SPECIFICATIONS FOR LCD MODULE

MODEL NO.
BP160160D series
VER.01

FOR MESSRS:

_____

ON DATE OF:

_____

APPROVED BY:

_____

BOLYMIN, INC.
13F-1, 20, TA-LONG RD., TAICHUNG CITY 403, TAIWAN, R.O.C.
WEB SITE:http://www.bolymin.com.tw TEL:+886-4-23293029 FAX:+886-4-23293055

History of Version

Version	Contents	Date	Note
01	NEW VERSION	2007/03/29	SPEC.

CONTENTS

1. Numbering System

2. General Specification

3. Absolute Maximum Rating

4. Electrical Characteristics

5. Optical Characteristics

6. Interface Pin Function

7. Outline Drawing

8. Timing Characteristics

9. Instruction Set

10. Power supply for LCD Module and LCD operating voltage adjustment

11. Block Diagram

12. Backlight information

13. Touch panel Information

14. Quality Assurance

15. Reliability

1. Numbering System

B	**P**	**160160**	**D**	**-**	**-**	**-**	**-**	**-**	**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	56.0(W)x 56.0(H)x 6.0max(T) 56.0(W)x 56.0(H)x 9.0max(T)-LED	mm
View area	49.0(W)x 49.0(H)	mm
Active area	44.77(W)x 44.77(H)	mm
Dot size	0.25(W)x 0.25(H)	mm
Dot pitch	0.28(W)x 0.28(H)	mm

(2) Controller IC: S1D13700

(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 16.7 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

