



SPECIFICATIONS FOR LCD MODULE

MODEL NO.
BP160160A series
VER.02

FOR MESSRS:

ON DATE OF:

APPROVED BY:

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History of Version

Version	Contents	Date	Note
01	NEW VERSION	2005/11/22	SPEC.
02	Change: 1.Drawing 2.EL backlight information	2005/11/28	

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1. Numbering System

<u>B</u>	<u>P</u>	<u>160160</u>	<u>A-</u>	<u>:</u>	<u>:</u>	<u>:</u>	<u>:</u>	<u>:</u>	<u>:</u>	<u>xxx</u>
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 L=PLED/OLED
2	Format	2002=20 characters, 2 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 F=RGB Q=LED edge/red A=LED edge/amber N=No backlight	D=LED edge/blue E=EL/white B=EL/blue C=CCFL/white Y=LED Bottom/yellow O=LED array/orange K=LED edge/green A=LED edge/amber
7	CGRAM Font (applied only on character type)	J=English/Japanese Font E=English/European Font G=Chinese(simple) F=Chinese(traditional)	C=English/Cyrillic Font H=English/Hebrew Font A=English/Arabic 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 E=Top/ultra wide temperature
9	Special Code	3=3 volt logic power supply n=negative voltage for LCD c=cable/connector xxx=to be assigned on datasheet	t=temperature compensation for LCD p=touch panel

2. General Specification

(1) Mechanical Dimension

Item	Standard Value	Unit
Number of dots	160x160	dots
Outline dimension	69.0(W)x 69.5(H)x 5.5max(T) 69.0(W)x 69.5(H)x 8.5max(T)-LED	mm
View area	60.1(W)x 60.0(H)	mm
Active area	55.985(W)x 55.985(H)	mm
Dot size	0.335(W)x 0.335(H)	mm
Dot pitch	0.35(W)x 0.35(H)	mm

(2) Temperature Range

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

(3) Polarizer

FSTN / black / Negative : Anti-glare Polarizer

3. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T _{OP}	-20	-	+70	°C
Storage Temperature	T _{ST}	-30	-	+80	°C
Input Voltage	V _I	0	-	V _{DD}	V
Supply Voltage For Logic	V _{DD}	0	-	6.5	V
Supply Voltage For LCD	V _{DD} -V _{EE}	0	-	32	V

4. Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Voltage	$V_{DD}-V_{SS}$	—	3.0	5.0	5.5	V
Supply Voltage For LCD	$V_{ADJ}-V_{SS}$	Ta=-20°C	-	18.5	-	V
		Ta=25°C	-	17.0	-	V
		Ta=+70°C	-	15.5	-	V
Input High Volt.	V_{IH}	-	$0.8V_{DD}$	-	V_{DD}	V
Input Low Volt.	V_{IL}	-	0	-	$0.2V_{DD}$	V
Output High Volt.	V_{OH}	-	$V_{DD}-0.4$	-	-	V
Output Low Volt.	V_{OL}	-	-	-	0.4	V
Supply Current(EL ON)	I_{DD}	-	-	-	100	mA
	I_{EE}	-	-	-	1.0	mA

