CS8216 Datasheet and user manual

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Version 1.0, 2025-11-18

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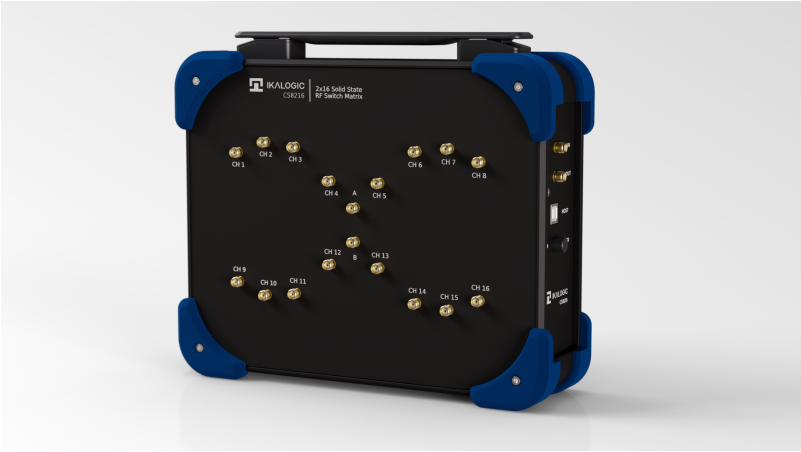
CS8216 Overview

CS8216 is a fully programmable, 2x16 (2 x SP16T) RF switch : it offers 2 COMMON RF ports, each can be connected to 1 of 16 channels. It is capable of switching RF signals from 100MHz up to 8GHz with low insertion loss (-3dB at 2.4GHz) and high isolation between channels (-85dB typical). CS8216 can be controlled using a user friendly software. In an automated test setup, it can be programmed using Python scripts or NodeJS (various examples are provided).



Thanks to the integrated FPGA controller, a sequence of switching operations can be loaded in the internal memory of the device, allowing for fast and precise switching operations without being limited by the communication speed of the host computer. Furthermore, switching sequences can be triggered using a dedicated hardware trigger input, allowing for precise synchronization with other test equipment. A trigger output is also provided to signal the settling of a switching step.

This unique set of features makes CS8216 the perfect instrument for automating the switching of RF signals in various demanding applications.

Thanks the CS8000 SwitchMaster software, controlling the CS8216 device is very easy. The software provides a graphical user interface (GUI) to manually control the switch matrix, as well as the ability to load a sequence of switching steps into the internal memory of the device.

CS8000 SwitchMaster software run on windows, linux and macOS operating systems and can be downloaded from the Ikalogic website.

