

LIQUID CRYSTAL DISPLAY MODULE

Product Specification

DENSITRON	STANDARD LCD MODULE	
PRODUCT NUMBER	LWM320240C-SERIES	
DEFINITION	Display 320*240 dots	Date 19/04/04

INTERNAL APPROVALS				
Quality Mgr	Product Mgr	Project Leader	Mech. Eng	Electr. Eng
Date:	Date:	Date:	Date:	Date:

TABLE OF CONTENTS

1	PART NUMBERING SYSTEM	4
2	MAIN FEATURES.....	6
3	MECHANICAL SPECIFICATION.....	7
3.1	MECHANICAL CHARACTERISTICS	7
3.2	MECHANICAL DRAWING	8
4	ELECTRICAL SPECIFICATION	9
4.1	ABSOLUTE MAXIMUM RATINGS.....	9
4.2	ELECTRICAL CHARACTERISTICS	9
4.3	INTERFACE PIN ASSIGNMENT.....	10
4.4	BLOCK DIAGRAM	11
4.5	POWER SUPPLY CIRCUIT	12
4.6	DISPLAY CONTROL INSTRUCTION	13
4.7	CHARACTER ROM MAP	37
4.8	TIMING CHARACTERISTICS.....	39
5	OPTICAL SPECIFICATION.....	40
6	TOUCH SCREEN SPECIFICATION	42
6.1	TOUCH SCREEN ELECTRICAL CHARACTERISTICS.....	42
6.2	TOUCH SCREEN MECHANICAL CHARACTERISTICS	42
6.3	TOUCH SCREEN MECHANICAL DRAWING	43
7	BACKLIGHT SPECIFICATION	44
7.1	LED BACKLIGHT CHARACTERISTICS.....	44
7.1.1	<i>WHITE EDGE STANDARD LED BACKLIGHT CHARACTERISTICS</i>	<i>44</i>
7.1.2	<i>YELLOW GREEN STANDARD LED BACKLIGHT CHARACTERISTICS</i>	<i>44</i>
7.2	CCFL BACKLIGHT CHARACTERISTICS	45
8	QUALITY ASSURANCE SPECIFICATION	46
8.1	CONFORMITY	46
8.2	DELIVERY ASSURANCE	46
8.2.1	<i>Delivery inspection standards</i>	<i>46</i>
8.2.2	<i>Zone definition</i>	<i>47</i>
8.2.3	<i>Visual inspection.....</i>	<i>47</i>
8.2.4	<i>Standard of appearance inspection</i>	<i>48</i>
9	RELIABILITY SPECIFICATION	50
10	HANDLING PRECAUTIONS	51

Page	
------	--

REVISION RECORD

Rev.	Date	Page	Chapt.	Comment	ECR no.
1	19/04/2004			Initial Specification	

1 PART NUMBERING SYSTEM

LWM 320240C – xx - x xx (()
 Densitron mono module ① ② ③ ④ ⑤ ⑥

① Resolution dots width x high

② Model serials number

③ Display mode and backlight type :

A = Reflective (without backlight) =

B* = Transflective positive LEDS array type backlight (BG, BA, BW, BR, BT ...)

B*(E) = Transflective LEDS edge type backlight (BGE, BAE, BWE, BR...)

B = Transflective CFL

C* = Transflective positive EL backlight (CB, CW)

D* = Transmissive negative EL backlight (DB, DW)

E = CFL

E* = Transmissive negative LEDS array type backlight (EG, EA, EW, ER...)

E*(E) = Transmissive negative LEDS edge type backlight (EGE, EAE, EWE, ERE...)

(* color LED or EL backlight = G/ yellow-green, A/ amber, W/ white, R/ red, B/blue ,T/ tricolour)

④ Temperature range and power supply

D = Standard temperature range; negative supply voltage required (0°C~+50°C)

S = Standard temperature range; on board negative voltage generator (0°C~+50°C)

H= Wide temperature range; negative supply voltage required (-20°C ~+70°C)

W= Wide temperature range; on board negative voltage generator (-20°C ~+70°C)

⑤ Fluid type and compensation circuit option

NY = STN yellow-green glass, without temperature compensation circuit

CY = STN yellow green glass, with temperature compensation circuit on board

NG = STN gray glass without temperature compensation circuit

CG = STN gray glass with temperature compensation circuit

NB = STN blue glass, without temperature compensation circuit

CB = STN blue glass with temperature compensation circuit

NF = FSTN black and white glass without temperature compensation circuit

CF = FSTN black and white glass with temperature circuit on board

⑥ Special code for customized features or additional features

12 = it is mentioned if top view angle is needed

HL = High Luminosity for White LED Backlight if needed

Other code = Please refer to our commercial office

Remarks and definitions :

1°) Display mode and backlight type :

- Reflective polarizer, no backlight, usable only in good ambient light conditions.
- Transflective polarizer uses a background backlight and a mirror reflector, usable in all lighting conditions.
- Transmissive polarizer needs the backlight switched on continuously, usable mostly in low ambient light conditions
- EL (electro-luminescent), uniform brightness, short life time (8000 hours max), needs EL inverter, low current consumption, low thickness.
- LED (light emitting diode), uniform brightness, long lifetime (100 000 hours), doesn't need inverter, reliable in vibration and shock environment, different colors available.

Array version is a direct lighting type, available in standard form, uniform and good brightness on all the active area.

Edge version is an edge lighting type providing a low consumption backlight, has a low thickness and brightness.

- Positive mode has dark pixels on a light background
- Negative mode has light pixels in a dark background and is normally used only with a transmissive polarizer as it needs a backlight on to be visible.