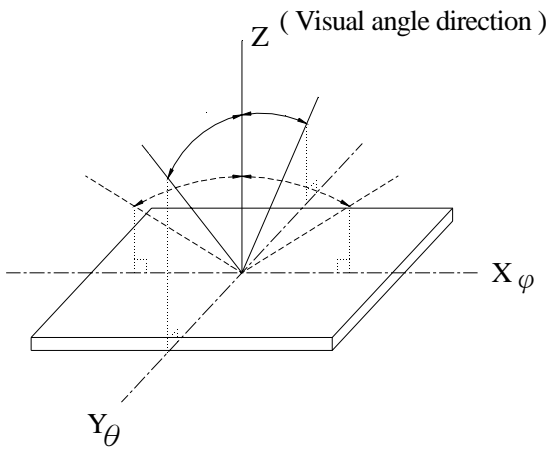
5. Optical Characteristics

FSTN

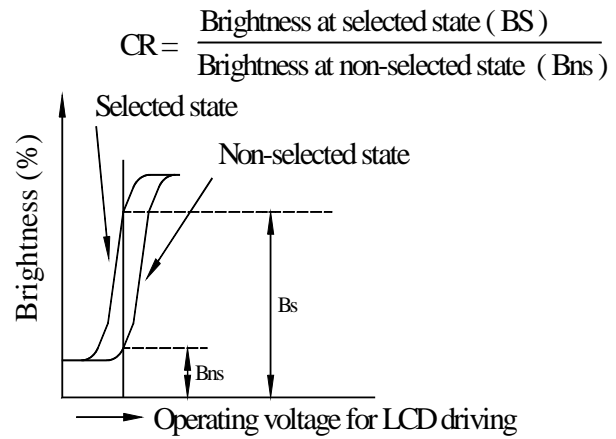
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) θ	$CR \geq 3$	10		60	deg
	(H) φ	$CR \geq 3$	-45		45	deg
Contrast Ratio	CR	—		5		—
Response Time 25°C	T rise	—		100	150	ms
	T fall	—		150	200	ms

