



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
No.163 Chung Ching RD.,
Taichune, Taiwan, R.O.C

WEB: <http://www.winstar.com.tw>
E-mail: winstar@winstar.com.tw
Tel:886-4-24262208 Fax : 886-4-24262207

SPECIFICATION

CUSTOMER : _____

MODULE NO.: WG12864B-YGH-V#N

<p style="text-align: center;">APPROVED BY:</p> <p>(FOR CUSTOMER USE ONLY)</p>	<p style="text-align: center;">PCB VERSION: DATA:</p>
-----------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------

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	2005.08.12		First issue

Contents

- 1.Module Classification Information
- 2.Precautions in use of LCD Modules
- 3.General Specification
- 4.Absolute Maximum Ratings
- 5.Electrical Characteristics
- 6.Optical Characteristics
- 7.Interface Description
- 8.Contour Drawing & Block Diagram
9. Timing Characteristics
- 10.Display Control Instruction
- 11.Detailed Explanation
- 12.Reliability
- 13.Backlight Information
- 14.Inspection specification
- 15.Material List of Components for RoHs

1.Module Classification Information

W G 1 2 8 6 4 B - Y G H - V#N
 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 no.

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

⑧ Special Code V : Build in Negative Voltage
 N : IC NT7107C,NT7108C
 # : Lead - Free

2. Precautions in use of LCD Modules

- (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	Dimension	Unit
Number of Characters	128 x 64 Dots	—
Module dimension	75.0 x 52.7 x 8.9(MAX)	mm
View area	60.0 x 32.6	mm
Active area	55.0 x 27.48	mm
Dot size	0.41 x 0.41	mm
Dot pitch	0.44 x 0.44	mm
LCD type	STN Positive, Gray, Transflective	
Duty	1/64	
View direction	6 o'clock	
Backlight Type	LED Yellow-Green	

4. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	—	+70	°C
Storage Temperature	T_{ST}	-30	—	+80	°C
Input Voltage	V_I	0	—	V_{DD}	V
Supply Voltage For Logic	V_{DD}	0	—	6.7	V
Supply Voltage For LCD	$V_{DD}-V_{LCD}$	0	—	16.7	V

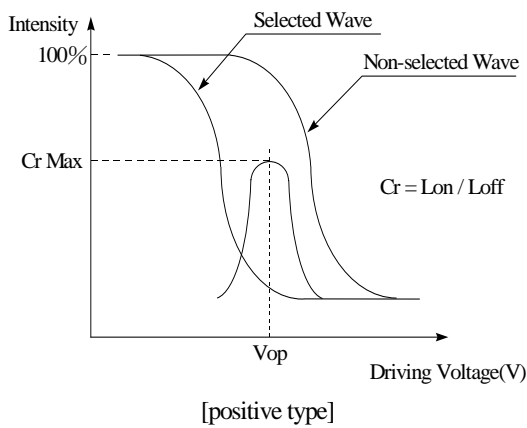
5. Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	$V_{DD}-V_{SS}$	—	4.5	5.0	5.5	V
Supply Voltage For LCD	$V_{DD}-V_0$	$T_a=-20^{\circ}\text{C}$	—	—	9.6	V
		$T_a=25^{\circ}\text{C}$	—	8.0	—	V
		$T_a=+70^{\circ}\text{C}$	7.6	—	—	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}	—	—	—	0.4	V
Supply Current	I_{DD}	—	2.0	2.5	4.0	mA

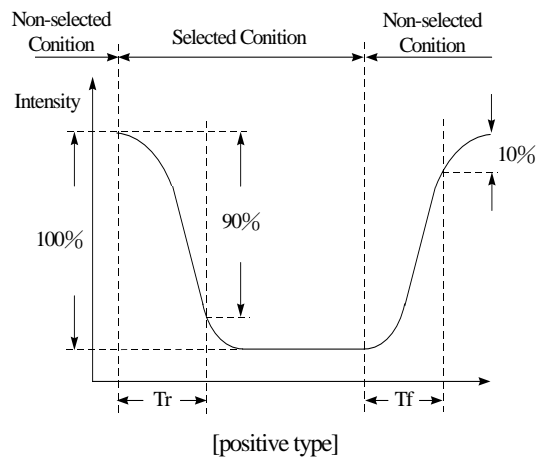
6. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V) θ	$CR \geq 2$	20	—	40	deg
	(H) φ	$CR \geq 2$	-30	—	30	deg
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	200	300	ms
	T fall	—	—	200	300	ms

