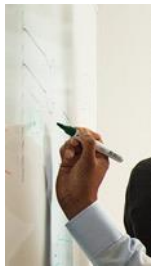
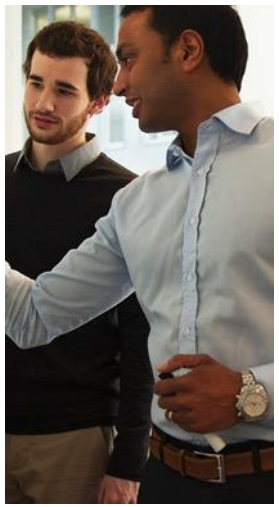




New Chip to Module Channel Simulation

802.3ck

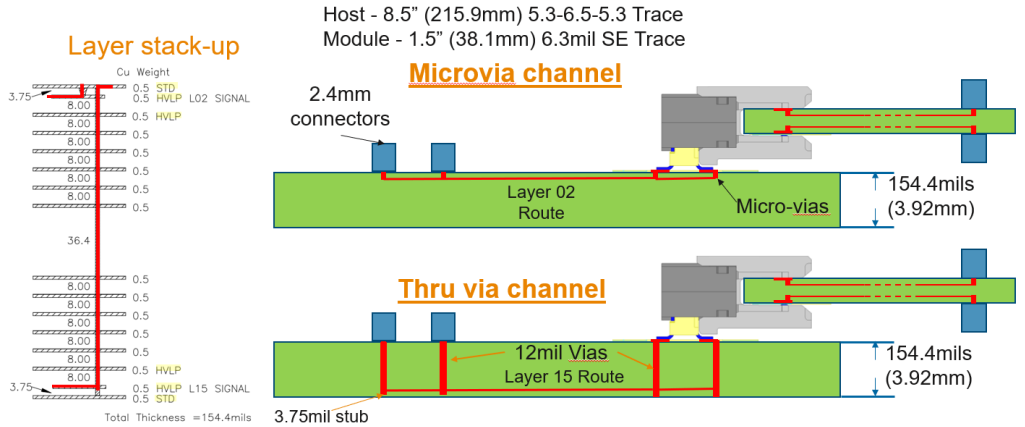
Nathan Tracy

Week of November 14, 2019, Waikoloa Village, Hawaii

In January 2018, a Measured Chip to Module Channel Was Contributed, tracy_100GEL_02_1119

January 2018, tracy_100GEL_02_1119

- Included comparative microvias and long barrel vias on the host connector footprint
- Based on Megtron7 PCB
- Had 8.5 inches of host PCB and 1.5 inches of module PCB
- Used existing 50Gbps OSFP connector
- Measured data S-Parameters



November 2019 - Providing a NEW channel, tracy_3ck_02_1119

- New connector footprint
- 10 inch and 5 inch Host trace lengths
- Based on 100G OSFP connector (validated with measured result)
- Simulation S-Parameters

