DISPLAY Elektronik GmbH

DATA SHEET

7,0” TFT MODULE

DEM 480234A TMH-PW-N

Product Specification **Version: 2.0**

06.09.2007

REVISION HISTORY:

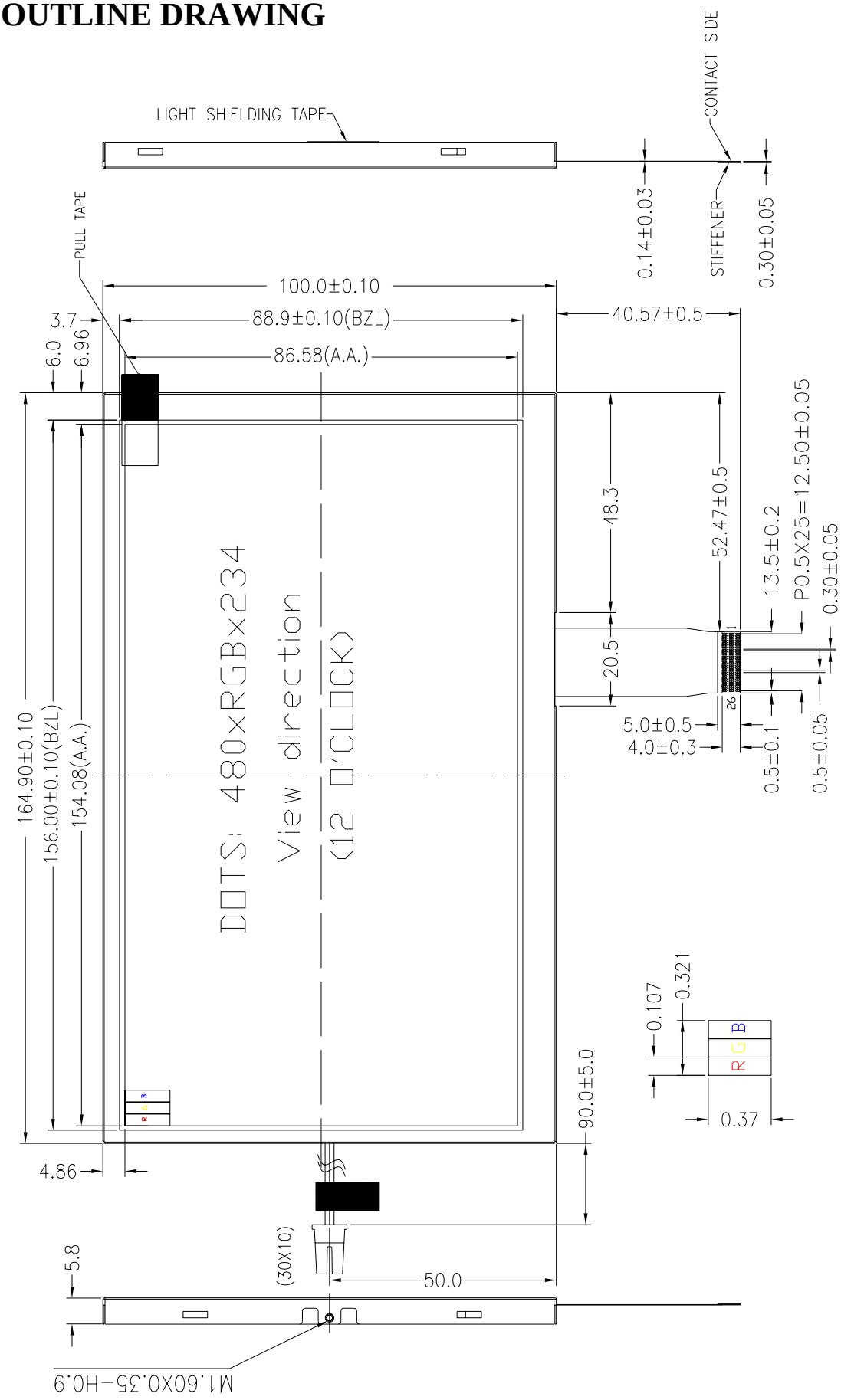
Revision	Date	Description	Written By	Approved By
1.0	31-Aug.-2007	New Release	XH	JY
2.0	06-Sep.-2007	Modify "Item1.0 General Specification" Modify "Item 3.0 Outline Drawing" Modify "Item 8.0 Backlight Specification"	XH	MH

