Bolymin, Inc.

LCD MODULE SPECIFICATION

MODEL NO.

BP240160C series

* EL and no backlight LCM are not with metal frame
* LED backlight LCM is with metal frame

FOR MESSRS:

_____

ON DATE OF:

_____

APPROVED BY:

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RECORD OF REVISION

Revision Date	Version	Contents
2003/3/7	0	New Release

C O N T E N T S

1. Numbering System
2. General Specification
3. Absolute Maximum Ratings
4. Electro-optical Characteristics
5. Interface Description
6. Jumper setting
7. Block Diagram
8. Power supply for LCD Module and LCD operating voltage adjustment
9. Backlight information
10. Timing characteristics
11. Quality
12. Reliability
13. Handling Precautions
14. Drawing ,Touch panel Information
    14 –1 Drawing
    14 –2 Touch panel Information
        14 – 2.1 Touch Panel Electrical Specification

1. Numbering System

B	P	240160	C	F	P	L		B	xxx
0	1	2	3	4	5	6	7	8	9

0	Brand		Bolymin	
1	Module Type		C= character type G= graphic type P= TAB/TCP type	O= COG type F= COF type
2	Format		2002=20 characters, 4 lines 12232= 122 x 32 dots	
3	Version No.		A type	
4	LCD Color		G=STN/gray Y=STN/yellow-green C=color STN	B=STN/blue F=FSTN T=TN
5	LCD Type		R=positive/reflective P=positive/transflective	M=positive/transmissive N=negative/transmissive
6	Backlight type/color		L=LED array/ yellow-green H=LED edge/white R=LED array/red G=LED edge/yellow-green	D=LED edge/blue E=EL/white B=EL/blue C=CCFL/white
7	CGRAM Font (applied only on character type)		J=English/Japanese Font E=English/European Font	C=English/Cyrillic Font H=English/Hebrew Font
8	View Angle/ Operating Temperature		B=Bottom/Normal Temperature H=Bottom/Wide Temperature U=Bottom/Ultra wide Temperature	T=Top/Normal Temperature W=Top/Wide Temperature C=9H/Normal Temperature
9	Special Code		3=3 volt logic power supply n=negative voltage for LCD c=cable/connector xxx=to be assigned on data sheet	t=temperature compensation for LCD p=touch panel

2. General Specification

(1) Mechanical Dimension

Item	Dimension		Unit
Number of Dots	240 x 160		dots
Module dimension (W*H*T)	**EL type**	**LED type**	mm
	74.6*54.9*6.0(max)-No B/L 74.6*54.9*7.0 (max)-EL B/L 74.6*54.9*8.0 (max)-Touch panel	88.2*59.5* 9.5 (max)- LED B/L 88.2*59.5*10.5 (max)-Touch panel	
View area	67.6 x 47.5		mm
Dot size	0.225x 0.225		mm
Dot pitch	0.24 x 0.24		mm

(2) Controller IC: No built-in controller (Recommended controller: SED1335)

(3) Temperature Range

	Normal	Wide
Operating	0 ~+50℃	-20 ~+70℃
Storage	-10 ~+60℃	-30 ~+80℃

3. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	0	—	+50	℃
Storage Temperature	T_{ST}	-20	—	+70	℃
Input Voltage	V_I	-0.3	—	V_{DD}+0.3	V
Supply Voltage For Logic	V_{DD}-V_{SS}	-0.3	—	7.0	V
Supply Voltage For LCD	V_{ADJ}-V_{SS}	-0.3	—	26.0	V

