

EXPLORER

BIN

- a.out
- andgate_test.v
- andgate.v
- andgatenor_test.v
- andgatenor.v
- full_adder_test.v
- full_adder.v
- half_adder_nand_t...
- half_adder_nand.v
- iverilog-vpi.exe
- iverilog.exe
- libbz2-1.dll
- libgcc_s_seh-1.dll
- libhistory8.dll
- libreadline8.dll
- libstdc++-6.dll
- libtermcap-0.dll
- libwinpthread-1.dll
- mux4x1_test.v
- mux4x1.v
- nandgate_test.v
- nandgate.v
- norgate_test.v
- norgate.v

OUTLINE

TIMELINE

```

1  include "andgate.v"
2
3  module testbench;
4      reg b,c,d;
5      wire out;
6
7      andgate and2(out,b,c,d);
8
9      initial begin;
10         b = 1'b0;
11         c = 1'b1;
12         d = 1'b1;
13         #5;
14         b = 1'b1;
15         c = 1'b1;
16         d = 1'b1;
17     end
18
19     initial
20         $monitor($time, " : b=%b c=%b d=%b out=%b", b, c, d, out);
21 endmodule
    
```

Windows PowerShell

Windows PowerShell
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Try the new cross-platform PowerShell <https://aka.ms/pscore6>

```

PS C:\iverilog\bin> iverilog andgate_test.v
PS C:\iverilog\bin> vvp a.out
                        0 : b=0 c=1 d=1 out=0
                        5 : b=1 c=1 d=1 out=1

PS C:\iverilog\bin>
    
```


EXPLORER

BIN

- libhistory8.dll
- libreadline8.dll
- libstdc++-6.dll
- libtermcap-0.dll
- libwinpthread-1.dll
- mux4x1_test.v
- mux4x1.v
- nandgate_test.v
- nandgate.v
- norgate_test.v
- norgate.v
- notgate_test.v
- notgate.v
- orgate_test.v
- orgate.v
- vvp.exe
- xnorgate_test.v
- xnorgate.v
- xorgate_test.v
- xorgate.v
- xorgatenand_test.v
- xorgatenand.v
- zlib1.dll

OUTLINE

TIMELINE

```
orgate_test.v
1  include "orgate.v"
2
3  module testbench;
4      reg b,c,d;
5      wire out;
6
7      orgate or2(out,b,c,d);
8
9      initial begin;
10         b = 1'b0;
11         c = 1'b1;
12         d = 1'b1;
13         #5;
14         b = 1'b0;
15         c = 1'b0;
16         d = 1'b0;
17     end
18
19     initial
20         $monitor($time, " : b=%b c=%b d=%b out=%b", b, c, d, out);
21 endmodule
```

Windows PowerShell

Windows PowerShell
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Try the new cross-platform PowerShell <https://aka.ms/pscore6>

```
PS C:\iverilog\bin> iverilog andgate_test.v
PS C:\iverilog\bin> vvp a.out
0 : b=0 c=1 d=1 out=0
5 : b=1 c=1 d=1 out=1
PS C:\iverilog\bin> iverilog orgate_test.v
PS C:\iverilog\bin> vvp a.out
0 : b=0 c=1 d=1 out=1
5 : b=0 c=0 d=0 out=0
PS C:\iverilog\bin>
```


EXPLORER

BIN

libhistory8.dll
libreadline8.dll
libstdc++-6.dll
libtermcap-0.dll
libwinpthread-1.dll
mux4x1_test.v
mux4x1.v
nandgate_test.v
nandgate.v
norgate_test.v
norgate.v
notgate_test.v
notgate.v
orgate_test.v
orgate.v
vvp.exe
xnorgate_test.v
xnorgate.v
xorgate_test.v
xorgate.v
xorgatenand_test.v
xorgatenand.v
zlib1.dll

OUTLINE

TIMELINE

notgate_test.v

notgate_test.v

```

1  include "notgate.v"
2
3  module testbench;
4      reg a;
5      wire out;
6
7      notgate not3(a, out);
8
9      initial begin;
10         a = 1'b0;
11         #5;
12         a = 1'b1;
13     end
14
15     initial
16         $monitor($time, " : a=%b out=%b", a, out);
17 endmodule

