

# RTL design for 8-bit Barrel Shifter

P Akhil Reddy

Department of Electronics and Communication Engineering  
Koneru Lakshmaiah University

Andhra Pradesh, India

[peesariakhil47@gmail.com](mailto:peesariakhil47@gmail.com)

## Abstract

This paper is about designing of 8-bit Barrel Shifter which is a specialized electronic circuit used to shift the bits of binary data and often employed by embedded digital signal processors. A barrel shifter is able to shift the bits of binary data by moving it from one multiplexer to the next. The bits shifted out the MSB end of the register are shifted back into the LSB end of the register. Data shifting is required for various low-level data applications such as floating-point arithmetic operations, bit indexing and variable-length coding. A barrel shifter is able to complete the shift in a single clock cycle, giving it a great advantage over a simple shifter which can shift  $n$  bits in  $n$  clock cycles.

## I. DESCRIPTION

A barrel shifter is a specialized digital electronic circuit with the purpose of shifting an entire data word by a specified number of bits by only using combinational logic, with no sequential logic used. It is simply a bit-rotating shift register. The bits shifted out the MSB end of the register are shifted back into the LSB end of the register. In a barrel shifter, the bits are shifted the desired number of bit positions in a single clock cycle. For example, an eight-bit barrel shifter could shift the data by three positions in a single clock cycle. If the original data was 11110000, one clock cycle later the result will be 10000111. The simplest way of achieving this is by using a series of multiplexers where one output is connected to the input of the next multiplexer in the chain, in a specific manner that depends on the amount of shift specified.

For example, an eight-bit barrel shifter could shift the data by three positions in a single clock cycle. If the original data was 11110000, one clock cycle later the result will be 10000111. Functionally, since any bit can end up in any bit position, multiplexers are used to place the bits correctly for proper storage. Thus, a barrel shifter is implemented by feeding an  $N$ -bit data word into  $N$ ,  $N$ -bit-wide multiplexers.

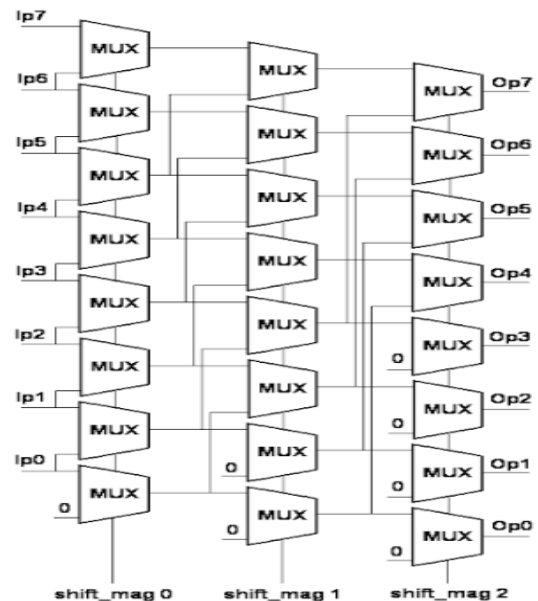


Fig. 1. Block diagram for 8-bit Barrel Shifter

## III REFERENCE: -

- <https://github.com/sudhamshu091/32-Verilog-Mini-Projects/blob/main/LICENCE.txt>
- <https://github.com/sudhamshu091/32-Verilog-Mini-Projects/tree/main/Barrel%20Shifter>

## II Waveforms

