LIQUID CRYSTAL DISPLAY MODULE

Product Specification

CUSTOMER	**Standard**
CUSTOMER PART NUMBER	
PRODUCT NUMBER	**DET104XGNLNT0M-1A**

Product Mgr	Design Eng
Bruno Recaldini	**Sunny**
Date: 17-Dec-13	Date: 17-Dec-13

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REVISION RECORD

Rev.	Date	Page	Chapt.	Comment	ECN no.
1.0	17-Dec-13			Initial Release	

1 MAIN FEATURES

| ITEM	CONTENTS
Screen Size	10.4" Diagonal
Display Format	1024 x RGB x 768 Dots
N° of Colour	16.7M/262K
Overall Dimensions	236.0 mm (H) x 167.9 mm (V) x 5.7 mm (D)
Active Area	211.2 mm (H) x 158.4 mm (V)
LCD Type	TFT
Mode	MVA Transmissive / Normally White
Viewing Direction	Full view
Electrical Interface	LVDS
Backlight Type	LED
Operating Temperature	-20°C ~ +70°C
Storage Temperature	-30°C ~ +80°C
RoHS compliant	Yes

2 MECHANICAL SPECIFICATION
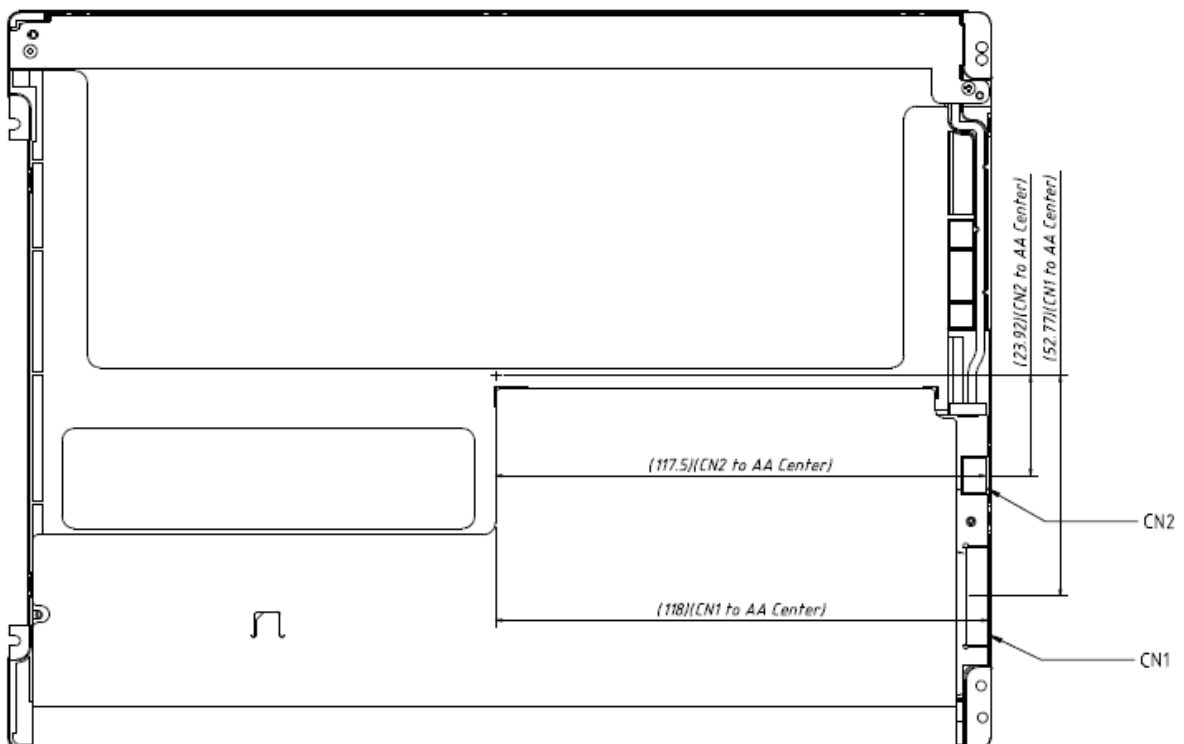
2.1 MECHANICAL CHARACTERISTICS

ITEM	CHARACTERISTIC	UNIT
Display Format	1024 x RGB x 768 Dots	Dots
Overall Dimensions	236.0 mm (H) x 167.9 mm (V) x 5.7 mm (D)	mm
Active Area	211.2 mm (H) x 158.4 mm (V)	mm
pixel Pitch	0.20625 (H) x 0.20625 (V)	mm
Weight	TBD	g

