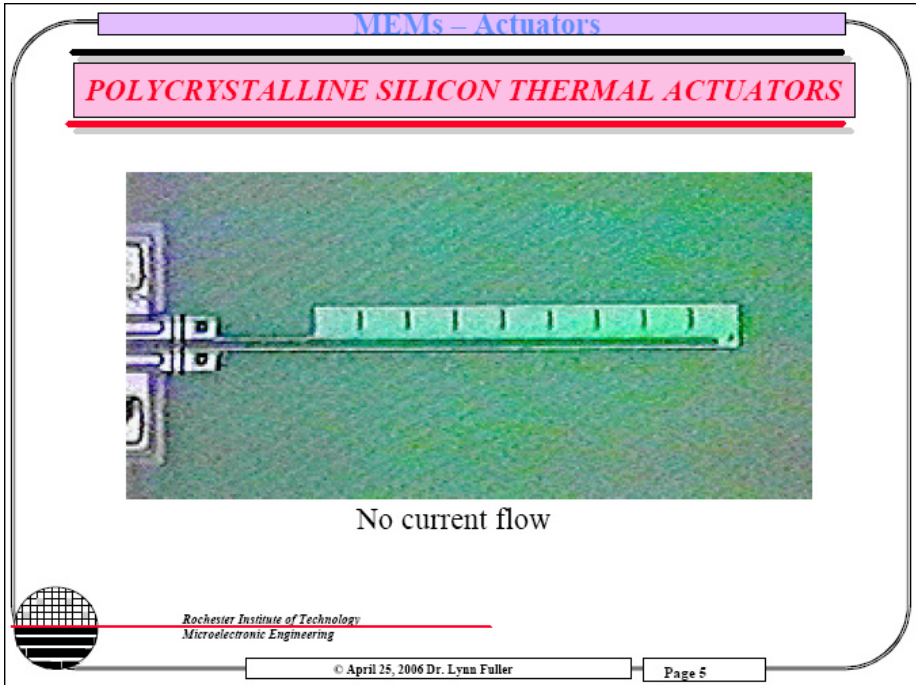
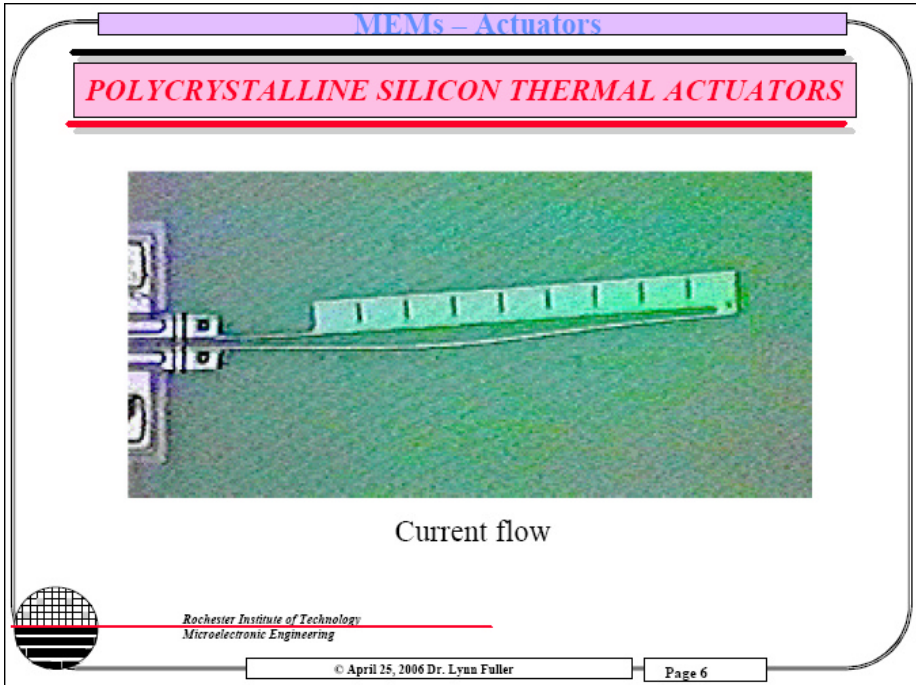
Thermal Actuator Simulation
EE686 – MEMS Evaluation
Spring 2006

