Winstar Display Co., LTD
華凌光電股份有限公司

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SPECIFICATION

CUSTOMER ： _____

MODULE NO.: WG320240C0-TMI-VZ#

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

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

VERSION	DATE	REVISED PAGE NO.	SUMMARY
C	2011/11/16	10	Remove the VOP adjust circuit of outer.

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MODLE NO：

DOC. FIRST ISSUE

RECORDS OF REVISION

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2006/8/9		First issue
A	2008.08.14	14	Modify Backlight information
B	2008.10.31	14	Modify Backlight information
C	2011/11/16	10	Remove the VOP adjust circuit of outer.

Contents

1.Module Classification Information

WG 320240 C0－ TMI － VZ#

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：320 * 240 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	T→LED,White

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 Polarize Type/ Temperature range/ View direction

A→Reflective, N.T, 6:00	H→Transflective, W.T,6:00
D→Reflective, N.T, 12:00	K→Transflective,W.T,12:00
G→Reflective, W. T, 6:00	C→Transmissive, N.T,6:00
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 : Negative Voltage ; Controller: RA8835 for 68K MPU Interface

Z : ICNT7086

#:Fit in with the ROHS Directions and regulations

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.

(8) Winstar have the right to change the passive components, including R3,R6 & backlight adjust resistors. (Resistors,capacitors and other passive components will have different appearance and color caused by the different supplier.)

(9)Winstar have the right to change the PCB Rev. (In order to satisfy the supplying stability, management optimization and the best product performance...etc, under the premise of not affecting the electrical characteristics and external dimensions, Winstar have the right to modify the version.)

3.General Specification

ITEM	STANDARD VALUE	UNIT
Number of dots	320x240	dots
Outline dimension	148.02(W)x 120.24(H)x 15.6max(T)	mm
View area	120.14(W)x 92.14(H)	mm
Active area	115.18(W)x 86.38(H)	mm
Dot size	0.34(W)x 0.34(H)	mm
Dot pitch	0.36(W)x 0.36(H)	mm
LCD type	STN ,Negative , Blue, Transmissive (In LCD production, It will occur slightly color difference. We can only guarantee the same color in the same batch.)	
View direction	6 o'clock	
Backlight	LED , White	

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_{EE}	0	—	32	V

5.Electrical Characteristics

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Voltage	V_{DD}-V_{SS}	—	4.5	5.0	5.5	V
Supply Voltage For LCD *Note	V_{DD}-V_O	Ta=-20℃	—	—	26.2	V
		Ta=25℃	—	24.0	—	V
		Ta=+70℃	22.1	—	—	V
Input High Volt.	V_{IH}	—	0.5V_{DD}	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	Vss	—	0.2V_{DD}	V
Output High Volt.	V_{OH}	—	2.4	—	—	V
Output Low Volt.	V_{OL}	—	—	—	0.4	V
Supply Current	I_{DD}	VDD=5.0V	90.0	100.0	105.0	mA

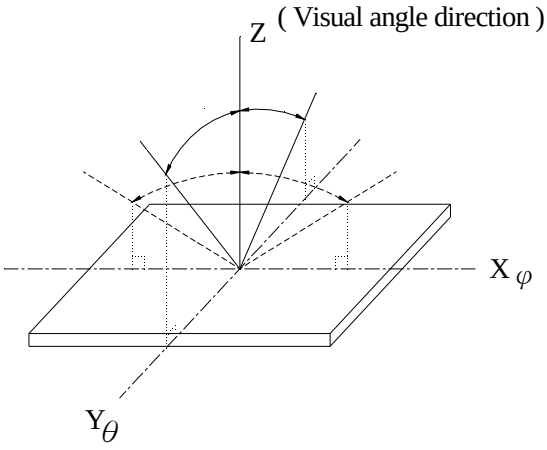
*Note: Please design the VOP adjustment circuit on customer's main board

