

Class Description

This application note describes the class *Tsc2046* for a *Texas Instruments TSC2046* using *Hpe[®]_JTAG*, a cost efficient boundary scan tool for interactive and automated PCB and IC debugging. An example python application for testing the *Texas Instruments TSC2046* is provided in the same python module, *Texas_Instruments_TSC2046.py*, for this class located at `<Hpe®_JTAG installation dir>/HpeJTAG_DeviceLibrary/Devices/Displays`. The application example is based on the following *Gleichmann Electronics Research* Hardware:

Hpe_MIDiv2 with *HM_ALC* module plus the connected touchscreen *Hitachi TX18D16VM1CBB* and the *TX18D Adapter*.

The class *Tsc2046* has as base class the *Spi_basis*.

The *Tsc2046* class provides methods for reading out the X, Y, Z1 and Z2 position of the connected touchscreen.

Functional block diagram of the *Texas Instruments TSC2046*

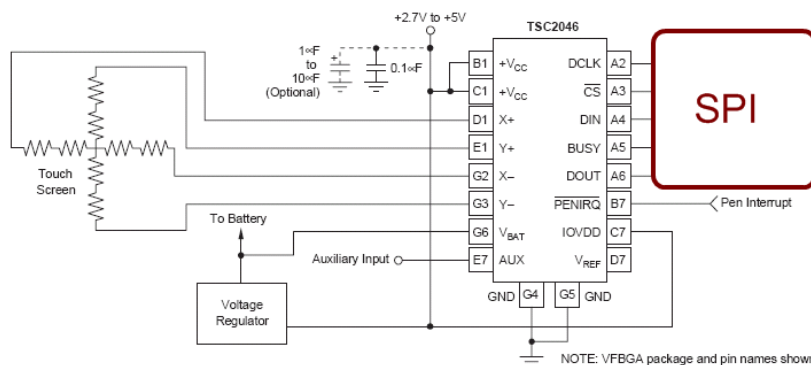


Figure 1: Functional block diagram [1]

The class variables are connected as following:

- self.din = DIN
- self.dout = DOUT
- self.dclk = DCLK
- self.cen = \overline{CE}
- self.busy = BUSY
- self.penirq = \overline{PE}/IRQ

This is the so called Serial Peripheral Interface (SPI)

Constructor `__init__`:

The parameter `jtag` must be an already initialized `jtag-chain`.

The parameter `jtagdevice_idx` is the position of the device in the `jtag-chain` where the Nand-Flash is connected to.

public method `setVerbose()`:

Extra Information will be displayed if the `verbose` parameter is set to `True`. The default-value is `False`

public method `printName()`:

The name of the *Texas Instruments TSC2046* device and its Revision Information will be displayed

public method `readXYZ1Z2()`:

This method is for reading out the X, Y, Z1, Z2 Position. Only one of these four possibilities can be read at any given time.

Figure 2 shows the timing diagram of the *Texas Instruments TSC2046* device, which is also used for this method.

The used *Texas Instruments TSC2046* device mounted on the *Hpe_MIDIV2* baseboard is used in the differential input mode. When the *Texas Instruments TSC2046* is used in this mode only the in figure 3 shown Addresses are possible.

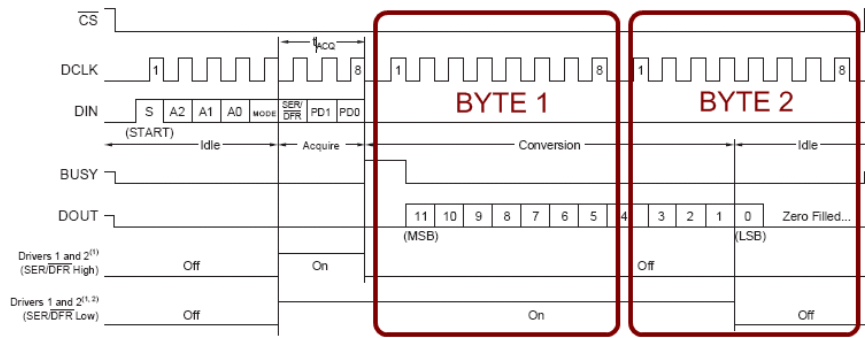


Figure 2: Timing diagram of the Texas Instruments TSC2046 [1]

A2	A1	A0	+REF	-REF	Y-	X+	Y+	Y-POSITION	X-POSITION	Z1-POSITION	Z2-POSITION	DRIVERS
0	0	1	Y+	Y-		+IN		Measure				Y+, Y-
0	1	1	Y+	X-		+IN				Measure		Y+, X-
1	0	0	Y+	X-	+IN						Measure	Y+, X-
1	0	1	X+	X-			+IN		Measure			X+, X-

Figure 3: Available addresses of the Texas Instruments TSC2046 when used in differential input mode [1]

public method read():

This method reads the X, Y, Z1 and Z2 position at once.

