Winstar Display Co., LTD
華凌光電股份有限公司

住址: **407** 台中市中清路 **163** 號　　WEB: http://www.winstar.com.tw
No.163 Chung Ching RD.,　　E-mail: winstar@winstar.com.tw
Taichune, Taiwan, R.O.C　　Tel:886-4-24262208　Fax : 886-4-24262207

SPECIFICATION

CUSTOMER ：

MODULE NO.:　　WG12864C-YGH-VN

APPROVED BY: (FOR CUSTOMER USE ONLY)	
	PCB VERSION:　　　　DATA:

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
ISSUED DATE:			

Winstar Display Co., LTD

華凌光電股份有限公司

MODLE NO：

RECORDS OF REVISION

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2006/9/29		First issue

Contents

1.Module Classification Information

<u>W</u> <u>G</u>   <u>1 2 8 6 4</u>   <u>C</u>－<u>YG</u> <u>H</u>－   <u>VN</u>

① ②   ③   ④   ⑤ ⑥ ⑦   ⑧

① Brand：WINSTAR DISPLAY CORPORATION

② Display Type：H→Character Type, G→Graphic Type

③ Display Font：128 * 64 Dots

④ Model serials number

⑤ Backlight Type：
N→Without backlight	T→LED, White
B→EL, Blue green	A→LED, Amber
D→EL, Green	R→LED, Red
W→EL, White	O→LED, Orange
F→CCFL, White	G→LED, Green
Y→LED, Yellow Green	

⑥ LCD Mode：
B→TN Positive, Gray	T→FSTN Negative
N→TN Negative,	
G→STN Positive, Gray	
Y→STN Positive, Yellow Green	
M→STN Negative, Blue	
F→FSTN Positive	

⑦ LCD Polarizer Type/ Temperature range/ View direction
A→Reflective, N.T, 6:00	H→Tranmsflective, W.T,6:00
D→Reflective, N.T, 12:00	K→Tranmsflective, W.T,12:00
G→Reflective, W. T, 6:00	C→Tranmsmissive, N.T,6:00
J→Reflective, W. T, 12:00	F→Tranmsmissive, N.T,12:00
B→Transflective, N.T,6:00	I→Tranmsmissive, W. T, 6:00
E→Transflective, N.T.12:00	L→Tranmsmissive, W.T,12:00

⑧ Special Code   V : Build in Negative Voltage；

N: ICNT7107 ICNT7108

2.Precautions in Use of LCD Module

(1)Avoid applying excessive shocks to the module or making any alterations or modifications to it.

(2)Don't make extra holes on the printed circuit board, modify its shape or change the components of

LCD Module.

(3)Don't disassemble the LCM.

(4)Don't operate it above the absolute maximum rating.

(5)Don't drop, bend or twist LCM.

(6)Soldering: only to the I/O terminals.

(7)Storage: please storage in anti-static electricity container and clean environment.

3.General Specification

ITEM	STANDARD VALUE	UNIT
Number of dots	128 ×64	dots
Outline dimension	78.0 (W) ×70.0 (H) ×14.3 (T)	mm
View area	62.0(W) ×44.0(H)	mm
Active area	56.3(W) ×38.38(H)	mm
Dot size	0.42(W)×0.58(H)	mm
Dot pitch	0.44(W)×0.60(H)	mm
LCD type	STN Positive, Transflective , Gray	
View direction	6 o'clock	
Backlight	LED , Yellow Green	

4.Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Temperature	T_{OP}	-20	—	+70	℃
Storage Temperature	T_{ST}	-30	—	+80	℃
Input Voltage	V_I	0	—	V_{DD}	V
Supply Voltage For Logic	V_{DD}	0	—	6.5	V
Supply Voltage For LCD	V_{DD}-V_{LCD}	0	—	17.0	V

5.Electrical Characteristics

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Voltage	V_{DD}	—	4.5	5.0	5.5	V
Supply Voltage For LCD	V_{DD}-V_{LCD}	Ta=-20℃	—	—	9.6	V
		Ta=25℃	—	8.5	—	V
		Ta=+70℃	8.2	—	—	V
Input High Volt.	V_{IH}	—	2.0	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	0	—	0.8	V
Output High Volt.	V_{OH}	—	2.4	—	V_{DD}	V
Output Low Volt.	V_{OL}	—	0	—	0.4	V
Supply Current	I_{OP}	—	2.0	2.5	4.0	mA

6.Optical Characteristics

ITEM	SYMBAL	CONDITION	MIN	TYP	MAX	UNIT
View Angle	(V) θ	CR $\geqq$ 2	20	—	40	deg.
	(H) φ	CR $\geqq$ 2	-30	—	30	deg.
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	200	300	ms
	T fall	—	—	150	200	ms

6.1 Definitions

■View Angles

Z (Visual angle direction)