5.1 Definitions

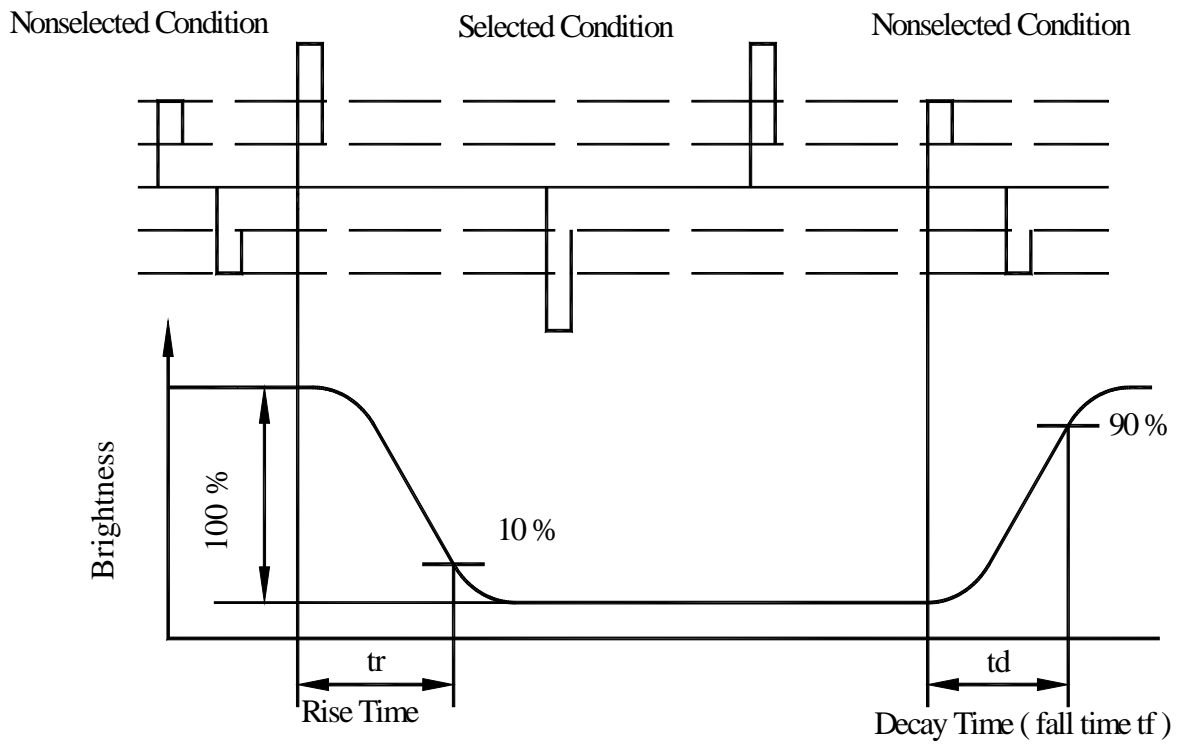
View Angles



Contrast Ratio



Response time



6. Interface Description

CN1: LCM with Built-In Controller

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	NC (M)	--	No Connection (M signal input while not built-in M signal circuit)
8	LP	H/L	Data Latch Signal
9	CP	H/L	Clock Signal
10	VDD	-	Power Supply for Logic(+5V)
11	VSS	-	Power Supply(Ground:0V)
12	VLCD	-	Positive voltage output (+25V)
13	VADJ		Contrast Adjustment Input (VADJ-VSS = LCD driving voltage)
14	EL_ON	H/L	EL On/Off Signal; H: EL On L: EL Off
15	Y1	-	Touch Panel Upper Signal in Y Axis
16	X2	-	Touch Panel Right Signal in X Axis
17	Y2	-	Touch Panel Lower Signal in Y Axis
18	X1	-	Touch Panel Left Signal in X Axis
19,20	NC	--	No Connection

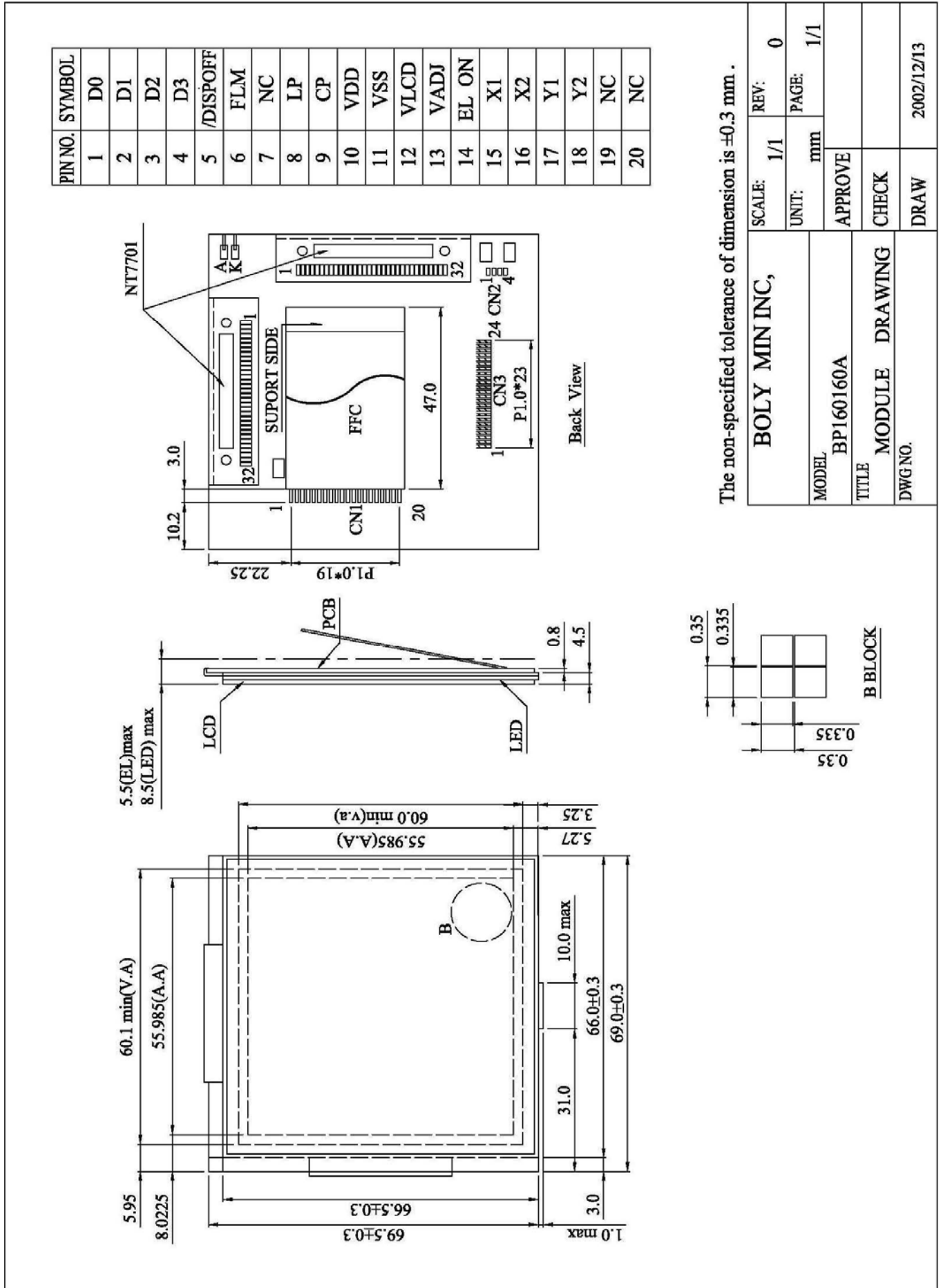
CN2: Interface of pure driver (No Use in this LCM)

