

**SPECIFICATION
FOR
LCD Module
KD43C-1A**

MODULE:	KD043C-1A
CUSTOMER:	

REV	DESCRIPTION	DATE
1.0	FIRST ISSUE	2014.05.29

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. Waveform	14
8. LCD Module Out-Going Quality Level	17
9. Reliability Test Result	26
10. Cautions and Handling Precautions	27
11. Packing	28

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 4.3TFT-LCD contains 480x 272pixels, and can display up to 16.7M colors.

* Features

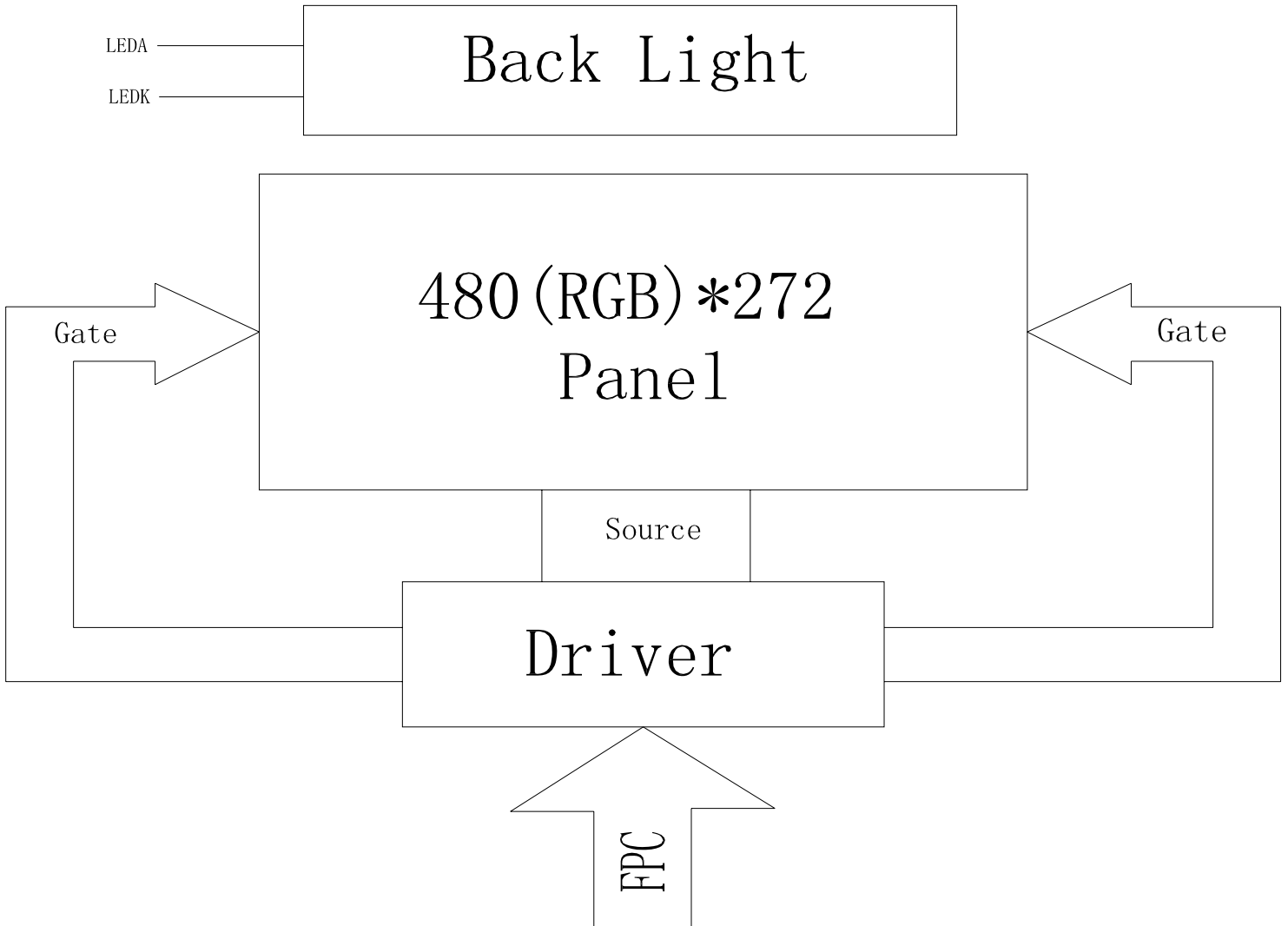
- Input Voltage: 3.3V(TYP)
- Display Colors of TFT LCD: 16.7M colors
- RGB Interface: 8/16/18/24 Bit RGB
- Internal Power Supply Circuit.

