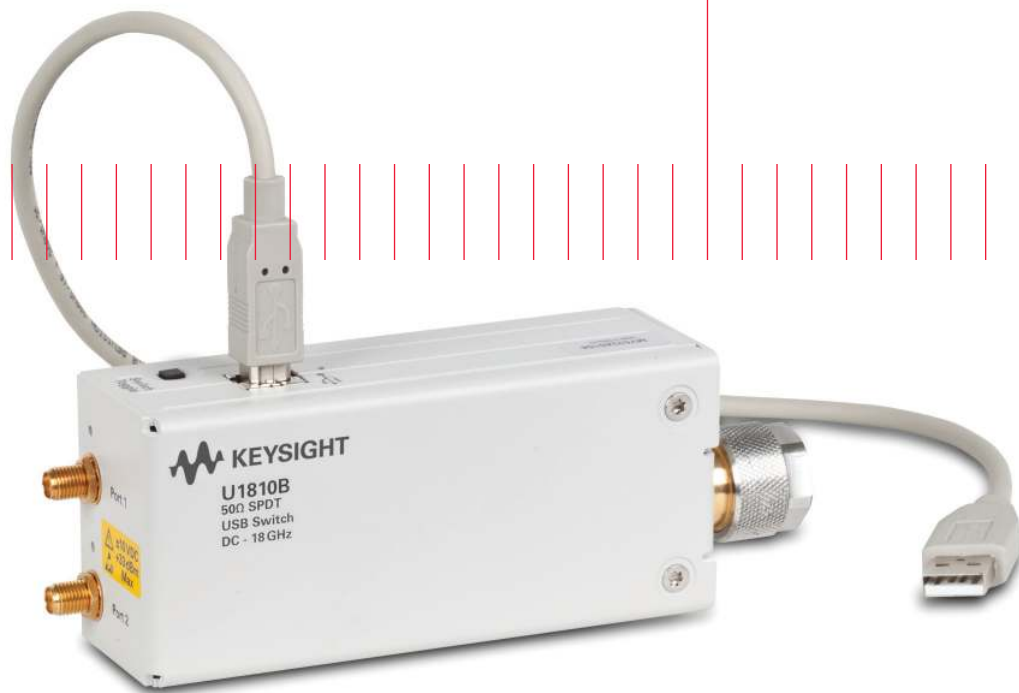


Keysight Technologies

U1810B USB Coaxial Switch SPDT

DC to 18 GHz

Technical Overview



# Introduction

## Description

The Keysight Technologies, Inc. U1810B is a USB-powered SPDT coaxial switch, operating from DC to 18 GHz, and supports the standard plug-and-play functionality of typical USB devices. The unique combination of excellent RF performance with the convenience of USB connectivity presents an invaluable alternative for users to increase the efficiency of their test systems. No additional power supply is required and the Type-N common input connector provides a rugged and robust connection with the instrument ports. A push-button on the switch casing allows for direct toggling of the two output ports without the need for any software interface. In addition, the bundled soft front panel provides an alternative virtual interface to control the U1810B. Users also have the option to control the switch through commonly used software programming platforms such as C#, C++, LabVIEW, VEE, etc.

Inheriting Keysight's unique switch technology, the U1810B is designed to operate for more than 10 million cycles. The exceptional 0.03 dB insertion loss repeatability is warranted for 5 million cycles. This excellent RF characteristic significantly reduces downtime for recalibration, improves testing efficiency and ultimately maximizes test throughput.

## Key features and benefits

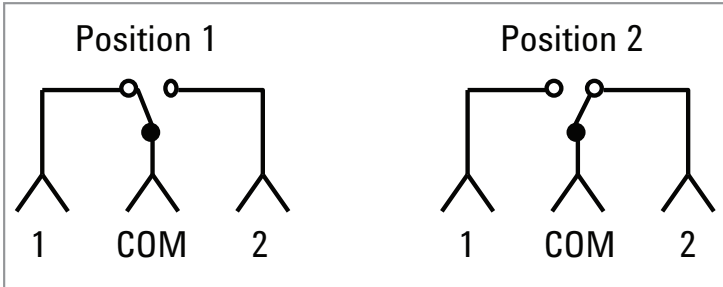
- USB plug-and-play eliminates the need for additional power adapters or drivers, simplifies complex test setup
- Guaranteed 0.03 dB insertion loss repeatability, ensures measurement accuracy
- Guaranteed 5 million cycles operating life (typical 10 million cycles), reduces cost-of-test and ensures reliability of the test system
- Excellent isolation (> 70 dB at 18 GHz), minimizes cross-talk between channels to ensure signal integrity
- Instant switch toggling via the push-button on the casing facilitates quick test setup validation



*Using four U1810B's to extend a 4-port ENA to 8 ports to increase throughput*

## Applications

The U1810B USB switch is a single-pole double-throw (SPDT) relay which consists of one common port and two output ports. It routes signals from one input to two output paths. The following figure shows the SPDT relay schematics of an RF circuit state.