CONTENTS

1.0 GENERAL SPECIFICATION

Item	Contents	Unit
LCD Type	TFT-color transmissive LCD	-
Module outer dimension	164.90 × 100.00 × 5.70	mm
Active display area	154.08 × 86.58	mm
Number of dots	480xRGB x 234	dots
Pixel driving element	a-SI TFT	-
Pixel arrangement	RGB-Stripe	-
Pixel Size	0.107 × 0.370	mm
Viewing Direction	12	O'clock
Backlight	LED, White, Lightguide	-
Drive IC	HX8226A+HX8615B (HIMAX)	-
Display colors	Analog full color	-
MPU interface	Analog	-
Operating temperature	-20°C ~ 70°C	°C
Storage temperature	-30°C ~ 80°C	°C
Weight	~ 169	g

2.0 OUTLINE DRAWING



3.0 INTERFACE PIN CONNECTION

Pin No.	Symbol	Functions
1	GND	Digital ground.
2	VCC	Power supply for digital circuit.
3	VGL	Negative power supply for X1~X240 outputs
4	VGH	Positive power supply for X1~X240 outputs.
5	STVD	These two pins are the device start pulse input or output pin, the function of these two pins depends on the status of LR pin. When LR="L", STVD is enabled output and STVU is enabled input. When LR="H", STVD is enabled input and STVU is enabled output. Start pulse is read at the rising edge of CPV and a scan signal is output from the driver output pin. Start pulse goes up to high level at the 240th falling edge of CPV and goes down to low level are the 241st falling edge of CPV.
6	STVU	
7	CKV	This is the clock input for chip internal shift register. Data is shifted at each rising edge of this clock.
8	U/D	Shift up or down control, U/D="H", up shift: STVD (input)~X1~X240~STVU (output). U/D="L", down shift: STVU (input)~X240~X1~STVD (output)
9	OEV	Output off, active high. The driver outputs are disabled, output=VEE, when OEV is connected to high "1". Under this condition, the operation of registers will not be affected.
10	VCOM	Common electrode driving signal.
11	VCOM	Common electrode driving signal.
12	L/R	Select left or right shift, normally pulled high. L/R=H, STH1~QX1~QX2~QX240~STH2. L/R=L,STH2~QX240~QX239~QX1~STH1.
13	MOD	Clock select signal on latching RGB signals. MOD=0: Latching R, G, B signals to QAx,QBx,QCx, by the rising edge of CPH1,CPH2 and CPH3, normally pull low. Mod=1: latching R,G,B signal by CPH1.
14	OEH	Enables outputs, QA1 to QC240, and the dual sample & hold circuit will be switched at the falling edge of OEH.
15	STHL	Input output switch of start pulse. Start pulse input pin and cascade output pin is controlled by L/R input.
16	STHR	
17	CPH3	A clock pulse is simulated to CPH1. When L/R=H, sequentially latches the input data, VC, at using the rising edge into embedded buffers from QC1 to QC240. When L/R=L, latches the input data, VA to the buffers from QA240 to QA1. When MOD=H, CQH3 must be connected to VDD or VSS.

18	CPH2	Clock signal for latching video signal, using the rising edge of this signal to sample and hold the input data sequentially, VB, into embedded buffers. When L/R=H, the data are applied form QB1 to QB 240. When L/R=L, the data are applied from QB240 to QB1. When MOD=H,CPH2 must be connected to VDD or VSS.
19	CPH1	Clock signal for latching video signals. When L/R=H, using the rising edge of this signal to samples and hold the input data, VA, into embedded buffers. The data are applied from QA1 to QA240 sequentially, then these data are output through output pins. When L/R=L, using the rising edge of this signal to sample and hold the input data, VC, into embedded buffers. The data are applied from QC240 to QC1, then these data are output through output pins.
20	VCC	Power supply for digital circuit.
21	GND	Digital ground.
22	VR	Analog signal inputs for R,G,B data.
23	VG	
24	VB	
25	AVDD	Power supply for analog circuit.
26	AVSS	Analog ground.

