

Arithmetic Logic Unit

Default Signal Levels: GND--all input pins

AHDL Function Prototype (port name and order also apply to Verilog HDL):

FUNCTION 74181 (s[3..0], m, cn, a3n, a2n, a1n, a0n, b3n, b2n, b1n, b0n)

RETURNS (gn, pn, f3n, f2n, f1n, f0n, aeqb, cn4);

Selection				Active Low Data		
S3	S2	S1	S0	M = H Logic Functions	M = L; Arithmetic Operations Cn = L Cn = H (No Carry) (With Carry)	
L	L	L	L	F = /A	F = A minus 1	F = A
L	L	L	H	F = /(AB)	F = AB minus 1	F = AB
L	L	H	L	F = /A + B	F = A(/B) minus 1	F = A(/B)
L	L	H	H	F = 1	F = minus 1 (2s Comp)	F = ZERO
L	H	L	L	F = /(A + B)	F = A plus (A + /B)	F = A plus (A + /B) plus 1
L	H	L	H	F = /B	F = AB plus (A + /B)	F = AB plus (A + /B) plus 1
L	H	H	L	F = /(A \$ B)	F = A minus B minus 1	F = A minus B
L	H	H	H	F = A + /B	F = A + /B	F = (A + /B) plus 1
H	L	L	L	F = (/A)B	F = A plus (A + B)	F = A plus (A + B) plus 1
H	L	L	H	F = A \$ B	F = A plus B	F = A plus B plus 1
H	L	H	L	F = B	F = A(/B) plus (A + B)	F = A(/B) plus (A + B) plus 1
H	L	H	H	F = A + B	F = (A + B)	F = (A + B) plus 1
H	H	L	L	F = 0	F = A plus A*	F = A plus A plus 1
H	H	L	H	F = A(/B)	F = AB plus A	F = AB plus A plus 1
H	H	H	L	F = AB	F = A(/B) plus A	F = A(/B) plus A plus 1
H	H	H	H	F = A	F = A	F = A plus 1

* Each bit is shifted to the next more significant position

74181 Function Table (2):

Selection				Active High Data		
S3	S2	S1	S0	M = H Logic Functions	M = L; Arithmetic Operation /Cn = H (No Carry)	/Cn = L (With Carry)
L	L	L	L	$F = /A$	$F = A$	$F = A \text{ plus } 1$
L	L	L	H	$F = /(A + B)$	$F = A + B$	$F = (A + B) \text{ plus } 1$
L	L	H	L	$F = (/A)B$	$F = A + /B$	$F = (A + /B) \text{ plus } 1$
L	L	H	H	$F = 0$	$F = \text{minus } 1 \text{ (2s Comp)}$	$F = \text{ZERO}$
L	H	L	L	$F = /(AB)$	$F = A \text{ plus } A(/B)$	$F = A \text{ plus } A(/B) \text{ plus } 1$
L	H	L	H	$F = /B$	$F = (A + B) \text{ plus } A(/B)$	$F = (A + B) \text{ plus } A(/B) \text{ plus } 1$
L	H	H	L	$F = A \$ B$	$F = A \text{ minus } B \text{ minus } 1$	$F = A \text{ minus } B$
L	H	H	H	$F = A(/B)$	$F = A(/B) \text{ minus } 1$	$F = A(/B)$
H	L	L	L	$F = /A + B$	$F = A \text{ plus } AB$	$F = A \text{ plus } AB \text{ plus } 1$
H	L	L	H	$F = /(A \$ B)$	$F = A \text{ plus } B$	$F = A \text{ plus } B \text{ plus } 1$
H	L	H	L	$F = B$	$F = (A + /B) \text{ plus } AB$	$F = (A + /B) \text{ plus } AB \text{ plus } 1$
H	L	H	H	$F = AB$	$F = AB \text{ minus } 1$	$F = AB$
H	H	L	L	$F = 1$	$F = A \text{ plus } A^*$	$F = A \text{ plus } A \text{ plus } 1$
H	H	L	H	$F = A + /B$	$F = (A + B) \text{ plus } A$	$F = (A + B) \text{ plus } A \text{ plus } 1$
H	H	H	L	$F = A + B$	$F = (A + /B) \text{ plus } A$	$F = (A + /B) \text{ plus } A \text{ plus } 1$
H	H	H	H	$F = A$	$F = A \text{ minus } 1$	$F = A$

* Each bit is shifted to the next more significant position