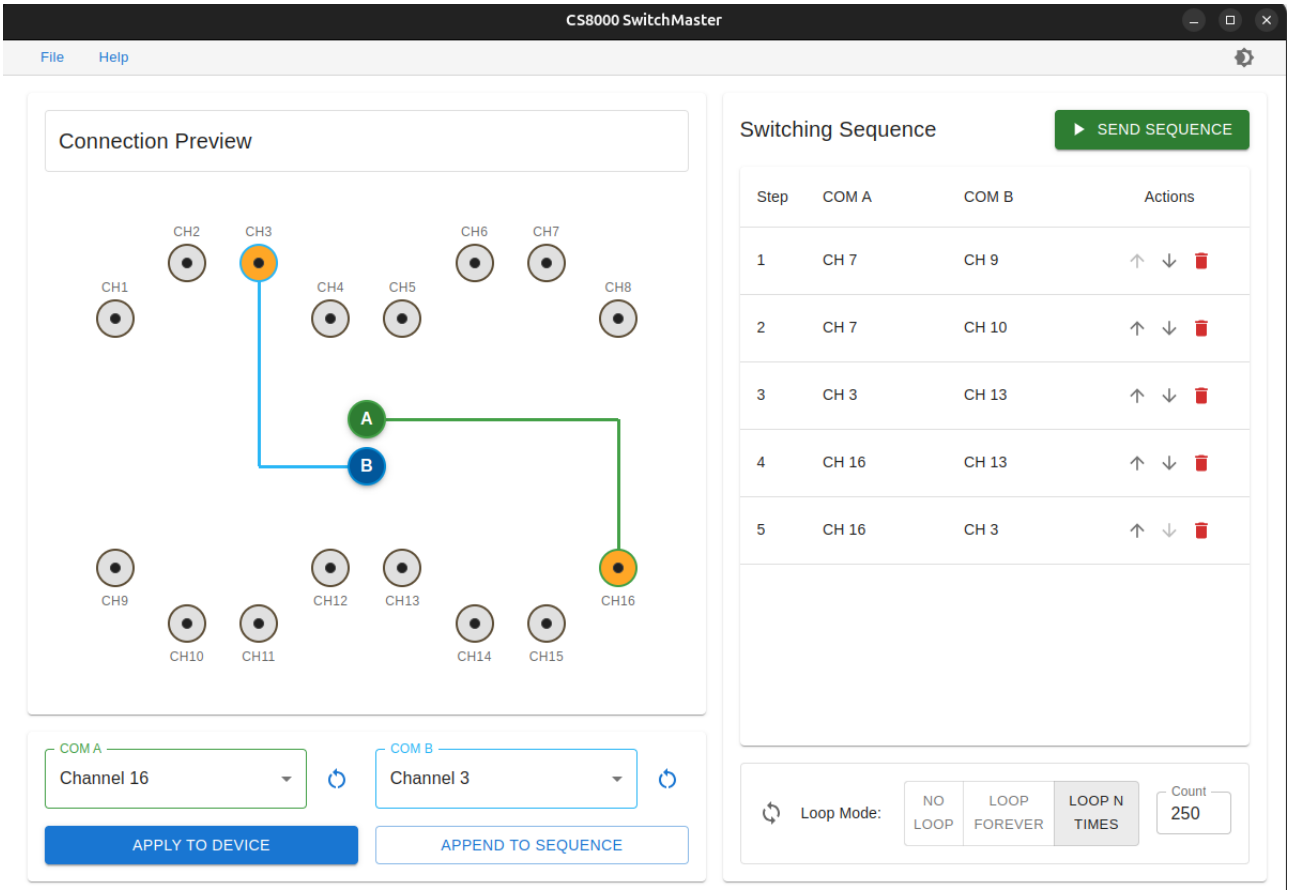


Figure 1. CS8216 Application Software Interface

Typical applications

CS8216 2x16 RF switch matrix is perfectly adapted to advanced RF switching applications. Typical application are:

- Switch based Multi-port VNA setups
- Automated test systems
- 5G MIMO antenna measurements
- Signal routing in production test setups
- Antenna switching systems
- Radar and telecommunication systems
- Signal distribution systems

Product highlights

- 2x16 RF switch matrix in a single instrument.
- Frequency range from 100MHz to 8GHz.
- Low insertion loss: -2.5dB at 2GHz, -5dB at 4GHz, -10dB at 8GHz.
- High isolation between channels: typically 80dB at 8GHz.
- Fast switching time: typically less than 1µs.
- Internal memory can store up to 256 switching steps sequences.
- Possibility to loop sequences for continuous operation.
- Hardware trigger input and output for precise synchronization.
- USB powered device with no external power supply needed.
- Can be controlled from any programming language capable of sending commands over a serial interface (Python, NodeJS, C/C++, LabVIEW, etc.)
- Multi-platform CS8000 SwitchMaster application software (Windows, Linux, macOS) for easy manual control and sequence programming.
- Multi-platform API libraries and code examples (Python, NodeJS) to easily integrate the CS8216 device in automated test setups.

