LIQUID CRYSTAL DISPLAY MODULE

Product Specification

CUSTOMER	**Standard**
CUSTOMER PART NUMBER	
PRODUCT NUMBER	**DET043WVNMRSSS-1A**

Product Mgr	Design Eng
Bruno Recaldini	**Sunny**
Date: 5-Dec-14	Date: 5-Dec-14

TABLE OF CONTENTS

REVISION RECORD

Rev.	Date	Page	Chapt.	Comment	ECN no.
1.0	05-Dec-14			Initial Release	

1 MAIN FEATURES

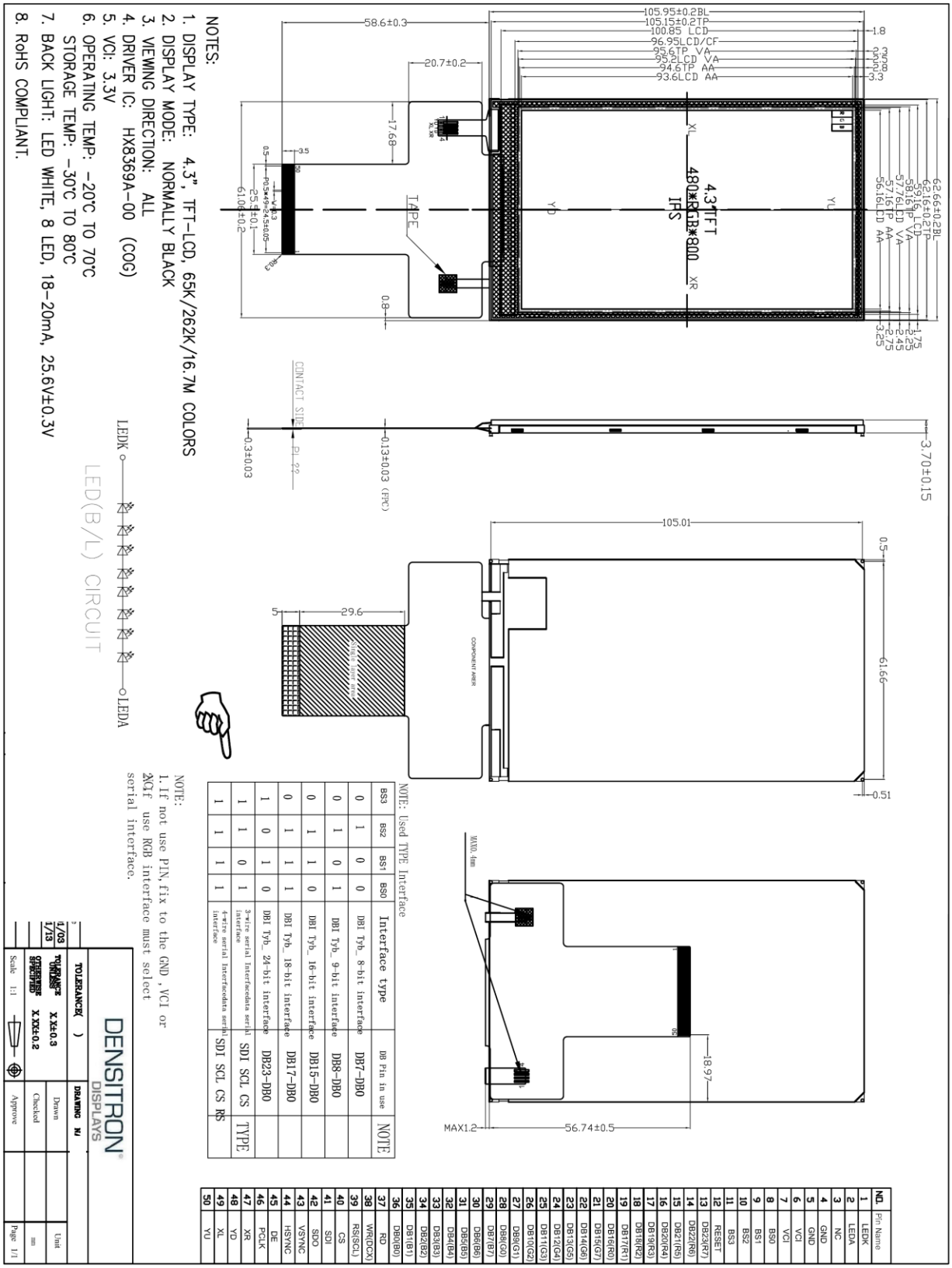
ITEM	CONTENTS
Screen Size	4.3” Diagonal
Display Format	480 x RGB x 800 Dots
N° of Colour	16.7M
Active Area	56.16 mm (H) x 93.6 mm (V)
LCD Type	TFT
Mode	IPS Transmissive / Normally Black
Viewing Direction	Full view
Interface	8/9/16/18/24-bit DBI Type B (CPU) interface 16/18/24-bit RGB interface 3/4-lines serial interface
Driver IC	HX8369A-00 or equivalent
Backlight Type	LED
Touch Panel	4-wire resistive
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	480 x RGB x 800 Dots	Dots
Overall Dimensions	62.66 mm (H) x 105.95 mm (V) x 3.7 mm (D)	mm
Active Area	56.16 mm (H) x 93.6 mm (V)	mm
pixel Pitch	51 (H) x 45.9 (V)	µm
Weight	30	g

