Crystal Clear Technology

Product Specification

G64128X17 series

1.0   Table of Contents   Page

2.0   Record of revision

Rev	Date	Item	Page	Comment	Originator	Checked By
1.0	15/09/08			Initial Release	Syam	Azhar
2.0	28/05/09		8	Revise Pin out – Pin 1 and 2	Khairiah	Azhar
3.0	21/07/09		8	Revise Pin out – pin 4 to 14	Khairiah	Azhar

3.0   General specification

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

Dot size: 0.49 (w) x 0.49 (h) mm

Dot pitch: 0.52 (w) x 0.52 (h) mm
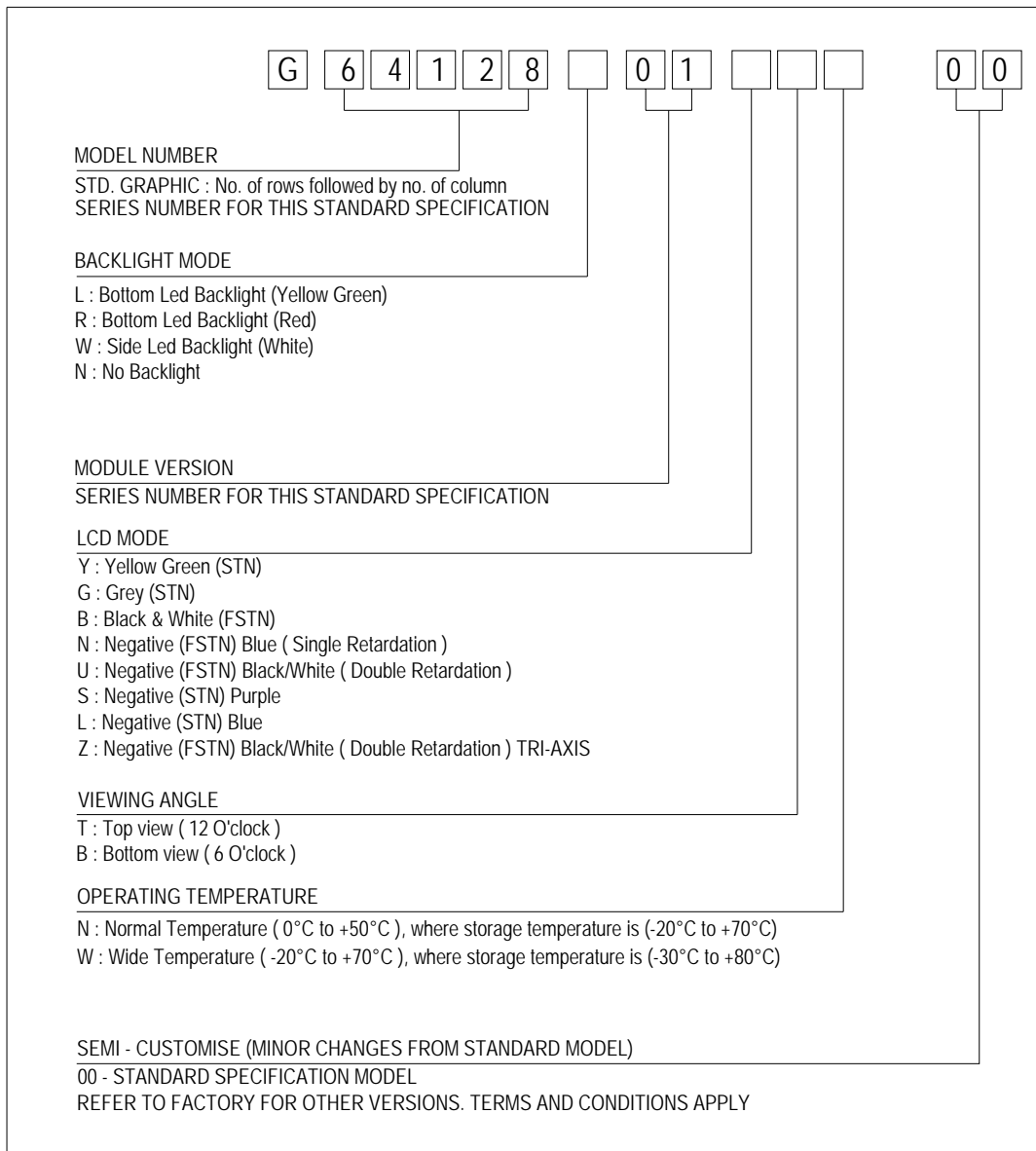
View area: 70.7 (w) x 38.8 (h) mm

