Introduction to ispGDS™

Lattice Semiconductor Corporation (LSC), the pioneer of non-volatile in-system programmable (ISP™) logic has now expanded the application of ISP to include programmable system interconnect. The new ispGDS (Generic Digital Switch) family combines the in-system programmability, high performance and low power of LSC's GAL programmable logic technology with a switch matrix architecture, resulting in an innovative programmable signal router. The ispGDS is a configurable switch matrix which provides the ability to quickly implement and change p.c. board connections without changing mechanical switches or other system hardware. ISP allows the connections to be reprogrammed without removal from the p. c. board via a simple 5V, 4 wire serial interface. This capability allows the system designer to define hardware which can be reconfigured in-system to meet a variety of applications. The ispGDS also conserves board real estate, providing up to 22 I/Os in about a quarter square inch of board space.

With today's demand for user-friendly systems, there is an increasing need for hardware which is easily reconfigured under software control without manual intervention. The ispGDS family is an ideal solution for end-system feature reconfiguration and signal routing applications. The fast 7.5ns propagation delay through the devices supports high-performance signal routing applications. Easier system upgrades, user feature selection and system manufacturing are the results.

The ispGDS also provides higher quality and reliability than other switch solutions due to the nature of E^2CMOS technology. E^2CMOS technology supports 100% testability which guarantees you 100% in-system programmability and functionality.

There are three members of the ispGDS family: the ispGDS22, ispGDS18, and ispGDS14. Each of the devices operate identically with the only difference being the number of I/O cells available.

