深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, LTD.

TFT-LCD Module Specification

Module NO.： TST062CCGS-W01

Version： V1.0

☐ APPROVAL FOR SPECIFICATION ☐ APPROVAL FOR SAMPLE

For Customer’ s Acceptance：	
Approved by	Comment

Team Source Display：		
Presented by	Reviewed by	Organized by

Version No.	Date	Content	Remark
V1.0	2017-05-21	Initial Release	

2.0 Record of revision

Rev	Date	Item	Page	Comment	Originator	Checked By
1.0	20170521			Initial Release		

3.0 General specification

Panel size: 6.2 inch

Display format: Graphics 640 (w) x 320 (h) dots

Dot pitch: 0.21875 (w) x 0.21875 (h) mm

Active area: 140.0 (w) x 70.0 (h) mm

General dimensions: 160.0 (w) x 109.0 (h) x 4.6 (t) mm

Color pixel arrangement: Mono stripe

Display mode: Normal black VA

Driving method: TFT active matrix

Viewing direction: Wide view

LCD controller / driver: ST7511 or equivalent

Interface: LCD controller / driver – Parallel 6800 / 8080, 4-line serial, 3-line serial

4.0 Absolute maximum rating (at Vss = 0V, ambient temperature = 25°C)

NO	ITEM	SIMBOL	MIN	MAX	UNIT
1.	Power Supply Voltage	VDDI, VDDA	- 0.3	6.0	V
2.	LCD Power Supply Voltage	AVDD, GVDD		7.0	V
		AVCL, GVCL, VCOM		- 7.0	V
		VGH - VGL		35.0	V
3.	MCU Interface Input Voltage	V_{IN}	- 0.3	VDDI+0.3	V
4.	Operating Temperature	T_{op}	-20°C to +70°C		°C
5.	Storage Temperature	T_{st}	-30°C to +80°C		°C

5.0 Electrical characteristics

NO	ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
1.	Operating Voltage	VDDI, VDDA	-	2.7	-	5.5	V
2.	Operating Voltage	VCCO	Built-in power	-	1.8	-	V
3.	Operating Voltage	AVDDO	Built-in power	6.1	-	9.0	V
4.	Operating Voltage	AVCLO	Built-in power	- 9.0	-	- 6.1	V
5.	Operating Voltage	GVDD	Built-in power	3.1	-	6.2	V
6.	Operating Voltage	GVCL	Built-in power	- 6.2	-	- 3.1	V
7.	Operating Voltage	VGH	Built-in power	8.0	-	19.0	V
8.	Operating Voltage	VGL	Built-in power	- 15.0	-	- 5.0	V
9.	Operating Voltage	VCOM	Built-in power	- 2.0	-	- 0.425	V
10.	“H” Input Voltage	V_{IH}	-	0.8VDDI	-	VDDI	V
11.	“L” Input Voltage	V_{IL}	-	V_{SS}	-	0.2VDDI	V
12.	“H” Output Voltage	V_{OH}	VDDI=2.7V, I_{OL}=1mA	0.8VDDI	-	VDDI	V
13.	“L” Output Voltage	V_{OL}	VDDI=2.7V, I_{OL}=1mA	V_{SS}	-	0.2VDDI	V
15.	Current Supply	I_{DD}	-	-	-	-	A

5.1 Backlight Options

NO	COLOR	FORWARD VOLTAGE (V)			FORWARD CURRENT (mA)			TYPICAL BRIGHTNESS (cd/m2) *
		Min	Typ.	Max	Min	Typ.	Max	
1.	White	-	3.3	-	-	180	240	3000

*Note : 1. Brightness measured at backlight surface.
2. On LCD surface, brightness is only about 10% to 15% of backlight brightness.
3. Lifetime of backlight: For YG, Amber, Red = 50K hrs. For White, Blue = 10K hrs

6.0 Environmental requirements

NO	ITEM	CONDITION
1.	Operating Temperature	Refer page 4
2.	Storage Temperature	Refer page 4
3.	Operating Humidity	5% to 95%RH
4.	Cycle Test	0 C @ 30 min to 50 C @ 30min for 1 cycle run for 10 cycles
5.	Lifetime	50000 HOURS (excluding backlight)

*Note: The background color and contrast ratio of LCD will vary throughout operating temperature range.

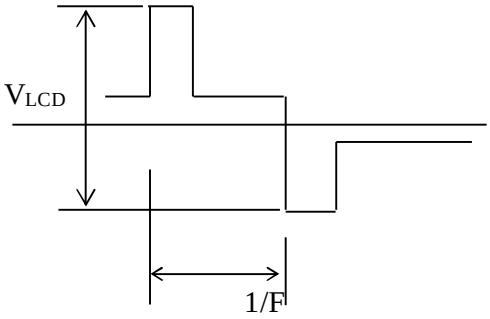
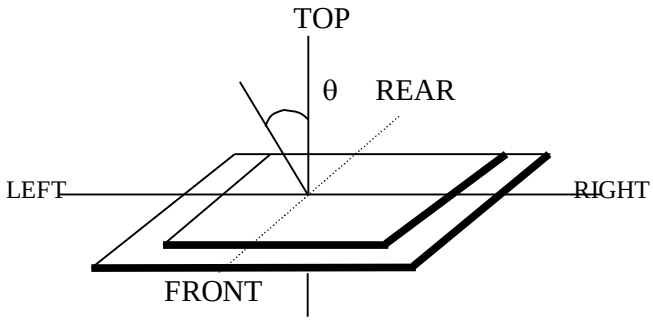
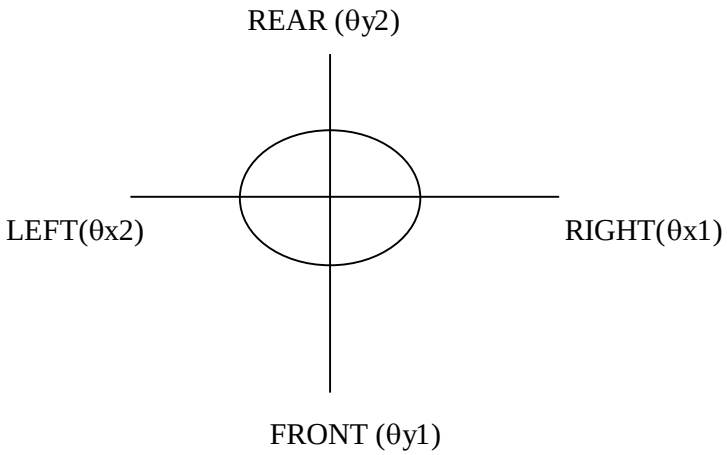
7.0 LCD specification

