
Alphion®

# Semiconductor Optical Amplifier Application Catalog

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# Photonic Devices...Powered by QLight®

Based on our proprietary QLight® technology platform, Alphion's photonic device product family delivers best-in-classs performance for a broad spectrum of markets...fiber optic sensing, medical & industrial imaging, test & measurement, telecommunication networks, Fiber-to-the-Premises (FTTP), CATV, and defense systems.

The QLight® platform is based on chip-level optimization and integration of Semiconductor Optical Amplifier (SOA) structures and robust optoelectronic packaging.

QLight® supports the design and production of a wide variety of both discrete and integrated devices that can be used as amplifiers, broad band ASE source, high extinction gates, nanosecond optical switches, wavelength conversion, and photonic regeneration.

QLight® offers the flexibility of up to 6 fibers per package, allows the integration of passive and active elements on a single Photonic Integrated Circuit (PIC), and supports wavelength options from 1000 nm to 1600 nm.

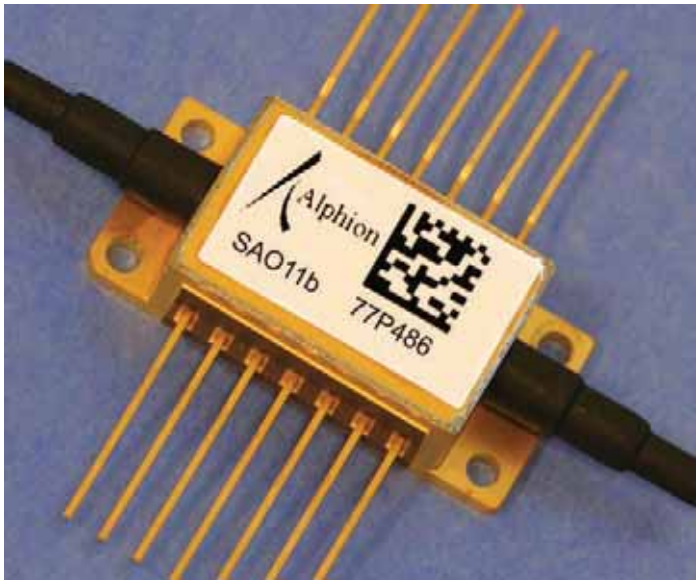
The Photonic Device Business Unit has a Quality Management System in place that meets the high standards demanded by the International Organization for Standards (ISO). The ISO 9001:2000 certification is a key foundation in the continual growth, improvement and development of the company, and demonstrates Alphion's commitment to quality and customer satisfaction.

# Booster Amplifier

Models SAO11b, SAC11b

## Features

- Wide optical bandwidth
- O-Band and C-Band versions
- Supports rates up to 160 Gb/s
- High output power
- 14-Pin MSA package




## Applications

- Booster Amplifier
- Telecom and datacom
- Loss compensation
- 40G and 100G amplifiers

## Description

The QLight® SAO11b and SAC11b are semiconductor optical amplifiers (SOA) for use as booster amplifiers. They significantly increase output power and are suitable for fixed and tunable ITU transmitters and transponders. They are based on the Alphion proprietary QLight technology platform for the manufacturing of advanced discrete photonic devices.

The amplifiers are available in a MSA compliant, 14-pin butterfly package, based on the Alphion standard packaging platform. The use of a laser-welded, hermetic, organics-free package ensures highly reliable operation. The package incorporates both a thermistor and a thermo-electric cooler to provide stable operation of the SOA over the full operating temperature range.

Alphion offers a broad range of SOAs supporting wavelengths from 1000 nm to 1600 nm, with gain options from 5 to 30 dB and we can optimize parameters to meet your specific application needs.