Active area: 66.53 (w) x 33.25 (h) mm

General dimensions: 93.0 (w) x 70.0 (h) x 13.5 max (t) mm

Controller/Driver: NT7107 and NT7108 or equivalent

Interface: Parallel

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

| G | 6 | 4 | 1 | 2 | 8 | | 0 | 1 | | | | | 0 | 0 |

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

BACKLIGHT MODE
L : Bottom Led Backlight (Yellow Green)
R : Bottom Led Backlight (Red)
W : Side Led Backlight (White)
N : No Backlight

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
N : Normal Temperature (0°C to +50°C), where storage temperature is (-20°C to +70°C)
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

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)	$V_{DD} - V_0$	-	14.0	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	8.5±5%			V
3.	Input Voltage	V_{IH}	-	$0.7V_{DD}$	-	V_{DD}	V
		V_{IL}		0	-	$0.3V_{DD}$	
4.	Current Supply	I_{DD}	$V_{DD} - V_{SS} = 5V$ $V_{DD} - V_0 = 8.3V$	-	3.3	-	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	-	-	30	60	7
2.	White	-	5.0	-	-	60	80	60
3.	Blue	-	5.0	-	-	60	80	40

*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, 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.
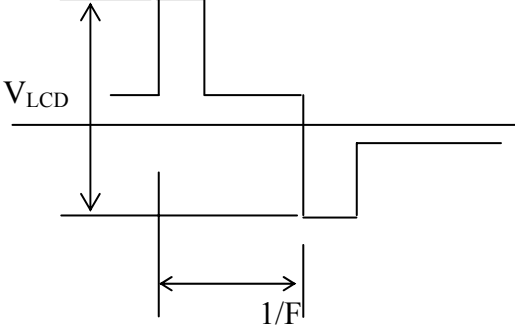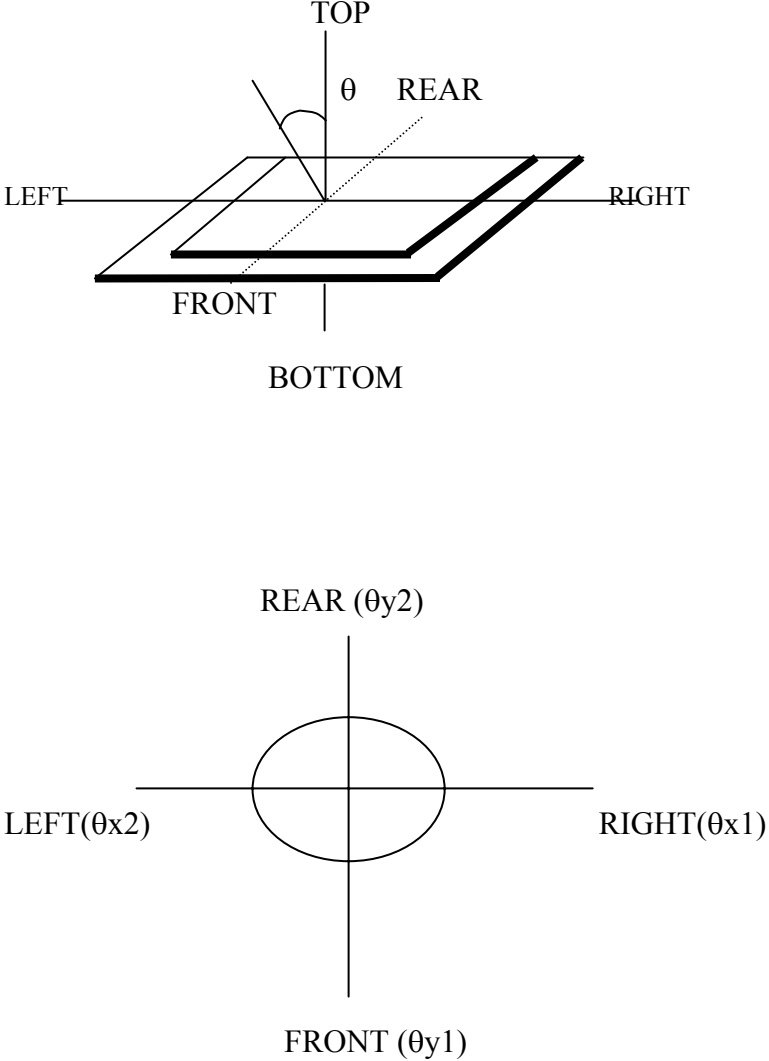
7.0   LCD specification

