PRODUCT SPECIFICATIONS

For Customer: _____ □ : APPROVAL FOR SPECIFICATION

Customer Model No. _____ □ : APPROVAL FOR SAMPLE
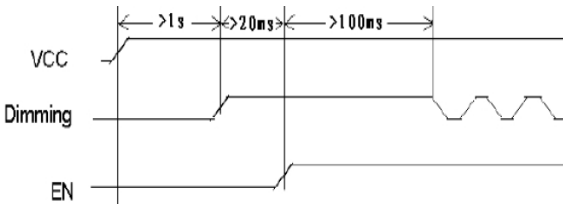
Module No.: B104VMT

Customer :_____

Approved by	Notes

prepared by	Checked by	Approved by

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REVISED PAGE NO.
1.0	2010-07-14	Preliminary Release	
1.1	2011-06-11	Update External Dimensions	
1.2	2011-12-24	Revise Electrical Characteristics and Backlight Characteristics	
1.3	2012-02-22	Update Viewing Direction	
1.4	2014-02-11	■General Information Add Driver IC:NT39411B+NT39211 Color Depth:16.7M/262K→16.2M/262K Add CN1 match connection type:DF19G-20S-1C Add CN2 match connection type:H208K-P05N-02B	4
		■Absolute Maximum Ratings <table><tr><td>Input voltage for backlight</td><td>Vt</td><td>-0.5</td><td>7.0</td><td>V</td><td>→</td></tr></table><table><tr><td>Input voltage for backlight</td><td>Vt</td><td>-0.5</td><td>5.0</td><td>V</td></tr></table>Add Note 3 ■Electrical Characteristics <table><tr><td>Input current</td><td>I IN</td><td>-10</td><td>-</td><td>10</td><td>µ A</td><td>→</td></tr></table><table><tr><td>Rush current</td><td>Irush_VDD</td><td>-</td><td>1.6</td><td>2.0</td><td>A</td></tr></table>Add <table><tr><td>Power supply ripple voltage</td><td>V RP_VDD</td><td>-</td><td>-</td><td>100</td><td>mV</td></tr></table>	7
		■Backlight Characteristics <table><tr><td>High Level Input Voltage</td><td>V IH</td><td>2</td><td>-</td><td>-</td><td>V</td><td>For Dimming, EN pin</td><td>→</td></tr></table><table><tr><td>High Level Input Voltage</td><td>V IH</td><td>2</td><td>-</td><td>5</td><td>V</td><td>For Dimming, EN pin</td></tr></table>Add <table><tr><td>Rush current</td><td>Irush_VCC</td><td>-</td><td>0.6</td><td>1.0</td><td>A</td></tr></table>Add Remark: The Timing Sequence Of Back Light Power-on As Following: This Is Only Spec. Correction, Product Has Not Any Changes.	8

CONTENTS

■ GENERAL INFORMATION

Item	Contents	Unit
LCD type	TFT/Transmissive/Normally white	/
Size	10.4	Inch
Viewing direction	12:00(without image inversion and least brightness change)	O' Clock
Gray scale inversion direction	6:00(contrast peak located at)	O' Clock
LCM (W × H)× D	243.00×179.40×8.50	mm^3
Active area (W×H)	211.20×158.40	mm^2
Pixel pitch (W×H)	0.264×0.264	mm^2
Number of dots	800 (RGB) × 600	/
Driver IC	NT39411B+NT39211	/
Backlight type	40 LEDs	/
Interface type	LVDS 8-bit/6-bit	/
Color depth	16.2M/262K	/
Pixel configuration	R.G.B vertical stripe	/
Surface treatment(Up polarizer)	Anti-Glare(3H)	/
CN1 match connection type	DF19G-20S-1C	/
CN2 match connection type	H208K-P05N-02B(ENTERY)	/
Input voltage	3.3	V
With/Without TSP	Without TSP	/
Weight	432.89	g

Note 1: RoHS compliant;

Note 2: LCM weight tolerance: ± 5% .

■ EXTERNAL DIMENSIONS

Pin No.	Symbol
1	VDD
2	VDD
3	GND
4	DPS
5	RxIN0-
6	RxIN0+
7	GND
8	RxIN1-
9	RxIN1+
10	GND
11	RxIN2-
12	RxIN2+
13	GND
14	RxCLK1N-
15	RxCLK1N+
16	GND
17	RxIN3-
18	RxIN3+
19	AG Mode
20	SEL68

Note:
1.General tolerance to be±0.3;
2.Connector type:
CN1:107A20-002IRA-G3-R;
⚠ CN2:ENTERY 3808K-F05N-03R,match connector:H208K-P05N-02B(for reference);
3.Gray Scale Inversion Direction: 6 o'clock;
4.Recommended Case Open Area should be less than Module V.A.
5.Requirement on Environment Protection RoHS Compliant.

BACKLIGHT CIRCUIT

A(+)

K(-)

2-2.40±0.30
2-5.30±0.30
8.5MAX
2-5.30±0.30
2-2.40±0.30

179.40±0.50
166.60±0.30
162.50±0.30(Bezel Opening)
159.40(Viewing Area)
158.40(Active Area)
(83.30±0.50)
17.00±0.30
5.25±0.30
2.05±0.30
0.50
3.20±0.20
0.50
12.70

A

2-ø3.50±0.10(Mounting Hole)

10.4" SVGA(800*600)

(120.10±0.50)

243.00±0.50
235.00±0.30
214.80±0.30(Bezel Opening)
212.20(Viewing Area)
211.20(Active Area)

2-R1.75±0.15

132.60±0.30

0.264
0.088
0.264

R G B

Detail:A
50:1

(57.76)

(36.19)

(13.45)

CN2

CN1

Label Area

■ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Power voltage	VDD	-0.3	5.0	V
Power for LED driving circuit	VCC	-0.3	13.5	V
Input voltage	VIN	-0.3	5.0	V
Input voltage for backlight	Vt	-0.5	5.0	V
Operating temperature	T_{OP}	-30	80	°C
Storage temperature	T_{ST}	-30	85	°C
Humidity	RH	-	90%(Max60°C)	RH

Note1: VIN represents RxIN0±,RxIN1±,RxIN2±,RxIN3±,RxCLKIN±,DPS,AG mode,SEL68.

Note2: Vt represents EN and Dimming.

Note3: Should keep the maximum value of EN and Dimming are equal.

