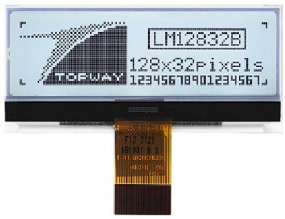


Topway Display LM12832BCW-A 128×32 Graphic Display Module User Manual

Contents

Topway Display LM12832BCW-A 128×32 Graphic Display Module

Product Description:

The LM12832BCW-A is an LCD display module that has a FSTN, Positive, Transflective display mode. It has a display color of Dark Gray (*1) when the display data is 1 and Light White (*2) when the display data is 0. The viewing angle is 6H and the driving method is 1/33 duty, 1/6 bias. The module has an outline dimension of 58.0 x 25.5 x 7.8 (mm) excluding FPC terminal.
The module has several terminal functions including GND, /CS1, /RES, A0, SCL, SI, VDD, VSS, NC, V0, XV0, VG, BLA, and BLK. These terminals have varying functions such as power supply, input/output, and no connection. The backlight functions are also available with BLA and BLK as the backlight positive and negative power supply respectively.

Product Usage Instructions

Before using the LM12832BCW-A LCD module, refer to the product manual for basic specifications, absolute maximum ratings, electrical characteristics, function specifications, design and handling precaution.
Connect the module to a power supply by connecting GND to VSS, VDD to a positive power supply, and VSS to a negative power supply of 0V. Connect the backlight functions by connecting BLA to the backlight positive power supply and BLK to the backlight negative power supply.
To enable access to the LCD module using /CS1, set /CS to L. To disable access to the LCD module, set /CS to H. To initialize the module, set /RES to L. To run normally, set /RES to H. To transfer display data, set A0 to H. To transfer control data, set A0 to L.
For optimal display result, fine contrast adjustment function is necessary in the application design. Note that the color tone may slightly change by temperature and driving condition.
Refer to the manual for more information on the terminal functions and block diagram of the module.

Basic Specifications

Display Specifications

1. LCD Display Mode : FSTN, Positive, Transflective
2. Display Color : Display Data = “1” : Dark Gray(*1)
   : Display Data = “0” : Light White (*2)
3. Viewing Angle : 6H
4. Driving Method : 1/33 duty, 1/6 bias

Note:

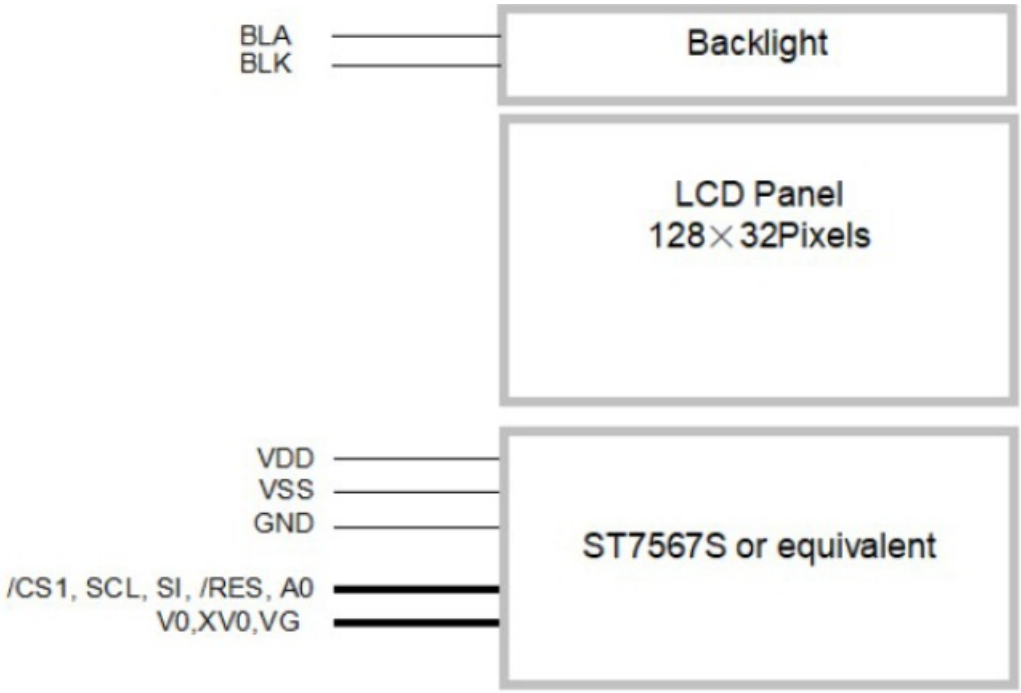
1. Color tone may slightly change by Temperature and Driving Condition.
2. The Color is defined as the inactive / background color

