

## DATA SHEET

# 1/2/4/8 GBPS 850NM PIN + PREAMP LC ROSA PACKAGE HFD7180-XXX

### FEATURES:

- LC ROSA HFD7180-413 includes flex circuit
- LC ROSA HFD7180-001 leaded package
- High performance GaAs PIN photodiode with separate transimpedance amplifier
- Low electrical parasitic TO46 package
- Data rates from 1Gbps to 8.5Gbps
- Received signal strength indicator with bandwidth select
- Low bias currents and voltages
- Low power dissipation

The HFD7180-xxx use a high-performance GaAs PIN photo-detector packaged with a transimpedance amplifier designed to meet performance requirements for data rates up to 8.5Gbps data communication over multi-mode optical fiber at 850nm. Applications include Ethernet, Fiber Channel and ATM protocols. The optical assembly is designed to interface either 50 $\mu$ m or 62.5 $\mu$ m multi-mode fiber.

The HFD7180-xxx is designed to be paired with AOC VCSEL TOSA products (see data sheets for HFE719x products).



| Part Number | Description                                             |
|-------------|---------------------------------------------------------|
| HFD7180-001 | 5 pin LC ROSA, with separate PD bias                    |
| HFD7180-413 | 5 pin LC ROSA, with separate PD bias, with flex circuit |

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Advanced Optical Components Division

ABSOLUTE MAXIMUM RATINGS

| Parameter                  | Rating                         |
|----------------------------|--------------------------------|
| Storage temperature        | -40°C to +95°C                 |
| Case Operating temperature | -20° to +95°C                  |
| Lead solder temperature    | 260°C, 10 seconds              |
| Power Supply Voltage       | -0.5V to 4V                    |
| Incident Optical Power     | +3 dBm average,<br>+6 dBm peak |

**NOTICE:** Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operations section for extended periods of time may affect reliability.

**NOTICE:** The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation to equipment, take normal ESD precautions when handling this product.

## ELECTRICAL-OPTICAL CHARACTERISTICS

3.0V<V<sub>cc</sub><3.6V, AC coupled to 50 ohm differential), -20°C<T<95°C unless otherwise specified, with flex circuit

