MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI0350BT-5

This module uses ROHS material

For Customer's Acceptance:

Customer	
Approved	
Comment	

This specification may change without prior notice in order to improve performance or quality. Please contact Multi-Inno for updated specification and product status before design for this product or release of this order.	Revision	1.1
	Engineering	
	Date	2013-11-05
	Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2012-06-26	First release	
1.1	2013-11-05	Correct supply voltage parameter	

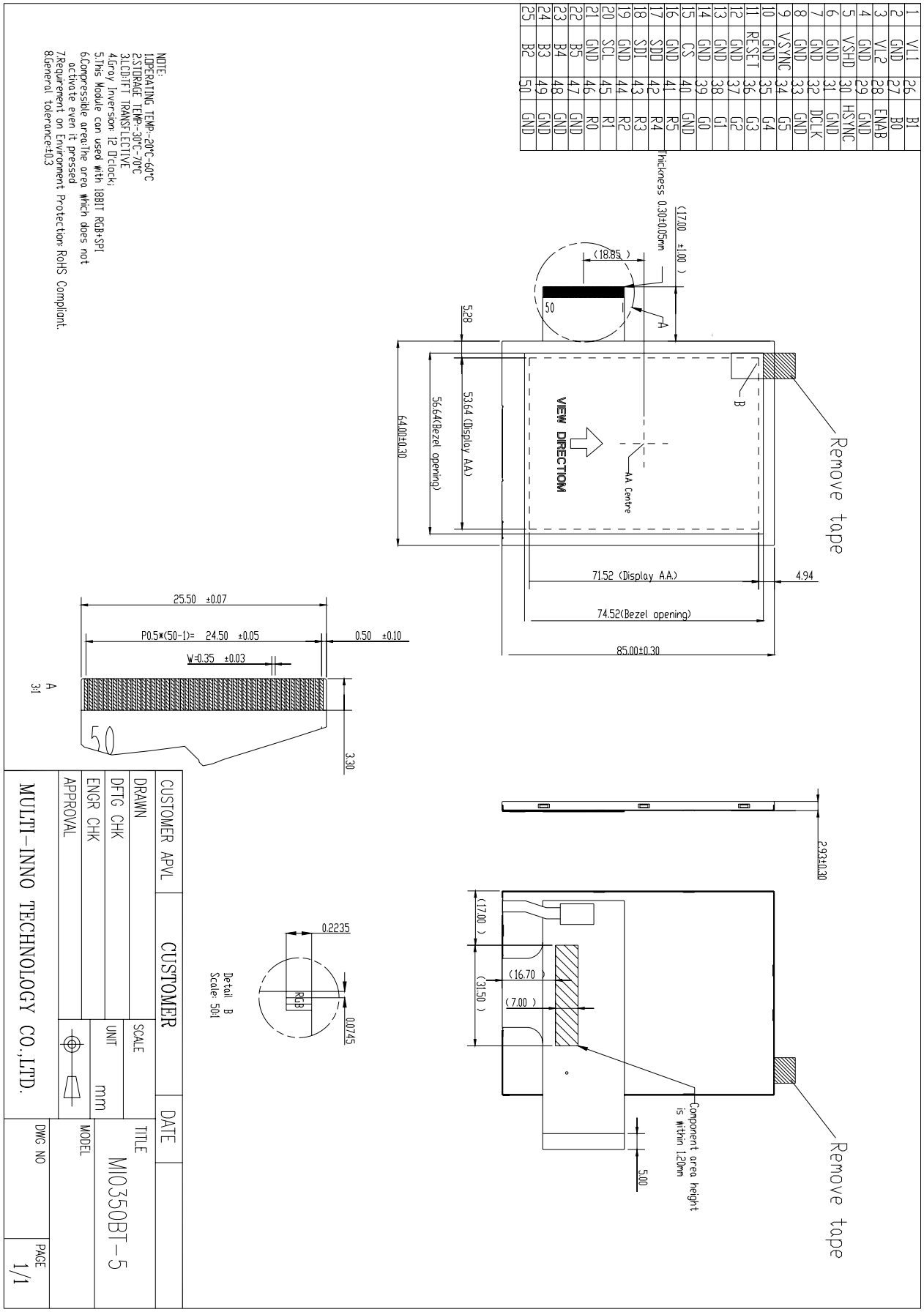
CONTENTS

■ GENERAL INFORMATION

Item	Contents	Unit/Note
LCDtype	TFT/Transflective	/
Size	3.5	Inch
Viewing direction	6:00(without image inversion and least brightness change)	O'Clock
Gray scale inversion direction	12:00(contrast peak located at)	O'Clock
Module area (W × H)	64.00×85.00x2.93	mm^2
Active area (W×H)	53.64×71.52	mm^2
Number of Dots	240(RGB)×320	/
Pixel pitch(W × H)	0.2235× 0.2235	mm^2
Colors	262K	/
Surface treatment(Up polarizer)	HC	/
Driving IC	ILI9341	/
Backlight Type	6LEDs	/
InterfaceType	RGB 18 bit+SPI	/
Input voltage	2.8	V
Weight	33.5	g
With/Without TSP	Without TSP	/

Note 1:Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.
Note 2 : RoHS compliant;
Note 3: LCM weight tolerance: ± 5% .

■ EXTERNAL DIMENSIONS



■ABSOLUTE MAXIMUM RATINGS

GND=0V,Ta=25℃

Item	Symbol	Min	Max	Unit	Remark
Supply Voltage	VSHD	-0.3	4.6	V	
Driver supply voltage	VGH-VGL	-0.3	+32.0	V	
Logic input voltage range	VIN	-0.3	VSHD + 0.3	V	
Logic output voltage range	VO	-0.3	VSHD + 0.3	V	
Operating temperature	Top	-20.0	60.0	℃	Note1
Storage temperature	Tst	-30.0	70.0	℃	Note1

Note1: The parameter is for driver IC (gate driver, source driver) only.
Note2: Signals include R0~R5, G0~G5, B0~B5, DCLK, Hsync, Vsync,Reset,CS,SDI,SCL,.ENABLE

■ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

GND=0V, Ta=25℃

Item		Symbol	Min	Typ	Max	Unit	Remark
Supply Voltage		VSHD	2.5	2.8	3.3	V	
Gate on voltage		VGH	13.5	15.0	16.5	V	
Gate off voltage		VGL	-11.0	-10.0	-9.0	V	
Input Signal Voltage	Low Level	V_{IL}	0	-	0.3VSHD	V	R0~R5;G0~G5;B0~B5 DOTCLK; Hsync; Vsync ENABLE;R/L;U/D
	High Level	V_{IH}	0.7VSHD	-	VSHD	V	
Current of VSHD Power supply		I_{VSHD}	-	15	-	mA	Note 1

Note1: For different LCM, the value may have a bit of difference.
Note2: To test the current dissipation, use “all Black Pattern”.