3. Fine Contrast adjustment function is necessary in the application design for optimal display result

Mechanical Specifications

1) Outline Dimension : 58.0 x 25.5 x 7.8 (mm) (exclude FPC terminal)
(See attached Outline Drawing for details)

Block Diagram



Terminal Functions

PIN NO	PIN Name	I/O	Descriptions
1	GND	Supply	Connect to VSS
2	/CS1	Input	Chip Select /CS=L, enable access to the LCD module /CS=H, disable access to the LCD module
3	/RES	Input	Reset signal /RES = L, Initialization is executed /RES = H, Normal running.
4	A0	Input	Register Select A0 = H, Transferring the Display Data A0 = L, Transferring the Control Data
5	SCL	I/O	Serial clock input
6	SI	I/O	Serial data input
7	VDD	Supply	Positive power supply
8	VSS	Supply	Negative power supply,0V
9	NC	—	No connection
10	NC	—	
11	V0	Supply	LCD driving voltage for common circuits at negative frame
12	XV0	Supply	LCD driving voltage for common circuits at positive frame
13	NC	—	No connection
14	NC	—	
15	NC	—	
16	NC	—	
17	NC	—	
18	NC	—	
19	VG	Supply	LCD driving voltage for segment circuits
20	NC	—	No connection
21	NC	—	
22	GND	Supply	Connect to VSS

Backlight Functions

PIN NO	PIN Name	I/O	Descriptions
1	BLA	Supply	Backlight Positive power supply
2	BLK	Supply	Backlight Negative power supply

Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	VDD	-0.3	+4.0	V	VSS = 0V
Input Voltage	VIN	-0.3	VDD+0.3	V	VSS = 0V
Operating Temperature	TOP	-20	+70	°C	No Condensation
Storage Temperature	TST	-30	+80	°C	No Condensation

Cautions:
Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

Electrical Characteristics

DC Characteristics

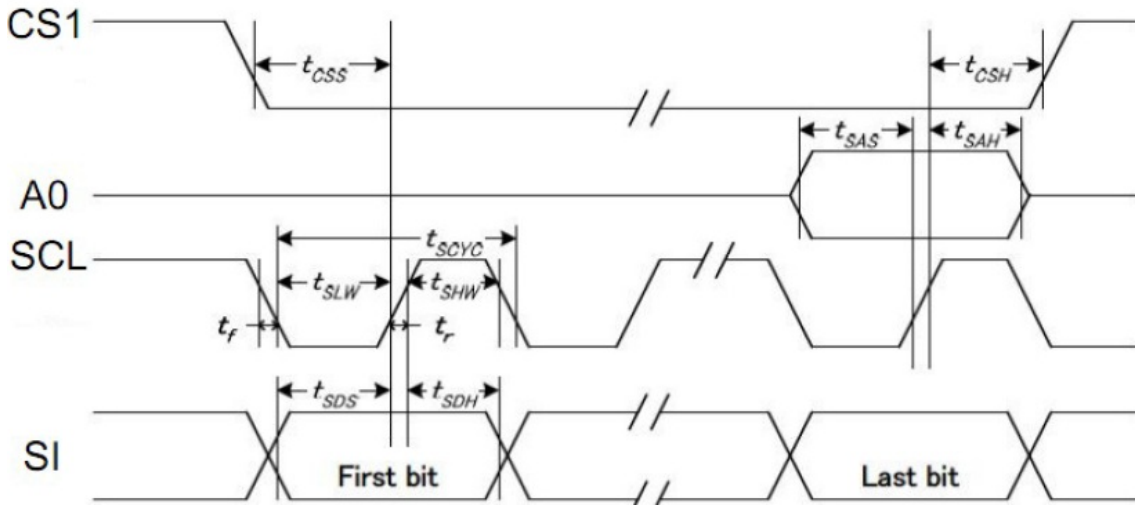
Items	Symbol	MIN.	TYP.	MAX.	Unit	Condition / Application Pin
Operating Voltage	VDD	3.0	3.3	3.6	V	VDD
Input High Voltage	VIH	0.7xVDD	–	VDD	V	/RES, /CS1, A0, SCL, SI
Input Low Voltage	VIL	VSS	–	0.3xVDD	V	
Operating Current	IDD	–	0.2	0.5	mA	VDD

LED Backlight Circuit Characteristics

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Forward Voltage	VfBLA	–	3.3	–	V	BLA
Forward Current	IfBLA	–	45	50	mA	BLA

Cautions:
Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.

