

New Products

Contact No. 231

NKK
SWITCHES

OLED Full Screen Color Pushbutton



NKK SWITCHES CO., LTD.

A full screen with the thinnest frame enables expressions with real impact!

(Patent pending, design application submitted)

Using the World's Smallest Class of OLED

We put the most advanced OLED in a frame slimmed to the minimum.

In combination with a high-color display, it reproduces beautiful images with a sense of reality. Because the screen is so compact, it can display a more impressive high-quality image.

OLED is characterized by high definition, contrast, and resolution.

Display dots: 96 x 64

Now With 50,000 Hour Lifespan

We have raised the lifespan of color OLEDs from 30,000 hours (our previous products) to 50,000 hours.

Smooth and sure operation feeling

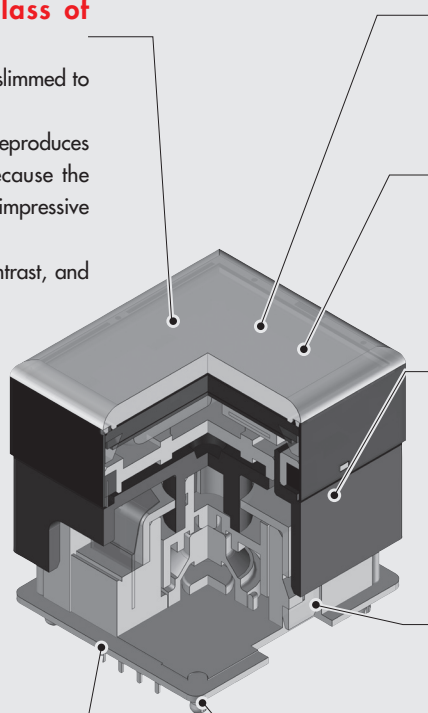
Operation is smooth and unusually quiet while keeping the stroke to a short 0.07", giving the certainty of a tactile feedback that touch panels cannot offer.

Shutting Out Flux Infiltration

Terminals are sealed with epoxy to prevent infiltration by flux, and to prevent slack in the terminals, greatly enhancing contact stability.

Using SPI Protocol

The interface uses SPI Protocol, enabling high-speed synchronous communications.



Richly Expressive

High color (16-bit color: 65,536 colors) display is richly expressive.

Multiple units can combine to form one screen, for flexibility in sizes and layouts.

The top of the button has a unique shape so that the frame cannot be felt.

Highly-reliable Gold-plated Twin Contacts

The contacts are highly-reliable gold-plated twin contacts, providing stable contact performance through long-term use.

Dust-tight construction

Simple dust-tight construction prevents dust from infiltrating the contact mechanism, making the contacts more reliable.

Preventing Printed Circuit Boards From Lifting Out of Position Retainer mechanism

The switch body is equipped with a fastening rib for temporary fastening. (Compatible with boards of 1.6mm and 2.0mm thick)

Extraordinary Open/Close Durability

The light operation feeling also achieves open/close durability for minimum one million cycles.

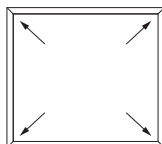
Reduced substances of concern

Component parts and packaging are free of substances of concern (lead, cadmium, mercury, hexavalent chromium, PBB, PBDE) RoHS directive compliant
*2011/65/EU

Key points for achieving full-screen configuration.

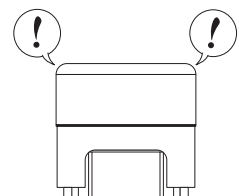
POINT 1

In developing this new display, we took care to make the frame of the OLED as slim as possible.

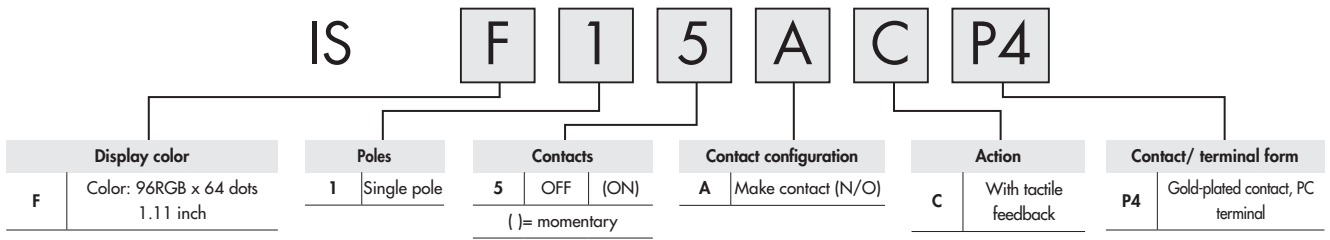


POINT 2

Working through countless prototypes in search of the control form that makes maximum use of the display, we arrived at our unique lens form and achieved full-screen display.