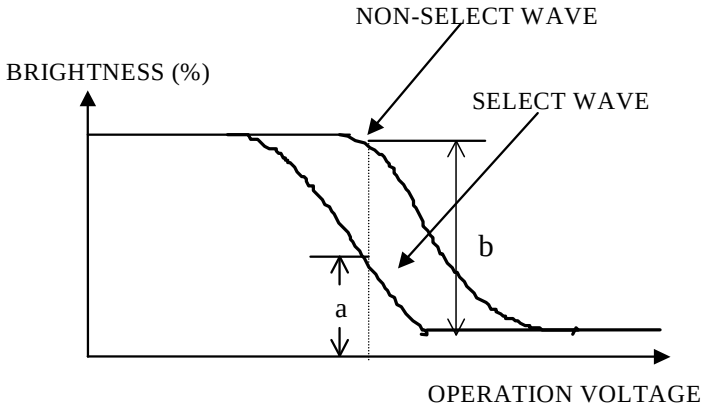
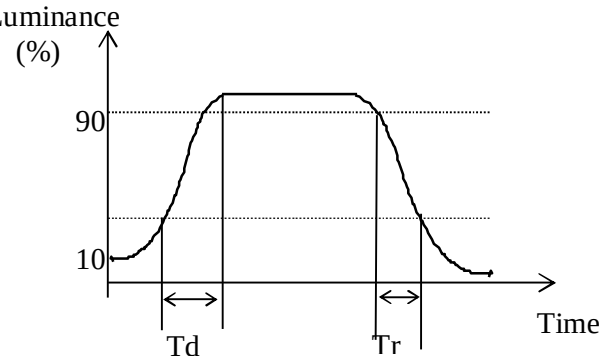
7.1 Electro-optical characteristics (at ambient temperature = 25°C)

NO	ITEM	SYMBOL	CONDITION	LCD TYPE UNIT	REF.
1.	Viewing Angle (Deg)	θ x 1	CR ≥ 250	52.1	7.1.2
		θ x 2		47.5	
		θ y 1		40.9	
		θ y 2		47.1	
2.	Contrast Ratio	CR	$\theta = 0^0$	1900	7.1.3
3.	Response Time (msec)	Rise Time (Tr) + Decay Time (Td)	$\theta = 0^0$	35	7.1.4

*Note:

1. Viewing angle data is based on bottom view product by default. Should it be a top view product, values are then swap.
2. Contrast ratio is based on typical data when using white colour as backlight.
3. Equipment Used Eldim; Ez Contrast 120R , Spot Size = 2mm

NO	CHARACTERISTICS	DEFINITIONS
7.1.1	***Definition of Operating Voltage (V_{LCD})***	 V_{LCD} : Operating Voltage F : Frame Frequency
7.1.2	***Definition of Viewing Angle***	 

7.1.3	***Definition of Contrast Ratio***	 Contrast Ratio = Brightness of non-selected state (b) / Brightness of selected state (a) ***Conditions*** (a) Operating Voltage: V_{LCD} (b) Temperature: 25°C (c) Viewing Angle, θ = 0°
7.1.4	***Response Time***	 Tr: Measured between 10% and 90% of LCD segment maximum response with $V_{ON.}$ Td: With voltage switches to zero and the instant LCD segment reaches 10% of its maximum response.

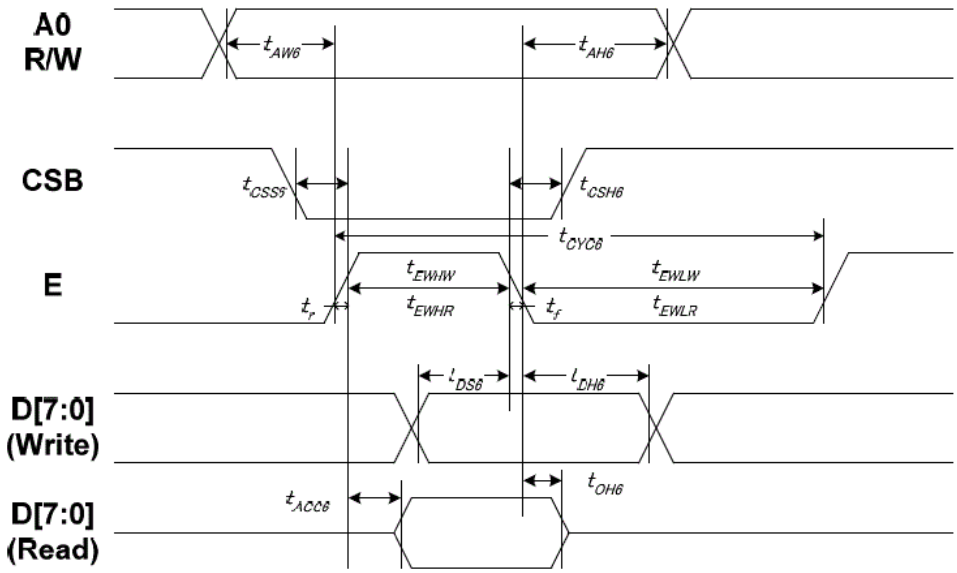
8.0 Interface

8.1	***Display Driver***	ST7511 or equivalent	
8.2	**Pin No**	**Symbol**	**Description**
	1	GND	Ground
	2	GND	Ground
	3	VDDA	Power supply for analog and booster circuit
	4	VDDI	Power supply for IO system
	5	D0 / SDA	8 bits bi-directional data bus / Serial data
	6	D1	8 bits bi-directional data bus
	7	D2	8 bits bi-directional data bus
	8	D3	8 bits bi-directional data bus
	9	D4	8 bits bi-directional data bus
	10	D5	8 bits bi-directional data bus
	11	D6	8 bits bi-directional data bus
	12	D7 / SCL	8 bits bi-directional data bus / Serial input clock
	13	RSTB	Reset input, active low
	14	CSB	Chip select input, active low
	15	A0	Register select input, H : Data / Parameter, L : Command
	16	RWR	R/W : 6800 Series Parallel Interface Read & Write Control Input /WR : 8080 Series Parallel Interface Write Enable Clock Input
	17	ERD	E : 6800 Series Parallel Interface Read & Write Control Input /RD : 8080 Series Parallel Interface Read Enable Clock Input
	18	NC	No Connection
	19	K	LED cathode
	20	A	LED anode