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	95.04(H) *53.86(V) (4.3inch)	mm	-
Driver element	TFT active matrix	-	-
Display colors	16.7M	colors	-
Number of pixels	480(RGB) *272	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.066 (H) x 0.198 (V)	mm	-
Viewing angle	12: 00	o'clock	-
Controller IC	ILI6408B	-	-
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)		105.4		mm	-
	Vertical(V)		67.15		mm	-
	Depth(D)		2.86		mm	-
Weight			TBD		g	-

1. Block Diagram



3. Input terminal Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	LEDK	Cathode pin OF backlight	P
2	LEDA	Anode pin of backlight	P
3	GND	Ground.	P
4	VDD	Supply voltage(3.3V).	P
5	R0	Red data input.	I
6	R1	Red data input.	I
7	R2	Red data input.	I
8	R3	Red data input.	I
9	R4	Red data input.	I
10	R5	Red data input.	I
11	R6	Red data input.	I
12	R7	Red data input.	I
13	G0	Green data input.	I
14	G1	Green data input.	I
15	G2	Green data input.	I
16	G3	Green data input.	I
17	G4	Green data input.	I
18	G5	Green data input.	I
19	G6	Green data input.	I
20	G7	Green data input.	I
21	B0	Blue data input.	I
22	B1	Blue data input.	I
23	B2	Blue data input.	I
24	B3	Blue data input.	I
25	B4	Blue data input.	I
26	B5	Blue data input.	I



27	B6	Blue data input.	I
28	B7	Blue data input.	I
29	GND	Ground.	P
30	PCLK	Clock signal. Latching data at the rising edge	I
31	DISP	Standby setting for testing, it should be connected to VDDIO in normal operation mode. If connected to GND, the IC is in standby mode.	I
32	HSYNC	Horizontal Sync input. Negative polarity.	I
33	VSYNC	Vertical Sync input. Negative polarity.	I
34	DE	Data input Enable. Active High to enable the data input Bus under "DE Mode".	I
35	NC		
36	GND	Ground.	P
37	XR(NC)	Touch panel Right Glass Terminal	
38	YD(NC)	Touch panel Bottom Film Terminal	
39	XL(NC)	Touch panel LIFT Glass Terminal	
40	YU(NC)	Touch panel Top Film Terminal	

4. LCD Optical Characteristics

2.1 Optical specification

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	60	70	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	60	70	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	40	50	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	60	70	-		
Response time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 3
	T_{OFF}		-	15	30	msec	Note 3
Contrast ratio	CR		400	500	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5
	W_Y		0.28	0.33	0.38	-	
Transmittance	Tr		-	6.26	-	%	

Test Conditions:

- $V_{DD}=3.3V$, $I_L=20mA$ (Backlight current), the ambient temperature is 25° :
- The test systems refer to Note 2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

