

TINSHARP

TF4-8B VER:00

Specification For Approval

Customer Approval: _____ Date: _____

Prepared: _____ Check: _____ Approval: _____

Date: _____ Date: _____ Date: _____

Description

REV.	DESCREPTION	DATE
V00	First issue	Sep-04-2007

CONTENTS

1. SPECIFICATIONS

- 1.1 Features
- 1.2 Block Diagram
- 1.3 Mechanical Specifications
- 1.4 Absolute Maximum Ratings
- 1.5 DC Electrical Characteristics
- 1.6 AC Characteristics
- 1.7 Electro-Optical Characteristics
- 1.8 Backlight Characteristics

2. MODULE STRUCTURE

- 2.1 Interface Pin Description
- 2.2 Command Table
- 2.3 Functional Description
- 2.4 MCU And Module Connection

3. RELIABILITY

- 3.1 Reliability test condition:
- 3.2 Quality Guarantee
- 3.3 Inspection method
- 3.4 Inspection Standard for Solder
- 3.5 Screen Cosmetic Criteria (Appearance)
- 3.6 Precautions for using LCM Modules
- 3.7 Installing LCM Modules
- 3.8 Precaution for Handling LCM Modules
- 3.9 Electro-Static Discharge Control
- 3.10 Precaution for soldering to the LCM
- 3.11 Precautions for operation
- 3.12 Storage
- 3.13 Safety
- 3.14 Limited Warranty
- 3.15 Return LCM under warranty

4 . DATE CODE RULES

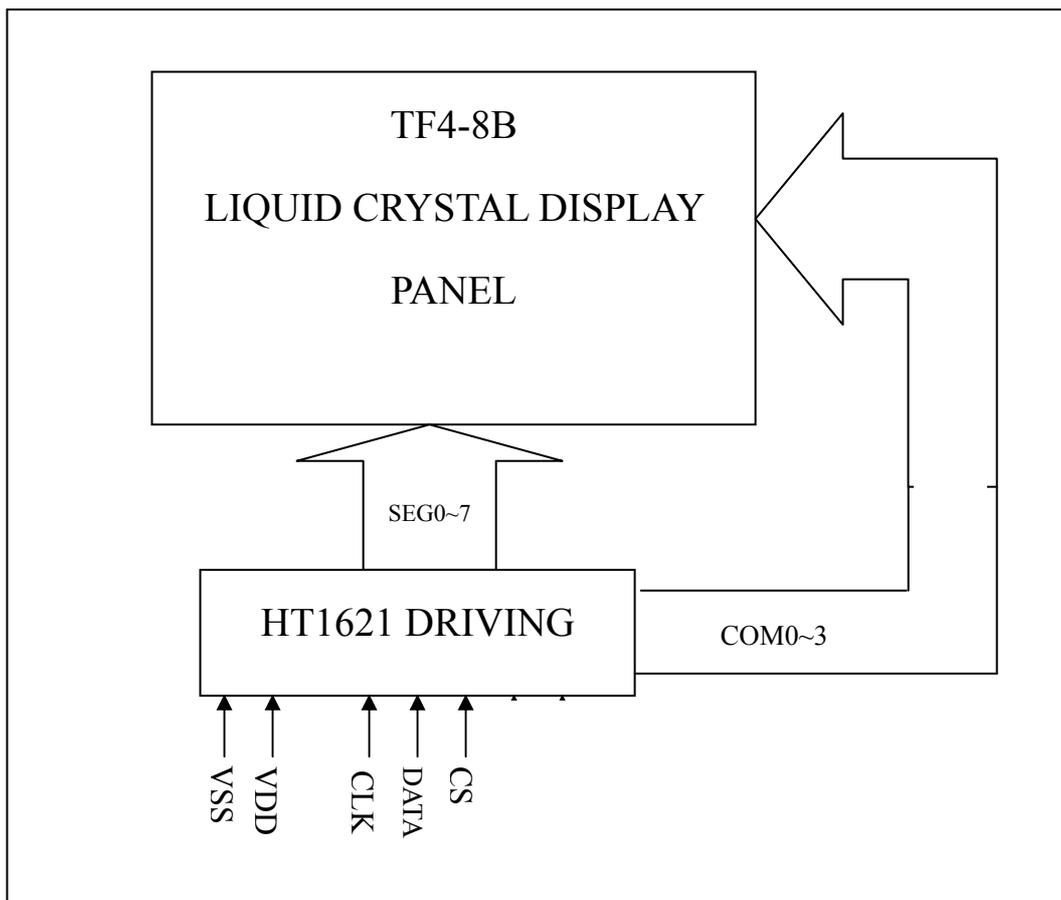
- 4.1 Date code for sample
- 4.2 Date code for production

