Electronic Supplementary Material (ESI) for Nanoscale.

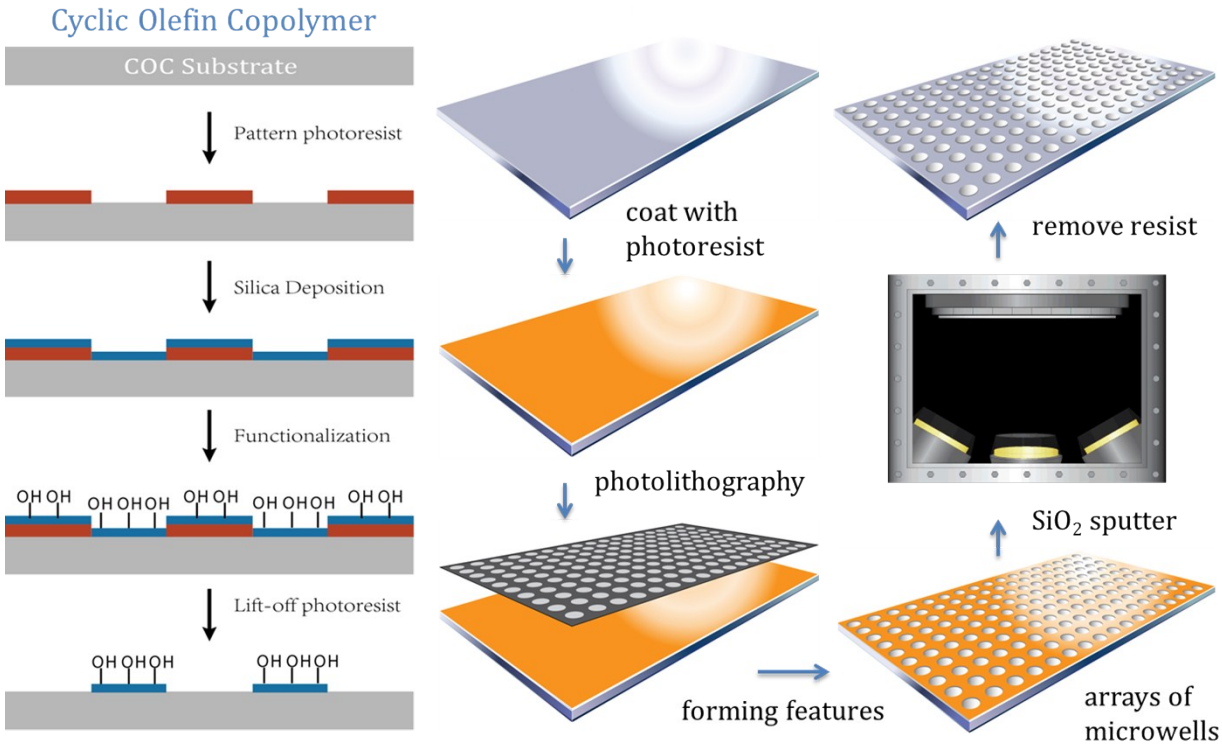

Figure S1. Functionalization of thermoplastic microchips with reduced edge-effect. Standard photolithography technology was adopted to create arrays of microwells on an extremely hydrophobic thermoplastic cyclic olefin copolymer. The surface was patterned with silica deposition (SiO^2) followed by silanization (hydroxyl-silane) to create hydrophilic spots as individual reactors. The photoresist was then removed to reveal the silica dioxide features.

