Low Loss C2M Hosts Models with Cabling between the Front Panel Connector and an ASIC Package

Data for Comments: 189, 193, 194, 195 196, 412, 418, 522, 566

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Supporters

- Howard Heck, Intel
- Mike Dudek, Marvel

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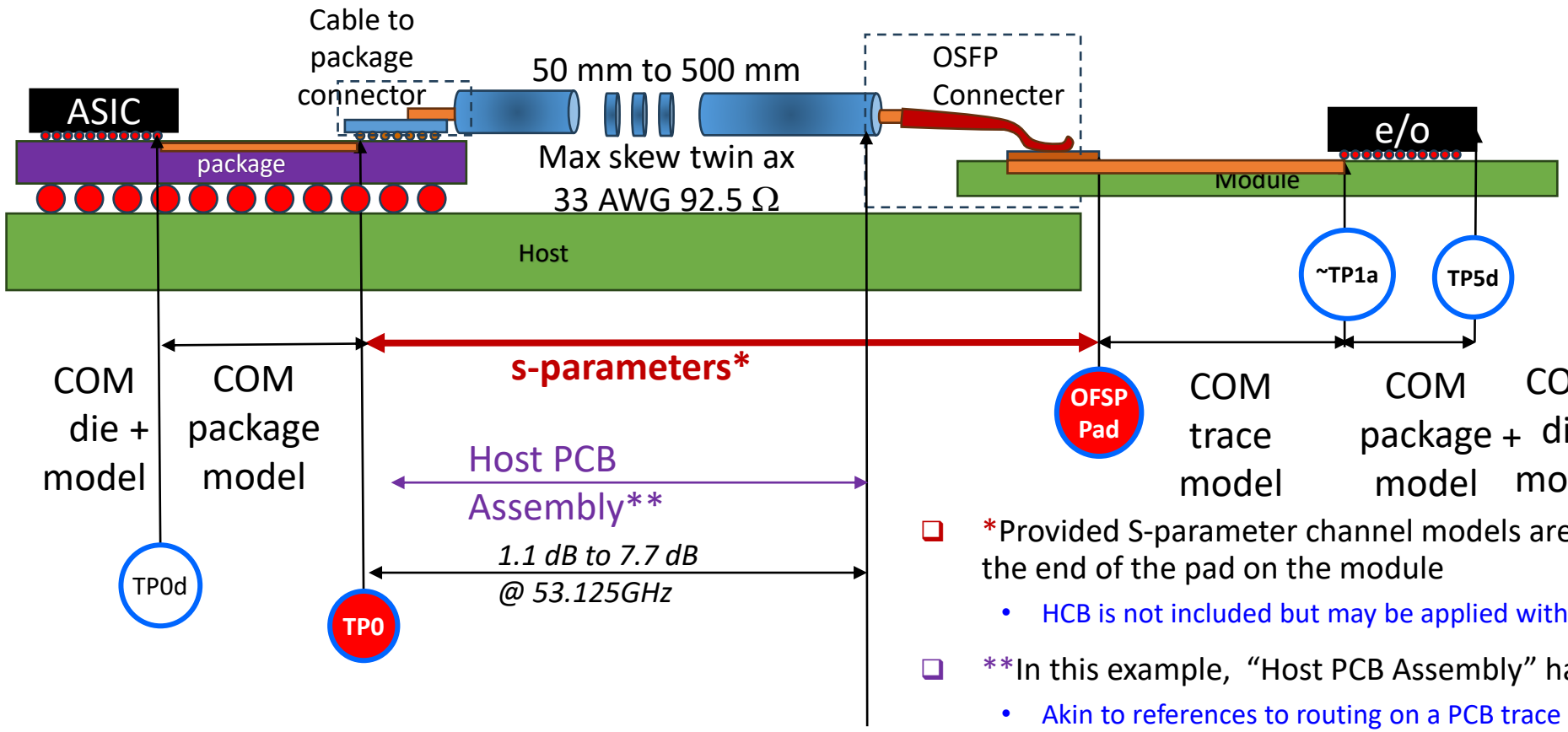
Front Panel Connector Cabled to Package

Model Description

- The models provided are channel topologies not previously considered and which broaden market potential
  - Background data for the resolution of comments (189, 193, 194, 195, 196, 412, 418, 522, 566)
- Channel models are between TP0 and the end of the connector pad on the module
  - Most of the channel is twin ax cable
  - Models with cabling lengths of 50 mm, 150 mm, 250 mm, and 500 mm are provided
  - Cable models have worse than expected skew
  - The 33 AWG twin ax cable differential impedance targets 92.5 Ω
- Not in the provided channel models
  - Package and die models
  - Module routing (HCB)
- The usage model is intended to be flexible
  - A COM example is shown

Front Panel Connector Cabled to Package

Topology and Location of s-parameter Models



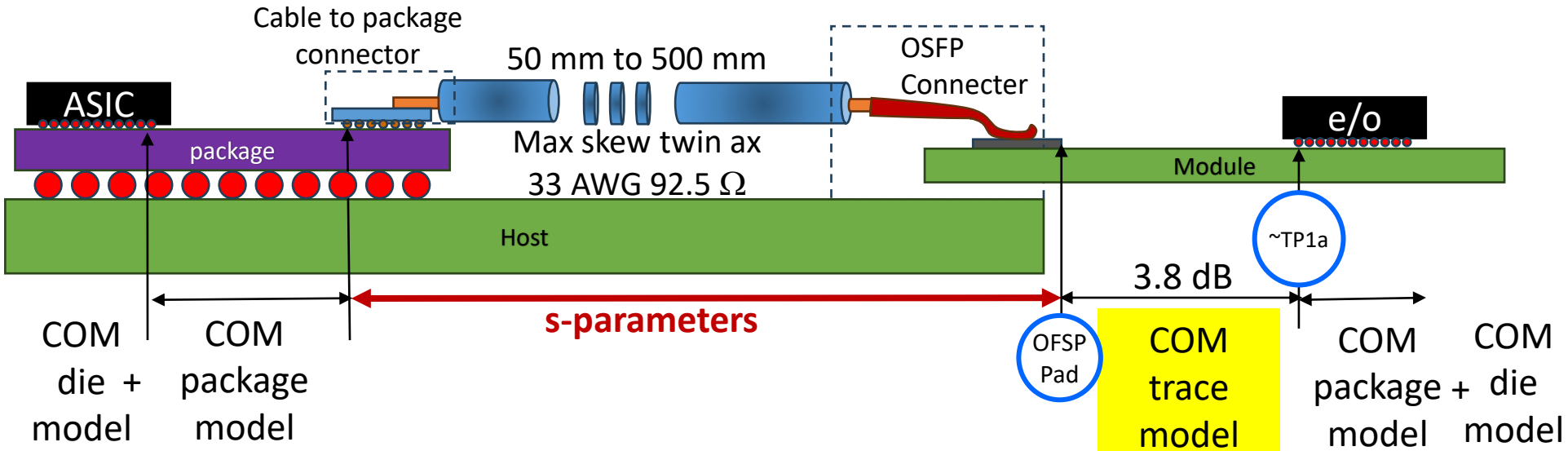
- *Provided S-parameter channel models are between TP0 and the end of the pad on the module
  - HCB is not included but may be applied with the COM script
- **In this example, "Host PCB Assembly" has no PCB routing
  - Akin to references to routing on a PCB trace route
  - Host interconnect loss of the model is 1.1 dB to 7.7 dB
- ~Tp1a is not really tp1a. Explanation on next slide

COM Example

- The COM results are for one usage example and illustrates flexibility
- The s-parameters end is at the OSFP pad.
  - There are many options for usage in COM which were not available with Tp0 to TP1a models.
- A note on ~TP1a in this example
  - In practice an HCB includes an instrumented connector at TP1a
  - As in many other presentations, the COM example just adds HCB loss of a PCB trace to end of the OSFP pad calling this ~TP1a.
  - The OSFP pad to TP1a represent module and package.
  - The high end of the HCB loss in sekel_3dj_elec_01_240620 of 3.8 dB was used in the example.
  - Other channel models use 3.4 dB HCB loss (lim_3dj_01_2309, akinwale_3dj_01_2307, rabinovich_3dj_01_230116, sekel_3dj_elec_01_240620)
  - Adding a COM module package at ~TP1a completes the die-to-die channel
- Improvements to this simple method are welcome and contributions could
  - Include their own PCB or module routing instead
  - Include their own HCB
  - Refine the Rx added PCB trace models and C0/C1
  - Refine the module package die model
  - Reduce the added module PCB trace loss to complement the module package loss

