

International Resistive Company
Advanced Film Division
4222 South Staples Street
Corpus Christi, Texas 78411, USA



Telephone: +1(361)992-7900
Facsimile: +1(361)992-3377
Email: morrist@irctt.com
Website: www.irctt.com

Test Report-AnotherTM vs IMS Substrate in Power LED Applications

Purpose: To evaluate the differences in thermal conductivity between AnotherTM and IMS substrate when used with a high brightness (Lumiled style) Light Emitting Diode. Thermal Conductivity is an important parameter as the characteristics of modern LEDs are such that higher operating temperatures result in less light output and a shift in the wavelength of light produced (wavelength increases as temperature rises).

Materials: For this evaluation, Lumileds high brightness white LEDs were used. These LEDs were mounted onto a suitable thermally conductive substrate to be evaluated (Another and IMS type). Each thermal substrate was similar in size and bolted to an "infinite heatsink" consisting of a large finned heatsink with air blowing across it. Photos of the test units attached to the heatsink are shown below :



Fig. 1: Another Test Board



A subsidiary of TT electronics plc

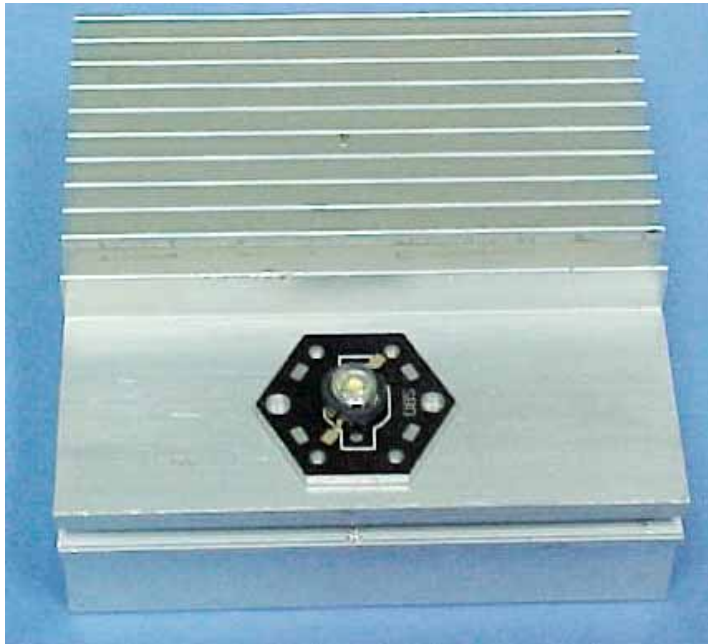


Fig. 2: IMS Test Board

Method: The method used for this test was taken from Appendix 4A of LumiLeds Application Brief AB20-4, "Thermal Management Considerations for SuperFlux LEDs", available from the Lumileds website: www.lumileds.com/pdfs/protected/AB20-4.PDF. This method, in summary, calculates the temperature based on the change in the forward voltage drop across the LED while unpowered, and again after a steady state operating temperature has been achieved. The forward voltage across the LED junction is a constant $-2.0\text{mv}/^\circ\text{C}$

Test Results: The calculated temperature results of both substrate types indicate that Anotherm™ substrates offer considerable improvement (25 to 50% reduction) in the temperature rise of the LED junction. Data is shown below:

1 watt LEDs:

	Vf (@23°C, 1ma):	Vf (at 1.36 watts)	Δ Vf	Temperature Rise	Junction Temperature
IMS:	2.570	2.528	-0.042v	21°C	44°C
Anotherm™	2.535	2.518	-0.017v	8.5°C	31.5°C

3 watt LEDs

	Vf (@23°C, 1ma):	Vf (at rated)	_Vf	Temperature Rise	Junction Temperature
IMS:	3.45	3.288	-0.162v	81°C	104°C
Another TM	3.44	3.346	-0.094v	47°C	70°C

Conclusion: AnotherTM Substrates offer a significant improvement in the operating temperature of LEDs. The lower thermal impedance due to the construction process of AnotherTM allows longer operating life and the potential for driving LEDs harder (to achieve higher light output). The significantly lower thermal impedance is a direct result of the insulating layer on the aluminum substrate being thinner (35 microns typical versus 75 microns minimum for IMS type substrates) and of higher thermal conductivity insulator material. Another uses aluminum oxide (27w/m-°K thermal conductivity) versus filled epoxy (0.9w/m-°K typical) as the dielectric layer between the LED slug and the aluminum board.

T. Morris

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