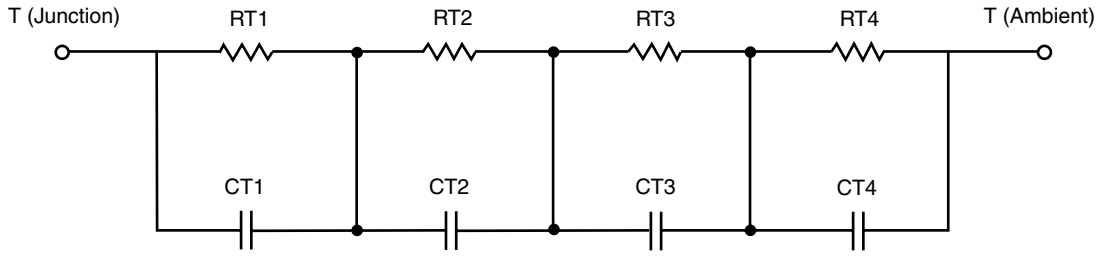
# R-C Thermal Model Parameters

## DESCRIPTION

The parametric values in the R-C thermal model have been derived using curve-fitting techniques. R-C values for the electrical circuit in the Foster/tank and Cauer/filter configurations are included. When implemented in P-SPICE, these values have matching characteristic curves to the single-pulse transient thermal impedance curves for the MOSFET.

These RC values can be used in the P-SPICE simulation to evaluate the thermal behavior of the MOSFET junction temperature under a defined power profile. These techniques are described in application note AN609, “Thermal Simulation of Power MOSFETs on the P-SPICE Platform”.

## R-C THERMAL MODEL FOR TANK CONFIGURATION

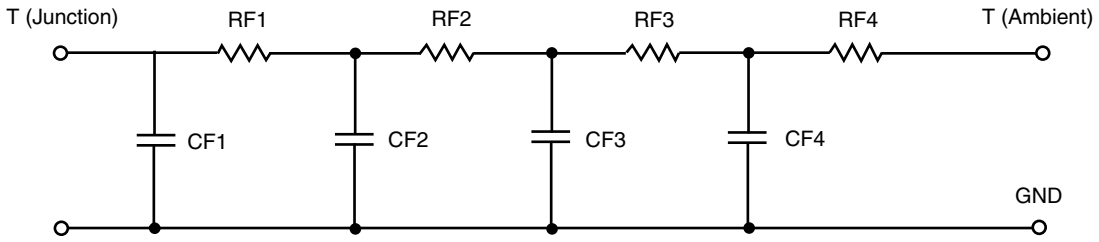



| R-C VALUES FOR TANK CONFIGURATION | | | |
|---|---|---|---|
| THERMAL RESISTANCE (°C/W) | | | |
| **Junction to** | **Ambient** | **Case-Drain Top** | **Case-Source** |
| RT1 | 3.1362 | 602.0700 m | 1.9579 |
| RT2 | 12.0459 | 1.0938 | 1.7234 |
| RT3 | 17.6497 | 2.5327 | 2.6525 |
| RT4 | 35.1682 | 771.4300 m | 666.2000 m |
| THERMAL CAPACITANCE (Joules/°C) | | | |
| **Junction to** | **Ambient** | **Case-Drain Top** | **Case-Source** |
| CT1 | 1.9866 m | 379.1138 m | 49.2110 m |
| CT2 | 51.6905 m | 24.6176 m | 9.9046 m |
| CT3 | 1.0084 | 18.1494 m | 195.3756 m |
| CT4 | 2.9678 | 1.0428 m | 458.3565 u |

**Note**
N/A indicates not applicable

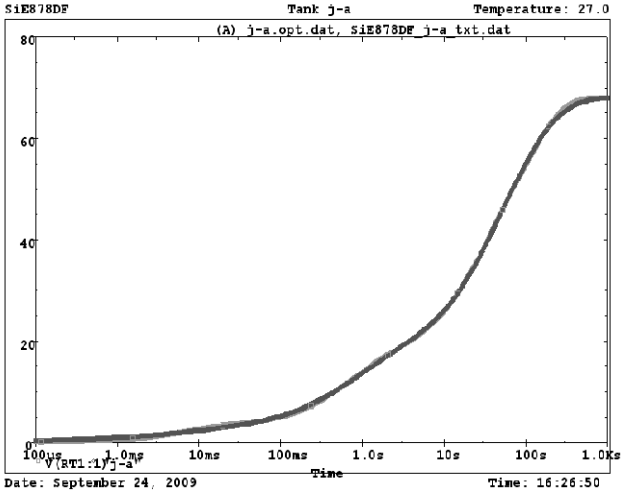
*This document is intended as a SPICE modeling guideline and does not constitute a commercial product datasheet. Designers should refer to the appropriate datasheet of the same number for guaranteed specification limits.*

