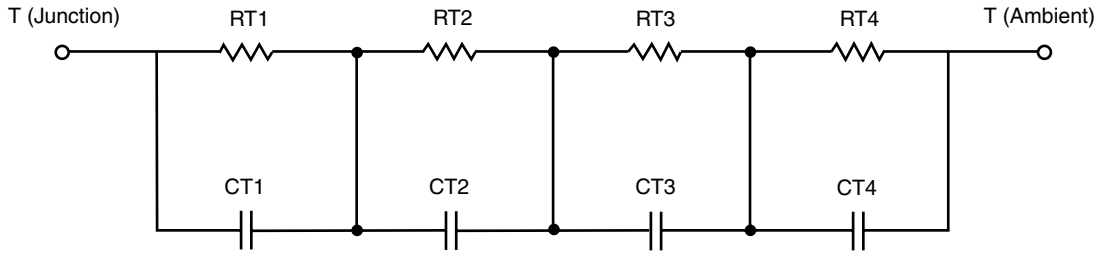
R-C Thermal Model Parameters

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

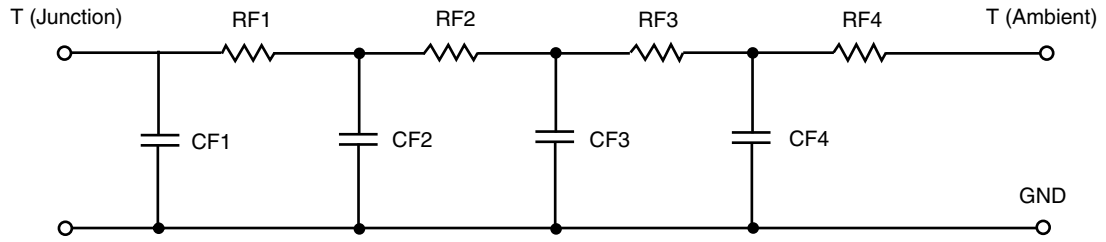


R-C VALUES FOR TANK CONFIGURATION			
THERMAL RESISTANCE (°C/W)			
Junction to	**Ambient**	**Case-Drain Top**	**Case-Source**
RT1	9.8729	280.0146 m	229.4359 m
RT2	33.2529	280.2433 m	2.4496
RT3	7.0235	193.4902 m	18.9606 m
RT4	17.8944	245.9958 m	2.0035 m
THERMAL CAPACITANCE (Joules/°C)			
Junction to	**Ambient**	**Case-Drain Top**	**Case-Source**
CT1	37.7083 m	70.6539 m	1.6173 m
CT2	1.7318	68.4949 m	27.1858 m
CT3	323.9341 m	2.8446 m	4.8725
CT4	5.5472	55.2105 m	1.5477 m

Note
N/A indicates not applicable

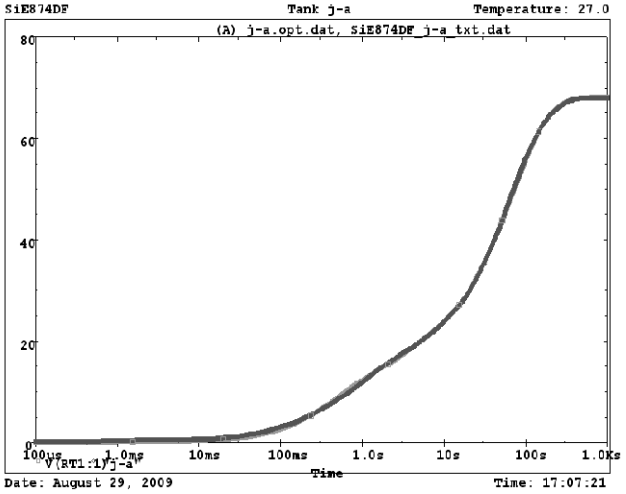
This document is intended as a SPICE modeling guideline and does not constitute a commercial product datasheet. Designers should refer to the appropriate datasheet of the same number for guaranteed specification limits.

