Crystal Clear Technology

Product Specification

C216x21xxx00

Crystal Clear Technology sdn. bhd.

1.0   Table of Contents

2.0   Record of revision

Rev	Date	Item	Page	Comment	Originator	Checked By
1.0	22/07/10			Initial Release	Khairiah	Azhar
2.0	16/08/10		27	Update Mechanical Drawing	Khairiah	Azhar
3.0	20/08/10		4	Update Electrical Spec		
				- change VDD – 3.0V (min)	Khairiah	Azhar

3.0   General specification

Display format: Characters 2 x 16 COG

Character size: 5 x 8

Character size: 2.95mm x 5.55mm
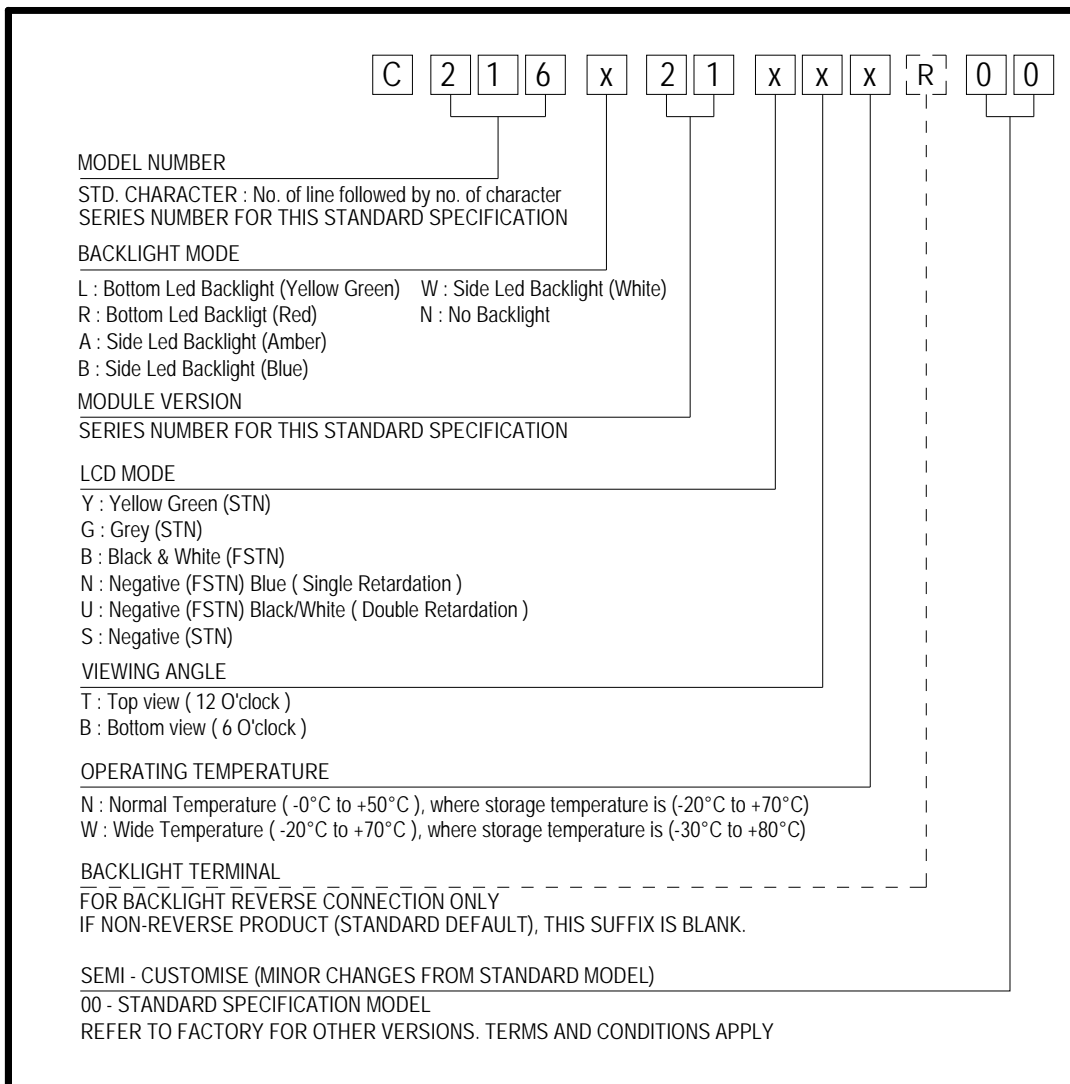
View area: 61.0mm x 15.7mm

Active area: 56.20mm x 11.6mm

General dimensions: 68.6mm x 27.7mm

Controller/Driver: NT7605 or equivalent

Microprocessor interface: Parallel (Connection: Pinning)

Driving Method : 1/16 duty, 1/5 bias

| C | 2 | 1 | 6 | x | 2 | 1 | x | x | x | R | 0 | 0 |

MODEL NUMBER
STD. CHARACTER : No. of line followed by no. of character
SERIES NUMBER FOR THIS STANDARD SPECIFICATION

BACKLIGHT MODE

L : Bottom Led Backlight (Yellow Green)   W : Side Led Backlight (White)
R : Bottom Led Backligt (Red)   N : No Backlight
A : Side Led Backlight (Amber)
B : Side Led Backlight (Blue)

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)

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)

BACKLIGHT TERMINAL
FOR BACKLIGHT REVERSE CONNECTION ONLY
IF NON-REVERSE PRODUCT (STANDARD DEFAULT), THIS SUFFIX IS BLANK.

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}	-0.3	7	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}	-	3.0	5.0	5.2	V
2.	Power Supply voltage (V_{LCD})	V_{DD}-V_5	25°C	5.0±5%			V
3.	Current Supply	I_{DD}	V_{DD} = 5V	-	1.2	1.5	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	-	4.1	-	-	20	40	3

*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.