■ELECTRICAL CHARACTERISTICS

| Parameter	Symbol	Min	Typ	Max	Unit	Remark
LVDS differential input high threshold	V_{TH}	-	-	+100	mV	V_{CMLVDS}=1.2V
LVDS differential input low threshold	V_{TL}	-100	-	-	mV	V_{CMLVDS}=1.2V
Differential input voltage	$|V_{ID}|$	0.1	-	0.6	V	
LVDS input common mode voltage	V_{CMLVDS}	$|V_{ID}|/2$	-	$1.4-(|V_{ID}|/2)$	V	
Power supply ripple voltage	V_{RP_VDD}	-	-	100	mV	
Rush current	I_{rush_VDD}	-	1.6	2.0	A	
Supply voltage	VDD	3.0	3.3	3.6	V	
Common electrode driving signal	VCOM	-	4.3	-	V	Note 1
Sync frequency	FVD	-	60	70	Hz	
VDD power consumption	I_{DD}	-	340	380	mA	Note 2
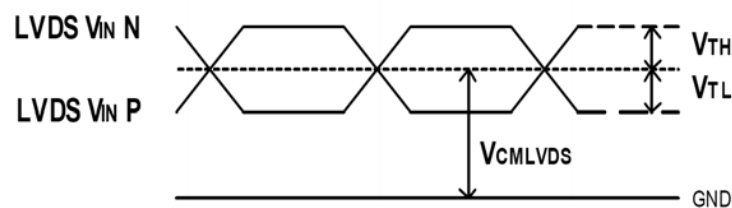
Figure 1.1 LVDS DC timing diagram

Note1: For different LCM, the value may have a bit of difference.

Note2: To test the current dissipation, use "all Black Pattern" test pattern.Because of the in-rush current at the moment of the power-on,so should ensure the VDD power supplier could supply at least 1.5A current at the moment of power-on.

■ BACKLIGHT CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Power for LED driving circuit	VCC	10.8	12.0	12.6	V	
Current of Backlight Power	I_{VCC}	-	0.32	-	A	100% PWM duty Note 1
Rush current	I_{rush_VCC}	-	0.6	1.0	A	
Backlight Power Consumption	W_{BL}	-	3.84	-	W	100% PWM duty
Dimming Frequency	F_{PWM}	200	-	20K	Hz	
Dimming duty cycle	-	0	-	100	%	-
High Level Input Voltage	V_{IH}	2	-	5	V	For dimming, EN pin
Low Level Input Voltage	V_{IL}	-	-	0.8	V	For dimming, EN pin
LED Life Time	-	25000	(50000)	-	hrs	Note 1

Note 1: Optical performance should be evaluated at Ta=25℃ only.
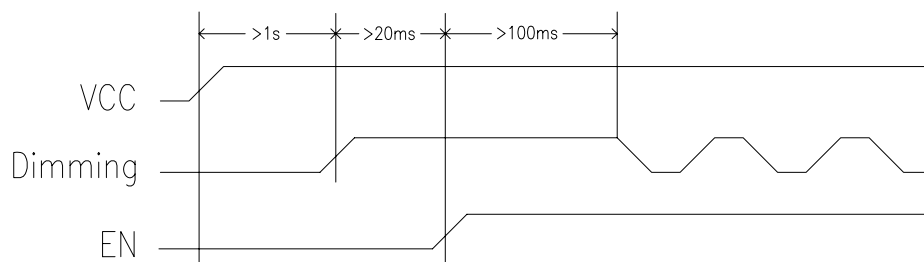　　　　If LED is driven by high current, high ambient temperature & humidity condition.
　　　　The life time of LED will be reduced.
　　　　Operating life means brightness goes down to 50% initial brightness.
　　　　Typical operating life time is estimated data.

Remark: The timing sequence of back light power-on as following:

■ELECTRO-OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time		Tr+Tf		-	25	40	ms	FIG 1.	4
Contrast ratio		Cr	θ=0°	400	500	-	---	FIG 2.	1
Luminance uniformity		δ WHITE	∅=0° Ta=25℃	70	80	-	%	FIG 2.	3
Surface Luminance		Lv		280	350	-	cd/m^2	FIG 2.	2
Viewing angle range		θ	∅ = 90°	50	60	-	deg	FIG 3.	6
			∅ = 270°	60	70	-	deg	FIG 3.	
			∅ = 0°	60	70	-	deg	FIG 3.	
			∅ = 180°	60	70	-	deg	FIG 3.	
CIE (x, y) chromaticity	Red	x	θ=0° ∅=0° Ta=25℃	0.5592	0.6092	0.6592		FIG 2.	5
		y		0.3052	0.3552	0.4052			
	Green	x		0.2649	0.3149	0.3649			
		y		0.5053	0.5553	0.6053			
	Blue	x		0.0897	0.1367	0.1897			
		y		0.0896	0.1396	0.1896			
	White	x		0.2545	0.3045	0.3545			
		y		0.2946	0.3446	0.3946			
NTSC	-	-	-	-	50	-	%	-	-

Note 1. Contrast Ratio(CR) is defined mathematically as For more information see FIG 2.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P 3,P4, P5)}}$$

Note 2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see FIG 2.

Lv = Average Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)

Note 3. The uniformity in surface luminance，δ WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see FIG 2.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)}}$$

Note 4. Response time is the time required for the display to transition from White to black(Rise Time, Tr) and from black to white(Decay Time, Tf). For additional information see FIG 1. The test equipment is Autronic-Melchers's ConoScope. Series.

Note 5. CIE (x, y) chromaticity，The x, y value is determined by measuring luminance at each test position 1 through 5,and then make average value.

Note 6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the conrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

Note 7. For viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope. Series Instruments For contrast ratio, Surface Luminance, Luminance uniformity, CIE The test data is base on TOPCON's BM-5 photo detector.

