

WELL BUYING INDUSTRIAL CO., LTD

APPROVAL SHEET

DESCRIPTION: PUSH BUTTON WITH LCD

PART NO: PS009-N11AK

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



APPROVAL

Kaven

REVIEW

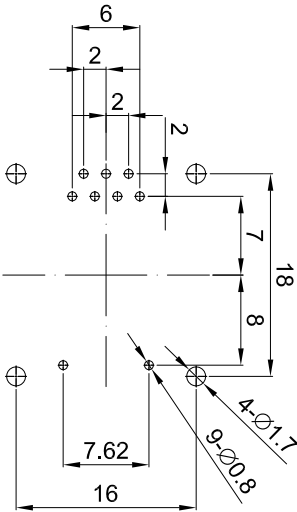
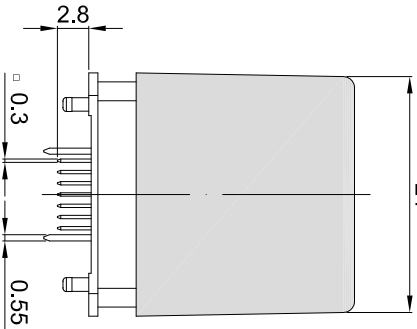
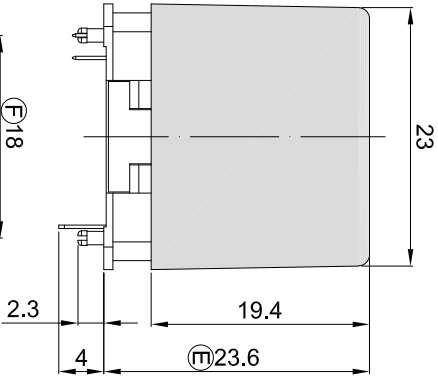
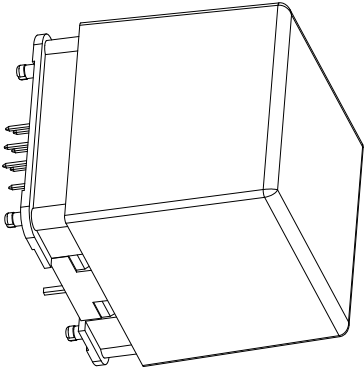
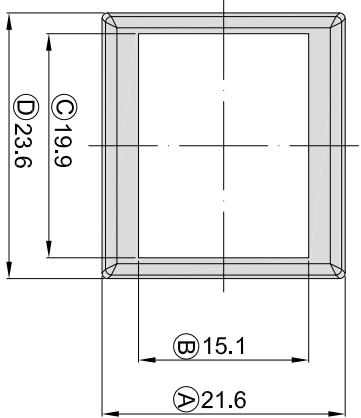
Eason

PREPARE

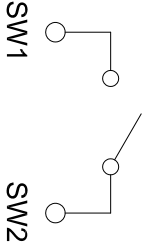
Gina

DIMENSION	TOLERANCE
BELOW 10 mm	± 0.3
10~100 mm	± 0.5
ABOVE 100 mm	± 0.8
ANGLE	± 3°

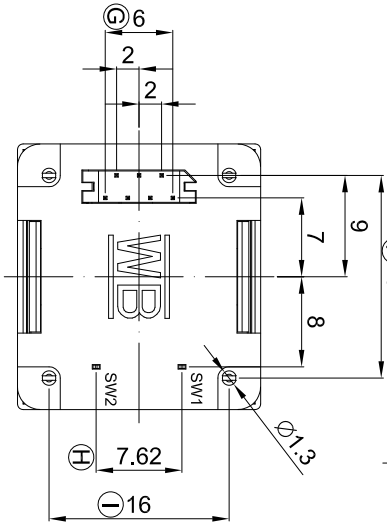
P.C.B LAYOUT



SCHEMATIC



1. RATING : 12 V DC , 100 mA .
2. CONTACT RESISTANCE : 200 Ω MAX .
3. INSULATION RESISTANCE : 500 V DC , 100 MΩ MIN .
4. OPERATING TEMPERATURE : -40°C ~ 85°C .
5. OPERATING FORCE : 250± 100gf .
6. OPERATING LIFE : 1000,000 CYCLES .
7. CRITICAL DIMENSIONS: 'A' ~ 'I'.