1 . SPECIFICATIONS

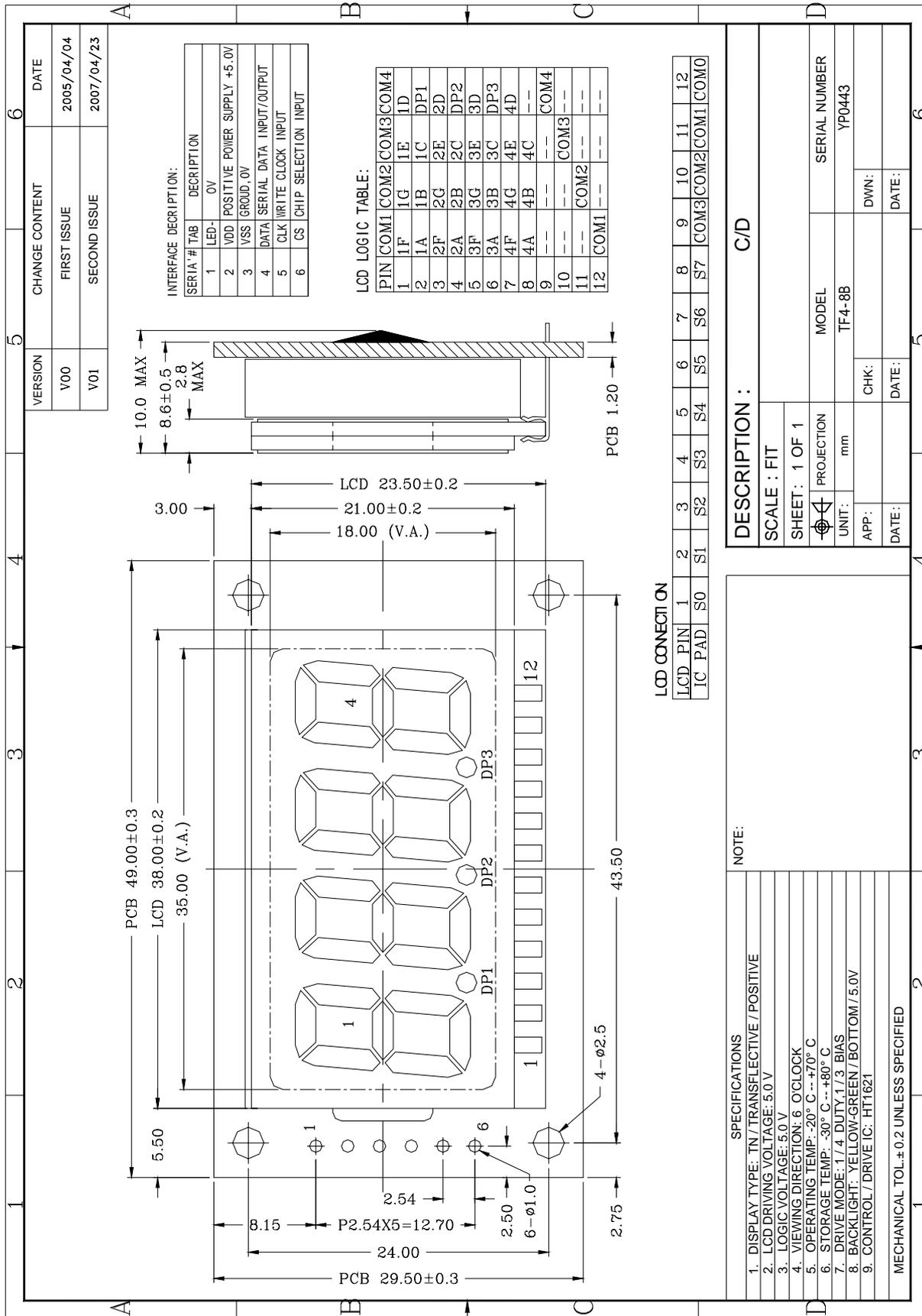
1.1 FEATURES

Item	Contents	Unit
LCD type	TN / Transflective / Positive	--
LCD duty	1/4	--
LCD bias	1/3	--
Viewing direction	6	o'clock
Module size(W x H x T)	49.0 X 29.5 X 10.0	mm
Viewing area(W x H)	35.0 X 18.0	mm

1.2. BLOCK DIAGRAM



1.3. MECHANICAL SPECIFICATION



1.4 ABSOLUTE MAXIMUM RATINGS (Ta = 25)

Unless otherwise specified, Vss = 0V

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	VDD	-0.3	5.5	V
Supply voltage for LCD	Vlcd	0.3	5.5	V
Normal Operating temperature	Top	-20	+70	
Normal Storage temperature	Tst	-30	+80	

1.5 DC ELECTRICAL CHARACTERISTIC

Unless otherwise specified, Vss = 0V, VDD = 5.0V

Parameter	Symbol	Condition	Min	Type	Max	Unit
Supply voltage for logic	VDD	--	4.8	5.0	5.2	V
Supply current for logic	IDD	--	--	--	1.5	mA
Operating voltage for LCD	V0	25	4.8	5.0	5.2	V
Input voltage "H" level	VIH	--	0.8 VDD	--	VDD	V
Input voltage "L" level	VIL	--	0	--	0.2 VDD	V

1.6 AC CHARACTERISTIC

Serial Interface System

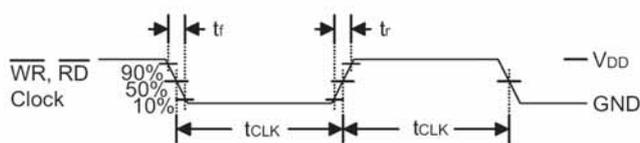


Figure 1

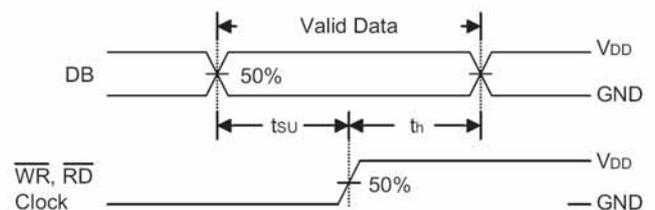
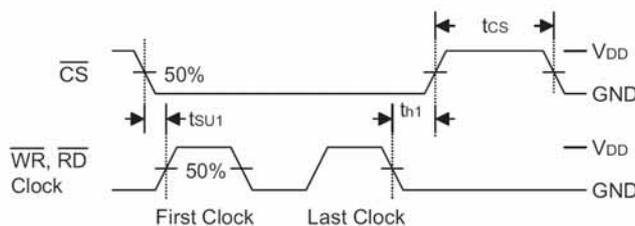


