Optical Comb Filter

Data Sheet

P/N: CF-CxCyyCnnn
PRODUCT SPECIFICATION

1. Introduction

Optoplex provides customized flat-top optical comb filter based on its optical interleaver technology. In contrast with traditional Fabry-Perot cavity-based comb filter, Optoplex’s comb filter is capable of transmitting modulated DWDM signals with its passband width available anywhere down to a few GHz. Both the filter channel spacing (FSR) and filter duty cycle (3-dB bandwidth to FSR ratio) can be specified by customers.

Based on Optoplex’s patented technologies of micro-optics and phase modulation through thin-film coating, the flat-top comb filter is a purely passive device characterized by minimal temperature dependence, flat-top passband, high channel isolation, low PDL, and uniform insertion loss. The product is Telcordia GR-1221 qualified.

Key Features and Benefits

- Wide and Flat Passband
- Minimal PDL
- High Isolation
- Minimal Thermal Drift
- Low and Customizable Dispersion
- Low Insertion Loss & IL Uniformity
- Dual C- and L-Band Coverage
- Telcordia GR-1221/63 Qualified

Figure 1.1, spectrum of a 50GHz comb filter
Figure 1.2, Pass-band of a flat-top comb filter, compared to an F-P filter
Figure 1.3, Photo of a 50GHz comb filter
Applications

- Noise Suppression in DWDM System
- Passband Reduction of Signals with High Modulation Rate
- Reshape Signal Passband
- Optical Ruler in DWDM System

2. Absolute Maximum Rating

Table 2.1, Absolute Maximum Rating

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Storage temperature range</td>
<td>$T_{stg}$</td>
<td>Non Condensing</td>
<td>-40</td>
<td>85</td>
<td>°C</td>
</tr>
<tr>
<td>2</td>
<td>Storage humidity</td>
<td>$RH_{stg}$</td>
<td>Non Condensing</td>
<td>5</td>
<td>85</td>
<td>%</td>
</tr>
<tr>
<td>3</td>
<td>Maximal optical input power</td>
<td>$P_{opt_max}$</td>
<td>Continuous wave</td>
<td>24</td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>4</td>
<td>Minimum bending radius of the fiber</td>
<td>$R$</td>
<td>SMF-28, or equivalent</td>
<td>15</td>
<td></td>
<td>mm</td>
</tr>
</tbody>
</table>

3. Operating Conditions

Table 3.1, Operating Conditions

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operating case temperature range</td>
<td>$T_{case}$</td>
<td>Long Term, non condensing</td>
<td>-5</td>
<td>65</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Relative humidity range</td>
<td>$RH$</td>
<td>Long Term, non condensing</td>
<td>5</td>
<td>85</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Operating wavelength range</td>
<td>$\lambda$</td>
<td>C- Band</td>
<td>1528</td>
<td>1568</td>
<td>nm</td>
<td></td>
</tr>
</tbody>
</table>
4. Optical Performance Specification

4.1 Optical Performance Specification of a 100GHz Comb Filter

Table 4.1, optical performance specification

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Unit</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength Range (C-Band)</td>
<td>WR</td>
<td>nm</td>
<td>1527 ~ 1567</td>
</tr>
<tr>
<td>Free Spectral Range (FSR)</td>
<td>FSR</td>
<td>GHz</td>
<td>100</td>
</tr>
<tr>
<td>Spectrum Valley Position</td>
<td>VP</td>
<td>GHz</td>
<td>Offset 50GHz from ITU Grid</td>
</tr>
<tr>
<td>Channel Center Frequency Error</td>
<td>CFE</td>
<td>GHz</td>
<td>&lt; ±1.0</td>
</tr>
<tr>
<td>Peak Insertion Loss(^1)</td>
<td>IL</td>
<td>dB</td>
<td>&lt; 4.5</td>
</tr>
<tr>
<td>Insertion Loss Uniformity</td>
<td>UNI</td>
<td>dB</td>
<td>&lt; 0.7</td>
</tr>
<tr>
<td>Spectrum Dip Depth</td>
<td>PTV</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>Spectrum Shape</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passband Width @ 1.0 dB</td>
<td>BW(_1)</td>
<td>GHz</td>
<td>&gt; 2.5</td>
</tr>
<tr>
<td>Passband Width @ 3.0 dB</td>
<td>BW(_3)</td>
<td>GHz</td>
<td>&gt; 7.0</td>
</tr>
<tr>
<td>Passband Width @ 20 dB</td>
<td>BW(_{20})</td>
<td>GHz</td>
<td>&lt; 40</td>
</tr>
<tr>
<td>PDL(^1)</td>
<td>PDL</td>
<td>dB</td>
<td>&lt; 0.3</td>
</tr>
<tr>
<td>Chromatic Dispersion (within ITU-Grid ±15 GHz)</td>
<td>CD</td>
<td>ps/nm</td>
<td>&lt; ±90</td>
</tr>
<tr>
<td>Polarization Mode Dispersion (within ITU-Grid ±15 GHz)</td>
<td>PMD</td>
<td>ps</td>
<td>&lt; 0.2</td>
</tr>
<tr>
<td>Return Loss(^1)</td>
<td></td>
<td>dB</td>
<td>&gt; 40</td>
</tr>
</tbody>
</table>

