SPECIFICATIONS FOR LCD MODULE

MODEL NO.
BG12832B series
VER.01

FOR MESSRS:

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ON DATE OF:

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APPROVED BY:

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BOLYMIN, INC.
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History of Version

Version	Contents	Date	Note
01	NEW VERSION	2007/10/02	SPEC.

CONTENTS

1. Numbering System

B	G	12832	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 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 PLED/yellow-green C=color STN,OLED/RGB	B=STN/blue,OLED/blue F=FSTN T=TN D=OLED/blue+yellow A=OLED/blue+yellow+green
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 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 $=RoHS

2. General Specification

(1) Mechanical Dimension

Item	Standard Value	Unit
Number of dots	128X32	dots
Module dimension (W*H*T)	59.0*29.3*5.4(Max)	mm
View area	52(W)X19.4(H)	mm
Dot size	0.345(W)X0.345(H)	mm
Dot pitch	0.375(W)X0.375(H)	mm

(2) Controller IC: **S1D15601 (or Equivalent)**

(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}	-20	—	+70	℃
Storage Temperature	T_{ST}	-30	—	+80	℃
Input Voltage	V_I	VSS	—	Vdd	V
Supply Voltage For Logic	Vdd-Vss	0	—	+5.5	V
Supply Voltage For LCD	Vdd-Vo	0	—	9	V

4. Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage For Logic	V_{DD}-V_{SS}	—	2.7	3.0	4.5	V
Supply Voltage For LCD	V_{DD}-V_0	Ta=-20℃ Ta=25℃ Ta=+70℃	— — —	5.1 5.0 4.8	— — —	V V V
Input High Vol	V_{IH}	—	$0.7V_{DD}$	—	V_{DD}	V
Input Low Vol	V_{IL}	—	0	—	$0.3V_{DD}$	V
Output High Vol	V_{OH}	—	2.4	—	—	V
Output Low Vol.	V_{OL}	—	—	—	0.4	V
Supply Current	I_{DD}	—	—	0.14	—	mA

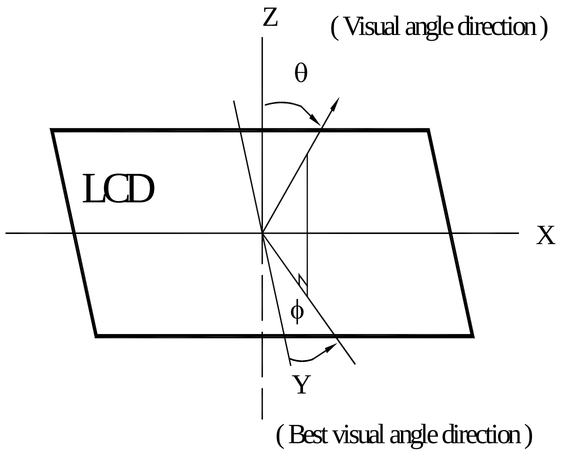
5. Optical Characteristics

STN

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) θ	CR≧2	10		45	deg
	(H) φ	CR≧2	-30		30	deg
Contrast Ratio	CR	—		8.2		—
Response Time 25℃	T rise	—		172	400	ms
	T fall	—		211	400	ms