2.2 MECHANICAL DRAWING



BS3	BS2	BS1	BS0	Interface type	DB Pin in use	NOTE
0	1	0	0	DBI Typ_ 8-bit interface	DB7-DB0	
0	1	0	1	DBI Typ_ 9-bit interface	DB8-DB0	
0	1	1	0	DBI Typ_ 16-bit interface	DB15-DB0	
0	1	1	1	DBI Typ_ 18-bit interface	DB17-DB0	
1	0	1	0	DBI Typ_ 24-bit interface	DB23-DB0	
1	1	0	1	3-wire serial Interfacedata serial interface	SDI SCL CS	TYPE
1	1	1	0	4-wire serial Interfacedata serial interface	SDI SCL CS RS	

NO.	Pin Name
1	LEDK
2	LEDA
3	NC
4	GND
5	GND
6	VCI
7	VCI
8	BS0
9	BS1
10	BS2
11	BS3
12	RESET
13	DB23(R7)
14	DB22(R6)
15	DB21(R5)
16	DB20(R4)
17	DB19(R3)
18	DB18(R2)
19	DB17(R1)
20	DB16(R0)
21	DB15(G7)
22	DB14(G6)
23	DB13(G5)
24	DB12(G4)
25	DB11(G3)
26	DB10(G2)
27	DB9(G1)
28	DB8(G0)
29	DB7(B7)
30	DB6(B6)
31	DB5(B5)
32	DB4(B4)
33	DB3(B3)
34	DB2(B2)
35	DB1(B1)
36	DB0(B0)
37	RD
38	WR(DCX)
39	RS(SCL)
40	CS
41	SDI
42	SDO
43	VSYNC
44	HSYNC
45	DE
46	PCLK
47	XR
48	YD
49	XL
50	YU

3 ELECTRICAL SPECIFICATION

3.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Min	Max	Unit	Note
Power Supply Voltage	VCI	Ta=25˚C	-0.3	5.0	V	
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 DC ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage	VCI		2.8	3.3	3.6	V	
Input Voltage for Logic	VIH		$0.8V_{CI}$	-	-	V	
	VIL		GND	-	$0.2\ V_{CI}$	V	
Output Voltage for Logic	VOH		$0.8V_{CI}$	-	-	V	
	VOL		GND	-	$0.2\ V_{CI}$	V	
Current Consumption	ICC		-	30		mA	1

Note 1: The specified power consumption is under the conditions of VCI=3.3V, FV=60Hz.

3.3 INTERFACE PIN ASSIGNMENT

3.3.1 LCM PIN ASSIGNMENT

Recommended connector: Omron XF2M-5015-1A

Pin NO.	Symbol	Function
1	LEDK	Power supply for Backlight
2	LEDA	
3	NC	NC
4	GND	Ground
5	GND	
6	VCI	Analogue power supply, 2.8V~3.3V.
7	VCI	
8	BS0	Select Interface mode signal
9	BS1	
10	BS2	
11	BS3	
12	RESX	Reset pin, active low
13-36	DB23-DB16 (R7-R0) DB15-DB8 (G7-G0) DB7-DB0 (B7-B0)	24-bit bi-directional data bus. 8-bit bus: use DB7-DB0 9-bit bus: use DB8-DB0 16-bit bus: use DB15-DB0 18-bit bus: use DB17-DB0 24-bit bus: use DB23-DB0 When Operation is MIPI DPI interface mode, it is an 18-bit bus RGB data bus. 24-bit bus: use DB23-DB0 16-bit bus: use DB15-DB0 18-bit bus: use DB17-DB0 Please connect unused pins to GND.
37	RDX_E	DBI Type-B: Serves as a read signal and read data at the low level. If not used, please connect to VCI.
38	WR_DCX	DBI Type-B: Serves as a write signal and write data, active low. DBI Type-C: it servers as RS (Data / Command Selection pin). If not used, please connect to VCI.
39	DCX_SCL	Data / Command Selection pin. It also servers as SCL (Serial Clock) If not used, please connect to GND.
40	CSX	Chip select signal. Low: chip can be accessed; High: chip cannot be accessed. If not used, please connect to VSSD.

