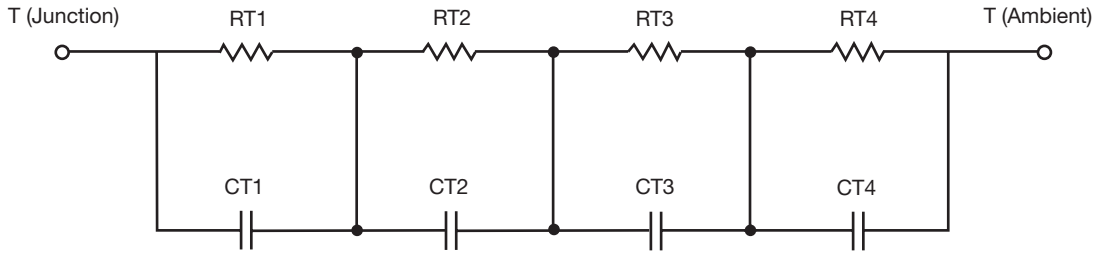
# R-C Thermal Model Parameters

## 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

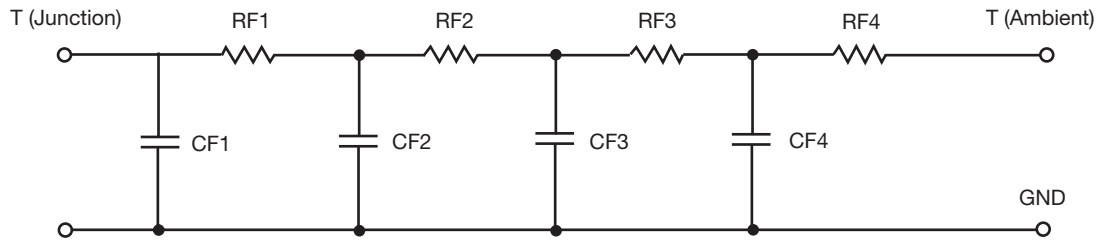



| R-C VALUES FOR TANK CONFIGURATION | | | |
|---|---|---|---|
| THERMAL RESISTANCE (°C/W) | | | |
| **Junction to** | **Ambient** | **Case** | **Foot** |
| RT1 | 27.2039 | N/A | 4.5059 |
| RT2 | 8.9995 | N/A | 10.4558 |
| RT3 | 6.1635 | N/A | 8.1953 |
| RT4 | 49.5401 | N/A | 1.8534 |
| THERMAL CAPACITANCE (Joules/°C) | | | |
| **Junction to** | **Ambient** | **Case** | **Foot** |
| CT1 | 33.0517m | N/A | 475.2209m |
| CT2 | 1.1810 | N/A | 45.1141m |
| CT3 | 2.5606m | N/A | 9.3789m |
| CT4 | 1.5740 | N/A | 1.3804m |

**Note**
N/A indicates not applicable

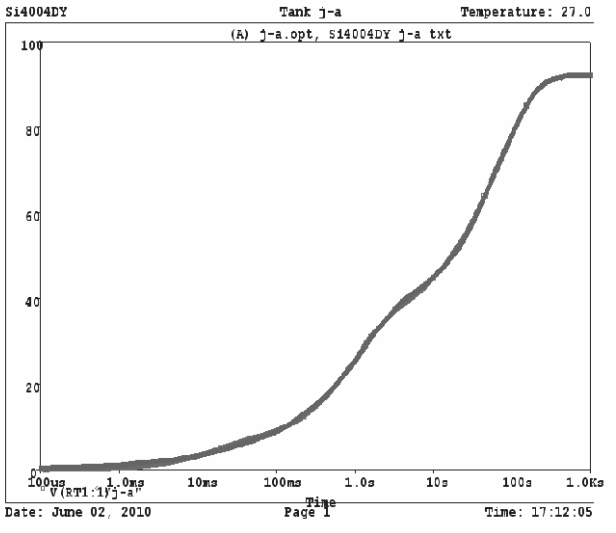
*This document is intended as a SPICE modeling guideline and does not constitute a commercial product datasheet. Designers should refer to the appropriate datasheet of the same number for guaranteed specification limits.*

