Supplementary Materials: 3D printed microfluidic features using dose control in X, Y, and Z dimensions

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The supplementary information contains all the images used for measurements of interior and exterior features. The standard deviation is given for each measurement at *n* = 3. The tables are organized as follows:

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1. Exterior Features

1.1. Ridges

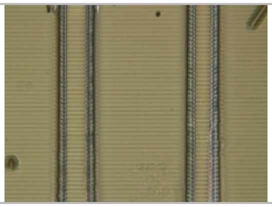
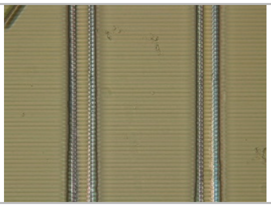
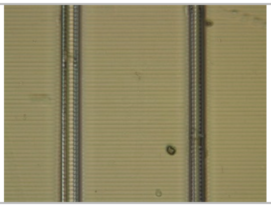
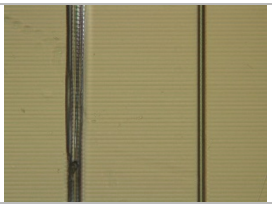
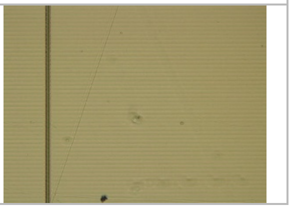
Designed Trench Width (µm)	76.0 and 68.4	60.8 and 53.2	45.6 and 38.0	30.4 and 22.8	15.2 and 7.6
Measured Trench Width (µm)	62.0 ±0.9 and 55.3 ±1.0	48.5 ± 2.2and 40.6 ± 0.9	30.7 ± 0.8 and 23.4 ±0.2	16.1 ±1.3 and 7.5 ±0.5	3.2 ±0.3 and -
Image					

Figure S1. Exterior ridges exposed for 500 ms. Widths range from 10 to 1 pixels from left to right. The designed and measured widths are given as well as images of the ridges.

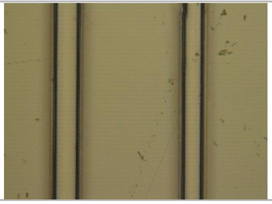
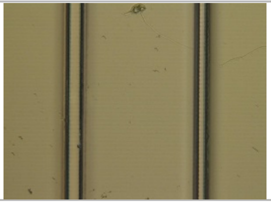
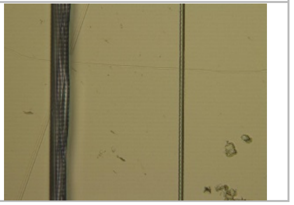
Designed Trench Width (µm)	76.0 and 68.4	60.8 and 53.2	45.6 and 38.0	30.4 and 22.8	15.2 and 7.6
Measured Trench Width (µm)	72.0 ± 0.3 and 64.4± 0.5	56.8 ± 0.3 and 48.4 ± 0.6	40.6 ±0.2 and 32.8 ± 0.9	24.9 ± 0.7 and 16.3 ± 1.5	7.2 ± 0.7 and 2.9 ± 0.4
Image					

Figure S2. Exterior ridges exposed for 1000 ms. Widths range from 1 to 10 pixels from left to right. The designed and measured widths are given as well as images of the ridges.

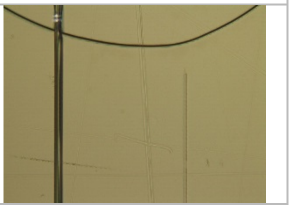
Designed Trench Width (µm)	76.0 and 68.4	60.8 and 53.2	45.6 and 38.0	30.4 and 22.8	15.2 and 7.6
Measured Trench Width (µm)	77.1 ± 0.3 and 69.2 ± 0.4	61.7 ± 0.2 and 54.0 ± 0.3	45.9 ± 0.3 and 37.9 ± 0.3	29.8 ± 1.1 and 25.3 ± 1.3	15.1 ± 0.6 and 7.1 ± 0.8
Image					

Figure S3. Exterior ridges exposed for 1500 ms. Widths range from 1 to 10 pixels from left to right. The designed and measured widths are given as well as images of the ridges.

