
Procedure for Measuring Pad-to-Ambient Thermal Resistance ($R_{\theta PA}$) for Exposed Pad Packages

Scope

For devices with an exposed die pad, the die-to-exposed pad thermal resistance ($R_{\theta JP}$) is independent of the printed wire board (PWB) on which the device is mounted. The value of pad-to-ambient thermal resistance ($R_{\theta PA}$) can be measured using a simple experiment. From the measured value of $R_{\theta PA}$ and a known $R_{\theta JP}$, it is possible to compute the value of die junction-to-ambient thermal resistance ($R_{\theta JA}$) of the device when mounted on any type of PWB. Because the $R_{\theta JA}$ is affected by the PWB, computing $R_{\theta JA}$ using this procedure offers a convenient way to estimate and compare the thermal performance of various PWBs.

Procedure for Measuring Pad-to-Ambient Thermal Resistance ($R_{\theta PA}$)

The customer can measure the $R_{\theta PA}$ for the package on their PWB by using the following procedure:

1. Drill a small hole in the PWB through the exposed pad footprint.
2. Solder the device to the PWB.

3. Insert a fine wire thermocouple into the exposed pad through the hole in the PWB so that it is touching the exposed pad, and then secure it with a thermally conductive epoxy:

- Recommended fine-wire thermocouple:
Omega 5SC-TT-K-30-36
- Recommended thermally conductive epoxy:
Omega Bond 101

4. Allow the epoxy to harden.
5. Power-up the device for at least 20 minutes for it to reach thermal equilibrium.
6. The thermocouple indicates the exposed pad temperature. From this, the pad-to-ambient thermal resistance can be calculated:

$$R_{\theta PA} = (T_{\text{Pad}} - T_{\text{Ambient}}) / \text{Power}$$

7. By combining $R_{\theta PA}$ with the junction-to-pad thermal resistance ($R_{\theta JP}$) from Allegro's [thermal Web page](#), the die junction-to-ambient thermal resistance ($R_{\theta JA}$) can then be computed:

$$R_{\theta JA} = R_{\theta JP} + R_{\theta PA}$$

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