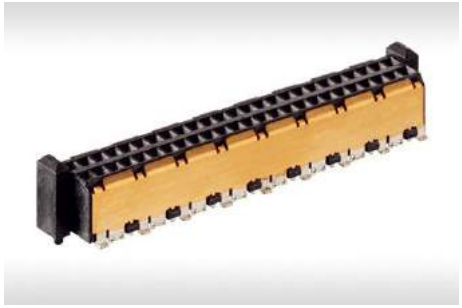
MICROSPEED®

Product Portfolio

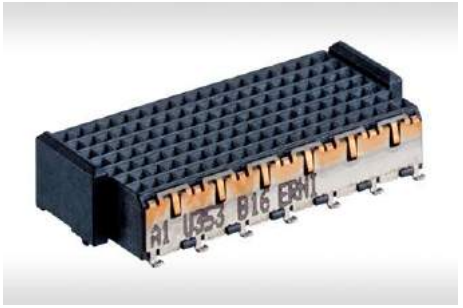
- Shielded connector family for high-speed data applications
- Performance up to 25 Gbit/s (at 0.5dB IL / 12.5GHz)
- Miniaturized design with 1mm pitch
- Supports board-to-board (mezzanine), backplane to daughtercard and coplanar applications
- Extensive connector portfolio with robust Blind-Mate solutions

Various Types



2-row configuration

MicroSpeed Triple



7-row Open Pin Field Array

Combo module

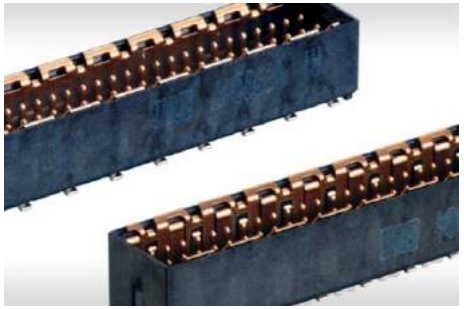
High Speed Connectors / High Density Open Pin Field Arrays

- 2-row configuration: 26, 32, 44 and 50 contacts
- MicroSpeed Triple (3-row configuration); 75 contacts
- Open Pin Field Arrays (7-row configuration); 91 and 133 contacts

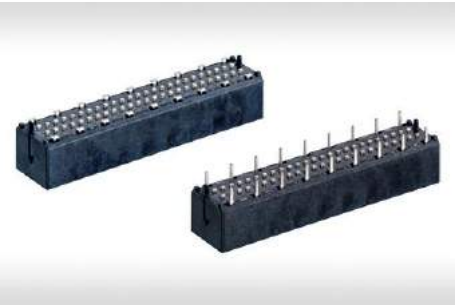
Various Types

Vertical and right angled

Blind-Mate



Standard shield vs. EMC enhanced shield

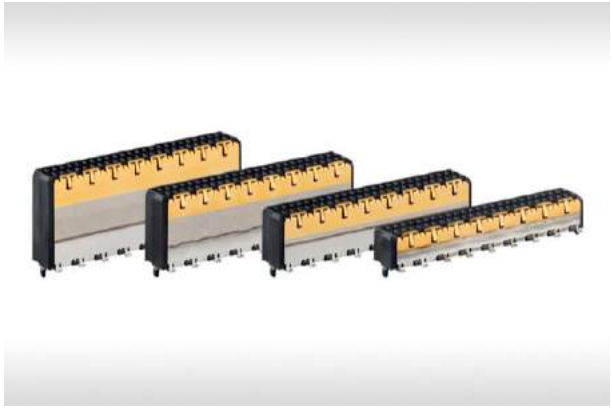


SMT contacts / SMT shielding vs. SMT contacts / THR shielding

High Speed Connectors / High Density Open Pin Field Arrays

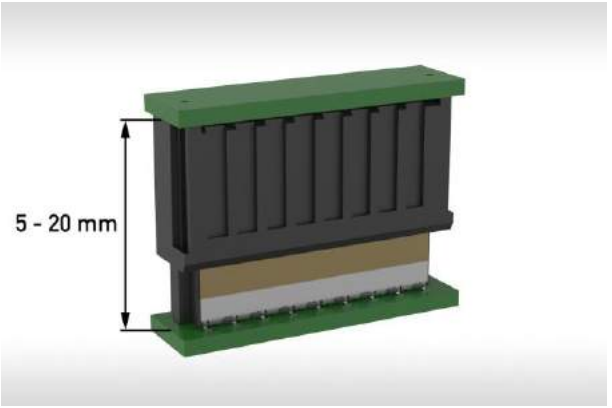
- Vertical (180º) and right angled (90º) connectors
- Male and female
- Robust Blind-Mate versions
- Standard shield and EMC enhanced shielding types
- SMT/SMT termination of contacts/shields and
- SMT/THR termination of contacts/shields

Various Types



Female Connector
10 mm, 8 mm, 6 mm, 4 mm

Male Connector
10 mm, 9 mm, 2 mm, 1 mm

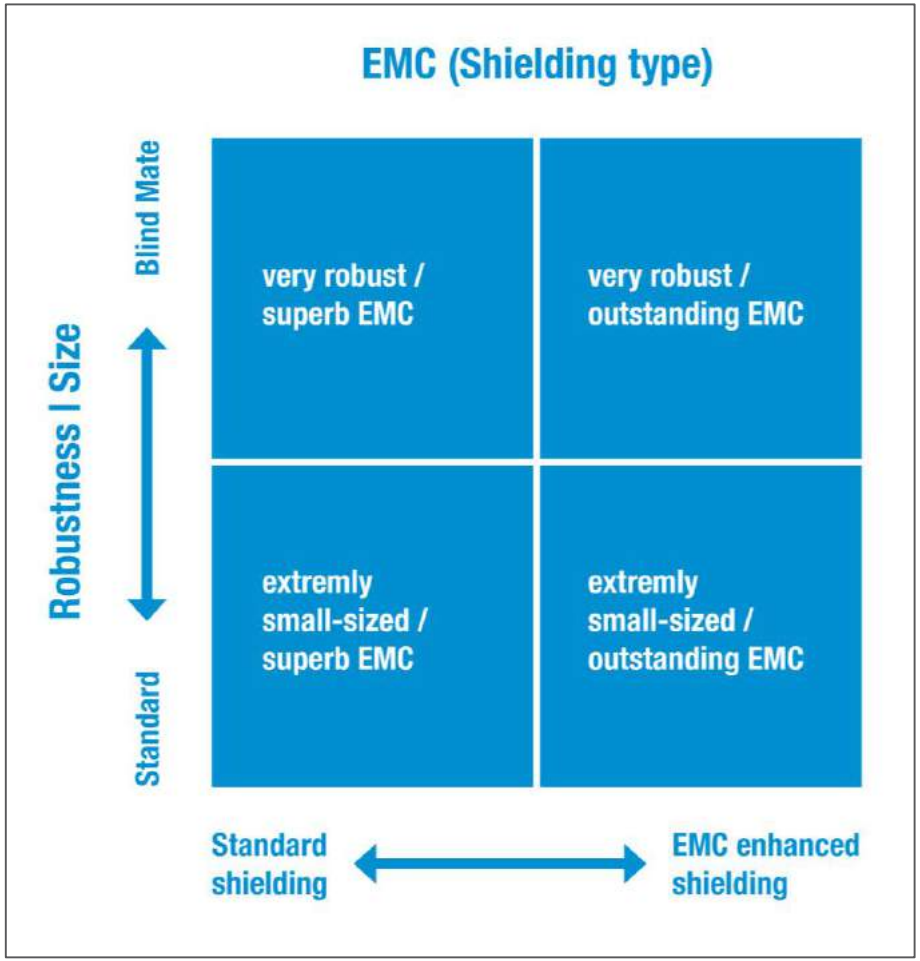


Flexible Board Stacking
5 mm to 20 mm

Flexible Board Stacking Heights

- Vertical versions with 4 different heights
  - Female 10 mm, 8 mm, 6 mm, 4 mm
  - Male 10 mm, 9 mm, 2 mm, 1 mm
- Allow flexible board stacking from 5 mm to 20 mm

Various Types



Blind-Mate and EMC enhanced MicroSpeed

Mechanical Design & Shielding Concept

MicroSpeed meets various application requirements:

Robustness/ Size of Conncetor

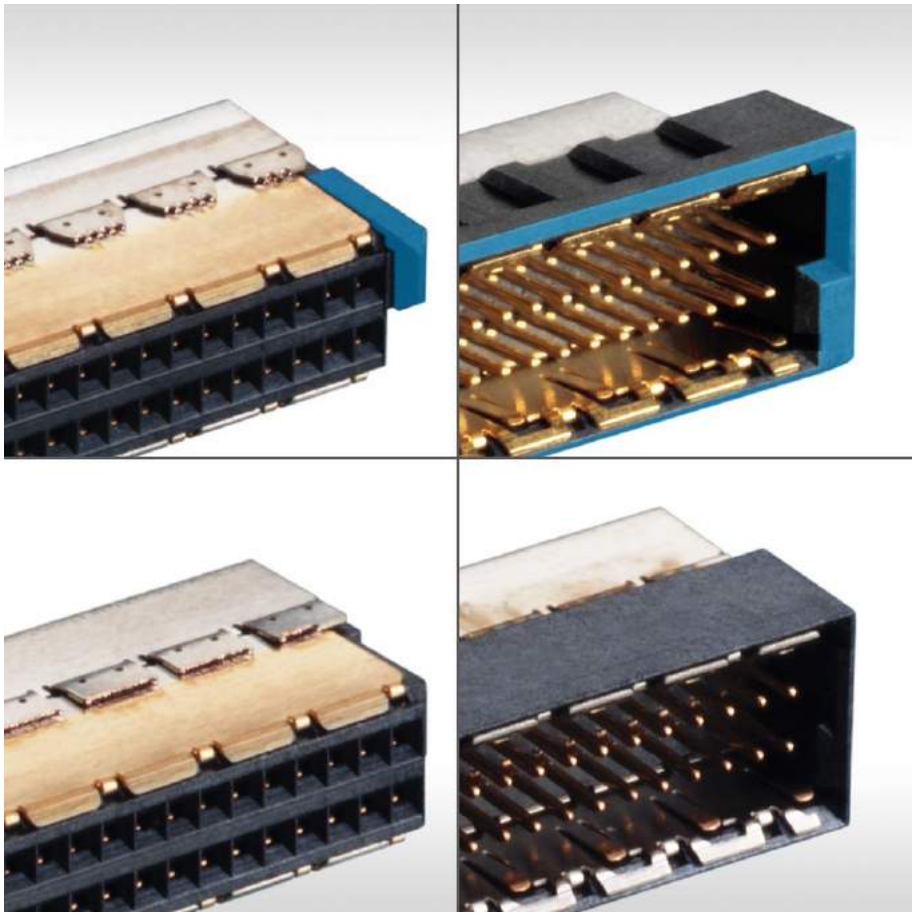
- Standard (very small-sized footprint)
- Blind-Mate (very robust, slightly larger footprint)

Electromagnetic Compatibility (EMC)

- Standard shields (very good EMC performance)
- EMC enhanced shields (outstanding EMC capability; minimized coupling inductance)

