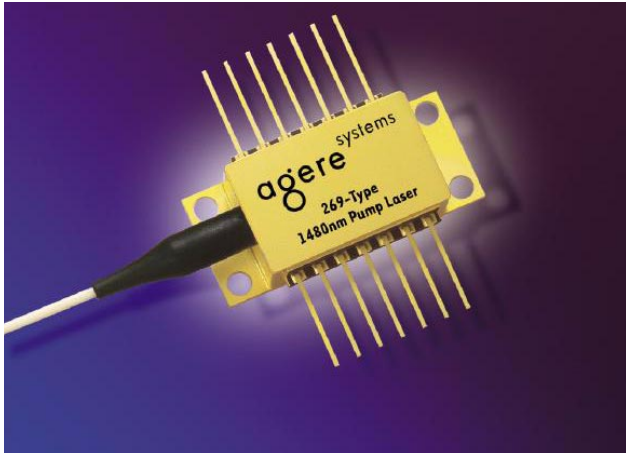


## 269-Type 14xx nm Pump Laser Module with Fiber Grating



Offering superior wavelength stability, the 269-type pump laser module with fiber grating is designed as a continuous-wave (CW) optical pump source for erbium-doped fiber amplifiers and Raman pump modules.

### Features

- High-coupled rated output power up to 280 mW, CW
- Available with fiber grating for wavelength stability (1420 nm—1510 nm)
- Wide environmental range
- Field-proven packaging technology
- InGaAsP/InP high-power, strained multiple quantum-well (MQW) chip design
- Internal thermoelectric cooler (TEC)
- InGaAs PIN photodetector back-facet monitor
- Single-mode and polarization-maintaining fiber pig-tails
- Compact, 14-pin butterfly package
- Industry compatible package and pinout

### Applications

- Raman pump modules (RPM)
- Erbium-doped fiber amplifiers (EDFA)

### Description

The 269-type pump laser module with fiber grating represents a family of thermoelectrically cooled, high-power lasers. These modules utilize a fiber Bragg grating to achieve stable wavelength performance within the 1420 nm to 1510 nm range, over the full operating temperature range. They are designed as continuous-wave (CW) optical pump sources for dense wavelength-division multiplexing (DWDM) EDFA and Raman applications operating in the C- and L-bands. The 269-type laser modules with polarization-maintaining fiber are particularly suitable for use in RPM designs requiring the high-power combinations of multiple pumps.

The laser optical spectrum is locked by the fiber grating over a wide optical power range. The optical spectrum is very narrow and the peak wavelength is nearly insensitive to temperature variations and back reflections.

The laser modules incorporate a high-power, quantum-well laser chip that achieves grating-stabilized fiber powers ranging to 280 mW.

An integral thermoelectric cooler (TEC) stabilizes the laser at room temperature and, combined with a hermetic environment, allows the device to achieve high-power operation over the extended temperature range of 0 °C to 75 °C. An internal InGaAs PIN photodiode, mounted behind the laser diode, functions as the laser detector and monitors light emissions from the rear facet of the laser.

The 269-type module is offered in a 14-pin, hermetic butterfly package.

## Absolute Maximum Ratings

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 sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

| Parameter                              | Symbol            | Min | Max  | Unit |
|----------------------------------------|-------------------|-----|------|------|
| Operating Case Temperature Range       | T <sub>C</sub>    | 0   | 75   | °C   |
| Storage Case Temperature Range         | T <sub>stg</sub>  | -40 | 85   | °C   |
| Laser Forward Bias (TEC on):           | I <sub>F</sub>    |     |      |      |
| P <sub>O</sub> = 120 mW—150 mW         |                   | —   | 1000 | mA   |
| P <sub>O</sub> = 160 mW—210 mW         |                   | —   | 1500 | mA   |
| P <sub>O</sub> = 220 mW—280 mW         |                   | —   | 1900 | mA   |
| Laser Reverse Voltage                  | V <sub>R</sub>    | —   | 2    | V    |
| Photodiode Reverse Voltage             | V <sub>RMON</sub> | —   | 20   | V    |
| TEC Current                            | I <sub>TEC</sub>  | —   | 2.2  | A    |
| TEC Voltage                            | V <sub>TEC</sub>  | —   | 5.0  | V    |
| Temperature Sensor Current             | I <sub>TS</sub>   | —   | 5    | mA   |
| Laser Diode Operating Chip Temperature | T <sub>LD</sub>   | —   | 40   | °C   |

