Crystal Clear Technology

Product Specification

G64128Z11 series

Crystal Clear Technology sdn. bhd.

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1.0   Table of Contents

2.0   Record of revision

Rev	Date	Item	Page	Comment	Originator	Checked By
1.0	28/09/08			Initial Release	Syam	Azhar
2.0	10/10/08	5	4	Update of IDD value from 300 uA to typical 900 uA	Syam	Azhar

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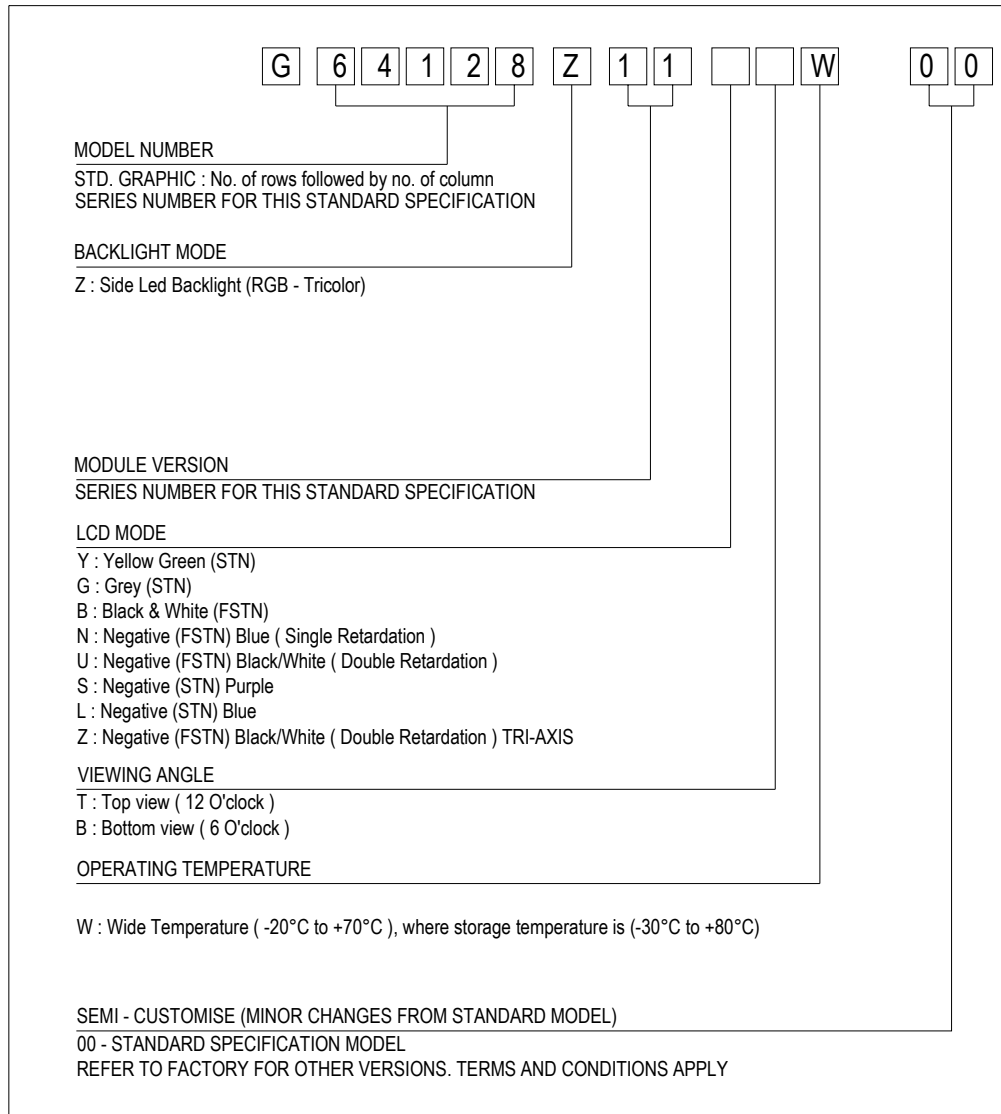
View area: 70.7 (w) x 38.8 (h) mm

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: S1D10605 or equivalent

Interface: Parallel (6800 series MPU)

Driving method: 1/64 duty, 1/9 bias

G	6	4	1	2	8	Z	1	1		W		0	0

MODEL NUMBER
STD. GRAPHIC : No. of rows followed by no. of column
SERIES NUMBER FOR THIS STANDARD SPECIFICATION

