Introducing the FT-X Series of USB2.0 Full Speed Peripheral Solutions

USB MADE EASY
Introducing the FT-X Chip Series

• 13 chip/package options to optimize your design when you need to quickly and easily add a USB port into your system.

• FTDI provides a wide selection of OS support:
  – Windows, Android, Mac OS, and Linux.

• Offering a wide selection of IO bridges including: Basic UART, Full Handshake UART, FIFO, I²C, SPI, and FTDI’s FT1248 interface.
  – I²C to USB bridge in 10 pin DFN package.

• Low power, small device footprints, and abundant features minimizes PCB real estate and lowers overall system costs.

FT-X Series has IT all!!
Extension of FTDI’s product mission:
- Future Technology Devices International (FTDI) specialises in the design and supply of silicon and software solutions for the Universal Serial Bus (USB). FTDI offers a simple route to USB migration / integration by combining easy to implement IC devices with proven ready-to-use, royalty-free USB firmware and driver software.
- FTDI offers the widest selection of USB chips for USB peripherals.
  - Familiar FT232R and FT245R for ease-of-use and fast time-to-market.
  - USB2 Hi-Speed solutions, with single and multi-channel options FT232H / FT2232H / FT4232H.
  - FT-X Series offering is the PREMIERE cost / benefit profile for USB2.0 Full Speed solutions in the market.

Whatever your USB design need, FTDI can meet it !!!
USB Peripheral / Device Solutions

- **FT232H**
  - Hi-Speed
  - Single Channel (UART/FIFO)
- **FT2232H**
  - Full-Speed
  - Dual/Quad
- **FT4232H (quad)**
  - Hi-Speed
- **FT232H (FT1248 IO)**
  - Hi-Speed
- **FT2232D**
  - Dual/Quad
- **FT-X**
  - Feature rich, footprint optimized
  - Hi-Speed
- **FT232/245R (3Mbaud)**
  - Full-Speed
- **FT232/245B (1Mbaud)**
  - Full-Speed
- **Parallel bus**
<table>
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<tr>
<th>Part Number</th>
<th>Pins</th>
<th>Package</th>
<th>Description</th>
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<td>FT231XS</td>
<td>20</td>
<td>SSOP</td>
<td>Full Handshake UART Interface</td>
</tr>
<tr>
<td>FT231XQ</td>
<td>20</td>
<td>QFN</td>
<td>Full Handshake UART Interface</td>
</tr>
<tr>
<td>FT230XS</td>
<td>16</td>
<td>SSOP</td>
<td>Basic UART Interface</td>
</tr>
<tr>
<td>FT230XQ</td>
<td>16</td>
<td>QFN</td>
<td>Basic UART Interface</td>
</tr>
<tr>
<td>FT221XS</td>
<td>20</td>
<td>SSOP</td>
<td>8bit SPI/FT1248 Interface</td>
</tr>
<tr>
<td>FT221XQ</td>
<td>20</td>
<td>QFN</td>
<td>8bit SPI/FT1248 Interface</td>
</tr>
<tr>
<td>FT220XS</td>
<td>16</td>
<td>SSOP</td>
<td>4bit SPI/FT1248 Interface</td>
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<tr>
<td>FT220XQ</td>
<td>16</td>
<td>QFN</td>
<td>4bit SPI/FT1248 Interface</td>
</tr>
<tr>
<td>FT201XS</td>
<td>16</td>
<td>SSOP</td>
<td>I²C Interface</td>
</tr>
<tr>
<td>FT201XQ</td>
<td>16</td>
<td>QFN</td>
<td>I²C Interface</td>
</tr>
<tr>
<td>FT200XD</td>
<td>10</td>
<td>DFN</td>
<td>I²C Interface</td>
</tr>
<tr>
<td>FT240XS</td>
<td>24</td>
<td>SSOP</td>
<td>8bit FIFO Interface</td>
</tr>
<tr>
<td>FT240XQ</td>
<td>24</td>
<td>QFN</td>
<td>8bit FIFO Interface</td>
</tr>
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</table>
FT-X Series Features

- X-Chip Factor provides the extra elements/features that add value:
  - Battery charger detection to enable higher current, faster charging.
  - Extensive clocking features; internal clock generation and external clock out.
  - Internal 3V3 level converter.
  - Integrated crystal and MTP memory to save board space and maximize flexibility.
  - Extended temperature range support, -40° to +85°C.
  - Low power consumption:
    - 8mA active (typical)
    - 125uA suspend (typical)
  - Input/ output voltage support, 1.8V to 3.3V, with 5V tolerance.
FT-X Series Support, Breakout Modules

- Breakout modules, such as the USB to \( \text{I}^2\text{C} \), UMFT200XD, provide the simplest method to connect to a USB host, and interface directly into your system via the appropriate IO.

