



## LCD MODULE SPECIFICATION

**MODEL NO.**

**BO12832A series**

FOR MESSRS:

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ON DATE OF:

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APPROVED BY:

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## 1. Numbering System

<u>B</u>	<u>Q</u>	<u>12832</u>	<u>A</u>	<u>F</u>	<u>P</u>	<u>L</u>		<u>H</u>	<u>xxx</u>
0	1	2	3	4	5	6	7	8	9

<b>0</b>	Brand	Bolymin	
<b>1</b>	Module Type	C= character type G= graphic type P= TAB/TCP type	O= COG type F= COF type
<b>2</b>	Format	2002=20 characters, 4 lines 12232= 122 x 32 dots	
<b>3</b>	Version No.	A type	
<b>4</b>	LCD Color	G=STN/gray Y=STN/yellow-green C=color STN	B=STN/blue F=FSTN T=TN
<b>5</b>	LCD Type	R=positive/reflective P=positive/transflective	M=positive/transmissive N=negative/transmissive
<b>6</b>	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
<b>7</b>	CGRAM Font	J=English/Japanese Font E=English/European Font	C=English/Cyrillic Font H=English/Hebrew Font
<b>8</b>	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
<b>9</b>	Special Code	3=3 volt logic supply n=negative voltage 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 BO12832A is a dot matrix graphic LCD module fabricated by low power COMS technology, interfaced with I2C serial data

### **Features**

- Display format: 128dots\* 32dots
- FSTN Positive mode
- Easy interface with I2C
- Low power consumption
- Transflective (low)light method
- Viewing angle:6 o'clock
- Multiplex level: 1/32duty, 1/6bias
- LCD driver IC :PCF8531
- Connector: COG+PINS
- Power supply: 5.0V
- Backlight: LED backlight (R,G,B)



#### 4. Mechanical Specifications

Item	Dimension	Unit
Module Size(W*H*T)	86.0*34.0*9.0(max)	mm
Viewing Area (W*H)	79.0*24.7	mm
Dot Pitch (W*H)	0.57*0.63	mm
Dot Size (W*H)	0.53*0.59	mm
Active Area (W*H)	72.92*20.12	mm
Number of Dots	128*32	mm

#### 5. Temperature Characteristics

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

#### 6. Electrical-Optical characteristics

##### 6.1 Electrical characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage For Logic	$V_{DD}-V_{SS}$	—	3.0	5.0	5.5	V
Supply Voltage For LCD	$V_{lcd}$	Ta=-20°C	—	7.0	—	V
		Ta=25°C	—	6.0	—	V
		Ta=+70°C	—	5.0	—	V
Input High Vol	$V_{IH}$	—	$0.8V_{DD}$	—	$V_{DD}$	V
Input Low Vol	$V_{IL}$	—	0	—	$0.2V_{DD}$	V
Output High Vol	$V_{OH}$	—	$V_{DD}-0.4$	—	—	V
Output Low Vol.	$V_{OL}$	—	—	—	0.4	V
Power supply current	I <sub>dd</sub>	V <sub>dd</sub> =5.0v	—	0.2	—	Ma



## 6.2 Optical characteristics

### a. STN

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) $\theta$	$CR \cong 2$	10		45	deg
	(H) $\phi$	$CR \cong 2$	-30		30	deg
Contrast Ratio	CR	—		3		—
Response Time 25°C	T rise	—		100	150	ms
	T fall	—		150	200	ms

