Sample FIFO Depth calculations

Example : 1

Write frequency = 100MHz

Read frequency = 50MHz

Burst size = 120

Time taken to write 1 item $= \frac{1}{100MHz} = 10nSec$

Time taken to write one total burst $= 120 \times 10nSec$

$= 1200 nSec$

Time required to read one item $= \frac{1}{50MHz}$

$= 20nSec$

No. of data items that can be read in 1 burst time (or 1200 nsec) $= \frac{1200 nsec}{20 nsec}$

$= 60$

$\therefore$ No. of bytes that would be needed to be stored in FIFO $= 120 - 60$

$= 60$

This is nothing but FIFO Depth

Ideal burst to burst Gap = FIFO Depth $\times$ Read time for one data item

$= 60 \times 20\,nSec$

$= 1200\,nSec$

Imp: We are not considering any ideal cycles in between two successive Read or Write

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Example : 2

Write frequency = 50 MHz

Read frequency = 200 MHz

Burst size = 120

# of ideal cycles between two successive write signals = 1

# of ideal cycles between two successive Read signal = 2

Now due to the introduction of Ideal cycles actual no. of cycles will be

No. of ideal cycles + One cycle for operation

∴ for write it will be = 2

for read it will be = 3

Now,

Time taken to write one signal $= 2 \times \frac{1}{F_w}$

$= \frac{2}{200\ MHz}$

$= 10\ nSec$

Hence time taken to write one burst $= 120 \times 10\ nSec$

$= 1200\ nSec$

Time taken to read one data item $= 3 \times \frac{1}{F_r}$

$= \frac{3}{50}$

$= 60\ nSec$

No. of data items that can be read in burst time $= \frac{1200\ nSec}{60\ nSec}$

$= 20$

∴ FIFO Depth = Burst Size − 20

$\leq 120 - 20 = 100$

It is very important to have a FIFO buffer of appropriate depth or else it can cause issues in terms of data transfer