



**SPECIFICATION
FOR
LCD Module
KD030C-1 V3 -TP**

MODULE:	KD030C-1 V3 -TP
CUSTOMER:	

REV	DESCRIPTION	DATE
1.0	FIRST ISSUE	2012.05.29

STARTEK	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		



Revision History

[illegible]

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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 3.0" TFT-LCD contains 240x400 pixels, and can display up to 65K/262K colors.

* Features

-Low Input Voltage: 2.8V~3.3V(TYP)

-Display Colors of TFT LCD: 65K/262K colors

-Interface: 8/9/16/18 BIT MCU Interface

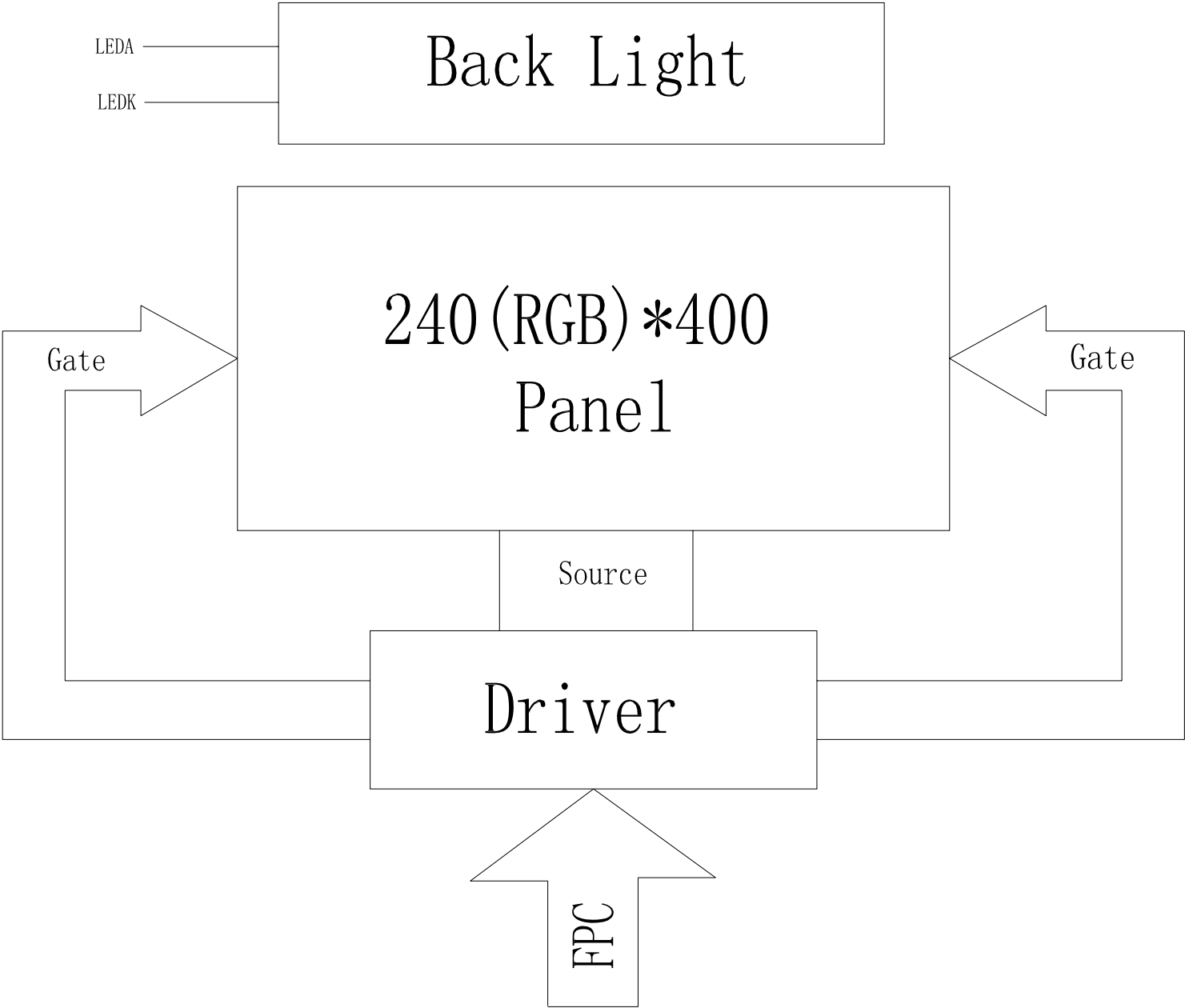
General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	38.88(H)*64.80(V) (3.0inch)	mm	-
Driver element	TFT active matrix	-	-
Display colors	65K/262k	colors	-
Number of pixels	240(RGB)*400	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.051(H)*0.051(V)	mm	-
Viewing angle	12:00	o'clock	-
Controller IC	OTM4001A	-	-
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)		45.4		mm	-
	Vertical(V)		77		mm	-
	Depth(D)		3.7		mm	-
Weight			TBD		g	-