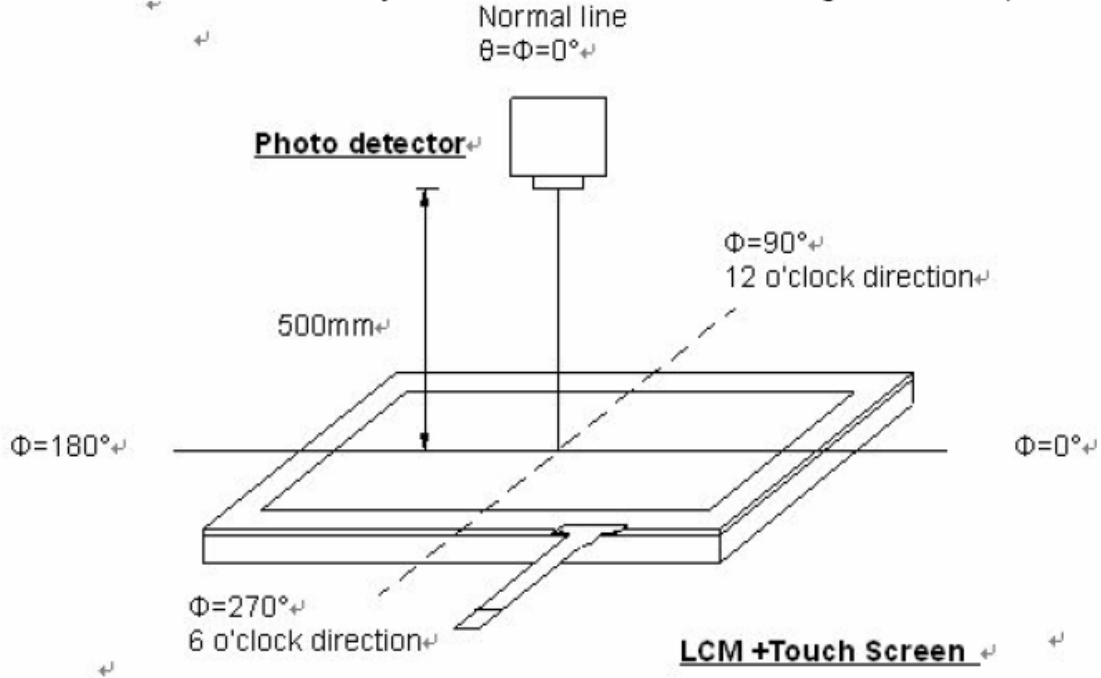


Fig. 4-2 Optical measurement system setup

Fig. Optical measurement system setup

Note 2: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 3: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $V_{LED} = 5.0V$.

5. Electrical Characteristics

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

Characteristics	Symbol	Min.	Max.	Unit
Digital Supply Voltage	VDD	3.0	4.6	V
Digital interface supply Voltage	VDDIO	1.8	VDD	V
Operating temperature	T _{OP}	-20	+70	°C
Storage temperature	T _{ST}	-30	+80	°C

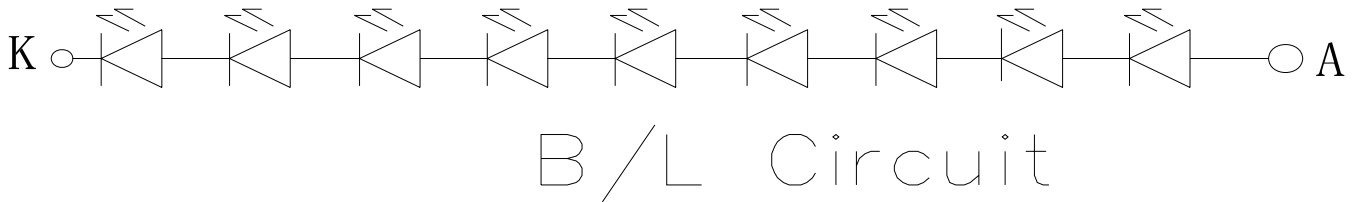
5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VDD	3.0	3.3	4.2	V	
Digital interface supply Voltage	VDDIO	1.8	3.3	4.2	V	
Normal mode Current consumption	IDD	--	25	--	mA	
Level input voltage	V _{IH}	0.7V _{DDIO}		V _{DDIO}	V	
	V _{IL}	GND		0.3V _{DDIO}	V	
Level output voltage	V _{OH}	V _{DDIO} -0.4		-	V	
	V _{OL}	GND		GND+0.4	V	

5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 9 chips White LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	15	20	-	mA	
Forward Voltage	V_F	--	28.8	--	V	
LCM Luminance	L_V	350	--	--	cd/m ²	IF=20mA
Uniformity	AVg	80	--	--	%	



