

DMT080H4NLCMI-1G

PRODUCT SPECIFICATION

Version 0.2
Jan 13, 2023

TBD

<i>Customer's Approval</i>	
<u>Signature</u>	<u>Date</u>

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Approved by *Kenny Lin*

Revision History

VERSION	DATE	DESCRIPTION	AUTHOR
0.1	May 26, 2022	Preliminary	Victoria Ho
0.2	Jan 13, 2023	<ol style="list-style-type: none"> 1. Add TFT firmware – p.5 2. Add Touch firmware – p.6 3. Modify mechanical drawing – p.8 	Victoria Ho

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1. General Description

1.1 Introduction

This is an 8.0" size colour active matrix TFT LCD module that uses amorphous silicon TFT as a switching device. The display is normally black mode, transmissive, and featuring high contrast and excellent colour saturation. The resolution of the TFT-LCD is 800 x 1280 and can display up to 16.7M colours. The display module supports LVDS interface and optical bonding touch panel.

1.2 Main Features

Item	Contents
Display Type	TFT LCD
Screen Size	8.0" Diagonal
Display Format	1280 x RGB x 800 Dots
No. of Colour	16.7M
Overall Dimensions	238±0.2 (W) x 179.94±0.2 (H) x 4.85±0.5 (D) mm
Active Area	172.224 (W) x 107.64 (H) mm
Mode	Normally Black / Transmissive / IPS
Viewing Direction	All round
Interface	LVDS
Driver IC	ILI9881C & LT9211
Backlight Type	LED, White, 21 chips
Touch Panel	CTP
Touch Interface	I ² C
Touch Driver IC	ST1727
Bonding Type	Optical Bonding
Operating Temperature	-10°C ~ +50°C
Storage Temperature	-20°C ~ +60°C
ROHS	Compliant to RoHS 2.0
Firmware version for MCU	DMT080H4NLCMI-1C-01-T.bin

1.3 CTP Features

Item	Contents
CTP Technology	Mutual Capacitor
Input Method	Finger
Touch Point	5 Point
Positional Accuracy	2.5mm at 4 edges and 1.5mm at center
Cover Glass	Soda lime glass, chemically hardened
Hardness	6H
Optical Transmittance	87%
Touch Controller	ST1727
Interface to Host	I ² C
I ² C Address	0X55
Connection Type	ZIF Connector
Touch Firmware	MTP800-020IAAMFIL_V1.dump

2. Mechanical Specification

2.1 Mechanical Characteristics

Item	Characteristic	Unit
Display Format	1280 x 800 x RGB	Dots
Overall Dimensions	238±0.2 (W) x 179.94±0.2 (H) x 4.85±0.5 (D)	mm
Active Area	172.224 (W) x 107.64 (H)	mm
Pixel Pitch	0.13455 x 0.13455	mm
Weight	TBD	g
IC Controller/Driver	ILI9881C & LT9211	

3. Electrical Specification

3.1 Absolute Maximum Ratings

AGND = GND = 0V, Ta = 25° C

Item	Symbol	Min	Max	Unit	Note
Operating Temperature	T _{OPR}	-10	50	°C	-
Storage Temperature	T _{STG}	-20	60	°C	-

Note 1: When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. For normal operations, it is desirable to use this module under the conditions according to Section 3.2 “Electrical Characteristics”, to avoid malfunctioning.

Note 2: Background colour changes slightly depending on ambient temperature. This phenomenon is reversible.

Note 3: Please refer to item of RELIABILITY.

3.2 Electrical Characteristics

3.2.1 Recommended Operating Condition

AGND = GND = 0V, Ta = 25° C

Item	Symbol	Condition	Min	Typ.	Max	Unit	Note
Power Voltage	5V0_SW	-	-	5	-	V	-
Input Logic High Voltage	VIH	-	0.7IOVCC	-	IOVCC	V	IOVCC=1.8V
Input Logic Low Voltage	VIL	-	-0.3	-	0.3IOVCC	V	IOVCC=1.8V

