Crystal Clear Technology

Product Specification

G64128Z24xxW00

(REPLACEMENT FOR G64128Z11xxW00)

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1.0 Table of Contents Page

2.0 Record of revision

Rev	Date	Item	Page	Comment	Originator	Checked By
1.0	11/10/10			Initial Release	Thorn	Azhar
2.0	12/01/13	11	12	Update power supply, backlight and boosting circuit	Azhar	Azhar
3.0	12/05/16	3	3	Change Part No description	Azhar	Azhar
4.0	04/05/17	6	5	Reliability Test		
		7	6	Update Optical Specification		
		15	22	Update Mechanical Drawing	Azhar	Azhar

3.0 General specification

Display format: Graphics 128 (w) x 64 (h) dots

Dot size: 0.48 (w) x 0.48 (h) mm

Dot pitch: 0.52 (w) x 0.52 (h) mm

View area: 70.7 (w) x 38.8 (h) mm

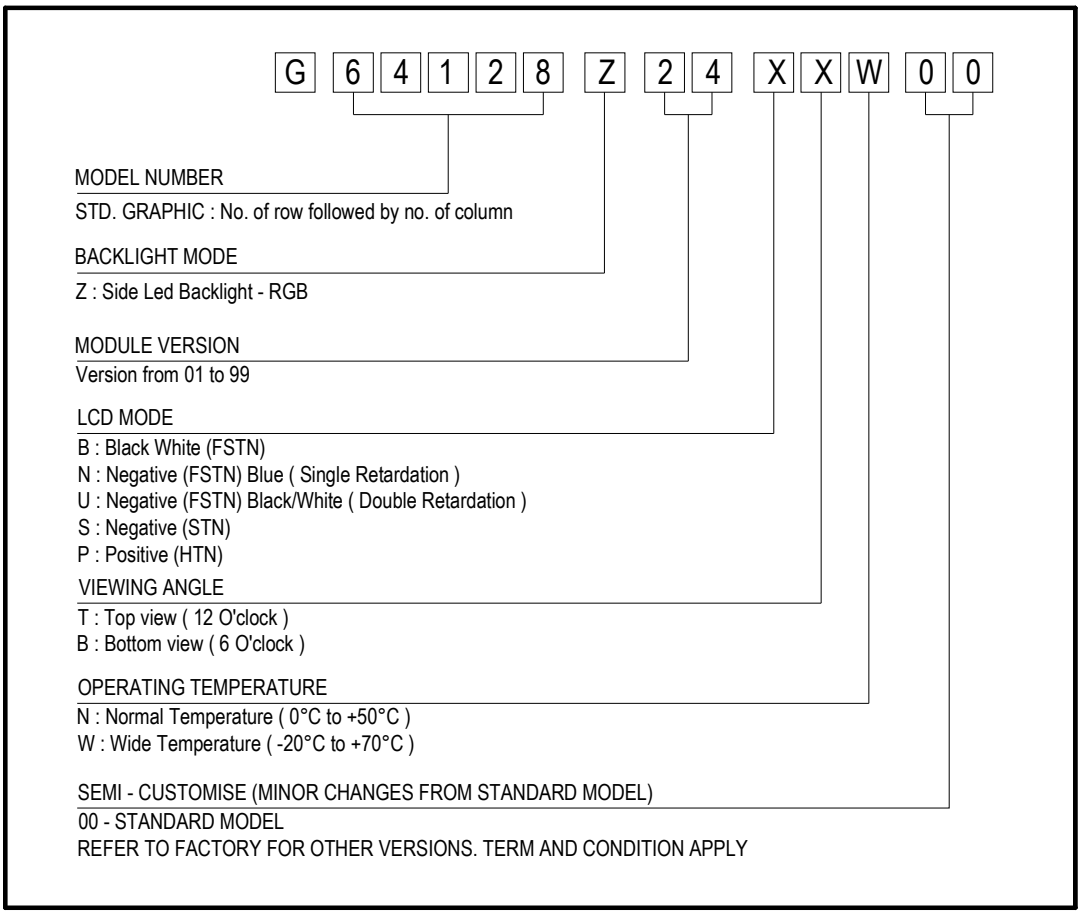
Active area: 66.52 (w) x 33.24 (h) mm

General dimensions: 76.10 (w) x 53.80 (h) x 6.7 (t) mm

Controller/Driver: ST7565P or equivalent

Interface: Parallel

Driving method: 1/64 duty, 1/9 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}	1.8	3.3	V
2.	Supply Voltage Range	V_{LCD}	-	10.2	V
3.	Input Voltage	V_{IN}	-	-	V
4.	Operating Temperature	T_{op}	Refer page 3		°C
5.	Storage Temperature	T_{st}	Refer page 3		°C

5.0 Electrical characteristics

NO	ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
1.	Power Supply voltage (Logic)	$V_{DD} - V_{SS}$	-	-	3.0	-	V
2.	Power Supply voltage for LCD	V_0 - V_{SS}	25°C	9.6±5%			V
3.	Current Supply	I_{DD}	$V_{DD} - V_{SS}$ =3.0V	-	2.06	3.0	mA

*Note: Point 2, power supply voltage for LCD functions as a reference voltage. CCT is to set samples limit for contrast programming at factory level. This is to ensure consistent contrast ratio for all production LCD.

