SPECIFICATION

CUSTOMER :

MODULE NO.: **LC1602B-CFH-JT**

APPROVED BY: **(FOR CUSTOMER USE ONLY)**	**PCB VERSION:** **DATA:**

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

VERSION	DATE	REVISED PAGE NO.	SUMMARY
C	2016/01/27		Modify Precautions in use of LCD Modules & Static electricity test

1.Contents

2.Precautions in use of LCD Modules

(1)Avoid applying excessive shocks to the module or making any alterations or modifications to it.

(2)Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.

(3)Don't disassemble the LCM.

(4)Don't operate it above the absolute maximum rating.

(5)Don't drop, bend or twist LCM.

(6)Soldering: only to the I/O terminals.

(7)Storage: please storage in anti-static electricity container and clean environment.

(8) Producer has the right to change the passive components, including R3,R6 & backlight adjust resistors. (Resistors,capacitors and other passive components will have different appearance and color caused by the different supplier.)

(9)Producer has the right to change the PCB Rev. (In order to satisfy the supplying stability,

3.General Specification

Item	Dimension	Unit
Number of Characters	16 characters x 2Lines	―
Module dimension	80.0 x 36.0 x 13.5 (MAX)	mm
View area	66.0 x 16.0	mm
Active area	56.20 x 11.5	mm
Dot size	0.55 x 0.65	mm
Dot pitch	0.60 x 0.70	mm
Character size	2.95 x 5.55	mm
Character pitch	3.55 x 5.95	mm
LCD type	FSTN Positive Transflective (In LCD production, It will occur slightly color difference. We can only guarantee the same color in the same batch.)	
Duty	1/16	
View direction	6 o'clock	
Backlight Type	LED, Full color	
IC	ST7066U or equivalent	

4.Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	—	+70	℃
Storage Temperature	T_{ST}	-30	—	+80	℃
Input Voltage	V_I	V_{SS}	—	V_{DD}	V
Supply Voltage For Logic	V_{DD}-V_{SS}	-0.3	—	7	V
Supply Voltage For LCD	V_{DD}-V_o	-0.3	—	13	V

5.Electrical Characteristics

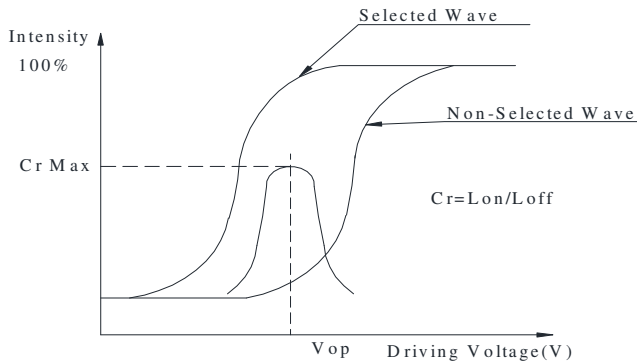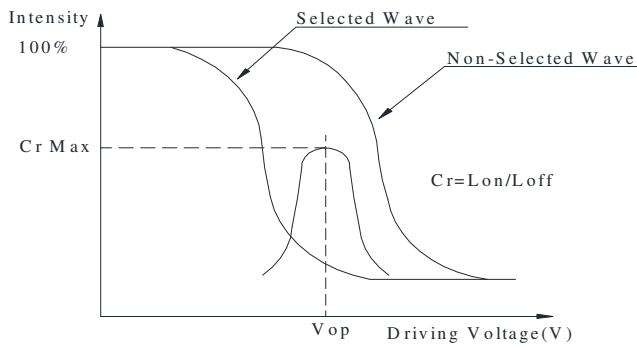| Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	V_{DD}-V_{SS}	—	4.5	5.0	5.5	V
Supply Voltage For LCD *Note	V_{DD}-V_0	Ta=-20℃	—	—	5.2	V
		Ta=25℃	3.6	3.7	3.8	V
		Ta=70℃	3.2	—	—	V
Input High Volt.	V_{IH}	—	0.7 V_{DD}	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	V_{SS}	—	0.6	V
Output High Volt.	V_{OH}	—	3.9	—	V_{DD}	V
Output Low Volt.	V_{OL}	—	0	—	0.4	V
Supply Current	I_{DD}	V_{DD}=5.0V	1.0	1.2	1.5	mA