1.2. *Trenches with edge compensation*

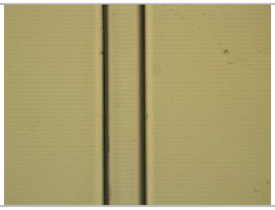
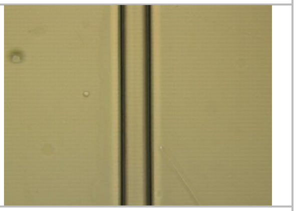
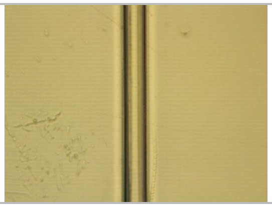
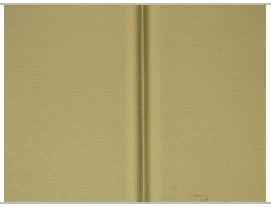
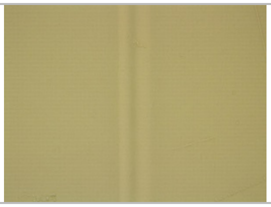
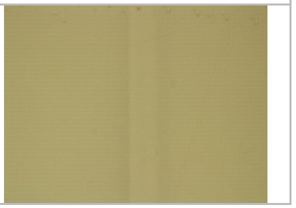
Designed Trench Width (µm)	76.0	68.4	60.8	53.2	45.6
Measured Trench Width (µm)	77.3 ± 0.6	68.7 ± 0.3	61.7 ± 0.4	50.5 ± 0.6	38.9 ± 0.4
Image					
Designed Trench Width (µm)	38.0	30.4	22.8	15.2	7.6
Measured Trench Width (µm)	28.6 ± 0.7	5.5 ± 0.6	-	-	-
Image					

Figure S4. Exterior trenches with edge compensation exposed for 500 ms. Widths range from 10 to 1 pixels from left to right across two rows. The designed and measured widths are given as well as images of the trenches.

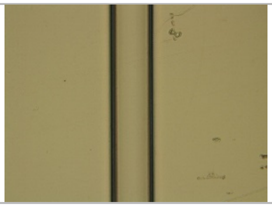
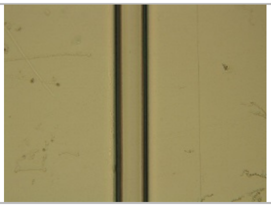
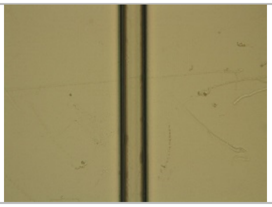
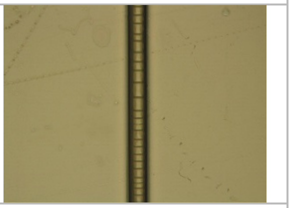
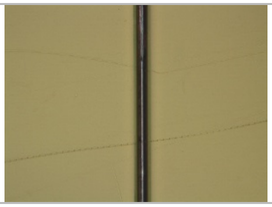
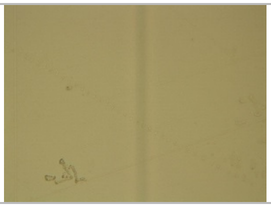
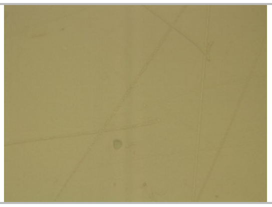
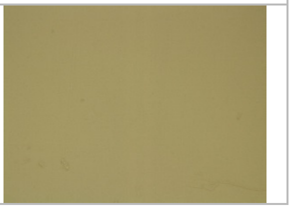
Designed Trench Width (μm)	76.0	68.4	60.8	53.2	45.6
Measured Trench Width (μm)	62.8 ± 0.2	53.5 ± 0.5	43.6 ± 0.6	33.5 ± 0.3	20.7 ± 0.4
Image					
Designed Trench Width (μm)	38.0	30.4	22.8	15.2	7.6
Measured Trench Width (μm)	13.1 ± 1.9	-	-	-	-
Image					

Figure S5. Exterior trenches with edge compensation exposed for 1000 ms. Widths range from 10 to 1 pixels from left to right across two rows. The designed and measured widths are given as well as images of the trenches.

