

## Product Datasheet - Technical Specifications



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# P9164A/B/C 2X16 & P9165A/B/C 2X8 USB Solid State Switch Matrix

300 KHz to 6.5/9/18 GHz

## Compact Form. Zero Compromise

- Choose frequency ranges from 300 KHz up to 18 GHz
- Extend the number of test ports for multi-DUT or multipoint devices measurement
- Portable and easily share the compact switch matrix between your location
- Achieve lower cost-per-port test without compromising performance and bench space

## Description

Keysight P916x A/B/C 2X8/16 USB solid state switch matrix, 300 KHz to 6.5/9/18 GHz is a full crossbar switch matrix. It works seamlessly with Keysight's P50xxA streamline series of VNA solution in providing a switch based multipoint VNA solution in the form of compact USB controlled involving larger scale of multi-DUT or multipoint measurement such as 5G massive MIMO antenna measurement and others.

The P916xA/B/C is compact and portable. Together with exceptional RF performance, it delivers confidence in your measurement for a reliable and repeatable results while at the same time reducing the overall cost of test.

## Specifications

Specifications describe the instrument's warranted performance. Supplemental and typical characteristics are intended to provide information useful in applying the instrument by giving typical, but not warranted performance parameters

### P9164A/B/C 2X16 USB Solid State Switch Matrix

Specification	P9164A	P9164B	P9164C
Operating Frequency	300 KHz to 6.5 GHz	300 KHz to 9 GHz	300 KHz to 18 GHz
Configuration	2X16 full crossbar	2X16 full crossbar	2X16 full crossbar
Isolation (dB)	300 KHz to 2 GHz: 87 2 to 6.5 GHz: 85	300 KHz to 2 GHz: 87 2 to 9 GHz: 85	300 KHz to 2 GHz: 87 2 to 15 GHz: 85 15 to 18 GHz: 77
Insertion loss (dB) Port 1 to CH9, CH10, CH11, CH12, CH13, CH14, CH15, CH16 and Port 2 to CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8	300 KHz to 100 MHz: 3.5 100 MHz to 2 GHz: 5.1 2 to 4 GHz: 6.8 4 to 6.5 GHz: 8.6	300 KHz to 100 MHz: 3.5 100 MHz to 2 GHz: 5.1 2 to 4 GHz: 6.8 4 to 6.5 GHz: 8.6 6.5 to 8 GHz: 9.9 8 to 9 GHz: 10.6	300 KHz to 100 MHz: 3.5 100 MHz to 2 GHz: 5.1 2 to 4 GHz: 6.8 4 to 6.5 GHz: 8.6 6.5 to 8 GHz: 9.9 8 to 9 GHz: 10.6 9 to 12.5 GHz: 12.6 12.5 to 15 GHz: 14.3 15 to 17 GHz: 15.3 17 to 18 GHz: 16
Insertion loss (dB) Port 2 to CH9, CH10, CH11, CH12, CH13, CH14, CH15, CH16 and Port 1 to CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8	300 KHz to 100 MHz: 3.5 100 MHz to 2 GHz: 5 2 to 4 GHz: 6.8 4 to 6.5 GHz: 8.4	300 KHz to 100 MHz: 3.5 100 MHz to 2 GHz: 5 2 to 4 GHz: 6.8 4 to 6.5 GHz: 8.4 6.5 to 8 GHz: 9.2 8 to 9 GHz: 10	300 KHz to 100 MHz: 3.5 100 MHz to 2 GHz: 5 2 to 4 GHz: 6.8 4 to 6.5 GHz: 8.4 6.5 to 8 GHz: 9.2 8 to 9 GHz: 10 9 to 12.5 GHz: 11.3 12.5 to 15 GHz: 12.7 15 to 17 GHz: 14.3 17 to 18 GHz: 14.5
Return loss (Port 1/2 ON) (dB) Port 1 to CH9, CH10, CH11, CH12, CH13, CH14, CH15, CH16 and Port 2 to CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8	300 KHz to 100 MHz: 8.0 100 MHz to 3 GHz: 8.9 3 to 6.5 GHz: 9.7	300 KHz to 100 MHz: 8.0 100 MHz to 3 GHz: 8.9 3 to 6.5 GHz: 9.7 6.5 to 9 GHz: 8.4	300 KHz to 100 MHz: 8.0 100 MHz to 3 GHz: 8.9 3 to 6.5 GHz: 9.7 6.5 to 9 GHz: 8.4 9 to 10.5 GHz: 8 10.5 to 12 GHz: 7.9 12 to 13.5 GHz: 8.6 13.5 to 17 GHz: 6.4 17 to 18 GHz: 7.4