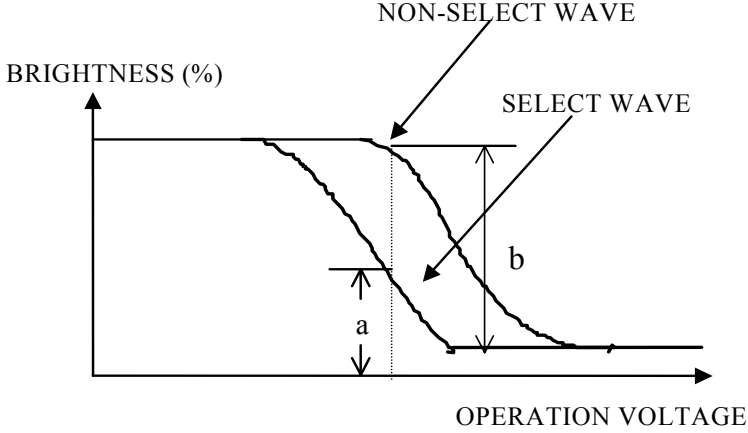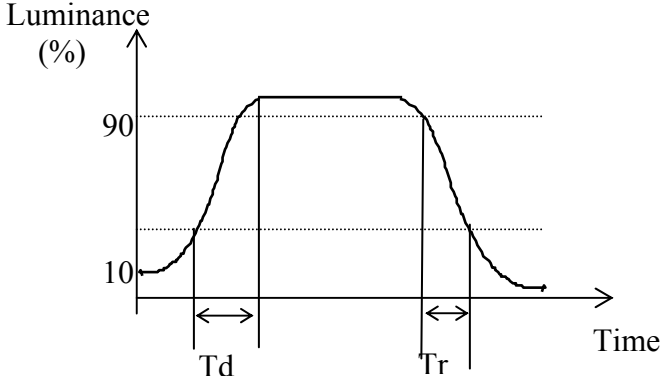7.1   Electro-optical characteristics (at ambient temperature = 25°C)

NO	ITEM	SYMBOL	CONDITION	LCD TYPE							REF.
				STN YG	STN GREY	STN -VE BLUE	FSTN +VE B/W	FSTN −VE BLUE	FSTN -VE TRUE B/W	FSTN -VE TRI AXIS	
1	Operating Voltage (Volt)	V_{LCD}	$\theta = 0$ Cr = max	8.5 ± 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*	

NON-SELECT WAVE

SELECT WAVE

BRIGHTNESS (%)

b

a

OPERATION VOLTAGE

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*	

Luminance (%)

90

10

Td   Tr

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*	NT7107
8.2	*Display Driver*	NT7108
8.3	*Duty Cycle*	1/64
8.4	*Pin-out Assignments*	

|	Pin No	Symbol	Description
	1	V_{SS}	Ground terminal of module
	2	V_{DD}	Supply terminal of module
	3	V_O	Power supply for Liquid Crystal Drive
	4	RS	Command Data Select
	5	R/W	Read/Write Selection: High = Read Low = Write
	6	E	Enable Signal
	7 to 14	D0 to D7	Bi-directional Data Bus. Data transfer is performed once, thru D0 to D7, in the case of interface data length is 8-bits.
	15	CS1	Select IC U2 (Active high)
	16	CS2	Select IC U3 (Active high)
	17	RSTB	Reset Signal (Active low)
	18	VOUT*	Negative voltage from the LCD Module
	19	SLA	Backlight power supply
	20	SLK	Backlight ground

Note:

VOUT*: The module will generate its own negative voltage.