Compared to conventional switch designs where all the connector ports are on the same plane, Keysight's U1810B USB switch design helps users to simplify test setup without using additional RF cables. Figure 1 below shows a conventional switch connected to a measuring instrument. Both methods require extra RF cable(s) to be connected between the switch and the instrument. If a rigid cable is used, the length and bend angle of the cable has to be taken into consideration during the cable design. If a semi-rigid or flexible cable is used, the cable has to be fixed during measurement, any slight movement of the cable will change the mismatch and affect the measurement accuracy.

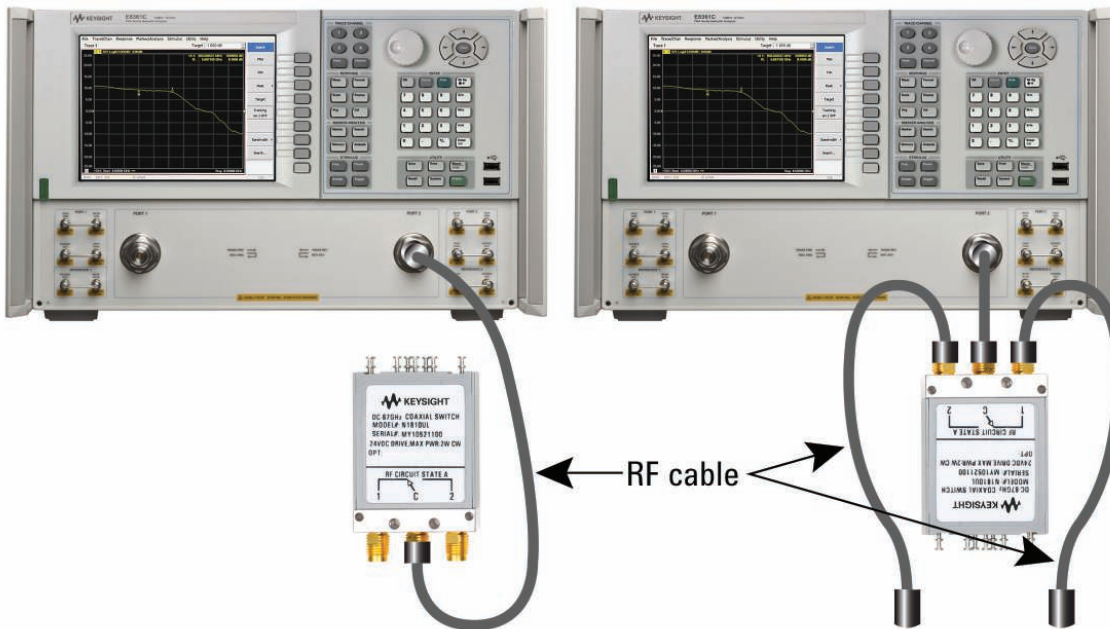


Figure 1. How a conventional switch is connected to a measuring instrument

With Keysight's U1810B switch design, the user can perform the same measurement without any additional RF cable (Figure 2). Hence, the user can avoid all the test setup issues caused by the additional RF cable.