9.0 Functional Descriptions

9.1 Read/Write timing characteristics

System Bus Timing for 6800 Series MPU



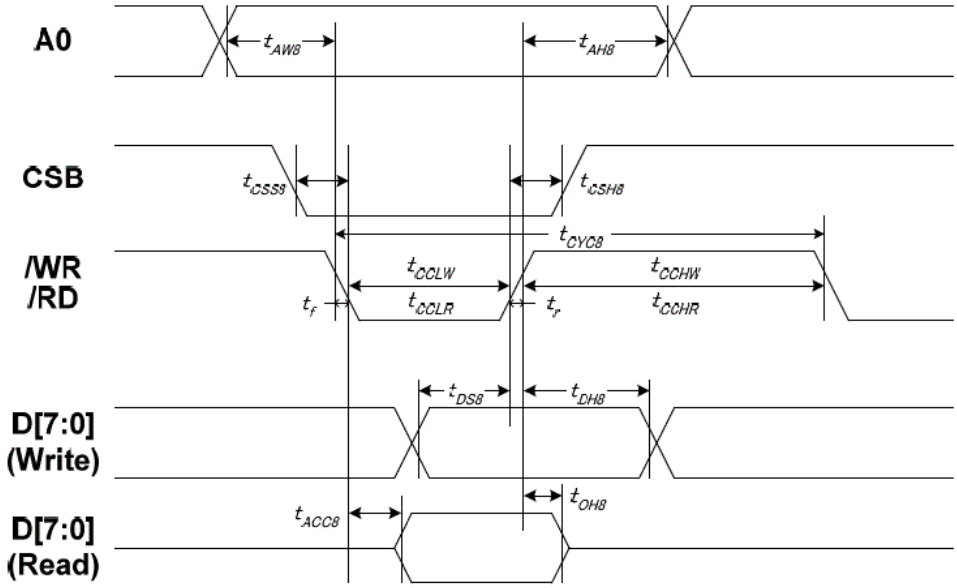
AGND = PGND =DGND = 0V, VDDA = VDDP= VDDI = 3.0 to 5.0V , Ta = 25℃

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW6		10	—	ns
Address hold time		tAH6		0	—	
System cycle time	E	tCYC6		1100	—	
Enable L pulse width (WRITE)		tEWLW		500	—	
Enable H pulse width (WRITE)		tEWHW		500	—	
Enable L pulse width (READ)		tEWLR		500	—	
Enable H pulse width (READ)		tEWHR		500	—	
CSB setup time	CSB	tCSS6		100	—	
CSB hold time		tCSH6		130	—	
Write data setup time	D[7:0]	tDS6		200	—	
Write data hold time		tDH6		250	—	
Read data access time		tACC6	CL = 100 pF	—	950	
Read data output disable time		tOH6	CL = 100 pF	5	200	

Note:

1. The input signal rise time and fall time (tr, tf) is specified at 15 ns or less. When the system cycle time is extremely fast, (tr + tf) ≤ (tCYC8 – tCCLW – tCCHW) for (tr + tf) ≤ (tCYC8 – tCCLR – tCCHR) are specified.
2. All timing is specified using 20% and 80% of VDD1 as the reference.
3. tCCLW and tCCLR are specified as the overlap between CSB being “L” and /WR and /RD being at the “L” level. CSB and /WR (or /RD) cannot act at the same time and CSB should be 100ns widther than /WR (or /RD).

System Bus Timing for 8080 Series MPU



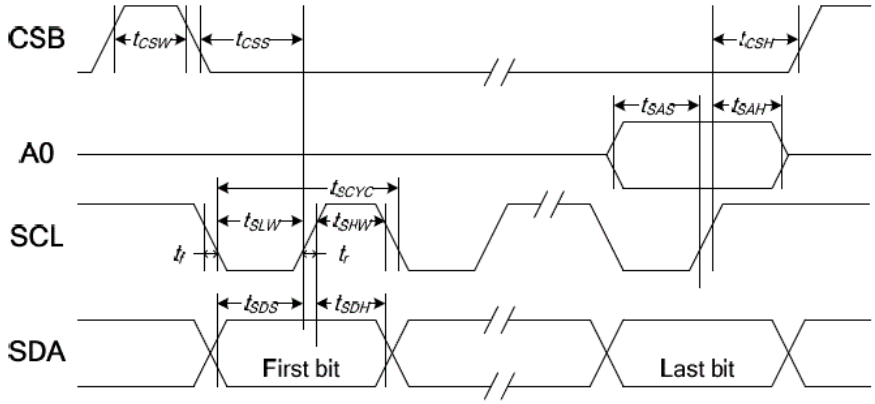
AGND = PGND =DGND = 0V, VDDA = VDDP= VDDI = 3.0 to 5.0V , Ta = 25℃

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW8		10	—	ns
Address hold time		tAH8		0	—	
System cycle time	/WR	tCYC8		1100	—	
/WR L pulse width (WRITE)		tCCLW		500	—	
/WR H pulse width (WRITE)		tCCHW		500	—	
/RD L pulse width (READ)	/RD	tCCLR		950	—	
/RD H pulse width (READ)		tCCHR		500	—	
CSB setup time	CSB	tCSS8		100	—	
CSB hold time		tCSH8		100	—	
WRITE Data setup time	D[7:0]	tDS8		200	—	
WRITE Data hold time		tDH8		50	—	
READ access time		tACC8	CL = 100 pF	—	950	
READ Output disable time		tOH8	CL = 100 pF	5	200	

Note:

1. The input signal rise time and fall time (tr, tf) is specified at 15 ns or less. When the system cycle time is extremely fast, (tr + tf) ≤ (tCYC8 – tCCLW – tCCHW) for (tr + tf) ≤ (tCYC8 – tCCLR – tCCHR) are specified.
2. All timing is specified using 20% and 80% of VDD1 as the reference.
3. tCCLW and tCCLR are specified as the overlap between CSB being “L” and /WR and /RD being at the “L” level. CSB and /WR (or /RD) cannot act at the same time and CSB should be 100ns widther than /WR (or /RD).