## P9164A/B/C 2X16 USB Solid State Switch Matrix (continue)

Specification	P9164A	P9164B	P9164C
Return loss (Port 1/2 ON) (dB) Port 2 to CH9, CH10, CH11, CH12, CH13, CH14, CH15, CH16 and Port 1 to CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8	300 KHz to 100 MHz: 8.0 100 MHz to 3 GHz: 8.9 3 to 6.5 GHz: 9.7	300 KHz to 100 MHz: 8.0 100 MHz to 3 GHz: 8.9 3 to 6.5 GHz: 9.7 6.5 to 9 GHz: 8.4	300 KHz to 100 MHz: 8.0 100 MHz to 3 GHz: 8.9 3 to 6.5 GHz: 9.7 6.5 to 9 GHz: 8.4 9 to 10.5 GHz: 8 10.5 to 12 GHz: 7.9 12 to 13.5 GHz: 8.6 13.5 to 17 GHz: 6.4 17 to 18 GHz: 7.4
Return loss (CHx port, ON) (dB) Port 1 to CH9, CH10, CH11, CH12, CH13, CH14, CH15, CH16 and Port 2 to CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8	300 KHz to 100 MHz: 8 100 MHz to 5 GHz: 8.9 5 to 5.5 GHz: 8.2 5.5 to 6.5 GHz: 10.1	300 KHz to 100 MHz: 8 100 MHz to 5 GHz: 8.9 5 to 5.5 GHz: 8.2 5.5 to 6.5 GHz: 10.1 6.5 to 7 GHz: 10.1 7 to 8 GHz: 9.6 8 to 9 GHz: 9.6	300 KHz to 100 MHz: 8 100 MHz to 5 GHz: 8.9 5 to 5.5 GHz: 8.2 5.5 to 7 GHz: 10.1 7 to 9 GHz: 9.6 9 to 10.5 GHz: 6.1 10.5 to 12 GHz: 5.6 12 to 16 GHz: 6.6 16 to 18 GHz: 6
Return loss (CHx port, ON) (dB) Port 2 to CH9, CH10, CH11, CH12, CH13, CH14, CH15, CH16 and Port 1 to CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8	300 KHz to 100 MHz: 8 100 MHz to 5 GHz: 8.9 5 to 5.5 GHz: 8.2 5.5 to 6.5 GHz: 10.1	300 KHz to 100 MHz: 8 100 MHz to 5 GHz: 8.9 5 to 5.5 GHz: 8.2 5.5 to 6.5 GHz: 10.1 6.5 to 7 GHz: 10.1 7 to 8 GHz: 9.6 8 to 9 GHz: 9.6	300 KHz to 100 MHz: 8 100 MHz to 5 GHz: 8.9 5 to 5.5 GHz: 8.2 5.5 to 7 GHz: 10.1 7 to 9 GHz: 9.6 9 to 10.5 GHz: 6.1 10.5 to 12 GHz: 5.6 12 to 16 GHz: 6.6 16 to 18 GHz: 6
Return loss (CHx port, OFF) (dB)	300 KHz to 100 MHz: 12.0 100 MHz to 4 GHz: 13.4 4 to 6.5 GHz: 12.4	300 KHz to 100 MHz: 12.0 100 MHz to 4 GHz: 13.4 4 to 6.5 GHz: 12.4 6.5 to 8 GHz: 14 8 to 9 GHz: 11.0	300 KHz to 100 MHz: 12.0 100 MHz to 4 GHz: 13.4 4 to 6.5 GHz: 12.4 6.5 to 8 GHz: 14 8 to 9 GHz: 11.0 9 to 10.5 GHz: 9.4 10.5 to 14 GHz: 6 14 to 18 GHz: 5
Typical Temperature Stability - 20 to 30°C (Magnitude dB/°C)		300 KHz to 3 GHz: 0.002 3 to 6.5 GHz: 0.003 6.5 to 11 GHz: 0.004 11 to 15 GHz: 0.006 15 to 18 GHz: 0.008	
Typical Temperature Stability - 20 to 30°C (Phase Degree/°C)		300 KHz to 3 GHz: 0.02 3 to 6.5 GHz: 0.03 6.5 to 11 GHz: 0.05 11 to 15 GHz: 0.07 15 to 18 GHz: 0.10	