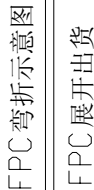


1. Block Diagram



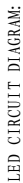


Pin Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
GND			NC	LEDK4	LEDK3	LEDK1	LEDA	RESET	IM0	IM1	DB17	DB16	DB15	DB14	DB13	DB12	DB11	DB10	DB09	DB08	DB07	DB06	DB05	DB04	DB03	DB02	DB01	DB0	RD	WR	RS	CS	ID(NC)	XL(X-)	YD(Y-)	XR(X+)	YU(Y+)	VDD	GND



IM1	IM0	Interface type	DB Pin in use
0	0	DB1 T _{vb} _18-bit interface	DB17-DB0
0	1	DB1 T _{vb} _9-bit interface	DB17-DB9
1	0	DB1 T _{vb} _16-bit interface	DB17-10, DB8-D1
1	1	DB1 T _{vb} _8-bit interface	DB17-DB10

1. If not use PIN, fix to the GND or VDD.



Display type:TFT/Normal white
Display mode:Transmissive
Viewing direction: 12:00
Interface: 8080-8/9/16/18 bit
Driver IC: OTM4001A
Backlight: White LED(4-LED PaIalIed)
Vled=3.2±0.2V Iled=60mA
Operating temperature: -20°C ~ +70°C
Storage temperature: -30°C ~ +80°C
Interface connector: FPC
Unspecified tolerance is ±0.3mm

Rev/	Revision content description	Date	TOLERANCE(公差)			DRAWING NAME		KD030C-1-T V3	
A	FIRST	2012/03/01	TOLERANCE UNLESS OTHERWISE SPECIFIED		X X±0.3	Drawn		Unit	
					X XX±0.2	Checked		mm	
			Scale 1:1			Approve		Page 1/1	

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3. Input terminal Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	GND	Ground.	P
2	NC	NC.	
3	LEDK4	Cathode pin of backlight.	P
4	LEDK3	Cathode pin of backlight.	P
5	LEDK2	Cathode pin of backlight.	P
6	LEDK1	Cathode pin of backlight.	P
7	LEDA	Anode pin of backlight.	P
8	RESET	This signal low will reset the device and must be applied to properly initialize the chip. Signal is low active.	I
9	IM0	Interface selecting signal.	I
10	IM1		I
11~28	DB17~DB0	These pins are data bus. If they are not used; please fix these pins as GND.	I/O
29	RD	Read control pin for the DBI interface. If not used, please connect this pin to VCC.	I
30	WR	Write control pin for the DBI interface. If not used, please connect this pin to VCC.	I
31	RS	Display data / Command selection pin RS='1': Display data. RS='0': Command data.	I
32	CS	Chip select input pin ("Low" enable). When it is not used, please fix this pin at VCC.	I
33	ID(NC)	NC	
34	XL	Touch panel LIFT Glass Terminal	
35	YD	Touch panel Bottom Film Terminal	
36	XR	Touch panel Right Glass Terminal	
37	YU	Touch panel Top Film Terminal	
38	VDD	Power supply voltage (VCI=2.5V-3.3V).	P
39	GND	Ground.	P