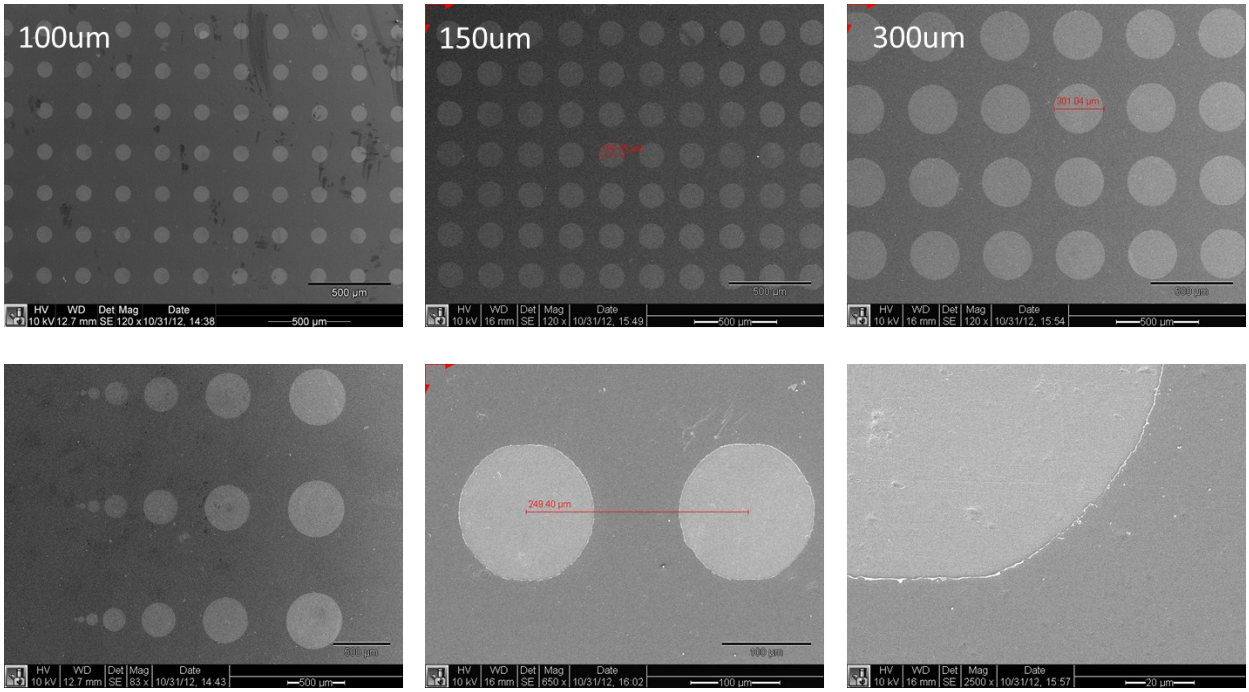

Figure S2. Scanning Electron Microscopic images of several microchip designs with feature size ranging from 100 to 300 µm in diameter (Scale bar = 500 µm).