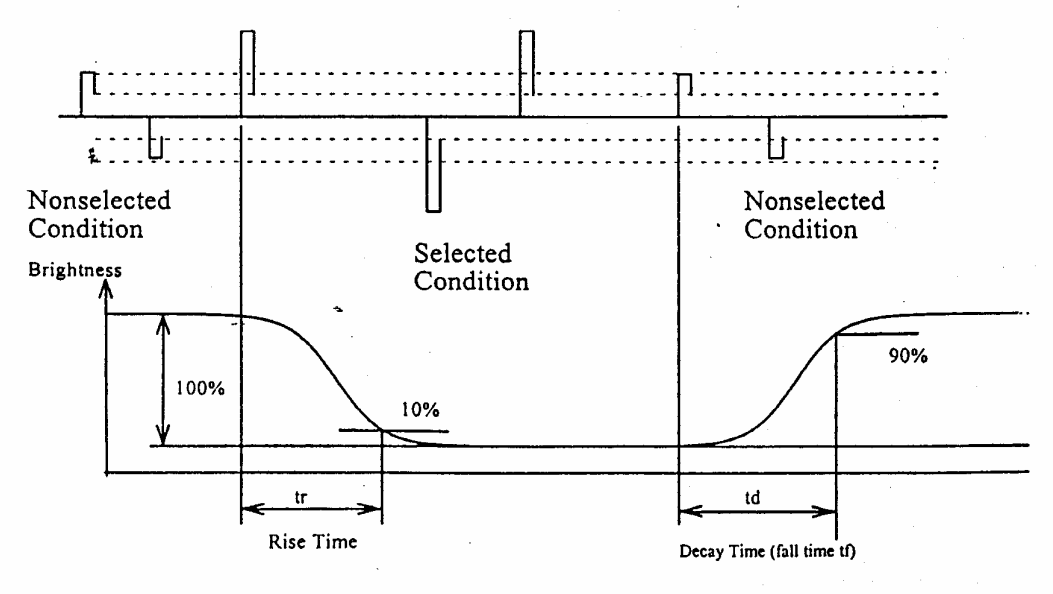
4. Electro-optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	V_{DD}-V_{SS}	--	2.7	--	5.5	V	
LCD Driving Voltage	V_{ADJ}-V_{SS}	25°C	20	**20.5**	21.0	V	
Input Voltage	V_{IH}	--	0.8 V_{DD}	--	V_{DD}	V	
	V_{IL}	--	V_{SS}	--	0.2 V_{DD}	V	
Logic Supply Current(B/L off,No DC-DC circuit)	I_{DD}	V_{DD} = 5V	--	1.0	--	mA	
Logic Supply Current(B/Loff,with DC-DC circuit)	I_{DD}	V_{DD} = 5V	--	48	--	mA	
Supply Current for (EL on.with DC-DC circuit	I_{DD}	V_{DD} = 5V	--	100	110	mA	
----- Optical Characteristics -----							
Contrast	CR	25°C	4.19	4.28	4.33		Note 1
Rise Time	Tr	25°C	216	242	269	ms	Note 2
Fall Time	Tf	25°C	95	113	125	ms	
Viewing Angle Range	θ1	25°C & CR≥2	37	37	38	Deg.	Note 3
	θ2		30	30	30		
	ϕ1		37	38	40		
	ϕ2		35	37	39		
Frame Frequency	fF	25°C	--	64	--	Hz	

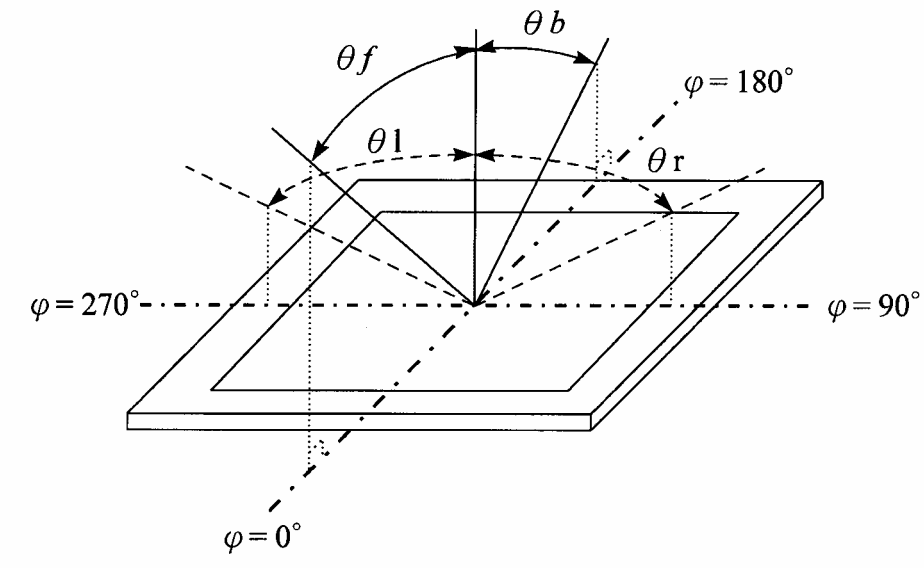
Note 1 Contrast ratio :

CR = (Brightness in OFF state) / (Brightness in ON state)

Note 2 Response time :



