The eGaN® FET Journey Continues

Thermal Model of EPC2052

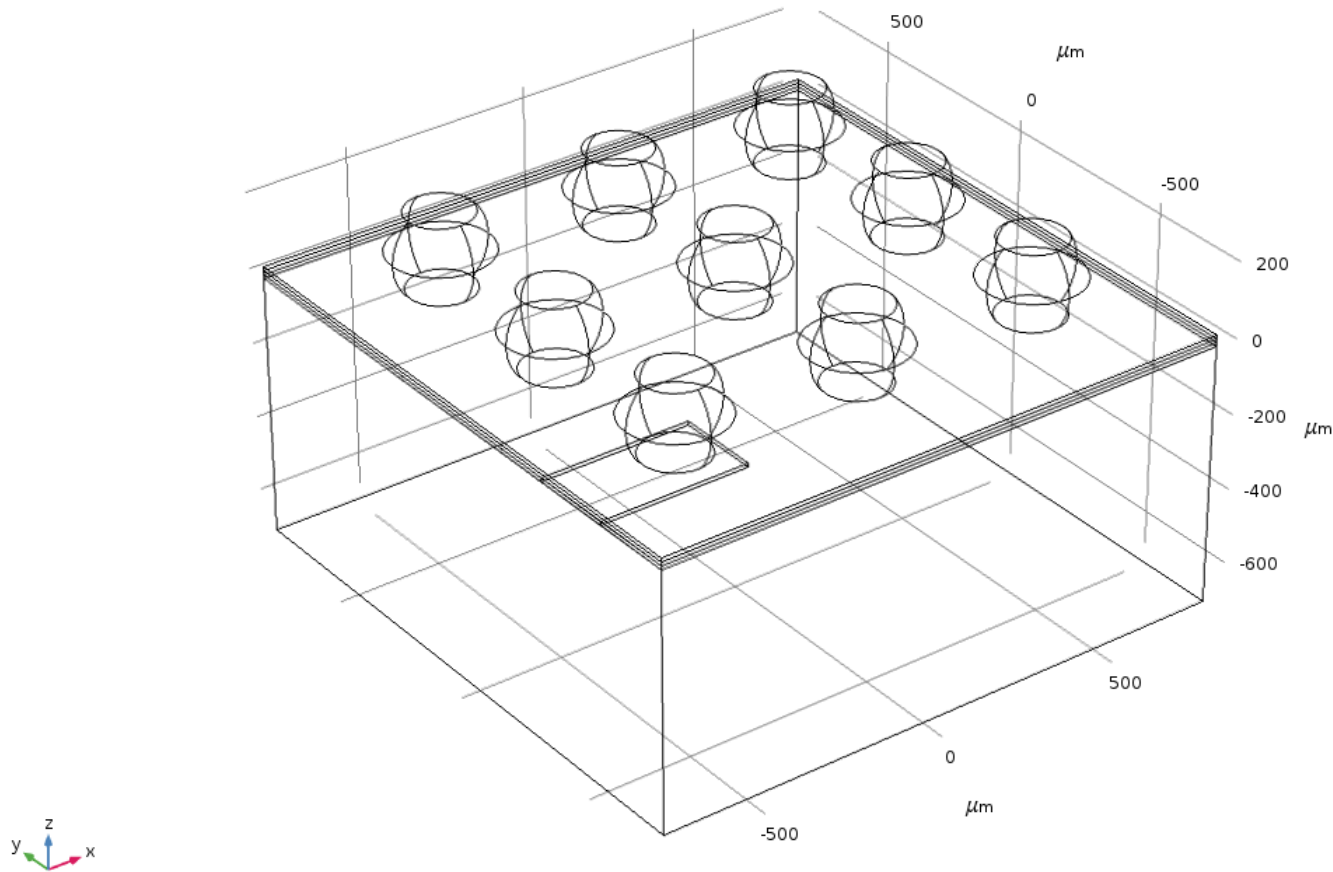
Efficient Power Conversion Corporation

EPC2052 FEA thermal simulation

EPC EFFICIENT POWER CONVERSION

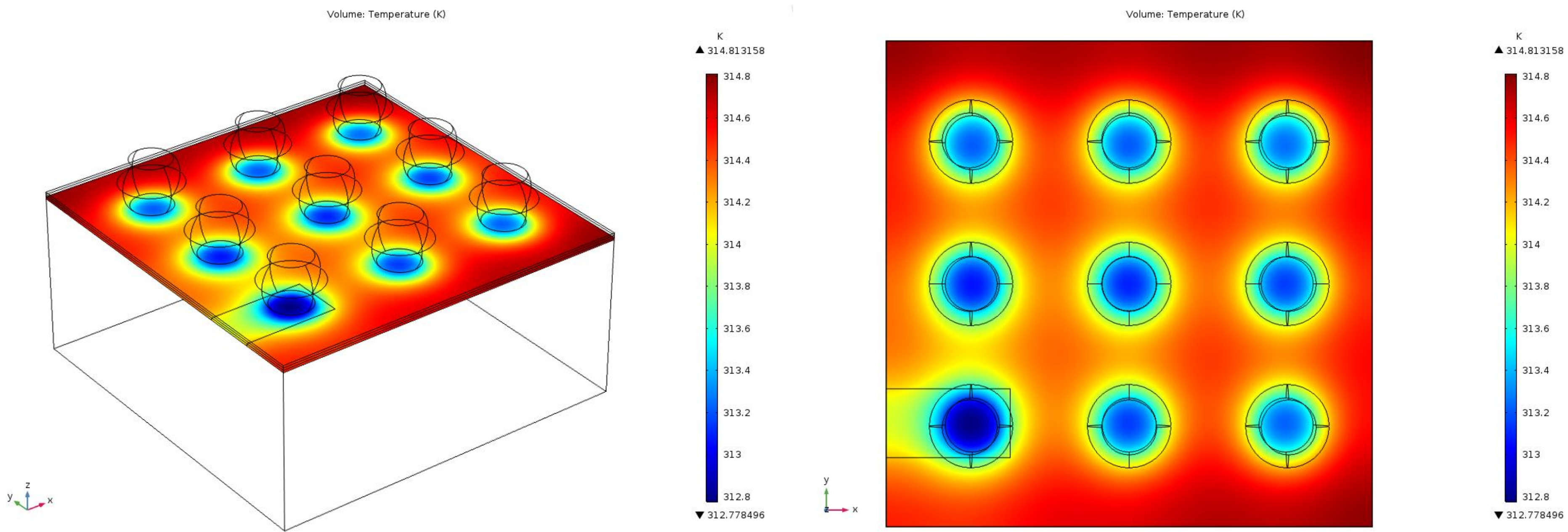
- The thermal model applies to EPC2052.
- A power dissipation of 1 W in the device active area is assumed.
- Finite element analysis (FEA) thermal simulations
  - $R_{\Theta JB}$ and $R_{\Theta JC}$ are obtained by stationary simulations.
  - $Z_{\Theta JB}$ and $Z_{\Theta JC}$ are obtained by transient simulations.
- R-C thermal model is generated.

