

LIQUID CRYSTAL DISPLAY MODULE

Product Specification

CUSTOMER	Standard
CUSTOMER PART NUMBER	
PRODUCT NUMBER	DET090WVNTNT0N-1A

Product Mgr	Design Eng
Bruno Recaldini	Sunny
Date: 23-Dec-13	Date: 23-Dec-13

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REVISION RECORD

Rev.	Date	Page	Chapt.	Comment	ECN no.
1.0	23-Dec-13			Initial Release	

1 MAIN FEATURES

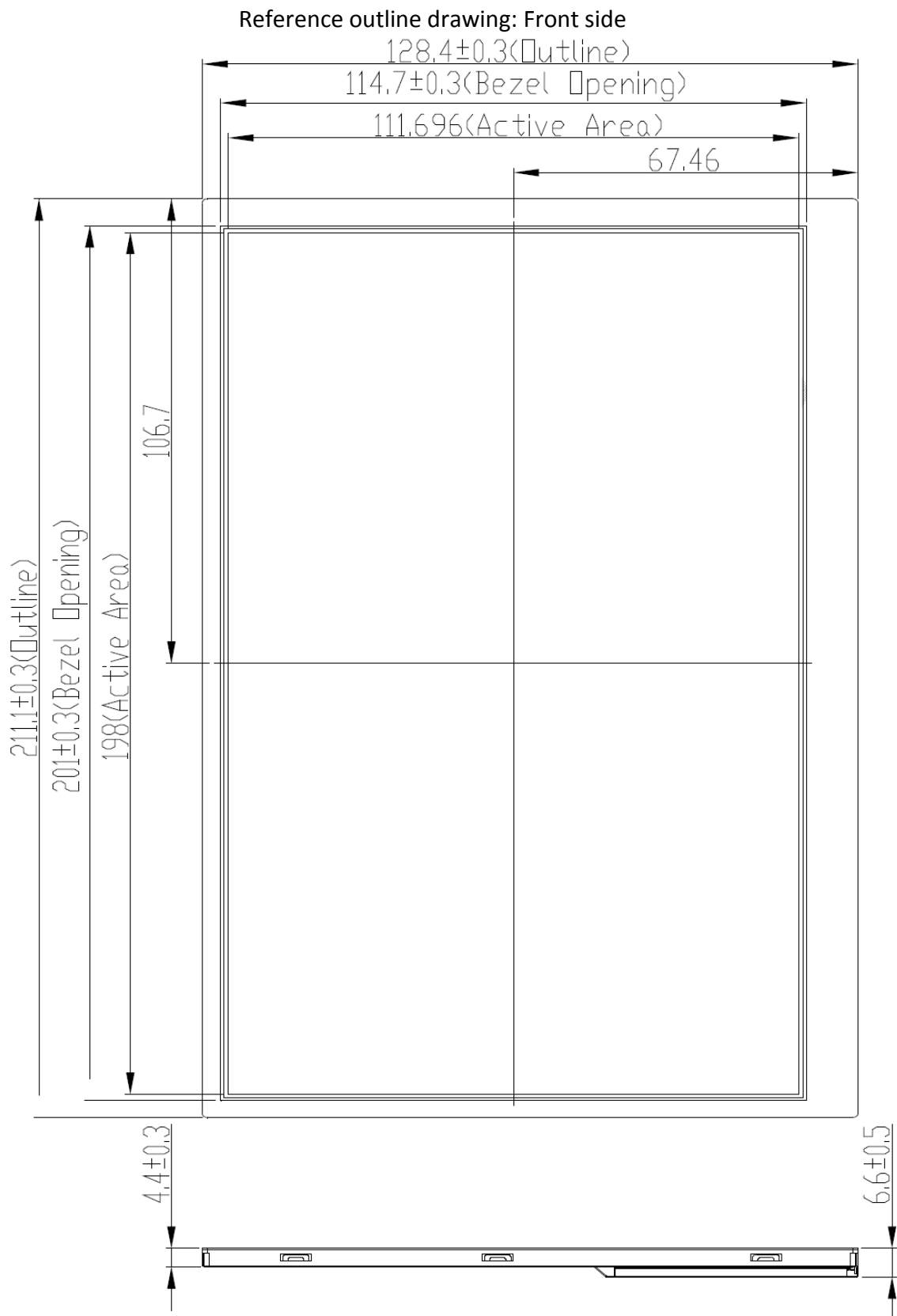
ITEM	CONTENTS
Screen Size	9" Diagonal
Display Format	800 x RGB x 480 Dots
N° of Colour	16.7M (6 bits+ HFRC)
Overall Dimensions	211.1 mm (H) x 128.4 mm (V) x 6.6 mm (D)
Active Area	198.0 mm (H) x 111.696 mm (V)
LCD Type	TFT
Mode	Normally White
Viewing Direction	6 O'clock
Electrical Interface	TTL
Backlight Type	LED
Temperature	-20°C ~ +75°C
Storage Temperature	-30°C ~ +80°C
RoHS compliant	Yes