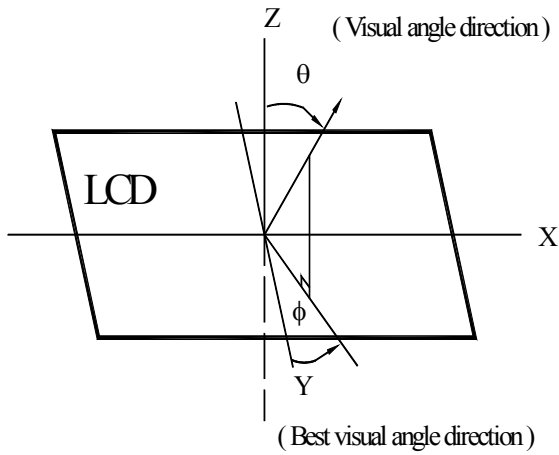
### b. FSTN

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

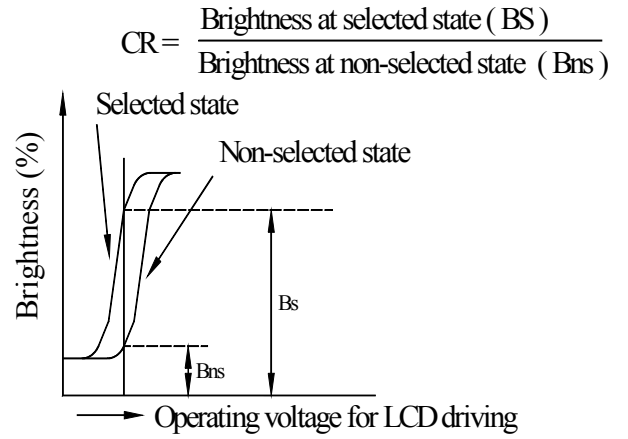


Definitions

■ View Angles



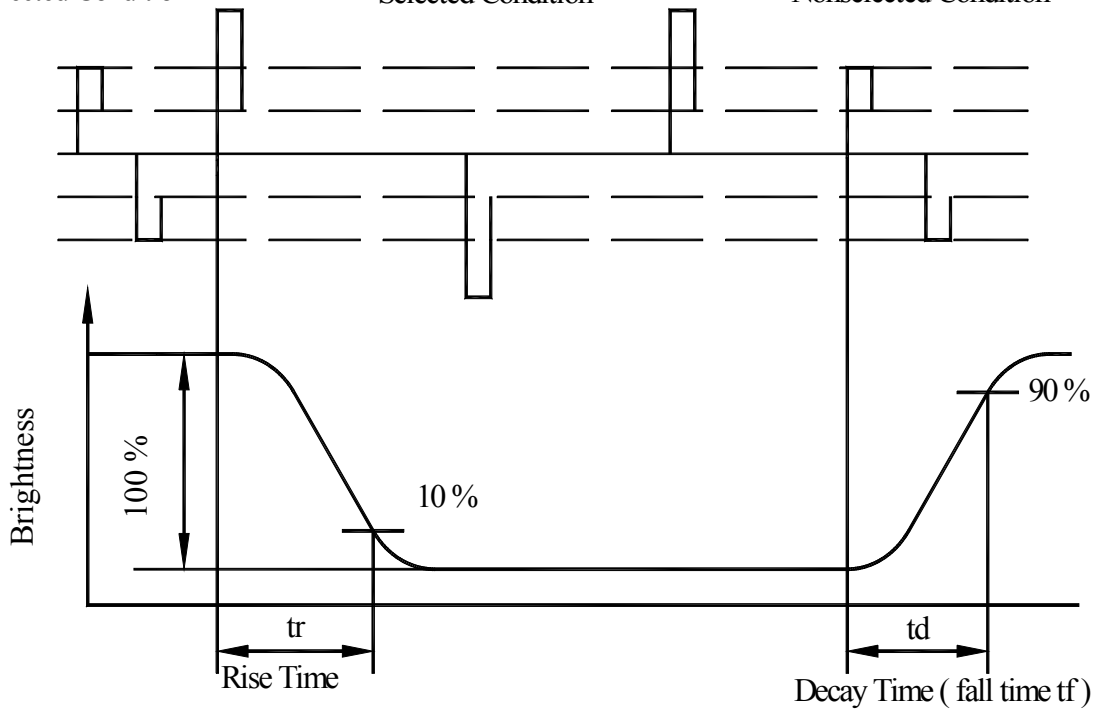
■ Contrast Ratio



Nonselected Condition

Selected Condition

Nonselected Condition



■ Response time

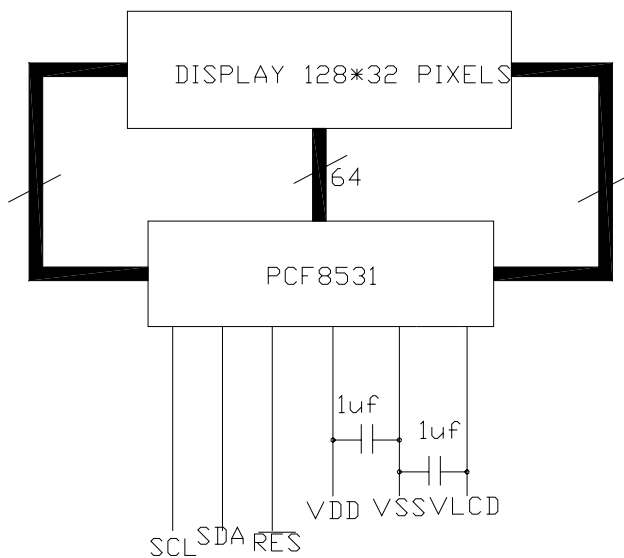


### 7. Interface Pin Function

Pin No.	Symbol	Level	Description
1	Vlcd		LCD power supply *note1
2	/RES	H/L	Reset Signal, Active “L”
3	VDD	5V	Power Supply For Logic
4	SDA	H/L	I2C bus serial data
5	VSS	0V	GND
6	SCL	H/L	I2C bus serial clock

Note1: internal charge bump circuit( positive voltage) used. Must be connected a capacitor(1uf) to Vss(figure 1)

(figure1)







## 8. Backlight information

LED / RGB

Parameter	Symbol	Light Source	Min	Typ	Max	Unit	Test Condition
Drive Voltage	Vmax	RED	5.6	5.9	6.0	Vdc	25°C
		YG	5.8	6.0	6.2		
		BLUE	5.8	6.0	6.5		
Wave Length	$\lambda P$	RED		660	665	nm	IF=100mA
		YG		570	574		
		BLUE		470	475		
Brightness	IV	RED		200		cd/m <sup>2</sup>	IF=100mA
		YG		150			
		BLUE		250			
Current Consumption		RED		100		mA	25°C
		YG		100		mA	
		BLUE		100		mA	
Life time		100000				Hours	IF=100mA

(1) LED array / yellow-green

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	I <sub>LED</sub>	—	280	—	mA	V=4.2V
Supply Voltage	V	—	4.2	4.3	V	—
