LIQUID CRYSTAL DISPLAY MODULE

Product Specification

CUSTOMER	
CUSTOMER PART NO.	
PRODUCT NUMBER	**LMR67802**

Product Mgr	Quality Mgr	Engineering	Document Control
Bruno Recaldini Digitally signed by Bruno Recaldini DN: cn=Bruno Recaldini, c=GB, o=Densitron Technologies, ou=Product Management, email=bruno.recaldini@densitron.co.uk Reason: I am approving this document Date: 2006.08.11 14:14:50 +01'00'			Digitally signed by Robert J. Mendoza DN: CN = Robert J. Mendoza, C = US, O = Densitron Technologies Reason: I am the author of this document Location: Santa Fe Springs, CA. Date: 2006.07.06 15:37:08 -07'00'
Date:	Date:	Date:	Date:

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REVISION RECORD

Rev.	Date	Page	Chapt.	Comment	ECN no.
A	05/04/06	--	--	Initial DCA Release, ROHS Compliant	E3116
B	07/06/06	4	1	Update dimensions and main features.	E3176

1 MAIN FEATURES

UNIT=MM

ITEM	CONTENTS
Display Format	320 x RGB x 234 Dots
Colour	R.G.B. Stripe, 32K
Overall Dimensions	148.0 (W) x 120.0 (H) x 19.4 Max
Viewing Area	115.48 (W) x 86.91 (H)
LCD Type	TFT
Mode	Transmissive - Negative
Viewing Angle	6:00
Duty Ratio	1/234
IC Controller/Driver	Hit1270
Backlight Type	Edge CCFL
DC/DC Converter	Built-In
Operating Temperature	0°C ~ +60°C
Storage Temperature	-25°C ~ +80°C
ROHS Compliant	Yes

