General
The ERmet ZD is specifically designed for high speed differential signaling in telecom applications at data rates of up to 5 Gbit/s. This robust, high performance, modular connector system is also designed to be used in conjunction with the 2mm hard metric (IEC 61076-4-101) family of connectors. The connector meets the electrical performance requirements of high speed, low voltage differential signaling. The ERmet ZD connector family is available in pressfit versions. The backplane module is a male pin header that has three mating levels. The robust mechanical design and excellent signal integrity are a result of the internal differential shielding scheme and the “L” shaped male shield blades. The inherently rigid male shields stand higher than the signal pins and surround each pair. An improved guidance feature completes the rugged mechanical design. Optimized grid design to improve the RF characteristics. Easy and economical trace routing achieved by in-line-design of signal and ground pins.

Technical Features
- Modules: 2 pair, 3 pair and 4 pair versions available.
- Design: Wafers with individually fully shielded pairs of contacts.
- Contacts: Low noise, dual beam, leaf contacts with one ground blade for every pair of signals.
- Wafer pitch: 2.5mm from wafer to wafer.
- Pitch between signal pins: 1.5mm between pairs (within wafer).
- Pitch between pairs: 4.5mm (within wafer).
- Ground arrangement: In line with signals at termination and surrounding shield.
- Multiline Crosstalk: <3% at 100ps rise time, 250mV swing.
- Insertion loss: <1dB up to 3GHz.
- Differential Impedance: 100Ω
- Propagation Delay:
  - A Pin 97 ±10ps
  - B Pin 107 ±10ps
  - C Pin 125 ±10ps
  - D Pin 134 ±10ps
  - E Pin 157 ±10ps
  - F Pin 166 ±10ps
  - G Pin 187 ±10ps
  - H Pin 199 ±10ps
- Power Modules: Closed entry, vertical female backplane modules with stamped blades.
- Alignment Features: Improved pre-alignment guide and polarizing features, 4 rigid blades for all modules.
**Dimensional Drawings**

**Vertical Male Connectors 4 pair / 10 wafer**

- **Id.-Nr.**
- **Date Code**

**EE-Zone für durchkontaktierte Löcher ø 0.6 ± 0.05**

- Compliant zone for through hole ø 0.6 ± 0.05

**Part Numbers**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Pin Version</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 4 (4 pairs) / 10 wafers</td>
<td>D</td>
<td>973031</td>
</tr>
<tr>
<td>Type 4 (4 pairs) / 10 wafers</td>
<td>B</td>
<td>973061</td>
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</table>

All dimensions in mm
**Vertical Male Connectors 3 pair / 10 wafer**

**Part Numbers**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Pin Version</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 3 (3 pairs) / 10 wafers</td>
<td>D</td>
<td>973027</td>
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<td>B</td>
<td>973062</td>
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All dimensions in mm
Vertical Male Connectors 2 pair / 10 wafer

Part Numbers

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<th>Pin Version</th>
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<td>D</td>
<td>973056</td>
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All dimensions in mm
Right Angle Female Connectors 4 pair / 10 wafer

Part Numbers

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<td>973032</td>
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All dimensions in mm
Right Angle Female Connectors 3 pair / 10 wafer

Part Numbers

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<tr>
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<tbody>
<tr>
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<td>973028</td>
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</table>

All dimensions in mm
Right Angle Female Connectors 2 pair / 10 wafer

Part Numbers

<table>
<thead>
<tr>
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<tbody>
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<td>Type 2 (2 pairs) / 10 wafers</td>
<td>973046</td>
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</table>

All dimensions in mm
Layouts

Backplane Layout 4 Pair

Additional GND-holes for improved RF-characteristics in pair a-b

Backplane Layout 3 Pair

Additional GND-holes for improved RF-characteristics in pair a-b

All dimensions in mm
Backplane Layout 2 Pair

Additional GND-holes for improved RF-characteristics in pair a-b.

Drill (27.5 mil) (23 mil) (45 mil) depends from manufacturer and size of the backplane.

Daughtercard Layout 4 Pair

Additional GND-holes for improved RF-characteristics in pair a-b.

Drill (27.5 mil) (23 mil) (41 mil) depends from manufacturer and board size.
Daughtercard Layout 3 Pair

Daughtercard Layout 2 Pair

All dimensions in mm
Plated Through-Holes for Pressfit Terminals

All ERmet ZD, ERmet 5+2, ERmet 8+2 and ERmet Power Module pressfit terminals share the same plated through-hole requirements. These pressfit terminals have been used successfully with reflowed tin-lead, plated tin-lead, immersion tin, organic coatings over bare copper and immersion gold hole plating regimes. The hole recommendations and press in force information shown in this catalog are for reflowed tin-lead and plated tin-lead. Additional test data for other hole plating regimes are available through customer service.