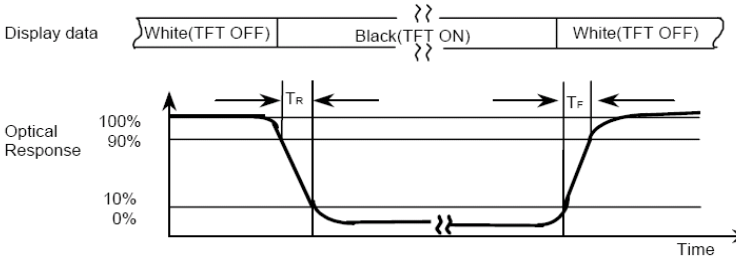
4.0 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Unit	Value	Note
Digital Power Supply	Vcc	V	-0.3 to +7.0	
Analog power supply	AVDD	V	-0.3 to +7.0	
Video input voltage	VA,VB,VC	V	-0.2 to AVDD+0.3	
Positive power supply	VGH	V	7 to VEE+40	
Negative power supply	VEE	V	-20 to -5	
Input Voltage	VI	V	-0.3 to VCC+0.3	
LSI Operating Temperature	Topr	^{o}C	-10 to +70	
LSI Storage Temperature	Tstg	^{o}C	-30 to +80	

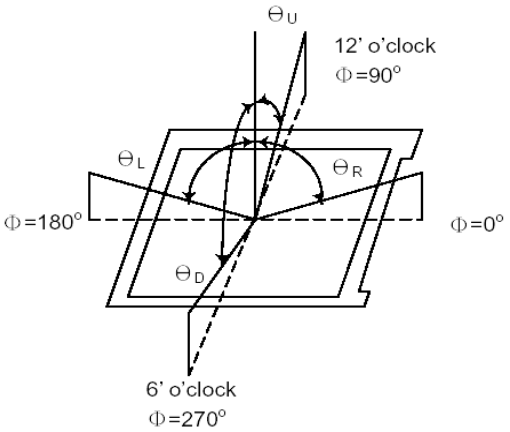
5.0 ELECTRO-OPTICAL CHARACTERISTICS

No	Item		Symbol	Measuring Conditions		Min.	Typ.	Max.	Unit	Note
1	Response Time	Rise	Tr	$\theta = 0^o$ $\phi = 0^o$	25 °C	-	15	30	ms	Note (1)
		Fall	Tf	$\theta = 0^o$ $\phi = 0^o$	25 °C	-	35	50		
2	Viewing Angle (CR ≥ 10)		θ_R	$\phi = 0^o$	25 °C	-	45	-	Deg	Note (3)
			θ L	$\phi = 180^o$	25 °C	-	45	-		
			θ_U	$\phi = 90^o$	25 °C	-	35	-		
			θ D	$\phi = 270^o$	25 °C	-	10	-		
3	Contrast Ratio		CR	-	25 °C	150	250	-	-	Note (2)
4	Luminance of white(Center point)		L	-	25 °C	200	250		Cd/m^2	Note (5)
5	Transmissive rate		T%	Viewing normal angle θx=0° θy=0°		-	8.6	-	%	Note (4) NTSC=50%
6	Chromaticity	Red	X_R			0.585	0.615	0.645	-	
			Y_R			0.314	0.344	0.374	-	
		Green	X_G			0.277	0.307	0.337	-	
			Y_G			0.533	0.563	0.593	-	
		Blue	X_B			0.103	0.133	0.163	-	
			Y_B			0.120	0.150	0.180	-	
		White	X_W			0.279	0.309	0.339	-	
			Y_W			0.320	0.350	0.380	-	

Note (1): Definition of Response Time



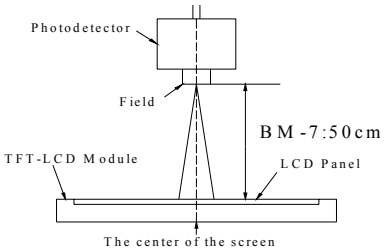
Note (3): Definition of Viewing



Note (2): Definition of Contrast Ratio
CR = Brightness at all pixels "White" / Brightness at all pixels "Black"

Note (4): Measured at center point vertically with backlight on.

