Product Bulletin

eXpressDSP™ Reference Frameworks Software

Key Benefits/Features

- **Get started today**–Out-of-the-box framework software available for entire TI TMS320™ DSP family
- **Adapts to your needs**–100 percent C source code
- **Pick version just right for you**–Several versions available for different applications
- **Reduces cost**–Royalty-free, run-time licensing
- **Saves time**–Eliminate design, build and test of low-level parts of DSP solution
- **New**–Source code version 2.2 now available. Includes support for TMS320C6713 and TMS320C6416 DSKs

eXpressDSP Software and Development Tools Overview

TI's real-time eXpressDSP Software and Development Tools are a premier open software environment for TI DSPs. With eXpressDSP Software Technology, a simplified and streamlined software infrastructure helps reduce development time. Programmers can spend more time creating innovative applications rather than working on cumbersome and repetitive development and integration tasks.

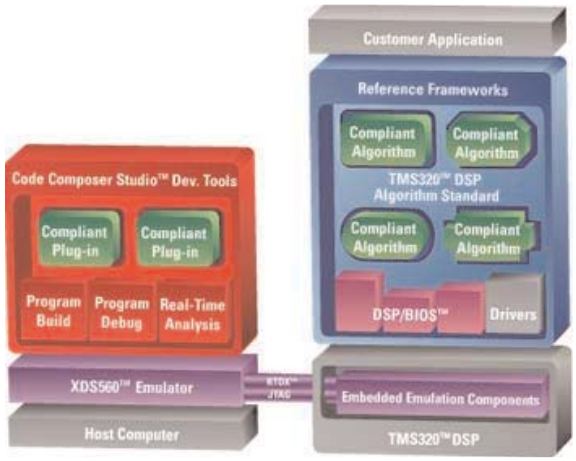
The two previously introduced elements of eXpressDSP software are the DSP/BIOS™ kernel and the TMS320™ DSP Algorithm Standard.

The DSP/BIOS kernel is a highly optimized kernel for the TMS320 DSP generation. It is scalable, extensible and designed to operate in the most compact personal systems all the way to high-end enterprise applications. The kernel is based on an industry-proven code base and has removed the need to design a kernel from scratch. It is installed in thousands of active designs and is currently being designed into more than 80 percent of all new TMS320 DSP designs.

The TMS320 DSP Algorithm Standard is designed to free DSP designers from the "custom-crafted" approach to a new paradigm of interoperable components. There are now over 100 different TI third parties supplying more than 700 algorithms compliant to the rules of the standard.

To extend the eXpressDSP software environment, TI introduced Reference Frameworks for eXpressDSP Software. These Reference Frameworks build upon the existing foundation provided by DSP/BIOS kernel and the TMS320 DSP Algorithm Standard.

eXpressDSP Software and Development Tools



Reference Frameworks – The Next Step

Reference Frameworks for eXpressDSP™ Software provide the ultimate answer on how to get going with software development for the TMS320™ DSP family. They can be considered as "super-starterware." The common characteristics of Reference Frameworks include:

- Robust, design-ready C source code. They are portable to different platforms including custom hardware. The code is reusable from project to project and is easy to cut and paste the needed modules.
- Supplied as complete generic applications. All of the required code plus simple algorithms are supplied to allow an immediate out-of-the-box application to run on TI DSP Starter Kits (DSKs).
- Multiple designs available and clear criteria provided to enable the selection of the most appropriate framework for the project.
- Accurate budgets for both memory footprint and MIPS usage for each Reference Framework.
- Extensive and detailed adaptation guides. Examples include how to replace the supplied generic algorithms with more complex algorithms such as voice coders, modems or imaging algorithms. Also, how to add additional channels to a system, and how to add different drivers for special purpose hardware.

Select the Reference Framework that Best Works for You

Design Parameter	Compact	Flexible	Extensive
Absolute minimum footprint	✔	○	○
Static configuration	✔	✔	✔
Static memory management	✔	✔	✔
Single-rate operation	✔	✔	✔
Number of channels	1 to 3	1 to 10+	1 to 100+
Number of eXpressDSP algorithms	1 to 3	1 to 10+	1 to 100+
Dynamic memory allocation	○	✔	✔
Multi-rate operation	○	✔	✔
Implements control functionality	○	✔	✔
Thread preemption	○	✔	✔
Blocking	○	○	✔
Total memory footprint (less algorithms)	3.5 kW (C54x)	12 kW (C55x)	17 kW (C55x)
Part number	RF1	RF3	RF5

- Application programming interface (API) Reference Guides for the bonus modules have been added.
- Consistent documentation across all the different levels of Reference Designs.
- Each Reference Framework is provided with a royalty-free run-time license for use on any and all TMS320 DSPs.