Note3 Viewing angle



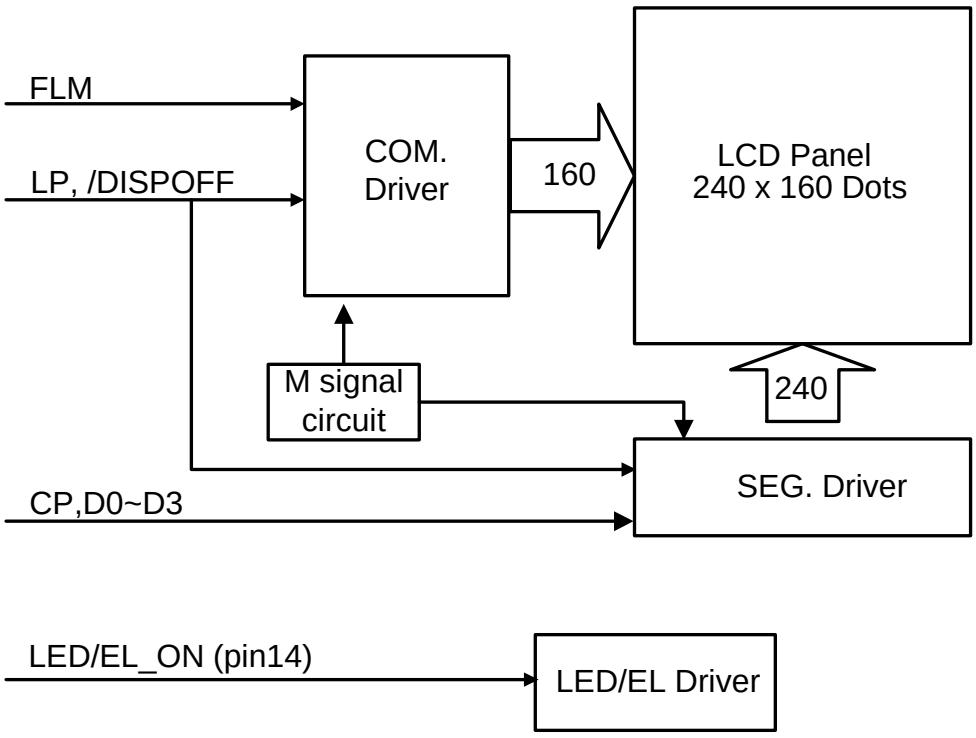
5. Interface Description

Pin No.	Signal	Level	Function
1~4	D0~D3	H/L	Data Input(4 bits)
5	/DISPOFF	H/L	H: Display ON(default) L: Display OFF
6	FLM	H/L	First Line Marker
7	M	--	Alternate signal
8	LP	H/L	Data Latch Clock
9	CP	H/L	Data Shift Clock
10	VDD	-	Power Supply for Logic (+3~+5V)
11	VSS	-	Power Supply (GND)
12	VLCD	-	Positive voltage output **+27.0V**
13	VADJ		Contrast Adjustment Input (VADJ-VSS = LCD driving voltage)
14	BL_ON	H/L	LED or EL BL on/off signal ; H: on L: off
15	Y1	-	Touch panel upper signal
16	X1	-	Touch panel right signal
17	Y2	-	Touch panel lower signal
18	X2	-	Touch panel left signal
19	BL+	A	LED V+(5V) , EL1(EL inverter non built in)
20	BL--	K	LED V-(GND), EL2(EL inverter non built in)

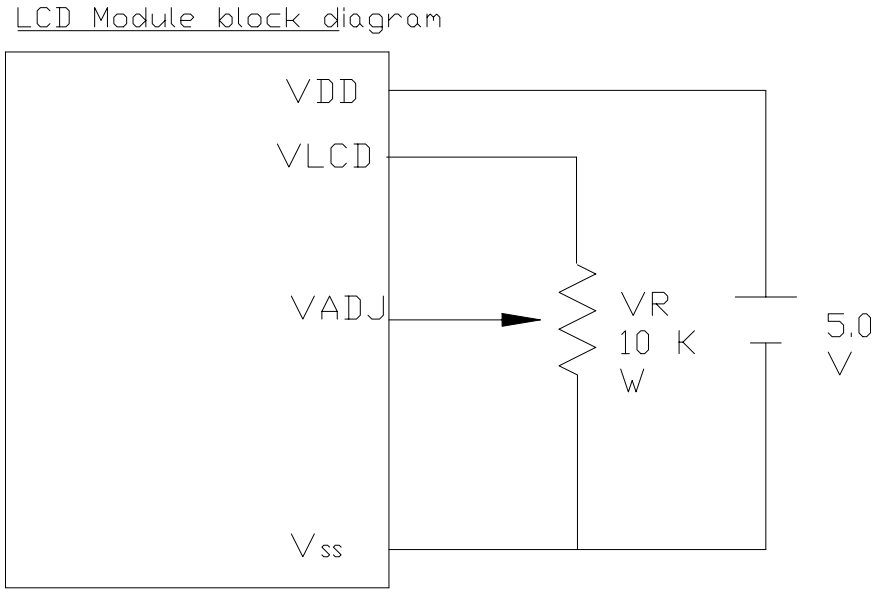
6. Jumper setting

Item	Option	Jumper Setting	Remark
Display Type	Landscape (default)	Pin 1,2 short on JP1&JP2	
	Portrait	Pin 2,3 short on JP1&JP2	
EL driver	Built-in (default)	Pin 1,2 short on EL-JP1 & EL-JP2	Pin 19,20 are NC on CN2

7. Block Diagram



8. Power Supply for LCD Module and LCD Operating Voltage a Adjustment



9. Backlight Information

9.1 Specification

(1) LED edge / yellow-green

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	ILED	—	50		mA	VLED+=5V
Supply Voltage	V	—	5.0	5.2	V	
Reverse Voltage	VR	—	—	8	V	
Luminous Intensity	IV		20	—	cd/m^2	ILED=50mA
Wave Length	λp		574		nm	ILED=50mA
Life Time		—	100000	—	Hr.	V≦3.9V
Color	Yellow-green					

