# R-C Thermal Model Parameters

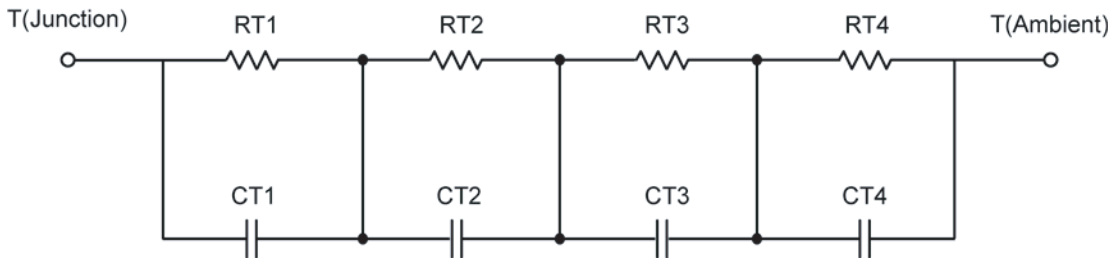
## DESCRIPTION

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.*

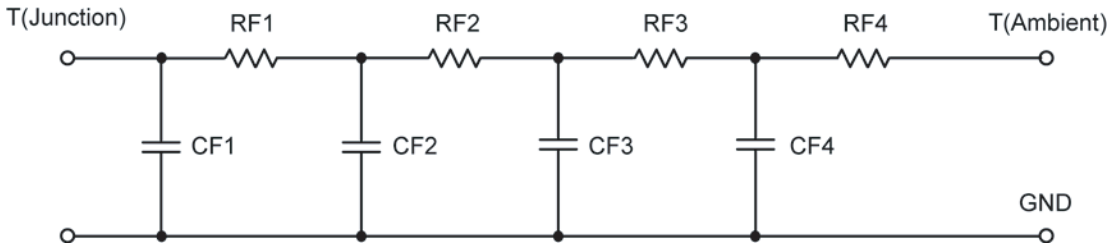
## R-C THERMAL MODEL FOR TANK CONFIGURATION




| R-C VALUES FOR TANK CONFIGURATION | | | | | |
|---|---|---|---|---|---|
| **Thermal Resistance (°C/W)** | | | | | |
| **Junction to** | **Ambient Nch** | **Ambient Pch** | **Case** | **Foot Nch** | **Foot Pch** |
| RT1 | 18.8723 | 16.6933 | N/A | 11.0937 | 12.7957 |
| RT2 | 8.7985 | 7.5970 | N/A | 2.7173 | 3.7553 |
| RT3 | 26.8668 | 28.1882 | N/A | 14.2007 | 11.7384 |
| RT4 | 54.9607 | 57.4171 | N/A | 11.9112 | 11.6561 |
| **Thermal Capacitance (Joules/°C)** | | | | | |
| **Junction to** | **Ambient Nch** | **Ambient Pch** | **Case** | **Foot Nch** | **Foot Pch** |
| CT1 | 12.9669 m | 23.2467 m | N/A | 5.9662 m | 4.2529 m |
| CT2 | 3.3110 m | 970.0034 u | N/A | 845.9260 u | 511.3149 u |
| CT3 | 56.7398 m | 44.7215 m | N/A | 15.0022 m | 33.9748 m |
| CT4 | 1.1690 | 1.2124 | N/A | 166.9101 m | 130.9698 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

