

MicroTCA Next Generation Update

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Motivation & Requirements for the Next Generation

- **Keep the standard alive for a long time**
 - Adapt state-of-the-art technology
- **Backward compatibility**
 - All existing AMC modules **MUST** be usable

PICMG MicroTCA Next Generation Working Group

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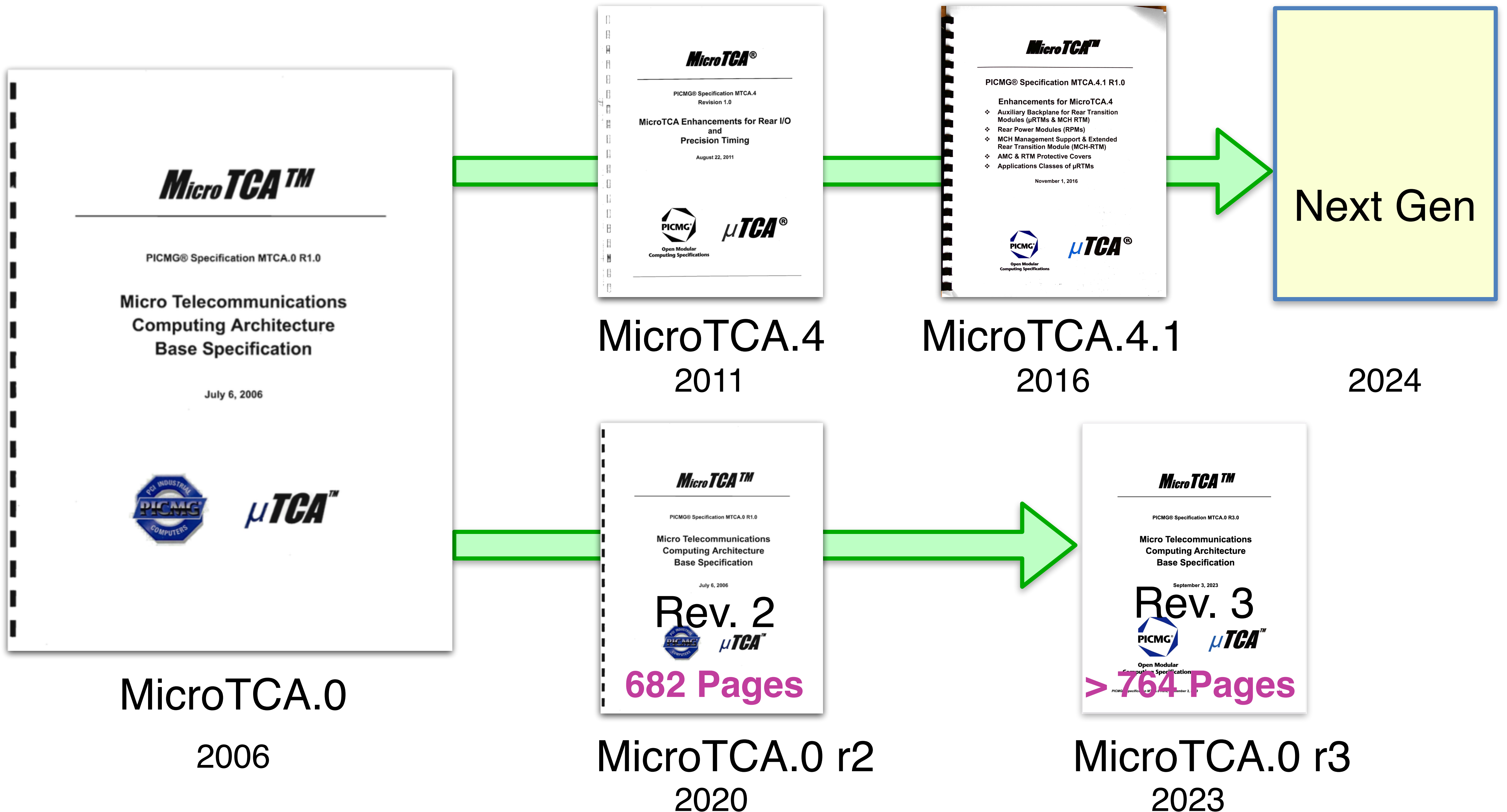
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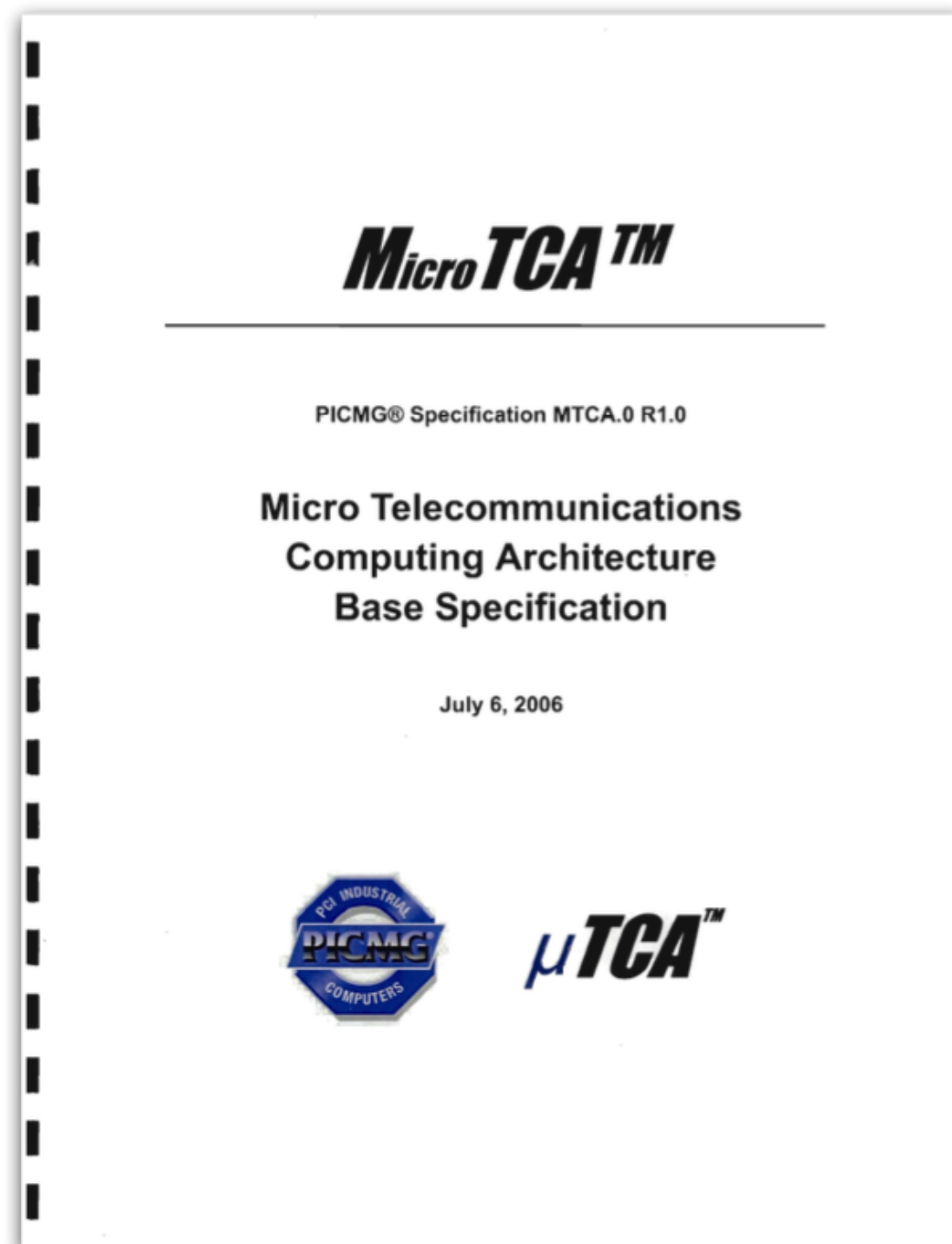