Typical API usage example

Example NodeJS script to open a serial port and control the CS8216 device:

```
import { CS8000 } from '@ikalogic/cs8000-api';

const sw = new CS8000("CS8216");
await sw.open(); // Auto-detect first available device
sw.prepare(1, 1);
sw.prepare(2, 0);
await sw.commit();
await sw.close();
```

And the same example script in Python:

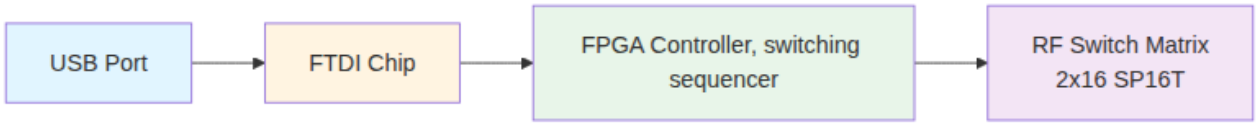
```
from ikalogic_cs8000 import CS8000

sw = CS8000("CS8216")
await sw.open()  # Auto-detect first available device
sw.prepare(1, 1)
sw.prepare(2, 0)
await sw.commit()
await sw.close()
```

Detailed and up-to-date documentation of the API can be found [here](***https://ikalogic.com/kb/cs8000-api/cs8000_home/***).

Read ***Safety Information*** serction carefully before using this instrument.

CS8216 system architecture

The diagram below shows the main components of CS8216 device.



Power supply

CS8216 is powered via the USB interface. No other external power supply is required.

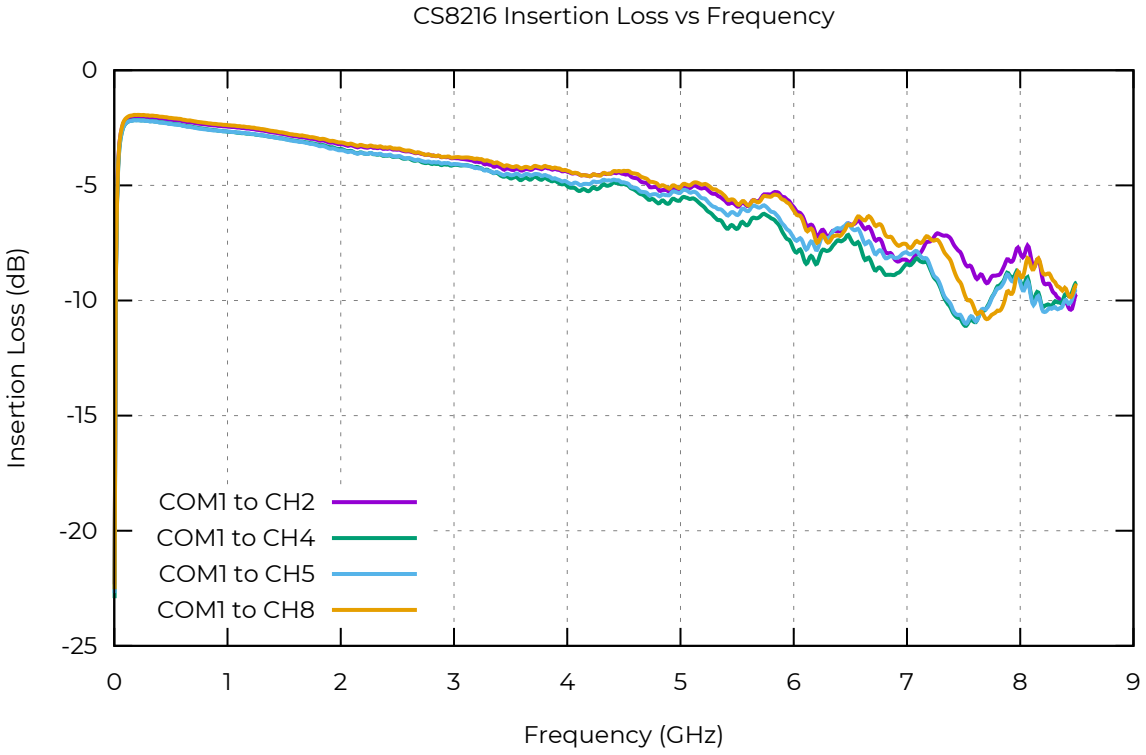
Power suply votage	5.0 V ± 0.5V (USB)
Power supply current	250mA max

