# R-C Thermal Model Parameters

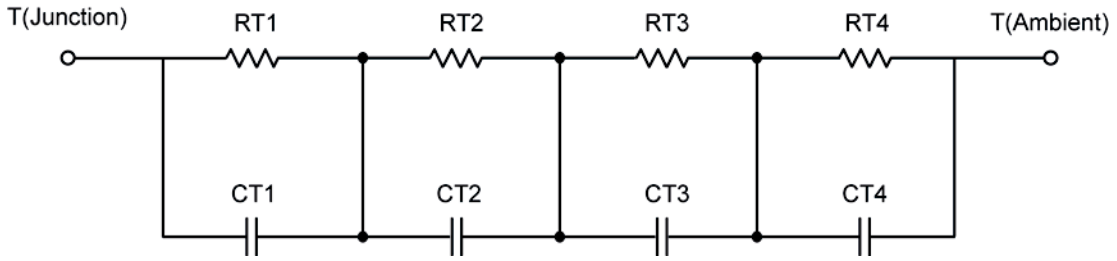
## DESCRIPTION

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.*

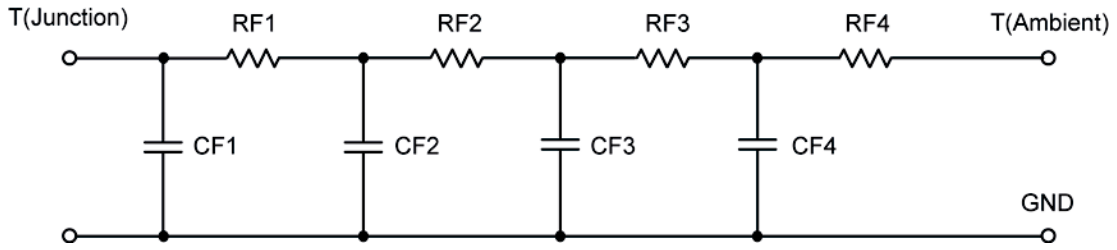
## R-C THERMAL MODEL FOR TANK CONFIGURATION




| R-C VALUES FOR TANK CONFIGURATION | | | | | |
|---|---|---|---|---|---|
| **Thermal Resistance (°C/W)** | | | | | |
| **Junction to** | **Ambient Mosfet** | **Ambient Schottky** | **Case** | **Foot Mosfet** | **Foot Schottky** |
| RT1 | 8.9501 | 10.2453 | N/A | 14.6689 | 8.2123 |
| RT2 | 27.7425 | 26.9788 | N/A | 4.6383 | 8.6349 |
| RT3 | 25.6011 | 32.1590 | N/A | 9.0894 | 24.6709 |
| RT4 | 42.7063 | 55.6169 | N/A | 8.6034 | 23.4819 |
| **Thermal Capacitance (Joules/°C)** | | | | | |
| **Junction to** | **Ambient Mosfet** | **Ambient Schottky** | **Case** | **Foot Mosfet** | **Foot Schottky** |
| CT1 | 644.1619 u | 283.5449 u | N/A | 15.5665 m | 159.6755 m |
| CT2 | 38.1412 m | 37.2940 m | N/A | 387.3313 u | 109.0039 u |
| CT3 | 4.7543 m | 2.5499 m | N/A | 2.9876 m | 2.7372 m |
| CT4 | 1.6519 | 1.3305 | N/A | 6.1516 m | 1.0823 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