COM Usage Example: HCB Emulation

Module Routing Emulation

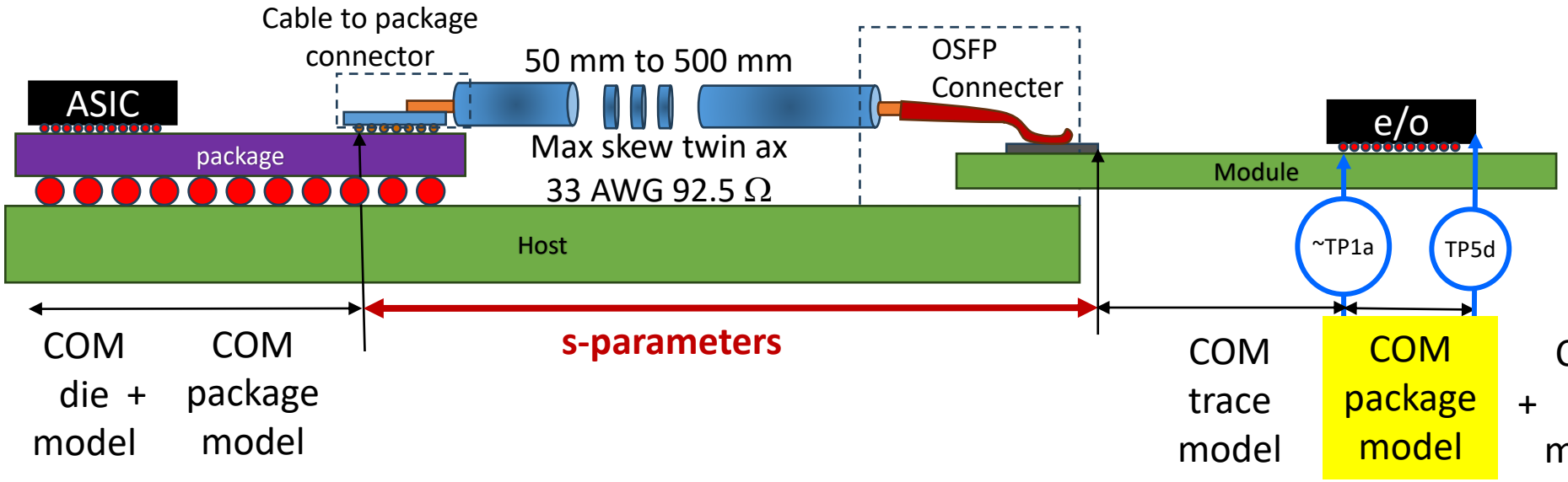


The configuration file change here is to set Include_PCB to 1 and add 3.8 dB of PCB trace

Parameter	Setting	
board_tl_gamma0_a1_a2	*[0 2.61e-4 5.75e-5]*	**1.1 dB/in @ 53.125G**
board_tl_tau	*5.790E-03*	ns/mm
board_Z_c	100	Ohm
z_bp (TX)	*0*	mm
z_bp (NEXT)	*87*	mm
z_bp (FEXT)	*0*	mm
z_bp (RX)	*87*	mm (3.8 dB)
C_0	[0 0]	nF
C_1	[0 0]	nF
Include PCB	**1**	**logical**

COM Usage Example: E/O and Module Package

COM module package and die model

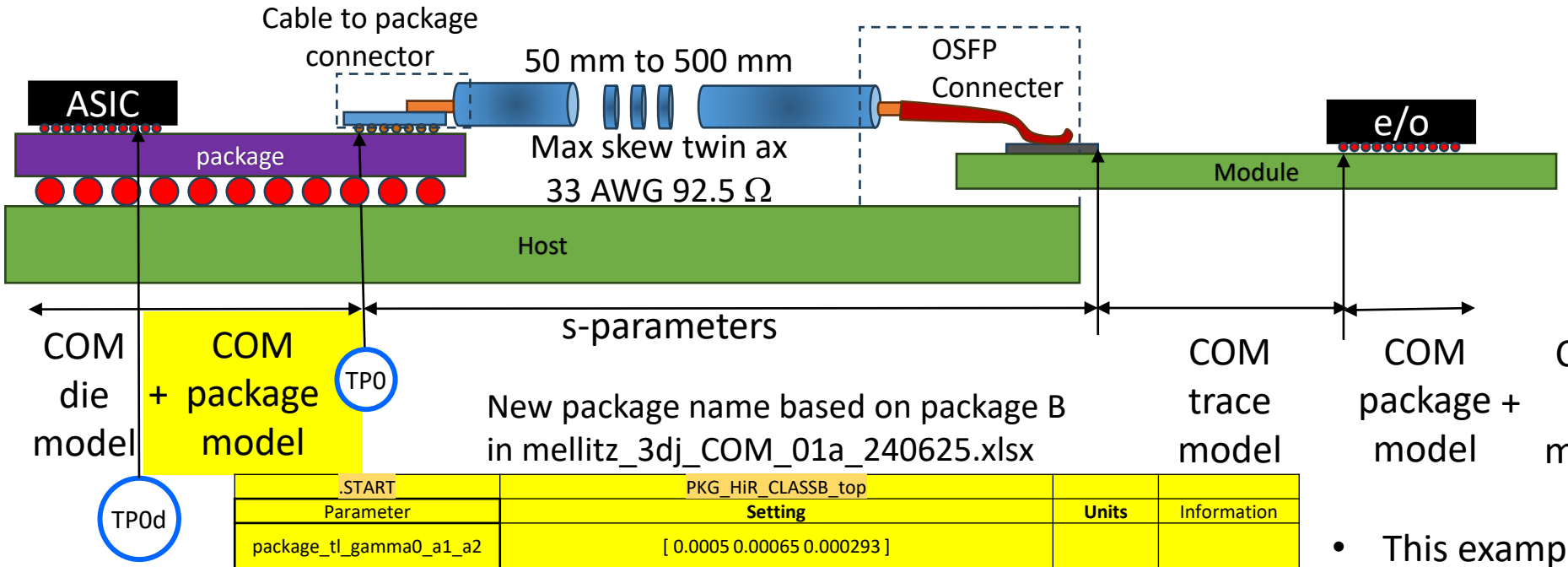


- The example uses a module model used in mellitz_3dj_COM_01a_240625.xlsx.
- The number Zp selections need to be the same for all package models
- There are 6 Zp cases selectors here.
  - There we 4 case in mellitz_3dj_COM_01a_240625.xlsx

.START	PKG_Module	
Parameter	**Setting**	**Units**
package_tl_gamma0_a1_a2	[0.0005 0.00089 0.0002]	
package_tl_tau	0.006141	ns/mm
package_Z_c	[87.5 87.5 ; 95 95 ; 100 100; 100 100]	Ohm
R_d	[50 50]	Ohm
z_p (TX)	[888888 ; 000000 ; 000000 ; 000000]	mm
z_p (NEXT)	[888888 ; 000000 ; 000000 ; 000000]	mm
z_p (FEXT)	[888888 ; 000000 ; 000000 ; 000000]	mm
z_p (RX)	[888888 ; 000000 ; 000000 ; 000000]	mm
C_p	[0.4e-4 0.4e-4]	nF
A_v	0.413	V
A_fe	0.413	V
A_ne	0.45	V
.START	PKG_Module	