BACKLIGHT MODE

Z : Side Led Backlight (RGB - Tricolor)

MODULE VERSION
SERIES NUMBER FOR THIS STANDARD SPECIFICATION

LCD MODE
  Y : Yellow Green (STN)
  G : Grey (STN)
  B : Black & White (FSTN)
  N : Negative (FSTN) Blue (Single Retardation)
  U : Negative (FSTN) Black/White (Double Retardation)
  S : Negative (STN) Purple
  L : Negative (STN) Blue
  Z : Negative (FSTN) Black/White (Double Retardation) TRI-AXIS

  VIEWING ANGLE
  T : Top view (12 O'clock)
  B : Bottom view (6 O'clock)

  OPERATING TEMPERATURE

  W : Wide Temperature (-20°C to +70°C), where storage temperature is (-30°C to +80°C)

  SEMI - CUSTOMISE (MINOR CHANGES FROM STANDARD MODEL)
  00 - STANDARD SPECIFICATION MODEL
  REFER TO FACTORY FOR OTHER VERSIONS. TERMS AND CONDITIONS APPLY

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

NO	ITEM	SIMBOL	MIN	MAX	UNIT
1.	Operating Voltage Range	V_{DD}	-0.3	6.0	V
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 (Recommended)	V_{DD}	-	2.7	3.0	3.3	V
2.	Power Supply voltage	V_{LCD} ($V_5 - V_{DD}$)	25°C	8.7±5%			V
3.	Current Supply	I_{DD}	$V_{DD} = 3.0V$ 4x Boosting	-	900	-	uA

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

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)

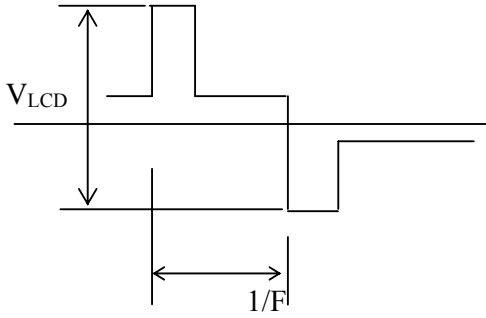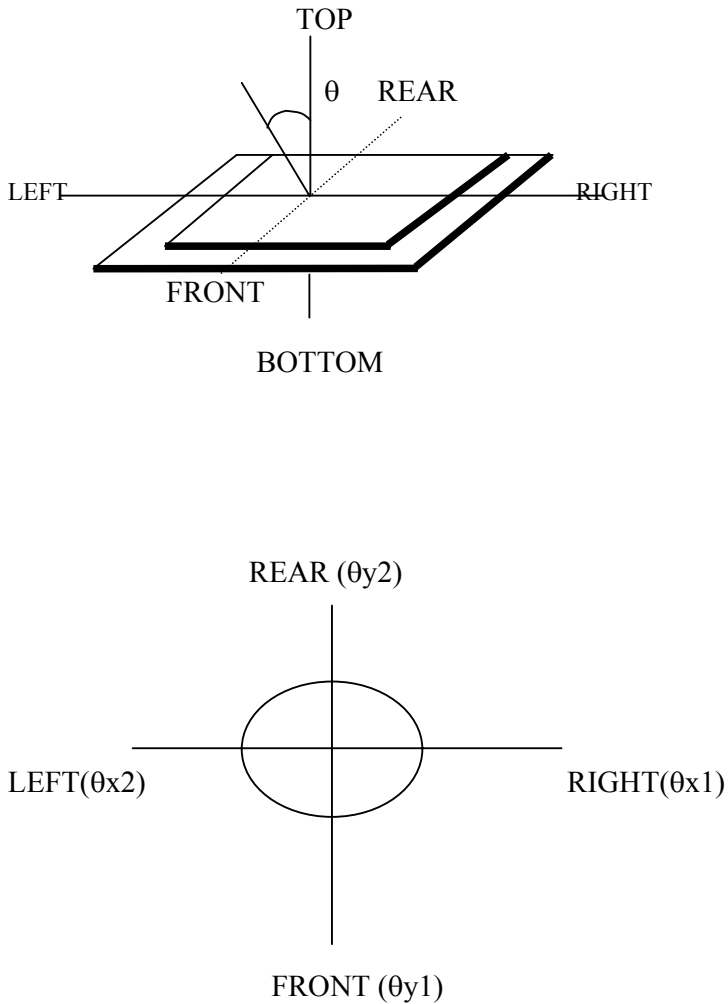Note: The background on LCD has the possibility to be changed in different temperature range.