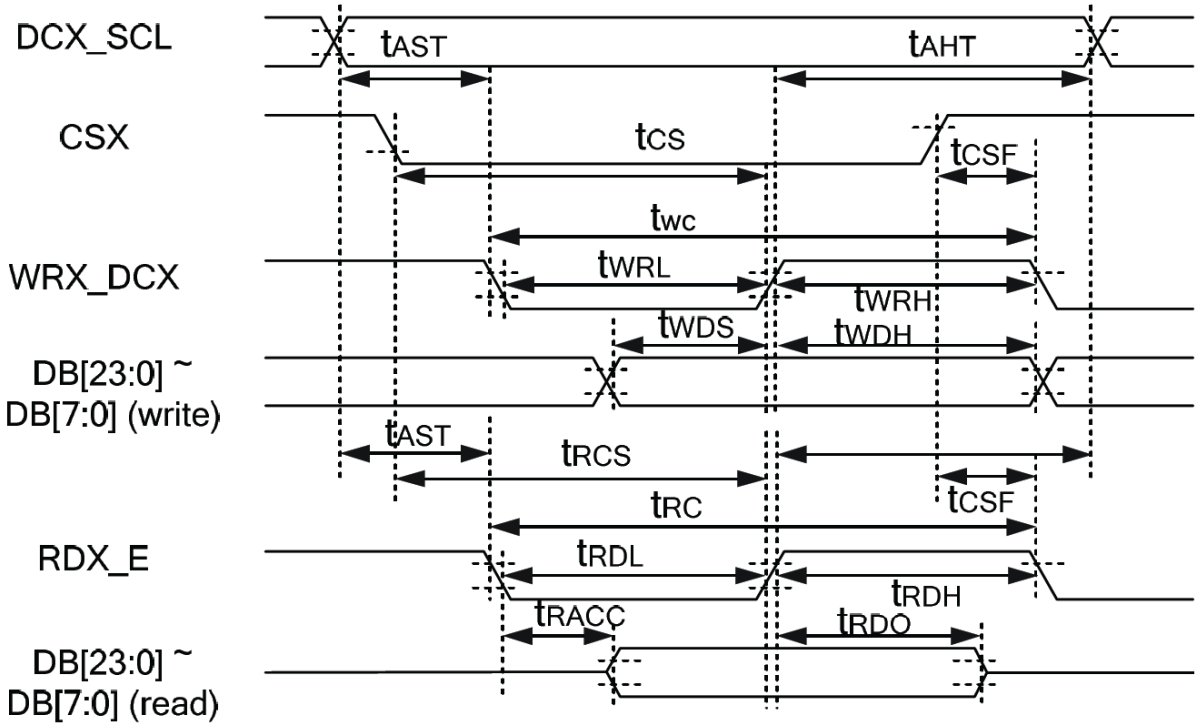
41	SDI	Serial data input pin or input/output pin in serial bus system interface. The data is inputted on the rising edge of the SCL signal. If not used, please connect to GND.
42	SDO	Serial data output pin in serial bus system interface. If not used, please leave this pin open.
43	VSYNC	Frame synchronizing signal for DPI I/F mode. If not used, please connect to GND.
44	HSYNC	Frame synchronizing signal for DPI I/F mode. If not used, please connect to GND.
45	DE	Data Enable signal for DPI I/F mode. If not used, please connect to GND.
46	PCLK	Pixel clock signal for DPI I/F mode. If not used, please connect to GND.
47	XR	Touch panel right electrode
48	YD	Touch panel bottom electrode
49	XL	Touch panel left electrode
50	YU	Touch panel top electrode

3.4 TIMING CHARACTERISTICS

Please refer to IC HX8369A-00 datasheet for more information

3.4.1 (CPU) DBI Type B (24/18/16/9/8 Bits) Timing Characteristics

Item	Symbol		MIN	MAX	Unit	Remark
Address setup time	DCX_SCL	tast	10	-	ns	
Address hold time (Write/Read)		taht	10	-	ns	
Chip select setup time (write)	CSX	tcs	20	-	ns	
Chip select setup time (Read ID)		trcs	45	-	ns	
Chip select setup time (Read FM)		trcsfm	355	-	ns	
Chip select Wait time (Write/Read)		tcsf	20	-	ns	
Write cycle Time (write register)	WRX_DCX	twc	100	790	ns	
Write cycle (write GRAM@ SLPOUT)		twc	33	790		
Write cycle (write GRAM@SLPIN)		twc	100	790		
Write Control pulse H duration		Twrh	15	630	ns	
Write Control pulse L duration		twrl	15	160	ns	
Read cycle (read register)	RDX_E	trc	100	790	ns	
Read cycle (GRAM)		trc	350	790		
Read Control H duration		trdh	30	630	ns	
Read Control L duration		trdl	20	160	ns	
Data setup time	DB23-DB0	t_{WDS}	15	-	ns	For max CL=30pF
Data hold time		t_{WDH}	25	-	ns	
Read access time		t_{RACC}	10	-	ns	For min CL=8pF
Read output disable time		t_{RDO}	10	-	ns	



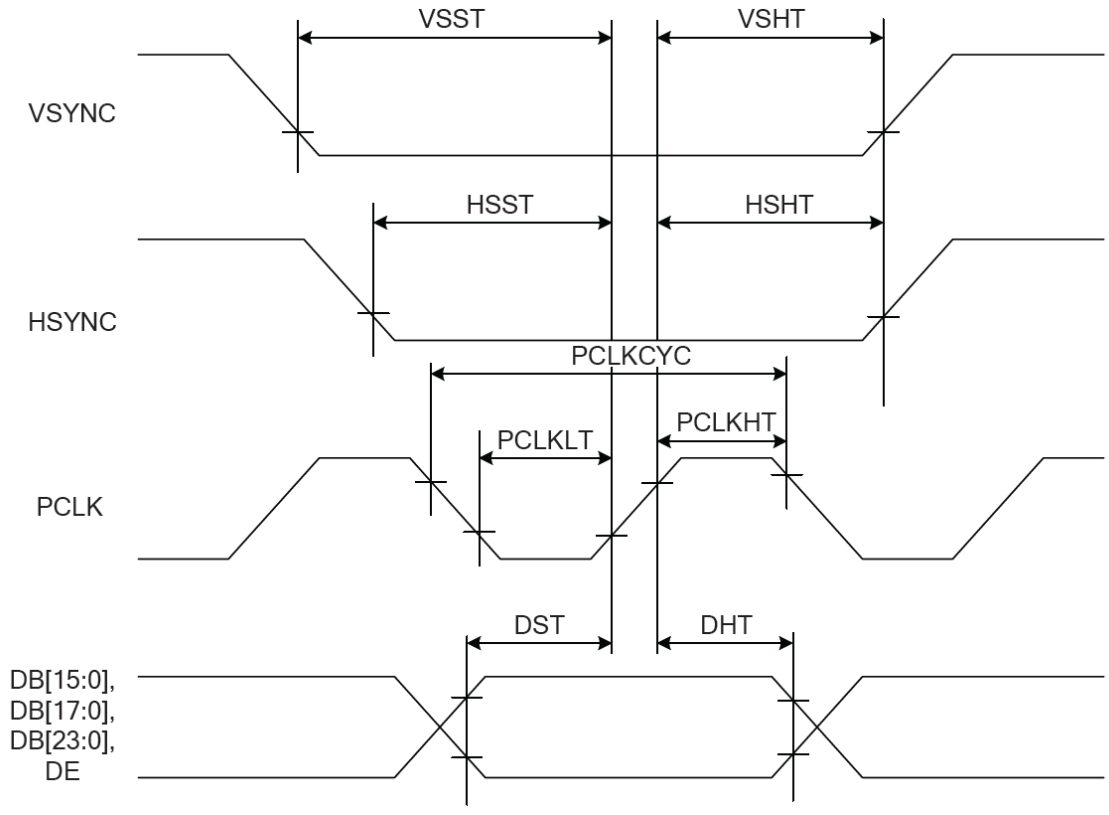
Note: Logic high and low levels are specified as 30% and 70% of VCI for Input signals.