6.Optical Characteristics

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

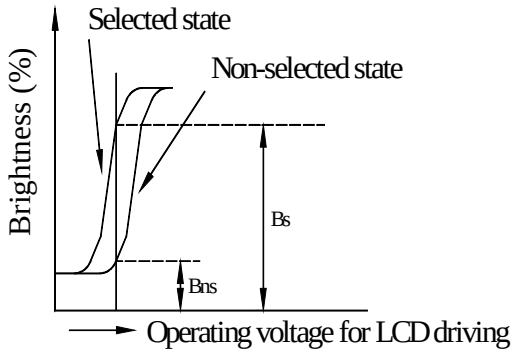
6.1 Definitions

■View Angles

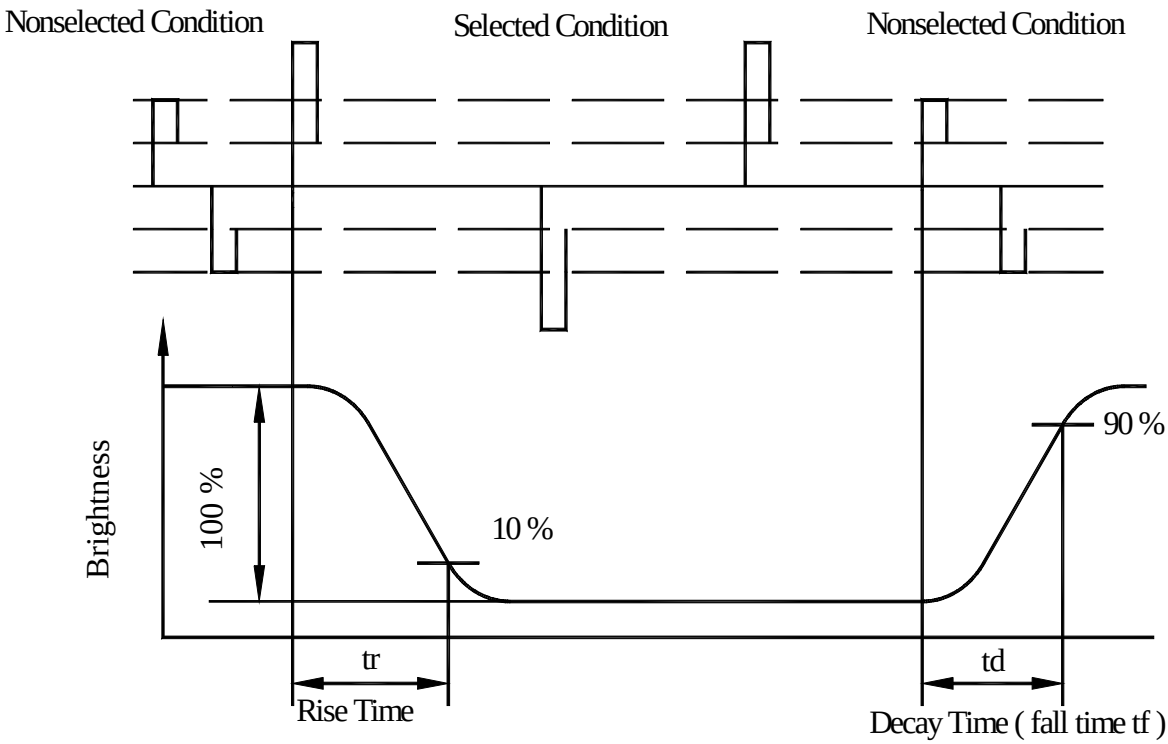


■Contrast Ratio

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



■Response time

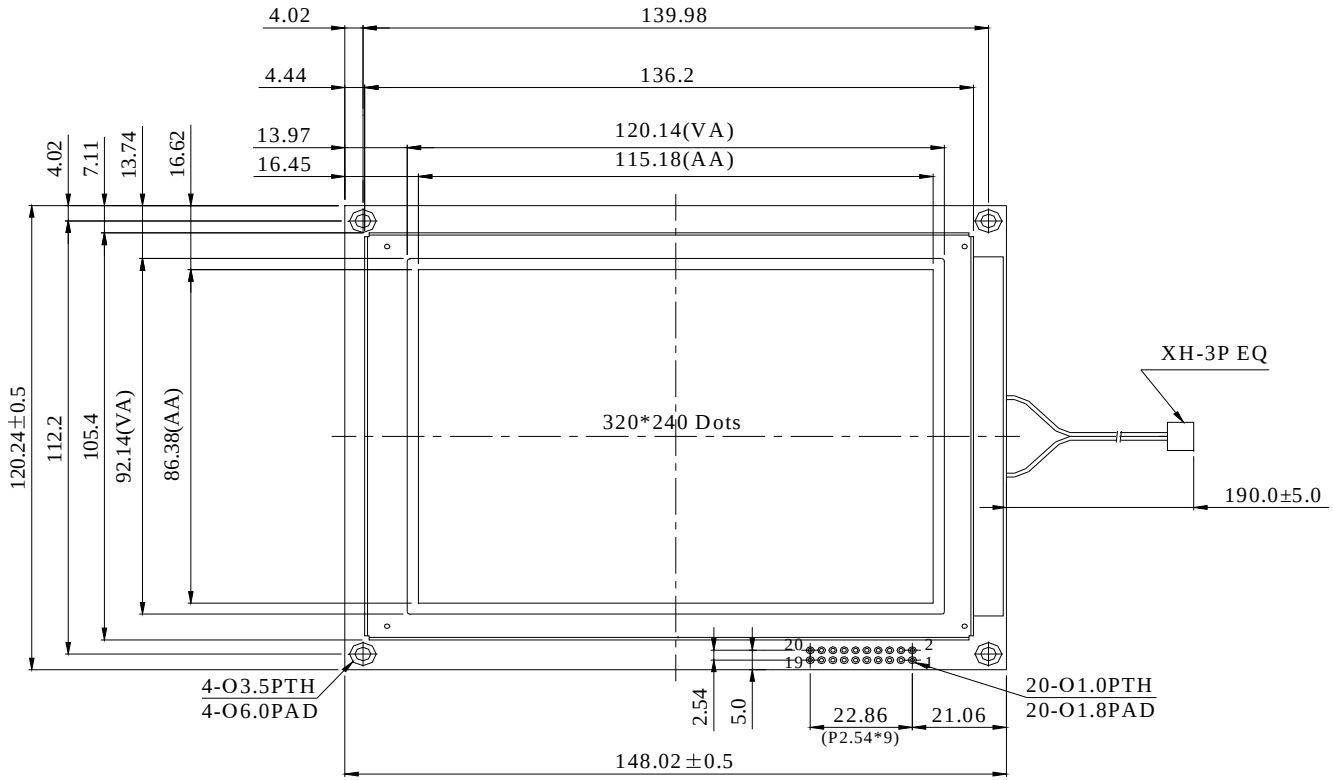


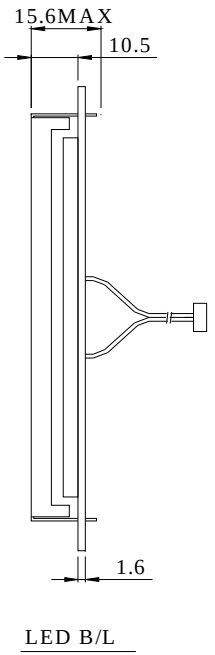
7.Interface Description

JM (right) short , for 6800 MPU family

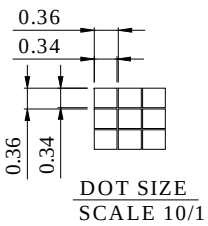
Pin No.	Symbol	Level	Description
1	V_{SS}	0V	GND
2	V_{DD}	5.0V	Power supply for Logic
3	V_O	(Variable)	Driving voltage for LCD
4	$\overline{RD}$	H/L	8088 family**:** Read signal,6800 family **:**Enable Clock
5	R/W	H/L	8088 family**:** Write signal,6800 family **:**R/Wsignal
6	A0		RD =L,WR=H A0=L: Data Read A0=H: Status read RD =H,WR=L A0=L: Data Write A0=H: Command write For80 Family
			RD =L,WR=H A0=L: Command write A0=H: Data read RD =H,WR=L A0=L: Status read A0=H: Data write For68 Family
7~14	DB0~DB7	H/L	Data bus line
15	$\overline{CS}$	H/L	Chip select ,Active L
16	$\overline{RES}$	H/L	Controller reset signal, Active L
17	V_{ee}		Negative voltage output (Optional)
18	FGND		Frame Ground
19	NC		No connection
20	NC		No connection