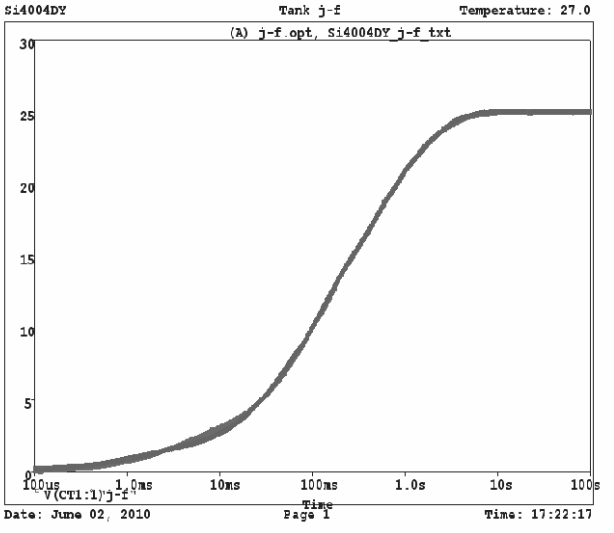
## R-C THERMAL MODEL FOR FILTER CONFIGURATION

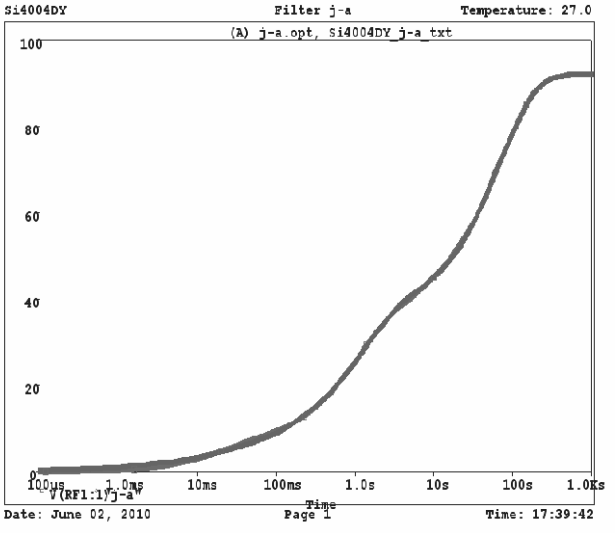


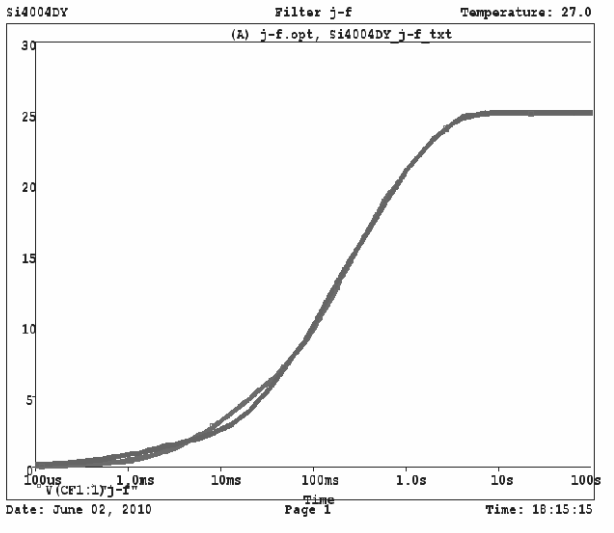

| R-C VALUES FOR FILTER CONFIGURATION | | | |
|---|---|---|---|
| THERMAL RESISTANCE (°C/W) | | | |
| **Junction to** | **Ambient** | **Case** | **Foot** |
| RF1 | 7.7724 | N/A | 5.1959 |
| RF2 | 27.7442 | N/A | 10.2552 |
| RF3 | 14.3421 | N/A | 3.6911 |
| RF4 | 41.9552 | N/A | 5.7961 |
| THERMAL CAPACITANCE (Joules/°C) | | | |
| **Junction to** | **Ambient** | **Case** | **Foot** |
| CF1 | 2.7091m | N/A | 1.9944m |
| CF2 | 30.5039m | N/A | 11.5460m |
| CF3 | 527.6331m | N/A | 21.2019m |
| CF4 | 1.1242 | N/A | 166.0747m |

**Note**
N/A indicates not applicable


Si4004DY
Tank j-a
Temperature: 27.0
(A) j-a.opt, Si4004DY_j-a_txt
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1)'j-a'
Time
Date: June 02, 2010
Page 1
Time: 17:12:05


Si4004DY
Tank j-f
Temperature: 27.0
(A) j-f.opt, Si4004DY_j-f_txt
30
25
20
15
10
5
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
V(CT1:1)'j-f'
Time
Date: June 02, 2010
Page 1
Time: 17:22:17


Si4004DY
Filter j-a
Temperature: 27.0
(A) j-a.opt, Si4004DY_j-a_txt
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1)'j-a'
Time
Date: June 02, 2010
Page 1
Time: 17:39:42


Si4004DY
Filter j-f
Temperature: 27.0
(A) j-f.opt, Si4004DY_j-f_txt
30
25
20
15
10
5
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
V(CF1:1)'j-f'
Time
Date: June 02, 2010
Page 1
Time: 18:15:15