## P9165A/B/C 2X8 USB Solid State Switch Matrix

Specification	P9165A	P9165B	P9165C
Operating Frequency	300 KHz to 6.5 GHz	300 KHz to 9 GHz	300 KHz to 18 GHz
Configuration	2X8 full crossbar	2X8 full crossbar	2X8 full crossbar
Isolation (dB)	300 KHz to 1 GHz: 90 1 to 6.5 GHz: 88	300 KHz to 1 GHz: 90 1 to 9 GHz: 88	300 KHz to 2 GHz: 90 2 to 10 GHz: 88 10 to 15 GHz: 85 15 to 18 GHz: 80
Insertion loss (dB) Port 1 to CH5, CH6, CH7, CH8 and Port 2 to CH1, CH2, CH3, CH4	300 KHz to 1MHz: 3.7 1MHz to 1 GHz: 4.3 1 to 3 GHz: 5.7 3 to 6.5 GHz: 7.2	300 KHz to 1MHz: 3.7 1MHz to 1 GHz: 4.3 1 to 3 GHz: 5.7 3 to 6.5 GHz: 7.2 6.5 to 9 GHz: 9.2	300 KHz to 5 MHz: 3.8 5MHz to 1 GHz: 4.3 1 to 3 GHz: 5.7 3 to 6.5 GHz: 7.2 6.5 to 10 GHz: 9.4 10 to 13 GHz: 11.5 13 to 15 GHz: 13.5 15 to 16.5 GHz: 16.5 16.5 to 18 GHz: 16.2
Insertion loss (dB) Port 1 to CH1, CH2, CH3, CH4 and Port 2 to CH5, CH6, CH7, CH8	300 KHz to 1MHz: 3.7 1 MHz to 1 GHz: 4.3 1 to 3 GHz: 5.7 3 to 6.5 GHz: 7.2	300 KHz to 1MHz: 3.7 1 MHz to 1 GHz: 4.3 1 to 3 GHz: 5.7 3 to 6.5 GHz: 7.2 6.5 to 9 GHz: 9.2	300 KHz to 5 MHz: 3.8 5 MHz to 1 GHz: 4.3 1 to 3 GHz: 5.7 3 to 6.5 GHz: 7.2 6.5 to 10 GHz: 9.4 10 to 13 GHz: 11.2 13 to 15 GHz: 12.5 15 to 16.5 GHz: 13.5 16.5 to 18 GHz: 14.2
Return loss (Port 1/2 ON) (dB) Port 1 to CH5, CH6, CH7, CH8 and Port 2 to CH1, CH2, CH3, CH4	300 KHz to 1MHz: 7.7 1 MHz to 6.5 GHz: 11.7	300 KHz to 1MHz: 7.7 1 MHz to 6.5 GHz: 11.7 6.5 to 9 GHz: 10.2	300 KHz to 1 MHz: 7.7 1 MHz to 8 GHz: 11.7 8 to 10 GHz: 10.2 10 to 13 GHz: 7.7 13 to 15 GHz: 6.7 15 to 16.5 GHz: 4.5 16.5 to 18 GHz: 5.2
Return loss (Port 1/2 ON) (dB) Port 1 to CH1, CH2, CH3, CH4 and Port 2 to CH5, CH6, CH7, CH8	300 KHz to 1MHz: 8 1 MHz to 6.5 GHz: 12	300 KHz to 1MHz: 8 1 MHz to 6.5 GHz: 12 6.5 to 9 GHz: 10	300 KHz to 1 MHz: 8 1 MHz to 8 GHz: 12 8 to 10 GHz: 10 10 to 13 GHz: 8.7 13 to 15 GHz: 7.7 15 to 16.5 GHz: 6 16.5 to 18 GHz: 6.5