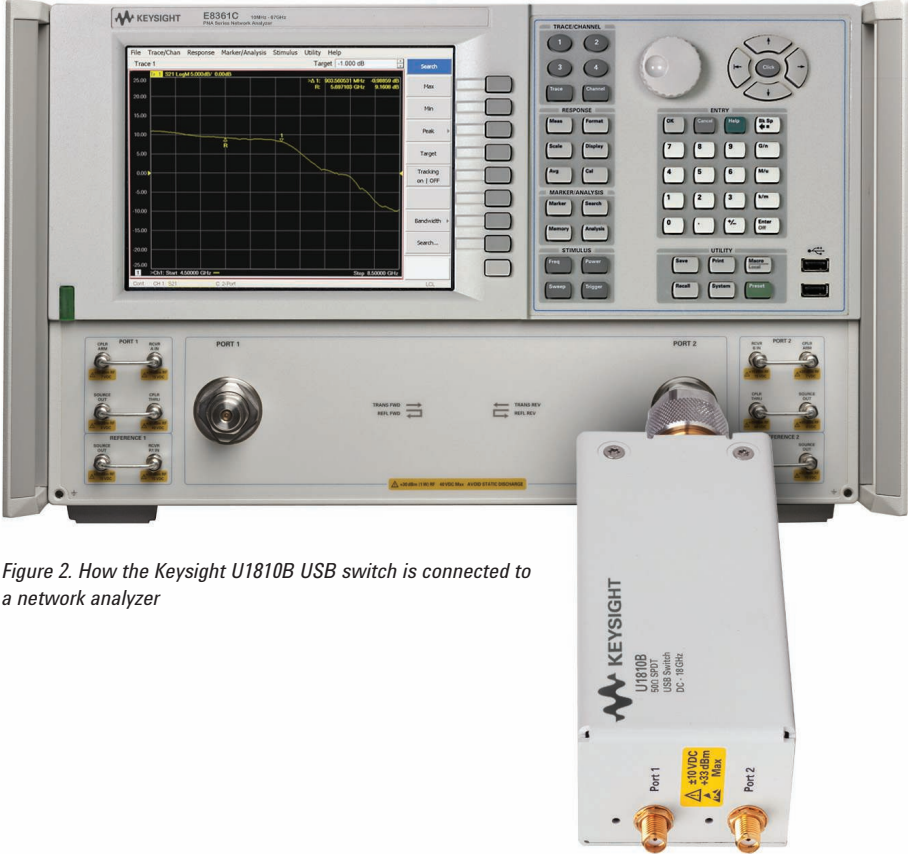
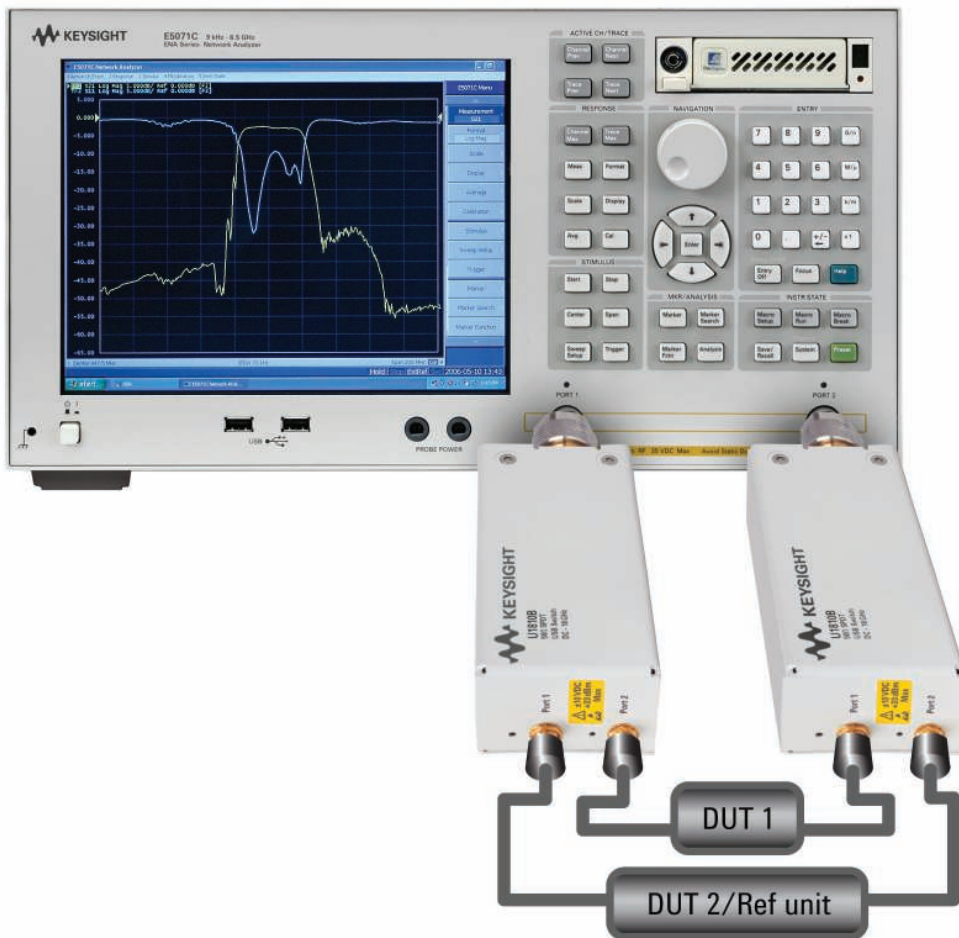