2°) Fluid type :

- STN yellow green or grey LCD has a yellow green or grey background with dark blue pixels and offers a good contrast.
- FSTN LCD is to produce very high contrast with black and white pixels using a film polarizer

2 MAIN FEATURES

ITEM	CONTENTS
Display Format	320 * 240 dos
Overall Dimensions	148.02(W)x 120.24(H)x 15.6max(T)
Viewing Area	120.14(W)x 92.14(H)
LCD type	STN / FSTN
Mode	Available in Reflective / Transflective / Transmissive
Viewing Angle	6 o'clock
Duty ratio	1/240
Driver IC	RA8835 or equivalent
Backlight type	None / LED
Backlight colour	Yellow Green / White / Other on request
DC/DC converter	None or Included
Operating temperature	-20°/+70°C
Storage temperature	-30°/+80°C

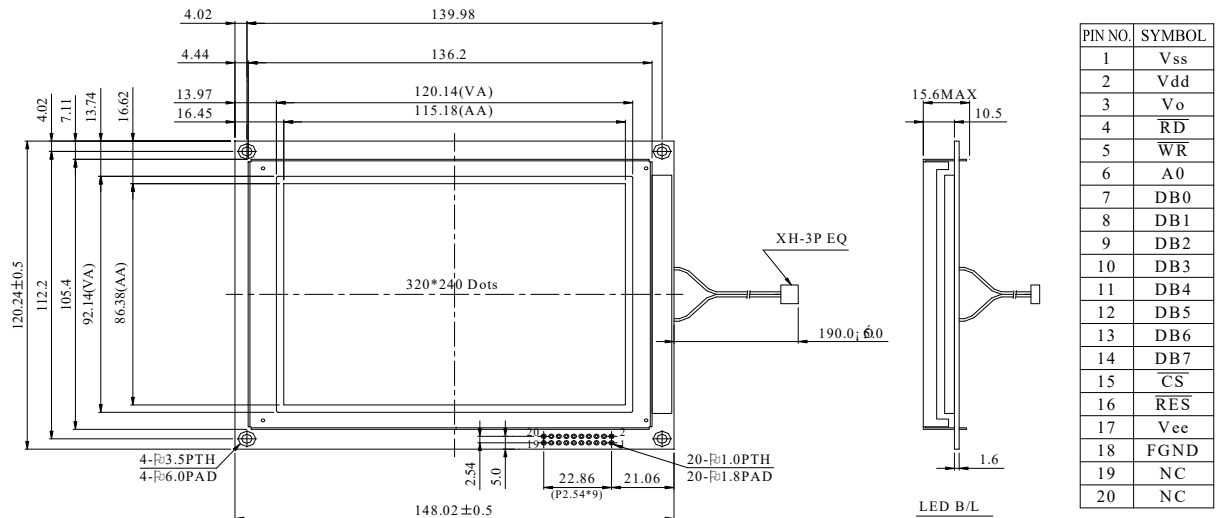
3 MECHANICAL SPECIFICATION

3.1 MECHANICAL CHARACTERISTICS

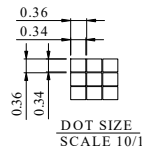
ITEM	CHARACTERISTIC	UNIT
Display Format	320 * 240 dots	
Overall Dimensions	148.02(W)x 120.24(H)x 15.6max(T)	mm
Viewing Area	120.14(W)x 92.14(H)	mm
Active Area	115.18(W)x 86.38(H)	mm
Dot Size	0.34x 0.34	mm
Dot Pitch	0.36x 0.36	mm
IC Controller/Driver	RA8835 or equivalent	

3.2 MECHANICAL DRAWING

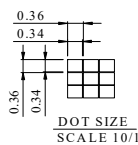
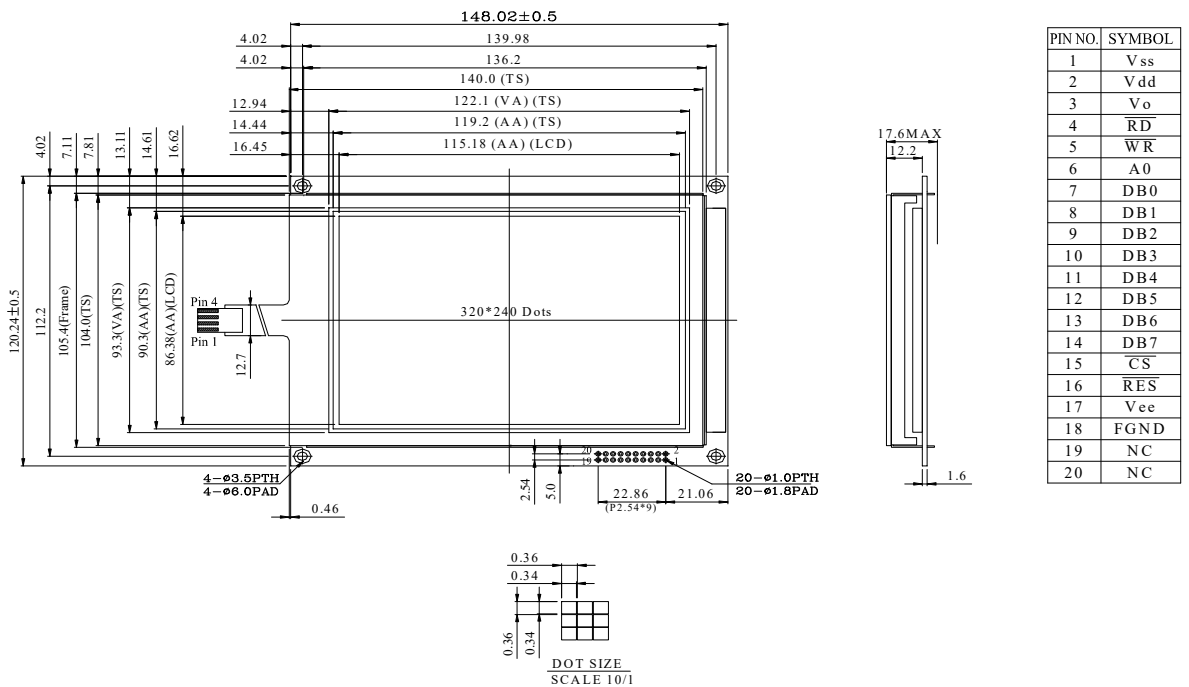
Non-Touch version drawing



