
Silicon Pressure Sensor Sensitivity Modification Based on Wafer Level Packaging Technology

Thongchai Thongvigitmanee, Chanakarn Klavohm, Amporn
Poyai, Win Bunjongpru, Nanthiya Hansupalak, and Itti
Rittaporn

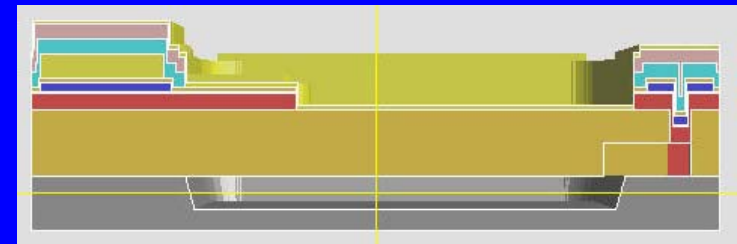
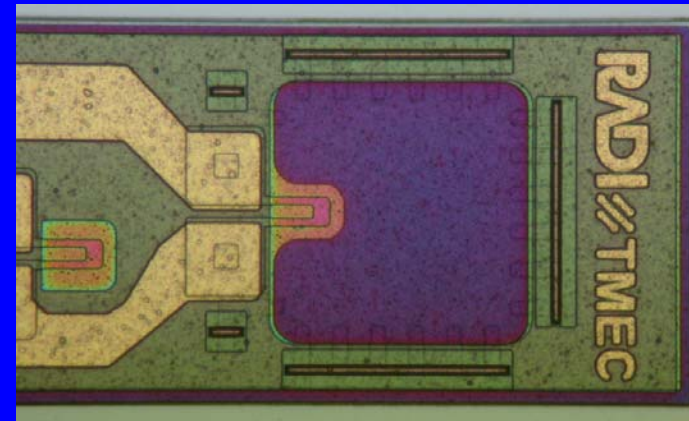
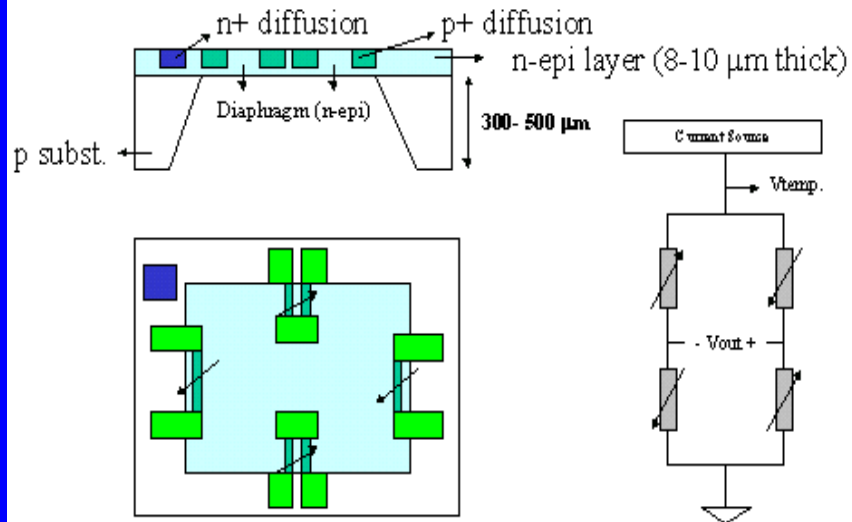
Thai Microelectronics Center (TMEC)
National Electronics and Computer Technology Center