  - 4 PCB traces slot directly into a USB Host (A Port)
  - USB protocol engine and interface bridge integrated into FT-X Series silicon devices
  - Interface connector provided for system integration
  - Choice of module per interface required

<table>
<thead>
<tr>
<th>Module</th>
<th>Interface</th>
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<tr>
<td>UMFT201XB</td>
<td>( \text{I}^2\text{C} )</td>
</tr>
<tr>
<td>UMFT200XD</td>
<td>( \text{I}^2\text{C} )</td>
</tr>
<tr>
<td>UMFT220XB</td>
<td>FT1248</td>
</tr>
<tr>
<td>UMFT230XB</td>
<td>UART</td>
</tr>
</tbody>
</table>
FT-X Series Support, Evaluation Modules

- Evaluation modules are larger than breakout modules, and provide access to all pins.
  - Manufactured in DIP form factor (0.3” wide).
  - Easy to integrate into system boards for thorough prototyping, system emulation, and check-out.
  - USB protocol engine and interface bridge integrated into FT-X Series silicon devices.
  - Choice of module per interface required.

<table>
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<tr>
<th>Module</th>
<th>Interface</th>
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<tbody>
<tr>
<td>UMFT201XA</td>
<td>I²C</td>
</tr>
<tr>
<td>UMFT220XA</td>
<td>FT1248 (4 bit)</td>
</tr>
<tr>
<td>UMFT221XA</td>
<td>FT1248 (8 bit)</td>
</tr>
<tr>
<td>UMFT230XA</td>
<td>Basic UART</td>
</tr>
<tr>
<td>UMFT231XA</td>
<td>Full UART</td>
</tr>
<tr>
<td>UMFT240XA</td>
<td>FIFO</td>
</tr>
</tbody>
</table>
UMFT231XC - Battery Charging Detection (BCD)

- Development board provides for USB to UART bridge functionality as well as battery charging detection (BCD), and battery charging via LTC4053.
  - FT231X device supports BCD to simplify and optimize battery charging in portable systems.
  - Detects Dedicated Charging Port (DCP) or Standard Downstream Port (SDP,) enabling selection of higher battery charging current, 1.8A or .5A.
  - CBUS pins enable control of charging rate.
  - Complete sleep and suspend capabilities.

FT-X enables optimal battery charging!
FTDI provides two alternative software interfaces for USB controllers.

**COM Port Application**
One interface provides a Virtual COM Port (VCP) which appears to the system as a legacy COM port. Legacy applications should work with VCP drivers with minimal modification.

**D2XX API**
The second interface, D2XX, is provided via a proprietary DLL (FTD2XX.DLL). The D2XX interface provides special functions to optimize performance and improve flexibility.
Experience the X Chip Factor!
FT-X Series

I^2C Bridges

World-Class Feature Set:
- Low power
- Battery Charger Detection
- Internal Regulator
- Extended clocking
- MTP memory
- Extended Temperature support

