



LCD MODULE SPECIFICATION

MODEL NO.

BO12864D series

FOR MESSRS:

ON DATE OF:

APPROVED BY:



Revision Record

1. 12.30.2004

To modify LED A,K pin size from 1.0mm(W)x 2.6mm(L) to 2.0mm(W) x 2.6mm(L)

2.



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1. Numbering System

<u>B</u>	<u>O</u>	<u>12864</u>	<u>D</u>	<u>F</u>	<u>P</u>	<u>H</u>		<u>B</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				
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		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. Precaution in use of LCD Module

1. To avoid applying excessive shocks to the module or making any alterations or modifications to it.
2. Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.
3. Don't disassemble the LCM.
4. Don't operate it above the absolute maximum rating.
5. Don't drop, bend or twist LCM.
6. Soldering: only to the I/O terminals.
7. Storage: please storage in anti-static electricity container and clean environment.
8. Don't touch the elastmer connector, especially insert a backlight panel (EL or CCFL)

3. General Features

This BO12864D is a dot matrix graphic LCD module fabricated by low power COMS technology, interfaced with 8-bit MPU.

Features

- Display format: 128dots* 64dots
- FSTN positive mode
- Easy interface with 8-bit MPU
- Low power consumption
- Transflective (low)light method
- Viewing angle:6 o'clock
- Multiplex level: 1/64duty, 1/9bias
- LCD driver IC :SSD1851
- Connector: COG+FPC
- Power supply:3.0±0.3V
- Backlight: LED(optional)
- 4 gray scale



4. Mechanical Specifications

Item	Dimension	Unit
Module Size(W*H*T)	52.0X42.0X4.65	mm
Viewing Area (W*H)	48.0*31.0	mm
Dot Pitch (W*H)	0.35*0.43	mm
Dot Size (W*H)	0.32*0.4	mm
Active Area (W*H)	44.77*27.49	mm
Number of Dots	128*64	mm

5. Temperature Characteristics

Parameter	Symbol	Rating	Unit
Operating	Top	-20~+70	°C
Storage temperature	Tst	-30~+80	°C

6. Electro-Optical characteristics

6.1 STN Type

Item	Sym	Condition	Min.	Typ.	Max.	Unit
Contrast	K	$\theta=0^\circ$ $\Phi=0^\circ$	3 : 1	—	—	deg.
Viewing Angle	θ	K=5 $\Phi=0^\circ$	$\theta_2 - \theta_1=30$	—	—	deg.
		K=5 $\theta=10^\circ$	$\Phi=\pm 30$	—	—	deg.
Response time	T _{on}	25°C	—	—	150	ms
	T _{off}	25°C	—	—	200	ms

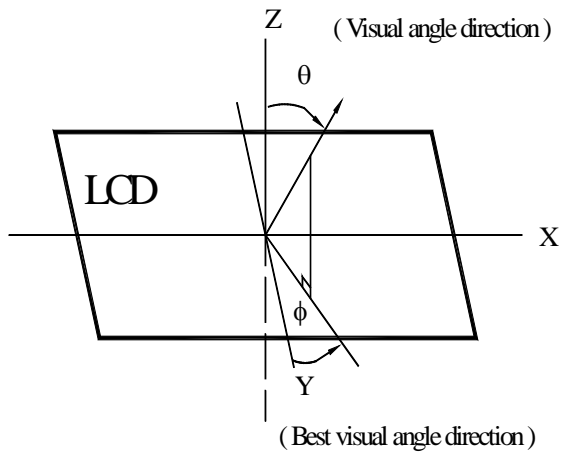
6.2 FSTN Type

Item	Sym	Condition	Min.	Typ.	Max.	Unit
Contrast	K	$\theta=0^\circ$ $\Phi=0^\circ$	5 : 1	—	—	deg.
Viewing Angle	θ	K=5 $\Phi=0^\circ$	$\theta_2 - \theta_1=45$	—	—	deg.
		K=5 $\theta=10^\circ$	$\Phi=\pm 45$	—	—	deg.
Response time	T _{on}	25°C	—	—	150	ms
	T _{off}	25°C	—	—	200	ms