DATE	APPROVAL	DESIGN	ENGINEERING CHANGE DESCRIPTION	DATE	UNIT	MODE	PUSH SWITCH
2015/07/02	KAVEN	SCALE	1 : 1	PART	PS009-N11AK		
CONFIRM	TEREANCE	VIEW	2D FILE NAME	PS009-N11AK			
BRILLY	VER.	01	3D FILE NAME				

REVISION HISTORY

[illegible]

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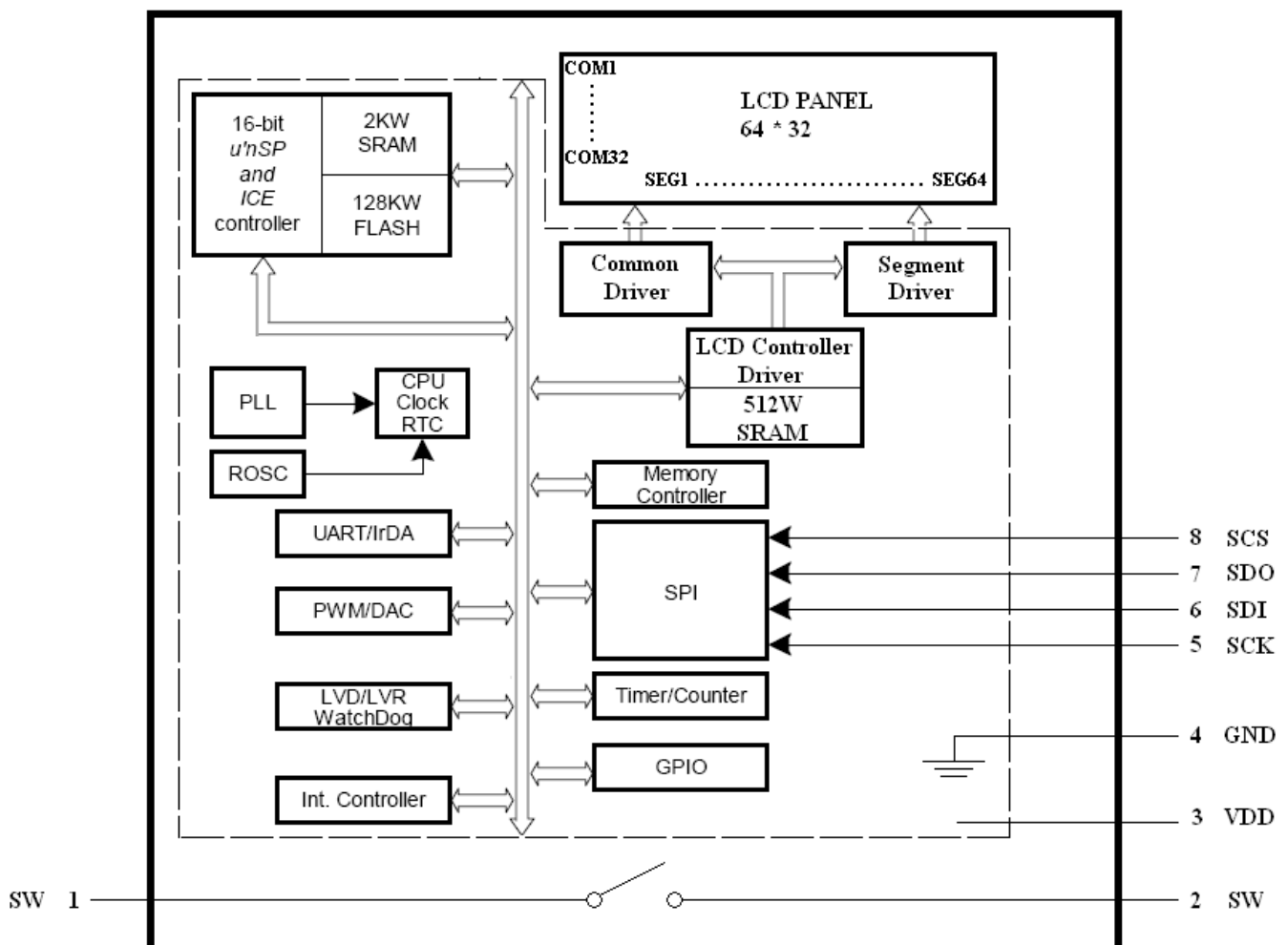
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1. CHARACTERISTICS

