LIQUID CRYSTAL DISPLAY MODULE

Product Specification

CUSTOMER		
PRODUCT NUMBER	**DVC40418**	
CUSTOMER APPROVAL		**Date**

INTERNAL APPROVALS				
Quality Mgr	Product Mgr	Project Leader	Mech. Eng	Electr. Eng
				
Date:	Date: 11 Feb. 05	Date:	Date:	Date:

☐ **Approval for Specification only**

☐ **Approval for Specification and Sample**

Sample no.: Date: ISIR no.:

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REVISION RECORD

Rev.	Date	Page	Chapt.	Comment	ECR no.
A	02/10/05			New DCA Release	E1838

1 MAIN FEATURES

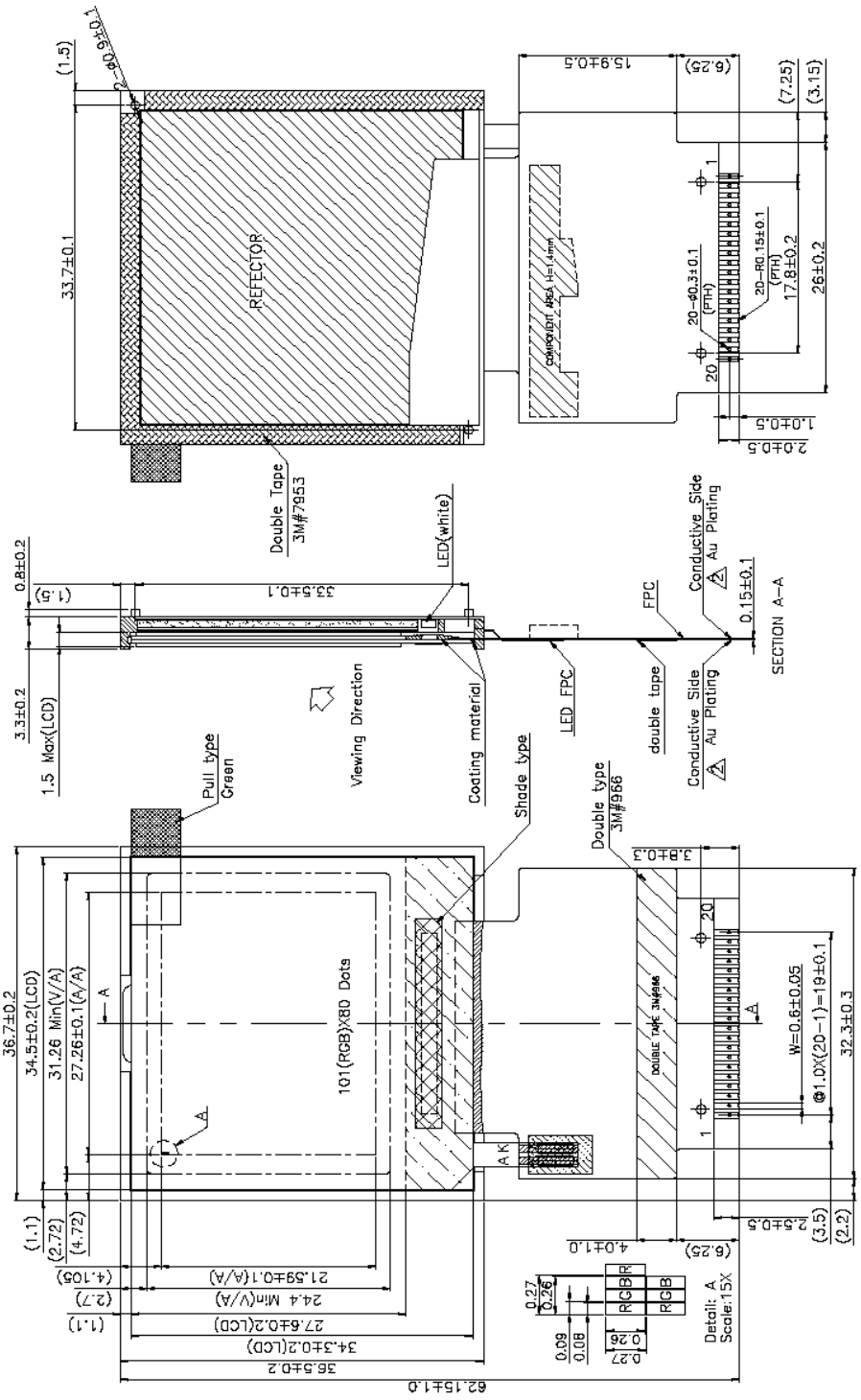
ITEM	CONTENTS
Display Format	101*(RGB)*80 DOTS
Colour	4096
Overall Dimensions	36.7mm(W) x 62.15mm(H) x 4.1mm(D) Max
Viewing Area	31.26mm(W) Min. x 24.4mm(H) Min.
LCD type	CSTN-Negative
Mode	Transmissive
Viewing Angle	6 o'clock
Duty ratio	1/80
Driver IC	TL0482A
Backlight type	LED
Backlight colour	White
DC/DC converter	Built-In
Operating temperature	-20ºC to +70ºC
Storage temperature	-30ºC to +80ºC

