

# ***Deeds:***

**E-Learning Environment for Digital Design**

**Deeds** is the acronym of  
**Digital Electronics Education and Design Suite**

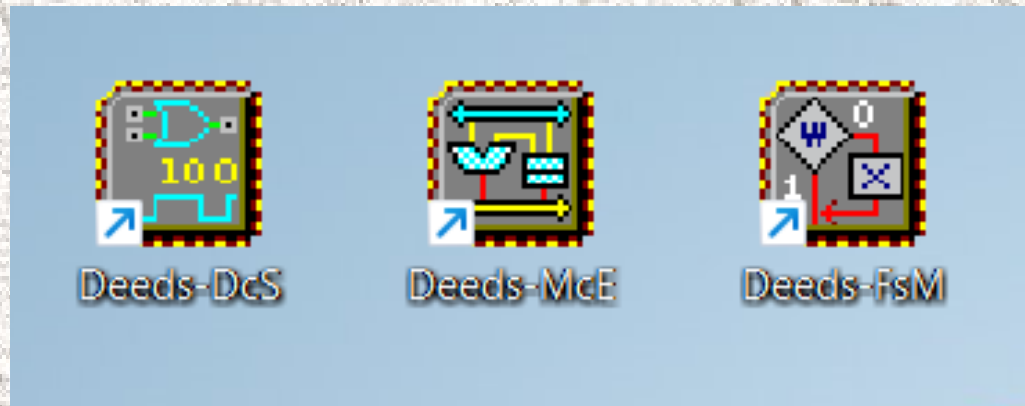


# What is *Deeds*?

- *Deeds* is a set of educational tools for Digital Electronics, characterised by a “learn-by-doing” approach.
- *Deeds* covers the following areas:
  - combinational and sequential logic
  - finite state machines
  - microcomputers

# What is *Deeds*?

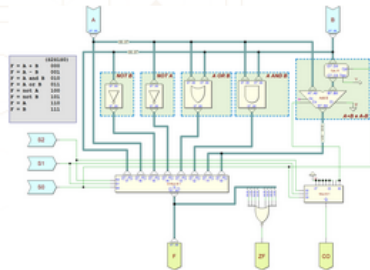
- *Deeds* includes three design tools:
  - **Deeds-DcS** (Digital Circuit Simulator)
  - **Deeds-FsM** (Finite State Machine Simulator)
  - **Deeds-McE** (Micro Computer Emulator)





# What is **Deeds**?

- **Deeds** tools are available to the community of Digital Design teachers and students.
- **Deeds** learning materials can be shared within the community.
- **Deeds** website .....



- Home
- Deeds Simulator
- Downloads
- Version Notes
- Learning Materials
- Discussion Group
- Books & Digital Contents

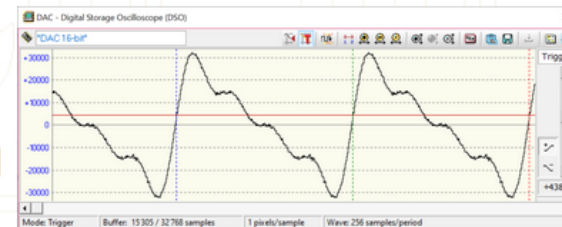
## Welcome to Digital Electronics Deeds

(by Giuliano Donzellini)

In this web site you'll find **digital circuits**, **ideas**, **projects**, **tools for simulation** and **testing on FPGA**, and more. A complete learning path to understanding and designing digital systems, supported step-by-step by [Deeds simulator](#). We tried to do our best but... is up to you to judge if our "deeds" (literal meaning of the word!) are good or bad...

## News

### New Deeds version published (2.50.200)



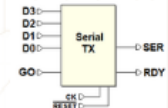
The new version introduces the *Digital Storage Oscilloscope (DSO)* (associated with the virtual DAC component) and the new *Attenuator* components... [\(read more\)](#).

### Introduction to Microprocessor-based Systems Design

## Ideas & Projects

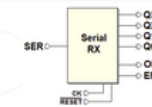
### Synchronous Serial Transmitter (4 bits)

In this example, we'll design a simplified 4-bits synchronous serial transmitter... [\(read more\)](#).



### Synchronous Serial Receiver (4 bits)

Let's design a 4-bits synchronous serial receiver. The unit will receive serial sequences on... [\(read more\)](#).