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.
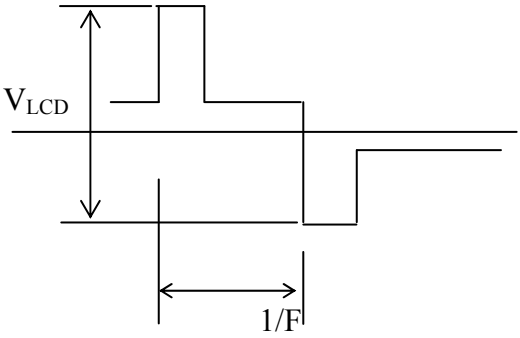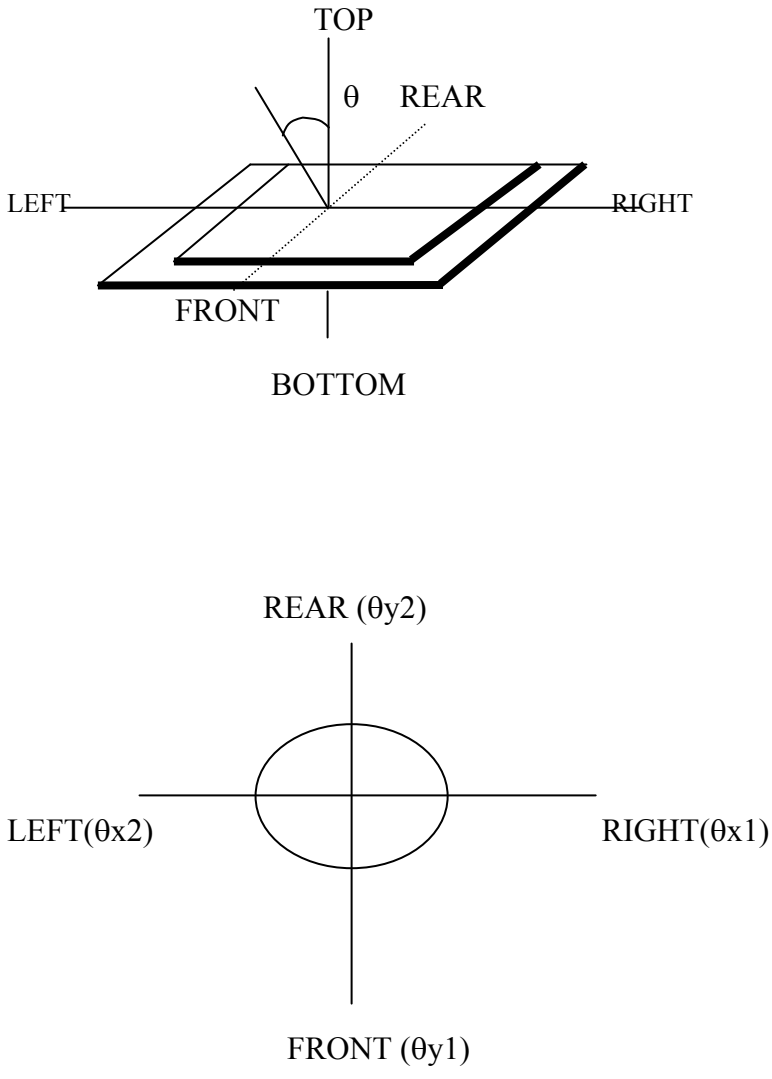
7.0   LCD specification

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

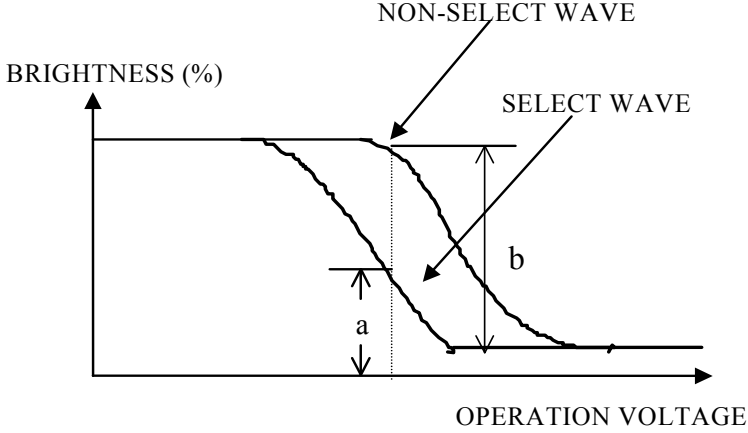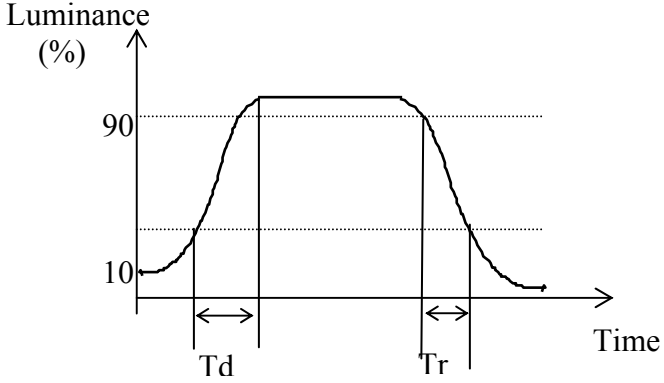| NO	ITEM	SYMBOL	CONDITION	LCD TYPE						REF.
				STN YG	STN GREY	STN -VE BLUE	FSTN +VE B/W	FSTN –VE BLUE	FSTN -VE TRUE B/W	
1	Operating Voltage (Volt)	V_{LCD}	$\theta = 0$ Cr = max	5.0 ± 5%						7.1.1
2	Viewing Angle (Deg)	$\theta x 1$	CR ≥ 2 V_{LCD} = 5.0V	+25	+20	+35	+25	+35	+35	7.1.2
		$\theta x 2$		-25	-20	-35	-25	-35	-40	
		$\theta y 1$		-30	-25	-35	-30	-35	-35	
		$\theta y 2$		+30	+25	+35	+30	+35	+35	
3	Contrast Ratio	CR	$\theta = 0^0$ V_{LCD} =5.0V	3.0	2.3	6.0	3.0	6.0	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*	