4. LCD Optical Characteristics

4.1 Optical specification

(Note1 + Note2)

(Using CPT LC+ EWV Polarizer+Corresponding Backlight, reference only)

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
Transmittance		T		(5.2)	(5.5)		%	
Contrast Ratio		CR	*1)		(250)	-	--	Note 3
Response Time		Tr+ Tf	*3)	-	(30)		ms	Note 4
Viewing Angle	Vertical	θ *2)	$CR \geq 10$	(100)	(110)	-		
						-		Note 5
	Horizontal	ϕ *2)		(120)	(130)	-		
						-		
Color Filter Chromaticity	White	$\begin{matrix} x \\ y \\ Y \end{matrix}$	$\theta = \phi = 0^\circ$	(0.288)	(0.308)	(0.328)		Note 6
				(0.322)	(0.342)	(0.362)		
				(27.8)	(30.8)	(33.8)		
	Red	$\begin{matrix} x \\ y \\ Y \end{matrix}$	$\theta = \phi = 0^\circ$	(0.633)	(0.653)	(0.673)		
				(0.311)	(0.331)	(0.351)		
				(15.4)	(18.4)	(21.4)		
	Green	$\begin{matrix} x \\ y \\ Y \end{matrix}$	$\theta = \phi = 0^\circ$	(0.291)	(0.311)	(0.331)		
				(0.554)	(0.574)	(0.594)		
				(55.0)	(59.0)	(63)		
	Blue	$\begin{matrix} x \\ y \\ Y \end{matrix}$	$\theta = \phi = 0^\circ$	(0.114)	(0.134)	(0.154)		
				(0.114)	(0.134)	(0.154)		
				(12.3)	(15.3)	(18.3)		
	NTSC				-	(61%)	-	

4.2 Measuring Condition

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

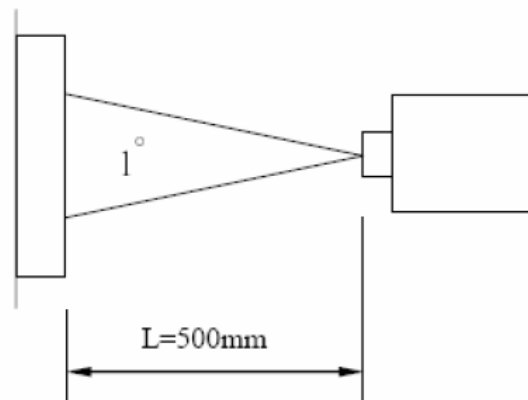
4.3 Measuring Equipment

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



Note 1. Ambient condition : $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, $60 \pm 10\% \text{RH}$, under 10 Lux in the darkroom .

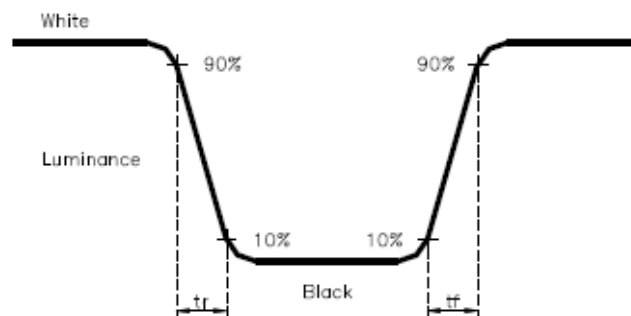
Note 2. Measure device : BM-5A (TOPCON) , viewing cone= 1° , $I_L=20\text{mA}$.