Features

Blind Mate Design

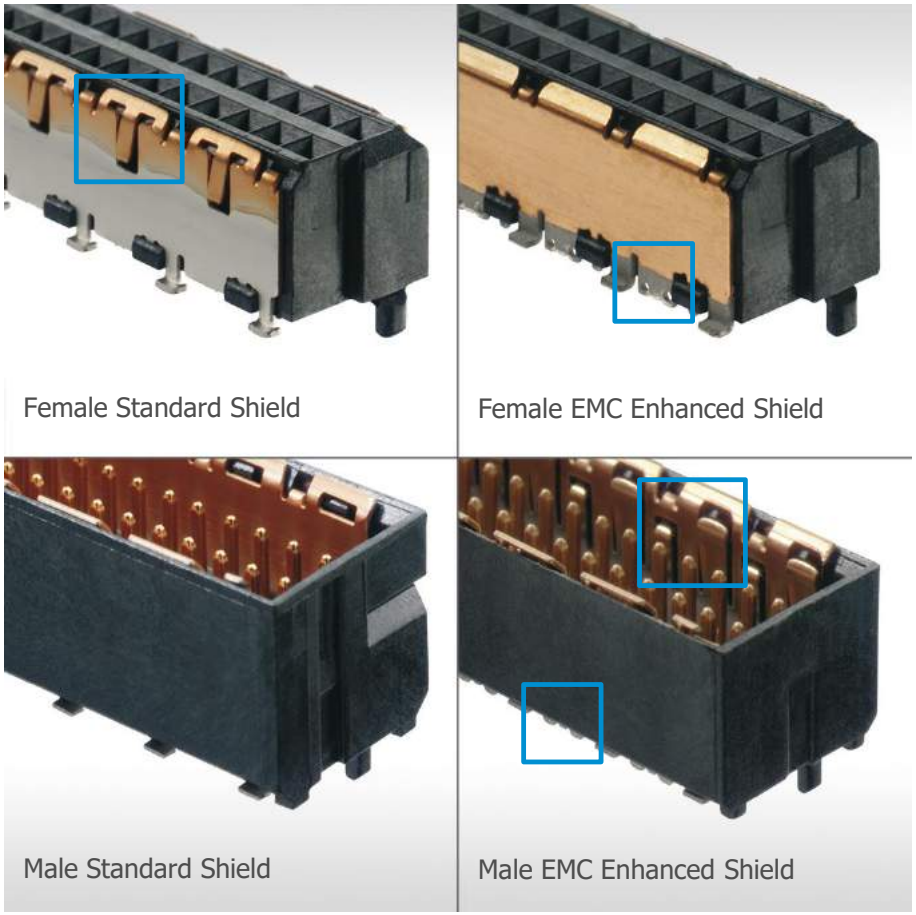


- Blind Mate versions feature
  - a distinctive polarization of the mating face
  - extended guides to capture the mating connector
  - increased wall thickness
  - slightly larger footprint
- Self-aligning feature guides the Blind Mate connectors into correct mating position
- Designed to ensure consistent and reliable mating even in difficult conditions, i.e. where the connectors are recessed or hidden in a way that impairs viewing and tangibility

→ Robust connectors for harsh environments

Shielding Design

Standard vs. EMC Enhanced Shielding (1/3)



Standard Shielding

- EMC fingers on Female

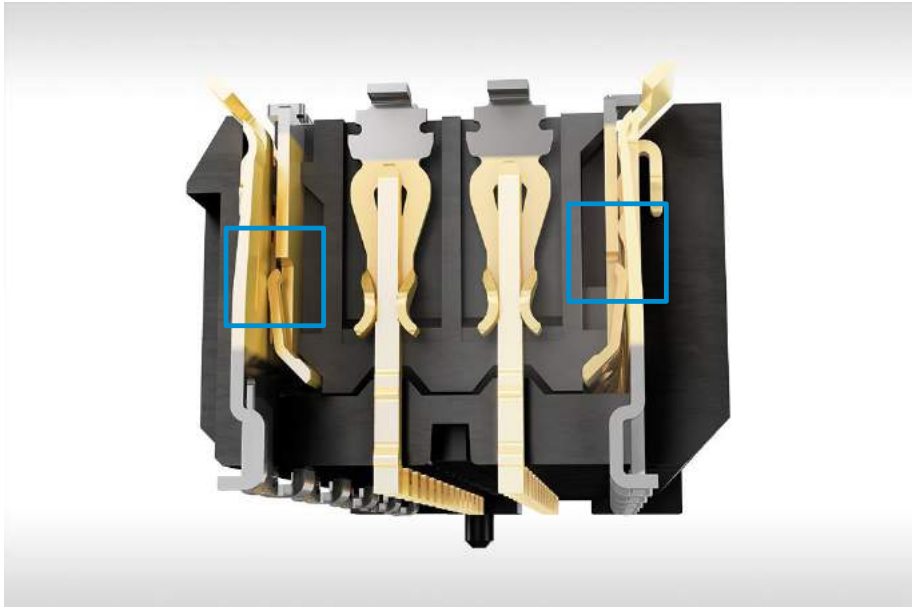
EMC Enhanced Shielding

- EMC fingers on Male
- Additional SMT pads on shielding for both Male and Female

→ **significantly reduced coupling inductance** which is the decisive para-meter for electromagnetic compatibility

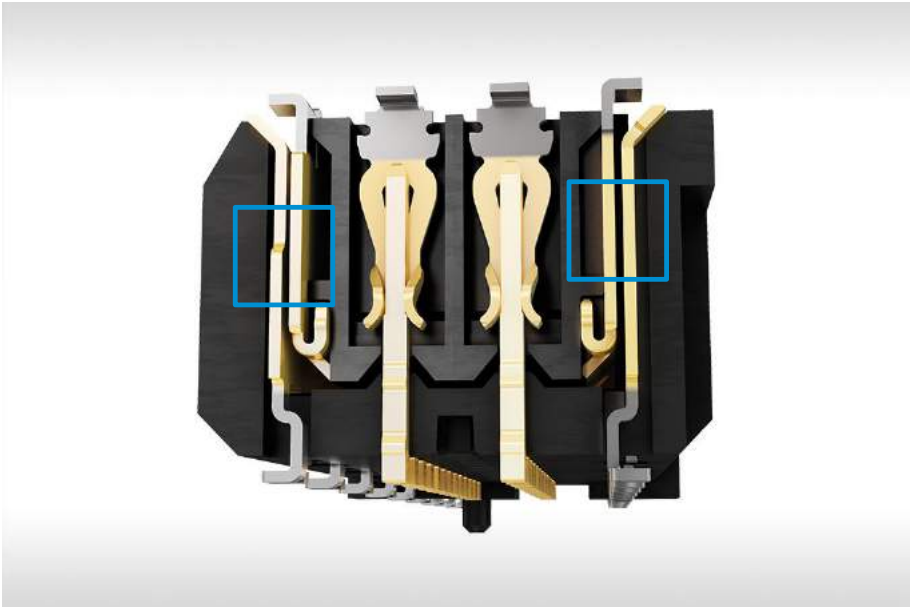
Shielding Design

Standard vs. EMC Enhanced Shielding (2/3)



Standard Shield **Female** connector
+ EMC improved **Male** connector

= Contact between shields **guaranteed**

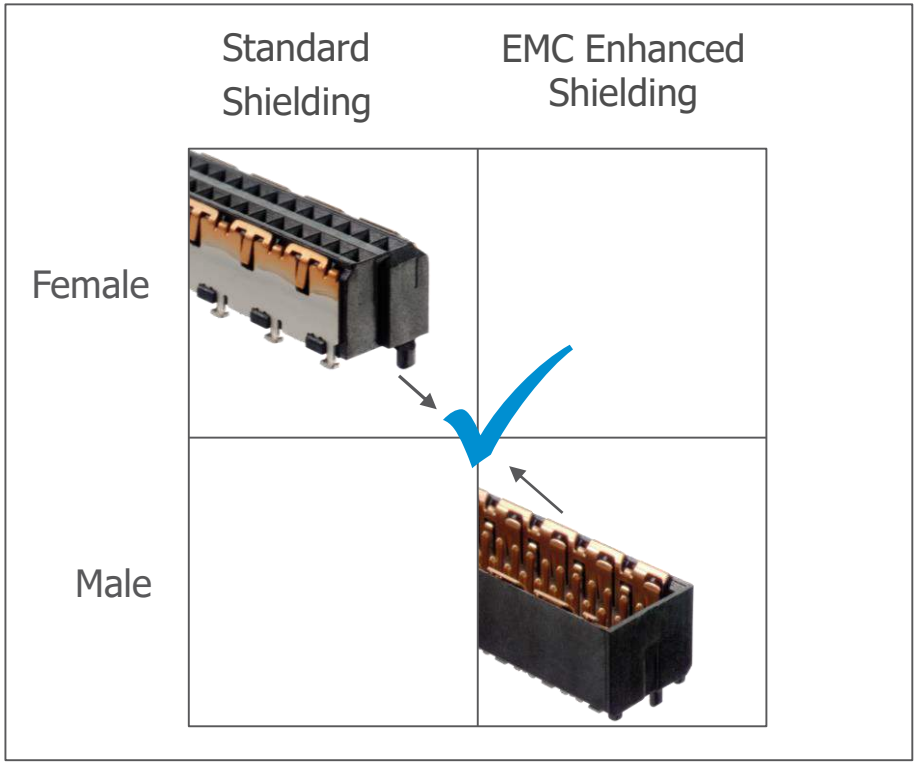


EMC improved **Female** connector
+ Standard Shield **Male** connector

= No Contact between shields!

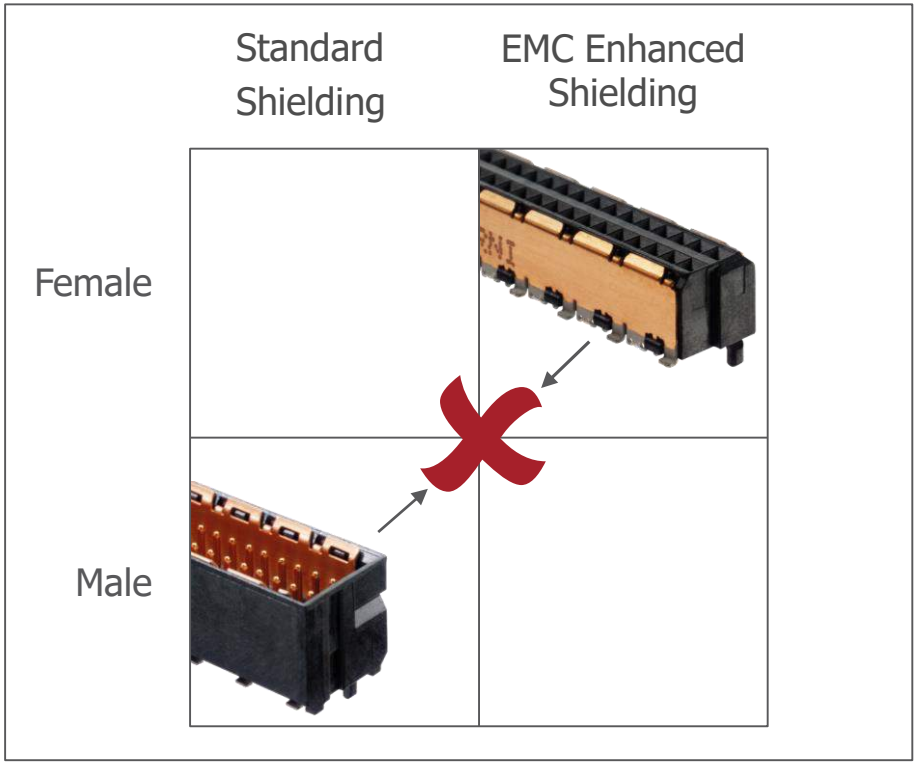
Shielding Design

Standard vs. EMC Enhanced Shielding (3/3)



