dsPIC33CH512MP508 Family Silicon Errata and Data Sheet Clarification

The dsPIC33CH512MP508 family devices that you have received conform functionally to the current Device Data Sheet (DS70005371**D**), except for the anomalies described in this document.

The silicon issues discussed in the following pages are for silicon revisions with the Device and Revision IDs listed in Table 1. The silicon issues are summarized in Table 2.

The errata described in this document will be addressed in future revisions of the dsPIC33CH512MP508 silicon.

Note: This document summarizes all silicon errata issues from all revisions of silicon, previous as well as current. Only the issues indicated in the last column of Table 2 apply to the current silicon revision (**A0**).

Data Sheet clarifications and corrections start on Page 7, following the discussion of silicon issues.

The silicon revision level can be identified using the current version of MPLAB® IDE and Microchip's programmers, debuggers, and emulation tools, which are available at the Microchip corporate website (www.microchip.com).

For example, to identify the silicon revision level using MPLAB IDE in conjunction with a hardware debugger:

1. Using the appropriate interface, connect the device to the hardware debugger.
2. Open an MPLAB IDE project.
3. Configure the MPLAB IDE project for the appropriate device and hardware debugger.
4. Based on the version of MPLAB IDE you are using, do one of the following:
   a) For MPLAB IDE 8, select *Programmer > Reconnect*.
   b) For MPLAB X IDE, select *Window > Dashboard* and click the **Refresh Debug Tool Status** icon ( ).
5. Depending on the development tool used, the part number *and* Device Revision ID value appear in the **Output** window.

Note: If you are unable to extract the silicon revision level, please contact your local Microchip sales office for assistance.

The DEVREV values for the various dsPIC33CH512MP508 silicon revisions are shown in Table 1.

TABLE 1: SILICON DEVREV VALUES

Part Number	Device ID(1)	Revision ID for Silicon Revision
		A0
Devices with CAN FD		
dsPIC33CH256MP505	0x7D42	0x0000
dsPIC33CH512MP505	0x7D52	
dsPIC33CH256MP506	0x7D43	
dsPIC33CH512MP506	0x7D53	
dsPIC33CH256MP508	0x7D44	
dsPIC33CH512MP508	0x7D54	
Devices with No CAN FD		
dsPIC33CH256MP205	0x7D02	0x0000
dsPIC33CH512MP205	0x7D12	
dsPIC33CH256MP206	0x7D03	
dsPIC33CH512MP206	0x7D13	
dsPIC33CH256MP208	0x7D04	
dsPIC33CH512MP208	0x7D14	

Note 1: The Device IDs (DEVID and DEVREV) are located at the last two implemented addresses of configuration memory space. They are shown in hexadecimal in the format "DEVID DEVREV".

TABLE 2: SILICON ISSUE SUMMARY

Module	Feature	Item Number	Issue Summary	Affected Revisions
				A0
I²C	Interrupt	1.	In Slave mode, incorrect interrupt generated with DHEN = 1.	X
I²C	Error	2.	False bus collision error generated.	X
I²C	Idle	3.	SFRs are reset in Idle mode.	X
I²C	SMBus 3.0	4.	When Configuration bit, SMBEN (FDEVOPT<10>) = 1, the SMBus 3.0 VIH minimum specification may not be met.	X
Oscillator	HS, XT	5.	Removed	
UART	FERR	6.	The FERR bit will not get set if one Stop bit is received.	X
UART	OERR	7.	The 9th byte received will not be available to be read.	X
UART	TXWRE	8.	TXWRE bit (UxSTAH<7>) cannot be cleared once it gets set.	X
UART	Address Detect	9.	When writing to UxP1 with UTXBRK = 1, content of P1 will not get transmitted.	X
UART	Address Detect	10.	In Address Detect mode, content of P1 is not transmitted on writing to P1 with UTXBRK = 1.	X
UART	Sleep	11.	When waking from Sleep with a UART reception, SLPEN needs to be set in addition to WAKE = 1.	X
UART	Smart Card	12.	Wait time interrupt flag is set when the last character transmitted has the bit, LAST = 0.	X
MBIST	MBISTDONE	13.	After executing a Reset, the MBISTDONE bit will always be set.	X
CPU	FLIM Instruction	14.	When the operands are of different signs, the FLIM instruction may not force the correct data limit.	X
CPU	MAXAB/MINAB Instructions	15.	When the operands are of different signs, the MAXAB, MINAB and MINZAB instructions may not output the correct value.	X
CPU	div.sd Instruction	16.	When using the signed 32-by-16-bit division instruction, div.sd, the Overflow bit is not getting set when an overflow occurs.	X
SCCP/ MCCP	Clock Source	17.	Using FOSC as the clock source may cause synchronization issues.	X
I/O	POR	18.	Spike on I/O at POR.	X
DMA	ADC Triggers	19.	DMA is triggered continuously from ADC.	X
PWM	Time Base Capture	20.	PWM Capture Status (CAP) flag will not set again under certain conditions.	X
I²C	I²C	21.	All instances of I²C may exhibit errors and should not be used.	X
Oscillator	VCO and AVCO Dividers	22.	Main and auxiliary PLL external VCO dividers can fail to output the clock signal.	X
Master Slave Interface (MSI)	DMA Transfer	23.	DMA transfer of mailbox data.	X