# Booster Amplifier Specifications

## Absolute Maximum Ratings*

| Parameter | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|
| Operating Temperature | $T_{case}$ | 0 | | 70 | ˚C | Case Temperature |
| Storage Temperature | $T_{store}$ | -40 | | 85 | ˚C | |
| Operating Bias Current | $I_f$ | | | 450 | mA | |
| Optical Amplifier Reverse Bias | $V_{rev}$ | | | 2 | V | |
| Thermistor Current | $I_{therm}$ | | | 5 | mA | |
| TEC Current | $I_{TEC}$ | | | 1.8 | A | |
| TEC Voltage | $V_{TEC}$ | | | 3.4 | V | |

* Stresses in excess of the Absolute Maximum Ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational section of the datasheet. Exposure to Absolute Maximum Ratings for extended periods can adversely affect the device reliability.

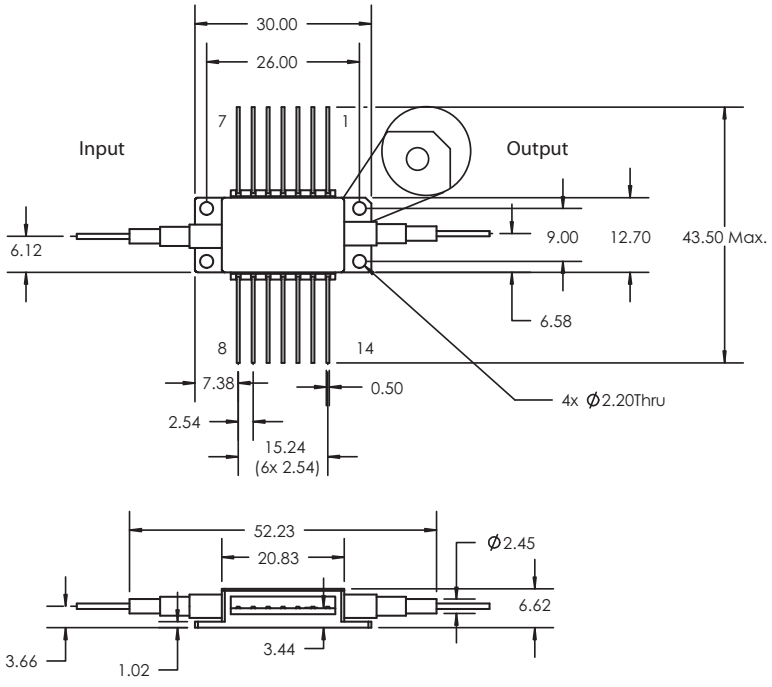
## Operating Specifications*

| | | SAO11b | | | SAC11b | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | Symbol | Min | Typ | Max | Min | Typ | Max | Unit | Note |
| Operating Wavelength | λ | 1290 | | 1330 | 1530 | | 1570 | nm | |
| Peak Gain | $G_{pk}$ | 9.5 | | | 9.5 | | | dB | |
| Gain Ripple | GR | | 0.2 | | | 0.2 | | dB | |
| Saturation Output Power | $P_{3dB}$ | 11 | | | 12 | | | dBm | 3.0 dB gain compression |
| Forward Voltage | $V_f$ | | 2 | | | 2 | | V | |
| Operating Bias Current | $I_{op}$ | | 300 | | | 300 | | mA | |
| Thermistor Resistance | $R_{therm}$ | | 10 | | | 10 | | kΩ | At 25˚C |
| Total Power Consumption | P | | | 4 | | | 4 | W | $T_{case}$ = 70˚C, By design |

*Specifications are subject to change without notice.*

| Pin Assignments | | | |
|---|---|---|---|
| 1 | TEC (+) | 14 | TEC (-) |
| 2 | Thermistor | 13 | NC |
| 3 | NC | 12 | NC |
| 4 | NC | 11 | Chip (-) |
| 5 | Thermistor | 10 | Chip (+) |
| 6 | NC | 9 | NC |
| 7 | NC | 8 | NC |