Outlines

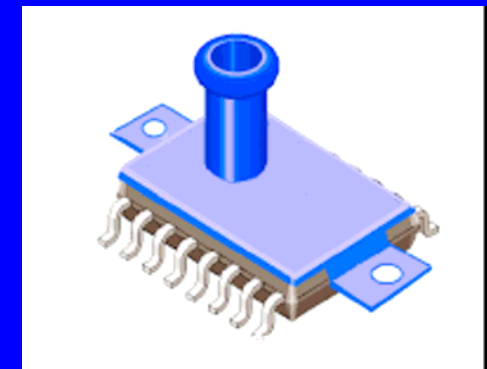
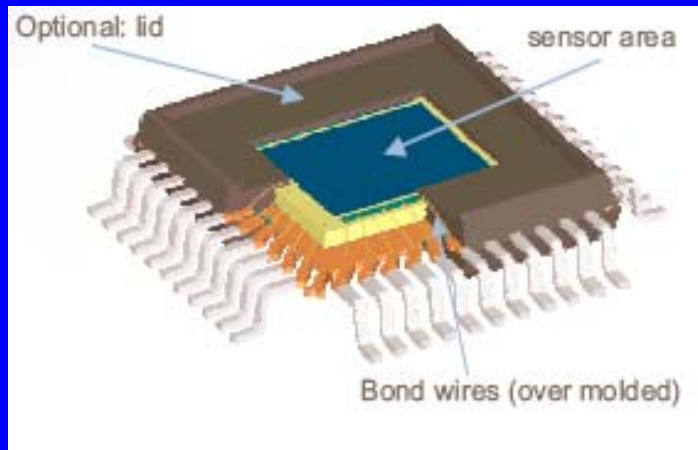
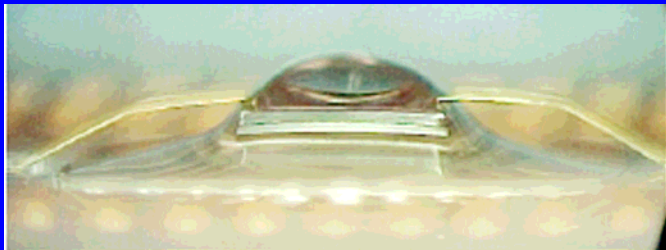
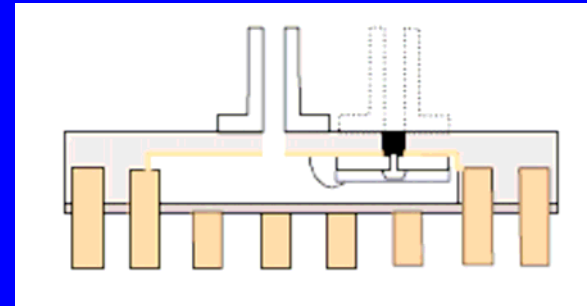
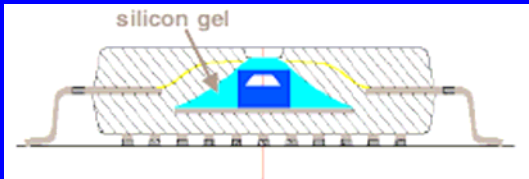
1. Introduction to pressure sensor
2. Wafer level packaging (WLP)
3. WLP technology to modifies pressure range
4. Simulation results
5. Process modeling
6. Conclusion

Pressure Sensor

Basic Structure



Pressure Sensor



WLP

WLP Vs. Conventional IC Packaging

Conventional IC Packaging



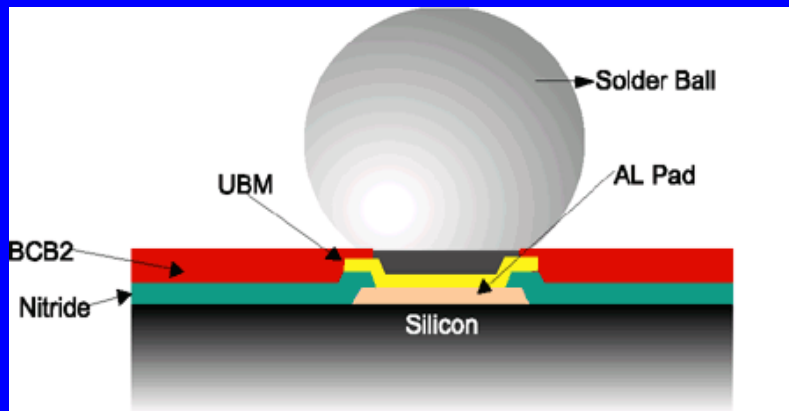
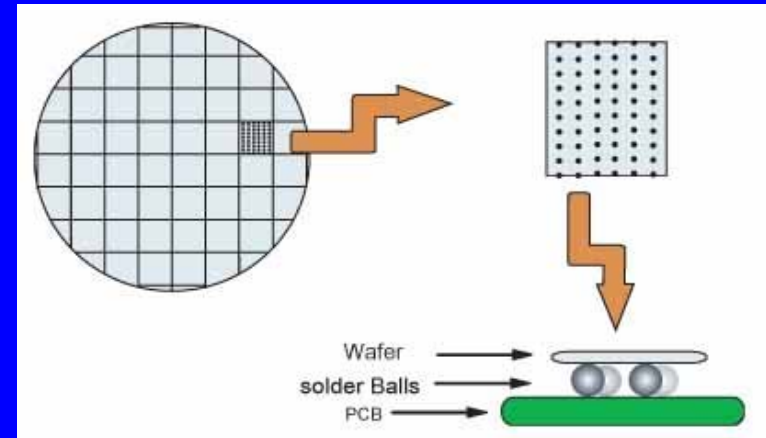
Nano-Wafer-Level Packaging