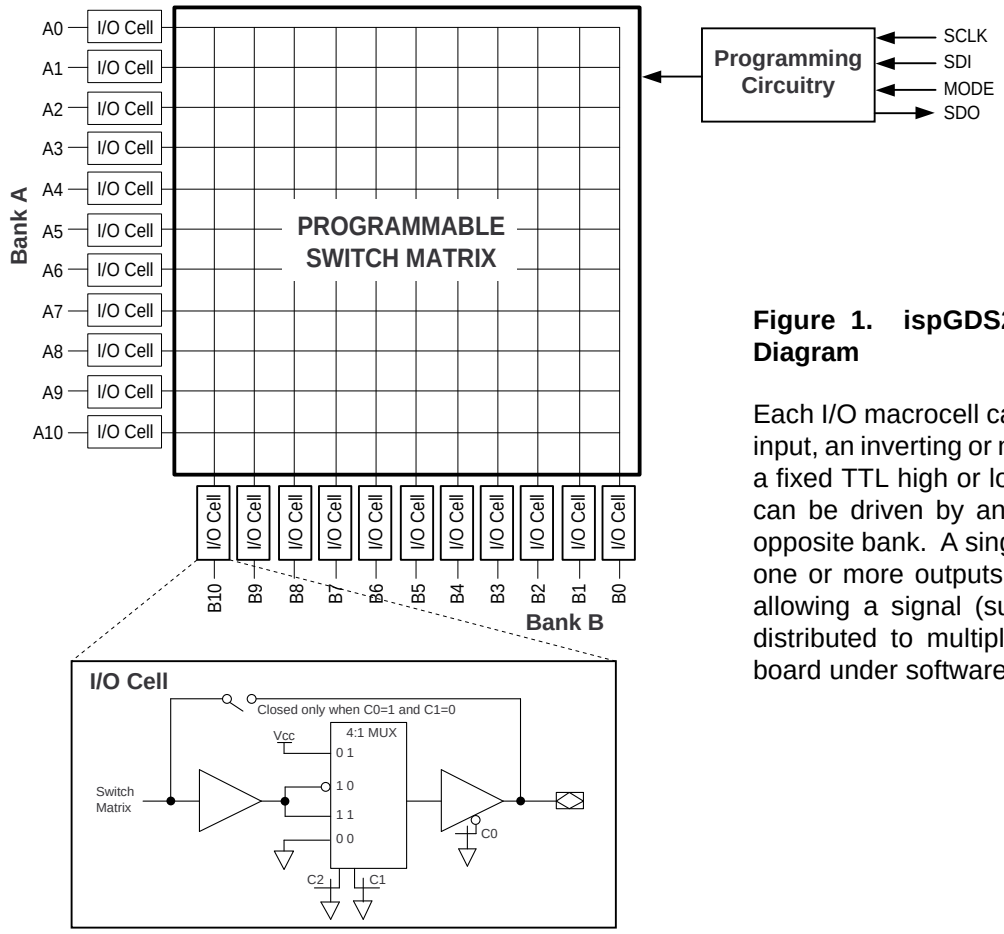

Figure 1. ispGDS22 Functional Block Diagram

Each I/O macrocell can be configured as an input, an inverting or non-inverting output, or a fixed TTL high or low output. Any I/O pin can be driven by any other I/O pin in the opposite bank. A single input can also drive one or more outputs in the opposite bank, allowing a signal (such as a clock) to be distributed to multiple destinations on the board under software control.

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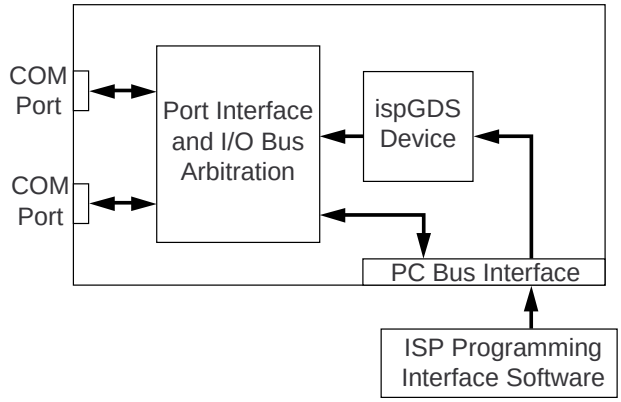
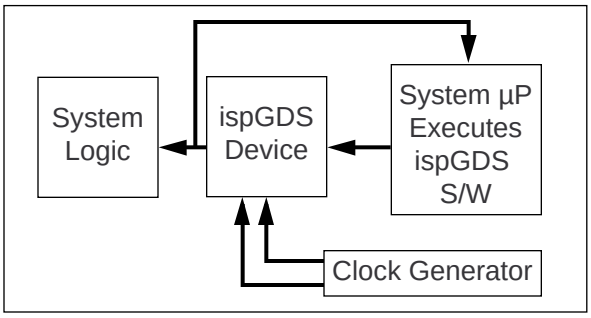
ispGDS Applications

With the ispGDS, designs can be reconfigured without mechanical devices or user intervention. Provision for easier system upgrades and feature selection can now be included in the system's original design. A few examples of actual ispGDS applications demonstrate the possibilities.



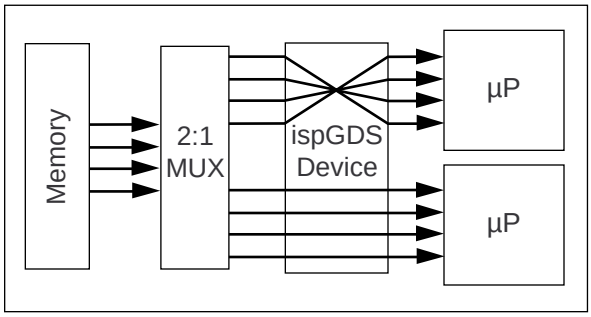
PC add-on cards can be configured for plug-and-play applications with an ispGDS device.

The ispGDS supports reconfiguration of COM port characteristics and interrupt levels via software updates through the PC bus interface. The ispGDS provides the flexibility so one generic PC card can be reconfigured by software for multiple applications.