Figure 2. How the Keysight U1810B USB switch is connected to a network analyzer

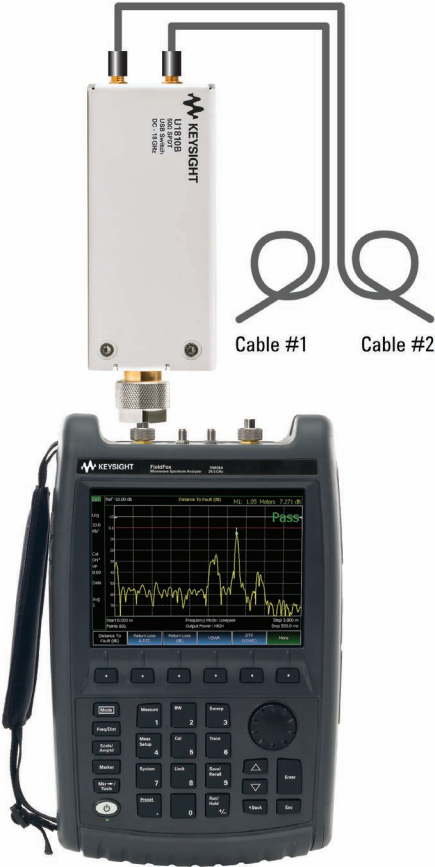
## Using U1810B with a network analyzer

Below is an application example where the U1810B is used with a network analyzer to measure two devices under test (DUT) with 1 connection, either in frequency or time domain. Similarly, the U1810B can be used to switch between the DUT and the reference unit for calibration or compensation. In a traditional test calibration process, the user needs to remove the reference unit from the network analyzer after the calibration and connect the DUT to the network analyzer to complete a measurement. The U1810B helps to eliminate the time and resource to change the connection between the DUT and reference unit.



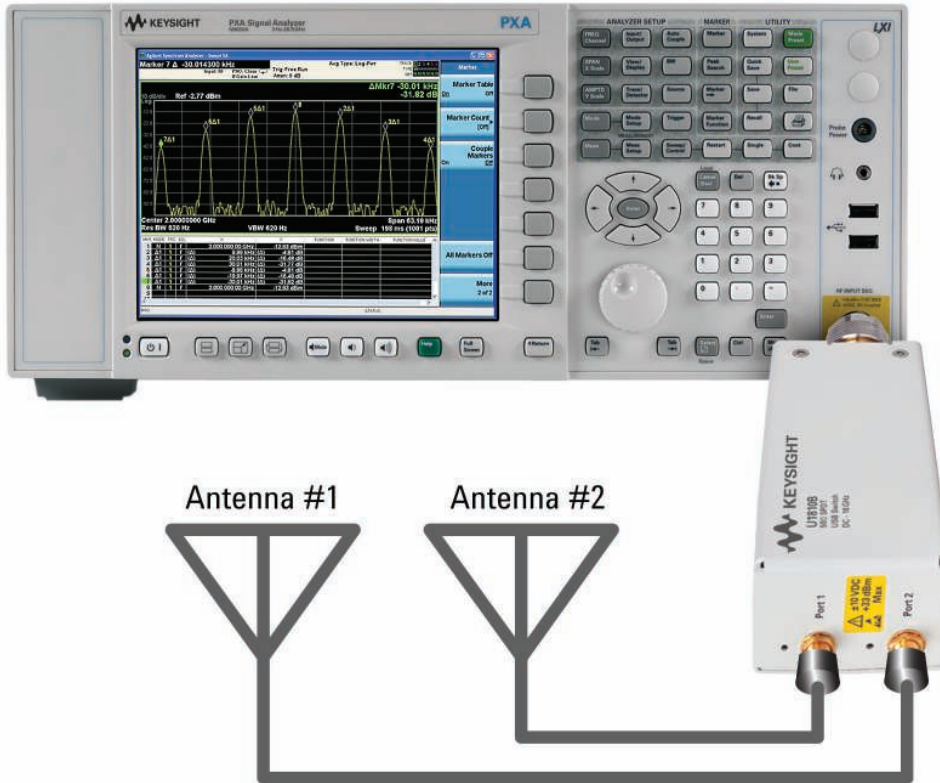
# Using U1810B with Keysight's FieldFox Handheld RF Analyzer

At a cell site, the USB switch can be used to perform return loss, cable loss, and DFT (distance-to-fault) measurements on two cables.