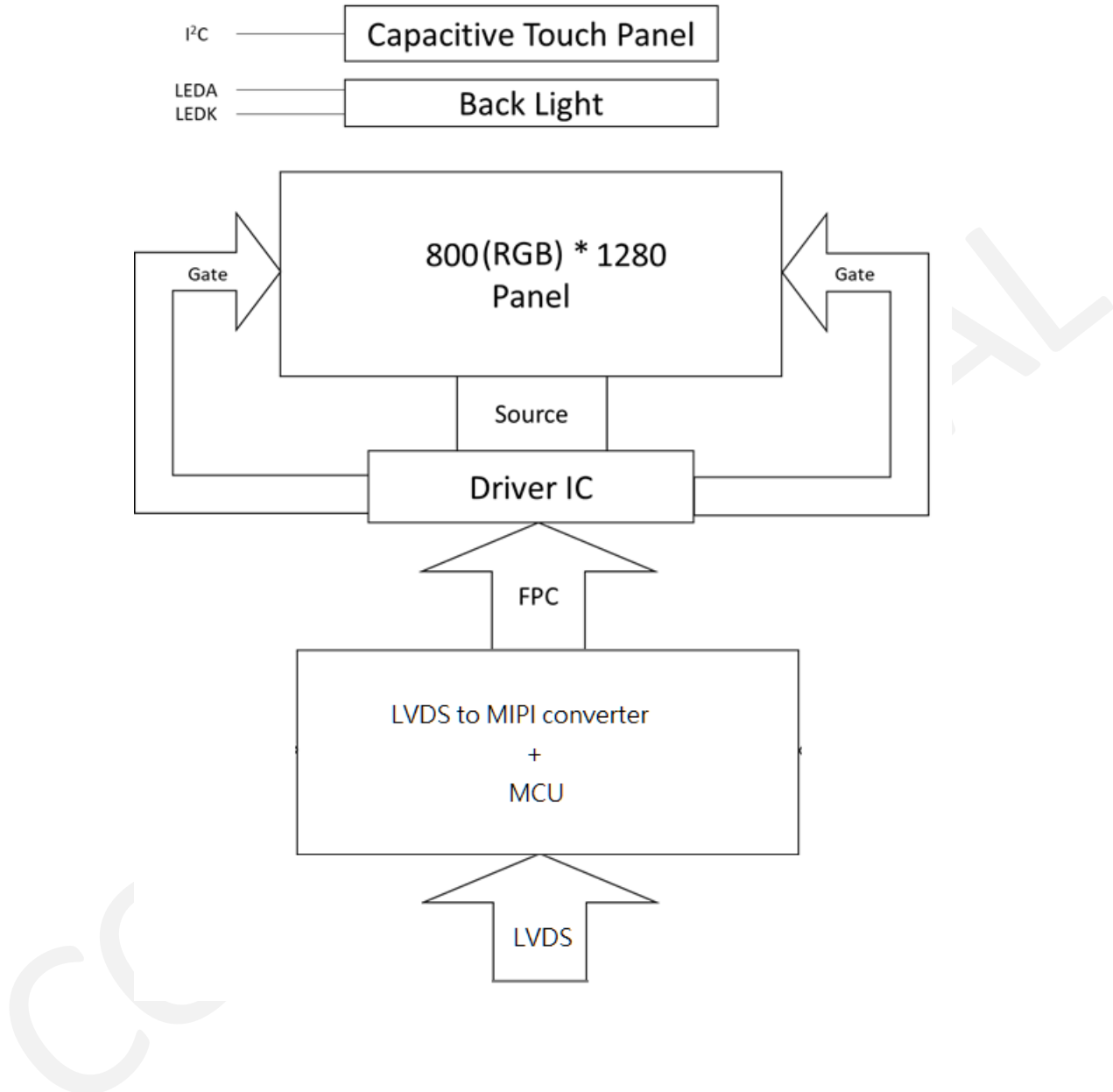
3.3 Interface Pin Assignment

3.3.1 Pin Assignment

No.	Symbol	I/O	Function
1	STBYB	-	No connection
2	USB3_VBUS	-	No connection
3	USB3-_LVDS	-	No connection
4	USB3+_LVDS	-	No connection
5	CTP_SCL	I	TP clock Signal.
6	CTP_SDA	I	TP data Signal.
7	CTP_RESET	I	TP reset Input pin.
8	CTP_INT	O	External interrupt to the host.
9	VDD2_LCD	-	No connection
10	VDD2_LCD	-	No connection
11	VDI_LCD0	-	No connection
12	VDI_LCD0	-	No connection
13	VDD2_LCD	-	No connection
14	GND	P	Ground
15	LED_A1	P	LED anode
16	LED_A2	-	No connection
17	LED_C1	P	LED cathode
18	LED_C2	-	No connection
19	GND	P	Ground
20	LA0P	I	+LVDS differential data input
21	LA0N	I	-LVDS differential data input
22	GND	P	Ground
23	LA1P	I	+LVDS differential data input
24	LA1N	I	-LVDS differential data input
25	GND	I	Ground
26	LA2P	I	+LVDS differential data input
27	LA2N	I	-LVDS differential data input
28	GND	P	Ground
29	LACP	I	+LVDS differential clock input
30	LACN	I	-LVDS differential clock input
31	GND	P	Ground

No.	Symbol	I/O	Function
32	LA3P	I	+LVDS differential data input
33	LA3N	I	-LVDS differential data input
34	GND	P	Ground
35	SCL	-	No connection
36	SDA	-	No connection
37	GND	P	Ground
38	RSTN	I	The external reset input Initializes the chip with a low input. Be sure to execute a power-on reset after supplying power. Fix to VDDI level when it's not in use.
39	LVDS_IRQ	-	No connection
40	GND	P	Ground
41	LCDO_BKLTEN_3V3	-	No connection
42	LCDO_BKLT_PWM_3V3	-	No connection
43	5V0_SW	P	Power supply
44	5V0_SW	P	Power supply
45	5V0_SW	P	Power supply
46	+24V	-	No connection
47	+24V	-	No connection
48	VIO_LCDO	-	No connection
49	DEV_PWR_3V3_SW	-	No connection
50	LCD_EN	I	Data input enable

3.4 Block Diagram



3.5 Timing Characteristics

3.5.1 AC Electrical Characteristics

LVDS Receiver AC Specifications

Symbol	Description	Condition	Min	Typ.	Max	Unit	Note
CLK	Output clk cycle	-	6.25	Tc	37	ns	-
T0	Input data position0	-	-0.15	0	0.15	ns	-
T1	Input data position1	-	$Tc/7-0.15$	-	$Tc/7-0.15$	ns	-
T2	Input data position2	-	$2Tc/7-0.15$	-	$2Tc/7-0.15$	ns	-
T3	Input data position3	-	$3Tc/7-0.15$	-	$3Tc/7-0.15$	ns	-
T4	Input data position4	-	$4Tc/7-0.15$	-	$4Tc/7-0.15$	ns	-
T5	Input data position5	-	$5Tc/7-0.15$	-	$5Tc/7-0.15$	ns	-
T6	Input data position6	-	$6Tc/7-0.15$	-	$6Tc/7-0.15$	ns	-

LVDS Transmitter AC Specifications

Symbol	Description	Condition	Min	Typ.	Max	Unit	Note
CLK	Output clk cycle	-	6.25	Tc	37	ns	-
trise	VOD rise time, 20%	-	250	350	500	ps	-
tfall	VOD fall time, 20% to 80%	-	250	350	500	ps	-
T0	Output data position0	-	-0.15	0	0.15	ns	-
T1	Output data position1	-	$Tc/7-0.15$	-	$Tc/7-0.15$	ns	-
T2	Output data position2	-	$2Tc/7-0.15$	-	$2Tc/7-0.15$	ns	-
T3	Output data position3	-	$3Tc/7-0.15$	-	$3Tc/7-0.15$	ns	-
T4	Output data position4	-	$4Tc/7-0.15$	-	$4Tc/7-0.15$	ns	-
T5	Output data position5	-	$5Tc/7-0.15$	-	$5Tc/7-0.15$	ns	-
T6	Output data position6	-	$6Tc/7-0.15$	-	$6Tc/7-0.15$	ns	-

