



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



Toggle



Frameless OLED Pushbutton.....E4

Switch with 96 x 64 Programmable Color Display  
Video Capability; 180° Viewing Angle; High Contrast

← **NEW**

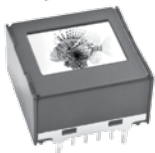
Rockers



OLED Pushbutton.....E8

Switch with 64 x 48 Programmable Color Display  
Video Capability; 180° Viewing Angle; High Contrast

Pushbuttons



OLED Display.....E11

52 x 36 Programmable Color Display  
Video Capability; 180° Viewing Angle; High Contrast

Illuminated PB

Programmable  
**E**



OLED Rocker.....E15

Switch with 96 x 64 Programmable Display  
White Monochrome OLED Display; 180° Viewing Angle; IP64

Keylocks

Rotaries

Wide View LCD 64 x 32 Pushbutton.....E21

Switch with Programmable Display; Short & Long Travel Options  
RGB 64 Colors; Long Life LCD; up to 4 Lines with 10 Characters Each

← **NEW**

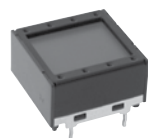
Slides



Wide View LCD 64 x 32 Display.....E26

Programmable Display  
RGB 64 Colors; Long Life LCD; up to 4 Lines with 10 Characters Each

Tactiles



← **NEW**

Wide View Compact LCD 64 x 32 Pushbutton..E30

Switch with Programmable Display  
RGB 64 Colors; Long Life LCD; up to 4 Lines with 10 Characters Each

Tilt

Touch



← **NEW**

Wide View LCD 36 x 24 Pushbutton.....E35

Switch with Programmable Display  
RGB Backlight; Long Life LCD; up to 3 Lines with 6 Characters Each

Indicators

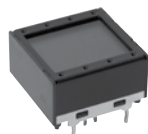


← **NEW**

Wide View LCD 36 x 24 Display.....E39

Programmable Display  
RGB Backlight; Long Life LCD; up to 3 Lines with 6 Characters Each

Accessories



← **NEW**

Supplement



Wide View Compact LCD 36 x 24 Pushbutton..E43

Switch with Programmable Display  
RGB Backlight; Long Life LCD; up to 3 Lines with 6 Characters Each

← **NEW**



LCD 64 x 32 Pushbutton.....E48

\* Switch with Programmable Display  
RGB 64 Colors; Long Life LCD; up to 4 Lines with 10 Characters Each



LCD 64 x 32 Display.....E51

\* Programmable Display  
RGB 64 Colors; Long Life LCD; up to 4 Lines with 10 Characters Each



Compact LCD 64 x 32 Pushbutton.....E55

\* Switch with Programmable Display; 28% Smaller than Standard Size  
RGB 64 Colors; Long Life LCD; up to 4 Lines with 10 Characters Each



LCD 36 x 24 Pushbutton.....E60

\* Switch with Programmable Display  
Single, Bicolor or RGB Backlight; up to 3 Lines with 6 Characters Each



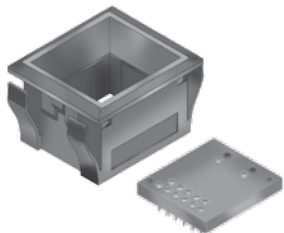
LCD 36 x 24 Display.....E67

\* Programmable Display  
Single, Bicolor or RGB Backlight; up to 3 Lines with 6 Characters Each



Compact LCD 36 x 24 Pushbutton.....E73

\* Switch with Programmable Display; 28% Smaller than Standard Size  
Single, Bicolor or RGB Backlight; up to 3 Lines with 6 Characters Each



Accessories.....E78

Enhance Your Applications

Development Tools & Support

NKK provides numerous development tools to get any SmartSwitch project started easily. Please visit our web site or contact a sales representative.

\* These switches and displays will be available until March 31, 2015.

Toggle

Rockers

Pushbuttons

Illuminated PB

**E** Programmable

Keylocks

Rotaries

Slides

Tactiles

Tilt

Touch

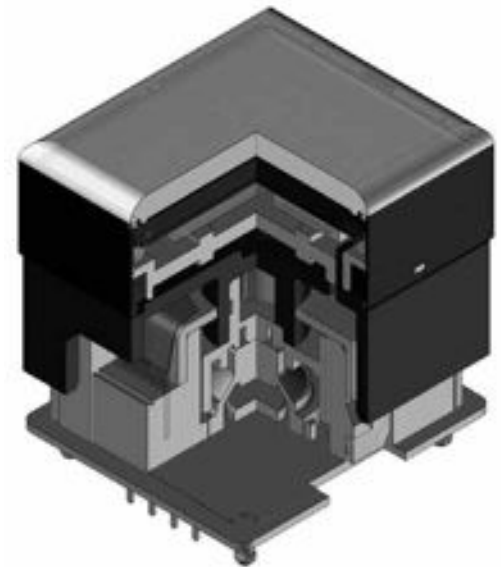
Indicators

Accessories

Supplement

## DISTINCTIVE CHARACTERISTICS

- High definition, contrast and resolution of 96RGB 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
- Snap-in standoff for easy, secure mounting and alignment; aids in prevention of dislodging during wave soldering



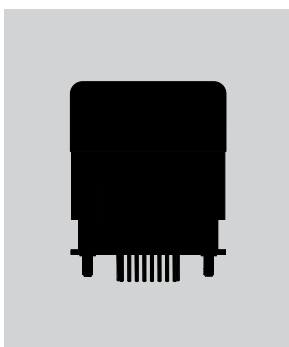
Viewing area: 21.28mm x 18.7mm (horizontal x vertical)

High reliability and long life of one million actuations minimum

Highly reliable gold plated twin contacts

Epoxy sealed straight PC terminals

Actual Size





**SWITCH PART NUMBER & DESCRIPTION**

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

**SWITCH SPECIFICATIONS**

<b>Circuit</b>	SPST normally open
<b>Contact Position</b>	Leave actuator: ① – ② OFF Push actuator: ① – ② ON
<b>Electrical Capacity (Resistive Load)</b>	100mA @ 12V DC (resistive circuit)
<b>Contact Resistance</b>	200 milliohms maximum @ 20mV 10mA
<b>Insulation Resistance</b>	100 megohms minimum @ 100V DC
<b>Dielectric Strength</b>	125V AC for 1 minute minimum
<b>Mechanical Endurance</b>	1,000,000 operations minimum
<b>Electrical Endurance</b>	1,000,000 operations minimum
<b>Operating Force</b>	2.0 ± 0.5 Newtons
<b>Total Travel</b>	1.8mm (0.07")

**OLED SPECIFICATIONS**

**Characteristics of Display**

<b>Display Device</b>	Color OLED display module
<b>Display Mode</b>	Passive matrix
<b>Viewing Area</b>	21.28mm x 18.74mm (horizontal x vertical)
<b>Pixel Format</b>	96RGB x 64 pixels (horizontal x vertical)
<b>Pixel Size</b>	0.044mm x 0.263mm (horizontal x vertical)
<b>Interface</b>	Serial (SPI) interface
<b>Number of Colors</b>	65,536 Colors (16bit: R 5bit/G 6bit/B 5bit) or 256 Colors (8bit: R 2bit/G 3bit/B 3bit)
<b>Operating Temperature Range</b>	-20°C ~ +70°C (-4°F ~ +158°F)
<b>Storage Temperature Range</b>	-30°C ~ +80°C (-22°F ~ +176°F)
<b>Operating Life (Display)</b>	50,000 hours @ 100cd/m <sup>2</sup> (based on 40% pixels ON; Ta = 77°F)

**Absolute Maximum Ratings**

Items	Symbols	Ratings
<b>Supply Voltage for Logic/Interface</b>	V <sub>DD</sub>	-0.3V to +4.0V
<b>Supply Voltage for Drive</b>	V <sub>CC</sub>	-0.0V to +19.0V
<b>Input Voltage</b>	V <sub>I</sub>	-0.3V to V <sub>DD</sub> +0.3V

**Current Consumption**

(Temperature at 25°C, V<sub>DD</sub> = 2.8V, V<sub>CC</sub> = 15.0V)

Items	Symbols	Min	Typical	Max
<b>All-Pixels-On Mode *Drive System Power Current</b>	I <sub>CC1</sub>	—	11.0mA	13.2mA
<b>All-Pixels-On Mode *Logic/IF System Power Current</b>	I <sub>DD1</sub>	—	0.17mA	0.20mA
<b>Sleep Mode **Drive System Power Current</b>	I <sub>CC2</sub>	—	—	10µA
<b>Sleep Mode **Logic/IF System Power Current</b>	I <sub>DD2</sub>	—	—	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
<b>Supply Voltage for Logic/Interface</b>	V <sub>DD</sub>	2.4V	2.8V	3.5V
<b>Supply Voltage for Drive</b>	V <sub>CC</sub>	14.0V	15.0V	16.0V
<b>Input High Level Voltage</b>	V <sub>IH</sub>	0.8 x V <sub>DD</sub>	—	—
<b>Input Low Level Voltage</b>	V <sub>IL</sub>	—	—	0.2 x V <sub>DD</sub>

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

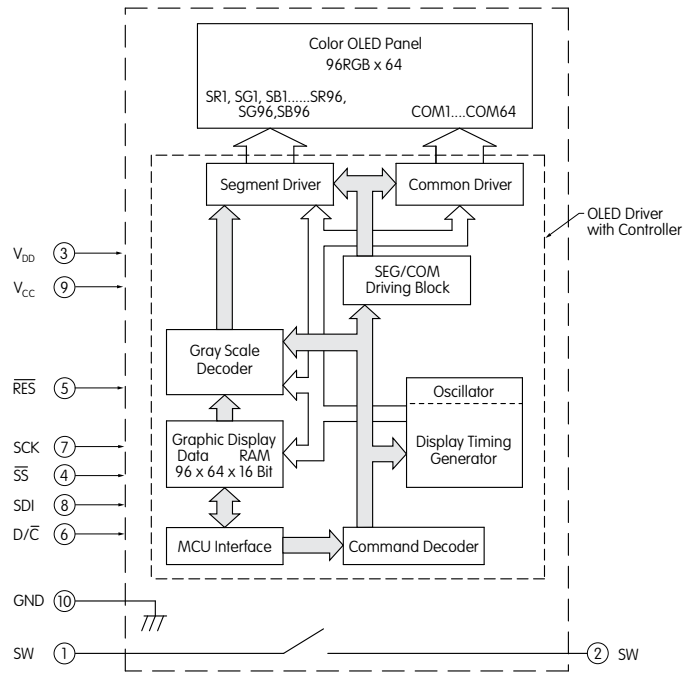
Items	Min	Typical	Max	Unit	Remarks
<b>Luminosity</b>	80	105	130	cd/m <sup>2</sup>	White (All pixels on)
<b>White Color Coordinate</b>	(x)	0.26	0.30	0.34	—
	(y)	0.31	0.36	0.41	—
<b>Red Color Coordinate</b>	(x)	0.62	0.66	0.70	—
	(y)	0.30	0.34	0.38	—
<b>Green Color Coordinate</b>	(x)	0.24	0.29	0.33	—
	(y)	0.59	0.63	0.67	—
<b>Blue Color Coordinate</b>	(x)	0.10	0.15	0.19	—
	(y)	0.10	0.17	0.23	—
<b>Contrast Ratio</b>	100	—	—	—	—