Figure 2

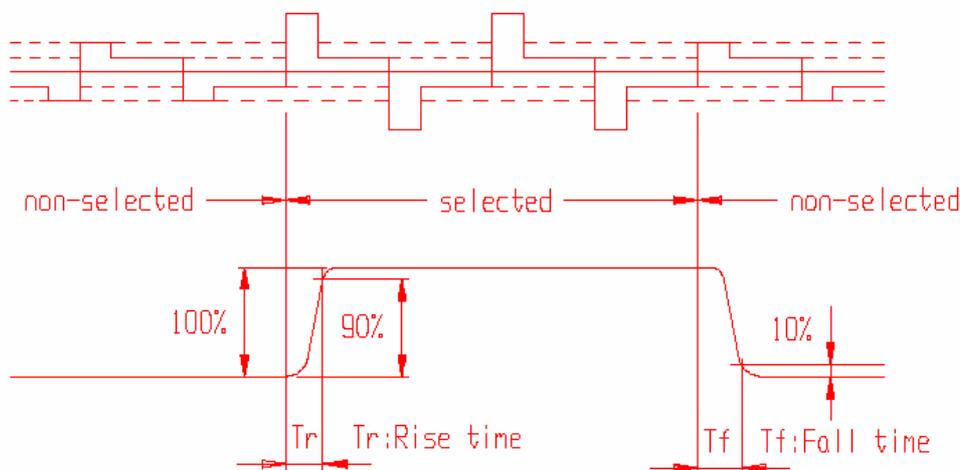


Unless otherwise specified, Vss = 0V, VDD = 5.0V

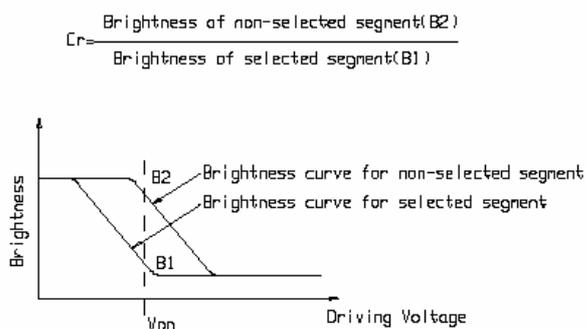
Parameter	Symbol	Condition	Min	Type	Max	Unit
System Clock	fsys1	On-chip RC oscillator	--	256	--	KHz
LCD Clock	Flcd	On-chip RC oscillator	--	fsys1/1024	--	Hz
Serial Interface Reset Pulse Width	Tcs	CS	--	250	--	ns
WR, RD Input Pulse Width	tclk	Write mode	2.0	--	--	us
		Read mode	4.0	--	--	us

1.7 ELECTRO-OPTICAL CHARACTERISTICS

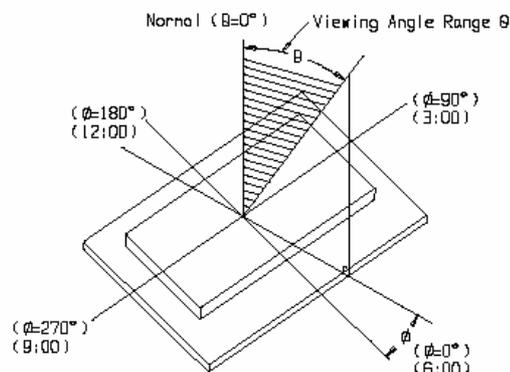
Note1: Definition of response time.



Note2: Definition of contrast ratio 'Cr' .



Note3: Definition of viewing angle range 'θ'.



1.8 BACKLIGHT CHARACTERISTICS

1.8.1 ABSOLUTE MAXIMUM RATINGS(Ta=25)

Item	Symbol	Conditions	Rating	Unit
Absolute maximum forward current	Ifm		140	mA
Reverse voltage	V _r		10	V
Reverse current	I _r		200	uA
Power dissipation	P _d		600	mW
Operating Temperature Range	T _{OPr}		-20~+70	
Storage Temperature Range	T _{stg}		-30~+80	

1.8.2 ELECTRICAL –OPTICAL CHARACTERISTICS(Ta=25)

COLOR	Operating Voltage(± 0.2V)	Forward Current (mA)
Yellow-Green	4.2	70

2. MODULE STRUCTURE

2.1 INTERFACE PIN DESCRIPTION

PIN NO.	Symbol	Level	Description
1	LED-	0V	The backlight ground.
2	VDD	+5.0V	Power supply for logic operating.
3	VSS	0V	Ground
4	DATA	H/L	This is a serial data.
5	CLK	H/L	Write signal.Data on the DATA line is latched into the HT1621 on the rising edge of the WR signal.
6	CS	H/L	This is the chip select signal. When /CS1 = L, then the chip select becomes active.

2.2 COMMAND TABLE

Name	ID	Command Code	D/C	Function
READ	1 1 0	A5A4A3A2A1A0D0D1D2D3	D	Read data from the RAM
WRITE	1 0 1	A5A4A3A2A1A0D0D1D2D3	D	READ and WRITE to the RAM
READ-MODIFYWRIT	101	A5A4A3A2A1A0D0D1D2D	D	READ and WRITE to the RAM
SYS DIS	1 0 0	0000-0000-X	C	Turn off both system oscillator and LCD bias generator
LCD OFF	1 0 0	0000-0010-X	C	Turn off LCD bias generator
LCD ON	1 0 0	0000-0011-X	C	Turn on LCD bias generator
TIMER DIS	1 0 0	0000-0100-X	C	Disable time base output
RC 256K	1 0 0	0001-10XX-X	C	System clock source, on-chip RC oscillator
BIAS 1/2	1 0 0	0010-abX0-X	C	LCD 1/2 bias option ab=00: 2 commons option ab=01: 3 commons option ab=10: 4 commons option
BIAS 1/3	1 0 0	0010-abX1-X	C	LCD 1/3 bias option ab=00: 2 commons option ab=01: 3 commons option ab=10: 4 commons option

Note: X : Don,t care

A5~A0 : RAM addresses

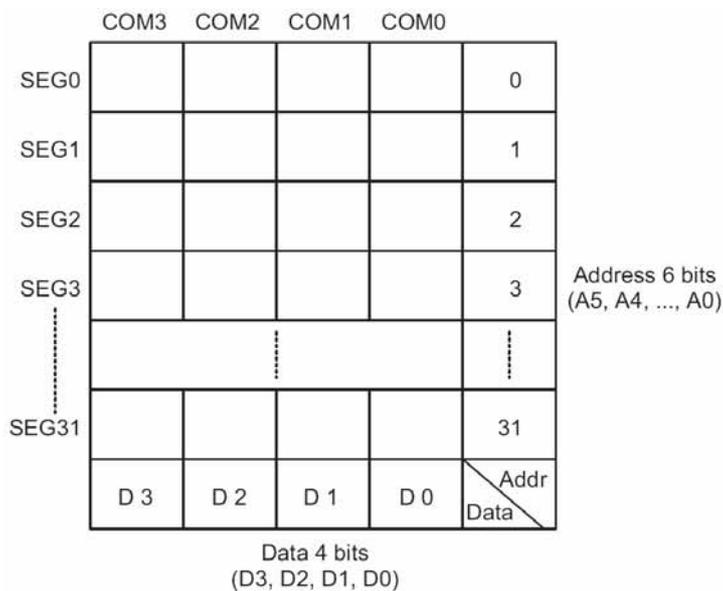
D3~D0 : RAM data

D/C : Data/command mode

2.3. Functional Description

2.3.1 Display Memory RAM

The static display memory (RAM) is organized into 32*4 bits and stores the displayed data. The contents of the RAM are directly mapped to the contents of the LCD driver. Data in the RAM can be accessed by the READ, WRITE, and READ-MODIFY-WRITE commands. The following is a mapping from the RAM to the LCD pattern:



RAM Mapping

2.3.2 Command Format

The HT1621 can be configured by the S/W setting. There are two mode commands to configure the HT1621 resources and to transfer the LCD display data. The configuration mode of the HT1621 is called command mode, and its command mode ID is 1 0 0. The command mode consists of a system configuration command, a system frequency selection

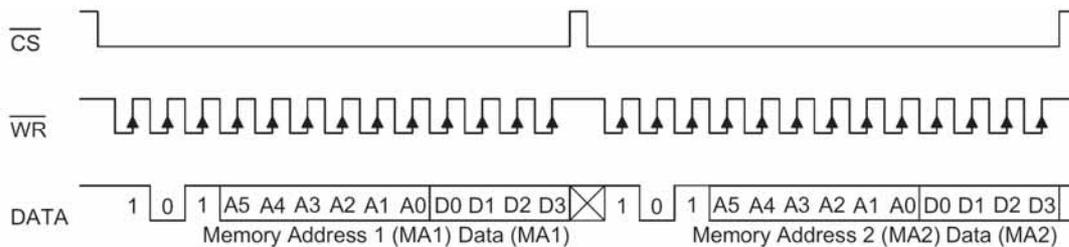
command, a LCD configuration command, a tone frequency selection command, a timer/WDT setting command, and an operating command. The data mode, on the other hand, includes READ, WRITE, and READ-MODIFY-WRITE operations. The following are the data mode IDs and the command mode ID.

The mode command should be issued before the data or command is transferred. If successive commands have been issued, the command mode ID, namely 1 0 0, can be omitted. While the system is operating in the non-successive command or the non-successive address data mode, the CS pin should be set to 1 and the previous operation mode will be reset also. Once the CS pin returns to 0 a new operation mode ID should be issued first.

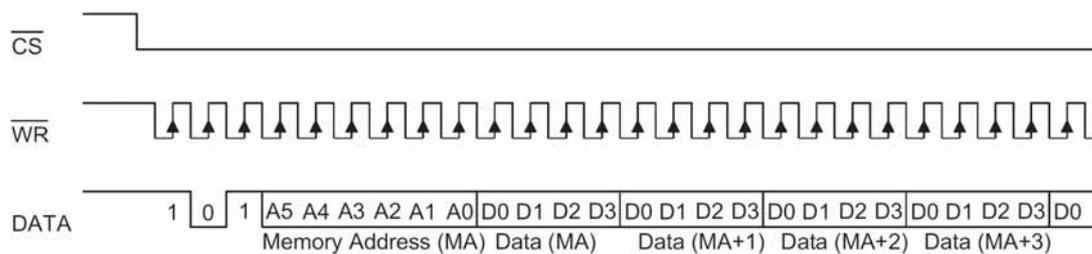
Operation	Mode	ID
Read	Data	1 1 0
Write	Data	1 0 1
Read-Modify-Write	Data	1 0 1
Command	Command	1 0 0

2.3.3 Timing Diagrams

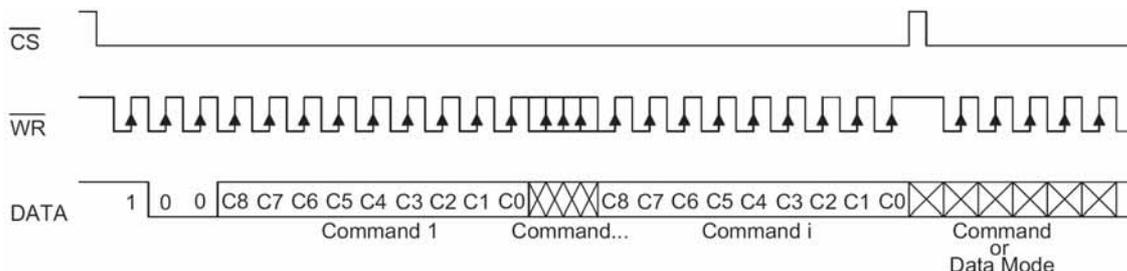
WRITE Mode (Command Code : 1 0 1)



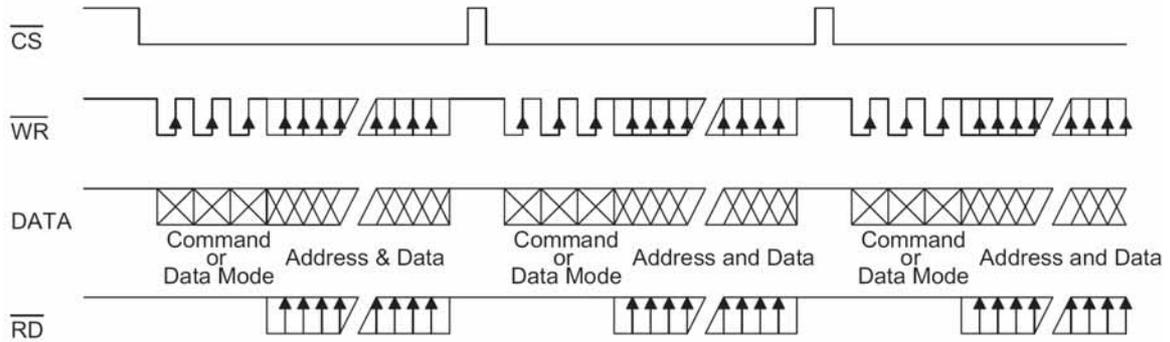
WRITE Mode (Successive Address Writing)



Command Mode (Command Code : 1 0 0)

