The eGaN® FET Journey Continues

Thermal Model of 4:1 Extra-Large Half-Bridge Products EPC2100, EPC2101, and EPC2105

Efficient Power Conversion Corporation

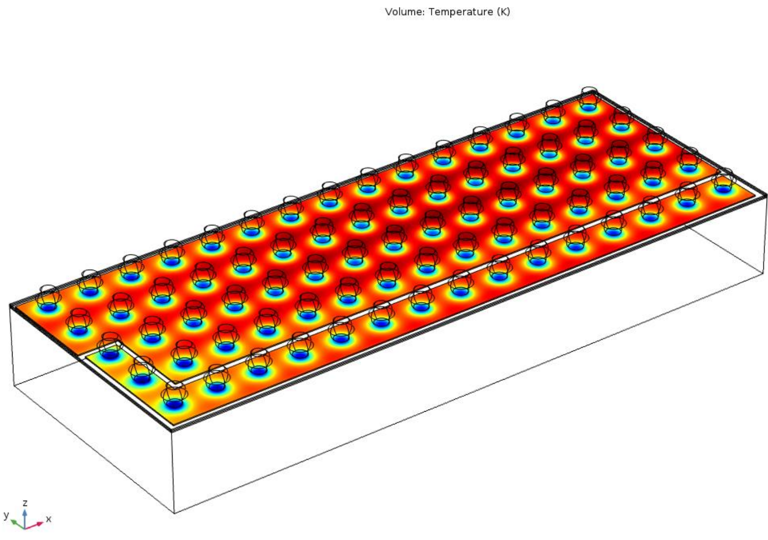
4:1 XL half-bridge device FEA thermal simulation

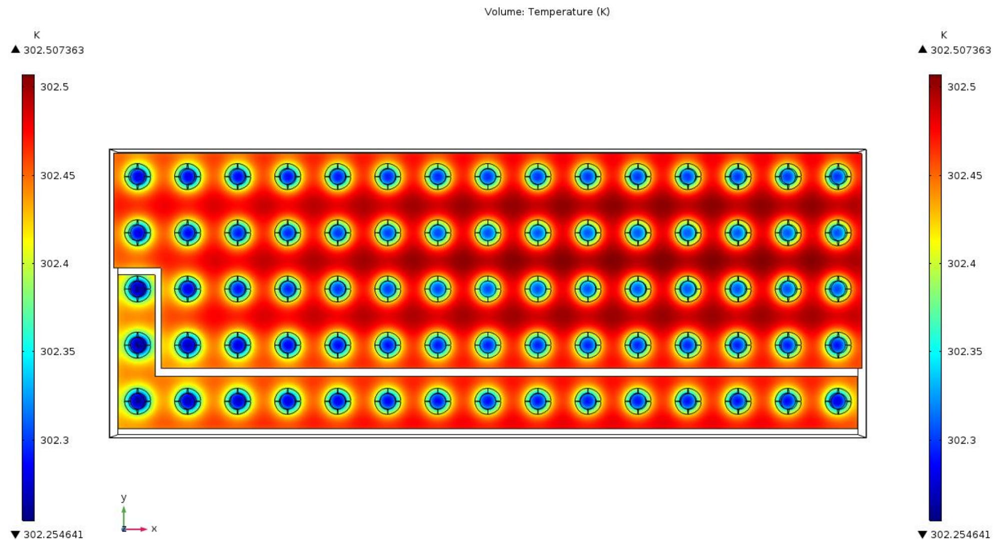
- The thermal model applies to 4:1 half-bridge products including **EPC2100**, **EPC2101**, and **EPC2105**.
- Equal power density of Q1 and Q2 and a total power dissipation of 1 W in the device active area is assumed.
- $R_{\Theta JB}$ and $R_{\Theta JC}$ are obtained by static steady simulations.
- $Z_{\Theta JB}$ and $Z_{\Theta JC}$ are obtained by transient simulations. SPICE thermal model of RC network is generated.