2 MECHANICAL SPECIFICATION

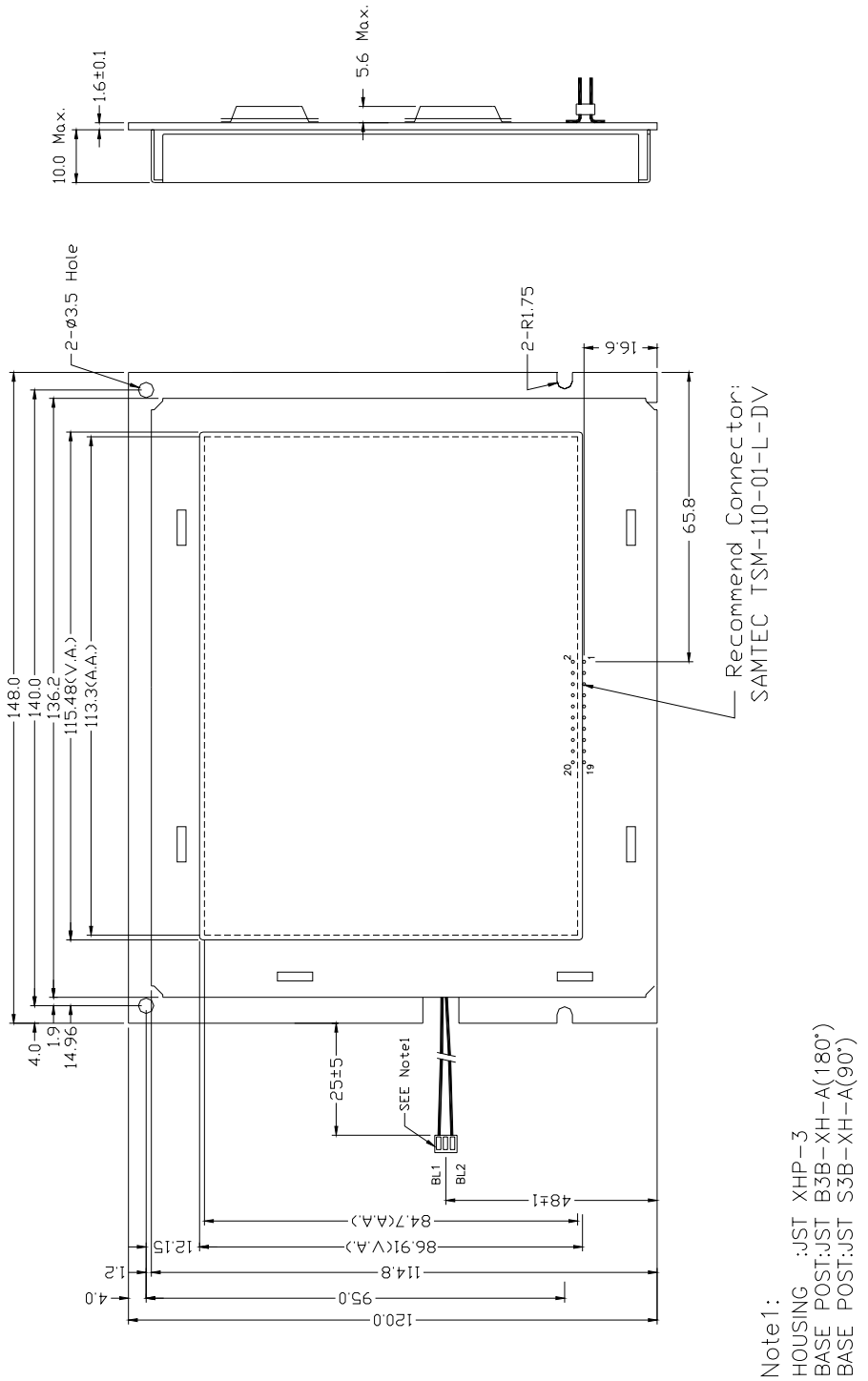
2.1 MECHANICAL CHARACTERISTICS

ITEM	CHARACTERISTIC	UNIT
Display Format	320 x RGB x 234 Dots	--
Overall Dimensions	148.0 (W) x 120.0 (H) x 19.4 Max	mm
Viewing Area	115.48 (W) x 86.91 (H)	mm
Active Area	113.3 (W) x 84.7 (H)	mm
Dot Pitch	0.118 (W) x 0.362 (H)	mm
IC Controller/Driver	Hit1270	

2.2 LABELLING & MARKING

DENSITRON
LMR67802
TAIWAN YYMM

2.3 MECHANICAL DRAWING



3 ELECTRICAL SPECIFICATION

3.1 ABSOLUTE MAXIMUM RATINGS

VSS = 0 V, Ta = 25 °C

Item	Symbol	Min	Max	Unit	Note
Power Supply Voltage	V_{DD}	0	5.5	V	
Operating Temperature	Top	0	+60	°C	
Storage Temperature	Tst	-25	+80	°C	Note 1

Note 1: <48 hrs @20~90% RH, <1000 hrs @20~65% RH.

3.2 ELECTRICAL CHARACTERISTICS

VSS = 0 V, Ta = 25 °C

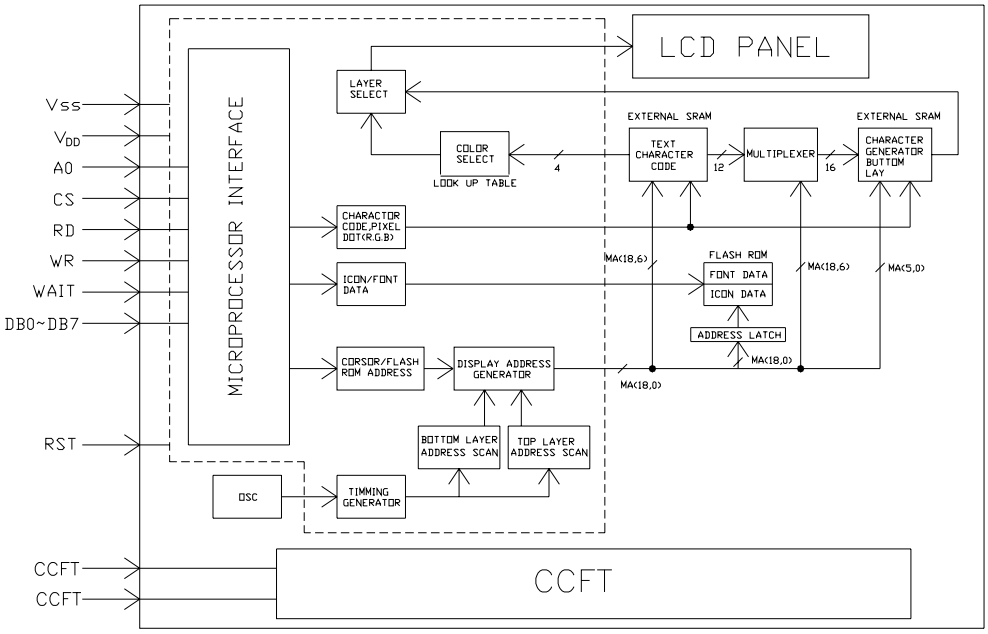
Item	Symbol	Condition	Min	Typ	Max	Unit
Power Supply for Logic	V_{DD}	Ta = 25°C	4.8	5.0	5.2	V
Input Voltage	V_{IHC}	Ta = 25°C	$0.8V_{DD}$	--	V_{DD}	V
	V_{ILC}	Ta = 25°C	0	--	$0.2V_{DD}$	V
LCD Module Driving Voltage	V_{DD}-V_O	Ta = 25°C	0	--	10.0	V
Current Consumption	* I_{DD}	V_{DD} = 5V	--	550	--	mA