COM Usage Example: ASIC model

COM ASIC package and die model



New package name based on package B in mellitz_3dj_COM_01a_240625.xlsx

.START	PKG_HiR_CLASSB_top		
Parameter	**Setting**	**Units**	Information
package_tl_gamma0_a1_a2	[0.0005 0.00065 0.000293]		
package_tl_tau	0.006141	ns/mm	
package_Z_c	[87.5 87.5 ; 95 95 ; 100 100; 78 78]	Ohm	
R_d	[46.25 46.25]	Ohm	[TX RX]
z_p (TX)	[8 24 30 45 85 130; 0 0 0 0 0 0 ; 0 0 0 0 0 0; 0 0 0 0 0 0]	mm	[test cases]
z_p (NEXT)	[7 23 29 45 84 129; 0 0 0 0 0 0; 0 0 0 0 0 0; 0 0 0 0 0 0]	mm	[test cases]
z_p (FEXT)	[8 24 30 45 85 130; 0 0 0 0 0 0 ; 0 0 0 0 0 0; 0 0 0 0 0 0]	mm	[test cases]
z_p (RX)	[7 23 29 45 84 129; 0 0 0 0 0 0; 0 0 0 0 0 0; 0 0 0 0 0 0]	mm	[test cases]
C_p	[0.1e-4 0.1e-4]	nF	[TX RX]
A_v	0.413	V	Vf=0.400
A_fe	0.413	V	Vf=0.399
A_ne	0.45	V	Vf=0.400
.END			

- This example uses [8 24 30 45 85 130] mm package lengths to create large ranges of IL_{dd}

PKG_NAME	**PKG_HiR_CLASSB_top PKG_Module**
z_p select	[1 2 3 4 5 6]

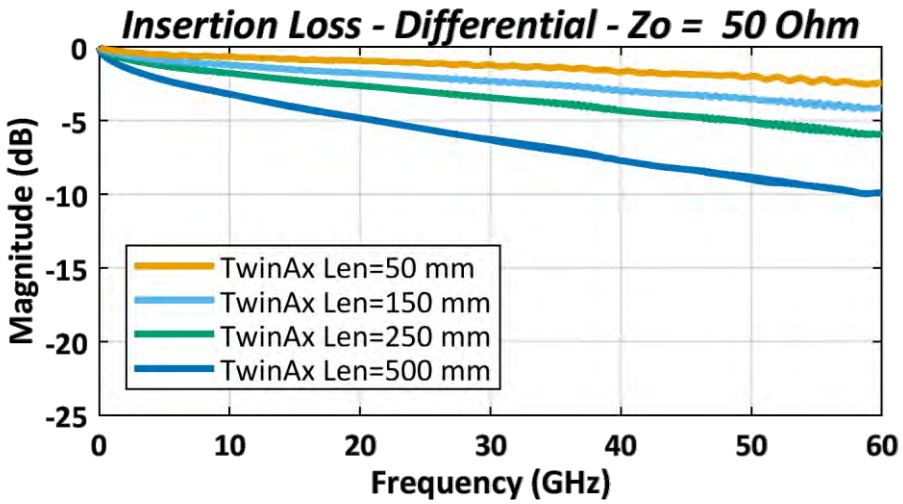
S-parameters

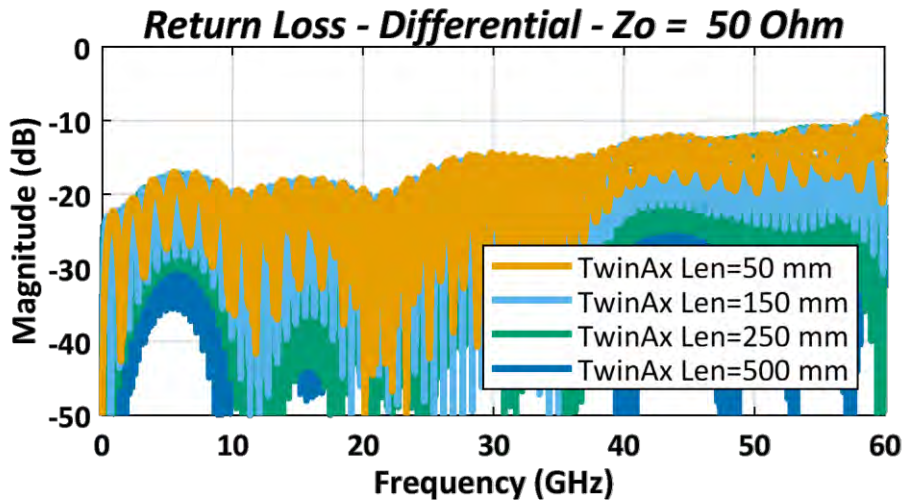
- Are betweenTP0 to OSFP pad
- [1 3] are Tx ports
- [2 4] are Rx ports (victim port)
- 50 mm, 150 mm, 250 mm, and 500 mm cables
- Files
  - 1 Through, 5 FEXT, 6 NEXT