2 MECHANICAL SPECIFICATION

2.1 MECHANICAL CHARACTERISTICS

ITEM	CHARACTERISTIC	UNIT
Display Format	101*(RGB)*80 DOTS	
Overall Dimensions	36.7(W) x 62.15(H) x 4.1(D) Max	mm
Viewing Area	31.26(W) Min. x 24.4(H) Min.	mm
Active Area	27.26(W) x 21.59(H)	mm
Dot Size	0.26(W) x 0.26(H)	mm
Dot Pitch	0.27(W) x 0.27(H)	mm
IC Controller/Driver	TL0482A	

2.2 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}-V_{SS}	-0.3	+4.0	V	
Power Supply for LCD	V_{OUT}	-0.3	+20.0	V	
Input Voltage	Vin	-0.3	V_{DD} +0.3	V	
Operating Temperature	Top	-20	+70	°C	Note 1
Storage Temperature	Tst	-30	+80	°C	Note 2
Static Electricity	Be sure that you are grounded when handling displays.				

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

Note 2: Ta≤80 °C: 75% RH max.

3.2 ELECTRICAL CHARACTERISTICS

VSS = 0 V, Ta = 25 °C

Item	Symbol	Condition	Min	Typ	Max	Unit
Power Supply for Logic	V_{DD}-V_{SS}	Ta = 25 °C	-	2.6	-	V
Input Voltage	V_{IL}	L Level	0	-	0.2* V_{DD}	V
	V_{IH}	H Level	0.8 *V_{DD}	-	V_{DD}	V
LCD Module Driving Voltage	V_O-V_{SS}	Ta = 25 °C	-	9.75	-	V
Current Consumption	* I_{DD}	V_{DD}=2.6V	-	1.0	2.0	mA

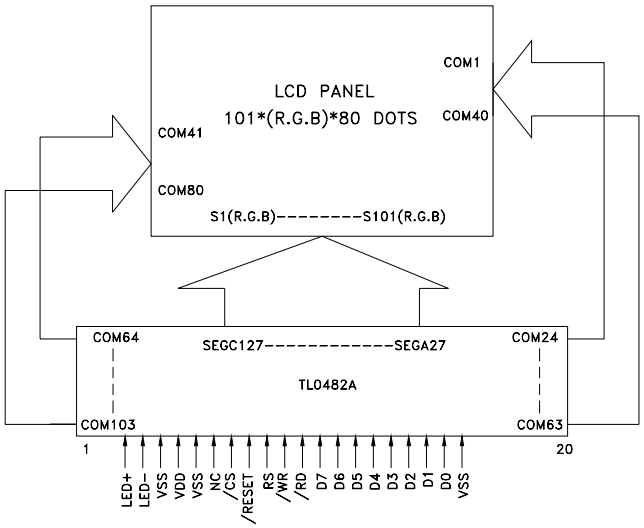
* I_{DD} measurement condition is for all pattern ON

