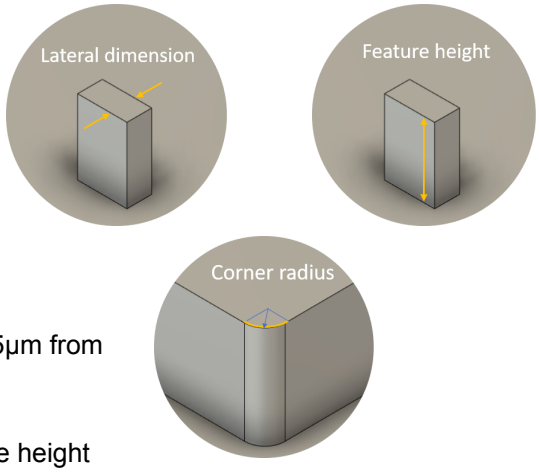
Edge
EMBOSSING

Edge Embossing Prototype Design Rules:

Design Rules	Required	Recommended
Minimum lateral dimension	>3μm	
Aspect ratio of embedded features (channels/wells)	<5:1 (higher aspect ratios are possible through our custom service)	<3:1
Aspect ratio of protruding features (walls/posts)	<5:1	<3:1 <2:1 for isolated features <1:1 to avoid distortion during thermal bonding
Feature height	5-150μm	>50μm for PSA lidding
Support posts		Use in open areas with aspect ratio <1:2 to avoid significant lid sagging.
Distance to edge of part	5mm	
Number of inlet/outlet ports used	0-8	

Tolerances	
Feature height	±10% average height from nominal, ±5% variation across part
Lateral feature dimensions	±5%
Lateral spacing between features	±1%
Surface roughness (Sa)	50nm
Part thickness variation	±100μm

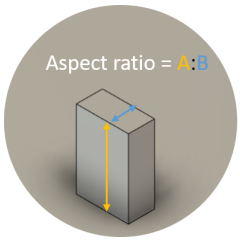
Feature dimensions:

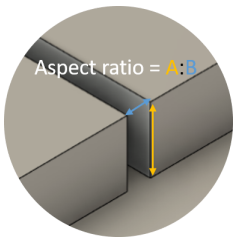


- Critical lateral dimension:
  - The smallest features should have lateral dimensions of no less than 3μm.
  - Expect a radius of <2μm on sharp corners defined in your design.
  - An additional charge will apply for critical dimensions <10μm.
- Feature heights:
  - Select the feature height in increments of 5μm from 5μm-100μm and increments of 25μm from 100μm-150μm.
  - Expect a tolerance of <10% on the average height and variation of <5% across the part.
- Aspect ratio:
  - The maximum aspect ratio of embedded and protruding features should be kept to <5:1. Edge Embossing's replication process can produce parts with very high aspect ratios

(e.g. 15:1), however since we use SU-8 master structures for our standard prototype offering, it is best to stay below 5:1, and recommended to stay below 3:1. Please contact us for a custom quote if you need higher aspect ratio features.

- Isolated features such as posts are more likely to delaminate from the master structure. Keep the aspect ratio of isolated features to <2:1.



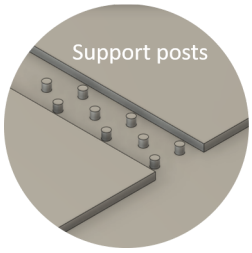


Multilayer designs:

- Features in each layer should not overhang features on underlying features.
- Expect an alignment accuracy of 2µm between layers.

Lidding considerations:

- Choose between PSA and thermal bonding:
  - Thermally bonded parts will be lidded with the same type of thermoplastic as the part, in a 100 - 250 µm film. The high pressure and temperature applied during the bonding process can sometimes lead to deformation of features. To avoid channel distortion, limit the aspect ratio of walls between channel features to <1:1. To avoid collapsing of narrow channels, limit the aspect ratio of channels to <5:1. Some degree of sagging should be expected on all thermally bonded features.
  - We use 3M Microfluidic Diagnostic Tape 9795R, a hydrophilic tape with a polyolefin backing and low autofluorescence, for PSA bonding. Keep in mind that fluids passing through your device will be in contact with the 50µm silicone acrylic pressure sensitive adhesive layer. The PSA layer is a soft deformable material that can be pressed into channels during bonding, sometimes entirely closing off very shallow channels. To avoid this, select a feature height of >50µm or use a channels aspect ratio of >1:1
- Adjacent channels should be separated by at least 200 µm in order to provide enough bonding area to isolate the channels
- The lidding will typically sag to some degree over open areas. Refer to the following charts showing lid sagging vs. channels width for PSA and thermal bonding. Keep the aspect ratio of channels and open areas to >1:5 to avoid the lid from touching the bottom of the open area. Alternatively, insert support posts in wide channels and open areas to mitigate lid sagging.



CAD layout:

- Any layout software that can modify and export a dxf, dwg or gds file can be used to draw your design. We recommend the following programs: Layout Editor, Clewin, Autocad.
- For single height designs, draw all features on “microfluidic layer 1”.
- For multi height designs, define the bottom layer on “microfluidic layer 1” and next layer on “microfluidic layer 2” and so on.
- Keep all features within boundary defined in the “device boundary” layer.
- To connect channels to inlet/outlet ports, overlap channels with the circular landing pads in the “microfluidic layer 1”.
- Use zero-width closed polylines, polylines with width and circles to define your features.

- Use a close command to ensure that the area is completely closed.
- Do not use hatching to identify filled surfaces on the mask.
- Do not allow boundaries to overlap or self-intersect.
- Do not create any additional layers.
- Keep units set to millimeter.