*Note: Pin #1 is marked by a bevel (notch) at the base of the housing

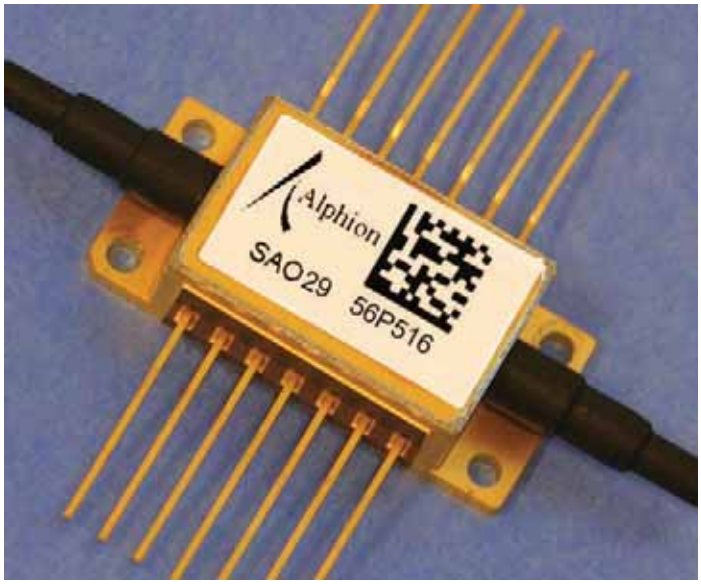


# PON Amplifier

Models SAO29p, SAS26p

## Features

- 1310 nm upstream: SAO29p
- 1490 nm downstream: SAS26p
- Low polarization dependence
- High output power
- 14-Pin MSA package




## Applications

- GPON, EPON, and BPON systems
- Mid span amplifier
  - 26 dB gain downstream
  - 29 dB gain upstream
  - Extend reach to 60 km
  - Supports up to 128 ONTs

## Description

The QLight® SAO29p and SAS26p are semiconductor optical amplifiers (SOA) designed for use in PON access networks. They are based on the Alphion proprietary QLight® technology platform for the manufactur of advanced discrete photonic devices.

The amplifiers regenerate signals using all-opical amplification, and are transparent to both data rate and protocol. This allows them to support legacy (BPON, GE-PON and GPON) and future FTTx standards, making them interoperable with a broad range of OEM PON equipment. Based on Alphion proprietary QLight® technology, they amplify signals at 1310 nm and 1490 nm, wavelengths not accessible with commercial fiber-amplifier (EDFA) technology. The fast-response-time of QLight® technology allows the SAO29p and SAS26p to accommodate both continuous (downstream) and bursty (upstream) traffic.

The amplifiers are available in a MSA compliant, 14-pin butterfly package, based on the Alphion standard packaging platform. Alphion offers a broad range of SOAs supporting wavelengths from 1000 nm to 1600 nm, with gain options from 5 to 30 dB and we can optimize parameters to meet your specific application needs.

# PON Amplifier Specifications

## Absolute Maximum Ratings*

| Parameter | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|
| Operating Temperature | $T_{case}$ | 0 | | 70 | ˚C | Case Temperature |
| Storage Temperature | $T_{store}$ | -40 | | 85 | ˚C | |
| Operating Bias Current | $I_f$ | | | 500 | mA | |
| Optical Amplifier Reverse Bias | $V_{rev}$ | | | 2 | V | |
| Thermistor Current | $I_{therm}$ | | | 5 | mA | |
| TEC Current | $I_{TEC}$ | | | 1.8 | A | |
| TEC Voltage | $V_{TEC}$ | | | 3.4 | V | |

* Stresses in excess of the Absolute Maximum Ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational section of the datasheet. Exposure to Absolute Maximum Ratings for extended periods can adversely affect the device reliability