3.3 INTERFACE PIN ASSIGNMENT

No.	Symbol	Function
1	LED+	Backlight Power Supply A.
2	LED-	Backlight Power Supply B.
3	VSS	Ground (0V)
4	VDD	Power Supply for Logic (2.6V)
5	VSS	Ground (0V)
6	NC	No Connection.
7	/CS	Chip select input pins.
8	/RESET	Reset input pins.
9	RS	Register select input pins.
10	/WR	Read / Write Execution Control Pin.
11	/RD	Read / Write Execution Control Pin.
12	D7	Data Bit 7
13	D6	Data Bit 6
14	D5	Data Bit 5
15	D4	Data Bit 4
16	D3	Data Bit 3
17	D2	Data Bit 2
18	D1	Data Bit 1
19	D0	Data Bit 0
20	VSS	Ground (0V)

Note: Use internal oscillator. Bias set (B2, B1, B0) : (1,1,0) →1/11 Bias. DS SET (0110) , DSE SET “1” , Duty= 1/80

3.4 BLOCK DIAGRAM



NOTE: SHIFT Should Select to "0" (COM1 to COM80)
REF Set "H" (SEG127 to SEG27)

3.5 TIMING CHARACTERISTICS

Note: Please reference the manufacturers datasheet for the TL0482A controller.

4 OPTICAL SPECIFICATION

4.1 OPTICAL CHARACTERISTICS

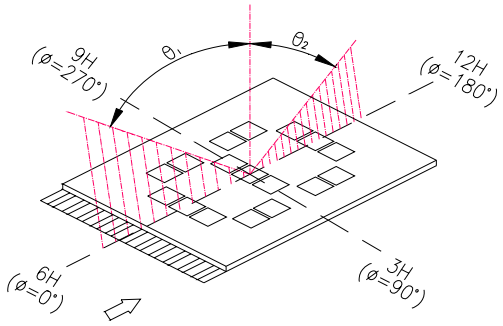
Ta = 25 °C

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Viewing Angle	θ1	CR≥2	-	40	-	deg	1
	θ2	CR≥2	-	10	-	deg	1
	θ3	CR≥2	-	30	-	deg	2
	θ4	CR≥2	-	30	-	deg	2
Contrast Ratio	CR	Ta = 25 °C	-	15	-	-	3
Response Time	Tr	Ta = 25 °C	-	200	300	ms	4
	Tf	Ta = 25 °C	-	200	300		
Driving Method	Duty	1/80					
	Bias	1/11					
LCD Type	CSTN-Negative-Transflective						
Viewing Direction	6 O'CLOCK						

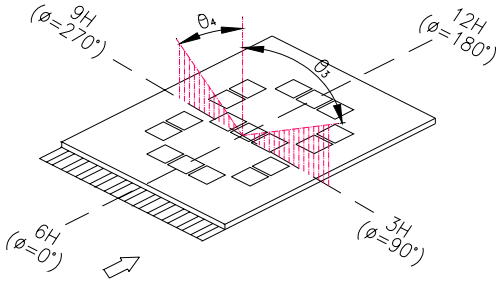
4.2 COLOR OF CIE COORDINATES

Item		Symbol	Condition	Value	Brightness
Chromaticity Coordinates	Red	X	Θ = Φ = 0ºC LED Backlight Color Degree X=0.29 Y=0.29 Brightness = 1500 cd/m²	0.42	20 cd/m²
		Y		0.31	
	Green	X		0.28	50 cd/m²
		Y		0.41	
	Blue	X		0.18	15 cd/m²
		Y		0.218	
	White	X		0.28	80 cd/m²
		Y		0.30	