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



TSA Touch version drawing



4 ELECTRICAL SPECIFICATION

4.1 ABSOLUTE MAXIMUM RATINGS

VSS = 0 V, Ta = 25 °C

Item	Symbol	Min	Typ	Max	Unit	Note
Power Supply Voltage	$V_{DD}-V_{SS}$	-0,3	-	+6,0	V	
Power Supply for LCD	$V_{DD}-V_0$	0	-	32	V	
Input Voltage	V_{in}	V_{SS}	-	V_{DD}	V	
Operating Temperature	Top	0 -20	-	+50 +70	°C	Note 1
Storage Temperature	Tst	-20 -30	-	+70 +80	°C	Note 2
Static Electricity	Be sure that you are grounded when handling displays.					

Note 1: Background colour changes slightly depending on ambient temperature. This phenomenon is reversible. Ta ≤ 70 °C: 75% RH max

Note 2: Ta ≤ 80 °C: 75% RH max

4.2 ELECTRICAL CHARACTERISTICS

VSS = 0 V, Ta = 25 °C

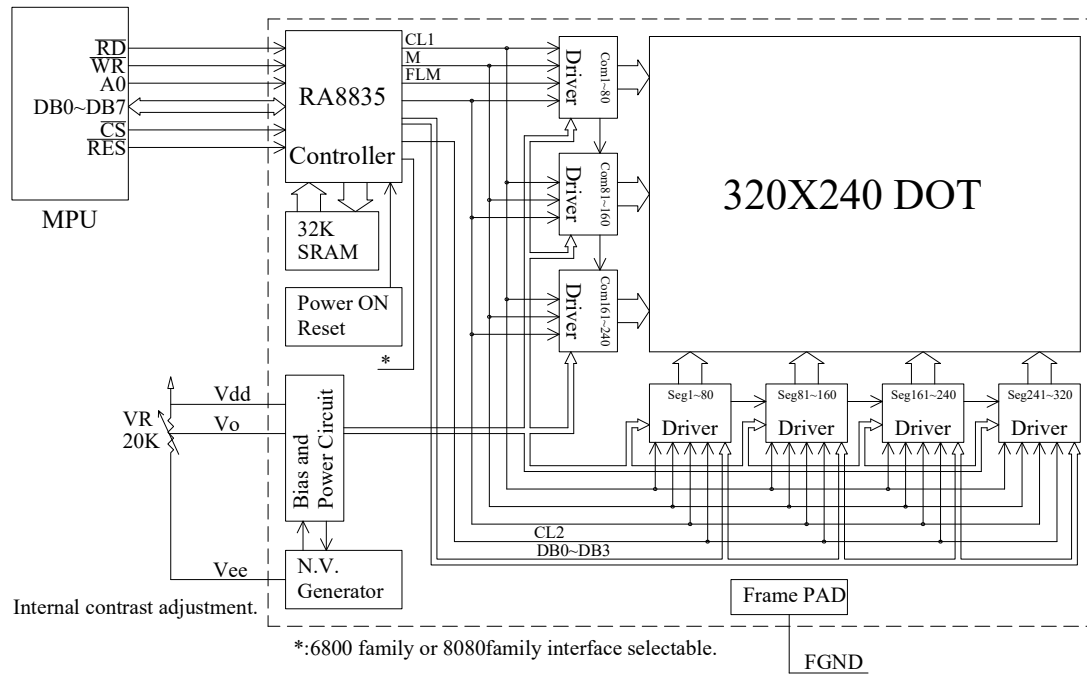
Item	Symbol	Condition	Min	Typ	Max	Unit
Power Supply for Logic	$V_{DD}-V_{SS}$	Ta = 25 °C	4,75	5,0	5,25	V
Input Voltage	V_{IL}	Ta = 25 °C	0	-	0,8	V
	V_{IH}	Ta = 25 °C	2,2	-	V_{DD}	V
Output Voltage	V_{OL}	Ta = 25 °C	0	-	0,4	V
	V_{OH}	Ta = 25 °C	2,4	-	V_{DD}	V
LCD Module Driving Voltage	$V_{DD}-V_0$	Ta = -20 °C	-	-	25	V
		Ta = 25 °C	-	24	-	V
		Ta = 70 °C	23	-	-	V
Current Consumption	* I_{DD}	$V_{DD} = 5V$ $V_{LCD} = 24V$	-	100	-	mA

