KT12864B-A1

Product

Standard LCD Module
128 x 64 dots
STN/FSTN positive/negative display
LED backlight

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1. Document revision history :

DOCUMENT REVISION	DATE	DESCRIPTION	PREPARED BY	APPROVED BY
01	2010.05.03	First Release.	XW Lee	

2. General Description

- 128 x64 dots
- LCD type: STN/FSTN, Positive/Negative, Transmissive/Transflective/Reflective
- Duty: 1/64
- Controller/Driver: KS0108 or equivalent
- View direction: 3/6/9/12 o'clock
- Backlight: LED Yellow Green / Blue / Orange / White

3. Mechanical Specifications

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

Table 1

Parameter	Specifications	Unit
Outline dimensions	93.0(W)×70.0(H)×13.0MAX.(T)	mm
View area	72.0(W)×40.0(H)	mm
Active area	66.5(W)×33.24(H)	mm
Dot size	0.48(W)×0.48(H)	mm
Dot pitch	0.52(W)×0.52(H)	mm
Weight	TBD	grams

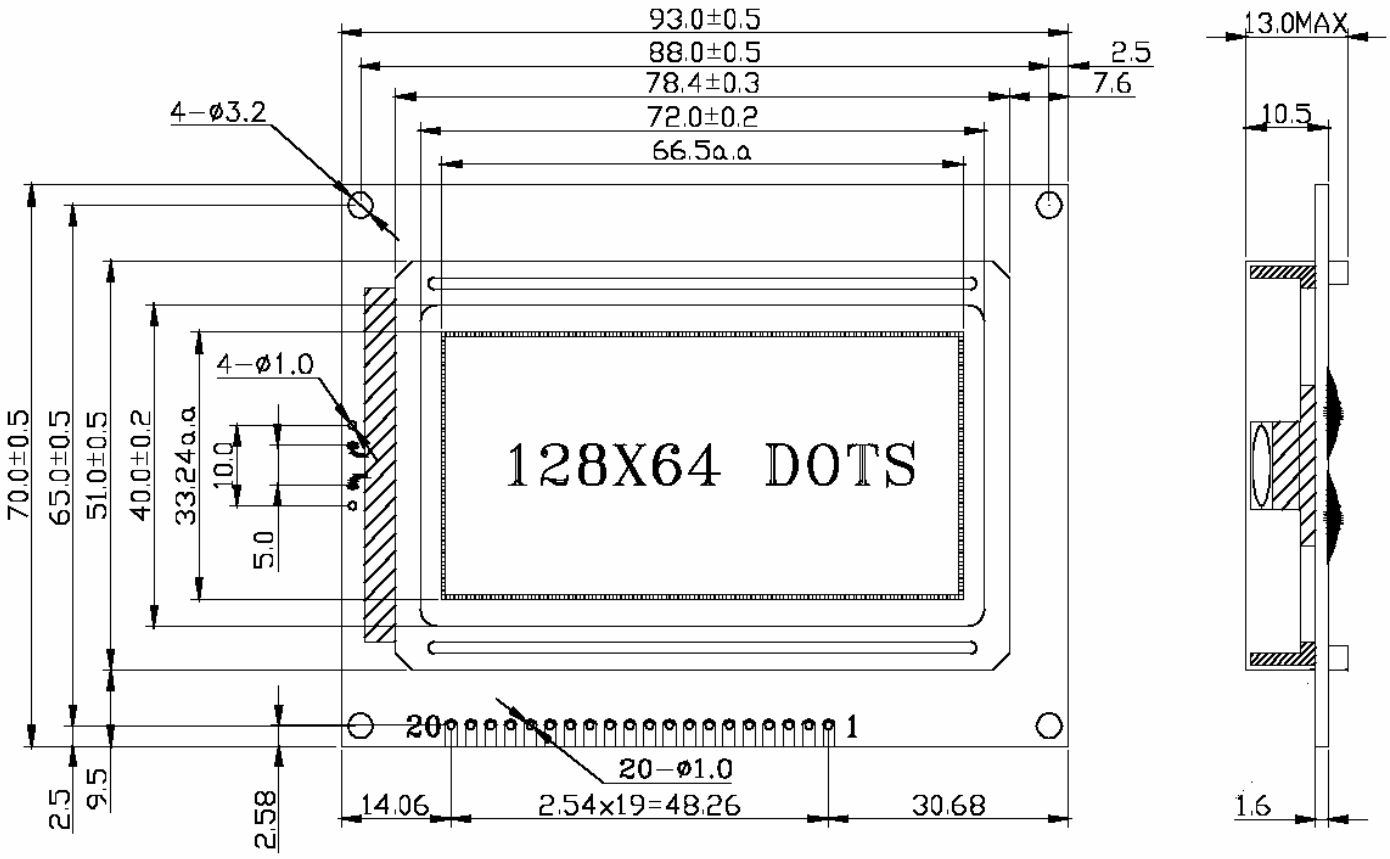


Figure 1: Outline Drawing

4. Interface signals

Table 2: Pin assignment

Pin No.	Symbol	Symbol	Description
1	V_{SS}	0V	Ground
2	V_{DD}	5.0V	Supply Voltage for logic
3	V0	(Variable)	Operating voltage for LCD
4	RS	H/L	H: DATA, L: Instruction code
5	R/W	H/L	H: Read(Module? MPU) L: Write(MPU? Module)
6	E	H/L	Chip enable signal
7	DB0	H/L	Data bit 0
8	DB1	H/L	Data bit 1
9	DB2	H/L	Data bit 2
10	DB3	H/L	Data bit 3
11	DB4	H/L	Data bit 4
12	DB5	H/L	Data bit 5
13	DB6	H/L	Data bit 6