■ BACKLIGHT CHARACTERISTICS

Ta = 25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	-	20	-	mA	
Forward Voltage	V_{BL}	-	19.2	-	V	
Backlight Power Consumption	W_{BL}	-	384	-	mW	
Life Time	-	10,000	-	-	Hrs	Note 3

Note 1: I_F is defined for one channel LED. There are total three LED channels in back light unit
Note 2: Optical performance should be evaluated at Ta=25℃ only.
Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

Table 4.2 LED backlight characteristics

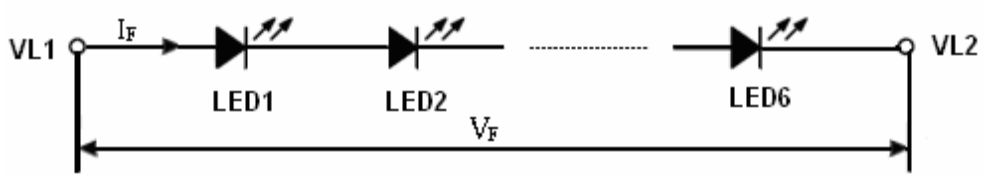


Figure 4.2 LED connection of backlight

■ELECTRO-OPTICAL CHARACTERISTICS

DRIVING THE BACKLIGHT CONDITION

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time	Tr +Tf	θ=0° ∅=0° Ta=25℃	-	35	-	ms	Fig.1	4
Contrastratio	Cr		100	150	-	---	FIG 2.	1
Surface Luminance	Lv		60	100	-	cd/m^2	FIG 2.	2
Viewing angle range	θ	∅ = 90°	55	60	-	deg	FIG 3.	6
		∅ = 270°	40	45	-	deg	FIG 3.	
		∅ = 0°	45	50	-	deg	FIG 3.	
		∅ = 180°	40	45	-	deg	FIG 3.	
CIE (x, y) chromaticity	White x	Ta=25℃	-	0.293	-		FIG 2.	5
	White y		-	0.307	-			

NOT DRIVING THE BACKLIGHT CONDITION

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Contrastratio	Cr	∅=0° Ta=25℃	-	6.5	-	---	FIG 2.	1
Reflectance			-	7.0	-	%	FIG 2.	3
Viewing angle range	θ	∅ = 90°	-	60	-	deg	FIG 3.	6
		∅ = 270°	-	60	-	deg	FIG 3.	
		∅ = 0°	-	60	-	deg	FIG 3.	
		∅ = 180°	-	55	-	deg	FIG 3.	
CIE (x, y) chromaticity	White x	Ta=25℃	-	0.310	-		FIG 2.	5
	White y		-	0.320	-			

Test Conditions:

1. I_F= 20mA, V_F=19.2V,the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1. Contrast Ratio(CR) is defined mathematically as For more information see FIG 2.:

$$\textbf{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels } (P_1, P_2, P_3, P_4, P_5)}{\text{Average Surface Luminance with all black pixels } (P_1, P_2, P_3, P_4, P_5)}$$

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

Lv = Average Surface Luminance with all white pixels $(P_1, P_2, P_3, P_4, P_5)$

Note 3. The uniformity in surface luminance , δ WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see FIG 2.

$$\delta\ \textbf{WHITE} = \frac{\textbf{Minimum Surface Luminance with all white pixels } (P_1, P_2, P_3, P_4, P_5)}{\textbf{Maximum Surface Luminance with all white pixels } (P_1, P_2, P_3, P_4, P_5)}$$

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. The test equipment is Autronic-Melchers's ConoScope. Series

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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. The test equipment is Autronic-Melchers's ConoScope. Series

Note 5. CIE (x, y) chromaticity,The x,y value is determined by measuring luminance at each test position 1 through 5,and then make average value

Note 6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the conrast ratio is greater than 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,CIE The test data is base on TOPCON's BM-5 photo detector.

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

FIG.1. The definition of Response Time

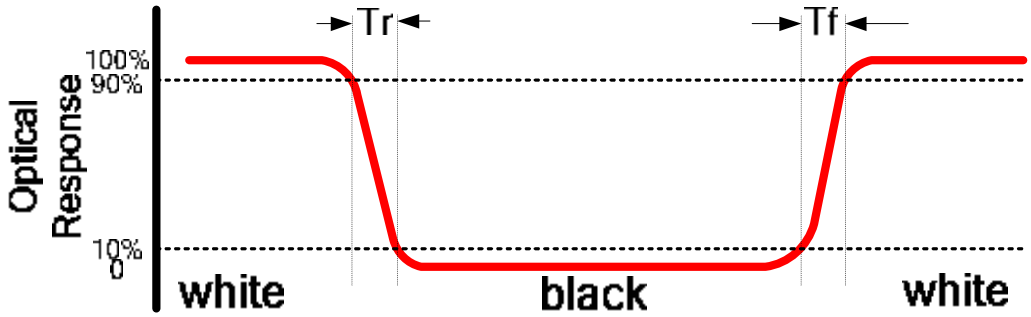


FIG.2. Measuring method for Contrast ratio,surface luminance, Luminance uniformity , CIE (x, y) chromaticity

A : 5 mm
B : 5 mm
H,V : Active Area
Light spot size ∅=5mm, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5

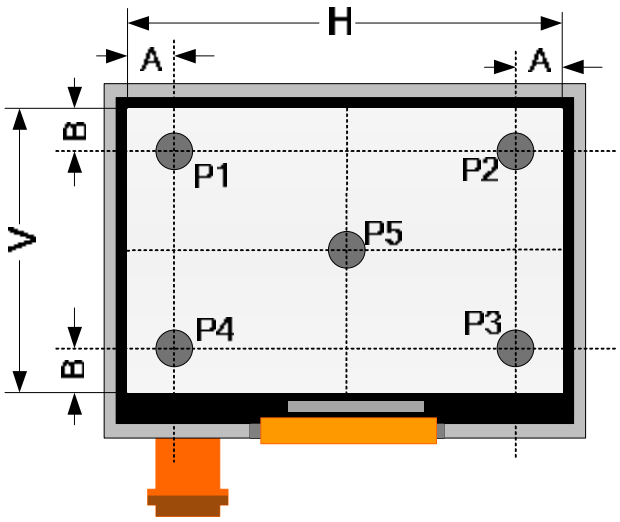
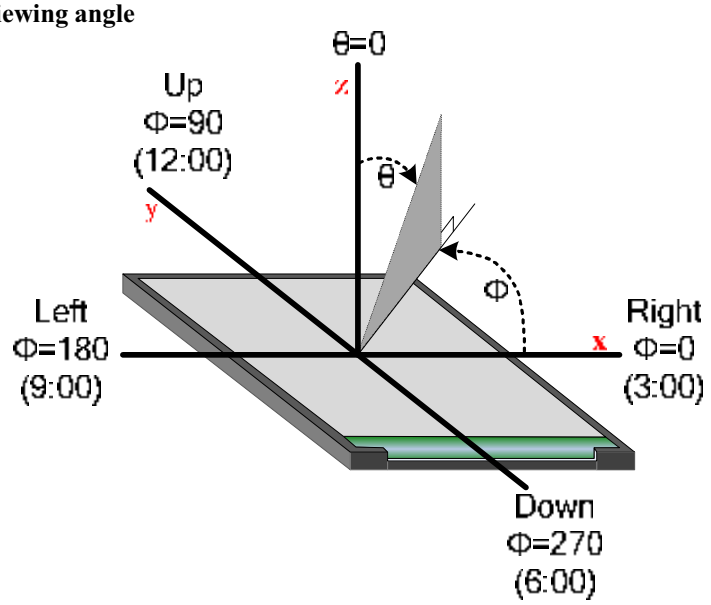


