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SFF-TA-1043

Specification for

COM Parameters for 400G AI Copper Interconnects

Rev 0.0.1 February 13, 2026

SECRETARIAT: SFF TWG

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ABSTRACT: This specification defines the COM Parameters for 400G AI Copper Interconnects.

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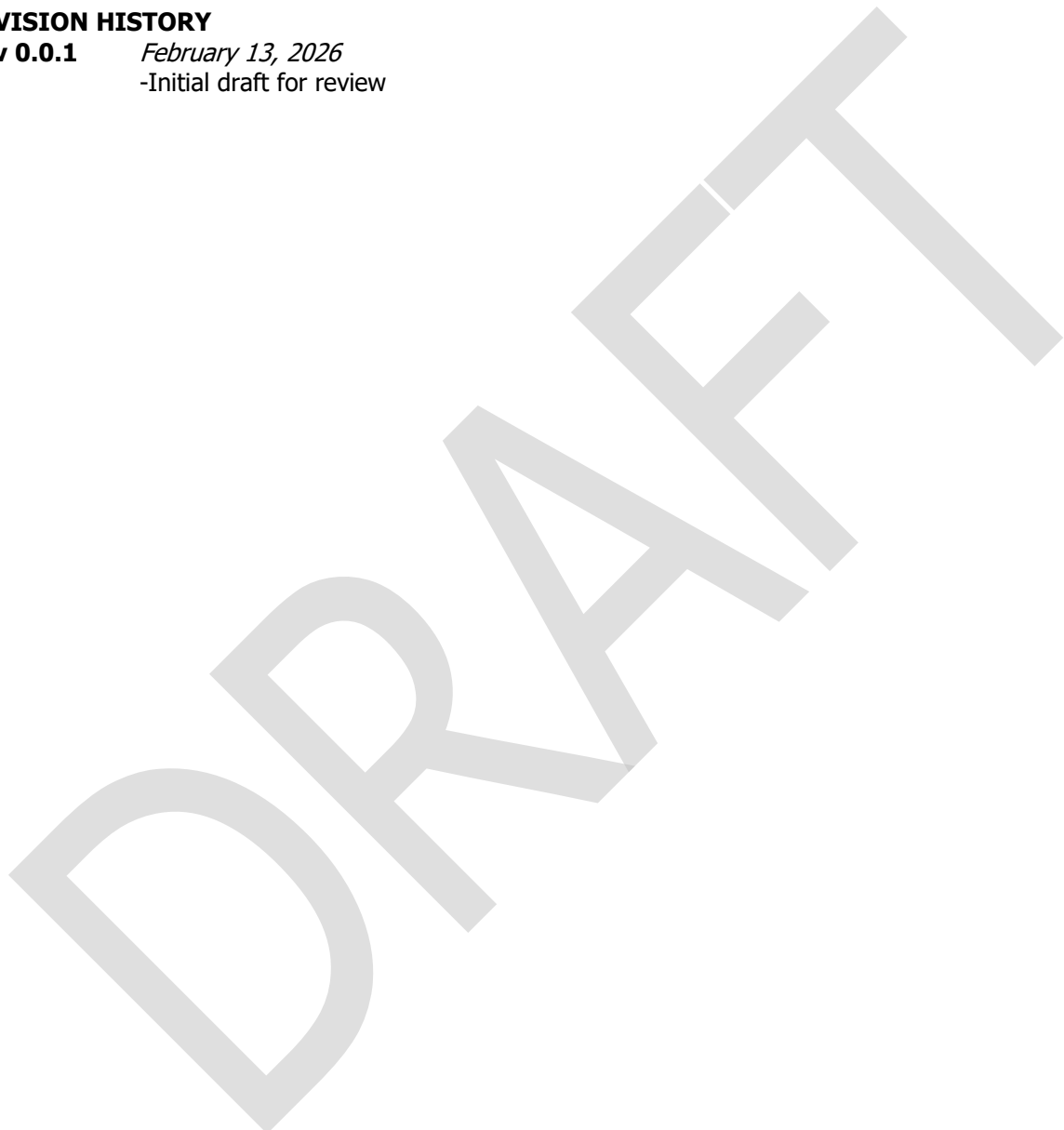
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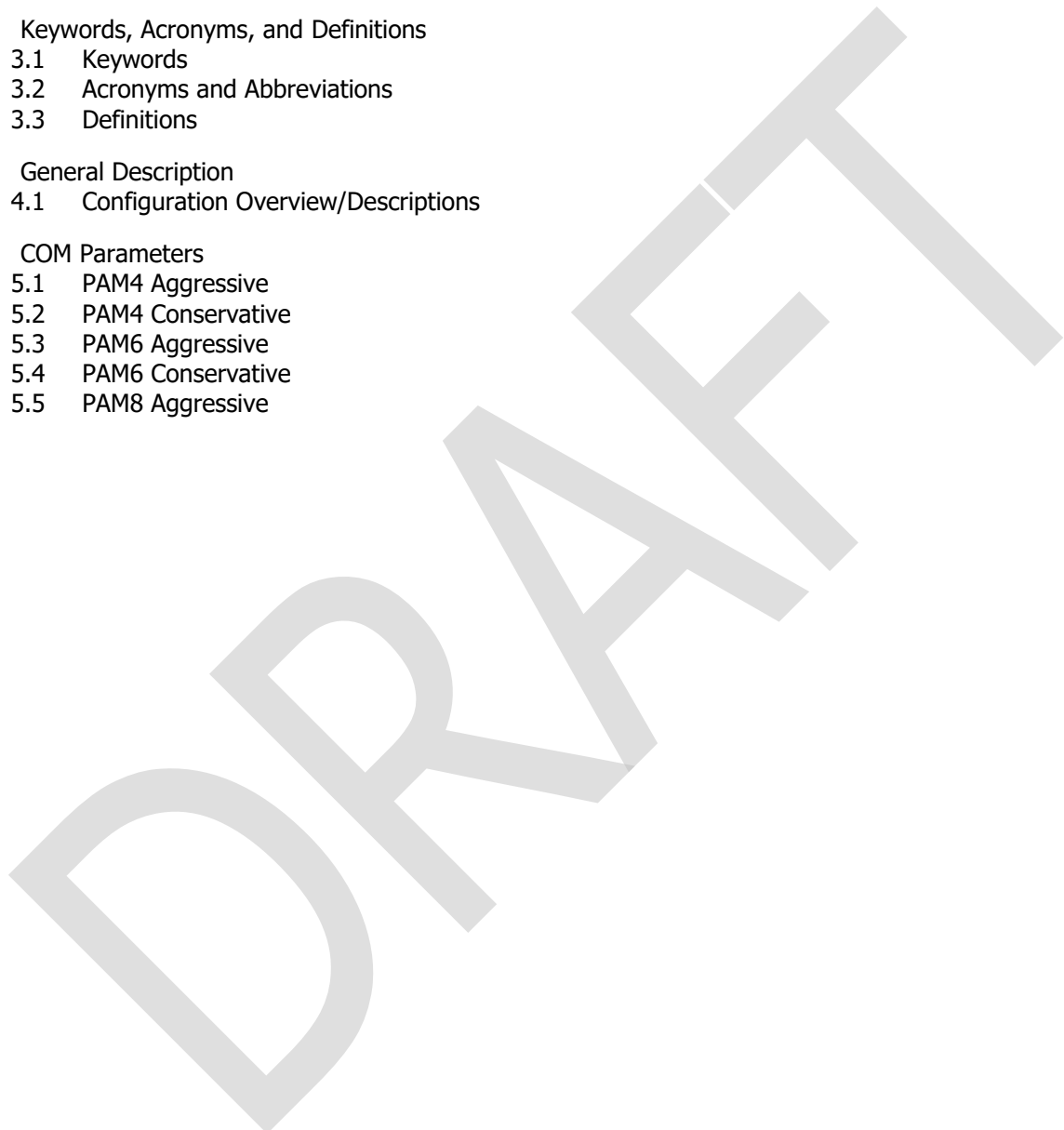
For those who wish to participate in the activities of the SFF TWG, the signup for membership can be found at <https://www.snia.org/join>.

