



*Classic LCDs & LEDs*

# LCD MODULE SPECIFICATION

## ITEM CODE

# FG24064B00-FSWFBW-51YN

SPECIFICATION ESTABLISHED DATE: 2016.11.17



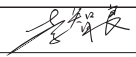
ISSUED BY: 邱林生 CHECKED BY: 邱林生 APPROVED BY: 邱林生

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**AMENDMENT RECORD**

<b>MARK</b>	<b>DATE</b>	<b>DESCRIPTION</b>	<b>ITEM</b>	<b>PAGE</b>	<b>APPROVED</b>
1	2016.11	INITIAL ISSUED	ALL	ALL	



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2. The ISO9001 logo used in this document is authorized by SGS (www.sgs.com). FORDATA had already successfully passed the strict and professional ISO9001:2000 Quality Management System Certification and got the certificate. (No.: CN07/00404)
3. The technologies/techniques/crafts which denoted by the following icons are not exclusively owned by FORDATA but also shared by FORDATA's LCD strategic cooperators, however all these technologies/techniques/crafts have been finally confirmed by FORDATA's professional engineers and QC department.
4. As the difference in test standard and test conditions, also FORDATA's insufficient familiarity with the actual LCD using environment, all the referred information in this DATASHEET (including the icons) only have two functions:
  - 4.1: providing quick reference when you are judging whether or not the product meets your requirements.
  - 4.2: listing out definitely the tolerance.

**FORDATA declares seriously:** you should first test the corresponding sample(s) before signing the formal FORDATA SAMPLE APPROVAL document rather than consider this DATASHEET as the standard for judging whether or not the LCD meets your requirements. Once you instruct FORDATA to a mass-production without definite demand for providing sample before, FORDATA will disclaim all responsibility if the mass-production is proved not meeting with your requirements.
5. The sequence of the icons is random and doesn't indicate the importance grade.

6. Icons explanation



FORDATA is an integrated manufacturer of flat panel display (FPD). All above listed icons and words compses FORDATA's logo.  
 From 2000, FORDATA supplies LCD module  
 From 2006, FORDATA supplies TN, HTN, STN, FSTN monochrome LCD panel  
 From 2012, FORDATA supplies all kinds of LED backlight.



**FAST RESPONSE TIME**  
 This icon on the cover indicates the product is with high response speed; Otherwise not.



**PROTECTION CIRCUIT**  
 This icon on the cover indicates the product is with protection circuit; Otherwise not.



**HIGH CONTRAST**  
 This icon on the cover indicates the product is with high contrast; Otherwise not.



**LONG LIFE VERSION**  
 This icon on the cover indicates the product is long life version (over 9K hours guaranteed); Otherwise not.



**WIDE VIEWING SCOPE**  
 This icon on the cover indicates the product is with wide viewing scope; Otherwise not.



**Anti UV VERSION**  
 This icon on the cover indicates the product is against UV line. Otherwise not.



**RoHS COMPLIANCE**  
 This icon on the cover indicates the product meets ROHS requirements; Otherwise not.



**EASY OPERATION TEMPERATURE**  
 This icon on the cover indicates the product can have good contrast on one driving voltage in indicated operation temperature range .



**3TIMES 100% QC EXAMINATION**  
 This icon on the cover indicates the product has passed FORDATA's thrice 100% QC. Otherwise not.



**TWICE SELECTION OF LED MATERIALS**  
 This icon on the cover indicates the LED had passed FORDATA's twice strict selection which promises the product's identical color and brightness; Otherwise not.



