Single Edge Contact Cartridge 2 (S.E.C.C.2) Heat Sink Attachment and Heat Sink Functional Requirements

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Glossary of Terms

Core Package: silicon package, either PLGA or OLGA, mounted to the substrate; see Fig. 3.

Substrate Attachment Holes: four holes surrounding substrate that correspond to the cover boss'; see Fig. 3.

Substrate-to-Cover Attachment Features: features that provide retain the substrate to the cover; see Fig. 3.

Cover Boss: features that align with substrate attachment holes and facilitate heat sink attachment; see Fig. 3 & 6.

Retention Mechanism (RM): parts that retain the S.E.C.C. 2 assembly and thermal solution to the planar.

Keep-Out: zone that establishes boundaries for heat sink attachment solutions to stay outside of.

Keep-In: zone that establishes boundaries for heat sink attachment solutions to stay inside of.

1. Introduction and Specification Scope

The purpose of the functional specification for the Heat Sink Attachment, Heat Sink and Thermal Interface is to provide the design constraints and requirements for a heat sink attachment, heat sink and thermal interface to comply with the Single Edge Contact Cartridge 2 (S.E.C.C. 2) performance requirements set by Intel. This includes environmental testing outlined in *Support Component Test Requirments*. With this information, a developer could design a heat sink attachment and heat sink. These constraints are compatible with the Universal Retention Mechanism and the Integrated Retention Mechanism. If not properly retained and supported, the S.E.C.C. 2 can disconnect from the SC242 Connector or the heat sink, possibly causing damage to motherboard components or the S.E.C.C. 2 processor package.

Heat sink attachment is typically accomplished through a heat sink clip. For the Intel-designed heat sink attachment an initial uniform compressive load of 12-20 lbf is required between the S.E.C.C. 2 core package and the heat sink to maintain thermal performance. Your thermal solution may require a different compressive load depending on your heat sink design, heat sink attachment methodology and thermal interface. The heat sink attachment must not induce any bending or tensile loads in the S.E.C.C. 2 assembly beyond the limits stated in this document.

2. Connector Requirements

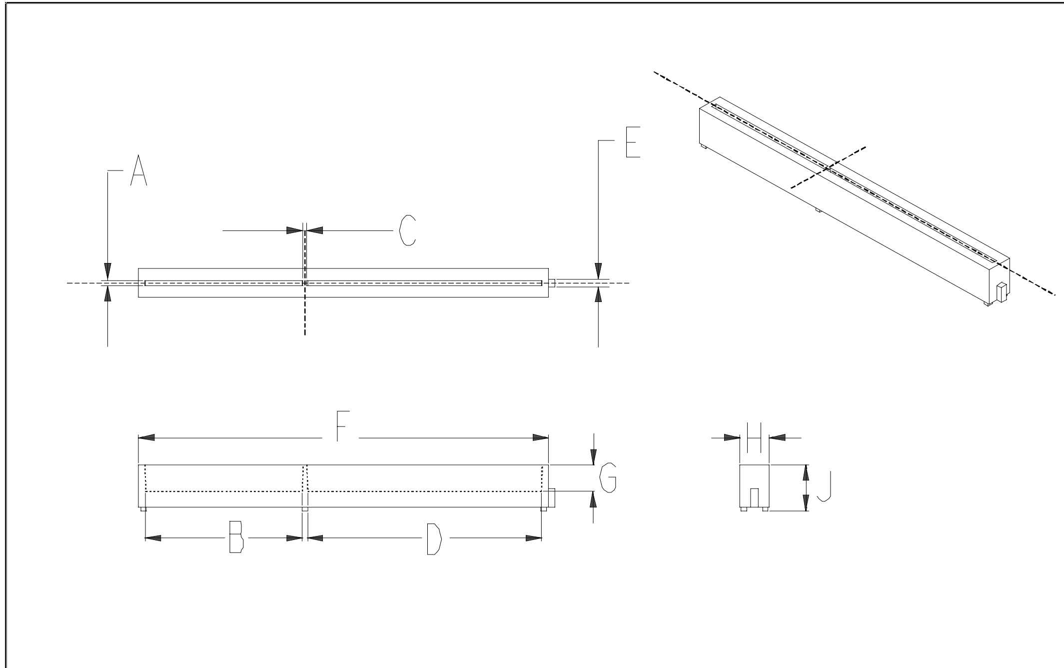

Fig 1. Connector Critical to Function Dimensions Diagram

Dimension	Minimum (inch)	Maximum (inch)
A	0.070	0.078
B	1.9855	N/A
C	0.069	0.071
D	2.9645	N/A
E	0.095	0.105
F	5.221	5.241
G	0.344	0.356
H	0.364	0.384
J	0.600	0.615

Table of Critical to Function Dimensions

Figure 1 shows critical interface dimensions and tolerances of the SC 242 Connector. See the *SC242 Design Guidelines* (Order Number 243397) for further detail.