System Bus Timing for 4-Line Serial Interface



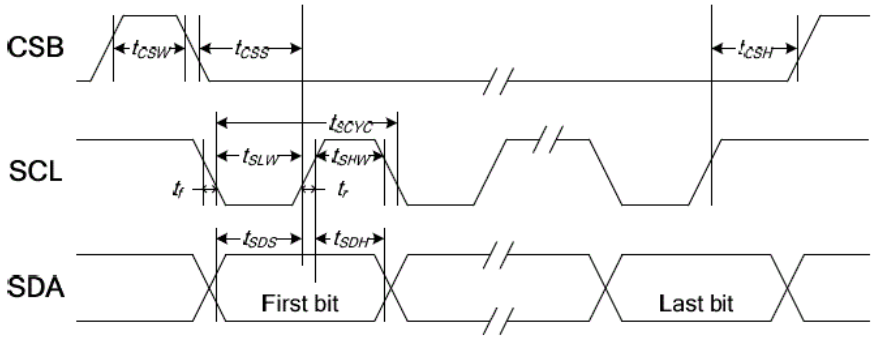
AGND = PGND =DGND = 0V, VDDA = VDDP= VDDI = 3.0 to 5.0V, Ta = 25℃

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCL	tSCYC		300	—	ns
SCL “H” pulse width		tSHW		150	—	
SCL “L” pulse width		tSLW		150	—	
Address setup time	A0	tSAS		150	—	
Address hold time		tSAH		150	—	
Data setup time	SDA	tSDS		120	—	
Data hold time		tSDH		120	—	
CSB-SCL time	CSB	tCSS		150	—	
CSB-SCL time		tCSH		150	—	
CSB “H” pulse width		tCSW		30	—	

Note:

1. The input signal rise and fall time (tr, tf) are specified at 15 ns or less.
2. All timing is specified using 20% and 80% of VDD1 as the standard.

System Bus Timing for 3-Line Serial Interface



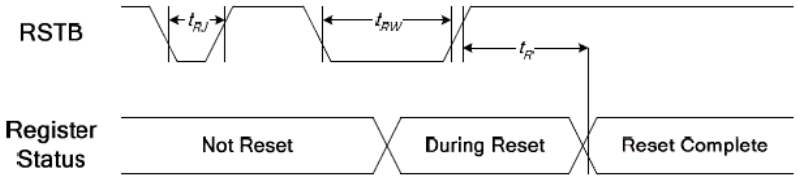
AGND = PGND =DGND = 0V, VDDA = VDDP= VDDI = 3.0 to 5.0V, Ta = 25℃

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial Clock Period	SCL	tSCYC		300	—	ns
SCL “H” pulse width		tSHW		150	—	
SCL “L” pulse width		tSLW		150	—	
Data setup time	SDA	tSDS		120	—	
Data hold time		tSDH		120	—	
CSB-SCL time	CSB	tCSS		150	—	
CSB-SCL time		tCSH		150	—	
CSB “H” pulse width		tCSW		30	—	

Note:

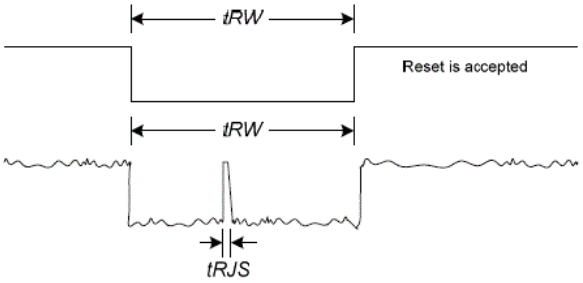
1. The input signal rise and fall time (tr, tf) are specified at 15 ns or less.
2. All timing is specified using 20% and 80% of VDD1 as the standard.

Hardware Reset Timing



AGND = PGND =DGND = 0V, VDDA = VDDP= VDDI = 3.0 to 5.0V, Ta = 25℃

Item	Signal	Symbol	Condition	Rating		Unit
				Min.	Max.	
Reset time	RSTB	tR		—	5 *1	us
Reset "L" pulse width		tRW		15	—	
Reset rejection		tRJ		—	5	
Reset rejection (for noise spike)		tRJS		—	10	ns

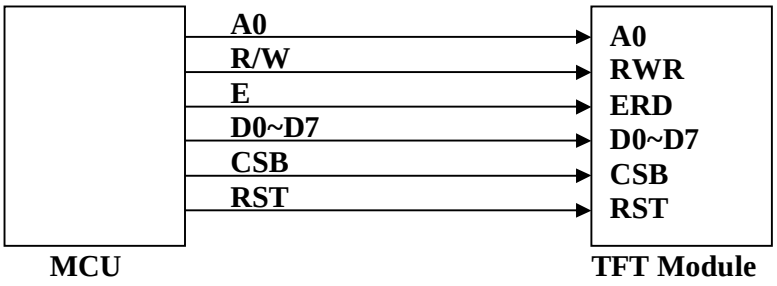


Note:

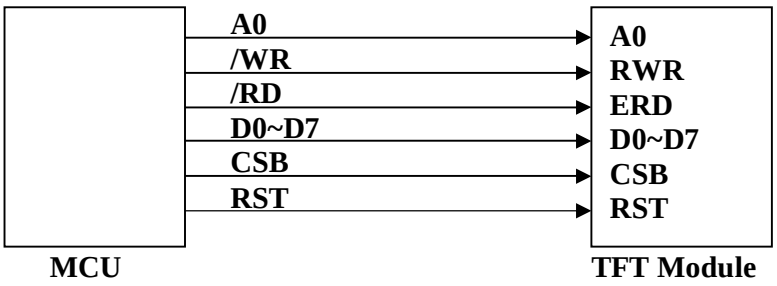
1. For PROM related operation, it takes 50ms at least for PROM Registers to load PROM contents. Do NOT use any PROM related command during this period.
2. When the system issues a RSTB LOW pulse, the reset procedure of IC will start if the LOW pulse is longer than tRW specified above. If the LOW pulse is less than tRJ specified above, the reset procedure of IC will not start. If the LOW pulse is longer than tRJ and less than tRW, the reset procedure of IC is not guaranteed.

