

WELL BUYING INDUSTRIAL CO., LTD

APPROVAL SHEET

DESCRIPTION: PUSH BUTTON SWITCH WITH LED

PART NO: PS013-N11BW

CUSTOMER: 玖新	CUSTOMER'S PART NO: _____
CUSTOMER SIGNATURE	COMMENTS



APPROVAL	REVIEW	PREPARE
<i>Kaven</i>	<i>Tereance</i>	<i>Gina</i>

REVISION HISTORY

[illegible]

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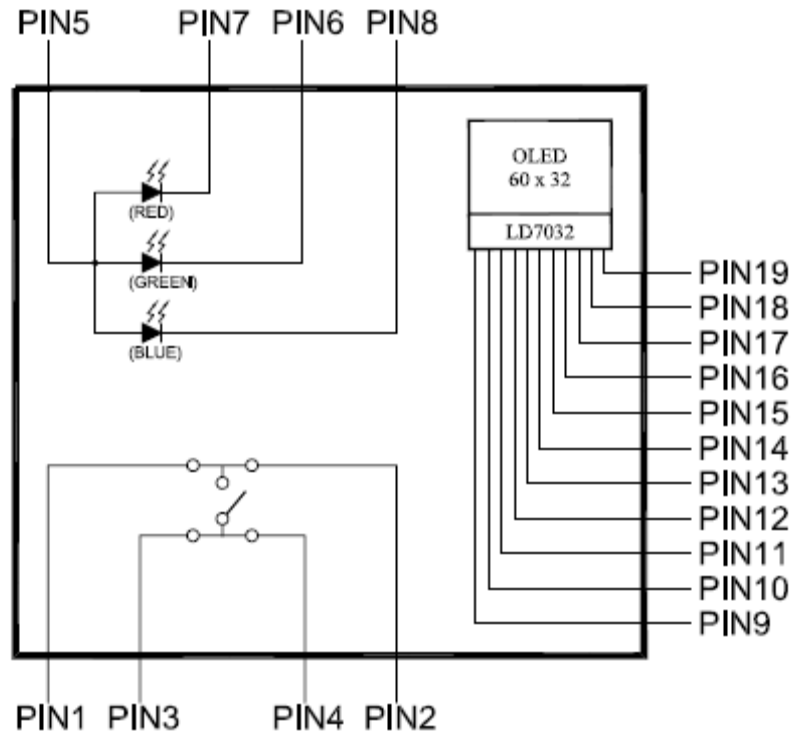
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1. CHARACTERISTICS

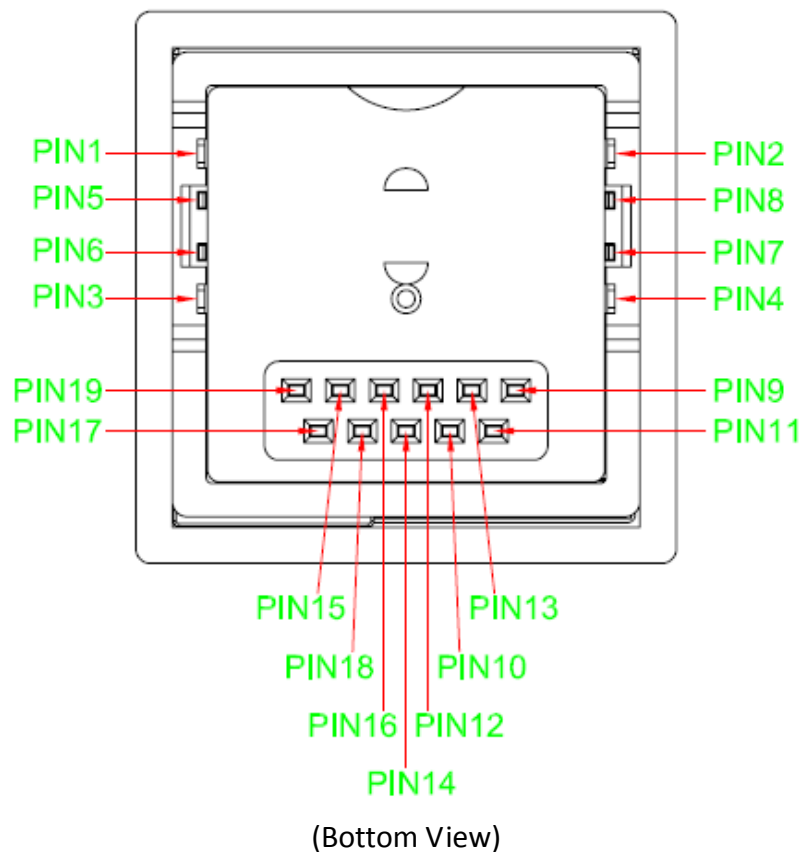
- Programmable pushbutton switch with OLED & RGB-LED
- High resolution of 60 * 32 pixels
- Interface : SPI / I²C
- Low power consumption
- Dust proof design

2. SWITCH BLOCK DIAGRAM & PIN CONFIGURATIONS

2.1. SWITCH SPECIFICATIONS



2.2. PIN STRUCTURE



PIN No.	SYMBOL	NAME	FUNCTION
1.	SW	Switch Pin	Terminal of Switch.
2.	SW	Switch Pin	Terminal of Switch.
3.	SW	Switch Pin	Terminal of Switch.
4.	SW	Switch Pin	Terminal of Switch.
5.	LED C+	LED Common	Full Color LED - Common Anode.
6.	LED G-	LED Green	Full Color LED–Green Cathode.
7.	LED R-	LED Red	Full Color LED–Red Cathode.
8.	LED B-	LED Blue	Full Color LED–Blue Cathode.
9.	IXS	Communication Select	H : I2C(Slave address : 0110000b), L : SPI.
10.	D0(SCL)	Serial Clock	Serial clock input.
11.	D1(SI)	Serial Data	Serial data input.
12.	DC	Data / Command	Switch data or command.
13.	CSB	Slave Control Select	Chip Select (Active Low), When IXS=H, CSB must be Low.
14.	RSTB	Reset	Reset terminal.
15.	VDD	Power	Power supply for analog and digital.
16.	IREF	Reference Current	Resistor terminal for reference current.
17.	VCC	Power	High voltage power supply for driving circuits.
18.	VCC	Power	High voltage power supply for driving circuits.
19.	VSS	Ground	Ground.