AC Characteristics

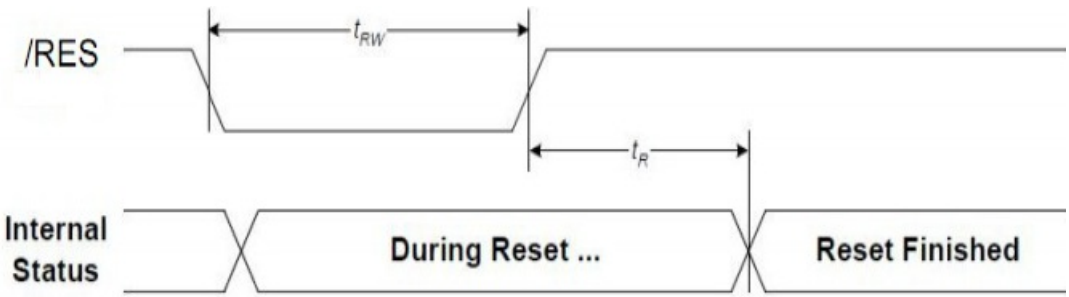


Item	Symbol	MIN.	TYP.	MAX.	Unit
Serial Clock Period	tscyc	50	–	–	ns
Address setup time (A0)	tsas	20	–	–	ns
Address hold time (A0)	tsah	10	–	–	ns
SCL “H” pulse width	tshw	25	–	–	ns
SCL “L” pulse width	tslw	25	–	–	ns
Data setup time	tsds	20	–	–	ns
Data hold time	tsdh	10	–	–	ns
CS-SCL time	tcss	20	–	–	ns
CS-SCL time	tcsh	40	–	–	ns

Note:

1. Input signal rise/fall time should be less than 15ns .
2. All timing is using 20% and 80% of VDD as the reference.

Reset Timing



Item	Symbol	MIN.	TYP.	MAX.	Unit
Reset time	tr	–	–	1.0	μs
Reset LOW pulse width	trw	1.0	–	–	μs

Note:

1. All timing is using 20% and 80% of VDD as the reference.

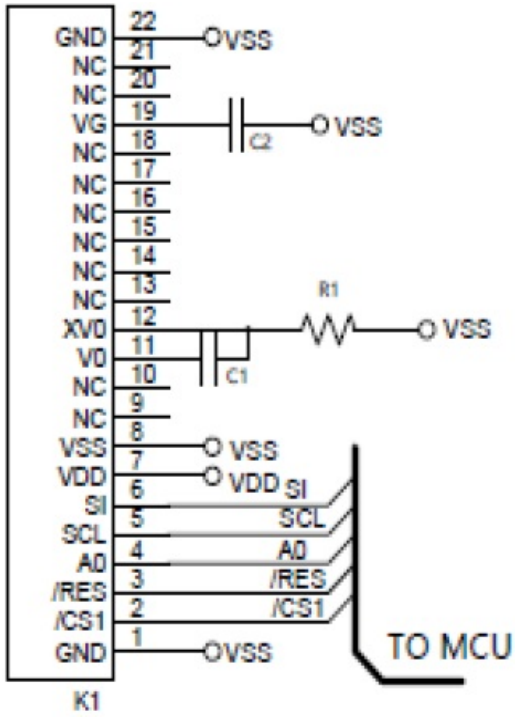
Function specifications

Adjusting the Display Contrast

- This LCD module equipped with latest digital contrast adjustment function.
- Its display contrast could be adjusted by MCU command. (please see the command tables for details)
- It is recommended to provide a contrast adjustment interface for end-user, where the best display result could meet the individual preference in mass production.