Note(5):After stabilizing and leaving the panel alone at a given temperature for 30 min ,the measurement should be executed .Measurement should be executed in a stable, windless, and dark room. 30 min after lighting the back-light. This should be measured in the center of screen.
Environment condition: Ta=25±2°C Back-Light On condition



6.0 DC CHARACTERISTICS

(DVDD=2.5 to 5.5V, AVDD=3.0 to 5.5V, T_{OPR}=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply voltage	AVDD	3	-	5.5	V	-
Supply voltage	DVDD	2.5	-	5.5	V	-
Low level input voltage	V_{IL}	0	-	0.3DVDD	V	CPH1~CPH3, OE, L/R, STH1, STH2, Q1H, Q2H, MOD, CHNSL
High level input voltage	V_{IH}	0.7DVDD	-	DVDD	V	CPH1~CPH3, OE, L/R, STH1, STH2, Q1H, Q2H, MOD, CHNSL
Input leakage current	I_{IN}	-	-	±1	μA	CPH1~CPH3, OE, STH1, STH2, Q1H, Q2H, L/R, MOD, CHNSL
High level output voltage	V_{OH}	DVDD -0.4	-	DVDD	V	STH1, STH2, I_{OH}=-400μA
Low level output voltage	V_{OL}	0	-	0.4	V	STH1, STH2, I_{OL}=400μA
Voltage deviation of output	V_{VD}	-	±20	-	mV	QA1 to QC240, V_{IN}=0.1~4.9V
DC offset	V_{OS}	-	-	±20	mV	Vx to QAx~QCx
Dynamic range of output	V_{DR}	AVDD -0.4	AVDD-0.2	-	V	QA1 to QC240, 0.1 to 4.9V (AVDD =5V)
Output current	I_{OH}	20	40	-	μA	QA1 to QC240, (AVDD =5V) V_O =4.9V vs. 4.0V
Output current	I_{OL}	20	40	-	μA	QA1 to QC240, (AV_{DD} =5V) Vo=0.1V vs. 1.0V

(Please also refer to datasheet of TFT driver)

7.0 BACKLIGHT SPECIFICATION

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	Vf	-	9.6	-	V	If=150mA
Reverse current	Ir	0	50	-	μA	T=25°C
Chromaticity coordinates	X	0.28	-	0.32	-	
	Y	0.28	-	0.33	-	
Luminance	Lv	2200	2500	3000	cd/m^2	
Forward current	If	-	150	-	mA	Vf=9.6V
Uniformity	Δ	75	80	-	%	Min/max*100%
Half-Brightness Life Time	30000hours					

8.0 STANDARD SPECIFICATION FOR RELIABILITY

8.1 Standard specification of Reliability Test

No	Test Item	Content of Test	Test Condition	Applicable Standard
1	High temperature storage	Endurance test applying the high storage temperature for a long time.	80+/-3 °C 240 hrs	------
2	Low temperature storage	Endurance test applying the low storage temperature for a long time.	-30+/-3 °C 240 hrs	------
3	High temperature operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70+/-3 °C 240 hrs	------
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time.	-10+/-3 °C 240 hrs	------
5	High temperature / Humidity operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	40 °C, 90 %RH 120 hrs	MIL-202E-103B JIS-C5023
6	Temperature cycle	Endurance test applying the low and high temperature cycle. -30°C 30min. ⇌ 25°C 5min. ⇌ 80°C 30min. 1 cycle	-30°C / 80°C 10 cycles	------
Mechanical Test				
7	Drop Test	Endurance test applying the drop during transportation.	Packed, 100cm free fall (6 sides, 1 corner, 3edges)	----

Remarks:

13 For operation test, above specification is applicable when test pattern is changing during entire operation test.

14 Inspections after reliability tests are performed when the display temperature resumes back to room temperature.

15 It is a normal characteristic that some display abnormality can be seen during reliability test. If the display abnormality can resume back to normal condition at room temperature within 24hours, there is no permanent destruction over the display. The display still possesses its functionality after reliability tests.

8.2 Failure Judgment Criteria

After the reliability tests above, test sample shall be let return to room temperature and humidity for at least 4 hours before final tests are carried out.