X φ

Y θ
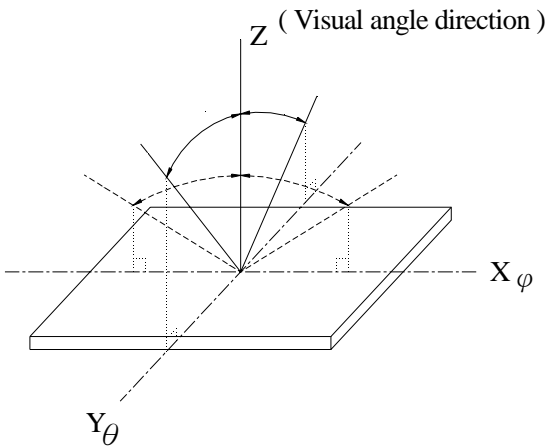
■Contrast Ratio

$$CR = \frac{\text{Brightness at selected state (BS)}}{\text{Brightness at non-selected state (Bns)}}$$

Selected state

Non-selected state

Brightness (%)

Bs

Bns

Operating voltage for LCD driving

■Response time

Nonselected Condition   Selected Condition   Nonselected Condition

Brightness

100 %

10 %

90 %

tr

Rise Time

td

Decay Time (fall time tf)
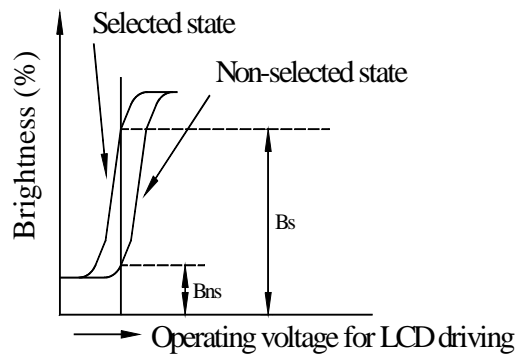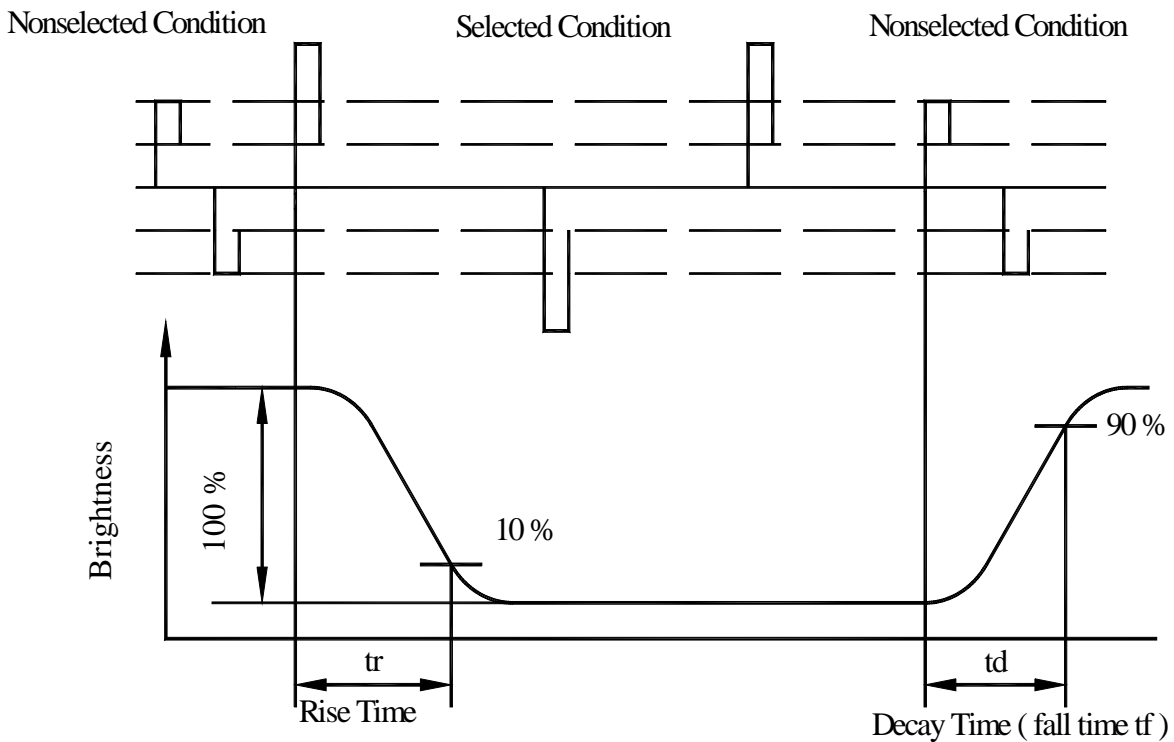
7.Power Supply for LCD Module