6. AC Characteristic

6.1. Input signal characteristics

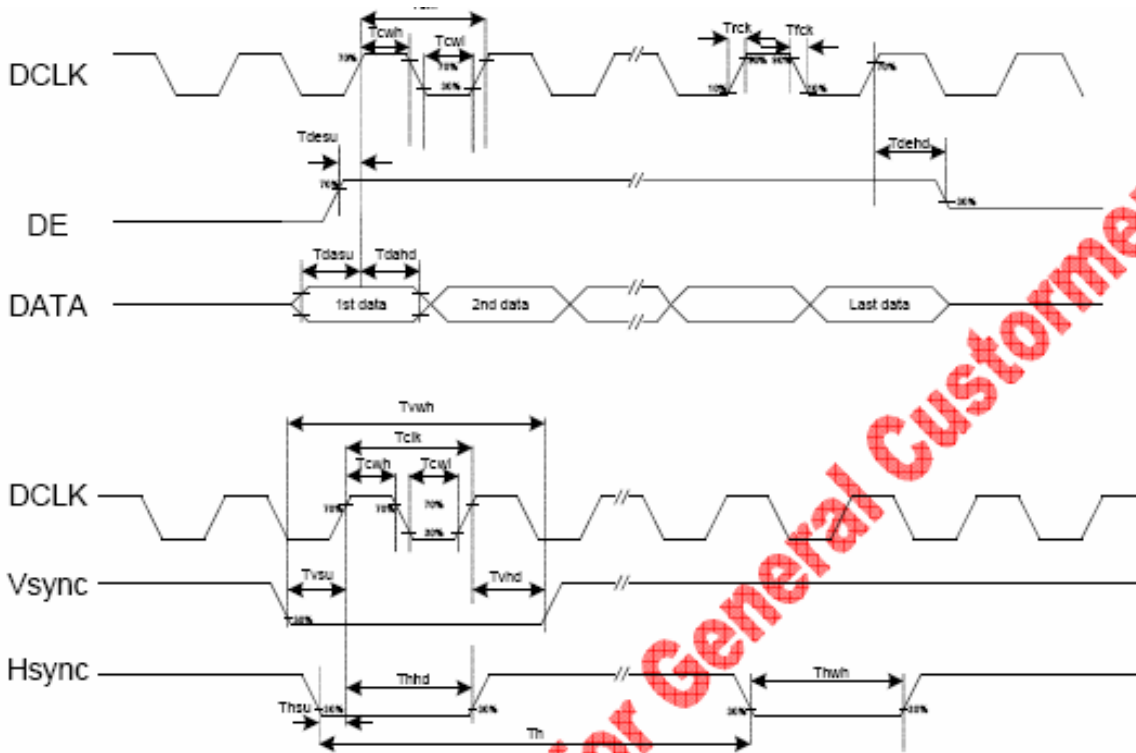
AC Electrical Characteristics (VDDIO=VDD=3.0 to 3.6v, GND=0V, TA=-20 to +85 °C°C°C°C)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Conditions
System operation timing						
VDD power source slew time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB pulse width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
Input Output timing						
DCLK clock time	Tclk	33.3	-	-	ns	DCLK=30MHz
DCLK clock low period	Tcwl	40	-	60	%	
DCLK clock high period	Tcwh	40	-	60	%	
Clock rising time	Trck	9	-	-	ns	
Clock falling time	Tfck	9	-	-	ns	
HSD width	Thwh	1	-	-	DCLK	
HSD period time	Th	55	60	65	us	
HSD setup time	Thsu	12	-	-	ns	
HSD hold time	Thhd	12	-	-	ns	
VSD width	Tvwh	1	-	-	Th	
VSD setup time	Tvsu	12	-	-	ns	
VSD hold time	Tvhd	12	-	-	ns	
Data setup time	Tdasu	12	-	-	ns	
Data hold time	Tdahd	12	-	-	ns	
DE setup time	Tdesu	12	-	-	ns	
DE hold time	Tdehd	12	-	-	ns	
Source output setting time	Tsst	-	-	TBD	us	10% to 90% CL=60pF, RL=2Kohm
Gate output setting time	Tgst	-	-	TBD	ns	10% to 90%, CL=60pF
VCOM output setting time	Tcst	-	-	TBD	us	10% to 90%, CL=40nF, RL=50ohm
Time from VSD to 1st line data input	Tvs	3	8	31	Th	HV mode By HDL[4:0] setting