**V<sub>lcm</sub> = 3.0V**  
 This icon on the cover indicates the product can work at 3.0V exactly; otherwise not.



**N SERIES TECHNOLOGY (2008 developed)**  
 FORDATA adopts new structure, new craft, new technology and new materials inside both LCD module and LCD panel to improve the "RainBow"



1	2	3	4	5	6	—	7	8	9	10	11	12	—	13	14	15	16
F	C	08	01	A	23	—	F	H	Y	Y	B	W	—	5	2	L	E

No.	REMARKS	DESCRIPTION				
1	COMPANY ABBRAVIATION	F = FORDATA				
2	STANDARD MODULE TYPE	C = Character type standard LCD module (COB version) G = Graphic type standard LCD module (COB version)				
3	Character (FC series)	08, 10, 12, 16, 20, 24, 40, = Character number Per line				
	Graphic (FG series)	80, 100, 120, 122, 128, 160 ... .. = Row Dots Quantity				
4	Character (FC series)	01, 02, 04, = Character Lines				
	Graphic (FG series)	32, 64, 80, 128, 160 ... .. =Column Dots Quantity				
5	Serial Number	A~Z which is decided by the sizes of viewing area				
6	Identifying Code	00~99 which is decided by all the other aspects for the same viewing area				
7	Polarizer type	R = Positive Reflective M = Positive Transmissive B = Super Black technology <i>New!</i> F = Positive Transflective N = Negative Transmissive				
8	Backlight type	N = No Backlight S = Edge Type LED Backlight (Standard version) H = Edge Type LED Backlight (Long life span version) <i>New!</i> E = EL backlight without Invertor C = CCFL backlight without Invertor L = Array Type LED Backlight F = EL backlight with Invertor T = CCFL backlight with Invertor				
9	Backlight color	N = No Backlight R = Red B = Blue Y = Yellow-Green A = Amber G = Green W = White C = Blue-Green Q = RedGreenBlue three color <i>New!</i>				
10	LCD panel type	T = TN G = Gray STN H = HTN B = Blue STN Y = Yellow-Green STN F = FSTN				
11	Viewing angle	B = Bottom 6:00 T = Top 12:00 R = Right 3:00 L = Left 9:00				
12	Operation temperature range	S = 0°C ~ 50°C (Single Supply Voltage) W = -20°C ~ 70°C (Single Supply Voltage) T = -30°C ~ 80°C (Single Supply Voltage) D = 0°C ~ 50°C (Dual Supply Voltage) H = -20°C ~ 70°C (Dual Supply Voltage) E = -30°C ~ 80°C (Dual Supply Voltage)				
13	Driving Voltage Code (This code was updated from 2015-JAN-1ST)		Vlcm = 3.0V	Vlcm = 3.3V	Vlcm = 3.6V	Vlcm = 5.0V
		Vled = Indicated Voltage*	P	R	X	Q
		Vled = 4.2V	M	G	D	K
		Vled = 3.0V	9	A	3	4
		Vled = 3.3V	T	B	K	F
		Vled = 5.0V	8	C	2	5
	NO/EL/CCFL	1	H	7	6	
14	Backlight Connect Method	0 = PIN1 LED-, PIN2 LED+ 1 = PIN15(17/19) LED+, PIN16(18/20) LED- 2 = PIN15(17/19) LED-, PIN16(18/20) LED+ 3 = PIN15(17/19) LED+, PIN16(18/20) NC 4 = PIN15(17/19) NC, PIN16(18/20) LED+ 5 = PINA LED+, PINK LED- 6 = No / EL / CCFL Backlight				
15	IC Manufacturer Code	A~Z or 01~99 which is decided by different IC manufacturers				
16	Font Set	A~Z or 01~99 which is decided by different font maps				

Please refer INDICATED VOLTAGE of LED in Page4 and Page5.



