

# MPC5xxx: Proper Methods for Suspending an Active DMA channel

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## 1 Introduction

This engineering bulletin provides guidance on how to properly suspend and resume an active Direct Memory Access (DMA) channel hardware service request, when the DMA is triggered by a slave module such as the Deserial Serial Peripheral Interface (DSPI), the Sigma Delta Analog to Digital Converter (SDADC), or other peripheral modules. The information provided here applies to MPC5xxx and S32Kxx families of devices.

## 2 Overview

DMA allows the user to move data from memory or a peripheral module's registers to another location of memory or another module's registers without CPU interaction. Normally, the DMA and slave module are configured and there is no reason to suspend the DMA channel. However, in some rare cases, it is desirable to suspend a peripheral's DMA hardware service request dynamically while it is in operation. In such a use case, there are certain restrictions for disabling the DMA hardware service request. For coherency, a specific procedure must be followed.

### 2.1 Procedure to suspend an active DMA channel

If an active DMA channel needs to be suspended, the slave trigger must be stopped first, followed by suspending the DMA. This is done by using the following sequence.

1. Disable the DMA service request at the source peripheral first. Confirm it has been disabled by reading back the appropriate register in the peripheral.
2. Check the DMA's Hardware Request Status register (DMA\_HRSx) to ensure there is no pending DMA service request for the DMA channel being suspended. Then, disable the DMA hardware request by clearing the ERQ bit on the appropriate DMA channel via the DMA Channel Clear Enable Request (DMA\_CERQ) register . If a service request is present, wait until the request has been processed and the HRS bit reads zero. Then disable the DMA channel hardware request by clearing the ERQ bit.

### 2.2 Procedure to resume the DMA channel

As with the suspend procedure, the resume sequence must also be properly performed.

1. Enable the DMA hardware service request on the appropriate channel by setting the ERQ bit via Set Enable Request Register (DMA\_SERQ)



2. Enable the DMA service request at the source peripheral.

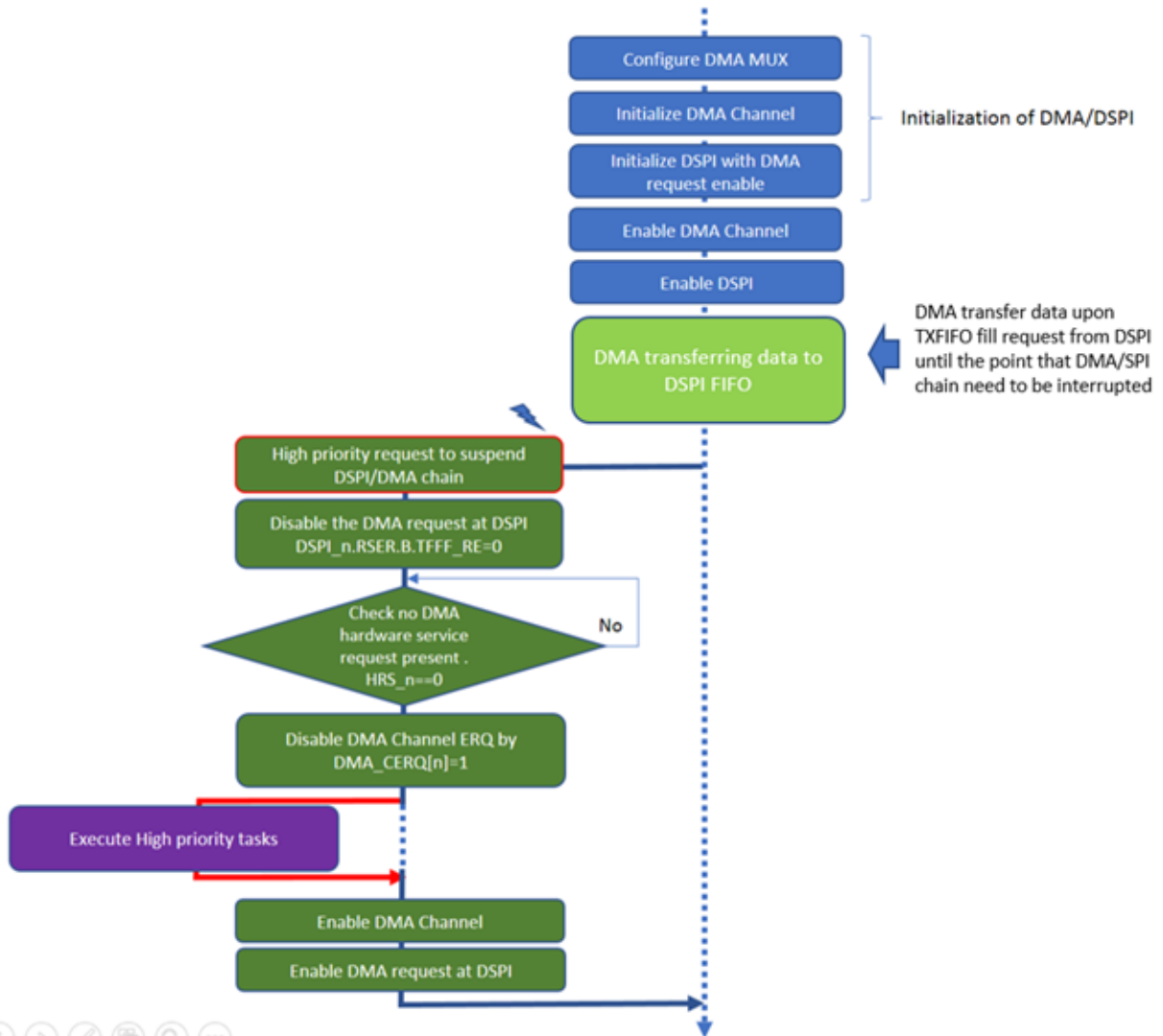
### 3 Use case example

One use case that could require suspending is when using the DMA with the DSPI module.

The DSPI is set as the master for transmitting data via a DMA request when the DSPI\_TXFIFO has an empty slot. The TXFIFO fill DMA request enable/disable can be configured by the TFFF\_RE bit of the DSPI\_RESR register. The DMA will transfer the next command & data to the TXFIFO upon the request. If the DMA/DSPI transfer loop needs to be suspended, use the following steps.

1. Disable the DMA service request at the source by writing '0' to the DSPI\_RSER.B.TFFF\_RE bit. Confirm that DSPI\_RSER.B.TFFF\_RE == 0.
2. Ensure there is no DMA request from the DSPI by verifying Hardware Request Status Register (DMA\_HRSx)\_HRS.b.HRSn == 0 for the appropriate channel. If no service request is present (HRS\_n=0), disable the DMA channel by clearing the channel's ERQ bit by DMA\_x.CERQ[CH]= 1. If a service request is present, wait until the request has been processed and the HRS bit reads zero.

The following diagram illustrates the procedure described above to suspend an ongoing DSPI/DMA chain.



When a “high priority task” is executing, the user needs to ensure that the application software does not cause any FIFO overflow situation. For example, when the CPU is being used to write to the DSPI TX\_FIFO/CMD\_FIFO etc.

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