* I_{DD} measurement condition is for all pattern ON

4.3 INTERFACE PIN ASSIGNMENT

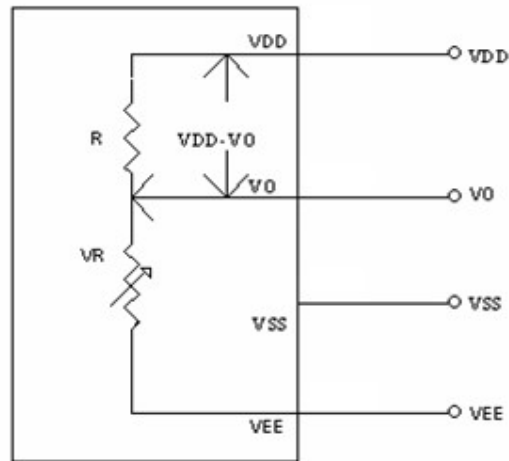
Pin No.	Symbol	Level	Description
1	V _{SS}	0V	Ground
2	V _{DD}	5.0V	Power supply for Logic
3	V _O	(Variable)	Driving voltage for LCD
4	E	H/L	Start enable signal to read or write the data
5	R/W	H/L	R/W signal input is used to select the read/write mode High = Read mode , Low = Write mode
6	A0	H/L	R/W=L, A0=H: Command Write A0=L: Data Write R/W=H, A0=H: Status Read A0=L: Data Read
7~14	DB0~DB7	H/L	Data bus
15	$\overline{\text{CS}}$	H/L	Chip select ,Active L
16	$\overline{\text{RES}}$	H/L	Controller reset signal, Active L
17	V _{EE}	-25V	Negative voltage output (Optional)
18	FGND		Frame Ground
19	NC		No connection
20	NC		No connection

4.4 BLOCK DIAGRAM



4.5 POWER SUPPLY

Internal LCD VO Adjustment



4.6 DISPLAY CONTROL INSTRUCTION

Please refer to graphics controller RA8835A datasheet from Raio Technology www.raio.com.tw

4.7 CHARACTER ROM MAP

Please refer to graphics controller RA8835A datasheet from Raio Technology www.raio.com.tw

4.8 TIMING CHARACTERISTICS

Please refer to graphics controller RA8835A datasheet from Raio Technology www.raio.com.tw

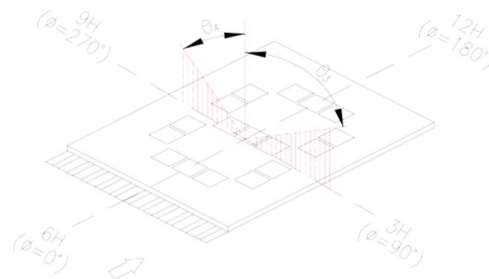
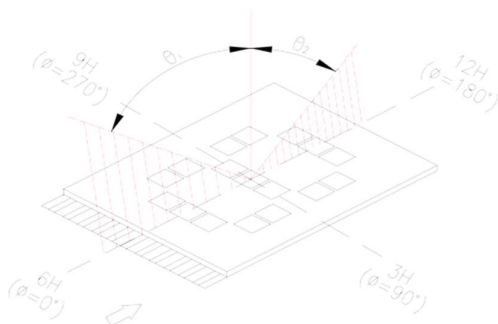
5 OPTICAL SPECIFICATION

Ta = 25 °C

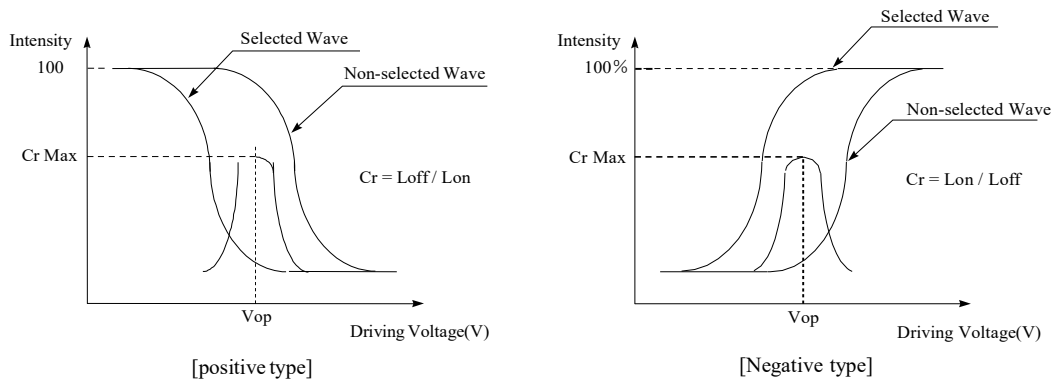
Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Viewing Angle in STN	θ1	CR≥2	-	60	-	deg	1
	θ2	CR≥2	-	30	-	deg	1
	θ3	CR≥2	-	30	-	deg	2
	θ4	CR≥2	-	30	-	deg	2
Viewing Angle in FSTN	θ1	CR≥2	-	120	-	deg	1
	θ2	CR≥2	-	10	-	deg	1
	θ3	CR≥2	-	45	-	deg	2
	θ4	CR≥2	-	45	-	deg	2
Contrast Ratio	CR	Ta = 25 °C	-	5	-	-	3
Response Time	Tr	Ta = 25 °C	-	200	300	ms	4
	Tf	Ta = 25 °C	-	150	250		
Driving Method	Duty	1/240					
Viewing Direction	6 O'CLOCK						

Note 1: definition of viewing angle θ1 & θ2

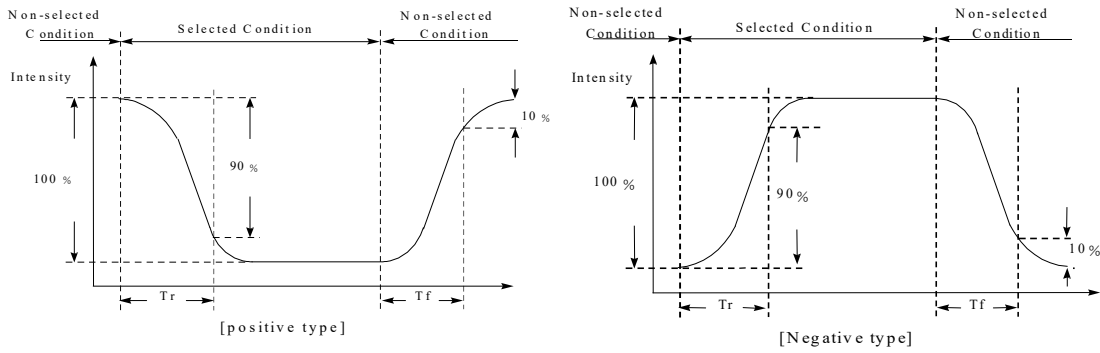
Note 2: definition of viewing angle θ3 & θ4