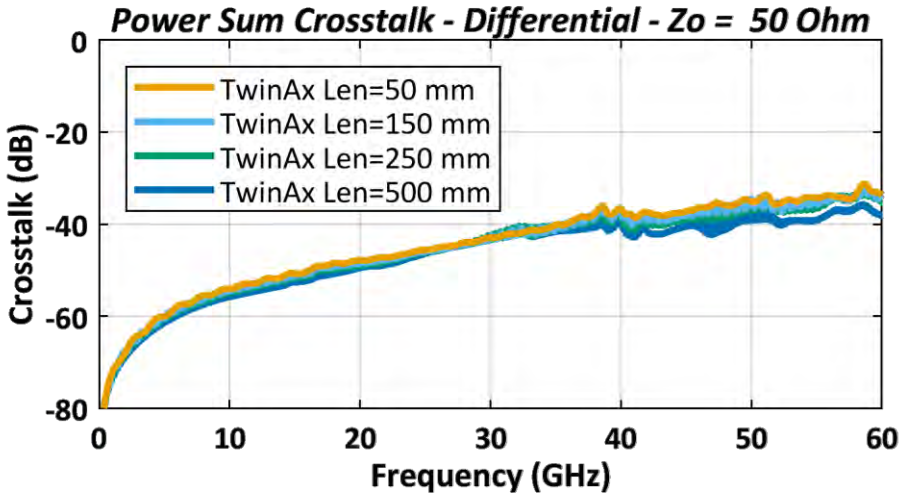
File list

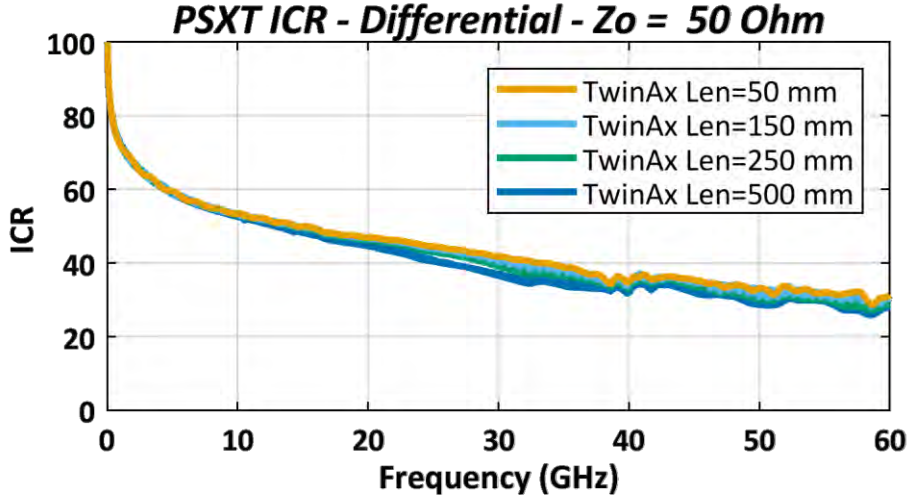
Through	FEXT	NEXT
host_pkg_top_150mm_max_skew_cable_module_pin_pad_thru.s4p	host_pkg_top_150mm_max_skew_cable_module_pin_pad_fext1.s4p	host_pkg_top_150mm_max_skew_cable_module_pin_pad_next1.s4p
	host_pkg_top_150mm_max_skew_cable_module_pin_pad_fext2.s4p	host_pkg_top_150mm_max_skew_cable_module_pin_pad_next2.s4p
	host_pkg_top_150mm_max_skew_cable_module_pin_pad_fext3.s4p	host_pkg_top_150mm_max_skew_cable_module_pin_pad_next3.s4p
	host_pkg_top_150mm_max_skew_cable_module_pin_pad_fext4.s4p	host_pkg_top_150mm_max_skew_cable_module_pin_pad_next4.s4p
	host_pkg_top_150mm_max_skew_cable_module_pin_pad_fext5.s4p	host_pkg_top_150mm_max_skew_cable_module_pin_pad_next5.s4p
		host_pkg_top_150mm_max_skew_cable_module_pin_pad_next6.s4p
host_pkg_top_250mm_max_skew_cable_module_pin_pad_thru.s4p	host_pkg_top_250mm_max_skew_cable_module_pin_pad_fext1.s4p	host_pkg_top_250mm_max_skew_cable_module_pin_pad_next1.s4p
	host_pkg_top_250mm_max_skew_cable_module_pin_pad_fext2.s4p	host_pkg_top_250mm_max_skew_cable_module_pin_pad_next2.s4p
	host_pkg_top_250mm_max_skew_cable_module_pin_pad_fext3.s4p	host_pkg_top_250mm_max_skew_cable_module_pin_pad_next3.s4p
	host_pkg_top_250mm_max_skew_cable_module_pin_pad_fext4.s4p	host_pkg_top_250mm_max_skew_cable_module_pin_pad_next4.s4p
	host_pkg_top_250mm_max_skew_cable_module_pin_pad_fext5.s4p	host_pkg_top_250mm_max_skew_cable_module_pin_pad_next5.s4p
		host_pkg_top_250mm_max_skew_cable_module_pin_pad_next6.s4p
host_pkg_top_500mm_max_skew_cable_module_pin_pad_thru.s4p	host_pkg_top_500mm_max_skew_cable_module_pin_pad_fext1.s4p	host_pkg_top_500mm_max_skew_cable_module_pin_pad_next1.s4p
	host_pkg_top_500mm_max_skew_cable_module_pin_pad_fext2.s4p	host_pkg_top_500mm_max_skew_cable_module_pin_pad_next2.s4p
	host_pkg_top_500mm_max_skew_cable_module_pin_pad_fext3.s4p	host_pkg_top_500mm_max_skew_cable_module_pin_pad_next3.s4p
	host_pkg_top_500mm_max_skew_cable_module_pin_pad_fext4.s4p	host_pkg_top_500mm_max_skew_cable_module_pin_pad_next4.s4p
	host_pkg_top_500mm_max_skew_cable_module_pin_pad_fext5.s4p	host_pkg_top_500mm_max_skew_cable_module_pin_pad_next5.s4p
		host_pkg_top_500mm_max_skew_cable_module_pin_pad_next6.s4p
host_pkg_top_50mm_max_skew_cable_module_pin_pad_thru.s4p	host_pkg_top_50mm_max_skew_cable_module_pin_pad_fext1.s4p	host_pkg_top_50mm_max_skew_cable_module_pin_pad_next1.s4p
	host_pkg_top_50mm_max_skew_cable_module_pin_pad_fext2.s4p	host_pkg_top_50mm_max_skew_cable_module_pin_pad_next2.s4p
	host_pkg_top_50mm_max_skew_cable_module_pin_pad_fext3.s4p	host_pkg_top_50mm_max_skew_cable_module_pin_pad_next3.s4p
	host_pkg_top_50mm_max_skew_cable_module_pin_pad_fext4.s4p	host_pkg_top_50mm_max_skew_cable_module_pin_pad_next4.s4p
	host_pkg_top_50mm_max_skew_cable_module_pin_pad_fext5.s4p	host_pkg_top_50mm_max_skew_cable_module_pin_pad_next5.s4p
		host_pkg_top_50mm_max_skew_cable_module_pin_pad_next6.s4p