3.4.2 Parallel RGB (24/18/16 bit) DPI Interface Timing Characteristics

Item	Symbol	MIN	MAX	Unit	Remark
Vertical sync. setup time	VSST	5	-	ns	
Vertical sync. hold time	VSHT	5	-	ns	
Horizontal sync. setup time	HSST	5	-	ns	
Horizontal sync. hold time	HSHT	5	-	ns	
Pixel clock cycle When RGB I/F is running	PCLKCYC	31(3)	49.2(4)	ns	VRR(5) = Min 50Hz Max 70Hz
Pixel clock low time	PCLKLT	5	-	ns	
Pixel clock high time	PCLKHT	5	-	ns	
Data setup time DB[23:0]	DST	5	-	ns	
Data hold time DB[23:0]	DHT	5	-	ns	

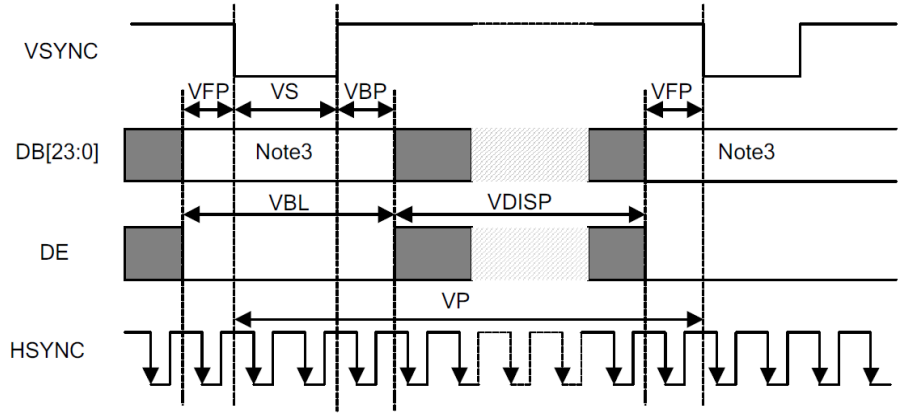
Notes:

(1) Signal rise and fall times are equal to or less than 20ns
(2) Input signals are measured by 0.30 x VCI for low state and 0.70 x VCI for high state
(3) 32.2 MHz
(4) 20.3 MHz
(5) VRR: Vertical Refresh Rate, equal to VSYNC frequency



3.4.2.1 Vertical Timings for RGB I/F

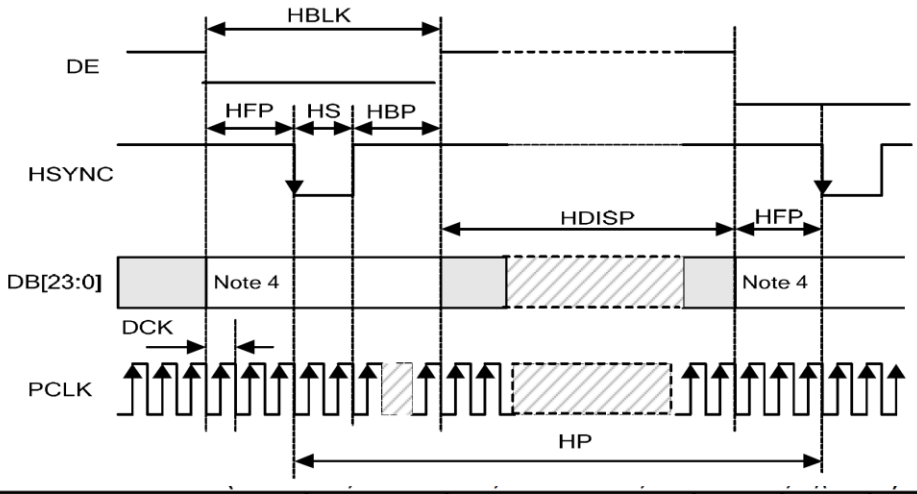
Vertical Timings for RGB I/F



Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP	-	806 Note(5)	-	-	Line
Vertical low pulse width	VS	-	2 Note(5)	-	Note(4)	Line
Vertical front porch	VFP	-	2 Note(5)	-	-	Line
Vertical back porch	VBP	-	2 Note(5)	-	Note(4)	Line
Vertical data start point	-	VS+VBP	4 Note(5)	-	Note(4)	Line
Vertical blanking period	VBL	VS+VBP+VFP	6 Note(5)	-	-	Line
Vertical active area	-	VDISP	-	800	-	Line
Vertical Refresh rate	VRR	-	50	-	70	Hz

