

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 script for testing the *Texas Instruments TSC2046* is provided in the same directory where the python module for this class will be found (`<Hpe®_JTAG install directory>/scripts/JTAG/JtagExampleLib/SpiDevices/TouchCtrlTsc2046.py`). 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* provides methods for reading out the X, Y, Z1 and Z2 position of the connected touchscreen.

Functional block diagram of the *Texas Instruments TSC2046*

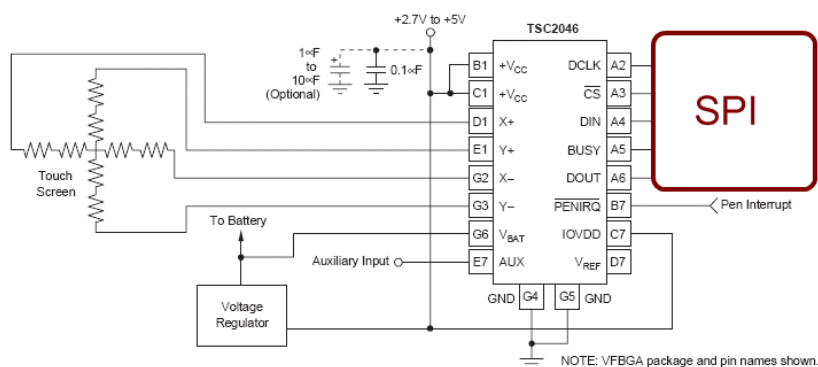


Figure 1: Functional block diagram [1]

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` 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 paramter is set to True. The default-value is False

public method `printName()`:

The name of the *Texas Instruments TSC2046* and the Revision 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 once.

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

The used *Texas Instruments TSC2046* 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.

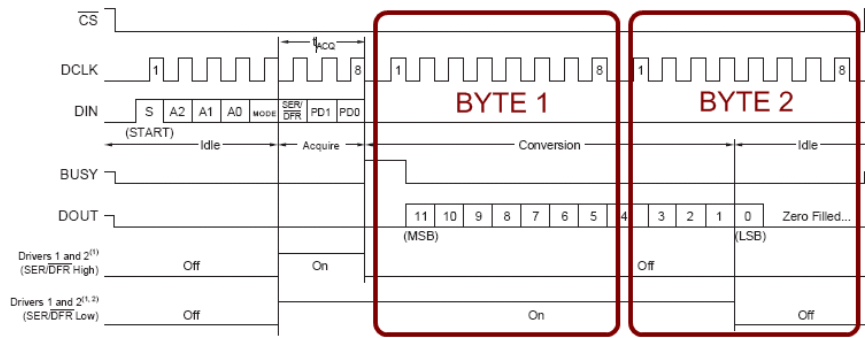


Figure 2: Timing diagram of the Texas Instruments TSC2046 [1]

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.

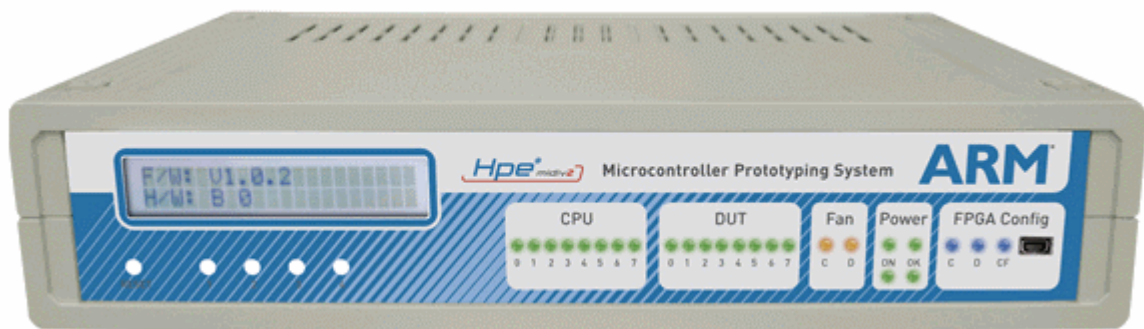


Figure 4: HM-ALC

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

Manual execution of the described *Texas Instruments TSC2046* methods with the *Hpe®_JTAG*

