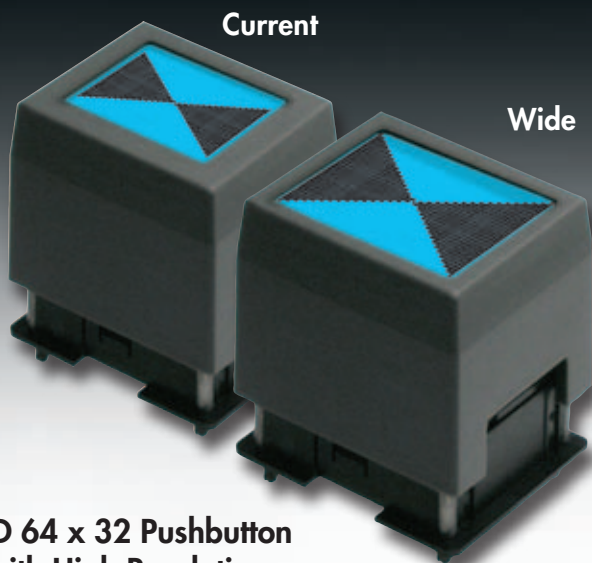


IS Series Wide Viewing Area

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

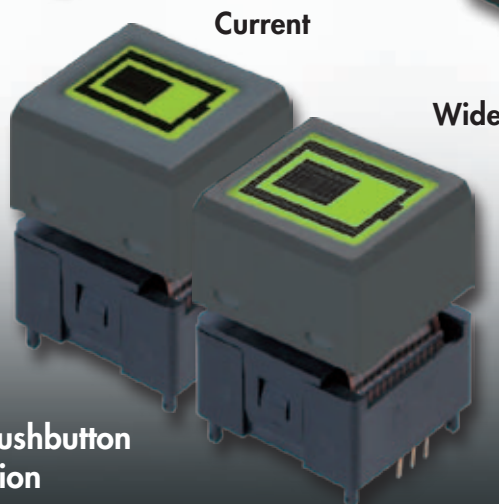
Larger Screen, Narrow Frame, Superior Visibility



LCD 64 x 32 Pushbutton
with High Resolution



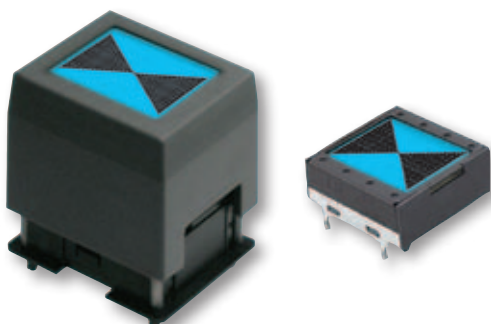
LCD 36 x 24 Pushbutton
Standard



LCD 64 x 32 Compact Pushbutton
with High Resolution

Wide Viewing Area Features & Specifications

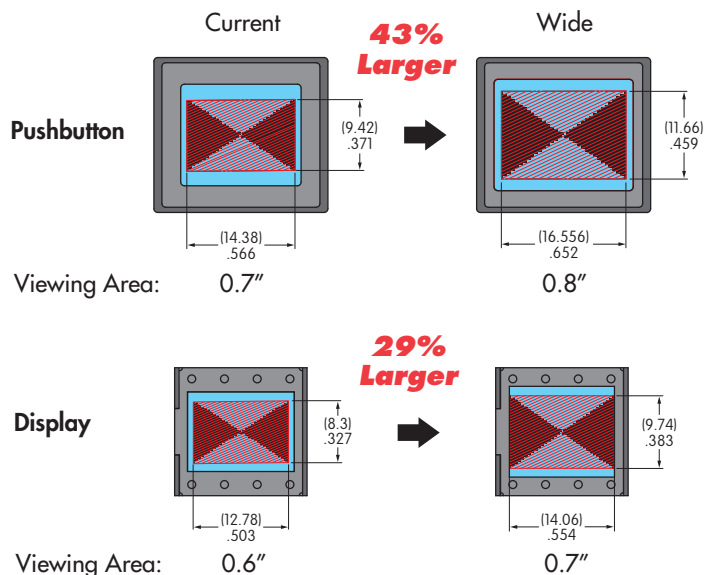
LCD 64 x 32 Pushbutton with High Resolution



Viewing Areas

Pushbutton: 0.8" Display: 0.7"

Viewing Area Comparisons

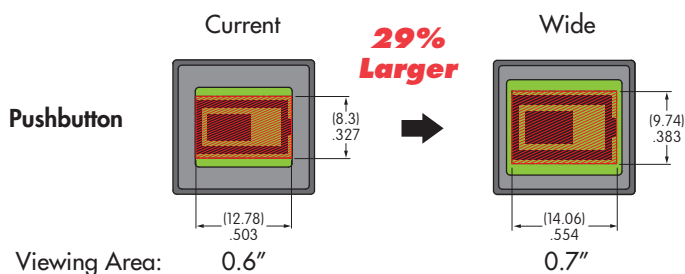


LCD 64 x 32 Compact Pushbutton with High Resolution



Viewing Area

Pushbutton: 0.7"

