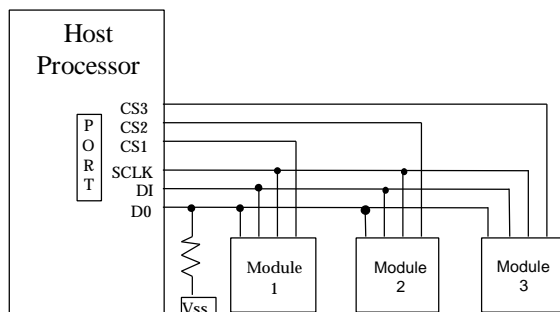# Atmodule
Four-Wire Serial Interface
Specification

GENERAL DESCRIPTION

The Atmodule four-wire serial interface is a microwire type synchronous serial interface. Multiple modules can be placed on the same bus with an individual chip-select (CS) line per module. The data-out line (DO) is tristated when the module is not selected. A 20 K ohm pull-down resistor is required on the data-out line. The input data word and the output data words are 16 bits long. The most significant bit of the output data word is the end-of-conversion bit and is always a one. To select the module the chip-select line is brought low. The conversion in progress is finished. The data line is driven, and the end of conversion bit (D15) is output. The module is now ready to receive and transmit data. The 16-bit input word is clocked into the module while the 16-bit output word is read from the module. The output data word is the result of the **previous** command. The data-in line is read on the rising edge of the serial clock (SCLK) line. The data out line changes state on the falling edge of the serial clock line. The input command is executed when the chip-select line is brought high. The command result is read on the next module access.

OUTPUT DATA FORMAT

The output data word is 16 bits long. The data is clocked out of the module from most significant to least significant bit. Data bit D15, the most significant bit, is the end-of-conversion bit and is always a one. Data bit D14 is the sign bit for the output magnitude.

$\qquad$ 0 = positive $\quad$ 1 = negative

Data bits D13 through D0 contain the magnitude.

$\qquad$ Magnitude = 0 to 16383

```
(D15        D8)(D7        D0)
(1 x x x x x x x)(x x x x x x x x)
(E S |------ Magnitude ---------|)
```

E = End of conversion bit

S = Sign bit

INPUT DATA FORMAT
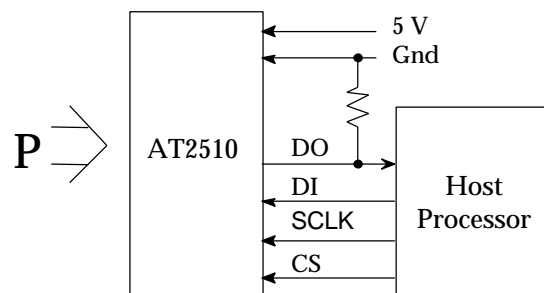
The input data word is 16 bits long.

The data is clocked into the module most significant to least significant bit.

Data bit D15 through D8 contain the command.

Data bits D7 through D0 contain the command option.

```
(D15        D8) (D7        D0)
(x x x x x x x x) (x x x x x x x x)
 |---Command---|   |----Option-----|
```

Multi-Module Connection

4-Wire Connection

AT2510 Pressure Module Commands

	Command	Command Data	Binary Command Word
Measure the applied pressure and return the pressure value	0	0	(00000000)(00000000)
Return average pressure value	1	0	(00000001)(00000000)
Return the serial number	6	0	(00000110)(00000000)

AT3500 Series Tilt Module Commands

	Command	Command Data	Binary Command Word
Measure the X and Y axis tilt and return the status.	0	0	(00000000)(00000000)
Return x axis tilt value	1	0	(00000001)(00000000)
Return y axis tilt value	2	0	(00000010)(00000000)
Return the serial number	6	0	(00000110)(00000000)

Four-Wire Data Timing Diagram
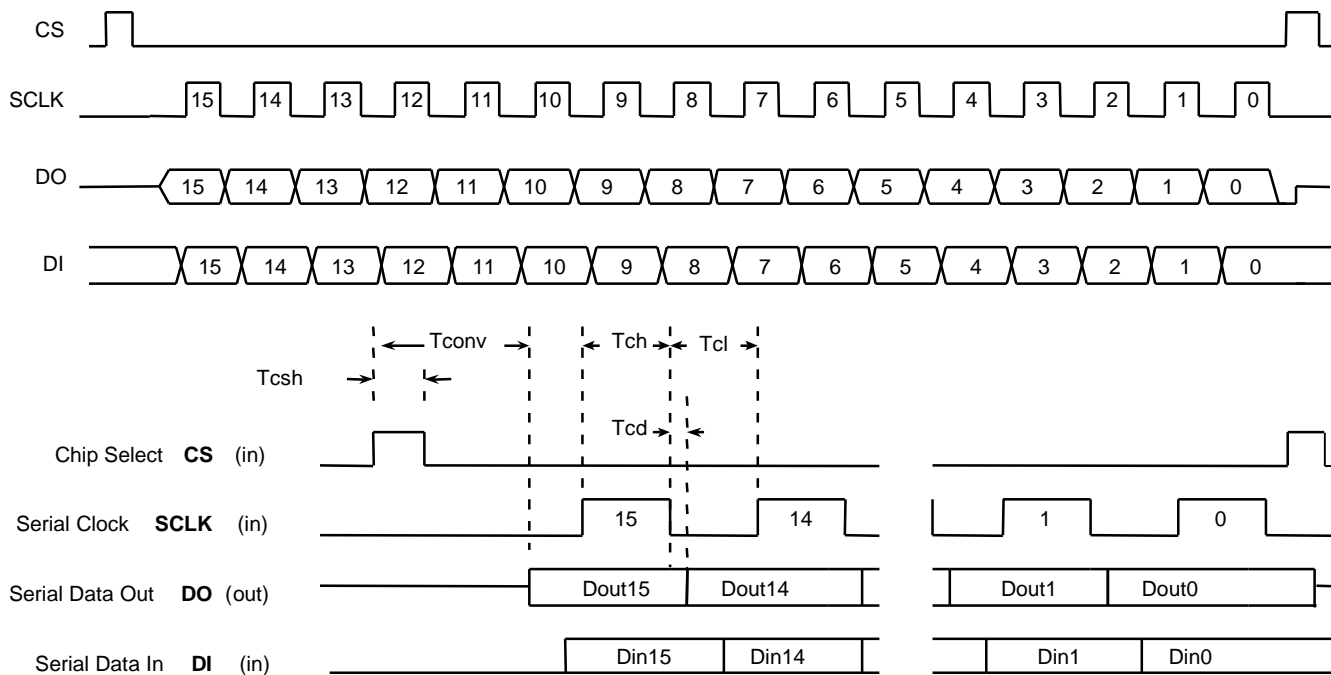
I/O Timing

Parameter	Description	Minimum	Typical	Maximum
Tconv	AT2510 pressure conversion		220 mS	300 mS
Tconv	AT3500 tilt , x or y axis tilt conversion		110 mS	250 mS
Tconv	Read module serial number or average value	1.0 mS	2.0 mS	3.0 mS
Tcsh	Chip select high time	50 μS		Tconv
Tch	Serial data clock high time	28 μS		
Tcl	Serial data clock low time	28 μS		
Tcsdr	Chip select high to date line tristate		14 μS	
Tcd	Serial data clock low to data valid time	4 μS	15 μS	28 μS