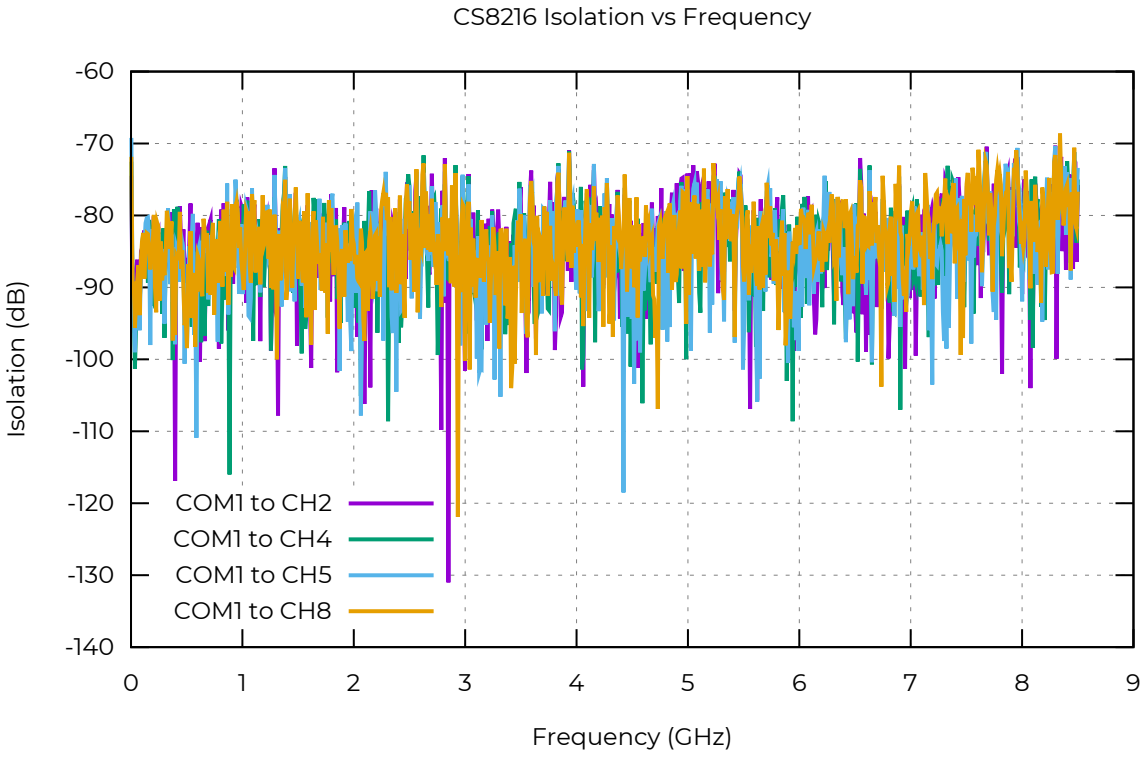
Operating Conditions

Parameter	Conditions
Temperature	10°C to 40°C
Relative humidity	< 80% non-condensing
Altitude	< 2000 m

Switch matrix performances

The graphs below show typical insertion loss and isolation performances of the CS8216 switch matrix on select lines.