V_{DD}

V_{LC} →   VR 10KΩ

LCM

5 V

V_{EE} -5V

V_{SS}
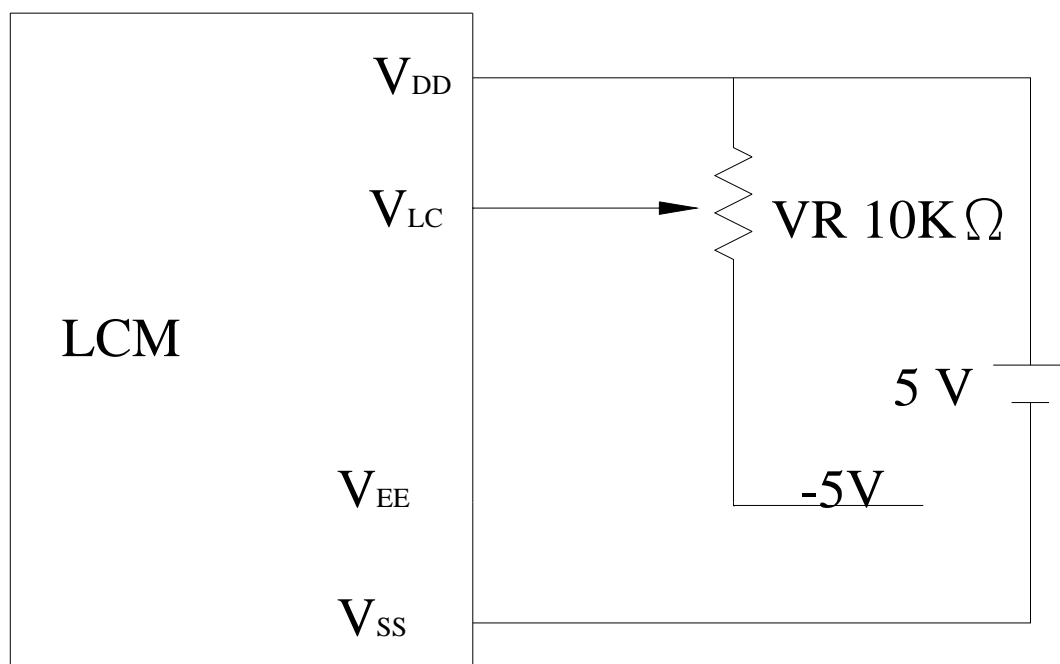
8.Counter Drawing & Block diagram
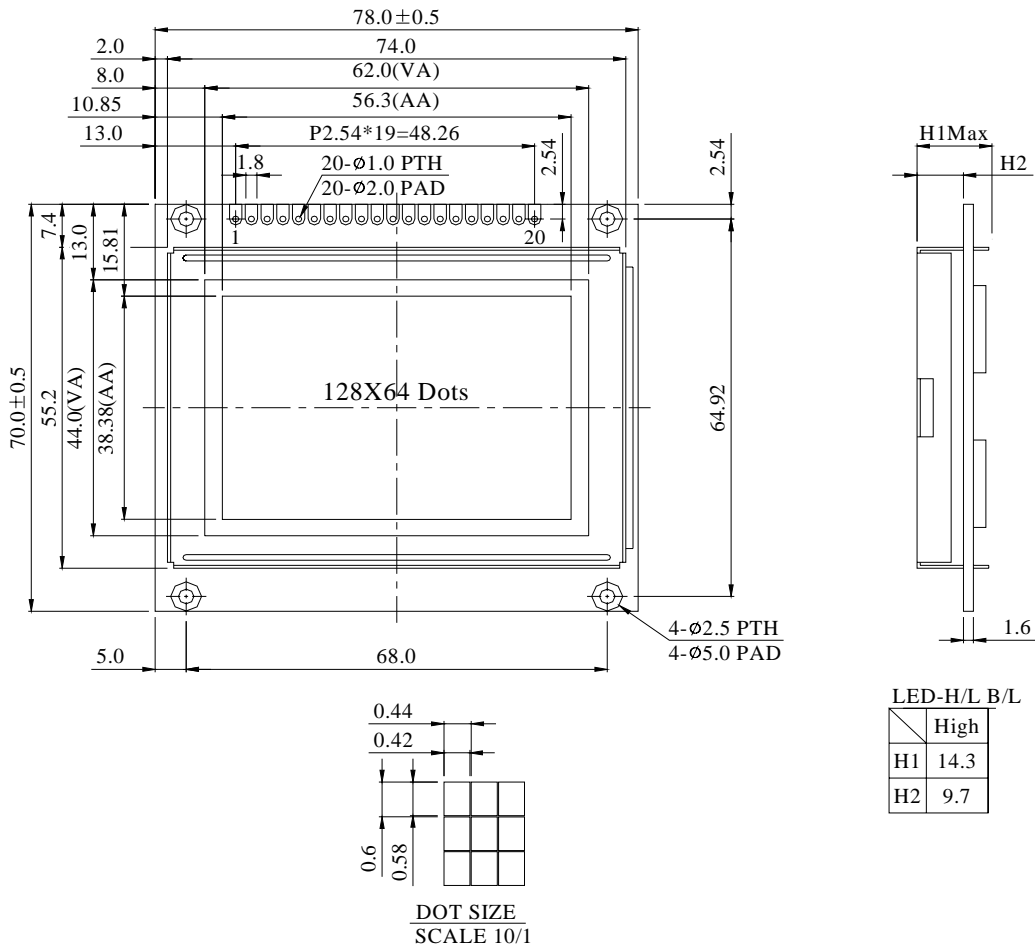
PIN NO.	SYMBOL
1	$\overline{CS1}$
2	$\overline{CS2}$
3	GND
4	VDD
5	VLC
6	D/I
7	R/$\overline{W}$
8	E
9	DB0
10	DB1
11	DB2
12	DB3
13	DB4
14	DB5
15	DB6
16	DB7
17	RST
18	VEE
19	A
20	K

