Keysight Single Mode Side Channel Laser Source

DS1210A/11A Single Mode Side Channel Laser Source

KEYSIGHT

USER MANUAL

Notices

Trademark Acknowledgments

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CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Where to Find the Latest Information

Documentation is updated periodically. For the latest information about these products, including instrument software upgrades, application information, and product information, browse to one of the following URLs, according to the name of your product:

https://www.keysight.com/us/en/product/DS1210A/1310-nm-single-mode-side-channel-laser-source.html

https://www.keysight.com/us/en/product/DS1211A/1425-nm-single-mode-side-channel-laser-source.html

To receive the latest updates by email, subscribe to Keysight Email Updates at the following URL:

https://support.keysight.com

Information on preventing instrument damage can be found at:

https://www.keysight.com/find/PreventingInstrumentDamage

Is your product software up-to-date?

Periodically, Keysight releases software updates to fix known defects and incorporate product enhancements. To search for software updates for your product, go to the Keysight Technical Support website at:

https://www.keysight.com/find/techsupport

Product and Solution Cybersecurity

Keysight complies with multinational regulations for the cybersecurity of its own products and is committed to providing information to assist you in protecting your products and solutions from external cyber threats. For more information, see:

https://www.keysight.com/us/en/about/quality-and-security/security/product-and-solution-cyber-security.html

Keysight also recommends that you secure your IT environments using appropriate third-party tools. For instruments that run the Microsoft Windows operating system, Keysight concurs with Microsoft's recommendations for ensuring that the instrument is protected:

- Get the latest critical Windows updates
- For network-connected instruments, use an Internet firewall (in Keysight instruments, Windows Firewalls enabled by default)
- For network-connected instruments, use up-to-date antivirus and anti-spyware software

Responsible Disclosure Program

Keysight recommends that security researchers share the details of any suspected vulnerabilities across any asset owned, controlled, or operated by Keysight (or that would reasonably impact the security of Keysight and our users) using this form:

https://www.keysight.com/us/en/contact/responsible-disclosure-program.html

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If you discover a cybersecurity issue that you suspect may involve Keysight's proprietary software, or third-party software supplied by Keysight as part of a product, or that may affect the operation of Keysight products, we encourage you to report it to us using this form:

https://www.keysight.com/us/en/about/quality-and-security/security/product-and-solution-cyber-security.html

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What's in the Box?

The box contains a Single Mode Side Channel Laser Source, an optional power supply unit and cables to connect it to control equipment.

Quantity	Description	Photo	Identifier[1]
1	Single Mode Side Channel Laser Source, class-4		-
1	Fiber Coupler *Optional*		
1	Power supply unit, 12 VDC Input 100 V to 240 V AC, 50 Hz to 60 Hz Included: power cable with country-specific jack Not present if shipment includes the Laser Fault Injection Safety Box, or the customer already owns one. [1]		PSU
1	Signal cables: — SMB-to-SMB, 50 Ω, 6 ft.		SMB2SMB

1. By default, the Laser Fault Injection Safety Box is shipped together with Single Mode Side Channel Laser Source module and serves as the power supply of it. Under rare circumstances, where the Laser Fault Injection Safety Box is specifically excluded from the order, the discrete power supply is shipped.

Depending on your order, the laser has one of the following wavelengths:

— 1310 nm, single mode, 130mw

— 1425 nm, single mode, 500mw

What It Does

The Single Mode Side Channel Laser Source is a source of light produced by laser diodes with energy levels up to 500mW power. The Single Mode Side Channel Laser Source are designed to operate in continuous wave mode.

The Single Mode Side Channel Laser Source is normally attached to the DS1101A Fault Injection Laser System and operated for failure analysis methods applied for side channel analysis. An example is Thermal Laser Stimulation (TLS) on semiconductors.

Figure 1 Single Mode Side Channel Laser Source

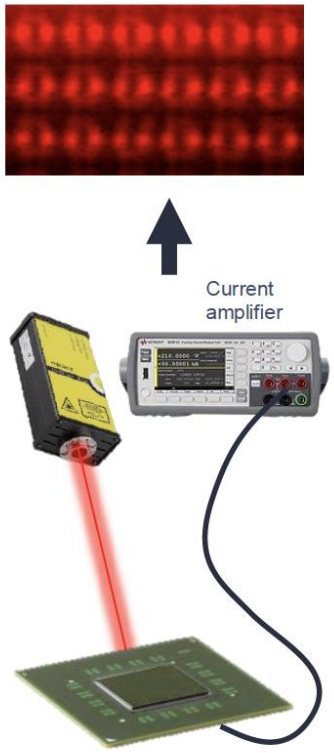
Thermal Laser Stimulation (TLS)

