Crystal Clear Technology

Product Specification

G1225x02 series

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1.0 Table of Contents

2.0 Record of revision

Rev	Date	Item	Page	Comment	Originator	Checked By
1.0	30/09/08			Initial Release	Syam	Azhar
2.0	31/10/08	5.0	4	Vdd values update 3.0V typ and 3.3V max.	Syam	Azhar
		9.2.4	13	Figure error. Corrected from IF1, IF2, IF3 tie to high (Vdd), changed to all tie to low (Vss).		

3.0 General specification

Display format: Graphics 255 (w) x 128 (h) dots

Dot size: 0.28 (w) x 0.28 (h) mm

Dot pitch: 0.30 (w) x 0.30 (h) mm

View area: 82.0 (w) x 43.0 (h) mm

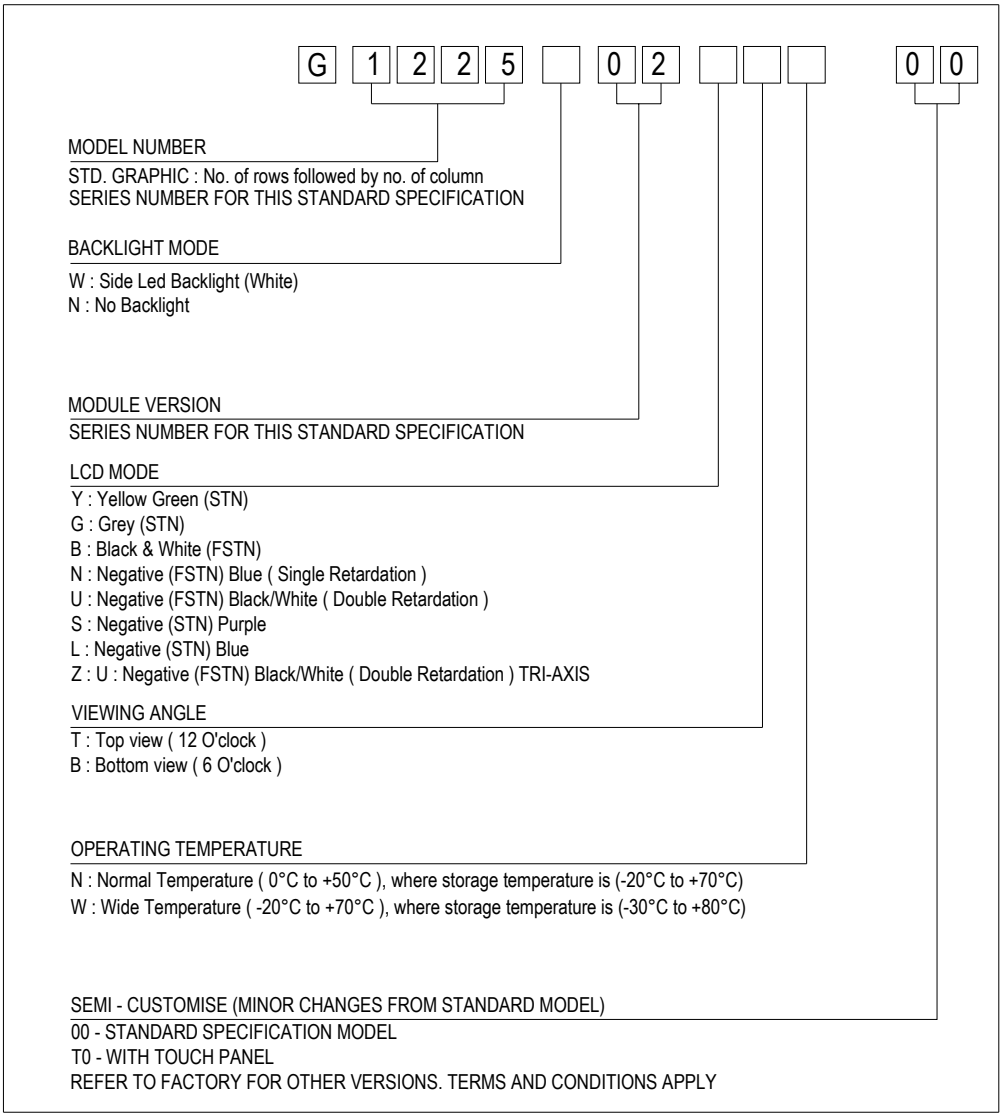
Active area: 76.48 (w) x 38.38 (h) mm

General dimensions: 110.7 (w) x 63.2 (h) x 6.1 (t) mm

Controller/Driver: ST7529 or equivalent

Interface: Parallel/Serial

Driving method: 1/144 duty, 1/11 bias



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

NO	ITEM	SIMBOL	MIN	MAX	UNIT
1.	Operating Voltage Range	V_{DD}	-0.5	5.0	V
		V_{DDA}	-0.5	5.0	
2.	Operating Temperature	T_{op}	Refer page 3		°C
3.	Storage Temperature	T_{st}	Refer page 3		°C

5.0 Electrical characteristics

NO	ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
1.	Operating Voltage	V_{DD}	-	-	3.0	3.3	V
		V_{DDA}					
2.	Power Supply voltage (V_{LCD})		25°C	14.5±5%			V
3.	Current Supply	I_{DD}	V_{DD} = 3.3V	-	3.2	-	mA

5.1 Backlight Options

NO	COLOR	FORWARD VOLTAGE (V)			FORWARD CURRENT (mA)			MIN BRIGHTNESS (cd/m2) *
		Min	Typ.	Max	Min	Typ.	Max	
1.	White	-	4.0	-	-	75	100	250

*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 = 20K hrs

6.0 Environmental requirements

NO	ITEM	CONDITION
1.	Operating Temperature	Refer page 3
2.	Storage Temperature	Refer page 3
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 on LCD has the possibility to be changed in different temperature range.

