



深圳市拓普微科技开发有限公司
SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LM12832KCW

LCD Module User Manual

Prepared by: Li KeKe Date: 2020-07-17	Checked by: Date:	Approved by: Date:
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Rev.	Descriptions	Release Date
0.1	Preliminary release	2020-07-17

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1. Basic Specifications

1.1 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 : 1/32 duty, 1/9 bias

Note:

*1. Color tone may slightly change by Temperature and Driving Condition.

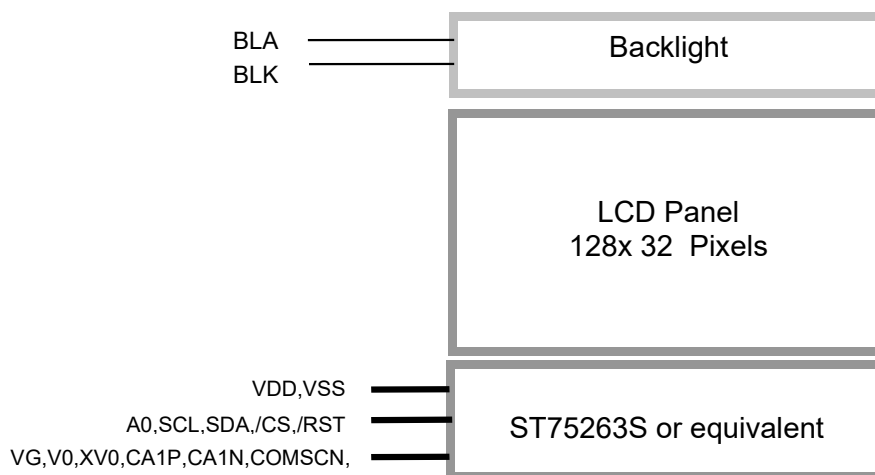
*2. The Color is defined as the inactive / background color

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

1.2 Mechanical Specifications

- 1) Outline Dimension : 46.9x 22.6 x 7.85 MAX
(See attached Outline Drawing for details)

1.3 Block Diagram



1.4 Terminal Functions

PIN NO	PIN Name	I/O	Descriptions
1	BLA	P	Backlight Positive power supply
2	BLK		Negative power for LED backlight
3	VG		VG is the power of SEG-drivers.
4	V0		Positive operating voltage of COM-drivers.
5	XV0		Negative operating voltage of COM-drivers.
6	CA1P	O	DC/DC voltage converter. Connect a capacitor between CA1P and CA1N.
7	CA1N		
8	VDD	P	Positive power supply.
9	VSS		Negative power supply,0V
10	COMSCN	I	Set scan direction of COM. COMSCN= "L" ; COM0--COMX ; COMSCN= "H" ; COMX--COM0; Note: COMX is determined by the DUTY setting.
11	/CS	I	Chip select input pin. /CS= "L" : This chip is selected and the MPU interface is active. /CS= "H" : This chip is not selected and the MPU interface is disabled
12	A0	I	Register Select A0 = H, Transferring the Display Data A0 = L, Transferring the Control Data
13	/RST	I	Reset signal /RST = L, Initialization is executed /RST = H, Normal running.
14	SCL	I	serial input clock (SCL).
15	SDA	I/O	input/output data (SDA).
16	VSS	P	Negative power supply,0V

2. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	V_{DD}	-0.3	+4.0	V	$V_{SS} = 0V$
Input Voltage	V_{IN}	-0.3	+4.0	V	$V_{SS} = 0V$
Operating Temperature	T_{OP}	-40	+70	°C	No Condensation
Storage Temperature	T_{ST}	-40	+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.

3. Electrical Characteristics

3.1 DC Characteristics

$V_{SS}=0V, V_{DD}=3.3V, T_{OP}=25^{\circ}C$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Condition / Application Pin
Operating Voltage	V_{DD}	3.0	3.3	3.6	V	VDD
Input High Voltage	V_{IH}	$0.8 \times V_{DD}$	-	V_{DD}	V	/RST, /CS, A0, SCL, SDA, COMSCN
Input Low Voltage	V_{IL}	V_{SS}	-	$0.2 \times V_{DD}$	V	
Operating Current	I_{DD}	-	0.85	2.1	mA	VDD