Toggle  
Rockers  
Pushbuttons  
Illuminated PB  
Programmable  
Keylocks  
Rotaries  
Slides  
Tactiles  
Tilt  
Touch  
Indicators  
Accessories  
Supplement

## BLOCK DIAGRAM & PIN CONFIGURATIONS

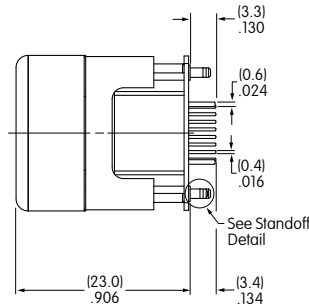
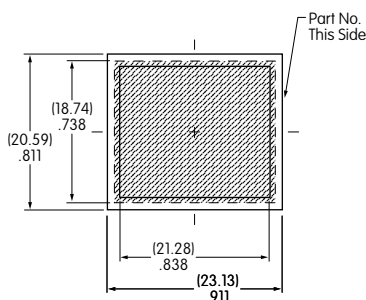


**ISF15ACP4**

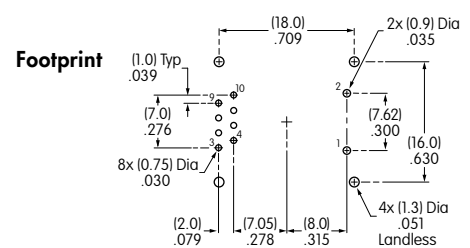
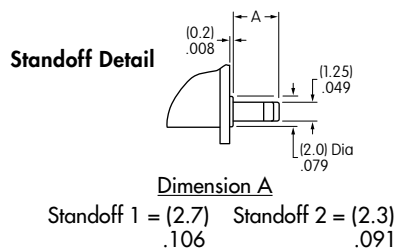
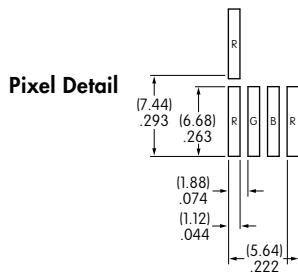
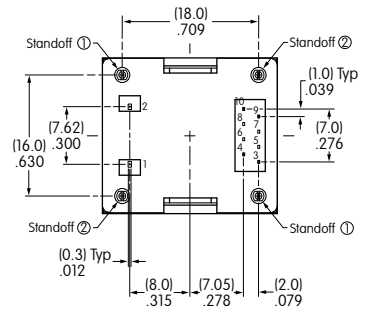


Pin No.	Symbol	Name	Function
①	SW	Terminal of Switch	Normally open
②	SW	Terminal of Switch	Normally open
③	V <sub>DD</sub>	Power	Power source for logic circuit
④	SS	Slave Select	Slave select for SPI. This line is active low.
⑤	RES	Reset	Reset signal input. When pin is low, initialization of chip is executed.
⑥	D/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 <sub>CC</sub>	Power	Power source for drive circuit
⑩	GND	Ground	Connect to Ground

## TYPICAL SWITCH DIMENSIONS



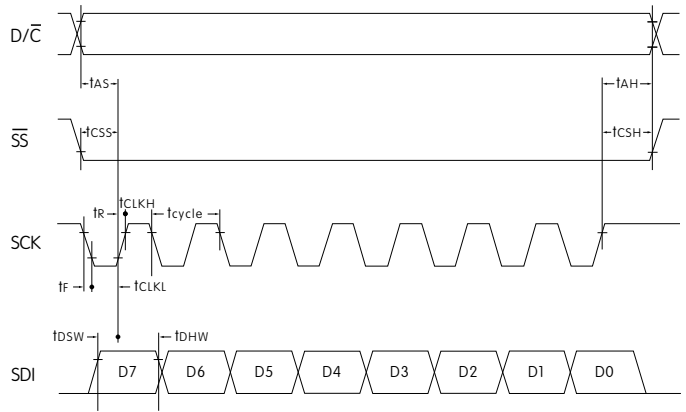
Terminal numbers are not on the switch.



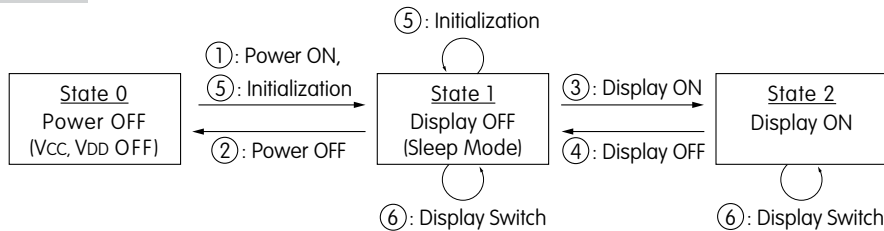
**TIMING SPECIFICATIONS**

**AC Characteristics** (Temperature at 25°C),  $V_{DD} = 2.4V \sim 3.5V$

Items	Symbols	Minimum	Typical	Maximum
Clock Cycle Time	$t_{cycle}$	150ns	—	—
D/ $\bar{C}$ Setup Time	$t_{AS}$	40ns	—	—
D/ $\bar{C}$ Hold Time	$t_{AH}$	40ns	—	—
$\bar{SS}$ Setup Time	$t_{CSS}$	75ns	—	—
$\bar{SS}$ Hold Time	$t_{CSH}$	60ns	—	—
Write Data Setup Time	$t_{DSW}$	40ns	—	—
Write Data Hold Time	$t_{DHW}$	40ns	—	—
SCK Low Time	$t_{CLKL}$	75ns	—	—
SCK High Time	$t_{CLKH}$	75ns	—	—
SCK Rise Time	$t_R$	—	—	15ns
SCK Fall Time	$t_F$	—	—	15ns



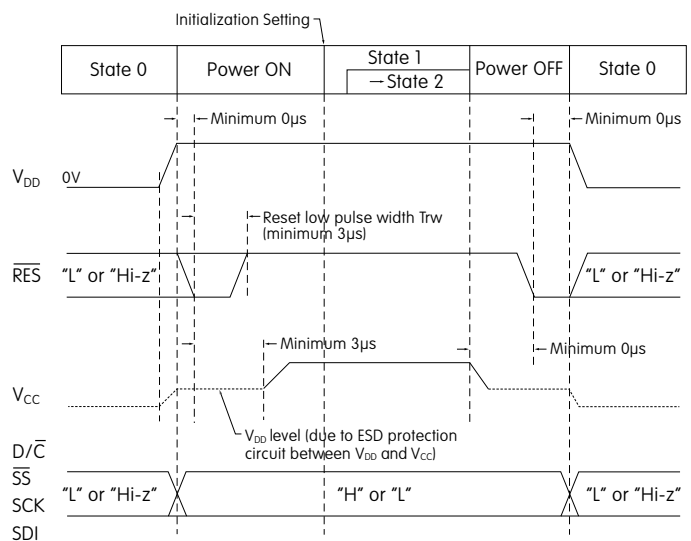
**STATE TRANSITION**



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**



### DISTINCTIVE CHARACTERISTICS

- Organic LED technology
- Life 30,000 hours @ 100cd/m<sup>2</sup> (based on 40% pixels on) or 60,000 hours @ 50cd/m<sup>2</sup> (based on 40% pixels on)
- Power consumption only 3.8mA (30% less than previous product)
- Range of 65,536 colors in 16 bit mode, 256 colors in 8 bit mode
- Full viewing angle of 180°
- Exceptional contrast: 50 times greater than LCD products
- Four times more enhanced resolution
- High resolution provides sharp, clear images of very small characters
- Operated by commands and data supplied via serial communications (SPI)
- Distinct, long travel of 4.5mm (same as KP01 series pushbuttons)
- Dust tight construction
- Stylish, translucent black housing design

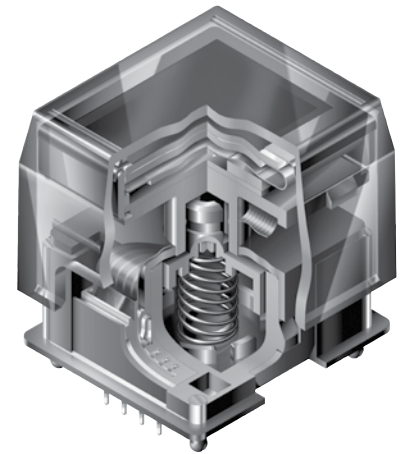
Viewing area: 15.5mm x 11.6mm (horizontal x vertical)

High reliability and long life of three million actuations minimum

High resolution of 64RGB x 48 pixels

Epoxy sealed straight PC terminals

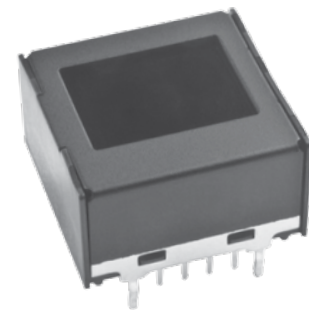
Snap-in standoff for easy, secure mounting and alignment