UART Bridges

FIFO Bridges

Flexible FT1248 Interface
## FT-X Series – Meet the Family

<table>
<thead>
<tr>
<th>Device</th>
<th>FT200XD</th>
<th>FT201X</th>
<th>FT220X</th>
<th>FT221X</th>
<th>FT230X</th>
<th>FT231X</th>
<th>FT240X</th>
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</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>I²C slave to USB 2.0 Full Speed</td>
<td>I²C slave to USB 2.0 Full Speed</td>
<td>SPI/FT1248 (4-bits) to USB 2.0 Full Speed</td>
<td>SPI/FT1248 (8-bits) to USB 2.0 Full Speed</td>
<td>Basic UART to USB 2.0 Full Speed</td>
<td>Full UART to USB 2.0 Full Speed</td>
<td>FIFO to USB 2.0 Full Speed</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td>3.4 Mbits/sec</td>
<td>3.4 Mbits/sec</td>
<td>0.5 MByte/sec</td>
<td>1 MByte/sec</td>
<td>3 Mbaud</td>
<td>3 Mbaud</td>
<td>1 Mbyte/sec</td>
</tr>
<tr>
<td><strong>CBUS Pins</strong></td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td><strong>Clock Oscillator</strong></td>
<td>Internal</td>
<td>Internal</td>
<td>Internal</td>
<td>Internal</td>
<td>Internal</td>
<td>Internal</td>
<td>Internal</td>
</tr>
<tr>
<td><strong>EE/MTP Memory</strong></td>
<td>Internal</td>
<td>Internal</td>
<td>Internal</td>
<td>Internal</td>
<td>Internal</td>
<td>Internal</td>
<td>Internal</td>
</tr>
<tr>
<td><strong>Packages</strong></td>
<td>10-pin DFN</td>
<td>16-pin SSOP/16-pin QFN</td>
<td>16-pin SSOP/16-pin QFN</td>
<td>20-pin SSOP/20-pin QFN</td>
<td>16-pin SSOP/16-pin QFN</td>
<td>20-pin SSOP/20-pin QFN</td>
<td>24-pin SSOP/24-pin QFN</td>
</tr>
</tbody>
</table>

* Configurable as GPIO, LED drivers, or clock signals

- All devices, -40 to 85 °C
- All devices IO, 1.8V to 3.3V (5V tolerant)
- All devices, 8 mA (active-typical), 125 uA (suspend-typical)
With FTDI’s I²C solutions, designers can maximize performance while minimising space and power.

- **USB to I²C Slave bridge with speeds up to 3.4Mbit/s.**
  - FT200XD is 10 pin DFN package – smallest solution.
  - FT201X is 16 pin QFN/SSOP packages – more GPIO lines.
- Low power – typically 8mA active / 125uA suspend.
- Configurable CBUS pins for BCD, driving LED, clock-out, or GPIO.
- USB Battery Charger Detection function.
- Internal 2KB, MTP can be reprogrammed via both USB and I²C I/F.
- FTDI Chip-ID security feature.
- VCC, 5V (single-supply) or 3.3V.
  - Internal regulator for 3.3V supplies.
  - Supports Bus-Powered (5V) or Self-Powered (3.3V).
FT200XD/FT201X USB to I²C Slave Converter

FT200XD/FT201X supports standard I²C data rates such as 100 kbit/s standard mode (SM), 400 kbit/s fast mode (FM), 1 Mbit/s Fast mode plus (FM+), and 3.4 Mbit/s High Speed mode (HS).

FT200XD has 1 CBUS pin and FT201X has 6 CBUS pins
FT220X / FT221X USB to FT1248 Interface

- FT1248 interface is a synchronous serial / parallel interface.
  - Provides for flexibility depending upon IO constraints.
  - Allows for pin usage / bus performance trade-offs.
- Flexible interface may be 1, 2, 4, or 8 bits wide.
  - 1, 2, or 4 bit interface for FT220X in 16 pin packages.
  - Extended 8 bit wide for FT221X in 20 pin packages.
- FT220/221X contains the complete FT-X Series feature set.
FT220X / FT221X Advantages

- Optimal pin / performance choices when IO considerations appear.
  - FT220X – 16 pin SSOP/QFN options 1, 2, or 4 bit wide interface.
  - FT221X – 20 pin SSOP/QFN options – 1, 2, 4, or 8 bit wide interface.
- Functions similar to SPI slave.
- Low power option – typically 8mA active / 125uA suspend.
- Configurable CBUS pins for BCD, driving LED, clock-out, or GPIO.
- USB Battery Charger Detection function.
- Internal 2KB, MTP could be reprogrammed via USB or FT1248.
- FTDI Chip-ID security feature.
- 1.8V to 3.3V IO (5V Tolerant).
- VCC, 5V (single-supply) or 3.3V.
  - Internal regulator for 3.3V supplies.
  - Supports Bus-Powered (5V) or Self-Powered (3.3V).
FT230X/FT231X USB to UART Converters

Experience FTDI’s World-Class, leadership UART solutions!