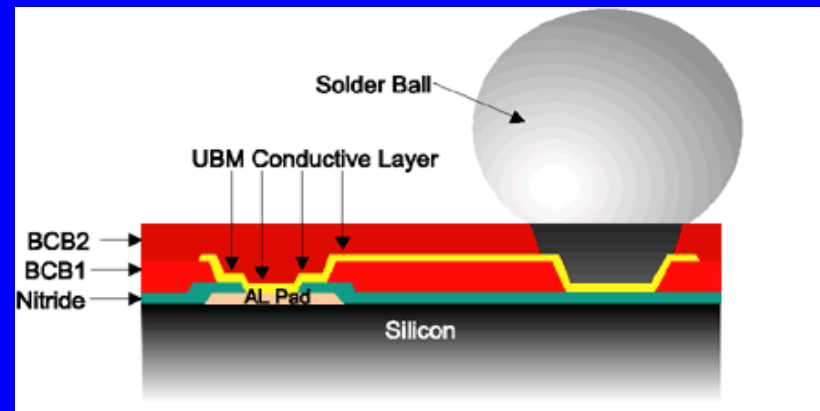
Advantages

- > 10x reduction in cost
- > Better electrical performance
- > Acceptable mechanical reliability
- > 100x interconnect
- > Size reduction

Figure 1: Comparing conventional IC packaging and wafer-level packaging.