Execution with Hpe[®]_JTAG

Preparation

The Hpe_MIDiv2 with a HM_ALC module (see figure 4) and the Hitachi TX18D16VM1CBB connected to the TX18D Adapter are needed for the execution of the example application with name `jtag_test_TSC2046_0()` found in the `Texas_Instruments_TSC2046.py` module.

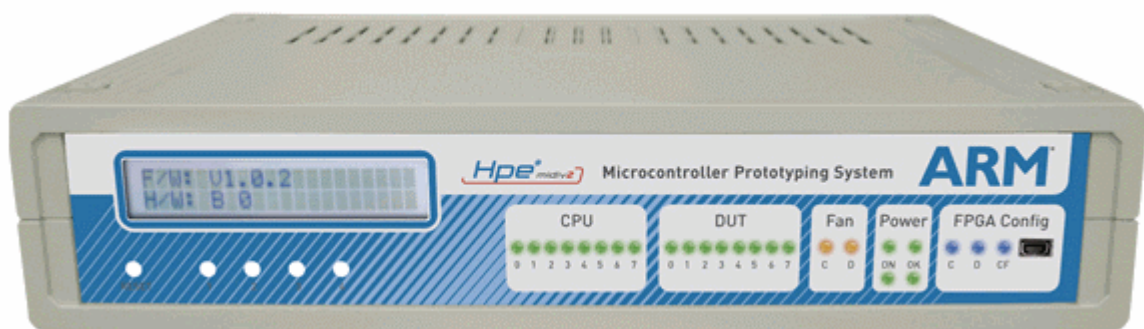


Figure 4: HM-ALC

Connect an USB-Mini cable, start the Hpe[®]_JTAG tool and press initialize ALTERA_INTERFACE (result of this action is shown in figure 5).

The `Texas_Instruments_TSC2046.py` script can be started in two ways. Method One is by choosing *Execute Python Script...* under Hpe[®]_JTAG's *Automation* Menu item; and browsing to the script's location `<Hpe®_JTAG installation dir>/HpeJTAG_DeviceLibrary/Devices/Display` and selecting the module in question. Method Two is by choosing the *Execute Device Library Script* option from Hpe[®]_JTAG's *JTAG* Menu Item and then navigating to the script's location and selecting it. In case Hpe[®]_JTAG's Python Shell is not visible, then it first needs to be enabled by choosing the *JTAG* option from Hpe[®]_JTAG's *Window* Menu item.

