
EIGHTEENTH ANNUAL
BiTS
TM
Burn-in & Test Strategies Workshop
March 5 - 8, 2017
Hilton Phoenix / Mesa Hotel
Mesa, Arizona
Archive – Session 4
© 2017 BiTS Workshop – Image: tonda / iStock

Copyright Notice

Session 4

Rahima Mohammed

Session Chair

BiTS Workshop 2017 Schedule

Frontier Day

Tuesday March 7 - 8:00 am

Launch Pad

"Load Board PCB Socket Contact Pad Solution"

Willy Ganoy, Jess Coleta – ON Semiconductor Philippines

"Addressing high frequency challenges for burn-in requiring LVDS"

Rolando Reyes - Analog Devices Inc.

"New Applications for Embedded Thin Film Heaters"

Bruce Mahler - Ohmega Technologies, Inc.

"Adressing the EOS on legacy burn-in boards with over voltage protection through a modular design"

Gil Conanan - Analog Devices, Inc.

BiTS 2017 Burn-in & Test Strategies Workshop

New Applications for Embedded Thin Film Heaters

Bruce Mahler
Ohmega Technologies, Inc.

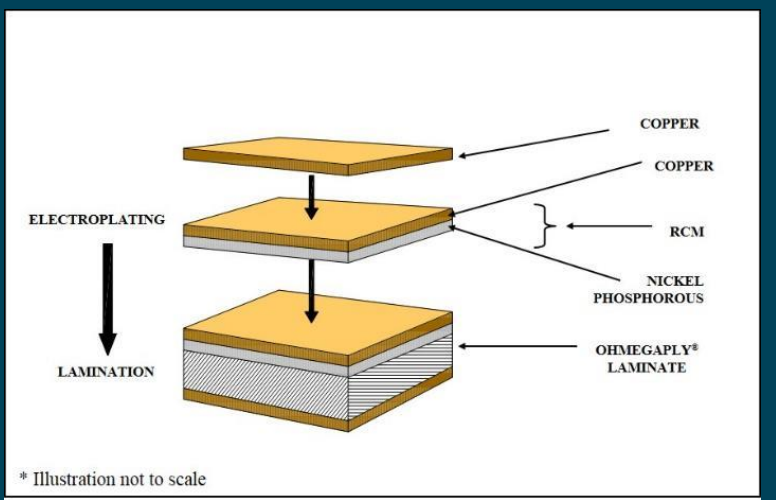
BiTS Burn-in & Test Strategies Workshop

BiTS Workshop
March 5 - 8, 2017

Ohmega Ohmega Technologies, Inc.