Ivan Puchades

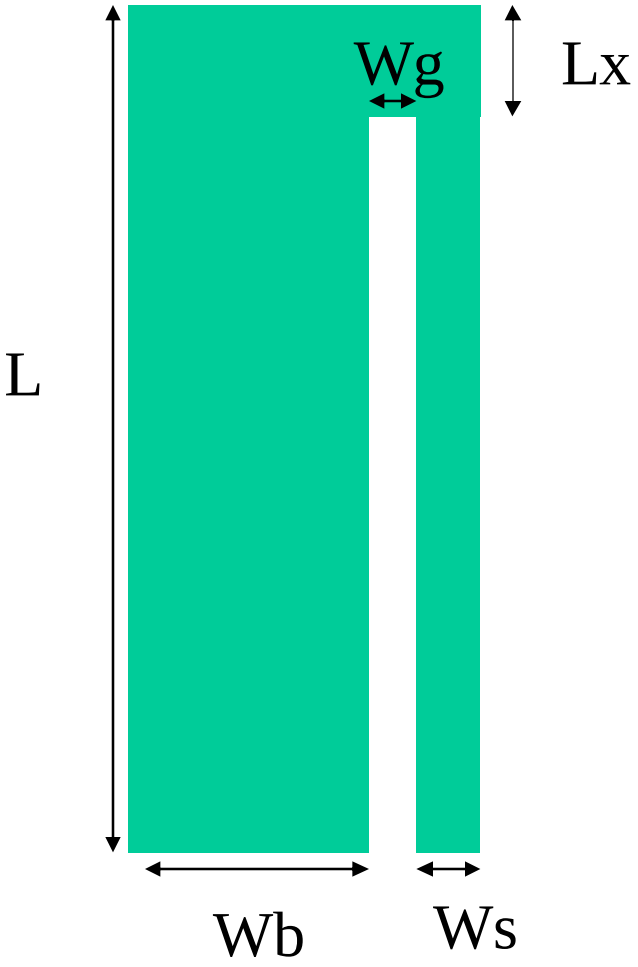
Polysilicon thermal actuator





Kevin Munger

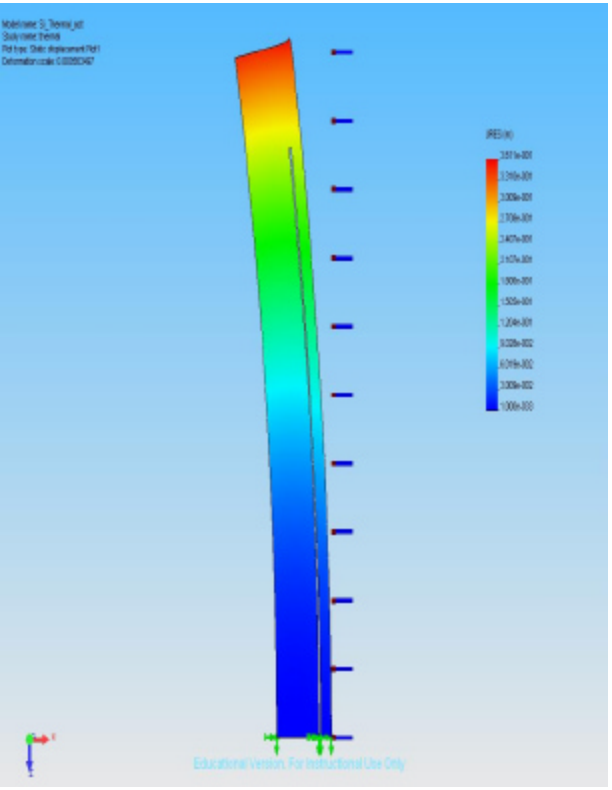
SolidWorks Simulation Dimensions



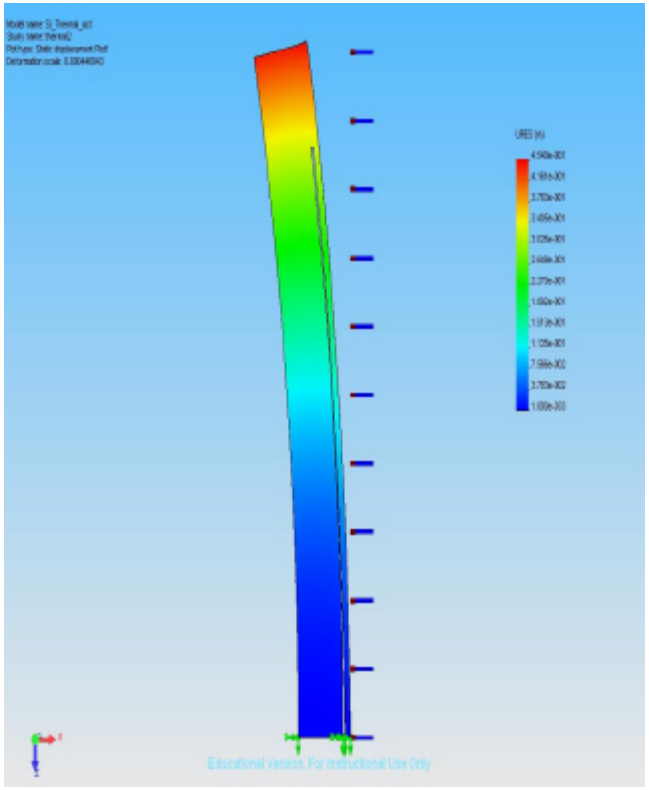
	L	Wb	Wg	Ws	Lx
1	2mm	200µm	10µm	**50µm**	**300µm**
2	2mm	200µm	10µm	**25µm**	**300µm**
3	2mm	200µm	10µm	**10µm**	**300µm**
4	2mm	200µm	**10µm**	**25µm**	**200µm**
5	2mm	200µm	**10µm**	**25µm**	**100µm**
6	2mm	200µm	**10µm**	**25µm**	**10µm**
7	2mm	200µm	**100µm**	**25µm**	**300µm**

