# Distinctive Characteristics

Brilliant illumination for highly visible status indication with LEDs and caps in red, green, or amber; subdued illumination for low light requirements with white cap over red, green, or amber LEDs.

Photo interrupter, rather than contacts, ensures high reliability and long life of 3 million operations minimum.

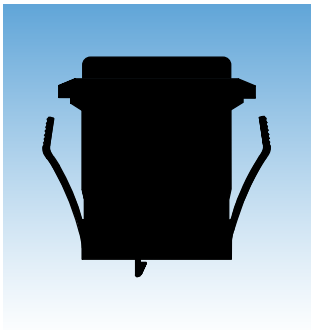
Rugged construction and smooth actuation allow repeated, rapid actuation force anywhere on cap surface.

Snap-in mounting for easy installation.

Connector socket with 6 pins for simple connection.

Well suited for gaming and vending machines, as well as equipment exposed to corrosive gases used in environments such as chemical or steel manufacturing plants.

Actual Size



# Series FP01 Contactless Illuminated Pushbuttons

## TYPICAL SWITCH ORDERING EXAMPLE

FP01 [1] [5] [C] [A] [C1] [F] [F] – [ ]

**PHOTO TRANSISTOR**

| | |
|---|---|
| 1 | Single |

**SHAPE**

| | |
|---|---|
| C | Round |

**RECEPTACLE**

| | |
|---|---|
| C1 | 6-pin Socket |

See Plug Options.

**LEDS**

| | |
|---|---|
| C | Red |
| D | Amber |
| F | Green |

**PHOTO INTERRUPTER**

| | | |
|---|---|---|
| 5 | Unshaded | (Shaded) |

(Momentary Operating Function)

**HOUSING**

| | |
|---|---|
| A | Black |

**ACTUATOR COLORS**

| | |
|---|---|
| B | White |
| C | Red |
| D | Amber |
| F | Green |

**PLUG OPTIONS**

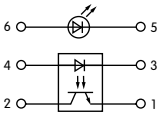
| | |
|---|---|
| C2 | Assembled Connector Plug with Wire Leads |
| C3 | Unassembled Connector Plug and Pins |
| No Code | No Connector Plug |

Contact factory for custom options.

### DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

FP0115CAC1FF

## ACTUATOR & INTERRUPTER

| | | Actuator Position | | Photo Interrupter | | Schematics |
|---|---|---|---|---|---|---|
| | | Normal | Down | Unshaded | Shaded | |
| Model | 1 | ▬ | ▬ | 5 | Normally Unshaded with Momentary Shaded status | LED connector pins are 5 & 6; interrupter connector pins are 3-4 & 1-2. |
| FP0115 | Single Photo Transistor | When shaded, the photo transistor momentarily activates electrical function which signals the external device to change its state. | | | |  |



## HOUSING SHAPE & COLOR

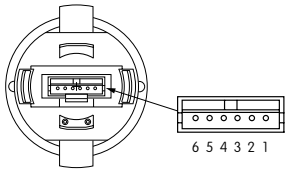
[C] **Round Shape**

[A] **Black Housing**

## INTERNAL RECEPTACLE

[C1] **Receptacle**

Internal male connector socket



## SWITCH SPECIFICATIONS

| | Actuator Up | Actuator Down |
|---|---|---|
| **Status of Photo Interrupter:** | Unshaded | Shaded |
| **Collector Current $I_C$:** | 0.8mA minimum | 10μA maximum |
| **Status of Photo Transistor:** | On | Off |
| **Output Condition of Photo Transistor:** | $I_F$ = 20mA & $V_{CE}$ = 5V | |

## MECHANICAL SPECIFICATIONS

| | |
|---|---|
| **Total Travel:** | .079″ (2.0mm) |
| **Operating Force:** | 0.75 N (.169 lbf) |
| **Mechanical Life:** | 3,000,000 operations minimum |
| **Operating Temperature Range:** | –25°C through +50°C (–13°F through +122°F) |

## MATERIALS

| | |
|---|---|
| **Actuator:** | Polyacetal |
| **Housing:** | Polyamide |

## PHOTO INTERRUPTER SPECIFICATIONS

(Temperature @ 25°C)

| Electrical & Optical Characteristics | Typical | Maximum | Condition |
|---|---|---|---|
| **Input** | | | |
| **Forward Voltage $V_F$:** | 1.3V | 1.6V | $I_F$ = 50mA |
| **Reverse Current $I_R$:** | | 10μA | $F_R$ = 5V |
| **Transmission** | | | |
| **Collector-Emitter Saturation Voltage $V_{CE}$ sat:** | | 0.4V | $I_F$ = 20mA & $I_C$ = 0.1mA |

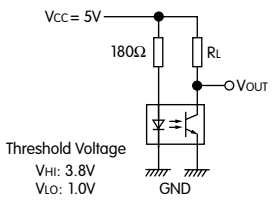
**Absolute Maximum Ratings**

| Input LED | | Output Photo Transistor | |
|---|---|---|---|
| **Forward Current $I_F$:** | 50mA | **Collector-Emitter Voltage $V_{CEO}$:** | 30V |
| **Reverse Voltage $V_R$:** | 5V | **Emitter-Collector Voltage $V_{ECO}$:** | 4.5V |
| **Power Dissipation $P_D$:** | 80mW | **Collector Current $I_C$:** | 30mA |
| | | **Collector Dissipation $P_C$:** | 80mW |

**Circuit Design Considerations**

Output of the infrared LED in the photo interrupter decreases approximately 50% after 100,000 hours.

