Crystal Clear Technology

Product Specification

G64240x02 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	15/09/08			Initial Release	Syam	Azhar
2.0	17/12/08	3.0	3	At type of controller/driver, deleted “equivalent” comment.		
		5.1	4	Added pure-green backlight variation.	Syam	Azhar

3.0 General specification

Display format: Graphics 240 (w) x 64 (h) dots

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

Dot pitch: 0.53 (w) x 0.53 (h) mm

View area: 132.6 (w) x 39.0 (h) mm

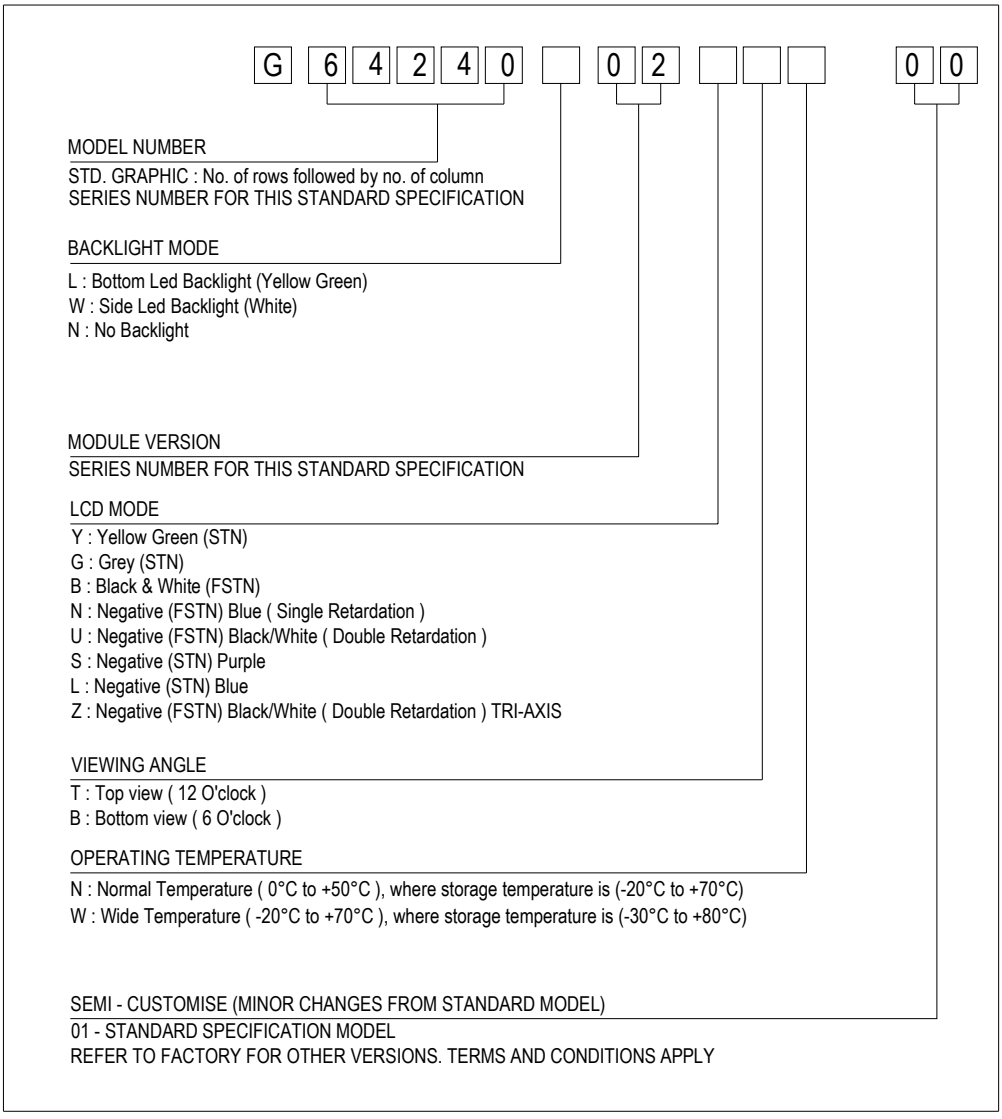
Active area: 127.15 (w) x 33.87 (h) mm

General dimensions: 180.0 (w) x 65.0 (h) x 15.0 max (t) mm

Controller/Driver: T6963 and NT7086

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.	Power Supply Voltage (Logic)	V_{DD} - V_{SS}	0	7.0	V
2.	Power Supply Voltage (LCD Driver)	V_{DD} – V_0	-	13.5	V
