

## **Optical Amplifiers Selection Guide**

Finisar offers a wide selection of optical amplifiers, ranging in optical and electrical specification parameters, and in a variety of form factors and communications interfaces.

This selection guide seeks to help end-users to identify the amplifier(s) that best suit their application needs by providing an “at a glance” comparison of the specification parameters.

The part numbers referenced in the following tables represent a small portion of the full capabilities and offerings of our optical amplifier families. These tables include only the products that are available for purchase by any customer. Customized solutions for special applications are available upon

II. Ultraspan® EDFAs

Finisar’s UltraSpan® family of optical amplifiers offers the power of optical amplification in a user-friendly, network-interfaced, rack-mountable platform. They are ideal for field deployment and integration in new or existing network elements. Ultraspan amplifiers can provide stand-alone amplification or work in conjunction with existing systems, complementing or enhancing their performance capabilities.



1RU EDFA Platform

| Parameter                           | P/N➔  | FOA-M2200PB-EFG1C-AA015  |          | FOA-R2100PB-EPB2C-AA010            |          | FOA-M2000PB-EFG2C-AA066  |          | FOA-M2000PB-EFG2C-AA067  |         | FOA-M2000PB-EFG1C-AA069  |          | FOA-M1000PB-EFG2C-AA028                             |          |                      |      |
|-------------------------------------|-------|--------------------------|----------|------------------------------------|----------|--------------------------|----------|--------------------------|---------|--------------------------|----------|-----------------------------------------------------|----------|----------------------|------|
|                                     | Unit  | Specification            |          | Specification                      |          | Specification            |          | Specification            |         | Specification            |          | Booster Specification                               |          | Preamp Specification |      |
|                                     |       | Min                      | Max      | Min                                | Max      | Min                      | Max      | Min                      | Max     | Min                      | Max      | Min                                                 | Max      | Min                  | Max  |
| Form Factor                         | mm    | 1RU Rack Mount           |          | 1RU Rack Mount                     |          | 1RU Rack Mount           |          | 1RU Rack Mount           |         | 1RU Rack Mount           |          | 1RU Rack Mount                                      |          |                      |      |
|                                     |       | 442x240x43.6             |          | 442x240x43.6                       |          | 442x240x43.6             |          | 442x240x43.6             |         | 442x240x43.6             |          | 442x240x43.6                                        |          |                      |      |
| Amplifier Type                      | -     | WDM FGA                  |          | WDM FGA PowerBooster with OSC EDFA |          | Dual WDM FGA EDFAs       |          | WDM FGA EDFA             |         | WDM FGA                  |          | Dual EDFAs with integrated DCM optimized for ITU 28 |          |                      |      |
| Operating Wavelength Range          | nm    | 1529.1                   | 1564.2   | 1529.1                             | 1530     | 1528.77                  | 1564     | 1528.77                  | 1564    | 1529.1                   | 1564.2   | 1554.94 (ITU-T 28)                                  |          |                      |      |
| Input Power Range                   | dBm   | -15                      | 12       | -5                                 | -35      | -35                      | -3       | -35                      | 3       | -15                      | 12       | -26                                                 | 11       | -45                  | -15  |
| Output Power Range                  | dBm   | -2                       | 18       | 5                                  | -8       | -8                       | 20       | -8                       | 20      | -2                       | 18       | -2                                                  | 22       | -20                  | 0    |
| Saturated Output Power              | dBm   | 17                       |          | 25.5                               |          | 20                       |          | 20                       |         | 17                       |          | 20.8                                                |          |                      |      |
| Settable Gain Range                 | dB    | 5                        | 18       | 5.5                                | 6.5      | 11                       | 24       | 11                       | 24      | 5                        | 18       | 10                                                  | 25       | 5                    | 25   |
| Optimal Flat Gain                   | dB    | 17                       |          | 6                                  |          | 23                       |          | 23                       |         | 17                       |          | 20                                                  |          | 20                   |      |
| Gain/Power Setting Accuracy         | dB    | -0.5                     | 0.5      |                                    |          | -0.25                    | 0.25     | -0.25                    | 0.25    | -0.5                     | 0.5      | -0.25                                               | 0.25     | -0.25                | 0.25 |
| Gain Flatness vs. Wavelength        | dB    |                          | ±0.6     |                                    |          |                          | ±0.6     |                          | ±0.6    |                          | ±0.6     | N/A                                                 |          |                      |      |
| Dynamic gain tilt                   | dB/dB |                          | 0.85     | N/A                                |          |                          | 0.9      |                          | 0.9     |                          | 0.85     | N/A                                                 |          |                      |      |
| Gain / Power Stability              | dB    |                          | ±0.1     |                                    | ±0.1     |                          | ±0.1     |                          | ±0.1    |                          | ±0.1     |                                                     | ±0.1     |                      | ±0.1 |
