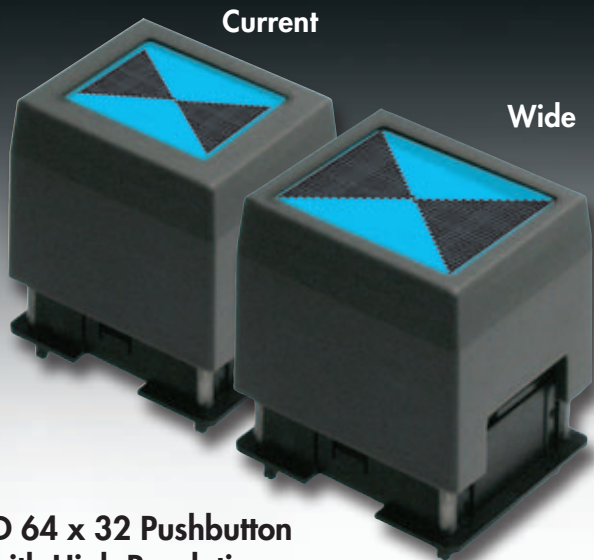


# IS Series Wide Viewing Area

*High Resolution, High Resolution Compact, & Standard  
SmartSwitch Pushbuttons & Displays*

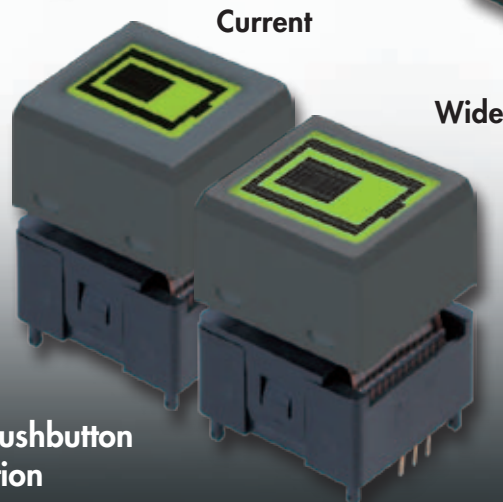
**Larger Screen, Narrow Frame, Superior Visibility**



LCD 64 x 32 Pushbutton  
with High Resolution



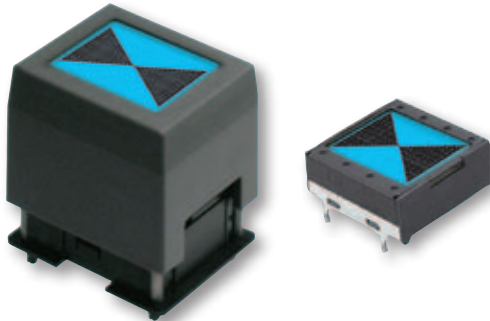
LCD 36 x 24 Pushbutton  
Standard



LCD 64 x 32 Compact Pushbutton  
with High Resolution

### Wide Viewing Area Features & Specifications

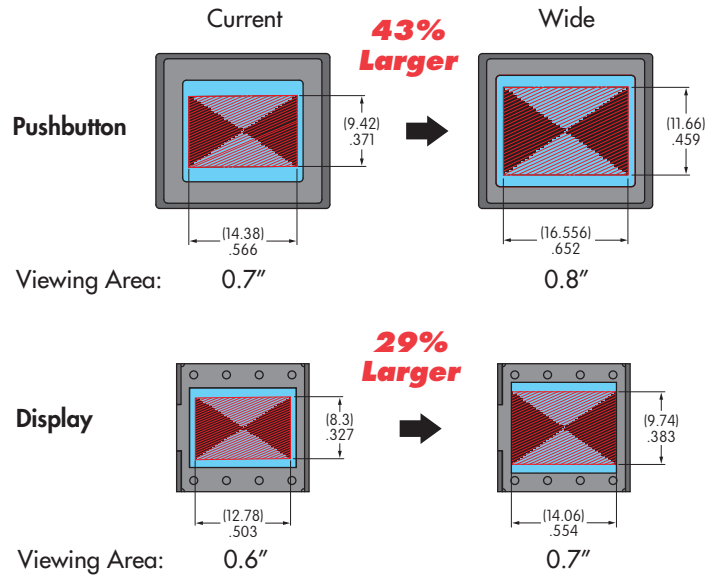
#### LCD 64 x 32 Pushbutton with High Resolution



Viewing Areas

Pushbutton: 0.8" Display: 0.7"

#### Viewing Area Comparisons

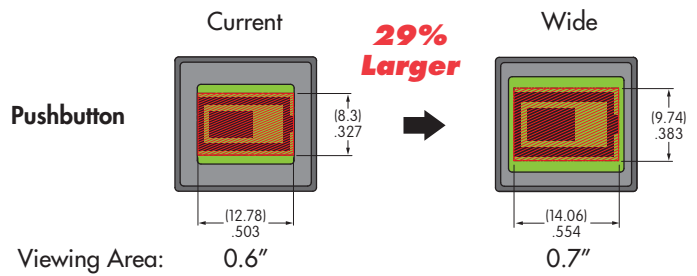


#### LCD 64 x 32 Compact Pushbutton with High Resolution



Viewing Area

Pushbutton: 0.7"

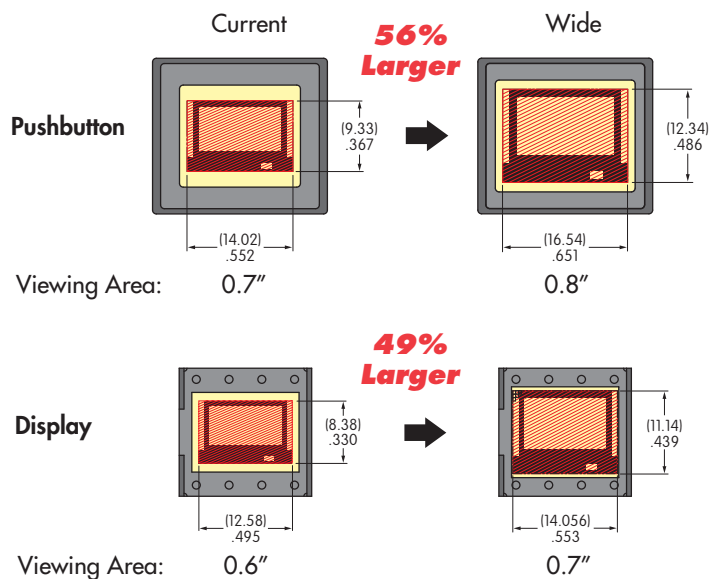


#### LCD 36 x 24 Pushbutton Standard



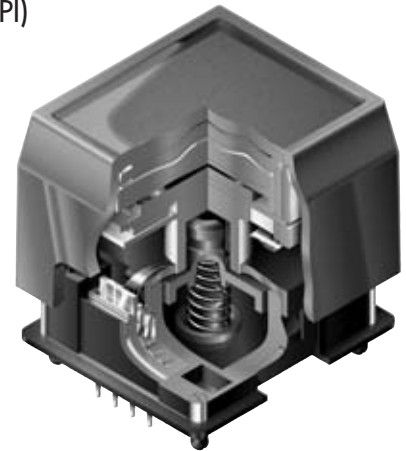
Viewing Areas

Pushbutton: 0.8" Display: 0.7"