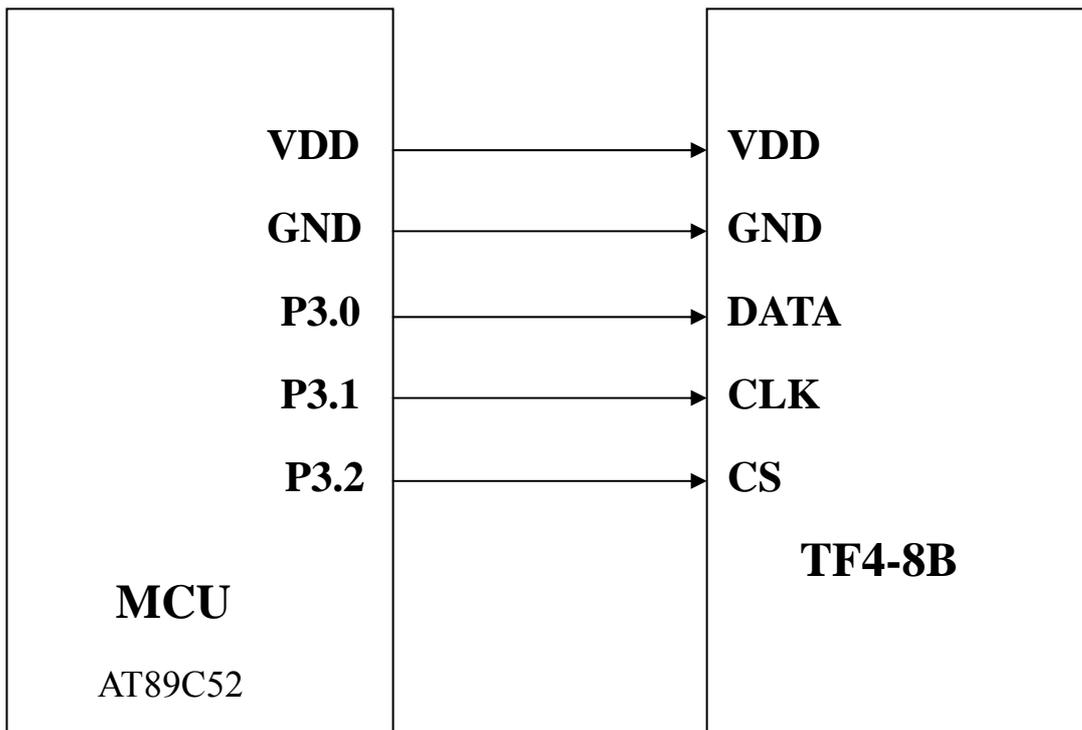


Mode (Data And Command Mode)



2.4. MCU AND MODULE CONNECTION

The MCU interface



3. RELIABILITY TEST AND QUALITY

3.1. RELIABILITY TEST CONDITION

No.	Test Item	Content of Test	Test Condition	Applicable Standard
1	High temperature storage	Endurance test applying the high storage temperature for a long time.	60 °C 200 hrs	-----
2	Low temperature storage	Endurance test applying the low storage temperature for a long time.	-10 °C 200 hrs	-----
3	High temperature operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	50 °C 200 hrs	-----
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time.	0 °C 200 hrs	-----
5	High temperature / Humidity storage	Endurance test applying the high temperature and high humidity storage for a long time.	60 °C , 90 %RH 96 hrs	MIL-202E-103B JIS-C5023
6	High temperature / Humidity operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	40 °C , 90 %RH 96 hrs	MIL-202E-103B JIS-C5023
7	Temperature cycle	Endurance test applying the low and high temperature cycle. $\begin{array}{c} -10^{\circ}\text{C} \rightleftharpoons 25^{\circ}\text{C} \rightleftharpoons 60^{\circ}\text{C} \\ \leftarrow 30\text{min} \quad \leftarrow 5\text{min.} \quad \leftarrow 30\text{min} \rightarrow \\ \leftarrow \hspace{10em} \rightarrow \\ \text{1 cycle} \end{array}$	-10°C / 60°C 10 cycles	-----

Supply voltage for logic system = 5V. Supply voltage for LCD system = Operating voltage at 25 °C.

Mechanical Test

Vibration test	Endurance test applying the vibration during transportation and using	10~22Hz 1.5mm p-p 22~500Hz 1.5G Total 0.5hour	MIL-202E-201A JIS-C5025 JIS-C7022-A-10
Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G half sign wave 11 msede 3 times of each direction	MIL-202E-213B
Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air	115mbar 40hrs	MIL-202E-105C
Static electricity	Endurance test applying the electric stress to the terminal	VS=800V,RS-1.5K	MIL-883B-3015. 1

test		CS=100pF, 1 time	
------	--	------------------	--

Failure Judgment criterion

Criterion Item	Test Item No.											Failure Judgment Criterion
	1	2	3	4	5	6	7	8	9	10	11	
Basic specification												Out of the Basic specification
Electrical characteristic												Out of the DC and AC characteristic
Mechanical characteristic												Out of the Mechanical specification Color change: out of Limit Appearance Specification
Optical characteristic												Out of the Appearance Standard

3.2. QUALITY GUARANTEE

Acceptable Quality Level, Each lot should satisfy the quality level defined as follows.

-Inspection method: MIL-STD-105E LEVEL II Normal one time sampling

AQL

Partition	AQL	Description
A: Major	0.4%	Functional defective product
B: Minor	1.5%	Satisfy all functions as product but not satisfy cosmetic standard

Definition of ‘LOT’

One lot means the delivery quality to customer at once time.

Conditions of Cosmetic Inspection

. Environmental condition

The inspection should be performed at the 1 metre height from the LCD module under 2 pieces of 40W white fluorescent lamps (Normal temperature 20~25 and normal humidity 60 ± 15%RH).

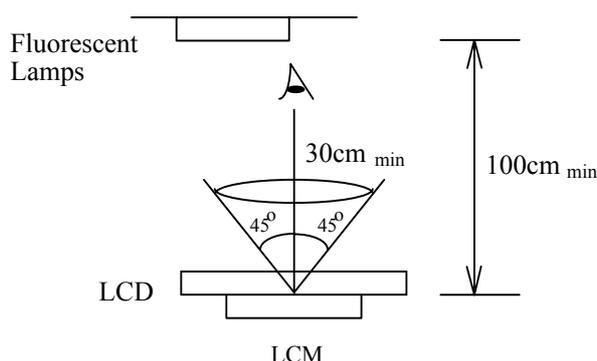
Driving voltage

The Vo value which the most optimal contrast can be obtained near the specified Vo in the specification (Within of the typical value at 25).

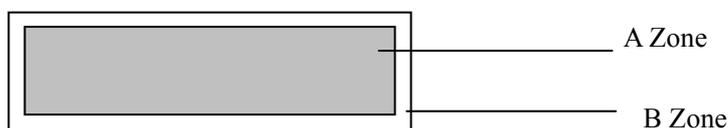
3.3. INSPECTION METHOD

The visual check should be performed vertically at more than 30cm distance from the LCD panel

Viewing direction for inspection is 45° from vertical against LCM.



