R-C Thermal Model Parameters

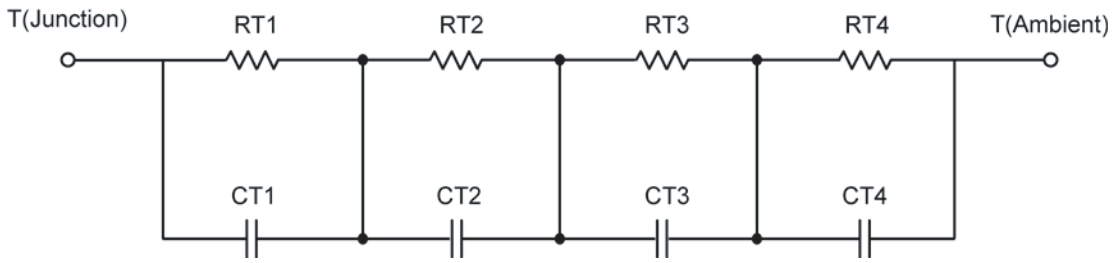
DESCRIPTION

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.

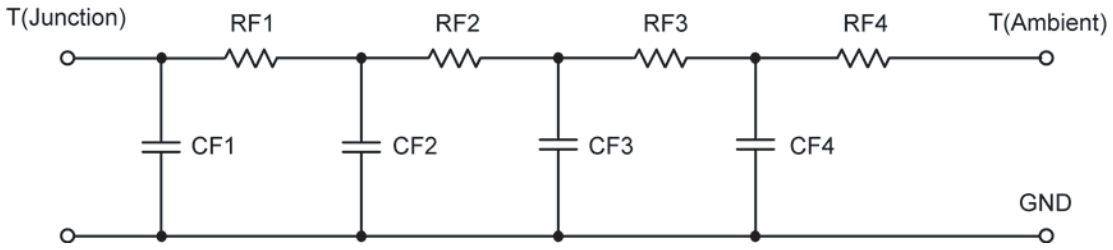
R-C THERMAL MODEL FOR TANK CONFIGURATION



R-C VALUES FOR TANK CONFIGURATION					
Thermal Resistance (°C/W)					
Junction to	**Ambient Mosfet**	**Ambient Schottky**	**Case Mosfet**	**Case Schottky**	**Foot**
RT1	8.5117	12.0786	2.9780 m	1.3467	N/A
RT2	16.1180	22.6277	430.1346 m	1.2264	N/A
RT3	20.7492	21.7409	1.7003	4.9517	N/A
RT4	48.0327	57.8662	2.8739	4.5216	N/A
Thermal Capacitance (Joules/°C)					
Junction to	**Ambient Mosfet**	**Ambient Schottky**	**Case Mosfet**	**Case Schottky**	**Foot**
CT1	167.3505 u	169.1710 u	797.2607 m	222.4059 u	N/A
CT2	5.0463 m	5.7336 m	37.0670 m	6.0816 m	N/A
CT3	58.5975 m	77.5902 m	416.6477 u	1.3230 m	N/A
CT4	1.3898	1.1815	1.5891 m	317.8890 u	N/A

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



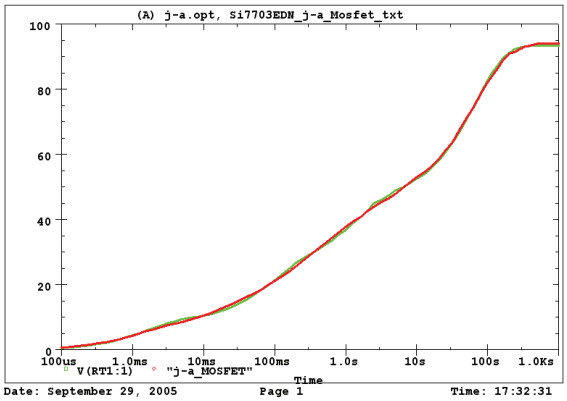
R-C VALUES FOR FILTER CONFIGURATION					
Thermal Resistance (°C/W)					
Junction to	**Ambient Mosfet**	**Ambient Schottky**	**Case Mosfet**	**Case Schottky**	**Foot**
RF1	9.7923	12.1851	1.8773	6.7787	N/A
RF2	18.2866	22.9276	2.3824	3.6030	N/A
RF3	19.2655	23.6043	645.7117 m	1.6294	N/A
RF4	46.0405	55.6368	113.0212 m	3.3965 m	N/A
Thermal Capacitance (Joules/°C)					
Junction to	**Ambient Mosfet**	**Ambient Schottky**	**Case Mosfet**	**Case Schottky**	**Foot**
CF1	189.5119 u	157.0245 u	271.5201 u	141.0220 u	N/A
CF2	5.0427 m	4.3415 m	934.5457 u	915.1951 u	N/A
CF3	60.3343 m	55.7095 m	4.8144 m	1.1171 m	N/A
CF4	1.3820	1.1666	47.1751 m	2.0898	N/A