FIG.3. The definition of viewing angle



■ INTERFACE DESCRIPTION

1 J1 Pin Assignment

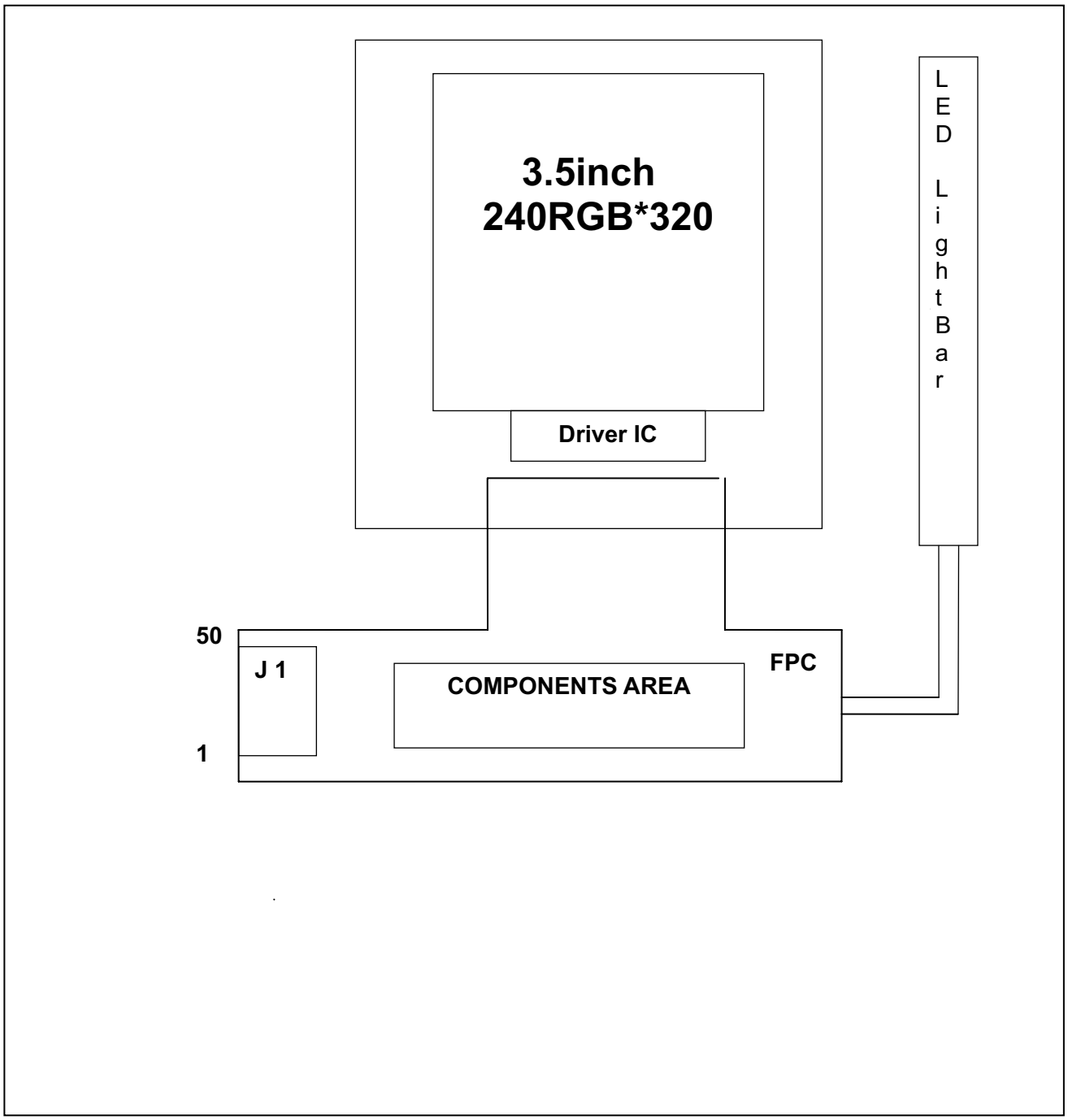
Connector type: FH12A-50S-0.5SH

No	Symbol	I/O	Description	Comment
1	VL1	P	Power supply for LED(High voltage)	
2	GND	P	Ground	
3	VL2	P	Power supply for LED(Low voltage)	
4	GND	P	Ground	
5	VSHD	P	Power supply for digital	
6	GND	P	Ground	
7	GND	P	Ground	
8	GND	P	Ground	
9	VSYNC	I	Vertical sync. in RGB mode	
10	GND	P	Ground	
11	RESET	I	Reset(Low active)	
12	GND	P	Ground	
13	GND	P	Ground	
14	GND	P	Ground	
15	CS	I	Chip select input(Low enable)	
16	GND	P	Ground	
17	SDO	O	Serial data output	
18	SDI	I	Serial data input	
19	GND	P	Ground	
20	SCL	I	Serial interface clock	
21	GND	P	Ground	
22	B5	I	Blue data input(MSB)	
23	B4	I	Blue data input	
24	B3	I	Blue data input	
25	B2	I	Blue data input	
26	B1	I	Blue data input	
27	B0	I	Blue data input(LSB)	
28	ENAB	I	Data enable in RGB mode	
29	GND	P	Ground	
30	HSYNC	I	Horizontal sync. in RGB mode	
31	GND	P	Ground	
32	DCLK	I	Pixel clock signal in RGB mode	
33	GND	P	Ground	
34	G5	I	Green data input(MSB)	
35	G4	I	Green data input	
36	G3	I	Green data input	
37	G2	I	Green data input	
38	G1	I	Green data input	
39	G0	I	Green data input(LSB)	
40	GND	P	Ground	
41	R5	I	Red data input(MSB)	
42	R4	I	Red data input	
43	R3	I	Red data input	
44	R2	I	Red data input	

45	R1	I	Red data input	
46	R0	I	Red data input(LSB)	
47	GND	P	Ground	
48	GND	P	Ground	
49	GND	P	Ground	
50	GND	P	Ground	

Note1: I/O definition:
I----Input O----Output P----Power/Ground

■ BLOCK DIAGRAM



■ APPLICATION NOTES

1. Data input timing

1.1 Signal AC Timing

(VSHD=2.5~3.2V,Ta=25℃)

Signal	Symbol	Parameter	min	max	Unit
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns
DE	t_{ENS}	DE setup time	15	-	ns
	t_{ENH}	DE hold time	15	-	ns
D[17:0]	t_{POS}	Data setup time	15	-	ns
	t_{PDH}	Data hold time	15	-	ns
DOTCLK	PWDH	DOTCLK high-level period	15	-	ns
	PWDL	DOTCLK low-level period	15	-	ns
	t_{CYCD}	DOTCLK cycle time	100	-	ns
	t_{rgbr} , t_{rgbf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns

Table 1.1 RGB Interface Characteristics

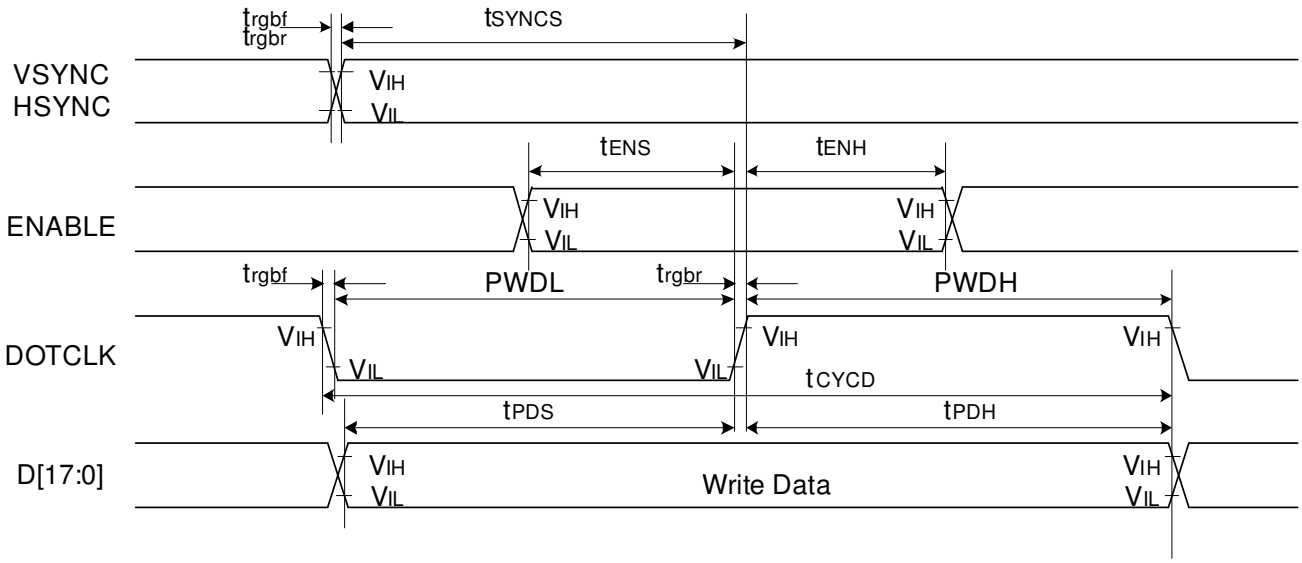


Fig.1-1 RGB Interface Timing

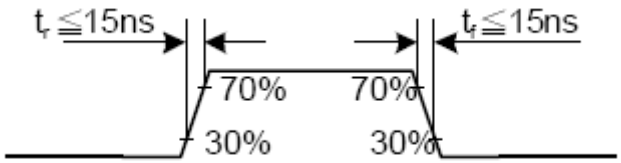


Fig.1-2 Input signal's rise and fall times

1.2 Recommend RGB Interface Timing

(VSHD=2.5~3.2V,Ta=25℃)

Parameter	Symbol	Symbol	Min	Typ	Max	Unit	Remark
DCLK	DCLK frequency	fDCYC	-	5.64	10	MHz	
	DCLK period	tDCYC	100	177.15	-	ns	
HSYNC	Horizontal	Thd	240			DCLK	
	1horizontalline	Th	-	310	-		
	Horizontal blank	Thb	56	60	-		
	Horizontal front porch	Thfp	2	10	16		
VSYNC	Vertical display area	Tvd	320			Line	
	Vsync period time	Tv	-	328	-		
	Vsync blank	Tvb	2	4	-		
	Vsync Front porch	Tvfp	2	4	-		

Tab.1-2 Recommend Input Timing (DCLK, HSYNC, VSYNC, ENAB)

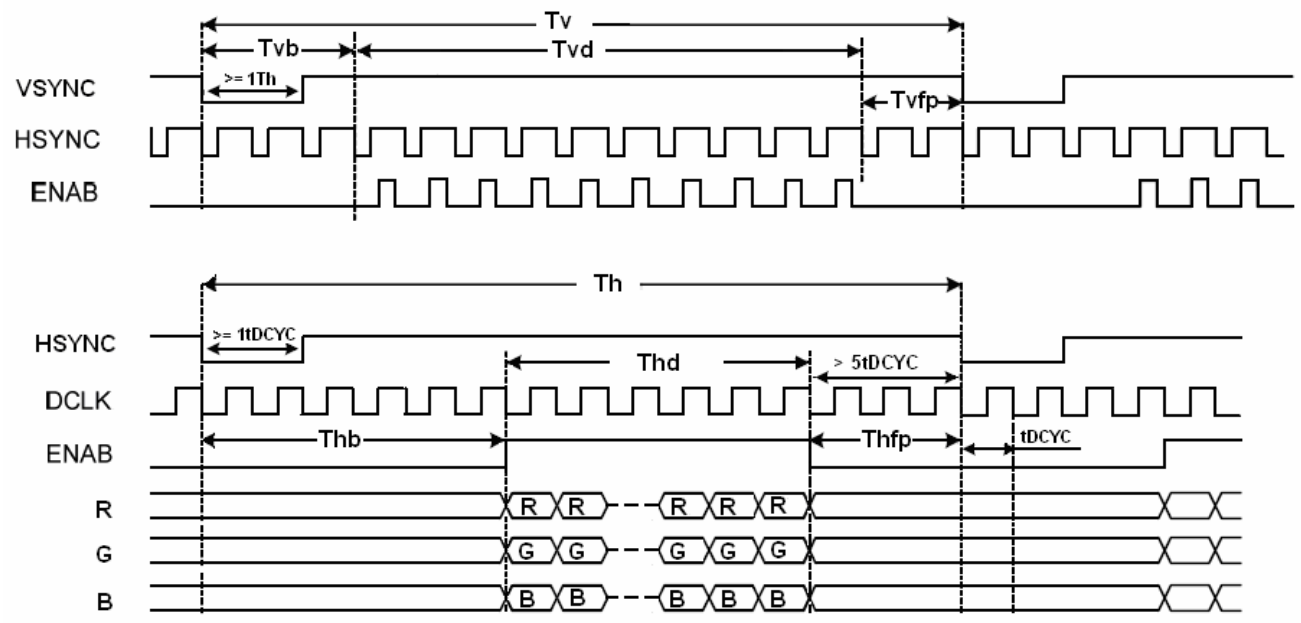


Fig.1-3 Recommend RGB Interface Timing

1.2 3-Wire 9-BIT Serial Interface

1.2.1 3-Wire 9-Bit data serial interface write mode

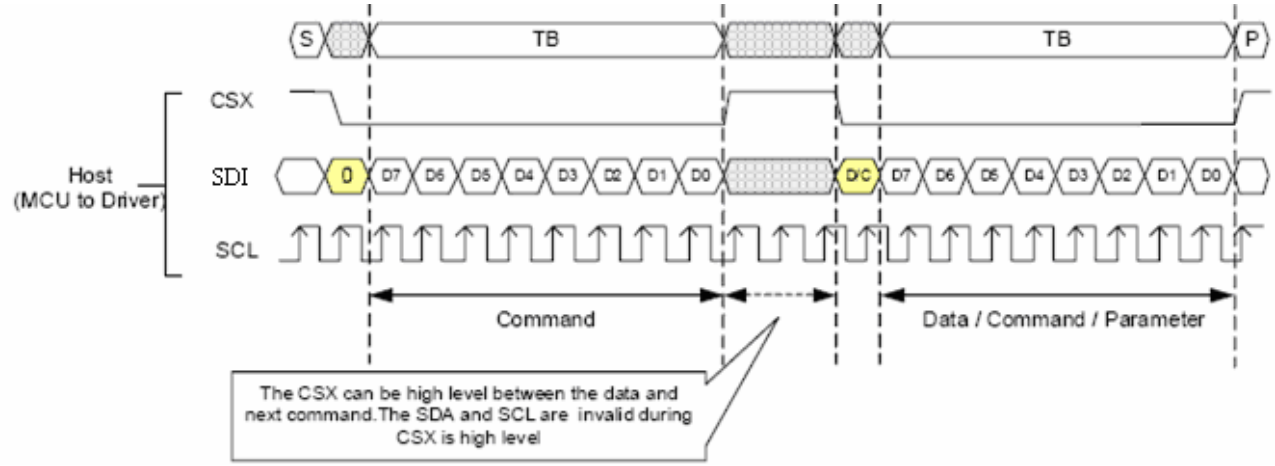


Figure. 1-4 3-Wire 9-Bit Serial Interface I Bus Protocol, Write to Register or Display RAM

Note: D/C =0, Transfer Command; D/C =1, Transfer Data.

