

N-port grid array substrate with NxN surface heating elements thermalnport

Form:

thermalnport:(instance name) n_1 n_2 ... (parameter list)

n_1 and n_2 are the element nodes.

Parameters:

Parameter	Type	Default value	Required?
nimesteps: Number of time steps in transient simulation	INTEGER	0	no
dt: Length of timestep (s)	DOUBLE	0	no
tambient: Ambient temperature (K)	DOUBLE	300	no
time_d: Flag, if true, calculate in the time domain.	BOOLEAN	false	no
read_input: Flag, read_input thermal resistance matrices from file	BOOLEAN	false	no
l: Substrate x-dimension in meters.	DOUBLE	0.05	no
w: Substrate y-dimension in meters	DOUBLE	0.05	no
d: Substrate z-dimension in meters.	DOUBLE	0.0016	no
ks: Thermal conductivity (W/m.K)	DOUBLE	0.294	no
rho: Density (kg.m ⁻³)	DOUBLE	1900	no
c: Specific heat (J/kg.K)	DOUBLE	1150	no
xi: Adjustment for $T * 4$ non linearity.	DOUBLE	1.3	no
eta: Adjustment for natural convection.	DOUBLE	3	no
epsilon: Emissivity.	DOUBLE	0.7	no
narray: Order of NxN grid array	INTEGER	n/a	yes
ndevices: Number of heat dissipating devices	INTEGER	1	no
b: Exponent in power law temperature dependence of thermal conductivity	DOUBLE	0	no

Example:

```
thermalnport: test1 12 22 32 42 52 62 72 82 92 10 Ntimesteps = nsteps dt = deltat
Tambient = temp time_d=1 nfingers = 1 narray = 3 read_input = 1
```

Notes:

There is no equivalent SPICE element.

Version:

2000.09.01

Credits:

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Links

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Publications:

1. W Batty, C. E. Christoffersen, A. J. Panks, S. David, C. M. Snowden and M. B. Steer, "Electro-Thermal CAD of Power Devices and Circuits with Fully Physical Time-Dependent Compact Thermal Modelling of Complex Non Linear 3-D Systems," IEEE Transactions on Components and Packaging Technology, Vol. 34, No. 4, December 2002, pp. 566-590.
2. W. Batty , C. E. Christoffersen, C. M. Snowden and M. B. Steer, " Fully Physical Coupled Electro-Thermal Modelling of Power Devices and Circuits," PSSD conference Digest, Ilkley, UK, March 2002.
3. W. Batty, C. E. Christoffersen, S. David, A. J. Panks, R. G. Johnson, C. M. Snowden and M. B. Steer, "Global Electro-thermal CAD of Complex Non Linear 3-D Systems Based on a Fully Physical Time-dependent Compact Thermal Model," 2001 IEEE Int. Microwave Symp. Digest, May 2001, pp. 667-670.