2.2 MECHANICAL DRAWING

Reference outline drawing: Front side
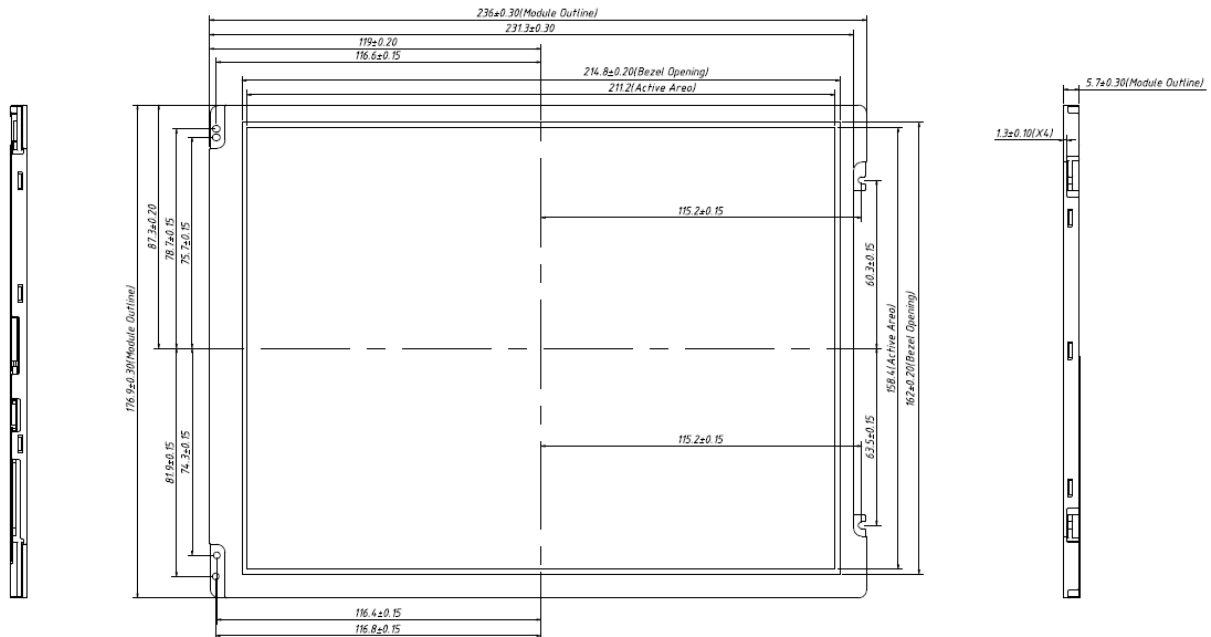
Reference outline drawing: Back side

3 ELECTRICAL SPECIFICATION

3.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Min	Max	Unit	Note
Operating Temperature	TOP		-20	70	°C	1
Storage Temperature	TST		-30	80	°C	1,2,3

Note 1. 90 % RH Max for Ta<50 °C, and 60% RH for Ta≥50°C.

Note 2. In case of below 0°C, the response time of liquid crystal (LC) becomes slower and the colour of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's characteristic.

Note 3. Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

3.2 INTERFACE PIN ASSIGNMENT

3.2.1 SIGNAL PIN ASSIGNMENT

Pin #	Signal Name	Description	Remarks
1	VDD	Power Supply, 3.3V (typical)	
2	VDD	Power Supply, 3.3V (typical)	
3	VSS	Ground	
4	REV	Reverse Scan selection	[H:Enable,L:Disable]
5	Rin1-	-LVDS differential data input	
6	Rin1+	+LVDS differential data input	
7	GND	Ground	
8	Rin2-	-LVDS differential data input	
9	Rin2+	+LVDS differential data input	
10	GND	Ground	
11	Rin3-	-LVDS differential data input	
12	Rin3+	+LVDS differential data input	
13	GND	Ground	
14	ClkIN-	-LVDS differential clock input	
15	ClkIN+	+LVDS differential clock input	
16	GND	Ground	
17	Rin4-	-LVDS differential clock input	
18	Rin4+	+LVDS differential clock input	
19	SEL68	6/8 bits LVDS data input selection	[H:8 bit L/NC:6 bit]
20	Bist	Internal use	