9.2 Application Circuits

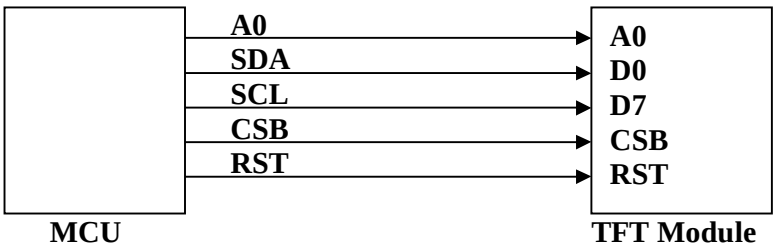
9.2.1 6800 – Series Parallel Interface



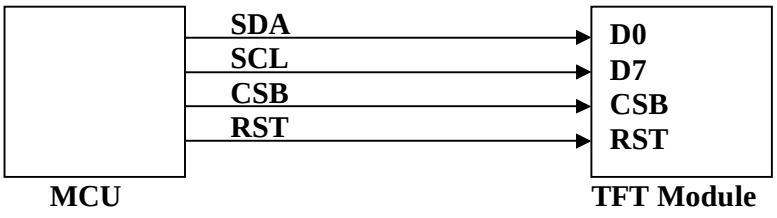
9.2.2 8080 – Series Parallel Interface



9.2.3 4-line Serial Interface



9.2.4 3-line Serial Interface



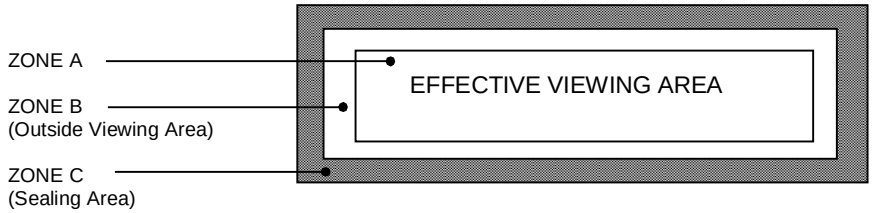
10.0 Instruction set

10.1 Initialization code for ST7511

```
Write(COMMAND, 0xAE);   // SWreset
Write(DATA, 0xA5);

Write(COMMAND, 0x61);   // all PWR on
Write(DATA, 0x0F);
Write(DATA, 0x04);
Write(DATA, 0x02);
Write(DATA, 0xA5);

Write(COMMAND, 0x62);   // Electronic Volumn Set 1
Write(DATA, 0x0A);      // VCOM[6:0] 0~127 => -0.4250-(0.0125xVCOM)
Write(DATA, 0x06);      // VGHREG[5:0] 0~63 => 1.5+(0.1x(VGHREG-1))***
Write(DATA, 0x0F);      // VGLREG[4:0] 0~31 => 2.4+(0.1xVGLREG)
Write(DATA, 0xA5);

Write(COMMAND, 0x63);   // Electronic Volumn Set 2
Write(DATA, 0x0F);      // GVDD[4:0] 0~31 => 3.1+(0.1xGVDD)
Write(DATA, 0x0F);      // GVCL[4:0] 0~31 => -3.1-(0.1xGVCL)
Write(DATA, 0xA5);
Write(DATA, 0xA5);

Write(COMMAND, 0x12);   // SLP out
Write(DATA, 0xA5);

Write(COMMAND, 0x15);   // display on
Write(DATA, 0xA5);

Write(COMMAND, 0x26);   // col. addr. setting
Write(DATA, 0x00);      // CSA[9:8]
Write(DATA, 0x00);      // CSA[7:0]
Write(DATA, 0x02);      // CEA[9:8]
Write(DATA, 0x7F);      // CEA[7:0]

Write(COMMAND, 0x25);   // page addr. setting
Write(DATA, 0x00);      // PSA[7:0]
Write(DATA, 0x9F);      // PEA[7:0] Max = 159
Write(DATA, 0x00);
Write(DATA, 0xA5);

Write(COMMAND, 0x2C);   // write data command
Write(DATA, 0xA5);
```

11.0 Quality Assurance

11.1 Zone Definition

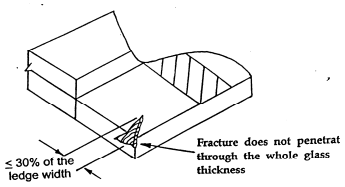


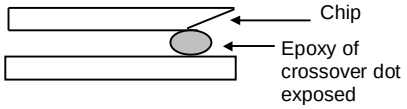
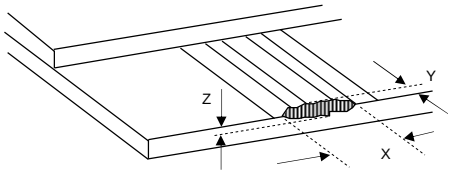
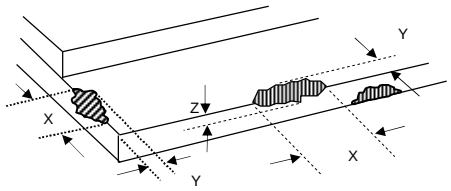
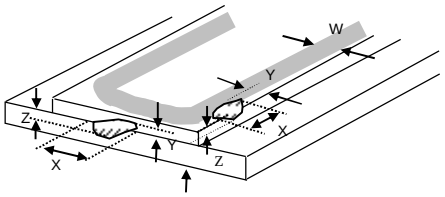
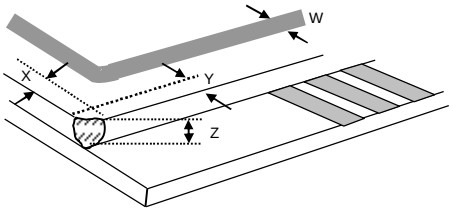
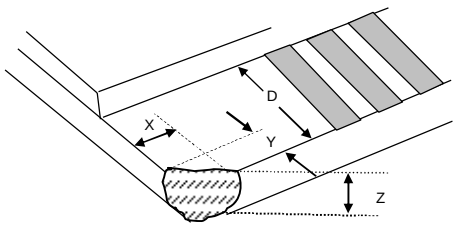
11.2 Rejection Criteria