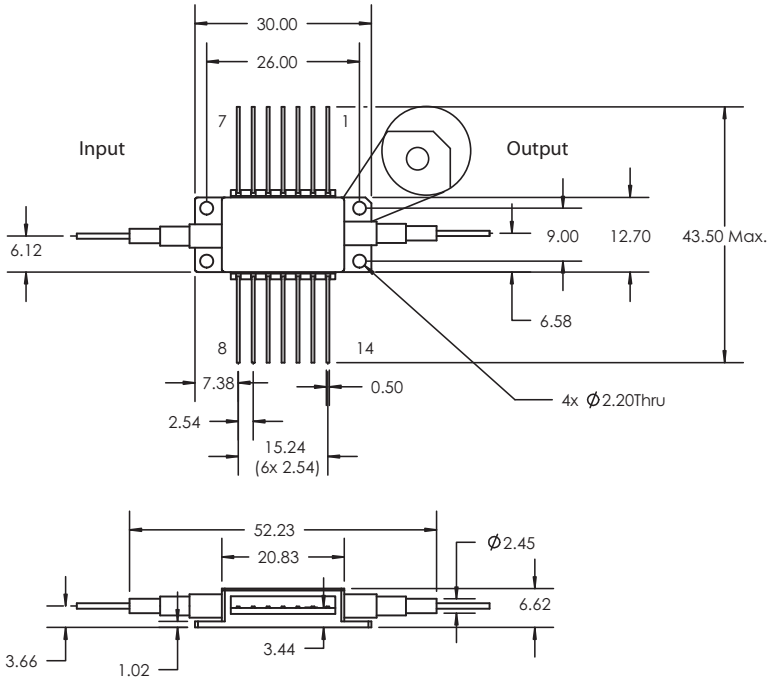
## Operating Specifications*

| | | SAO29p | | | SAS26p | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | Symbol | Min | Typ | Max | Min | Typ | Max | Unit | Note |
| Operating Wavelength | $\lambda$ | 1290 | 1310 | 1330 | 1480 | 1490 | 1510 | nm | |
| Peak Gain | $G_{pk}$ | | 29 | | | 26 | | dB | |
| Noise Figure | NF | | | 7.5 | | | 8.0 | dB | Max gain pol., -20 dBm input power |
| Polarization Dependent Gain | PDG | | | 1.9 | | | 1.5 | dB | |
| Saturation Output Power | $P_{3dB}$ | 9 | | | 9 | | | dBm | 3.0 dB gain compression |
| Forward Voltage | $V_f$ | | 2 | | | 2 | | V | |
| Operating Bias Current | $I_{op}$ | | 420 | | | 390 | | mA | |
| Thermistor Resistance | $R_{therm}$ | | 10 | | | 10 | | kΩ | At 25˚C |
| Total Power Consumption | P | | | 4 | | | 4 | W | $T_{case}$ = 70˚C, By design |

*Specifications are subject to change without notice.*

| Pin Assignments | | | |
|---|---|---|---|
| 1 | TEC (+) | 14 | TEC (-) |
| 2 | Thermistor | 13 | NC |
| 3 | NC | 12 | NC |
| 4 | NC | 11 | Chip (-) |
| 5 | Thermistor | 10 | Chip (+) |
| 6 | NC | 9 | NC |
| 7 | NC | 8 | NC |

*Note: Pin #1 is marked by a bevel (notch) at the base of the housing

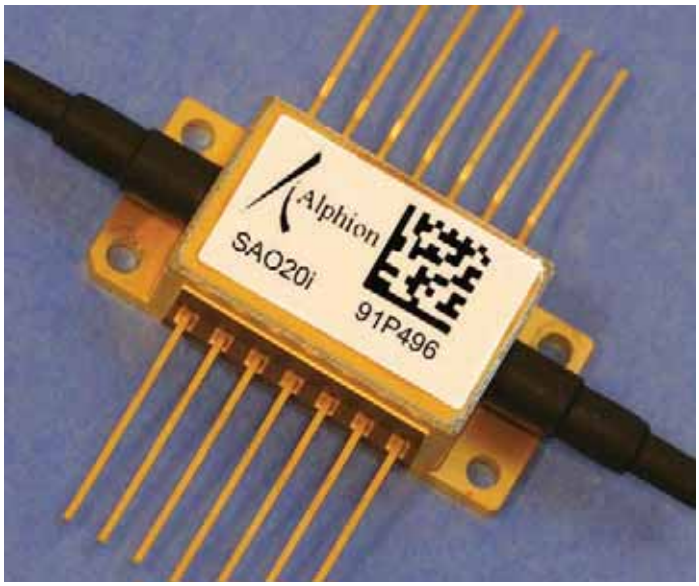


# Pre-Amplifiers / In-Line Amplifiers

Models SAO20i, SAC20i

## Features

- Wide optical bandwidth
- O-Band and C-Band versions
- Supports rates up to 160 Gb/s
- Low polarization dependence
- Low Noise Figure
- 14-Pin MSA package