All simulations performed with small arm at 400C

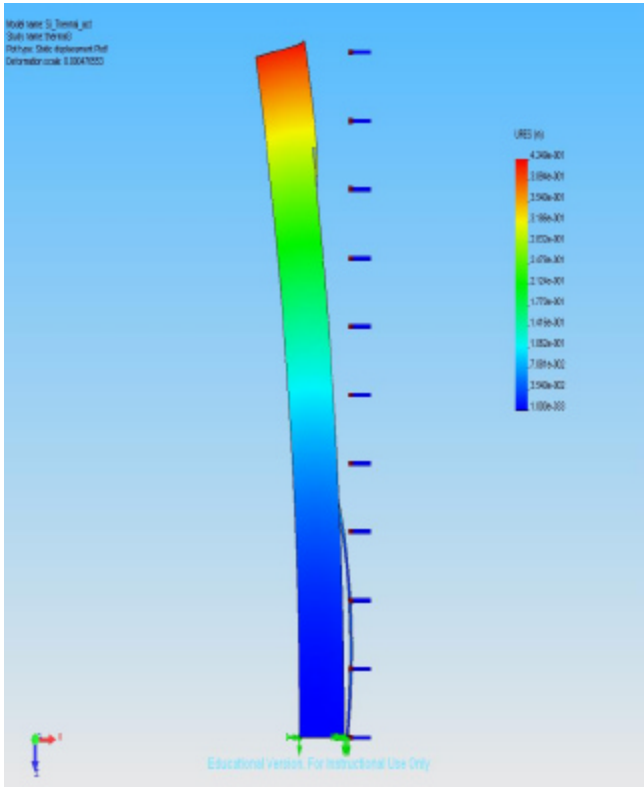
Varying small-arm width



10_50

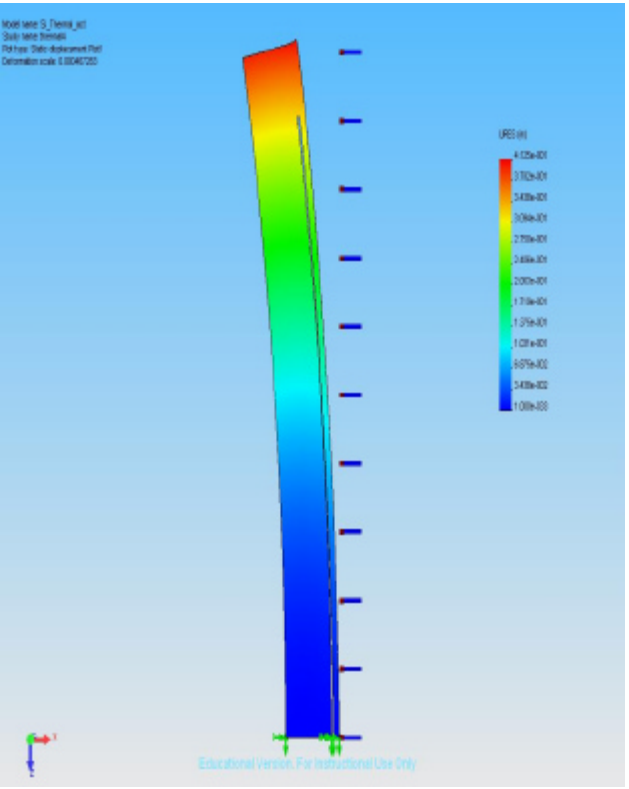


10_25

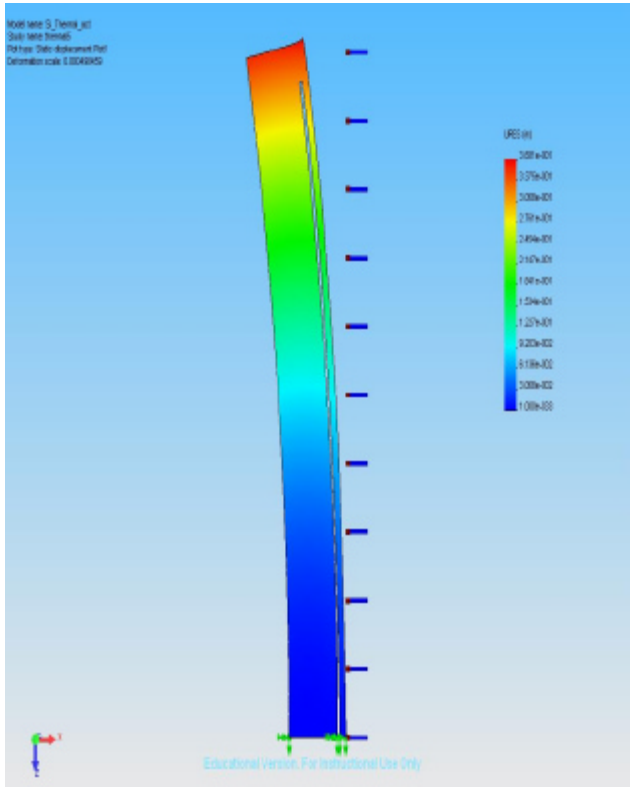


10_10

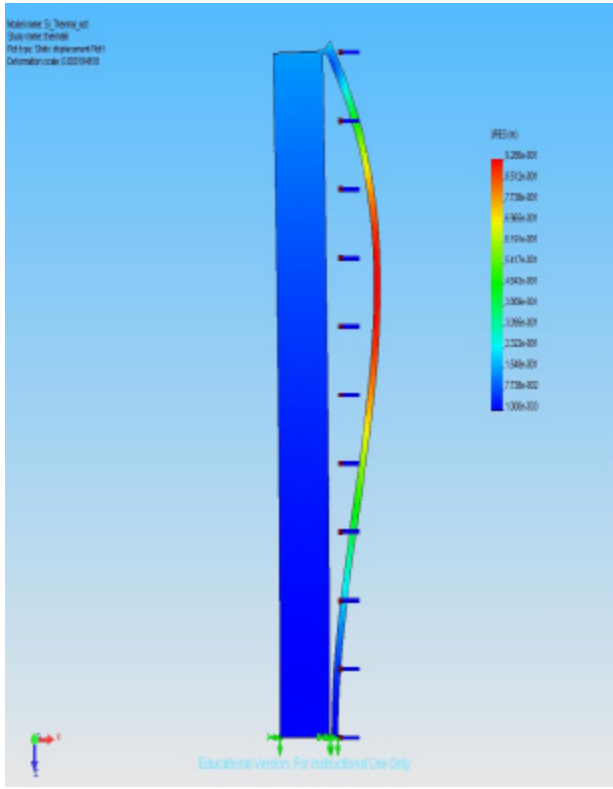
Varying Connection Width Lx



10_25_200

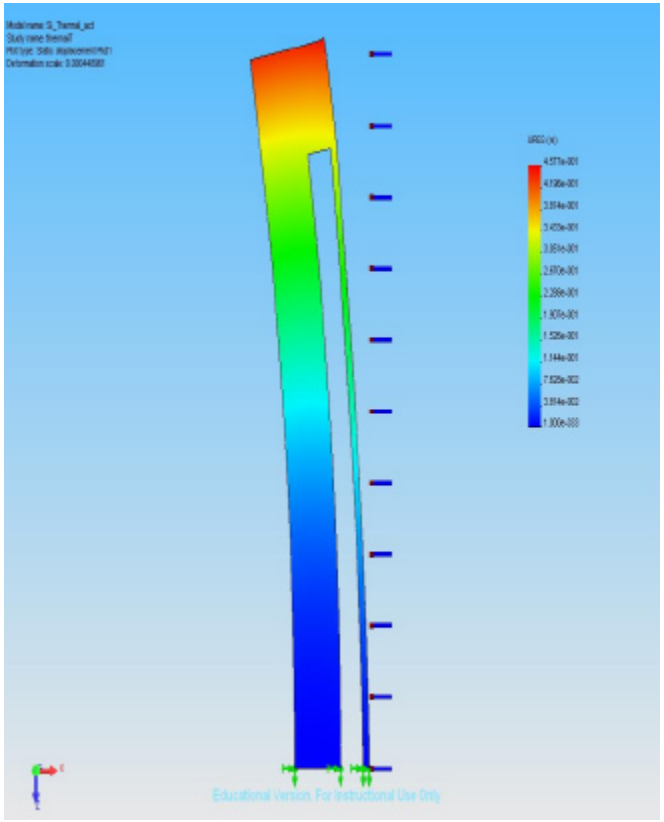


10_25_100

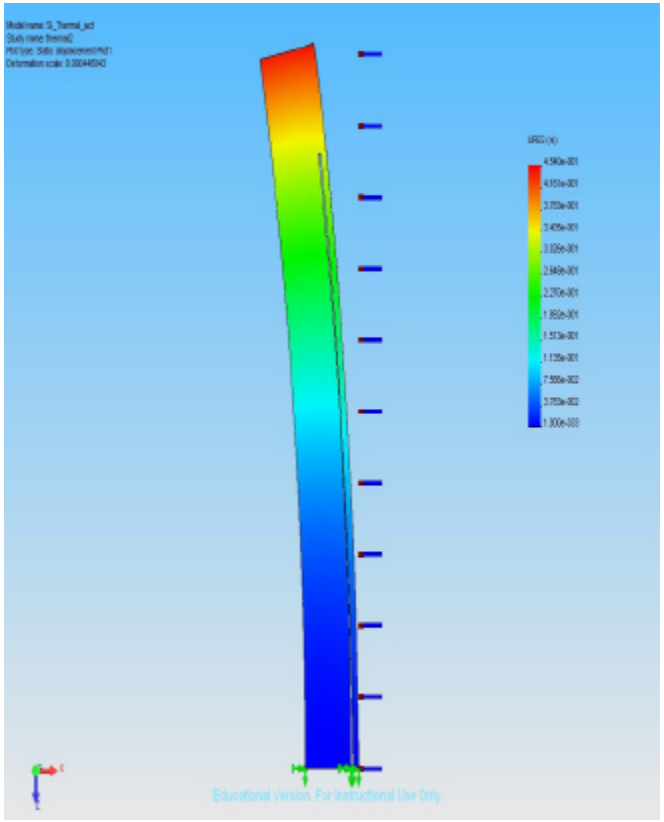