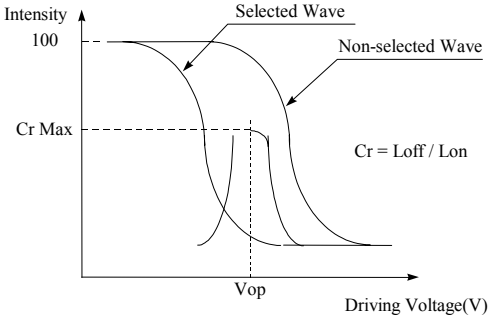
Note 1: definition of viewing angle θ1 & θ2



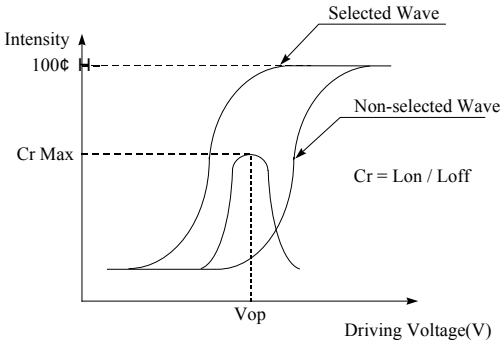
Note 2: definition of viewing angle θ3 & θ4



Note 3: definition of contrast ratio (CR)

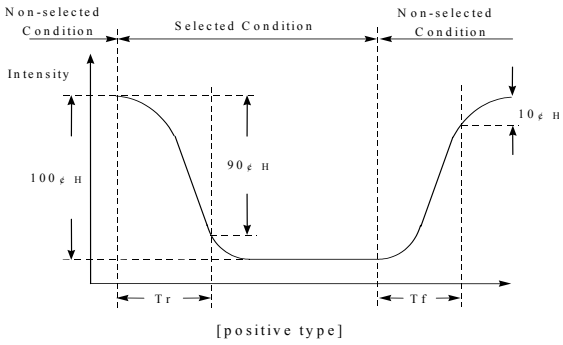


[positive type]

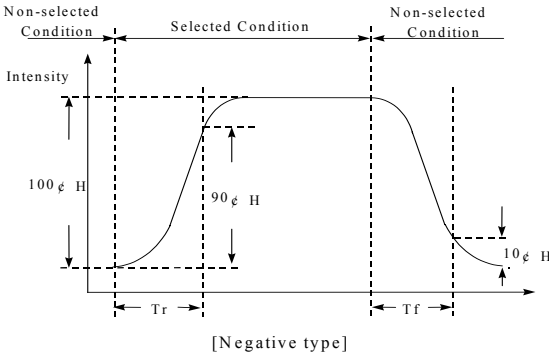


[Negative type]

Note 4: definition of response time



[positive type]



[Negative type]

5 BACKLIGHT SPECIFICATION

5.1 BACKLIGHT CHARACTERISTICS

5.1.1 Standard Lamp Styles (Edge Lighting Type):

The LED chips are distributed over the edge light area of the illumination unit, which gives the less power consumption. The main advantages of the LED Backlight are as follows: a resistor or potentiometer can simply adjust the brightness of the backlight.

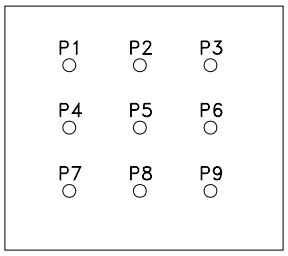
PARAMETER	Symbol	Test Condition	Min	Typ	Max	Unit	Note
Supply Current	I	V=3.6V	-	20	-	mA	
Supply Voltage	V	-	-	3.6	-	V	
Reverse Voltage	V_R	-	-	-	4	V	
Luminous Intensity	I_V	V=3.6V	-	1500	-	cd/m²	1,2
Uniformity (For Module)	-	V=3.6V	65	-	-	%	3
Life time		V≦4.0V	-	20000	-	hrs	
Color	White						