2 MECHANICAL SPECIFICATION

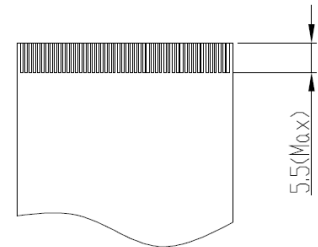
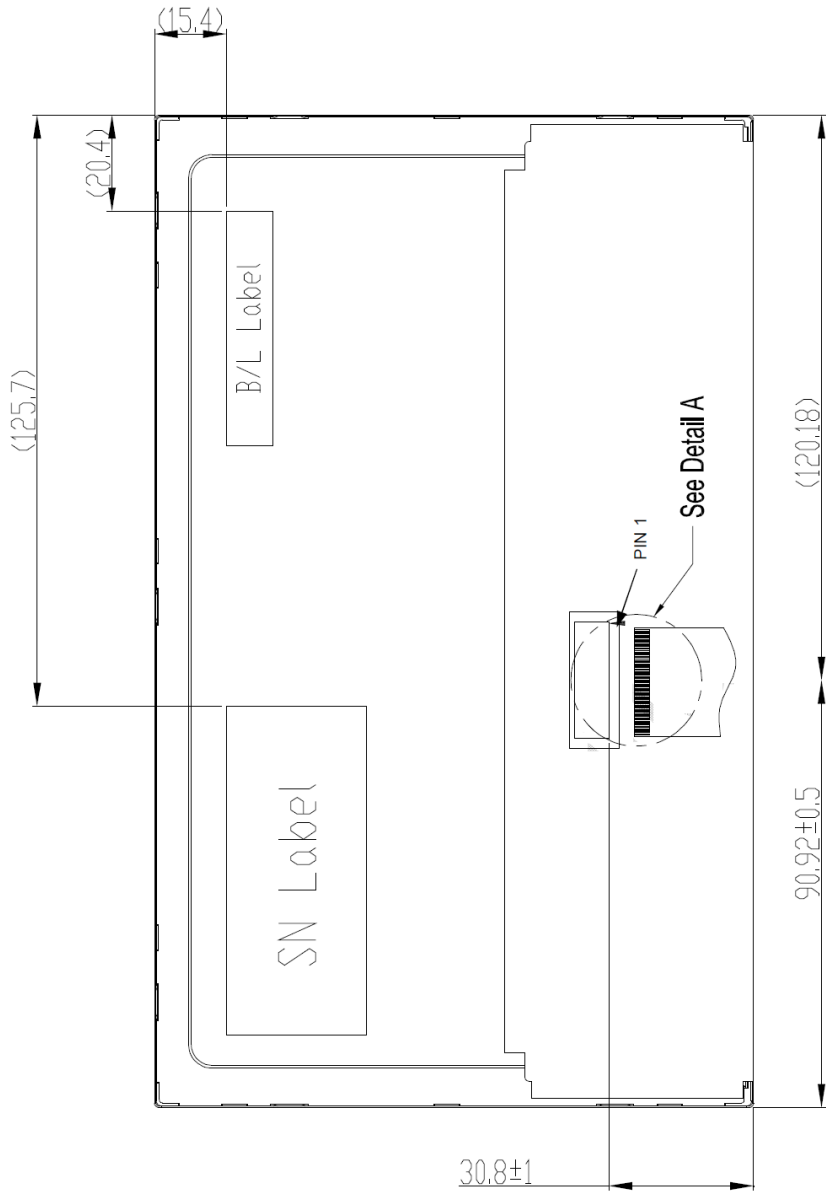
2.1 MECHANICAL CHARACTERISTICS

ITEM	CHARACTERISTIC	UNIT
Display Format	800 x RGB x 480 Dots	Dots
Overall Dimensions	211.1 mm (H) x 128.4 mm (V) x 6.6 mm (D)	mm
Active Area	198.0 mm (H) x 111.696 mm (V)	mm
pixel Pitch	0.0825 (H) x 0.2327 (V)	mm
Weight	TBD	g

2.2 MECHANICAL DRAWING



Reference outline drawing: Back side



Detail A
Scale 2:1

3 Electrical Specification

3.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Min	Max	Unit	Note
Supply Voltage	VDD		-0.3	4.0	V	
Operating Temperature	TOP		-20	75	°C	1
Storage Temperature	TST		-30	80	°C	1,2,3
Operating Humidity	HOP		10	90	%RH	
Storage Humidity	HST		10	90	%RH	

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

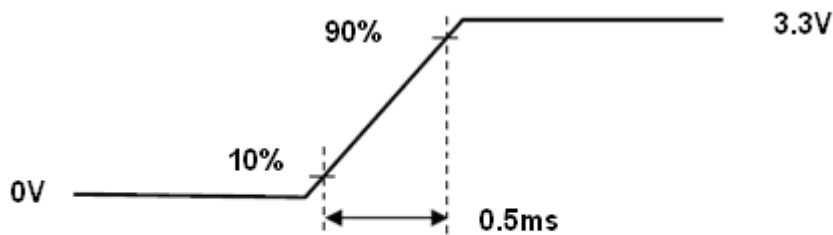
Note 2. In case of below 0°C, the response time of liquid crystal (LC) becomes slower and the colour of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's characteristic.

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

3.2 ELECTRICAL CHARACTERISTICS

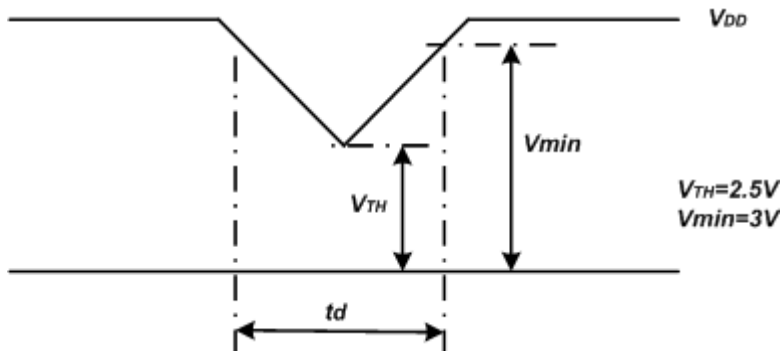
Symbol	Parameter	Min.	Typ.	Max.	Units	Condition
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	V	-
IDD	VDD current	-	0.1	-	A	-
PDD	VDD Power	-	-	0.7	W	Black Pattern. 60Hz
Irush	Rush Current	-	-	1.5	A	Note1
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	200	[mV]p-p	Note2

Note1: Measure Condition



VDD rising time

Note2. VDD Power Dip Condition



If $V_{th} < VDD \leq V_{min}$, then $t_d \leq 10ms$; when the voltage return to normal our panel must revive automatically.

