Today

- Reverse Engineering Example
- 5-Input Design Example
- More Advanced DesignWorks Features
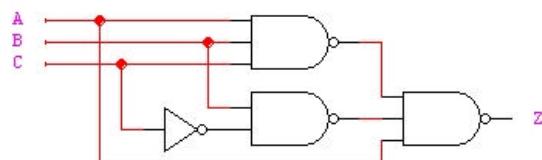

Reverse Engineering Example

- Write down the Boolean expression:

$$f(A, B, C) = \overline{\overline{AB\overline{C}} \bullet \overline{B\overline{\overline{C}}} \bullet A}$$

Reverse Engineering Ex (cont.)

■ Simplify the function using Boolean algebra:

$$f(A,B,C) = \overline{\overline{\overline{ABC}} \bullet \overline{\overline{\overline{BC}}} \bullet A}$$

$$= ABC + B\overline{C} + \overline{A} \qquad \text{DeMorgan's/Involution}$$

$$= B(AC + \overline{C}) + \overline{A} \qquad \text{Distributive}$$

$$= B(A + \overline{C}) + \overline{A} \qquad \text{Simplification}$$

$$= AB + B\overline{C} + \overline{A} \qquad \text{Distributive}$$

$$= \overline{A} + B + B\overline{C} \qquad \text{Simplification}$$

$$= \overline{A} + B \qquad \text{Simplification}$$

Reverse Engineering Ex (cont.)

■ Write the complete truth table for the circuit.

A	B	C	Z
0	0	0	1
	0	1	1
	1	0	1
	1	1	1
1	0	0	0
	0	1	0
	1	0	1
	1	1	1

Reverse Engineering Ex (cont.)

■ Write the canonical SOP form.

$$f(A,B,C) = \overline{A}\,\overline{B}\,\overline{C} + \overline{A}\,\overline{B}C + \overline{A}B\overline{C} + \overline{A}BC + AB\overline{C} + ABC$$

$$f(A,B,C) = \sum m(0,1,2,3,6,7)$$

Reverse Engineering Ex (cont.)

■ Minimize again using a K-map.

$$f(A,B,C) = \sum m(0,1,2,3,6,7)$$

AB \ C	00	01	11	10
0	1	1	1	0
1	1	1	1	0

$$f(A,B,C) = \overline{A} + B$$
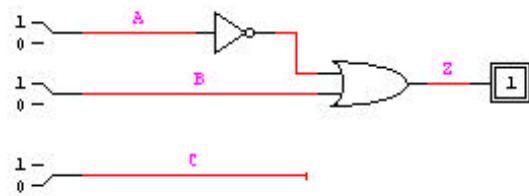
Reverse Engineering Ex (cont.)

■ Re-implement the better design.

5-Input Design Example

■ Consider the following five-input function.

A	B	C	D	E	Z
0	0	0	0	0	1
		0	0	1	1
		0	1	0	0
		0	1	1	0
	0	1	0	0	1
		1	0	1	0
		1	1	0	0
		1	1	1	0
	1	0	0	0	1
		0	0	1	1
		0	1	0	1
		0	1	1	0
	1	1	0	0	1
		1	0	1	0
		1	1	0	0
		1	1	1	0

A	B	C	D	E	Z
1	0	0	0	0	0
		0	0	1	1
		0	1	0	1
		0	1	1	0
	0	1	0	0	0
		1	0	1	0
		1	1	0	1
		1	1	1	0
	1	0	0	0	1
		0	0	1	0
		0	1	0	0
		0	1	1	0
	1	1	0	0	0
		1	0	1	0
		1	1	0	0
		1	1	1	0

5-Input Design Example (cont.)

❚ Write the canonical SOP form.

$$f(A,B,C,D,E) = \sum m(0,1,4,8,9,10,12,17,18,22,24,25)$$
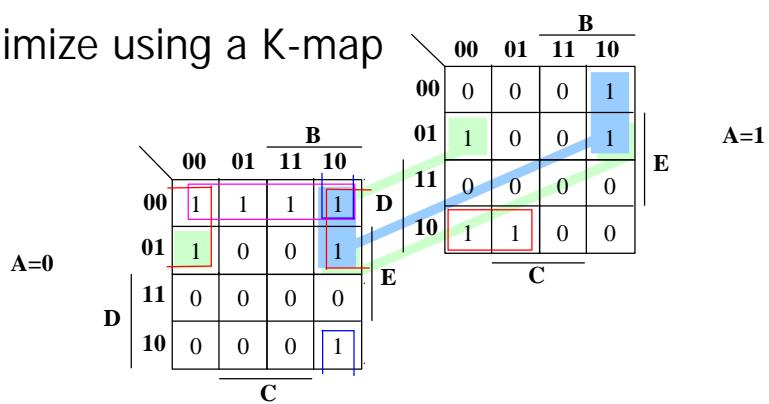
# 5-Input Design Example (cont.)

❚ Minimize using a K-map

$$f(A,B,C,D,E) = \overline{A}\,\overline{D}\,\overline{E} + \overline{A}\,\overline{B}\,\overline{C}\,\overline{E} + A\overline{B}\,D\overline{E} + B\overline{C}\,\overline{D} + \overline{C}\,DE$$

DesignWorks Powertoys

- Adding your own personal libraries
- Encapsulating your own custom-built parts
- See the online hints page for exact steps to follow.

6