3.3 PIXEL DATA FORMAT
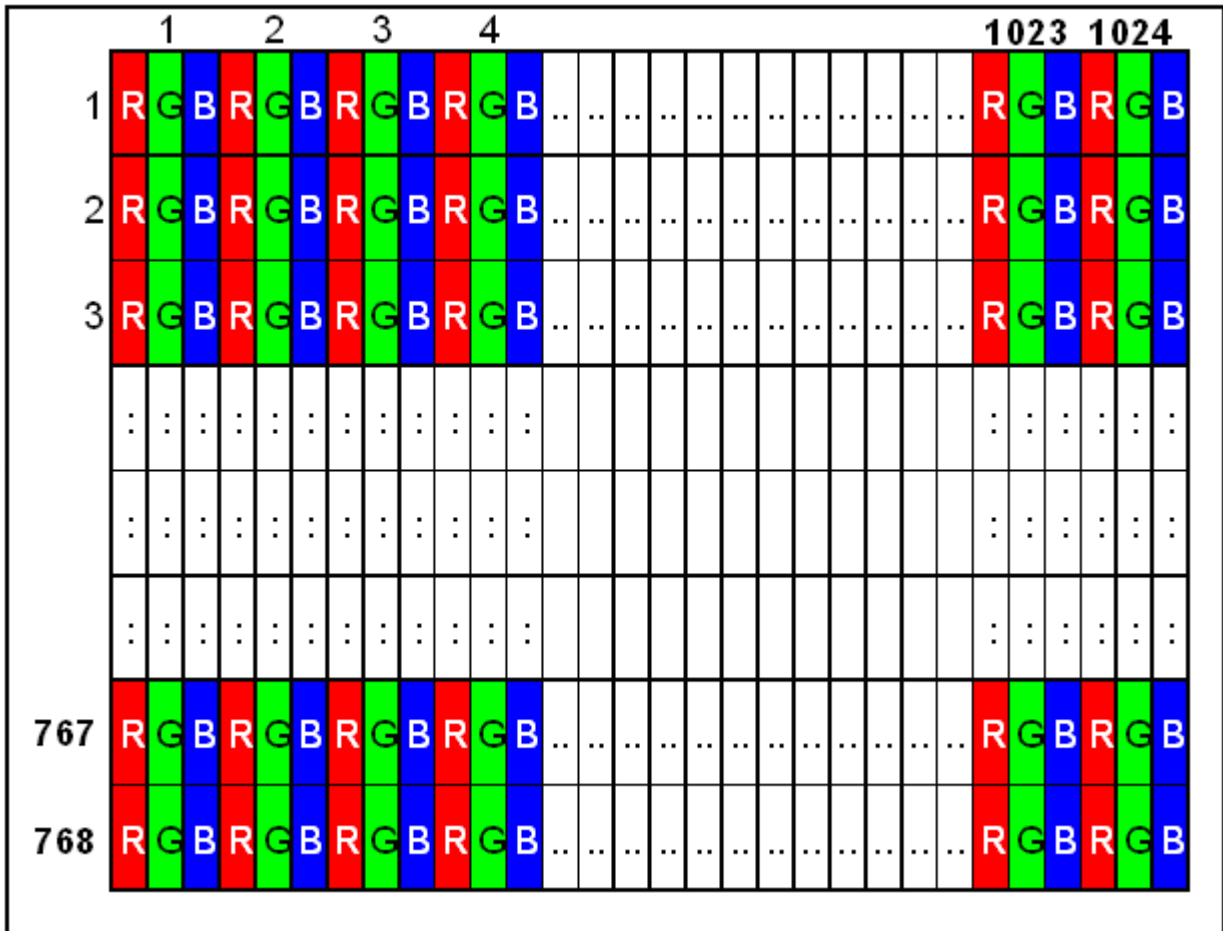
3.4 POWER SEQUENCE

IOVCC and VCI can be applied in any order.
VCI and IOVCC can be powered down in any order.
During power off, if LCD is in the Sleep Out mode, VCI and IOVCC must be powered down minimum 120msec after RESET has been released.
During power off, if LCD is in the Sleep In mode, IOVCC or VCI can be powered down minimum 0msec after RESET has been released.
CS can be applied at any timing or can be permanently grounded. RESET has priority over CS.
Note 1: There will be no damage to the display module if the power sequences are not met.
Note 2: There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.
Note 3: There will be no abnormal visible effects on the display between end of Power On Sequence and before receiving Sleep Out command. Also between receiving Sleep In command and Power Off Sequence.
Note 4: If RESET line is not held stable by host during Power On Sequence as defined in Sections 3.7.1 and 3.7.2, then it will be necessary to apply a Hardware Reset (RESET) after Host Power On Sequence is complete to ensure correct operation. Otherwise function is not guaranteed.