3.3 INTERFACE PIN ASSIGNMENT

SIGNAL PIN ASSIGNMENT

Type/Part number: 089H50-000000-G2-R

Pin #	Signal Name	Description	Remarks
1	GND	Ground	
2	GND	Ground	
3	VDD	Power Supply	3.3V (typical)
4	VDD	Power Supply	3.3V (typical)
5	UPDN	Gate up or down scan control	
6	Rin1+	Source right or left sequence control	
7	GND	Ground	
8	R0	Data input (LSB)	
9	R1	Data input	
10	R2	Data input	
11	R3	Data input	
12	GND	Ground	
13	R4	Data input	
14	R5	Data input	
15	GND	Ground	
16	R6	Data input	
17	R7	Data input (MSB)	
18	GND	Ground	
19	G0	Data input (LSB)	[H:8 bit L/NC:6 bit]
20	G1	Data input	
21	G2	Data input	
22	G3	Data input	
23	GND	Ground	
24	G4	Data input	
25	G5	Data input	
26	GND	Ground	
27	G6	Data input	
28	G7	Data input (MSB)	
29	GND	Ground	
30	B0	Data input (LSB)	
31	B1	Data input	
32	B2	Data input	
33	B3	Data input	
34	GND	Ground	
35	B4	Data input	
36	B5	Data input	
37	GND	Ground	
38	B6	Data input	
39	B7	Data input (MSB)	

40	GND	Ground	
41	DCLK	Clock input	
42	GND	Ground	
43	DE	Data Input Enable	
44	BIST	Aging Mode	High Enable
45	GND	Ground	
46	GND	Ground	
47	LED_PWM	System PWM Signal Input	
48	LED_EN	LED Enable Pin	
49	VLED	LED Power Supply	
50	VLED	LED Power Supply	

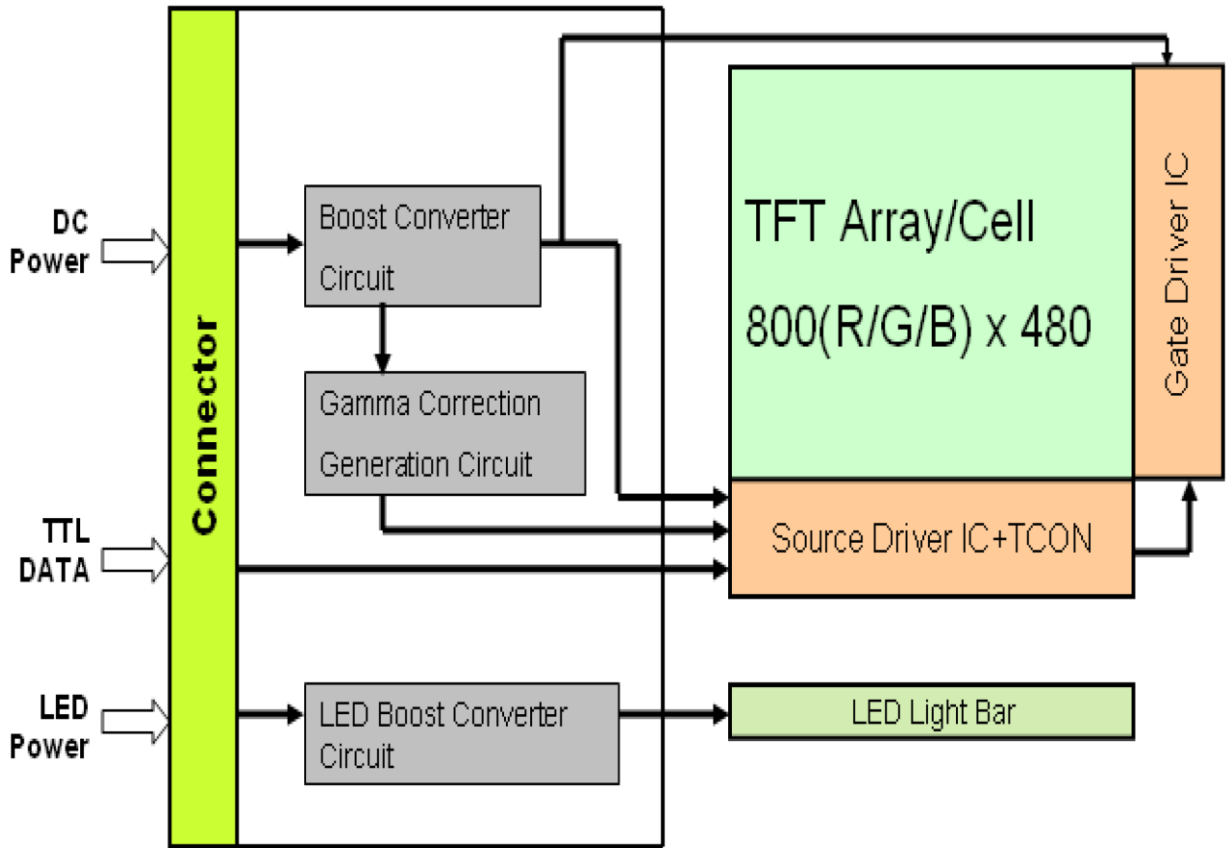
Note1: When input 18 bits RGB data, the two low bits of R, G and B data must be grounded.

