



- Snapshot / Status -

Galen Fromm – Senior Electrical Project Engineer
Jay Neer – Strategic Product Manager
Edmund Poh – Senior Project Engineer



Overview

- Standards & Industry Organizations Involved
- Pluggable Device / Backplane Receptacle Objectives
- Device Form Factor Compliance
- Current SATA & SAS Backplane Receptacle Connectors
- New Backplane Receptacles
- Cabling Objectives
- Legacy SATA Cabling
- Legacy and New SAS Cabling
- New PCIe Cabling Solutions



Standards & Industry Organizations Involved in the Development Process

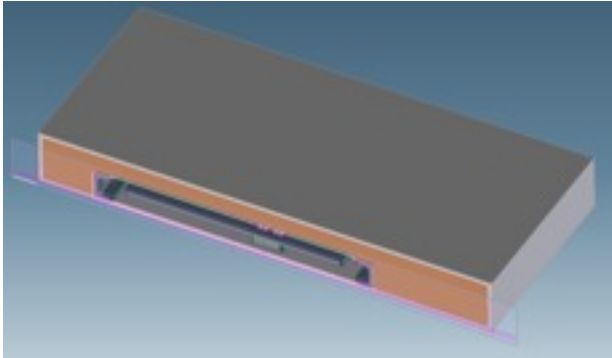
- INCITS Technical Committee T10 (SAS-3)
- SCSI Trade Association
- SFF Committee
- EIA
- SATA IO
- SSD Formfactor Work Group
- NVM Express
- PCI SIG



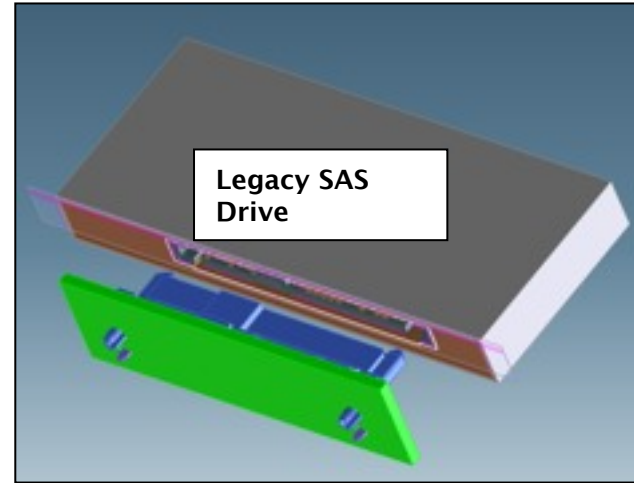
Backplane Receptacle Objectives

- Incorporate Additional connector contacts within the current SAS backplane receptacle to accommodate:
 - (2) additional ports to provide a total of (4) ports plus sidebands for SAS (a port is 2 diff pair)
 - (2) additional ports to provide the capability to independently operate (2) SAS ports plus (4) Enterprise PCIe ports; plus sidebands and power
 - Additional types of devices – HDD's plus SSD's
 - Devices with differing port densities
 - 1 SATA, 1/2/4 SAS, 1/2/4 PCIe + sidebands and power
 - Faster Data Rates – 12Gbps for SAS, 8GTs for PCIe
 - Increased Power Requirements – 20W / port

Device Form-factor Compatibility



Device shown with device casing and components around connector



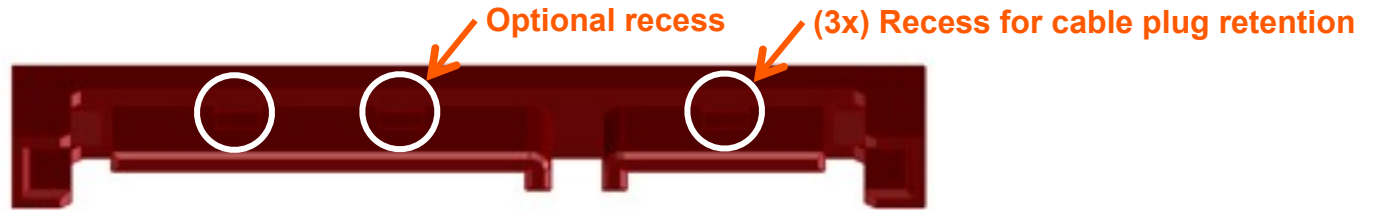
New receptacle housings shall NOT interfere with legacy SAS HDD's that conform to SFF-8223



White boundary defines connector keep out area

Device Component Area

Single Port 3/6Gbps SATA (SFF-8482 superseded by EIA-966)



Port 1 -
Power
(15Pins)

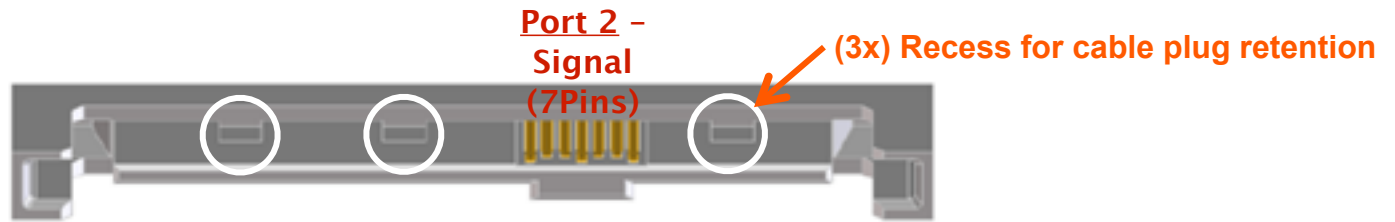
Port 1 -
Signal
(7Pins)