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

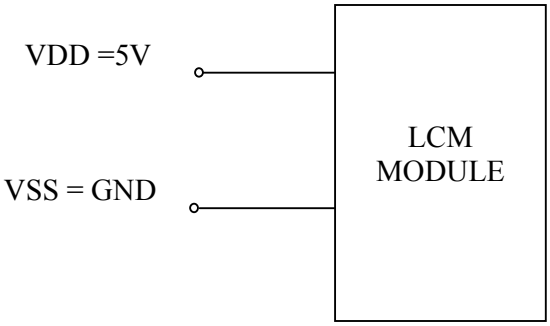
3.3 INTERFACE PIN ASSIGNMENT

Pin No.	Function	Level	Description
1	Vss	---	Power Supply (OV,GND)
2	Vdd	---	Power Supply for Logic
3	N/C	---	No connection
4	/RD	H/L	Read signal
5	/WR	H/L	Write signal
6	A0	H/L	H : parameter register L : command register
7	DB0	H/L	Display Data 0
8	DB1	H/L	Display Data 1
9	DB2	H/L	Display Data 2
10	DB3	H/L	Display Data 3
11	DB4	H/L	Display Data 4
12	DB5	H/L	Display Data 5
13	DB6	H/L	Display Data 6
14	DB7	H/L	Display Data 7
15	/CS	H/L	Chip select
16	/RST	L	Reset signal
17	N/C	---	No connection
18	FG	---	Frame Ground
19	/Wait	H/L	H : release command L : busy
20	N/C	---	No connection

3.4 BLOCK DIAGRAM



3.5 POWER SUPPLY CIRCUIT



3.6 ROM ADDRESS

- 8M bit ROM (512K x 16 bit)
- Address: 0~3FFF: 5x8 character font like English and Japanese (can't be erased)
- Address: 4000~7FFF: 5x8 character font like English European character (can't be erased)
- Address: 8000~BFFF: 5x8 character font like English European character (can't be erased)
- Address: C000~13FFF: 16x16 character font like English and number (can't be erased)
- Address: 14000~17FFF: Reserved (can't be erased)
- Address: 18000~1FFFF: report.txt to describe the starting and ending address of every picture (photo) and character (controlled by software)
- Address: 20000~7FFFF: developed by user (can be erased)

3.7 RAM ADDRESS

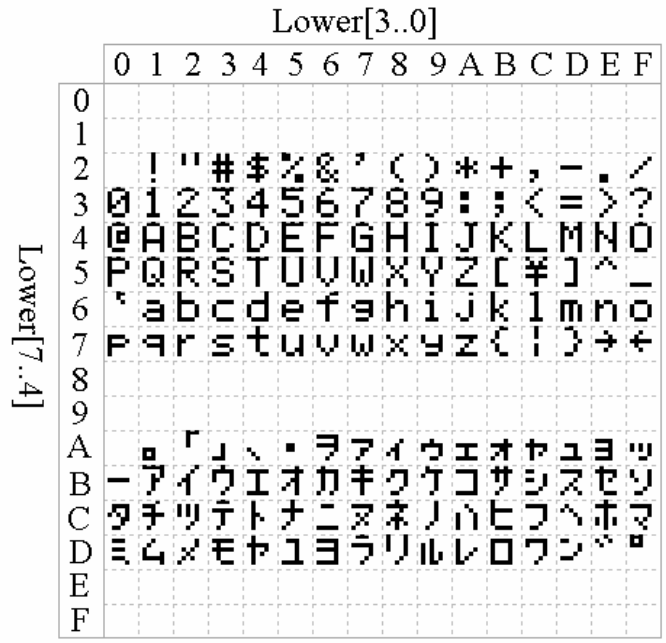
- Text Mode: 0h ~ 487Fh
- Graphics Mode: 18000h ~ 24A7Fh