## FEATURES

AVAILABLE OPTIONS	CHARACTERISTICS	CODE	No.
DISPLAY FORMAT	240 Characters by 64 Lines	FG24064B00	1~6
POLARIZER OPTIONS	Positive Transflective	F	7
BACKLIGHT TYPE OPTIONS	Edge Type LED Backlight (Standard version)	S	8
BACKLIGHT COLOR OPTIONS	White color	W	9
LCD PANEL OPTIONS	FSTN	F	10
VIEWING ANGLE OPTIONS	6:00 ( Bottom )	B	11
TEMPERATURE RANGE OPTIONS	-20°C ~ 70°C, Single Supply Voltage	W	12
SUGGESTED DRIVING VOLTAGE	V <sub>lcm</sub> = 5.0V V <sub>led</sub> = 5.0V	5	13
SUGGESTED LED DRIVING MODE	PIN21: LED+, PIN22:LED-	1	14
CONTROLLER ▲1	RA6963(RAIO)+NT7086	Y	15
FONT MAP CODE	NO FONT SET	N	16
DRIVING DUTY	1/64	—	—
DRIVING BIAS	1/9	—	—

▲1 Please ask for datasheet of the mentioned controller from FORDATA or FORDATA's authorized distributors. You can find the related information including AC & DC characteristics, Write & Read Timing diagram, Instruction table and descriptions, DDRAM & CGRAM, Rest Function and so on from the datasheet of controller.

▲1 You can ask for the example of software program (C language) from FORDATA or FORDATA's authorized distributors.


## MECHANICAL SPECIFICATIONS

OVERALL SIZE	180.0W x 65.0H	mm	THICKNESS	max 16.0	mm
VIEWING AREA	132.0W x 39.0H	mm	HOLE-HOLE	176.0W x 54.0H	mm
CHARACTER SIZE	-----	mm	CHARACTER PITCH	-----	mm
DOT SIZE	0.49W x 0.49H	mm	DOT PITCH	0.04W x 0.04H	mm

## ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
POWER SUPPLY ( LOGIC)	V <sub>dd</sub>	25°C	-0.3	—	7.0	V
POWER SUPPLY (LCD)	V <sub>0</sub>	25°C	V <sub>dd</sub> -30	—	V <sub>dd</sub> +0.3	V
INPUT VOLTAGE	V <sub>in</sub>	25°C	-0.3	—	V <sub>dd</sub> +0.3	V
OPERATING TEMPERATURE	V <sub>opr</sub>	—	-20	—	70	°C
STORAGE TEMPERATURE	V <sub>stg</sub>	—	-30	—	80	°C

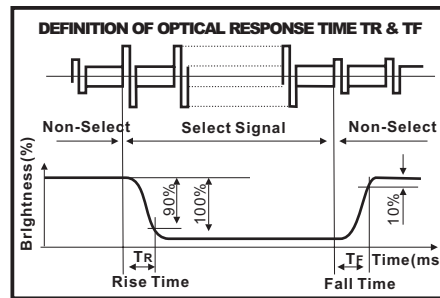
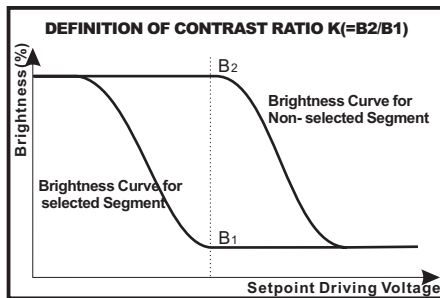
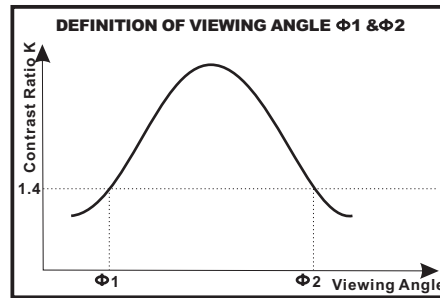
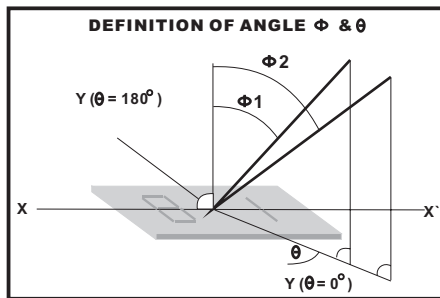
## ELECTRONIC CHARACTERISTICS \*

