AN2488

maXTouch I2C/USB Bridge Boards

1.0 INTRODUCTION

Most maXTouch devices are designed to communicate with host systems using an I^2C interface, or occasionally an SPI bus. They may also provide a unidirectional SPI bus for output of debug data (refer to Application Note QTAN0050, *Using the maXTouch Debug Port*). However, PCs do not normally provide I^2C or SPI ports as standard.

To facilitate connection of maXTouch devices to PCs, Microchip has developed "bridge boards" that connect to the maXTouch device on one side and to a PC (over a USB link) on the other.

Over the years, there have been a number of different bridge boards (see Table 1). This document explains the differences between them and notes how they can best be used with maXTouch parts.

TABLE 1: MAXTOUCH BRIDGE BOARDS

Board	Brief Description
5016	Now obsolete
5030 (also known as 9206)	Upgraded 5016, now also obsolete
80146	Enhanced design with link-selectable external supply voltages
80195	Enhanced design with built-in level shifters, standard for Automotive products
D21	Additional circuitry for improved test coverage in a factory environment
HSBB	Much faster design with improved PC-to-Bridge as well as Bridge-to-maXTouch throughput

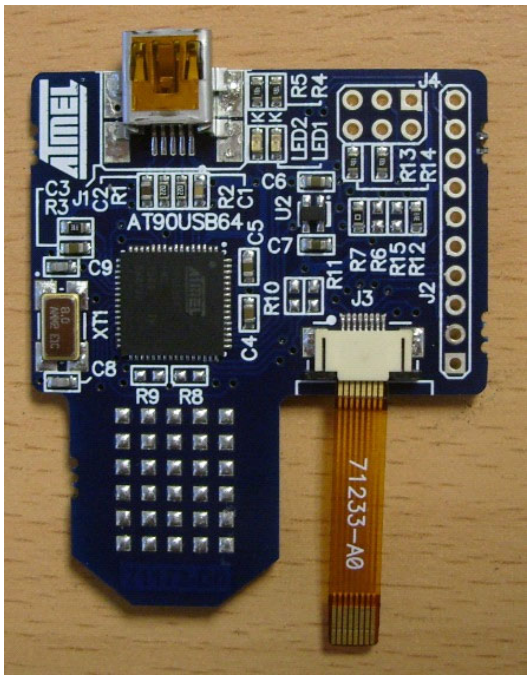
2.0 DETAILED DESCRIPTION

5030/9206

The 5030/9206 has been the standard bridge board for several years, but as of July 2015 is now obsolete. It is based on an AT90USB647 and provides an HID interface over USB to the host system and an I^2C master, by default at 200 kHz, but configurable to 100 kHz or 400 kHz.

It can also support SPI communications at moderate data rates (1 MHz or so). Note that maXTouch Studio allows you to connect two bridge boards: one for I^2C and one for SPI Debug communications.

It operates at 3.3V and connects to maXTouch systems operating at 3V or more. It can supply modest amount of 3V power (50 mA) to the maXTouch system.

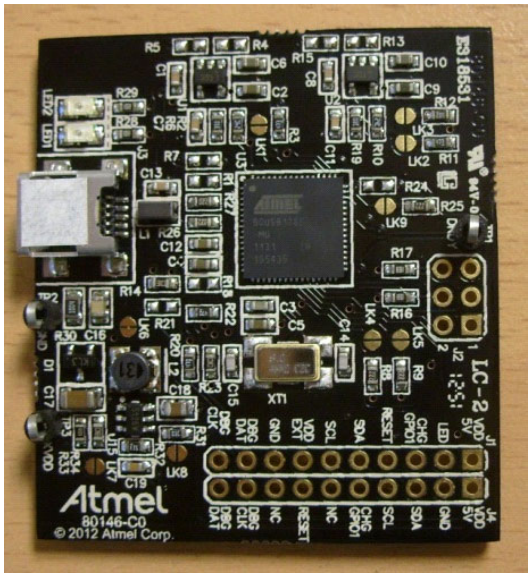


80146

The 80146 is an upgraded bridge board based on the AT90USB1286 chip and provides an HID interface over USB to the host system and an I^2C master, by default at 400 kHz.