Standard Shield **Female** connector
+ EMC improved **Male** connector

= Contact between shields **guaranteed**

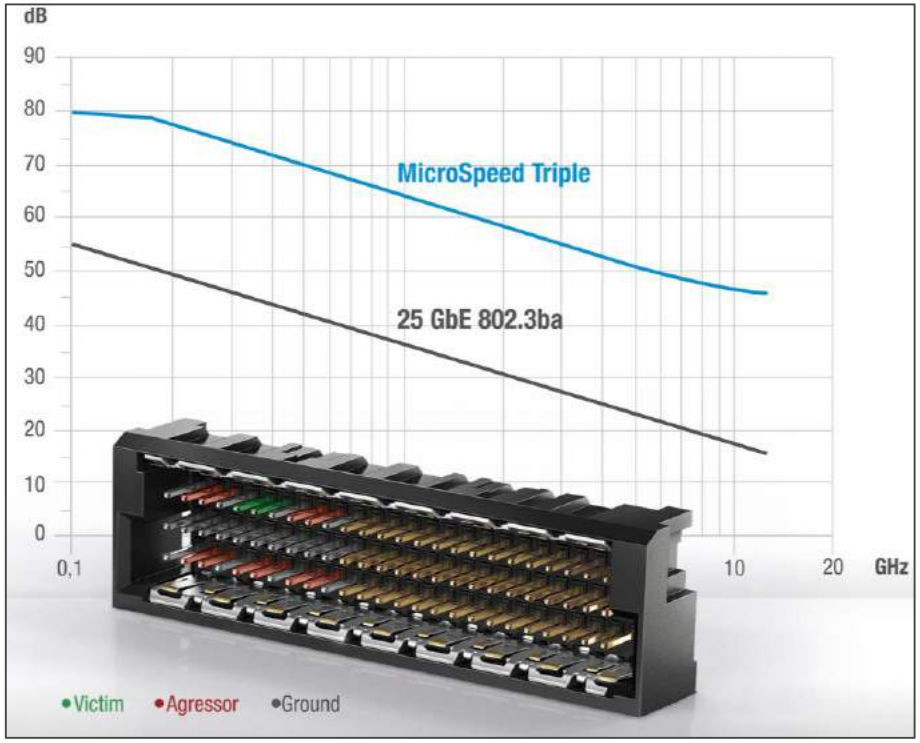


EMC improved **Female** connector
+ Standard Shield **Male** connector

= No Contact between shields!

Features

High-Speed Performance & Signal Integrity (1/4)



Performance compared to 100 Gigabit Ethernet (4x25GbE IEEE 802.3ba)

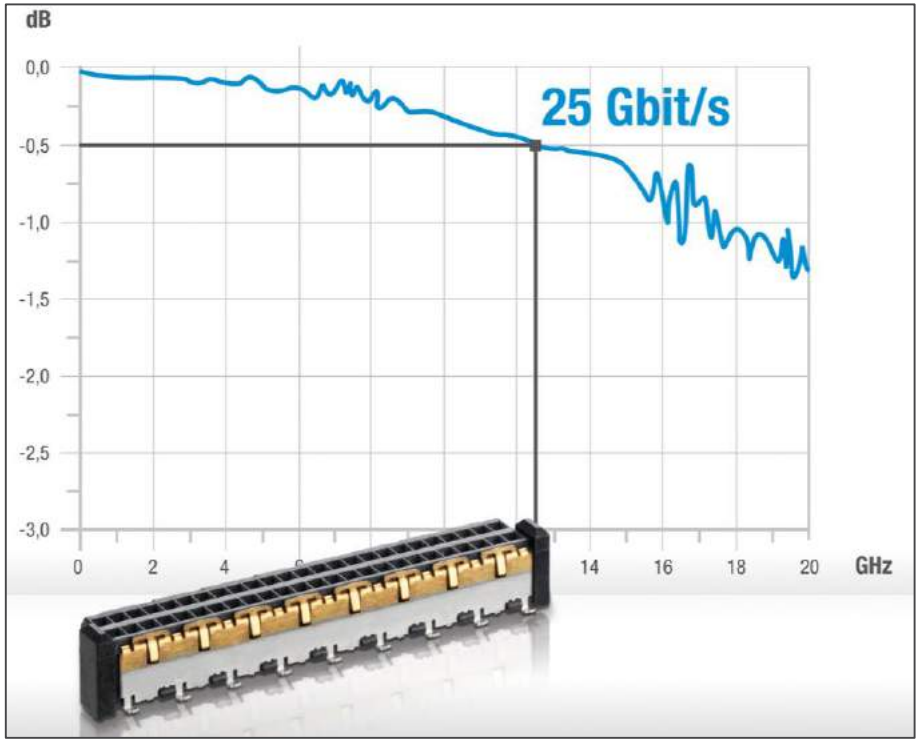
- Next-generation platforms demand optimal signal integrity performance when routing high-speed signals.
- Maintaining proper impedance while minimizing discontinuities can be a challenge. Also unwanted noise from coupling of nearby signal lines may result in distortion of the desired signal.

→ MicroSpeed connectors combine best high-speed performance with excellent signal integrity.

→ Based on experience, the best performance is gives at shorter stack heights as it results in shorter period of time for reflections and undesired coupling.

Features

High-Speed Performance & Signal Integrity (2/4)



Insertion Loss: 0.5dB at 12.5GHz

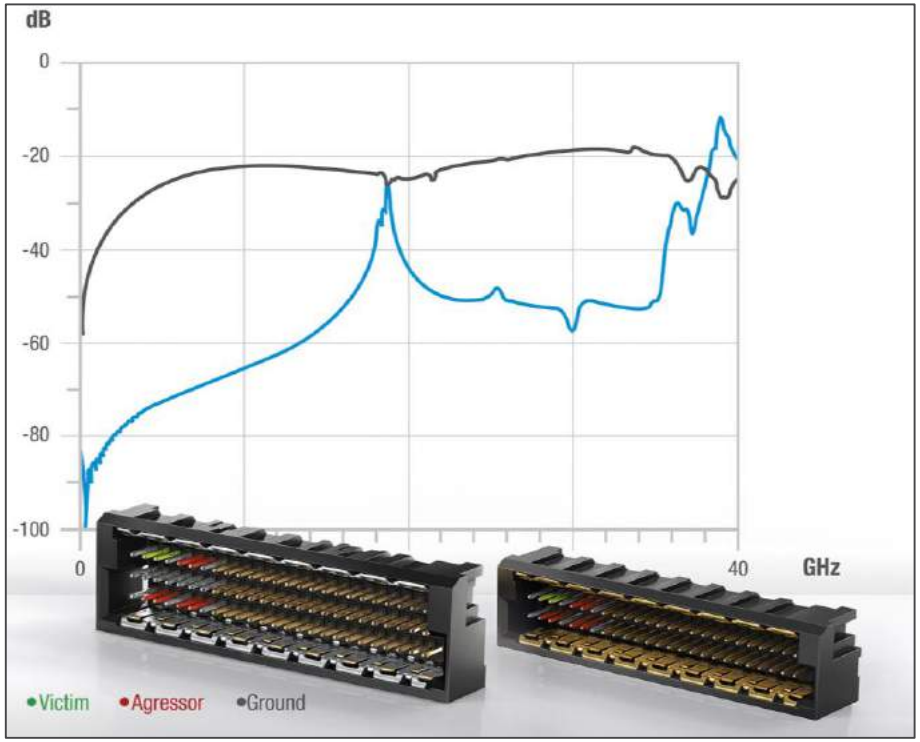
High-Speed Connector Rating

Insertion Loss is a performance feature for signal integrity and high-speed characterization as it indicates the loss of power in a transmission channel.

- MicroSpeed high-speed connector rating is based on 0.5dB insertion loss (IL).
- Performance: 25Gbps at 0.5dB IL / 12.5GHz
- Meets 100 Gigabit Ethernet standard (IEEE 802.3ba; 25Gbps per channel)
- Up to 42 differential IOs for 25+Gbps high-speed rating
- Low inductance of signal pins to ground pins

Features

High-Speed Performance & Signal Integrity (3/4)



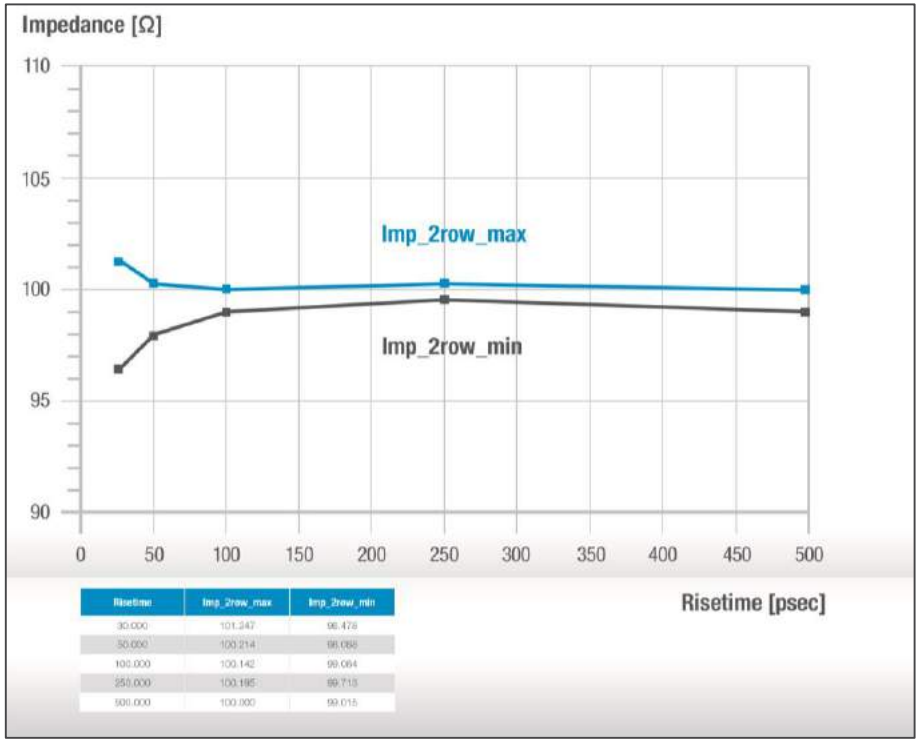
Crosstalk (NEXT): 3-row versus 2-row configuration

Signal Integrity

- MicroSpeed high-speed / high-density connectors offer maximum grounding and routing flexibility, i.e. for transversal, longitudinal or meshed pin assignments.
- Various signal-to-ground pattern meet individual crosstalk requirements (NEXT, FEXT) and hence maintain signal integrity
- MicroSpeed Triple supports crosstalk reduction of up to 90% for certain pattern
- NEXT typical: < 0.5% @ 50ps (10-90%)

Features

High-Speed Performance & Signal Integrity (4/4)



Impedance versus Risetime

Characteristic Impedance

- Impedance matched connectors designed to minimize impedance mismatch
- For single-ended (50Ω) or differential pair (100Ω) signaling type
- Typical Rise time / Bandwidth: 50 ps