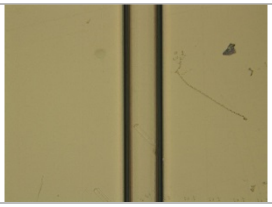
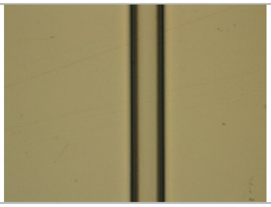
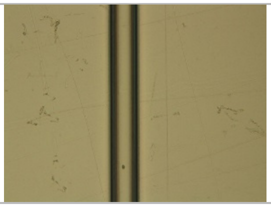
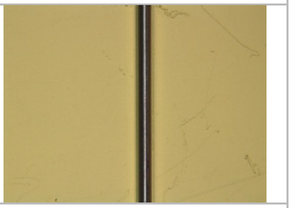
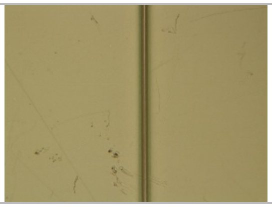
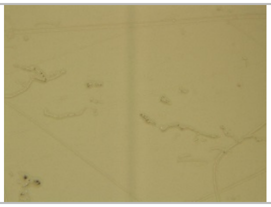
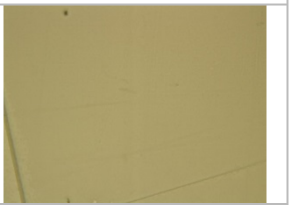
Designed Trench Width (μm)	76.0	68.4	60.8	53.2	45.6
Measured Trench Width (μm)	52.0 ± 0.3	42.9 ± 0.5	31.8 ± 0.2	22.2 ± 0.5	11.4 ± 0.4
Image					
Designed Trench Width (μm)	38.0	30.4	22.8	15.2	7.6
Measured Trench Width (μm)	9.3 ± 0.7	-	-	-	-
Image					

Figure S6. Exterior trenches with edge compensation exposed for 1500 ms. Widths range from 10 to 1 pixels from left to right across two rows. The designed and measured widths are given as well as images of the trenches.

1.3. Trenches without edge compensation

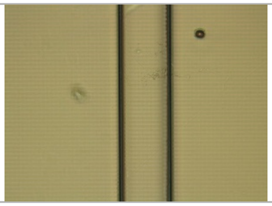
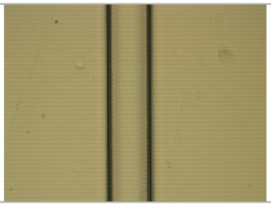
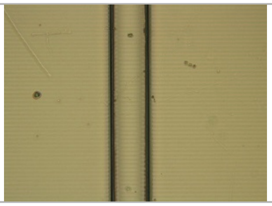
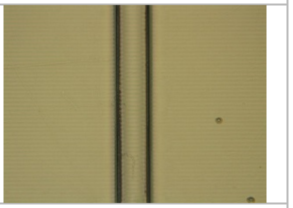
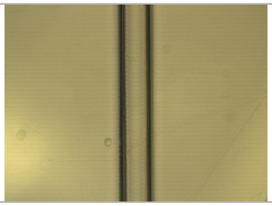
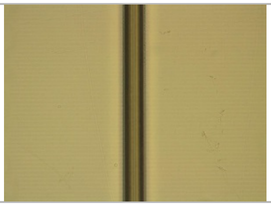
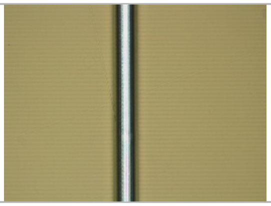
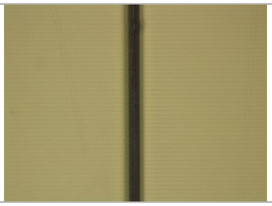
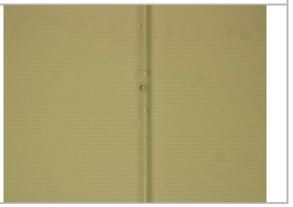
Designed Trench Width (µm)	76.0	68.4	60.8	53.2	45.6
Measured Trench Width (µm)	81.9 ± 0.5	74.3 ± 0.6	66.7 ± 0.9	58.1 ± 0.5	49.0 ± 1.2
Image					
Designed Trench Width (µm)	38.0	30.4	22.8	15.2	7.6
Measured Trench Width (µm)	41.7 ± 0.4	21.1 ± 0.6	14.2 ± 0.6	10.1 ± 0.4	-
Image					

Figure S7. Exterior trenches without edge compensation exposed for 500 ms. Widths range from 10 to 1 pixels from left to right. The designed and measured widths are given as well as images of the trenches.