| Parameters                                  | Test Condition                                                               | Symbol                         | Min. | Typ. | Max. | Units | Notes |
|---------------------------------------------|------------------------------------------------------------------------------|--------------------------------|------|------|------|-------|-------|
| Data Rate                                   |                                                                              | DR                             | 0.1  |      | 8.5  | Gbps  |       |
| Supply Voltage                              |                                                                              |                                | 3.0  | 3.3  | 3.6  | V     |       |
| Supply Current                              | P <sub>R</sub> =0μW, R <sub>L</sub> =50 Ω AC coupled                         | I <sub>CC</sub>                |      | 35   | 50   | mA    | 1     |
| Optical Return Loss                         | P <sub>R</sub> =-12dBm                                                       | ORL                            | 12   |      |      | dB    | 1     |
| Input Optical Wavelength                    |                                                                              | λ <sub>p</sub>                 | 770  | 850  | 870  | nm    |       |
| PD Responsivity                             | P <sub>R</sub> =-12dBm                                                       | Resp                           | 0.43 | 0.5  | 0.6  | A/W   | 1     |
| PD Bias Voltage                             |                                                                              | V <sub>PD</sub>                | 3.0  | 3.3  | 3.6  | V     |       |
| Maximum Average Input Power Before Overload |                                                                              | P <sub>MAX</sub>               | 0    | +3   |      | dBm   |       |
| Differential Output Voltage Swing           | P <sub>R,OMA</sub> =-12dBm<br>R <sub>L</sub> =50 Ω AC coupled                | V <sub>o</sub> (pk-pk)         | 150  | 260  | 330  | mV    | 1,2   |
| Differential Responsivity                   | P <sub>R,OMA</sub> =-12dBm<br>R <sub>L</sub> =50 Ω AC coupled                | T                              | 2300 | 3000 | 5300 | V/W   | 1,2   |
| -3dB Optical/Electrical Bandwidth           | T <sub>A</sub> =25°C                                                         | BW                             | 6    | 7.5  | 11   | GHz   | 1,2,3 |
| Low Frequency -3dB Cutoff                   |                                                                              | BW <sub>LF</sub>               |      | 20   | 90   | KHz   | 1,2,3 |
| Output Impedance                            |                                                                              | Z <sub>out</sub>               | 40   | 50   | 60   | Ω     |       |
| Optical Return Loss                         | F<6GHz                                                                       | S <sub>22</sub>                | 8    | 12   |      | dB    |       |
| Sensitivity, OMA                            | DR = 2.125Gbps                                                               | S                              |      | -19  | -16  | dBm   | 4     |
|                                             | DR = 2.125Gbps                                                               |                                |      | -18  | -15  |       |       |
|                                             | DR = 2.125Gbps                                                               |                                |      | -15  | -13  |       |       |
| Rise/Fall Time                              | P <sub>R</sub> OMA = -12dBm,<br>(20%-80%)                                    | T <sub>R</sub> /T <sub>F</sub> |      | 30   | 50   | ps    | 2.5   |
| Differential Power Supply Rejection Ratio   | P <sub>R</sub> =0μW (dark)<br>5MHz<F<2GHz                                    | PSRR                           | 20   |      |      | dB    | 1,6   |
| Group Delay                                 | P <sub>R,OMA</sub> =-12dBm<br>R <sub>L</sub> =50 Ω AC coupled<br>2MHz<F<6GHz | GVD                            | -50  |      | 50   | ps    | 7     |
| Deterministic Jitter                        | P <sub>R,OMA</sub> =-12dBm<br>R <sub>L</sub> =50 Ω AC coupled                | DJ <sub>TIA</sub>              |      | 20   | 40   | ps    | 8     |
| Random Jitter                               | P <sub>R,OMA</sub> =-12dBm<br>R <sub>L</sub> =50 Ω AC coupled                | RJ <sub>TIA</sub>              |      | 3    | 5    | ps    | 9     |

NOTES

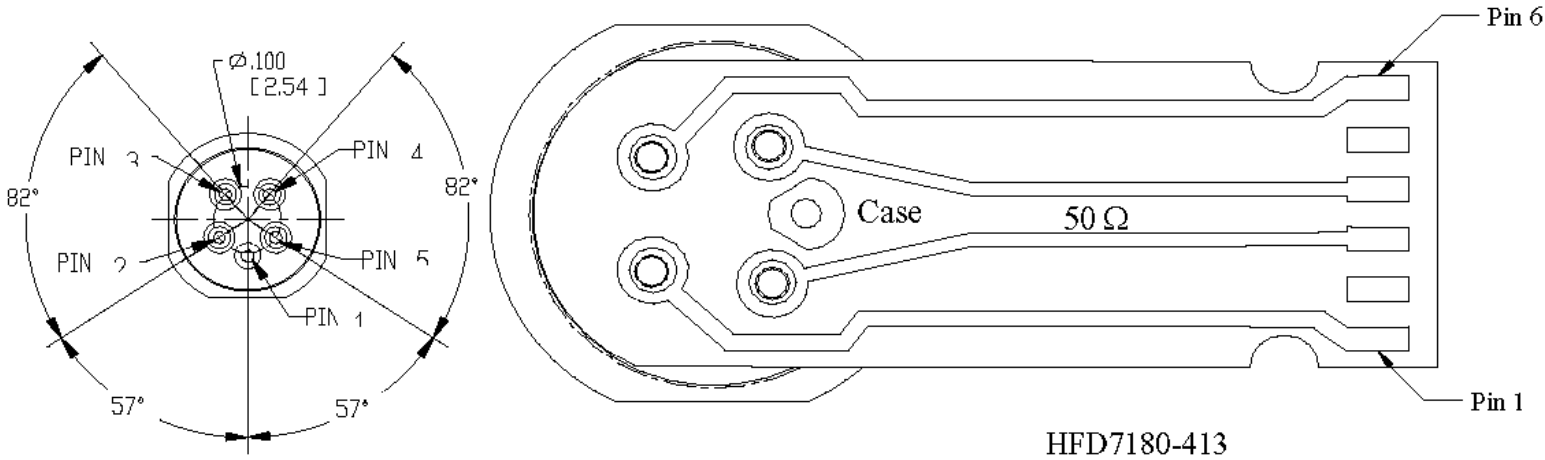
- 1.  $P_R$  is the average optical power at the fiber face.
- 2.  $P_{R,OMA}$  is the peak to peak optical power at the fiber face (Optical Modulation Amplitude)  
$$P_{R,OMA} \equiv \frac{2P_R(ER-1)}{ER+1}$$
where ER is the extinction ratio (linear) of the optical source.
- 3. Bandwidth and Low Frequency Cutoff are measured with a small signal sinusoidal light source with -10dBm average power
- 4. Sensitivity is measured with an optical source with an extinction ratio of 3dB. For sensitivity measurements at 2 and 4Gbps, bandwidth limiting of the TIA is assumed to be implemented at the front end of the post amplifier.
- 5. Rise/Fall times are corrected for optical source Rise/Fall