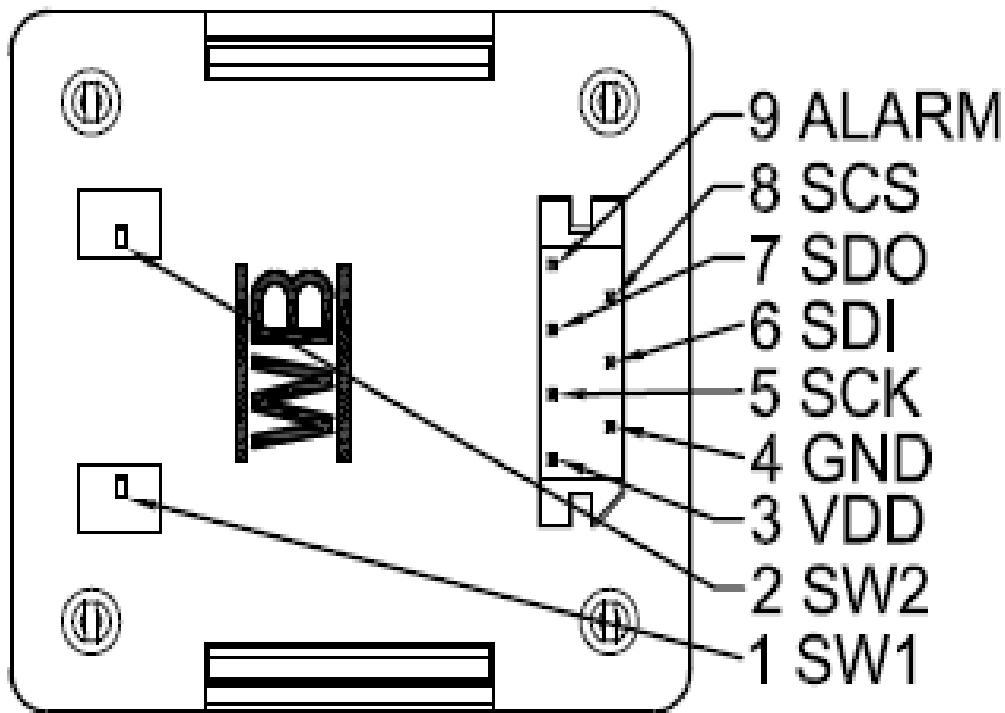
- Programmable pushbutton switch with LCD & RGB backlight
- High resolution of 64 * 32 pixels
- 16-bit Microprocessor and pronounce as micro-n-SP
- Low power consumption
- Dust proof design

2. SWITCH BLOCK DIAGRAM & PIN CONFIGURATIONS

SWITCH SPECIFICATIONS



2.1. PIN STRUCTURE



(Bottom View)

PIN No.	SYMBOL	NAME	FUNCTION
1.	SW1	Switch Pin	Normally open.
2.	SW2	Switch Pin	Normally open.
3.	VDD	Power	Power source for logic current and panel.
4.	GND	Ground	Connect to Ground.
5.	SCK	Serial Clock	Clock line to synchronize data write for SPI.
6.	SDI	Serial Data In	Data input line for SPI. (MOSI)
7.	SDO	Serial Data Out	Data output line for SPI. (MISO)
8.	SCS	Slave Control Select	Slave select for SPI. This line is active low.
9.	ALARM	Alarm Input	For Button Mode to trigger Change Picture.

3. SPECIFICATIONS

- Pole-Position : OFF –(ON) FOR MOMENTARY TYPE ; SPST
- Rating : 100mA / 12 VDC
- Operation Temperature : -10°C ~ 70°C
- Storage Temperature : -20°C ~ 80°C

3.1. SWITCH SPECIFICATIONS

- Electrical Performance

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Contact Resistance	DC 1.5 ; 100 mA By method of voltage drop	200			mΩ
Insulation Resistance	DC 500V	100			MΩ
Dielectric Strength	Break down is unallowable	AC 500V(50-60HZ) For 1 minute			

- Mechanical Performance

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Operating Force	Along the direction to apply a static load at end of actuator	250 ± 100			gf
Robustness Of Terminal	Any direction to apply a static load 500gf at end of terminal for 1 minute once for a terminal only	Terminal bent and board broken is unallowable			
Robustness Of Actuator	Along operating direction to apply a static load 5Kgf to push/pull actuator	Actuator broken of any unusual appearance occurred on switch construction are unallowable			
Travel	Along operational direction, to apply a static load on top of the stem depressing stem gradually until it stops movement	3.3 ± 0.2			mm
Soldering Ability	260±5°C IN 3 SECONDS	Coverage 75%			

● Resistance Of Soldering Heat

■ Manual Soldering : $300 \pm 5^{\circ}\text{C}$ in 3 seconds

■ Wave Soldering : $260 \pm 5^{\circ}\text{C}$ in 3 seconds

● Durability

Operating Life With Load : 1,000,000 MIN. (SPEED 100 CYCLES/MIN.)