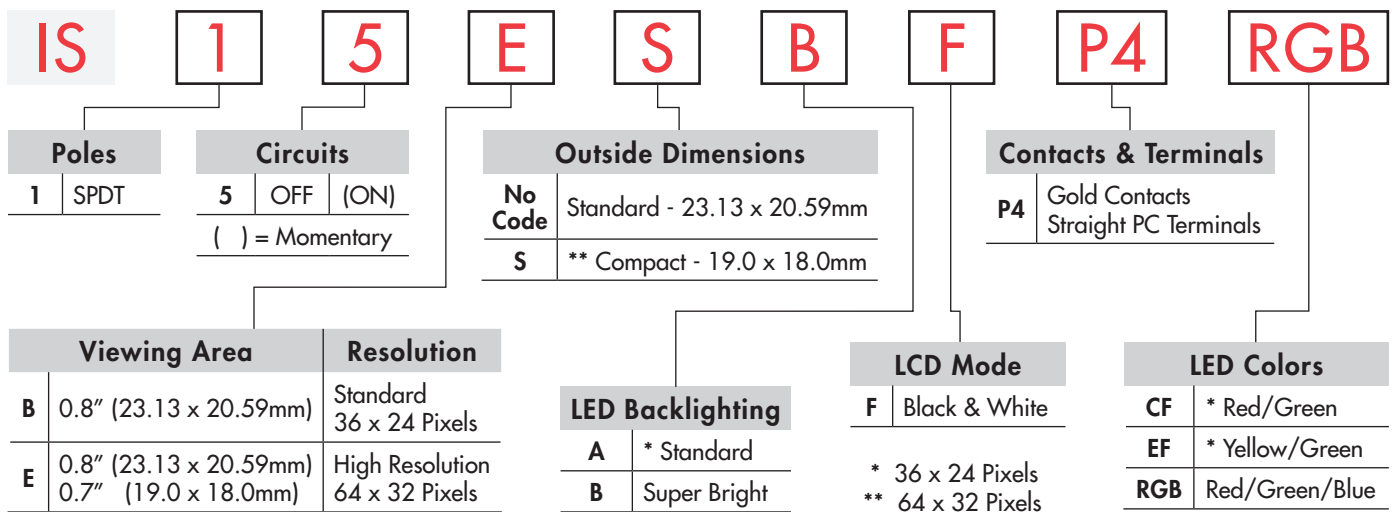


**DISTINCTIVE CHARACTERISTICS**

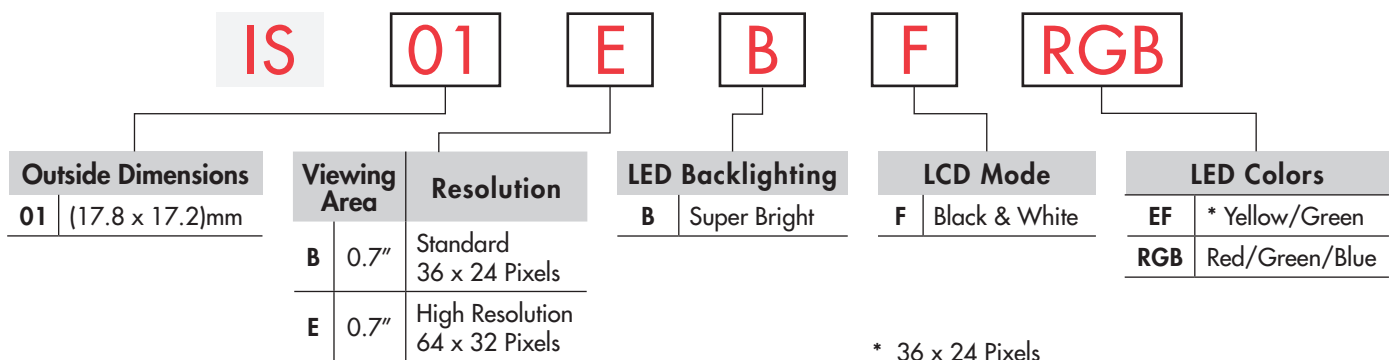
- High resolution of 64 x 32 pixels
- Same outer dimensions of switch and footprint, enabling ease of replacement with current switches
- Programmable display graphics for alphanumeric characters and animated sequences
- 64 colors of backlighting can be controlled dynamically
- Pushbutton switch or display 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
- Distinct, long travel of 4.5mm (same as KP01 Series)
- Low energy consumption
- Dust tight construction
- High reliability and long life of three million actuations
- Epoxy sealed straight PC terminals
- Snap-in standoff for easy, secure mounting and alignment
- Standoff legs ensure secure mounting and prevent dislodging during wave soldering.



**TYPICAL SWITCH ORDERING EXAMPLE**



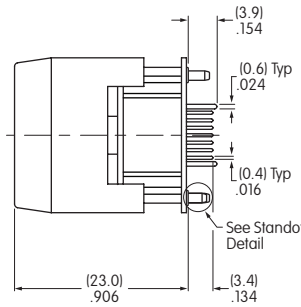
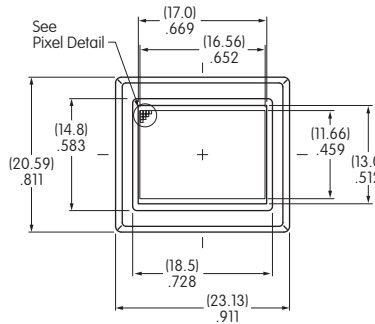
**TYPICAL DISPLAY ORDERING EXAMPLE**



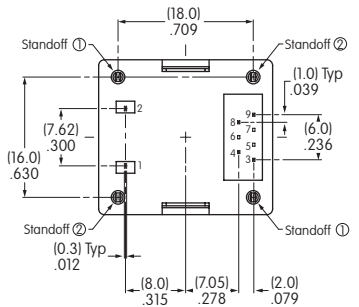
### TYPICAL SWITCH DIMENSIONS



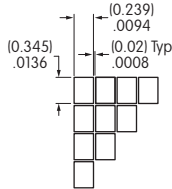
**IS15BFP4RGB**  
RGB LED and  
Black and White LCD Mode



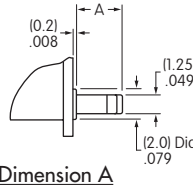
Terminal numbers are not on the switch.



Pixel Detail

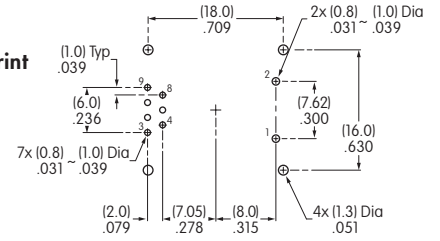


Standoff Detail



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

Footprint



### SWITCH SPECIFICATIONS

Circuit	SPST normally open
Electrical Capacity (Resistive Load)	100mA @ 12V DC
Contact Resistance	200 milliohms max @ 20mV 10mA
Insulation Resistance	100 megohms min @ 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")

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

Items	Symbols	Ratings
Supply Voltage	V <sub>DD</sub>	-0.3V to +7.0V
Input Voltage	V <sub>I</sub>	-0.3V to V <sub>DD</sub> +0.3V
Output Voltage	V <sub>O</sub>	-0.3V to V <sub>DD</sub> +0.3V

### LCD SPECIFICATIONS

#### Characteristics of Display

Display Operation Mode	FSTN positive; background, 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 Temp. Range	-15°C ~ +50°C (+5°F ~ +122°F)
Storage Temp. Range	-20°C ~ +60°C (-4°F ~ +140°F)
Backlight LED	RGB: red/green/blue

\* In low temperatures (below 0°C), speed and contrast decrease when image changes. The non-indicator dot may become dense in high temperatures (about +50°C).

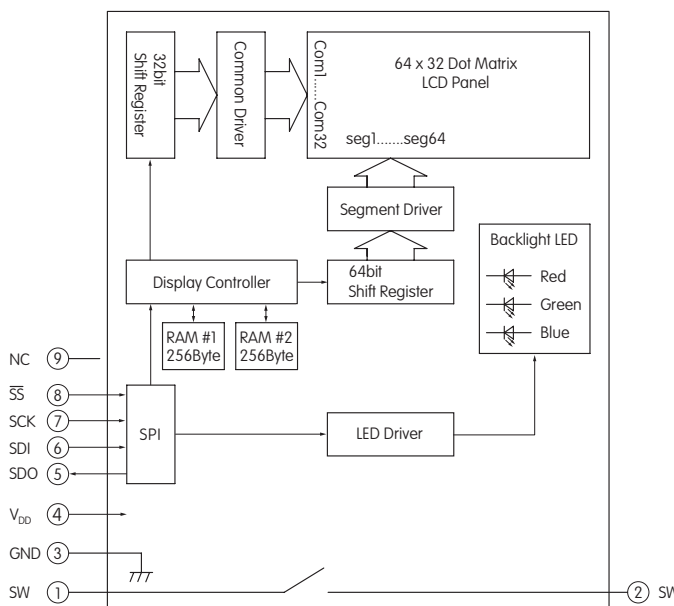
#### Recommended Operating Conditions (Temperature at 25°C)

Items	Symbols	Minimum	Typical	Maximum
Supply Voltage	V <sub>DD</sub>	4.9V	5.0V	5.1V
High Level Input Voltage	V <sub>IH</sub>	0.8 V <sub>DD</sub>	—	—
Low Level Input Voltage	V <sub>IL</sub>	—	—	0.2V <sub>DD</sub>
SPI Clock Frequency	f <sub>SCK</sub>	—	—	8MHz
Current Consumption	I <sub>DD</sub>	** 10mA	—	*** 50mA

\*\* 10mA: Backlighting LED is off

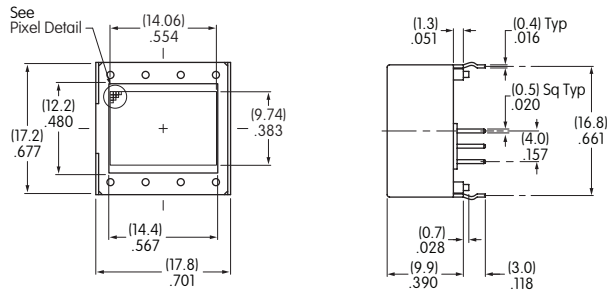
\*\*\* 50mA: Backlighting LEDs (Red, Green, Blue) at maximum brightness

### SWITCH BLOCK DIAGRAM & PINS

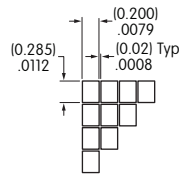


Pin	Symbol	Name	Function
①	SW	Terminal of Switch	Normally open
②	SW	Terminal of Switch	Normally open
③	GND	Ground	
④	V <sub>DD</sub>	Power	Power source for logic circuit and LCD
⑤	SDO	Data Out	Data output line for SPI
⑥	SDI	Data In	Data input line for SPI
⑦	SCK	Serial Clock	Clock line for SPI; commands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

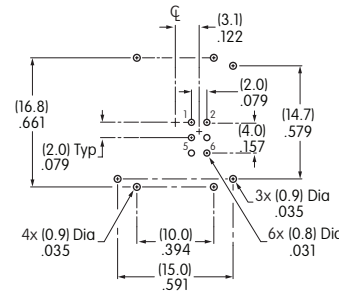
**TYPICAL DISPLAY DIMENSIONS**



**Pixel Detail**



**Footprint**



Terminal numbers are not on the device.