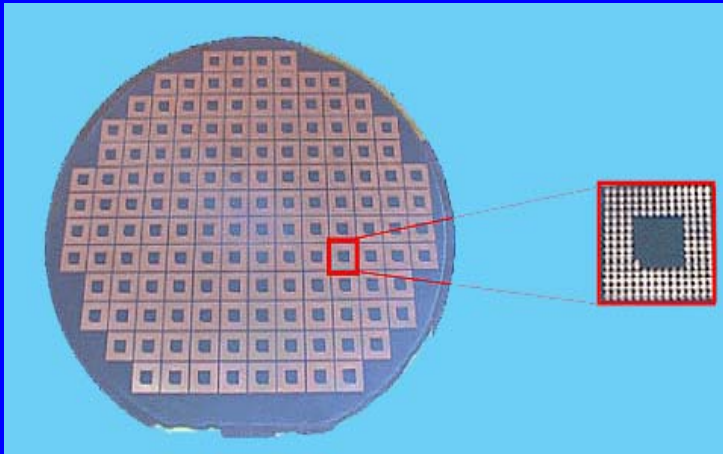


One Layer Ultra CSP™ Bump on I/O



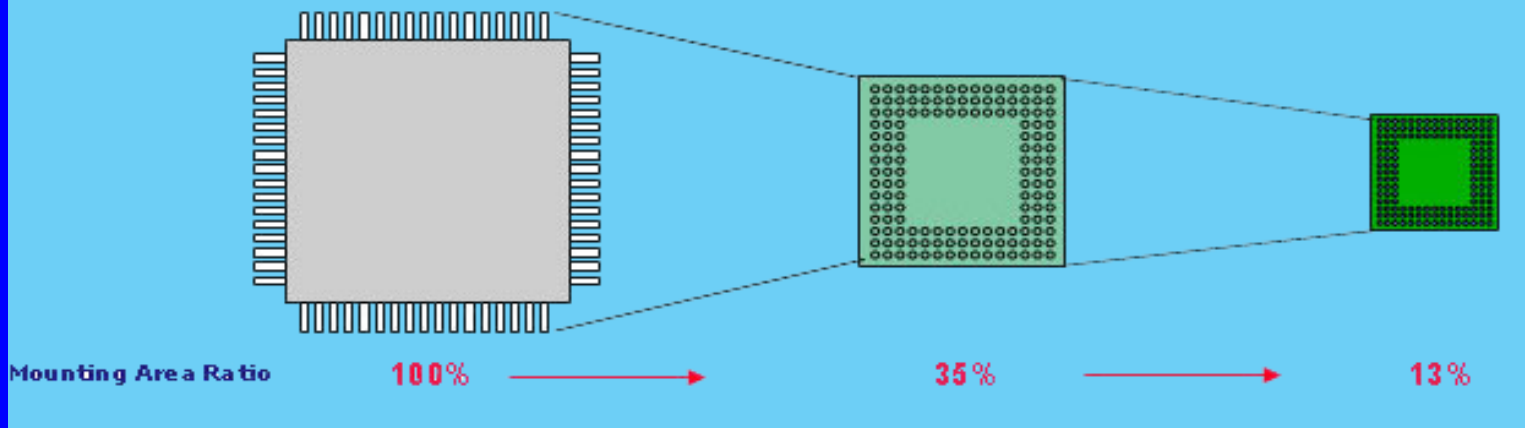
Redistributed Ultra CSP™ (2-layer BCB)

WLP



Chip Size 8 x 8 mm	144 Pin LQFP	144 Pin FBGA	144 Pin W-CSP
Pin Pitch	0.5 mm	0.8 mm	0.5 mm
Package Size	20 x 20 mm	13 x 13 mm	8 x 8 mm
Mounting Area	484 mm ²	169 mm ²	64 mm ²
Package Weight	1.4 g	0.3 g	0.08 g

Figure 2: Comparison of LQFP and FBGA to W-CSP

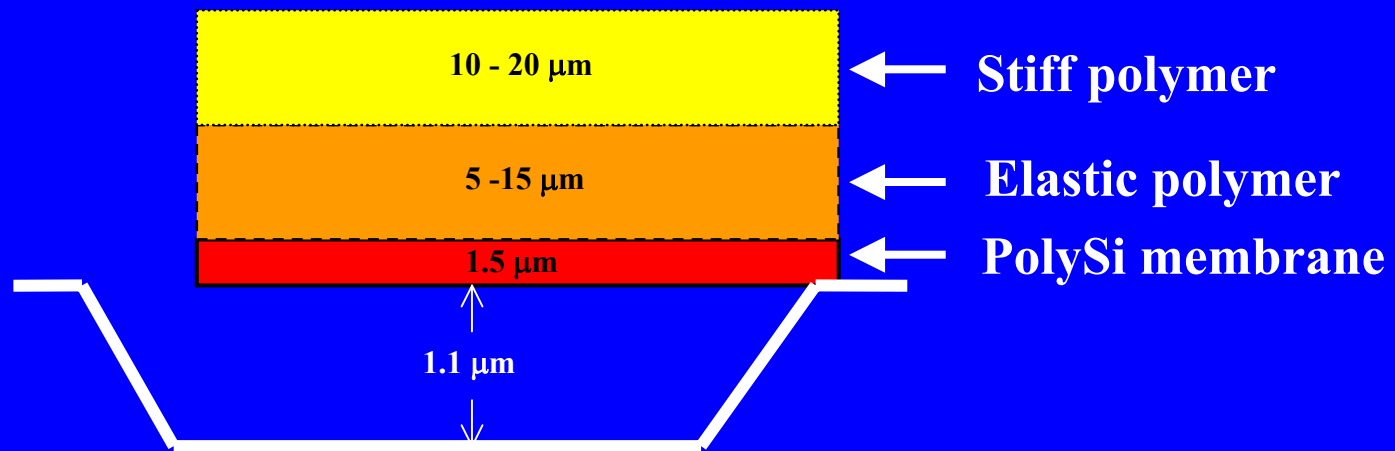
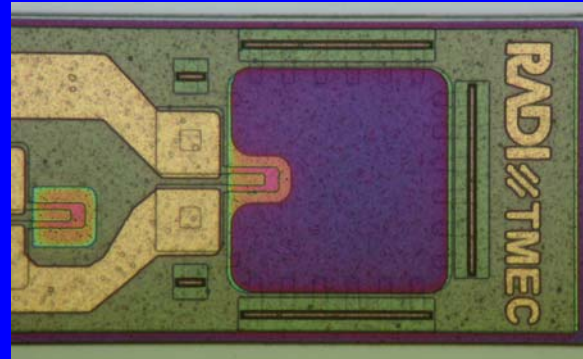


