Arithmetic Circuits

Multiplication &
Arithmetic Unit for 4-bit Dual Numbers

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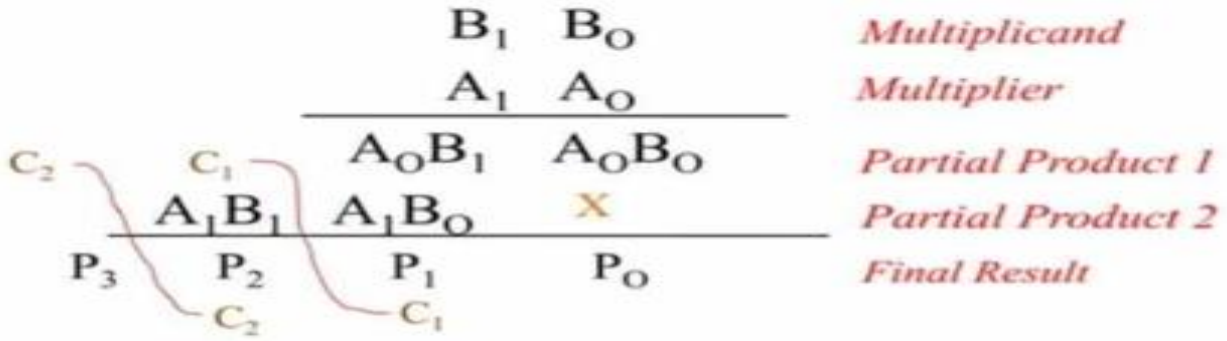
BINARY MULTIPLIERS

- A Combinational multiplier is the logic circuit which is implemented to perform multiplication.
- The multiplicand is multiplied by each bit of the multiplier starting from the least significant bit.
- Each multiplication forms a partial product, successive partial products are shifted one position to the left.
- The final product is obtained from the sum of the partial products.

2-bit by 2-bit Binary Multiplier:

(i) 2-bit by 2-bit Binary Multiplier:

Consider the following multiplication of two 2-bit number



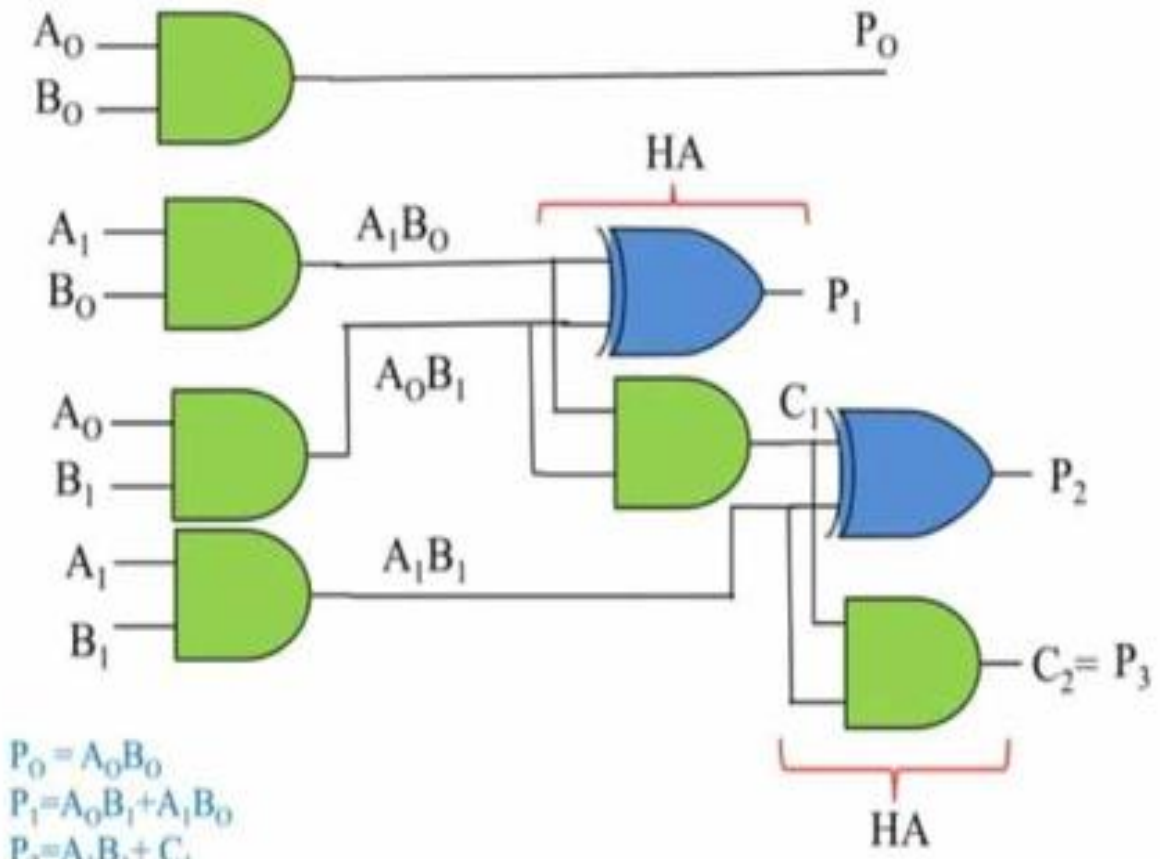
$P_0 = A_0B_0$

$P_1 = A_0B_1 + A_1B_0$

$P_2 = A_1B_1 + C_1$

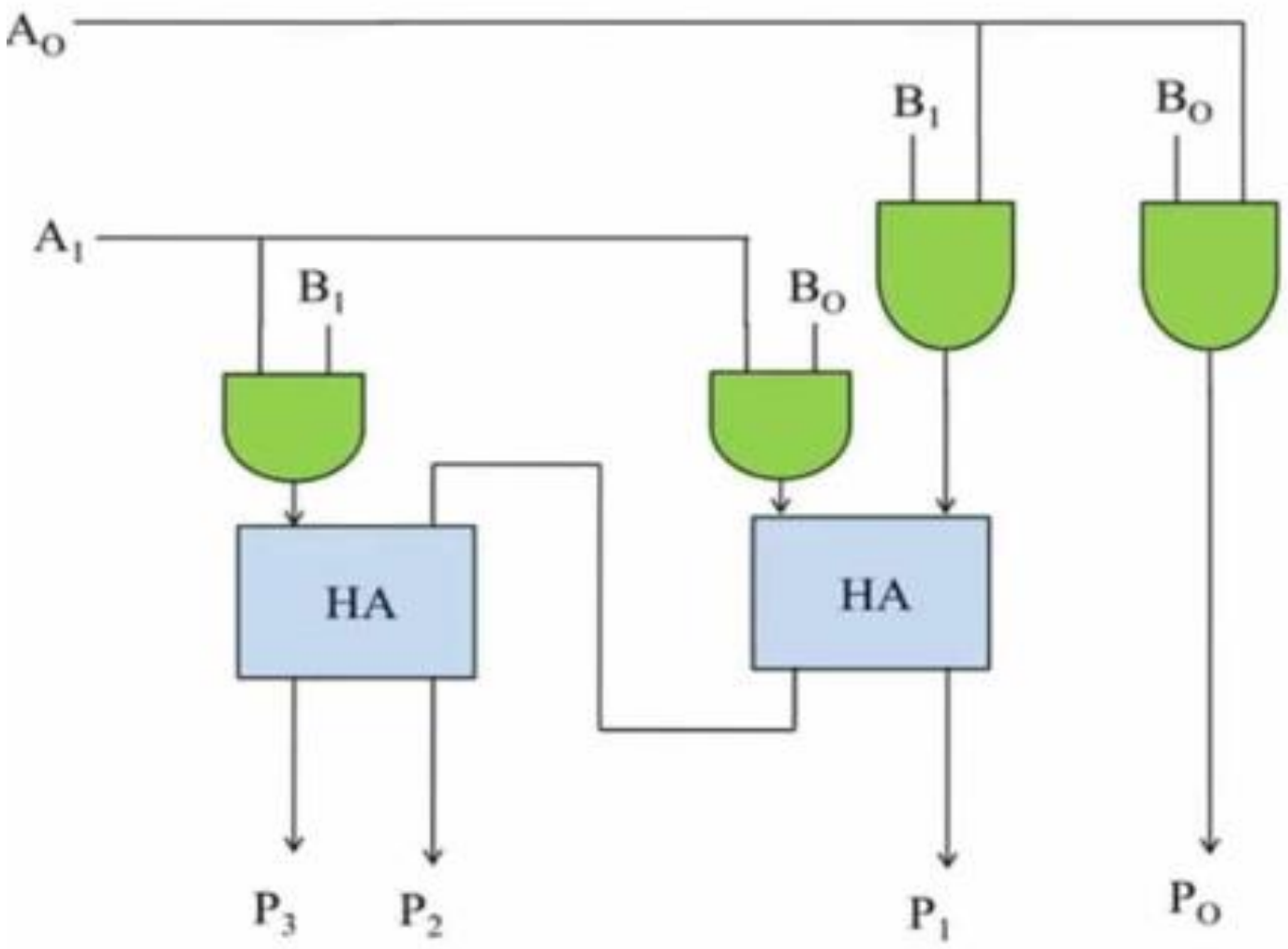
$P_3 = C_2$

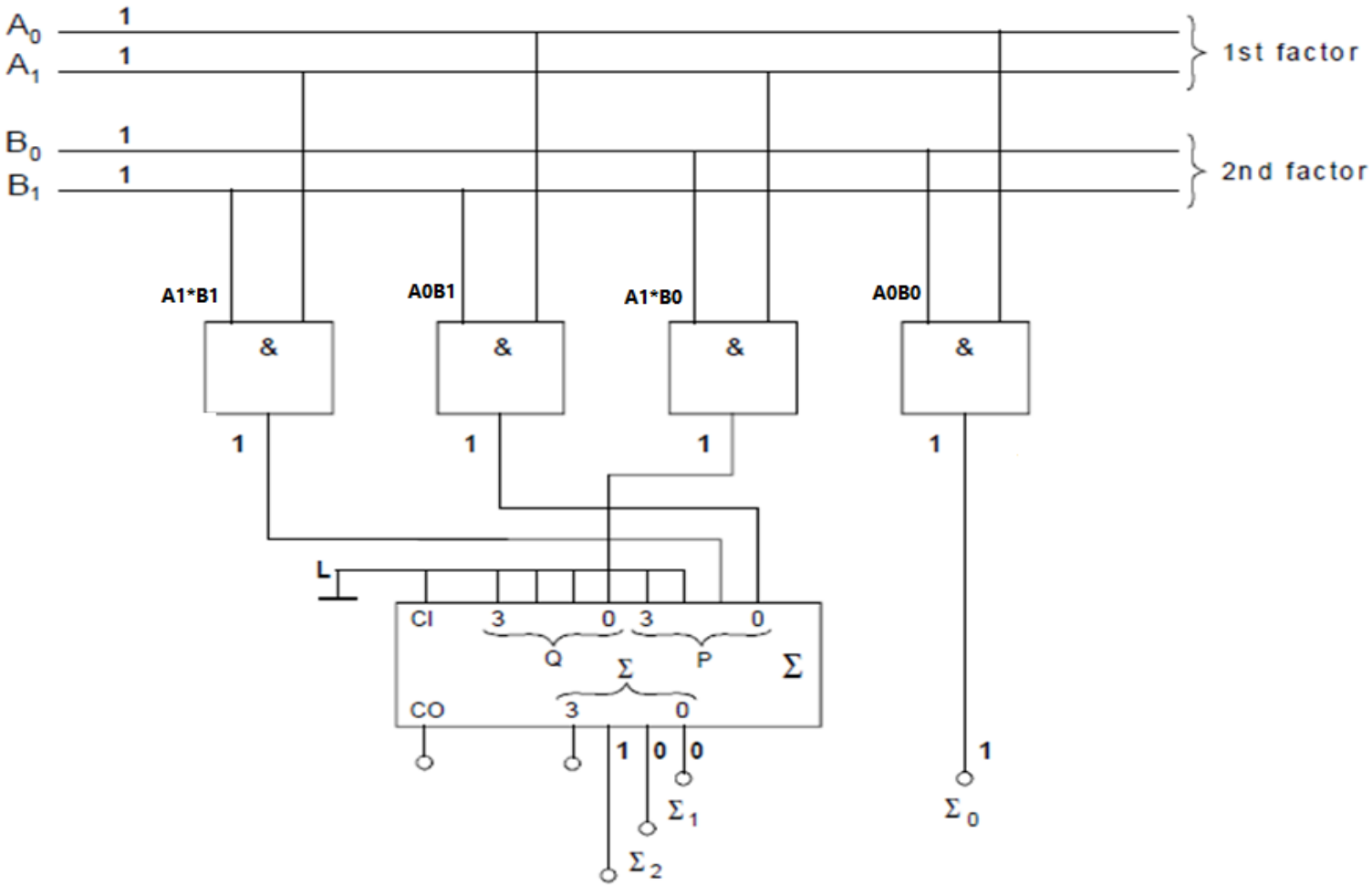
IMPLEMENTATION OF GATES



$P_0 = A_0B_0$
$P_1 = A_0B_1 + A_1B_0$
$P_2 = A_1B_1 + C_1$
$P_3 = C_2$

FIG. 2


A_0
B_1
B_0
A_1
B_1
B_0
HA
HA
P_3
P_2
P_1
P_0


A0
A1
B0
B1
1
1st factor
2nd factor
A1*B1
A0B1
A1*B0
A0B0
&
L
CI
3
0
Q
P
Σ
CO
Σ0
Σ1
Σ2

6.2.8 Arithmetic Unit for 4-bit Dual Numbers

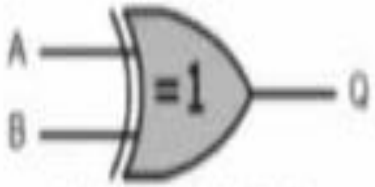
The following circuit shows an arithmetic unit for linking 4-bit dual numbers.

The module D9 contains a 4-bit 1s complement.

❖XOR gate operation

- If one input is high it produce invert of the other input.
- If one input is low it produce same of the other input.
- Example

Symbol	Truth Table		
	A	B	Q
	0	0	0
	0	1	1
	1	0	1
	1	1	0
Boolean Expression Q = A XOR B			



2-input Ex-OR Gate

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