STM32F42xx and STM32F43xx Errata sheet

STM32F427/437 and STM32F429/439 line limitations

Applicability

This document applies to the part numbers of STM32F4xx devices listed in *Table 1* and their variants shown in *Table 2*.

Section 1 gives a summary and *Section 2* a description of device limitations, with respect to the device datasheet and reference manual [RM0090].

Table 1. Device summary

Reference	Part numbers
STM32F427xxx	STM32F427VG, STM32F427ZG, STM32F427IG, STM32F427AG, STM32F427VI, STM32F427ZI, STM32F427II, STM32F427AI
STM32F437xxx	STM32F437VG, STM32F437ZG, STM32F437IG, STM32F437VI, STM32F437ZI, STM32F437II, STM32F437AI
STM32F429xx	STM32F429VG, STM32F429ZG, STM32F429IG, STM32F429VI, STM32F429ZI, STM32F429II, STM32F429AI, STM32F429AG, STM32F429BG, STM32F429BI, STM32F429NI, STM32F429NG, STM32F429VE, STM32F429ZE, STM32F429IE, STM32F429BE, STM32F429NE
STM32F439xx	STM32F439VI, STM32F439VG, STM32F439ZG, STM32F439ZI, STM32F439IG, STM32F439II, STM32F439AI, STM32F439BG, STM32F439BI, STM32F439NI, STM32F439NG

Table 2. Device variants

Reference	Silicon revision codes	
	Device marking(1)	REV_ID(2)
STM32F42xxxSTM32F43xxx	A	0x1000
STM32F42xxxSTM32F43xxx	Y	0x1003
STM32F42xxxSTM32F43xxx	1	0x1007
STM32F42xxxSTM32F43xxx	3	0x2001
STM32F42xxxSTM32F43xxx	5 and B	0x2003

1. Refer to the device data sheet for how to identify this code on different types of package.
2. REV_ID[15:0] bit field of DBGMCU_IDCODE register. Refer to the reference manual.

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1 Summary of device limitations

The following table gives a quick references to all documented device limitations of STM32F4xx and their status:

A = limitation present, workaround available

N = limitation present, no workaround available

P = limitation present, partial workaround available

"-" = limitation absent

Applicability of a workaround may depend on specific conditions of target application. Adoption of a workaround may cause restrictions to target application. Workaround for a limitation is deemed partial if it only reduces the rate of occurrence and/or consequences of the limitation, or if it is fully effective for only a subset of instances on the device or in only a subset of operating modes, of the function concerned.

Table 3. Summary of device limitations

Function	Section	Limitation	Status				
			Rev. A	Rev. Y	Rev. 1	Rev. 3	Rev. 5 and B
Core	2.1.1	Interrupted loads to stack pointer can cause erroneous behavior	A	A	A	A	A
Core	2.1.2	VDIV or VSQRT instructions might not complete correctly when very short ISRs are used	A	A	A	A	A
Core	2.1.3	Store immediate overlapping exception return operation might vector to incorrect interrupt	A	A	A	A	A
System	2.2.1	Debugging Stop mode and system tick timer	A	A	A	A	A
System	2.2.2	Debugging Stop mode with WFE entry	A	A	A	A	A
System	2.2.3	Debugging Sleep/Stop mode with WFE/WFI entry	A	A	A	A	A
System	2.2.4	Wakeup sequence from Standby mode when using more than one wakeup source	A	A	A	A	A
System	2.2.5	Full JTAG configuration without NJTRST pin cannot be used	A	A	A	A	A
System	2.2.6	MPU attribute to RTC and IWDG registers could be managed incorrectly	A	A	A	A	A
System	2.2.7	Delay after an RCC peripheral clock enabling	A	A	A	A	A
System	2.2.8	Internal noise impacting the ADC accuracy	N	-	-	-	-
System	2.2.9	Over-drive and Under-drive modes unavailability	N	N	-	-	-
System	2.2.10	Operating voltage extension down to 1.7 V in the whole temperature range	A	A	A	-	-
System	2.2.11	PA12 GPIO limitations	A	A	A	-	-

Table 3. Summary of device limitations (continued)

Function	Section	Limitation	Status				
			Rev. A	Rev. Y	Rev. 1	Rev. 3	Rev. 5 and B
System	*2.2.12*	*Data cache might be corrupted during Flash read-while-write operation*	A	A	A	A	A
System	*2.2.13*	*Possible delay in backup domain protection disabling/enabling after programming the DBP bit*	A	A	A	A	A
System	*2.2.14*	*No Alarm out when PC13 GPIO is configured in Open Drain*	A	A	A	A	A
FMC	*2.3.1*	*Dummy read cycles inserted when reading synchronous memories*	N	N	N	N	N
FMC	*2.3.2*	*FMC synchronous mode and NWAIT signal disabled*	A	A	A	-	-
FMC	*2.3.3*	*Read access to a non-initialized FMC_SDRAM bank*	P	P	P	-	-
FMC	*2.3.4*	*Corruption of data read from the FMC*	A	-	-	-	-
FMC	*2.3.5*	*Interruption of CPU read burst access to an end of SDRAM row*	A	A	A	-	-
FMC	*2.3.6*	*FMC NOR/PSRAM controller: asynchronous read access on bank 2 to 4 returns wrong data when bank 1 is in synchronous mode (BURSTEN bit is set)*	A	A	-	-	-
FMC	*2.3.7*	*FMC dynamic and static bank switching*	A	A	A	-	-
FMC	*2.3.8*	*NAND/PCCard transaction and Wait timing*	A	A	A	A	A
FMC	*2.3.9*	*Data corruption during burst read from FMC synchronous memory*	A	A	A	A	A
FMC	*2.3.10*	*Missed burst write transaction on multiplexed PSRAM*	-	-	A	A	A
FMC	*2.3.11*	*FMC NOR/PSRAM controller write protocol violation*	N	N	N	-	-
FMC	*2.3.12*	*FMC NOR/PSRAM controller bank switch with different BUSTURN durations*	A	A	A	A	A
FMC	*2.3.13*	*Wrong data read from a busy NAND memory*	A	A	A	A	A
FMC	*2.3.14*	*Missed clocks with continuous clock feature enabled*	A	A	A	A	A
FMC	*2.3.15*	*SDRAM bank address corruption upon an interruption of CPU read burst access*	A	A	A	A	A
ADC	*2.4.1*	*ADC sequencer modification during conversion*	A	A	A	A	A
DAC	*2.5.1*	*DMA underrun flag management*	A	A	A	A	A
DAC	*2.5.2*	*DMA request not automatically cleared by DMAEN=0*	A	A	A	A	A
TIMx	*2.6.1*	*PWM re-enabled in automatic output enable mode despite of system break*	A	A	A	A	A
TIMx	*2.6.2*	*Consecutive compare event missed in specific conditions*	A	A	A	A	A
TIMx	*2.6.3*	*Output compare clear not working with external counter resettle of the limitation here*	A	A	A	A	A
TIMx	*2.6.4*	*TRGO and TRGO2 trigger output failure*	A	A	A	A	A

Table 3. Summary of device limitations (continued)

Function	Section	Limitation	Status				
			Rev. A	Rev. Y	Rev. 1	Rev. 3	Rev. 5 and B
IWDG	*2.7.1*	*RVU and PVU flags are not reset in Stop mode*	A	A	A	A	A
RTC and TAMP	*2.8.1*	*Spurious tamper detection when disabling the tamper channel*	N	N	N	N	N
RTC and TAMP	*2.8.2*	*Detection of a tamper event occurring before enabling the tamper detection is not supported in edge detection mode*	A	A	A	A	A
RTC and TAMP	*2.8.3*	*RTC calendar registers are not locked properly*	A	A	A	A	A
I2C	*2.9.1*	*SMBus standard not fully supported*	A	A	A	A	A
I2C	*2.9.2*	*Start cannot be generated after a misplaced Stop*	A	A	A	A	A
I2C	*2.9.3*	*Mismatch on the "Setup time for a repeated Start condition" timing parameter*	A	A	A	A	A
I2C	*2.9.4*	*Data valid time ($t_{VD;DAT}$) violated without the OVR flag being set*	A	A	A	A	A
I2C	*2.9.5*	*Both SDA and SCL maximum rise time (t_r) violated when VDD_I2C bus higher than ((VDD+0.3) / 0.7) V*	A	A	A	A	A
I2C	*2.9.6*	*Spurious Bus Error detection in Master mode*	A	A	A	A	A
USART	*2.10.1*	*Idle frame is not detected if receiver clock speed is deviated*	N	N	N	N	N
USART	*2.10.2*	*In full-duplex mode, the Parity Error (PE) flag can be cleared by writing to the data register*	A	A	A	A	A
USART	*2.10.3*	*Parity Error (PE) flag is not set when receiving in Mute mode using address mark detection*	N	N	N	N	N
USART	*2.10.2*	*In full-duplex mode, the Parity Error (PE) flag can be cleared by writing to the data register*	N	N	N	N	N
USART	*2.10.5*	*nRTS signal abnormally driven low after a protocol violation*	A	A	A	A	A
SPI	*2.11.1*	*Wrong CRC calculation when the polynomial is even*	A	A	A	A	A
SPI	*2.11.2*	*Corrupted last bit of data and/or CRC, received in Master mode with delayed SCK feedback*	A	A	A	A	A
SPI	*2.11.3*	*Wrong CRC transmitted in Master mode with delayed SCK feedback*	A	A	A	A	A
SPI	*2.11.4*	*BSY bit may stay high at the end of a data transfer in Slave mode*	A	A	A	A	A
I2S	*2.12.1*	*In I2S Slave mode, WS level must be set by the external master when enabling the I2S*	A	A	A	A	A
I2S	*2.12.2*	*Corrupted last bit of data and/or CRC, received in Master mode with delayed SCK feedback*	A	A	A	A	A
SDIO	*2.13.1*	*SDIO HW flow control*	N	N	N	N	N

Table 3. Summary of device limitations (continued)