## Applications

- Receiver pre-amplifier
- In-line amplifier
- Loss compensation
- 40G and 100G amplifiers

## Description

The QLight® SAO20i and SAC20i are semiconductor optical amplifiers (SOA) suitable for use in 40G and 100G transponder applications. They significantly improve the sensitivity of PIN based receivers greatly improving network performance. They are based on the Alphion proprietary QLight technology platform for the manufacturing of advanced discrete photonics and photonic integrated circuits (PICs).

The amplifiers are available in a MSA compliant, 14-pin butterfly package, based on the Alphion standard packaging platform. The use of a laser-welded, hermetic, organics-free package ensures highly reliable operation. The package incorporates both a thermistor and a thermo-electric cooler to provide stable operation of the SOA over the full operating temperature range.

Alphion offers a broad range of SOAs supporting wavelengths from 1000 nm to 1600 nm, with gain options from 5 to 30 dB and we can optimize parameters to meet your specific application needs.

# Pre-Amplifier / In-Line Amplifier Specifications

## Absolute Maximum Ratings*

| Parameter | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|
| Operating Temperature | $T_{case}$ | 0 | | 70 | ˚C | Case Temperature |
| Storage Temperature | $T_{store}$ | -40 | | 85 | ˚C | |
| Operating Bias Current | $I_f$ | | | 450 | mA | |
| Optical Amplifier Reverse Bias | $V_{rev}$ | | | 2 | V | |
| Thermistor Current | $I_{therm}$ | | | 5 | mA | |
| TEC Current | $I_{TEC}$ | | | 1.8 | A | |
| TEC Voltage | $V_{TEC}$ | | | 3.4 | V | |

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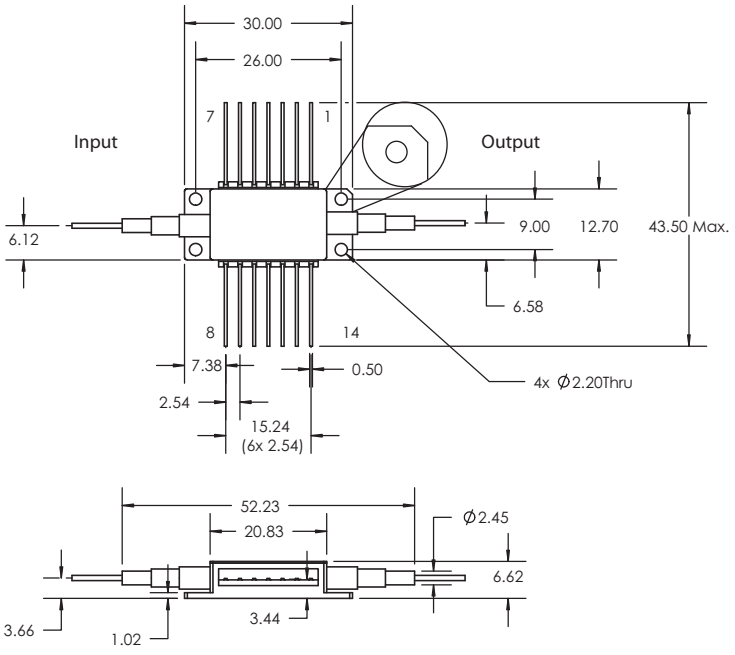
## Operating Specifications*