### Synchronous Serial Communication System (4 bits)

In this example, starting from the



# What **Deeds** includes? (1)

- The **Main Program** and the **Official Deeds** website, to navigate among lessons, exercises and laboratory assignments
- A **Digital Circuit Simulator**, that includes:
  - A schematic **Editor**
  - An interactive **circuit Animator**
  - An interactive **Timing Simulator**

# **Deeds** as Learning Environment

- A collection of tools and text material that help students acquiring:
  - Theoretical foundations of the subject
  - Analysis capabilities
  - Ability to solve problems
  - Practical synthesis and design skills



# Deeds - The online Learning Materials

- The [page](#) showing an index with aside a [lab exercises](#)
- All text and objects in the page can be [Active](#).
- By clicking on the schematics, the circuit shown will be loaded in the [Digital Circuit Simulator](#), ready to be tested or modified

**Introduction to digital electronics**

**Introduction to the Digital Circuit Simulator**

In this introductory exercise you will test the simple logic network represented in the figure below and, at the same time, you will gain confidence with the **Digital Circuit Simulator (d-DcS)** of the [Deeds](#). To open the file in the **d-DcS**, just click on the figure:

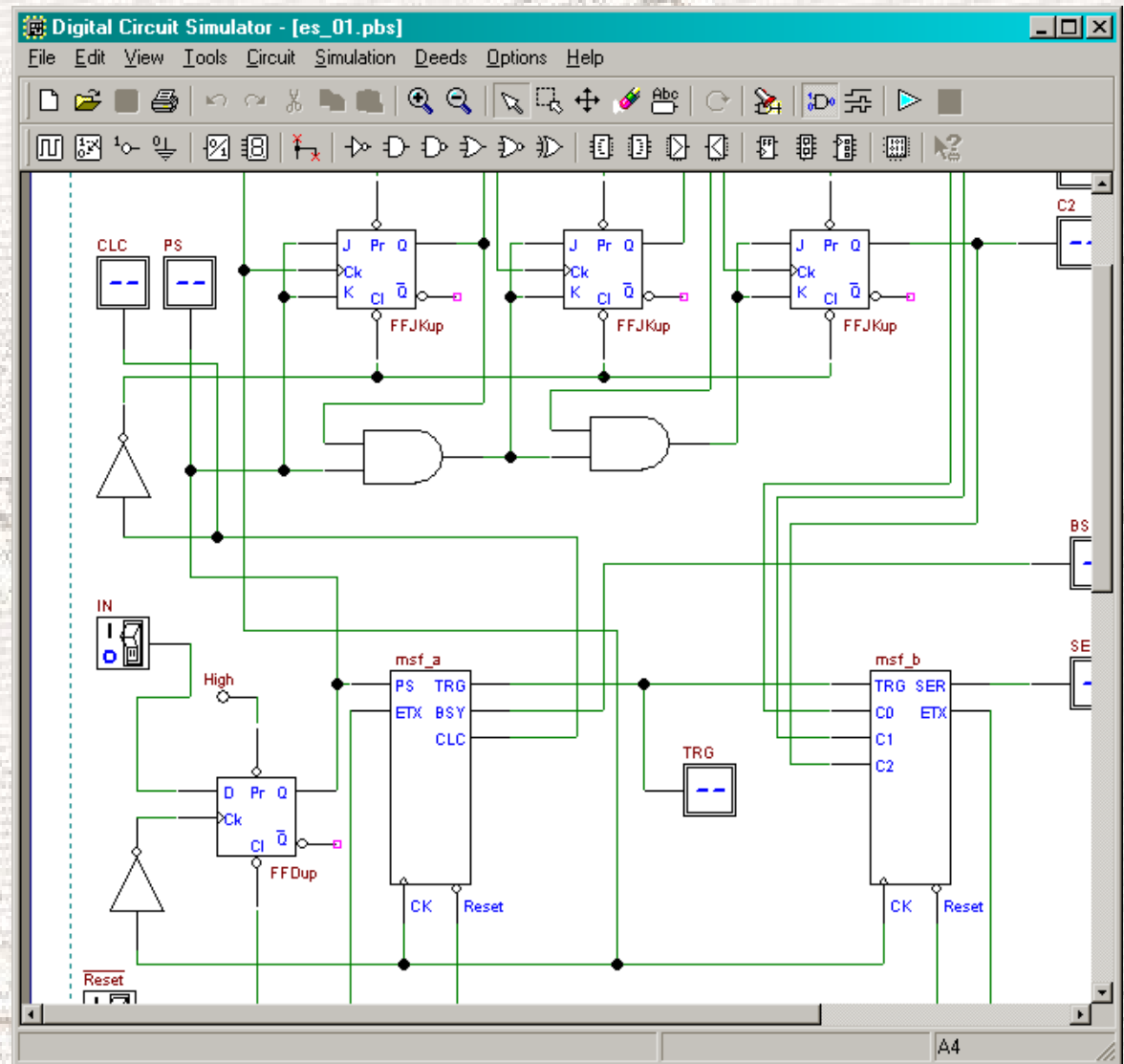
Next step is to check the behavior of the network. You will start the **functional simulation (Interactive Animation)** of the network by clicking, on the **d-DcS toolbar**, the command . Now the three input switches **A**, **B** and **C** can be toggled and the gate's output **OUT** will change accordingly. We suggest that you draw the truth table for a three variable boolean function and then fill the output column with the data resulting from the simulation.