times.  $T^2_{TIA} = T^2_{MEASURED} - T^2_{OPTICAL}$

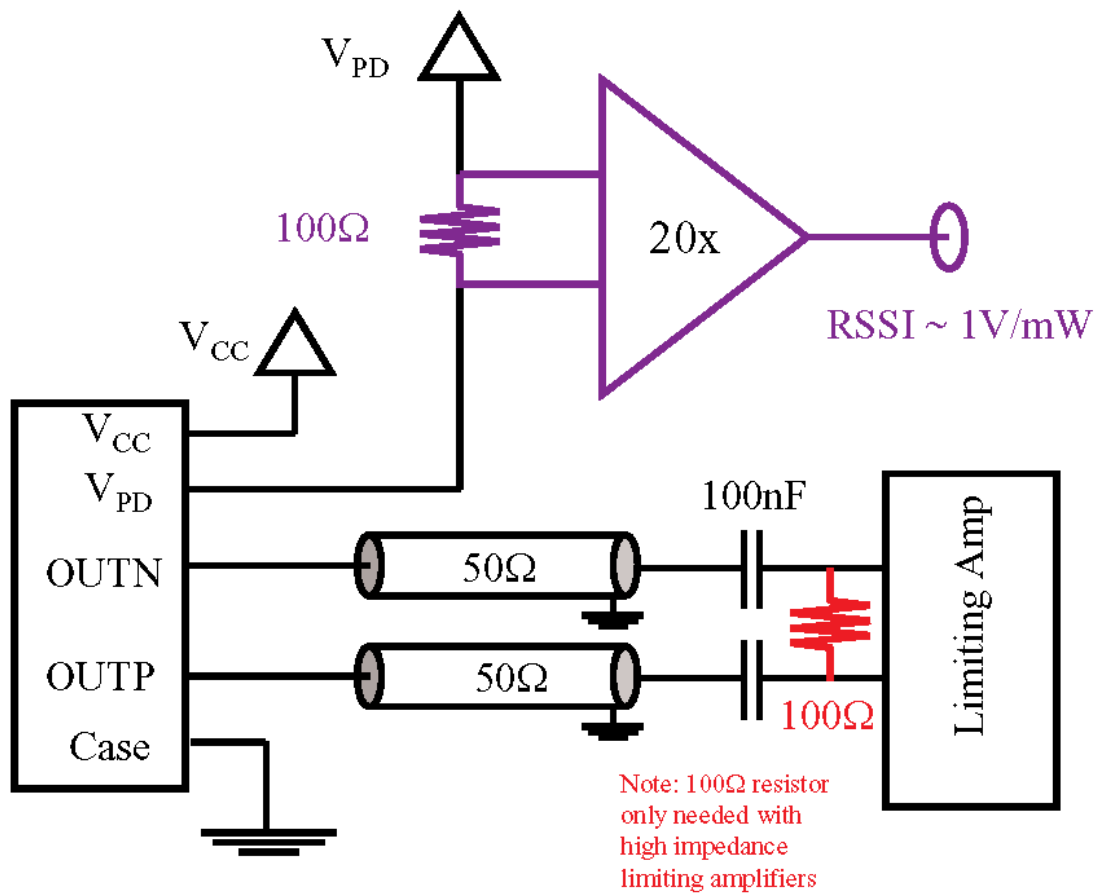
- 6. Value shown is with no external power supply filtering.
- 7. Group delay is a sensitive measurement to package interface, and includes the effects of PD, TIA and package. Measurement is made with TO leads as short as possible.
- 8.  $DJ_{TIA}$  is specified as contributed DJ by the TIA, obtained from  $DJ^2_{TIA} = DJ^2_{TOTAL} - DJ^2_{OPTICAL}$
- 9.  $RJ_{TIA}$  is specified as contributed DJ by the TIA, obtained from  $RJ^2_{TIA} = RJ^2_{TOTAL} - RJ^2_{OPTICAL}$
- 10. The electrical performance of the ROSA is dependent upon the quality of the electrical connection between the TO can and the circuit board. AOC cannot guarantee all performance specifications for parts without the flex circuit attached.