Note 3: definition of contrast ratio (CR)



Note 4: definition of response time



6 TOUCH SCREEN SPECIFICATION

6.1 TOUCH SCREEN ELECTRICAL CHARACTERISTICS

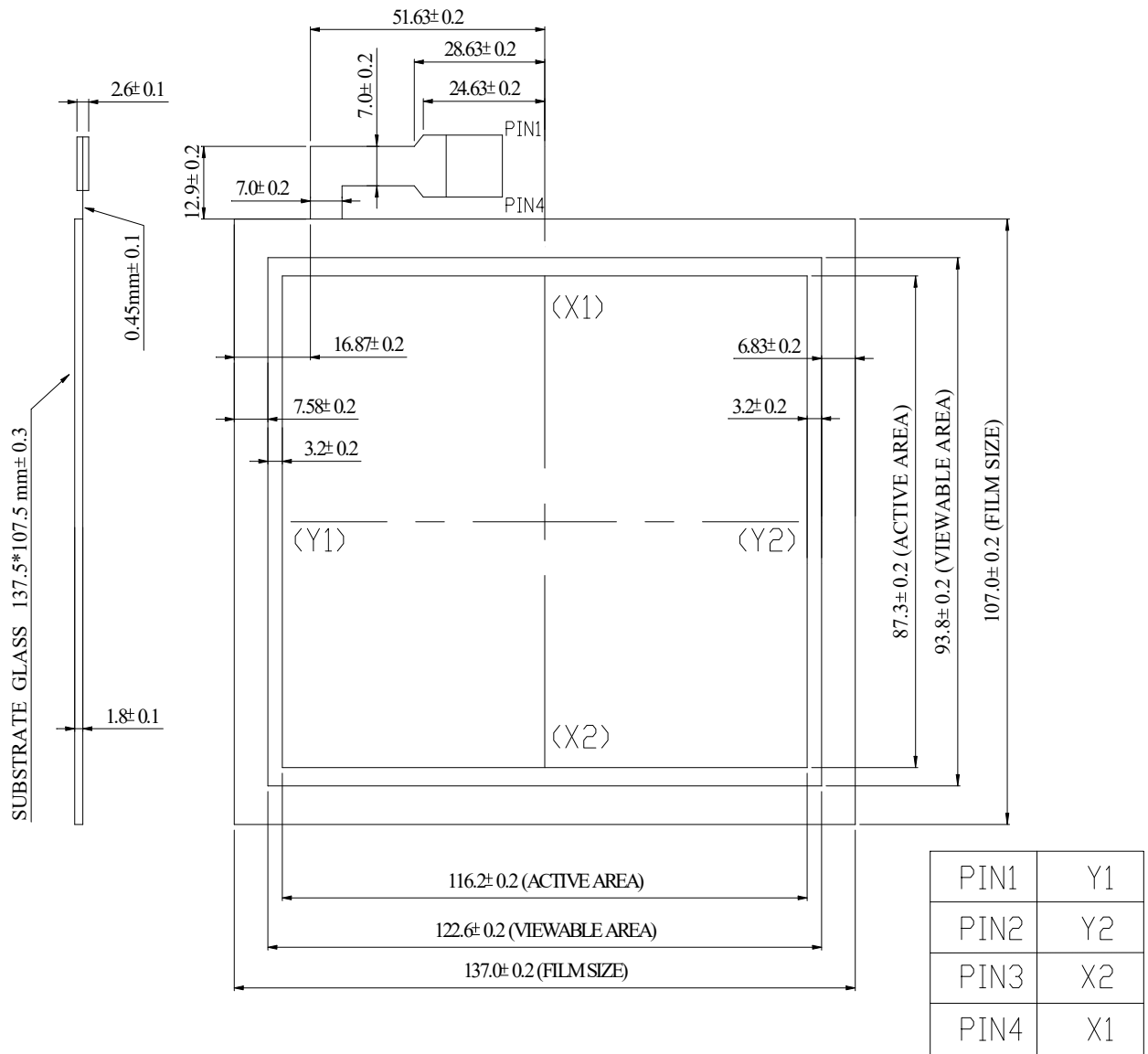
Item	Specification	Condition
Resistance	250 to 750 ohms	X Axis
	250 to 800 ohms	Y Axis
Insulation Resistance	More than 20Mohms	DC 25V
Chattering Time	Less than 10ms	100Kohms Pull-Up
Linearity	+/- 2,0%	X Axis
	+/- 2,0%	Y Axis

6.2 TOUCH SCREEN MECHANICAL CHARACTERISTICS

Item	Specification	Condition
Operating Force	Less than 80g	R8.0 HS 40 ° Silicon Rubber Or R0.8 Polyacetal Pen
Surface Hardness	More than 2H	Pencil Test
Light Transmission	More than 80%	@ 550 nm HITACHI U3300
Durability for Pen Selection	More than 1 200 000 times	Force : 250g Speed : 2cm / s