(2) LED edge / white

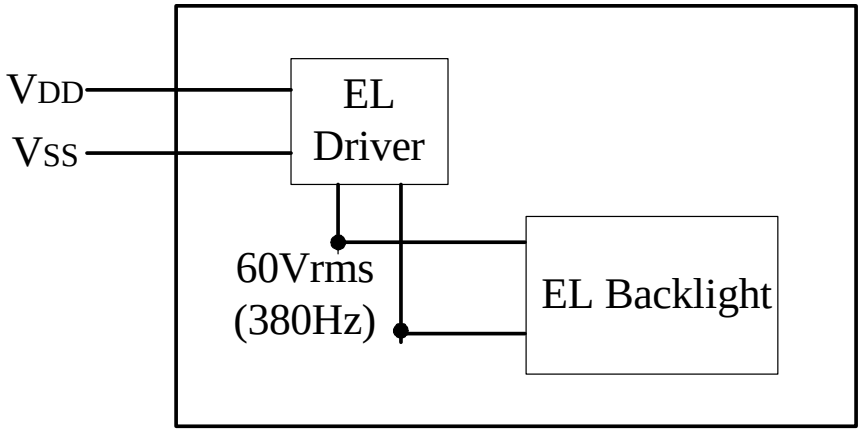
Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	ILED	—	60		mA	VLED+=5V
Supply Voltage	V	—	5.0	5.2	V	
Reverse Voltage	VR	—	—	8	V	
Luminous Intensity	IV		60	—	cd/m^2	ILED=50mA
Wave Length	λp				nm	ILED=50mA
Life Time		—	20000	—	Hr.	V≦5 V
Color	White					

(3) EL / white

Parameter	Specification	Unit
Color	White	-
Voltage	Vrms = 60	V(AC)
Frequency	Sine Wave = 380	Hz
Current Density	0.12	mA / cm^2
Bare EL Initial Brightness	15	cd / m^2
LCM Initial Brightness	5	cd / m^2

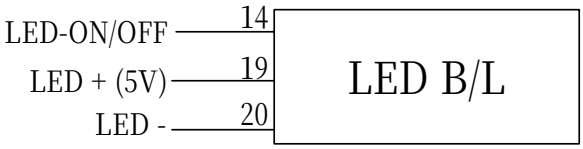
9.2 Backlight driving methods

a. EL B/L driven

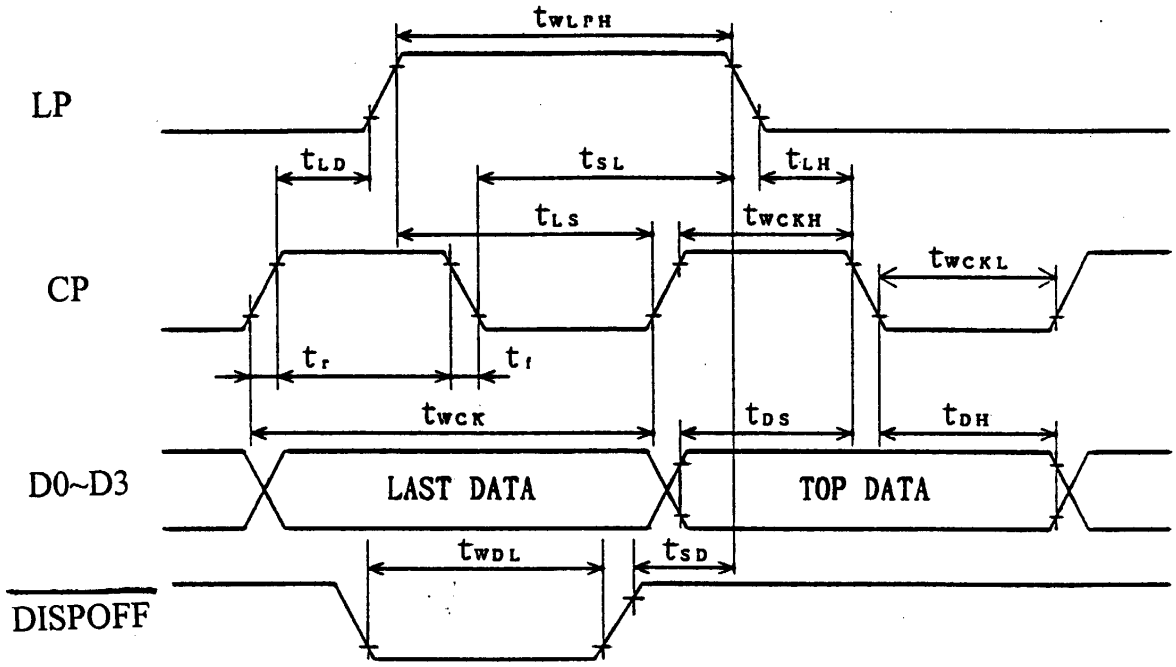


Control by “EL-ON”

