R-C Thermal Model Parameters

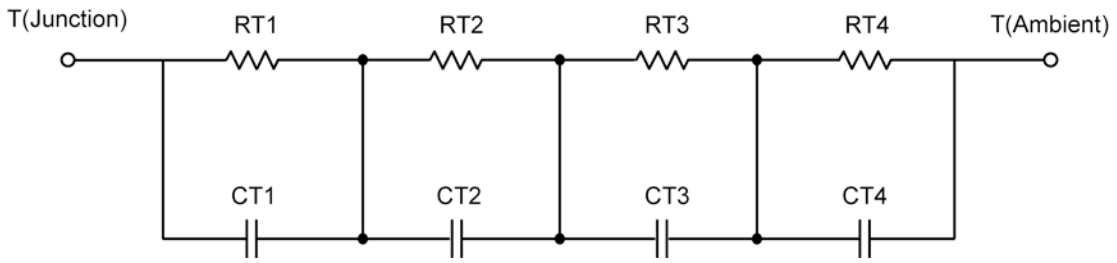
DESCRIPTION

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.

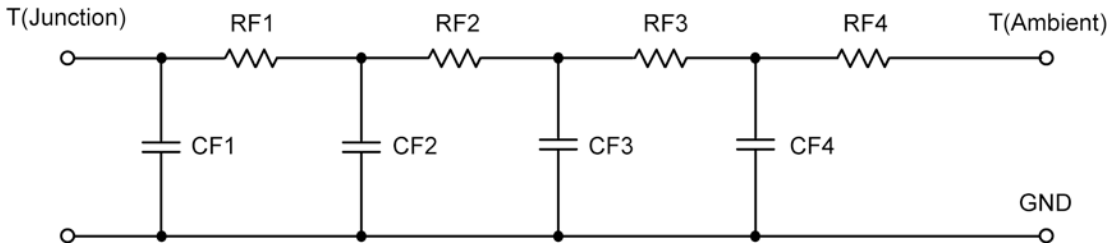
R-C THERMAL MODEL FOR TANK CONFIGURATION



R-C VALUES FOR TANK CONFIGURATION					
Thermal Resistance (°C/W)					
Junction to	**Ambient Mosfet**	**Ambient Schottky**	**Foot**	**Case Mosfet**	**Case Schottky**
RT1	13.6813	21.0048	N/A	9.7234	8.3273
RT2	35.1142	35.1756	N/A	8.6576	16.3671
RT3	31.9431	37.6724	N/A	16.7125	22.8958
RT4	39.2614	31.1472	N/A	4.9065	2.4098
Thermal Capacitance (Joules/°C)					
Junction to	**Ambient Mosfet**	**Ambient Schottky**	**Foot**	**Case Mosfet**	**Case Schottky**
CT1	56.0857 u	41.3949 u	N/A	3.3430 m	2.7630 m
CT2	12.5636 m	734.0350 u	N/A	68.2401 u	34.5317 u
CT3	910.2313 u	11.0793 m	N/A	583.4551 u	381.9205 u
CT4	914.9333 m	923.3225 m	N/A	13.0639 m	24.9169 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

