MEMS 1XN ALL-OPTICAL SWITCH

Features:
- Telcordia GR-1221 qualified
- Small size, low cost
- Available in the following configurations:
  - 1x2, 1x3, 1x4, 1x8, 1x12
- No-hit switching
- Fully symmetric for 1xN or Nxn applications
- Fast response time: < 5 ms for 1x4 no-hit switching
- Available as discrete switch with Analog DC Voltage Control or module with I2C or TTL interface
- Singlemode fiber
- Low insertion loss
- Low WDL, PDL, TDL
- Low crosstalk
- Very low power consumption
- Non-latching
- High durability >1x10^9 cycles
- Stable and repeatable in open loop operation
- Best-in-class resistance to shock & vibration

Applications:
- Optical channel monitoring in optical networks
- Switch & select modules (multicast switches, switch & broadcast applications)
- Contention-less, Direction-less, Color-less ROADMs
- Wavelength Selective Switches
- OADMs
- Test & measurement

Product Description:
OZ Optics offers MEMS-based non-latching 1xN optical switches in a fast, low cost miniature package. These best-in-class switches are available either as discrete units driven by analog DC Voltage control (no control electronics), or as modules with built-in control electronics with I2C or TTL interface. OZ Optics 1xN MEMS Switches have best-in-class shock & vibration spec, and come in compact, easy to install form factors. Form factors of 1x2, 1x3, 1x4, 1x8 and 1x12 switches are identical. The MEMS technology used in these switches offers extremely low electrical power consumption, high durability (> 1x10^9 cycles), no stiction, and high resistance to shock & vibration. Laser welded assembly ensures repeatability and ruggedness in field applications.

For evaluation, OZ Optics provides a Software Applet & Test PCB that users can connect to a Personal Computer to easily control the 1xN switch via a graphical user interface.

Figure 1: 1xN (N=2, 3, 4, 8, 12) MEMS Optical Switch Module with Control Electronics and I2C or TTL Interface

Figure 2: 1xN (N=2, 3, 4, 8, 12) MEMS Optical Switch with Analog DC Voltage Control
### Standard Product Specifications:

<table>
<thead>
<tr>
<th>Port count</th>
<th>1x2, 1x3, 1x4</th>
<th>1x8</th>
<th>1x12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating wavelength range</strong></td>
<td>C or L band</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Switching time for no-hit open-loop operation</strong></td>
<td>&lt; 5.0</td>
<td>&lt; 8.0</td>
<td>&lt; 8.0</td>
</tr>
<tr>
<td><strong>Insertion loss at CWL at room temperature</strong></td>
<td>0.7</td>
<td>0.8</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Return loss</strong></td>
<td>&gt; 50</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td><strong>Port Isolation</strong></td>
<td>&gt; 55</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td><strong>Wavelength Dependent Loss (WDL)</strong></td>
<td>0.20</td>
<td>0.20</td>
<td>0.30</td>
</tr>
<tr>
<td>20 nm window at room temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Polarization Dependent Loss (PDL)</strong></td>
<td>0.10</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td><strong>Temperature Dependent Loss (TDL)</strong></td>
<td>0.30</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td><strong>Repeatability after 100 cycles</strong></td>
<td>0.02</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td><strong>Wear-out</strong></td>
<td>&gt; 1x10^9</td>
<td>Cycles</td>
<td></td>
</tr>
<tr>
<td><strong>Maximum optical power</strong></td>
<td>500</td>
<td>mW</td>
<td></td>
</tr>
<tr>
<td><strong>Operating temperature</strong></td>
<td>Discrete Switch Module with Interface</td>
<td>-5 to +70°C</td>
<td>-5 to +65°C</td>
</tr>
<tr>
<td><strong>Storage temperature</strong></td>
<td>-40 to +85°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hermeticity (MEMS Header)</strong></td>
<td>&lt; 10⁻⁷ atm.cm³/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control Interface</strong></td>
<td>Discrete Switch Module with Interface</td>
<td></td>
<td>Analog DC Voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I²C or TTL</td>
</tr>
<tr>
<td><strong>Driving voltage</strong></td>
<td>Discrete Switch Module with Interface</td>
<td>0-35 V Analog</td>
<td>5 V Power Supply</td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>Discrete Switch Module with Interface</td>
<td>&lt; 1x10⁻⁶</td>
<td>&lt; 80x10⁻³</td>
</tr>
<tr>
<td><strong>Mechanical Dimensions</strong></td>
<td>See Drawing</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fiber Type</strong></td>
<td>SMF 28</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Telcordia spec</strong></td>
<td>GR-1221</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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(1) 1310 nm, 1060 nm and other wavelengths are available.

(2) Excluding connectors.
Ordering Information for Custom Parts:
OZ Optics welcomes the opportunity to provide custom designed products to meet your application needs. As with most manufacturers, customized products take additional effort, so please expect some differences in pricing compared to our standard parts list. In particular, we will need additional time to prepare a comprehensive quotation, and lead times may be longer than normal. In most cases non-recurring engineering (NRE) charges, lot charges, and a 50 piece minimum order will be necessary. These points will be carefully explained in your quotation, so that your decision is as well-informed as possible. We strongly recommend buying our standard products.

Questionnaire for Custom Parts:
1. Number of switching ports: 1, 2, 3, 4, 8, or 12.
2. What wavelengths are you using?
3. Which core/cladding size are you using?
4. What type of connectors do you need?
5. How long should the fibers be? What size jacketing?
6. Are there any other special requirements?

Description
- **C** = Number of non-latching Channels: 1, 2, 3, 4, 8, or 12
- **a/b** = Fiber core/cladding sizes in microns
  - 9/125 for 1300/1550 nm singlemode fiber
  - See tables 1 to 5 of the Standard Tables data sheet for other standard fiber sizes.
- **F** = Fiber Type
  - S = Singlemode
  - P = Polarization Maintaining Fiber
- **W** = Wavelength: Specify in nanometers
  - C = C Band
  - L = L Band
  - S = S Band
  - Please specify in nm if different from Standard ITU Spec (Example: 1310 for 1310 nm). Other wavelengths and/or polarization maintaining fiber versions are available upon request.
- **XY** = Connector codes for each port. Input and output connections (x: input, y: outputs)
  - 3S = Super NTT-FC/PC
  - 3U = Ultra NTT-FC/PC
  - 3A = Angled NTT-FC/PC
  - LC = LC
  - MU = MU
  - SC = SC
  - SCA = Angled SC
  - X = No connector
  - See table 6 of the Standard Tables data sheet for other connectors.
- **L** = Fiber length, in meters (1 meter is standard)
- **CI** = Control Interface
  - A = Analog DC Voltage Interface for Bare Switch only
  - M = TTL/I2C interface for Module only
- **JD** = Fiber jacket type
  - 0.25 = 250 micron OD acrylate coating
  - 1 = 900 micron OD hytrel jacket