Function	Section	Limitation	Status				
			Rev. A	Rev. Y	Rev. 1	Rev. 3	Rev. 5 and B
SDIO	*2.13.2*	*Wrong CCRCFAIL status after a response without CRC is received*	A	A	A	A	A
SDIO	*2.13.3*	*Data corruption in SDIO clock dephasing (NEGEDGE) mode*	N	N	N	N	N
SDIO	*2.13.4*	*CE-ATA multiple write command and card busy signal management*	A	A	A	A	A
SDIO	*2.13.5*	*No underrun detection with wrong data transmission*	A	A	A	A	A
bxCAN	*2.14.1*	*BxCAN time triggered communication mode not supported*	N	N	N	N	N
OTG-FS	*2.15.1*	*Data in RxFIFO is overwritten when all channels are disabled simultaneously*	A	A	A	A	A
OTG-FS	*2.15.2*	*OTG host blocks the receive channel when receiving IN packets and no TxFIFO is configured*	A	A	A	A	A
OTG-FS	*2.15.3*	*Host channel-halted interrupt not generated when the channel is disabled*	A	A	A	A	A
OTG-FS	*2.15.4*	*Error in software-read OTG_FS_DCFG register values*	A	A	A	A	A
OTG-FS	*2.15.5*	*Transmit data FIFO is corrupted when a write sequence to the FIFO is interrupted with accesses to certain OTG_FS registers*	A	A	A	A	A
OTG-HS	*2.16.1*	*Transmit data FIFO is corrupted when a write sequence to the FIFO is interrupted with accesses to certain OTG_HS registers*	A	A	A	A	A
ETH	*2.17.1*	*Incorrect layer 3 (L3) checksum is inserted in transmitted IPv6 packets without TCP, UDP or ICMP payloads*	A	A	A	A	A
ETH	*2.17.2*	*The Ethernet MAC processes invalid extension headers in the received IPv6 frames*	N	N	N	N	N
ETH	*2.17.3*	*MAC stuck in the Idle state on receiving the TxFIFO flush command exactly 1 clock cycle after a transmission completes*	A	A	A	A	A
ETH	*2.17.4*	*Transmit frame data corruption*	A	A	A	A	A
ETH	*2.17.5*	*Successive write operations to the same register might not be fully taken into account*	A	A	A	A	A
ETH	*2.17.6*	*Incorrect status and corrupted frames when RxFIFO overflow occurs on the penultimate word of Rx frames*	A	A	A	A	A
ETH	*2.17.7*	*Incorrect remote wakeup on global unicast packet*	A	A	A	A	A
ETH	*2.17.8*	*Overflow status bits of missed frame and buffer overflow counters are cleared without a read operation*	A	A	A	A	A
ETH	*2.17.9*	*MAC may provide incorrect Rx status for the MAC control frames when receive checksum offload is enabled*	A	A	A	A	A

Table 3. Summary of device limitations (continued)

Function	Section	Limitation	Status				
			Rev. A	Rev. Y	Rev. 1	Rev. 3	Rev. 5 and B
ETH	*2.17.10*	*MAC may provide an inaccurate Rx status when receive checksum offload is enabled in cutthrough mode*	A	A	A	A	A
ETH	*2.17.11*	*MAC may not drop received giant error frames*	A	A	A	A	A

2 Description of device limitations

The following sections describe device limitations and provide workarounds if available. They are grouped by device function.

2.1 Core

Errata notice for the Arm®(a) Cortex®-M4 FPU core revisions r0 is available from *http://infocenter.arm.com.*

Only applicable information from the Arm® errata notice is replicated in this document. Extra information may be added for more clarity.

2.1.1 Interrupted loads to stack pointer can cause erroneous behavior

This limitation is registered under Arm® ID number 752770 and classified into “Category B”. Its impact to the device is minor.

Description

An interrupt occurring during the data-phase of a single word load to the stack pointer (SP/R13) can cause an erroneous behavior of the device. In addition, returning from the interrupt results in the load instruction being executed with an additional time.

For all the instructions performing an update of the base register, the base register is erroneously updated on each execution, resulting in the stack pointer being loaded from an incorrect memory location.

The instructions affected by this limitation are the following:

- LDR SP, [Rn],#imm
- LDR SP, [Rn,#imm]!
- LDR SP, [Rn,#imm]
- LDR SP, [Rn]
- LDR SP, [Rn,Rm]

Workaround

As of today, no compiler generates these particular instructions. This limitation can only occur with hand-written assembly code.

Both issues can be solved by replacing the direct load to the stack pointer by an intermediate load to a general-purpose register followed by a move to the stack pointer.

a. Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

Example:

Replace LDR SP, [R0] with

LDR R2,[R0]

MOV SP,R2

2.1.2 VDIV or VSQRT instructions might not complete correctly when very short ISRs are used

This limitation is registered under Arm® ID number 776924 and classified into “Category B”. Its impact to the device is limited.

Description

The VDIV and VSQRT instructions take 14 cycles to execute. When an interrupt is taken a VDIV or VSQRT instruction is not terminated, and completes its execution while the interrupt stacking occurs. If lazy context save of floating point state is enabled then the automatic stacking of the floating point context does not occur until a floating point instruction is executed inside the interrupt service routine.

Lazy context save is enabled by default. When it is enabled, the minimum time for the first instruction in the interrupt service routine to start executing is 12 cycles. In certain timing conditions, and if there is only one or two instructions inside the interrupt service routine, then the VDIV or VSQRT instruction might not write its result to the register bank or to theFPSCR.

The failure occurs when the following condition is met:

1. The floating point unit is enabled
2. Lazy context saving is not disabled
3. A VDIV or VSQRT is executed
4. The destination register for the VDIV or VSQRT is one of s0 - s15
5. An interrupt occurs and is taken
6. The interrupt service routine being executed does not contain a floating point instruction
7. Within 14 cycles after the VDIV or VSQRT is executed, an interrupt return is executed

A minimum of 12 of these 14 cycles are utilized for the context state stacking, which leaves two cycles for instructions inside the interrupt service routine, or two wait states applied to the entire stacking sequence (which means that it is not a constant wait state for every access).

In general, this means that if the memory system inserts wait states for stack transactions (that is, external memory is used for stack data), then this erratum cannot be observed.

The effect of this erratum is that the VDIV or VQSRT instruction does not complete correctly and the register bank and FPSCR are not updated, which means that these registers hold incorrect (out of date) data.

Workaround

A workaround is only required if the floating point unit is enabled. A workaround is not required if the stack is in external memory.

There are two possible workarounds:

1. Disable lazy context save of floating point state by clearing LSPEN to 0 (bit 30 of theFPCCR at address 0xE000EF34).
2. Ensure that every interrupt service routine contains more than two instructions in addition to the exception return instruction.

2.1.3 Store immediate overlapping exception return operation might vector to incorrect interrupt

This limitation is registered under Arm® ID number 838869 and classified into “Category B (rare)”. Its impact to the device is minor.

Description

The core includes a write buffer that permits execution to continue while a store is waiting on the bus. Under specific timing conditions, during an exception return while this buffer is still in use by a store instruction, a late change in selection of the next interrupt to be taken might result in there being a mismatch between the interrupt acknowledged by the interrupt controller and the vector fetched by the processor.

The failure occurs when the following condition is met:

1. The handler for interrupt A is being executed.
2. Interrupt B, of the same or lower priority than interrupt A, is pending.
3. A store with immediate offset instruction is executed to a bufferable location.
   - STR/STRH/STRB <Rt>, [<Rn>,#imm]
   - STR/STRH/STRB <Rt>, [<Rn>,#imm]!
   - STR/STRH/STRB <Rt>, [<Rn>],#imm
4. Any number of additional data-processing instructions can be executed.
5. A BX instruction is executed that causes an exception return.
6. The store data has wait states applied to it such that the data is accepted at least two cycles after the BX is executed.
   - Minimally, this is two cycles if the store and the BX instruction have no additional instructions between them.
   - The number of wait states required to observe this erratum needs to be increased by the number of cycles between the store and the interrupt service routine exit instruction.
7. Before the bus accepts the buffered store data, another interrupt C is asserted which has the same or lower priority as A, but a greater priority than B.

Example:

The processor should execute interrupt handler C, and on completion of handler C should execute the handler for B. If the conditions above are met, then this erratum results in the processor erroneously clearing the pending state of interrupt C, and then executing the handler for B twice. The first time the handler for B is executed it will be at interrupt C's priority level. If interrupt C is pended by a level-based interrupt which is cleared by C's handler then interrupt C will be pended again once the handler for B has completed and the handler for C will be executed.

As the STM32 interrupt C is level based, it eventually becomes pending again and is subsequently handled.

Workaround

For software not using the memory protection unit, this erratum can be worked around by setting DISDEFWBUF in the Auxiliary Control Register.

In all other cases, the erratum can be avoided by ensuring a DSB occurs between the store and the BX instruction. For exception handlers written in C, this can be achieved by inserting the appropriate set of intrinsics or inline assembly just before the end of the interrupt function, for example:

```
ARMCC:
...
__schedule_barrier();
__asm{DSB};
__schedule_barrier();
}
GCC:
...
__asm volatile ("dsb 0xf":::"memory");
}
```

2.2 System

2.2.1 Debugging Stop mode and system tick timer

Description

If the system tick timer interrupt is enabled during the Stop mode debug (DBG_STOP bit set in the DBGMCU_CR register), it will wake up the system from Stop mode.

Workaround

To debug the Stop mode, disable the system tick timer interrupt.

2.2.2 Debugging Stop mode with WFE entry

Description

When the Stop debug mode is enabled (DBG_STOP bit set in the DBGMCU_CR register), this allows software debugging during Stop mode.

However, if the application software uses the WFE instruction to enter Stop mode, after wakeup some instructions could be missed if the WFE is followed by sequential instructions. This affects only Stop debug mode with WFE entry.

Workaround

To debug Stop mode with WFE entry, the WFE instruction must be inside a dedicated function with 1 instruction (NOP) between the execution of the WFE and the Bx LR.

Example:

__asm void _WFE(void) {

```
WFE
NOP
BX lr }
```

2.2.3 Debugging Sleep/Stop mode with WFE/WFI entry

Description

When the Sleep debug or Stop debug mode is enabled (DBG_SLEEP bit or DBG_STOP bit are set in the DBGMCU_CR register), this allows software debugging during Sleep or Stop mode. After wakeup some unreachable instructions could be executed if the following condition are met:

- If the application software disables the Prefetch queue
- The number of wait state configured on Flash interface is higher than 0
- And Linker place WFE or WFI instructions on 4-bytes aligned addresses (0x080xx_xxx4)

Workaround

- Add three NOPs after WFI/WFE instruction
- Keep one AHB master active during sleep (example keep DMA1 or DMA2 RCC clock enable bit set)
- Execute WFI/WFE instruction from routines inside the SRAM

2.2.4 Wakeup sequence from Standby mode when using more than one wakeup source

Description

The various wakeup sources are logically OR-ed in front of the rising-edge detector which generates the wakeup flag (WUF). The WUF needs to be cleared prior to Standby mode entry, otherwise the MCU wakes up immediately.

