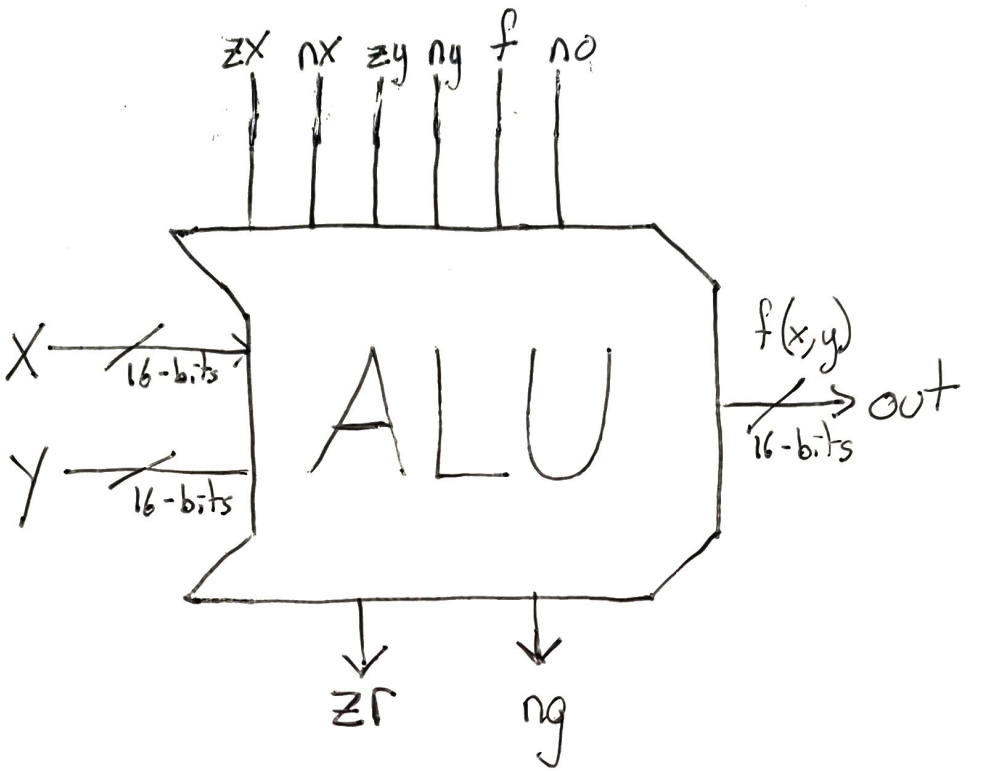
ChipName: ALU

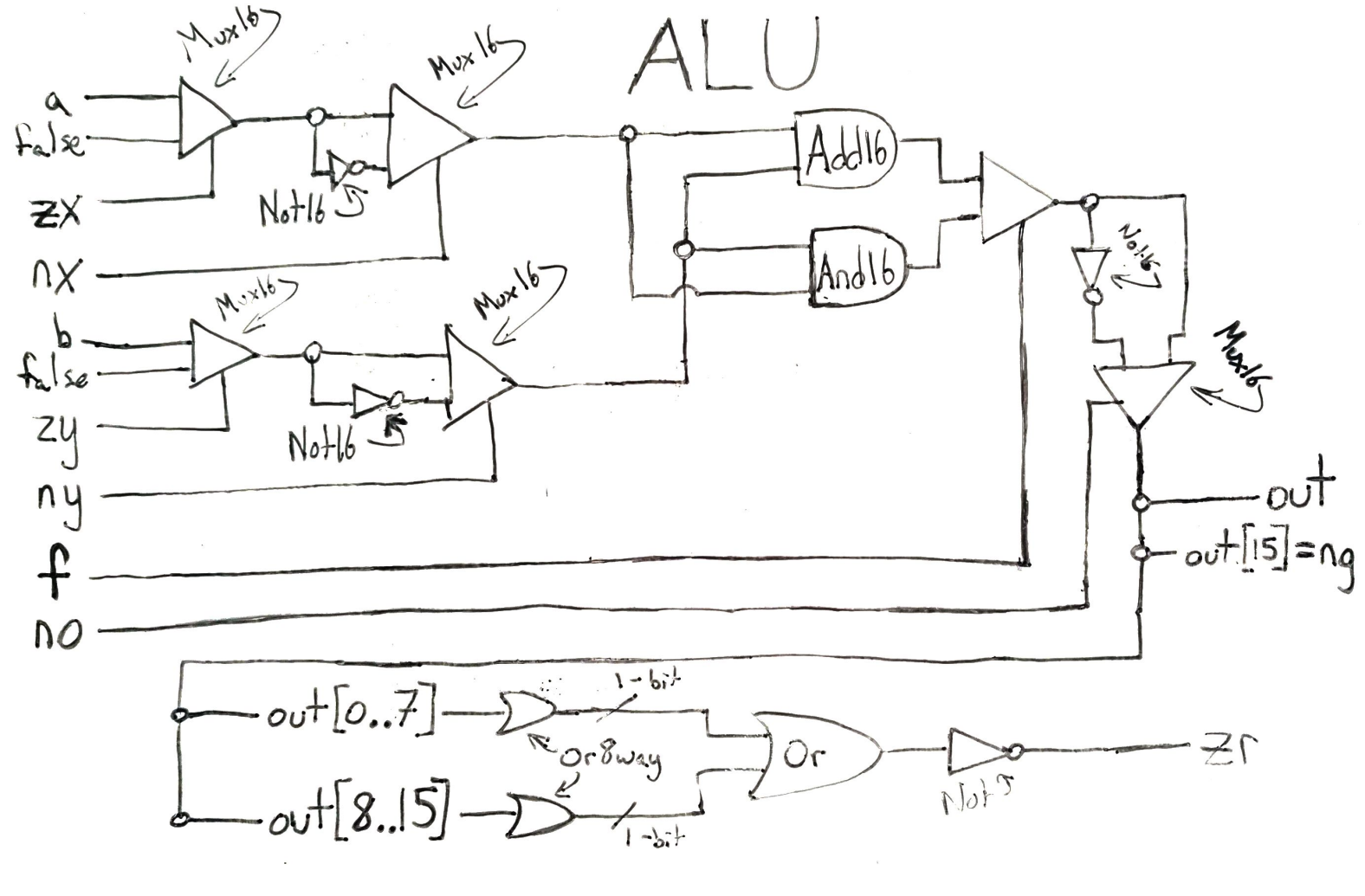
Inputs: x[16], y[16], // Two 16-bit data inputs
zx, // Zero the x input
nx, // negate the x input
zy, // Zero the y input
ny, // negate the y input
f, // function code: 1 for Add, 0 for And
no // negate the output

Outputs: out[16], // 16-bit output
zr, // True iff out = 0
ng // True iff out < 0

Functions: if zx then x = 0 // 16-bit zero constant
if nx then x = !x // bit-wise negation
if zy then y = 0
if ny then y = !y
if f then out = x + y // bit-wise Add
else out = x & y // bit-wise And
if no then out = !out
if out = 0 then zr = 1
else zr = 0
if out < 0 then ng = 1
else ng = 0

Comment: Overflow is neither detected nor handled


zx
nx
zy
ny
f
no
X
16-bits
Y
16-bits
ALU
f(x,y)
16-bits
out
zr
ng


ALU
x
false
zx
nx
y
false
zy
ny
f
no
Mux16
Mux16
Not16
Mux16
Mux16
Not16
Add16
And16
Not16
Mux16
out
out[15]=ng
out[0..7]
out[8..15]
1-bit
Or8way
1-bit
Or
Not
zr