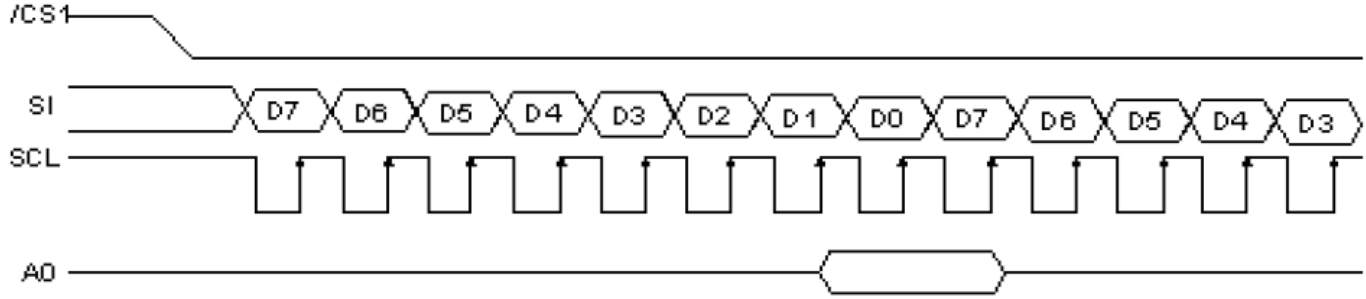
Application circuit(Example)

- 4-Wire SPI mode
- Using internal ref resistor
- C1=0.1uF~1.0uF(25V)
- C2=0.1uF~1.0uF(25V)
- R1=500KΩ~1MΩ



Note:
Please refer to the ST7567S data sheet for details.
The Serial Interface
When the serial interface has been selected then when the chip is in active state the serial data input(SI) and the

serial clock(SCL) can be received. The serial data is read from the serial data input pin in the rising edge of the serial clock . When “A0”=“H”, the data is display data, and when “A0”=“L”, the data is command.



Basic Setting

To drive the LCD module correctly and provide normally display, please use the following setting

- MX = 0 (normal)
- MY select = 1 (reverse)
- LCD Bias Select = 1/6
- Initial Display Line = 0
- Entire Display ON/OFF = OFF (normal)
- Reverse Display ON/OFF = OFF (normal)
- Set Power Control Set:

  voltage follower = ON, voltage converter = ON, voltage regulator = ON
- Display ON/OFF = ON

Note:

1. These setting/commands should issue the LCD module while start up.
2. See the Display Commands section for details.

Resetting the LCD module

The LCD module should be initialized by using /RES terminal.
While turning on the VDD and VSS power supply, maintain /RES terminal at LOW level. After the power supply stabilized, release the reset terminal (/RES=HIGH)

Display Memory Map

Page address	data	LCD Display (front view)
0	D0 : D7	128x32 pixels
1	D0 : D7	
2	D0 : D7	
3	D0 : D7	
Column Address		00h → 7F

Note:

1. MX = 0 (normal)
2. MY Selection = 1 (reverse)

3. Initial Display Line = 0

Display Commands

INSTRUCTION	A0	RD	/WR	COMMAND BYTE								DESCRIPTION
				D7	D6	D5	D4	D3	D2	D1	D0	
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	D	D=1, display ON D=0, display OFF
(2) Set Start Line	0	1	0	0	1	S5	S4	S3	S2	S1	S0	Set display start line
(3) Set Page Address	0	1	0	1	0	1	1	Y3	Y2	Y1	Y0	Set page address
(4)Set Column Address	0	1	0	0	0	0	1	X7	X6	X5	X4	Set column address (MSB)
	0	1	0	0	0	0	0	X3	X2	X1	X0	Set column address (LSB)
(5) Read Status	0	0	1	0	MX	D	RST	0	0	0	0	Read IC Status
(6) Write Data	1	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write display data to RAM
(7) Read Data	1	0	1	D7	D6	D5	D4	D3	D2	D1	D0	Read display data from RAM
(8) SEG Direction	0	1	0	1	0	1	0	0	0	0	MX	Set scan direction of SEG MX=1, reverse direction MX=0, normal direction
(9) Inverse Display	0	1	0	1	0	1	0	0	1	1	INV	INV =1, inverse display INV =0, normal display
(10) All Pixel ON	0	1	0	1	0	1	0	0	1	0	AP	AP=1, set all pixel ON AP =0, normal display
(11) Bias Select	0	1	0	1	0	1	0	0	0	1	BS	Select bias setting 0=1/9; 1=1/7 (at 1/65 duty)
(12) Read-modify-Write	0	1	0	1	1	1	0	0	0	0	0	Column address increment: Read:+0 , Write:+1
(13) END	0	1	0	1	1	1	0	1	1	1	0	Exit Read-modify-Write mode
(14) RESET	0	1	0	1	1	1	0	0	0	1	0	Software reset