b. LED B/L driven from pin 19,20



10.Timing Characteristics



VDD = 4.5V to 5.5V

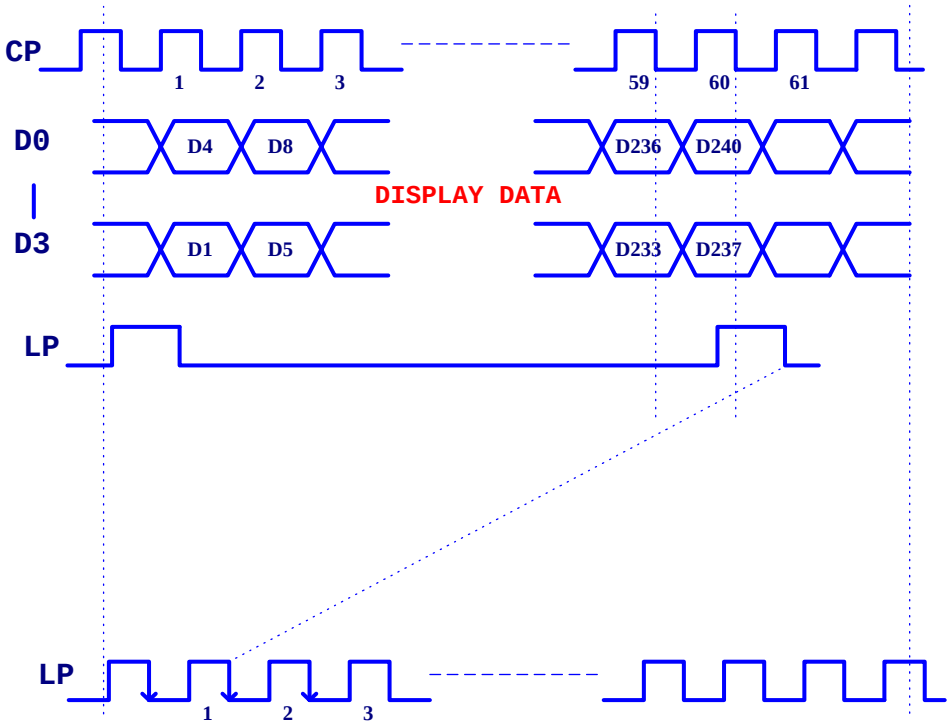
Parameter	Symbol	Condition	Min	Max	Unit
Shift Clock Period	tWCK	Tr, Tf ≤ 10ns	50		ns
Clock Width “H” Pulse Width	tWCKH		15		ns
Clock Width “L” Pulse Width	tWCKL		15		ns
Data Set Up Time	tDS		10		ns
Data Hold Time	tDH		12		ns
Latch Pulse “H” Pulse Width	tWLPH		15		ns
Shift Clock to Latch Pulse Rise Time	tLD		0		ns
Shift Clock to Latch Pulse Fall Time	tSL		30		ns
Latch Pulse to Shift Clock Rise Time	tLS		25		ns
Latch Pulse to Shift Clock Fall Time	tLH		25		ns
Input Signal Rise/Fall Time	tr,tf			50	ns
/DISPOFF Removal Time	tSD		100		ns
/DISPOFF “L” Pulse Width	tWDL		1.2		ns

VDD = 3.0V to 4.5V

Parameter	Symbol	Condition	Min	Max	Unit

Shift Clock Period	t_{WCK}	Tr, Tf ≤ 10ns	66		ns
Clock Width “H” Pulse Width	t_{WCKH}		23		ns
Clock Width “L” Pulse Width	t_{WCKL}		23		ns
Data Set Up Time	t_{DS}		15		ns
Data Hold Time	t_{DH}		23		ns
Latch Pulse “H” Pulse Width	t_{WLPH}		30		ns
Shift Clock to Latch Pulse Rise Time	t_{LD}		0		ns
Shift Clock to Latch Pulse Fall Time	t_{SL}		50		ns
Latch Pulse to Shift Clock Rise Time	t_{LS}		30		ns
Latch Pulse to Shift Clock Fall Time	t_{LH}		30		ns
Input Signal Rise/Fall Time	tr,tf			50	ns
/DISPOFF Removal Time	t_{SD}		100		ns
/DISPOFF “L” Pulse Width	t_{WDL}		1.2		ns

10.1 Controller Interface Timing Chart



10.2 Display Data Format(default)



	SEG1												SEG240		
#1	**D3**	D2	D1	D0	D3	D2			-			D3	D2	D1	D0
#2	D3	D2	D1	D0	D3	D2						D3	D2	D1	D0
#160	D3	D2	D1	D0	D3	D2						D3	D2	D1	D0

Landscape Display Type(Top View)



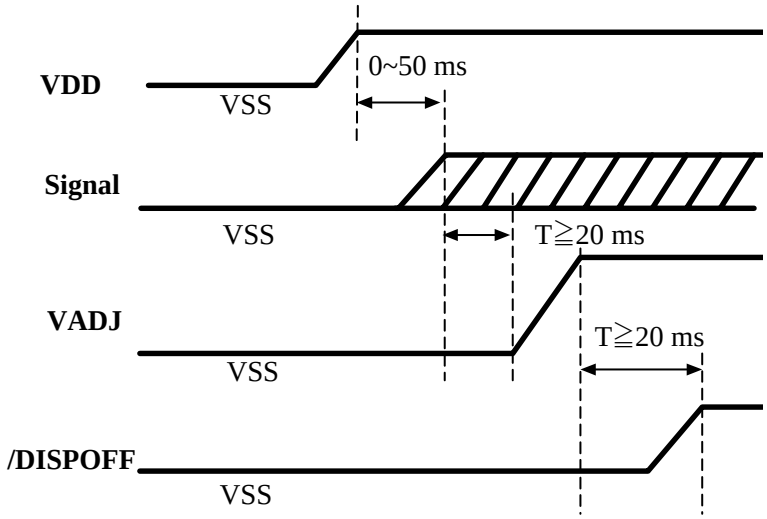
	COM1							COM160
#1	**D3**	D3	D3					D3
#2	D2	D2	D2					D2
	D1	D1	D1					D1
	D0	D0	D0					D0
	D3							D3
	D2	D2						D2
	D1	D1						D1
#240	D0	D0						D0

