

Improved Power Handling in Resistive Devices

Technical Introduction of Components

ESTEC - Space Passive Component Days

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Product Specialist - Board Level Components



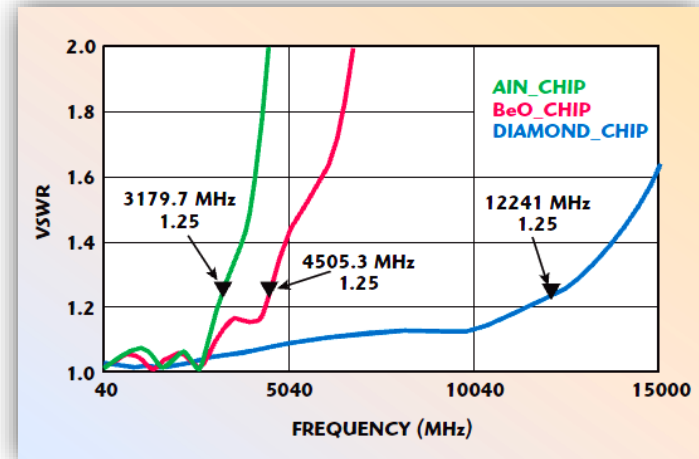
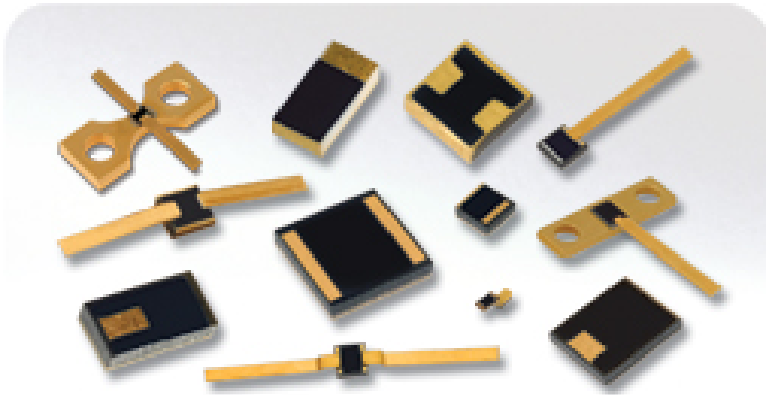
Smiths Interconnect – Board Level Components

- **Smiths Interconnect Stuart, Florida**
 - (EMC Technology & Florida RF Labs)
- **RF/Microwave Board Level Components**
 - Resistors & terminations
 - Fixed attenuators
 - Temperature variable attenuators
 - Signal distribution devices (couplers, power dividers, etc)
- **Primary Focus on High Reliability**
 - In house qualification and screening
 - Extensive space heritage (over 35 years)
- **Notable achievements**
 - Inventor of temperature variable attenuator (Thermopad®)
 - First commercially available CVD Diamond Resistives
- **Key component trends**
 - Higher power, higher frequency and smaller size



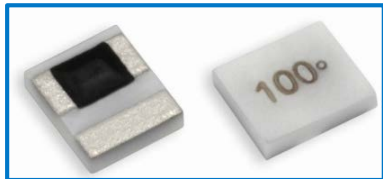
Advanced Substrate Material - CVD Diamond

- **Chemical Vapor Deposition** - Similar properties to “natural” diamond
- **Polycrystalline material** - Compatible with thin-film process
- **High Thermal Conductivity** (1000 W/m*K) – Highest power to size ratio and excellent peak power capability
- **Low Dielectric Constant** (5.7) – Lower shunt capacitance and improved frequency response
- **Standard chip package sizes** ranging from 0402 (20 Watts) to 2010 (300 Watts)
- **Operating frequency up to 30 GHz.**
- **Space qualified and participated on several key programs with various international space agencies: ESA, JAXA, ISRO, SAC and NASA**

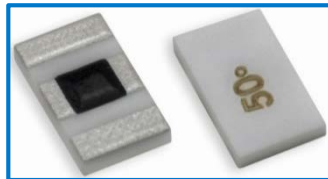


Innovative Board Mounted Solution - Outrigger Resistives

- **Smiths Interconnect invented the Outrigger Resistor in 2013 (Patent # 8,994,490)**
 - A surface mount chip resistor for increasing power handling capabilities of RF circuits and minimizing parasitic capacitance and inductance effects.
- **Conventional resistor sizes (0402, 0603, TBD) with additional ground pads used for thermal transfer.**
- **Optimized for high frequency operation when matched with coplanar waveguide structures.**
- **Single Outrigger has 4-6X the power handling of an equivalent conventional resistor.**
- **Dual Outrigger has 7-8X the power handling of an equivalent conventional resistor.**
- **Outrigger Termination has 12X the power handling of an equivalent conventional resistor.**