(15) COM Direction	0	1	0	1	1	0	0	MY	–	–	–	Set output direction of COM MY=1, reverse direction MY=0, normal direction
(16) Power Control	0	1	0	0	0	1	0	1	VB	VR	VF	Control built-in power circuit ON/OFF
(17) Regulation Ratio	0	1	0	0	0	1	0	0	RP1	RP1	RP0	Select regulation resistor ratio
(18) Set EV	0	1	0	1	0	0	0	0	0	0	1	Double command!! Set electronic volume (EV) level
	0	1	0	0	0	EV5	EV4	EV3	EV2	EV1	EV0	
(19) Set Booster	0	1	0	1	1	1	1	1	0	0	0	Double command!! Set booster level: BL=0: 4X BL=1: 5X
	0	1	0	0	0	0	0	0	0	0	BL	
(20) Power Save	0	1	0	Compound Command								Display OFF + All Pixel ON
(21) NOP	0	1	0	1	1	1	0	0	0	1	1	No operation
(22) SPI Read Status	0	1	1	1	1	1	1	1	1	0	0	SPI read status command
	0	1	1	0	MX	D	RST	ID3	ID2	ID1	ID0	
(23) SPI Read DDRAM	0	1	1	1	1	1	1	1	1	0	1	SPI read DDRAM command
	1	1	1	D7	D6	D5	D4	D3	D2	D1	D0	

Note:

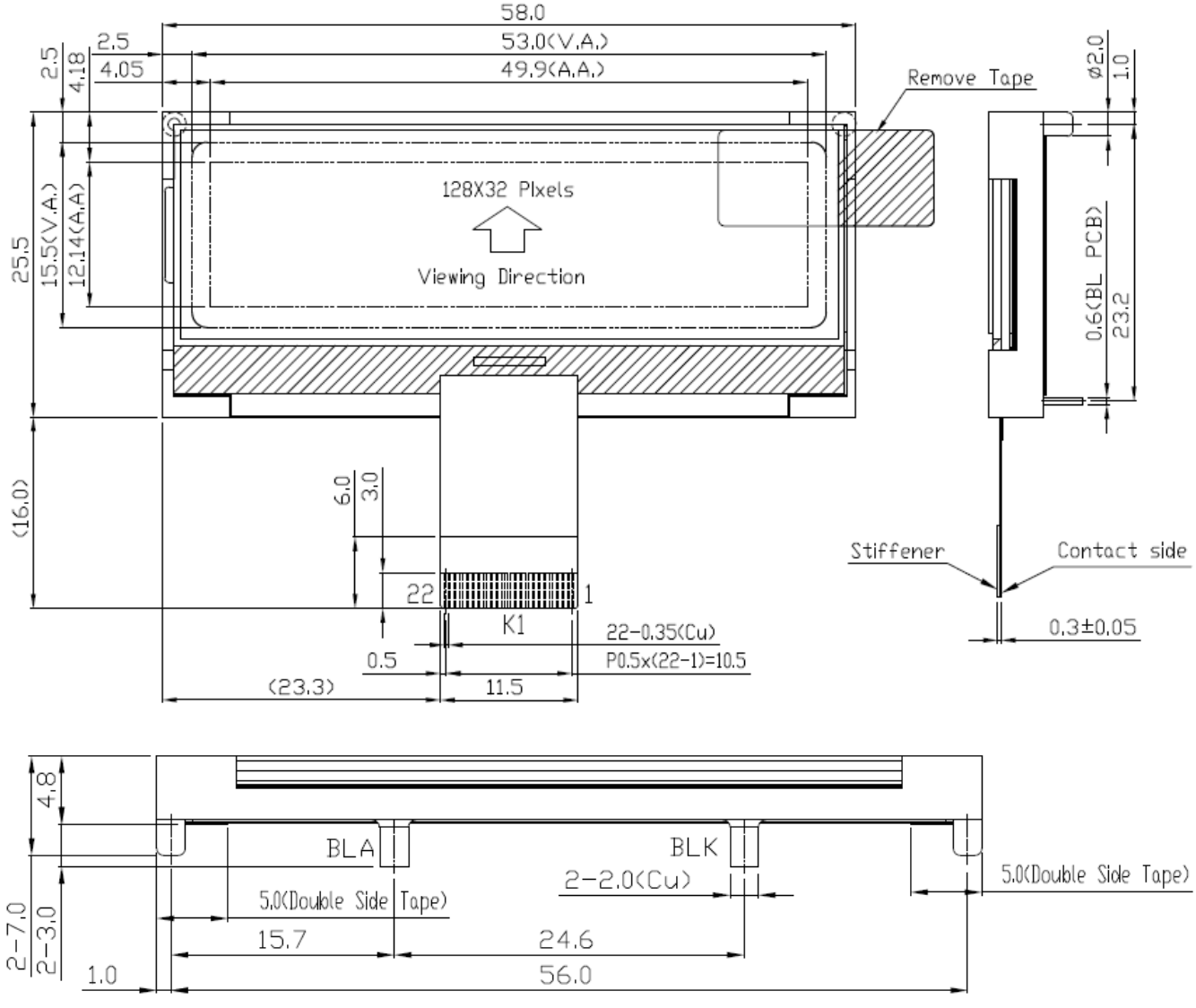
1. Symbol “-” means this bit can be “H” or “L”.
2. For the details of the Display Commands, please refer to ST7567S data sheet.