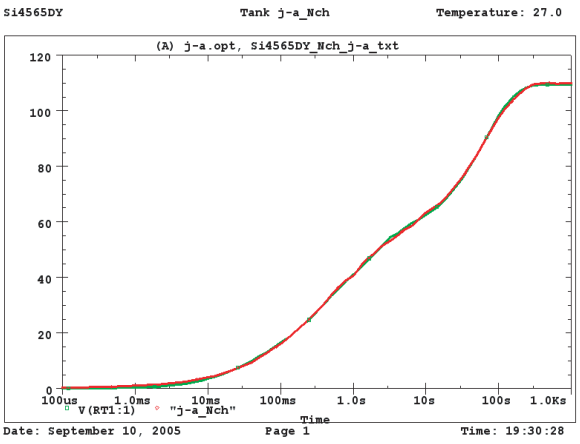



| R-C VALUES FOR FILTER CONFIGURATION | | | | | |
|---|---|---|---|---|---|
| **Thermal Resistance (°C/W)** | | | | | |
| **Junction to** | **Ambient Nch** | **Ambient Pch** | **Case** | **Foot Nch** | **Foot Pch** |
| RT1 | 6.6538 | 6.1531 | N/A | 5.5258 | 5.2134 |
| RT2 | 25.6696 | 23.1988 | N/A | 20.6873 | 19.9882 |
| RT3 | 24.1929 | 25.6127 | N/A | 8.2291 | 9.5257 |
| RT4 | 53.0059 | 54.6507 | N/A | 5.4518 | 5.2791 |
| **Thermal Capacitance (Joules/°C)** | | | | | |
| **Junction to** | **Ambient Nch** | **Ambient Pch** | **Case** | **Foot Nch** | **Foot Pch** |
| CT1 | 1.2523 m | 455.1067 u | N/A | 1.0313 m | 380.8703 u |
| CT2 | 6.1023 m | 9.6892 m | N/A | 4.2548 m | 4.7932 m |
| CT3 | 46.9702 m | 34.5765 m | N/A | 58.6845 m | 64.0459 m |
| CT4 | 1.1277 | 1.2216 | N/A | 334.8835 m | 87.5032 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*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Tank j-a_Nch
Temperature: 27.0
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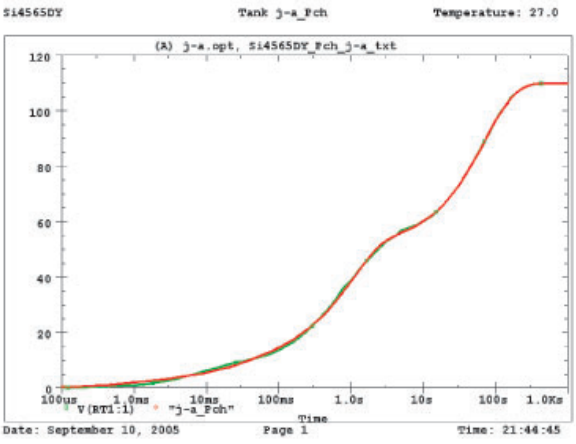
120
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1)
"j-a_Nch"
Time
Date: September 10, 2005
Page 1
Time: 19:30:28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100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
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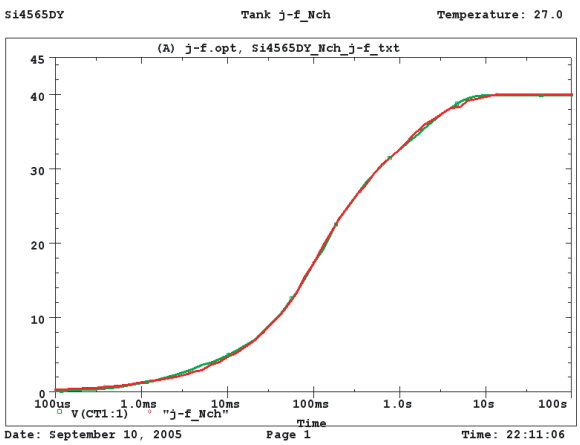
Time
Date: September 10, 2005
Page 1
