



CYPRESS

Thermal Characteristics of SRAMs

Introduction

This application note introduces thermal characteristics of SRAMs and also provides the thermal values for most of the current SRAMs shipped by Cypress Semiconductor.

Thermal resistance is a measure of the ability of a package to transfer the heat generated by the device inside it to the ambient.

Junction to Case thermal resistance θ_{JC} and Junction to Ambient thermal resistance θ_{JA} are the two parameters generally used to characterize a package.

Formulae:

$$T_J = P_d \theta_{JA} + T_A \text{ where}$$

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

$$\theta_{JC} = (T_J - T_C) / P_d \text{ degrees C/W}$$

θ_{JC} is Junction to Case thermal resistance. It is mainly a function of the thermal properties of the materials constituting the

package. θ_{JC} is defined as the temperature difference between the junction and a reference point on the package when the device is dissipating 1 Watt of power.

θ_{CA} is Case to Ambient thermal resistance and is mainly dependent on the surface area available for convection and radiation and the ambient conditions among other factors. This can be controlled at by the user by using heat-sinks providing greater surface area and better conduction path or by air or liquid cooling.

T_A is the ambient temperature in degrees Celcius.

P_d is the device power dissipation in Watts (W).

T_J is the Junction temperature in degrees Celcius.

T_C is the temperature at an accessible reference point on the package, ie., Location of Highest temperature accessible outside the package.

Table 1 provides the thermal values. θ_{JA} is measured at 0 ft/sec of air flow.

Table 1. Thermal numbers of SRAMs

Part #	Description	Package Type	θ_{JA} (C/W)	θ_{JC} (C/W)
CY7C185	8K x 8 Fast Async SRAM	SOJ	58.6	17.58
		DIP	57.7	17.31
CY7C199	32K x 8 Async SRAM	SOJ	58.6	17.58
		DIP	55.4	16.62
		TSOP	99.4	29.82
CY7C109	128K x 8 Async SRAM, 0.35 μ	SOJ	57.3	17.19
		TSOP	66.3	19.89
CY7C109B	128K x 8 Async SRAM, 0.25 μ	SOJ	57.9	17.37
		TSOP	67.6	20.28
CY7C1021	64K x 16 Async SRAM, 0.35 μ	SOJ	45.3	13.59
		TSOP	65.5	19.65
CY7C1021B	64K x 16 Async SRAM, 0.25 μ	SOJ	47.4	14.22
		TSOP	67.9	20.37
CY7C1020	32K x 16 Async SRAM	SOJ	46.8	14.04
		TSOP	67.2	20.16
CY7C1049	512K x 8 Async SRAM, 0.35 μ	SOJ	48.3	14.49
CY7C1049B	512K x 8 Async SRAM, 0.25 μ	SOJ	49.9	14.97

Table 1. Thermal numbers of SRAMs (Continued)

Part #	Description	Package Type	θ_{JA} (C/W)	θ_{JC} (C/W)
CY7C1041	256K x 16 Async SRAM, 0.35 μ	SOJ	48.3	14.49
CY62127V	128K x 16 Micropower SRAM	TSOP	68.3	20.37
CY7C1302/1304	512K x18 QDR SRAM	165 FBGA	50.0	20.0