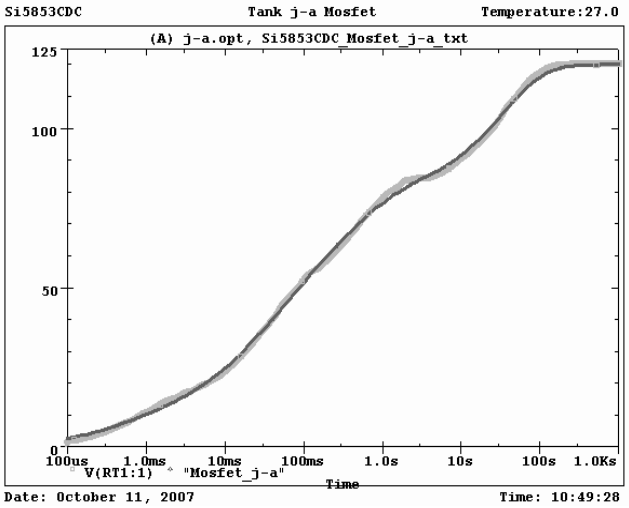


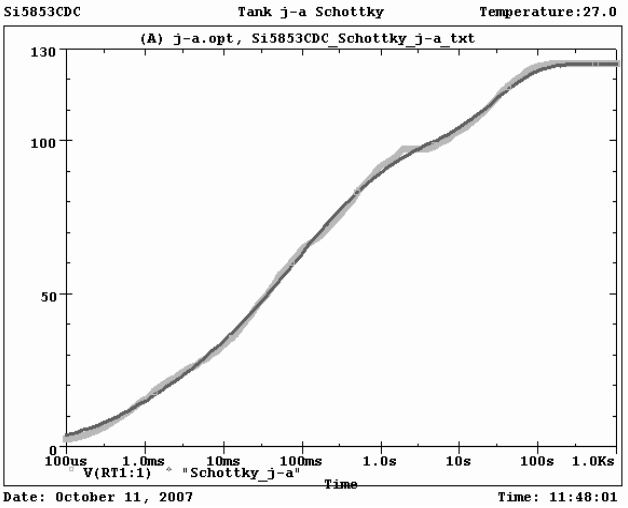
R-C VALUES FOR FILTER CONFIGURATION					
Thermal Resistance (°C/W)					
Junction to	**Ambient Mosfet**	**Ambient Schottky**	**Foot**	**Case Mosfet**	**Case Schottky**
RF1	15.3634	23.9464	N/A	10.9138	19.3531
RF2	34.2797	38.7487	N/A	22.3976	26.5665
RF3	32.1694	32.6811	N/A	6.2203	3.1732
RF4	38.1875	29.6238	N/A	468.3000 m	907.2000 m
Thermal Capacitance (Joules/°C)					
Junction to	**Ambient Mosfet**	**Ambient Schottky**	**Foot**	**Case Mosfet**	**Case Schottky**
CF1	54.3045 u	39.1764 u	N/A	60.1579 u	31.1322 u
CF2	784.9054 u	729.4247 u	N/A	457.3270 u	325.4892 u
CF3	12.6510 m	13.3364 m	N/A	7.9660 m	8.4036 m
CF4	929.7123 m	995.7505 m	N/A	244.0744 m	109.2139 m

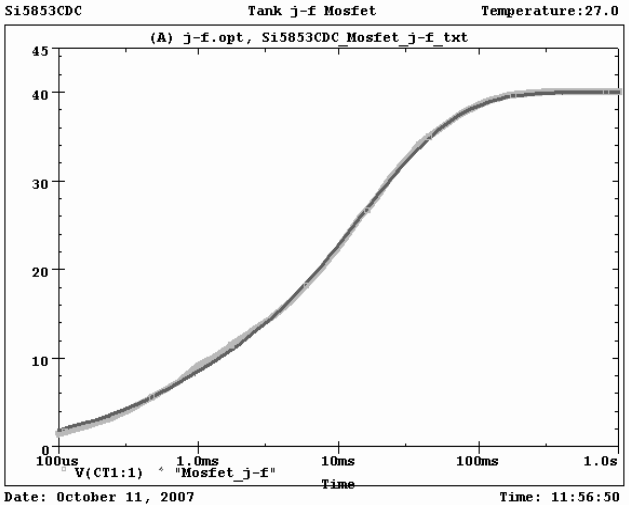
Note: NA indicates not applicable

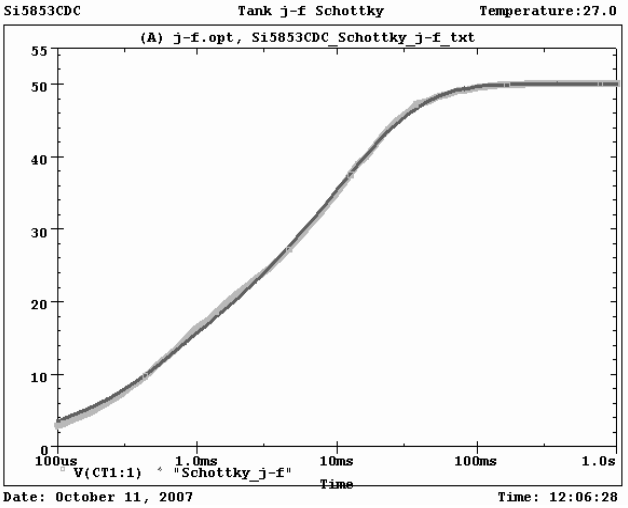
Reference:

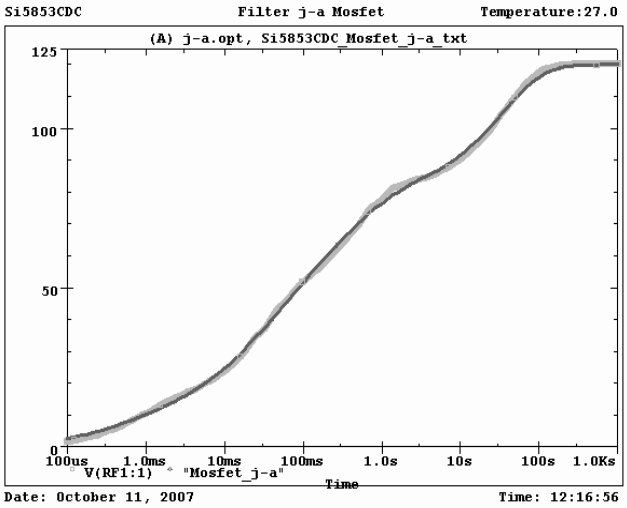
[1] "A Simple Method of Generating Thermal Models for a Power MOSFET" by Wharton McDaniel and Kandarp Pandya, IEEE / SEMITHERM 2002