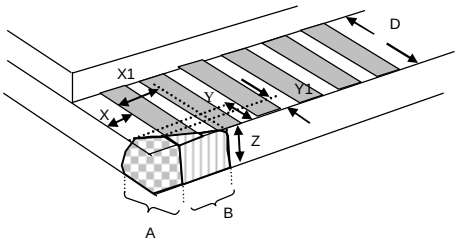
11.2.1 Dimensional Defects

Defect Category	Defect Description	Criterion	Drawing Specification
Glass Size	Dimensions of LCD, do not conform to the drawing	Reject	Refer to LCD Physical Dimension Drawing
Perimeter Seal Extension	Perimeter seal epoxy enters the effective viewing area	Reject	
End Seal Size	Size of end seal does not meet drawing specification	Reject	Refer to LCD Physical Dimension Drawing

11.2.2 Visual Defects

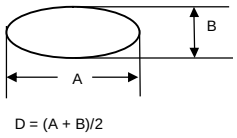
Defect Category	Defect Description	Criterion	Drawing Specification
Fracture	A type of glass breakage containing running cracks. Inspectors should attempt to remove it with fingernail. If removed, evaluate as chip	Reject – if the size is ≥ 30% of the contact ledge width.	

Defect Category	Defect Description	Criterion	Drawing Specification
Chip	Chip in cross over area	1) Reject - if the chip causes crossover dot to be exposed 2) Chip on outside edge of the glass plate but is greater than 50% of glass thickness at crossover dot is reject able.	
Chip	Chip in contact pad area	Accept if:- a) X ≤ 2.0mm b) Y ≤ 0.5mm c) Z disregard	
	Chip in non-contact pad area	Accept if:- a) X ≤ 6.0mm b) Y ≤ 1.0mm c) Z disregard	
	Chip in perimeter seal area	Accept if:- a) Y ≤ 1/3 of perimeter seal width (W) b) X ≤ 3.0mm c) Z disregard d) X and Y not touch crossover dot	
Corner Chip	Corner chip within seal area	Accept if:- a) X ≤ 1/3 of perimeter seal width (W) b) Y ≤ 1/3 of perimeter seal width (W) c) Z disregard	
	Corner chip not effecting contact pad / ITO	Accept if:- a) XY ≤ 4mm^2 AND b) Y ≤ D and X ≤ 2.0mm c) Z disregard	

Defect Category	Defect Description	Criterion	Drawing Specification
	Corner chip effecting contact pad / ITO	A) Accept if:- a) XY ≤ 4mm² AND b) Y ≤ D and X ≤ 2.0mm B) Accept if:- a) X1 ≤ 2.0mm b) Y1 ≤ 0.5mm Z disregard	
Glass flare	A thin layer of glass flare at contact area	Accept if:- a) Flare thickness ≤ ¼ W when W ≤ 3mm b) Flare thickness ≤ 1mm when W > 3mm W: Contact ledge width	
Glass burr	A rough edge(s) left along the scribing edge (i.e. along the edges of display)	Reject – if the burr cause undersize or oversize of the LCD	Refer to LCD Physical Dimension Drawing
Rainbow	Colored ring in sharp blotches observed	Reject – if 3 or more colored rings in sharp blotches of color are observed. (Limit samples should be used when applicable)	
Discoloration		Reject - if the discolorations enter the active viewing area of LCD. Color of the LCD shall follow product specification as specified in the manufacturing specification	
Air Void	LC does not fulfill the display	Reject	
Fill end contamination	Discoloration at end seal area	Reject if discoloration exceeded the baffle (for display with baffle) or viewing area (for display without baffle)	

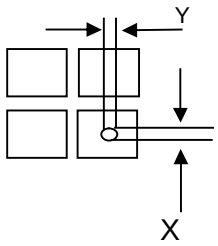
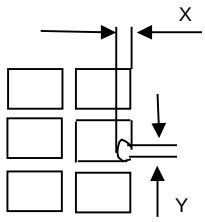
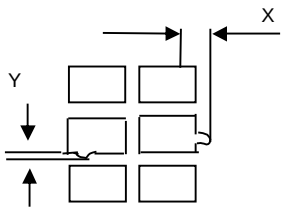
11.2.3 Polarizer Defects

<table>
<tr><th>Defect Category</th><th>Defect Description</th><th>Criterion</th><th>Drawing Specification</th></tr>
<tr><td rowspan="5">Polarizer defect</td><td>Polarizer coverage</td><td>1- Polarizer should cover effective viewing area of display.
2- It is acceptable if perimeter seal bolder at all sides could be seen.
3- It is acceptable if polarizer attaching position meeting the tolerance mentioned in the drawing.
4- It is reject able if polarizer edge jagged and not even</td><td>Refer to LCD Physical Dimension Drawing</td></tr>
<tr><td>Polarizer Peeling / delamination</td><td>1- Reject if any edge or corner of the polarizer is lifted up or not adheres to the glass</td><td></td></tr>
<tr><td>Polarizer Scratches</td><td>1- Any scratch should be acceptable if it is not visible from viewing distance at head of position
2-Polarizer scratch in viewing area is reject able if it is visible from the specified viewing distance
3-Defect, which is visible under surface glare, should be disregard</td><td></td></tr>
<tr><td>Polarizer damage</td><td>1-Stain mark or depression in front polarizer surface should be acceptable if it is not visible from viewing distance at head on position.
2-Defect, which is visible under surface glare, should be disregard</td><td></td></tr>
<tr><td>Polarizer bubble / Foreign material</td><td>
<table>
<tr><td rowspan="2">Zone / Dimension</td><td colspan="3">Acceptable No.</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>D ≤ 0.30mm</td><td>NC</td><td>NC</td><td rowspan="4">NC if the Polarizer not lifted up/ peel off</td></tr>
<tr><td>D ≤ 0.50mm</td><td>2</td><td>NC</td></tr>
<tr><td>0.50 < D ≤ 0.60mm</td><td>1</td><td>2</td></tr>
<tr><td>D > 0.60mm</td><td>0</td><td>0</td></tr>
</table>
NC: No count
D: Mean Diameter of Defect