Port 1 -
Signal
(7Pins)

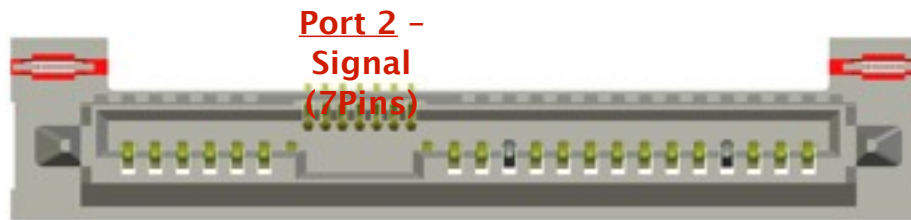
Port 1 -
Power
(15Pins)

Dual Port 3/6Gbps SAS 2.1 (SFF-8482 superseded by EIA-966)



**Port 1 -
Power
(15Pins)**

**Port 1 -
Signal
(7Pins)**

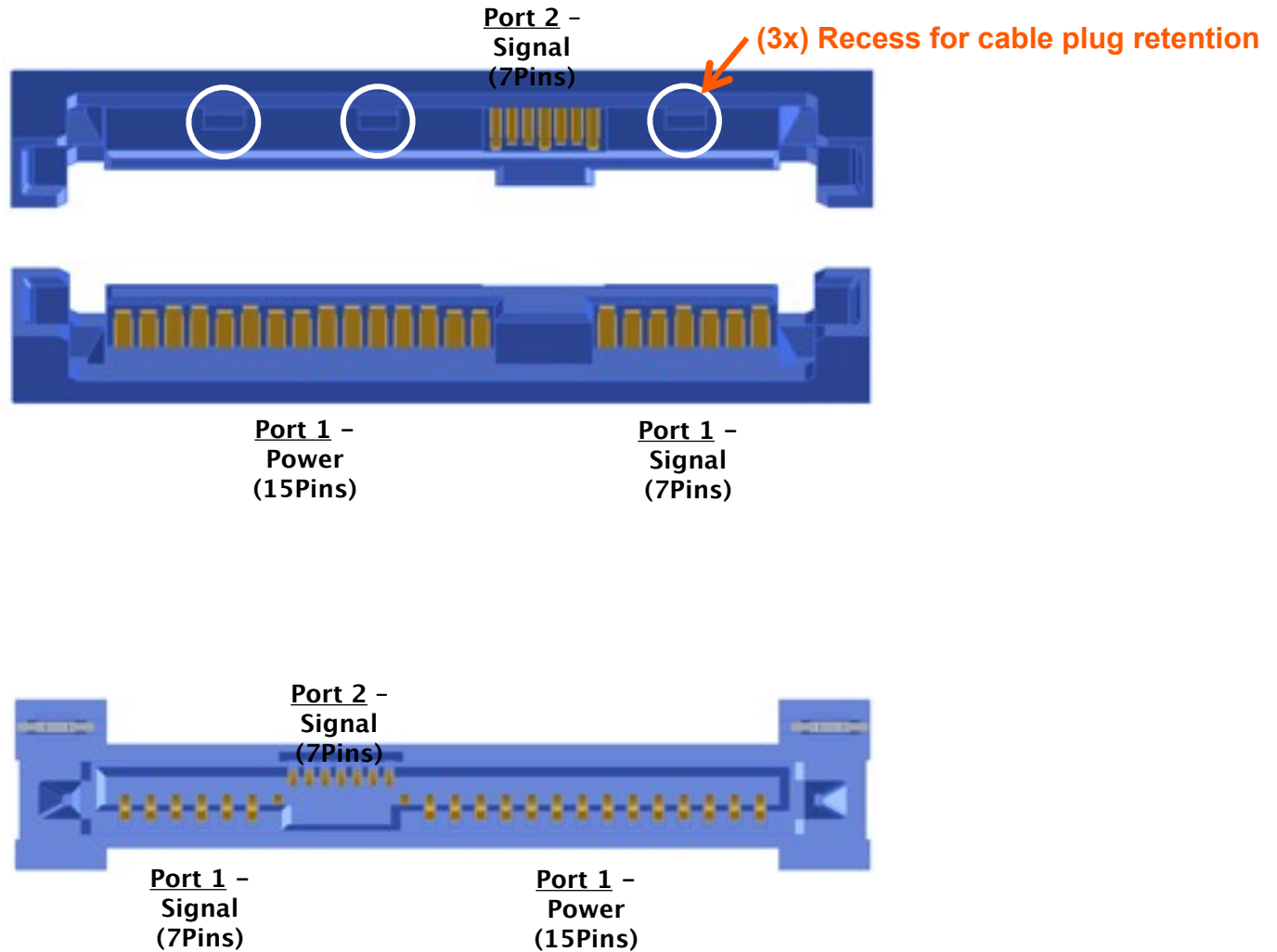


**Port 1 -
Signal
(7Pins)**

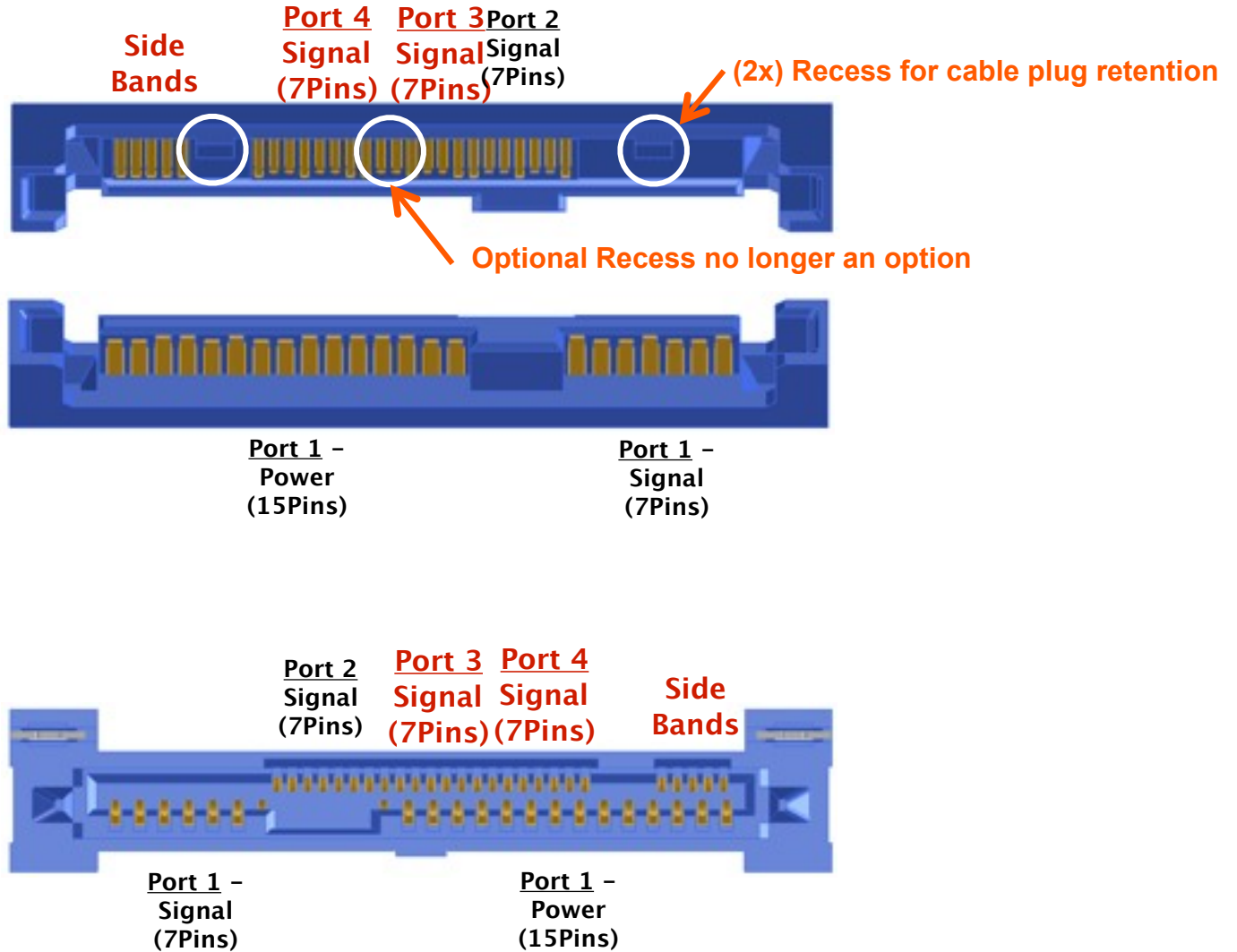
**Port 1 -
Power
(15Pins)**

Dual Port 12Gbps SAS-3

(Preliminary SFF-8680 – still in Development)