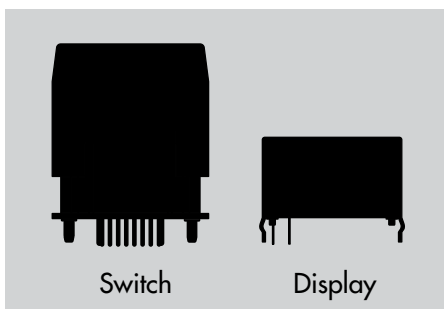
Viewing area: 12.9mm x 9.9mm (horizontal x vertical)

High resolution of 52RGB x 36 pixels

Bracket has crimped legs to ensure secure PC mounting and prevent dislodging during wave soldering



Actual Sizes





## SWITCH PART NUMBER & DESCRIPTION



Part Number	Switch Description	OLED	Pixel Format
<b>ISC15ANP4</b>	SPST, Momentary ON Gold Contacts Straight PC Terminals	Color OLED Display Module 65,536 Colors	64RGB x 48 Pixels Horizontal x Vertical

## SWITCH SPECIFICATIONS

<b>Circuit</b>	SPST normally open
<b>Contact Position</b>	Leave actuator: ① – ② OFF Push actuator: ① – ② ON
<b>Electrical Capacity (Resistive Load)</b>	100mA @ 12V DC
<b>Contact Resistance</b>	200 milliohms maximum @ 20mV 10mA
<b>Insulation Resistance</b>	100 megohms minimum @ 100V DC
<b>Dielectric Strength</b>	125V AC for 1 minute minimum
<b>Mechanical Endurance</b>	3,000,000 operations minimum
<b>Electrical Endurance</b>	3,000,000 operations minimum
<b>Operating Force</b>	2.0 ± 0.5 Newtons
<b>Total Travel</b>	4.5mm (.177")

## OLED SPECIFICATIONS

### Characteristics of Display

<b>Display Device</b>	Color OLED display module
<b>Display Mode</b>	Passive matrix
<b>Viewing Area</b>	15.5mm x 11.6mm (horizontal x vertical)
<b>Pixel Format</b>	64RGB x 48 pixels (horizontal x vertical)
<b>Pixel Size</b>	0.21mm x 0.20mm (horizontal x vertical)
<b>Interface</b>	Serial (SPI) interface
<b>Number of Colors</b>	65,536 Colors (16bit: R 5bit/G 6bit/B 5bit) or 256 Colors (8bit: R 2bit/G 3bit/B 3bit)
<b>Operating Temperature Range</b>	-20°C ~ +70°C (-4°F ~ +158°F)
<b>Storage Temperature Range</b>	-30°C ~ +80°C (-22°F ~ +176°F)
<b>Operating Life (Display)</b>	30,000 hours @ 100cd/m <sup>2</sup> (based on 40% pixels ON) 60,000 hours @ 50cd/m <sup>2</sup> (based on 40% pixels ON)

### Absolute Maximum Ratings

Items	Symbols	Ratings
Supply Voltage for Logic/Interface	V <sub>DD</sub>	-0.3V to +4.0V
Supply Voltage for Drive	V <sub>CC</sub>	-0.0V to +19.0V
Input Voltage	V <sub>I</sub>	-0.3V to V <sub>DD</sub> +0.3V

### Current Consumption

(Temperature at 25°C, V<sub>DD</sub> = 2.8V, V<sub>CC</sub> = 16.0V)

Items	Symbols	Min	Typical	Max
All-Pixels-On Mode *Drive System Power Current	I <sub>CC1</sub>	—	3.8mA	4.6mA
All-Pixels-On Mode *Logic/IF System Power Current	I <sub>DD1</sub>	—	0.16mA	0.19mA
Sleep Mode **Drive System Power Current	I <sub>CC2</sub>	—	—	10µA
Sleep Mode **Logic/IF System Power Current	I <sub>DD2</sub>	—	—	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 <sub>DD</sub>	2.4V	2.8V	3.5V
Supply Voltage for Drive	V <sub>CC</sub>	15.0V	16.0V	17.0V
Input High Level Voltage	V <sub>IH</sub>	0.8 x V <sub>DD</sub>	—	—
Input Low Level Voltage	V <sub>IL</sub>	—	—	0.2 x V <sub>DD</sub>

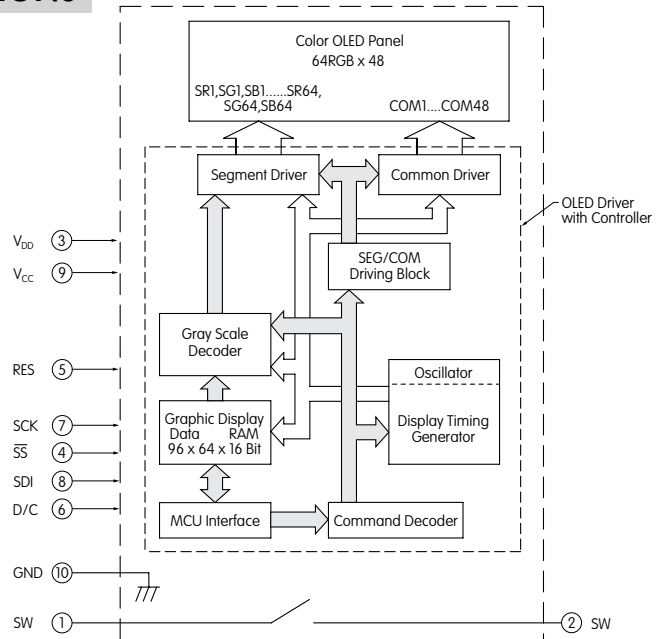
### Optical Characteristics (Temperature at 25°C, Initial Value: 87 x 0F)

Items	Min	Typical	Max	Unit	Remarks
Luminosity	75	100	125	cd/m <sup>2</sup>	White (All pixels on)
White Color Coordinate	(x)	0.26	0.30	0.34	—
	(y)	0.32	0.37	0.42	—
Red Color Coordinate	(x)	0.63	0.67	0.71	—
	(y)	0.29	0.33	0.37	—
Green Color Coordinate	(x)	0.19	0.23	0.27	—
	(y)	0.61	0.65	0.69	—
Blue Color Coordinate	(x)	0.10	0.14	0.18	—
	(y)	0.14	0.20	0.26	—
Contrast Ratio	100	—	—	—	—

## SWITCH BLOCK DIAGRAM & PIN CONFIGURATIONS

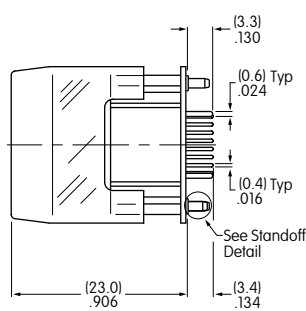
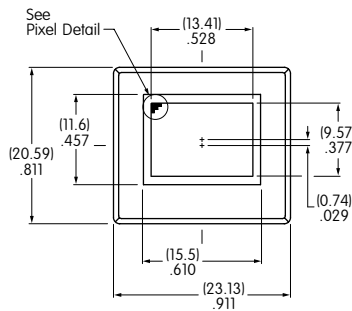


ISC15ANP4

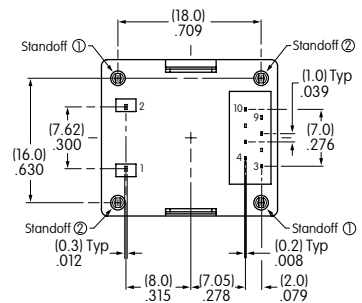


Pin No.	Symbol	Name	Function
①	SW	Terminal of Switch	Normally open
②	SW	Terminal of Switch	Normally open
③	V <sub>DD</sub>	Power	Power source for logic circuit
④	SS	Slave Select	Slave select for SPI. This line is active low.
⑤	RES	Reset	Reset signal input. When pin is low, initialization of chip is executed.
⑥	D/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 <sub>CC</sub>	Power	Power source for drive circuit
⑩	GND	Ground	Connect to Ground

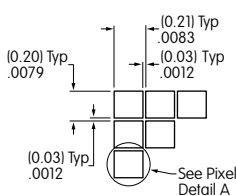
## TYPICAL SWITCH DIMENSIONS



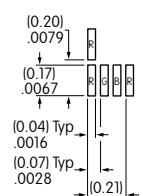
Terminal numbers are not on the switch.



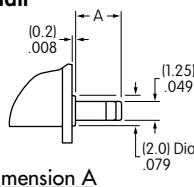
Pixel Detail



Pixel Detail A

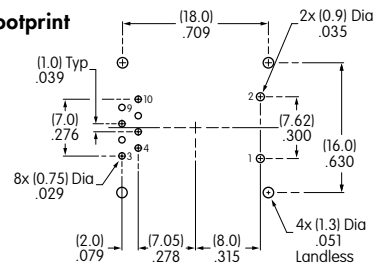


Standoff Detail



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

Footprint





## DISPLAY PART NUMBER & DESCRIPTION

Part Number	Display Description	OLED	Pixel Format
<b>ISC01P</b>	Straight PC Terminals	Color OLED Display Module 65,536 Colors	52RGB x 36 Pixels Horizontal x Vertical

## OLED SPECIFICATIONS

### Characteristics of Display

Display Device	Color OLED display module
Display Mode	Passive matrix
Viewing Area	12.9mm x 9.9mm (horizontal x vertical)
Pixel Format	52RGB x 36 pixels (horizontal x vertical)
Pixel Size	0.21mm x 0.22mm (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)	30,000 hours @ 100cd/m <sup>2</sup> (based on 40% pixels ON) 60,000 hours @ 50cd/m <sup>2</sup> (based on 40% pixels ON)

### Absolute Maximum Ratings

Items	Symbols	Ratings
Supply Voltage for Logic/Interface	V <sub>DD</sub>	-0.3V to +4.0V
Supply Voltage for Drive	V <sub>CC</sub>	0.0V to +19.0V
Input Voltage	V <sub>I</sub>	-0.3V to V <sub>DD</sub> +0.3V

### Current Consumption

(Temperature at 25°C, V<sub>DD</sub> = 2.8V, V<sub>CC</sub> = 16.0V)

