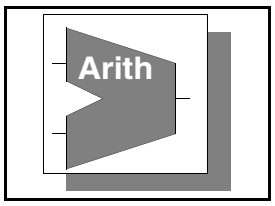
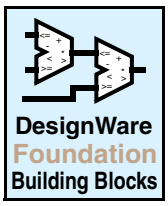


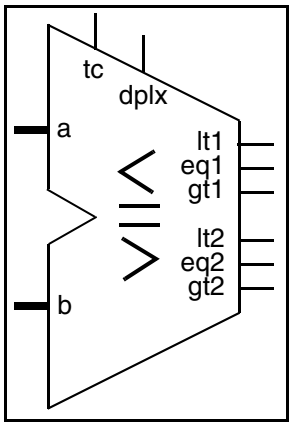


DW_cmp_dx

Duplex Comparator

Version, STAR and Download Information: IP Directory

Features and Benefits



- Selectable single full width Compare, or two smaller width Compare operations (duplex)
- Selectable number system (unsigned or two's complement)
- Parameterized full word width
- Parameterized partial word width (allowing for asymmetric partial width operations)
- Separate flags for Less Than, Equal To, and Greater Than
- Two sets of flags for duplex operation

Description

The DW_cmp_dx compares operands `a` and `b` as either:

- A single comparison of *width* bits (simplex mode [`dplx` is 0]), or
- Two comparisons: one of *p1_width* (least significant) bits and one of (*width–p1_width*) (most significant) bits (duplex mode [`dplx` is 1]).

Table 1-1 Pin Description

Pin Name	Width	Direction	Function
a	*width* bit(s)	Input	Input data
b	*width* bit(s)	Input	Input data
tc	1 bit	Input	Two's complement control
dplx	1 bit	Input	Duplex mode select (active high)
lt1	1 bit	Output	Part1 : less-than output condition
eq1	1 bit	Output	Part1 : equal output condition
gt1	1 bit	Output	Part1 : greater-than output condition
lt2	1 bit	Output	Full width or part2 : less-than output condition
eq2	1 bit	Output	Full width or part2 : equal output condition
gt2	1 bit	Output	Full width or part2 : greater-than output condition

Table 1-2 Parameter Description

Parameter	Values	Description
width	≥ 4	Word width of a and b
p1_width	2 to *width*–2	Word width of part1 of duplex compare

Table 1-3 Synthesis Implementations[a]

Implementation Name	Function	License Feature Required
rpl	Ripple carry synthesis model	DesignWare
bk	Brent-Kung synthesis model	DesignWare

a. During synthesis, Design Compiler will select the appropriate architecture for your constraints. However, you may force Design Compiler to use any architectures described in this table. For more, see *DesignWare Building Block IP User Guide*

Table 1-4 Simulation Models

Model	Function
DW01.DW_CMP_DX_CFG_SIM	Design unit name for VHDL simulation
dw/dw01/src/DW_cmp_dx_sim.vhd	VHDL simulation model source code
dw/sim_ver/DW_cmp_dx.v	Verilog simulation model source code

Block Diagram

The control signal `tc` determines whether the input data is interpreted as unsigned (`tc` is 0) or signed (`tc` is 1) numbers. Figure 1-1 shows a functional block diagram of DW_cmp_dx.