| | | SAO20i | | | SAC20i | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | Symbol | Min | Typ | Max | Min | Typ | Max | Unit | Note |
| Operating Wavelength | λ | 1290 | | 1330 | 1530 | | 1570 | nm | |
| Peak Gain | $G_{pk}$ | 18.5 | | | 18.5 | | | dB | |
| Gain Ripple | GR | | 0.2 | | | 0.2 | | dB | |
| Noise Figure | NF | | | 7.5 | | | 7.5 | dB | Max gain pol., -20 dBm input power |
| Polarization Dependent Gain | PDG | | | 1.5 | | | 1.5 | dB | |
| Saturation Output Power | $P_{3dB}$ | 8 | | | 8 | | | dBm | 3.0 dB gain compression |
| Forward Voltage | $V_f$ | | 2 | | | 2 | | V | |
| Operating Bias Current | $I_{op}$ | | 300 | | | 300 | | mA | |
| Thermistor Resistance | $R_{therm}$ | | 10 | | | 10 | | k Ω | At 25˚C |
| Total Power Consumption | P | | | 4 | | | 4 | W | $T_{case}$ = 70˚C, By design |

*Specifications are subject to change without notice.*

| Pin Assignments | | | |
|---|---|---|---|
| 1 | TEC (+) | 14 | TEC (-) |
| 2 | Thermistor | 13 | NC |
| 3 | NC | 12 | NC |
| 4 | NC | 11 | Chip (-) |
| 5 | Thermistor | 10 | Chip (+) |
| 6 | NC | 9 | NC |
| 7 | NC | 8 | NC |

*Note: Pin #1 is marked by a bevel (notch) at the base of the housing

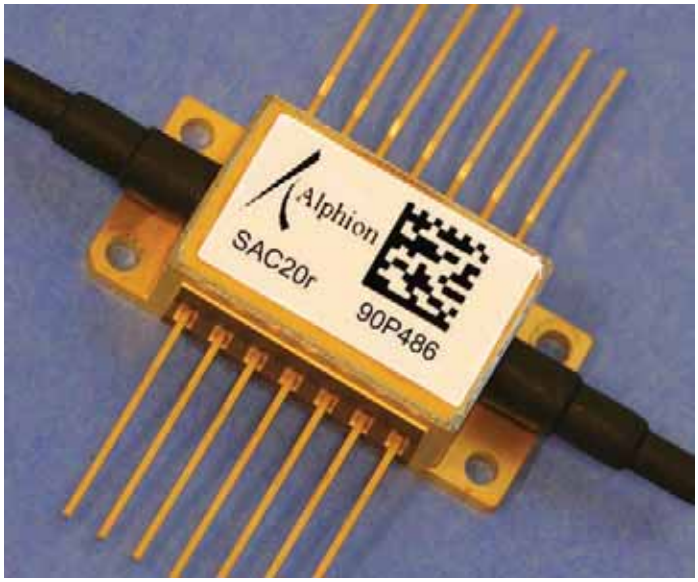


# Swept Source

Models SAX20r, SAO20r, SAC20r

## Features

- Wide bandwidth operation
- X-Band: 40 nm
- O-Band: 100 nm
- C-Band: 150 nm
- Low polarization dependence
- 14-Pin MSA package




## Applications

- Medical imaging
- ASE source
- Fiber optic sensing
- Gain medium for swept sources

## Description

The QLight® SAX20r, SAO20r, SAC20r are semiconductor optical amplifiers (SOA) suitable for use as gain elements in swept sources and as ASE sources. They are used in a broad spectrum of applications including fiber optic sensing, medical imaging and test & measurement. They are based on the Alphion proprietary QLight technology platform for the manufacturing of advanced discrete photonic devices.

The amplifiers are available in a MSA compliant, 14-pin butterfly package, based on the Alphion standard packaging platform. The use of a laser-welded, hermetic, organics-free package ensures highly reliable operation. The package incorporates both a thermistor and a thermo-electric cooler to provide stable operation of the SOA over the full operating temperature range.

Alphion offers a broad range of SOAs supporting wavelengths from 1000 nm to 1600 nm, with gain options from 5 to 30 dB and we can optimize parameters to meet your specific application needs.