Note: (1) Signal rise and fall times are equal to or less than 20 ns.
(2) Input signals are measured by 0.30 x VDD1 for low state and 0.70 x VDD1 for highstate.
(3) Data lines can be set to "High" or "Low" during blanking time – Don't care.
(4) The VS and VBP pulse width are related to ASG/GIP STV and CKV timing. The STV and CKV must be set at corresponding position for LCD normal display.
(5) The VS and VBP and VFP pulse width are related to ASG/GIP STV and CKV timing. The minimum of VS and VBP and VFP must ≧3 Hsync if the STV0~STV3 and CKV0~CKV7 are all in used in corresponding position for LCD normal display.

3.4.2.2 Horizontal Timing for RGB I/F



Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS cycle	HP	Note 3	504	-	568	DCK
HS low pulse width	HS	-	5	-	78	DCK
Horizontal back porch	HBP	-	5	-	78	DCK
Horizontal front porch	HFP	-	5	-	78	DCK
Horizontal data start point	-	HS+HBP	19	-	83	DCK
			700	-	-	ns
Horizontal blanking period	HBLK	HS+HBP+HFP	24	-	88	DCK
Horizontal active area	HDISP	-	-	480	-	DCK
Pixel clock frequency When RGB I/F is running	DCK	VRR = Min. 50 Hz – Max. 70 Hz	20.3	-	32.2	MHz
			31	-	49.2	ns

Note: (1) Signal rise and fall times are equal to or less than 20 ns.
(2) Input signals are measured by 0.30 x VDD1 for low state and 0.70 x VDD1 for high state.
(3) HP is multiples of eight DCK.
(4)Data lines can be set to “High” or “Low” during blanking time – Don’t care.

3.4.3 DBI Type C interface characteristics

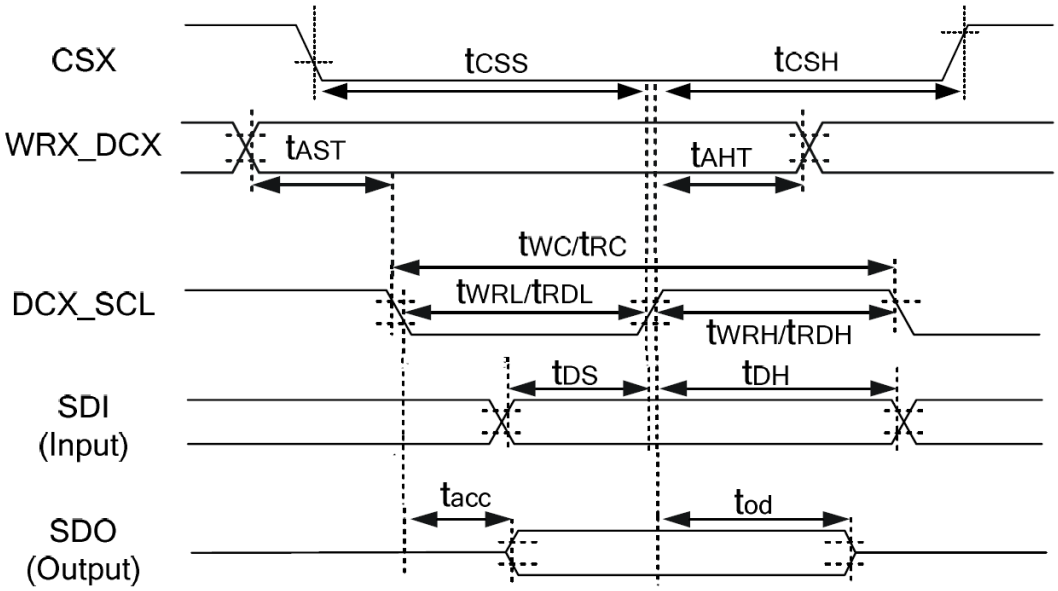


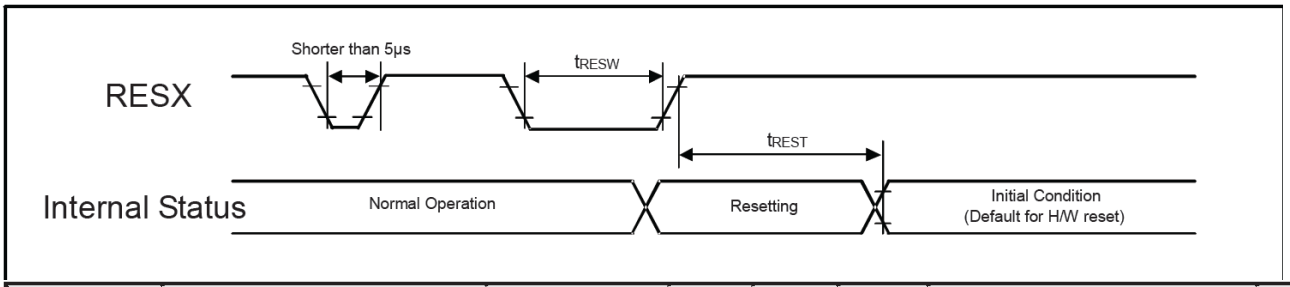
Figure 8.3: DBI Type C interface characteristics