MicroTCA Specifications



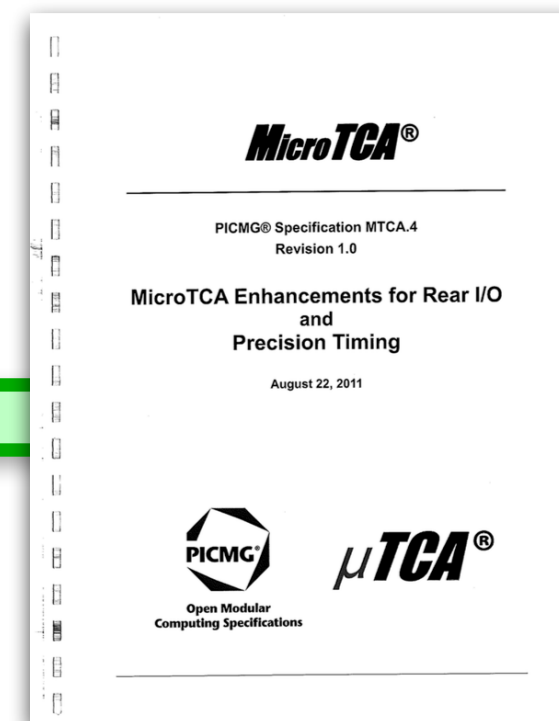


MicroTCA Specifications



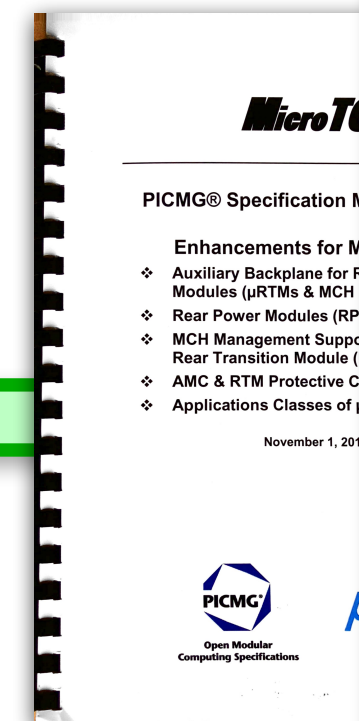
MicroTCA.0

2006



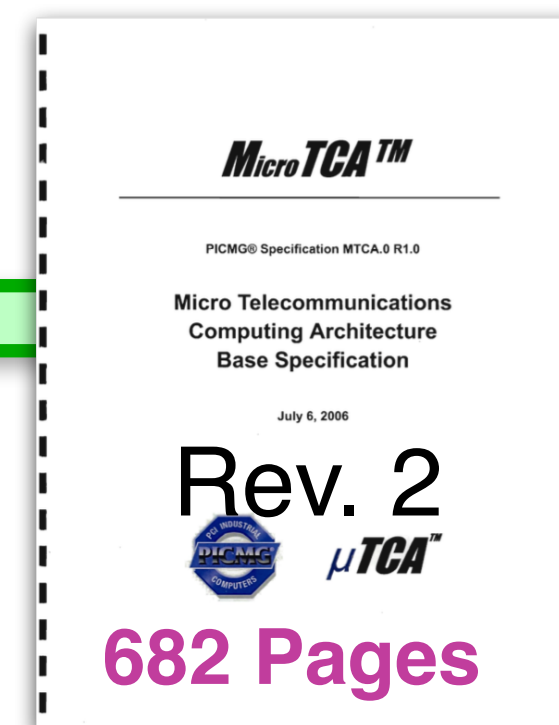
MicroTCA.4

2011



MicroTCA.0

2016



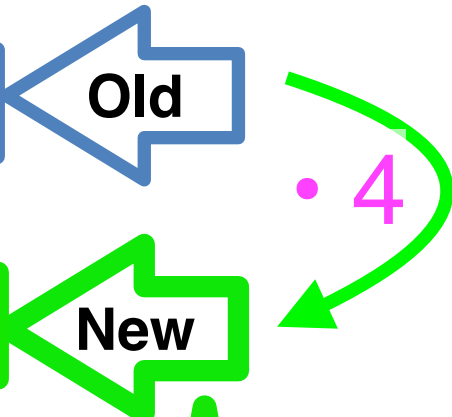
MicroTCA.0 r2

2020

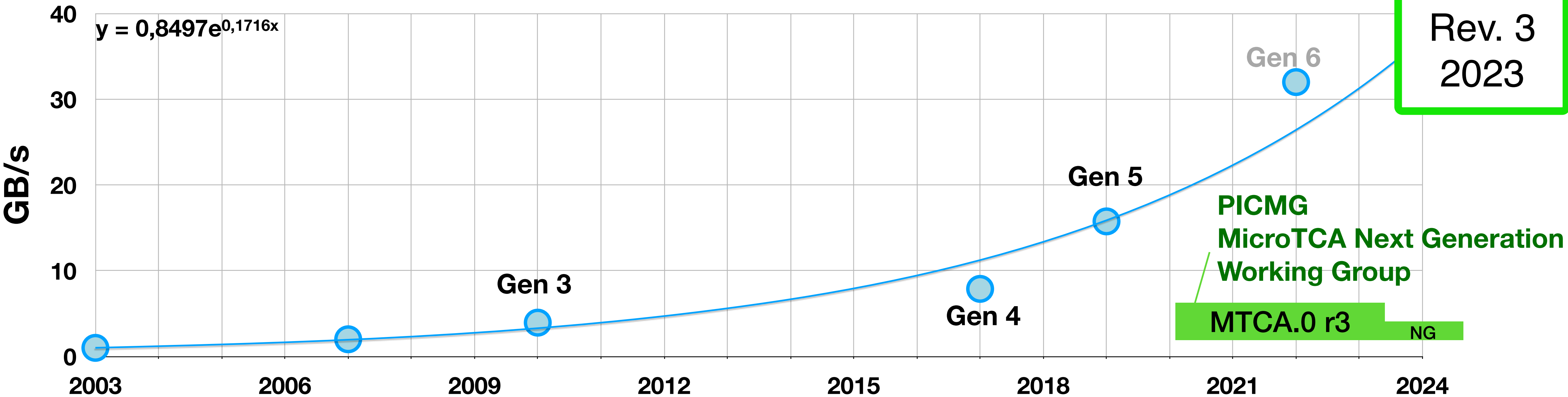


MTCA.0 Rev 3: PCIe Gen 4 and 5, 100GbEthernet

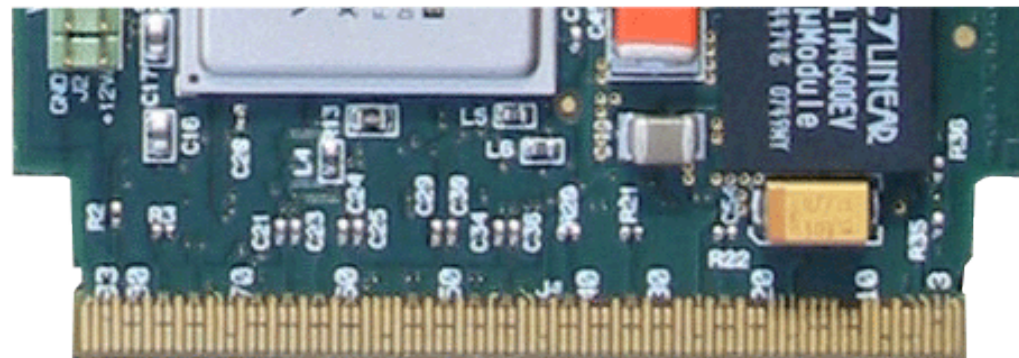
PCI Express version	Introduced	Line code	Transfer rate	Throughput (simplex)				
				x1	x2	x4	x8	x16