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

● Environmental Performance

Parameter	Test Conditions	CRITERIA
Cold	$-10 \pm 2^{\circ}\text{C}$ For 96 Hours	1. It should meet the requirements of <u>Switch Electrical Performance</u> Stated. 2. Mechanical performance should remain in normal.
Dry Heat	$60 \pm 2^{\circ}\text{C}$ For 96 Hours	1. The contact resistance should be less than 200Ω . 2. It should meet the requirements of <u>Switch Electrical Performance (Insulation Resistance & Dielectric Strength)</u> .
Damp Heat	$40 \pm 2^{\circ}\text{C}$ · RH 90% ~ 95% For 96 Hours	1. The contact resistance should be less than 95% For 96 Hours 200Ω . 2. The insulation resistance should be higher than $10 \text{ M}\Omega$. 3. Dielectric strength should meet <u>Switch Electrical Performance (Dielectric Strength)</u> stated. 4. Mechanical performance should remain to normal.

3.2. LCD ELECTRICAL SPECIFICATIONS

● Characteristics Of Display

Parameter	SPECIFICATION	Unit
LCD Type	FSTN / Transflective / Positive	
Pixels	64(L) x 32(W)	dot
View Area	17.8(L) x 16.0(W)	mm ²
Active Area	15.985(L) x 11.185(H)	mm ²
Dots Size	0.225(L) x 0.335(W)	mm ²
Dots Pitch	0.25(L) x 0.35(W)	mm ²
Panel Size	20.8(L) x 18(W) x 2.0(H)	mm ³
Viewing Angle	6 O'clock	
Duty Ratio	1/32	duty
Bias	1/6	bias

● Absolute Maximum Ratings

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Supply Voltage (V _{DD})	TA=25°C			3.6	V
Input Voltage (V _I)		-0.5		V _{DD} + 0.5	V

Note: Stresses beyond those given in the Absolute Maximum Rating table may cause operational errors or damage to the device. For normal operational conditions see AC/DC Electrical Characteristics.

● Recommended Operating Conditions

Sym.	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{DD}	Logic Power Supply		2.7		3.6	V
V _{IH}	Input High Level Voltage		0.7 x V _{DD}		V _{DD}	V
V _{IL}	Input Low Level Voltage		0		0.3 x V _{DD}	V

● Optical Characteristics

Item	Sym.	Temp.	Condition	Min.	Typ.	Max.	Unit
Response Time	Rise Time	-10°C	$\theta = 0^\circ$ $\phi = 0^\circ$	-	940	1200	mSec
		25°C		-	120	150	
		70°C		-	38	45	
	Fall Time	-10°C		-	1800	2200	
		25°C		-	200	240	
		70°C		-	65	80	



- Backlight Specifications (LED)

Parameter	Device	Test Conditions	Min.	Typ.	Max.	Unit
Peak Wavelength	Hyper Red	IF=20mA	630			nm
	Green		515			
	Blue		468			

4. COMMAND

4.1. Backlight

Command	Data 1	Data 2	Data 3	Remark
0x40	Hyper Red	Green	Blue	RGB each color represents by MSB 5 bits (XXXXX000b).

Hyper Red : Adjustment backlight (Hyper Red) luminance. Adjustment Range is 0x00 ~ 0xF8 (LSB 3 Bit always 0). 1 LSB = 1mA, min current is 0mA, max current is 31mA.

Green : Adjustment backlight (Green) luminance. Adjustment Range is 0x00 ~ 0xF8 (LSB 3 Bit always 0). 1 LSB = 1mA, min current is 0mA, max current is 31mA.

Blue : Adjustment backlight (Blue) luminance. Adjustment Range is 0x00 ~ 0xF8 (LSB 3 Bit always 0). 1 LSB = 1mA, min current is 0mA, max current is 31mA.

4.2. Software Reset

Command	Data 1	Data 2	Data 3	Remark
0x5E	0x55	0xAA	0xE5	

PS009 will execute Software Reset when received complete command 0x5E→0x55→0xAA→0xE5.

Note :

When SPI transfer Software Reset Command , SPI_SCS need to Delay 5uSec before transferring Software Reset Command when the SPI_SCS pull down(0V). (tsSS Min. = 5uSec)

4.3. Mode

Command	Data 1	Data 2	Data 3	Remark
0x77	Mode	Pic_Begin	Pic_End	

Mode : Picture display mode setting.