Signal	Symbol	Parameter	Min.	Max.	Unit	Description
CSX	t_{CSS} t_{CSH}	Chip select setup time (Write) Chip select setup time (Read)	40 40	- -	ns	-
WRX_DCX	t_{AST} t_{AHT}	Address setup time Address hold time (Write/Read)	10 10	- -	ns	-
DCX_SCL (Write)	t_{WC} t_{WRH} t_{WRL}	Write cycle Control pulse “H” duration Control pulse “L” duration	100 40 40	- - -	ns	-
DCX_SCL (Read)	t_{RC} t_{RDH} t_{RDL}	Read cycle Control pulse “H” duration Control pulse “L” duration	150 60 60	- - -	ns	-
SDI/SDO (Input)	t_{DS} t_{DT}	Data setup time Data hold time	30 30	- -	ns	For maximum C_L=30pF For minimum C_L=8pF
SDI/SDO (Output)	t_{RACC} t_{OD}	Read access time Output disable time	10 10	- 50	ns	

Note: The input signal rise time and fall time (tr, tf) is specified at 15 ns or less
Logic high and low levels are specified as 30% and 70%

3.5 POWER SEQUENCE

3.5.1 RESET Input Timing

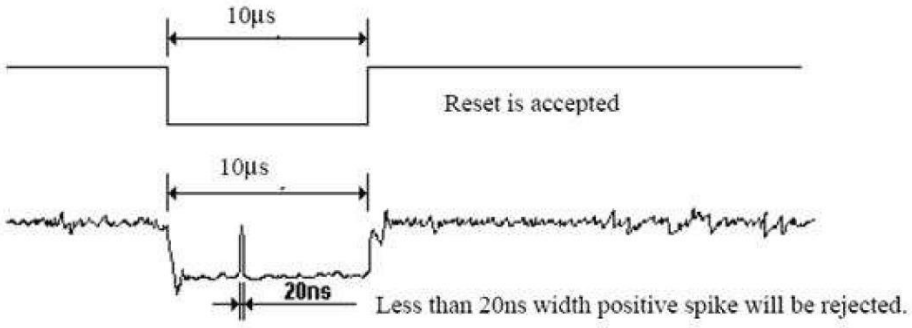


Symbol	Parameter	Related pins	Min.	Typ.	Max.	Note	Unit
t_{RESW}	Reset low pulse width(1)	RESX	10	-	-	-	µs
t_{REST}	Reset complete time(2)	-	-	-	5	When reset is applied during Sleep In mode	ms
		-	-	-	120	When reset is applied during Sleep Out mode	ms

Note: (1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5 µ	Reset Rejected
Longer than 10 µs	Reset
Between 5 µs and 10 µs	Reset Start

(2) During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then returns to Default condition for H/W reset.
(3) During Reset Complete Time, ID2 value in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (tREST) within 5ms after a rising edge of RESX.
(4) Spike Rejection also applies during a valid reset pulse as shown below:



(5) When Reset is applied during Sleep In Mode.
(6) When Reset is applied during Sleep Out Mode.
(7) It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

3.5.2 Power on/off Sequence

Please refer to IC HX8369A-00 datasheet.

4 OPTICAL SPECIFICATION

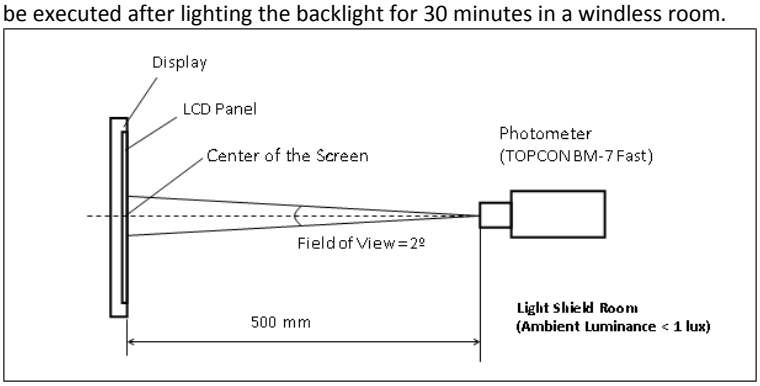
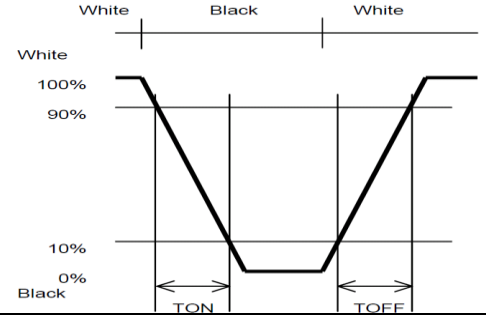
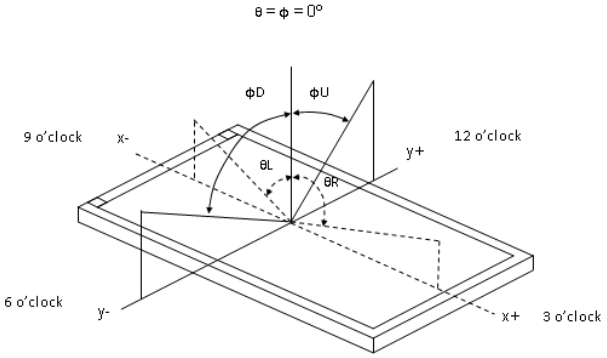
4.1 OPTICAL CHARACTERISTICS