3.8 TIMING CHARACTERISTICS

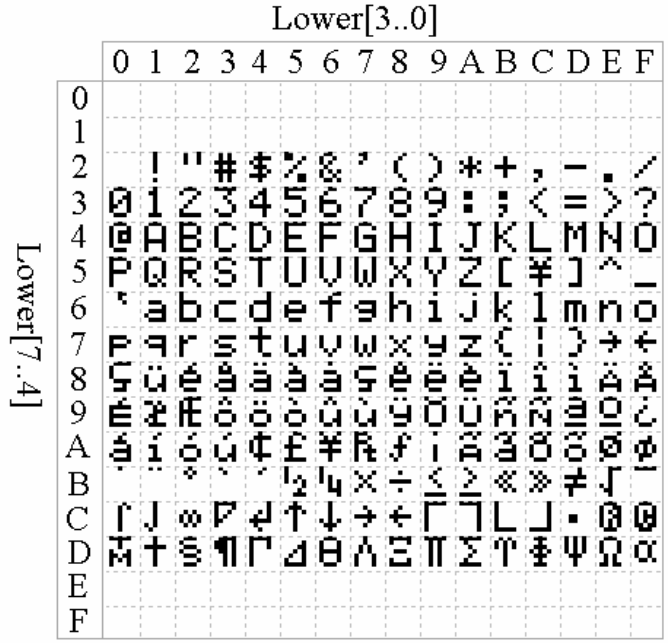
Note: Please reference the manufacturer's datasheet for the Hit1270 controller.

3.9 CHARACTER FONT

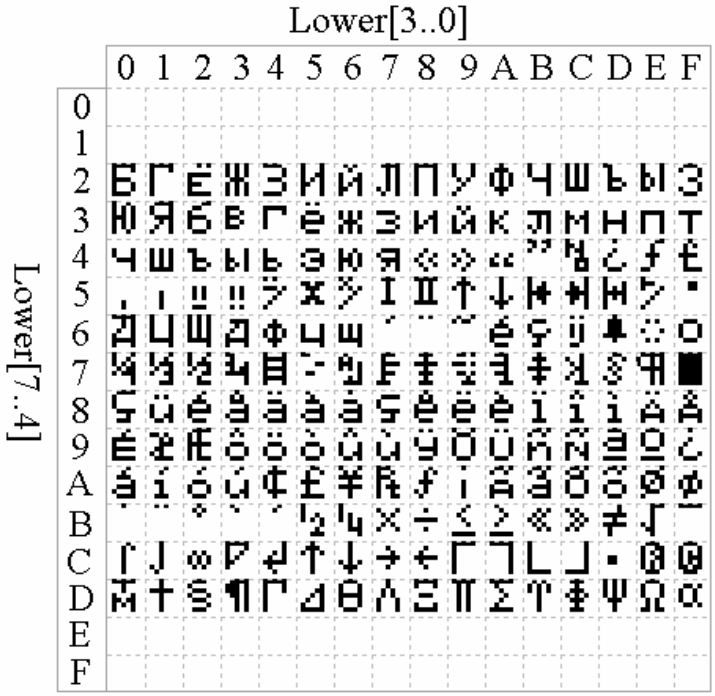
3.9.1 Address: 0 ~ 3FFF ------ 5X8 character font like English and Japanese.