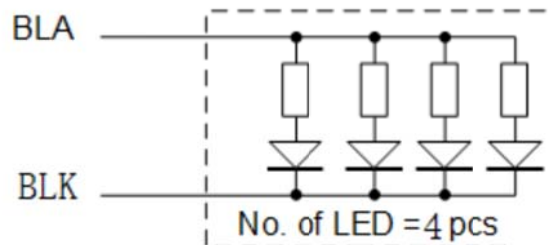
3.2 LED Backlight Circuit Characteristics

$V_{SS}=0V, BLA=3.3V, T_{OP}=25^{\circ}C$

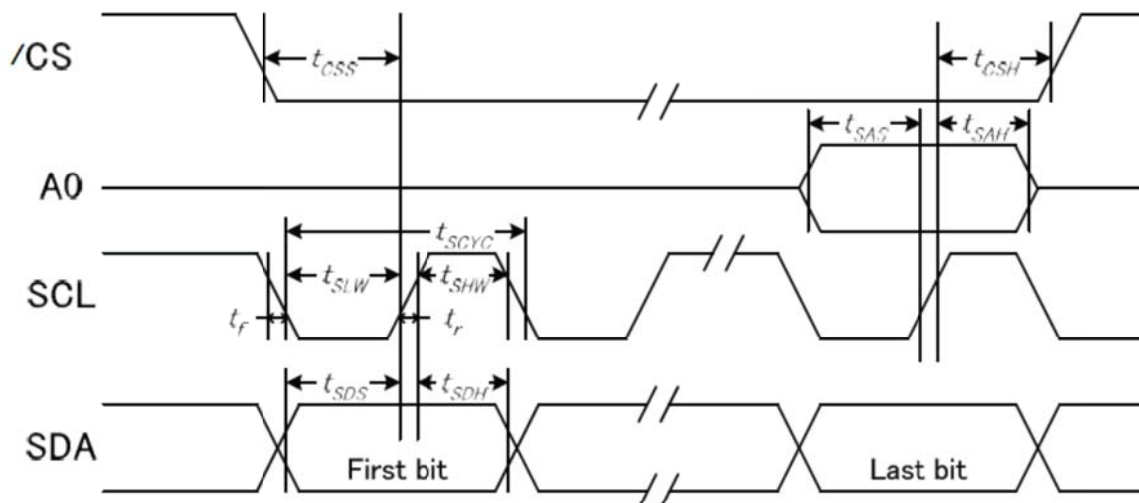
Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Forward Voltage	BLA	-	3.3	-	V	BLA
Forward Current	I_{BLA}	-	40	-	mA	BLA

Cautions:

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



3.3 AC Characteristics



$V_{SS}=0V, V_{DD}=3.3V, T_{OP}=25^{\circ}C$

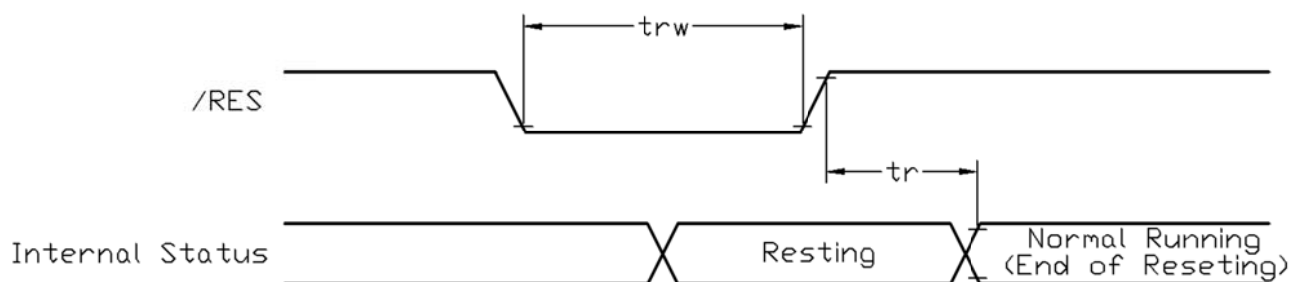
Item	Signal	Symbol	MIN.	TYP.	MAX.	Unit
Serial Clock Period	SCL	tscyc	80	-	-	ns
SCLK "H" pulse width		tSHW	30	-	-	ns
SCLK "L" pulse width		tSLW	30	-	-	ns
Address setup time	A0	tSAS	20	-	-	ns
Address hold time		tSAH	20	-	-	ns
Data setup time	SDA	tsDS	20	-	-	ns
Data hold time		tsDH	20	-	-	ns
/CS-SCL time	/CS	tcss	20	-	-	ns
/CS-SCL time		tcsh	20	-	-	ns
/CS "H" pulse width		tCHW	0			

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.