9.0   Functional Descriptions
   9.1   Display Control Timing Waveform and Characteristics

Characteristic	Symbol	Min	Type	Max	Unit
FRM delay time	t_{DF}	-2	-	2	μs
M delay time	t_{DM}	-2	-	2	
CL "low" level width	t_{WL}	35	-	-	
CL "high" level width	t_{WH}	35	-	-	
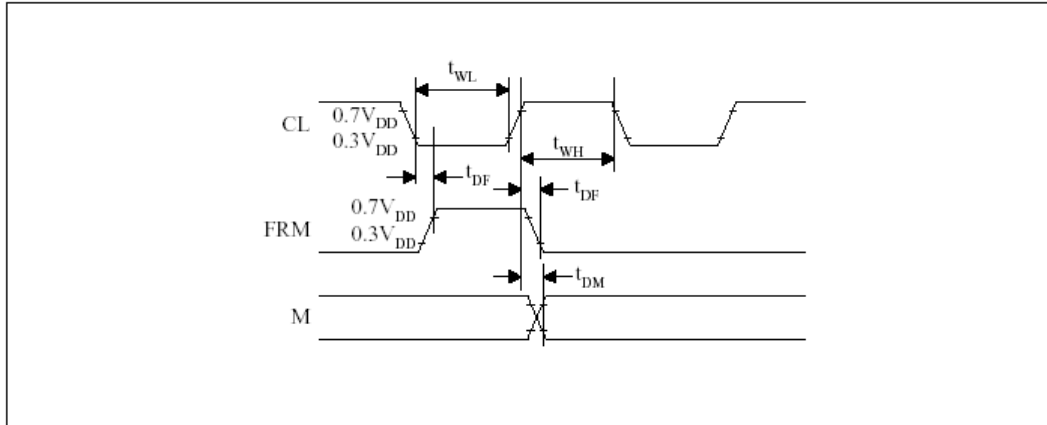
   9.2   MPU Timing