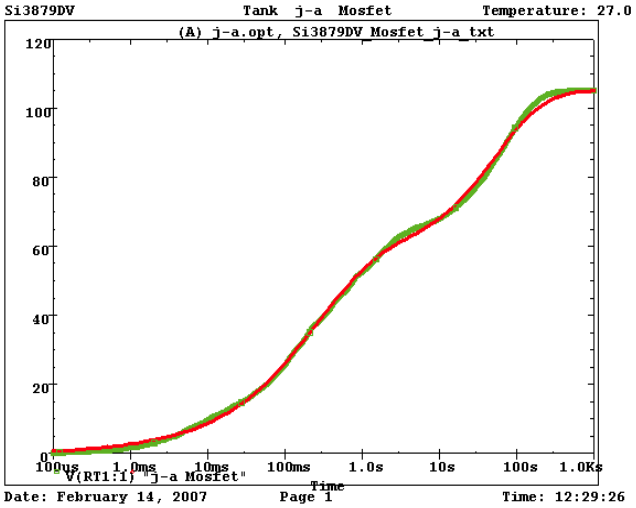



| R-C VALUES FOR FILTER CONFIGURATION | | | | | |
|---|---|---|---|---|---|
| **Thermal Resistance (°C/W)** | | | | | |
| **Junction to** | **Ambient Mosfet** | **Ambient Schottky** | **Case** | **Foot Mosfet** | **Foot Schottky** |
| RF1 | 10.5377 | 16.5738 | N/A | 7.6550 | 12.8683 |
| RF2 | 30.6744 | 35.8269 | N/A | 16.8137 | 27.2699 |
| RF3 | 22.8344 | 20.7607 | N/A | 8.4709 | 16.7347 |
| RF4 | 40.9535 | 51.8386 | N/A | 4.0604 | 8.1271 |
| **Thermal Capacitance (Joules/°C)** | | | | | |
| **Junction to** | **Ambient Mosfet** | **Ambient Schottky** | **Case** | **Foot Mosfet** | **Foot Schottky** |
| CF1 | 508.9049 u | 330.1880 u | N/A | 370.6514 u | 112.1569 u |
| CF2 | 3.5874 m | 3.1878 m | N/A | 1.6792 m | 737.7182 u |
| CF3 | 46.4679 m | 78.4614 m | N/A | 8.1080 m | 1.2459 m |
| CF4 | 1.6802 | 1.4037 | N/A | 79.1993 m | 137.9870 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*