5.1 Backlight Options

NO	COLOR	FORWARD VOLTAGE (V)			FORWARD CURRENT (mA)			MIN BRIGHTNESS (cd/m2) *
		Min	Typ.	Max	Min	Typ.	Max	
1.	Red Green Blue	-	4.0	-	-	40 x 3	60 x 3	50

*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 RGB = 20K hrs
4. This backlight is not recommended for mixing colour

6.0 Environmental and Reliability requirements

NO	ITEM	CONDITION	
1.	High Temperature Storage	+80±2°C / 96Hours	Inspection after 2 ~ 4 hours storage at room temperature, the sample shall be free from defects: 1. Air bubble in LCD 2. Seal leak 3. Non-Display 4. Missing segment 5. Glass crack 6. Current Idd should be lower than double of initial Idd.
2.	Low Temperature Storage	-30±2°C / 96Hours	
3	High Temperature Operating	+80±2°C / 96Hours	
4	Low Temperature Operating	-30±2°C / 96Hours	
5	Temperature Cycle Operating	-30±2°C ~ 25°C ~ +80±°C x 10 Cycles (30min) (5 min) (30min)	
6	Humidity Test (Operating)	40°C, 90±5%RH, 96Hrs	
7	LCD Lifetime	50 000 Hours (Excluding Backlight)	

Note:

1. The background on LCD has the possibility to be changed in different temperature range.
2. The test samples should be applied to only one test item.
3. Sample size for each test item is 1 ~ 5 pcs.

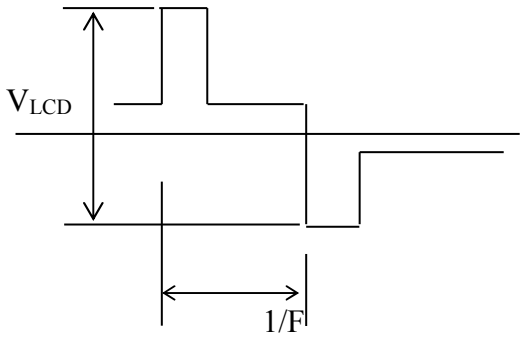
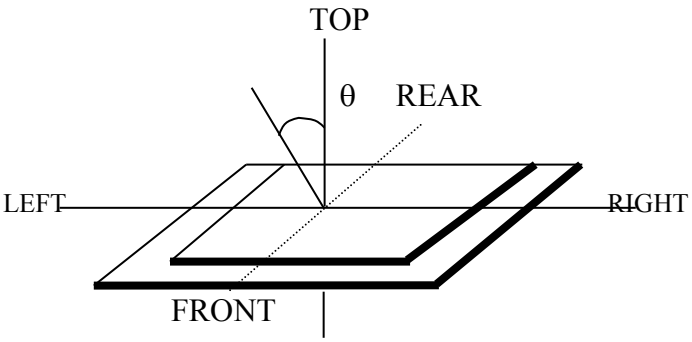
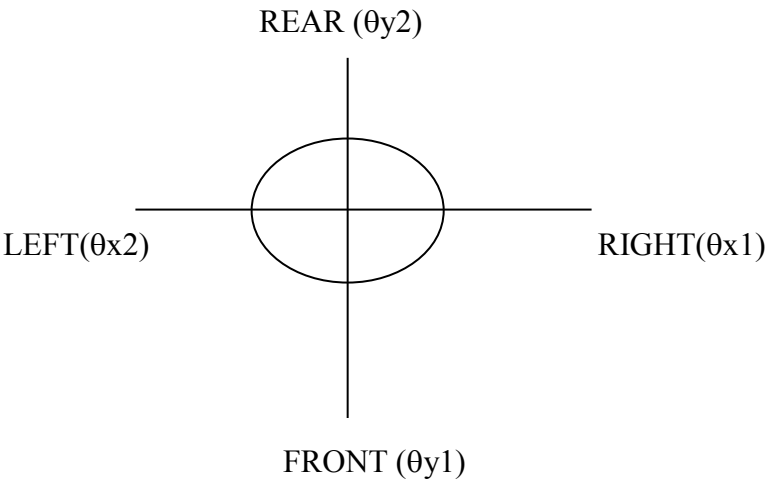
7.0 LCD specification

