Merging ATCA & VLP

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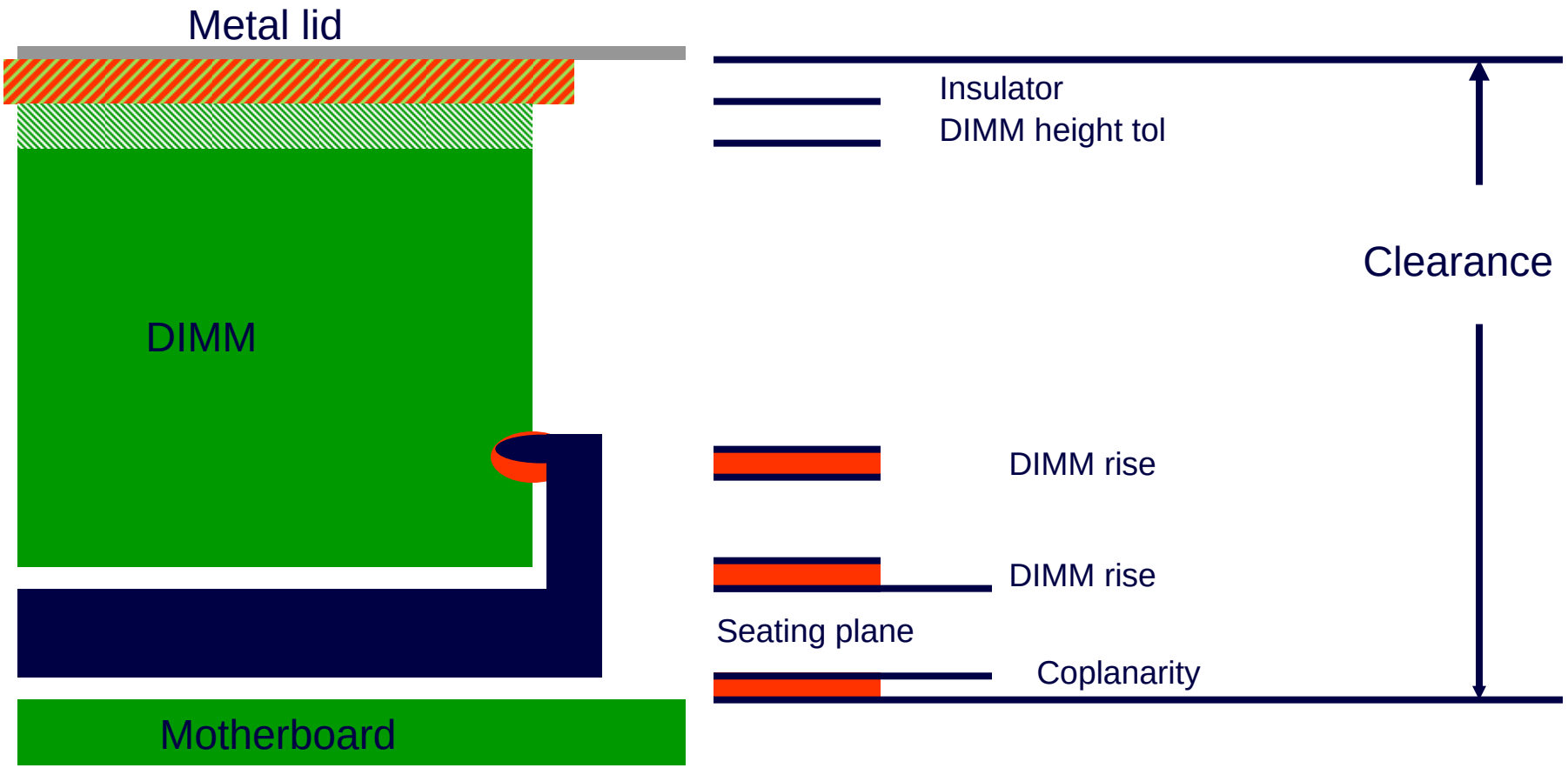
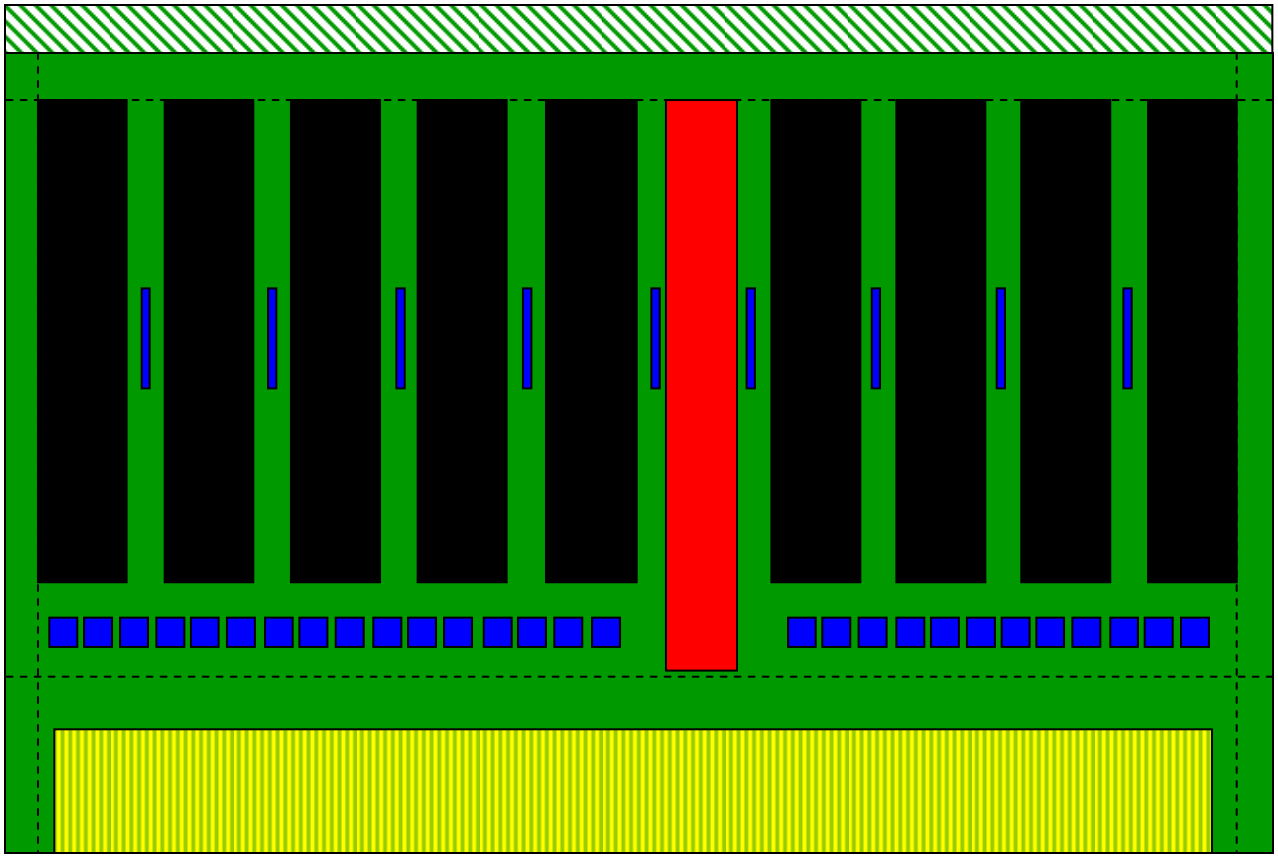
System Terminology