Note2: Data should be latched at falling edge of DCLK

Note3: Selection of scanning mode

Setting of scan control input		Scanning Direction
SHLR	UPDN	
VDD	GND	Left to Right, Up to Down
GND	GND	Right to Left, Up to Down
VDD	VDD	Left to Right, Down to Up
GND	VDD	Right to Left, Down to Up

3.4 BLOCK DIAGRAM



3.5 TIMING CHARACTERISTICS

3.5.1 Interface timing

Synchronization Method : DE only

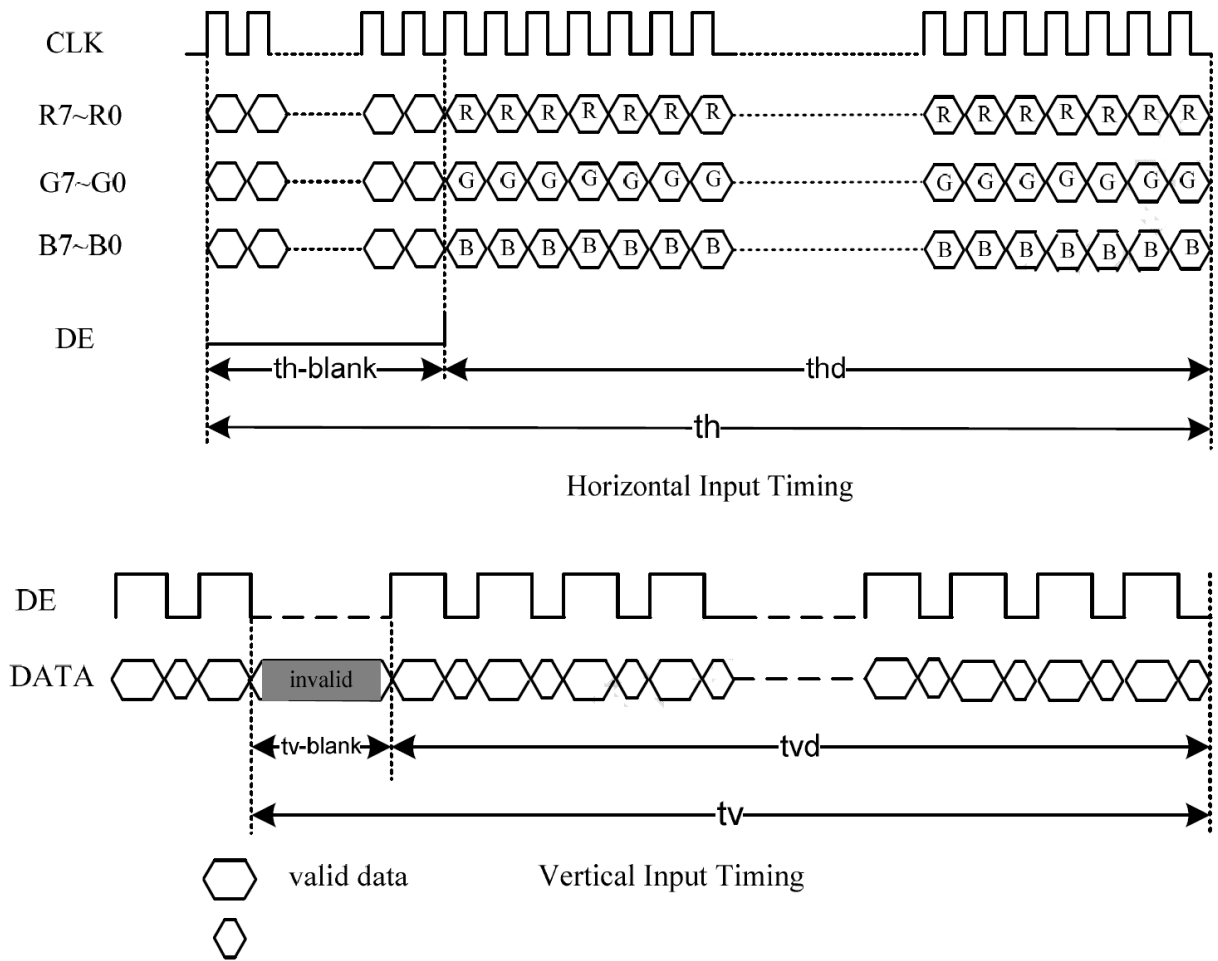
Parameter	Symbol	Min	Typ	Max	Unit	Note
DCLK Frequency	fclk	28	30	40	MHz	-
Horizontal Display Area	thd	800			DCLK	-
One Horizontal Line	th	908	928	1080	DCLK	-
H Blank Area	th-blank	108	128	280	DCLK	-
Vertical Display Area	tvd	480			H	-
V Period time	tv	517	525	704	H	-
V Blank Area	tv-blank	37	45	224	H	-

Note: H Blank area and V Blank area can not be changed at every frame
DC Electrical