## P9165A/B/C 2X8 USB Solid State Switch Matrix (continue)

Specification	P9165A	P9165B	P9165C
Return loss (CHx port, ON) (dB) Port 1 to CH5, CH6, CH7, CH8 and Port 2 to CH1, CH2, CH3, CH4	300 KHz to 1MHz: 8 1 MHz to 6.5 GHz: 11.7	300 KHz to 1MHz: 8 1 MHz to 6.5 GHz: 11.7 6.5 to 9 GHz: 9.7	300 KHz to 1 MHz: 8 1 MHz to 6.5 GHz: 11.7 6.5 to 10 GHz: 9.7 10 to 11.5 GHz: 9 11.5 to 13.5 GHz: 8.7 13.5 to 15 GHz: 6.7 15 to 16.5 GHz: 4.2 16.5 to 18 GHz: 5.2
Return loss (CHx port, ON) (dB) Port 1 to CH1, CH2, CH3, CH4 and Port 2 to CH5, CH6, CH7, CH8	300 KHz to 1MHz: 7.7 1 MHz to 6.5 GHz: 11.7	300 KHz to 1MHz: 7.7 1 MHz to 6.5 GHz: 11.7 6.5 to 9 GHz: 10	300 KHz to 1 MHz: 8 1 MHz to 6.5 GHz: 11.7 6.5 to 10 GHz: 8.7 10 to 11.5 GHz: 8.7 11.5 to 13.5 GHz: 9.7 13.5 to 15 GHz: 6.2 15 to 18 GHz: 5.7
Return loss (CHx port, OFF) (dB)	300 KHz to 1 MHz: 7.7 1 MHz to 6.5 GHz: 12.7	300 KHz to 1 MHz: 7.7 1 MHz to 6.5 GHz: 12.7 6.5 to 9 GHz: 9.7	300 KHz to 1 MHz: 7.7 1 MHz to 8.5 GHz: 12.7 8.5 to 11 GHz: 8.7 11 to 14 GHz: 10.7 14 to 1 GHz: 5.5 17 to 18 GHz: 6.5
Typical Temperature Stability - 20 to 30°C (Magnitude dB/°C)		300 KHz to 8 GHz: 0.002 8 to 11 GHz: 0.003 11 to 18 GHz: 0.007	
Typical Temperature Stability - 20 to 30°C (Phase Degree/°C)		300 KHz to 8 GHz: 0.02 8 to 11 GHz: 0.03 11 to 18 GHz: 0.03	

## P916xA/B/C 2X8/16 USB Solid State Switch Matrix Supplemental Specification and Characteristics

Supplemental characteristics are intended to provide useful information. They are typical but non-warranted performance parameters

Specification	P916xA/B/C
Maximum input power	25 dBm
Typical switching speed (10% trigger to 90% output)	50 us
Typical input P1dB	25 dBm
Typical input TOI	54 dBm
RF connector	SMA (f)

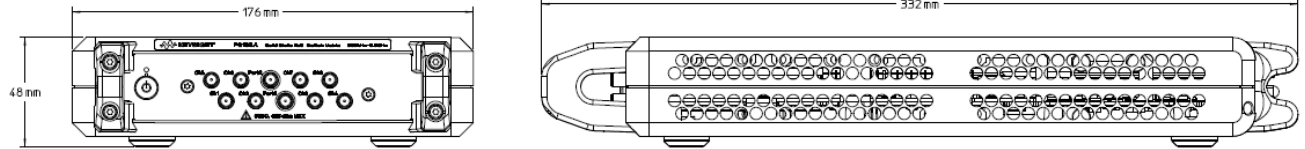
## Environmental Specifications

Keysight P916xA/B/C USB solid state switch matrix are designed for indoor use and in an area with low condensation. They are fully complying with Keysight Technologies' product operating environmental specifications. The following summarizes the environmental specifications for these products.

