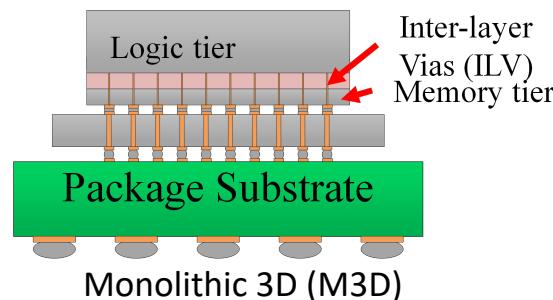
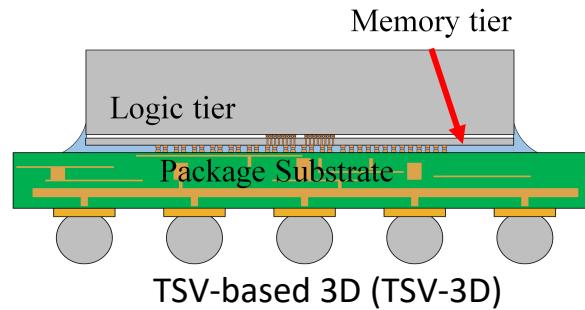


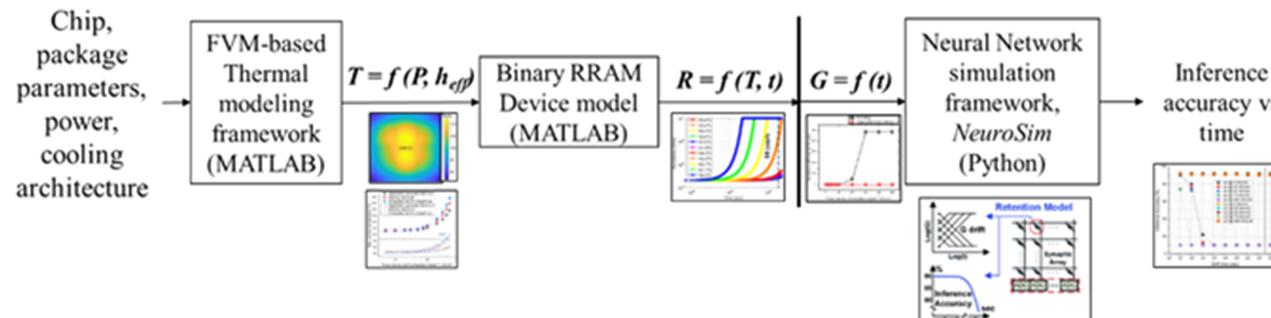
3D RRAM reliability: Results

Wednesday, September 22, 2021 7:45 PM

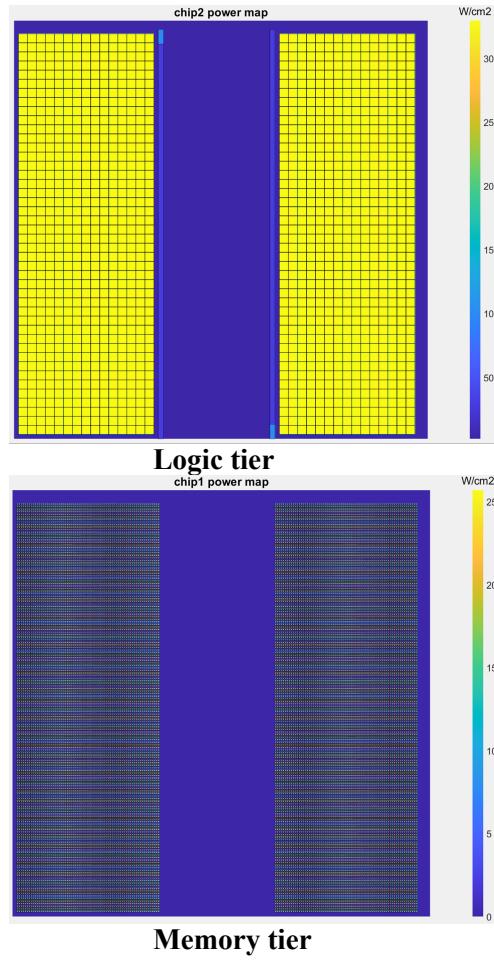
- **Integration schemes**



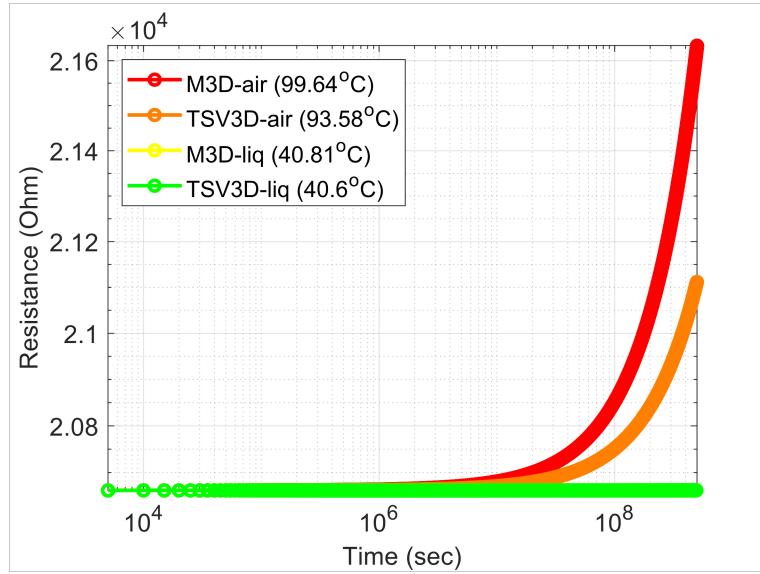
- **Thermal reliability-CIM accuracy evaluation flow:**



- **Power maps for CIM inputs:**



- **Binary RRAM retention vs time:**
 - TSV-3D and M3D, both air and liquid cooling



- **Retention data**

- Sampling time step in retention simulations was: **5000 sec**
- Please find two .txt files for each integration case (i.e. total 6 files): 1. **retention_*temperature*.txt** and corresponding **time.txt**
 - In time.txt, find R at time 3.154e8 (i.e. 10 years, which corresponds to line number 63072)
- For reference, here is the retention and corresponding drift data @10 yrs:

Integration	Resistance (ohm) (t=0 yrs)	Resistance (ohm) (t=0 yrs)	Resistance (ohm) (t=10 yrs)	Resistance (ohm) (t=10 yrs)	drift = (t10 - t0)/t0	drift = (t10 - t0)/t0
	Air	Liquid	Air	Liquid	Air	Liquid
TSV-3D	20661.8	20661.8	20945.3	20661.9	0.0137	0.0000048
M3D	20661.8	20661.8	21269.7	20661.9	0.0294	0.0000048

- **CIM Inference accuracy:**

- VGG-8 network (8bit) for CIFAR-10 dataset
- Shared folder also contains **Retention_Accuracy-8bit_VGG8.xlsx** (check this later needs to be updated) which is a template to record drift ratio and drift coefficient, and drift targets for 9 time samples.

Assumptions	
Device	1-bit per cell RRAM, Ron = 10 kΩ, Roff = 100 kΩ
Network	VGG-8
Dataset	CIFAR10
Number of tiers for both TSV-3D and M3D	2 (one memory and one logic)