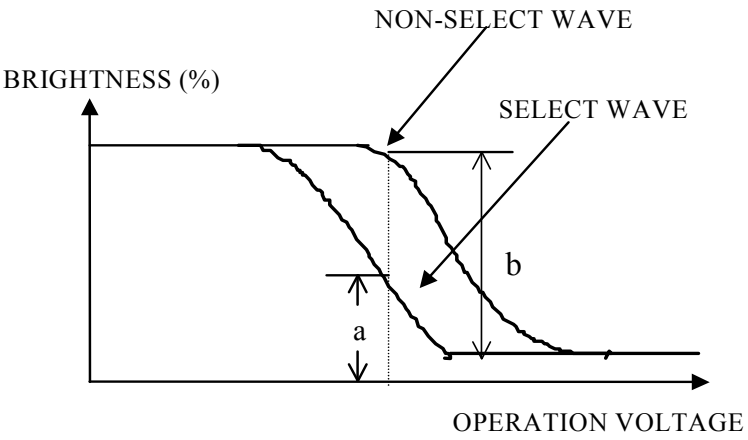
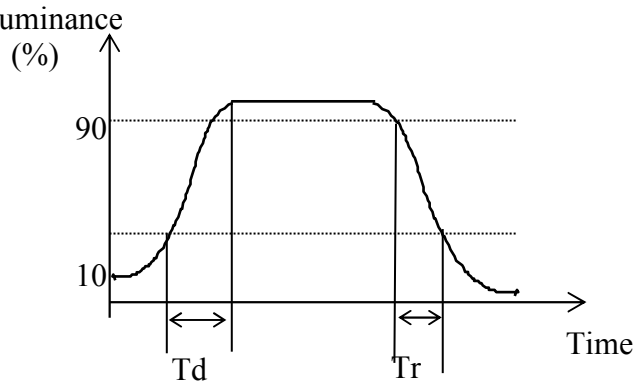
7.1 Electro-optical characteristics (at ambient temperature = 25°C)

NO	ITEM	SYMBOL	CONDITION	LCD TYPE						REF.
				STN YG	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	9.67 ± 5%						7.1.1
2	Viewing Angle (Deg)	θ x 1	CR ≥ 2 V_{LCD} = 9.67V	+25	+35	+25	+35	+35	+40	7.1.2
		θ x 2		-25	-35	-25	-35	-40	-40	
		θ y 1		-30	-35	-30	-35	-35	-50	
		θ y 2		+30	+35	+30	+35	+35	+30	
3	Contrast Ratio	CR	θ = 0^0 V_{LCD} =9.67V	3.0	6.0	3.0	6.0	20	20	7.1.3
4	Response Time (msec)	Rise Time (Tr)	θ = 0^0	200						7.1.4
		Decay Time (Td)	θ = 0^0	250						

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	***Controller/Driver***	ST7565P	
8.2	***Duty Cycle***	1/64	
8.3	***Pin out Assignments***		
	Pin No	**Symbol**	**Description**
	1	Vss	Ground
	2	Vdd	Logic Power Supply
	3	Vout	Booster Output Voltage
	4	/Res	Read / Write execution control pin
	5	/CS1	Chip Select execution control pin
	6	A0	Data or Command execution control pin
	7	WR	Read / Write execution control pin
	8	E	Enable execution control pin
	9	D0	8-bit MPU bus via the 8-bit bi-directional bus
	10	D1	8-bit MPU bus via the 8-bit bi-directional bus
	11	D2	8-bit MPU bus via the 8-bit bi-directional bus
	12	D3	8-bit MPU bus via the 8-bit bi-directional bus
	13	D4	8-bit MPU bus via the 8-bit bi-directional bus
	14	D5	8-bit MPU bus via the 8-bit bi-directional bus
	15	D6	8-bit MPU bus via the 8-bit bi-directional bus
	16	D7	8-bit MPU bus via the 8-bit bi-directional bus
	17	A	Backlight Anode Terminal
	18	K (RED)	RED Backlight Cathode Terminal
	19	K (GREEN)	GREEN Backlight Cathode Terminal
	20	K (BLUE)	BLUE Backlight Cathode Terminal

9.0 Functional Descriptions

9.1 Read/Write timing characteristics

System Bus Read/Write Characteristics (For the 6800 Series MPU)