LED-H/L B/L	High
H1	14.3
H2	9.7

DOT SIZE
SCALE 10/1

128X64 Dots

128X64 DOT

External contrast adjustment.
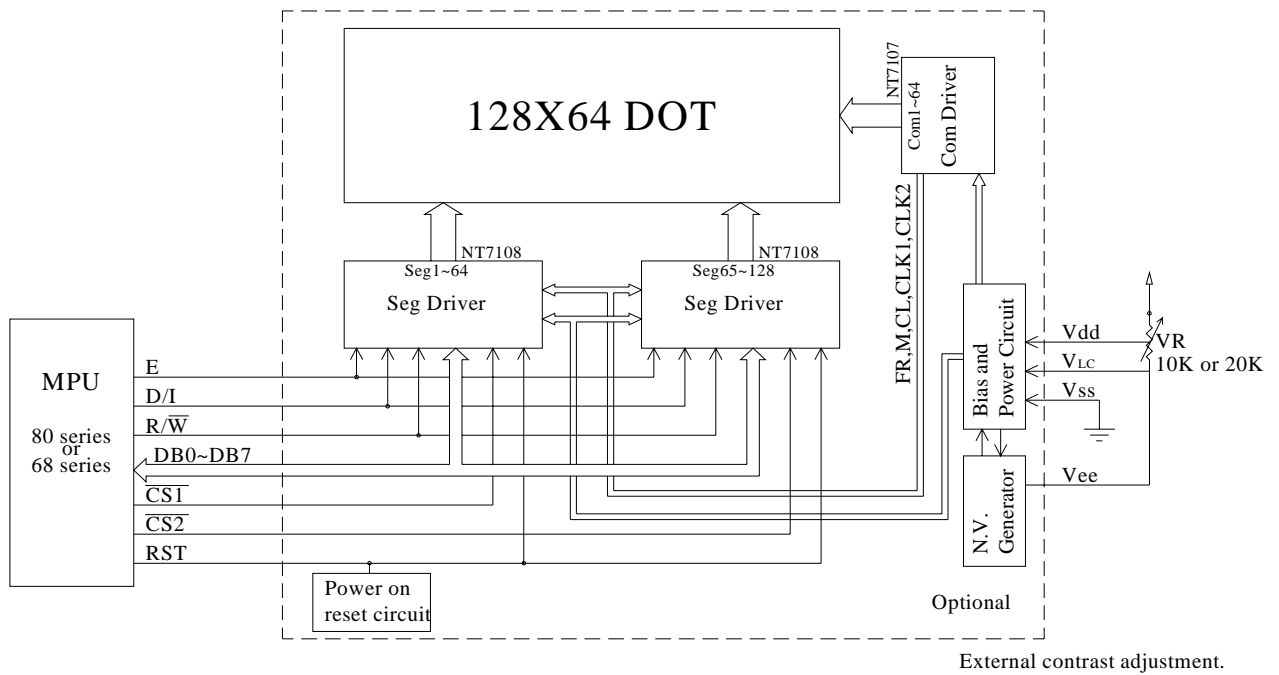
9.Interface Pin Function