| Noise Figure (at OFG or equivalent) | dB    |                          | 6.5      |                                    |          |                          | 6        |                          | 6       |                          | 6.5      |                                                     | 7        |                      | 5    |
| Return loss                         | dB    | 40                       |          | 40                                 |          | 40                       |          | 40                       |         | 40                       |          | 40                                                  |          | 40                   |      |
| PDG                                 | dB    |                          | 0.3      |                                    | 0.3      |                          | 0.3      |                          | 0.3     |                          | 0.3      |                                                     | 0.3      |                      | 0.3  |
| PMD                                 | ps    |                          | 0.3      |                                    | 0.3      |                          | 0.3      |                          | 0.3     |                          | 0.3      |                                                     | 0.3      |                      | 0.3  |
| Multi-Path Interference             | dB    |                          | -40      |                                    | -40      |                          | -40      |                          | -40     |                          | -40      |                                                     | -40      |                      | -40  |
| Laser Safety Classification         | -     | Class 1M                 |          | Class 1M with APR                  |          | Class 1M                 |          | Class 1M                 |         | Class 1M                 |          | Class 1M                                            |          |                      |      |
| Optical Connectors                  | -     | 2: In, Out               |          | 3: In, Out, Monitor Out            |          | 4: In1, Out1, In2, Out2  |          | 2: In, Out               |         | 2: In, Out               |          | 6: In1, Out1, In2, Out2, DCM IN, DCM OUT            |          |                      |      |
| Operating Modes                     | -     | AGC, APC, Manual         |          | APC, Manual                        |          | AGC, APC, Manual         |          | AGC, APC, Manual         |         | AGC, APC, Manual         |          | AGC, APC, Manual                                    |          |                      |      |
| Power Supply Voltage                | V     | 110 (AC)                 | 240 (AC) | -76 (DC)                           | -36 (DC) | -76 (DC)                 | -36 (DC) | 110(AC)                  | 240(AC) | -76 (DC)                 | -36 (DC) | -76 (DC)                                            | -36 (DC) |                      |      |
| Power Consumption                   | W     |                          | 40       |                                    |          |                          |          |                          | 40      |                          | 40       |                                                     | 50       |                      |      |
| Operating Case Temperature          | °C    | -5                       | 55       | -5                                 | 55       | -5                       | 55       | -5                       | 55      | -5                       | 55       | -5                                                  | 55       |                      |      |
| Interface                           | -     | Ethernet and             |          | Ethernet and                       |          | Ethernet and             |          | Ethernet and             |         | Ethernet and             |          | Ethernet and                                        |          |                      |      |
|                                     |       | RS-2132                  |          | RS-2132                            |          | RS-2132                  |          | RS-2132                  |         | RS-2132                  |          | RS-2132                                             |          |                      |      |
| Communications Protocol             | -     | SNMP v2 or web-based GUI |          | SNMP v2 or web-based GUI           |          | SNMP v2 or web-based GUI |          | SNMP v2 or web-based GUI |         | SNMP v2 or web-based GUI |          | SNMP v2 or web-based GUI                            |          |                      |      |
| Ethernet cable P/N                  | -     | 18-10-0138R              |          | 18-10-0138R                        |          | 18-10-0138R              |          | 18-10-0138R              |         | 18-10-0138R              |          | 18-10-0138R                                         |          |                      |      |
| Power Cable P/N                     | -     | 1133098 (US AC)          |          | 18-10-0089R                        |          | 18-10-0089R              |          | 18-10-0089R              |         | 18-10-0089R              |          | 18-10-0089R                                         |          |                      |      |
|                                     |       | 1133099 (EU AC)          |          |                                    |          |                          |          |                          |         |                          |          |                                                     |          |                      |      |
| 19” Brackets Kit P/N                | -     | 50-60-0102-01R           |          | 50-60-0102-01R                     |          | 50-60-0102-01R           |          | 50-60-0102-01R           |         | 50-60-0102-01R           |          | 50-60-0102-01R                                      |          |                      |      |
| 21” Brackets Kit P/N                | -     | 50-60-0103-01R           |          | 50-60-0103-01R                     |          | 50-60-0103-01R           |          | 50-60-0103-01R           |         | 50-60-0103-01R           |          | 50-60-0103-01R                                      |          |                      |      |
| 23” Brackets Kit P/N                | -     | 50-60-0104-01R           |          | 50-60-0104-01R                     |          | 50-60-0104-01R           |          | 50-60-0104-01R           |         | 50-60-0104-01R           |          | 50-60-0104-01R                                      |          |                      |      |
| ETSI Brackets Kit P/N               | -     | 50-60-0105-01R           |          | 50-60-0105-01R                     |          | 50-60-0105-01R           |          | 50-60-0105-01R           |         | 50-60-0105-01R           |          | 50-60-0105-01R                                      |          |                      |      |