3.4 Reset Timing



$V_{SS}=0V, V_{DD}=3.3V, T_{OP}=25^{\circ}C$

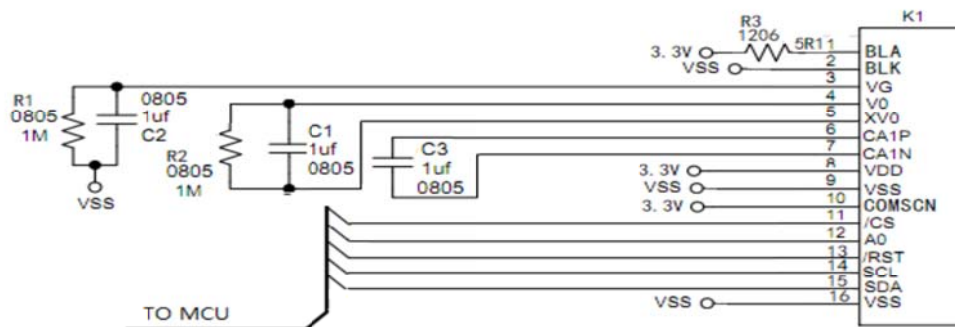
Item	Symbol	MIN.	TYP.	MAX.	Unit
Reset time	tr	-	-	1	ms
Reset LOW pulse width	trw	1	-	-	ms

Note:

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

4. Function specifications

4.1 Application circuit(example)

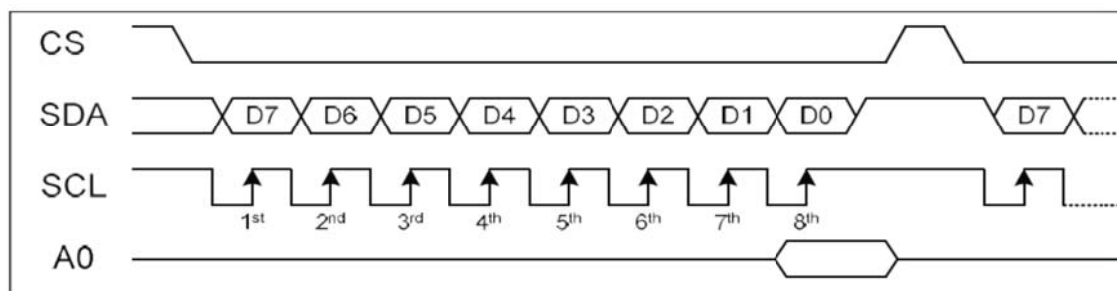


4.2 Adjusting the Display Contrast

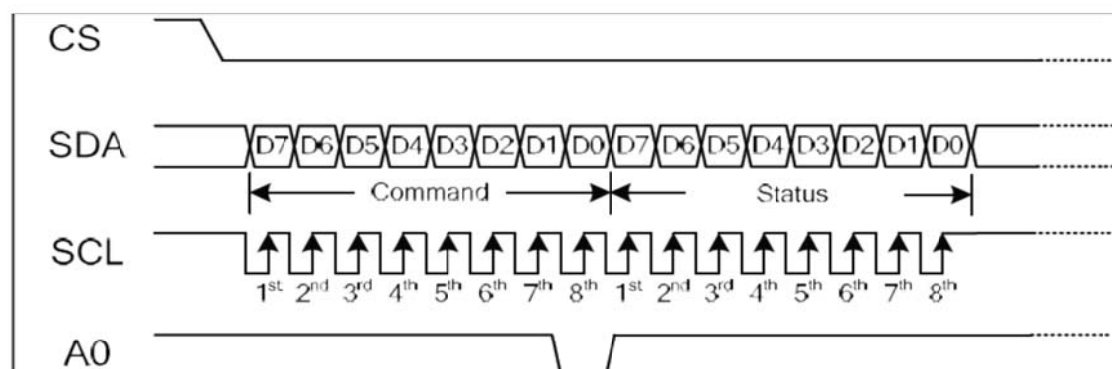
- This LCD module equipped with latest digital contrast adjustment function.
- Its display contrast could be adjusted by MCU command. (please see the command tables for details)
- It is recommended to provide a contrast adjustment interface for end-user, where the best display result could meet the individual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

