SPECIFICATIONS FOR LCD MODULE

MODEL NO.
BP160160B series
VER.01

FOR MESSRS:

_____

ON DATE OF:

_____

APPROVED BY:

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History of Version

Version	Contents	Date	Note
01	NEW VERSION	2005/10/14	SPEC.

CONTENTS

1. Numbering System

	B	P	160160	B	F	P	E	-	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=LEDedge/yellow-green F=RGB	D=LED edge/blue E=EL/white B=EL/blue C=CCFL/white Y=LED Bottom/yellow O=LED array/orangr K=LED edge/green
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	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) Controller IC: SED1335

(3) Temperature Range

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

(4) Polarizer

FSTN / black / Negative : Anti-glare Polarizer

3.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	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℃ Ta=25℃ Ta=+70℃	- - -	18.5 17.0 15.5	- - -	V V 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
	IEE	-	-	-	1.0	mA

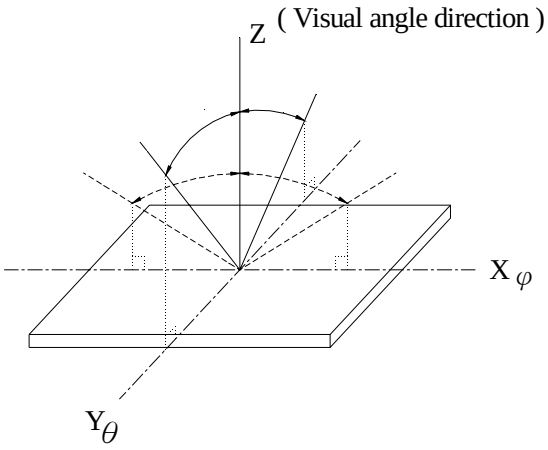
5.Optical Characteristics

FSTN

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

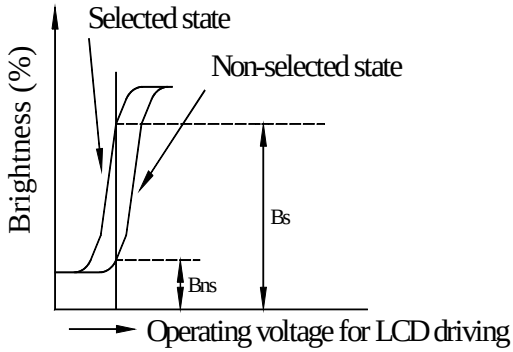
5.1 Definitions

■View Angles

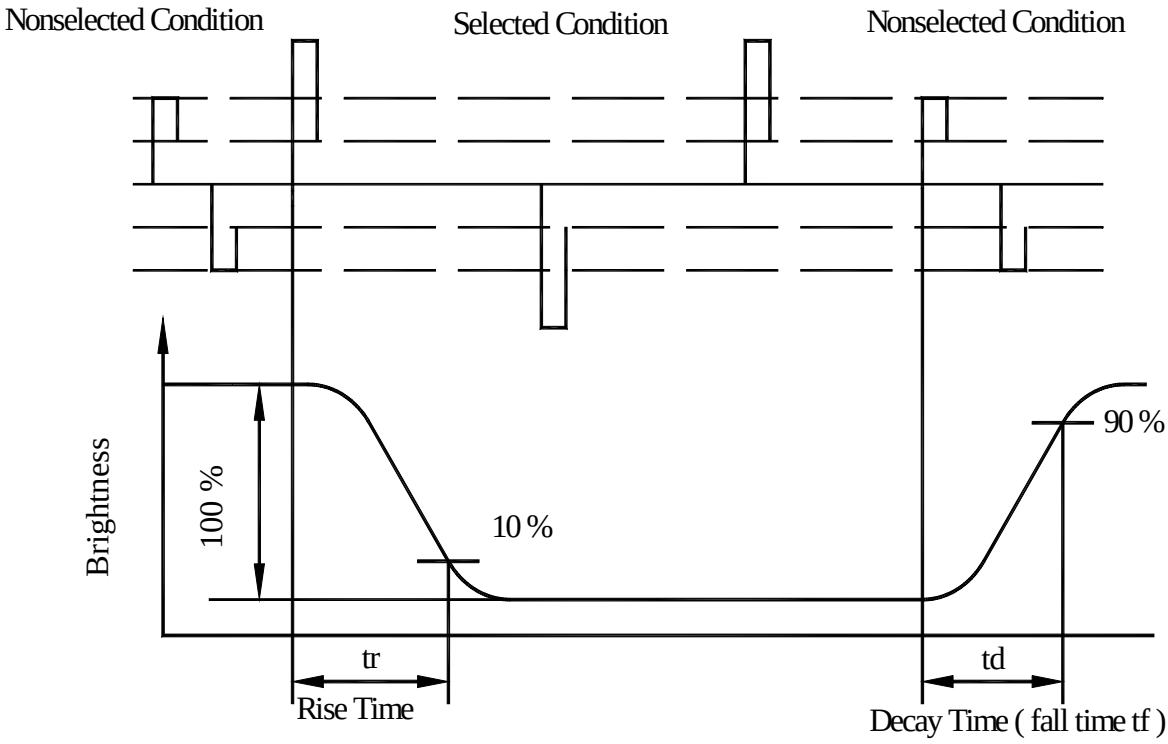


■Contrast Ratio

$$CR = \frac{\text{Brightness at selected state (BS)}}{\text{Brightness at non-selected state (Bns)}}$$



