

### DISTINCTIVE CHARACTERISTICS

- Organic LED technology
- Range of 65,536 colors in 16 bit mode, 256 colors in 8 bit mode
- Full viewing angle of 180°
- Exceptional contrast and brightness: 50 times greater brightness than previous LCD products, four times more enhanced resolution
- High resolution provides sharp, clear images of very small characters
- Operated by commands and data supplied via SPI communications protocol
- Distinct, long travel of 4.5mm (same as KP01 Series)
- Dust tight construction
- Sophisticated housing based on black color

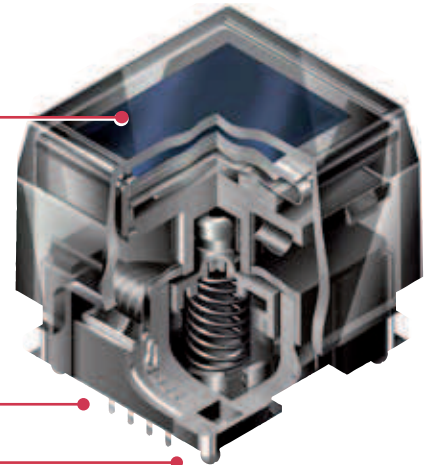
Viewing area: 15.5mm x 11.6mm (horizontal x vertical)

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

Crimped terminals ensure secure PC mounting and prevent dislodging during wave soldering

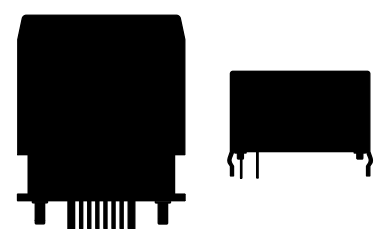


### APPLICATIONS

The OLED SMARTSWITCH™ Series complements multiple applications, including:

- Broadcast equipment
- Image equipment
- Education equipment
- Vending machines
- Audio equipment
- POS
- Automation control equipment

Actual Sizes



### SMARTSWITCH PART NUMBER & DESCRIPTION

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

### SMARTSWITCH SPECIFICATIONS

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

### SMARTSWITCH OLED SPECIFICATIONS

#### Characteristics of Display

Display Device	Color OLED display module
Display Mode	Passive matrix
Viewing Area	15.5mm x 11.6mm (horizontal x vertical)
Pixel Format	64RGB x 48 pixels (horizontal x vertical)
Pixel Size	0.21mm x 0.20mm (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 Time (Display)	30,000 hours (at 40% duty)

#### 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>	-0.3V 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>	---	5.5mA	7.0mA
All-Pixels-On Mode *Logic/IF System Power Current	I <sub>DD1</sub>	---	0.16mA	0.2mA
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)

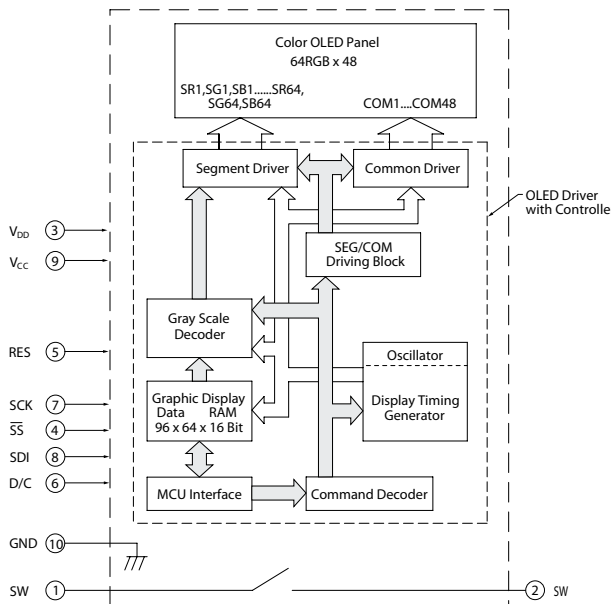
#### Recommended Operating Conditions

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>	---	---	0.2V 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)	0.29	0.31	0.35	---
	(y)	0.30	0.35	0.40	---
Red Color Coordinate	(x)	0.60	0.64	0.68	---
	(y)	0.31	0.35	0.39	---
Green Color Coordinate	(x)	0.26	0.30	0.34	---
	(y)	0.59	0.63	0.67	---
Blue Color Coordinate	(x)	0.10	0.14	0.18	---
	(y)	0.12	0.18	0.24	---
Contrast Ratio	100	---	---	---	---