PINOUT

| PIN | HFE7180-001     | PIN | HFE7180-413     |
|-----|-----------------|-----|-----------------|
| 1   | GND (Case)      | 1   | V <sub>CC</sub> |
| 2   | OUTN            | 2   | Case            |
| 3   | V <sub>CC</sub> | 3   | OUTN            |
| 4   | V <sub>PD</sub> | 4   | OUTP            |
| 5   | OUTP            | 5   | Case            |
|     |                 | 6   | PD_Bias         |



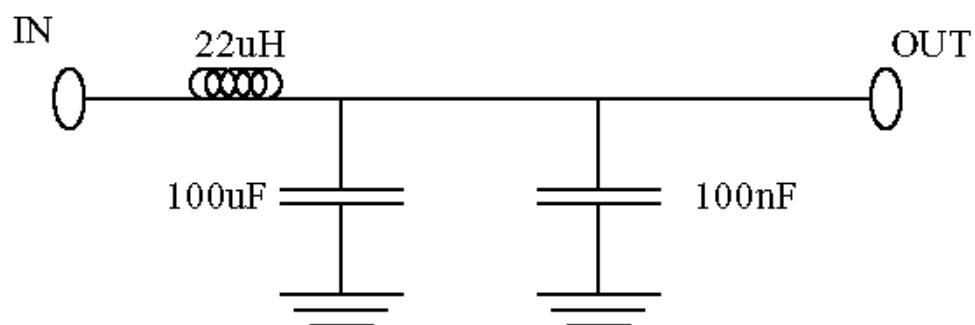
## INTERFACE EXAMPLE



Optional  $100\Omega$  differential termination for high impedance limiting amplifiers is shown in red