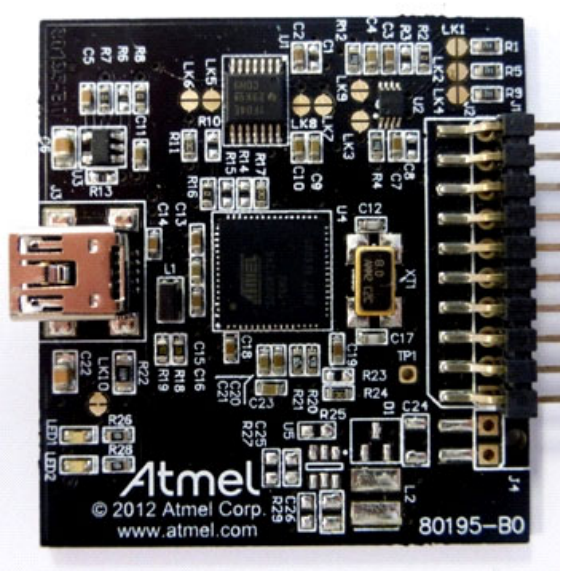
Like the 9206, it can also support SPI communications at moderate data rates (1 MHz or so). As an HID device, overall throughput is limited to 64 bytes/ms.

The advantage of this unit over the older bridge is that it can interface directly to customer systems operating with IO voltages as low as 1.8V and can supply power at 3.3V, 2.8V or 1.8V (link-selectable). It can also provide a high-voltage XVDD supply for use with S Series devices.



80195 (AUTOMOTIVE BRIDGE)

The 80195 is also based on the AT90USB1286 chip and similarly provides an HID interface over USB to the host system and an I^2C interface (plus DBG Clock and Data) to the maXTouch device. The form factor is designed for direct connection to the Automotive EVK boards in a modular fashion, rather than the previous practice of embedding bridge circuitry directly in the EVK PCB. Like the other HID-interface bridges, overall throughput is limited to 64 bytes/ms.

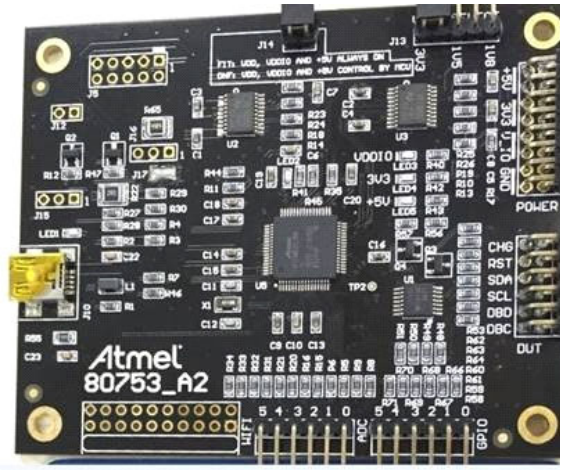


This unit can interface directly to customer systems with IO voltages of between 1.6V and 3.6V by the use of built-in level shifters for both Object-Based Protocol (I^2C) and DBG buses. It can also provide a high-voltage XVDD supply for use with S Series devices.

NOTE On the previous boards pin 7 of the 10-way header that connects to the target system is an *output* that may be used to supply the target IO. On the 80195, however, pin 7 is an *input* that must connect to the target IO supply to provide a reference voltage to the level shifters. Therefore when using an 80195 the target must have its own IO supply.

D21

The D21 is a factory-focused bridge board based on the Atmel SAMD21 chip. Like the AVR-based devices, it provides an HID interface over USB to the host system and an I^2C master to the maXTouch device. By default, this is at 400 kHz, but Fast-mode Plus at up to 1 MHz is also supported. It does not support SPI.