Pin No.	Symbol	Level	Description
1	$\overline{CS1}$	L	Select Segment 1 ~ Segment 64
2	$\overline{CS2}$	L	Select Segment 65 ~ Segment128
3	GND	0V	Ground
4	V_{DD}	5.0V	Supply voltage for logic
5	V_{LC}	(Variable)	Operating voltage for LCD
6	D/I	H/L	H: Data , L: Instruction
7	R/W	H/L	H: Read(MPU←Module) , L :Write(MPU→Module)
8	E	H	Enable signal
9	DB0	H/L	Data bus line
10	DB1	H/L	Data bus line
11	DB2	H/L	Data bus line
12	DB3	H/L	Data bus line
13	DB4	H/L	Data bus line
14	DB5	H/L	Data bus line
15	DB6	H/L	Data bus line
16	DB7	H/L	Data bus line
17	RST	L	Reset the LCM
18	VEE		Negative Voltage output
19	A		Power supply for LED B/L(+)
20	K		Power supply for LED B/L(-)

10.Timing Characteristics

MPU Interface   (T=25℃, VDD=+5.0V±0.5)

Characteristic	Symbol	Min	Typ	Max	Unit
E cycle	tcyc	1000	—	—	ns
E high level width	twhE	450	—	—	ns
E low level width	twlE	450	—	—	ns
E rise time	tr	—	—	25	ns
E tall time	tf	—	—	25	ns
Address set-up time	tas	140	—	—	ns
Address hold time	tah	10	—	—	ns
Data set-up time	tdsw	200	—	—	ns
Data delay time	tddr	—	—	320	ns
Data hold time (write)	tdhw	10	—	—	ns
Data hold time (read)	tdhr	20	—	—	ns
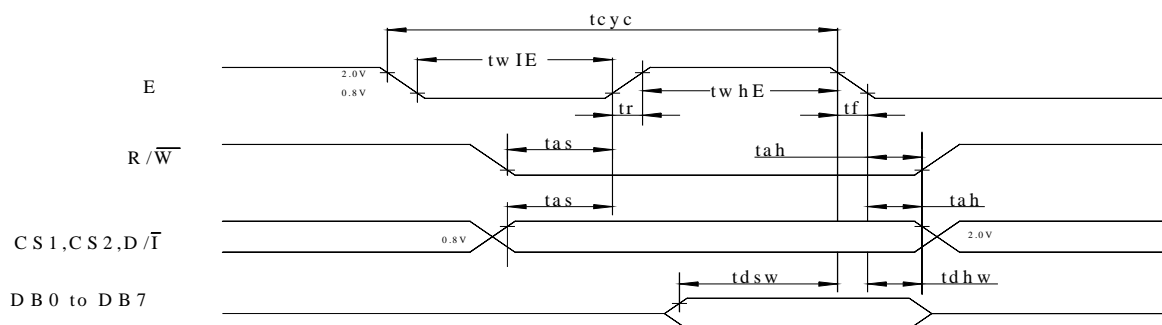
MPU Write Timing
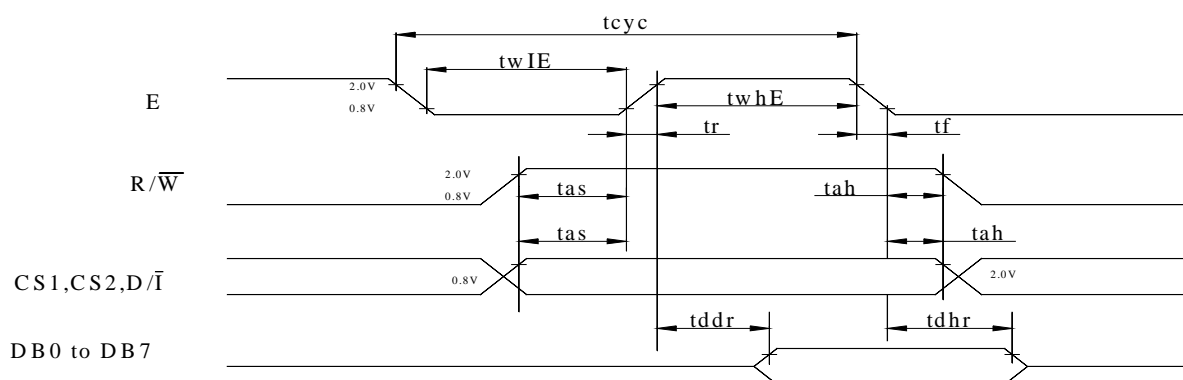
MPU Read Timing

11.Display Control Instruction

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

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

12.Detailed Explanation

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	1	1	1	D

The display data appears when D is 1 and disappears when D is 0. Though the data is not on the

screen with D=0, it remains in the display data RAM. Therefore, you can make it appear by

changing D=0 into D=1.

SET ADDRESS (Y ADDRESS)

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0

Y address (AC0-AC5) of the display data RAM is set in the Y address counter. An address is set by

instruction and increased by 1 automatically by read or write operations of display data.

SET PAGE (X ADDRESS)

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	0	1	1	1	AC2	AC1	AC0

X address (AC0-AC2) of the display data RAM is set in the X address register. Writing or reading to

or from MPU is executed in this specified page until the next page is set.