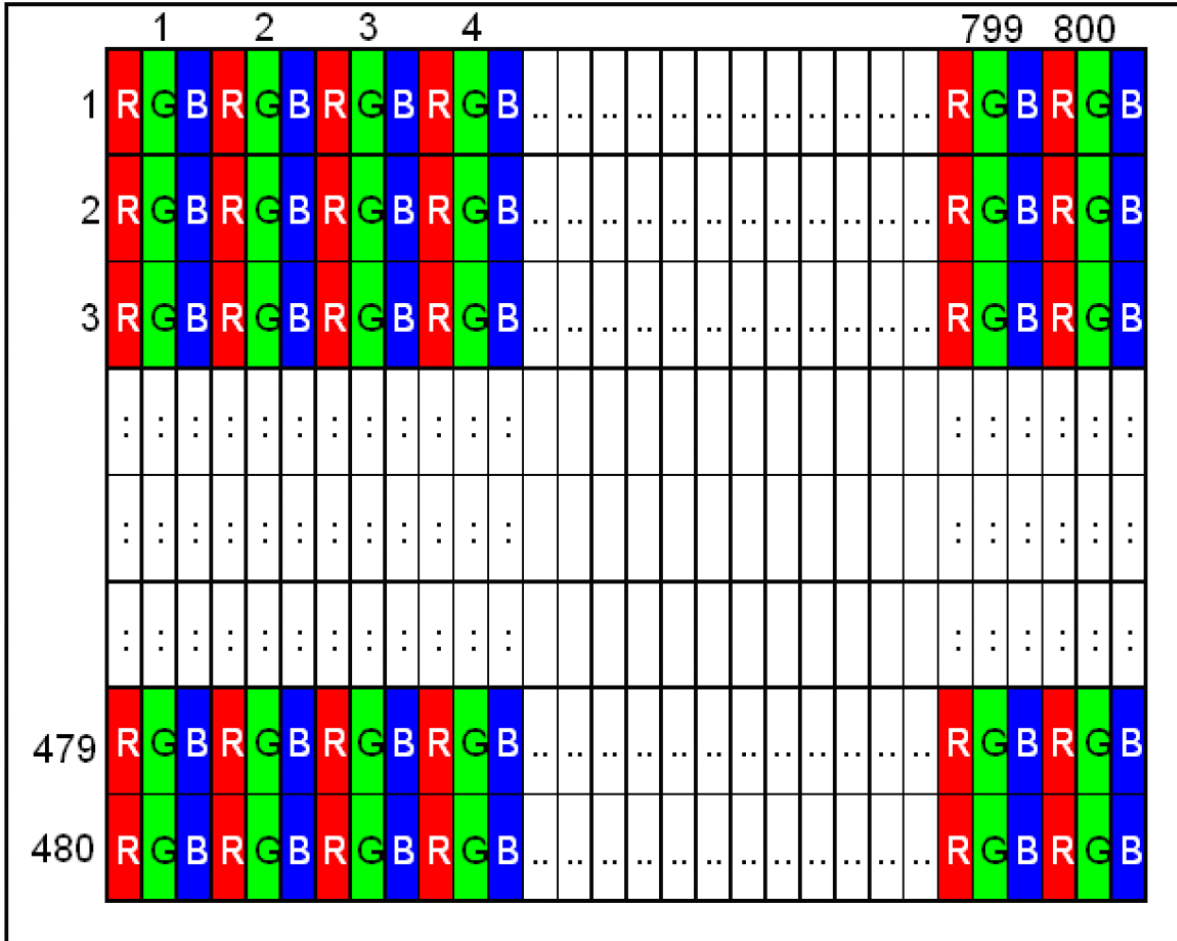
(VDD=2.7 to 3.6V ,TA=-20 to +85°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Low level input voltage	Vil	0	-	0.3*VDD	V	For the digital circuit
High level input voltage	Vih	0.7*VDD	-	VDD	V	For the digital circuit

3.5.2 TIMING DIAGRAM AND INTERFACE SIGNAL



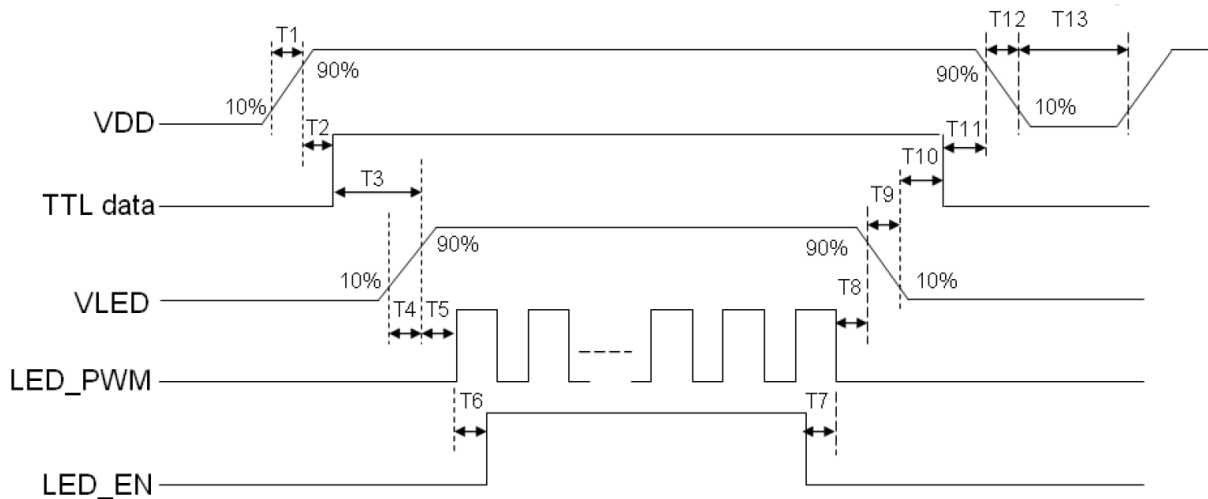
3.6 PIXEL DATA FORMAT



3.7 POWER SEQUENCE

Power ON/OFF Sequence

VDD power on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Power Sequencing Requirements

Parameter	Symbol	Unit	Min	Typ	Max
VDD Rise Time	T1	ms	0.5	--	10
VDD Good to Signal Valid	T2	ms	30	--	90
Signal Valid to Backlight On	T3	ms	200	--	--
Backlight Power On Time	T4	ms	0.5	--	--
Backlight Power Good to System PWM On	T5	ms	10	--	--
System PWM ON to Backlight Enable On	T6	ms	10	--	--
Backlight Enable Off to System PWM Off	T7	ms	0	--	--
System PWM Off to B/L Power Disable	T8	ms	10	--	--
Backlight Power Off Time	T9	ms	--	10	30
Backlight Off to Signal Disable	T10	ms	200	--	--
Signal Disable to VDD Down	T11	ms	0	--	50
VDD Fall Time	T12	ms	1	--	30
VDD Off Time	T13	ms	500	--	--