3. Geometric Requirements

3.1 Heat sink to Retention Mechanism Attachment Requirements

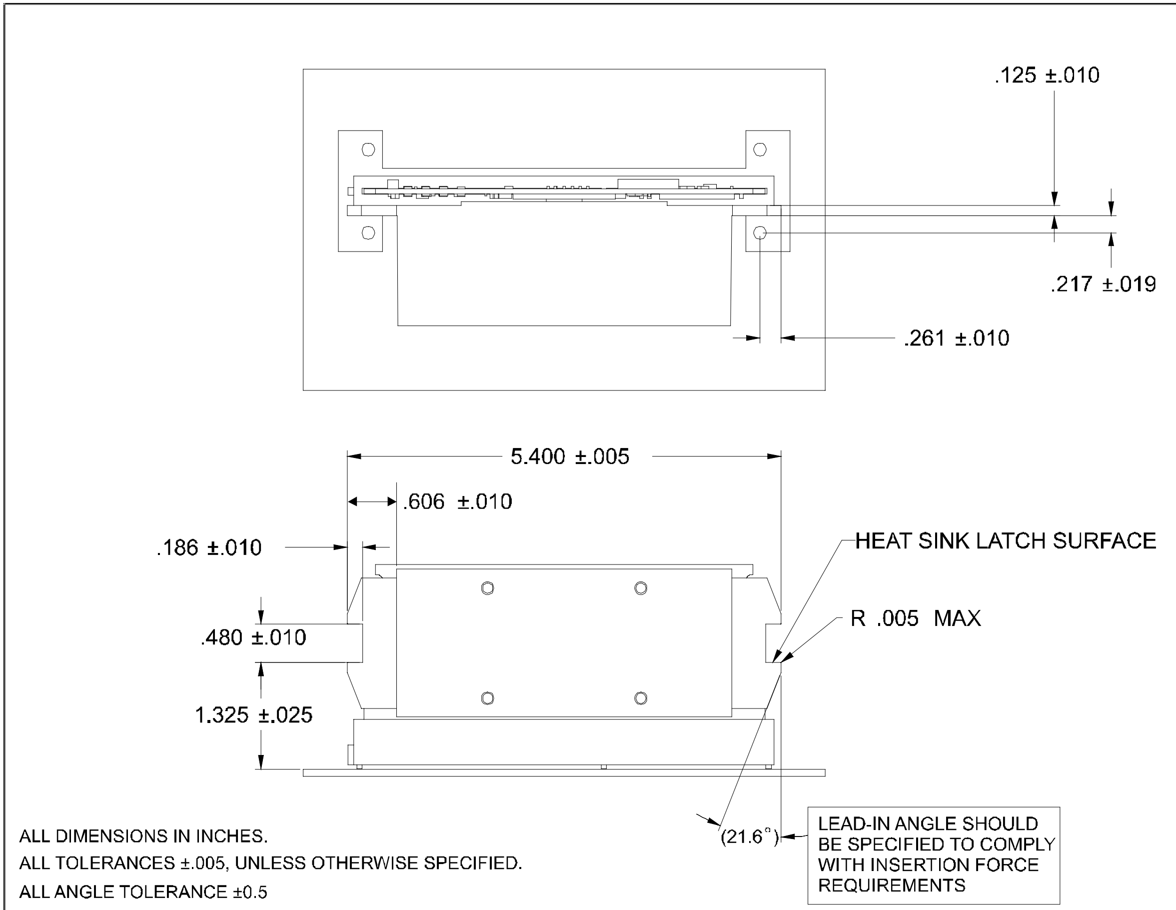

Fig. 2 Retention Mechanism features to interface Heat Sink (OLGA heat sink shown)

Fig. 2 shows dimensioned critical features of the generic heat sink that will interface with the RM. The .480" wide rectangular cutout is designed to be a latching feature for a RM. The .480" cut-out can be reduced to .200" cut-out but must be located 1.325" above the planar. This can be used to retain the S.E.C.C. 2 to the planar. All other necessary dimensions are given in Fig. 2 to locate the heat sink latch surface.

The heat sink, heat sink attachment and thermal interface must not allow the substrate to back out of the connector more than .035". It must also not allow the substrate to bend more than 1.40 degrees from the vertical plane when inserted into the connector. Lastly, the RM must not allow an offset of more than .050" in the lengthwise direction of the connector, or else the substrate may not insert into the connector. For further information on heat sink constraints see *S.E.P.P. Functional Specification* and/or *URM Test Specification.*

3.2 S.E.C.C. 2 Substrate to Heat Sink Attachment Requirements

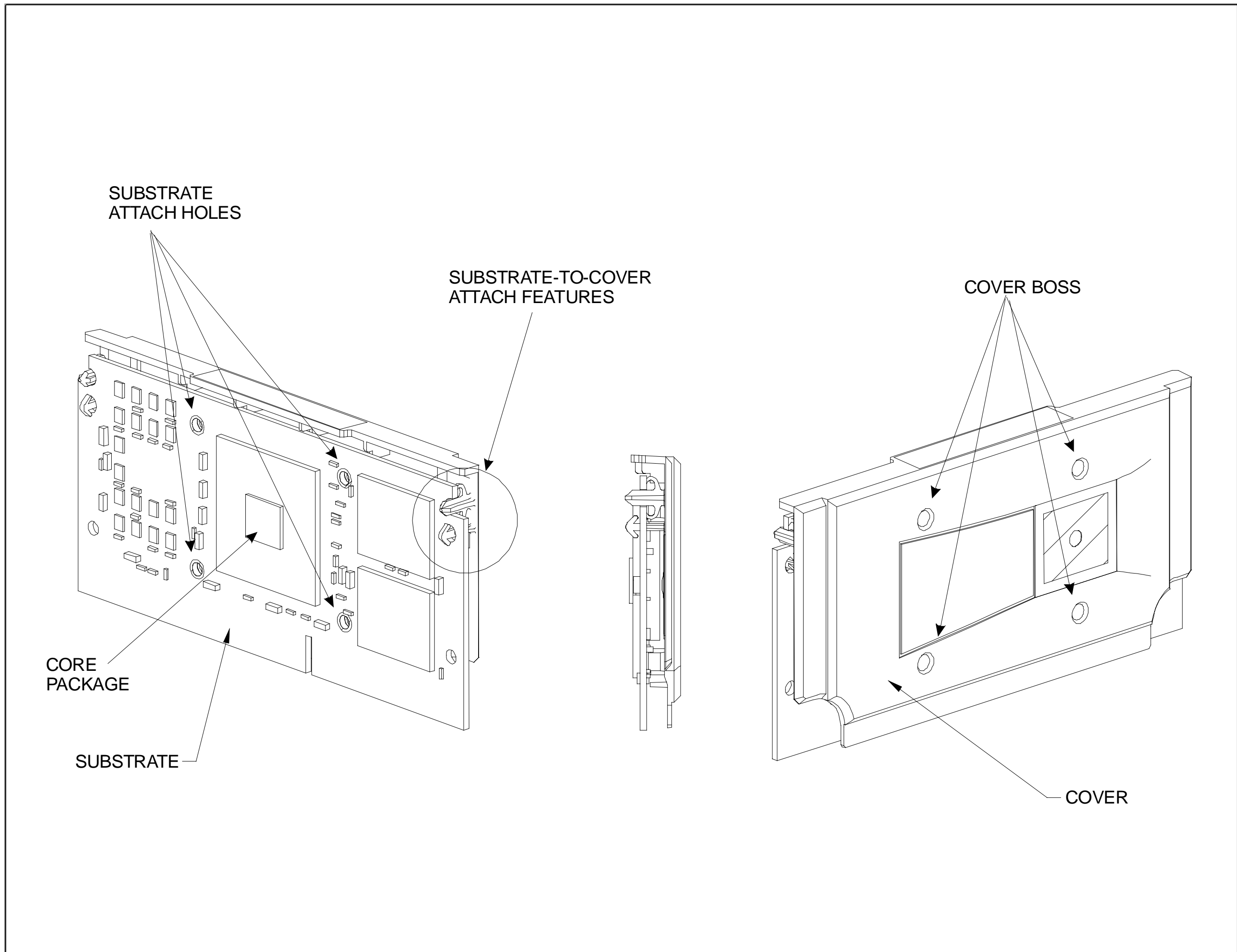

Fig. 3 General Views, S.E.C.C. 2 Assembly (OLGA substrate shown)

Fig. 3 shows the S.E.C.C. 2 assembly. This assembly is comprised of the substrate, either OLGA or PLGA (OLGA shown), and the S.E.C.C. 2 Cover. The substrate is attached to the cover via snap features located in the upper right and left corners of the assembly.