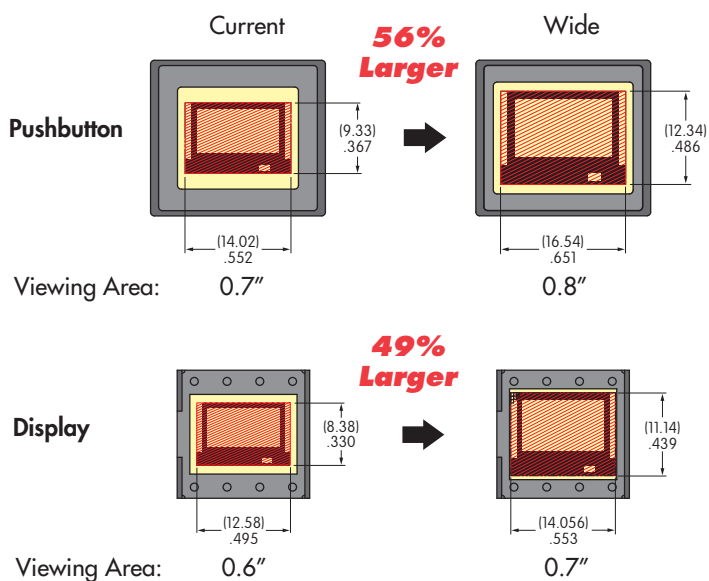


LCD 36 x 24 Pushbutton Standard

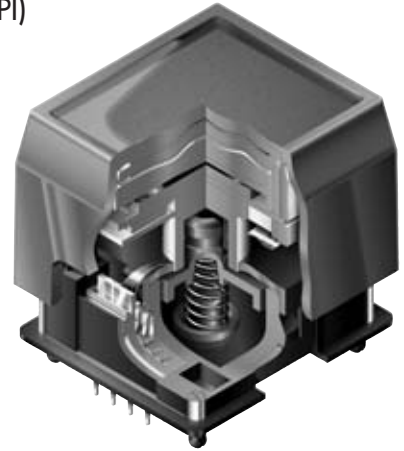


Viewing Areas

Pushbutton: 0.8" Display: 0.7"



- 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.



The diagram illustrates the relationship between the letters in the model number and their corresponding specifications:

- IS**: Poles (1 SPDT)
- 1**: Circuits (5 OFF (ON), () = Momentary)
- 5**: Circuits (5 OFF (ON), () = Momentary)
- E**: Outside Dimensions (No Code: Standard - 23.13 x 20.59mm, S: ** Compact - 19.0 x 18.0mm)
- S**: Outside Dimensions (No Code: Standard - 23.13 x 20.59mm, S: ** Compact - 19.0 x 18.0mm)
- B**: Viewing Area (B: 0.8" (23.13 x 20.59mm), E: 0.8" (23.13 x 20.59mm), 0.7" (19.0 x 18.0mm))
- F**: LCD Mode (F: Black & White)
- P4**: Contacts & Terminals (P4: Gold Contacts, Straight PC Terminals)
- RGB**: LED Colors (CF: * Red/Green, EF: * Yellow/Green, RGB: Red/Green/Blue)

```

graph TD
    IS[IS] --- 01[01]
    IS --- E[E]
    IS --- B[B]
    IS --- F[F]
    IS --- RGB[RGB]
    01 --- 01_01[01]
    E --- E_07[0.7"]
    E --- E_32[32"]
    B --- B_Super[B]
    F --- F_BW[F]
    RGB --- RGB_EF[EF]
    RGB --- RGB_RGB[RGB]
    
```

The diagram illustrates the configuration options for the device, organized into a tree structure. The root node is 'IS' (Outside Dimensions). It branches into five main categories: '01' (Viewing Area), 'E' (Resolution), 'B' (LED Backlighting), 'F' (LCD Mode), and 'RGB' (LED Colors). Each of these categories further branches into specific options.

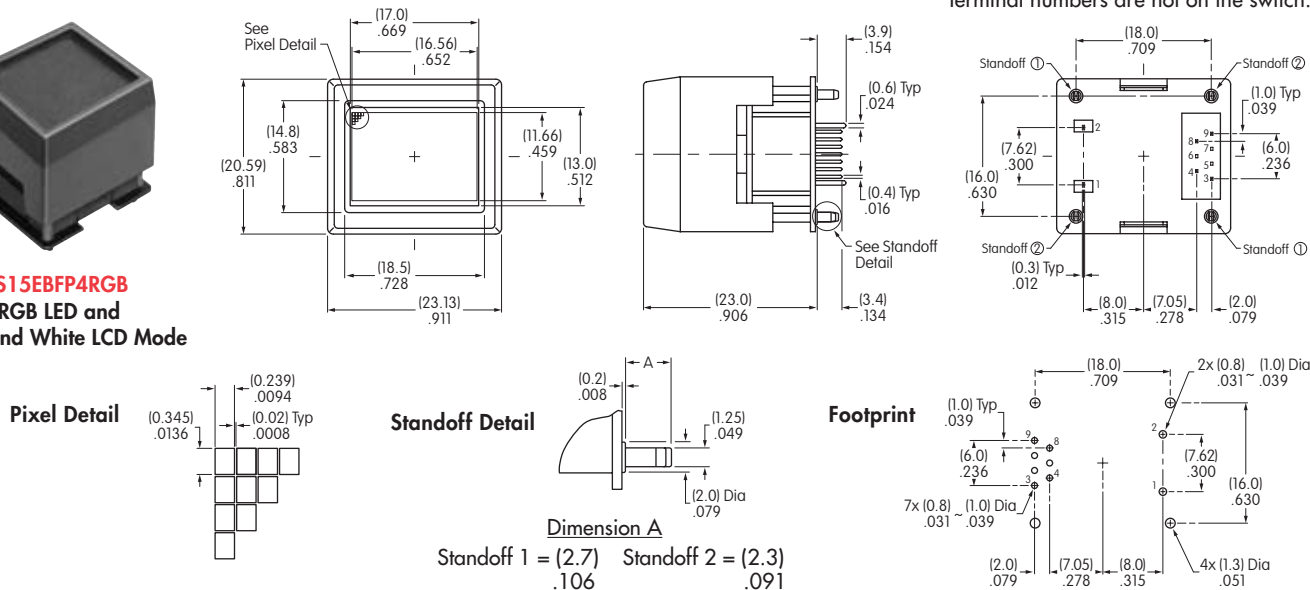
- IS (Outside Dimensions)**
 - 01** (17.8 x 17.2)mm
- E (Resolution)**
 - 0.7"** (Standard 36 x 24 Pixels)
 - 32"** (High Resolution 64 x 32 Pixels)
- B (LED Backlighting)**
 - B** (Super Bright)
- F (LCD Mode)**
 - F** (Black & White)
- RGB (LED Colors)**
 - EF** (* Yellow/Green)
 - RGB** (Red/Green/Blue)