III. Ultraspan Raman and ROPA

Finisar’s Ultraspan® family of Raman and ROPA optical amplifiers offer the power of optical amplification in a user-friendly, network-interfaced, rack-mountable platform ideal for field deployment and integration in new or existing network elements. Ultraspan amplifiers can provide stand-alone amplification or work in conjunction with existing systems, complementing or enhancing their performance capabilities.

| Parameter                            | P/N➔  | FOA-R9100PR-RBW2C-AA003             |          | FOA-R9100PR-RBW3C-AA004             |          | FOA-R9200PR-RFW3C-AA037        |          |
|--------------------------------------|-------|-------------------------------------|----------|-------------------------------------|----------|--------------------------------|----------|
|                                      | Unit  | Specification                       |          | Specification                       |          | Specification                  |          |
|                                      |       | Min                                 | Max      | Min                                 | Max      | Min                            | Max      |
| Form Factor                          | mm    | 1RU Rack Mount                      |          | 1RU Rack Mount                      |          | 1RU Rack Mount                 |          |
|                                      |       | 442x240x43.6                        |          | 442x240x43.6                        |          | 442x240x43.6                   |          |
| Amplifier Type                       | -     | Counter-Propagating Raman Amplifier |          | Counter-Propagating Raman Amplifier |          | Co-Propagating Raman Amplifier |          |
| Operating Wavelength Range           | nm    | 1528                                | 1567     | 1529                                | 1564     | 1529.2                         | 1564.2   |
| Total Pump Power                     | mW    | 450                                 | 490      | 680                                 | 710      | 680                            | 710      |
| Input Signal Power Range (pumps off) | dBm   | -45                                 | -10      | -44                                 | 5        | -10                            | 26       |
| Signal Insertion Loss                | dB    |                                     | 1.6      |                                     | 1.8      |                                | 1.8      |
| Nominal Gain for G.652               | dB    |                                     | 10       |                                     | 14.5     |                                | 9        |
| Nominal Gain for Leaf                | dB    |                                     | 13       |                                     | 17.5     |                                | 10       |
| Nominal Gain for TrueWave            | dB    |                                     | 15       |                                     | 20       |                                | 11.5     |
| Nominal Gain for TeraLight           | dB    |                                     | 14       |                                     | 19       |                                | N/A      |
| Spectral Gain Flatness               | dB    |                                     | 1        |                                     | 1.2      |                                | 1.2      |
| Effective Noise Figure               | dB    |                                     | -1       |                                     | -0.5     |                                | N/A      |
| OSC Wavelength Range                 | nm    | 1500                                | 1520     | 1500                                | 1520     | 1500                           | 1520     |
| Raman Gain at OSC Wavelength         | dB    | 5                                   |          | 10                                  |          | 6                              |          |
| OSC Insertion Loss                   | dB    |                                     | 2.5      |                                     | 1.8      |                                | 1.8      |
| Return loss                          | dB    | 40                                  |          | 40                                  |          | 40                             |          |
| PDL                                  | dB    |                                     | 0.15     |                                     | 0.15     |                                | 0.15     |
| PDG                                  | dB    |                                     | 0.6      |                                     | 0.2      |                                | 0.2      |
| PMD                                  | ps    |                                     | 0.2      |                                     | 0.2      |                                | 0.2      |
| RIN (any pump)                       | dB/Hz |                                     | -110     |                                     | -110     |                                | -115     |
| Laser Safety Classification          | -     | Class 1M                            |          | Class 1M with APR                   |          | Class 1M with APR              |          |
| Optical Connectors                   | -     | 4: In, Out, Monitor in, Monitor Out |          | 3: In, Out, Monitor Out             |          | 3: In, Out, Input Monitor      |          |
| Operating Modes                      | -     | AGC, Manual                         |          | AGC, Manual                         |          | AGC, Manual                    |          |
| Power Supply Voltage                 | V     | -76 (DC)                            | -36 (DC) | -76 (DC)                            | -36 (DC) | -76 (DC)                       | -36 (DC) |
| Power Consumption                    | W     |                                     | 55       |                                     | 55       |                                | 55       |
| Operating Case Temperature           | °C    | -5                                  | 55       | -5                                  | 55       | -5                             | 55       |
| Interface                            | -     | Ethernet and                        |          | Ethernet and                        |          | Ethernet and                   |          |
|                                      |       | RS-2132                             |          | RS-2132                             |          | RS-2132                        |          |
| Communications Protocol              | -     | SNMP v2 or web-based GUI            |          | SNMP v2 or web-based GUI            |          | SNMP v2 or web-based GUI       |          |
| Ethernet cable P/N                   | -     | 18-10-0138R                         |          | 18-10-0138R                         |          | 18-10-0138R                    |          |
| Power Cable P/N                      | -     | 18-10-0048R                         |          | 18-10-0048R                         |          | 18-10-0089R                    |          |
| 19" Brackets Kit P/N                 | -     | 50-60-0102-01R                      |          | 50-60-0102-01R                      |          | 50-60-0102-01R                 |          |
| 21" Brackets Kit P/N                 | -     | 50-60-0103-01R                      |          | 50-60-0103-01R                      |          | 50-60-0103-01R                 |          |
| 23" Brackets Kit P/N                 | -     | 50-60-0104-01R                      |          | 50-60-0104-01R                      |          | 50-60-0104-01R                 |          |
| ETSI Brackets Kit P/N                | -     | 50-60-0105-01R                      |          | 50-60-0105-01R                      |          | 50-60-0105-01R                 |          |



1RU Raman / ROPA Platform

IV. Ultraspan for the lab

Finisar’s Ultraspan® family optical amplifiers for laboratory and production environments offer the power of optical amplification in a user-friendly, network-interfaced, rack-mountable platform ideal for laboratory or production line use. Ultraspan amplifiers can be integrated via LAN interface with other network components or test equipment in the measurement set-up.