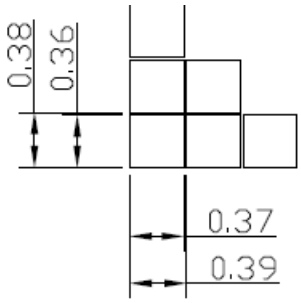
Power off the LCD Module
It recommends that enter Power Save mode before power off the LCD module.
Refreshing The LCD Module
It recommends that the operating modes and display contents be refreshed periodically to prevent the effect of unexpected noise.

Design and Handling Precaution

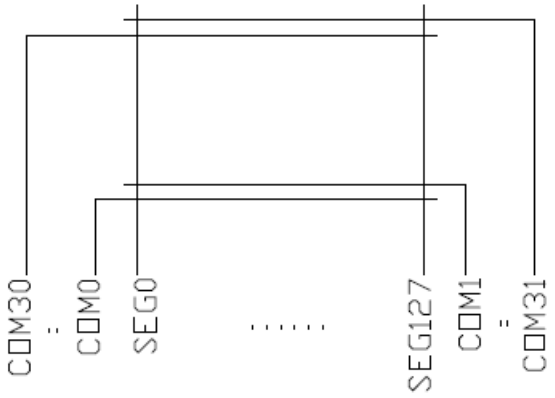
1. The LCD panel is made by glass. Any mechanical shock (eg. dropping form high place) will damage the LCD module.
2. Do not add excessive force on the surface of the display, which may cause the Display color change abnormally.
3. The polarizer on the LCD is easily get scratched. If possible, do not remove the LCD protective film until the last step of installation.
4. Never attempt to disassemble or rework the LCD module.

5. Only Clean the LCD with Isopropyl Alcohol or Ethyl Alcohol. Other solvents (eg. water) may damage the LCD.
6. When mounting the LCD module, make sure that it is free form twisting, warping and distortion.
7. Ensure to provide enough space (with cushion) between case and LCD panel to prevent external force adding on it, or it may cause damage to the LCD or degrade the display result.
8. Only hold the LCD module by its side. Never hold LCD module by add force on the heat seal or TAB.
9. Never add force to component of the LCD module. It may cause invisible damage or degrade of the reliability.
10. LCD module could be easily damaged by static electricity. Be careful to maintain an optimum anti-static work environment to protect the LCD module.
11. When peeling off the protective film from LCD, static charge may cause abnormal display pattern. It is normal and will resume to normal in a short while.
12. Take care and prevent get hurt by the LCD panel sharp edge.
13. Never operate the LCD module exceed the absolute maximum ratings.
14. Keep the signal line as short as possible to prevent noisy signal applying to LCD module.
15. Never apply signal to the LCD module without power supply.
16. IC chip (eg. TAB or COG) is sensitive to the light. Strong lighting environment could possibly cause malfunction. Light sealing structure casing is recommend.
17. LCD module reliability may be reduced by temperature shock.
18. When storing the LCD module, avoid exposure to the direct sunlight, high humidity, high temperature or low temperature. They may damage or degrade the LCD module