Environmental specifications	Description
<b>Temperature</b>	
Operating	0 °C to +40 °C
Storage	-40 °C to +70 °C
<b>Humidity</b>	
Operating	95% RH at 40 °C (non-condensing)
<b>Shock</b>	
End-user handling	Delta V: 3 m/s (60 in/s) ±5%, Duration <3ms
Transportation	50G, Delta V: 8m/s ±10%
<b>Vibration</b>	
Operating	Random: 0.3 Grms
Survival	Random: 2.41 Grms
<b>ESD immunity</b>	
Contact discharge	8 kV per IEC 61000-4-2
Air discharge	20 kV per IEC 61000-4-2
<b>Altitude</b>	
Operating	< 3,000 meters (< 9,842 feet)
<b>Radiated Emissions</b>	
CISPR11/EN 55011	
<b>Conducted Emissions</b>	
<b>Radiated Immunity</b>	
IEC/EN 61000-4-3 IEC 61000-6-1 (S. Korea requirement for KC)	
<b>Conducted immunity</b>	
IEC/EN 61000-4-6	
<b>Surge on AC power line immunity</b>	
IEC/EN 61000-4-5	
<b>Electrical fast transient (EFT) immunity</b>	
IEC/EN 61000-4-4	
<b>Voltage dips and interrupts on A.C. power line immunity</b>	
IEC/EN 61000-4-11	
<b>Electrostatic discharge (ESD) immunity</b>	
IEC/EN 61000-4-2	
<b>Power frequency magnetic Field immunity test</b>	
IEC/EN 61000-4-8	
<b>Mains Supply Input Test/ Sound Pressure Test/ Single Fault Conditions/ Temperature Test</b>	
IEC/EN 61010-4 3 <sup>rd</sup> Ed	

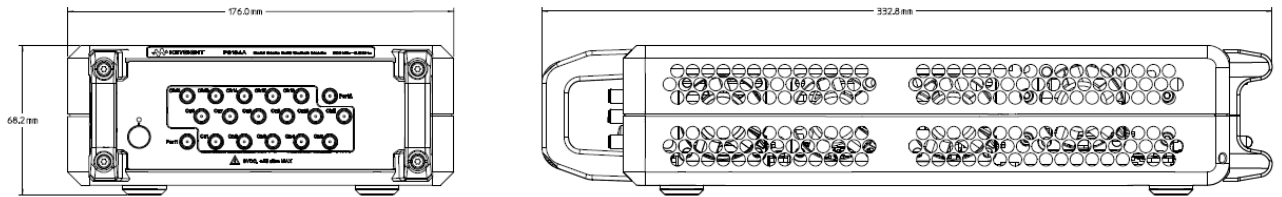
## Mechanical Information

Dimensions are in mm (inches) nominal, unless otherwise specified



### P9165A/B/C product dimensions (SMA (f) connectors)

Net weight	1.92 kg
Dimension (H x W x D)	48 mm x 176 mm x 332 mm (1.89 inches x 6.93 inches x 13.07 inches)



### P9164A/B/C product dimensions (SMA (f) connectors)

Net weight	2.65 kg
Dimension (H x W x D)	68.2 mm x 176 mm x 332.8 mm (2.69 inches x 6.93 inches x 13.10 inches)



## Ordering Information

Description	
P9164A	2X16 USB Solid State Switch Matrix, 300 KHz to 6.5 GHz
P9164B	2X16 USB Solid State Switch Matrix, 300 KHz to 9 GHz
P9164C	2X16 USB Solid State Switch Matrix, 300 KHz to 18 GHz
P9165A	2X8 USB Solid State Switch Matrix, 300 KHz to 6.5 GHz
P9165B	2X8 USB Solid State Switch Matrix, 300 KHz to 9 GHz
P9165C	2X8 USB Solid State Switch Matrix, 300 KHz to 18 GHz