

The eGaN<sup>®</sup> FET  
Journey Continues

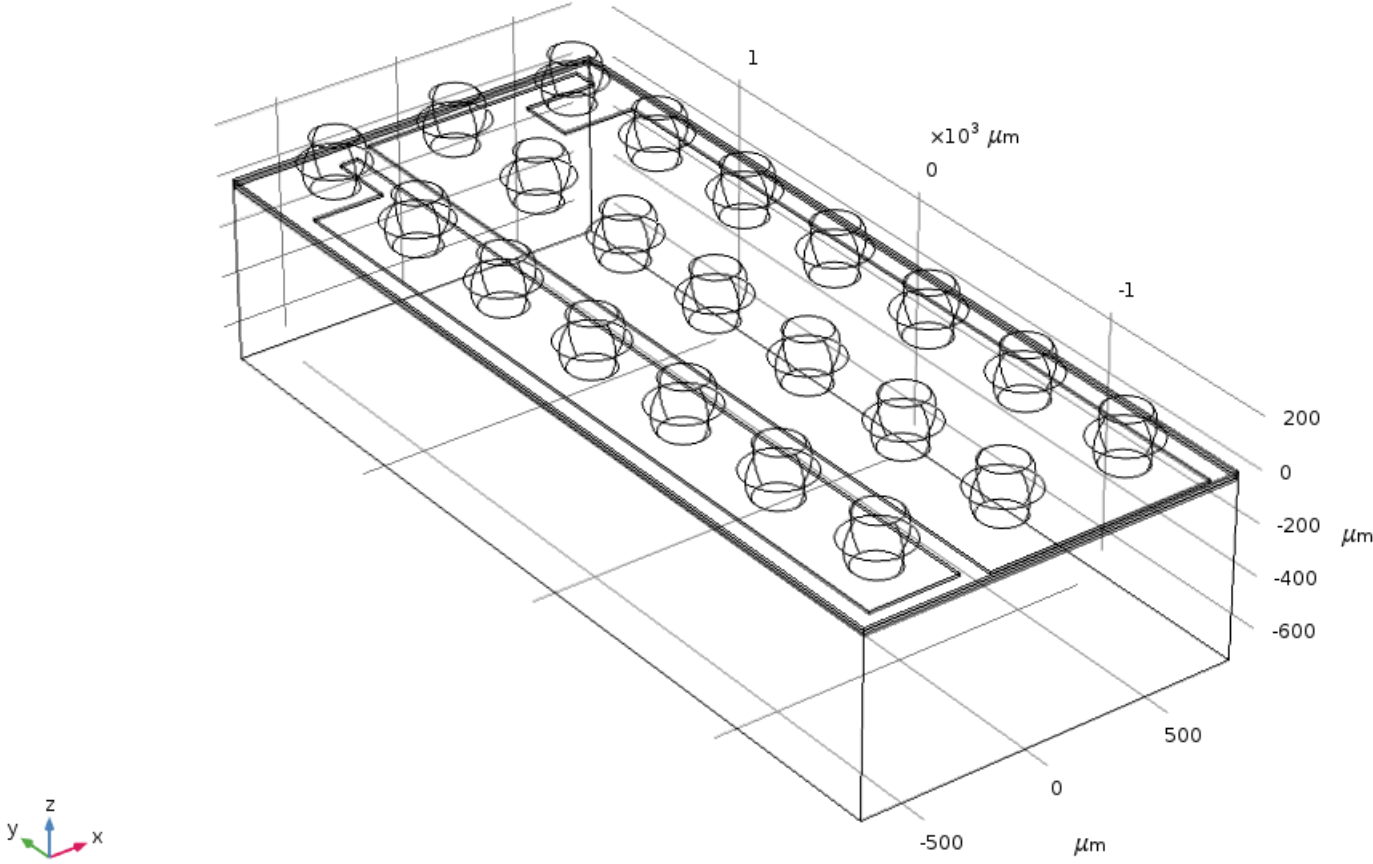


Thermal Model of EPC2111

*Efficient Power Conversion Corporation*

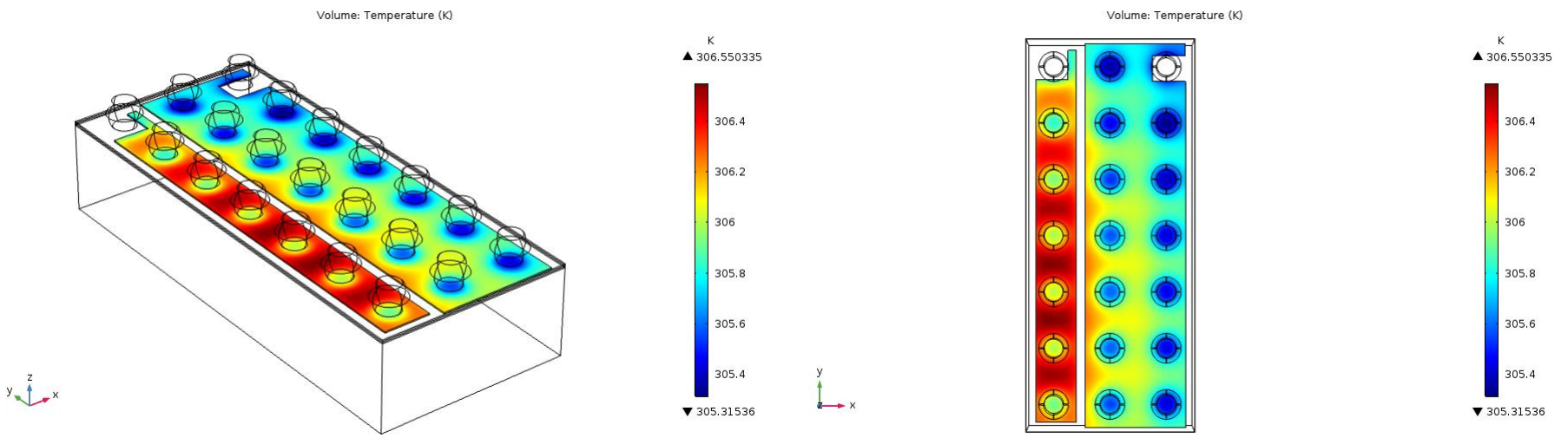
- Equal power density of Q1 and Q2 and a total power dissipation of 1 W in the device active area is assumed.
