K28QCNN-N14C

Product

Standard LCD Module
240 x RGB x 320 Dots
2.8” 262K TFT LCD
Wide temperature
With white LED backlight
With resistive touch screen

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1. Document revision history :

DOCUMENT REVISION	DATE	DESCRIPTION	CHANGED BY	CHECKED BY
01	2014.12.11	First Release.	XW Lee	

2. General Description

- 2.8”(diagonal), 240 x RGB x 320 dots, 262k colors, Transmissive, TFT LCD module.
- Viewing Direction: 12 o’clock.
- Driving IC: ILI9341 or equivalent TFT controller/driver.
- 80 MCU 8/16-bit parallel interface, 3/4-wire SPI interface, DE/SYNC mode RGB interface
- Logic voltage: 2.8V (typ.).

3. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Parameter		Specifications	Unit
Outline dimensions		50.0(W) x 69.2(H) x 2.45(D) (Exclude FPC, cables of backlight)	mm
Color TFT 240xRGBx320	LCD view area	44.2(W) x 58.6(H)	mm
	TP active area	-	mm
	LCD active area	43.2(W) x 57.6(H)	mm
	Display format	240 x RGB x 320	dots
	Color configuration	RGB stripes	-
	Dot pitch	0.18(RGB)(W) x 0.18(H)	mm
Weight		TBD	grams