7. Waveform

7.1. Timing Chart

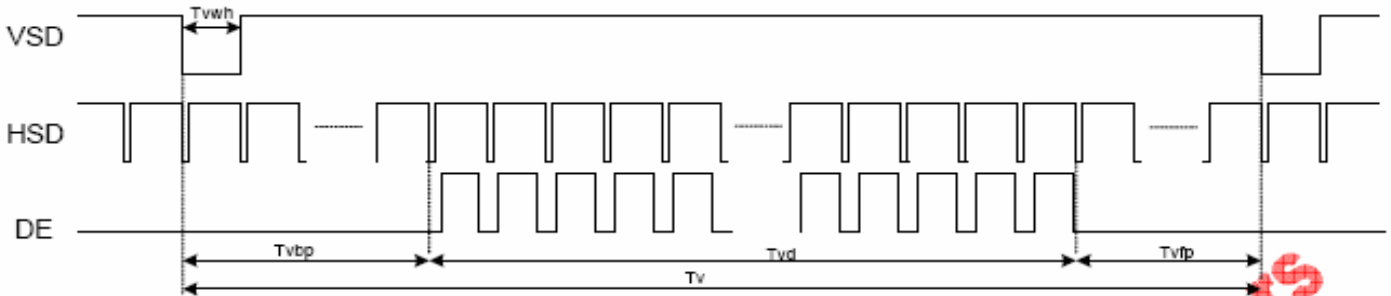
7.1.1. Clock and Data Input Waveforms



Get General Customers

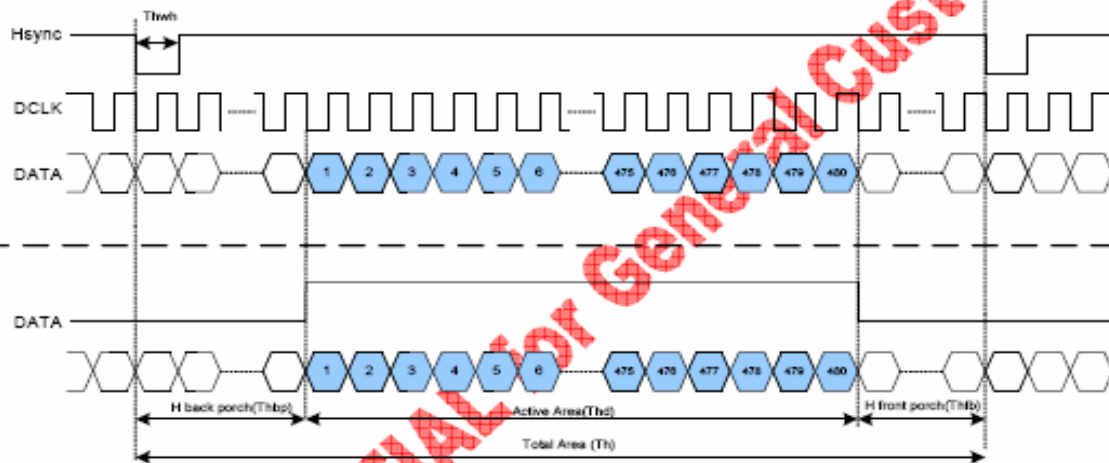
7.1.2. Data Input Format

Vertical input timing

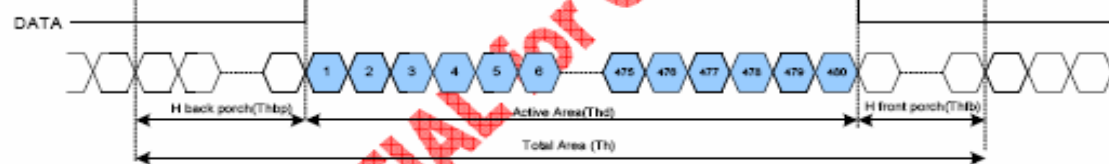


Serial 8-bit RGB Mode Data format

(HV Mode)



