Mid Board Optical Transceiver
Featuring Coolbit Optical Engines 12 x 25.78125 Gbps

High Speed + Low Power = Your Next Communications System
TE Connectivity’s (TE) mid board optical module (MBO) is a 12-channel transceiver capable of transmitting and receiving data for a total bandwidth of 300 Gbps per square inch. The MBO features TE’s Coolbit optical engines that enable the product to perform at high speeds while consuming extremely low power, approximately < 4.5 Watts.

TE’s MBO was designed to move the I/O connection from a system’s faceplate onto its PCB—allowing systems to achieve ultra-high bandwidth density. This internal I/O connection helps free up faceplate space, enabling more connections and hence overall higher system density. The MBO module, using an LGA socket design, can be placed on a small 1-inch PCB grid.

What’s Inside Our Active Optic Products: Coolbit Optical Engines
Each TE 25 Gbps active optic product is designed with our latest Coolbit optical engine product technology. A single engine uses 25G VCSEL and PIN devices, a TIA amplifier and a driver IC and is produced in an automated wafer-scale assembly line at TE’s fabrication center. In this facility, our active optics products are manufactured in a fully vertically integrated capacity—allowing TE to control the entire manufacturing process, research to release. The Coolbit optical engine is our latest creation, from start to finish.
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FEATURES
• 12 transmit and 12 receive 25G -channels (12x2, 25.78 Gb/s)
• Bandwidth density of 300 Gb/s per square inch of PCB
• Low power dissipation, consuming a nominal 380mW per channel including CDR’s
• Footprint 1” x 1”, low -profile 1/2”
• Designed to enable densely-packed 2D arrays of MBO modules
• Enables ultra-high bandwidth density on the faceplate
• Uses a TE developed BGA/LGA high-density, high-speed electrical socket
• Compatible with the OIF-VSR electrical interface
• Differential, internally AC-coupled data I/O
• Digital Diagnostics Monitoring Interface (DDMI) allows customer management and monitoring of key modules parameters
• Internal CDR circuits on both receiver and transmitter channels
• Transmitter input equalizer and output pre-emphasis that can compensate for more than 12dB at 12.9GHz
• Optical detachable connectivity via industry standard 2x12 position MT termination
• Field-programmable firmware updates
• Secondary heat sink allows for customer specific thermal solutions

APPLICATIONS
• High-speed interconnects within/between switches, routers and transport equipment
• Server-server clusters and super-computing
• Proprietary backplanes
• Interconnects rack-to-rack, shelf-to-shelf, board-to-board, board-to-optical backplane
• Standards: OIF-CEI-28G
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Figure 1. Basic outline of the TE MBO Interconnect

REGULATORY COMPLIANCE

<table>
<thead>
<tr>
<th>Compliance Area</th>
<th>Standard / Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety of Information Technology Equipment:</td>
<td>ANS/UL 60950-1; CAN/CSA-C22.2 No.60950-1-07; CB Certificate: IEC 60950-1</td>
</tr>
<tr>
<td>Electrostatic Discharge Immunity (external):</td>
<td>EN 55024/EN 61000-4-2: Tested to sustain 4kV contact discharge and 8kV air discharge</td>
</tr>
<tr>
<td>Electrostatic Discharge Immunity (connector pads):</td>
<td>Human Body Model (JESD22-A114-D): sustains 500V.</td>
</tr>
<tr>
<td>Recognition by Nationally Recognized Testing Laboratories (NRTL):</td>
<td>TuV: Recognized component</td>
</tr>
<tr>
<td>RoHS Compliance:</td>
<td>Compliant with EU Directive 2002/95/EC (RoHS)</td>
</tr>
</tbody>
</table>
### ABSOLUTE MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage¹</td>
<td>VCC</td>
<td>-0.5</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>Differential input voltage amplitude²</td>
<td>ΔV</td>
<td>1600</td>
<td></td>
<td>mV p-p</td>
</tr>
<tr>
<td>Voltage on any pin</td>
<td>VPIN</td>
<td>-0.3</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>Relative humidity (non-condensing)</td>
<td>MOS</td>
<td>5</td>
<td>95</td>
<td>%</td>
</tr>
<tr>
<td>Operating case temperature</td>
<td>TCASE</td>
<td>-5</td>
<td>75</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>TSTG</td>
<td>-40</td>
<td>100</td>
<td>°C</td>
</tr>
<tr>
<td>ESD resistance³</td>
<td>VESD</td>
<td>± 500</td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

1. Applies to all input supply voltages.
2. Differential input voltage amplitude is peak to peak value.
3. All pins withstand 500V based on Human Body Model, JEDEC JESD22-A114-D.

### RECOMMENDED OPERATING CONDITIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply voltage¹</td>
<td>VCC</td>
<td>3.135</td>
<td>3.3</td>
<td>3.465</td>
<td>V</td>
</tr>
<tr>
<td>Module Power Consumption²</td>
<td>PD</td>
<td></td>
<td>5 W</td>
<td></td>
<td>W</td>
</tr>
<tr>
<td>Operating case temperature</td>
<td>TCASE</td>
<td>0</td>
<td>70</td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Signaling rate (per channel)⁴</td>
<td>fD</td>
<td>1.25</td>
<td></td>
<td>25.78125</td>
<td>Gbps</td>
</tr>
<tr>
<td>Differential input voltage amplitude</td>
<td>ΔV</td>
<td></td>
<td>1200</td>
<td></td>
<td>mV p-p</td>
</tr>
<tr>
<td>Power supply noise⁵</td>
<td>VNPS</td>
<td>50</td>
<td></td>
<td></td>
<td>mV p-p</td>
</tr>
</tbody>
</table>

1. Applies to all input supply voltages.
2. Includes CDRs and equalizers, 800mV output amplitude, 70C.
3. Data patterns are to have maximum run lengths and DC balance shifts no worse than that of a Pseudo Random Bit Sequence of length 2³¹-1 (PRBS-31).
4. Power supply noise is defined at the supply side of the recommended filter for all VCC supplies over the frequency range of 1 kHz to 25.78125 GHz with the recommended power supply filter in place.
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RELATED PRODUCTS

MPO CABLE ASSEMBLIES
TE offers durable MTP brand MPO products for any parallel optics application. Available in 4, 8, 12, 24 and 48 fiber counts, the MPO cable assemblies use round cable for the most efficient, user-friendly and cost-effective solution for connecting to your CXP or QSFP transceivers.

LC CABLE ASSEMBLIES
TE offers a wide range of LC cable assemblies and associated accessories to meet your design needs. The addition of the Ultra Short LC connector helps provide a solution for the connectivity needs in professional networks and systems, especially in places with limited space.

LEGACY PASSIVE FIBER INTERCONNECTS
Find solutions for standard passive fiber optic connection challenges. The section covers industry standards including ST, SC, FC and many other connectors, adapters, attenuators and off the shelf cable assemblies.

10-14 GBPS ACTIVE OPTICS
We offer active optical cable assemblies and transceivers for 10 and 14 Gbps applications.

PLUGGABLE I/O CONNECTORS AND CAGES
TE high-speed I/O interconnects offer standard equipment I/O interface and the flexibility of pluggable modules for fiber and copper links and various data rates and protocols.

COPPER CABLE ASSEMBLIES
TE’s high-speed copper cable assembly portfolio includes multiple options for simplified cable management. The products support latest high-speed standards at 10 Gbps and beyond and offer flexibility and customizability.
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104002AE 1/14 Original

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