| Parameter                           | P/N➔ | FOA-M2200TM-EFG1C-AA060        |         | FOA-M2200TM-EFG2C-AA061        |         | FOA-M7100TM-EFG2C-AA027        |               | FOA-S2000TM-ASE3C-AA062        |         |
|-------------------------------------|------|--------------------------------|---------|--------------------------------|---------|--------------------------------|---------------|--------------------------------|---------|
|                                     | Unit | Specification                  |         | Specification                  |         | Specification                  |               | Specification                  |         |
|                                     |      | Min                            | Max     | Min                            | Max     | Min                            | Max           | Min                            | Max     |
| Form Factor                         | mm   | 1RU Rack Mount<br>442x240x43.6 |         | 1RU Rack Mount<br>442x240x43.6 |         | 1RU Rack Mount<br>442x240x43.6 |               | 1RU Rack Mount<br>442x240x43.6 |         |
| Amplifier Type                      | -    | WDM FGA                        |         | Dual WDM FGA EDFAs             |         | WDM VGA EDFA                   |               | High-Power ASE Source          |         |
| Operating Wavelength Range          | nm   | 1529.1                         | 1564.2  | 1528.77                        | 1564    | 1527.6                         | 1565.5        | 1528.7                         | 1567.1  |
| Input Power Range                   | dBm  | -15                            | 12      | -35                            | -3      | -25                            | 8             | N/A                            |         |
| Output Power Range                  | dBm  | -2                             | 18      | -8                             | 20      | 0                              | 19.5          | 15                             | 26.5    |
| Saturated Output Power              | dBm  | 17                             |         | 20                             |         | 13                             | 21            | 26.5                           |         |
| Settable Gain Range                 | dB   | 5                              | 18      | 11                             | 24      | -0.25                          | 0.25          | N/A                            |         |
| Optimal Flat Gain                   | dB   | 17                             |         | 23                             |         | N/A                            |               | N/A                            |         |
| Gain/Power Setting Accuracy         | dB   | -0.5                           | 0.5     | -0.25                          | 0.25    | -0.25                          | 0.25          | N/A                            |         |
| Gain Flatness vs. Wavelength        | dB   |                                | ±0.6    |                                | ±0.6    |                                | 1             |                                | ±0.9    |
| Dynamic gain tilt                   | dB   |                                | 0.85    |                                | 0.9     | N/A                            |               | N/A                            |         |
| Gain / Power Stability              | dB   |                                | ±0.1    |                                | ±0.1    |                                | ±0.1          |                                | ±0.2    |
| Noise Figure (at OFG or equivalent) | dB   |                                | 6.5     |                                | 6       |                                | 5.5           | N/A                            |         |
|                                     |      |                                |         |                                |         |                                | (at max gain) |                                |         |
| Return loss                         | dB   | 40                             |         | 40                             |         | 40                             |               | 40                             |         |
| PDG                                 | dB   |                                | 0.3     |                                | 0.3     |                                | 0.3           | N/A                            |         |
| PMD                                 | ps   |                                | 0.3     |                                | 0.3     |                                | 0.3           | N/A                            |         |
| Multi-Path Interference             | dB   |                                | -40     |                                | -40     |                                | -40           | N/A                            |         |
| Laser Safety Classification         | -    | Class 1M                       |         | Class 1M                       |         | Class 1M                       |               | Class 3B                       |         |
| Optical Connectors                  | -    | 2: In, Out                     |         | 4: In1, Out1, In2, Out2        |         | 2: In, Out                     |               | 1: Out                         |         |
| Operating Modes                     | -    | AGC, APC, Manual               |         | AGC, APC, Manual               |         | AGC, APC, Manual               |               | ON / OFF                       |         |
| Power Supply Voltage                | V    | 110V(AC)                       | 240(AC) | 110V(AC)                       | 240(AC) | 110V(AC)                       | 240(AC)       | 110V(AC)                       | 240(AC) |
| Power Consumption                   | W    |                                | 40      |                                | 40      |                                | 40            |                                | 50      |
| Operating Case Temperature          | C    | 15                             | 35      | 15                             | 35      | 15                             | 35            | 15                             | 35      |
| Interface                           | -    | Ethernet                       |         | Ethernet                       |         | Ethernet                       |               | Ethernet                       |         |
| Communications Protocol             | -    | Web-based GUI                  |         | Web-based GUI                  |         | Web-based GUI                  |               | Web-based GUI                  |         |
| Ethernet cable P/N                  | -    | 18-10-0138R                    |         | 18-10-0138R                    |         | 18-10-0138R                    |               | 18-10-0138R                    |         |
| US AC Power Cable P/N               | -    | 1133098                        |         | 1133098                        |         | 1133098                        |               | 1133098                        |         |
| EU AC Power Cable P/N               | -    | 1133099                        |         | 1133099                        |         | 1133099                        |               | 1133099                        |         |
| 19" Brackets Kit P/N                | -    | 50-60-0102-01R                 |         | 50-60-0102-01R                 |         | 50-60-0102-01R                 |               | 50-60-0102-01R                 |         |
| 21" Brackets Kit P/N                | -    | 50-60-0103-01R                 |         | 50-60-0103-01R                 |         | 50-60-0103-01R                 |               | 50-60-0103-01R                 |         |
| 23" Brackets Kit P/N                | -    | 50-60-0104-01R                 |         | 50-60-0104-01R                 |         | 50-60-0104-01R                 |               | 50-60-0104-01R                 |         |
| ETSI Brackets Kit P/N               | -    | 50-60-0105-01R                 |         | 50-60-0105-01R                 |         | 50-60-0105-01R                 |               | 50-60-0105-01R                 |         |



Lab Ultraspan

V. Fixed Gain Amplifiers (FGAs)

Finisar’s Fixed Gain Amplifiers (FGAs) are typically single-stage EDFAs whose gain spectrum is either non-flattened, or flattened at a specific gain setting (Optimal Flat Gain). They can be used as boosters at the transmission side of a link, preamplifiers at the receive side, or inline amplifiers at the mid-span. Output power and gain can be controlled by the end user, and gain tilt occurs whenever the set gain differs from the OFG. In the following table “Single Channel” refers to non-gain flattened amplifiers, WDM to gain flattened ones.