Silicon Errata Issues

Note: This document summarizes all silicon errata issues from all revisions of silicon, previous as well as current. Only the issues indicated by the shaded column in the following tables apply to the current silicon revision (**A0**).

1. Module: I²C

In Slave mode with DHEN = 1 (Data Hold Enable), if software sends a NACK, a Slave interrupt is asserted at the 9th falling edge of the clock.

Work around

Software should ignore the Slave interrupt that is asserted after sending a NACK.

Affected Silicon Revisions

A0							
X							

2. Module: I²C

In Slave mode, a false bus collision event is generated when the bus collision is enabled (SBCDE = 1) and a Stop bit is received.

Work around

None.

Affected Silicon Revisions

A0							
X							

3. Module: I²C

In Slave mode, the SFRs are reset when the device is in Idle and the module is set for discontinue in Idle (I2CSIDL = 1).

Work around

None.

Affected Silicon Revisions

A0							
X							

4. Module: I²C

When selecting SMBus 3.0 operation using Configuration bit, SMBEN (FDEVOPT<10>), the Voltage Input High (V_{IH}) of the SMBus 3.0 specification minimum may not be met.

Work around

None.

Affected Silicon Revisions

A0							
X							

5. Module: Oscillator

This errata is no longer applicable to any silicon revisions of this product. See **Section 2.5 External Oscillator Pins** in the current device data sheet (DS70005371**D**) for guidance on oscillator design to avoid start-up related issues.

6. Module: UART

When the UART is operating with STSEL<1:0> = 2 (two Stop bits sent, two checked at receive) and STPMD = 0, the FERR bit will not get set if one Stop bit is received.

Work around

Use STPSEL = 3 instead of STSEL = 2. When operating with STSEL = 3 mode, the UART will be configured to send two Stop bits, but check one at receive.

Affected Silicon Revisions

A0							
X							

7. Module: UART

When the receive buffer overflows, the 9th byte received will get lost and cannot be read.

Work around

Do not allow the OERR bit to get set by reading the received data byte on each byte reception.

Affected Silicon Revisions

A0							
X							

8. Module: UART

Once the TX Write Transmit Error Status bit (TXWRE, UxSTAH<7>) gets set, the TXWRE bit cannot be cleared by a single clear instruction.

Work around

Use multiple clear instructions in a loop until the TXWRE bit gets cleared.

Affected Silicon Revisions

A0							
X							

9. Module: UART

In UART Address Detect mode, writing to UxP1 with UTXBRK = 1 should cause a Break to be transmitted, followed by the content in P1, but the content of P1 will not get transmitted.

Work around

After writing to P1, wait for UTXBRK to get clear and then rewrite to P1.

Affected Silicon Revisions

A0							
X							

10. Module: UART

In Address Detect mode, the content of P1 is not transmitted on writing to P1 with UTXBRK = 1.

Work around

Write P1 a second time after waiting for the Break transmission to start.

Affected Silicon Revisions

A0							
X							

11. Module: UART

When waking from Sleep with a UART reception, SLPEN needs to be set in addition to WAKE = 1.

Work around

Set SPLEN bit in addition to WAKE before entering Sleep.

Affected Silicon Revisions

A0							
X							

12. Module: UART

In Smart Card T = 1 mode, the Wait time interrupt flag is set when the last character transmitted has the bit, LAST = 0.

Work around

Ignore WTC interrupt events on non-last bytes.

Affected Silicon Revisions

A0							
X							

13. Module: MBIST

After a Reset, the MBISTDONE status bit will be set regardless of a BIST test being executed. If a BIST is requested and executed, the MBISTDONE bit will set as expected.

Work around

None.