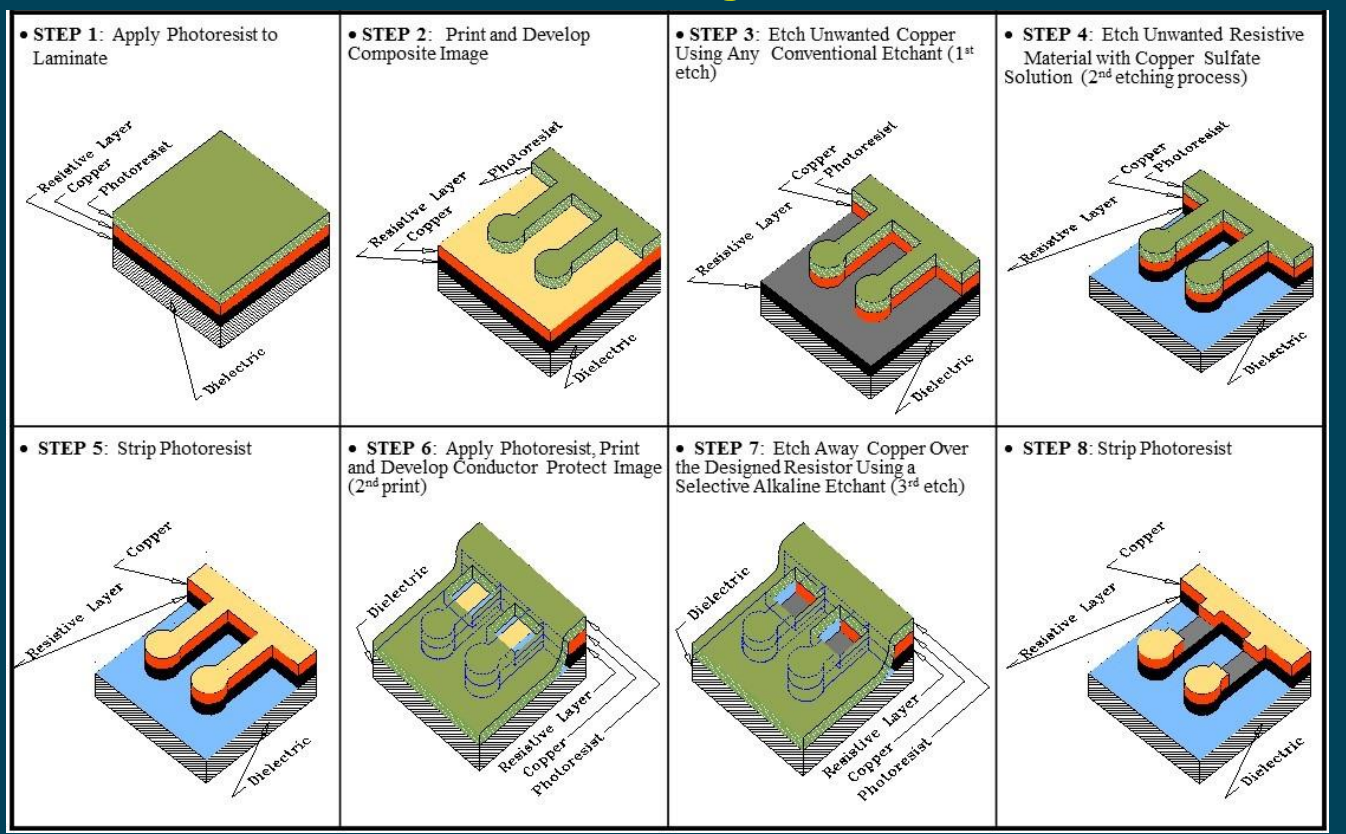
NiP Resistor Manufacturing Overview

- Thin film **NiP** resistive alloy material is made by electrodepositing of the NiP alloy onto copper foil (RESISTOR-CONDUCTOR MATERIAL) which is then laminated to a dielectric material and subtractively processed to produce planar resistors.
- Because of its thin film nature, it can be buried within layers without increasing the thickness of the board or occupying any surface space like discrete resistors.



RCM construction

PCB Processing of the NiP Resistor Alloy

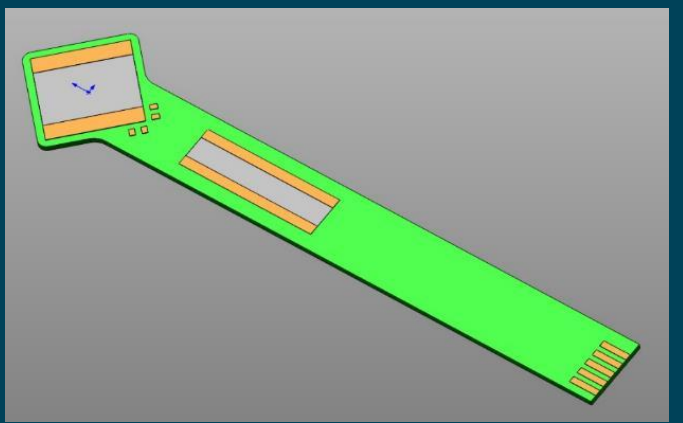


NiP resistor fabrication process

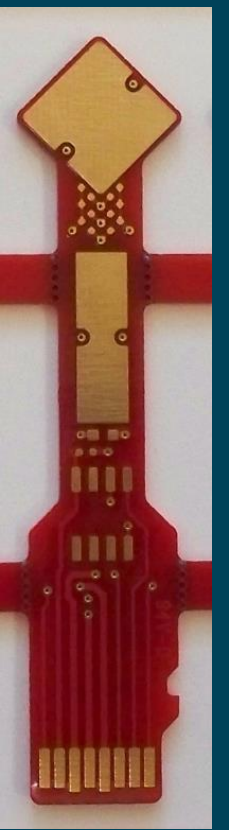
Embedded Thin Film Heater Applications

- Aerospace & Defense
  - SAL (semi-active laser) activation guided munitions
  - XRF Spectrometer & Control board (Mars Beagle 2 lander)
  - Satellite solar array deployment mechanism
- Biomedical Electronics
  - Bioassay
  - Drug vaporization for subcutaneous injections
  - Heat therapy for dry eye
- PCB Temperature Control
- IC Testing/Burn-In