Criterion Item	Failure Judgment Criteria
Electrical characteristic	Electrical short and open.
Mechanical characteristic	Out of mechanical specification
Optical characteristic	Out of the Appearance Standard

9.0 QUALITY ASSURANCE

9.1 Acceptable Quality Level (AQL)

Each lot should satisfy the quality level defined as follows:

a) Inspection method: MIL-STD-105E Level II normal one time sampling

b) AQL level

Category	AQL	Definition
Major	0.25%	Functional defective as product
Minor	1.00%	Satisfy all functions as product but not satisfy cosmetic standard

9.2 Cosmetic Screening Criteria

<table>
<tr><th>No</th><th>Defect</th><th>Judgment Criteria</th><th>Category</th></tr>
<tr><td>1</td><td>Spots/Dust
/Bubble
(Round type)</td><td><table><tr><td>Size, d (mm)</td><td>Acceptable quantity in active area</td></tr><tr><td>d ≤ 0.15</td><td>Disregard</td></tr><tr><td>0.15 < d ≤ 0.20</td><td>3</td></tr><tr><td>d > 0.20</td><td>0</td></tr></table></td><td>Minor</td></tr>
<tr><td>2</td><td>Dust/Scratches/
Black streak
(Line type)</td><td><table><tr><td>Width, W (mm)</td><td>Length, L (mm)</td><td>Acceptable quantity in active area</td></tr><tr><td>W ≤ 0.02</td><td>Disregard</td><td>Disregard</td></tr><tr><td>W ≤ 0.03</td><td>L ≤ 1.0</td><td>Disregard</td></tr><tr><td>W ≤ 0.05</td><td>L ≤ 2.0</td><td>3</td></tr><tr><td>W > 0.05</td><td>Disregard</td><td>0</td></tr></table></td><td>Minor</td></tr>
<tr><td>3</td><td>Allowable
density</td><td>Above defects should be separated more than 5mm each other.</td><td>Minor</td></tr>
<tr><td>4</td><td>Rainbow</td><td>Obvious uneven color (rainbow) shall not be noticeable.</td><td>Minor</td></tr>
<tr><td>5</td><td>Display
condition</td><td>Dim display on the patterns, extra pattern and short circuit are not acceptable.</td><td>Major</td></tr>
<tr><td>6</td><td>No display or
missing display</td><td>The patterns of display shall light up as required. No display or missing display are not acceptable.</td><td>Major</td></tr>
</table>

Note: d = (long length + short length) / 2

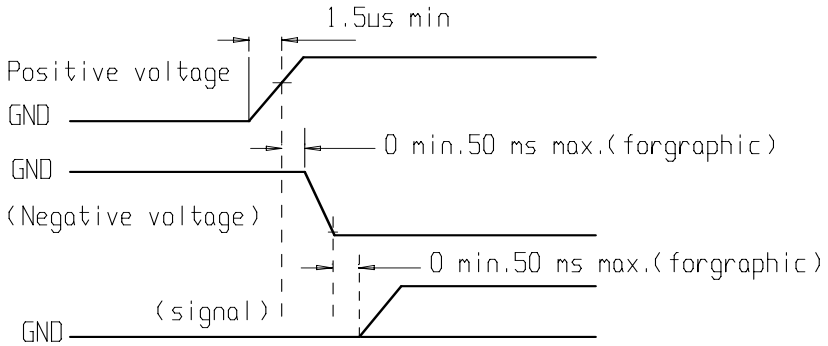
10.0 PRECAUTIONS FOR USING LCD MODULE

Handing Precautions

- Observe the following when soldering lead wire, connector cable and etc. to the LCD module.
- Soldering iron temperature: 300 ~ 350°C.
- Soldering time: ≤ 3 sec.
- Solder: eutectic solder.
- Above is a recommended approach. Due to different solder composition and processing method, it is recommended that customer to study and fine tuning their soldering process parameters accordingly.
- If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

Precautions for Operation

- Viewing angle varies with the change of liquid crystal driving voltage (V_O). Adjust V_O to show the best contrast.
- Driving the LCD in the voltage above the limit shortens its lifetime.
- Response time is greatly delayed at temperature below the operating temperature range. However, it will recover when it returns to the specified temperature range.
- If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.
- When turning the power on, input each signal after the positive/negative voltage becomes stable.