3.5.2 DC Electrical Characteristics

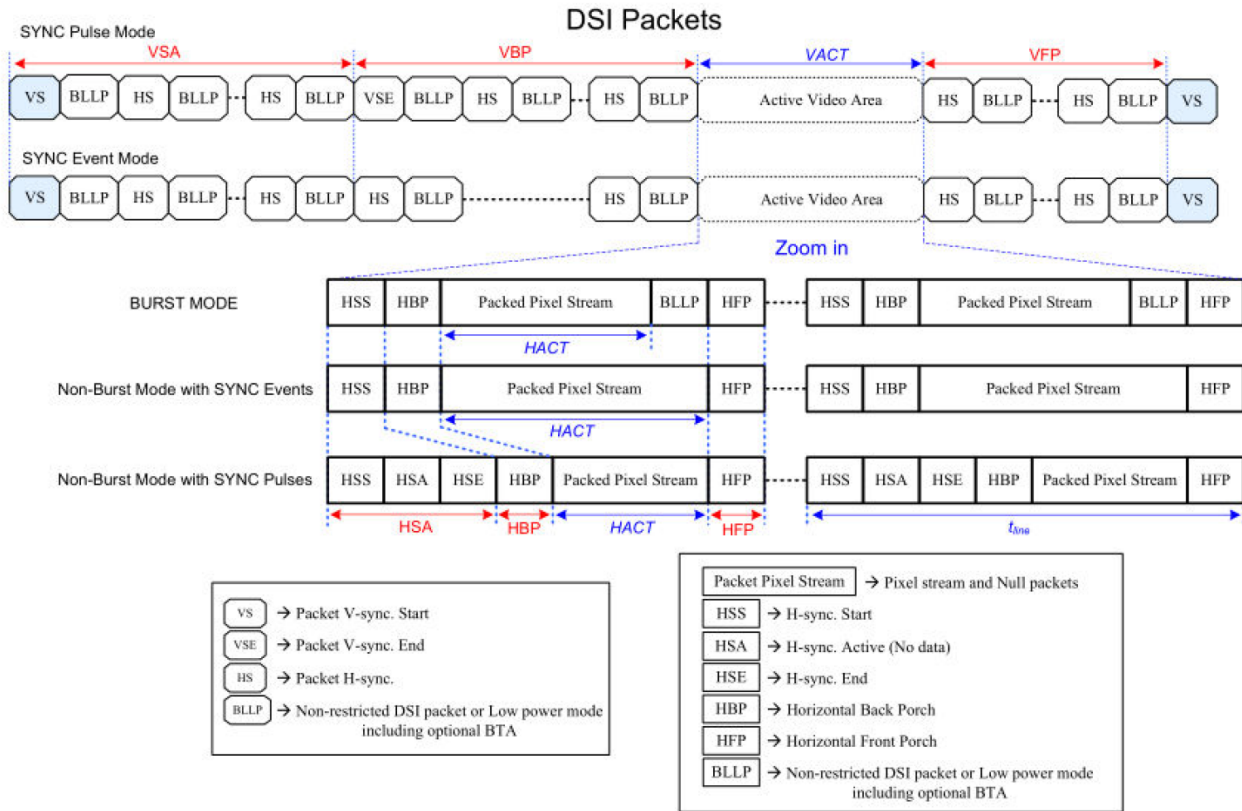
LVDS Receiver DC Specifications

Symbol	Description	Condition	Min	Typ.	Max	Unit	Note
VIDTH	Differential input high voltage threshold	-	-	-	50	mV	-
VIDTL	Differential input low voltage threshold	-	-50	-	-	mV	-
VCMRXDC	Input common mode voltage	-	0	1200	1800	mV	-
Rterm	Termination Resister	-	80	100	125	Ω	-
VIDTH	Differential input high voltage threshold	-	-	-	50	mV	-

LVDS Transmitter DC Specifications

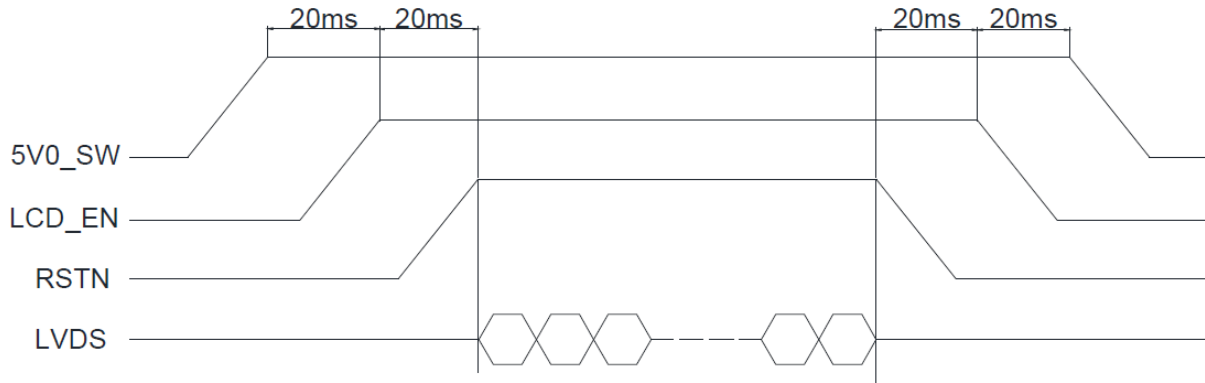
Symbol	Description	Condition	Min	Typ.	Max	Unit	Note
VOD	Differential Out Voltage: RL=100 Ω	-	150	350	500	mV	-
Δ VOD	Change in VOD between complementary output states: RL=100 Ω	-	-	-	35	mV	-
VOC	Common Mode Voltage: RL=100 Ω	-	1.1	1.25	1.4	V	-
Δ VOC	Change in VOC between complementary output states: RL=100 Ω	-	-	-	35	mV	-
IOS	Output short circuit current: Vout=0V, RL=100 Ω	-	-	-	-24	mA	-
IOZ	Output TRI-State Current: Vout=0V to VCC	-	-	-	\pm 10	μ A	-

3.5.3 Timing



Parameters	Symbols	Min.	Typ.	Max.	Units
Vertical sync. active	VSA	-	4	-	Line
Vertical Back Porch	VBP	-	30	-	Line
Vertical Front Porch	VFP	-	30	-	Line
Active lines per frame	VACT	-	1280	-	Line
Horizontal sync. active	HSA	-	4	-	Pixel
Horizontal Back Porch	HBP	-	70	-	Pixel
Horizontal Front Porch	HFP	-	70	-	Pixel
Active pixels per line	HACT	-	800	-	Pixel
Line time	t_{line}	TBD		-	bps/lane
Bit rate	BR _{DSI}	200		Note 5	Line