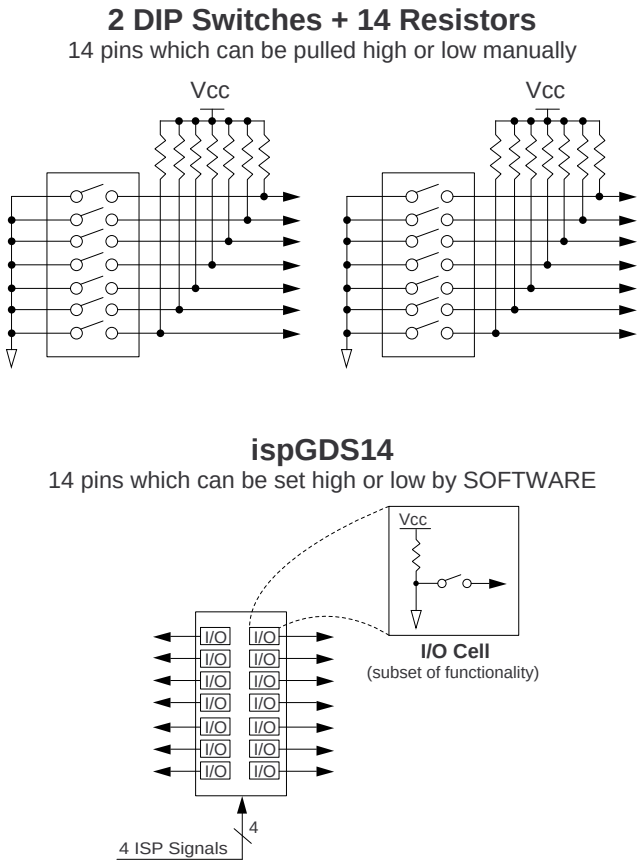
One board design can support two different microprocessor speeds with the ispGDS.

Based on the motherboard processor configuration, the software directs the ispGDS to set the clock speed and the hardware for the correct configuration. The ispGDS eliminates the need to manually reconfigure the hardware to support manufacturing motherboards with different processors.



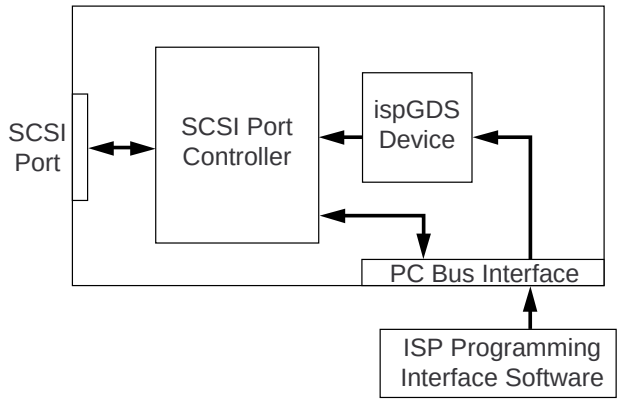
Create a cross point switch with the ispGDS

A crosspoint switch enables the MSB and LSB bytes on a bus to be swapped. The ispGDS acts as a crosspoint switch and swaps MSB and LSB bytes of the data for the different microprocessors.



Replace DIP switches with a software controlled switch alternative

The ispGDS can be configured as a programmable replacement for standard DIP switches, providing space savings, in-system reconfigurability, higher reliability as well as ease of use. The programmable nature of the ispGDS eliminates the need to manually select DIP switch settings.



SCSI port interface configurations can be set using the ispGDS

Software can reconfigure the ispGDS via the PC bus which in turn controls the SCSI port and interrupt level selection. Hardware changes become transparent to the user as the ispGDS is reconfigured by software while in-system, eliminating the need for manual intervention.

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In-System Programming

The ispGDS devices can be programmed in-system using 5 volt only signals through a simple 4-wire programming interface using TTL level signals. Programming and erasure of the entire device can be done in less than one second.

In addition to third party programmers, the ispGDS can be programmed from your automatic test equipment (ATE) or even from a PC on your manufacturing line. For more flexibility, you can have your product's embedded microprocessor configure the ispGDS devices though one of its I/O ports, making a field upgrade a snap.

Lattice Semiconductor provides free compiler support and "ISP Download Software" to support the software side of these programming options. The ispGDS Download routines are written in ANSI-standard C language which can be integrated directly into your system.