3.	Operating Temperature	T_{op}	Refer page 3		°C
4.	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}	-	4.5	5.0	5.5	V
2.	Power Supply Voltage (V_{LCD})	V_{DD}-V_0	25°C	12.0±5%			V
3.	Input Voltage	V_{IH}	-	0.7V_{DD}	-	V_{DD}	V
		V_{IL}		0	-	0.8V_{DD}	
4.	Current Supply	I_{DD}	V_{DD} - V_{SS} = 5V V_{DD} – V_0 = 12V	-	30	-	mA

5.1 Backlight Options

NO	COLOR	FORWARD VOLTAGE (V)			FORWARD CURRENT (mA)			MIN BRIGHTNESS (cd/m2) *
		Min	Typ.	Max	Min	Typ.	Max	
1.	Yellow Green	-	5.0	-	-	100	250	75
2.	White	-	5.0	-	-	45	60	60
3.	Pure Green	-	5.0	-	-	45	60	60

*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 = 50K hrs. For White and pure green = 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.

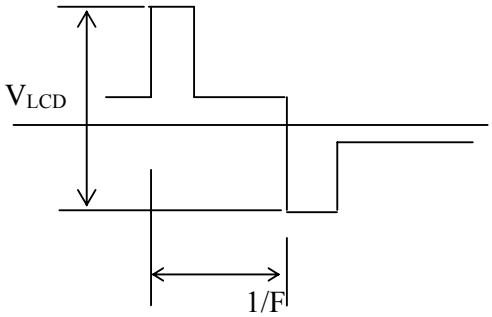
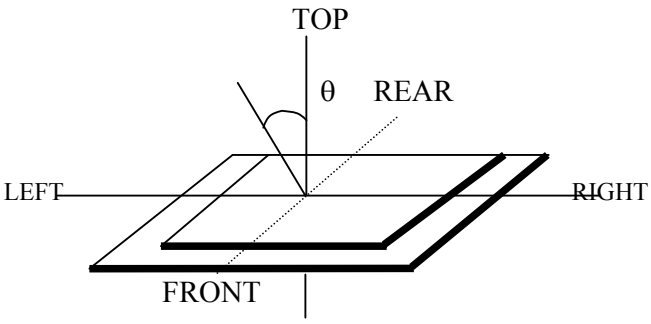
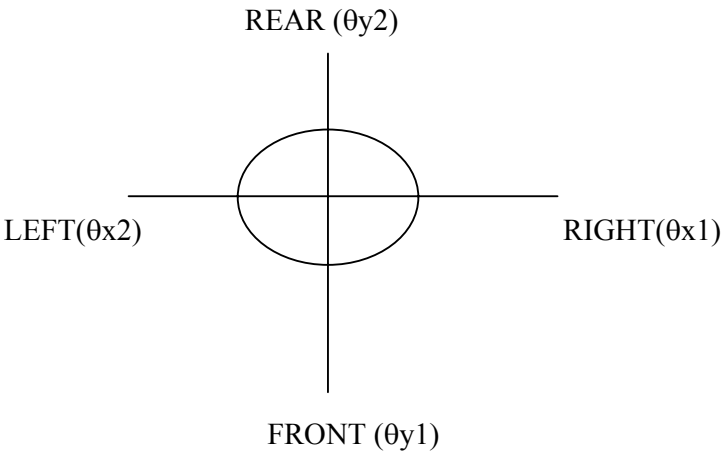
7.0 LCD specification

