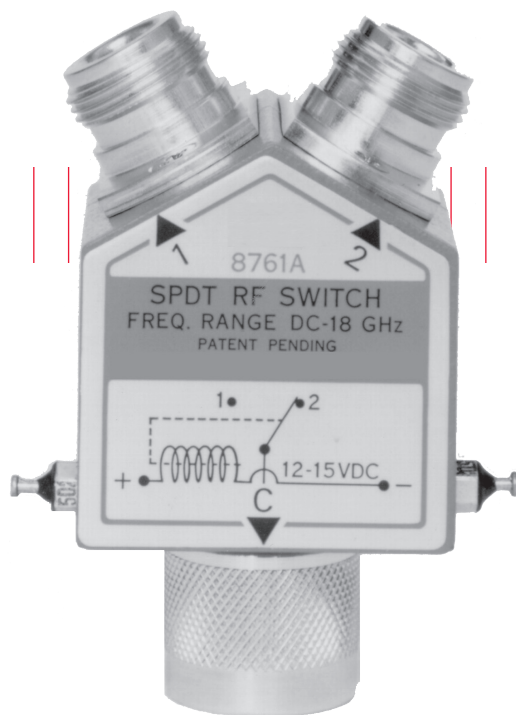


# Keysight Technologies

## 8761A/B Microwave Switches

### Technical Overview



- Broadband (dc to 18 GHz)
- User specified connectors (over 250 possible combinations)
- Excellent repeatability (typically 0.03 dB for 1,000,000 cycles)
- Environmentally rugged

## Product Description

The Keysight Technologies, Inc. 8761A and 8761B are single-pole, double-throw coaxial switches with excellent electrical and mechanical characteristics for 50-ohm transmission systems operating from dc to 18 GHz. Both switches feature broadband operation, long life, low SWR, excellent repeatability, and magnetic latching solenoids. The 8761A and 8761B switches are small and lightweight, making them ideal for applications where space is limited. Because of their versatility and excellent electrical performance, they are well suited for automated testing and systems applications. The A version is for 12 to 15 VDC operation, and the B version uses 24 to 30 VDC solenoid drive voltage.

The Keysight 8761A/B Series can be custom configured with any combination of Type-N, SMA, and precision 7-mm connectors, thus enabling the user to “custom design” a connector arrangement and eliminate the need for connector adapters.

## Electrical Performance

These switches have proven reliable in Keysight microwave instrumentation, special purpose test equipment, and many other applications. They have been optimized for broadband operation, high isolation, minimal insertion loss, low SWR, and high repeatability.

### High Isolation

High port-to-port isolation is important in applications requiring wide dynamic range such as receiver sensitivity testing. The RF structure designs used for these switches yield the high isolation shown in Figure 1.

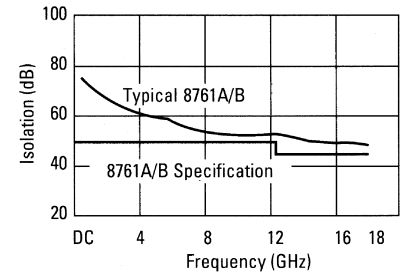


Figure 1. Typical port-to-port isolation

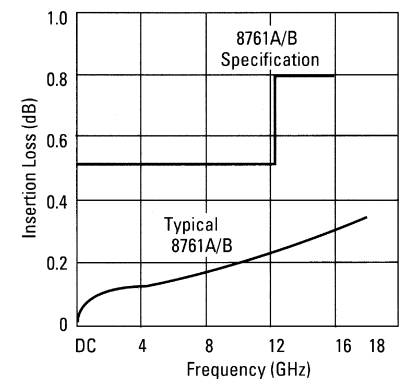


Figure 2. Typical insertion loss

### Low Insertion Loss

Low insertion loss is very desirable in many applications where the user needs to minimize the loss of signal power. Using miniature gold-plated contacts, these switches offer the low insertion loss shown in Figure 2.

### Low SWR

Low SWR is an important characteristic for switches because transmission line mismatches degrade the measurement system accuracy. Through the use of “edge line” design and precision machining, these switches offer the excellent SWR shown in Figure 3.

