R-C Thermal Model Parameters

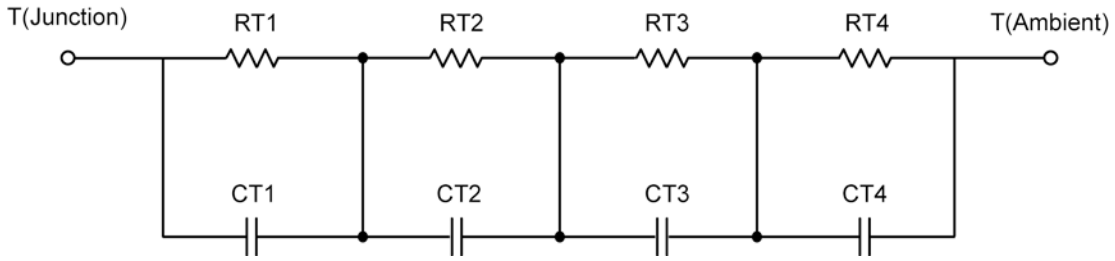
DESCRIPTION

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.

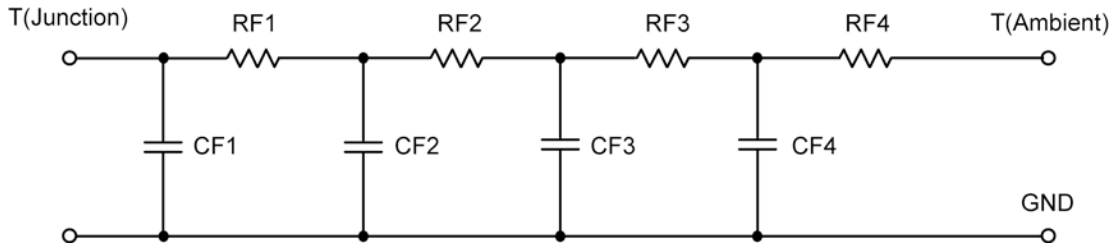
R-C THERMAL MODEL FOR TANK CONFIGURATION



R-C VALUES FOR TANK CONFIGURATION					
Thermal Resistance (°C/W)					
Junction to	**Ambient Nch**	**Ambient Pch**	**Foot**	**Case Nch**	**Case Pch**
RT1	24.2346	24.2346	N/A	3.1721	3.1721
RT2	7.7573	7.7573	N/A	3.6283	3.6283
RT3	20.9158	20.9158	N/A	806.4000 m	806.4000 m
RT4	52.0923	52.0923	N/A	4.3932	4.3932
Thermal Capacitance (Joules/°C)					
Junction to	**Ambient Nch**	**Ambient Pch**	**Foot**	**Case Nch**	**Case Pch**
CT1	2.8739 m	2.8739 m	N/A	201.0635 u	201.0635 u
CT2	167.8179 u	167.8179 u	N/A	3.2639 m	3.2639 m
CT3	53.6028 m	53.6028 m	N/A	94.0355 m	94.0355 m
CT4	922.7308 m	922.7308 m	N/A	4.5641 m	4.5641 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