Portrait Display Type (Top View)

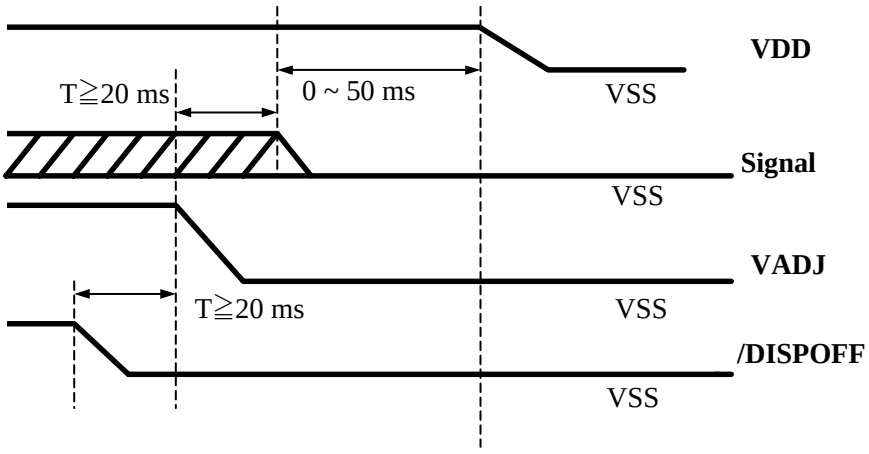
10.3 Power ON/OFF Sequence

Please maintain the blow sequence when turning on and off the power supply of the module. If /DISPOFF is supplied to the module while internal alter signal for LCD driving (M) is unstable, DC component will be supplied to the LCD panel. This may cause damage the LCD module.

POWER ON SEQUENCE



POWER OFF SEQUENCE



11. Quality

11-1. Test Conditions

Tests should be conducted under the following conditions：

Ambient temperature ： 25±5°C

Humidity ： 60±25% RH.

11-2. Sampling Plan

Sampling method shall be in accordance with MIL-STD-105E, inspection level II, normal inspection, and single sampling plan tables for normal, tightened, and reduced inspection.

11-3. Acceptable Quality Level

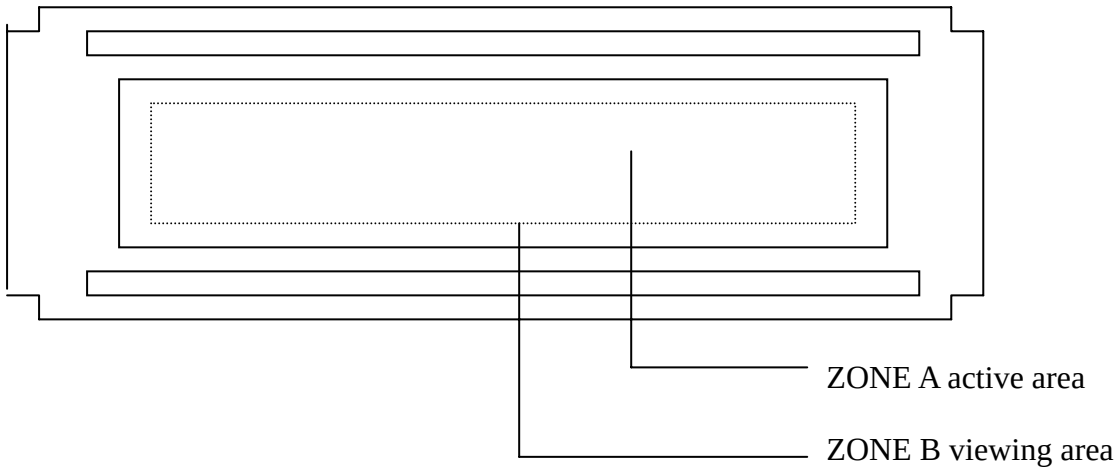
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

11-4. Appearance

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under flourescent light. The inspection area of LCD panel shall be within the range of following limits.