BRIGHTNESS (%)

NON-SELECT WAVE

SELECT WAVE

b

a

OPERATION VOLTAGE

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 (%)

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

Pin No.	Symbol	Function
1	GND	Ground
2	VDD	Logic power supply
3	NC	No Connection
4	RS	Register select input
5	R/W	Read and write input
6	E	Read/Write start signal
7	DB0	Data input
8	DB1	Data input
9	DB2	Data input
10	DB3	Data input
11	DB4	Data input
12	DB5	Data input
13	DB6	Data input
14	DB7	Data input

9.0   Timing characteristics / Timing diagrams

9.1   Read Timing Signal

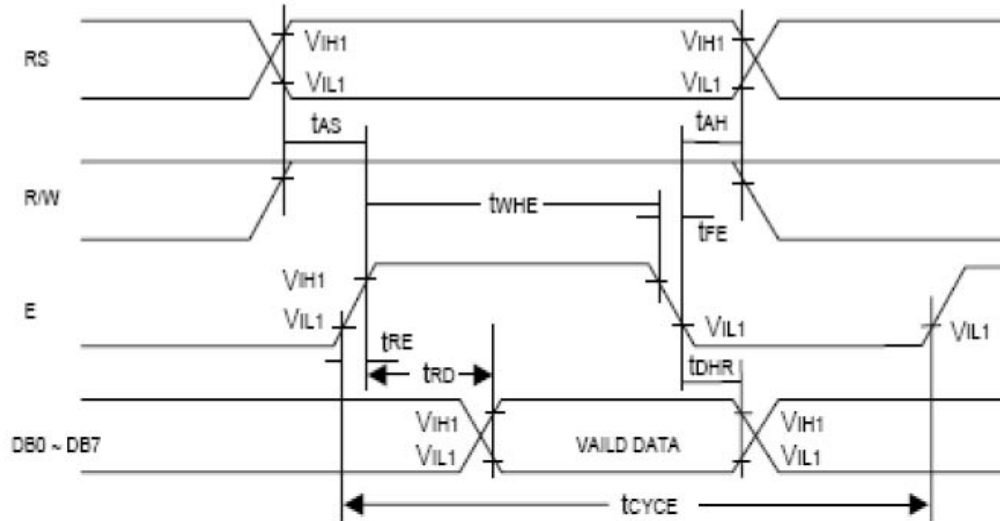Figure 1. Bus Read Operation Sequence
(Reading out data from NT7605 to MPU)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
t_{CYCE}	Enable Cycle Time	500	-	-	ns	Figure 1
t_{WHE}	Enable "H" Level Pulse Width	300	-	-	ns	Figure 1
t_{RE}, t_{FE}	Enable Rise/Fall Time	-	-	25	ns	Figure 1
t_{AS}	RS, R/W Setup Time	60[1]	-	-	ns	Figure 1
		100[2]				
t_{AH}	RS, R/W Address Hold Time	10	-	-	ns	Figure 1
t_{RD}	Read Data Output Delay	-	-	190	ns	Figure 1
t_{DHR}	Read Data Hold Time	20	-	-	ns	Figure 1

9.2 Write Timing Signal
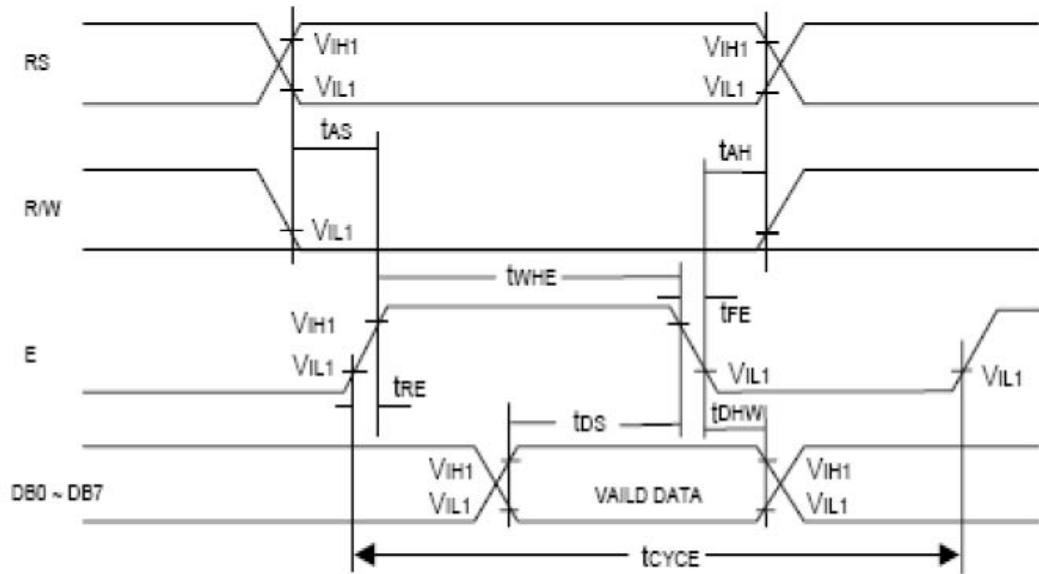
Figure 2. Bus Write Operation Sequence
(Writing data from MPU to NT7605)