1.0	2003		2.5 GT/s	250 MB/s	0.50 GB/s	1.0 GB/s	2.0 GB/s	4.0 GB/s
2.0	2007	8b/10b	5.0 GT/s	500 MB/s	1.0 GB/s	2.0 GB/s	4.0 GB/s	8.0 GB/s
3.0	2010		8.0 GT/s	985 MB/s	1.97 GB/s	3.9 GB/s	7.88 GB/s	15.8 GB/s
4.0	2017	128b/130b	16.0 GT/s	1969 MB/s	3.94 GB/s	7.9 GB/s	15.75 GB/s	31.5 GB/s
5.0	2019	128b/130b	32.0 GT/s	3938 MB/s	7.88 GB/s	15.8 GB/s	31.51 GB/s	63.0 GB/s
6.0	In preparation	PAM4	64.0 GT/s	~7800 MB/s	~15.7 MB/s	~31.4.8 GB/s	~62 GB/s	~124 GB/s



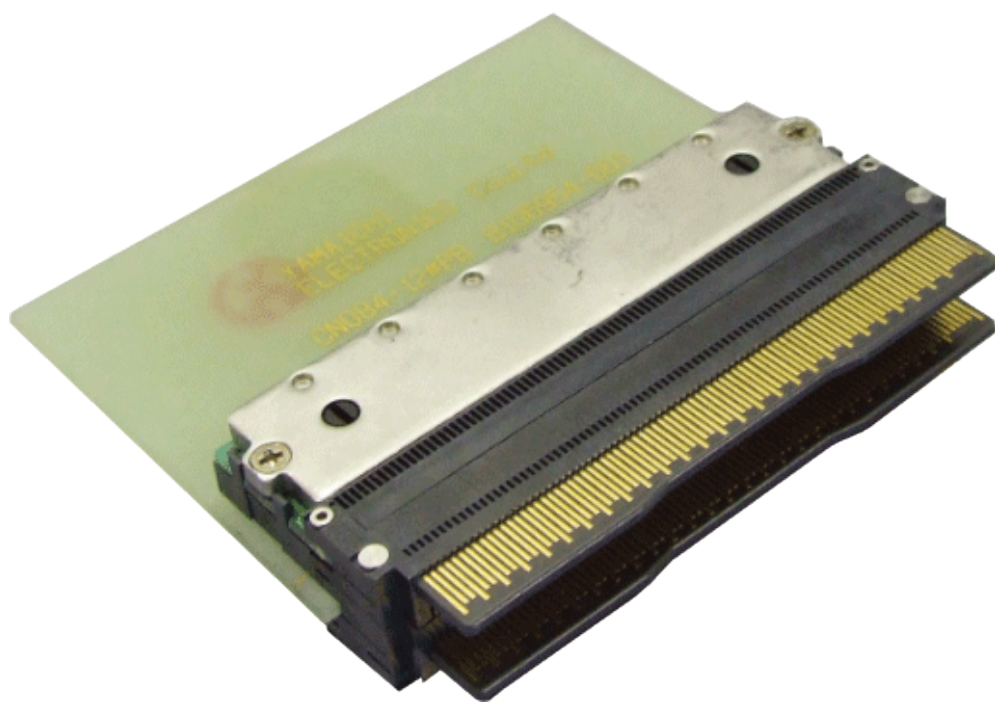
Transfer Rate 4 Lanes / Specs ready (Test specs + 1 year)