Features

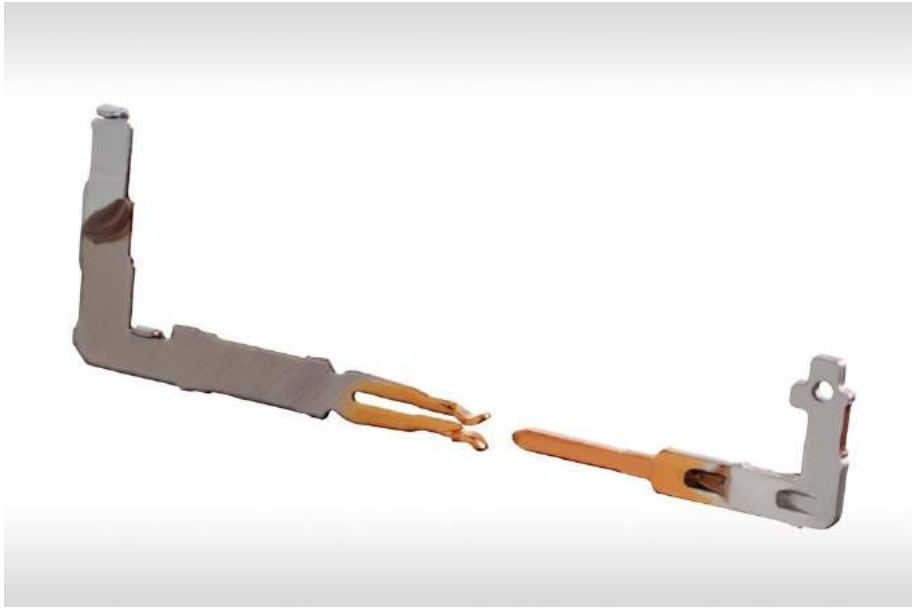
Interface / Mating Face

Interface / Mating Face

- Shrouded housing to protect contacts; high-temperature liquid crystal polymer (LCP), 30%GF
- Distinctive polarization avoids mismating
- The capture range guarantees self-alignment and provides a high misalignment tolerance and inclination
- Thus, assures the correct execution of the plug-in process
- Low-profile narrow housing design ensures airflow to promote system cooling

Features

Contact Design and Durability



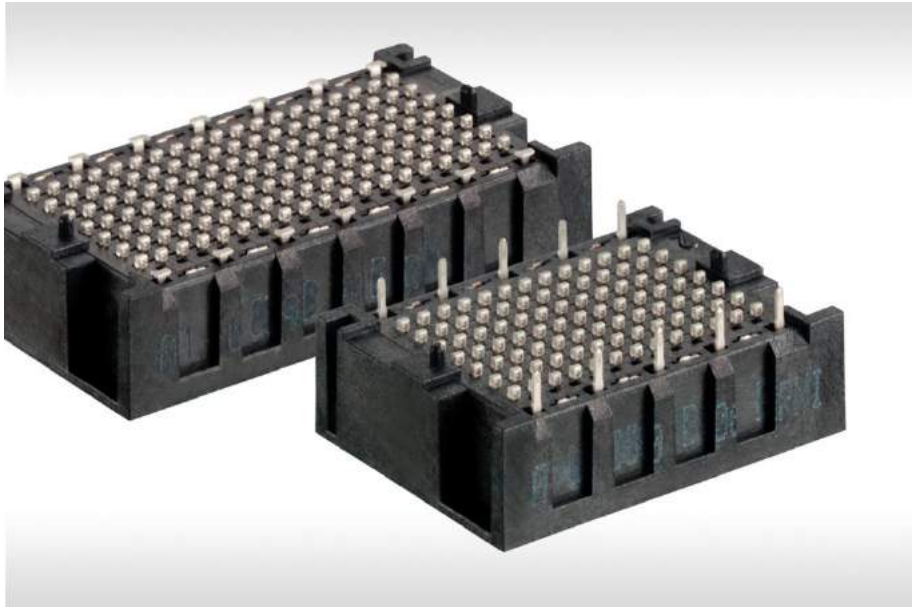
ERNI's reliable and proven contact design

- Superior reliability due to dual-beam female contact design:
  - Twisted contact tulip (90º)
  - Homogeneous, rolled surface guarantees secure contact mating
  - Wide contact surface between mated pair
  - Low surface roughness minimizes abrasion
  - Low contact resistance
- Provides excellent misalignment tolerance/ tolerance compensation
- Wipe length 1,5 mm
- Durability: >500 mating cycles1)
- Contact finish: Au plating
- Lubricated contacts to avoid fretting corrosion

[1)] Experience: >3000 cycles

Features

SMT/SMT and SMT/THR Termination

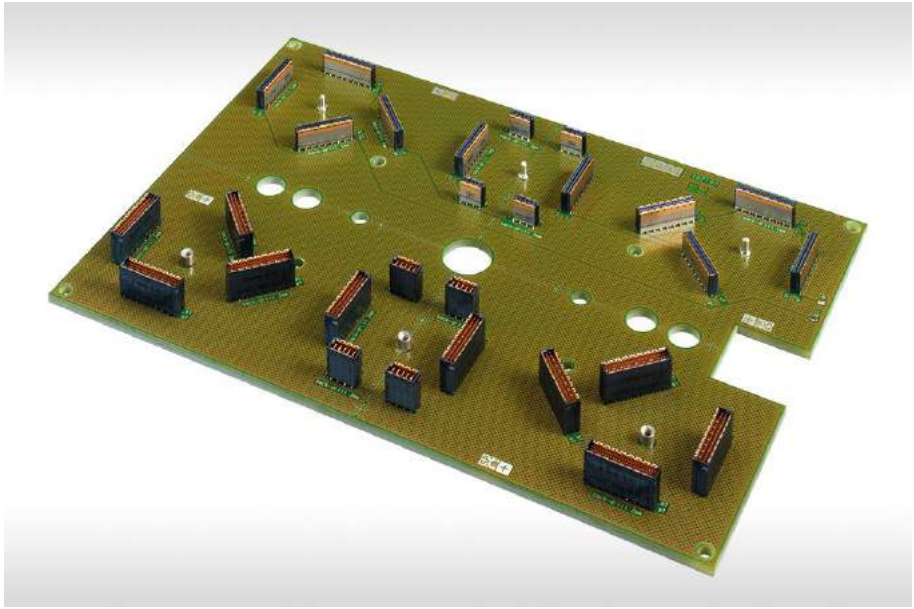


SMT shield tabs and THR shield terminals

- Surface mount connectors (**SMT/SMT**):
  - SMT contacts
  - SMT shielding
- Allow double-sided board assembly
- 100% coplanarity of ≤0.1mm leads to excellent soldering results
- Optional THR terminals on shielding (**SMT/THR**):
  - SMT contacts
  - THR shielding contacts
- THR shield terminals provide strong mechanical solder joint for demanding industrial applications subject to mechanical stress

Features

Misalignment Capability



Misalignment Capability: electrical continuity test at 400 cycles and high temperature load

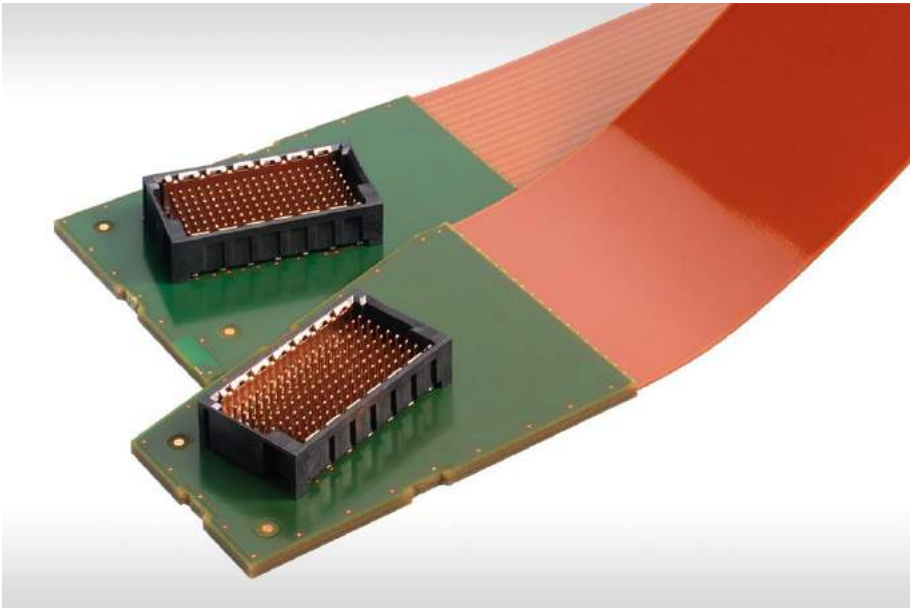
- Use of numerous connectors in board-to-board (mezzanine) applications
  - 20 MSP Signal and 8 MSP PM connectors
  - 0º, 45º and 90º alignment
- Positioning tolerances are crucial for reliable mating and withdrawal behaviour
- Even relatively large mechanical tolerances guarantee secure contact

→ MicroSpeed connectors are able to withstand misalignment of up to 0.27mm even under severe environmental conditions

→ Allows for mezzanine arrangements with numerous connectors

MicroFlex

FPC High-Speed Connections



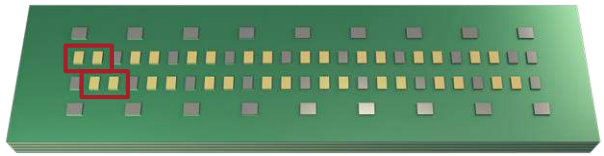
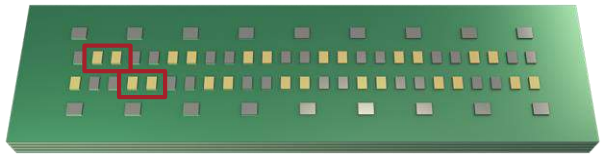
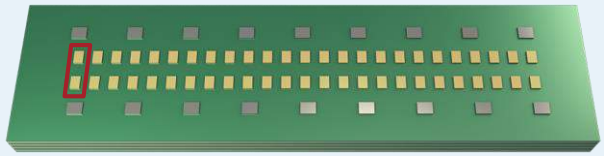
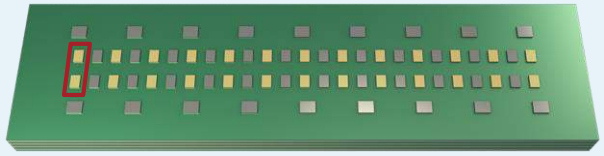
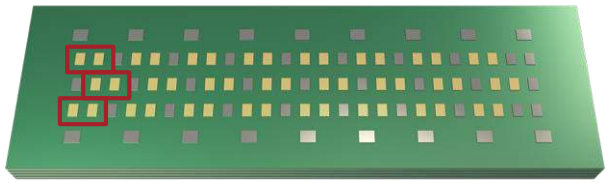
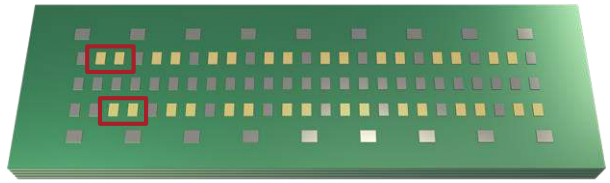
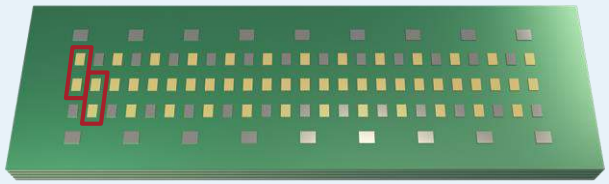
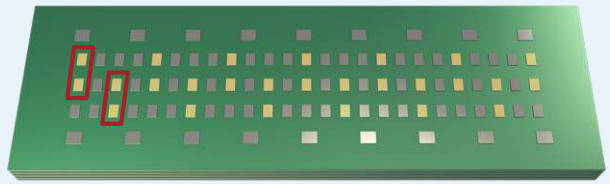
- High-speed connections using multi-layer rigid-flexible boards FPC

Example:

- Two-layer FPC
- High-speed data 25 GBit/s
- 20 differential pairs
- 500mm length
- MicroSpeed Open Pin Field Array, 133 pins
- Test equipment for 100Gig optical network transmission system (Nokia Networks)

Pin Assignments

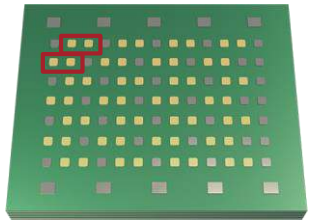
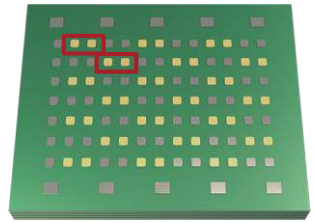
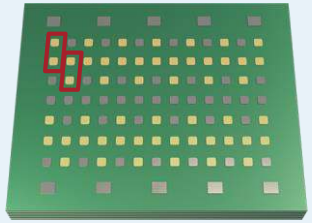
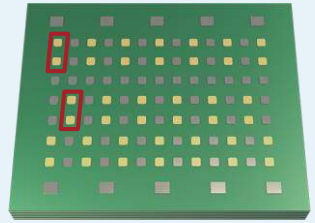
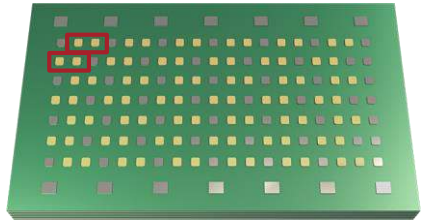
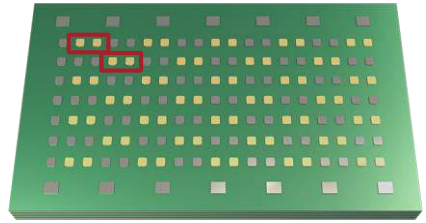
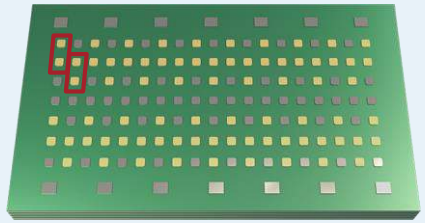
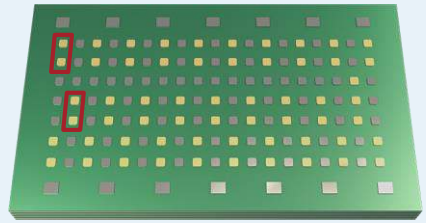
Options Considering Crosstalk Requirements

		„High Speed“		„Very High Speed“	
No. of Pins	Orientation	Diff. Pairs		Diff. Pairs	
50	Horizontal	16		12	
50	Vertical	25		13	
75	Horizontal	24		16	
75	Vertical	25		13	

yellow: differential pair | grey: ground contact

Pin Assignments

Options Considering Crosstalk Requirements

		„High Speed“		„Very High Speed“	
No. of Pins	Orientation	Diff. Pairs		Diff. Pairs	
91	Horizontal	28		21	
91	Vertical	26		20	
133	Horizontal	42		32	
133	Vertical	38		29	

yellow: differential pair | grey: ground contact

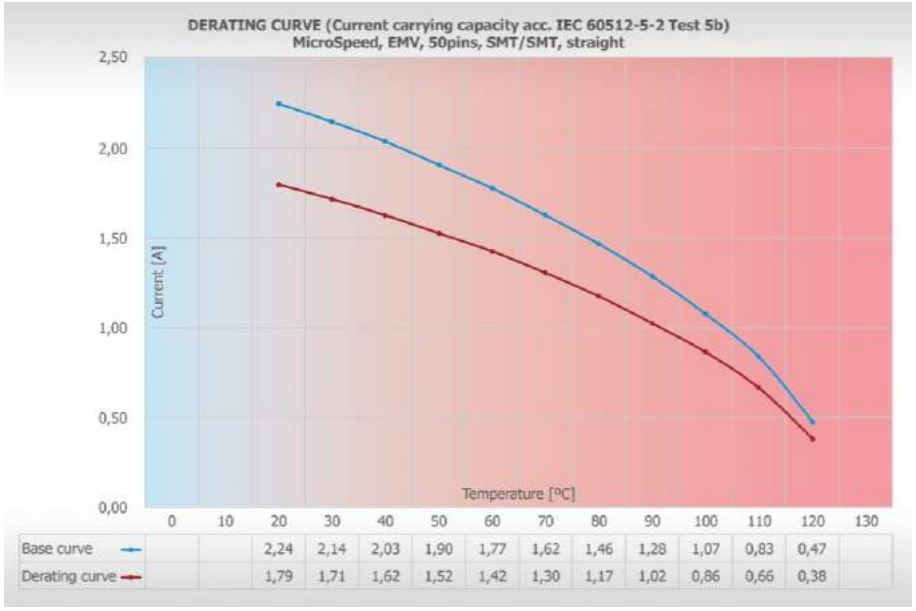
TECHNICAL CHARACTERISTICS

Technical Characteristics

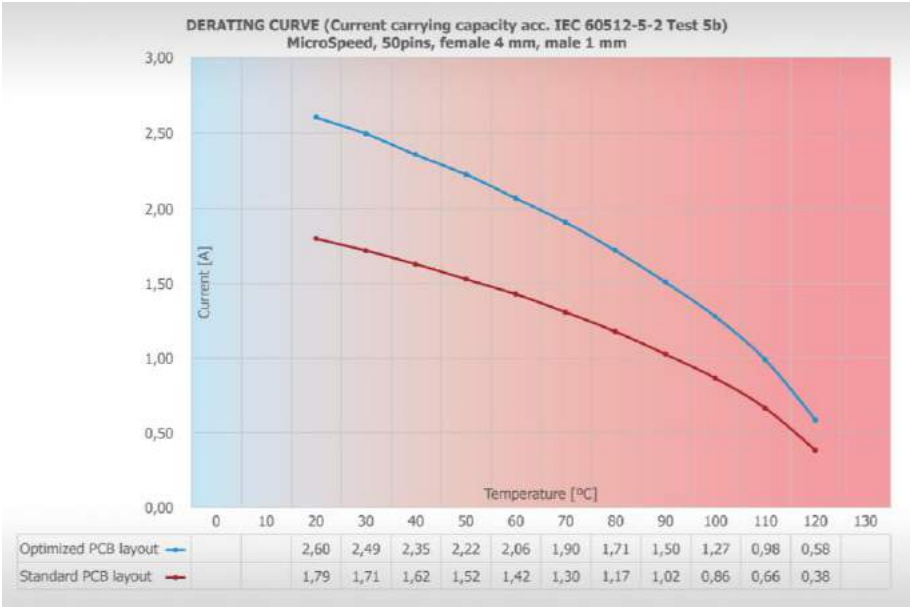
Pitch	[mm]	1.0 contact-contact; 1.5 row-row 1.25 row-row (7-row versions)
Performance level 1		> 500 mating cycles
High-Speed performance	[Gbit/s]	up to 25 (differential)
Crosstalk (NEXT)		< 0.5% @ 50ps (10-90%)
Impedance	[Ω]	100 differential, 50 single-ended
Contact resistance	[mΩ]	< 25
Insulation resistance	[MΩ]	> 10^4
Rated voltage	[V]	depends on application (pollution degree), creepage & clearance, CTI value
Contact test voltage	[V_{eff}]	500 V
Current carrying capacity	A at 20 °C	up to 1.8 A (at 125 °C limit temperature)
Insertion and withdrawal force	[N] typ.	0,5 per contact
Temperature range	°C	from -55 to +125
Flammability		UL94 V-0

Technical Characteristics

Current Carrying Capacity



Current carrying capacity per contact; MSP 50 180° EMV SMT/SMT

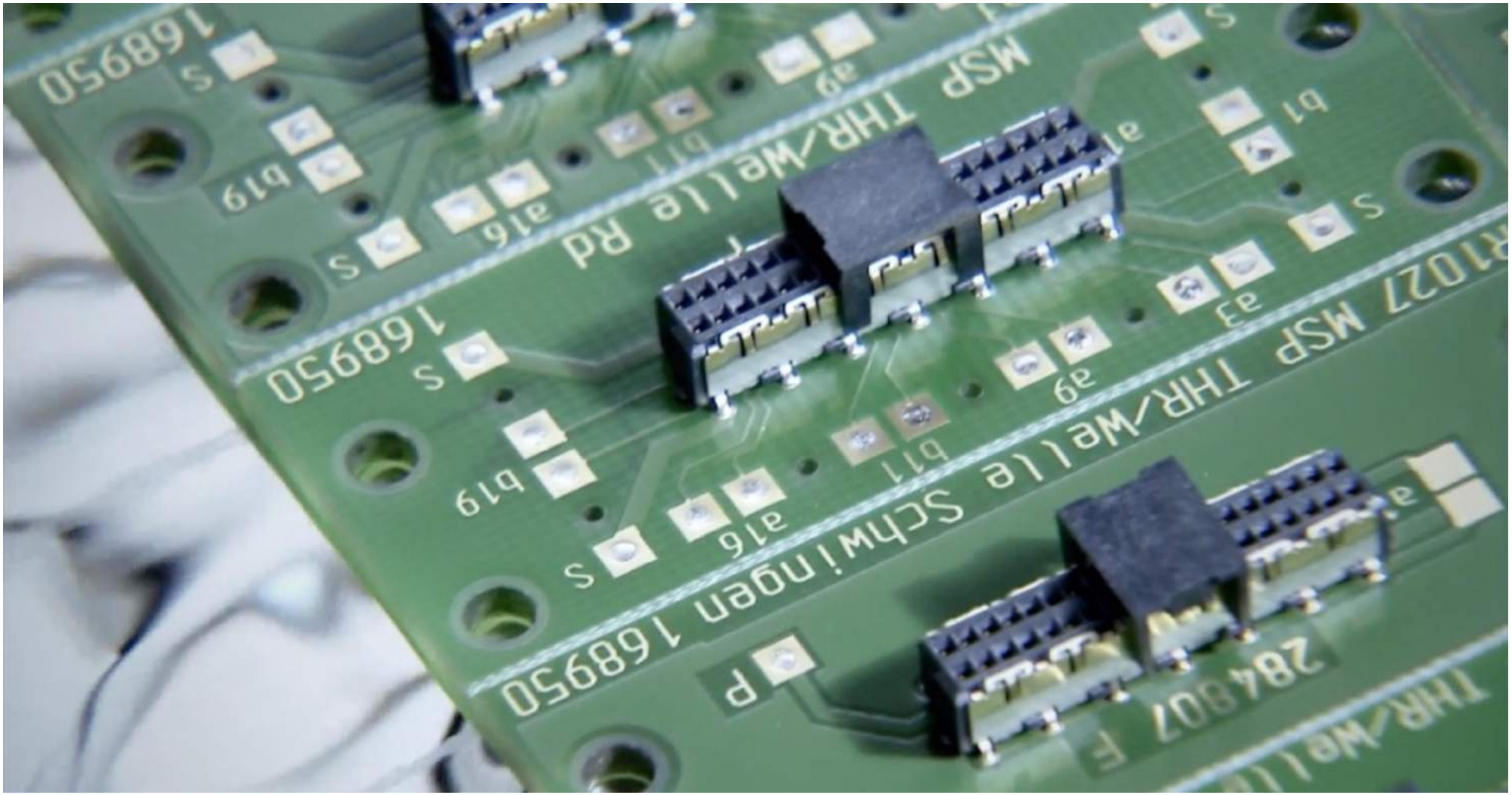


Current carrying capacity per contact; optimized PCB; MSP 50pin F4 M1 180°

- Current rating varies for connectors having different orientation, pin count, termination etc.
- Derating is done up to a temperature limit. Past that temperature limit, the risk of deterioration/relaxation occurs
- ERNI's derating curves are done with simple single-layer boards (conservative)
- Customers using optimized layouts can increase the current rating by approx. 30-40%, e.g. by multi-layer boards with 70µm thick inner Cu layers