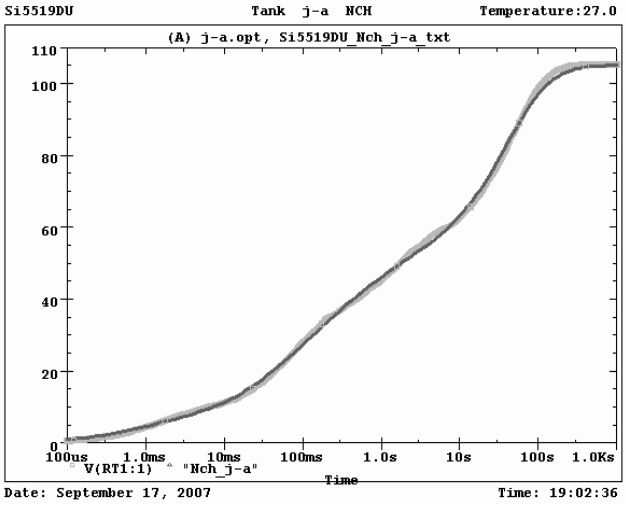


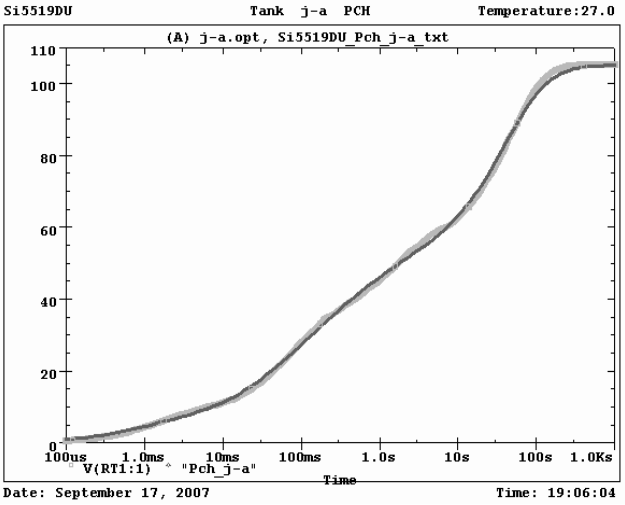
R-C VALUES FOR FILTER CONFIGURATION					
Thermal Resistance (°C/W)					
Junction to	**Ambient Nch**	**Ambient Pch**	**Foot**	**Case Nch**	**Case Pch**
RF1	7.5893	7.5893	N/A	3.8775	3.8775
RF2	25.7462	25.7462	N/A	7.7466	7.7466
RF3	21.6436	21.6436	N/A	240.8800 m	240.8800 m
RF4	50.0209	50.0209	N/A	135.0200 m	135.0200 m
Thermal Capacitance (Joules/°C)					
Junction to	**Ambient Nch**	**Ambient Pch**	**Foot**	**Case Nch**	**Case Pch**
CF1	131.3245 u	131.3245 u	N/A	178.4125 u	178.4125 u
CF2	2.2568 m	2.2568 m	N/A	1.8560 m	1.8560 m
CF3	45.6016 m	45.6016 m	N/A	191.6831 m	191.6831 m
CF4	900.5508 m	900.5508 m	N/A	3.3652 m	3.3652 m

