![Texas Instruments logo] **TEXAS INSTRUMENTS**

Product Bulletin

TMS320FLEX
# Messaging Solutions Family

Key Specifications
- Two-chipset solution for A/D conversion and decoding of FLEX wireless messaging transmission
- Choice of alphanumeric, alphanumeric/roaming, and numeric decoders with identical footprints
- No additional glue logic required, reducing component count
- Supports 1600-, 3200- and 6400-bps transmission speeds
- Can coexist with older paging standards
- Enables significant power savings by allowing microcontroller to operate in low power mode
- Fast acquisition time and system synchronization

As the demand for wireless messaging continues to grow, service providers look for new ways of increasing service quality and subscribers, while OEMs seek access to technology that enables fast time-to-market with standard-compliant products. Texas Instruments offers a two-chip solution that meets these needs and provides a variety of functionality choices, making advanced wireless messaging applications a reality today.

The TMS320FLEX Family of chipsets[†], which handles the A/D data conversion and decoding of FLEX™ wireless messaging transmissions, offers advantages over other messaging solutions with easy upgrade and redesign from existing systems, reduced system component count and lower system power consumption.

As a TI Digital Signal Processing Solution, the TMS320FLEX Family of chipsets gives designers a seamless bridge of analog and digital system functions.

Advantages of the FLEX Messaging Protocol

The FLEX protocol offers significant improvements in messaging data integrity, transmission speeds, capacity and battery life. Beyond paging, this power and versatility will enable a spectrum of new applications that integrate wireless messaging functionality. The protocol, which is becoming the defacto standard worldwide, will enable high-quality, one-way wireless messaging that will drive the FLEX protocol into a range of diverse applications such as PCs, personal digital assistants (PDAs), smart home electronics and automobiles.

FLEX enables increased system capacity with its provision for multi-speed communication. Systems providers using the protocol can select from three transmission speeds — 1600-bps, 3200-bps and 6400-bps. Operating at full 6400-bps speed, FLEX systems deliver more than 10 times the performance of current 512 bps paging systems.

FLEX can also coexist with older systems so that providers can continue service to current users as they upgrade to FLEX-based systems.

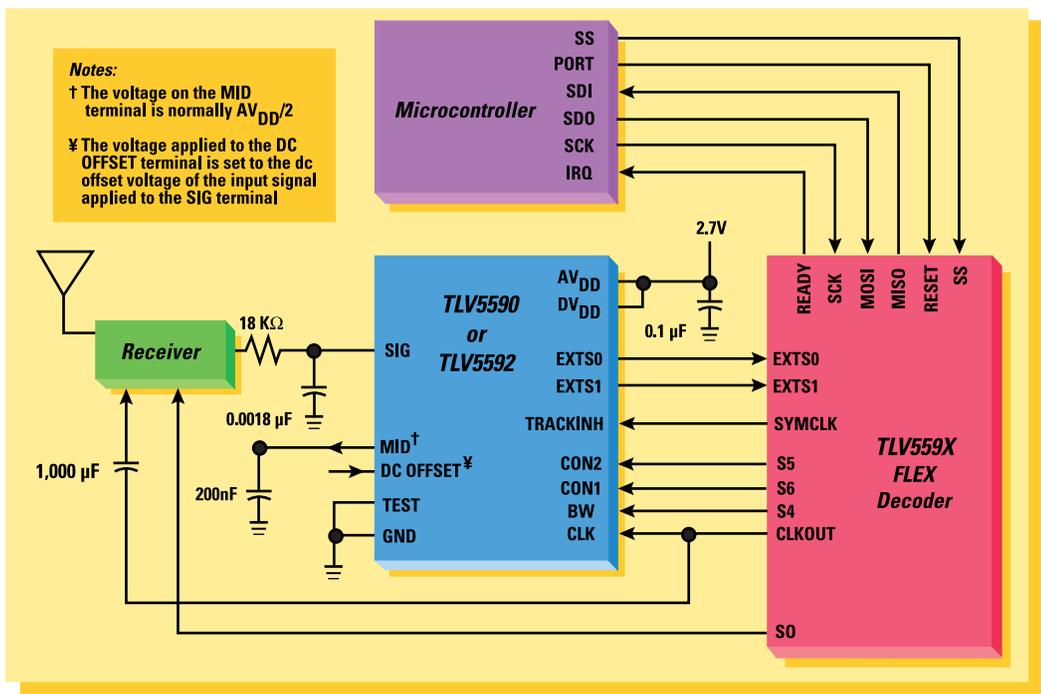### TMS320FLEX Family — The Performance Solution