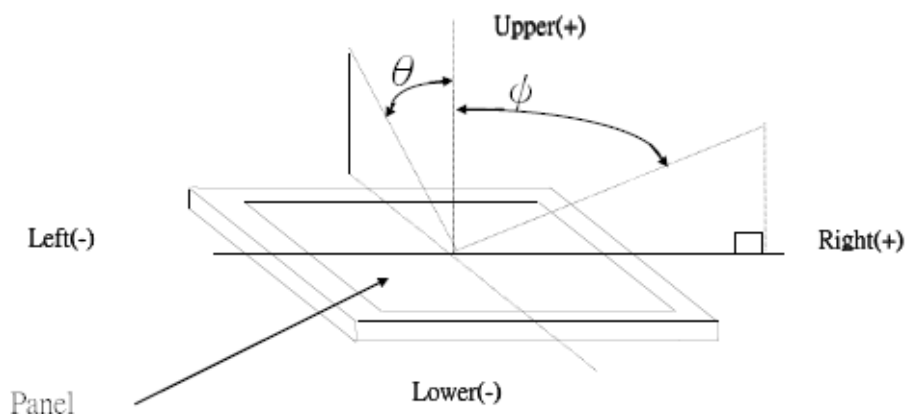
Note 3. Definition of Contrast Ratio :

$$\text{CR} = \text{White Luminance (ON)} / \text{Black Luminance (OFF)}$$

Note 4. Definition of response time : The response time is defined as the time interval between the 10% and 90% amplitudes.



Note 5. Definition of view angle(θ , ψ) :



Note 6. Light source: C light.

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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

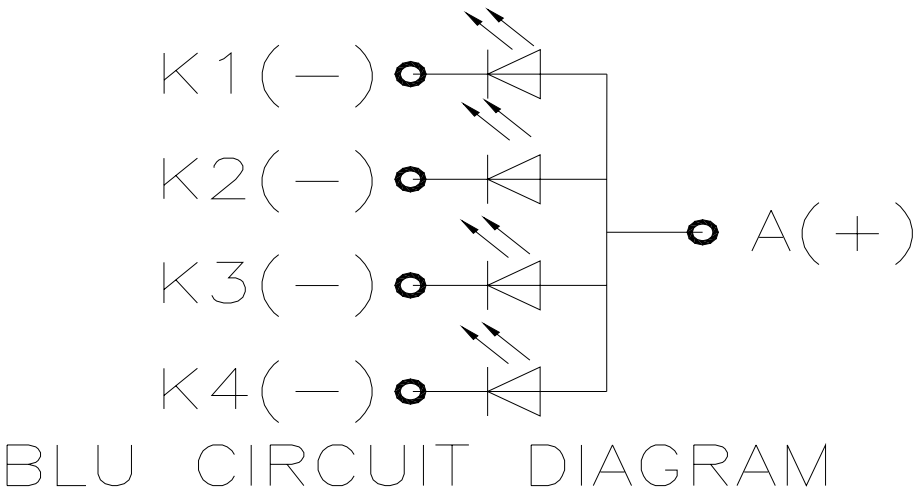
Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VDD	2.4	3.3	4.2	V	
Digital interface supply Voltage	VDDIO	1.65	3.3	4.2	V	
Normal mode Current consumption	IDD	--	12	--	mA	
Level input voltage	V _{IH}	0.7V _{DDIO}		VDDIO	V	
	V _{IL}	GND		0.3V _{DDIO}	V	
Level output voltage	V _{OH}	0.8VDDIO		VDDIO	V	
	V _{OL}	GND		0.2VDDIO	V	



5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 4chips White LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	60	80	-	mA	
Forward Voltage	V_F		3.2		V	-
LCM Luminance	L_V	220	-	-	cd/m2	$I_F=80mA$
Uniformity	AVg	80	-	-	%	-