DIMM Terminology



DIMM height tol

DIMM top edge

DRAM Height

Resistors

Finger keepout

DDR3 Analysis: Three Options

- Small DRAM and no changes
- Large DRAM and changes in system, socket, and DIMM
- Largest DRAM and embedded resistors

How Big is ATCA?

- With top cover on blade: 21.57
- With no top cover: 21.33

- Requiring top cover solves two problems:
  - Gets us 0.24 mm
  - Eliminates DIMM rise in socket factor (DIMM has nowhere to go)

Option 1: No Compromises

- With top cover
  - 21.57 clearance
  - 0.10 insulator
  - 3.30 seating plane
  - 4.00 finger keepout
  - 0.5 DIMM top edge
  - 1.5 resistors
  - 0.10 coplanarity
  - 0.30 DIMM height tol
  - DIMM = 17.77-18.07
  - DRAM = 11.77max
- Without top cover
  - 21.33 clearance
  - 0.40 DIMM rise
  - 3.30 seating plane
  - 4.00 finger keepout
  - 0.5 DIMM top edge
  - 1.5 resistors
  - 0.10 coplanarity
  - 0.30 DIMM height tol
  - DIMM = 17.23-17.53
  - DRAM = 11.23max

Option 2: Everyone Gives a Little

- With top cover
  - 21.57 clearance
  - 0.10 insulator
  - 2.40 seating plane
  - 3.80 finger keepout
  - 0.3 DIMM top edge
  - 1.5 resistors
  - 0.10 coplanarity
  - 0.30 DIMM height tol

  - DIMM = 18.67-18.97
  - DRAM = 13.07max

← System supplier compromise

← Socket supplier compromise

← Socket supplier compromise

← DIMM supplier compromise

Option 3: Embedded Resistors

- With top cover
  - 21.57 clearance
  - 0.10 insulator
  - 3.10 seating plane
  - 4.00 finger keepout
  - 0.4 DIMM top edge
  - no resistors
  - 0.10 coplanarity
  - 0.30 DIMM height tol
  - DIMM = 17.97-18.27
  - DRAM = 13.57max
- Without top cover
  - 21.33 clearance
  - 0.40 DIMM rise in socket
  - 3.10 seating plane
  - 4.00 finger keepout
  - 0.4 DIMM top edge
  - no resistors
  - 0.10 coplanarity
  - 0.30 DIMM height tol
  - DIMM = 17.63-17.93
  - DRAM = 13.23max

Intel's Statistical Analysis on B

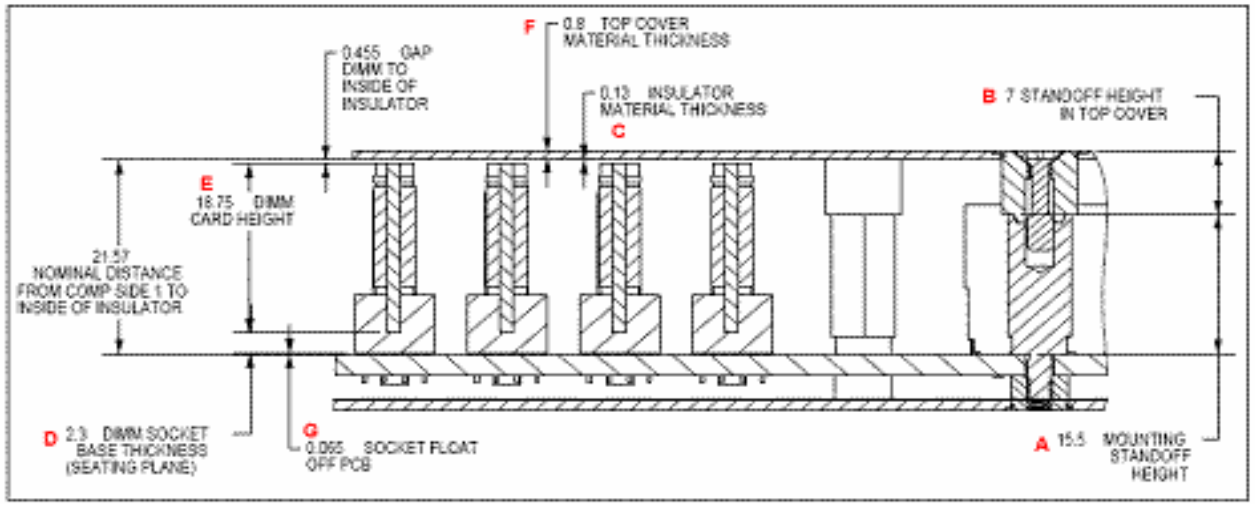
Millimeters

Note: Cells highlighted in yellow are internally calculated and are not to be entered by user.