DISPLAY START LINE (Z ADDRESS)

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	1	AC5	AC4	AC3	AC2	AC1	AC0

Z address (AC0-AC5) of the display data RAM is set in the display start line register and displayed

at the top of the screen. When the display duty cycle is 1/64 or others (1/32-1/64), the data of total

line number of LCD screen, from the line specified by display start line instruction, is displayed.

STATUS READ

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	1	BUSY	0	ON/OFF	RESET	0	0	0	0

‧BUSY

When BUSY is 1, the Chip is executing internal operation and no instructions are accepted.

When BUSY is 0, the Chip is ready to accept any instructions.

‧ON/OFF

When ON/OFF is 1, the display is OFF.

When ON/OFF is 0, the display is ON.

‧RESET

When RESET is 1, the system is being initialized.

In this condition, no instructions except status read can be accepted.

When RESET is 0, initializing has finished and the system is in usual operation condition.

WRITE DISPLAY DATA

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	0	D7	D6	D5	D4	D3	D2	D1	D0

Writes data (D0-D7) into the display data RAM. After writing instruction, Y address is increased by 1automatically.
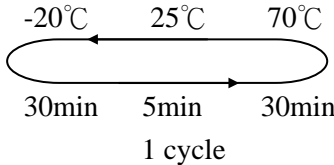
READ DISPLAY DATA

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	1	D7	D6	D5	D4	D3	D2	D1	D0

Reads data (D0-D7) from the display data RAM. After reading instruction, Y address is increased by 1 automatically.

13.RELIABILITY

Content of Reliability Test (wide temperature, -20℃~70℃)

Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 200hrs	2
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30℃ 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 200hrs	――
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60℃,90%RH max For 96hrs under no-load condition excluding the polarizer, Then taking it out and drying it at normal temperature.	60℃,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation 　-20℃　　25℃　　70℃ 　30min　5min　30min 1 cycle	-20℃/70℃ 10 cycles	――
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kΩ CS=100pF 1 time	――

Note1: No dew condensation to be observed.
Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.
Note3: Vibration test will be conducted to the product itself without putting it in a container.

14.Backlight Information

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	ILED	380	480	650	mA	V=4.2V
Supply Voltage	V	4.0	4.2	4.4	V	
Reverse Voltage	VR	—	—	8	V	
Luminous Intensity	IV	160	200	—	CD/M^2	ILED=480mA
Wave Length	λp	560	570	580	nm	ILED=480mA
Life Time		—	100000	—	Hr.	ILED≦480mA
Color	Yellow Green					
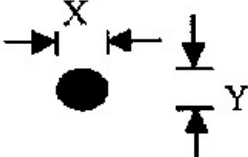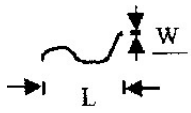
Note: The LED of B/L is drive by current only, drive voltage is for reference only.

drive voltage can make driving current under safety area (current between

minimum and maximum).
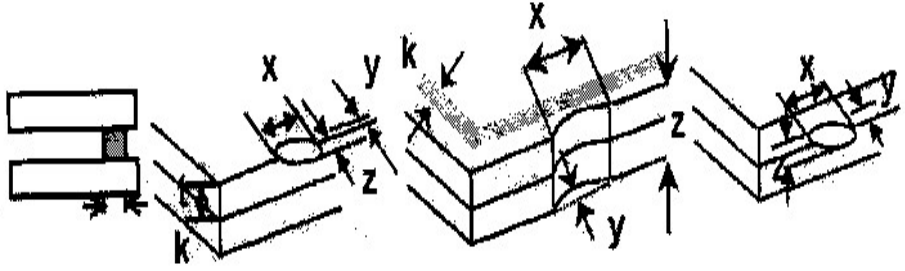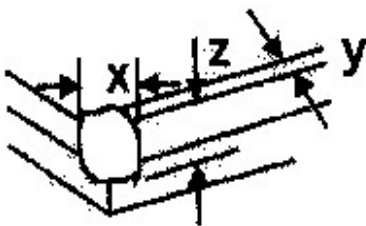
.Drive from pin19,pin20
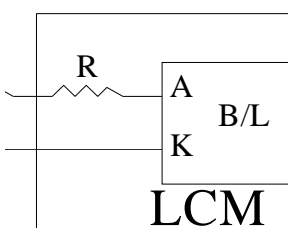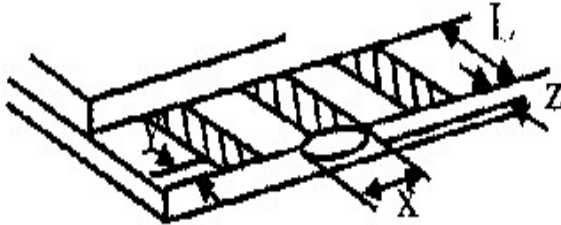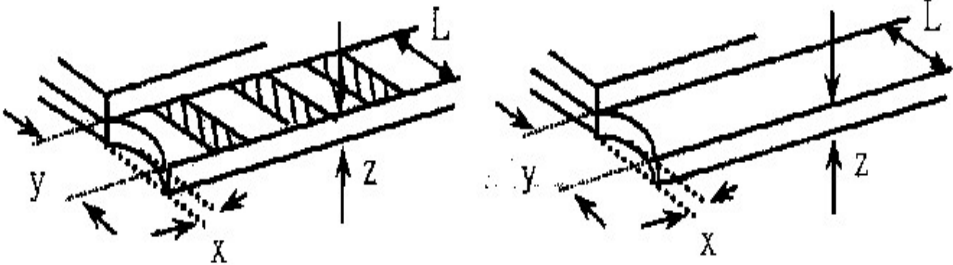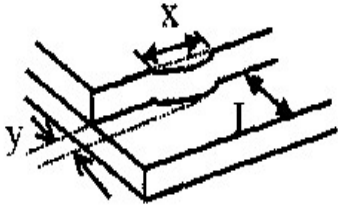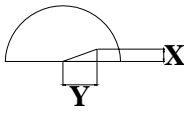
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15. Inspection specification

