High-speed Signal Transmission Connector with Power Supply Contact
FCN-260D

Fujitsu Component Limited has developed a high-speed signal transmission connector with power supply contact capable of supplying high-density power. This product is optimal for PCI Express\textsuperscript{®} transmission as an expansion of our high-speed transmission connector microGiGaCN\textsuperscript{TM}, which is utilized for a variety of interface standards.

Overview

In concurrence with the large data capacity due to the use of moving images as well as the recent developments in information processing devices and telecommunication devices, the demand is growing for further speedup of the signals used in various devices. Furthermore, the balanced transmission method which is resistant to noise is currently being widely adopted, such as the connection between computers and peripheral devices. Fujitsu Component Limited has developed high-speed transmission connectors in response to these market trends. The I/O connector of the microGiGaCN Series has been normally selected as the connector for the InfiniBand\textsuperscript{®} Trade Association\textsuperscript{*1}—this is a high-speed I/O standard for servers.

The latest office devices are rapidly adopting PCI Express (PCIe), a potential third-generation high-performance I/O bus that is expected to succeed ISA/EISA and PCI/PCI-X. Fujitsu Component Limited’s newly developed high-speed signal transmission connector with power supply contact is capable of transmitting 2.5Gbps while supplying high-density power from the special contact. As such, it is optimal for the connection of this PCIe board. This product can supply the two types of power supply specifications necessary for PCIe as well as the specification for the optional power-down mode through the special 8-pin contact, thus addressing three types of power supply specifications in a single connector. In addition, it realizes 5Gbps signal transmission for Generation 2 of PCIe, thereby contributing to the developments of flexible performance and improved functions to satisfy the growing number of device users and the increasing load.

The signal transmission rates addressed by the microGiGaCN Series correspond to those of InfiniBand SDR, DDR (2.5Gbps, 5.0Gbps), 10GBASE-CX4 (3.125Gbps), 10G-Fiber Channel (3.1875Gbps), and PCI Express Generation 2 (5Gbps).

Photo 1  External View
Product Features

The microGiGaCN board-to-board connector with power supply offers the following features:

- **Adopts the balanced transmission method by applying the basic concept of strip line structure**
  This structure shields the signal contacts by using a ground contact that is larger than the signal contact to absorb the cross-talk noise and paired signal contacts to transmit reverse + and – signals that are equal in size so that a virtual ground plane is formed between the paired signals.
  **Fig.1** shows a cross-section drawing of the connector.

- **High-density connector**
  - Pitch between signal-ground contact: 0.75mm, 0.5mm pitch for SMT lead
  - Pitch between signal-signal contact: 1.5mm
  - Pitch between power supply contacts: 3.0mm

- **Transmission rate**
  This product enables to offer high-speed transmission of 2.5Gbps and higher compared to the several hundred Mbps of conventional high-speed transmission connectors.

- **Impedance match value**
  100Ω ±10% for the transmission speed of 2.5Gbps.

- **Active insertion and removal**
  The structure is one in which the ground contact is connected earlier than the signal contact and the power supply contact is the last to make contact. This allows connector insertion and removal while the power is turned ON.

- **Blind mating function**
  Position is corrected by the guide and thus the connector can be inserted even when its position is shifted ±1.5mm.

- **PAGOS plating is adopted for the treatment of contacts**

Technology

High-density connectors adopting strip line structure to satisfy the conditions for the transmission of high-frequency signals are already well known and have been reported in various different literatures. The strip line structure is characterized by parallel assignment of larger and wider ground/power contacts and signal contacts.

This product assigns the contacts as shown in **Fig.1** by applying the basic concept of the strip line structure. Each signal contact pair transmits + signals and – signals in equal

<table>
<thead>
<tr>
<th>Table 1 Connector Specifications</th>
<th>Rated value</th>
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<tbody>
<tr>
<td>Rated current</td>
<td></td>
</tr>
<tr>
<td>Signal</td>
<td>AC 0.1A</td>
</tr>
<tr>
<td>Ground</td>
<td>AC 0.5A</td>
</tr>
<tr>
<td>Power supply</td>
<td>AC 2.5A to 5.0A</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>AC 30V</td>
</tr>
<tr>
<td>Operating temperature and humidity range</td>
<td>−55 to +105°C, 80%RH or lower</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Table 2 Connector Features</th>
<th>Characteristic value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic impedance</td>
<td>100Ω</td>
<td>Tr=100ps</td>
</tr>
<tr>
<td>Cross talk</td>
<td>3%</td>
<td>Tr=100ps</td>
</tr>
<tr>
<td>Skew in pair</td>
<td>1.0ps</td>
<td>—</td>
</tr>
</tbody>
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<tr>
<th>Table 3 Product Series</th>
<th>Item</th>
</tr>
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<tbody>
<tr>
<td>Connection type</td>
<td>Plug, Socket</td>
</tr>
<tr>
<td></td>
<td>Straight / Right angle</td>
</tr>
<tr>
<td>Number of signals (pairs)</td>
<td>12/24/36 pairs</td>
</tr>
<tr>
<td>Number of power supply pins</td>
<td>2-4-8-pin</td>
</tr>
</tbody>
</table>
size and reverse direction respectively. This forms a virtual
ground plane between the paired signals and the signal contact
is thus surrounded by the ground.

Table 1 shows the connector specifications; Table 2 shows
the connector features. This product has been designed to
satisfy these specifications.

Development was implemented with the target transmission
properties of impedance 100Ω and cross talk 3% or smaller.
The contact pitch was set to 0.75mm and the pitch in SMT
lead to 0.5mm; the dimensions were determined based on the
3D-CAD system and transmission property simulation.
Furthermore, 1-line development on one side has been realized
for the lead, enabling simple pattern assignment on the board.
The other structural features incorporated are active insertion
and removal and the blind mating function. Processing on
SMT lead of the connector adopts gold coating by PAGOS
plating instead of solder plating, so lead-free is realized.

Fig.2 shows the characteristic impedance, Fig.3 the cross
talk, and Figs.4, 5, and 6 the eye pattern characteristics for the
connector.

**Future Development**

The high-speed signal transmission connector with power
supply contact introduced herein is delivered in a series of
stack and balanced connection types. The number of signals
can be selected from 12, 24, or 36 pairs and the power supply
terminal from 2-, 4-, or 8-pin to realize the desired combination.
(Table 3)

In the future, Fujitsu Component Limited will continue to
develop connectors addressing transmission at higher speed
and density as connectors that will support the advancing
infrastructure of our information society.

*1: InfiniBand Trade Association is a consortium formed by
Compaq, Dell, Hewlett-Packard, IBM, Intel, Microsoft, and Sun
Microsystems, and this unifies “Next Generation I/O (NGIO)”
for which Intel had been leading the development, and
“Future I/O (FIO)”, which IBM, Compaq, and Hewlett-Packard
had been developing.

**NOTES**

* PCI-Express is a registered trademark of PCI-SIG.
* InfiniBand is a trademark or registered trademark, and
  service mark of InfiniBand Trade Association.
* microGiGaCN is a trademark of Fujitsu Component Limited.
* PAGOS plating is gold-palladium two-layer plating and
  PAGOS is a trademark of Fujitsu Component Limited.
* Other company names and brand names are the trademarks or registered trademarks of their respective owners.
New Products

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Figure 4  Eye pattern 2.5Gbps

Figure 5  Eye pattern 5Gbps

Figure 6  Eye pattern 10Gbps