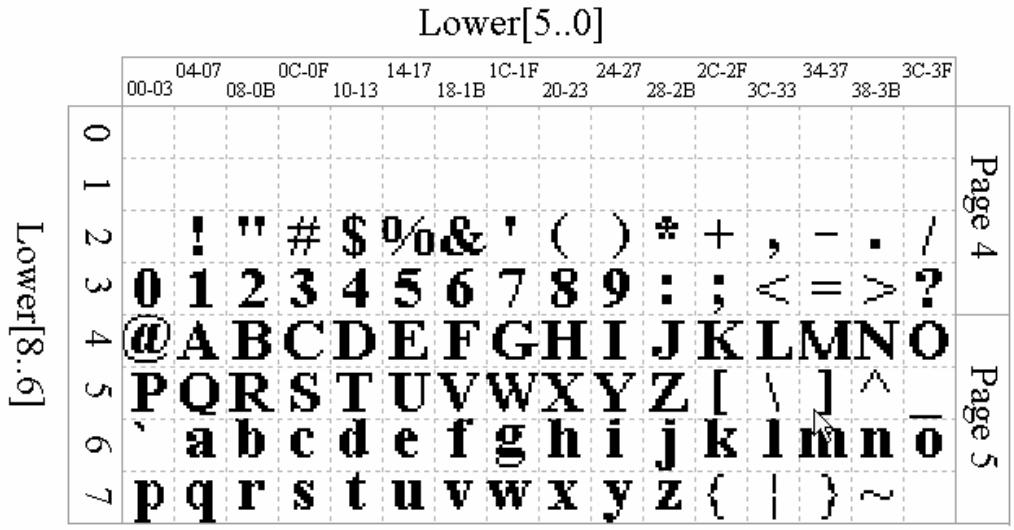
3.9.2 Address: 4000 ~ 7FFF ------ 5X8 character font like English European character.



3.9.3 Address: 8000 ~ BFFF ------ 5X8 character font like English European character.



3.9.4 Address: C000 ~ 13FFF ------ 16X16 character font like English character and number.



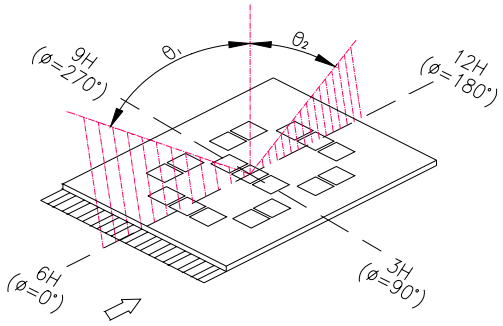
4 OPTICAL SPECIFICATION

4.1 OPTICAL CHARACTERISTICS

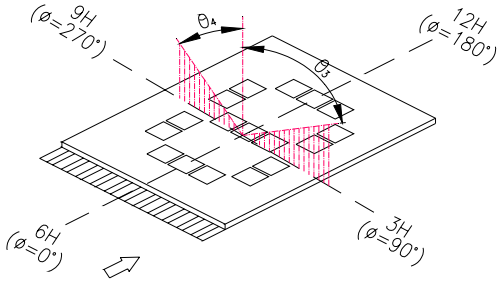
Ta = 25 °C

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Viewing Angle	*0°*	θ1 Down	CR≥2	--	50	--	deg	1
	180°	θ2 Up	CR≥2	--	30	--	deg	1
	90°	θ3 Right	CR≥2	--	50	--	deg	2
	270°	θ4 Left	CR≥2	--	30	--	deg	2
Contrast Ratio		CR	Ta = 25 °C	--	250	--	-	3
Response Time		Tr	Ta = 25 °C	--	15	30	ms	4
		Tf	Ta = 25 °C	--	20	40		
Driving Method		Duty	1/234					
LCD Type		TFT – (Negative / Transmissive)						
Viewing Direction		6:00						

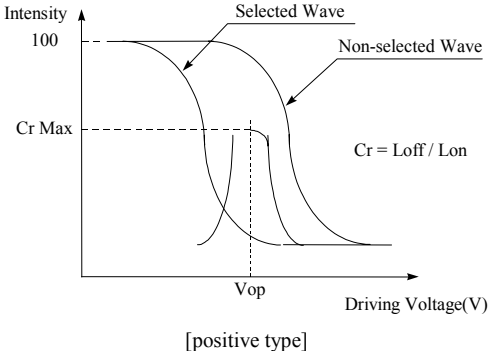
Note 1: definition of viewing angle θ1 & θ2



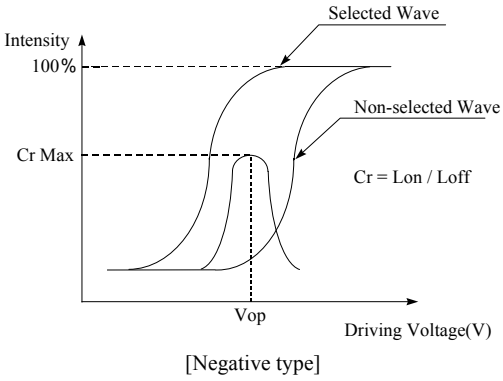
Note 2: definition of viewing angle θ3 & θ4



Note 3: definition of contrast ratio (CR)

