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# Software MRS for UtRAM Application Note

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## Purpose

This application note will guide you to compare set up of Software MRS and Hardware MRS in UtRAM. It describes how to use Software MRS instead of using hardware MRS. This is helpful for mobile system software engineers.

## Definitions and Acronyms

Definitions and Acronyms	Description
Software MRS	Software Mode Register Setting
Hardware MRS	Hardware Mode Register Setting

## References

- Samsung UtRAM Databook

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## 1. What's Software MRS?

There are two types of MRS in UtrAM. One is Hardware MRS which is using the MRS pin in UtrAM. The other is Software MRS using sequential codes (Red box in the Fig.1) in the address. The figure shows how to use Software MRS in asynchronous mode in UtrAM. Software MRS is not easy to control as compared to Hardware MRS. Hardware MRS is controlled by MRS pin in UtrAM. Software MRS is much safer than hardware MRS since it resists noise and abnormal situations.

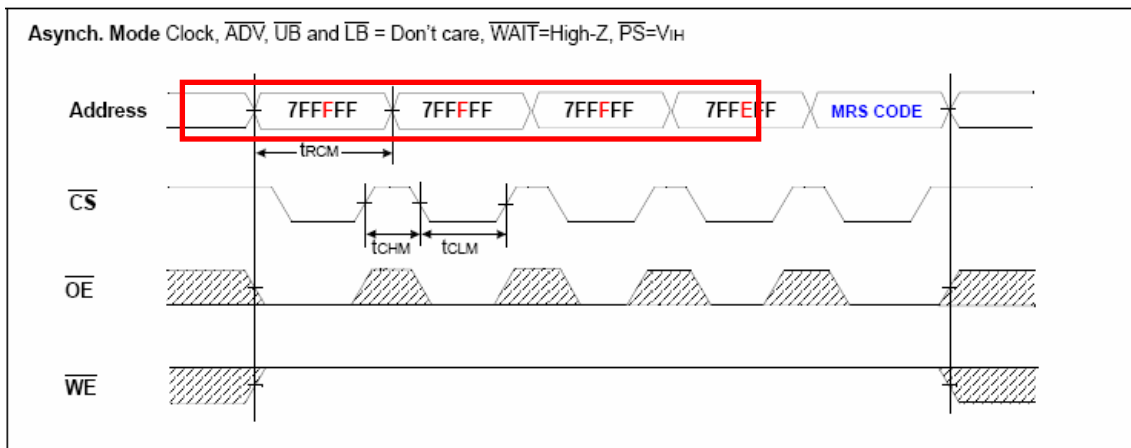


Figure 1 Software MRS in Asynchronous mode using UtrAM

## 2. A risk using Hardware MRS instead of Software MRS

In comparison to Software MRS, Hardware MRS is easier to implement in the system. But it always has a risk since unexpected operation makes MRS Pin to be abnormal. The figure below describes the abnormal operation in Hardware MRS.

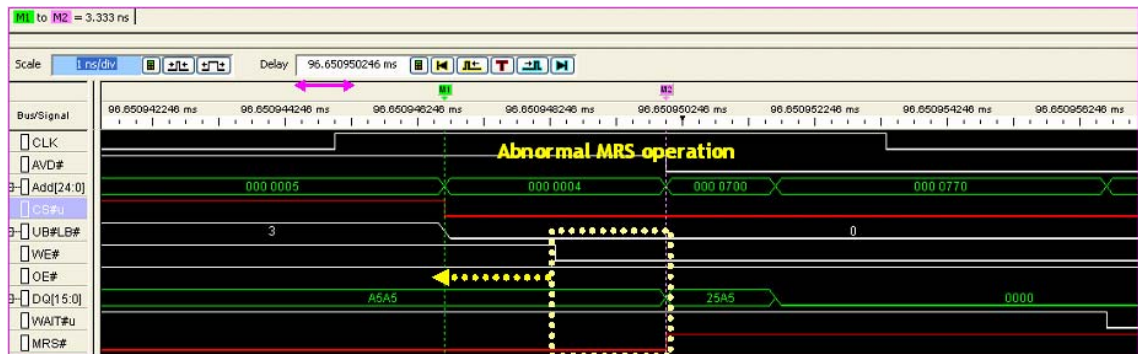


Figure 2 Abnormal Operation during Hardware MRS

Unexpected operation often comes from using Hardware MRS. Although this system does not want Hardware MRS pin to be low active (in the yellow circle), unexpectedly the Hardware MRS Pin has been low active by abnormal operation as shown in the yellow box. It makes the system halt because wrong address codes are taken to the system as MRS codes when the MRS pin is low active. To solve this problem the area of the MRS low (in yellow box) has to be shifted to the left by 1 clock cycle in order not to meet /cs low area. This situation shows why you may use software MRS instead of hardware MRS.

Software MRS does not behave abnormal because 4 correct codes in the address are needed for MRS (fig.1). It means that a noise or any abnormal operation in the input pins may not affect MRS operation, when UtrAM is in READ or Write mode or etc. Keep in mind that Hardware MRS Pin should be always High (Not active) during any operation, if you want to use software MRS. This is done in order to prevent abnormal operations by the Hardware MRS.

In summary, we recommend Software MRS because since it's much safer than Hardware MRS.