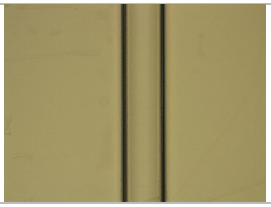
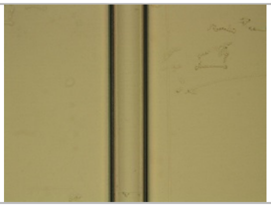
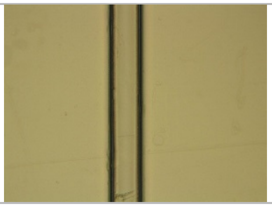
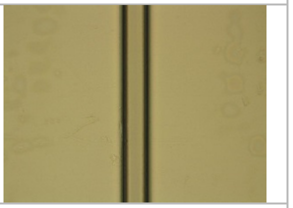
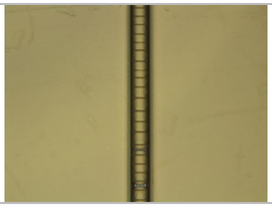
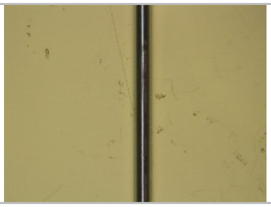
Designed Trench Width (µm)	76.0	68.4	60.8	53.2	45.6
Measured Trench Width (µm)	72.4 ± 0.3	64.3 ± 0.4	55.6 ± 0.2	44.9 ± 0.5	33.6 ± 0.4
Image					
Designed Trench Width (µm)	38.0	30.4	22.8	15.2	7.6
Measured Trench Width (µm)	21.1 ± 0.3	12.9 ± 1.5	11.5 ± 0.9	-	-
Image					

Figure S8. Exterior trenches without edge compensation exposed for 1000 ms. Widths range from 10 to 1 pixels from left to right across two rows. The designed and measured widths are given as well as images of the trenches.

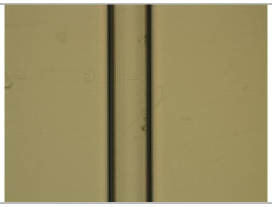
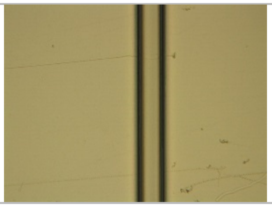
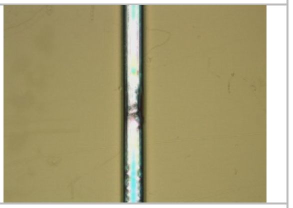
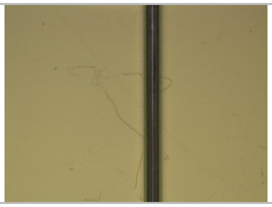
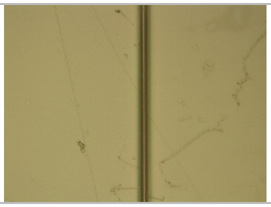
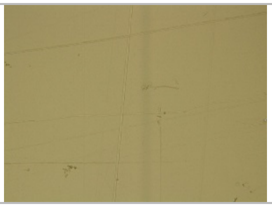
Designed Trench Width (µm)	76.0	68.4	60.8	53.2	45.6
Measured Trench Width (µm)	62.4 ± 0.2	53.6 ± 0.1	44.2 ± 0.4	33.8 ± 0.2	24.7 ± 0.6
Image					
Designed Trench Width (µm)	38.0	30.4	22.8	15.2	7.6
Measured Trench Width (µm)	16.5 ± 0.3	8.6 ± 0.7	-	-	-
Image					

Figure S9. Exterior trenches without edge compensation exposed for 1500 ms. Widths range from 10 to 1 pixels from left to right across two rows. The designed and measured widths are given as well as images of the trenches.

2. Interior Features

2.1. Ridges

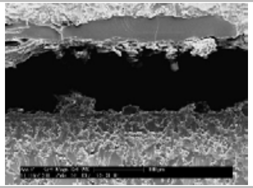
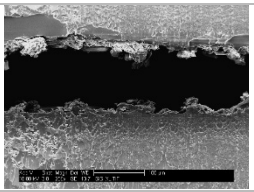
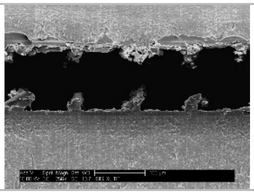
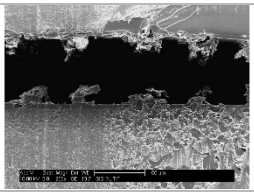
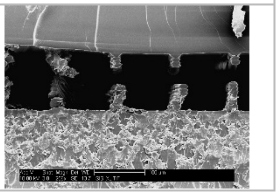
Designed Ridge Height (layers)	1 and 2	3 and 4	5 and 6	7 and 8	9 and 10
Measured Ridge Height (µm)	9.8 and 18.1	18.8 and 27.8	33.8 and 38.0	55.7 and 40.1	78.5 and 79.9
Measured Gap to Ceiling (µm)	129.3 ± 0.4 and 126.3 ± 0.8	127.8 ± 2.0 and 102.3 ± 0.9	87.2 ± 5.0 and 94.7 ± 3.1	78.2 ± 4.6 and 90.8 ± 2.8	44.8 ± 2.3 and 32.1 ± 0.4
Image					