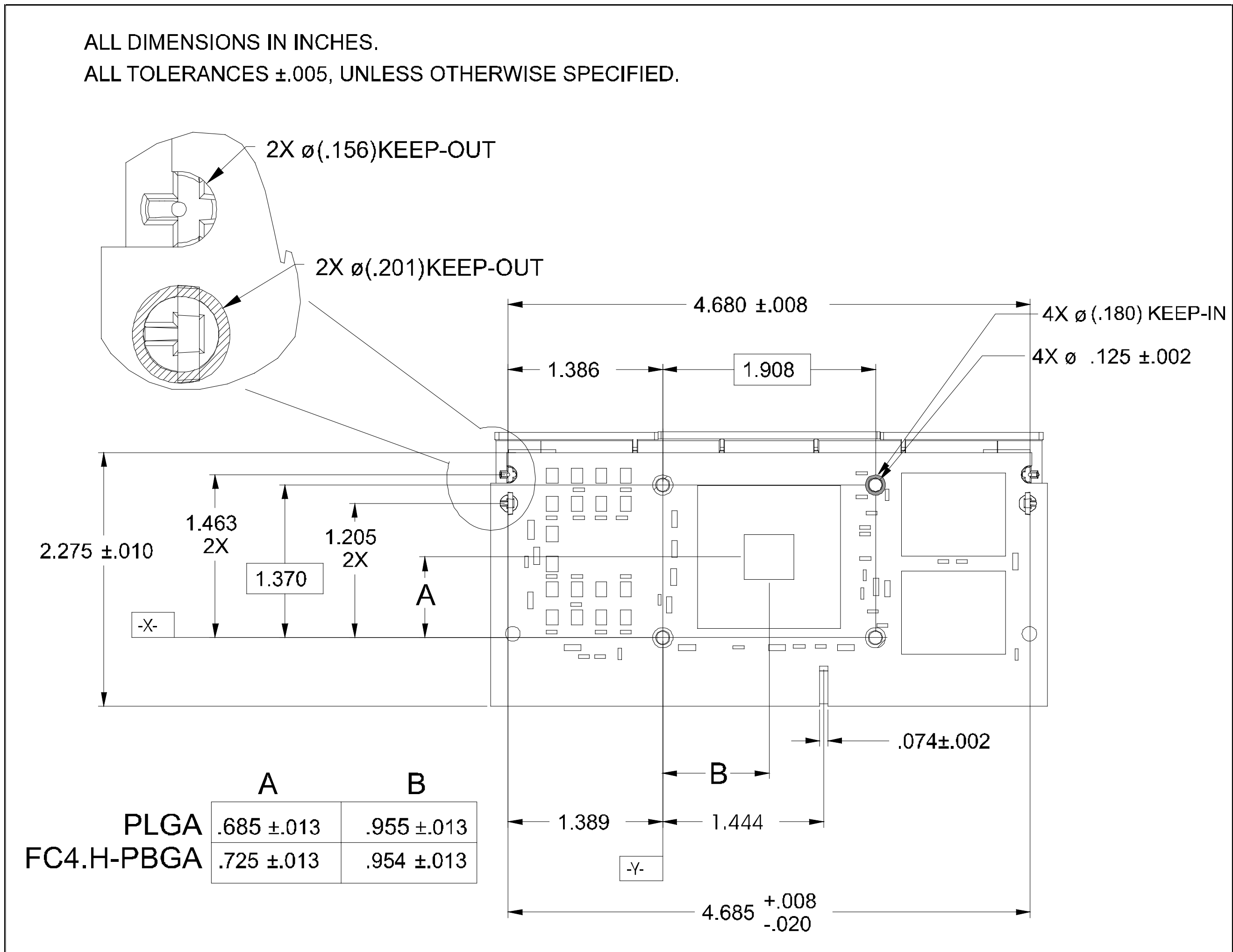

Fig. 4 Primary View, S.E.C.C. 2 Assembly (OLGA substrate shown)

Fig. 4 shows the S.E.C.C. 2 assembly from the direction of the thermal interface (primary side). The datums shown align the cover and the substrate at the hole location shown. The dimensions and tolerances of interest in this view are: 1) substrate attachment holes (.125 ± .002) and keep-in zone (.180), 2) processor core package locations for both PLGA and OLGA and 3) substrate-to-cover attachment feature locations and keep-out. Note that the bottom-most dimension (4.685 +.008 - .020) locates the centers of the lower substrate-to-cover attachment features while the upper dimension (4.680 ± .008) locates the centers of the upper substrate-to-cover attachment feature (see detail view in upper left-hand portion of drawing).