WLP Benefits

- Providing smallest system size (CSP)
- Lowest cost per I/O
- Lowest cost of electrical testing
- Lowest burn-in cost
- Enhances electrical performance

Keyword: Size & Cost

WLP technology to modified pressure range



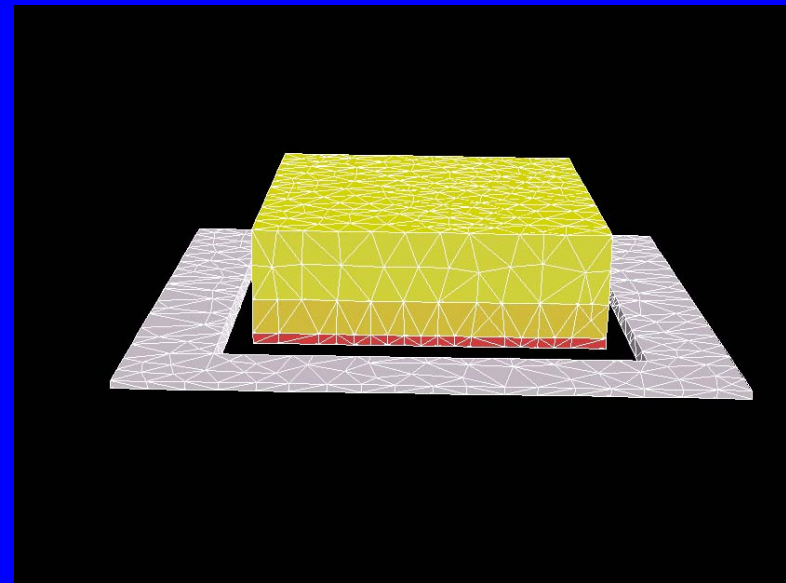
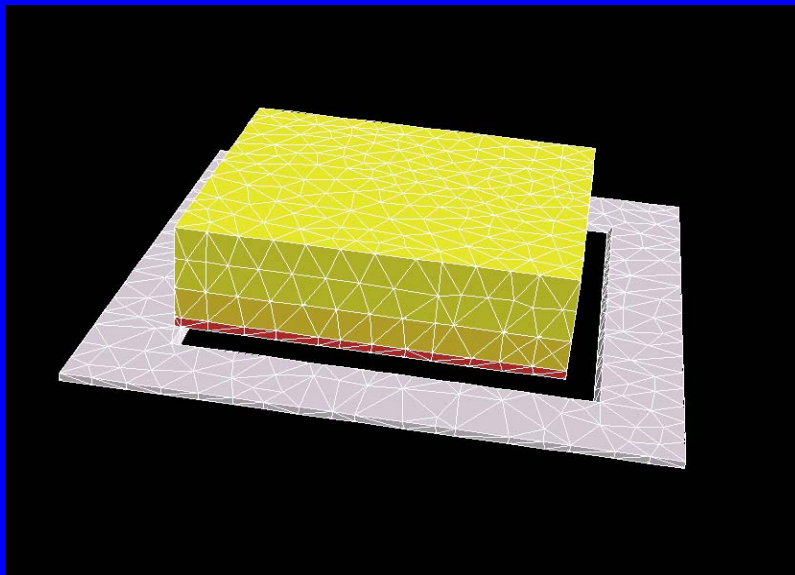
WLP for pressure sensor