REVISION HISTORY

Rev 0.0.1 *February 13, 2026*
 -Initial draft for review



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1 **FIGURES**

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1 **1. Scope**

2 This specification defines the This specification defines the COM Parameters for 400G AI Copper Interconnects.

3 **2. References and Conventions**

4 **2.1 Industry Documents**

5 The following documents are relevant to this specification:

- 6 - IEEE802.3-2022 IEEE Standard for Ethernet
- 7 -

9 **2.2 Sources**

10 The complete list of SFF documents which have been published, are currently being worked on, or that have been
11 expired by the SFF Committee can be found at <https://www.snia.org/sff/specifications>. Suggestions for improve-
12 ment of this specification are welcome and should be submitted to <https://www.snia.org/feedback>.

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14 Other standards may be obtained from the organizations listed below:

Standard	Organization	Website
IEEE	Institute of Electrical and Electronics Engineers (IEEE)	https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=68
OIF	Optical Internetworking Forum (OIF)	https://www.oiforum.com/technical-work/implementation-agreements-ias/

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2.3 Conventions

The following conventions are used throughout this document:

DEFINITIONS: Certain words and terms used in this standard have a specific meaning beyond the normal English meaning. These words and terms are defined either in the definitions or in the text where they first appear.

ORDER OF PRECEDENCE: If a conflict arises between text, tables, or figures, the order of precedence to resolve the conflicts is text; then tables; and finally figures. Not all tables or figures are fully described in the text. Tables show data format and values.

LISTS: Lists sequenced by lowercase or uppercase letters show no ordering relationship between the listed items.

EXAMPLE 1 - The following list shows no relationship between the named items:

- a. red (i.e., one of the following colors):
 - A. crimson; or
 - B. pink;
- b. blue; or
- c. green.

Lists sequenced by numbers show an ordering relationship between the listed items.

EXAMPLE 2 -The following list shows an ordered relationship between the named items:

- 1. top;
- 2. middle; and
- 3. bottom.

Lists are associated with an introductory paragraph or phrase and are numbered relative to that paragraph or phrase (i.e., all lists begin with an a. or 1. entry).

DIMENSIONING CONVENTIONS: The dimensioning conventions are described in ASME-Y14.5, Geometric Dimensioning and Tolerancing. All dimensions are in millimeters, which are the controlling dimensional units (if inches are supplied, they are for guidance only).

NUMBERING CONVENTIONS: The ISO convention of numbering is used (i.e., the thousands and higher multiples are separated by a space and a period is used as the decimal point). This is equivalent to the English/American convention of a comma and a period.

American	French	ISO
0.6	0,6	0.6
1,000	1 000	1 000
1,323,462.9	1 323 462,9	1 323 462.9

3. Keywords, Acronyms, and Definitions

For the purposes of this document, the following keywords, acronyms, and definitions apply.

3.1 Keywords

May: Indicates flexibility of choice with no implied preference.

May or may not: Indicates flexibility of choice with no implied preference.

Obsolete: Indicates that an item was defined in prior specifications but has been removed from this specification.

Optional: Describes features which are not required by the SFF specification. However, if any feature defined by the SFF specification is implemented, it shall be implemented as defined by the specification. Describing a feature as optional in the text is an informational callout to assist the reader.

Prohibited: Describes a feature, function, or coded value that is defined in a referenced specification to which this SFF specification makes a reference, where the use of said feature, function, or coded value is not allowed for implementations of this specification.

Reserved: Where the term is used for a signal on a connector contact, the function is set aside for future standardization. It is not available for vendor specific use. Where this term is used for bits, bytes, fields, and code values; the bits, bytes, fields, and code values are set aside for future standardization. The default value shall be zero. The originator is required to define a Reserved field or bit as zero, but the receiver should not check Reserved fields or bits for zero.

Restricted: Refers to features, bits, bytes, words, and fields that are set aside for other standardization purposes. If the context of the specification applies to the restricted designation, then the restricted bit, byte, word, or field shall be treated as a value whose definition is not in scope of this document, and is not interpreted by this specification.

Shall: Indicates a mandatory requirement. Designers are required to implement all such mandatory requirements to ensure interoperability with other products that conform to this specification.

Should: Indicates flexibility of choice with a strongly preferred alternative.

Vendor specific: Indicates something (e.g., a bit, field, code value) that is not defined by this specification. Specification of the referenced item is determined by the manufacturer and may be used differently in various implementations.

3.2 Acronyms and Abbreviations

To be added in a future revision of this document.

3.3 Definitions

To be added in a future revision of this document.