Note:
1. Over the stated spectral and operating temperature ranges and all polarization states.
2. Not including one collimator sleeve extending by ~16 mm.
4.2 Spectral Profile

Figure 4.1, Example of a 50GHz Comb Filter with 6-dB Dip (spectrum curve is within inner and outer limit). Custom-profile is available upon request

Figure 4.2, Designed Spectrum of a 100GHz comb filter
4.3 Definition of Parameters

- **Operating Wavelength Range (WR)**
  The wavelength range shall be expanded when measuring adjacent channel isolation of shortest and longest wave channel.

- **Insertion Loss at Peak (IL)**
  Defined as minimum value of insertion loss within the Passband over all state of polarization (ASOP) and operating temperature range. (“Insertion loss” means optical loss between Port 1 and Port 2) Connector loss is not included.

- **Insertion Loss Uniformity (UNI)**
  UNI is defined as maximum value of IL subtracted by minimum value of IL for all channels.

- **Polarization Dependent Loss (PDL)**
  PDL is defined as the maximum variation of loss over polarization (at a given frequency) within the 0.5-dB Passband and over operating temperature range.

- **Spectrum Valley Position (VP)**
  VP is defined as the position of the spectrum where the insertion loss over ASOP and operating temperature range is the maximum.

- **Spectrum Dip Depth (PtV)**
  PtV is defined as the difference between “minimum insertion loss over ASOP and operating temperature range, within Passband” and “maximum insertion loss over ASOP and operating temperature range, within Stopband”.

- **Return Loss (RL)**
  RL is defined as the minimum value of (“the power of input light” minus “the power of input reflected light”) over all polarization state. Return loss of connectors is not included. RL is measured for both ports and over the operating wavelength range.
5. Physical and Mechanical Specification

5.1 Device Dimension

Table 5.1, Device Dimensions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>21</td>
<td>16</td>
<td>10.3</td>
<td>mm</td>
</tr>
</tbody>
</table>

Note:
1. Not including the collimator sleeves extending in two adjacent sides. See the detailed drawing below.

5.2 Mechanical Drawing

Figure 5.1, Mechanical drawing of 100GHz comb filter
5.3 Fiber and Connector

Table 5.2, Fiber and Connector Requirements

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector Type</td>
<td>-</td>
<td>FC/APC (or customer specific)</td>
</tr>
<tr>
<td>Fiber Pigtail Type</td>
<td>-</td>
<td>SMF-28, or equivalent, with 900 μm loose tube</td>
</tr>
<tr>
<td>Fiber Pigtail Length</td>
<td>mm</td>
<td>1,000 ± 100</td>
</tr>
</tbody>
</table>

5.4 Port Definition and Labeling

![Port Definition and Labeling Diagram]

Port Label ~6 mm width.
Brother industrial grade adhesive tape for p-touch label maker. TZS series.

Figure 5.2, Port definition and labeling
6. Product Label Requirements

6.1 Port label position and type — Flag tape on pigtail near connector. Width of tape: ~3 mm.
6.2 Port label contents — See Figure 5.2.
6.3 Device label — On top, contains the following information:
   a) Optoplex logo
   b) Product description: Optical Comb Filter, xxGHz Channel Spacing, C-Band
   c) Manufacturer P/N: CF-CxCyyCnnn
   d) Manufacturer S/N: (TBD)

Note: x, yy and nnn are determined by customer’s selection; see Section 9, “Ordering Information”

7. Quality and Reliability

- RoHS 6 compliance
- Telcordia 1221-CORE qualified

8. Ordering Information
9. Sales Contact

Optoplex Corporation
3374 Gateway Boulevard
Fremont, CA 94538
USA
Tel: (510) 490-9930
Fax: (510) 490-9330
E-Mail: sales@optoplex.com
       support@optoplex.com
       info@optoplex.com
Website: www.optoplex.com