**Freescale Semiconductor**
Engineering Bulletin

Document Number: EB722
Rev. 0, 10/2009

# Configuration of FlexRay Controller System Memory Access Timeout Value

by: Dirk Moeller
Munich Design Center

## 1 Introduction

This document describes the configuration of the timeout value in System Memory Access Time-Out Register.

The correct configuration of the timeout value is required for reliable and defined operation of the FlexRay Controller. This value depends only on the frequency of the system bus clock, which is used as the clock of the CHI module in the FlexRay controller.

The timeout value corresponds directly to a certain acceptable number of wait states on the system bus.

**Contents**

1 Introduction . . . . . 1
2 Configure System Memory Access Time-Out Register (FR_SYMATOR) . . . . . 2
3 System Bus Wait State Constraints. . . . . 2

© Freescale Semiconductor, Inc., 2009. All rights reserved.

freescale™ semiconductor

# 2 Configure System Memory Access Time-Out Register (FR_SYMATOR)

To ensure reliable operation of the FlexRay Controller, the application must ensure that the TIMEOUT value in System Memory Access Time-Out Register (FR_SYMATOR) and the CHI clock frequency $f_{CHI}$ in MHz fulfill Equation 2-1.

$$0 \leq \text{SYMATOR[TIMEOUT]} \leq \lfloor 0.45 \cdot f_{CHI} - 8 \rfloor \qquad \textit{Eqn. 2-1}$$

If the SYMATOR[TIMEOUT] value and $f_{CHI}$ violates Equation 2-1, the behavior of the FlexRay Controller becomes unreliable and undefined. It may happen that frames are not transmitted at all, including key slot frames.

For a given SYMATOR[TIMEOUT] value, $f_{CHI}$ can be increased without causing unreliable operation of the FlexRay Controller. The same holds for reducing the SYMATOR[TIMEOUT] value for a given $f_{CHI}$.

Some examples for maximum values of the SYMATOR[TIMEOUT] for a minimum CHI frequency are given in Table 2-1.

**Table 2-1. Maximum SYMATOR[TIMEOUT] examples**

| $f_{CHI}$ | SYMATOR[TIMEOUT] |
|---|---|
| >= 18 MHz | 0 |
| >= 23 MHz | <= 2 |
| >= 27 MHz | <= 4 |
| >= 32 MHz | <= 6 |
| >= 60 MHz | <= 19 |
| >= 80 MHz | <= 28 |

# 3 System Bus Wait State Constraints

The SYMATOR[TIMEOUT] value corresponds directly to a certain acceptable number of wait states on the system bus.

For single-channel configurations and if the sync frame table generation functionality is *not* used (FR_SFTCCSR[SDVEN,SIDEN] = 0), no timeout will be detected if less than 2*SYMATOR[TIMEOUT]+1 wait states will be seen on the system bus for each system bus access.

For dual-channel configurations, or if the sync frame table generation functionality is used, no timeout will be detected if less than SYMATOR[TIMEOUT]–1 wait states will be seen on the system bus for each system bus access.

**How to Reach Us:**

**Home Page:**
www.freescale.com

**Web Support:**
http://www.freescale.com/support

**USA/Europe or Locations Not Listed:**
Freescale Semiconductor, Inc.
Technical Information Center, EL516
2100 East Elliot Road
Tempe, Arizona 85284
+1-800-521-6274 or +1-480-768-2130
www.freescale.com/support

**Europe, Middle East, and Africa:**
Freescale Halbleiter Deutschland GmbH
Technical Information Center
Schatzbogen 7
81829 Muenchen, Germany
+44 1296 380 456 (English)
+46 8 52200080 (English)
+49 89 92103 559 (German)
+33 1 69 35 48 48 (French)
www.freescale.com/support

**Japan:**
Freescale Semiconductor Japan Ltd.
Headquarters
ARCO Tower 15F
1-8-1, Shimo-Meguro, Meguro-ku,
Tokyo 153-0064
Japan
0120 191014 or +81 3 5437 9125
support.japan@freescale.com

**Asia/Pacific:**
Freescale Semiconductor China Ltd.
Exchange Building 23F
No. 118 Jianguo Road
Chaoyang District
Beijing 100022
China
+86 10 5879 8000
support.asia@freescale.com

For Literature Requests Only:
Freescale Semiconductor Literature Distribution Center
1-800-441-2447 or 303-675-2140
Fax: 303-675-2150
LDCForFreescaleSemiconductor@hibbertgroup.com

Document Number: EB722
Rev. 0
10/2009

Information in this document is provided solely to enable system and software implementers to use Freescale Semiconductor products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits or integrated circuits based on the information in this document.

Freescale Semiconductor reserves the right to make changes without further notice to any products herein. Freescale Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. “Typical” parameters that may be provided in Freescale Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including “Typicals”, must be validated for each customer application by customer’s technical experts. Freescale Semiconductor does not convey any license under its patent rights nor the rights of others. Freescale Semiconductor products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Freescale Semiconductor product could create a situation where personal injury or death may occur. Should Buyer purchase or use Freescale Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold Freescale Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Freescale Semiconductor was negligent regarding the design or manufacture of the part.

RoHS-compliant and/or Pb-free versions of Freescale products have the functionality and electrical characteristics as their non-RoHS-compliant and/or non-Pb-free counterparts. For further information, see http://www.freescale.com or contact your Freescale sales representative.

For information on Freescale’s Environmental Products program, go to http://www.freescale.com/epp.

Freescale™ and the Freescale logo are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners.
© Freescale Semiconductor, Inc. 2009. All rights reserved.

freescale™
semiconductor