6. AC Characteristic

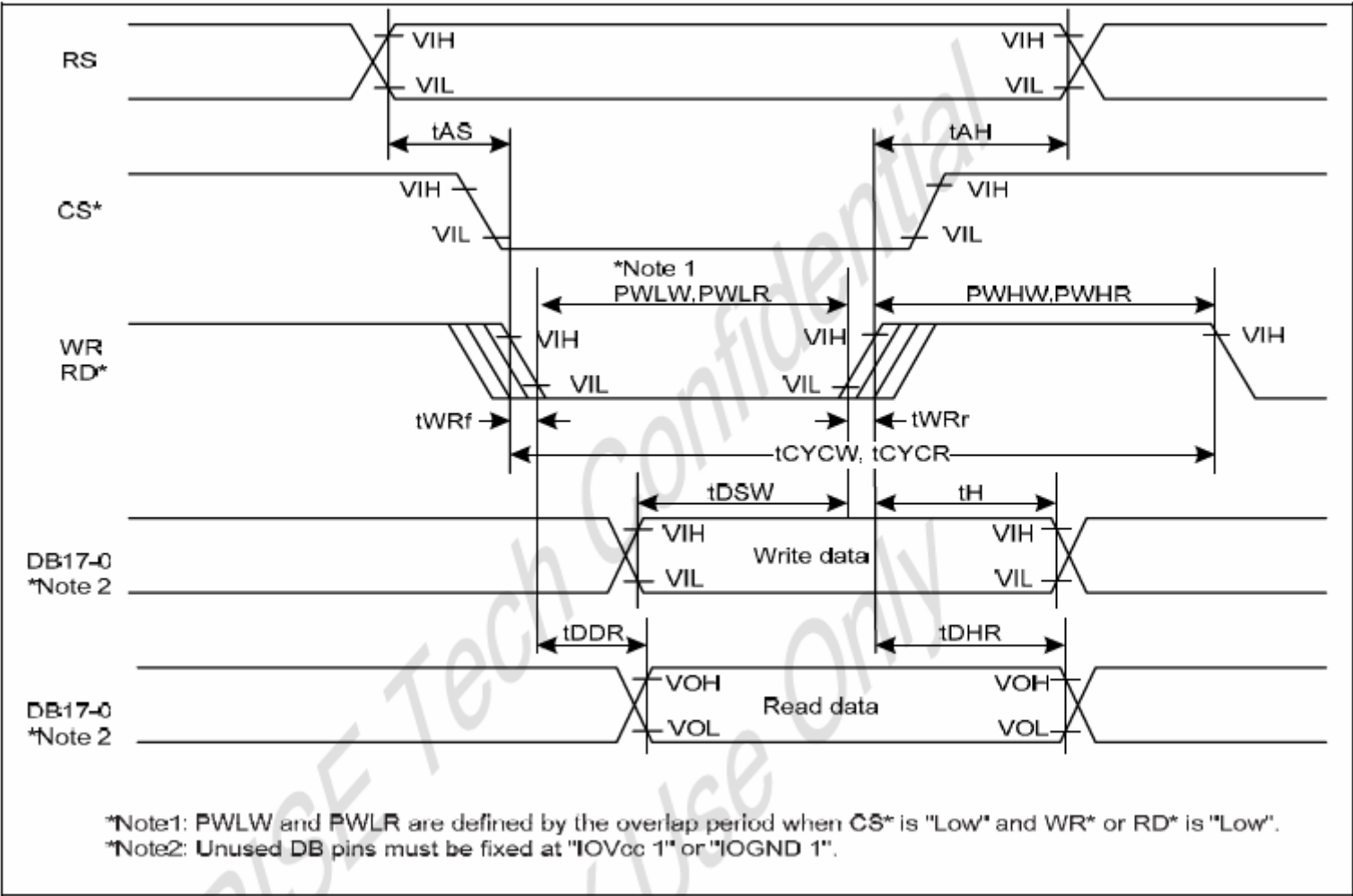
VCC=2.5V~3.6V,IOVCC=1.65V~3.6V,Ta= -40℃ ~ +85℃.

6.1 Clock Characteristics

80-System Bus Interface Timing Characteristics

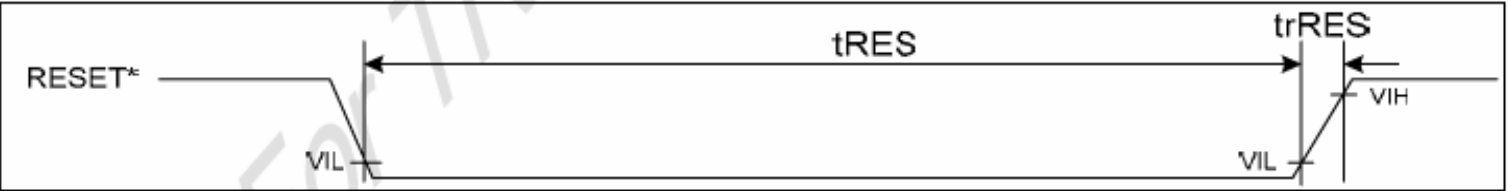
Table 13-4 Normal write operation (HWM=0), IOVCC=1.65V~3.60V