Antipad Size

The table below shows two examples for the antipad size

<table>
<thead>
<tr>
<th>No. of Track-Pairs</th>
<th>Pad-Diameter F</th>
<th>Antipad Size X x Y</th>
<th>Space C</th>
<th>Trackwidth A</th>
<th>Space between Tracks B</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1.0mm</td>
<td>1.3 x 2.8mm</td>
<td>0.075mm*</td>
<td>0.15mm</td>
<td>0.15mm</td>
</tr>
<tr>
<td>1</td>
<td>1.0mm</td>
<td>1.4 x 2.9mm</td>
<td>0.1mm*</td>
<td>0.25mm</td>
<td>0.4mm</td>
</tr>
</tbody>
</table>

* overlapping is necessary because of impedance control

Note:
To improve the high speed characteristics, remove all pads on unconnected layers! Smaller padsizes also improves the electrical characteristics! Antipad size as large as possible also improves the electrical characteristics!
Impedance Profiles

Measured from the daughtercard side, with Agilent 86100A TDR. Rise time is typically 35ps.

Row a-b

Row c-d
Stubbing Effect

The bottom connection is to prefer, because it doesn't cause so much reflection.
Measurement Setup for Eye Diagrams

The rise time of the bit pattern generator is 40ps. We use a PBRS 2 exp 7-1 signal.

Board Materials

For the testboards we used the materials Rogers 4350 and Standard FR4

<table>
<thead>
<tr>
<th>Material Parameters</th>
<th>Permittivity</th>
<th>Dielectric loss</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR4</td>
<td>4 - 4.5</td>
<td>0.02</td>
<td>1MHz</td>
</tr>
<tr>
<td>Rogers 4350</td>
<td>3.5</td>
<td>0.004</td>
<td>up to 10GHz</td>
</tr>
</tbody>
</table>
Board Constructions

Edge coupled stripline

The traces are designed for 100Ω differential impedance. Copper layer thickness is 35µm for stripline and 18µm for microstrip.

The trace width and spacing is for:

Layer 1  0.25 / 0.20mm
Layer 3  0.25 / 0.27mm
Layer 5  0.15 / 0.15mm
Layer 13 0.20 / 0.17mm
Layer 16 0.25 / 0.20mm

The SMA connectors were applied in SMD technology. The Daughtercards thickness is between 2.5 and 3mm. They had the same layer structure without the blind layers.
Eye Diagrams

Without ERmet ZD Connectors for Different Materials

Data rate: 5Gbit/s  
Trace length: 380mm / 15inch  
Layer: 13

FR4  
Max. eye opening: 46%

Rogers  
Max. eye opening: 66%
With ERmet ZD Connectors

Data rate: 3.125Gbit/s
Trace length: 600mm / 24inch
Layer: 13
Antipadsize: 3.5 x 1.7mm

FR4
Max. eye opening: 46%

Rogers
Max. eye opening: 65%
With ERmet ZD Connectors

Data rate: 5Gbit/s
Trace length: 600mm / 24inch
Layer: 13
Antipads: 3.0 x 1.3mm

FR4
Max. eye opening: 13%

Rogers
Max. eye opening: 49%
With ERmet ZD Connectors “Stubbing Effect”

Data rate: 5Gbit/s
Trace length: 190mm / 7.5inch
Material: Rogers
Antipadsize: 3.5 x 1.7mm

Layer 13
Max. eye opening: 67%

Layer 5
Max. eye opening: 52%
With Different Antipad sizes

Data rate: 5Gbit/s
Trace length: 190mm / 7.5inch
Layer: 13

Antipadsizes:
- Antipadsize: 3.0 x 1.3mm
  Max. eye opening: 57%
- Antipadsize: 3.5 x 1.7mm
  Max. eye opening: 63%
Measurements ERmet ZD Backdrilled

Board Constructions

The traces are designed for 100Ω differential impedance. Copper layer thickness is 35µm for stripline and 18µm for microstrip.

The trace width and spacing is for:

- Layer 1: 0.25 / 0.20mm
- Layer 3: 0.25 / 0.27mm
- Layer 5: 0.15 / 0.15mm
- Layer 13: 0.20 / 0.17mm
- Layer 16: 0.25 / 0.20mm

The SMA connectors were applied in SMD technology. The Daughtercards thickness is between 2.5 and 3mm. Backplane and daughtercard has the same layer structure without the blind layers.

The via sleeves were backdrilled to a length A of 2.5mm at the backplane, and 2mm on the daughtercard.
Eye Diagrams

ERmet ZD Connector Backdrilled

Data rate: 3.125Gbit/s
Trace length: 1000mm / 40inch
Trace width: 0.25mm / 10mil
Layer: 3
Antipad size: 3.5 x 1.7mm

FR4
Max. eye opening: 25%

Rogers
Max. eye opening: 53%
ERmet ZD Connector Backdrilled

Data rate: 5Gbit/s
Trace length: 1000mm / 40inch
Trace width: 0.25mm / 10mil
Layer: 3
Antipadsize: 3.5 x 1.7mm

FR4
Max. eye opening: 14%
At 5Gbit eye is closed.

