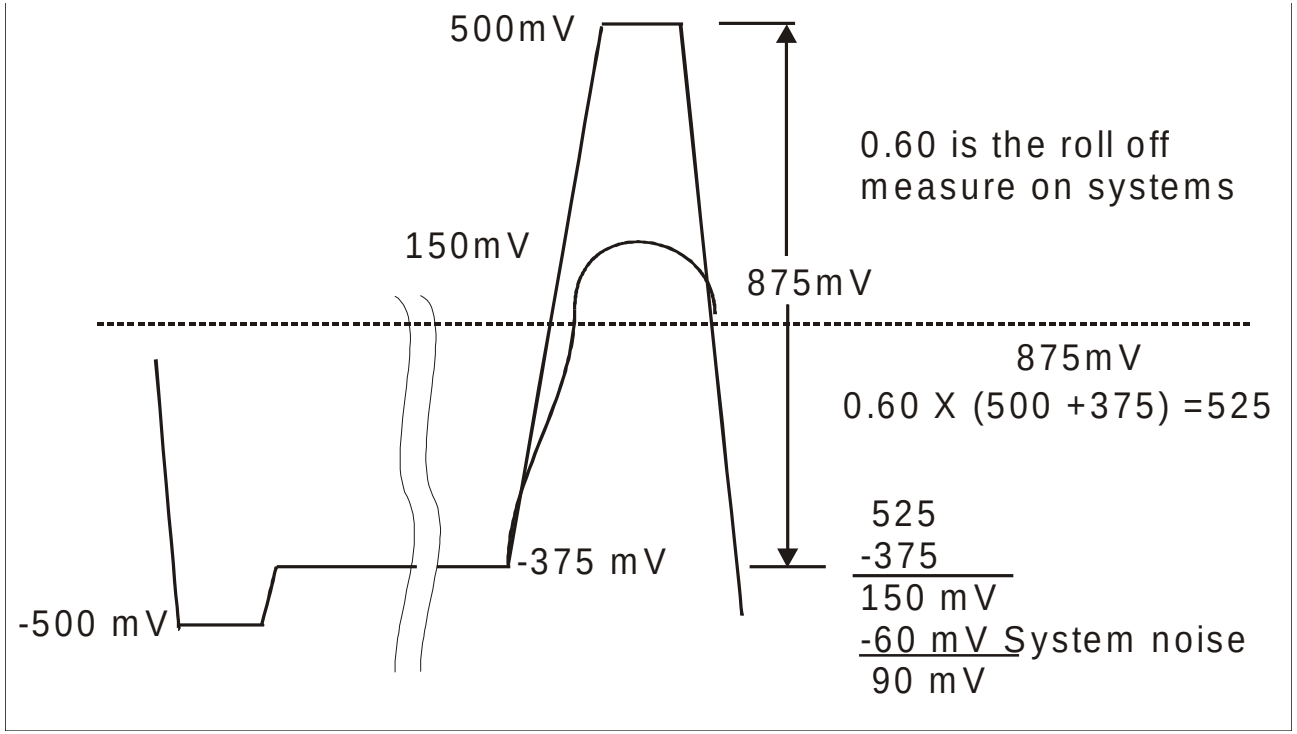
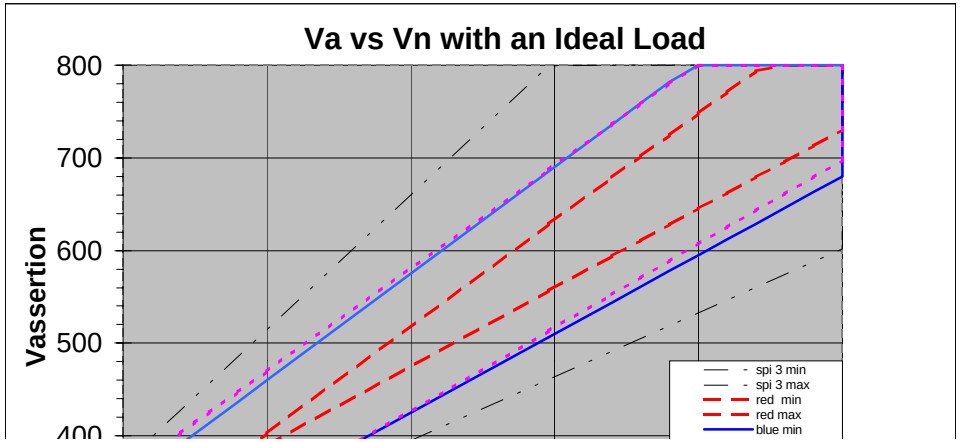
Driver Precomp Proposal, Review — 50 mV removed from the equations, it is a problem for the driver spec.