8.Contour Drawing & Block diagram

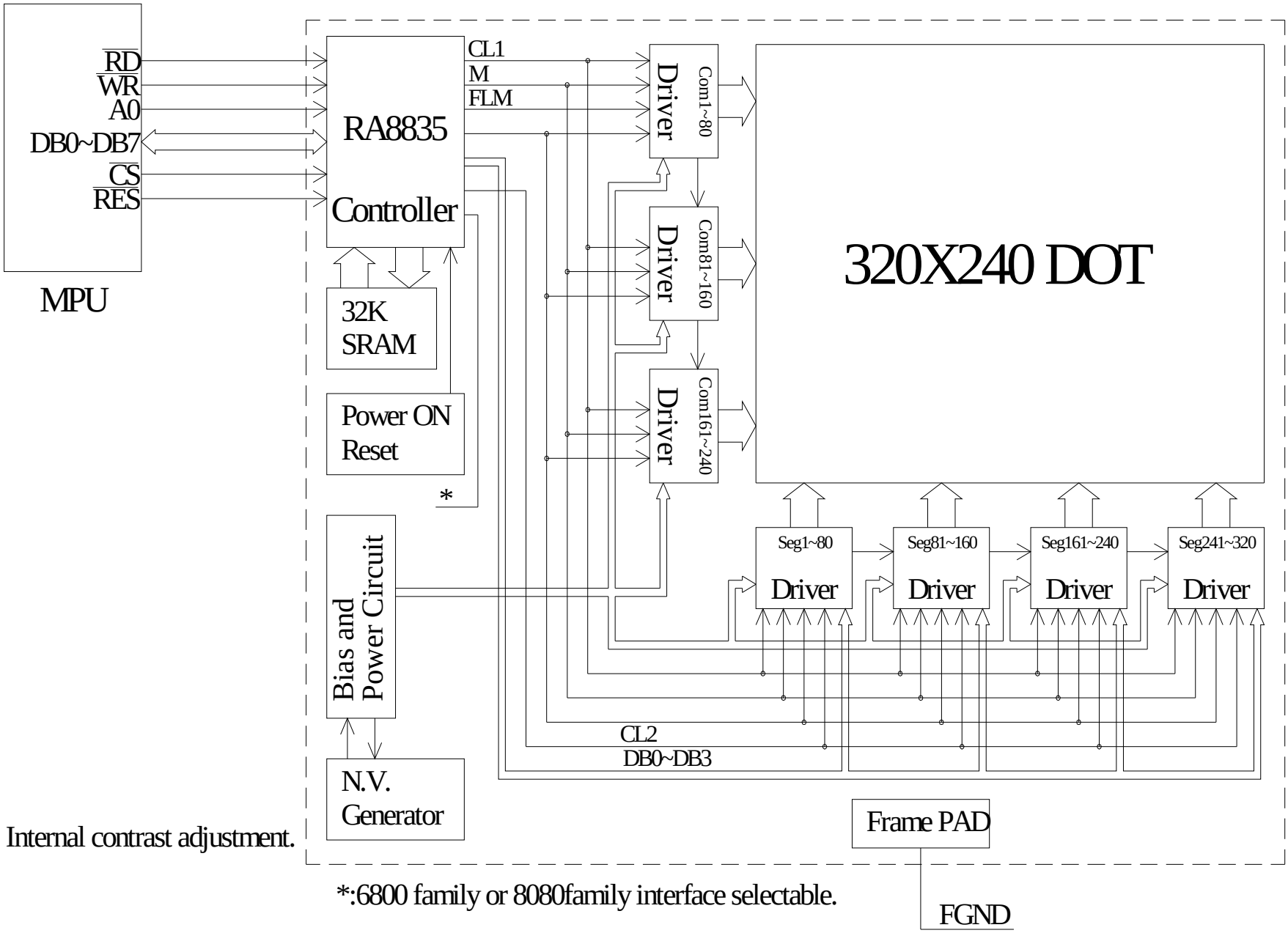




PIN NO.	SYMBOL
1	Vss
2	Vdd
3	Vo
4	$\overline{RD}$
5	$\overline{WR}$
6	A0
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	$\overline{CS}$
16	$\overline{RES}$
17	Vee
18	FGND
19	NC
20	NC