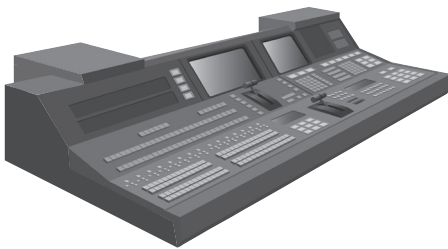


► Switch Ordering



► Main applications

Broadcasting and audio equipment, amusement, monitoring systems, vehicular, medical devices, etc.



Digital video switcher

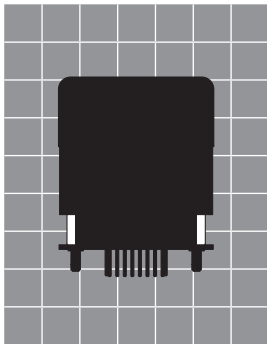


Vehicular

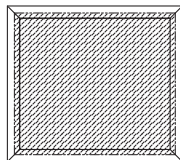


Amusement

► Actual size



Operational areas at actual size



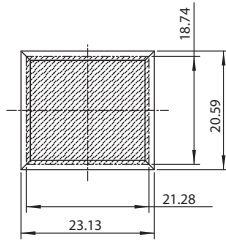
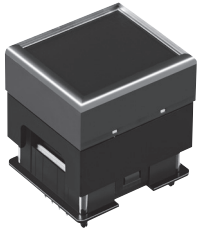
(When mounted continuously)

► Sales start date

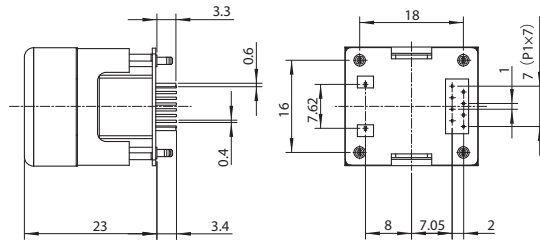
September 16, 2014

► Full Screen Color IS Multi-function Push Button Switch

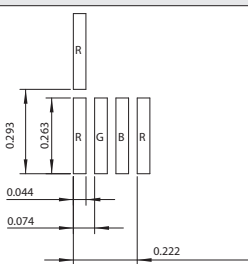
IS-F15ACP4



Model name label side

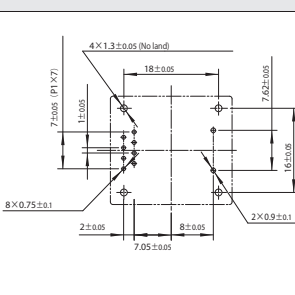


Dot size

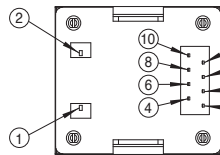


Total 6,144 dots

Printed circuit board mounting hole dimension diagram
(View from the switch-equipped side)



Terminal layout diagram
(View from the terminal side)



Basic specification

Display Device	Color OLED (organic EL) display elements
Resolution	96RGB x 64 dots
Display Mode	Passive matrix
Communications Method	Serial (SPI) communications
Number of Colors	65,536 colors (16-bit color: R 5 bits/ G 6 bits/ B 5 bits) or 256 colors (8-bit color: R 2 bits/ G 3 bits/ B 3 bits)
Operation Temperature Range	-20°C ~ +70°C (-4°F ~ +158°F)
Storage Temperature Range	-30°C ~ +80°C (-22°F ~ +176°F)
Operating Life (Display)	50,000 hours (with 40% lit, Ta=77°F)

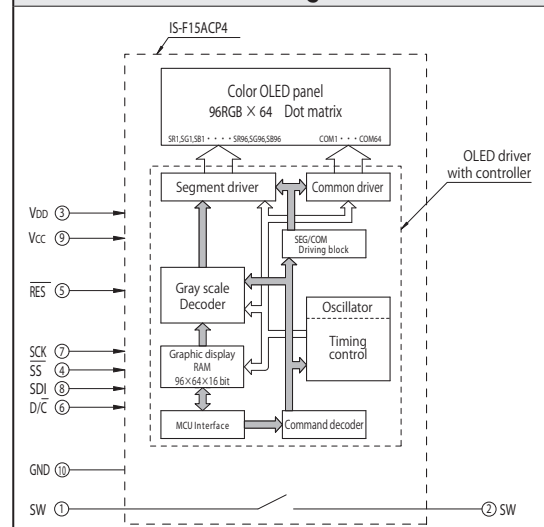
Switch specification

Circuit	SPST normally open
Contact Position	Leave actuator: ① - ② OFF Push actuator: ① - ② ON
Electrical Capacity (Resistive Load)	100mA @ 12V DC (resistive circuit)
Contact Resistance	200 milliohms maximum @ 20mV 10mA
Insulation Resistance	100 megohms minimum @ 100V DC
Dielectric Strength	125V AC for 1 minute minimum
Mechanical Endurance	1,000,000 operations minimum
Electrical Endurance	1,000,000 operations minimum
Total Travel	1.8mm (0.07")