Driving condition: VCI = 3.3V, 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	-	35	50	ms	2
Contrast Ratio		CR		400	500	-		3
Viewing Angle	Left	θL	CR ≥ 10	-	80	-	deg	4
	Right	θR		-	80	-	deg	
	Up	ϕU		-	80	-	deg	
	Down	ϕD		-	80	-	deg	
Colour Chromaticity	Red	Rx	CR ≥ 10	0.640	0.660	0.680	-	5
		Ry		0.297	0.317	0.337	-	
	Green	Gx		0.240	0.260	0.280	-	
		Gy		0.555	0.575	0.595	-	
	Blue	Bx		0.121	0.141	0.161	-	
		By		0.055	0.075	0.095	-	
	White	Wx		0.275	0.295	0.315	-	
		Wy		0.297	0.317	0.337	-	
Centre Brightness				320	-	-	cd/m²	6
Brightness Distribution				80	-	-	%	7

.

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. Contrast Ratio (CR) = Brightness of unselected position (white) / 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 DRIVING CONDITIONS

The back light system is edge-lighting type with 8 chips White LED

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Current	IF	Ta=25 °C,	18	20	-	mA
Forward Voltage	VF	Ta= 25°C,		25.6		V

Note:

- The lifetime of the LED is defined as a period till the brightness of the LED decreases to the half of its initial value.
- This figure is given as a reference purpose only, and not a guarantee.
- This figure is estimated for an LED operating alone.
  The performance of an LED may differ when assembled as a monitor together with a TFT panel due to different environmental temperature.
- Estimated lifetime could vary on a different temperature and usually higher temperature could reduce the life significantly.

5.2 LED CIRCUIT

6 TOUCH PANEL SPECIFICATION

6.1 ELECTRICAL CHARACTERISTICS

Item	Min.	Typ.	Max.	Unit	Note
Linearity	-1.5	-	1.5	%	Analogue X and Y directions
Terminal resistance	100	-	900	Ω	X (Film side)
	100	-	900	Ω	Y (Glass side)
Insulation resistance	20	-	-	MΩ	DC 25V
Voltage	-	5.0	7.0	V	DC
Chattering	-	-	10	ms	100kΩ pull-up

Caution: Operate the touch panel with a polyacetal pen (tip R0.8mm or less) or a finger, avoiding those items with hard or sharp tips such as a ball point pen or a mechanical pencil.

6.2 MECHANICAL CHARACTERISTICS

Item	Min.	Typ.	Max.	Unit	Note
Activation force	80	-	-	g	(1)
Durability-surface scratching	Write 100,000	-	-	characters	(2)
Durability-surface pitting	1,000,000	-	-	touches	(3)
Surface hardness	3	-	-	H	JIS K5400

Note (1) Stylus pen Input: R0.8mm polyacetal pen or Finger

Note (2) Measurement for Surface area
- Scratch 100,000 times straight line on the Film with a stylus. Change stylus every 20,000 times
- Force: 250gf
- Speed: 60mm/sec
- Stylus: R0.8 polyacetal tip

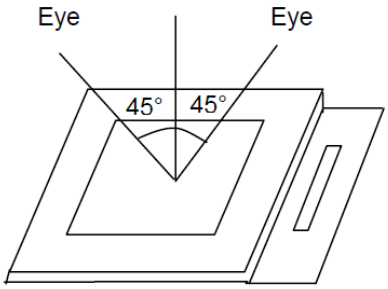
Note (3) Hit 1,000,000 times on the Film with a R8.0 silicon rubber.
- Force: 250gf
- Speed: 2 times/sec

7 QUALITY ASSURANCE SPECIFICATION

7.1 DELIVERY INSPECTION STANDARDS

7.1.1 Inspection Conditions

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



7.1.2 Environmental Conditions

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

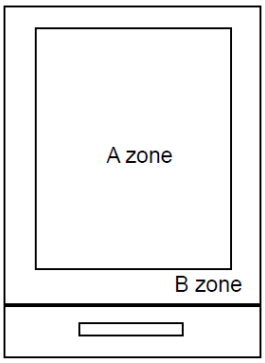
7.1.3 Sampling Conditions

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%

7.1.4 Definition of Area

A zone: active area
B zone: viewing area

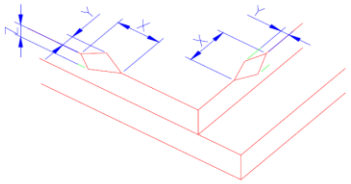
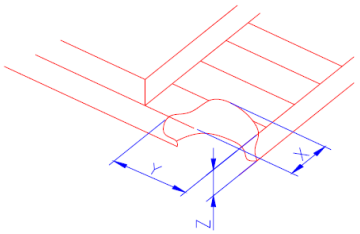
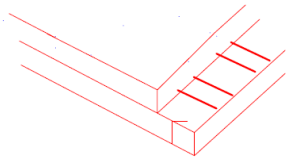


7.1.5 Basic Principle

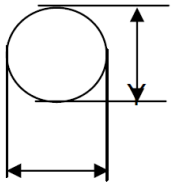
A set of sample to indicate the limit of acceptable quality level shall be discussed should a dispute occur.