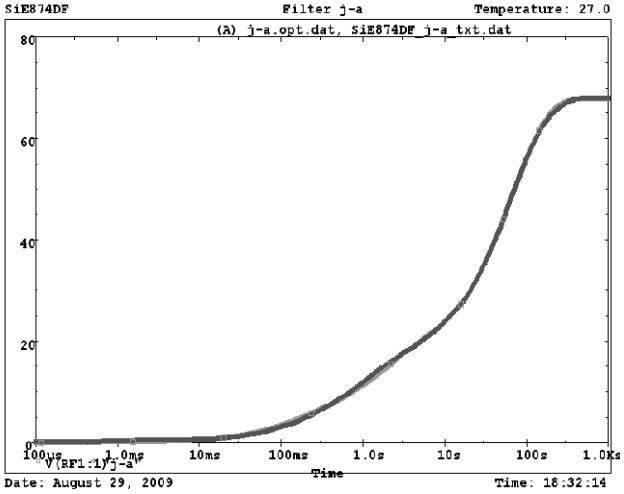
R-C THERMAL MODEL FOR FILTER CONFIGURATION

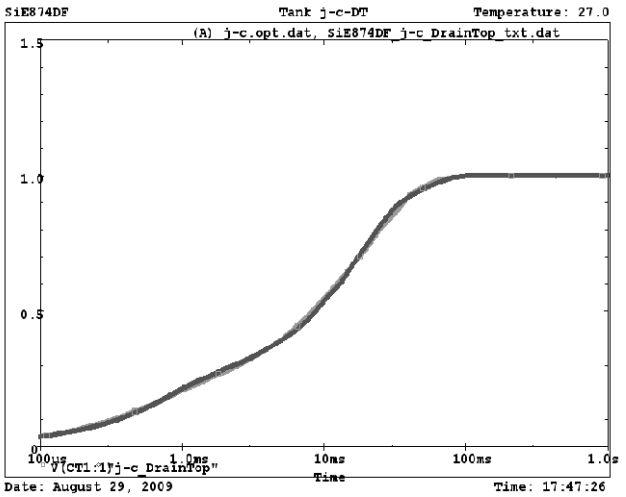


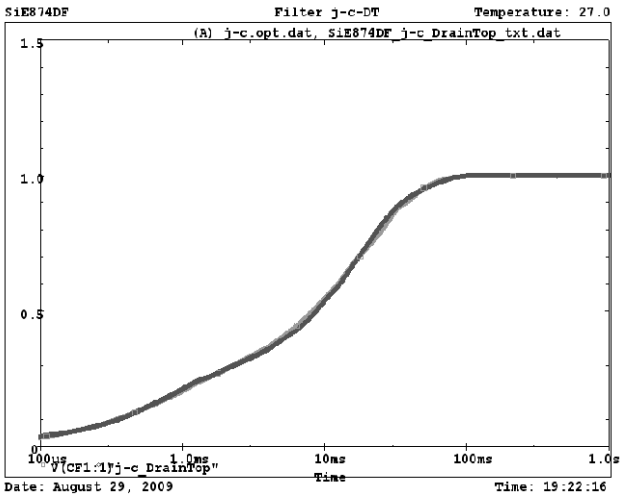
R-C VALUES FOR FILTER CONFIGURATION			
THERMAL RESISTANCE (°C/W)			
Junction to	**Ambient**	**Case-Drain Top**	**Case-Source**
RF1	6.2853	270.5949 m	286.8241 m
RF2	12.6431	945.5000 u	1.2831
RF3	24.0167	8.1951 m	1.0331
RF4	24.8774	720.2645 m	96.9759 m
THERMAL CAPACITANCE (Joules/°C)			
Junction to	**Ambient**	**Case-Drain Top**	**Case-Source**
CF1	19.7167 m	2.7316 m	1.8593 m
CF2	98.7879 m	5.1728 m	25.9227 m
CF3	1.1540	13.7470 m	910.0863 u
CF4	424.1004 m	2.9036 m	23.0192 m

