VISHAY

One of the World's Largest Manufacturers of
Discrete Semiconductors and Passive Components

ESCCON 2011

Vishay Sfernice Thin Film Division

ROADMAP

Ms D. Vignolo

Build Vishay into your Design

Who are we?

Issues and Strategy

Roadmap

Other Specific Products

Let’s dream..

Conclusion

Vishay Sfernice has been involved in Space business since the early 80’s. With the evolution of electronics to miniaturization, today, only the Thin Film division of Vishay Sfernice is offering suitable products for Space applications.

Issues:

- Cost of Space qualified products
- Less and less European Manufacturers
- ITAR regulations

Vishay/Sfernice answer:

- Offer cost effective products
- Offer a complete product range of qualified resistors and resistive networks

ROADMAP 2006 - 2010

2 Main axis:

ESCC/QML qualification (Technology Flow qualification)

→ Goal: Increase number of qualified products more easily and quickly answer to the needs of our customers.

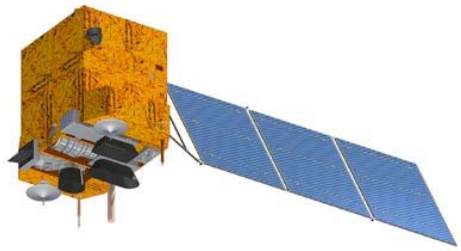
- Requirement for the Technology Flow qualification of film resistors Basic Specification No. 2544001
- Evolution of Generic ESCC 4001
- Qualified Products Listed in REP 006 list

ROADMAP 2006 - 2010

R Failure Rate

→ Goal: Offer a qualified cost effective part

- Failure Rate Level Sampling Plans and Procedures ESCC Basic Specification No. 26000
- Evolution of ESCC 4001/023
- Qualification of PFRR



In the meantime, extension of performances of other qualified products

ROADMAP 2011 - 2015

2011 Status

Qualified	PFRR	4001/023 Variant 09 to 12	Alternative to M55342E	100R - 3M01 depending on size (0603 to 2010) Also qualified with 0.05% - 10ppm/°C [-55°C; +155°C]	
	PHR	4001/023 Variant 01 to 08		10R - 3M depending on size (0603 to 2010) 0.01% to 0.1% - 5ppm/°C to 25ppm/°C[-55°C; +155°C]	
	PRAHR	4001/025 variant 01 to 21		100R - 1M depending on size 0.1% abs / 0.05% ratio - 10ppm/°C abs - 3ppm/°C ratio [-55°C; +155°C]	
	CNWHR	4001/025 variant 22 to 42		Same performances as PRAHR: different values in Networks	
EPPL Level 1	CHPHR	4001/026 Vaiant 01 to 10		1R - 10M / 1% - 2% - 5% / 100ppm/°C - 200ppm/°C [-55°C; +155°C] Evaluation completed - Qualification foreseen Q2/2011	
Evaluation On Going	LHR	4001/xxx		0R1 - 9R99 / 1% / 100ppm/°C to 300ppm/°C [-55°C; +155°C] - 0603 to 2512 - Completion of evaluation foreseen Q4/2011	
	PZHR	4001/yyy	Alternative to MI-PRF-32159	0R: Strap - 0402 to 1206	
	PHR0402	4001/023		Extension of qualification to size 0402	
	PFRR0402	4001/023	Alternative to M55342E	Extension of qualification to size 0402 (R Failure Rate on going)	
Not Qualified	RMK/RSK/ CS/TA	N/A		Wirebondable chips: Sizes: 22 / 33 / 55 / 515 - Tol: 0.01% to 0.1% - TCR: 5ppm/°C to 100ppm/°C [-55°C; +155°C] - Al pads	
	RMK/RSK/ CS/TA / CN	N/A		Wirebondable Networks: Sizes: 33 / 48 /408 /508 / 714 / 816 / 914- Tol: 0.1% abs - 0.01% ratio - TCR: 10ppm/°C abs - 2ppm/°C ratio [-55°C; +155°C] - Al pads - Custom available	
	SA, SB, SC	N/A		Wirebondable shunts - 50mR to 1R - 1% to 5% - 100ppm/°C [-55°C; +155°C] - 0.5W to 6W	

2010: Extension of PHR qualification down to 10Ω and TCR to 5ppm/°C [-55°C; +155°C]

Dies: Have been used for space applications for more than 10 years

ROADMAP 2011 - 2015

Complete qualification of:

- LHR
- PZHR
- CHPFR (alternative to M55342K)
- PFRR: extension of qualification down to 10Ω

Evaluation and qualification of:

- PRAHR073 and PRAHR074
- PHR: increase power rating (330mW for 1206)

Characterization in Cryogenics (-185°C)

- PHR
- PRAHR

Others Specific products

Not yet used for Space applications, but which can be of some interest

Hyper-frequency:

CH: Thin Film chip resistors (50GHz) 

HCHP: Thick film chip resistor (10GHz) 

High Temperature (230°C)