4.3 The Serial Interface

The display data/command indication is controlled by the register selection pin (A0). The signals transferred on data bus will be display data when A0 is high and will be instruction when A0 is low. Serial data (SDA) is latched at the rising edge of serial clock (SCL). After the 8th serial clock, the serial data will be processed as 8-bit parallel data. The DDRAM column address pointer will be increased by one automatically after each byte of DDRAM access.



After entering the “Read Status” instruction to read IC status, the information is shifted out as shown below. CS signal must be kept at “L” during this period. All read out data will be 8 bits.



4.4 Basic Setting

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

- Set Bias 1/9
- Set Duty 1/32
- MV = 0, MX =0
- AP=0, INV=0 (Normal display)
- Analog SET
- Power control
- Display ON

Note:

*1. These setting/commands should issue the LCD module while start up.

*2. See the Display Commands section for details.

4.5 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)

4.6 Display Memory Map

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

Note:

*1.MV=0

*2.MX=0

*3.COMSCN=1

*4.Initial Display Line=0

4.7 Display Commands

INSTRUCTION	A0	R/W	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
1.Extension Command	0	0	0	0	1	1	EXT1	0	0	EXT0	Set extension instruction
Ext[1:0]=0,0 (Extension Command 1)											
2.Display ON/OFF	0	0	1	0	1	0	1	1	1	DSP	Set LCD display DSP=0: Display off DSP=1: Display on
3.Inverse Display	0	0	1	0	1	0	0	1	1	INV	Set inverse display INV=0: Normal display INV=1: Inverse display
4.All Pixel ON/OFF	0	0	0	0	1	0	0	0	1	AP	Set all pixel on mode AP=0: All pixel off mode AP=1: All pixel on mode
5.Display Control	0	0	1	1	0	0	1	0	1	0	Set display control CLD :Set CL dividing ratio DT[8:0] : Set the number of duty LF[4:0] : Set N-line inversion counter FI : Set the inversion type of frame at the end of common scan cycle
	1	0	0	0	0	0	0	CLD	0	0	
	1	0	0	DT6	DT5	DT4	DT3	DT2	DT1	DT0	
	1	0	0	0	LF4	FI	LF3	LF2	LF1	LF0	
6.Power Save	0	0	1	0	0	1	0	1	0	SLP	Set power save mode SLP=0: Sleep out mode SLP=1: Sleep in mode
7.Set Page Address	0	0	0	1	1	1	0	1	0	1	Set page address Starting page address: 00h ≤ YS ≤ 9h Ending page address: YS ≤ YE ≤ 9h
	1	0	0	0	0	0	YS3	YS2	YS1	YS0	
	1	0	0	0	0	0	YE3	YE2	YE1	YE0	
8.Set Column Address	0	0	0	0	0	1	0	1	0	1	Set column address Starting column address: 00h ≤ XS ≤ CFh Ending column address: XS ≤ XE ≤ CFh
	1	0	XS7	XS6	XS5	XS4	XS3	XS2	XS1	XS0	
	1	0	XE7	XE6	XE5	XE4	XE3	XE2	XE1	XE0	
9.Data Scan Direction	0	0	1	0	1	1	1	1	0	0	Set normal/ inverse display of address and address scan direction
	1	0	0	0	0	0	0	MV	MX	0	
10.Write Data	0	0	0	1	0	1	1	1	0	0	Write data to DDRAM
	1	0	D7	D6	D5	D4	D3	D2	D1	D0	
11.Read Data	0	0	0	1	0	1	1	1	0	1	Read data from DDRAM (Only for parallel interface and I ² C)
	1	1	D7	D6	D5	D4	D3	D2	D1	D0	
12.Partial In	0	0	1	0	1	0	1	0	0	0	Set partial area Starting partial display address: 00h ≤ PTS ≤ 4Fh Ending partial display address: 00h ≤ PTE ≤ 4Fh
	1	0	0	PTS6	PTS5	PTS4	PTS3	PTS2	PTS1	PTS0	
	1	0	0	PTE6	PTE5	PTE4	PTE3	PTE2	PTE1	PTE0	