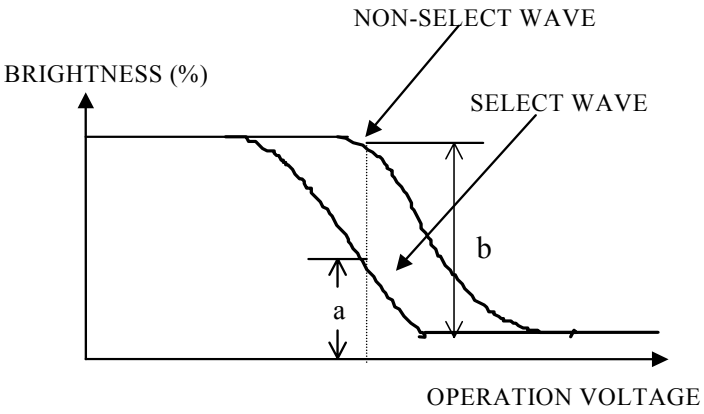
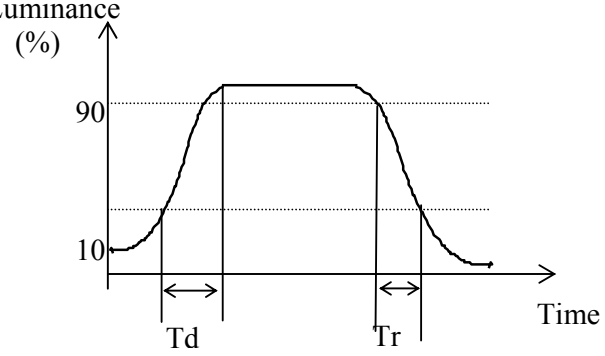
7.1 Electro-optical characteristics (at ambient temperature = 25°C)

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	12.0 ± 5%							7.1.1
2	Viewing Angle (Deg)	θ x 1	CR ≥ 2 V_{LCD} = 14.7V	+25	+20	+35	+25	+35	+35	+40	7.1.2
		θ x 2		-25	-20	-35	-25	-35	-40	-40	
		θ y 1		-30	-25	-35	-30	-35	-35	-50	
		θ 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 = 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	***Controller***	T6963C	
8.2	***Display Driver***	T6A39 and T6A40	
8.3	***Duty Cycle***	1/64	
8.4	***Pin-out Assignments***		
	Pin No	**Symbol**	**Description**
	1	FG	Frame ground
	2	V_{SS}	Ground terminal of module
	3	V_{DD}	Supply terminal of module
	4	V_O	Power supply for Liquid Crystal Drive
	5	R/W	Data Write
	6	RD	Data Read
	7	CE	Chip Enable
	8	C/D	H: Instruction , L: Data
	9	NC	Not Connected
	10	Reset	Reset signal
	11 to 18	D0 to D7	Bi-directional Data Bus. Data Transfer is performed once, thru D0 to D7
	19	FS	Pin for selection of number of column
	20	V_{OUT}	Negative output voltage from module
	21	SLA	LED backlight power supply.
	22	SLK	LED backlight ground.

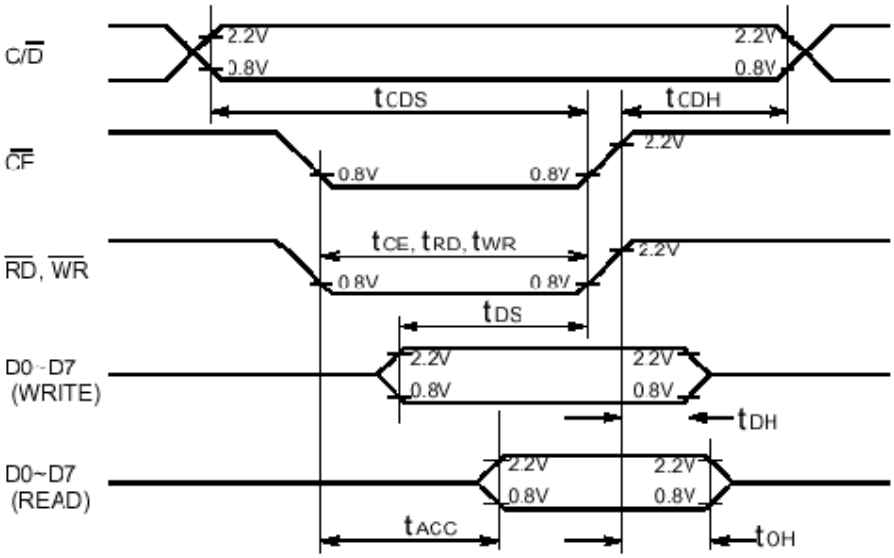
***Font interface format selection :**

Font size	J1	J2	Pin FS
5x8	Used	NC	High
6x8	NC	Used	High
7x8	Used	NC	Low
8x8	NC	Used	Low