Advantage of WLP over Silicon fabrication

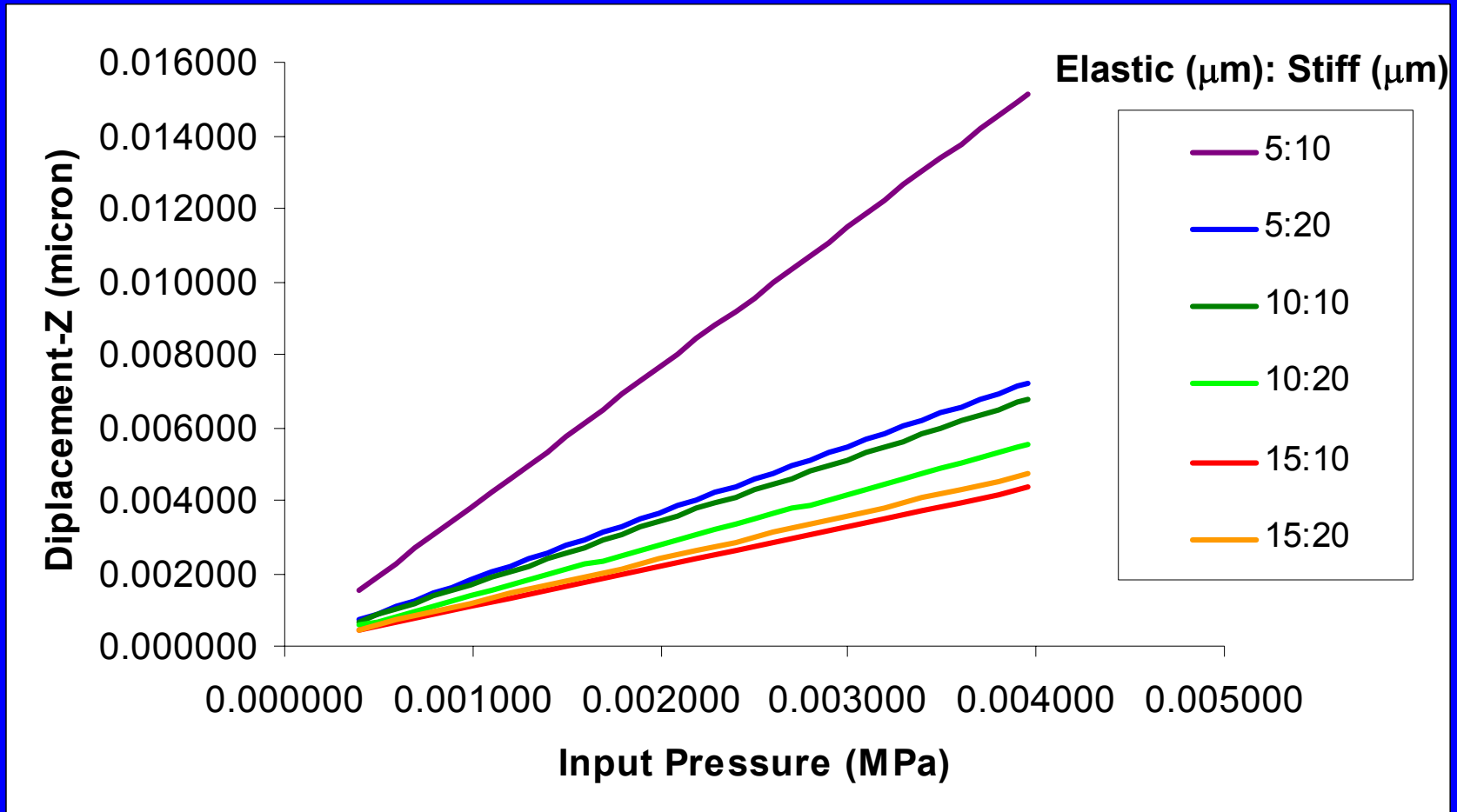
- Low temperature
- Low cost
- Less complex process
- Utilize optimal pressure sensor or known good die
- Less time to market