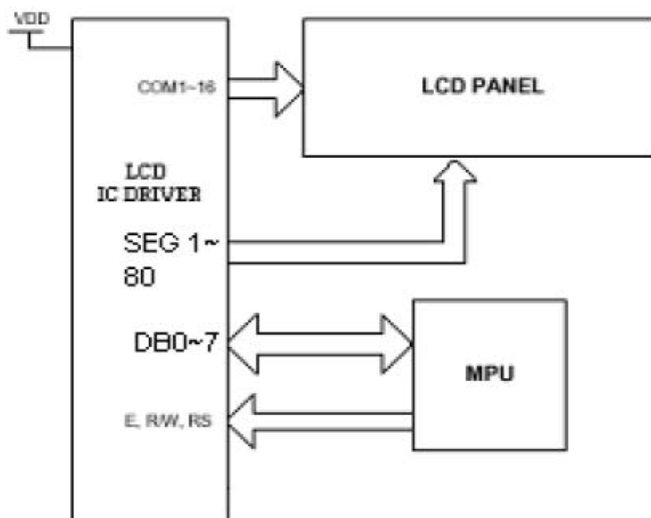| Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
t_{CYCE}	Enable Cycle Time	500	-	-	ns	Figure 2
t_{WHE}	Enable "H" Level Pulse Width	300	-	-	ns	Figure 2
t_{RE}, t_{FE}	Enable Rise/Fall Time	-	-	25	ns	Figure 2
t_{AS}	RS, R/W Setup Time	60^1	-	-	ns	Figure 2
		100^2				
t_{AH}	RS, R/W Address Hold Time	10	-	-	ns	Figure 2
t_{DS}	Data Output Delay	150	-	-	ns	Figure 2
t_{DHW}	Data Hold Time	10	-	-	ns	Figure 2

Notes: 1: 8-bit operation mode
2: 4-bit operation mode

9.3 Interface with 8-bit MPU
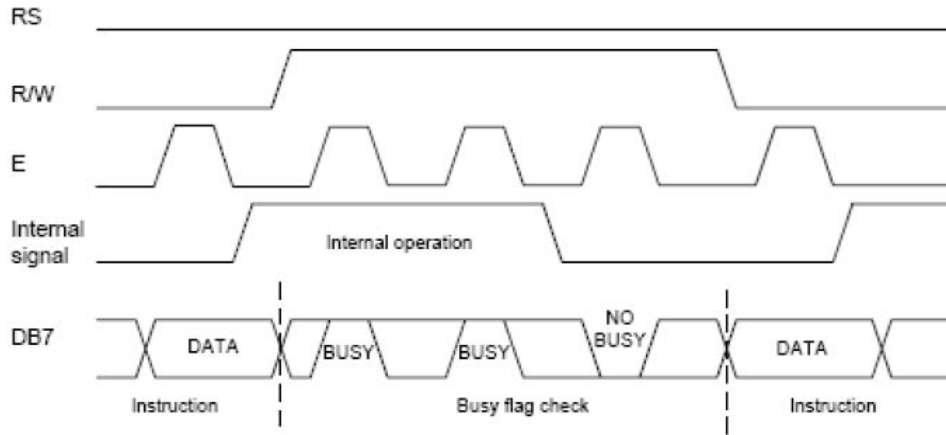
9.4 Interface with 4-bit MPU
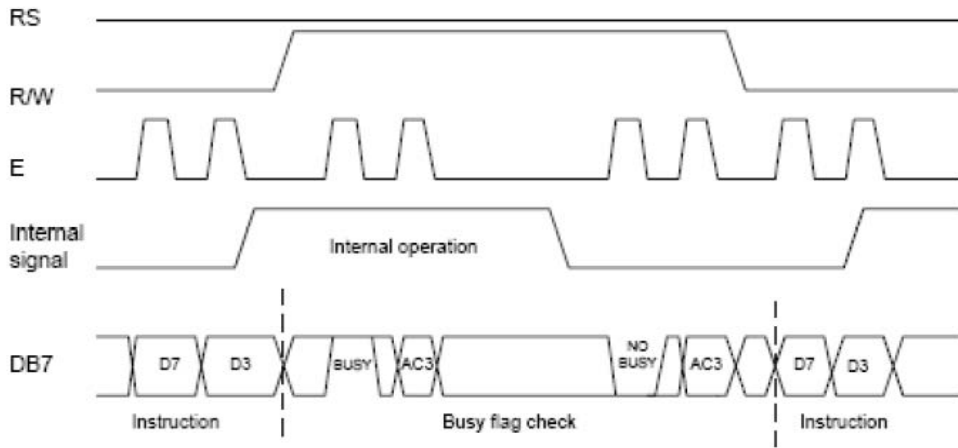
10. Application Block Diagram/Circuit

11. Instructions

Instruction	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function	Execution time (max) (fosc = 250kHz)
											Code	
Display Clear	0	0	0	0	0	0	0	0	0	1	Clear entire display area, restore display from shift, and load address counter with DDRAM address 00h.	1.64ms
Display/ Cursor Home	0	0	0	0	0	0	0	0	1	*	Restore display from shift and load address counter with DDRAM address 00h.	1.64ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Specify direction of cursor movement and display shift mode. This operation takes place after each data transfer (read/write).	40us
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	Specify activation of display (D) cursor (C) and blinking of character at cursor position (B).	40us
Display/ Cursor Shift	0	0	0	0	0	1	S/C	R/L	*	*	Shift displays or move cursor.	40us
Function Set	0	0	0	0	1	DL	1	0	*	*	Set interface data length (DL :8 bit/4 bit)	40us
RAM Address Set	0	0	0	1	ACG						Load the address counter with a CGRAM address. Subsequent data access is for CGRAM data.	40us
DDRAM Address Set	0	0	1	ADD							Load the address counter with a DDRAM address. Subsequent data access is for DDRAM data.	40us
Busy Flag/ Address Counter Read	0	1	BF	AC							Read Busy Flag(BF) and contents of Address Counter (AC)	40us
CGRAM/ DDRAM Data Write	1	0	Write data								Write data to CGRAM or DDRAM	40us

CGRAM/ DDRAM Data Read	1	1	Read data	Read data from CGRAM or DDRAM	40us
CGRAM/ DDRAM Data Read	1	1	Read data	Read data from CGRAM or DDRAM	40us

Note: Symbol "*" signifies an insignificant bit (disregard)

