

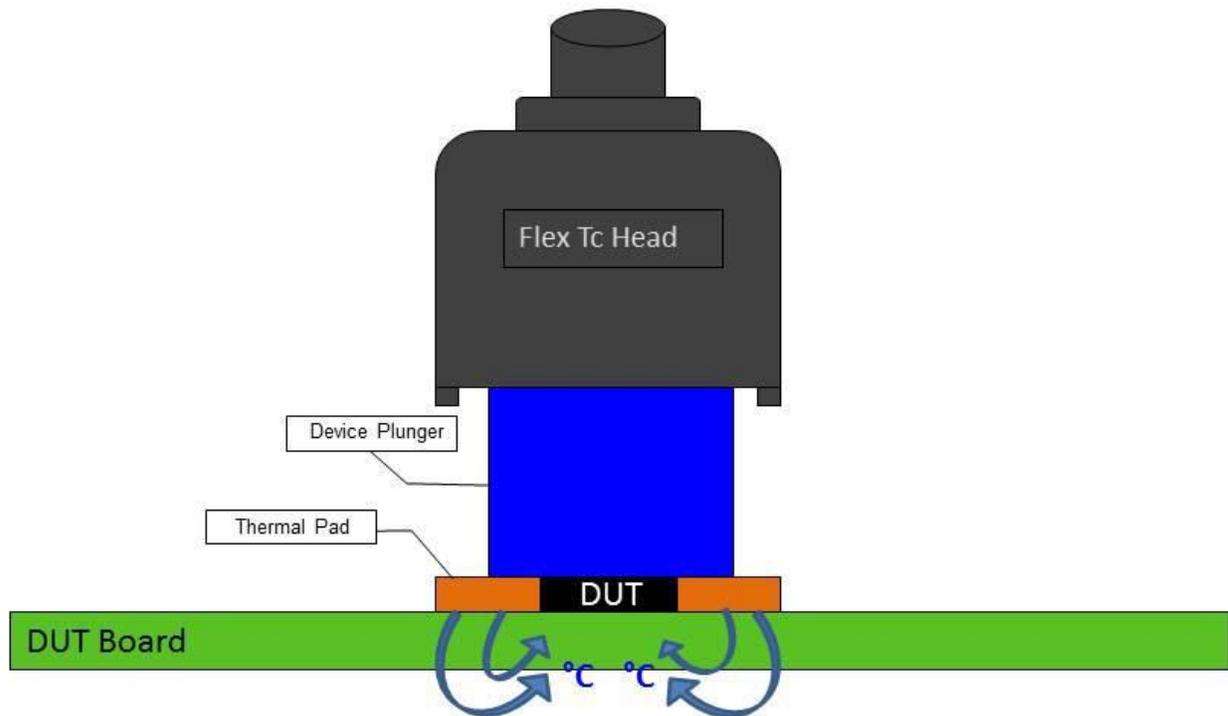
### [Using Mini-chamber for Soldered application](#)

#### **Guidelines for cooling/heating soldered device packages using FlexTC systems.**

Abstract: Semiconductor devices are either tested in test sockets or when soldered to PCBs. In socket testing the device is thermally isolated from the PCB and the main influence on the junction temperature is from the device case ( $\theta_{JC}$ ). In soldered devices testing the junction temperature is more influenced by the surrounding PCB temperatures due to the thermal conduction via the solder leads.

Introduction:

Managing PCB temperatures in close proximity (up to 0.5mm overlap) around soldered devices is important for ensuring minimum junction to case offsets in soldered device thermal testing. The following application note describes *mini chamber environment* setup for conducting temperatures to PCB area around the soldered device.



# MECHANICAL DEVICES

## Mini Chamber setup using thermal pad material:

**Photo 1** shows the PCB and the soldered device before *mini chamber environment* setup.

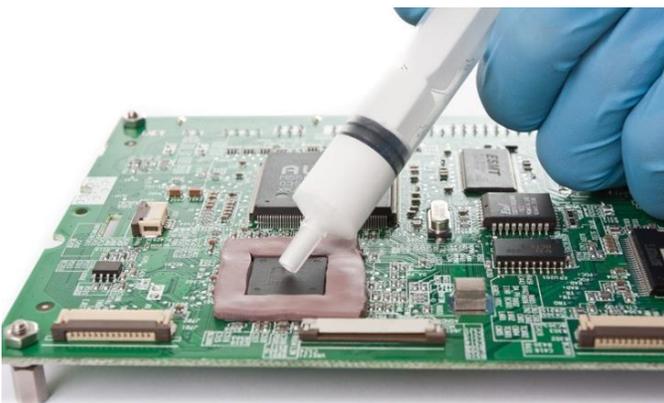
Photo



**Photo 2** shows thermal conductive pad material (TIM) trimmed to frame shape



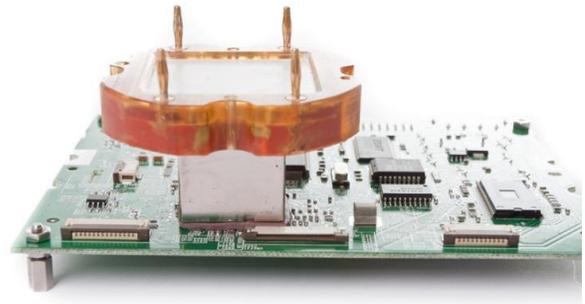
**Photo 3** shows Thermal pad material placed around the soldered device, on top of approximate components.



**Photo 4** shows thermal grease that is placed on the soldered device.



**Photo 5** shows device plunger contacting the entire area of the soldered device and the frame shaped thermal pad.



Mini Chamber setup using parker paste:

**Photo 1:** shows the PCB and the soldered device before mini chamber environment setup.



Photo 2, 3: shows thermal conductive parker paste (TIM) placed on the soldered DUT and the surrounding components



Photo 4: shows device plunger contacting the entire area of the soldered device and the surrounding component on top of the parker paste.



Case study - Junction to case offsets in soldered devices and in sockets testing:

In a case study performed with a 13x13 BGA temperature values were measured on the junction using an imbedded thermal diode. The 13x13 BGA device was tested under the same operation mode in test socket and when soldered to a PCB.

The following temperature values were measured:

Setup/ Measurements	Case Temperature (C)	Junction Temperature (C)	Junction to case offset (C)
13x13 BGA Device tested inside test socket with a 13x13 Plunger	-55C	-40C	15C
13x13 BGA Device Tested soldered to PCB using a 13x13 plunger. <i>Without mini chamber setup</i>	-55C	-15C	-40C
13x13 BGA Device Tested Soldered to PCB using an 18x18 plunger <i>With mini chamber setup</i>	-55C	-40C	15C

**Summary:**

The primary purpose of mini chamber environment is to conduct temperatures to the Junction through the solder leads in the PCB. Mini chamber environment substantially drop the junction to case offset is soldered device applications, sometimes by up to 25C, depending on the package type and dimensions.