3.5.4 Power ON/OFF Sequence



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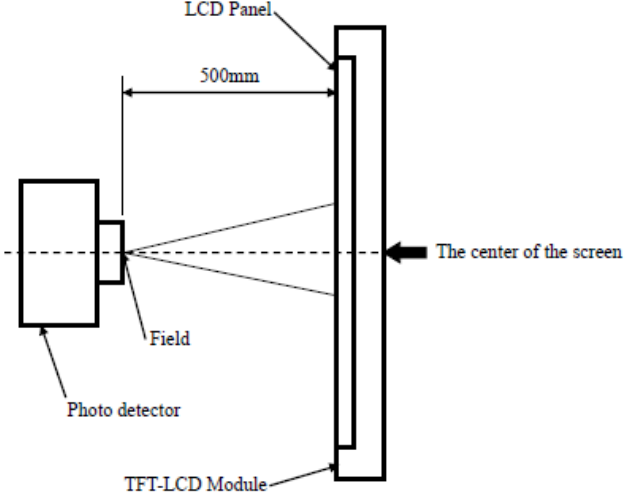
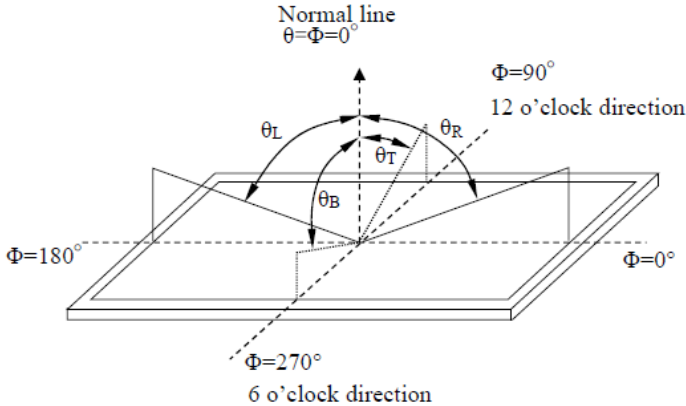
4. Optical Specification

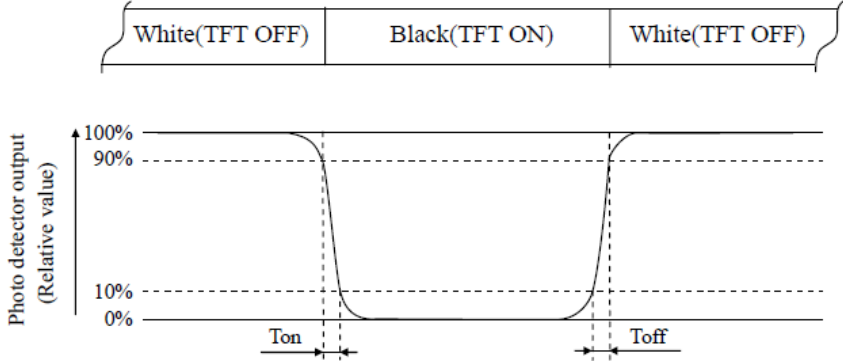
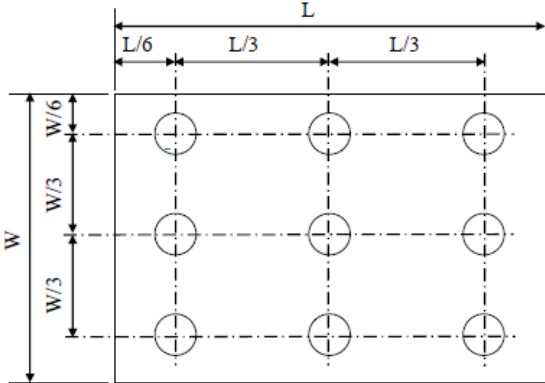
4.1 Optical Characteristics

Characteristics		Symbol	Conditions	Min	Typ.	Max	Unit	Note
Contrast Ratio		CR	$\theta = 0^\circ$	900	1200	-	-	1, 3
Response time		TR + TF	25°C	-	-	35	ms	1, 4
Viewing Angle	Left	θ_{x-}	CR≥10	-	80	-	Degree	2
	Right	θ_{x+}		-	80	-		
	Up	θ_{y+}		-	80	-		
	Down	θ_{y-}		-	80	-		
Colour Chromaticity	Red	Rx	$\theta = 0^\circ$	(0.598)	(0.638)	(0.678)	-	1, 5
		Ry		(0.310)	(0.350)	(0.390)		
	Green	Gx		(0.297)	(0.337)	(0.377)		
		Gy		(0.555)	(0.595)	(0.635)		
	Blue	Bx		(0.117)	(0.157)	(0.197)		
		By		(0.068)	(0.108)	(0.148)		
	White	Wx		(0.275)	(0.315)	(0.355)		
		Wy		(0.308)	(0.348)	(0.388)		
Luminance		L	-	220	270	-	cd/m ²	6, 7
Uniformity		U	-	75	-	-	%	6

Test Conditions:

1. If= 60 mA (Backlight current), 5V0_SW = 5 V, the ambient temperature is 25°C.
2. The test systems refer to Note 2.

Note	Item	Test method																		
1	Definition of Optical Measurement System	<p>The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. ALL input terminals LCD panel must be ground when measuring the center area of the panel.</p>  <table border="1" data-bbox="673 1108 1337 1476"> <thead> <tr> <th>Item</th> <th>Photo detector</th> <th>Field</th> </tr> </thead> <tbody> <tr> <td>Contrast Ratio</td> <td></td> <td></td> </tr> <tr> <td>Luminance</td> <td>CS1000</td> <td>1°</td> </tr> <tr> <td>Lum Uniformity</td> <td></td> <td></td> </tr> <tr> <td>Chromaticity</td> <td>CS1000</td> <td>-</td> </tr> <tr> <td>Response Time</td> <td>DMS703</td> <td>-</td> </tr> </tbody> </table>	Item	Photo detector	Field	Contrast Ratio			Luminance	CS1000	1°	Lum Uniformity			Chromaticity	CS1000	-	Response Time	DMS703	-
Item	Photo detector	Field																		
Contrast Ratio																				
Luminance	CS1000	1°																		
Lum Uniformity																				
Chromaticity	CS1000	-																		
Response Time	DMS703	-																		
2	Definition of Viewing Angle Range and Measurement System																			
3	Definition of Contrast Ratio (CR)	<p>Contrast ratio (CR) = $\frac{\text{Luminance measured when LCD is at "white state"}}{\text{Luminance measured when LCD is at "black state"}}$</p>																		