■Response time



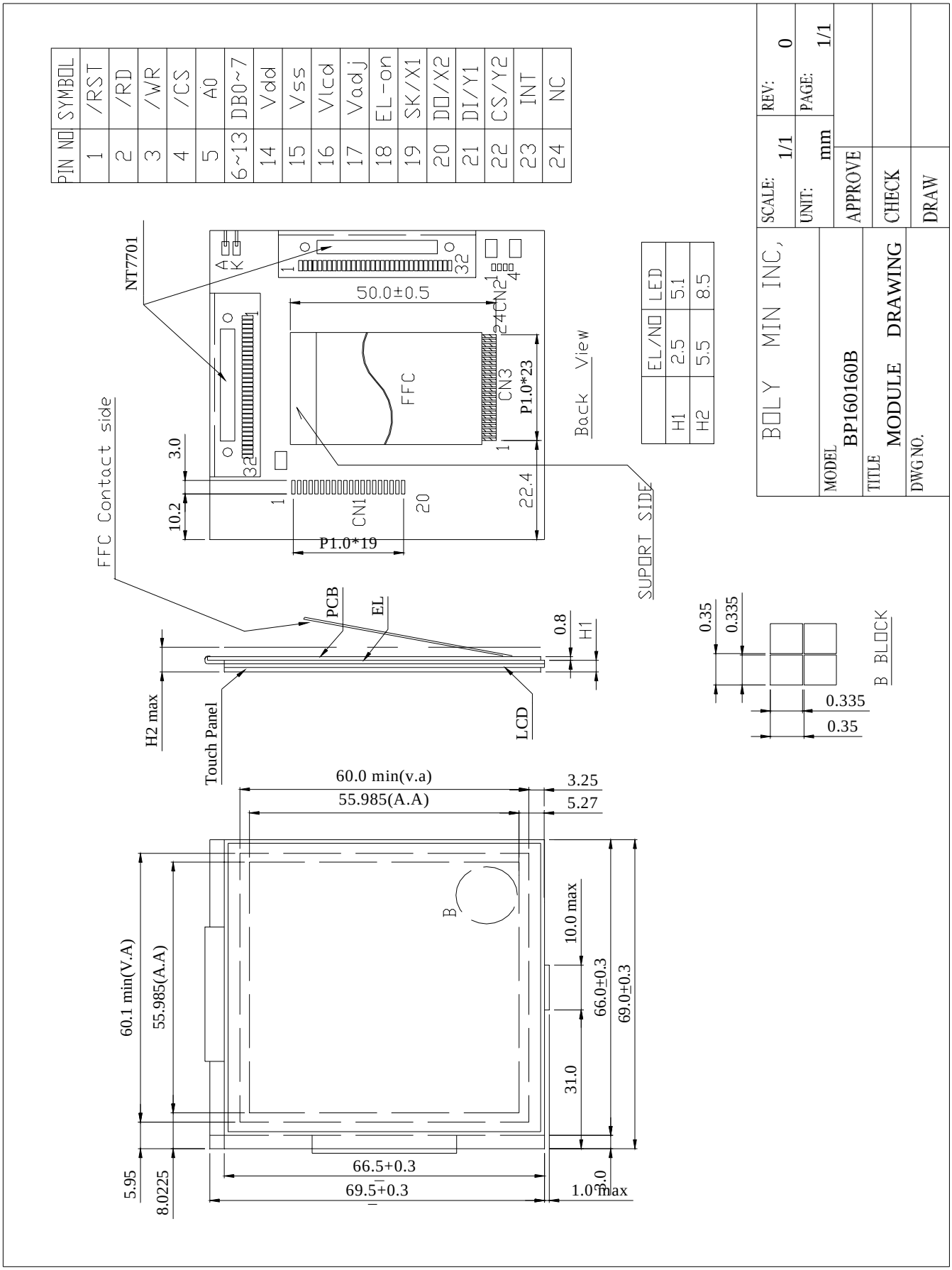
6. Interface Description

Pin No.	Symbol	Level	Description
1	$\overline{RES}$	H/L	Controller reset signal, Active L
2	RD	H/L	8080 family: Read signal, 6800 family: Enable clock
3	WR	H/L	8080 family: Write signal, 6800 family: R/W signal
4	CS	H/L	Chip select , Active L
5	A0	H/L	RD=L WR=H ,A0=L :Data Read AO=H :Status read RD=H WR=L ,A0=L :Data Write AO=H :Command write
6~13	DB0~DB7	H/L	Data bus
14	V_{DD}	5.0V	Power supply for Logic (option +3V)
15	VSS	0V	Logic Ground
16	VLCD	25V	Positive voltage output
17	VADJ	(Variable)	Driving voltage for LCD
18	EL-ON	H/L	H:EL(LED) backlight on
19	SK/X1	-	Serial clock/Right signal in X axis (For touch panel)
20	DO/X2	-	Data output / Left signal in X axis (For touch panel)
21	DI/Y1	-	Data input / Upper signal in Y axis (For touch panel)
22	CS/Y2	-	Chip select / Lower signal in Y axis (For touch panel)
23	INT	-	Interrupt for touch panel controiler
24	NV	-	-

