MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model: MI24064U-1

This module is ROHS compliant

For Customer's Acceptance:

Customer	
Approved by	
Comment	

The standard product specification may change without prior notice in order to improve performance or quality. Please contact Multi-Inno for updated specification and product status before design for the standard product or release of the order.	Revision: 1.1 Engineering: Date: 2025-12-15 Our Reference:

■ REVISION RECORD

REV NO.	REV DATE	CONTENTS	REVISED PAGE NO.
1.0	2025-12-11	First Release	
1.1	2025-12-15	Change the LED backlight connection method in the block diagram	P.10

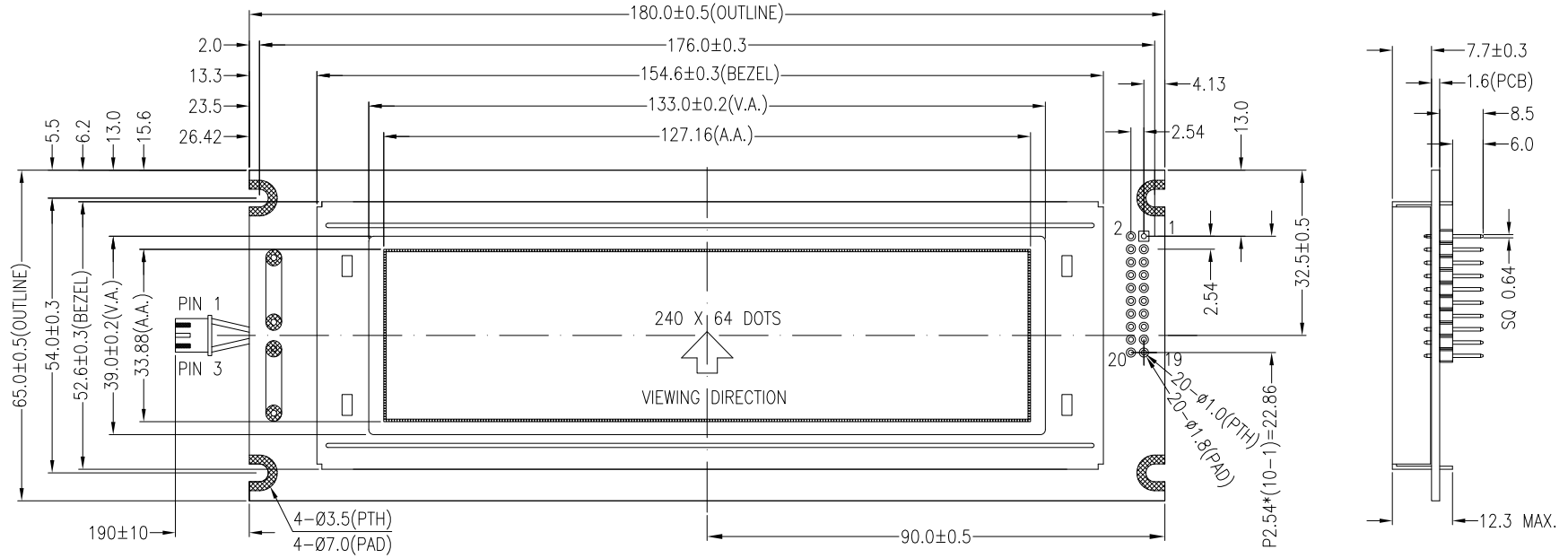
CONTENTS

■ GENERAL INFORMATION

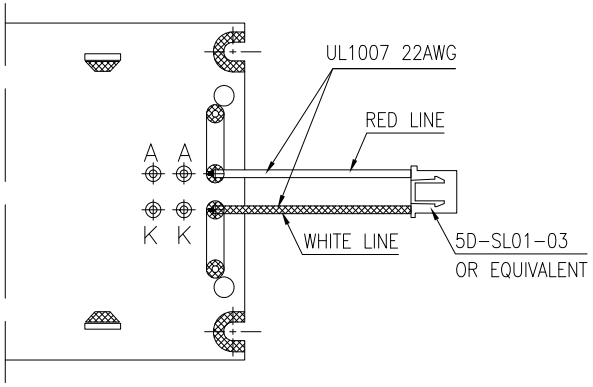
Item	Specification	Unit
Display Type	FSTN, Transflective, Positive	/
Viewing Direction	6:00	O'clock
LCD Duty	1/64	/
LCD Bias	1/9	/
Outline Dimension (W × H × D)	180.00 × 65.00 × 17.80	mm^3
Viewing Area (W × H)	133.00 × 39.00	mm^2
Active Area (W × H)	127.16 × 33.88	mm^2
Pixel Pitch	0.53 × 0.53	mm^2
Dot Pitch	0.49 × 0.49	mm^2
Number of Dots	240 × 64	/
Driver IC	UCI6963	/
Backlight Type	White LED	/
Interface Type	System Parallel Interface	/
Input Voltage	VDD=5.0, VOP=10.6	V
With / Without TSP	Without TP	/
TP Surface Treatment	-	/
Weight	TBD	g

Note 1: ROHS compliant;
Note 2: LCM weight tolerance: ±5%.

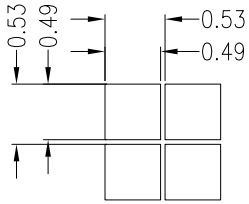
■ EXTERNAL DIMENSIONS



PIN ASSIGNMENT	
NO.	SYMBOL
1	FGND
2	VSS
3	VDD
4	NC
5	WR
6	RD
7	CE
8	C/D
9	NC
10	RESET
11	DB0
12	DB1
13	DB2
14	DB3
15	DB4
16	DB5
17	DB6
18	DB7
19	FS
20	NC



COMPONENT SIDE



DOT SIZE
(SCALE 20:1)

NOTES:

1. DISPLAY TYPE: FSTN, TRANSFLETIVE, POSITIVE
2. OPERATING VOLTAGE: VDD=5.0V, VOP=10.6V
3. DRIVE METHOD: 1/64DUTY, 1/9BIAS
4. VIEWING DIRECTION: 6:00 O'CLOCK
5. DRIVER IC: UCI6963 OR EQUIVALENT
6. OPERATING TEMP.: −20°C ~ 70°C
7. STORAGE TEMP.: −30°C ~ 80°C
8. BACKLIGHT TYPE: WHITE LED, If=60mA, Vf=3.4V~3.6V
9. UNMARKED TOLERANCE: ±0.3MM
10. ROHS COMPLIANT

VER.	REVISED DESCRIPTION	REVISER	DATE
01	FIRST ISSUE	RITA	2025.12.11

MULTI-INNO TECHNOLOGY CO., LTD.

