

Within the Stratix® V family, devices can have small differences in the overall package height due to differences in the thickness of their lid construction. Short devices have lids with a thickness of 0.5 or 0.6 mm, while tall devices have lids with a thickness of 1.0 mm.

When multiple Stratix V devices with different lid thicknesses are placed on a single board, a single-piece heatsink may not cover the devices evenly.

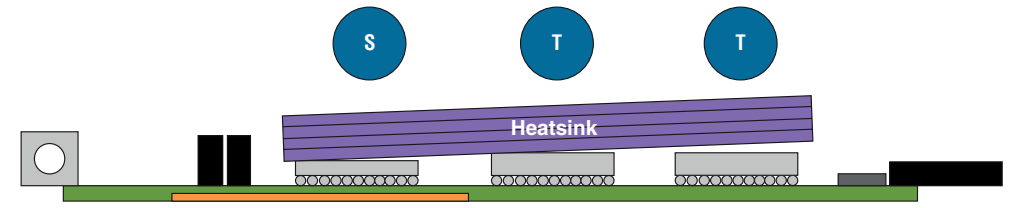
Figure 1 shows a board with multiple Stratix V FPGAs on it.

Figure 1. Stratix V Development Board



Figure 2 shows the cross-section of a board with a heatsink lying at an angle across one short (S) and two tall (T) devices.

Figure 2. Cross-section of the Stratix V Development Board



The problem particularly manifests itself in the Stratix V KF40/KH40 and NF45 package options. Within each package, vertical migration allows different Stratix V devices to be substituted for each other on the board. Table 1 lists the devices and their lid thicknesses in the two affected Stratix V packages.

Table 1. Lid Thickness and Vertical Migration of Affected Stratix V Packages

Device	Package	
	KF40/KH40	NF45
Stratix V GS FPGAs		
5SGSD3		
5SGSD4	▲ 0.5 mm	
5SGSD5	0.5 mm	
5SGSD6	0.6 mm	▲ 1.0 mm
5SGSD8	0.6 mm	1.0 mm
Stratix V GX FPGAs		
5SGXA3	0.5 mm	
5SGXA4	0.5 mm	
5SGXA5	0.5 mm	0.5 mm
5SGXA7	0.5 mm	0.5 mm
5SGXA9	1.0 mm	1.0 mm
5SGXAB	▼ 1.0 mm	▼ 1.0 mm

▲ Vertical migration

▼ Vertical migration

0.5 mm Lid thickness

0.6 mm Lid thickness

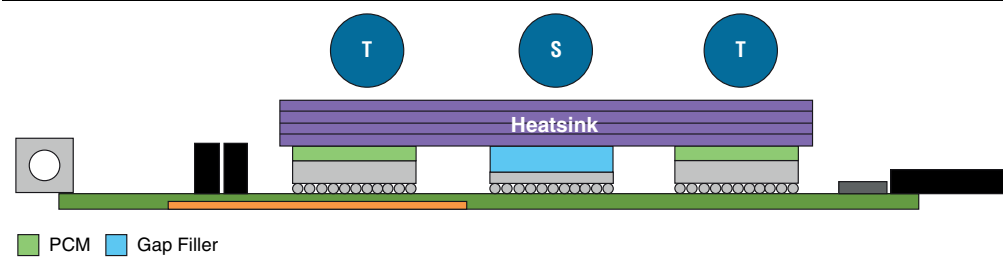
1.0 mm Lid thickness

For devices with a lid thickness of 0.5 mm or 0.6 mm, the difference is negligible and substituting one device for another does not cause a problem with the heatsink. However, the difference between a device with a lid thickness of 0.5/0.6 mm and one with a lid thickness of 1.0 mm is significant. Substituting a shorter device for a taller one creates a gap that is greater than the tolerance allowed by a heatsink designed for the taller device. Similarly, substituting a taller device for a shorter one may have the effect of raising the heatsink and creating gaps above other devices on the board.

Filling the Gaps for Even Heat Distribution

To compensate for the height difference, Altera recommends using a conductive thermal interface material (TIM) to fill in the gaps and evenly distribute the heat (Figure 3). For taller devices, an example of a satisfactory conductive phase change material (PCM) is Tpcm 588. For the shorter devices, satisfactory gap fillers include Tflex 640 and Tputty 504. (All materials are manufactured by Laird Technologies.)

Figure 3. Preferred Solution



Document Revision History

Table 2 lists the revision history for this document.

Table 2. Document Revision History

Date	Version	Changes
October 2012	1.0	Initial release.