3. SPECIFICATIONS

- Pole-Position : 1P1T, Normal-Open
- Rating :
 - Max. : 1mA @ 20VDC or 5mA @ @5VDC
 - Min. : 1mA @ 5VDC
- Operation Temperature : -20°C ~ 75°C
- Storage Temperature : -30°C ~ 85°C

3.1. SWITCH SPECIFICATIONS

- Electrical Performance

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Contact Resistance	DC 5V ; 100 mA By method of voltage drop	200			Ω
Insulation Resistance	DC 100V	100			MΩ
Dielectric Strength	Break down is unallowable	AC 250V(50-60HZ) For 1 minute			
Bounce Time	Lightly strike the center of the stem at a rate 3 ~ 4 operation / second encountered in normal use. Bounce shall be tested at ON and OFF. 	10			mSec

● Mechanical Performance

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Operating Force	Along operational direction, to apply a static load on top of the stem until it stops movement.		160 ± 40		gf
Full Travel	Along operational direction, to apply a static load on top of the stem depress in stem gradually until it stops movement.		1.25 ± 0.3		mm
Robustness of terminal	Any direction, to apply a static load 200gf at top of terminal for 15 second once for a terminal only.	1. Terminal could be bent but loosened terminal or bas frame broken is not allowable. 2. Any damages on switch construction are not allowable. 3. It should meet Electrical Performance .			
Robustness of stem	Along operation direction, to apply a static load 2 Kgf on top of the actuator to apply a static load 2 Kgf for 15 seconds.	In addition to moving contact, any damages on switch, construction are not allowable.			
Solder ability	1. Wave soldering : 260 ± 5 °C in 3 second. 2. Manual soldering : 350 ± 5 °C in 3 second for 15W soldering iron.	Coverage 75% (Min.).			

● Resistance Of Soldering Heat

- Manual Soldering : 320±5°C in 3 seconds
- Wave Soldering : 260±5°C in 3 seconds

● Durability

Operating Life Without Load : 1,000,000 MIN. (SPEED 15 ~ 20 CYCLES/MIN.) :

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Contact Resistance				1K	Ω
Operating Force		Within the range between ±30% of specification			
Insulation Resistance	DC100V	10M			Ω
Dielectric Strength	AC250V	1			minute

● Environmental Performance

Parameter	Test Conditions	CRITERIA
Cold	-20±2 °C For 96 Hours. - Water should be remove before testing. - Standard conditions after test : 1 hour.	- It should meet the requirements of <u>Switch Electrical Performance Stated</u>. <u>Mechanical performance</u> should remain to normal.
Dry Heat	70±2 °C For 96 Hours. - Standard conditions after test : 1 hour.	- Switch should meet <u>Electrical Performance</u>. <u>Mechanical Performance</u> should remain to normal.
Damp Heat	0 ± 2°C · RH 90% ~ 95% For 96 Hours - Water should be remove before testing. - Standard conditions after test : 1 hour.	- Contact resistance : 500mΩ Max. - The insulation resistance should be higher than 10 MΩ. - Dielectric strength should meet <u>Switch Electrical Performance (Dielectric Strength) stated</u>. <u>Mechanical performance</u> should remain to normal.

3.2. OLED ELECTRICAL SPECIFICATIONS

- Characteristics Of Display

Parameter	SPECIFICATION	Unit
Panel Type	OLED	
Dot Matrix	60 x 32	dot
View Area	14.6 x 8.31	mm ²
Color	White	colors
Dot Pitch	0.188 x 0.188	mm ²
OLED Driver IC	LD7032 / LDT	
Interface	Serial(SPI / IIC)	

- Absolute Maximum Ratings ^{*1}

Parameter		Test Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	OLED Driver Power (VCC)	TA=25°C	-0.3		18.0	V
	Logic Power (VDD)		-0.3		3.6	V
	Interface Power (VDD)					V
Input Voltage (VIN)		TA=25°C	-0.3		VDD + 0.3	V
Operation Temperature ^{*2} (Topr)			-20		+75	°C
Storage Temperature (Tstq)			-40		+85	°C

Notice :

*1. Absolute Maximum Rating is the limit value that it must not exceed.

*2. No Condensation.

- Recommended Operating Conditions

Sym.	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
VCC	OLED Driver Power Supply Voltage		12.0	13.0	14.0	V
VDD	Logic Power Supply Interface Power Supply		1.65	2.8	3.5	V
VIH	Input High Level Voltage		0.8 x VDD		VDD	V
VIL	Input Low Level Voltage		0		0.2 x VDD	V

● Current Consumption

Sym.	Parameter	Lighting Pattern		Min.	Typ.	Max.	Unit
ICC	OLED Driver	250 cd/m ²	All Pixels ON		5.2	6.5	mA
	Power Supply	All Pixels OFF			0.9	1.1	
	Current	Stand-by				10	uA
IDD	Logic Power	250 cd/m ²	All Pixels ON		117	145	uA
	Supply Current	All Pixels OFF			117	145	
		Stand-by				10	

3.3. OLED OPTICAL CHARACTERISTICS

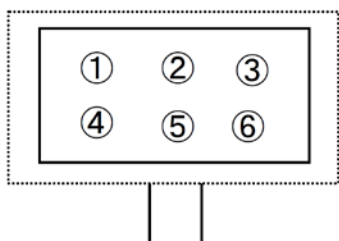
● Luminance / Chromaticity

Parameter	Conditions	Min.	Typ.	Max.	Unit
Luminance	All Pixels ON	200	250		cd / m ²
Chromaticity x	All Pixels ON	0.27	0.32	0.37	
Chromaticity y	All Pixels ON	0.28	0.33	0.38	
Contrast	*1	10,000			
Luminance Distribution	*2			20	%

Notice :

*1. Contrast Ratio of Display All Pixels ON in a Dark Room = Display All Pixels ON / Display All Off.

*2. Measuring Point : 6 Point (① ~ ⑥).