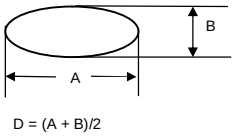
3 are the totally permissible numbers of bubble</td><td> 
</td></tr>
</table>

11.2.4 Electrical Test Defects

Defect Category	Defect Description	Criterion	Drawing Specification
Missing common	Part of the pattern does not light up	Reject	
Missing segment	One or few segment does not light up	Reject	
Common-common short	Common and common connected	Reject	

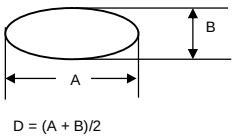
<table>
<tr><td>Segment-segment short</td><td>Segment and segment connected</td><td>Reject</td><td></td></tr>
<tr><td>Common – segment short</td><td>Common and segment connected</td><td>Reject</td><td></td></tr>
<tr><td>Wrong viewing angle</td><td>Wrong viewing angle</td><td>Reject if display viewing angle not conform to customer requirement</td><td></td></tr>
<tr><td>Metal residue</td><td>Extra spot lights up at the border of the segment.</td><td>Accept if ≤ 0.20mm (mean diameter)</td><td></td></tr>
<tr><td>Slow response</td><td>Response of the display on one side slower than the other side</td><td>Reject if it is visible at 30cm distance</td><td></td></tr>
<tr><td>Pin Hole</td><td>Pin hole / void at light up segment</td><td><table><tr><td>Zone / Dimension</td><td>Acceptable No.</td></tr><tr><td>Located inside single pixel/dot:- (X + Y)/2 ≤ 0.20mm</td><td>- 1 per pixel/dot
- 3 per display (Active Area)</td></tr><tr><td>Laid over the plural pixel/dots: (X + Y)/2 ≤ 0.20mm</td><td>- 1 per pixel/dot
- 3 per display (Active Area)</td></tr><tr><td colspan="2">(¾ or larger part of dot area has to be effective for display)</td></tr></table></td><td>  </td></tr>
<tr><td rowspan="2">Deformed display dot</td><td>Lacked deformation</td><td>Accept if:
i) X ≤ 0.15 and
ii) Y ≤ 0.15</td><td>  </td></tr>
<tr><td>Added deformation</td><td>Accept if:
i) X < 0.02 and
ii) Y < 0.02</td><td>  </td></tr>
<tr><td>Reverse twist/ tilt</td><td>Segment are darker or clearer than other area of the same segment</td><td>Reject</td><td></td></tr>
<tr><td>Misalignment</td><td>Segment fatter or smaller or extra segment</td><td>Reject if > 10% of designed segment width and visible at 30cm distance</td><td></td></tr>
<tr><td>Segment Smearing</td><td>Light up segment smear</td><td>Reject</td><td></td></tr>
<tr><td>Dim segment</td><td>Display shows poor contrast at pre set voltage</td><td>Reject</td><td></td></tr>
</table>

11.2.5 Black Spot, White Spot and Foreign Material (Solid Figure)

Defect Category	Defect Description	Criterion				Drawing Specification
Black Spot, White Spot and Foreign Material	Black Spot, White Spot and Foreign Material	Zone / Dimension	Acceptable No.			
			A	B	C	
		D ≤ 0.10mm	NC	NC	NC	
		0.10<D ≤ 0.15mm	3	3	NC	
		0.15 < D ≤ 0.25mm	1	2	NC	
		0.25 < D ≤ 0.35mm	1	1	NC	
		D > 0.35 mm	0	0	NC	
		NC: No count D: Mean Diameter of Defect				

*Note: The 1/3 or larger parts of individual dot has to be lighted on.
The solid figure is that the defect has clear-cut outline at the optimum driving condition in both positive and negative, of which size does not change when the contrast changes.

11.2.6 Black Spot, White Spot and Foreign Material (Faded Figure)

Defect Category	Defect Description	Criterion				Drawing Specification
Black Spot, White Spot and Foreign Material	Black Spot, White Spot and Foreign Material	Zone / Dimension	Acceptable No.			
			A	B	C	
		D ≤ 0.60mm	NC	NC	NC	
		0.60<D ≤ 0.70mm	3		NC	
		0.70 < D ≤ 0.80mm	1		NC	
		D > 0.80 mm	0		NC	
		NC: No count D: Mean Diameter of Defect				

*Note: Faded figure means that the defects has unclear outline at the optimum driving condition in both positive and negative, of which size seems to change when the contrast changes.

11.2.7 Line Shape and Scratches

Defect Category	Defect Description	Criterion					Drawing Specification
Line shape and scratches	Line shape and scratches						
		Zone /Dimension		Acceptable No.			
		X	Y	A	B	C	
		NC	≤ 0.03mm	NC	NC	NC	
		≤ 2 mm	≤ 0.05mm	1	1	NC	
		≤ 1 mm	≤ 0.10mm	1	2	NC	
		NC	≥ 0.10mm	Due to (1) round defect			

*Note: Length is X and Width is Y.

REMARK:

i) Total amount of spot defects including round and linear – A total of 5 permissible numbers of defects in Zone A & B including above (12.2.5), (12.2.6), (12.2.7). Regardless of number of defects, the minimum distance between individual defects have to be 5mm or larger.

ii) All the other items of inspection that are not included herein must be determined by the “Limit Standard” sample, which were occasionally set up with the mutual consent of both parties. In every case of the items set up with the Limit Standard, the Limit Standard always takes precedence over the other means of definition.

12.0 Precaution for using LCM

1. Liquid Crystal Display (LCD)

LCD is made up of glass, organic sealant, organic fluid and polymer based polarizers. The following precautions should be taken when handling.

a) Keep the temperature within the range of use and storage. Excessive temperature and humidity could cause polarization degredation, polarizer peel off or bubble.
b) Do not contact the exposed polarizer with anything harder than HB pencil lead. To clean dust off the display surface, wipe gently with cotton, chamois or other soft material soaked in petroleum benzin.
c) Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause polarizer deformation or colour fading, while an active LCD with water condensation on its surface will cause corrosion of ITO electrodes.
d) Glass can be easily chipped or cracked from rough handling, especially at corners and edges.
e) Do not drive LCD with DC voltage.