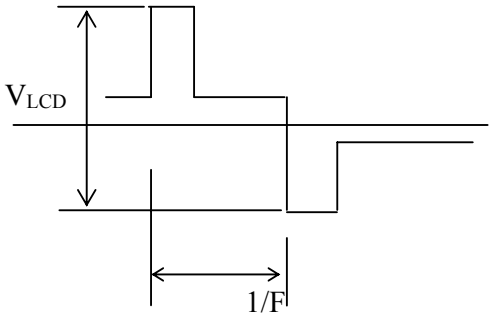
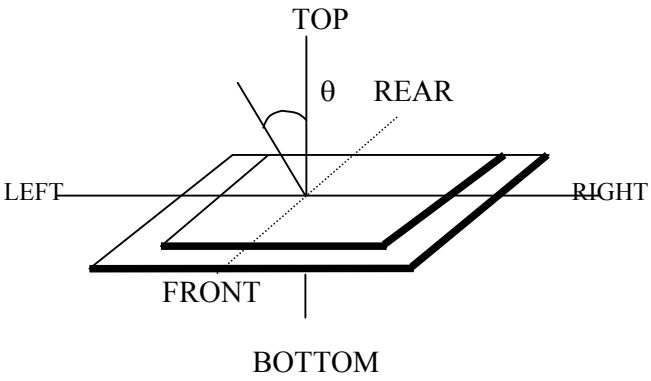
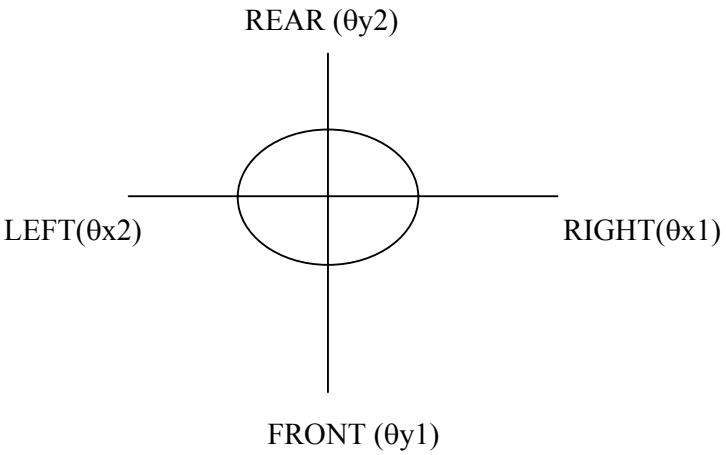
7.0 LCD specification

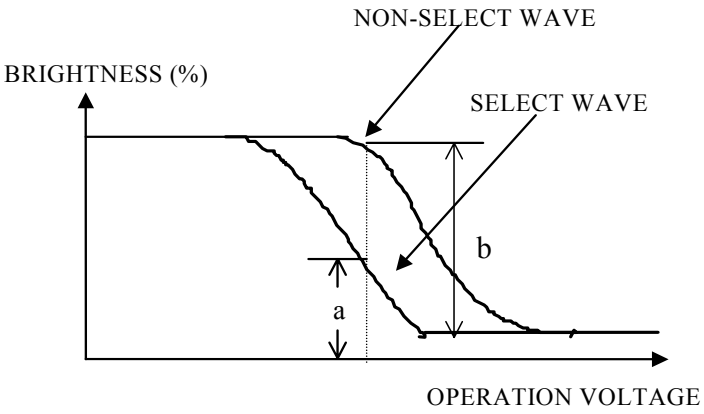
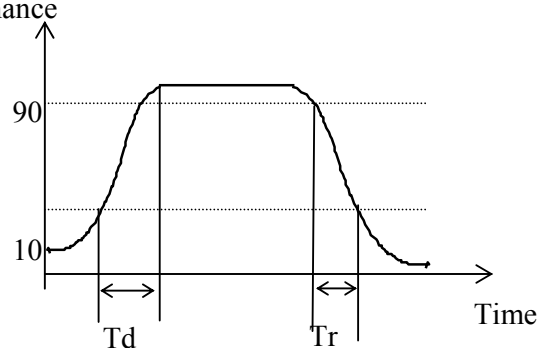
7.1 Electro-optical characteristics (at ambient temperature = 25°C)

NO	ITEM	SYMBOL	CONDITION	LCD TYPE							REF.
				STN YG	STN GREY	STN -VE BLUE/ PURPLE	FSTN +VE B/W	FSTN –VE BLUE	FSTN -VE TRUE B/W	FSTN -VE TRI AXIS	
1	Operating Voltage (Volt)	V_{LCD}	θ = 0 Cr = max	14.5 ± 5%							7.1.1
2	Viewing Angle (Deg)	θ x 1	CR ≥ 2 V_{LCD} = 14.7V	+20	+15	+35	+20	+35	+30	+40	7.1.2
		θ x 2		-20	-15	-35	-20	-35	-35	-40	
		θ y 1		-25	-20	-30	-25	-30	-30	-50	
		θ y 2		+25	+20	+30	+25	+30	+30	+30	
3	Contrast Ratio	CR	$\theta = 0^0$ V_{LCD} =14.7V	2.5	2.0	5.5	2.5	5.5	15	15	7.1.3
4	Response Time (msec)	Rise Time (Tr)	$\theta = 0^0$	400							7.1.4
		Decay Time (Td)	$\theta = 0^0$	400							

