Appendix F
Specification for ‘Slim-I/O’
Panel Mount Cable to Board I/O Connector
Version 1.0
FOREWORD

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Comments on specifications and requests for interpretations should be addressed to:

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Summary of changes

<table>
<thead>
<tr>
<th>Version</th>
<th>Approved by</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Management Board</td>
<td>June 28, 2006</td>
</tr>
</tbody>
</table>
2 Scope

Specification for:

Panel Mount I/O cable Connector for RF Module in Base Transmission System.
3 General Description

- Type: I/O
- Connection method: Panel Mount – Cable to Board
- Shape: Rectangle
- Number of positions: 16

Figure 1: ‘Slim-I/O’, Right Angle Receptacle & Cable Plug.
4 Ratings

- Max. Voltage (U): 50 VDC
- Max. Current (I): 1.0 A at 30°C temp. rise above ambient
- Operational temperature range: -10…+60 °C
- Relative Humidity: 10% to 90%
- Characteristic Impedance: 100Ω ± 10% (Differential)
- Data Rate: Up to 3.125Gbps
### 5 Electrical Specification (Ratings)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry circuit resistance</td>
<td>70 mΩ maximum. ΔR 20 mΩ maximum.</td>
<td>EIA-364-23. Subject specimens to 100mA maximum and 20mV maximum open circuit voltage. See Figure 2.</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>1000 MΩ minimum</td>
<td>EIA-364-21. Test between adjacent contacts of unmated specimens.</td>
</tr>
<tr>
<td>Dielectric withstanding voltage</td>
<td>350 VAC at sea level. 1 minute hold with no breakdown or flashover.</td>
<td>EIA-364-20 Condition I. Test between adjacent contacts of unmated specimens.</td>
</tr>
<tr>
<td>Impedance, Single Ended / Differential</td>
<td>$Z_{SE}(\Omega) \pm 10%$ \ $Z_{DIFF}(\Omega) \pm 10%$</td>
<td>Measured with TDR @ Rise time =100ps (10% -to- 90%)</td>
</tr>
<tr>
<td>Eye pattern. Differential – Normalized</td>
<td>0.8 minimum @ 50% of UI</td>
<td>Stimulated 1$V_{_{\text{PP}}}$ Differential PRBS $2^{11}-1$. Measured Procedure EIA 364-107</td>
</tr>
<tr>
<td>Insertion loss, Diff. Mixed Mode (SDD21)</td>
<td>1.0 dB max. @ $f \leq 2.5$ GHz \ -2.0 dB @ ($f$) up to 5 GHz</td>
<td>Measured Procedure EIA 364-101</td>
</tr>
<tr>
<td>Return loss, Diff. Mixed Mode (SDD11)</td>
<td>$\leq -10$ dB @ $f \leq 2.5$ GHz \ $\leq -5$ dB @ ($f$) up 5 GHz</td>
<td>Measured Procedure EIA 364-108</td>
</tr>
<tr>
<td>Near end Noise, Differential (Isolation)</td>
<td>$-28$dB max. up to 2.5GHz  \ $-26$ dB @ ($f$) up 5 GHz</td>
<td>Measured Procedure EIA 364-90</td>
</tr>
</tbody>
</table>
6 Mechanical Specification