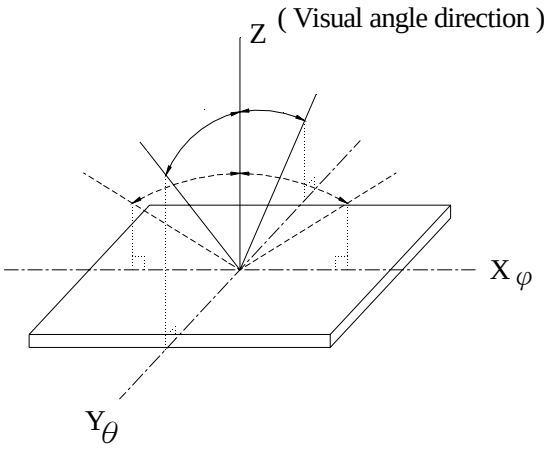
5.Optical Characteristics

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

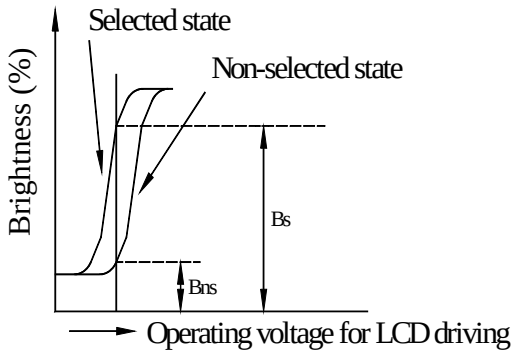
5.1 Definitions

■View Angles

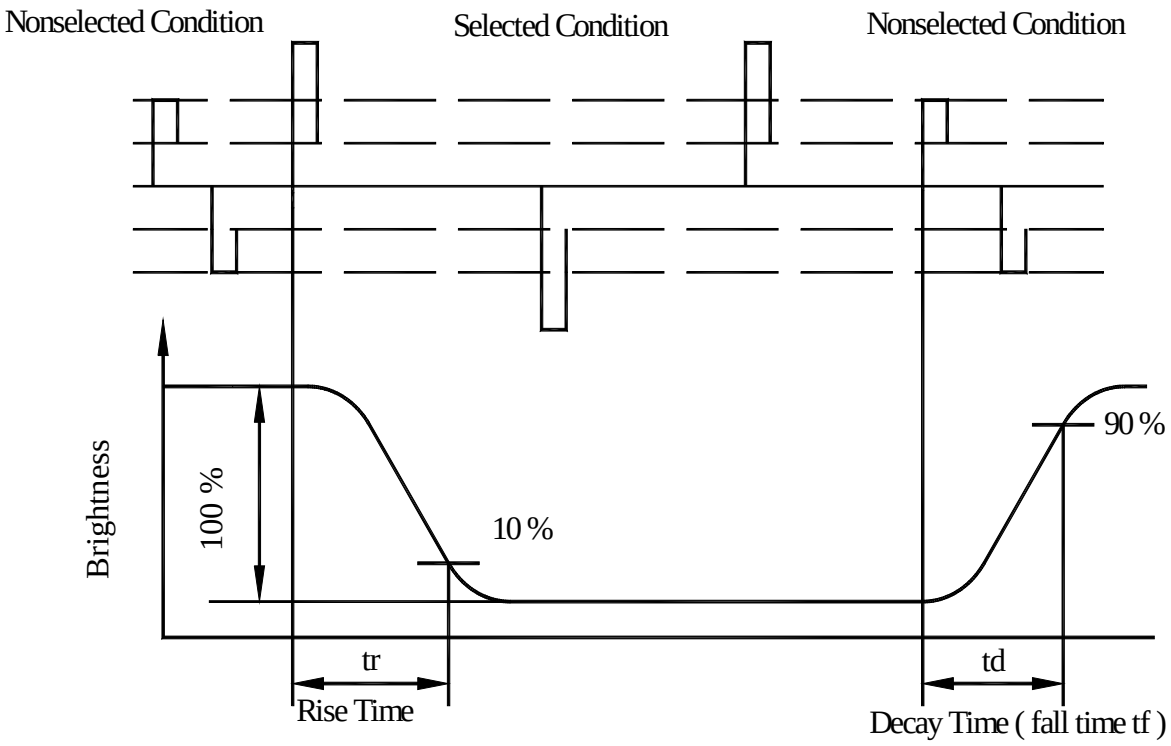


■Contrast Ratio

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