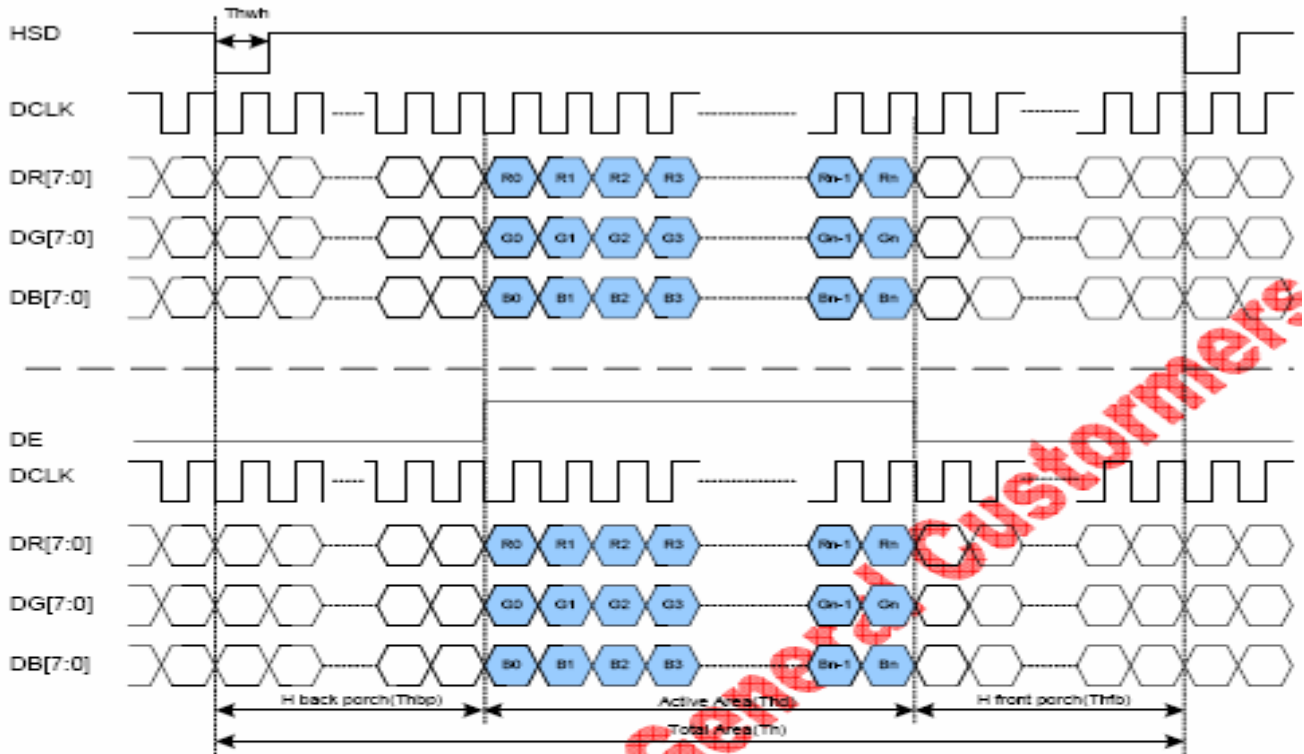
(DE Mode)



