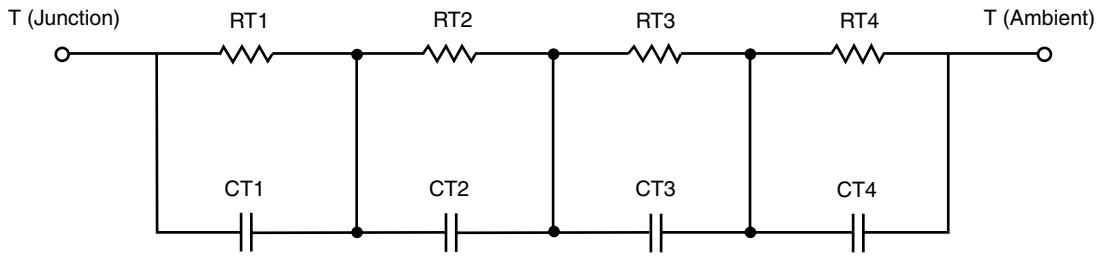
R-C Thermal Model Parameters

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

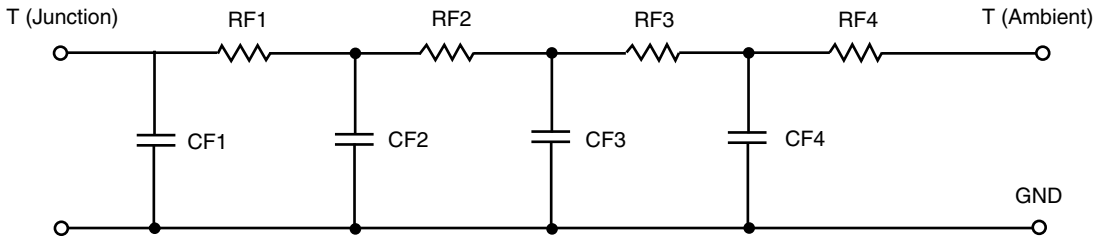


R-C VALUES FOR TANK CONFIGURATION				
THERMAL RESISTANCE (°C/W)				
Junction to	**Ambient NCh**	**Ambient PCh**	**Case NCh**	**Case PCh**
RT1	12.4956	12.4956	764.1000 m	764.1000 m
RT2	27.7856	27.7856	5.6063	5.6063
RT3	26.5938	26.5938	5.7425	5.7425
RT4	43.1250	43.1250	3.8871	3.8871
THERMAL CAPACITANCE (Joules/°C)				
Junction to	**Ambient NCh**	**Ambient PCh**	**Case NCh**	**Case PCh**
CT1	90.5366 u	91.1173 u	5.0483 m	5.0483 m
CT2	1.9891 m	1.9742 m	452.2021 u	452.2021 u
CT3	34.1114 m	34.9892 m	54.4164 u	54.4164 u
CT4	1.1118	1.1314	486.1773 u	486.1773 u

Note
N/A indicates not applicable

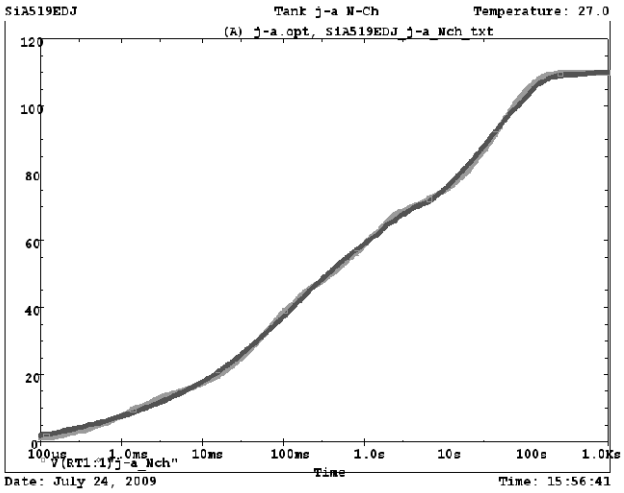
This document is intended as a SPICE modeling guideline and does not constitute a commercial product datasheet. Designers should refer to the appropriate datasheet of the same number for guaranteed specification limits.

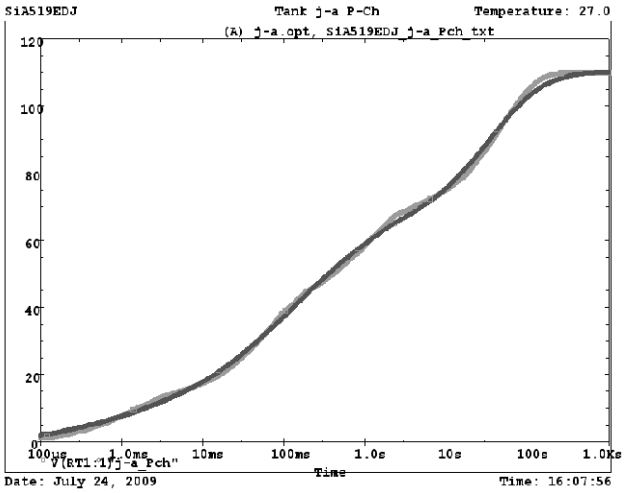
R-C THERMAL MODEL FOR FILTER CONFIGURATION

