THERMFLOW® T766
Thermal Impedance Test Report
(Metal Foil Carrier Imperfections)

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T766
Thermal Impedance Test

Introduction

Numerous tests were performed in our Research and Development Department to quantify the effect on thermal performance of T766 phase change material when the conformable metal carrier became wrinkled, dented, or folded. The results are documented in this report to help the customer better understand the T766 material performance under such conditions. This document can also be a useful reference tool for customers to train production personnel in how to determine an acceptable assembly.

This data is intended to be a reference only.

Please contact our Applications Engineering Department for additional information at 781-939-4620

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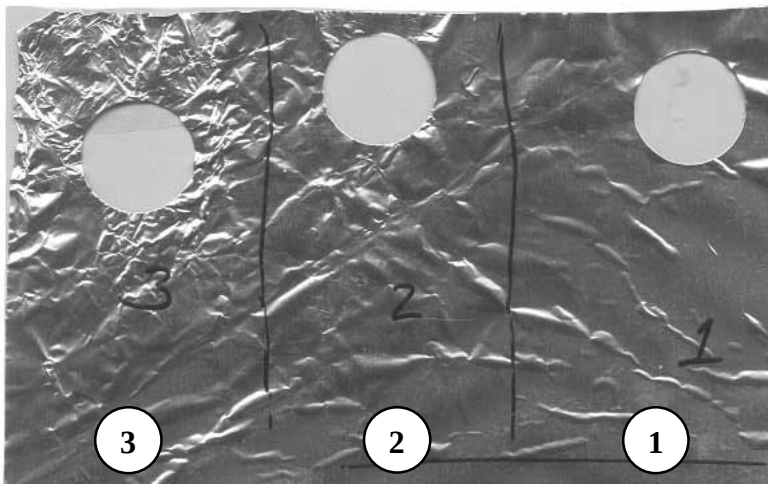
I. Wrinkle Test

Thermal Impedance testing was performed on wrinkled T766 material. The extent of wrinkling was separated into three categories, 1 – lightly wrinkled, 2 – moderately wrinkled, and 3 – severely wrinkled.

Picture 1a. Actual piece of T766 wrinkled test material (with 1 in^2 test samples removed)

Picture 1b. Test sample 3 after test. Note the wrinkles are smoothed out considerably.

1a.



1b.

Results:

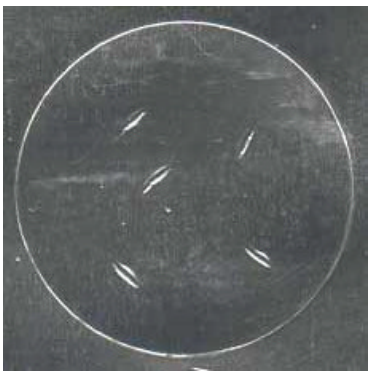
Thermal Impedance [°C-in^2/watt]	Not wrinkled (0)	Lightly wrinkled (1)	Moderately wrinkled (2)	Severely wrinkled (3)
20 psi	0.079	0.079	0.093	0.101
50 psi	0.055	0.055	0.066	0.068
100 psi	0.040	0.044	0.051	0.052

II. Dent Test

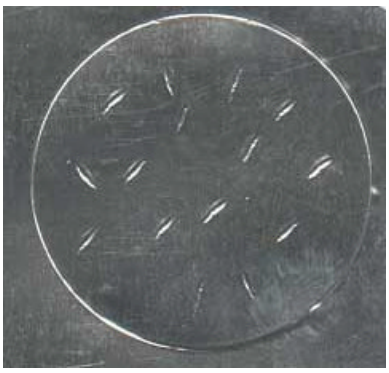
Thermal Impedance testing was performed on dented T766 material. The dents were created with the edge of a wooden tongue depressor. Samples with a few dents (5/in^2) and several dents (15/in^2) were tested.

Picture 2. Actual pieces of T766 dented test samples, before and after testing. After test samples have dented areas circled to emphasize the smoothing out of dents during testing.

2a.



2b.



2c.

2d.