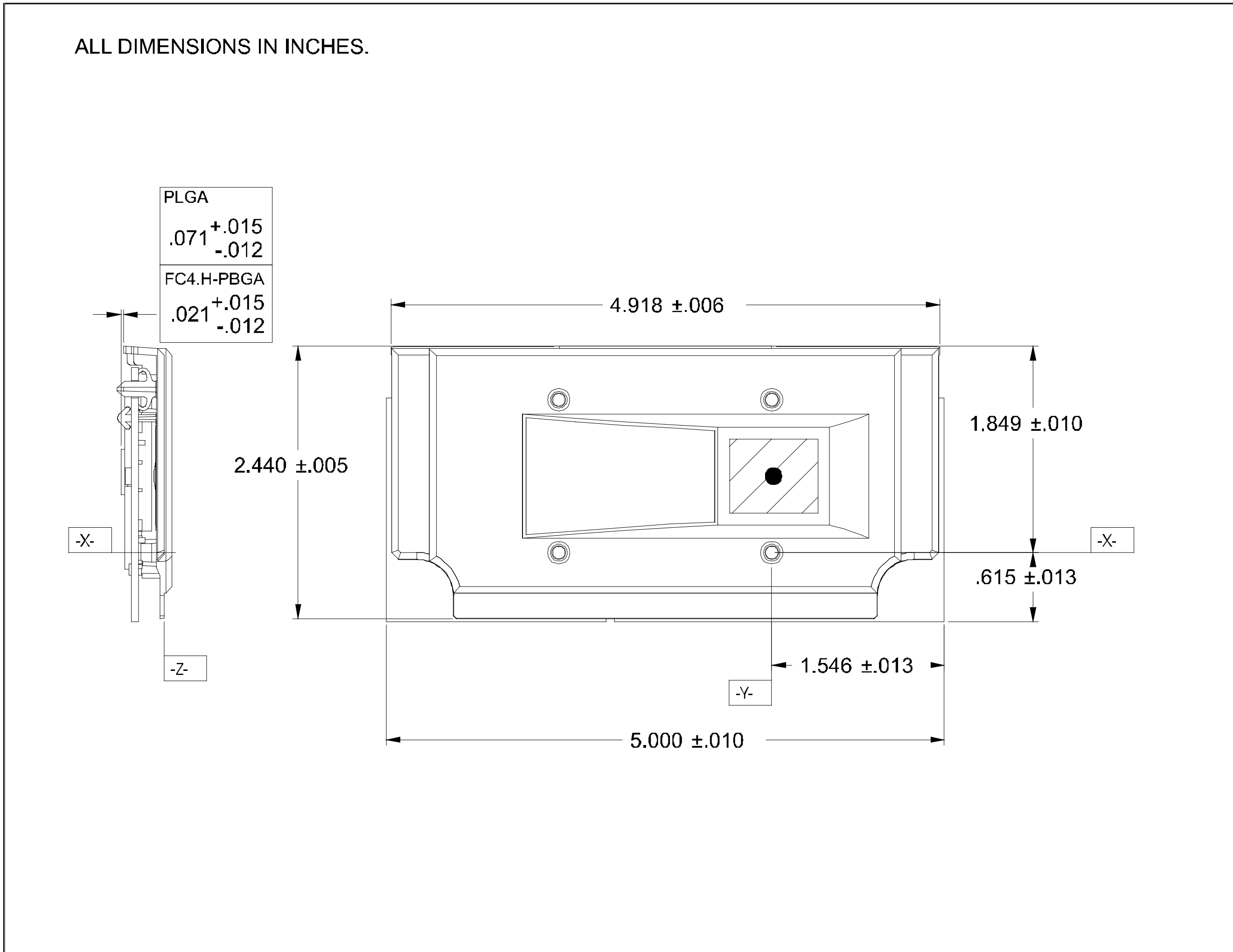

Fig. 5 Cover View, S.E.C.C. 2 Assembly (OLGA substrate shown)

Fig. 5 shows the S.E.C.C. 2 assembly from the cover side. The datums shown align the substrate and the cover at the hole location shown. The dimensions of interest in this view are: 1) substrate edges with respect to heat sink attachment boss holes and 2) top lip of cover with respect to core package height for the two substrate types. Note that the lower-most dimension is the overall substrate width. For a detailed view of the cover boss see Fig. 6.

ALL DIMENSIONS IN INCHES.
ALL TOLERANCES ±.005, UNLESS OTHERWISE SPECIFIED
ALL ANGLE TOLERANCES ± 1°

ø .112 ±.001
ø .005
ø .025 ±.001
SUBSTRATE
.100
.283
.154
.062 +.007 -.005
.020 ±.010
5.0°
COVER
82.0°

TYP BOSS DETAIL 4X

Fig. 6 Heat Sink Attachment Boss Section Detail View, S.E.C.C. 2 Assembly

Fig. 6 shows a cross-section detail of the cover boss and adjacent substrate. Dimensions of interest are: 1) inner diameter of cover boss and 2) effective length and location of cover boss with respect to substrate (applies to OLGA and PLGA).

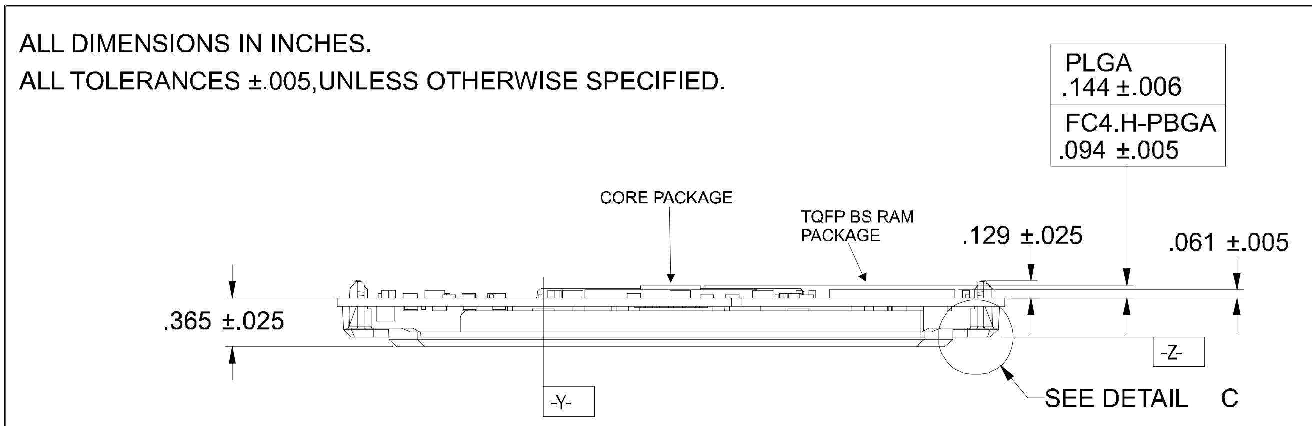

Fig. 7 Side View, S.E.C.C. 2 Assembly (OLGA substrate shown)

Fig. 7 shows a side view of the S.E.C.C. 2 assembly with the OLGA substrate. Dimensions of interest are: 1) overall height from bottom of cover to top of substrate surface, 2) height of PLGA and OLGA core package, 3) height of tallest cover attachment feature and 4) height of OLGA TQFP BS RAM packages.