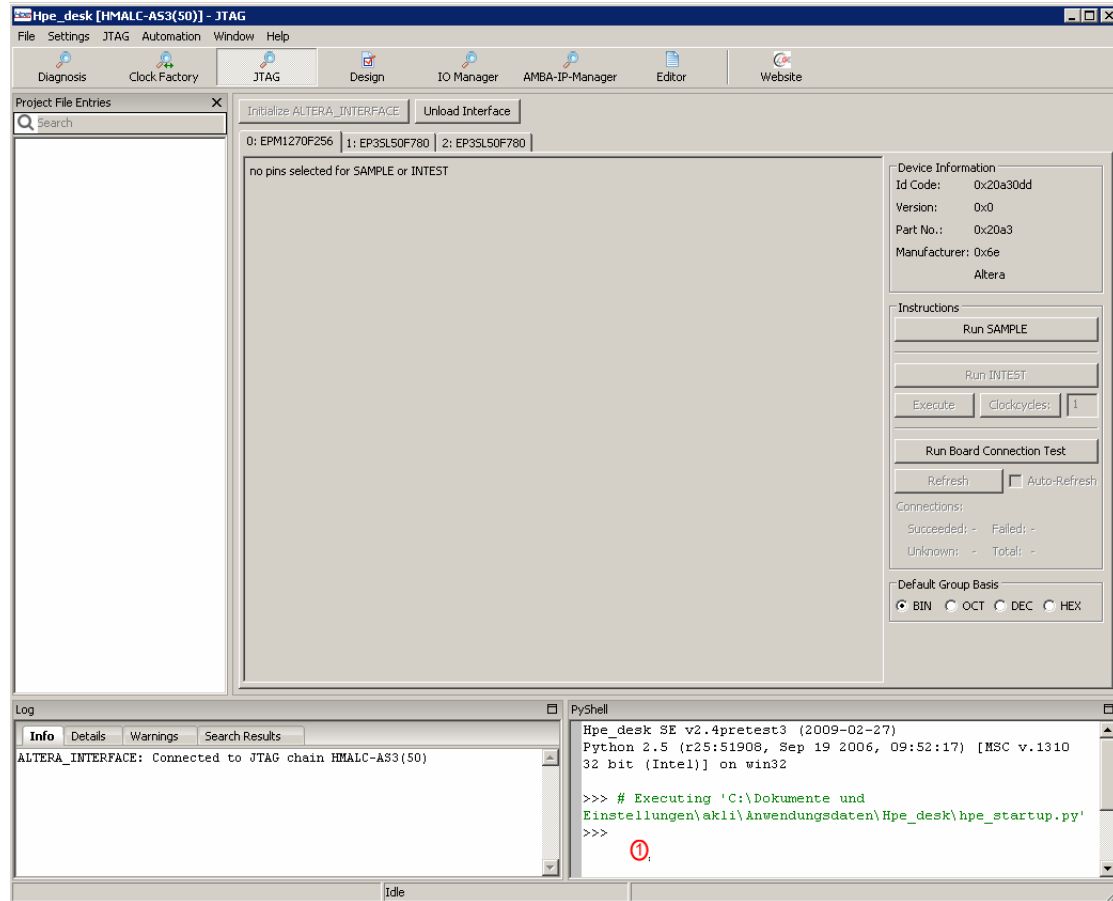


Figure 5: Hpe®_JTAG

[Select the `execute_tsc2046.py`-file
 (<Hpe®_JTAG install directory>/scripts/JTAG/JtagExampleLib/SpiDevices)
 where the before described methods of the class *Tsc2046* will be executed.

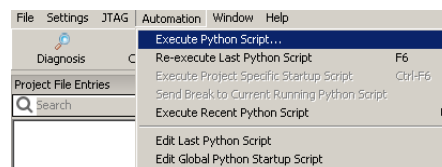


Figure 6: Specify `execute_tsc2046.py`-file

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 left top corner of the touchscreen
TSC2046 mode: 12-bit
X-Position: 1840
Y-Position: 1680
Z1-Position: 1280
Z2-Position: 1921
```

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

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

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

The pin assignment must be done in the `execute_tsc2046.py`-file. This file has in the principle the same structure as shown in the App-Note *AN-1-004* [2].

Revision History

Version 1.0: Initial Version

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.

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