FIG. 1 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".
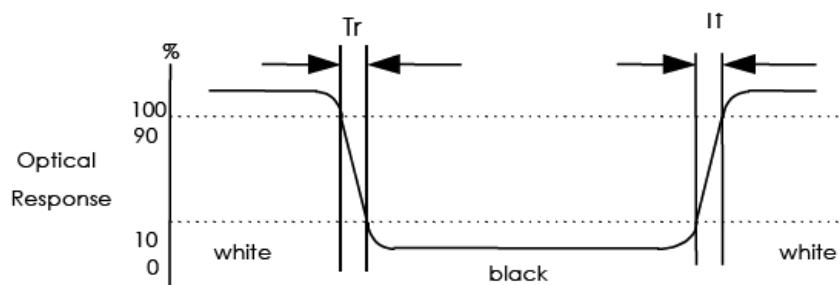

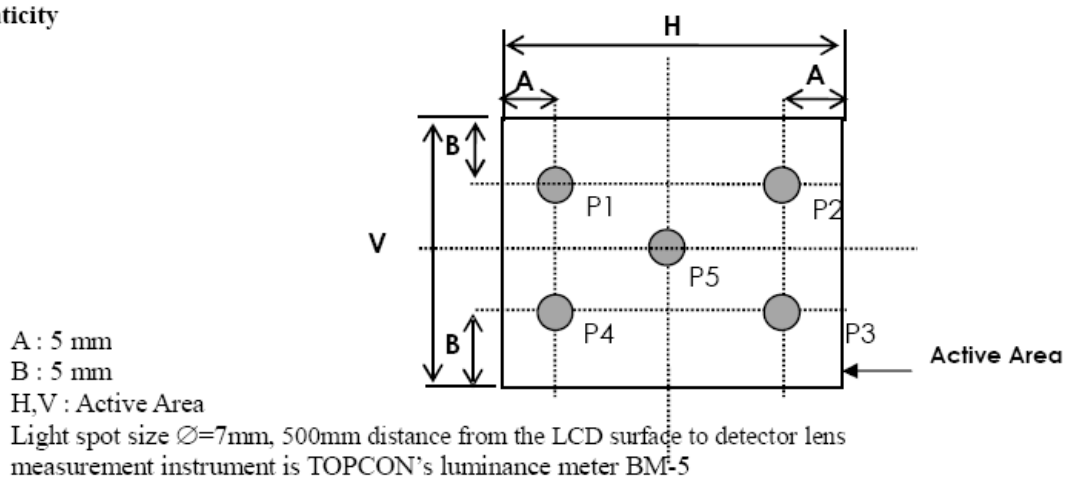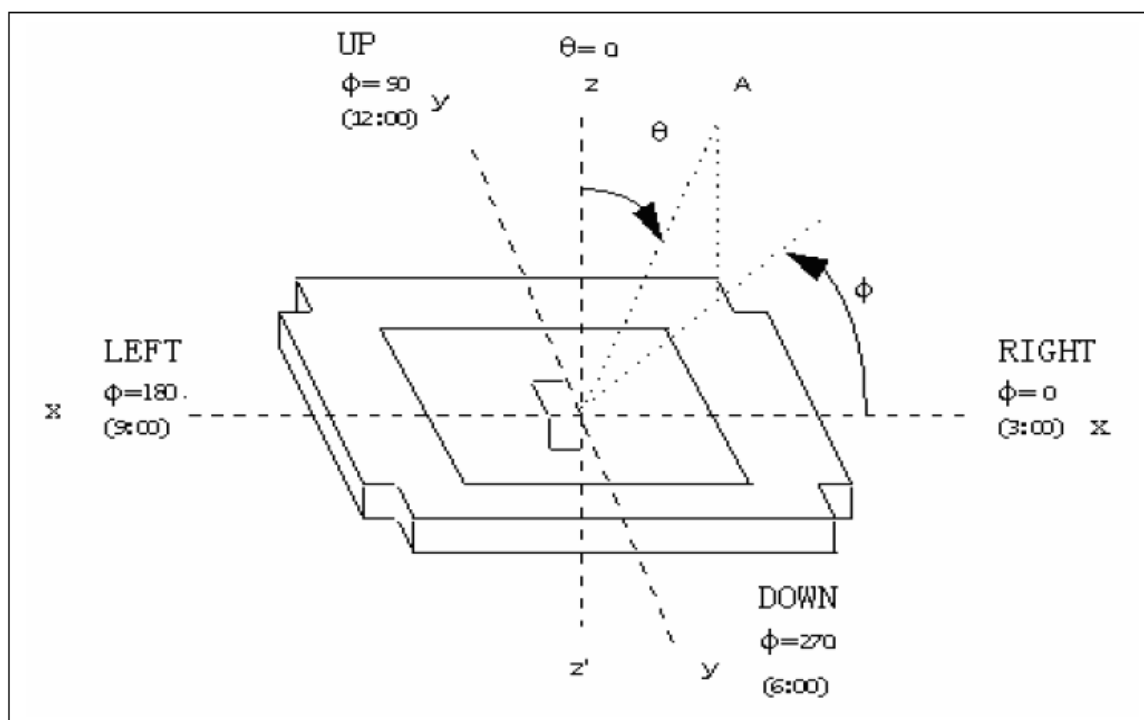## FIG. 2 Measuring method for Contrast ratio, surface luminance, Luminance uniformity ， CIE (x, y) chromaticity

A : 5 mm
B : 5 mm
H,V : Active Area
Light spot size $\varnothing$=7mm, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5

FIG. 3 The definition of viewing angle

■ INTERFACE DESCRIPTION

1. TFT LCD Panel

<div align="right">CN1 Connector type: 107A20-0021RA-G3-R</div>

No	Symbol	I/O	Description	Comment
1	VDD	P	Power Supply	
2	VDD	P	Power Supply	
3	GND	P	Ground	
4	DPS	I	Reverse Scan Function [H: Enable; L/NC: Disable]	Note3
5	RxIN0-	I	LVDS receiver signal channel 0. LVDS Differential Data Input (R0, R1, R2, R3, R4, R5, G0)	Note2
6	RxIN0+	I		
7	GND	P	Ground	
8	RxIN1-	I	LVDS receiver signal channel 1. LVDS Differential Data Input (G1, G2, G3, G4, G5, B0, B1)	Note2
9	RxIN1+	I		
10	GND	P	Ground	
11	RxIN2-	I	LVDS receiver signal channel 2 LVDS Differential Data Input (B2, B3, B4, B5, DE)	Note2
12	RxIN2+	I		
13	GND	P	Ground	
14	RxCLKIN-	I	LVDS receiver signal clock	Note2
15	RxCLKIN+	I		
16	GND	P	Ground	
17	RxIN3-	I	LVDS receiver signal channel 3, NC for 6-bit LVDS Input. LVDS Differential Data Input (R6, R7,G6,G7,B6, B7, RSV) for 8-bit LVDS input.	Note2
18	RxIN3+	I		
19	AGMode	I	Aging Mode setting [H: Aging Mode; L/NC: Normal]	
20	SEL68	P	6-bit/8-bit LVDS data input selection [H: 8-bit L/NC: 6-bit]	Note2