Concept

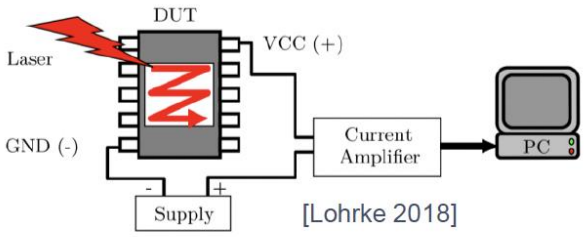
1. **Create thermal variation on chip using laser**
2. **Observe response**

For example, measure current/voltage difference caused by temperature difference between two semiconductor or metal nodes

– As TLS reveals circuit behavior, you can use it for side channel analysis. For example, you can observe stored data in memory cells.



Thermal Laser Stimulation (TLS)



[Lohrke 2018]

Laser Wavelength: ~ 1300nm-1400nm
⇒ Photon energy < bandgap
⇒ mainly heating occurs

How to Build a Setup

Follow the next steps to install the laser on the Fault Injection Laser System.

Installing the laser

1. Install the selected laser.

NOTE Which laser to choose (1310nm/1425nm) is outside the scope of this user manual.

2. Fasten the FC/APC connector from the Single Mode Side Channel Laser Source to the fiber coupler.

Figure 2 Fiber coupler

Figure 3 Fiber coupler attached to Single Mode Side Channel Laser Source

3. Insert the laser on top of the spot size reducer.

Verification of the Setup

Follow the next checks to verify you have built a working setup.

1. Is the laser powered?
2. Is the laser connected?
3. Is the laser power switch in the right position?

Please ensure that a check is successful, before proceeding to the next check.

Check: Is the laser powered?

There are no signals if the power supply is applied.

Check 2: Is the laser connected?

The interlock connector coming from the Laser Fault Injection Safety Box must be inserted into the back of the 1310 nm Single Mode Side Channel Laser Source.

Check 3: Is the laser power switch in the right position?

In the lower position, the laser is at 100% power.

In the upper position, the laser is at 50% power.

Temperature Lock

The Single Mode Side Channel Laser Source has a thermoelectric cooler (TEC) that regulates the laser temperature.

When 3.3v is applied to the “operate laser” input.

The “optimal operation temp.” status LED will go from blinking to continuous illumination.

This is not the case with the Single Mode Side Channel Laser Source.

Because of the low heat emission of the Single Mode Side Channel Laser Source, the temperature will not reach the threshold temperature easily.

NOTE **Only when “operate laser” is driven with 3.3V will the “Optimal operation temp.” status LED have continuous illumination.**

Figure 4 Status LED blinking

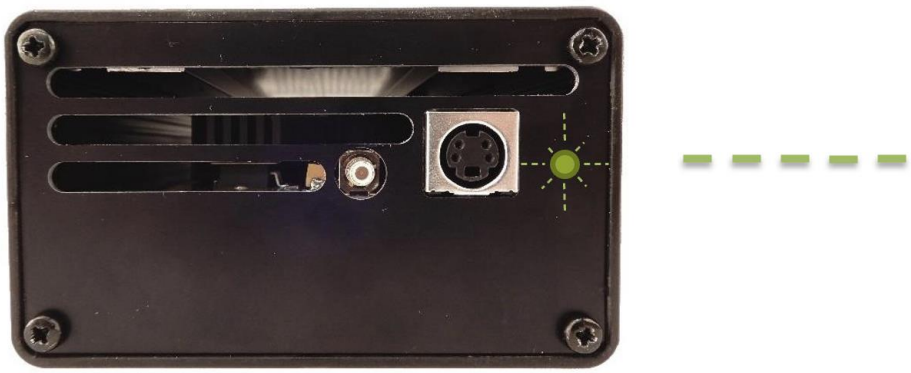


Figure 5 Status LED continues illuminated

Power Output Switch

The Single Mode Side Channel Laser Source has a power output switch.

For 100% power or 50% power.