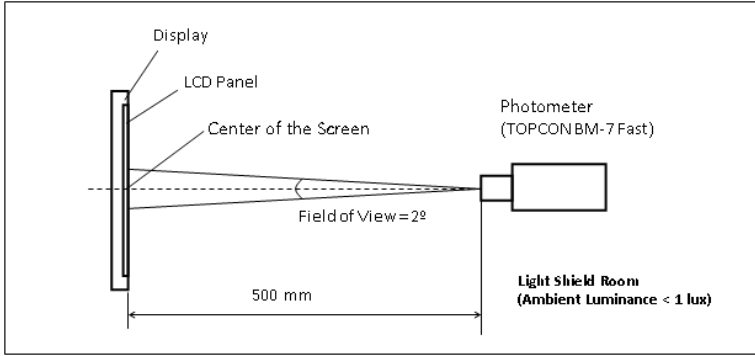
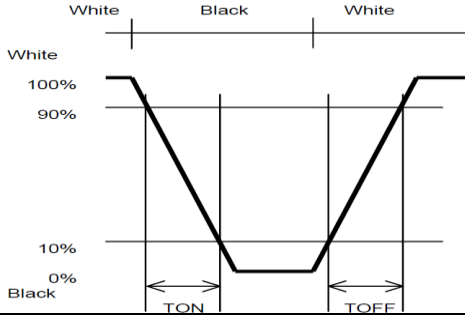
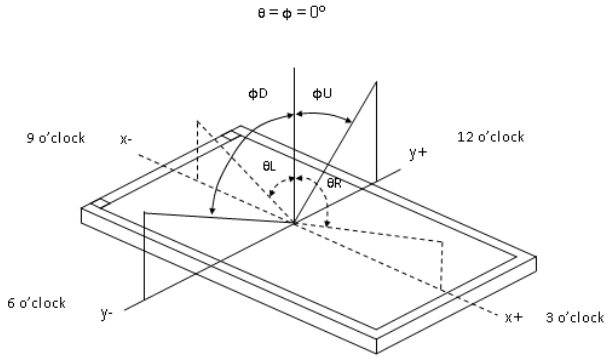
4 OPTICAL SPECIFICATION

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	$\theta=\phi=0^\circ$ Normal Viewing Angle	-	25	35	ms	2
Contrast Ratio		CR		400	500	-		3
Viewing Angle	Left	θ_L	CR \geq 10	60	70	-	deg	4
	Right	θ_R		60	70	-	deg	
	Up	ϕ_U		40	50	-	deg	
	Down	ϕ_D		60	70	-	deg	
Colour Chromaticity	Red	Rx	CR \geq 10	0.554	0.584	0.614	-	5
		Ry		0.328	0.358	0.388	-	
	Green	Gx		0.302	0.332	0.362	-	
		Gy		0.535	0.565	0.595	-	
	Blue	Bx		0.125	0.155	0.185	-	
		By		0.063	0.093	0.123	-	
	White	Wx		0.263	0.313	0.363	-	
		Wy		0.279	0.329	0.379	-	
Centre Brightness				250	300	-	cd/m ²	6
Brightness Distribution				70		-	%	7

Test Method

Note	Item	Test method
1	Setup	<p>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.</p> 
2	Response time	<p>Measure output signal waveform by the luminance meter when raster of window pattern is changed from white to black and from black to white.</p> 
3	Contrast ratio	<p>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.</p> $\text{Contrast Ratio (CR)} = \frac{\text{Brightness of unselected position (white)}}{\text{Brightness of selected position (black)}}$
4	Viewing angle Horizontal θ Vertical ϕ	<p>Move the luminance meter from right to left and up and down and determinate the angles where contrast ratio is 10</p> 
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	<p>(Brightness distribution)= 100 x B/A % A: max. brightness of the 9 points B: min. brightness of the 9 points</p>

5 BACKLIGHT SPECIFICATION

5.1 LED INTERFACE CONNNECTOR

Connector Name/ Designation

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

LED Connector Pin Assignment

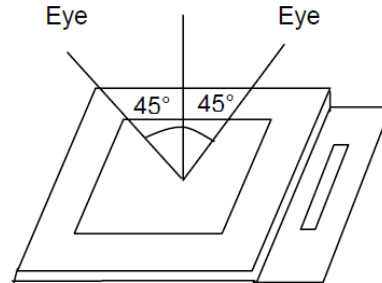
Pin#	Symbol	Signal Name
1	Vcc	12 V
2	GND	GND
3	Enable	V-On/OV-Off
4	Dimming	PWM Dimming or Analog Dimming
5	NC	NC

6 QUALITY ASSURANCE SPECIFICATION

6.1 DELIVERY INSPECTION STANDARDS

Inspection Conditions

Inspection distance: 30 cm ± 2 cm
Viewing angle: ±45°



Environmental Conditions

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

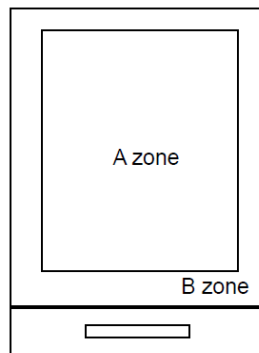
Sampling Conditions

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%

Definition of Area

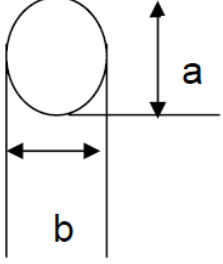
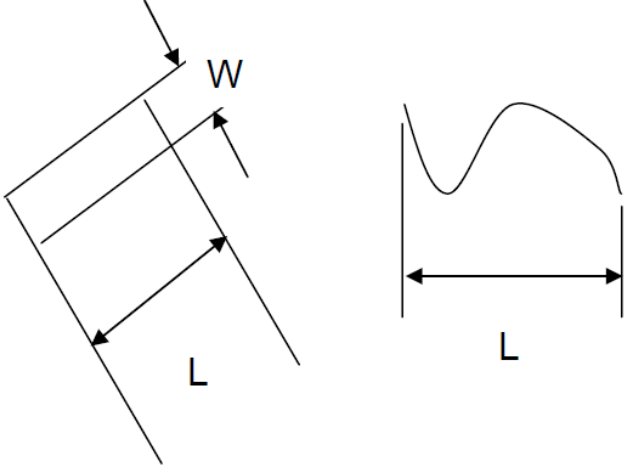
A zone: active area
B zone: viewing area