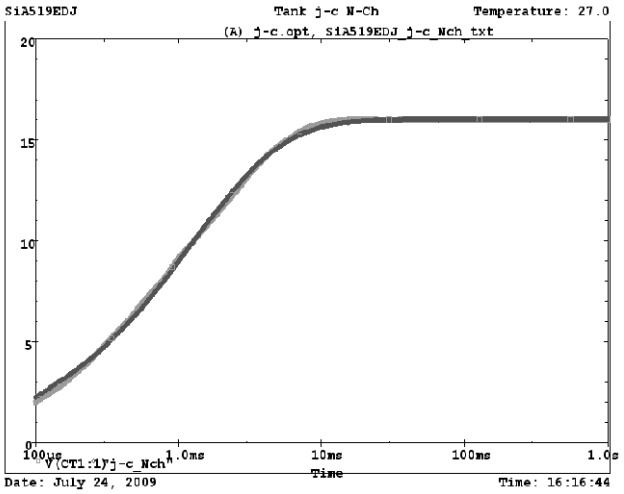


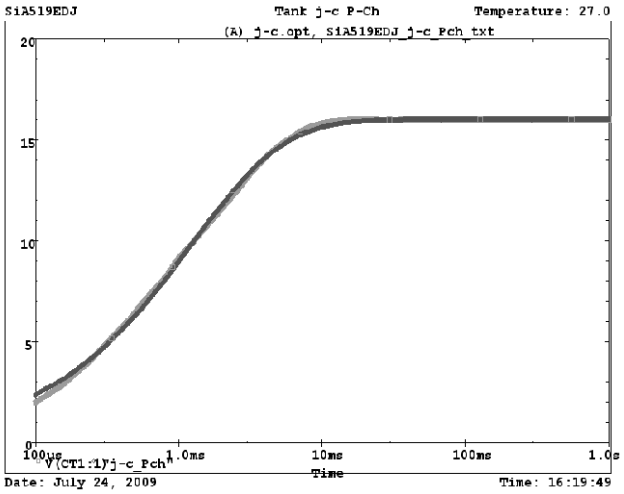
R-C VALUES FOR FILTER CONFIGURATION				
THERMAL RESISTANCE (°C/W)				
Junction to	**Ambient NCh**	**Ambient PCh**	**Case NCh**	**Case PCh**
RF1	14.2316	14.2316	8.6635	8.6635
RF2	31.2018	31.2018	4.0091	4.0091
RF3	23.4786	23.4786	1.6771	1.6771
RF4	41.0898	41.0898	1.6503	1.6503
THERMAL CAPACITANCE (Joules/°C)				
Junction to	**Ambient NCh**	**Ambient PCh**	**Case NCh**	**Case PCh**
CF1	92.1040 u	92.1040 u	43.9117 u	43.9117 u
CF2	2.0224 m	2.0224 m	226.4934 u	226.4934 u
CF3	41.6061 m	41.6061 m	229.4698 u	229.4698 u
CF4	1.1219	1.1219	103.4306 u	103.4306 u

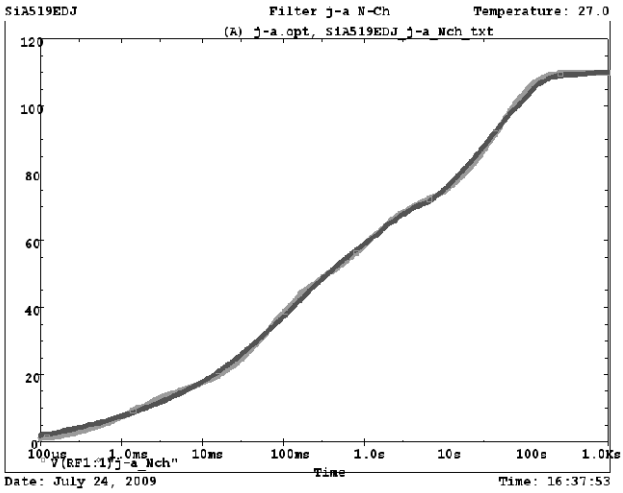
Note
N/A indicates not applicable

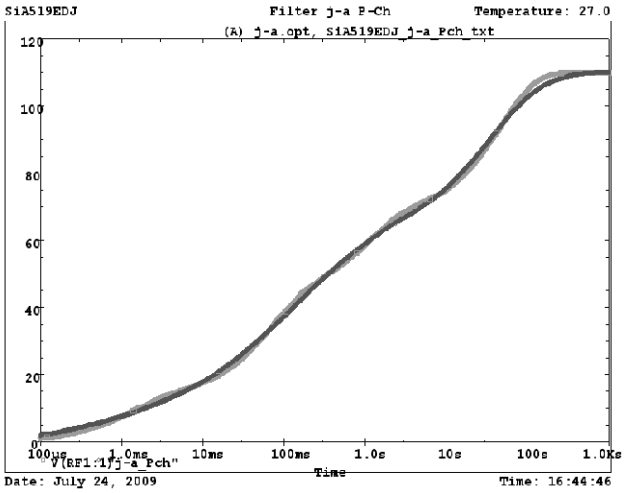

SiA519EDJ
Tank j-a N-Ch
Temperature: 27.0
(A) j-a.opt, SiA519EDJ_j-a_Nch_txt
120
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1)j-a_Nch"
Time
Date: July 24, 2009
Time: 15:56:41