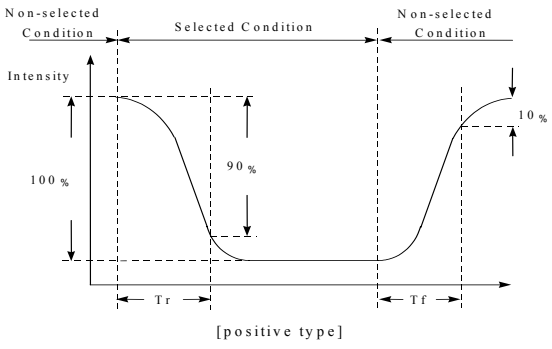


[positive type]

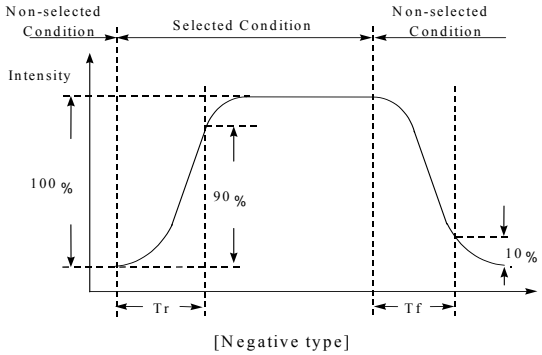


[Negative type]

Note 4: definition of response time



[positive type]



[Negative type]

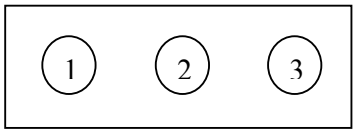
5 BACKLIGHT SPECIFICATION

5.1 Edge CCFL B/L Operating Range

Item	Conditions	Standard			Unit	Remark
		Min.	Typ.	Max.		
Starting voltage	Ta = 0 C	---	---	910	Vrms	
	Ta = 25 C	---	---	650	Vrms	
Lamp voltage	Ta = 25 C	---	470	528	Vrms	
Lamp current	Ta = 25 C	5.9	6.0	6.1	mA	
Oscillation frequency	Ta = 25 C	---	60.0	80.0	KHz	
Lamp life	Ta = 25 C , IL = 6 mA Humidity : 30%RH ~ 85%RH	---	20,000	---	Hrs	Note 3
Operating Temp.	Humidity : 30%RH ~ 85%RH	0	---	60	C	
Storage Temp.	Humidity : 30%RH ~ 85%RH	-30	---	80	C	
Brightness uniformity	Ta = 25 C , IL = 6 mA	80	---	---	%	Note 1
Average brightness of white	Ta = 25 C , IL = 6 mA	250	300	---		Note 2

Note :

1 : Average brightness of 3 points when B/L is used at the beginning.
2 : Brightness uniformity = (MIN / MAX) x 100 %
3 : Half of the original average brightness.



6 QUALITY ASSURANCE SPECIFICATION

6.1 CONFORMITY

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

6.2 DELIVERY ASSURANCE

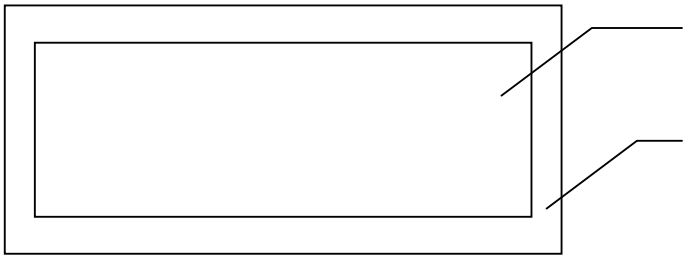
6.2.1 Delivery inspection standards

- 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:

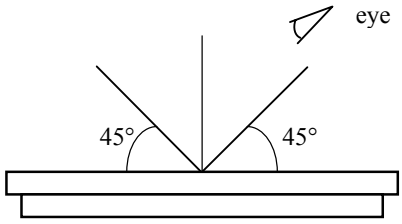
Class	**AQL (%)**
Critical defect	0.5%
Major defect	1.0%
Minor defect	1.5%
TOTAL	2.0%

6.2.2 Zone definition



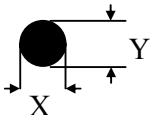
6.2.3 Visual inspection

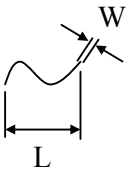
- Inspect under 2x20W or 40W fluorescent lamp (approximately 3000 lux) leaving 25 to 30 cm between the module and the lamp and 30 cm between the module and the eye (measuring position).
- Appearance is inspected at the best contrast voltage (best contrast is adjusted considering clearness and crosstalk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