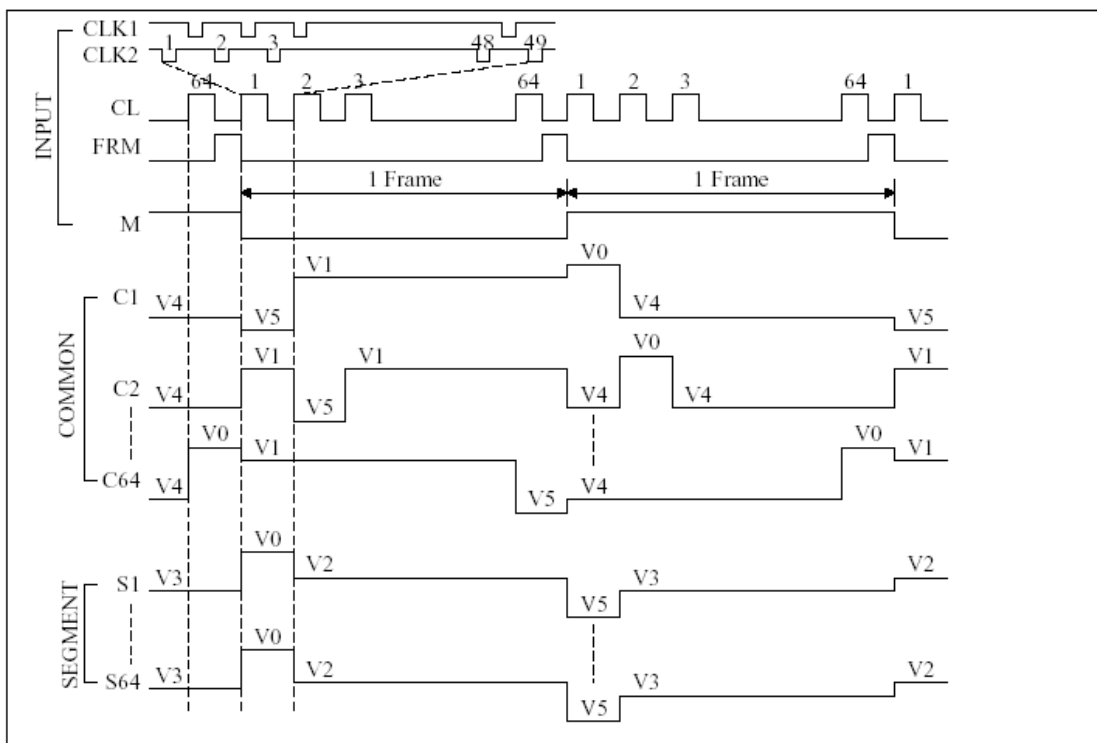| Characteristic	Symbol	Min	Type	Max	Unit
E cycle	t_C	1000	-	-	ns
E high level width	t_{WH}	450	-	-	
E low level width	t_{WL}	450	-	-	
E rise time	t_R	-	-	25	
E fall time	t_F	-	-	25	
Address set-up time	t_{ASU}	140	-	-	
Address hold time	t_{AH}	10	-	-	
Data set-up time	t_{DSU}	200	-	-	
Data delay time	t_D	-	-	320	
Data hold time (write)	t_{DHW}	10	-	-	
Data hold time (read)	t_{DHR}	20	-	-	
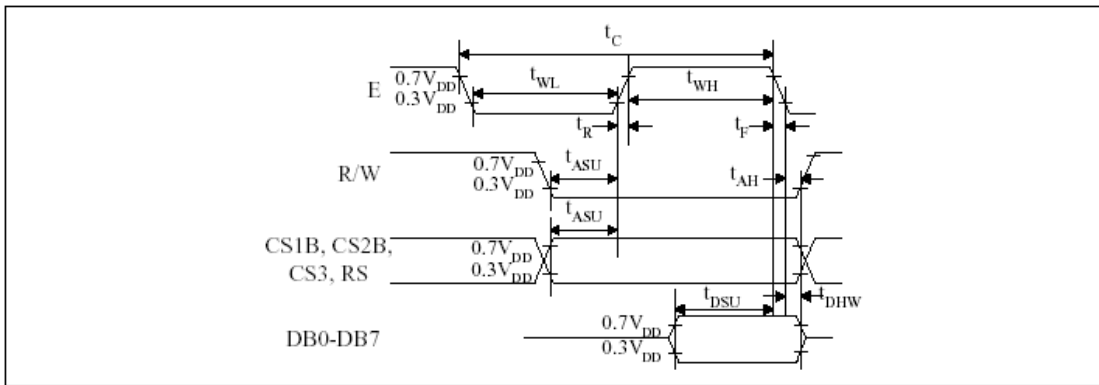
MPU Write Timing
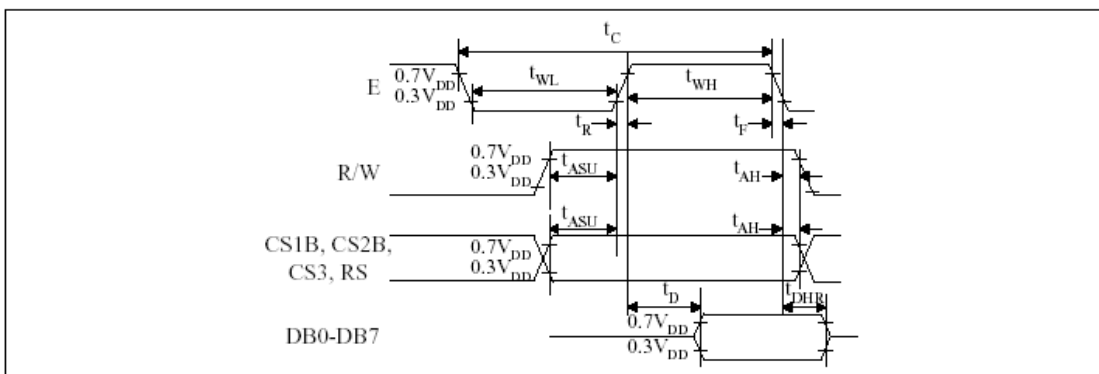
MPU Read Timing

9.3   Timing Diagram (1/64 Duty)

10.   Instruction Set

The display control instructions control the internal state of the NT7108. Instruction is received from MPU to NT7108 for the display control. The following table shows various instructions.

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Display on/off	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L:OFF, H:ON
Set address (Y address)	L	L	L	H	Y address (0-63)						Sets the Y address in the Y address counter.
Set page (X address)	L	L	H	L	H	H	H	Page (0-7)			Sets the X address at the X address register.
Display Start line (Z address)	L	L	H	H	Display start line (0-63)						Indicates the display data RAM displayed at the top of the screen.
Status read	L	H	Busy	L	On/Off	Reset	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset
Write display data	H	L	Write data								Writes data (DB0: 7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read display data	H	H	Read data								Reads data (DB0: 7) from display data RAM to the data bus.

