

2m QSFP-DD Update & Loss Budget Proposal



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Overview:

- Updated 2m QSFP-DD TP1-TP4 channel
- TP1-TP4 Loss Budget
- TP0-TP5 Loss Budget
- Summary & Conclusions

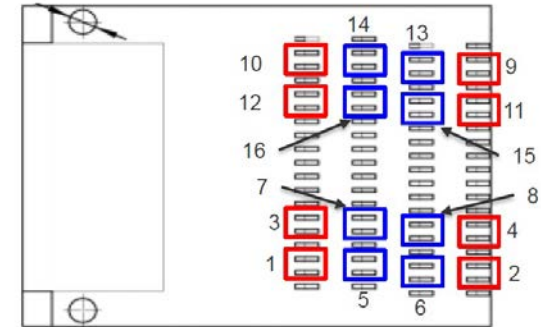
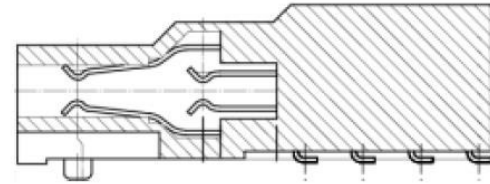


Updated 2m QSFP-DD TP1-TP4 Channel:

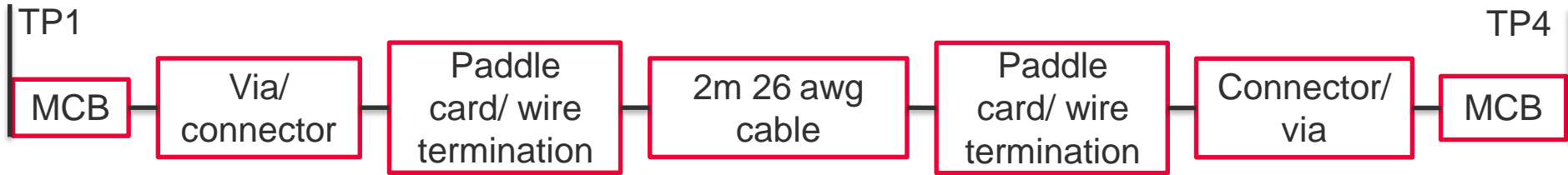
QSFP-DD Pinout:

Legacy Pairs
DD Pairs

Pair #:	Pair Name:	Pair #:	Pair Name:
1	Rx1-Tx1	9	Tx8-Rx8
2	Rx2-Tx2	10	Tx7-Rx7
3	Rx3-Tx3	11	Tx6-Rx6
4	Rx4-Tx4	12	Tx5-Rx5
5	Rx5-Tx5	13	Tx4-Rx4
6	Rx6-Tx6	14	Tx3-Rx3
7	Rx7-Tx7	15	Tx2-Rx2
8	Rx8-Tx8	16	Tx1-Rx1



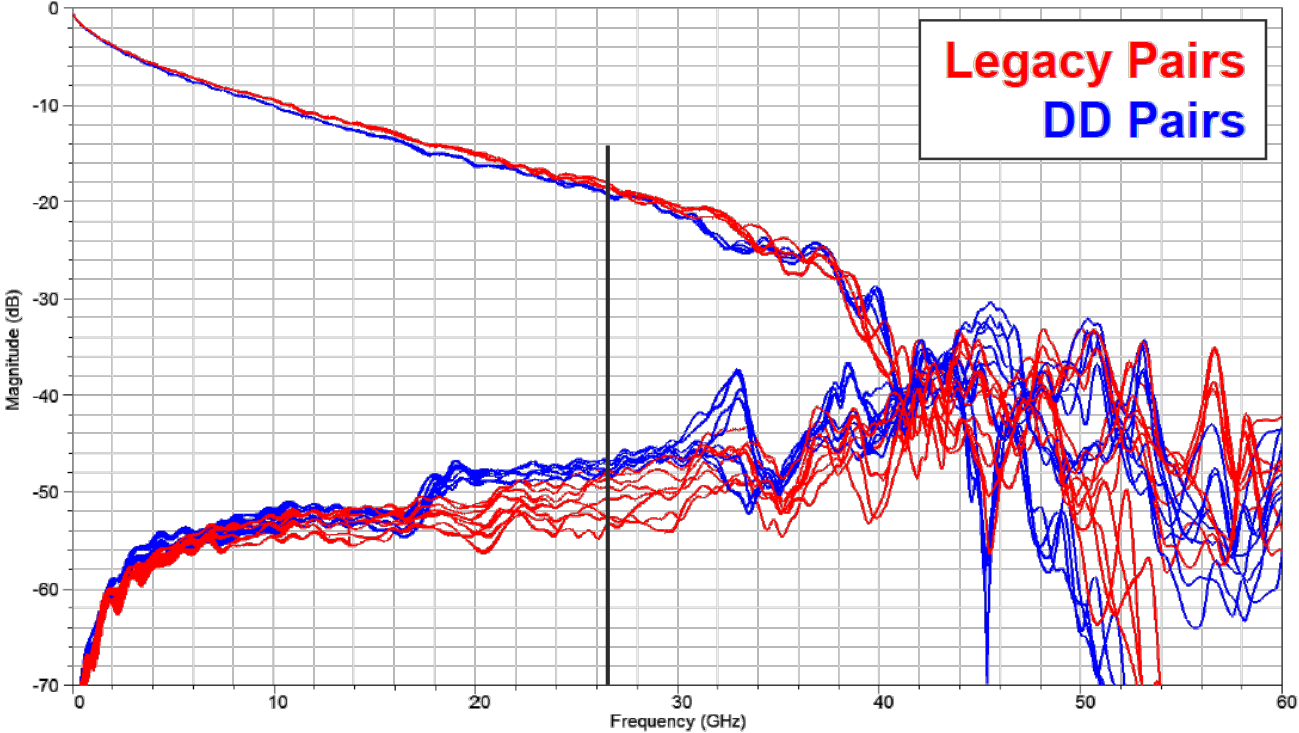
Topology & COM Settings:



- COM Settings

- Config file: `config_com_ieee8023_93a=100GEL-CR_030119.xls`
- Note: These results do not include effects from the BGA via

2m QSFP-DD Cable: TP1 to TP4 Simulated IL & PSXT



Victim Pair (Near Side- Far Side)	IL (dB)	FOM _{ILD} (dBrms)	ERL11	ERL22	With Crosstalk			
					NEXT ICN (mV)	FEXT ICN (mV)	Total ICN (mV)	COM Case 2 (dB)
1 (Rx1-Tx1)	28.054	0.676	13.235	13.108	0.137	0.398	0.421	4.223
2 (Rx2-Tx2)	28.001	0.774	12.899	13.610	0.138	0.355	0.381	4.194
3 (Rx3-Tx3)	27.921	0.778	13.445	12.705	0.168	0.456	0.486	4.223
4 (Rx4-Tx4)	27.555	0.701	13.267	13.614	0.164	0.423	0.453	4.293
5 (Rx5-Tx5)	28.601	0.677	12.007	12.199	0.255	0.448	0.515	3.822
6 (Rx6-Tx6)	28.534	0.702	11.893	12.181	0.506	0.447	0.492	3.917
7 (Rx7-Tx7)	28.659	0.669	11.938	11.818	0.326	0.509	0.605	3.795
8 (Rx8-Tx8)	28.765	0.696	12.048	11.842	0.227	0.501	0.550	3.755
9 (Tx8-Rx8)	28.758	0.697	11.845	12.048	0.314	0.513	0.601	3.728
10 (Tx7-Rx7)	28.660	0.671	11.818	11.941	0.224	0.510	0.557	3.795
11 (Tx6-Rx6)	28.528	0.702	12.181	11.893	0.260	0.458	0.527	3.917
12 (Tx5-Rx5)	28.612	0.675	12.199	12.007	0.207	0.456	0.501	3.822
13 (Tx4-Rx4)	27.540	0.703	13.614	13.247	0.193	0.396	0.441	4.293
14 (Tx3-Rx3)	27.950	0.774	12.709	13.445	0.170	0.464	0.494	4.223
15 (Tx2-Rx2)	27.970	0.782	13.614	12.895	0.142	0.346	0.374	4.194
16 (Tx1-Rx1)	28.046	0.673	13.112	13.239	0.114	0.417	0.432	4.208

Summary:

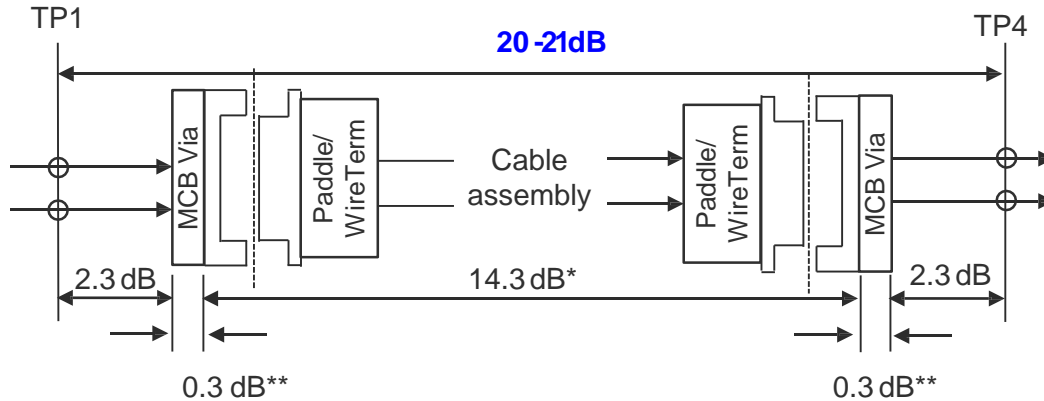
- Worst case TP1-TP4 loss: ~19.5 dB
 - These results are simulated and do not account for manufacturing variation
 - These results do not include the effects of the BGA via
- Worst case COM: 3.7 dB