P: Power/GND; I: input pin;

<div align="center">Table 1.1 input terminal pin assignment</div>

Note1: CN1 Match Connector type: DF19G-20S-1C or compatible

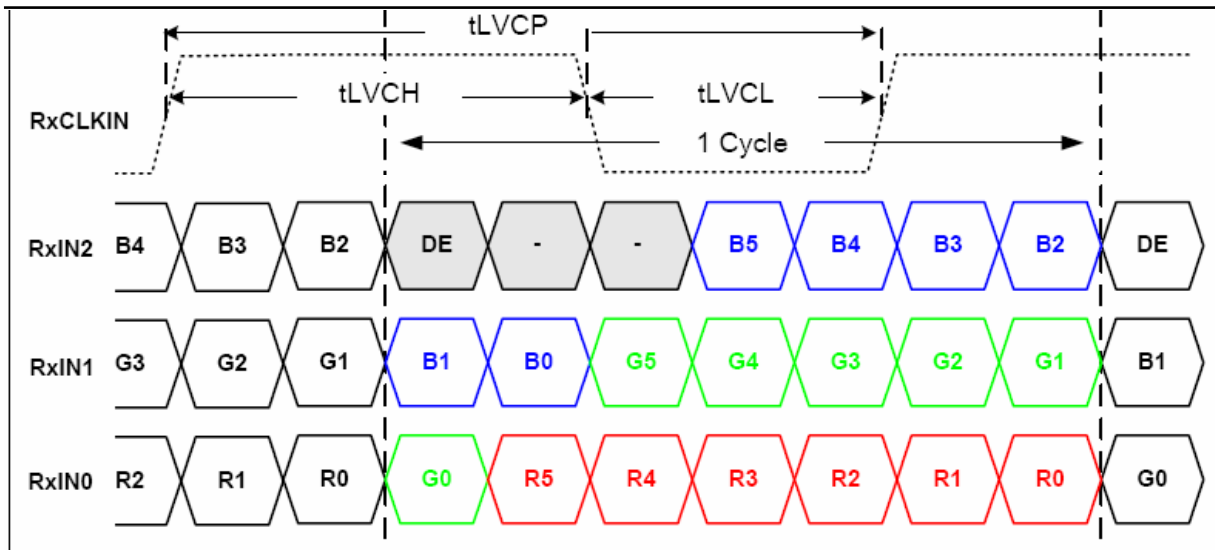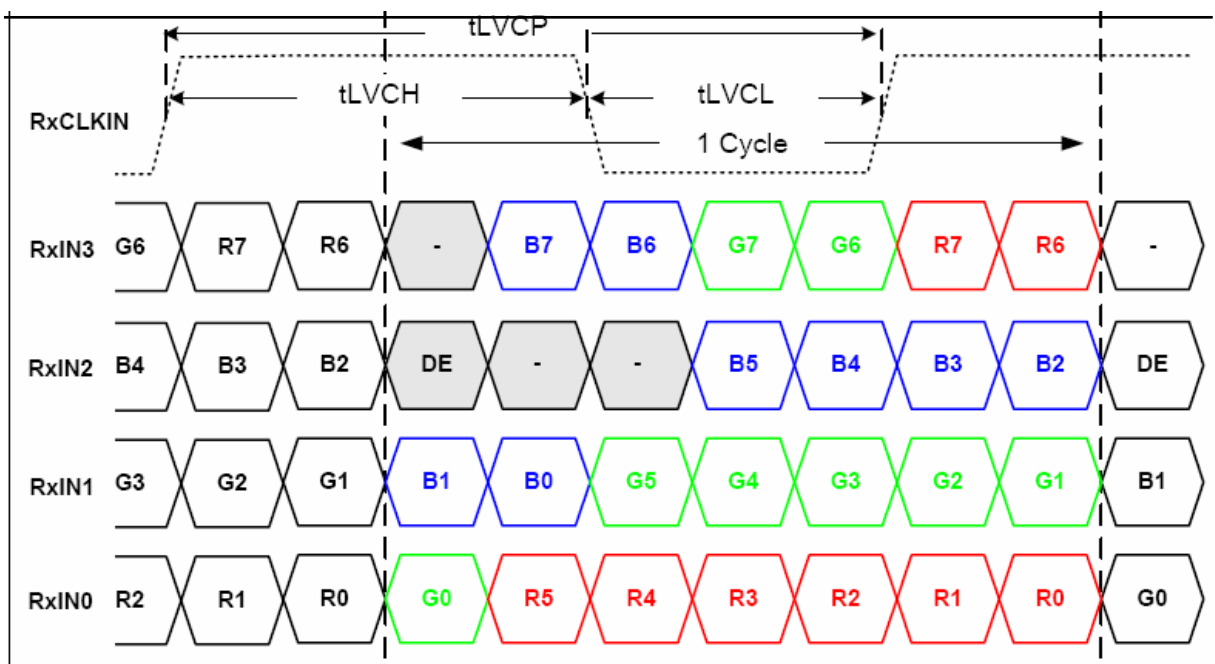Note2: LVDS 6-bit data mapping when SEL68=L/NC as follows:

Figure 1.1.1 Input signal data mapping

LVDS 8-bit data mapping when SEL68=H as follows:

Note3: DPS: Scan direction setting

DPS	Horizontal Scan direction	Vertical Scan direction
High	Right to left	Down to up
Low/NC	Left to right	Up to down

2.2 CN2(Backlight Connector)

Connector type: 3808K-F05N-03R (ENTERY)

No	Symbol	I/O	Description	Remark
1	VCC	P	Power for LED driving circuit.12.0V input.	Note 1
2	PGND	P	Ground for LED driving circuit. 0V input.	
3	EN	I	Backlight enable setting. High: enabled; Low: disable.	Note 2
4	Dimming	I	PWM signal for adjusting luminance of backlight.	
5	NC	-	No connection	

Note 1: Because of the in-rush current at the moment of power-on,so should ensure the current of
VCC could supply 1A current at the moment of the power-on.

