

Programming mDDR/DDR2 EMIF on OMAP-L1x/C674x

Catalog Processors

ABSTRACT

This application report provides the guidance needed to program the mDDR/DDR2 memory controller using the accompanied tool in order to access external DDR memories.

The spreadsheet mentioned in this document can be downloaded from the following URL: <http://www.ti.com/lit/zip/spracq4>.

Contents

1	Introduction	1
2	Configuring mDDR/DDR2 Memory Controller	1
3	Spreadsheet Improvements	2
4	References	2

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1 Introduction

Often, when it comes to programming the mDDR/DDR2 memory controller, customers reuse the values provided in an EVM GEL file. This can lead to read/write issues as the GEL file timings are specifically tuned for a particular memory chip and clock speed. The mDDR/DDR2 memory controller register settings must be tuned for the customer's specific use case.

2 Configuring mDDR/DDR2 Memory Controller

The mDDR/DDR2 memory controller contains a set of registers that must be programmed according to the requirements of the memory chip being used. To determine the values to program into these registers you must read through AC timing information given in the memory chip data sheet. The *DDR2/mDDR Memory Controller* chapter of the device-specific Technical Reference Manual contains step-by-step instructions on how to calculate the values for the mDDR/DDR2 memory controller. A spreadsheet was created to aid in that calculation.

To use the spreadsheet, plug in the memory-specific timings into the green cells. The spreadsheet will automatically generate the values for the mDDR/DDR2 memory controller registers. It will also automatically populate some register fields when you select between DDR2 and mDDR. The "memory clock frequency" should be programmed to reflect the frequency at which the DDR bus will run (not the max frequency of the RAM itself).

NOTE: The function DEC2HEX is used during the register value calculation. If you see an error where this function is used, you will have to install the Analysis ToolPak in Excel. Go to Tools → Add-Ins and select Analysis ToolPak from the options listed.

3 Spreadsheet Improvements

The spreadsheet was created with minimal functionality. Suggestions for future improvements include:

- Implementing checks on the register field calculations to guard against overflows and illegal values.
- Adding pull down lists to some options like "page size" instead of requiring that the specific values be entered.

Completed improvements:

- Rev 3 & 4 - Added a separate sheet that will input a register value and decode that value into the register bit fields. Two values for the same register are entered side by side, for quick comparison of the two register values at the same time. This is helpful when you want to quickly determine what is the difference between say an EVM GEL file configuration and your custom configuration.
- Rev 5 - For mDDR, tRTP calculation formula has been updated.
- Rev 6 – Changed formula for RL in cell G62 to be “RL = CAS Latency + Board Delay (BD) – 1”. The spreadsheet assumes BD = 1 since that is the case for any 150 MHz OMAP-L138 design

4 References

For more information, see the *DDR2/mDDR Memory Controller* chapter in the below documents.

- [OMAP-L138 C6000 DSP+ARM Processor Technical Reference Manual](#)
- [AM1808/AM1810 ARM Microprocessor Technical Reference Manual](#)
- [AM1806 ARM Microprocessor Technical Reference Manual](#)
- [AM1802 ARM Microprocessor Technical Reference Manual](#)
- [AM1802 ARM Microprocessor Technical Reference Manual](#)
- [TMS320C6746 DSP Technical Reference Manual](#)
- [TMS320C6742 DSP Technical Reference Manual](#)

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