which is difference between ICE40HX4K  and ICE40HX8K ?

The ICE40HX4K and ICE40HX8K are both FPGA (Field-Programmable Gate Array) chips from Lattice Semiconductor's iCE40 HX family. The main difference between these two chips lies in their logic capacity and available resources.

Here is a comparison of the key specifications for the ICE40HX4K and ICE40HX8K:

1. Logic Elements (LEs):
   ICE40HX4K: 4,000 LEs
   ICE40HX8K: 8,000 LEs
   The ICE40HX8K has twice the number of logic elements compared to the ICE40HX4K, which means it can accommodate more complex designs or implement more functions.
2. Memory:
   ICE40HX4K: 80 kbits of BRAM (Block RAM)
   ICE40HX8K: 128 kbits of BRAM
   The ICE40HX8K has more on-chip memory available for designs, making it suitable for applications that require larger memory buffers or look-up tables.
3. Phase-Locked Loops (PLLs):
   Both the ICE40HX4K and ICE40HX8K have 2 PLLs available for clock synthesis and conditioning.
4. I/O Pins:
   Both the ICE40HX4K and ICE40HX8K have similar I/O pin counts, depending on the package selected. However, the actual number of available I/O pins will depend on the specific package and pin configuration you choose.

In summary, the main difference between the ICE40HX4K and ICE40HX8K FPGA chips is their logic capacity and available memory resources. The ICE40HX8K is better suited for more complex designs or applications requiring more memory, while the ICE40HX4K is a more cost-effective solution for smaller designs. The choice between the two depends on your specific design requirements and resource needs.