Rogers
Max. eye opening: 34%
ERmet ZD Connector Backdrilled

Data rate: 3.125Gbit/s
Trace length: 600mm / 24inch
Trace width: 0.25mm / 10mil
Layer: 3
Antipadsize: 3.5 x 1.7mm
ERmet ZD Connector Backdrilled

Data rate: 5Gbit/s
Trace length: 600mm / 24inch
Trace width: 0.25mm / 10mil
Layer: 3
Antipads: 3.5 x 1.7mm

FR4
Max. eye opening: %

Rogers
Max. eye opening: %
ERmet ZD Connector Backdrilled

Data rate: 7Gbit/s
Trace length: 600mm / 24inch
Trace width: 0.25mm / 10mil
Layer: 3
Antipads: 3.5 x 1.7mm
ERmet ZD Connector Backdrilled

Data rate: 5Gbit/s  
Trace length: 380mm / 15inch  
Trace width: 0.25mm / 10mil  
Layer: 3  
Antipadsize: 3.5 x 1.7mm

FR4  
Max. eye opening: %

Rogers  
Max. eye opening: %
ERmet ZD Connector Backdrilled

Data rate: 5Gbit/s
Trace length: 190mm / 7.5inch
Trace width: 0.25mm / 10mil
Layer: 3
Antipads: 3.5 x 1.7mm

FR4
Max. eye opening: %

Rogers
Max. eye opening: %
ERmet ZD Connector Backdrilled

Data rate: 10Gbit/s
Trace length: 190mm / 7.5inch
Trace width: 0.25mm / 10mil
Layer: 3
Antipadsize: 3.5 x 1.7mm

FR4
Max. eye opening: %

Rogers
Max. eye opening: %
Influence of Skin Effect

Data rate: 5Gbit/s
Trace length: 1000mm / 40inch
Material: Rogers
Antipad size: 3.5 x 1.7mm

Trace width: 0.15mm / 6mil
Max. eye opening: 19%

Trace width: 0.25mm / 10mil
Max. eye opening: 34%
Influence of Skin Effect

Data rate: 7Gbit/s  
Trace length: 1000mm / 40inch  
Material: Rogers  
Antipadsize: 3.5 x 1.7mm

Trace width: 0.15mm / 6mil  
Max. eye opening: 4%

Trace width: 0.25mm / 10mil  
Max. eye opening: 19%
Spice Model

Single pair and multi pair spice models available. Also s-parameter and spectraquest models.
Guiding System

Layouts

Alignment pin kit with base plate

<table>
<thead>
<tr>
<th>Description</th>
<th>PCB Thickness</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment pin kit without base plate</td>
<td>3.2 – 5 mm</td>
<td>144370</td>
</tr>
<tr>
<td>Alignment pin kit without base plate</td>
<td>6 – 8 mm</td>
<td>144371</td>
</tr>
<tr>
<td>Alignment pin kit with base plate</td>
<td>3.2 – 5 mm</td>
<td>144131</td>
</tr>
<tr>
<td>Alignment pin kit with base plate</td>
<td>6 – 8 mm</td>
<td>144132</td>
</tr>
</tbody>
</table>

Alignment socket kit

<table>
<thead>
<tr>
<th>Description</th>
<th>PCB Thickness</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment socket kit</td>
<td>min. 1.5 mm</td>
<td>144127</td>
</tr>
<tr>
<td>Alignment socket kit</td>
<td>min. 3 mm</td>
<td>144128</td>
</tr>
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</table>

Ordering Information

Backplane versions

<table>
<thead>
<tr>
<th>Description</th>
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<th>Part Number</th>
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<tbody>
<tr>
<td>Alignment pin kit without base plate</td>
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</tr>
<tr>
<td>Alignment pin kit without base plate</td>
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<td>144371</td>
</tr>
<tr>
<td>Alignment pin kit with base plate</td>
<td>3.2 – 5 mm</td>
<td>144131</td>
</tr>
<tr>
<td>Alignment pin kit with base plate</td>
<td>6 – 8 mm</td>
<td>144132</td>
</tr>
</tbody>
</table>

Daughtercard versions

<table>
<thead>
<tr>
<th>Description</th>
<th>PCB Thickness</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment socket kit</td>
<td>min. 1.5 mm</td>
<td>144127</td>
</tr>
<tr>
<td>Alignment socket kit</td>
<td>min. 3 mm</td>
<td>144128</td>
</tr>
</tbody>
</table>