IS01EBFRGB  
RGB LED and  
Black and White LCD Mode

**LCD SPECIFICATIONS**

Characteristics of Display

<b>Display Operation Mode</b>	FSTN positive; background, 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 Temp. Range</b>	-15°C ~ +50°C (+5°F ~ +122°F)
<b>Storage Temp. Range</b>	-20°C ~ +60°C (-4°F ~ +140°F)
<b>Backlight LED</b>	<b>RGB:</b> red/green/blue

\* In low temperatures (below 0°C), speed and contrast decrease when image changes. The non-indicator dot may become dense in high temperatures (about +50°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

**DISPLAY BLOCK DIAGRAM & PINS**

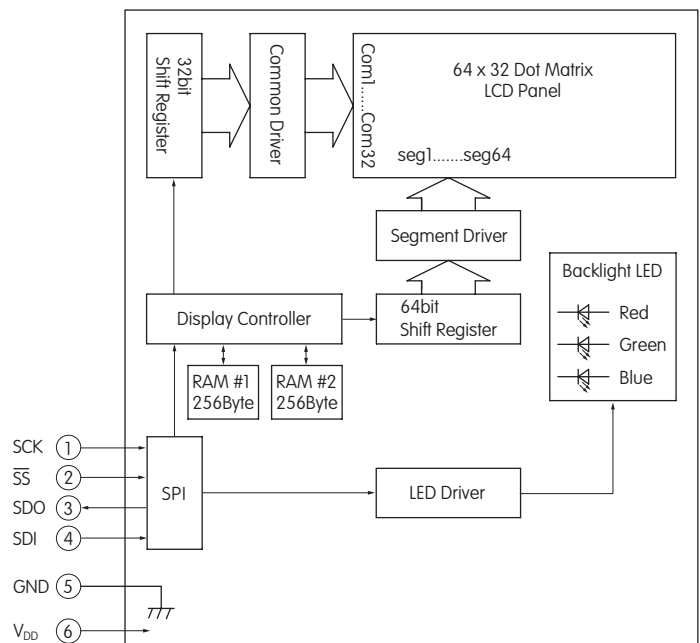
Pin	Symbol	Name	Function
①	SCK	Serial Clock	Clock line for SPI that synchronizes commands and data
②	$\overline{SS}$	Slave Select	Chip select for SPI; line is active low
③	SDO	Data Out	Data output line for SPI
④	SDI	Data In	Data input line for SPI
⑤	GND	Ground	
⑥	$V_{DD}$	Power	Power source for logic circuit and LCD

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	—	*** 50mA

\*\* 10mA: Backlighting LED is off

\*\*\* 50mA: Backlighting LEDs (Red, Green, Blue) at maximum brightness



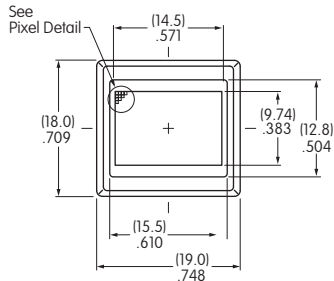


### TYPICAL SWITCH DIMENSIONS

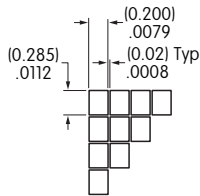


**IS15ESBFP4RGB**

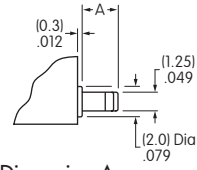
**RGB LED and Black and White LCD Mode**



**Pixel Detail**

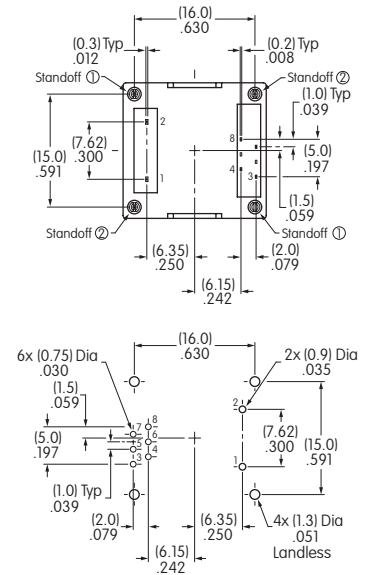


**Standoff Detail**



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

**Footprint**



Terminal numbers are not on the switch.

### SWITCH SPECIFICATIONS

<b>Circuit</b>	SPST normally open
<b>Electrical Capacity (Resistive Load)</b>	100mA @ 12V DC
<b>Contact Resistance</b>	200 milliohms max @ 20mV 10mA
<b>Insulation Resistance</b>	100 megohms min @ 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")

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

Items	Symbols	Ratings
<b>Supply Voltage</b>	V <sub>DD</sub>	-0.3V to +7.0V
<b>Input Voltage</b>	V <sub>I</sub>	-0.3V to V <sub>DD</sub> +0.3V
<b>Output Voltage</b>	V <sub>O</sub>	-0.3V to V <sub>DD</sub> +0.3V

### LCD SPECIFICATIONS

#### Characteristics of Display

<b>Display Operation Mode</b>	FSTN positive; background & black & white
<b>Display Condition</b>	Transflective with built-in LED backlight
<b>Viewing Angle Direction</b>	6 o'clock
<b>Viewing Area</b>	14.5mm 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 Temp Range</b>	-15°C ~ +50°C (+5°F ~ +122°F)
<b>Storage Temp Range</b>	-20°C ~ +60°C (-4°F ~ +140°F)
<b>Backlight LED</b>	RGB: red/green/blue

\* In low temperatures (below 0°C), speed and contrast decrease when image changes. The non-indicator dot may become dense in high temperatures (about +50°C).

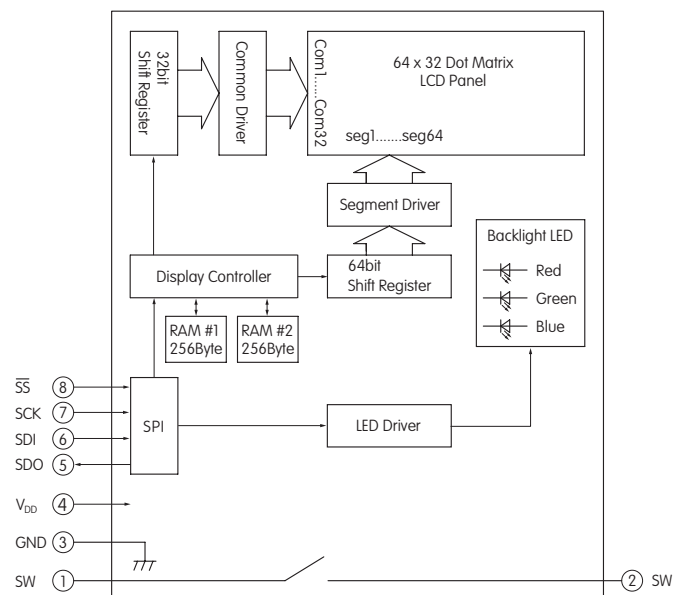
#### Recommended Operating Conditions (Temperature at 25°C)

Items	Symbols	Min	Typical	Max
<b>Supply Voltage</b>	V <sub>DD</sub>	4.9V	5.0V	5.1V
<b>High Level Input Voltage</b>	V <sub>IH</sub>	0.8 V <sub>DD</sub>	—	—
<b>Low Level Input Voltage</b>	V <sub>IL</sub>	—	—	0.2V <sub>DD</sub>
<b>SPI Clock Frequency</b>	f <sub>SCK</sub>	—	—	8MHz
<b>Current Consumption</b>	I <sub>DD</sub>	** 10mA	—	*** 50mA

\*\* 10mA: Backlighting LED is off

\*\*\* 50mA: Backlighting LEDs (Red, Green, Blue) at maximum brightness

### SWITCH BLOCK DIAGRAM & PINS



Pin	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; commands and data
⑧	SS	Slave Select	Chip select for SPI; line is active low