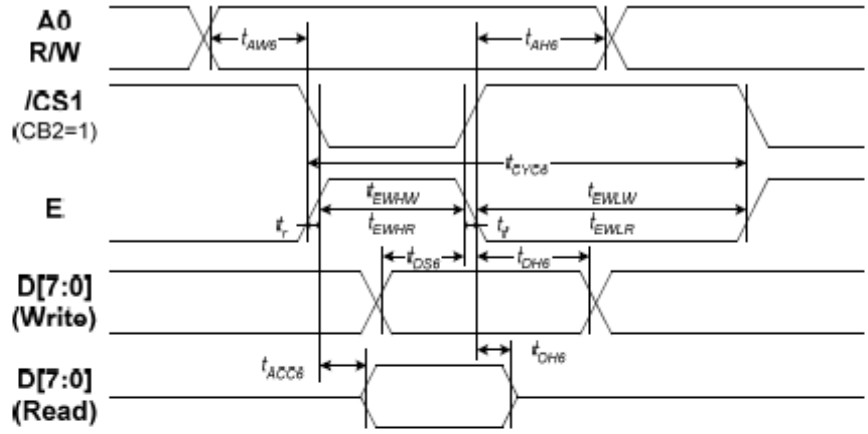


Figure 38

Table 27

(VDD = 3.3V, Ta = –30 to 85℃)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	t_{AH6}		0	—	ns
Address setup time		t_{AW6}		0	—	
System cycle time		t_{CYC6}		240	—	
Enable L pulse width (WRITE)	E	t_{EWLW}		80	—	
Enable H pulse width (WRITE)		t_{EWHW}		80	—	
Enable L pulse width (READ)		t_{EWLR}		80	—	
Enable H pulse width (READ)		t_{EWHR}		140		
WRITE Data setup time	D0 to D7	t_{DS6}		40	—	
WRITE Address hold time		t_{DH6}		0	—	
READ access time		t_{ACC6}	C_L = 100 pF	—	70	
READ Output disable time		t_{OH6}	C_L = 100 pF	5	50	

(VDD = 2.7V, Ta = –30 to 85℃)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH6		0	—	ns
Address setup time		tAW6		0	—	
System cycle time		tCYC6		400	—	
Enable L pulse width (WRITE)	E	tEWLW		220	—	
Enable H pulse width (WRITE)		tEWHW		180	—	
Enable L pulse width (READ)		tEWLR		220	—	
Enable H pulse width (READ)		tEWHR		180	—	
WRITE Data setup time	D0 to D7	tDS6		40	—	
WRITE Address hold time		tDH6		0	—	
READ access time		tACC6	CL = 100 pF	—	140	
READ Output disable time		tOH6	CL = 100 pF	10	100	

Table 29

(VDD = 1.8V, Ta = –30 to 85℃)

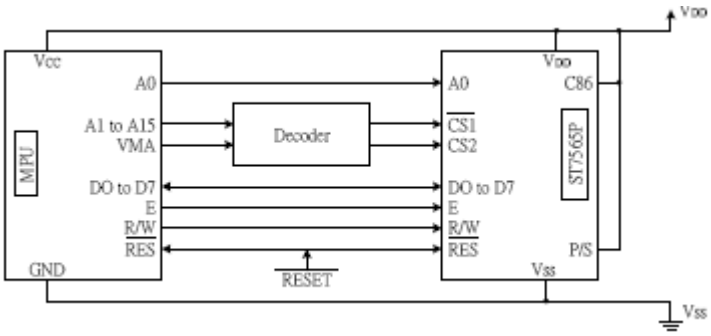
Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH6		0	—	ns
Address setup time		tAW6		0	—	
System cycle time		tCYC6		640	—	
Enable L pulse width (WRITE)	E	tEWLW		360	—	
Enable H pulse width (WRITE)		tEWHW		280	—	
Enable L pulse width (READ)		tEWLR		360	—	
Enable H pulse width (READ)		tEWHR		280	—	
WRITE Data setup time	D0 to D7	tDS6		80	—	
WRITE Address hold time		tDH6		0	—	
READ access time		tACC6	CL = 100 pF	—	240	
READ Output disable time		tOH6	CL = 100 pF	10	200	

*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) ≤ (tCYC6 – tEWLW – tEWHW) for (tr + tf) ≤ (tCYC6 – tEWLR – tEWHR) are specified.
*2 All timing is specified using 20% and 80% of VDD as the reference.
*3 tEWLW and tEWLR are specified as the overlap between $\overline{CS1}$ being "L" (CS2 = "H") and E.