PIN NO.	SIGNAL	LEVEL	FUNCTION
1~24	NC	-	No Connection

CN3:Inter-connection of Touch Panel

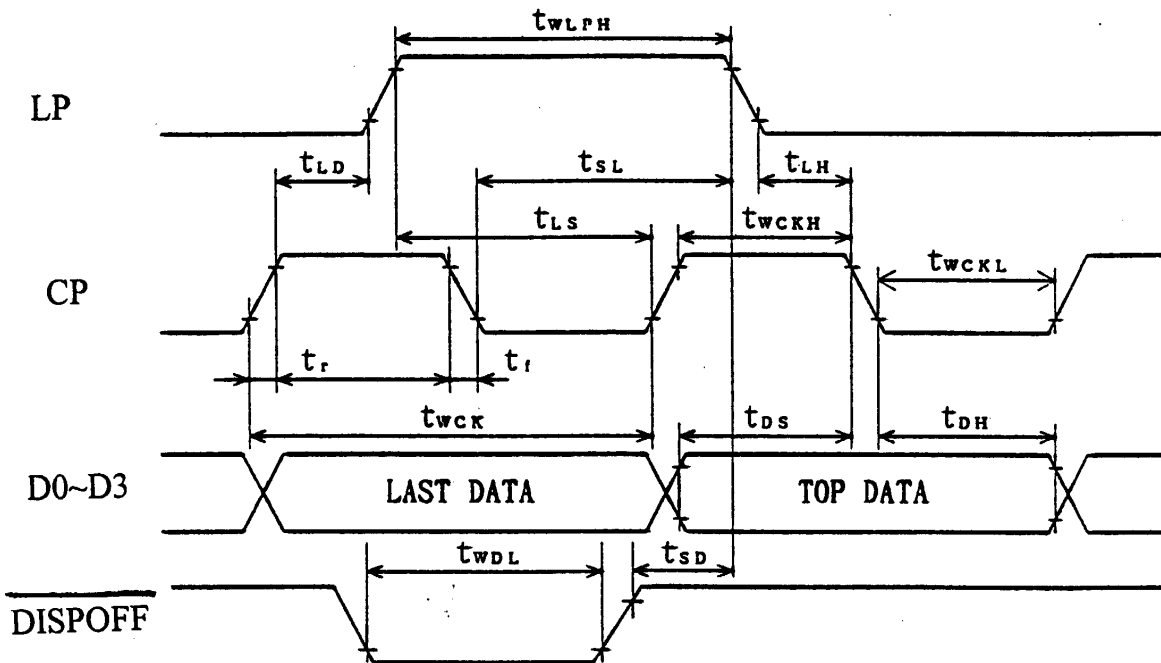
PIN NO.	SIGNAL	LEVEL	FUNCTION
1	Y1	-	Touch Panel Upper Signal in Y Axis
2	X2	-	Touch Panel Right Signal in X Axis
3	Y2	-	Touch Panel Lower Signal in Y Axis
4	X1	-	Touch Panel Left Signal in X Axis

7. Outline drawing



The non-specified tolerance of dimension is ± 0.3 mm.