3.4.1 Case 1 – RESET line is held High or Unstable by Host at Power ON

If RESET (RESX) line is held High or unstable by the host during Power On, then a Hardware Reset must be applied after both VCI and IOVCC have been applied – otherwise correct functionality is not guaranteed. There is no timing restriction upon this hardware reset.
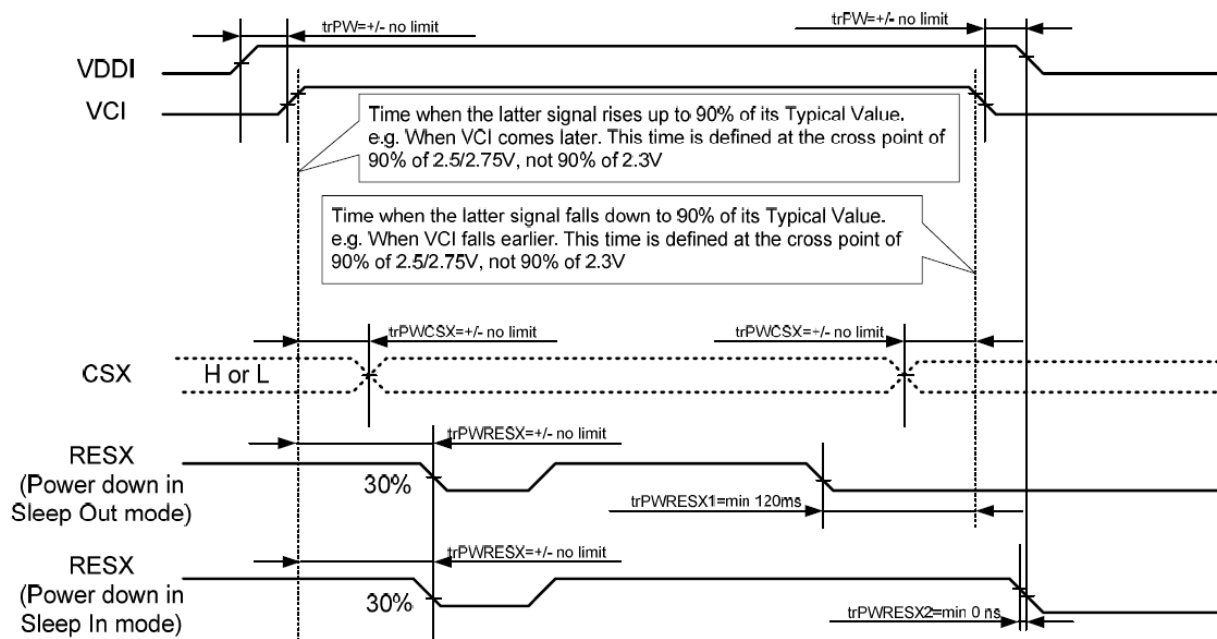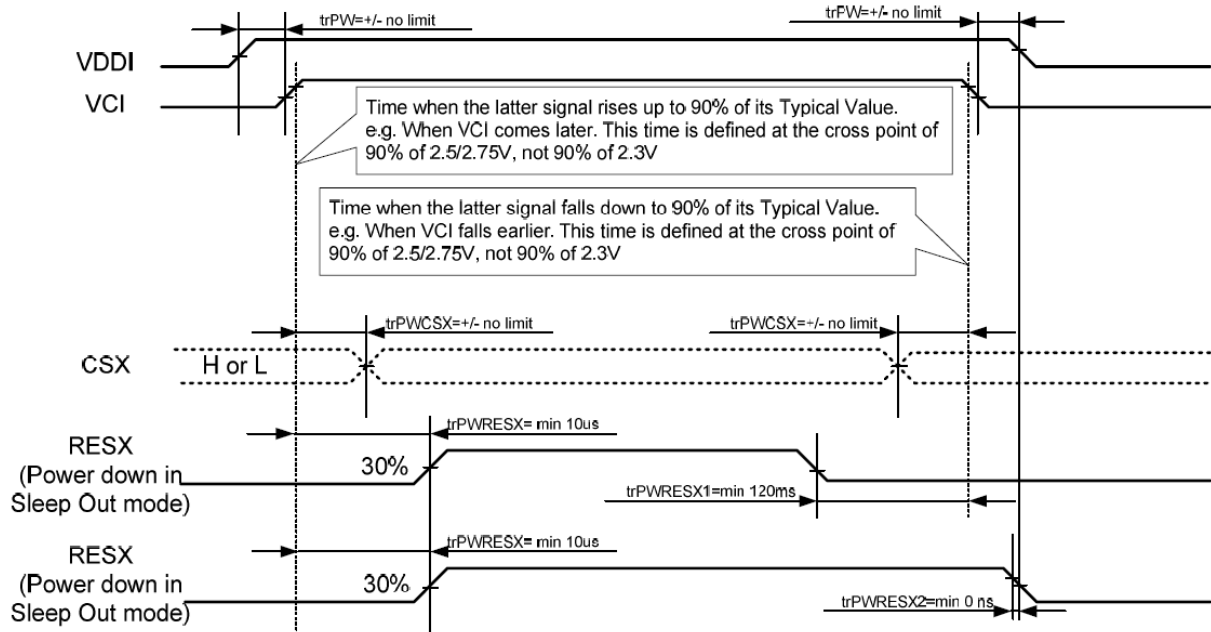