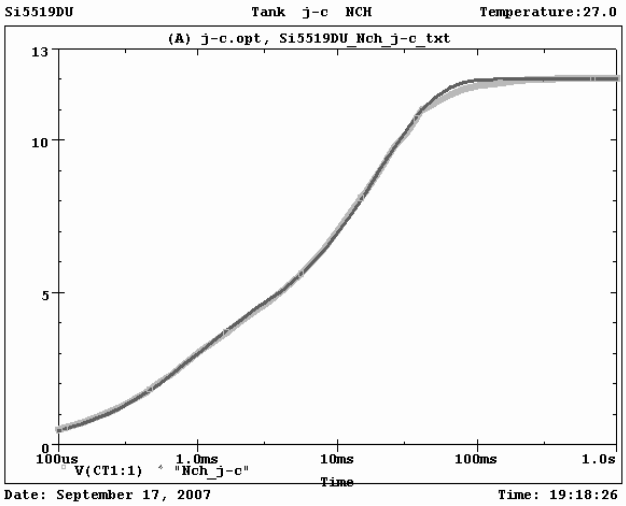
Note: NA indicates not applicable

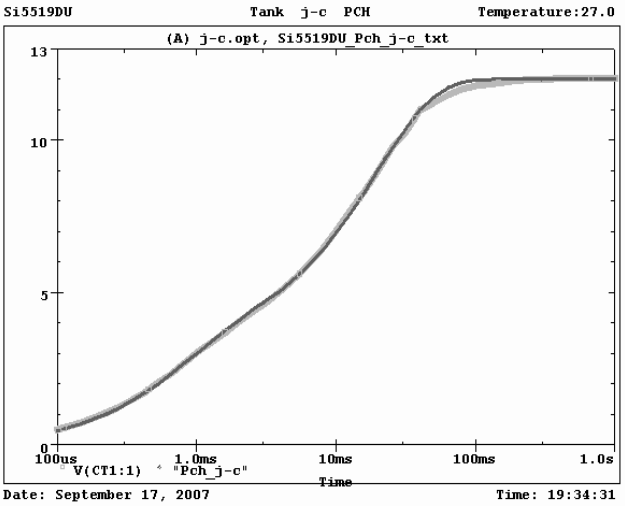
Reference:

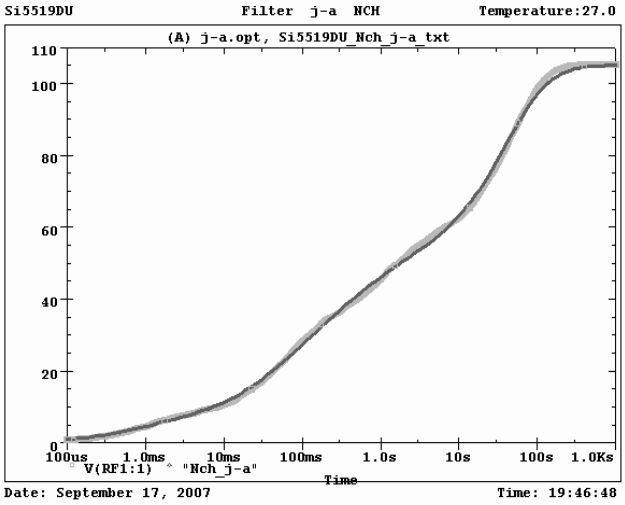
[1] "A Simple Method of Generating Thermal Models for a Power MOSFET" by Wharton McDaniel and Kandarp Pandya, IEEE / SEMITHERM 2002

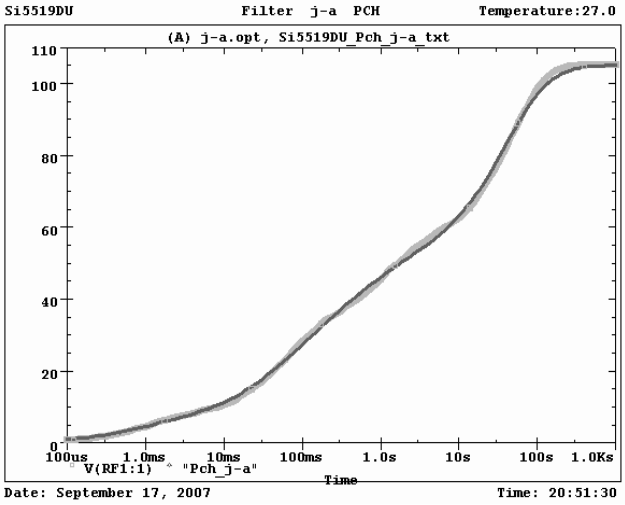

Si5519DU
Tank j-a NCH
Temperature:27.0
(A) j-a.opt, Si5519DU_Nch_j-a_txt
110
100
80
60
40
20
0
100us 1.0ms 10ms 100ms 1.0s 10s 100s 1.0Ks
V(RT1:1) "Nch_j-a"
Time
Date: September 17, 2007
Time: 19:02:36