- All mechanical dimensions are described in drawings in chapter 8.
- Allowed misalignment (Plug relative to Receptacle):
  - Longitudinal $\leq \pm 25^\circ$
  - Vertical $\leq \pm 6^\circ$
- Basic material of the body:
  - Housing – Thermoplastic, UL94V-0, Black
  - Shell: Copper Alloy
  - Jack Screw Spacer – Thermoplastic, UL94V-0, Black
- Contact material:
  - Receptacle – Phosphor Bronze
  - Plug – PCB Substrate. FR4 with Au Plated Copper Conductors
- PCB Termination: Plated Through Hole – Solder Type as well as Pin In Paste compatible
- Weight (g): 9.0 gr. $\pm$ 0.5 gr.
- Connector must be compatible with RoHS requirements.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solderability</td>
<td>Solderable area shall have a minimum of 95% solder coverage.</td>
<td>EIA-364-638. Subject contacts to Solderability.</td>
</tr>
<tr>
<td>Vibration, random</td>
<td>No discontinuities of 1 $\mu$sec. or longer duration. See Note (1).</td>
<td>EIA-364-28, Test condition VII, Condition D. Subject mated specimens to 3.10 G’s RMS between 20-500 Hz. 15 minutes in each of 3 mutually perpendicular planes.</td>
</tr>
<tr>
<td>Mechanical shock</td>
<td>No discontinuities of 1 $\mu$sec. or longer duration. See Note (1).</td>
<td>EIA-364-27, Method H. Subject mated specimens to 30 G’s half-sine shock pulses of 11msec. duration. 3 shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.</td>
</tr>
<tr>
<td></td>
<td>Durability</td>
<td>50 Mating / Unmating cycles</td>
</tr>
<tr>
<td>---</td>
<td>------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td></td>
<td>Mating force</td>
<td>30 N maximum.</td>
</tr>
<tr>
<td></td>
<td>Unmating force</td>
<td>2N minimum.</td>
</tr>
<tr>
<td></td>
<td>Retention force</td>
<td>Specimens shall remain mated when a force of 75 N is applied. No opens detected.</td>
</tr>
<tr>
<td></td>
<td>Side load force</td>
<td>Specimens shall remain mated when a force of 50 N is applied. No opens detected.</td>
</tr>
<tr>
<td></td>
<td>Longitudinal force</td>
<td>Specimens shall remain mated when a force of 50 N is applied. No opens detected.</td>
</tr>
</tbody>
</table>

**NOTE (1)** Shell meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Prequalification Test Sequence Per EIA-346-D.
Figure 2: Dry Circuit resistance Measurement Points

Figure 3: Side Load Force
Figure 4: Longitudinal Force
7 Environmental Requirement

Following values are a list of conditions where the connector will be used. Connector manufacturer does not have to test the connector according to these conditions. However this information must be considered in connector design.

These requirements come from system requirements and might be extended by a connector environmental test specification in a separate document.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal shock.</td>
<td>See Note (1)</td>
<td>EIA-364-32. Subject unmated specimens to 5 cycles between –10 and +70°C</td>
</tr>
<tr>
<td>Humidity – Temperature cycling.</td>
<td>See Note (1)</td>
<td>EIA-364-31, Method III Subject unmated specimens to 10 cycles (10 days) between 25 and 65°C at 80 to 100% RH.</td>
</tr>
<tr>
<td>Temperature life.</td>
<td>See Note (1)</td>
<td>EIA-364-17, Method A, Test condition C. Subject mated specimens to 70°C for 500 hours.</td>
</tr>
<tr>
<td>Corrosion &amp; Porosity Industrial atmosphere</td>
<td>See Note (1)</td>
<td>EIA-364-53B,</td>
</tr>
</tbody>
</table>

NOTE (1) Shell meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Prequalification Test Sequence Per EIA-346-D.

7.1 Environment specification for transportation

Climatic and mechanical conditions for units, modules and components:

ETS 300 019-1-2: 1994 (testing methods) class 2.3.

ETS 300 019-1-2: 1992 (requirements) class 2.3.
PCB Layout and Minimum Connector Spacing

Figure 5: Board layout of R/A Receptacle

GENERAL TOLERANCE: ±0.05
Figure 6: R/A Receptacle Recommended Panel Cutout

GENERAL TOLERANCE: ±0.05
**Panel Mounting Inserts**

**NOTES:**
1. MATERIALS: STAINLESS STEEL PER ASTM A-582 TYPE 303 CONDITION A 4mm DIA.
2. DEBURR AND REMOVE SHARP EDGES.
3. FINISH: PASSIVARE PER QQ-P-35.

**Figure 7:** Panel Inserts for Jack Screws
Figure 8: Right Angle Receptacle Connector – 16 Positions
Figure 9: Plug Assembly

Figure 10: Fully Mated Condition
12 Mating Dimensions

Figure 11: Right Angle Receptacle
Figure 12: Cable Plug
13 Cable Assembly Specifications

Figure 13: General Cable Assembly Drawing

Unless otherwise specified, herein after specifications refers to L=3m long!