Items	Symbols	Min	Typical	Max
All-Pixels-On Mode *Drive System Power Current	I <sub>CC1</sub>	—	2.4mA	2.9mA
All-Pixels-On Mode *Logic/IF System Power Current	I <sub>DD1</sub>	—	0.15mA	0.18mA
Sleep Mode **Drive System Power Current	I <sub>CC2</sub>	—	—	10µA
Sleep Mode **Logic/IF System Power Current	I <sub>DD2</sub>	—	—	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 <sub>DD</sub>	2.4V	2.8V	3.5V
Supply Voltage for Drive	V <sub>CC</sub>	15.0V	16.0V	17.0V
Input High Level Voltage	V <sub>IH</sub>	0.8 x V <sub>DD</sub>	—	—
Input Low Level Voltage	V <sub>IL</sub>	—	—	0.2 x V <sub>DD</sub>

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

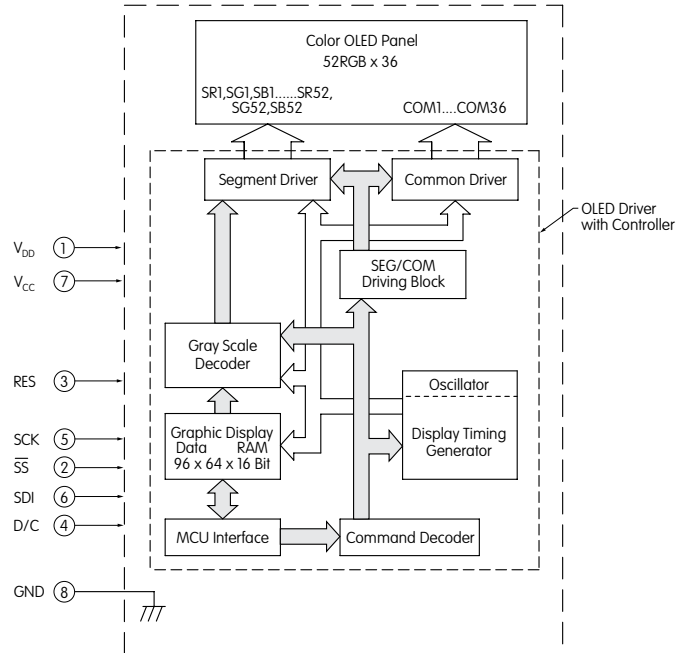
Items	Min	Typical	Max	Unit	Remarks
Luminosity	75	100	125	cd/m <sup>2</sup>	White (All pixels on)
White Color Coordinate	(x)	0.25	0.29	0.33	—
	(y)	0.31	0.36	0.41	—
Red Color Coordinate	(x)	0.63	0.67	0.71	—
	(y)	0.29	0.33	0.37	—
Green Color Coordinate	(x)	0.19	0.23	0.27	—
	(y)	0.60	0.64	0.68	—
Blue Color Coordinate	(x)	0.10	0.14	0.18	—
	(y)	0.14	0.20	0.26	—
Contrast Ratio	100	—	—	—	—

Toggles  
Rockers  
Pushbuttons  
Illuminated PB  
Programmable  
Keylocks  
Rotaries  
Slides  
Tactiles  
Tilt  
Touch  
Indicators  
Accessories  
Supplement

## DISPLAY BLOCK DIAGRAM & PIN CONFIGURATIONS

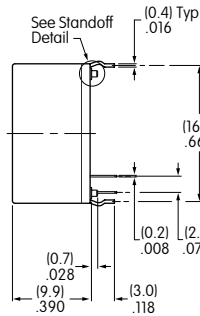
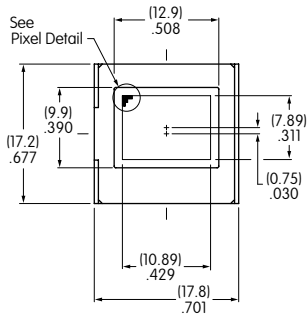


ISC01P

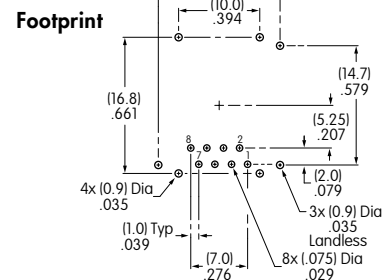
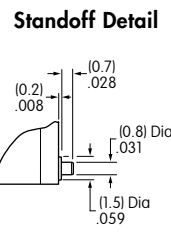
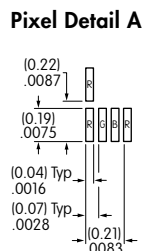
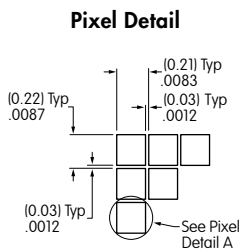
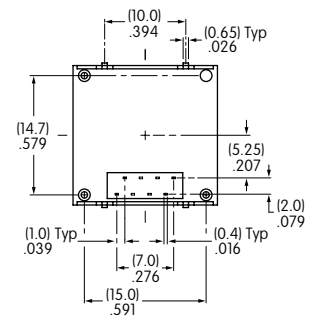


Pin No.	Symbol	Name	Function
①	V <sub>DD</sub>	Power	Power source for logic circuit
②	SS	Slave Select	Slave select for SPI. This line is active low.
③	RES	Reset	Reset signal input. When pin is low, initialization of chip is executed.
④	D/C	Data/Command	Data/Command Control. When pin is pulled low, data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

## TYPICAL DISPLAY DIMENSIONS



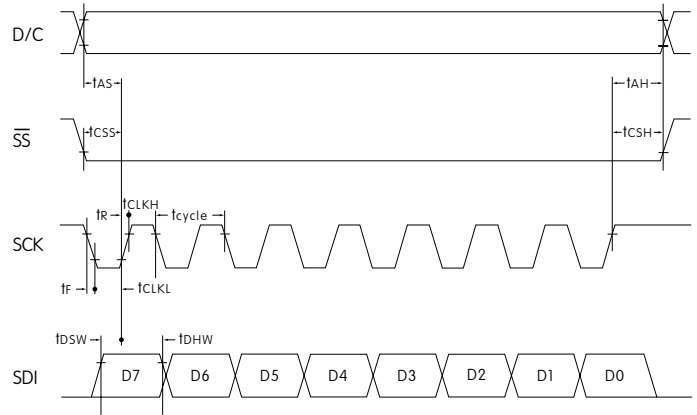
Terminal numbers are not on the switch.



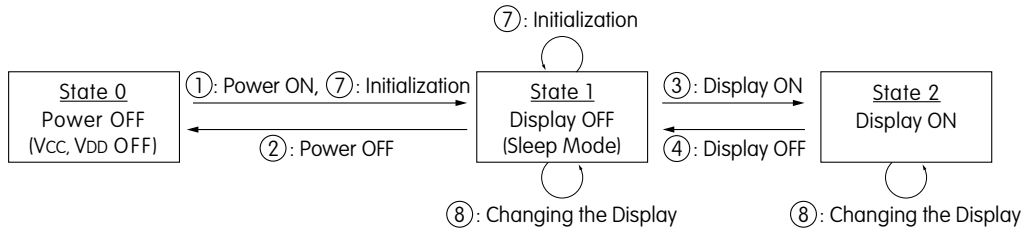
## TIMING SPECIFICATIONS FOR SWITCH & DISPLAY

**AC Characteristics** (Temperature at 25°C,  $V_{DD} = 2.4V \sim 3.5V$ )

Items	Symbols	Minimum	Typical	Maximum
Clock Cycle Time	$t_{cycle}$	150ns	—	—
D/C Setup Time	$t_{AS}$	40ns	—	—
D/C Hold Time	$t_{AH}$	40ns	—	—
$\overline{SS}$ Setup Time	$t_{CSS}$	75ns	—	—
$\overline{SS}$ Hold Time	$t_{CSH}$	60ns	—	—
Write Data Setup Time	$t_{DSW}$	40ns	—	—
Write Data Hold Time	$t_{DHW}$	40ns	—	—
SCK Low Time	$t_{CLKL}$	75ns	—	—
SCK High Time	$t_{CLKH}$	75ns	—	—
SCK Rise Time	$t_R$	—	—	15ns
SCK Fall Time	$t_F$	—	—	15ns



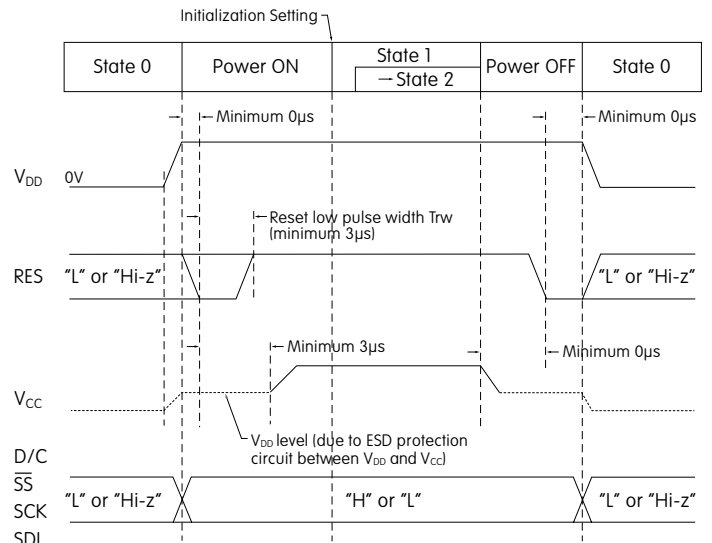
## STATE TRANSITION



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	
⑦	Initialization	Initialize Setting of Command/Data
⑧	Image Rewriting	Send Display Data
	Display Settings	Dimmer, Scroll, etc.

## Power ON/OFF Sequence



Note: Refer to Application Notes on web site.

## PRECAUTIONS FOR HANDLING & STORAGE OF OLED DEVICES

### Handling



1. The IS Series OLED devices are electrostatic sensitive. To avoid damage to IC, do not touch terminals unless properly isolated from static electricity.
2. Signal input under conditions not recommended may cause damage to the OLED unit or deterioration of the display. Follow directions regarding supply sequences of power and signal voltages.
3. If the OLED panel is broken, avoid touching the contents. Wash off any contact to the skin or clothing.
4. Limit operating force to switch keytop to 100.0N maximum, as excessive pressure may damage the OLED.
5. For OLED display, it is necessary for bracket legs to be Grounded.
6. Recommended soldering time and temperature limits for OLED switch or display:  
 Avoid temperatures exceeding 80°C at the OLED.  
 Wave Soldering: see Profile A in Supplement section.  
 Manual Soldering: see Profile A in Supplement section.
7. The IS series OLED devices are not process sealed.
8. Pixels acquire diminished brightness over time and use, and those most frequently habituated have greater reduction of brightness than those less used. To minimize this difference, operate OLED unit so that all pixels are used as consistently as possible.
9. For switch, 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. For display, avoid contact with any flux or detergent. If any liquids spill on display surface, immediately wipe with soft absorbent cloth.
10. Proper serial resistors and buffers for signals should be used to prevent noise problems.