0x00 = Single Picture Mode. Pic_End = 0x00.

0x33 = Slide Mode.

0x66 = Button Mode. Use ALARM Pin (Pin. 3) pull low to trigger Change Picture.

0x99 = Real-Time Display Mode. This mode for use with command:Real-Time Display Data Transfer(0x60).

Pic_Begin = Pic_End = 0x00.

0xAA = Auto Change Picture Mode.

Pic_Begin : Picture display begin number.

Pic_End : Picture display end number.

Example :

Slide display from picture 0 to picture 9 → 0x77, 0xAA, 0x00, 0x09

4.4. Time Interval between Pictures

Command	Data 1	Data 2	Data 3	Remark
0x99	Time 1	Time 2	0x00	Time interval (Time 1 + Time 2 x 256) mSec.

Time interval (Time 1 + Time 2 x 256) mSec

Time 1 : Set Sleep Time Setting value.

Time 2 : Set Sleep Time Setting value.

Note :

Slide Mode **Time Interval between Pictures** minimum as 5 mSec.

Auto Change Picture Mode **Time Interval between Pictures** minimum as 30 mSec.

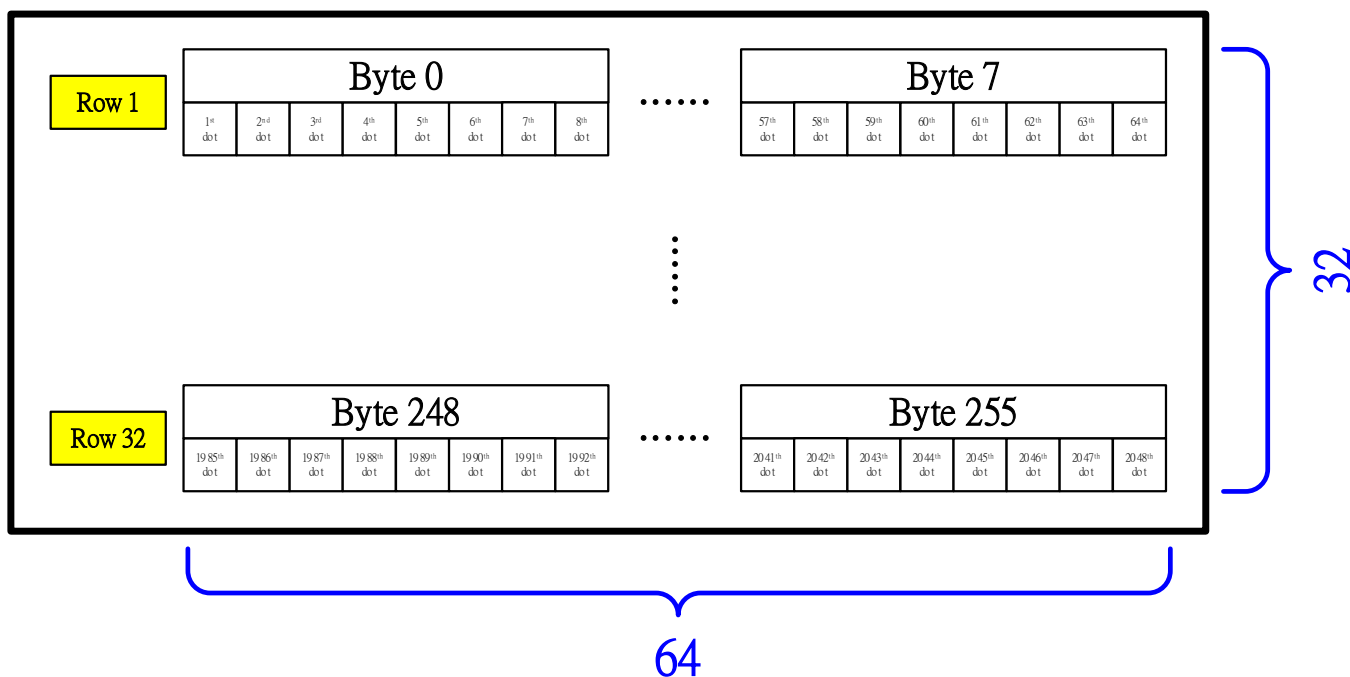
4.5. Picture Data Saving Position

Command	Data 1	Data 2	Data 3	Remark
0x50	SP	0x00	0x00	Total saving 255 pictures.