DRAWN BY:	RITA		MODULE P/N: MI24064U-1
CHECKED BY:		SCALE : 1/1	
APPROVED BY:		UNIT: mm	DESCRIPTION: GRAPHIC MODULE
VERSION NO:	01	SHEET NO: 1/1	

■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage for Logic	VDD	-0.3	7.0	V
Input Voltage	VIN	-0.3	VDD+0.3	V
Operating Temperature	Top	-20	75	℃
Storage Temperature	Tst	-30	85	℃

■ ELECTRICAL CHARACTERISTICS

DC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage for Logic	VDD	4.5	5.0	5.5	V	
Input voltage ' H ' level	VIH	VDD-2.2	-	VDD	V	
Input voltage ' L ' level	VIL	0	-	0.8	V	
Output voltage ' H ' level	VOH	VDD-0.3	-	VDD	V	
Output voltage ' L ' level	VOL	0	-	0.3	V	
Output resistance ' H ' level	ROH	-	-	400	Ω	
Output resistance ' L ' level	ROL	-	-	400	Ω	
Input Pull-up resistance	RPU	50	100	200	K Ω	
Operating Frequency	fOSC	0.4	-	5.5	MHz	
Current consumption (operating)	IDD	-	3.3	6	mA	
Current consumption (halt)	IDD	-	-	3.3	μA	

■ ELECTRO-OPTICAL CHARACTERISTICS

Ta=25℃ ± 2℃. VDD=5.0V, If=60mA.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	Notes
Response Time	Tr + Tf	θ=0°	-	244	366	ms	FIG 1, 2	4
Contrast Ratio	Cr		1.6	3.2	-	---	FIG 1, 3	1
Luminance Uniformity	δ white		84	93	-	---	FIG 1, 3	3
Surface Luminance	Lv		TBD	TBD	-	---	FIG 1, 3	2
Viewing Angle Range	θ	Ø = 90°	22	32	-	deg	FIG 1, 4	1, 5
		Ø = 270°	23	33		deg		
		Ø = 0°	17	27		deg		
		Ø = 180°	24	34		deg		

Note 1. Contrast Ratio (CR) is defined by following formula. For more information see FIG 3.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P3, P4, P5)}}$$

Note 2. Surface luminance is the LCD surface luminance with all pixels displaying white state. For more information see FIG 3.

Lv = Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)

Note 3. The uniformity in surface luminance (δ White) is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see FIG 3.

$$\delta \text{ White} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}$$

Note 4. Response time is the time required for the display to transition from white to black (Rise Time, Tr) and from black to white (Fall Time, Tf). For additional information see FIG 2.

Note 5. Viewing angle is the angle at which the contrast ratio is greater than a specific value. For TFT module, the specific value of contrast ratio is 10. For monochrome module, the specific value of contrast ratio is 2. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 4.

FIG 1. The setup of optical measurement.

The optical characteristics should be measured in a stable, windless, and dark room.

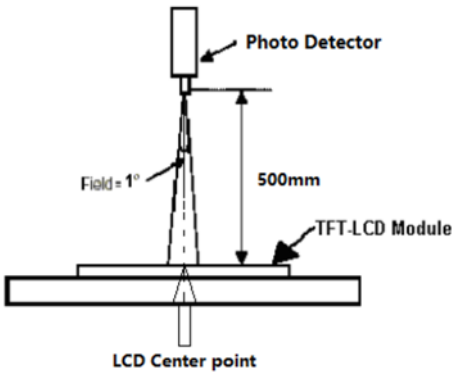


FIG 2. The Definition of Response Time

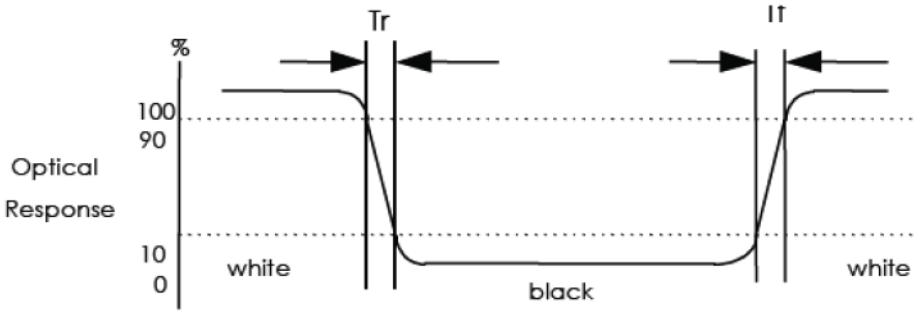
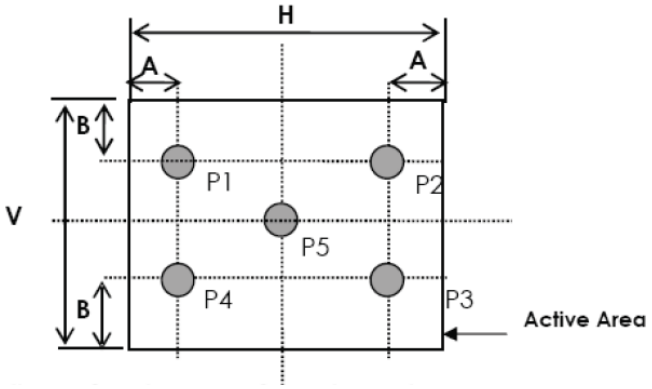
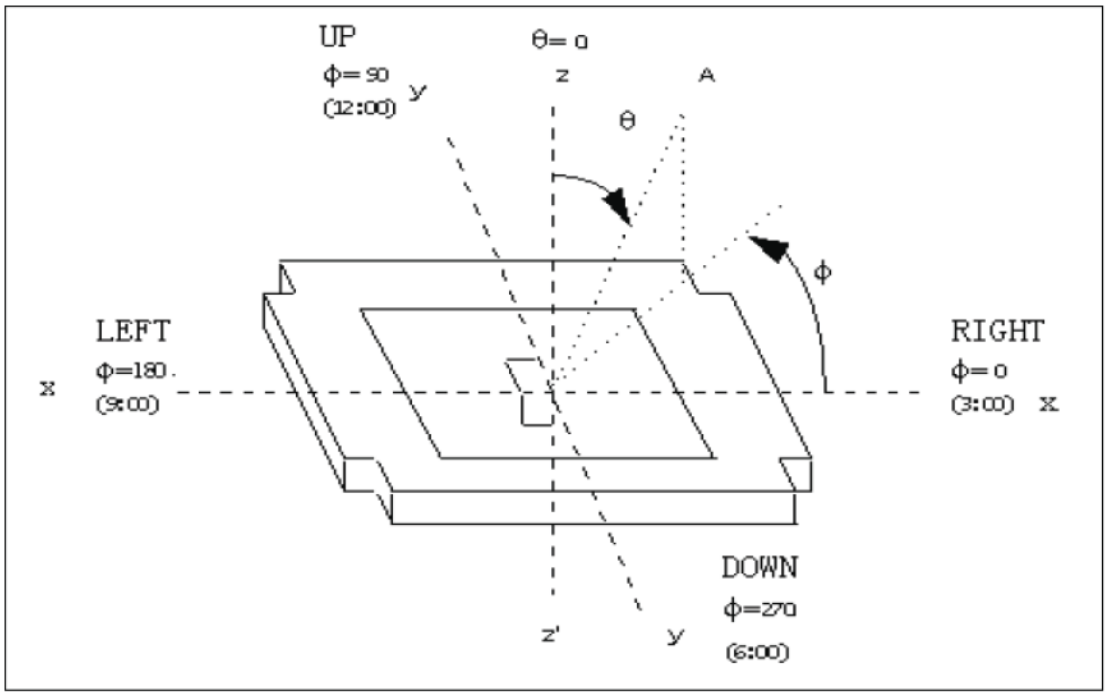


FIG 3. Measuring method for contrast ratio, surface luminance, Luminance uniformity, CIE (x,y) chromaticity.



A: H/6
B: V/6
H, V: Active Area
Light spot size Ø =7mm, 500mm distance from the LCD surface to detector lens.
Measurement instrument is TOPCON's luminance meter BM-7.