Read/Write characteristics (6800 series MPU)

9.2 Application Circuits

9.2.1 6800 – Series Parallel Interface

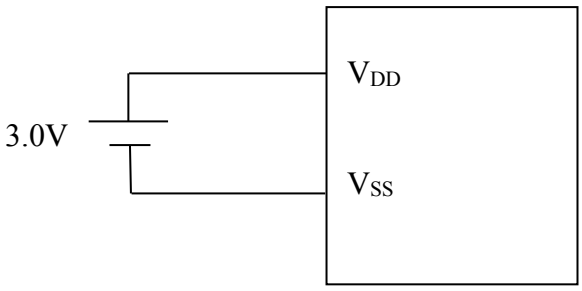


10. Instruction Set

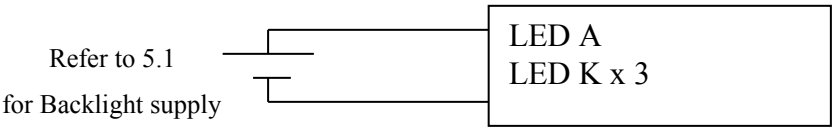
Command	Command Code										Function
	A0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1	D0	
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0 1	LCD display ON/OFF 0: OFF, 1: ON
(2) Display start line set	0	1	0	0	1	Display start address						Sets the display RAM display start line address
(3) Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address.
Column address set lower bit	0	1	0	0	0	0	0	Least significant column address				Sets the least significant 4 bits of the display RAM column address.
(5) Status read	0	0	1	Status				0	0	0	0	Reads the status data
(6) Display data write	1	1	0	Write data								Writes to the display RAM
(7) Display data read	1	0	1	Read data								Reads from the display RAM
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0 1	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse
(9) Display normal/ reverse	0	1	0	1	0	1	0	0	1	1	0 1	Sets the LCD display normal/ reverse 0: normal, 1: reverse
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0 1	Display all points 0: normal display 1: all points ON
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0 1	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565P)
(12) Read/modify/write	0	1	0	1	1	1	0	0	0	0	0	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset
(15) Common output mode select	0	1	0	1	1	0	0	0 1	*	*	*	Select COM output scan direction 0: normal direction 1: reverse direction
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode			Select internal power supply operating mode
(17) Vo voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			Select internal resistor ratio(Rb/Ra) mode
(18) Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	1	Set the Vo output voltage electronic volume register
Electronic volume register set				0	0	Electronic volume value						
(20) Booster ratio set	0	1	0	1 0	1 0	1 0	1 0	1 0	0 0	0 step-up value	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x
(21) Power saver												Display OFF and display all points ON compound command
(22) NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
(23) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command