8. Timing Characteristics



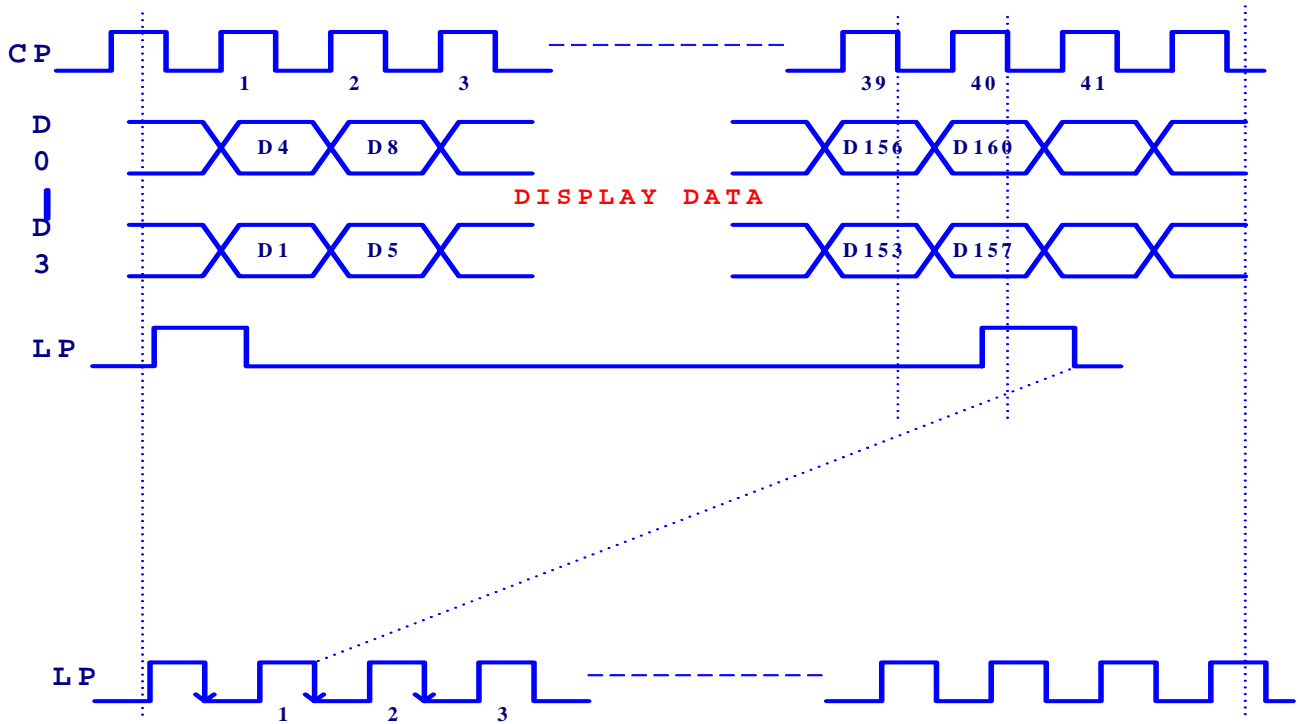
VDD = 4.5V to 5.5V

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	twck	Tr, Tf ≤ 10ns	66		ns
Clock Width “H” Pulse Width	twckH		23		ns
Clock Width “L” Pulse Width	twckL		23		ns
Data Set Up Time	tDS		15		ns
Data Hold Time	tDH		23		ns
Latch Pulse “H” Pulse Width	twLPH		30		ns
Shift Clock to Latch Pulse Rise Time	tLD		0		ns
Shift Clock to Latch Pulse Fall Time	tSL		50		ns
Latch Pulse to Shift Clock Rise Time	tLS		30		ns
Latch Pulse to Shift Clock Fall Time	tLH		30		ns
Input Signal Rise/Fall Time	tr,tf			50	ns
/DISPOFF Removal Time	tSD		100		ns
/DISPOFF “L” Pulse Width	twDL		1.2		ns

