

## Qualifier $T_J = T_A$ Defined

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### ABSTRACT

In the header of most datasheet specification tables there is a qualifier for the tests defined in the table, ( $T_A = T_J$ , unless otherwise stated). Specifically, these tests are valid for the device as long as the junction temperature remains within the specified limits for that device.

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### Qualifier $T_J = T_A$ Defined

This qualifier is derived during the packaged device testing, but when listed in the data sheet, can be misleading.

In this testing, the packaged device is mounted on a thermally controlled test set. The tests are then performed in a few milliseconds to verify the parameters. This test is performed in so short a time and with such low power that there is not sufficient time for the junction temperature to be materially affected.

These tests are performed on a sampling of the initial microcircuits at multiple temperatures to characterize the device at various junction temperatures. From that information, the change in temperature of the various parameters is determined. This leads to a narrow window for each of the parameters that can be used for test limits at a nominal junction temperature. During testing, if the device characteristics fall within that narrow window at the nominal junction temperature, they will remain inside the much wider parameter window at the junction-temperature extremes, with some margin for lifetime shifts.

This wider parameter window in the datasheet is stated as:

- $T_J = T_A$

For example, a device that operates from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  may not be out of specification at a junction temperature of  $86^{\circ}\text{C}$ . The device may very well stay within specification right up to a junction temperature of  $124^{\circ}\text{C}$ , for devices that have equivalent military versions. It simply means that the device may start to drift out of specification at a junction temperature of  $86^{\circ}\text{C}$ .

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