13.1 Electrical Specifications:

13.1.1 Insertion Loss Lower Limit for L=3m Long, High Speed Cable Assembly:

\[
SDD_{21}(dB)=\begin{cases} 
-5 \times \frac{f}{f_0} ; & 0.1GHz < f \leq \frac{f_0}{3} \\
-5 \times \left( f - \frac{f_0}{3} \right) - 5 ; & \frac{f_0}{3} < f \leq 7GHz 
\end{cases}
\]

Where:
\( f \) is given in (GHz)
\( f_0 = 1.575 \) GHz

13.1.2 Insertion Loss Lower Limit for L=3m Long, Low Speed Cable Assembly:

\[
SDD_{21}(dB)=\begin{cases} 
-5 ; & 0.01 < f \leq 0.2GHz \\
-8 ; & 0.2 < f \leq 0.525GHz \\
-21 ; & 0.525 < f \leq 2.1GHz \\
-30 ; & 2.1 < f \leq 4.5GHz 
\end{cases}
\]

Where:
\( f \) is given in (GHz)
13.1.3 Return Loss Lower Limit for L=3m Long, High Speed Cable

Assembly:

\[
SDD11\, (dB) = \begin{cases}
-15 & ; \quad 0.1\text{GHz} < f \leq \frac{f_0}{3} \\
-15 + 11 \times \log_{10} \left( \frac{3 \times f}{f_0} \times 1000 \right) & ; \quad \frac{f_0}{3} < f \leq 7\text{GHz}
\end{cases}
\]

Where:

\( f \) is given in (GHz)

\( f_0 = 1.575 \text{ GHz} \)

13.1.4 Return Loss Lower Limit for L=3m Long, Low Speed Cable

Assembly:

\[
SDD11\, (dB) = \begin{cases}
-12 & ; \quad 0.01 < f \leq 1.0\text{GHz} \\
-6 & ; \quad 1.0 < f \leq 2.0\text{GHz} \\
-4 & ; \quad 2.0 < f \leq 4.5\text{GHz}
\end{cases}
\]

Where:

\( f \) is given in (GHz)

13.2 Cable Assembly Impedance Profile (TDR method):

<table>
<thead>
<tr>
<th>Section</th>
<th>Value</th>
<th>Tolerance</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Fixture</td>
<td>100Ω</td>
<td>±10%</td>
<td></td>
</tr>
<tr>
<td>Mating Contact</td>
<td>Differential</td>
<td>±10%</td>
<td></td>
</tr>
<tr>
<td>Cable termination</td>
<td>Differential</td>
<td>±15%</td>
<td>Rise Time: 110ps (20% + 80%)</td>
</tr>
<tr>
<td>Cable</td>
<td></td>
<td>±5%</td>
<td></td>
</tr>
</tbody>
</table>
13.3 Cable Assembly (L=3m Long) Total Differential Noise (TDR method):

Total Noise under multi aggressor synchronous condition shall not exceed 3.5% for rise time of 100ps (10% ÷ 90%) or slower.

Multi aggressor condition shall be considered as ‘N - 1’ active differential pairs switching concurrently while ‘N’ is the maximum number of assigned differential pair in the connector. The remaining pair shall be passive, terminated and monitored using TDR sampling head for NEN and FEN.

The total noise shall be the summation of NEN and FEN.

13.4 Differential Skew (L=3m Long):

Using differential TDR sampling head, the following values shall be considered as maximum allowed skew:

<table>
<thead>
<tr>
<th>Type</th>
<th>Maximum Value</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intra-Pair Skew</td>
<td>35 ps</td>
<td>Measured at 15% of TDR’s Single-Ended Output voltage swing</td>
</tr>
<tr>
<td>Inter-Pair Skew</td>
<td>150 ps</td>
<td>Measured at 15% of TDR’s Differential Output voltage swing</td>
</tr>
</tbody>
</table>
14 Reference Documents

- MIL-STD-1344, test methods
- EIA-364 Test Procedures
- IEC-512 Test Procedures
- See EIA-364-D Annex Page A-1 to A-4 Test Comparison Cross Reference
  (informative) among EIA-364, IEC-512 & MIL-STD-1344