11. Block Diagram and Power Supply
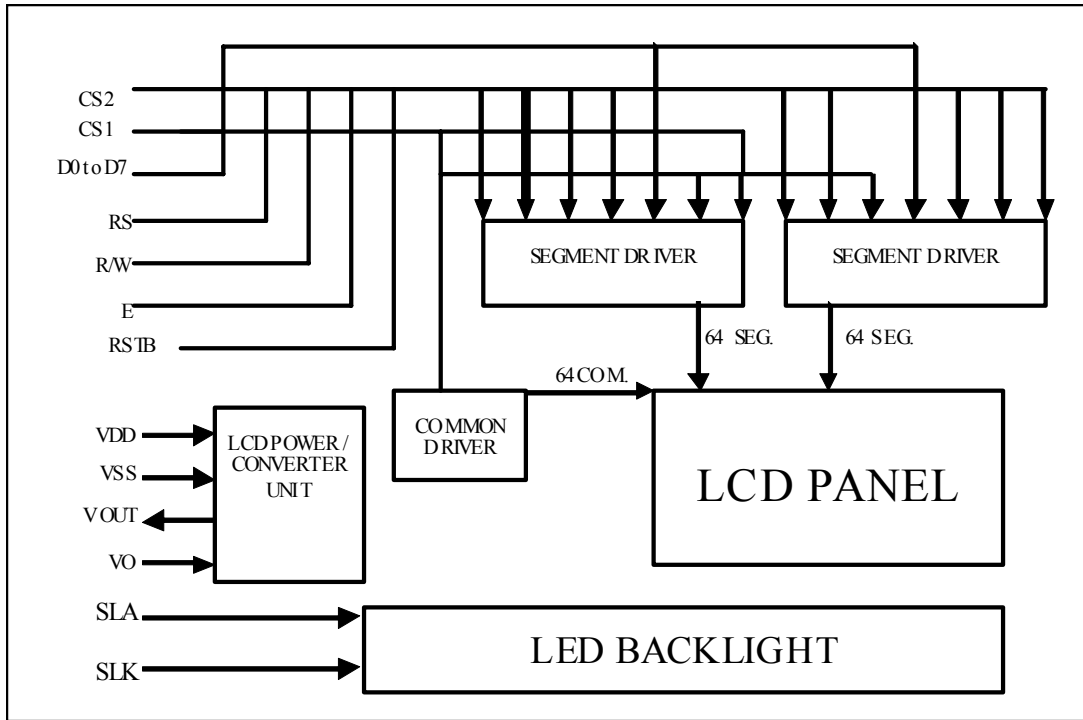
Block Diagram
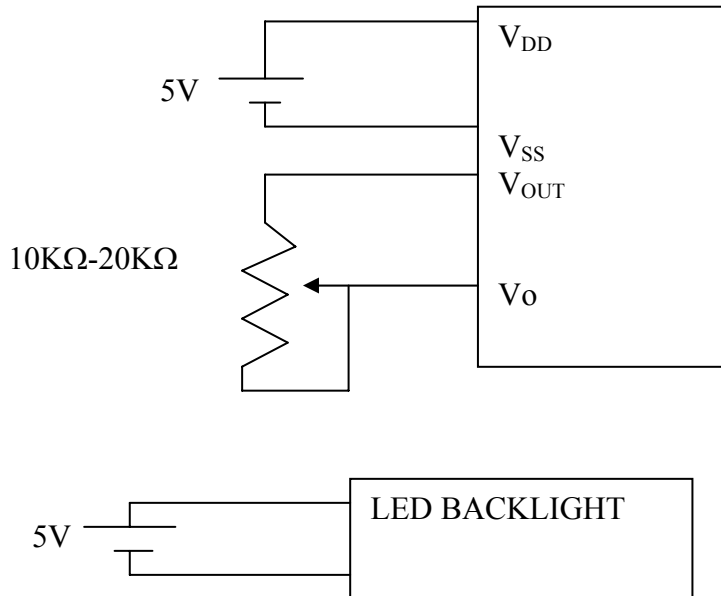
Power Supply

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				

$D = (A + B)/2$

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	

$D = (A + B)/2$

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	D = (A + B)/2
		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				