Time: 21:44:45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40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
V(CT1:1)
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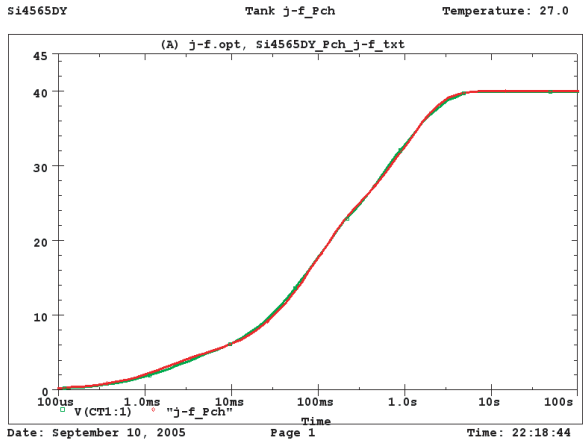
Time
Date: September 10, 2005
Page 1
Time: 22:11:06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Tank j-f_Pch
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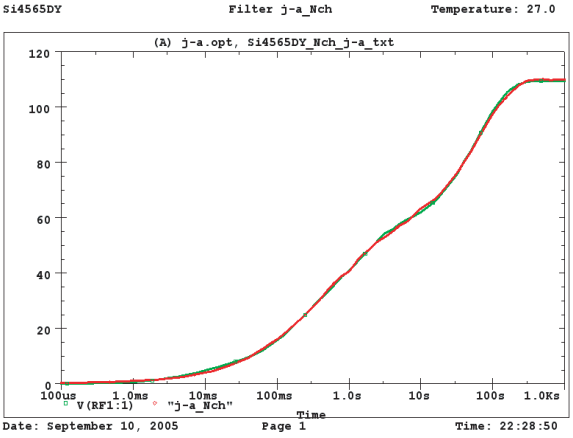
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
V(CT1:1)
"j-f_Pch"
Time
Date: September 10, 2005
Page 1
Time: 22:18:44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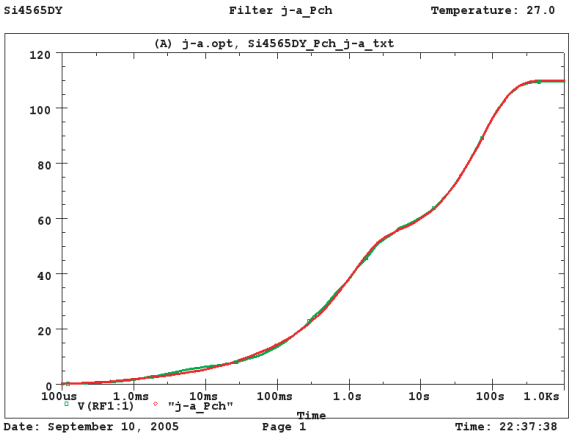
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1)
"j-a_Nch"
Time
Date: September 10, 2005
Page 1
Time: 22:28:50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Filter j-a_Pch
Temperature: 27.0
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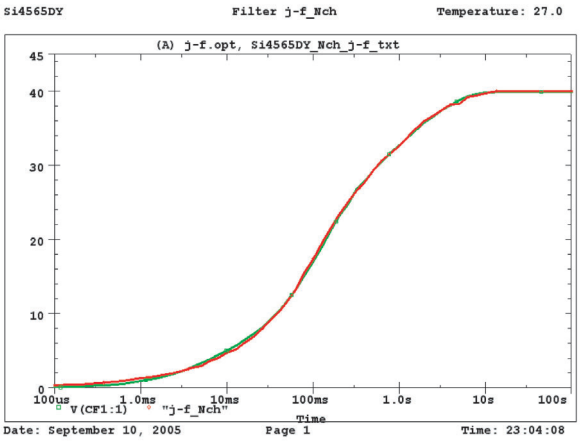
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1)
"j-a_Pch"
Time
Date: September 10, 2005
Page 1
Time: 22:37:38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Filter j-f_Nch
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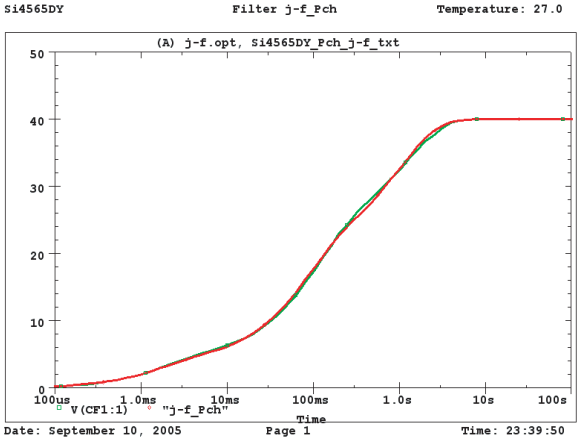
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
V(CF1:1)
"j-f_Nch"
Time
Date: September 10, 2005
Page 1
Time: 23:04:08


Si4565DY
Filter j-f_Pch
Temperature: 27.0
(A) j-f.opt, Si4565DY_Pch_j-f_txt
50
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
V(CF1:1)
"j-f_Pch"
Time
Date: September 10, 2005
Page 1
Time: 23:39:50