4:1 XL half-bridge device structure

Steady-State $R_{\Theta JB}$

Typical $R_{\Theta JB}$ = 2.5 °C/W

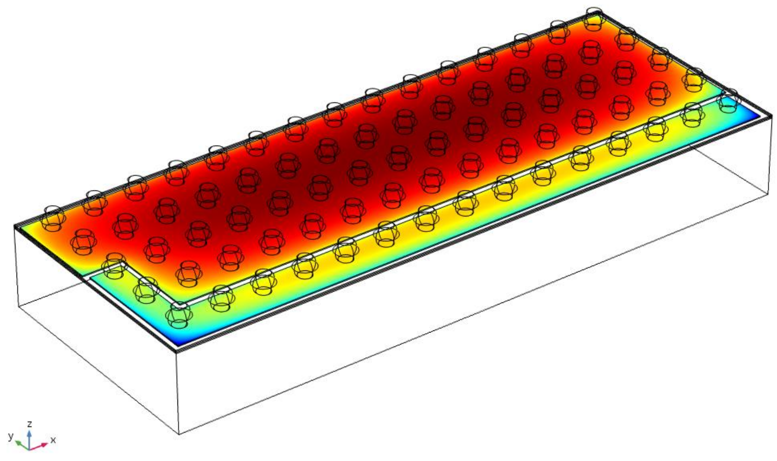


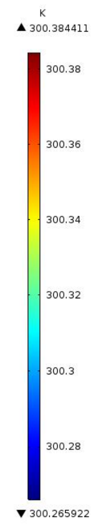


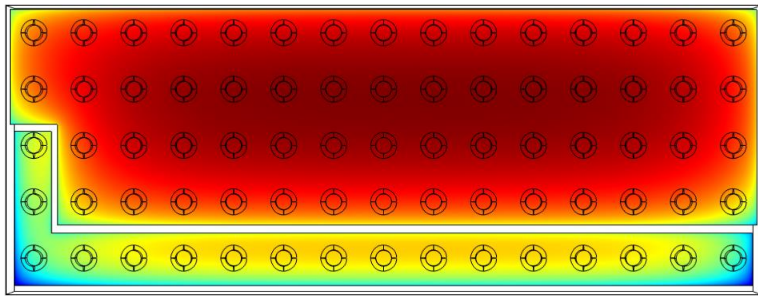
- Operating condition: Total power = 1 W with equal power density of Q1 and Q2.
- Boundary condition: Temperature of top of solder balls set to be 300 K.

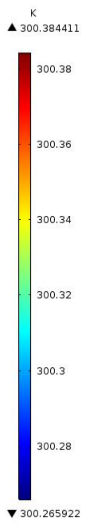
Steady-State $R_{\Theta JC}$

Typical $R_{\Theta JC}$ = 0.4 °C/W





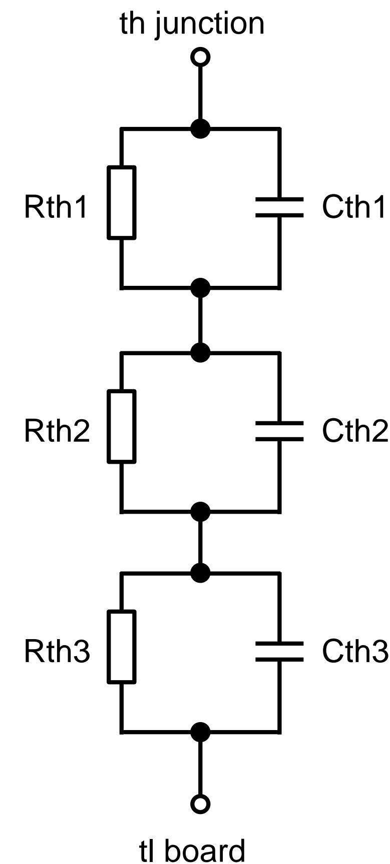




- Operating condition: Total power = 1 W with equal power density of Q1 and Q2.
- Boundary condition: Temperature of bottom of the device backside set to be 300 K.

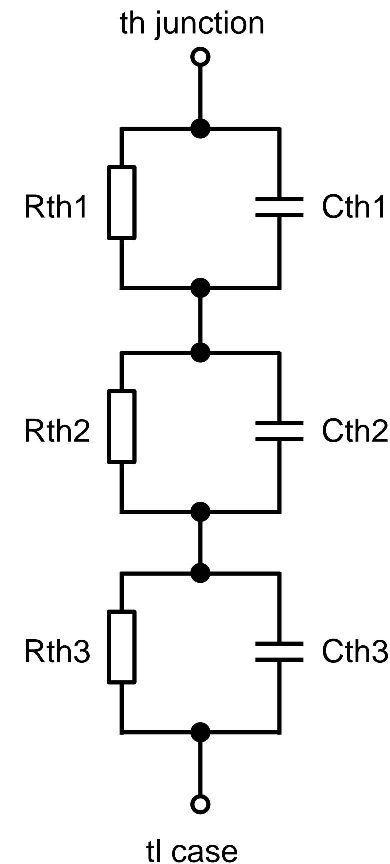
$Z_{\Theta JB}$ SPICE Thermal Model

Fitting parameter	Value	Unit
Rth1	2.39E+00	°C/W
Rth2	9.01E-02	
Rth3	2.67E-02	
Cth1	1.99E-02	J/°C
Cth2	6.70E-03	
Cth3	1.61E-03	



$Z_{\Theta JC}$ SPICE Thermal Model

Fitting parameter	Value	Unit
Rth1	3.20E-01	°C/W
Rth2	4.71E-02	
Rth3	1.72E-02	
Cth1	9.71E-03	J/°C
Cth2	5.12E-03	
Cth3	1.33E-03	



END OF ROAD

The end of the road for silicon…

but a clear road ahead for GaN FETs and ICs!