Note	Item	Test method
		<p>“White state”: The state is that the LCD should drive by Vwhite.</p> <p>“Black state”: The state is that the LCD should drive by Vblack.</p> <p>Vwhite: To be determined</p> <p>Vblack: To be determined</p>
4	Definition of Response Time (TR, TF)	<p>The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON)is the time between photo detector output intensity changed from 90% to 10%.And fall time (TOFF)is the time between photo detector output intensity changed from 10% to 90%.</p> 
5	Definition of Color Chromaticity (CIE1931)	Color coordinates measured at center point of LCD.
6	Definition of Luminance Uniformity	<p>Active area is divided into 9 measuring areas. Every measuring point is placed at the center of each measuring area.</p> <p>Luminance Uniformity (U)=Lmin/Lmax</p> <p>L-----Active area length W-----Active area width</p> 

Note	Item	Test method
		L max: The measured Maximum luminance of all measurement position. L min: The measured Minimum luminance of all measurement position.
7	Definition of Luminance	Measure the luminance of white state at center point.

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5. LED Backlight Specification

5.1 LED Backlight Characteristics

Ta = 25° C

Item	Symbol	Condition	Min	Typ.	Max	Unit	Note
Forward Voltage	Vf	-	19.6	-	23.8	V	-
Forward Current	If	-	-	60	-	mA	-
Operating Lifetime	-	-	30000	-	-	Hours	-

Note 1: Ta means ambient temperature of TFT-LCD module.

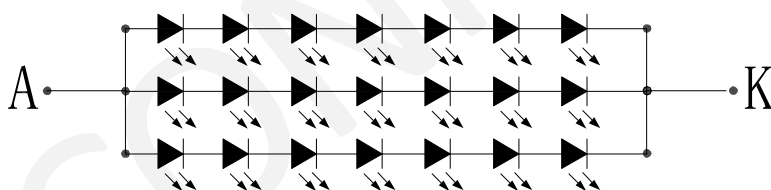
Note 2: IF, VF are defined for one channel LED. There are two LED channel in back light unit.

Note 3: If the module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note 4: Operating life means brightness goes down to 50% initial brightness. Minimum operating lifetime is estimated data.

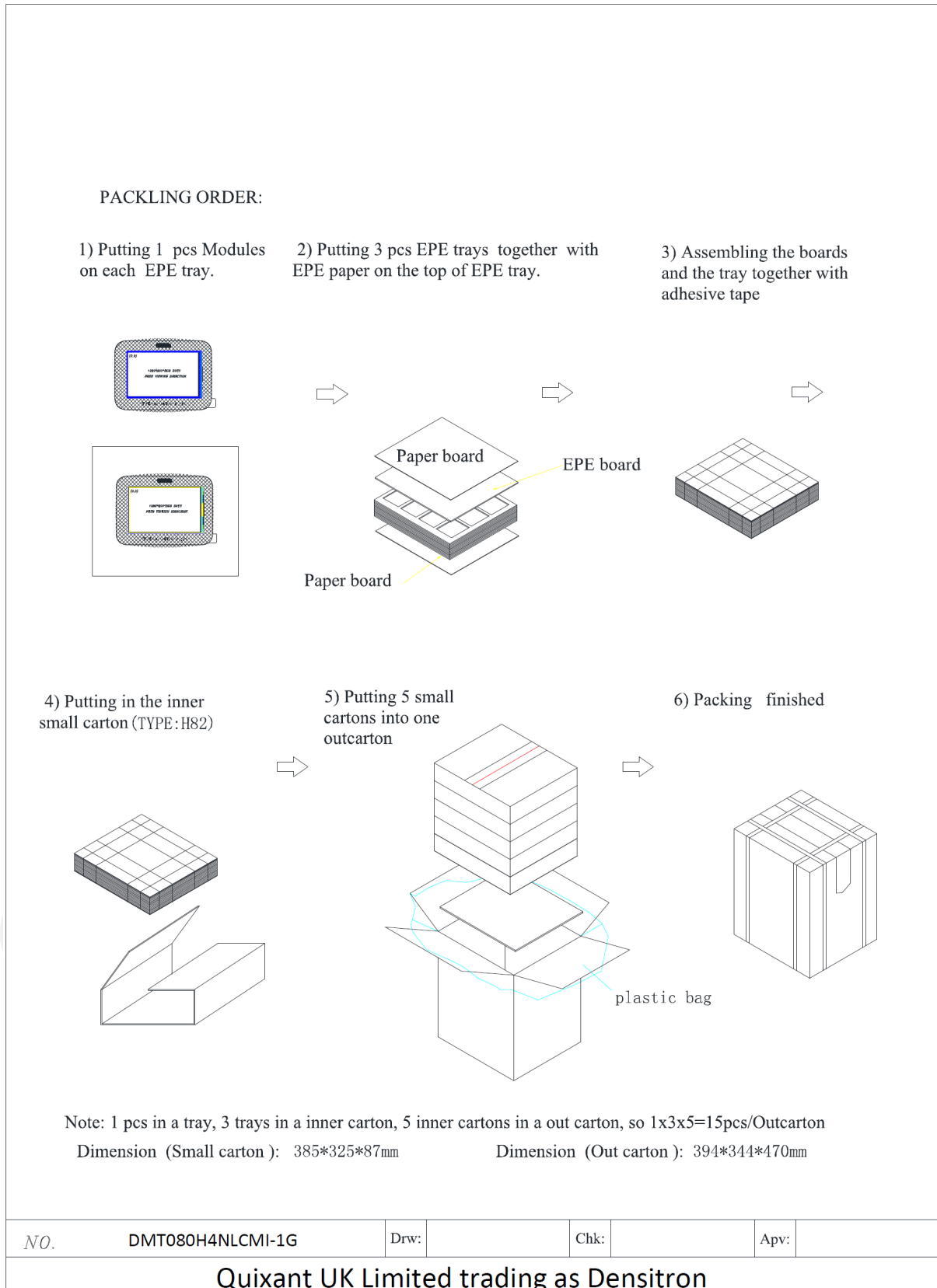
5.2 INTERNAL CIRCUIT DIAGRAM

LED CIRCUIT DIAGRAM:



$$V_f = 19.6V(MIN), 23.8V(MAX.) @ I_f = 60mA$$

6. Packaging



7. Quality Assurance Specification

7.1 Conformity

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

7.2 Environment Required

Customer's test & measurement are required to be conducted under the following conditions:

Temperature:	25 ± 5°C
Humidity:	65% ± 5% RH
Illumination:	under 40W fluorescent light
Viewing distance:	35 ± 5 cm

Finger glove (or finger cover) must be worn by the inspector.