Reference Framework 1 (RF1) – The compact framework

Available Immediately – SPRA791

RF1, the compact framework, is designed to be the absolute minimum memory footprint and yet still use all elements of eXpressDSP software. It has been optimized to support a small number of channels and algorithms. A typical implementation is less than 4 KW on a TMS320C54x™ DSP generation. This leaves room for algorithms on even the most memory-constrained TMS320 devices. It is designed for static object configuration and does not support run-time or dynamic object creation. Memory management is also static. Run-time or dynamic memory management is not supported. RF1 supports single-rate operation. This means all algorithms and all channels must run at the same data and frame rate. Multi-rate operation is not supported. DSP/BIOS™ TSK is not used and thus task blocking is not enabled. Control thread functionality is not provided in this level.

Reference Framework 3 (RF3) – The flexible framework

Available Immediately – SPRA793

RF3, the flexible framework, trades the absolute minimum footprint for flexibility. A typical implementation of RF3 is 11 KW on a C54x™ DSP generation, still leaving plenty of room for algorithms. RF3 supports static object creation, but also supports both static and dynamic memory management (i.e., data buffers can be configured and managed at run time). The added flexibility also allows the use of more channels and different algorithms, both

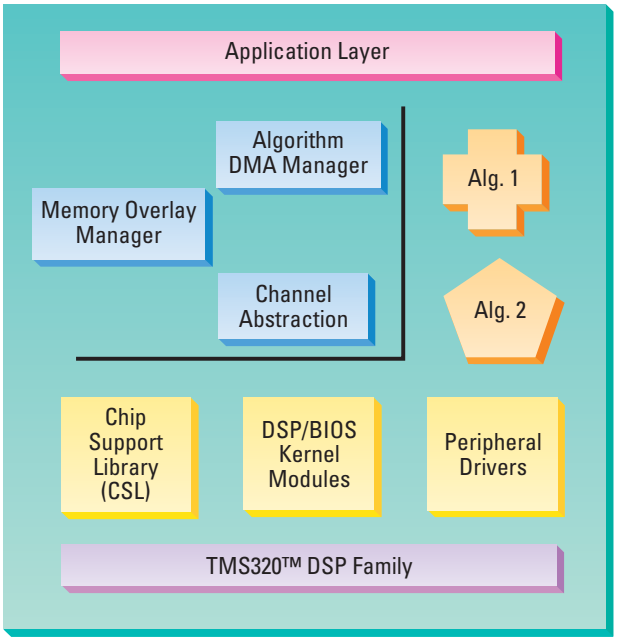
typically up to 10. RF3 also supports multi-rate operation, allowing different algorithms to run at different data and frame rates.

Reference Framework 5 (RF5) – The extensive framework
Available Immediately – SPRA795
RF5, the extensive framework, is for system designers who are looking for extensive flexibility. RF5 supports static object creation, plus static and dynamic memory management. It supports a large number of algorithms and channels and allows both single-rate and multi-rate operation. Full-thread preemption and blocking are enabled, as is a dedicated control thread.

Adapting a Reference Framework for New Hardware and Application Area

Out-of-the-box, the Reference Frameworks run on several different DSP Starter Kits (DSKs). The actual starterware contains several discrete elements. At the lowest level are the required DSP/BIOS™ kernel modules and Chip Support Library (CSL) components needed for the particular Reference Framework. (Refer to diagram to the right.) RF1 contains fewer modules than RF3 and RF3 requires fewer modules than RF5. Also provided are drivers specifically designed to move data on and off the DSK. The framework also contains the code that enables memory overlay schemes, a DMA manager for algorithms requiring DMA, and channel abstraction. The framework is initially fitted with simple eXpressDSP-compliant algorithms like a finite impulse response (FIR) filter.

Components of a Reference Framework for eXpressDSP™



To modify the Reference Framework for the final application and target hardware, several well-documented steps need to be followed. At the hardware level, new drivers will be needed for unique peripherals. Leveraging TI's standard driver model makes this step much easier than in the past. Choosing the appropriate Reference Framework determines many of the important design decisions as most scheduling, memory and direct memory access (DMA) management schemes are pre-determined by this choice. Unnecessary modules and techniques are automatically discarded. The simple FIR and VOL algorithms can be exchanged for the actual system algorithms. Any eXpressDSP-compliant algorithm will quickly and simply integrate into this environment. Over 700 such algorithms are available from more than 100 TI DSP third parties, or you can develop your own to install into this environment. Reference Frameworks have been shown to operate with voice, speech, imaging, audio, video and biometric algorithms. A multitude of other algorithms should also integrate easily into these Frameworks. Lastly, it will be necessary to write the application specific code to control the final system.

How to Get Started

For additional information or to download the free Reference Frameworks and application notes containing the required code to get started, visit **www.ti.com/referenceframeworks**

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