Channel IL,RL, PST, and ICR plots

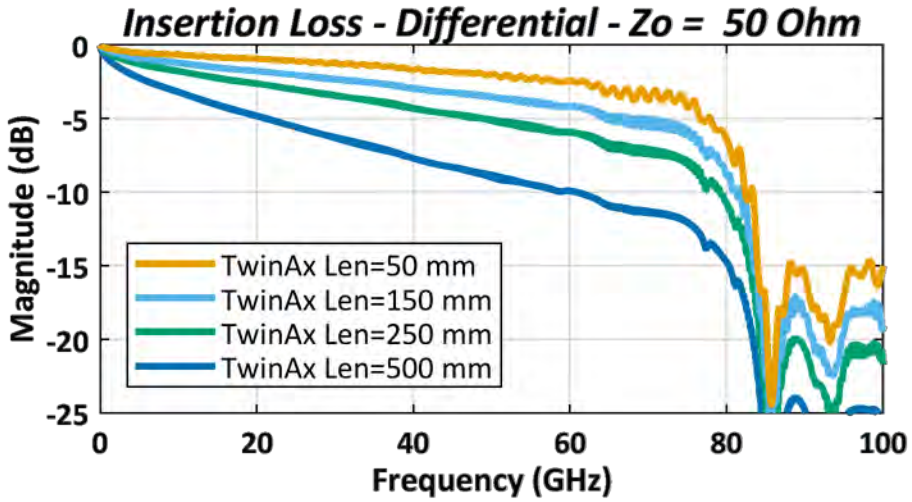


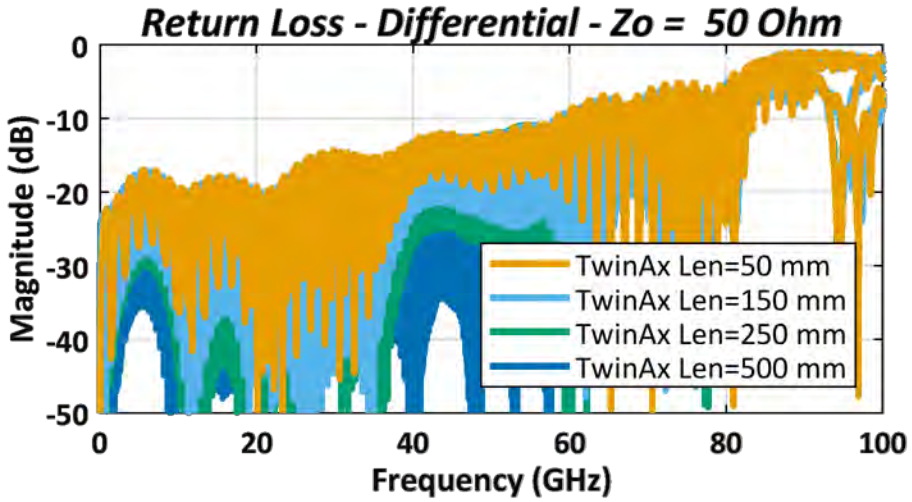


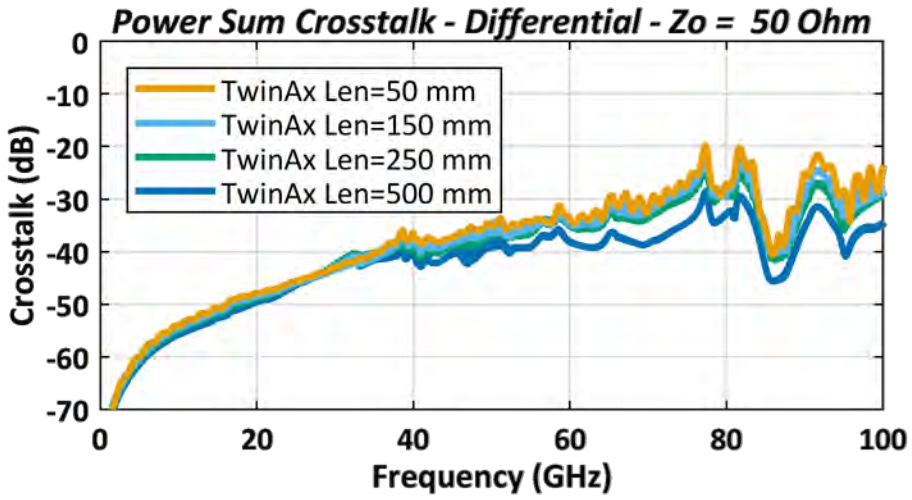


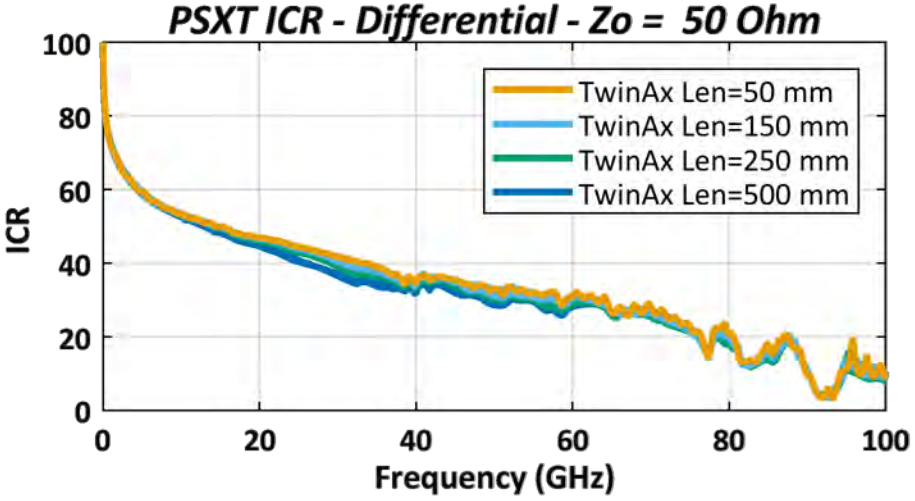


Channel plots to 100 GHz

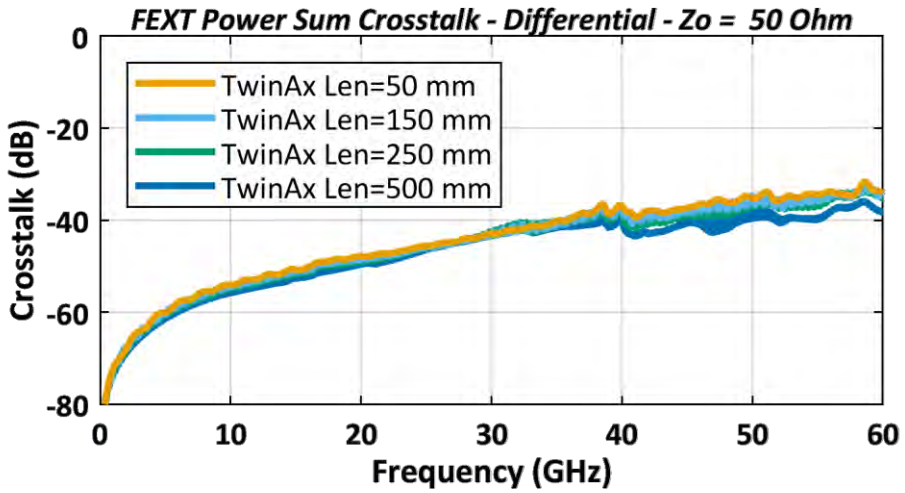


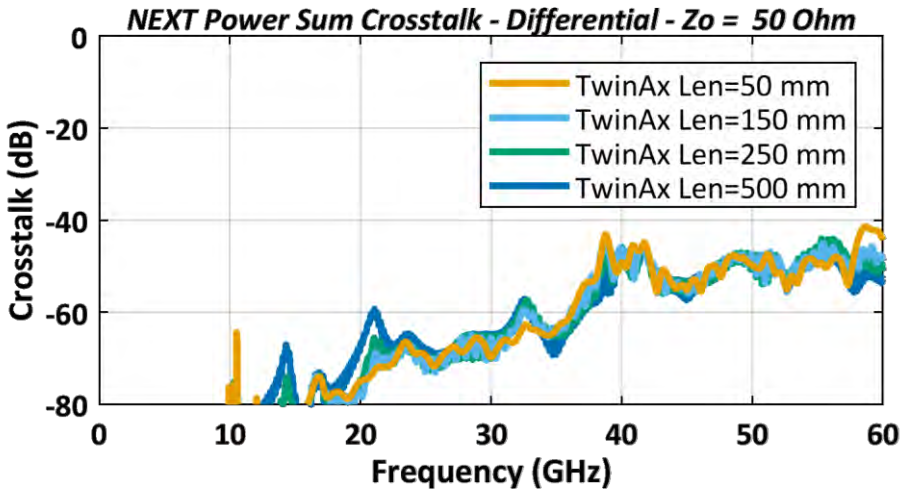


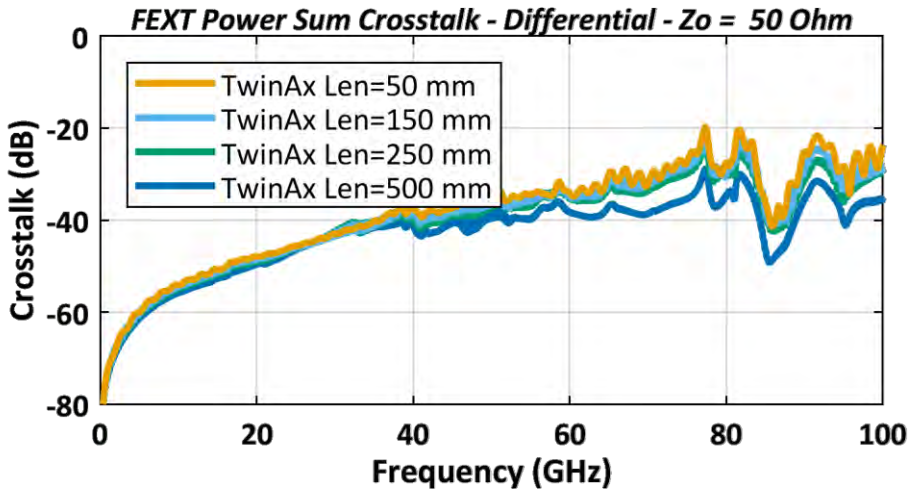


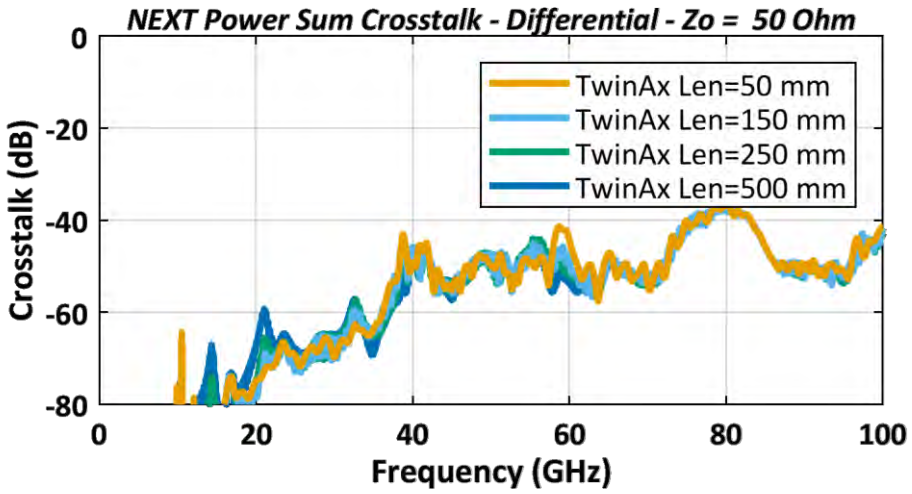


NEXT and FEXT to 60 GHz and 100 GHz

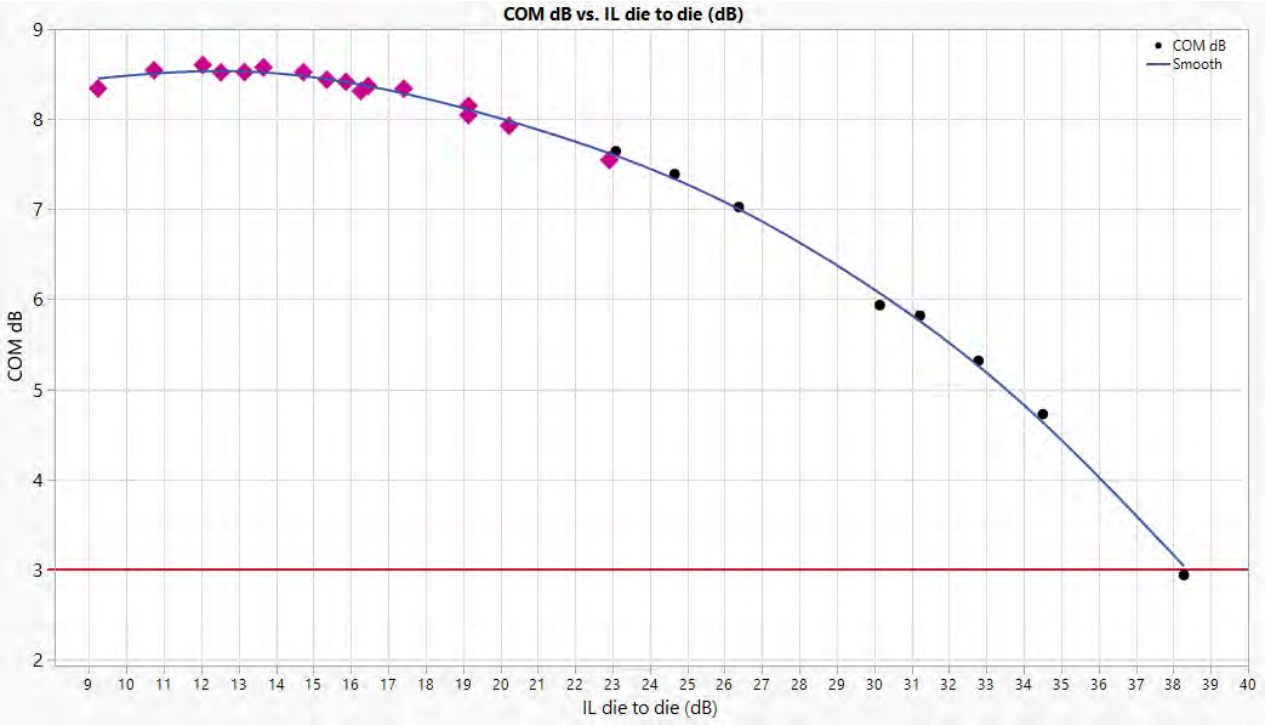








COM Example Results are Promising



- Magenta diamond markers represent package lengths of 45 mm or less.
- COM results here suggest cabled hosts can perform well.
- COM script is 4.7beta1

COM configuration starting reference is
https://www.ieee802.org/3/dj/public/adhoc/COM/24_0625/mellitz_3dj_COM_01a_240625.xlsx
Modified configuration is in back up slides and previously annotated

Thoughts in Summary

- Short low loss channels are not always poor performers
- Host IL_{DD} can go down to 1.1 dB
- Passing channel loss ranges are tempered by topology, components, and manufacturing choices
- Channel models provide new flexibility using COM analysis
- Consider words used before ‘up to at least’ to widen the market potential
  - Resolve comment 195 and 522 by defining two ranges acknowledging a wider market potential. One for hosts based on PCB routing and another for advanced (or other) routing
- Previously, larger packages were not considered but may be possible
- The following contributions would be considered useful to be used in future work which align to the models provided in this presentation
  - DAC cable models between connector pads
  - Module models starting at the connector pad

Thank You!

Backup Reference

COM Configuration Section 1

Parameter Keyword	Parameters Values			I/O control			Parameter	Setting	Units		SAVE_CONFIG2MAT	0	
Parameter	**Setting**	**Units**	**nformatior**	DIAGNOSTICS	1	logical	**Operational**				**Receiver testing**		
f_b	106.25	GBd		DISPLAY_WINDOW	1	logical	ERL Pass threshold	7	dB		RX_CALIBRATION	0	logical
f_min	0.05	GHz		CSV_REPORT	0	logical	COM Pass threshold	3	db		Sigma BBN step	5.00E-03	V
Delta_f	0.01	GHz		RESULT_DIR	.\results\C2M_{date}\		DER_0	2.00E-05			**ICN parameters**		
C_d	[0.4e-4 0.9e-4 1.1e-4 ;0.4e-4 0.9e-4 1.1e-4]	nF	[TX RX]	SAVE_FIGURES	0	logical	T_r	0.00400	ns		f_v	0.278	Fb