NOTE **Do not switch while the Single Mode Side Channel Laser Source is active.**

Figure 6 50% power out

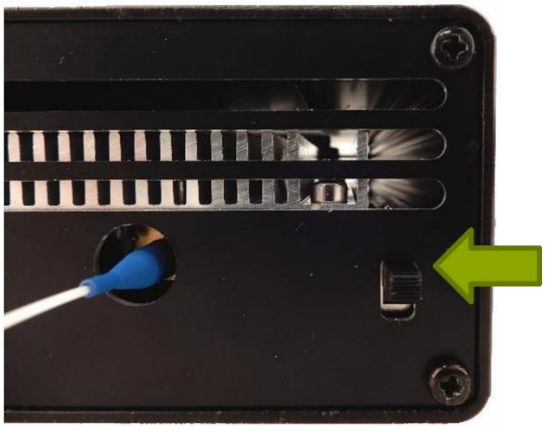
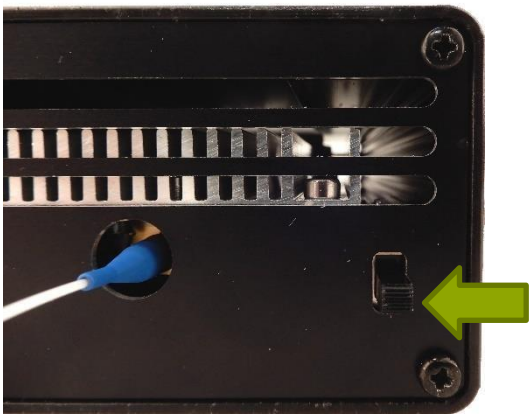


Figure 7 100% power out



Airflow

The Single Mode Side Channel Laser Source has openings on the front and the backside to regulate airflow.

Under no circumstance may these openings be blocked. Blocking the openings will lead to overheating, thereby damaging the Single Mode Side Channel Laser Source.

Figure 8 **Airflow through the Single Mode Side Channel Laser Source**

Help and Troubleshooting

Still have questions?

Visit the Keysight Support portal at https://support.keysight.com.

Technical Specifications

Operational conditions

- Room temperature 20 - 30 °C, (68 – 86 °F), preferred

Power supply input

- 12 V DC, max 2.5 A

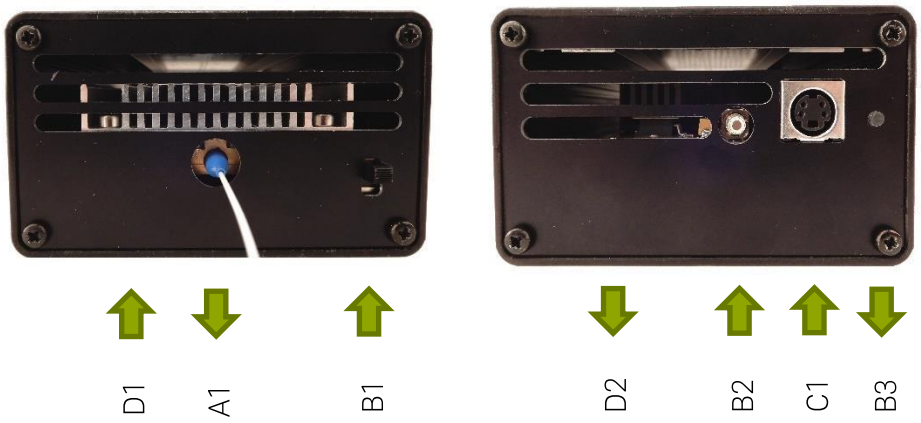
Laser

- Diode laser Class-4
- Wavelength 1310 nm, 130 mW, single mode
- Wavelength 1425 nm, 500 mW, single mode
- Activation duration, continuous wave
- Laser activation, 3.3V
- Fiber, FC/APC connector

Product dimensions

- Length x Width x Height: 200 x 95 x 56 [mm], 7.8 x 3.7 x 2.2 [inch]

Connectors



Port	Label	Description
A1	-	Laser light fiber output
B1	Power out	Sets the power output to 50% or 100% power out Switch in down position = 100% power out Switch in upper position = 50% power out
B2	Operate laser	SMB. Analog input 0.0 – 3.3 V 1kΩ Laser power control: 0.0V = off, 3.3V = on
B3	Optimal operating temp.	LED indicator for TEC temperature Continuous illuminated LED = TEC temperature is optimal Blinking LED = TEC temperature is not yet set (Continuous illuminated LED is only when Single Mode Side Channel Laser Source is active)
C1	Interlock	12 V DC Power supply connection from Laser Fault Injection Safety Box PSU
D1	-	Airflow intake
D2	-	Airflow exhaust

Safety Instructions

Laser safety

The Single Mode Side Channel Laser Source is power compatible with a Class 4 laser product as defined in international Standard IEC 60825-1.

The operator of the Single Mode Side Channel Laser Source should observe the general precautions:

WARNING Do not attempt to use the laser sources outside the Laser Fault Injection Safety Box.