* 36 x 24 Pixels

TYPICAL SWITCH DIMENSIONS



IS15EBFP4RGB
RGB LED and
Black and White LCD Mode

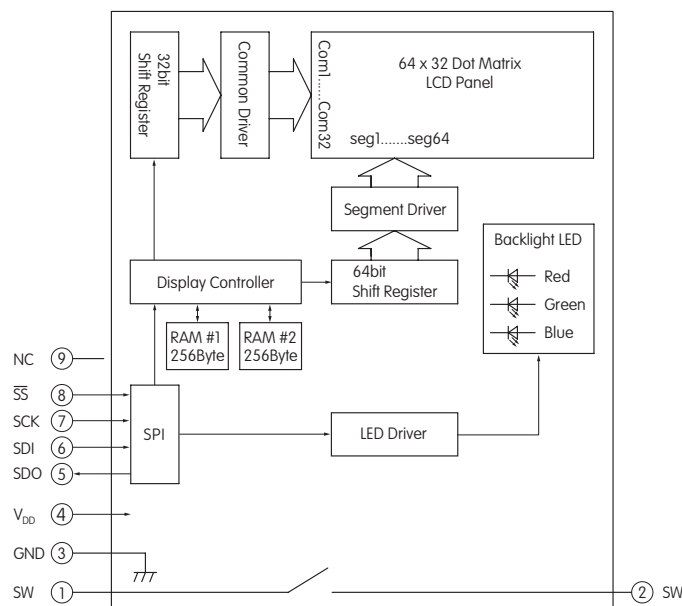


SWITCH SPECIFICATIONS

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_{DD}	$-0.3V$ to $+7.0V$
Input Voltage	V_I	$-0.3V$ to $V_{DD} + 0.3V$
Output Voltage	V_O	$-0.3V$ to $V_{DD} + 0.3V$



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_{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	—	*** 50mA

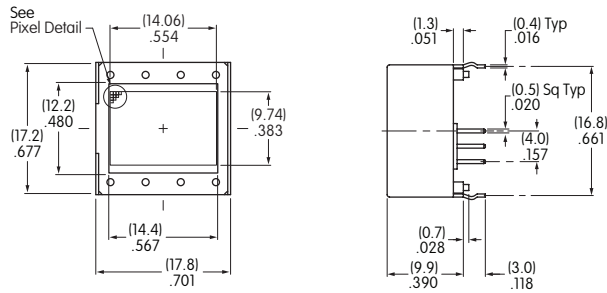
** 10mA: Backlighting LED is off

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

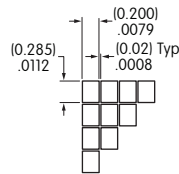
SWITCH BLOCK DIAGRAM & PINS

Pin	Symbol	Name	Function
①	SW	Terminal of Switch	Normally open
②	SW	Terminal of Switch	Normally open
③	GND	Ground	
④	V_{DD}	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	$\overline{SS}$	Slave Select	Chip select for SPI; line is active low
⑨	NC	None	No connection

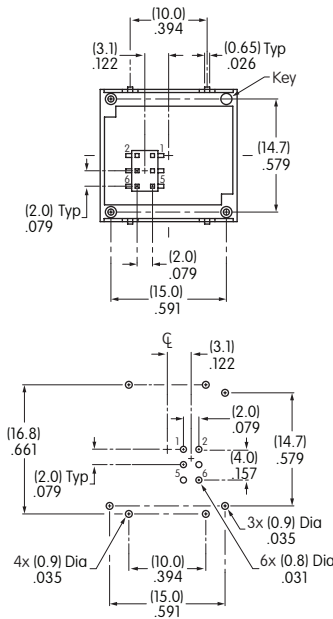
TYPICAL DISPLAY DIMENSIONS



Pixel Detail



Footprint



ISO1EBFRGB
RGB LED and
Black and White LCD Mode

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	14.4mm x 11.8mm (horizontal x vertical)
Pixel Format	64 x 32 pixels (horizontal x vertical)
Pixel Size	0.200mm x 0.285mm (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).

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

DISPLAY BLOCK DIAGRAM & PINS

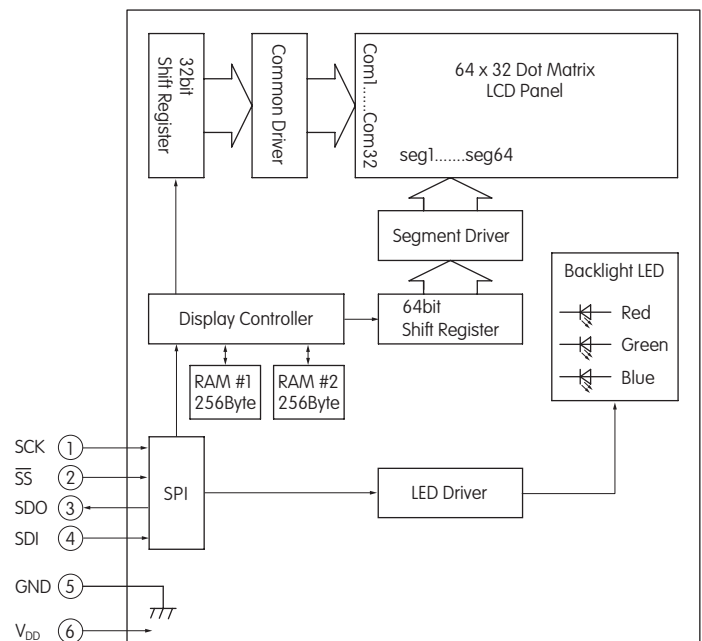
Pin	Symbol	Name	Function
①	SCK	Serial Clock	Clock line for SPI that synchronizes commands and data
②	$\overline{SS}$	Slave Select	Chip select for SPI; line is active low
③	SDO	Data Out	Data output line for SPI
④	SDI	Data In	Data input line for SPI
⑤	GND	Ground	
⑥	V_{DD}	Power	Power source for logic circuit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

Recommended Operating Conditions (Temperature at 25°C)

Items	Symbols	Minimum	Typical	Maximum
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	—	*** 50mA

