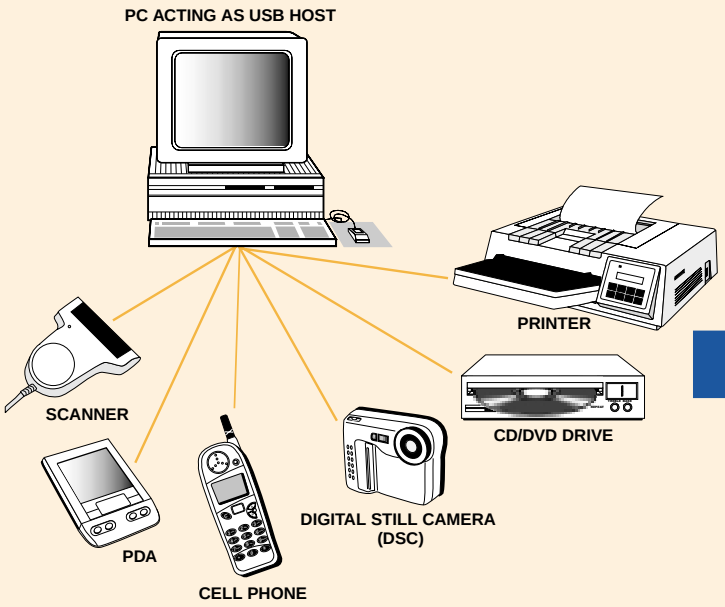
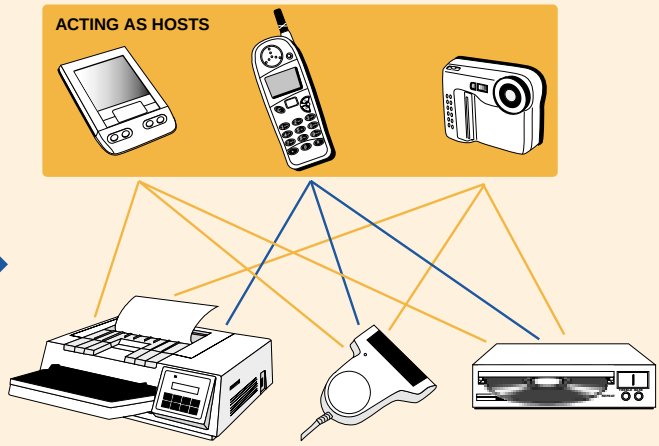
*Providing Powerful Interconnectivity and Peer-to-Peer Features for Embedded Systems and Peripherals*

# ISP1161/62

## Single-Chip USB Host and Device Controller




*Conventional USB network, with the PC acting as USB host. All transactions must be done through the PC as the nerve center.*




*New paradigm: Peer-to-peer networking is now possible with USB. A PDA or DSC can directly print to a printer.*

### Features

- Full compliance with USB Specification Rev. 1.1
- Enhanced USB 1.1 OHCI-compliant host
- On-chip Device Controller (DC)
- Simultaneous host-mode and device-mode supported via different I/O port access
- Two USB downstream ports for the Host Controller (HC) and one USB upstream port for the DC
- High-speed parallel interface to most generic microprocessors and RISC processors
- Fully autonomous and multi-configuration DMA operation
- 16 programmable USB endpoints for the DC
- Integrated multi-configuration dual FIFO memory
- Dual-buffering scheme for DC transfers and HC transactions
- 6 MHz crystal or oscillator for low EMI performance
- 3.3 V supply voltage operation
- Available in LQFP64 (ISP1161 with 16-bit interface) and LQFP80 (ISP1162 with 16-bit/32-bit interface) packages

The ISP1161/62 combines the functions of a Universal Serial Bus (USB) host and a USB device. This highly integrated single-chip solution allows not only the PC, but also any device within a system, to act as a USB host. This increases the degree of USB connectivity and extends it to the world of embedded systems.

### Description

The ISP1161/62 goes a step beyond current USB technology, which provides universal interconnectivity of peripherals to a PC. By enabling any embedded system to function as a USB host, the ISP1161/62 dramatically expands the degree of interconnectivity and extends the applicability of the USB into many new areas.

Incorporation of the ISP1161/62 device in peripherals enables the following :

- USB host function for embedded systems
- Supports programmable host or device functions
- Allows host and device to coexist
- Enables USB connectivity without PC intervention
- Makes USB peer-to-peer connectivity possible
- Allows USB peripherals to be shared among multiple hosts

**The ISP1161/62 goes a step beyond current USB technology, extending USB to the world of embedded systems.**

The ISP1161/62 device enables direct control of USB peripherals for embedded systems. In today's market, for example, a Digital Still Camera (DSC) must be connected to a PC in order for photographs to be uploaded and photo printouts to be transmitted to a photo printer. However, with the ISP1161/62 device in the DSC, printouts can be sent directly from the DSC to the photo printer. Similarly, when used in the Personal Digital Assistant (PDA), this chip allows the PDA to directly control USB peripherals independent of the PC. This gives the users of palm-sized PCs a greater choice of exciting plug-and-play peripherals that are very affordable and available off-the-shelf.