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


MPU
RD
WR
A0
DB0~DB7
CS
RES
RA8835
Controller
CL1
M
FLM
32K
SRAM
Power ON
Reset
*
Bias and
Power Circuit
N.V.
Generator
Internal contrast adjustment.
Driver
Com1~80
Com81~160
Com161~240
320X240 DOT
Seg1~80
Seg81~160
Seg161~240
Seg241~320
CL2
DB0~DB3
Frame PAD
FGND
*:6800 family or 8080family interface selectable.

9. Fuction Description

The RA8835 series is controller IC that can display text and graphics on LCD panel. The RA8835 series can display layered text and graphics , scroll the display in any direction and partition the display into multiple screens. The RA8835 series stores text, character codes and bitmapped graphics data in external frame buffer memory. Display controller functions include transferring data from controlling microprocessor to the buffer memory ,reading memory data ,converting data to display pixels and generating timing signals for the buffer memory, LCD panel. The RA8835 series has internal character generator with 160, 5*7 pixel characters in internal mask ROM . The character generators support up to 64,8*16 pixel characters in external characters in external character generator RAM and up to 256,8*16 pixel characters in external character generator ROM .

The Command Set

Table 1. Command set

Class	Command	Code											Hex	Command Description	Command Read Parameters	
		$\overline{RD}$	$\overline{WR}$	A0	D7	D6	D5	D4	D3	D2	D1	D0			No. of Bytes	Section
System control	SYSTEM SET	1	0	1	0	1	0	0	0	0	0	0	40	Initialize device and display	8	8.2.1
	SLEEP IN	1	0	1	0	1	0	1	0	0	1	1	53	Enter standby mode	0	8.2.2
Display control	DISP ON/OFF	1	0	1	0	1	0	1	1	0	0	D	58, 59	Enable and disable display and display flashing	1	8.3.1
	SCROLL	1	0	1	0	1	0	0	0	1	0	0	44	Set display start address and display regions	10	8.3.2
	CSRFORM	1	0	1	0	1	0	1	1	1	0	1	5D	Set cursor type	2	8.3.3
	CGRAM ADR	1	0	1	0	1	0	1	1	1	0	0	5C	Set start address of character generator RAM	2	8.3.6
	CSRDIR	1	0	1	0	1	0	0	1	1	CD 1	CD 0	4C to 4F	Set direction of cursor movement	0	8.3.4
	HDOT SCR	1	0	1	0	1	0	1	1	0	1	0	5A	Set horizontal scroll position	1	8.3.7
	OVLAY	1	0	1	0	1	0	1	1	0	1	1	5B	Set display overlay format	1	8.3.5
Drawing control	CSRW	1	0	1	0	1	0	0	0	1	1	0	46	Set cursor address	2	8.4.1
	CSRR	1	0	1	0	1	0	0	0	1	1	1	47	Read cursor address	2	8.4.2
Memory control	MWRITE	1	0	1	0	1	0	0	0	0	1	0	42	Write to display memory	—	8.5.1
	MREAD	1	0	1	0	1	0	0	0	0	1	1	43	Read from display memory	—	8.5.2

Notes:

1. In general, the internal registers of the RA8835 series are modified as each command parameter is input. However, the microprocessor does not have to set all the parameters of a command and may send a new command before all parameters have been input. The internal registers for the parameters that have been input will have been changed but the remaining parameter registers are unchanged.

   2-byte parameters (where two bytes are treated as 1 data item) are handled as follows:

   a. CSRW, CSRR: Each byte is processed individually. The microprocessor may read or write just the low byte of the cursor address.

   b. SYSTEM SET, SCROLL, CGRAM ADR: Both parameter bytes are processed together. If the command is changed after half of the parameter has been input, the single byte is ignored.