** 10mA: Backlighting LED is off

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

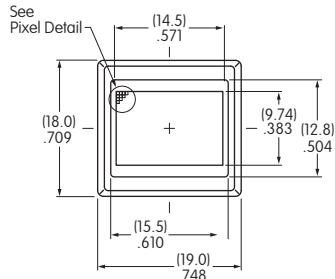


TYPICAL SWITCH DIMENSIONS

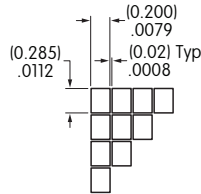


IS15ESBFP4RGB

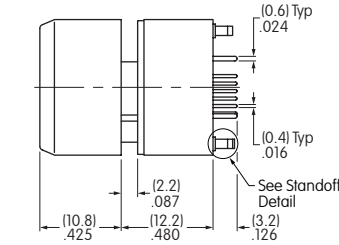
RGB LED and
Black and White LCD Mode



Pixel Detail



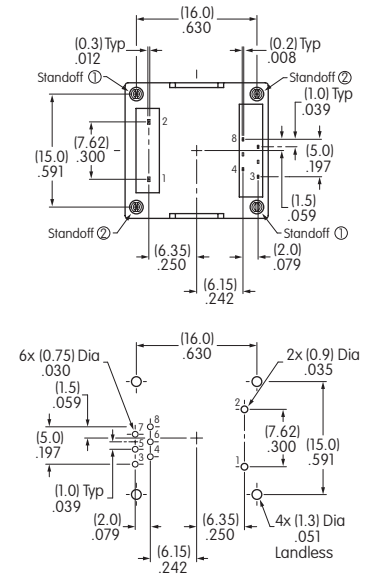
Standoff Detail



Dimension A

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

Footprint



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 _{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

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	14.5mm x 11.8mm (horizontal x vertical)
Pixel Format	64 x 32 pixels (horizontal x vertical)
Pixel Size	0.200mm x 0.285mm (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).

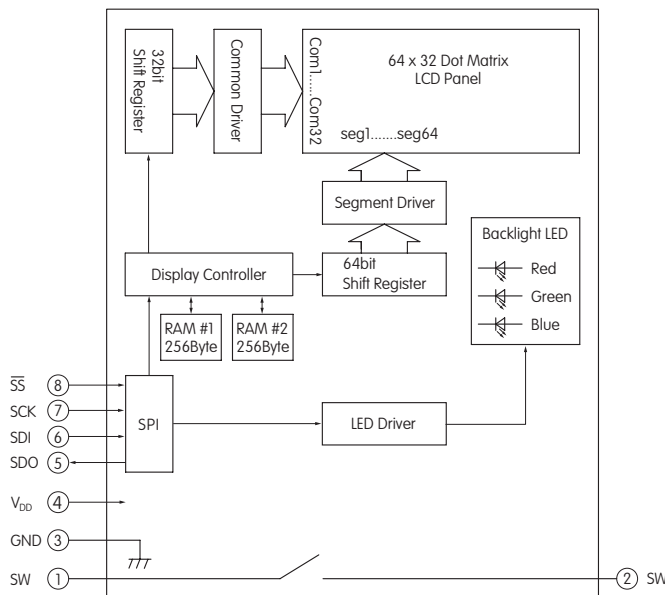
Recommended Operating Conditions (Temperature at 25°C)

Items	Symbols	Min	Typical	Max
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}	—	—	0.2V _{DD}
SPI Clock Frequency	f _{SCK}	—	—	8MHz
Current Consumption	I _{DD}	** 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 _{DD}	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 (dark) 100 = 1/3 001 = 1/10 101 = 1/2 010 = 1/7 110 = 2/3 011 = 1/5 111 = full (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

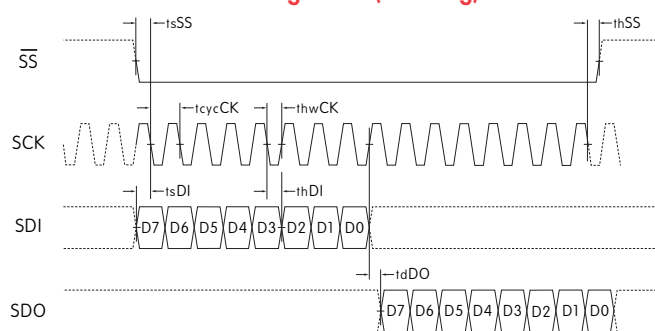
TIMING SPECIFICATIONS FOR SWITCH & DISPLAY

SPI Characteristics (See Timing Diagram)

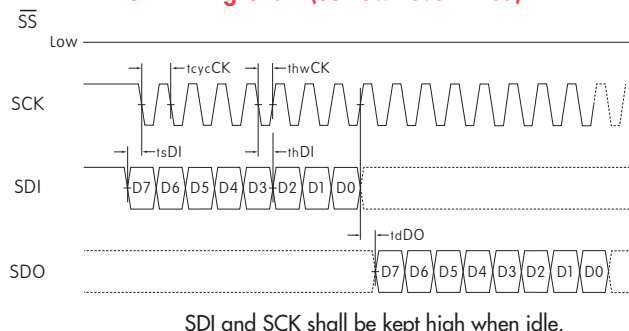
(Temperature at $-15^{\circ}\text{C} \sim +50^{\circ}\text{C}$ and $V_{\text{DD}} = 5.0\text{V} \pm 2\%$)

Items	Symbols	Minimum	Maximum
SPI_SS Set Up Time	t_{SS}	10ns	
SPI_SS Hold Time	t_{hSS}	10ns	
SPI_CLK Cycle	t_{cycCK}		8MHz
SPI_CLK Width	t_{hwCK}	10ns	
SPI_DI Set Up Time	t_{sDI}	10ns	
SPI_DI Hold Time	t_{hDI}	10ns	
SPI_DO Delay Time	t_{dDO}	10ns	

SPI Timing Chart (SS Using)



SPI Timing Chart (SS Low Level Fixed)



SDI and SCK shall be kept high when idle.

BITMAP

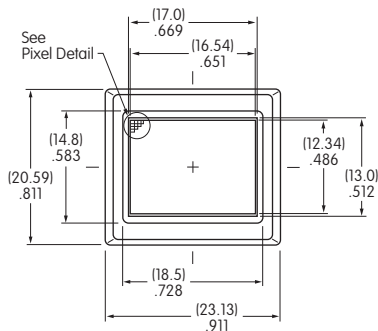
Segment																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Common	1	2	3	4	5	6	7	8	9	•	•	•	16	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Transferring Display Data/Displaying LCD Command and Data Sequence

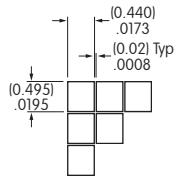
Command	Data (256 Bytes)																						
0 x 55	Byte1								Byte2 • • • Byte255				Byte256										
0 1 0 1 0 1 0 1	D7	D6	D5	D4	D3	D2	D1	D0	D7	D6	•	•	•	D1	D0	D7	D6	D5	D4	D3	D2	D1	D0

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.