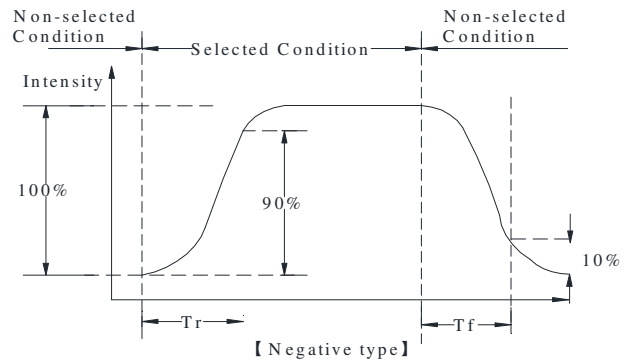* Note: Please design the VOP adjustment circuit on customer's main board
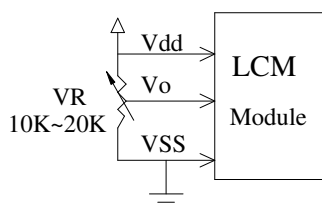
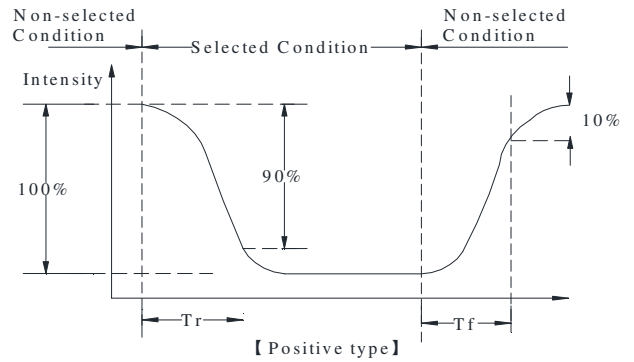# 6.Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	θ	CR$\geqq$2	0	—	30	$\phi = 180°$
	θ	CR$\geqq$2	0	—	60	$\phi = 0°$
	θ	CR$\geqq$2	0	—	45	$\phi = 90°$
	θ	CR$\geqq$2	0	—	45	$\phi = 270°$
Contrast Ratio	CR	—	—	5	—	—
Response Time	T rise	—	—	150	200	ms
	T fall	—	—	150	200	ms

Definition of Operation Voltage (Vop) **Definition of Response Time (Tr , Tf)**

Conditions :

Operating Voltage : Vop   Viewing Angle(θ , φ) : 0° , 0°
Frame Frequency : 64 HZ   Driving Waveform : 1/N duty , 1/a bias