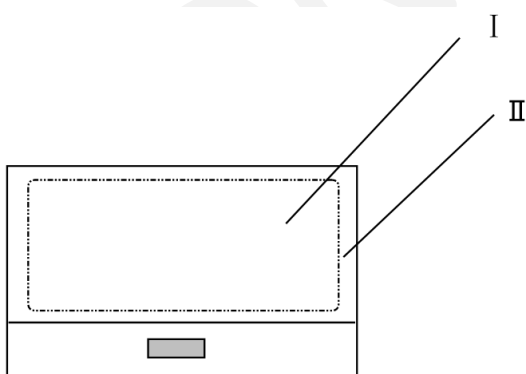
Inspection table or jig must be anti-electrostatic.

7.3 Delivery Assurance

7.3.1 Delivery Inspection Standards

Class II, Normal Inspection, MIL-STD-105E

7.3.2 Zone Definition



I area: viewing area

II area: outside viewing area

7.3.3 Criteria & Acceptable Quality Level

Partition	AQL	Definition
Major (MA)	0.65	<ol style="list-style-type: none"> 1. Liquid crystal leakage 2. Wrong polarizer 3. Outside dimension 4. Bright dot, dark dot 5. Display abnormal 6. Class crack
Minor (MI)	1.0	<ol style="list-style-type: none"> 1. Spot defect (including black spot, white spot, pinhole, foreign particle, bubbles, hurt) 2. Fragment 3. Line defect (including black line, white line, scratch) 4. Incision defect 5. Newton's ring 6. Other visual defects

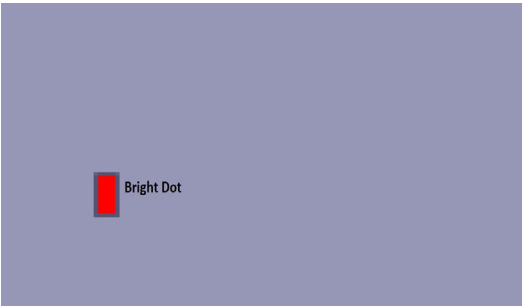
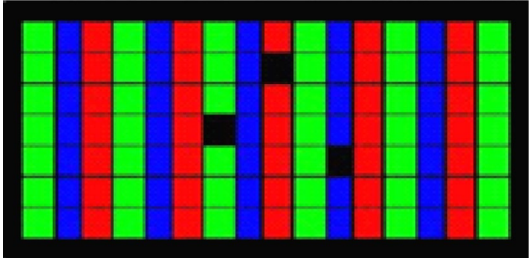
7.3.4 Packing Inspection

Standard of appearance test for I area: (unit: mm)

Note: Defect ignore for II area.

7.3.5 Criteria & Classification

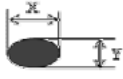
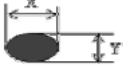

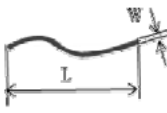
Bright/Dark Dots explain

Item	Description	Definition
Bright Dot	Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern. 	The definition of dot: The size of a defective dot over 1/2 of single pixel dot is regarded as one defective dot. Note: One pixel consists of 3 sub-pixels, including R, G, and B dot. (Sub-pixel = Dot)
Dark Dot	Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue pattern. 	
Adjacent Dot	Adjacent two sub-pixel are defect (define two dot defect)	

Inspection Standard



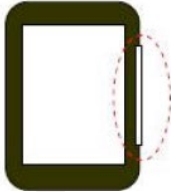



Units: mm



No.	Item	Criterion				Checking Manner	Defect Classes
		LCD≤4.3"	4.3" < LCD < 7"	7"≤LCD≤12"	LCD > 12"		
1	Bright/dark dot	Bright dot: N≤2 Dark dot: N≤3 Total: N≤4	Bright dot: N≤3 Dark dot: N≤4 Total: N≤6	Bright dot: N≤4 Dark dot: N≤5 Total: N≤8	Bright dot: N≤5 Dark dot: N≤6 Total: N≤10	Checking with eyes	Maj -

No.	Item	Criterion				Checking Manner	Defect Classes
		The distance between the two defect dots shall be greater than 5mm. The distance between two defect dots above 7 inches shall be more than 10 mm. Note: Adjacent dot defect N≤0					
2	Spot defects (black and white spot, pinhole, foreign matter, dent, backlight foreign matter)  $D=(X+Y)/2$	$D \leq 0.15$ Ignore $0.15 < D \leq 0.3$ $N \leq 3$ $0.3 < D$ N=0	$D \leq 0.2$ Ignore $0.2 < D \leq 0.5$ $N \leq 4$ $0.5 < D$ N=0	$D \leq 0.2$ Ignore $0.2 < D \leq 0.5$ $N \leq 5$ $0.5 < D$ N=0	$D \leq 0.2$ Ignore $0.2 < D \leq 0.5$ $N \leq 6$ $0.5 < D$ $N=0$	Checking with eyes	Min
3	Bubble  $D=(X+Y)/2$	$D \leq 0.2$ Ignore $0.2 < D \leq 0.5$ $N \leq 3$ $0.5 < D$ N=0	$D \leq 0.2$ Ignore $0.2 < D \leq 0.5$ $N \leq 4$ $0.5 < D$ N=0	$D \leq 0.2$ Ignore $0.2 < D \leq 0.5$ $N \leq 5$ $0.5 < D$ N=0	$D \leq 0.2$ Ignore $0.2 < D \leq 0.5$ $N \leq 6$ $0.5 < D$ $N=0$	Checking with eyes	Min
4	Line defects (Black and white line, backlight foreign matter etc.) 	$W \leq 0.03$ Ignore $0.03 < W \leq 0.06$ $L \leq 5$ N≤3 $W > 0.06$ $L > 5$ N=0	$W \leq 0.03$ Ignore $0.03 < W \leq 0.1$ $L \leq 5$ N≤4 $W > 0.1$ $L > 5$ N=0	$W \leq 0.03$ Ignore $0.03 < W \leq 0.1$ $L \leq 5$ N≤5 $W > 0.1$ $L > 5$ N=0	$W \leq 0.03$ Ignore $0.03 < W \leq 0.1$ $L \leq 5$ N≤6 $W > 0.1$ $L > 5$ N=0	Checking with eyes	Min
5	Scratch 	$W \leq 0.03$ Ignore $0.03 < W \leq 0.2$ $1.0 < L \leq 5.0$	$W \leq 0.03$ Ignore $0.03 < W \leq 0.2$ $1.0 < L \leq 5.0$	$W \leq 0.03$ Ignore $0.03 < W \leq 0.2$ $W \leq 0.2$	$W \leq 0.03$ Ignore $0.03 < W \leq 0.2$ $W \leq 0.2$	Checking with eyes	Min

