Laser Processing of 3M™ Thermally Conductive Interface Tape 8926

- Smooth laser-processed edges and minimal heat-affected zones
- No degradation to the physical properties of the materials
- Eliminates material deformation during processing
- Consistently and repeatedly process 3M tape 8926 to a high degree of dimensional accuracy

PROCESSING EXAMPLE

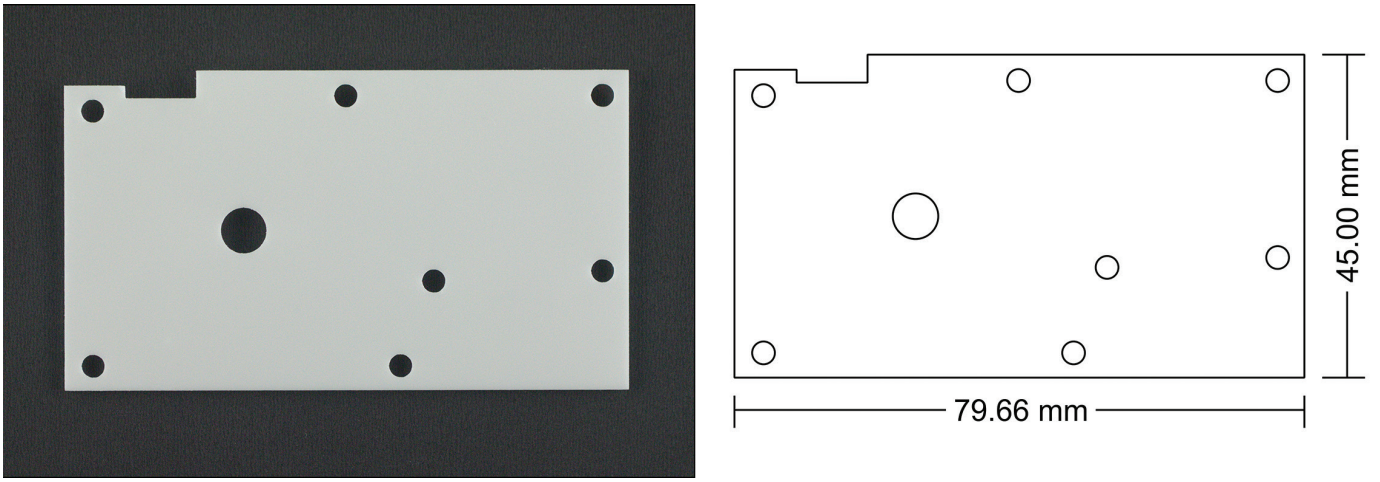

Figure 1. *Example of the fine geometry possible with laser processing 3M tape 8926.*

3M™ Thermally Conductive Interface Tape 8926 applications requiring fine geometry and intricate detail without degrading the physical properties of the material can be achieved with Universal Laser Systems technology. An example demonstrating the results of laser processing the 3M tape material is shown in ***Figure 1***.

MATERIAL OVERVIEW

3M™ Thermally Conductive Interface Tape 8926 series pressure-sensitive adhesive tapes are filled with thermally conductive ceramic particles and are designed for heat management in electronic devices or general heat dissipation in devices. They may also be used for bonding/joining parts in electronic products. These products are designed to have good converting ability, handling, and re-workability through the introduction of a thin PET carrier. 3M tape series 8926 is designed with a soft acrylic polymer and multiple thickness options to allow excellent wet-out or conformability to many surfaces. The tape series has good adhesion performance to many substrate types and has excellent dielectric performance.

Figure 2. *3M tape 8926-05 diagram showing the thermally conductive acrylate adhesive layer with ceramic particles and PET release liner. The 9826 series tape is available in thicknesses of 0.20mm, 0.25mm, and 0.50mm.*

LASER PROCESSING NOTES

3M tape 8926-05 was tested to assess laser processing compatibility and determine the best system configuration of laser peak power and wavelength. The soft acrylate adhesive layer absorbs 9.3µm energy more efficiently than other wavelengths, meaning less peak power was necessary to produce good results with minimum heat effects. The PET liner layer also absorbs the 9.3µm wavelength efficiently with minimum heat effects along the processed path. A microscopy image taken at 69X magnification of the processed edge of the 3M tape 8926-05 post-processing is shown in ***Figure 3***. In this image, it is shown that the processed acrylate adhesive layer has minimal heat effects and discoloration. Further inspection of the laser-processed material shows that the acrylate adhesive layer is cleanly processed along the processed path with a 50 watt 9.3µm CO_2 laser source.