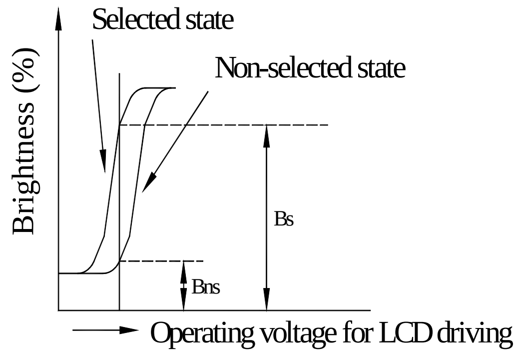
5.1 Definitions

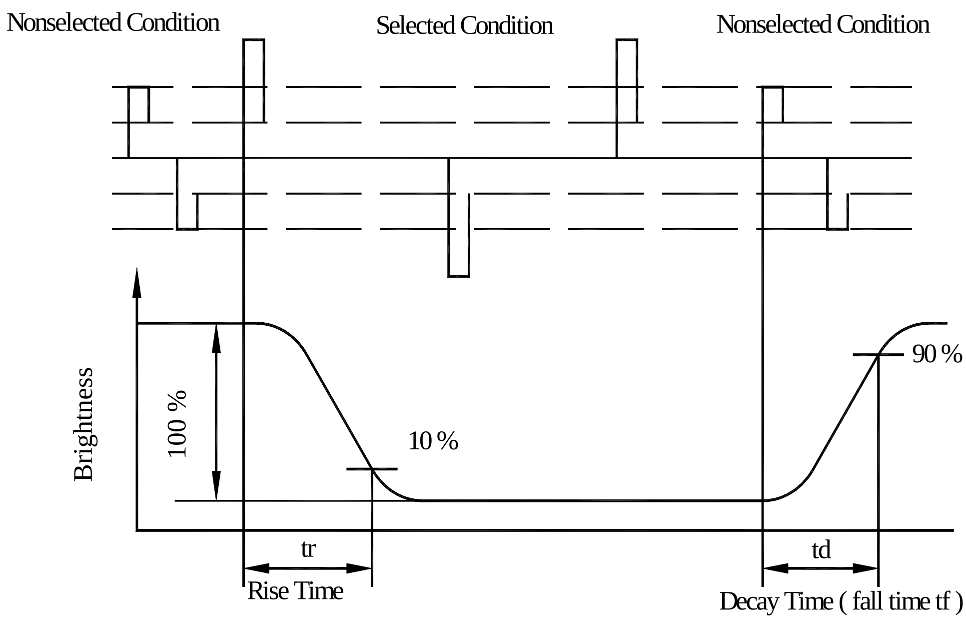
■View Angles



■Contrast Ratio

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





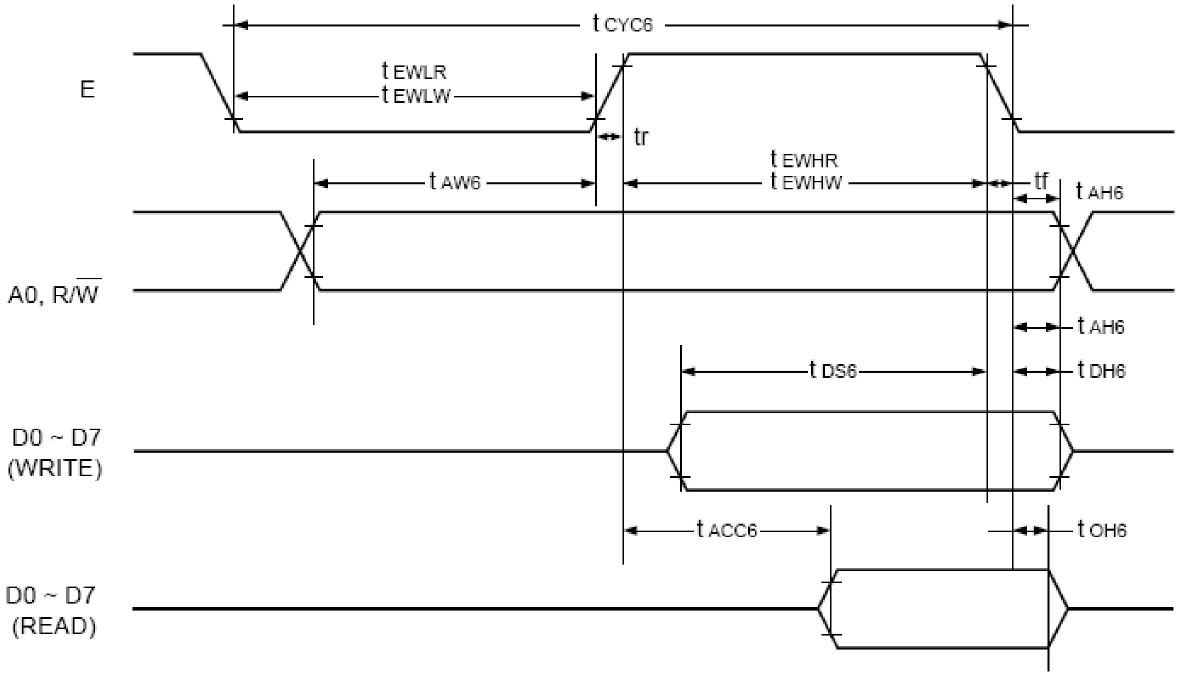
■Response time

6. Interface Pin Function

Pin No.	Symbol	Level	Description
1	SCL	L	Serial clock input
2	SI	—	Serial data input
3	/RES	—	L:Reset
4	P/S	H/L	H:Parallel input , L:Serial input
5	/CS	L	L:Chip select input
6	A0	H/L	H: Data , L: Instruction
7	Vdd	—	Supply voltage for logic