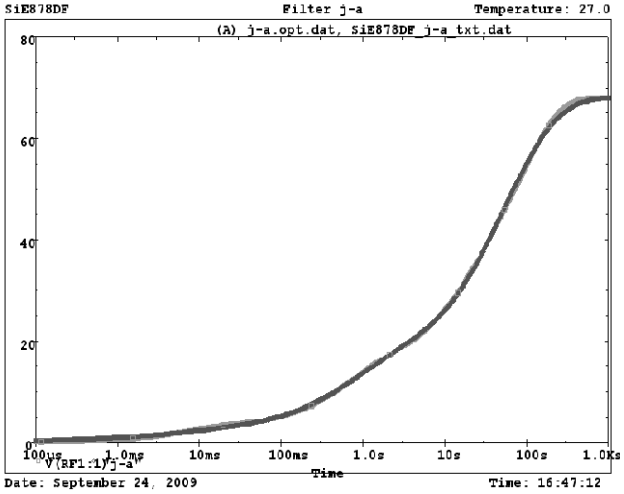
## R-C THERMAL MODEL FOR FILTER CONFIGURATION

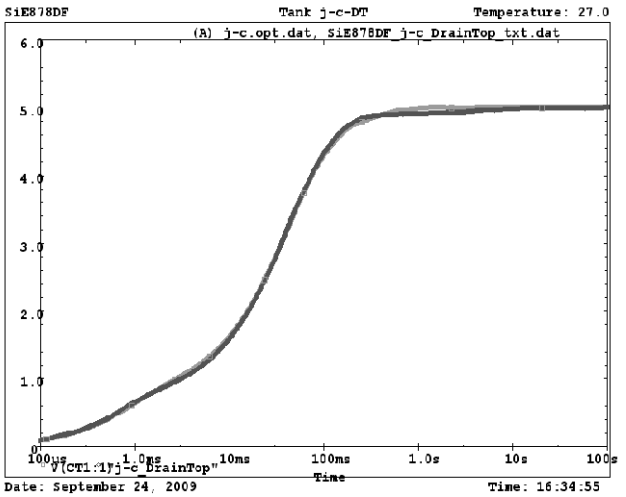


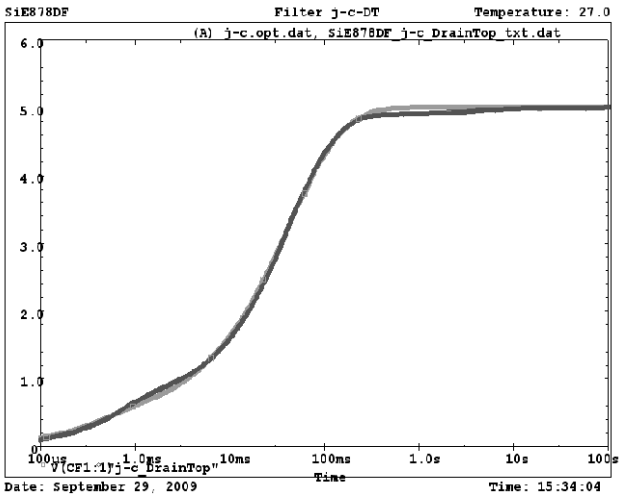

| R-C VALUES FOR FILTER CONFIGURATION | | | |
|---|---|---|---|
| THERMAL RESISTANCE (°C/W) | | | |
| **Junction to** | **Ambient** | **Case-Drain Top** | **Case-Source** |
| RF1 | 3.4101 | 625.4239 m | 946.2009 m |
| RF2 | 12.9975 | 1.8052 | 2.5715 |
| RF3 | 24.3507 | 1.9862 | 2.3405 |
| RF4 | 27.2417 | 583.1221 m | 1.1233 |
| THERMAL CAPACITANCE (Joules/°C) | | | |
| **Junction to** | **Ambient** | **Case-Drain Top** | **Case-Source** |
| CF1 | 1.8381 m | 724.1169 u | 693.0973 u |
| CF2 | 46.3111 m | 5.8368 m | 9.4783 m |
| CF3 | 643.9213 m | 9.6125 m | 52.6817 m |
| CF4 | 2.6406 | 137.0924 m | 544.8042 m |