## Handling Precautions

### Electrostatic Discharge

**CAUTION: This device is susceptible to damage as a result of electrostatic discharge (ESD). Take proper precautions during both handling and testing. Follow guidelines such as EIA\* Standard EIA 625.**

Agere Systems Inc. employs a human-body model (HBM) for ESD-susceptibility testing and protection-design evaluation. ESD voltage thresholds are dependent on the critical parameters used to define the model. A standard HBM (resistance = 1.5 kΩ, capacitance = 100 pF) is widely used and, therefore, can be used for comparison purposes. The HBM ESD withstand voltage established for the 269-type laser pump module is ±500 V.

\* EIA is a registered trademark of The Electronic Industries Association.

## Electrical/Optical Characteristics

**Table 1. Electrical/Optical Characteristics** (All performance parameters are specified for  $I_F$ ,  $O_P$ ,  $T_{SET} = 25\text{ }^\circ\text{C}$ ,  $T_{CASE} \sim 25\text{ }^\circ\text{C}$ , unless otherwise specified.)

| Parameter                            | Symbol            | Conditions                                           | Min               | Typ | Max                         | Unit |
|--------------------------------------|-------------------|------------------------------------------------------|-------------------|-----|-----------------------------|------|
| Operating Optical Power              | $P_O$             | —                                                    | 120               | —   | 280                         | mW   |
| Wavelength:                          |                   |                                                      |                   |     |                             |      |
| Target Wavelength                    | $\lambda_t$       | —                                                    | 1420              | —   | 1510                        | nm   |
| Center Wavelength                    | $\lambda_c$       | $0\text{ }^\circ\text{C} - 70\text{ }^\circ\text{C}$ | $\lambda_t - 1.5$ | —   | $\lambda_t + 1.5$           | nm   |
| RMS Spectral Width                   | $\Delta\lambda$   | $P_O$                                                | —                 | —   | 1.5                         | nm   |
| BOL Operating Laser Forward Current: | $I_F$ , $O_P$ BOL |                                                      |                   |     |                             |      |
| $P_O = 120\text{ mW}$                |                   | —                                                    | —                 | —   | 550                         | mA   |
| $P_O = 130\text{ mW}$                |                   | —                                                    | —                 | —   | 600                         | mA   |
| $P_O = 140\text{ mW}$                |                   | —                                                    | —                 | —   | 600                         | mA   |
| $P_O = 150\text{ mW}$                |                   | —                                                    | —                 | —   | 600                         | mA   |
| BOL Operating Laser Forward Current: | $I_F$ , $O_P$ BOL |                                                      |                   |     |                             |      |
| $P_O = 160\text{ mW}$                |                   | —                                                    | —                 | —   | 650                         | mA   |
| $P_O = 170\text{ mW}$                |                   | —                                                    | —                 | —   | 700                         | mA   |
| $P_O = 180\text{ mW}$                |                   | —                                                    | —                 | —   | 700                         | mA   |
| $P_O = 190\text{ mW}$                |                   | —                                                    | —                 | —   | 750                         | mA   |
| $P_O = 200\text{ mW}$                |                   | —                                                    | —                 | —   | 800                         | mA   |
| BOL Operating Laser Forward Current: | $I_F$ , $O_P$ BOL |                                                      |                   |     |                             |      |
| $P_O = 210\text{ mW}$                |                   | —                                                    | —                 | —   | 850                         | mA   |
| $P_O = 220\text{ mW}$                |                   | —                                                    | —                 | —   | 900                         | mA   |
| $P_O = 230\text{ mW}$                |                   | —                                                    | —                 | —   | 950                         | mA   |
| $P_O = 240\text{ mW}$                |                   | —                                                    | —                 | —   | 1000                        | mA   |
| $P_O = 250\text{ mW}$                |                   | —                                                    | —                 | —   | 1000                        | mA   |
| $P_O = 260\text{ mW}$                |                   | —                                                    | —                 | —   | 1100                        | mA   |
| $P_O = 270\text{ mW}$                |                   | —                                                    | —                 | —   | 1100                        | mA   |
| $P_O = 280\text{ mW}$                |                   | —                                                    | —                 | —   | 1100                        | mA   |
| EOL Operating Laser Forward Current  | $I_F$ , $O_P$ EOL | —                                                    | —                 | —   | 1.15 x<br>$I_F$ , $O_P$ BOL | mA   |
| EOL Laser Diode Forward Voltage      | $V_R$             | $I_F$ , $O_P$ EOL                                    | —                 | 2.3 | 3.0                         | V    |
| Polarization Extinction Ratio        | PER               | —                                                    | 13                | —   | —                           | dB   |