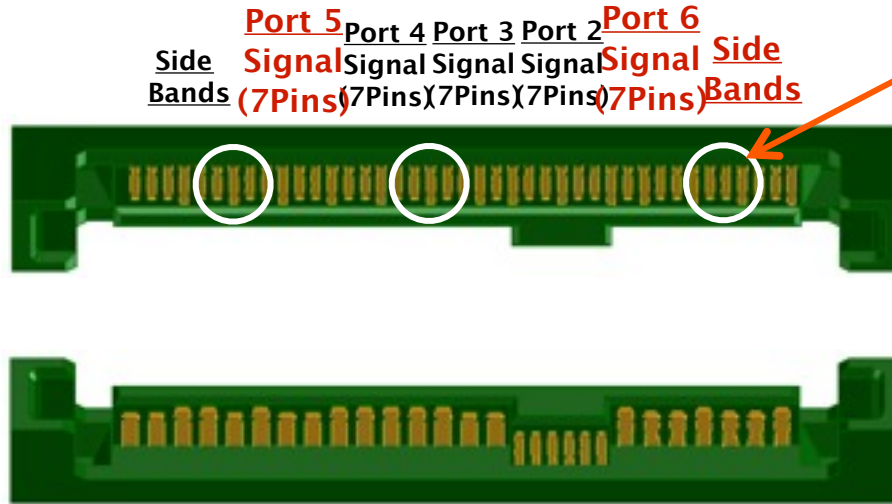


Quad Port 12Gbps SAS-3 (Preliminary SFF-8630 – still in Development)



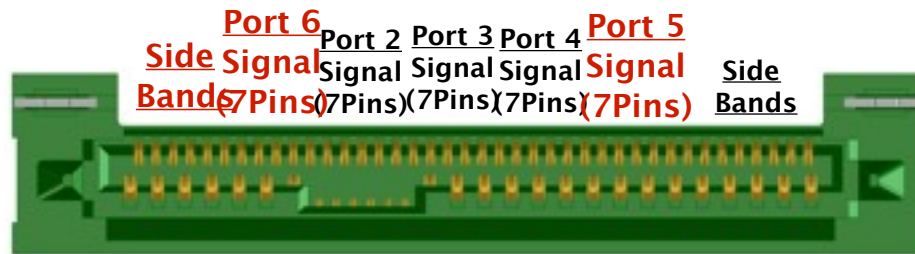


Dual Port 12Gbps SAS-3 plus Quad Port 8GT/s Enterprise PCIe (Preliminary SFF-8639 – still in Development)



(3x) Recess for SAS/SATA cable plug retention no longer available – new cable retention design required. This is a work in-process.

