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THE WORLD'S TOUGHEST POLISHING TEMPLATES

The secret of ZeroMicron's (ZM's) lowest cost per wafer template is that we build a template that has a very long life under adverse conditions.

The first secret is to select adhesives specifically for the materials being bonded. ZM's program of constant improvement obtains adhesives from multiple manufacturers and selects the best for use in our template manufacturing process.

The competitors simply bond a piece of FR-4 material to a PET (PolyEthylene Terephthalate) backed piece of poromeric material, which, by definition, is porous and serves to hold the wafer in the pocket (Figure 1). ZM bonds the template frame, made of G-10 or rugged G-11 material directly to a thick sheet of clear PET film to form a strong and lasting assembly. Then ZM inserts a transparent spacer made of PET and pressure bonds it in the wafer pocket to the backing PET film.

This spacer is used for three purposes. First, it elevates the wafer away from the weakest point, the adhesive bond between the G-10 and backing material. And, more important, it serves to adjust the pocket depth. FR-4/G-10 material is notorious for thickness variations. ZM adjusts the depth of every pocket to insure that you have the proper pocket depth for your application (Figure 2).

The third purpose has to do with the transparency of the spacer and the clear base material. With the other template manufacturers products it is impossible to see any air bubbles that might be trapped under the template. When air bubbles are located they need to be deflated to flatten them but this process results in minor distortions in the template surface. With the transparent ZM pocket, the ZM template can be mounted without introducing air bubbles.

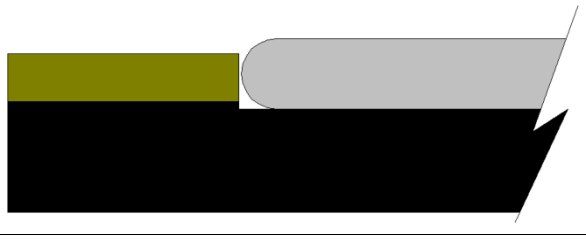

Figure 1
"Competitor" Template Partial Cross-Section

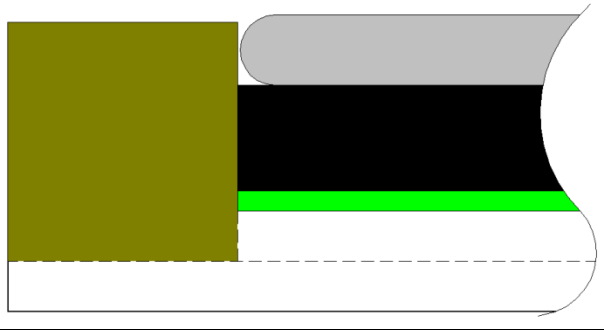

Figure 2
ZeroMicron Template Partial Cross-Section

Wafer	Poromeric Material	FR-4/G-10	PET Shim	Clear PET

This assembly of the backing sheet, frame and pocket depth spacer form the template assembly but the rugged design does not stop there. After mounting a shim is inserted into the template pocket and a PET backed poromeric insert is placed on top of that. This PET-to-PET, PET-to-PET and poromeric-to-wafer construction is referred to as our Shim Spinning System (S^3) and allows the wafer to rotate in the pocket.

The S3 patented technology allows the ZM template to provide a more even finish with lower Bow and Warp measurements and a shorter time to polish which means lower TTV conditions. However, there is another advantage in that this system allows for greater poromeric compression.

Poromeric compression has little effect on the performance except that the wafer protrusion is compromised. Other templates require replacement of the template once the poromeric material is compressed which requires the purchase of a new template and the removal and replacement of the template on the polishing head. The ZM template only requires the replacement of the shim with a thicker shim. Typically this can be done twice before the poromeric insert needs to be replaced.

Clients have reported replacing the poromeric material eight to ten times without replacing the template. By using multiple shims to extend the poromeric insert life and replacing the insert, this equates to more than sixteen of the other manufacturers templates. Sixteen times that the template does not have to be removed. Actually, the ZeroMicron template should not be considered a consumable but rather it is a short term investment.

Now let's take a moment to examine the typical failure modes of the templates. There are four failure modes; 1) blowout, 2) template separation, 3) backside staining and 4) worn out pockets. From client reports we can state that ZM templates report a 75 to 80% reduction in blowouts. With other templates, a blowout requires replacement of the template. The ZM template normally only requires replacement of the poromeric insert resulting in a large time and expense savings.

An examination of Figures 1 and 2 helps explain how the other manufacturers' templates separate while the ZM template does not have this problem. The bond between the poromeric material, a porous structure, and the FR-4 frame is very weak. Further, the FR-4 material is rather thin and flexible. If the wafer starts to wear at that glue layer, the template will delaminate. The ZM template, by comparison (Figure 3) uses a very thick and rigid frame of G-10 or on special request, G-11 material. And, the ZM construction keeps the wafer away from the glue layers.

Backside staining occurs when the poromeric material becomes contaminated with a buildup of slurry. This is normally addressed by scrubbing the material and rinsing. With other templates, vigorous scrubbing can lead to early delamination and it is difficult to get into the edges of the pocket. With the ZM design, the poromeric inserts can be removed and scrubbed or replaced, further extending the life of the template.

The last failure mode is when the wafer pocket wears out. Over many runs the edge of the pocket will start to wear. As this wear continues it will round the edge of the pocket off and the wafer will slip out of the pocket. A close look at Figures 1 and 2 will show that other manufacturers try to run their wafers at a 30% exposure. This puts the apex of the wafer edge very close to the upper edge of the FR-4 material. This is done to obtain the maximum life from the template as the poromeric material is compressed but also acts to weaken the template and cause early failures.

With the ZM template, this is not a concern as the depth can be adjusted for poromeric compression. We strongly recommend a 20% protrusion. This means that the wafer edge apex is located deeper in the pocket and takes substantially longer to wear sufficiently to require replacement.

- ✓ **Rugged design**
- ✓ **Longer life**
- ✓ **Better performance**
- ✓ **Lower costs**

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