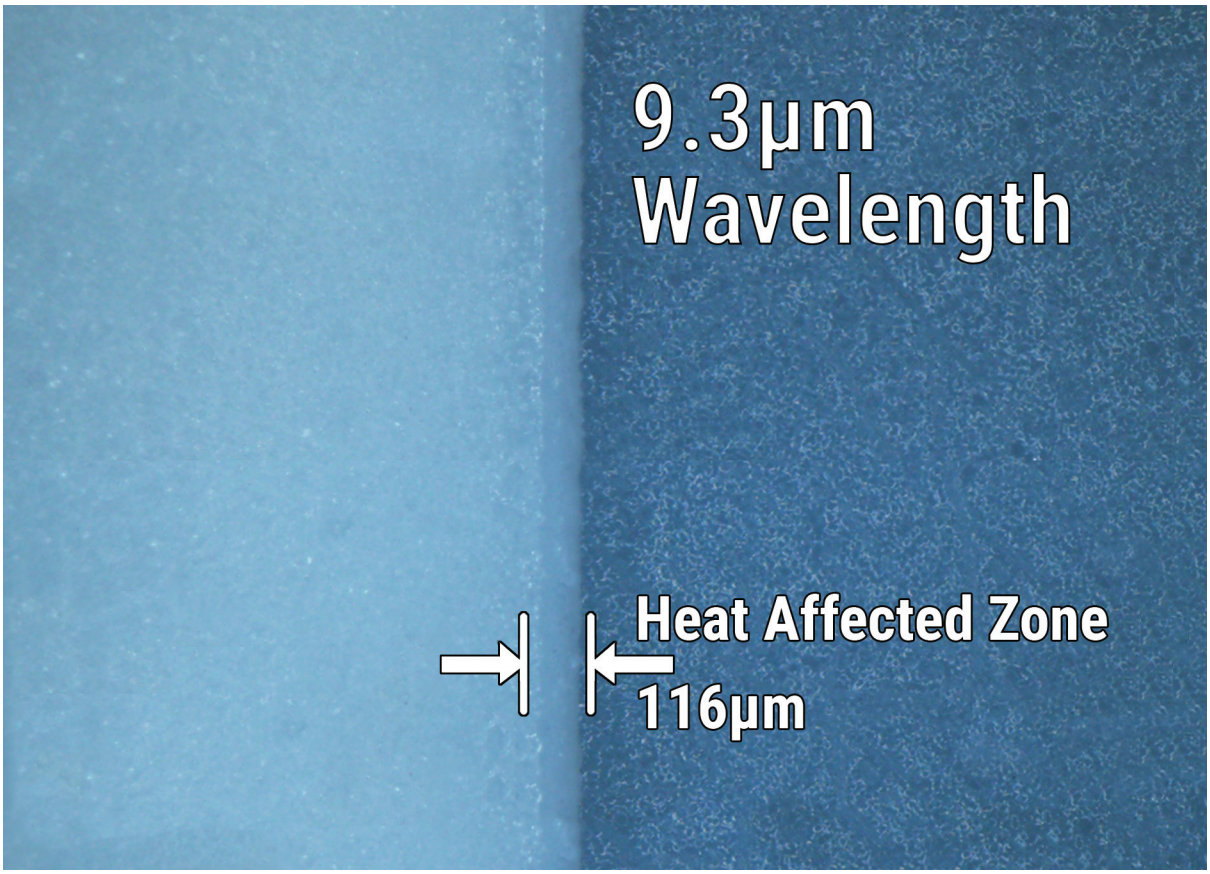

Figure 3. *Microscopy image (69X) of the laser-processed edge of 3M tape 8926-05 with the bottom PET liner in place. The heat-affected zone measures 116µm*

ALTERNATIVE SYSTEM CONFIGURATION ANALYSIS

3M tape 8926-05 was also tested with alternate system configurations at equivalent laser power levels for comparison and determination of the effectiveness of each system configuration. The results of these tests were compared by analyzing the heat effects, quality of the processed edge, and post-processing requirements. The results of the comparison of these system configurations are listed in tabular form in ***Table 1*** and shown photographically in ***Figure 4***. Both system configurations appear viable with some reduction in quality of the results for the 10.6µm configuration as stated in the comparison.