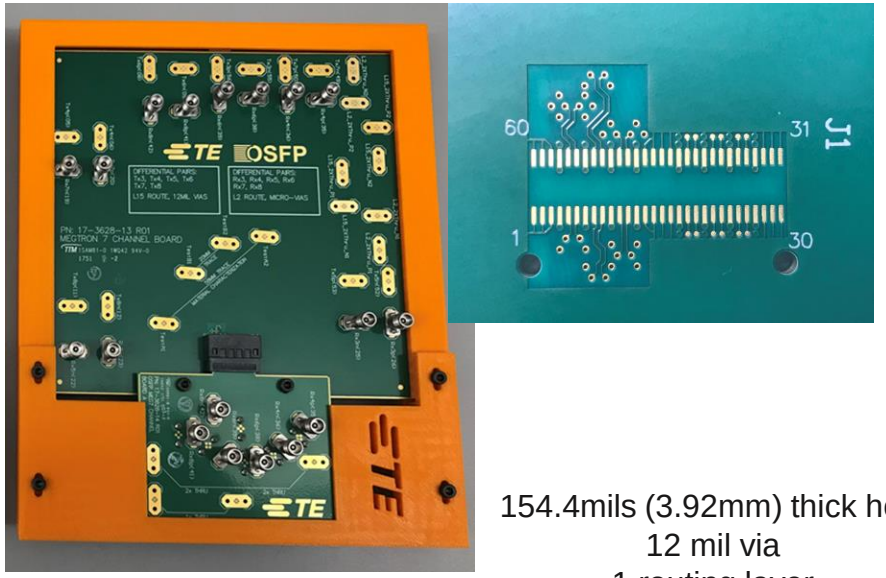
Set-up Comparison

Test Data Jan 2018

- 8.5 inch Host trace
- 1.36 dB/inch trace

} 11.5dB host loss

- 1.5dB loss on module PCB
- **OSFP 50G Connector**
- Host Conn FP used excess microstrip trace to optimize crosstalk



154.4mils (3.92mm) thick host
12 mil via
1 routing layer

Model Data Nov 2019

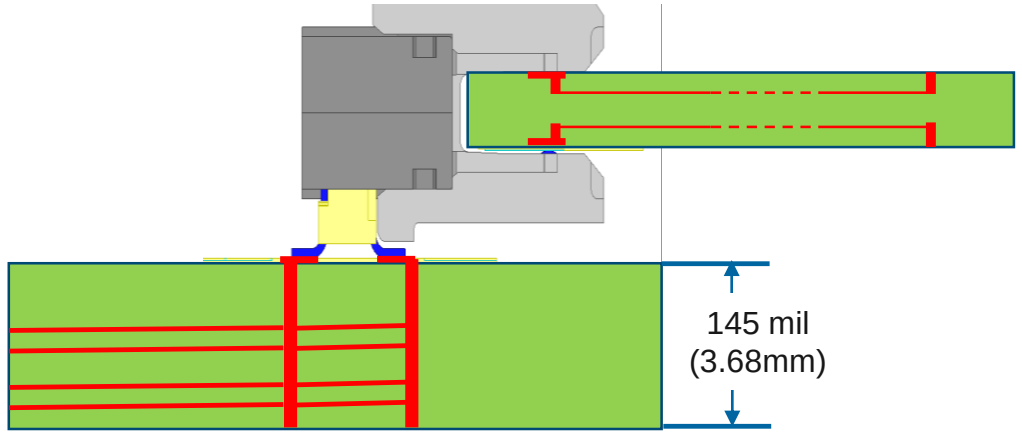
- 10 inch Host trace
- 1.15 dB/inch trace

} 11.5dB host loss

- 5 inch Host trace
- 1.15 dB/inch trace

} 5.75dB host loss

- 1.5dB loss on module PCB
- **OSFP 100G Connector**
- Host FP uses via-in pad to optimize IL