Definition of Operation Voltage (Vop)



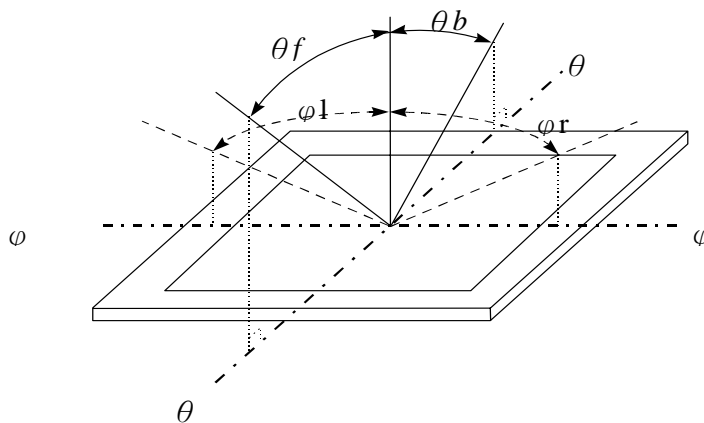
Definition of Response Time (Tr, Tf)



Conditions :

Operating Voltage : Vop Viewing Angle(θ , φ) : 0° , 0°
 Frame Frequency : 64 HZ Driving Waveform : 1/N duty , 1/a bias

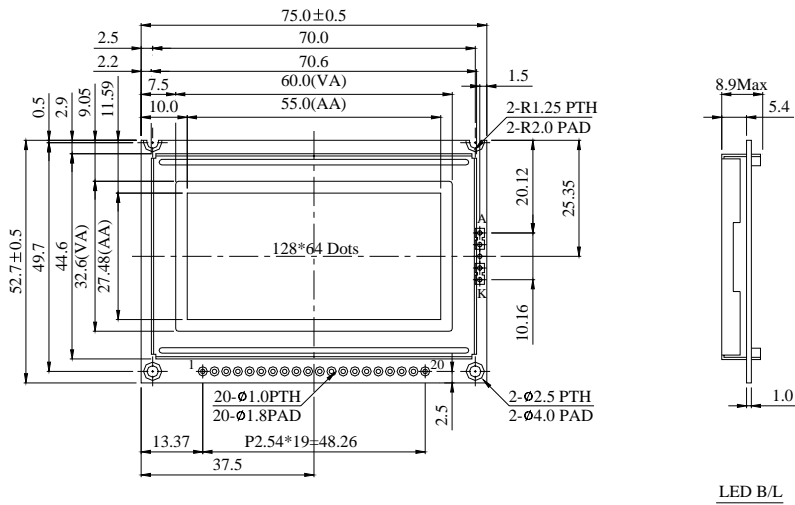
Definition of viewing angle($CR \geq 2$)



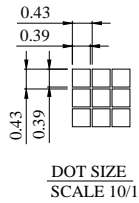
7. Interface Description

Pin No.	Symbol	Level	Description
1	VDD	5.0V	Supply Supply (+5V)
2	V _{SS}	0V	Power Supply (GND)
3	V _o	(Variable)	Contrast Adjustment
4	DB0	H/L	Data bus line
5	DB1	H/L	Data bus line
6	DB2	H/L	Data bus line
7	DB3	H/L	Data bus line
8	DB4	H/L	Data bus line
9	DB5	H/L	Data bus line
10	DB6	H/L	Data bus line
11	DB7	H/L	Data bus line
12	CS1	L	Chip select IC1
13	CS2	L	Chip select IC2
14	$\overline{\text{RST}}$	L	Reset signal
15	$\text{R}/\overline{\text{W}}$	H/L	Data read /write
16	D/I	H/L	Data/ Instruction
17	E	H	Enable signal
18	V _{ee}	—	Negative Voltage output
19	A	—	Power Supply for LED (+)
20	K	—	Power Supply for LED (-)

