Change Notice

CN-0231

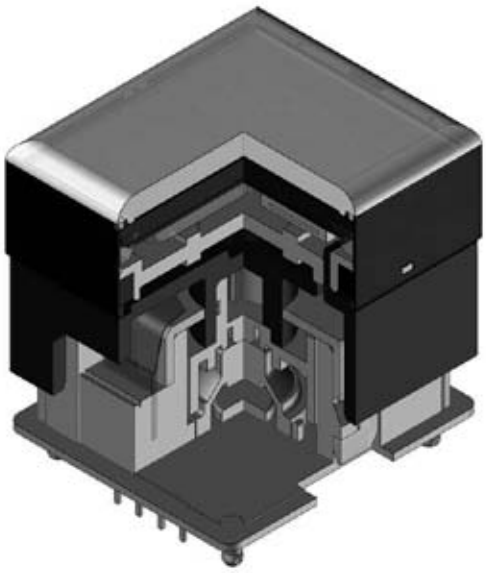
OLED Display
Frameless Pushbutton

2014-05-15
Rev 2014-10-22
Rev 2015-06-29

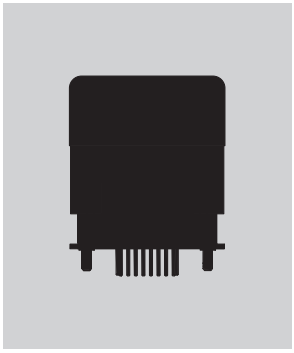
NKK SWITCHES

DISTINCTIVE CHARACTERISTICS

- High definition, contrast and resolution of 96 x 64 pixels in compact screen and minimal frame
- Range of 65,536 colors in 16 bit mode
- Operating life of 50,000 hours minimum
- Maximum use of display lens with ultra-thin frame provides full screen capacity
- Multiple units easily combine to form one screen, offering flexibility in size and layout
- Smooth, silent operation with short stroke of 0.07" lends to tactile feedback unparalleled to touch panels
- Same outer dimensions of switch and footprint, enabling ease of replacement with current switches
- Operated by commands and data supplied via serial communications (SPI)
- Incorporates bitmap display function
- Low energy consumption
- Dust tight construction
- High reliability and long life of one million actuations
- Epoxy sealed straight PC terminals
- Snap-in standoff for easy, secure mounting and alignment; aids in prevention of dislodging during wave soldering



Actual Size



Typical Markets Include:

Industrial Controls	Test and Instrumentation	Medical	Security
Broadcast	Telecommunications	Military	Commercial
Aerospace	Computer Systems	Financial Systems	

SWITCH PART NUMBER & DESCRIPTION

ATTENTION ELECTROSTATIC SENSITIVE DEVICES

Part Number	Switch Description	OLED	Pixel Format
ISF15ACP4	SPST, Momentary ON Gold Contacts Straight PC Terminals	Color OLED Display Module 65,536 Colors	96RGB x 64 Pixels Horizontal x Vertical

SWITCH SPECIFICATIONS

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
Operating Force	2.0 ± 0.5 Newtons
Total Travel	1.8mm (0.07")

OLED SPECIFICATIONS

Characteristics of Display

Display Device	Color OLED display module
Display Mode	Passive matrix
Viewing Area	21.28mm x 18.74mm (horizontal x vertical)
Pixel Format	96RGB x 64 pixels (horizontal x vertical)
Pixel Size	0.222mm x 0.293mm (horizontal x vertical)
Interface	Serial (SPI) interface
Number of Colors	65,536 Colors (16bit: R 5bit/G 6bit/B 5bit) or 256 Colors (8bit: R 2bit/G 3bit/B 3bit)
Operating 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 @ 100cd/m² (based on 40% pixels ON; Ta = 77°F)

Absolute Maximum Ratings

Items	Symbols	Ratings
Supply Voltage for Logic/Interface	V_{DD}	–0.3V to +4.0V
Supply Voltage for Drive	V_{CC}	–0.0V to +19.0V
Input Voltage	V_I	–0.3V to V_{DD} +0.3V

Current Consumption

(Temperature at 25°C, V_{DD} = 2.8V, V_{CC} = 15.0V)