Last task requested is the **timing simulation** of the same network. You start the timing simulation of the network by clicking, on the **d-DcS toolbar**, the command . The input values must be drawn directly on the **timing diagram window**. You should define the values versus time of the three inputs, such as all the possible combinations of **A**, **B** and **C** are tested.

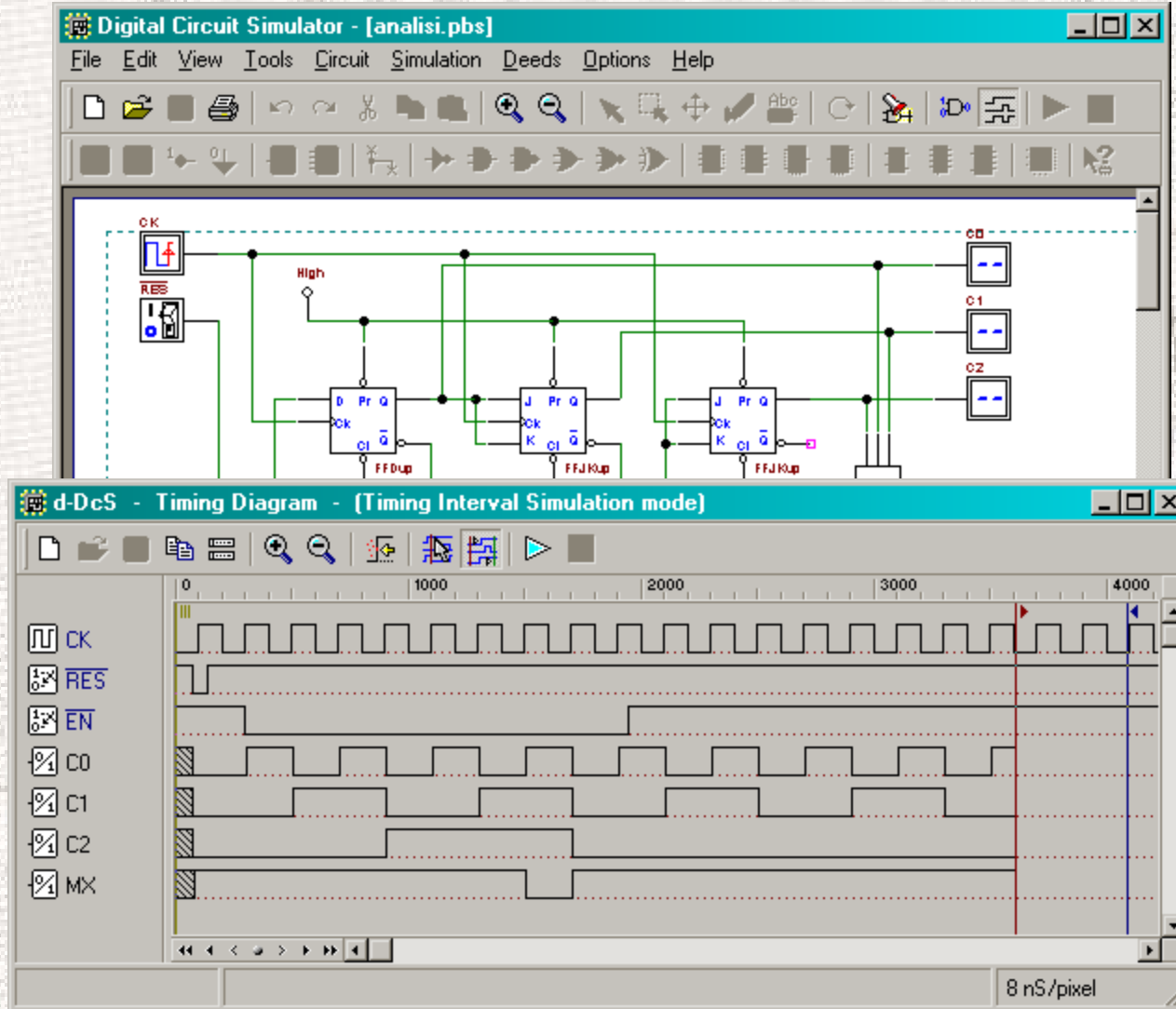
Learning Materials		
		Download
1	Introduction to digital electronics	<a href="#">Download</a>
1.1	<a href="#">Introduction to the Digital Circuit Simulator</a>	<a href="#">001001</a>
1.2	<a href="#">Analysis of simple logic gates</a>	<a href="#">001002</a>
2	Multiplexers and Demultiplexers	<a href="#">Download</a>
2.1	<a href="#">Analysis of a multiplexer (2 to 1)</a>	<a href="#">005030</a>
2.2	<a href="#">Analysis of a demultiplexer (1 to 2)</a>	<a href="#">005040</a>
2.3	<a href="#">Analysis of a simplified shared-line communication channel</a>	<a href="#">005050</a>
3	Applications of Boolean Algebra	<a href="#">Download</a>