$$\text{Luminance Distribution} = (1 - (L_{\min} / L_{\max})) \times 100 \%$$

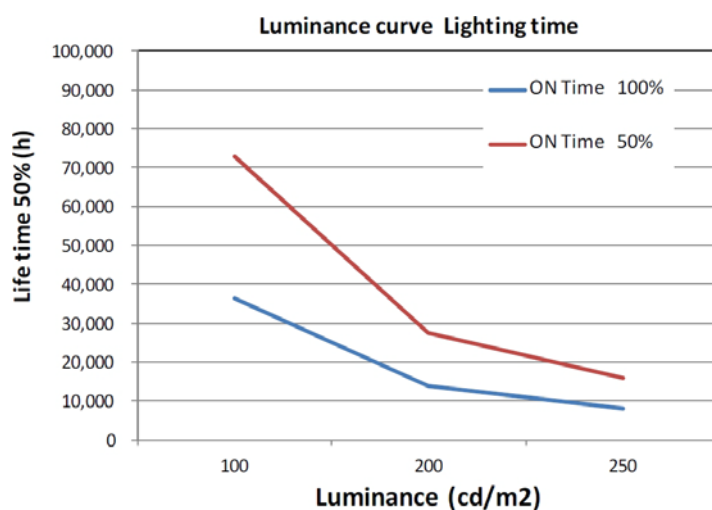
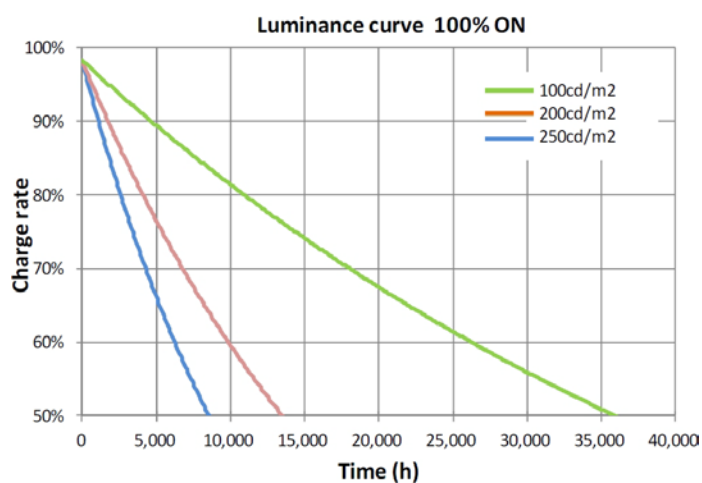
● Gray Scale

Gray Scale : 2 (White / Black)

● AC Characteristics

Frame Rate : Min. 100Hz

● Luminance curve



Luminance(cd/m2)	Life Time(h) (100% ON)	Life Time(h) ^{※1} (50% ON)
100	36,500	73,000
200	13,800	27,600
250	8,000	16,000

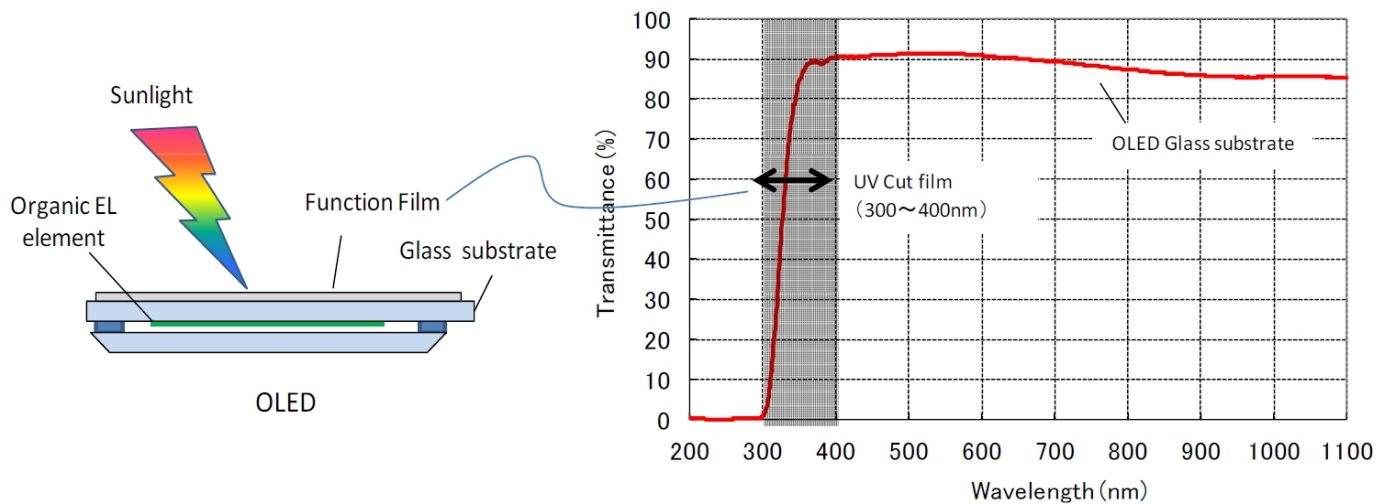
※1 Simulation of lighting time 1/2

- UV protection

UV damage prevention :

It recommends a paste of UV-cut film to the OLED emission glass surface.