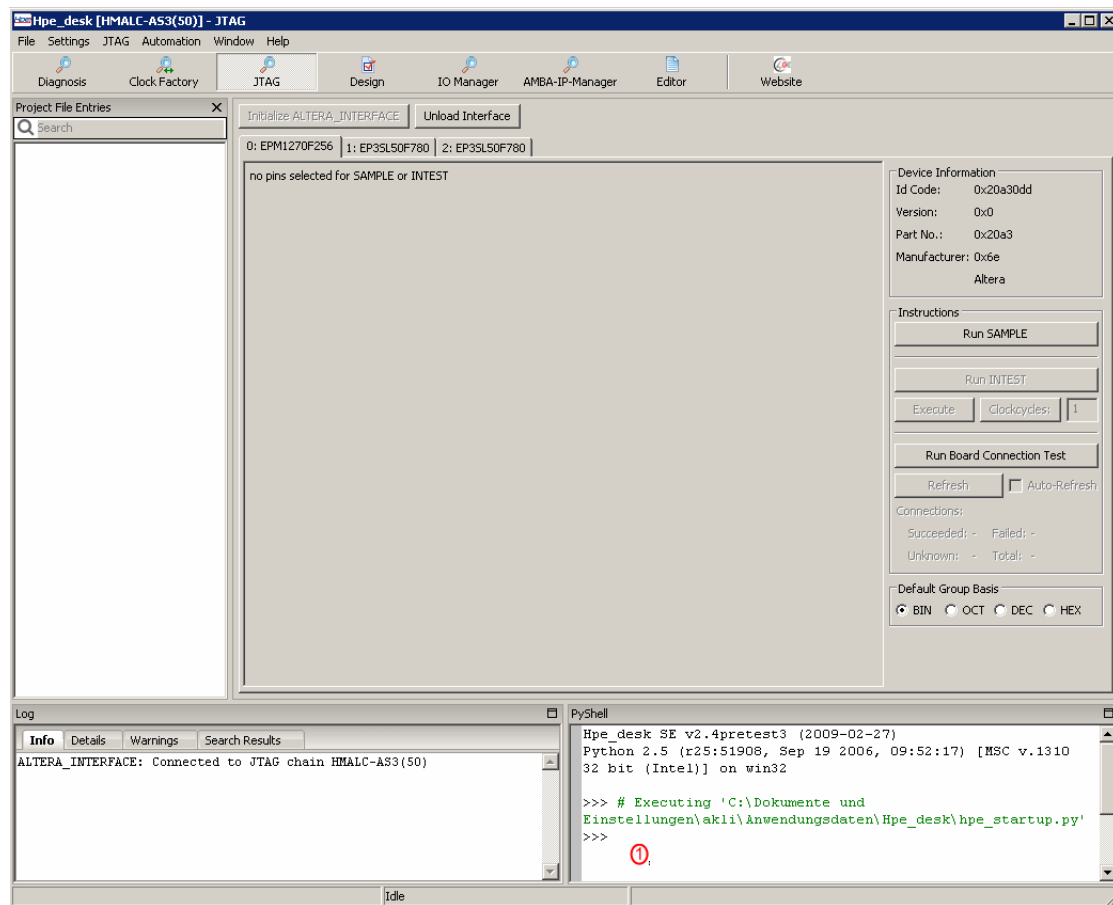


Figure 5: Hpe®_JTAG

The result will be displayed in the Log-Window (left from PyShell in the Hpe®_JTAG tool) and should look like this:

```
ALTERA_INTERFACE: Connected to JTAG chain HMALC-AS3(50)
Prepared for board: ALC-AS3
Texas Instruments TSC2046 Rev. G
```

```
Please press in the middle of the touchscreen
TSC2046 mode: 12-bit
X-Position: 928
Y-Position: 976
Z1-Position: 1
Z2-Position: 2033
```

Please press in the top left corner of the touchscreen

TSC2046 mode: 12-bit
X-Position: 1840
Y-Position: 1680
Z1-Position: 1280
Z2-Position: 1921

Please press in the bottom left corner of the touchscreen
TSC2046 mode: 12-bit
X-Position: 112
Y-Position: 1696
Z1-Position: 192
Z2-Position: 1793

Please press in the bottom right corner of the touchscreen
TSC2046 mode: 12-bit
X-Position: 161
Y-Position: 256
Z1-Position: 176
Z2-Position: 1201

Please press in the top right corner of the touchscreen
TSC2046 mode: 12-bit
X-Position: 1873
Y-Position: 336
Z1-Position: 1041
Z2-Position: 1601
End of Touchscreen Test

Revision History

Version 1.0:	Initial Version
Version 1.1:	Adapted for <i>HpeJTAG_DeviceLibrary</i>

Bibliography

- [1] Texas Instruments. Low-voltage i/o touch screen controller. <http://www.ti.com/lit/gpn/tsc2046>, October 2002.
- [2] Gleichmann Electronics Research. *AN-1-004*: Execute some functions of the class *Tsc2046*. <http://www.ge-research.com/downloads.html>, April 2009.

Disclaimer

Disclaimer. The information in this document is provided in connection with Gleichmann Electronics Research (GE Research) products. GE Research makes no representations or warranties with respect to the accuracy or completeness of the document and reserves the right to make changes to specification and product description at any time without notice. GE Research does not accept any liability to the accuracy of the design completed by the developer, whether original design, copied from schematics and/or application notes, supplied by GE Research and/or otherwise. The final circuit integrity and testing is solely the responsibility of the design authority. GE Research accepts no responsibility and/or liability.

This document includes links to both internal (GE Research) and external (non-GE Research) websites to support the users of GE Research products. External links are selected and reviewed whenever a new set of CD/DVD or manuals is published. However, GE Research is not responsible for the content of external websites. Furthermore, GE Research is not responsible for changes made to the products and datasheets that are used in the GE Research product.

If you have any improvements and/or suggestions concerning this manual, please feel free to let us know.

AppNote: TI TSC2046

Alfred Klingesberger

Copyright Notice

This document is copyrighted, 2009-2011, by Gleichmann Electronics Research (Austria) GmbH & Co KG. All rights are reserved. Gleichmann Electronics Research (Austria) GmbH & Co KG reserves the right to make improvements to the products described in this manual at any time without notice. No part of this manual may be reproduced, copied, translated or transmitted in any form or by any means without the prior written permission of Gleichmann Electronics Research (Austria) GmbH & Co KG. Information provided in this manual is intended to be accurate and reliable. However, Gleichmann Electronics Research (Austria) GmbH & Co KG assumes no responsibility for its use, nor for any infringements upon the rights of third parties which may result from its use.