

# USB TRANSCEIVERS

Ultra-low-power transceiver solutions for mobile and portable applications



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Designed for use with ASICs, FPGAs, and system chipsets that interface with the physical layer of the USB connection, these transceivers provide reliable USB performance in a UTMI+ low pin interface (ULPI) format and support a full range of mobile and portable applications.

## KEY FEATURES

- Fully compliant with:
  - Universal Serial Bus Specification revision 2.0
  - On-The-Go supplement to the USB Specification revision 1.3
  - UTMI+ low pin interface (ULPI) Specification revision 1.1
  - Battery Charging Specification version 1.0
  - USB 2.0 link power management addendum
- Interface support to Hi-Speed USB host, peripheral, and dual-role device cores
- Ability to support 60-MHz, 8- or 12-pin interface between ASIC and transceiver
  - 4-bit dual data rate (DDR)
  - 8-bit single data rate (SDR)
- Flexibility with chip select pin polarity
  - Provides an option to fit the ASIC polarity
- Support for wide range of clock frequencies to suit the industrial needs
  - 13, 19.2, 24, 26, 38.4, and 60 MHz
- Variable I/O voltage support
  - 1.65 V to 3.6 V
- Integrated Hi-Speed USB transceiver solutions to minimize external components
  - Integrated 2.7 V or 3.3 V and 1.8 V regulators
  - Integrated ESD protection circuit
  - Integrated  $V_{BUS}$  overvoltage protection circuit
- Low power consumption for longer battery life
  - Typical operating current of 13 mA for full-speed and 34 mA for high-speed
- Separate I/O voltage supply pins to minimize crosstalk
- Input clock mode support, eliminates the external reference clock/oscillator
- Fully integrated USB battery-charger detection with automatic hardware detection and software-controlled detection

- Robust design to handle noisy clock and power supplies
- Very good receiver sensitivity handling data errors with bad cables
- UART pass-through mode for serial application
- Full industrial grade operating temperature range from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- ESD compliance:
  - JESD22-A114F  $\pm 2$  kV contact human body model (HBM)
  - JESD22-C101-C  $\pm 500$  V charged device model (CDM)
  - IEC 61000-4-2  $\pm 8$  kV contact and  $\pm 15$  kV air on the DP and DM pins
- Small foot print for efficient space utilization
  - WLCSP25, TFBGA36, HVQFN36/32/24

## TARGETED APPLICATIONS

- Mobile phones
- Digital still and video cameras
- Digital TVs
- Digital video disc (DVD) recorders
- Media players
- Set-top boxes (STB)
- GPS personal navigation devices
- Personal media players (PMPs)
- External hard disk drives
- Printers and multifunction printer (MFP)
- Point of sale terminals
- Test and measurement equipment
- Gaming consoles
- Industrial systems
- Communications/networking equipment (wireless access points, LAN switches, network routers)