L_s	[0.13 0.15 0.14; 0.13 0.15 0.14]	nH	[TX RX]	Port Order	[1 3 2 4]	input fi	FORCE_TR	1	logical	required	f_f	0.278	Fb
C_b	[0.3e-4 0.3e-4]	nF	[TX RX]	RUNTAG	C2M_		PMD_type	C2C			f_n	0.278	Fb
R_0	50	Ohm	[TX RX]	COM_CONTRIBUTION	1	logical	samples_for_C2M	100			f_2	60.000	GHz
PKG_NAME	**PKG_HiR_CLASSB_top PKG_Module**		TX RX				**A_nt**	0.450	V		A_ft	0.450	V
TDR and ERL options				50									
TDR	1	logical		1			**Parameter**	**Setting**					
ERL	1	logical		0	logical		ts_anchor	1					
z_p select	[1 2 3 4 5 6]			ERL_ONLY	0	logical	sample_adjustment	[-12 12]			board_tl_gamma0_a1_a2	*[0 2.61e-4 5.75e-5]*	1.1 db/in @ 53.125G
L	4			TR_TDR	0.005	ns	Local Search	0		if set to	board_tl_tau	*5.790E-03*	ns/mm
M	32			N	1600	UI	**Filter: Rx FFE**				board_Z_c	100	Ohm
filter and Eq				TDR_Butterworth	1		ffe_pre_tap_len	5	UI		z_bp (TX)	*0*	mm
f_r	0.565	*fb		beta_x	0		ffe_post_tap_len	14	UI		z_bp (NEXT)	*87*	mm
c(0)	0.54		min	rho_x	0.618		ffe_pre_tap1_max	0.7	interpreted as +/-	COM to	z_bp (FEXT)	*0*	mm
c(-1)	0	[-0.34:0.02:0	hin:step:ma	TDR_W_TXPKG	1	UI	ffe_post_tap1_max	0.7	interpreted as +/-	COM to	z_bp (RX)	*87*	mm (3.8 dB)
c(-2)	0	[0:.02:0.14]	hin:step:ma	N_bx	0	UI	ffe_tapn_max	0.7	interpreted as +/-	COM to	C_0	[0 0]	nF
c(-3)	0	0	hin:step:ma	fixture delay time	[0 0]	S	FFE_OPT_METHOD	MMSE		FV-LMS or M	C_1	[0 0]	nF
c(-4)	0	0	hin:step:ma	Tukey_Window	1		num_ui_RXFF_noise	1024			**Include PCB**	**1**	**logical**
c(1)	0	[-0.2:0.02:0]	hin:step:ma	**Noise, jitter**			**Floating Tap Control**				**Seletions (rectangle, gaussian,dual_rayleigh,triangle**		
N_b	1	UI		sigma_RJ	0.01	UI	N_bg	2	0 1 2 or 3 groups		Histogram_Window_Weight	gaussian	selection
b_max(1)	0.85		As/dffe1	A_DD	0.02	UI	N_bf	4	taps per group		Qr	*0.02*	UI
b_max(2..N_b)	0		As/dfe2..N_	eta_0	1.00E-08	V^2/GHz	N_f	50	UI span for floating taps				
b_min(1)	0		As/dffe1	SNR_TX	33.5	dB	bmaxg	0.2	max DFE value for floating taps				
b_min(2..N_b)	-0.15	UI	NA if Nb=1	R_LM	0.95		B_float_RSS_MAX	1	rss tail tap limit				
g_DC	[-20:1:0]	dB	hin:step:max]				N_tail_start	15	(UI) start of tail taps limit				
f_z	42.50	GHz											
f_p1	42.50	GHz		**Host chip to Module (AUI)**									
f_p2	106.25	GHz											
g_DC_HP	[-6:1:0]	[min:step:max]											
f_HP_PZ	1.328125	GHz											
Butterworth	1	logical	include in fr										