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7.0   LCD specification

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

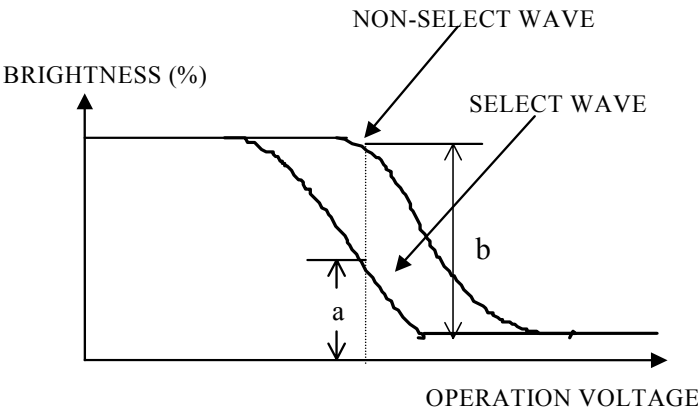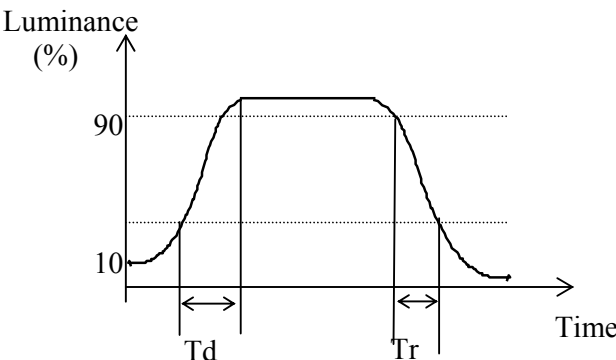| NO	ITEM	SYMBOL	CONDITION	STN YG	STN GREY	STN -VE BLUE/ PURPLE	FSTN +VE B/W	FSTN –VE BLUE	FSTN -VE TRUE B/W	FSTN -VE TRI AXIS	REF.
1	Operating Voltage (Volt)	V_{LCD}	$\theta = 0$ Cr = max	8.7 ± 5%							7.1.1
2	Viewing Angle (Deg)	$\theta x 1$	CR ≥ 2 V_{LCD} = 14.7V	+25	+20	+35	+25	+35	+35	+40	7.1.2
		$\theta x 2$		-25	-20	-35	-25	-35	-40	-40	
		$\theta y 1$		-30	-25	-35	-30	-35	-35	-50	
		$\theta y 2$		+30	+25	+35	+30	+35	+35	+30	
3	Contrast Ratio	CR	$\theta = 0^0$ V_{LCD} =14.7V	3.0	2.3	6.0	3.0	6.0	20	20	7.1.3
4	Response Time (msec)	Rise Time (Tr)	$\theta = 0^0$	200							7.1.4
		Decay Time (Td)	$\theta = 0^0$	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 = $\dfrac{\text{Brightness of non-selected state (b)}}{\text{Brightness of selected state (a)}}$ ***Conditions*** (a) Operating Voltage: V_{LCD} (b) Temperature: 25°C (c) Viewing Angle, $\theta = 0^{o}$
7.1.4	*Response Time*	 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.

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8.0   Interface

8.1	*Display Driver*	S1D10605 OR EQUIVALENT	
8.2	**Pin No**	**Symbol**	**Description**
	1	Vss	Ground
	2	Vdd	Logic Power Supply
	3	Vout	Booster Output Voltage
	4	RES	Reset Terminal
	5	CS	Chip Select Terminal
	6	RS	Data or Command Terminal
	7	R/W	Read / Write Terminal
	8	E	Enable Terminal
	9	DB0	Data Line Terminal
	10	DB1	Data Line Terminal
	11	DB2	Data Line Terminal
	12	DB3	Data Line Terminal
	13	DB4	Data Line Terminal
	14	DB5	Data Line Terminal
	15	DB6	Data Line Terminal
	16	DB7	Data Line Terminal
	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