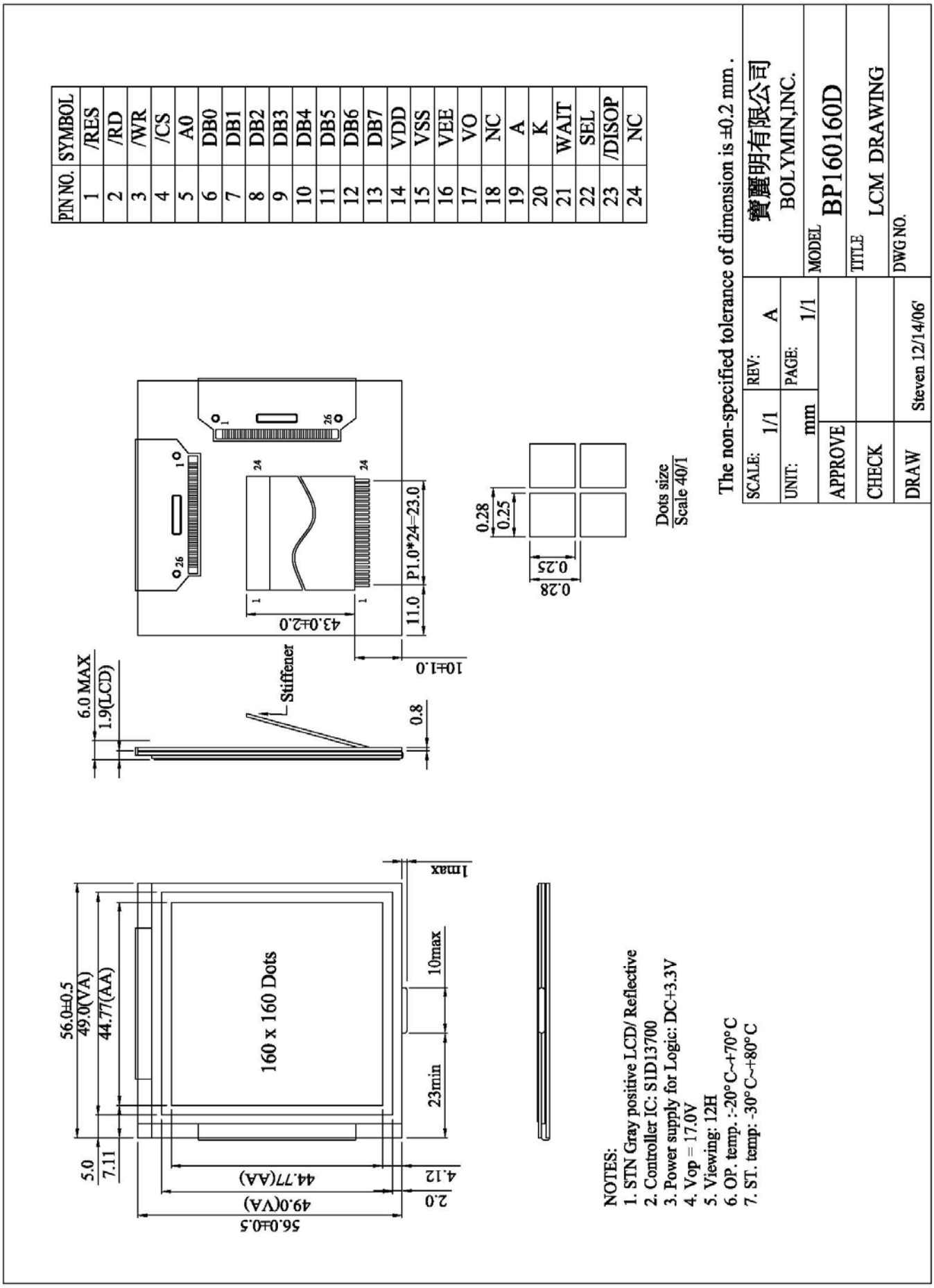
■Response time



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	NC		No connection
19	A	-	Power supply for backlight(+)
20	K	-	Power supply for backlight(-)
21	WAIT	H/L	Wait signal
22	SEL	H/L	uP select (H:8080 series L:6800 series)
23	/DISPO	H/L	Display off signal (H:on L:off)
24	NC	-	No connection