# Deeds - The d-DcS Digital Circuit Simulator

- The **basic operations** of professional tools have been adapted to the **educational needs**
- The components available on the bin are **simple to understand**
- We avoided complex real components, that could confuse the beginner
- Two simulation mode are available:
  - a) *Interactive Animation*
  - b) *Timing diagram*

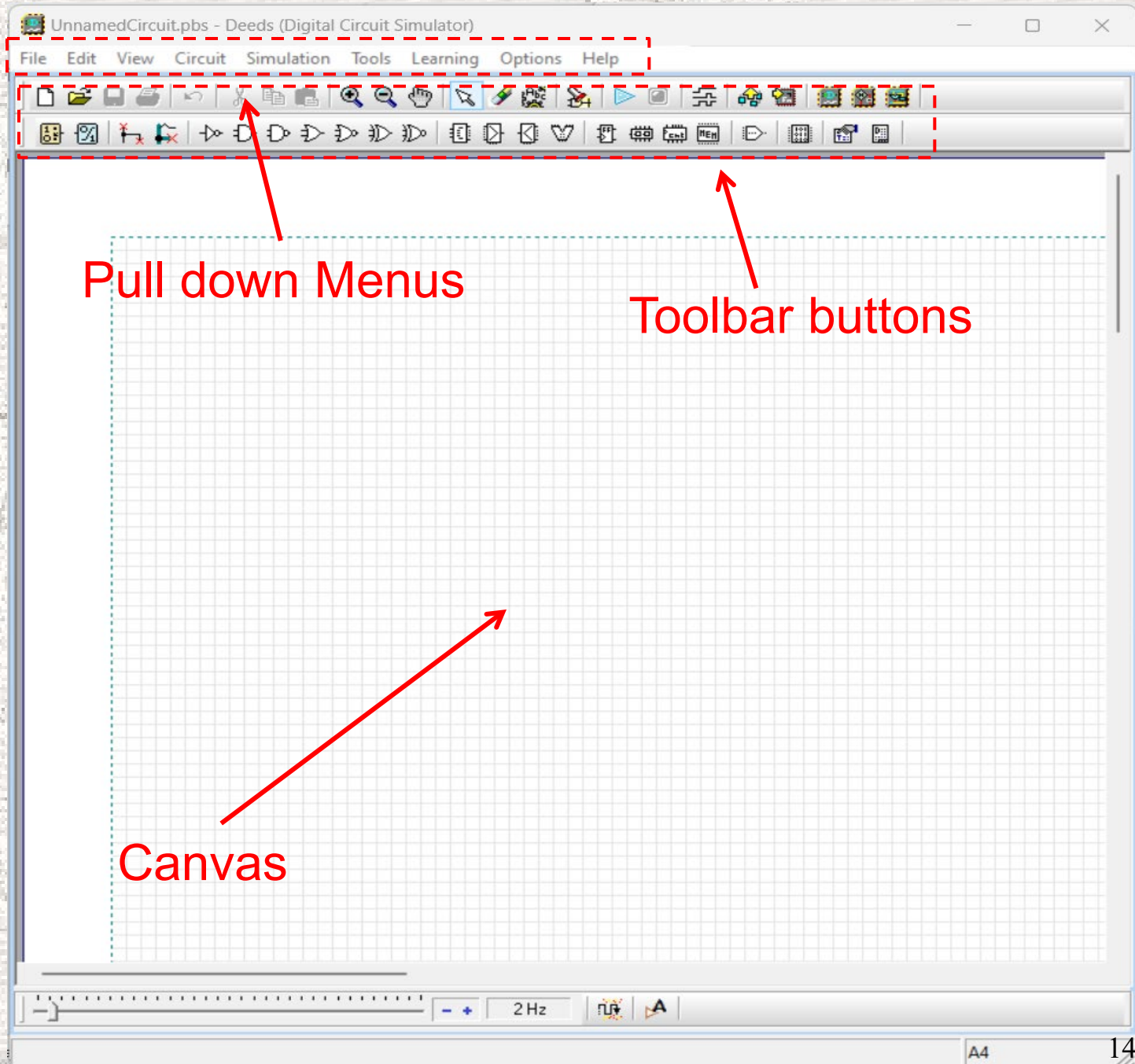


# Deeds - The d-DcS Timing Simulator



- Timing simulation can be executed in various operation modes
- Clock and input signals can be easily edited