Note 2: Should keep En & Dimming both high when power on,and after 500ms,then input the PWM
signal.

Match connector: H208K…P05N-02B (ENTERY)

■ BLOCK DIAGRAM
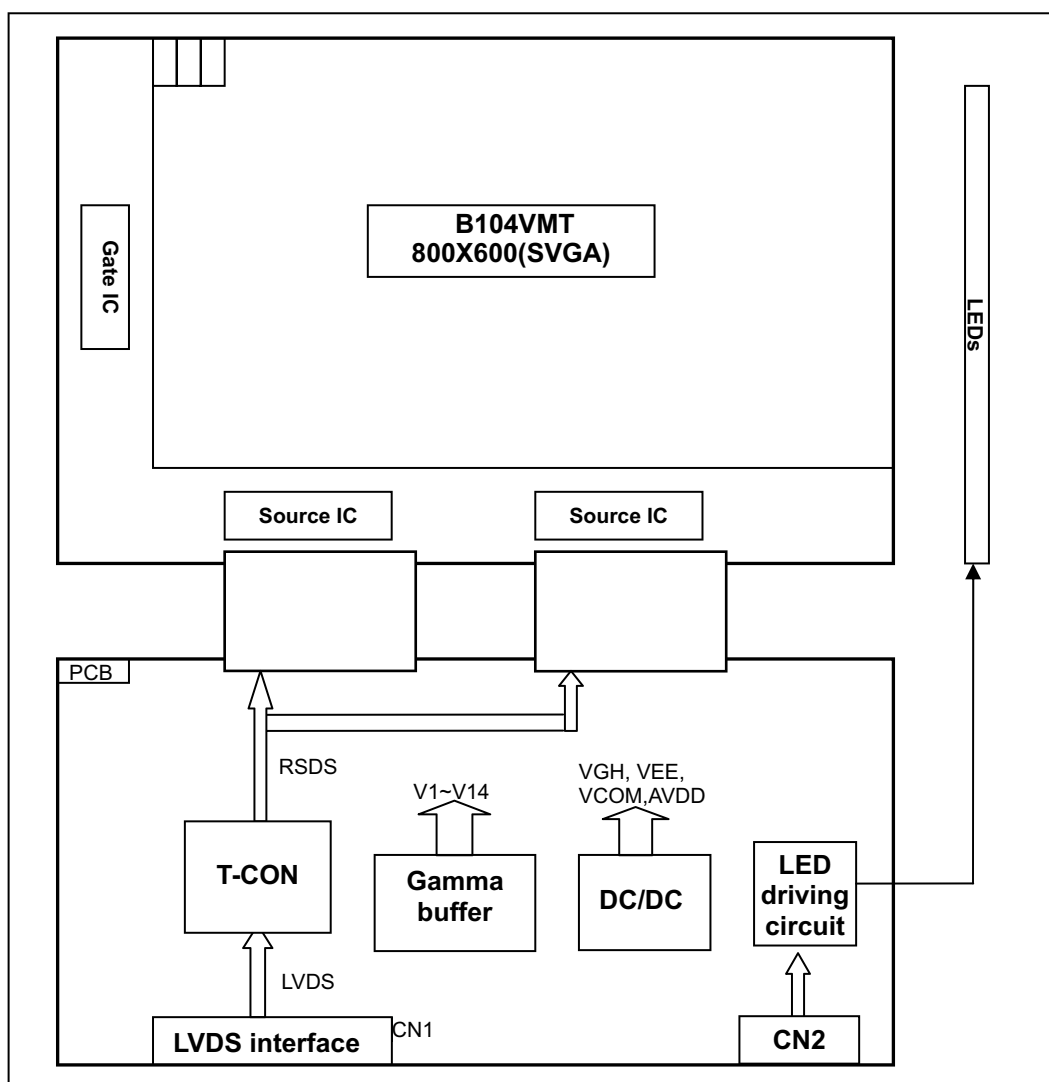
■ APPLICATION NOTES

1. Timing Chart

1.1 Timing Parameter

Item	Symbol	Min	Typ	Max	Unit	Condition
Clock period	tLVCP	20.0	25	31.25	ns	
Clock high time	tLVCH	-	14.29	-	ns	
Clock low time	tLVCL	-	10.71	-	ns	
PLL wake-up time	tLVPLL	-	-	1	ms	
Input skew marign	tLVSKM	400	-	-	ps	f=85MHz

Table 1.1 timing parameter
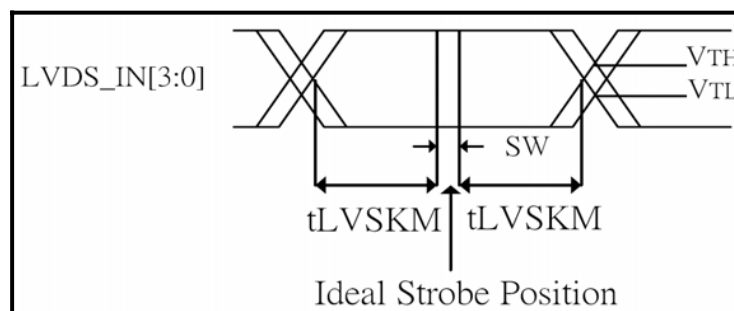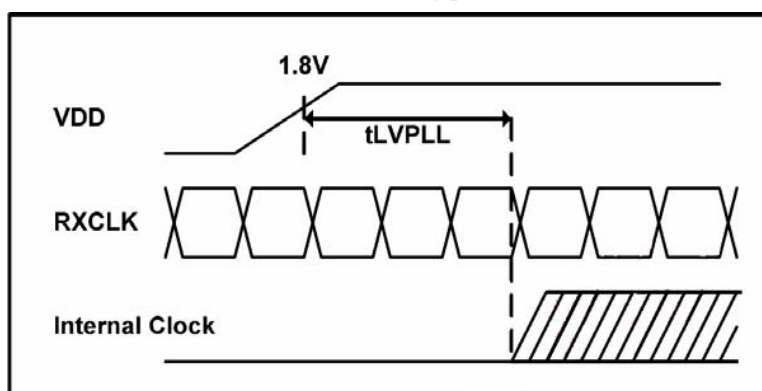
SW: Setup and Hold time
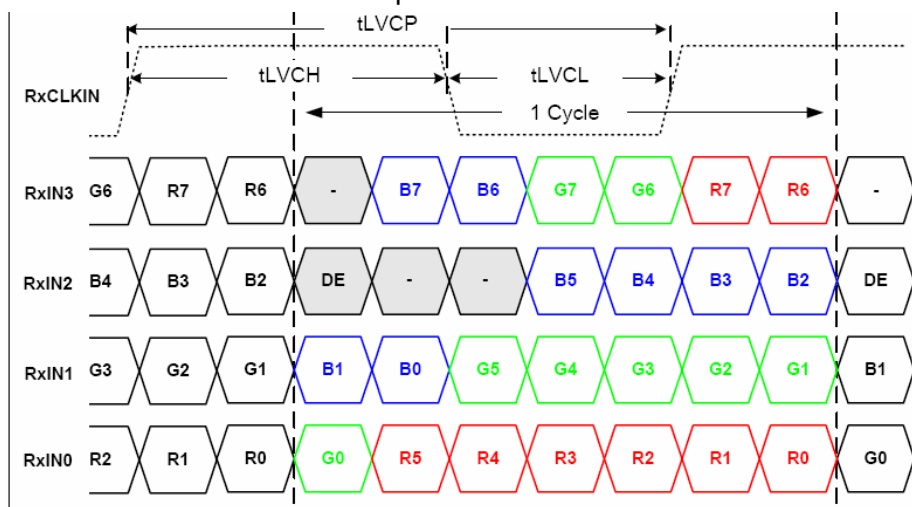
Figure 1.1 Input signal data timing