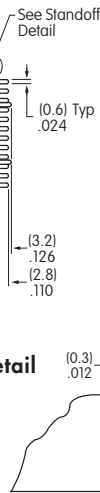
TYPICAL SWITCH DIMENSIONS



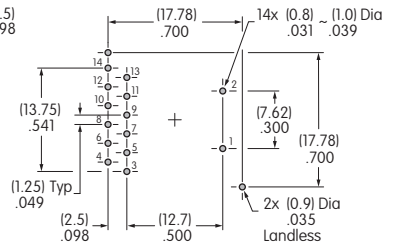
Pixel Detail



Standoff Detail



Footprint



Terminal numbers are not on the switch.



IS15B8FP4RGB
RGB LED Option and
Black and White LCD Mode

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	2.2 ± 0.5 Newtons
Total Travel	1.8mm (.071")
Operating Temp. Range	-20°C ~ +60°C (-4°F ~ +140°F)
Storage Temp. Range	-30°C ~ +70°C (-22 °F ~ +158°F)

Absolute Maximum Ratings (Temperature at 25°C)

Items	Symbols	Ratings
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

LCD SPECIFICATIONS

Characteristics of Display

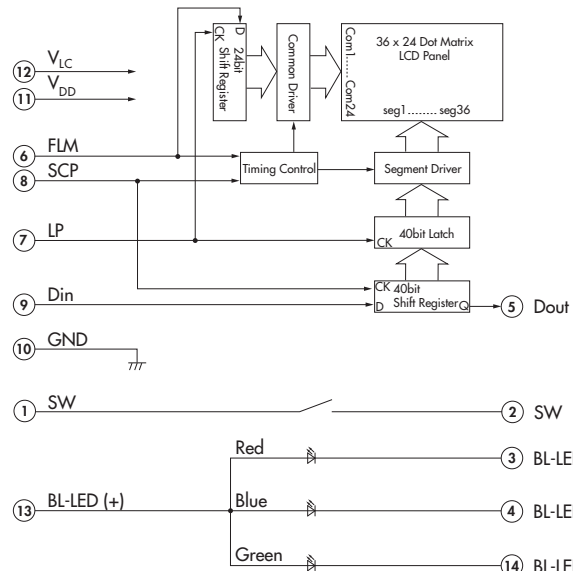
Display Operation Mode	STN positive, STN negative, FSTN positive
Display Condition	Transflective with built-in LED backlight
Viewing Angle	6 o'clock
Driving Method	1/24 duty, 1/5 bias (built-in driving circuit)
Viewing Area	17.0mm x 13.0mm (horizontal x vertical)
Pixel Format	36 x 24 pixels (horizontal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

Recommended Operating Conditions (Temperature at 25°C)

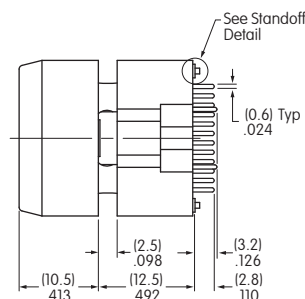
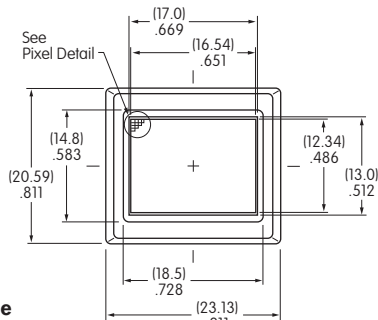
Items	Symbols	Min	Typical	Max
Supply Voltage for Logics	V _{DD}	4.5V	5.0V	5.5V
Supply Voltage Yellow	V _{LC}	—	7.4V	—
Supply Voltage Blue	V _{LC}	—	7.5V	—
Supply Voltage Black/White	V _{LC}	—	7.3V	—
Input Voltage	V _I	0V	—	V _{DD}
Driving Frequency	f _{FLM}	—	150Hz	—

SWITCH BLOCK DIAGRAM & PINS

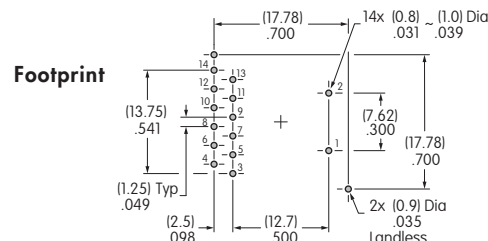
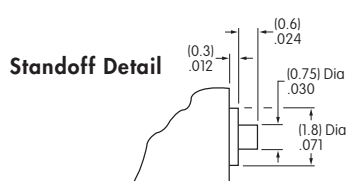
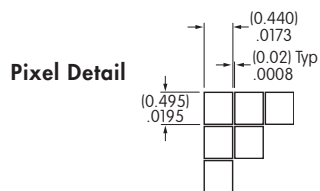
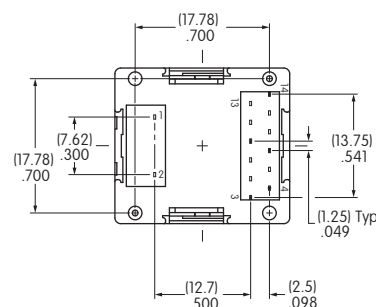
Pin	Symbol	Name	Function
①	SW	Terminal of Switch	Normally open
②	SW	Terminal of Switch	Normally open
③	BL-LED (-)	Terminal of Backlight LED	Cathode for red
④	BL-LED (-)	Terminal of Backlight LED	Cathode for blue
⑤	Dout	Data Output	
⑥	FLM	First Line Marker	Input signal frame
⑦	LP	Latch Pulse	Input display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



Terminal numbers are not on the switch.