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9.0   Functional Descriptions
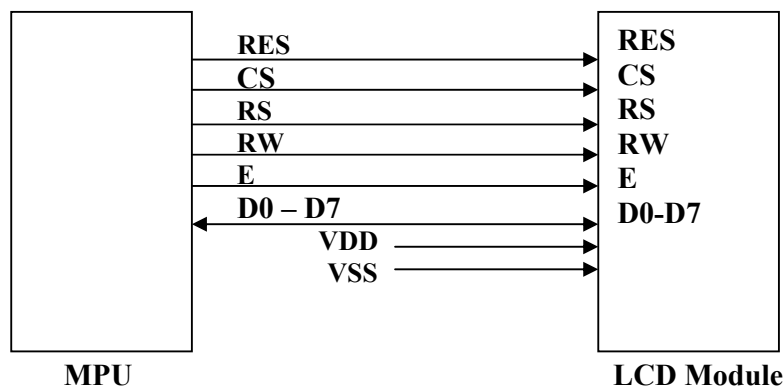   9.1   Read/Write timing characteristics
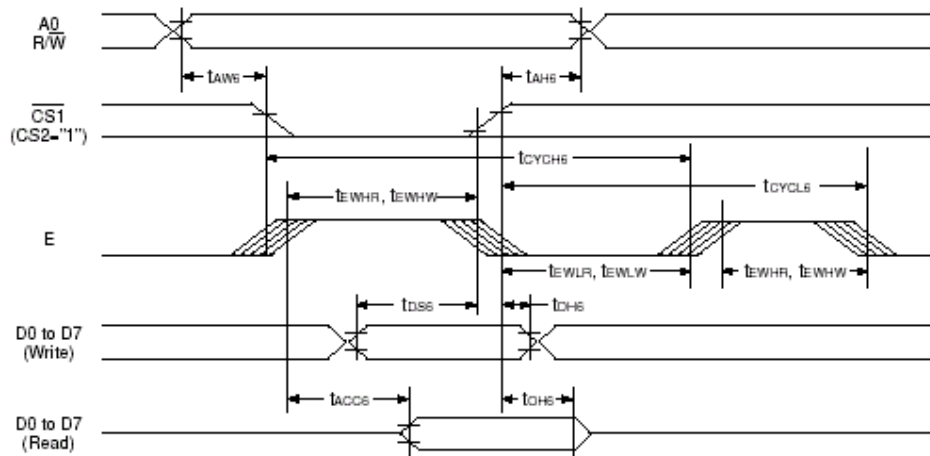
(V$_{DD}$ = 2.7 V to 3.6 V, Ta = −40 to 85°C)

Item		Signal	Symbol	Condition	Rating		Units
					Min.	Max.	
Address hold time		A0	t$_{AH6}$		0	—	ns
Address setup time			t$_{AW6}$		0	—	ns
System cycle time 1		A0	t$_{CYCH6}$		300	—	ns
System cycle time 2			t$_{CYCL6}$		300	—	ns
Data setup time		D0 to D7	t$_{DS6}$		40	—	ns
Data hold time			t$_{DH6}$		15	—	ns
Access time			t$_{ACC6}$	CL = 100 pF	—	140	ns
Output disable time			t$_{OH6}$		10	100	ns
Enable HIGH pulse time	Read	E	t$_{EWHR}$		120	—	ns
	Write		t$_{EWHW}$		60	—	ns
Enable LOW pulse time	Read	E	t$_{EWLR}$		60	—	ns
	Write		t$_{EWLW}$		60	—	ns

Read/Write characteristics (6800 series MPU Parallel Interface)

    9.2   Application Circuits

    9.2.1 Parallel Interface

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10. Instruction Set

10.1 Command Table

|	Command	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function
(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	0: 1/6, 1: 1/5
(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)	Vs 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	
	Electronic volume register set	0	1	0	*	*	Electronic volume value						Set the Vs output voltage electronic volume register
(19)	Static indicator ON/OFF	0	1	0	1	0	1	0	1	1	0	0 / 1	0: OFF, 1: ON
	Static indicator register set	0	1	0	*	*	*	*	*	*	Mode		Set the flashing mode
(20)	Power saver												Display OFF and display all points ON compound command
(21)	NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
(22)	Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command

(Note) *: disabled data

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11.   Power Supply

      11.1   Boosting circuit is provided in the LCD module.
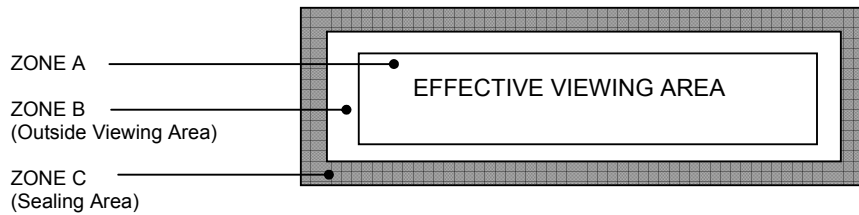
      11.2   Backlight power supply below:

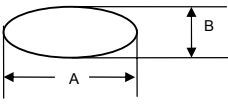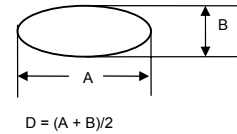Refer to 5.1

for Backlight supply

| LED A (Common) |
| LED K (Red) |
| LED K (Green) |
| LED K (Blue) |
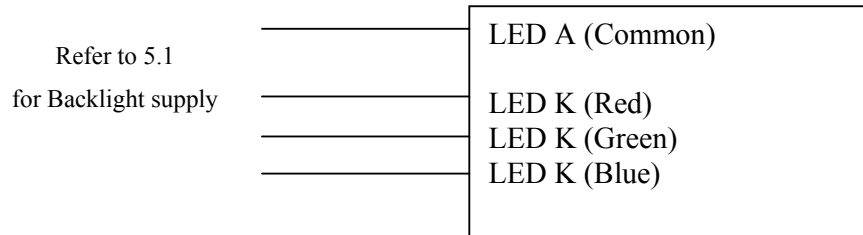
For LED backlight version only

12.0   Quality Assurance

12.1 ZONE DEFINITION

ZONE A

ZONE B
(Outside Viewing Area)

ZONE C
(Sealing Area)

EFFECTIVE VIEWING AREA

12.1.1   Black Spot, White Spot and Foreign 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	
		$D \leq 0.10$mm	NC	NC	NC	
		$0.10 < D \leq 0.20$mm	3	3	NC	
		$0.20 < D \leq 0.30$mm	1	2	NC	
		$D > 0.30$ mm	0	0	NC	
		NC: No count				
		D: Mean Diameter of Defect				

Drawing: $D = (A + B)/2$

12.1.2   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	
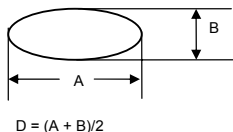
12.1.3   Pin Hole

Defect Category	Defect Description	Criterion	Drawing Specification
Pin Hole	Pin hole / void at light up segment	$D \leq 0.20$mm within 1 part/segment	

Drawing: $D = (A + B)/2$

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12.1.4 Polarizer Bubble/Foreign Material

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

$D = (A + B)/2$

Note: Total defects shall not exceed five

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.

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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".
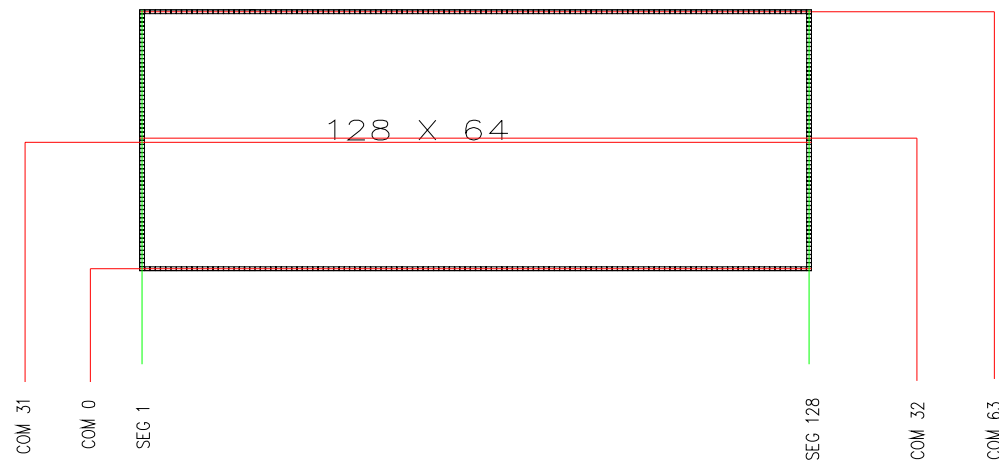
2.5 Storage

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.

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	DRAWING NUMBER	SHEET	REV.
		AZHAR 24-09-2008	UNIT : MM NTS	G64128Z11xxW00	1/1	1

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128 X 64

COM 31   COM 0   SEG 1

SEG 128   COM 32   COM 63

LCD Segment and Common Layout

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