Terminal functions

Pin No.	Symbol	Name	Function
①	SW	Terminal of Switch	Normally open
②	SW	Terminal of Switch	Normally open
③	V _{DD}	Power	Power source for logic circuit
④	\overline{SS}	Slave Select	Slave select for SPI. This line is active low.
⑤	\overline{RES}	Reset	Reset signal input. When pin is low, initialization of chip is executed.
⑥	D/ \overline{C}	Data/Command	Data/Command Control. When pin is pulled low, data will be interpreted as Command; when pulled high, data will be interpreted as Data.
⑦	SCK	Serial Clock	Clock line for SPI that synchronizes command and data
⑧	SDI	Serial Data In	Data input line for SPI
⑨	V _{CC}	Power	Power source for drive circuit
⑩	GND	Ground	Connect to Ground

Circuit diagram



▶ OLED Characteristics

Absolute maximum ratings (Ta=77°F)			
Item	Symbols	Ratings	Unit
Supply Voltage for Logic/Interface	V _{DD}	-0.3 ~ +4.0	V
Supply Voltage for Drive	V _{CC}	-0.0 ~ +19.0	V
Input Voltage	V _I	-0.3 ~ V _{DD} +0.3	V

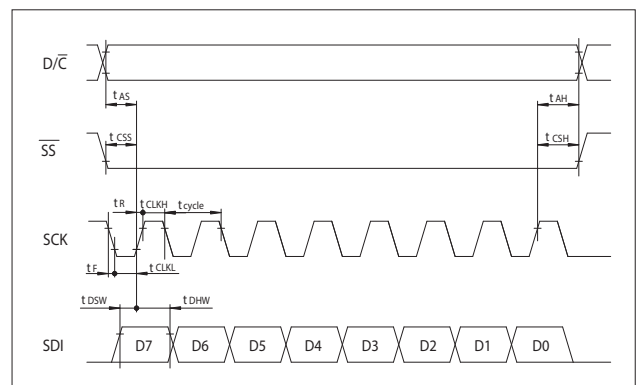
Recommended operating range (Ta=77°F)					
Item	Symbols	min.	typ.	max.	Unit
Supply Voltage for Logic/Interface	V _{DD}	2.4	2.8	3.5	V
Supply Voltage for Drive	V _{CC}	14.0	15.0	16.0	V
Input High Level Voltage	V _{IH}	0.8xV _{DD}	-	-	V
Input Low Level Voltage	V _{IL}	-	-	0.2xV _{DD}	V

Current consumption (Ta=77 °F, V _{DD} =2.8V, V _{CC} =15.0V)						
Item	Abbreviation	min.	typ.	max.	Unit	
All-Pixels-On Mode *Drive System Power Current	I _{CC1}	-	11.0	13.2	mA	
All-Pixels-On Mode *Logic/IF System Power Current	I _{DD1}	-	0.17	0.20	mA	
Sleep Mode **Drive System Power Current	I _{CC2}	-	-	10	μA	
Sleep Mode **Logic/IF System Power Current	I _{DD2}	-	-	10	μA	

*All pixels shall be turned on with the maximum level gray scale
**All pixels shall be turned off (while chip is operating)

Luminescence characteristics (Ta=77 °F, default value: 87x0F)						
Item	min.	typ.	max.	Unit	Notes	
Luminosity	80	105	130	cd/m ²	When lit in white	
White Color Coordinate	(x)	0.26	0.30	0.34	-	
	(y)	0.31	0.36	0.41	-	
Red Color Coordinate	(x)	0.62	0.66	0.70	-	
	(y)	0.30	0.34	0.38	-	
Green Color Coordinate	(x)	0.24	0.29	0.33	-	
	(y)	0.59	0.63	0.67	-	
Blue Color Coordinate	(x)	0.10	0.15	0.19	-	
	(y)	0.10	0.17	0.23	-	
Contrast Ratio	100	-	-	-	-	

