

## SERIES 97

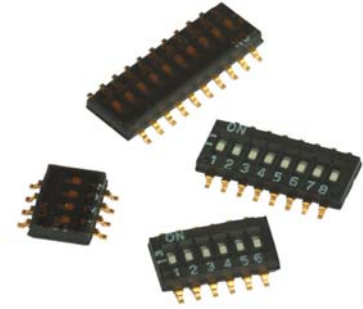
### Half-Pitch

#### FEATURES

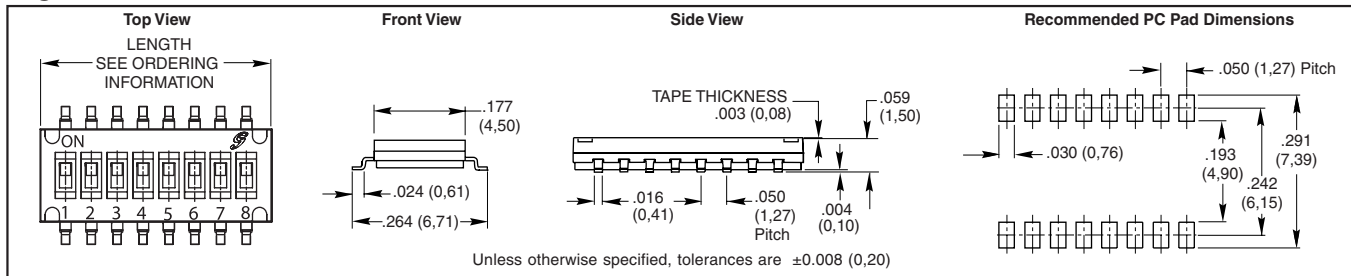
- Half the Size of Standard DIP Switches
- Available in 2, 4, 6, 8, and 10 Positions
- Low Profile
- Less Mass for Easy Vacuum Pick & Place

#### APPLICATIONS

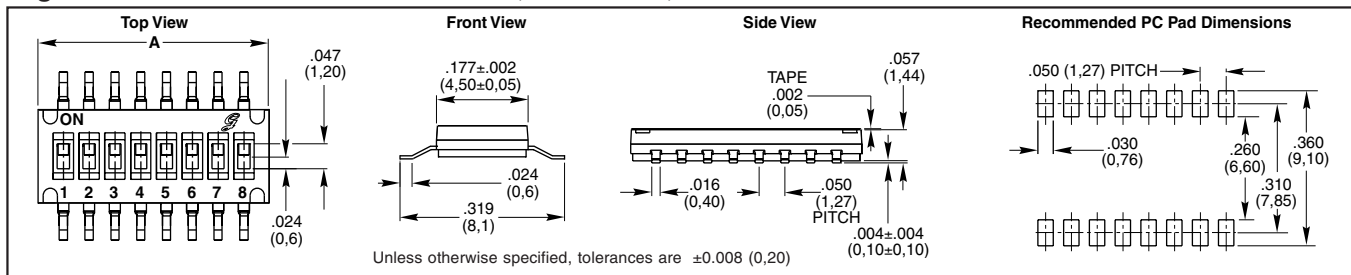
Used in any DIP application where space is at a premium such as notebook computers, hand-held radios, industrial control products, CD-ROM drives, cellular base stations and coin changers.



**Fig. 1 Series 97C DIMENSIONS** In inches (and millimeters)



**Fig. 2 Series 97R DIMENSIONS** In inches (and millimeters)



## SPECIFICATIONS

### Electrical Ratings

**Contact Rating:** 25 mA at 24 Vdc switching; 100 mA at 50 Vdc non-switching

**Contact Resistance:** 100 mΩ max, initially  
**Insulation Resistance:** 100 MΩ minimum at 100 Vdc

**Dielectric Strength:** 300 Vac for one minute

**Switch Capacitance:** 5pF maximum

**Contact Arrangement:** SPST

### Mechanical Ratings

**Life:** 1,000 cycles minimum

**Operation Force:** 500 gF

**Mechanical Shock:** MIL-STD-202F, Method, 213B, Test Condition A. Gravity: 50G's (peak value), 11 m/sec. Direction and times: 6 sides and 3 times in each direction.