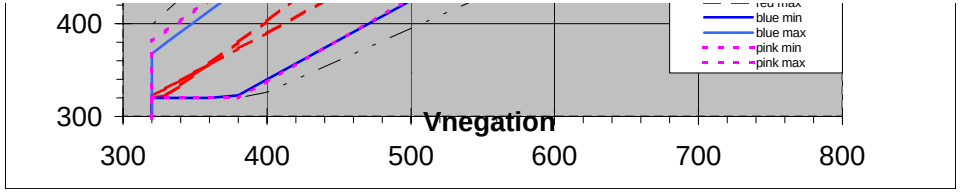
00-227r8 — 24-Aug-00 — 500 mV strong driver

Paul Aloisi - TI	**320**	**410**	**427**	**485**	**500**	**533**	**600**	**700**	**800**	**Millivolt drive**
Nominal Voltage										
No driver imbalance, matched assertion and negation										
Driver fall back 22%	249.6	**319.8**	**333.06**	**378.3**	**390**	**415.74**	**468**	**546**	**624**	410.2564 mV
Driver fall back 25%	240	307.5	**320.25**	**363.75**	**375**	**399.75**	**450**	**525**	**600**	426.6667 mV
Driver Fall back 33%	211.2	270.6	281.82	**320.1**	**330**	**351.78**	**396**	**462**	**528**	484.8485 mV
Driver Fall Back 40%	192	246	256.2	291	**300**	**319.8**	**360**	**420**	**480**	533.3333 mV
Driver Fall Back 50%	160	205	213.5	242.5	**250**	**266.5**	**300**	**350**	**400**	Min high drive, for 320 mV
Assuming perfect driver assymetry	Signals levels below are at the connector of the receiving device, use the numbers with DC loss									
No Fall back	**4**	**22**	**25.4**	**37**	**40**	**46.6**	**60**	**80**	**100**	
Precomp off	**0.8**	**17.9**	**21.13**	**32.15**	**35**	**41.27**	**54**	**73**	**92**	5% DC loss from cable, connectors and terminators
Worst case, no driver tolerance					**35 mV**					**-5 mV receiver required - Adaptive Active Filter - no eye pattern**
Cable roll off to 60% signal -60 mV crosstalk & Noise										
Trans FB 22% to assert (60%)	32.16	**58.08**	**62.976**	**79.68**	**84**	**93.504**	**112.8**	**141.6**	**170.4**	mV signal at the receiver minus cable loss
	22.944	**46.272**	**50.6784**	**65.712**	**69.6**	**78.1536**	**95.52**	**121.44**	**147.36**	10% DC loss from cable, connectors and terminators
Trans FB 25% roll off to 60%	36	63	**68.1**	**85.5**	**90**	**99.9**	**120**	**150**	**180**	mV signal at the receiver minus cable loss
	26.4	50.7	**55.29**	**70.95**	**75**	**83.91**	**102**	**129**	**156**	10% DC loss from cable, connectors and terminators
Trans FB 33% roll off to 60%	47.52	**77.76**	**83.472**	**102.96**	**108**	**119.088**	**141.6**	**175.2**	**208.8**	mV signal at the receiver minus cable loss
Trans FB 40% roll off to 60%	55.2	87.6	**93.72**	**114.6**	**120**	**131.88**	**156**	**192**	**228**	mV signal at the receiver minus cable loss
	43.68	72.84	**78.348**	**97.14**	**102**	**112.692**	**134.4**	**166.8**	**199.2**	10% DC loss from cable, connectors and terminators
					75 mV	**(((V+VFB)*.6)-Vfb)-60)**				**46 mV receiver required, 60 mV Crosstalk and System Noise**
20 mV @ receiver	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**mV** **Adaptive Active filter required, eye pattern**
80 mV @ receiver	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**mV** 99-295 wide pulse
100 mV @ receiver	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**mV** **Bold Black does not work without Adaptive Active Filter**
										Purple 20 mV receiver - active Filter
Driver Assymetry caclulations										**Red 80 mV receiver**
No Fall back - toleranced 10%	**-29**	**-16.4**	**-14.02**	**-5.9**	**-3.8**	**0.82**	**10.2**	**24.2**	**38.2**	**Blue 100 mV receiver**
Precomp off	**-33.48**	**-22.14**	**-19.998**	**-12.69**	**-10.8**	**-6.642**	**1.8**	**14.4**	**27**	10% DC loss from cable, connectors and terminators
Improved Tolerance driver asymmetry		**10%**			**-10 mV**					**-35 mV receiver required - Adaptive Active Filter - no eye pattern**
Cable roll off to 60% signal -60 mV crosstalk & Noise										**Recommended -100 mV Adaptive Active Filter**
Trans FB 22% to assert (60%)	-0.84	**19.68**	**23.556**	**36.78**	**40.2**	**47.724**	**63**	**85.8**	**108.6**	mV signal at the receiver minus cable loss
	-8.136	**10.332**	**13.8204**	**25.722**	**28.8**	**35.5716**	**49.32**	**69.84**	**90.36**	10% DC loss from cable, connectors and terminators
Trans fb 25% roll off to 60%	3	24.6	**28.68**	**42.6**	**46.2**	**54.12**	**70.2**	**94.2**	**118.2**	
	-4.68	14.76	**18.432**	**30.96**	**34.2**	**41.328**	**55.8**	**77.4**	**99**	10% DC loss from cable, connectors and terminators
Trans fb 33% roll off to 60%	14.52	39.36	44.052	**60.06**	**64.2**	**73.308**	**91.8**	**119.4**	**147**	136.5 245.04 10% DC loss 33% - additive asymetry
	5.688	28.044	32.2668	**46.674**	**50.4**	**58.5972**	**75.24**	**100.08**	**124.92**	10% DC loss from cable, connectors and terminators
Trans fb 40% roll off to 60%	22.2	49.2	54.3	71.7	**76.2**	**86.1**	**106.2**	**136.2**	**166.2**	mV signal at the receiver minus cable loss
	12.6	36.9	41.49	57.15	**61.2**	**70.11**	**88.2**	**115.2**	**142.2**	10% DC loss from cable, connectors and terminators
Trans fb 50% roll off to 60%	35	65.6	71.38	91.1	**96.2**	**107.42**	**130.2**	**164.2**	**198.2**	
	24.12	51.66	56.862	74.61	**79.2**	**89.298**	**109.8**	**140.4**	**171**	10% DC loss from cable, connectors and terminators
					DC & AC Loss (((0.9*(V*.9)-23)+(Vfb*.9))*0.6)-(Vfb*.9))-60					**Adaptive Active filter required**
Drive tolerance calculation					**50 mV**	**((((0.9*V)-23)+Vfb)*0.6)-Vfb)-60**				**10 mV receiver needed minimum**
										Recommended 0 mV Adaptive active filter
Seagate numbers limits configuration										
Trans fb 22% roll off to 70%	37.948	**70.024**	**76.0828**	**96.754**	**102.1**	**113.8612**	**137.74**	**173.38**	**209.02**	10% DC loss from cable, connectors and terminators
Trans fb 25% roll off to 70%	40.54	73.345	**79.5415**	**100.6825**	**106.15**	**118.1785**	**142.6**	**179.05**	**215.5**	10% DC loss from cable, connectors and terminators
Trans fb 40% roll off to 70%	53.5	89.95	96.835	120.325	**126.4**	**139.765**	**166.9**	**207.4**	**247.9**	10% DC loss from cable, connectors and terminators
Trans fb 50% roll off to 70%	62.14	101.02	108.364	133.42	**139.9**	**154.156**	**183.1**	**226.3**	**269.5**	10% DC loss from cable, connectors and terminators
					DC & AC Loss (((0.9*(V*.9)-23)+(Vfb*.9))*0.7)-(Vfb*.9))-60					**SPI-3 receiver levels are marginal, limits system loss**
					100 mV					**70 mV Receiver needed for minimum**