### Storage

1. Store in original container and away from direct sunlight.
2. Keep away from static electricity.
3. Avoid extreme temperatures, high humidity, gaseous substances, and all forms of chemical contamination.

**DISTINCTIVE CHARACTERISTICS**

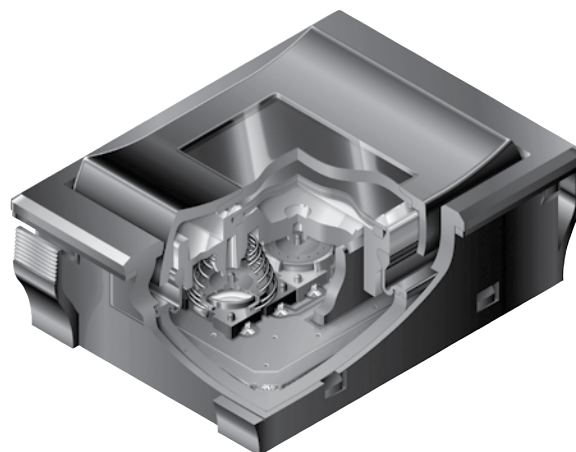
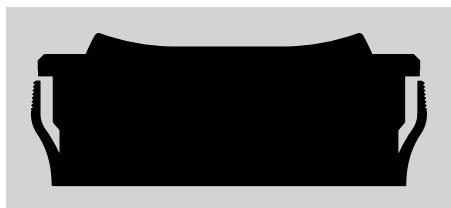
- Organic LED technology in display rocker (patent pending)
- Multifunction programmable device: select with rocker, push for activation
- Replaces multiple switches and displays with one device in a small package
- Broad display aids in navigation, both forward and reverse and up and down, in structured menus
- Wide viewing angle of 180° and large 0.92" display with exceptional contrast
- Conforms to IP64 of IEC60529 Standards on panel surface; dust tight construction of switch prevents entry of dust and improves contact reliability
- Commands and data supplied via serial communications protocol (SPI)
- Long life OLED with 52,000 hours at 30% illumination
- High reliability and long mechanical and electrical life of one million actuations minimum
- Stylish black housing design with matte finish complements any application

Monochrome OLED featuring sharp contrast and high resolution with 96 x 64 pixels

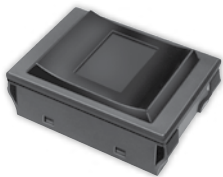
Panel mount with easy, snap-in installation

Short 14.6mm (.575") behind-panel height for compact spaces

Actual Size



**SMARTSWITCH PART NUMBER & DESCRIPTION**

Part Number	Description
<p><b>IS18WWC1W</b></p>	<p><b>OLED Rocker Switch:</b> SP3T Switch                      Rocker (ON) (ON) (ON)                      Pushbutton Normally OFF</p> 

Toggle  
 Rockers  
 Pushbuttons  
 Illuminated PB  
**E Programmable**  
 Keylocks  
 Rotaries  
 Slides  
 Tactiles  
 Tilt  
 Touch  
 Indicators  
 Accessories  
 Supplement

## SWITCH SPECIFICATIONS

<b>Circuit</b>	Single Pole Three Throw (Momentary)					
<b>Contact Position</b>	Top		Center		Bottom	
	Normal OFF	Down (ON) 9-12	Normal OFF	Down (ON) 10-12	Normal OFF	Down (ON) 11-12
<b>Electrical Capacity (Resistive Load)</b>	3VA maximum DC					
<b>Contact Resistance</b>	200 milliohms maximum					
<b>Insulation Resistance</b>	500 megohms minimum @ 250V DC					
<b>Dielectric Strength</b>	250V AC for 1 minute minimum					
<b>Electrostatic Resisting Pressure</b>	15kV minimum					
<b>Mechanical Endurance</b>	1,000,000 operations minimum					
<b>Electrical Endurance</b>	1,000,000 operations minimum					
<b>Operating Force</b>	5±2 Newtons at center of cap; 3.7±1.7 Newtons at top and bottom					
<b>Total Travel</b>	1.3±0.5mm (.051"±.020") at center of cap; 1.8±0.6mm (.71"±.024") at top and bottom					

## OLED SPECIFICATIONS

### Characteristics of Display

<b>Display Device</b>	Single color OLED display
<b>Display Mode</b>	Passive matrix
<b>Pixel Format</b>	96 x 64 pixels (horizontal x vertical)
<b>Pixel Size</b>	0.16mm x 0.177mm (horizontal x vertical)
<b>Interface</b>	Serial (SPI) interface
<b>Color</b>	White/Black (normally White)
<b>Splash &amp; Dust Proof</b>	Conforms to IP64 of IEC60529 standards on panel surface
<b>Operating Temperature Range</b>	-20°C ~ +70°C (-4°F ~ +158°F)
<b>Storage Temperature Range</b>	-25°C ~ +80°C (-13°F ~ +176°F)
<b>Operating Life Time (Display)</b>	52,000 hours (30% brightness); 15,600 hours (100% brightness)

### Absolute Maximum Ratings (Temperature at 25°C)

Items	Symbols	Ratings
Supply Voltage for Logic/Interface	VDDA	-0.3V to +3.6V
Supply Voltage for Drive	VAH	-0.3V to +18.0V
Input Voltage	V <sub>in</sub>	-0.3V to VDDA +0.3V

### Current Consumption

(Temperature at 25°C, VDDA = 2.8V, VAH = 15.0V)

Items	Symbols	Min	Typical	Max
All-Pixels-On Mode *Drive System Power Current	I <sub>H1</sub>	—	11.0mA	13.2mA
All-Pixels-On Mode *Logic/IF System Power Current	I <sub>DD1</sub>	—	0.58mA	0.72mA
Sleep Mode **Drive System Power Current	I <sub>H2</sub>	—	—	10µA
Sleep Mode **Logic/IF System Power Current	I <sub>DD2</sub>	—	—	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	VDDA	2.7V	2.8V	2.9V
Supply Voltage for Drive	VAH	14.5V	15.0V	15.5V
Input High Level Voltage	V <sub>IH</sub>	0.75 x VDDA	—	VDDA
Input Low Level Voltage	V <sub>IL</sub>	0.0	—	0.25V x VDDA

### Optical Characteristics

(Temperature at 25°C, Initial Value: depends on initial setting)

Items	Minimum	Typical	Maximum
Brightness	75 cd/m <sup>2</sup>	100 cd/m <sup>2</sup>	125 cd/m <sup>2</sup>
Chromaticity	(x)	*1	*1
	(y)	*1	*1
Contrast	100	—	—

\* Chromaticity range is the area of the ellipse. (See Chromaticity Diagram next page) The ellipse passes through points A, B, C and D and designates the center of each side of the quadrangle.



## Chromaticity Diagram

Point	Chromaticity X	Chromaticity Y
A	0.3441	0.3663
B	0.2983	0.3384
C	0.2799	0.2881
D	0.3257	0.3160

## TIMING SPECIFICATIONS

### AC Characteristics

(Temperature at -20°C ~ +70°C), VDDA = 2.8V, VAH = 16V

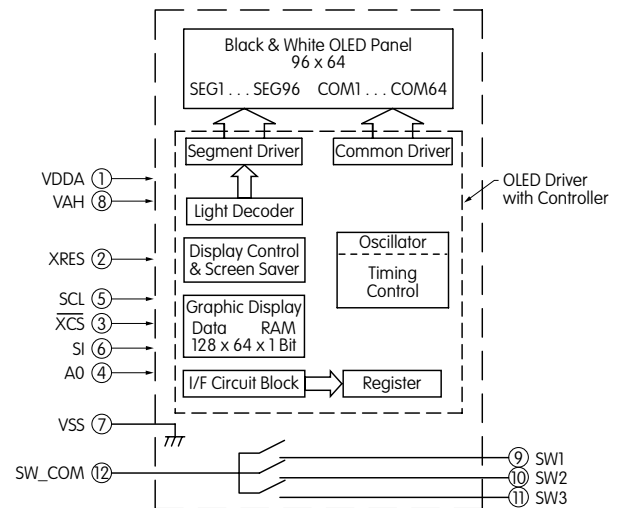
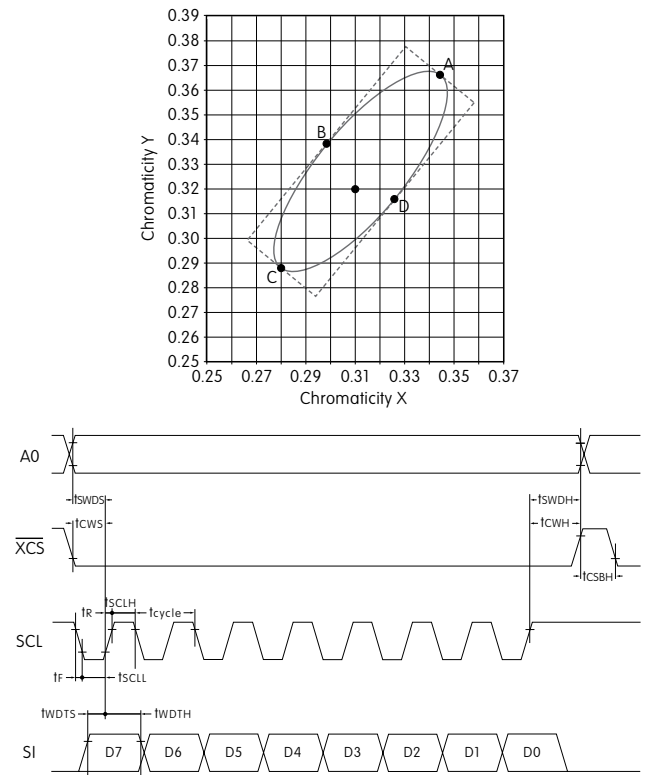
Items	Symbols	Minimum	Typical	Maximum
Clock Cycle Time	$t_{cycle}$	100ns	—	—
A0 Setup Time	$t_{SWDS}$	65ns	—	—
A0 Hold Time	$t_{SWDH}$	35ns	—	—
$\overline{XCS}$ Setup Time	$t_{CWS}$	65ns	—	—
$\overline{XCS}$ Hold Time	$t_{CWH}$	95ns	—	—
High Level $\overline{XCS}$ Pulse Width	$t_{CSBH}$	*10ns	—	—
Write Data Setup Time	$t_{WDTS}$	10ns	—	—
Write Data Hold Time	$t_{WDTH}$	20ns	—	—
SCL Low Time	$t_{SCLL}$	45ns	—	—
SCL High Time	$t_{SCLH}$	45ns	—	—
SCL Rise Time	$t_r$	—	—	15ns
SCL Fall Time	$t_f$	—	—	15ns