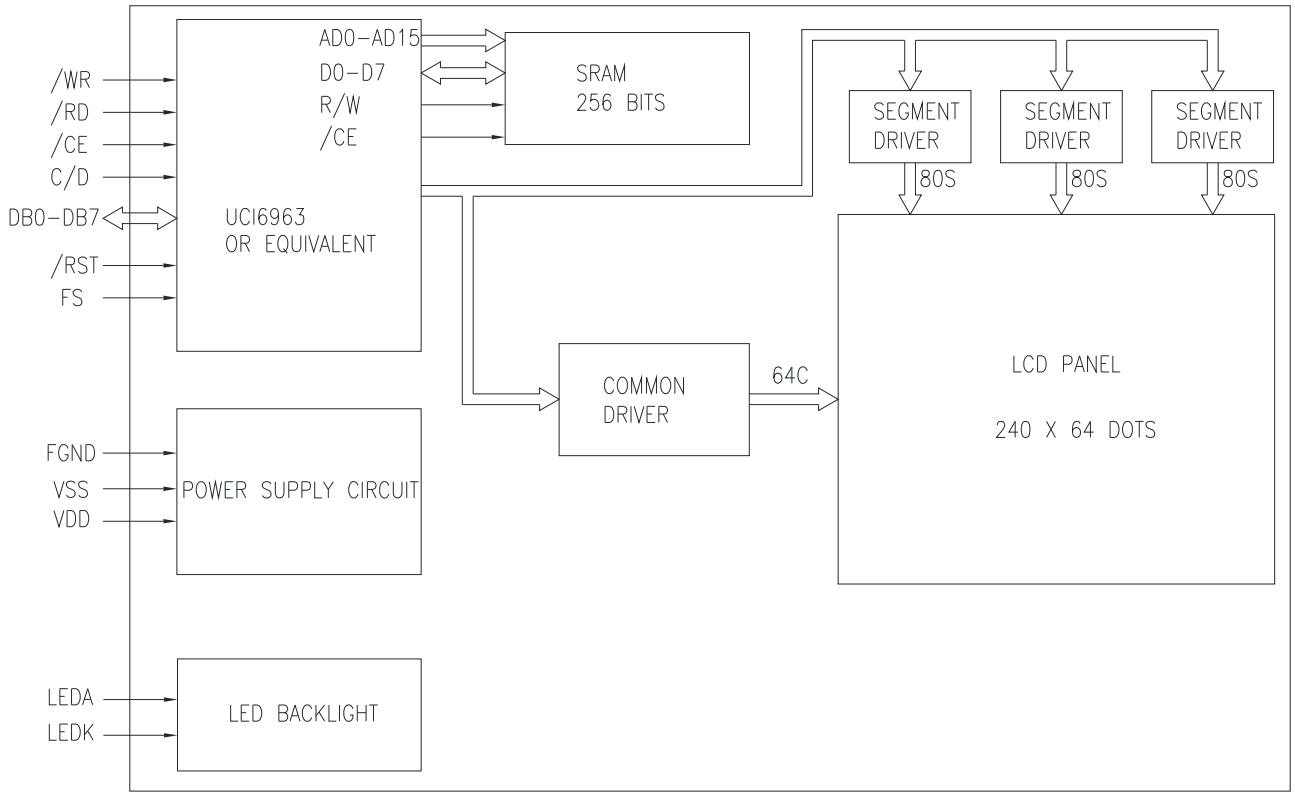
FIG 4. The definition of viewing angle



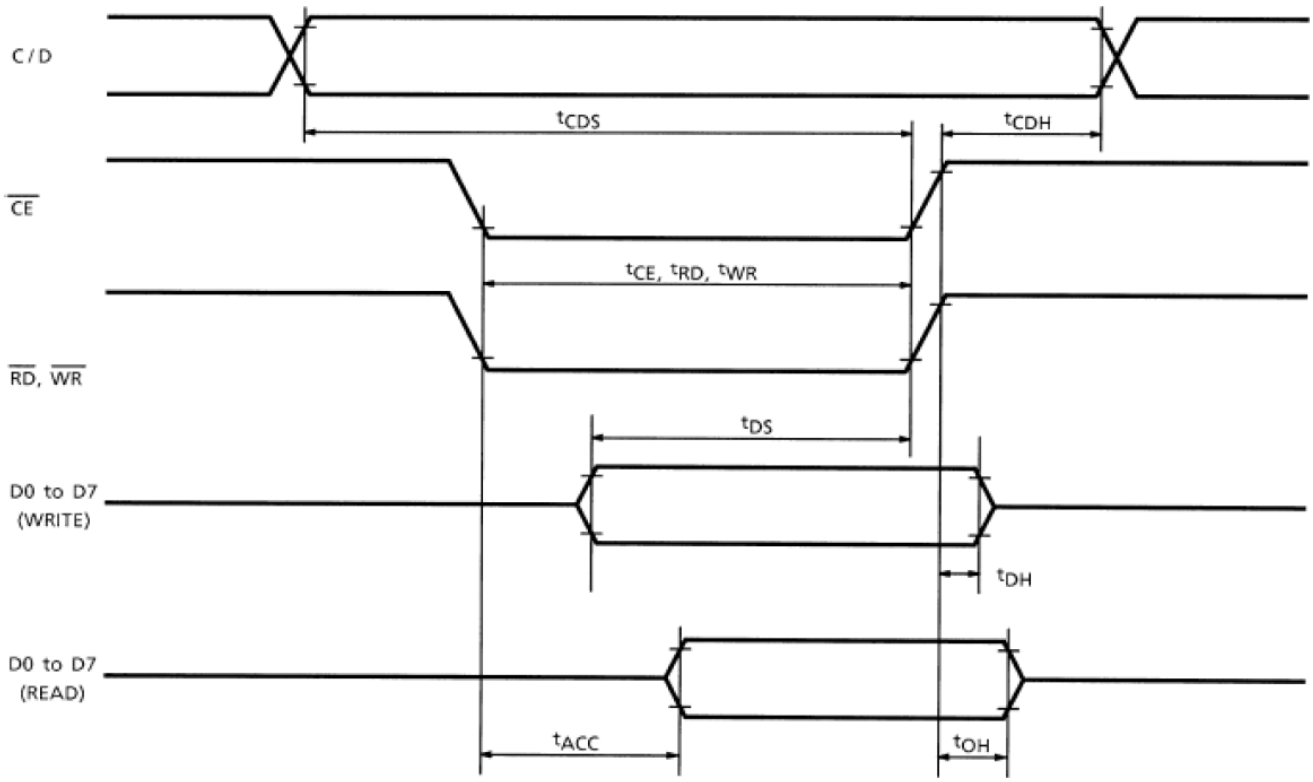
■ INTERFACE DESCRIPTION

<table>
<tr><th>Pin No.</th><th>Symbol</th><th>I/O/P</th><th>Description</th></tr>
<tr><td>1</td><td>FGND</td><td>0V</td><td>Frame ground.</td></tr>
<tr><td>2</td><td>VSS</td><td>0V</td><td>Ground.</td></tr>
<tr><td>3</td><td>VDD</td><td>5V</td><td>Power supply.</td></tr>
<tr><td>4</td><td>NC</td><td>-</td><td>No connection.</td></tr>
<tr><td>5</td><td>/WR</td><td>H/L</td><td>WRITE control bus between the UCI6963 and the system microcontroller.
When WR = Low, the system microcontroller can write data to the UCI6963. The data is on the D0~D7 data bus.</td></tr>
<tr><td>6</td><td>/RD</td><td>H/L</td><td>READ control bus between the UCI6963 and the system microcontroller.
When RD = Low, the system microcontroller can read data from the UCI6963.
The data is on the D0~D7 data bus.</td></tr>
<tr><td>7</td><td>/CE</td><td>H/L</td><td>Chip Enable signal of the UCI6963.
System microcontroller must put this signal to LOW to do READ/WRITE operation to the UCI6963.</td></tr>
<tr><td>8</td><td>C/D</td><td>H/L</td><td>Selection of COMMAN / STATUS or DATA for data transfer between the UCI6963 and the host microcontroller.
<table>
<tr><td>$\overline{WR}$</td><td>L</td><td>L</td><td>H</td><td>H</td></tr>
<tr><td>$\overline{RD}$</td><td>H</td><td>H</td><td>L</td><td>L</td></tr>
<tr><td>C/$\overline{D}$</td><td>H</td><td>L</td><td>H</td><td>L</td></tr>
<tr><td>Operation</td><td>write command to the UCI6963</td><td>write data to the UCI6963</td><td>Read status from the UCI6963</td><td>Read data from the UCI6963</td></tr>
</table></td></tr>
<tr><td>9</td><td>NC</td><td>-</td><td>No connection.</td></tr>
<tr><td>10</td><td>/RST</td><td>H/L</td><td>Reset the system, active low.</td></tr>
<tr><td>11~18</td><td>DB0~DB7</td><td>H/L</td><td>Bi-directional data bus between the UCI6963 and the system microcontroller.
Data, commands, and status are written to or read from the UCI6963 via these data lines. This data bus has an internal latch for each bit.</td></tr>
<tr><td>19</td><td>FS</td><td>H/L</td><td>Font selection (H: 6x8dots L: 8x8dots)</td></tr>
<tr><td>20</td><td>NC</td><td>-</td><td>No connection.</td></tr>
</table>

■ BLOCK DIAGRAM



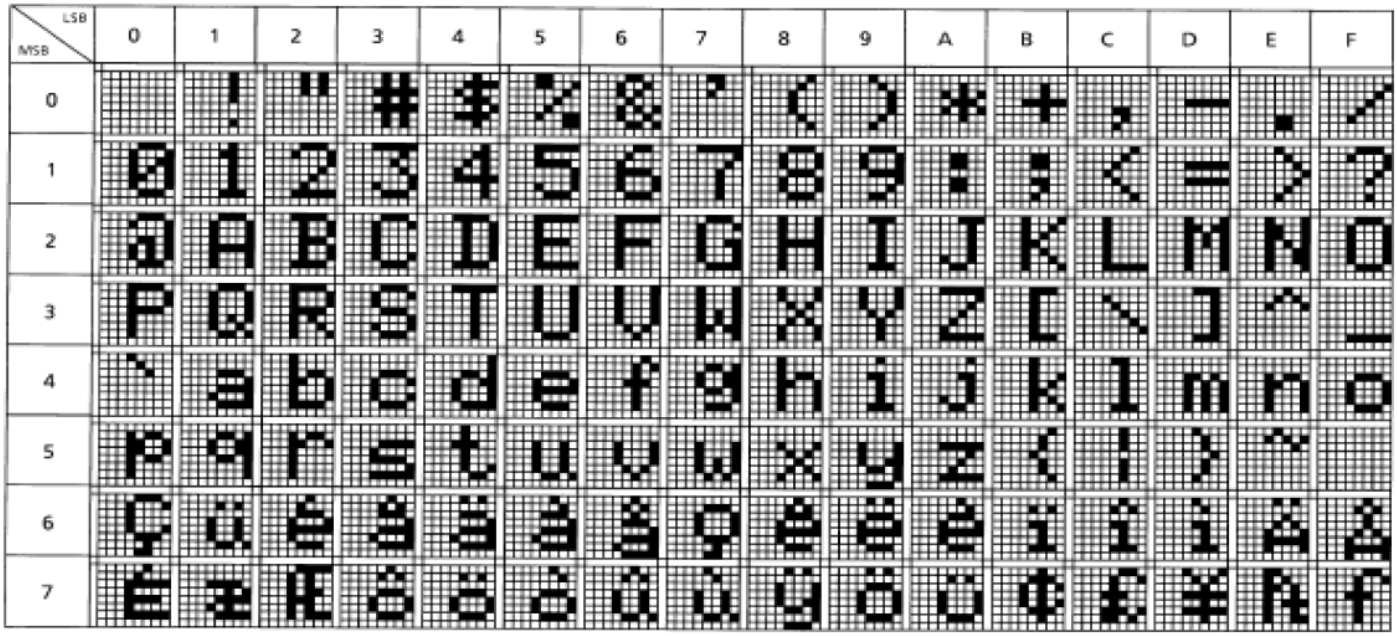
■ APPLICATION NOTES



Test Conditions (Unless Otherwise Noted, VDD = 5.0 V ± 10%, VSS = 0 V, Ta = −20 to 75° C)

Item	Symbol	Condition	Min.	Max.	Unit
C/D Set−up Time	tCDS	-	100	-	ns
C/D Hold Time	tCDH	-	10	-	ns
CE, RD, WR Pulse Width	tCE, tRD, tWR	-	80	-	ns
Data Set−up Time	tDS	-	80	-	ns
Data Hold Time	tDH	-	40	-	ns
Access Time	tACC	-	-	150	ns