Port 1 Power (15Pins) Side Bands Port 1 Signal (7Pins)



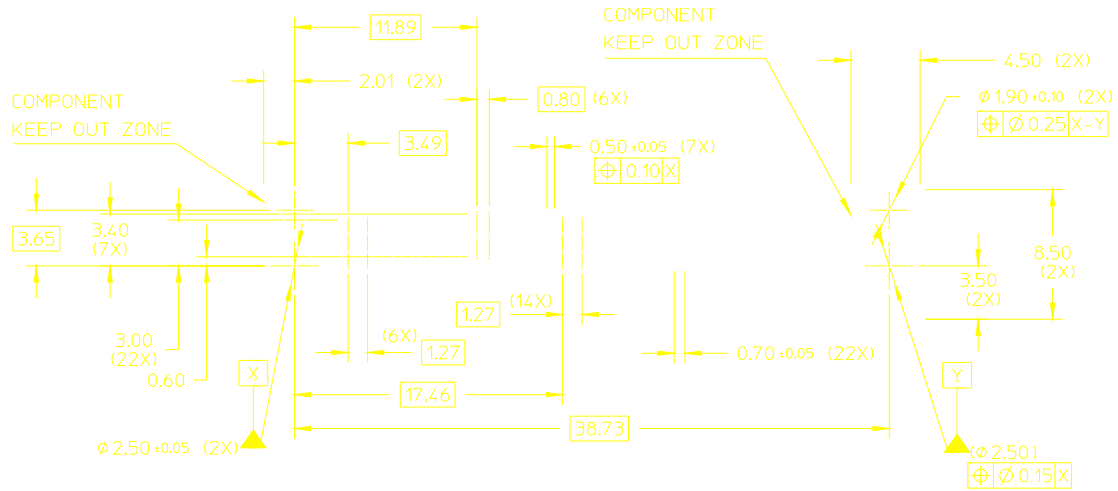
Port 1 Signal (7Pins) Side Bands Port 1 Power (15Pins)