- $R_{\theta_{JB}}$  and  $R_{\theta_{JC}}$  are obtained by static steady simulations.
- $Z_{\theta_{JB}}$  and  $Z_{\theta_{JC}}$  are obtained by transient simulations.  
SPICE thermal model of RC network is generated.

# EPC2111 device structure



# Steady-State $R_{\Theta JB}$

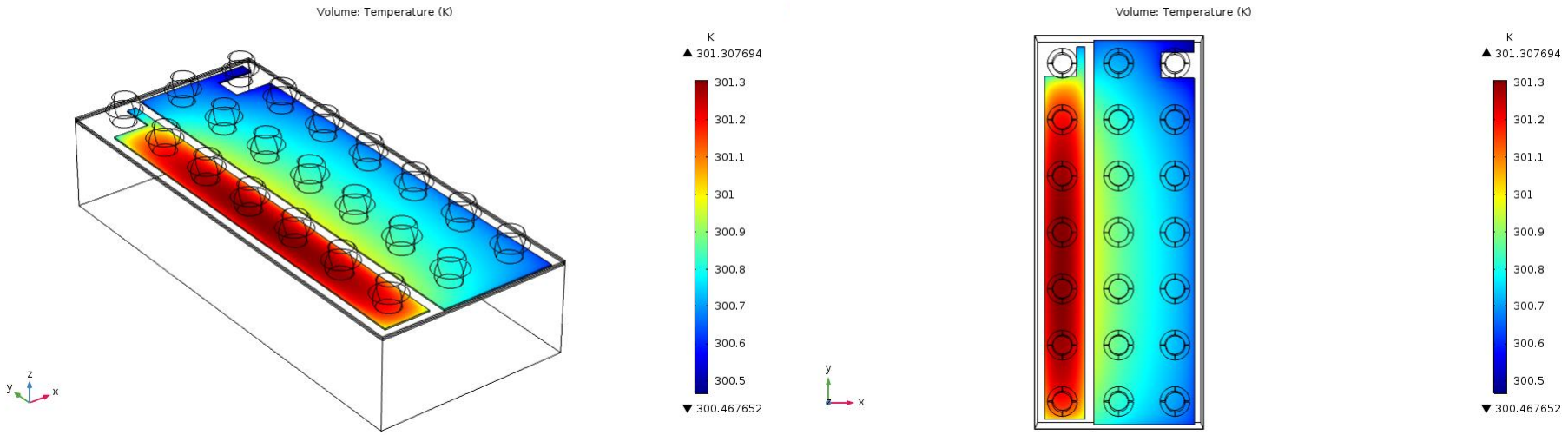
**Typical  $R_{\Theta JB} = 6.6 \text{ }^\circ\text{C/W}$**