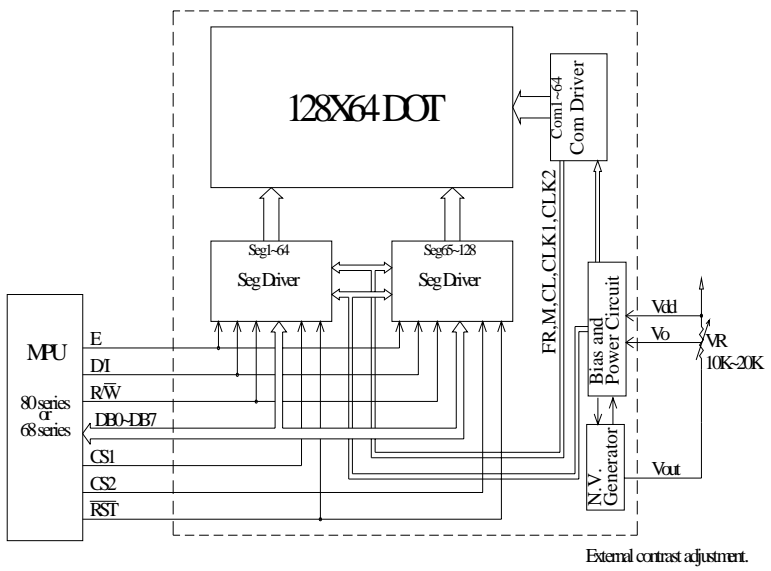
8. Contour Drawing & Block Diagram



PIN NO.	SYMBOL
1	Vdd
2	Vss
3	Vo
4	DB0
5	DB1
6	DB2
7	DB3
8	DB4
9	DB5
10	DB6
11	DB7
12	CS1
13	CS2
14	RST
15	R/W
16	D/I
17	E
18	Vee
19	A
20	K

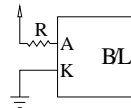


The non-specified tolerance of dimension is ±0.3 mm .

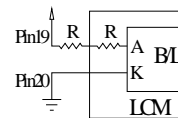


LEDB/L Drive Method

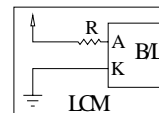
1. Drive from AK



2. Drive from pin19, pin20



3. Drive from Vdd/Vss



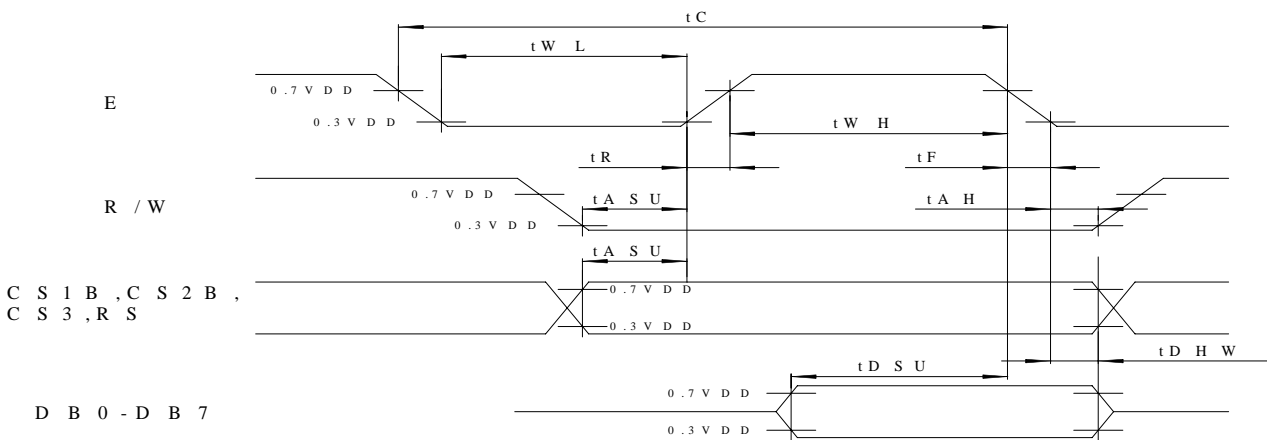
(Contrast performance may go down)