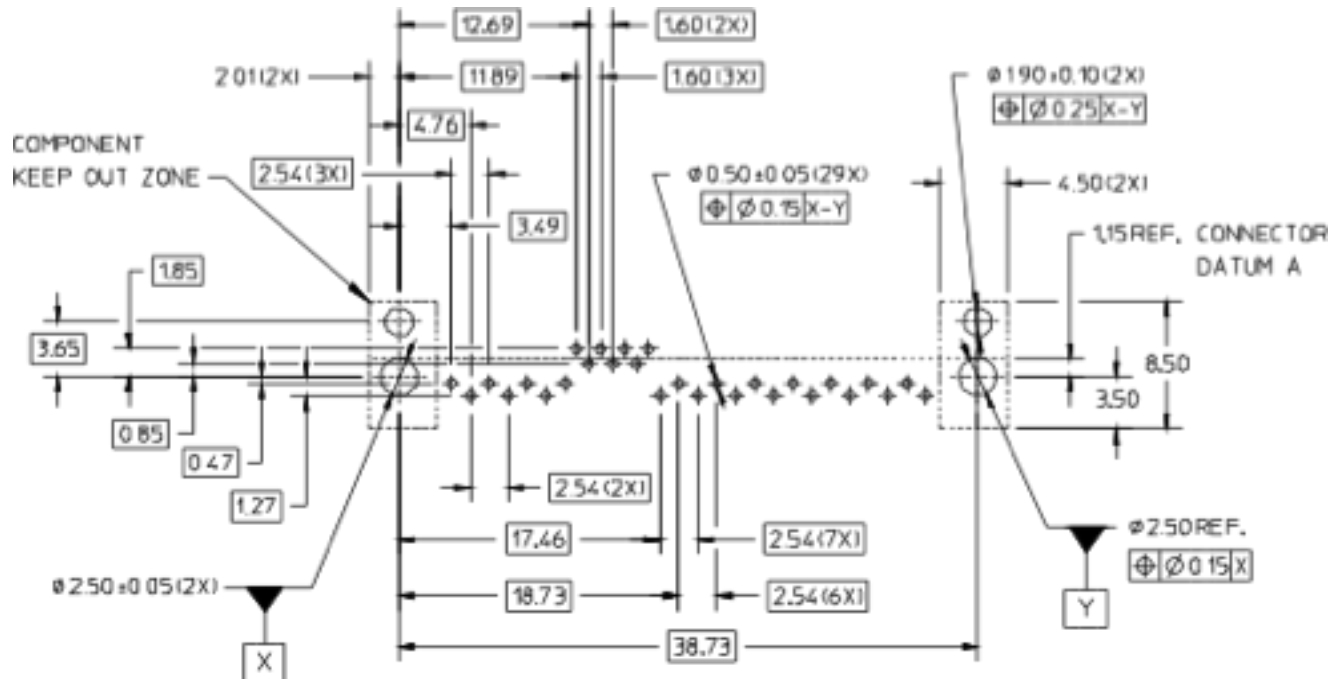
Legacy SAS Receptacle Footprints

- for Reference only

SMT

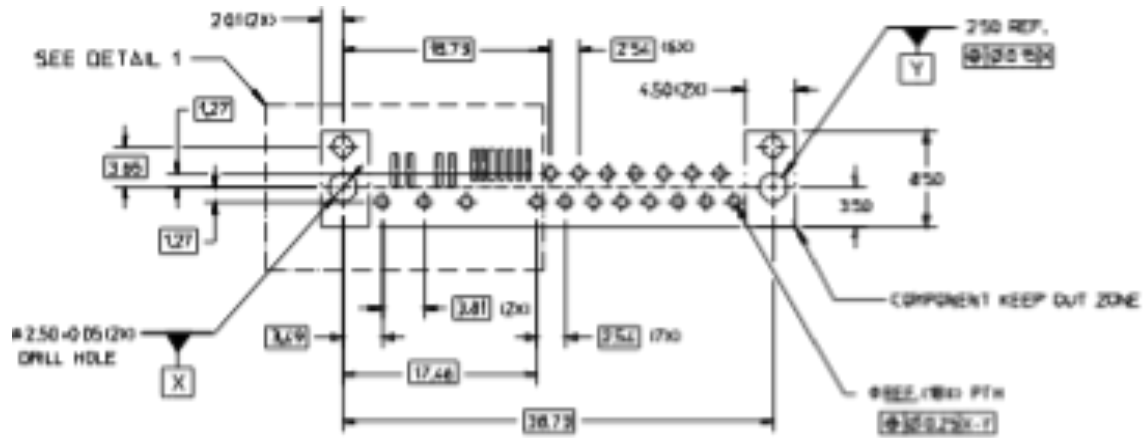


PTH

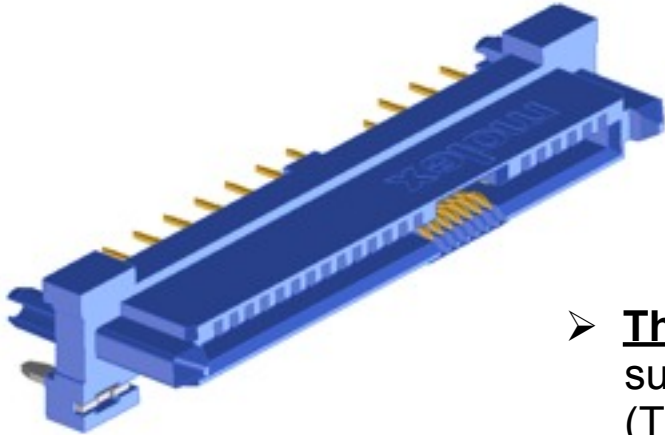


Legacy SAS Receptacle Footprints - for Reference only

Hybrid
SMT & PTH



Backplane Receptacle Connectors



- **The mating interface is defined for all receptacles** such that all plugs will intermate with them (There is a new proposal that may mechanically key one or more solutions)
- **The connector attachment to the host board is customer specific and is not defined**
 - SMT, PTH, and Hybrid solutions are acceptable so long as the solution meets the electrical performance criteria
- Retention bumps or latches for cables are not required on backplane receptacle connectors

Cabling Objectives

- **Legacy SATA cables**
 - The independent power and signal cable receptacles may mate with the new PCIe device plugs but will not be retained

- **Legacy SAS Cables**
 - Will mate with all device plugs but will not be retained when mated to PCIe device plugs

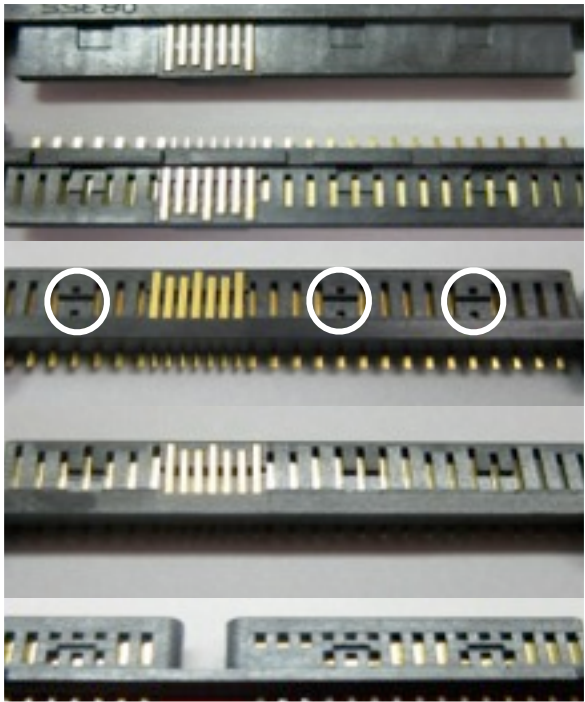
- **SAS-3 Cables**
 - Will mate with all device plugs but will not be retained when mated to PCIe device plugs and shall have retention

- **Enterprise PCIe Cables**
 - Will mate with all device plugs but will not be retained when mated with legacy SAS/SATA or SAS-3 device plugs
 - This is a work in-process