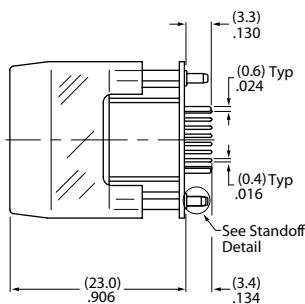
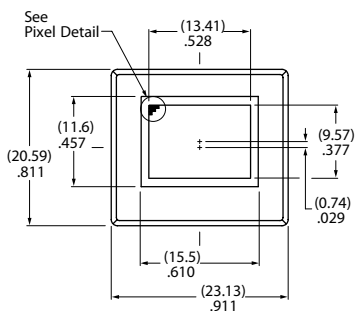
### SMARTSWITCH BLOCK DIAGRAM & PIN CONFIGURATIONS



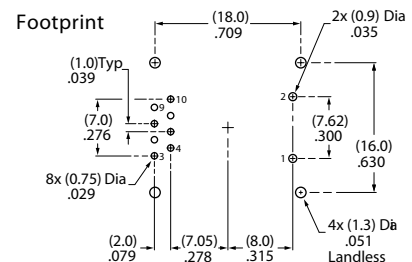
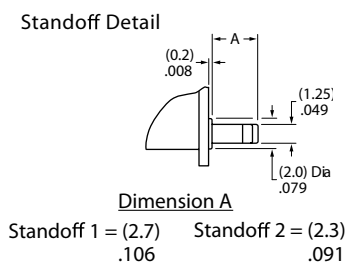
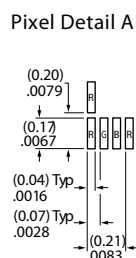
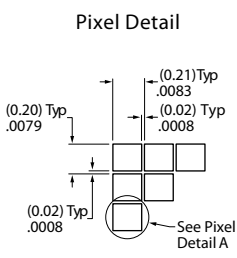
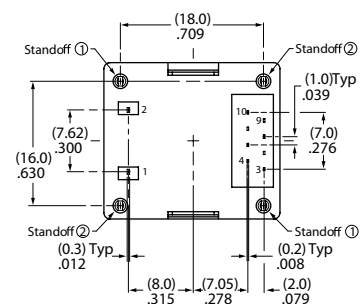
ISC15ANP4

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 OLED
⑩	GND	Ground	Connect to ground

### SMARTSWITCH TYPICAL DIMENSIONS



Terminal numbers are not on the switch.



### SMARTSWITCH PART NUMBER & DESCRIPTION

Part Number	Display Description	OLED	Pixel Format
ISCO1P	Straight PC Terminals	Color OLED Display Module 65,536 Colors	52RGB x 36 Pixels Horizontal x Vertical

### SMARTSWITCH LCD 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: B 5bit/G 6bit/R 5bit) or 256 Colors (8bit: B 3bit/G 3bit/R 2bit)
Operating Temperature Range	-20°C ~ +70°C (-4°F ~ +158°F)
Storage Temperature Range	-30°C ~ +80°C (-22°F ~ +176°F)
Operating Life Time (Display)	30,000 hours (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>	0.3V 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>	--	3.5mA	4.5mA
All-Pixels-On Mode *Logic/IF System Power Current	I <sub>DD1</sub>	--	0.16mA	0.2mA
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)