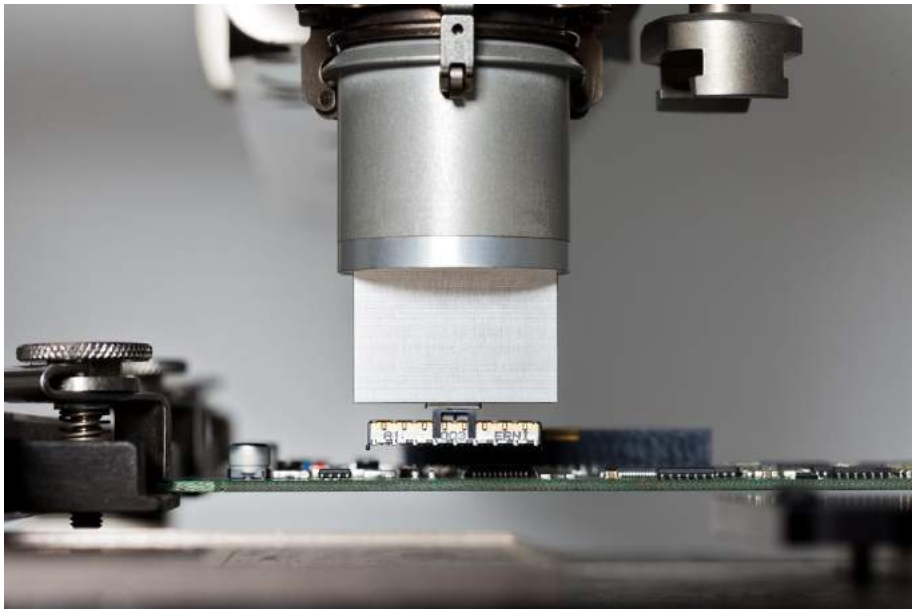
PROCESSING & RELIABILITY

Board Assembly

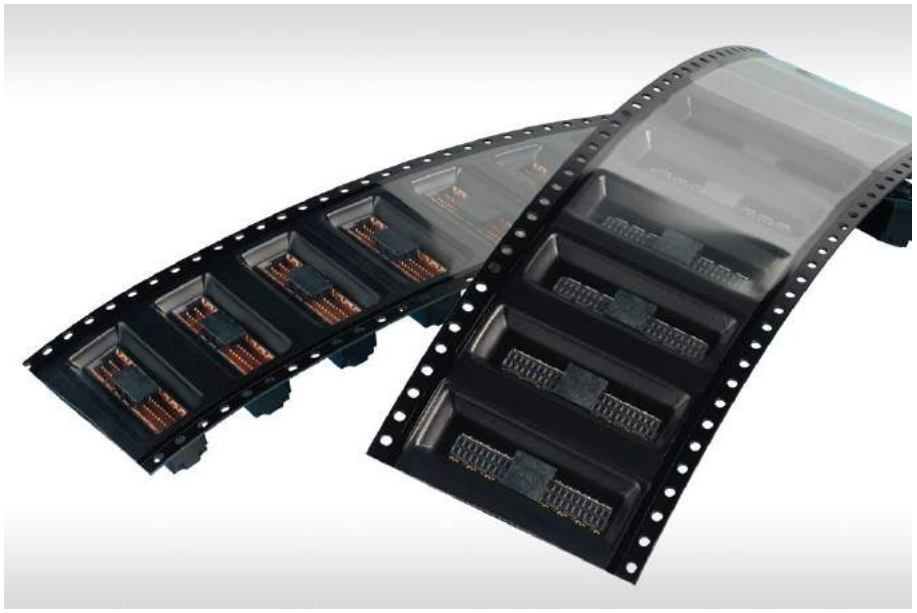


Board Assembly

Packaging, Board Assembly



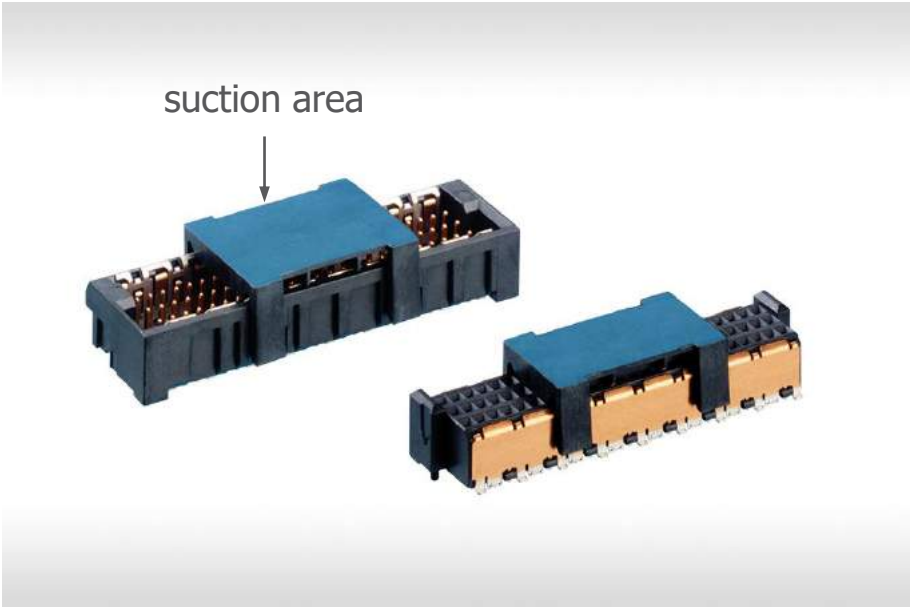
- Fully automated board assembly with pick and place machines
- Precisely placed into the solder paste with consistent pressure/without damage to the leads

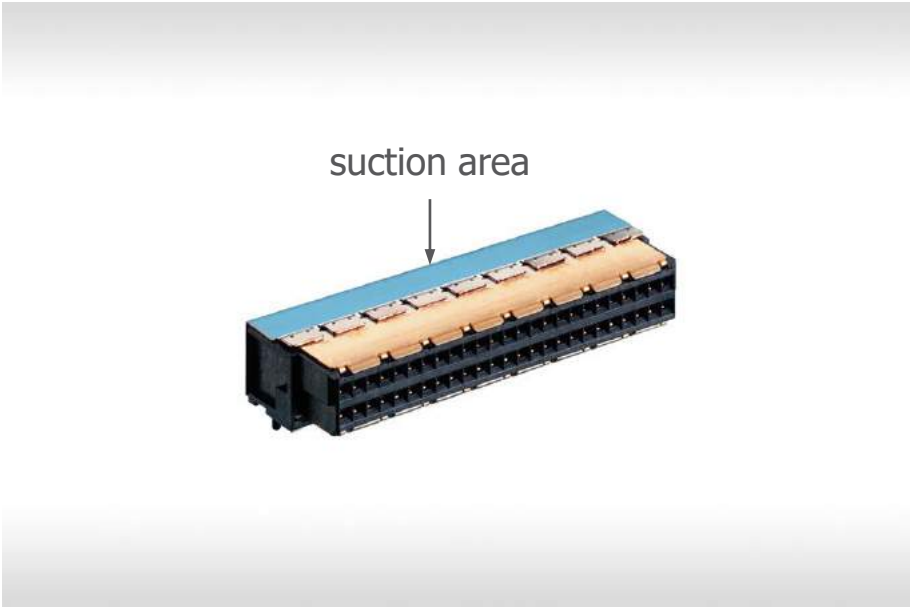


- Transport safe packaging due to Tape & Reel
- Allow for efficient processing/assembly

Board Assembly

Pick & Place Pad



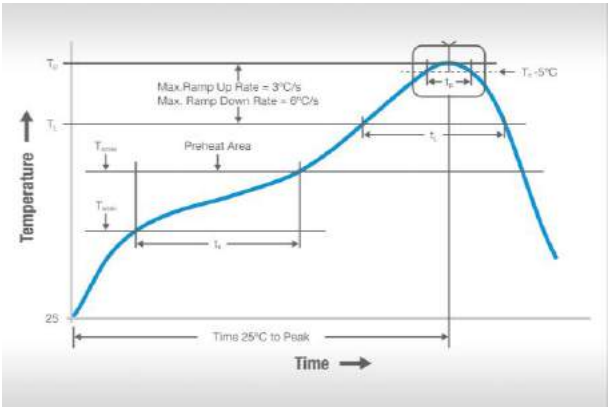


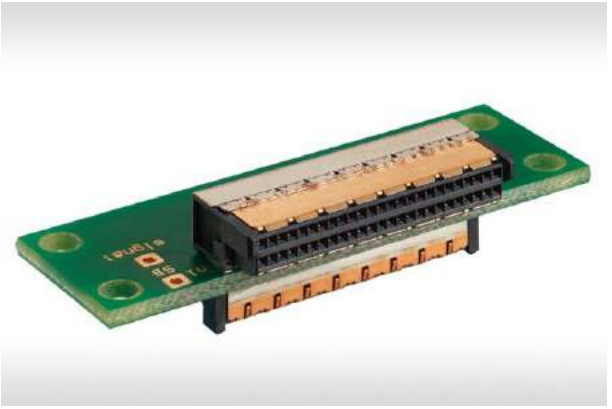
- Pick and Place pad for vacuum pick-up nozzles provided for vertical connectors
- High-temperature plastic to withstand reflow solder temperatures

- Right angled versions are commonly picked-up at the smooth shield surface

Board Assembly

Reflow Soldering / Vapourphase Soldering



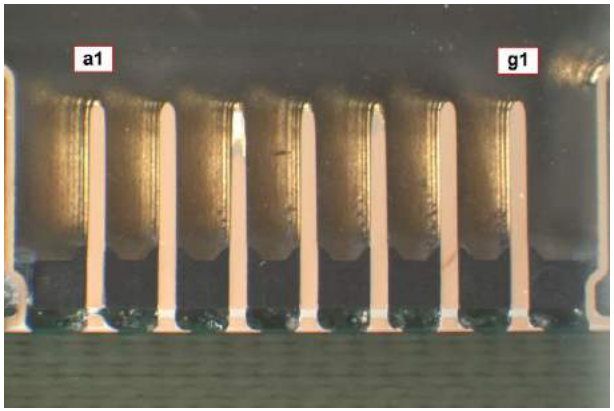


- Paste printing: recommended stencil 150µm
- Reflow / vapourphase soldering for SMT / THR components
- Soldering Profile acc. IPC/ JEDEC J-STD-020
- Withstands peak temperature of up to 260°C

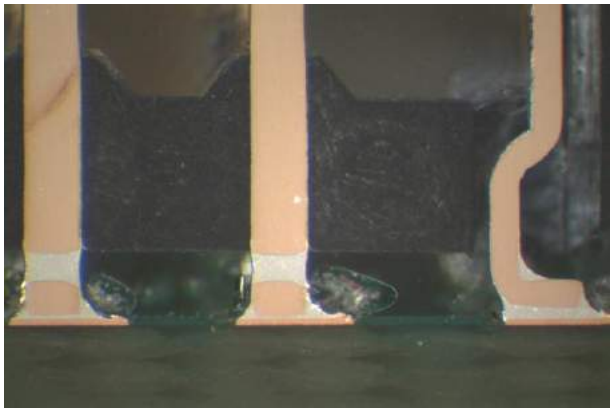
- Capable of backside reflow soldering (vertical low profile male & female SMT versions)
- Tin plated SMT pads / THR terminals with Nickel underplating