NO	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character , dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Contrast defect.	0.65
02	Black or white spots on LCD (display only)	2.1 White and black spots on display $\leqq$0.25mm, no more than three white or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm	2.5

NO	Item	Criterion			AQL
03	LCD black spots, white spots, contamination (non-display)	3.1 Round type : As following drawing $\Phi=(x + y) / 2$			2.5

3.1 Round type table:

SIZE	Acceptable Q TY
$\Phi\leqq0.10$	Accept no dense
$0.10<\Phi\leqq0.20$	2
$0.20<\Phi\leqq0.25$	1
$0.25<\Phi$	0

3.2 Line type : (As following drawing)

Length	Width	Acceptable Q TY
---	$W\leqq0.02$	Accept no dense
$L\leqq3.0$	$0.02<W\leqq0.03$	2
$L\leqq2.5$	$0.03<W\leqq0.05$	
---	$0.05<W$	As round type

AQL: 2.5

| 04 | Polarizer bubbles | If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction. | | | 2.5 |

Size Φ	Acceptable Q TY
$\Phi\leqq0.20$	Accept no dense
$0.20<\Phi\leqq0.50$	3
$0.50<\Phi\leqq1.00$	2
$1.00<\Phi$	0
Total Q TY	3

NO	Item	Criterion	AQL
05	Scratches	Follow NO.3 LCD black spots, white spots, contamination	
06	Chipped glass	Symbols Define: x: Chip length　　y: Chip width　　z: Chip thickness k: Seal width　　t: Glass thickness　a: LCD side length L: Electrode pad length: 6.1 General glass chip : 6.1.1 Chip on panel surface and crack between panels: | z: Chip thickness	y: Chip width	x: Chip length
---	---	---
Z≦1/2t	Not over viewing area	x≦1/8a
1/2t＜z≦2t	Not exceed 1/3k	x≦1/8a | ⊙If there are 2 or more chips, x is total length of each chip. 6.1.2 Corner crack: | z: Chip thickness	y: Chip width	x: Chip length
---	---	---
Z≦1/2t	Not over viewing area	x≦1/8a
1/2t＜z≦2t	Not exceed 1/3k	x≦1/8a | ⊙If there are 2 or more chips, x is the total length of each chip.	2.5

NO	Item	Criterion	AQL
06	Glass crack	Symbols : x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length 6.2 Protrusion over terminal : 6.2.1 Chip on electrode pad :	2.5

6.2.1 Chip on electrode pad :

y: Chip width	x: Chip length	z: Chip thickness
$y \leqq 0.5mm$	$x \leqq 1/8a$	$0 < z \leqq t$

6.2.2 Non-conductive portion:

y: Chip width	x: Chip length	z: Chip thickness
$y \leqq L$	$x \leqq 1/8a$	$0 < z \leqq t$

⊙If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.

⊙If the product will be heat sealed by the customer, the alignment mark not be damaged.

