AN204936

MB89630 Series, Using A PWM Timer As The Clock Input For The UART

This Application Note gives a short example on how to calculate timer settings for configuring the PWM-Timer so that the UART clock of the MB89630 can be provided by the timer.

1 Introduction

This Application Note gives a short example on how to calculate timer settings for configuring the PWM-Timer so that the UART clock of the MB89630 can be provided by the timer.

2 Background:

The UART block of the MB89630 series controller allows to select its required clock signal from 4 different sources.

The 1st source is a dedicated baud-rate generator belonging to the UART block, which is most suitable if the controller operates with a 10 MHz main clock to derive popular baud rates of 9600-, 4800, 2400- etc. baud.

If the main-clock is chosen to be different, it's most likely that the desired baud rate cannot be generated by this dedicated generator.

In this case, the UART can receive its clock signal from either PWM-Timer 1 or 2, which can be programmed to produce the required clock signal, or finally from an external clock input.

Following, this relationship between main-clock, PWM-timer setting and baud rate will be discussed.

It should be noticed, that if a PWM Timer is used for the UART clock generation, the PWM-Timer must be configured to operate as a simple timer and not to generate a PWM-signal, so the name ´PWM-Timer´ might be confusing.

3 Formulas

The output clock frequency of the PWM timer can be calculated according to the following formula:

$$f_{PWM} = \frac{f_{MAIN}}{8 * SC * (COMR + 1)}$$

f_{PWM} : PWM-Timer Output Frequency

f_{MAIN} : Main Clock Frequency

SC : PWM-Timer Input Clock Selector
can be set to {1 | 8 | 16 | 64}

COMR : Timer Value
Can be set to 0..256

The UART baud rate (assuming it is driven by the PWM timer) is given by :

$$BR = \frac{f_{PWM}}{CR}$$

CR : UART Clock Division Ratio
can be set to {16 | 64}

If we rearrange the equations to derive COMR we get:

$$COMR = \frac{f_{MAIN}}{BR * 8 * SC * CR} - 1$$

Example 1:

Let's assume:	Main Clock	f_{MAIN} = 10 MHz
	PWM-Timer Selector	SC = 1
	UART Clock Ratio	CR = 16
	and the Baud Rate shall be	BR = 9600

COMR = 7.138

Thus, the PWM timer would have to be set to the integer value 7.

If we recalculate the baud rate with this timer value the real baud rate would be 9765.625 baud,

which results in a 1.7 % deviation.

The equation can also be used to calculate main-clock frequencies which allow to realize precise baud-rates. The following table lists some of these frequencies to realize a baud rate of 9600 baud.

Main-Clock Frequency	COMR-Setting
(1,2288 MHz)	1
2,4576 MHz	1
3,6864 MHz	2
4,9152 MHz	3
6,144 MHz	4
7,3728 MHz	5
(8,6016 MHz)	6
9,8304 MHz	7
11,0592 MHz	8

4 Document History

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	-	NOFL	02/20/2014	Initial release
*A	5270047	NOFL	10/12/2016	Migrated Spansion Application Note MCU-AN-389014-E-V10 to Cypress format
*B	5877525	AESATMP9	09/08/2017	Updated logo and copyright.

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