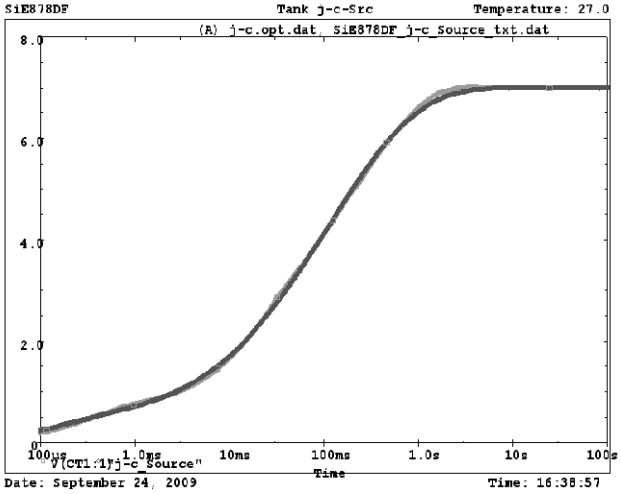
**Note**
N/A indicates not applicable

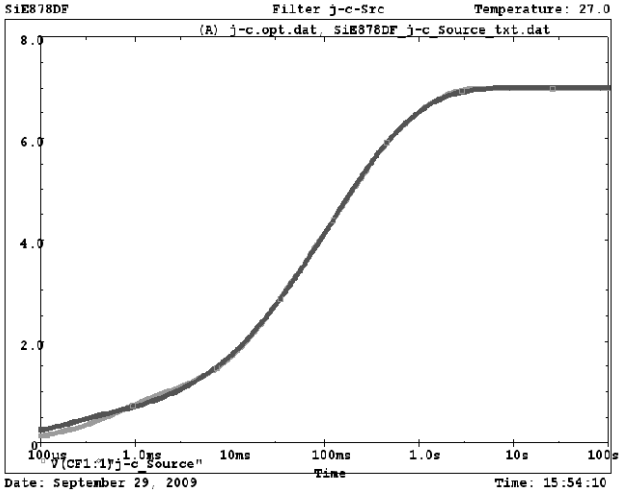

SiE878DF
Tank j-a
Temperature: 27.0
(A) j-a.opt.dat, SiE878DF_j-a_txt.dat
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1)j-a
Time
Date: September 24, 2009
Time: 16:26:50


SiE878DF
Filter j-a
Temperature: 27.0
(A) j-a.opt.dat, SiE878DF_j-a_txt.dat
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1)j-a
Time
Date: September 24, 2009
Time: 16:47:12


SiE878DF
Tank j-c-DT
Temperature: 27.0
(A) j-c.opt.dat, SiE878DF_j-c_DrainTop_txt.dat
6.0
5.0
4.0
3.0
2.0
1.0
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
V(CT1:1)j-c_DrainTop"
Time
Date: September 24, 2009
Time: 16:34:55


SiE878DF
Filter j-c-DT
Temperature: 27.0
(A) j-c.opt.dat, SiE878DF_j-c_DrainTop_txt.dat
6.0
5.0
4.0
3.0
2.0
1.0
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
V(CF1:1)j-c_DrainTop"
Time
Date: September 29, 2009
Time: 15:34:04


SiE878DF
Tank j-c-Src
Temperature: 27.0
(A) j-c.opt.dat, SiE878DF_j-c_Source_txt.dat
8.0
6.0
4.0
2.0
0
100µs
1.0ms
10ms
100ms
1.0s
10s
100s
V(CT1:1)j-c_Source"
Time
Date: September 24, 2009
Time: 16:38:57


SiE878DF
Filter j-c-Src
Temperature: 27.0
(A) j-c.opt.dat, SiE878DF_j-c_Source_txt.dat
8.0
6.0
4.0
2.0
0
100µs
1.0ms
10ms
100ms
1.0s
10s
100s
V(CF1:1)j-c_Source"
Time
Date: September 29, 2009
Time: 15:54:10