## HI-SPEED USB TRANSCEIVERS WITH ULPI INTERFACE: FOR MOBILE

|             |                                              | Products                       |                              |                           |                                 |                                 |
|-------------|----------------------------------------------|--------------------------------|------------------------------|---------------------------|---------------------------------|---------------------------------|
| Features    |                                              | ISP1504                        | ISP1508                      | ISP1514                   | ISP1703                         | ISP1704*                        |
| Form factor | Commercial product code                      | ISP1504A1ETTM<br>ISP1504C1ETTM | ISP1508AETTM<br>ISP1508BETTM | ISP1514AUKTS              | ISP1703AUKTS<br>ISP1703BUKTS    | ISP1704AETTM                    |
|             | Package type                                 | TFBGA36                        | TFBGA36                      | WLCSP25                   | WLCSP25                         | TFBGA36                         |
|             | Package dimensions (mm) (L x W x H)          | 3.5 x 3.5 x 0.8                | 3.5 x 3.5 x 0.8              | 2.24 x 2.21 x 0.6         | 2.24 x 2.21 x 0.6               | 3.5 x 3.5 x 0.8                 |
|             | Ball or lead pitch (mm)                      | 0.5                            | 0.5                          | 0.4                       | 0.4                             | 0.5                             |
|             | ULPI mode                                    | SDR                            | SDR or DDR                   | SDR                       | SDR                             | SDR                             |
| Features    | Transparent UART mode                        | no                             | yes                          | yes                       | yes                             | yes                             |
|             | Active chip select pin polarity              | low                            | AETTM: high<br>BETTM: low    | high                      | AUKTS: low<br>BUKTS: high       | low and high                    |
|             | USB charger detection                        | supports resistive method      | supports resistive method    | supports resistive method | Battery Charging Spec. Rev. 1.0 | Battery Charging Spec. Rev. 1.0 |
|             | Input clock mode                             | no                             | no                           | no                        | yes                             | no                              |
|             | Crystals and clocks supported (MHz)          | A1ETTM: 19.2<br>C1ETTM: 26     | 13, 19.2, 24, 26             | 19.2                      | AUKTS: 19.2<br>BUKTS: 26        | 19.2, 26                        |
|             | Control external charge pump/switch          | yes                            | yes                          | no                        | no                              | yes                             |
| Power       | Main supply input voltage, $V_{CC}$ (V)      | 3.0 to 4.5                     | 3.0 to 4.5                   | 3.0 to 4.5                | 3.0 to 4.5                      | 3.0 to 4.5                      |
|             | Digital I/O input voltage, $V_{CCI(V)}$ (V)  | 1.65 to 3.6                    | 1.65 to 1.95                 | 1.65 to 1.95              | 1.65 to 1.95                    | 1.65 to 1.95                    |
|             | $V_{BUS}$ protection (V)                     | 5.5 limiting                   | 5.5 limiting                 | 5.5 limiting              | 16                              | 5.5 limiting                    |
| Others      | Operating temperature ( $^{\circ}\text{C}$ ) | $-40$ to $+85$                 | $-40$ to $+85$               | $-40$ to $+85$            | $-40$ to $+85$                  | $-40$ to $+85$                  |
|             | Charger detect pin polarity                  | NA                             | NA                           | NA                        | low                             | high                            |
|             | USB application                              | Peripheral/host/OTG            | Peripheral/host/OTG          | Peripheral/host           | Peripheral/host/OTG             | Peripheral/host/OTG             |

\* ISP1704 is qualified in EMP reference platform design

## HI-SPEED USB TRANSCEIVERS WITH ULPI INTERFACE: GENERIC

|             |                                               | Products                     |                              |                              |                                               |
|-------------|-----------------------------------------------|------------------------------|------------------------------|------------------------------|-----------------------------------------------|
| Features    |                                               | ISP1507A/B                   | ISP1507C/D                   | ISP1507E/F                   | ISP1715                                       |
| Form factor | Commercial product code                       | ISP1507ABSTM<br>ISP1507BBSTM | ISP1507CBSUM<br>ISP1507DBSUM | ISP1507EBSUM<br>ISP1507FBSUM | ISP1715AHNUM<br>ISP1715AETTM                  |
|             | Package type                                  | HVQFN32                      | HVQFN24                      | HVQFN24                      | AHNUM: HVQFN36<br>AETTM: TFBGA36              |
|             | Package dimensions [mm] (L x W x H)           | 5 x 5 x 0.85                 | 4 x 4 x 0.85                 | 4 x 4 x 0.85                 | AHNUM: 5 x 5 x 0.85<br>AETTM: 3.5 x 3.5 x 0.8 |
|             | Ball or lead pitch [mm]                       | -                            | -                            | -                            | 0.5                                           |
|             | ULPI mode                                     | SDR                          | SDR                          | DDR                          | SDR                                           |
| Features    | Transparent UART mode                         | no                           | no                           | no                           | yes                                           |
|             | Active chip select pin polarity               | low                          | no                           | no                           | low and high                                  |
|             | USB charger detection                         | no                           | no                           | no                           | supports resistive method                     |
|             | Input clock mode                              | no                           | no                           | no                           | no                                            |
|             | Crystals and clocks supported [MHz]           | ABSTM: 19.2<br>BBSTM: 26     | CBSUM: 19.2<br>DBSUM: 26     | EBSUM: 19.2<br>FBSUM: 26     | 13, 19.2, 24, 26                              |
| Power       | Control external charge pump/switch           | yes                          | yes                          | yes                          | yes                                           |
|             | Main supply input voltage, $V_{CC}$ [V]       | 3.0 to 3.6                   | 3.0 to 3.6                   | 3.0 to 3.6                   | 3.0 to 4.5                                    |
|             | Digital I/O input voltage, $V_{CCI(I/O)}$ [V] | 1.65 to 3.6                  | 1.65 to 3.6                  | 1.65 to 1.95                 | 3.0 to 3.6                                    |
|             | $V_{BUS}$ 5 V output: charge pump [mA]        | 50                           | no                           | 50                           | no                                            |
|             | $V_{BUS}$ protection [V]                      | 5.5 limiting                 | 5.5 limiting                 | 5.5 limiting                 | 5.5 limiting                                  |
| Others      | Operating temperature [°C]                    | -40 to +85                   | -40 to +85                   | -40 to +85                   | -40 to +85                                    |
|             | USB application                               | Peripheral/host/OTG          | Peripheral/host              | Peripheral/host/OTG          | Peripheral/host/OTG                           |