2. APL and APH are 2-byte parameters, but are treated as two 1-byte parameters.

SYSTEM SET

Initializes the device, sets the window sizes, and selects the LCD interface format. Since this command sets the basic operating parameters of the RA8835 i series, an incorrect SYSTEM SET command may cause other commands to operate incorrectly.

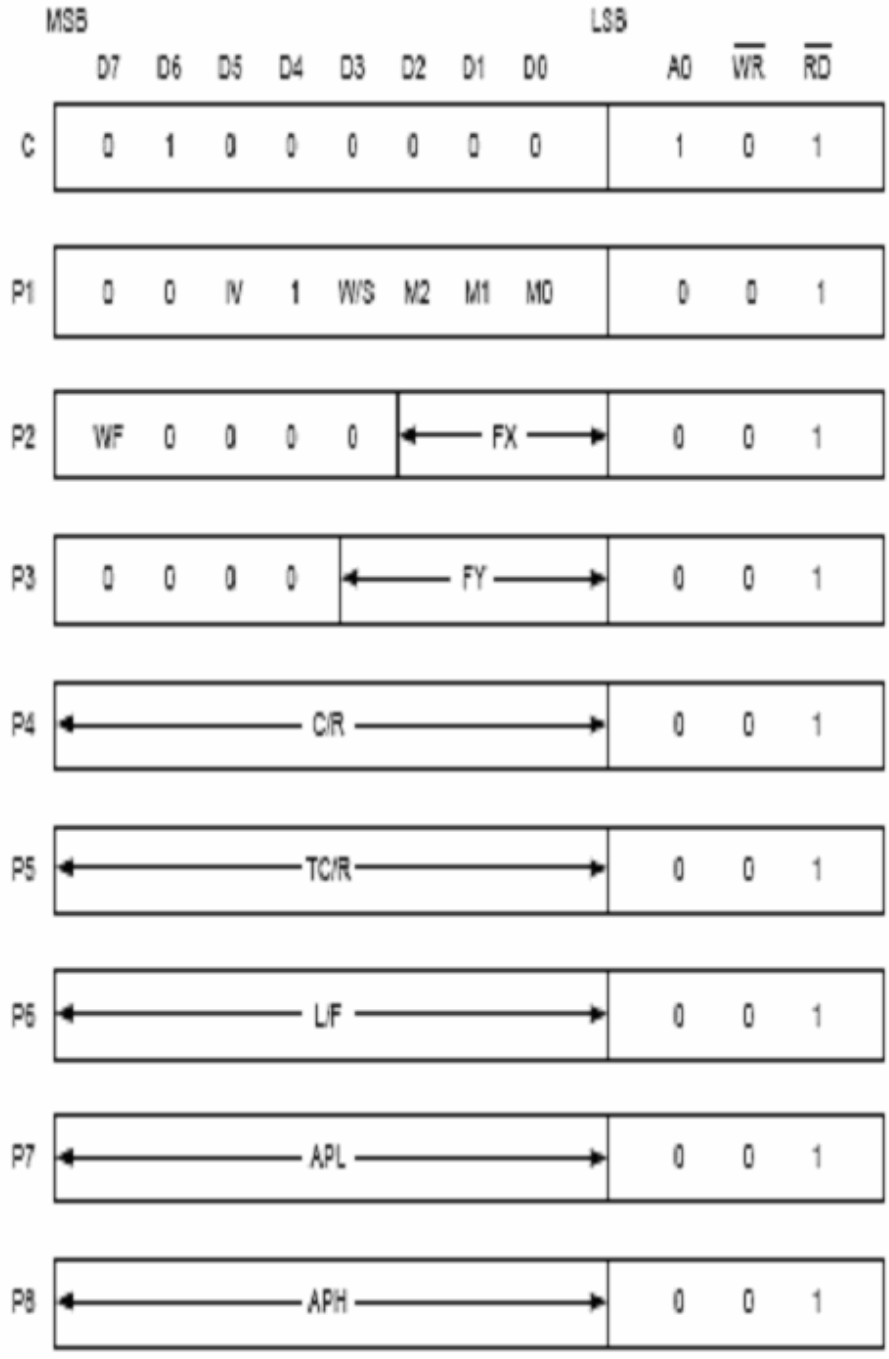
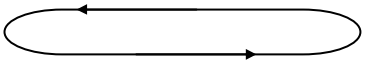


Figure 1. SYSTEM SET instruction

10.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=1.5k 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.