**Vibration:** MIL-STD-202F, Method 201A. Passed 6 hours (2 hours in each) of three

perpendicular planes at a cycle of 10-55-10Hz/1 minute.

**Operating Temperature Range:** -40 to 85°C

**Storage Temperature Range:** -40 to 85°C

### Materials

**Base and Cover:** UL94V-0 Nylon, black

**Actuators:** UL94V-0 Nylon thermoplastic, white

**Base Contacts:** Alloy copper with gold-plating over nickel

**Terminals:** Brass with gold-plating

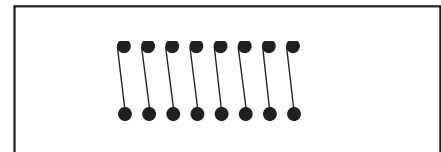
**Tape Seal:** Kapton

### Soldering Information

Vapor phase and IR-reflow soldering can be applied. With stands 255°C peak temperature.

All DIP switches are shipped in the "ON" position.

## CIRCUITRY



**Cleaning:** Tape sealed versions are capable of withstanding washing processes using alcohol-based solvents only. Water or other water-based solvent washing processes are not recommended. Care should be taken to avoid flux adhering to the switch body from the circuit board soldering process. The switch should be allowed to cool for at least 3 minutes between the end of the solder process and the beginning of the wash process. The solvent stage of the cleaning process is not to exceed 1 minute and the whole wash process is not to exceed 3 minutes. Ultrasonic or pressure wash cleaning is not recommended.

### Packaging Information

**Tube:** 130 pcs/tube (2 positions), 75 pcs/tube (4 positions), 54 pcs/tube (6 positions), 40 pcs/tube (8 positions), 33 pcs/tube (10 positions).

**Tape and Reel:** 97C: 4,000 pcs/reel (all positions). 97R: 2500 pcs/reel (all positions).

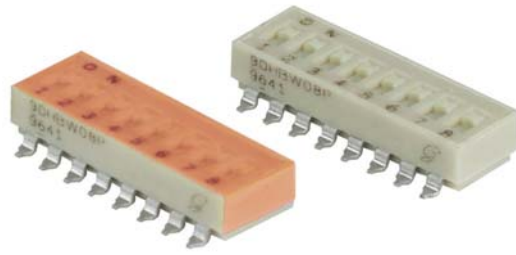
## ORDERING INFORMATION

<p><b>97C06SRT</b></p>	<b>Series:</b> 97C see fig. 1, 97R see fig. 2
	<b>Positions:</b> 02 = .148 (3,76), 04 = .248 (6,30), 06 = .348 (8,84), 08 = .448 (11,38), 10 = .548 (13,92)
	<b>T=</b> RoHS compliant
	<b>Packaging:</b> Blank = Tube, R = Tape and Reel (see pkg note)
	<b>Seal:</b> Blank = Unsealed, S = Top Tape Seal

**SERIES 90HB**  
SPST, Low Profile

**FEATURES**

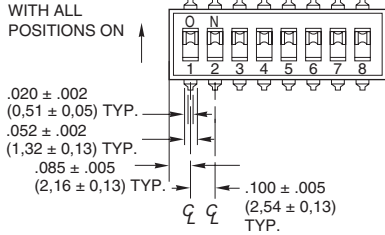
- Compatible with SMT Assembly, Including Infrared Reflow and Vapor-Phase
- Reliable Spring and Ball Contact



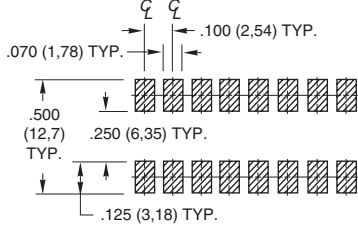
**DIMENSIONS** In inches (and millimeters)