Items	Symbols	Min	Typical	Max
All-Pixels-On Mode *Drive System Power Current	I_{CC1}	8.6mA	10.8mA	13.0mA
All-Pixels-On Mode *Logic/IF System Power Current	I_{DD1}	0.15mA	0.18mA	0.21mA
Sleep Mode **Drive System Power Current	I_{CC2}	—	—	10μA
Sleep Mode **Logic/IF System Power Current	I_{DD2}	—	—	10μA

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

Recommended Operating Conditions

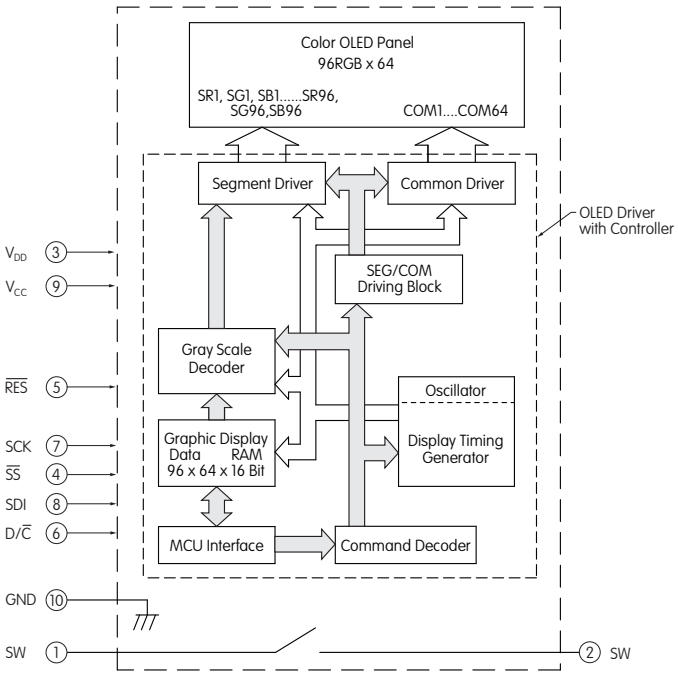
Items	Symbols	Minimum	Typical	Maximum
Supply Voltage for Logic/Interface	V_{DD}	2.4V	2.8V	3.5V
Supply Voltage for Drive	V_{CC}	14.0V	15.0V	16.0V
Input High Level Voltage	V_{IH}	0.8 x V_{DD}	—	—
Input Low Level Voltage	V_{IL}	—	—	0.2 x V_{DD}

Optical Characteristics (Temperature at 25°C, Initial Value: 87 x 0F)

Items		Min	Typical	Max	Unit	Remarks
Luminosity		80	105	130	cd/m²	White (All pixels on)
White Color Coordinate	(x)	0.26	0.30	0.34	—	
	(y)	0.32	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	0.28	0.33	—	
	(y)	0.60	0.63	0.66	—	
Blue Color Coordinate	(x)	0.10	0.15	0.19	—	
	(y)	0.10	0.17	0.23	—	
Contrast Ratio		100	—	—	—	

BLOCK DIAGRAM & PIN CONFIGURATIONS

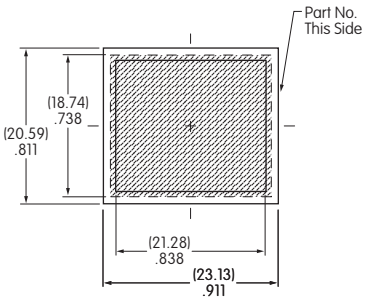
ISF15ACP4

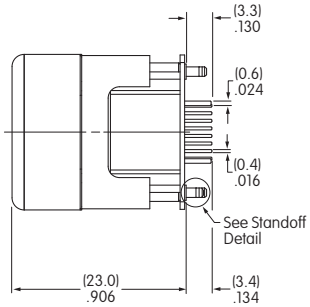


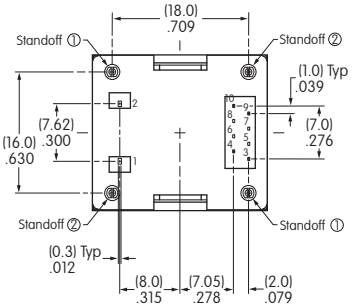
Pin No.	Symbol	Name	Function
1	SW	Terminal of Switch	Normally open
2	SW	Terminal of Switch	Normally open
3	V_{DD}	Power	Power source for logic circuit
4	$\overline{SS}$	Slave Select	Slave select for SPI. This line is active low.
5	$\overline{RES}$	Reset	Reset signal input. When pin is low, initialization 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