14	DB7	H/L	Data bit 7
15	CS1	H	Chip select signal (L), active high
16	CS2	H	Chip select signal (R), active high
17	/RES	L	Reset signal, active low
18	VOUT	-	Negative voltage supply for LCD
19	LED_A	-	Power supply for backlight (LED+)
20	LED_K	-	Power supply for backlight (LED-)

5. Absolute Maximum Ratings

5.1 Electrical Maximum Ratings

Table 3: Electrical Maximum Ratings – for IC

Parameter	Symbol	Min.	Max.	Unit	Note
Input Voltage	V_I	V_{SS}	V_{DD}	V	
Supply voltage For Logic	V_{DD}-V_{SS}	-0.3	7.0	V	1
Supply Voltage For LCD	V_{DD}-V_0	0.3	13.0	V	
LED forward current	If	--	150	mA	
LED reverse	Vr	--	8.0	V	

Note:

1.VDD, GND must be maintained.

2.The modules may be destroyed if they are used beyond the absolute maximum ratings.

5.2 Environmental Condition

Table 4

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

Typical Electrical Characteristics

At VDD= 5.0V, GND=0V.

Table 5

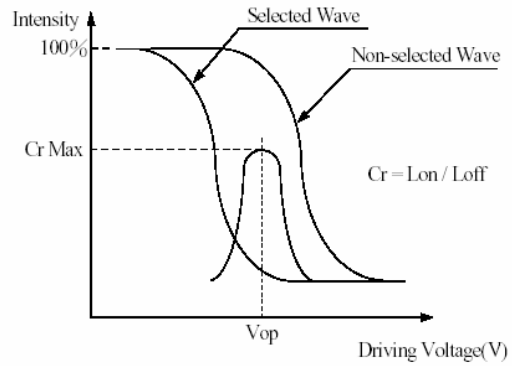
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (logic)	VDD-GND	-	4.5	5.0	5.5	V
Supply Voltage For LCD	V_{DD}-V_0	Ta=25?	-	4.6	-	V
Input signal voltage	VIH		0.7VDD	-	VCC	V
	VIL		0	-	0.6	V
Supply current (Logic & LCD)	ICC	VDD=5.0V	-	1.5	-	mA
Supply Current of LED backlight	I_{LED}	Vf=4.1	200	240	260	mA
Wave length	? p	560	560	570	580	nm
Luminance	Iv	I_{LED}=100mA	50	75	-	cd/m^2
Backlight color	Yello-Green					