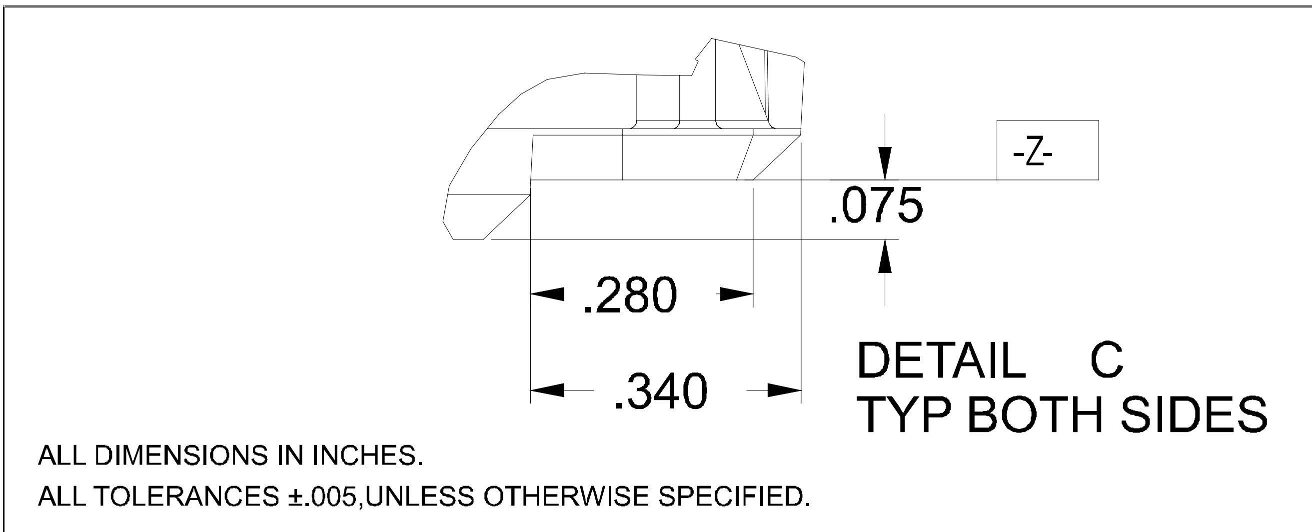

Fig. 8 Detail View of Cover in the Vicinity of Substrate Attachment Features

Fig. 8 show a detail view of the S.E.C.C. 2 cover in the vicinity of the substrate-to-cover attachment features. These dimensions may be of importance to the heat sink attachment processes and/or fixturing as well as clearance around the retention mechanism.

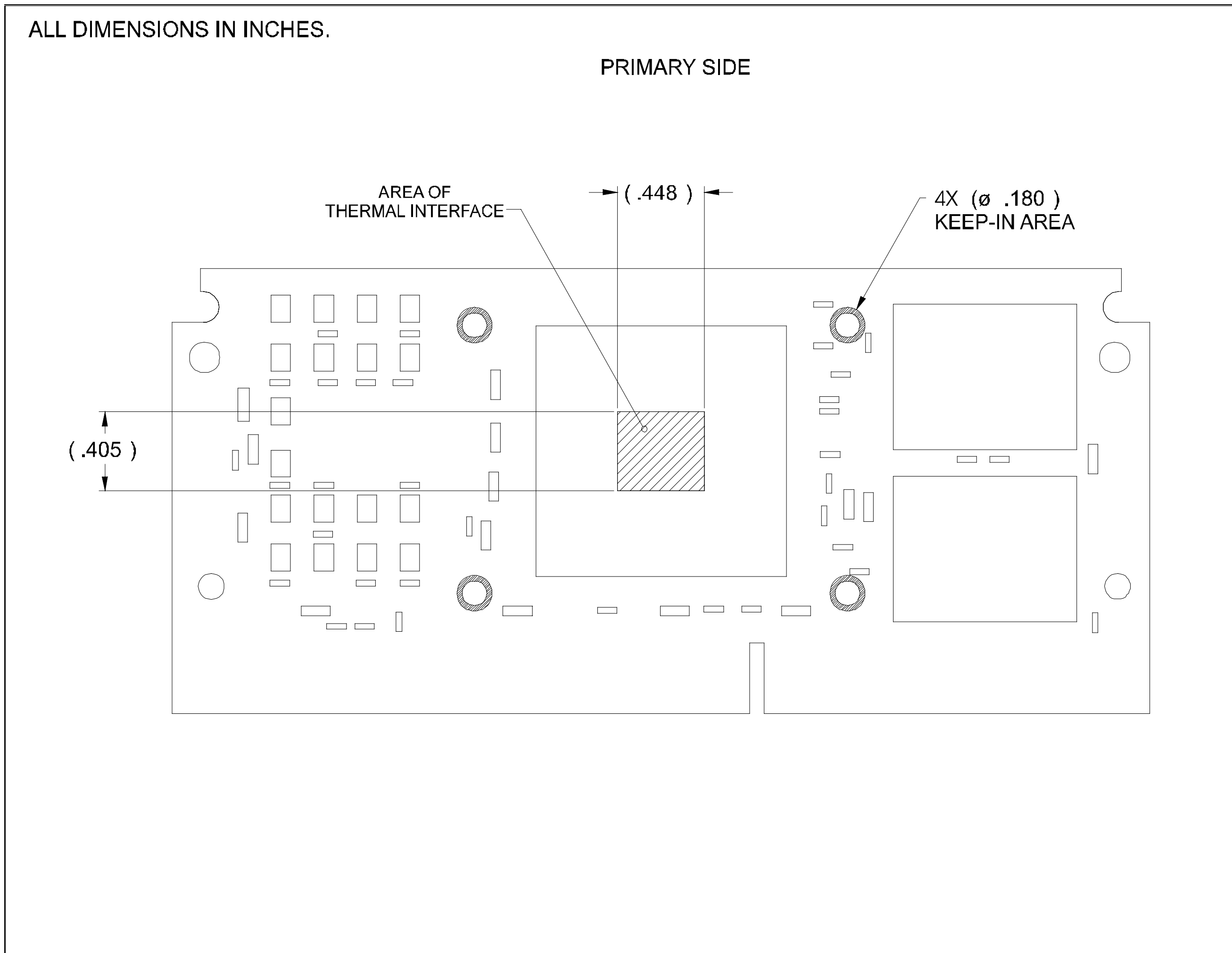

Fig. 9 S.E.C.C. 2 OLGA Substrate, Primary Side

Fig. 9 shows the OLGA substrate from the thermal interface (primary) side. Dimensions of interest are: 1) the dimensions of the core package thermal interface area and 2) the keep-in dimension area surrounding the heat sink attachment through holes (this latter keep-in area also applies to PLGA substrates). Note that all these dimensions are reference dimensions and have no tolerances associated with them.