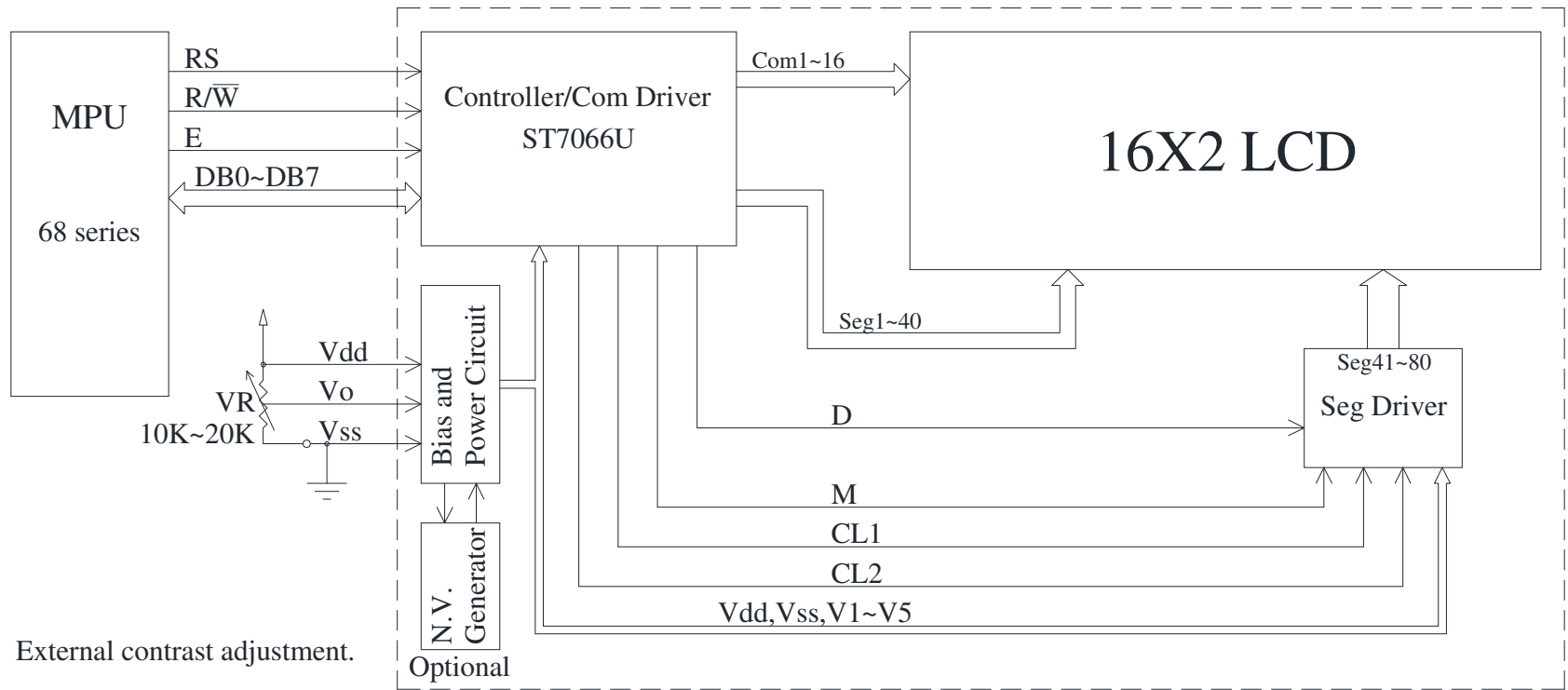**Definition of viewing angle(CR$\geqq$2)**
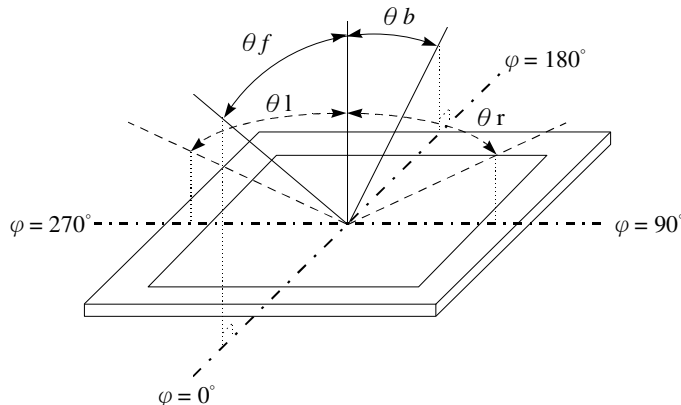
7.Interface Pin Function

Pin No.	Symbol	Level	Description
1	V_{SS}	0V	Ground
2	V_{DD}	5.0V	Supply Voltage for logic
3	VO	(Variable)	Contrast Adjustment
4	RS	H/L	H: DATA, L: Instruction code
5	R/W	H/L	H: Read L: Write
6	E	H,H→L	Chip enable signal
7	DB0	H/L	Data bus line
8	DB1	H/L	Data bus line
9	DB2	H/L	Data bus line
10	DB3	H/L	Data bus line
11	DB4	H/L	Data bus line
12	DB5	H/L	Data bus line
13	DB6	H/L	Data bus line
14	DB7	H/L	Data bus line
15	A	─	Supply power for LED +
16	R	─	Supply power for Red -
17	G	─	Supply power for Green -
18	B	─	Supply power for Blue -