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***	 

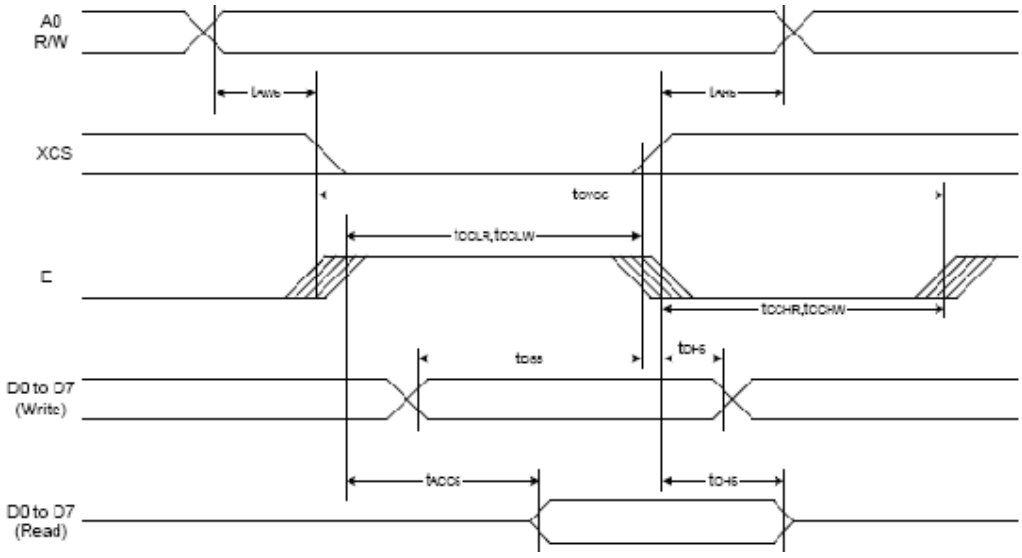
7.1.3	***Definition of Contrast Ratio***	 Contrast Ratio = Brightness of non-selected state (b) / Brightness of selected state (a) ***Conditions*** (a) Operating Voltage: V_{LCD} (b) Temperature: 25°C (c) Viewing Angle, $\theta = 0^{o}$
7.1.4	*Response Time*	Luminance (%)  Tr: Measured between 10% and 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***	ST7529 OR EQUIVALENT	
8.2	**Pin No**	**Symbol**	**Description**
	1	V0	LCD driving voltage
	2	V1	LCD driving voltage
	3	V2	LCD driving voltage
	4	V3	LCD driving voltage
	5	V4	LCD driving voltage
	6	VLCD	LCD driving voltage
	7	C6P	Positive connection for capacitor 6
	8	C4P	Positive connection for capacitor 4
	9	C2N	Negative connection for capacitor 2
	10	C2P	Positive connection for capacitor 2
	11	C1P	Positive connection for capacitor 1
	12	C1N	Negative connection for capacitor 1
	13	C3P	Positive connection for capacitor 3
	14	C5P	Positive connection for capacitor 5
	15	VDDA	Internal generator supply
	16	VSS	Ground
	17	VSS	Ground
	18	VDD	Logic supply voltage
	19	XCS	Chip select input pin
	20	SCL	Serial clock input pin
	21	SI	Serial data input pin
	22	IF3	Interface mode selection
	23	IF2	Interface mode selection
	24	IF1	Interface mode selection
	25	RST	Reset input active low
	26	ERD	R/W : 68000 Series Parallel Interface Read & Write Control Input RD : 8080 Series Parallel Interface Read Enable Clock Input
	27	D7	8 bit bi-directional data bus
	28	D6	8 bit bi-directional data bus
	29	D5	8 bit bi-directional data bus
	30	D4	8 bit bi-directional data bus
	31	D3	8 bit bi-directional data bus
	32	D2	8 bit bi-directional data bus
	33	D1	8 bit bi-directional data bus
	34	D0	8 bit bi-directional data bus
	35	EWR	R/W : 68000 Series Parallel Interface Read & Write Control Input RD : 8080 Series Parallel Interface Write Enable Clock Input
	36	A0	Register select input pin

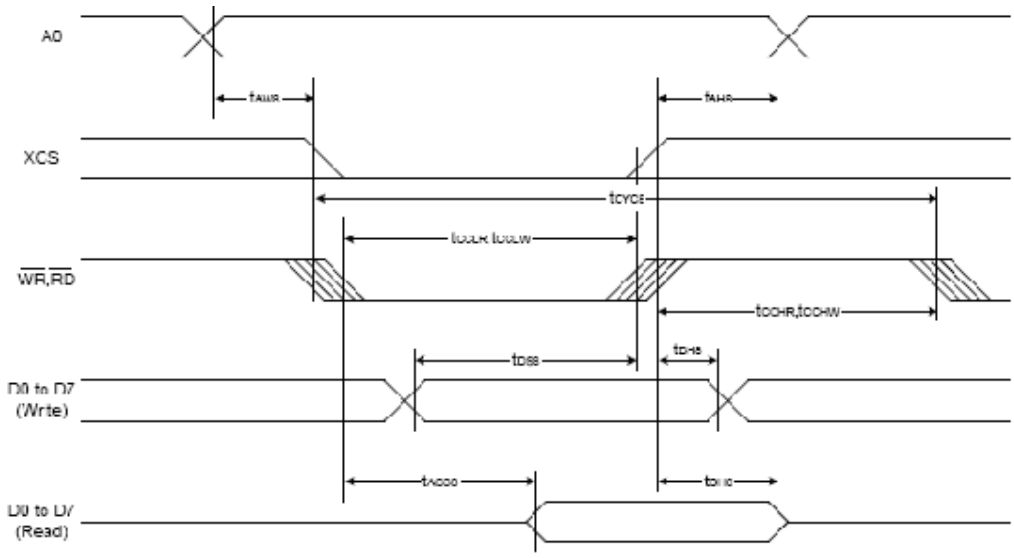
9.0 Functional Descriptions

9.1 Read/Write timing characteristics



Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH6	-	20	-	ns
Address setup time		tAW6	-	20	-	
System cycle time		tCYC6	-	400	-	
Enable L pulse width (WRITE)	WR	tEWLW	-	200	-	
Enable H pulse width (WRITE)		tEWHW	-	200	-	
Enable L pulse width (READ)	RD	tEWLR	-	200	-	
Enable H pulse width (READ)		tEWHR	-	200	-	
WRITE Data setup time	D0 to D7	tDS6	-	200	-	
WRITE Address hold time		tDH6	-	20	-	
READ access time		tACC6	CL = 100 pF	-	40	
READ Output disable time		tOH6	CL = 100 pF	-	30	

Read/Write characteristics (6800 series MPU)



Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH8	-	20	-	ns
Address setup time		tAW8	-	20	-	
System cycle time		tCYC8	-	400	-	
Enable L pulse width (WRITE)	WR	tCCLW	-	200	-	
Enable H pulse width (WRITE)		tCCHW	-	200	-	
Enable L pulse width (READ)	RD	tCCLR	-	200	-	
Enable H pulse width (READ)		tCCHR	-	200	-	
WRITE Data setup time	D0 to D7	tDS8	-	200	-	
WRITE Address hold time		tDH8	-	20	-	
READ access time		tACC8	CL = 100 pF	-	40	
READ Output disable time		tOH8	CL = 100 pF	-	30	