WARNING Do not disassemble the laser source or the Laser Fault Injection Safety Box while the Laser Fault Injection Safety Box is connected to a power supply

WARNING Do not attempt to disable the door interlocks of the Laser Fault Injection Safety Box.

WARNING Only operate the laser when the Single Mode Side Channel Laser Source is mounted on the microscope together with the camera, light guide, and objectives

CAUTION Use of controls or adjustments or performance of procedures other than those specified may result in hazardous laser radiation exposure.

Recommendations for safe use of lasers

The standard reference for laser safety is the American Standard for the Safe Use of Lasers, Z136.1-2000, developed by the American National Standards Institute (ANSI). This reference is the basis for many of the federal regulations for laser and laser system manufacturers, and for the Occupational Safety and

Health Administration (OSHA) laser safety guidelines. It contains detailed information concerning proper installation and use of laser systems.

While the ANSI standard itself does not have the force of law, its recommendations, including warning signage, training, and the designation of a laser safety officer, may be compulsory under local workplace regulations when operating laser systems above Class I. It is the operator's responsibility to ensure that the installation and operation of the laser source with safety box is performed in accordance with all applicable laws.

Copies of ANSI Standard Z136.1-2000 are available from:

Laser Institute of America
12424 Research Parkway, Suite 125
Orlando, FL 32826
(407) 380-1553

The safety features of the Laser Fault Injection Safety Box are described in section Safety Features and Regulatory Compliance.

Electrical safety

The safety box is powered by a 12V power supply unit. The AC input to the 12V power supply unit is potentially lethal and is fully contained with the power supply unit.

WARNING Do not open the 12 V power supply unit while the unit is plugged in. Opening the power supply unit may expose the operator to the unit's AC input power.

WARNING Do not open the Single Mode Side Channel Laser Source while the laser source is plugged in. Opening the Single Mode Side Channel Laser Source may expose the operator to the internal voltage driving the laser diode.

WARNING Do not open the Single Mode Side Channel Laser Source while the Single Mode Side Channel Laser Source is connected via the interlock plug to the safety box. Opening the Single Mode Side Channel Laser

Source may expose the operator to the internal voltage driving the laser diode.

WARNING Do not make or break any electrical connections to the system while the unit is switched on.

Fire safety

High power laser systems represent a fire hazard in combination with light absorbing surfaces and flammable or ignitable materials.

WARNING Do not use any flammable or combustible materials, explosives, or volatile solvents such as acetone, alcohol, or gasoline inside the Laser Fault Injection Safety Box.

WARNING Always keep a properly maintained and inspected fire extinguisher at hand.

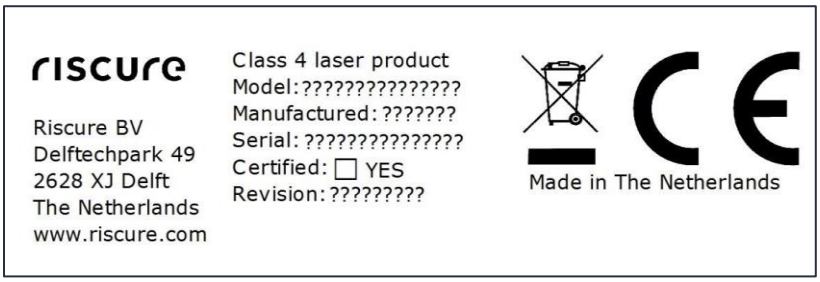
Safety features and regulatory compliance

Keysight has incorporated specific safety features into the Single Mode Side Channel Laser Source to meet the requirements of 21 CFR 1040 and the International Standard IEC 60825-1.

These safety features included in 21 CFR 1040 and IEC 60825-1 require that certification, identification, and warning labels be placed on laser products.

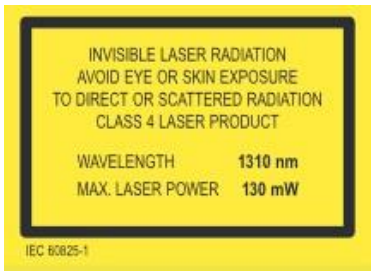
Reproductions of labels on the Single Mode Side Channel Laser Sources and Laser Fault Injection Safety Box follow, with their locations specified:

1. Certification/identification label:
   This label is located on the backside of the Laser Fault Injection Safety Box.



2. Warning label:
   This label is located on the front of the Single Mode Side Channel Laser Source.

3. Explanatory labels:
   These labels identify the classification of the Single Mode Side Channel Laser Source in accordance with IEC 60825-1. The labels are located on the side of the Single Mode Side Channel Laser Source:



Interlocked protective housing safety label:
This label is located on the door of the Laser Fault Injection Safety Box.

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