DDRAM : Display Data RAM
CGRAM : Character Generator RAM
ACG   : Character Generator RAM Address
ADD   : Display Data RAM Address
AC   : Address Counter

I/D	= 1	:	Increment	I/D	= 0	: Decrement
S	= 1	:	Display Shift On			
D	= 1	:	Display On			
C	= 1	:	Cursor Display On			
B	= 1	:	Cursor Blink On			
S/C	= 1	:	Shift Display	S/C	= 0	: Move Cursor
R/L	= 1	:	Shift Right	R/L	= 0	: Shift Left
DL	= 1	:	8-bit	DL	= 0	: 4-bit
BF	= 1	:	Internal Operation			
BF	= 0	:	Ready for Instruction			

11.2 Character Generator ROM (NT7605)

12.0   LCD Module Initialization Flow

12.1   8-bit interface

Power On

↓

Wait for more than 30 ms after VDD on

↓

Function set									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	N	F	X	X

N	0	1-line mode
	1	2-line mode

F	0	5 x 7 dots
	1	5 x 10 dots

↓

Wait for more than 40 μs

↓

Display ON/OFF Control									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	1	D	C	B

D	0	display off
	1	display on

C	0	cursor off
	1	cursor on

B	0	blink off
	1	blink on

↓

Wait for more than 40 μs

↓

Clear Display									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	0	0	1

↓

Wait for more than 1.64ms

↓

Entry Mode Set									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	1	I/D	S

I/D	0	decrement mode
	1	increment mode

S	0	entire shift off
	1	entire shift on

↓

Initialization end

↓

Write date to DDRAM: Write N									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	0	0	1	0	0	1	1	1	0

↓

....

15

12.2   4-bit interface

```
┌─────────────────────┐
│      Power On        │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│ Wait for more than 30 ms │
│     after VDD on     │
└─────────────────────┘
           │
           ▼
```

Function set

RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	0	X	X	X	X
0	0	0	0	1	0	X	X	X	X
0	0	N	F	X	X	X	X	X	X

N	0	1-line mode
	1	2-line mode

F	0	5 x 7 dots
	1	5 x 10 dots

```
           │
           ▼
┌─────────────────────┐
│ Wait for more than 40 µs │
└─────────────────────┘
           │
           ▼
```

Display ON/OFF Control

RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	D	C	B	X	X	X	X

D	0	display off
	1	display on

C	0	cursor off
	1	cursor on

B	0	blink off
	1	blink on

```
           │
           ▼
┌─────────────────────┐
│ Wait for more than 40 µs │
└─────────────────────┘
           │
           ▼
```

Clear Display

RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	0	0	1	X	X	X	X

```
           │
           ▼
┌─────────────────────┐
│ Wait for more than 1.64ms │
└─────────────────────┘
           │
           ▼
```

Entry Mode Set

RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	0	I/D	S	X	X	X	X

I/D	0	decrement mode
	1	Increment mode

S	0	entire shift off
	1	entire shift on

```
           │
           ▼
┌─────────────────────┐
│  Initialization end  │
└─────────────────────┘
           │
           ▼
```

Write date to DDRAM: Write N

RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	0	0	1	0	0	X	X	X	X
1	0	1	1	1	0	X	X	X	X

```
           │
           ▼
       ..........
```

13.0   Quality Assurance
13.1 INSPECTION CONDITION

13.1.1   MECHANICAL
Vernier Caliper, Micrometer, Microscope or Magnifier (10X) are used to aid measurement.

13.1.2   VISUAL
- Visual Inspection should be conducted on light table using two floating polarizers on top and bottom of LCD and fluorescent lamp at distance of 2 meter between LCD and light source.
- The Inspection distance between inspector's eyes and the LCD should be 12 inch (30.48 cm) away.
- Viewing angle should be 45°C with no lighting glare or follows customer's viewing angle specification.
- Inspectors should ensure the protective film is in good condition while doing the visual inspection.

13.1.3   ELECTRICAL
- LCD will be energized with LCD Functional tester.
- Display Current, Segment Current and testing Voltage will be as per product / customer requirement (shall be specified in the Manufacturing Specification)

13.2 SAMPLING PLAN

13.2.1   The sampling inspection plan shall be in accordance with ISO 2859 standard, Normal Inspection General II for first submission. The AQL level for Visual, Mechanical, Electrical shall be as follows:

INSPECTION ITEM	Sampling Plan
VISUAL	AQL 0.4%
ELECTRICAL	AQL 0.4%
MECHANICAL	LTPD 20%

13.2.2   The sampling inspection plan shall be in accordance with ISO 2859 standard, Normal Inspection General II for second submission. The AQL level for Visual, Mechanical & Electrical shall follow table in 13.2.1.

13.2.3   Third submission permitted only if the failure mode of the first submission is different than the failure mode of the second submission. Sampling plan shall follow 13.2.2. Submit for MRB decision if any failure occurs in the third submission.

13.3 REJECTION CRITERIA

13.3.1 VISUAL DEFECTS – NOT REWORKABLE

SPECK AND CONTAMINATION
The display which contains black spot should be rejected if the mean diameter > 0.30 mm. (Refer to appendix I)

SCRATCHES
Scratches or flaws on display viewing area will be accepted if its size is ≤ 0.02mm x 2.0mm   and not more than 2 scratches. (Refer to appendix 1 table 2 line shape)

RAINBOW
Three or more colored rings in sharp blotches of color are rejectable. (Limit samples should be used when applicable)

DISCOLORATION
No discoloration is allowed in active viewing area as specified in product specification and manufacturing specification. The LCD shall be rejected if the discolorations enter the active viewing area. Color of the LCD shall follow product specification as specified in the manufacturing spec.

AIR VOID
Air void in display is not allowable.