Output Hold Time	tOH	-	10	50	ns

Command	Code	D1	D2	Function
REGISTERS 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 ROM 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)



■ INITIAL CODE

```
#include<reg51.h>
#include<intrins.h>
#include"24064-T6963-PIC.h"
#define uint unsigned int
#define uchar unsigned char
#define NOP _nop_()
#define DataBus P1
#define LCDX 240
#define LCDY 64
sbit CD =P3^4; //
sbit WR_ =P3^2;
sbit RD_ =P3^1;
sbit CE =P3^0;
sbit RST =P3^5;
sbit FS =P3^3;
 /*******************************************************

 *******************************************************/
 void Delay2Us(uchar us)
 {
 while(--us);
 }

/*******************************************************
*******************************************************/
void DelayMs(uint ms)
{
while(ms--)
{
uchar t=5;
while(t--)
```

```
{
Delay2Us(92);
}
}
}

/*********************************************************
*********************************************************/
void WriteCommand(uchar cmd)
{
CheckBusy();
CD=1;
RD_=1;
DataBus=cmd;
WR_=0;
NOP;
WR_=1;

}
/*********************************************************
*********************************************************/

void WriteData(uchar dat)
{
CheckBusy();
CD=0;
RD_=1;
DataBus=dat;
WR_=0;
NOP;
WR_=1;
}

/*********************************************************
*********************************************************/
ReadData(void)
{
uchar dat;
CheckBusy();
CD=0;
WR_=1;
RD_=0;
NOP;
dat=DataBus;
RD_=0;
return dat;
}

/*********************************************************
*********************************************************/
void CheckBusy(void)
{
DataBus=0xff;
```

```
CD=1;
WR_=1;
RD_=0;
while((DataBus&0x03)!=0x03);
RD_=1;
}

/*********************************************************
*********************************************************/
void WriteDataCommand(uchar dat,uchar cmd)
{
WriteData(dat);
WriteCommand(cmd);
}
/*********************************************************
*********************************************************/
void WriteDataDataCommand(uchar datalow,uchar datahigh,uchar cmd)
{
WriteData(datalow);
WriteData(datahigh);
WriteCommand(cmd);
}
/*********************************************************
*********************************************************/
void LCDInit(void) //LCD {
WriteDataDataCommand(0x00,0x00,0x40); //TEXT HOME ADDRESS 0000H
WriteDataDataCommand(0xf0,0x00,0x42); //GRAPHIC HOME ADDRESS 0080H
WriteDataDataCommand(0x1e,0x00,0x41); //TEXT AREA 16 COLUMNS
WriteDataDataCommand(0x1e,0x00,0x43); //GRAPHIC AREA 16 COLUMNS
WriteCommand(0x81);
WriteDataDataCommand(0x02,0x00,0x22); //CGRAM
WriteCommand(0x9c);
}
```