1 **4. General Description**

2 **4.1 Configuration Overview/Descriptions**

3 This document contains the COM parameters for an AI Copper Interconnect signaling at 400Gb.
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1 **5. COM Parameters**

2 The following sections describe the COM parameters for a 400Gb copper connection.

3 **5.1 PAM4 Aggressive**

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Table 5-1. COM Parameters for PAM4 Aggressive

Operational Parameter	Setting	Units	Information
data rate	425	Gbit	
L	4		
f_b	212.50	GBd	106.25GHz Fnq
f_min	0.05	GHz	
Delta_f	0.01	GHz	
R_0	46.25	s	
ERL Pass threshold	7.3	dB	
COM Pass threshold	3	db	
DER_0	2.00E-04		
T_r	0.00200	ns	
MLSD	1	enabled	
	Die Termination		
C_d	[0.4e-4 0.9e-4 1.1e-4]/1.4	nF	Segment capacitance
L_s	[0.13 0.15 0.14]/1.4	nH	Segment inductance
C_b	[0.3e-4]/1.4	nF	Bump capacitance
	filter and Eq		
f_r	0.55	*fb	116.88GHz
c(0)	0.55		min
c(-1)	[-0.34:0.02:0]		[min:step:max]
c(-2)	[0:0.02:0.14]		[min:step:max]
c(1)	[-0.2:0.02:0]		[min:step:max]
N_b	1	UI	As/dffe1
b_max(1)	0.85		As/dfe2..N_b
b_min(1)	0		As/dfe2..N_b
g_DC	[-20:1:0]	dB	gain sweep range
f_z	85.00	GHz	
f_p1	85.00	GHz	
f_p2	212.50	GHz	
g_DC_HP	[-6:1:-0]	dB	LF gain sweep range
f_HP_PZ	1.328125	GHz	

TDR, ERL and SCMR options			
TR_TDR	0.002	ns	TDR transition time
N	10000	UI	End of TDR
TDR_Butterworth	1	enabled	
beta_x	0		
rho_x	0.618		
TDR_W_TXPKG	1	UI	
N_bx	16		
Z_t	46.25	ohm	
P_peak	1.00E-07		Probability
Noise, jitter			
sigma_RJ	0.01	UI	
A_DD	0.02	UI	
eta_0	5.00E-09	V ² /GHz	
SNR_TX	32.5	dB	
R_LM	0.95		RLM measured may be different from COM RLM value (see Ayal Shoval presentation)
Filter: Rx FFE			
ffe_pre_tap_len	8.00	UI	
ffe_post_tap_len	21	UI	
ffe_main_cursor_min	1		
ffe_pre_tap1_max	0.7		
ffe_post_tap1_max	0.7		
ffe_tapn_max	0.7		
N_qb	6.5	like enob	
P_qc	1.00E-07		
Floating Tap Control			
N_bg	3	0 1 2 or 3 groups	
N_bf	6	taps per group	
N_f	160	UI span for floating taps	
bmaxg	0.05	max FFE magnitude for floating taps	

	PKG_CPC	[2.8 5.6 6.7 9.4] db	tp0p or Tp5p
Parameter	Setting	Units	
R_d	[46.25]	Ohm	termination impedance
package_tl_gamma0_a1_a2	[0.0005 0.00065 0.000293]		
package_tl_tau	0.006141	ns/mm	
package_Z_c	[87.5]	Ohm	Segment impedance
z_p (TX)	[8 30 45]	mm	segment length
z_p (NEXT)	[8 30 45]	mm	segment length
z_p (FEXT)	[8 30 45]	mm	segment length
z_p (RX)	[8 30 45]	mm	segment length
A_v	0.385	V	
A_fe	0.385	V	
A_ne	0.481	V	

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5.2 PAM4 Conservative

Table 5-2. COM Parameters for PAM4 Conservative

Operational Parameter	Setting	Units	Information
data rate	425	Gbit	
L	4		
f_b	212.50	GBd	106.25GHz Fnq
f_min	0.05	GHz	
Delta_f	0.01	GHz	
R_0	46.25	s	
ERL Pass threshold	7.3	dB	
COM Pass threshold	3	db	
DER_0	2.00E-04		
T_r	0.00200	ns	
MLSD	1	enabled	
	Die Termination		
C_d	[0.4e-4 0.9e-4 1.1e-4]/1.4	nF	Segment capacitance
L_s	[0.13 0.15 0.14]/1.4	nH	Segment inductance
C_b	[0.3e-4]/1.4	nF	Bump capacitance
filter and Eq			