\* Requires more than 100ns after resetting software

## BLOCK DIAGRAM & PIN CONFIGURATIONS

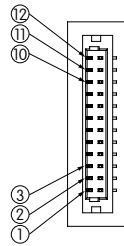
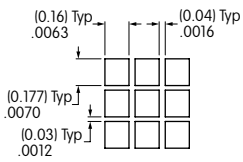
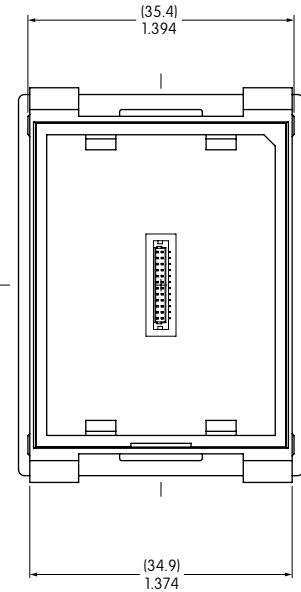
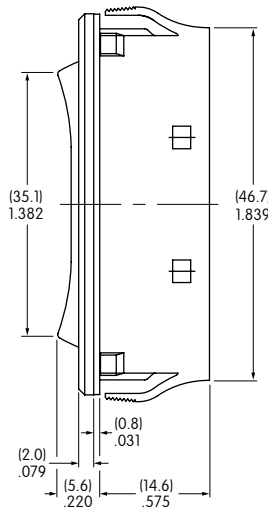
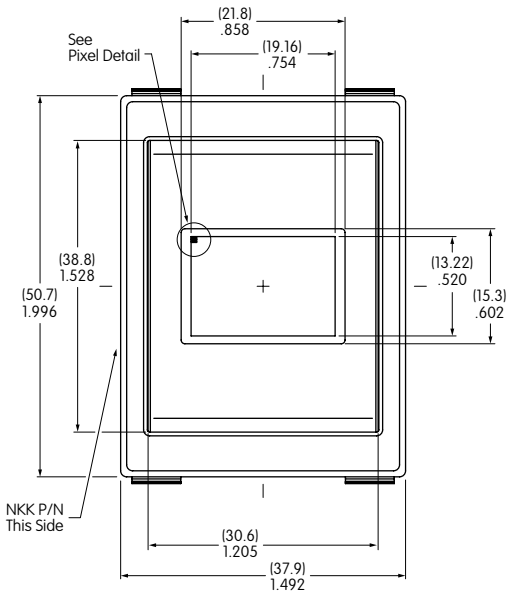


IS18WWC1W



Pin No.	Symbol	Name	Function
①	VDDA	Logic Type Power Source	
②	XRES	Reset	Terminal to initialize IC built-in logic; initializes with low level
③	$\overline{XCS}$	Chip Select	Slave select for SPI. This line is active low.
④	A0	Address	Terminal to input control signals of command/parameter Set low at time of command input and high level at the time of parameter input.
⑤	SCL	Serial Clock	Read command/parameter at time of SCL signal standing up
⑥	SI	Serial Data Input	Terminal to input command/parameter by SPI
⑦	VSS	Ground	
⑧	VAH	Drive Type Power Source	
⑨	SW1	Switch Terminal 1	N/O
⑩	SW2	Switch Terminal 2	N/O
⑪	SW3	Switch Terminal 3	N/O
⑫	SW_COM	Switch Common Terminal	

## SMARTSWITCH TYPICAL DIMENSIONS

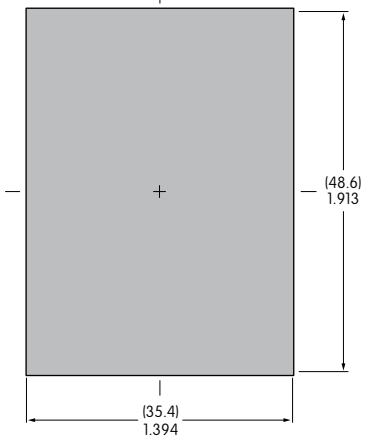


Pixel Detail

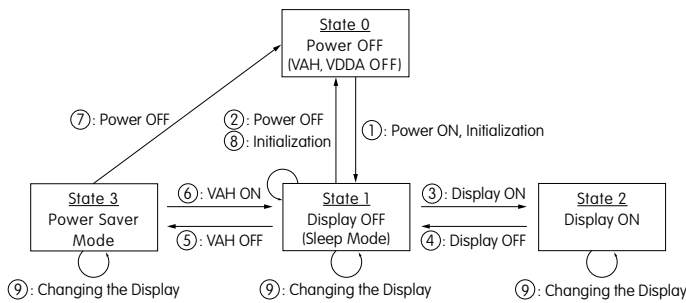
Terminal Connector Detail

### Panel Thickness Range

.039 ~ .157"  
(1.0mm ~ 4.0mm)

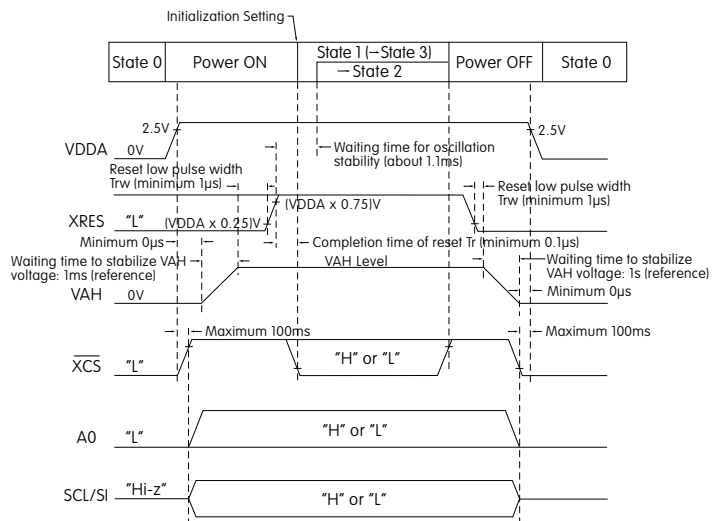


## STATE TRANSITION



State Number	State	Display	Sleep	VAH	VDDA	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
3	Power Saver	OFF	ON	OFF	ON	Enable

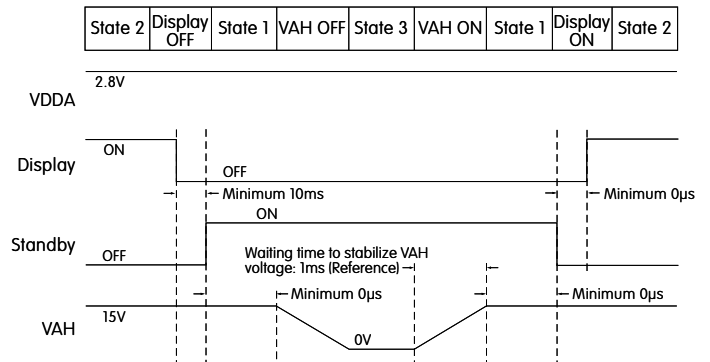
### Power ON/OFF Sequence



STATE TRANSITION (CONTINUED)

State Transition	Transition	Reference or Setting Procedure
①	Power ON	Refer to "Power ON/OFF Sequence" → Refer to "Initialization Setting"
②	Power OFF	Refer to "Power ON/OFF Sequence"
③	Display ON	Refer to "Display ON/OFF Sequence"
④	Display OFF	
⑤	VAH OFF	Wait until VAH becomes stable
⑥	VAH ON	
⑦	Power OFF	Refer to "Power ON/OFF Sequence"
⑧	Initialization	Refer to "Initialization Setting"
⑨	Display Change	Image Rewriting 96 x 64 Image Data Sending
		Display Settings Dimmer/Screen Saver/Indication 180° Reversal

Display ON/OFF Sequence



INITIALIZATION SETTING

Command Name	Command Address	Parameter (1 or 2Byte)	Remarks
Software Reset	01		
Dot Matrix Display ON/OFF	02	00	Note 1
Read/Write Operation Wetting	07	00	Note 1
Display Direction Set Command	09	00	Note 1
Reserved 1	10	03	Note 2
Reserved 2	12	63	Note 2
Reserved 3	13	00	Note 2
Dot Matrix Display Standby ON/OFF	14	00	
Reserved 4	16	00	Note 2
Reserved 5	17	00	Notes 1 & 2
Reserved 6	18	09	Note 2
Reserved 7	1A	04	Notes 1 & 2
Reserved 8	1C	00	Notes 1 & 2
Graphic Memory Writing Direction	1D	00	Note 1
Setting Column Output Range	30	005F	Note 1
Setting Row Output Range	32	003F	Note 1
X Axis Reading/Writing Start Point	34	00	Note 1
X Axis Reading/Writing End Point	35	0B	Note 1
Y Axis Reading/WritingStart Point	36	00	Note 1
Y Axis Reading/Writing End Point	37	3F	Note 1

