



# Implementing and Testing Efficient Video Line Stores

(Includes 7 ready to use macros for  
popular line lengths)

Ken Chapman  
Xilinx Ltd  
28<sup>th</sup> June 2006

Rev.1



# Limitations

**Limited Warranty and Disclaimer.** These designs are provided to you “as is”. Xilinx and its licensors make and you receive no warranties or conditions, express, implied, statutory or otherwise, and Xilinx specifically disclaims any implied warranties of merchantability, non-infringement, or fitness for a particular purpose. Xilinx does not warrant that the functions contained in these designs will meet your requirements, or that the operation of these designs will be uninterrupted or error free, or that defects in the Designs will be corrected. Furthermore, Xilinx does not warrant or make any representations regarding use or the results of the use of the designs in terms of correctness, accuracy, reliability, or otherwise.

**Limitation of Liability.** In no event will Xilinx or its licensors be liable for any loss of data, lost profits, cost or procurement of substitute goods or services, or for any special, incidental, consequential, or indirect damages arising from the use or operation of the designs or accompanying documentation, however caused and on any theory of liability. This limitation will apply even if Xilinx has been advised of the possibility of such damage. This limitation shall apply notwithstanding the failure of the essential purpose of any limited remedies herein.

These design modules are not supported by general Xilinx Technical support as an official Xilinx Product. Please refer any issues initially to the provider of the module.

Any problems or items felt of value in the continued improvement of these reference designs would be gratefully received by the author.

Ken Chapman  
Senior Staff Engineer – Spartan Applications Specialist  
email: [chapman@xilinx.com](mailto:chapman@xilinx.com)

# Introduction

This reference design for the Spartan-3E Starter Kit serves two quite different purposes. As such, you may be interested in one particular aspect or both.

**Hardware Development and Testing of Macros** - The design provides an example of how the Starter Kit can be used as a test bed for macros enabling real implementations to be evaluated during development. This technique can be applied to many parts of designs and helps reduce the burden of testing and debugging when putting a final system together. Such 'real simulation' can also be significantly faster than using a traditional software simulator since the logic is working at full clock rate. When testing a macro, it is not always necessary to have all the peripherals and connectors that the final system will have. The macro is effectively placed in a 'virtual socket' within the Spartan-3E device and some means provided to stimulate and monitor the macro. In this example PicoBlaze is used as a convenient way to control and monitor the macros under test with an RS232 (UART) link to the PC providing the human interface (HyperTerminal). So in fact the test design only uses 2 pins on the Spartan device and all others are 'virtual pins' (OK, I used the LEDs too).

**Efficient Video Line Store Macros** - In this case the macros under evaluation are a set of highly efficient video line stores implemented using Block Memory (BRAM). Line stores are often used when performing image processing algorithms. In recent years the resolution of images has been increasing resulting in more pixels per line and pixels of greater resolution (more bits to represent each colour). Unless these line stores are implemented efficiently it becomes very difficult to implement an adequate number of line stores on a Spartan-3E device. This reference design provides 7 ready to use line store macros all of which can be evaluated using this design. If your main interest in this reference design is purely to use one or more of these macros then you may wish to advance directly to page 16 (without passing GO and without collecting £200!).

