



Application Note

AN_302

Comparison of Device / Software features for FT313H and ST-Ericsson ISP1763

Version 1.0

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In this application note, features of the FT313H and ST-Ericsson ISP1763 are compared with the main focus on software development related features. Differences between these two chips are highlighted and each feature is briefly described.

This document could serve as a starting point for migrating from ISP1763 to FT313H.

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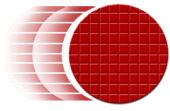
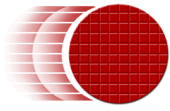


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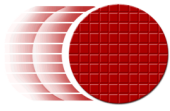


1 Introduction

FT313H is an embedded USB 2.0 Hi-Speed host controller chip which is EHCI compatible (revision 1.0) and provides one downstream port for support of Hi-Speed, Full-Speed, and Low-Speed USB peripherals.

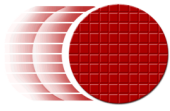
The FT313H provides a subset of the ISP1763 functionality, specifically, a USB2.0 Hi-Speed Host port, and offers many of the same IO interfaces so that the chip should be capable of being easily integrated into current ISP1763 systems. Note the FT313H targets a low cost, single host port for embedded systems and is compatible with the EHCI specification (1.0). The FT313H functions as an embedded USB Host port, whereas the ISP1763 is a dual port chip that supports the USB2.0 On-The-Go protocol. As a result the effort to change devices will center around the software integration of the FT313H HCD over the selected IO, and integration to the USB Host stack. In addition to this application note the designer should also consult the FT313H Programming Guide, AN_226. In the end, when the system requires a single, USB2.0 host port with common IO between the FT313H and ISP1763, the FT313H can meet the system requirement and likely offer a reduced bill of material.

In this article, we compare the features of these two chips and highlight the differences. In addition a description of features provides a good starting point for software engineers to port ISP1763 software to FT313H.



2 Features shared between FT313H and ISP1763

FT313H and ISP1763 share a number of features, including: both chips' primary function is to provide USB 2.0 Hi-Speed USB host, both have 24 Kbytes of on-chip memory. As they are both embedded USB host controllers, they share the operation that USB transfer descriptors must be programmed into their memory and payload must be copied from their chip's master memory into memory for OUT transfers, and payload must be copied to their chip's master memory from their memory for IN transfers. Both chips apply similar data port concepts to access memory by either 8-bit or 16-bit interfaces.



3 Feature differences between FT313H and ISP1763

3.1 Register definition

Though the ISP1763 claims to be EHCI compatible in its datasheet, its register definition is quite different from that in EHCI specification. There are only five registers that seem related to EHCI, and the device does not possess all the functional bits as defined by the EHCI specification.

In comparison, the FT313H's register definition is compatible to EHCI definition, with only a few registers needing an addressing offset change.

3.2 Chip architecture

The ISP1763 exports USB downstream ports through a built-in hub, thus after the ISP1763's USB host controller completes initialization it will start to enumerate its built-in hub. As a result, the ISP1763 requires a standard hub (not root hub) driver for integration with the ISP1763 USB stack. This in turn requires support of periodic transfer (interrupt transfer) in ISP1763's host controller driver (HCD).

In comparison, the FT313H executes USB downstream port through its host controller's root hub. As a result, it is possible that the FT313H host controller driver does not need to support interrupt transfer transactions. This is very efficient and convenient for resource, restricted embedded systems.

3.3 Memory management

Both FT313H and ISP1763 have 24 Kbytes of built-in memory which is used for holding transfer descriptors and payload data.

However, the FT313H and ISP1763 apply different strategies for memory management.

The ISP1763 reserves the first 4 Kbytes to store the 16 ATL, 16 ISO and 16 INT transfer descriptors with the remaining 20 Kbytes for payload. The location and total number of each kind of descriptors are all fixed.

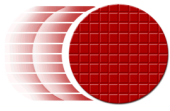
In comparison, the FT313H apply a much more flexible memory management scheme, as long as alignment requirements are met. The FT313H software can partition the memory according to its needs and also control the number of different descriptors as needed.

3.4 Transfer scheduling

The ISP1763 and FT313H apply different methods to schedule transfer on the USB bus.

3.4.1 ISP1763 traffic scheduling

The ISP1763 schedules transfers by manipulating the skip register and corresponding category of descriptor. ISP1763 driver need to update the content of selected PTD (ISP1763 Proprietary Transfer Descriptor) according to the transfer requests such as, endpoint type, data payload length etc. and clear the corresponding bit in the skip register to trigger the execution of the descriptor. This is applicable to all three types of descriptors.



3.4.2 FT313H transfer scheduling

In comparison, the FT313H employs different methods for asynchronous transfers and periodic transfers.

3.4.2.1 Asynchronous transfers

The FT313H use two types of descriptors to schedule asynchronous transfers (control and bulk transfers), qHead and qTD. The former one represents an endpoint, and the latter one carries the actual payload. All qHeads must be linked as a looped linked list which starts from an offset indicated by ASYNCLISTADDR register.

After software enables the asynchronous traffic scheduling, the FT313H hardware will start to execute all the transfers described by the qHead and qTD.

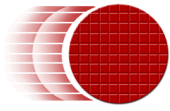
3.4.2.2 Periodic transfer

FT313H applies an array based method to schedule periodic transfer (interrupt and isochronous transfers).

A 256, 512 or 1024 double word array (configurable) starting at 4 Kbytes aligned address (recommend at address 0) is used to represent the time frames on the USB bus. The transfers which are scheduled at certain times will be indicated by the pointers stored in the corresponding element of the frame array. All these transfer requests that need to happen in the same frame will be linked together as a linked list.

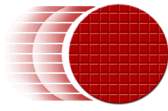
3.4.3 Interrupt processing

When one or more transfers scheduled are completed on the USB bus, both FT313H and ISP1763 will generate an interrupt to notify software for further processing. However, the ISP1763 depends upon the PTD Done Map register to find out which PTD has been scheduled. In comparison, the FT313H reads out all the descriptors for FT313H built-in memory to find out which descriptor has been executed and needs further processing.



4 Summary

This document compares major functional differences between the ISP1763 and FT313H which are important for software development. This document is not a step by step guide for replacing the ISP1763 with the FT313H. However as the primary function of the two devices (USB2.0 Hi-Speed Host port) is the same and many of the IO interfaces are identical, it is very possible to convert a system with the ISP1763 to FT313H. Users are encouraged to further review the FT313H datasheet and AN_226 FT313H Programming Guide for more detailed information.



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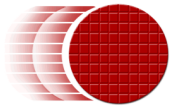
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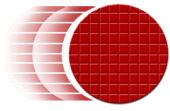
Appendix A – References

Document References

- [1] ST-Ericsson ISP1763 Datasheet
- [2] FT313H Programing Guide
- [3] Enhanced Host Controller Interface Specification for USB, Revision 1.0

Acronyms and Abbreviations

Terms	Description
USB	Universal Serial Bus
USB-IF	USB Implementers Forum
EHCI	Enhanced Host Controller Interface
HCD	Host Controller Driver



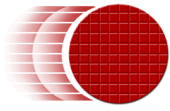
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Appendix C – Revision History

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1.0	Initial Release	2014-03-04