f_r	0.55	*fb	116.88GHz
c(0)	0.55		min
c(-1)	[-0.34:0.02:0]		[min:step:max]
c(-2)	[0:0.02:0.14]		[min:step:max]
c(1)	[-0.2:0.02:0]		[min:step:max]
N_b	1	UI	As/dfe1
b_max(1)	0.85		As/dfe2..N_b
b_min(1)	0		As/dfe2..N_b
g_DC	[-20:1:0]	dB	gain sweep range
f_z	85.00	GHz	
f_p1	85.00	GHz	
f_p2	212.50	GHz	
g_DC_HP	[-6:1:-0]	dB	LF gain sweep range
f_HP_PZ	1.328125	GHz	
TDR, ERL and SCMR options			
TR_TDR	0.002	ns	TDR transition time
N	10000	UI	End of TDR
TDR_Butterworth	1	enabled	
beta_x	0		
rho_x	0.618		
TDR_W_TXPKG	1	UI	
N_bx	16		
Z_t	46.25	ohm	
P_peak	1.00E-07		Probability
Noise, jitter			
sigma_RJ	0.01	UI	
A_DD	0.02	UI	
eta_0	5.00E-09	V ² /GHz	
SNR_TX	30.5	dB	
R_LM	0.95		RLM measured may be different from COM RLM value (see Ayal Shoval presentation)
Filter: Rx FFE			
ffe_pre_tap_len	5.00	UI	
ffe_post_tap_len	10	UI	
ffe_main_cursor_min	1		
ffe_pre_tap1_max	0.7		

ffe_post_tap1_max	0.7		
ffe_tapn_max	0.7		
N_qb	5.5	like enob	
P_qc	1.00E-07		
Floating Tap Control			
N_bg	2	0 1 2 or 3 groups	
N_bf	4	taps per group	
N_f	90	UI span for floating taps	
bmaxg	0.05	max FFE magnitude for floating taps	
	PKG_CPC	[2.8 5.6 6.7 9.4] db	tp0p or Tp5p
Parameter	Setting	Units	
R_d	[46.25]	Ohm	termination impedance
package_tl_gamma0_a1_a2	[0.0005 0.00065 0.000293+B55]		
package_tl_tau	0.006141	ns/mm	
package_Z_c	[87.5]	Ohm	Segment impedance
z_p (TX)	[8 30 45]	mm	segment length
z_p (NEXT)	[8 30 45]	mm	segment length
z_p (FEXT)	[8 30 45]	mm	segment length
z_p (RX)	[8 30 45]	mm	segment length
A_v	0.385	V	
A_fe	0.385	V	
A_ne	0.481	V	

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5.3 PAM6 Aggressive

Table 5-3. COM Parameters for PAM6 Aggressive

Operational Parameter	Setting	Units	Information
data rate	425	Gbit	
L	6		
f_b	164.41	GBd	82.205GHz Fnq
f_min	0.05	GHz	
Delta_f	0.01	GHz	

R_0	46.25	s	
ERL Pass threshold	7.3	dB	
COM Pass threshold	3	db	
DER_0	2.00E-04		
T_r	0.00200	ns	
MLSD	1	enabled	
	Die Termination		
C_d	[0.4e-4 0.9e-4 1.1e-4]/1.4	nF	Segment capacitance
L_s	[0.13 0.15 0.14]/1.4	nH	Segment inductance
C_b	[0.3e-4]/1.4	nF	Bump capacitance
	filter and Eq		
f_r	0.55	*fb	90.43GHz
c(0)	0.55		min
c(-1)	[-0.34:0.02:0]		[min:step:max]
c(-2)	[0:0.02:0.14]		[min:step:max]
c(1)	[-0.2:0.02:0]		[min:step:max]
N_b	1	UI	As/dffe1
b_max(1)	0.85		As/dfe2..N_b
b_min(1)	0		As/dfe2..N_b
g_DC	[-20:1:0]	dB	gain sweep range
f_z	65.76	GHz	
f_p1	65.76	GHz	
f_p2	164.41	GHz	
g_DC_HP	[-6:1:-0]	dB	LF gain sweep range
f_HP_PZ	1.0275625	GHz	
	TDR, ERL and SCMR options		
TR_TDR	0.002	ns	TDR transition time
N	10000	UI	End of TDR
TDR_Butterworth	1	enabled	
beta_x	0		
rho_x	0.618		
TDR_W_TXPKG	1	UI	
N_bx	16		
Z_t	46.25	ohm	
P_peak	1.00E-07		Probability