*** SK,DO,DI,CS,INT are for touch panel controller IC built in.**

*** X1,X2,Y1,Y2 are for touch panel only.**

7. Outline drawing

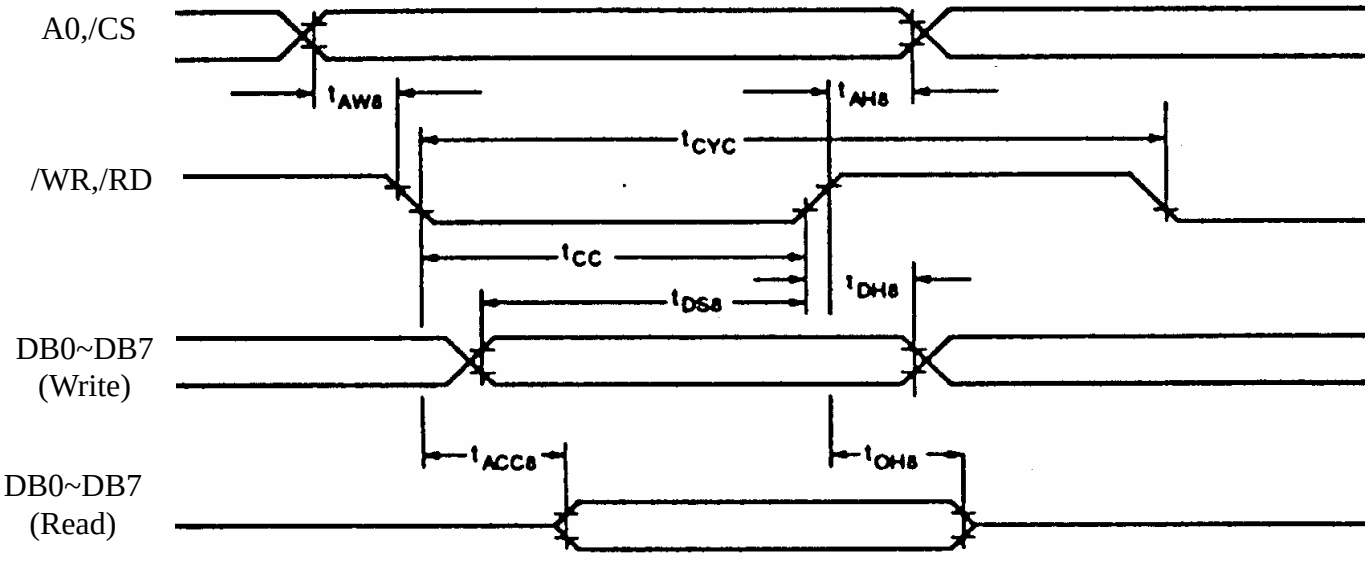


8. Timing Characteristics

8.1 8080 Family Interface Timing

Parameter	Condition	Symbol	Min	Max	Unit	Remark
Address Hold Time	CL=100 pF VDD=2.7~4.5	tAH8	10	-	ns	A0,/CS
Address Setup Time		tAW8	0	-	ns	
