Advantages of FLEX 8000 Fitting

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The flexible and predictable routing architecture of FLEX® 8000 devices provides both efficient device utilization and consistent fixed-point fitting—regardless of density level. In contrast, the segmented routing structure in competing FPGAs requires switch matrices to connect a variable number of routing paths, which makes fixed-point fitting less consistent across density levels.

When evaluating device fitting characteristics, designers must be sure to use comparable device utilization levels. Fitting to a fixed pin-out becomes more difficult as device utilization increases. Conversely, when targeting a design for a larger device, a smaller portion of the resources are utilized. Therefore, the fitting algorithm has more flexibility for success, giving the design a higher probability of fitting to a fixed pin-out.

As an example, Altera Applications recently conducted device-fitting experiments comparing FLEX 8000 devices to Xilinx XC5200 devices with the VersaRing I/O interface feature using:

- XACT 6.0 and MAX+PLUS® II version 6.2
- FLEX 8000 and XC5200 devices filled to comparable utilization levels
- Four randomly-selected pin assignments for each device/utilization combination
- "Locked-down" pin-outs for each pin assignment
- The *Advanced Try Harder/Longer Compilation Fitting option for FLEX 8000* devices in MAX+PLUS II

Data from various devices was used in the Altera Applications experiments, representing three different utilization levels as illustrated in Table 1.

Table 1. FLEX 8000 vs. XC5200 Fitting Probability

Device	Probability of Fit		
	71%-80% Utilization	81%-90% Utilization	91%-100% Utilization
XC5206	100%	98%	96%
XC5210	86%	75%	68%
XC5215	75%	50%	33%
EPF8820A	100%	100%	80%
EPF81188A	100%	90%	70%
EPF81500A	95%	85%	65%

XC5200 Devices: *Severe fitting degradation as density levels increase.*

FLEX 8000 Devices: *Fitting is more consistent across density levels.*

Source: Altera Applications

Table 1 shows that for equivalent device utilization levels, fitting characteristics of the FLEX 8000 devices are similar to—or better than—Xilinx XC5200 devices. Specifically, when comparing the XC5210 against the EPF81188A and the EPF81500A devices at 81% to 90% device utilization, FLEX 8000 devices achieve roughly a 10% greater probability of fitting to a fixed pin-out. Table 1 also shows the fitting consistency advantage of the FLEX 8000 devices and the degradation of fitting effectiveness of the larger XC5200 devices. For example, the ability of the XC5215 device to fit to a fixed pin-out decreases to as low as 33%, whereas the FLEX 8000 devices are more consistent across density levels.

In conclusion, when comparing fitting characteristics for different devices, it is critical to use comparable device utilization levels. When comparable levels are used, FLEX 8000 devices provide similar—or better—fitting to fixed pin-outs than is attainable with the VersaRing feature of the XC5200 family.

The documents listed below provide more detailed information. Part numbers are in parentheses.

- ***FLEX 8000 Handbook*** (A-FLEXHB-94-01)
- *FLEX 8000 Programmable Logic Family Device Data Sheet* (A-DS-F8000-08)

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