| “Half-MSA” Platform                 |              |       |                         |         |                         |        |                         |       |                         |      |                         | MSA Platform |                         |      |                         |      |                         |      |                         |      |                         |          |  |
|-------------------------------------|--------------|-------|-------------------------|---------|-------------------------|--------|-------------------------|-------|-------------------------|------|-------------------------|--------------|-------------------------|------|-------------------------|------|-------------------------|------|-------------------------|------|-------------------------|----------|--|
| Parameter                           |              | P/N➔  | FOA-M1100MB-ESC1C-AA001 |         | FOA-M1500CB-ESC1C-AA011 |        | FOA-M2200CB-EFG1C-AA002 |       | FOA-M2200CB-EFG1C-AA003 |      | FOA-M2200CB-EFG1C-AA004 |              | FOA-M2200CB-EFG1C-AA005 |      | FOA-M2200CB-EFG1C-AA006 |      | FOA-M2200CB-EFG1C-AA007 |      | FOA-M2200CB-EFG1C-AA008 |      | FOA-M2300CD-EFV1C-AA009 |          |  |
|                                     |              |       | Specification           |         | Specification           |        | Specification           |       | Specification           |      | Specification           |              | Specification           |      | Specification           |      | Specification           |      | Specification           |      | Specification           |          |  |
|                                     |              |       | Min                     | Max     | Min                     | Max    | Min                     | Max   | Min                     | Max  | Min                     | Max          | Min                     | Max  | Min                     | Max  | Min                     | Max  | Min                     | Max  | Min                     | Max      |  |
| Form Factor                         |              | mm    | 70x45x12                |         | 90x70x15                |        | 90x70x15                |       | 90x70x15                |      | 90x70x15                |              | 90x70x15                |      | 90x70x15                |      | 90x70x15                |      | 90x70x15                |      | 90x70x15                |          |  |
| Amplifier Type                      |              | -     | Single Channel          |         | OSC EDFA                |        | WDM FGA                 |       | WDM FGA                 |      | WDM FGA                 |              | WDM FGA                 |      | WDM FGA                 |      | WDM FGA                 |      | WDM FGA                 |      | WDM FGA + Output VOA    |          |  |
| Operating Wavelength Range          |              | nm    | 1528.77                 | 1567.13 | 1504.5                  | 1517.5 | 1529                    | 1563  | 1528.77                 | 1564 | 1528.77                 | 1565         | 1529                    | 1563 | 1528.77                 | 1565 | 1528.77                 | 1565 | 1529                    | 1563 | 1529.5                  | 1563     |  |
| Input Power Range                   | Booster mode | dBm   | -10                     | 5       | -2                      | 7      | -27                     | 2     | -25                     | 8    | -35                     | -5           | -24                     | 5    | -25                     | 10   | -25                     | 10   | -25                     | 8    | -18                     | 2        |  |
|                                     | Pre-amp mode |       |                         |         |                         |        | -35                     | -3    | -40                     | -5   |                         |              | -32                     | 0    | -35                     | 0    | -40                     | -5   |                         |      |                         |          |  |
| Output Power Range                  | Booster mode | dBm   | 5                       | 16      | 13                      |        | -7                      | 17    | -7                      | 17.4 | -7                      | 17           | -5                      | 20   | -5                      | 21   | -5                      | 21   | -5                      | 20.8 | -15                     | 19       |  |
|                                     | Pre-amp mode |       |                         |         |                         |        | -10                     | 13    | -7                      | 17.4 |                         |              | -10                     | 13   |                         |      |                         |      |                         |      |                         |          |  |
| Saturated Output Power              |              | dBm   | 16                      |         | 13                      |        | 17                      |       |                         | 17.4 | 17                      |              | 20                      |      | 20                      |      | 20                      |      | 21                      |      | 19                      |          |  |
| Settable Gain Range                 | Booster mode | dB    | 5                       | 26      | N/A                     | N/A    | 10                      | 20    | 4                       | 28   | 15                      | 30           | 10                      | 20   | 15                      | 25   | 10                      | 26   | 10                      | 20   | 0                       | 20       |  |
|                                     | Pre-amp mode | dB    |                         |         |                         |        | 13                      | 25    | 13                      | 33   |                         |              | 13                      | 25   | 15                      | 30   | 15                      | 33   |                         |      | VOA, not gain range     |          |  |
| Optimal Flat Gain                   |              | dB    | N/A                     |         | N/A                     |        | 15                      |       | 23                      |      | 23                      |              | 15                      |      | 22                      |      | 26                      |      | 20                      |      | 22                      |          |  |
| Gain/Power Setting Accuracy         | Booster mode | dB    | -0.5                    | 0.5     | -0.5                    | 1      | -0.5                    | 0.5   | -0.5                    | 0.5  | -0.5                    | 0.5          | -0.5                    | 0.5  | -0.5                    | 0.5  | -0.5                    | 0.5  | -0.5                    | 0.5  | -0.5                    | 0.5      |  |
|                                     | Pre-amp mode | dB    |                         |         |                         |        | -0.5                    | 0.5   | -0.5                    | 0.5  |                         |              | -0.5                    | 0.5  | -0.5                    | 0.5  | -0.5                    | 0.5  |                         |      |                         |          |  |