**Top View—Gull Wing**

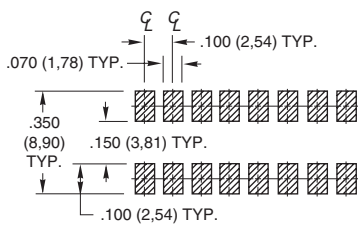
SWITCH IS PACKAGED AS SHOWN HERE WITH ALL POSITIONS ON



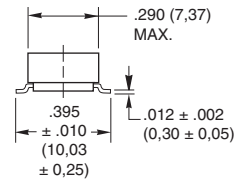
**Recommended PC Pad Dimensions—Gull Wing**



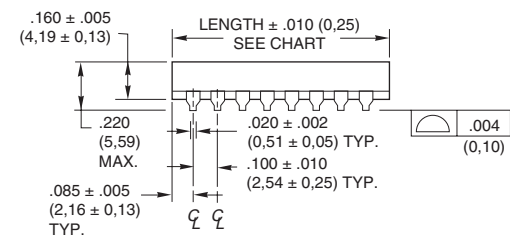
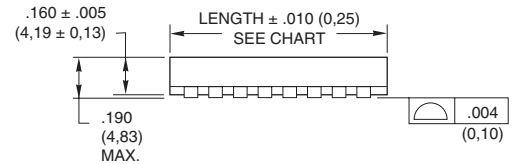
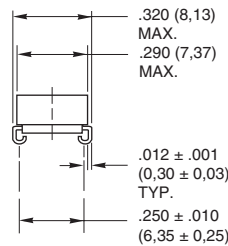
**Recommended PC Pad Dimensions—J-Bend**



**Gull Wing**



**J-Bend**



**CIRCUITRY**

As viewed from the top of the switch in the positions shown in the drawi



## SPECIFICATIONS

### Electrical Ratings

**Make-and-break Current Rating:** 2,000 operations per switch position at these resistive loads: 10 mA, 30 Vdc; or 10 mA, 50 mVdc; 10 mA, 50 mVdc; or 25 mA, 24 Vdc; or 100 mA, 6 Vdc.

**Contact Resistance:** (measured at 10 mA, 50 mVdc). Initial: 20 mohms maximum, After Life: 100 mohms maximum

**Insulation Resistance:** Minimum, at 100 Vdc between adjacent closed contacts and also across open switch contacts.

Initial (Mohms): 5,000, After Life (Mohms): 1,000

**Dielectric Strength:** Minimum voltage (AC RMS) measured between adjacent closed contacts and also across open switch contacts. Initial: 500 volts, After Life: 500 volts

**Current Carry Rating:** 3A maximum rise of 20°C

**Switch Capacitance:** 2 pF at 1 megahertz

### Mechanical Ratings

Where Grayhill performance is superior, the MIL spec is listed in parentheses.

**Mechanical Life:** 2,000 operations per switch position

**Vibration Resistance:** Per Method 204, Test Condition B, 1mS opening (10 mS allowed)

**Mechanical Shock:** Per Method 213, Test Condition A. 1mS opening (10 mS allowed)

**Thermal Shock Resistance:** Per specification; no failures; passes contact resistance.

**Terminal Strength:** Per specification

**Thermal Aging:** 1,000 hours at 85°C; no failures.

### Environmental Ratings

Meets all requirements of MIL- S-83504.

**Operating Temperature Range:** -40°C to + 85°C

**Storage Temperature Range:** -40°C to + 85°C

**Moisture Resistance:** Per MIL-STD-202, Method 106.

### Soldering Information

**Solderability:** Per MIL-STD-202, Method 208

**Soldering Heat Resistance:** Per MIL-S-83504, six second test.

**Recommended Processing Temperature:** 220°C–230°C (1 pass—260°C maximum)

**Processing Position:** Switch is to be processed with all actuators in the closed (on) position as shipped.

**Fluxing:** Per EIA RS-448-2 with flux touching switch body.

**Cleaning:** Passes immersion test using water/detergent. Acceptable solutions include 1-1-1 trichlorethane, freon, (TF, TE, or TMS), isopropyl alcohol, detergent (140°F maximum). Terpene acceptable for Series 90 only. Solutions which are not recommended include acetone, methylene chloride, freon TMC. High pressure aqueous cleaning is not recommended.