Figure S10. Interior ridges exposed for 500 ms. Heights range from 1 to 10 layers from left to right. The designed height, measured height, and height from top of the ridge to the top of the void feature (gap height), are given, as well as images of the ridges.

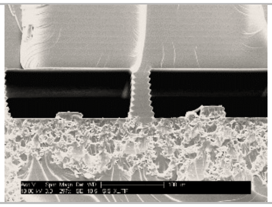
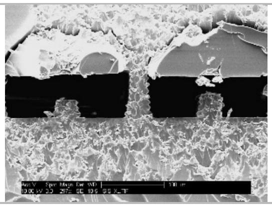
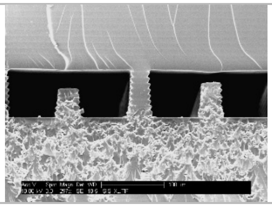
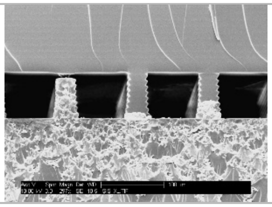
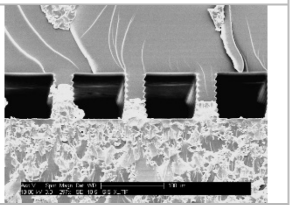
Designed Ridge Height (layers)	1 and 2	3 and 4	5 and 6	7 and 8	9 and 10
Measured Ridge Height (μm)	9.7 and 18.2	27.9 and 37.7	46.1 and 55.2	63.6 and 72.1	70.1 and 72.1
Measured Gap to Ceiling (μm)	69.5 ± 1.0 and 58.4 ± 0.8	39.6 ± 0.7 and 27.3 ± 0.7	27.9 ± 1.0 and 18.2 ± 1.0	7.1 ± 0.4 and -	- and -
Image					

Figure S11. Interior ridges exposed for 1000 ms. Heights range from 1 to 10 layers from left to right. The designed height, measured height, and height from top of the ridge to the top of the void feature (gap height), are given, as well as images of the ridges.

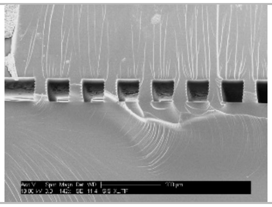
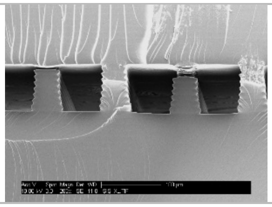
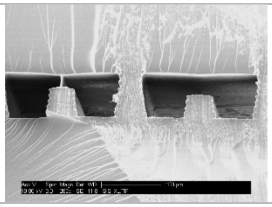
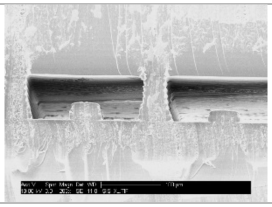
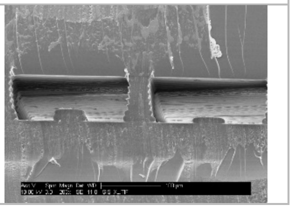
Designed Ridge Height (layers)	10, 9, and 8	7 and 6	5 and 4	3 and 2	2 and 1
Measured Ridge Height (μm)	77.6, 74.8, and 73.5	69.4 and 62.6	48.3 and 38.8	29.3 and 19.1	19.1 and 9.5
Measured Gap to Ceiling (μm)	-, -, and -	6.8 ± 0.7 and 17.7 ± 0.4	19.7 ± 1.2 and 33.3 ± 0.7	42.9 ± 0.4 and 55.1 ± 0.7	55.1 ± 0.7 and 63.3 ± 0.7
Image					

Figure S12. Interior ridges exposed for 1500 ms. Heights range from 10 to 1 layers from left to right. The designed height, measured height, and height from top of the ridge to the top of the void feature (gap height), are given, as well as images of the ridges.