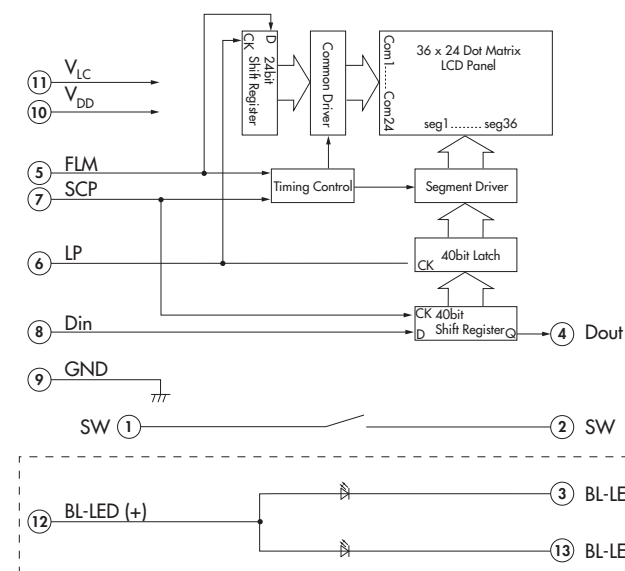
SWITCH SPECIFICATIONS

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 _{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

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 _{DD}	4.9V	5.0V	5.1V
High Level Input Voltage	V _{IH}	0.8 V _{DD}	—	—
Low Level Input Voltage	V _{IL}	—	—	0.2V _{DD}
SPI Clock Frequency	f _{SCK}	—	—	8MHz
Current Consumption	I _{DD}	** 10mA	—	*** 50mA

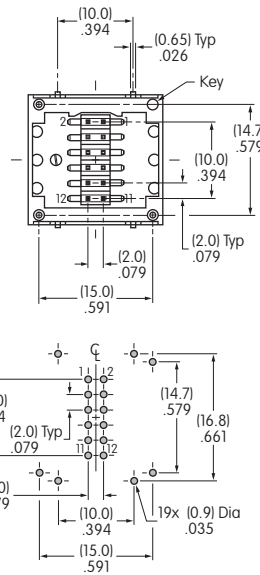
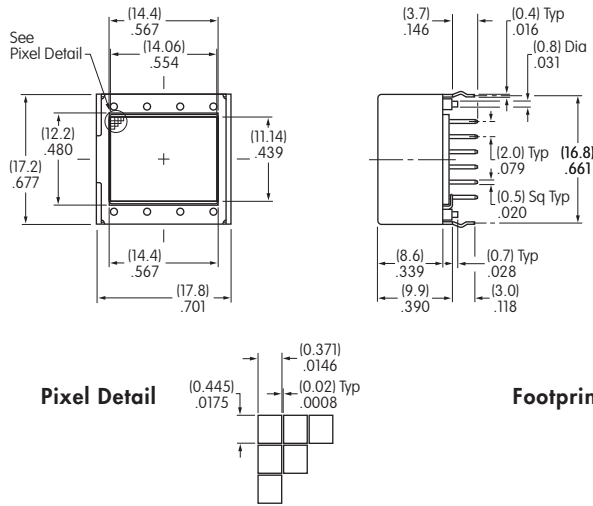
** 10mA: Backlighting LED is off

*** 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: super bright - yellow; standard - 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 _{DD}	Power	
⑪	V _{LC}	Power	
⑫	BL-LED (+)	Terminal of Backlight LED	Anode
⑬	BL-LED (-)	Terminal of Backlight LED	Cathode: super bright - green; standard - 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

Display Operation Mode	STN positive, FSTN positive
Display Condition	Transflective with built-in LED backlight
Viewing Angle	Adjustable
Driving Method	1/24 duty, 1/5 bias (built-in driving circuit)
Viewing Area	14.4mm x 11.8mm (horizontal x vertical)
Pixel Format	36 x 24 pixels (horizontal x vertical)
Pixel Size	0.371mm x 0.445mm (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	Bicolor: red/green, yellow/green; RGB: red/green/blue

Absolute Maximum Ratings (Temperature at 25°C)

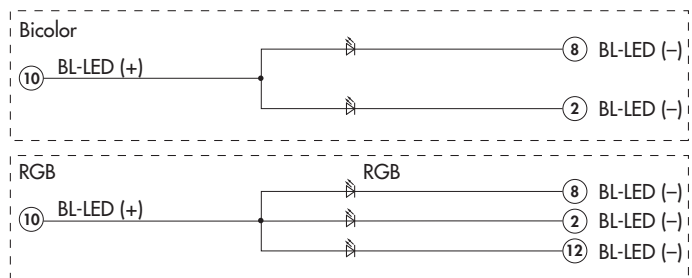
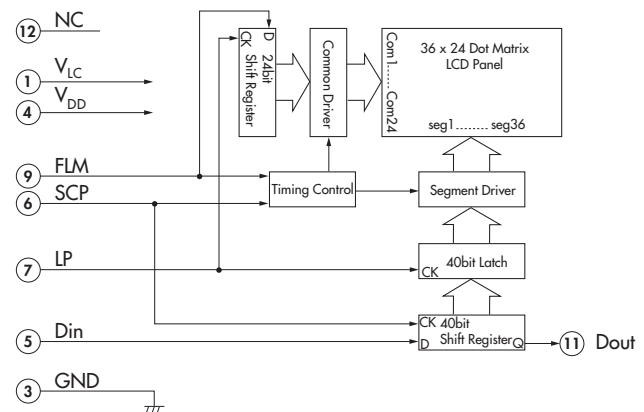
Items	Symbols	Ratings
Supply Voltage for Logics	V_{DD}	-0.3V to +7.0V
Supply Voltage LCD	V_{LC}	-0.3V to +12.0V
Input Voltage	V_I	-0.3V to $V_{DD} + 0.3V$
Output Voltage	V_O	-0.3V to $V_{DD} + 0.3V$

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: super bright bicolor - green; RGB - 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: super bright bicolor - yellow; RGB - 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