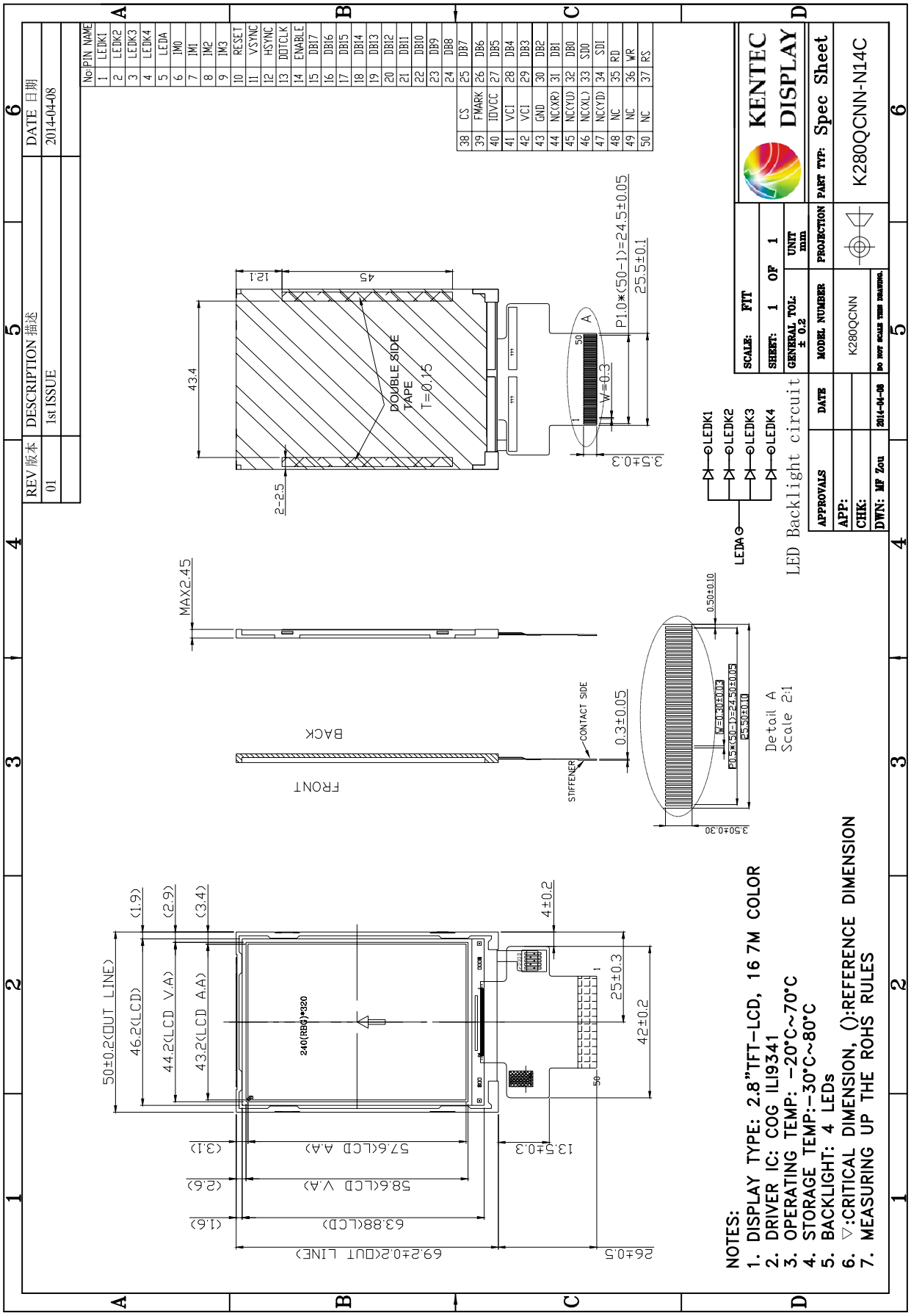

Figure 1: Outline Drawing

4. Interface signals

<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Description</th></tr>
<tr><td>1~4</td><td>LEDK1~LEDK4</td><td>Cathode of LED backlight.</td></tr>
<tr><td>5</td><td>LEDA</td><td>Anode of LED backlight.</td></tr>
<tr><td>6
7
8
9</td><td>IM0
IM1
IM2
IM3</td><td>
<table>
<tr><th rowspan="2">IM3</th><th rowspan="2">IM2</th><th rowspan="2">IM1</th><th rowspan="2">IM0</th><th rowspan="2">MCU-Interface Mode</th><th colspan="2">DB Pin in use</th></tr>
<tr><th>Register/Content</th><th>GRAM</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>80 MCU 8-bit bus interface Ⅰ</td><td>D[7:0]</td><td>D[7:0]</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>80 MCU 16-bit bus interface Ⅰ</td><td>D[7:0]</td><td>D[15:0]</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>0</td><td>80 MCU 9-bit bus interface Ⅰ</td><td>D[7:0]</td><td>D[8:0]</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>80 MCU 18-bit bus interface Ⅰ</td><td>D[7:0]</td><td>D[17:0]</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td><td>3-wire 9-bit data serial interface Ⅰ</td><td colspan="2">SDA: In/OUT</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td><td>4-wire 8-bit data serial interface Ⅰ</td><td colspan="2">SDA: In/OUT</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>80 MCU 16-bit bus interface Ⅱ</td><td>D[8:1]</td><td>D[17:10], D[8:1]</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>1</td><td>80 MCU 8-bit bus interface Ⅱ</td><td>D[17:10]</td><td>D[17:10]</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>0</td><td>80 MCU 18-bit bus interface Ⅱ</td><td>D[8:1]</td><td>D[17:0]</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>80 MCU 9-bit bus interface Ⅱ</td><td>D[17:10]</td><td>D[17:9]</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>1</td><td>3-wire 9-bit data serial interface Ⅱ</td><td colspan="2">SDI: In
SDO: Out</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>4-wire 8-bit data serial interface Ⅱ</td><td colspan="2">SDI: In
SDO: Out</td></tr>
</table>
</td></tr>
<tr><td>10</td><td>RESET</td><td>Reset pin, low active.</td></tr>
<tr><td>11</td><td>VSYNC</td><td>Frame synchronizing signal for RGB interface operation.</td></tr>
<tr><td>12</td><td>HSYNC</td><td>Line synchronizing signal for RGB interface operation.</td></tr>
<tr><td>13</td><td>DOTCLK</td><td>Dot clock signal for RGB interface operation.</td></tr>
<tr><td>14</td><td>ENABLE</td><td>Data enable signal for RGB interface operation.</td></tr>
<tr><td>15~32</td><td>DB17~DB0</td><td>Parallel bi-directional data bus, fix to GND when not use.</td></tr>
<tr><td>33</td><td>SDO</td><td>Serial output signal. If not use, open this pin.</td></tr>
<tr><td>34</td><td>SDI</td><td>Serial input signal. If not use, fix this pin to IOVCC or GND.</td></tr>
<tr><td>35</td><td>RD</td><td>Read signal and reads data at the low level.</td></tr>
<tr><td>36</td><td>WR</td><td>Write signal and writes data at the rising edge.</td></tr>
<tr><td>37</td><td>RS</td><td>Register Select Signal (H: Data, L: Instruction)</td></tr>
<tr><td>38</td><td>CS</td><td>Chip select signal. 0: chip can be accessed; 1: chip cannot be accessed.</td></tr>
<tr><td>39</td><td>FMARK</td><td>Frame mark signal output. Open this pin if not use.</td></tr>
<tr><td>40</td><td>IOVCC</td><td>Power supply for logic circuit (IOVCC = 1.65 ~ 3.3V).</td></tr>
<tr><td>41~42</td><td>VCI</td><td>Power supply for analog circuit (VCI = 2.5 ~ 3.3V).</td></tr>
<tr><td>43</td><td>GND</td><td>Ground for the logic and analog circuit.</td></tr>
<tr><td>44~47</td><td>NC</td><td>Terminal reserved for touch panel, open this pins.</td></tr>
<tr><td>48</td><td>NC</td><td>No connection</td></tr>
<tr><td>49</td><td>NC</td><td>No connection</td></tr>
<tr><td>50</td><td>NC</td><td>No connection</td></tr>
</table>