Note: NA indicates not applicable

Reference:

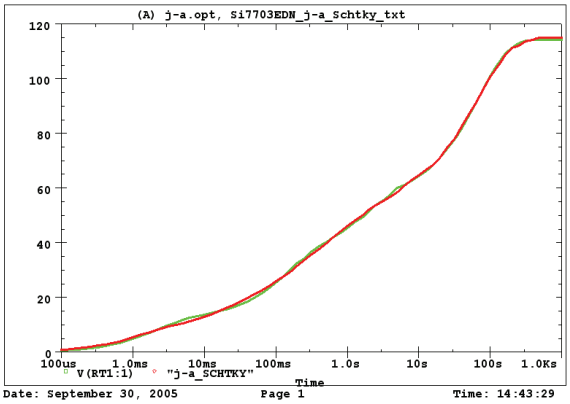
[1] "A Simple Method of Generating Thermal Models for a Power MOSFET" by Wharton McDaniel and Kandarp Pandya, IEEE / SEMITHERM 2002

Si7703EDN Tank j-a Mosfet Temperature: 27.0



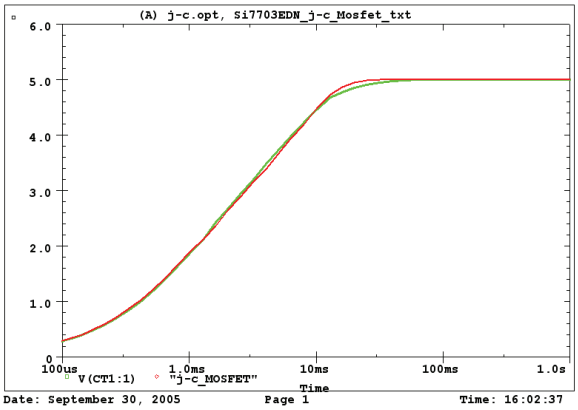
Date: September 29, 2005 Page 1 Time: 17:32:31

Si7703EDN Tank j-a Schottky Temperature: 27.0



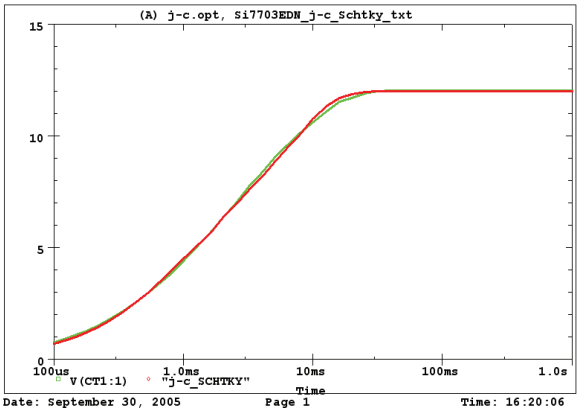
Date: September 30, 2005 Page 1 Time: 14:43:29