2.2. *Trenches with edge compensation*

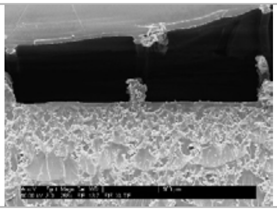
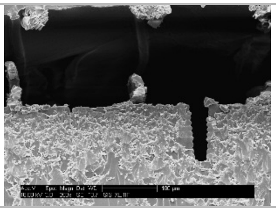
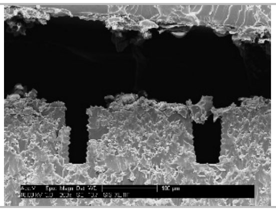
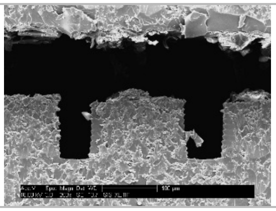
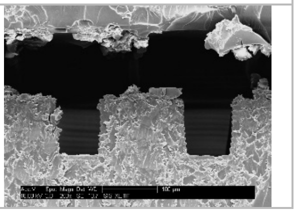
Designed Trench Width (μm)	7.6 and 15.2	22.8 and 30.4	38.0 and 45.6	53.2 and 60.8	68.4 and 76.0
Measured Trench Width (μm)	- and -	- and 25.1 ± 0.9	37.3 ± 1.2 and 50.4 ± 0.8	58.1 ± 1.2 and 69.2 ± 0.8	77.4 ± 0.8 and 84.7 ± 0.9
Image					

Figure S13. Interior trenches with edge compensation exposed for 500 ms. Widths range from 1 to 10 pixels from left to right. The designed and measured widths are given as well as images of the trenches.

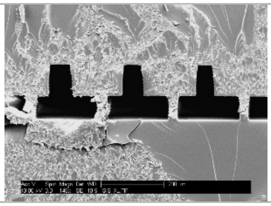
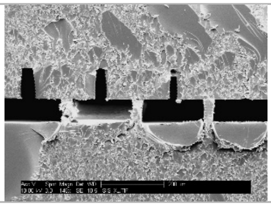
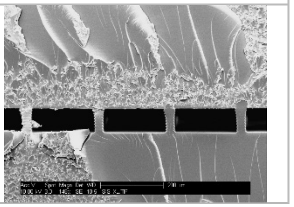
Designed Trench Width (μm)	76.0, 68.4 and 60.8	53.2, 45.6, 38.0 and 30.4	22.8, 15.2, and 7.6
Measured Trench Width (μm)	71.4 ± 1.3, 62.8 ± 1.5, and 52.8 ± 0.8	42.4 ± 0.8, 34.2 ± 0.8, 21.6 ± 0.8, and -	-, -, and -
Image			

Figure S14. Interior trenches with edge compensation exposed for 1000 ms. Widths range from 10 to 1 pixels from left to right. The designed and measured widths are given as well as images of the trenches.

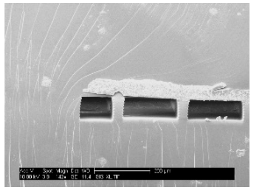
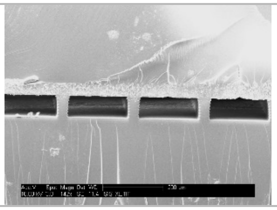
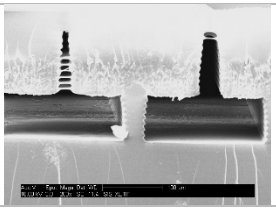
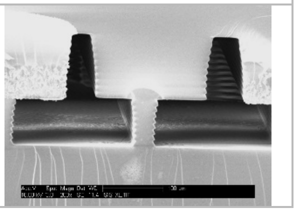
Designed Trench Width (μm)	7.6 and 15.2	22.8, 30.4, 38.0, and 45.6	53.2 and 60.8	68.4 and 76.0
Measured Trench Width (μm)	- and -	-, -, -, and -	17.7 ± 0.7 and 30.8 ± 1.0	43.1 ± 0.8 and 55.8 ± 0.7
Image				

Figure S15. Interior trenches with edge compensation exposed for 1500 ms. Widths range from 1 to 10 pixels from left to right. The designed and measured widths are given as well as images of the trenches.