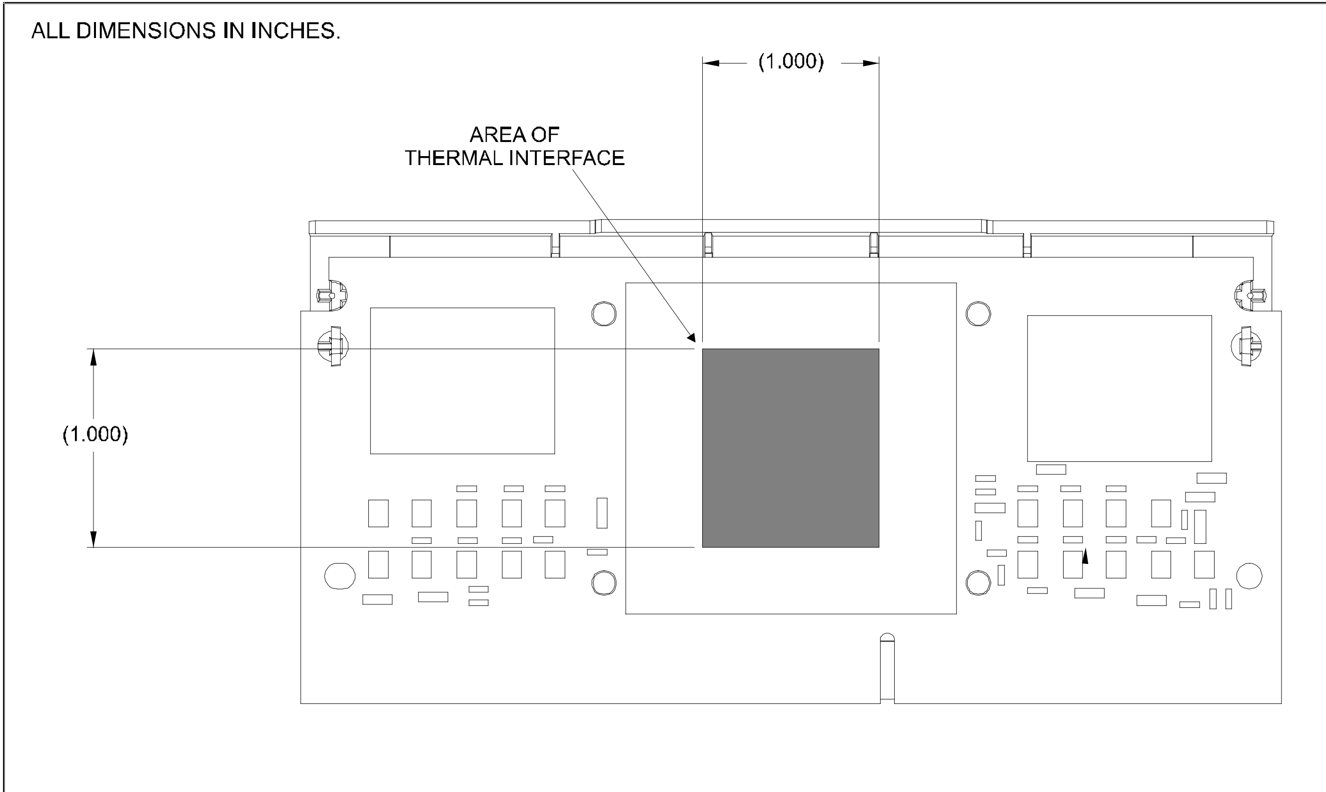

Fig. 10 S.E.C.C. 2 PLGA Assembly

Fig. 10 shows the S.E.C.C. 2 Cover and PLGA Substrate. Note that these are reference dimensions and have no associated tolerance.

3.3 Heat Sink to Thermal Interface Attachment Requirements

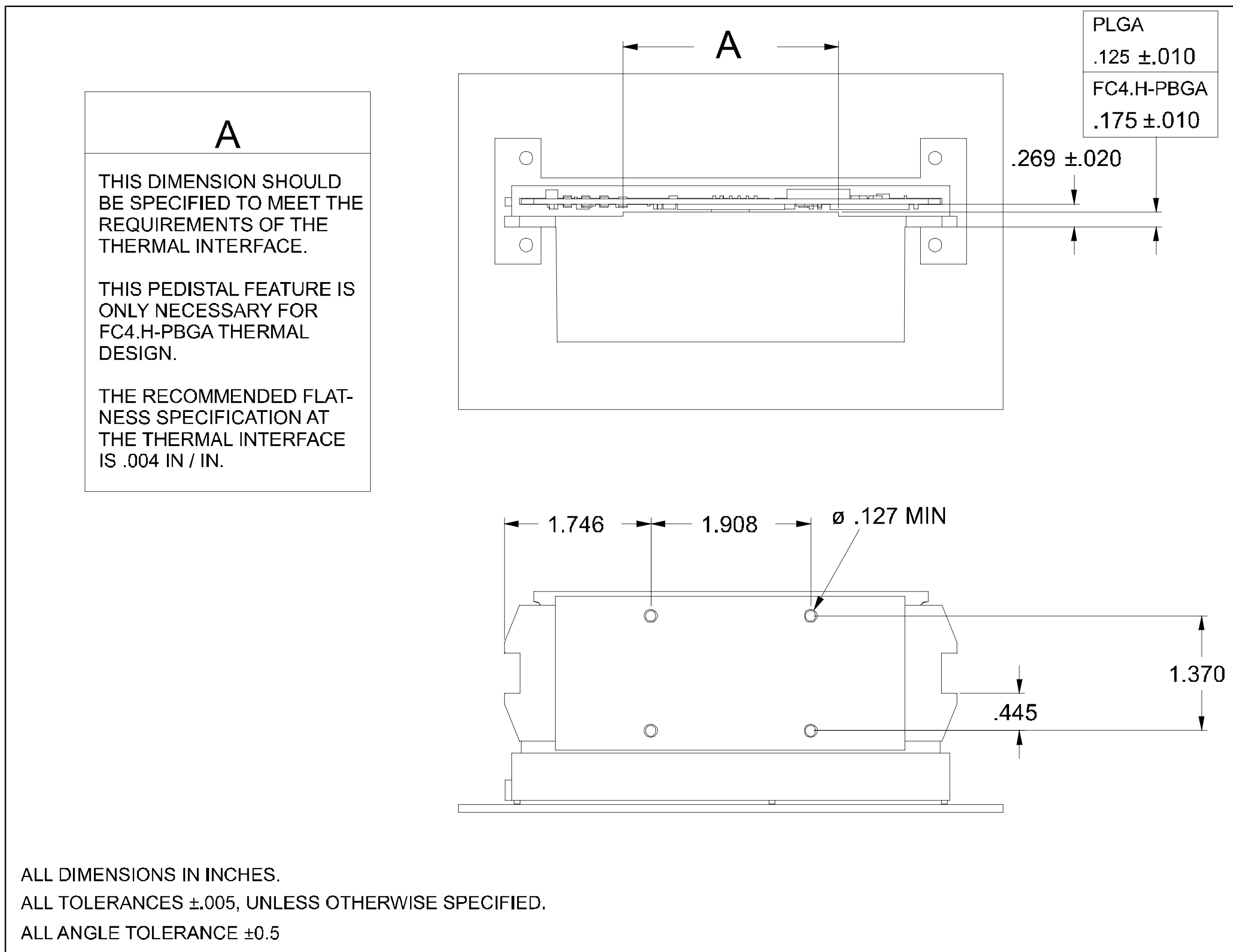

Fig 11. Heat Sink Geometry (OLGA substrate shown)

Fig. 11 shows a generic heat sink solution that is dimensioned to show the thermal interface requirements. Dimensions that should be noted in this figure are: 1) attachment through hole minimum diameter and location, 2) location of the heat sink thermal interface for PLGA and OLGA (the associated tolerance is recommended), 3) location of the primary side substrate and 4) pedestal dimension ‘A’ will be necessary for OLGA compatibility. Fin spacing and length is dependent on your thermal needs. Adherence to additional keep-outs described in Figure 12 should be observed if the Intel-designed heat sink attachment clip is used.