### Materials and Finishes

**Shorting Member (Ball):** Brass, gold-plate over nickel barrier.

**Base Contacts:** Copper alloy, gold-plate over nickel barrier.

**Terminals:** Copper alloy, matte tin plated over nickel barrier.

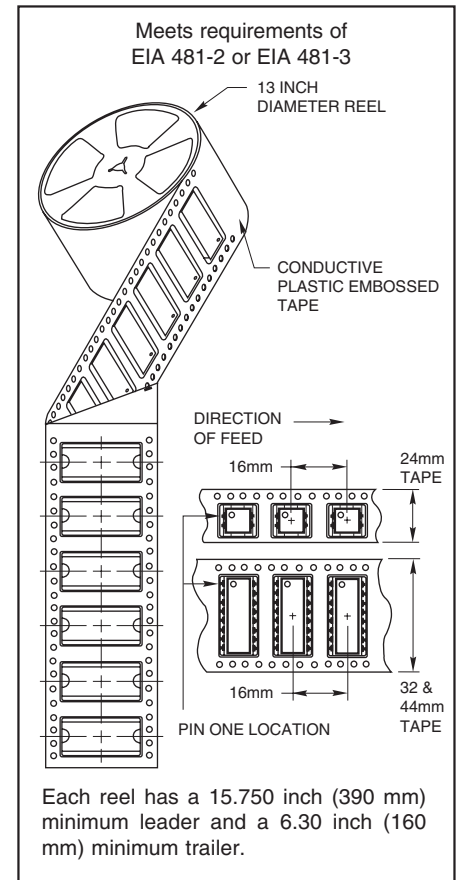
**Non-Conductive Parts:** Thermoplastic (UL94V-O)

### Tape and Reel Packaging

**Tape Seal Integrity:** Passes gross leak test using 125°C flourinert for 20 seconds minimum. Reference MIL-STD-202, Method 112

**Tape Seal:** Polyimide film

## TAPE AND REEL PACKAGING



## ORDERING INFORMATION

**Series**  
**Terminal Style:** W = Gull Wing, J = J-Bend  
**RoHS compliant**

90HBW02PRT

**Packaging:** R = Tape and reel packaging (750 switches/reel)  
 Blank = Tube packaging (each tube is 19.5" long)

**Seal:** P = Polyimide Seal  
 Blank = No Seal

**Number of Positions:** 02 through 10

No. of Positions	Length Inches	Length Metric	Number Per Tube
2	.270"	6,9 mm	60
3	.370"	9,4 mm	47
4	.470"	11,9 mm	37
5	.570"	14,5 mm	31
6	.670"	17,0 mm	26
7	.770"	19,6 mm	23
8	.870"	22,1 mm	20
9	.970"	24,6 mm	18
10	1.070"	27,2 mm	16

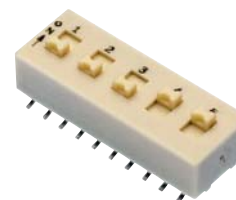
Available from your local Grayhill Distributor.

For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

**SERIES 78H**  
**SPDT and DPST**

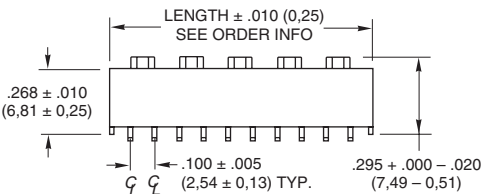
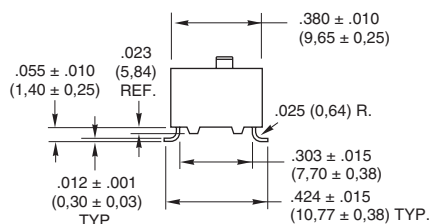
**FEATURES**