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.
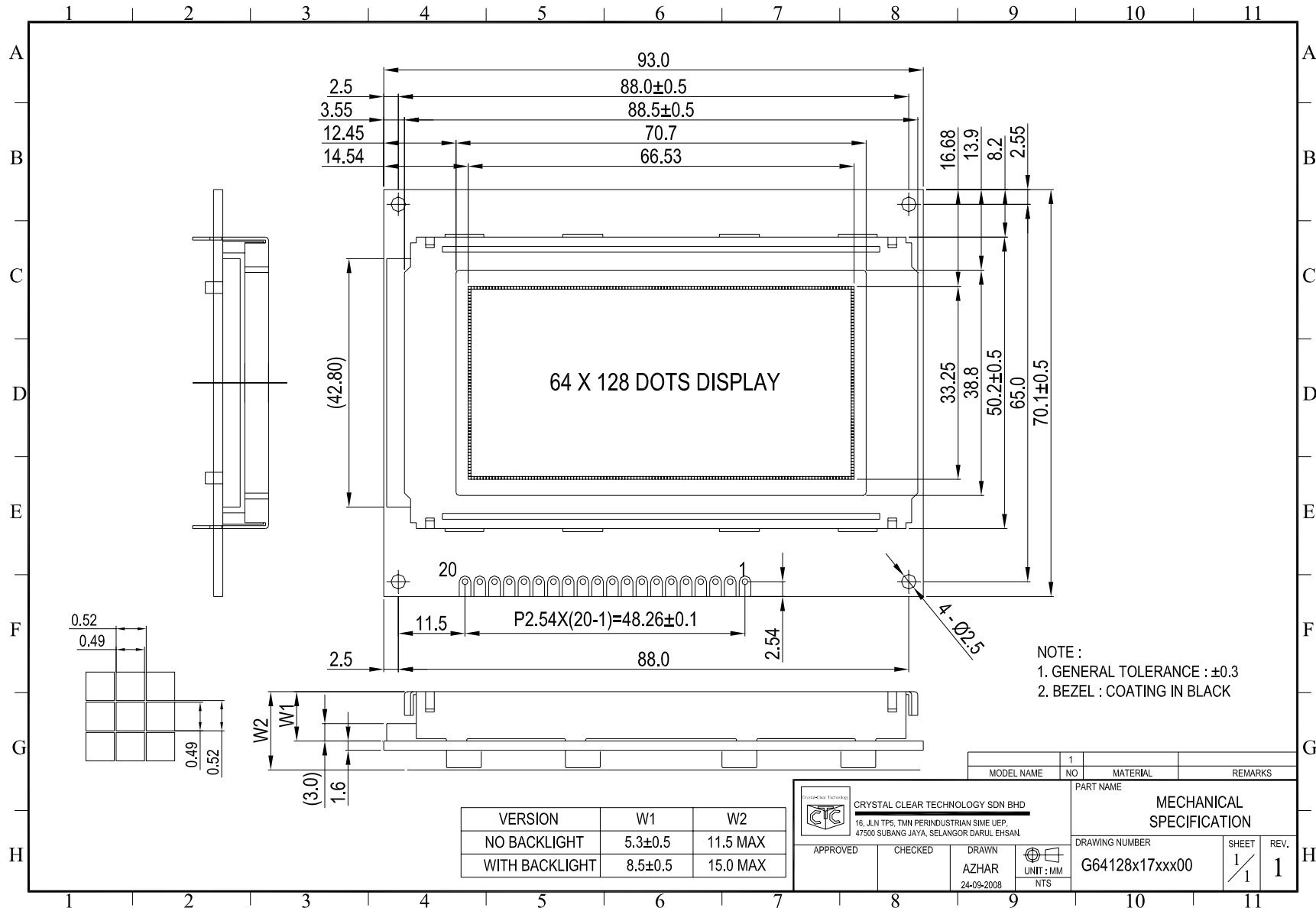
2.4 Operation

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.

64 X 128 DOTS DISPLAY

93.0
88.0±0.5
88.5±0.5
70.7
66.53
2.5
3.55
12.45
14.54

16.68
13.9
8.2
2.55

(42.80)

33.25
38.8
50.2±0.5
65.0
70.1±0.5

20   1
11.5
P2.54X(20-1)=48.26±0.1
2.54
2.5
88.0

4 - Ø2.5

0.52
0.49
0.49
0.52

W2
W1
(3.0)
1.6

NOTE :
1. GENERAL TOLERANCE : ±0.3
2. BEZEL : COATING IN BLACK

VERSION	W1	W2
NO BACKLIGHT	5.3±0.5	11.5 MAX
WITH BACKLIGHT	8.5±0.5	15.0 MAX

MODEL NAME	NO	MATERIAL	REMARKS
	1		

PART NAME

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

MECHANICAL
SPECIFICATION

APPROVED	CHECKED	DRAWN	UNIT : MM	DRAWING NUMBER	SHEET	REV.
		AZHAR 24-09-2008	NTS	G64128x17xxx00	1/1	1

17

Crystal Clear Technology
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