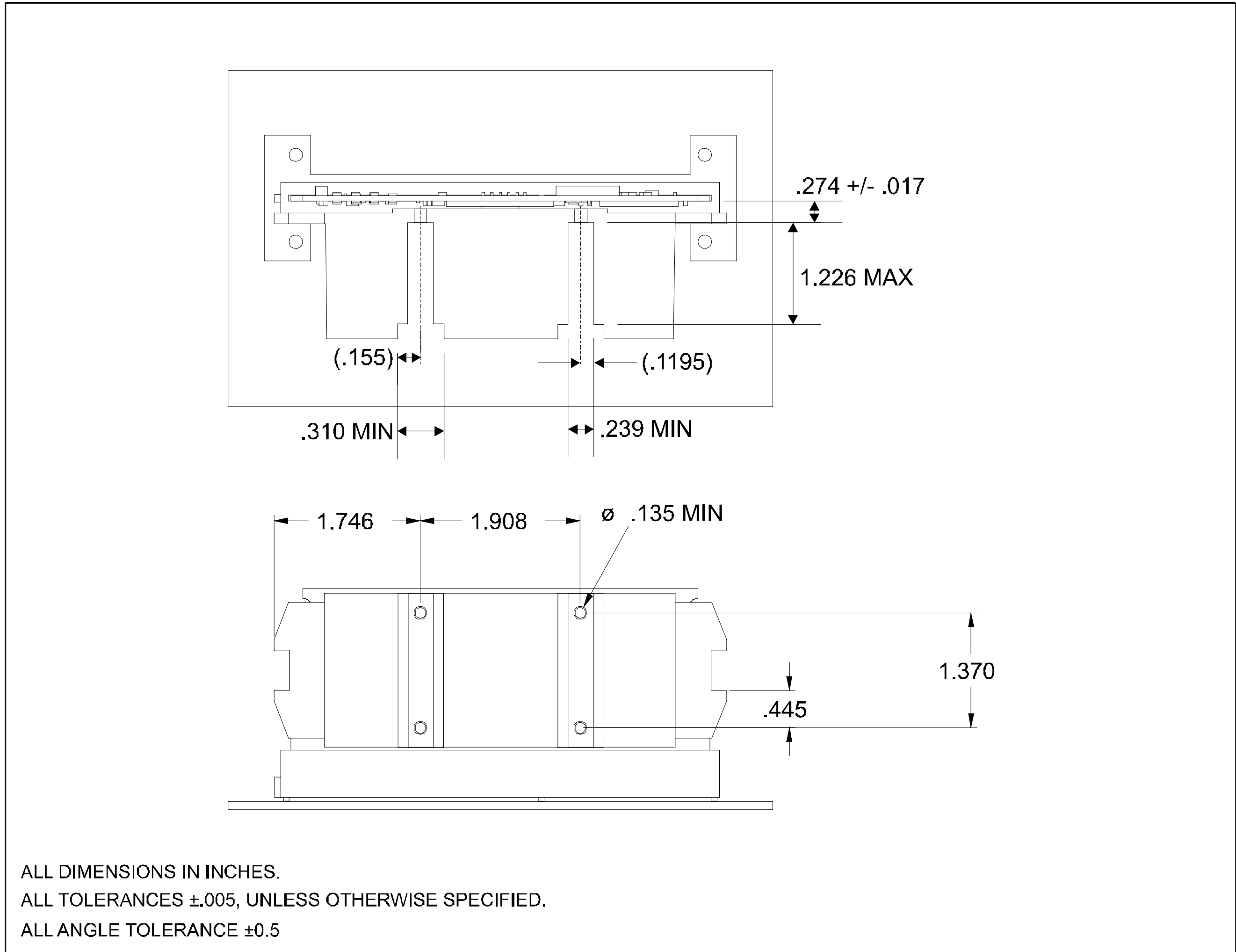

Fig. 12 Heat Sink Requirements for Compatibility with Intel Enabled Heat Sink Clip (OLGA substrate shown)

Figure 12 shows additional heat sink keep-out zones that are necessary in order for the design to be compatible with the Intel-designed heat sink attachment clip. Note that the dimension in the upper right of the figure is from the heat sink surface shown to the surface of the substrate and can be used for both PLGA and OLGA products.

4. Structural Requirements

4.1 Component Level Survival Expectations

The intent of the structural requirements for the heat sink attachment, heat sink and thermal interface is to maintain proper operation and to guard against processor failures during environmental testing. For details see the *Support Component Test Requirements* document.

4.2 Heat Sink Attachment and S.E.C.C. 2 Structural Requirements

The heat sink attachment mechanism must not induce permanent stress into the S.E.C.C. 2 substrate with the exception of a uniform load not to exceed 20 lbf compressive loads to maintain the heat sink to the processor thermal interface. Your heat sink and thermal interface will determine the minimum compressive force.

S.E.C.C. 2 substrate stresses induced during handling, assembly or shock cannot exceed 0.050" deflection as measured from the end of the substrate in the direction of the heat sink or 0.025" deflection as measured from the end of the substrate in the direction away from the heat sink.