- Compatible with SMT Assembly Including Infrared Reflow and Vapor-Phase
- Reliable Spring and Ball Contact

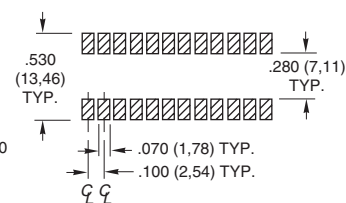


**DIMENSIONS** In inches (and millimeters)

**SPDT, DPST, Top Actuated, Slide Operated**

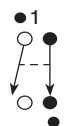
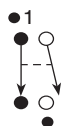


**Recommended PC Pad Dimensions**

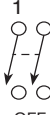


**CIRCUITRY**

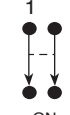
**SPDT 2 Circuits (no common)**



ON



ON



• Dot indicates active circuit.

**SPECIFICATIONS**

**Electrical Ratings**

**Make-and-break Current Rating:** 2,000 operations per switch position at 1 mA, 5 Vdc; 50 mA, 30 Vdc; or 150 mA, 30 Vdc

**Contact Resistance:** Initial: 30 mohms max. After Life: 100 mohms max. (10 mA at 50 Vdc, open circuit)

**Insulation Resistance:** Minimum, at 100 Vdc between adjacent closed contacts and also across open switch contacts. Initial: 2,000 Mohms; After Life: 1,000 Mohms

**Dielectric Strength:** Minimum voltage (AC, RMS) measured between adjacent closed contacts and also across open switch contacts. Initial: 750 volts; After Life: 500 volts

**Current Carry Rating:** 4 amps, maximum rise of 20°C

**Switch Capacitance:** 2 pF at 1megahertz

**Mechanical Ratings**

**Mechanical Life:** 2,000 operations per switch position

**Vibration Resistance:** Per method 204, Test Condition B. 1 mS opening (10 mS allowed)

**Mechanical Shock:** Per Method 213, Test Condition A. 1 mS opening (10 mS allowed)

**Terminal Strength:** Per specification

**Thermal Aging:** 1,000 hours at 85°C; no failures

**Thermal Shock:** Per specification; no failures; passes contact resistance

**Environmental Ratings**

Meets all requirements of MIL- S-83504. Where Grayhill performance is superior, the MIL spec is listed in parentheses.

**Operating Temperature Range:** -40°C to + 85°C

**Storage Temperature Range:** -55°C to + 85°C

**Moisture Resistance:** Per MIL-STD-202, Method 106

**Soldering Information**

**Solderability:** Per MIL-STD-202, Method 208

**Soldering Heat Resistance:** Per MIL-S-83504, six second test

**Recommended Processing Temperature:** 220°C–230°C (1 pass—260°C maximum)

**Processing Position:** Switch is to be processed with all actuators in the closed (on) position as shipped.

**Materials and Finishes**

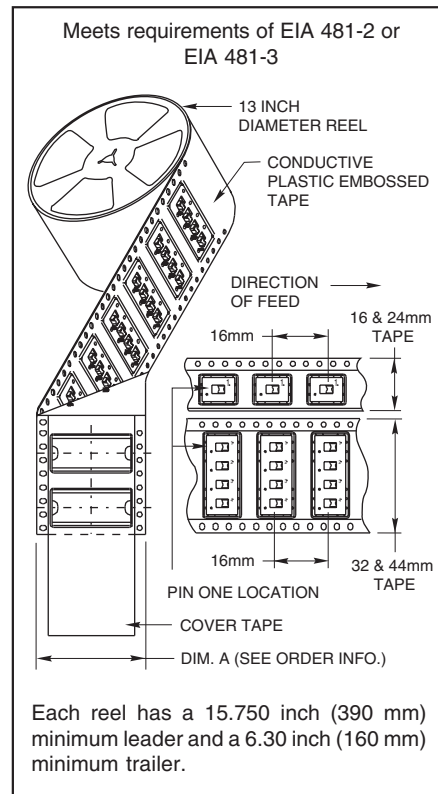
**Shorting Member:** Brass, gold-plated over nickel barrier.