### Peer-to Peer USB Connectivity

In addition, the ISP1161/62 chip allows host and device functions to coexist and operate simultaneously. This provides peer-to-peer connectivity between the PC and the embedded system, or between embedded systems.

### A USB "Chameleon"

The highly versatile ISP1161/62 can be configured by software to function in the following ways:

- As a standalone host
- As an interface device
- With both host and device functions operating simultaneously

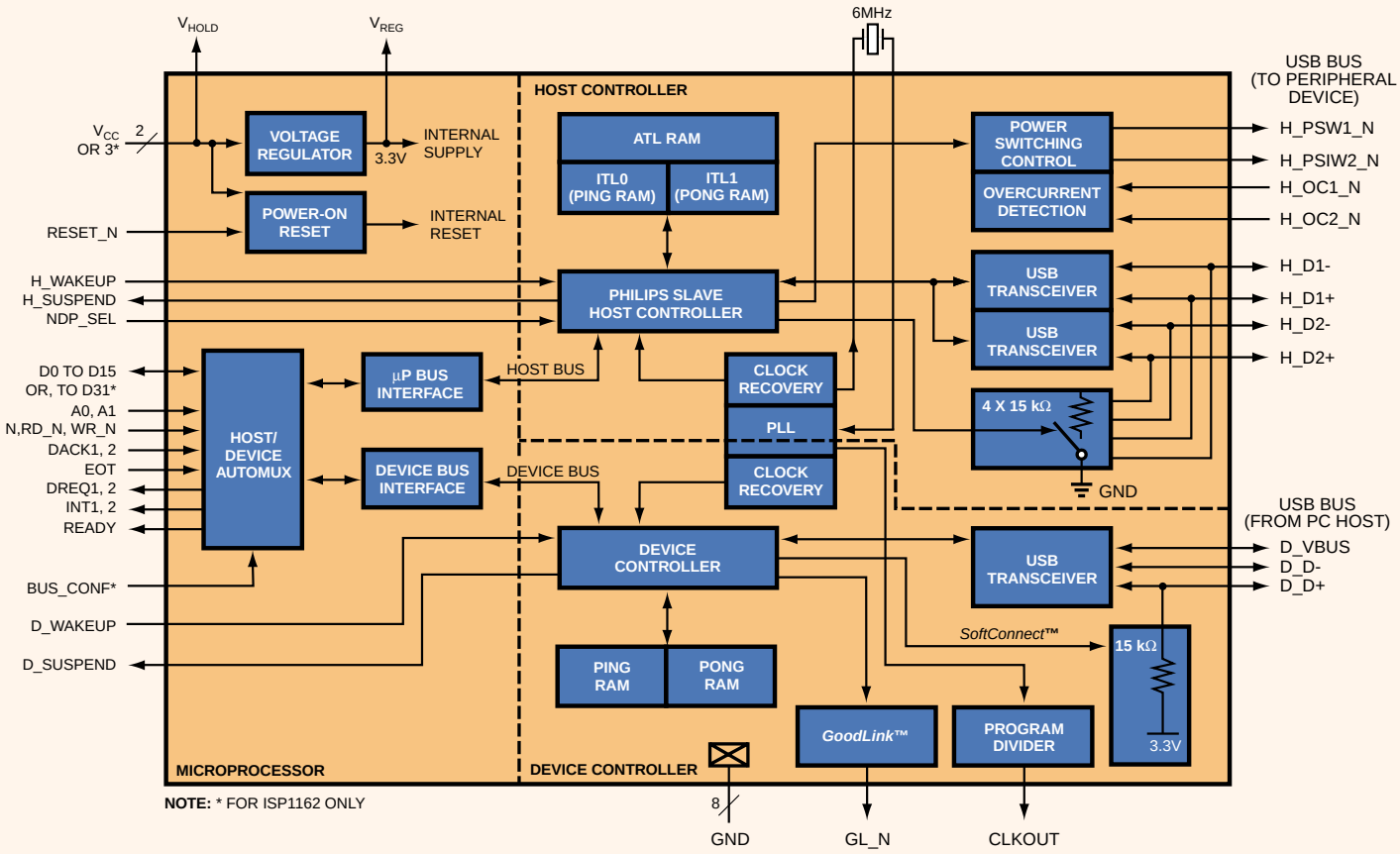
The generic 32-bit/16-bit parallel I/O (PIO) and Direct Memory Access (DMA) interface circuitry simplify the interface to most of the popular Reduced Instruction Set Command (RISC) chips, Digital Signal Processor (DSP) chips, and microcontroller devices on the market (e.g., SH3/4, MIPS-based RISC, ARM7/9, StrongArm); up to 24 Mbytes for the HC, and 8 Mbytes for the DC. This allows the system processor to maintain bandwidth in a multi-tasking environment.

