

# L64782 Single-Chip COFDM Receiver

## OVERVIEW

### DVB-T COMPLIANT DEMODULATION

The L64782, a fully integrated, single-chip COFDM (Coded Orthogonal Frequency Division Multiplex) receiver, is the third generation chip in LSI Logic's family of highly integrated, high-performance solutions for digital terrestrial TV (DTT) broadcast. Following-on from the highly successful L64781 and L64780 receivers, the L64782 is fully compliant with DVB-T standards, as defined by ETS 300 744 and exceeds all mandatory requirements of today's broadcasters, placing it at the forefront of DVB-T receiver design.

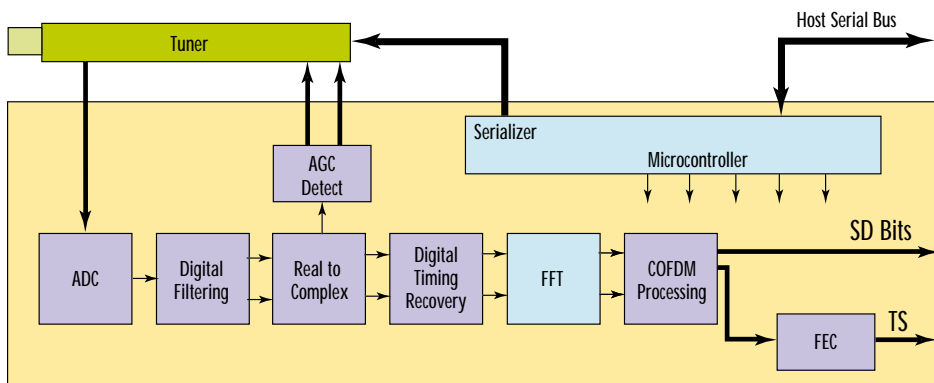
### PROVEN SOLUTION FOR FAST TIME-TO-MARKET

The L64782 comprises the COFDM demodulator with direct IF sampling, a DVB-compliant FEC decoder, a 10-bit analog-to-digital converter and an integrated microcontroller. With this device, digital set-top box and TV manufacturers have a ready-proven, high-performance technology to bring DTT-enabled products to market quickly and cost effectively.

### MOBILE RECEPTION

The L64782 adds to the robust channel equalizer and doppler immunity characteristics of its predecessors. Performance has been enhanced in both of these critical areas and a diversity combining interface has been added to allow two L64782 devices to be interconnected, giving Maximum Ratio Combination (MRC) like performance, where best-in-class mobile performance is required.

Coupled with the small 64-pin TQFP package and low power features, the L64782 is ideally suited to mobile reception.



*The L64782 is a highly integrated device that contains both digital timing and frequency loops. No external components are needed to operate the demodulation and only a low cost crystal is required.*

## FEATURES

- 2K and 8K FFT size
- DVB-T ETS 300-744 compliant
- Includes FEC and 10-bit ADC
- Choice of direct IF (36.167 MHz) and low IF (4.57MHz) sampling
- Digital channel filter eliminates the need for dual switchable bandwidth SAW filter in tuner
- Digital timing recovery
- 6MHz, 7MHz and 8MHz variable bandwidth capability
- Implements all non-hierarchical and hierarchical constellations
- All code rates and guard intervals
- Includes digital common phase error correction (CPE)
- Dual AGC control
- New timing algorithm for near optimal echo and SFN pre-echo performance
- Integrated microcontroller to automate acquisition, operating mode determination and simplify chip control
- Channel state information for protection against multipath and interference

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## FEATURES CONTINUED

- Fully programmable digital channel filter to reject adjacent NICAM interference
- Further improvement to current industry-leading co-channel interference rejection performance
- Expanded AFC acquisition range to fully detect 1/6 MHz offset
- Diversity interface for optimum Maximum Ratio Combination (MRC) like performance with two L64782 devices
- Reliable chip status reporting
- Serial microprocessor interface
- Low Profile 64-pin TQFP package

## TECHNICAL DESCRIPTION

The L64782 implements all operational modes specified in the DVB-T specification, i.e., 2K and 8K FFT, non-hierarchical and hierarchical modulations, all guard interval sizes and Viterbi code rates. The chip supports a wide range of either direct IF or low IF sampling (including 36.167 MHz and 4.57 MHz) and converts it digitally into baseband.

