up_apb3.v

AUTHORS

JAY CONVERTINO

DATES

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INFORMATION

Brief

APB3 slave to uP interface

License MIT

up_apb3

```
module up_apb3 #(
parameter
ADDRESS_WIDTH
  =
16,
parameter
BUS_WIDTH
  =
4
) ( input clk, input rstn, input [ADDRESS_WIDTH-1:0] s_apb_paddr, input [0:0
```

APB3 slave to uP interface

Parameters

ADDRESS_WIDTH parameter	Width of the APB3 address port in bits.
BUS_WIDTH parameter	Width of the APB3 bus data port in bytes.

Ports

clk	Clock
rstn	negative reset
s_apb_paddr	APB3 address bus, up to 32 bits wide.
s_apb_psel	APB3 select per slave (1 for this core).
s_apb_penable	APB3 enable device for multiple transfers after first.
s_apb_pready	APB3 ready is a output from the slave to indicate its able to process the request.
s_apb_pwrite	APB3 Direction signal, active high is a write access. Active low is a read access.
s_apb_pwdata	APB3 write data port.
s_apb_prdata	APB3 read data port.
s_apb_pslverror	APB3 error indicates transfer failure, not implimented.
up_rreq	uP bus read request
up_rack	uP bus read ack
up_raddr	uP bus read address
up_rdata	uP bus read data
up_wreq	uP bus write request
up_wack	uP bus write ack
up_waddr	uP bus write address
up_wdata	uP bus write data

VARIABLES

valid

```
assign valid = s_apb_psel & s_apb_penable & rstn
```

This will add an extra clock cycle. since enable happens after select. both are needed to use the device.

s_apb_pslverror

```
assign s_apb_pslverror = 1'b0
```

APB3 error is always 0, no error.

up_waddr

```
assign up_waddr = s_apb_paddr[ADDRESS_WIDTH-1:shift]
```

up_waddr and s_apb_addr are a direct mapping.

up_waddr

up_raddr and s_apb_addr are a direct mapping.

up_wdata

```
assign up_wdata = s_apb_pwdata
```

up_wdata and s_apb_pwdata are a direct mapping.

s_apb_prdata

```
assign s_apb_prdata = up_rdata
```

s_apb_prdata and up_rdata are a direct mapping.

up_wreq

```
assign up_wreq = valid & s_apb_pwrite
```

uP write request is a combination of the APB3 valid and APB3 write select (active high is write).

up_rreq

```
assign up_rreq = valid & ~s_apb_pwrite
```

uP read request is a combination of the APB3 valid and APB3 write select (active low is read).

s_apb_pready

```
assign s_apb_pready = (
                                                    up_wack |

up_rack |
                                                           ~

valid
) & rstn
```

Diagrams seem to indicate that we should indicate ready when not sel and enable, which is why valid is complimented.