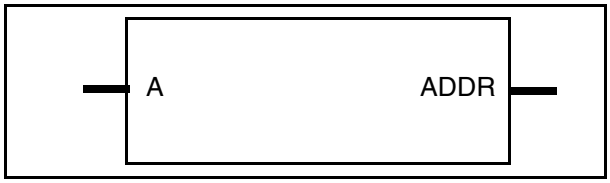
DW01_binenc

Binary Encoder

Version, STAR and Download Information: IP Directory

Features and Benefits

- Parameterized word length
- Inferable using a function call



Description

DW01_binenc encodes the input port A to a binary value on output port ADDR. The encoded value of A is determined by the bit position of the least significant '1' bit. All bits on A higher than the least significant '1' bit are don't care.

The acceptable values for *ADDR_width* are greater than or equal to ceil($\log_2$[*A_width*]), as described in Table 1-2. However, the recommended value for *ADDR_width* is ceil($\log_2$[*A_width*+1]). With this value, the output ADDR can cover all the possible legal values. Note that if *ADDR_width* is equal to ceil($\log_2$[*A_width*]) with A_*width* greater than 1, all 0's on pin A would result in the same ADDR output value as when there is a single '1' bit on pin A (one-hot encoding) and that '1' is also in the most significant bit position.

Table 1-1 Pin Description

Pin Name	Width	Direction	Function
A	*A_width*	Input	Input data
ADDR	*ADDR_width*	Output	Binary encoded output data

Table 1-2 Parameter Description

Parameter	Values	Description
A_width	≥ 1	Word length of input A
ADDR_width	≥ ceil($\log_2$[*A_width*])	Word length of output ADDR

Table 1-3 Synthesis Implementations

Implementation Name	Function	License Feature Required
str	Synthesis model	DesignWare
cla[a]	Synthesis model	DesignWare
aot	Synthesis model	DesignWare

a. The ‘cla’ implementation is only available when *A_width* ≤ 512.

Table 1-4 Simulation Models

Model	Function
DW01.DW01_BINENC_CFG_SIM	Design unit name for VHDL simulation
dw/dw01/src/DW01_binenc_sim.vhd	VHDL simulation model source code
dw/sim_ver/DW01_binenc.v	Verilog simulation model source code

Table 1-5 Truth Table (*A_width* = 8, *ADDR_width* = 4)

A(7)	A(6)	A(5)	A(4)	A(3)	A(2)	A(1)	A(0)	ADDR(3:0)
X	X	X	X	X	X	X	1	0000
X	X	X	X	X	X	1	0	0001
X	X	X	X	X	1	0	0	0010
X	X	X	X	1	0	0	0	0011
X	X	X	1	0	0	0	0	0100
X	X	1	0	0	0	0	0	0101
X	1	0	0	0	0	0	0	0110
1	0	0	0	0	0	0	0	0111
0	0	0	0	0	0	0	0	1111

Related Topics

- Logic – Combinational Overview
- DesignWare Building Block IP Documentation Overview

HDL Usage Through Function Inferencing - VHDL

```
library IEEE,DWARE;
use IEEE.std_logic_1164.all;
use IEEE.std_logic_arith.all;
use DWARE.DW_foundation_arith.all;

entity DW01_binenc_func is
  generic(func_A_width :integer := 8;func_ADDR_width : integer := 4);
  port(func_A: in std_logic_vector(func_A_width-1 downto 0);
       ADDR_func_TC : out std_logic_vector(func_ADDR_width-1 downto 0);
       ADDR_func_UNS : out std_logic_vector(func_ADDR_width-1 downto 0);
       ADDR_func : out std_logic_vector(func_ADDR_width-1 downto 0));
end DW01_binenc_func;

architecture func of DW01_binenc_func is

begin
  ADDR_func_TC  <= std_logic_vector(DWF_binenc(SIGNED(func_A),
                                    func_ADDR_width));
  ADDR_func_UNS <= std_logic_vector(DWF_binenc(UNSIGNED(func_A),
                                    func_ADDR_width));
  ADDR_func     <= DWF_binenc(func_A,func_ADDR_width);

end func;
```

HDL Usage Through Function Inferencing - Verilog

```
module DW01_binenc_func (func_A,ADDR_func);
  parameter func_A_width = 8;
  parameter func_ADDR_width = 4;

  // Passes the widths to the binary encoder function
  parameter A_width = func_A_width;
  parameter ADDR_width = func_ADDR_width;

  // Please add search_path = search_path + {synopsys_root + "/dw/sim_ver"}
  // to your .synopsys_dc.setup file (for synthesis) and add
  // +incdir+$SYNOPSYS/dw/sim_ver+ to your verilog simulator command line
  // (for simulation).
  `include "DW01_binenc_function.inc"

  input [func_A_width-1:0] func_A;
  output [func_ADDR_width-1:0] ADDR_func;
  assign ADDR_func = DWF_binenc(func_A);
endmodule
```

HDL Usage Through Component Instantiation - VHDL

```
library IEEE,DWARE,DWARE;
use IEEE.std_logic_1164.all;
use DWARE.DWpackages.all;
use DWARE.DW_foundation_comp.all;

entity DW01_binenc_inst is
  generic (inst_A_width    : POSITIVE := 8;
           inst_ADDR_width : POSITIVE := 4);
  port (inst_A    : in  std_logic_vector(inst_A_width-1 downto 0);
        ADDR_inst : out std_logic_vector(inst_ADDR_width-1 downto 0));
end DW01_binenc_inst;

architecture inst of DW01_binenc_inst is
begin
  -- Instance of DW01_binenc
  U1 : DW01_binenc
    generic map ( A_width => inst_A_width, ADDR_width => inst_ADDR_width )
    port map ( A => inst_A, ADDR => ADDR_inst );
end inst;

-- pragma translate_off
configuration DW01_binenc_inst_cfg_inst of DW01_binenc_inst is
  for inst
  end for; -- inst
end DW01_binenc_inst_cfg_inst;
-- pragma translate_on
```

HDL Usage Through Component Instantiation - Verilog

```
module DW01_binenc_inst( inst_A, ADDR_inst );
  parameter A_width = 8;
  parameter ADDR_width = 4;

  input [A_width-1 : 0] inst_A;
  output [ADDR_width-1 : 0] ADDR_inst;

  // Instance of DW01_binenc
  DW01_binenc #(A_width, ADDR_width)
    U1 ( .A(inst_A), .ADDR(ADDR_inst) );

endmodule
```

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