Si3879DV
Tank j-a Mosfet
Temperature: 27.0
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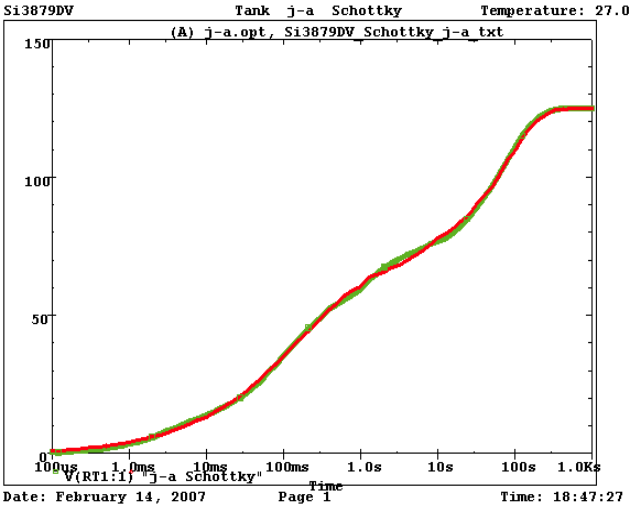
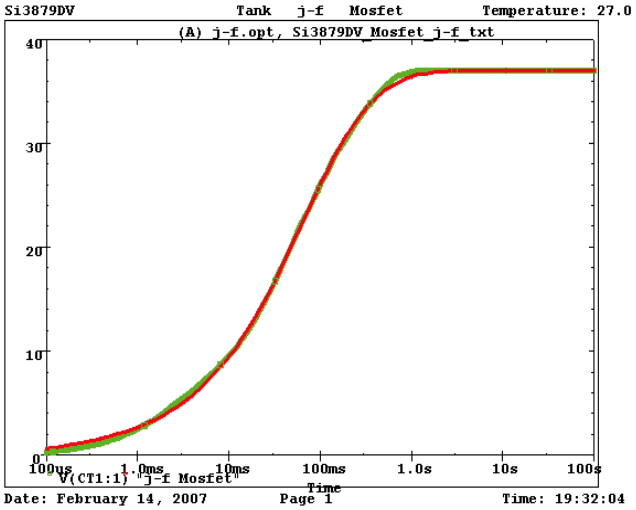
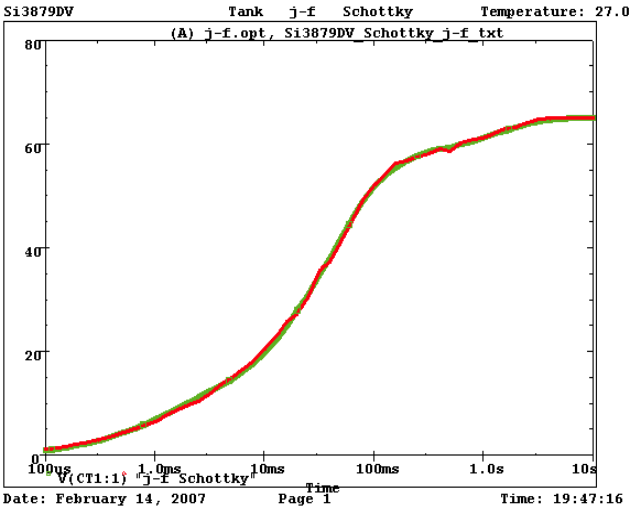
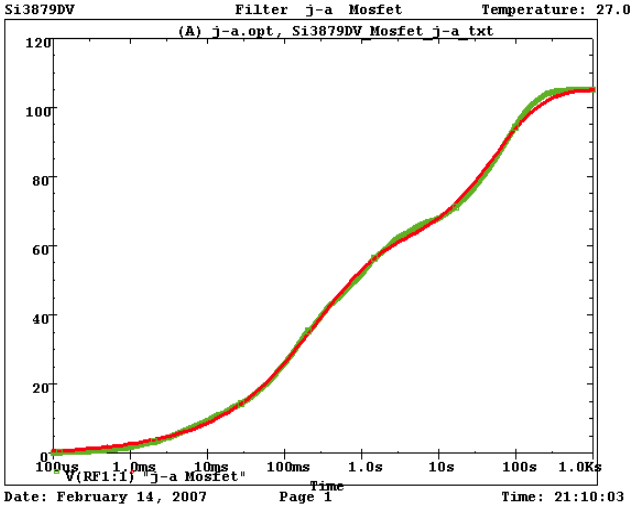
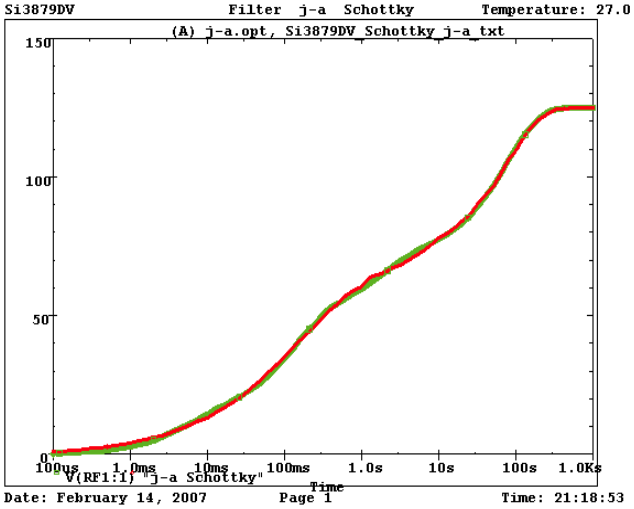
120
100
80
60
40
20
0
100us 1.0ms 10ms 100ms 1.0s 10s 100s 1.0Ks
V(RT1:1) "j-a Mosfet"
Time
Date: February 14, 2007
Page 1
Time: 12:29:26