Noise, jitter			
sigma_RJ	0.008	UI	
A_DD	0.0015	UI	
eta_0	5.00E-09	V ² /GHz	
SNR_TX	33.3	dB	
R_LM	0.93		RLM measured may be different from COM RLM value (see Ayal Shoval presentation)
Filter: Rx FFE			
ffe_pre_tap_len	6.00	UI	
ffe_post_tap_len	16	UI	
ffe_main_cursor_min	1		
ffe_pre_tap1_max	0.7		
ffe_post_tap1_max	0.7		
ffe_tapn_max	0.7		
N_qb	7	like enob	
P_qc	1.00E-07		
Floating Tap Control			
N_bg	3	0 1 2 or 3 groups	
N_bf	5	taps per group	
N_f	106	UI span for floating taps	
bmaxg	0.05	max FFE magnitude for floating taps	
	PKG_CPC	[2.8 5.6 6.7 9.4] db	tp0p or Tp5p
Parameter	Setting	Units	
R_d	[46.25]	Ohm	termination impedance
package_tl_gamma0_a1_a2	[0.0005 0.00065 0.000293]		
package_tl_tau	0.006141	ns/mm	
package_Z_c	[87.5]	Ohm	Segment impedance
z_p (TX)	[8 30 45]	mm	segment length
z_p (NEXT)	[8 30 45]	mm	segment length
z_p (FEXT)	[8 30 45]	mm	segment length
z_p (RX)	[8 30 45]	mm	segment length

A_v	0.385	V	
A_fe	0.385	V	
A_ne	0.481	V	

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5.4 PAM6 Conservative

Table 5-4. COM Parameters for PAM6 Conservative

Operational			
Parameter	Setting	Units	Information
data rate	425	Gbit	
L	6		
f_b	164.41	GBd	82.205GHz Fnq
f_min	0.05	GHz	
Delta_f	0.01	GHz	
R_0	46.25	s	
ERL Pass threshold	7.3	dB	
COM Pass threshold	3	db	
DER_0	2.00E-04		
T_r	0.00200	ns	
MLSD	1	enabled	
	Die Termination		
C_d	[0.4e-4 0.9e-4 1.1e-4]/1.4	nF	Segment capacitance
L_s	[0.13 0.15 0.14]/1.4	nH	Segment inductance
C_b	[0.3e-4]/1.4	nF	Bump capacitance
	filter and Eq		
f_r	0.55	*fb	90.43GHz
c(0)	0.55		min
c(-1)	[-0.34:0.02:0]		[min:step:max]
c(-2)	[0:0.02:0.14]		[min:step:max]
c(1)	[-0.2:0.02:0]		[min:step:max]
N_b	1	UI	As/dffe1
b_max(1)	0.85		As/dfe2..N_b
b_min(1)	0		As/dfe2..N_b
g_DC	[-20:1:0]	dB	gain sweep range
f_z	65.76	GHz	
f_p1	65.76	GHz	
f_p2	164.41	GHz	

g_DC_HP	[-6:1:-0]	dB	LF gain sweep range
f_HP_PZ	1.0275625	GHz	
TDR, ERL and SCMR options			
TR_TDR	0.002	ns	TDR transition time
N	10000	UI	End of TDR
TDR_Butterworth	1	enabled	
beta_x	0		
rho_x	0.618		
TDR_W_TXPKG	1	UI	
N_bx	16		
Z_t	46.25	ohm	
P_peak	1.00E-07		Probability
Noise, jitter			
sigma_RJ	0.008	UI	
A_DD	0.0015	UI	
eta_0	5.00E-09	V ² /GHz	
SNR_TX	31.3	dB	
R_LM	0.93		RLM measured may be different from COM RLM value (see Ayal Shoval presentation)
Filter: Rx FFE			
ffe_pre_tap_len	6.00	UI	
ffe_post_tap_len	16	UI	
ffe_main_cursor_min	1		
ffe_pre_tap1_max	0.7		
ffe_post_tap1_max	0.7		
ffe_tapn_max	0.7		
N_qb	6.5	like enob	
P_qc	1.00E-07		
Floating Tap Control			
N_bg	3	0 1 2 or 3 groups	
N_bf	5	taps per group	
N_f	106	UI span for floating taps	
bmaxg	0.05	max FFE	