11. Power Supply

11.1 Boosting circuit is provided in the LCD module

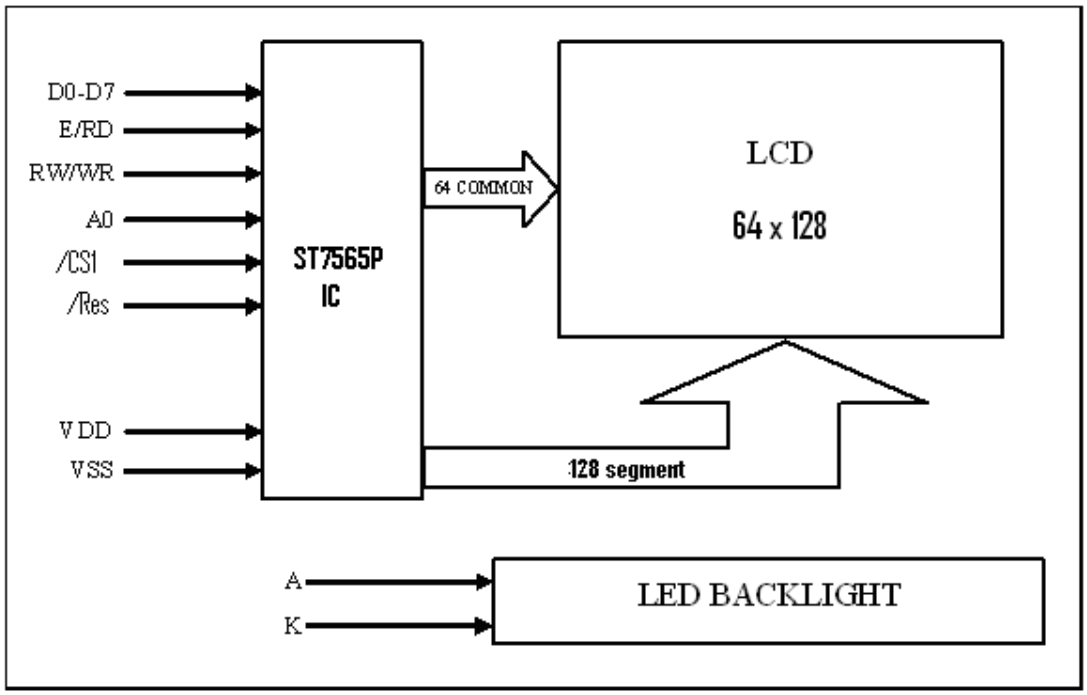


11.2 Backlight power supply below:



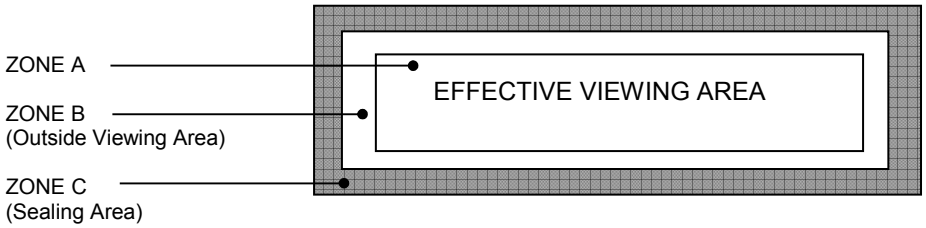
For LED backlight version only

12. Block Diagram



13.0 Quality Assurance

13.1 ZONE DEFINITION

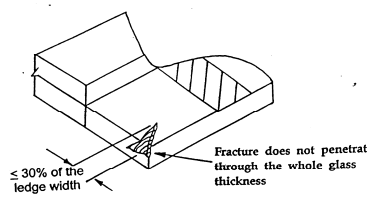


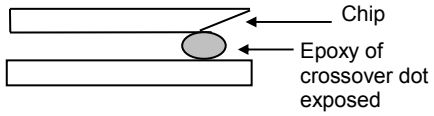
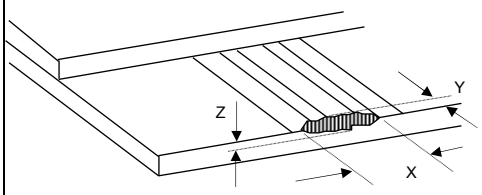
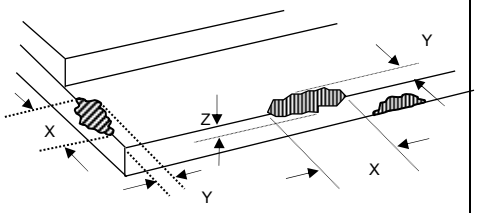
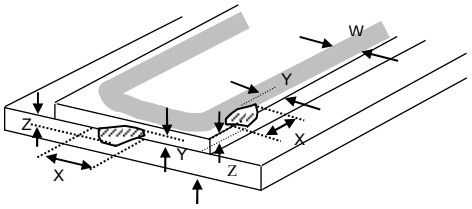
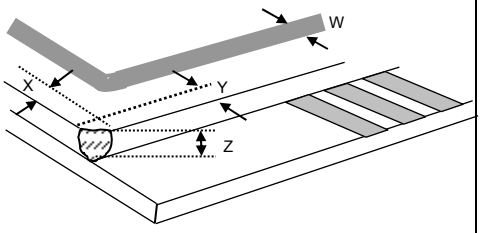
13.2 REJECTION CRITERIA

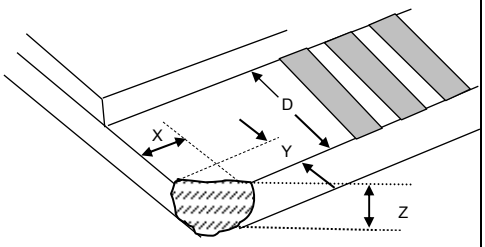
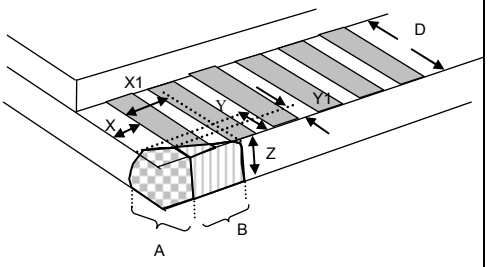
13.2.1 DIMENSIONAL DEFECTS

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

13.2.2 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.	