| Gain Flatness vs. Wavelength        |              | dB    | N/A                     |         | N/A                     |        |                         | ±0.6  |                         | ±0.6 |                         | ±0.5         |                         | ±0.6 |                         | ±0.6 |                         | ±0.6 |                         | ±0.6 |                         | 1.5pk-pk |  |
| Dynamic gain tilt                   |              | dB/dB | N/A                     |         | N/A                     |        |                         | ±0.06 |                         | 0.9  |                         | 0.9          |                         | 0.9  |                         | 0.9  |                         | 0.9  |                         | 0.9  |                         | N/A      |  |
| Gain / Power Stability              |              | dB    | -0.2                    | 0.2     | -0.1                    | 0.1    |                         | ±0.1  |                         | ±0.1 |                         | ±0.1         |                         | ±0.1 |                         | ±0.1 |                         | ±0.1 |                         | ±0.1 |                         | ±0.1     |  |
| Noise Figure (at OFG or equivalent) |              | dB    |                         | 6.5     |                         | 8      |                         | 6     |                         | 5.5  |                         | 5.5          |                         | 6    |                         | 5.5  |                         | 5.5  |                         | 5.5  |                         | 5.5      |  |
| Return loss                         |              | dB    | 40                      |         | 40                      |        | 40                      |       | 40                      |      | 40                      |              | 40                      |      | 40                      |      | 40                      |      | 40                      |      | 40                      |          |  |
| PDG                                 |              | dB    |                         | 0.5     |                         | 0.3    |                         | 0.5   |                         | 0.4  |                         | 0.3          |                         | 0.5  |                         | 0.4  |                         | 0.4  |                         | 0.5  |                         | 0.5      |  |
| PMD                                 |              | ps    |                         | 0.3     |                         | 0.15   |                         | 0.3   |                         | 0.2  |                         | 0.3          |                         | 0.3  |                         | 0.2  |                         | 0.2  |                         | 0.3  |                         | 0.3      |  |
| Multi-Path Interference             |              | dB    |                         | -40     |                         | -40    |                         | -40   |                         | -40  |                         | -40          |                         | -40  |                         | -40  |                         | -40  |                         | -40  |                         | -40      |  |
| Laser Safety Classification         |              | -     | Class 1M                |         | Class 1M                |        | Class 1M                |       | Class 1M                |      | Class 1M                |              | Class 1M                |      | Class 1M                |      | Class 1M                |      | Class 1M                |      | Class 1M                |          |  |
| Optical Connectors                  |              | -     | 2: In, Out              |         | 2: In, Out              |        | 2: In, Out              |       | 3: In, Out, Out Mon     |      | 3: In, Out, Out Mon     |              | 2: In, Out              |      | 3: In, Out, Out Mon     |      | 3: In, Out, Out Mon     |      | 3: In, Out, Out Mon     |      | 3: In, Out, Out Mon     |          |  |
| Operating Modes                     |              | -     | APC, Manual             |         | APC, Manual             |        | AGC, APC, Manual        |       | AGC, APC, Manual        |      | AGC, APC, Manual        |              | AGC, APC, Manual        |      | AGC, APC, Manual        |      | AGC, APC, Manual        |      | AGC, APC, Manual        |      | AGC, APC, Manual        |          |  |
| Power Supply Voltage                |              | V     | 2.97                    | 3.63    | 3.13                    | 3.46   | 4.75                    | 5.25  | 4.75                    | 5.25 | 4.75                    | 5.25         | 4.75                    | 5.25 | 4.75                    | 5.25 | 4.75                    | 5.25 | 3.15                    | 3.45 | 4.75                    | 5.25     |  |
| Power Consumption                   |              | W     |                         | 2.5     |                         | 9.5    |                         | 8     |                         | 8    |                         | 8            |                         | 11   |                         | 11   |                         | 8    |                         | 12   |                         | 8        |  |
| Operating Case Temperature          |              | °C    | 0                       | 70      | 0                       | 70     | 0                       | 70    | 0                       | 70   | 0                       | 70           | 0                       | 70   | 0                       | 70   | 0                       | 70   | 0                       | 70   | 0                       | 70       |  |
| Communications Protocol             |              | -     | RS-232                  |         | RS-232                  |        | RS-232                  |       | RS-232                  |      | RS-232 LVTTTL           |              | RS-232                  |      | RS-232 LVTTTL           |      | RS-232 LVTTTL           |      | RS-232                  |      | RE-232 LVTTTL           |          |  |
| Default Baud Rate                   |              | Baud  | 9600                    |         | 19200                   |        | 19200                   |       | 9600                    |      | 19200                   |              | 19200                   |      | 19200                   |      | 19200                   |      | 19200                   |      | 57600                   |          |  |
| Eval Board P/N                      |              | -     | 1178581                 |         | 1185403                 |        | 1185403                 |       | 1185403                 |      | 1185403                 |              | 1185403                 |      | 1185403                 |      | 1185403                 |      | 1185403                 |      | 1185402                 |          |  |
| Eval Board Cable P/N                |              | -     | 18-10-0006R             |         | 18-10-0006R             |        | 18-10-0006R             |       | 18-10-0006R             |      | 18-10-0006R             |              | 18-10-0006R             |      | 18-10-0006R             |      | 18-10-0006R             |      | 18-10-0006R             |      | 18-10-0006R             |          |  |