TYPICAL SWITCH DIMENSIONS

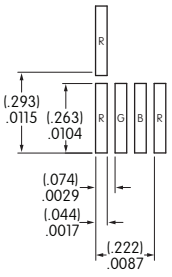
Terminal numbers are not on the switch.



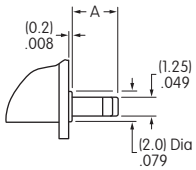




Pixel Detail



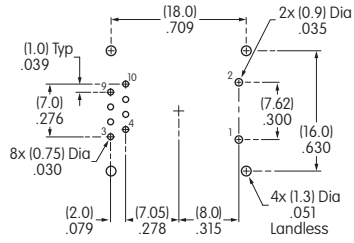
Standoff Detail



Dimension A

Standoff 1 = (2.7) .106 Standoff 2 = (2.3) .091

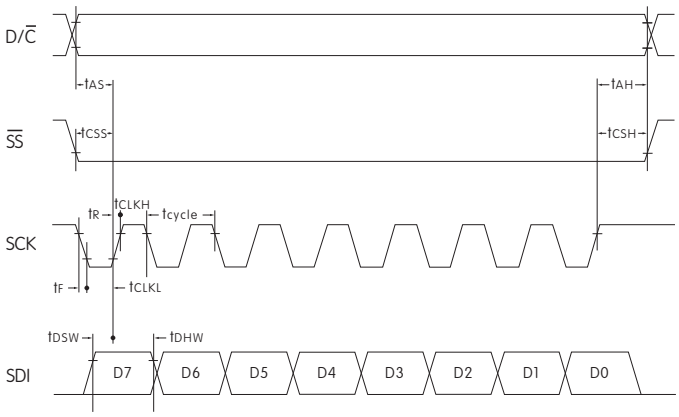
Footprint



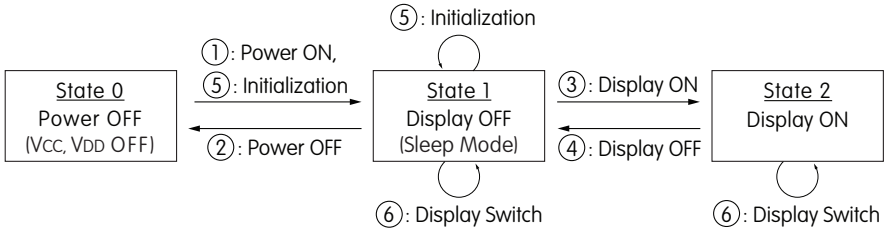
TIMING SPECIFICATIONS

AC Characteristics (Temperature at 25°C), V_{DD} = 2.4V ~ 3.5V)

Items	Symbols	Minimum	Typical	Maximum
Clock Cycle Time	tcycle	150ns	—	—
D/C̄ Setup Time	tAS	40ns	—	—
D/C̄ Hold Time	tAH	40ns	—	—
S̄S̄ Setup Time	tCSS	75ns	—	—
S̄S̄ Hold Time	tCSH	60ns	—	—
Write Data Setup Time	tDSW	40ns	—	—
Write Data Hold Time	tDHW	40ns	—	—
SCK Low Time	tCLKL	75ns	—	—
SCK High Time	tCLKH	75ns	—	—
SCK Rise Time	tR	—	—	15ns
SCK Fall Time	tF	—	—	15ns