1.2 Power On/Off Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VDD 3.0V to signal starting	Tp1	5	-	50	ms	
Signal starting to backlight on	Tp2	150	-	-	ms	
Signal off to VDD 3.0V	Tp3	5	-	50	ms	
Backlight off to signal off	Tp4	150	-	-	ms	
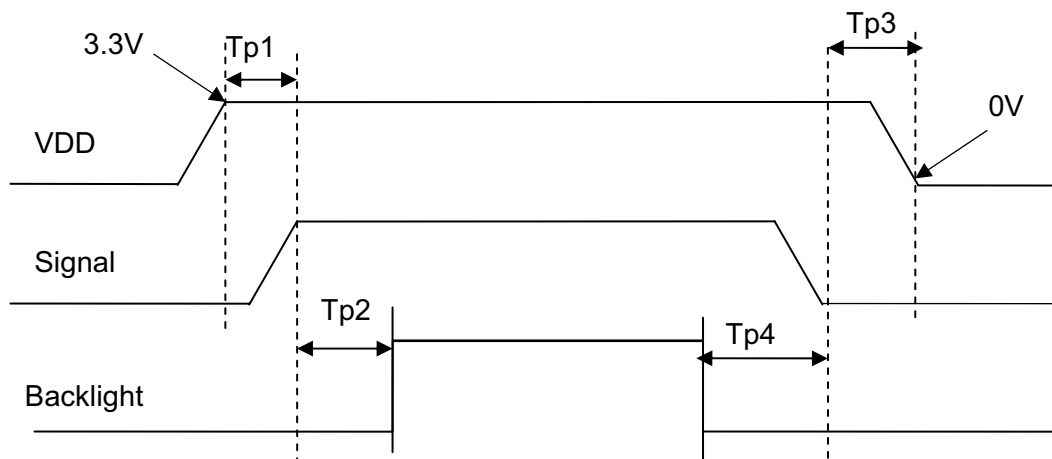
Figure 1.2 Interface power on/off sequence

1.3 Recommended Input Timing of LVDS transmitter

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Dclk frequency		1/Tclk	32	40	50	MHz	
Horizontal section	Horizontal total	Th	866	1056	1064	Tclk	
	Horizontal blanking	Thb	66	256	264	Tclk	
	Valid Data Width	Thd	800	800	800	Tclk	
Vertical section	Frame rate	-	-	60	70	Hz	
	Vertical total	Tv	604	628	800	Th	
	Vertical blanking	Tvb	4	28	200	Th	
	Valid Data Width	Tvd	600	600	600	Th	

Note: DE signal is necessary.

Input Timing Control Conditions

DE

Tvb

Tvd

Tv

Th

DE

Thb

Thd

DCLK

Tclk

DATA

Valid Data
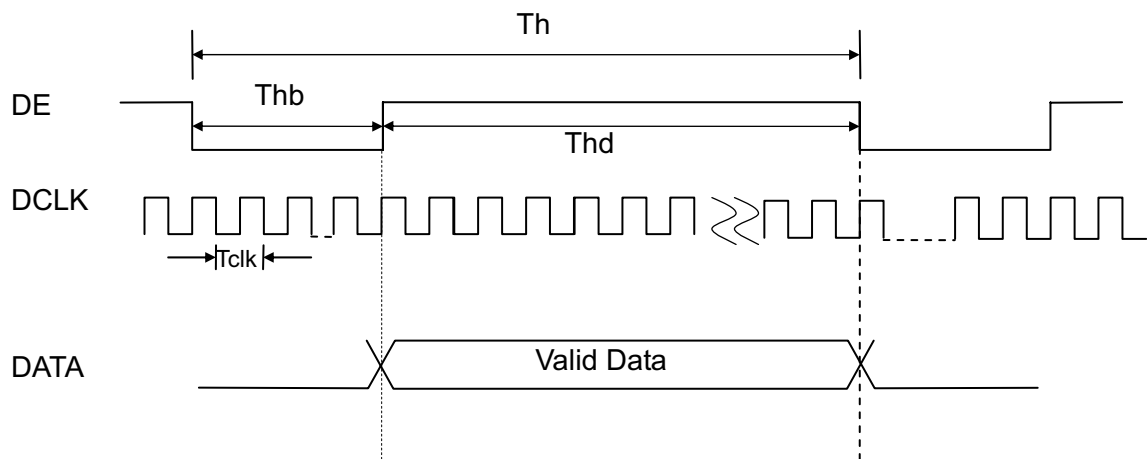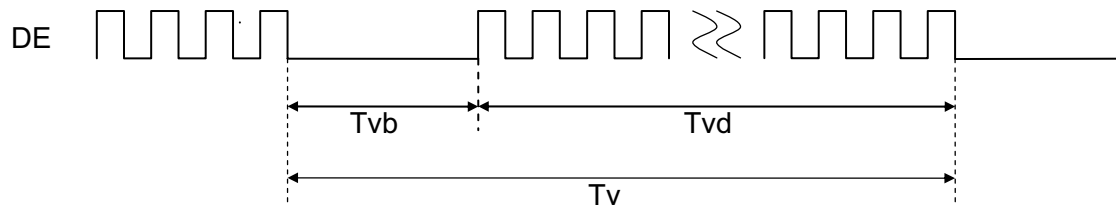
■ RELIABILITY TEST