7. Optical Characteristics

Table 7: Optical specifications

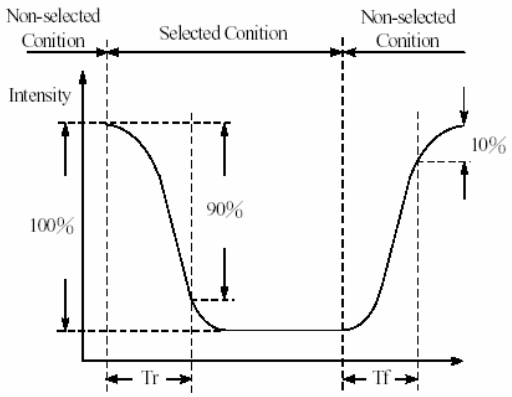
Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V) θ	CR≧2	20	—	40	deg
	(H) φ	CR≧2	-30	—	30	deg
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	150	200	ms
	T fall	—	—	150	200	ms

Definition of Operation Voltage (Vop)



[positive type]

Definition of Response Time (Tr , Tf)



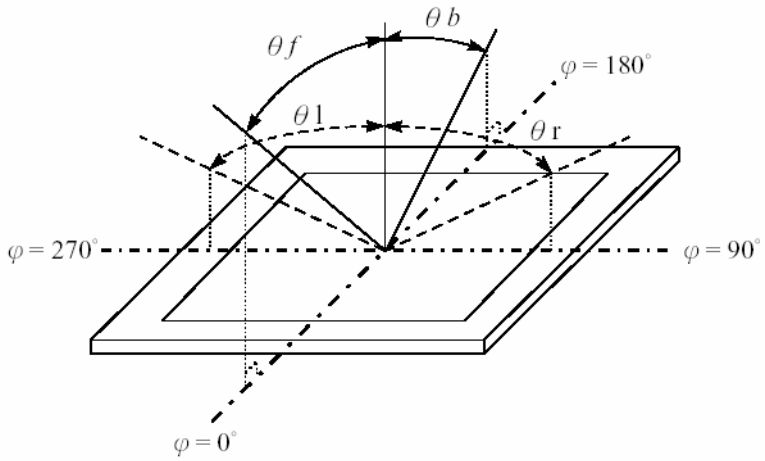
[positive type]

Conditions :

Operating Voltage : Vop　　Viewing Angle(θ , φ) : 0° , 0°

Frame Frequency : 64 HZ　　Driving Waveform : 1/N duty , 1/a bias

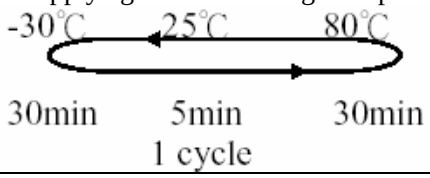
Definition of viewing angle(CR≧2)



8. Function description

Please refer KT12864B application note.

9. Reliability Test Item

Test Item	Content of test	Test Condition
High temperature storage	Endurance test applying the high storage temperature for a long time.	80℃, 200hrs
Low temperature storage	Endurance test applying the high storage temperature for a long time.	-30℃, 200hrs
High temperature /humidity storage	Endurance test applying the high temperature and high humidity storage for a long time.	80℃, 90%RH, 96hrs
High temperature operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃, 200hrs
Low temperature operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃, 200hrs
High temperature /humidity operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	70℃, 90%RH, 96hrs
Temperature Cycle	Endurance test applying the low and high temperature cycle. 	-30℃/80℃, 10 cycles
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 15mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kO CS=100pF 1 time

*Supply voltage for logic system=5V. Supply voltage for LCD system =Operating voltage at 25℃

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.

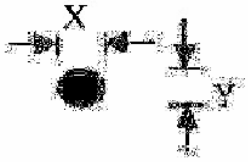
10.2 Storage

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.

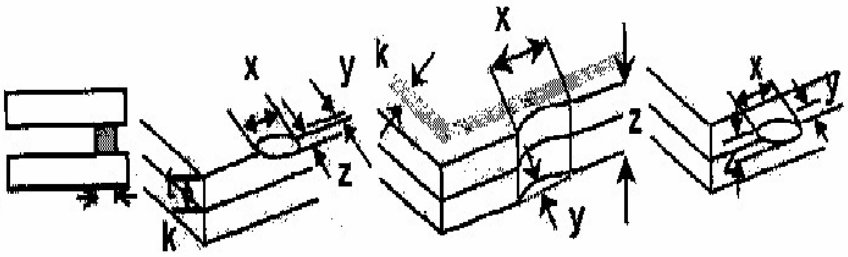
2. Storage in a clean environment, free from dust, active gas, and solvent.