Note: NC = Not Connected

9.0 Functional Descriptions

9.1 Display Control Timing Waveform and Characteristics

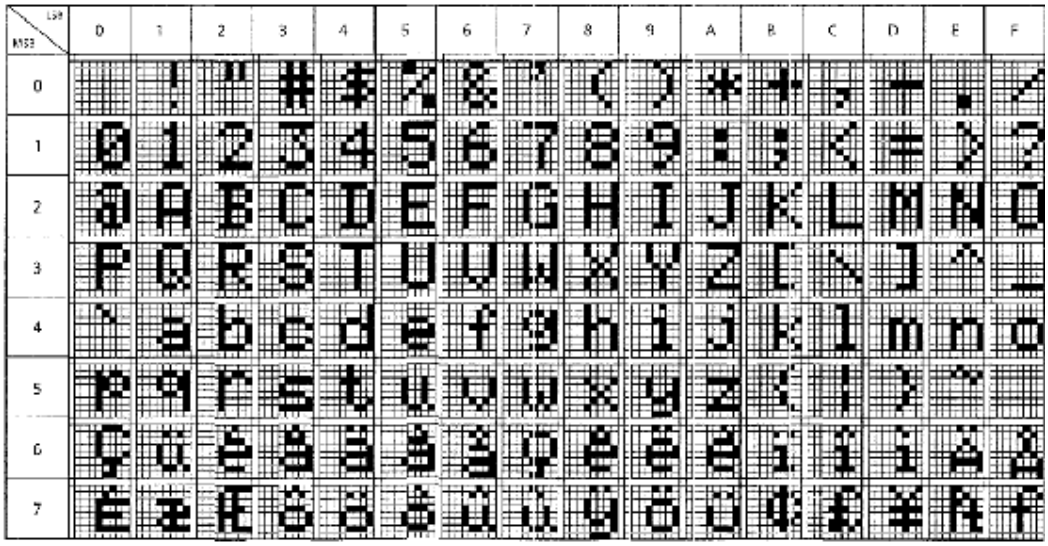


Item	Symbol	Min	Typ	Max	Unit
C/D Set Up Time	t_{CDS}	100	-	-	ns
C/D Hold Time	t_{CDH}	10	-	-	ns
CE, RD, WR Pulse Width	t_{CE}, t_{RD}, t_{WR}	80	-	-	ns
Data Set Up Time	t_{DS}	80	-	-	ns
Data Hold Time	t_{DH}	40	-	-	ns
Access time	t_{ACC}	-	-	150	ns
Output Hold Time	t_{OH}	10	-	50	ns

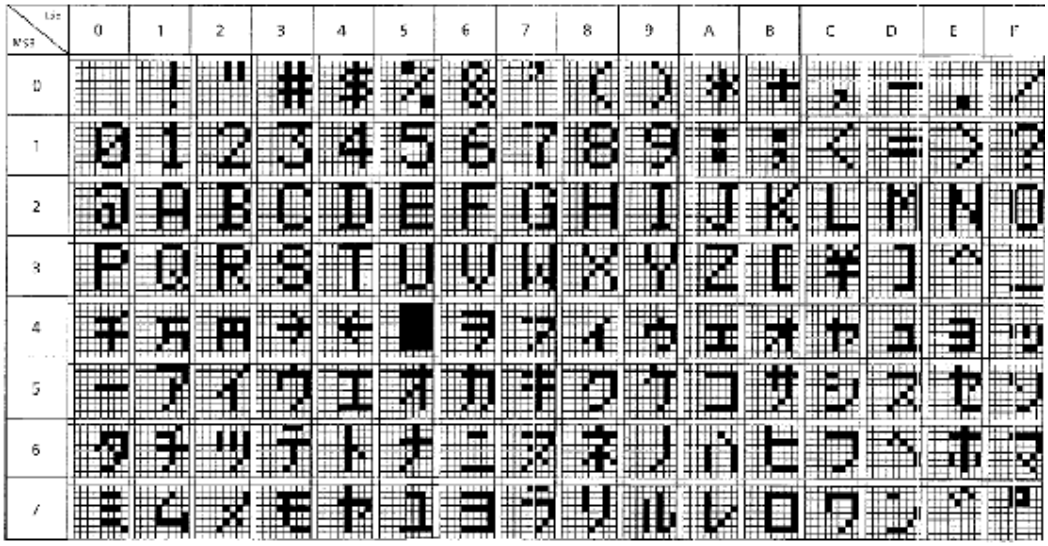
Timing Characteristics between MPU and T6963