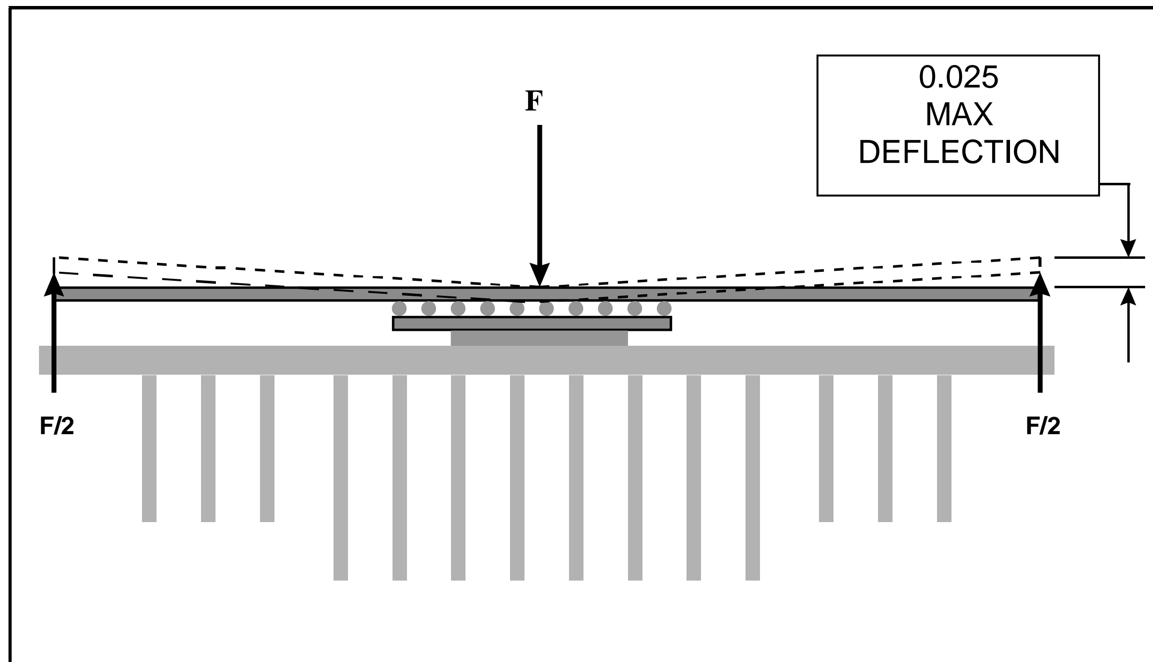

Fig. 13 Substrate Deflection Away From Heat Sink

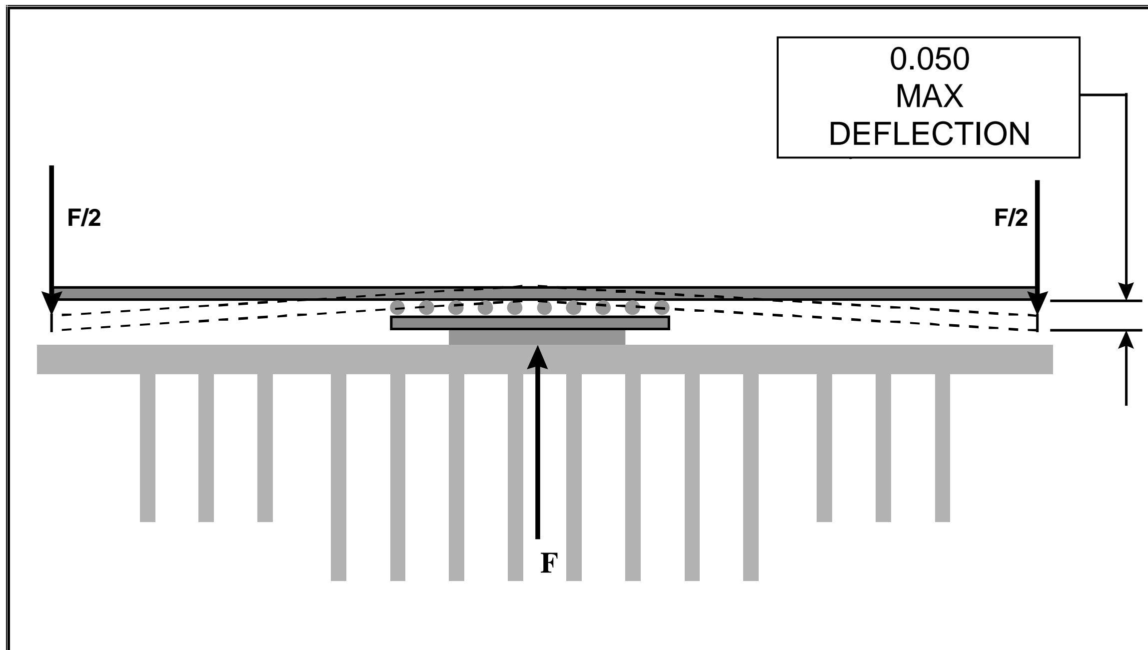

Fig. 14 Substrate Deflection Toward Heat Sink

Metal components must be shielded from electrical contact with the S.E.C.C. 2 substrate with the exception of the S.E.C.C. 2 substrate through holes.

Heat sink attachment must not create any contact wear points on the S.E.C.C. 2 substrate. For more detail on thermal interface / OLGA compliance see the *Thermal Interface Functional Requirements (S.E.C.C. 2).*

Heat sink attachment must not create any metal shavings.

5. Material and Recycling Requirements

Material shall be resistant to fungal growth. Examples of non resistant materials include: Cellulosic materials, animal and vegetable based adhesives, greases, oils, and, many hydrocarbons. Synthetic materials such as PVC formulations, certain Polyurethanes (e.g. polyester and some polyethers), plastics which contain organic fillers of laminating materials, paints, and varnishes also are susceptible to fungal growth. If materials are not fungal growth resistant, then MIL-STD-810E, Method 508.4 must be performed to determine material performance.

Material used shall not have deformation or degradation in a temperature life test as described in *Support Component Test Requirements* Document.

Any plastic component exceeding 25 grams should be recyclable per the *European Blue Angel* recycling standards.

6. Testing Requirements

Qualification testing for the Retention Mechanism and Heat Sink Attachment Mechanism will follow the *Support Component Test Requirments*.

7. Safety Requirements

Retention mechanism and heat sink attachment assemblies shall be consistent with the manufacture of units that meet the safety standards:

- UL Recognition-approved for flammability at the system level
  All mechanical-support components must be a minimum UL94V-0 approved.

8. SUMMARY OF HEATSINK ATTACHEMENT ATTRIBUTES

This attachment provides third parties the necessary information to successfully design attachment mechanisms that repeatedly produce an acceptable thermal performance for the interface between the processor and heat sink while not overloading the processor or substrate.

Attribute	Details	Comments
Substrate Attachment Hole Diameter	• .125 ± .002 in. dia. plus • .180 in. dia. keep-in zone beyond the hole circumference–both sides.	See Fig. 4.
Maximum allowable substrate deflection	• .025 in. away from primary side • .050 in. toward primary side	See Fig. 13 and 14
Substrate thickness	.062 +.007/-.005 in.	See Fig. 6
PLGA core package height	.144 ± .006 in.	See Fig. 7
OLGA core package height	.094 ± .005 in.	See Fig. 7

Attribute	**Details**	**Comments**
Minimum required compressive force at heat sink/processor interface	12 lbf. min.	This can vary depending on the thermal solution.
Maximum static compressive force at heat sink/processor interface	20 lbf. max.	No line or corner loads allowed.
Maximum transient compressive force at heat sink/processor interface	• 100 lbf. max for uniform load • 75 lbf. Max for non-uniform load	No line or corner loads allowed.
Thermal interface thickness	• 0033 ± .0023 in. loaded • .0055 ± .0005 un-loaded	Loaded compressed dimension is compatible with Intel RM design. For further detail see *Thermal Interface Functional Requirements (S.E.C.C. 2)*
Heat sink base thickness	• .125 ± .010 in. for PLGA • .175 ± .010 in. for OLGA	See Fig. 11
Heat sink base flatness	.004 in./in.	Recommended

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