## Using U1810B with a spectrum analyzer

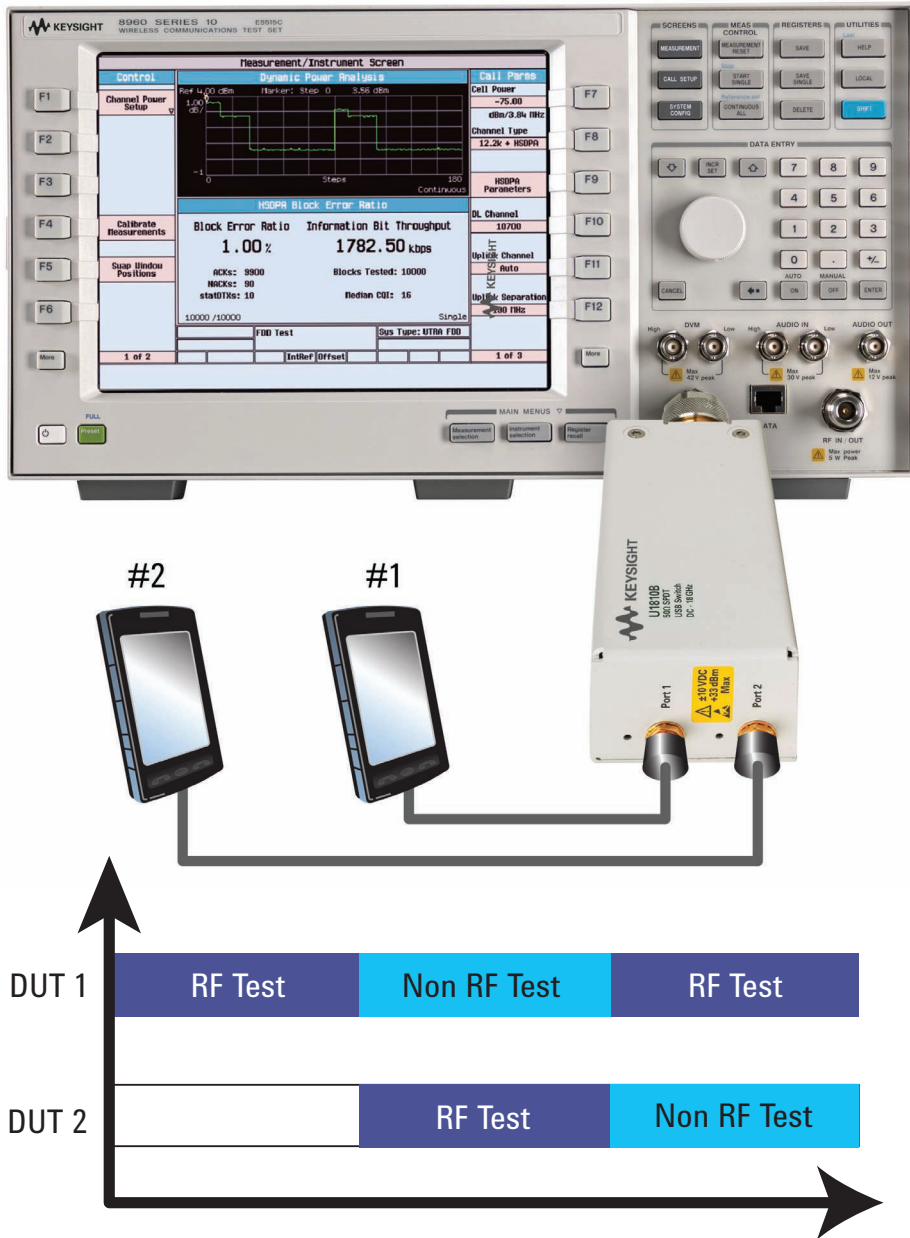
The USB switch can also direct connect to a spectrum analyzer to measure two DUT's concurrently, such as switching between two antennas for spectrum measurements.





## Using U1810B with a Keysight's wireless communications test set

Mobile phone manufacturing test typically requires RF and non-RF testing. During non-RF testing, the wireless test set is idle. With the U1810B USB switch, it helps to reduce the idle time of the wireless test set by switching to DUT 2 for testing, before it switches back to DUT 1 to continue the RF test.





## Specifications

Specifications refer to the performance standards or limits against which the U1810B is tested. Typical characteristics are included for additional information only and they are not specifications. These are denoted as “typical”, “nominal” or “approximate” and are printed in *italic*.

Frequency range	DC to 18 GHz
SWR	DC to 4 GHz: < 1.15 4 to 12.4 GHz: < 1.25 12.4 to 18 GHz: < 1.40
Insertion loss (dB, max)	$0.3 + (0.6/18)f$ , where <i>f</i> is specified in GHz
Isolation (dB, min)	$90 - (30/26.5)f$ , where <i>f</i> is specified in GHz
Life	5 million cycles (typical 10 million cycles)
Common connector	Type N (male)
Port 1 / port 2 connector	SMA (female)
Maximum input RF power	
Hot switching	2 W CW, 100 W peak, 10 $\mu$ s max pulse width, not to exceed 2 W average
Cold switching	See “Supplement Specifications (Cold Switching)”