9. Timing Characteristics

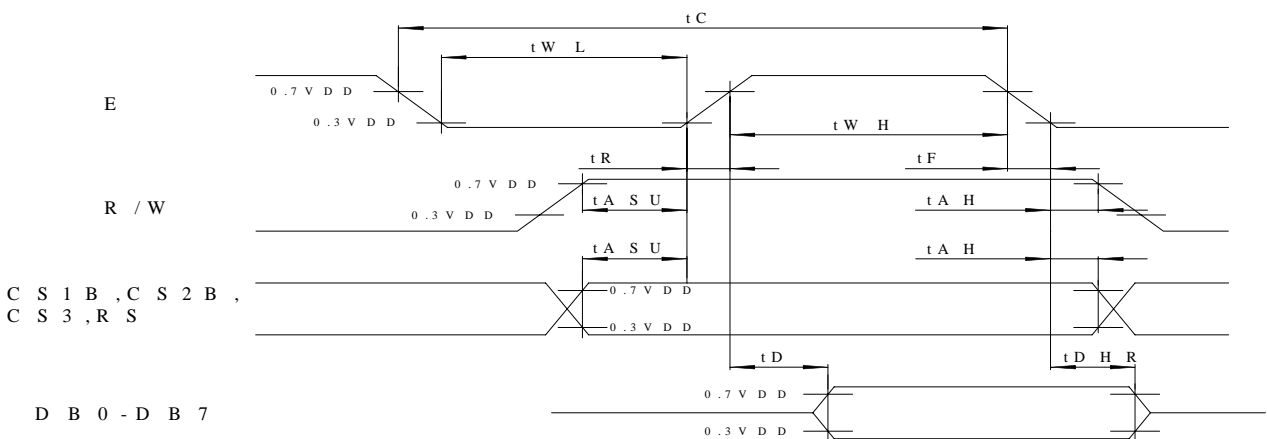
MPU Interface

(T=25°C, VDD=+5.0V±0.5)

Characteristic	Symbol	Min	Typ	Max	Unit
E cycle	t _{cy}	1000	—	—	ns
E high level width	t _{whE}	450	—	—	ns
E low level width	t _{wlE}	450	—	—	ns
E rise time	t _r	—	—	25	ns
E fall time	t _f	—	—	25	ns
Address set-up time	t _{as}	140	—	—	ns
Address hold time	t _{ah}	10	—	—	ns
Data set-up time	t _{dsw}	200	—	—	ns
Data delay time	t _{ddr}	—	—	320	ns
Data hold time (write)	t _{dhw}	10	—	—	ns
Data hold time (read)	t _{dhr}	20	—	—	ns



MPU Read Timing



MPU Write Timing

10. 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	D/I	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 are not affected. 0:OFF, 1:ON	
Set 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	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	B U S Y	L	ON/ OFF	R E S E T	L	L	L	L	Read status. BUSY 0:Ready 1:In operation ON/OFF 0:Display ON 1:Display OFF RESET 0:Normal 1:Reset	
Write Display Data	H	L	Display Data									Writes data (DB0:7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read Display Data	H	H	Display Data									Reads data (DB0:7) from display data RAM to the data bus.

11. Detailed Explanation

Display On/Off

R/W	D/I	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.

Display Start Line

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

Z address (AC0~AC5) (binary) of the display data RAM is set in the display start line register and displayed at the top of the screen. shows examples of display (1/64 duty cycle) when the start line = 0-3. When the display duty cycle is 1/64 or more (ex. 1/32, 1/24 etc.), the data of total line number of LCD screen, from the line specified by display start line instruction, is displayed

Set Page (X Address)

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

X address (AC0~AC2) (binary) of the display data RAM is set in the X address register. After that, writing or reading to or from MPU is executed in this specified page until the next page is set. See Figure 1.

Set Y Address

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

Y address (AC0~AC5) (binary) of the display data RAM is set in the Y address counter. After that, Y address counter is increased by 1 every time the data is written or read to or from MPU.

Status Read

R/W	D/I	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 LSI is executing internal operations. No instruction are accepted while busy is 1, so you should make sure that busy is 0 before writing the next instruction.