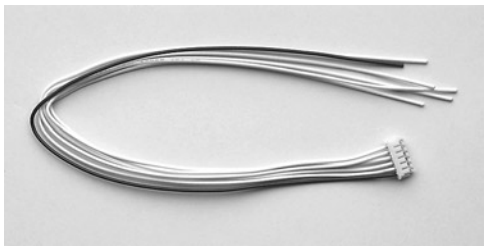
Recommended load resistance (RL) is 40k ~ 120kΩ for the illustrated circuit.



## EXTERNAL PLUG OPTIONS

**C2** **AT021**
**Assembled Connector Plug with Wire Leads**

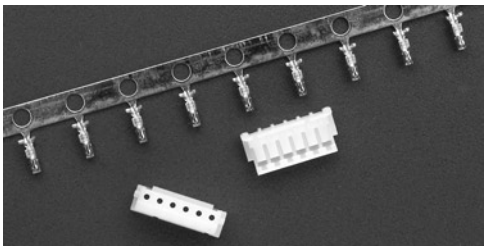
Connector plug body: JST model ZHR-6
Crimp connector pins: JST model SZH-002T-P0.5
Wire leads: 28-26AWG; 12-inch, unstripped;
Blue for Pin 1



**C2** **AT022**
**Unassembled Connector Plug and Pins**

1 connector plug and 8 crimp connector pins only (no wire leads provided).

Matching wire leads: 28-26AWG



**No Code**

**No Connector Plug**

Recommended connector plug for assembly:
JST model number ZHR-6

Recommended crimp connector pins:
JST model SZH-002T-P0.5 for 28-26AWG wire leads or SZH-003T-P0.5 for 32-28AWG wire leads.

## ACTUATOR COLORS

**B** White

**C** Red

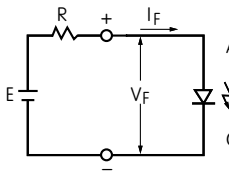
**D** Amber

**F** Green

## LED COLORS & SPECIFICATIONS

LEDs are an integral part of the switch and not available separately. The electrical specifications shown are determined at a basic temperature of 25°C.

If the source voltage exceeds the rated voltage, a ballast resistor is required.

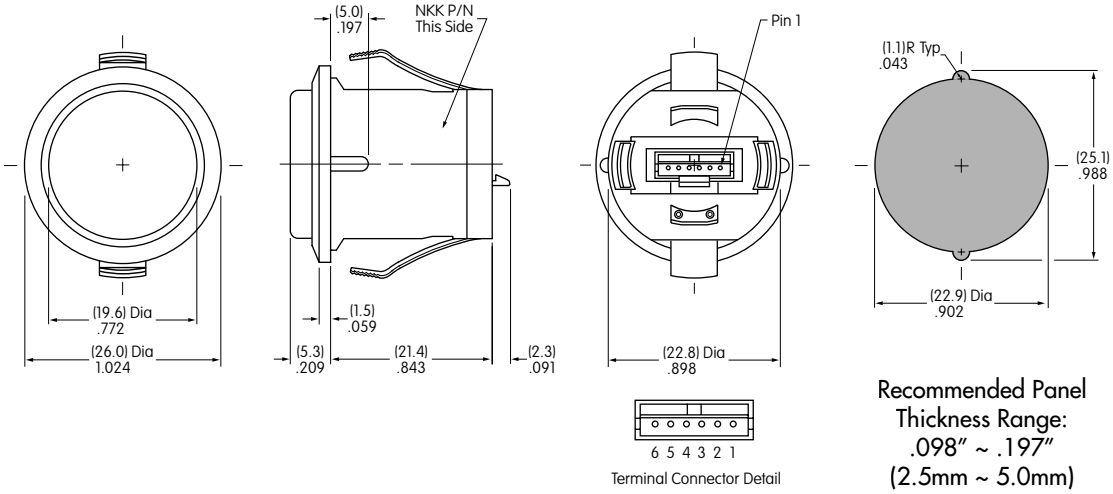



$$R = \frac{E - V_F}{I_F}$$

Where: R = Resistor Value (Ohms)
E = Source Voltage (V)
$V_F$ = Forward Voltage (V)
$I_F$ = Forward Current (A)

| Single Element LED | | C | D | F |
|---|---|---|---|---|
| | Color | Red | Amber | Green |
| Forward Peak Current | $I_{FM}$ | 30mA | 25mA | 25mA |
| Continuous Forward Current | $I_F$ | 20mA | 20mA | 20mA |
| Forward Voltage | $V_F$ | 1.85V | 2.0V | 2.25V |
| Reverse Peak Voltage | $V_{RM}$ | 5V | 5V | 5V |
| Current Reduction Rate Above 25°C | $\Delta I_F$ | 0.38mA /°C | 0.28mA /°C | 0.40mA /°C |
| Ambient Temperature Range | | –25° ~ +50°C | | |

## TYPICAL SWITCH DIMENSIONS




Recommended Panel Thickness Range:
.098" ~ .197"
(2.5mm ~ 5.0mm)

FP0115CAC1FF

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NKK Switches:

AT021 AT022 AT021X001

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