COM Configuration Section 2

.START	PKG_HiR_CLASSB_top		
Parameter	**Setting**	**Units**	nformation
ckage_tl_gamma0_a1_	[0.0005 0.00065 0.000293]		
package_tl_tau	0.006141	ns/mm	
package_Z_c	[87.5 87.5 ; 95 95 ; 100 100; 78 78]	Ohm	
R_d	[46.25 46.25]	Ohm	[TX RX]
z_p (TX)	[8 24 30 45 85 130; 0 0 0 0 0 0 ; 0 0 0 0 0 0; 0 0 0 0 0 0]	mm	[test cases]
z_p (NEXT)	[7 23 29 45 84 129; 0 0 0 0 0 0; 0 0 0 0 0 0; 0 0 0 0 0 0]	mm	[test cases]
z_p (FEXT)	[8 24 30 45 85 130; 0 0 0 0 0 0 ; 0 0 0 0 0 0; 0 0 0 0 0 0]	mm	[test cases]
z_p (RX)	[7 23 29 45 84 129; 0 0 0 0 0 0; 0 0 0 0 0 0; 0 0 0 0 0 0]	mm	[test cases]
C_p	[0.1e-4 0.1e-4]	nF	[TX RX]
A_v	0.413	V	Vf=0.400
A_fe	0.413	V	Vf=0.399
A_ne	0.45	V	Vf=0.400
.END			

.START	PKG_Module		
Parameter	**Setting**	**Units**	nformation
ckage_tl_gamma0_a1_	[0.0005 0.00089 0.0002]		
package_tl_tau	0.006141	ns/mm	
package_Z_c	[87.5 87.5 ; 95 95 ; 100 100; 100 100]	Ohm	
R_d	[50 50]	Ohm	[TX RX]
z_p (TX)	[8 8 8 8 8 8 ; 0 0 0 0 0 0 ; 0 0 0 0 0 0 ; 0 0 0 0 0 0]	mm	[test cases]
z_p (NEXT)	[8 8 8 8 8 8 ; 0 0 0 0 0 0 ; 0 0 0 0 0 0 ; 0 0 0 0 0 0]	mm	[test cases]
z_p (FEXT)	[8 8 8 8 8 8 ; 0 0 0 0 0 0 ; 0 0 0 0 0 0 ; 0 0 0 0 0 0]	mm	[test cases]
z_p (RX)	[8 8 8 8 8 8 ; 0 0 0 0 0 0 ; 0 0 0 0 0 0 ; 0 0 0 0 0 0]	mm	[test cases]
C_p	[0.4e-4 0.4e-4]	nF	[TX RX]
A_v	0.413	V	Vf=0.400
A_fe	0.413	V	Vf=0.399
A_ne	0.45	V	Vf=0.400
.START	PKG_Module		

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Table 93A-1 parameters				stds ref.
Parameter	**Setting**	**Units**	**Information**	
f_b	106.25	GBd		
f_min	0.05	GHz		
Delta_f	0.01	GHz		
C_d	[0.4e-4 0.9e-4 1.1e-4 ;0.4e-4 0.9e-4 1.1e-4]	nF	[TX RX]	d1.0
L_s	[0.13 0.15 0.14; 0.13 0.15 0.14]	nH	[TX RX]	d1.0
C_b	[0.3e-4 0.3e-4]	nF	[TX RX]	d1.0
R_0	50	Ohm	[TX RX]	d1.0 cmt 396
R_d	[46.25 46.25]	Ohm	[TX RX]	
PKG_NAME	**PKG_HiR_CLASSB PKG_Module**		TX RX	module is really TBD
A_v	0.413	V		
A_fe	0.413	V		
A_ne	0.45	V		
z_p select	[3 4]			
L	4			
M	32			
filter and Eq				
f_r	0.565	*fb		d1.0 cmt 60 (60 GHz)
c(0)	0.54		min	d1.0 cmt 37
c(-1)	[-0.34:0.02:0]	[-0.34:0.02:0	[min:step:max]	d1.0 cmt 37
c(-2)	[0:.02:0.14]	[0:.02:0.14]	[min:step:max]	d1.0 cmt 37
c(-3)	0	0	[min:step:max]	
c(-4)	0	0	[min:step:max]	
c(1)	[-0.2:0.02:0]	[-0.2:0.02:0]	[min:step:max]	d1.0 cmt 37
N_b	1	UI		d1.0
b_max(1)	0.85		As/dffe1	d1.0 cmt 279
b_max(2..N_b)	0		As/dfe2..N_b	
b_min(1)	0		As/dffe1	d1.0 cmt 279
b_min(2..N_b)	-0.15	UI	NA if Nb=1	
g_DC	[-20:1:0]	dB	[min:step:max]	d1.0
f_z	42.50	GHz		d1.0
f_p1	42.50	GHz		d1.0
f_p2	106.25	GHz		d1.0
g_DC_HP	[-6:1:0]		[min:step:max]	d1.0
f_HP_PZ	1.328125	GHz		d1.0
Butterworth	1	logical	include in fr	

I/O control			stds ref.
DIAGNOSTICS	1	logical	
DISPLAY_WINDOW	1	logical	
CSV_REPORT	0	logical	
RESULT_DIR	.\results\C2M_{date}\		
SAVE_FIGURES	0	logical	
Port Order	[1 3 2 4]	input fi	
RUNTAG	C2M_		
COM_CONTRIBUTION	1	logical	
TDR and ERL options			
TDR	1	logical	
ERL	1	logical	
ERL_ONLY	0	logical	
TR_TDR	0.005	ns	d1.0 cmt 48
N	1600	UI	
TDR_Butterworth	1		
beta_x	0		d1.0 cmt 48
rho_x	0.618		d1.0 cmt 48
TDR_W_TXPKG	1	UI	ERL computed at TP1a
N_bx	0	UI	d1.0
fixture delay time	[0 0]	S	
Tukey_Window	1		
Noise, jitter			
sigma_RJ	0.01	UI	d1.0 cmt 271
A_DD	0.02	UI	d1.0 cmt 271
eta_0	1.00E-08	V^2/GHz	d1.0 cmt 269 straw poll
SNR_TX	33.5	dB	d1.0 cmt 45
R_LM	0.95		d1.0 cmt 273
Host chip to Module (AUI)			

Table 93A–3 parameters				stds ref.
Parameter	**Setting**	**Units**	Information	
package_tl_gamma0_a1_a2	[5e-4 0.00065 0.0003]			
package_tl_tau	0.006141	ns/mm		
package_Z_c	2 92 ; 70 70; 80 80; 100 10	Ohm		
z_p (TX)	; 1 1 1 1; 1 1 1 1 ; 0.5 0	mm	[test cases to run]	
z_p (NEXT)	; 1 1 1 1; 1 1 1 1 ; 0.5 0	mm	[test cases]	
z_p (FEXT)	; 1 1 1 1; 1 1 1 1 ; 0.5 0	mm	[test cases]	
z_p (RX)	; 1 1 1 1; 1 1 1 1 ; 0.5 0	mm	[test cases]	
C_p	[0.4e-4 0.4e-4]	nF	[test cases]	
Operational				
ERL Pass threshold	10	dB		
COM Pass threshold	3	db		d1.0 cmt 250
DER_0	2.00E-05			
T_r	0.00400	ns		d1.0 176E.4.2
FORCE_TR	1	logical	required for backward compatability	
PMD_type	C2C			d1.0 176E.4.2
samples_for_C2M	100			
T_O	50			
EW	1			
MLSE	0	logical		
ts_anchor	1			
sample_adjustment	[-12 12]			
Local Search	0		if set to 2 validate resuults	
Filter: Rx FFE				
ffe_pre_tap_len	5	UI		d1.0 cmt 72
ffe_post_tap_len	14	UI		d1.0 cmt 72
ffe_pre_tap1_max	0.7	interpreted as +/-	COM to change to W	d1.0 cmt 279
ffe_post_tap1_max	0.7	interpreted as +/-	COM to change to W	d1.0 cmt 279
ffe_tapn_max	0.7	interpreted as +/-	COM to change to W	d1.0 cmt 279
FFE_OPT_METHOD	MMSE		FV-LMS or MMSE	
num_ui_RXFF_noise	1024			
Floating Tap Control				
N_bg	2	0 1 2 or 3 groups		d1.0 cmt 72
N_bf	4	taps per group		d1.0 cmt 72
N_f	50	UI span for floating taps		d1.0 cmt 72
bmaxg	0.2	max DFE value for floating taps		
B_float_RSS_MAX	1	rss tail tap limit		
N_tail_start	15	(UI) start of tail taps limit		d1.0 cmt 72