Biomedical Application

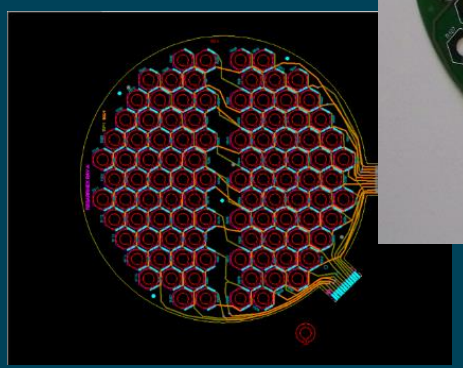


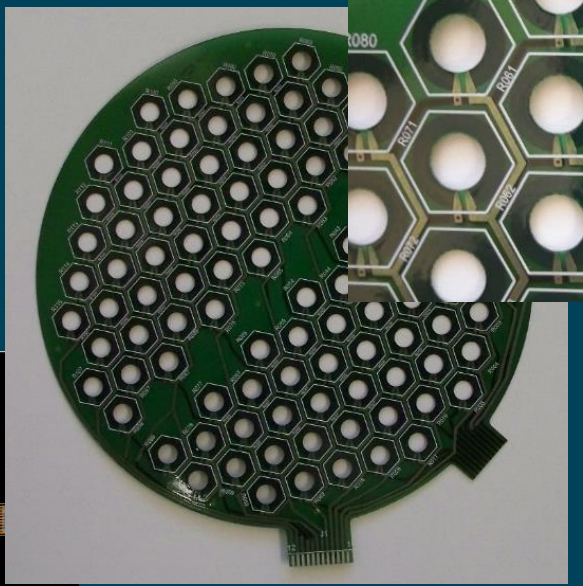
Embedded NiP heater illustration

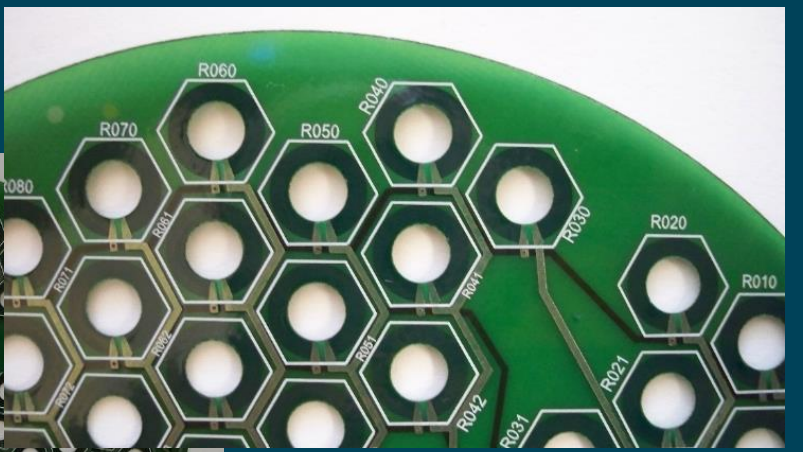


Finished board with Embedded NiP heaters

Biomedical Application





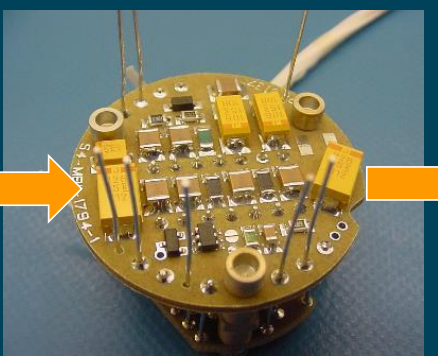


Example NiP heater array

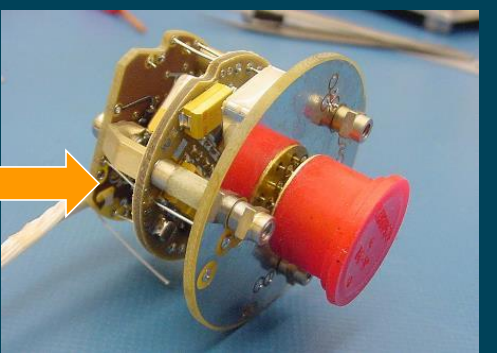
Aerospace & Defense

- Application shows a heater used to bring the X-Ray Spectrometer (XRS) biasing and pre-amplification electronics to -50 degrees Celsius in the Mars Beagle 2 Lander.