FILL END CONTAMINATION
Coloration at fill-end side is rejectable if it exceeded the baffle (for displays with baffle) or viewing area (for displays with out baffle)
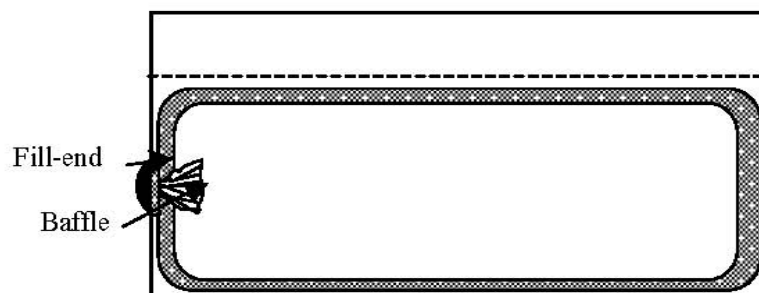
13.3.2 VISUAL DEFECTS – REWORKABLE

POLARIZER COVERAGE
- Polarizer should overlap the seal area (typical 0.5mm).
- Seal border at all sides must be visible and
- Meeting the attaching tolerance mentioned in respective Manufacturing Specification.
- The polarizer should cover the effective viewing area of the display.
- The polarizer edge should be even and not jagged.
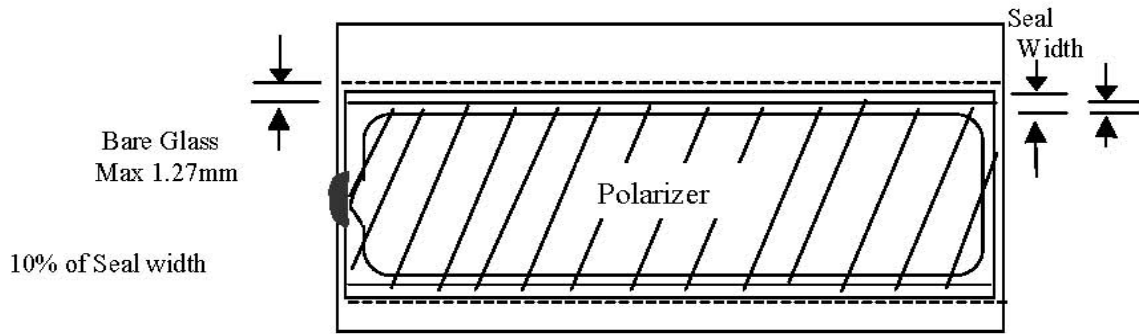
POLARIZER DELAMINATION
- Any edge or corner of the polarizer that is lifted up or not adheres to the glass is rejectable.
- Air Bubble at the seal area is acceptable if does not propagate into the display viewing area.

POLARIZER AIR BUBBLES/FOREIGN MATERIAL
- Per Appendix I.

POLARIZER DAMAGE
- Stain mark or depression in front polarizer surface should be acceptable if it is not visible from viewing distance at head on position. Defect, which is visible under surface glare, should be disregard.
- Polarizer damage in viewing area is rejectable if it is visible from the specified viewing distance and fail Appendix I.

POLARIZER SCRATCH
- Any scratch in the front polarizer surface should be acceptable if it is not visible from viewing distance at head of position.
- Defect, which is visible under surface glare, should be disregard.
- Polarizer scratch in viewing area is rejectable if it is visible from the specified viewing distance .

13.3.3 TERMINAL PIN DEFECTS – REWORKABLE

TERMINAL DEFECTS

Poor pin insertion is rejectable if the terminals are not seated firmly against the edge of pattern plate and the maximum width between terminal at the pattern plate exceeding + 0.635mm pattern plate width.
Broken, loose, missing or extra terminal is rejectable.
Bent terminals will be rejected if it fails terminal dimension specification.
Distorted, damaged or unplated terminals are rejectable.
Present of corrosion or foreign material on terminal legs will be rejected if it causes solderibility problem.
Burrs at the tip of the terminal leg is rejectable if it thickness exceed 0.305mm.
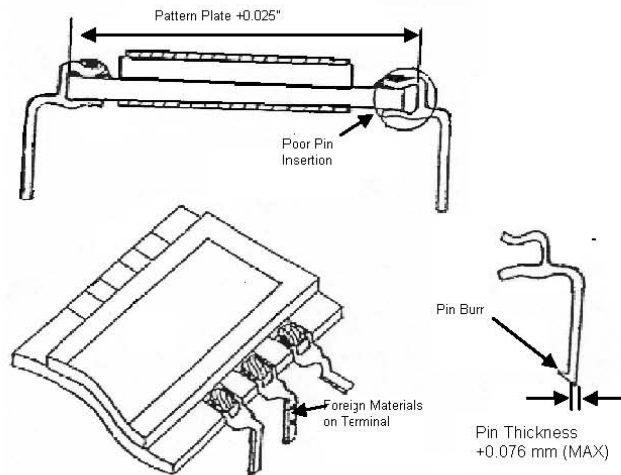
TERMINAL MISREGISTRATION

Accept if both prongs of each terminal or whole pinhead are completely or at least in contact with the conductive surface.
Reject if one of the prongs is not in contact with contact pads.
Reject if the pinhead contact both contact pads.
Pinhead should cover at least 70% of the contact pad width.
Pin leg is not to shift for more than 5° at any direction.
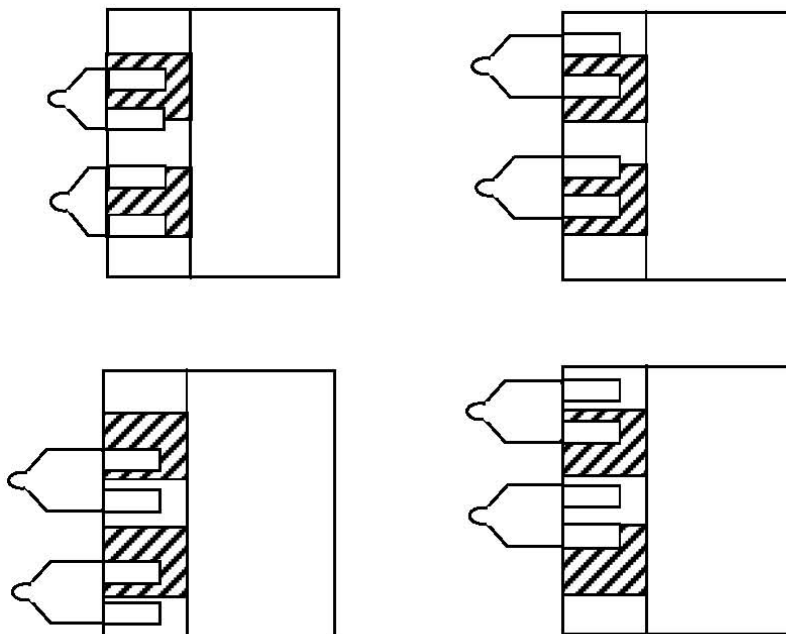
TERMINAL DOTTING DEFECT