SAVE_CONFIG2MAT	0	
Receiver testing		
RX_CALIBRATION	0	logical
Sigma BBN step	5.00E-03	V
ICN parameters		
f_v	0.278	Fb
f_f	0.278	Fb
f_n	0.278	Fb
f_2	60.000	GHz
A_ft	0.450	V
A_nt	0.450	V
Parameter	**Setting**	
board_tl_gamma0_a1_a2	*[0 6.44084e-4 3.6036e-05]*	1.4 db/in @ 53.125G
board_tl_tau	*5.790E-03*	ns/mm
board_Z_c	100	Ohm
z_bp (TX)	*32*	mm
z_bp (NEXT)	*32*	mm
z_bp (FEXT)	*32*	mm
z_bp (RX)	*32*	mm
C_0	[0.2e-4 0]	nF
C_1	[0.2e-4 0]	nF
Include PCB	**0**	**logical**
Seletions (rectangle, gaussian,dual_rayleigh,triangle		
Histogram_Window_Weight	gaussian	selection
Qr	*0.02*	UI

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.START	PKG_LowR_CLASSA	[2.44 5.7] db		
Table 93A–3 parameters				
Parameter	Setting	Units	Information	
package_tl_gamma0_a1_a2	[0.0005 0.00089 0.0002]			d1.0
package_tl_tau	0.006141	ns/mm		d1.0
package_Z_c	[87.5 87.5 ; 95 95 ; 100 100; 100 100]	Ohm		d1.0
R_d	[46.25 46.25]	Ohm	[TX RX]	d1.0 cmt 396
z_p (TX)	[12 33 33 33 ; 1.8 1.8 1.8 1.8 ; 0 0 0 0 ; 0 0 0 0]	mm	[test cases]	d1.0
z_p (NEXT)	[12 33 33 33 ; 1.8 1.8 1.8 1.8 ; 0 0 0 0 ; 0 0 0 0]	mm	[test cases]	d1.0
z_p (FEXT)	[12 33 33 33 ; 1.8 1.8 1.8 1.8 ; 0 0 0 0 ; 0 0 0 0]	mm	[test cases]	d1.0
z_p (RX)	[12 33 33 33 ; 1.8 1.8 1.8 1.8 ; 0 0 0 0 ; 0 0 0 0]	mm	[test cases]	d1.0
C_p	[0.4e-4 0.4e-4]	nF	[TX RX]	d1.0
A_v	0.413	V	Vf=0.400	d1.0 cmt 434
A_fe	0.413	V	Vf=0.399	d1.0 cmt 434
A_ne	0.45	V	Vf=0.400	d1.0 cmt 434
.END				

.START	PKG_HiR_CLASSB	[2.8 5.6 6.7 9.4] db		
Table 93A–3 parameters				
Parameter	Setting	Units	Information	
package_tl_gamma0_a1_a2	[0.0005 0.00065 0.000293]			d1.0
package_tl_tau	0.006141	ns/mm		d1.0
package_Z_c	[87.5 87.5 ; 95 95 ; 100 100; 78 78]	Ohm		d1.0
R_d	[46.25 46.25]	Ohm	[TX RX]	d1.0 cmt 396
z_p (TX)	[8 24 30 45 ; 2 2 2 2; 1.3 1.3 1.3 1.3 ; 1.5 1.5 1.5 1.5]	mm	[test cases]	d1.0
z_p (NEXT)	[8 24 29 44 ; 2 2 2 2; 1.3 1.3 1.3 1.3 ; 1.5 1.5 1.5 1.5]	mm	[test cases]	d1.0
z_p (FEXT)	[8 24 30 45 ; 2 2 2 2; 1.3 1.3 1.3 1.3 ; 1.5 1.5 1.5 1.5]	mm	[test cases]	d1.0
z_p (RX)	[8 24 29 44 ; 2 2 2 2; 1.3 1.3 1.3 1.3 ; 1.5 1.5 1.5 1.5]	mm	[test cases]	d1.0
C_p	[0.4e-4 0.4e-4]	nF	[TX RX]	d1.0
A_v	0.413	V	Vf=0.400	d1.0 cmt 434
A_fe	0.413	V	Vf=0.399	d1.0 cmt 434
A_ne	0.45	V	Vf=0.400	d1.0 cmt 434
.END				

.START	PKG_Module			
Table 93A–3 parameters				
Parameter	Setting	Units	Information	
package_tl_gamma0_a1_a2	[0.0005 0.00089 0.0002]			TBD
package_tl_tau	0.006141	ns/mm		TBD
package_Z_c	[87.5 87.5 ; 95 95 ; 100 100; 100 100]	Ohm		TBD
R_d	[50 50]	Ohm	[TX RX]	TBD
z_p (TX)	[8 8 8 8 ; 0 0 0 0 ; 0 0 0 0 ; 0 0 0 0]	mm	[test cases]	TBD
z_p (NEXT)	[8 8 8 8 ; 0 0 0 0 ; 0 0 0 0 ; 0 0 0 0]	mm	[test cases]	TBD
z_p (FEXT)	[8 8 8 8 ; 0 0 0 0 ; 0 0 0 0 ; 0 0 0 0]	mm	[test cases]	TBD
z_p (RX)	[8 8 8 8 ; 0 0 0 0 ; 0 0 0 0 ; 0 0 0 0]	mm	[test cases]	TBD
C_p	[0.4e-4 0.4e-4]	nF	[TX RX]	TBD
A_v	[0.4057 0.4057 0.4057 0.4057]	V	Vf=0.400	TBD
A_fe	[0.4057 0.4057 0.4057 0.4057]	V	Vf=0.399	TBD
A_ne	[0.600 0.600 0.600 0.600]	V	Vf=0.400	TBD
.END				

.START	PKG_Null			
Table 93A–3 parameters				
Parameter	Setting	Units	Information	
package_tl_gamma0_a1_a2	[5e-4 0.001 0.03]			
package_tl_tau	0.006141	ns/mm		
package_Z_c	[92 92 ; 70 70; 80 80; 100 100]	Ohm		
R_d	[50 50]	Ohm	[TX RX]	
z_p (TX)	[0 0 0 0 ;0 0 0 0 ; 0 0 0 0 ; 0 0 0 0]	mm	[test cases]	
z_p (NEXT)	[0 0 0 0 ;0 0 0 0 ; 0 0 0 0 ; 0 0 0 0]	mm	[test cases]	
z_p (FEXT)	[0 0 0 0 ;0 0 0 0 ; 0 0 0 0 ; 0 0 0 0]	mm	[test cases]	
z_p (RX)	[0 0 0 0 ;0 0 0 0 ; 0 0 0 0 ; 0 0 0 0]	mm	[test cases]	
C_p	[0 0]	nF	[TX RX]	
A_v	0.5	V	Vf=0.400	
A_fe	0.5	V	Vf=0.400	
A_ne	0.61	V		
.END				