No.	Item	Criterion				Checking Manner	Defect Classes
		N≤3 W>0.2 L>5 N=0	N≤4 W>0.2 L>5 N=0	1.0<L≤5.0 N≤5 W>0.2 L>5 N=0	1.0<L≤5.0 N≤6 W>0.2 L>5 N=0		
6	Display abnormal	Not allowed				Checking with eyes	Maj
7	Outside dimension	Accord with drawing				Calipers	Maj
8	Glass crack	Not allowed				Checking with eyes	Maj
9	Leak	Not allowed				Checking with eyes	Maj
10	Comer and side fragment			<p>1. Comer fragment: X, Y≤1mm Z≤T/2→ allowed</p> <p>2. Side fragment: X≤2.0mm Y≤1mm Z≤T/2 → allowed</p>		Calipers & Eyes	Min
11	Crack			NG		Eyes	Maj
12	Newton's ring (CTP or Cover board)			Newton's ring <1/9 area, after Lightened, no influence on words and lines.		Checking with eyes	Min

TP Standard

No.	Item	Picture	Criterion	Checking Manner	Defect Classes
1	Outside dimension	-	Accord with drawing	Calipers & Eyes	min
2	Color deviation	Difference of ink color	Obvious deviation compared with samples	Eyes	Min
3	Ink pinhole		No any holes near VA side 3mm Out of VA: $D \leq 0.15\text{mm}$ $N \leq 1$, no present in reflection condition.	Eyes Film	Min
4	Ink saw tooth		$W \leq 0.15\text{mm}$ $N=1$	Eyes Film	Min
5	Ink light leakage		1、width of light leakage at the edge area $\leq 0.15\text{mm}$ OK 2、width of light leakage at the edge area $> 0.15\text{mm}$ NG	Eyes Film	Min
6	Cover glass profile	-	No ink, adhesive, oil stain, etc.	Eyes	Min
7	IR(LED)dot/black-white dot		$\varphi \leq 0.2$ 、 $N \leq 1$ $0.15 < \varphi$ 、not allowed	Eyes & Film	Min
8	IR(LED)dot blackwhite dot/different color		no present when use all viewing angle to determine at 35cm, allowed	Eyes	Min
9	Shooting hole		$\varphi \leq 0.2$ 、 $N \leq 1$ $0.15 < \varphi$ 、not allowed	Eyes & Film	Min

No.	Item	Picture	Criterion	Checking Manner	Defect Classes
10	LOGO/ICON black-white dot		Diagram clear $\varphi \leq 0.2$ 、 $N \leq 1$	Eyes& Film	Min
11	FPC warped		OK	Eyes	Min
12	FPC broken, stained, oxidation		NG	Eyes	Maj
13	Stain	-	No evident finger print, oil print, gelatinoids, etc.	Eyes	Min
14	Sponge	-	Presented in AA area. NG	Eyes	Min
15	Protection foil	Finished Protection foil	<p>1、Protection foil stain: In normal inspection Condition, fingerprint, pen print and gelatinoids are presented. NG</p> <p>2、Bubbles $\leq 5.0\text{mm}$, or according to client's limited sample</p> <p>3、Protection foil worn and warped。NG</p> <p>4、Scratch: $W \leq 0.10\text{mm}$, ignore length; $0.10\text{mm} < W \leq 0.20\text{mm}$, $L \leq 30\text{mm}$, and $N \leq 4$, $d > 15\text{mm}$; OK; $L > 30\text{mm}$ or $W > 0.20\text{mm}$; NG</p>	Eyes& Film	Min

7.4 Dealing with Customer Complaints

7.4.1 Non-conforming Analysis

Purchaser should supply Densitron with detailed data of non-conforming sample.

7.4.2 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
High Temperature Storage	60±2°C/240 hours	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Sealleak; 3.Non-display; 4.Missing segments; 5.Glass crack; 6.Current Idd is twice higher than initial value.
Low Temperature Storage	-20±2°C/240 hours	
High Temperature Operating	50±2°C/240 hours	
Low Temperature Operating	-10±2°C/240 hours	
Temperature Cycle	-20°C ~ 25°C ~ 60°C × 10cycles (30min.) (5min.) (30min.)	
Damp Proof Test	40°C±5°C×90%RH/240 hours	
Vibration Test	Frequency : 10Hz~55Hz~10Hz Amplitude : 1.5mm, X , Y , Z direction for total 3hours (Packing condition)	
Dropping test	Drop to the ground from 1m height, one time, every side of carton. (Packing condition)	
ESD test	Voltage: ±8KV R: 330Ω C: 150pF Air discharge, 10time	
	Voltage: ±6KV R: 330Ω C: 150pF Contact discharge, 10time	

Note 1: The test samples should be applied to only one test item.

Note 2: Sample size for each test item is 5~10pcs.

Note 3: For Damp Proof Test, Pure water(Resistance > 10MΩ) should be used.

Note 4: In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.