Affected Silicon Revisions

A0							
X							

14. Module: CPU

The FLIM instruction may incorrectly limit the data range when operating on signed operands of different sign values. If the operands are either all negative or all positive, the limit is correct.

Work around

None.

Affected Silicon Revisions

A0							
X							

15. Module: CPU

When operating on signed operands of different sign values, the output for MAXAB, MINAB and MINZAB instructions may be incorrect. If the operands are either all negative or all positive, the output is correct.

Work around

None.

Affected Silicon Revisions

A0							
X							

16. Module: CPU

When using the Signed 32-by-16-Bit Division instruction, `div.sd`, the Overflow bit may not always get set when an overflow occurs. This erratum only affects operations in which at least one of the following conditions is true:

- Dividend and divisor differ in sign,
- Dividend > 0x3FFFFFFF or
- Dividend < 0xC0000000

Work around

The application software must perform both the following actions to handle possible undetected overflow conditions:

a) The value of the dividend must always be constrained to be in the following range: 0xC0000000 ≤ Dividend ≤ 0x3FFFFFFF.

b) If the dividend and divisor differ in sign (e.g., dividend is negative and divisor is positive), then after executing the `div.sd` instruction or the compiler built-in function, `__builtin_divsd()`, inspect the sign of the resultant quotient. If the quotient is found to be a positive number, then treat it as an overflow condition.

Affected Silicon Revisions

A0							
X							

17. Module: SCCP/MCCP

When FOSC is selected as the clock source using the CLKSEL<2:0> bits (CCPxCON1L<10:8>), unexpected operation may occur. For proper SCCP/MCCP input clock synchronization, do not use FOSC as the CCP clock source.

Work around

Use any of the other available clock sources in CLKSEL<2:0>.

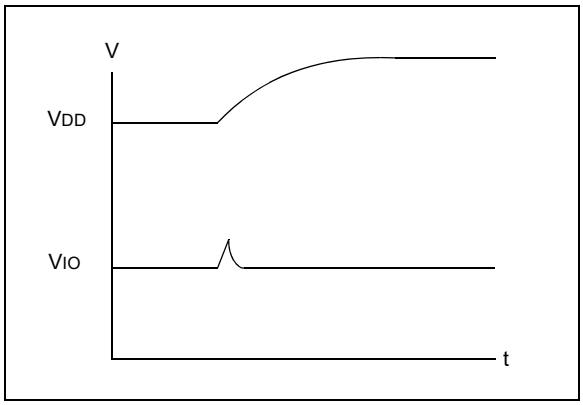
Affected Silicon Revisions

A0							
X							

18. Module: I/O

During a fast device power-up, when the VDD ramp is less than 4 mS, the I/O pins may drive up to 100 µA current for a duration of up to 10 µS (Figure 1-1).

FIGURE 1-1: I/O RAMP



Work around

1. Slow down the VDD ramp time (greater than 4 mS for VDD to ramp 0V to 3.3V).
2. Ensure the circuitry that is connected to the pins can endure this pulse.

   Example applications affected may include complementary power switches, where a transient current shoot-through might occur. High-voltage applications with complementary switches should power the high-voltage 200 µSec later than powering the dsPIC® device to avoid the current shoot-through. This behavior is specific to each device and not affected by aging.

Affected Silicon Revisions

A0							
X							

19. Module: DMA

The DMA receives multiple continuous triggers from the ADC until the trigger event from ADC is cleared. The OVRUNIF flag (DMAINTn[3]) will be set. When the OVRUNIF bit changes state, from '0' to '1', a DMA interrupt is generated.

Work around

Ignore the OVRUNIF bit and the first DMA interrupt. Clear the ADC trigger source, ANxRDY, with a DMA read of the ADC buffer, ADCBUFx, for the corresponding ADC channel.

Affected Silicon Revisions

A0							
X							

20. Module: PWM

When using a PWM Control Input (PCI) to trigger a time base capture, the Capture Status flag, CAP (PGxSTAT[5]), may not set again under certain conditions. When a subsequent PWM capture event occurs while, or just after, reading the current capture value from the PGxCAP register, the Capture Status Flag, CAP, will not set again.

Work around

Read the PWM Generator x Capture (PGxCAP) register as soon as possible to avoid the condition. Poll the CAP bit and read the PGxCAP value within the associated PWM Generator (1-8) interrupt or any of the six PWM Event (A-F) interrupts corresponding to the PCI event which triggered the time base capture.