8.Contour Drawing &Block Diagram
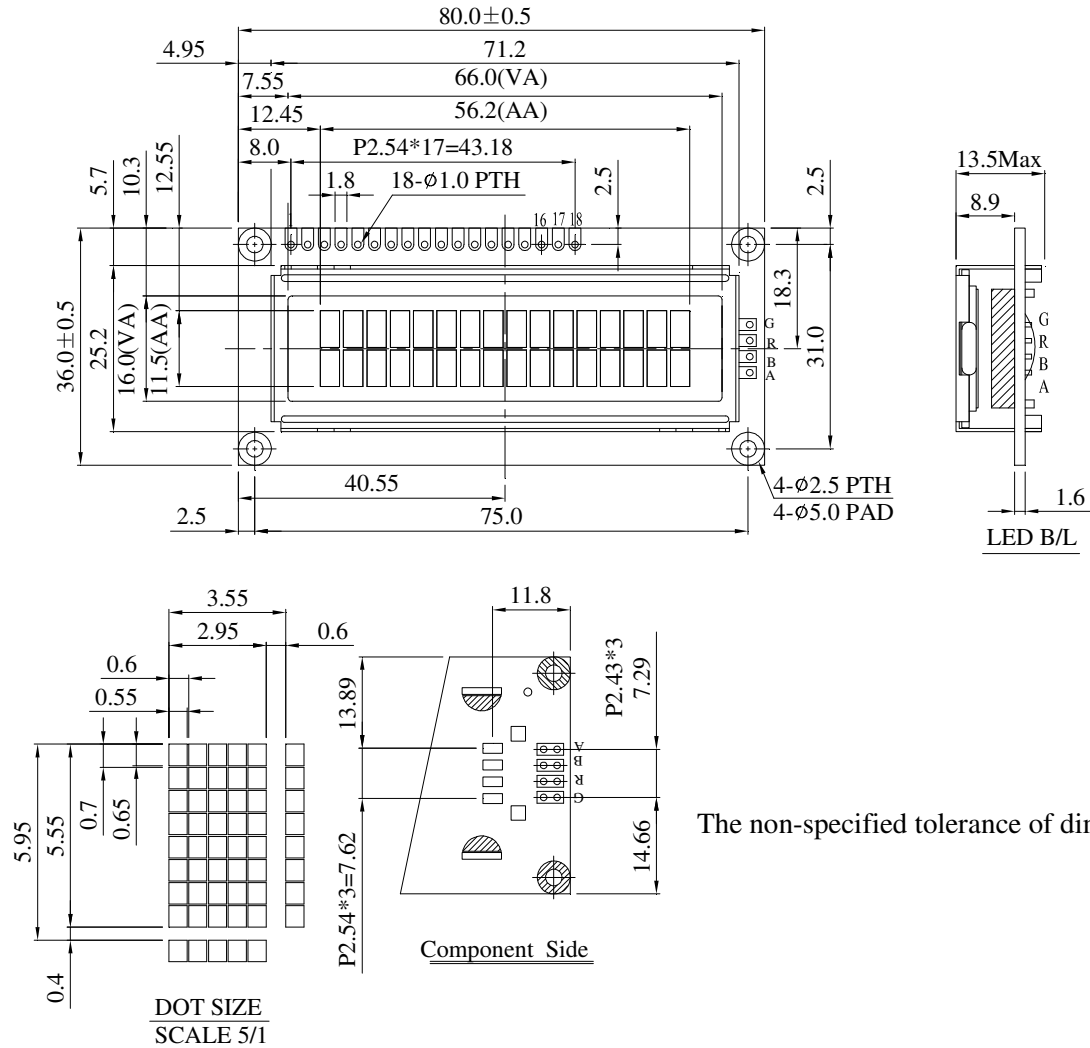
PIN NO.	SYMBOL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/$\overline{W}$
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A
16	R
17	G
18	B

The non-specified tolerance of dimension is ¡Ó0.3 mm .