8.1 Controller Interface Timing Chart



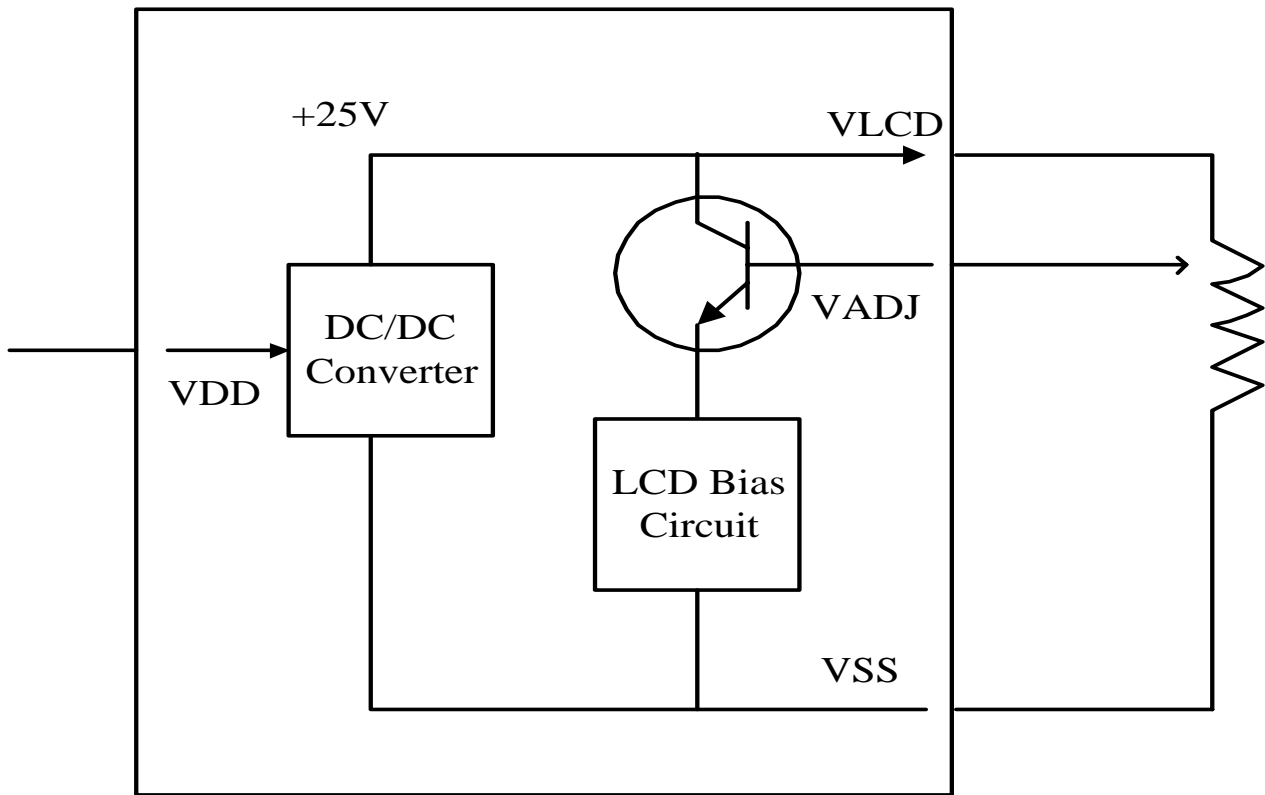
8.2 Display Data Format

→

	SEG1								SEG160						
#1	D3	D2	D1	D0					-			D3	D2	D1	D0
#2	D3	D2	D1	D0								D3	D2	D1	D0
#160	D3	D2	D1	D0								D3	D2	D1	D0

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

LCM operating on " DC 3V or 5V " input with external negative voltage.