VI. Variable Gain Amplifiers (VGAs)

Finisar’s compact Variable Gain Amplifiers (VGAs) are available in two form factors. Compact VGAs combine the ubiquity of the EDFA MSA form factor (90x70mm) with the advanced feature of a variable gain range; with up to 20dBm output power. Other VGAs with a larger form factor enable more complex functions and higher output power (up to 23dBm). VGAs find their application as booster, pre, or inline amplifiers, and are all suitable for WDM applications, their gain spectrum being flat.



MSA NVG Platform



Dual-Pump Platform

| Parameter                    | P/N→ | FOA-M7300CD-EVG1C-AA002 |      | FOA-M7300CD-EVG1C-AA003      |      | FOA-M7300CD-EVG1C-AA004              |      | FOA-M7100DA-EVG2C-AA013              |      | FOA-M7100DA-EVG2C-AA014              |      | FOA-R7100DA-EVG2C-AA015              |      |
|------------------------------|------|-------------------------|------|------------------------------|------|--------------------------------------|------|--------------------------------------|------|--------------------------------------|------|--------------------------------------|------|
|                              | Unit | Specification           |      | Specification                |      | Specification                        |      | Specification                        |      | Specification                        |      | Specification                        |      |
|                              |      | Min                     | Max  | Min                          | Max  | Min                                  | Max  | Min                                  | Max  | Min                                  | Max  | Min                                  | Max  |
| Form Factor                  | mm   | 90x70x16.5              |      | 90x70x16.5                   |      | 90x70x16.5                           |      | 100x150x18                           |      | 100x150x18                           |      | 100x150x18                           |      |
| Amplifier Type               | -    | WDM VGA                 |      | WDM VGA                      |      | WDM VGA with Mid-stage access        |      | WDM VGA with Mid-stage access        |      | WDM VGA with Mid-stage access        |      | WDM VGA with Mid-stage access        |      |
| Operating Wavelength Range   | nm   | 1529.5                  | 1564 | 1529.5                       | 1564 | 1529.5                               | 1564 | 1529.5                               | 1564 | 1529.5                               | 1564 | 1529.5                               | 1564 |
| Input Power Range            | dBm  | -38                     | 5    | -27                          | 10   | -27                                  | 8    | -40                                  | -3.5 | -42                                  | 5    | -38                                  | 6    |
| Output Power Range           | dBm  | -8                      | 17   | -8                           | 19.5 | -8                                   | 18   | 2                                    | 20.5 | -5                                   | 20.5 | -2                                   | 23   |
| Saturated Output Power       | dBm  | 17                      |      | 19.5                         |      | 18                                   |      | 20.5                                 |      | 20.5                                 |      | 23                                   |      |
| Gain Range                   | dB   | 15                      | 30   | 10                           | 25   | 10                                   | 25   | 25                                   | 40   | 17                                   | 40   | 17                                   | 40   |
| Gain/Power Setting Accuracy  | dB   | -0.25                   | 0.25 | -0.25                        | 0.25 | -0.25                                | 0.25 | -0.5                                 | 0.5  | -0.4                                 | 0.4  | -0.4                                 | 0.4  |
| Gain Flatness vs. Wavelength | dB   |                         | ±0.6 |                              | ±0.6 |                                      | ±0.6 |                                      | ±0.6 |                                      | ±0.6 |                                      | ±0.6 |
| Gain / Power Stability       | dB   |                         | ±0.1 |                              | ±0.1 |                                      | ±0.1 |                                      | ±0.1 |                                      | ±0.2 |                                      | ±0.2 |
| Settable Gain Tilt Range     | dB   | -2                      | 2    | -2                           | 2    | -2                                   | 2    | -3.5                                 | 0    | -2                                   | 0    | -2                                   | 0    |
| Mid-Stage Loss               | dB   | N/A                     |      | N/A                          |      | 0                                    | 4    | 4                                    | 9    | 4                                    | 9.5  | 4                                    | 9.5  |
| Noise Figure <sup>1</sup>    | dB   | 5.5                     | 11.5 | 5.6                          | 14.5 | 5.8                                  | 18.5 | 6.1                                  | 7.2  | 5.6                                  | 12.5 | 6.6                                  | 16.3 |
| Return loss                  | dB   | 40                      |      | 40                           |      | 40                                   |      | 45                                   |      | 40                                   |      | 40                                   |      |
| PDG                          | dB   |                         | 0.3  |                              | 0.3  |                                      | 0.3  |                                      | 0.3  |                                      | 0.3  |                                      | 0.5  |
| PMD                          | ps   |                         | 0.3  |                              | 0.3  |                                      | 0.3  |                                      | 0.2  |                                      | 0.2  |                                      | 0.3  |
| Multi-Path Interference      | dB   |                         | -40  |                              | -40  |                                      | -40  |                                      | -40  |                                      | -40  |                                      | -40  |
| Laser Safety Classification  | -    | Class 1M                |      | Class 1M                     |      | Class 1M                             |      | Class 1M                             |      | Class 1M                             |      | Class 1M with APR                    |      |
| Optical Connectors           | -    | 3: In, Out, Out Mon     |      | 2: In, Ou3: In, Out, Out Mon |      | 5: In, out, Out mon, MSA in, MSA Out |      | 5: In, out, Out mon, MSA in, MSA Out |      | 5: In, out, Out mon, MSA in, MSA Out |      | 5: In, out, Out mon, MSA in, MSA Out |      |
| Operating Modes              | -    | AGC, APC, Manual        |      | AGC, APC, Manual             |      | AGC, APC, Manual                     |      | AGC, APC, Manual                     |      | AGC, APC, Manual                     |      | AGC, APC, Manual                     |      |
| Power Supply Voltage         | V    | 4.75                    | 5.25 | 4.75                         | 5.25 | 4.75                                 | 5.25 | 4.75                                 | 5.25 | 4.75                                 | 5.25 | 4.75                                 | 5.25 |
| Power Consumption            | W    |                         | 10   |                              | 13   |                                      | 11   |                                      | 17   |                                      | 17   |                                      | 26   |
| Operating Case Temperature   | °C   | 0                       | 70   | 0                            | 70   | 0                                    | 70   | 0                                    | 70   | 0                                    | 70   | 0                                    | 70   |
| Communications Protocol      | -    | RS-232                  |      | RS-232                       |      | RS-232 LVTTTL                        |      | RS-232 LVTTTL                        |      | RS-232 LVTTTL                        |      | RS-232 LVTTTL                        |      |
| Default Baud Rate            | Baud | 19200                   |      | 19200                        |      | 9600                                 |      | 19200                                |      | 19200                                |      | 19200                                |      |
| Eval Board P/N               | -    | 1185403                 |      | 1185403                      |      | 1185403                              |      | 50-45-0069-01R                       |      | 50-45-0069-01R                       |      | 50-45-0069-01R                       |      |
| Eval Board Cable P/N         | -    | 18-10-0006R             |      | 18-10-0006R                  |      | 18-10-0006R                          |      | 18-10-0006R                          |      | 18-10-0006R                          |      | 18-10-0006R                          |      |