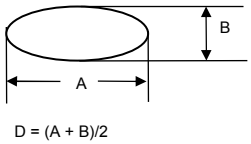
Defect Category	Defect Description	Criterion	Drawing Specification
Chip	Chip in cross over area	1) Reject - if the chip causes crossover dot to be exposed 2) Chip on outside edge of the glass plate but is greater than 50% of glass thickness at crossover dot is reject able.	
Chip	Chip in contact pad area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

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)	

13.2.3 POLARIZER DEFECT

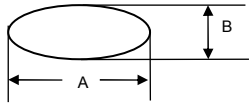
Defect Category	Defect Description	Criterion	Drawing Specification
Polarizer defect	Polarizer coverage	1- Polarizer should cover effective viewing area of display. 2- It is acceptable if perimeter seal bolder at all sides could be seen. 3- It is acceptable if polarizer attaching position meeting the 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	
	Polarizer damage	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	

<table>
<tr><th>Defect Category</th><th>Defect Description</th><th>Criterion</th><th>Drawing Specification</th></tr>
<tr><td></td><td>Polarizer bubble / Foreign material</td><td>
<table>
<tr><td>Zone /
Dimension</td><td colspan="3">A</td></tr>
<tr><td>D ≤ 0.15mm</td><td>NC</td><td>B</td><td>C</td></tr>
<tr><td>0.15 < D ≤ 0.30mm</td><td>3</td><td>NC</td><td>NC</td></tr>
<tr><td>0.30 < D ≤ 0.50mm</td><td>2</td><td>5</td><td>NC</td></tr>
<tr><td>0.50 < D ≤ 1.0mm</td><td>0</td><td>3</td><td>NC</td></tr>
<tr><td>NC: No count</td><td></td><td>1</td><td>NC</td></tr>
<tr><td colspan="4">D: Mean Diameter of Defect</td></tr>
<tr><td colspan="4">Accept - if air bubble at the seal area does not propagate into effective viewing area</td></tr>
</table>
</td><td>Acceptable No.
 

D = (A + B)/2</td></tr>
</table>

13.2.4 FUNCTIONAL DEFECT

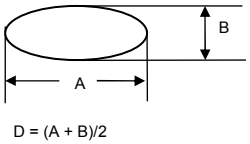
<table>
<tr><th>Defect Category</th><th>Defect Description</th><th>Criterion</th><th>Drawing Specification</th></tr>
<tr><td>Missing common</td><td>Part of the pattern does not light up</td><td>Reject</td><td></td></tr>
<tr><td>Missing segment</td><td>One or few segment does not light up</td><td>Reject</td><td></td></tr>
<tr><td>Common-common short</td><td>Common and common connected</td><td>Reject</td><td></td></tr>
<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>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>Pin Hole</td><td>Pin hole / void at light up segment</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 ≤ 0.10mm</td><td>NC</td><td>NC</td><td>NC</td></tr>
<tr><td>0.10<D ≤ 0.20mm</td><td>3</td><td>3</td><td>NC</td></tr>
<tr><td colspan="4">NC: No count

D: Mean Diameter of Defect</td></tr>
</table>
</td><td> 

D = (A + B)/2</td></tr>
</table>

Defect Category	Defect Description	Criterion	Drawing Specification
Segment Smearing	Light up segment smear	Reject	
Dim segment	Display shows poor contrast at pre set voltage	Reject	

13.2.5 BLACK SPOT, WHITE SPOT AND FOEREIGN MATERIAL

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 ≤ 0.20mm	3	3	NC	
		0.20 < D ≤ 0.30mm	1	2	NC	
		D > 0.30 mm	0	0	NC	
		NC: No count D: Mean Diameter of Defect				

13.2.6 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	
		-	<0.01mm	NC	NC	NC	
		< 2 mm	< 0.02mm	1	1	NC	
		<1 mm	< 0.0 2mm	1	2	NC	

Note: Total defects shall not exceed five

14. 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 degradation, 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 benzene.
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 at conductor area.
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 antistatic containers.
c) Only properly grounded soldering irons should be used.
d) If an electric screwdriver is used, it should be well grounded and shielded from spark commutator.
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 Operation

a) Viewing angle varies with the change of liquid crystal driving voltage (VLCD). VLCD has to be adjusted to show the best contrast.
b) It is a necessary condition to drive LCD's within the specified voltage limit since at the higher voltage limit this can result in 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.
c) Response times will be delayed at lower temperature than the operating temperature range and on the other hand, at higher temperature LCD's show darker color in them. However those phenomena do not mean a malfunction or out of order with the LCD's which will recover in the specified operating temperature.
d) 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.

e) 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.
f) 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.
g) It is advisable to keep the temperature within the specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

2.4 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.

2.5 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 time.