trPWRESX1 is applied to RESET (RESX) falling in the Sleep Out Mode
trPWRESX2 is applied to RESET (RESX) falling in the Sleep In Mode

3.4.2 Case 2 – RESET line is held Low by Host at Power ON

If RESET (RESX) line is held Low (and stable) by the host during Power On, then the RESET must be held low for minimum 10µsec after both VCI and IOVCC have been applied.

trPWRESX1 is applied to RESET (RESX) falling in the Sleep Out Mode
trPWRESX2 is applied to RESET (RESX) falling in the Sleep In Mode

3.4.3 Uncontrolled Power Off

The uncontrolled power off means a situation when e.g. there is removed a battery without the controlled power off sequence. There will not be any damages for the display module or the display module will not cause any damages for the host or lines of the interface. At an uncontrolled power off event, ILI9341 will force the display to blank and will not be any abnormal visible effects within 1 second on the display and remains blank until "Power On Sequence" actives.

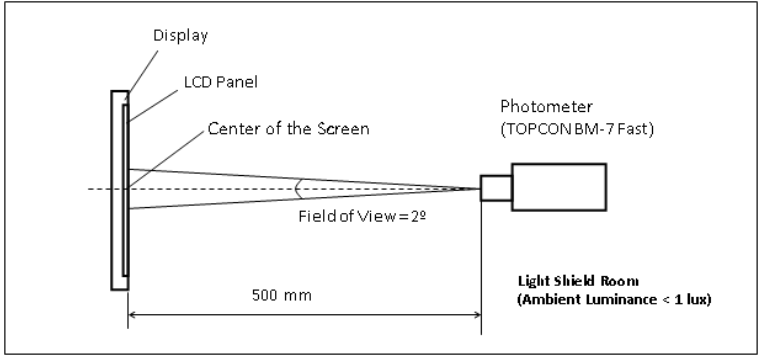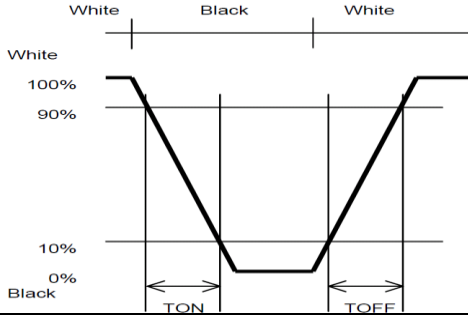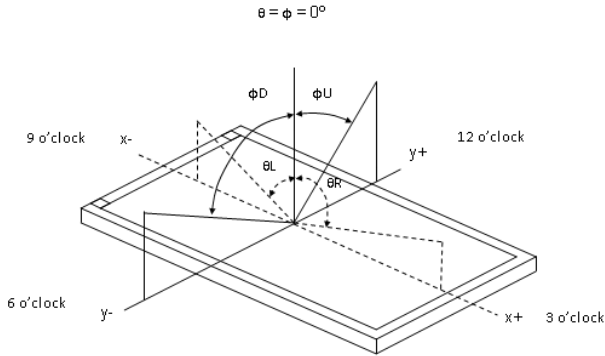For other settings and details please refer to ILI9341 data sheet.