Inner Layer Heater



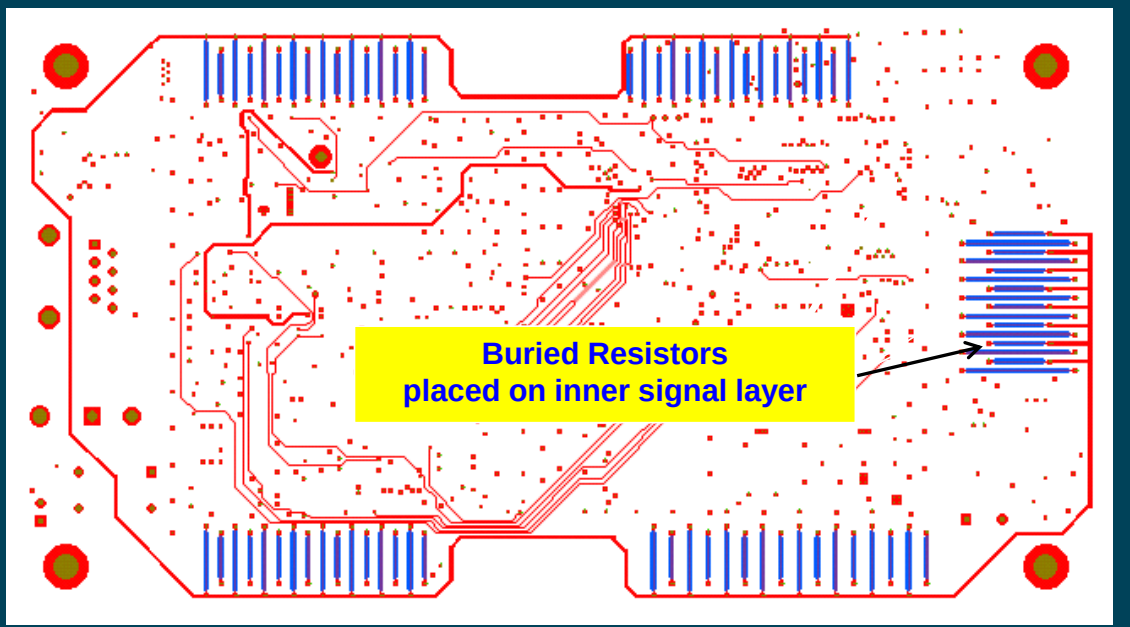
Assembled board



Assembled XRS unit

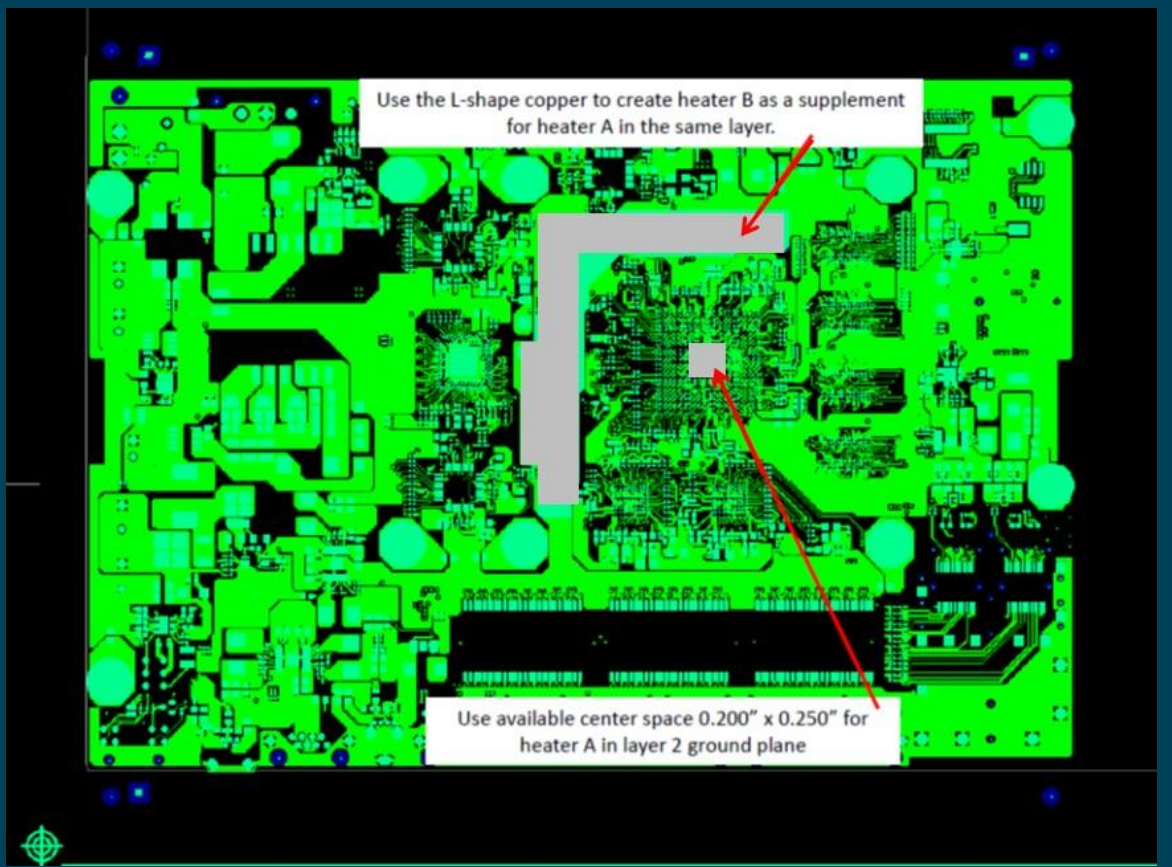
Images Courtesy of the University of Leicester Space Research Centre and the Beagle2 Consortium.

PCB Temperature Control