7. Outline drawing

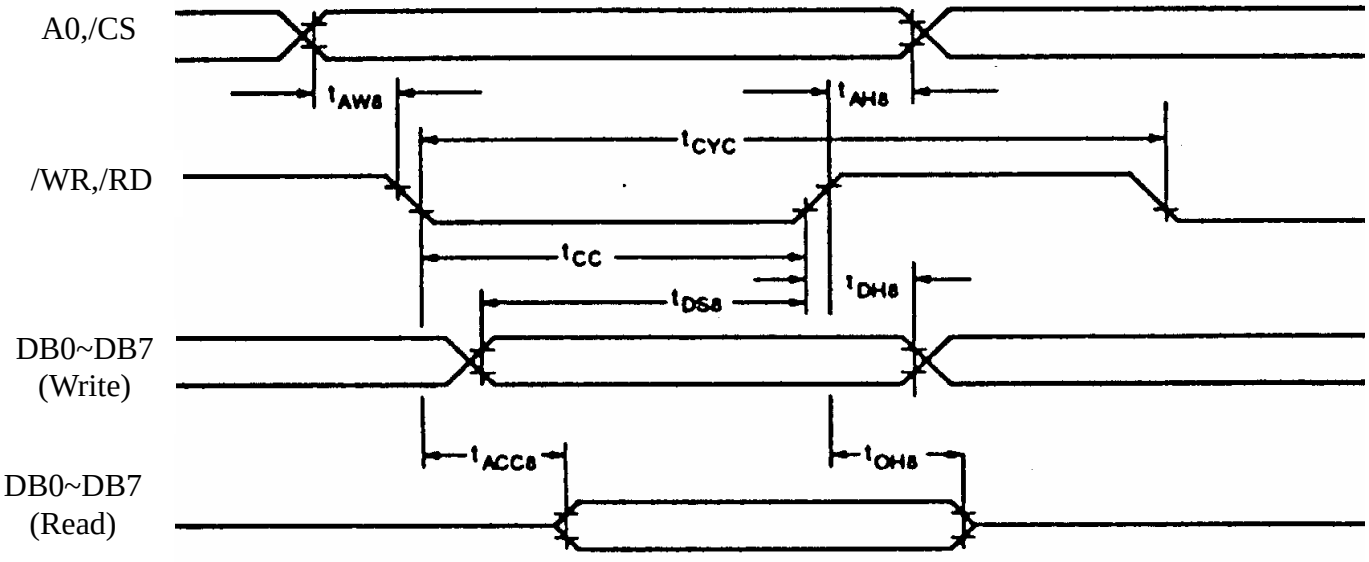


8. Timing Characteristics

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	

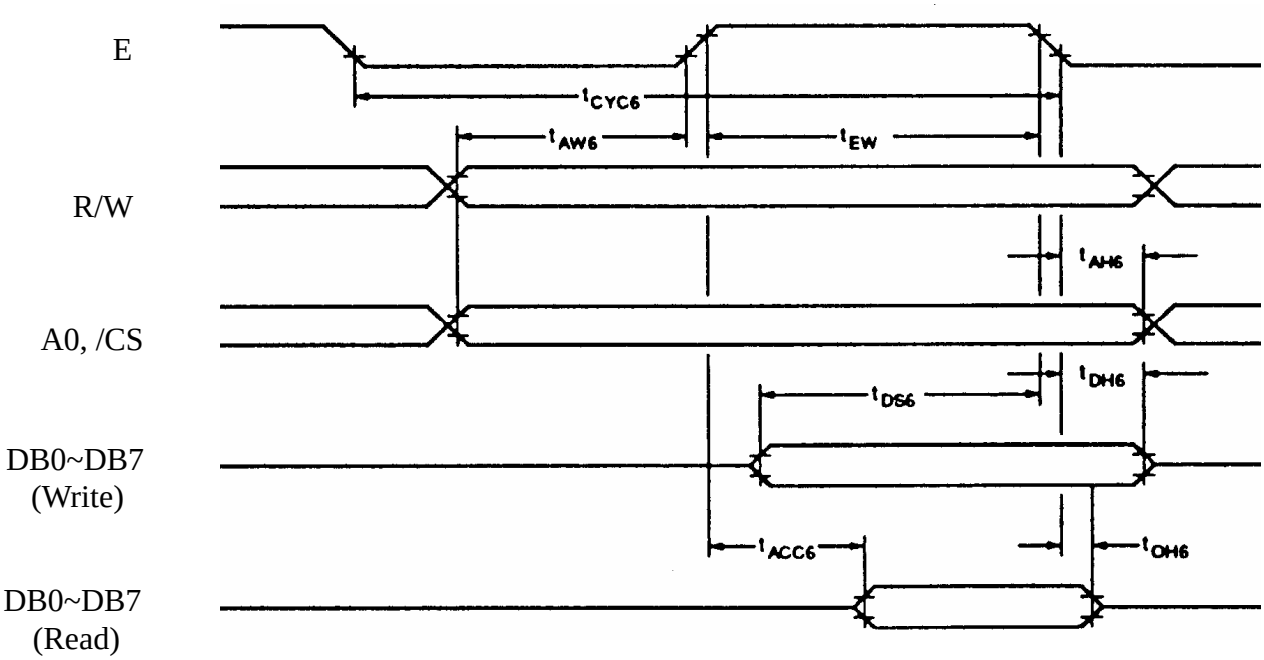
Note: For memory control and system control commands:
tCYC8=2tC+tOC+tCEA+75 > tACV +245
For all other commands:
tCYC8=4tC+tOC+30