Item	Symbol		Unit	Min.	Typ.	Max.
Bus cycle time	Write	tCYCW	ns	150	-	-
	Read	tCYCR	ns	450	-	-
Write low-level pulse width		PWLW	ns	55	-	-
Read low-level pulse width		PWLR	ns	170	-	-
Write high-level pulse width		PWHW	ns	70	-	-
Read high-level pulse width		PWHR	ns	250	-	-
Write/Read rise/ fall time		tWRr, WRf	ns	-	-	10
Setup time	Write (RS to CS*,WR*)	tAS	ns	0	-	-
	Read (RS to CS*, RD*)		ns	10	-	-
Address Hold Time		tAH	ns	2	-	-
Write data setup time		tDSW	ns	25	-	-
Write data hold time		tH	ns	10	-	-
Read data delay time		tDDR	ns	-	-	150
Read data hold time		tDHR	ns	5	-	-



6.2 RESET Timing

Item	Symbol	Unit	Min.	Typ.	Max.
Reset low-level width	tRES	ms	1	—	—
Reset rise time	trRES	μs	—	—	10





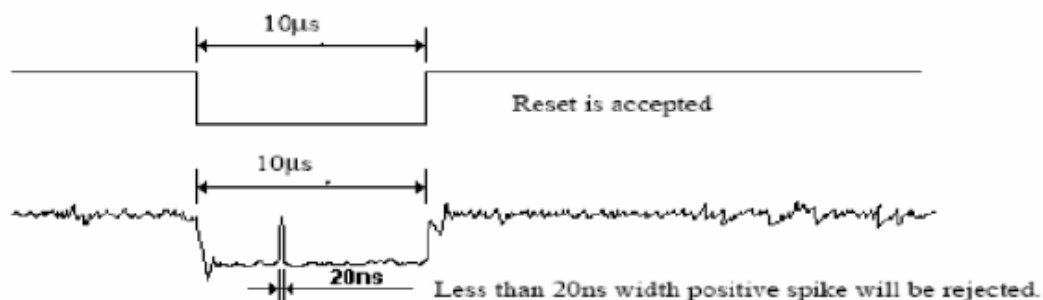
Note 1: The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (t_{RT}) within 5 ms after a rising edge of RESX.

Note 2: Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below: -

RESX Pulse	Action
Shorter than 5 μ s	Reset Rejected
Longer than 10 μ s	Reset
Between 5 μ s and 10 μ s	Reset starts

Note 3: During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In -mode.) And then return to Default condition for Hardware Reset.

Note 4: Spike Rejection also applies during a valid reset pulse as shown below:



Note 5: When Reset applied during Sleep In Mode.

Note 6: When Reset applied during Sleep Out Mode.