**Table 2. Monitor Photodiode Characteristics** (All test parameters are specified for  $I_F$ ,  $O_P$ ,  $T_{SET} = 25\text{ }^\circ\text{C}$ ,  $T_{CASE} \sim 25\text{ }^\circ\text{C}$  unless otherwise specified.)

| Parameter                  | Symbol   | Conditions                      | Min | Max  | Unit          |
|----------------------------|----------|---------------------------------|-----|------|---------------|
| Monitor Diode Current      | $I_{BF}$ | —                               | 200 | 2000 | $\mu\text{A}$ |
| Monitor Diode Dark Current | $I_D$    | $V_R = -5\text{ V}$ , $I_F = 0$ | —   | 100  | nA            |

**Electrical/Optical Characteristics** (continued)

**Table 3. TEC and Thermistor Characteristics** (All performance parameters are specified for IF, OP, TSET = 25 °C, unless otherwise specified.)

| Parameter                                                                                                                            | Symbol | Conditions                                         | Min  | Max  | Unit |
|--------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------------|------|------|------|
| TEC Current:<br>Po = 120 mW<br>Po = 130 mW<br>Po = 140 mW<br>Po = 150 mW                                                             | ITEC   | TSET = 25 °C;<br>TCASE = 75 °C;<br>ΔT = 50 °C, EOL | —    | 1.6  | A    |
| —                                                                                                                                    |        |                                                    | 1.6  | A    |      |
| —                                                                                                                                    |        |                                                    | 1.6  | A    |      |
| —                                                                                                                                    |        |                                                    | 1.6  | A    |      |
| TEC Current:<br>Po = 160 mW<br>Po = 170 mW<br>Po = 180 mW<br>Po = 190 mW<br>Po = 200 mW                                              | ITEC   | TSET = 25 °C;<br>TCASE = 70 °C;<br>ΔT = 45 °C, EOL | —    | 1.7  | A    |
| —                                                                                                                                    |        |                                                    | 1.7  | A    |      |
| —                                                                                                                                    |        |                                                    | 1.7  | A    |      |
| —                                                                                                                                    |        |                                                    | 1.7  | A    |      |
| —                                                                                                                                    |        |                                                    | 1.7  | A    |      |
| TEC Current:<br>Po = 210 mW<br>Po = 220 mW<br>Po = 230 mW<br>Po = 240 mW<br>Po = 250 mW<br>Po = 260 mW<br>Po = 270 mW<br>Po = 280 mW | ITEC   | TSET = 25 °C;<br>TCASE = 65 °C;<br>ΔT = 40 °C, EOL | —    | 2.0  | A    |
| —                                                                                                                                    |        |                                                    | 2.0  | A    |      |
| —                                                                                                                                    |        |                                                    | 2.0  | A    |      |
| —                                                                                                                                    |        |                                                    | 2.0  | A    |      |
| —                                                                                                                                    |        |                                                    | 2.0  | A    |      |
| —                                                                                                                                    |        |                                                    | 2.0  | A    |      |
| —                                                                                                                                    |        |                                                    | 2.0  | A    |      |
| —                                                                                                                                    |        |                                                    | 2.0  | A    |      |
| TEC Voltage:<br>Po = 120 mW<br>Po = 130 mW<br>Po = 140 mW<br>Po = 150 mW                                                             | VTEC   | TSET = 25 °C;<br>TCASE = 75 °C;<br>ΔT = 50 °C, EOL | —    | 3.5  | V    |
| —                                                                                                                                    |        |                                                    | 3.5  | V    |      |
| —                                                                                                                                    |        |                                                    | 3.5  | V    |      |
| —                                                                                                                                    |        |                                                    | 3.5  | V    |      |
| TEC Voltage:<br>Po = 160 mW<br>Po = 170 mW<br>Po = 180 mW<br>Po = 190 mW<br>Po = 200 mW                                              | VTEC   | TSET = 25 °C;<br>TCASE = 70 °C;<br>ΔT = 45 °C, EOL | —    | 3.7  | V    |
| —                                                                                                                                    |        |                                                    | 3.7  | V    |      |
| —                                                                                                                                    |        |                                                    | 3.7  | V    |      |
| —                                                                                                                                    |        |                                                    | 3.7  | V    |      |
| —                                                                                                                                    |        |                                                    | 3.7  | V    |      |
| TEC Voltage:<br>Po = 210 mW<br>Po = 220 mW<br>Po = 230 mW<br>Po = 240 mW<br>Po = 250 mW<br>Po = 260 mW<br>Po = 270 mW<br>Po = 280 mW | VTEC   | TSET = 25 °C;<br>TCASE = 65 °C;<br>ΔT = 40 °C, EOL | —    | 4.2  | V    |
| —                                                                                                                                    |        |                                                    | 4.2  | V    |      |
| —                                                                                                                                    |        |                                                    | 4.2  | V    |      |
| —                                                                                                                                    |        |                                                    | 4.2  | V    |      |
| —                                                                                                                                    |        |                                                    | 4.2  | V    |      |
| —                                                                                                                                    |        |                                                    | 4.2  | V    |      |
| —                                                                                                                                    |        |                                                    | 4.2  | V    |      |
| —                                                                                                                                    |        |                                                    | 4.2  | V    |      |
| Thermistor Resistance                                                                                                                | RTHERM | 25 °C Laser Diode<br>Set Temperature               | 9.5  | 10.5 | kΩ   |
| Thermistor B Constant                                                                                                                | B      | —                                                  | 3700 | 4100 | K    |

