# R-C Thermal Model Parameters

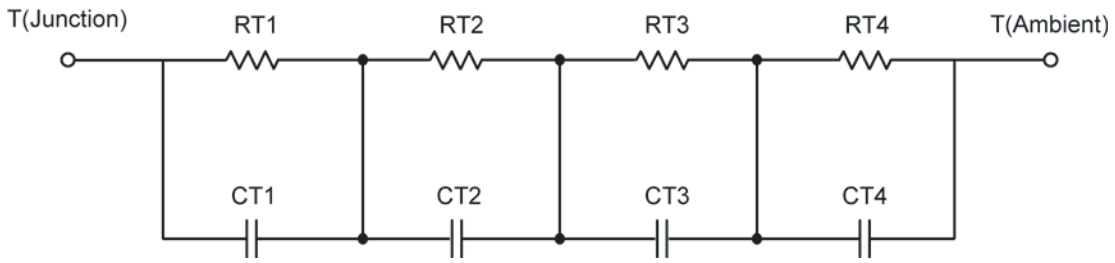
## DESCRIPTION

The parametric values in the R-C thermal model have been derived using curve-fitting techniques. These techniques are described in "A Simple Method of Generating Thermal Models for a Power MOSFET"[1]. When implemented in P-Spice, these values have matching characteristic curves to the Single Pulse Transient Thermal Impedance curves for the MOSFET.

R-C values for the electrical circuit in the Foster/Tank and Cauer/Filter configurations are included.

*Note:*
*For a detailed explanation of implementing these values in P-SPICE, refer to Application Note AN609 Thermal Simulations Of Power MOSFETs on P-SPICE Platform.*

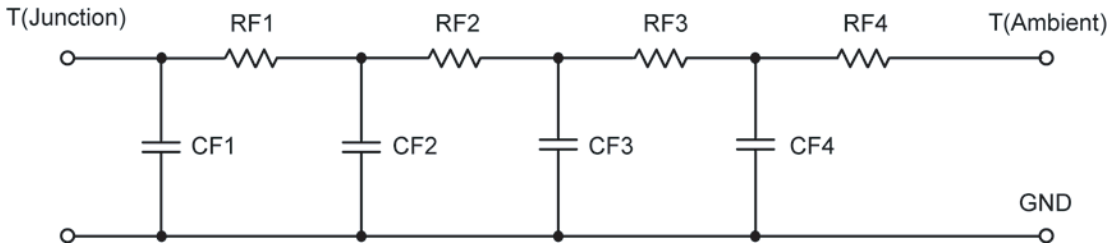
## R-C THERMAL MODEL FOR TANK CONFIGURATION




| R-C VALUES FOR TANK CONFIGURATION | | | |
|---|---|---|---|
| **Thermal Resistance (°C/W)** | | | |
| **Junction to** | **Ambient** | **Case** | **Foot** |
| RT1 | 20.4479 | N/A | 13.9489 |
| RT2 | 5.2285 | N/A | 3.6892 |
| RT3 | 35.2771 | N/A | 14.6643 |
| RT4 | 48.7310 | N/A | 8.7285 |
| **Thermal Capacitance (Joules/°C)** | | | |
| **Junction to** | **Ambient** | **Case** | **Foot** |
| CT1 | 5.8305 m | N/A | 4.2521 m |
| CT2 | 567.4529 u | N/A | 519.4117 u |
| CT3 | 29.9527 m | N/A | 27.4798 m |
| CT4 | 1.0281 | N/A | 132.2231 m |

*This document is intended as a SPICE modeling guideline and does not constitute a commercial product data sheet. Designers should refer to the appropriate data sheet of the same number for guaranteed specification limits.*