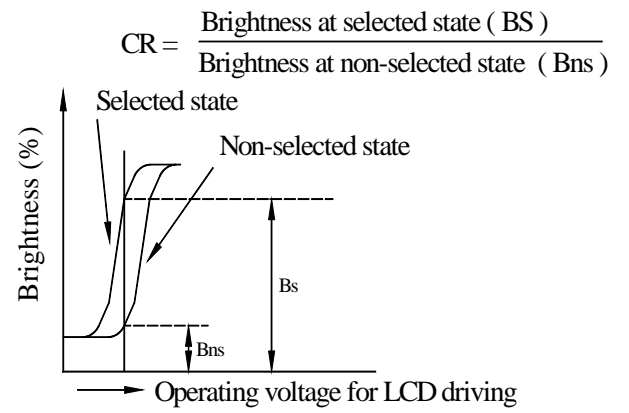


6.3 Definitions

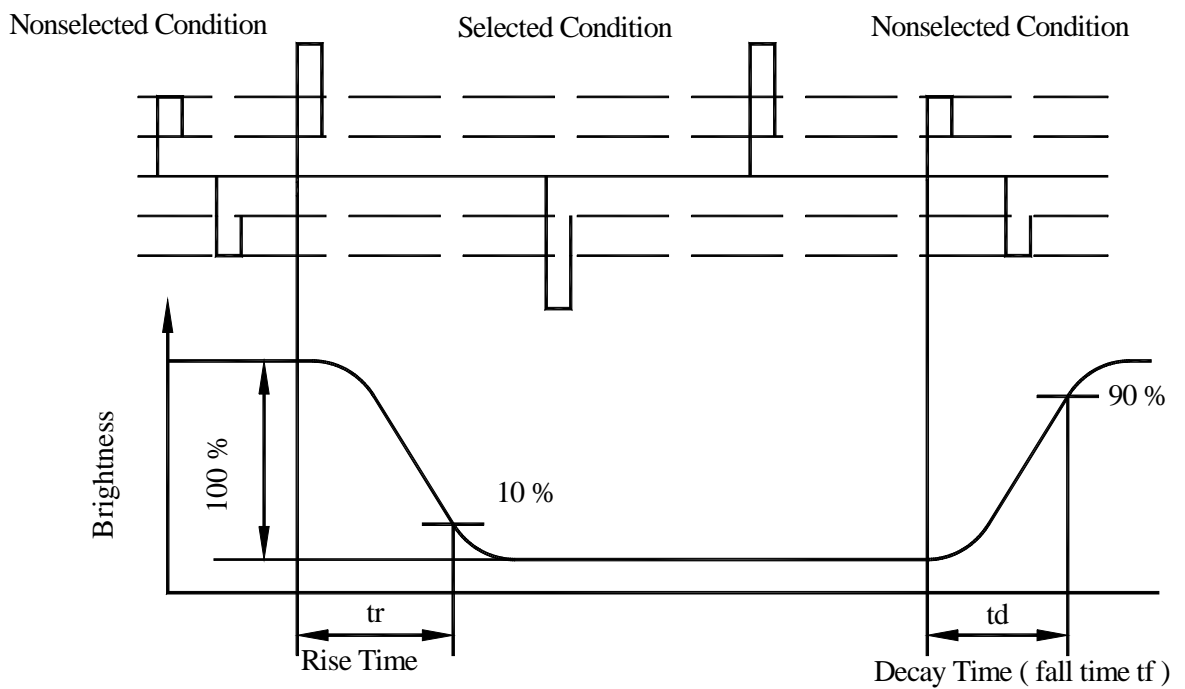
■ View Angles



■ Contrast Ratio



■ Response Time



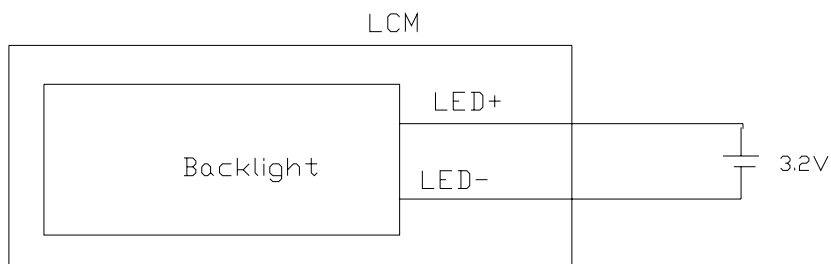


7. Backlight

(1) LED edge / White

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	I _{LED}	—	30		mA	V=3.2V
Supply Voltage	V	3.0	3.2	3.4	V	
Reverse Voltage	V _R	—	—	5	V	
Luminous Intensity	I _V	80	—	—	cd/m ²	I _{LED} =30mA
Wave Length			X=0.30 Y=0.30			I _{LED} =30mA
Life Time		—	10000	—	Hr.	V ≤ 3.2V
Color	White					

Drive Method

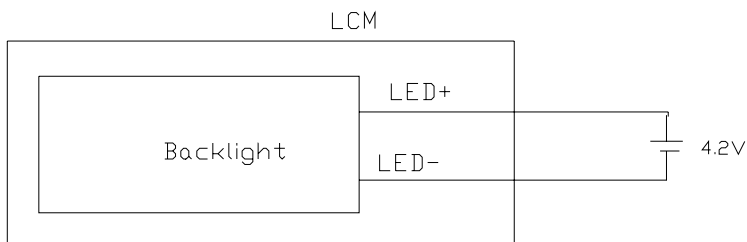




(2)LED edge / Yellow Green

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	I _{LED}	—	60		mA	V=4.2V
Supply Voltage	V	4.0	4.2	4.4	V	