Notes

1. Max NF at minimum gain setting; min NF at maximum gain setting

VII. Raman And Hybrid Modules

Finisar’s Raman and Hybrid Raman Amplifiers enable accurate automatic gain control and deliver the superior OSNR performance achievable with Raman amplification.

| Parameter                                | P/N➔ | FOA-R9100PR-RBW2C-AA003       |         |
|------------------------------------------|------|-------------------------------|---------|
|                                          | Unit | Specification                 |         |
|                                          |      | Min                           | Max     |
| Form Factor                              | mm   | 160x220x26                    |         |
| Amplifier Type                           | -    | Hybrid Raman / EDFA Amplifier |         |
| Operating Wavelength Range               | nm   | 1529                          | 1567.2  |
| Total Gain Range for G.652               | dB   | 19                            | 37      |
| Gain Setting Accracy                     | dB   |                               | ±0.5    |
| Gain Flatness (G=27-40dB)                | dB   |                               | 1.3     |
| Saturated Output Power                   | dBm  |                               | 20.5    |
| Input Power Range (Raman Pumps off)      | dBm  | -40                           | 1.5     |
| Output Power Range                       | dBm  | -2                            | 20.5    |
| Tilt Range                               | dB   | -2.5                          | 0       |
| Pre-Tilt                                 | dB   | -0.7                          | -1.3    |
| Tilt Accuracy                            | dB   |                               | 0.5     |
| Total Gain Range for LEAF                | dB   | 19                            | 40      |
| Total Raman Pump Power (ex-fiber)        | mW   |                               | 750     |
| Input Signal Power Range (pumps off)     | dBm  | -40                           | 1.5     |
| Signal Insertion Loss                    | dB   |                               | 1.7     |
| Nominal Raman Gain for G.652 (after GFF) | dB   | 13.6                          |         |
| Nominal Raman Gain for LEAF (after GFF)  | dB   | 15                            |         |
| Raman-Only effective NF for G.652        | dB   | -1.6                          | -0.8    |
| Raman-Only effective NF for LEAF         | dB   | -2.4                          | -1.5    |
| Total NF for G.652 (at Max Gain)         | dB   |                               | -0.2    |
| Total NF for LEAF (at Max Gain)          | dB   |                               | -0.3    |
| OSC Wavelength Range                     | nm   | 1527.9                        | 1528.09 |
| Raman Gain at OSC Wavelength             | dB   | -0.4                          | 0.4     |
| OSC Insertion Loss (IN to OSC drop port) | dB   |                               | 3       |
| Return loss                              | dB   | 40                            |         |
| PDL+PDG                                  | dB   |                               | 0.35    |
| PMD                                      | ps   |                               | 0.25    |



| Parameter                            | P/N➔  | FOA-R9100TD-RBW2C-AA049             |        |
|--------------------------------------|-------|-------------------------------------|--------|
|                                      | Unit  | Specification                       |        |
|                                      |       | Min                                 | Max    |
| Form Factor                          | mm    | 100x240x33.6                        |        |
| Amplifier Type                       | -     | Counter-Propagating Raman Amplifier |        |
| Operating Wavelength Range           | nm    | 1527.8                              | 1567.8 |
| Total Raman Pump Power               | mW    |                                     | 750    |
| Input Signal Power Range (pumps off) | dBm   | -48                                 | +5     |
| Signal Insertion Loss                | dB    |                                     | 2.5    |
| Nominal Gain for G.652               | dB    | 13.5                                |        |
| Nominal Gain for Leaf                | dB    | 14.5                                |        |
| Spectral Gain Flatness               | dB    |                                     | 1      |
| Effective Noise Figure               | dB    |                                     | -0.5   |
| OSC Wavelength Range                 | nm    | 1504                                | 1518   |
| OSC Insertion Loss (to drop port)    | dB    |                                     | 4.5    |
| Return loss                          | dB    | 45                                  |        |
| PDL                                  | dB    |                                     | 0.2    |
| PDG                                  | dB    |                                     | 0.3    |
| PMD                                  | ps    |                                     | 0.2    |
| RIN (any pump)                       | dB/Hz |                                     | -110   |
| Laser Safety Classification          | -     | Class 1M with APR                   |        |
| Optical Connectors                   | -     | 4: In, Out, Mon Out, OSC drop       |        |
| Operating Modes                      | -     | AGC, Manual                         |        |
| Power Supply Voltage                 | V     | 4.75                                | 5.25   |
| Power Consumption                    | W     |                                     | 32     |
| Operating Case Temperature           | °C    | -5                                  | 70     |
| Communications Protocol              | -     | RS-2132 LVTTTL                      |        |
| Default Baud Rate                    | Baud  | 115200                              |        |
| Eval Board P/N                       | -     | 50-45-0069-01R                      |        |
| Eval Board Cable P/N                 | -     | 18-10-0006R                         |        |



Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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