8	Vss	—	Ground
9	K	L	L:LED ON
10	C86	H/L	H:68-Interface series , L:80-Interface series
11	WR(R/W)	H/L	WR for 80 series , R/W for 68 series
12	RD(E)	H	RD for 80 series , E for 68 series
13	DB0	H/L	Data bus line
14	DB1	H/L	Data bus line
15	DB2	H/L	Data bus line
16	DB3	H/L	Data bus line
17	DB4	H/L	Data bus line
18	DB5	H/L	Data bus line
19	DB6	H/L	Data bus line
20	DB7	H/L	Data bus line

7. Timing Characteristics

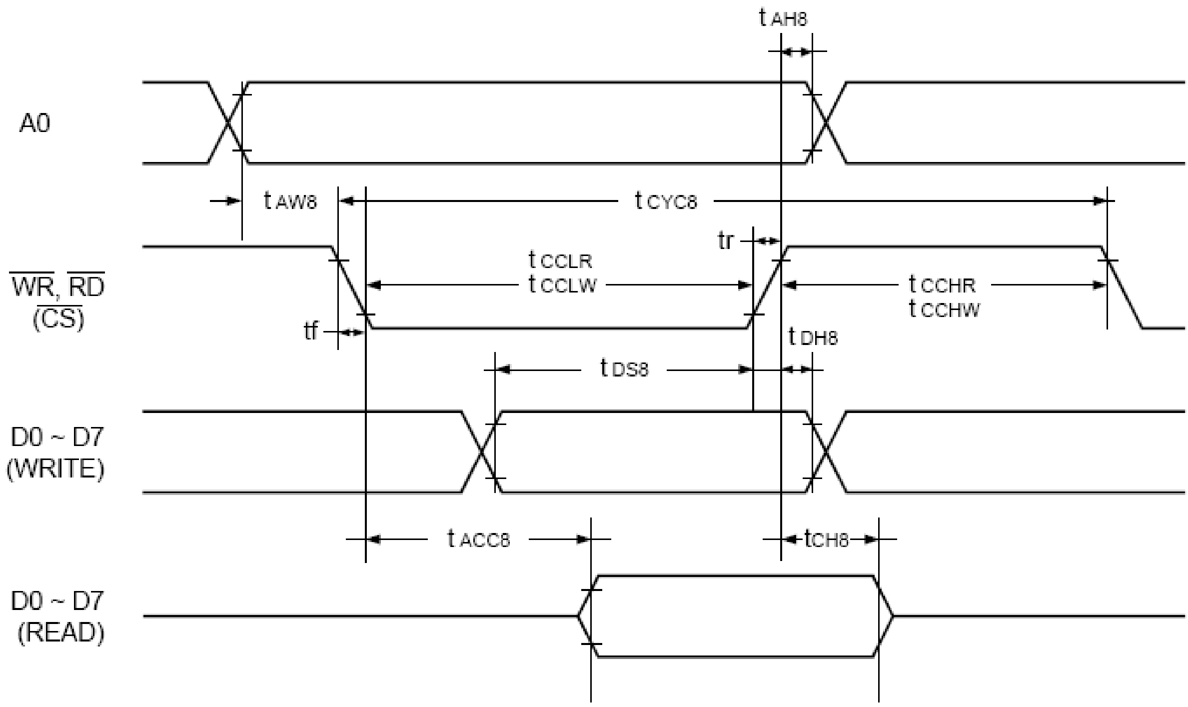
7.1 MPU Bus Read/Write (68-family MPU)