4 OPTICAL SPECIFICATION

4.1 OPTICAL CHARACTERISTICS

Measuring instruments: LCD-5100, Eldim, Topcon BM-7
Driving condition: IOVCC = VCI = 2.8V, VSS = 0V
Backlight: IF=20mA
Measured temperature: Ta ＝ 25° C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Note
Response Time		TR+TF	θ=Φ=0° Normal Viewing Angle	-	16		ms	2
Contrast Ratio		CR			900	-		3
Viewing Angle	Left	θL	CR ≥ 10	70	80	-	deg	4
	Right	θR		70	80	-	deg	
	Up	φU		70	80	-	deg	
	Down	φD		70	80	-	deg	
Colour Chromaticity	Red	Rx	CR ≥ 10	TBD	TBD	TBD	-	5
		Ry		TBD	TBD	TBD	-	
	Green	Gx		TBD	TBD	TBD	-	
		Gy		TBD	TBD	TBD	-	
	Blue	Bx		TBD	TBD	TBD	-	
		By		TBD	TBD	TBD	-	
	White	Wx		0.255	0.305	0.335	-	
		Wy		0.275	0.325	0.375	-	
Centre Brightness				TBD	350	-	cd/m²	6
Brightness Distribution				75	80	-	%	7

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4.1.1 Test Method

Note	Item	Test method
1	Setup	The display should be stabilised at a given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilise the luminance, measurements should be executed after lighting the backlight for 30 minutes in a windless room.
2	Response time	Measure output signal waveform by the luminance meter when raster of window pattern is changed from white to black and from black to white.
3	Contrast ratio	Measure maximum brightness and minimum brightness at the centre of the screen by displaying raster or window pattern. Then calculate the ratio between these two values. $$\text{Contrast Ratio (CR)} = \frac{\text{Brightness of unselected position (white)}}{\text{Brightness of selected position (black)}}$$
4	Viewing angle Horizontal θ Vertical Ø	Move the luminance meter from right to left and up and down and determinate the angles where contrast ratio is 10
5	Colour chromaticity	Measure chromaticity coordinates x and y of CIE1931 colorimetric system
6	Centre brightness	Measure the brightness at the centre of the screen
7	Brightness distribution	(Brightness distribution)= 100 x B/A % A: max. brightness of the 9 points B: min. brightness of the 9 points

5 BACKLIGHT SPECIFICATION

5.1 LED INTERFACE CONNCETOR

Connector Name/ Designation

Connector Name/Designation	LED Driver Connector
Manufacturer	STM or Compatible
Connector Model Number	MSB24038P5A or Compatible

LED Connector Pin Assignment

Pin#	Symbol	Signal Name
1	Vcc	12 V
2	GND	GND
3	Enable	V-On/0V-Off
4	Dimming	PWM Dimming or Analog Dimming
5	NC	NC

6 QUALITY ASSURANCE SPECIFICATION

6.1 DELIVERY INSPECTION STANDARDS

6.1.1 Inspection Conditions

Inspection distance: 30 cm ± 2 cm
Viewing angle: ±45°
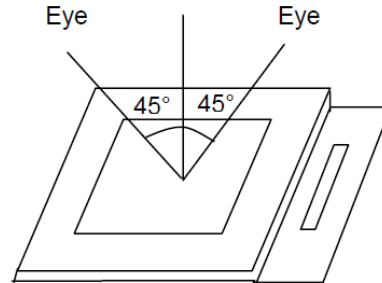
6.1.2 Environmental Conditions

Ambient temperature: 23°C ±5°C
Ambient humidity: 55±10% RH
Ambient illumination: 1000~1500 lux

6.1.3 Sampling Conditions

1. Lot size: quantity of shipment lot per model
2. Sampling method:

Sampling Plan		ANSI / ASQC Z1.4-1993
		Normal inspection, Single Sampling
AQL	Major Defect	0.65%
	Minor Defect	1.5%