Not uniform size of conductive dots is rejectable if it does not touch the top of both prongs of the terminal and its contact pad between them.
Dotting material on terminal leg should not exceed 1.27mm from the back glass, or causes any soldering/insertion problems.
Bridging of dotting material from one terminal to another is rejectable if it causes shorted segment (confirm defects by testing LCD at 15V, RPG tester).
Dotting material on double prongs, glass edge and forming portion is allowable unless it causes shorted segments.
Dotting material on polarizer shall not exceed seal area.
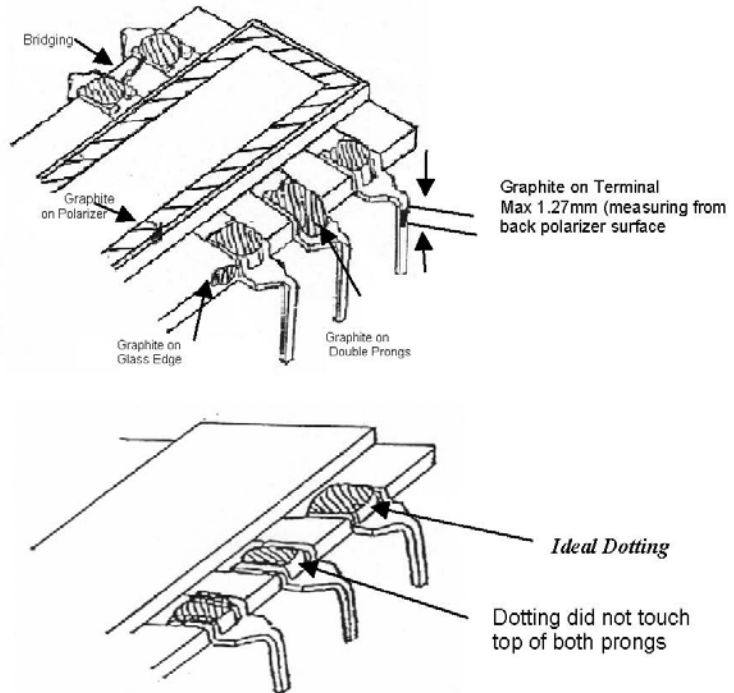
13.3.4 ELECTRICAL DEFECTS – NOT REWORKABLE

MISSING SEGMENT
Any missing segment caused by an open circuit of the display traces is not allowable.

NO GROUND CONTACT/OPEN COMMON PLANE.
Poor crossover contact between common and pattern is not allowable.

COMMON-SEGMENT SHORTS
Common and segment shorts are not allowable.
COMMON – COMMON AND SEGMENT – SEGMENT SHORTS
Common-common shorts, segment-segment shorts are not allowable.

VIEWING ANGLE
Display viewing angle should conform to customer requirement.

REVERSE TWIST/TILT
There shall be no areas on segment that are darkened or clearer than other area of the same segment.

SEGMENT MISALIGNMENT
Digits and segment shall not appear distorted, or show any pattern irregularities, greater than 10% of segment width and visible at stated viewing distance (generally 304.8mm).

HIGH VOLTAGE/DIM SEGMENT
Display show poor contrast at pre set voltage.

PIN HOLE/SEGMENT VOID
Pin hole's mean diameter should not exceed 0.20mm.(Refer to Appendix II)

SLOW RESPONSE
Response of the display on one side shall not be noticeably faster than the other.
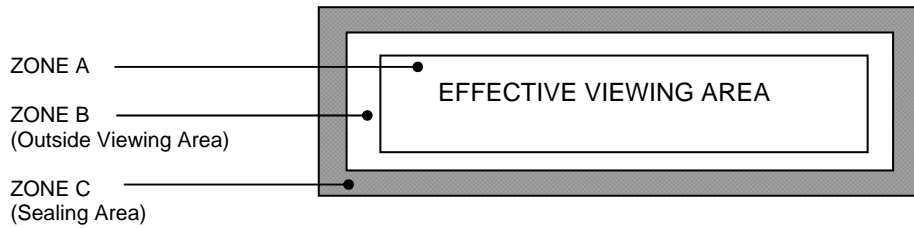
METAL RESIDUE
Unwanted spotlights up at the border of the segment when the display is energize. It shall not exceed 0.20mm (mean diameter).

SMEARING
Smearing of the segment is not allowable.

13.4 ZONE DEFINITION

ZONE A

ZONE B
(Outside Viewing Area)

ZONE C
(Sealing Area)

EFFECTIVE VIEWING AREA

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

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	

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	$D = (A + B)/2$

Polarizer Bubble/Foreign Material

Defect Category	Defect Description	Criterion				Drawing Specification
	Polarizer bubble / Foreign material					
		Zone / Dimension	Acceptable No.			
			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

14.0 Precaution for Handling LCM

14.1 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.
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 benzene.
d) Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause polarizer deformation or color 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.
g) Do not touch ITO on the contact pad and ITO traces around LSI without glove as it might cause distribution of contamination agents to the ITO.