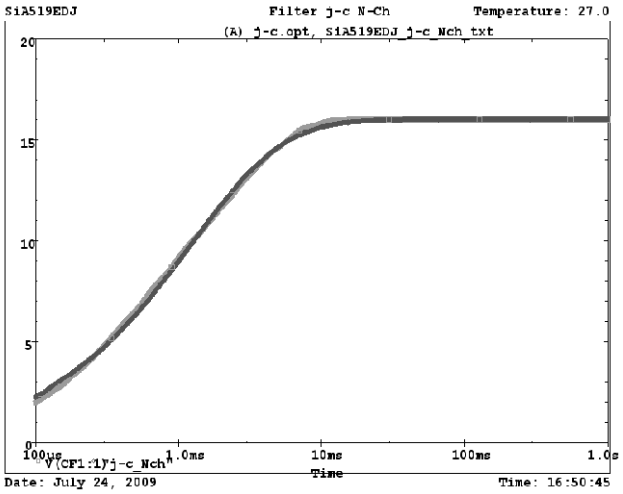

SiA519EDJ
Tank j-a P-Ch
Temperature: 27.0
(A) j-a.opt, SiA519EDJ_j-a_Pch_txt
120
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1)j-a_Pch"
Time
Date: July 24, 2009
Time: 16:07:56

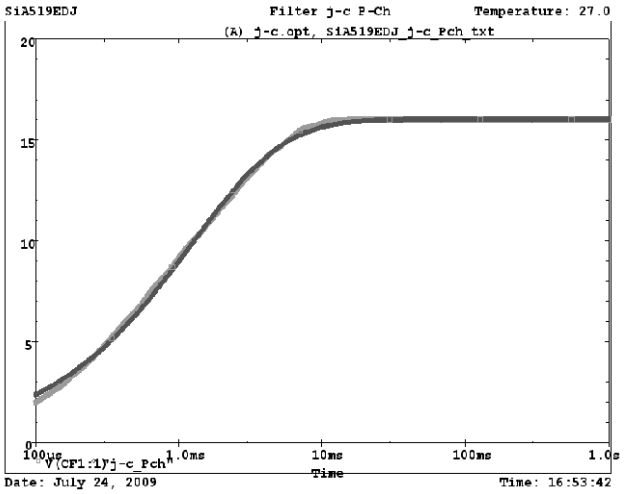

SiA519EDJ
Tank j-c N-Ch
Temperature: 27.0
(A) j-c.opt, SiA519EDJ_j-c_Nch_txt
20
15
10
5
0
100us
1.0ms
10ms
100ms
1.0s
V(CT1:1)j-c_Nch"
Time
Date: July 24, 2009
Time: 16:16:44


SiA519EDJ
Tank j-c P-Ch
Temperature: 27.0
(A) j-c.opt, SiA519EDJ_j-c_Pch_txt
20
15
10
5
0
100us
1.0ms
10ms
100ms
1.0s
V(CT1:1)j-c_Pch"
Time
Date: July 24, 2009
Time: 16:19:49


SiA519EDJ
Filter j-a N-Ch
Temperature: 27.0
(A) j-a.opt, SiA519EDJ_j-a_Nch_txt
120
100
80
60
40
20
0
100µs
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1)j-a_Nch"
Time
Date: July 24, 2009
Time: 16:37:53


SiA519EDJ
Filter j-a P-Ch
Temperature: 27.0
(A) j-a.opt, SiA519EDJ_j-a_Pch_txt
120
100
80
60
40
20
0
100µs
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1)j-a_Pch"
Time
Date: July 24, 2009
Time: 16:44:46


SiA519EDJ
Filter j-c N-Ch
Temperature: 27.0
(A) j-c.opt, SiA519EDJ_j-c_Nch_txt
20
15
10
5
0
100µs
1.0ms
10ms
100ms
1.0s
V(CF1:1)j-c_Nch"
Time
Date: July 24, 2009
Time: 16:50:45


SiA519EDJ
Filter j-c P-Ch
Temperature: 27.0
(A) j-c.opt, SiA519EDJ_j-c_Pch_txt
20
15
10
5
0
100µs
1.0ms
10ms
100ms
1.0s
V(CF1:1)j-c_Pch"
Time
Date: July 24, 2009
Time: 16:53:42