Vss = –2.7 to +4.5V, Ta = –30 to 85°C

Parameter		Signal	Symbol	Condition	Min	Max	Unit
System cycle time		A0, CS	tCYC6		450	—	ns
Address setup time		(CS1, CS2)	tAW6		25	—	ns
Address hold time		R/W	tAH6		25	—	ns
Data setup time		D0 ~ D7	tDS6		40	—	ns
Data hold time			tDH6		20	—	ns
Output disable time			tOH6	CL = 100pF	20	100	ns
Access time			tACC5		—	140	ns
Enable H pulse width	READ	E	tEWHR		154	—	ns
	WRITE		tEWHW		44	—	ns
Enable L pulse width	READ	E	tEWLR		244	—	ns
	WRITE		tEWLW		394	—	ns
Input signal change time			tr, tf		—	15	ns

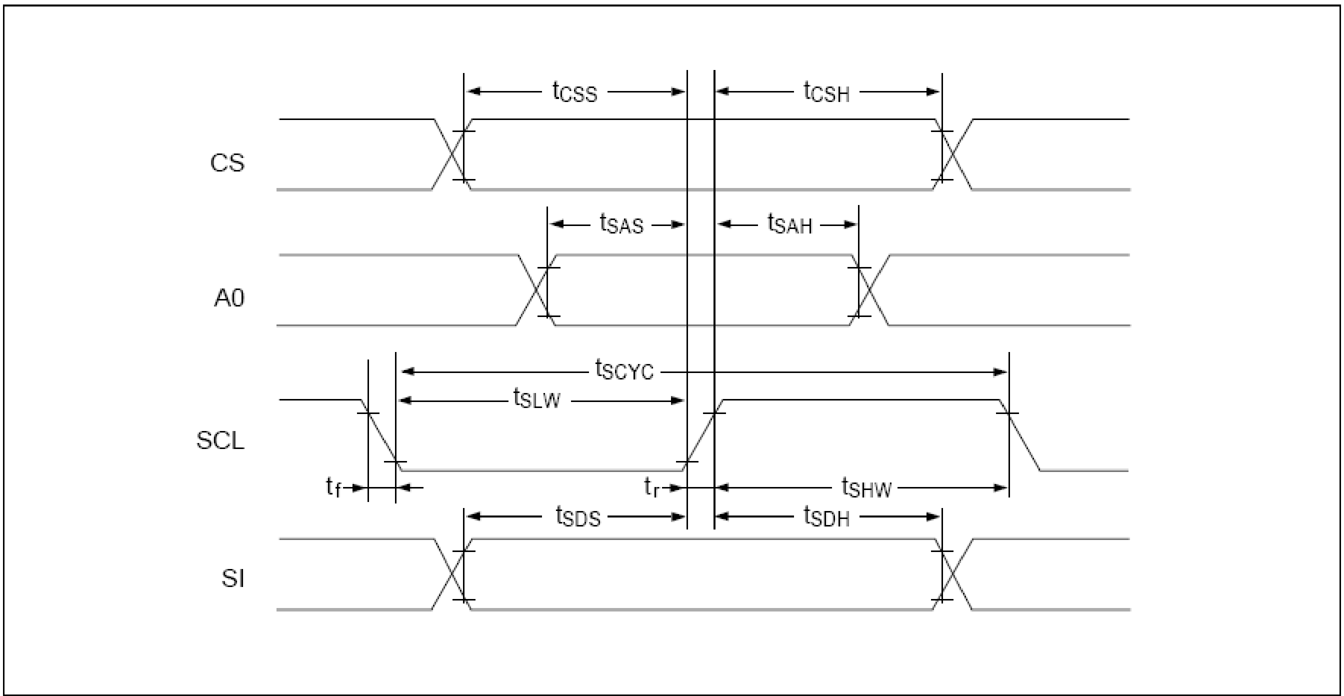
7.2 MPU Bus Read/Write (80-family MPU)