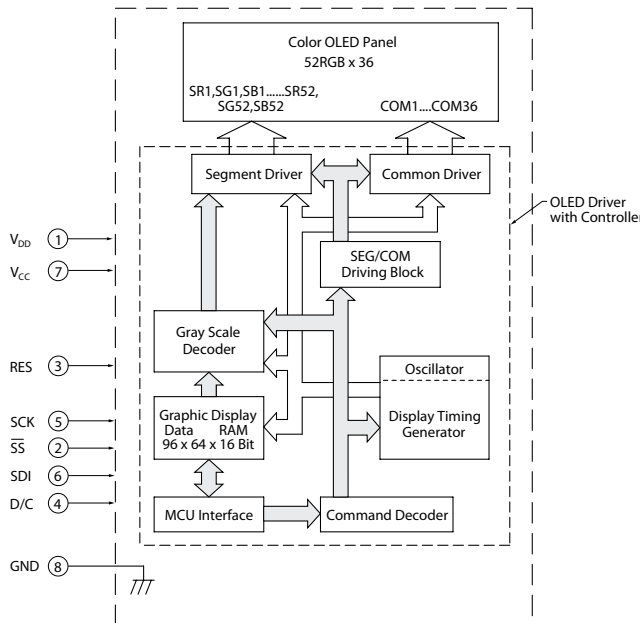
#### Absolute Maximum Ratings

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>	--	--	0.2V 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)	0.29	0.31	0.35	--
	(y)	0.30	0.35	0.40	--
Red Color Coordinate	(x)	0.60	0.64	0.68	--
	(y)	0.31	0.35	0.39	--
Green Color Coordinate	(x)	0.26	0.30	0.34	--
	(y)	0.59	0.63	0.67	--
Blue Color Coordinate	(x)	0.10	0.14	0.18	--
	(y)	0.12	0.18	0.24	--
Contrast Ratio	100	--	--	--	

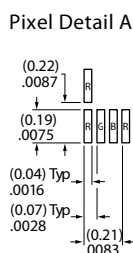
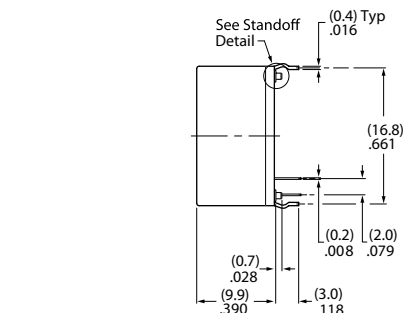
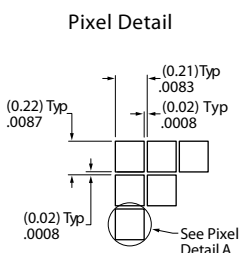
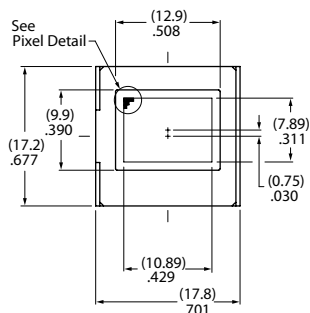
### SMARTSWITCH BLOCK DIAGRAM & PIN CONFIGURATIONS



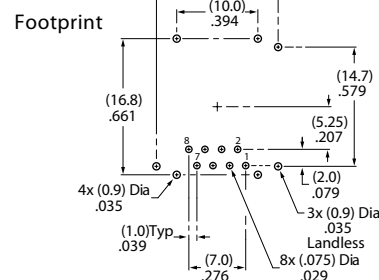
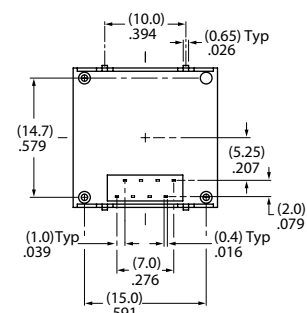
ISCO1P

Pin No.	Symbol	Name	Function
①	$V_{DD}$	Power	Power source for logic circuit
②	$\overline{SS}$	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	$V_{CC}$	Power	Power source for drive OLED
⑧	GND	Ground	Connect to ground

### SMARTSWITCH TYPICAL DIMENSIONS



Terminal numbers are not on the switch.