9.2 Relationship between character code and pattern

CG ROM TYPE 0101



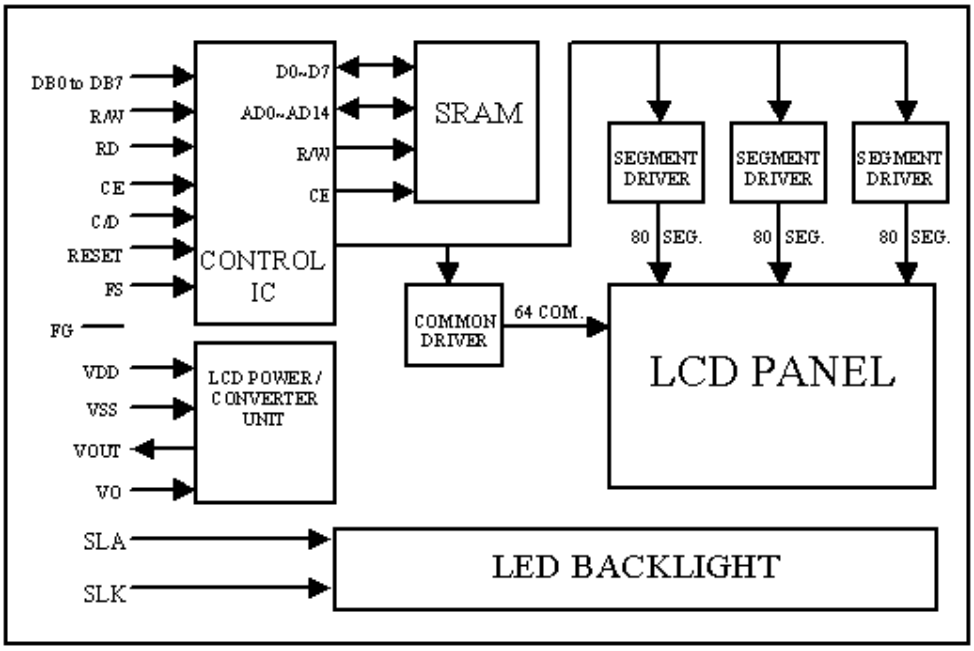
CG ROM TYPE 0201



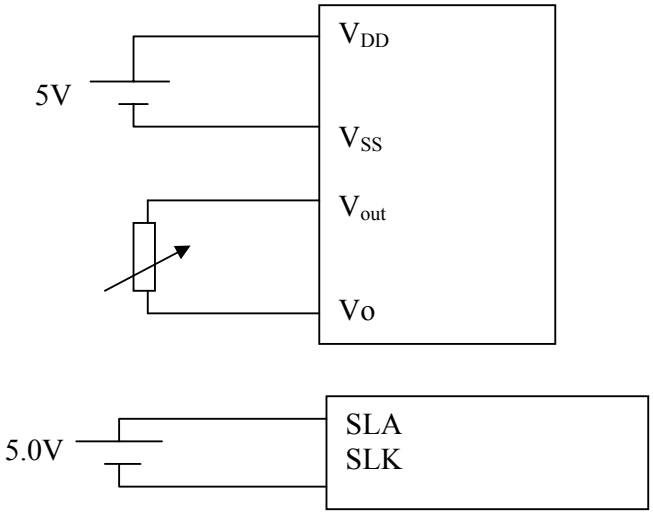
10. Instruction Set

COMMAND	CODE	D1	D2	FUNCTION
REGISTER SETTING	00100001	X address	Y address	Set Cursor Pointer
	00100010	Data	00H	Set Offset Register
	00100100	Low address	High address	Set Address Pointer
SET CONTROL WORD	01000000	Low address	High address	Set Text Home Address
	01000001	Columns	00H	Set Text Area
	01000010	Low address	High address	Set Graphic Home Address
	01000011	Columns	00H	Set Graphic Area
MODE SET	1000X000	-	-	OR mode
	1000X001	-	-	EXOR mode
	1000X011	-	-	AND mode
	1000X100	-	-	Text Attribute mode
	10000XXX	-	-	Internal CG ROM mode
	10001XXX	-	-	External CG RAM mode
DISPLAY MODE	10010000	-	-	Display off
	1001XX10	-	-	Cursor on, blink off
	1001XX11	-	-	Cursor on, blink on
	100101XX	-	-	Text on, graphic off
	100110XX	-	-	Text off, graphic on
	100111XX	-	-	Text on, graphic on
CURSOR PATTERN SELECT	10100000	-	-	1-line cursor
	10100001	-	-	2-line cursor
	10100010	-	-	3-line cursor
	10100011	-	-	4-line cursor
	10100100	-	-	5-line cursor
	10100101	-	-	6-line cursor
	10100110	-	-	7-line cursor
	10100111	-	-	8-line cursor
DATA AUTO READ / WRITE	10110000	-	-	Set Data Auto Write
	10110001	-	-	Set Data Auto Read
	10110010	-	-	Auto Reset