System Cycle Time		tCYC	Note	-	ns	/WR,/RD
Strobe Pulse Width		tOC	150	-	ns	
Data Setup Time		tDS8	120	-	ns	DB0~DB7
Data Hold Time		tDH8	5	-	ns	
/RD Access Time		tACC8	-	80	ns	
Output Disable Time		tOH8	10	55	ns	

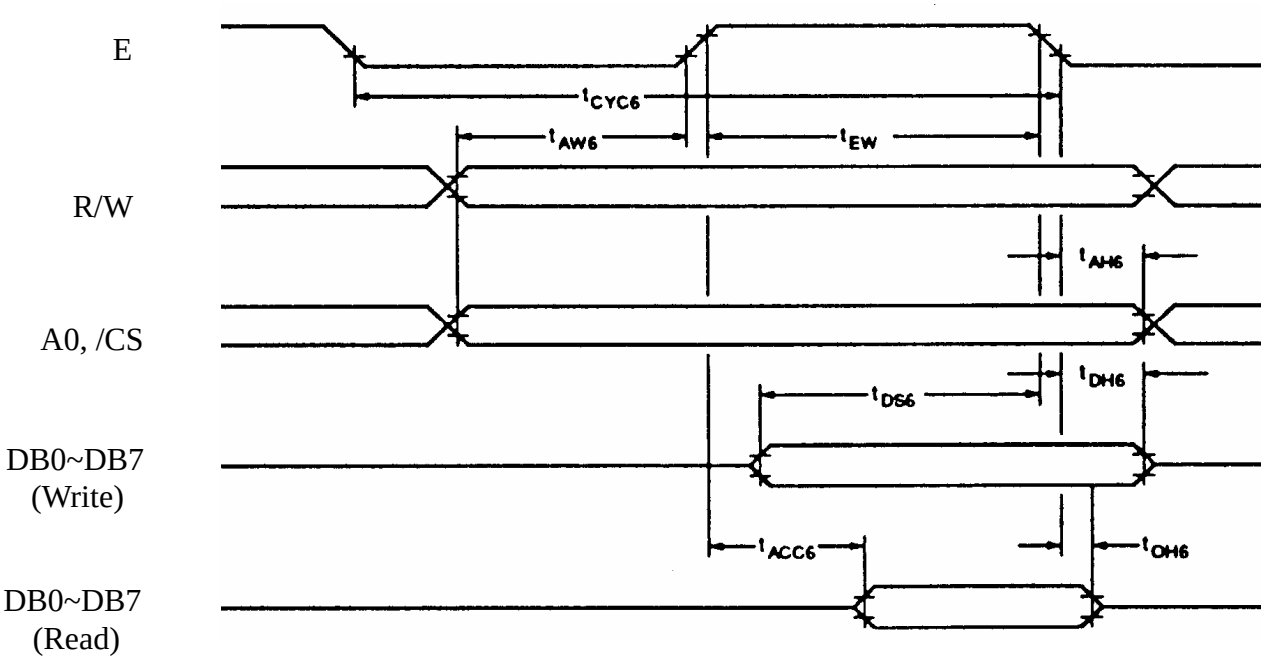
Note: For memory control and system control commands:
tCYC8=2tC+tOC+tCEA+75 > tACV +245
For all other commands:
tCYC8=4tC+tOC+30