- Operating condition: Total power = 1 W with equal power density of Q1 and Q2.
- Boundary condition: Temperature of top of solder balls set to be 300 K.

# Steady-State $R_{\Theta JC}$

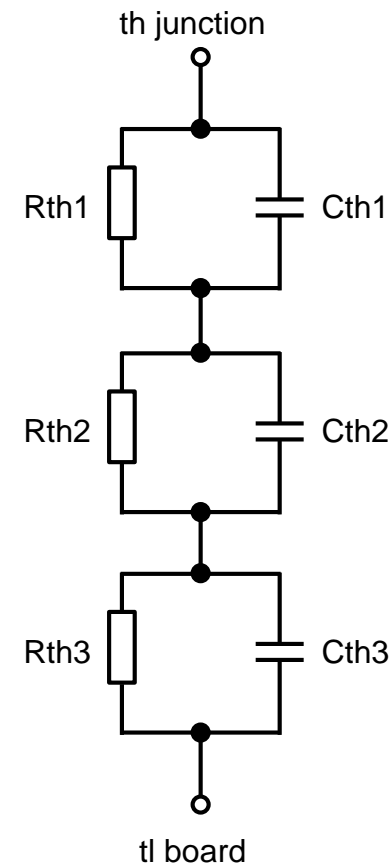
Typical  $R_{\Theta JC} = 1.3 \text{ } ^\circ\text{C/W}$



- Operating condition: Total power = 1 W with equal power density of Q1 and Q2.
- Boundary condition: Temperature of bottom of the device backside set to be 300 K.

# $Z_{\Theta JB}$ SPICE Thermal Model

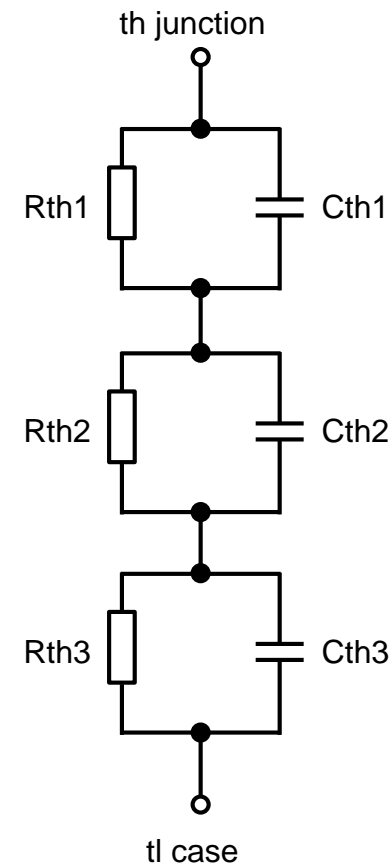
| Fitting parameter | Value    | Unit |
|-------------------|----------|------|
| Rth1              | 6.26E+00 | °C/W |
| Rth2              | 2.35E-01 |      |
| Rth3              | 5.83E-02 |      |
| Cth1              | 6.78E-03 | J/°C |
| Cth2              | 1.77E-03 |      |
| Cth3              | 6.75E-04 |      |





# $Z_{\Theta JC}$ SPICE Thermal Model

| Fitting parameter | Value    | Unit |
|-------------------|----------|------|
| Rth1              | 1.07E+00 | °C/W |
| Rth2              | 1.71E-01 |      |
| Rth3              | 6.73E-02 |      |
| Cth1              | 3.53E-03 | J/°C |
| Cth2              | 1.66E-03 |      |
| Cth3              | 4.01E-04 |      |





*The end of the  
road for silicon...*

*but a clear road  
ahead for GaN  
FETs and ICs!*