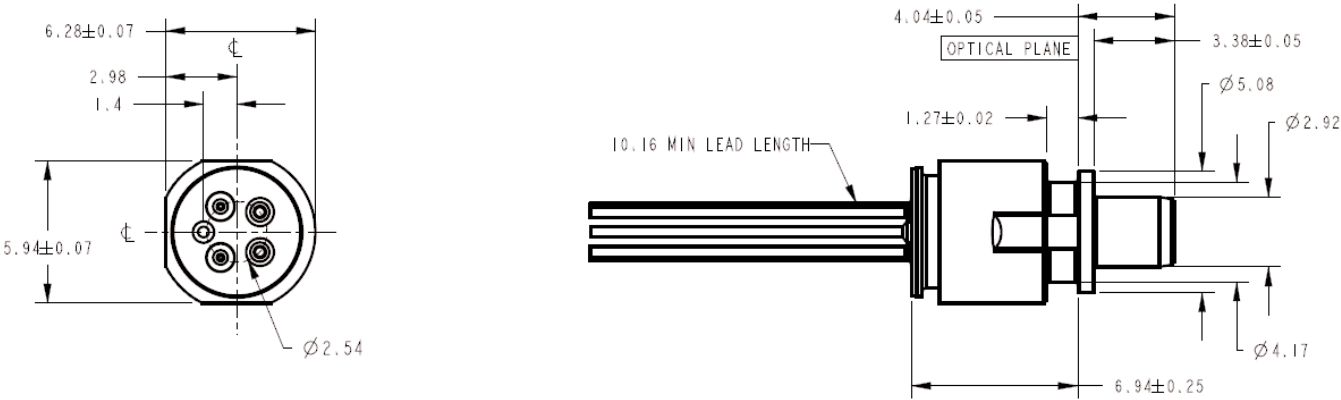
## RECOMMENDED BIAS FILTER NETWORK

Note, better performance will be obtained if a ferrite bead is used in place of the inductor.