Vss = –2.7 to –4.5V, Ta = –30 to 85°C

Parameter	Signal	Symbol	Condition	Min	Max	Unit
Address hold time	A0, CS	t_{AH8}		25	—	ns
Address setup time		t_{AW8}		25	—	ns
System cycle time		t_{CYC8}		450	—	ns
Control L pulse width (WR)	$\overline{WR}$	t_{CCLW}		44	—	ns
Control L pulse width (RD)	$\overline{RD}$	t_{CCLR}		194	—	ns
Control H pulse width (WR)	$\overline{WR}$	t_{CCHW}		394	—	ns
Control H pulse width (RD)	$\overline{RD}$	t_{CCHR}		244	—	ns
Data setup time		t_{DS8}		40	—	ns
Data hold time		t_{DH8}		20	—	ns
$\overline{RD}$ access time	D0 ~ D7	t_{ACC8}	CL = 100pF	—	140	ns
Output disable time		t_{CH8}		10	100	ns
Input signal change time		tr, tf		—	15	ns

7.3 Serial Interface

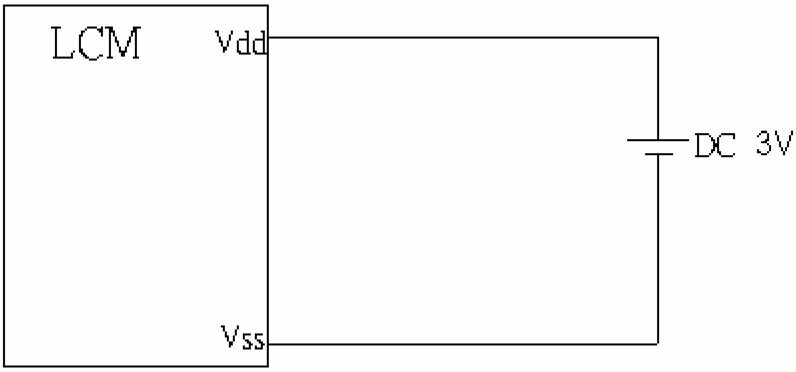


Vss = –2.7 to –4.5V, Ta = –30 to 85°C

Parameter	Signal	Symbol	Condition	Min	Max	Unit
Serial clock cycle	SCL	t_{SCYC}		1000	—	ns
SCL high pulse width		t_{SHW}		300	—	ns
SCL low pulse width		t_{SLW}		300	—	ns
Address setup time	A0	t_{SAS}		250	—	ns
Address hold time		t_{SAH}		400	—	ns
Data setup time	SI	t_{SDS}		250	—	ns
Data hold time		t_{SDH}		100	—	ns
CS-SCL time	CS	t_{CSS}		60	—	ns
		t_{CSH}		800	—	ns
Input signal change time		t_r, t_f		—	50	ns