10_10_10

Increasing gap width



100_25_300

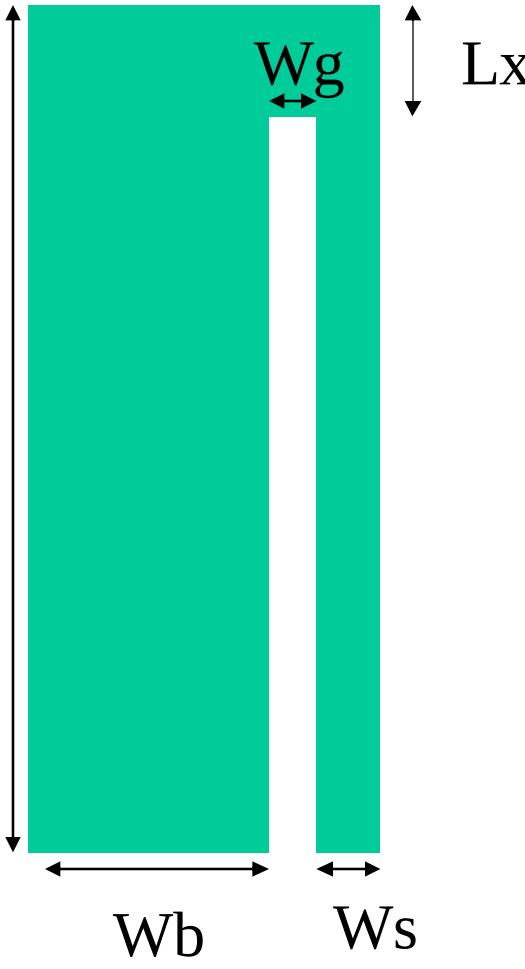


10_25_300

Summary

	L	Wb	Wg	Ws	Lx	Max. Disp.	Scale	Microns
1	2mm	200µm	10µm	**50µm**	**300µm**	**3.611e-1**	**0.000563**	**203.3**
2	2mm	200µm	10µm	**25µm**	**300µm**	**4.54e-1**	**0.000446**	**202.5**
3	2mm	200µm	10µm	**10µm**	**300µm**	-	-	
4	2mm	200µm	**10µm**	**25µm**	**200µm**	**4.125e-1**	**0.000467**	**192.7**