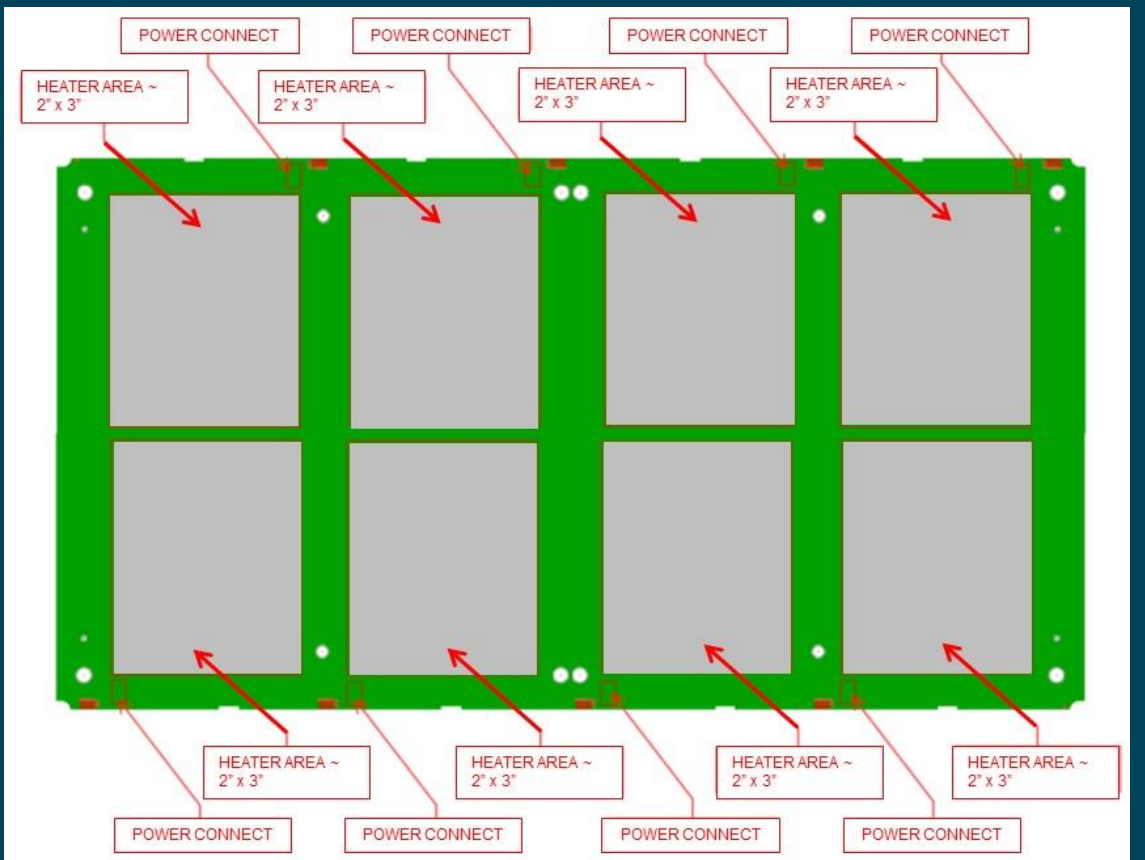
- **Resistors are not in BOM. Resistors built into the PWB and used as a PCB heater for colder climate markets**
- **Buried resistors placed under components and use a thermostat to maintain constant temperature for outdoor products**