## Absolute maximum rating

Parameter	Condition	Typical	Units
Rated voltage	—	5	V
Rated current	Switching	420	mA
	Non switching (Quiescent)	60	mA
Switching time	—	25	ms

## Minimum system requirements

Parameter	Requirements
Interface	USB HID
Host operating system	32-bit operating system: Windows XP, Windows Vista, Windows 7 64-bit operating system: Windows Vista, Windows 7

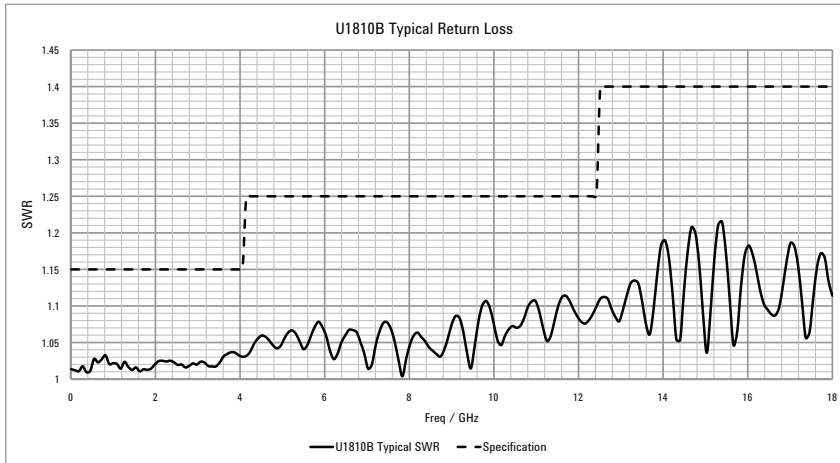


Figure 3. Keysight U1810B typical return loss performance

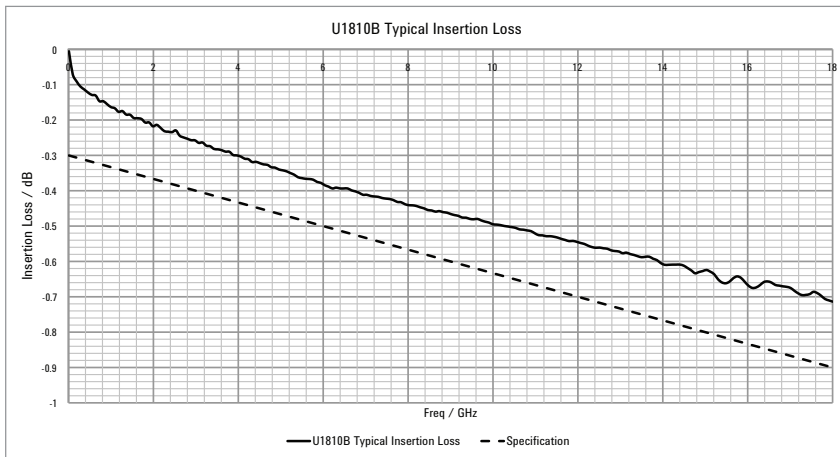


Figure 4. Keysight U1810B typical insertion loss performance

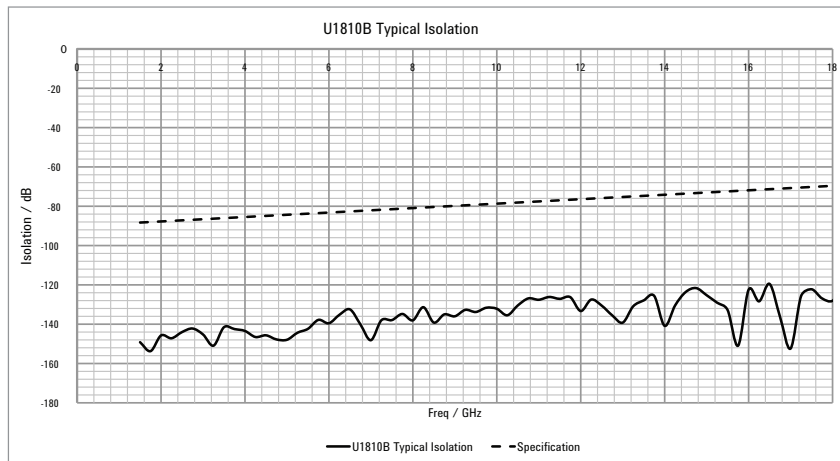


Figure 5. Keysight U1810B typical isolation performance

## Supplement specifications (cold switching)

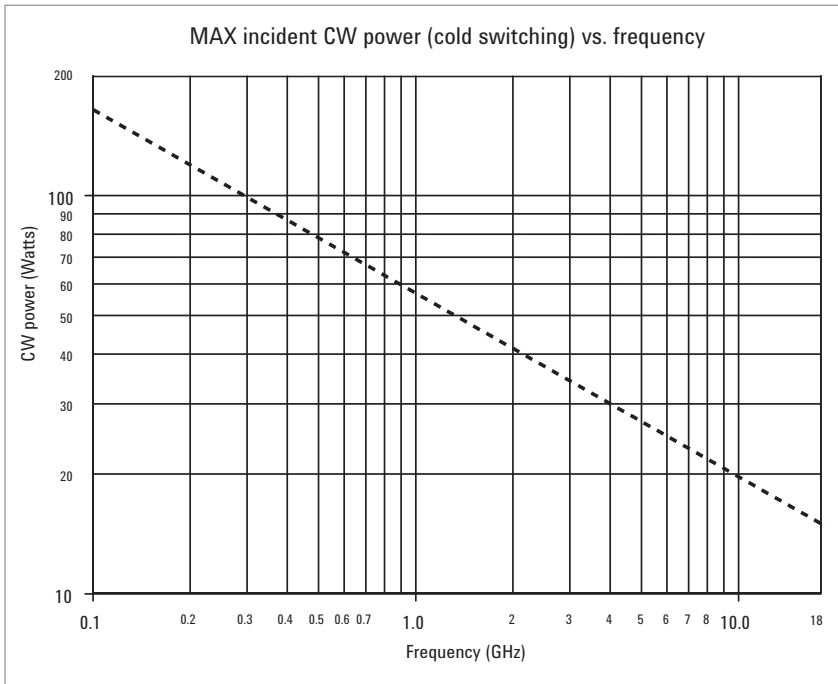


Figure 6. Maximum incident CW power across frequency

### Note:

- Cold switching only (NO hot switching)
- Ambient temperature of 75 °C or less
- Sea level (0.88 derating at 15,000 ft.)
- Load VSWR < 1.2 (see graph for derating above 1.2 VSWR)
- Power handling at 25 °C is 100 W at 4 GHz

