TMS320C66x multicore DSPs for high-performance computing

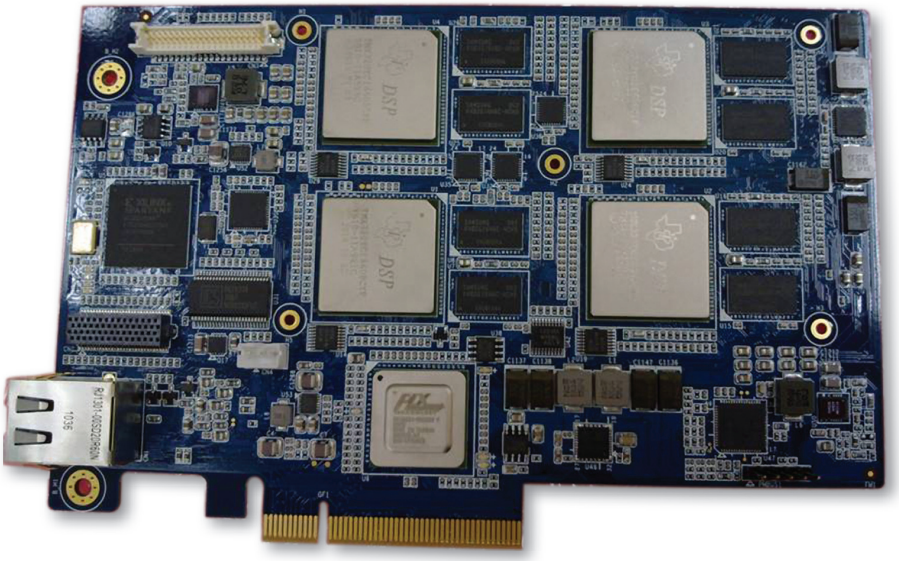
Delivering the industry's most power efficient, scalable solutions for high-performance computing

Texas Instruments' multicore DSPs are bringing new lows in power consumption to High-Performance Computing (HPC) systems. Utilizing the highest performing floating-point DSP core on the market today, TI's TMS320C6678 and TMS320TCI6609 multicore DSPs deliver tremendous power efficiency for HPC systems. A half-length PCIe card providing >500 Giga-Floating Point Operations per Second (GFLOPS) of performance while consuming only 50 Watts of power, is available to HPC developers today, while full-length cards providing 1 and 2 teraflops of performance will be available soon. These new PCIe cards enable faster and more efficient systems for many high-performance computing applications including:

- Oil and gas exploration
- Financial modeling
- Molecular dynamics
- Supercomputing
- Fluid dynamics
- Computational chemistry
- High-performance imaging
- Weather and atmospheric modeling

Key features

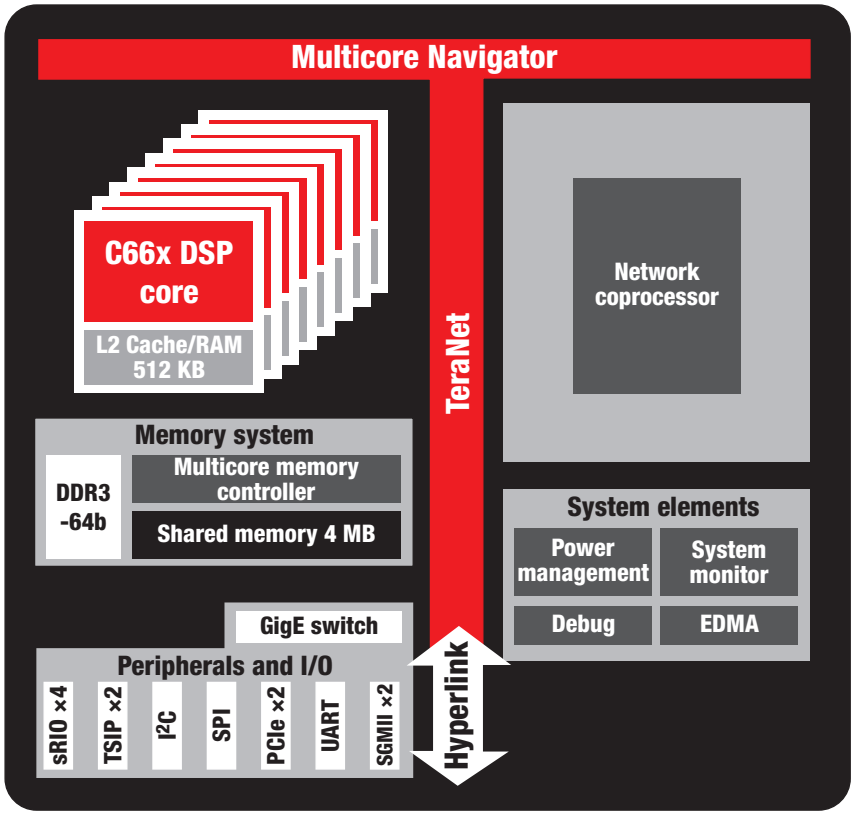
- >500-GFLOPS PCIe cards available today – half-length, single-width, 50W
- Standard programming model and support for OpenMP
- Free multicore software development kit and scientific programming examples
- Optimized math and imaging libraries
- Low-cost evaluation modules available for faster development



