitry broken is not allowed.</p>
X	Y	Z									
X ≤ 6.0mm	Y ≤ 2.0mm	Z < LCD thickness									

Criteria (functional items)

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

8. Reliability Test Result

8.1 Condition

Item	Condition	Sample Size	Test Result	Note
Low Temperature Operating Life test	-20℃, 96HR	3ea	pass	-
Thermal Humidity Operating Life test	60℃, 90%RH, 96HR	3ea	pass	-
Temperature Cycle ON/OFF test	-20℃ ↔ 70℃, ON/OFF, 20CYC	3ea	pass	(1)
High Temperature Storage test	80℃, 96HR	3ea	pass	-
Low Temperature Storage test	- 30℃, 96HR	3ea	pass	-
Thermal Shock Resistance	The sample should be allowed to stand the following 5 cycles of operation: TSTL for 30 minutes -> normal temperature for 5 minutes -> TSTH for 30 minutes -> normal temperature for 5 minutes, as one cycle, then taking it out and drying it at normal temperature, and allowing it stand for 24 hours	3ea	pass	
Box Drop Test	1 Corner 3 Edges 6 faces, 66cm(MEDIUM BOX)	1box	pass	-

Note (1) ON Time over 10 seconds, OFF Time under 10 seconds

9. Cautions and Handling Precautions

9.1 Handling and Operating the Module

- (1) When the module is assembled, it should be attached to the system firmly.
Do not warp or twist the module during assembly work.
- (2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
- (3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
- (4) Do not allow drops of water or chemicals to remain on the display surface.
If you have the droplets for a long time, staining and discoloration may occur.
- (5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
- (6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.
Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
- (8) Protect the module from static; it may cause damage to the CMOS ICs.
- (9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (10) Do not disassemble the module.
- (11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (12) Pins of I/F connector shall not be touched directly with bare hands.
- (13) Do not connect, disconnect the module in the "Power ON" condition.
- (14) Power supply should always be turned on/off by the item 6.1 Power On Sequence & 6.2 Power Off Sequence

9.2 Storage and Transportation.

- (1) Do not leave the panel in high temperature, and high humidity for a long time.
It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%
- (2) Do not store the TFT-LCD module in direct sunlight.
- (3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.
- (4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.
In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.
- (5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

Part. No	KD022C-1 V3	REV	V1.0	Page 24 of 25
----------	-------------	-----	------	---------------

10.Packing

---TBD-----

Part. No	KD022C-1 V3	REV	V1.0	Page 25 of 25
----------	-------------	-----	------	---------------