Note 7: It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

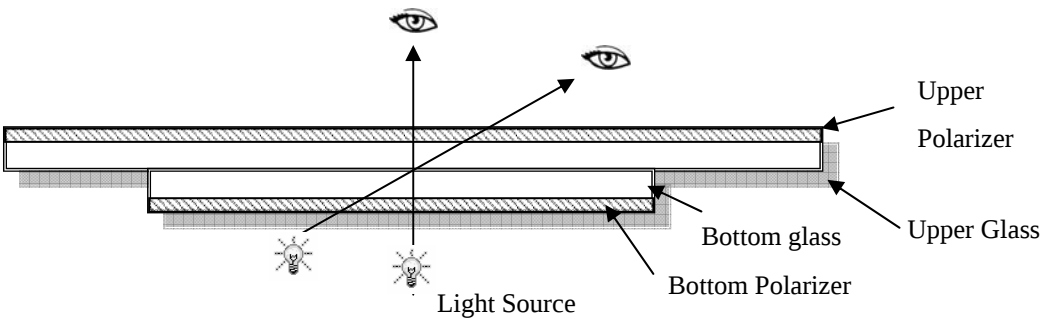
7. LCD Module Out-Going Quality Level

7.1 VISUAL & FUNCTION INSPECTION STANDARD

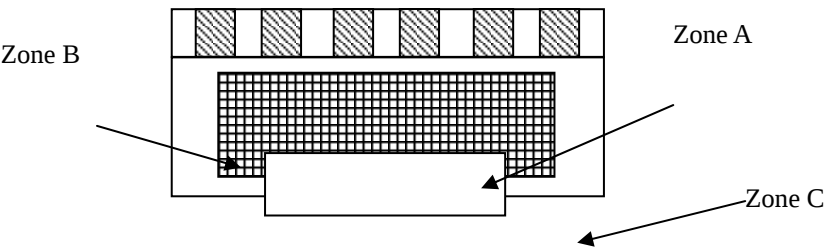
7.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

- Temperature : 25±5℃
- Humidity : 65%±10%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

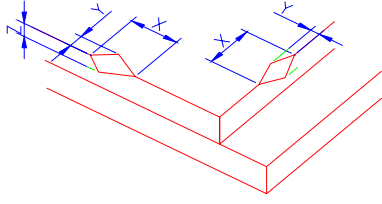
AQL:

Major defect	Minor defect
0.65	1.5

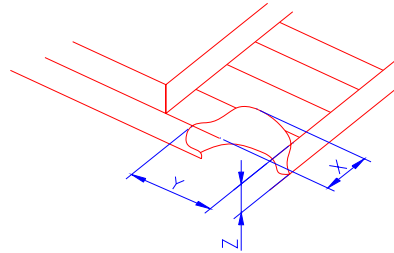
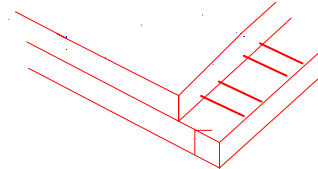
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

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.	

7.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken	(1) The edge of LCD broken	 <table> <tr> <th>X</th><th>Y</th><th>Z</th></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 Z: Height L: Length of ITO,								



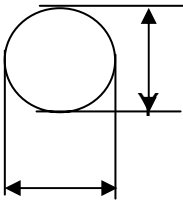
T: Height of LCD	(2)LCD corner broken	 <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table>	X	Y	Z	≤3.0mm	≤L	≤T
	X	Y	Z					
≤3.0mm	≤L	≤T						
(3) LCD crack	 Crack Not allowed							

Number	Items	Criteria (mm)
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2.0

Spot defect



X

$\Phi=(X+Y)/2$

① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi\leq0.10$	Ignore		Ignore
$0.10<\Phi\leq0.15$	3(distance $\geq 10\text{mm}$)		
$0.15<\Phi\leq0.2$	1		
$0.2<\Phi$	0		

②Dim spot (LCD/TP/Polarizer dim dot, light leakage、 dark spot)

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi\leq0.1$	Ignore		Ignore
$0.1<\Phi\leq0.2$	2(distance $\geq 10\text{mm}$)		
$0.2<\Phi\leq0.3$	1		
$\Phi > 0.3$	0		

③ Polarizer accidented spot

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi\leq0.2$	Ignore		Ignore
$0.2<\Phi\leq0.5$	2(distance $\geq 10\text{mm}$)		
$\Phi>0.5$	0		

Line defect
(LCD/TP
/Polarizer
black/white
line, scratch,
stain)

Width(mm)	Length(mm)	Acceptable Qty		
		A	B	C
$\Phi\leq0.03$	Ignore	Ignore		Ignore
$0.03<W\leq0.05$	$L\leq3.0$	$N\leq2$		
$0.05<W\leq0.08$	$L\leq2.0$	$N\leq2$		
$0.08<W$	Define as spot defect			