Simulation

- Utilize CoventorWare to verified concept idea
- CoventorWare simulation based on finite element method



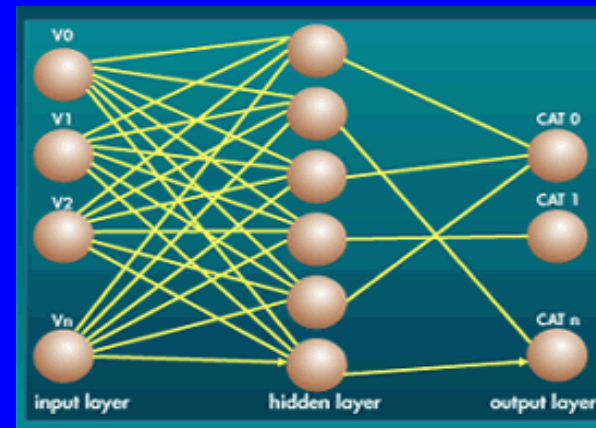
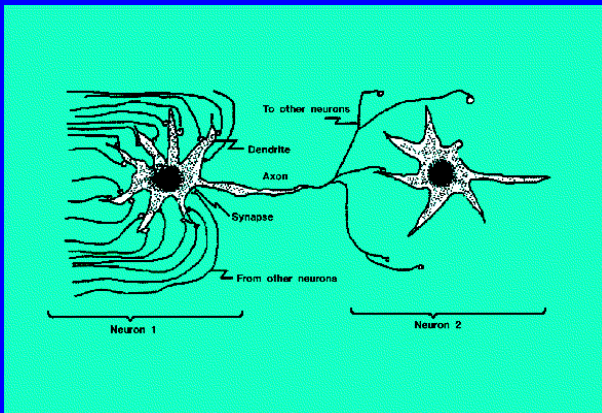
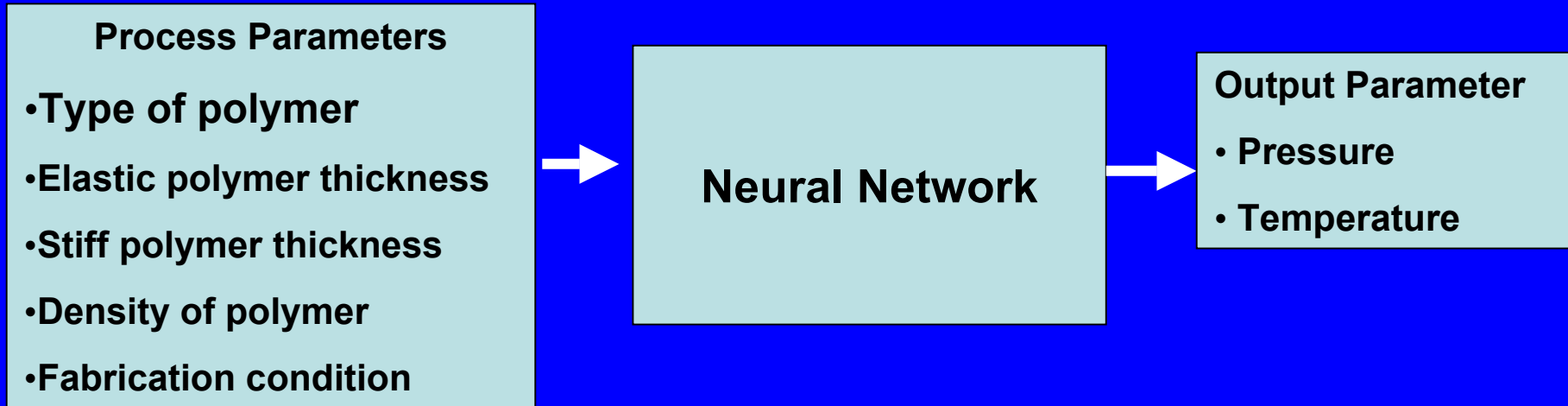
Simulation