5	2mm	200µm	**10µm**	**25µm**	**100µm**	**3.681e-1**	**0.000498**	**183.3**
6	2mm	200µm	**10µm**	**25µm**	**10µm**	-	-	
7	2mm	200µm	**100µm**	**25µm**	**300µm**	**4.577e-1**	**0.000448**	**205.1**

L

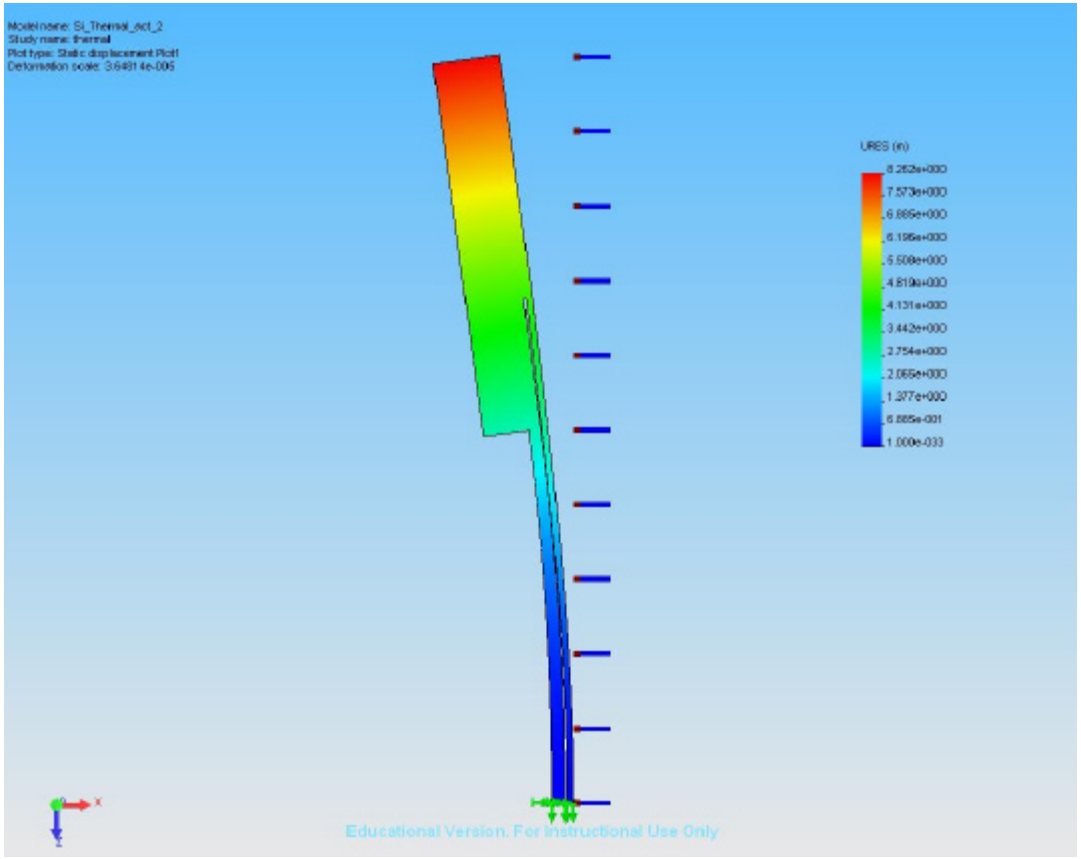


To obtain max. displacements Lx has to be maintained at 300µm. Wg does not affect the max. displacement much but needs to be >10µm to maintain structure integrity.
Max. displacement of 300µm obtained in next page.

Future Work

- Simulate structure that resembles the real design better (max displacement increases to 301µm vs. the 205µm of previous structure)

- Vary parameters and apply DOE techniques to investigate optimal parameters for max displacement.



Ws=25um, Lx=300um, Wg=10um
Max displacement=301.4µm