5. Absolute Maximum Ratings

5.1 Electrical Maximum Ratings – for IC Only

Item	Symbol	Unit	value	Notes
Power supply voltage (1)	Vcc, IOVcc	V	-0.3 ~ +4.5	1, 2
Power supply voltage (2)	Vci – AGND	V	-0.3 ~ +4.5	1, 3
Power supply voltage (3)	DDVDH – AGND	V	-0.3 ~ +8.0	1, 4
Power supply voltage (4)	AGND – VCL	V	-0.3 ~ +4.5	1
Power supply voltage (5)	DDVDH –VCL	V	-0.3 ~ +8.0	1, 5
Power supply voltage (6)	VGH – AGND	V	-0.3 ~ +18	1, 6
Power supply voltage (7)	AGND – VGL	V	-0.3 ~ +18	1, 7
Input voltage	Vt	V	-0.3~IOVcc+0.3	1
Operating temperature	Topr	°C	-40 ~ +85	1, 8
Storage temperature	Tstg	°C	-55 ~ +125	1

Note:

1. Vcc, GND must be maintained.
2. The modules may be destroyed if they are used beyond the absolute maximum ratings.

5.2 Environmental Condition

Item	Operating temperature (Topr)		Storage temperature (Tstg) (Note 1)		Remark
	Min.	Max.	Min.	Max.	
Ambient temperature	-20°C	+70°C	-30°C	+80°C	Dry
Humidity (Note 1)	80% max. RH for Ta ≤ 40°C < 50% RH for 40°C < Ta ≤ Maximum operating temperature				No condensation

Note 1: Product cannot sustain at extreme storage conditions for long time.

6. Electrical Specifications

At Ta = 25 °C, VCC = 2.8V, GND=0V.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (logic)	VCC-GND		2.5	2.8	3.3	V
Supply current (Logic & LCD)	ICC	VDD=2.8V	-	-	25	mA
Supply voltage of white LED backlight	VLED =V(LEDA)- V(LEDK)	Number of LED dies = 4	3.0	3.2	3.4	V
Supply current (LED)	If		-	60	80	mA

7. Optical Characteristics

Items		Symbol	Condition	Specifications			Unit	Note
				Min.	Typ.	Max.		
Contrast Ratio		CR		-	500	-	-	
Response Time		$T_{R+} + T_F$		-	25	30	ms	
Chromaticity	Red	X_R		-	0.649	-	-	
		Y_R		-	0.323	-	-	
	Green	X_G		-	0.289	-	-	
		Y_G		-	0.588	-	-	
	Blue	X_B		-	0.133	-	-	
		Y_B		-	0.129	-	-	
	White	X_W		-	0.294	-	-	
		Y_W		-	0.334	-	-	
Viewing angle	Hor.	ϕ1(3 o'clock)	Center CR≥10	40	45	-	deg.	
		ϕ2(9 o'clock)		40	45	-		
	Ver.	θ2(12 o'clock)		30	35	-		
		θ1(6 o'clock)		10	15	-		
Brightness		IV		-	200	-	Cd/m^2	
Uniformity				80	85		%	

Note 1: Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63

L0: Luminance of gray level 0

CR = CR (10)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note 5.

