RF Interconnection Technologies for 40G Serial

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IEEE 802.3ba Task Force September 15 – 19 Seoul, Korea
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Outline

• Purpose of this presentation
  • RF interconnection technology to reduce 40GE Serial cost is proposed.
  • These technologies are available now and also enable to reduce optical module size in near future

• Effective cost reduction method for 40G Serial
  • Integration EML and EA Driver into one PKG
  • Removing GPPO from Serdes ICs and optical devices

• Two-types of RF interconnection method to remove GPPO
  • Edge mount GPPO method
  • FPC interconnection method

• Optical module size estimation by using proposed RF interconnection method
  • Comparison between Serial vs CWDM
RF Interconnection Methods

Current OC768

EML

GPPO edge mount connectors

EML (GPPO PKG)

EA Drv
(GPPO PKG)

50% cost reduction(*1)

XLMD w/ EA Drv
(GPPO PKG)

60% cost reduction(*1)

TOSA w/ EA Drv
(Feed-through)

 Serializer
OC768
16:1/1:16
(GPPO PKG)

(*1) TOSA(w/ driver)+ROSA cost, not include volume effect

From traverso_01_0909

FPC interconnection

(*1)  TOSA(w/ driver)+ROSA cost, not include volume effect

From traverso_01_0909

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Cost reduction of SerDes for 40GE Serial

Cost Comparison:
OC768 and 40GE SerDes, YR2008 technology

OC768 16:1/1:16 (GPPO PKG)
40GE 4:1/1:4 (LGA PKG)

85%
Edge Mount GPPO Method

Transmission loss = 1.0dB@40GHz
f_{-3dB} bandwidth = 60GHz

Available Today
FPC Interconnection Method

1. Alumina board connection (Reference)
2. FPC film connection

Available in 2009

Bit rate: 39.8Gb/s
Data pattern: PRBS31

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FPC Measurement Conditions

- FPC Material: Polyimide (t=50um)
- Signal Line: Micro strip line/ Grounded coplanar line (L=10mm)
- Measurement Conditions
  - FPC Temperature: 25, 50, 85°C
  - (a) Bent (90°, 120°, 180°, R=0.75mm)
  - (b) Twisted
  - (c) Folded

Micro Strip Line Type

Grounded Coplanar Line Type

(a)

(b)

(c)
MSL Type FPC Performance

Micro Strip Line Type

No degradation
Grounded CPL Type FPC Performance

Grounded Coplanar Line Type

No degradation

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40G Signal Transmission on FR4

Material: CCL-EL230 type T
Dielectric Constant: 3.8 (@1GHz)
Dielectric Tangent: 0.005 (@1GHz)
Thickness: 200um

S21 (measured)

Input waveform (40Gb/s) After 10mm transmission After 20mm transmission

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Optical Module Size

Which is the right technology?

Serial
- Double XENPAK
- FPC
- X2
- CMOS
- QSFP

CWDM
- Double XENPAK
- 4xTOSA
- 4xROSA
- O-Mux
- O-DeMux

Y2009-2010
Y2011-2012
Y20??

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Summary

• Recommend the 802.3ba task force to adopt 40GbE Serial PMD for 10Km SMF:
  • Two-types of RF interconnection method are proposed and confirmed that RF characteristics are acceptable for 40G Serial
    • GPPO edge mount method – Available today
    • FPC interconnect method – Available in 2009
  • These technologies enable to reduce optical module cost and size for 40G Serial
  • Optical module size
    • X2 by adopting FPC interconnection method
    • QSFP by adopting low power CMOS
  • Serial is the right technology for 40GbE 10km SMF application