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

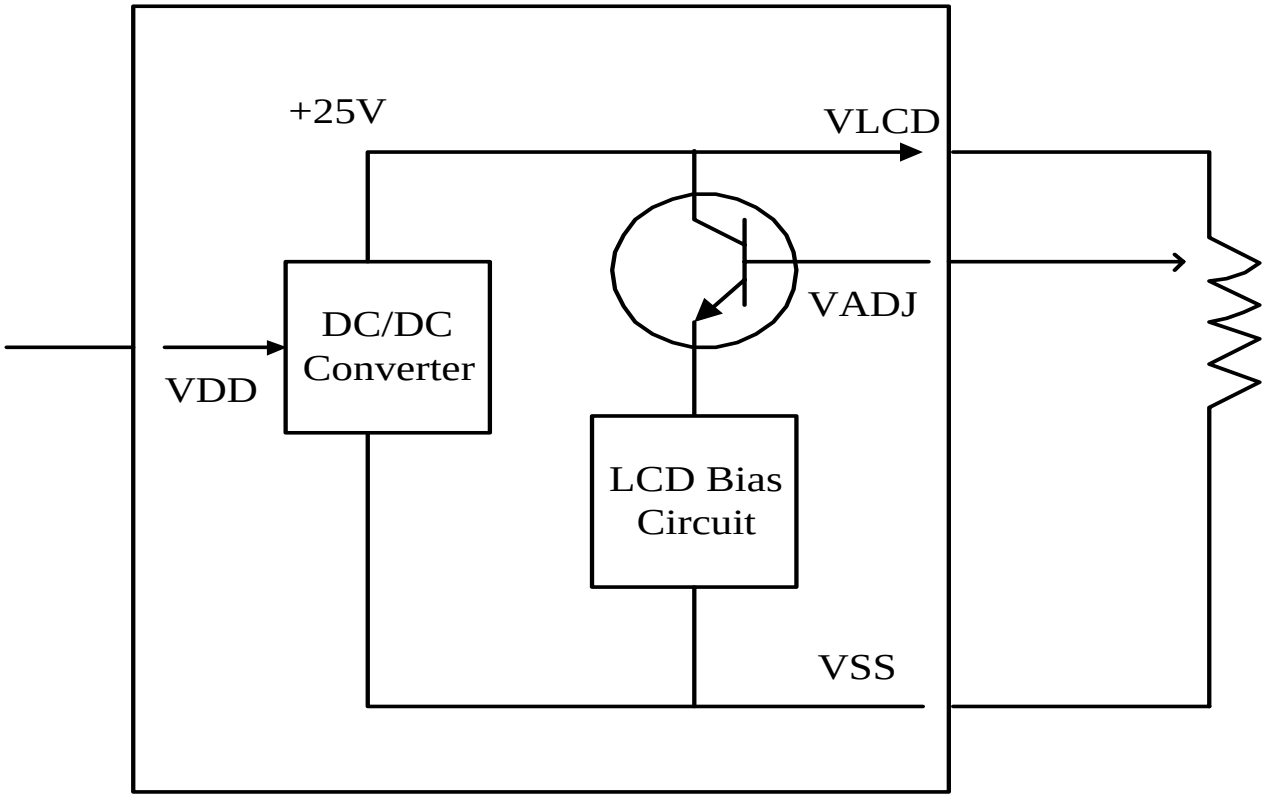
Class	Command	Code											Hex	Command Description	Command read parameters	
		/RD	/WR	A0	D7	D6	D5	D4	D3	D2	D1	D0			Number of byters	Section
System Control	SYSTEM SET	1	0	1	0	1	0	0	0	0	0	0	40	Initialized Device and display	8	8.2.1
	SLEEP IN	1	0	1	0	1	0	1	0	0	1	1	53	Enter Standby mode	0	8.2.2
Display 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:

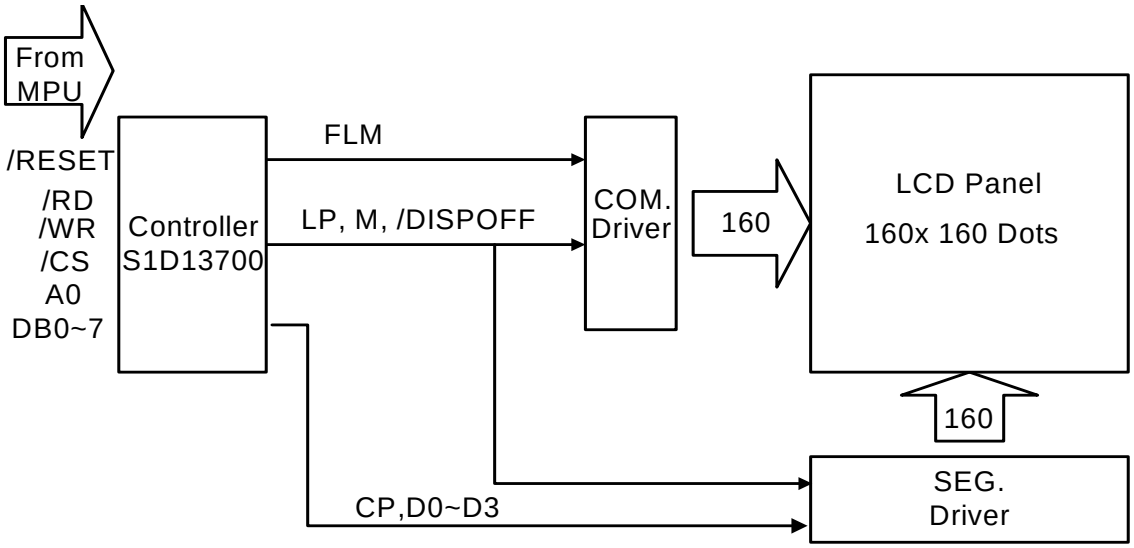
1. In general, the internal registers of the S1D13700 are modified as each command parameter is input. However, the microprocessor does not have to set all the parameters of a command and may send a new command before all parameters have been input. The internal registers for the parameters that have 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.

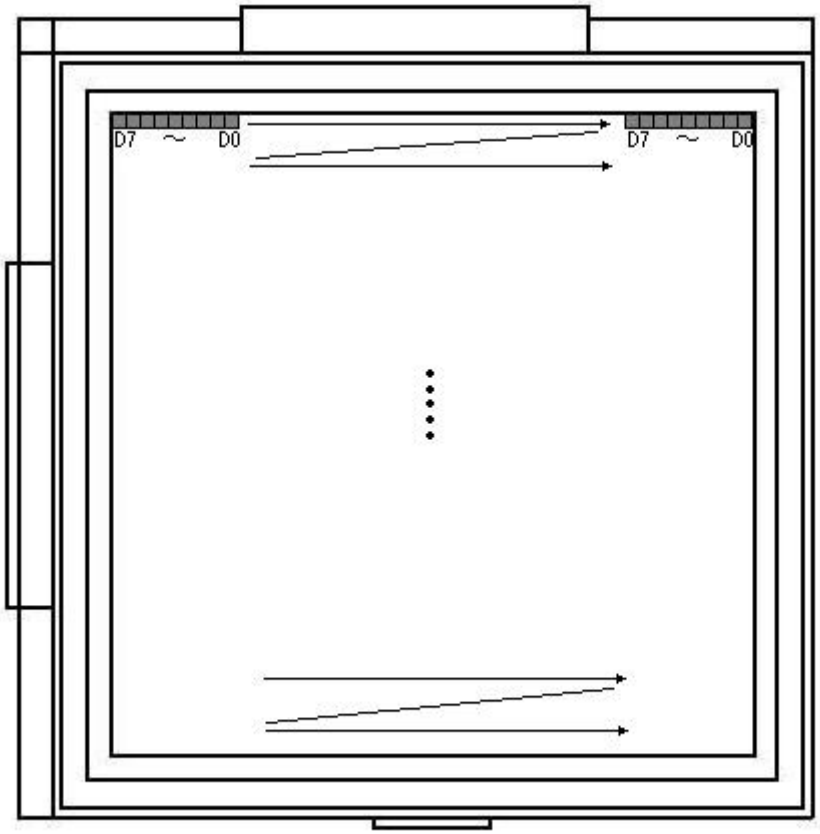
10. Power Supply for LCD Module and LCD Operating Voltage a Adjustment

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



11. Block Diagram





12. Backlight Information

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					

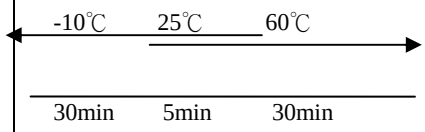
14. Quality Assurance

◆ 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℃