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Application to Reduce the Calculation Processing Time for F2MC-16LX/16FX Family 16-Bit Microcontroller

Associated Part Family: MB90340/MB96340

This document describes how to reduce the processing time of calculation formulas in source code of the F2MC-16LX/16FX.

1 Introduction

This document describes how to reduce the processing time of calculation formulas in source code of the F2MC-16LX/16FX.

Modifying divisions in a formula to multiplications reduces the processing time. The difference in processing time as a result of modifying a formula is indicated for cases with F2MC-16LX (MB90340) and F2MC-16FX (MB96340).

2 Modifying a Formula to Reduce the Processing Time

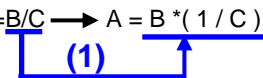
The following describes how to modify a formula to reduce the processing time.

2.1 How to Modify a Formula

Modify a division (B / C) to a multiplication ($B * (1 / C)$) to reduce the processing time as indicated by (1).

<Modification method>

Formula: $A = B / C \rightarrow A = B * (1 / C)$



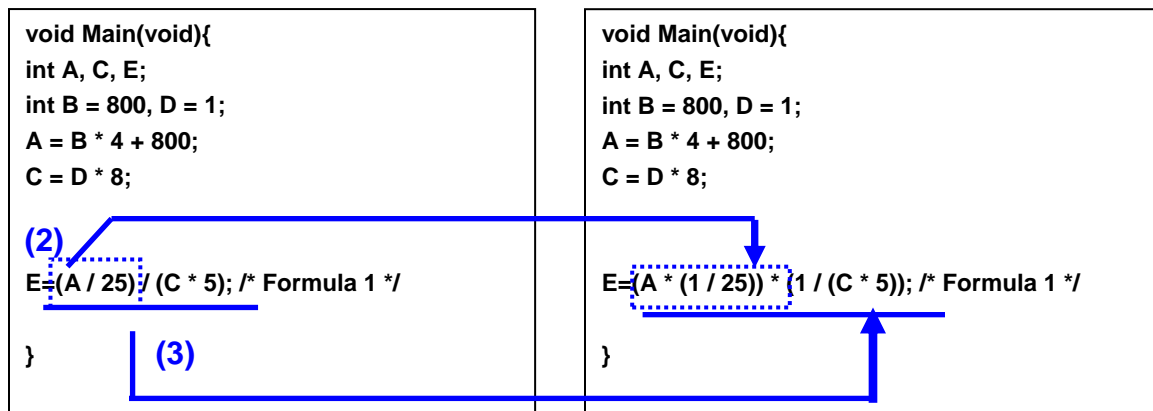
While the result A is a variable, B and C can be either a variable or constant (numeric value).

For example, modify the formula in source code (C language) of F²MC-16LX/16FX as indicated in the following Figure 1 and 2.

Figure 1. Formula before Modification

Figure 2. Formula after Modification

<pre>void Main(void){ int A, C, E; int B = 800, D = 1; A = B * 4 + 800; C = D * 8; (2) E = (A / 25) / (C * 5); /* Formula 1 */ (3) }</pre>	<pre>void Main(void){ int A, C, E; int B = 800, D = 1; A = B * 4 + 800; C = D * 8; E = (A * (1 / 25)) * {1 / (C * 5)}; /* Formula 1 */ }</pre>
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(2) and (3) in Formula 1 in Figure 1 are divisions. They are modified as shown in Figure 2.

(2) is modified as below.

$$A / 25 \longrightarrow A * (1 / 25)$$

Also, (3) is modified as below. The above (2) is replaced with **F** to simplify the formula.

$$F / (C * 5) \longrightarrow F * (1 / (C * 5))$$

The processing time is reduced after the above modification. The next section shows the actual processing results

3 Resulting Processing Time after Modifying a Formula

The following indicates the difference in processing time when the modified formula is executed by Softune.

3.1 Resulting Processing Time Executed by Softune

The following results are the processing time of formulas in Figure 1 and Figure 2 by Softune using F²MC-16LX (MB90340) and F²MC-16FX (MB96340).

Table 1. Processing Time of Formula 1 on F2MC-16LX (MB90340) and F2MC-16FX (MB96340)

CPU core		F ² MC-16LX		F ² MC-16FX	
Model		MB90340		MB96340	
Operating frequency		16 MHz	24 MHz	24 MHz	56 MHz
Processing time of Formula 1 (* number of cycles in parentheses)	Before modification	7.68 (μs) (148)	5.12 (μs)	3.00 (μs) (42)	1.28 (μs)
	After modification	4.88 (μs) (133)	3.28 (μs)	2.16 (μs) (32)	0.94 (μs)

As demonstrated above, modifying divisions to multiplications in source code of F²MC-16LX/16FX reduced the processing time by approximately 30%. Therefore, modifying formulas is a very effective means of reducing processing time of F²MC-16LX/16FX.

Document History

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	-	YUIS	09/28/2009	Initial Release
*A	5037988	YUIS	12/04/2015	Migrated Spansion Application Note from AN07-00214-1E to Cypress format
*B	5873442	AESATP12	09/06/2017	Updated logo and copyright.

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Cypress Semiconductor
198 Champion Court
San Jose, CA 95134-1709

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