DOT SIZE
SCALE 5/1

Component Side

LED B/L

| MPU | | Controller/Com Driver | | 16X2 LCD |

Diagram labels:
- MPU 68 series
- RS
- R/$\overline{W}$
- E
- DB0~DB7
- Controller/Com Driver ST7066U
- Com1~16
- 16X2 LCD
- Seg1~40
- Vdd
- Vo
- Vss
- VR 10K~20K
- Bias and Power Circuit
- N.V. Generator
- Optional
- External contrast adjustment.
- Seg41~80
- Seg Driver
- D
- M
- CL1
- CL2
- Vdd,Vss,V1~V5

Character located	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DDRAM address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DDRAM address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

9.Character Generator ROM Pattern

Table.2

10.Reliability

Content of Reliability Test (Wide temperature, -20℃~70℃)

Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30℃ 200hrs	1,2
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	1
High Temperature/ Humidity storage	The module should be allowed to stand at 60℃,90%RH max For 96hrs under no-load condition excluding the polarizer, Then taking it out and drying it at normal temperature.	60℃,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -20℃ 25℃ 70℃ 30min 5min 30min 1 cycle	-20℃/70℃ 10 cycles	——
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±600V(contact), ±800v(air), RS=330Ω CS=150pF 10 times	——

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal

Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

11.Backlight Information

Specification

PARAMETER	SYMBOL		MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	**ILED**	**R**	35	30	34	**mA**	**V=5.0V**
		G	25	30	34		
		B	25	30	34		
Supply Voltage	**V**		4.9	5.0	5.1	**V**	─
Reverse Voltage	**VR**		─	3.0	─	**V**	─
Luminous Intensity	**IV**	**R**	40	50		**CD/M^2**	**ILED(red)=30mA**
		G	250	310	─		**ILED(green)=30mA**
		B	55	68			**ILED(blue)=30mA**
Wave Length	**λ**	**R**	621	625	630	**nm**	─
		G	510	520	525		
		B	468	470	475		
LED Life Time		**R**	50K	─	─	**Hr.**	**ILED≦30mA For each LED Lamp**
		G	50K	─	─		
		B	50K	─	─		
Color	**Red, Green, Blue**						

Note:

1. The LED B/L of "*triple color*" is designed for voltage driving, user have to follow
   The drive voltage that can make driving current in safety range (current between
   minimum and maximum).

2. owing to having 3 chips in one LED lamp, which caused many combinations of
   different wave length. This situation will caused wave length shifting while driving
   2 colors or more in the same time.

3. The luminous intensity is measured on B/L surface only.

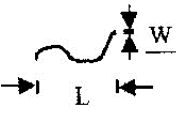Note1 :LED Life Time is only an estimate for reference.
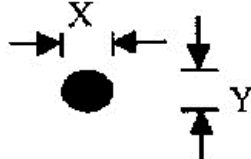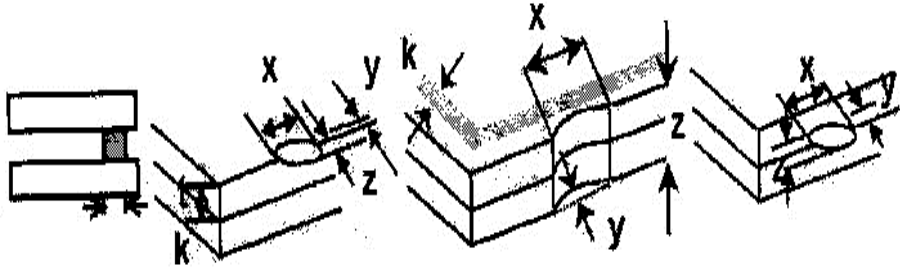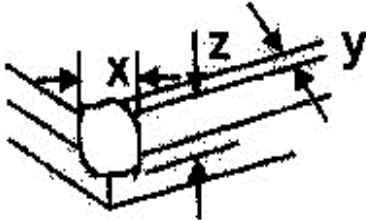
Note2：Brightness of parallel RGB backlight will be uneven.