PCB Temperature Control



Example NiP heaters for PCB temperature control of IC

IC Testing / Burn-In



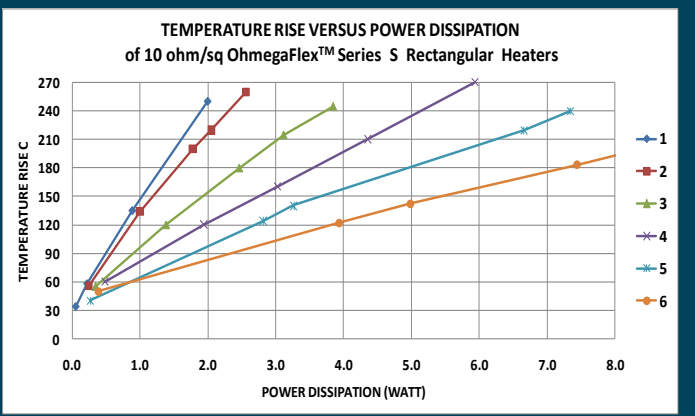
Example 10 ohm/sq embedded heater array for IC Burn-In testing at 65C

Considerations for Heater Applications

- Substrate material selection
- PCB stack-up
- Temperature/power requirements
- Resistor values
- Operating temperature
- Operating life