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|             |                                              | Products                               |                                                       |                                          |                          |                                       |
|-------------|----------------------------------------------|----------------------------------------|-------------------------------------------------------|------------------------------------------|--------------------------|---------------------------------------|
| Key Feature |                                              | Comments                               | ISP1102                                               | ISP1105                                  | ISP1110<br>UART mode     | ISP1302<br>OTG with carkit<br>support |
| Form factor | Commercial part code                         |                                        | ISP1102BSTS, ISP1102BSTM,<br>ISP1102AWTS, ISP1102AWTM | ISP1105BSTM, ISP1105-<br>WTS, ISP1105WTM | ISP1110VHTS, ISP1110VHTM | ISP1302UKTS                           |
|             | Package                                      | HBBC                                   | 16-pin, 3 x 3 x 0.65 mm                               | 16-pin, 3 x 3 x 0.65 mm                  | 16-pin, 3 x 3 x 0.65 mm  | NA                                    |
|             |                                              | HQVFN                                  | 14-pin, 2.5 x 2.5 x 0.85 mm                           | 16-pin, 3 x 3 x 0.85 mm                  | NA                       | NA                                    |
|             |                                              | Others                                 | NA                                                    | NA                                       | NA                       | WLCSP25, 2.5 x 2.5 x 0.6 mm           |
| Features    | Single-ended receiver output                 | VP/VM                                  | VP/VP0, VM/VM0<br>Bidirectional                       | Supported                                | Supported                | SEQ/VM, DAT/VP<br>Bidirectional       |
|             | Differential data receiver output            | RCV                                    | Supported                                             | Supported                                | Supported                | Supported                             |
|             | Driver data input                            | VP0/VO, VM0/FSE0                       | VP0/VM0                                               | VP0/VO, VM0/FSE0                         | VP0, VM0                 | SEQ/VM, DA/VP                         |
|             | Bypass mode                                  | $V_{REG(3.3)}$ short to $V_{CCI(5.0)}$ | Supported                                             | Supported                                | NA                       | NA                                    |
|             | Disable mode                                 | Only $V_{CCI(5.0)}$ connected          | NA                                                    | Supported                                | NA                       | Supported                             |
| Power       | Sharing mode (isolate)                       | $V_{CCI(I/O)}$ only                    | Supported                                             | Supported                                | NA                       | Supported Isolate mode                |
|             | Low I/O voltage level [V]                    |                                        | 1.65 to 3.6                                           | 1.65 to 3.6                              | 1.65 to 2.85             | 1.4 to 3.6                            |
|             | SOFTCON                                      |                                        | Supported                                             | Supported                                | Supported                | NA                                    |
|             | Resistor 1.5 kΩ                              |                                        | External                                              | External                                 | Internal                 | Internal (registers)                  |
|             | Data transfer rates                          |                                        | Full-speed and low-speed                              | Full-speed and low-speed                 | Full-speed               | Full-speed and low-speed              |
| Others      | $V_{BUS}$ detect                             |                                        | Supported                                             | NA                                       | Supported                | $V_{BUS}$ comparator (OTG)            |
|             | ESD [on D+, D-, $V_{CCI(5.0)}$ and GND] [kV] |                                        | ±12                                                   | ±12                                      | -                        | ±2                                    |
|             | Target applications                          |                                        | Mobile phone, DSC                                     | DSC                                      | GSM, PDA                 | PDA, DSC, mobile phone                |
|             | USB application                              |                                        | Peripheral/host                                       | Peripheral/host                          | Peripheral               | Peripheral/host/OTG                   |

To order the evaluation kits for these products, contact your local sales office or distributor.

For product related information, contact [wired.support@stericsson.com](mailto:wired.support@stericsson.com).

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