2.3. *Trenches without edge compensation*

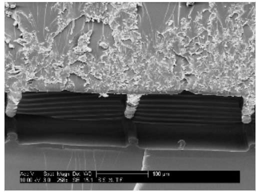
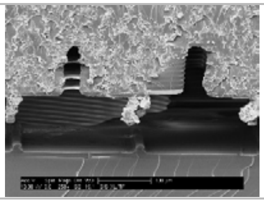
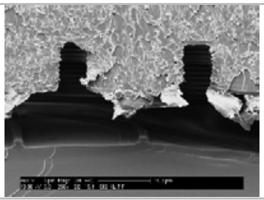
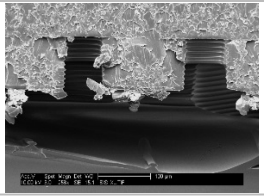
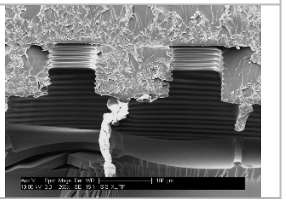
Designed Trench Width (μm)	7.6 and 15.2	22.8 and 30.4	38.0 and 45.6	53.2 and 60.8	68.4 and 76.0
Measured Trench Width (μm)	- and -	30.8 ± 0.8 and 39.1 ± 0.8	50.9 ± 0.4 and 54.4 ± 0.9	57.9 ± 0.8 and 66.9 ± 0.8	83.2 ± 0.9 and 94.7 ± 1.3
Image					

Figure S16. Interior trenches without edge compensation exposed for 500 ms. Widths range from 1 to 10 pixels from left to right. The designed and measured widths are given as well as images of the trenches.

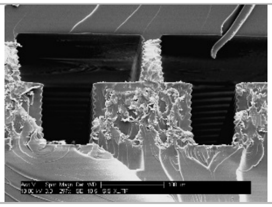
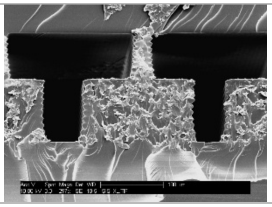
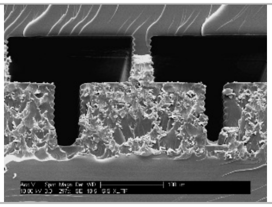
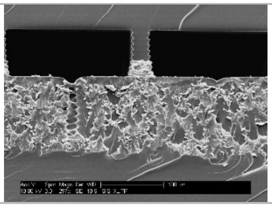
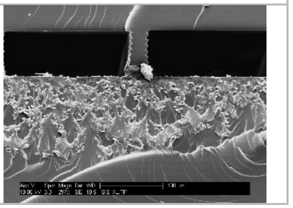
Designed Trench Width (µm)	76.0 and 68.4	60.8 and 53.2	45.6 and 38.0	30.4 and 22.8	15.2 and 7.6
Measured Trench Width (µm)	80.1 ± 0.4 and 71.0 ± 0.7	61.0 ± 0.7 and 46.3 ± 0.8	40.7 ± 1.5 and 27.9 ± 0.7	- and -	- and -
Image					

Figure S17. Interior trenches without edge compensation exposed for 1000 ms. Widths range from 10 to 1 pixels from left to right. The designed and measured widths are given as well as images of the trenches.

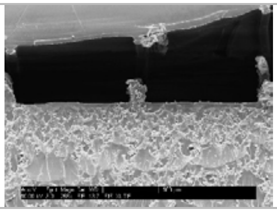
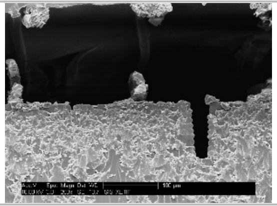
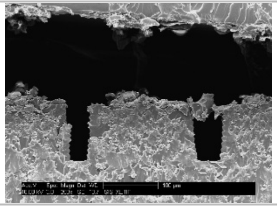
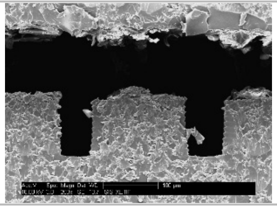
Designed Trench Width (µm)	7.6, 15.2, 22.8, and 30.4	38.0 and 45.6	53.2 and 60.8	68.4 and 76.0
Measured Trench Width (µm)	-, -, -, and -	- and 21.8 ± 0.7	34.0 ± 0.4 and 42.8 ± 0.7	57.6 ± 0.4 and 67.4 ± 0.7
Image				

Figure S18. Interior trenches without edge compensation exposed for 1500 ms. Widths range from 1 to 10 pixels from left to right. The designed and measured widths are given as well as images of the trenches.