3. Store in antistatic container.

11. Inspection Standard

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>01</td><td>Electrical Testing</td><td>1.1 Missing vertical, horizontal segment, segment contrast defect.
1.2 Missing character , dot or icon.
1.3 Display malfunction.
1.4 No function or no display.
1.5 Current consumption exceeds product specifications.
1.6 LCD viewing angle defect.
1.7 Mixed product types.
1.8 Contrast defect.</td><td>0.65</td></tr>
<tr><td>02</td><td>Black or white spots on LCD (display only)</td><td>2.1 White and black spots on display ≦0.25mm, no more than three white or black spots present.
2.2 Densely spaced: No more than two spots or lines within 3mm</td><td>2.5</td></tr>
<tr><td>03</td><td>LCD black spots, white spots, contamination (non-display)</td><td>3.1 Round type : As following drawing
Φ=(x + y) / 2
 
<table>
<tr><th>SIZE</th><th>Acceptable Q TY</th></tr>
<tr><td>Φ ≤0.10</td><td>Accept no dense</td></tr>
<tr><td>0.10＜Φ≤0.20</td><td>2</td></tr>
<tr><td>0.20＜Φ≤0.25</td><td>1</td></tr>
<tr><td>0.25＜Φ</td><td>0</td></tr>
</table></td><td>2.5</td></tr>
<tr><td></td><td></td><td>3.2 Line type : (As following drawing)
 
<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Q TY</th></tr>
<tr><td>---</td><td>W≤0.02</td><td>Accept no dense</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></td><td>2.5</td></tr>
<tr><td>04</td><td>Polarizer bubbles</td><td>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.
<table>
<tr><th>Size Φ</th><th>Acceptable Q TY</th></tr>
<tr><td>Φ ≤0.20</td><td>Accept no dense</td></tr>
<tr><td>0.20＜Φ≤0.50</td><td>3</td></tr>
<tr><td>0.50＜Φ≤1.00</td><td>2</td></tr>
<tr><td>1.00＜Φ</td><td>0</td></tr>
<tr><td>Total Q TY</td><td>3</td></tr>
</table></td><td>2.5</td></tr>
</table>

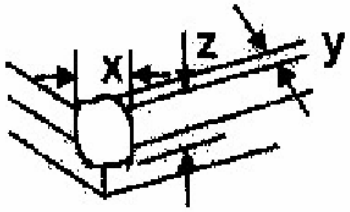
NO	Item	Criterion	AQL
05	Scratches	Follow NO.3 LCD black spots, white spots, contamination	
06	Chipped glass	Symbols Define: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length: 6.1 General glass chip : 6.1.1 Chip on panel surface and crack between panels:	2.5



z: Chip thickness	y: Chip width	x: Chip length
Z≦1/2t	Not over viewing area	x≦1/8a
1/2t<z≦2t	Not exceed 1/3k	x≦1/8a

⊙If there are 2 or more chips, x is total length of each chip.

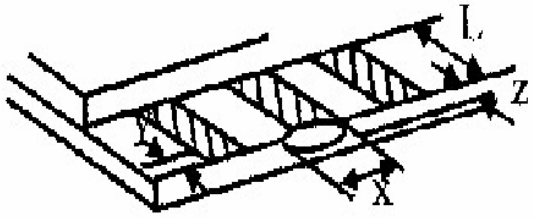
6.1.2 Corner crack:



z: Chip thickness	y: Chip width	x: Chip length
Z≦1/2t	Not over viewing area	x≦1/8a
1/2t<z≦2t	Not exceed 1/3k	x≦1/8a

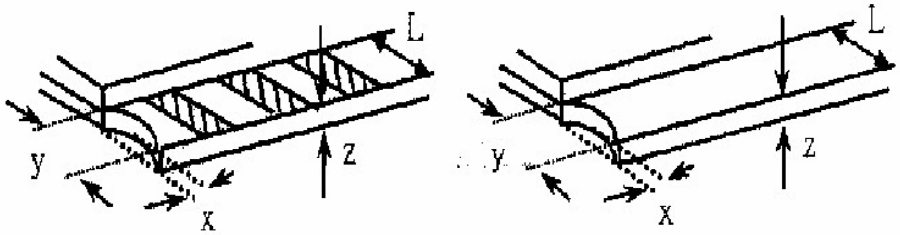
⊙If there are 2 or more chips, x is the total length of each chip.