ICONS	ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
	INPUT VOLTAGE	V <sub>lcm</sub> = V <sub>dd</sub>	+5.0	4.7	5.0	5.5	V
	SUPPLY CURRENT	I <sub>dd</sub>	V <sub>dd</sub> =5V	—	8.0	—	mA
	DRIVING VOLTAGE FOR LCD PANEL	V <sub>lcd</sub> = (V <sub>dd</sub> - V <sub>0</sub> )	-20°C	11.30	—	11.70	V
			0°C	—	—	—	
			25°C	11.25	11.40	11.70	
			50°C	—	—	—	
			70°C	11.20	—	11.80	

\* All data are recorded from TEST REPORT #FSYP027800095

LCD CHARACTERISTICS

FOR STN/FSTN TYPE LCD Panel (TA=25 °C, Vlcd=5.0V ± 0.5V)							
ICONS	ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
	VIEWING ANGLE	$\Phi 2 - \Phi 1$	K=4	40	—	—	deg
		$\theta$		60			
	CONTRAST RATIO	K	—	6	—	—	—
	RESPONSE TIME(RISE)	TR	—	—	150	250	ms
	RESPONSE TIME(FALL)	TF	—	—	150	250	ms



LED CHARACTERISTICS

ICONS	ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
	LED FORWARD VOLTAGE	Vf	25°C If = 2*30mA	—	5.0	—	V
	LED FORWARD CURRENT ▲2	If	25°C	—	2*30	—	mA
	LED REVERSE CURRENT	Ir	25°C Vr=5.0V	—	—	40	μA
	LED COLOR RANGE	X coordinate	25°C If = 2*30mA	0.26	—	0.30	—
		Y coordinate		0.27	—	0.31	—
	LED BRIGHTNESS (WITHOUT LCD)	Lv	25°C If = 2*30mA	—	400	—	cd/m <sup>2</sup>
	LED BRIGHTNESS UNIFORMITY	Lvmin/Lvmax	25°C If = 2*30mA	70	—	—	Ratio
LED LIFE TIME ▲3	—	25°C If = 2*30mA	9K	—	—	Hours	

▲2 请注意, 驱动背光考虑的是恒流而不是恒压. 所以, 这个数值非常重要!  
 YOUR ATTENTION: It is constant current (not constant voltage) that should be applied when driving LED backlight. Therefore, this data is very important!

\* 当工作温度高于25°C时, Ifm, Ifp和Pd必须降低; 电流降低率是 -0.36\*4mA/°C (直流驱动), 或-0.86\*4mA/°C (脉冲驱动), 功率降低率是-75\*4mW/°C. 产品工作电流不能大于对应的工作条件温度Ifm或Ifpr的60%.  
 For operation above 25°C, The Ifm Ifp & Pd must be derated, the Current derating is -0.36\*4mA/°C for DC drive and -0.86\*4 mA/°C for Pulse drive, the power dissipation is -75\*4 mW/°C The product working current must not be more than 60% of the Ifm or Ifp according to the working temperature.