3. Limited Warranty

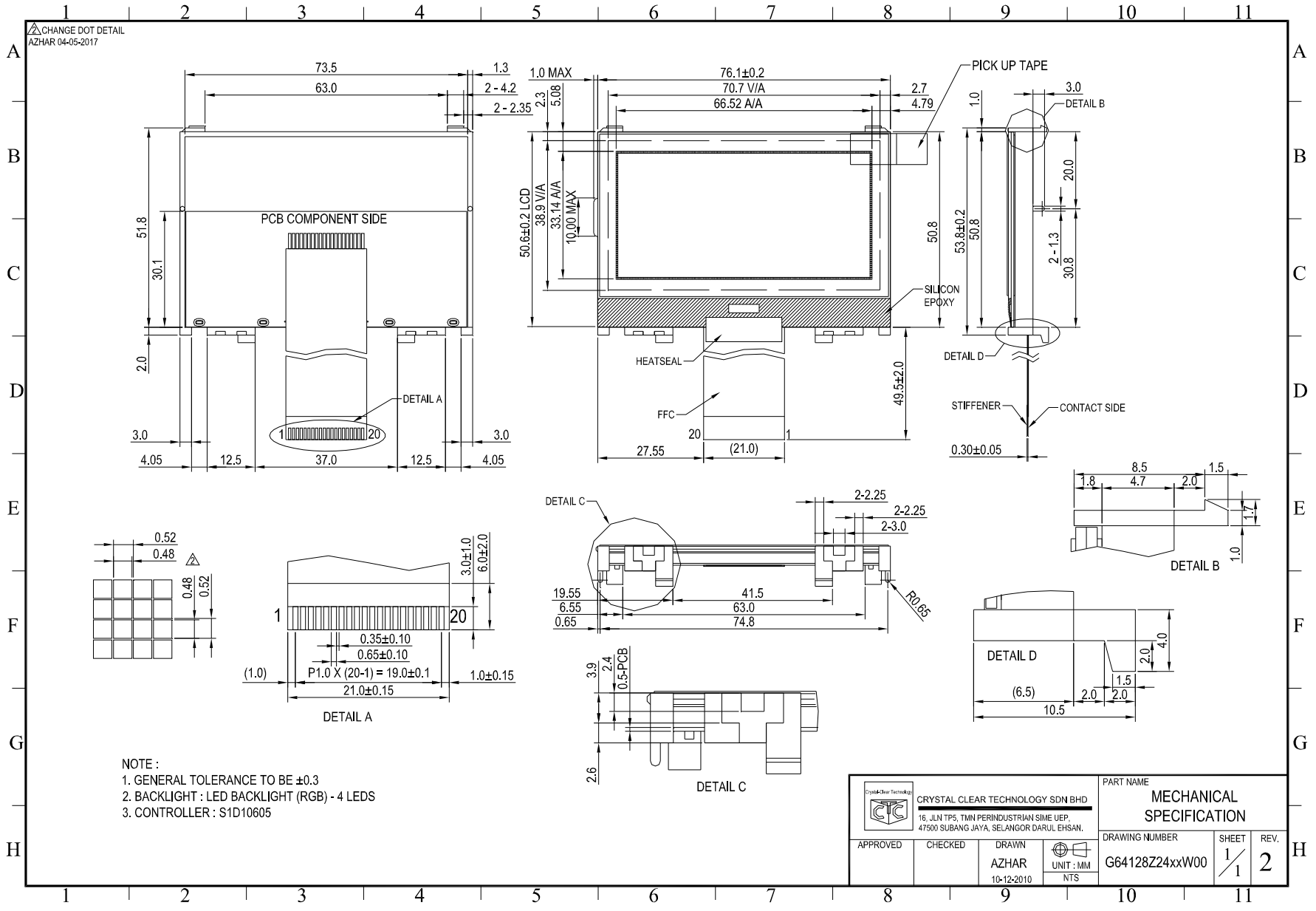
Unless otherwise agreed between Crystal Clear Technology and customer, Crystal Clear Technology will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with Crystal Clear Technology acceptance standards, for a period of one year 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.

4. Return LCM under Warranty

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

i. Broken LCD glass
ii. PCB eyelet's damaged or modified
iii. PCB conductors damaged
iv. Circuit modified in any way, including addition of components.
v. PCB tampered with by grinding, engraving or painting varnish.
vi. Soldering to, or modifying the bezel in any manner.

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


CHANGE DOT DETAIL
AZHAR 04-05-2017
PCB COMPONENT SIDE
DETAIL A
DETAIL B
DETAIL C
DETAIL D
PICK UP TAPE
SILICON EPOXY
HEATSEAL
FFC
STIFFENER
CONTACT SIDE
NOTE :
1. GENERAL TOLERANCE TO BE ±0.3
2. BACKLIGHT : LED BACKLIGHT (RGB) - 4 LEDS
3. CONTROLLER : S1D10605
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
AZHAR
10-12-2010
UNIT : MM
NTS
DRAWING NUMBER
G64128Z24xxW00
SHEET
1/1
REV.
2

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