1.2.2 3-Wire 9-Bit data serial interface read 1-byte mode

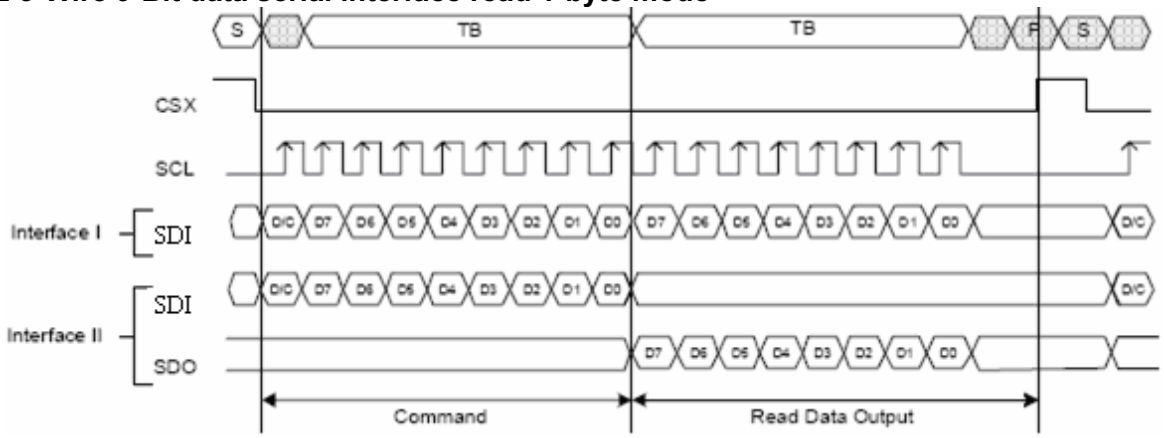


Figure. 1-5 3-Wire 9-Bit Serial Interface I/II Bus Protocol, Read 1-Byte From Register

Note: D/C=0, Transfer Command; D/C=1, Transfer Data.

1.2.3 3-Wire 9-Bit data serial interface read 3-byte mode

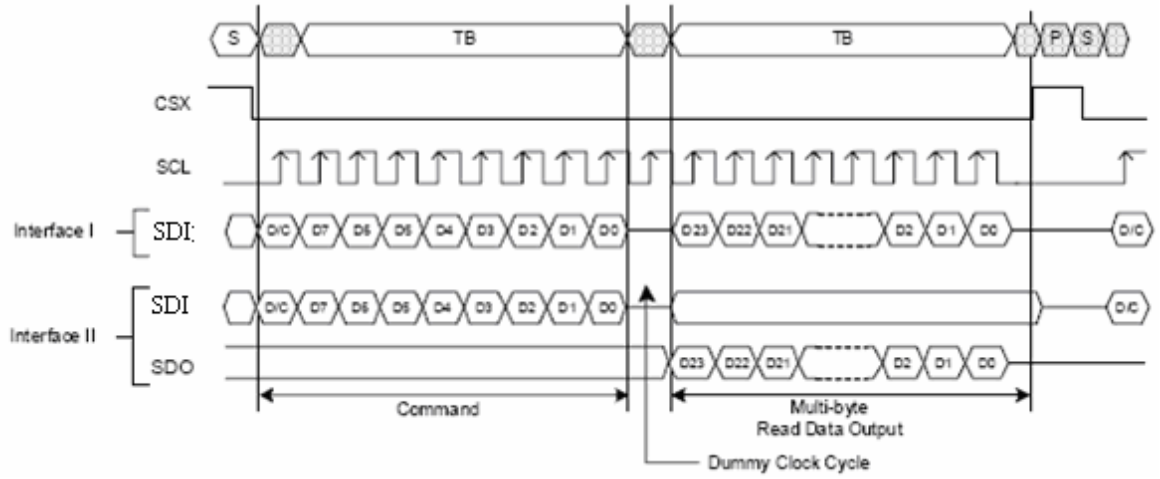


Figure. 1-6 3-Wire 9-Bit Serial Interface I/II Bus Protocol, Read 3-Byte From Register

Note: D/C=0, Transfer Command; D/C=1, Transfer Data.

1.2.4 3-Wire 9-Bit serial interface Timing

(VSHD=2.5~3.2V,Ta=25℃)

Parameter	Symbol	Conditions	Min	Max	Unit	Remark
Serial Clock Cycle(Write)	tscycw	SCL	100	-	ns	
SCL “H” pluse width(Write)	tshw	SCL	40	-	ns	
SCL “L” pluse width(Write)	tslw	SCL	40	-	ns	
Data setup time(Write)	tsds	SDI	30	-	ns	
Data hold time(Write)	tsdh	SDI	30	-	ns	
Serial Clock Cycle(Read)	tscycr	SCL	150	-	ns	
SCL “H” pluse width(Read)	tshr	SCL	60	-	ns	
SCL “L” pluse width(Read)	tslr	SCL	60	-	ns	
Access time	tacc	SDO(Read)	10		ns	
Output disable time	toh	SDO(Read)	10	50	ns	
CS “H” pluse width	tchw	CS	40	-	ns	
CS-SCL time	tcss	CS (Write)	60	-	ns	
	tcsh	CS (Write)	65	-	ns	

Tab.1-3 AC Characteristics of 3-Wire 9-Bit Serial Interface

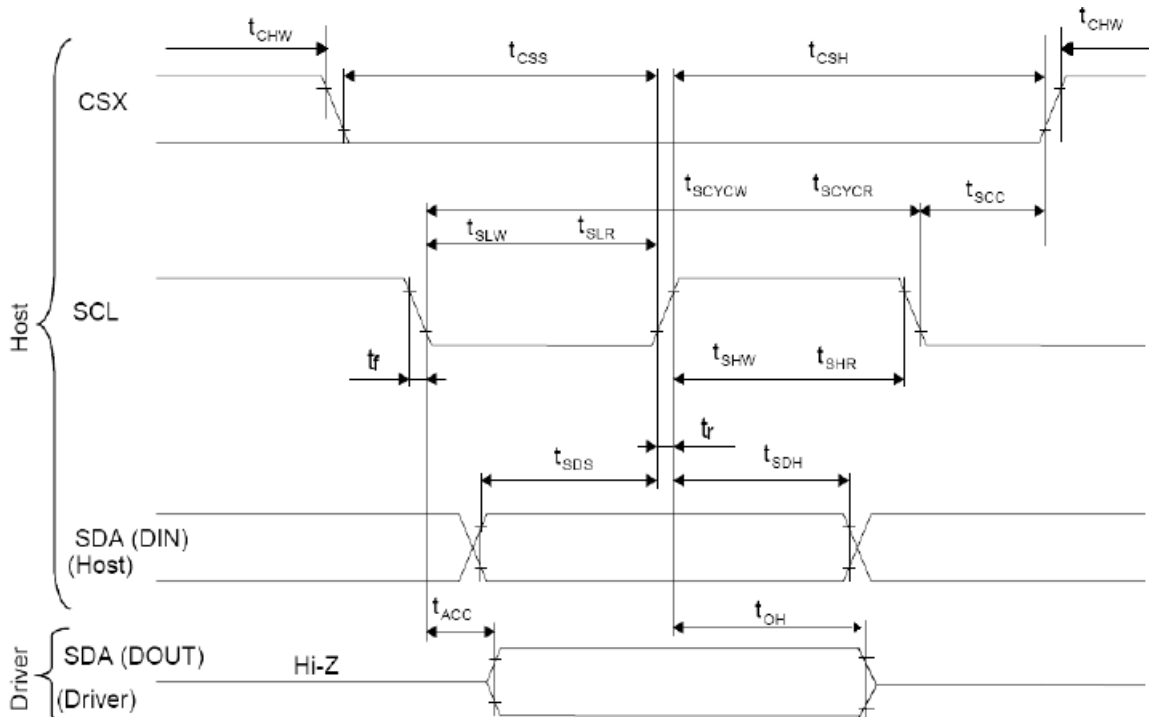


Fig.1-7 AC Characteristics of 3-Wire 9-Bit Serial Interface timing

1.3 Reset Timing

Parameter	Symbol	MIN	TYP	MAX	Unit	Remark
RESET	tRW	10	-	-	us	-
	tRT	-	-	5	ms	note 1
		-	-	120	ms	note 2

Tab.1-4 Reset input timing

Note1: When Reset applied during Sleep In Mode.
Note2: When Reset applied during Sleep Out Mode.