Richard Uber's chart



SPI-4 proposal to limit the strong driver to 500 mV minimum

SPI-3

	320	340	400	427	485	500	600	700	800	Millivolt drive
Nominal Voltage										
SPI-2/3 driver	320	340	400	427	485	500	600	700	800	**320**
Isolated Transition	164	178	220	238.9	279.5	290	360	430	500	mV signal at the receiver minus cable loss
SPI-3 Receiver signal	**130.4**	**142.3**	**178**	**194.065**	**228.575**	**237.5**	**297**	**356.5**	**416**	15% cable loss
100 mV @ receiver	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**mV**
										Minimum signal at the receiver

Tolorance driver

SPI-2/3 driver	320	340	400	427	485	500	600	700	800	320
Cable roll off to 85% signal										mV
Trans FB min to assert (85%)	122.18	130.91	157.1	168.8855	194.2025	200.75	244.4	288.05	331.7	mV signal at the receiver minus cable loss
SPI-2/3 calculations	**94.853**	**102.2735**	**124.535**	**134.5527**	**156.0721**	**161.6375**	**198.74**	**235.8425**	**272.945**	15% cable loss **First step min 320 mV**
Should be SPI-2/3	**76.635**	**83.1825**	**102.825**	**111.6641**	**130.6519**	**135.5625**	**168.3**	**201.0375**	**233.775**	25% cable & system loss

Additional Data on backplane losses shows that SPI-2 and SPI-3 should have been 25% loss.
Minimum drive level did not work in the worst case.

mV

First step 320 mV marginal