### SMARTSWITCH PART NUMBER & DESCRIPTION

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

### SMARTSWITCH 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")

### SMARTSWITCH 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/m <sup>2</sup> (based on 40% pixels ON; Ta = 77°F)

#### 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> = 15.0V )

Items	Symbols	Min	Typical	Max
All-Pixels-On Mode *Drive System Power Current	I <sub>CC1</sub>	--	11.0mA	13.2mA
All-Pixels-On Mode *Logic/IF System Power Current	I <sub>DD1</sub>	--	0.17mA	0.20mA
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)

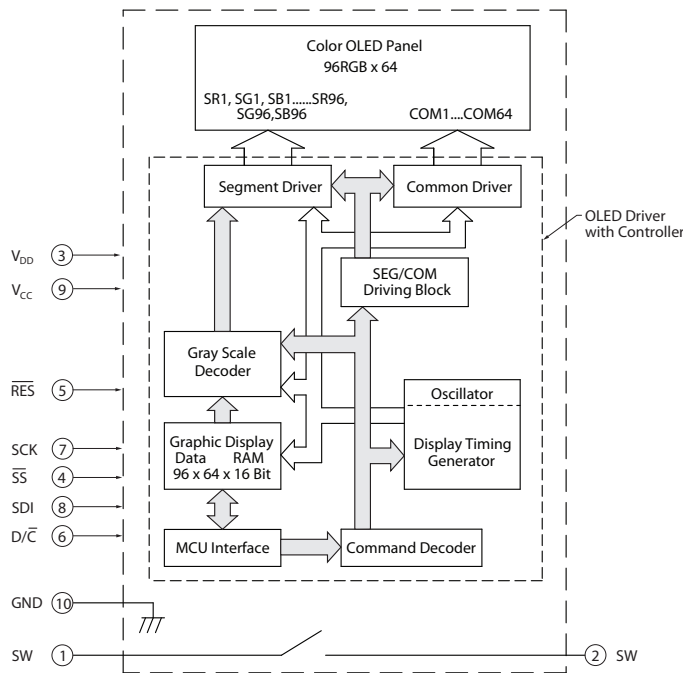
#### Recommended Operating Conditions

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>	14.0V	15.0V	16.0V
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	80	105	130	cd/m <sup>2</sup>	White (All pixels on)
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	--	--	--	