10. Backlight Information

EL / white

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Voltage	Vrms	-	60 (AC)	-	-	-
Frequency	HZ	-	380	-	-	-
Brightness*	cd/m ²	-	15	-	-	60Vrms 380Hz
CIE Chromaticity Diagram	X	-	0.330	-	-	
	Y	-	0.335	-	-	
Current Dissipation	mA/cm ²	-	1.2	-	-	
Power Dissipation	mW/cm ²	-	22.4	-	-	
Color	white					

- **With EL backlight drive circuit built in,**
- **Input 5Vdc on Interface pin14(EL-ON), the EL backlight will be light on.**

LED edge/white

PARAMETER	Symbol	Condition	Min	Typ	Max	Unit	Note
Forward Voltage	VF	-	-	3.2	3.4	V	Supply Voltage
Forward Current	IF	VF=3.2V	-	60	-	mA	-
LCM Luminous intensity		VF=3.2V	-	80	-	cd/m ²	-
Color	White						

- **Input 5Vdc on Interface pin14(EL-ON), the LED backlight will be light on.**

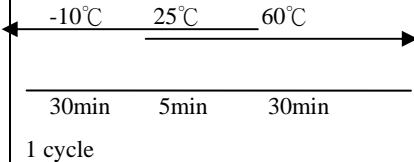
11. Quality Assurance

◆ Screen Cosmetic Criteria

No.	Defect	Judgement Criterion	Partition																				
1	Spots	<p>A)Clear</p> <table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>$d \leq 0.1$</td> <td>Disregard</td> </tr> <tr> <td>$0.1 < d \leq 0.2$</td> <td>6</td> </tr> <tr> <td>$0.2 < d \leq 0.3$</td> <td>2</td> </tr> <tr> <td>$0.3 < d$</td> <td>0</td> </tr> </tbody> </table> <p>Note: Including pin holes and defective dots which must be within one pixel size.</p> <p>B)Unclear</p> <table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>$d \leq 0.2$</td> <td>Disregard</td> </tr> <tr> <td>$0.2 < d \leq 0.5$</td> <td>6</td> </tr> <tr> <td>$0.5 < d \leq 0.7$</td> <td>2</td> </tr> <tr> <td>$0.7 < d$</td> <td>0</td> </tr> </tbody> </table>	Size: d mm	Acceptable Qty in active area	$d \leq 0.1$	Disregard	$0.1 < d \leq 0.2$	6	$0.2 < d \leq 0.3$	2	$0.3 < d$	0	Size: d mm	Acceptable Qty in active area	$d \leq 0.2$	Disregard	$0.2 < d \leq 0.5$	6	$0.5 < d \leq 0.7$	2	$0.7 < d$	0	Minor
Size: d mm	Acceptable Qty in active area																						
$d \leq 0.1$	Disregard																						
$0.1 < d \leq 0.2$	6																						
$0.2 < d \leq 0.3$	2																						
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$0.2 < d \leq 0.5$	6																						
$0.5 < d \leq 0.7$	2																						
$0.7 < d$	0																						
2	Bubbles Polarize in	<table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>$d \leq 0.3$</td> <td>Disregard</td> </tr> <tr> <td>$0.3 < d \leq 1.0$</td> <td>3</td> </tr> <tr> <td>$1.0 < d \leq 1.5$</td> <td>1</td> </tr> <tr> <td>$1.5 < d$</td> <td>0</td> </tr> </tbody> </table>	Size: d mm	Acceptable Qty in active area	$d \leq 0.3$	Disregard	$0.3 < d \leq 1.0$	3	$1.0 < d \leq 1.5$	1	$1.5 < d$	0	Minor										
Size: d mm	Acceptable Qty in active area																						
$d \leq 0.3$	Disregard																						
$0.3 < d \leq 1.0$	3																						
$1.0 < d \leq 1.5$	1																						
$1.5 < d$	0																						
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. Reliability

Content of Reliability Test

Environmental Test				
No.	Test Item	Content of Test	Test Condition	Applicable Standard
1	High Temperature storage	Endurance test applying the high storage temperature for a long time.	60°C 200hrs	-
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-10°C 200hrs	-
3	High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	50°C 200hrs	-
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	0°C 200hrs	-
5	High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	60°C, 90%RH 96hrs	-
6	High Temperature/ Humidity Operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	50°C, 90%RH 96hrs	-
7	Temperature Cycle	Endurance test applying the low and high temperature cycle. 	-10°C/60°C 10 cycles	-
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs	-
9	Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11 msdc 3 times of each direction	-
10	Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115mbar 40hrs	-
Others				
11	Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V, RS=1.5kΩ CS=100pF 1 time	-

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