**四位无符号数乘法器**

**一、设计分析：**

四位无符号数乘法器：

两个输入信号：a\_in，b\_in 四位无符号数

一个输出信号：c\_out 八位无符号数

运算：c\_out = a\_in × b\_in

**二、代码设计：**

library IEEE;

use IEEE.std\_logic\_1164.all;

use IEEE.std\_logic\_arith.all;

use IEEE.std\_logic\_unsigned.all;

entity mul\_4 is

port(a\_in,b\_in:in std\_logic\_vector(3 downto 0);

c\_out:out std\_logic\_vector( 7 downto 0));

end entity mul\_4;

architecture behavior of mul\_4 is

signal temp1 :std\_logic\_vector(3 downto 0);

signal temp2 :std\_logic\_vector(4 downto 0);

signal temp3 :std\_logic\_vector(5 downto 0);

signal temp4 :std\_logic\_vector(7 downto 0);

begin

temp1<=a\_in when b\_in(0)='1' else "0000";

temp2<=a\_in&'0' when b\_in(1)='1' else "00000";

temp3<=a\_in&"00" when b\_in(2)='1' else "000000";

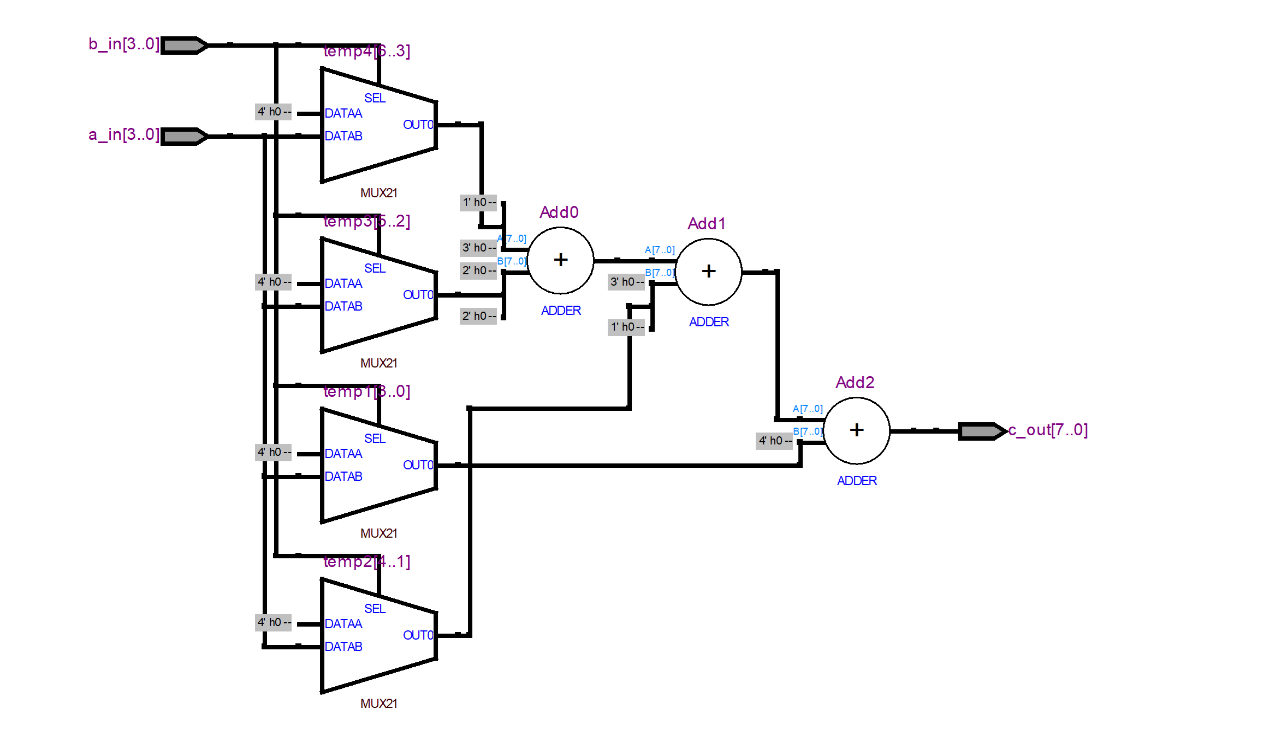
temp4<='0'&a\_in&"000" when b\_in(3)='1' else "00000000";

c\_out<=temp4+temp3+temp2+temp1 ;

end architecture behavior;

**三、逻辑图**

四位无符号乘法器逻辑图：



**四、波形仿真**

测试数据：

|  |  |  |
| --- | --- | --- |
| 输入：a\_in | 输入：b\_in | 输出：c\_out |
| 0000 | 0000 | 0000 0000 |
| 0001 | 0001 | 0000 0001 |
| 0010 | 0010 | 0000 0100 |
| 0011 | 0011 | 0000 1001 |

四位全加器仿真波形图：