Reverse Voltage	V _R	—	—	8	V	
Luminous Intensity	I _V	20	—	—	cd/m ²	I _{LED} =60mA
Wave Length			575nm			I _{LED} =60mA
Life Time		—	100000	—	Hr.	V ≤ 4.4V
Color	Yellow Green					

Drive Method



**8. Interface Pin Function**

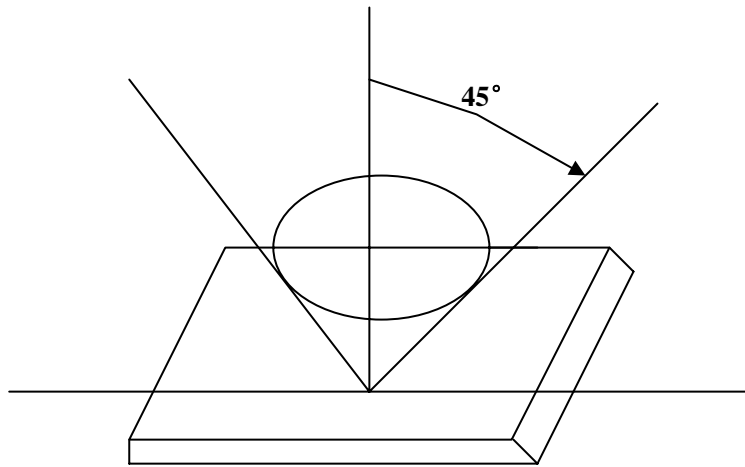
Pin No.	Symbol	Level	Description
1	GND	0V	Ground
2	Vdd	3.0V	Supply Voltage for logic
3	D7	H/L	Data bit 7
4	D6	H/L	Data bit 6
5	D5	H/L	Data bit 5
6	D4	H/L	Data bit 4
7	D3	H/L	Data bit 3
8	D2	H/L	Data bit 2
9	D1	H/L	Data bit 1
10	D0	H/L	Data bit 0
11	E	H/L	Enable signal
12	R/W	H/L	H:READ signal L:WRITE signal
13	D/C	H/L	H:D0~7 is data , L:D0~D7 is command
14	/RES	H/L	L: Reset the controller IC.
15	/CS	H/L	Chip select signal
16	GND	0V	Ground