DATA READ / WRITE	11000000	Data	-	Data Write and Increment ADP
	11000001	-	-	Data Read and Increment ADP
	11000010	Data	-	Data Write and Decrement ADP
	11000011	-	-	Data Read and Decrement ADP
	11000100	Data	-	Data Write and Nonvariable ADP
	11000101			Data Read and Nonvariable ADP
SCREEN PEEK	11100000	-	-	Screen Peek
SCREEN COPY	11101000			Screen Copy
BIT SET / RESET	11110XXX	-	-	Bit Reset
	11111XXX	-	-	Bit set
	1111X000	-	-	Bit 0 (LSB)
	1111X001	-	-	Bit 1
	1111X010	-	-	Bit 2
	1111X011	--	--	Bit 3
	1111X100	-	-	Bit 4
	1111X101	-	-	Bit 5
	1111X110	-	-	Bit 6
	1111X111	-	-	Bit 7 (MSB)

11. Block Diagram and Power Supply



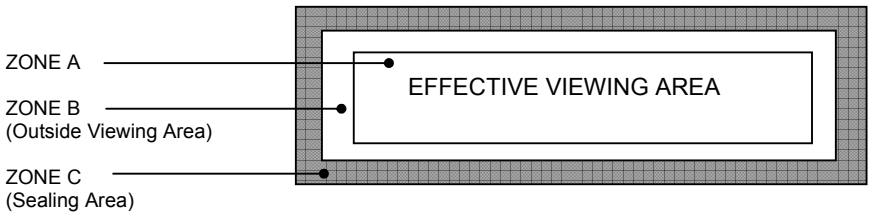
Block Diagram



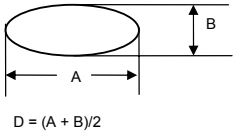
Power Supply

12.0 Quality Assurance

12.1 ZONE DEFINITION



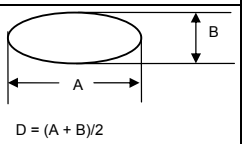
12.1.1 Black Spot, White Spot and Foreign Material

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 ≤ 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				

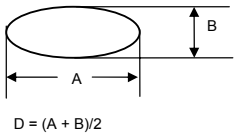
12.1.2 Line Shape and Scratches

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 ≤ 0.20mm within 1 part/segment	

12.1.4 Polarizer Bubble/Foreign Material

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

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

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.