**Base Contacts:** Copper alloy, gold-plated over nickel barrier.

**Terminals:** Copper alloy, matte tin-plated over nickel barrier.

**Non-Conductive Parts:** Cover is natural color thermoplastic, actuators are white thermoplastic (UL94V-0)

**TAPE AND REEL PACKAGING**



**ORDERING INFORMATION: Tube Packaging**

No. of Positions	Length (inches)	Length (metric)	Carrier Width Dim. A	Part Number*	
				SPDT	DPST
1	0.280"	7,1 mm	24 mm	78HJ01GWT	78HF01GWT
2	0.480"	12,2 mm	24 mm	78HJ02GWT	78HF02GWT
3	0.680"	17,3 mm	32 mm	78HJ03GWT	78HF03GWT
4	0.880"	22,4 mm	44 mm	78HJ04GWT	78HF04GWT
5	1.080"	27,4 mm	44 mm	78HJ05GWT	78HF05GWT

\* Insert "R" before the "T" in the Grayhill part number for tape and reel packaging (500 switches/reel).

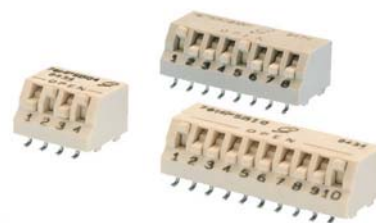
**Available from your local Grayhill Distributor.** For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.



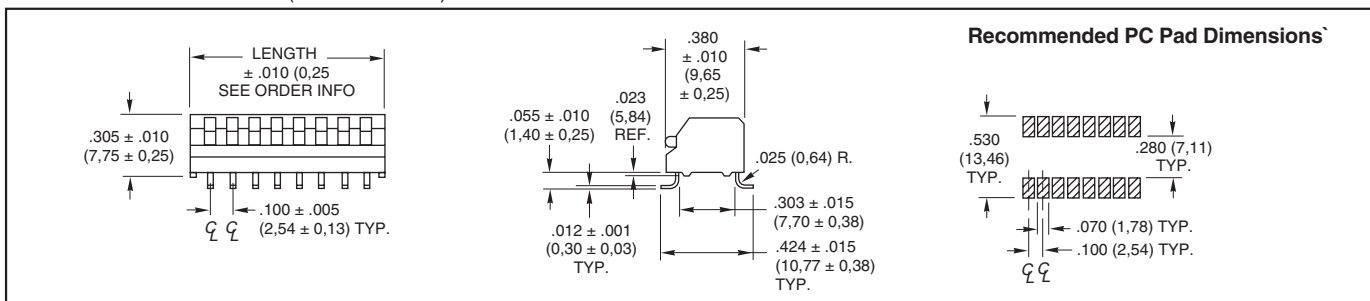
**SERIES 76HP**  
Side Actuated PIANO-DIP®

**FEATURES**

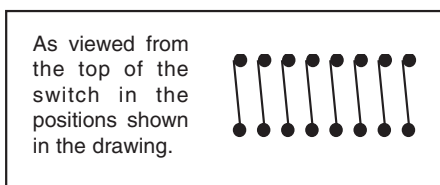
- Compatible with SMT Assembly Including Infrared Reflow and Vapor-Phase
- Easily Accessed when PC Boards are Racked
- Reliable Spring and Ball Contact



**DIMENSIONS** In inches (and millimeters)



**CIRCUITRY**



Condition B. 1 mS opening (10 mS allowed)  
**Mechanical Shock:** Per Method 213, Test Condition A. 1 mS opening (10 mS allowed)  
**Thermal Shock Resistance:** Per specification; no failures; passes contact resistance  
**Terminal Strength:** Per specification  
**Thermal Aging:** 1,000 hours at 85°C; no failures