Table 1. System Configuration Comparison

System Configuration	Heat-Affected Zone	Process Characteristics	Post-Processing Requirements
9.3µm (strongly recommended)	Minimal heat-affected zone of approximately 116µm.	The 9.3µm laser energy has the advantage of better absorption by the material resulting in a consistent edge along the processed path.	Processing of the 3M tape 8926 material with either the 9.3µm or the 10.6µm configuration did not require additional post-processing.
10.6µm	Increased heat-affected zone compared to 9.3µm wavelength of approximately 135µm.	This configuration results in an increased heat-affected zone along the processed path when compared to the 9.3µm configuration.	

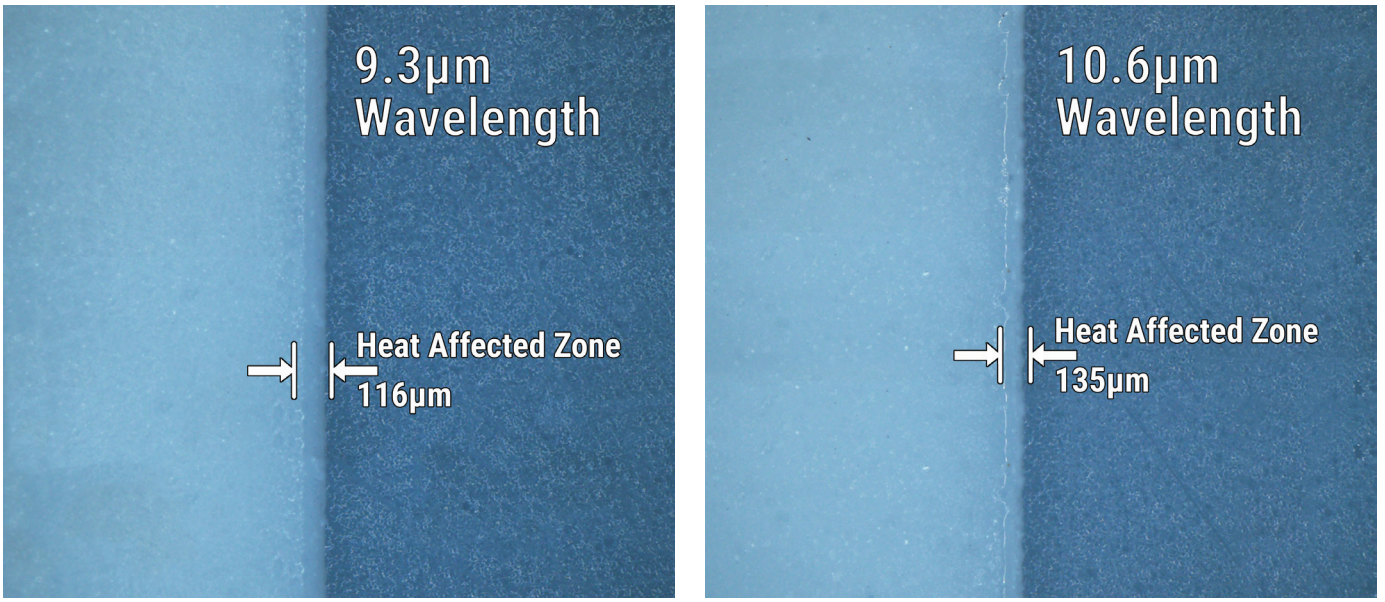

Figure 5. *Comparison microscopy images (69X) of the processed edge resulting from 9.3µm processing (left), and 10.6µm processing (right).*

CONCLUSION

3M tape 8926-05 tape is very well suited for laser processing and was extensively tested to determine the most efficient processing configuration. Through this testing, it was determined that laser processing is viable with this material, and a 50 watt 9.3µm CO_2 laser source is the best configuration of wavelength and power for the processing of this material. The soft acrylate adhesive and PET liner efficiently absorb the 9.3µm wavelength laser energy and, coupled with the peak power of the 50 watt laser source, produce a processed edge with minimal heat effects.

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