Read/Write characteristics (8080 series MPU)

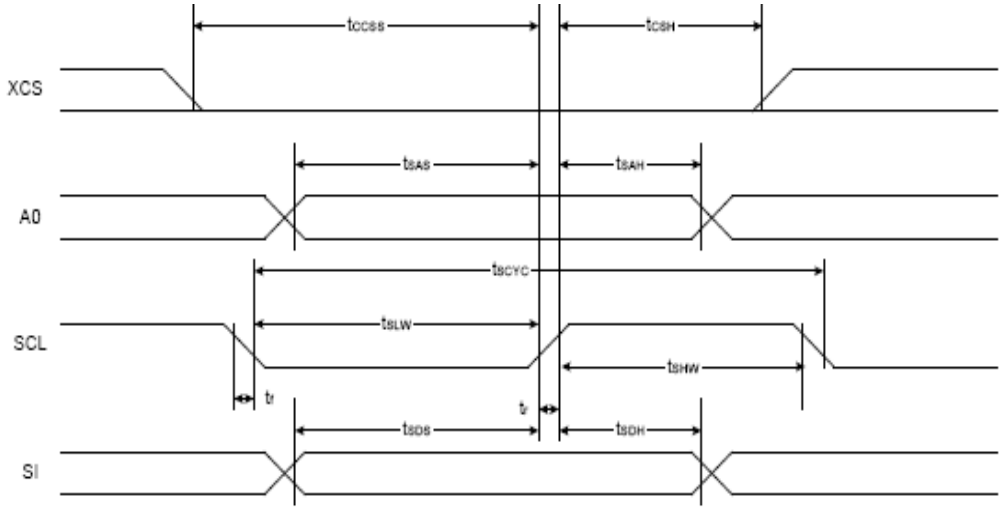


Fig 41.

(V_{DD}=3.3V,Ta= –30 to 85°C,Die)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC	-	100	-	ns
SCL "H" pulse width		tSHW	-	50	-	
SCL "L" pulse width		tSLW	-	50	-	
Address setup time	A0	tSAS	-	40	-	
Address hold time		tSAH	-	30	-	
Data setup time	SI	tSDS	-	30	-	
Data hold time		tSDH	-	30	-	
CS-SCL time	XCS	tCSS	-	20	-	
CS-SCL time		tCSH	-	50	-	

Read/Write characteristics (Serial Interface 4 Line)

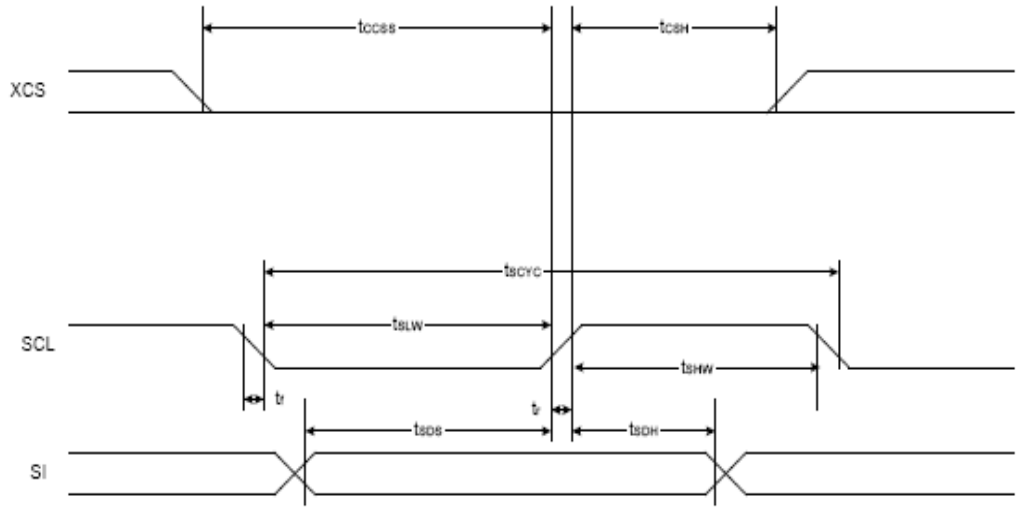


Fig 42.

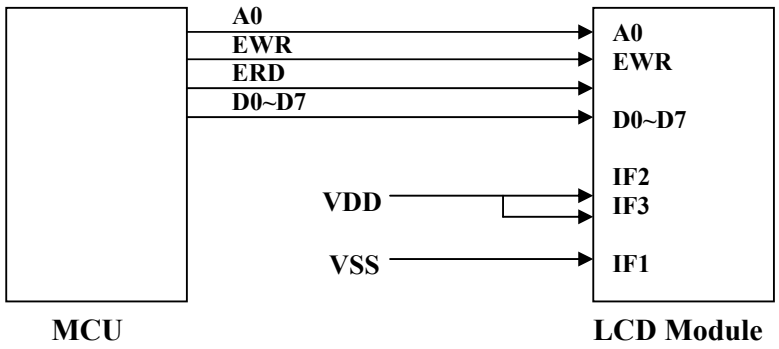
(V_{DD}=3.3V,Ta= –30 to 85°C,Die)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC	-	100	-	ns
SCL "H" pulse width		tSHW	-	50	-	
SCL "L" pulse width		tSLW	-	50	-	
Data setup time	SI	tSDS	-	30	-	
Data hold time		tSDH	-	30	-	
CS-SCL time	XCS	tCSS	-	20	-	
CS-SCL time		tCSH	-	50	-	

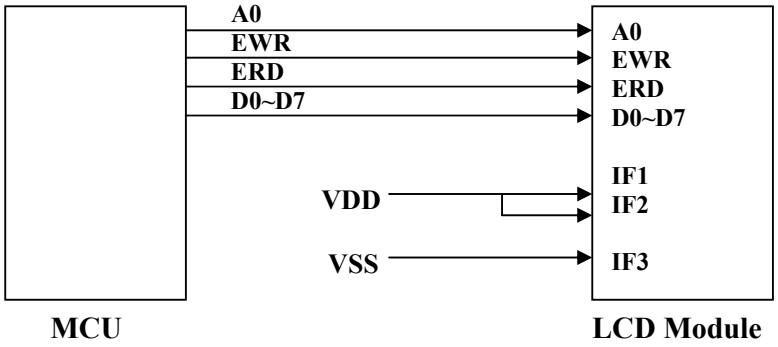
Read/Write characteristics (Serial Interface 3 Line)