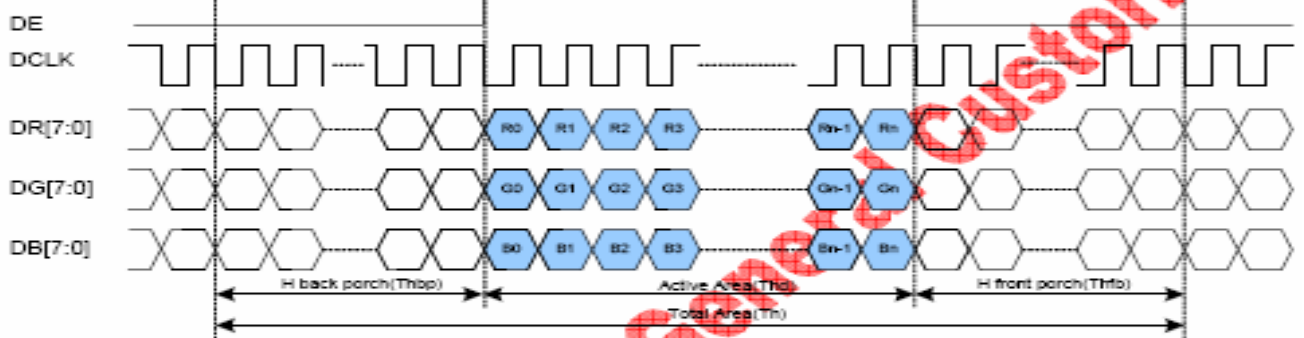
Parameters	Symbol	Min.	Typ.	Max.	Unit	Conditions
DCLK frequency	Fclk	24	27	30	MHz	
DCLK cycle time	Tclk	83	110	200	ns	
DCLK pulse duty	Tcwh	40	50	60	%	
Time from HSD to source output	Thso	-	13	-	DCLK	
Time from HSD to gate output	Thgo	-	27	-	DCLK	
Time from HSD to gate output off	Thgz	-	3	-	DCLK	
Time from HSD to VCOM	Thvc	-	12	-	DCLK	

Parallel RGB Mode Data format

(HV Mode)



(DE Mode)



Parallel RGB input timign table

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	5	9	12	MHz
VSD period time	T_v	277	288	400	H
VSD display area	T_{vd}	272			H
VSD back porch	T_{vb}	3	8	31	H
VSD front porch	T_{vfp}	2	8	97	H
HSD period time	T_h	520	525	800	DCLK
HSD display area	T_{hd}	480			DCLK
HSD back porch	T_{hbp}	36	40	255	DCLK
HSD front porch	T_{hfp}	4	5	65	DCLK

Serial RGB input timign table

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	-	27	-	MHz
VSD period time	Tv	277	288	400	H
VSD display area	Tvd	272			H
VSD back porch	Tvb	3	8	31	H
VSD front porch	Tvfp	2	8	97	H
HSD period time	Th	-	1728	-	DCLK
HSD display area	Thd	1440			DCLK
HSD back porch	Thbp	-	120	-	DCLK
HSD front porch	Thfp	-	168	-	DCLK

8. LCD Module Out-Going Quality Level

8.1 VISUAL & FUNCTION INSPECTION STANDARD

8.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

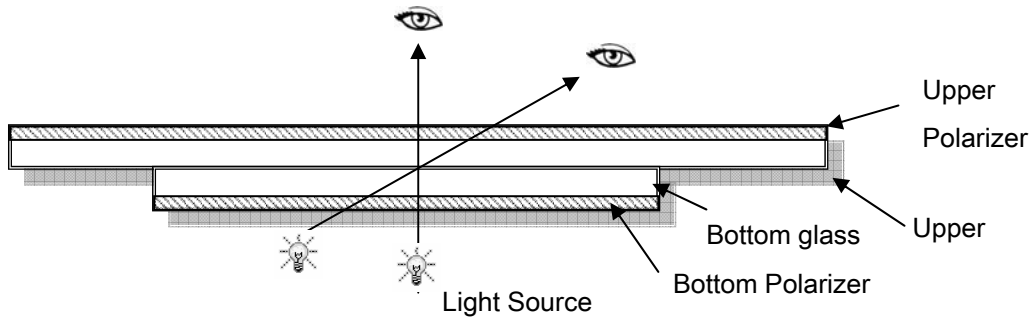
Temperature : $25 \pm 5^{\circ}\text{C}$

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

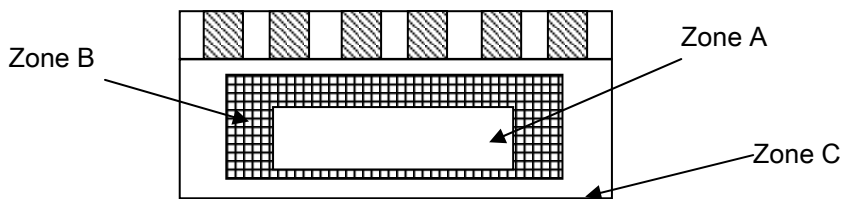
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance: 30–50cm



8.1.2 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.