2. Liquid Crystal Display Modules.

2.1 Mechanical Considerations

LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modification. The following should be noted.

a) Do not tamper in any way with the tabs on the metal frame.
b) Do not modify the PCB by drilling extra holes, changing its outline, moving its component or modifying its pattern.
c) Do not touch the elastomer connector, especially insert a backlight panel (for example, EL)
d) When mounting a LCM make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
e) Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.

2.2 Static Electricity

LCM contains CMOS LSI's and the same precaution for such devices should apply, namely

a) The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.
b) The modules should be kept in antistatic bags or other containers to static for storage.
c) Only properly grounded soldering irons should be used.
d) If an electric screwdriver is used, it should be well grounded and shielded from commutator spark.
e) The normal static prevention measures should be observed for work clothes and working benches, the latter conductive (rubber) mat is recommended.
f) Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

2.3 Soldering

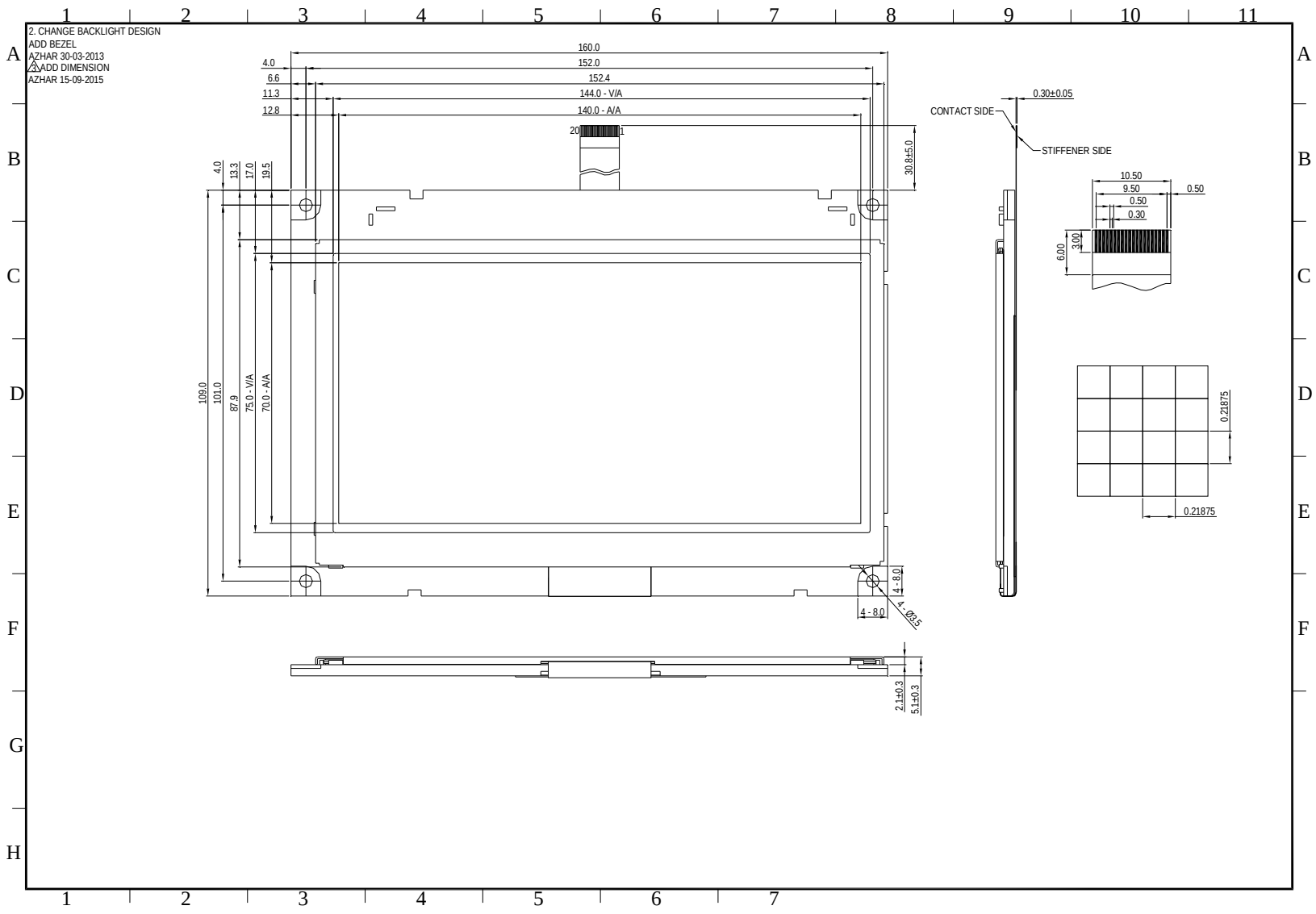
a) Solder only to the I/O terminals.
b) Use only soldering irons with proper grounding and no leakage.
c) Soldering temperature: 280 °C
d) Soldering time: 3 to 4 sec
e) Use eutectic solder with resin flux fill.
f) If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed afterwards.

2.4 Operation

a) The contras can be adjusted by varying the LCD driving voltage V0
b) Driving voltage should be kept within specified range, excess voltage shortens display life.
c) Response time increases with decrease in temperature.
d) Display may turn black or dark blue at temperature above its operational range, this is (however not pressing on the viewing area) may cause the segments to appear “fractured”.
e) Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear “fractured”.

2.5 Storage

If any fluid leaks out of the damage glass cell, wash off any human part that comes into contact with soap and water. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all the time.


2. CHANGE BACKLIGHT DESIGN
ADD BEZEL
AZHAR 30-03-2013
2 ADD DIMENSION
AZHAR 15-09-2015
160.0
152.0
152.4
144.0 - V/A
140.0 - A/A
4.0
6.6
11.3
12.8
20
1
30.8±5.0
4.0
13.3
17.0
19.5
109.0
101.0
87.9
75.0 - V/A
70.0 - A/A
4 - 8.0
4 - 8.0
4 - Ø3.5
2.1±0.3
5.1±0.3
CONTACT SIDE
STIFFENER SIDE
0.30±0.05
10.50
9.50
0.50
0.50
0.30
6.00
3.00
0.21875
0.21875