

Boolean equation

$$Y = \bar{A}\bar{B}CD + A\bar{B}\bar{C}D + \bar{A}B\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}\bar{D} + AB\bar{C}\bar{D} + A\bar{B}C\bar{D} + AB\bar{C}D$$

$$Y = \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}C\bar{D} + \bar{A}B\bar{C}\bar{D}$$

$$Y = A\bar{B}\bar{C}D + A\bar{B}\bar{C}\bar{D} + AB\bar{C}D$$

$$Y = \bar{A}D + A\bar{B}\bar{D} + A\bar{D}\bar{C}$$

$$\bar{A}D(\bar{B}\bar{C} + \bar{B}C + B\bar{C} + BC)$$

$$\bar{B}\bar{D} + \bar{B}D + B\bar{D} + BD = 1 \rightarrow \bar{A}D$$

$$\bar{A}\bar{D}(\bar{B}\bar{C} + \bar{B}D + BC)$$

$$\bar{B} + BC$$

$$\bar{A}\bar{D}(\bar{B} + \bar{C})$$

$$\bar{A}\bar{D}\bar{B} + \bar{A}\bar{D}\bar{C}$$

Simplified

$$Y = \bar{A}D + A\bar{B}\bar{D} + A\bar{C}\bar{D}$$