8.1.3 Sampling Plan

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

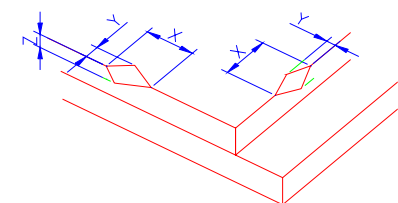
AQL:

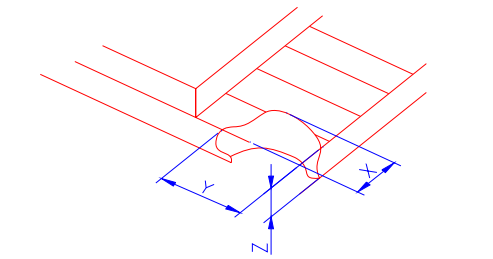
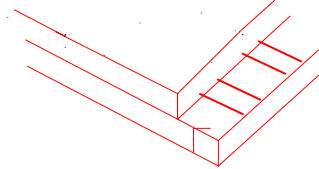
Major defect	Minor defect
0.65	1.5

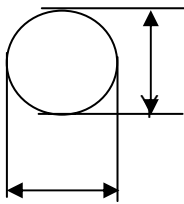
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

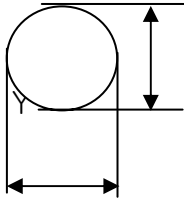
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing 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.	

8.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken	(1) The edge of LCD broken	 <table border="1" data-bbox="861 1657 1388 1803"> <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>							

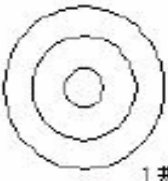
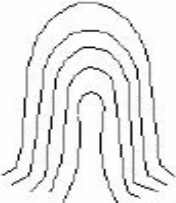

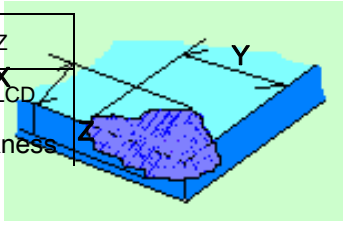
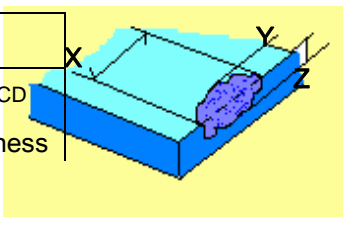
Number	Items	Criteria (mm)																									
2.0	Spot defect  $\Phi = (X+Y)/2$	① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain) <table border="1" data-bbox="406 347 1348 705"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </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>	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																							
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		$0.15 < \Phi \leq 0.2$	1																								
		$0.2 < \Phi$	0																								
		② Dim spot (LCD/TP/Polarizer dim dot, light leakage、 dark spot) <table border="1" data-bbox="406 795 1372 1153"> <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>	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				
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③ Polarizer accidented spot <table border="1" data-bbox="406 1243 1372 1534"> <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	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi \leq 0.5$	2(distance $\geq 10\text{mm}$)			$\Phi > 0.5$	0										
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	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="406 1579 1364 1960"> <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			
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Items	Criteria (mm)																																																									
<p>Spot defect</p>  <p>X</p> <p>Y</p> <p>$\Phi = (X+Y)/2$</p>	<p>① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)</p> <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>$\Phi \leq 0.10$</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"> <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"> <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	
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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			
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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	
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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		
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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

9. Reliability Test Result

9.1 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

10. Cautions and Handling Precautions

10.1 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

10.2 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	KD043C-1A	REV	V1.0	Page 27 of 28
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11.Packing

-----TBD-----