Qualification & Testing

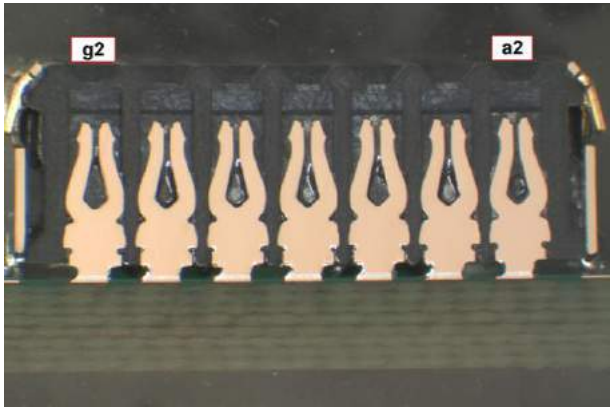
Soldering Results



7-row Male


Signal Pins and Shield Tabs


Detail 400-times magnification



7-row Female


Signal Pins

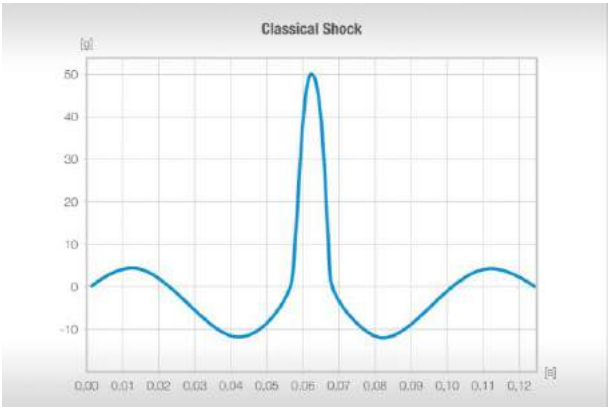

Detail 400-times magnification

- Microsections show excellent solder results: uniform wetting and reliable solder joint

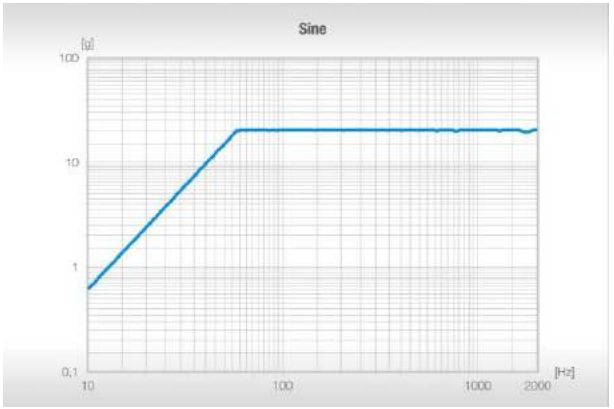
Test Results

Shock & Vibration Tests

Test Equipment



Shock test with 50g



Vibration testing in 3 directions 20g

Specification

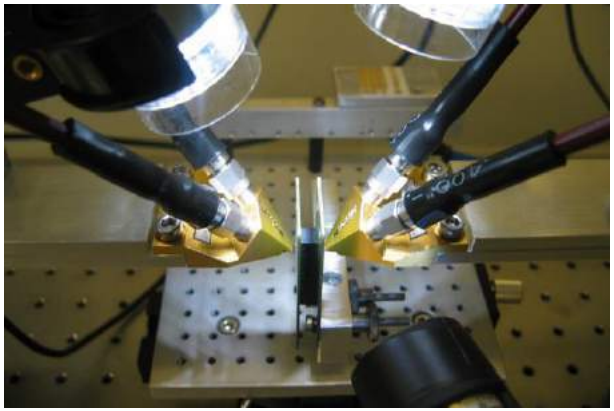
- Four MicroSpeed connector pairs soldered to PCBs; signal and ground contacts serially wired in separated circuits
- Device under test (DUT) being mounted to the cube and shaker
- Vibration testing in all three directions
- For shock testing the fixture being mounted straight to the shaker

Result

- No contact disturbance > 1 µs
- No damages on DUT

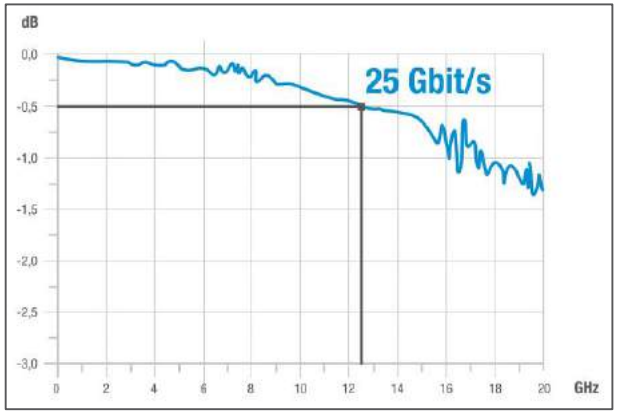
Test Results

Signal Integrity / High-Speed Transmission



Test Equipment

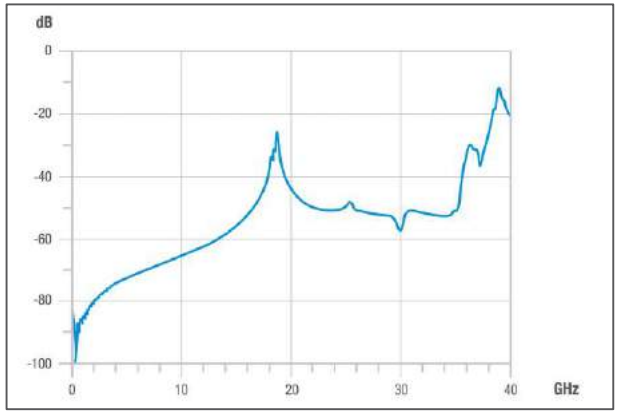
- Differential RF/microwave wafer probe



Insertion Loss

- MicroSpeed high-speed characterization is based on 0.5 dB Insertion Loss

→ thus better than common connectors on the market



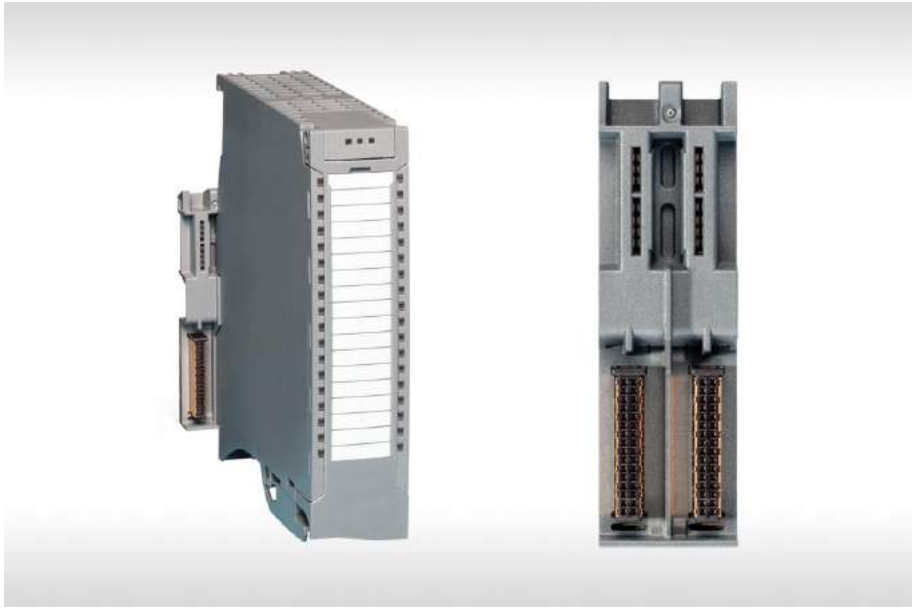
Near-End Crosstalk (NEXT)

- Factors like
  - Crosstalk
  - Insertion/ return loss
  - Electromagnetic compatibility