ON/OFF

Shows the liquid crystal display condition: on condition or off condition.

When on/off is 1, the display is in off condition.

When on/off is 0, the display is in on condition

RESET

RESET = 1 shows that the system is being initialized. In this condition, no instructions except status read can be accepted.

RESET = 0 shows that initializing has system is in the usual operation condition.

Write Display Data

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

Writes 8-bit data (D0~D7) (binary) into the display data RAM. The Y address is increased by 1 automatically.

Read Display Data

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

Reads out 8-bit data (D0~D7) (binary) from the display data RAM. Then Y address is increased by 1 automatically.

One dummy read is necessary right after the address setting. For details, refer to the explanation of output register in “Function of Each Block”.

12. Reliability

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

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°C 200hrs	2
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30°C 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°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C, 90%RH max For 96hrs under no-load condition excluding the polarizer, Then taking it out and drying it at normal temperature.	60°C, 90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation <div style="text-align: center;"> <p style="margin: 0;">-20°C 25°C 70°C</p> <p style="margin: 0;">30min 5min 30min</p> <p style="margin: 0;">1 cycle</p> </div>	-20°C/70°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 15mm 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.

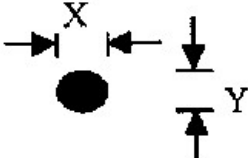
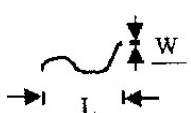
13. Backlight Information

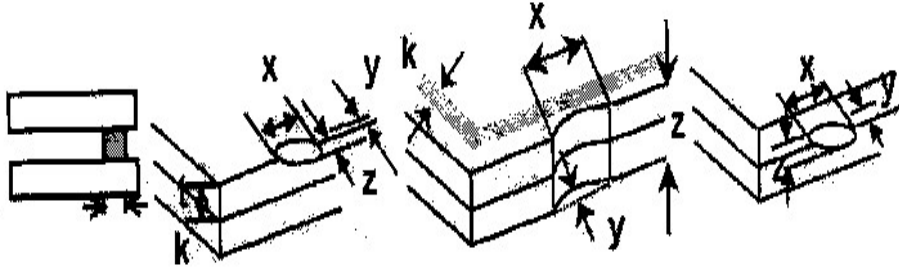
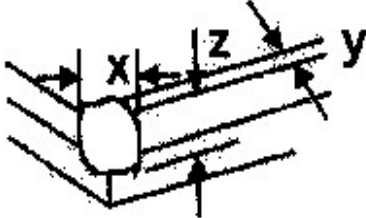
Specification

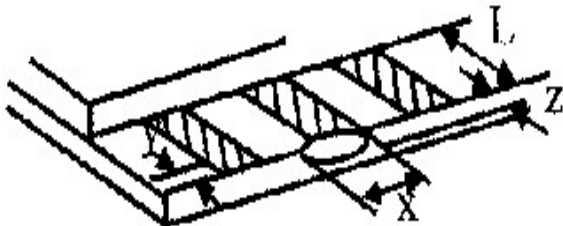
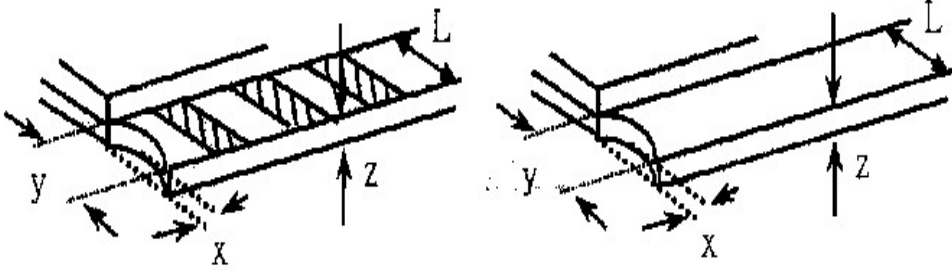
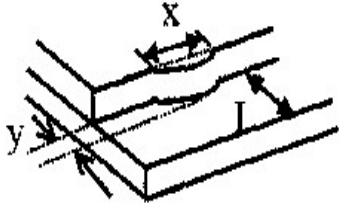
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	I _{LED}	80	100	150	mA	V=4.2V
Supply Voltage	V	4.0	4.2	4.4	V	—
Reverse Voltage	V _R	—	—	8	V	—
Luminous Intensity	I _V	14	18	—	cd/m ²	I _{LED} =100mA
Wave Length	λ _p	560	570	580	nm	I _{LED} =100mA
Life Time	—	—	50K	—	Hr.	I _{LED} ≤ 100mA
Color	Yellow Green					