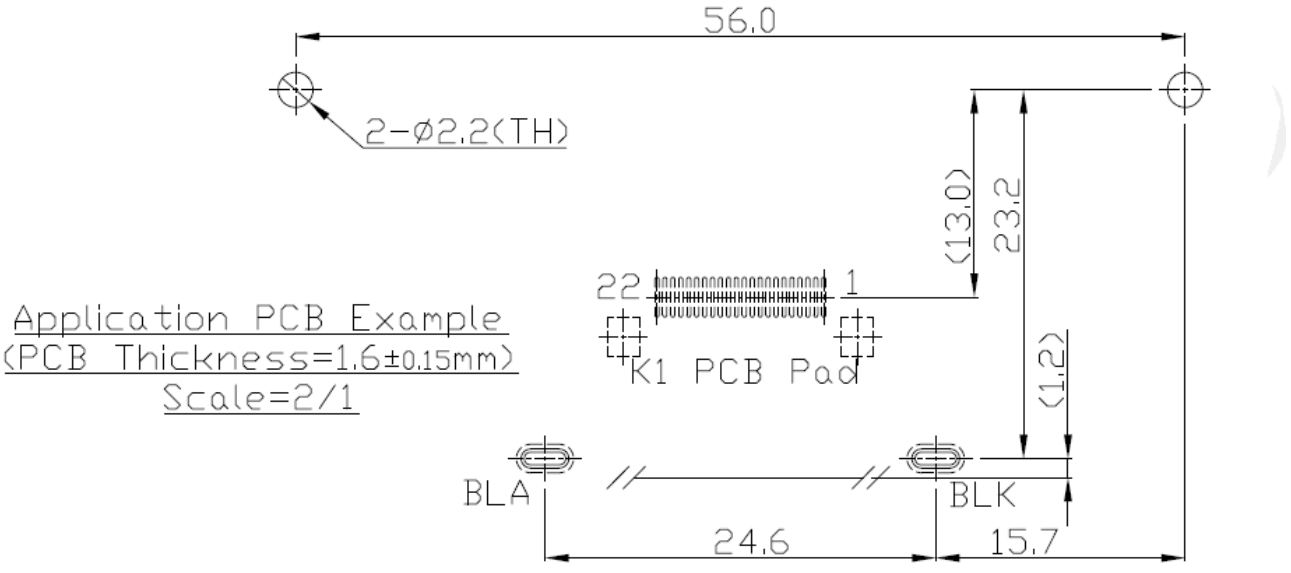


Pixels Details
Scale=20/1

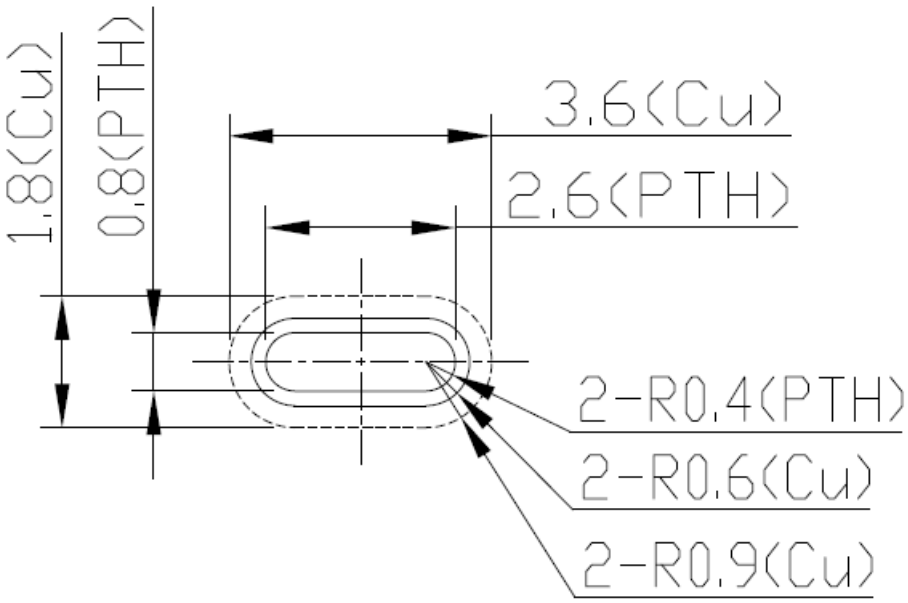


Wiring Details(Top View)
Scale=free

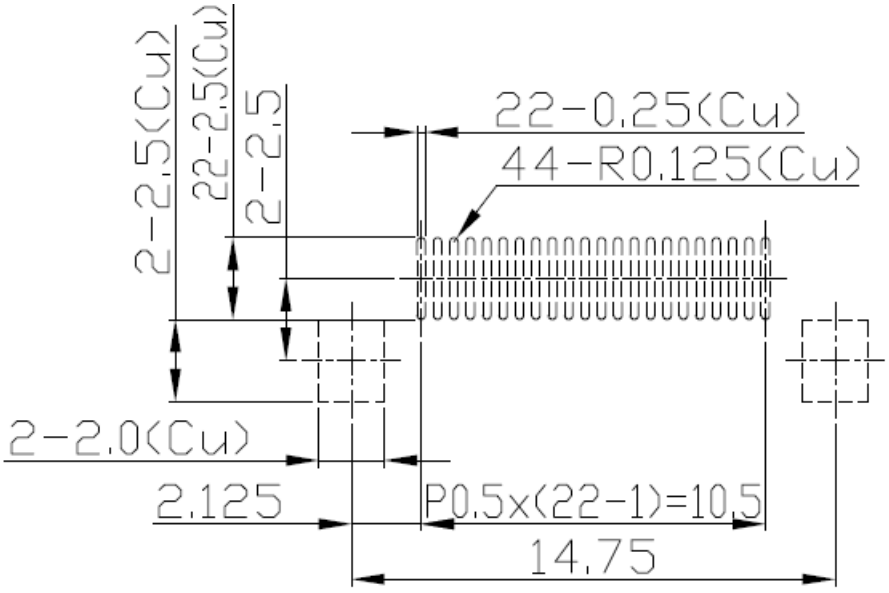
K1 Terminal	
No.	Pin Name
1	GND
2	/CS1
3	/RES
4	A0
5	SCL
6	SI
7	VDD
8	VSS
9	NC
10	NC
11	V0
12	XV0
13	NC
14	NC
15	NC
16	NC
17	NC
18	NC
19	VG
20	NC
21	NC
22	GND



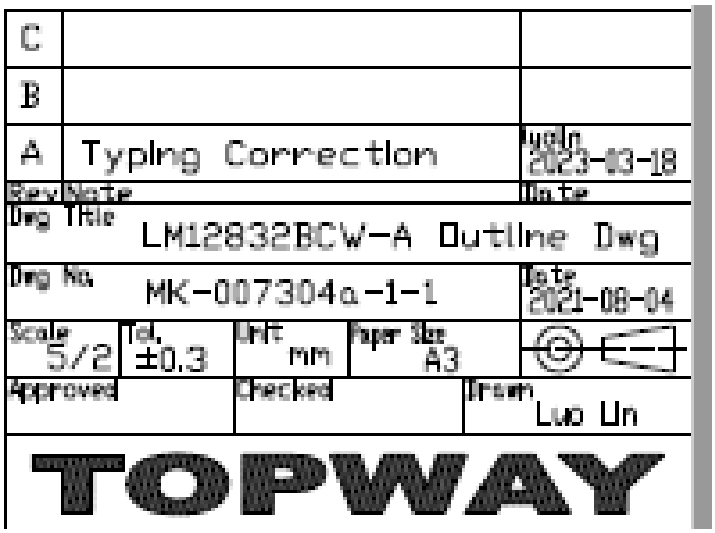
Application PCB Example
(PCB Thickness=1.6±0.15mm)
Scale=2/1



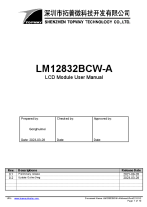
BLA&BLK Details
Scale=5/1



K1 PCB Pad Details
Scale=3/1



Documents / Resources

	Topway Display LM12832BCW-A 128x32 Graphic Display Module [pdf] User Manual LM12832BCW-A 128x32 Graphic Display Module, LM12832BCW-A, 128x32 Graphic Display Module, Graphic Display Module, Display Module

References

- -7 -2.8 - |
- -7 -2.8 - |