# Swept Source Specifications

## Absolute Maximum Ratings*

| Parameter | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|
| Operating Temperature | $T_{case}$ | 0 | | 70 | ˚C | Case Temperature |
| Storage Temperature | $T_{store}$ | -40 | | 85 | ˚C | |
| Operating Bias Current | $I_f$ | | | 450 | mA | |
| Optical Amplifier Reverse Bias | $V_{rev}$ | | | 2 | V | |
| Thermistor Current | $I_{therm}$ | | | 5 | mA | |
| TEC Current | $I_{TEC}$ | | | 1.8 | A | |
| TEC Voltage | $V_{TEC}$ | | | 3.4 | V | |

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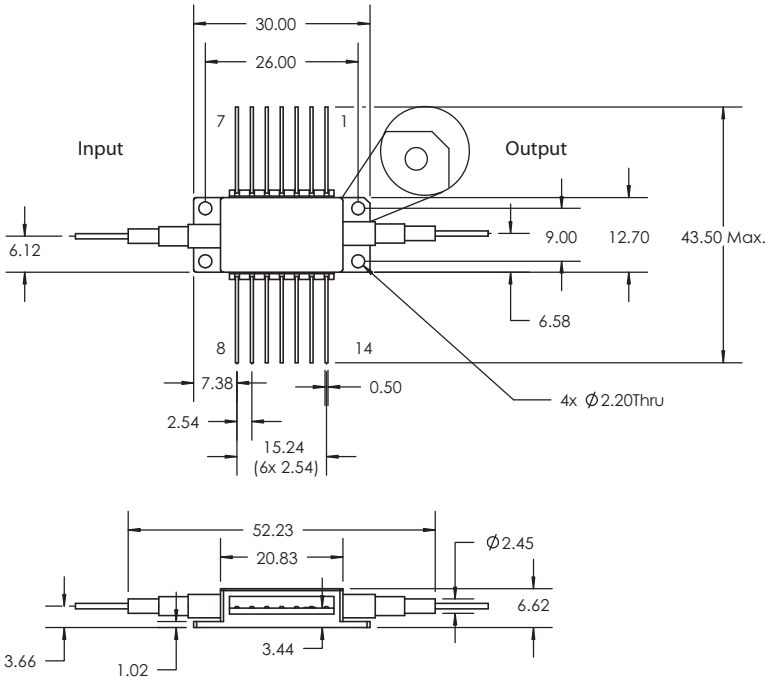
## Operating Specifications*

| | | SAX20r | | | SAO20r | | | SAC20r | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Symbol | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | Unit | Note |
| Operating Wavelength | λ | 1040 | | 1080 | 1250 | | 1350 | 1450 | | 1600 | nm | |
| Peak Gain | $G_{pk}$ | 19 | | | 19 | | | 19 | | | dB | |
| Gain Ripple | GR | | | 2 | | | 2 | | | 2 | dB | |
| Polarization Dependent Gain | PDG | | – | | | | 2 | | | 2 | dB | Gain peak ± 10 nm |
| Saturation Output Power | $P_{SAT}$ | 7 | | | 7 | | | 7 | | | dBm | 3.0 dB gain compression |
| Forward Voltage | $V_f$ | | 2 | | | 2 | | | 2 | | V | |
| Operating Bias Current | $I_{op}$ | | 300 | | | 300 | | | 300 | | mA | |
| Thermistor Resistance | $R_{therm}$ | | 10 | | | 10 | | | 10 | | kΩ | At 25˚C |
| Total Power Consumption | P | | | 4 | | | 4 | | | 4 | W | $T_{case}$ = 70˚C, By design |

*Specifications are subject to change without notice.*

| Pin Assignments | | | |
|---|---|---|---|
| 1 | TEC (+) | 14 | TEC (-) |
| 2 | Thermistor | 13 | NC |
| 3 | NC | 12 | NC |
| 4 | NC | 11 | Chip (-) |
| 5 | Thermistor | 10 | Chip (+) |
| 6 | NC | 9 | NC |
| 7 | NC | 8 | NC |

*Note: Pin #1 is marked by a bevel (notch) at the base of the housing



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