INSTRUCTION	A0	R/W	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
13. Partial Out	0	0	1	0	1	0	1	0	0	1	Exit the partial mode
14. Read/Modify/Write In	0	0	1	1	1	0	0	0	0	0	Enable read modify write
15. Read/Modify/Write Out	0	0	1	1	1	0	1	1	1	0	Disable read modify write
16. Scroll Area	0	0	1	0	1	0	1	0	1	0	Set scroll area TL[6:0]: Set top line address BL[6:0]: Set bottom line address NSL[6:0]: Number of specified line SCM[1:0]: Area scroll mode
	1	0	0	TL6	TL5	TL4	TL3	TL2	TL1	TL0	
	1	0	0	BL6	BL5	BL4	BL3	BL2	BL1	BL0	
	1	0	0	NSL6	NSL5	NSL4	NSL3	NSL2	NSL1	NSL0	
	1	0	0	0	0	0	0	0	SCM1	SCM0	
17. Set Start Line	0	0	1	0	1	0	1	0	1	1	Set start line address $00h \leq SL \leq 4Fh$
	1	0	0	SL6	SL5	SL4	SL3	SL2	SL1	SL0	
18. Power Control	0	0	0	0	1	0	0	0	0	0	Power circuit operation VB=0: OFF, VB=1: ON VF=0: OFF, VF=1: ON VR=0: OFF, VR=1: ON
	1	0	0	0	0	0	VB	0	VF	VR	
19. Set Vop	0	0	1	0	0	0	0	0	0	1	Set Vop
	1	0	0	0	Vop5	Vop4	Vop3	Vop2	Vop1	Vop0	
	1	0	0	0	0	0	0	Vop8	Vop7	Vop6	
20. Vop Control	0	0	1	1	0	1	0	1	1	VOL	Control Vop VOL=0: Vop increase one step VOL=1: Vop decrease one step
21. Read Register Mode	0	0	0	1	1	1	1	1	0	REG	Set read register mode REG=0: read the register value of Vop[5:0] REG=1: read the register value of Vop[8:8]
22. Nop	0	0	0	0	1	0	0	1	0	1	No operation
23. Read Status (Parallel and I ² C)	0	1	D7	D6	D5	D4	D3	D2	D1	D0	Read status byte (Parallel and I ² C)
24. Read Status (4-Line and 3-Line SPI)	0	0	1	1	1	1	1	1	1	0	Read status byte (4-Line and 3-Line SPI)
	0	1	D7	D6	D5	D4	D3	D2	D1	D0	
25. Data Format Select	0	0	0	0	0	0	1	DO	0	0	DO=0: LSB on bottom (Default) DO=1: LSB on top
26. Set ICON	0	0	0	1	1	1	0	1	1	ICON	Enable/Disable ICON RAM ICON=1: Enable ICON RAM ICON=0: Disable ICON RAM
Ext[1:0]=0,1 (Extension Command 2)											
27. Analog Circuit Set	0	0	0	0	1	1	0	0	1	0	Set analog circuit BE[1:0]: Booster efficiency set BS[2:0]: Set bias ratio
	1	0	0	0	0	0	0	0	0	0	
	1	0	0	0	0	0	0	0	BE1	BE0	