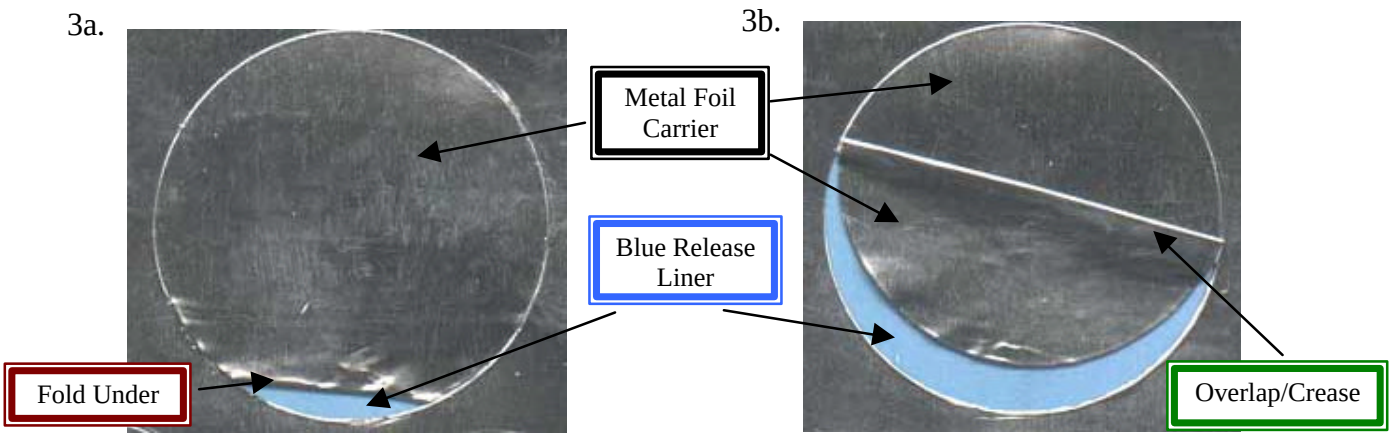
Results:

Thermal Impedance [°C-in^2/watt]	Not dented (0 dents)	Lightly dented (5 dents)	Severely dented (15 dents)
20 psi	0.079	0.075	0.088
50 psi	0.055	0.052	0.064
100 psi	0.040	0.040	0.052

III. Fold Test

Thermal Impedance testing was performed on folded T766 material. The sample was intentionally folded under on one edge of the first sample and then overlapped down the center of the other.

Picture 3. Actual pieces of T766 folded test samples.



Results:

Thermal Impedance [°C-in^2/watt]	Not folded	One edge fold (under)	Large center fold (overlap/crease)
20 psi	0.079	0.088	0.235
50 psi	0.055	0.070	0.235
100 psi	0.040	0.056	0.210

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Summary

In general, T766 performs exceptionally well with imperfections in the metal foil carrier. Several scenarios were simulated and sometimes exaggerated in order to show that T766 will still perform well and do the job it was intended to do, even when the foil is wrinkled, nicked, or slightly folded.

Prior to thermal testing in phase I, the pad was purposely wrinkled to a far greater extent than would be expected in actual handling. Even with the most severe wrinkling, thermal impedance never increased by more than 0.02 °C-in^2/W. For 50W of power, through 1 square inch of material, that's only 1.0°C change! The metal foil carrier is so conformable that the wrinkles were smoothed out entirely during the test with 100 psi of pressure. Any wrinkles incurred during normal handling of the material will not affect its performance.

The second phase of performance testing consisted of testing the thermal performance of a pad with nicks and dents in the foil. Imperfections in the metal foil were inflicted using moderate pressure on the edge of a wooden tongue depressor. Once again, the thermal impedance did not increase by more than 0.01 °C-in^2/W. For 50W of power, through 1 square inch of material, that's only 0.5°C change! The metal foil carrier is so conformable that the dents were almost unidentifiable after testing with 100 psi of pressure.

Finally, the third phase of thermal testing was performed in order to test T766 with folds in the pad. During removal from the release liner, it can be possible for the handler to inadvertently fold under one edge of the pad. Small folds, up to approximately 5 % of the pad's area, are acceptable in most instances, as thermal impedance does not increase significantly. A large fold in the pad, where the thickness is actually tripled in the center, causes the thermal impedance to increase significantly. This large fold would be an example of what is not acceptable for good thermal performance of T766.

Conclusions

Thermflow™ T766 has proven to be an outstanding performer in thermal applications requiring clean break, or easy removal. The metal foil carrier is extremely conformable, allowing it to make intimate contact with many surfaces, thereby lowering the contact resistance and increasing the thermal performance. T766 will perform extremely well even when the pad is wrinkled or folded, or the foil is scratched or dented. The high conformability of the metal foil carrier will allow it to smooth out and erase almost any imperfection.

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