Storage

- When storing LCDs as spares for some years, the following precautions are necessary.
- Store them in a sealed polyethylene bag. If properly sealed, there is no need for desiccant.
- Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
- Environmental conditions:
    - Do not leave them for more than 168hrs. at 60°C.
    - Should not be left for more than 48hrs. at -20°C.

Safety

- It is recommended to crush damaged or unnecessary LCD into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

11.0 LOT NUMBERING SYSTEM

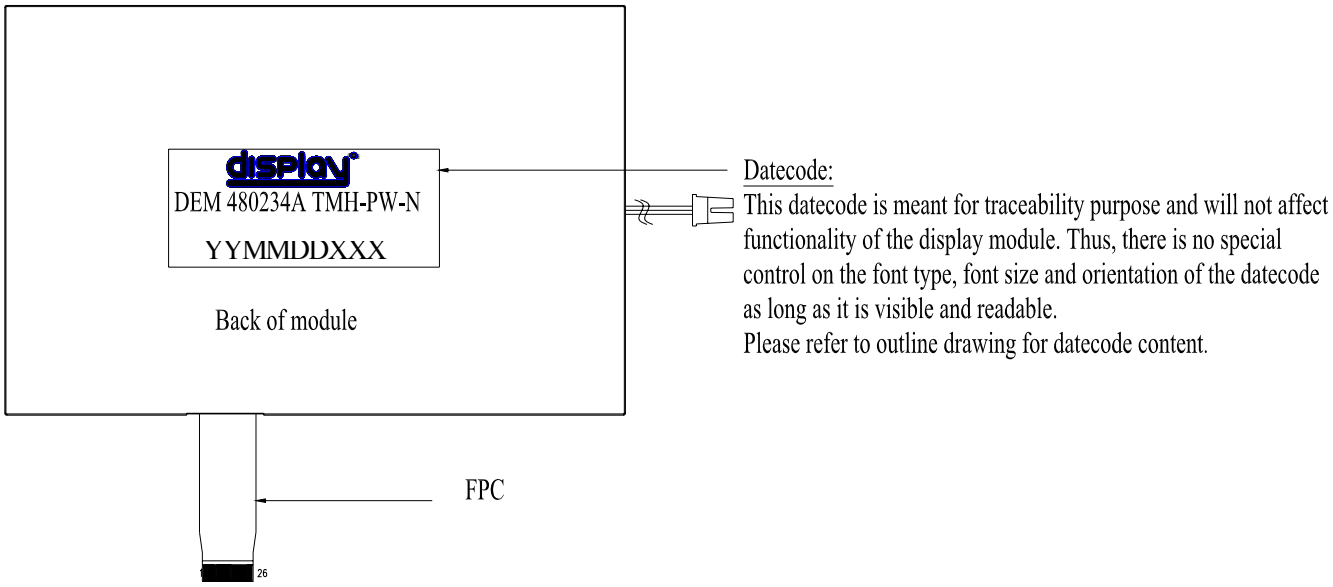
11.1 Definition of Lot Number

One lot means the delivery date and times to customer at one time.

YYMMDD XXX
(1) (2)

(1) Manufacturing date (COG bonding) (YY: Year, MM: Month, DD: Day)
(2) Serial number starts from A01,A02…….A99,B01,B02…….

11.2 Location of datecode number



12.0 ROHS COMPLIANT PRODUCT

Standard of specific chemical substance

1.	Cadmium and Cadmium Compounds	Less than 100ppm
2.	Hexavalent Chromium Compounds	Less than 1000ppm
3.	Lead and Lead Compounds	Less than 1000ppm
4.	Mercury and Mercury Compounds	Less than 1000ppm
5.	Polybrominated Biphenyls (PBBs)	Less than 1000ppm
6.	Polybrominated Diphenyl ethers (PBDEs)	Less than 1000ppm

13.0 LIMITED WARRANTY

Please inspect the LCD modules within one month after your receipt. Unless agreed between DISPLAY and customer, DISPLAY will replace or repair any of its LCD modules, which are found to be functionally defective when inspected in accordance with DISPLAY LCD/LCM acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to DISPLAY within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of DISPLAY limited to repair and/or replacement on the terms set forth above. DISPLAY will not be responsible for any subsequent or consequential events.