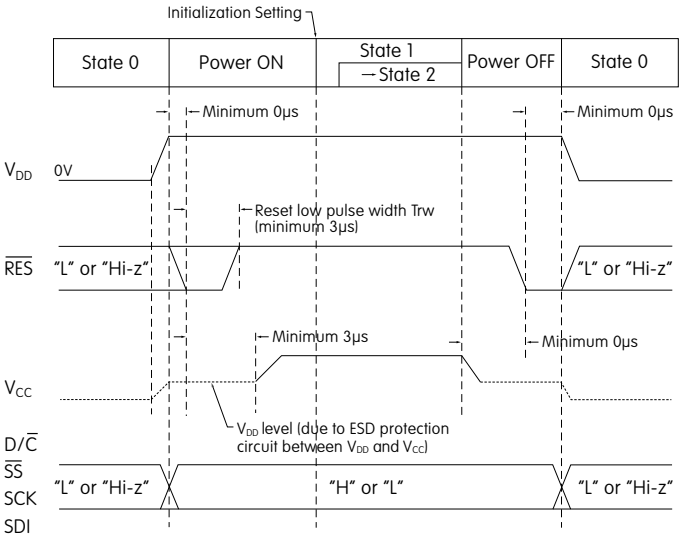
STATE TRANSITION



State Number	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 Transition	Transition	Index
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



GENERAL PRECAUTIONS FOR HANDLING & STORAGE

1. The IS Series devices are electrostatic sensitive. Use care and preventative measures as with any devices that are susceptible to static electricity.
2. Limit operating force to keytop to 100.0N maximum, as excessive pressure may damage the OLED device.
3. Under fixed conditions and over an extended period of time, an afterimage may appear in the viewing area.
4. To avoid damage to the IC, do not touch terminals unless properly insulated from static electricity.
5. The IS series devices are not process sealed. Do not allow devices to become exposed to any liquids. A transparent material may be used as protective cover if devices are in area that may be susceptible to splashing.
6. If the OLED is accidentally broken, avoid contact with the liquid and wash off any liquid spills to the skin or clothing.
7. Clean cap surface with dry cloth. If further cleaning is needed, wipe with dampened cloth using neutral cleanser and dry with clean cloth. Do not use organic solvent.
8. Store in original container, away from static electricity, and away from direct sunlight.
9. Avoid extreme temperatures, high humidity, gaseous substances, and all forms of chemical contamination.
10. Recommended soldering time and temperature limits:

    Wave Soldering: Temperature not to exceed 518°F and 11 seconds
    When soldering, avoid exposing the OLED to temperatures in excess of 176°F.
11. Proper serial resistors and buffers for signals should be used to prevent noise problems.
12. Do not send any commands other than those on the specification sheet.

OPTIONAL ACCESSORIES

IC Specification

Specifications for the OLED driver IC is available. Contact NKK's Sales Department for further information.

Support Products

IS Color Editor (image data creation and editing tool)

The IS Color Editor is software for creating and editing images on Windows, and can be downloaded from our website. (Compatible with OS: Windows XP / Vista). It may be used with OLED Pushbutton, Display and Rocker; LCD 64 x 32 Pushbutton and Display.

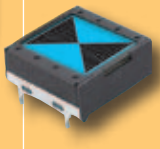
Support Tools

Many support tools are currently in the development process. There will be notifications on the website as they become available for our customers.

Sockets for Switches

The socket permits the SMARTSWITCH™ to be plugged in after automated processing.
Use of the socket enables easy field replacement of the device.

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

Resolution 96 x 64	OLED	 **OLED Display** **Full Screen** Organic LED Switch: 96 x 64 Pixels 65,536 Colors	 **OLED Display Rocker** Organic LED Switch: 96 x 64 Pixels Black/White	
Resolution 64 x 48	OLED	  **OLED Display** Organic LED Switch: 64 x 48 Pixels Display: 52 x 36 Pixels 65,536 Colors		
Resolution 64 x 32	LCD	  **Wider View IS** **High Resolution** **Standard LCD** Switch or Display: 64 x 32 Pixels Backlight RGB: 64 Colors	 **Wider View IS** **High Resolution** **Compact LCD** Switch: 64 x 32 Pixels Backlight RGB: 64 Colors	
Resolution 36 x 24	LCD	  **Wider View IS** **Standard LCD** Switch or Display: 36 x 24 Pixels Backlight Bicolor/RGB 3 Switches, 2 Displays	 **Wider View IS** **Compact LCD** Switch: 36 x 24 Pixels Backlight Bicolor/RGB	

Effective Date

May 2014

NKK SWITCHES

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