

Comment: Changes to AC Coupling

Joel Goergen – Cisco, Beth Kochuparambil – Cisco

Summary: This presentation presents the outcome of consensus building activity regarding AC coupling; which should be added to the KR and KP clauses.

Supporters

- Rick Rabinovich – Alcatel-Lucent
- Matt Brown – AppliedMicro
- Brian Misek – Avago
- Charles Moore – Avago
- Ali Ghiasi – Broadcom
- Umesh Chandra – Dell
- Yasuo Hidaka – Fujitsu
- Alex Umnov – Huawei
- Adee Ran – Intel
- Dave Chalupsky – Intel
- John Ewen – IBM
- Kent Lusted – Intel
- Rich Mellitz – Intel
- Liav Ben Artsi – Marvell
- Scott Irwin – MoSys
- Mike Dudek – Qlogic
- Pavel Zivney - Tektronix

Update: Consensus Building Activity

- Hosted ongoing discussions to action item accepted at March plenary
 - Resulting from zivny_01_0312 and goergen_01_0312
 - Presenter volunteers to lead, and Chair encourages, off line consensus building on the topic [AC cap/test points].
- 8 calls and countless email exchanges
- 49 individuals involved from 29 affiliations
 - Adam Healey, Adee Ran, Alex Umnov, Ali Ghiasi, Andy Zambell, Ben Rubovitch, Bengt Kvist, Beth Kochuparambil, Bhavesh Patel, Brian Misek, Charles Moore, Dan Dove, Dariush Dabiri, David Chalupsky, Ed Sayre, Francois Tremblay, Ingvar Karlsson, Joe Pankow, Joel Goergen, John D'Ambrosia, John Lehman, Kent Lusted, Liav Ben Artsi, Madhumitha Rengarajan, Matt Brown, Megha Shanbhag, Merrick Moeller, Mike Dudek, Mike Li, Mohammad Kermani, Mounir Meghelli, Myles Kimmett, Nathan Tracy, Oren Sela, Pavel Zivny, Piers Dawe, Pravin Patel, Rich Mellitz, Rick Rabinovich, Ron Kennedy, Scott Irwin, Umesh Chandra, VasuPathasarathy, Wheling Cheng, Wolfgang Meier, Yasuo Hidaka, Yoav Rozenberg, Yonatan Malkiman, Ziad Hatab
- Reached perceived consensus within group; no additional concerns have surfaced via phone or e-mail that need to be addressed.

Continued calls/e-mails of group resulted in these...

Points of Consensus: AC Coupling

- The receiver shall be AC-coupled to the backplane to allow for maximum interoperability.
- Common mode is addressed as if the capacitor is implemented between TP0 to TP5. Should the capacitor be implemented outside TP0 to TP5, the implementer must address any common mode divergence.
- The impacts of a capacitor implementation located between TP0 and TP5 are to be accounted for within the channel budget. Should the capacitor be implemented outside TP0 to TP5, the system designer must consider effects to the receiver and transmitter verification testing as well as account for impacts to channel budgeting; all of which were defined with the capacitor located inside TP0 to TP5 .

Proposed Comment To The Floor

Comment Type: FLOOR Cl: 93 SC: 93.8.2 P: 136

- **AC coupling and budgeting is not fully addressed in clause 93.**
- Suggested Remedy
 - Given consensus building activities, insert AC Coupling section to both clause 93 with the following text
 - “ The 100GBASE-KR4 receiver lanes shall be AC-coupled for maximum interoperability. Common mode is addressed as if the capacitor is implemented between TP0 to TP5. Should the capacitor be implemented outside TP0 to TP5, the implementer must address any common mode divergence. ”
 - “ The impacts of a capacitor implementation located between TP0 and TP5 are to be accounted for within the channel budget. Should the capacitor be implemented outside TP0 to TP5, the system designer must consider effects to the receiver and transmitter verification testing as well as account for impacts to channel budgeting; all of which were defined with the capacitor located inside TP0 to TP5. ”
- Other comment on AC coupling: #171 by Piers Dawe, #1 by Ryan Latchman

Proposed Comment To The Floor

Comment Type: FLOOR Cl: 94 SC: 94.3.12 P: 167

- **AC coupling and budgeting is not fully addressed in clause 94.**
- Suggested Remedy
 - Given consensus building activities, insert AC Coupling section to both clause 94 with the following text
 - “ The 100GBASE-KP4 receiver lanes shall be AC-coupled for maximum interoperability. Common mode is addressed as if the capacitor is implemented between TP0 to TP5. Should the capacitor be implemented outside TP0 to TP5, the implementer must address any common mode divergence. ”
 - “ The impacts of a capacitor implementation located between TP0 and TP5 are to be accounted for within the channel budget. Should the capacitor be implemented outside TP0 to TP5, the system designer must consider effects to the receiver and transmitter verification testing as well as account for impacts to channel budgeting; all of which were defined with the capacitor located inside TP0 to TP5. ”
- Other comment on AC coupling: #171 by Piers Dawe, #1 by Ryan Latchman

Thank you to the consensus group
for your diligence and participation!

backup slides are attached

What is Available: AC Coupling

72.7.2.3 AC-coupling

The 10GBASE-KR receiver shall be AC-coupled to the backplane to allow for maximum interoperability between various 10 Gbps components. AC-coupling is considered to be part of the receiver for the purposes of this specification unless explicitly stated otherwise. It should be noted that there may be various methods for AC-coupling in actual implementations.

NOTE—It is recommended that the maximum value of the coupling capacitors be limited to 100 nF. This will limit the inrush currents to the receiver that could damage the receiver circuits when repeatedly connected to transmit modules with a higher voltage level.

84.8.2 Receiver characteristics

Receiver electrical characteristics at TP4 for 40GBASE-KR4 shall be the same as 10GBASE-KR, as detailed in 72.7.2.1 through 72.7.2.5.

P802.3bj, draft 1.0 – AC coupling is not directly addressed

Comment #171

CI 92	SC 92.8.4.5	P 106	L 49	# 171
Dawe, Piers		IPtronics		

Comment Type T Comment Status X

"The 100GBASE-CR4 receivers are AC coupled. AC coupling shall be part of the receive function for Style-2 100GBASE-CR4 connectors. For Style-1 100GBASE-CR4 plug connectors, the receive lanes are AC coupled; the coupling capacitors shall be within the plug connectors."

But, isn't there only one connector type at present, with the AC coupling in the cable, therefore not needed in the receiver?

Suggested Remedy

Delete the first two sentences and "Style-1".

Proposed Response Response Status O

Comment #1

CI 93	SC 93.8.1 Table 93-4	P131	L11	# 1
Latchman, Ryan		Mindspeed		

Comment Type T *Comment Status* X

Common mode DC output voltage is specified between 0V and TBDV. TBD needs to be established.

0V minimum is not a practical common mode (see figure 93-3)

In the case of DC coupling, a max leakage current spec is required to ensure device reliability and biasing.

Suggested Remedy

Change TBD to 1.9V

Change Common-mode DC output voltage (min.) to 0.4V

Add leakage current spec to Table 93-4 (source and sink)

Proposed Response *Response Status* O