Reverse Voltage	V <sub>R</sub>	—	—	8	V	—
Luminous Intensity	IV	60	—	—	cd/m <sup>2</sup>	I <sub>LED</sub> =280mA
Wave Length	$\lambda p$	—	574	—	nm	I <sub>LED</sub> =280mA
Life Time	—	—	100000	—	Hr.	V ≤ 280mA
Color	Yellow Green					



9. 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><math>d \leq 0.1</math></td> <td>Disregard</td> </tr> <tr> <td><math>0.1 &lt; d \leq 0.2</math></td> <td>6</td> </tr> <tr> <td><math>0.2 &lt; d \leq 0.3</math></td> <td>2</td> </tr> <tr> <td><math>0.3 &lt; d</math></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><math>d \leq 0.2</math></td> <td>Disregard</td> </tr> <tr> <td><math>0.2 &lt; d \leq 0.5</math></td> <td>6</td> </tr> <tr> <td><math>0.5 &lt; d \leq 0.7</math></td> <td>2</td> </tr> <tr> <td><math>0.7 &lt; d</math></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																						
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2	Bubbles Polarizer	<table border="1"> <thead> <tr> <th>Size:d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td><math>d \leq 0.3</math></td> <td>Disregard</td> </tr> <tr> <td><math>0.3 &lt; d \leq 1.0</math></td> <td>3</td> </tr> <tr> <td><math>1.0 &lt; d \leq 1.5</math></td> <td>1</td> </tr> <tr> <td><math>1.5 &lt; d</math></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																				