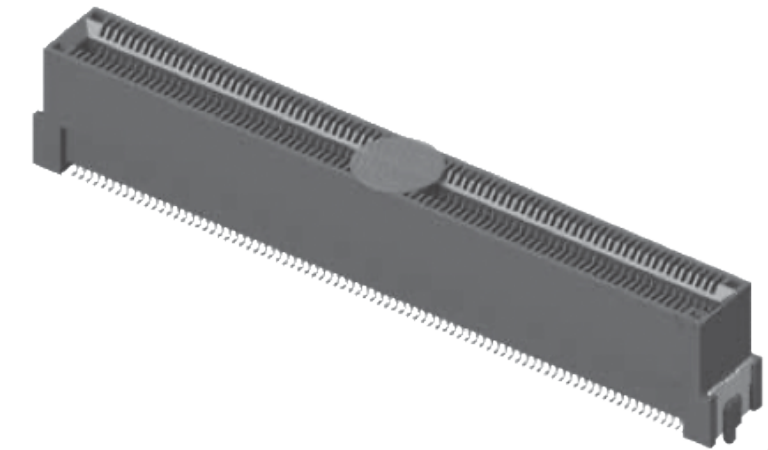
Challenges: MCH & AMC Connector for 32Gb/s



1



2



Backplane connector:

No change required

Improved PCB layout

Harting connector does not allow > PCIe gen 3 (remains backward compatible)

Options for the AMC are:

1 PCB Card Edge contacts

2 Yamaichi connector

PCB thickness = 1.6 mm !

Challenges: Power

More speed ==> more power

MCH and cooling requires more than 80 W!

Challenges: Power

- **Limitation of MCH connector:**

- MCH/AMC connector: 8 pins @ 10.8 V = 98 W max

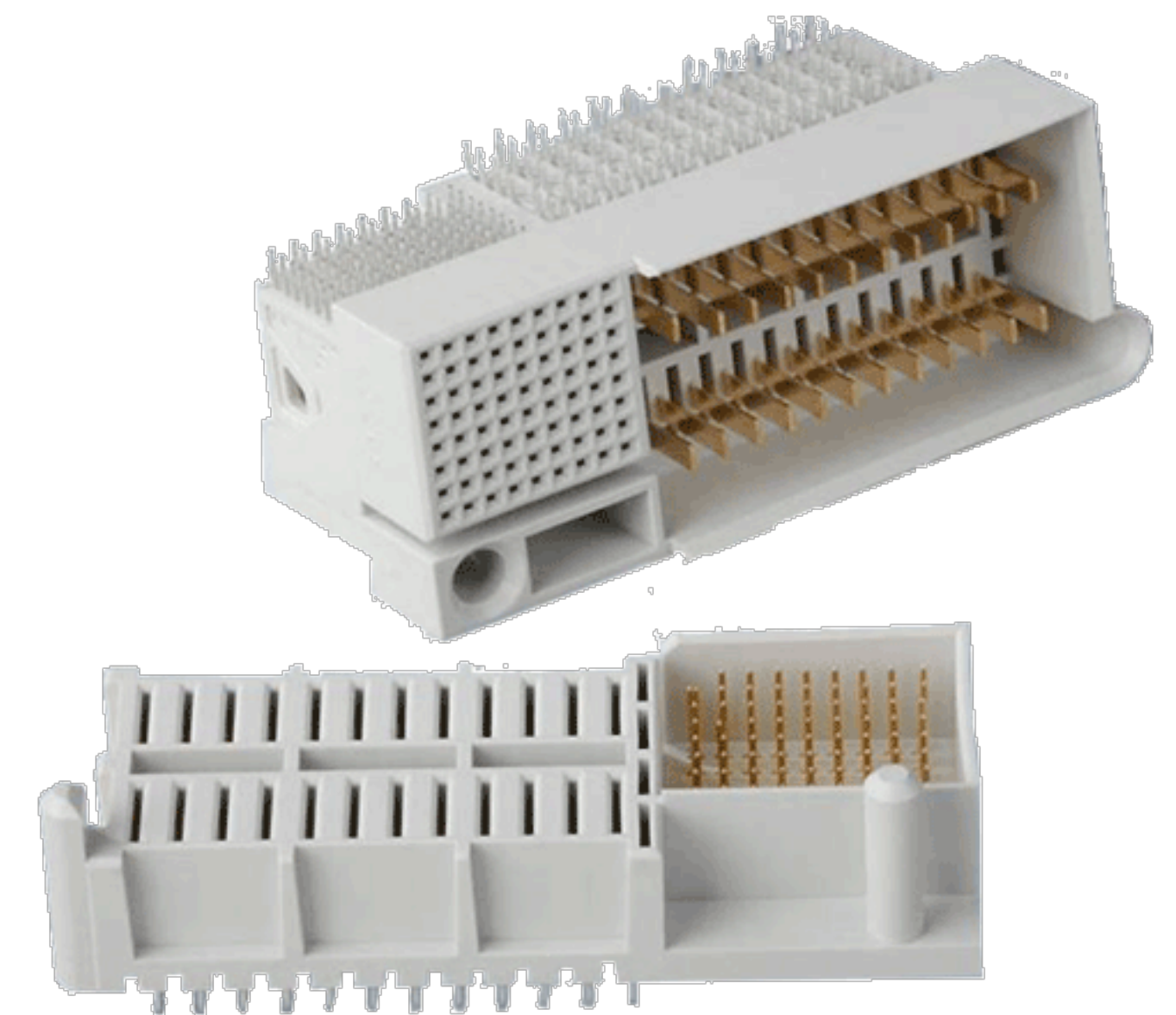
- **Solution:**

- Use 9 power pins on MCH ==> 110W
- Enable management of mixed 80 W / 110 W channels