11. Backlight Information

Specification

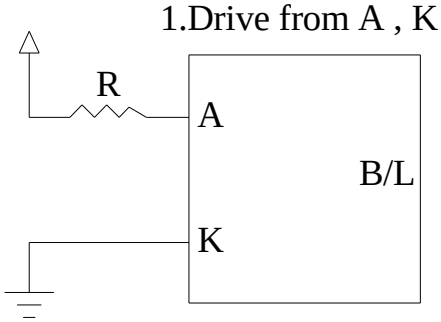
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	ILED	115.2	128	200	mA	V=3.5V
Supply Voltage	V	3.4	3.5	3.6	V	—
Reverse Voltage	VR	—	—	5	V	—
Luminous Intensity	IV	260	280	—	CD/M^2	ILED=128mA
LED Life Time (For Reference only)	—	—	50K	—	Hr.	ILED=128mA 25℃,50-60%RH, (Note 1)
Color	white					

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).

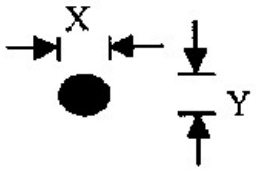
Note1 :50K hours is only an estimate for reference.

LED B\L Drive Method

1.Drive from A , K



12. Inspection specification

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>01</td><td>Electrical Testing</td><td>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.</td><td>0.65</td></tr>
<tr><td>02</td><td>Black or white spots on LCD (display only)</td><td>2.1 White and black spots on display 0.25mm, no more than three white or black spots present.
2.2 Densely spaced: No more than two spots or lines within 3mm</td><td>2.5</td></tr>
<tr><td rowspan="2">03</td><td rowspan="2">LCD black spots, white spots, contamination (non-display)</td><td>3.1 Round type : As following drawing
 

<table>
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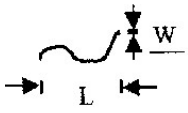
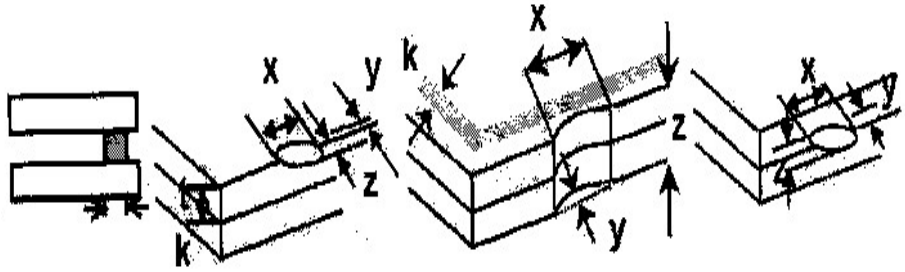
<tr><td></td><td></td></tr>
</table></td><td>2.5</td></tr>
<tr><td>3.2 Line type : (As following drawing)
 

<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Q TY</th></tr>
<tr><td>---</td><td>W</td><td>Accept no dense</td></tr>
<tr><td>L</td><td>0.02 W</td><td rowspan="2">2</td></tr>
<tr><td>L</td><td>0.03 W</td></tr>
<tr><td>---</td><td>0.05 W</td><td>As round type</td></tr>
</table></td><td>2.5</td></tr>
<tr><td>04</td><td>Polarizer bubbles</td><td>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.
<table>
<tr><th>Size</th><th>Acceptable Q TY</th></tr>
<tr><td></td><td>Accept no dense</td></tr>
<tr><td></td><td>3</td></tr>
<tr><td></td><td>2</td></tr>
<tr><td></td><td>0</td></tr>
<tr><td>Total Q TY</td><td>3</td></tr>
</table></td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>05</td><td>Scratches</td><td>Follow NO.3 LCD black spots, white spots, contamination</td><td></td></tr>
<tr><td>06</td><td>Chipped glass</td><td>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:
 