```

Windows PowerShell

```

PS C:\iverilog\bin> iverilog andgate_test.v
PS C:\iverilog\bin> vvp a.out
0 : b=0 c=1 d=1 out=0
5 : b=1 c=1 d=1 out=1
PS C:\iverilog\bin> iverilog orgate_test.v
PS C:\iverilog\bin> vvp a.out
0 : b=0 c=1 d=1 out=1
5 : b=0 c=0 d=0 out=0
PS C:\iverilog\bin> iverilog notgate_test.v
PS C:\iverilog\bin> vvp a.out
0 : a=0 out=1
5 : a=1 out=0
PS C:\iverilog\bin>

```

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EXPLORER

BIN

- libhistory8.dll
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- mux4x1.v
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- nandgate.v
- norgate_test.v
- norgate.v
- notgate_test.v
- notgate.v
- orgate_test.v
- orgate.v
- vvp.exe
- xnorgate_test.v
- xnorgate.v
- xorgate_test.v
- xorgate.v
- xorgatenand_test.v
- xorgatenand.v
- zlib1.dll

OUTLINE

TIMELINE

```
nandgate_test.v
1  include "nandgate.v"
2  module testbench;
3      reg a, b;
4      wire out;
5      nandgate nand4(out, a, b);
6      initial begin;
7          a = 1'b0;
8          b = 1'b0;
9          #5;
10         a = 1'b1;
11         b = 1'b0;
12         #5;
13         a = 1'b0;
14         b = 1'b1;
15         #5;
16         a = 1'b1;
17         b = 1'b1;
18     end
19     initial
20         $monitor($time, " : a=%b b=%b out=%b", a, b, out);
21 endmodule
```

```
Windows PowerShell
PS C:\iverilog\bin> vvp a.out
0 : b=0 c=1 d=1 out=1
5 : b=0 c=0 d=0 out=0
PS C:\iverilog\bin> iverilog notgate_test.v
PS C:\iverilog\bin> vvp a.out
0 : a=0 out=1
5 : a=1 out=0
PS C:\iverilog\bin> iverilog nandgate_test.v
PS C:\iverilog\bin> vvp a.out
0 : a=0 b=0 out=1
5 : a=1 b=0 out=1
10 : a=0 b=1 out=1
15 : a=1 b=1 out=0
PS C:\iverilog\bin>
```


EXPLORER

BIN

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- nandgate.v
- norgate_test.v
- norgate.v
- notgate_test.v
- notgate.v
- orgate_test.v
- orgate.v
- vvp.exe
- xnorgate_test.v
- xnorgate.v
- xorgate_test.v
- xorgate.v
- xorgatenand_test.v
- xorgatenand.v
- zlib1.dll

OUTLINE

TIMELINE

```
norgate_test.v
1  include "norgate.v"
2  module testbench;
3      reg a, b;
4      wire out;
5      norgate nor5(out, a, b);
6      initial begin;
7          a = 1'b0;
8          b = 1'b0;
9          #5;
10         a = 1'b1;
11         b = 1'b0;
12         #5;
13         a = 1'b0;
14         b = 1'b1;
15         #5;
16         a = 1'b1;
17         b = 1'b1;
18     end
19     initial
20         $monitor($time, " : a=%b b=%b out=%b", a, b, out);
21 endmodule
```

```
Windows PowerShell
PS C:\iverilog\bin> iverilog nandgate_test.v
PS C:\iverilog\bin> vvp a.out
5 : a=1 out=0
0 : a=0 b=0 out=1
5 : a=1 b=0 out=1
10 : a=0 b=1 out=1
15 : a=1 b=1 out=0
PS C:\iverilog\bin> iverilog norgate_test.v
PS C:\iverilog\bin> vvp a.out
0 : a=0 b=0 out=1
5 : a=1 b=0 out=0
10 : a=0 b=1 out=0
15 : a=1 b=1 out=0
PS C:\iverilog\bin>
```


EXPLORER

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- libhistory8.dll
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- mux4x1.v
- nandgate_test.v
- nandgate.v
- norgate_test.v
- norgate.v
- notgate_test.v
- notgate.v
- orgate_test.v
- orgate.v
- vvp.exe
- xnorgate_test.v
- xnorgate.v
- xorgate_test.v
- xorgate.v
- xorgatenand_test.v
- xorgatenand.v
- zlib1.dll