■ RELIABILITY TEST

No.	Test Item	Test Condition	Description
1	High Temperature Storage Test	85°C± 2°C / 200Hrs.	Inspection after 2~4hours storage at Room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Sealleak; 3.Non-display; 4.Missing segments; 5.Glass crack; 6.Current Idd is twice higher than initial value.
2	Low Temperature Storage Test	-30°C± 2°C / 200Hrs.	
3	High Temperature Operating Test	75°C± 2°C / 120Hrs.	
4	Low Temperature Operating Test	-20°C± 2°C / 120Hrs.	
5	High Temperature and High Humidity Operation Test	50°C± 5°C, 90%RH 120Hrs.	
6	Thermal Shock Test	-20°C±2°C(30min.) ~25 ±2°C(5min.) ~75 ± 2°C (30min.) 10Cycles	
7	Vibration Test	Frequency_10Hz~55Hz~10Hz Amplitude: 1.5mm, X, Y, Z direction for total 3hours (Packing condition)	
8	Dropping Test	Drop to the ground from 1m height, one time, every side of carton. (Packing condition)	
9	ESD Test	Voltage: ±8KV, R: 330Ω, C: 150pF Air discharge, 10time	

Remark:
1.The test samples should be applied to only one test item.
2.Sample size for each test item is 5~10pcs.
3.For Damp Proof Test, Pure water (Resistance>10MΩ) should be used.
4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
5.EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6.Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

■ INSPECTION CRITERION

This specification is made to be used as the standard acceptance/rejection criteria for Normal LCM Product.

1. Sample plan

Sampling plan according to GB/T2828.1-2003/ISO 2859-11999 and ANSI/ASQC Z1.4-1993, normal level 2 and based on:

Major defect: AQL 0.65

Minor defect: AQL 1.5

2. Inspection condition

Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45° against perpendicular line. (Normal temperature 20~25℃ and normal humidity 60±15%RH).

Driving voltage

The Vop value from which the most optimal contrast can be obtained near the specified Vop in the specification (Within ±0.5V of the typical value at 25℃.).

3. Definition of inspection zone in LCD.

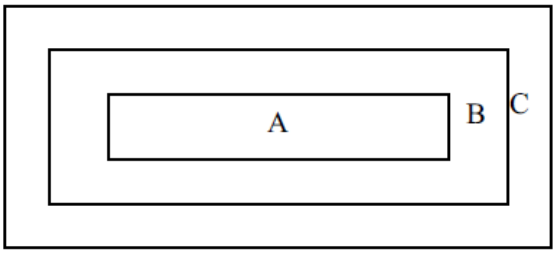


Fig.1 Inspection zones in an LCD

Zone A: Character / Digit area (Active area)

Zone B: Viewing area except Zone A (Zone A+Zone B=minimum viewing area)

Zone C: Outside viewing area (invisible area after assembly in customer's product)

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product. If any visual defect in Zone C is impermissible, customers need to inform us by written.

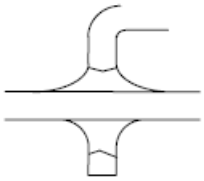
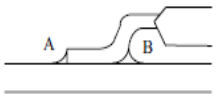
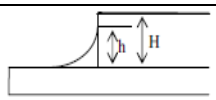
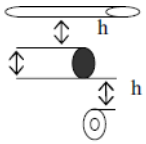
4.Inspection Standard

4.1 Major Defect

Items to be inspected	Inspection Standard	Classification of defects
All functional defects	1) No display	Major
	2) Display abnormally	
	3) Missing vertical, horizontal segment	
	4) Short circuit	
	5) Back-light no lighting, flickering and abnormal lighting	
Missing	Missing component	
Outline dimension	Overall outline dimension beyond the drawing is not allowed.	

4.2 Cosmetic Defect

4.2.1 Module Cosmetic Criteria

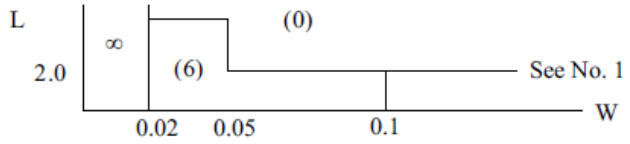
No.	Item	Criteria	Partition
1	Difference in Spec.	None allowed	Major
2	Pattern peeling	No substrate pattern peeling and floating	Major
3	Soldering defects	No soldering missing No soldering bridge No cold soldering	Major Major Minor
4	Resist flaw on Printed Circuit Boards	visible copper foil (Ø0.5mm or more) on substrate pattern	Minor
5	Accretion of metallic Foreign matter	No accretion of metallic foreign matters (Not exceed Ø0.2mm)	Minor
6	Plate discoloring	No plate fading, rusting and discoloring	Minor
7	Plate discoloring	No plate fading, rusting and discoloring	Minor
8	Solder amount 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) b. Components side (In case of 'Through Hole PCB') Solder to reach the Components side of PCB. 	Minor
	2). Flat packages	Either 'Toe' (A) or 'Seal' (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
9	Solder ball/Solder splash	a. The spacing between solder ball and the conductor or solder pad h ≥0.13mm. The diameter of solder ball d ≤0.15mm.  b. The quantity of solder balls or solder Splashes isn't beyond 5 in 600 mm2. c. Solder balls/Solder splashes do not violate minimum electrical clearance. d. Solder balls/Solder splashes must be entrapped/encapsulated or attached to the metal surface. NOTE: Entrapped/encapsulated/attached is intended to mean that normal service environment of the product will not cause a solder ball to become dislodged.	Minor Minor Major Minor

4.2.2 Cosmetic Criteria (Non-Operating)

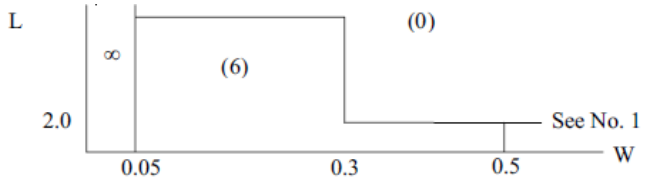
<table>
<tr><th>No.</th><th>Item</th><th>Criteria</th><th>Partition</th></tr>
<tr><td>1</td><td>Spots</td><td>In accordance with Screen Cosmetic Criteria (Operating) No.1.</td><td>Minor</td></tr>
<tr><td>2</td><td>Lines</td><td>In accordance with Screen Cosmetic Criteria (Operating) No.2.</td><td>Minor</td></tr>
<tr><td>3</td><td>Bubbles in polarizer</td><td><table><tr><td>Size: d mm</td><td>Acceptable Qty in active area</td></tr><tr><td>d ≤ 0.3</td><td>Disregard</td></tr><tr><td>0.3 < d ≤ 1.0</td><td>3</td></tr><tr><td>1.0 < d ≤ 1.5</td><td>1</td></tr><tr><td>1.5 < d</td><td>0</td></tr></table></td><td>Minor</td></tr>
<tr><td>4</td><td>Scratch</td><td>In accordance with spots and lines operating cosmetic criteria. When the
light reflects on the panel surface, the scratches are not to be remarkable.</td><td>Minor</td></tr>
<tr><td>5</td><td>Allowable density</td><td>Above defects should be separated more than 30mm each other.</td><td>Minor</td></tr>
<tr><td>6</td><td>Coloration</td><td>Not to be noticeable coloration in the viewing area of the LCD panels.
Back-lit type should be judged with back-lit on state only.</td><td>Minor</td></tr>
<tr><td>7</td><td>Contamination</td><td>Not to be noticeable.</td><td>Minor</td></tr>
</table>