- **Power Module & Crate cooling**

- More airflow ==> Fans need more power
- **Limitation of Power Module connector: 110 W**
- **Fan unit has a product specific connector**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
G	P	NC	NC	Rs	P	G	Rs	P	G	T	T	G	T	T	G	Rs
										Left Neighbor						
								Reserved (Port 19, 20)								
G	Reserved				G	T	T	G	T	T	G	R	R	G	R	
170	169	168	167	166	165	164	163	162	161	160	159	158	157	156	155	154



Power Module Spec Incompatibility Solved

Old specifications:

AMC.0R2

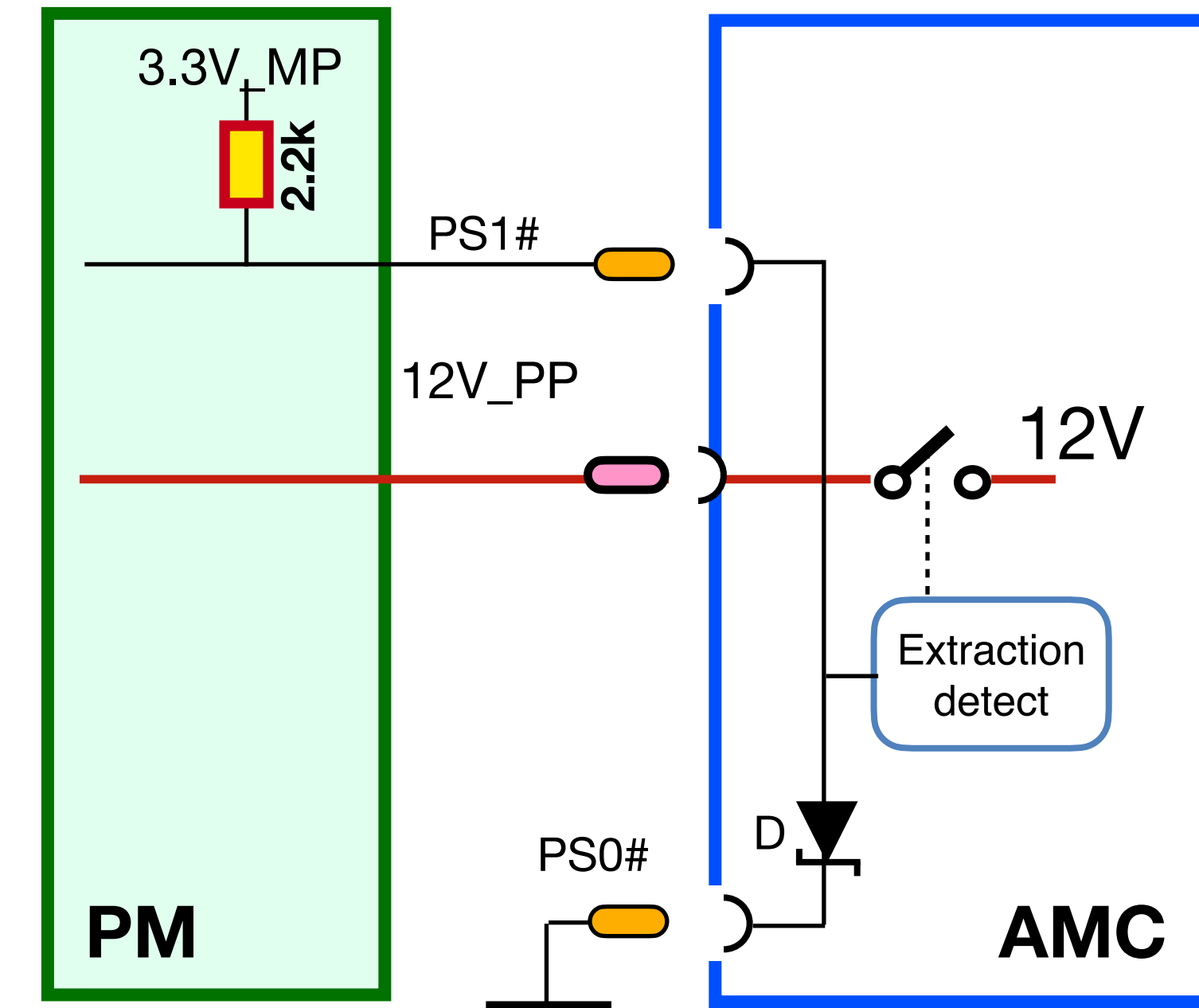
- Req 3.4b: SHALL be 2.2K Ohm

MTCA.0 R1.0

- Req 4.122 SHALL be 10K Ohm or lower value resistor

MTCA.0 R2.0 :

- REQ 4.122 The Power Subsystem **should** pull up each PS1_[Slot]# pin to Management Power with a 2.2K Ohm $\pm 10\%$ resistor.
- REQ 4.123 The Power Subsystem **may** pull up each PS1_[Slot]# pin to Management Power with a 10K Ohm $\pm 10\%$ to 1K Ohm $\pm 10\%$ resistor.



New:

MTCA.0 R3.0 :

- REQ 4.125 An AMC implementing a means against **Surprise State Change due to extraction** (aka “surprise extraction”) requires a pull-up resistor of 2.2K Ohm in the Power Module. In this case the Power Subsystem shall implement a 2.2K Ohm $\pm 10\%$.

PCIe Gen5 & 100GbE is Specified: What's Next?