Designing with the ispGDS will provide you with the flexibility to reconfigure your design while in-system. It will revolutionize the way systems are designed and maintained. Call 1-800-327-8425 for a data sheet and begin designing today!

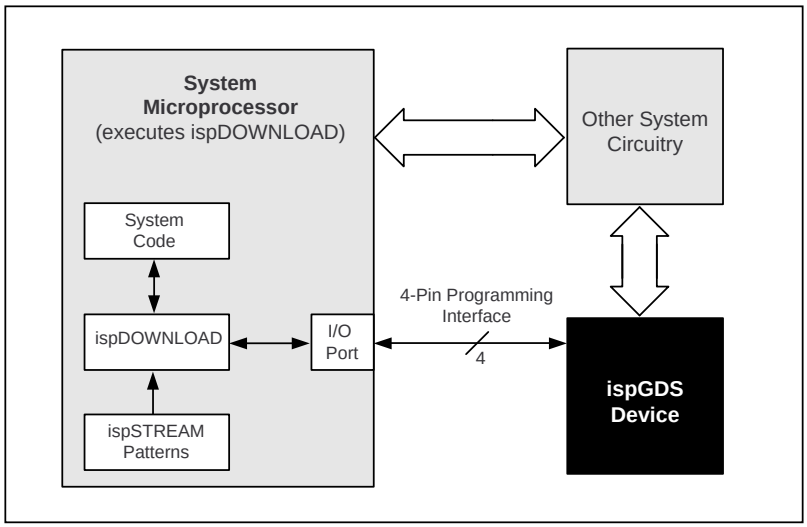

Figure 2. In-System Programming Using ispGDS Download Routines

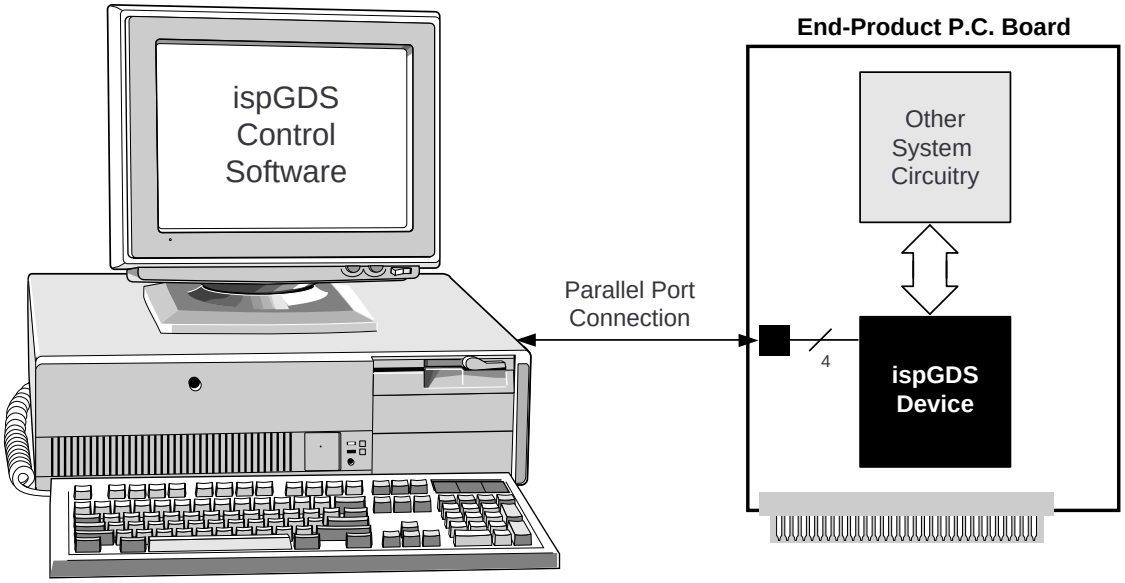

Figure 3. Configuring an ispGDS Device from a Remote System

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LATTICE SEMICONDUCTOR CORPORATION
5555 Northeast Moore Court
Hillsboro, Oregon 97124 U.S.A.
Tel.: (503) 681-0118
FAX: (503) 681-3037
http://www.latticesemi.com

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