Note 2: Definition of Response Time (TR, TF):

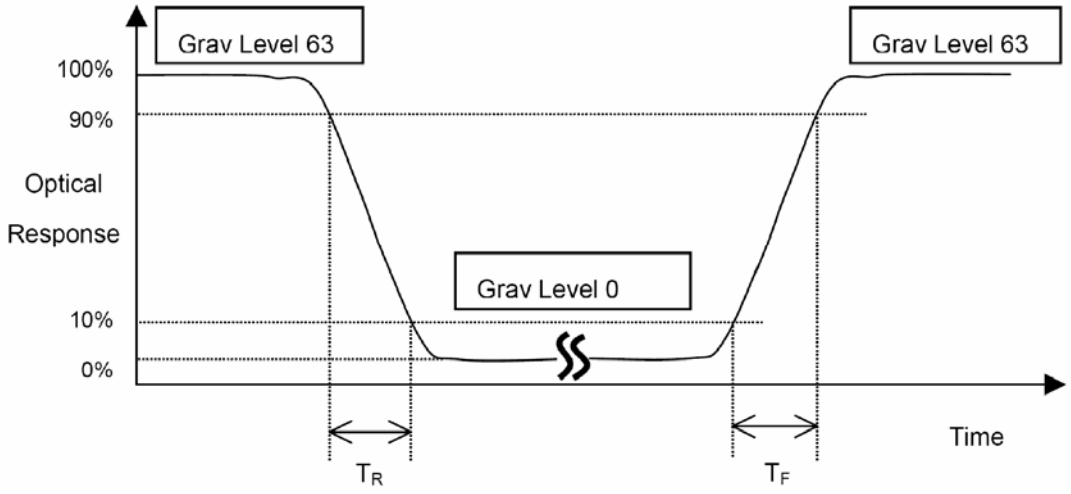

Figure 3

Note 3: Viewing Angle

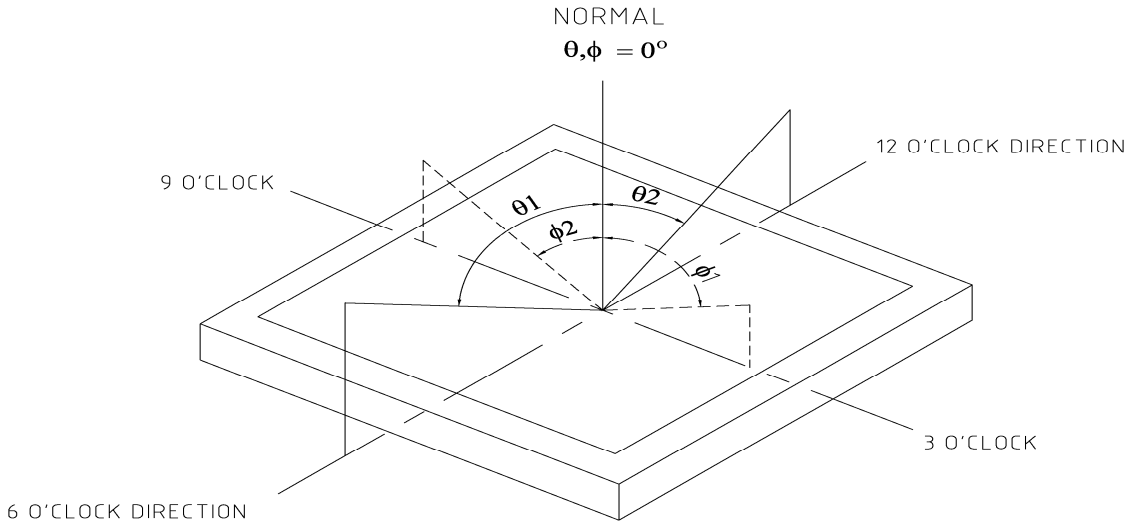

Figure 4

The above "Viewing Angle" is the measuring position with Largest Contrast Ratio; not for good image quality. View Direction for good image quality is 12 O'clock. Module maker can increase the "Viewing Angle" by applying Wide View Film.