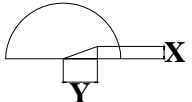
Note: The LED of B/L is drive by current only, drive voltage is for reference only. drive voltage can make driving current under safety area (current between minimum and maximum).

14. 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 $\leq 0.25\text{mm}$, no more than three white or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm	2.5													
03	LCD black spots, white spots, contamination (non-display)	3.1 Round type : As following drawing $\Phi = (x + y) / 2$  <table border="1" data-bbox="858 1097 1337 1344"> <thead> <tr> <th>SIZE</th> <th>Acceptable Q TY</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.10$</td> <td>Accept no dense</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.20$</td> <td>2</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.25$</td> <td>1</td> </tr> <tr> <td>$0.25 < \Phi$</td> <td>0</td> </tr> </tbody> </table>	SIZE	Acceptable Q TY	$\Phi \leq 0.10$	Accept no dense	$0.10 < \Phi \leq 0.20$	2	$0.20 < \Phi \leq 0.25$	1	$0.25 < \Phi$	0	2.5			
		SIZE	Acceptable Q TY													
$\Phi \leq 0.10$	Accept no dense															
$0.10 < \Phi \leq 0.20$	2															
$0.20 < \Phi \leq 0.25$	1															
$0.25 < \Phi$	0															
3.2 Line type : (As following drawing)  <table border="1" data-bbox="694 1406 1337 1653"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable Q TY</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.02$</td> <td>Accept no dense</td> </tr> <tr> <td>$L \leq 3.0$</td> <td>$0.02 < W \leq 0.03$</td> <td rowspan="2">2</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.03 < W \leq 0.05$</td> </tr> <tr> <td>---</td> <td>$0.05 < W$</td> <td>As round type</td> </tr> </tbody> </table>	Length	Width	Acceptable Q TY	---	$W \leq 0.02$	Accept no dense	$L \leq 3.0$	$0.02 < W \leq 0.03$	2	$L \leq 2.5$	$0.03 < W \leq 0.05$	---	$0.05 < W$	As round type	2.5	
Length	Width	Acceptable Q TY														
---	$W \leq 0.02$	Accept no dense														
$L \leq 3.0$	$0.02 < W \leq 0.03$	2														
$L \leq 2.5$	$0.03 < W \leq 0.05$															
---	$0.05 < W$	As round type														
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.	<table border="1" data-bbox="826 1729 1337 2024"> <thead> <tr> <th>Size Φ</th> <th>Acceptable Q TY</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.20$</td> <td>Accept no dense</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.50$</td> <td>3</td> </tr> <tr> <td>$0.50 < \Phi \leq 1.00$</td> <td>2</td> </tr> <tr> <td>$1.00 < \Phi$</td> <td>0</td> </tr> <tr> <td>Total Q TY</td> <td>3</td> </tr> </tbody> </table>	Size Φ	Acceptable Q TY	$\Phi \leq 0.20$	Accept no dense	$0.20 < \Phi \leq 0.50$	3	$0.50 < \Phi \leq 1.00$	2	$1.00 < \Phi$	0	Total Q TY	3	2.5
Size Φ	Acceptable Q TY															
$\Phi \leq 0.20$	Accept no dense															
$0.20 < \Phi \leq 0.50$	3															
$0.50 < \Phi \leq 1.00$	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	<p>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:</p> <p>6.1 General glass chip : 6.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="427 929 1337 1077"> <tr> <td>z: Chip thickness</td> <td>y: Chip width</td> <td>x: Chip length</td> </tr> <tr> <td>$Z \leq 1/2t$</td> <td>Not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> <tr> <td>$1/2t < z \leq 2t$</td> <td>Not exceed 1/3k</td> <td>$x \leq 1/8a$</td> </tr> </table> <p>⊙ If there are 2 or more chips, x is total length of each chip.</p> <p>6.1.2 Corner crack:</p>  <table border="1" data-bbox="427 1512 1337 1659"> <tr> <td>z: Chip thickness</td> <td>y: Chip width</td> <td>x: Chip length</td> </tr> <tr> <td>$Z \leq 1/2t$</td> <td>Not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> <tr> <td>$1/2t < z \leq 2t$</td> <td>Not exceed 1/3k</td> <td>$x \leq 1/8a$</td> </tr> </table> <p>⊙ If there are 2 or more chips, x is the total length of each chip.</p>	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$	2.5
z: Chip thickness	y: Chip width	x: Chip length																			
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$																			
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$																			
z: Chip thickness	y: Chip width	x: Chip length																			
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$																			
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$																			