PHT: Wraparound chip resistor 

RMKHT: Wirebondable chip resistors and networks 

PRAHT: Wraparound chip arrays 

CHPHT: Wraparound thick film chip resistors 

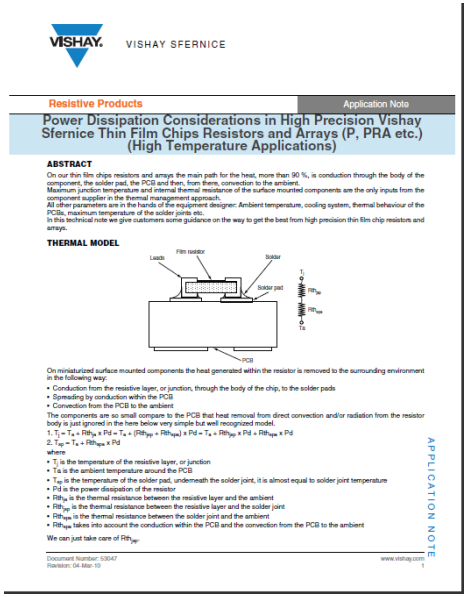
We can imagine:
A precision resistor in TO220 package

Examples of products used by Space customers

TFS-W: temperature sensors (for temperature measurement)

EPIC: Electro-Pyrotechnic Chip Initiator (unfold antennas)

Tools to help Designers


VISHAY SFERNICE

Resistive Products | Application Note

Power Dissipation Considerations in High Precision Vishay Sfernice Thin Film Chips Resistors and Arrays (P, PRA etc.) (High Temperature Applications)

ABSTRACT

On our thin film chips resistors and arrays the main path for the heat, more than 90 %, is conduction through the body of the component, the solder pad, the PCB and then, from there, connection to the ambient.
Maximum junction temperature and internal thermal resistance of the surface mounted components are the only inputs from the component supplier in the thermal management approach.
All other parameters are in the hands of the equipment designer: Ambient temperature, cooling system, thermal behaviour of the PCBs, maximum temperature of the solder joints etc.
In this technical note we give customers some guidance on the way to get the best from high precision thin film chip resistors and arrays.

THERMAL MODEL

On miniaturized surface mounted components the heat generated within the resistor is removed to the surrounding environment in the following way:

- Conduction from the resistive layer, or junction, through the body of the chip, to the solder pads
- Spreading by conduction within the PCB
- Convection from the PCB to the ambient

The components are so small compare to the PCB that heat removal from direct convection and/or radiation from the resistor body is just ignored in the here below very simple but well recognized model.

1. $T_j = T_a + Rth_{ja} \times Pd = T_a + (Rth_{jsp} + Rth_{spa}) \times Pd = T_a + Rth_{jsp} \times Pd + Rth_{spa} \times Pd$
2. $T_{sp} = T_a + Rth_{spa} \times Pd$

where

- T_j is the temperature of the resistive layer, or junction
- T_a is the ambient temperature around the PCB
- T_{sp} is the temperature of the solder pad, underneath the solder joint, it is almost equal to solder joint temperature
- Pd is the power dissipation of the resistor
- Rth_{ja} is the thermal resistance between the resistive layer and the ambient
- Rth_{jsp} is the thermal resistance between the resistive layer and the solder joint
- Rth_{spa} is the thermal resistance between the solder joint and the ambient
- Rth_{spa} takes into account the conduction within the PCB and the convection from the PCB to the ambient

We can just take care of Rth_{jsp}.

APPLICATION NOTE

Document Number: 53047 Revision: 04-Mar-10 www.vishay.com 1


VISHAY SFERNICE

Resistive Products | Application Note

Power Dissipation in High Precision Vishay Sfernice Chip Resistors and Arrays (P Thin Film, PRA Arrays, CHP Thick Film)

A. ABSTRACT

B. THERMAL MODEL

On miniaturized surface-mount components the heat generated within the resistor is dissipated to the surrounding environment in the following way:

- Conduction from the resistive layer, or junction, through the body of the chip, to the solder pads
- Spreading by conduction within the PCB
- Convection from the PCB to the ambient