If one of the configured wakeup sources is kept high during the clearing of the WUF (by setting the CWUF bit), it may mask further wakeup events on the input of the edge detector. As a consequence, the MCU might not be able to wake up from Standby mode.

Workaround

To avoid this problem, the following sequence should be applied before entering Standby mode:

- Disable all used wakeup sources,
- Clear all related wakeup flags,
- Re-enable all used wakeup sources,
- Enter Standby mode

Note: Be aware that, when applying this workaround, if one of the wakeup sources is still kept high, the MCU enters Standby mode but then it wakes up immediately generating a power reset.

2.2.5 Full JTAG configuration without NJTRST pin cannot be used

Description

When using the JTAG debug port in debug mode, the connection with the debugger is lost if the NJTRST pin (PB4) is used as a GPIO or as another alternate function than NJTRST. Only the 4-wire JTAG port configuration is impacted.

Workaround

Use the SWD debug port instead of the full 4-wire JTAG port.

2.2.6 MPU attribute to RTC and IWDG registers could be managed incorrectly

Description

If the MPU is used and the non bufferable attribute is set to the RTC or IWDG memory map region, the CPU access to the RTC or IWDG registers could be treated as bufferable, provided that there is no APB prescaler configured (AHB/APB prescaler is equal to 1).

Workaround

If the non bufferable attribute is required for these registers, the software could perform a read after the write to guaranty the completion of the write access.

2.2.7 Delay after an RCC peripheral clock enabling

Description

A delay between an RCC peripheral clock enable and the effective peripheral enabling should be taken into account in order to manage the peripheral read/write to registers.

This delay depends on the peripheral mapping:

- If the peripheral is mapped on AHB: the delay should be equal to 2 AHB cycles.
- If the peripheral is mapped on APB: the delay should be equal to 1 + (AHB/APB prescaler) cycles.

Workaround

1. Use the DSB instruction to stall the Cortex®-M4 CPU pipeline until the instruction is completed.
2. Insert “n” NOPs between the RCC enable bit write and the peripheral register writes (n = 2 for AHB peripherals, n = 1 + AHB/APB prescaler in case of APB peripherals).
3. Or simply insert a dummy read operation from the corresponding register just after enabling the peripheral clock.

2.2.8 Internal noise impacting the ADC accuracy

Description

An internal noise generated on V_{DD} supplies and propagated internally may impact the ADC accuracy.

This noise is always active whatever the power mode of the MCU (RUN or Sleep).

Workaround

To adapt the accuracy level to the application requirements, set one of the following options:

- Option1
  Set the ADCDC1 bit in the PWR_CR register.
- Option2
  Set the corresponding ADCxDC2 bit in the SYSCFG_PMC register.

Only one option can be set at a time.

For more details on option 1 and option2 mechanisms, refer to AN4073.

2.2.9 Over-drive and Under-drive modes unavailability

Description

The Over-drive and Under-drive modes are not available on revision A devices.

Workaround

None

2.2.10 Operating voltage extension down to 1.7 V in the whole temperature range

Description

Revision “A” and “Y” devices powered from a 1.7 V supply voltage, operate only in the 0 to 70 °C temperature range.

Starting from revision 1, the operating voltage down to 1.7 V is extended at full temperature ranges:

- -40 °C to 105 °C (suffix 7)

-40 °C to 85 °C (for suffix 6).

Workaround

None

2.2.11 PA12 GPIO limitations

Description

When PA12 is used as GPIO or alternate function in input or output mode, the data read from Flash memory can be corrupted. This behavior is observed only when the following conditions are met:

- The device operates from a 2.7 to 3.6 V V_{DD} power supply whatever the temperature range
- Flash memory Bank2 is used or the dual bank feature is enabled.

Impacted products

- STM32F42xxI and STM32F43xxI part numbers
- STM32F42xxG and STM32F43xxG part numbers only when dual bank feature is enabled.

Not impacted products

- STM32F42xxG and STM32F43xxG part numbers when dual bank feature is disabled
- STM32F42xxE and STM32F43xxE part numbers.

Workaround

PA12 must be left unconnected on the PCB (configured as push-pull and held Low). You can use all the other GPIOs and all alternate functions except for the ones mapped on PA12. Use the OTG_HS peripheral in full-speed mode instead of the OTG_FS peripheral.

This limitation is fixed in silicon starting from revision 3.

2.2.12 Data cache might be corrupted during Flash read-while-write operation

Description

When a write operation to the internal Flash memory is done, the data cache is updated to reflect the data update. If a read operation to the other memory bank occurs during the data cache update, the data cache content may be corrupted. In this case, subsequent read operations from the same address (Cache hits) will be corrupted.

This issue only occurs in dual bank mode when reading (data access or code execution) from one Flash bank while writing to the other Flash bank with data cache enabled.

Workaround

When the application is performing data accesses in both Flash memory banks, the data cache must be disabled by resetting the DCEN bit in FLASH_ACR register before performing any write operation to Flash memory. Before enabling the data cache again, the cache must be reset by setting and then resetting the DCRST bit in FLASH_ACR register.

Example of code

```
  /* Disable data cache  */
  __HAL_FLASH_DATA_CACHE_DISABLE();

  /* Set PG bit */
  SET_BIT(FLASH->CR, FLASH_CR_PG);

  /* Program the Flash word */
WriteFlash(Address, Data);

  /* Reset data cache */
  __HAL_FLASH_DATA_CACHE_RESET();
  /* Enable data cache */
  __HAL_FLASH_DATA_CACHE_ENABLE();
```

2.2.13 Possible delay in backup domain protection disabling/enabling after programming the DBP bit

Description

Depending on the AHB/APB1 prescaler, a delay between DBP bit programming and the effective disabling/enabling of the backup domain protection must be taken into account.

The higher APB1 prescaler value, the higher the delay.

Workaround

Apply one of the following measures:

- Insert a dummy read operation to the PWR_CR register just after programming the DBP bit.
- Wait for end of the operation (reset through BDRST bit or write to the backup domain) via a polling loop on targeted registers.

2.2.14 No Alarm out when PC13 GPIO is configured in Open Drain

Description

When PC13 is used as GPIO before configuring the RTC alarm in open drain in RTC_OR register, the RTC alarm is not output.

Workaround

In case RTC alarm is configured in output open drain, the GPIO must be configured in input with Pull-Up. (when an alarm occurs alarm signal will rise on PC13 by the Pull-Up)

2.3 FMC

2.3.1 Dummy read cycles inserted when reading synchronous memories

Description

When performing a burst read access to a synchronous memory, two dummy read accesses are performed at the end of the burst cycle whatever the type of AHB burst access. However, the extra data values which are read are not used by the FMC and there is no functional failure.

Workaround

None.

2.3.2 FMC synchronous mode and NWAIT signal disabled

Description

When the FMC synchronous mode operates with the NWAIT signal disabled, if the polarity (WAITPOL in the FMC_BCRx register) of the NWAIT signal is identical to that of the NWAIT input signal level, the system hangs and no fault is generated.

Workaround

PD6 (NWAIT signal) must not be connected to AF12 and the NWAIT polarity must be configured to active high (set WAITPOL bit to 1 in FMC_BCRx register).

2.3.3 Read access to a non-initialized FMC_SDRAM bank

Description

When a read access is performed to an SDRAM bank while the SDRAM controller is not yet initialized, the system hangs and no fault is generated.

Workaround

Read access to an SDRAM bank must be performed only when the SDRAM controller initialization is complete.

2.3.4 Corruption of data read from the FMC

Description

When the FMC is used as stack, heap or variable data, an interrupt occurring during a CPU read access to the FMC may results in read data corruption or hard fault exception. This problem does not occur when read accesses are performed by another master or when FMC accesses are done when the interrupts are disabled.

Workaround

Two workarounds can be applied:

- Do not use the FMC as stack or heap, and make sure CPU read accesses to the FMC are performed while interrupts are disabled
- Use only DMAs to perform read accesses to the FMC.

This limitation is present only in revision “A” devices. It is fixed in revision “Y”, “1”, “3” and “5” and “B”.

2.3.5 Interruption of CPU read burst access to an end of SDRAM row

Description

If an interrupt occurs during an CPU AHB burst read access to an end of SDRAM row, it may result in wrong data read from the next row if all the conditions below are met:

- The SDRAM data bus is 16-bit or 8-bit wide. 32-bit SDRAM mode is not affected.
- RBURST bit is reset in the FMC_SDCR1 register (read FIFO disabled).
- An interrupt occurs while CPU is performing an AHB incrementing bursts read access of unspecified length (using LDM = Load Multiple instruction).
- The address of the burst operation includes the end of an SDRAM row.

Workaround

Enable the read FIFO by setting the RBURST bit in the FMC_SDCR1 register.

2.3.6 FMC NOR/PSRAM controller: asynchronous read access on bank 2 to 4 returns wrong data when bank 1 is in synchronous mode (BURSTEN bit is set)

Description

If an interrupt occurs during a CPU AHB read access to one NOR/PSRAM bank (bank2 to 4) which is enabled in asynchronous mode, while bank 1 of the NOR/PSRAM controller is configured in synchronous read mode (BURSTEN bit set to ‘1’), then the FMC NOR/PSRAM controller returns wrong data. This limitation does not occur when using the DMA or when only bank1 is used in synchronous mode.

Workaround

If multiple banks are enabled in mixed asynchronous and synchronous modes, use any NOR/PSRAM bank for synchronous read accesses, except for bank 1. As a consequence the continuous clock feature is not available in asynchronous mode.

This limitation is fixed in revision “1”, “3”, “5” and “B”.

2.3.7 FMC dynamic and static bank switching

Description

The dynamic and static banks cannot be accessed concurrently.

Workaround

Do not use dynamic and static banks at the same time. The SDRAM device must be in self-refresh before switching to the static memory mapped on the NOR/PSRAM or NAND/PC-Card controller. Before switching from static memory to SDRAM, issue a Normal command to wake-up the device from self-refresh mode.

This limitation is fixed in silicon revision “3”, “5” and “B”.

2.3.8 NAND/PCCard transaction and Wait timing

Description

If the WAIT timing in the corresponding space (common/attribute) is configured to 0xFF, the NAND/PCCard transaction stalls the system and no fault is generated. This issue occurs whatever the value of PWAITEN bit in the FMC_PCRx register.

Workaround

Configure the WAIT timing in the (common/attribute) to any value except 0xFF.

2.3.9 Data corruption during burst read from FMC synchronous memory

Description

A burst read from static memory can be corrupted if all the following conditions are met:

- One FMC bank is configured in synchronous mode with WAITEN bit enabled while another FMC bank is used with WAITEN bit disabled
- A read burst transaction is ongoing from static synchronous memory with wait feature enabled
- The synchronous memory asserts the wait signal during the ongoing burst read
- The read burst transaction is followed by an access to an FMC dynamic or static banks which the WAITEN bit is disabled in the FMC_BCRx register.