## User Information

Table 4. Pin Information

| Pin Number | Connection              |
|------------|-------------------------|
| 1          | TE Cooler (+)*          |
| 2          | Thermistor              |
| 3          | Monitor Anode (-Bias)   |
| 4          | Monitor Cathode (+Bias) |
| 5          | Thermistor              |
| 6          | No Connect              |
| 7          | No Connect              |
| 8          | No Connect              |
| 9          | No Connect              |
| 10         | Laser Anode (+)         |
| 11         | Laser Cathode (-)       |
| 12         | No Connect              |
| 13         | Package Ground          |
| 14         | TEC Cooler (-)          |

\* A positive input into this pin cools the laser.

## Fiber Characteristics

- Length of fiber pigtail:
  - 1.75 m ± 0.25 m
- Length of fiber pigtail to end of grating:
  - 0.86 m ± 0.14 m
- Standard fiber:
  - Cladding OD: 125 μm ± 2 μm
  - Acrylate buffer OD: 250 μm ± 15 μm
  - Cut off wavelength: <1320 nm
- Polarization-maintaining fiber:
  - PANDA
  - Cut off wavelength: <1400 nm
  - Acrylate buffer: 400 μm

## Mounting and Connections

**CAUTION:** This device is susceptible to damage as a result of electrostatic discharge. Proper precautions should be taken during both handling and testing.

The base of the laser module (see Outline Diagram) should be maintained at or below 75 °C (maximum) during operation. Interfaces between the laser module base and heat sink must be clean, and the use of a thermal filler may be necessary.

## Mounting Instructions

The minimum fiber bend radius is 1.0 in.

To avoid degradation in performance, mount the module on the board as follows:

1. Place the bottom flange of the module on a flat heat sink at least 0.5 in. x 1.180 in. (12.7 mm x 30 mm) in size. The surface finish of the heat sink should be better than 32 μin. (0.8 μm), and the surface flatness must be better than 0.001 in. (25.4 μm). Using thermal conductive grease is optional; however, thermal performance may be improved if conductive grease is applied between the bottom flange and the heat sink.
2. Mount four #2-56 screws with Fillister heads (M2-3 mm) at the four screw hole locations (see Outline Diagram). The Fillister head diameter must not exceed 0.140 in. (3.55 mm). Do not apply more than 1 in./lb. of torque to the screws.