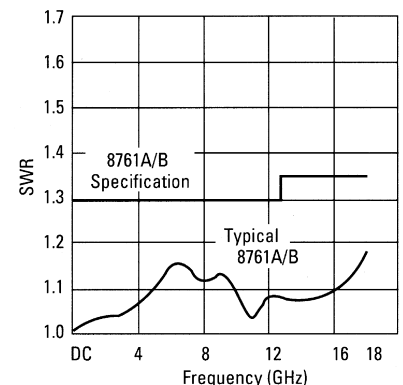


Figure 3. Typical SWR for SMA connection

### High Repeatability

For measurement system applications, repeatability of the switched connection is a key factor in minimizing measurement error. The excellent repeatability of these switches (typically 0.03 dB for one million switching operations) has been achieved by employing gold-plated contacts and edge line design for the transmission line. This unique design feature of switching only the center conductor eliminates high friction sliding contacts, and results in long life and highly repeatable measurements.

The 8761 is a “break before make” switch controlled by a magnetic latching solenoid. Solenoid voltages of 12 and 24 volts are available. To change the state of the switch requires a reversal of the voltage polarity for at least 20 milliseconds (see Figure 4). Once switched, the solenoid is latched by strong permanent magnets.

## Typical Keysight 8761A Driver Circuit<sup>1</sup>

Figure 5 shows a typical driver circuit which uses a clock driver to control the 8761A switch. A TTL “HI” input to the circuit results in +V at point Q and –V (ground) at point R. Conversely, a TTL “LO” input results in –V (ground) at point Q and +V at point R. Internal diodes in the DS0026 suppress inductive voltage spikes.

## Connector Information

The Keysight 8761A/B switches are available with any combination of SMA, Type-N, precision 7-mm (mates with APC-7), and 50-ohm termination. This feature enables the user to custom design a single switch or multiple switch configuration for a specific application. By properly specifying connector options, switch trees can be configured to provide single-pole multi-throw as well as multi-pole multi-throw functions, all without the need for interconnecting cables. To specify connector options, refer to the ordering example.

## Mechanical Information

Three versions of the precision 7-mm connector are available on the 8761A/B which mate with the APC-7 connector, but differ slightly from the standard APC-7 to conserve space. One of these versions (option 102, 202, or 302) has a fixed threaded sleeve and the other (option 103, 203, or 303) has a coupling nut. The third precision 7-mm connector (option 104, 204, or 304) is designed to be used with a 0.250-in. outer diameter, semirigid coaxial cable. This connector is the same as the 7-mm option 102, 202, or 302 connector described above, with the exception of the center conductor which is female and accepts the center conductor of the semi-rigid coax. The fittings for a compatible connector on the semi-rigid coax are shown in Figure 6.

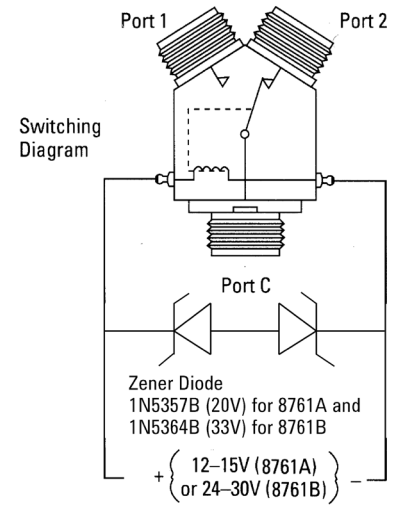
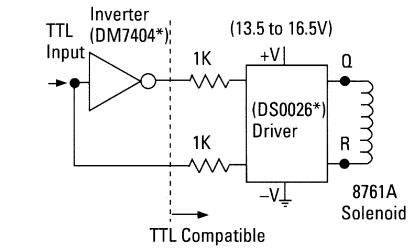
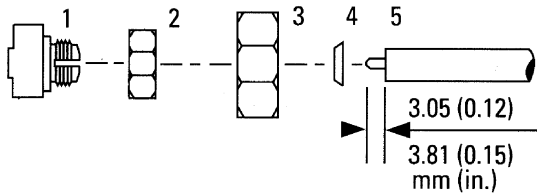


Figure 4. To connect ports 2 and C (as shown) requires the indicated solenoid voltage for at least 20 milliseconds. Reversing the polarity of the solenoid voltage connects ports 1 and C.