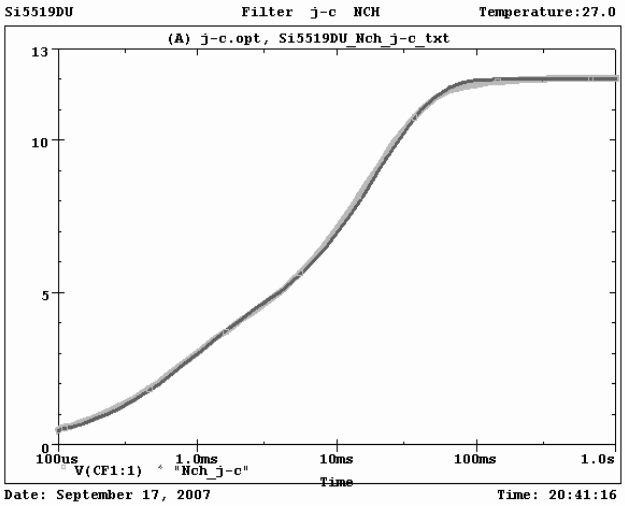

Si5519DU
Tank j-a PCH
Temperature:27.0
(A) j-a.opt, Si5519DU_Pch_j-a_txt
110
100
80
60
40
20
0
100us 1.0ms 10ms 100ms 1.0s 10s 100s 1.0Ks
V(RT1:1) "Pch_j-a"
Time
Date: September 17, 2007
Time: 19:06:04

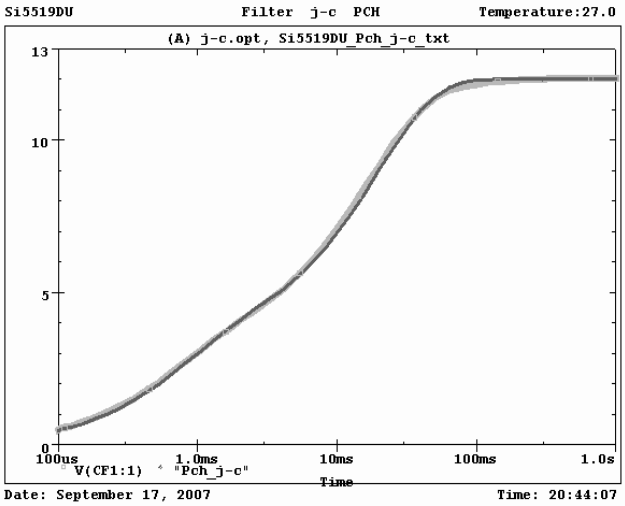

Si5519DU
Tank j-c NCH
Temperature:27.0
(A) j-c.opt, Si5519DU_Nch_j-c_txt
13
10
5
0
100us 1.0ms 10ms 100ms 1.0s
V(CT1:1) "Nch_j-c"
Time
Date: September 17, 2007
Time: 19:18:26


Si5519DU
Tank j-c PCH
Temperature:27.0
(A) j-c.opt, Si5519DU_Pch_j-c_txt
13
10
5
0
100us 1.0ms 10ms 100ms 1.0s
V(CT1:1) "Pch_j-c"
Time
Date: September 17, 2007
Time: 19:34:31


Si5519DU
Filter j-a NCH
Temperature:27.0
(A) j-a.opt, Si5519DU_Nch_j-a_txt
110
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1) "Nch_j-a"
Time
Date: September 17, 2007
Time: 19:46:48


Si5519DU
Filter j-a PCH
Temperature:27.0
(A) j-a.opt, Si5519DU_Pch_j-a_txt
110
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1) "Pch_j-a"
Time
Date: September 17, 2007
Time: 20:51:30


Si5519DU
Filter j-c NCH
Temperature:27.0
(A) j-c.opt, Si5519DU_Nch_j-c_txt
13
10
5
0
100us
1.0ms
10ms
100ms
1.0s
V(CF1:1) "Nch_j-c"
Time
Date: September 17, 2007
Time: 20:41:16


Si5519DU
Filter j-c PCH
Temperature:27.0
(A) j-c.opt, Si5519DU_Pch_j-c_txt
13
10
5
0
100us
1.0ms
10ms
100ms
1.0s
V(CF1:1) "Pch_j-c"
Time
Date: September 17, 2007
Time: 20:44:07