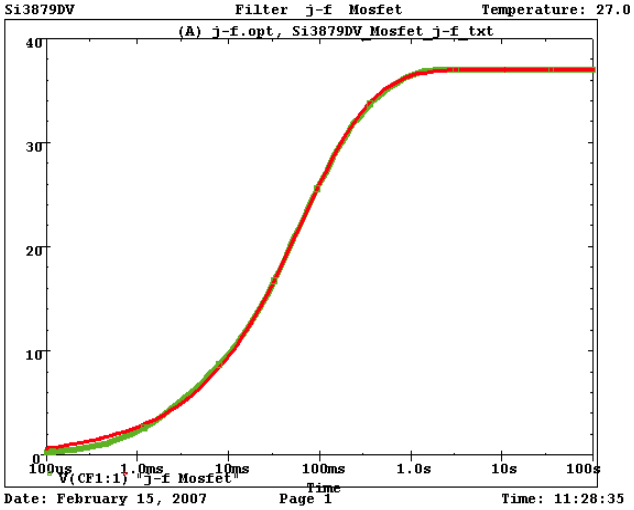

Si3879DV
Tank j-a Schottky
Temperature: 27.0
(A) j-a.opt, Si3879DV_Schottky_j-a_txt
150
100
50
0
100us 1.0ms 10ms 100ms 1.0s 10s 100s 1.0Ks
V(RT1:1) "j-a Schottky"
Time
Date: February 14, 2007
Page 1
Time: 18:47:27

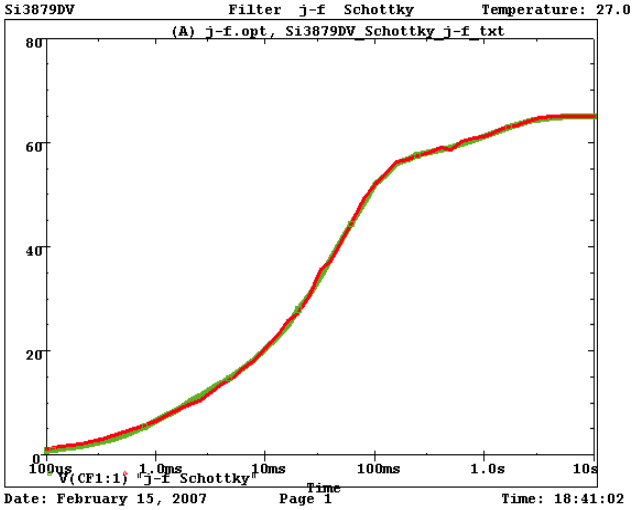

Si3879DV
Tank j-f Mosfet
Temperature: 27.0
(A) j-f.opt, Si3879DV_Mosfet_j-f_txt
40
30
20
10
0
100us 1.0ms 10ms 100ms 1.0s 10s 100s
V(CT1:1) "j-f Mosfet"
Time
Date: February 14, 2007
Page 1
Time: 19:32:04


Si3879DV
Tank j-f Schottky
Temperature: 27.0
(A) j-f.opt, Si3879DV_Schottky_j-f_txt
80
60
40
20
0
100us 1.0ms 10ms 100ms 1.0s 10s
V(CT1:1) "j-f Schottky"
Time
Date: February 14, 2007
Page 1
Time: 19:47:16


Si3879DV
Filter j-a Mosfet
Temperature: 27.0
(A) j-a.opt, Si3879DV_Mosfet_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 Mosfet"
Time
Date: February 14, 2007
Page 1
Time: 21:10:03


Si3879DV
Filter j-a Schottky
Temperature: 27.0
(A) j-a.opt, Si3879DV_Schottky_j-a_txt
150
100
50
0
100us 1.0ms 10ms 100ms 1.0s 10s 100s 1.0Ks
V(RF1:1) "j-a Schottky"
Time
Date: February 14, 2007
Page 1
Time: 21:18:53


Si3879DV
Filter j-f Mosfet
Temperature: 27.0
(A) j-f.opt, Si3879DV_Mosfet_j-f_txt
40
30
20
10
0
100us 1.0ms 10ms 100ms 1.0s 10s 100s
V(CF1:1) "j-f Mosfet"
Time
Date: February 15, 2007
Page 1
Time: 11:28:35


Si3879DV
Filter j-f Schottky
Temperature: 27.0
(A) j-f.opt, Si3879DV_Schottky_j-f_txt
80
60
40
20
0
100us 1.0ms 10ms 100ms 1.0s 10s
V(CF1:1) "j-f Schottky"
Time
Date: February 15, 2007
Page 1
Time: 18:41:02