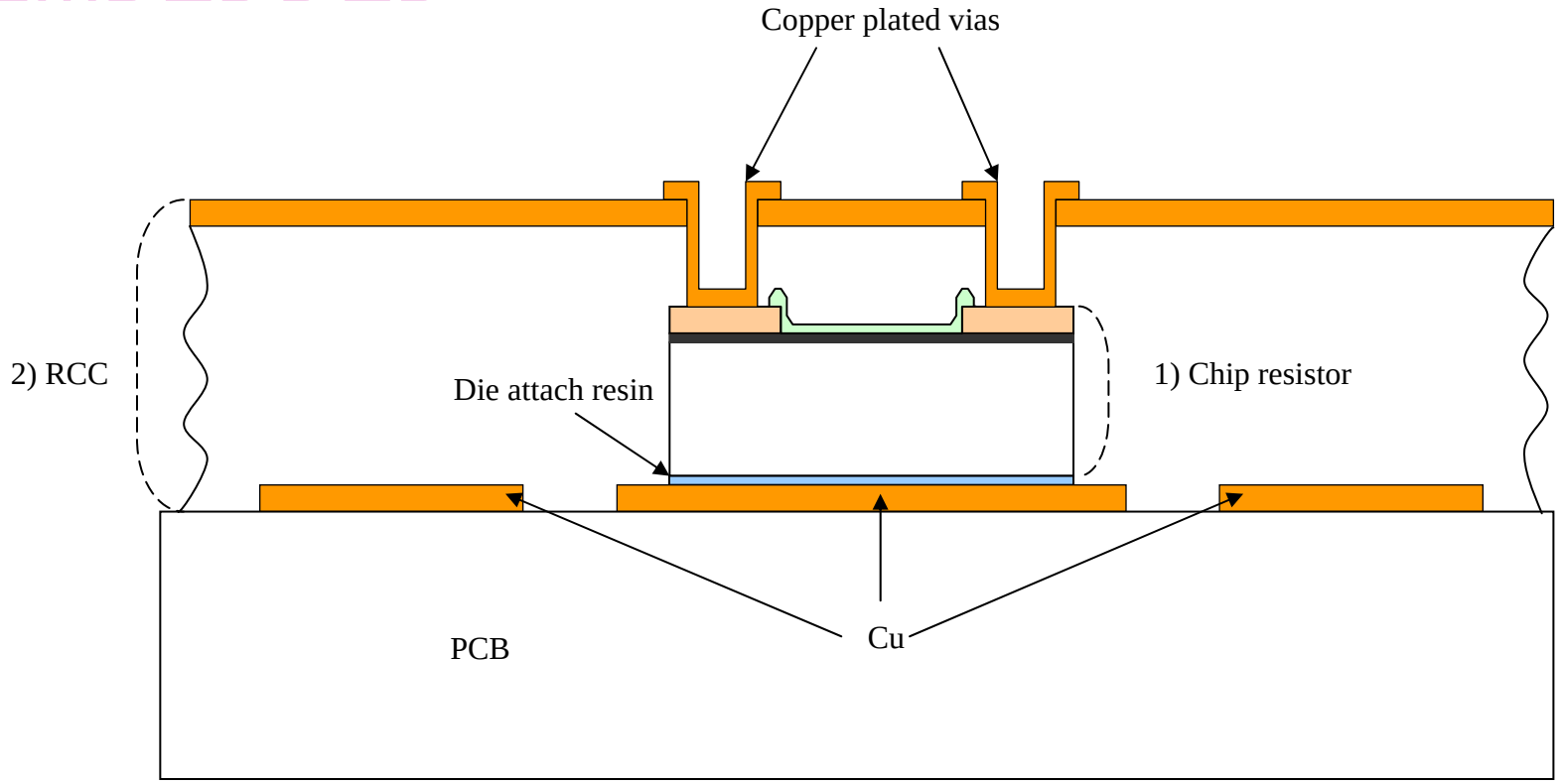
APPLICATION NOTE

Document Number: 53048 Revision: 29-Oct-09 www.vishay.com 1

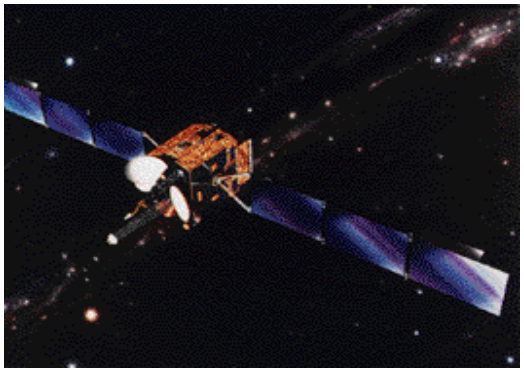
Application Notes
Space product Selector Guide
Capability brochure

Let's Dream !

EMBEDDED



2) RCC : Resin Coated Copper (or prepeg + copper)

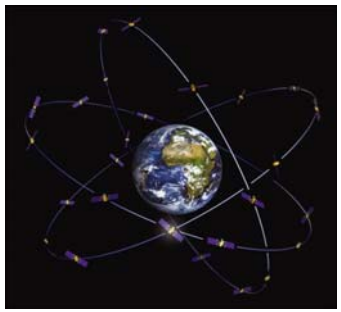


Vishay / Sfernice strategy is to be one stop shop for Space Customers
In this frame Vishay/Sfernice has run the qualification of

ESCC QML: ESCC Technology Flow Qualified Manufacturer

Vishay/Sfernice FIRST passive manufacturer qualified

Vishay Sfernice on going qualification: to offer a whole range of resistive products from 0Ω to 10M:



Special Thanks to Jean-Paul Bussenot (CNES) for his un-valuable help during QML and products qualification processes

Thank you to ESCCON committee to have given me this opportunity to present Vishay/Sfernice Roadmap

Thank you for your attention