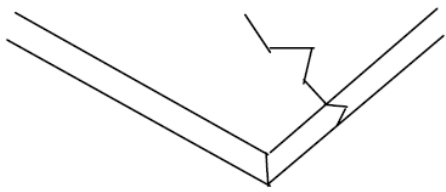
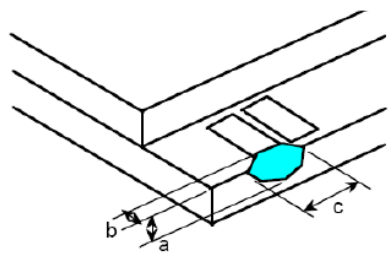


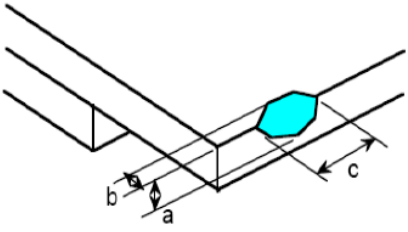
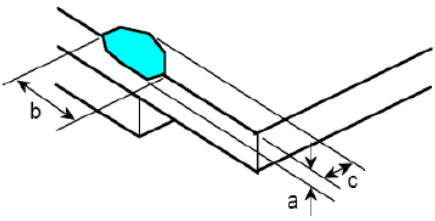
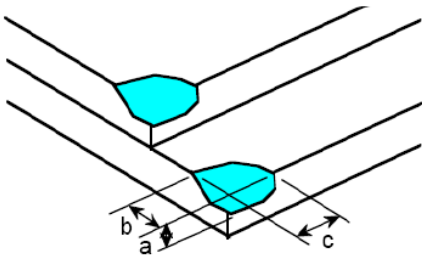
Basic Principle

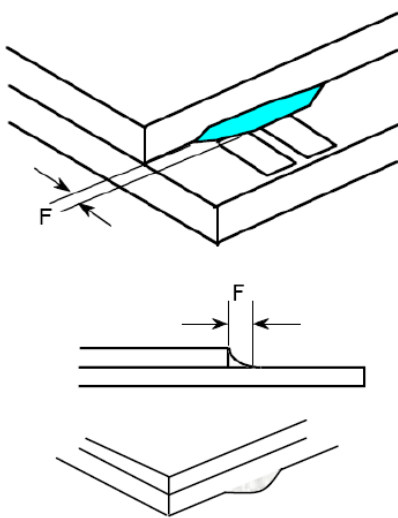
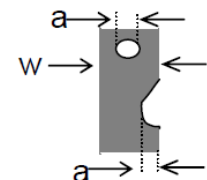
A set of sample to indicate the limit of acceptable quality level shall be discussed should a dispute occur.

Inspection Criteria

No.	Item	Criteria (Unit: mm)																		
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	 <p>$\phi = (a + b) / 2$</p> <table border="1" data-bbox="853 443 1380 801"> <thead> <tr> <th>Size</th> <th>Area</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$\phi \leq 0.10$</td> <td></td> <td>Ignore</td> </tr> <tr> <td>$0.10 < \phi \leq 0.15$</td> <td></td> <td>2</td> </tr> <tr> <td>$0.15 < \phi \leq 0.25$</td> <td></td> <td>1</td> </tr> <tr> <td>$0.25 < \phi$</td> <td></td> <td>0</td> </tr> <tr> <td>Total</td> <td></td> <td>2 no include $\phi \leq 0.10$</td> </tr> </tbody> </table> <p>Distance between 2 defects should more than 3mm apart.</p>	Size	Area	Acc. Qty	$\phi \leq 0.10$		Ignore	$0.10 < \phi \leq 0.15$		2	$0.15 < \phi \leq 0.25$		1	$0.25 < \phi$		0	Total		2 no include $\phi \leq 0.10$
Size	Area	Acc. Qty																		
$\phi \leq 0.10$		Ignore																		
$0.10 < \phi \leq 0.15$		2																		
$0.15 < \phi \leq 0.25$		1																		
$0.25 < \phi$		0																		
Total		2 no include $\phi \leq 0.10$																		
02	Black and White line Scratch Foreign material (Line type) (Minor defect)																			

		<table border="1"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>/</td> <td>$W \leq 0.03$</td> <td>Ignore</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.03 < W \leq 0.05$</td> <td>3</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.05 < W \leq 0.10$</td> <td>2</td> </tr> <tr> <td>/</td> <td>$0.1 < W$</td> <td>0</td> </tr> <tr> <td colspan="2">Total</td> <td>3</td> </tr> </tbody> </table> <p>Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.</p>	Length	Width	Acc. Qty	/	$W \leq 0.03$	Ignore	$L \leq 2.5$	$0.03 < W \leq 0.05$	3	$L \leq 2.5$	$0.05 < W \leq 0.10$	2	/	$0.1 < W$	0	Total		3
Length	Width	Acc. Qty																		
/	$W \leq 0.03$	Ignore																		
$L \leq 2.5$	$0.03 < W \leq 0.05$	3																		
$L \leq 2.5$	$0.05 < W \leq 0.10$	2																		
/	$0.1 < W$	0																		
Total		3																		
03	Glass Crack (Minor defect)	 <p>Crack is potential to enlarge, any type is not allowed.</p>																		
04	Glass Chipping Pad Area: (Minor defect)	 <table border="1"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$c > 3.0, b < 1.0$</td> <td>1</td> </tr> <tr> <td>$c < 3.0, b < 1.0$</td> <td>3</td> </tr> <tr> <td colspan="2">$a < \text{Glass Thickness}$</td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	3	$a < \text{Glass Thickness}$											
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<p>05</p>	<p>Glass Chipping Rear of Pad Area: (Minor defect)</p> 	<table border="1"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$c > 3.0, b < 1.0$</td> <td>1</td> </tr> <tr> <td>$c < 3.0, b < 1.0$</td> <td>2</td> </tr> <tr> <td>$c < 3.0, b < 0.5$</td> <td>4</td> </tr> <tr> <td colspan="2" style="text-align: center;">$a < \text{Glass Thickness}$</td> </tr> </tbody> </table>	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	$a < \text{Glass Thickness}$	
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											
$a < \text{Glass Thickness}$												
<p>06</p>	<p>Glass Chipping Except Pad Area: (Minor defect)</p> 	<table border="1"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$c > 3.0, b < 1.0$</td> <td>1</td> </tr> <tr> <td>$c < 3.0, b < 1.0$</td> <td>2</td> </tr> <tr> <td>$c < 3.0, b < 0.5$</td> <td>4</td> </tr> <tr> <td colspan="2" style="text-align: center;">$a < \text{Glass Thickness}$</td> </tr> </tbody> </table>	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	$a < \text{Glass Thickness}$	
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$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												
<p>07</p>	<p>Glass Corner Chipping: (Minor defect)</p> 	<table border="1"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$c < 3.0, b < 3.0$</td> <td>Ignore</td> </tr> <tr> <td colspan="2" style="text-align: center;">$a < \text{Glass Thickness}$</td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c < 3.0, b < 3.0$	Ignore	$a < \text{Glass Thickness}$					
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$c < 3.0, b < 3.0$	Ignore											
$a < \text{Glass Thickness}$												