Workaround

1. Set the WAITEN bit on all FMC static banks even if it is not used by the memory.
2. Set the same WAIT polarity on all static banks
3. Enable the internal pull-up on PD6 in order to set to ready the FMC_NWAIT input when the synchronous memory is de-selected and the other FMC bank without wait feature is selected.

2.3.10 Missed burst write transaction on multiplexed PSRAM

Description

If an interrupt occurs during an CPU AHB read access from an FMC bank with the write burst feature disabled (CBURSTRW bit is reset in the FMC_BCRx register), the following burst write access to another FMC bank with the write feature enabled is missed.

Workaround

Set the CBURSTRW bit even for the FMC bank that is not targeted by the write burst access. The write burst transaction has no effect on the asynchronous read protocol. However, to perform write accesses to asynchronous FMC bank while the CBURSTRW bit is set, the AHB size must be equal to memory size.

2.3.11 FMC NOR/PSRAM controller write protocol violation

Description

When an interrupted asynchronous or synchronous CPU read access to any NOR/PSRAM FMC bank is followed by an asynchronous write access to the same bank or to any other NOR/PSRAM FMC bank, this causes a write protocol violation. There is no functional issue but the FMC NOR/PSRAM controller write protocol is violated since the FMC_NWE signal is de-asserted at the same time as the Chip select (FMC_NEx).

Workaround

None.

2.3.12 FMC NOR/PSRAM controller bank switch with different BUSTURN durations

Description

The system hangs when the FMC NOR/PSRAM memory controller switches between two banks and the following conditions are met:

1. One NOR/PSRAM bank is configured in synchronous mode and the BUSTURN bits in FMC_BTRx/FMC_BTWx register are set to a nonzero value.
2. Another NOR/PSRAM bank is configured in asynchronous multiplexed mode and BUSTURN bits are set to 0.
3. FMC clock divide ratio (CLKDIV) is higher or equal to 4 HCLK periods.
4. A single read transaction from the bank operating in synchronous mode is followed by any transaction in another bank operating in asynchronous multiplexed mode.

Workaround

If several NOR/PSRAM banks are used, the BUSTURN duration configured for each bank must be set to a nonzero value.

2.3.13 Wrong data read from a busy NAND memory

Description

When the read command is issued to the NAND memory, the R/B signal gets activated upon the de-assertion of the chip select. If a read transaction is pending, the NAND controller might not detect the R/B signal (connected to NWAIT) previously asserted, and will sample wrong data. This problem occurs only when the MEMSET timing is configured to 0 or when ATTHOLD timing is configured to 0 or 1.

Workaround

Either configure MEMSET timing to a value greater than 0 or ATTHOLD timing to a value greater than 1.

2.3.14 Missed clocks with continuous clock feature enabled

Description

When the continuous clock feature is enabled, the FMC_CLK clock can be switched off in the following conditions:

- FMC_CLK clock divided by 2
- An asynchronous byte transaction is performed on an FMC bank configured in 32-bit memory data width. When the FMC_CLK clock for static memories is switched off, it will be switched on by issuing a synchronous transaction or any asynchronous transaction different from byte access with 32-bit width.

Workaround

When issuing a byte transaction on 32-bit asynchronous memories while the continuous clock feature is enabled, do not use the FMC_CLK clock divider ratio of 2.

2.3.15 SDRAM bank address corruption upon an interruption of CPU read burst access

Description

If an interrupt occurs during an CPU AHB burst read access to one SDRAM internal bank followed by a second read to another SDRAM internal bank, it may result in wrong data read if all the conditions below are met:

- SDRAM read FIFO enabled. RBURST bit is set in the FMC_SDCR1 register
- An interrupt occurs while CPU is performing an AHB incrementing bursts read access of unspecified length (using LDM = Load Multiple instruction) to one SDRAM internal bank and followed by another CPU read access to another SDRAM internal bank.

The issue occurs only when the address of the second data read access in the following bank match one of the data address in the read FIFO.

Workaround

One of the following workarounds can be applied:

- Disable the SDRAM read FIFO.
- Or send a “PRECHARGE ALL” command before the second read access (before switching between SDRAM internal banks).
- Or perform a dummy write before the second read access.

2.4 ADC

2.4.1 ADC sequencer modification during conversion

Description

If an ADC conversion is started by software (writing the SWSTART bit), and if the ADC_SQRx or ADC_JSQRx registers are modified during the conversion, the current conversion is reset and the ADC does not restart a new conversion sequence automatically.

If an ADC conversion is started by hardware trigger, this limitation does not apply. The ADC restarts a new conversion sequence automatically.

Workaround

When an ADC conversion sequence is started by software, a new conversion sequence can be restarted only by setting the SWSTART bit in the ADC_CR2 register.

2.5 DAC

2.5.1 DMA underrun flag management

Description

If the DMA is not fast enough to input the next digital data to the DAC, as a consequence, the same digital data is converted twice. In these conditions, the DMAUDR flag is set, which usually leads to disable the DMA data transfers. This is not the case: the DMA is not disabled by DMAUDR=1, and it keeps servicing the DAC.

Workaround

To disable the DAC DMA stream, reset the EN bit (corresponding to the DAC DMA stream) in the DMA_SxCR register.

2.5.2 DMA request not automatically cleared by DMAEN=0

Description

if the application wants to stop the current DMA-to-DAC transfer, the DMA request is not automatically cleared by DMAEN=0, or by DACEN=0.

If the application stops the DAC operation while the DMA request is high, the DMA request will be pending while the DAC is reinitialized and restarted; with the risk that a spurious unwanted DMA request is serviced as soon as the DAC is re-enabled.

Workaround

To stop the current DMA-to-DAC transfer and restart, the following sequence should be applied:

1. Check if DMAUDR is set.
2. Clear the DAC/DMAEN bit.
3. Clear the EN bit of the DAC DMA/Stream
4. Reconfigure by software the DAC, DMA, triggers etc.
5. Restart the application.

2.6 TIMx

2.6.1 PWM re-enabled in automatic output enable mode despite of system break

Description

In automatic output enable mode (AOE bit set in TIMx_BDTR register), the break input can be used to do a cycleby-cycle PWM control for a current mode regulation. A break signal (typically a comparator with a current threshold) disables the PWM output(s) and the PWM is re-armed on the next counter period.

However, a system break (typically coming from the CSS Clock security System) is supposed to stop definitively the PWM to avoid abnormal operation (for example with PWM frequency deviation).

In the current implementation, the timer system break input is not latched. As a consequence, a system break indeed disables the PWM output(s) when it occurs, but PWM output(s) is (are) re-armed on the following counter period.

Workaround

Preferably, implement control loops with the output clear enable function (OCxCE bit in the TIMx_CCMR1/CCMR2

register), leaving the use of break circuitry solely for internal and/or external fault protection (AOE bit reset).

2.6.2 Consecutive compare event missed in specific conditions

Description

Every match of the counter (CNT) value with the compare register (CCR) value is expected to trigger a compare event. However, if such matches occur in two consecutive counter clock cycles (as consequence of the CCR value change between the two cycles), the second compare event is missed for the following CCR value changes:

- in edge-aligned mode, from ARR to 0:
  - first compare event: CNT = CCR = ARR
  - second (missed) compare event: CNT = CCR = 0
- in center-aligned mode while up-counting, from ARR-1 to ARR (possibly a new ARR value if the period is also changed) at the crest (that is, when TIMx_RCR = 0):
  - first compare event: CNT = CCR = (ARR-1)
  - second (missed) compare event: CNT = CCR = ARR
- in center-aligned mode while down-counting, from 1 to 0 at the valley (that is, when TIMx_RCR = 0):
  - first compare event: CNT = CCR = 1
  - second (missed) compare event: CNT = CCR = 0

This typically corresponds to an abrupt change of compare value aiming at creating a timer clock single-cyclewide pulse in toggle mode.

As a consequence:

- in toggle mode, the output only toggles once per counter period (squared waveform), whereas it is expected to toggle twice within two consecutive counter cycles (and so exhibit a short pulse per counter period).
- in center mode, the compare interrupt flag does note rise and the interrupt is not generated.

Note: The timer output operates as expected in modes other than the toggle mode.

Workaround

None.

2.6.3 Output compare clear not working with external counter resettle of the limitation here

Description

Description

The output compare clear event (ocref_clr) is not correctly generated when the timer is configured in the following

slave modes: Reset mode, Combined reset + trigger mode, and Combined gated + reset mode.

The PWM output remains inactive during one extra PWM cycle if the following sequence occurs:

1. the output is cleared by the ocref_clr event

2. the timer reset occurs before the programmed compare event

Workaround

Apply one of the following measures:

1. Use BKIN (or BKIN2 if available) input for clearing the output, selecting the Automatic output enable mode

(AOE = 1).

2. Mask the timer reset during the PWM ON time to prevent it from occurring before the compare event (for

example with a spare timer compare channel open-drain output connected with the reset signal, pulling the timer reset line down).

Limitation described here.

2.6.4 TRGO and TRGO2 trigger output failure

Description

Some reference manual revisions may omit the following information.

The timers can be linked using ITRx inputs and TRGOx outputs. Additionally, the TRGOx outputs can be used as triggers for other peripherals (for example ADC). Since this circuitry

is based on pulse generation, care must be taken when initializing master and slave peripherals or when using different master/slave clock frequencies:

- if the master timer generates a trigger output pulse on TRGOx prior to have the destination peripheral clock
- enabled, the triggering system may fail.
- if the frequency of the destination peripheral is modified on-the-fly (clock prescaler modification), the triggering system may fail.

As a conclusion, the clock of the slave timer or slave peripheral must be enabled prior to receiving events from the master timer, and must not be changed on-the-fly while triggers are being received from the master timer.

This is a documentation issue rather than a product limitation.

Workaround

No application workaround is required or applicable as long as the application handles the clock as indicated.

2.7 IWDG

2.7.1 RVU and PVU flags are not reset in Stop mode

Description

The RVU and PVU flags of the IWDG_SR register are set by hardware after a write access to the IWDG_RLR and the IWDG_PR registers, respectively. If the Stop mode is entered immediately after the write access, the RVU and PVU flags are not reset by hardware.

Before performing a second write operation to the IWDG_RLR or the IWDG_PR register, the application software must wait for the RVU or PVU flag to be reset. However, since the RVU/PVU bit is not reset after exiting the Stop mode, the software goes into an infinite loop and the independent watchdog (IWDG) generates a reset after the programmed timeout period.