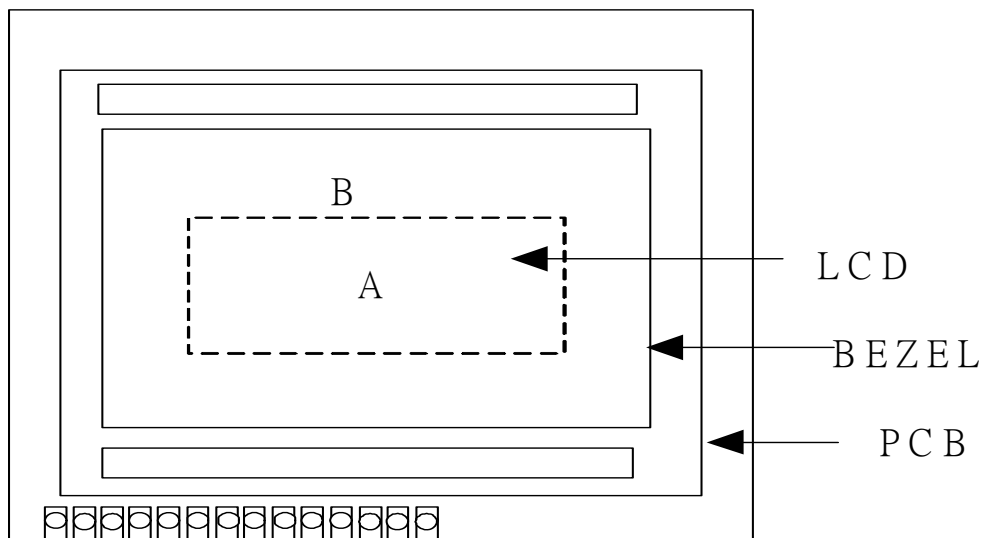
9. Quality Assurance

10.1 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light



Definition of applicable Zones



A : Display Area

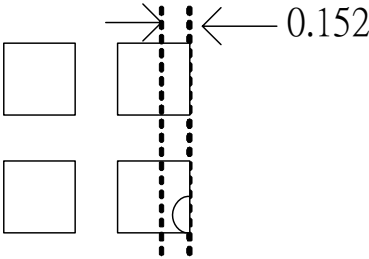
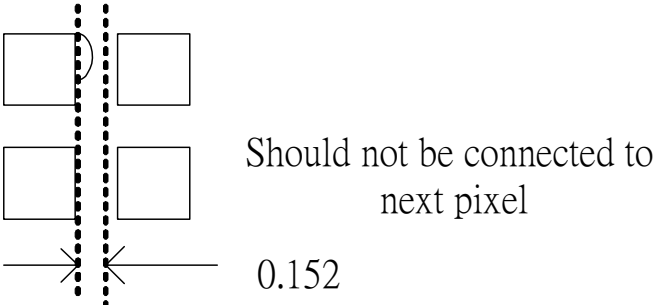
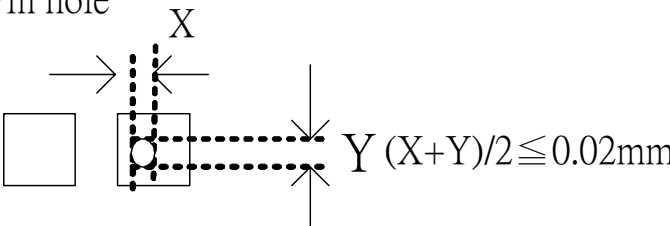
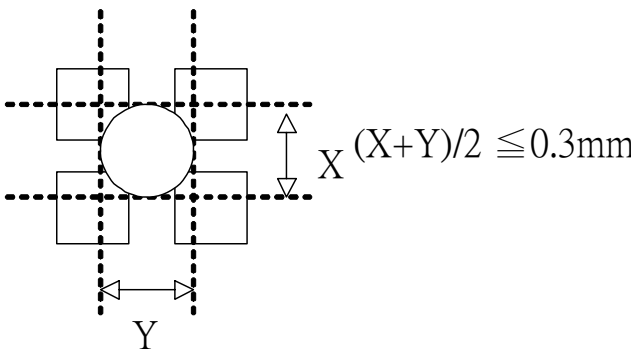
B : Non-Display Area