Definition of zone:



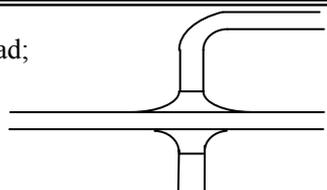
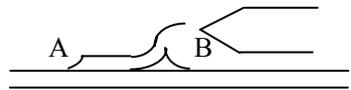
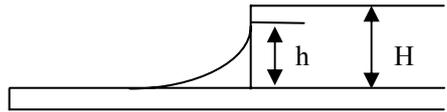
A Zone: Active display area (minimum viewing area).

B Zone: Non-active display area (outside viewing area).

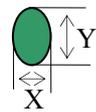
3.4. INSPECTION STANDARD FOR SOLDER

Module Cosmetic Criteria

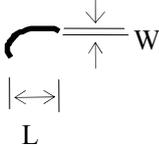
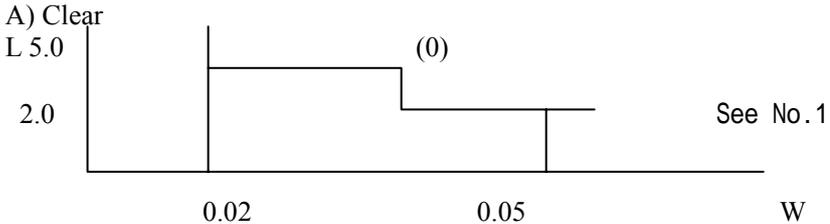
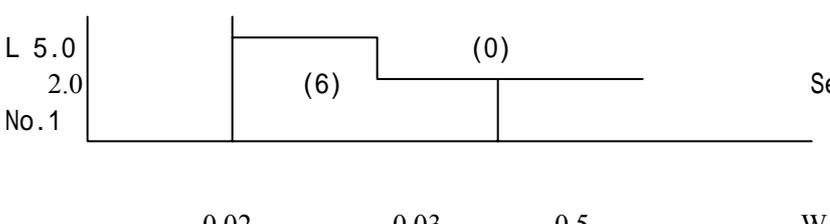
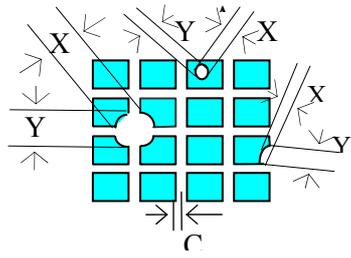
No.	Item	Judgment Criterion	Partition
1	Difference in Spec.	None allowed	Major
2	Pattern Peeling	No substrate pattern peeling and floating	Major
3	Soldering defects	No soldering missing No soldering bridge No cold soldering	Major Major Minor
4	Resist flaw on substrate	Invisible copper foil (0.5mm or more) on substrate pattern	Minor
5	Accretion of metallic Foreign matter	No soldering dust No accretion of metallic foreign matters (Not exceed 0.2mm)	Minor Minor
6	Stain	No stain to spoil cosmetic badly	Minor
7	Plate discoloring	No plate fading, rusting and discoloring	Minor

8	Plate discoloring			
	1. Lead parts	a. Soldering side of PCB Solder to form a 'Filet' all around the lead; Solder should not hide the lead form perfectly too much		Minor
	2. Flat packages	Either 'toe' (A) or 'heel' (B) of The lead to be covered by 'Filet' Lead form to be assume over Solder.		Minor
3. Chips	$(3/2) H$ h $(1/2) H$		Minor	

3.5. SCREEN COSMETIC CRITERIA(APPEARANCE)

No.	Item	Criterion										
1	Short or open circuit	No allow										
	LC leakage											
	Flickering											
	No display											
	Wrong viewing direction											
	Wrong Back-light											
	Wrong or missing component											
2	Contrast defect (dim, ghost)	Refer to the approval sample										
	Background color deviation											
3	Point defect, Black spot, dust (including Polarizer) $= (X+Y)/2$	 <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Point Size</th> <th>Acceptable Qty.</th> </tr> </thead> <tbody> <tr> <td>$\phi \leq 0.10$</td> <td>Disregard</td> </tr> <tr> <td>$0.10 < \phi \leq 0.20$</td> <td>6</td> </tr> <tr> <td>$0.20 < \phi \leq 0.3$</td> <td>2</td> </tr> <tr> <td>$\phi > 0.30$</td> <td>0</td> </tr> </tbody> </table>	Point Size	Acceptable Qty.	$\phi \leq 0.10$	Disregard	$0.10 < \phi \leq 0.20$	6	$0.20 < \phi \leq 0.3$	2	$\phi > 0.30$	0
Point Size	Acceptable Qty.											
$\phi \leq 0.10$	Disregard											
$0.10 < \phi \leq 0.20$	6											
$0.20 < \phi \leq 0.3$	2											
$\phi > 0.30$	0											