Note:

1. Backlight only.
2. Average Luminous Intensity of P1-P9.
3. Uniformity = Min/Max * 100%.

Measured Method:

10.4 Measured Method:



(Effective spatial Distribution)

Hole Diameter: ±1∅ ; 1 to 9 per Position Measured Luminous

6 LABELLING & MARKING

DENSITRON DVC40418EW80G101WU TAIWAN YYMM

7 QUALITY ASSURANCE SPECIFICATION

7.1 CONFORMITY

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

7.2 DELIVERY ASSURANCE

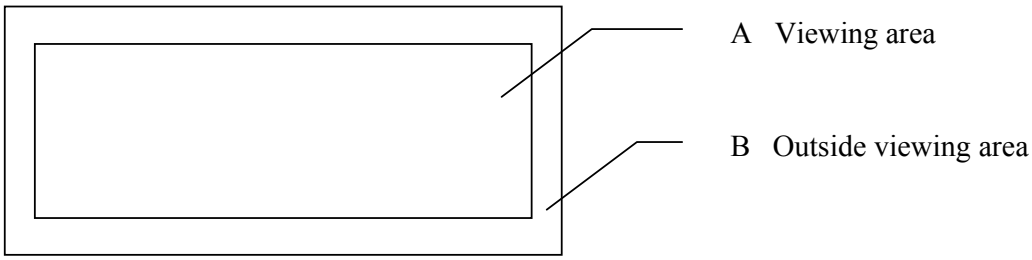
7.2.1 Delivery inspection standards

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

The quality assurance levels are shown below:

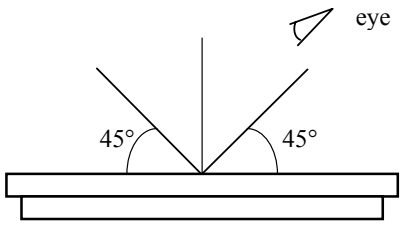
Rank	Item Inspected	Defect type	AQL	Remark
Major defect	Display	Non display	0.65%	Fit/Function defect
		Over current		
		Missing segment		
		Wrong viewing direction		
		Incorrect operating		
		Backlight OFF		
		Backlight flashing		
	Dimension	PCB and bezel out of specification		
Minor defect	LCD	Black and white spot	2.5%	Appearance defect
		Black and white lines		
		Polariser scratch		
		Bubbles in polariser		
		Segment deformation, pin hole		
		Colour uniformity		
		Glass chip		
	PCB	Dust, solder ball on PCB		
		Pad scratch		
		Total	2.5%	

7.2.2 Zone definition



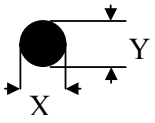
7.2.3 Visual inspection

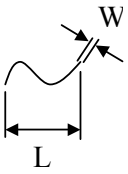
- Inspect under 2x20W or 40W fluorescent lamp (approximately 3000 lux) leaving 25 to 30 cm between the module and the lamp and 30 cm between the module and the eye (measuring position).
- Appearance is inspected at the best contrast voltage (best contrast is adjusted considering clearness and crosstalk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

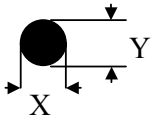


7.2.3.1 Standard of appearance inspection

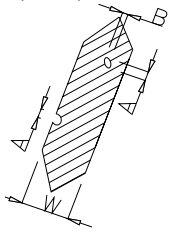
Units: mm

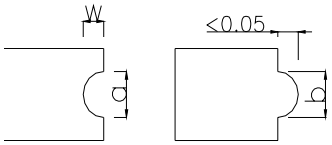
<table>
<tr><th>No</th><th>Item</th><th>Criteria</th></tr>
<tr><td>1</td><td>Black spot, white spot, dust</td><td>
Round type: as per following drawing
∅ = (X+Y)/2