SP : Set picture data saving position, picture saving position range is 0~254. (Total 255 pictures)

4.6. Picture Data Transfer

Command	Data	Remark
0x55	256 Bytes (64 x 32)	Correlation of byte and picture as below shown.

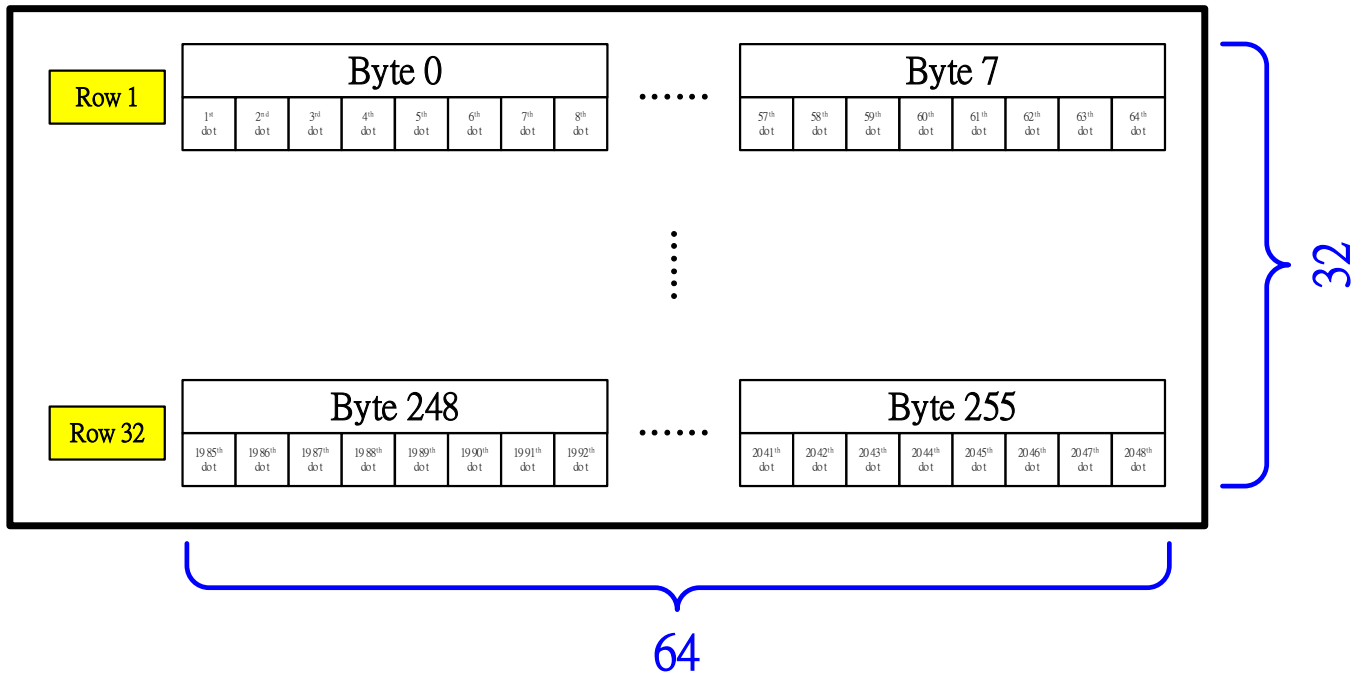


LCD resolution is 64 x 32, each row with 64 dots, 32 columns, 1 bit of each.

Data of picture saving must have the picture position saved before making transfer of picture data, continuously picture saving of each must have 100mSec time interval for SPI transfer.