No.	Item	Criterion
------------	-------------	------------------

<p>4</p>	<p>Line defect, Scratch: In accordance with spots and lines operating cosmetic criteria. When the light reflective on the panel surface, the scratches are not to be remarkable.</p>	 <table border="1" data-bbox="845 246 1396 504"> <thead> <tr> <th colspan="2">Line</th> <th rowspan="2">Acceptable Qty.</th> </tr> <tr> <th>L</th> <th>W</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>0.015 W</td> <td>Disregard</td> </tr> <tr> <td>3.0 L</td> <td>0.03 W</td> <td rowspan="2">2</td> </tr> <tr> <td>2.0 L</td> <td>0.05 W</td> </tr> <tr> <td>1.0 L</td> <td>0.1 > W</td> <td>1</td> </tr> <tr> <td>---</td> <td>0.05 < W</td> <td>Applied as point defect</td> </tr> </tbody> </table> <p>Unit: mm</p> <p>A) Clear</p>  <p>Note: () –Acceptable Qty in active area L –Length (mm) W –Width (mm) ∞ -Disregard</p> <p>B) Unclear</p> 	Line		Acceptable Qty.	L	W	---	0.015 W	Disregard	3.0 L	0.03 W	2	2.0 L	0.05 W	1.0 L	0.1 > W	1	---	0.05 < W	Applied as point defect
Line		Acceptable Qty.																			
L	W																				
---	0.015 W	Disregard																			
3.0 L	0.03 W	2																			
2.0 L	0.05 W																				
1.0 L	0.1 > W	1																			
---	0.05 < W	Applied as point defect																			
<p>5</p>	<p>Rainbow</p>	<p>Not more than two colors change across the viewing area</p>																			
<p>6</p>	<p>Dot-matrix pattern $\phi = (X+Y)/2$</p>	<p>Pin hole:</p>  <table border="1" data-bbox="981 1512 1388 1668"> <thead> <tr> <th>Size</th> <th>Acceptable Qty.</th> </tr> </thead> <tbody> <tr> <td>$\phi < 0.1$</td> <td>Disregard</td> </tr> <tr> <td>0.10 ϕ 0.20</td> <td>1</td> </tr> <tr> <td>$\phi > 0.20$</td> <td>0</td> </tr> </tbody> </table> <p>C: Shall not touch other dot(s).</p>	Size	Acceptable Qty.	$\phi < 0.1$	Disregard	0.10 ϕ 0.20	1	$\phi > 0.20$	0											
Size	Acceptable Qty.																				
$\phi < 0.1$	Disregard																				
0.10 ϕ 0.20	1																				
$\phi > 0.20$	0																				

No.	Item	Criterion
-----	------	-----------

7

Chip

Remark:

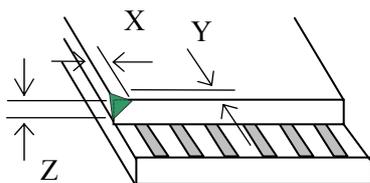
X: Length direction

Y: Short direction

Z: Thickness direction

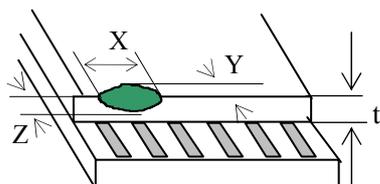
t: Glass thickness

W: Terminal Width



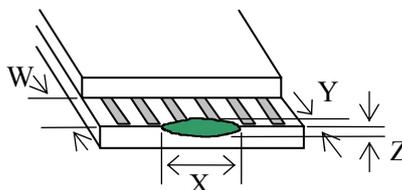
Acceptable criterion

X	Y	Z
2	0.5mm	t



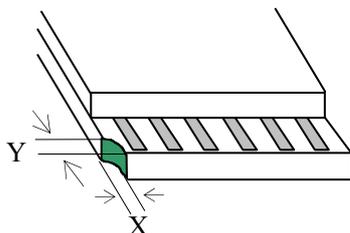
Acceptable criterion

X	Y	Z
2	0.5mm	t/2



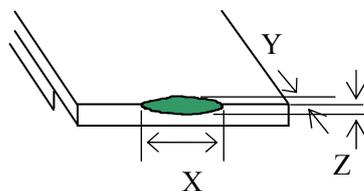
Acceptable criterion

X	Y	Z
Disregard	0.2	t



Acceptable criterion

X	Y	Z
3	2	t
shall not reach to ITO		



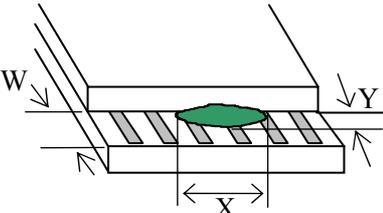
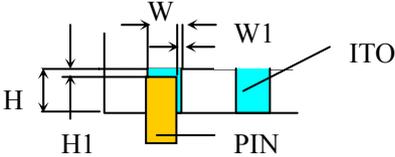
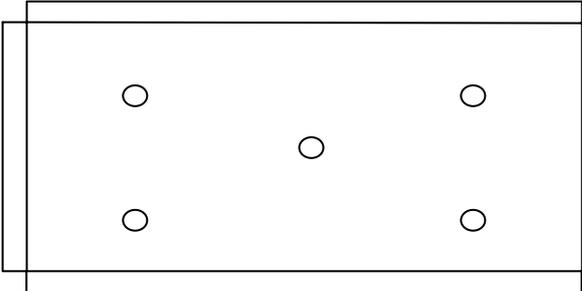
Acceptable criterion

X	Y	Z
5	2	t/3

No.

Item

Criterion

8	Total no. of acceptable Defect	<p>A. Zone</p> <p>Maximum 2 minor non-conformities per one unit. Defect distance: each point to be separated over 10mm</p> <p>B. Zone</p> <p>It is acceptable when it is no trouble for quality and assembly in customer's end product.</p>				
9	Protruded W: Terminal Width	 <p>Acceptable criteria: $Y \leq 0.4$</p>				
10	PIN	<p>Position</p>  <table border="1" data-bbox="1121 902 1353 1037"> <tr> <td>W1</td> <td>1/3W</td> </tr> <tr> <td>H1</td> <td>1/3H</td> </tr> </table>	W1	1/3W	H1	1/3H
W1	1/3W					
H1	1/3H					
11	Uneven brightness (only back-lit type module)	<p>Uneven brightness must be $B_{MAX}/B_{MIN} \leq 2$</p> <p>-BMAX : Max. value by measure in 5 points -BMIN : Min. value by measure in 5 points Divide active area into 4 vertically and horizontally. Measure 5 points shown in the following figure</p> 				
12	Allowable density	Above defects should be separated more than 10mm each other.				
13	Rubbing line	Not to be noticeable.				
14	Dot size	To be 95% ~ 105% of the dot size (typ.) in drawing, Partial defects of each dot (ex. Pin-hole) should be treated as 'spot'.(see Screen Cosmetic Criteria (operating) No.)				

No.	Item	Criterion	
15	Bubbles in polarizer	Size : d mm	Acceptable Qty in active area

		d 0.3 0.3<d 1.0 1.0<d 1.5 1.5<d	Disregard 3 1 0
16	Allowable density	Above defects should be sea rated more than 30mm each other	
17	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Backlit type should be judged with back-lit on state only.	
18	Contamination	Not to be noticeable.	

Note:

‘Clear’= the shade and size are not changed by Vo.

‘Unclear’= the shade and size are changed by V0.

Size: $d = (\text{long length} + \text{short length}) / 2$

The limit samples for each item have priority

Completed defects are defined item by item, but if the number of defects is defined in above table, the total number should not exceed 10.