NO	Item	Criterion	AQL						
06	Glass crack	<p>Symbols :</p> <p>x: Chip length y: Chip width z: Chip thickness</p> <p>k: Seal width t: Glass thickness a: LCD side length</p> <p>L: Electrode pad length</p> <p>6.2 Protrusion over terminal :</p> <p>6.2.1 Chip on electrode pad :</p>  <table border="1" data-bbox="338 833 1248 931"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td>$y \leq 0.5\text{mm}$</td> <td>$x \leq 1/8a$</td> <td>$0 < z \leq t$</td> </tr> </table>	y: Chip width	x: Chip length	z: Chip thickness	$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$	2.5
		y: Chip width	x: Chip length	z: Chip thickness					
		$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$					
		<p>6.2.2 Non-conductive portion:</p>  <table border="1" data-bbox="408 1317 1248 1415"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td>$y \leq L$</td> <td>$x \leq 1/8a$</td> <td>$0 < z \leq t$</td> </tr> </table>	y: Chip width	x: Chip length	z: Chip thickness	$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$	
y: Chip width	x: Chip length	z: Chip thickness							
$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$							
<p>⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.</p> <p>⊙ If the product will be heat sealed by the customer, the alignment mark not be damaged.</p>									
<p>6.2.3 Substrate protuberance and internal crack.</p>  <table border="1" data-bbox="746 1671 1254 1769"> <tr> <td>y: width</td> <td>x: length</td> </tr> <tr> <td>$y \leq 1/3L$</td> <td>$x \leq a$</td> </tr> </table>	y: width	x: length	$y \leq 1/3L$	$x \leq a$					
y: width	x: length								
$y \leq 1/3L$	$x \leq a$								

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  $X * Y \leq 2\text{mm}^2$	2.5 2.5 0.65 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
		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.	2.5
		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.	0.65

15. Material List of Components for RoHs

15.1 Process for WEEE and Rohs requirement

- (1) We are now in the process of evaluating/convertng to lead-free components/products.
- (2) We use **Sn/Ag/Cu** soldering surface. The surface of pb-free solder is more **rough** than we used before.
- (3) Heat-resistance temp.:
Reflow : 250°C,30 seconds Max.;
Connector soldering wave or hand soldering: 320°C, 10 seconds max.
- (4) Temp. curve of reflow, max. Temp.: 235±5°C;
Recommended customer's soldering temp. of connector: 280°C, 3 seconds.
- (5) The LCD controller T6963c is not available now, Toshiba lead –free version will be in mass production in August.
- (6) How to differentiate pb-free LCM from 2005/Apr to 2005/June, we will add a symbol “#” at the end of module's part number. The symbol “#” will be removed from 2005/7/1.

15.2 Consisting material of LCM

Please refer to the summarization and supplement of test report as follows:

- PAGE 1/2: Item 1 ~ 12 are Common parts list of current LCM, basically used in standard reflective LCM products.
- PAGE 2/2: Item 13 ~ 23 are optional parts list according to customer's requirement, ex.: backlight components such as CCFL B\L , LED B\L, EL ..., ect., or cable connector. Please present this list to customer if these materials are used.
- Each test report is provided by notarization organization, authorized by material suppliers; the none-verified components had sent to notarization organization by Winstar. Quality and manufacturing process of all materials will be kept improving to achieve the requirement of decreasing/totally prohibiting the usage of toxic chemical substances.