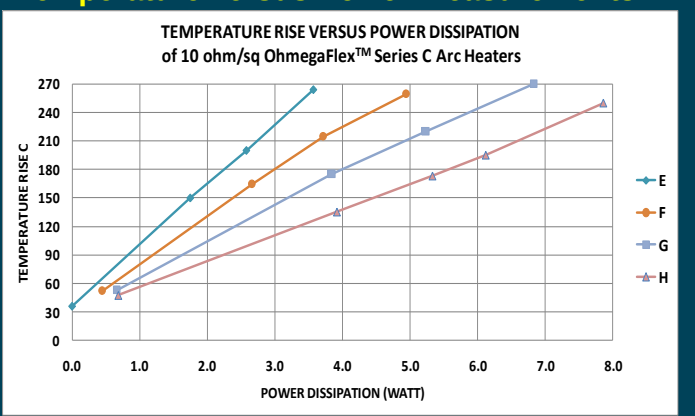
Sample Heater Boards

OhmegaFLEX rectangular heaters



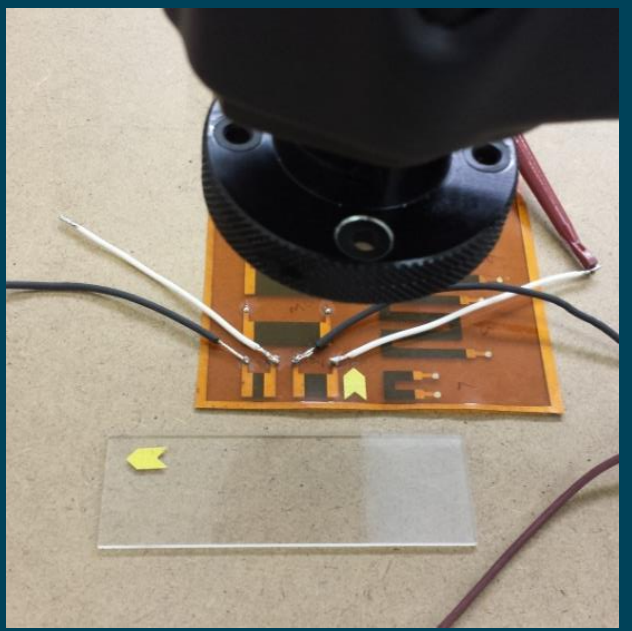
Temperature versus Power measurements

OhmegaFLEX circular heaters

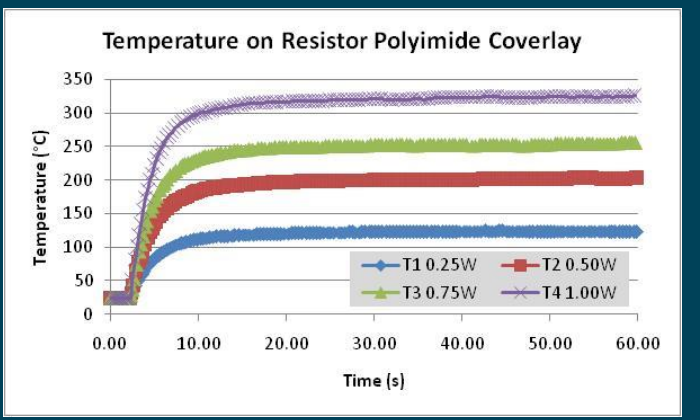


Temperature versus Power measurements

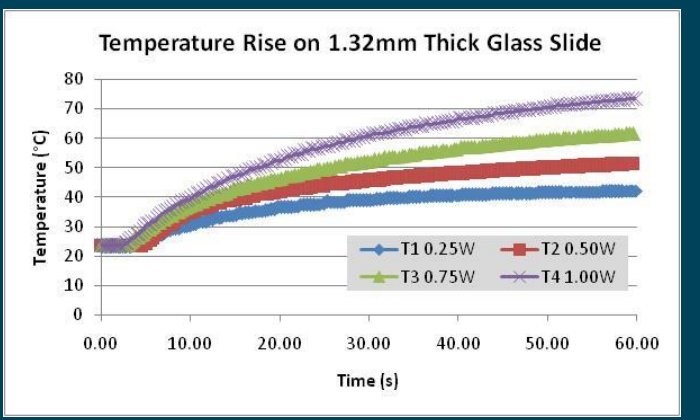
Considerations for Heater Applications



Heater measurement test set-up



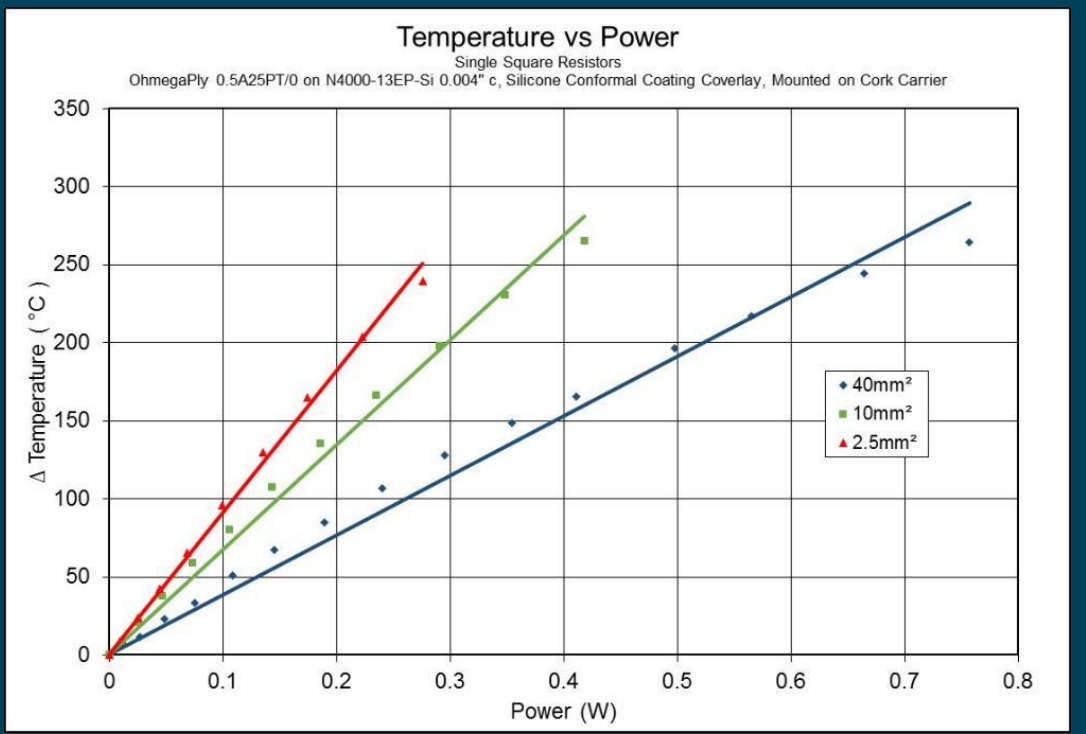
Temperature on heater Polyimide cover-lay