08	<p>Glass Burr: (Minor defect)</p> 	<table border="1" data-bbox="837 555 1305 645"> <thead> <tr> <th>Length</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$F < 1.0$</td> <td>Ignore</td> </tr> </tbody> </table> <p>Glass burr don't affect assemble and module dimension.</p>	Length	Acc. Qty	$F < 1.0$	Ignore				
Length	Acc. Qty									
$F < 1.0$	Ignore									
09	<p>FPC Defect: (Minor defect)</p> 	<p>9.1 Dent, pinhole width $a < w/3$. (w: circuitry width.)</p> <p>9.2 Open circuit is unacceptable.</p> <p>9.3 No oxidation, contamination and distortion.</p>								
10	<p>Bubble on Polarizer (Minor defect)</p>	<table border="1" data-bbox="715 1438 1182 1610"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$\varphi \leq 0.20$</td> <td>Ignore</td> </tr> <tr> <td>$0.20 < \varphi \leq 0.30$</td> <td>4</td> </tr> <tr> <td>$0.30 < \varphi$</td> <td>None</td> </tr> </tbody> </table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi$	None
Diameter	Acc. Qty									
$\varphi \leq 0.20$	Ignore									
$0.20 < \varphi \leq 0.30$	4									
$0.30 < \varphi$	None									
11	<p>Dent on Polarizer (Minor defect)</p>	<table border="1" data-bbox="715 1680 1182 1852"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$\varphi \leq 0.20$</td> <td>Ignore</td> </tr> <tr> <td>$0.20 < \varphi \leq 0.30$</td> <td>4</td> </tr> <tr> <td>$0.30 < \varphi$</td> <td>None</td> </tr> </tbody> </table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi$	None
Diameter	Acc. Qty									
$\varphi \leq 0.20$	Ignore									
$0.20 < \varphi \leq 0.30$	4									
$0.30 < \varphi$	None									
12	<p>Bezel</p>	<p>12.1 No rust, distortion on the Bezel.</p> <p>12.2 No visible fingerprints, stains or other contamination.</p>								

13	Touch Panel	<p>D: Diameter W: width L: length</p> <p>13.1 Spot: $D < 0.25$ is acceptable $0.25 \leq D \leq 0.4$</p> <p>2dots are acceptable and the distance between defects should more than 10 mm. $D > 0.4$ is unacceptable</p> <p>13.2 Dent: $D > 0.40$ is unacceptable</p> <p>13.3 Scratch: $W \leq 0.03$, $L \leq 10$ is acceptable, $0.03 < W \leq 0.10$, $L \leq 10$ is acceptable</p> <p>Distance between 2 defects should more than 10 mm. $W > 0.10$ is unacceptable.</p>
14	PCB	<p>14.1 No distortion or contamination on PCB terminals.</p> <p>14.2 All components on PCB must same as documented on the BOM/component layout.</p> <p>14.3 Follow IPC-A-600F.</p>
15	Soldering	Follow IPC-A-610C standard
16	Electrical Defect (Major defect)	<p>The below defects must be rejected.</p> <p>16.1 Missing vertical / horizontal segment,</p> <p>16.2 Abnormal Display.</p> <p>16.3 No function or no display.</p> <p>16.4 Current exceeds product specifications.</p> <p>16.5 LCD viewing angle defect.</p> <p>16.6 No Backlight.</p> <p>16.7 Dark Backlight.</p> <p>16.8 Touch Panel no function.</p> <p>16.9 Dark Dot –one Allowed.</p> <p>16.10 Bright Dot – one Allowed.</p> <p>Remark:</p> <p>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.</p> <p>2. Bright dot caused by scratch and foreign object accords to item 1.</p>

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

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.

Identification / marking criteria

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

6.2 DEALING WITH CUSTOMER COMPLAINTS

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.

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 RELIABILITY SPECIFICATION

7.1 RELIABILITY TESTS

Test Item		Test Condition
Durability Test	High Temperature Storage	Ta= 80°C 96h
	Low Temperature Storage	Ta=-30°C 96h
	Temperature Cycle Storage	-20°C for 30 min, then 70°C for 30 min, 20 cycles
	High Temperature Operation	Tp= 70°C 96h
	Low Temperature Operation	Tp= -20°C 96h
	High Temperature & Humidity Operation	Tp= 40°C RH= 90% 96h Non condensing
	Thermal Shock Resistance	The sample should be allowed to stand the following 5 cycles of operation: TSTL for 30 minutes -> normal temperature for 5 minutes -> TSTH for 30 minutes -> normal temperature for 5 minutes, as one cycle, then taking it out and drying it at normal temperature, and allowing it stand for 24 hours

Note: Ta=ambient temperature Tp= Panel temperature

Notes:

1. No dew condensation to be observed.
2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
3. No cosmetic or functional defects should be allowed.
4. Total current consumption should be less than twice the initial value.

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 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°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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