6.3 TOUCH SCREEN MECHANICAL DRAWING

For TSA Touch version drawing see pae 8
TS Touch version drawing below



7 BACKLIGHT SPECIFICATION

7.1 LED BACKLIGHT CHARACTERISTICS

7.1.1 WHITE STANDARD LED BACKLIGHT CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Current	I	V = 3,5V	-	128	-	mA
Forward Voltage	V _F	I _F = 128mA	-	3,5	-	V
Reverse Voltage	V _R		-	-	8	V
Luminous Intensity before through LCD	I _V	I _F = 128mA	-	180	-	cd/m ²
Life time		I _F = 128mA	-	50K	-	hrs
Colour	WHITE					

7.1.2 YELLOW GREEN STANDARD LED BACKLIGHT CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Current	I	V = 4.2V	-	360		mA
Forward Voltage	V _F	I _F = 200mA	-	4,2	4,6	V
Reverse Voltage	V _R		-	-	10	V
Luminous Intensity	I _V	I _F = 360mA		23	-	cd/m ²
LED Peak Emission Wavelength	λ _p	I _F = 360mA	-	571	-	nm
Life time		I _F = 360mA	-	100K	-	hrs
Colour	YELLOW GREEN					

8 QUALITY ASSURANCE SPECIFICATION

8.1 CONFORMITY

The performance, function and reliability of the shipped products conform to the Product Specification.

8.2 DELIVERY ASSURANCE

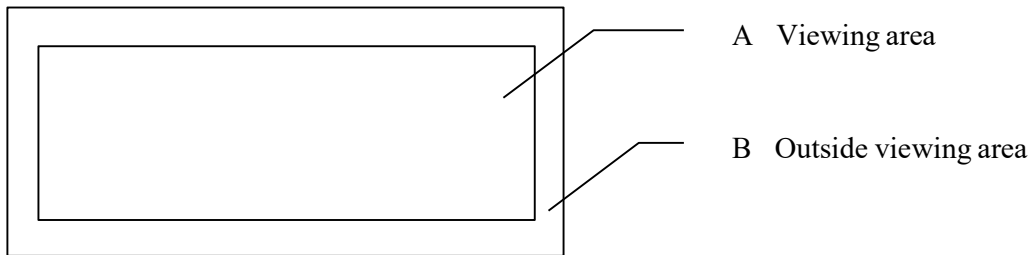
8.2.1 Delivery inspection standards.

- MIL-STD-105E, general inspection level II, single sampling level;
- IPC-AA610 rev. C, class 2 electronic assemblies standard

The quality assurance levels are shown below:

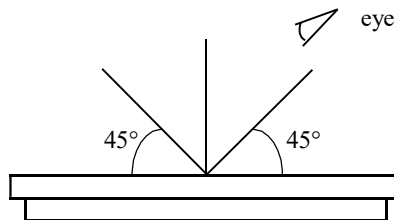
Rank	Item Inspected	Defect type	AQL	Remark
Critical defect	Display	Non display	0.65%	Display malfunction
		Over current		
		Missing segment		
		Wrong viewing direction		
		Backlight OFF		
	Dimension	PCB and bezel out of specification	0.65%	Assembly failure
Major defect	Display	Incorrect operating	1.0%	
	Backlight	Flashing, dust		
		Wrong colour		
Minor defect	LCD	Black and white spot	2.5%	Appearance defect
		Black and white lines		
		Polariser scratch		
		Bubbles in polariser		
		Segment deformation, pin hole		
		Colour uniformity		
		Glass chip		
	COB	Wire bond pad exposed		
		Insufficient covering with resin (wire bond line exposed)		
		Bubble, dust on COB		
	PCB	Dust, solder ball on PCB		
Pad scratch				
Total			2.5%	

8.2.2 Zone definition



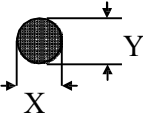
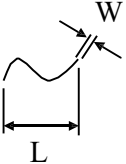
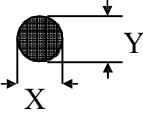
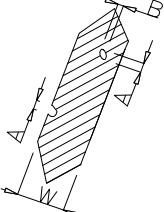
8.2.3 Visual inspection

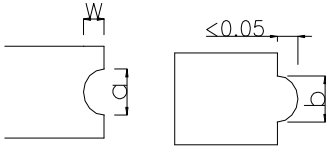
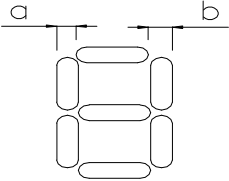
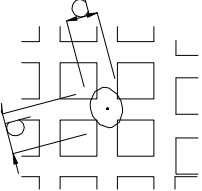

- Inspect under 2x20W or 40W fluorescent lamp (approximately 3000 lux) leaving 25 to 30 cm between the module and the lamp and 30 cm between the module and the eye (measuring position).
- Appearance is inspected at the best contrast voltage (best contrast is adjusted considering clearness and crosstalk on screen).
- Inspect the module at 45° right and left, top and bottom.
- Use the optimum viewing angle during the contrast inspection.



