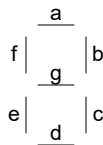


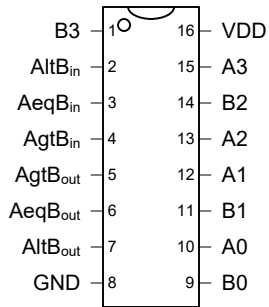
7447 7-Seg Decoder

7-segment Display Decoder

D_{3:0}: data
a...f: segments
(low = ON)
LTb: light test
RBIb: ripple blanking in
RBOb: ripple blanking out



RBO	LT	RBI	D3:0	a	b	c	d	e	f	g
0	x	x	x	1	1	1	1	1	1	1
1	0	x	x	0	0	0	0	0	0	0
x	1	0	0000	1	1	1	1	1	1	1
1	1	1	0000	0	0	0	0	0	0	1
1	1	1	0001	1	0	0	1	1	1	1
1	1	1	0010	0	0	1	0	0	1	0
1	1	1	0011	0	0	0	0	1	1	0
1	1	1	0100	1	0	0	1	1	0	0
1	1	1	0101	0	1	0	0	1	0	0
1	1	1	0110	1	1	0	0	0	0	0
1	1	1	0111	0	0	0	1	1	1	1
1	1	1	1000	0	0	0	0	0	0	0
1	1	1	1001	0	0	0	1	1	0	0
1	1	1	1010	1	1	1	0	0	1	0
1	1	1	1011	1	1	0	0	1	1	0
1	1	1	1100	1	0	1	1	1	0	0
1	1	1	1101	0	1	1	0	1	0	0
1	1	1	1110	0	0	0	1	1	1	1
1	1	1	1111	0	0	0	0	0	0	0

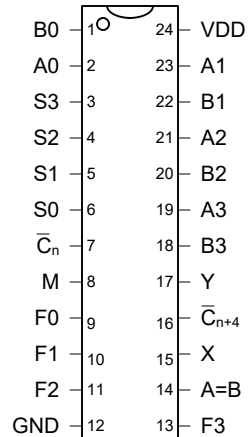


7485 Comparator

4-bit Comparator

A_{3:0}, B_{3:0}: data
rel_{in}: input relation
rel_{out}: output relation

```
always @(*)
  if (A > B | (A == B & AgtBin)) begin
    AgtBout = 1; AeqBout = 0; AltBout = 0;
  end
  else if (A < B | (A == B & AltBin)) begin
    AgtBout = 0; AeqBout = 0; AgtBout = 1;
  end
  else begin
    AgtBout = 0; AeqBout = 1; AgtBout = 0;
  end
end
```



74181 ALU

4-bit ALU

A_{3:0}, B_{3:0}: inputs
Y_{3:0}: output
F_{3:0}: function select
M: mode select
Cb_n: carry in
Cb_{nplus4}: carry out
AeqB: equality
(in some modes)
X,Y: carry lookahead
adder outputs

```
always @(*)
  case (F)
    0000: Y = M ? ~A : A + ~Cbn;
    0001: Y = M ? ~(A | B) : A + B + ~Cbn;
    0010: Y = M ? (~A) & B : A + ~B + ~Cbn;
    0011: Y = M ? 4'b0000 : 4'b1111 + ~Cbn;
    0100: Y = M ? ~(A & B) : A + (A & ~B) + ~Cbn;
    0101: Y = M ? ~B : (A | B) + (A & ~B) + ~Cbn;
    0110: Y = M ? A ^ B : A - B - Cbn;
    0111: Y = M ? A & ~B : (A & ~B) - Cbn;
    1000: Y = M ? ~A + B : A + (A & B) + ~Cbn;
    1001: Y = M ? ~(A ^ B) : A + B + ~Cbn;
    1010: Y = M ? B : (A | ~B) + (A & B) + ~Cbn;
    1011: Y = M ? A & B : (A & B) + ~Cbn;
    1100: Y = M ? 1 : A + A + ~Cbn;
    1101: Y = M ? A | ~B : (A | B) + A + ~Cbn;
    1110: Y = M ? A | B : (A | ~B) + A + ~Cbn;
    1111: Y = M ? A : A - Cbn;
  endcase
```