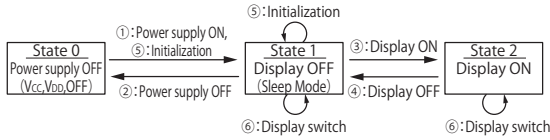
AC characteristics (Ta=77°F, V _{DD} =2.4~3.5V)					
Items	Symbols	min.	typ.	max.	Unit
Clock Cycle Time	t _{cycle}	150	-	-	ns
D/ \bar{C} Setup Time	t _{AS}	40	-	-	ns
D/ \bar{C} Hold Time	t _{AH}	40	-	-	ns
SS Setup Time	t _{CSS}	75	-	-	ns
SS Hold Time	t _{CSH}	60	-	-	ns
Write Data Setup Time	t _{DSW}	40	-	-	ns
Write Data Hold Time	t _{DHW}	40	-	-	ns
SCK Low Time	t _{CLKL}	75	-	-	ns
SCK High Time	t _{CLKH}	75	-	-	ns
SCK Rise Time	t _R	-	-	15	ns
SCK Fall Time	t _F	-	-	15	ns



► **State transitions and support products**

State transition

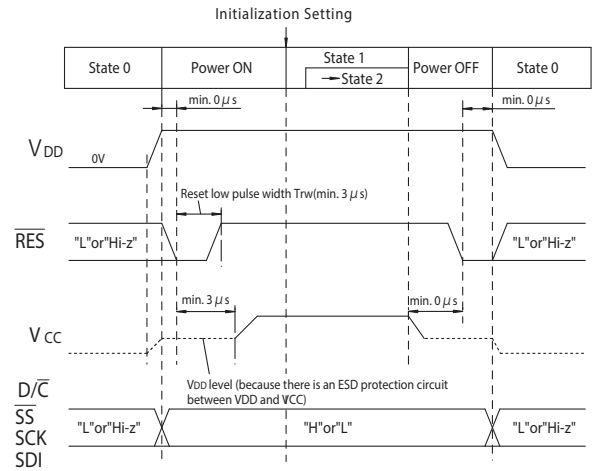
State transition diagram



State No.	State	Display	Sleep	V _{CC}	V _{DD}	Changing the Display
0	Power OFF	OFF	-	OFF	OFF	Disable
1	Display OFF	OFF	ON	ON	ON	Enable
2	Display ON	ON	OFF	ON	ON	Enable

State transitions	Transition name	Reference or setup procedure
①	Power ON	Refer to "Power ON/OFF Sequence"
②	Power OFF	
③	Display ON	
④	Display OFF	
⑤	Initialization	Initialize Setting of Command/Data
⑥	Image Rewriting	Send Display Data
	Display Settings	Dimmer, Scroll, etc.

Power ON/OFF Sequence



IC specification

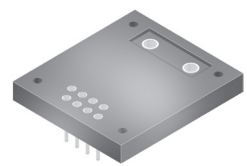
The specification for the OLED driver IC is available. Contact our sales department when using it.

Support products

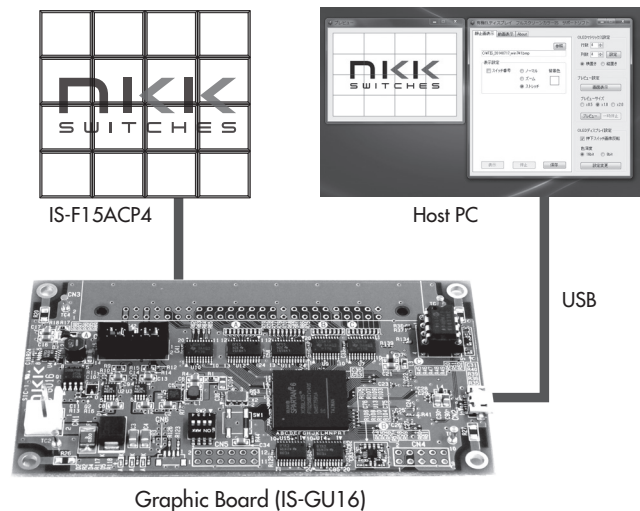
- **IS Color Editor** (image data creation and editing tool)
IS Color Editor is software for creating and editing images on Windows, for one page of an image file. It is used with OLED Full Screen Color IS, OLED Color IS, OLED Locker IS, High Resolution IS, and High Resolution Compact IS. Download it from our website, or contact our sales department.
*Confirmed compatible OS: Windows XP/ Vista
- **ISGU16 Graphic Board for OLED Full Screen Color Pushbutton**
The ISGU16 Graphic Board for OLED Full Screen Color Pushbutton (hereinafter IS-GU16) is available as a development design support tool.
Image display can be controlled easily on the OLED Full Screen Color Pushbutton (hereinafter IS-F15ACP4) by connecting the IS-GU16 to the host PC and IS-F15ACP4. Please contact our sales department for details.
Support software is available as reference application software. The support software can be downloaded from our website. A separate board for mounting the IS-F15ACP4 is required when displaying images on the IS-F15ACP4 using the support software.

