

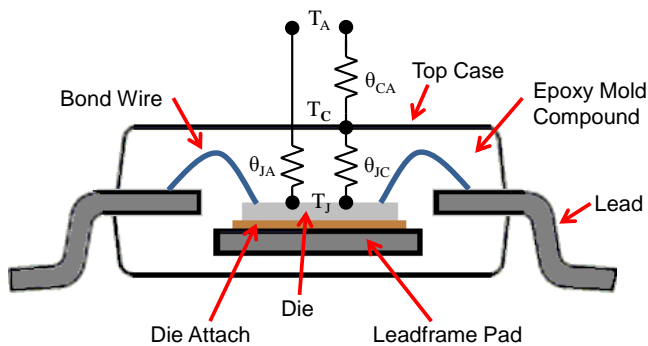
PTA Quick Reference Guide

Package Thermal Analysis (PTA) is a program written for the HP50g calculator that aids in the analysis of the thermal properties of integrated circuit packages. These include thermal resistance, power dissipation and derating, and die, package, and ambient temperatures. Each parameter can be entered or found.

Parameters

1. Power Dissipation, **P**, in mW
2. Junction Temperature, **T_j**, in °C
3. Junction-Case Thermal Resistance, **θ_{jc}**, in °C/W
4. Case Temperature, **T_c**, in °C
5. Case-Ambient Thermal Resistance, **θ_{ca}**, in °C/W
6. Ambient Temperature, **T_a**, in °C
7. Junction-Ambient Thermal Resistance, **θ_{ja}**, in °C/W
8. Power Derating Factor, **DF**, in mW/°C
9. Maximum Junction Temperature, **T_{jmax}**, in °C
10. Maximum Power Dissipation, **P_{max}**, in mW

Integrated Circuit Thermal Model



Package Diagram

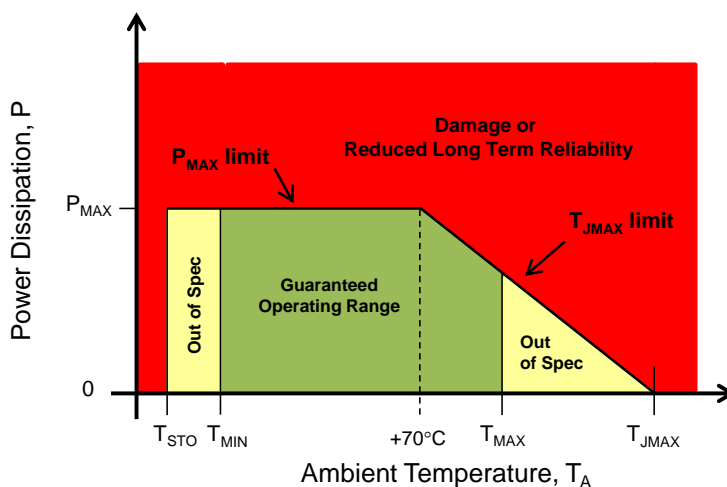
$$T_J = T_A + P \cdot \theta_{JA} = T_A + P \cdot (\theta_{JC} + \theta_{CA})$$