- USB to RS232/422/485 Cable or Adaptors

- Integrate UART interface into embedded system application

![Diagram of USB to UART connection](image)
FT230X / FT231X Advantages

- Match your UART configuration to minimize PCB area / system cost.
  - FT230X – 16 pin SSOP/QFN options – RXD/TXD/RTS/CTS only.
  - FT231X – 20 pin SSOP/QFN options – full modem control.
- Up to 3M Baud data rates.
- Low power option – typically 8mA active / 125uA suspend.
- Configurable CBUS pins for BCD, driving LED, clock-out, or GPIO.
- USB Battery Charger Detection function.
- Internal 2KB, MTP could be reprogrammed via USB.
- FTDI Chip-ID security feature.
- 1.8V to 3.3V IO (5V Tolerant).
- VCC, 5V (single-supply) or 3.3V.
  - Internal regulator for 3.3V supplies.
  - Supports Bus-Powered (5V) or Self-Powered (3.3V).
USB-Duo maximizes your system

- FTDI USB Duo package provides complete functionality for a single price.
- FTDI’s X chip factor provides optimal USB functionality with an extended feature set.
FTDI USB-Duo

- FTDI provides a USB to RS232 total solution
  - Bundling a USB bridge controller and RS232 Transceiver IC
- The solution maximizes functionality and optimizes system price
- Integrated crystal and MTP to reduce BOM cost and PCB size
- FTDI provides Royal Free Driver Supported for both Virtual COM Port (VCP) and D2XX options.

**Best Benefit for Price, Functions and PCB size**
FT3243S Low power 3.3V RS232 Transceiver

- Meets or Exceeds the EIA/TIA-232F and CCITT V.28/V.24 specification for VCC at +3.3V ±10% and +5V ±10% Operations
- Interoperable with EIA/TIA-232 and adheres to EIA/TIA-562 down to a +2.7V power source
- Low quiescent current – 0.5mA typ., 1mA max. Low shutdown current (where applicable) - 1μA; typical, 10μA max.
- Guaranteed data rate 250kbps
- Proprietary Switch-Capacitor Regulated Voltage Converters (patent pending)
- 28 Pins SSOP package
- Extended -40°C to 85°C; industrial operating temperature range.
- Latch-up Free and 15KV ESD Protection for RS-232 I/O's
- Drop-in Replacements for MAX3243E, ICL3243E, ISL4243E, ZT2343E, ST3243E and SP3243E
The FT240X is a USB to parallel FIFO interface which can be integrated into embedded system application easily.

The Data transfer rates can up to 1Mbyte / second
FT240X Advantages

- Reduced pin count for space critical designs.
  - FT240X – 24 pin SSOP/QFN options – 8-bit wide FIFO.
- 1MByte/s data rates.
- Low power option – typically 8mA active / 125uA suspend.
- Configurable CBUS pins for BCD, driving LED, clock-out, or GPIO.
- USB Battery Charger Detection function.
- FTDI Chip-ID security feature.
- 1.8V to 3.3V IO (5V Tolerant).
- Internal 2KB, MTP could be reprogrammed via USB.
- VCC, 5V (single-supply) or 3.3V.
  - Internal regulator for 3.3V supplies.
  - Supports Bus-Powered (5V) or Self-Powered (3.3V).
FTI-X Series Enables Optimal Battery Charging

- Detects DCP (Dedicated Charging Port) or SDP (Standard Downstream Port), enabling selection of higher battery charging current, 1.8A or .5A.
- CBUS pins enable control of charging rate
- Complete sleep and suspend capabilities
FTEX Development Modules

- Rapid prototyping
- Limited development
- Maximum Flexibility

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<th>Breakout Module (USB trace connections plug PCB direct into host port)</th>
<th>Evaluation Modules (Mini-B USB connector, with DIP PCB insert)</th>
<th>Battery Charging Evaluation Board</th>
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<td>UMFT201XB</td>
<td>UMFT220XA</td>
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<td>UMFT220XB</td>
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<td>UMFT230XB</td>
<td>UMFT230XA</td>
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<td>UMFT231XA</td>
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<td></td>
<td>UMFT240XA</td>
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FTDI Web Resources

Visit www.ftdichip.com

- **Drivers**: Newest VCP and D2XX driver
- **Data Sheets**: FTDI Data Sheets for production released chips are available
- **Application Notes**: Application notes for basic and advanced development
- **Technical Notes**: Providing application background and system design considerations
- **Software Utilities**: Beneficial programs for design creation and manufacturing support
- **Software Examples**: Sample example code to assist in the development
- **FAQs**: Useful Frequently Asked Questions

FTDI are ISO9001:2008 certified.

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