# R-C Thermal Model Parameters

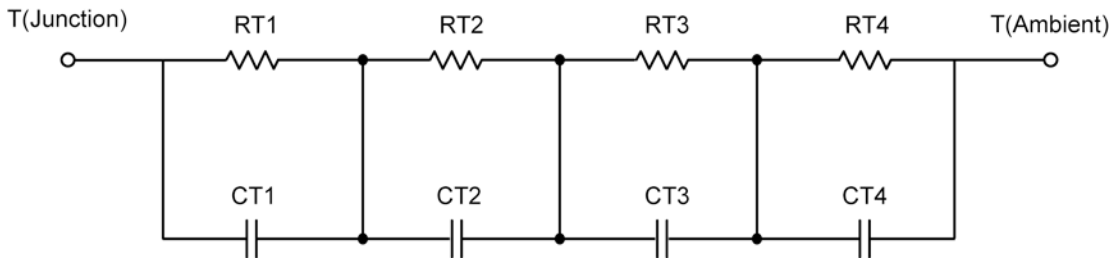
## DESCRIPTION

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.*

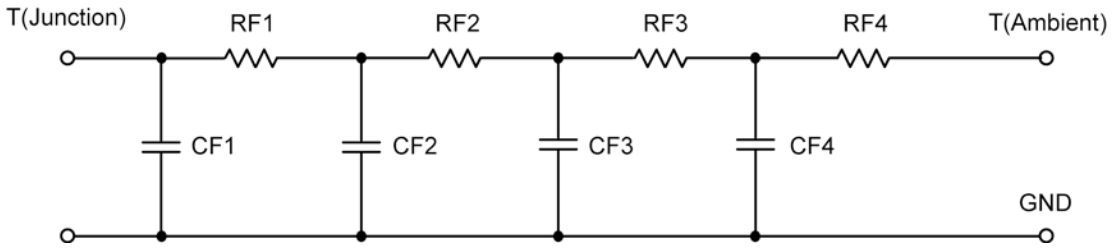
## R-C THERMAL MODEL FOR TANK CONFIGURATION




| R-C VALUES FOR TANK CONFIGURATION | | | | | |
|---|---|---|---|---|---|
| **Thermal Resistance (°C/W)** | | | | | |
| **Junction to** | **Ambient Ch1** | **Ambient Ch2** | **Case** | **Foot Ch1** | **Foot Ch2** |
| RT1 | 20.2615 | 17.1236 | N/A | 12.5201 | 15.8334 |
| RT2 | 31.3084 | 19.9107 | N/A | 15.0130 | 11.0107 |
| RT3 | 3.7262 | 12.0169 | N/A | 3.9622 | 4.2755 |
| RT4 | 54.7039 | 60.9488 | N/A | 8.5047 | 8.8804 |
| **Thermal Capacitance (Joules/°C)** | | | | | |
| **Junction to** | **Ambient Ch1** | **Ambient Ch2** | **Case** | **Foot Ch1** | **Foot Ch2** |
| CT1 | 8.5568 m | 42.8107 m | N/A | 42.5506 m | 79.4131 m |
| CT2 | 56.4965 m | 53.9821 m | N/A | 5.0473 m | 3.9493 m |
| CT3 | 982.5193 u | 1.0904 m | N/A | 283.6484 u | 201.5379 u |
| CT4 | 1.6094 | 1.2903 | N/A | 3.7356 m | 38.1364 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