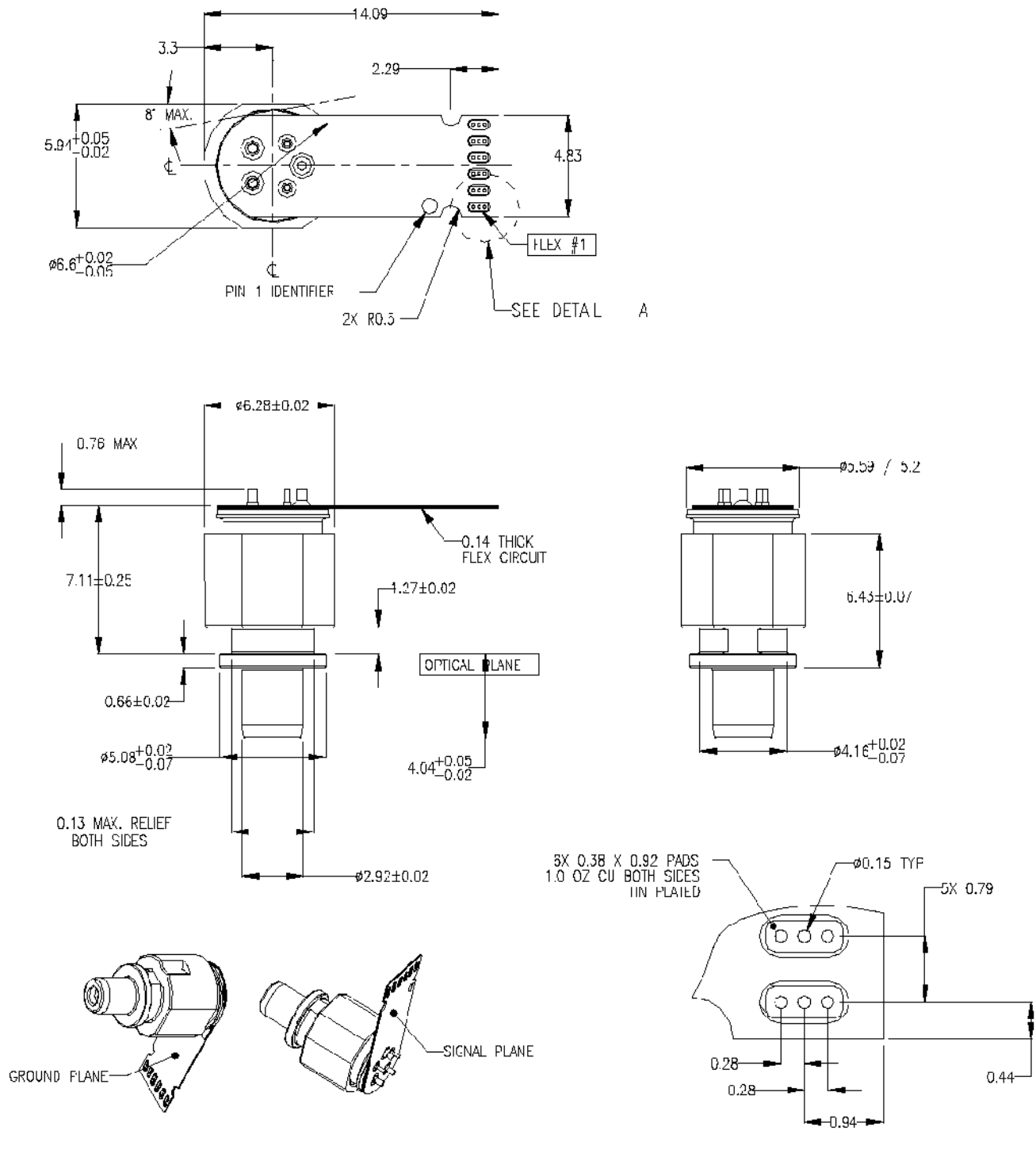
**MECHANICAL DIMENSIONS HFD 7180-001**

(for reference only):  
Dimensions in Inches



## MECHANICAL DIMENSIONS HFD 7180-413

(for reference only):  
Dimensions in Inches



## ADVANCED OPTICAL COMPONENTS

Finisar's ADVANCED OPTICAL COMPONENTS division was formed through strategic acquisition of key optical component suppliers. The company has led the industry in high volume Vertical Cavity Surface Emitting Laser (VCSEL) and associated detector technology since 1996. VCSELs have become the primary laser source for optical data communication, and are rapidly expanding into a wide variety of sensor applications. VCSELs' superior reliability, low drive current, high coupled power, narrow and circularly symmetric beam and versatile packaging options (including arrays) are enabling solutions not possible with other optical technologies. ADVANCED OPTICAL COMPONENTS is also a key supplier of Fabrey-Perot (FP) and Distributed Feedback (DFB) Lasers, and Optical Isolators (OI) for use in single mode fiber data and telecommunications networks

## LOCATION

- Allen, TX - Business unit headquarters, VCSEL wafer growth, wafer fabrication and TO package assembly.
- Fremont, CA – Wafer growth and fabrication of 1310 to 1550nm FP and DFB lasers.
- Shanghai, PRC – Optical passives assembly, including optical isolators and splitters.

## SALES AND SERVICE

Finisar's ADVANCED OPTICAL COMPONENTS division serves its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call the number listed below.

## AOC CAPABILITIES

ADVANCED OPTICAL COMPONENTS' advanced capabilities include:

- 1, 2, 4, 8, and 10Gbps serial VCSEL solutions
- 1, 2, 4, 8, and 10Gbps serial SW DETECTOR solutions
- VCSEL and detector arrays
- 1, 2, 4, 8, and 10Gbps FP and DFB solutions at 1310 and 1550nm
- 1, 2, 4, 8, and 10Gbps serial LW DETECTOR solutions
- Optical Isolators from 1260 to 1600nm range
- Laser packaging in TO46, TO56, and Optical subassemblies with SC, LC, and MU interfaces for communication networks
- VCSELs operating at 670nm, 780nm, 980nm, and 1310nm in development
- Sensor packages include surface mount, various plastics, chip on board, chipscale packages, etc.
- Custom packaging options

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