9.2 Application Circuits

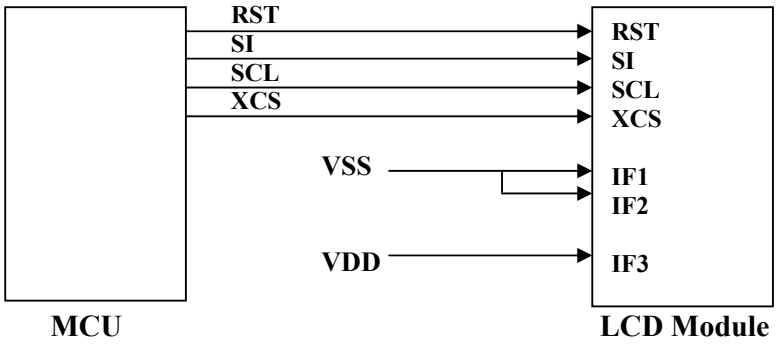
9.2.1 6800 – Series Parallel Interface



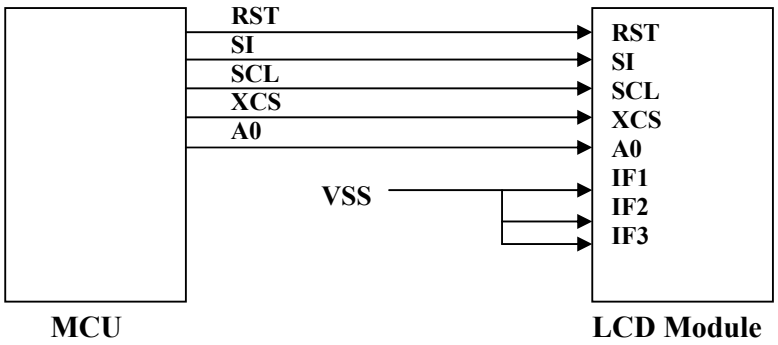
9.2.2 8080 – Series Parallel Interface



9.2.3 3 Lines Serial Interface



9.2.4 4 Lines Serial Interface



10. Instruction set

Ext=0 or Ext=1

Index	Command	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function	Hex	Parameter
1	Ext In	0	1	0	0	0	1	1	0	0	0	0	Ext=0 Set	30	None
2	Ext Out	0	1	0	0	0	1	1	0	0	0	1	Ext=1 Set	31	None

Ext=0

Index	Command	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function	Hex	Parameter
1	DISON	0	1	0	1	0	1	0	1	1	1	1	Display On	AF	None
2	DISOFF	0	1	0	1	0	1	0	1	1	1	0	Display Off	AE	None
3	DISNOR	0	1	0	1	0	1	0	0	1	1	0	Norma Display	A6	None
4	DISINV	0	1	0	1	0	1	0	0	1	1	1	Inverse Display	A7	None
5	COMSCN	0	1	0	1	0	1	1	1	0	1	1	COM Scan Direction	BB	1 byte
6	DISCTRL	0	1	0	1	1	0	0	1	0	1	0	Display Control	CA	3 bytes
7	SLPIN	0	1	0	1	0	0	1	0	1	0	1	Sleep In	95	None
8	SLPOUT	0	1	0	1	0	0	1	0	1	0	0	Sleep Out	94	None
9	LASET	0	1	0	0	1	1	1	0	1	0	1	Line Address Set	75	2 bytes
10	CASET	0	1	0	0	0	0	1	0	1	0	1	Column Address Set	15	2 bytes
11	DATSDR	0	1	0	1	0	1	1	1	1	0	0	Data Scan Direction	BC	3 bytes
12	RAMWR	0	1	0	0	1	0	1	1	1	0	0	Writing to Memory	5C	Data
13	RAMRD	0	1	0	0	1	0	1	1	1	0	1	Reading from Memory	5D	Data
14	PTLIN	0	1	0	1	0	1	0	1	0	0	0	Partial display in	A8	2 bytes
15	PTLOUT	0	1	0	1	0	1	0	1	0	0	1	Partial display out	A9	None
16	RMWIN	0	1	0	1	1	1	0	0	0	0	0	Read and Modify Write	E0	None
17	RMWOUT	0	1	0	1	1	1	0	1	1	1	0	RMW end	EE	None
18	ASCSET	0	1	0	1	0	1	0	1	0	1	0	Area Scroll Set	AA	4 bytes
19	SCSTART	0	1	0	1	0	1	0	1	0	1	1	Scroll Start Set	AB	1 byte
20	OSCON	0	1	0	1	1	0	1	0	0	0	1	Internal OSC on	D1	None
21	OSCOFF	0	1	0	1	1	0	1	0	0	1	0	Internal OSC off	D2	None
22	PWRCTRL	0	1	0	0	0	1	0	0	0	0	0	Power Control	20	1 byte
23	VOLCTRL	0	1	0	1	0	0	0	0	0	0	1	EC control	81	2 bytes
24	VOLUP	0	1	0	1	1	0	1	0	1	1	0	EC increase 1	D6	None
25	VOLDOWN	0	1	0	1	1	0	1	0	1	1	1	EC decrease 1	D7	None
26	RESERVED	0	1	0	1	0	0	0	0	0	1	0	Not Use	82	0
27	EPSRRD1	0	1	0	0	1	1	1	1	1	0	0	READ Register1	7C	None

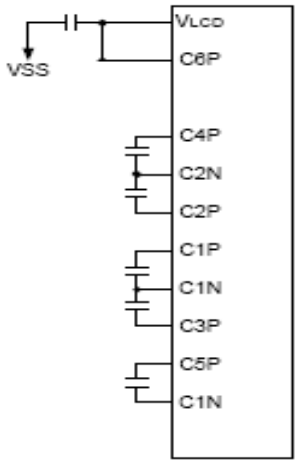
28	EPSRRD2	0	1	0	0	1	1	1	1	1	0	1	READ Register2	7D	None
29	NOP	0	1	0	0	0	1	0	0	1	0	1	NOP Instruction	25	None
30	STRFAD	0	0	1	Read Data								Status Read		
31	EPINT	0	1	0	0	0	0	0	0	1	1	1	Initia code(1)	07	1 byte