NO	Item	Criterion	AQL
06	Glass crack	Symbols : x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length 6.2 Protrusion over terminal : 6.2.1 Chip on electrode pad :	2.5



y: Chip width	x: Chip length	z: Chip thickness
y≦0.5mm	x≦1/8a	0 < z ≦ t

6.2.2 Non-conductive portion:

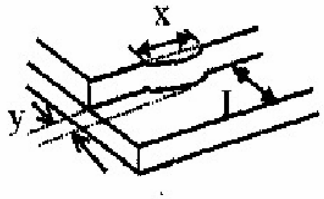


y: Chip width	x: Chip length	z: Chip thickness
y≦ L	x≦1/8a	0 ＜ z ≦ t

⊙If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.

⊙If the product will be heat sealed by the customer, the alignment mark not be damaged.

6.2.3 Substrate protuberance and internal crack.



y: width	x: length
y≦1/3L	x ≦ a

NO	Item	Criterion	AQL
07	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
08	Backlight elements	8.1 Illumination source flickers when lit. 8.2 Spots or scratched that appear when lit must be judged. Using LCD spot, lines and contamination standards. 8.3 Backlight doesn’ t light or color wrong.	0.65 2.5 0.65
09	Bezel	9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 9.2 Bezel must comply with job specifications.	2.5 0.65
10	PCB、COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination. 10.2 COB seal surface may not have pinholes through to the IC. 10.3 The height of the COB should not exceed the height indicated in the assembly diagram. 10.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places. 10.5 No oxidation or contamination PCB terminals. 10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing	2.5 2.5 0.65 2.5 2.5 0.65

		parts or excess parts. 10.7 The jumper on the PCB should conform to the product characteristic chart. 10.8 If solder gets on bezel tab pads, LED pad, zebra pad or screw hold pad, make sure it is smoothed down.	0.65 2.5
11	Soldering	11.1 No un-melted solder paste may be present on the PCB. 11.2 No cold solder joints, missing solder connections, oxidation or icicle. 11.3 No residue or solder balls on PCB. 11.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65

NO	Item	Criterion	AQL
12	General appearance	12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP. 12.2 No cracks on interface pin (OLB) of TCP. 12.3 No contamination, solder residue or solder balls on product. 12.4 The IC on the TCP may not be damaged, circuits. 12.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it cause the interface pin to sever. 12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color. 12.7 Sealant on top of the ITO circuit has not hardened. 12.8 Pin type must match type in specification sheet. 12.9 LCD pin loose or missing pins. 12.10 Product packaging must the same as specified on packaging specification sheet. 12.11 Product dimension and structure must conform to product specification sheet.	2.5 0.65 2.5 2.5 2.5 2.5 0.65 0.65 0.65 0.65

Screen Cosmetic Criteria

Item	Defect	Judgment Criterion	Partition
1	Spots	A)Clear Size: d mm — Acceptable Qty in active area d ≦0.1 — Disregard 0.1<d≦0.2 — 6 0.2<d≦0.3 — 2 0.3<d — 0 Note: Including pin holes and defective dots which must be within one pixel size. B)Unclear Size: d mm — Acceptable Qty in active area d ≦0.2 — Disregard 0.2<d≦0.5 — 6 0.5<d≦0.7 — 2 0.7<d — 0	Minor
2	Bubbles in Polarize	Size: d mm — Acceptable Qty in active area d≦0.3 — Disregard 0.3<d≦1.0 — 3 1.0<d≦1.5 — 1 1.5<d — 0	Minor
3	Scratch	In accordance with spots cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor
4	Allowable Density	Above defects should be separated more than 30mm each other.	Minor
5	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Back-light type should be judged with back-light on state only.	Minor

12. Packing (Reference only)

T.B.D

- END -