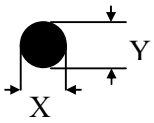


6.2.3.1 Standard of appearance inspection

Units: mm

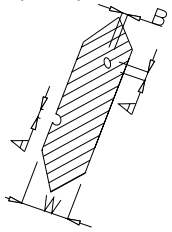
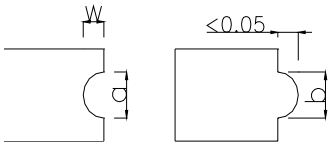
<table>
<tr><th>Class</th><th>Item</th><th colspan="3">Criteria</th></tr>
<tr><td>Minor</td><td rowspan="2">Packing & Label</td><td>Outside & inside package</td><td colspan="2">Presence of product no., lot no., quantity</td></tr>
<tr><td>Critical</td><td colspan="3">Product must not be mixed with others and quantity must not be different from that indicated on the label</td></tr>
<tr><td>Major</td><td>Dimension</td><td colspan="3">Product dimensions must be according to specification and drawing</td></tr>
<tr><td>Major</td><td>Electrical</td><td colspan="3">Product electrical characteristics must be according to specification</td></tr>
<tr><td>Critical</td><td>LCD Display</td><td colspan="3">Missing lines or wrong patterns on LCD display are not allowed</td></tr>
<tr><td>Minor</td><td>Black spot, white spot, dust</td><td colspan="3">Round type: as per following drawing
∅ = (X+Y)/2
 

<table><tr><th colspan="3">Acceptable quantity</th></tr><tr><th>Size</th><th>Zone A</th><th>Zone B</th></tr><tr><td>∅<0.1</td><td>Any number</td><td rowspan="4">Any number</td></tr><tr><td>0.1<∅<0.2</td><td>2</td></tr><tr><td>0.2<∅<0.25</td><td>1</td></tr><tr><td>0.25<∅</td><td>0</td></tr></table>
Line type: as per following drawing
 

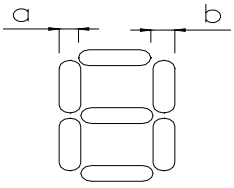
<table><tr><th colspan="4">Acceptable quantity</th></tr><tr><th>Length</th><th>Width</th><th>Zone A</th><th>Zone B</th></tr><tr><td>- -</td><td>W≤0.02</td><td>Any number</td><td rowspan="4">Any number</td></tr><tr><td>L≤3.0</td><td>0.02<W≤0.03</td><td rowspan="2">2</td></tr><tr><td>L≤2.5</td><td>0.03<W≤0.05</td></tr><tr><td>- -</td><td>0.05<W</td><td>As round type</td></tr></table>
Total acceptable quantity: 3</td></tr>
<tr><td>Minor</td><td>Polariser scratch</td><td colspan="3">Scratch on protective film is permitted
Scratch on polariser: same as No. 1</td></tr>
<tr><td>Minor</td><td>Polariser bubble</td><td colspan="3">∅ = (X+Y)/2
 

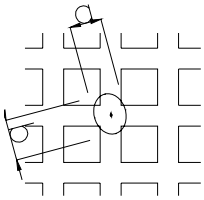
<table><tr><th colspan="3">Acceptable quantity</th></tr><tr><th>Size</th><th>Zone A</th><th>Zone B</th></tr><tr><td>∅<0.2</td><td>Any number</td><td rowspan="4">Any number</td></tr><tr><td>0.2<∅<0.5</td><td>2</td></tr><tr><td>0.5<∅<1.0</td><td>1</td></tr><tr><td>1.0<∅</td><td>0</td></tr></table>
Total acceptable quantity: 3</td></tr>
</table>

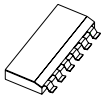
<table>
<tr><th>Class</th><th>Item</th><th>Criteria</th></tr>
<tr><td>Minor</td><td>Segment deformation</td><td>1.a. Pin hole on segmented display

