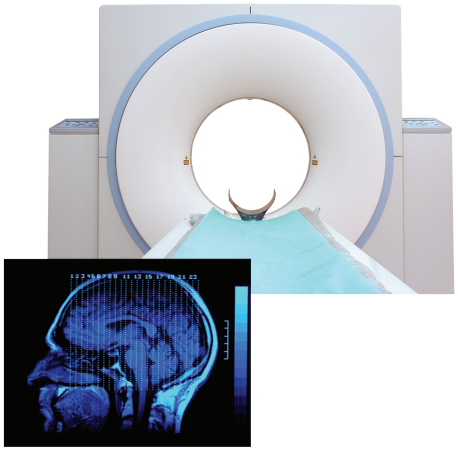
Picture it:

DSPs in medical imaging

Texas Instruments



TI has an extensive portfolio of products for numerous health care applications. Among these are TI's digital signal processors (DSPs), which are well suited to meet the intensive processing needs demanded by medical-imaging applications. These DSPs are inherently software programmable, which provides several key benefits in the medical-imaging space. Chief among these is the ability to upgrade existing equipment in the field via a software load. This provides a solid level of future-proofing by enabling upgrades and improvements to product functionality without having to redo any hardware. Software programmability also aides in development and implementation of new, advanced algorithms on existing equipment or development hardware, thus speeding up time-to-market and return on investment.

The combination of high performance and low power consumption makes DSPs ideal for a range of imaging applications, from real-time surgical imaging equipment to portable handheld devices. The high-performance processing of DSPs adds real-time capability required by many medical-imaging modalities. The low power consumption of DSPs minimizes battery size, and consequently product size, enabling medical-imaging applications in portable form factors.

TI offers several devices based on the innovative KeyStone™ multicore architecture that leverage TI's TMS320C66x DSP generation, the fastest integrated fixed- and floating-point DSP core available today. In addition to having the highest GMACS and GFLOPS per watt of any programmable high-performance core in the industry, the C66x DSPs are fully backward compatible with all existing TMS320C6000™ power-efficient DSPs, allowing for maximum reuse from previous platforms.

The **TMS320C667x family** of devices offers pin- and software-compatible platforms that allow scaling from one, two, four and eight DSP core devices to meet a range of processing requirements. Each C667x DSP can deliver 40 GMACS/20 GLFOPS of processing performance at 1.2 GHz and includes 512-KB local L2 per core and large shared L2 on-chip cache for image manipulation and processing. The C667x DSPs also feature high-bandwidth I/O including two lanes of v2 PCIe and four lanes of v2 Serial RapidIO® (SRIO) providing processor-to-processor communication at up to 5 Gbaud per lane full-duplex. The family also supports 4× HyperLink with up to 12.5-Gbaud lane rate and 2× SGMII Ethernet ports. These interfaces make multiprocessing architectures easier to implement, eliminating the need for external interface bridge devices and lowering overall system cost.

With up to 10GHz of total processing power, the eight-core **TMS320C6678 DSP** is well-suited for complex imaging applications. The C6678 DSP has up to 320 GMACS/160 GFLOPS of processing performance at 1.2 GHz and includes 4-MB shared L2 on-chip cache for image manipulation and processing.

The TMS320C665x DSP generation fits well in portable and power-constrained medical imaging applications like portable ultrasound systems. Optimized for power efficiency, the dual-core **TMS320C6657 DSP** running at 1 GHz delivers 64 GMACS/32 GFLOPS at 3.5W, while the single-core **TMS320C6654 DSP** can consume as little as 2W at 850 MHz.

For medical-imaging applications that require RISC processing, TI's **66AK2Hxx family** of DSP+ARM® system-on-chip (SoC) processors are designed to reduce development costs and time-to-market. These 28-nm devices based on the second generation of TI's KeyStone™ architecture integrate TI's C66x DSPs with multiple ARM Cortex™-A15 MPCore™ processors, facilitating the development of a wide-range of medical-imaging applications. The unique combination of Cortex-A15 processors and C66x DSPs, with built-in packet processing and Ethernet switching, is designed to efficiently offload and enhance the growing number of connected applications in the medical imaging space.

All these devices benefit from TI's development tools and runtime software support that makes migration and development simpler than ever. TI's free **Multicore Software Development Kit (MCSDK)** incorporates core software building blocks including platform software, a real-time operating system (SYS/BIOS™), open source Linux operating system, low-level drivers, high-level APIs and optimized algorithm libraries, all in one package. Out-of-box demonstration applications and preloaded example projects that are included in the MCSDK and provide a quick start for developers creating new medical-imaging applications on TI's KeyStone devices.

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