14.2 Static Electricity

LCM contains CMOS LSI's and the same precaution for such devices should apply, namely
a) The operator should be grounded when ever he/she comes into contact with the module. Never touch any of the conductive parts such as 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 the 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.

14.3 Operation

a) The contrast can be adjusted by varying Gain and Potentiometer in the software.
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"
f) Care should be taken when the power supply turns on as following.
   a)Do not apply any input signals before the supplying voltage is applied.
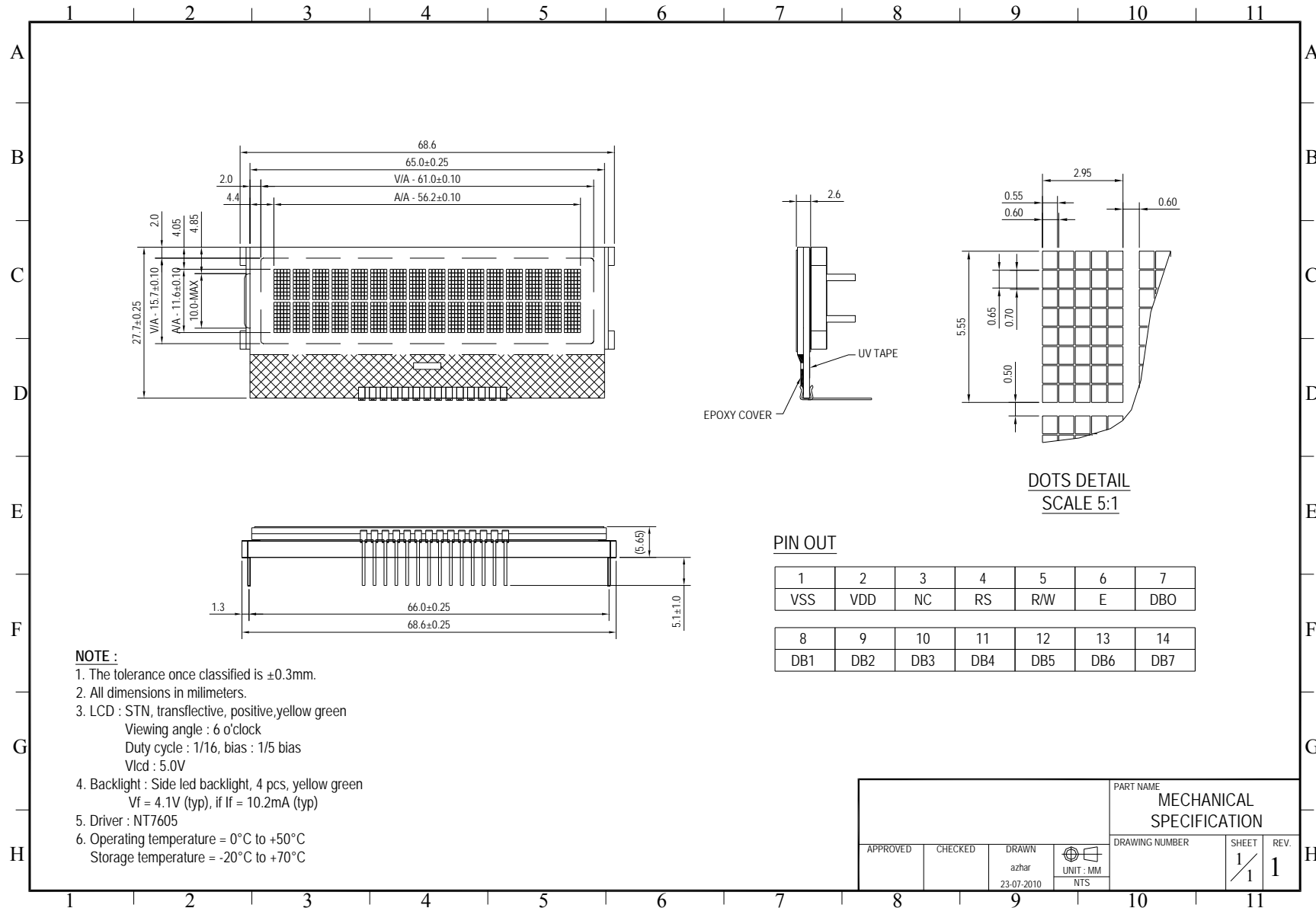   b)Do not turn off the power supply while any input signals are applied.

14.4 Storage

    a) Do not store module for an extended periods of time under the conditions of high temperature and high humidity. Excessive temperature and humidity could cause polarization degradation, polarizer peel off or bubble.

    b) Avoid using or storing the module in areas that expose it to direct sunlight or ultraviolet rays. The LSI is sensitive to light.

    c) If any liquid leaks out of the damaged 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.

14.5 Limited Warranty

Unless otherwise agreed between Crystal Clear Technology and customer, Crystal Clear Technology will replace or repair any if 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 be responsible for any subsequent or consequential events.

UV TAPE

EPOXY COVER

DOTS DETAIL
SCALE 5:1

PIN OUT

1	2	3	4	5	6	7
VSS	VDD	NC	RS	R/W	E	DBO

8	9	10	11	12	13	14
DB1	DB2	DB3	DB4	DB5	DB6	DB7

NOTE :
1. The tolerance once classified is ±0.3mm.
2. All dimensions in milimeters.
3. LCD : STN, transflective, positive, yellow green
    Viewing angle : 6 o'clock
    Duty cycle : 1/16, bias : 1/5 bias
    Vlcd : 5.0V
4. Backlight : Side led backlight, 4 pcs, yellow green
    Vf = 4.1V (typ), if If = 10.2mA (typ)
5. Driver : NT7605
6. Operating temperature = 0°C to +50°C
    Storage temperature = -20°C to +70°C

				PART NAME		
				MECHANICAL SPECIFICATION		
APPROVED	CHECKED	DRAWN	UNIT : MM	DRAWING NUMBER	SHEET	REV.
		azhar			1/1	1
		23-07-2010	NTS			

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