4.7. Real-Time Display Data Transfer

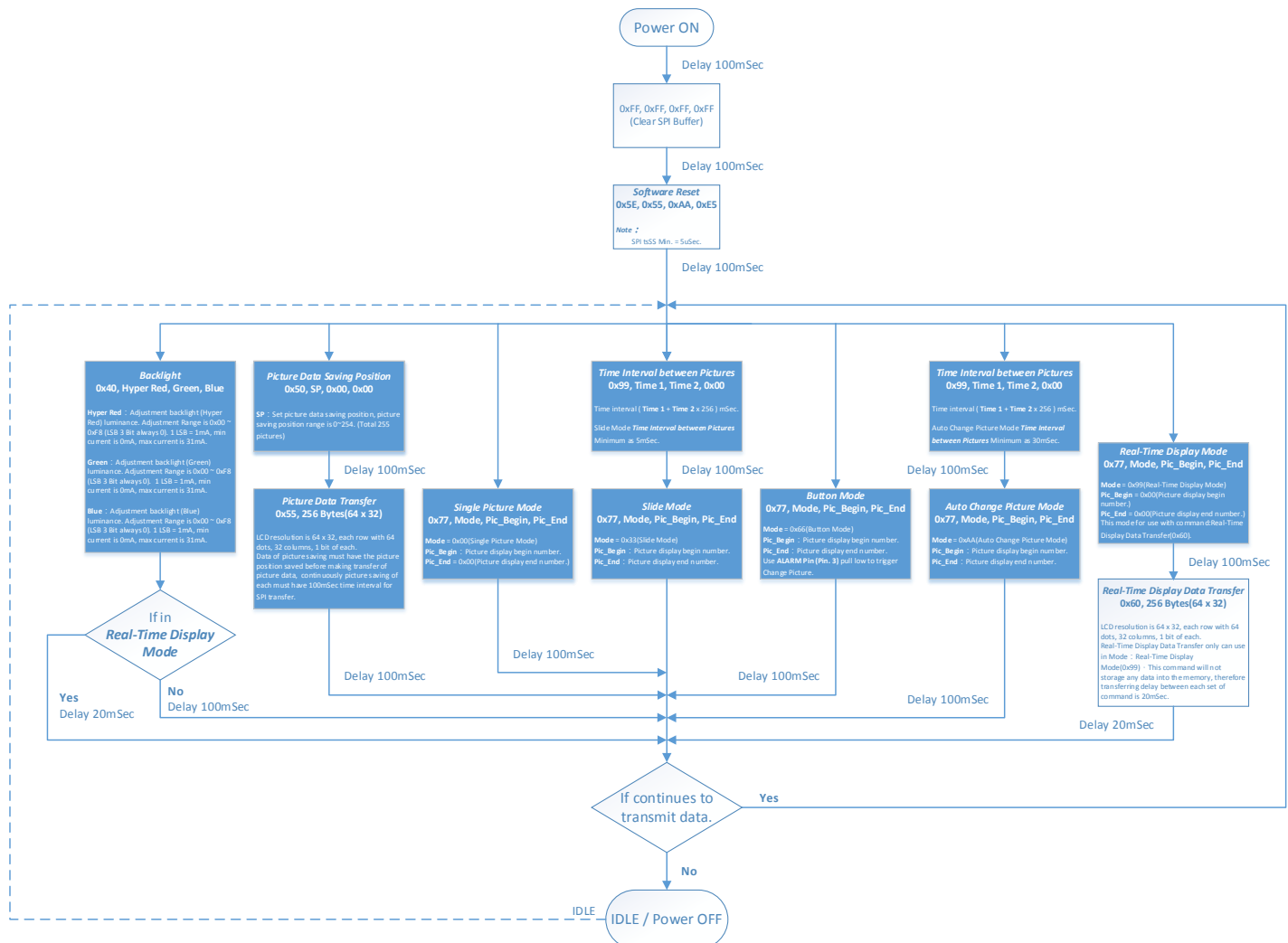
Command	Data	Remark
0x60	256 Bytes (64 x 32)	Correlation of byte and picture as below shown.



LCD resolution is 64 x 32, each row with 64 dots, 32 columns, 1 bit of each.

Real-Time Display Data Transfer only can use in Mode : Real-Time Display Mode(0x99) · This command will not storage any data into the memory, therefore transferring delay between each set of command is 20mSec.

5. OPERATION FLOWCHART



※Set value of the blue portion will be stored, when connected to power supply / execute Software Reset, performing action in accordance with the set value before power cut / execute Software Reset.

Example :

Before power cut/ execute Software Reset is **Auto Chang Picture Mode** with **highest intensity blue backlight(0xF8)**. When re-connected to power supply / execute Software Reset, mode and backlight will remain unchanged as **Auto Chang Picture Mode** with **highest intensity blue backlight(0xF8)**.