2.4 Operation

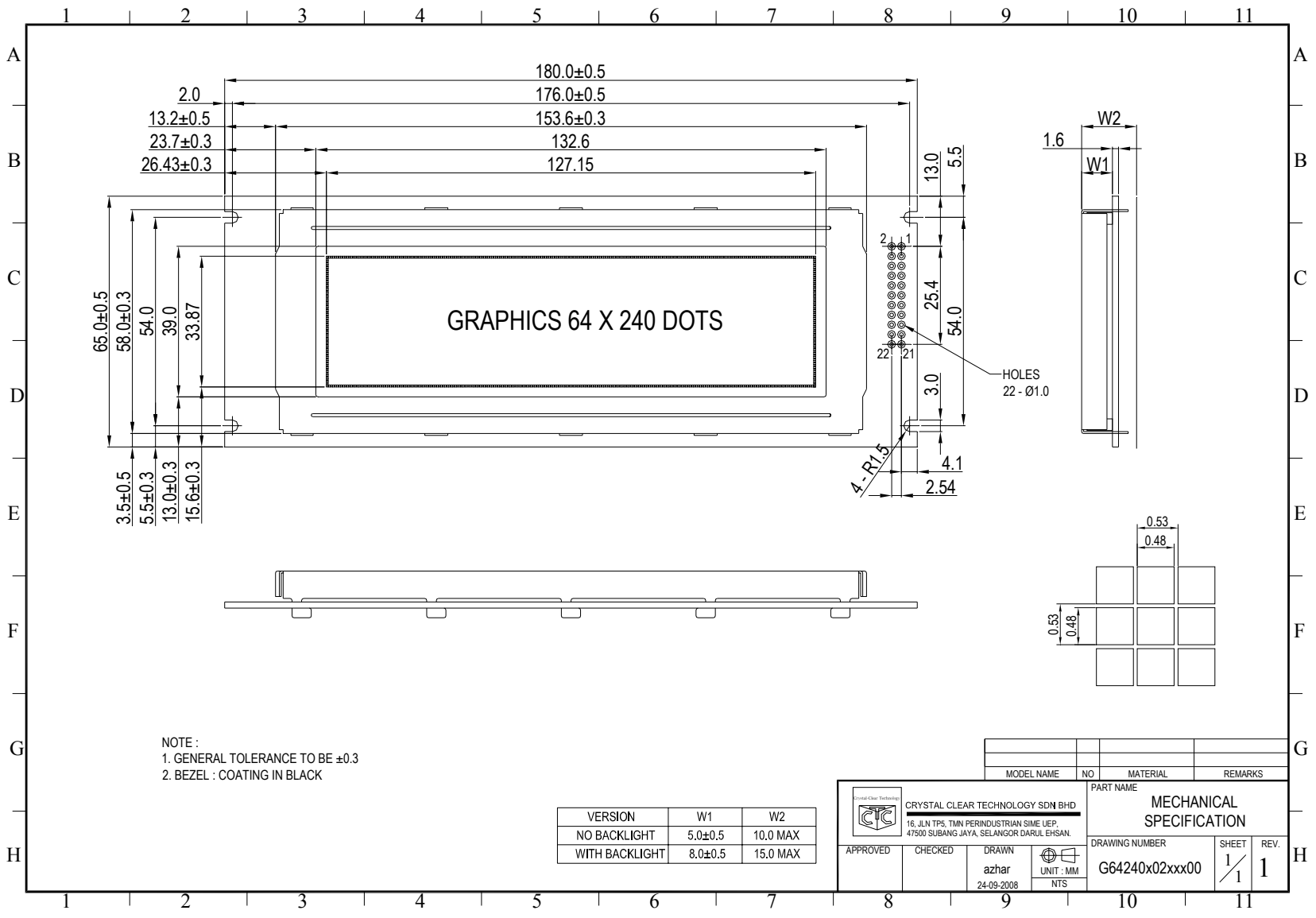
a) The contras can be adjusted by varying the LCD driving voltage V0
b) Driving voltage should be kept within specified range, excess voltage shortens display life.
c) Response time increases with decrease in temperature.
d) Display may turn black or dark blue at temperature above its operational range,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



VERSION	W1	W2
NO BACKLIGHT	5.0±0.5	10.0 MAX
WITH BACKLIGHT	8.0±0.5	15.0 MAX

Crystal Clear Technology

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