Workaround

Wait until the RVU or PVU flag of the IWDG_SR register is reset before entering the Stop mode.

2.8 RTC and TAMP

2.8.1 Spurious tamper detection when disabling the tamper channel

Description

If the tamper detection is configured for detection on falling edge event (TAMPFLT=00 and TAMPxTRG=1) and if the tamper event detection is disabled when the tamper pin is at high level, a false tamper event is detected.

Workaround

None

2.8.2 Detection of a tamper event occurring before enabling the tamper detection is not supported in edge detection mode

Description

When the tamper detection is enabled in edge detection mode (TAMPFLT=00):

- When TAMPxTRG=0 (rising edge detection): if the tamper input is already high before enabling the tamper detection, the tamper event may or may not be detected when enabling the tamper detection. The probability to detect it increases with the APB frequency.
- When TAMPxTRG=1 (falling edge detection): if the tamper input is already low before enabling the tamper detection, the tamper event is not detected when enabling the tamper detection.

Workaround

The I/O state should be checked by software in the GPIO registers, just after enabling the tamper detection and before writing sensitive values in the backup registers, in order to ensure that no active edge occurred before enabling the tamper event detection.

2.8.3 RTC calendar registers are not locked properly

Description

When reading the calendar registers with BYPSHAD=0, the RTC_TR and RTC_DR registers may not be locked after reading the RTC_SSR register. This happens if the read operation is initiated one APB clock period before the shadow registers are updated. This can result in a non-consistency of the three registers. Similarly, RTC_DR register can be updated after reading the RTC_TR register instead of being locked.

Workaround

1. Use BYPSHAD = 1 mode (Bypass shadow registers), or
2. If BYPSHAD = 0, read SSR again after reading SSR/TR/DR to confirm that SSR is still the same, otherwise read the values again.

2.9 I2C

2.9.1 SMBus standard not fully supported

Description

The I^2C peripheral is not fully compliant with the SMBus v2.0 standard since It does not support the capability to NACK an invalid byte/command.

Workaround

A higher-level mechanism should be used to verify that a write operation is being performed correctly at the target device, such as:

1. Using the SMBAL pin if supported by the host
2. the alert response address (ARA) protocol
3. the Host notify protocol

2.9.2 Start cannot be generated after a misplaced Stop

Description

If a master generates a misplaced Stop on the bus (bus error) while the microcontroller I2C peripheral attempts to switch to Master mode by setting the START bit, the Start condition is not properly generated.

Workaround

In the I²C standard, it is allowed to send a Stop only at the end of the full byte (8 bits + acknowledge), so this scenario is not allowed. Other derived protocols like CBUS allow it, but they are not supported by the I²C peripheral.

A software workaround consists in asserting the software reset using the SWRST bit in the I2C_CR1 control register.

2.9.3 Mismatch on the “Setup time for a repeated Start condition” timing parameter

Description

In case of a repeated Start, the “Setup time for a repeated Start condition” (named Tsu;sta in the I²C specification) can be slightly violated when the I²C operates in Master Standard mode at a frequency between 88 kHz and 100 kHz.

The limitation can occur only in the following configuration:

- in Master mode
- in Standard mode at a frequency between 88 kHz and 100 kHz (no limitation in Fast-mode)
- SCL rise time:
  - If the slave does not stretch the clock and the SCL rise time is more than 300 ns (if the SCL rise time is less than 300 ns, the limitation cannot occur)
  - If the slave stretches the clock

The setup time can be violated independently of the APB peripheral frequency.

Workaround

Reduce the frequency down to 88 kHz or use the I²C Fast-mode, if supported by the slave.

2.9.4 Data valid time ($t_{VD;DAT}$) violated without the OVR flag being set

Description

The data valid time ($t_{VD;DAT}$, $t_{VD;ACK}$) described by the I²C standard can be violated (as well as the maximum data hold time of the current data ($t_{HD;DAT}$)) under the conditions described below. This violation cannot be detected because the OVR flag is not set (no transmit buffer underrun is detected).

This limitation can occur only under the following conditions:

- in Slave transmit mode
- with clock stretching disabled (NOSTRETCH=1)
- if the software is late to write the DR data register, but not late enough to set the OVR flag (the data register is written before)

Workaround

If the master device allows it, use the clock stretching mechanism by programming the bit NOSTRETCH=0 in the I2C_CR1 register.

If the master device does not allow it, ensure that the software is fast enough when polling the TXE or ADDR flag to immediately write to the DR data register. For instance, use an interrupt on the TXE or ADDR flag and boost its priority to the higher level.

2.9.5 Both SDA and SCL maximum rise time (t_r) violated when VDD_I2C bus higher than ((VDD+0.3) / 0.7) V

Description

When an external legacy I^2C bus voltage (VDD_I2C) is set to 5 V while the MCU is powered from V_{DD}, the internal 5-Volt tolerant circuitry is activated as soon the input voltage (V_{IN}) reaches the V_{DD} + diode threshold level. An additional internal large capacitance then prevents the external pull-up resistor (R_P) from rising the SDA and SCL signals within the maximum timing (t_r) which is 300 ns in fast mode and 1000 ns in Standard mode.

The rise time (t_r) is measured from V_{IL} and V_{IH} with levels set at 0.3VDD_I2C and 0.7VDD_I2C.

Workaround

The external VDD_I2C bus voltage should be limited to a maximum value of ((VDD+0.3) / 0.7) V. As a result, when the MCU is powered from V_{DD}=3.3 V, VDD_I2C should not exceed 5.14 V to be compliant with I^2C specifications.

2.9.6 Spurious Bus Error detection in Master mode

Description

In Master mode, a bus error can be detected by mistake, so the BERR flag can be wrongly raised in the status register. This will generate a spurious Bus Error interrupt if the interrupt is enabled. A bus error detection has no effect on the transfer in Master mode, therefore the I2C transfer can continue normally.

Workaround

If a bus error interrupt is generated in Master mode, the BERR flag must be cleared by software. No other action is required and the on-going transfer can be handled normally.

2.10 USART

2.10.1 Idle frame is not detected if receiver clock speed is deviated

Description

If the USART receives an idle frame followed by a character, and the clock of the transmitter device is faster than the USART receiver clock, the USART receive signal falls too early when receiving the character start bit, with the result that the idle frame is not detected (IDLE flag is not set).

Workaround

None.

2.10.2 In full-duplex mode, the Parity Error (PE) flag can be cleared by writing to the data register

Description

In full-duplex mode, when the Parity Error flag is set by the receiver at the end of a reception, it may be cleared while transmitting by reading the USART_SR register to check the TXE or TC flags and writing data to the data register.

Consequently, the software receiver can read the PE flag as '0' even if a parity error occurred.

Workaround

The Parity Error flag should be checked after the end of reception and before transmission.

2.10.3 Parity Error (PE) flag is not set when receiving in Mute mode using address mark detection

Description

The USART receiver is in Mute mode and is configured to exit the Mute mode using the address mark detection. When the USART receiver recognizes a valid address with a parity error, it exits the Mute mode without setting the Parity Error flag.

Workaround

None.

2.10.4 Break frame is transmitted regardless of nCTS input line status

Description

When CTS hardware flow control is enabled (CTSE = 1) and the Send Break bit (SBK) is set, the transmitter sends a break frame at the end of the current transmission regardless of nCTS input line status.

Consequently, if an external receiver device is not ready to accept a frame, the transmitted break frame is lost.

Workaround

None.

2.10.5 nRTS signal abnormally driven low after a protocol violation

Description

When RTS hardware flow control is enabled, the nRTS signal goes high when data is received. If this data was not read and new data is sent to the USART (protocol violation), the nRTS signal goes back to low level at the end of this new data.

Consequently, the sender gets the wrong information that the USART is ready to receive further data.

On USART side, an overrun is detected, which indicates that data has been lost.

Workaround

Workaround

Workarounds are required only if the other USART device violates the communication protocol, which is not the case in most applications.

Two workarounds can be used:

- After data reception and before reading the data in the data register, the software takes over the control of the nRTS signal as a GPIO and holds it high as long as needed. If the USART device is not ready, the software holds the nRTS pin high, and releases it when the device is ready to receive new data.
- The time required by the software to read the received data must always be lower than the duration of the second data reception. For example, this can be ensured by treating all the receptions by DMA mode.

2.11 SPI

2.11.1 Wrong CRC calculation when the polynomial is even

Description

When the CRC is enabled, the CRC calculation will be wrong if the polynomial is even.

Workaround

Use odd polynomial.

2.11.2 Corrupted last bit of data and/or CRC, received in Master mode with delayed SCK feedback

Description

In receive transaction, in both I^2S and SPI Master modes, the last bit of the transacted frame is not captured when the signal provided by internal feedback loop from the SCK pin exceeds a critical delay. The lastly transacted bit of the stored data then keeps the value from the pattern received previously. As a consequence, the last receive data bit may be wrong and/or the CRCERR flag can be unduly asserted in the SPI mode if any data under check sum and/or just the CRC pattern is wrongly captured.

In SPI mode, data are synchronous with the APB clock. A delay of up to two APB clock periods can thus be tolerated for the internal feedback delay. The I^2S mode is more sensitive than the SPI mode, especially in the case where an odd I2S prescaler factor is set and the APB clock is the system clock divided by two. In this case, the internal feedback delay is lower than 1.5 APB clock period.

The main factors contributing to the delay increase are low V_{DD} level, high temperature, high SCK pin capacitive load and low SCK I/O output speed. The SPI communication speed has no impact.

Workaround

The following workaround can be adopted, jointly or individually:

- Decrease the APB clock speed.
- Configure the I/O pad of the SCK pin to be faster.

The following table gives the maximum allowable APB frequency (that still prevents the issue from occurring) versus GPIOx_OSPEEDR output speed for the SCK pin, with a 30 pF capacitive load.

Table 4. Maximum allowable APB frequency at 30 pF load

OSPEEDR [1:0] for SCK pin	Max. APB frequency for SPI mode [MHz]	Max. APB frequency for I^2S mode [MHz]
11 (very high)	90	42 (45 if V_{DD} > 2.7 V)
10 (high)	90	36

Table 4. Maximum allowable APB frequency at 30 pF load (continued)

OSPEEDR [1:0] for SCK pin	Max. APB frequency for SPI mode [MHz]	Max. APB frequency for I^2S mode [MHz]
01 (medium)	70	30
00 (low)	26	14

2.11.3 Wrong CRC transmitted in Master mode with delayed SCK feedback

Description

In transmit transaction of the SPI/I^2S interface in SPI Master mode with CRC enabled, the CRC data transmission may be corrupted if the delay of an internal feedback signal derived from the SCK output (further feedback clock) is greater than two APB clock periods. While data and CRC bit shifting and transfer is based on an internal clock, the CRC progressive calculation uses the feedback clock. If the delay of the feedback clock is greater than two APB periods, the transmitted CRC value may get wrong.