Notes: 1. Same as default value  
2. Do not change setting value

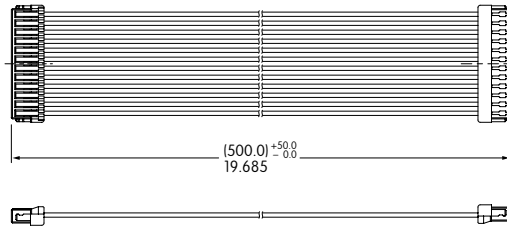
Command Name	Command Address	Parameter (1 or 2Byte)	Remarks
X Axis Reading Start Address	38	00	Note 1
Y Axis Reading Start Address	39	00	Note 1
Reserved 9	48	03	Note 2
Screen Saver Event Timer Setting Command	C3	00	Note 1
Screen Saver Event Timer Setting Command	C4	00	Note 1
One Time, Repeat or Direction Setting for Screen Saver	CC	00	Note 1
Start/Stop Setting for Screen Saver	CD	00	Note 1
System Clock Division Ratio Setting	D0	80	Note 2
Setting the STBY Pin	D2	00	Notes 1 & 2
DACA Setting	D4	00	Note 2
DACB Setting	D5	00	Note 2
DACC Setting	D6	00	Note 2
DACD Setting	D7	00	Note 2
Reserved 10	D9	00	Notes 1 & 2
Dimmer Setting	DB	0F	Note 1
Reserved 11	DD	88	Note 2
Image Writing	08	Image data	

Notes: 1. Same as default value  
2. Do not change setting value

Toggles  
Rockers  
Pushbuttons  
Illuminated PB  
Programmable  
Keylocks  
Rotaries  
Slides  
Tactiles  
Tilt  
Touch  
Indicators  
Accessories  
Supplement

## ACCESSORIES

### AT715 Cable for Connection



## PRECAUTIONS FOR HANDLING & STORAGE

### Handling



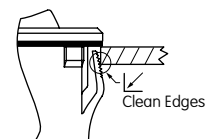
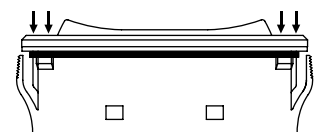
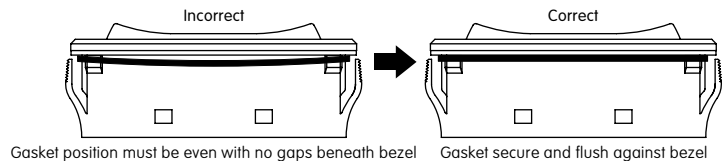
1. OLED devices are electrostatic sensitive.
2. Signal input under conditions not recommended may cause damage to the OLED unit or deterioration of the display. Follow directions regarding supply sequences of power and signal voltages.
3. If the OLED panel is broken, avoid touching the contents. Wash off in case of contact to the skin or clothing.
4. Limit operating force to 100.0N maximum, as excessive pressure may damage the display.
5. Under certain actuation conditions, one side of the rocker and the center switch can both send actuation signals.
6. Pixels acquire diminished brightness over time and use, and those most frequently habituated have greater reduction of brightness than those less used. To minimize this difference, operate OLED unit so that all pixels are used as consistently as possible.
7. Clean actuator 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.

### Storage

1. Store in original container and away from direct sunlight.
2. Keep away from static electricity.
3. Avoid extreme temperatures, high humidity, gaseous substances, and all forms of chemical contamination.

### Panel Mounting

- Before snapping a switch into the panel, align the gasket evenly under the bezel of the switch.
- When mounting into a panel, apply equal pressure to sides of bezel and insert parallel to the panel.
- After mounting, be sure there are no gaps between switch and panel. Lightly push into panel.
- After installing into panel, do not apply excessive force.
- After panel installation and wiring is completed, do not apply force horizontally or vertically from behind panel.
- Behind the panel, cut area should be squared. If front of panel is painted, do not allow any paint to collect in corners of cutout to prevent level mounting.
- Avoid reinstalling a switch once it has been mounted into panel. This may cause deterioration of panel sealability.



**DISTINCTIVE CHARACTERISTICS**

- Same outer dimensions of switch and footprint, enabling ease of replacement with current switches
- Programmable display graphics for alphanumeric characters and animated sequences
- 64 colors of backlighting can be controlled dynamically
- Pushbutton switch or display with LCD, RGB LED backlighting
- General brightness of backlight is dynamically controlled in eight steps from dark to bright
- Operated by commands and data supplied via serial communications (SPI)
- Incorporates bitmap display function
- Dual image VRAM for quick change of displayed images
- Travel options: Short travel of 1.8mm, or long travel of 4.5mm (same as KP01 Series)
- Low energy consumption
- Dust tight construction

Viewing area: 17.0mm x 13.0mm (horizontal x vertical)

High reliability and long life of one million (short travel) or three million (long travel) actuations

High resolution of 64 x 32 pixels

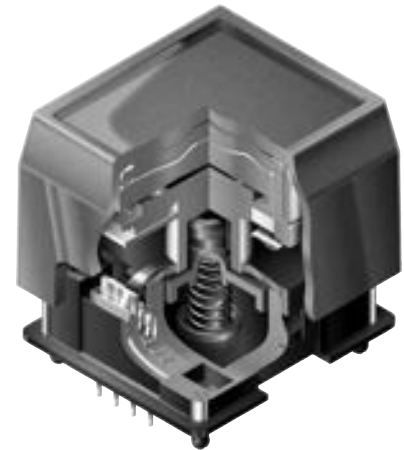
Epoxy sealed straight PC terminals

Snap-in standoff legs ensure secure mounting and alignment, and prevents dislodging during wave soldering.

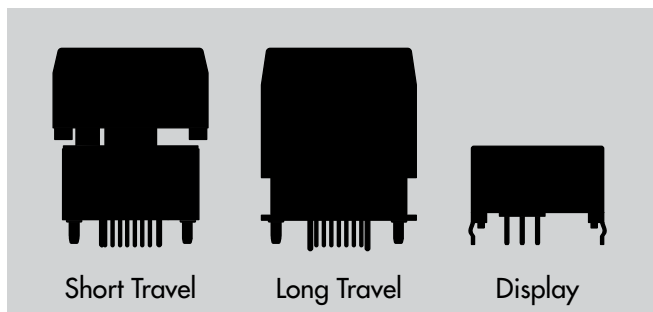
Viewing area: 14.4mm x 11.8mm (horizontal x vertical)

High resolution of 64 x 32 pixels

Bracket has crimped legs to ensure secure PC mounting and prevent dislodging during wave soldering



Actual Sizes of Switches & Display



Toggle

Rockers

Pushbuttons

Illuminated PB

**E** Programmable

Keylocks

Rotaries

Slides

Tactiles

Tilt

Touch

Indicators

Accessories

Supplement

# SmartSwitch™ NEW → Wide View/Short Travel LCD 64 x 32 Pushbutton



**IS15EBFP4RGB-09YN**  
**RGB LED Backlight**  
**Black and White LCD**  
**Short Travel**

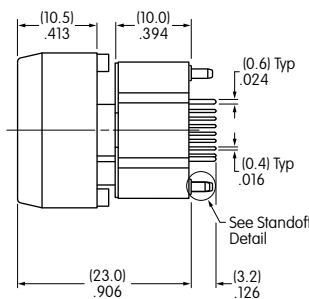
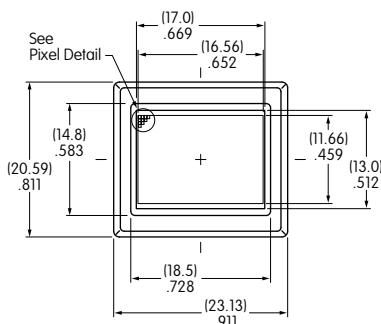
## SWITCH PART NUMBER & DESCRIPTION

Part Number	Switch Description	LCD Mode	LED Color
<b>IS15EBFP4RGB-09YN</b>	SPST Momentary ON Gold Contacts Straight PC Terminals	Black & White FSTN Positive	Red/Green/Blue

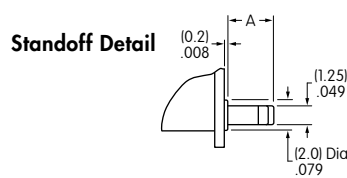
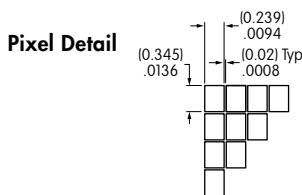
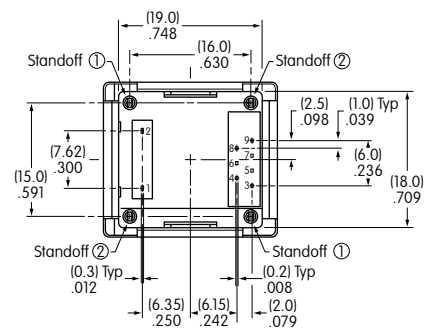
## SWITCH SPECIFICATIONS

<b>Circuit</b>	SPST normally open
<b>Electrical Capacity (Resistive Load)</b>	100mA @ 12V DC
<b>Contact Resistance</b>	200 milliohms maximum @ 20mV 10mA
<b>Insulation Resistance</b>	100 megohms minimum @ 100V DC
<b>Dielectric Strength</b>	125V AC for 1 minute minimum
<b>Mechanical Endurance</b>	1,000,000 operations minimum
<b>Electrical Endurance</b>	1,000,000 operations minimum
<b>Operating Force</b>	1.7 ± 0.5 Newtons
<b>Total Travel</b>	1.8mm (.071")

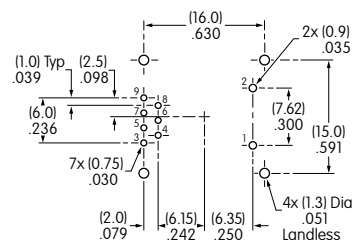
## TYPICAL SWITCH DIMENSIONS



Terminal numbers are not on the switch.



### Footprint



**Dimension A**  
 Standoff 1 = (2.7) .106    Standoff 2 = (2.3) .091

The Wide View Compact LCD 64 x 32 Pushbutton may utilize the same footprint as the Wide View/Short Travel LCD 64 x 32 Pushbutton.