6.1.4 Definition of Area
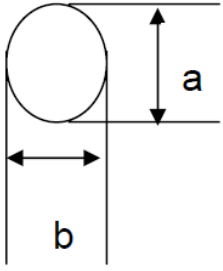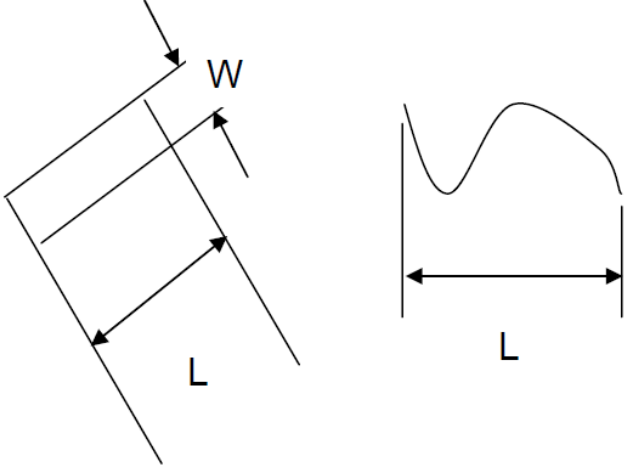
A zone: active area
B zone: viewing area
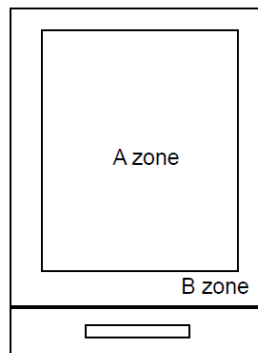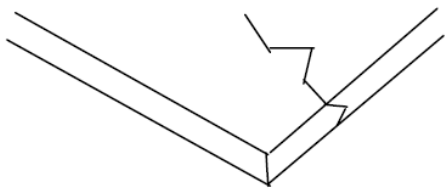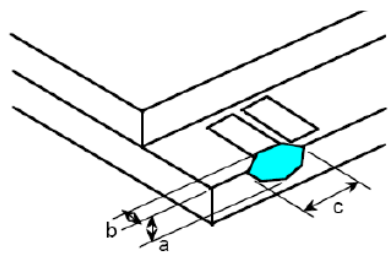
6.1.5 Basic Principle
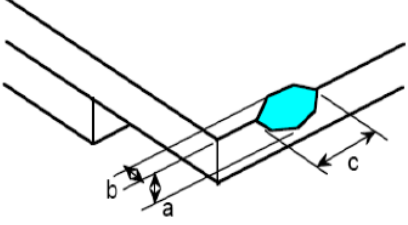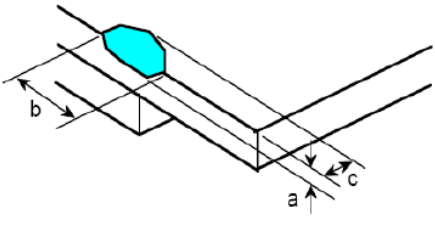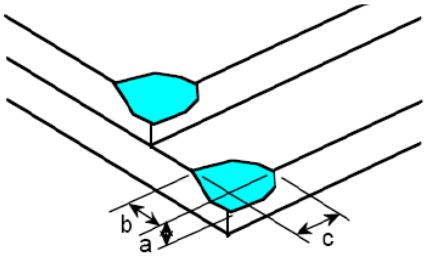
A set of sample to indicate the limit of acceptable quality level shall be discussed should a dispute occur.

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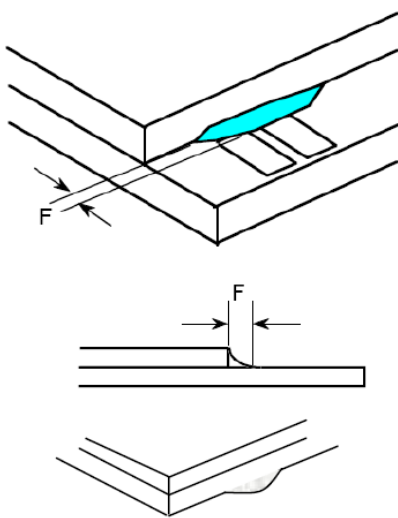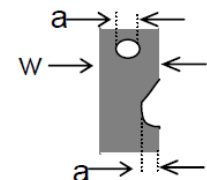
6.1.6 Inspection Criteria

No.	Item	Criteria (Unit: mm)		
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	 $\varphi = (a + b)/2$		

Table within No. 01 criteria:

Size \ Area	Acc. Qty
$\varphi \leq 0.10$	Ignore
$0.10 < \varphi \leq 0.15$	2
$0.15 < \varphi \leq 0.25$	1
$0.25 < \varphi$	0
Total	2 no include $\varphi \leq 0.10$

Distance between 2 defects should more than 3mm apart.