8.2 6800 Family Interface Timing

Parameter	Condition	Symbol	Min	Max	Unit	Remark
System Cycle Time	CL=100 pF VDD=2.7~4.5	tCYC6	Note	-	ns	A0,/CS, R/W
Address Setup Time		tAW6	10	-	ns	
Address Hold Time		tAH6	0	-	ns	
Data Setup Time		tDS6	120	-	ns	DB0~DB7
Data Hold Time		tDH6	0	-	ns	
Output Disable Time		tOH6	10	75	ns	
Access Time		tACC6	-	130	ns	
Enable Pulsewidth		tEW	150	-	ns	E

Note: For memory control and system control commands:
tCYC6=2tC+tEW+tCEA+75 > tACV +245
For all other commands:
tCYC6=4tC+tEW+30



AC Electrical Characteristics

9 Instruction Set

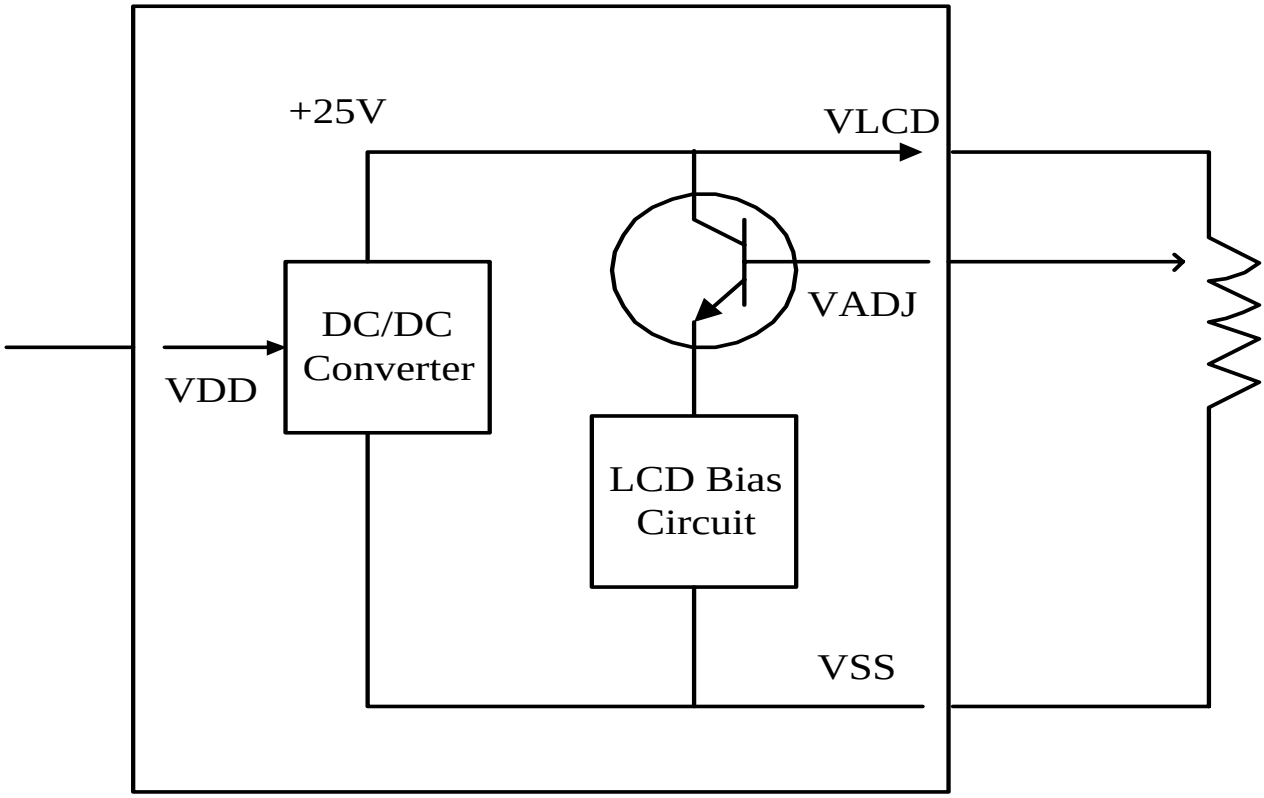
Class	Command	Code											Hex	Command Description	Command read parameters	
		/RD	/WR	A0	D7	D6	D5	D4	D3	D2	D1	D0			Number of byters	Section
System Control	SYSTEM SET	1	0	1	0	1	0	0	0	0	0	0	40	Initialized Device and display	8	8.2.1
	SLEEP IN	1	0	1	0	1	0	1	0	0	1	1	53	Enter Standby mode	0	8.2.2
Display Control	DISP ON/OFF	1	0	1	0	1	0	1	1	0	0	D	58, 59	Enable and disable display and display flashing	1	8.3.1
	SCROLL	1	0	1	0	1	0	0	0	1	0	0	44	set Display start address and display regions	10	8.3.2
	CSRFORM	1	0	1	0	1	0	1	1	1	0	1	5D	Set cursor byte	2	8.3.3
	CGRAM ADDR.	1	0	1	0	1	0	1	1	1	0	0	5C	Set start address of character generator RAM	2	8.3.6
	CSRDIR	1	0	1	0	1	0	0	1	1	CD 1	CD 0	4C to 4F	Set direction of cursor movement	0	8.3.4
	HDOT SCR	1	0	1	0	1	0	1	1		1	0	5A	set horizontal scroll position	1	8.3.7
	OVLAY	1	0	1	0	1	0	1	1	0	1	1	5B	set display overlay format	1	8.3.5
Drawing Control	CSRW	1	0	1	0	1	0	0	0	1	1	0	46	set cursor address	2	8.4.1
	CSRR	1	0	1	0	1	0	0	0	1	1	1	47	read cursor address	2	8.4.2
Memory Control	MWRITE	1	0	1	0	1	0	0	0	0	1	0	42	write to display memory	-	8.5.1
	MREAD	1	0	1	0	1	0	0	0	0	1	1	43	read from display memory	-	8.5.2