Figure 1-1 Functional Block Diagram

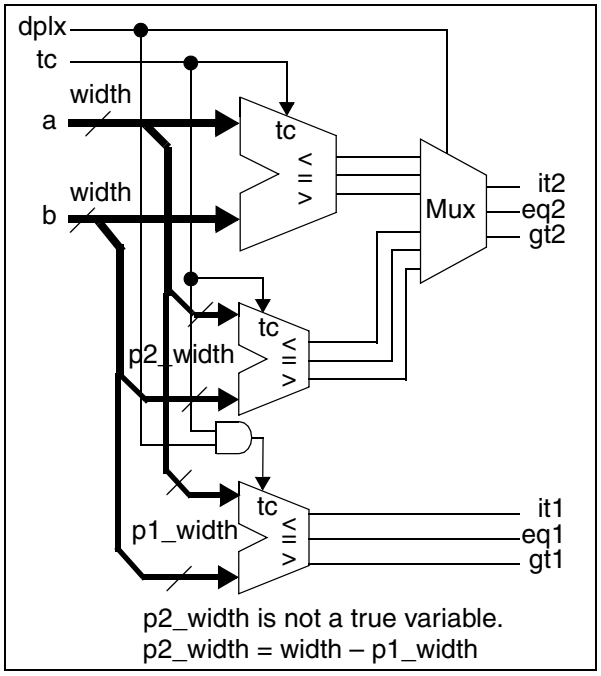


Table 1-5 Operating Modes

dplx	tc	Function
0	0	Simplex unsigned compare operation:[a] lt2 is 1 when a is less than b eq2 is 1 when a is equal to b gt2 is 1 when a is greater than b
0	1	Simplex signed compare operation:[a] lt2 is 1 when a is less than b eq2 is 1 when a is equal to b gt2 is 1 when a is greater than b
1	0	Duplex unsigned compare operation: lt2 is 1 when part2 a is less than part2 b eq2 is 1 when part2 a is equal to part2 b gt2 is 1 when part2 a is greater than part2 b lt1 is 1 when part1 a is less than part1 b eq1 is 1 when part1 a is equal to part1 b gt1 is 1 when part1 a is greater than part1 b

Table 1-5 Operating Modes (Continued)

dplx	tc	Function
1	1	Duplex signed compare operation: lt2 is 1 when part2 a is less than part2 b eq2 is 1 when part2 a is equal to part2 b gt2 is 1 when part2 a is greater than part2 b lt1 is 1 when part1 a is less than part1 b eq1 is 1 when part1 a is equal to part1 b gt1 is 1 when part1 a is greater than part1 b

a. The output values of lt1, eq1, and gt1 in the simplex modes are “don’t care.”

Related Topics

- Math – Arithmetic Overview
- DesignWare Building Block IP Documentation Overview

HDL Usage Through Component Instantiation - VHDL

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

entity DW_cmp_dx_inst is
  generic ( inst_width    : NATURAL := 24;
            inst_p1_width : NATURAL := 16 );
  port ( inst_a    : in std_logic_vector(inst_width-1 downto 0);
         inst_b    : in std_logic_vector(inst_width-1 downto 0);
         inst_tc   : in std_logic;
         inst_dplx : in std_logic;
         lt1_inst  : out std_logic;
         eq1_inst  : out std_logic;
         gt1_inst  : out std_logic;
         lt2_inst  : out std_logic;
         eq2_inst  : out std_logic;
         gt2_inst  : out std_logic );
end DW_cmp_dx_inst;

architecture inst of DW_cmp_dx_inst is
begin

  -- Instance of DW_cmp_dx
  U1 : DW_cmp_dx
    generic map ( width => inst_width, p1_width => inst_p1_width )
    port map ( a => inst_a, b => inst_b, tc => inst_tc, dplx => inst_dplx,
               lt1 => lt1_inst, eq1 => eq1_inst, gt1 => gt1_inst,
               lt2 => lt2_inst, eq2 => eq2_inst, gt2 => gt2_inst );
end inst;

-- pragma translate_off
configuration DW_cmp_dx_inst_cfg_inst of DW_cmp_dx_inst is
  for inst
  end for; -- inst
end DW_cmp_dx_inst_cfg_inst;
-- pragma translate_on
```

HDL Usage Through Component Instantiation - Verilog

```
module DW_cmp_dx_inst( inst_a, inst_b, inst_tc, inst_dplx, lt1_inst,
                       eq1_inst, gt1_inst, lt2_inst, eq2_inst, gt2_inst );

  parameter width = 24;
  parameter p1_width = 16;

  input [width-1 : 0] inst_a;
  input [width-1 : 0] inst_b;
  input inst_tc;
  input inst_dplx;
  output lt1_inst;
  output eq1_inst;
  output gt1_inst;
  output lt2_inst;
  output eq2_inst;
  output gt2_inst;

  // Instance of DW_cmp_dx
  DW_cmp_dx #(width, p1_width)
    U1 ( .a(inst_a), .b(inst_b), .tc(inst_tc), .dplx(inst_dplx),
         .lt1(lt1_inst), .eq1(eq1_inst), .gt1(gt1_inst),
         .lt2(lt2_inst), .eq2(eq2_inst), .gt2(gt2_inst) );
endmodule
```

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