11-5. Inspection Quality Criteria

Item	Description of defects			Class of Defects	Acceptable level (%)
Function	Short circuit or Pattern cut			Major	0.65
Dimension	Deviation from drawings			Major	1.5
Black spots	Ave . dia . D	area A	area B	Minor	2.5
	D≦0.2	Disregard			
	0.2<D≦0.3	3	4		
	0.3<D≦0.4	2	3		
	0.4<D	0	1		
Black lines	Width W, Length L	A	B	Minor	2.5
	W≦0.03	disregard			
	0.03<W≦0.05	3	4		
	0.05<W≦0.07 , L≦3.0	1	1		
	See line criteria				
Bubbles in polarizer	Average diameter D 0.2 < D < 0.5 mm for N = 4 , D > 0.5 for N = 1			Minor	2.5
Color uniformity	Rainbow color or newton ring.			Minor	2.5
Glass Scratches	Obvious visible damage.			Minor	2.5
Viewing angle	See note 3			Minor	2.5
Contrast ratio	See note 1			Minor	2.5
Response time	See note 2			Minor	2.5



12. Reliability

Test Item	Test Conditions	Note
High Temperature Operation	50±3°C , t=96 hrs	
Low Temperature Operation	0±3°C , t=96 hrs	
High Temperature Storage	70±3°C , t=96 hrs	1,2
Low Temperature Storage	-20±3°C , t=96 hrs	1,2
Humidity Test	40 °C, Humidity 90%, 96 hrs	1,2
Thermal Shock Test	-20°C (30 min.) ~ 25°C (5 min.) ~ 70°C (30 min.) (1 cycle) Total 5 cycle	1,2
Vibration Test (Packing)	Sweep frequency：10 55 10 Hz/1min Amplitude：0.75mm Test direction：X.Y.Z/3 axis Duration：30min/each axis	2

Note 1：Condensation of water is not permitted on the module.

Note 2：The module should be inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

Definitions of life end point：

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

13. Handling Precautions

(1) An LCD module is a fragile item and should not be subjected to strong mechanical shocks.

(2) Avoid applying pressure to the module surface. This will distort the glass and cause a change in colour.

(3) Under no circumstances should the position of the bezel tabs or their shape be modified.

(4) Do not modify the display PCB in either shape or positioning of components.

(5) Do not modify or move location of the zebra or heat seal connectors.

(6) The device should only be soldered to during interfacing. Modification to other areas of the board should not be carried out.

(7) In the event of LCD breakage and resultant leakage of fluid do not inhale, ingest or make contact with the skin. If contact is made rinse immediately.

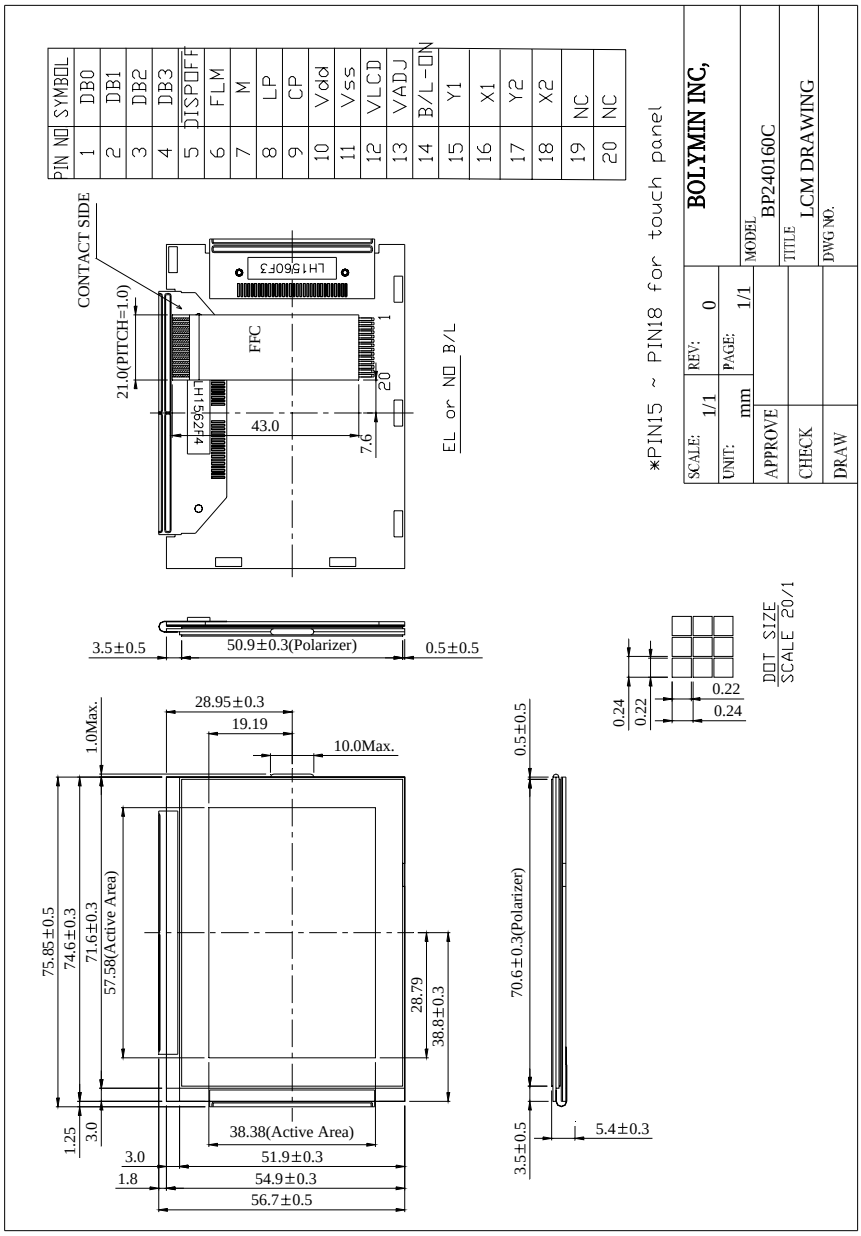
(8) When cleaning the module use a soft damp cloth with a mild solvent, such as Isopropyl or Ethyl alcohol. The use of water, ketone or aromatic is not permitted.