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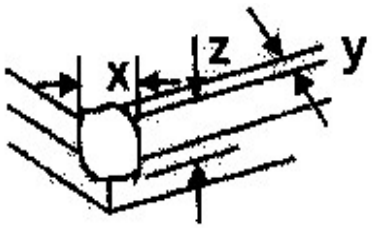
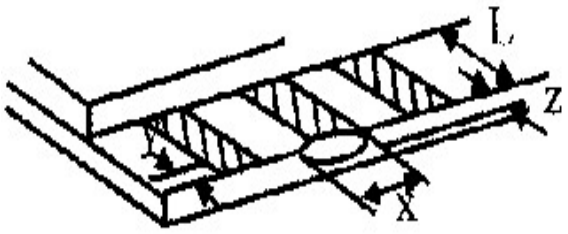
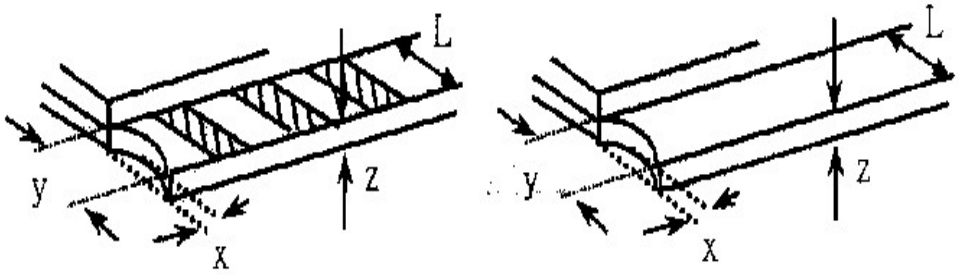
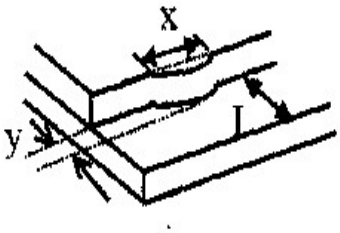
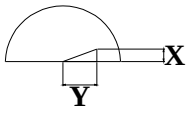
 

<table><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table></td><td>2.5</td></tr>
</table>

NO	Item	Criterion	AQL
06	Glass crack	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

NO	Item	Criterion	AQL
07	Cracked glass		2.5
08	Backlight elements		0.65 2.5 0.65
09	Bezel		2.5 0.65
10	PCB COB	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. 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		2.5 2.5 2.5 0.65

NO	Item	Criterion	AQL
12	General appearance		2.5 0.65 2.5 2.5 2.5 2.5 2.5 0.65 0.65 0.65 0.65

13. Material List of Components for RoHs

1. WINSTAR Display Co., Ltd hereby declares that all of or part of products (with the mark "#"in code), including, but not limited to, the LCM, accessories or packages, manufactured and/or delivered to your company (including your subsidiaries and affiliated company) directly or indirectly by our company (including our subsidiaries or affiliated companies) do not intentionally contain any of the substances listed in all applicable EU directives and regulations, including the following substances.

Exhibit A：The Harmful Material List

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Material	(Cd)	(Pb)	(Hg)	(Cr6+)	PBBs	PBDEs
Limited Value	100 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm
Above limited value is set up according to RoHS.						

2.Process for RoHS requirement：

(1) Use the Sn/Ag/Cu soldering surface　the surface of Pb-free solder is rougher than we used before.

(2) Heat-resistance temp.：

Reflow：250℃,30 seconds Max.

Connector soldering wave or hand soldering：320℃, 10 seconds max.

(3) Temp. curve of reflow, max. Temp.：235±5℃

Recommended customer's soldering temp. of connector：280℃, 3 seconds.

14. Recommendable storage

1. Place the panel or module in the temperature 25°C±5°C and the humidity below 65% RH
2. Do not place the module near organics solvents or corrosive gases.
3. Do not crush, shake, or jolt the module

winstar **LCM Sample Estimate Feedback Sheet**

Module Number：_____ **Page: 1**

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 ,_____

Go to page 2

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**： / /