Example Functional Film : Anti-Reflection Film ReaLook

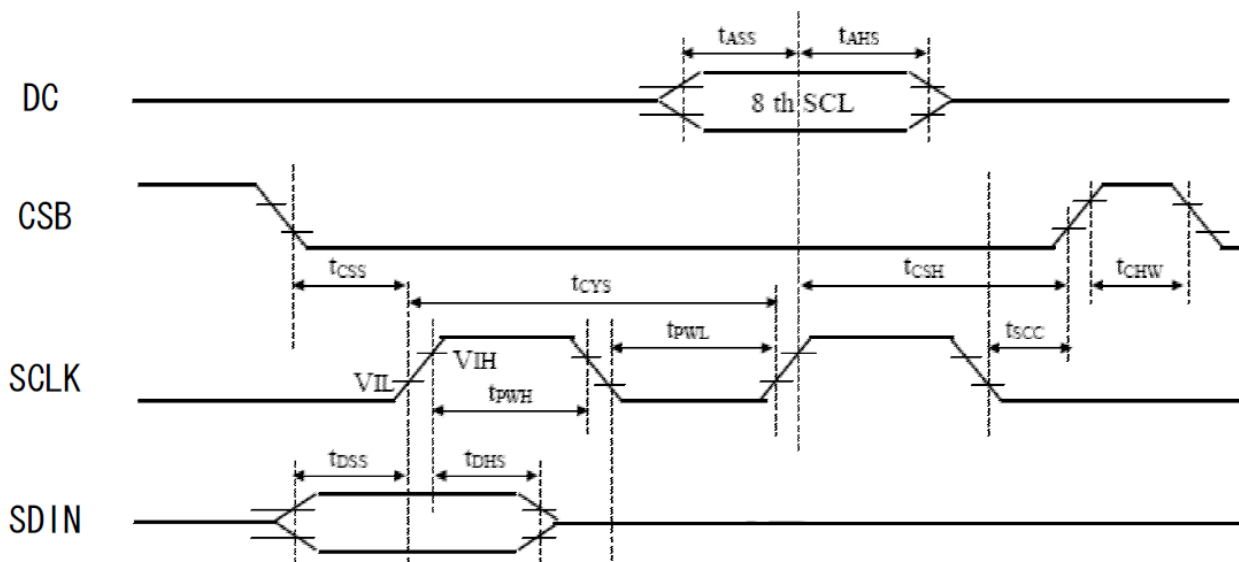


4. SERIAL CONTROLLER INTERFACE

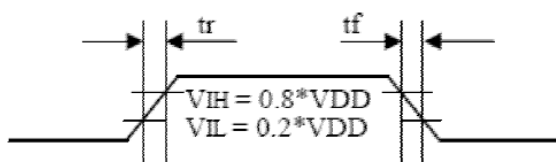
4.1. SERIAL INTERFACE

● Serial Interface Timing

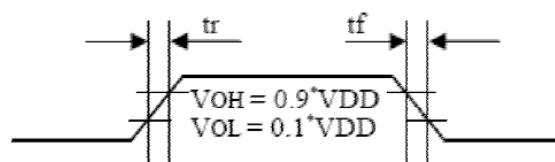
Item	Signal	Symbol	Min.	Typ.	Max.	Unit
Serial Clock Cycle Time		t_{CYS}	66			
High Pulse Width	D0	t_{PWH}	20			nSec
Low Pulse Width		t_{PWL}	20			
DC Setup Time		t_{ASS}	15			
DC Hold Time	DC	t_{AHS}	25			nSec
Serial Input Data Setup Time		t_{DSS}	20			
Serial Input Data Hold Time	D1	t_{DHS}	20			nSec
Chip Select Setup Time1		t_{CSS}	20			
Chip Select Setup Time2	CSB	t_{CSH}	50			nSec
Chip Select High Pulse Width		t_{CSW}	50			
Clock Fall Time → Chip Select Rise Time	D0 to CSB	t_{SCC}	15			nSec
Serial Clock Rise Time		t_r			15	
Serial Clock Fall Time	D0	t_f			15	nSec



Input Signal Slope



Output Signal Slope



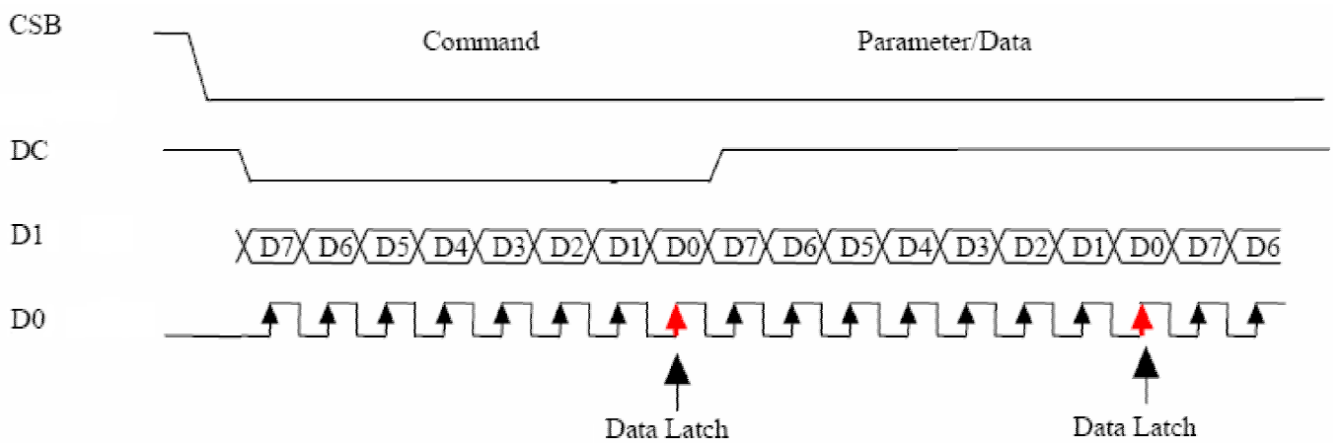
- Serial Interface Control Specification

If DC pin is LOW, the input at D1 is interpreted as command.

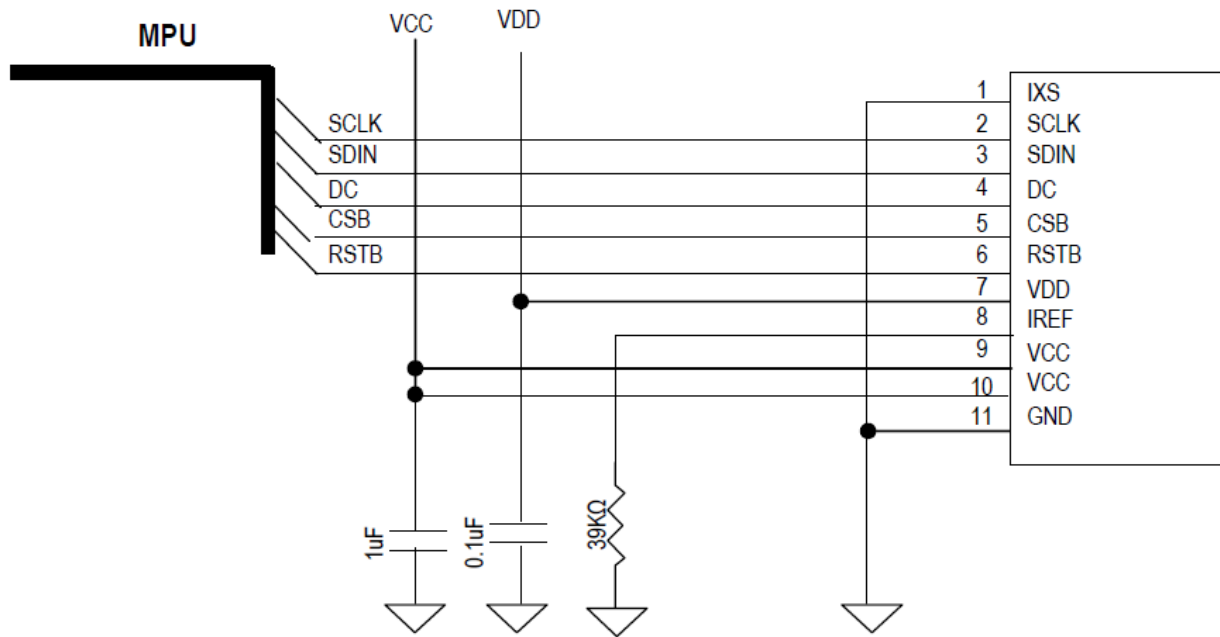
The serial interface is accessed with 8bit.

Set CSB "L" when the command/parameter is sent.

If the command is input, it is overwrite by the previous command parameter.