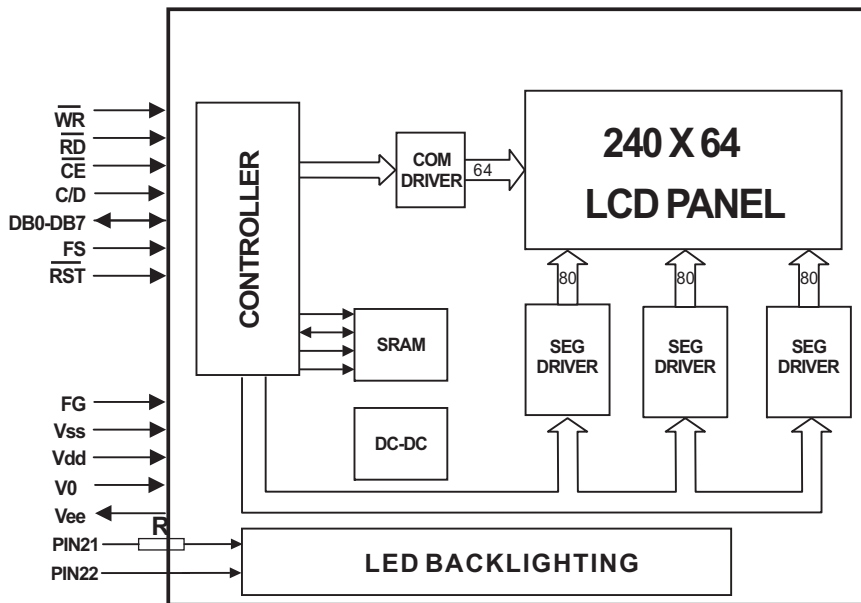
▲3 如果您需要让背光连续不间断工作超过8小时, 那么不建议您采用这款背光. 福德电子可以提供您长寿背光的解决方案.  
 If you want to drive the LED Backlight uninterruptedly over 8hours, this version is not suggested.  
 Please consult long life design solution from FORDATA or FORDATA's authorized distributors.



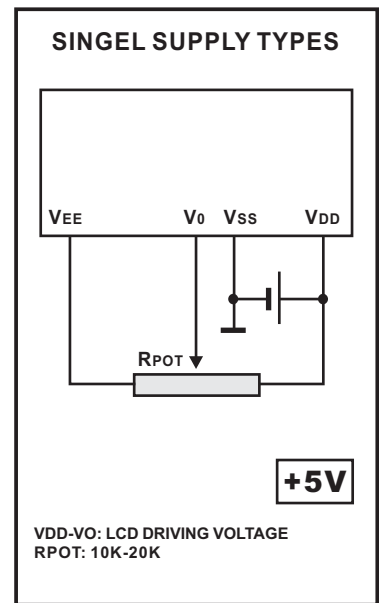
**PIN ASSIGNMENT**

PIN NO.	SYMBOL	FUNCTION	REMARK
1	FG	Module Frame Ground	
2	Vss	Power Supply	0V
3	Vdd		+5V
4	V0		Contrast adjustment
5	WR	Data Write	
6	RD	Data Read	
7	CE	Chip Enable	
8	C/D	Command/Data Select	
9	Vee	Operating voltage for LCD	-10.0V
10	RST	Reset Signal	
11	DB0	Data Bit 0	
12	DB1	Data Bit 1	
13	DB2	Data Bit 2	
14	DB3	Data Bit 3	
15	DB4	Data Bit 4	
16	DB5	Data Bit 5	
17	DB6	Data Bit 6	
18	DB7	Data Bit 7	
19	FS	Font Selection	
20	NC	No connection	
21	LED+	Power supply for BKL	5.0V
22	LED-	Power supply for BKL	0V