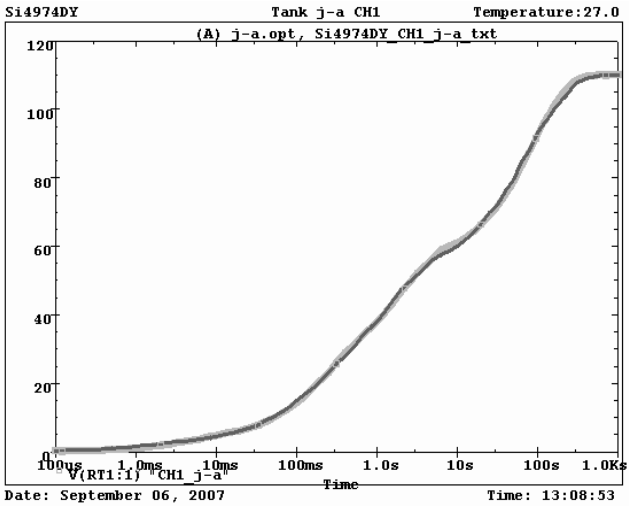


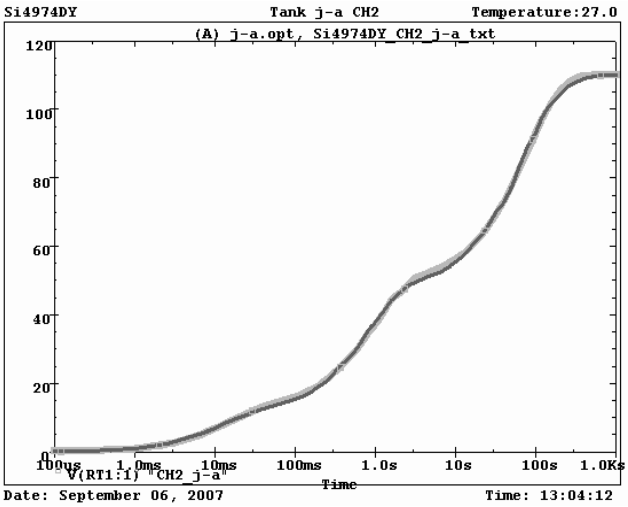

| R-C VALUES FOR FILTER CONFIGURATION | | | | | |
|---|---|---|---|---|---|
| **Thermal Resistance (°C/W)** | | | | | |
| **Junction to** | **Ambient Ch1** | **Ambient Ch2** | **Case** | **Foot Ch1** | **Foot Ch2** |
| RF1 | 4.3391 | 10.0822 | N/A | 4.9638 | 5.6086 |
| RF2 | 24.2012 | 17.6858 | N/A | 17.1582 | 14.8875 |
| RF3 | 28.5502 | 21.4399 | N/A | 12.7026 | 16.4891 |
| RF4 | 52.9095 | 60.7921 | N/A | 5.1754 | 3.0148 |
| **Thermal Capacitance (Joules/°C)** | | | | | |
| **Junction to** | **Ambient Ch1** | **Ambient Ch2** | **Case** | **Foot Ch1** | **Foot Ch2** |
| CF1 | 702.8591 u | 775.6964 u | N/A | 234.6154 u | 233.6176 u |
| CF2 | 6.3258 m | 14.6743 m | N/A | 1.6557 m | 4.1080 m |
| CF3 | 48.8845 m | 14.1282 m | N/A | 7.7587 m | 38.0499 m |
| CF4 | 1.5877 | 1.1823 | N/A | 145.8204 m | 568.0203 m |