Backlight Drive Method

A

LED B/L   Red   Green   Blue
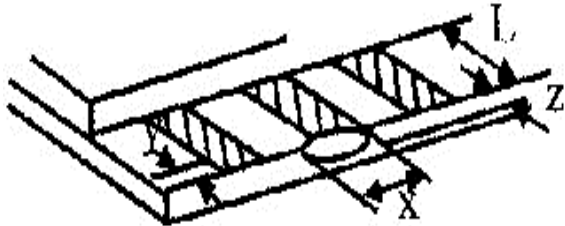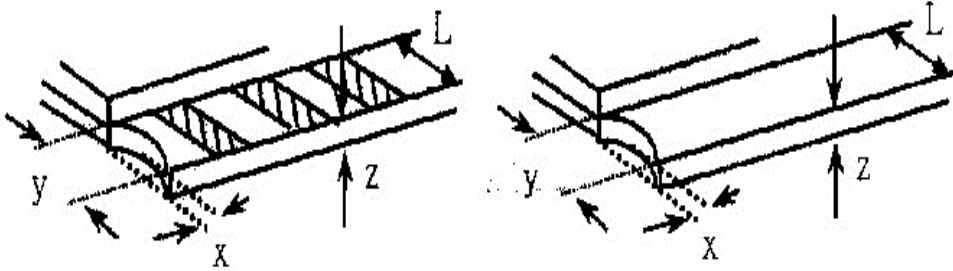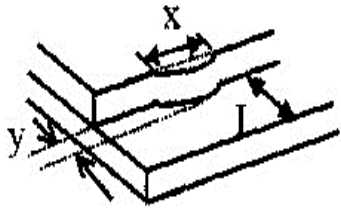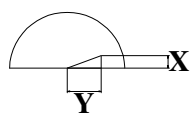
Control(red) Control(grn) Control(blue)
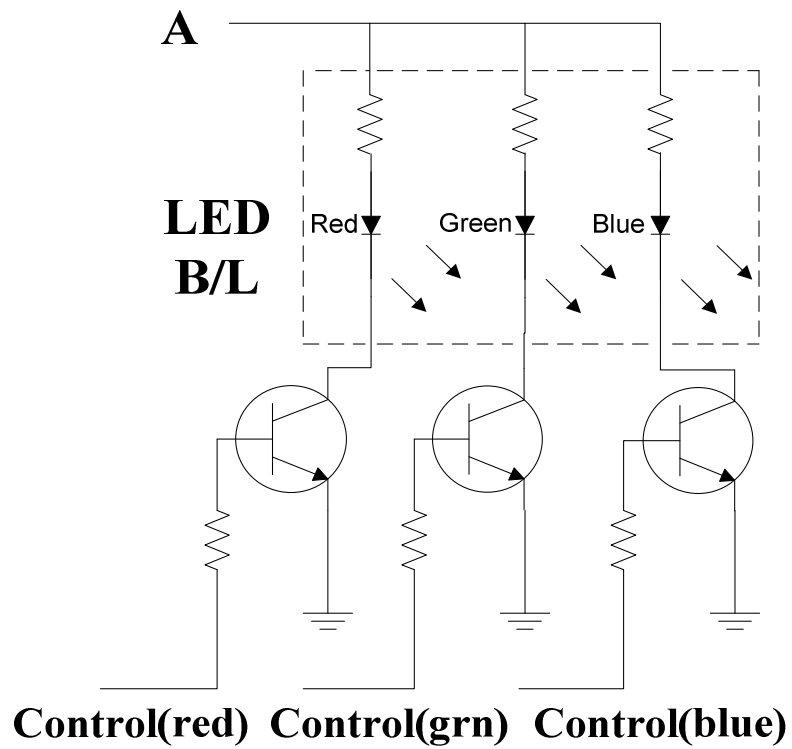
The driving circuit of suggestion is showed as above, owing to B/L being designed In parallel mode, so user can use transistor、FET or TRIC to control.