Serial Interface Recommended Circuit & Pin Assignment

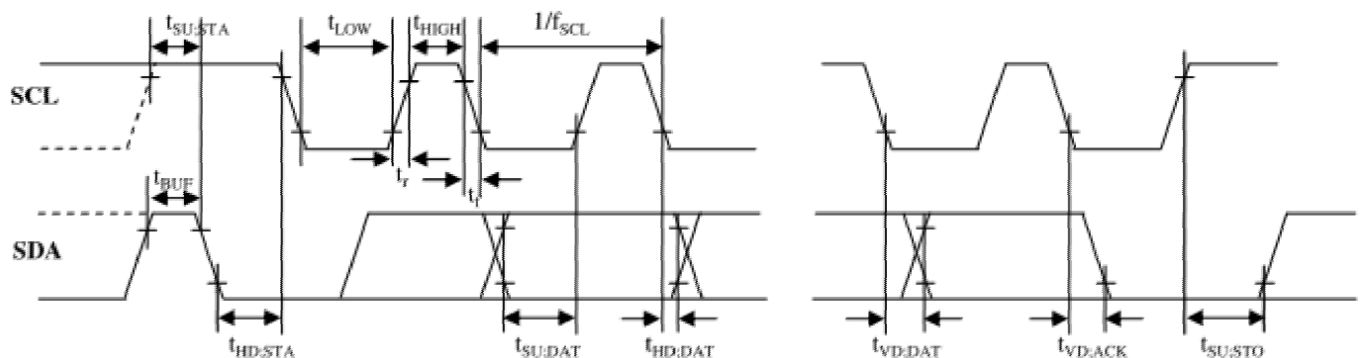


Pin No.	Pin Name	Function Description	I/O
9	IXS	SPI/I2C Selection	I
10	D0	Clock	I
11	D1	Data	I
12	DC	Data / Command Selection	I
13	CSB	Chip Selection	I
14	RSTB	Reset	I
15	VDD	Logic Power Supply	P
16	IREF	Segment Current Reference	O
17	VCC	OLED Drive Power Supply	P
18	VCC	OLED Drive Power Supply	P
19	VSS	GND	P

4.2. I²C INTERFACE

● I²C Interface Timing

Item	Symbol	Standard Mode			Fast Mode			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
SCL Clock Frequency	f_{SCL}	0		100	0		400	KHz
Bus Free Time between a STOP and START Condition	t_{BUF}	4.7			1.3			uSec
Hold Time (Repeated) START Condition	$t_{HD;STA}$	4			0.6			uSec
Set-up Time Form a Repeated START Condition	$t_{SU;STA}$	4.7			0.6			uSec
Set-up Time for STOP Condition	$t_{SU;STO}$	4			0.6			uSec
Data Set-up Time	$t_{SU;DAT}$	250			100			nSec
Data Hold Time	$t_{HD;DAT}$	0			0			nSec
Data Valid Acknowledge Time	$t_{VD;ACK}$	0.3		3.45	0.1		0.9	uSec
Data Valid Time	$t_{VD;DAT}$	300			50			nSec
LOW Period of the SCL Clock	t_{LOW}	4.7			1.3			uSec
HIGH Period of the SCL Clock	t_{HIGH}	4			0.6			uSec
Fall Time of Both SDA and SCL Signals	t_f			300			300	nSec
Rise Time of Both SDA and SCL Signals	t_r			1000			300	nSec



● I²C Interface Control Specification

I²C bus consists of the serial clock (SCL) and serial data (SDA) lines. Both lines must be connected to pull-up resistors.

I²C communication with this device is initiated by a master sending a Start condition, a high-to-low transition on the SDA input /output while the SCL input is high.

After receiving the valid address byte, this device respond with an acknowledge by the slave.

Any number of data bytes can be transferred from the transmitter to receiver between the Start and the Stop conditions.

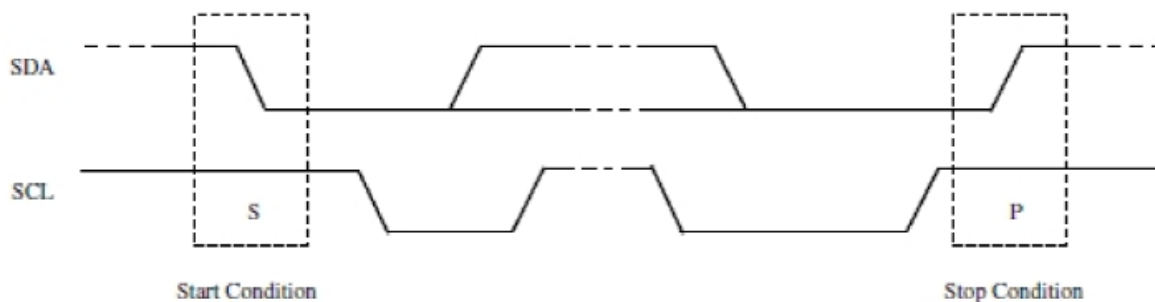
Each byte of eight bits is followed by one ACK bit.

A Stop condition, a low-to-high transition on the SDA input / output while the SCL input is high, is sent by the master.

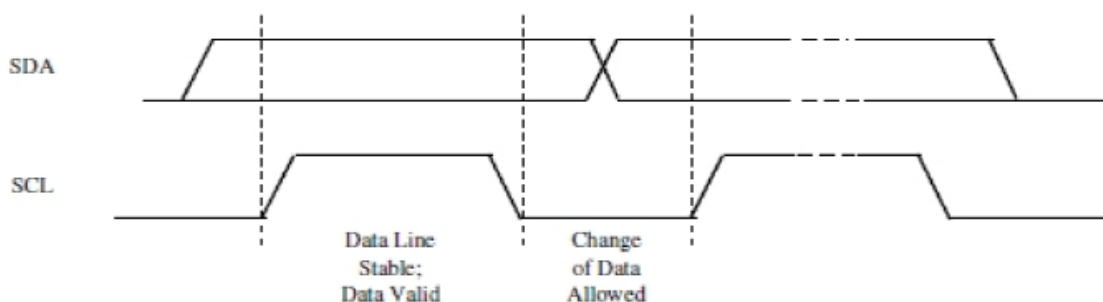
The transmitter must release the SDA line before the receiver can send an ACK bit.

Setup and hold times must be met to ensure proper operation.