**COMMANDS & DATA FOR SWITCH & DISPLAY**

- Transferring display data/displaying on LCD: command (1 Byte) + data (256 Bytes)
- Others: command (1 Byte) + data (1 Byte)
- Commands can be accepted only when all bits coincide; otherwise, they are not acknowledged
- Additional commands will not be received until the communication of commands (1 Byte) and data (256 or 1 Byte) is completed
- There is no time limit from the beginning to end of data receipt
- Commands may be executed consecutively (no need to wait between commands)
- Irregular commands or data are not recognized
- Initial status at power activation: LCD display off, LED off (brightness 1/20, color off)

**Transferring Display Data/Displaying on LCD**

Command		Data	Remarks
Hex	Binary		
0 x 55	01010101	256 Bytes (64 x 32 = 2,048 bits)	See previous page for details of bitmap data

**LED (Backlight) Color Set**

Command		Data	Remarks
Hex	Binary		
0 x 40	01000000	R R G G B B 1 1 2 bits x 3	For each of RGB: 00 = off      10 = 1/2 01 = 1/4      11 = full

**LED (Backlight) Brightness Set**

Command		Data	Remarks
Hex	Binary		
0 x 41	01000001	* * * 1 1 1 1 1 3 bits	For leading 3bits: 000 = 1/20      100 = 1/3 (dark)            101 = 1/2 001 = 1/10      110 = 2/3 010 = 1/7        111 = full 011 = 1/5        (bright)

**Reset (Returning to Initial Status at Power Activation)**

Command		Data	Remarks
Hex	Binary		
0 x 5E	01011110	00000011	Returning to initial status at power activation

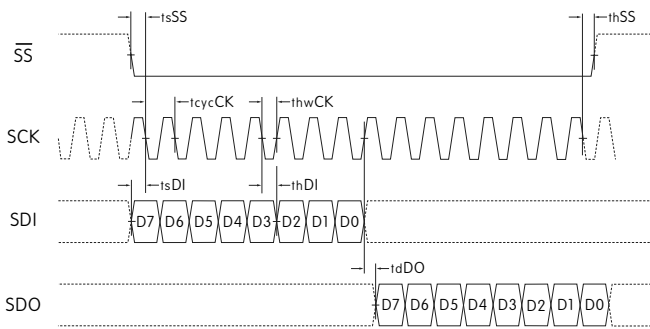
## TIMING SPECIFICATIONS FOR SWITCH & DISPLAY

### SPI Characteristics (See Timing Diagram)

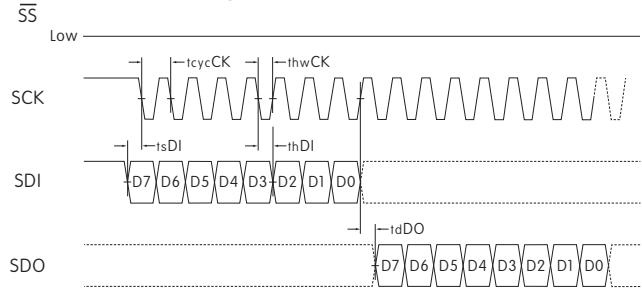
(Temperature at -15°C ~ +50°C and V<sub>DD</sub> = 5.0V ± 2%)

Items	Symbols	Minimum	Maximum
SPI_SS Set Up Time	t <sub>sSS</sub>	10ns	
SPI_SS Hold Time	t <sub>hSS</sub>	10ns	
SPI_CLK Cycle	t <sub>cyCK</sub>		8MHz
SPI_CLK Width	t <sub>hwCK</sub>	10ns	
SPI_DI Set Up Time	t <sub>sDI</sub>	10ns	
SPI_DI Hold Time	t <sub>hDI</sub>	10ns	
SPI_DO Delay Time	t <sub>dDO</sub>	10ns	

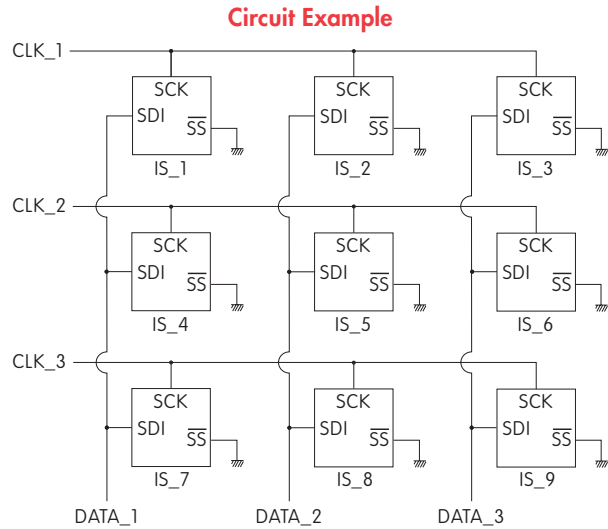
SPI Timing Chart (SS Using)



SPI Timing Chart (SS Low Level Fixed)



SDI and SCK shall be kept high when idle.



## BITMAP

### Segment

Common	1	2	3	4	5	6	7	8	9	...	16	...	49	...	56	57	58	59	60	61	62	63	64						
	Byte8							Byte7							Byte2							Byte1							
COM1	D0	D1	D2	D3	D4	D5	D6	D7	D0 ... D7							D0 ... D7							D0 D1 D2 D3 D4 D5 D6 D7						
	Byte16																Byte9												
COM2	D0 D1 D2 D3 D4 D5 D6 D7							D0 D1 D2 D3 D4 D5 D6 D7																					
•	•							•																					
•	•							•																					
•	•							•																					
	Byte256							...							...							Byte249							
COM32	D0 D1 D2 D3 D4 D5 D6 D7							D0 D1 D2 D3 D4 D5 D6 D7																					

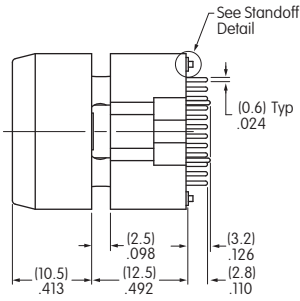
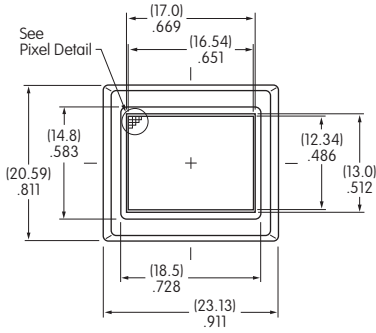
### Transferring Display Data/Displaying LCD Command and Data Sequence

Command	Data (256 Bytes)																							
0 x 55	Byte1							Byte2 ... Byte255							Byte256									
0 1 0 1 0 1 0 1	D7	D6	D5	D4	D3	D2	D1	D0	D7	D6	...	D1	D0	D7	D6	D5	D4	D3	D2	D1	D0			

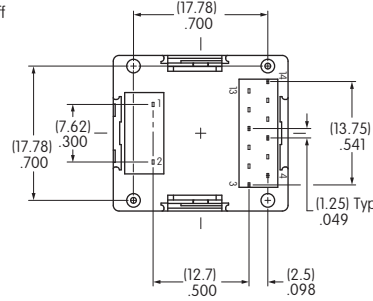
Notes: Display RAM has two screen areas. The first area is for the display on current LCD; the second area is for the data to be displayed next. The screens are changed when the second area is fully stored.



**TYPICAL SWITCH DIMENSIONS**

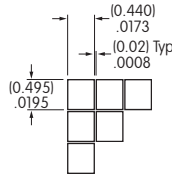


Terminal numbers are not on the switch.



**IS15BBFP4RGB**  
RGB LED Option and Black and White LCD Mode

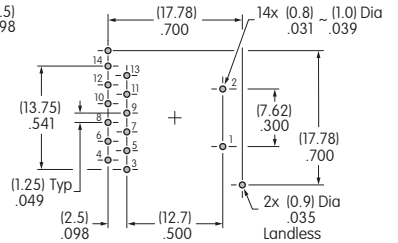
**Pixel Detail**



**Standoff Detail**



**Footprint**



**SWITCH SPECIFICATIONS**

<b>Circuit</b>	SPST normally open
<b>Electrical Capacity (Resistive Load)</b>	100mA @ 12V DC
<b>Contact Resistance</b>	200 milliohms max @ 20mV 10mA
<b>Insulation Resistance</b>	100 megohms min @ 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>	2.2 ± 0.5 Newtons
<b>Total Travel</b>	1.8mm (.071")
<b>Operating Temp. Range</b>	-20°C ~ +60°C (-4°F ~ +140°F)
<b>Storage Temp. Range</b>	-30°C ~ +70°C (-22 °F ~ +158°F)

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

Items	Symbols	Ratings
Supply Voltage for Logics	V <sub>DD</sub>	-0.3V to +7.0V
Supply Voltage for LCD	V <sub>LC</sub>	-0.3V to +12.0V
Input Voltage	V <sub>I</sub>	-0.3V to V <sub>DD</sub> +0.3V
Output Voltage	V <sub>O</sub>	-0.3V to V <sub>DD</sub> +0.3V