**BLOCK DIAGRAM**



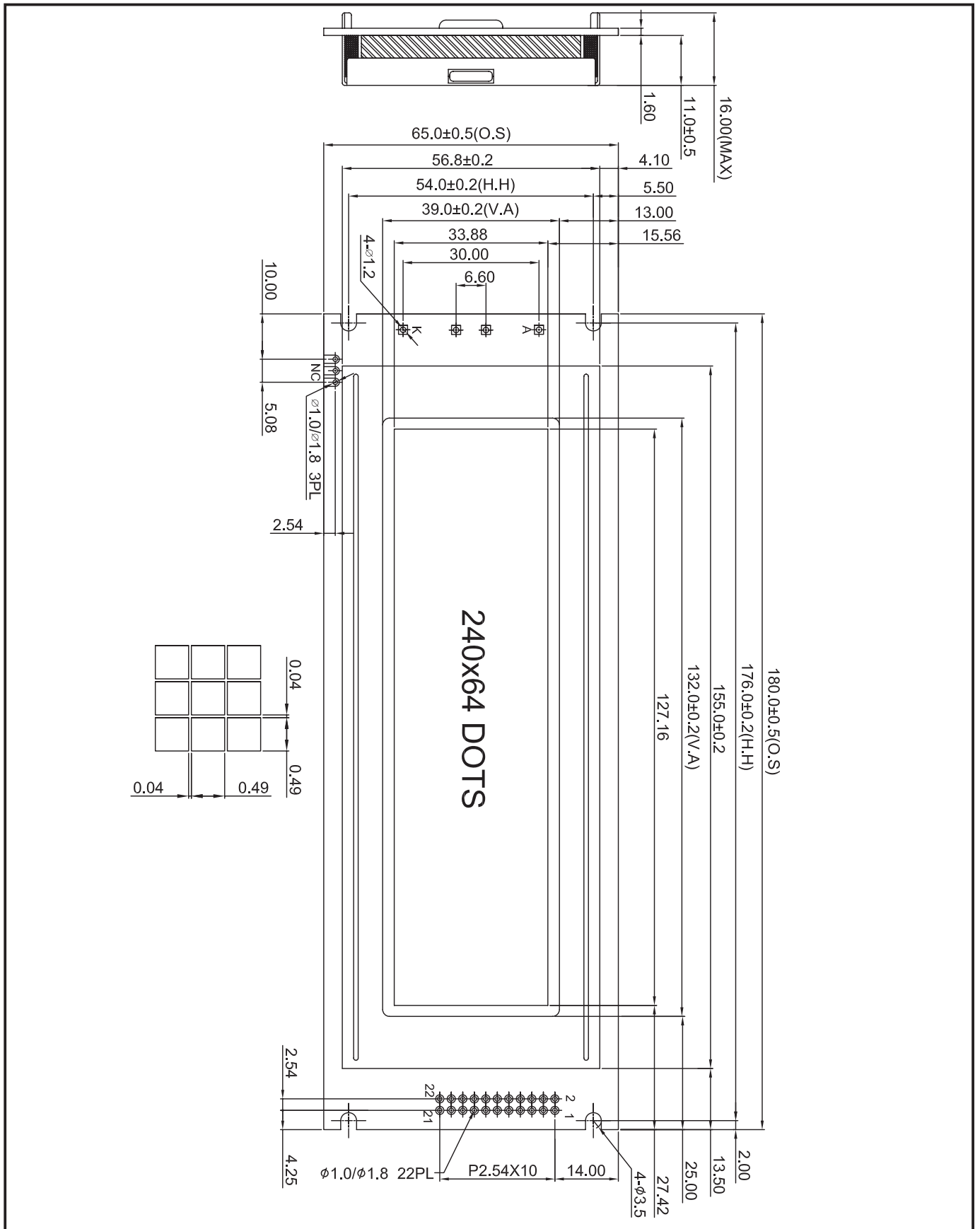
**POWER SUPPLY DIAGRAM**



ROM Code 0101

MSB \ LSB	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]
1	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]
2	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]
3	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]
4	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]
5	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]
6	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]
7	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]	[Pattern]





FULL-SIZED PACKAGE
12 PCS/BOX
8 BOXES/CARTON
96 PCS/CARTON
18.00 KGS/CTN(G.W.)
0.054 M <sup>3</sup> /CARTON

HALF-SIZED PACKAGE
12 PCS/BOX
4 BOXES/CARTON
48 PCS/CARTON
9 KGS/CTN(G.W.)
0.027 M <sup>3</sup> /CARTON

PACKING DECLARATION
1. This packaging information is for reference only. The actual information is subject to the actual packaging. Especially for packaging of LCL, tolerances may exist.
2. FORDATA will not be responsible for quality problems caused by unnormal transportation conditions (including but not limited to climate factors or human factors, such as improper handling).



BOX 

CARTON 