Temperature on 1.3mm glass slide over heater

Considerations for Heater Applications

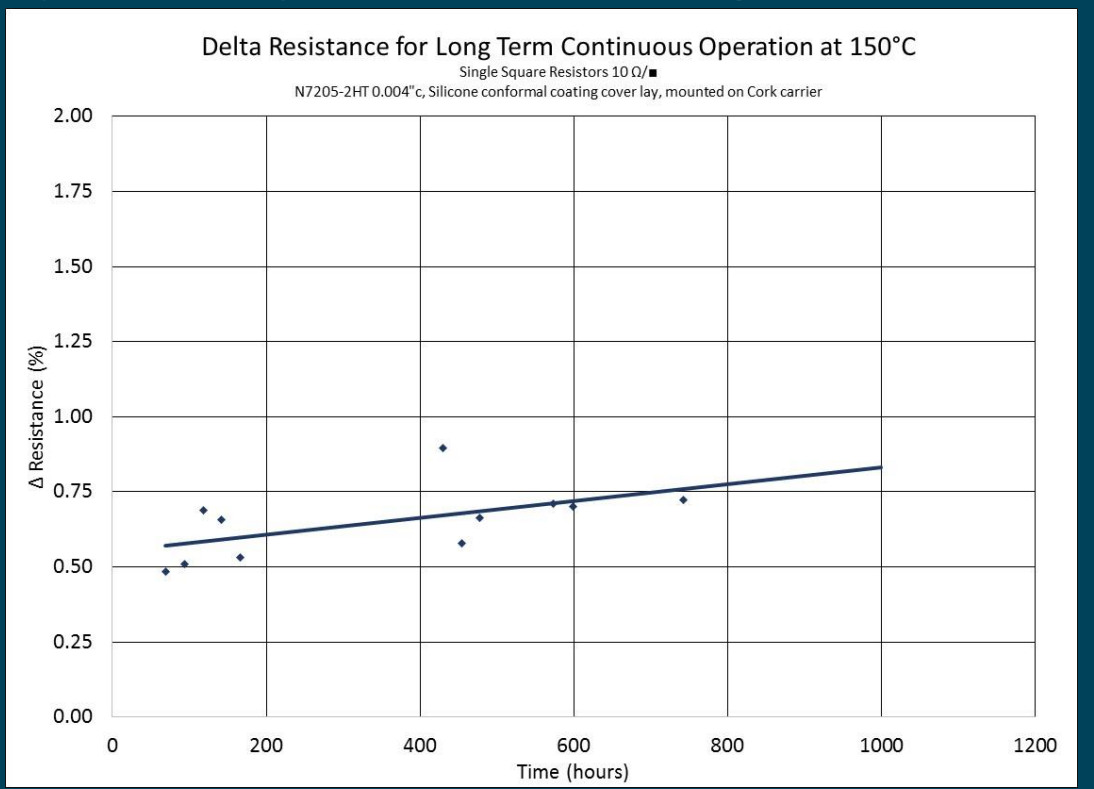
- Data showing relationship between temperature change, heater area and input power.



Example of heater area affect on Temperature versus Power

Considerations for Heater Applications

- Stability over long term continuous operation.



Change in resistance after long term high temperature operation

Summary & Conclusions

- Thin Film NiP Resistive Material
- Standard Subtractive PWB Processing
- Mature Technology (40+ years)
- Field Proven, Excellent Long Term Reliability
- Embedded resistors inside of PCBs to maintain optimum temperature for system operation and/or Burn-In and DUT testing