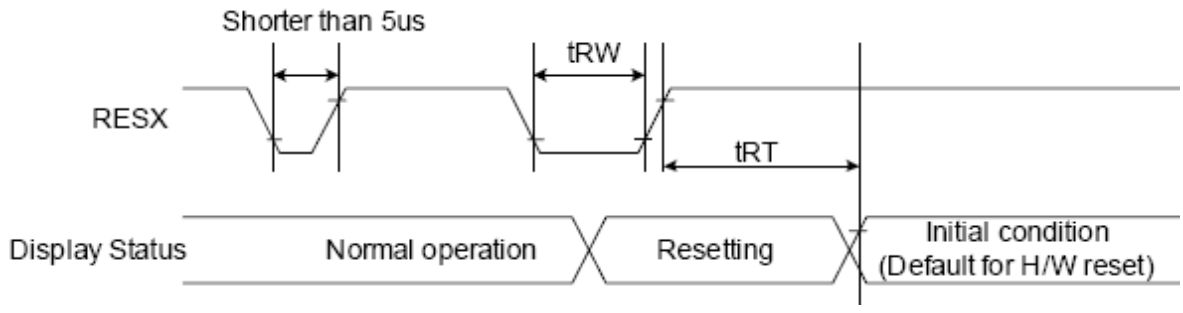


Fig.1-8 Reset timing

1.5 Power ON/OFF Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VSHD to RESET2 ending/ RESET2 starting to VSHD	t1	10			ms	
RESET2 ending to SPI starting/ SPI ending to RESET2 starting	t2	10	-	50	ms	
SPI starting to RGB starting/ RGB ending to SPI ending	t3	20	-	50	ms	
RGB starting to BLU starting/ BLU ending to RGB ending	t4	50	-	-	ms	
RGB ending to RESET1 starting	t5	20	-	-	ms	

Table 5.5 Power on/off sequence

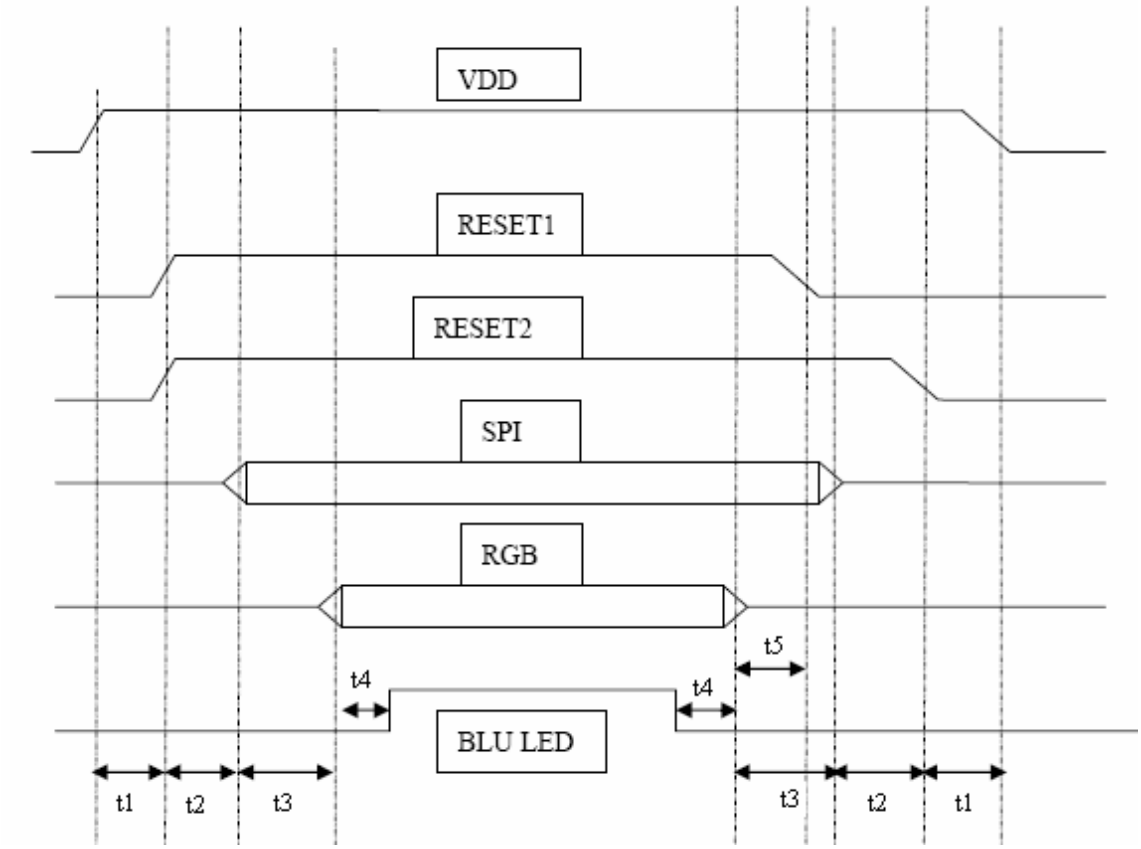


Figure 1.5 Power on/off sequence

Note1:RESET1Power down in sleep out mode.
Note2:RESET2 Power down in sleep in mode.

■ RELIABILITY TEST

No.	Test Item	Test Condition	Remark
1	High Temperature Storage	80±2℃/240 hours	IEC60068-2-1 GB2423.2
2	Low Temperature Storage	-30±2℃/240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Operating	60±2℃/240 hours	IEC60068-2-1 GB2423.2
4	Low Temperature Operating	-20±2℃/240 hours	IEC60068-2-1 GB2423.1
5	Temperature Cycle storage	-30±2℃~25~70±2℃×20cycles (30min.) (5min.) (30min.)	Start with cold temperature, End with high temperature, IEC60068-2-14 GB2423.22
6	Damp proof Test operating	40℃±5℃×90%RH/240 hours	IEC60068-2-78 GB/T2423.3
7	Vibration Test (non-operation)	Frequency range:10Hz~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2hours for each direction of X,Y,Z(6 hours for total)	IEC60068-2-6 GB/T2423.10
8	Package drop test	Height:60cm,1 corner,3 edges,6 surfaces	IEC60068-2-32,GB2423.8
9	ESD test (operation)	C=150pF,R=330Ω,5points/panel Air: ±8KV,5times Contact: ±4KV,5times(Environment: 15℃~35℃,30%~60%,86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.2
10	Shock(non-operation)	100G 6ms,±X,±Y,±Z 3times each direction	IEC60068-2-27 GB/T2423.5

Note 1:Ts is the temperature of panel's surface.
Note 2:Ta is the ambient temperature of sample.

■ INSPECTION CRITERION

OUTGOING QUALITY STANDARD	PAGE 1 OF 7
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

This specification is made to be used as the standard acceptance/rejection criteria for Color mobile phone LCM with touch panel.

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:

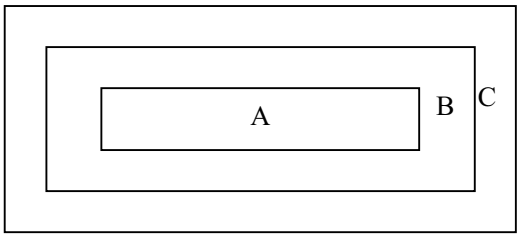
Major defect: AQL 0.65

Minor defect: AQL 1.5

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.

3. Definition of inspection zone in LCD.



Zone A: character/Digit area

Zone B: viewing area except Zone A (ZoneA+ZoneB=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.