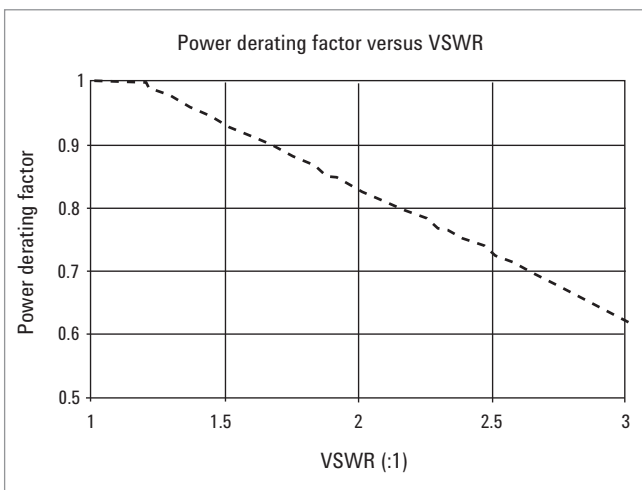


Figure 7. Power derating factor versus VSWR

## Environmental specification

The U1810B USB coaxial switch is designed to fully comply with Keysight's product operating environment specifications. The following are the summarized environmental specifications for this product.

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<b>Temperature</b>	
Operating:	-25 to +75 °C
Storage:	-55 to +85 °C

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<b>Vibration</b>	
Operating:	0.21 grms, 5 to 500 Hz, 10 min/axis
Survival random:	2.09 grms, 5 to 500 Hz, 10 min/axis
Swept Sine:	0.5 g, 5 to 500 Hz, 10 min/axis
Operating Shock:	Pulse duration < 3 ms, velocity 60 in/s
Transportation Shock:	Minimum 50 g

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<b>Humidity</b>	
Operating/Storage:	15 to 95 % Relative humidity

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<b>Altitude</b>	
Operating/Storage:	15,000 feet / 4.6 km

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<b>ESD immunity</b>	
Direct discharge:	8 kV
Air discharge:	15 kV