OUTLINE

TIMELINE

```
xorgate_test.v
1  include "xorgate.v"
2  module testbench;
3      reg a, b;
4      wire out;
5      xorgate xor6(out, a, b);
6      initial begin;
7          a = 1'b0;
8          b = 1'b0;
9          #5;
10         a = 1'b1;
11         b = 1'b0;
12         #5;
13         a = 1'b0;
14         b = 1'b1;
15         #5;
16         a = 1'b1;
17         b = 1'b1;
18     end
19     initial
20         $monitor($time, " : a=%b b=%b out=%b", a, b, out);
21 endmodule
```

```
Windows PowerShell
PS C:\iverilog\bin> iverilog norgate_test.v
PS C:\iverilog\bin> vvp a.out
    0 : a=0 b=0 out=1
    5 : a=1 b=0 out=0
   10 : a=0 b=1 out=0
   15 : a=1 b=1 out=0
PS C:\iverilog\bin> iverilog xorgate_test.v
PS C:\iverilog\bin> vvp a.out
    0 : a=0 b=0 out=0
    5 : a=1 b=0 out=1
   10 : a=0 b=1 out=1
   15 : a=1 b=1 out=0
PS C:\iverilog\bin> |
```


EXPLORER

BIN

- libhistory8.dll
- libreadline8.dll
- libstdc++-6.dll
- libtermcap-0.dll
- libwinpthread-1.dll
- mux4x1_test.v
- mux4x1.v
- nandgate_test.v
- nandgate.v
- norgate_test.v
- norgate.v
- orgate_test.v
- orgate.v
- vvp.exe
- xnorgate_test.v
- xnorgate.v
- xorgate_test.v
- xorgate.v
- xorgatenand_test.v
- xorgatenand.v
- zlib1.dll

OUTLINE

TIMELINE

```

xnorgate_test.v
1  include "xnorgate.v"
2  module testbench;
3      reg a, b;
4      wire out;
5      xnorgate xnor7(out, a, b);
6      initial begin;
7          a = 1'b0;
8          b = 1'b0;
9          #5;
10         a = 1'b1;
11         b = 1'b0;
12         #5;
13         a = 1'b0;
14         b = 1'b1;
15         #5;
16         a = 1'b1;
17         b = 1'b1;
18     end
19     initial
20         $monitor($time, " : a=%b b=%b out=%b", a, b, out);
21 endmodule
    
```

Windows PowerShell

```

PS C:\iverilog\bin> iverilog xorgate_test.v
PS C:\iverilog\bin> vvp a.out
15 : a=1 b=1 out=0
0 : a=0 b=0 out=0
5 : a=1 b=0 out=1
10 : a=0 b=1 out=1
15 : a=1 b=1 out=0
PS C:\iverilog\bin> iverilog xnorgate_test.v
PS C:\iverilog\bin> vvp a.out
0 : a=0 b=0 out=1
5 : a=1 b=0 out=0
10 : a=0 b=1 out=0
15 : a=1 b=1 out=1
PS C:\iverilog\bin>
    
```


EXPLORER

BIN

- a.out
- andgate_test.v
- andgate.v
- andgatenor_test.v
- andgatenor.v
- full_adder_test.v
- full_adder.v
- half_adder_nand_t...
- half_adder_nand.v
- iverilog-vpi.exe
- iverilog.exe
- libbz2-1.dll
- libgcc_s_seh-1.dll
- libhistory8.dll
- libreadline8.dll
- libstdc++-6.dll
- libtermcap-0.dll
- libwinpthread-1.dll
- mux4x1_test.v
- mux4x1.v
- nandgate_test.v
- nandgate.v
- norgate_test.v
- norgate.v

OUTLINE

TIMELINE

```

1  include "andgatenor.v"
2  module testbench;
3      reg a, b, c;
4      wire out;
5      andgateusingnor and_8(out, a, b, c);
6      initial begin
7          a = 1'b0;
8          b = 1'b1;
9          c = 1'b0;
10         #5;
11         a = 1'b1;
12         b = 1'b1;
13         c = 1'b1;
14         #5;
15         a = 1'b1;
16         b = 1'b0;
17         c = 1'b1;
18     end
19     initial
20         $monitor($time, " : a=%b b=%b c=%b out=%b", a, b, c, out);
21 endmodule
    
```