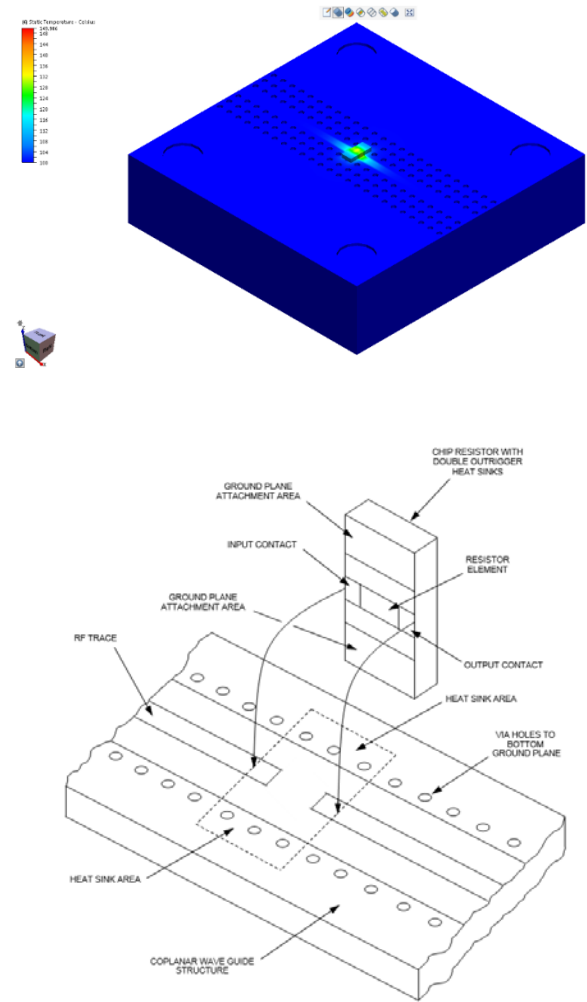
Single Outrigger



Dual Outrigger



Outrigger Termination



Innovative Flange Mount Solution - Integrated Spring Mount Chip Termination

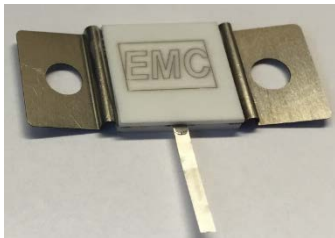
Patent Pending (PCT/US17/52961)

▪ Innovative Solution

- Eliminates CTE Mismatch issues with flange mounted chip terminations.
- Improved Reliability – Fatigue Life
- Tab launch is closer to the board (Reduced Height)
- Significant Weight Reduction. (Approximately 90%)

▪ Available in 3 different sizes and power rating (0.375" SQ, 0.5" SQ and 1.0" SQ Chips)

- Uses same footprint and hole spacing as conventional flange mount terminations.
- Chip to be mounted using suggested thermal grease for maximum power dissipation

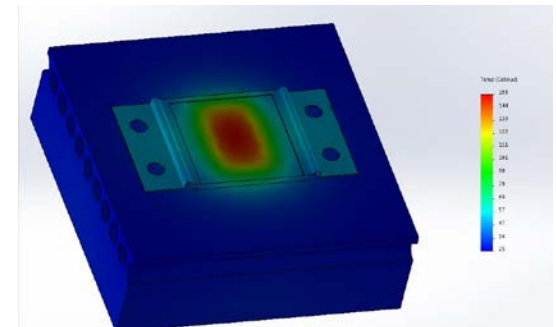
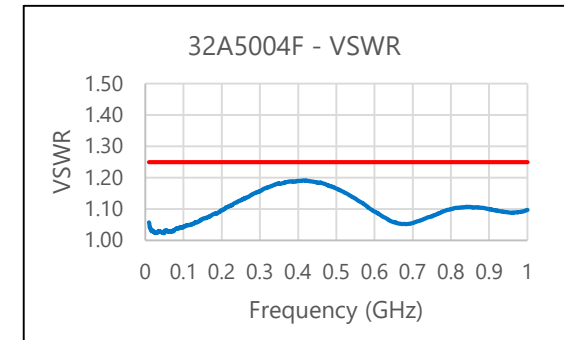


Integrated Spring Mount Termination

VS.



Conventional Flange Mount Termination



[more > smithsinterconnect.com](https://smithsinterconnect.com)