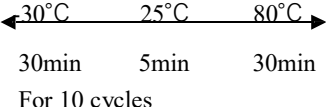
8.2.4 Standard of appearance inspection

Units: mm

No	Item	Criteria																																			
1	Black spot, white spot, dust	<p>Round type: as per following drawing $\varnothing = (X+Y)/2$</p>  <table border="1" style="margin-left: 200px;"> <thead> <tr> <th colspan="3">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th>Zone A</th> <th>Zone B</th> </tr> </thead> <tbody> <tr> <td>$\varnothing < 0.1$</td> <td>Any number</td> <td rowspan="4">Any number</td> </tr> <tr> <td>$0.1 < \varnothing < 0.2$</td> <td>6</td> </tr> <tr> <td>$0.2 < \varnothing < 0.3$</td> <td>2</td> </tr> <tr> <td>$0.3 < \varnothing$</td> <td>0</td> </tr> </tbody> </table> <p>Line type: as per following drawing</p>  <table border="1" style="margin-left: 200px;"> <thead> <tr> <th colspan="4">Acceptable quantity</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>Zone A</th> <th>Zone B</th> </tr> </thead> <tbody> <tr> <td>--</td> <td>$W \leq 0.02$</td> <td>Any number</td> <td rowspan="4">Any number</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> <p style="text-align: center;">Total acceptable quantity: 3</p>	Acceptable quantity			Size	Zone A	Zone B	$\varnothing < 0.1$	Any number	Any number	$0.1 < \varnothing < 0.2$	6	$0.2 < \varnothing < 0.3$	2	$0.3 < \varnothing$	0	Acceptable quantity				Length	Width	Zone A	Zone B	--	$W \leq 0.02$	Any number	Any number	$L \leq 3.0$	$0.02 < W \leq 0.03$	2	$L \leq 2.5$	$0.03 < W \leq 0.05$	--	$0.05 < W$	As round type
Acceptable quantity																																					
Size	Zone A	Zone B																																			
$\varnothing < 0.1$	Any number	Any number																																			
$0.1 < \varnothing < 0.2$	6																																				
$0.2 < \varnothing < 0.3$	2																																				
$0.3 < \varnothing$	0																																				
Acceptable quantity																																					
Length	Width	Zone A	Zone B																																		
--	$W \leq 0.02$	Any number	Any number																																		
$L \leq 3.0$	$0.02 < W \leq 0.03$	2																																			
$L \leq 2.5$	$0.03 < W \leq 0.05$																																				
--	$0.05 < W$	As round type																																			
2	Polariser scratch	Scratch on protective film is permitted Scratch on polariser: same as No. 1																																			
3	Polariser bubble	<p>$\varnothing = (X+Y)/2$</p>  <table border="1" style="margin-left: 200px;"> <thead> <tr> <th colspan="3">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th>Zone A</th> <th>Zone B</th> </tr> </thead> <tbody> <tr> <td>$\varnothing < 0.3$</td> <td>Any number</td> <td rowspan="4">Any number</td> </tr> <tr> <td>$0.3 < \varnothing < 1.0$</td> <td>3</td> </tr> <tr> <td>$1.0 < \varnothing < 1.5$</td> <td>1</td> </tr> <tr> <td>$1.5 < \varnothing$</td> <td>0</td> </tr> </tbody> </table> <p style="text-align: center;">Total acceptable quantity: 4</p>	Acceptable quantity			Size	Zone A	Zone B	$\varnothing < 0.3$	Any number	Any number	$0.3 < \varnothing < 1.0$	3	$1.0 < \varnothing < 1.5$	1	$1.5 < \varnothing$	0																				
Acceptable quantity																																					
Size	Zone A	Zone B																																			
$\varnothing < 0.3$	Any number	Any number																																			
$0.3 < \varnothing < 1.0$	3																																				
$1.0 < \varnothing < 1.5$	1																																				
$1.5 < \varnothing$	0																																				
4	Segment deformation	<p>1.a. Pin hole on segmented display</p> <p>W: segment width $\varnothing = (A+B)/2$</p>  <table border="1" style="margin-left: 200px;"> <thead> <tr> <th colspan="2">Acceptable quantity</th> </tr> <tr> <th>Width</th> <th>\varnothing</th> </tr> </thead> <tbody> <tr> <td>$W \leq 0.4$</td> <td>$\varnothing \leq 0.2$ and $\varnothing \leq 1/2W$</td> </tr> <tr> <td>$W > 0.4$</td> <td>$\varnothing \leq 0.25$ and $\varnothing \leq 1/3W$</td> </tr> </tbody> </table> <p style="text-align: center;">Total acceptable quantity: 1 defect per segment Pin holes with \varnothing under 0.10 mm are acceptable</p>	Acceptable quantity		Width	\varnothing	$W \leq 0.4$	$\varnothing \leq 0.2$ and $\varnothing \leq 1/2W$	$W > 0.4$	$\varnothing \leq 0.25$ and $\varnothing \leq 1/3W$																											
Acceptable quantity																																					
Width	\varnothing																																				
$W \leq 0.4$	$\varnothing \leq 0.2$ and $\varnothing \leq 1/2W$																																				
$W > 0.4$	$\varnothing \leq 0.25$ and $\varnothing \leq 1/3W$																																				