Windows PowerShell

```

./andgatenor.v:5: error: Unknown module type: nor_v
./andgatenor.v:6: error: Unknown module type: nor_v
./andgatenor.v:7: error: Unknown module type: nor_v
./andgatenor.v:8: error: Unknown module type: nor_v
7 error(s) during elaboration.
*** These modules were missing:
        nor_v referenced 6 times.
***
PS C:\iverilog\bin> iverilog andgatenor_test.v
PS C:\iverilog\bin> vvp a.out
                0 : a=0 b=1 c=0 out=0
                5 : a=1 b=1 c=1 out=1
               10 : a=1 b=0 c=1 out=0

PS C:\iverilog\bin>
    
```


EXPLORER

BIN

- libhistory8.dll
- libreadline8.dll
- libstdc++-6.dll
- libtermcap-0.dll
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- mux4x1_test.v
- mux4x1.v
- nandgate_test.v
- nandgate.v
- norgate_test.v
- norgate.v
- notgate_test.v
- notgate.v
- orgate_test.v
- orgate.v
- vvp.exe
- xnorgate_test.v
- xnorgate.v
- xorgate_test.v
- xorgate.v
- xorgatenand_test.v
- xorgatenand.v
- zlib1.dll

OUTLINE

TIMELINE

```
xorgatenand_test.v
1  include "xorgatenand.v"
2  module testbench;
3      reg a, b;
4      wire out;
5      xorgatenand xor_nand9(out, a, b);
6      initial begin
7          a = 1'b0;
8          b = 1'b0;
9          #5;
10         a = 1'b1;
11         b = 1'b0;
12         #5;
13         a = 1'b0;
14         b = 1'b1;
15         #5;
16         a = 1'b1;
17         b = 1'b1;
18     end
19     initial
20         $monitor($time, " : a=%b b=%b out=%b", a, b, out);
21 endmodule
```

```
Windows PowerShell
./xorgatenand.v:4: error: Unknown module type: nand_v
./xorgatenand.v:5: error: Unknown module type: nand_v
./xorgatenand.v:6: error: Unknown module type: nand_v
5 error(s) during elaboration.
*** These modules were missing:
        nand_v referenced 4 times.
***
PS C:\iverilog\bin> iverilog xorgatenand_test.v
PS C:\iverilog\bin> vvp a.out
0 : a=0 b=0 out=0
5 : a=1 b=0 out=1
10 : a=0 b=1 out=1
15 : a=1 b=1 out=0
PS C:\iverilog\bin> |
```


EXPLORER

▼ BIN

- a.out
- andgate_test.v
- andgate.v
- andgatenor_test.v
- andgatenor.v
- full_adder_test.v
- full_adder.v
- half_adder_nand_t...
- half_adder_nand.v
- iverilog-vpi.exe
- iverilog.exe
- libbz2-1.dll
- libgcc_s_seh-1.dll
- libhistory8.dll
- libreadline8.dll
- libstdc++-6.dll
- libtermcap-0.dll
- libwinpthread-1.dll
- mux4x1_test.v
- mux4x1.v
- nandgate_test.v
- nandgate.v
- norgate_test.v
- norgate.v

> OUTLINE

> TIMELINE

```
half_adder_nand.v
1  module half_adder_nand(output sum, output carry,input a, input b);
2      wire w1;
3      xorgatenand xor1(sum, a, b);
4      nandgate nand1(w1, a, b);
5      nandgate nand2(carry, w1, w1);
6  endmodule
7
8  module xorgatenand(output out, input a, input b);
9      wire w1, w2, w3;
10     nandgate nand1(w1, a, b);
11     nandgate nand2(w2, a, w1);
12     nandgate nand3(w3, b, w1);
13     nandgate nand4(out, w2, w3);
14 endmodule
15
16 module nandgate (output out, input a, input b);
17     wire w1;
18     and (w1, a, b);
19     not (out, w1);
20 endmodule
```

```
Windows PowerShell
PS C:\iverilog\bin> vvp a.out
10 : a=0 b=1 sum=1 carry=0
15 : a=1 b=1 sum=0 carry=1
PS C:\iverilog\bin> iverilog half_adder_nand_test.v
PS C:\iverilog\bin> vvp a.out
0 : a=0 b=0 sum=0 carry=0
5 : a=1 b=0 sum=1 carry=0
10 : a=0 b=1 sum=1 carry=0
15 : a=1 b=1 sum=0 carry=1
PS C:\iverilog\bin>
```