EPC2052 device structure



Steady-state $R_{\Theta JB}$

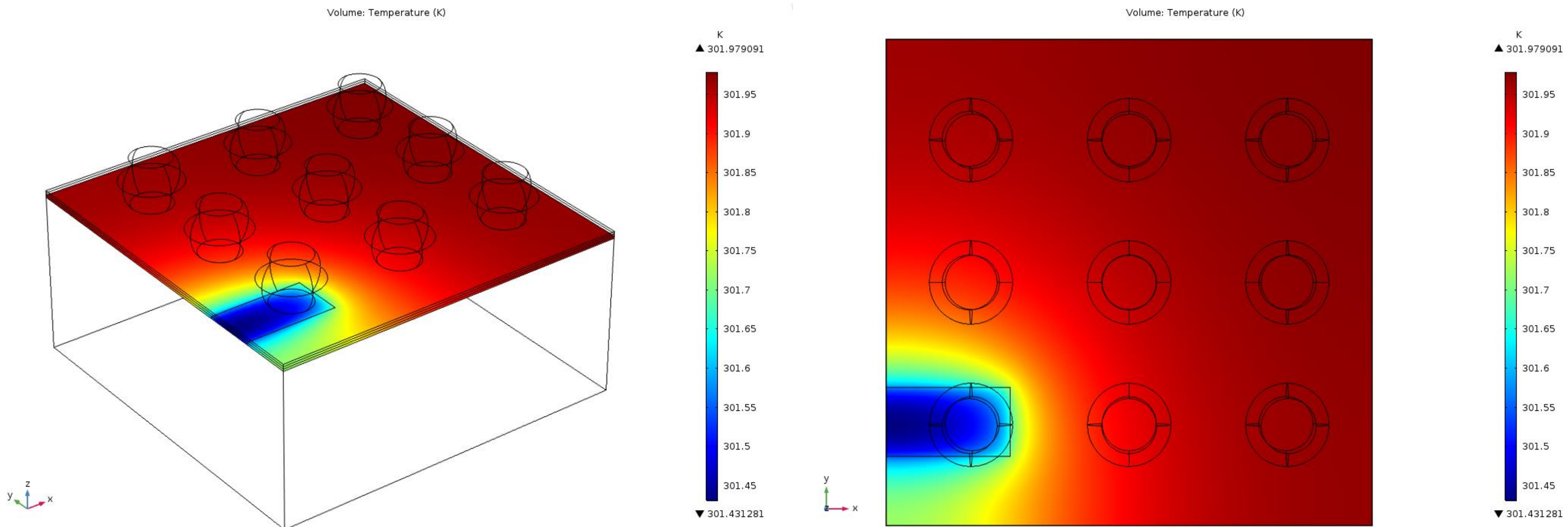
Typical $R_{\Theta JB}$ = 15 °C/W



- Operating condition: Power = 1 W in the active area.
- Boundary condition: Temperature of top of solder bars set to be 300 K.

Steady-state $R_{\Theta JC}$

Typical $R_{\Theta JC}$ = 2 °C/W



- Operating condition: Power = 1 W in the active area.
- Boundary condition: Temperature of bottom of the device backside set to be 300 K.

$Z_{\Theta JB}$ R-C thermal model

Transient junction temperature (Junction to Board, P = 1 W)

Finite element simulation
R-C thermal model

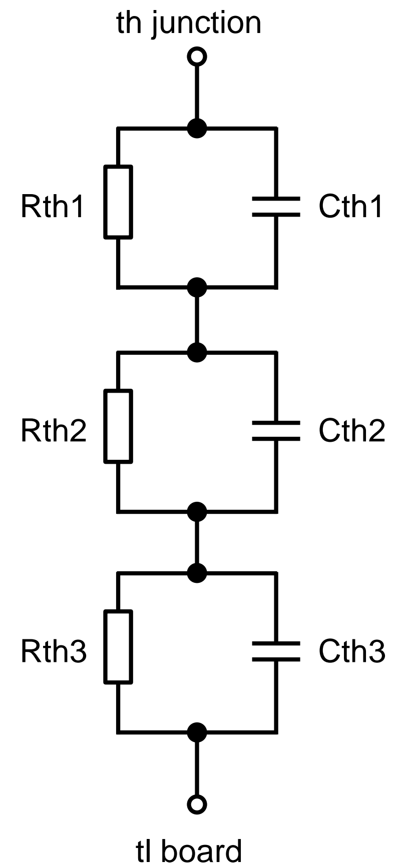
Model Parameter	Value	Unit
Rth1	1.41E+01	°C/W
Rth2	5.27E-01	
Rth3	1.39E-01	
Cth1	2.96E-03	J/°C
Cth2	9.99E-04	
Cth3	4.05E-04	

ΔT_J (°C)

15
10
5
0

10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^{0}

Time (s)



$Z_{\Theta JC}$ R-C thermal model

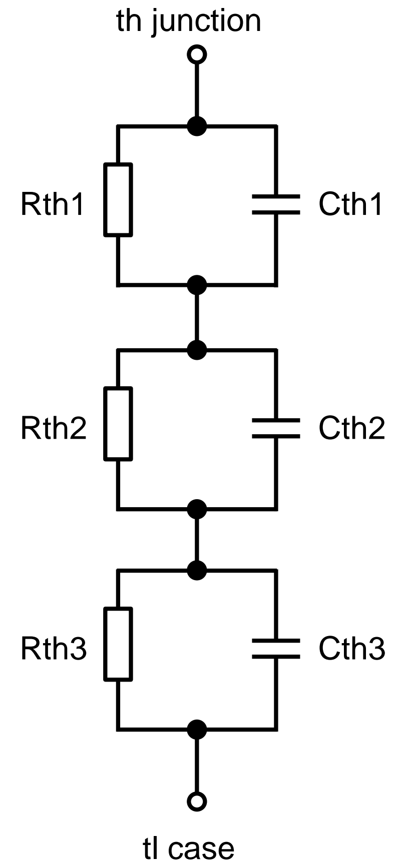
Transient junction temperature (Junction to Case, P = 1 W)

Finite element simulation
R-C thermal model

ΔT_J (°C)

Time (s)

Model Parameter	Value	Unit
Rth1	1.56E+00	°C/W
Rth2	2.93E-01	
Rth3	9.02E-02	
Cth1	1.60E-03	J/°C
Cth2	8.40E-04	
Cth3	2.49E-04	



END OF ROAD

The end of the road for silicon…

but a clear road ahead for GaN FETs and ICs!

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