No.	Test Item	Test Condition	Remark
1	High Temperature Storage	85±2℃/240 hours	IEC60068-2-1 GB2423.2
2	Low Temperature Storage	-30±2℃/240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Operating	80±2℃/240 hours	Note 1 IEC60068-2-1,GB2423.2
4	Low Temperature Operating	-30±2℃/240 hours	IEC60068-2-1 GB2423.1
5	Temperature Cycle storage	-30±2℃~25~85±2℃×100cycles (30min.) (5min.) (30min.)	Start with cold temperature, with high temperature, IEC60068-2-14:1984 GB2423.22
6	Damp proof Test operating	60℃±5℃×90%RH/240 hours	Note 2 IEC60068-2-78,GB2423.3
7	Vibration Test (non-operation)	Frequency range:10Hz~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2hours for each direction of X,Y,Z(6 hours for total)	IEC60068-2-6 GB/T2423.10
8	Package drop test	Height:80 cm,1 corner,3 edges,6 surfaces	IEC60068-2-32,GB2423.8
9	ESD test (operation)	C=150pF,R=330Ω Air: ±15Kv Contact: ±8Kv 10 times/terminal	IEC61000-4-2 GB/T17626.2
10	Shock(non-operation)	80G 6ms,±X,±Y,±Z 3times each direction	IEC60068-2-27 GB/T2423.5
11	Package vibration test	Random vibration: 0.015GxG/Hz for 5-200Hz, -6dB/Octave from 200-500Hz 2 hours for each dirction of X,Y,Z (6 hours for total)	IEC60068-2-34 GB/T2423.11

Note 1:Ts is the temperature of panel's surface.
Note 2:Ta is the ambient temperature of sample.

■ INSPECTION CRITERION

This specification is made to be used as the standard acceptance/rejection criteria for Normal LCM Product.

1 Sample plan

Sampling plan according to GB/T2828.1-2003/ISO 2859-1：1999 and ANSI/ASQC Z1.4-1993, normal level 2 and based on:

Major defect: AQL 0.65

Minor defect: AQL 1.5

2. Inspection condition

●Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45°against perpendicular line. (Normal temperature 20~25°C and normal humidity 60±15%RH).

● Driving voltage

The Vop value from which the most optimal contrast can be obtained near the specified Vop in the specification (Within ±0.5V of the typical value at 25°C.).

3. Definition of inspection zone in LCD.
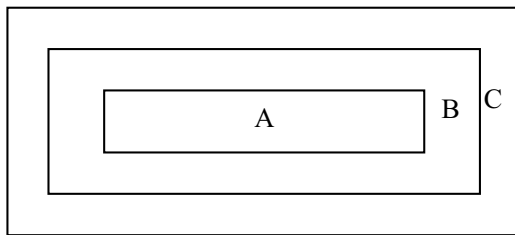
Zone A: character/Digit area

Zone B: viewing area except Zone A (ZoneA+ZoneB=minimum Viewing area)

Zone C: Outside viewing area (invisible area after assembly in customer's product)

Fig.1 Inspection zones in an LCD.

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.
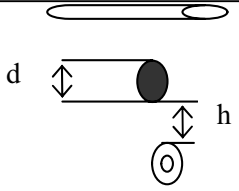
4.Inspection Standard

4.1 Major Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.1.1	All functional defects	1) No display 2) Display abnormally 3) Missing vertical，horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting.	Major
4.1.2	Missing	Missing component	
4.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	

4.2 Cosmetic Defect
4.2.1 Module Cosmetic Criteria
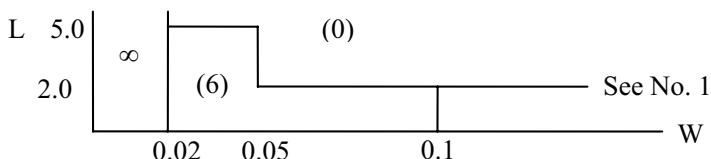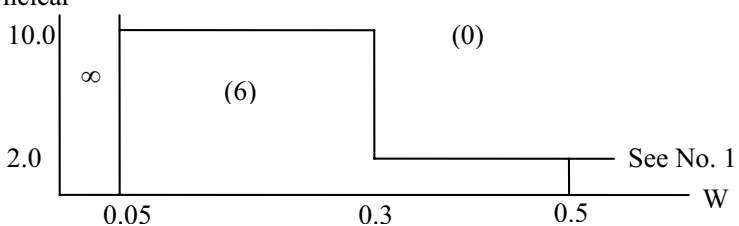
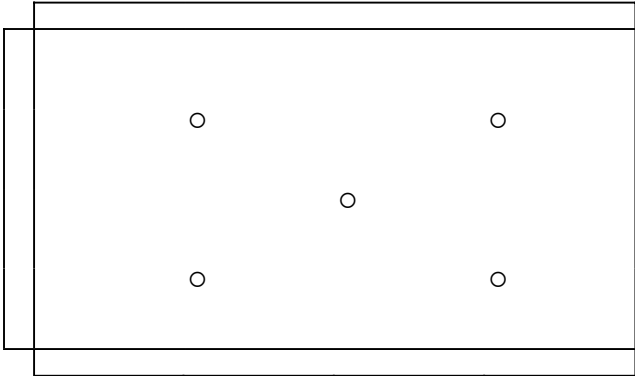| No.	Item	Judgement Criterion	Partition
1	Difference in Spec.	None allowed	Major
2	Pattern peeling	No substrate pattern peeling and floating	Major
3	Soldering defects	No soldering missing No soldering bridge No cold soldering	Major Major Minor
4	Resist flaw on Printed Circuit Boards	visible copper foil ($\varnothing$0.5mm or more) on substrate pattern	Minor
5	Accretion of metallic Foreign matter	No accretion of metallic foreign matters (Not exceed $\varnothing$0.2mm)	Minor Minor
6	Stain	No stain to spoil cosmetic badly	Minor
7	Plate discoloring	No plate fading, rusting and discoloring	Minor