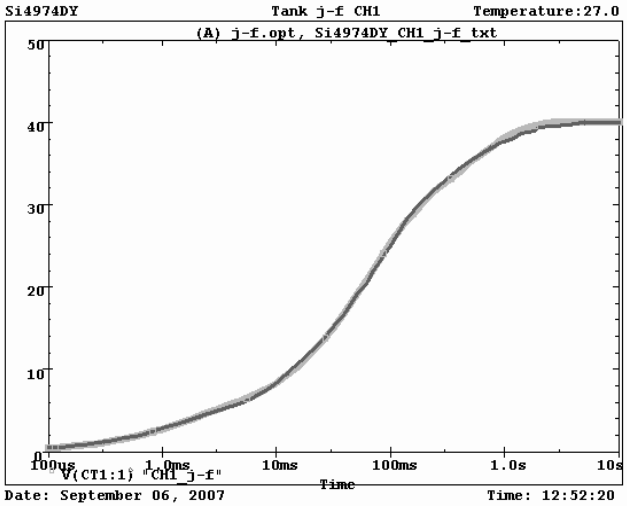
*Note: NA indicates not applicable*

*Reference:*

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


Si4974DY
Tank j-a CH1
Temperature:27.0
(A) j-a.opt, Si4974DY_CH1_j-a_txt
120
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1) "CH1_j-a"
Time
Date: September 06, 2007
Time: 13:08:53


Si4974DY
Tank j-a CH2
Temperature:27.0
(A) j-a.opt, Si4974DY_CH2_j-a_txt
120
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1) "CH2_j-a"
Time
Date: September 06, 2007
Time: 13:04:12


Si4974DY
Tank j-f CH1
Temperature:27.0
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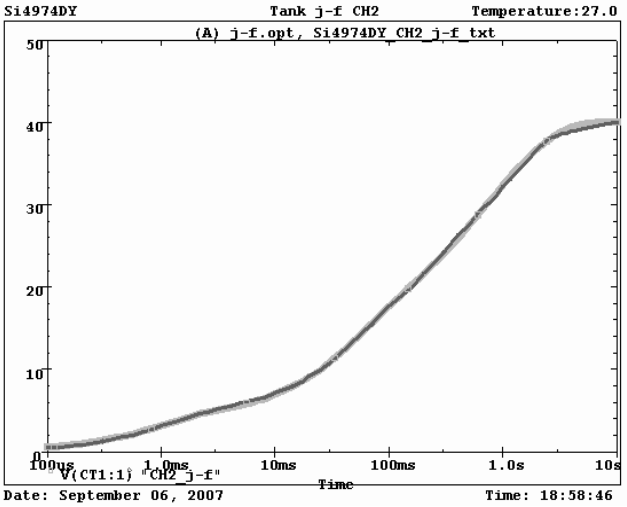
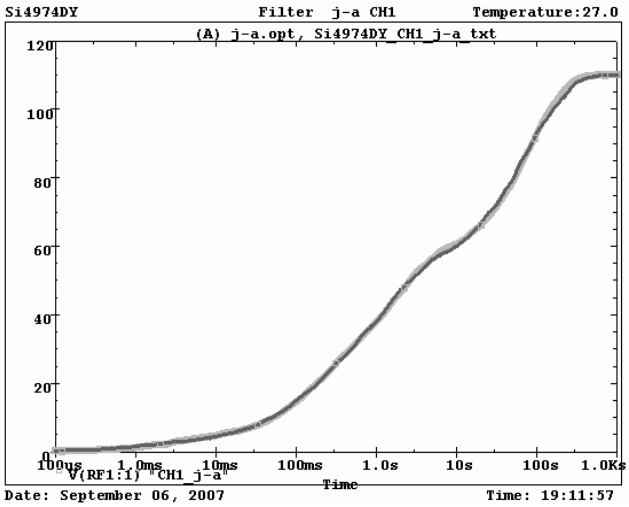
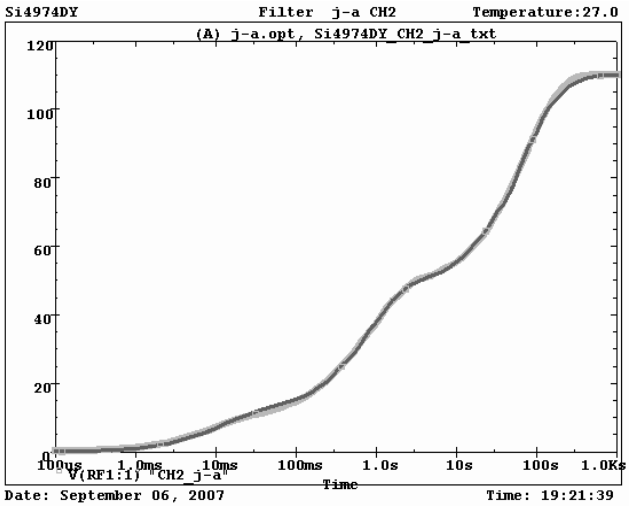
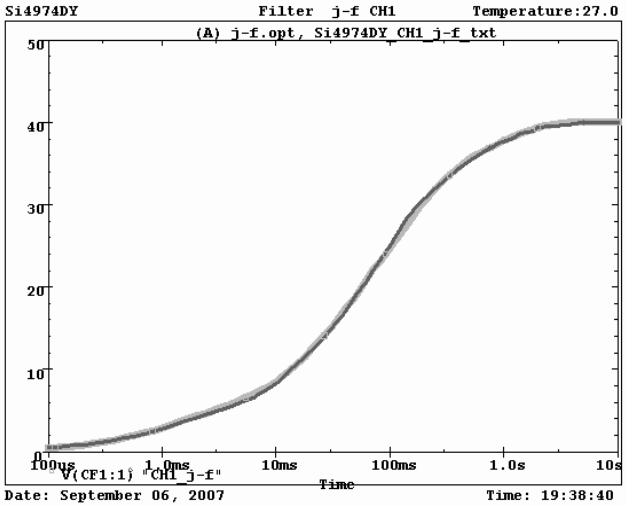
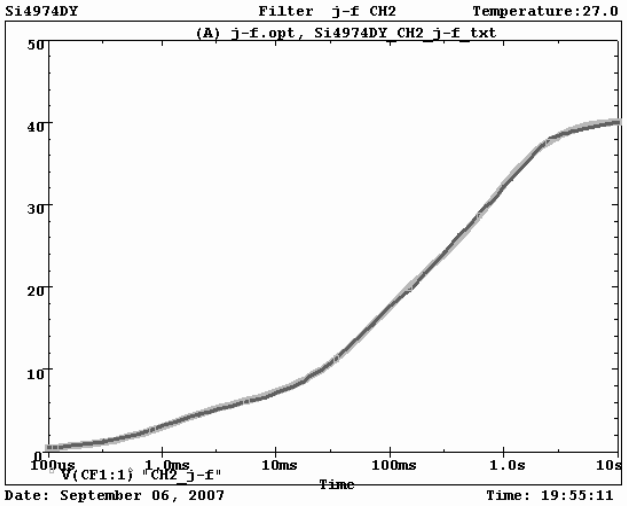
50
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
10s
V(CT1:1) "CH1_j-f"
Time
Date: September 06, 2007
Time: 12:52:20


Si4974DY
Tank j-f CH2
Temperature:27.0
(A) j-f.opt, Si4974DY_CH2_j-f_txt
50
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
10s
V(CT1:1) "CH2_j-f"
Time
Date: September 06, 2007
Time: 18:58:46


Si4974DY
Filter j-a CH1
Temperature:27.0
(A) j-a.opt, Si4974DY_CH1_j-a_txt
120
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1) "CH1_j-a"
Time
Date: September 06, 2007
Time: 19:11:57


Si4974DY
Filter j-a CH2
Temperature:27.0
(A) j-a.opt, Si4974DY_CH2_j-a_txt
120
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1) "CH2_j-a"
Time
Date: September 06, 2007
Time: 19:21:39


Si4974DY
Filter j-f CH1
Temperature:27.0
(A) j-f.opt, Si4974DY_CH1_j-f_txt
50
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
10s
V(CF1:1) "CH1_j-f"
Time
Date: September 06, 2007
Time: 19:38:40


Si4974DY
Filter j-f CH2
Temperature:27.0
(A) j-f.opt, Si4974DY_CH2_j-f_txt
50
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
10s
V(CF1:1) "CH2_j-f"
Time
Date: September 06, 2007
Time: 19:55:11