Ext=1

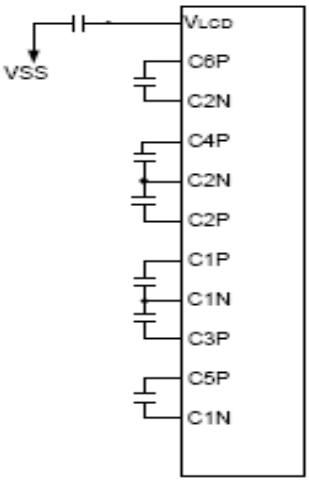
Index	*Command*	*A0*	*RD*	*WR*	*D7*	*D6*	*D5*	*D4*	*D3*	*D2*	*D1*	*D0*	*Function*	*Hex*	*Parameter*
1	Gray 1 Set	0	1	0	0	0	1	0	0	0	0	0	FRAME 1 Gray PWM Set	20	16 bytes
2	Gray 2 Set	0	1	0	0	0	1	0	0	0	0	1	FRAME 2 Gray PWM Set	21	16 bytes
3	Wt. Set	0	1	0	0	0	1	0	0	0	1	0	Weight Set	22	3 bytes
4	ANASET	0	1	0	0	0	1	1	0	0	1	0	Analog Circuit Set	32	3 bytes
5	DITHOFF	0	1	0	0	0	1	1	0	1	0	0	Dithering Circuit Off	34	None
6	DITHON	0	1	0	0	0	1	1	0	1	0	1	Dithering Circuit On	35	None
7	EPCTIN	0	1	0	1	1	0	0	1	1	0	1	Control EEPROM	CD	1 byte
8	EPCOUT	0	1	0	1	1	0	0	1	1	0	0	Cancel EEPROM	CC	None
9	EPMWR	0	1	0	1	1	1	1	1	1	0	0	Write to EEPROM	FC	None
10	EPMRD	0	1	0	1	1	1	1	1	1	0	1	Read from EEPROM	FD	None

11. Power Supply

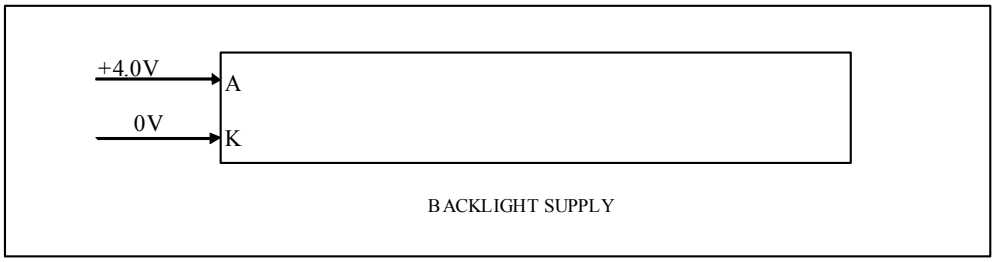
11.1 6x Boosting



11.2 7x Boosting

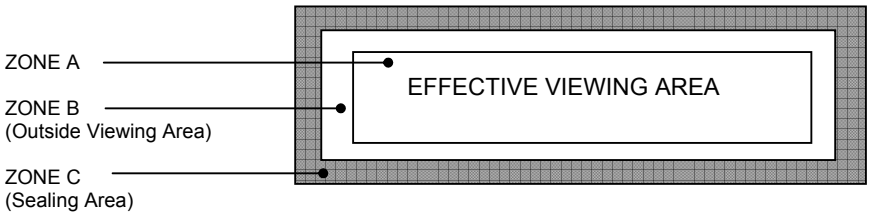


Cap = 1.0 uF to 2.2 uF



12.0 Quality Assurance

12.1 ZONE DEFINITION

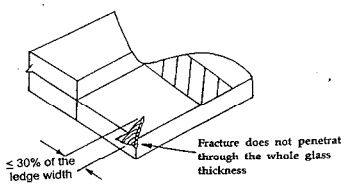


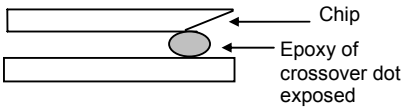
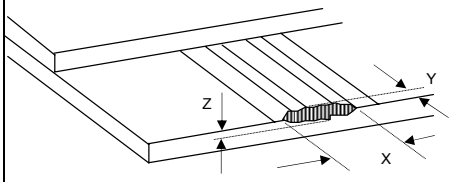
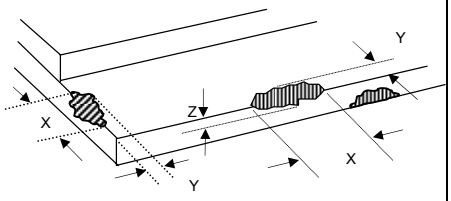
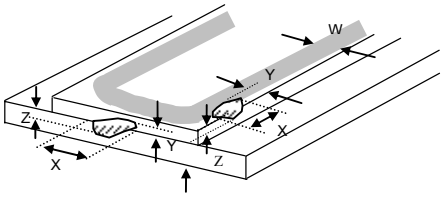
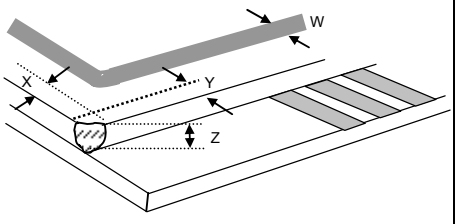
12.2 REJECTION CRITERIA

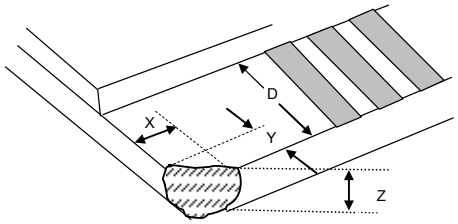
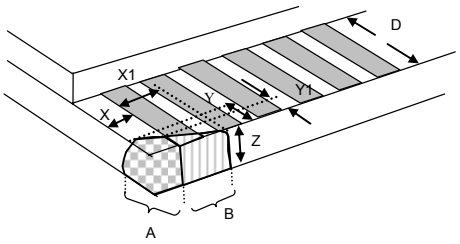
12.2.1 DIMENSIONAL DEFECTS

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

12.2.2 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 $\geq$ 30% of the contact ledge width.	