## 10. Reliability

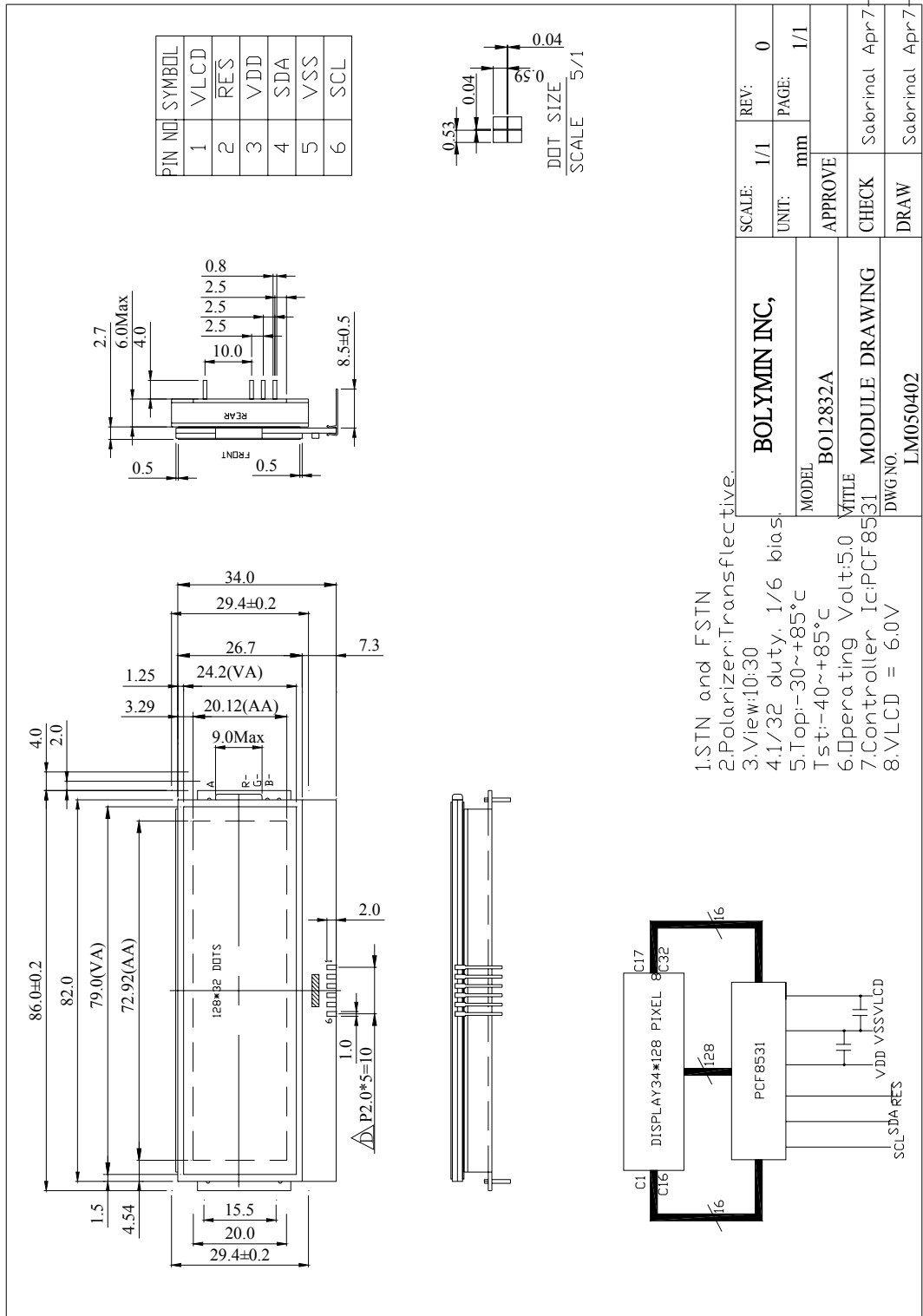
### ■ Content of Reliability Test

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.	70°C 200hrs	—
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30°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.	60°C 200hrs	—
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°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	<p>Endurance test applying the low and high temperature cycle.</p> <p style="text-align: center;"> <math>\xleftarrow{\hspace{1.5cm}}</math> <span style="margin: 0 0.5em;">-10°C</span> <span style="margin: 0 0.5em;">25°C</span> <span style="margin: 0 0.5em;">60°C</span> <math>\xrightarrow{\hspace{1.5cm}}</math> </p> <p style="text-align: center;"> <span style="margin: 0 0.5em;">30min</span> <span style="margin: 0 0.5em;">5min</span> <span style="margin: 0 0.5em;">30min</span> </p> <p style="text-align: center;">1 cycle</p>	-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 vo



11.1 Outline Dimension



Bolymin, Inc.



## 11.2 Controller IC spec.

Reference to PCF8548 spec.