No.	Item	Criteria (Unit: mm)
02	Black and White line Scratch Foreign material (Line type) (Minor defect)	

Length	Width	Acc. Qty
/	W $\leqq$ 0.03	Ignore
L $\leqq$ 2.5	0.03 $<$ W $\leqq$ 0.05	3
L $\leqq$ 2.5	0.05 $<$ W $\leqq$ 0.10	2
/	0.1 $<$ W	0
Total		3

Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.

| 03 | Glass Crack (Minor defect) | |

Crack is potential to enlarge, any type is not allowed.

| 04 | Glass   Chipping Pad Area: (Minor defect) | |

Length and Width	Acc. Qty
c > 3.0, b< 1.0	1
c< 3.0, b< 1.0	3
a<Glass Thickness	

05	Glass Chipping Rear of Pad Area: (Minor defect)	Length and Width	Acc. Qty
		c > 3.0, b< 1.0	1
		c< 3.0, b< 1.0	2
		c< 3.0, b< 0.5	4
		a<Glass Thickness	

06	Glass Chipping Except Pad Area: (Minor defect)	Length and Width	Acc. Qty
		c > 3.0, b< 1.0	1
		c< 3.0, b< 1.0	2
		c< 3.0, b< 0.5	4
		a<Glass Thickness	

07	Glass Corner Chipping: (Minor defect)	Length and Width	Acc. Qty
		c < 3.0, b< 3.0	Ignore
		a<Glass Thickness	

08	Glass Burr: (Minor defect) 	**Length / Acc. Qty** 	Length	Acc. Qty
---	---
F < 1.0	Ignore	 Glass burr don't affect assemble and module dimension.
09	FPC Defect: (Minor defect) 	9.1 Dent, pinhole width a<w/3. (w: circuitry width.) 9.2 Open circuit is unacceptable. 9.3 No oxidation, contamination and distortion.
10	Bubble on Polarizer (Minor defect)		Diameter	Acc. Qty
---	---
φ≤0.20	Ignore
0.20 <φ≤0.30	4
0.30 < φ	None	
11	Dent on Polarizer (Minor defect)		Diameter	Acc. Qty
---	---
φ≤0.20	Ignore
0.20 <φ≤0.30	4
0.30 < φ	None	
12	Bezel	12.1 No rust, distortion on the Bezel. 12.2 No visible fingerprints, stains or other contamination.

13	Touch Panel	D: Diameter W: width L: length 13.1 Spot: D<0.25 is acceptable $\qquad$ 0.25≤D≤0.4 2dots are acceptable and the distance between defects should more than 10 mm. $\qquad$ D>0.4 is unacceptable 13.2 Dent: D>0.40 is unacceptable 13.3 Scratch: W≤0.03, L≤10 is acceptable, $\qquad$ 0.03<W≤0.10, L≤10 is acceptable Distance between 2 defects should more than 10 mm. $\qquad$ W>0.10 is unacceptable.
14	PCB	14.1 No distortion or contamination on PCB terminals. 14.2 All components on PCB must same as documented on the BOM/component layout. 14.3 Follow IPC-A-600F.
15	Soldering	Follow IPC-A-610C standard
16	Electrical Defect (Major defect)	The below defects must be rejected. 16.1 Missing vertical / horizontal segment, 16.2 Abnormal Display. 16.3 No function or no display. 16.4 Current exceeds product specifications. 16.5 LCD viewing angle defect. 16.6 No Backlight. 16.7 Dark Backlight. 16.8 Touch Panel no function. 16.9 Dark Dot –one Allowed. 16.10 Bright Dot – one Allowed. Remark: 1. A pixel defect is acceptable if one color is none functional and causes a bright dot. The display may have one case where one color is out and cause a dark dot. 2. Bright dot caused by scratch and foreign object accords to item 1.

Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

6.1.7 Classification of Defects

Visual defects (except no or wrong label) are treated as minor defects, while electrical defects are treated as major defects.
Two minor defects are equal to one major defect in lot sampling inspection.

6.1.8 Identification / marking criteria

Any unit with illegible / wrong / double or no marking / label shall be rejected.

6.2 DEALING WITH CUSTOMER COMPLAINTS

6.2.1 Non-conforming analysis

Purchaser should supply Densitron with detailed data of non-conforming sample.
After accepting it, Densitron should complete the analysis in two weeks from receiving the sample.
If the analysis cannot be completed on time, Densitron must inform the purchaser.

6.2.2 Handling of non-conforming displays

If any non-conforming displays are found during customer acceptance inspection which Densitron is clearly responsible for, return them to Densitron.
Both Densitron and customer should analyse the reason and discuss the handling of non-conforming displays when the reason is not clear.
Equally, both sides should discuss and come to agreement for issues pertaining to modification of Densitron quality assurance standard.

7   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).

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