The main factors contributing to the delay increase are low V_{DD} level, high temperature, high SCK pin capacitive load and low SCK I/O output speed. The SPI communication speed has no impact.

Workaround

The following workaround can be adopted, jointly or individually:

- Decrease the APB clock speed.
- Configure the IO pad of the SCK pin to be faster.

The following table gives the maximum allowable APB frequency versus GPIOx_OSPEEDR output speed control field setting for the SCK pin, at 30 pF of capacitive load.

Table 5. Maximum allowable APB frequency at 30 pF load

OSPEEDR [1:0] for SCK pin	Max. APB frequency for SPI mode [MHz]	Max. APB frequency for I^2S mode [MHz]
11 (very high)	90	42 (45 if V_{DD} > 2.7 V)
10 (high)	90	36
01 (medium)	70	30
00 (low)	26	14

2.11.4 BSY bit may stay high at the end of a data transfer in Slave mode

Description

BSY flag may sporadically remain high at the end of a data transfer in Slave mode. The issue appears when an accidental synchronization happens between internal CPU clock and external SCK clock provided by master.

This is related to the end of data transfer detection while the SPI is enabled in Slave mode.

As a consequence, the end of data transaction may be not recognized when software needs to monitor it (e.g. at the end of session before entering the low-power mode or before direction of data line has to be changed at half duplex bidirectional mode). The BSY flag is unreliable to detect the end of any data sequence transaction.

Workaround

When NSS hardware management is applied and NSS signal is provided by master, the end of a transaction can be detected by the NSS polling by slave.

- If SPI receiving mode is enabled, the end of a transaction with master can be detected by the corresponding RXNE event signalizing the last data transfer completion.
- In SPI transmit mode, user can check the BSY under timeout corresponding to the time necessary to complete the last data frame transaction. The timeout should be measured from TXE event signalizing the last data frame transaction start (it is raised once the second bit transaction is ongoing). Either BSY becomes low normally or the timeout expires when the synchronization issue happens.

When upper workarounds are not applicable, the following sequence can be used to prevent the synchronization issue at SPI transmit mode.

1. Write last data to data register.
2. Poll TXE until it becomes high to ensure the data transfer has started.
3. Disable SPI by clearing SPE while the last data transfer is still ongoing.
4. Poll the BSY bit until it becomes low.
5. The BSY flag works correctly and can be used to recognize the end of the transaction.

Note: This workaround can be used only when CPU has enough performance to disable SPI after TXE event is detected while the data frame transfer is still ongoing. It is impossible to achieve it when ratio between CPU and SPI clock is low and data frame is short especially. In this specific case timeout can be measured from TXE, while calculating fixed number of CPU clock periods corresponding to the time necessary to complete the data frame transaction.

2.12 I2S

2.12.1 In I2S Slave mode, WS level must be set by the external master when enabling the I2S

Description

n Slave mode, the WS signal level is used only to start the communication. If the I2S (in Slave mode) is enabled while the master is already sending the clock and the WS signal level is low (for I2S protocol) or is high (for the LSB or MSB-justified mode), the slave starts communicating data immediately. In this case, the master and slave will be desynchronized throughout the whole communication.

Workaround

The I2S peripheral must be enabled when the external master sets the WS line at:

- High level when the I2S protocol is selected.
- Low level when the LSB or MSB-justified mode is selected.

2.12.2 Corrupted last bit of data and/or CRC, received in Master mode with delayed SCK feedback

The limitation described in *Section 2.11.2: Corrupted last bit of data and/or CRC, received in Master mode with delayed SCK feedback* also applies to I^2S interface.

2.13 SDIO

2.13.1 SDIO HW flow control

Description

When enabling the HW flow control by setting bit 14 of the SDIO_CLKCR register to '1', glitches can occur on the SDIOCLK output clock resulting in wrong data to be written into the SD/MMC card or into the SDIO device. As a consequence, a CRC error will be reported to the SD/SDIO MMC host interface (DCRCFAIL bit set to '1' in SDIO_STA register).

Workaround

None.

Note: Do not use the HW flow control. Overrun errors (Rx mode) and FIFO underrun (Tx mode) should be managed by the application software.

2.13.2 Wrong CCRCFAIL status after a response without CRC is received

Description

The CRC is calculated even if the response to a command does not contain any CRC field. As a consequence, after the SDIO command IO_SEND_OP_COND (CMD5) is sent, the CCRCFAIL bit of the SDIO_STA register is set.

Workaround

The CCRCFAIL bit in the SDIO_STA register shall be ignored by the software. CCRCFAIL must be cleared by setting CCRCFAILC bit of the SDIO_ICR register after reception of the response to the CMD5 command.

2.13.3 Data corruption in SDIO clock dephasing (NEGEDGE) mode

Description

When NEGEDGE bit is set to '1', it may lead to invalid data and command response read.

Workaround

None. A configuration with the NEGEDGE bit equal to '1' should not be used.

2.13.4 CE-ATA multiple write command and card busy signal management

Description

The CE-ATA card may inform the host that it is busy by driving the SDIO_D0 line low, two cycles after the transfer of a write command (RW_MULTIPLE_REGISTER or

RW_MULTIPLE_BLOCK). When the card is in a busy state, the host must not send any data until the BUSY signal is de-asserted (SDIO_D0 released by the card).

This condition is not respected if the data state machine leaves the IDLE state (Write operation programmed and started, DTEN = 1, DTDIR = 0 in SDIO_DCTRL register and TXFIFOE = 0 in SDIO_STA register).

As a consequence, the write transfer fails and the data lines are corrupted.

Workaround

After sending the write command (RW_MULTIPLE_REGISTER or RW_MULTIPLE_BLOCK), the application must check that the card is not busy by polling the BSY bit of the ATA status register using the FAST_IO (CMD39) command before enabling the data state machine.

2.13.5 No underrun detection with wrong data transmission

Description

In case there is an ongoing data transfer from the SDIO host to the SD card and the hardware flow control is disabled (bit 14 of the SDIO_CLKCR is not set), if an underrun condition occurs, the controller may transmit a corrupted data block (with wrong data word) without detecting the underrun condition when the clock frequencies have the following relationship:

[3 x period(PCLK2) + 3 x period(SDIOCLK)] >= (32 / (BusWidth)) x period(SDIO_CK)

Workaround

Avoid the above-mentioned clock frequency relationship, by:

- Incrementing the APB frequency
- or decreasing the transfer bandwidth
- or reducing SDIO_CK frequency

2.14 bxCAN

2.14.1 BxCAN time triggered communication mode not supported

Description

The time triggered communication mode described in the reference manual is not supported. As a result timestamp values are not available. TTCM bit must be kept cleared in the CAN_MCR register (time triggered communication mode disabled).

Workaround

None

2.15 OTG-FS

2.15.1 Data in RxFIFO is overwritten when all channels are disabled simultaneously

Description

If the available RxFIFO is just large enough to host 1 packet + its data status, and is currently occupied by the last received data + its status and, at the same time, the application requests that more IN channels be disabled, the OTG_FS peripheral does not first check for available space before inserting the disabled status of the IN channels. It just inserts them by overwriting the existing data payload.

Workaround

Use one of the following recommendations:

1. Configure the RxFIFO to host a *minimum* of 2 × MPSIZ + 2 × data status entries.
2. The application has to check the RXFLVL bit (RxFIFO non-empty) in the OTG_FS_GINTSTS register before disabling each IN channel. If this bit is not set, then the application can disable an IN channel at a time. Each time the application disables an IN channel, however, it first has to check that the RXFLVL bit = 0 condition is true.

2.15.2 OTG host blocks the receive channel when receiving IN packets and no TxFIFO is configured

Description

When receiving data, the OTG_FS core erroneously checks for available TxFIFO space when it should only check for RxFIFO space. If the OTG_FS core cannot see any space allocated for data transmission, it blocks the reception channel and no data is received.

Workaround

Set at least one TxFIFO equal to the maximum packet size. In this way, the host application, which intends to supports only IN traffic, also has to allocate some space for the TxFIFO.

Since a USB host is expected to support any kind of connected endpoint, it is good practice to always configure enough TxFIFO space for OUT endpoints.

2.15.3 Host channel-halted interrupt not generated when the channel is disabled

Description

When the application enables, then immediately disables the host channel before the OTG_FS host has had time to begin the transfer sequence, the OTG_FS core, as a host, does not generate a channel-halted interrupt. The OTG_FS core continues to operate normally.

Workaround

Do not disable the host channel immediately after enabling it.

2.15.4 Error in software-read OTG_FS_DCFG register values

Description

When the application writes to the DAD and PFIVL bitfields in the OTG_FS_DCFG register, and then reads the newly written bitfield values, the read values may not be correct.

The values written by the application, however, are correctly retained by the core, and the normal operation of the device is not affected.

Workaround

Do not read from the OTG_FS_DCFG register's DAD and PFIVL bitfields just after programming them.

2.15.5 Transmit data FIFO is corrupted when a write sequence to the FIFO is interrupted with accesses to certain OTG_FS registers

Description

When the USB on-the-go high-speed peripheral is in Device mode, interrupting transmit FIFO write sequence with read or write accesses to OTG_FS endpoint-specific registers (those ending in *0* or *x*) leads to corruption of the next data written to the transmit FIFO.

Workaround

Ensure that the transmit FIFO write sequence is not interrupted with accesses to the OTG_HS registers.

2.16 OTG-HS

2.16.1 Transmit data FIFO is corrupted when a write sequence to the FIFO is interrupted with accesses to certain OTG_HS registers

Description

When the USB on-the-go high-speed peripheral is in Device mode, interrupting transmit FIFO write sequence with read or write accesses to OTG_HS endpoint-specific registers (those ending in *0* or *x*) leads to corruption of the next data written to the transmit FIFO.

Workaround

Ensure that the transmit FIFO write sequence is not interrupted with accesses to the OTG_FH registers. Note that enabling DMA mode guarantees this.