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

＊Standard Type



9. Backlight Information

9.1 Specification

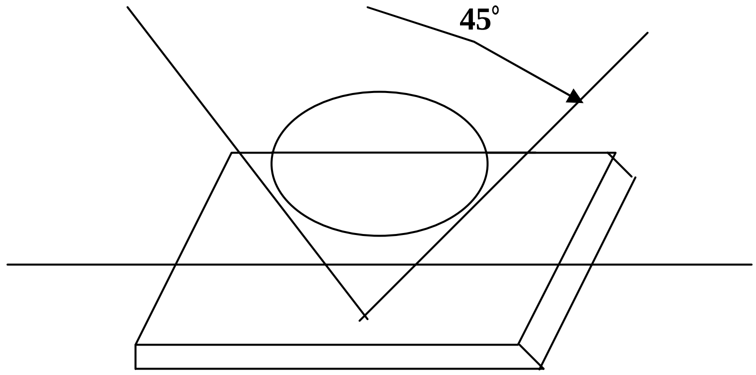
LED edge/yellow-green

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	ILED		40	60	mA	V=2.1V
Supply Voltage	V		2.1	2.3	V	—
Reverse Voltage	VR	—	—	5	V	—
Luminous Intensity	IV	—	15	—	cd/m^2	ILED=40mA
Wave Length	λp	569	—	576	nm	ILED=40mA
Life Time		—	50000	—	Hr.	ILED≦40mA
Color	Yellow-Green					

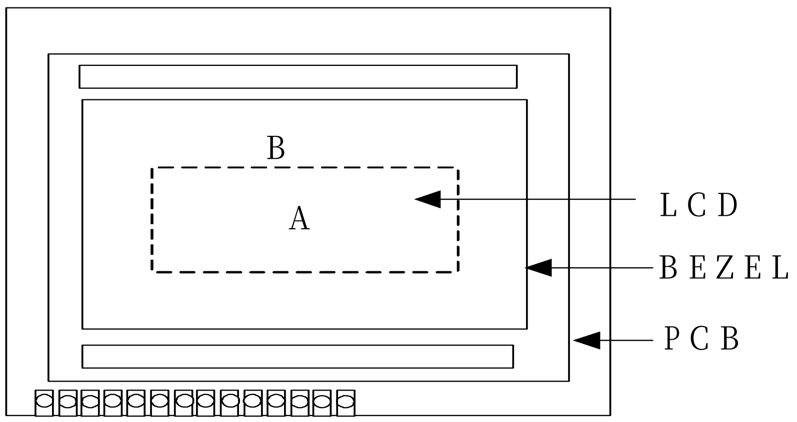
10. Quality Assurance

10.1 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light.



Definition of applicable Zones

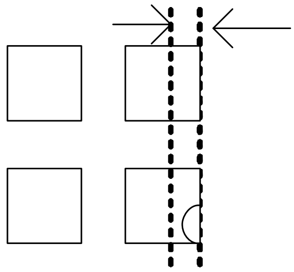
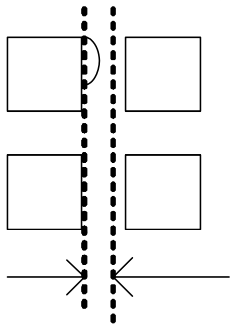
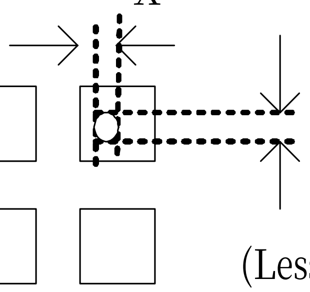
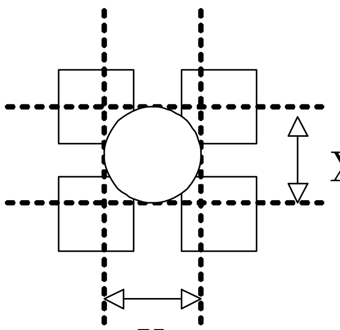