- **Sockets (by custom order):** For switches

Use of sockets makes it possible to mount only the socket by flow soldering (after the socket is mounted, fit the IS body into the socket), making soldering work more efficient.




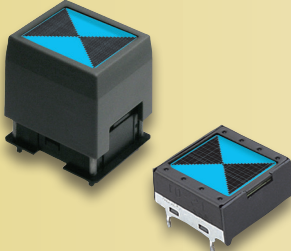

Contact our sales department if you want to use sockets.



► Instructions

- Handle with care to avoid applying static electricity.
- Power supply, signal application, and cutoff follow the ON/OFF sequence for the power supply signal voltage. When this is performed under non-recommended conditions, it may cause failure or display deterioration.
- **If the OLED panel breaks, do not place the contents in your mouth or swallow them. If any material sticks to your hands, feet, clothes, or elsewhere, wash it off with water.**
- If you use a solder bath, use the following conditions as a guideline.
 - Preheat time and temperature: 40 seconds maximum @100°C maximum
 - Peak time and temperature: 6 seconds maximum @ 270°C maximum
- If the same display pattern is displayed continuously for a long period, the differences in lit time between adjacent dots may cause visible differences in brightness. Use the display so that the cumulative lit times of each display element are as similar as possible.
- Note that excessive force applied to the switch control could break the internal OLED panel.
- Dirt on the switch control (key top) should be wiped off with a dry cloth. If the dirt is severe, wipe the key top with a cloth moistened with a small amount of neutral detergent, then wipe it dry with a dry cloth. Do not use thinners or other organic solvents, because they could attack the materials of the control.
- Entry of external noise etc. could change the internal state. We recommend periodic initialization of the IC as a countermeasure against malfunctions caused by noise.
- Do not send commands other than those stated in the IC specification. Malfunctions may result.
- Place circuit protection devices (fuses etc.) in the power supply line, as appropriate for the usage conditions. If there is no appropriate protective device, circuit boards or other components could burn out or be damaged due to dirt etc. adhering to them, or to some kinds of circuit failure.
- There are semiconductors mounted within the module, and they have a certain probability of failure. Take adequate care to avoid such failures resulting in human injury or other social harm. Apply safety precautions such as designing the implementation circuits with redundancy, designing countermeasures against the propagation of fire, and designing for malfunction prevention.
- Storage locations that are hot and highly humid, generate harmful gases, or have high dust concentrations, should be avoided.
- Avoid storage locations in which direct sunlight or strong UV light fall directly onto switches.
- Use storage containers that are not prone to building up static electric charge.

A Comprehensive Product Line with up to 65,536 Vibrant Colors!

↑ High resolution 96 × 64	Organic LED (OLED)	 <p>OLED Full Screen Color IS Display element: Organic LED Display dots: 96 x 64 Display colors: Color, 65,536 colors Number of device types: 1 type (1 switch)</p>	 <p>OLED Rocker IS Display element: Organic LED Display dots: 96 x 64 Display color: Black and white Number of device types: 1 type (1 switch)</p>
		 <p>OLED Color IS Display element: Organic LED Number of display dots ... Switch: 64 x 48, display module: 52 x 36 Display color: 65,536 colors Number of device types: 2 types (1 switch, 1 display module)</p>	
64 × 32	Liquid Crystal Display (LCD)	 <p>Wider View IS High resolution 64 x 32 pixels Standard LCD Display element: Liquid Crystal Display (LCD) Backlight: RGB (64 colors) Number of device types: 2 types (1 switch, 1 display module)</p>	 <p>Wider View IS High resolution 64 x 32 pixels Compact LCD Display element: Liquid Crystal Display (LCD) Backlight: RGB (64 colors) Number of device types: 1 type (1 switch)</p>
		 <p>Wider View IS Standard LCD 36 x 24 pixels Display element: Liquid Crystal Display (LCD) Backlight: 2 colors/ RGB Number of device types: 5 types (3 switches, 2 display modules)</p>	 <p>Wider View IS Compact LCD 36 x 24 pixels Display element: Liquid Crystal Display (LCD) Backlight: 2 colors/ RGB</p>
36 × 24			

* Specifications presented here are subject to change without notice. Check with our staff for the latest specifications.

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