(9) Prior to initial power up input signals should not be applied.

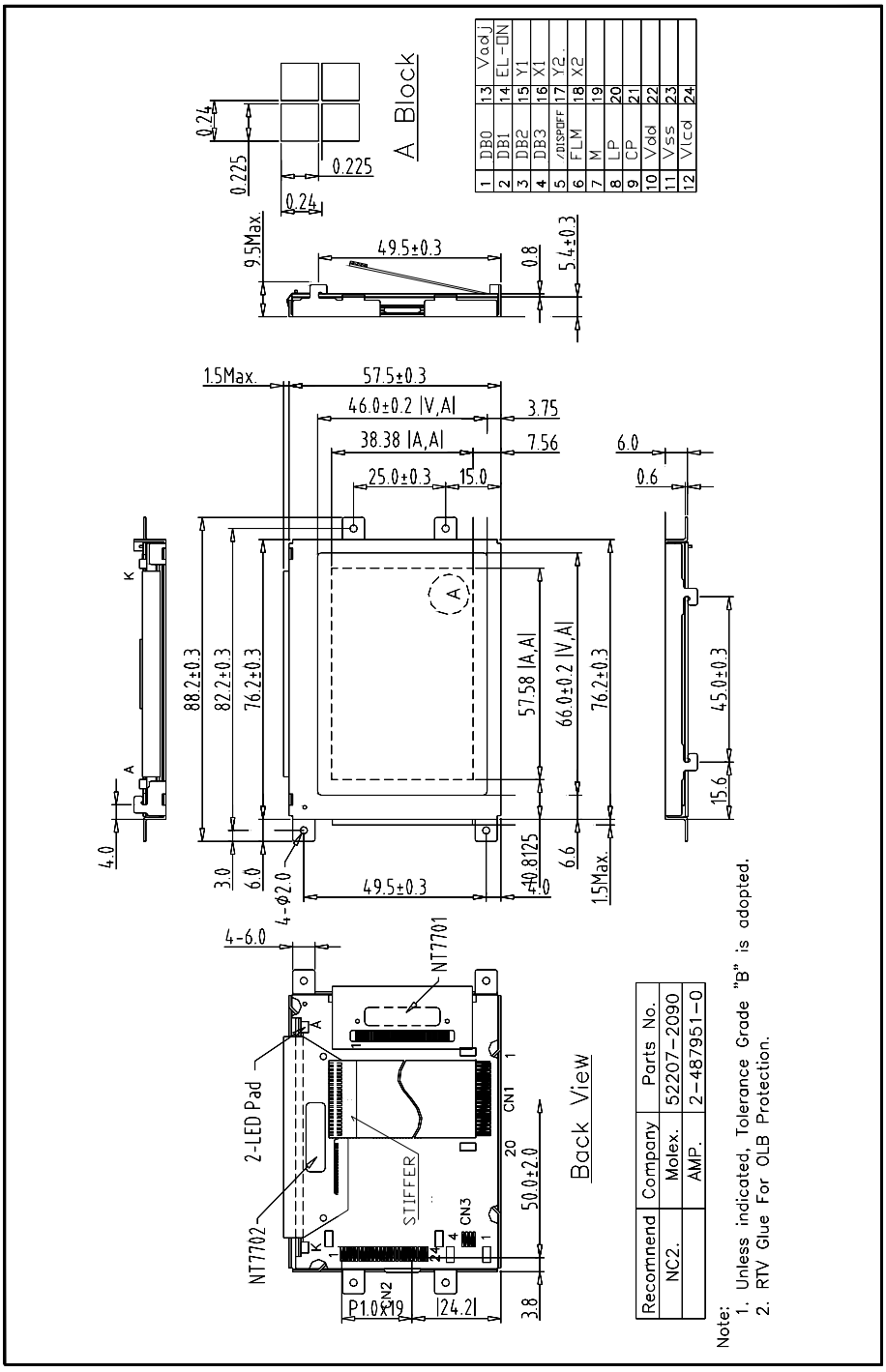
(10) Protect the module against static electricity and observe appropriate anti-static precautions.

14. Appendix (Drawing , Touch panel Information)

14 –1 Drawing(EL backlight and No backlight)



14 –1 Drawing(LED backlight)



14-2 Touch panel Information

14-2.1.Touch Panel Electrical Specification

Parameter	Specification	Condition
ON Resistance	351 Ω ~ 702 Ω	X Axis
	154 Ω ~ 893 Ω	Y Axis
Insulating Resistance	More than 20MΩ	DC 25 V
Chattering	Less Than 10 ms	DC 5V, Load of resistance(1mA), switching Time 2m/sec
Endurable Voltage	25 V for 1 min	