A :Display Area

B : Non-Display Area

10.2 Inspection Parameters

<table>
<tr><th>NO.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td>1</td><td>Black or White spots</td><td>
<table>
<tr><td rowspan="2">Zone / Dimension</td><td colspan="2">Acceptable Number</td><td rowspan="2">Class Of Defects</td><td rowspan="2">Acceptable Level</td></tr>
<tr><td>A</td><td>B</td></tr>
<tr><td>D＜0.15</td><td>*</td><td>*</td><td rowspan="4">Minor</td><td rowspan="4">2.5</td></tr>
<tr><td>0.15≦D≦0.2</td><td>4</td><td>4</td></tr>
<tr><td>0.2≦D≦0.25</td><td>2</td><td>2</td></tr>
<tr><td>D≦0.3</td><td>0</td><td>1</td></tr>
</table>
D=(Long + Short)/2 *: Disregard
</td></tr>
<tr><td>2</td><td>Scratch, Substances</td><td>
<table>
<tr><td rowspan="2">Zone / X(mm)</td><td rowspan="2">Zone / Y(mm)</td><td colspan="2">Acceptable Number</td><td rowspan="2">Class Of Defects</td><td rowspan="2">Acceptable Level</td></tr>
<tr><td>A</td><td>B</td></tr>
<tr><td>*</td><td>0.04≧W</td><td>*</td><td>*</td><td rowspan="4">Minor</td><td rowspan="4">2.5</td></tr>
<tr><td>3.0≧L</td><td>0.06≧W</td><td>4</td><td>4</td></tr>
<tr><td>2.0≧L</td><td>0.08≧W</td><td>2</td><td>3</td></tr>
<tr><td>—</td><td>0.1＜W</td><td>0</td><td>1</td></tr>
</table>
X: Length Y : Width * : Disregard
Total defects should not exceed 4/module
</td></tr>
<tr><td>3</td><td>Air Bubbles (between glass & polarizer)</td><td>
<table>
<tr><td rowspan="2">Zone / Dimension</td><td colspan="2">Acceptable Number</td><td rowspan="2">Class Of Defects</td><td rowspan="2">Acceptable Level</td></tr>
<tr><td>A</td><td>B</td></tr>
<tr><td>D≦0.15</td><td>*</td><td>*</td><td rowspan="3">Minor</td><td rowspan="3">2.5</td></tr>
<tr><td>0.15＜D≦0.25</td><td>2</td><td>*</td></tr>
<tr><td>0.25＜D</td><td>0</td><td>1</td></tr>
</table>
*: Disregard
Total defects shall not excess 3/module.
</td></tr>
</table>