Si7703EDN Tank j-c Mosfet Temperature: 27.0

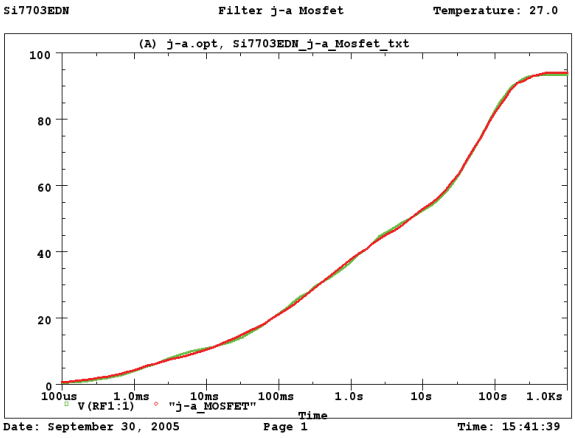


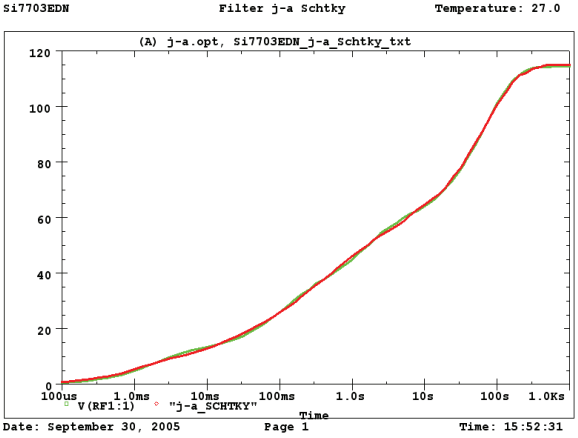
Date: September 30, 2005 Page 1 Time: 16:02:37

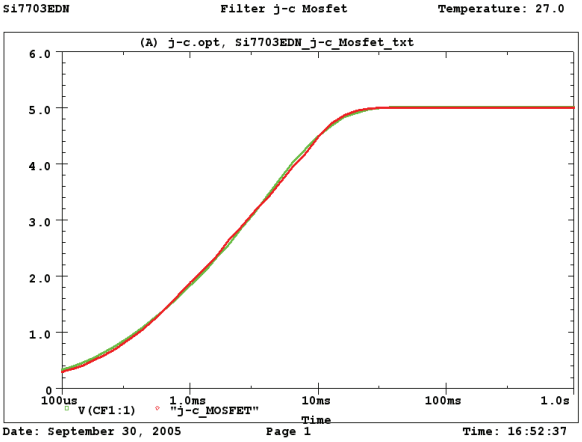
Si7703EDN Tank j-c Schtky Temperature: 27.0

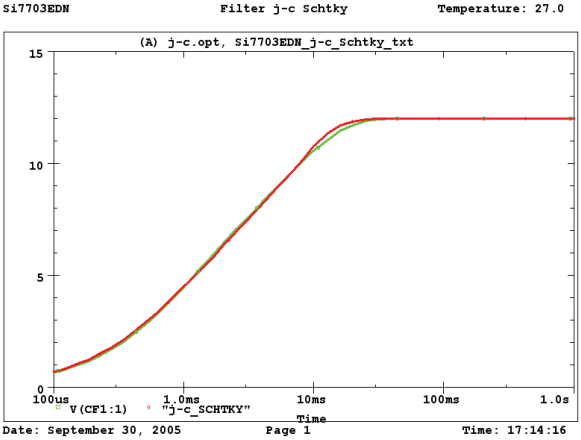


Date: September 30, 2005 Page 1 Time: 16:20:06


Si7703EDN
Filter j-a Mosfet
Temperature: 27.0
(A) j-a.opt, Si7703EDN_j-a_Mosfet_txt
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: September 30, 2005
Page 1
Time: 15:41:39


Si7703EDN
Filter j-a Schtky
Temperature: 27.0
(A) j-a.opt, Si7703EDN_j-a_Schtky_txt
120
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1)
"j-a_SCHTKY"
Time
Date: September 30, 2005
Page 1
Time: 15:52:31


Si7703EDN
Filter j-c Mosfet
Temperature: 27.0
(A) j-c.opt, Si7703EDN_j-c_Mosfet_txt
6.0
5.0
4.0
3.0
2.0
1.0
0
100us
1.0ms
10ms
100ms
1.0s
V(CF1:1)
"j-c_MOSFET"
Time
Date: September 30, 2005
Page 1
Time: 16:52:37


Si7703EDN
Filter j-c Schtky
Temperature: 27.0
(A) j-c.opt, Si7703EDN_j-c_Schtky_txt
15
10
5
0
100us
1.0ms
10ms
100ms
1.0s
V(CF1:1)
"j-c_SCHTKY"
Time
Date: September 30, 2005
Page 1
Time: 17:14:16