Toggles  
Rocker  
Pushbuttons  
Illuminated PB  
Programmable  
Keylocks  
Rotaries  
Slides  
Tactiles  
Tilt  
Touch  
Indicators  
Accessories  
Supplement



**IS15EBFP4RGB**  
**RGB LED Backlight**  
**Black and White LCD**  
**Long Travel**

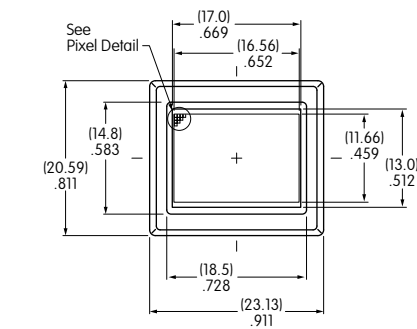
**SWITCH PART NUMBER & DESCRIPTION**

Part Number	Switch Description	LCD Mode	LED Color
<b>IS15EBFP4RGB</b>	SPST Momentary ON Gold Contacts Straight PC Terminals	Black & White FSTN Positive	Red/Green/Blue

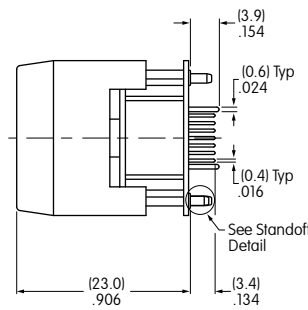
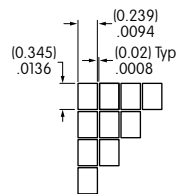
**SWITCH SPECIFICATIONS**

<b>Circuit</b>	SPST normally open
<b>Electrical Capacity (Resistive Load)</b>	100mA @ 12V DC
<b>Contact Resistance</b>	200 milliohms maximum @ 20mV 10mA
<b>Insulation Resistance</b>	100 megohms minimum @ 100V DC
<b>Dielectric Strength</b>	125V AC for 1 minute minimum
<b>Mechanical Endurance</b>	3,000,000 operations minimum
<b>Electrical Endurance</b>	3,000,000 operations minimum
<b>Operating Force</b>	2.0 ± 0.5 Newtons
<b>Total Travel</b>	4.5mm (.177")

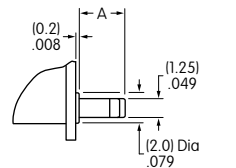
**TYPICAL SWITCH DIMENSIONS**



**Pixel Detail**

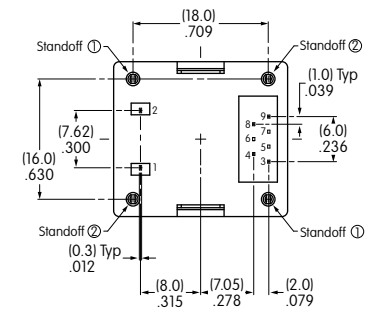


**Standoff Detail**

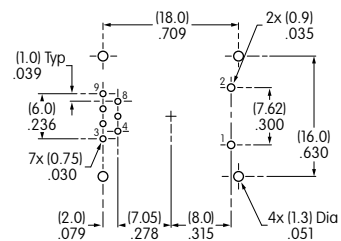


Standoff 1 = (2.7) .106  
 Standoff 2 = (2.3) .091

Terminal numbers are not on the switch.



**Footprint**



The following pages for Wide View LCD 64 x 32 Pushbuttons apply to the both Short Travel and Long Travel LCD 64 x 32 Pushbuttons.

## LCD SPECIFICATIONS

## Characteristics of Display

Display Operation Mode	FSTN positive; background colors, black & white
Display Condition	Transflective with built-in LED backlight
Viewing Angle Direction	6 o'clock
Viewing Area	17.0mm x 13.0mm (horizontal x vertical)
Pixel Format	64 x 32 pixels (horizontal x vertical)
Pixel Size	0.239mm x 0.345mm (horizontal x vertical)
* Operating Temperature Range	-15°C ~ +50°C (+5°F ~ +122°F)
Storage Temperature Range	-20°C ~ +60°C (-4°F ~ +140°F)
Backlight LED	RGB: red/green/blue

\* In a low temperature environment (below 0°C), speed and contrast decrease when image changes. The non-indicator dot may become dense in a high temperature environment (about +50°C). Highest backlight brightness level should not be used for temperatures above +35°C.

## Absolute Maximum Ratings (Temperature at 25°C)

Items	Symbols	Ratings
Supply Voltage	$V_{DD}$	-0.3V to +7.0V
Input Voltage	$V_I$	-0.3V to $V_{DD} + 0.3V$
Output Voltage	$V_O$	-0.3V to $V_{DD} + 0.3V$

## Optical Characteristics (Temperature at 25°C)

Items	Symbols	Min	Typical	Max
Contrast Ratio	$C_r$	—	3.0	—
Viewing Angle ( $C_r \geq 1.1$ )	Up & Down	$\theta$	—	90°
	Right & Left	$\phi$	—	90°

## Recommended Operating Conditions (Temperature at 25°C)

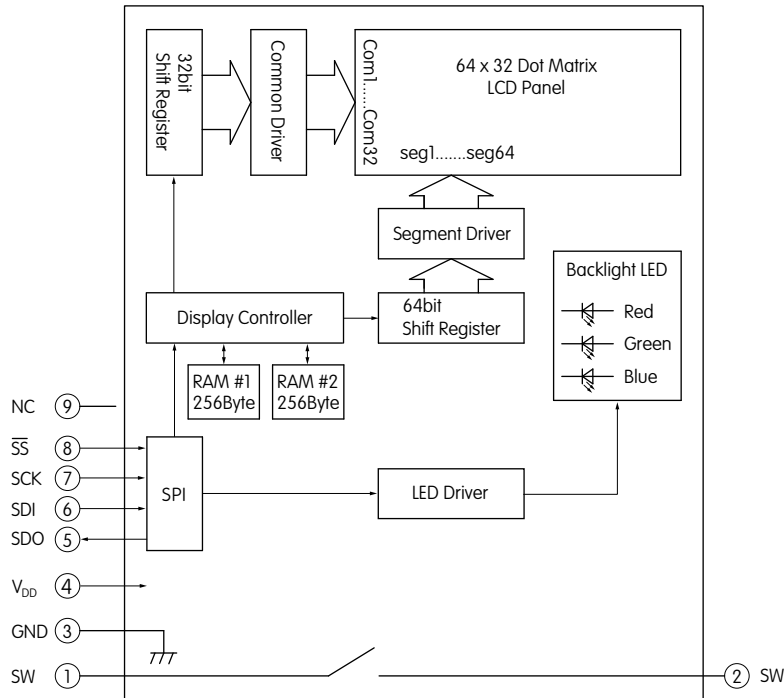
Items	Symbols	Minimum	Typical	Maximum
Supply Voltage	$V_{DD}$	4.9V	5.0V	5.1V
High Level Input Voltage	$V_{IH}$	0.8 $V_{DD}$	—	—
Low Level Input Voltage	$V_{IL}$	—	—	0.2 $V_{DD}$
SPI Clock Frequency	$f_{SCK}$	—	—	8MHz
Current Consumption	$I_{DD}$	** 10mA	—	*** 60mA

\*\* 10mA: Backlighting LED is off

\*\*\* 60mA: Backlighting LEDs (Red, Green, Blue) are maximum brightness



**SWITCH BLOCK DIAGRAM & PIN CONFIGURATIONS**



Pin No.	Symbol	Name	Function
①	SW	Terminal of Switch	Normally open
②	SW	Terminal of Switch	Normally open
③	GND	Ground	
④	V <sub>DD</sub>	Power	Power source for logic circuit and LCD
⑤	SDO	Data Out	Data output line for SPI
⑥	SDI	Data In	Data input line for SPI
⑦	SCK	Serial Clock	Clock line for SPI that synchronizes commands and data
⑧	$\overline{SS}$	Slave Select	Chip select for SPI; line is active low
⑨	NC	None	No connection

## DISPLAY PART NUMBER & DESCRIPTION

Part Number	Terminals	LCD Mode	LED Color
<b>ISO1EBFRGB</b>	Straight PC	Black & White FSTN Positive	Red/Green/Blue

## LCD SPECIFICATIONS

### Characteristics of Display

<b>Display Operation Mode</b>	FSTN positive; background colors, black & white
<b>Display Condition</b>	Transflective with built-in LED backlight
<b>Viewing Angle Direction</b>	6 o'clock
<b>Viewing Area</b>	14.4mm x 11.8mm (horizontal x vertical)
<b>Pixel Format</b>	64 x 32 pixels (horizontal x vertical)
<b>Pixel Size</b>	0.200mm x 0.285mm (horizontal x vertical)
<b>* Operating Temperature Range</b>	-15°C ~ +50°C (+5°F ~ +122°F)
<b>Storage Temperature Range</b>	-20°C ~ +60°C (-4°F ~ +140°F)
<b>Backlight LED</b>	<b>RGB:</b> red/green/blue

\* In a low temperature environment (below 0°C), speed and contrast decrease when image changes. The non-indicator dot may become dense in a high temperature environment (about +50°C). Highest backlight brightness level should not be used for temperatures above +35°C.

### Absolute Maximum Ratings (Temperature at 25°C)

Items	Symbols	Ratings
<b>Supply Voltage</b>	$V_{DD}$	-0.3V to +7.0V
<b>Input Voltage</b>	$V_I$	-0.3V to $V_{DD} + 0.3V$
<b>Output Voltage</b>	$V_O$	-0.3V to $V_{DD} + 0.3V$

### Recommended Operating Conditions (Temperature at 25°C)

Items	Symbols	Minimum	Typical	Maximum
<b>Supply Voltage</b>	$V_{DD}$	4.9V	5.0V	5.1V
<b>High Level Input Voltage</b>	$V_{IH}$	0.8 $V_{DD}$	—	—
<b>Low Level Input Voltage</b>	$V_{IL}$	—	—	0.2 $V_{DD}$
<b>SPI Clock Frequency</b>	$f_{SCK}$	—	—	8MHz
<b>Current Consumption</b>	$I_{DD}$	** 10mA	—	*** 60mA

\*\* 10mA: Backlighting LED is off

\*\*\* 60mA: Backlighting LEDs (Red, Green, Blue) are maximum brightness

### Optical Characteristics (Temperature at 25°C)

Items	Symbols	Min	Typical	Max
<b>Contrast Ratio</b>	$C_r$	—	3.0	—
<b>Viewing Angle (Cr ≥ 1.1)</b>	Up & Down	$\theta$	—	90°
	Right & Left	$\phi$	—	90°