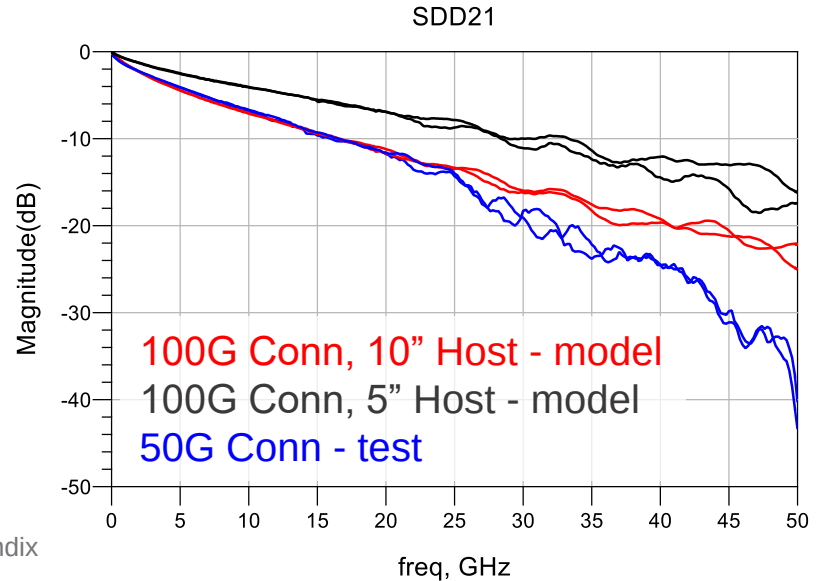
8 mil via

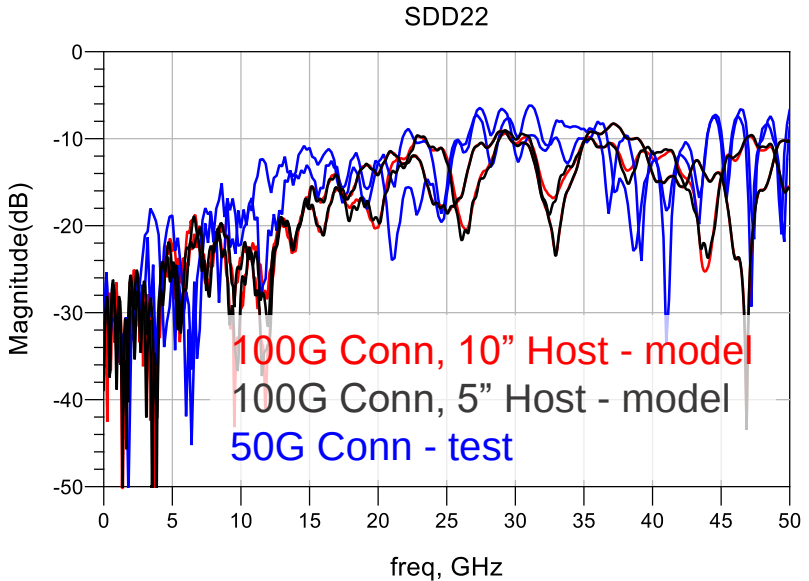
4 Routing Layers

Channel Results

	IL (@26.56GHz)	ILD FOM (dB)	*MDFEXT ICN (mV)	ERL11	ERL22	COM Case1	COM Case2
Tx5 – 100G, 10” Host - model	-13.56	0.115	1.278	25.29	10.46	4.486	4.228
Tx5 – 100G, 5” Host - model	-7.84	0.112	2.208	19.95	9.73	4.252	4.497
Tx5 – 50G (Jan 2018 Data)	-16.58	0.272	1.315	15.28	7.63	1.781	3.729
Tx6 – 100G, 10” Host - model	-14.27	0.129	1.496	26.47	11.90	4.523	4.833
Tx6 – 100G, 5” Host - model	-8.54	0.124	2.771	20.08	10.60	4.393	4.653
Tx6 – 50G (Jan 2018 Data)	-16.09	0.357	1.278	15.16	9.14	3.469	3.644

*Test data only routed FEXT aggressors therefore MDNEXT is excluded from this analysis





See COM config settings in appendix

Observations

- 100G Connector improvements
  - Roll-off improves past 25 GHz, which leads to better IL, ILD
  - Impedance improves which leads to better ERL
- Cross-talk remains similar between generations
- COM is greatly improved as a result of better ILD
- Host ASIC vias not included in channel
- S-Parameters are contributed (tracy_3ck_02_1119) which can be concatenated to your host ASIC vias for full channel analysis