Now, designers can get the combined benefit of FLEX messaging in an integrated, cost-effective solution from Texas Instruments. The TMS320FLEX Family of chipsets was developed to simplify the implementation of the FLEX protocol, offering system designers simple ease of upgrade from existing designs

TMS320FLEX Family of chipsets – The Two-Chip Wireless Messaging Solution
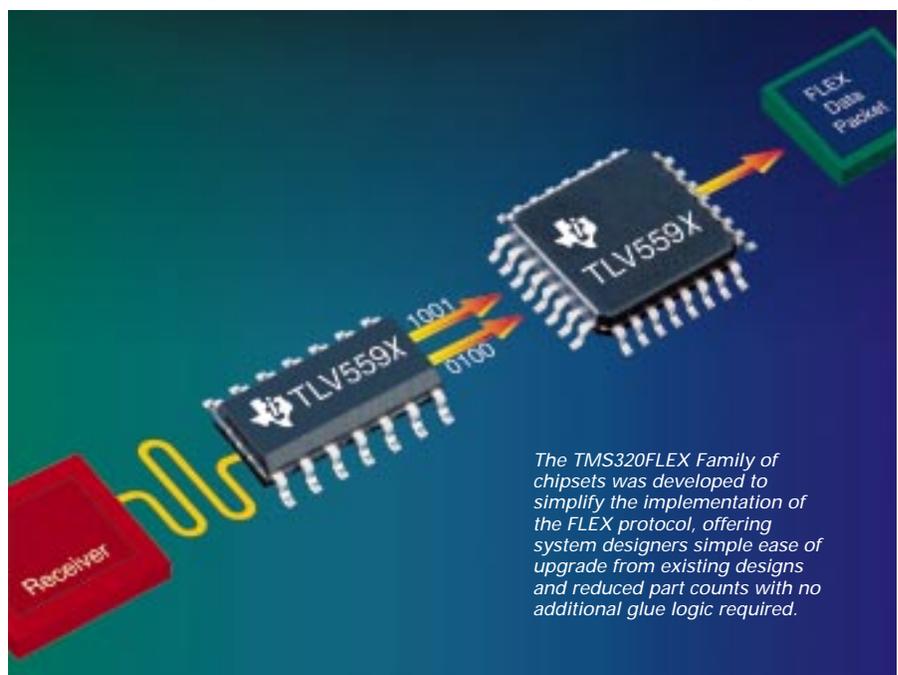
The TMS320FLEX Family of chipsets was developed to simplify the implementation of the FLEX protocol, offering system designers simple ease of upgrade from existing designs and reduced part counts with no additional glue logic required.

FLEX Chipset Block Diagram

Notes:
† The voltage on the MID terminal is normally AV$_{DD}$/2

¥ The voltage applied to the DC OFFSET terminal is set to the dc offset voltage of the input signal applied to the SIG terminal

Microcontroller — SS, PORT, SDI, SDO, SCK, IRQ

Receiver — 18 KΩ — SIG

1,000 µF — 0.0018 µF — 200nF

TLV5590 or TLV5592 — AV$_{DD}$, DV$_{DD}$, EXTS0, EXTS1, TRACKINH, MID†, DC OFFSET¥, TEST, GND, CON2, CON1, BW, CLK

2.7V — 0.1 µF

TLV559X FLEX Decoder — READY, SCK, MOSI, MISO, RESET, SS, EXTS0, EXTS1, SYMCLK, S5, S6, S4, CLKOUT, S0

Comprised of TI's industry-leading TLV5590 or TLV5592 5-bit A/D converters and choice of alphanumeric (TLV5591BVF), alphanumeric/roaming (TLV5593VF) or numeric only (TLV5594VF) FLEX decoders, the solution only requires the addition of a microcontroller and receiver to complete the system.

and reduced part counts with no required glue logic. The TI FLEX™ Family is comprised of TI's industry-leading A/D converters and a choice of alphanumeric, alphanumeric/roaming or numeric-only decoders. The highly integrated FLEX solution requires that designers add only a microcontroller and receiver to get FLEX designs up and running quickly. This implementation not only reduces time-to-market but lowers system cost over alternative discrete solutions that require extensive and expensive hardware redesign.

The TMS320FLEX Family of chipsets was designed in close conjunction with the developers of the FLEX protocol to maximize the operating efficiency of TMS320FLEX-based wireless messaging systems. As a result, these chipsets offers some important system-level benefits, including faster acquisition and synchronization of system data, less system on-time and longer battery life. Future FLEX developments will support two-way data and voice-and-data with the respective ReFLEX™ and InFLEXion™ protocols.