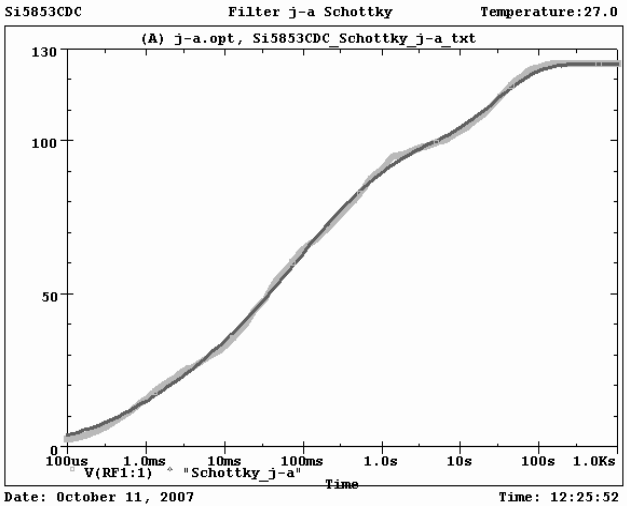

Si5853CDC
Tank j-a Mosfet
Temperature:27.0
(A) j-a.opt, Si5853CDC_Mosfet_j-a_txt
125
100
50
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1)
"Mosfet_j-a"
Time
Date: October 11, 2007
Time: 10:49:28

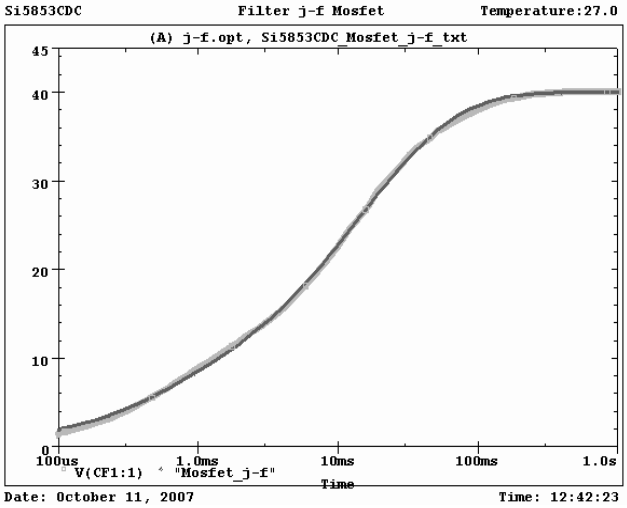

Si5853CDC
Tank j-a Schottky
Temperature:27.0
(A) j-a.opt, Si5853CDC_Schottky_j-a_txt
130
100
50
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1)
"Schottky_j-a"
Time
Date: October 11, 2007
Time: 11:48:01

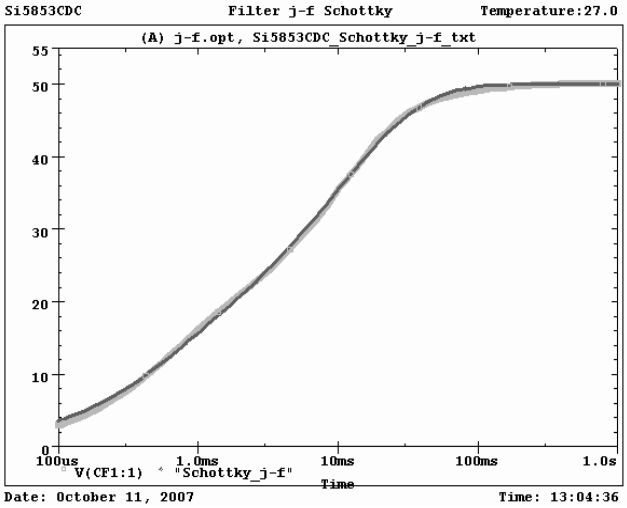

Si5853CDC
Tank j-f Mosfet
Temperature:27.0
(A) j-f.opt, Si5853CDC_Mosfet_j-f_txt
45
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
V(CT1:1)
"Mosfet_j-f"
Time
Date: October 11, 2007
Time: 11:56:50


Si5853CDC
Tank j-f Schottky
Temperature:27.0
(A) j-f.opt, Si5853CDC_Schottky_j-f_txt
55
50
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
V(CT1:1)
"Schottky_j-f"
Time
Date: October 11, 2007
Time: 12:06:28


Si5853CDC
Filter j-a Mosfet
Temperature:27.0
(A) j-a.opt, Si5853CDC_Mosfet_j-a_txt
125
100
50
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1)
"Mosfet_j-a"
Time
Date: October 11, 2007
Time: 12:16:56


Si5853CDC
Filter j-a Schottky
Temperature:27.0
(A) j-a.opt, Si5853CDC_Schottky_j-a_txt
130
100
50
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1)
"Schottky_j-a"
Time
Date: October 11, 2007
Time: 12:25:52


Si5853CDC
Filter j-f Mosfet
Temperature:27.0
(A) j-f.opt, Si5853CDC_Mosfet_j-f_txt
45
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
V(CF1:1)
"Mosfet_j-f"
Time
Date: October 11, 2007
Time: 12:42:23


Si5853CDC
Filter j-f Schottky
Temperature:27.0
(A) j-f.opt, Si5853CDC_Schottky_j-f_txt
55
50
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
V(CF1:1)
"Schottky_j-f"
Time
Date: October 11, 2007
Time: 13:04:36