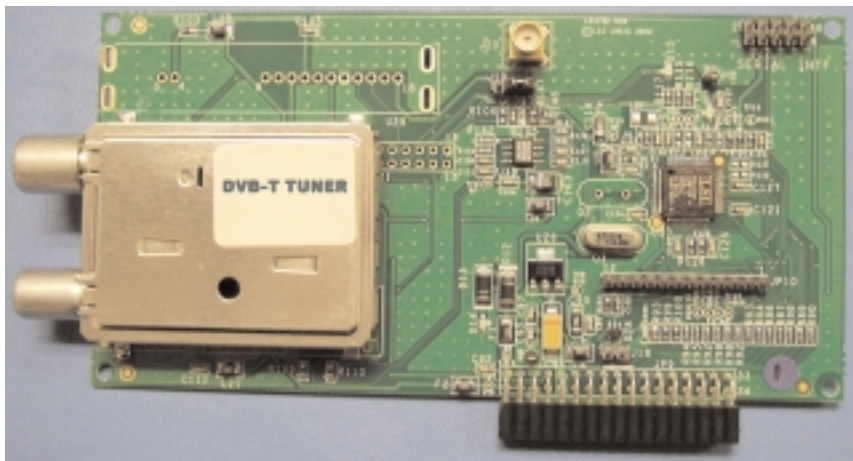
The L64782 then applies all digital processing steps to extract the data from the received signal, i.e., FFT, timing and frequency synchronization, channel estimation and equalization, generation of optimal soft decisions using the channel state information plus symbol and bit de-interleaving. It also extracts the system information carried by the TPS pilots. The L64782 finally applies all error correcting codes to deliver an error-free MPEG2 transport stream to the source decoding chip.

All aspects of the L64782 are controlled by its internal microcontroller, which also provides direct control of the associated upstream tuner. This results in much reduced host driver code complexity, faster acquisition and simplified channel scanning with the host issuing high level instructions to the front end such as "Channel Search" or "Channel Jump".

## COMPLETE SOLUTION FOR FAST TIME-TO-MARKET

To accelerate development of set-top box solutions, the L64782 development kit is available, which allows manufacturers to select the option best suited to their target market and application requirements. The kit provides the hardware and software components necessary to shorten development cycles and ensure a fast time-to-market. The powerful Windows Graphical User Interface allows manufacturers to easily perform validation tests and store results in an intuitive way. The development kit consists of a complete evaluation board with a PC interface and MPEG2 transport stream output. Software to enable system testing and code optimization, along with a manual that provides test and evaluation information and a PC board layout are also included. The GUI software can operate under Windows 95/98 and Windows NT/2000.

The NIM782 board also has a seamless interface to LSI Logic's Set-top Box Development Platform.



***The NIM782 Evaluation Board provides full capabilities for accelerated development and fast time-to-market***

### **LSI LOGIC INTEGRA<sup>®</sup> SET-TOP DEVELOPMENT PLATFORM**

For designers developing a set-top box solution using the L64782 chip, LSI Logic offers the Integra Set-top Development Platform. This provides a complete development environment, including complementary devices such as the single-chip SC2005 source decoder, enabling designers to implement a complete two-chip set-top box solution.

#### **Components of LSI Logic's L64782 Developer's Kit**

Evaluation board with PC interface and MPEG2-TS output
Complete documentation
Software, including driver and GUI interface under Windows
Microcode to download into the L64782's integrated microcontroller
Board layout
Schematics
Bill of materials

### **BENEFITS**

- Fully integrated single-chip COFDM DVB-T compliant demodulator for fast time-to-market
- Systems expertise and support gained from first- and second- generation chips
- Minimal effort required for implementation in a complete COFDM system
- Rapid time and frequency synchronization
- Excellent mobile reception
- Low power (Less than 800 mW)
- Reduced systems costs through common phase error compensation and direct IF sampling
- Near theory high-performance demodulation algorithm
- Fast access to circuit evaluation with local field application engineering support
- Requires only a thin host driver with L64782 integrated microcontroller providing a high level of automation including tuner control

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As an Integra component, the L64782 features all the advantages of this next-generation platform:

- Evolutionary product strategy, ensuring a seamless and cost-effective migration path to the future
- Software compatibility with legacy and new chipsets
- Support for open, international industry standards

## BACKGROUND

The L64780 and L64781 were jointly developed by LSI Logic and BBC Research and Development, a collaboration that has continued with the L64782. The BBC, a key influencer in the acceptance of the European DVB-T standard, has implemented hardware prototypes of the COFDM modem and successfully tested it over experimental broadcasts in the UK and other European locations.

In 1998, tests and field trials carried out by BBC Research and Development and other validation groups verified performance and interoperability of the new system and highlighted the L64780 as the best performing chipset in the marketplace. The L64781 subsequently benefited from various field validations carried out on the L64780, ensuring a high-performance device.

In April 2001, BBC Research and Development and LSI Logic jointly received the Queen's Award for Enterprise, in the category of Innovation, for the L64780 and L64781.

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