Advantages of MAX 7000S Devices

Although speed and in-system programmability (ISP) are two features responsible for the success of Altera's MAX® 7000S devices, a closer look reveals a complete design solution. This technical brief discusses speed, vertical migration, advanced manufacturing processes, and development tools as key advantages of MAX 7000S devices compared to competing high-density programmable logic devices (PLDs).

Speed

When evaluating device performance characteristics, it is important to use comparable operating conditions. For example, propagation delay (t_{pd}) is an important benchmark used to determine device performance. But, if t_{pd} times are determined via bypassing logic gates, memory elements, and routing resources, normal operating usage will result in slower performance.

As an example, this technical brief discusses the differences between the Lattice ispLSI1000E family and the MAX 7000S family. At first glance, the Lattice ispLSI1000E family appears to offer competitive speeds compared to the MAX 7000S family, but a closer look reveals that Lattice device propagation delay (t_{pd}) times are achieved with a four product-term bypass and an output routing-pool bypass. Thus, a better comparison of MAX 7000S and ispLSI1000E device propagation delays is obtained during normal operating usage. For ispLSI1000E devices, the worst-case t_{pd} is a more realistic measure of the speed obtained during normal operation. Table 1 summarizes the fastest and worst-case t_{pd} performances as well as other features of MAX 7000S and Lattice ispLSI1000E devices.

Table 1. MAX 7000S & Lattice ispLSI1000E Device Comparison

	Lattice *Note (1)*			**Altera**		
Device	ispLSI1016E	ispLSI1032E	ispLSI1048E	EPM7064S	EPM7128S	EPM7192S
Process	EEPROM	EEPROM	EEPROM	EEPROM	EEPROM	EEPROM
Macrocells	64	128	192	64	128	192
Maximum user I/O pins	36	72	108	68	100	124
JTAG compliant	No	No	No	Yes	Yes	Yes
Fastest t_{pd} (ns), *Note (2)*	7.5	7.5	10	7.5	7.5	10
Worst-case t_{pd} (ns)	10	10	12.5	7.5	7.5	10

Notes:
(1) Source: ***1996 Lattice Data Book*** and the Lattice world-wide web site.
(2) The Lattice device t_{pd} times are determined with a four product-term bypass and output routing-pool bypass.

Vertical Migration

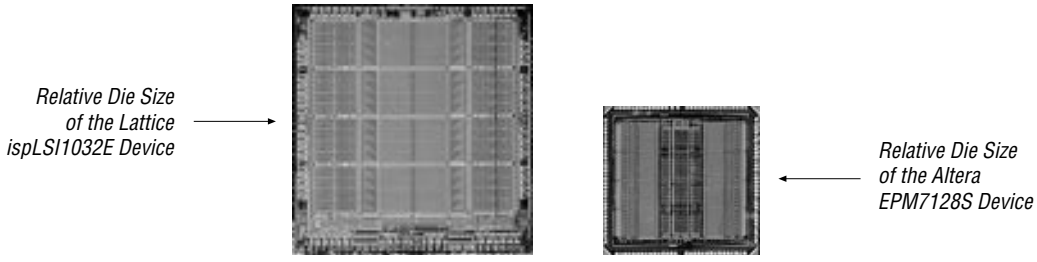
MAX 7000S devices offer designers many opportunities for upward and downward migration. Therefore, when a design requires a larger device or more speed, designers can simply substitute a compatible MAX 7000S device. For example, if a design requires more speed and less density, EPM7160S devices can be replaced with EPM7128S devices. In contrast, none of the Lattice ispLSI1000E devices are pin-for-pin compatible within the same family or within the larger ispLSI3000E device family.

Advanced Manufacturing Processes

Altera aggressively pursues the most advanced manufacturing processes so that designers can benefit from the highest performance products at the lowest price. For example, the relative die size of EPM7128S devices is half the size of ispLSI1032E devices, enabling Altera to offer competitive pricing. See Figure 1.

Figure 1. Relative Die Size of Lattice ispLSI1032E & Altera EPM7128S Devices

Magnification is approximately 4.9 times.



Tools

The MAX+PLUS® II software is a fully integrated programmable logic design environment that provides designers the flexibility to use a large variety of design entry methods and tools. For example, MAX+PLUS II designs can be created using different architectures, standard EDA design entry tools, and multiple hardware description languages (HDLs). Table 2 compares Altera and Lattice tools.

Table 2. MAX+PLUS II & pDS Feature Comparison

Features	Altera MAX+PLUS II	Lattice pDS *Note (1)*
Schematic capture	Fully integrated, schematic capture tool	Limited usage: Boolean equations and some macro-functions
VHDL entry	Available	Not available
Simulation capabilities	Functional and timing simulation available	Provides simulation tables only
Floorplan tool	Available	Not available
Design rule checker	Available	Not available

Note:
(1) Source: ***1996 Lattice Data Book***

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

- *MAX 7000 Programmable Logic Device Family Data Sheet (A-DS-M7000-04)*
- *Application Brief 145 (Designing for In-System Programmability in MAX 7000S Devices) (A-AB-145-01)*

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