### Host Function

The ISP1161/62 chip conforms to the USB Specification Rev. 1.1 for host and device functions. The built-in HC is a modified version of OpenHCI. In contrast to the traditional OpenHCI-compliant HC, the ISP1161/62 has been customized to interface directly with the system processor. It has no overhead requirement for a PCI interface or system memory control. All four types of transfer: control, interrupt, bulk, and isochronous, are supported.

# ISP1161/62

## ISP1161/ISP1162 HOST AND DEVICE CONTROLLER




### Device Function

The built-in DC leverages Philips' long history in USB. The DSC incorporates 16 endpoints that are configurable to allow for interrupt, bulk, control, and isochronous USB transfers. The DC also has a fast parallel interface of 11.1 MB/s (or 90 ns read/write cycles) and 16-bit parallel I/O ports. The DC supports local DMA transfers, which speed data to-and-from the external system processor, thus reducing the processor's load.

### Power Consumption

ISP1161/62's low suspend power consumption, along with LazyClock output, allows for easy implementation of equipment compliant with ACPI, OnNow, and USB power management requirements. The device's low operating power supports power-sensitive peripherals.

### Host Stack Support

With a strong commitment to USB technology, Philips Semiconductors' software group offers one-stop shopping for complete USB solutions for hardware, software, and intellectual property. This includes the host stack that enables the ISP1161/62 device to support various kinds of real-time operating systems. The host stack code is written in C and utilizes a modular design, which facilitates rapid porting to other operating systems and processors. Philips' USB software is fully compatible with the hardware, thereby speeding time-to-market by significantly reducing the time required to write and port software for various hardware solutions. Support and maintenance are also offered.

# Single-Chip USB Host and Device Controller

# ISP1161/62

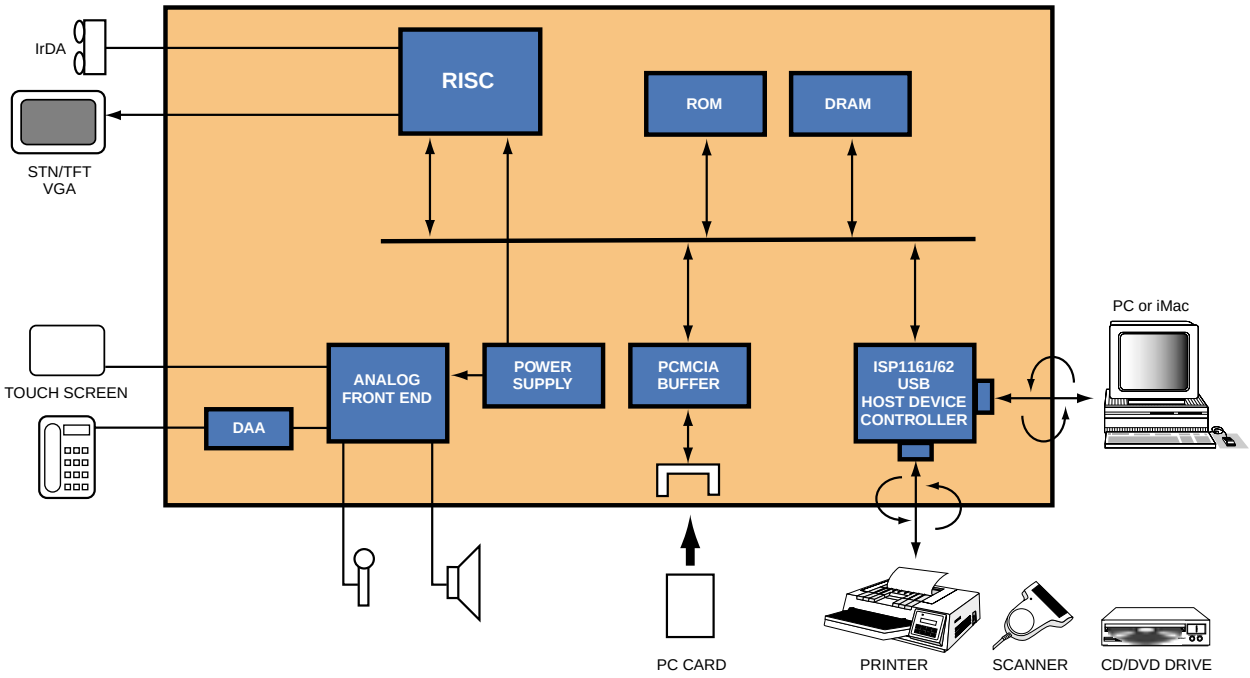
## Chip Options

| | ISP1161 | ISP1162 |
|---|---|---|
| Package | LQFP64 | LQFP80 |
| Data Bus | 16 bit | 32 bit |

## Evaluation Kit

An evaluation kit is available. It is based on the WinCE operating system and runs on an ISA platform.

**EXAMPLE APPLICATION: PDA**

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