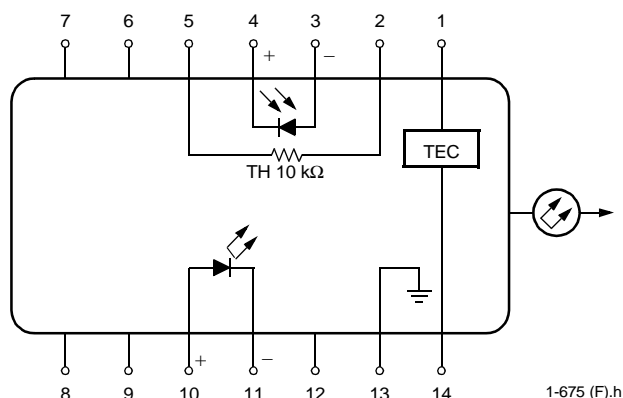
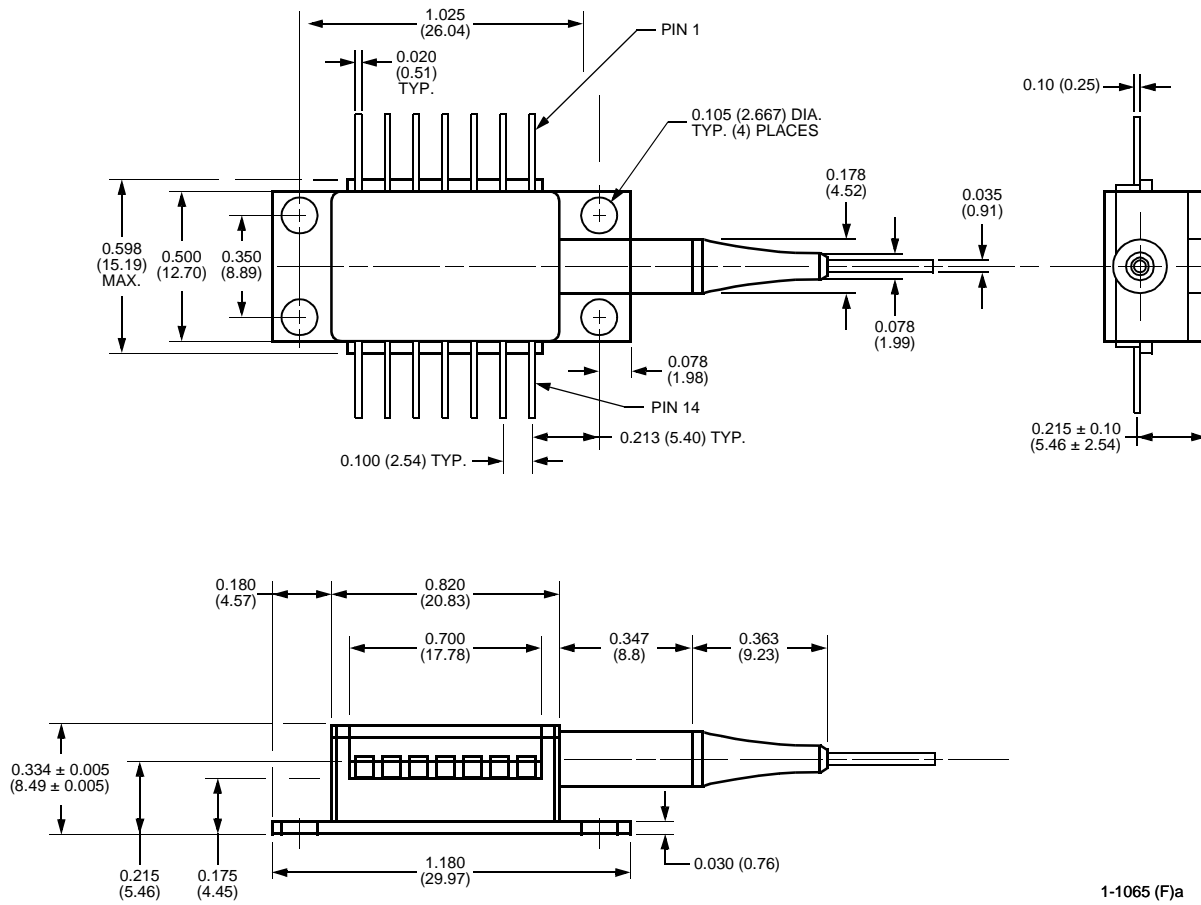


Figure 1. Circuit Schematic

Outline Diagram

Dimensions are in inches and (millimeters).