**LCD SPECIFICATIONS**

**Characteristics of Display**

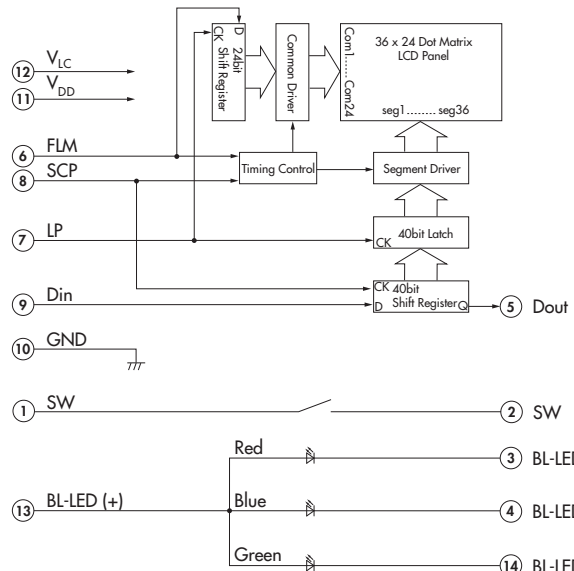
<b>Display Operation Mode</b>	STN positive, STN negative, FSTN positive
<b>Display Condition</b>	Transflective with built-in LED backlight
<b>Viewing Angle</b>	6 o'clock
<b>Driving Method</b>	1/24 duty, 1/5 bias (built-in driving circuit)
<b>Viewing Area</b>	17.0mm x 13.0mm (horizontal x vertical)
<b>Pixel Format</b>	36 x 24 pixels (horizontal x vertical)
<b>Pixel Size</b>	0.440mm x 0.495mm (horizontal x vertical)
<b>Backlight LED</b>	<b>Bicolor:</b> red/green, yellow/green <b>RGB:</b> red/green/blue

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

Items	Symbols	Min	Typical	Max
Supply Voltage for Logics	V <sub>DD</sub>	4.5V	5.0V	5.5V
Supply Voltage Yellow	V <sub>LC</sub>	—	7.4V	—
Supply Voltage Blue	V <sub>LC</sub>	—	7.5V	—
Supply Voltage Black/White	V <sub>LC</sub>	—	7.3V	—
Input Voltage	V <sub>I</sub>	0V	—	V <sub>DD</sub>
Driving Frequency	f <sub>FLM</sub>	—	150Hz	—

**SWITCH BLOCK DIAGRAM & PINS**

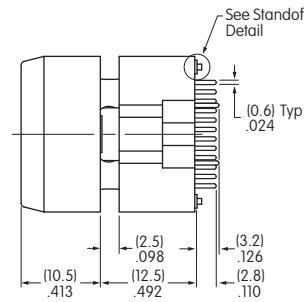
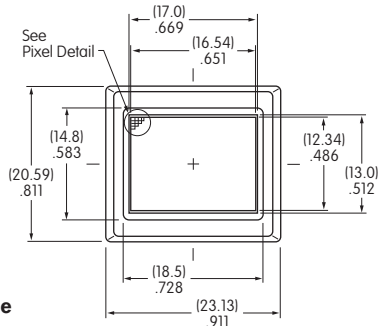
Pin	Symbol	Name	Function
①	SW	Terminal of Switch	Normally open
②	SW	Terminal of Switch	Normally open
③	BL-LED (-)	Terminal of Backlight LED	Cathode for red
④	BL-LED (-)	Terminal of Backlight LED	Cathode for blue
⑤	Dout	Data Output	
⑥	FLM	First Line Marker	Input signal frame
⑦	LP	Latch Pulse	Input display latch signal
⑧	SCP	Serial Clock Pulse	Input display shift clock
⑨	Din	Data Input	
⑩	GND	Ground	
⑪	V <sub>DD</sub>	Power	Power source for logic circuit
⑫	V <sub>LC</sub>	Power	Power source for LCD drive
⑬	BL-LED (+)	Terminal of Backlight LED	Anode for common
⑭	BL-LED (-)	Terminal of Backlight LED	Cathode for green



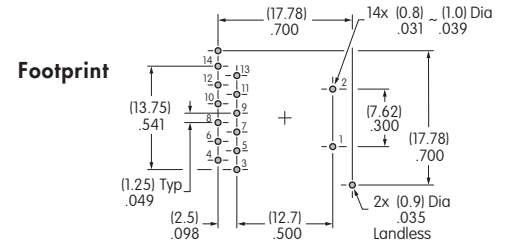
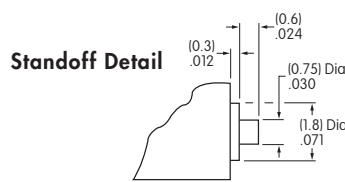
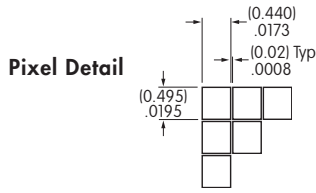
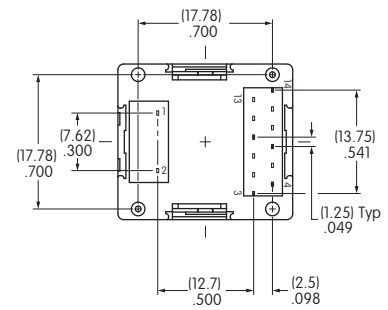
### TYPICAL SWITCH DIMENSIONS



**IS15BAFP4CF**  
Black and White LCD Mode



Terminal numbers are not on the switch.



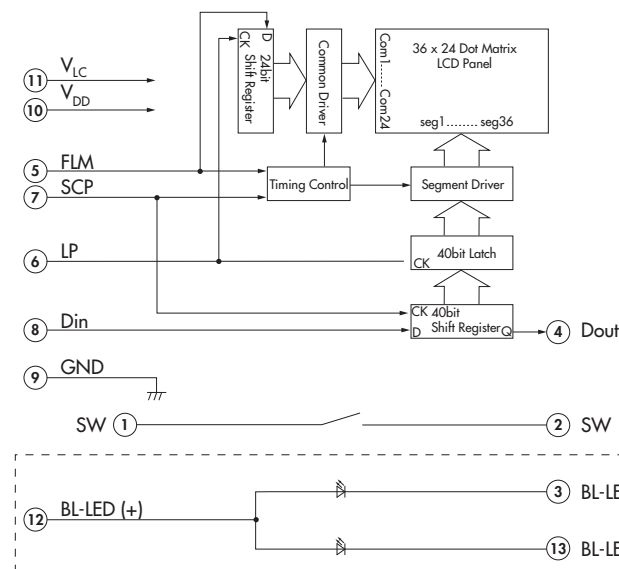
### SWITCH SPECIFICATIONS

Circuit	SPST normally open
Electrical Capacity (Resistive Load)	100mA @ 12V DC
Contact Resistance	200 milliohms max @ 20mV 10mA
Insulation Resistance	100 megohms min @ 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	1.7 ± 0.5 Newtons
Total Travel	1.8mm (.071")

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

Items	Symbols	Ratings
Supply Voltage	V <sub>DD</sub>	-0.3V to +7.0V
Input Voltage	V <sub>I</sub>	-0.3V to V <sub>DD</sub> +0.3V
Output Voltage	V <sub>O</sub>	-0.3V to V <sub>DD</sub> +0.3V

### SWITCH BLOCK DIAGRAM & PINS



### LCD SPECIFICATIONS

#### Characteristics of Display

Display Operation Mode	FSTN positive; background & 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	36 x 24 pixels (horizontal x vertical)
Pixel Size	0.440mm x 0.495mm (horizontal x vertical)
* Operating Temp Range	-20°C ~ +60°C (-4°F ~ +140°F)
Storage Temp Range	-30°C ~ +70°C (-22°F ~ +158°F)
Backlight LED	RGB: red/green/blue

\* In low temperatures (below 0°C), speed and contrast decrease when image changes. The non-indicator dot may become dense in high temperatures (about +50°C).