- **Client PCIe Cables**
 - This is a work in-process

Connector Concerns

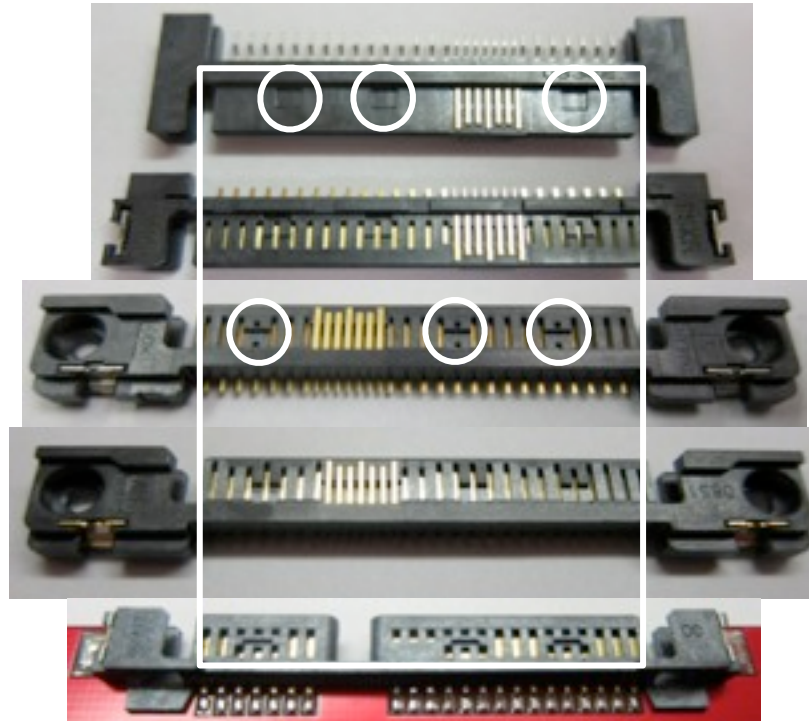
- Investigated and closed – no problem



Receptacle contacts riding over housing plastic as well as into retention recesses and into slots created in the over-molded versions of the device plugs would be damaged

- No contamination or damage to contacts revealed during or after durability testing per the specification.

Intermateable, Application & Customer Specific, Device Plug Connectors

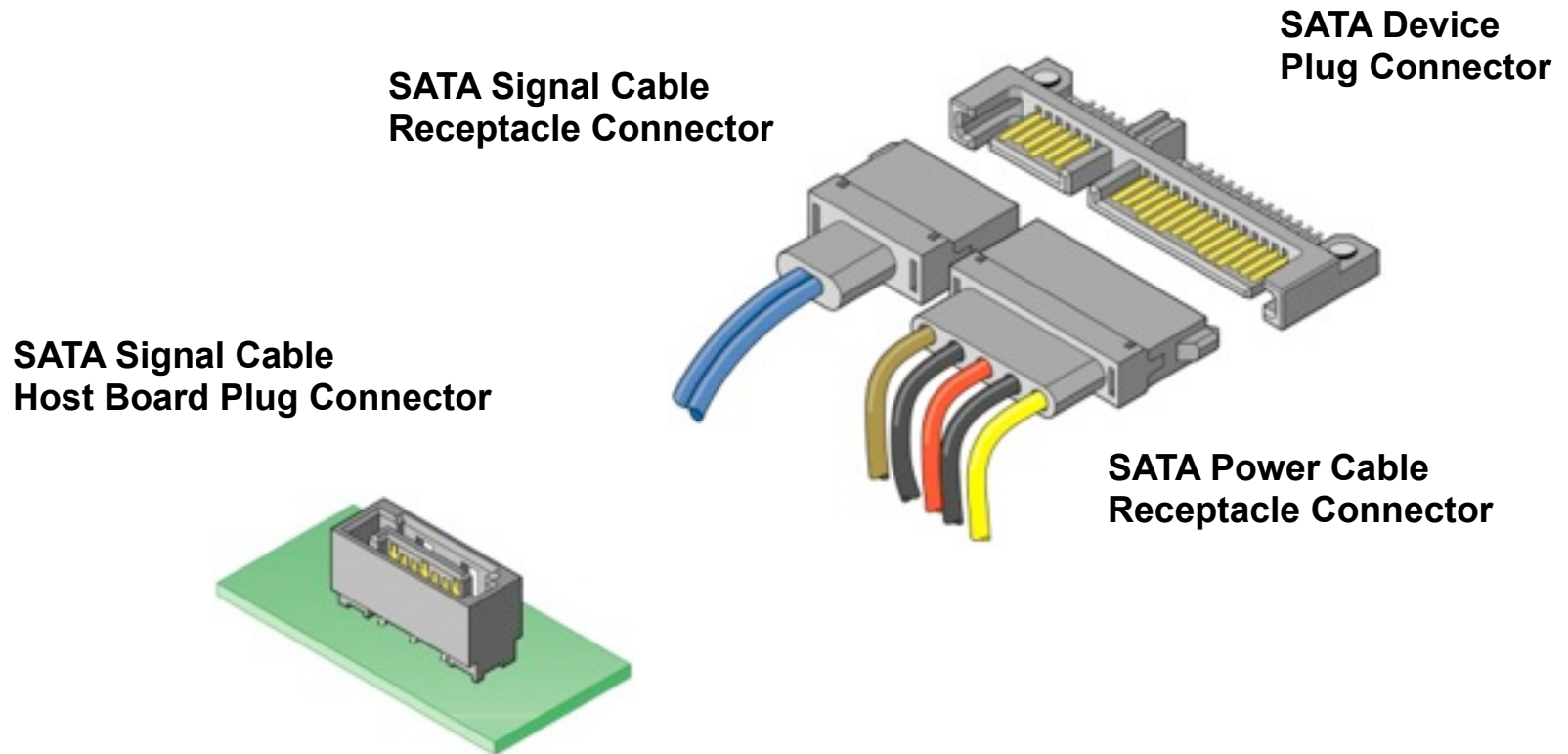


The device mating interface is defined in the standards and applies to all versions

