OSD335x-SM Thermal Guide

Rev.1 2/09/18

Introduction

The temperature of a device during operation in a system is an important parameter as it affects many properties such as device functionality, reliability and life. Since OSD335x-SM is a System-in-Package (SiP) with several ICs and passive components, single IC package data cannot be used to estimate its thermal characteristics. Hence, it was necessary to characterize OSD335x-SM SiP for its thermal behavior.

This document will provide thermal characteristics of OSD335x-SM and a way to estimate junction temperature. We will also give a comparison of OSD335x-SM with a similar system of discrete components.

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1 Revision History

Revision Number	Revision Date	Changes	Author
1	2/9/2018	Initial Release	Eshtaartha Basu

2 Comparison of OSD335x-SM with Discrete Components

One of the questions we seek to know is how SiP temperatures compare with a similar system that has individual components in it.

Figure 1 shows case temperature of AM335x at approximately 99% CPU Load on a board that had individual components mounted and Figure 2 shows case temperature of OSD335x-SM (focused on AM3358 die) under same load. We can see that OSD335x-SM case temperature is less (approximately 51.3 degrees C) compared to that of AM3358 for the same load (approximately 54.8 degrees C).

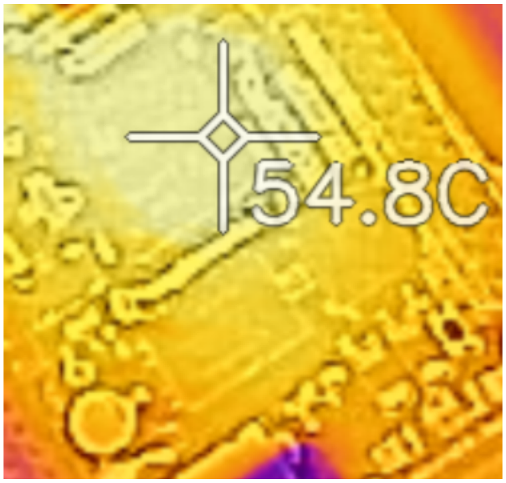

Figure 1 AM3358 Case Temp. with 99% CPU usage

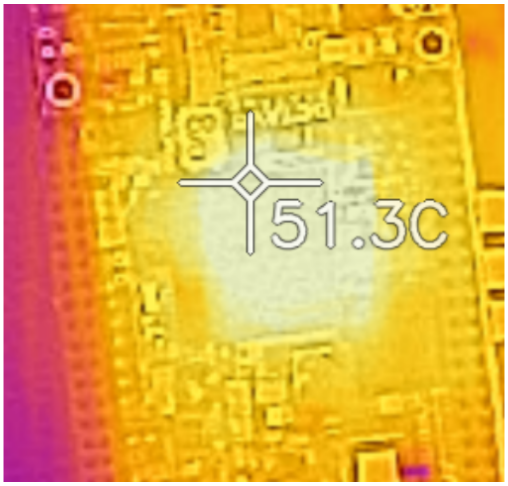

Figure 2 OSD335x-SM Case Temp. (focused on AM3358 die) with 99% CPU usage

3 OSD335x-SM Thermal Parameters

The measured Thermal Parameters of OSD335x-SM are given in Table 1.

Thermal Parameters	Value (^{O}C/W)
Ψ_{JT} (1)	1.6
θ_{JA} (2)	26.5

Table 1 OSD335x-SM Thermal Parameters

(1) Ψ_{JT} is the measured Thermal Resistance from Junction to Top of Package as measured above the CPU when the SiP is mounted on a 4 layer board (OSD3358-SM-RED platform) in still air and CPU under maximum load, and other components operating per spec.

(2) θ_{JA} is the measured Thermal Resistance from Junction to Ambient Air when the SiP is mounted on a 4 layer board (OSD3358-SM-RED platform) in still air and CPU under maximum load, and other components operating per spec.

4 Measuring Case Temperature and estimating Junction Temperature of the OSD335x-SM SiP

To measure the case temperature of OSD335x-SM SiP:

1. Tools needed: Thermocouple (Perfect-Prime TL0225 surface contact, 0.25mm diameter with K-Type Sensor Probe) or FLIR ONE PRO Thermal Camera.
2. Calibrate thermocouple or other temperature-measuring device such as FLIR ONE PRO with known temperatures such as ice-cold water and boiling water.
3. Place the SiP in an enclosure so that there are no stray air currents while making measurements and run the desired application on it.
4. Make contact or fix the thermocouple on the package or focus FLIR ONE PRO on the package. For thermocouples, make sure of good contact with the top surface of the SiP using thermal grease.
5. Record the case temperature (T_C) once the temperature is stabilized.
6. Measure the input power (P) consumed by the SiP.
7. Case temperature (T_C) thus obtained may be used to verify if the SIP is operating under conditions specified in the datasheet.

It may be desirable to estimate the Junction Temperature (T_J) of the AM3358 Die inside the System-in-Package. In this case it can be estimated with the following equation:

$$T_J = T_C + \Psi_{JT} * P$$

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