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

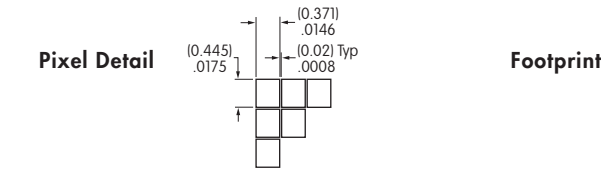
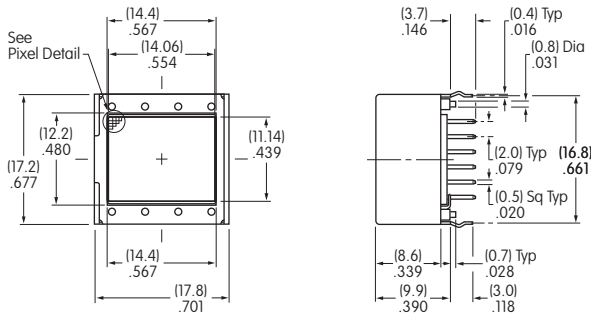
Items	Symbols	Min	Typical	Max
Supply Voltage	V <sub>DD</sub>	4.9V	5.0V	5.1V
High Level Input Voltage	V <sub>IH</sub>	0.8 V <sub>DD</sub>	—	—
Low Level Input Voltage	V <sub>IL</sub>	—	—	0.2V <sub>DD</sub>
SPI Clock Frequency	f <sub>SCK</sub>	—	—	8MHz
Current Consumption	I <sub>DD</sub>	** 10mA	—	*** 50mA

\*\* 10mA: Backlighting LED is off

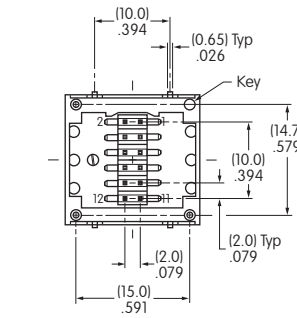
\*\*\* 50mA: Backlighting LEDs (Red, Green, Blue) at maximum brightness

Pin	Symbol	Name	Function
①	SW	Terminal of Switch	Normally open
②	SW	Terminal of Switch	Normally open
③	BL-LED (-)	Terminal of Backlight LED	Cathode: <b>super bright</b> - yellow; <b>standard</b> - green
④	Dout	Data Output	
⑤	FLM	First Line Marker	Input signal frame
⑥	LP	Latch Pulse	Input display latch signal
⑦	SCP	Serial Clock Pulse	Input display shift clock
⑧	Din	Data Input	
⑨	GND	Ground	
⑩	V <sub>DD</sub>	Power	
⑪	V <sub>LC</sub>	Power	
⑫	BL-LED (+)	Terminal of Backlight LED	Anode
⑬	BL-LED (-)	Terminal of Backlight LED	Cathode: <b>super bright</b> - green; <b>standard</b> - red

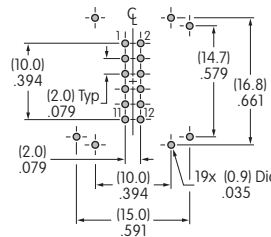
TYPICAL DISPLAY DIMENSIONS



Terminal numbers are not on the device.



ISO1BBFRGB Super Bright RGB  
ISO1BBFEF Super Bright Yellow/Green



LCD SPECIFICATIONS Characteristics of Display

<b>Display Operation Mode</b>	STN positive, FSTN positive
<b>Display Condition</b>	Transflective with built-in LED backlight
<b>Viewing Angle</b>	Adjustable
<b>Driving Method</b>	1/24 duty, 1/5 bias (built-in driving circuit)
<b>Viewing Area</b>	14.4mm x 11.8mm (horizontal x vertical)
<b>Pixel Format</b>	36 x 24 pixels (horizontal x vertical)
<b>Pixel Size</b>	0.371mm x 0.445mm (horizontal x vertical)
<b>Operating Temp. Range</b>	-20°C ~ +60°C (-4°F ~ +140°F)
<b>Storage Temp. Range</b>	-30°C ~ +70°C (-22°F ~ +158°F)
<b>Backlight LED</b>	<b>Bicolor:</b> red/green, yellow/green; <b>RGB:</b> red/green/blue

Absolute Maximum Ratings (Temperature at 25°C)

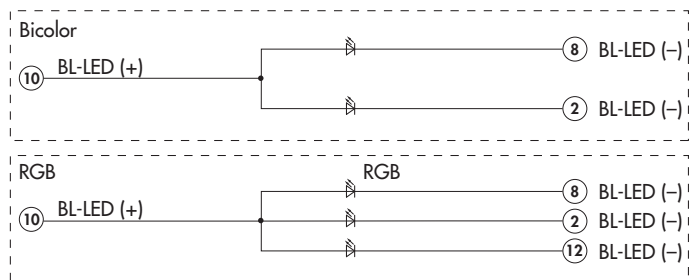
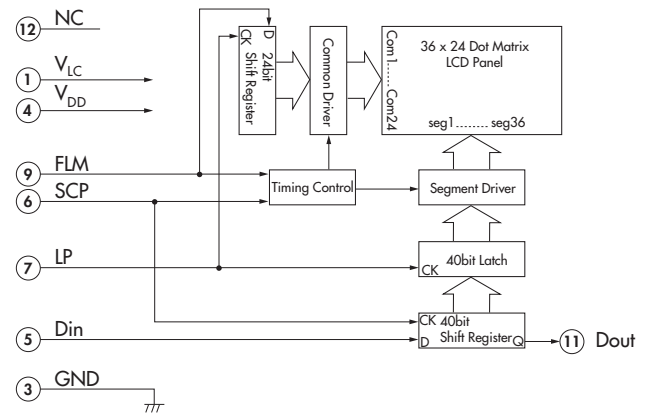
Items	Symbols	Ratings
Supply Voltage for Logics	$V_{DD}$	-0.3V to +7.0V
Supply Voltage LCD	$V_{LC}$	-0.3V to +12.0V
Input Voltage	$V_I$	-0.3V to $V_{DD}+0.3V$
Output Voltage	$V_O$	-0.3V to $V_{DD}+0.3V$

SWITCH BLOCK DIAGRAM & PINS

Pin	Symbol	Name	Function
①	$V_{LC}$	Power	Power source for LCD drive
②	BL-LED (-)	Terminal of Backlight LED	Cathode: <b>super bright bicolor</b> - green; <b>RGB</b> - green
③	GND	Ground	
④	$V_{DD}$	Power	Power source for logic circuit
⑤	Din	Data Input	
⑥	SCP	Serial Clock Pulse	Input display shift clock
⑦	LP	Latch Pulse	Input display latch signal
⑧	BL-LED (-)	Terminal of Backlight LED	Cathode: <b>super bright bicolor</b> - yellow; <b>RGB</b> - red
⑨	FLM	First Line Marker	Input signal frame
⑩	BL-LED (+)	Terminal of Backlight LED	Anode for common
⑪	Dout	Data Output	
⑫	BL-LED (-)	Terminal of Backlight LED	Bicolor: no connection; cathode for RGB: blue

Recommended Operating Conditions (Temperature at 25°C)

Items	Symbols	Min	Typical	Max
Supply Voltage for Logics	$V_{DD}$	4.5V	5.0V	5.5V
Supply Voltage LCD	$V_{LC}$	7.1V	7.3V	7.5V
Input Voltage	$V_I$	0V	—	$V_{DD}$
Driving Frequency	$f_{FLM}$	—	150Hz	—



## LCD & LED SPECIFICATIONS

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

	Items	Symbols	Ratings
LCD	Supply Voltage for Logics	$V_{DD}$	-0.3V to +7.0V
	Supply Voltage for LCD	$V_{LC}$	-0.3V to +12.0V
	Input Voltage	$V_I$	-0.3V to $V_{DD}$ +0.3V
	Output Voltage	$V_O$	-0.3V to $V_{DD}$ +0.3V
LED	Forward Current	$I_F$	20mA
	Power Dissipation	$P_d$	mW

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

Color	Super Bright					Standard	
	Yellow/Green		Red/Green/Blue			Red/Green	
	Yellow	Green	Red	Green	Blue	Red	Green
Unicolor	50mW	80mW	40mW	60mW	60mW	50mW	50mW
LED Overall	130mW		115mW			100mW	

### Display Electrical Characteristics

	Items	Symbols	Test Condition	Minimum	Typical	Maximum	
LCD	Supply Voltage	Logic Circuit	$V_{DD}$		4.5	5.0	5.5
		LCD Circuit	$V_{LC}$		7.1	7.3	7.5
	Input Voltage	H	$V_{IH}$		0.7 $V_{DD}$	—	$V_{DD}$
		L	$V_{IL}$		0	—	0.3 $V_{DD}$
	Output Voltage	H	$V_{OH}$	$D_{OUT}, I_{OH} = 500 \mu A$	$V_{DD} - 0.5$	—	—
		L	$V_{OL}$	$D_{OUT}, I_{OL} = 500 \mu A$	—	—	0.5
Power	Logic Circuit	$I_{DD}$	$f_{SCP} = 1.0MHz$	—	—	500	
	LCD Circuit	$I_{LC}$	$f_{LP} = 2.4kHz, V_{LC} = 7.3V$	—	500	2,000	