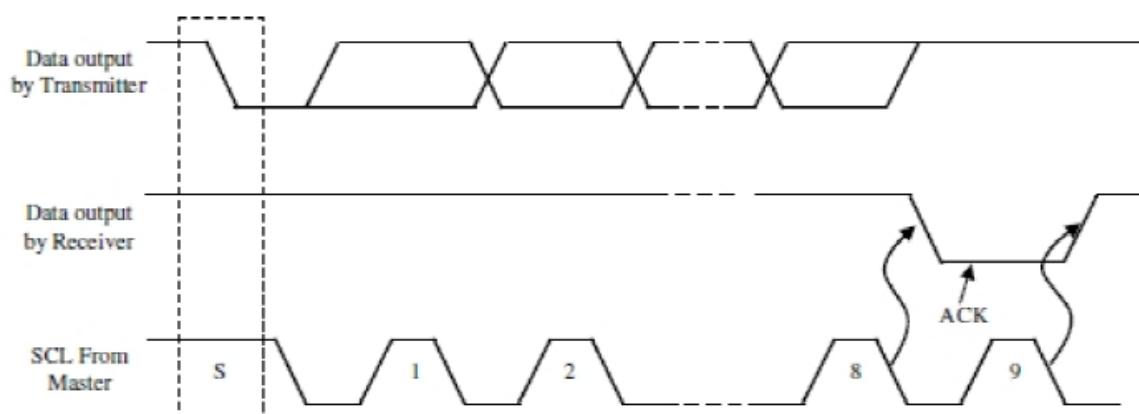
• Definition of Start and Stop Conditions



• Bit Transfer

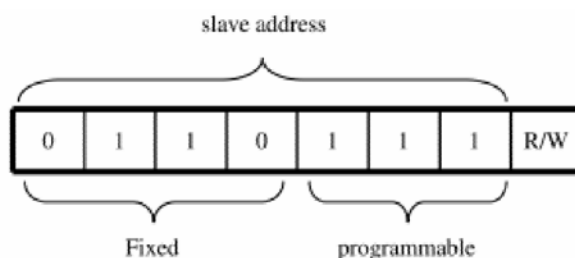


• Acknowledgement on I2C Bus



● I²C Device ID Address

Following a START condition, the bus master must output the address of the slave it is accessing. The slave address of this product is "37h".



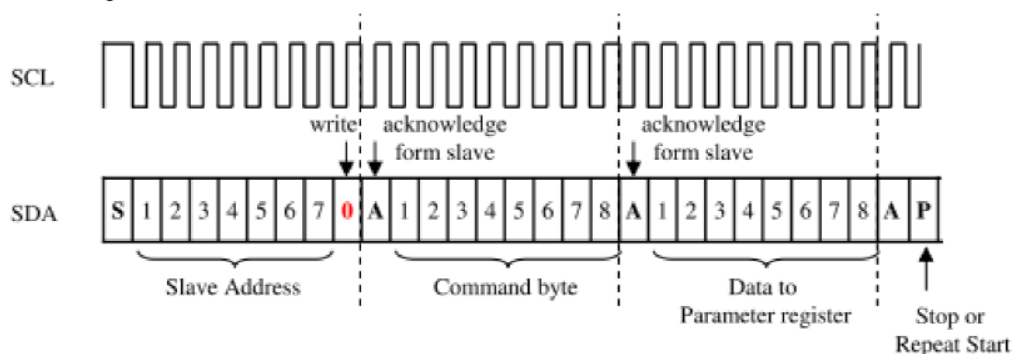
The last bit of the address byte defines the operation to be performed.

When set to logic 1 a read is selected, while a logic 0 selects a write operation.

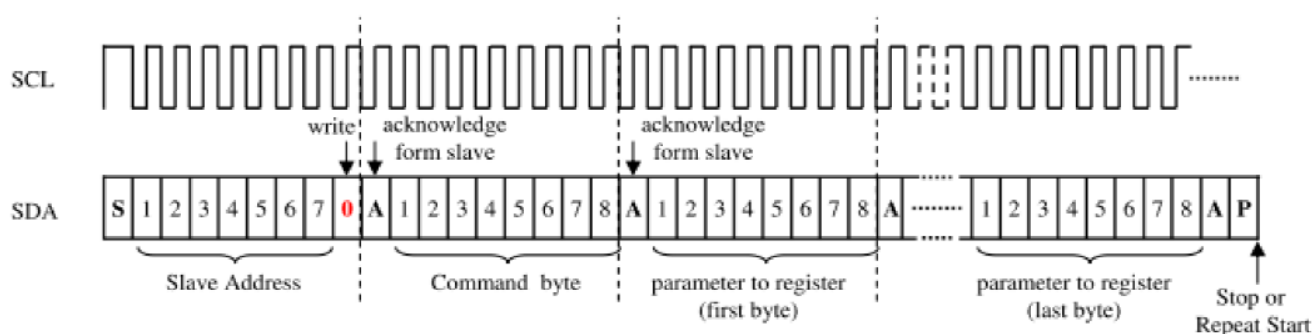
MSB bit is first transferred.

