MINI-CORDIC IP CORE

- *A16 Bit IP core for sine and cosine generation*

Developed By
Mitu Raj
Roshan Raju

- **Mini-Cordic Ip Core User Manual**

Mini Cordic IP Core

- *Documentation*

Revised on Oct 1 2016

Contents

1.Introduction

Most of the low cost microcontrollers and processors in the market lack the computability of DSP processors have. They don't have dedicated multipliers and floating point units to compute trigonometric functions like sine , cosine etc. CORDIC ALGORITHM is a popular approach to achieve such computability in low end processors using simple shifters and adders. **MINI CORDIC IP CORE** is an IP core based on **CORDIC ALGORITHM** to find sine and cosine of an angle . It may be easily integrated with processor cores to build simple and low cost dedicated processors for trigonometric applications and DSP computations.

2.Specifications

- **Inputs**
  (a) **Angle** in degrees, ϕ - 16 bit signed vector.
  (b) **Clock**.
  (c) **Load** - single bit.

- **Outputs**
  (a) **Sin ϕ** - 16 bit signed vector.
  (b) **Cos ϕ** - 16 bit signed vector.
  (c) **Done** - single bit.

- **Resolution**
  (a) **ϕ** - 0.01 degree.
  (b) **Sin ϕ , Cos ϕ** : 0.0003 with maximum error +/- 0.005.

- **Speed**
  Maximum of 16 clock cycles to obtain the output.

3.Description

The angle **ϕ** is input as 16-bit signed vector and the Load signal is asserted high to start processing the input. Depending upon the input angle, Sin **ϕ** and Cos **ϕ** are calculated and the respective outputs are obtained as 16 bit signed vectors within 16 clock cycles. Done signal is set to indicate that the output is available. Load signal is initially pulled low, before inputting the angle and it is then asserted high after inputting angle. It has to be kept high till the output is available ; for the proper functioning of the core. All inputs and outputs are synchronous with Clock signal at the input.

4.Examples

Angles are fed as 16-bit signed vector. For positive angle values , MSB is ‘0’, and for negative angle values , MSB is ‘1’ and the magnitude is represented in 2’s compliment form is employed. Maximum angle which can be input is 360 degrees. It is represented as 2^{15} in signed vector format. Then **ϕ** may be represented as the binary of (**ϕ** * 2^{15}/360). If **ϕ** is negative , then 2’s compliment has to be taken in addition to the previous step. Some examples are given below for reference

Angle ϕ in degrees	**16 bit signed representation**
45	1000H
-45	F000H
60	1555H
90	2000H
180	4000H
270	6000H
360	7FFFH

The outputs are also obtained as 16 bit signed vector. Positive values in the usual notation and the negative values in 2’s compliment form.

Copyright Notice

Mini-Cordic IP Core © 2016

Contact : iammituraj@gmail.com