### SMARTSWITCH BLOCK DIAGRAM & PIN CONFIGURATIONS

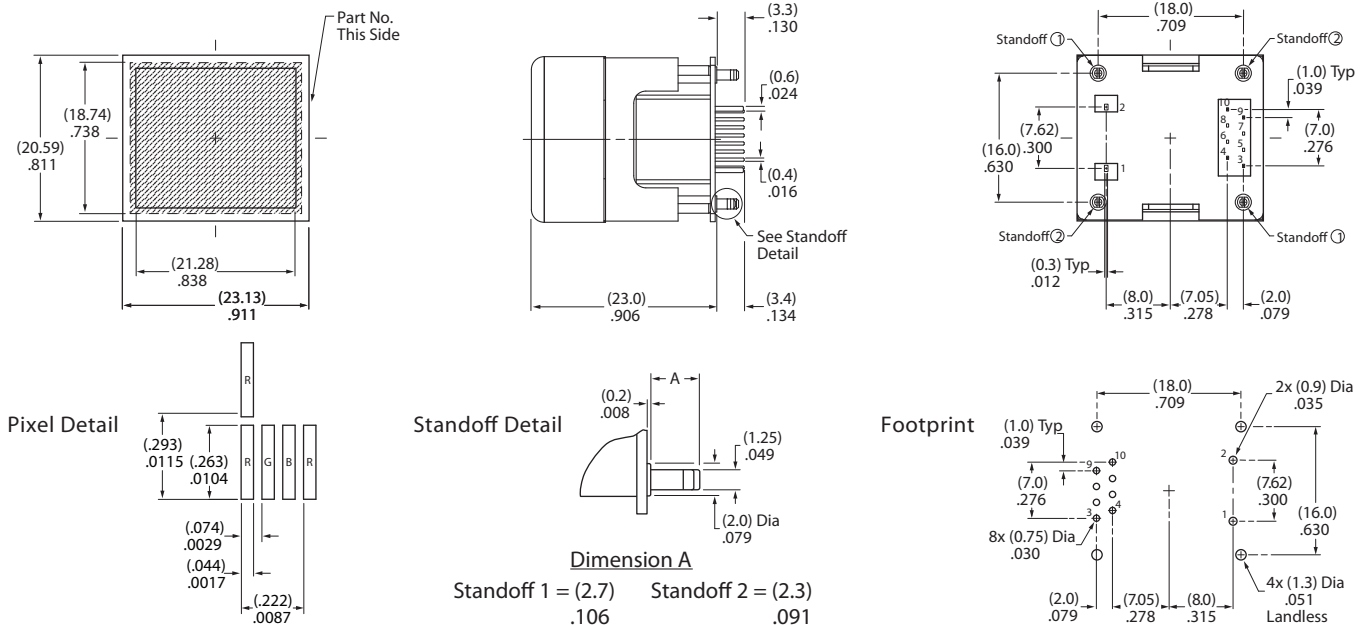


ISF15ACP4

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

### SMARTSWITCH TYPICAL DIMENSIONS

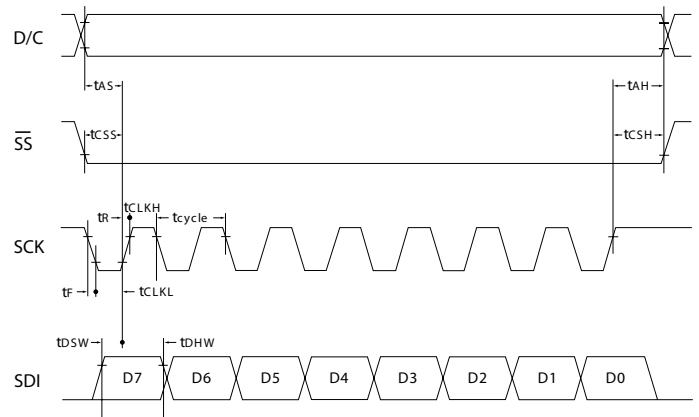
Terminal numbers are not on the switch.



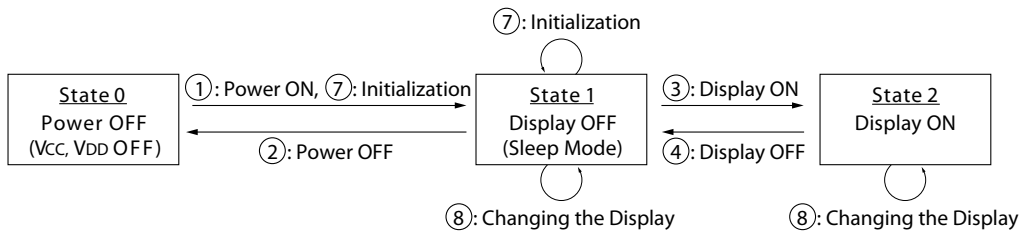
### TIMING SPECIFICATIONS FOR SMARTSWITCH & SMARTDISPLAY

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



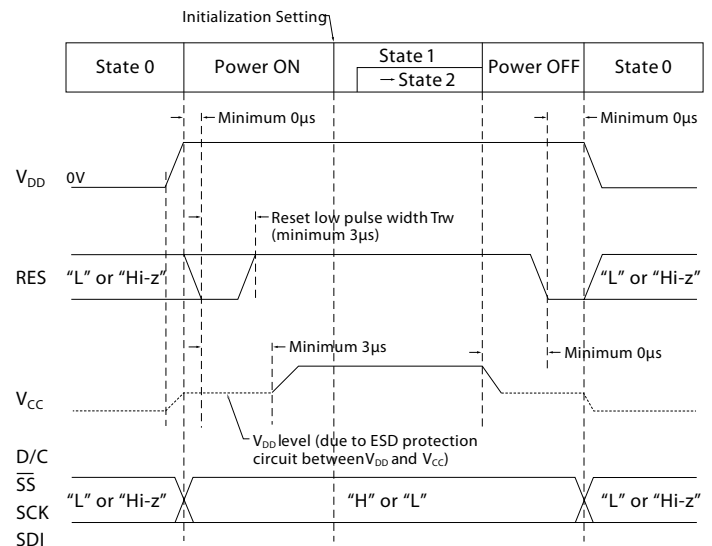
### STATE TRANSITION



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





### PRECAUTIONS FOR HANDLING & STORAGE

#### 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. Recommended soldering time and temperature limits for OLED switch:  
Avoid temperatures exceeding 80°C at the OLED.  
Wave Soldering: see Profile A in Supplement section.  
Manual Soldering: see Profile A in Supplement section.
6. The IS series OLED devices are not process sealed.
7. 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.
8. 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.
9. 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.