Table 93A-1 parameters			
Parameter	**Setting**	**Units**	**Information**
f_b	53.125	GBd	
f_min	0.05	GHz	
Delta_f	0.01	GHz	
C_d	[1.2e-4 1.2e-4]	nF	[TX RX]
L_s	[0.12, 0.12]	nH	[TX RX]
C_b	[0.3e-4 0.3e-4]	nF	[TX RX]
z_p select	[1 2]		[test cases to run]
z_p (TX)	[13 30; 1.8 1.8]	mm	[test cases]
z_p (NEXT)	[6 2 ; 0 0]	mm	[test cases]
z_p (FEXT)	[13 30; 1.8 1.8]	mm	[test cases]
z_p (RX)	[6 2; 0 0]	mm	[test cases]
C_p	[0.87e-4 0.87e-4]	nF	[TX RX]
R_0	50	Ohm	
R_d	[50 50]	Ohm	[TX RX]
A_v	0.391	V	vp/vf=.694
A_fe	0.391	V	vp/vf=.694
A_ne	0.489	V	
L	4		
M	32		
filter and Eq			
f_r	0.75	*fb	
c(0)	0.6		min
c(-1)	[-0.3:0.02:0]		[min:step:max]
c(-2)	[0:0.02:0.1]		[min:step:max]
c(-3)	[-0.04:0.02: 0]		[min:step:max]
c(1)	[-0.1:0.05:0]		[min:step:max]
N_b	4	UI	
b_max(1)	0.5		
b_max(2..N_b)	0.2		
g_DC	[-14:1:-3]	dB	[min:step:max]
f_z	12.58	GHz	
f_p1	20	GHz	
f_p2	28	GHz	
g_DC_HP	[-3:1:0]		[min:step:max]
f_HP_PZ	1.328125	GHz	

I/O control		
DIAGNOSTICS	0	logical
DISPLAY_WINDOW	0	logical
CSV_REPORT	0	logical
RESULT_DIR	.\results\100GEL_CR_{date}\	
SAVE_FIGURES	0	logical
Port Order	[1 3 2 4]	
RUNTAG	CR_eval_	
COM_CONTRIBUTION	0	logical
Operational		
COM Pass threshold	3	dB
ERL Pass threshold	10	dB
DER_0	1.00E-05	
T_r	6.16E-03	ns
FORCE_TR	1	logical
TDR and ERL options		
TDR	1	logical
ERL	1	logical
ERL_ONLY	0	logical
TR_TDR	0.01	ns
N	400	
beta_x	2.4000E+09	
rho_x	0.3	
fixture delay time	[0 0]	[port1 port2]
TDR_W_TXPKG	1	
N_bx	4	UI
Receiver testing		
RX_CALIBRATION	0	logical
Sigma BBN step	5.00E-03	V
Noise, jitter		
sigma_RJ	0.01	UI
A_DD	0.02	UI
eta_0	8.2E-09	V^2/GHz
SNR_TX	33	dB
R_LM	0.95	

Table 93A–3 parameters		
Parameter	**Setting**	**Units**
package_tl_gamma0_a1_a2	[0 0.0009909 0.0002772]	
package_tl_tau	6.141E-03	ns/mm
package_Z_c	[87.5 87.5 ; 92.5 92.5]	Ohm
benartsi_3ck_01_0119 & mellitz_3ck_01_0119		
Table 92–12 parameters		
Parameter	**Setting**	
board_tl_gamma0_a1_a2	*[0 3.8206e-04 9.5909e-05]*	1 dB / in
board_tl_tau	*5.790E-03*	ns/mm
board_Z_c	100	Ohm
z_bp (TX)	*110.3*	mm
z_bp (NEXT)	*110.3*	mm
z_bp (FEXT)	*110.3*	mm
z_bp (RX)	*110.3*	mm
C_0	[0.29e-4]	nF
C_1	[0.19e-4]	nF
Include PCB	**0**	**logical**
Floating Tap Control		
N_bg	0	0 1 2 or 3 groups
N_bf	4	taps per group
N_f	40	UI span for floating taps
bmaxg	0.05	max DFE value for floating taps
cable assemblies require this for each HCB		
ICN parameters (v2.73)		
f_f	12.919	
f_n	12.919	
f_2	39.844	
A_ft	0.600	
A_nt	**0.600**	
heck_3ck_03b_0319	**Adopted Mar 2019**	
walker_3ck_01d_0719	**Adopted July 2019**	
result of R_d=50		
benartsi_3ck_01a_0719	**require COM 2.72 or later**	
mellitz_3ck_03_0919		
mellitz_3ck_02_0919		
under consideration		