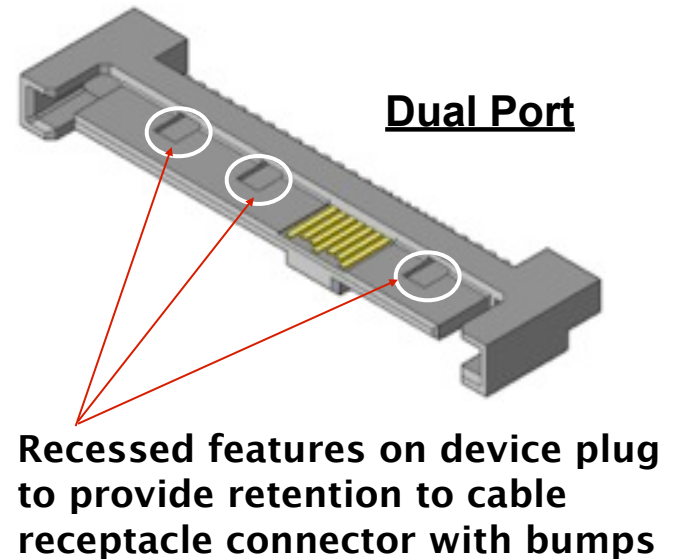
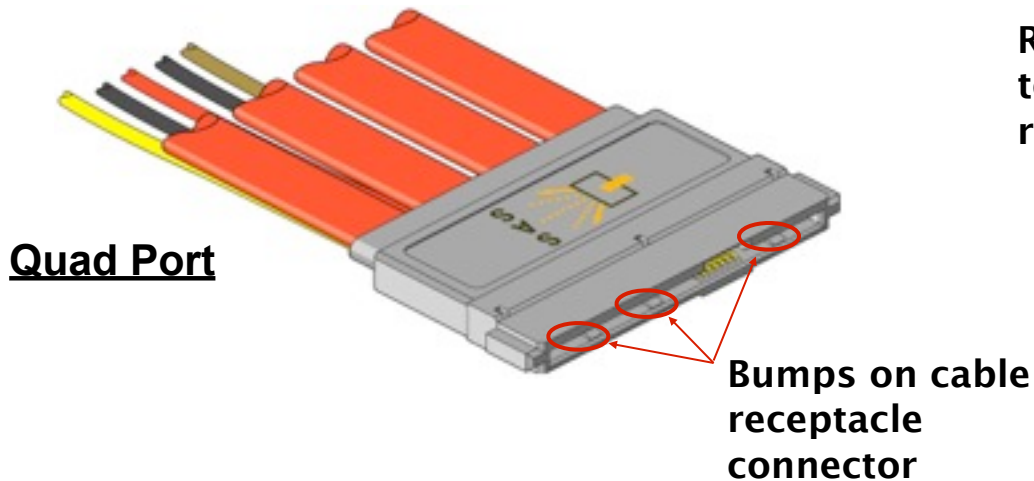
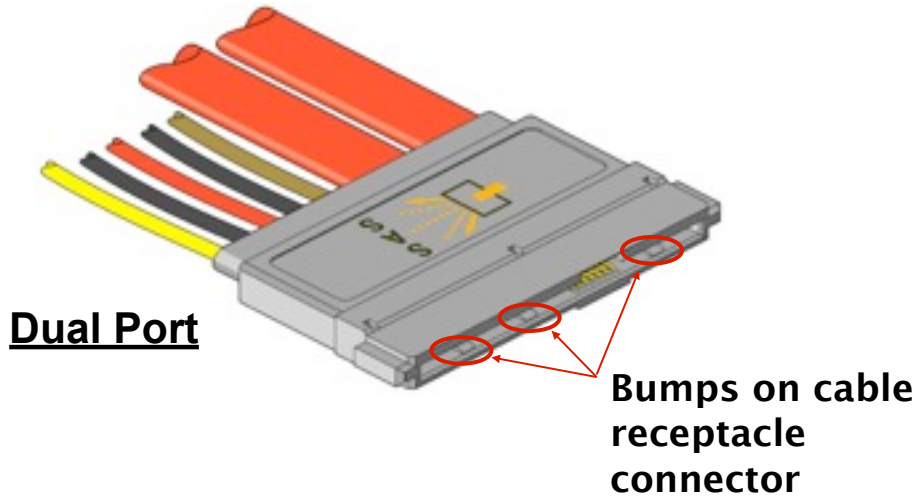
The attachment interface of the device connector to the device board is not defined and is customer specific as shown above

Intermateable, Cabled SATA Solutions

Individual Power and Signal Cables



Intermateable, Cabled SAS Solutions



* There is some concern that the addition of the two new ports will for SAS (and PCIe) will create a very stiff cable that will be difficult to manage and retain.

High Speed Signal Parameters

- Performance requirements developed by respective groups (T10 SAS, PCI-SIG)
- Connector interoperability with previous generations of SAS
- Multilink SAS requirements (defined up to 6GHz)
 - -36dB crosstalk limit, power sum of all near-end and far-end aggressors, as defined by specification Tx/Rx signal assignment
 - -1dB connector and PCB attach insertion loss limit
 - -12dB connector and PCB attach return loss limit
- Channel application spaces, and performance objectives, drive necessary connector characteristics
 - -25dB at 6GHz end-to-end (between BGA attach on Transmit and BGA attach on Receive) channel insertion loss
 - Crosstalk limit derived from this to provide sufficient SNR

High Speed Signal Parameters (Continued)