No	Item	Criteria																												
4	Segment deformation	<p>1b. Pin hole on dot matrix display</p>  <table border="1" data-bbox="993 321 1365 489"> <thead> <tr> <th colspan="2">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th></th> </tr> </thead> <tbody> <tr> <td>$a, b < 0.1$</td> <td>Any number</td> </tr> <tr> <td>$(a+b)/2 \le 0.1$</td> <td>Any number</td> </tr> <tr> <td>$0.5 < \varnothing < 1.0$</td> <td>3</td> </tr> </tbody> </table> <p>Total acceptable quantity: 7</p> <p>2. Segments / dots with different width</p>  <table border="1" data-bbox="993 684 1365 783"> <thead> <tr> <th colspan="2">Acceptable</th> </tr> </thead> <tbody> <tr> <td>$a \geq b$</td> <td>$a/b \leq 4/3$</td> </tr> <tr> <td>$a < b$</td> <td>$a/b > 4/3$</td> </tr> </tbody> </table> <p>3. Alignment layer defect</p> <p>$\varnothing = (a+b)/2$</p>  <table border="1" data-bbox="993 884 1365 1087"> <thead> <tr> <th colspan="2">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th></th> </tr> </thead> <tbody> <tr> <td>$\varnothing \le 0.4$</td> <td>Any number</td> </tr> <tr> <td>$0.4 < \varnothing \le 1.0$</td> <td>5</td> </tr> <tr> <td>$1.0 < \varnothing \le 1.5$</td> <td>3</td> </tr> <tr> <td>$1.5 < \varnothing \le 2.0$</td> <td>2</td> </tr> </tbody> </table> <p>Total acceptable quantity: 7</p>	Acceptable quantity		Size		$a, b < 0.1$	Any number	$(a+b)/2 \le 0.1$	Any number	$0.5 < \varnothing < 1.0$	3	Acceptable		$a \geq b$	$a/b \leq 4/3$	$a < b$	$a/b > 4/3$	Acceptable quantity		Size		$\varnothing \le 0.4$	Any number	$0.4 < \varnothing \le 1.0$	5	$1.0 < \varnothing \le 1.5$	3	$1.5 < \varnothing \le 2.0$	2
Acceptable quantity																														
Size																														
$a, b < 0.1$	Any number																													
$(a+b)/2 \le 0.1$	Any number																													
$0.5 < \varnothing < 1.0$	3																													
Acceptable																														
$a \geq b$	$a/b \leq 4/3$																													
$a < b$	$a/b > 4/3$																													
Acceptable quantity																														
Size																														
$\varnothing \le 0.4$	Any number																													
$0.4 < \varnothing \le 1.0$	5																													
$1.0 < \varnothing \le 1.5$	3																													
$1.5 < \varnothing \le 2.0$	2																													
5	Colour uniformity	Level of sample for approval set as limit sample																												
6	Backlight	<p>The backlight colour should correspond to the product specification</p> <p>Flashing and or unlit backlight is not allowed</p> <p>Dust larger than 0.25 mm is not allowed</p>																												
7	COB	<p>Exposed wire bond pad is not allowed</p> <p>Insufficient covering with resin is not allowed (wire bond line exposed)</p> <p>Dust or bubble on the resin are not allowed</p>																												
8	<p>PCB</p> 	<p>No unmelted solder paste should be present on PCB</p> <p>Cold solder joints, missing solder connections, or oxidation are not allowed</p> <p>No residue or solder balls on PCB are allowed</p> <p>Short circuits on components are not allowed</p>																												

9 RELIABILITY SPECIFICATION

Test Item	Test Condition	Description
High Temperature Operation	50°C or 70°C 200hrs	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.
Low Temperature Operation	0°C or -20°C 200hrs	Endurance test applying the electric stress under low temperature for a long time.
High Temperature Storage	70°C or 80°C 200hrs	Endurance test applying the high storage temperature for a long time.
Low Temperature Storage	-20°C or -30°C 200hrs	Endurance test applying the high storage temperature for a long time.
High Temperature & High Humidity Storage	80°C,90%RH 96hrs	Endurance test applying the high temperature and high humidity storage for a long time.
Thermal Shock Test	 <p>30min 5min 30min For 10 cycles</p>	Endurance test applying the low and high temperature cycle. Burn In Test.
Vibration	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs	Endurance test applying the vibration during transportation and using.
ESD	VS=800V,RS=1.5kΩ CS=100pF	Endurance test applying the electric stress to the terminal.
Shock Test	50G Half sign wave 11 msdc 3 times of each direction	Constructional and mechanical endurance test applying the shock during transportation.

10 HANDLING PRECAUTIONS

Safety

If the LCD panel breaks, be careful not to get the liquid crystal fluid in your mouth or in your eyes.

If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water.

Mounting and Design

Place a transparent plate (e.g. acrylic, polycarbonate or glass) on the display surface to protect the display from external pressure. Leave a small gap between the transparent plate and the display surface.

When assembling with a zebra connector, clean the surface of the pads with alcohol and keep the surrounding air very clean.

Design the system so that no input signal is given unless the power supply voltage is applied.

Caution during LCD cleaning

Lightly wipe the display surface with a soft cloth soaked with Isopropyl alcohol, Ethyl alcohol or Trichlorotrifluoroethane.

Do not wipe the display surface with dry or hard materials that will damage the polariser surface.

Do not use aromatic solvents (toluene and xylene), or ketonic solvents (ketone and acetone).

Caution against static charge

As the display uses C-MOS LSI drivers, connect any unused input terminal to VDD or VSS. Do not input any signals before power is turned on.

Also, ground your body, work/assembly table and assembly equipment to protect against static electricity.

Packaging

Displays use LCD elements, and must be treated as such. Avoid strong shock and drop from a height.

To prevent displays from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.

Caution during operation

It is indispensable to drive the display within the specified voltage limit since excessive voltage shortens its life.

Direct current causes an electrochemical reaction with remarkable deterioration of the display quality. Give careful consideration to prevent direct current during ON/OFF timing and during operation.

Response time is extremely delayed at temperatures lower than the operating temperature range while, at high temperatures, displays become dark. However, this phenomenon is reversible and does not mean a malfunction or a display that has been permanently damaged.

If the display area is pushed on hard during operation, some graphics will be abnormally displayed but returns to a normal condition after turning off the display once.

Even a small amount of condensation on the contact pads (terminals) can cause an electro-chemical reaction which causes missing rows and columns. Give careful attention to avoid condensation.

Storage

Store the display in a dark place where the temperature is $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ and the humidity below 50%RH.

Store the display in a clean environment, free from dust, organic solvents and corrosive gases.

Do not crash, shake or jolt the display (including accessories).