The Chipset Decoders

The TMS320FLEX Family includes three decoders. The TLV5591, which is an alphanumeric decoder; the TLV5593, which is an alphanumeric/roaming decoder; and the TLV5594 which is a numeric only decoder. Each decoder is a highly optimized device that processes received and demodulated data from a FLEX transmission. Each design requires only one of these decoders. The decoder is responsible for selecting messages addressed to the messaging device and communicating the messages to the host. These decoders contribute to significant power savings by enabling the host microcontroller to operate in low power mode when message information is not being received. They are pin-for-pin compatible with each other which allows for easy redesign and functionality upgrade.

Common Features of the Three Decoders

- FLEX messaging signal processor
- Real-time clock time base
- Low battery indication (external detector)
- Standard Serial Peripheral Interface (SPI) in slave mode
- Highly programmable receiver control
- Compatible with synthesized receivers
- Low-current STOP mode operation of host processor

Features Specific to the TLV5591 Decoder

- Alphanumeric functionality
- 16 programmable address words
- 16 fixed-temporary addresses
- 1600-, 3200-, or 6400-bps decoding
- Any-phase decoding

TI's FLEX Decoder Family

	TLV5591BVF	TLV5593VF	TLV5594VF
Functionality	Alphanumeric	Alphanumeric/ Roaming	Numeric or Tone Only
Programmable Address Words	16	16	4
Bits/Sec Decoding	1600, 3200, 6400	1600, 3200, 6400	1600, 3200
Single-Phase Decoding (S) Or Any-Phase Decoding (A)	A	A	S
Low Battery Indicator	Y	Y	Y
Real-Time Clock Time Base	Y	Y	Y
Packaging	32 Pin TQFP	32 Pin TQFP	32 Pin TQFP
Interfaces Gluelessly with the TLV5590 or TLV5592 Converters	Y	Y	Y

Features Specific to the TLV5593 Decoder

- Alphanumeric/roaming functionality
- 16 programmable address words
- 16 operator messaging addresses
- 1600-, 3200-, or 6400-bps decoding
- Any-phase decoding or single-phase decoding
- FLEX fragmentation and group messaging support
- Simulcast system ID (SSID) and network ID (NID) roaming support

Features Specific to the TLV5594 Decoder

- Numeric or tone only functionality
- 4 programmable address words
- 1600- or 3200-bps decoding
- Single-phase decoding

The Chipset A/D Converters

The TMS320FLEX Family includes two A/D converters, the TLV5590 and the TLV5592. These 5-bit A/D converters with dibit-symbol output were developed specifically to optimize data conversion in messaging systems. The TMS320FLEX implementation converts an audio signal from the receiver to a 2-bit digital output for processing by the TLV5591, TLV5593, or the TLV5594 FLEX decoder. The converters interface directly without any glue logic to any of the three decoders, reducing part count and power consumption. Designed exclusively for FLEX™ messaging applications, the TLV5590 and the TLV5592 incorporate signal conditioning and peak and valley detection in addition to analog-to-digital conversion.

Features of the TLV559X A/D Converters

- Support FLEX protocol messaging systems with the TLV559X FLEX decoders
- 3-pole butterworth low-pass selectable dual-bandwidth audio filter:

  BW 1 = 1 kHz ±5% (-3dB)
  BW 2 = 2 kHz ±5% (-3dB)

- Peak and valley detection
- 5-bit analog-to-digital converter with dibit-symbol output
- Operating temperature range: -25°C to 85°C
- Four modes of operation:
  – Fast track
  – Slow track
  – Hold
  – Standby
- 2.7-V to 3.3-V single power supply operation (TLV5590)
- 1.8-V to 2.5-V single power supply operation (TLV5592)

Software Development Support

With the TMS320FLEX Family of chipsets, designers also have access to complete FLEX One-Way Stack system software used to help build world-class products quickly and effectively. The software is specifically designed to support the TMS320FLEX Family of chipsets. It runs on the system's host processor and communicates with the decoder to interpret FLEX data-packets passed to the host from the decoder. FLEX One-Way Stack software is available on the worldwide web at http://www.mot.com/FLEXstack.

The TMS320FLEX Family of Chipsets — For a New Generation of Wireless Messaging

The TMS320FLEX Family of chipsets makes it possible for designers to create a new generation of powerful FLEX-based wireless messaging applications. Like the standard itself, the solution delivers the flexibility that allows manufacturers to quickly modify existing designs or develop exciting new applications with the volume and quality assurance of Digital Signal Processing Solutions from TI.

For More Information

To find out how you can develop the wireless messaging applications of tomorrow with the TMS320FLEX Family of chipsets, please contact your local TI field sales office or authorized distributor. Or you'll find more information at http://www.ti.com/sc/docs/wireless/home.htm on TI's Worldwide Web page.

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