8	Solder amount
	
	1. Lead parts
		a. Soldering side of PCB
		   Solder to form a 'Filet'
		   all around the lead.
		   Solder should not hide the
		   lead form perfectly. (too much)
		b. Components side
		   (In case of 'Through Hole PCB')
		
		Solder to reach the Components side of PCB.
			Minor

	2. Flat packages	Either 'Toe' (A) or 'Seal' (B) of the lead to be covered by 'Filet'. Lead form to be assume over solder.	Minor
	3. Chips	(3/2) H $\geq$ h $\geq$ (1/2) H	Minor

| 9 | Solder splash | the conductor or solder pad h ≥0.13mm

The diameter of solder ball d ≤0.15mm.

b. The quantity of solder balls or solder Splashes isn't beyond 5 in 600 mm^2.

c. Solder balls/Solder splashes do not violate minimum electrical clearance.
d. Solder balls/Solder splashes must be entrapped/encapsulated Or attached to the metal surface.

NOTE: Entrapped/encapsulated/attached is intended to mean that normal service environment of the product will not cause a solder ball to become dislodged. | Minor

Major

Minor |

4.2.2 Cosmetic Criteria (Non-Operating)

No.	Defect	Judgment Criterion	Partition
1	Spots	In accordance with *Screen Cosmetic Criteria (Operating) No.1*.	Minor
2	Lines	In accordance with *Screen Cosmetic Criteria (Operating) No.2*.	Minor
3	Bubbles in polarizer	<table><tr><td>Size : d mm</td><td>Acceptable Qty in active area</td></tr><tr><td>d ≤ 0.3</td><td>Disregard</td></tr><tr><td>0.3 < d ≤ 1.0</td><td>3</td></tr><tr><td>1.0 < d ≤ 1.5</td><td>1</td></tr><tr><td>1.5 < d</td><td>0</td></tr></table>	Minor
4	Scratch	In accordance with spots and lines operating cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor
5	Allowable density	Above defects should be separated more than 30mm each other.	Minor
6	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Back-lit type should be judged with back-lit on state only.	Minor
7	Contamination	Not to be noticeable.	Minor

4.2.3 Cosmetic Criteria (Operating)

No.	Defect	Judgment Criterion	Partition
1	Spots	A) Clear	Minor

Lcd size	Size : d mm	Acceptable Qty in active area
Lcd size≤8.0'	d≤0.1	Disregard
	0.1＜d≤0.2	6
	0.2＜d≤0.3	2
	0.3 < d	0
Lcd size＞8.0'	d ≤0.1	Disregard
	0.1＜d≤0.3	10
	0.3＜d≤0.5	5
	0.5 < d	0

Note :   Including pin holes and defective dots which must be within one pixel size; Total defective point shall not exceed 6 pcs no more than 8 inch LCD and 10PCS for more than 8 inch LCD.

B) Unclear

Lcd size	Size : d mm	Acceptable Qty in active area
Lcd size≤ 8.0'	d≤0.2	Disregard
	0.2＜d≤0.5	6
	0.5＜d≤0.7	2
	0.7＜d	0
Lcd size ＞8.0'	d≤0.2	Disregard
	0.2＜d≤0.5	10
	0.5＜d≤0.7	3
	0.7＜d≤1.0	1
	1.0< d	0

Note :   Total defective point shall not exceed 6 pcs for no more than 8 inch LCD and 10PCS for more than 8 inch LCD.

No.	Defect	Judgment Criterion	Partition
2	Lines	A) Clear	Minor

Note :   ( )   - Acceptable Qty in active area
    L   - Length (mm)
    W   - Width (mm)
    ∞   - Disregard

B) Unclear

'Clear'   = the shade and size of the line or dot are not changed with   the LCD operation voltage changing .the defect looks very apparent.
'Unclear' =   the shade and size of the line or dot are changed with   the LCD operation voltage changing ,the defect looks not so apparent

3	Rubbing line	Not to be noticeable.	Minor
4	Allowable density	Above defects should be separated more than 10mm each other.	Minor
5	Rainbow	Not to be noticeable.	Minor
6	Dot size	To be 95% ~ 105% of the dot size (Typ.) in drawing. Partial defects of each dot (ex. pin-hole) should be treated as 'Spot'. (see *Screen Cosmetic Criteria (Operating) No.1*)	Minor
7	Uneven brightness (only back-lit type module)	Uneven brightness must be BMAX / BMIN ≤ 2 - BMAX : Max. value by measure in 5 points - BMIN : Min. value by measure in 5 points Divide active area into 4 vertically and horizontally. Measure 5 points shown in the following figure. ○ : Measuring points	Minor

Note :

    (1) Size : d = (long length + short length) / 2

    (2) The limit samples for each item have priority.

    (3) Complex defects are defined item by item, but if the numbers of defects are defined in above table, the total number should not exceed 10.

        (4) In case of 'concentration', even the spots or the lines of 'disregarded' size should not allowed. Following three situations should be treated as 'concentration'.

        - 7 or over defects in circle of $\varnothing$5mm.

        - 10 or over defects in circle of $\varnothing$10mm.

        - 20 or over defects in circle of $\varnothing$20mm.

■ PRECAUTIONS FOR USING LCD MODULES

1   Handing Precautions

1.1   The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

1.2   If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

1.3   Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).

1.4   The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to   contact with room temperature air.

1.5   If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
         - Isopropyl alcohol
         - Ethyl alcohol
    Do not scrub hard to avoid damaging the display surface.

1.6   Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
         - Water
         - Ketone
         - Aromatic solvents
    Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contact with oil and fats.

1.7   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.

1.8   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.

1.9   Do not attempt to disassemble or process the LCD module.

1.10   NC terminal should be open. Do not connect anything.

1.11   If the logic circuit power is off, do not apply the input signals.

1.12   Electro-Static Discharge Control，Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
         - Before removing LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.
         - Tools required for assembling, such as soldering irons, must be properly grounded. Make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
         - To reduce the amount of static electricity generated, do not conduct assembling

and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dry. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

- 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.

1.13 Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- Do not alter, modify or change the shape of the tab on the metal frame.

- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

- Do not damage or modify the pattern writing on the printed circuit board.

- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

- Do not drop, bend or twist the LCM.