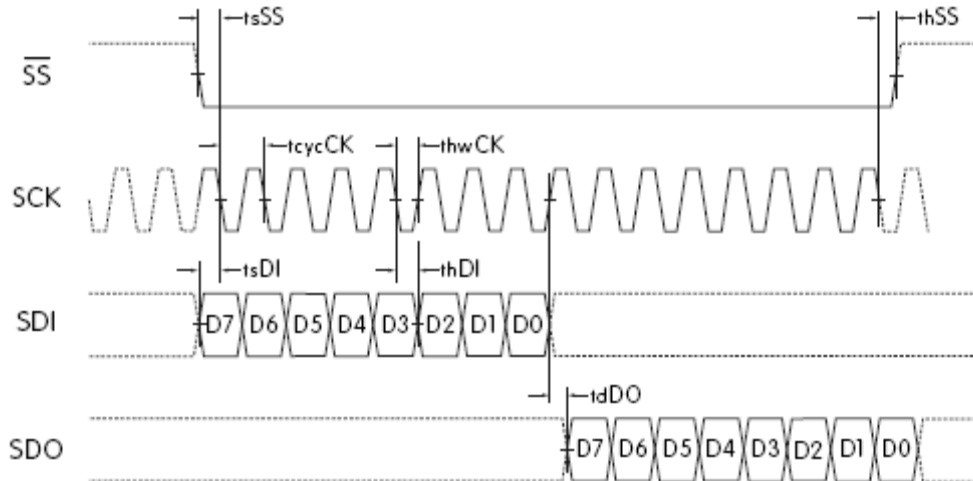
※**Real-Time Display Transfer** command only can use in **Real-Time Display Mode** and will not store any picture data. And **Picture Data Transfer** command will store picture data accordance with **Picture Data Saving Position** designated location.

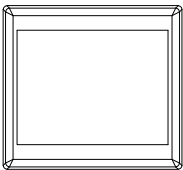
※When connected to power supply, **Software Reset** command can be execute any time to reset and need to subject to the delay time regulations of each set command.

6. SERIAL PERIPHERAL INTERFACE (SPI)

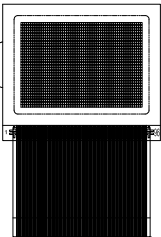
Items	Symbols	Minimum	Maximum
SPI_ $\overline{SS}$ Set Up Time	t_{sSS}	1 μ s	
SPI_ $\overline{SS}$ Hold Time	t_{hSS}	10ns	
SPI_CLK Cycle	t_{cycCK}		8MHz
SPI_CLK Width	t_{hwCK}	10ns	
SPI_DI Set Up Time	t_{sDI}	10ns	
SPI_DI Hold Time	t_{hDI}	10ns	
SPI_DO Delay Time	t_{dDO}	10ns	

SPI Timing Chart ($\overline{SS}$ Using)

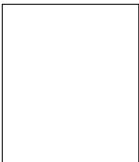




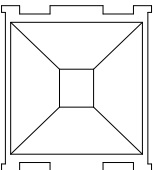
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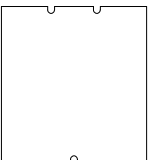
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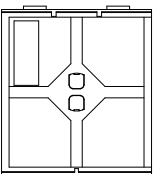
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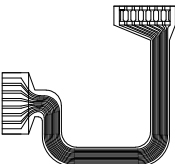
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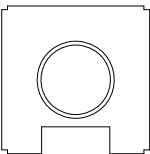
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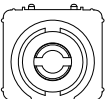
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7



8



9



10



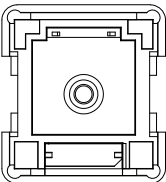
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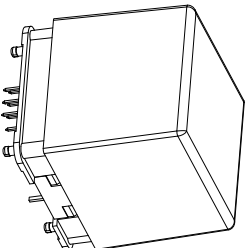
12



13



14



NO.	PART NAME	QTY	MATERIAL	SPECIAL DEAL
1	TRANSPARENT BOARD	1	PC	TRANSPARENT
2	LCD MODULE	1	EMH.CD-PS007-V0G0603A1	
3	FLUORESCENT PLATE	1	PC	WHITE
4	LAMP SHADE	1	POM	WHITE
5	PCB BOARD	1	PS007-PCBA	
6	BRACKET	1	POM	WHITE
7	FPC	1	PS009-FPC	
8	STEADY HOLDER	1	PA66	BLACK
9	ACTUATOR	1	POM	WHITE
10	SPRING	1	STAINLESS STEEL	
11	MOVING CONTACT	1	PHOSPHOR BRONZE	GOLD PLATING
12	BOARD WITH TERMINAL		PA66	BLACK
13	TERMINAL	1	BRASS	SILVER PLATING
14	CONNECTOR	1	GS097-071G	
15	BASE FRAME	1	PA66	BLACK

DATE	2015/7/2	UNIT	mm	MODE	PUSH SWITCH
1	DATE	2015/7/2	UNIT	mm	MODE
2	APPROVAL	KAVEN	SCALE	1 : 1	PART
3	CONFIRM	TEREANCE	VIEW		2D FILE NAME
4	DESIGN	BRILLY	VER.	01	3D FILE NAME