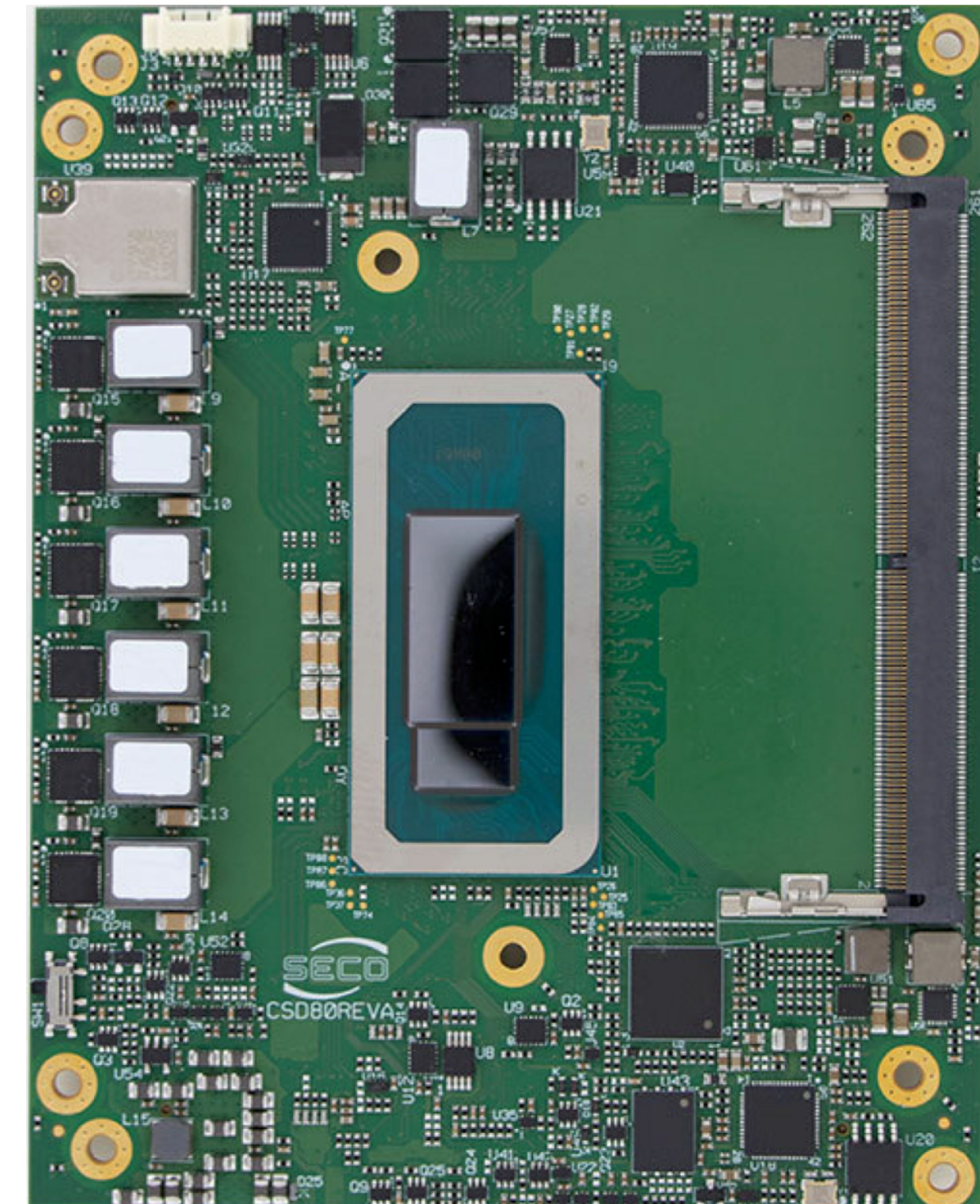
COM-HPC defines the direction of technology

- Client type modules up to **200 Watt**
- Up to **49 PCIe gen 5 lanes**
- **PICMG** published 2021

==> Conclusion for AMCs:

- **More power** (> 80 W) required
- More Fat Pipes for e.g. PCIe

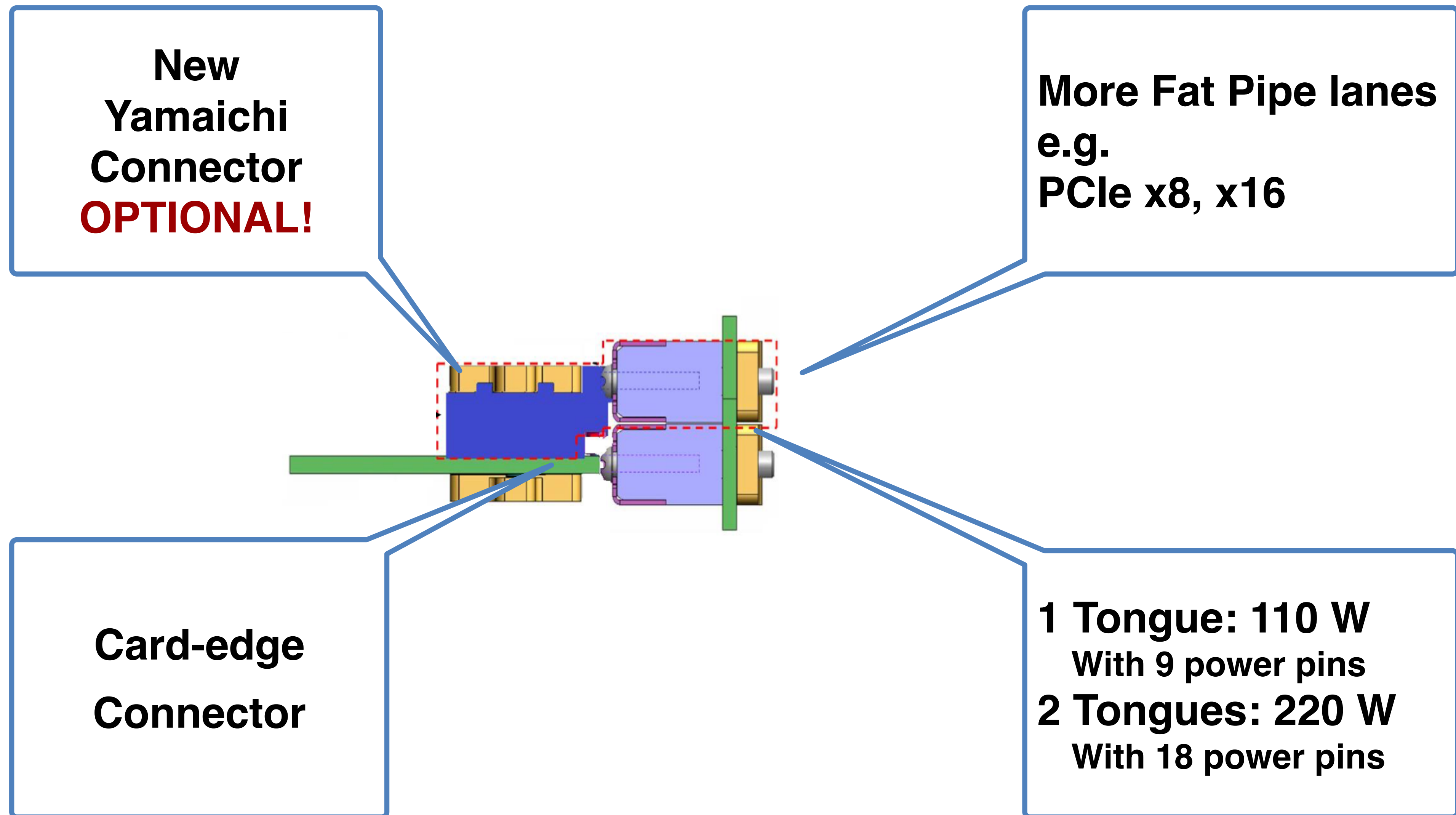
COM-HPC[®]