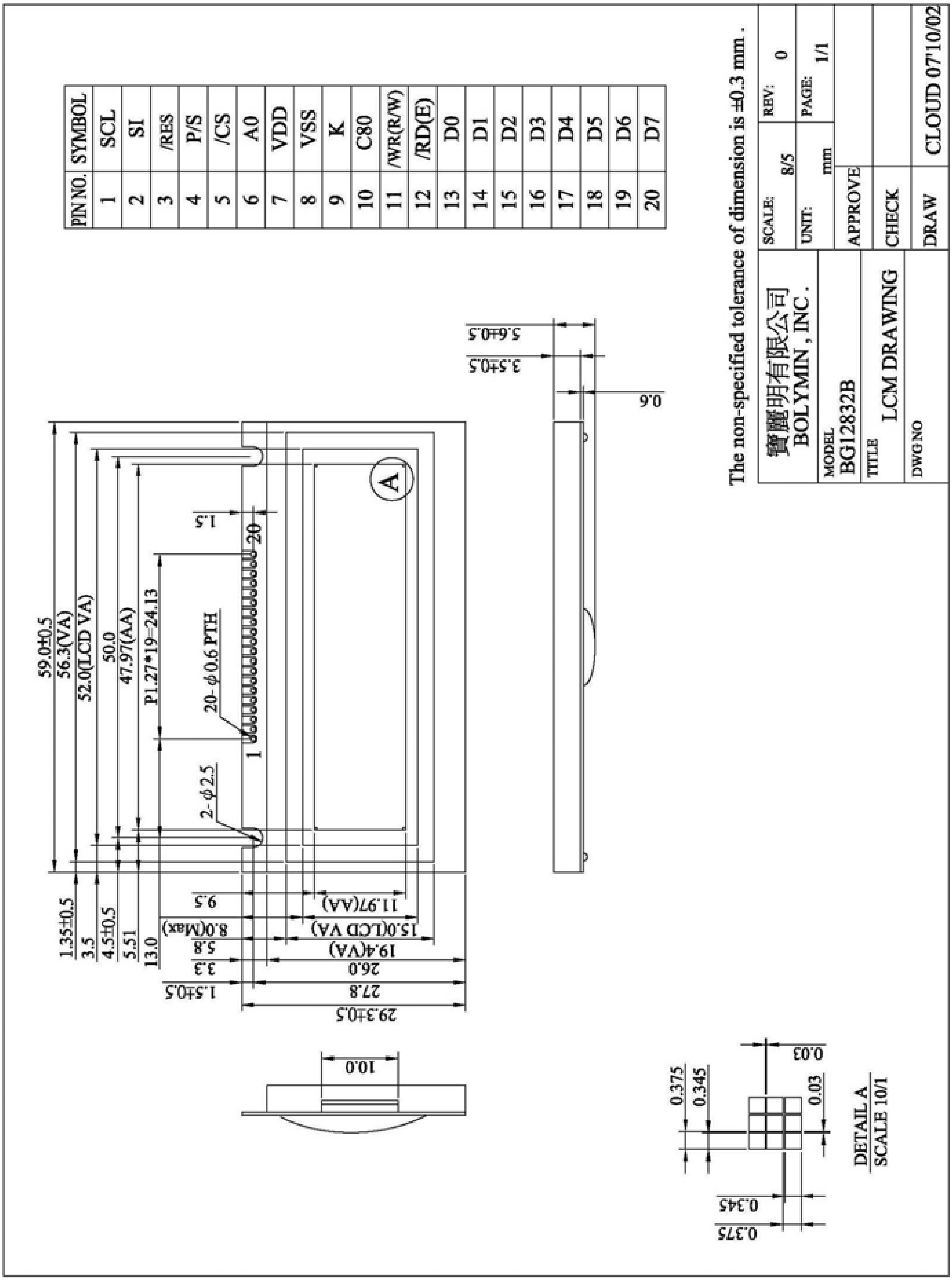
4	Uniformity	(1) Pixel shape (with Dent) 0.152  (2) Pixel shape (With Projection)  Should not be connected to next pixel 0.152 (3) Pin hole X  Y (X+Y)/2≦0.02mm (Less than 0.1mm is no counted) (4)Deformation  X (X+Y)/2 ≦0.3mm Y Total acceptable number : 1/pixel,5/cell

11. 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.	80℃ 96hrs	——
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30℃ 96hrs	——
3	High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 96hrs	——
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 96hrs	——
5	Humidity Test	Endurance test applying the high humidity storage for a long time.	40℃,90%RH 96hrs	——
6	Thermal Shock Test	Endurance test applying the low and high temperature cycle. -30℃ 25℃ 80℃ ←→ 30min 5min 30min 1 cycle	-30℃/ 80℃ 5 cycles	——
7	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 direction of X,Y,Z for each 15minutes	——

12. Appendix (Drawing)



PIN NO.	SYMBOL
1	SCL
2	SI
3	/RES
4	P/S
5	/CS
6	A0
7	VDD
8	VSS
9	K
10	C80
11	/WR(R/W)
12	/RD(E)
13	D0
14	D1
15	D2
16	D3
17	D4
18	D5
19	D6
20	D7