\*National Semiconductor part numbers, also supplied by other vendors.

Figure 5. Typical 8761A driver circuit

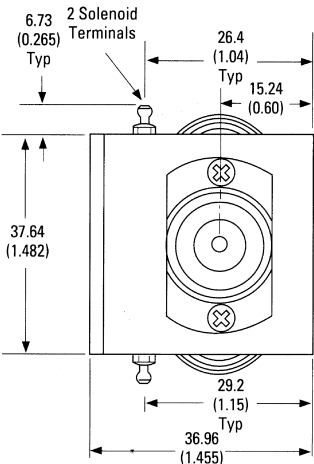
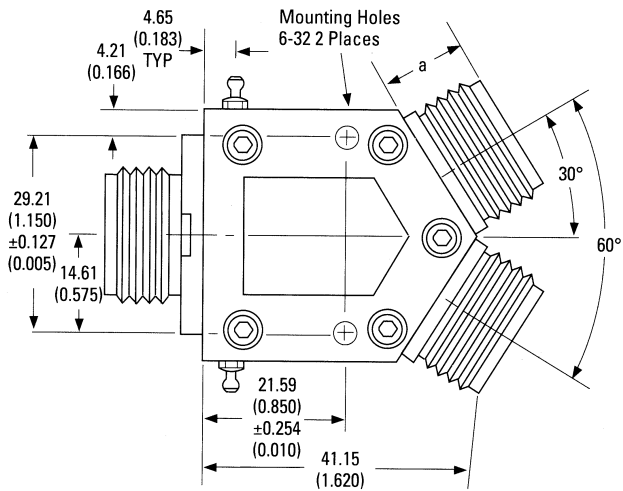


|                                      | Part Number |
|--------------------------------------|-------------|
| 1. Cable Terminator                  | 08742-2028  |
| 2. .375-32 Clamp Nut                 | 0590-0035   |
| 3. Cable Coupling Nut                | 08740-2081  |
| 4. Cable Washer                      | 5000-8676   |
| 5. Semi-rigid Coax Cable,<br>UT-250* |             |

\* Uniform Tubes Inc., Collegeville, PA. Dimensional drawings for items 1 through 4 above are available upon request.

Figure 6. Cable assembly to mate with the 7-mm connector for UT-250 cable (option code 4)

1. The switch solenoids are not designed to withstand continuous drive current due to excessive coil heating. To maximize switch life, Keysight recommends actuation using only pulsed drive. In this case, the pulse duration must be at least 20 milliseconds long, in order to ensure that the switch will fully latch. Also, Keysight recommends using back-to-back zener diodes connected in parallel with the switch solenoid, in order to minimize excessive fly-back currents through the solenoid. Refer to Figures 4 and 5 to see recommended connection configurations.



Connector Options

| Keysight 8761A/B  |                                 |                        |
|-------------------|---------------------------------|------------------------|
| Connector Options | Connector Type                  | Dimension “a” mm (in.) |
| 100, 200, 300     | Type-N Female                   | 13.72 (0.540)          |
| 101, 201, 301     | Type-N Male                     | 19.79 (0.775)          |
| 102, 202, 302     | 7-mm Threaded Sleeve (APC-7)    | 9.27 (0.365)           |
| 103, 203, 303     | 7-mm Coupling Nut (APC-7)       | 11.94 (0.470)          |
| 104, 204, 304     | 7-mm for UT-250 Coax            | 9.27 (0.365)           |
| 105, 205, 305     | SMA Female                      | 16.13 (0 @ 635)        |
| 106, 206, 306     | SMA Male                        | 17.15 (0.675)          |
| 107, 207          | 50-ohm Termination <sup>1</sup> | 30.5 (1.20)            |

Replaceable Parts: Refer to the Keysight 8761A/B Operating Note.