Note:

1. In general, the internal registers of the SED1335F are modified as each command parameter is input. However, the microprocessor does not have to set all the parameters of a command and may send a new command before all parameters have been input. The internal registers for the parameters that have been input will have been changed but the remaining parameter registers are unchanged.
   2 bytes parameters(where two bytes are treated as 1 data item) are handled as following:
   a. CSRW, CSRR: Each byte is processed individually. The microprocessor may read or write just the low byte of the cursor address.
   b. SYSTEM SET, SCROLL, CGRAM ADR. : Both parameter bytes are processed together. If the command is changed after half of the parameter has been input, the single byte is ignored.
2. APL and APH are 2-byte parameters, but are treated as two 1-byte parameters.
3. Please refer to SED1335F LCD Controller Data Book for detail.

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

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



11. Backlight Information

EL / white

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Voltage	Vrms	-	110 (AC)	-	-	-
Frequency	HZ	-	400	-	-	-
Brightness*	cd/m^2	48	60	-	-	110Vrms 1000Hz
CIE Chromaticity Diagram	X	-	0.330		-	
	Y	-	0.335		-	
Current Dissipation	mA/cm^2	-	1.33		-	
Power Dissipation	mW/cm^2	-	26.29	-	-	
Color	white					

- **With EL backlight drive circuit built in,**
- **Input 5Vdc on Interface pin18(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 pin18(EL-ON), the LED backlight will be light on.**

12.Touch panel Information

As shown on TPBP160160B touch panel spec.
Touch panel controller IC information shown onADS7846 spec.

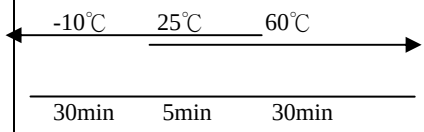
13. Quality Assurance

◆ Screen Cosmetic Criteria

No.	Defect	Judgement 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

14.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℃ 200hrs	-
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-10℃ 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℃ 200hrs	-
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	0℃ 200hrs	-
5	High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	60℃,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℃,90%RH 96hrs	-
7	Temperature Cycle	Endurance test applying the low and high temperature cycle.  1 cycle	-10℃/60℃ 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 msedc 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℃