Note 4: Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.

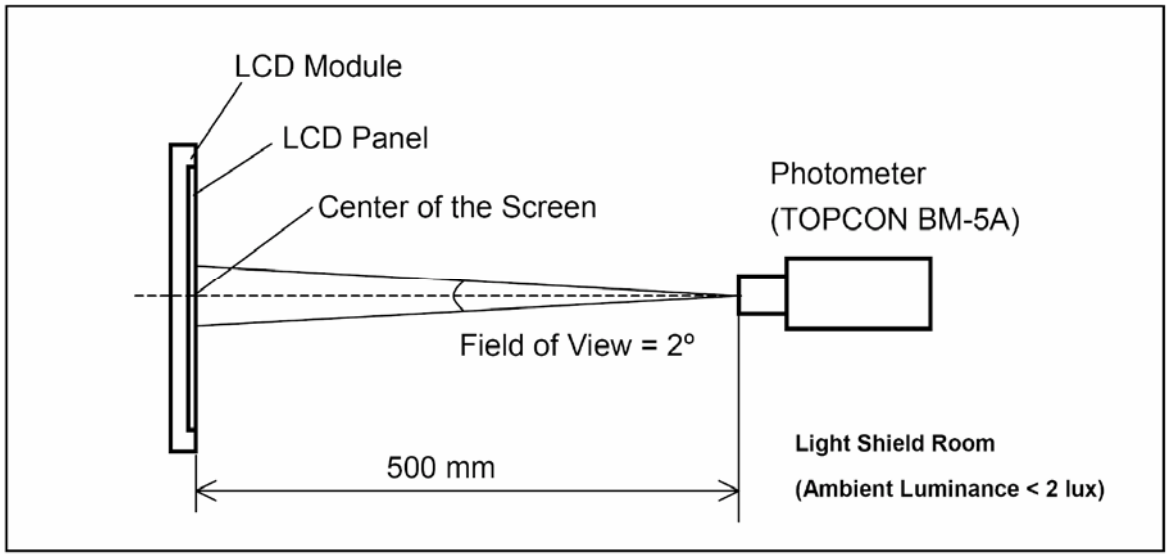

Figure 5

8. Timing Characteristics

Please refer ILI9341 datasheet.

9. Reliability Test Item

Test Item	Test Condition	Test result determinant gist
High temperature storage	80±3℃; 120H	the inspection of appearance and function character.
Low temperature storage	-30±3℃; 120H	
High temperature /humidity storage	60℃±3℃, 90%±3%RH; 120H	
High temperature operation	70±3℃; 120H	no objection of the function character; no fatal objection of the appearance.
Low temperature operation	-20±3℃; 120H	
High temperature /humidity operation	40℃±3℃, 90%±3%RH; 120H	
Temperature Shock	-30±3℃, 30min→80±3℃, 30min; 10cycle	inspect the objections appearance、function & the whole structure

10. Suggestions for using LCD modules

10.1 Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.
2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.
3. Don't apply excessive force on the surface of the LCM.
4. If the surface is contaminated ,clean it with soft cloth. If the LCM is severely contaminated , use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer . The following solvents is especially prohibited: water , ketone Aromatic solvents etc.
5. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
7. Don’t disassemble the LCM.
8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
   - Be sure to ground the body when handling the LCD modules.
   - Tools required for assembling, such as soldering irons, must be properly grounded.
   - To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
   - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
9. Do not alter, modify or change the the shape of the tab on the metal frame.

10. Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
11. Do not damage or modify the pattern writing on the printed circuit board.
12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector
13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
14. Do not drop, bend or twist LCM.

10.2 Storage

1. Store in an ambient temperature of 5 to 45 °C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.
2. Storage in a clean environment, free from dust, active gas, and solvent.
3. Store in antistatic container.

12. Packing
(T.B.D.)

- END -