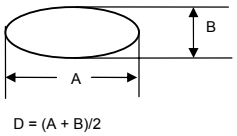
Defect Category	Defect Description	Criterion	Drawing Specification
Chip	Chip in cross over area	1) Reject - if the chip causes crossover dot to be exposed 2) Chip on outside edge of the glass plate but is greater than 50% of glass thickness at crossover dot is reject able.	
Chip	Chip in contact pad area	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	

Defect Category	Defect Description	Criterion	Drawing Specification
	Corner chip not effecting contact pad / ITO	Accept if:- a) XY ≤ 4mm^2 AND b) Y ≤ D and X ≤ 2.0mm c) Z disregard	
	Corner chip effecting contact pad / ITO	A) Accept if:- a) XY ≤ 4mm^2 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)	

Defect Category	Defect Description	Criterion	Drawing Specification
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)	

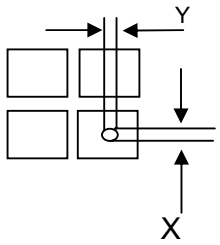
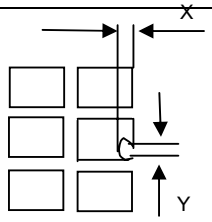
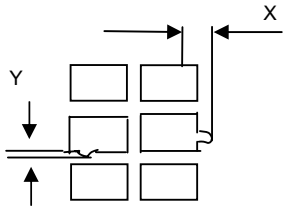
12.2.3 POLARIZER DEFECTS

Defect Category	Defect Description	Criterion	Drawing Specification
Polarizer defect	Polarizer coverage	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	Refer to LCD Physical Dimension Drawing
	Polarizer Peeling / delamination	1- Reject if any edge or corner of the polarizer is lifted up or not adheres to the glass	
	Polarizer Scratches	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	

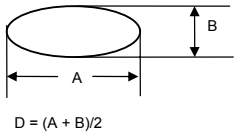
<table>
<tr><th>Defect Category</th><th>Defect Description</th><th>Criterion</th><th>Drawing Specification</th></tr>
<tr><td></td><td>Polarizer damage</td><td>1-Stain mark or depression in front polarizer surface should be acceptable if it is not visible from viewing distance at head on position.
2-Defect, which is visible under surface glare, should be disregard</td><td></td></tr>
<tr><td></td><td>Polarizer bubble / Foreign material</td><td>
<table>
<tr><td>Zone / Dimension</td><td colspan="3">Acceptable No.</td></tr>
<tr><td></td><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>

12.2.4 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	
Segment-segment short	Segment and segment connected	Reject	
Common – segment short	Common and segment connected	Reject	
Wrong viewing angle	Wrong viewing angle	Reject if display viewing angle not conform to customer requirement	
Metal residue	Extra spot lights up at the border of the segment.	Accept if ≤ 0.20mm (mean diameter)	
Slow response	Response of the display on one side slower than the other side	Reject if it is visible at 30cm distance	

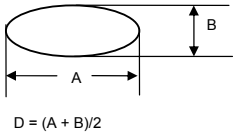
<table>
<tr><th>Defect Category</th><th>Defect Description</th><th>Criterion</th><th>Drawing Specification</th></tr>
<tr><td>Pin Hole</td><td>Pin hole / void at light up segment</td><td>
<table>
<tr><td>Zone / Dimension</td><td>Acceptable No.</td></tr>
<tr><td>Located inside single pixel/dot:- (X + Y)/2 ≤ 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>

12.2.5 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.

12.2.6 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.

12.2.7 LINE SHAPE AND SCRATCHES

<table>
<tr><th>Defect Category</th><th>Defect Description</th><th>Criterion</th><th>Drawing Specification</th></tr>
<tr><td>Line shape and scratches</td><td>Line shape and scratches</td><td>
<table>
<tr><td colspan="2">Zone /Dimension</td><td colspan="3">Acceptable No.</td></tr>
<tr><td>X</td><td>Y</td><td>A</td><td>B</td><td>C</td></tr>
<tr><td>NC</td><td>≤ 0.03mm</td><td>NC</td><td>NC</td><td>NC</td></tr>
<tr><td>≤ 2 mm</td><td>≤ 0.05mm</td><td>1</td><td>1</td><td>NC</td></tr>
<tr><td>≤ 1 mm</td><td>≤ 0.10mm</td><td>1</td><td>2</td><td>NC</td></tr>
<tr><td>NC</td><td>≥ 0.10mm</td><td colspan="3">Due to (1) round defect</td></tr>
</table>
</td><td></td></tr>
</table>

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.

13. 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.

b) Keep the temperature within the range of use and storage. Excessive temperature and humidity could cause polarization degredation, polarizer peel off or bubble.

c) 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.

d) 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.

e) Glass can be easily chipped or cracked from rough handling, especially at corners and edges.

f) 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.