7.1.6 Inspection Criteria

<table>
<tr><th>Number</th><th>Items</th><th>Criteria(mm)</th></tr>
<tr><td>1.0 LCD Crack/Broken

NOTE:
X: Length
Y: Width
Z: Height
L: Length of ITO,
T: Height of LCD</td><td>(1) The edge of LCD broken</td><td> 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr></table></td></tr>
<tr><td rowspan="2"></td><td>(2)LCD corner broken</td><td> 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table></td></tr>
<tr><td>(3) LCD crack</td><td> 
Crack
Not allowed</td></tr>
</table>

Spot defect



X

Φ=(X+Y)/2

① light dot（LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain）

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.10	Ignore		Ignore
0.10<Φ≤0.15	3(distance≧10mm)		
0.15<Φ≤0.2	1		
0.2<Φ	0		

②Dim spot（LCD/TP/Polarizer dim dot, light leakage、dark spot）

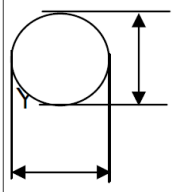
Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.1	Ignore		Ignore
0.1<Φ≤0.2	2(distance≧10mm)		
0.2<Φ≤0.3	1		
Φ＞0.3	0		

③ Polarizer accidented spot

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.2<Φ≤0.5	2(distance≧10mm)		
Φ>0.5	0		

Line defect (LCD/TP /Polarizer black/white line, scratch, stain)

Width(mm)	Length(mm)	Acceptable Qty		
		A	B	C
Φ≤0.03	Ignore	Ignore		Ignore
0.03<W≤0.05	L≤3.0	N≤2		
0.05<W≤0.08	L≤2.0	N≤2		
0.08<W	Define as spot defect			

<table>
<tr><td>Items</td><td>Criteria (mm)</td></tr>
<tr><td>Spot defect
 

X
Φ=(X+Y)/2</td><td>① light dot（LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain）
<table>
<tr><td rowspan="2">Zone
Size (mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.10</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.10<Φ≤0.15</td><td colspan="2">3(distance≧10mm)</td></tr>
<tr><td>0.15<Φ≤0.2</td><td colspan="2">1</td></tr>
<tr><td>0.2<Φ</td><td colspan="2">0</td></tr>
</table>
②Dim spot（LCD/TP/Polarizer dim dot, light leakage、dark spot）
<table>
<tr><td rowspan="2">Zone
Size (mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.1</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.1<Φ≤0.2</td><td colspan="2">2(distance≧10mm)</td></tr>
<tr><td>0.2<Φ≤0.3</td><td colspan="2">1</td></tr>
<tr><td>Φ＞0.3</td><td colspan="2">0</td></tr>
</table>
③ Polarizer accidented spot
<table>
<tr><td rowspan="2">Zone
Size (mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.2</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.2<Φ≤0.5</td><td colspan="2">2(distance≧10mm)</td></tr>
<tr><td>Φ>0.5</td><td colspan="2">0</td></tr>
</table></td></tr>
</table>

Line defect (LCD/TP /Polarizer black/white line, scratch, stain)

Width(mm)	Length(mm)	Acceptable Qty		
		A	B	C
Φ≤0.03	Ignore	Ignore		Ignore
0.03<W≤0.05	L≤3.0	N≤2		
0.05<W≤0.08	L≤2.0	N≤2		
0.08<W	Define as spot defect			

Polarizer Bubble

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.2<Φ≤0.4	2(distance≧10mm)		
0.4<Φ≤0.6	1		
0.6<Φ	0		

SMT

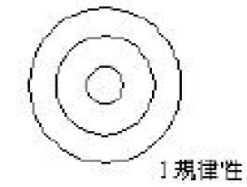
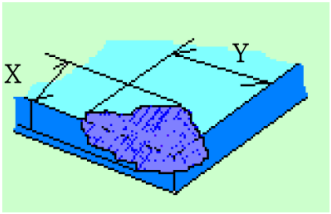
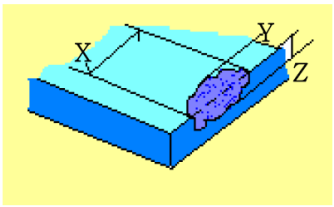
According to IPC-A-610C class Ⅱ standard . Function defect and missing part are major defect ,the others are minor defect.

TP bubble/ accidented spot

Size Φ(mm)	Acceptable Qty		
	A	B	C
Φ≤0.1	Ignore		Ignore
0.1<Φ≤0.2	2（distance≧10mm）		
0.2<Φ≤0.3	1		
0.3<Φ	0		

Assembly deflection

beyond the edge of backlight ≤0.15mm

<table>
<tr><td rowspan="3">TP
Related</td><td>Newton
Ring</td><td>Newton Ring area>1/3 TP area NG
Newton Ring area≤1/3 TP area OK</td><td> 
 
 
似牛顿环</td></tr>
<tr><td>TP corner
broken
X：length
Y：width
Z：height</td><td><table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>X≤3.0mm</td><td>Y≤3.0mm</td><td>Z<LCD
thickness</td></tr></table>Z
*
Circuitry broken is not allowed.</td><td>  </td></tr>
<tr><td>TP edge
broken
X：length
Y：width
Z：height</td><td><table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>X≤6.0mm</td><td>Y≤2.0mm</td><td>Z<LCD
thickness</td></tr></table>* Circuitry broken is not allowed.</td><td>  </td></tr>
</table>

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

7.2 DEALING WITH CUSTOMER COMPLAINTS

7.2.1 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.

7.2.2 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.

8 RELIABILITY SPECIFICATION

8.1 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	
	Box Drop Test	1 corner, 3 edges, 6 faces, 66 cm	

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.

9 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).