4.2.3 Cosmetic Criteria (Operating)

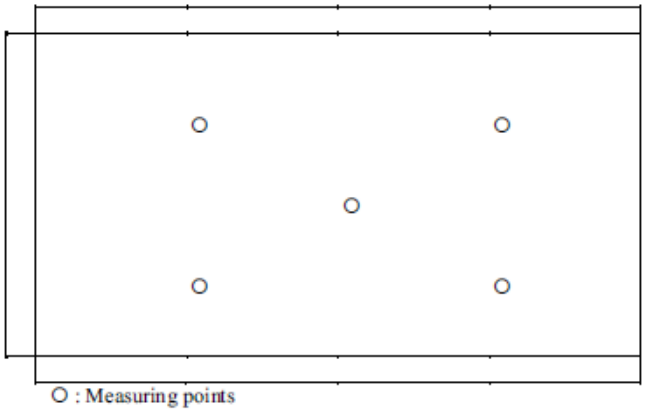
<table>
<tr><th>No.</th><th>Item</th><th>Criteria</th><th>Partition</th></tr>
<tr><td>1</td><td>Spots</td><td>A) Clear
<table>
<tr><td>LCD size</td><td>Size: d mm</td><td>Acceptable Qty in active area</td></tr>
<tr><td rowspan="4">LCD size≤8.0”</td><td>d≤0.1</td><td>Disregard</td></tr>
<tr><td>0.1< d≤0.2</td><td>6</td></tr>
<tr><td>0.2< d≤0.3</td><td>2</td></tr>
<tr><td>0.3 < d</td><td>0</td></tr>
<tr><td rowspan="4">LCD Size > 8.0”</td><td>d≤0.1</td><td>Disregard</td></tr>
<tr><td>0.1< d≤0.3</td><td>10</td></tr>
<tr><td>0.3< d≤0.5</td><td>5</td></tr>
<tr><td>0.5 < d</td><td>0</td></tr>
</table>
Note: Including pin holes and defective dots which must be within one pixel size; Total defective point shall not exceed 6 pcs no more than 8inch LCD and 10PCS for more than 8inch LCD.</td><td>Minor</td></tr>
</table>

<table>
<tr><th>No.</th><th>Item</th><th>Criteria</th><th>Partition</th></tr>
<tr><td>1</td><td>Spots</td><td>B) Unclear
<table>
<tr><td>LCD size</td><td>Size: d mm</td><td>Acceptable Qty in active area</td></tr>
<tr><td rowspan="4">LCD size≤8.0”</td><td>d≤0.2</td><td>Disregard</td></tr>
<tr><td>0.2< d≤0.5</td><td>6</td></tr>
<tr><td>0.5< d≤0.7</td><td>2</td></tr>
<tr><td>0.7 < d</td><td>0</td></tr>
<tr><td rowspan="4">LCD Size > 8.0”</td><td>d≤0.2</td><td>Disregard</td></tr>
<tr><td>0.2< d≤0.5</td><td>10</td></tr>
<tr><td>0.5< d≤0.7</td><td>3</td></tr>
<tr><td>0.7< d≤1.0</td><td>1</td></tr>
<tr><td>1.0 < d</td><td>0</td></tr>
</table>
Note: Total defective point shall not exceed 6 pcs for no more than 8inch LCD and 10PCS for more than 8inch LCD.</td><td>Minor</td></tr>
<tr><td>2</td><td>Lines</td><td>A) Clear
 

Note: ( ) - Acceptable Qty in active area
L - Length (mm)
W - Width (mm)
∞ - Disregard

B) Unclear
 

‘Clear’ = The shade and size are not changed by Vop.
‘Unclear’ = The shade and size are changed by Vop.</td><td>Minor</td></tr>
<tr><td>3</td><td>Rubbing line</td><td>Not to be noticeable.</td><td>Minor</td></tr>
<tr><td>4</td><td>Allowable density</td><td>Above defects should be separated more than 10mm each other.</td><td>Minor</td></tr>
<tr><td>5</td><td>Rainbow</td><td>Not to be noticeable.</td><td>Minor</td></tr>
</table>

No.	Item	Criteria	Partition
6	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.1)	Minor
7	Uneven brightness (only back-lit type module)	Uneven brightness must be BMAX / BMIN ≤ 2 - 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.  	Minor

Note:
(1) Size: d = (long length + short length) / 2
(2) The limit samples for each item have priority.
(3) Complex defects are defined item by item, but if the numbers of defects are defined in above table, the total number should not exceed 10.
(4) 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 Ø5mm.
- 10 or over defects in circle of Ø10mm.
- 20 or over defects in circle of Ø20mm.

■ PRECAUTIONS FOR USING LCD MODULES

◆ Handing Precautions

1. The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Dot not subject it to a mechanical shock by dropping it or impact.

2. If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).

4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

5. If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents.
   - Isopropyl alcohol
   - Ethyl alcohol

Do not scrub hard to avoid damaging the display surface.

6. Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
   - Water
   - Ketone
   - Aromatic solvents

7. Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.

8. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

9. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

10. Do not attempt to disassemble or process the LCD module.

11. If the logic circuit power is off, do not apply the input signals.

12. Electro-Static Discharge Control. Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

13. Electro-Static Discharge Control. Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- 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. Be sure to ground the body when handling the LCD modules.

- Tools required for assembling, such as soldering irons, must be properly grounded. make certain the AC power source for the soldering iron does not leak. 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 commutator of the motor.

- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. 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. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential

- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

- 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.

- Do not alter, modify or change the shape of the tab on the metal frame.

- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

- Do not damage or modify the pattern writing on the printed circuit board.

- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

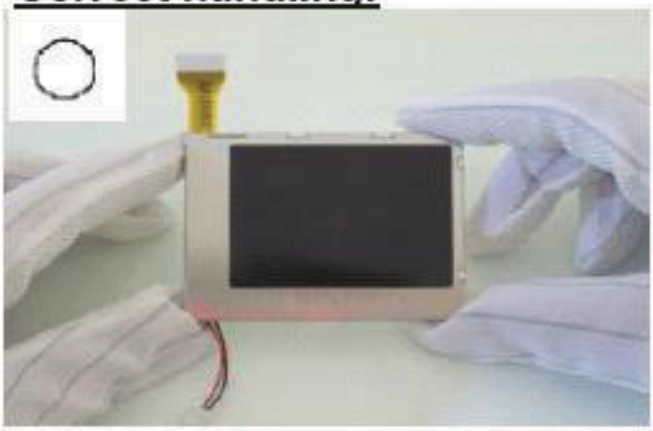
- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

- Do not drop, bend or twist LCM.