2.17 ETH

2.17.1 Incorrect layer 3 (L3) checksum is inserted in transmitted IPv6 packets without TCP, UDP or ICMP payloads

Description

The application provides the per-frame control to instruct the MAC to insert the L3 checksums for TCP, UDP and ICMP packets. When automatic checksum insertion is enabled and the input packet is an IPv6 packet without the TCP, UDP or ICMP payload, then the MAC may incorrectly insert a checksum into the packet. For IPv6 packets without a TCP, UDP or ICMP payload, the MAC core considers the next header (NH) field as the extension header and continues to parse the extension header. Sometimes, the payload data in such packets matches the NH field for TCP, UDP or ICMP and, as a result, the MAC core inserts a checksum.

Workaround

When the IPv6 packets have a TCP, UDP or ICMP payload, enable checksum insertion for transmit frames, or bypass checksum insertion by using the CIC (checksum insertion control) bits in TDES0 (bits 23:22).

2.17.2 The Ethernet MAC processes invalid extension headers in the received IPv6 frames

Description

In IPv6 frames, there can be zero or some extension headers preceding the actual IP payload. The Ethernet MAC processes the following extension headers defined in the IPv6 protocol: Hop-by-Hop Options header, Routing header and Destination Options header. All extension headers, except the Hop-by-Hop extension header, can be present multiple times and in any order before the actual IP payload. The Hop-by-Hop extension header, if present, has to come immediately after the IPv6's main header.

The Ethernet MAC processes all (valid or invalid) extension headers including the Hop-by-Hop extension headers that are present after the first extension header. For this reason, the GMAC core will accept IPv6 frames with invalid Hop-by-Hop extension headers. As a consequence, it will accept any IP payload as valid IPv6 frames with TCP, UDP or ICMP payload, and then incorrectly update the Receive status of the corresponding frame.

Workaround

None.

2.17.3 MAC stuck in the Idle state on receiving the TxFIFO flush command exactly 1 clock cycle after a transmission completes

Description

When the software issues a TxFIFO flush command, the transfer of frame data stops (even in the middle of a frame transfer). The TxFIFO read controller goes into the Idle state (TFRS=00 in ETH_MACDBGR) and then resumes its normal operation.

However, if the TxFIFO read controller receives the TxFIFO flush command exactly one clock cycle after receiving the status from the MAC, the controller remains stuck in the Idle state and stops transmitting frames from the TxFIFO. The system can recover from this state only with a reset (e.g. a soft reset).

Workaround

Do not use the TxFIFO flush feature.

If TXFIFO flush is really needed, wait until the TxFIFO is empty prior to using the TxFIFO flush command.

2.17.4 Transmit frame data corruption

Frame data corrupted when the TxFIFO is repeatedly transitioning from non-empty to empty and then back to non-empty.

Description

Frame data may get corrupted when the TxFIFO is repeatedly transitioning from non-empty to empty for a very short period, and then from empty to non-empty, without causing an underflow.

This transitioning from non-empty to empty and back to non-empty happens when the rate at which the data is being written to the TxFIFO is almost equal to or a little less than the rate at which the data is being read.

This corruption cannot be detected by the receiver when the CRC is inserted by the MAC, as the corrupted data is used for the CRC computation.

Workaround

Use the Store-and-Forward mode: TSF=1 (bit 21 in ETH_DMAOMR). In this mode, the data is transmitted only when the whole packet is available in the TxFIFO.

2.17.5 Successive write operations to the same register might not be fully taken into account

Description

A write to a register might not be fully taken into account if a previous write to the same register is performed within a time period of four TX_CLK/RX_CLK clock cycles. When this error occurs, reading the register returns the most recently written value, but the Ethernet MAC continues to operate as if the latest write operation never occurred.

See *Table 6: Impacted registers and bits* for the registers and bits impacted by this limitation.

Table 6. Impacted registers and bits

Register name	Bit number	Bit name
DMA registers		
ETH_DMABMR	7	EDFE
ETH_DMAOMR	26	DTCEFD
	25	RSF
	20	FTF
	7	FEF
	6	FUGF
	4:3	RTC
GMAC registers		
ETH_MACCR	25	CSTF
	23	WD
	22	JD
	19:17	IFG
	16	CSD
	14	FES
	13	ROD
	12	LM
	11	DM
	10	IPCO
	9	RD
	7	APCS
	6:5	BL
	4	DC
	3	TE
	2	RE
ETH_MACFFR		MAC frame filter register
ETH_MACHTHR	31:0	Hash Table High Register

Table 6. Impacted registers and bits (continued)

Register name	Bit number	Bit name
ETH_MACHTLR	31:0	Hash Table Low Register
ETH_MACFCR	31:16	PT
	7	ZQPD
	5:4	PLT
	3	UPFD
	2	RFCE
	1	TFCE
	0	FCB/BPA
ETH_MACVLANTR	16	VLANTC
	15:0	VLANTI
ETH_MACRWUFFR	-	all remote wakeup registers
ETH_MACPMTCSR	31	WFFRPR
	9	GU
	2	WFE
	1	MPE
	0	PD
ETH_MACA0HR	-	MAC address 0 high register
ETH_MACA0LR	-	MAC address 0 low register
ETH_MACA1HR	-	MAC address 1 high register
ETH_MACA1LR	-	MAC address 1 low register
ETH_MACA2HR	-	MAC address 2 high register
ETH_MACA2LR	-	MAC address 2 low register
ETH_MACA3HR	-	MAC address 3 high register
ETH_MACA3LR	-	MAC address 3 low register
IEEE 1588 time stamp registers		

Table 6. Impacted registers and bits (continued)

Register name	Bit number	Bit name
ETH_PTPTSCR	18	TSPFFMAE
	17:16	TSCNT
	15	TSSMRME
	14	TSSEME
	13	TSSIPV4FE
	12	TSSIPV6FE
	11	TSSPTPOEFE
	10	TSPTPPSV2E
	9	TSSSR
	8	TSSARFE
	5	TSARU
	3	TSSTU
	2	TSSTI
	1	TSFCU
	0	TSE

Workaround

Two workarounds could be applicable:

- Ensure a delay of four TX_CLK/RX_CLK clock cycles between the successive write operations to the same register.
- Make several successive write operations without delay, then read the register when all the operations are complete, and finally reprogram it after a delay of four TX_CLK/RX_CLK clock cycles.

2.17.6 Incorrect status and corrupted frames when RxFIFO overflow occurs on the penultimate word of Rx frames

Description

When operating in Threshold mode, the RxFIFO may overflow when the received frame data is written faster than the speed at which the application reads it from the RxFIFO. The RxFIFO overflow is declared at the moment that a non-EOF word is received and the RxFIFO has only two locations available. The receiver descriptor overflow error (OE) bit of the RDES0 receive descriptor word0 is set to indicate that the receive fram e is incomplete.

The problem occurs after the following events:

1. RxFIFO overflow is declared exactly on the penultimate word of the Rx Frame. The EOF word is received in the next clock cycle.
2. The EOF word has exactly one valid byte. This is possible only when the length of the packet, after CRC or PAD stripping (if enabled), is a multiple of 4 bytes plus 1 (for example, 5, 9, 13, 17).

After the above sequence, the frames status information is corrupted and the overflow error flag is not set.

Furthermore, if the next frame arrives soon enough, the MAC might falsely interpret that there is space in the RxFIFO and overwrite unread data with the next frame, thus corrupting the existing frames.

The MAC recovers automatically after transferring a few corrupt or incorrect packets.

Workaround

Operate the RxFIFO in the Store-and-Forward mode.

2.17.7 Incorrect remote wakeup on global unicast packet

Description

The PMT remote wakeup block can be enabled to generate remote wakeup interrupt on receiving a global unicast packet, for example a unicast destination address (DA) that perfectly matches one of the MAC address registers enabled for DA.

However, the PMT remote wakeup block generates interrupts for any unicast packet that passes the DA filter (not necessarily for a unicast packet that passes DA perfect filter). For example, the address filter is set for inverse filtering or hash filtering, it gives a PASS for any packet whose DA is accepted by the inverse/hash filter. This results in power down exit on unintended received packets.

Workaround

Only enable DA perfect filter when global unicast based remote wakeup is enabled.

2.17.8 Overflow status bits of missed frame and buffer overflow counters are cleared without a read operation

Description

The direct memory access (DMA) maintains two counters to track the number of frames missed because of the following events:

- • Rx descriptor not being available
- • Rx FIFO buffer overflow during reception

The missed frame and buffer overflow counter of the ETH_DMAMFBOCR register indicate the current value of the missed frames and FIFO overflow frame counters. This register also has the overflow status bits: OFOC bit OMFC bit which indicate whether the rollover occurred for the respective counters and are set when the respective counters roll over. They should remain set until this register is read.

However, when the counter rollover occurs a second time after the status bit is set, the respective status bits are cleared. Therefore, the application may incorrectly detect that the rollover did not occur since the last read operation.

Workaround

The application should read the missed frame and buffer overflow counter register periodically (or after the overflow or rollover status bits are set) such that the counter rollover does not occur twice between read operations.

2.17.9 MAC may provide incorrect Rx status for the MAC control frames when receive checksum offload is enabled

Description

The MAC can be programmed to forward the MAC control frames (with length/type field 0x8808) to the application by setting the PCF bits of the ETH_MACFFR register. When the IPv4 checksum offload function is enabled by setting the IPCO bit of the ETH_MACCR register and clearing the EDFE bit of the ETH_DMABMR register, the MAC provides the encoded Rx status in the FT bit, IPHCE/TSV bit, and the PCE/ESA bit of the RDES0 receive

descriptor word0. When a MAC control frame is received, the MAC should provide 0b011 in RDES0 receive descriptor word0 of Rx status. This indicates that an Ethernet type frame is received, which is neither IPv4 nor IPv6 (the checksum offload engine bypasses the checksum completely).

However, when a MAC control frame is received with IPv4 checksum offload function enabled without the extended status, the MAC provides incorrect Rx status (0b100) in RDES0 receive descriptor word0, indicating that an IPv4 or IPv6 type frame is received with no checksum error.

Workaround

Ignore these status bits, as reported in the RDES0 receive descriptor word0, about IP header error after it identifies the control packet from the received packet and processes it accordingly.

2.17.10 MAC may provide an inaccurate Rx status when receive checksum offload is enabled in cutthrough mode

Description

The MAC can be programmed in cut-through mode by resetting the DTCEFD bit of the ETH_DMAOMR register.

When IPv4 checksum offload function is enabled by setting the IPCO bit of ETH_MACCR register and extended status is not enabled, the MAC provides the bit 25 (error summary), bit 14 (descriptor error), bit 11 (overflow error), bit 7 (IPC checksum error), bit 6 (late collision), bit 4 (watchdog error), bit 3 (receive error) and bit 0 (payload checksum error) of the RDES0: Receive descriptor Word0.

