DDR1 Ind. Thermal application

Purpose

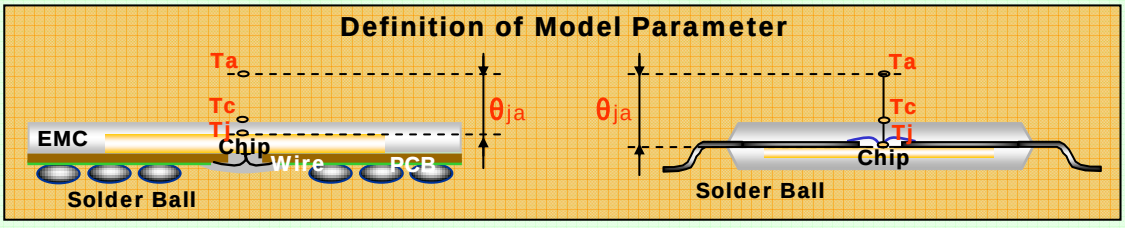
- This document provides a general range of thermal for ensuring that Samsung DDR Industrial Temp. memory does not exceed the maximum allowable temperature.
- And defines Ta and Tj value for reliability and functionality of DDR especially Industrial Temperature.
- So, anyone who design system with Samsung's DDR Industrial Temp. memory has to consider specified maximum Tjmax

Test Method

- Increased requirements for DDR Industrial Memory performance, reliability and quality have forced the need for specification of the junction temperature.
- However without a well-defined standard methodology for making thermal measurements, it has become increasingly difficult to accurately determine junction temperature under actual operating and environmental conditions.
- So, Samsung defines the thermal measurement method based on Jedec Standard(EIA/JESD51_xx)

Thermal Modeling

- Device Power : Active Power = Core Power (VDD x IDD) + I/O Power
- Flotherm S/W using CFD (Computational Fluid Dynamics) Code
- 3-dimensional Thermal Model of Packages and a Test Board
- Environments : JEDEC Standard JESD51-2 for theta JA
  Ta= 85℃(Industrial Product)
  Air Flow Condition : Natural Convection



Result

- Maximum Junction Temperature
  - Tj = Theta JA x DRAM Power + Ta

Conclusion

- Samsung tested Tj based on Jedec Test Method (EIA/JESD51_xx), and the result equation said that each factor cause to increase Tj value, So, we decide to increase test condition of Ta for supporting Tjmax=95℃

Tj(↑) = Theta JA x DRAM Power + Ta(↑)

DDR Industrial Thermal value

	Commercial	Industrial
Ambient Temperature (Ta)	0℃ ~ 70 ℃	-40 ℃ ~ 85 ℃
Junction Temperature (Tj)	0℃ ~ 80 ℃	-40 ℃ ~ 95 ℃