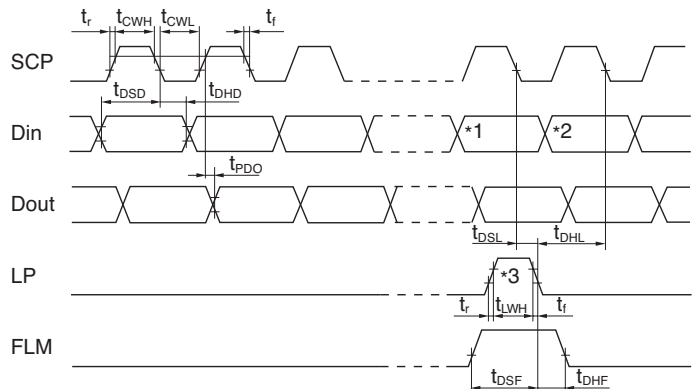
Items				Symbols		Test Condition		Minimum		Typical		Maximum	
LCD	Supply Voltage		Logic Circuit	V _{DD}			4.5		5.0		5.5		
			LCD Circuit	V _{LC}			7.1		7.3		7.5		
	Input Voltage		H	V _{IH}			0.7V _{DD}		—		V _{DD}		
			L	V _{IL}			0		—		0.3 V _{DD}		
	Output Voltage		H	V _{OH}	D _{OUT} , I _{OH} = 500 μ A		V _{DD} −0.5		—		—		
			L	V _{OL}	D _{OUT} , I _{OL} = 500 μ 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	I _F = Forward Current Ta = 25°C	15mA		Red	Green	Blue	15mA				
						10mA	8.5mA	8mA					
	Forward Voltage	V _F		Yellow	Green	Red	Green	Blue	Red	Green			
				1.9V	3.2V	2.0V	2.8V	2.8V	1.9V	1.9V			
	Current Reduction Rate	ΔI _F (DC)		Ta = 25°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

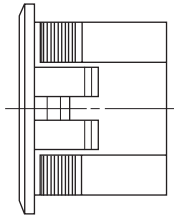
*2 Beginning data on second line

*3 Location of LP signal on first line

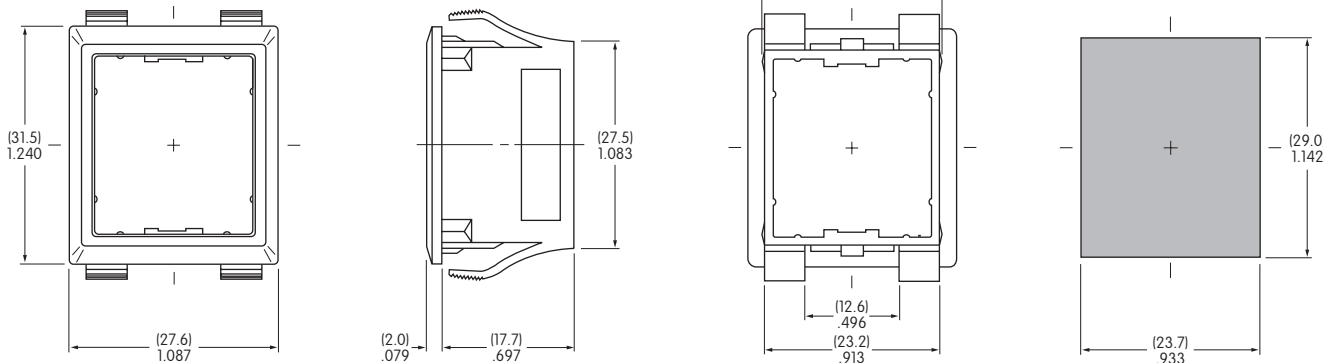
OPTIONAL ACCESSORIES

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.

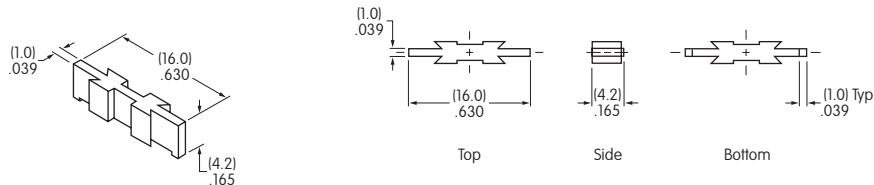


The Panel Mount Housing is available for the LCD 36 x 24 Pushbutton only.

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.

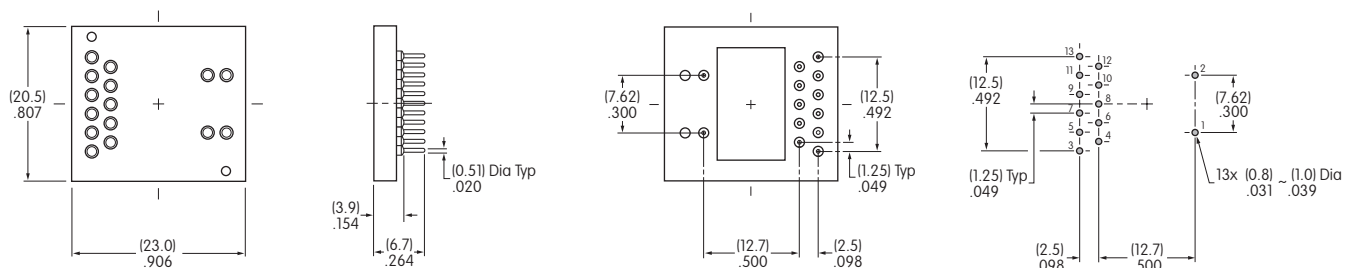
AT9704-02YC Socket for Single and Bicolor LCD 36 x 24 Pushbutton

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.