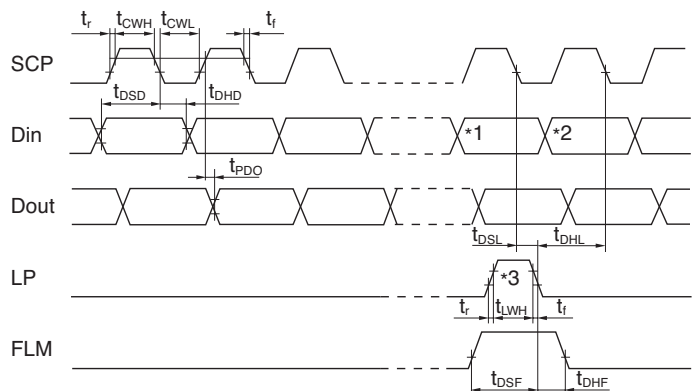
Items	Symbols	Test Condition	LED Colors							
			Super Bright					Standard		
			Yellow/Green		Red/Green/Blue			Red/Green		
LED	Forward Current	$I_F$		15mA		Red	Green	Blue	15mA	
					10mA	8.5mA	8mA			
	Forward Voltage	$V_F$	$I_F = \text{Forward Current}$ $T_a = 25^\circ C$	Yellow	Green	Red	Green	Blue	Red	Green
				1.9V	3.2V	2.0V	2.8V	2.8V	1.9V	1.9V
Current Reduction Rate	$\Delta I_F(DC)$	$T_a = 25^\circ C$ above		-0.26mA/°C		-0.33mA/°C			-0.26mA/°C	

### Timing Characteristics of LCD Drive IC

(Temperature at 0°C to +40°C and  $V_{DD} = 5.0V \pm 10\%$ )

Items	Symbols	Minimum	Maximum
Clock Operation Frequency	$f_{SCP}$		6.0MHz
Latch Pulse Frequency	$f_{LP}$		50kHz
Clock High Level Pulse Width	$t_{CWH}$	70ns	
Clock Low Level Pulse Width	$t_{CWL}$	70ns	
Data Setup Time	$t_{DSD}$	45ns	
Data Hold Time	$t_{DHD}$	50ns	
Data Output Delay Time	$t_{PDO}$		25ns
Latch Setup Time	$t_{DSL}$	50ns	
Latch Hold Time	$t_{DHL}$	50ns	
Latch High Level Width	$t_{LWH}$	200ns	
FLM Setup Time	$t_{DSF}$	50ns	
FLM Hold Time	$t_{DHF}$	50ns	
SCP, LP Rise/Fall Time	$t_r/t_f$		15ns

### Timing Diagram



\*1 Last data on first line

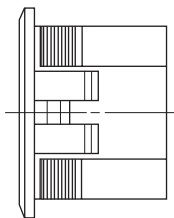
\*2 Beginning data on second line

\*3 Location of LP signal on first line

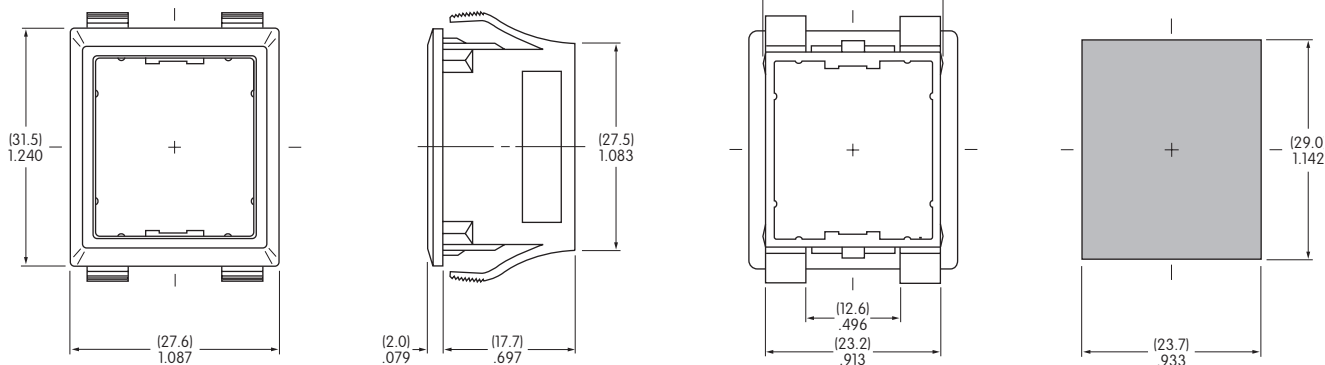
**OPTIONAL ACCESSORIES**

**AT548 Panel Mount Housing**

Material: Polyamide



Panel mount housing allows the LCD 36 x 24 Pushbutton to be snapped into a panel cutout for quick, secure mounting. It gives flexibility in locating the devices anywhere on the panel. It also allows using the LCD 36 x 24 Pushbutton on an existing panel.

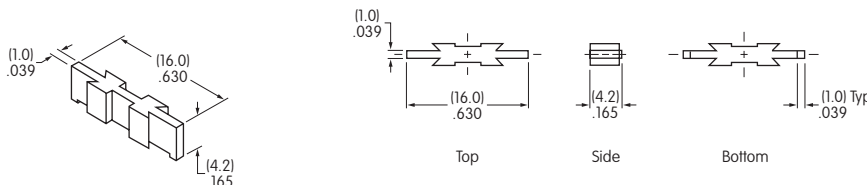


The Panel Mount Housing is available for the LCD 36 x 24 Pushbutton only.

Panel Thickness Range:  
(1.5 ~ 4.0mm) .059 ~ .157"

**AT542 Coupler**

Material: PBT



This coupler is for connecting the LCD 36 x 24 Pushbutton into precise, tight groupings that maintain an even distance from PCB to top of the actuator.

The Coupler is available for the LCD 36 x 24 Pushbutton only.

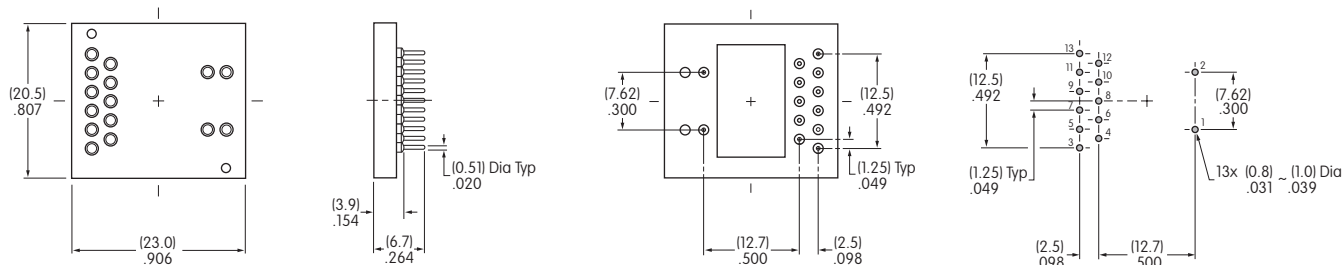
**AT9704-02YC Socket for Single and Bicolor LCD 36 x 24 Pushbutton**

Materials:

Base - Glass Fiber Reinforced PBT

Terminals - Brass/Beryllium Copper

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

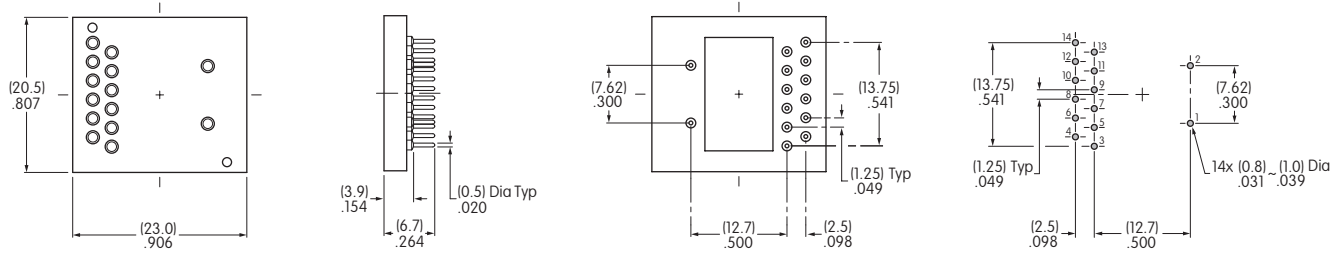


## OPTIONAL ACCESSORIES

### AT9704-065E Socket for RGB LCD 36 x 24 Pushbutton

Materials: Base - Glass Fiber Reinforced PBT; Terminals - Brass/Beryllium Copper

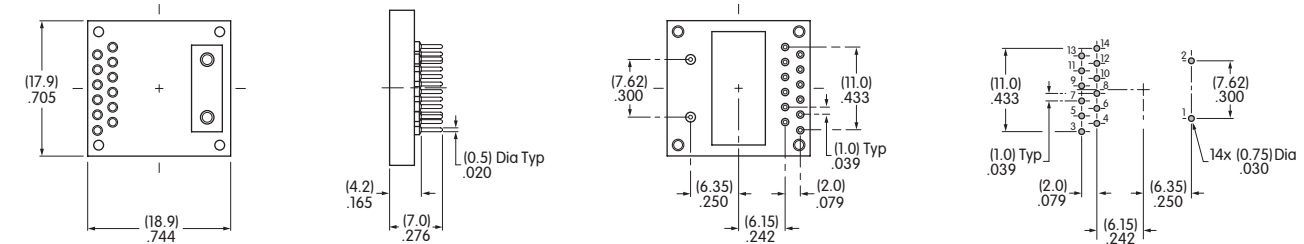
- The socket permits the RGB SMARTSWITCH™ to be plugged in after automated processing.
- Use of the socket enables easy field replacement of the device.