1-1065 (F)a

## Laser Safety Information

### Class IIIb Laser Product

FDA/CDRH Class IIIb laser product. All versions are Class IIIb laser products per CDRH, 21 CFR 1040 Laser Safety requirements. All versions are Class IIIb laser products per *IEC*\* 60825-1:1993. The device has been classified with the FDA under accession number 8720010.

This product complies with 21 CFR 1040.10 and 1040.11.

8.8  $\mu\text{m}$ /125  $\mu\text{m}$  single-mode fiber pigtail (see Fiber Characteristics, page 5).

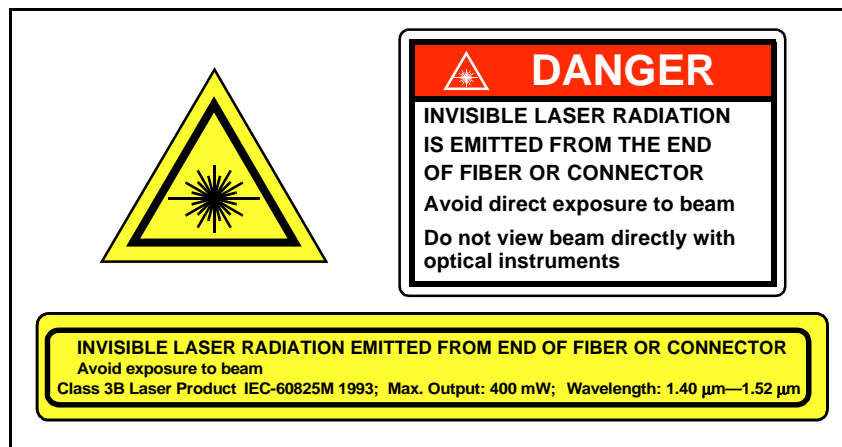
Wavelength = 1.40  $\mu\text{m}$ —1.52  $\mu\text{m}$ .

Maximum power = 400 mW.

Because of size constraints, laser safety labeling (including an FDA Class IIIb label) is not affixed to the module but attached to the outside of the shipping carton.

Product is not shipped with power supply.

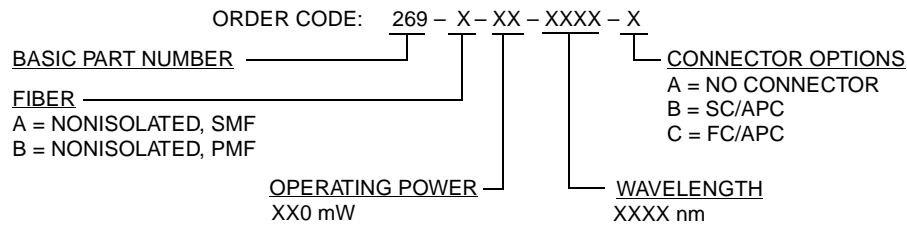
**Caution: Use of controls, adjustments, and procedures other than those specified herein may result in hazardous laser radiation exposure.**



\* *IEC* is a registered trademark of The International Electrotechnical Commission.

## Ordering Information

### Device Code Information



For additional information, contact your Agere Systems Account Manager or the following:

INTERNET: <http://www.agere.com>

E-MAIL: [docmaster@micro.lucent.com](mailto:docmaster@micro.lucent.com)

N. AMERICA: Agere Systems Inc., 555 Union Boulevard, Room 30L-15P-BA, Allentown, PA 18109-3286  
1-800-372-2447, FAX 610-712-4106 (In CANADA: 1-800-553-2448, FAX 610-712-4106)

ASIA PACIFIC: Agere Systems Singapore Pte. Ltd., 77 Science Park Drive, #03-18 Cintech III, Singapore 118256  
Tel. (65) 778 8833, FAX (65) 777 7495

CHINA: Agere Systems (Shanghai) Co., Ltd., 33/F Jin Mao Tower, 88 Century Boulevard Pudong, Shanghai 200121 PRC  
Tel. (86) 21 50471212, FAX (86) 21 50472266

JAPAN: Agere Systems Japan Ltd., 7-18, Higashi-Gotanda 2-chome, Shinagawa-ku, Tokyo 141, Japan  
Tel. (81) 3 5421 1600, FAX (81) 3 5421 1700

EUROPE: Data Requests: DATALINE: Tel. (44) 7000 582 368, FAX (44) 1189 328 148  
Technical Inquiries: OPTOELECTRONICS MARKETING: (44) 1344 865 900 (Ascot UK)

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