◆ **Handing Precaution for LCM**

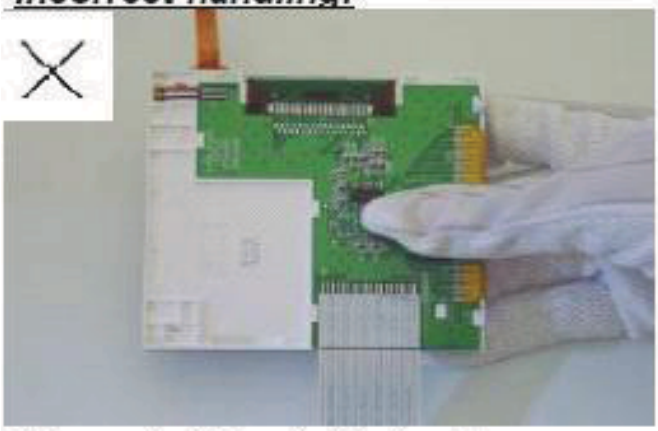
LCM is easy to be damaged.
Please note below and be careful for handling!

Correct handling:

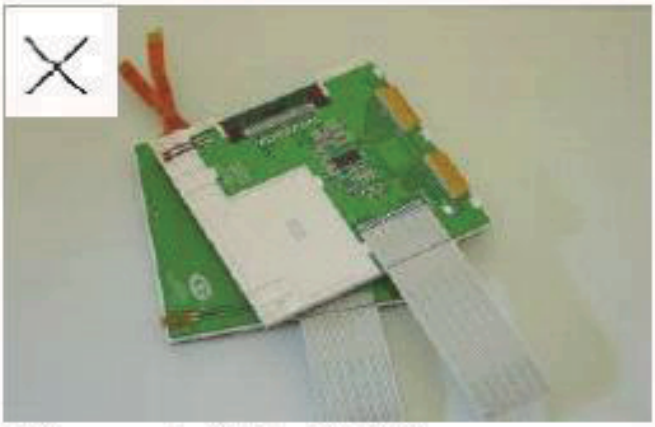


As above picture, please handle with anti-static gloves around LCM edges.

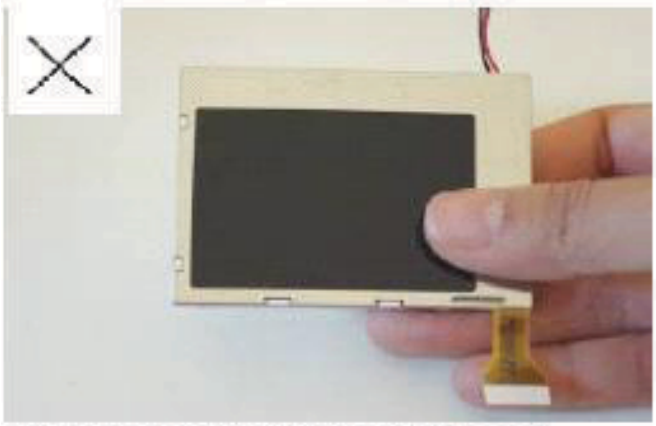
Incorrect handling:



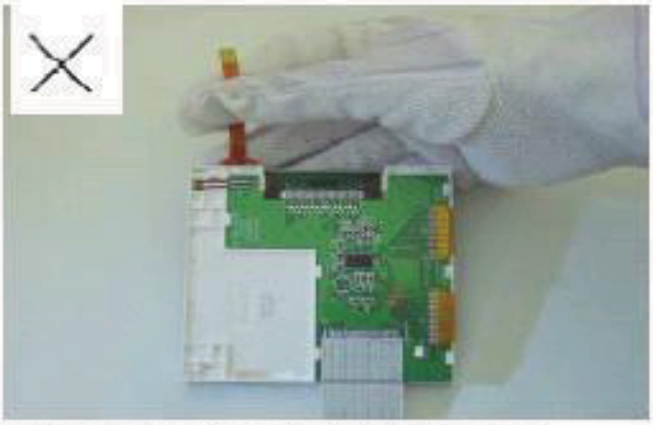
Please don't touch IC directly.



Please don't stack LCM.



Please don't hold the surface of panel.

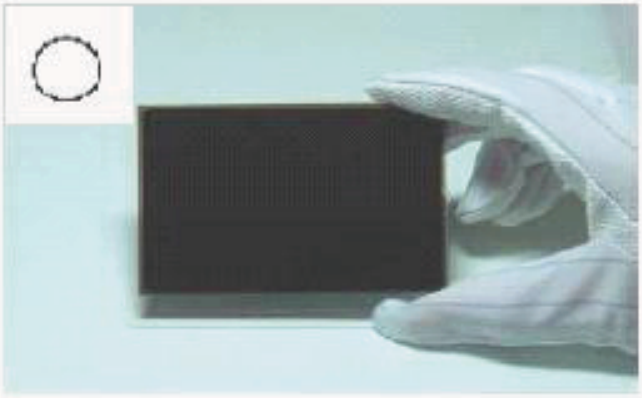


Please don't stretch interface of output, such as FPC cable.

◆ **Handing Precaution for LCD**

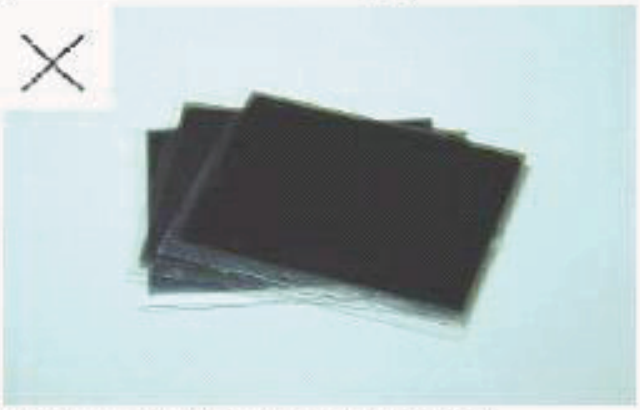
LCD is easy to be damaged.
Please note below and be careful for handling!

Correct handling:



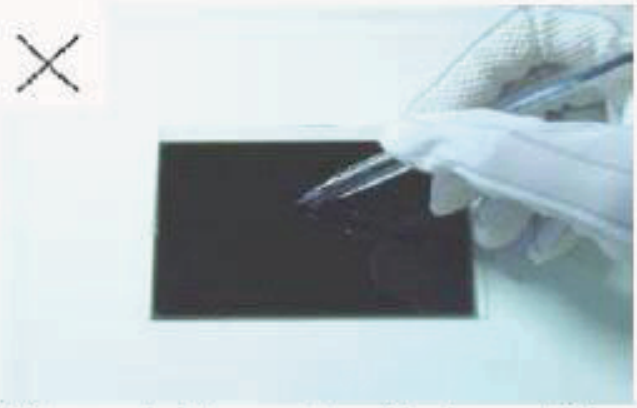
As above photo, please handle with anti-static gloves around LCD edges.

Incorrect handling:

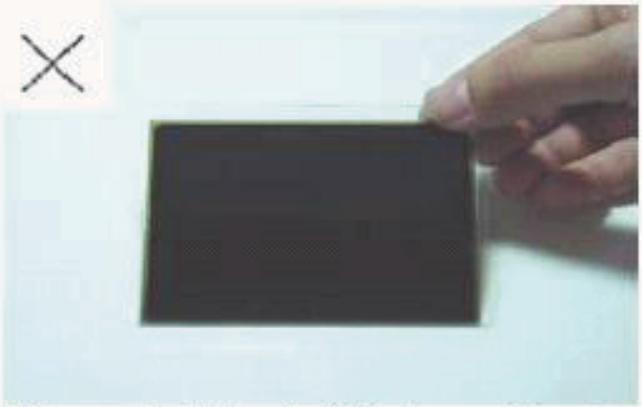


Please don't stack the LCDS.