1. Option 107, 207 available on port 1 or port 2 only.

Specifications

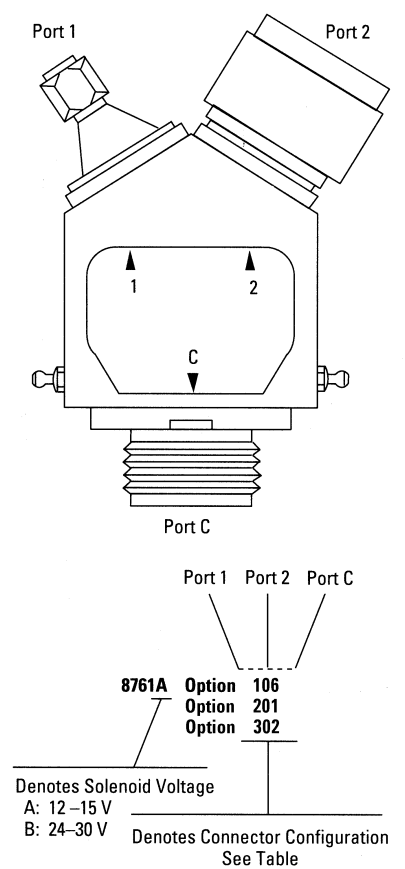
| Keysight 8761A/B             |                                                                                                      |
|------------------------------|------------------------------------------------------------------------------------------------------|
| Switch Type                  | Single-pole double-throw, break before make, latching solenoid                                       |
| Frequency Range              | DC to 18 GHz                                                                                         |
| Insertion Loss               | DC to 12.4 GHz: <0.5 dB<br>DC to 18.0 GHz: <0.8 dB                                                   |
| Isolation                    | DC to 12.4 GHz: >50 dB<br>DC to 18.0 GHz: >45 dB                                                     |
| Characteristic Impedance     | 50 Ω                                                                                                 |
| SWR <sup>1</sup>             |                                                                                                      |
| Connector Type               |                                                                                                      |
| Type N                       | DC to 12.4 GHz: 1.20<br>DC to 18.0 GHz: 1.25                                                         |
| 7-mm (APC-7) <sup>1</sup>    | DC to 12.4 GHz: 1.15<br>DC to 18.0 GHz: 1.20                                                         |
| 3-mm (SMA)                   | DC to 12.4 GHz: 1.30<br>DC to 18.0 GHz: 1.35                                                         |
| 50 ½ Load                    | SWR degraded by 0.05 when used with above connector types.                                           |
| Input Power Rating           | 10 watts average, 5 k watts peak (2 watts average, 100 watts peak with option 7, 50-ohm termination) |
| Life                         | 1,000,000 switchings                                                                                 |
| Repeatability                | 0.03 dB for 1,000,000 switchings                                                                     |
| Switching Speed              | Maximum: 50 milliseconds                                                                             |
| Coil Voltage                 | 8761A: 12 V (12 to 15 V)<br>8761B: 26 V (24 to 30 V)                                                 |
| Switching Current            | 8761A: 80 mA @ 12 V<br>8761B: 65 mA @ 26 V                                                           |
| Coil Impedance               | 8761A: 150 Ω, 90 mH<br>8761B: 400 Ω, 300 mH                                                          |
| Environmental Qualifications |                                                                                                      |
| Operating Temp.              | -25°C to +70°C                                                                                       |
| Humidity                     | 95% RH, +40°C, 5 days                                                                                |
| Vibration                    | 0.03", 10 to 55 Hz                                                                                   |
| Shock                        | 30 G's, 11 ms                                                                                        |
| Weight                       | Net: 140 to 220 gm (5 to 8 oz)<br>Shipping: 220 to 300 gm (8 to 11 oz)                               |

1. 8761A/B SWR specifications apply when all ports are of the same connector type. For mixed connector types, the larger of the two SWR's applies. Type-N connector SWR specifications apply to 7-mm for UT-250 Coax connectors (option 104, 204, or 304).
2. Either option will connect to a standard, sexless, 7-mm connector. To daisy-chain two 8761A's you must use one option 102, 202, or 302 and one option 103, 203, or 303 on the two mating connectors. If you have two of the same options, you will need to use a cable with two standard 7-mm connectors.

