Freescale Semiconductor
Engineering Bulletin

Document Number: EB795
Rev. 0, 08/2013

Working around ERR7026 according to application needs

by: Automotive and Industrial Solutions Group

1 Introduction

This document aims to describe Errata 7026 which affect the MPC564xS devices and how to safely handle it.

Contents

© Freescale Semiconductor, Inc., 2013. All rights reserved.

2 Errata Description

Repetitively cycling the flash with Standby mode may disturb flash bits, causing them to flip from a 1 (erased state) to a 0 (programmed state) when switching from Standby back to Run mode with VDD12 at approximately 100 mV.

3 Workaround options

When exiting Standby mode, ensure that the VDD12 pins are allowed to fully discharge to VSS (below 60 mV) before entering a Run mode.

There are two recommended ways of ensuring that VDD12 is fully discharged:

- Increase the time the MCU remains in Standby
- Use a pull down resistor on VDD12

These options are recommendations or guidelines that each customer needs to analyze and adjust to their specific application. In the following sections these two options are described in more detail.

3.1 Increase the time the MCU remains in Standby

The discharge time for the VDD12 capacitor array depends on both the VDD12 capacitance value and the Standby current.

Standby current depends on the application conditions (such as Standby mode, SXOSC and RTC configurations) and could range between tens to hundreds of µA as the following table illustrates:

Table 1. Low power mode current consumption

Parameter	Conditions	Value		Unit
		Typ	Max	
STANDBY2 mode current (64K SRAM on)	SXOSC (32 kHz) ON and RTC running	481	910	µA
	SXOSC (32 kHz) and RTC OFF	93	430	
STANDBY1 mode current (8K SRAM on)	SXOSC (32 kHz) ON and RTC running	426	915	µA
	SXOSC (32 kHz) and RTC OFF	29	410	

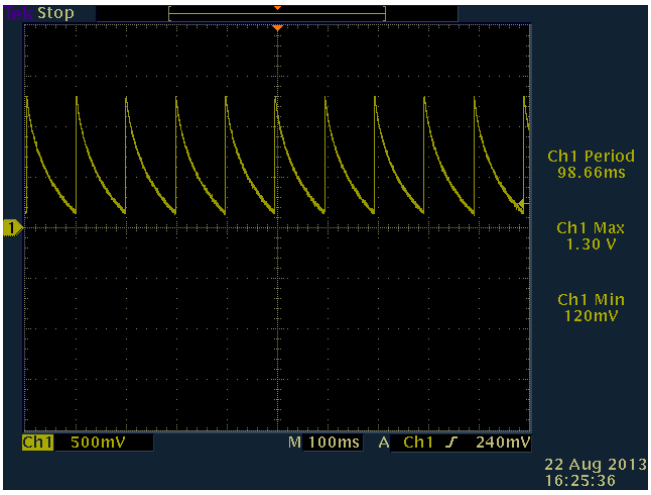
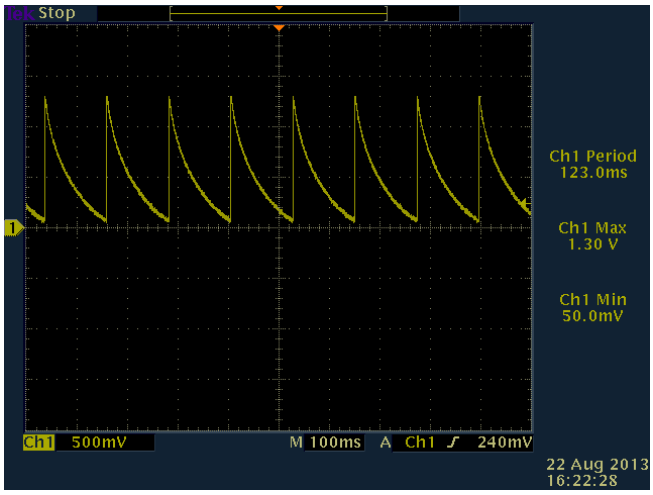
Please refer to the MPC5645S datasheet for the complete table.

It is recommended to evaluate the characteristics of each application and determine if increasing the Standby time ensures VDD12 to be below 60 mV before exiting the Standby mode.

The amount of time needed to discharge VDD12 will depend on the application hardware and capacitance assigned to the VDD12 pins.

The following table illustrates the time needed to discharge VDD12 pins:

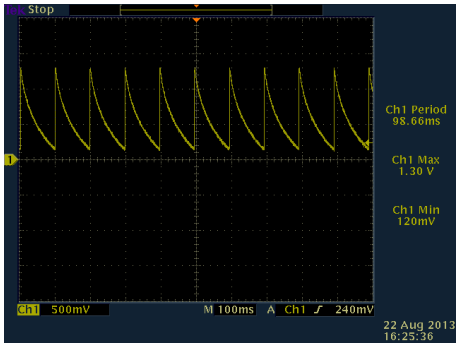
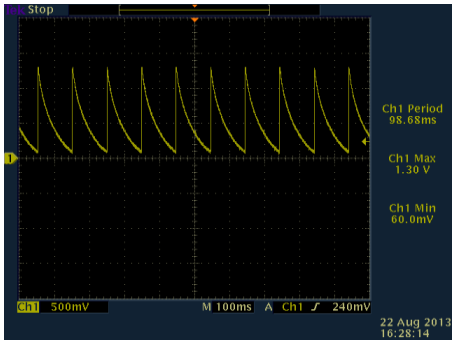
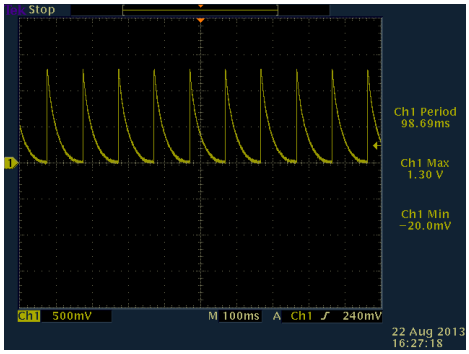
Table 2. Increasing the time between wake up and sleep modes

Short wake up time	Longer wake up time
MCU goes to standby and wakes up after 98.66 ms. VDD12 voltage drops to 120 mV. This application could eventually experience errata 7026.	MCU goes to standby and wakes up after 123 ms. VDD12 voltage has dropped to 50 mV. This application is safe.
	

3.2 Use a pull down resistor on VDD12

Including an additional pull-down resistor on VDD12 will shorten the VDD12 capacitive array discharge time.
Additional current demand for VDD12 needs to be considered during RUN and STOP modes.
The following table illustrates the voltage on VDD12 pin with different pull down resistors:

Table 3. Adding a resistor to VDD12

Situation description	Scope image of VDD12 voltage
This application wakes up after 98.66 ms of standby mode. VDD12 pins are allowed to drop only to 120 mV. This application may eventually experience errata 7026. Allowing more discharge time or adding a pull down resistor is recommended.	
A 5.4kΩ pull down resistor is added at VDD12. Wake up time was not changed. VDD12 voltage drops to 60 mV before next wake up. This application could eventually experience errata 7026. Lowering the resistance to ground is recommended to allow VDD21 voltage to drop below 60 mV before next wake up.	
A 1 kΩ pull down resistor is added at pin VDD12. VDD12 voltage drops well below 60 mV before next wake up. This application is safe from errata 7026.	

3.3 Summary comparison of workarounds

The following table provides a summary and comparison of both proposed workarounds as a reference to the user:

Table 4. Comparison of ERR7026 workarounds

	Increase the time the MCU remains in standby	**Use a pull down resistor on VDD12**
Description	Application does not wake up from standby until a time has passed that assures VDD12 is discharged.	An external pull down resistor is used to lower the discharge time of VDD12.
Current consumption	Not affected	Increased by current consumed by resistor.
Application response time to an event from standby	Response to an event may be delayed to allow VDD12 to discharge.	Not affected
External components	Not affected	A single external resistor is needed.

NOTE

All measurements were made on the MPC5645S board, which has four 10 µF capacitors and four 0.1 µF capacitors to ground, and a 10 kΩ pull down resistor on the VDD12 pins.

4 Pull down resistor simulation

The following image illustrates a simulation comparing the different pull down resistor options and their resulting discharge times for VDD12:

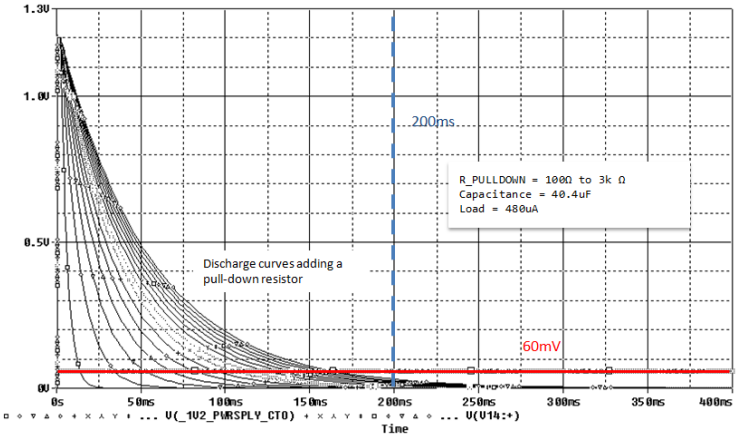


Figure 1. VDD12 Discharge resulting from different pull down resistor configurations

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

Freescale reserves the right to make changes without further notice to any products herein. Freescale makes no warranty, representation, or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale 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 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 does not convey any license under its patent rights nor the rights of others. Freescale sells products pursuant to standard terms and conditions of sale, which can be found at the following address: freescale.com/SalesTermsandConditions.

How to Reach Us:

Home Page:
freescale.com

Web Support:
freescale.com/support

Freescale, the Freescale logo, CodeWarrior, ColdFire, C-Ware and Qorivva are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. SafeAssure, Vybrid are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners.

© Freescale Semiconductor, Inc. 2013. All rights reserved.

Document Number: EB791
Rev. 0
04/2013