	Dimensional Component Description	+/- Nom	Tol	Cpk	n-σ	1-σ	Source
A	Top Cover Mounting Standoff Height	15.500	± 0.190	1.33	4	0.038	
B	Standoff Height in Top Cover	7.000	± 0.080	1.33	4	0.020	
C	Insulator Thickness	-0.130	± 0.050	1.33	4	0.013	
D	DIMM Socket Base Thickness	-2.300	± 0.100	1.33	4	0.025	
E	DIMM Height	-18.750	± 0.150	1.33	4	0.038	
F	Top Cover Material Thickness	-0.800	± 0.100	1.33	4	0.025	
G	Socket float off PCB	-0.065	± 0.065	1.33	4	0.016	
H	DIMM seating gap in socket	0.000	± 0.000	1.33	4	0.000	
				1.33	4	0.000	
				1.33	4	0.000	
				1.33	4	0.000	
				1.33	4	0.000	
				1.33	4	0.000	
	Nominal Gap(+)/Interference(-):	0.455	± 0.6750	Worst Case			
			± 0.0673	RSS (1σ)	68.3%		
			± 0.1347	RSS (2σ)	95.5%		
			± 0.2020	RSS (3σ)	99.7%		
			± 0.2693	RSS (4σ)	99.9%		
	Minimum allowable Gap(+)/Interference(-):	0.186	Assy σ =	4.000	DPM =	32	
	Maximum allowable Gap(+)/Interference(-):	0.724	Assy σ =	4.000	DPM =	32	
					Total DPM =	63	

Inches

+/- Nom	Tol	Cpk	n-σ	1-σ	Source
0.610	± 0.005	1.33	4	0.001	
0.276	± 0.003	1.33	4	0.001	
-0.005	± 0.002	1.33	4	0.000	
-0.091	± 0.004	1.33	4	0.001	
-0.738	± 0.006	1.33	4	0.001	
-0.031	± 0.004	1.33	4	0.001	
-0.003	± 0.003	1.33	4	0.001	
0.000	± 0.000	1.33	4	0.000	
		1.33	4	0.000	
		1.33	4	0.000	
		1.33	4	0.000	
0.000	± 0.000	1.33	4	0.000	
		1.33	4	0.000	
0.018	± 0.0266	Worst Case			
	± 0.0027	RSS (1σ)	68.3%		
	± 0.0053	RSS (2σ)	95.4%		
	± 0.0080	RSS (3σ)	99.7%		
	± 0.0106	RSS (4σ)	99.9%		
0.007	Assy σ =	4.000	DPM =	32	
0.029	Assy σ =	4.000	DPM =	32	
			Total DPM =	63	



DDR3 ATCA: Statement of Position

- Option 2: everyone gives a little
  - DIMM = 18.75±0.15, Seating plane 2.30±0.10, Finger keepout 3.80, DIMM top edge 0.30
  - To support first generation DRAMs > 13mm:
    - Use embedded resistors or
    - Use DRAM stacking
- Recommend to ATCA
  - Best fit with top cover for vertical socketed DIMMs
  - To remove top cover
    - Angle sockets or
    - Statistical analysis for fit or
    - Change the stackup factors (e.g. custom socket)

What About DDR2 ATCA?

- DDR2: It's a bit late to expect any infrastructure changes
- Can ask the socket guys to retrofit their DDR3 sockets for DDR2
- But better be ready to justify the effort…

- …Otherwise…
- Same analysis holds as for DDR3, but assume socket seating plane of 3.0mm max (yes, the industry sockets are better than the 3.3mm JEDEC spec)

ATCA for DDR2

- Socket seating plane difference
  - 3.00 versus 2.40 = 0.60mm taller
- With a lid on the blade
  - DIMM height 18.00 to 18.30
- With no lid on the blade
  - DIMM height 17.76 to 18.04
  - Must consider socket coplanarity and DIMM rise