Affected Silicon Revisions

A0							
X							

21. Module: I^2C

All instances of I^2C/SMBus may exhibit errors and should not be used. When operating I^2C/SMBus in a noisy environment, the I^2C module may exhibit various errors. These errors may include, but are not limited to, corrupted data, unintended interrupts or the I^2C bus getting hung up due to injected noise. Examples of system noise include, but are not limited to, PWM outputs or other pins toggled at high speed adjacent to the I^2C pins. Both Master and Slave I^2C/SMBus modes may exhibit this issue.

Work around

If I^2C is required, use a software I^2C implementation. An example I^2C software library is available from Microchip:

www.microchip.com/dsPIC33C_I2C_SoftwareLibrary

Affected Silicon Revisions

A0							
X							

22. Module: Oscillator

At PLL start-up, the main and auxiliary PLL VCO dividers may occasionally halt and not provide a clock output. The VCO and AVCO dividers can be selected as clock sources for different peripheral modules, including the ADC, PWM, DAC, CAN FD, UART, etc. VCO and AVCO divider outputs, FVCO/2, FVCO/3, FVCO/4, FVCODIV, AFVCO/2, AFVCO/3, AFVCO/4 and AFVCODIV outputs are affected.

Work around

1. Use another clock source, such as the FOSC, PLL or APLL output (FPLLO and AFPLLO) instead of the VCO or AVCO dividers.

   If the application requires the VCO/AVCO divider, test the clock source before using the peripheral in the end application. System resources, including a timer, I/O pin state or interrupts can be used to detect and verify peripheral activity for presence of the VCO divider clock output. Any type of Reset may recover the VCO divider clock (Software Reset, WDT, $\overline{\text{MCLR}}$ or POR).

Affected Silicon Revisions

A0							
X							

23. Module: Master Slave Interface (MSI)

When transferring data between cores using the MSI mailbox with DMA, if the transmitting core is running more than two times the system clock frequency of the receiving core, the data transfer may not be processed correctly and the MSI may appear to be in a Freeze state.

An example of the application includes, the DMA in the transmitting core may load data to the MSI Mailbox register after the receiving core initiates the MSI interrupt to Acknowledge data reception, but prior to hardware clear of the DTRDY bit, causing the hardware to appear to be frozen in the state where the DTRDY bit is set in the transmitting core and cleared in the receiving core.

Work around

Do not use DMA for MSI data transfer when the core sending data will be operating at more than two times the system clock frequency of the core receiving data. Instead, in the MSI ISR, clear the DTRDY bit and load the next data to the MSI buffer/FIFO directly.

Affected Silicon Revisions

A0							
X							

Data Sheet Clarifications

The following typographic corrections and clarifications are to be noted for the latest version of the device data sheet (DS70005371**D**):

Note:	Corrections are shown in **bold**. Where possible, the original bold text formatting has been removed for clarity.

1. Module: Electrical Characteristics

In Table 24-29, the FRC percentage is changed from -3 to +3, to -2 to +2. All changes are shown below in **bold**.

TABLE 24-29: INTERNAL FRC ACCURACY

Operating Conditions: 3.0V to 3.6V (unless otherwise stated) Operating temperature -40°C ≤ TA ≤ +85°C for Industrial -40°C ≤ TA ≤ +125°C for Extended					
Param No.	Characteristic	Min.	Max.	Units	Conditions
Internal FRC Accuracy @ FRC Frequency = 8 MHz(1)					
F20a	FRC	**-2**	**+2**	%	-40°C ≤ TA ≤ **-5**°C
		-1.5	+1.5	%	**-5**°C ≤ TA ≤ +85°C
		-2	+2	%	+85°C ≤ TA ≤ +125°C
F22	BFRC	-17	+17	%	-40°C ≤ TA ≤ +125°C

Note 1: Frequency is calibrated at +25°C and 3.3V.

APPENDIX A: DOCUMENT REVISION HISTORY

Rev A Document (10/2018)

Initial version of this document; issued for revision A0.

Rev B Document (7/2019)

Removes original silicon errata issues 6 (PWM) and 18 (CPU). The issues are no longer relevant and were removed.

Updates silicon errata issue 18 (I/O)

Adds silicon errata issues 19 (DMA) and 20 (PWM).

Rev C Document (9/2019)

Updates device data sheet reference to the current revision D.

Rev D Document (2/2020)

Adds silicon issue 21 (I^2C).

Rev E Document (6/2020)

Adds silicon issues 22 (Oscillator) and 23 (Master Slave Interface (MSI)).

Adds data sheet clarification 1 (Electrical Characteristics).

Removes silicon issue 5 (Oscillator) since it is no longer applicable.

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