$$\theta_{JA} = \theta_{JC} + \theta_{CA}$$

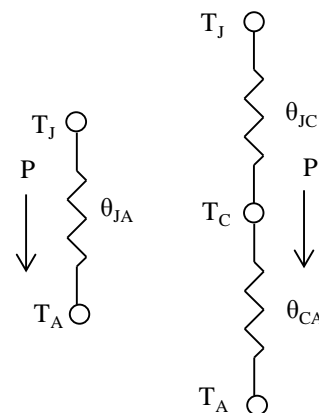
$$T_C = T_A + P \cdot \theta_{CA}$$

$$\theta_{JC} = \frac{T_J - T_C}{P}$$

Thermal Equations

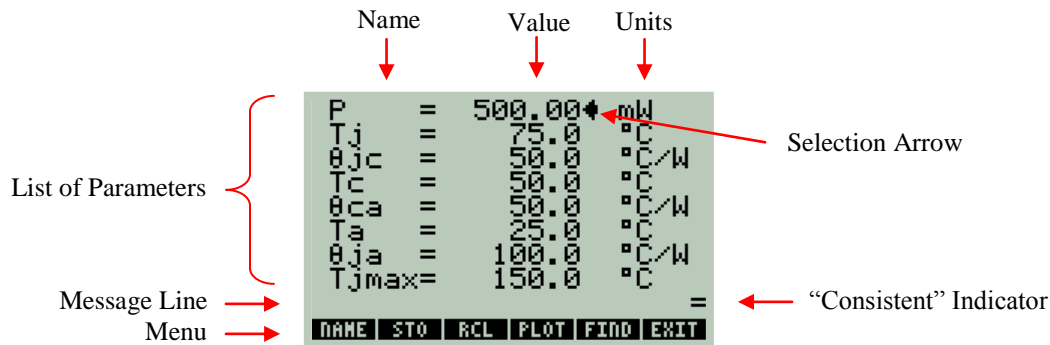


Power Derating Curve



Thermal Model

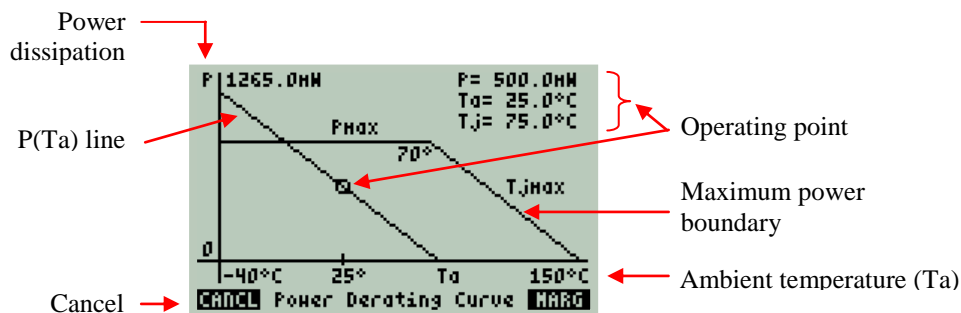
Parameter Display and Commands



- ▼ and ▲ key to select a parameter
- ⬅ (insert) or ➡ (delete) a parameter. Press **ENTER** when finished.
- ▶ Display an alternative parameter (**θja** or **DE**, and **Tjmax** or **Pmax**) or remove **θja**, **TC**, and **θja**
- F1** () display the name of the selected parameter in the message line
- ← F1** () display the full precision of the selected parameter in the message line
- F2** () store all parameters
- F3** () recall all stored parameters
- F4** () plot the power derating and junction temperature curves
- F5** () find the selected parameter
- F6** () or **ON** (Cancel) exit the program
- ← F6** () launch the previous run calculator (for physical calculators only - requires CALC)
- ON** turn off the calculator
- NXT F1** () display package and plot diagrams with the parameters used by PTA
- NXT F2** () export the selected parameter to the stack upon exiting
- NXT F3** () import a number present in level 1 of the stack when PTA was launched to the selected parameter
- NXT F4** () enter all default parameter values.

The equal sign (=) indicates all the parameters are consistent with each other and will appear following a **F5** () command. The not equal sign (≠) appears following an entry, indicating that the parameters may not be consistent.

Plot Commands ()



- ▲ Zoom out
- ▼ Zoom in
- ←** Decrease Ta operating point to the next lowest significant temperature
- ←** Decrease Ta operating point by 5 C°
- ←** Decrease Ta operating point by 1 C°
- ←** Increase Ta operating point to the next highest significant temperature
- ←** Increase Ta operating point by 5 C°
- ←** Increase Ta operating point by 1 C°
- F1** () Return to the parameter display
- F6** () Display the power and temperature margins