Process Modeling

- Determine input and output parameter
- Study effect of input parameters vs. output parameters
- Design for reliability
- Determine a samples space to cover the desired output ranges
- Design experiment with the statistical significant parameters
- Utilize intelligent manufacturing process based on neural network

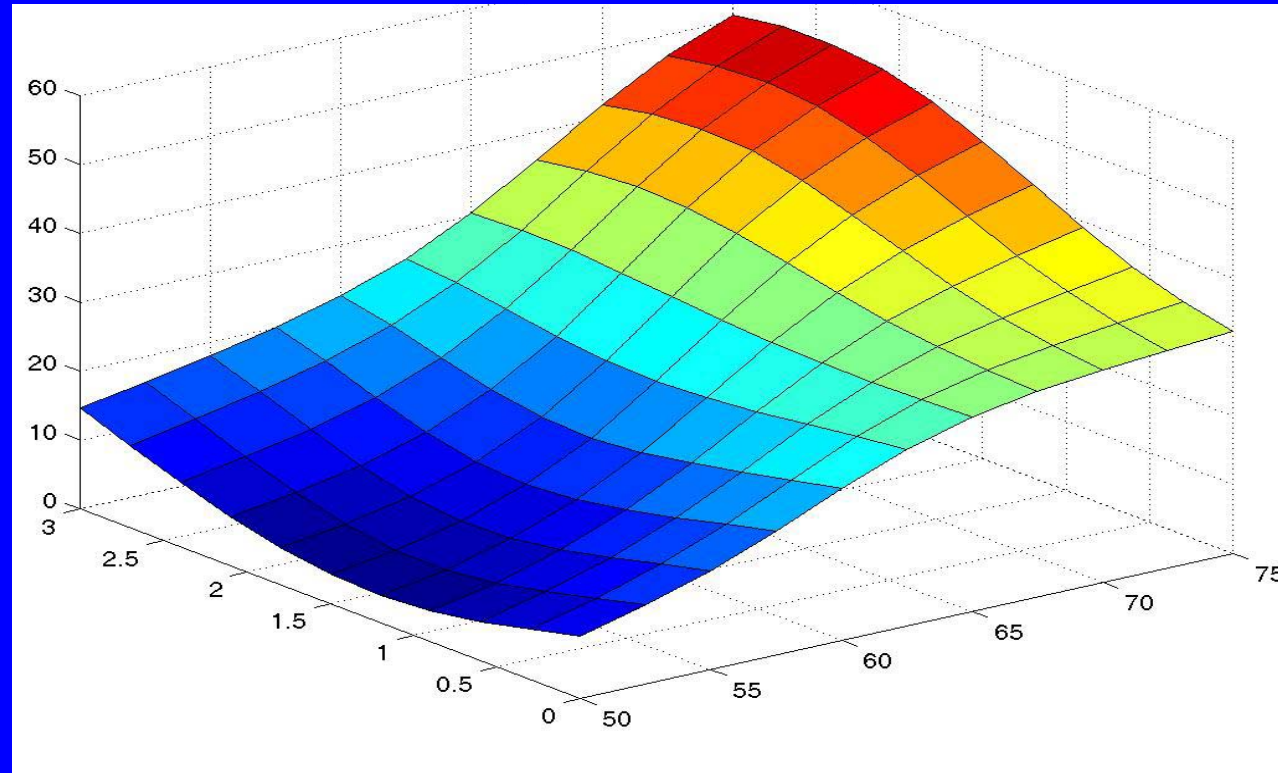
Process Modeling



Process Modeling

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Output



Input 1

Input 2

Response Surface Modeling for input and output

Conclusion

- The novel method to increase the pressure range of optimal pressure sensor is presented.
- This promising method is lower cost, less complicated process, and less time to market.
- Neural network process modeling is presented.

Acknowledgement

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