- Timing simulation can be *interactive*, for the beginners, with a event-by-event approach, or can be launched defining a time interval, as in professional tools

# Deeds - The interface

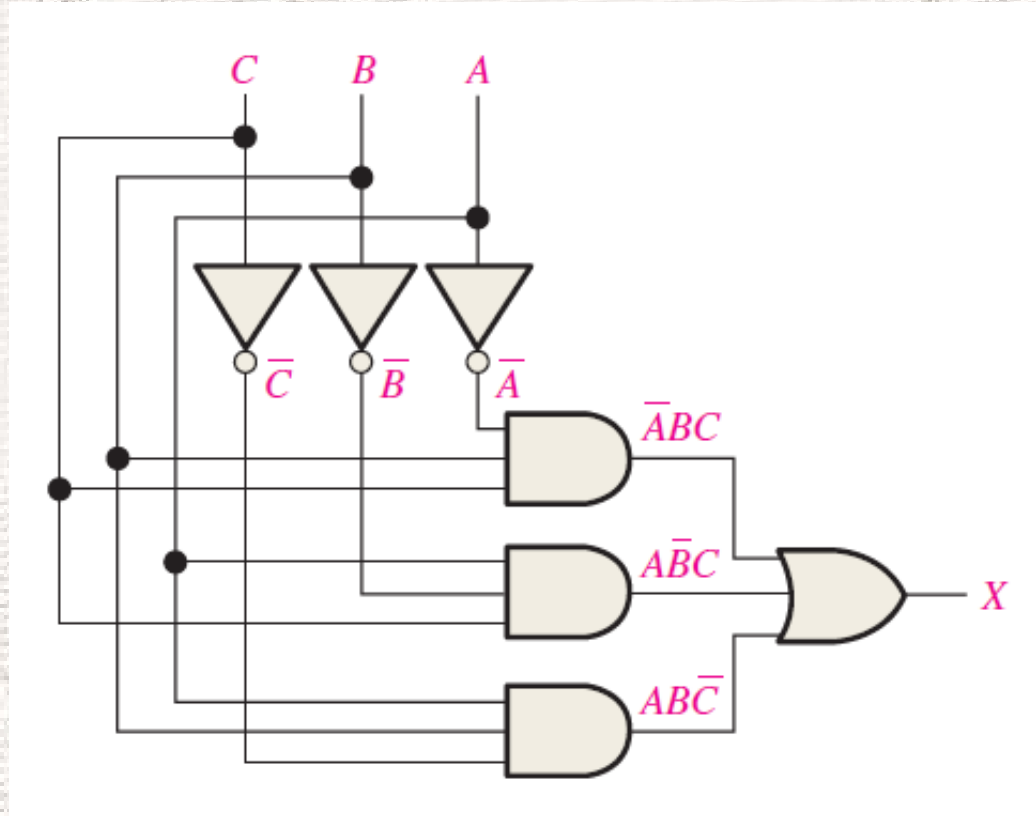






# The demo session

# Exercise: Create this circuit in Deeds



# Exercise: Create this circuit in Deeds

- Verify your circuit with this Truth Table

**TABLE 5-4**

Inputs			Output	
<i>A</i>	<i>B</i>	<i>C</i>	<i>X</i>	Product Term
0	0	0	0	
0	0	1	0	
0	1	0	0	
0	1	1	1	$\bar{A}BC$
1	0	0	0	
1	0	1	1	$A\bar{B}C$
1	1	0	1	$AB\bar{C}$
1	1	1	0	