INSTRUCTION	A0	R/W	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
	1	0	0	0	0	0	0	BS2	BS1	BS0	
28.Booster Level	0	0	0	1	0	1	0	0	0	1	Set booster level BST=0 : X8 BST=1 : X10
	1	0	1	1	1	1	1	0	1	BST	
29.Auto Read Control	0	0	1	1	0	1	0	1	1	1	Set auto-read instruction XARD=0: Enable auto read XARD=1: Disable auto read
	1	0	1	0	0	XARD	1	1	1	1	
30.OTP WR/RD Control	0	0	1	1	1	0	0	0	0	0	OTP WR/RD control WR/RD=0: Enable OTP read WR/RD=1: Enable OTP write
	1	0	0	0	WR/RD	0	0	0	0	0	
31.OTP Control Out	0	0	1	1	1	0	0	0	0	1	OTP control out
32.OTP Write	0	0	1	1	1	0	0	0	1	0	OTP write
33.OTP Read	0	0	1	1	1	0	0	0	1	1	OTP read
34.OTP Selection Control	0	0	1	1	1	0	0	1	0	0	OTP selection control Ctrl=1: Disable OTP Selection Ctrl=0: Enable OTP Selection
	1	0	1	Ctrl	0	1	1	0	0	1	
35.OTP Programming Setting	0	0	1	1	1	0	0	1	0	1	OTP programming setting
	1	0	0	0	0	0	1	1	1	1	
36.Frame Rate	0	0	1	1	1	1	0	0	0	0	Frame rate setting in different temperature range
	1	0	0	0	0	FRA4	FRA3	FRA2	FRA1	FRA0	
	1	0	0	0	0	FRB4	FRB3	FRB2	FRB1	FRB0	
	1	0	0	0	0	FRC4	FRC3	FRC2	FRC1	FRC0	
	1	0	0	0	0	FRD4	FRD3	FRD2	FRD1	FRD0	
37.Temperature Range	0	0	1	1	1	1	0	0	1	0	Temperature range setting
	1	0	0	TA6	TA5	TA4	TA3	TA2	TA1	TA0	
	1	0	0	TB6	TB5	TB4	TB3	TB2	TB1	TB0	
	1	0	0	TC6	TC5	TC4	TC3	TC2	TC1	TC0	
38.Temperature Gradient Compensation	0	0	1	1	1	1	0	1	0	0	Set temperature gradient compensation coefficient
	1	0	MT13	MT12	MT11	MT10	MT03	MT02	MT01	MT00	
	1	0	MT33	MT32	MT31	MT30	MT23	MT22	MT21	MT20	
	1	0	MT53	MT52	MT51	MT50	MT43	MT42	MT41	MT40	
	1	0	MT73	MT72	MT71	MT70	MT63	MT62	MT61	MT60	
	1	0	MT93	MT92	MT91	MT90	MT83	MT82	MT81	MT80	
	1	0	MTB3	MTB2	MTB1	MTB0	MTA3	MTA2	MTA1	MTA0	
	1	0	MTD3	MTD2	MTD1	MTD0	MTC3	MTC2	MTC1	MTC0	
	1	0	MTF3	MTF2	MTF1	MTF0	MTE3	MTE2	MTE1	MTE0	
Ext[1:0]=1,1(Extension Command 4)											
39.Enable OTP	0	0	1	1	0	1	0	1	1	0	Enable OTP EOTP =0 ; Disable (Default) EOTP =1 ; Enable
	1	0	0	0	0	EOTP	0	0	0	0	

Note: *1. Do not use any other command not listed, or the system malfunction may result.
*2. For the details of the Display Commands, please refer to ST75263S data sheet.