10. Inspection Parameters

NO.	Parameter	Criteria																												
1	Black or White spots	<table border="1"> <thead> <tr> <th rowspan="2">Zone Dimension</th> <th colspan="2">Acceptable Number</th> <th rowspan="2">Class Of Defects</th> <th rowspan="2">Acceptable Level</th> </tr> <tr> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>$D < 0.15$</td> <td>*</td> <td>*</td> <td rowspan="4">Minor</td> <td rowspan="4">2.5</td> </tr> <tr> <td>$0.15 \leq D \leq 0.2$</td> <td>4</td> <td>4</td> </tr> <tr> <td>$0.2 \leq D \leq 0.25$</td> <td>2</td> <td>2</td> </tr> <tr> <td>$D \leq 0.3$</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p>$D = (\text{Long} + \text{Short})/2$ *: Disregard</p>	Zone Dimension	Acceptable Number		Class Of Defects	Acceptable Level	A	B	$D < 0.15$	*	*	Minor	2.5	$0.15 \leq D \leq 0.2$	4	4	$0.2 \leq D \leq 0.25$	2	2	$D \leq 0.3$	0	1							
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2	Scratch, Substances	<table border="1"> <thead> <tr> <th colspan="2">Zone</th> <th colspan="2">Acceptable Number</th> <th rowspan="2">Class Of Defects</th> <th rowspan="2">Acceptable Level</th> </tr> <tr> <th>X(mm)</th> <th>Y(mm)</th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>*</td> <td>$0.04 \geq W$</td> <td>*</td> <td>*</td> <td rowspan="4">Minor</td> <td rowspan="4">2.5</td> </tr> <tr> <td>$3.0 \geq L$</td> <td>$0.06 \geq W$</td> <td>4</td> <td>4</td> </tr> <tr> <td>$2.0 \geq L$</td> <td>$0.08 \geq W$</td> <td>2</td> <td>3</td> </tr> <tr> <td>—</td> <td>$0.1 < W$</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p>X: Length Y: Width *: Disregard Total defects should not exceed 4/module</p>	Zone		Acceptable Number		Class Of Defects	Acceptable Level	X(mm)	Y(mm)	A	B	*	$0.04 \geq W$	*	*	Minor	2.5	$3.0 \geq L$	$0.06 \geq W$	4	4	$2.0 \geq L$	$0.08 \geq W$	2	3	—	$0.1 < W$	0	1
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3	Air Bubbles (between glass & polarizer)	<table border="1"> <thead> <tr> <th rowspan="2">Zone Dimension</th> <th colspan="2">Acceptable Number</th> <th rowspan="2">Class Of Defects</th> <th rowspan="2">Acceptable Level</th> </tr> <tr> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>$D \leq 0.15$</td> <td>*</td> <td>*</td> <td rowspan="3">Minor</td> <td rowspan="3">2.5</td> </tr> <tr> <td>$0.15 < D \leq 0.25$</td> <td>2</td> <td>*</td> </tr> <tr> <td>$0.25 < D$</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p>*: Disregard Total defects shall not exceed 3/module.</p>	Zone Dimension	Acceptable Number		Class Of Defects	Acceptable Level	A	B	$D \leq 0.15$	*	*	Minor	2.5	$0.15 < D \leq 0.25$	2	*	$0.25 < D$	0	1										
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4	Uniformity	<p>(1) Pixel shape (with Dent)</p>  <p>(2) Pixel shape (With Projection)</p>  <p>Should not be connected to next pixel</p> <p>(3) Pin hole</p>  <p>$(X+Y)/2 \leq 0.02\text{mm}$</p> <p>(Less than 0.1mm is no counted)</p> <p>(4) Deformation</p>  <p>$(X+Y)/2 \leq 0.3\text{mm}$</p> <p>Total acceptable number : 1/pixel,5/cell</p>
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11. Reliability