Please don't hold the surface of LCD.



Please don't operate with sharp stick such as pens.



Please don't touch ITO glass without anti-static gloves.

◆ **Storage Precautions**

When storing the LCD modules, the following precaution is necessary.

1. Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.
2. Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, and keep the relative humidity between 40%RH and 60%RH.
3. The polarizer surface should not come in contact with any other objects. (We advise you to store them in the anti-static electricity container in which they were shipped.

◆ **Others**

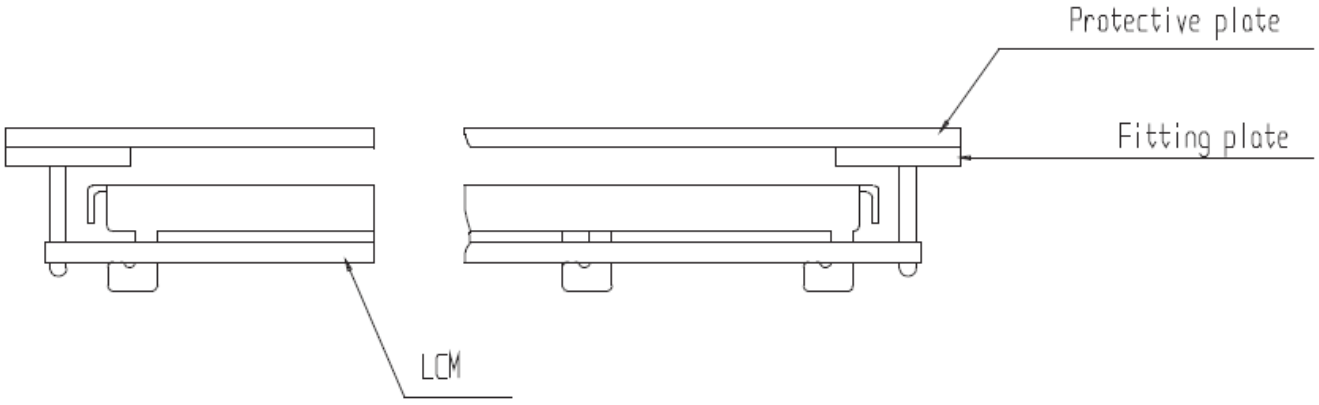
1. Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.
2. If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
3. To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.
   - Exposed area of the printed circuit board.
   - Terminal electrode sections.

◆ **Using LCD Modules**

1. Installing LCD Modules

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

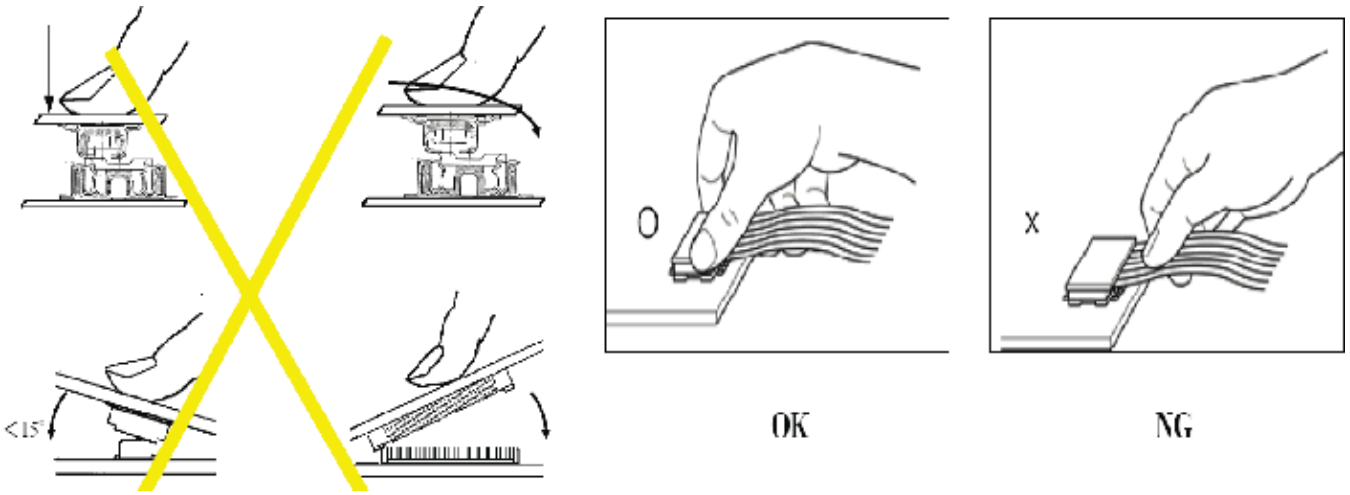
1.1.1 Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



1.1.2 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 ±0.1mm.

2. Precaution For Assemble The Module With BTB Connector

Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows.



◆ **Precaution For Soldering To The LCM**

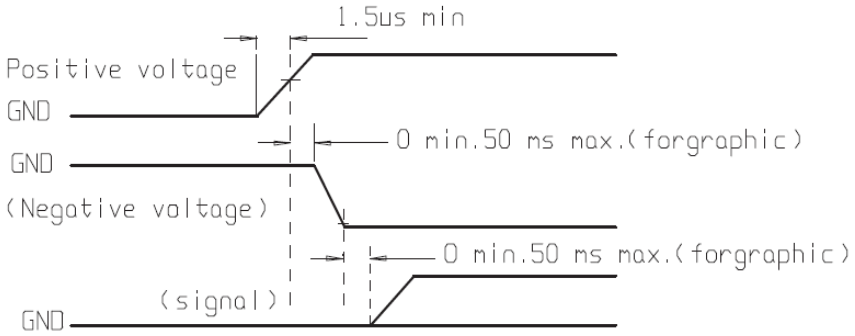
	Hand Soldering	Machine Drag Soldering	Machine Press Soldering
No ROHS Product	290°C ~ 350°C. Time: 3~5S.	330°C ~ 350°C. Speed: 4~8mm/s.	300°C ~ 330°C. Time: 3~6S. Press: 0.8~1.2Mpa
ROHS Product	340°C ~ 370°C. Time: 3~5S.	350°C ~ 370°C. Speed: 4~8mm/s.	330°C ~ 360°C. Time: 3~6S. Press: 0.8~1.2Mpa

1. 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 a 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 electroluminescent 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 electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

◆ **Precaution For Operation**

1. Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.
2. It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
3. Response time will be extremely delayed at lower temperature than the operating temperature range and on the mean malfunction or out of order with LCD's. Which will come back in the specified operating temperature.
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.
5. A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature, 50%RH or less is required.
6. Input each signal after the positive/negative voltage becomes stable.

7. Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.



◆ **Safety**

1. It is recommended to crush damaged or unnecessary LCDs 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.

◆ **Limited Warranty**

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

◆ **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 is 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 any 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 eyelet, conductors and terminals.

■ PRIOR CONSULT MATTER

1. For Multi-Inno standard products, we keep the right to change material, process ... for improving the product property without notice on our customer.
2. For OEM products, if any change needed which may affect the product property, we will consult with our customer in advance.
3. If you have special requirement about reliability condition, please let us know before you start the test on our samples.