  play a significant role in determining the best interconnect solution

APPLICATIONS

Typical Applications

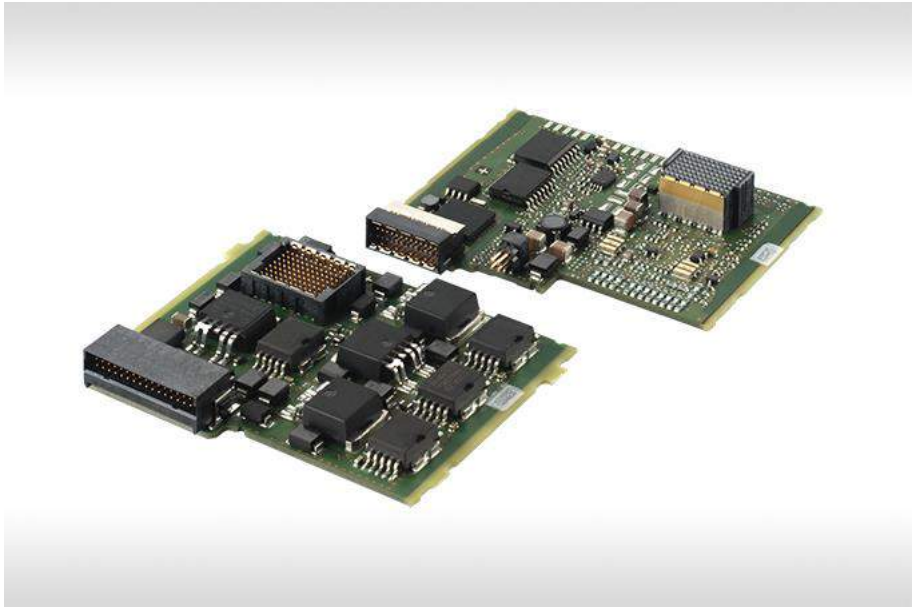


PLC

Typical Applications

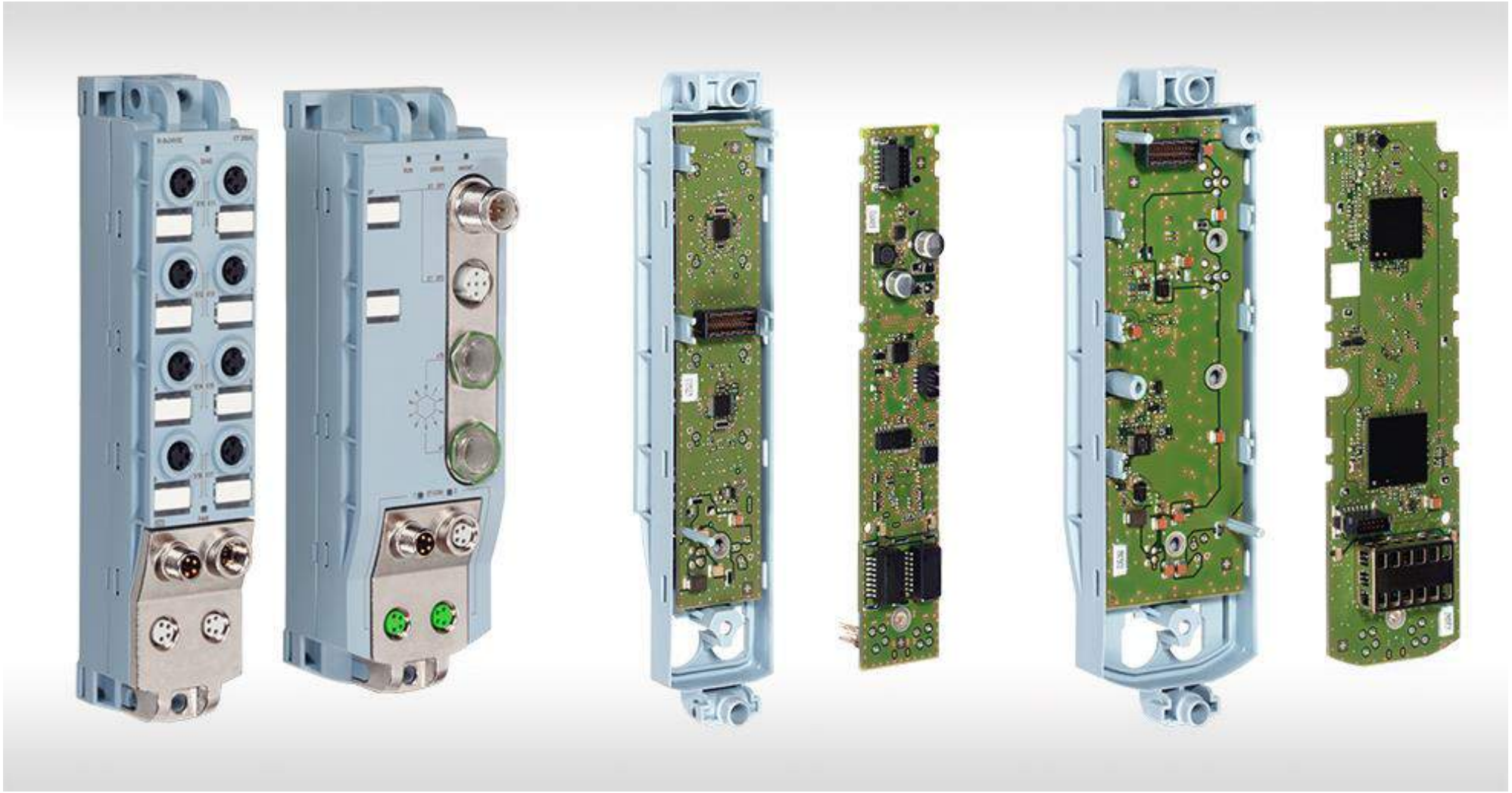
PLC I/O Module

Typical Applications



Fail-Safe I/O Modules

Typical Applications



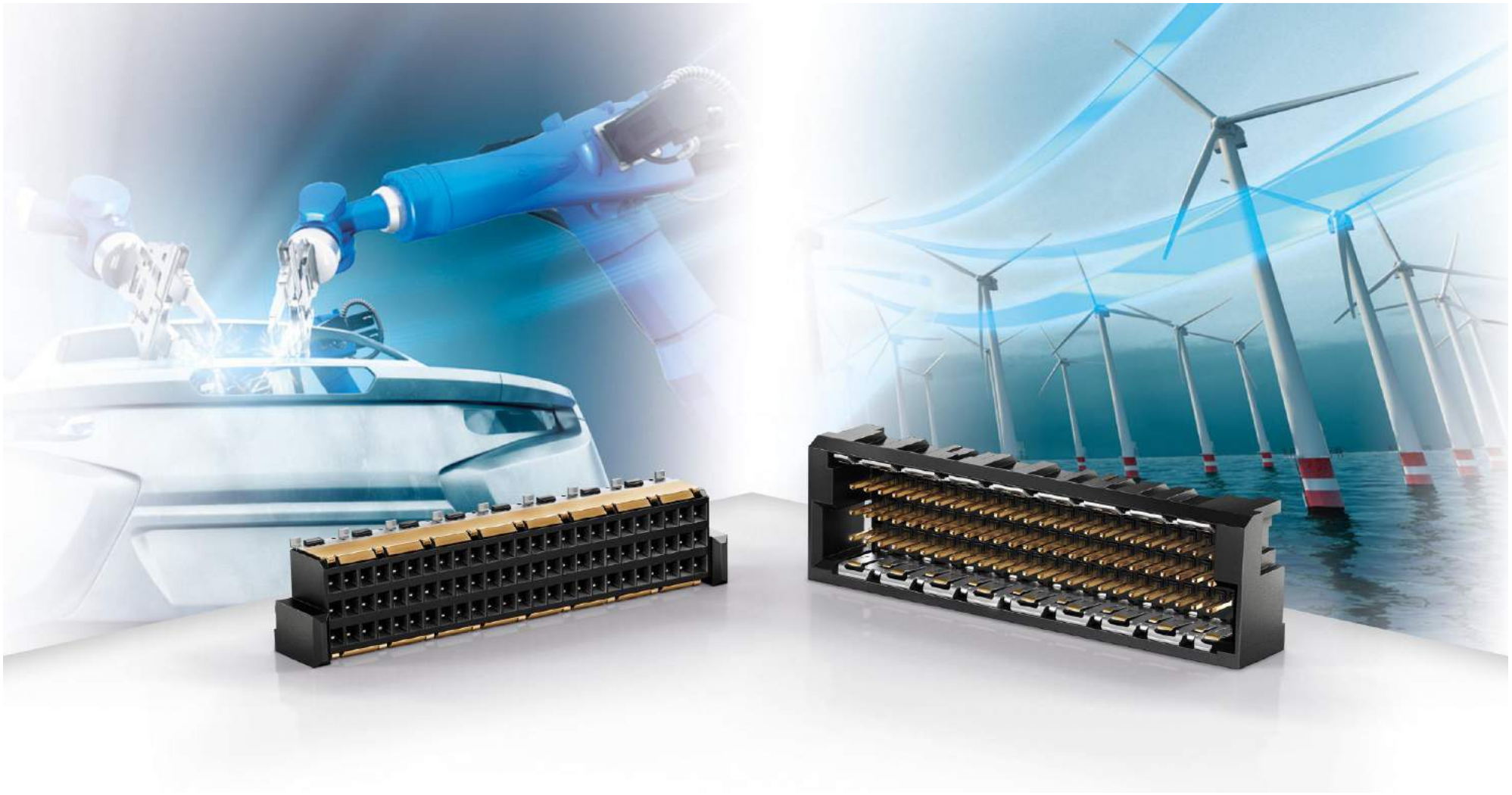
Interface Module

Typical Applications

Modular I/O System

USP / BENEFITS

USP / Benefits



USP / Benefits

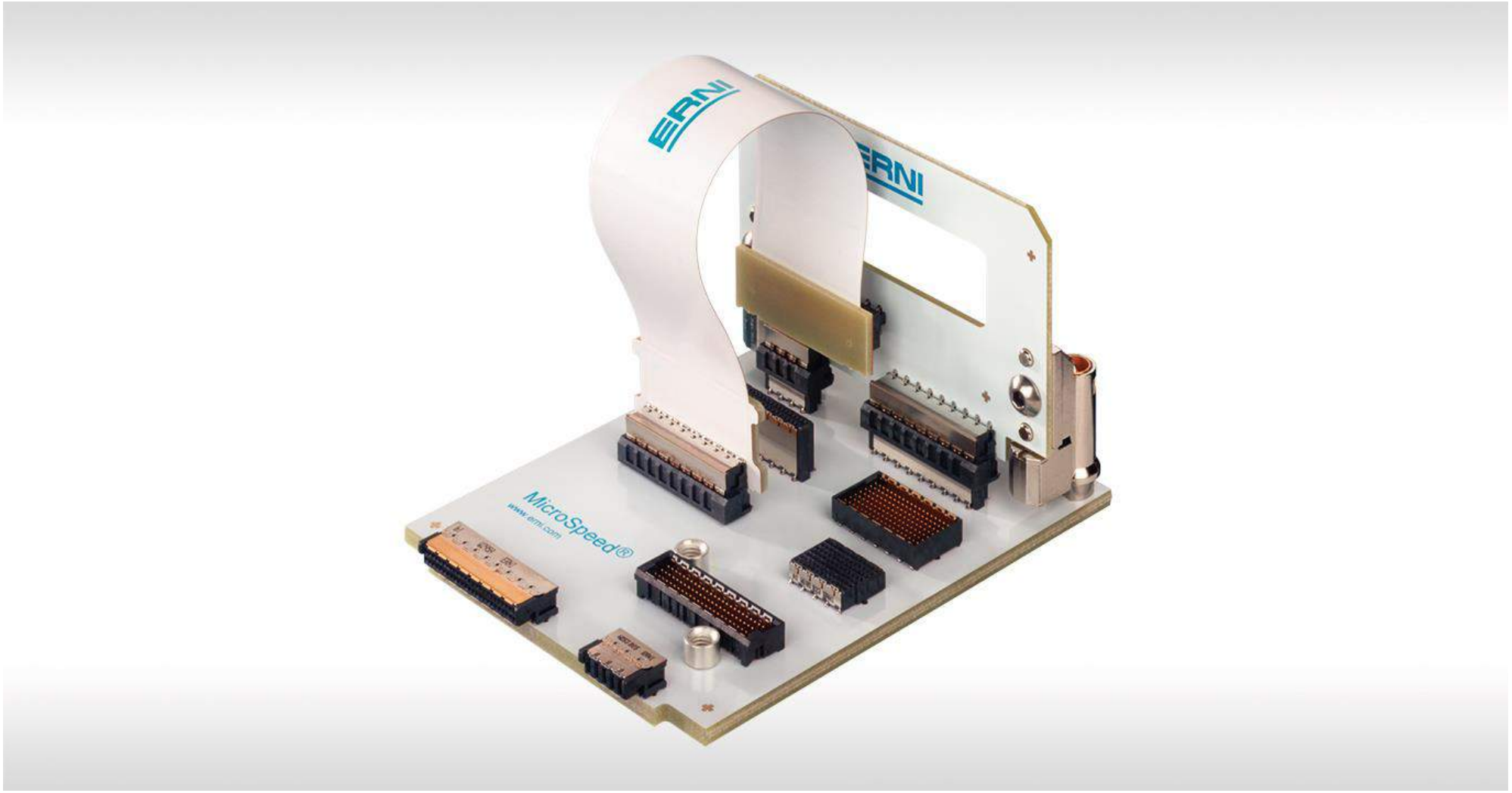
- Extensive connector portfolio with high-speed/ high-density connectors, power modules and rigid-flexible board solutions
- 2-, 3- and 7-row configurations
- 2-row, 50-pin version with flexible board stacking heights (5-20mm), scalable for individual board requirements
- Excellent EMC performance
- Shielded design for vertical and right angled connectors
- Proven design for high-speed data transmission, capable for next generation networks
- Up to 64 differential I/Os (~ 73 pairs per square inch)
- High-speed rating @ 0.5dB insertion loss (common market: 3dB IL)
- Robust Blind-Mate Solutions with optional THR shielding tabs
- Very reliable dual-beam spring contact design
- Au plated contacts and EMI fingers
- High-temperature plastic material to withstand modern reflow/vapourphase soldering
- Connectors are capable for backside reflow-soldering

USP / Benefits

- Offers all interconnect mating configurations: mezzanine, right angled and coplanar applications
- Rigid-flexible connections (high-speed / high power)
- Maximum grounding & routing flexibility and space-saving due to high packing density
- Blind-Mate solution: when robustness is crucial !
- Highly effective shielding: application shielding becomes dispensable !
- Meets 100Gbit Ethernet and next generation network standards
- Cost-effective connector family due to high level of process automation
- Full turn-key testing and product validation:
  - complete electrical,
  - mechanical,
  - environmental,
  - EMI, ESD and signal integrity testing
- Supports efficient handling and processing

MicroSpeed

High Speed. Interconnect. Solutions.




ERNI