Ordering Information

To order the Keysight 8761A/B switch, connector configuration and solenoid voltage must be specified as shown in the ordering example below.

| Connector Options | Connector Type                            |
|-------------------|-------------------------------------------|
| 100, 200, 300     | Type-N Female                             |
| 101, 201, 301     | Type-N Male                               |
| 102, 202, 302     | 7-mm Threaded Sleeve (APC-7) <sup>2</sup> |
| 103, 203, 303     | 7-mm Coupling Nut (APC-7) <sup>2</sup>    |
| 104, 204, 304     | 7-mm for UT-250 Coax                      |
| 105, 205, 305     | SMA Female                                |
| 106, 206, 306     | SMA Male                                  |
| 107, 207          | 50-ohm Termination                        |



## Evolving

Our unique combination of hardware, software, support, and people can help you reach your next breakthrough. **We are unlocking the future of technology.**



From Hewlett-Packard to Agilent to Keysight

### myKeysight

#### myKeysight

[www.keysight.com/find/mykeysight](http://www.keysight.com/find/mykeysight)

A personalized view into the information most relevant to you.

### KEYSIGHT SERVICES

Accelerate Technology Adoption.  
Lower costs.

#### Keysight Services

[www.keysight.com/find/service](http://www.keysight.com/find/service)

Our deep offering in design, test, and measurement services deploys an industry-leading array of people, processes, and tools. The result? We help you implement new technologies and engineer improved processes that lower costs.



#### Keysight Assurance Plans

[www.keysight.com/find/AssurancePlans](http://www.keysight.com/find/AssurancePlans)

Up to ten years of protection and no budgetary surprises to ensure your instruments are operating to specification, so you can rely on accurate measurements.

#### Keysight Channel Partners

[www.keysight.com/find/channelpartners](http://www.keysight.com/find/channelpartners)

Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

[www.keysight.com/find/mta](http://www.keysight.com/find/mta)

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at:  
[www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

### Americas

|               |                  |
|---------------|------------------|
| Canada        | (877) 894 4414   |
| Brazil        | 55 11 3351 7010  |
| Mexico        | 001 800 254 2440 |
| United States | (800) 829 4444   |

### Asia Pacific

|                    |                |
|--------------------|----------------|
| Australia          | 1 800 629 485  |
| China              | 800 810 0189   |
| Hong Kong          | 800 938 693    |
| India              | 1 800 11 2626  |
| Japan              | 0120 (421) 345 |
| Korea              | 080 769 0800   |
| Malaysia           | 1 800 888 848  |
| Singapore          | 1 800 375 8100 |
| Taiwan             | 0800 047 866   |
| Other AP Countries | (65) 6375 8100 |

### Europe & Middle East

|                |               |
|----------------|---------------|
| Austria        | 0800 001122   |
| Belgium        | 0800 58580    |
| Finland        | 0800 523252   |
| France         | 0805 980333   |
| Germany        | 0800 6270999  |
| Ireland        | 1800 832700   |
| Israel         | 1 809 343051  |
| Italy          | 800 599100    |
| Luxembourg     | +32 800 58580 |
| Netherlands    | 0800 0233200  |
| Russia         | 8800 5009286  |
| Spain          | 800 000154    |
| Sweden         | 0200 882255   |
| Switzerland    | 0800 805353   |
|                | Opt. 1 (DE)   |
|                | Opt. 2 (FR)   |
|                | Opt. 3 (IT)   |
| United Kingdom | 0800 0260637  |

For other unlisted countries:  
[www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)  
(BP-2-23-17)

DEKRA Certified  
ISO 9001 Quality Management System

[www.keysight.com/go/quality](http://www.keysight.com/go/quality)  
Keysight Technologies, Inc.  
DEKRA Certified ISO 9001:2015  
Quality Management System