● I²C Bus Transactions

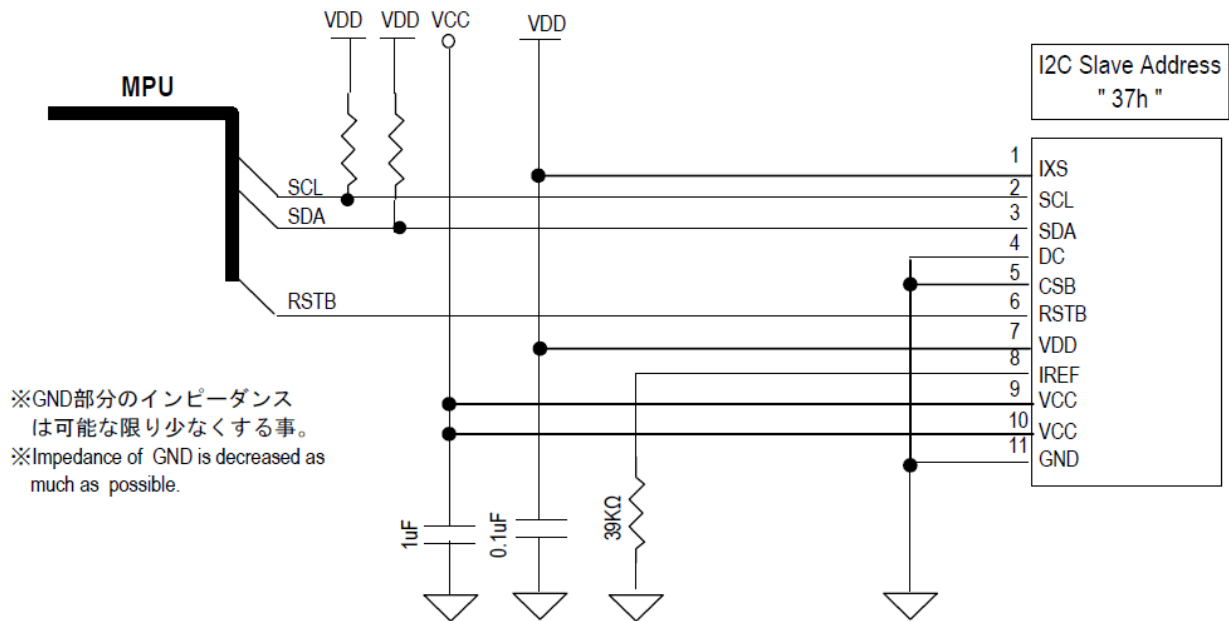
▪ Write Single Parameter Command



▪ Write Multi Parameter Command



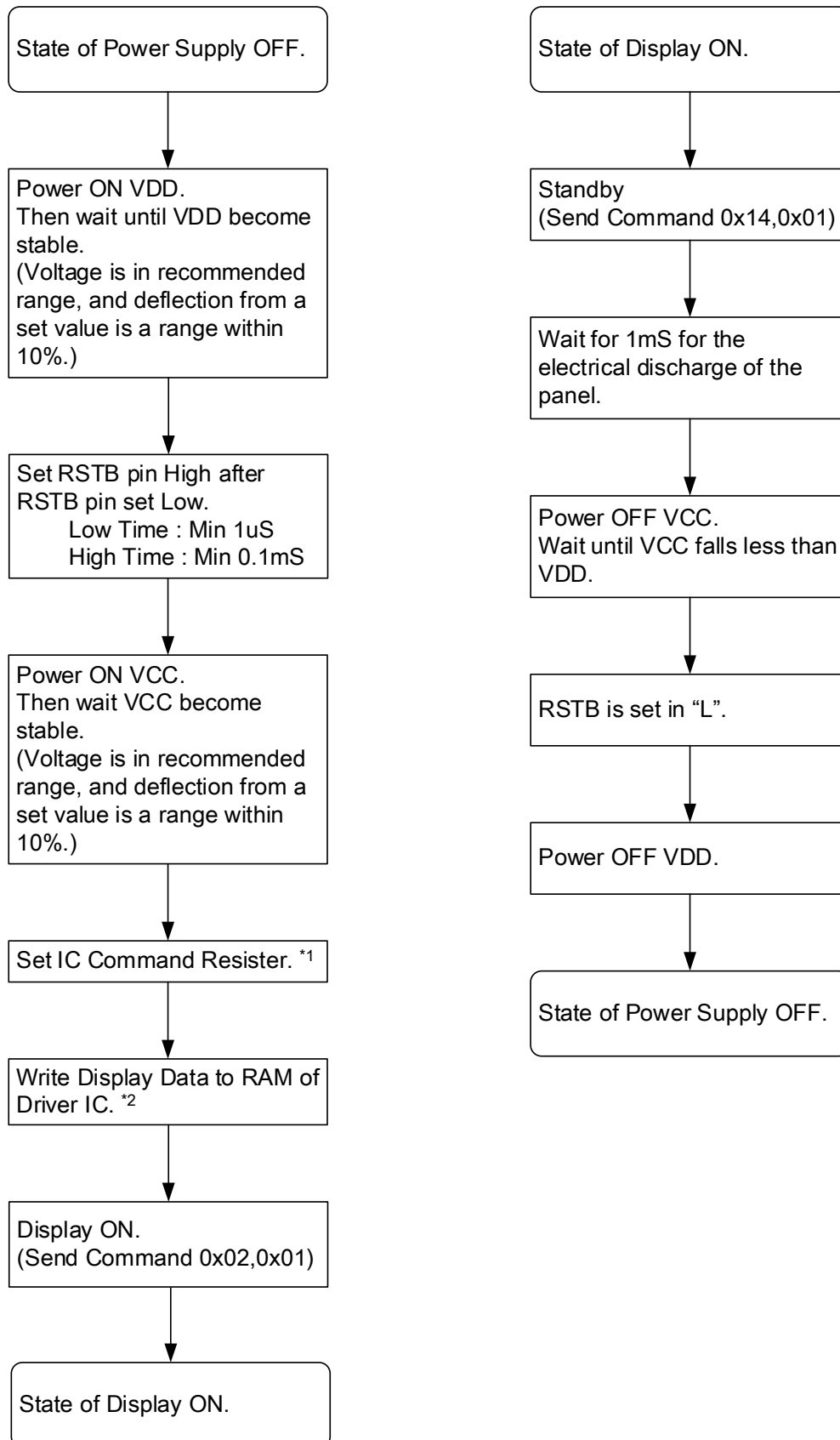
● I²C Interface Recommended Circuit & Pin Assignment

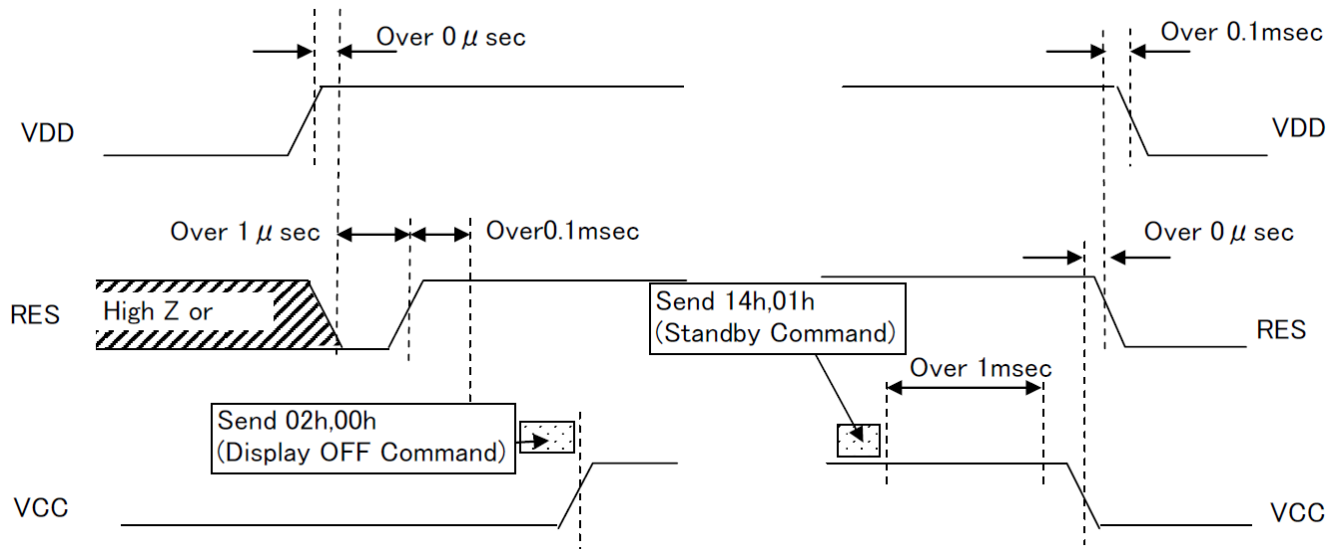


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10	SCL	Clock	I
11	SDA	Data	I
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15	VDD	Logic Power Supply	P
16	IREF	Segment Current Reference	O
17	VCC	OLED Drive Power Supply	P
18	VCC	OLED Drive Power Supply	P
19	VSS	GND	P