© SECO

- Intel 12th Gen with PCIe gen 5

AMC Connector for 220 W and More Connectivity

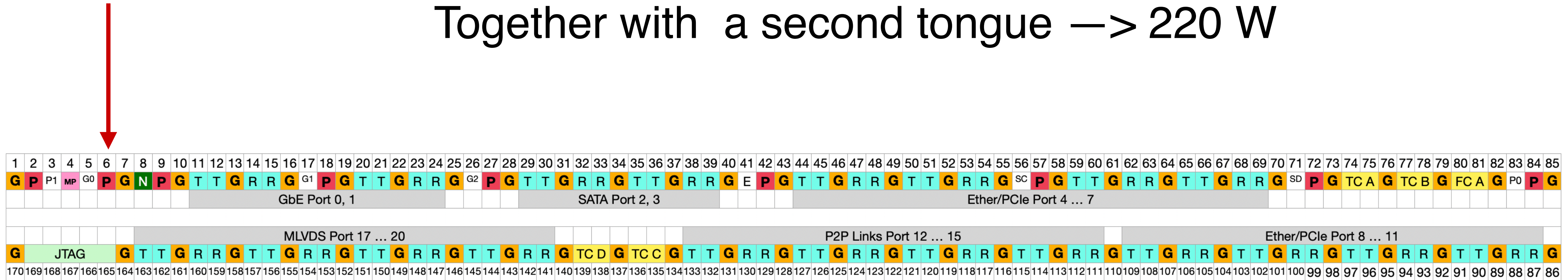


100% backward compatible

110 Watt for AMC per Connector

Use pin 6 in addition to the existing 8 power pins $\rightarrow$ 110 W

Together with a second tongue $\rightarrow 220 \text{ W}$

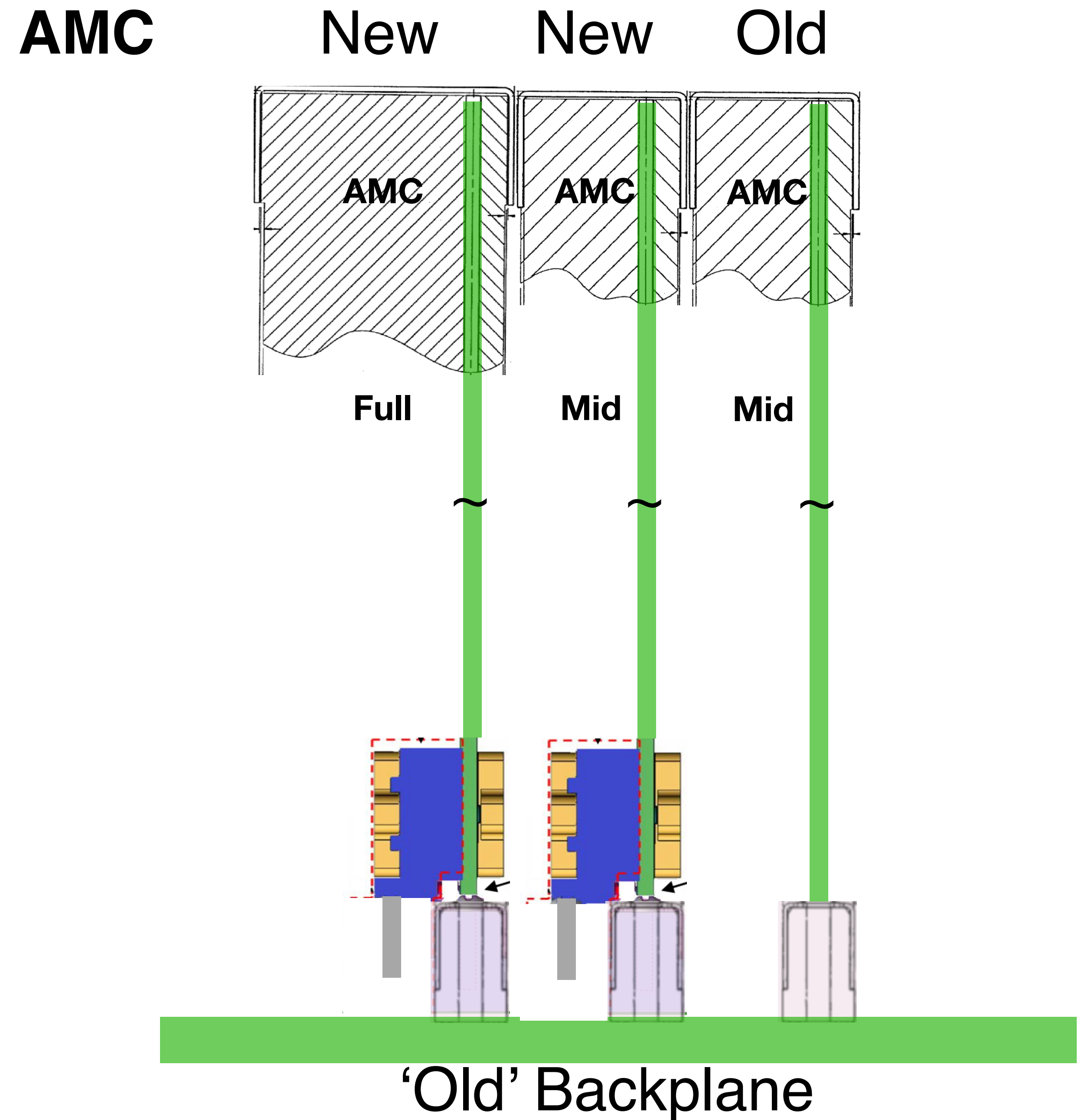
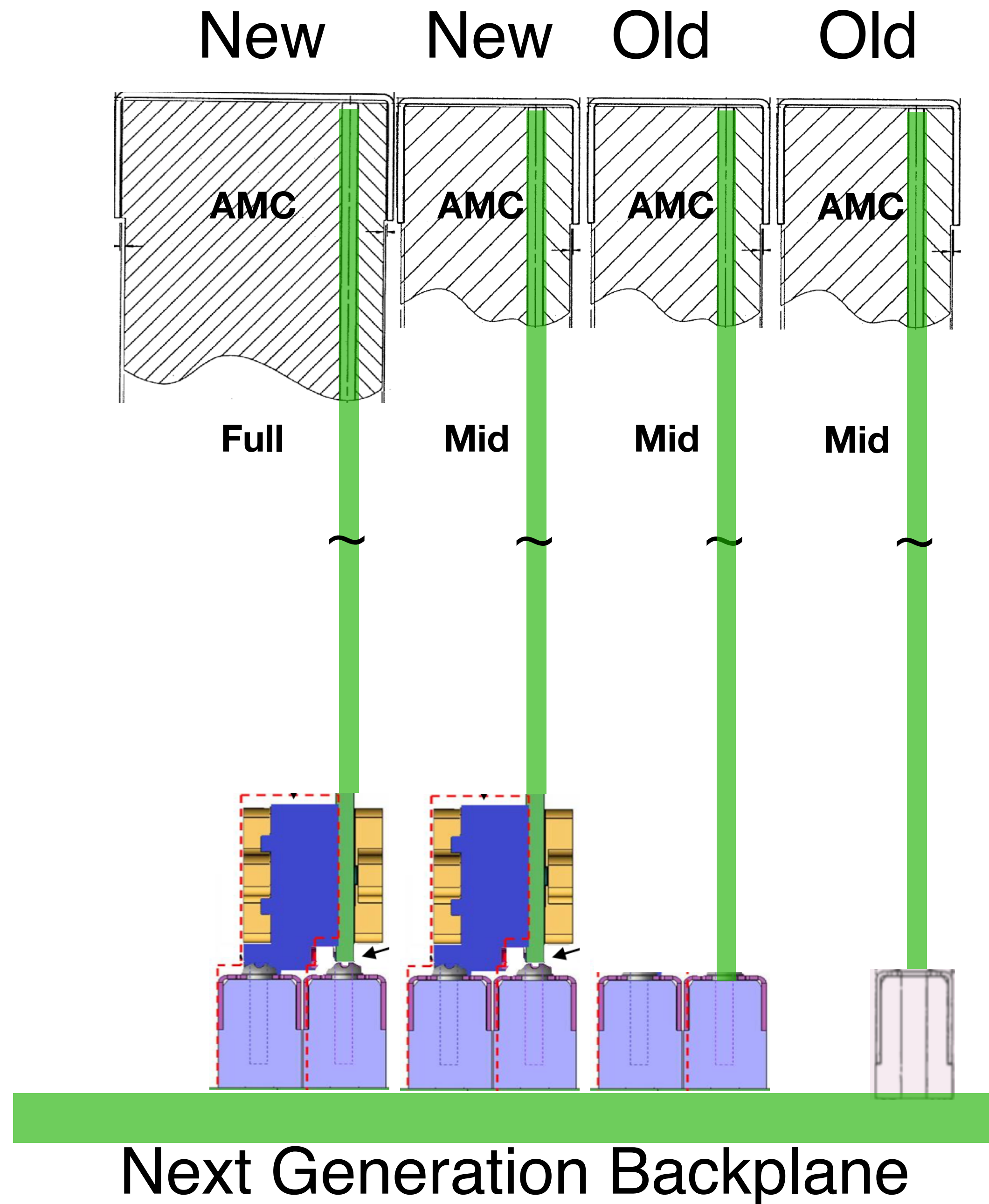


	G	GND
	P	PWR (12 V)
	MP	MP (3.3 V)
	G	Geo Address
T	T	Tx Lane
R	R	Rx Lane
	E	Enable#
	SC	IPMI Clock
	SD	IPMI Data

MTCA.0 Rev 3: Crate management handles compatibility of **80W and higher power channels** with new records for:

- Power source capability
- Backplane capability
- Power consumer demand

Full AMC Compatibility



Conclusions

MTCA.0 Rev. 3 is ready!

- 32 GT/s = PCIe gen 5
- With 4 lanes:
 - PCIs gen 5: **15.8 GB/s**
 - Ethernet: **12.5 GB/s**
- 110 W for MCH and cooling
- Management of 80 / 110 W power channels

MicroTCA Next Generation

Goals:

- Provide up to 220 W for AMCs
- Find best cooling solution
- More fat pipes: MCH & AMCs
- Further items:
 - Ports 2, 3 protocols (now SATA)
 - FMC management
 - HW based security option to prevent remote manipulation of firmware