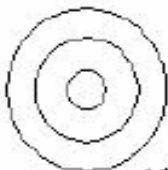
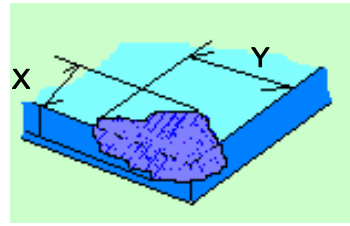
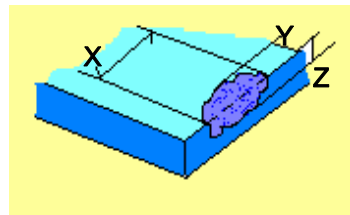


Items	Criteria (mm)
Spot defect	



	Line defect (LCD/TP /Polarizer black/white line, scratch, stain)	<table><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><tr><td>$\Phi\leq0.03$</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>$0.03<W\leq0.05$</td><td>$L\leq3.0$</td><td colspan="2">$N\leq2$</td></tr><tr><td>$0.05<W\leq0.08$</td><td>$L\leq2.0$</td><td colspan="2">$N\leq2$</td></tr><tr><td>$0.08<W$</td><td colspan="4">Define as spot defect</td></tr></table>					Width(mm)	Length(mm)	Acceptable Qty			A	B	C	$\Phi\leq0.03$	Ignore	Ignore		Ignore	$0.03<W\leq0.05$	$L\leq3.0$	$N\leq2$		$0.05<W\leq0.08$	$L\leq2.0$	$N\leq2$		$0.08<W$	Define as spot defect			
Width(mm)	Length(mm)	Acceptable Qty																														
		A	B	C																												
$\Phi\leq0.03$	Ignore	Ignore		Ignore																												
$0.03<W\leq0.05$	$L\leq3.0$	$N\leq2$																														
$0.05<W\leq0.08$	$L\leq2.0$	$N\leq2$																														
$0.08<W$	Define as spot defect																															
	Polarizer Bubble	<table><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><tr><td>$\Phi\leq0.2$</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>$0.2<\Phi\leq0.4$</td><td colspan="2">2(distance $\geq 10\text{mm}$)</td></tr><tr><td>$0.4<\Phi\leq0.6$</td><td colspan="2">1</td></tr><tr><td>$0.6<\Phi$</td><td colspan="2">0</td></tr></table>					Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi\leq0.2$	Ignore		Ignore	$0.2<\Phi\leq0.4$	2(distance $\geq 10\text{mm}$)		$0.4<\Phi\leq0.6$	1		$0.6<\Phi$	0							
Zone Size (mm)	Acceptable Qty																															
	A	B	C																													
$\Phi\leq0.2$	Ignore		Ignore																													
$0.2<\Phi\leq0.4$	2(distance $\geq 10\text{mm}$)																															
$0.4<\Phi\leq0.6$	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><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><tr><td>$\Phi\leq0.1$</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>$0.1<\Phi\leq0.2$</td><td colspan="2">2 (distance $\geq 10\text{mm}$)</td></tr><tr><td>$0.2<\Phi\leq0.3$</td><td colspan="2">1</td></tr><tr><td>$0.3<\Phi$</td><td colspan="2">0</td></tr></table>				Size Φ (mm)	Acceptable Qty			A	B	C	$\Phi\leq0.1$	Ignore		Ignore	$0.1<\Phi\leq0.2$	2 (distance $\geq 10\text{mm}$)		$0.2<\Phi\leq0.3$	1		$0.3<\Phi$	0							
Size Φ (mm)	Acceptable Qty																															
	A	B	C																													
$\Phi\leq0.1$	Ignore		Ignore																													
$0.1<\Phi\leq0.2$	2 (distance $\geq 10\text{mm}$)																															
$0.2<\Phi\leq0.3$	1																															
$0.3<\Phi$	0																															
		Assembly deflection	beyond the edge of backlight $\leq0.15\text{mm}$																													



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

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10.Packing

---TBD----

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