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## Mechanical dimension

Mechanical dimension	Figure 8 (below)
Weight	250 g
Shipping weight	0.88 kg

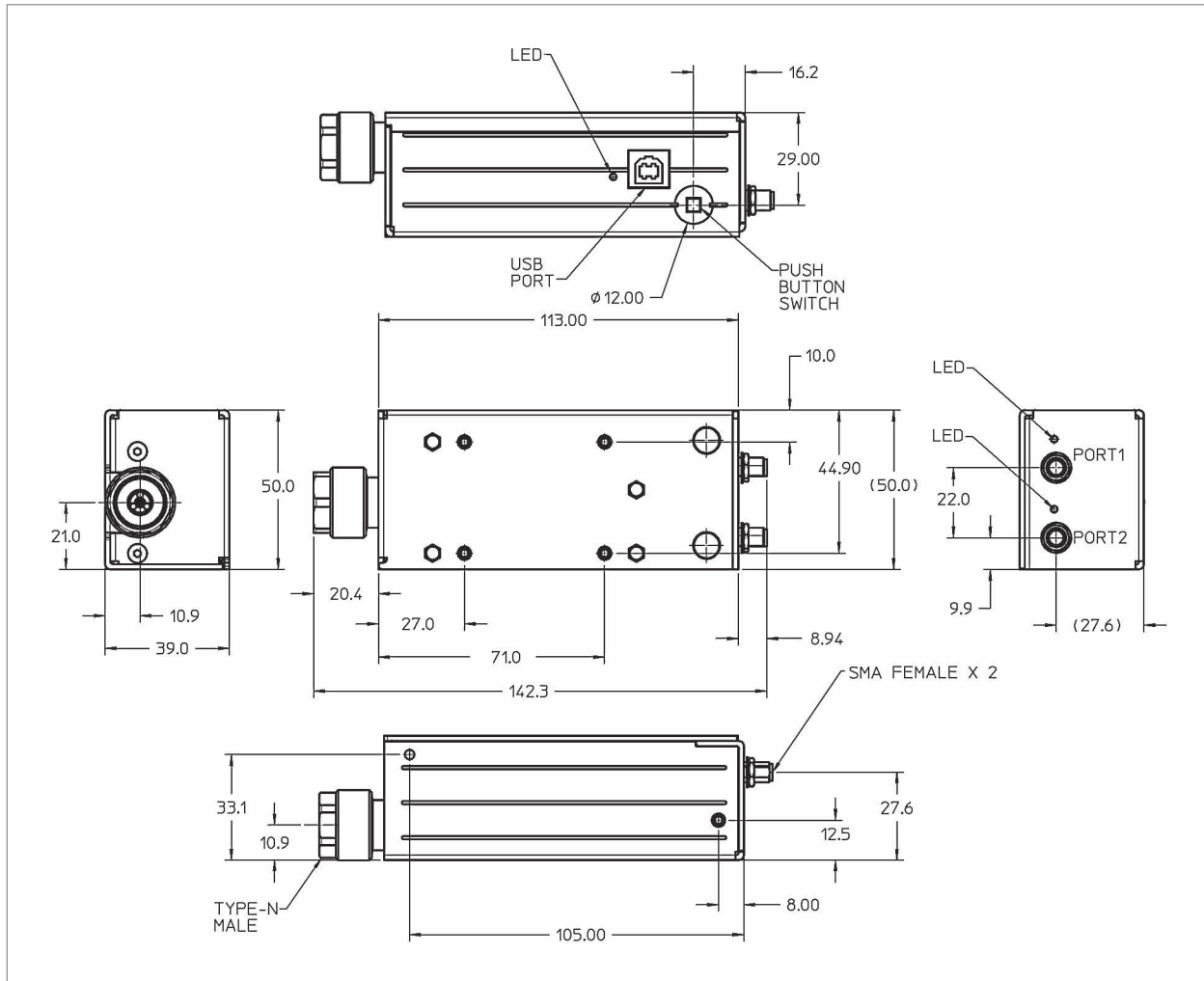


Figure 8. U1810B mechanical dimensions (dimensions are in millimeters, unless otherwise specified)

## Ordering information

U1810B USB Coaxial Switch, SPDT DC to 18 GHz

## Related literature

Keysight Bench and System Switching Products

Literature Number 5989-9872EN <http://literature.cdn.keysight.com/litweb/pdf/5989-9872EN.pdf>

*Keysight RF and Microwave Switch Selection Guide*

Literature Number 5989-6031EN <http://literature.cdn.keysight.com/litweb/pdf/5989-6031EN.pdf>

*Keysight 11713B/C Attenuator/Switch Drivers Configuration Guide*

Literature Number 5989-7277EN <http://literature.cdn.keysight.com/litweb/pdf/5989-7277EN.pdf>

## Application Notes:

*Power Handling Capability of Electro-mechanical Switches*

Literature Number 5989-6032EN <http://literature.cdn.keysight.com/litweb/pdf/5989-6032EN.pdf>

*How Operating Life and Repeatability of Keysight's Electromechanical Switches*

*Minimize System Uncertainty*

Literature Number 5989-6085EN <http://literature.cdn.keysight.com/litweb/pdf/5989-6085EN.pdf>

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