LCM COMMON PARTS LIST							
NO.	Material Item	Pb	Cd	Hg	Cr(6+)	PBDEs & PBBs	Controlled Material
1	PCB-FR4	N.D.	N.D.	N.D.	N.D.	N.D.<0.0005%	F<50.0ppm CL <1386.ppm Br<50.0ppm I<50.0abbr
2	PCB-GREEN Ink	N.D.	N.D.	N.D.	N.D.	—	Sb<5.0ppm As<10.0ppm Ba<10.0ppm Se<5.0ppm
3	PCB-Plate	N.D.	N.D.	N.D.	N.D.	—	As<12.9ppm Ba<14.5ppm Sb<5.0ppm Se<2.0ppm
4	Bezel Frame	77.3ppm	N.D.	N.D.	N.D.	—	
5	Plastic Frame	24.0ppm	4.8ppm	N.D.	N.D.	N.D.	
6	LCD-Glass	N.D.	N.D.	N.D.	N.D.	N.D.	
7	LCD-Polizer	N.D.	N.D.	N.D.	N.D.	N.D.	
8	Zebra Connector	N.D.	N.D.	N.D.	N.D.	N.D.	
9	Assembly Tape	N.D.	N.D.	N.D.	N.D.	N.D.	
10	Assembly Type Mylar	N.D.	N.D.	N.D.	N.D.	N.D.	
11	Solder Paste	66.7ppm	ND	N.D.	N.D.	—	
12	Packing	ND<90.0ppm	ND<75.0ppm	ND<60.0ppm	ND<60.0ppm	—	Sb<60ppm As<25ppm Ba<1000ppm Se<500ppm

Note: 1. N.D. for Pb , Cd , Hg and Cr means under 2.0ppm.

2. N.D. for PBDEs and PBBs means under 0.0005%.

Page 1/2

LCM COMMON PARTS LIST							
NO.	Material Item	Pb	Cd	Hg	Cr(6+)	PBDEs & PBBs	Controlled Material
13	CCFL-Tube (with inside material)	131ppm	N.D.	3069ppm	N.D.	ND<0.0005%	PBDE N.D. PBB N.D.
14	CCFL-Wire	256ppm	N.D.	N.D.	N.D.	N.D.	
15	CCFL B/L- Diffusion sheet	N.D.	N.D.	N.D.	N.D.	N.D.	As<0.001 Cr<0.012 Cu<0.02 Se<0.006
16	CCFL B/L-Light Guid	N.D.	N.D.	N.D.	N.D.	N.D.	
17	CCFL Tube Cover	N.D.	N.D.	N.D.	N.D.	N.D.	
18	LED B/L- Diffusion sheet	N.D.	N.D.	N.D.	N.D.	N.D.	As<2.0ppm Cr<0.007 Cu<0.31 Se<0.003
19	LED B/L-Light Guide	N.D.	N.D.	N.D.	N.D.	N.D.	
20	LED Lamp	149ppm	N.D.	N.D.	N.D.	N.D.	
21	LED B/L Reflector	N.D.	N.D.	N.D.	N.D.	N.D.	
22	EL B/L	N.D.	N.D.	N.D.	N.D.	N.D.	
23	FFC Cable Wire	N.D.	N.D.	N.D.	N.D.	—	

Note: 1. N.D. for Pb , Cd , Hg and Cr means under 2.0ppm.

2. N.D. for PBDEs and PBBs means under 0.0005%.

Page 2/2



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. Material 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 , _____

>> **Go to page 2** <<

Module Number : _____

Page: 2

5、Electronic Characteristics of Module :

- | | | |
|------------------------------|-------------------------------|-------------------------------------|
| 1. Input Voltage : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. Supply Current : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. Driving Voltage for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4. Contrast for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. B/L Driving Method : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6. Negative Voltage Output : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7. Interface Function : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 8. LCD Uniformity : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 9. ESD test : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 10. Others : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |

6、Summary :

Sales signature : _____

Customer Signature : _____

Date : / / _____