EXPLORER

▼ BIN

- a.out
- andgate_test.v
- andgate.v
- andgatenor_test.v
- andgatenor.v
- full_adder_test.v
- full_adder.v
- half_adder_nand_t...
- half_adder_nand.v
- iverilog-vpi.exe
- iverilog.exe
- libbz2-1.dll
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- libhistory8.dll
- libreadline8.dll
- libstdc++-6.dll
- libtermcap-0.dll
- libwinpthread-1.dll
- mux4x1_test.v
- mux4x1.v
- nandgate_test.v
- nandgate.v
- norgate_test.v
- norgate.v

> OUTLINE

> TIMELINE

full_adder_test.v

```

1  include "full_adder.v"
2  module testbench;
3      reg a, b, cin;
4      wire sum, cout;
5      full_adder full11(sum, cout, a, b, cin);
6      initial begin
7          a = 0;
8          b = 1;
9          cin = 1;
10         #5;
11         a = 1;
12         b = 0;
13         cin = 0;
14         #5;
15         a = 1;
16         b = 1;
17         cin = 0;
18         #5;
19         a = 1;
20         b = 1;
21         cin = 1;
22     end
23     initial
24         $monitor($time, " a=%b b=%b carry_in=%b sum=%b carry_out=%b", a, b, cin, sum, cout);
25 endmodule
    
```

Windows PowerShell

```

PS C:\iverilog\bin> iverilog half_adder_nand_test.v
PS C:\iverilog\bin> vvp a.out
    0 : a=0 b=0 sum=0 carry=0
    5 : a=1 b=0 sum=1 carry=0
   10 : a=0 b=1 sum=1 carry=0
   15 : a=1 b=1 sum=0 carry=1
PS C:\iverilog\bin> iverilog full_adder_test.v
PS C:\iverilog\bin> vvp a.out
    0 a=0 b=1 carry_in=1 sum=0 carry_out=1
    5 a=1 b=0 carry_in=0 sum=1 carry_out=0
   10 a=1 b=1 carry_in=0 sum=0 carry_out=1
   15 a=1 b=1 carry_in=1 sum=1 carry_out=1
PS C:\iverilog\bin>
    
```


EXPLORER

BIN

- a.out
- andgate_test.v
- andgate.v
- andgatenor_test.v
- andgatenor.v
- full_adder_test.v
- full_adder.v
- half_adder_nand_t...
- half_adder_nand.v
- iverilog-vpi.exe
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- libwinpthread-1.dll
- mux4x1_test.v
- mux4x1.v
- nandgate_test.v
- nandgate.v
- norgate_test.v
- norgate.v

OUTLINE

TIMELINE

```

mux4x1_test.v
1  include "mux4x1.v"
2  module testbench;
3      reg d0, d1, d2, d3;
4      reg s1, s0;
5      wire out;
6      mux m0 (out, d0, d1, d2, d3, s1, s0);
7      initial begin
8          d0 = 0; d1 = 1; d2 = 1; d3 = 0;
9          s1 = 0; s0 = 1;
10         #5;
11         d0 = 0; d1 = 1; d2 = 1; d3 = 0;
12         s1 = 0; s0 = 0;
13         #5;
14         d0 = 1; d1 = 0; d2 = 0; d3 = 1;
15         s1 = 1; s0 = 1;
16         #5;
17         d0 = 1; d1 = 0; d2 = 0; d3 = 1;
18         s1 = 1; s0 = 0;
19     end
20     initial
21         $monitor($time, " : d0 = %b, d1 = %b, d2 = %b, d3 = %b, s1 = %b, s0 = %b, out = %b", d0, d1, d2, d3, s1, s0,
22     endmodule
    
```

Windows PowerShell

```

and_3 referenced 4 times.
or_4 referenced 1 times.

***
PS C:\iverilog\bin> iverilog mux4x1_test.v
PS C:\iverilog\bin> vvp a.out
0 : d0 = 0, d1 = 1, d2 = 1, d3 = 0, s1 = 0, s0 = 1
, out = 1
5 : d0 = 0, d1 = 1, d2 = 1, d3 = 0, s1 = 0, s0 = 0
, out = 0
10 : d0 = 1, d1 = 0, d2 = 0, d3 = 1, s1 = 1, s0 = 1
, out = 1
15 : d0 = 1, d1 = 0, d2 = 0, d3 = 1, s1 = 1, s0 = 0
, out = 0
PS C:\iverilog\bin>
    
```