a) 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

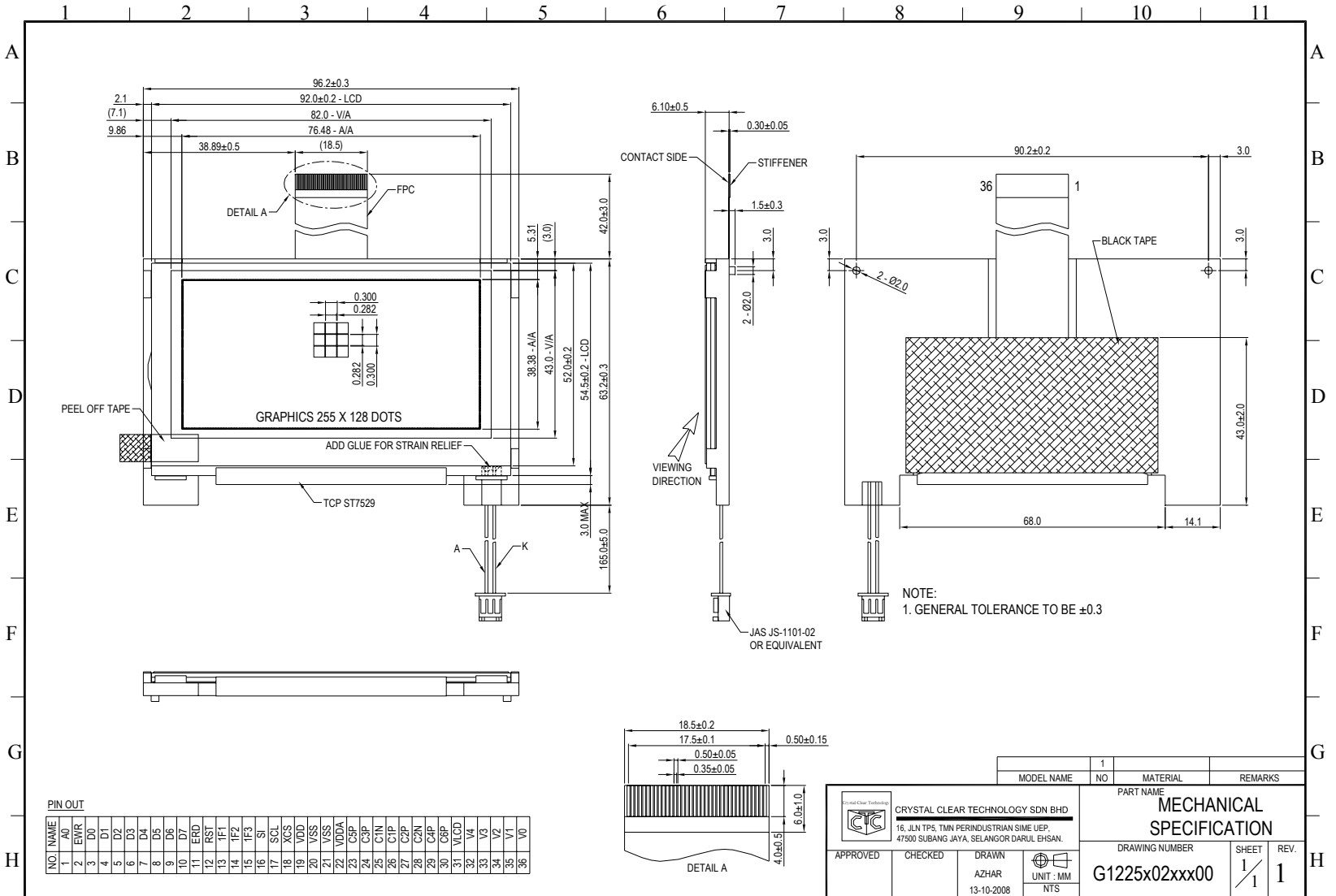
a) The contras can be adjusted by varying the LCD driving voltage V0
b) Driving voltage should be kept within specified range, excess voltage shortens display life.
c) Response time increases with decrease in temperature.
d) Display may turn black or dark blue at temperature above its operational range, 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.

2.6 Limited Warranty

Unless otherwise agreed between Crystal Clear Technology and customer, Crystal Clear Technology will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with Crystal Clear Technology acceptance standards, for a period of one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of Crystal Clear Technology is limited to repair and/or replacement on the terms set forth above. Crystal Clear Technology will not responsible for any subsequent or consequential events.



PIN OUT

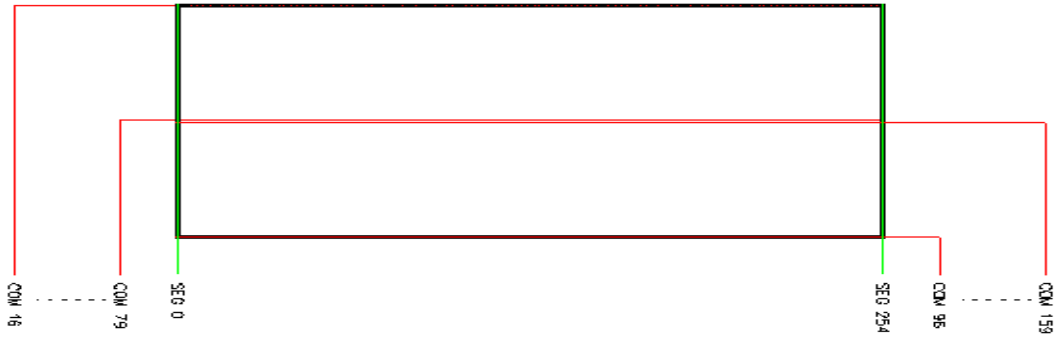
NO.	NAME
1	A0
2	EWR
3	D0
4	D1
5	D2
6	D3
7	D4
8	D5
9	D6
10	D7
11	ERD
12	RST
13	1F1
14	1F2
15	1F3
16	SI
17	SCL
18	XCS
19	VDD
20	VSS
21	VSS
22	VDDA
23	C5P
24	C3P
25	C1N
26	C1P
27	C2P
28	C2N
29	C4P
30	C6P
31	VLCD
32	V4
33	V3
34	V2
35	V1
36	V0

MODEL NAME	NO	MATERIAL	REMARKS
	1		

CRYSTAL CLEAR TECHNOLOGY SDN BHD
16, JLN TP5, TMN PERINDUSTRIAN SIME UEP,
47500 SUBANG JAYA, SELANGOR DARUL EHSAN.

PART NAME: MECHANICAL SPECIFICATION

APPROVED	CHECKED	DRAWN	UNIT : MM	DRAWING NUMBER	SHEET	REV.
		AZHAR 13-10-2008	NTS	G1225x02xxx00	1/1	1



LCD Segment and Common Layout

Crystal Clear Technology
16 Jalan TP5—Taman Perindustrian Sime UEP
47600 Subang Jaya—Selangor DE
Malaysia