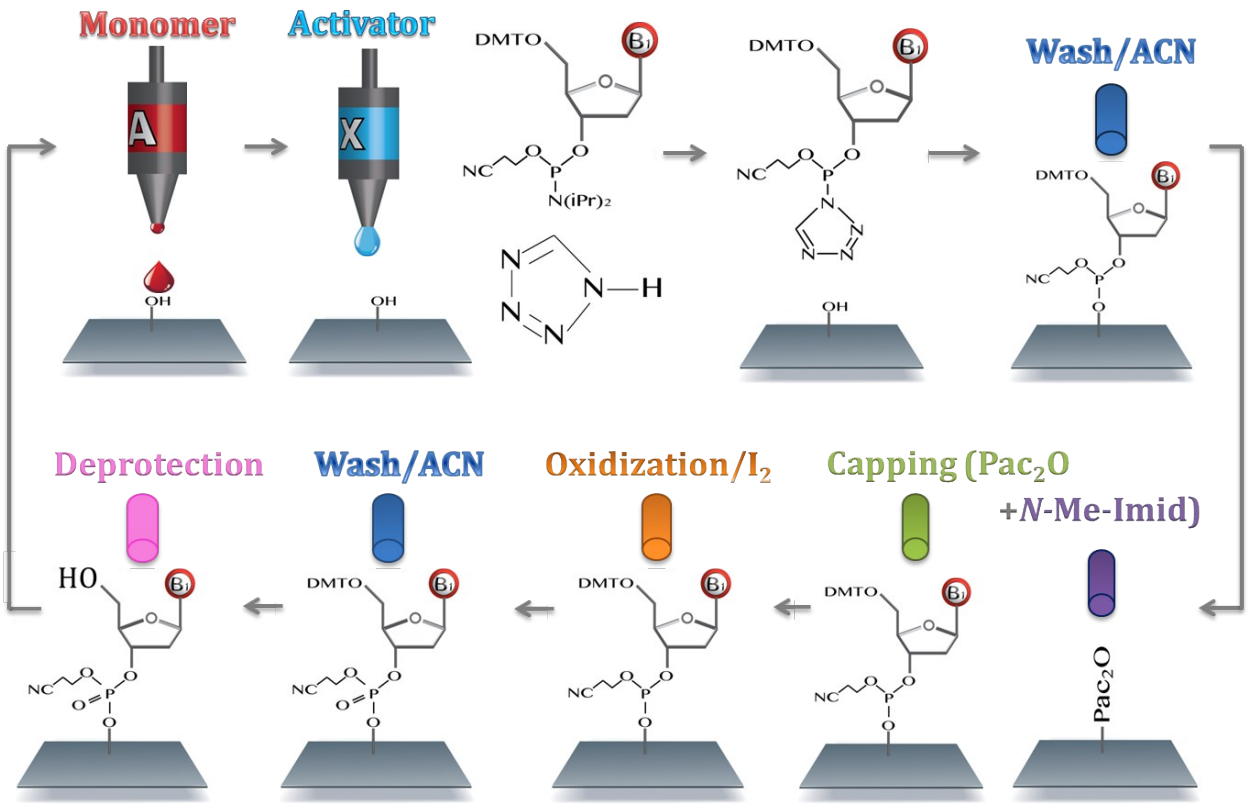

Figure S3. Gene synthesis process performed on microchip. First, the corresponding nucleotide was printed onto its designated spots, before activator was printed to all of the spots which would protonate the phosphorous and make it competent to coupling with the 5 hydroxyl group on the previous nucleotide. This would be followed by slide washing and supplying capping solution to terminate the growth of any sequences that failed to couple. Oxidization reagents were applied to convert the trivalent phosphorous into pentavalent one. Lastly, a strong acid was used to remove the protection group (4,4'-dimethoxytrityl) which would expose the labile hydroxyl for accepting the next nucleotide.

Table S1. Gene sequences used in microchip synthesis

gfp:
ATGGTGAGCAAGGGCGCCGAGCTGTTCACCGGCATCGTGCCCATCCTGATCGAGCTGAATGG
CGATGTGAATGGCCACAAGTTCAGCGTGAGCGGCGAGGGCGAGGGCGATGCCACCTACGGC
AAGCTGACCCTGAAGTTCATCTGCACCACCGGCAAGCTGCCTGTGCCCTGGCCCACCCTGGT
GACCACCCTGAGCTACGGCGTGCAGTGCTTCTCACGCTACCCCGATCACATGAAGCAGCACG
ACTTCTTCAAGAGCGCCATGCCTGAGGGCTACATCCAGGAGCGCACCATCTTCTTCGAGGAT
GACGGCAACTACAAGTCGCGCGCCGAGGTGAAGTTCGAGGGCGATACCCTGGTGAATCGCA
TCGAGCTGACCGGCACCGATTTCAAGGAGGATGGCAACATCCTGGGCAATAAGATGGAGTA
CAACTACAACGCCCACAATGTGTACATCATGACCGACAAGGCCAAGAATGGCATCAAGGTG
AACTTCAAGATCCGCCACAACATCGAGGATGGCAGCGTGCAGCTGGCCGACCACTACCAGC
AGAATACCCCCATCGGCGATGGCCCTGTGCTGCTGCCCGATAACCACTACCTGTCCACCCAG
AGCGCCCTGTCCAAGGACCCCAACGAGAAGCGCGATCACATGATCTACTTCGGCTTCGTGAC
CGCCGCCGCCATCACCCACGGCATGGATGAGCTGTACAAGTGA