6.2.3 Substrate protuberance and internal crack.

y: width	x: length
$y \leqq 1/3L$	$x \leqq a$

NO	Item	Criterion	AQL
07	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
08	Backlight elements	8.1 Illumination source flickers when lit. 8.2 Spots or scratched that appear when lit must be judged. Using LCD spot, lines and contamination standards. 8.3 Backlight doesn't light or color wrong.	0.65 2.5 0.65
09	Bezel	9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 9.2 Bezel must comply with job specifications.	2.5 0.65
10	PCB、COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination. 10.2 COB seal surface may not have pinholes through to the IC. 10.3 The height of the COB should not exceed the height indicated in the assembly diagram. 10.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places. 10.5 No oxidation or contamination PCB terminals. 10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts. 10.7 The jumper on the PCB should conform to the product characteristic chart. 10.8 If solder gets on bezel tab pads, LED pad, zebra pad or screw hold pad, make sure it is smoothed down. 10.9 The Scraping testing standard for Copper Coating of PCB **X * Y<=2mm^2**	2.5 2.5 0.65 2.5 2.5 0.65 0.65 2.5 2.5
11	Soldering	11.1 No un-melted solder paste may be present on the PCB. 11.2 No cold solder joints, missing solder connections, oxidation or icicle. 11.3 No residue or solder balls on PCB. 11.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65

NO	Item	Criterion	AQL
12	General appearance	12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP.	2.5
		12.2 No cracks on interface pin (OLB) of TCP.	0.65
		12.3 No contamination, solder residue or solder balls on product.	2.5
		12.4 The IC on the TCP may not be damaged, circuits.	2.5
		12.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it cause the interface pin to sever.	2.5 2.5
		12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color.	2.5
		12.7 Sealant on top of the ITO circuit has not hardened.	0.65
		12.8 Pin type must match type in specification sheet.	0.65
		12.9 LCD pin loose or missing pins.	0.65
		12.10 Product packaging must the same as specified on packaging specification sheet.	0.65
		12.11 Product dimension and structure must conform to product specification sheet.	

winstar   **LCM Sample Estimate Feedback Sheet**

1、Panel Specification：

1.   Panel Type：   ☐ Pass   ☐ NG ,_____

2.   View Direction：   ☐ Pass   ☐ NG ,_____

3.   Numbers of Dots：   ☐ Pass   ☐ NG ,_____

4.   View Area：   ☐ Pass   ☐ NG ,_____

5.   Active Area：   ☐ Pass   ☐ NG ,_____

6.   Operating Temperature：   ☐ Pass   ☐ NG ,_____

7.   Storage Temperature：   ☐ Pass   ☐ NG ,_____

8.   Others：_____

2、Mechanical Specification：

1.   PCB Size：   ☐ Pass   ☐ NG ,_____

2.   Frame Size：   ☐ Pass   ☐ NG ,_____

3.   Materal of Frame：   ☐ Pass   ☐ NG ,_____

4.   Connector Position：   ☐ Pass   ☐ NG ,_____

5.   Fix Hole Position：   ☐ Pass   ☐ NG ,_____

6.   Backlight Position：   ☐ Pass   ☐ NG ,_____

7.   Thickness of PCB：   ☐ Pass   ☐ NG ,_____

8.   Height of Frame to PCB：   ☐ Pass   ☐ NG ,_____

9.   Height of Module：   ☐ Pass   ☐ NG ,_____

10.   Others：   ☐ Pass   ☐ NG ,_____

3、Relative Hole Size：

1.   Pitch of Connector：   ☐ Pass   ☐ NG ,_____

2.   Hole size of Connector：   ☐ Pass   ☐ NG ,_____

3.   Mounting Hole size：   ☐ Pass   ☐ NG ,_____

4.   Mounting Hole Type：   ☐ Pass   ☐ NG ,_____

5.   Others：   ☐ Pass   ☐ NG ,_____

4、Backlight Specification：

1.   B/L Type：   ☐ Pass   ☐ NG ,_____

2.   B/L Color：   ☐ Pass   ☐ NG ,_____

3.   B/L Driving Voltage (Reference for LED Type)：   ☐ Pass   ☐ NG ,_____

4.   B/L Driving Current：   ☐ Pass   ☐ NG ,_____

5.   Brightness of B/L：   ☐ Pass   ☐ NG ,_____

6.   B/L Solder Method：   ☐ Pass   ☐ NG ,_____

7.   Others：   ☐ Pass   ☐ NG ,_____

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5、**Electronic Characteristics of Module**：

1   Input Voltage：   ☐ Pass   ☐ NG , _____

2   Supply Current：   ☐ Pass   ☐ NG , _____

3   Driving Voltage for LCD：   ☐ Pass   ☐ NG , _____

4   Contrast for LCD：   ☐ Pass   ☐ NG , _____

5   B/L Driving Method：   ☐ Pass   ☐ NG , _____

6   Negative Voltage Output：   ☐ Pass   ☐ NG , _____

7   Interface Function：   ☐ Pass   ☐ NG , _____

8   LCD Uniformity：   ☐ Pass   ☐ NG , _____

9   ESD test：   ☐ Pass   ☐ NG , _____

10   Others：   ☐ Pass   ☐ NG , _____

6、**Summary**：

Sales signature： _____

Customer Signature： _____   **Date**： __/__/__