▲ *Quad-DSPC 8681 PCIe card (half-length, single width) delivering >500 GFLOPS at 50 W*

With its small size and low power consumption, the Advantech DSPC-8681 card makes a perfect add-on accelerator card for all desktop and server systems. The DSPC-8681 comes with TI's multicore software development kit (MCSDK), Code Composer Studio™ (CCStudio) integrated development environment, and demo software to enable rapid development. In addition, a full-length, octal-DSP card will be available in early 2012.

The DSPC-8681E is powered by TI's C6678 DSP, the industry's highest performing multicore DSP in production today, featuring eight 1.25-GHz DSP cores and delivering 160 single-precision GFLOPS and 60 double-precision GFLOPS in just 10W.



▲ *Block diagram of the TMS320C6678 DSP. TI's KeyStone multicore architecture, as well as the powerful processing power of each individual core, make C66x DSPs an ideal fit for scientific computing applications.*

Benchmarks

The table below lists some important attributes and benchmarks of both the C6678 DSP as well as for the quad-DSP PCIe card.

The Fast Fourier Transform (FFT) is one of the most important signal processing benchmarks in HPC. The benchmark in the table was computed using a complex data series of length 4096. Another important function which serves as the building block for many larger and more complex linear algebra functions is the Generalized Matrix Multiply (GEMM) benchmark. In the table we show the results for a single-precision GEMM (SGEMM) which was computed for real data of size 4000×4000. The measured GFLOPS (Giga-Floating Point Operations per Second) was computed by taking the theoretical operations required and dividing by the measured time of the computation.

Key Attributes	C6678	DSPC-8681
Single-/Double-precision FLOPS	160/60	512/192
Cores	8	32
Processor speed	1.25	1
L2 memory (MB)	8	32
L3 memory (GB) ECC	Up to 8	4
Memory BW (GB/s)	12.8	42.6
Power consumption (W)	10	50 (board power)
Benchmarks (GFLOPS)		
FFT (SP) (4096 pt)	60	192
FFT GFLOPS/W	6	3.85
SGEMM (4k matrix multiply)	54.4	175
SGEMM GFLOPS/W	5.4	3.5

TMS320TCI6609

TI's TCI6609 DSP for high-performance computing packs the performance of the DSPC-8681 into a single die, using advanced packaging methods to provide 32 cores in a single package. This new DSP will increase the achievable computing density on a single PCIe card, achieving >2 TFLOPS at only 200W on a full-length card with four TCI6609 DSPs.

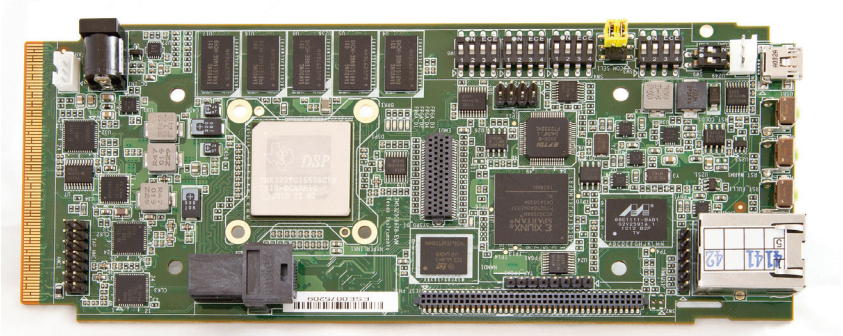
Get started today

In addition to the DSPC-8168, low-cost evaluation modules (EVMs) from TI are also available. The TMDXEVM6678L EVM includes TI's multicore software development kit (MCSDK) and Code Composer Studio™ integrated development environment, as well as multicore computing examples to allow programmers to quickly come up to speed on the **C66x** DSPs right away. EVMs start at just U.S. $399.

TI's multicore DSPs support standard programming languages such as C and OpenMP so developers can easily migrate their applications to take advantage of the power savings and performance. TI provides many optimized libraries for scientific computing that make it easier to achieve maximum performance without having to spend time optimizing code.

For additional information on TI's multicore DSPs, software and low-cost EVMs, please visit **www.ti.com/c66multicore**.

For additional information on Advantech's PCIe DSP cards, please visit **www.advantech.com/products**.



▲ *A comprehensive low-cost evaluation module (EVM) starting at U.S. $399 enables easier development and evaluation of TI's C66x multicore DSPs.*

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