W: segment width
∅ = (A+B)/2
 
<table><tr><td colspan="2">Acceptable quantity</td></tr><tr><td>Width</td><td>∅</td></tr><tr><td>W≤0.4</td><td>∅≤0.2 and ∅≤1/2W</td></tr><tr><td>W>0.4</td><td>∅≤0.25 and ∅≤1/3W</td></tr></table>Total acceptable quantity: 1 defect per segment
Pin holes with ∅ under 0.10 mm are acceptable</td></tr>
<tr><td>Minor</td><td>Segment deformation</td><td>1b. Pin hole on dot matrix display
 

<table><tr><td colspan="2">Acceptable quantity</td></tr><tr><td>Size</td><td></td></tr><tr><td>a,b<0.1</td><td>Any number</td></tr><tr><td>(a+b)/2≤0.1</td><td>Any number</td></tr><tr><td>0.5<∅<1.0</td><td>3</td></tr></table>Total acceptable quantity: 7

2. Segments / dots with different width
 

<table><tr><td colspan="2">Acceptable</td></tr><tr><td>a≥b</td><td>a/b≤4/3</td></tr><tr><td>a<b</td><td>a/b>4/3</td></tr></table>
3. Alignment layer defect
∅ = (a+b)/2
 
<table><tr><td colspan="2">Acceptable quantity</td></tr><tr><td>Size</td><td></td></tr><tr><td>∅≤0.4</td><td>Any number</td></tr><tr><td>0.4<∅≤1.0</td><td>5</td></tr><tr><td>1.0<∅≤1.5</td><td>3</td></tr><tr><td>1.5<∅≤2.0</td><td>2</td></tr></table>Total acceptable quantity: 7</td></tr>
<tr><td>Minor</td><td>Colour uniformity</td><td>Level of sample for approval set as limit sample</td></tr>
<tr><td>Critical</td><td rowspan="3">Backlight</td><td>The backlight colour should correspond to the product specification</td></tr>
<tr><td>Critical</td><td>Flashing and or unlit backlight is not allowed</td></tr>
<tr><td>Minor</td><td>Dust larger than 0.25 mm is not allowed</td></tr>
<tr><td>Major</td><td rowspan="3">COB</td><td>Exposed wire bond pad is not allowed</td></tr>
<tr><td>Major</td><td>Insufficient covering with resin is not allowed (wire bond line exposed)</td></tr>
<tr><td>Minor</td><td>Dust or bubble on the resin are not allowed</td></tr>
</table>

<table>
<tr><th>Class</th><th>Item</th><th>Criteria</th></tr>
<tr><td>Major</td><td rowspan="4">PCB
  </td><td>No unmelted solder paste should be present on PCB</td></tr>
<tr><td>Critical</td><td>Cold solder joints, missing solder connections, or oxidation are not allowed</td></tr>
<tr><td>Minor</td><td>No residue or solder balls on PCB are allowed</td></tr>
<tr><td>Critical</td><td>Short circuits on components are not allowed</td></tr>
<tr><td>Minor</td><td>Tray particles</td><td>
<table>
<tr><th></th><th>Size</th><th>Quantity</th></tr>
<tr><td rowspan="2">On tray</td><td>∅<0.2</td><td>Any number</td></tr>
<tr><td>∅>0.25</td><td>4</td></tr>
<tr><td rowspan="2">On display</td><td>∅≥0.25</td><td>2</td></tr>
<tr><td>L = 3</td><td>1</td></tr>
</table>
</td></tr>
</table>

7 RELIABILITY SPECIFICATION

7.1 RELIABILITY TESTS

Test Item	Test Condition	Evaluation and assessment
Operation at high temperature	60°C±2°C for 240 hours	No abnormalities in function* and appearance**
Low temperature	0°C±2°C for 240 hours	No abnormalities in function* and appearance**
Heat Shock	-30°C (30 min.) ->25°C (5 min.) ->80°C (30 min.) ->->25°C (5 min.) 5 cycle	No abnormalities in function* and appearance**
Vibration	10Hz ~ 55Hz 0.3mm / 1 Octave 55Hz ~ 500Hz 3g / 1 Octave 20 cycles / per axis	No abnormalities in function* and appearance**
Drop Shock	Drop Shock	No abnormalities in function* and appearance**
Current Consumption	< 3 times initial value	No abnormalities in function* and appearance**
Contrast	> ½ time initial value	No abnormalities in function* and appearance**

7.2 LIFE TIME

Item	Description
1	Function, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions of room temperature (25±10 °C), normal humidity (45±20% RH), and in area not exposed to direct sunlight.

8 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 Trichlorotriflorothane. 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°C ± 10°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).