		magnitude for floating taps	
	PKG_CPC	[2.8 5.6 6.7 9.4] db	tp0p or Tp5p
Parameter	Setting	Units	
R_d	[46.25]	Ohm	termination impedance
package_tl_gamma0_a1_a2	[0.0005 0.00065 0.000293]		
package_tl_tau	0.006141	ns/mm	
package_Z_c	[87.5]	Ohm	Segment impedance
z_p (TX)	[8 30 45]	mm	segment length
z_p (NEXT)	[8 30 45]	mm	segment length
z_p (FEXT)	[8 30 45]	mm	segment length
z_p (RX)	[8 30 45]	mm	segment length
A_v	0.385	V	
A_fe	0.385	V	
A_ne	0.481	V	

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5.5 PAM8 Aggressive

Table 5-5. COM Parameters for PAM8 Aggressive

Operational			
Parameter	Setting	Units	Information
data rate	425	Gbit	
L	8		
f_b	141.67	GBd	70.835GHz Fnq
f_min	0.05	GHz	
Delta_f	0.01	GHz	
R_0	46.25	s	
ERL Pass threshold	7.3	dB	
COM Pass threshold	3	db	
DER_0	2.00E-04		
T_r	0.00200	ns	
MLSD	1	enabled	
	Die Termination		
C_d	[0.4e-4 0.9e-4 1.1e-4]/1.4	nF	Segment capacitance

L_s	[0.13 0.15 0.14]/1.4	nH	Segment inductance
C_b	[0.3e-4]/1.4	nF	Bump capacitance
filter and Eq			
f_r	0.55	*fb	77.92GHz
c(0)	0.55		min
c(-1)	[-0.34:0.02:0]		[min:step:max]
c(-2)	[0:0.02:0.14]		[min:step:max]
c(1)	[-0.2:0.02:0]		[min:step:max]
N_b	1	UI	As/dffe1
b_max(1)	0.85		As/dfe2..N_b
b_min(1)	0		As/dfe2..N_b
g_DC	[-20:1:0]	dB	gain sweep range
f_z	56.67	GHz	
f_p1	56.67	GHz	
f_p2	141.67	GHz	
g_DC_HP	[-6:1:-0]	dB	LF gain sweep range
f_HP_PZ	0.8854375	GHz	
TDR, ERL and SCMR options			
TR_TDR	0.002	ns	TDR transition time
N	5000	UI	End of TDR
TDR_Butterworth	1	enabled	
beta_x	0		
rho_x	0.618		
TDR_W_TXPKG	1	UI	
N_bx	26		
Z_t	46.25	ohm	
P_peak	1.00E-07		Probability
Noise, jitter			
sigma_RJ	0.007	UI	
A_DD	0.0013	UI	
eta_0	5.00E-09	V^2/GHz	
SNR_TX	33.3	dB	
R_LM	0.93		RLM measured may be different from COM RLM value (see Ayal Shoval presentation)
Filter: Rx FFE			

ffe_pre_tap_len	5.00	UI	
ffe_post_tap_len	14	UI	
ffe_main_cursor_min	1		
ffe_pre_tap1_max	0.7		
ffe_post_tap1_max	0.7		
ffe_tapn_max	0.7		
N_qb	7.3	like enob	
P_qc	1.00E-07		
Floating Tap Control			
N_bg	3	0 1 2 or 3 groups	
N_bf	4	taps per group	
N_f	106	UI span for floating taps	
bmaxg	0.05	max FFE magnitude for floating taps	
	PKG_CPC	[2.8 5.6 6.7 9.4] db	tp0p or Tp5p
Parameter	Setting	Units	
R_d	[46.25]	Ohm	termination impedance
package_tl_gamma0_a1_a2	[0.0005 0.00065 0.000293]		
package_tl_tau	0.006141	ns/mm	
package_Z_c	[87.5]	Ohm	Segment impedance
z_p (TX)	[8 30 45]	mm	segment length
z_p (NEXT)	[8 30 45]	mm	segment length
z_p (FEXT)	[8 30 45]	mm	segment length
z_p (RX)	[8 30 45]	mm	segment length
A_v	0.385	V	
A_fe	0.385	V	
A_ne	0.481	V	
A_fe	0.481	V	
A_ne	0.481	V	

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