cfp:
ATGGTGAGCAAGGGCGAGGAGCTGTTCACCGGGGTGGTGCCCATCCTGGTCGAGCTGGACG
GCGACGTAAACGGCCACAGGTTCAGCGTGTCCGGCGAGGGCGAGGGCGATGCCACCTACGG
CAAGCTGACCCTGAAGTTCATCTGCACCACCGGCAAGCTGCCCGTGCCCTGGCCCACCCTCG
TGACCACCCTGACCTGGGGCGTGCAGTGCTTCAGCCGCTACCCCGACCACATGAAGCAGCAC
GACTTCTTCAAGTCCGCCATGCCCGAAGGCTACGTCCAGGAGCGTACCATCTTCTTCAAGGA
CGACGGCAACTACAAGACCCGCGCCGAGGTGAAGTTCGAGGGCGACACCCTGGTGAACCGC
ATCGAGCTGAAGGGCATCGACTTCAAGGAGGACGGCAACATCCTGGGGCACAAGCTGGAGT
ACAACTACATCAGCCACAACGTCTATATCACCGCCGACAAGCAGAAGAACGGCATCAAGGC
CCACTTCAAGATCCGCCACAACATCGAGGACGGCAGCGTGCAGCTCGCCGACCACTACCAG
CAGAACACCCCCATCGGCGACGGCCCCGTGCTGCTGCCCGACAACCACTACCTGAGCACCCA
GTCCGCCCTGAGCAAAGACCCCAACGAGAAGCGCGATCACATGGTCCTGCTGGAGTTCGTG
ACCGCCGCCGGGATCACTCTCGGCATGGACGAGCTGTACAAGTAA

rfp:
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GCGTTTCAAAGTTCGTATGGAAGGTTCCGTTAACGGTCACGAGTTCGAAATCGAAGGTGAAG
GTGAAGGTCGTCCGTACGAAGGTACCCAGACCGCTAAACTGAAAGTTACCAAAGGTGGTCC
GCTGCCGTTCGCTTGGGACATCCTGTCCCCGCAGTTCCAGTACGGTTCCAAAGCTTACGTTAA
ACACCCGGCTGACATCCCGGACTACCTGAAACTGTCCTTCCCGGAAGGTTTCAAATGGGAAC
GTGTTATGAACTTCGAAGACGGTGGTGTTGTTACCGTTACCCAGGACTCCTCCCTGCAAGAC
GGTGAGTTCATCTACAAAGTTAAACTGCGTGGTACCAACTTCCCGTCCGACGGTCCGGTTAT
GCAGAAAAAAACCATGGGTTGGGAAGCTTCCACCGAACGTATGTACCCGGAAGACGGTGCT
CTGAAAGGTGAAATCAAAATGCGTCTGAAACTGAAAGACGGTGGTCACTACGACGCTGAAG
TTAAAACCACCTACATGGCTAAAAAACCGGTTCAGCTGCCGGGTGCTTACAAAACCGACATC
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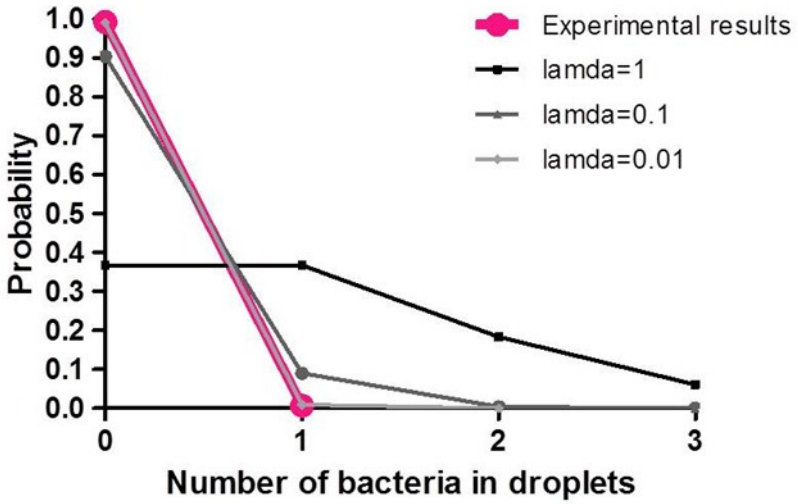
AAGGTCGTCACTCCACCGGTGCTTAAGAAACCGTGCGTTTCCAGTCTTAA

A



B

Probability

k	Experiment	λ=1	λ=0.1	λ=0.01
0	0.993±0.02	0.368	0.905	0.99
1	0.007±0.002	0.368	0.090	0.01
2		0.184	0.005	4.95E-05
3		0.061	1.5E-04	1.65E-07

Figure S4. A) Probability distribution of bacteria in droplets at experimental condition and according to Poisson distribution calculated at different cell seeding densities (lambda/λ = average cell number in droplet; k = specific cell number in the droplet) (n>200). B) Table detailing the exact value of probability displayed at (A).