### AT9704-065F Socket for Compact Pushbutton (All Models)

Materials: Base - Glass Fiber Reinforced PBT; Terminals - Brass/Beryllium Copper

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

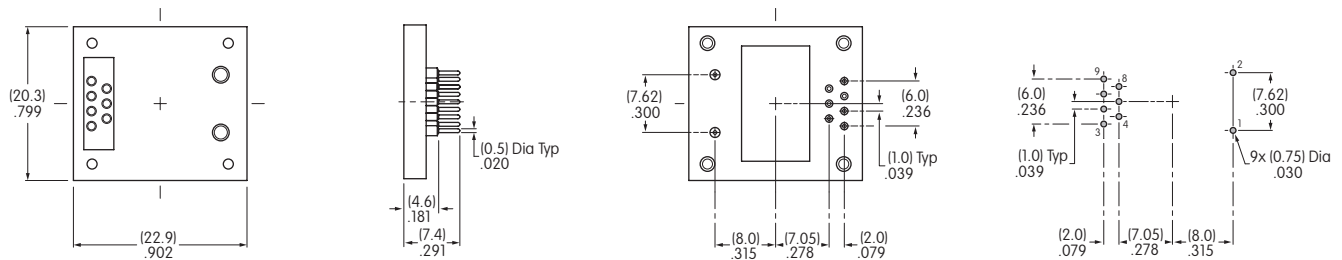


Note: AT9704-065F Socket may be used with the Compact 64 x 32 SMARTSWITCH™ by removing pins 3, 4, 11, 12, 13 and 14.

### AT9704-085K Socket for LCD 64 x 32 Pushbutton

Materials: Base - Glass Fiber Reinforced PBT; Terminals - Brass/Beryllium Copper

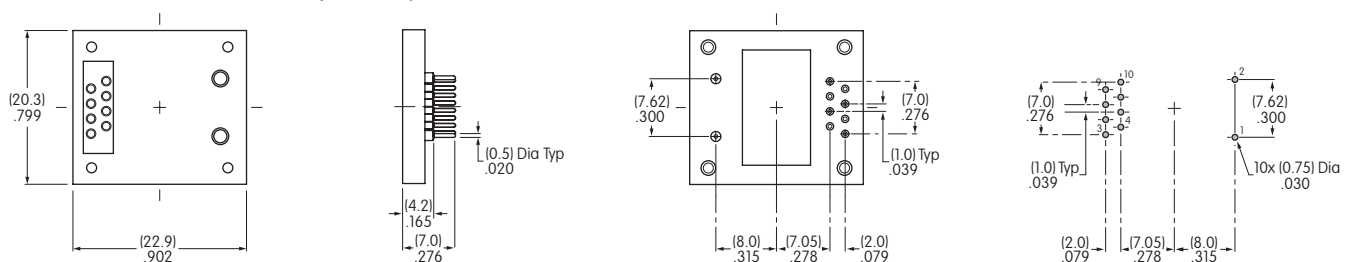
- The socket permits the SMARTSWITCH™ to be plugged in after automated processing.
- Use of the socket enables easy field replacement of the device.



### AT9704-085L Socket for OLED Pushbutton

Materials: Base - Glass Fiber Reinforced PBT; Terminals - Brass/Beryllium Copper

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

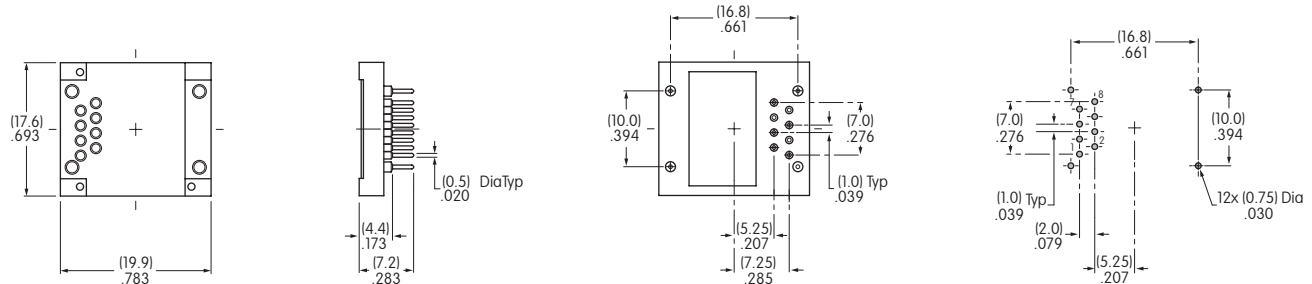




**OPTIONAL ACCESSORIES****AT9704-085M Socket for OLED Display**

Materials: Base - Glass Fiber Reinforced PBT; Terminals - Brass/Beryllium Copper

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

**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 LCD 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 , do not touch terminals unless properly insulated from static electricity.
5. For the display, it is necessary for the bracket legs to be grounded.
6. 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.
7. If the LCD is accidentally broken, avoid contact with the liquid and wash off any liquid spills to the skin or clothing.
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. Store in original container, away from static electricity, and away from direct sunlight.
10. Avoid extreme temperatures, high humidity, gaseous substances, and all forms of chemical contamination.







**Precautions for Handling LED 64 x 32 Devices**

1. Recommended soldering time and temperature limits: Wave Soldering: see Profile B in Supplement section of NKK's Switch Guide. Do not exceed 60°C at the LCD level.
2. Do not use below 0°C at the LED level, as it may cause slow response in the display switching speed or contrast. Using above 50°C may cause non-display pixels to appear darker.
3. Proper serial resistors and buffers for signals should be used to prevent noise problems.
4. Do not send any commands other than those on the specification sheet.

**Precautions for Handling LED 36 x 24 Devices**

1. Recommended soldering time and temperature limits: Wave Soldering: see Profile B in Supplement section of NKK's Switch Guide. Do not exceed 70°C at the LCD level.
2. Do not use below 0°C at the LED level, as it may cause slow response in the display switching speed or contrast. Using above 50°C may cause non-display pixels to appear darker.
3. Avoid exposing LCD to DC voltage.
4. More than twice the power voltage than the forward voltage for the LED is recommended.

## A Comprehensive Line of 11 Models with up to 65,536 Vibrant Colors!

Resolution <b>96 x 64</b>	O L E D		<b>OLED Rocker</b> Organic LED Switch: 96 x 64 Pixels Black/White		
			<b>OLED IS</b> Organic LED Switch: 64 x 48 Pixels Display: 52 x 36 Pixels 65,536 Colors		
Resolution <b>64 x 48</b>					
Resolution <b>64 x 32</b>	L C D		<b>Wide View IS High Resolution Standard LCD</b> Switch or Display: 64 x 32 Pixels Backlight RGB: 64 Colors		<b>Wide View IS High Resolution Compact LCD</b> Switch: 64 x 32 Pixels Backlight RGB: 64 Colors
			<b>Wide View IS Standard LCD</b> Switch or Display: 36 x 24 Pixels Backlight Bicolor/RGB 3 Switches, 2 Displays		<b>Wide View IS Compact LCD</b> Switch: 36 x 24 Pixels Backlight Bicolor/RGB
Resolution <b>36 x 24</b>					
<b>Viewing Area</b>		<b>Wide</b>	<b>Standard</b>	<b>Compact</b>	

### Comparative Guide for Current to New Part Numbers

Resolution	Switch/Display	LCD	Super Bright Backlight	Current Part No.	New Part No.	Notes
64 x 32 Pixels (Horizontal x Vertical)	Switch	Black/White	Red/Green/Blue	IS15DBFP4RGB	IS15EBFP4RGB	—
	Switch (Compact)	Black/White	Red/Green/Blue	IS15DSBFP4RGB	IS15ESBFP4RGB	—
	Display	Black/White	Red/Green/Blue	IS01DBFRGB	IS01EBFRGB	—
36 x 24 Pixels (Horizontal x Vertical)	Switch	Yellow	Yellow/Green	IS15ABCP4EF	IS15BBFP4EF	Black & White mode LCD; Replace yellow/green backlight
			Yellow	IS15ABCP4E		
			Red/Green	IS15ABCP4CF	IS15BBFP4RGB	Black & White mode LCD; Replace RGB backlight
			Red/Green	IS15AACP4CF	IS15BAFP4CF	Black & White mode LCD; Replace red/green backlight
	Black & White	Blue	White	IS15ABFP4B	IS15BBFP4RGB	Replace RGB backlight
			Yellow	IS15ABDP4E	No alternative part numbers	Contact factory for details
			Yellow/Blue	IS15ABDP4EG		
	Display	Yellow	White	IS15ABDP4B	IS01BBFEF	Black & White mode LCD; Replace yellow/green backlight
			Yellow/Green	IS01BCEF		
			Yellow	IS01BCE		
		Red/Green	IS01BCCF	IS01BBFRGB	Black & White mode LCD; Replace RGB backlight	