- Purpose-designed test fixtures fabricated for evaluation

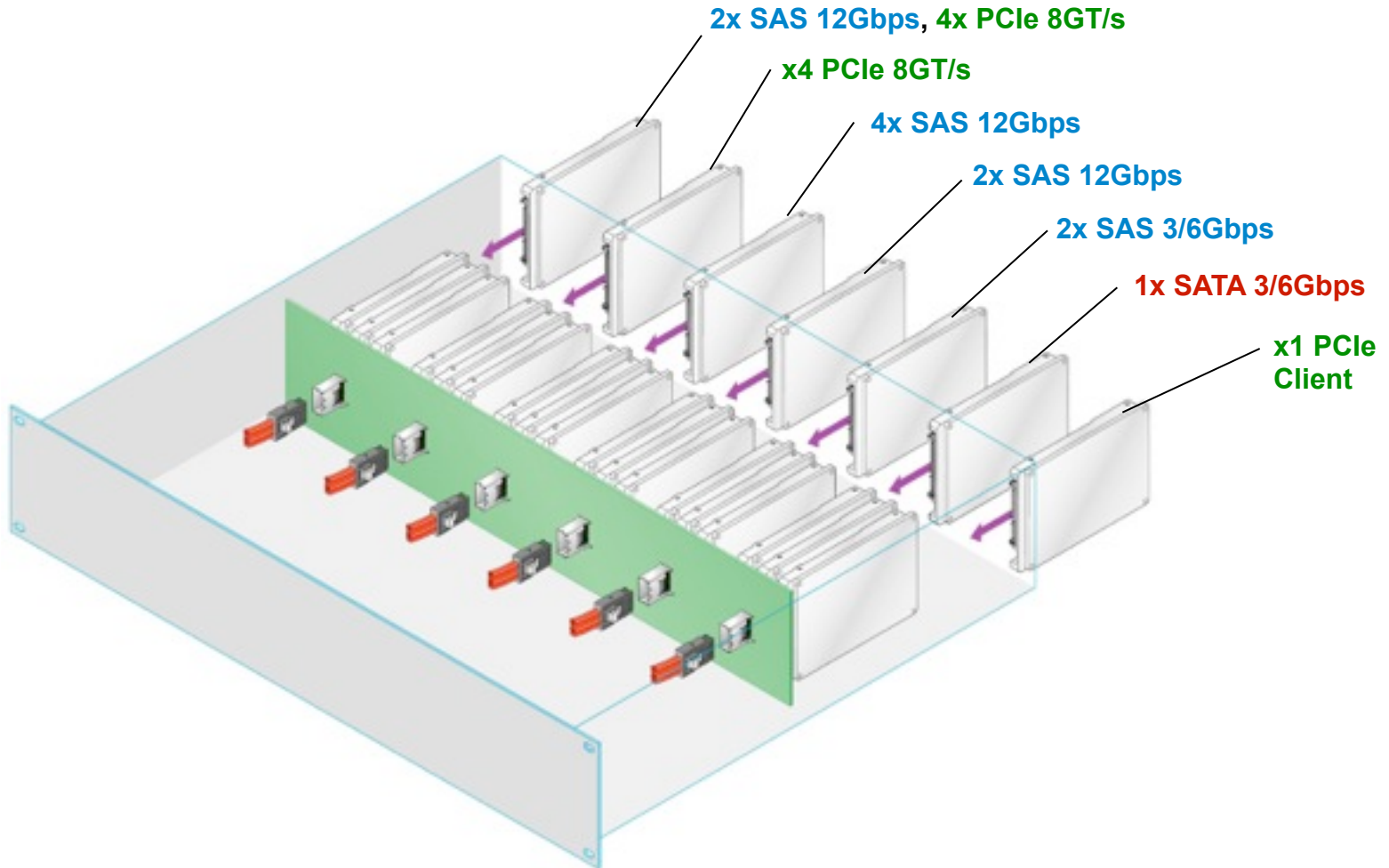




High Speed Signal Parameters

- SAS-3 specification including SSDs moving toward completion and release
- Multiport (SAS-3/PCIe) host receptacles under development

The Storage Device Bay Solutions





Annex – 1 Legacy Cable Retention Testing

Mating Half Part Number : 78467-0001
Cable Part Number: 745874011



Test Item: Module Insertion & Withdrawal Force
Environment : 24 +/- 3 deg.C - 60 +/- 20%RH
Equipment : SC - 05 - 0225
Spec: Insertion 50 N Max
Withdrawal 20 N Min

Test Range (N)	Load Cell used (N)	Select (✓)
0.1 ~ 20	20	
2.0 ~ 50	50	
50 ~ 100	100	✓
60 ~ 480	500	
119 ~ 950	1000	

Report Number : IT11-1840		
Date	Tested By	Signature
6-Jul-11	Benson	

Sample	3 Bumps			
	Initial		After 25X Durability	
	Mate Force	Unmate Force	Mate Force	Unmate Force
1	36.86	45.90	44.37	26.43
2	32.96	33.33	32.73	26.55
Min	32.96	33.33	32.73	26.55
Max	36.86	45.90	44.37	26.43
Ave	35.91	39.62	38.55	27.49
Std	4.17	8.89	8.23	1.33

Sample	2 Bumps			
	Initial		After 25X Durability	
	Mate Force	Unmate Force	Mate Force	Unmate Force
1	30.17	36.28	36.32	25.19
2	31.62	37.14	39.90	27.91
Min	30.17	36.28	36.32	25.19
Max	31.62	37.14	39.90	27.91
Ave	30.90	36.71	37.71	26.55
Std	1.03	0.61	1.97	1.92

Sample	No Bump			
	Initial		After 25X Durability	
	Mate Force	Unmate Force	Mate Force	Unmate Force
1	18.72	11.10	17.24	12.88
2	16.27	11.41	16.71	13.60
Min	16.27	11.10	16.71	12.88
Max	18.72	11.41	17.24	13.60
Ave	17.50	11.26	16.98	13.24
Std	1.73	0.22	0.37	0.31