In case of ‘concentration’, even the spots or the lines of ‘disregarded size should not allowed. Following three situations Should be treated as ‘concentration’.

-7 or over defects in circle of 2mm

-10 or over defects in circle of 10mm

-20 or over defects in circle of 20mm

3.6. PRECAUTIONS FOR USING LCM MODULES

1. Liquid Crystal Display Modules

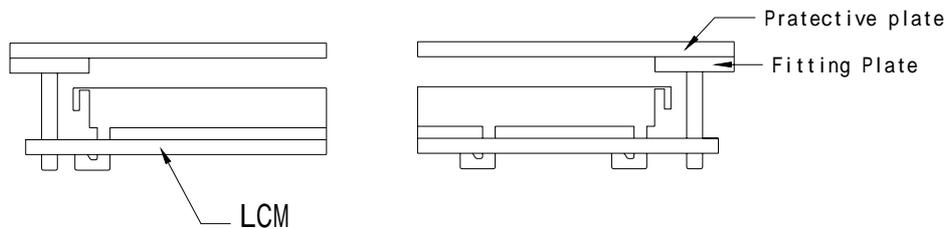
LCD is composed of glass and polarizer. Pay attention to the following items when handling.

- (1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or Polarizer peel-off may occur with high humidity.
- (2) Do not touch, push or rub the exposed polarizer with anything harder than an HB Pencil lead (Glass, tweezers, etc.).
- (3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic, substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropyl alcohol.
- (4) When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum Benin. Do not scrub hard to avoid damaging the display surface.
- (5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.
- (6) Avoid contacting oil and fats.
- (7) Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature the must be warmed up in a container before coming is contacting temperature air.
- (8) Do not put or attach anything on the display area to avoid leaving marks on.
- (9) Do not touch the display with bare hands. This will stain the display and degrade insulation between terminals (some cosmetics are determinate to the polarizer).
- (10)As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

3.7. INSTALLING LCM MODULES

The hole in the printed circuit board is used to fit LCM as shown in the picture below. Attend to the following items when installing the LCM

- (1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



- (2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be $\pm 0.1\text{mm}$

3.8. PRECAUTION FOR HANDING LCM MODULE

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- (1) Do not alter, modify or change shape of the tab on the metal frame
- (2) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- (3) Do not damage or modify the pattern writing on the printed circuit board.
- (4) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
- (5) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- (6) Do not drop, bend or twist LCM

3.9. ELECTRO-STATIC DISCHARGE CONTROL

Since this module uses a CMOS LSI, the same attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

- (1) Make certain that you are grounded when handing LCM.
- (2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
- (3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.
- (4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutation of the motor.
- (5) As far as possible make the electric potential of your work clothes and that of the workbench the ground potential.
- (6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of

50%-60% is recommended.

3.10. PRECAUTION FOR SOLDERING TO THE LCM

(1) Observe the following when soldering lead wire , connector cable and etc. to the LCM

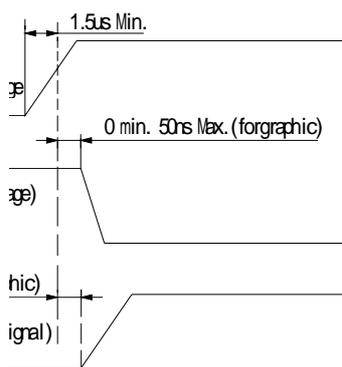
- Soldering iron temperature: 280 ±10
- Soldering time: 3-4 seconds
- Solder: eutectic solder.

If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation.(This does not apply in the case of non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

- (2) When soldering the electro-luminescent panel and PC board, the panel and board should not be detached more than three times, This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.
- (3) When remove the electro-luminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PX board could be damaged.

3.11. PRECAUTIONS FOR OPERATION

- (1) Viewing angle varies with the change of liquid crystal driving voltage (V0). Adjust Vo to show the best contrast.
- (2) Driving the LCD in the voltage above the limit shortens its life.
- (3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD cell be out of the order. It will recover when it returns to the specified temperature range.
- (4) 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. Used under the relative condition of 40 , 50%RH.
- (5) When turning the power on input each signal after the positive/negative voltage becomes stable.



3.12. STORAGE

When storing LCD as spares for some years, the following precautions are necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for dessicant.
- (2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0 and 35
- (3) The polarizer surface should not come in contact with any other object.(we advise you to store them in the container in which they were shipped.)
- (4) Environmental conditions:
 - Don not leave them for more than 168hrs. at 60
 - Should not be left for more than 48hrs. at -20 .

3.13. SAFETY

- (1) It is recommended to crush damaged or unnecessary LCD into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- (2)If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

3.14. LIMITED WARRANTY

Unless agreed between TINSHARP and customer, TINSHARP will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with TINSHAR LCD acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to TINSHARP within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of TINSHARP limited to repair and/ or replacement on the terms set forth above. TINSHARP will not be responsible for any subsequent or consequential events.

3.15. RETURN LCM UNDER WARRANTY

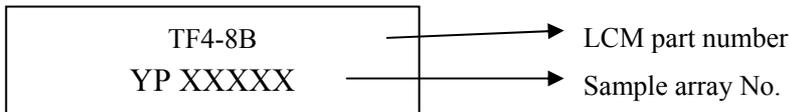
No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are:

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

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

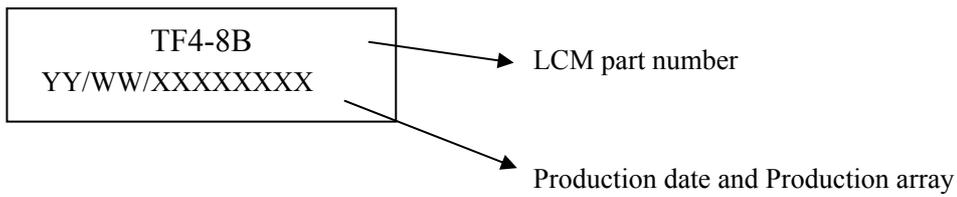
4. DATE CODE RULES

4-1. DATE CODE FOR SAMPLE



YP: meaning sample

4-2. DATE CODE FOR PRODUCTION



A. TF4-8B represents LCM part number

C. YY/WW represents Year, Week

YY—Year WW—Week

XXXXXXXX—Production array No.

END