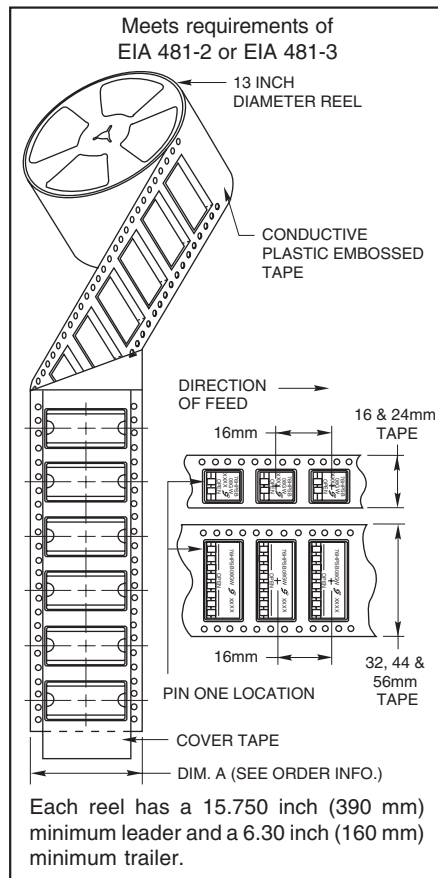
over nickel barrier.  
**Base Contacts:** Copper alloy, gold-plated, over nickel barrier.  
**Terminals:** Copper alloy, matte tin plated over nickel barrier.  
**Non-Conductive Parts:** Cover is natural color thermoplastic, actuators are white thermoplastic (UL94V-O)  
**Tape Seal:** Not available with Tape Seal.

**SPECIFICATIONS**

**Electrical Ratings**  
**Make-and-break Current Rating:** 2,000 operations per switch position at 1 mA, 5 Vdc; 50 mA, 30 Vdc; or 150 mA, 30 Vdc  
**Contact Resistance:** Initial: 30 mohms maximum; After Life: 100 mohms maximum (10 mA at 50 Vdc, open circuit)  
**Insulation Resistance:** Minimum, at 100 Vdc between adjacent closed contacts and also across open switch contacts. Initial: 2,000 Mohms  
**Dielectric Strength:** Minimum voltage (AC RMS) measured between adjacent closed contacts and also across open switch contacts. Initial: 750 volts; After Life: 500 volts  
**Carry Rating:** 5 amps, maximum rise of 20°C  
**Switch Capacitance:** 2 pF at 1 megahertz

**Environmental Ratings**  
 Meets all requirements of MIL- S-83504. Where Grayhill performance is superior, the MIL spec is listed in parentheses.  
**Operating Temperature Range:** -40°C to +85°C  
**Storage Temperature Range:** -55°C to +85°C  
**Moisture Resistance:** Per MIL-STD-202, Method 106

**TAPE AND REEL PACKAGING**



**Mechanical Ratings**

**Mechanical Life:** 2,000 operations per switch position  
**Vibration Resistance:** Per Method 204, Test

**Soldering Information**  
**Solderability:** Per MIL-STD-202, Method 208 Tested to EIA Standard RS-448-2.  
**Resistance to Soldering Heat:** Per MIL-S-83504, six second test  
**Recommended Processing Temperature:** 220°C–230°C (1 pass—260°C maximum)  
**Processing Position:** Switch is to be processed with all actuators in the closed (on) position as shipped.

**Materials and Finishes**  
**Shorting Member:** Brass, gold-plated

**ORDERING INFORMATION: Tape and Reel Packaging** (500 switches per reel)

No. of Positions*	Length (inches)	Length (metric)	Carrier Width Dim. A	Part Number
2	0.280"	7,1 mm	24 mm	76HPSB02GWRT
4	0.480"	12,2 mm	24 mm	76HPSB04GWRT
6	0.680"	17,3 mm	32 mm	76HPSB06GWRT
8	0.880"	22,4 mm	44 mm	76HPSB08GWRT
10	1.080"	27,4 mm	44 mm	76HPSB10GWRT

\* For other lengths, contact Grayhill, Inc.

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