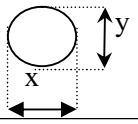
OUTGOING QUALITY STANDARD	PAGE 2 OF 7
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

4. Inspection standards

4.1 Major Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.1.1	All functional defects	1) No display 2) Display abnormally 3) Missing vertical，horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting.	Major
4.1.2	Missing	Missing component	
4.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
4.1.4	linearity	No more than 1.5%	

4.2 Cosmetic Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.2.1	**Clear Spots** Black and white Spot defect Pinhole, Foreign Particle, polarizer Dirt	For dark/white spot, size Φ is defined as $\Phi = \frac{(x+y)}{2}$  1.	Minor

Zone / Size(mm)	Acceptable Qty		
	A	B	C
Φ≤0.1	Ignore		Ignore
0.10<Φ≤0.15	**2**		
0.15<Φ≤0.20	**1**		
0.20<Φ	0		

			Minor
	Clear Spots TP Dirt	2.

Zone / Size(mm)	Acceptable Qty		
	A	B	C
Φ≤0.1	Ignore		Ignore
0.10<Φ≤0.15	**3**		
0.15<Φ≤0.25	**2**		
0.25<Φ	0		

<table>
<tr><td></td><td>Dim Spots

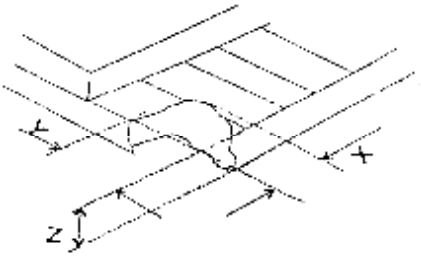
Circle shaped and dim edged defects</td><td>3.
<table><tr><td>2. Zone
Size(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>Φ≤0.2</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>0.20＜Φ≤0.40</td><td colspan="2">2</td></tr><tr><td>0.40＜Φ≤0.60</td><td colspan="2">1</td></tr><tr><td>0.60＜Φ</td><td colspan="2">0</td></tr></table></td><td>Minor</td></tr>
</table>

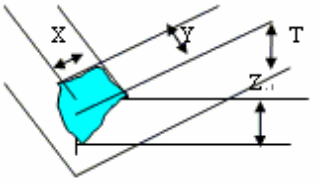
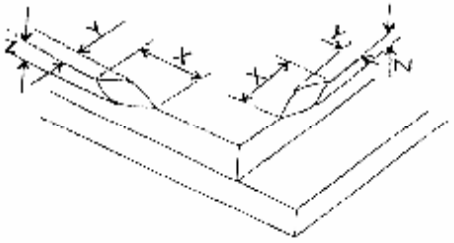
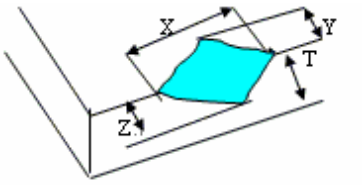
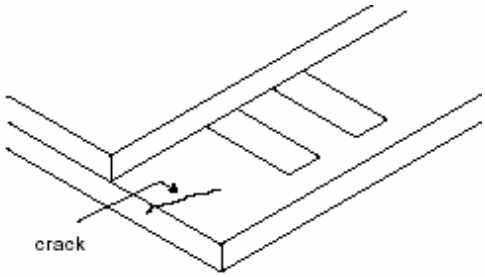
4.2 Cosmetic Defect

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th>Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td rowspan="2">4.2.2</td><td>Line defect
Black line, White line, Foreign material on polarizer</td><td><table><tr><td colspan="2">size(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td rowspan="2">L(Length)</td><td rowspan="2">W(Width)</td><td colspan="3">zone</td></tr><tr><td>A</td><td>B</td><td>C</td></tr><tr><td>Ignore</td><td>W≤0.02</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>L≤3.0</td><td>0.02＜W≤0.03</td><td colspan="2">2</td></tr><tr><td>L≤2.0</td><td>0.03＜W≤0.05</td><td colspan="2">1</td></tr><tr><td></td><td>0.05＜W</td><td colspan="2">Define as spot defect</td></tr></table></td><td rowspan="2">Minor</td></tr>
<tr><td>Foreign material on TP film</td><td>The line can be seen after mobile phone in the operating condition:
<table><tr><td colspan="2">size(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td rowspan="2">L(Length)</td><td rowspan="2">W(Width)</td><td colspan="3">zone</td></tr><tr><td>A</td><td>B</td><td>C</td></tr><tr><td>Ignore</td><td>W≤0.03</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>L≤5.0</td><td>0.03＜W≤0.05</td><td colspan="2">3</td></tr><tr><td></td><td>0.05＜W</td><td colspan="2">Define as spot defect</td></tr></table></td></tr>
<tr><td></td><td></td><td>If the scratch can be seen after mobile phone cover assembling or in the operating condition, judge by the line defect of 4.2.2.
If the scratch can be seen only in non-operating condition or some special angle, judge by the following.</td><td></td></tr>
</table>

<table>
<tr><td>4.2.3</td><td>Dim line defect
Polarizer scratch
TP film scratch</td><td>
<table>
<tr><td colspan="2">Size(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td rowspan="2">L(Length)</td><td rowspan="2">W(Width)</td><td colspan="3">Zone</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Ignore</td><td>W≤0.03</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>5.0＜L≤10.0</td><td>0.03＜W≤0.05</td><td colspan="2">2</td></tr>
<tr><td>L≤5.0</td><td>0.05＜W≤0.08</td><td colspan="2">1</td></tr>
<tr><td></td><td>0.08＜W</td><td colspan="2">0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>4.2.4</td><td>Polarize
Air bubble</td><td>Air bubbles between glass & polarizer
<table>
<tr><td>2. Zone
Size(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td></td><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.2</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.20＜Φ≤0.30</td><td colspan="2">2</td></tr>
<tr><td>0.30＜Φ≤0.50</td><td colspan="2">1</td></tr>
<tr><td>0.50＜Φ</td><td colspan="2">0</td></tr>
</table>
</td><td>Minor</td></tr>
</table>

4.3. Cosmetic Defect

<table>
<tr><td>Item No</td><td>Items to be inspected</td><td>Inspection Standard</td><td>Classification of defects</td></tr>
<tr><td></td><td></td><td>(i) Chips on corner
A:LCD Glass defect
 
<table>
<tr><td>X</td><td>Y</td><td>Z</td></tr>
<tr><td>≤2.0</td><td>≤S</td><td>Disregard</td></tr>
</table>
Notes: S=contact pad length
Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal.</td><td>Minor</td></tr>
</table>

4.3.5	Glass defect	B:TP Glass defect  X(mm) ≤3.0 / Y(mm) ≤3.0 / Z(mm) Disregard	
		(ii)Usual surface cracks A:LCD Glass defect  X ≤3.0 / Y <Inner border line of the seal / Z Disregard B:TP Glass defect  X(mm) ≤6.0 / Y(mm) <2.0 / Z(mm) Disregard	Minor
		(iii) Crack Cracks tend to break are not allowed.  	Major

4.4 Parts Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
	4.4.1 Parts contraposition	1、Not allow IC and FPC/heat-seal lead width is more than 50% beyond lead pattern. 2、Not allow chip or solder component is off center more than 50% of the pad outline.	Major
	4.4.2 SMT	According to the <Acceptability of electronic assemblies> IPC-A-610C class 2 standard. Component missing or function defect are Major defect, the others are Minor defect.	

■ PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

(1) The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).

(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents

- Isopropyl alcohol
- Ethyl alcohol

Do not scrub hard to avoid damaging the display surface.

(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.

- Water
- Ketone
- Aromatic solvents

Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.