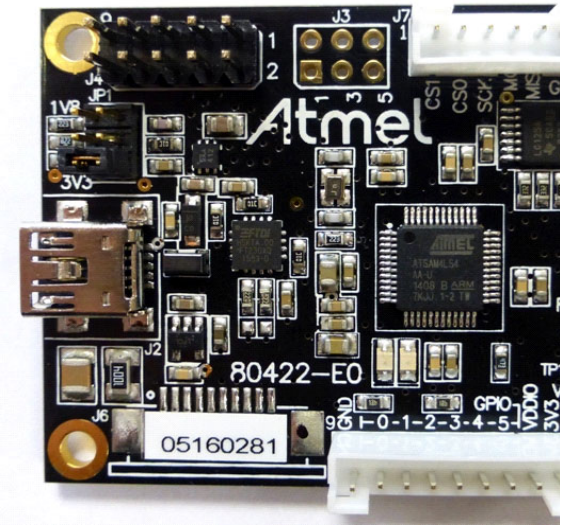
The advantage of the D21 unit is that it includes additional functionality for factory testing, such as monitoring the current drawn on the power rails and checking the voltage that the $\overline{\text{CHG}}$ line is being driven to. The factory “maXTouch Analyzer” software makes full use of this added functionality. The firmware in the board is optimized to minimize the factory test time (in combination with the MTA tool).

HSSB

The High-Speed Bridge Board (HSBB) is a major upgrade to Bridge Board capabilities to work with the latest generations of maXTouch devices, which have node counts and interface speeds far beyond those in use when the original HID-based bridge boards were designed.

The HSBB uses a SAM4L chip to provide both high-speed I^2C communications (1 MHz or more) and SPI communications (up to 7 MHz) to the maXTouch chip, with “backhaul” data rates to the PC of up to 3 MHz. To achieve these speeds, the HSBB uses an FTDI chip to establish a virtual COM port connection over the USB bus instead of the HID interface. This does mean that it needs to use a different Bridge Client with maXTouch Studio than the other boards, and requires installation of a FTDI Windows device driver, but otherwise operation with maXTouch Studio is the same as other bridges.

The HSBB can interface directly to customer systems operating with IO voltages as low as 1.8V and can supply IO power at 3.3V, 2.7V or 1.8V (link-selectable).



3.0 RECOMMENDATIONS

3.1 Legacy Devices

Pretty much any bridge board will work successfully with older (E and S series) parts, but the 80146 bridge is recommended for new purchases or, alternatively, the HSBB for future-proofing a customer's investment.

3.2 Automotive Devices

For T series parts, the EVK boards are specifically designed to work with the 80195 board. However, better performance will be gained by using an HSBB instead, especially for SPI interface designs.

3.3 Factory Test

The D21 is specifically designed for factory test usage. The only reason not to use it would be designs using an SPI interface.

3.4 Future and SPI Devices

For the future, the HSBB will gradually become the standard part, due to its much better throughput. However, a few features, such as reflashing over SPI, are still in development.

3.5 Comparison Chart

Feature	80146	80195	D21	HSBB
I^2C interface	Yes (400 kHz)	Yes (400 kHz)	Yes (1 MHz)	Yes (1 MHz plus)
SPI interface	Yes (1 MHz)	No	No	Yes (6 MHz)
SPI Debug interface	Yes (1 MHz)	Yes (1 MHz)	Yes (1 MHz)	Yes (6 MHz)
PC Interface type	HID	HID	HID	Virtual COM
PC Interface speed	512 kbps	512 kbps	512 kbps	2 Mbps plus
IO voltage	Link-selectable 1.8V, 2.8V, 3.3V	Built-in level shifters 1.6V to 3.6V		Link-selectable 1.8V, 2.7V, 3.3V
Purpose	Legacy devices	Automotive (I^2C)	Factory test (ADCs etc)	Automotive (SPI) High throughput

Note: The 5030/9206 board is not listed as it is now obsolete

APPENDIX A: REVISION HISTORY

Revision A (June 2017)

Initial edition

Note the following details of the code protection feature on Microchip devices:

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