TP1-TP4 Loss Budget:

TP1-TP4 Loss Budget:

- Simulated loss curves put TP1-TP4 loss just below 20 dB
- They are simulated and don't account for manufacturing variation
- Adding some room for error, proposed TP1-TP4 IL: **20-21 dB**



This leaves 0.5-1.5 dB of margin for manufacturing variation

*Value determined working backwards from 19.5 dB MCB-Cable-MCB loss

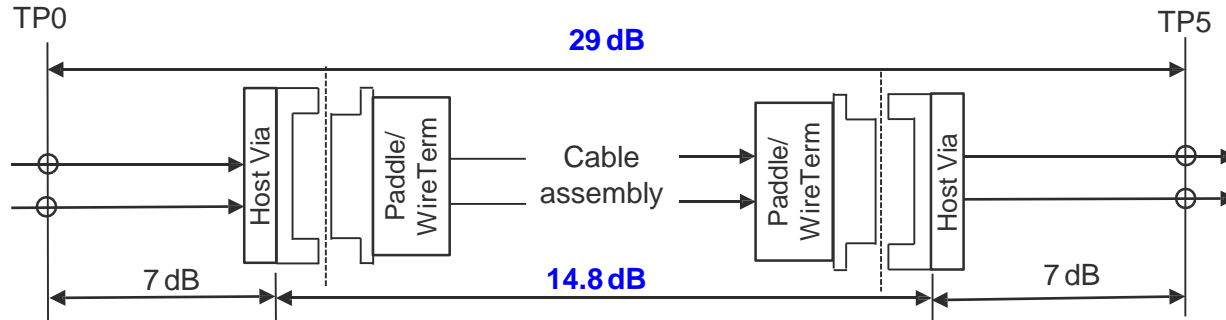
**This is a rough estimate based on one MCB design



TP0-TP5 Loss Budget:

TP0-TP5 Loss Budget:

- Simulated loss curves put TP1-TP4 loss just below 20 dB
- They are simulated and don't account for manufacturing variation
- Proposed TP0-TP5 IL: **~29 dB**





Summary & Conclusions:

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- Summary:
 - 2m QSFP-DD channel was updated
 - COM results presented (COM 3.7 dB minimum)
- Conclusions:
 - Proposal to increase TP1-TP4 loss budget to **~20-21 dB**
(further progress to be reported to ad hocs)
 - Proposal to increase TP0-TP5 loss budget to **~29 dB**



Questions?



Back Up

Config Sheet:

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	[1.1e-4 1.1e-4]	nF	[TX RX]
z_p select	[1 2]		[test cases to run]
z_p (TX)	[12 32; 1.8 1.8]	mm	[test cases]
z_p (NEXT)	[12 32; 1.8 1.8]	mm	[test cases]
z_p (FEXT)	[12 32; 1.8 1.8]	mm	[test cases]
z_p (RX)	[12 32; 1.8 1.8]	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	0.413	V	vp/vf=.694
A_fe	0.413	V	vp/vf=.694
A_ne	0.608	V	
L	4		
M	32		
filter and Eq			
f_r	0.75	*fb	
c(0)	0.54		min
c(-1)	[-0.34:0.02:0]		[min:step:max]
c(-2)	[0:0.02:0.12]		[min:step:max]
c(-3)	[-0.06:0.02:0]		[min:step:max]
c(1)	[-0.1:0.05:0]		[min:step:max]
N_b	24	UI	
b_max(1)	0.85		
b_max(2..N_b)	0.3		
g_DC	[-20:1:0]	dB	[min:step:max]
f_z	21.25	GHz	
f_p1	21.25	GHz	
f_p2	53.125	GHz	
g_DC_HP	[-6:1:0]		[min:step:max]
f_HP_PZ	0.6640625	GHz	

Operational		
COM Pass threshold	3	dB
ERL Pass threshold	10.5	dB
DER_0	1.00E-04	
T_r	6.16E-03	ns
FORCE_TR	1	logical
Include PCB	1	logical
TDR and ERL options		
TDR	1	logical
ERL	1	logical
ERL_ONLY	0	logical
TR_TDR	0.01	ns
N	1000	
TDR_Butterworth	1	logical
beta_x	1.70E+09	
rho_x	0.25	
fixture delay time	0	enter sec
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	8.20E-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

Table 92-12 parameters		
Parameter	Setting	Units
board_tl_gamma0_a1_a2	[0 0.000599 0.0001022]	
board_tl_tau	6.200E-03	ns/mm
board_Z_c	90	Ohm
z_bp (TX)	92.7	mm
z_bp (NEXT)	92.7	mm
z_bp (FEXT)	92.7	mm
z_bp (RX)	92.7	mm