



NXP USB battery-charger detection ICs ISP1601, ISP1703/4/7

Flexible, low-power USB ICs with battery-charger detection

These highly optimized, low-power USB ICs comply with the new Battery Charging specification. They support fully automated hardware detection and manual software control, and provide fast, reliable charging in a small, low-cost format.

Key features

- ▶ Full compliance with:
 - *Battery Charging Specification Rev. 1.1*
 - *Universal Serial Bus Specification Rev. 2.0*
 - *On-The-Go Supplement to the USB Specification Rev. 1.3*
 - *UTMI+ Low Pin Interface (ULPI) Specification Rev. 1.1 (ISP1703/4/7 only)*
- ▶ Two formats to make design-in simpler
 - Standalone IC (ISP1601) for easy upgrade of existing designs
 - Complete USB front-end (ISP1703/4/7) for new designs
- ▶ Support for automatic hardware detection and software-controlled detection
- ▶ Support for current-sink and dedicated-charger methods
- ▶ Wide-range supply voltage for full operation when battery is low
- ▶ Low-power shutdown mode (5 μ A typical)
- ▶ Operates only when V_{BUS} voltage is detected from USB cable
- ▶ Withstands V_{BUS} spikes up to 10 V
- ▶ Available in space-saving WLCSP (ISP1601/1703) and TFBGA (ISP1704/7) packages

Applications

- ▶ Mobile phones, personal media players, digital still cameras, and other portable applications

These USB ICs, the first to comply with the new Battery Charging specification, implement a standardized protocol for charger negotiation.

They make it possible for the USB connection to differentiate between USB sources and to determine the appropriate level of current for optimal charging. They detect USB-compliant wall chargers, host chargers, hub chargers, and standard host and hubs.

The ISP1601 is a standalone battery-charger detection IC, designed for fast upgrades in existing designs. For new designs, the ISP1703, the ISP1704, and the ISP1707 are ULPI Hi-Speed USB On-The-Go (OTG) transceivers that combine a full USB physical front-end with battery-charger detection.

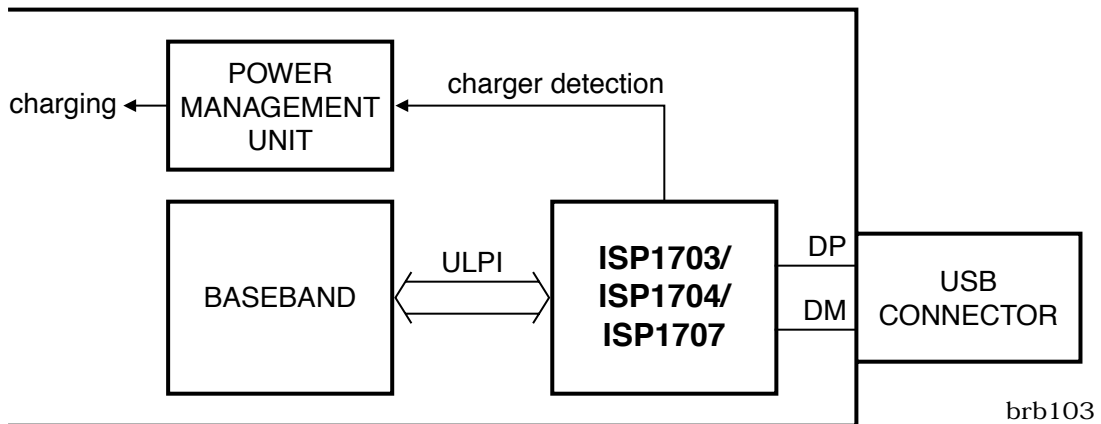
A better approach

On many PCs and laptops, the USB port is only rated for 0.5 A, so charging can be frustratingly slow. With the Battery Charging specification, PCs and laptops can now provide up to 1.5 A without interfering with the USB protocols, since the higher charging current doesn't create noise that could corrupt the USB data. That means faster, more convenient charging, with the same very high level of reliability people expect from USB.

From a dedicated charger, a portable device can draw up to 1.8 A. From a host charger, it can draw up to 900 mA while communicating at high speed (480 Mbps), and up to 1.5 A while communicating at full speed (12 Mbps) or low speed (12 Mbps).

On the host/charger side, the setup uses a Standard-A connector or a captive cable. On the phone/portable device side, there is a small, inexpensive Micro-B connector. By using standard cables and receptacles, the new standard makes it easy to use a single charger with all the phones, personal media players, and other portables in the home. And, while traveling, consumers only need a laptop, a laptop charger, and a USB connector to keep all their portables fully charged.

A single Micro-B connector now does it all – charges batteries, connects to headsets, transfers data to and from memory sticks and external hard drives, and synchronizes with a PC. Manufacturers can lower overall cost and shrink system size by replacing the system's proprietary charging connector, along with the barrel jack for audio connections, with a single USB connector.



NXP USB battery-charger detection solutions

	ISP1601	ISP1703	ISP1704/07
Package type	WLCSP12	WLCSP25	TFBGA36
Package dimensions (mm)	1.6 x 1.2 x 0.6	2.2 x 2.25 x 0.6	3.5 x 3.5 x 0.8
Ball pitch (mm)	0.4	0.4	0.5
USB application	-	Supports OTG	Supports OTG
ULPI mode	-	SDR	SDR
Transparent UART mode	-	Yes	Yes
Chip Select pin polarity (active HIGH/LOW)	-	Both	Both
USB charger detection	Yes	Yes	Yes
V _{BUS} charge and discharge resistors	-	Yes	Yes
Dataline and V _{BUS} pulsing	-	Yes	Yes
Crystals and clocks supported (MHz)	-	Output clock mode: 13, 19.2, 24, and 26 MHz Input clock mode: 60MHz	Output clock mode: 13, 19.2, 24, and 26 MHz Input clock mode: 60MHz
Main supply input voltage, V _{CC} (V)	2.2 to 4.5	3.0 to 4.5	3.0 to 4.5
Charger detection operation (V)	2.2 to 4.5	2.4 to 4.5	2.4 to 4.5
Digital I/O input voltage, V _{CCI/O} (V)	1.65 to 1.95	1.65 to 1.95	1.65 to 1.95
V _{BUS} 5-V output: V _{BUS} impedance (kΩ)	40 to 100	40 to 100	40 to 100
V _{BUS} 5-V output: charge pump (mA)	-	External	External
V _{BUS} 5-V output: control external charge pump/switch	-	Yes	Yes
V _{BUS} 5-V output: input for external V _{BUS} FAULT detector	-	Yes	Yes
Current consumption: power-down mode (μA)	20 (max)	20 (max)	20 (max)
Current consumption: low-power mode (μA)	35	70 (max)	70 (max)
Input clock mode	-	Yes	Yes

www.nxp.com/usb

www.nxp.com



© 2007 NXP B.V.

All rights reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Date of release: December 2007

Document order number: 9397 750 16212

Printed in the Netherlands