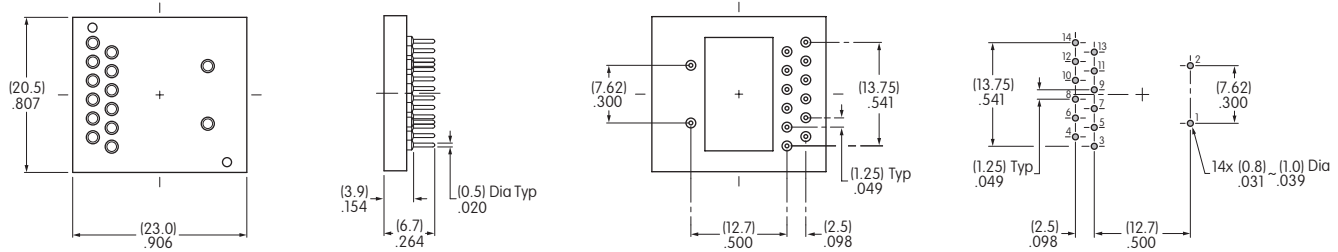


OPTIONAL ACCESSORIES

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

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

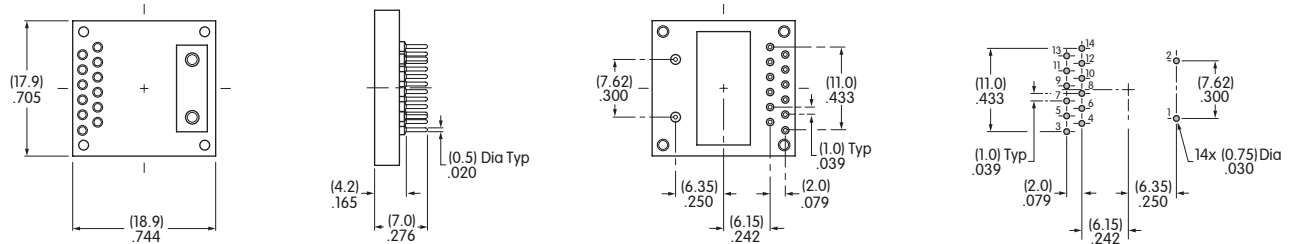
- The socket permits the RGB SMARTSWITCH™ to be plugged in after automated processing.
- Use of the socket enables easy field replacement of the device.



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.

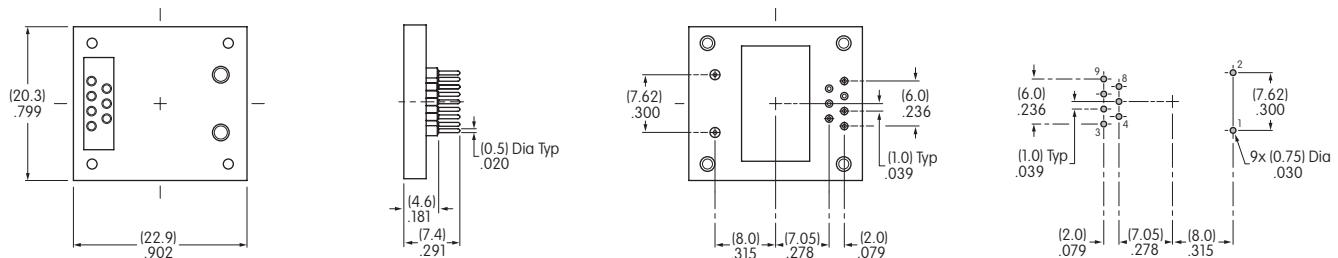


Note: AT9704-065F Socket may be used with the Compact 64 x 32 SMARTSWITCH™ by removing pins 3, 4, 11, 12, 13 and 14.

AT9704-085K Socket for LCD 64 x 32 Pushbutton

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

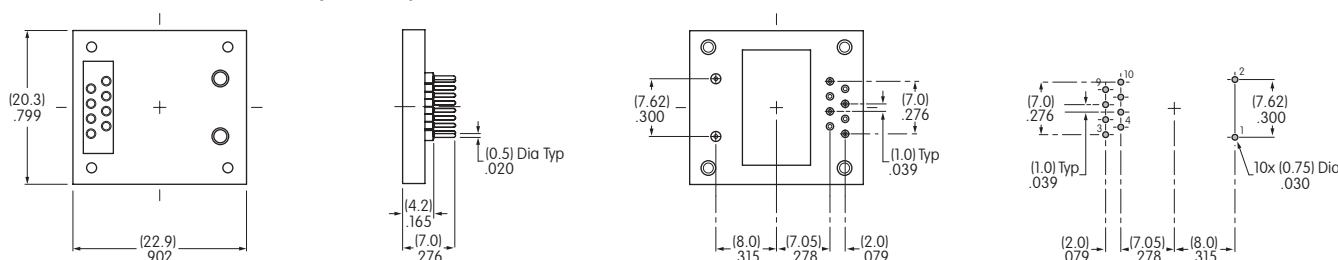
- The socket permits the SMARTSWITCH™ to be plugged in after automated processing.
- Use of the socket enables easy field replacement of the device.



AT9704-085L Socket for OLED Pushbutton

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

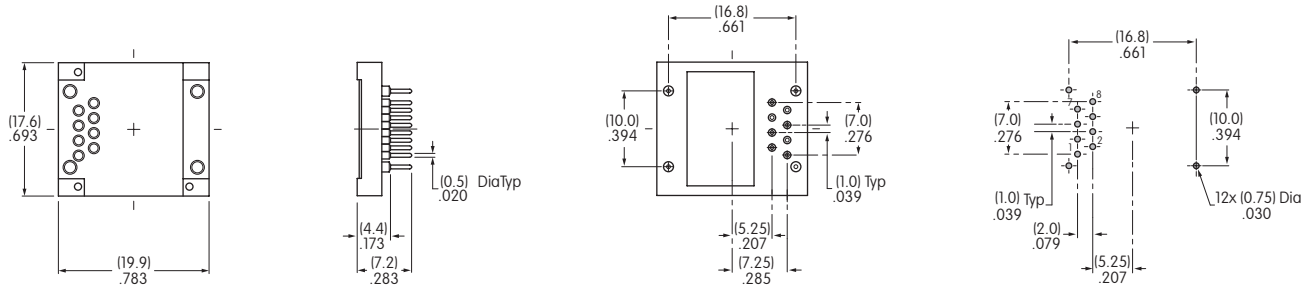
- The socket permits the OLED SMARTSWITCH™ to be plugged in after automated processing.
- Use of the socket enables easy field replacement of the device.



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

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	White	IS15ABFP4B	IS15BBFP4RGB	Replace RGB backlight
		Blue	Yellow	IS15ABDP4E	No alternative part numbers	Contact factory for details
			Yellow/Blue	IS15ABDP4EG		
			White	IS15ABDP4B		
	Display	Yellow	Yellow/Green	IS01BCEF	IS01BBFEF	Black & White mode LCD; Replace yellow/green backlight
			Yellow	IS01BCE		
			Red/Green	IS01BCCF	IS01BBFRGB	Black & White mode LCD; Replace RGB backlight

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