However, when a frame with a payload checksum error is received with the IPv4 checksum offload function enabled without the extended status, the MAC provides a correct error summary status but an incorrect Rx status on bit 0, indicating the IPv4 or IPv6 type frame is received with no checksum error. The source of the error is not specified, none of the individual status bits are set.

Workaround

Enable the Store-and-Forward mode by setting the RSF bit of the ETH_DMAOMR register. In this case the faulty frames are silently discarded as expected.

2.17.11 MAC may not drop received giant error frames

Description

The MAC considers a received frame with a length of more than 1522 bytes, as a giant error frame. When RxFIFO is operating in the Store-and-Forward mode and is programmed to

drop error frames, by resetting the FEF bit of the ETH_DMAOMR, all error frames should be dropped in the FIFO layer. Due to the error frames being dropped in the FIFO layer, the DMA does not send them to the host.

However, the MAC does not drop the giant error frames and the DMA unnecessarily wastes system bandwidth transferring the giant frame to the host.

Workaround

The software driver must check the FL bits of the RDES0 receive descriptor word0, ignore or drop the frame and not forward it to the upper layer.

The frame length field is valid only when the LS bit of the RDES0 receive descriptor word0 register is set and the DE bit of the RDES0 receive descriptor word0 is reset.

3 Revision history

Table 7. Document revision history

Date	Revision	Changes
11-Feb-2013	1	Initial release.
25-Feb-2013	2	Document converted to new template. Added *Section 2.11.4: Corruption of data read from the FMC*
26-Apr-2013	3	Added Silicon revision Y. Removed the reference to 'Cortex-M4F' in the whole document. Updated *Section 2.11.1: Dummy read cycles inserted when reading synchronous memories*. Added *Section 2.1.3: Wakeup sequence from Standby mode when using more than one wakeup source*, *Section 2.10.5: Successive write operations to the same register might not be fully taken into account* and *Section 2.8.3: FSMC NOR Flash/PSRAM controller asynchronous access on bank 2 to 4 when bank 1 is in synchronous mode (CBURSTRW bit is set)*. Removed limitation 2.10.3 SDIO clock divider BYPASS mode may not work properly. Updated *Section 2.12.5: No underrun detection with wrong data transmission*.
19-Sep-2013	4	Added *Section 2.8.1: bxCAN time triggered communication mode not supported*. Added STM32F429xx and STM32F439xx devices. Removed FSMC limitations. Added *Section 2.4.5: Both SDA and SCL maximum rise time (t_r) violated when VDD_I2C bus higher than ((VDD+0.3) / 0.7) V*. Updated *Section 2.11.5: Interruption of CPU read burst access to an end of SDRAM row*. Added *Section 2.11.1: Dummy read cycles inserted when reading synchronous memories*, *Section 2.11.2: FMC synchronous mode and NWAIT signal disabled*, *Section 2.11.3: Read access to a non-initialized FMC_SDRAM bank*, *Section 2.11.4: Corruption of data read from the FMC*, *Section 2.11.5: Interruption of CPU read burst access to an end of SDRAM row*, *Section 2.11.6: FMC NOR/PSRAM controller: asynchronous read access on bank 2 to 4 returns wrong data when bank 1 is in synchronous mode (BURSTEN bit is set)* and *Section 2.11.7: FMC dynamic and static bank switching*. Added *Figure 1: TFBGA216 top package view*, *Figure 2: WLCSP143 top package view*, and *Figure 3: LQFP208 top package view*.
23-Sep-2013	5	Updated workaround in *Section 2.11.6: FMC NOR/PSRAM controller: asynchronous read access on bank 2 to 4 returns wrong data when bank 1 is in synchronous mode (BURSTEN bit is set)*.

Table 7. Document revision history (continued)

Date	Revision	Changes
09-Jan-2014	6	Added silicon revision 1. Added STM32F429xE, STM32F427Ax, STM32F437Ax, STM32F429Ax, and STM32F439Ax part numbers. Removed mention of limitation fix in *Section 2.1.8: Over-drive and Under-drive modes unavailability*, *Section 2.11.4: Corruption of data read from the FMC* and *Section 2.11.6: FMC NOR/PSRAM controller: asynchronous read access on bank 2 to 4 returns wrong data when bank 1 is in synchronous mode (BURSTEN bit is set)*. Updated *Section 2.11.7: FMC dynamic and static bank switching* to indicate the limitation will be fixed in next silicon revision.
05-May-2014	7	Added silicon revision 3. Added *Section 1.2: VDIV or VSQRT instructions might not complete correctly when very short ISRs are used*. Added *Section 2.1.9: Operating voltage extension down to 1.7 V in the whole temperature range*, *Section 2.11.8: NAND/PCCard transaction and Wait timing*, *Section 2.11.9: Data corruption during burst read from FMC synchronous memory*, and *Section 2.11.10: Missed burst write transaction on multiplexed PSRAM*. Moved all device marking schematics to datasheets.
20-Jun-2014	8	Added *Section 2.1.10: PA12 GPIO limitations*, *Section 2.11.11: FMC NOR/PSRAM controller write protocol violation* and *Section 2.11.12: FMC NOR/PSRAM controller bank switch with different BUSTURN durations*.
03-Oct-2014	9	Updated *FMC NOR/PSRAM controller write protocol violation* limitation and *FMC synchronous mode and NWAIT signal disabled*limitations in *Table 4: Summary of silicon limitations*. Updated *Section 2.1.10: PA12 GPIO limitations*. Added *Section 2.8.1: bxCAN time triggered communication mode not supported*.

Table 7. Document revision history (continued)

Date	Revision	Changes
02-Nov-2016	10	Added workaround in *Section 2.1.6: Delay after an RCC peripheral clock enabling*. Added *Section 2.1.11: Data cache might be corrupted during Flash read-while-write operation*. Added RTC limitations: – *Section 2.3.1: Spurious tamper detection when disabling the tamper channel* – *Section 2.3.2: Detection of a tamper event occurring before enabling the tamper detection is not supported in edge detection mode* – *Section 2.3.3: RTC calendar registers are not locked properly*. Updated limitation description in *Section 2.4.2: Start cannot be generated after a misplaced Stop*. Added *Section 2.4.6: Spurious Bus Error detection in Master mode*. Added SPI limitations: – *Section 2.5.1: Wrong CRC calculation when the polynomial is even* – *Section 2.5.2: Corrupted last bit of data and/or CRC, received in Master mode with delayed SCK feedback* – *Section 2.5.3: Wrong CRC transmitted in Master mode with delayed SCK feedback* – *Section 2.5.4: BSY bit may stay high at the end of a data transfer in Slave mode* Added *Section 2.6.2: Corrupted last bit of data and/or CRC, received in Master mode with delayed SCK feedback* in *Section 2.6: I2S peripheral limitations*. Added FMC limitations: *Section 2.11.13: Wrong data read from a busy NAND memory* and *Section 2.11.14: Missed clocks with continuous clock feature enabled*.
20-Apr-2017	11	Updated: – *Table 2: Device variants* – *Table 3: Summary of device limitations* – *Section 2.2.11: PA12 GPIO limitations* – *Section 2.3.4: Corruption of data read from the FMC* – *Section 2.3.6: FMC NOR/PSRAM controller: asynchronous read access on bank 2 to 4 returns wrong data when bank 1 is in synchronous mode (BURSTEN bit is set)* – *Section 2.3.7: FMC dynamic and static bank switching* Added: – *Section 2.3.15: SDRAM bank address corruption upon an interruption of CPU read burst access*
31-Jul-2018	12	Updated: – *Table 2: Device variants* – *Table 3: Summary of device limitations* – *Section 2.11.2: Corrupted last bit of data and/or CRC, received in Master mode with delayed SCK feedback*

Table 7. Document revision history (continued)

Date	Revision	Changes
25-Feb-2019	13	Updated device marking and REV_ID *Table 2: Device variants*. Removed revision 4 in *Table 3: Summary of device limitations*. Change revision 4 to revision 5 and B in *Section 2.3.4: Corruption of data read from the FMC*, *Section 2.3.6: FMC NOR/PSRAM controller: asynchronous read access on bank 2 to 4 returns wrong data when bank 1 is in synchronous mode (BURSTEN bit is set)* and *Section 2.3.7: FMC dynamic and static bank switching*.
09-Jan-2020	14	Renamed Ethernet MAC peripheral into ETH and RTC into RTC and TAMP. Added *Possible delay in backup domain protection disabling/enabling after programming the DBP bit*, *Transmit data FIFO is corrupted when a write sequence to the FIFO is interrupted with accesses to certain OTG_FS registers* and *Transmit data FIFO is corrupted when a write sequence to the FIFO is interrupted with accesses to certain OTG_HS registers*.

Table 7. Document revision history (continued)

Date	Revision	Changes
09-Oct-2020	15	Added: – *Section 2.2.3: Debugging Sleep/Stop mode with WFE/WFI entry* – *Section 2.2.3: Debugging Sleep/Stop mode with WFE/WFI entry* – *Section 2.6.1: PWM re-enabled in automatic output enable mode despite of system break* – *Section 2.6.2: Consecutive compare event missed in specific conditions* – *Section 2.6.3: Output compare clear not working with external counter resettle of the limitation here* – *Section 2.6.4: TRGO and TRGO2 trigger output failure* – *Section 2.17.6: Incorrect status and corrupted frames when RxFIFO overflow occurs on the penultimate word of Rx frames* – *Section 2.17.7: Incorrect remote wakeup on global unicast packet* – *Section 2.17.8: Overflow status bits of missed frame and buffer overflow counters are cleared without a read operation* – *Section 2.17.9: MAC may provide incorrect Rx status for the MAC control frames when receive checksum offload is enabled* – *Section 2.17.10: MAC may provide an inaccurate Rx status when receive checksum offload is enabled in cutthrough mode* – *Section 2.17.11: MAC may not drop received giant error frames* Updated: – *Section 2.16.1: Transmit data FIFO is corrupted when a write sequence to the FIFO is interrupted with accesses to certain OTG_HS registers*
02-Mar-2021	16	Updated *Full JTAG configuration without NJTRST pin cannot be used* description. Updated *Table 3: Summary of device limitations*: – Updated references to limitations *Wrong CRC calculation when the polynomial is even* and *Corrupted last bit of data and/or CRC, received in Master mode with delayed SCK feedback*. – *PA12 GPIO limitations* fixed for rev 3, B and 5. Replaced USB on-the-go full-speed peripheral by USB on-the-go high-speed peripheral in . *Section 2.16.1: Transmit data FIFO is corrupted when a write sequence to the FIFO is interrupted with accesses to certain OTG_HS registers*.