2.4. Pillars

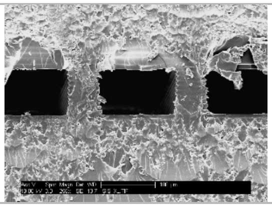
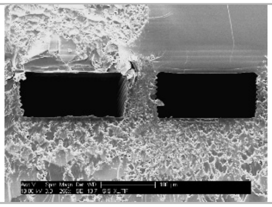
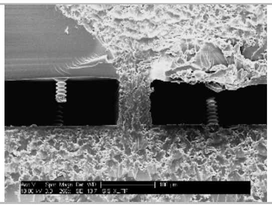
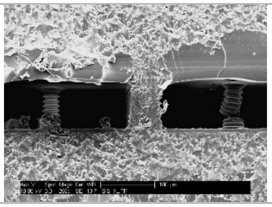
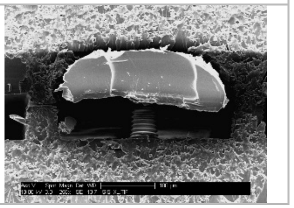
Designed Pillar Diameter (µm)	7.6, 15.2, and 22.8	30.4 and 38.0	45.6 and 53.2	60.8 and 68.4	76.0
Measured Pillar Diameter (µm)	-, -, and -	- and -	19.3 ± 0.4 and 21.1 ± 0.8	31.1 ± 0.4 and 40.4 ± 0.4	49.4 ± 0.4
Image					

Figure S19-Interior pillars exposed for 500 ms. Widths range from 1 to 10 pixels from left to right. The designed and measured diameters are given as well as images of the pillars.

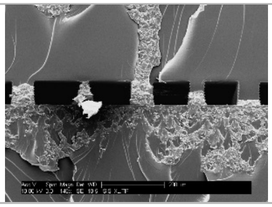
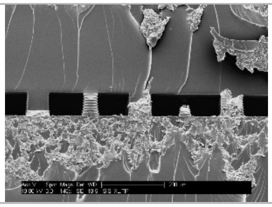
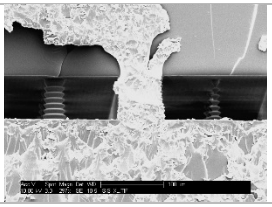
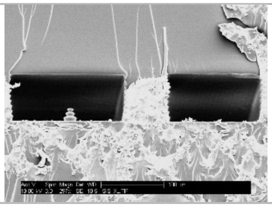
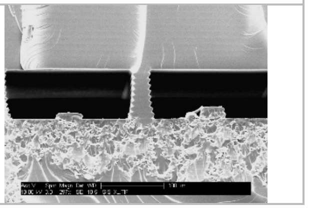
Designed Pillar Diameter (µm)	76.0 and 68.4	60.8 and 53.2	45.6 and 38.0	30.4 and 22.8	15.2 and 7.6
Measured Pillar Diameter (µm)	48.5 ± 0.8 and 50.2 ± 0.8	47.2 ± 0.8 and 35.1 ± 0.1	33.6 ± 0.8 and 16.7 ± 0.4	13.6 ± 1.1 and -	- and -
Image					

Figure S20. Interior pillars exposed for 1000 ms. Widths range from 10 to 1 pixels from left to right. The designed and measured diameters are given as well as images of the pillars.

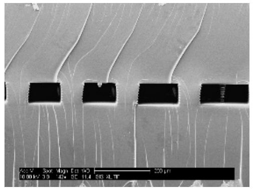
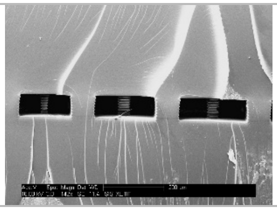
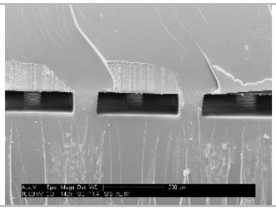
Designed Pillar Diameter (μm)	7.6, 15.2, 22.8 and 30.4	38.0, 45.6, and 53.2	60.8, 68.4 and 76.0
Measured Pillar Diameter (μm)	-, 12.2 ± 2.4, -, and 18.6 ± 0.8	24.9 ± 0.8, 36.3 ± 0.8, and 41.7 ± 0.8	52.6 ± 0.8, 58.0 ± 1.6, and 68.5 ± 0.8
Image			

Figure S21. Interior pillars exposed for 1500 ms. Widths range from 1 to 10 pixels from left to right. The designed and measured diameters are given as well as images of the pillars.