Note 5: Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

Note 6: Please use automatic switch menu (or roll menu) testing mode when test operating mode.

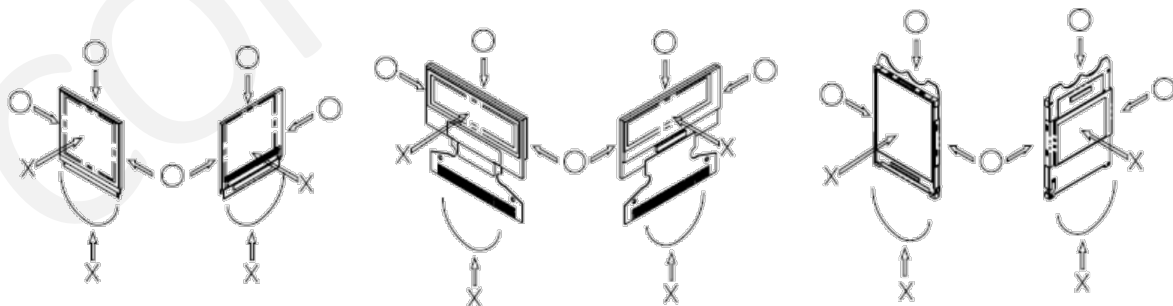
8.1.1 Inspection Check Standard

After the completion of the described reliability test, the samples are to be left at room temperature for 4 hrs prior to conducting the inspection check at 25±5 °C, 65±5% RH.

9. Handling Precautions

9.1 Handling Precautions

- 1) Since the display panel is being made of glass, do not apply mechanical impacts such as dropping from a high position.
- 2) If the display panel is broken by some accident and the internal organic substance leaks out, be careful not to inhale nor lick the organic substance.
- 3) If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water
- 4) If pressure is applied to the display surface or its neighbourhood of the display module, the cell structure may be damaged and be careful not to apply pressure to these sections.
- 5) The polarizer covering the surface of the display module is soft and easily scratched. Please be careful when handling the display module.
- 6) When the surface of the polarizer of the display module has soil, clean the surface. It takes advantage of by using following adhesion tape.
 - a. Scotch Mending Tape No. 810 or an equivalent
 - b. Never try to breathe upon the soiled surface nor wipe the surface using cloth containing solvent such as ethyl alcohol, since the surface of the polarizer will become cloudy.
 - c. Also, pay attention that the following liquid and solvent may spoil the polarizer:
 - Water
 - Ketone
 - Aromatic Solvents
- 7) Hold the display module very carefully when placing it into the system housing. Do not apply excessive stress or pressure to display module. And, do not over bend the film with electrode pattern layouts. These stresses will



influence the display performance. Also, secure sufficient rigidity for the outer cases.

- 8) Do not apply stress to the LSI chips and the surrounding molded sections.
- 9) Do not disassemble nor modify the display module.
- 10) Do not apply input signals while the logic power is off.
- 11) Pay sufficient attention to the working environments when handing display modules to prevent occurrence of element breakage accidents by static electricity.

- a. Be sure to make human body grounding when handling display modules.
 - b. Be sure to ground tools to use or assembly such as soldering irons.
 - c. To suppress generation of static electricity, avoid carrying out assembly work under dry environments.
 - d. Protective film is being applied to the surface of the display panel of the display module. Be careful since static electricity may be generated when exfoliating the protective film.
- 12) Protection film is being applied to the surface of the display panel and removes the protection film before assembling it. If the display module has been stored for a long period of time, residue adhesive material of the protection film may remain on the surface of the display panel after removed of the film. In such case, remove the residue material by the method introduced in the above Section 5).
- 13) If electric current is applied when the display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful to avoid the above.

9.2 Storage Precautions

- 1) When storing display modules, put them in static electricity preventive bags avoiding exposure to direct sun light nor to lights of fluorescent lamps, etc. and, also, avoiding high temperature and high humidity environments or low temperature (less than 0°C) environments. (We recommend you to store these modules in the packaged state when they were shipped from Densitron) At that time, be careful not to let water drops adhere to the packages or bags nor let dewing occur with them.
- 2) If electric current is applied when water drops are adhering to the surface of the display module, when the display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful about the above.

9.3 Designing Precautions

- 1) The absolute maximum ratings are the ratings which cannot be exceeded for display module, and if these values are exceeded, panel damage may be happen.
- 2) To prevent occurrence of malfunctioning by noise, pay attention to satisfy the VIL and VIH specifications and, at the same time, to make the signal line cable as short as possible.
- 3) We recommend you to install excess current preventive unit (fuses, etc.) to the power circuit (VDD). (Recommend value: 0.5A)
- 4) Pay sufficient attention to avoid occurrence of mutual noise interference with the neighbouring devices.
- 5) As for EMI, take necessary measures on the equipment side basically.
- 6) When fastening the display module, fasten the external plastic housing section.
- 7) If power supply to the display module is forcibly shut down by such errors as taking out the main battery while the display panel is in operation, we cannot guarantee the quality of this display module.

9.4 Operation Precautions

- 1) It is indispensable to drive the display within the specified voltage limit since excessive voltage shortens its life.
- 2) 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.
- 3) 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.
- 4) To protect display modules from performance drops by static electricity rapture, etc., do not touch the following sections whenever possible while handling the display modules.
 - a. Pins and electrodes
 - b. Pattern layouts such as the FPC
- 5) When the driver is being exposed (COG), semiconductor elements change their characteristics when light is radiated according to the principle of the solar battery. Consequently, if the driver is exposed to light, malfunctioning may occur.
 - a. Design the product and installation method so that the driver may be shielded from light in actual usage.
 - b. Design the product and installation method so that the driver may be shielded from light during the inspection processes.
- 6) Although the display module stores the operation state data by the commands and the indication data, when excessive external noise, etc. enters into the module, the internal status may be changed. It therefore is necessary to take appropriate measures to suppress noise generation or to protect from influences of noise on the system design.
- 7) We recommend you to construct its software to make periodical refreshment of the operation statuses (re-setting of the commands and re-transference of the display data) to cope with catastrophic noise.

9.5 Other Precautions

- 1) Request the qualified companies to handle industrial wastes when disposing of the display modules. Or, when burning them, be sure to observe the environmental and hygienic laws and regulations.