## R-C THERMAL MODEL FOR FILTER CONFIGURATION

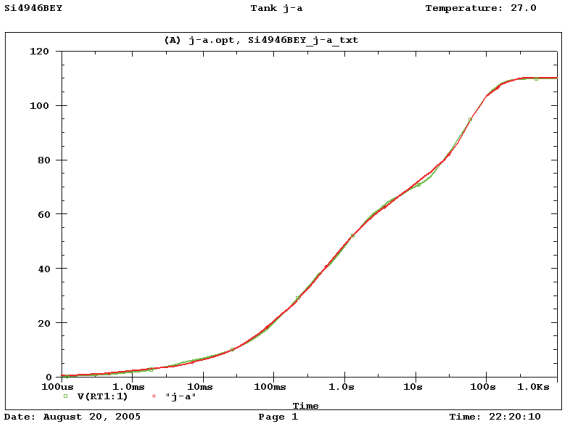


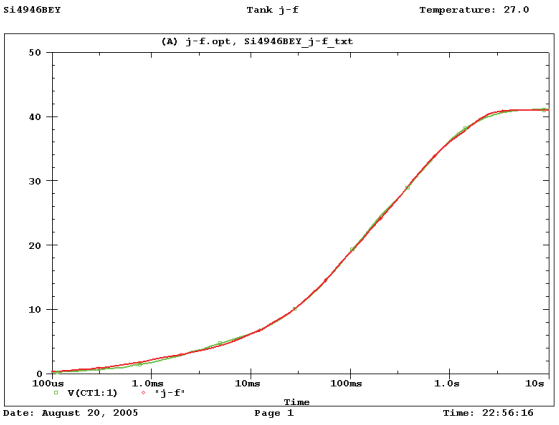

| R-C VALUES FOR FILTER CONFIGURATION | | | |
|---|---|---|---|
| **Thermal Resistance (°C/W)** | | | |
| **Junction to** | **Ambient** | **Case** | **Foot** |
| RF1 | 7.1285 | N/A | 4.8368 |
| RF2 | 27.1298 | N/A | 18.1843 |
| RF3 | 29.7839 | N/A | 15.7594 |
| RF4 | 45.7593 | N/A | 2.4026 |
| **Thermal Capacitance (Joules/°C)** | | | |
| **Junction to** | **Ambient** | **Case** | **Foot** |
| CF1 | 613.9002 u | N/A | 455.8803 u |
| CF2 | 4.4775 m | N/A | 3.3508 m |
| CF3 | 32.7783 m | N/A | 26.9370 m |
| CF4 | 1.0895 | N/A | 618.6570 m |

*Note: NA indicates not applicable*

*Reference:*

*[1] "A Simple Method of Generating Thermal Models for a Power MOSFET" by Wharton McDaniel and Kandarp Pandya, IEEE / SEMITHERM 2002*


Si4946BEY
Tank j-a
Temperature: 27.0
(A) j-a.opt, Si4946BEY_j-a_txt
120
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1)
'j-a'
Time
Date: August 20, 2005
Page 1
Time: 22:20:10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Tank j-f
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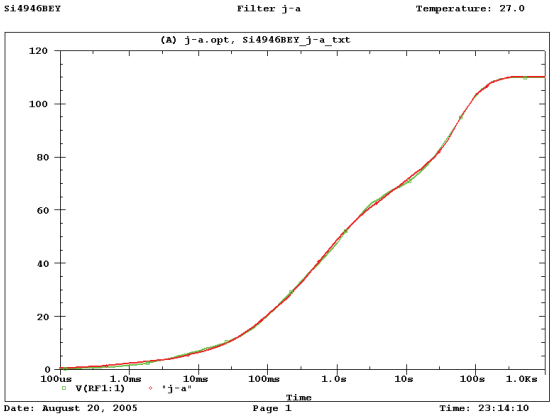
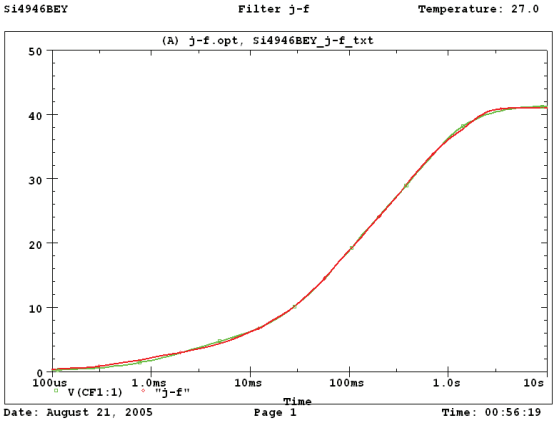
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
10s
V(CT1:1)
'j-f'
Time
Date: August 20, 2005
Page 1
Time: 22:56:16


Si4946BEY
Filter j-a
Temperature: 27.0
(A) j-a.opt, Si4946BEY_j-a_txt
120
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1)
'j-a'
Time
Date: August 20, 2005
Page 1
Time: 23:14:10


Si4946BEY
Filter j-f
Temperature: 27.0
(A) j-f.opt, Si4946BEY_j-f_txt
50
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
10s
V(CF1:1)
"j-f"
Time
Date: August 21, 2005
Page 1
Time: 00:56:19