12.Inspection specification

NO	Item	Criterion	AQL
01	Electrical Testing	Missing vertical, horizontal segment, segment contrast defect. Missing character , dot or icon. Display malfunction. No function or no display. Current consumption exceeds product specifications. LCD viewing angle defect. Mixed product types. Contrast defect.	0.65
02	Black or white spots on LCD (display only)	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	2.5
03	LCD black spots, white spots, contamination (non-display)	3.1 Round type : As following drawing Φ=(x + y) / 2 3.2 Line type : (As following drawing)	2.5
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.	2.5

3.1 Round type table:

SIZE	Acceptable Q TY
Φ≦0.10	Accept no dense
0.10＜Φ≦0.20	2
0.20＜Φ≦0.25	1
0.25＜Φ	0

3.2 Line type table:

Length	Width	Acceptable Q TY
---	W≦0.02	Accept no dense
L≦3.0	0.02＜W≦0.03	2
L≦2.5	0.03＜W≦0.05	
---	0.05＜W	As round type

04 Polarizer bubbles table:

Size Φ	Acceptable Q TY
Φ≦0.20	Accept no dense
0.20＜Φ≦0.50	3
0.50＜Φ≦1.00	2
1.00＜Φ	0
Total Q TY	3

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: (see table below) ⊙If there are 2 or more chips, x is total length of each chip. 6.1.2 Corner crack: (see table below) ⊙If there are 2 or more chips, x is the total length of each chip.	2.5

6.1.1 table:

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

6.1.2 table:

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

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 : 6.2.2 Non-conductive portion: ⊙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. 	2.5

Table for 6.2.1:

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

Table for 6.2.2:

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

Table for 6.2.3:

y: width	x: length
$y \leqq 1/3L$	$x \leqq a$

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.	0.65
		8.2 Spots or scratched that appear when lit must be judged. Using LCD spot, lines and contamination standards.	2.5
		8.3 Backlight doesn't light or color wrong.	0.65
09	Bezel	9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination.	2.5
		9.2 Bezel must comply with job specifications.	0.65
10	PCB、COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination.	2.5
		10.2 COB seal surface may not have pinholes through to the IC.	2.5
		10.3 The height of the COB should not exceed the height indicated in the assembly diagram.	0.65
		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.	2.5
		10.5 No oxidation or contamination PCB terminals.	2.5
		10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts.	0.65
		10.7 The jumper on the PCB should conform to the product characteristic chart.	0.65
		10.8 If solder gets on bezel tab pads, LED pad, zebra pad or screw hold pad, make sure it is smoothed down.	2.5
		10.9 The Scraping testing standard for Copper Coating of PCB $X * Y <= 2mm^2$	2.5
11	Soldering	11.1 No un-melted solder paste may be present on the PCB.	2.5
		11.2 No cold solder joints, missing solder connections, oxidation or icicle.	2.5
		11.3 No residue or solder balls on PCB.	2.5
		11.4 No short circuits in components on PCB.	0.65

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

13.Material List of Components for RoHs

1. Producer hereby declares that all of or part of products including, but not limited to, the LCM, accessories or packages, manufactured and/or delivered to your company (including your subsidiaries and affiliated company) directly or indirectly by our company (including our subsidiaries or affiliated companies) do not intentionally contain any of the substances listed in all applicable EU directives and regulations, including the following substances.

Exhibit A：The Harmful Material List

Material	(Cd)	(Pb)	(Hg)	(Cr6+)	PBBs	PBDEs
Limited Value	100 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm
Above limited value is set up according to RoHS.						

2.Process for RoHS requirement：**(only for RoHS inspection)**

  (1) Use the Sn/Ag/Cu soldering surface；the surface of Pb-free solder is rougher than we used before.

  (2) Heat-resistance temp.：

    Reflow：250℃,30 seconds Max.；

    Connector soldering wave or hand soldering：320℃, 10 seconds max.

  (3) Temp. curve of reflow, max. Temp.：235±5℃；

    Recommended customer's soldering temp. of connector：280℃, 3 seconds.

14.Recommendable Storage

1. Place the panel or module in the temperature 25°C±5°C and the humidity below 65% RH

2. Do not place the module near organics solvents or corrosive gases.

3. Do not crush, shake, or jolt the module.