4.7.1 Power off the LCD Module

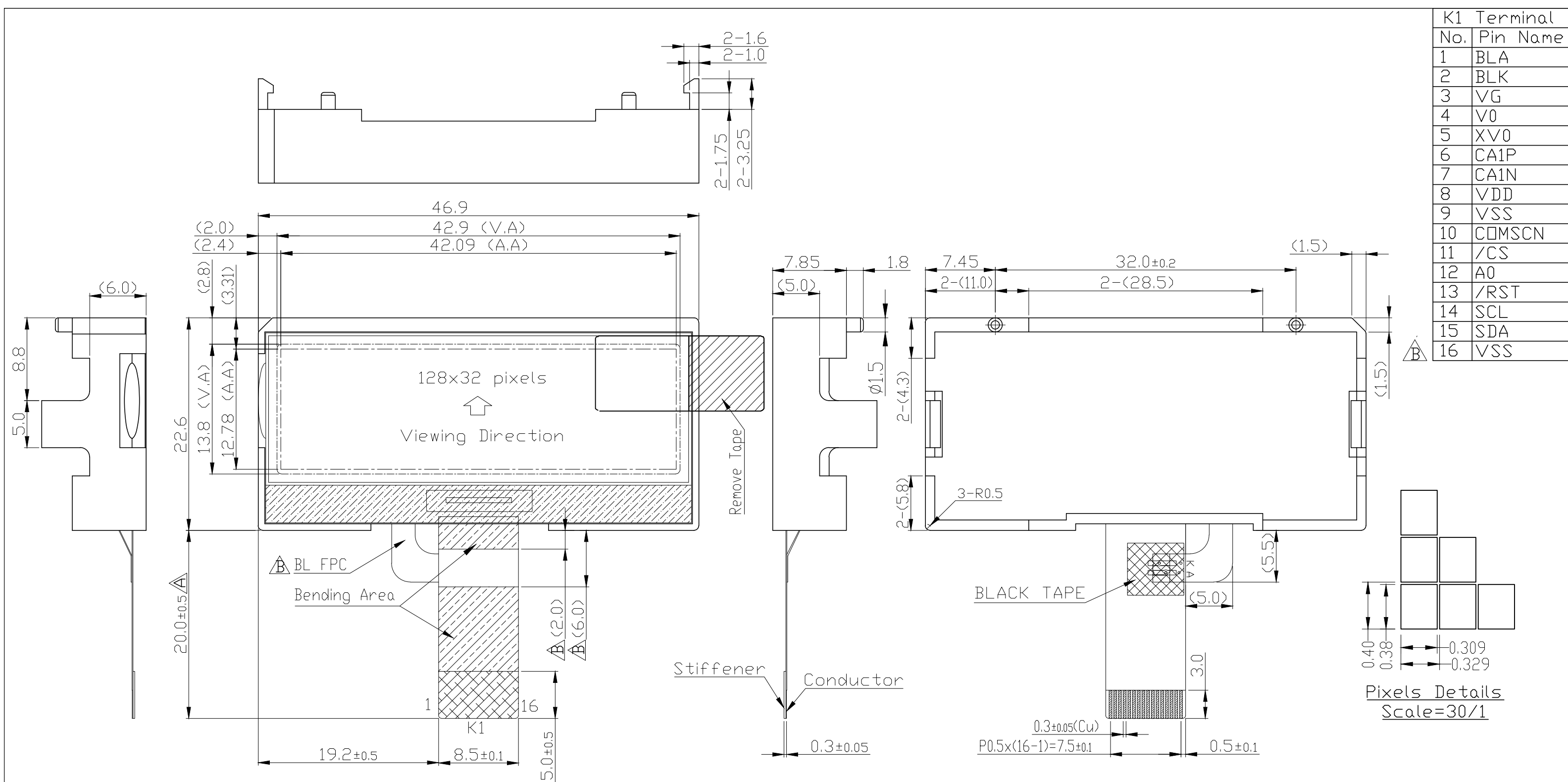
It recommends that enter Power Save mode before power off the LCD module.

4.7.2 Refreshing The LCD Module

It recommends that the operating modes and display contents be refreshed periodically to prevent the effect of unexpected noise.

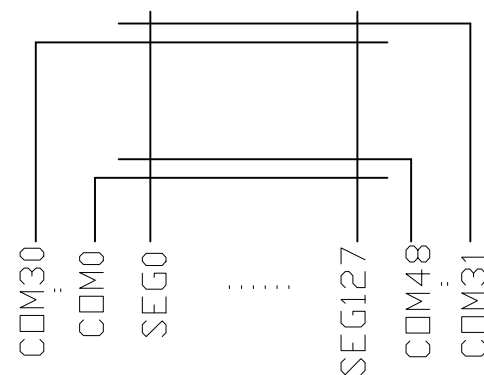
5. Design and Handling Precaution

1. The LCD panel is made by glass. Any mechanical shock (eg. dropping from 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 from 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



Note:

- *1. Display Type : FSTN, Positive, Transflective
- *2. Viewing Direction : 6H
- *3. Duty : 1/32, Bias : 1/9, Vop : 9.0V
- *4. Operating Voltage : 3.3V
- *5. Backlight Supply : 3.3V
- *6. Backlight Color : White
- *8. Recommended Connector : FH19SC-16S-0.5SH(HIROS) Or Equivalent
- *9. Operating Temperature : -40°C~70°C
- *10. Storage Temperature : -40°C~80°C



Wiring Details
(Top View)
Scale=free

C		
B	Typing Correction	Luo Lin 2020-07-21
A	Revise FPC	Luo Lin 2020-06-16
Rev	Note	Date
Dwg	Title	
Dwg No.	MK-006925b-1-1	Date 2020-06-13
Scale	5/2	Tol. ±0.3
Unit	mm	Paper Size A3
Approved	Checked	Drawn Luo Lin
TOPWAY		