<table>
<tr><th colspan="3">Acceptable quantity</th></tr>
<tr><td>Size</td><td>Zone A</td><td>Zone B</td></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


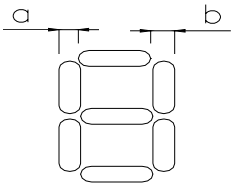
<table>
<tr><th colspan="4">Acceptable quantity</th></tr>
<tr><td>Length</td><td>Width</td><td>Zone A</td><td>Zone B</td></tr>
<tr><td>- -</td><td>W≤0.02</td><td>Any number</td><td rowspan="4">Any number</td></tr>
<tr><td>L≤3.0</td><td>0.02<W≤0.03</td><td rowspan="2">2</td></tr>
<tr><td>L≤2.5</td><td>0.03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


<table>
<tr><th colspan="3">Acceptable quantity</th></tr>
<tr><td>Size</td><td>Zone A</td><td>Zone B</td></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>
<tr><td>4</td><td>Segment deformation</td><td>
1.a. Pin hole on segmented display

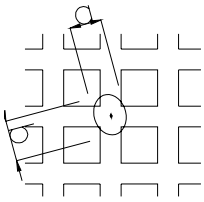
W: segment width
∅ = (A+B)/2

<table>
<tr><th colspan="2">Acceptable quantity</th></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>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Criteria</th></tr>
<tr><td>5</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>6</td><td>Colour uniformity</td><td>Level of sample for approval set as limit sample</td></tr>
<tr><td>7</td><td>Backlight</td><td>The backlight colour should correspond to the product specification
Flashing and or unlit backlight is not allowed
Dust larger than 0.25 mm is not allowed</td></tr>
</table>

7.3 DEALING WITH CUSTOMER COMPLAINTS

7.3.1 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.

7.3.2 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	Evaluation and assessment
Operation at High Temperature and Humidity	40°C±2°C, 90%RH for 240 hours	No abnormalities in function* and appearance**
Operation at High Temperature	70°C±2°C for 240 hours	No abnormalities in function* and appearance**
Heat Shock	-20~+70C. Left for 30 minutes at each temperature, transition time 5 min, repeated 10 times.	No abnormalities in function* and appearance**
Low Temperature	-20°C±2°C for 240 hours	No abnormalities in function* and appearance**
Vibration	Sweep for 1 minute at 10Hz, 55Hz, 10Hz, amplitude 1.5mm, 2 hours each in the X,Y and Z directions.	No abnormalities in function* and appearance**
Drop Shock	Drop Shock	No abnormalities in function* and appearance**

8.2 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.

9 PART NUMBER DESCRIPTIONS FOR AVAILABLE OPTIONS

DVC40418①②80G101④⑤
③

① POLARISER OPTION
E = Transmissive negative mode.

② LED BACKLIGHT COLOUR
W = White

③ ROW X COLUMN DOT FORMAT

④ TEMPERATURE RANGE AND POWER SUPPLY
W = Wide temperature range; on-board negative voltage regulator.

⑤ FLUID TYPE AND COMPENSATION CIRCUIT
U = CSTN.

10 HANDLING PRECAUTIONS

Safety
If the LCD panel breaks, be careful not to get the liquid crystal fluid in your mouth or in your eyes. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water.

Mounting and Design
Place a transparent plate (e.g. acrylic, polycarbonate or glass) on the display surface to protect the display from external pressure. Leave a small gap between the transparent plate and the display surface.
When assembling with a zebra connector, clean the surface of the pads with alcohol and keep the surrounding air very clean.
Design the system so that no input signal is given unless the power supply voltage is applied.

Caution during LCD cleaning
Lightly wipe the display surface with a soft cloth soaked with Isopropyl alcohol, Ethyl alcohol or 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).