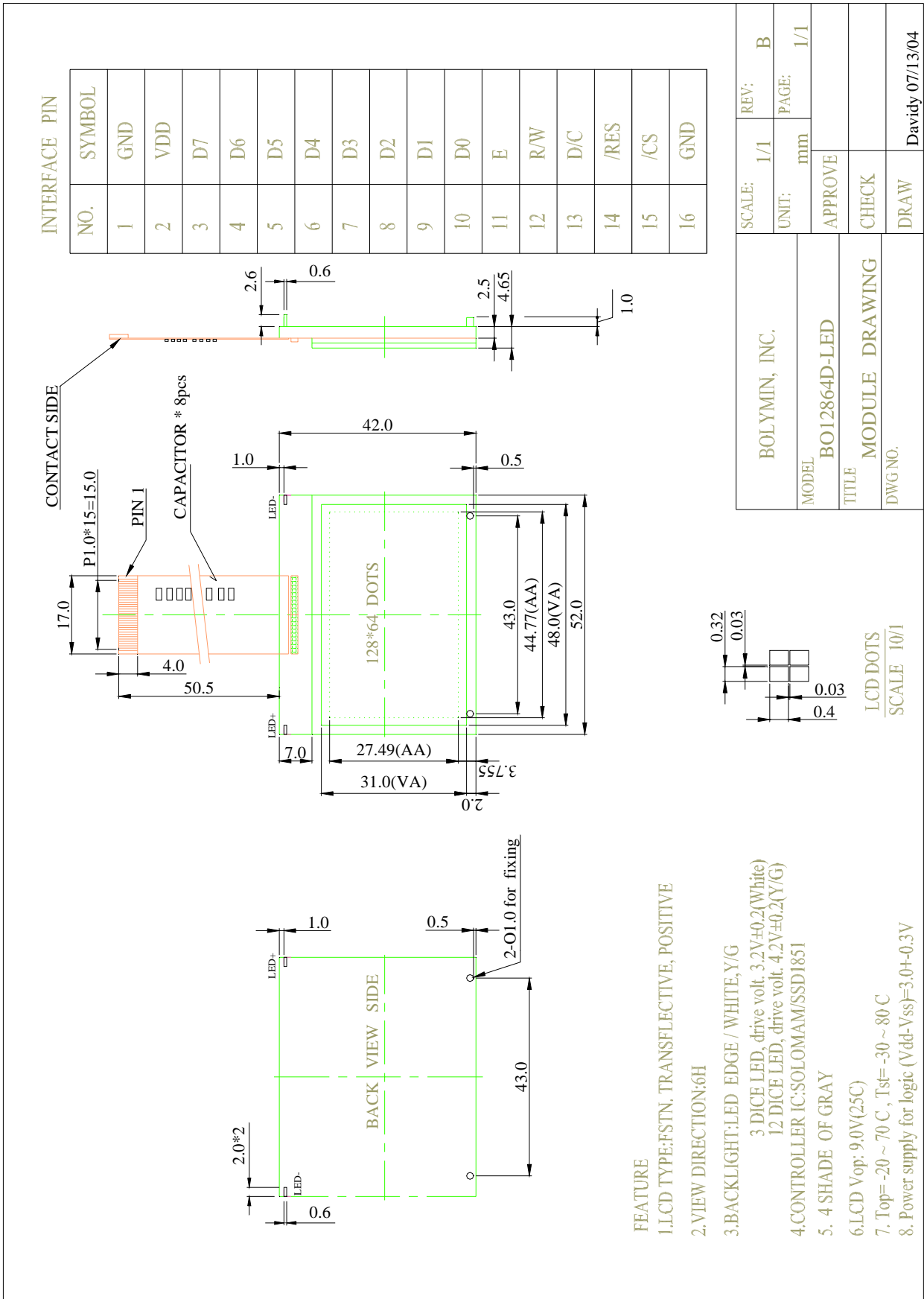
■ Content of Reliability Test

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.	60°C 200hrs	—
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-20°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.	40°C, 90%RH 96hrs	—
7	Temperature Cycle	Endurance test applying the low and high temperature cycle. 	-20°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



11. 1 Module drawing



- FEATURE**
- 1.LCD TYPE:FSTN, TRANSFLECTIVE, POSITIVE
 - 2.VIEW DIRECTION:6H
 - 3.BACKLIGHT:LED EDGE / WHITE, Y/G
3 DICE LED, drive volt. 3.2V±0.2(White)
12 DICE LED, drive volt. 4.2V±0.2(Y/G)
 - 4.CONTROLLER IC:SOLOMAM/SSDI851
 5. 4 SHADE OF GRAY
 - 6.LCD Vop: 9.0V(25C)
 7. Top= -20 ~ 70 C, Tst= -30 ~ 80 C
 8. Power supply for logic (Vdd-Vss)=3.0±0.3V