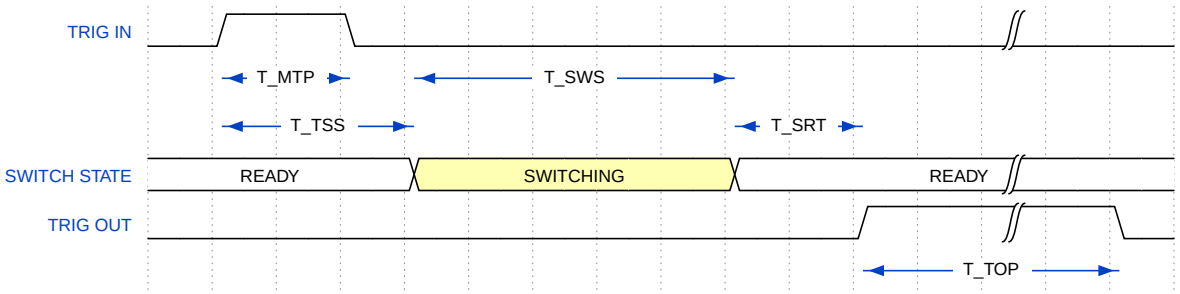
RF power specifications

Parameter	Value
Maximum RF input power (all ports)	27 dBm (preliminary)
Typical input P1dB (1dB compression point)	39 dBm (preliminary)
Typical input IP3 (third order intercept point)	60 dBm (preliminary)

Trigger input/output specifications

Parameter	Value
Trigger input type	TTL compatible
Trigger input voltage levels	Low: 0 to 0.8 V High: 2.0 to 5.0 V
Trigger input impedance	50 Ohm / 100 KOhm (configurable)
Trigger output type	TTL compatible
Trigger output voltage levels	Low: 0 to 0.4 V High: 2.4 to 5.0 V
Trigger output impedance	50 Ohm

Trigger timing



The trigger timing diagram above shows the various timing parameters related to the trigger input and output signals. Timings are summerized in the table below:

Symbol	Description	Parameter (Min)	Parameter (Max)	Unit
T_MTP	Minimum Trigger IN pulse width	1.5	---	µs
T_TSS	Trigger to Switch Start time	---	50	ns
T_SWS	Switch settling time (Reached 90% of signal)	---	0.8	µs
T_SRT	Switching done to Trigger OUT pulse	---	10	ns
T_TOP	Trigger OUT pulse width	99	101	µs

Table 1. Switching timing parameters

Mechanical characteristics

The CS8216 device is housed in a compact and robust enclosure, made of black anodized aluminum. The mechanical drawing with all relevant dimensions is shown below:

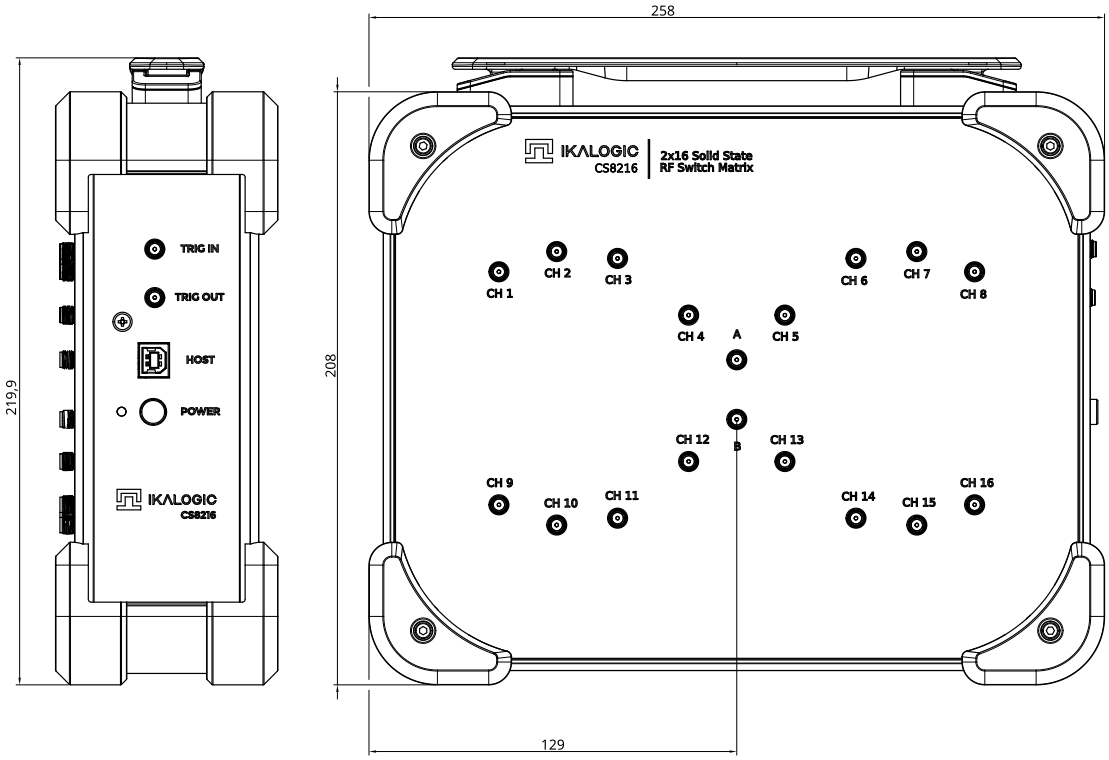


Figure 2. CS8216 Mechanical drawing - All dimensions in mm

All SMA connectors are female type, 50 Ohm impedance. USB connector is a standard USB-B type.

Software Technical Requirements

To operate CS8216 2x16 RF switch matrix, the user must use a computer with a USB port (USB2 or better).

The following operating systems are supported:

- Windows 7/8/10/11
- macOS 10.9 or later
- Ubuntu Linux 14.04 or later

CS8216 includes a USB chip from FTDI (***https://www.ftdichip.com***), please make sure the latest drivers are downloaded and installed. On most recent systems, drivers are already included and no any installation is needed.

Ordering Information and Customer Support

For purchases, distributor information, or technical inquiries:

Visit www.ikalogic.com

Email: ***support@ikalogic.com***

Accessories and Maintenance

Accessories and maintenance services are available on our website: www.ikalogic.com or by contacting customer support (***support@ikalogic.com***).

Certifications and Regulations

CS8216 complies with the following applicable European Directives: Electromagnetic Compatibility (EMC) Directive 2004/108/EC, Low-Voltage Directive 2006/95/EC, IEC 61326-2.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAN ICES-3 (B) / NMB-3 (B)**

RoHS Compliant 2011/65/EC. This device does not contain any of the substances in excess of the maximum concentration values ("MCVs") defined in the EU RoHS Directive.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CE Logo

ROHS Logo

WEEE Logo

Safety information

This product complies with safety standards IEC NF/EN 61010-1: 2010, IEC NF/EN 61010-2-030 and UL 61010-1: 2015 To prevent possible electrical shock, fire, personal injury, or damage to the product, read all safety information before you use the product. The following international symbols are used on the product and in this manual.

Important safety notes

Warning, to avoid electrical shock or fire :

- Carefully read all instructions.
- Use the product only as specified, otherwise the protection supplied by the product can be compromised.
- Do not use the product if it operates incorrectly.
- Before use, inspect device casing, probes, test leads and accessories for mechanical damage and replace if damaged.
- Never attempt to repair a defective device. Contact after-sale service.
- Do not use the product or its accessories in case of any damage.
- Remove all probes, test leads and accessories that are not in use.
- Never use the device for measuring mains circuits.
- Never use the device for measuring circuits which are not isolated from mains.
- Do not touch electrical wires with bare hands.
- Keep away from children's sight or from animals.
- Do not expose to water, heat or moisture.
- The device's ground connection through the USB cable is for measurement purposes only. The logic analyzer does not have a protective safety ground.
- Ensure there is no significant voltage between device ground and the point to which you intend to connect it.
- Do not apply more than the rated voltage, between the terminals or between each terminal and ground.
- Do not apply input voltages above the rating of the instrument.
- Measure a known voltage first to make sure that the product operates correctly.
- Do not work alone.
- Comply with local and national safety codes. Use personal protective equipment (approved rubber gloves, face protection, and flame resistant clothes) to prevent shock.
- Do not use the device in wet or damp conditions, or around explosive gas or vapor.
- Do not operate the product with covers removed or the case open. Hazardous voltage exposure is possible.
- Do not use in a system in which the failure of the product might result in personal injury.

Document Revisions

Date	Description
26-Oct-2025	Initial release of CS8216 2x16 RF switch matrix datasheet

Disclaimer

The information contained herein is subject to change without prior notice.