5. POWER & RESET

- Power ON/OFF Sequence & Display ON/OFF Sequence





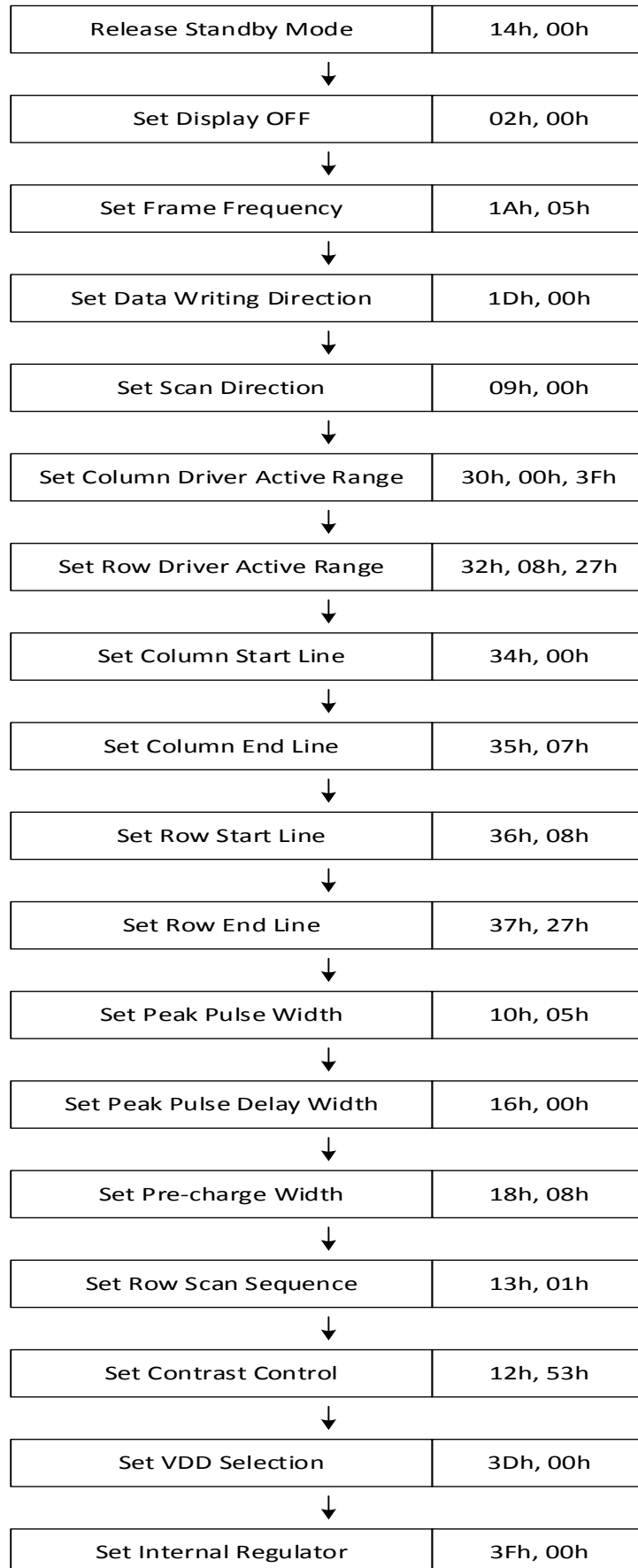
Notice :

1. Refer to 6. PS013 INITIALIZE AND DISPLAY Software Configuration.
2. Refer to 6. PS013 INITIALIZE AND DISPLAY Memory Writing Sequence.

Keep sequence, otherwise module would break down.

6. PS013 INITIALIZE AND DISPLAY

- Example of Software Configuration



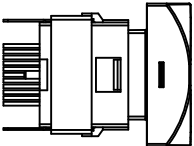
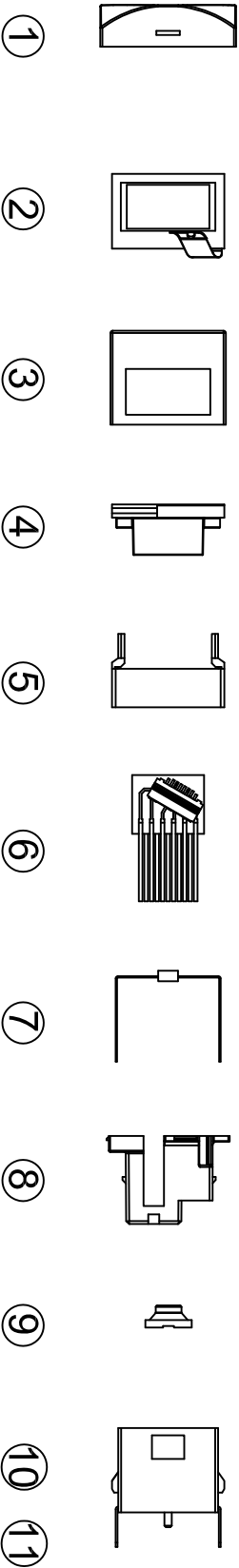
- Memory Writing Sequence

Write start command issued. 08h



The image data is issued.

Data = xxh, xxh, xxh, xxh
When the data for 64 x 32 pixels is transmitted,
it issues it 256 times.



NO.	PART NAME	QTY	MATERIAL	SPECIAL DEAL	RoHS REPORT No.
1	FRAME	1	PC	TRANSPARENT	CE/2014/10132
2	OLED	1			
3	SPACER	1	PC		CANEC1401484911A01
4	FLUORESCENT COVER	1	PC	WHITE	CE/2014/10132;CANEC1504968813
5	COVER	1	PA66-70G33L	BLACK	CE/2015/33405;CANEC1502974504
6	PCB	1			CE/2014/C0293;CE/2015/75405;CE/2015/32059;CE/2014/C5435
7	LED	1			SZHI00934929S1
8	ACTUATOR	1	POM	WHITE	KE/2015/C2286A-01;CANEC1504968813
9	SPRING PLATE	1	SILICON	TRANSPARENT	TWNC00419728
10	BASE FRAME	1	PA66-70G33L	BLACK	CE/2015/33405;CANEC1502974504
11	TERMINAL	1	BRASS	GOLD FLASH	CE/2015/C6129 : CANEC1505833705 CE/2015/30542;CANML1517389601

△				DATA	2016/1/30	UNIT	mm	MODE	PUSH BUTTON SWITCH	WB Well Buying Industrial Co.,Ltd.
△				APPROVAL	KAVEN	SCALE	1 : 1	PART	PS013-N11BW	
△				CONFIRM	TEREANCE	VIEW		2D FILE NAME	PS013-N11BW MATERIALS LIST	
DATA	APPROVAL	DESIGN	ENGINEERING CHANGE DESCRIPTION			DESIGN	CHENWEI	VER.	01	

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