(7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

(8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) Electro-Static Discharge Control，Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.
- Tools required for assembling, such as soldering irons, must be properly grounded. make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential
- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated

（13）Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- Do not alter, modify or change the shape of the tab on the metal frame.
- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- Do not damage or modify the pattern writing on the printed circuit board.
- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- Do not drop, bend or twist LCM.

Handling precaution for LCM

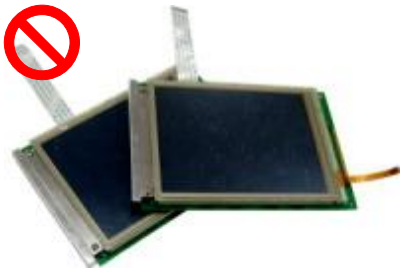
LCM is easy to be damaged. Please note below and be careful for handling.

Correct handling:

As above picture, please handle with anti-static gloves around LCM edges.

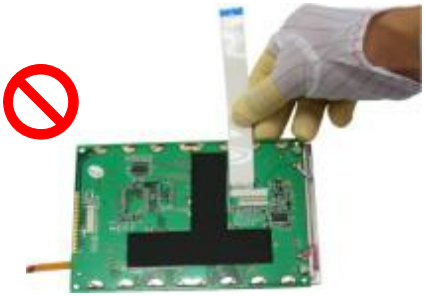
Incorrect handling:

Please don't touch IC directly.

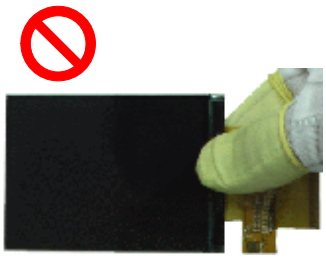


Please don't stack LCM.

Please don't hold the surface of panel.



Please don't stretch interface of output, such as FPC cable.



Please don't hold the surface of IC.

Please don't operate with sharp stick such as pens.

Storage Precautions

When storing the LCD modules, the following precaution is necessary.

(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.

(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, and keep the relative humidity between 40%RH and 60%RH.

(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the anti-static electricity container in which they were shipped.

Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

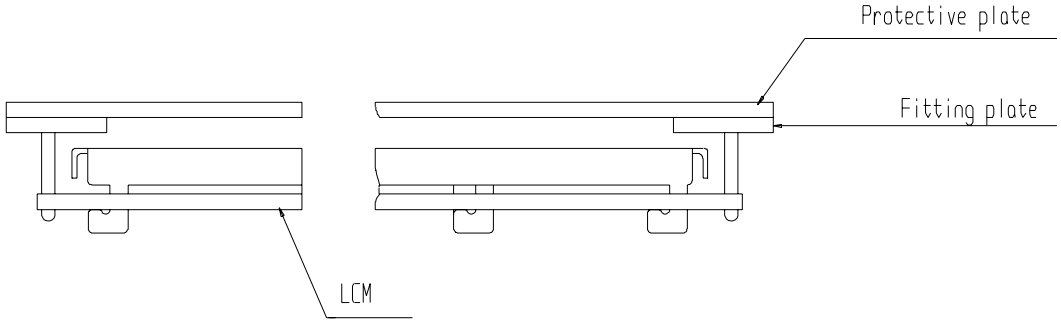
- Exposed area of the printed circuit board.
-Terminal electrode sections.

■ USING LCD MODULES

Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

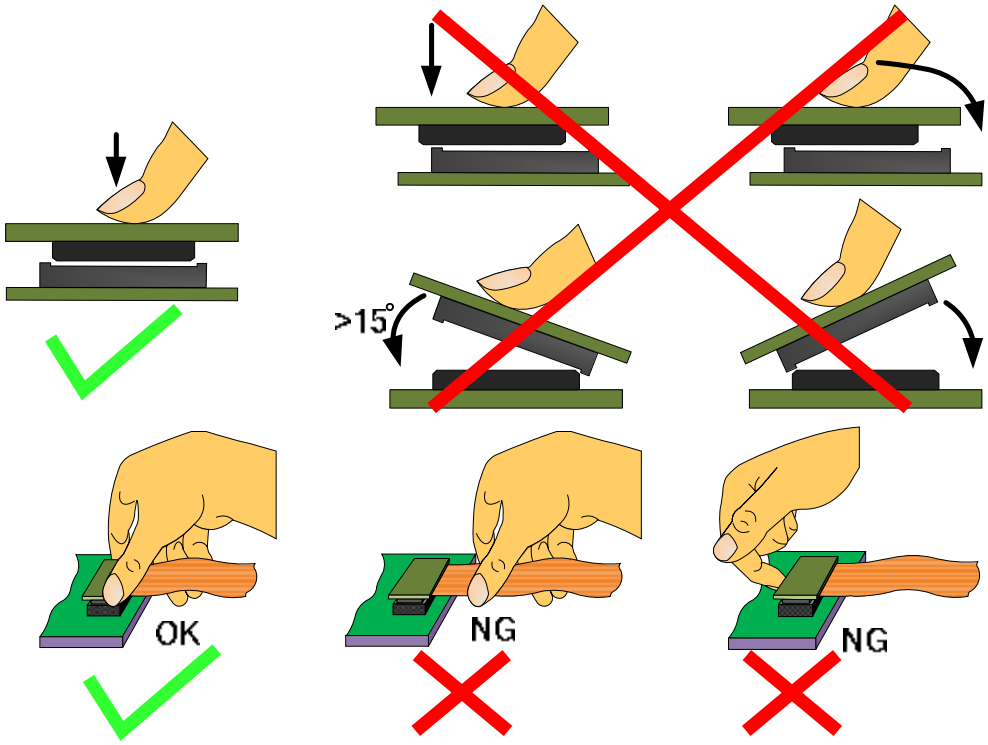
(1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



(2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ±0.1mm.

Precaution for assemble the module with BTB connector:

Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows



Precaution for soldering the LCM

	Manual soldering	Machine drag soldering	Machine press soldering
No RoHS product	290°C ~350°C. Time : 3-5S.	330°C ~350°C. Speed : 4-8 mm/s.	300°C ~330°C. Time : 3-6S. Press: 0.8~1.2Mpa
RoHS product	340°C ~370°C. Time : 3-5S.	350°C ~370°C. Time : 4-8 mm/s.	330°C ~360°C. Time : 3-6S. Press: 0.8~1.2Mpa

(1) If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

(2) When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.

(3) When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

Precautions for Operation

(1) Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.

(2) It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.

(3) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, Which will come back in the specified operating temperature.

(4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

(5) A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature, 50%RH or less is required.

(6) Input logic voltage before apply analog high voltage such as LCD driving voltage when power on. Remove analog high voltage before logic voltage when power off the module. Input each signal after the positive/negative voltage becomes stable.

(7) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

Safety

(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

(2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

Limited Warranty

Unless agreed betweenMulti-Inno and customer,Multi-Inno will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with Multi-Inno LCD acceptance standards (copies available upon request) for a period of one year from date of production. Cosmetic/visual defects must be returned to Multi-Inno within 90 days of shipment. Confirmation of such date shall be based on data code on product. The warranty liability of Multi-Inno limited to repair and/or replacement on the terms set forth above. Multi-Inno will not be responsible for any subsequent or consequential events.

Return LCM under warranty

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- PCB eyelet is damaged or modified.
- PCB conductors damaged.
- Circuit modified in any way, including addition of components.
- PCB tampered with by grinding, engraving or painting varnish.
- Soldering to or modifying the bezel in any manner.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.

■ PRIOR CONSULT MATTER

1.①For Multi-Inno standard products, we keep the right to change material, process ... for improving the product property without notice on our customer.
②For OEM products, if any change needed which may affect the product property, we will consult with our customer in advance.
2. If you have special requirement about reliability condition, please let us know before you start the test on our samples.