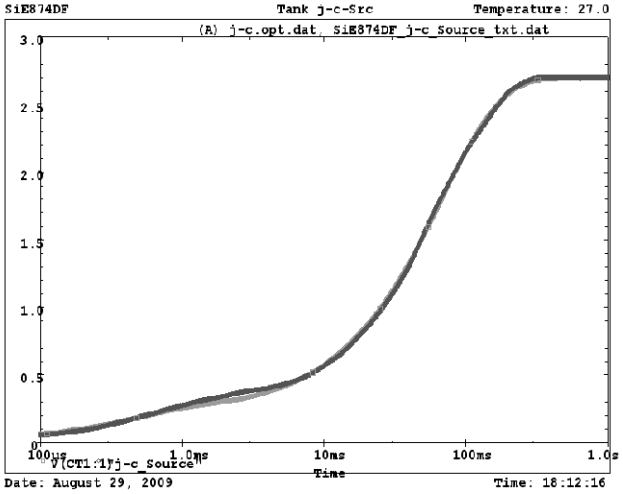
Note
N/A indicates not applicable

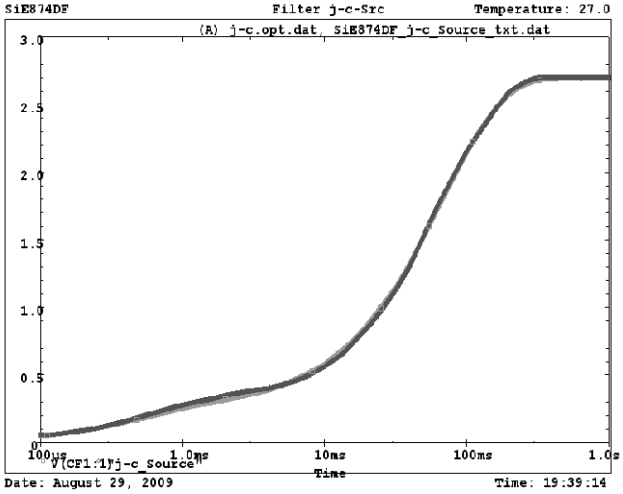

SiE874DF
Tank j-a
Temperature: 27.0
(A) j-a.opt.dat, SiE874DF_j-a_txt.dat
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1)/j-a
Time
Date: August 29, 2009
Time: 17:07:21


SiE874DF
Filter j-a
Temperature: 27.0
(A) j-a.opt.dat, SiE874DF_j-a_txt.dat
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RF1:1)/j-a
Time
Date: August 29, 2009
Time: 18:32:14


SiE874DF
Tank j-c-DT
Temperature: 27.0
(A) j-c.opt.dat, SiE874DF_j-c_DrainTop_txt.dat
1.5
1.0
0.5
0
100us
1.0ms
10ms
100ms
1.0s
V(CT1:1)/j-c_DrainTop"
Time
Date: August 29, 2009
Time: 17:47:26


SiE874DF
Filter j-c-DT
Temperature: 27.0
(A) j-c.opt.dat, SiE874DF_j-c_DrainTop_txt.dat
1.5
1.0
0.5
0
100us
1.0ms
10ms
100ms
1.0s
V(CF1:1)/j-c_DrainTop"
Time
Date: August 29, 2009
Time: 19:22:16


SiE874DF
Tank j-c-Src
Temperature: 27.0
(A) j-c.opt.dat, SiE874DF_j-c_Source_txt.dat
3.0
2.5
2.0
1.5
1.0
0.5
0
100µs
1.0ms
10ms
100ms
1.0s
V(CT1:1)j-c_Source
Time
Date: August 29, 2009
Time: 18:12:16


SiE874DF
Filter j-c-Src
Temperature: 27.0
(A) j-c.opt.dat, SiE874DF_j-c_Source_txt.dat
3.0
2.5
2.0
1.5
1.0
0.5
0
100µs
1.0ms
10ms
100ms
1.0s
V(CF1:1)j-c_Source
Time
Date: August 29, 2009
Time: 19:39:14