MCP9600/01

Silicon Errata and Data Sheet Clarification

The MCP9600/01 parts you have received conform functionally to the Device Data Sheet (DS20005426), except for the anomalies described below.

All of the issues listed here will be addressed in future revisions of the MCP9600/01 silicon.

Contact Microchip for the latest silicon fix.

1. Module: T_{H_ACY}, or the T_H Hot-Junction Temperature Accuracy - MCP9600 Only

The Hot-Junction (T_H) Temperature Accuracy T_{H_ACY} of the MCP9600 devices before Date Code 1723 or Device ID/Revision value of 0x4011, may not meet the specified accuracy in the data sheet, starting from revision C data sheet (DS20005426C) to the latest data sheet. This issue affects the T_H temperature register only.

The Cold-Junction (T_C) and the Junctions Delta (T_Δ) Temperature registers are not affected by this issue. These registers meet the accuracy performance as specified in the data sheet.

Work around

Convert the T_C and the T_Δ temperature data from the units of Degree Celsius (°C) to millivolt (mV) using the NIST ITS-90 conversion look-up table or polynomial equation. Then sum the two voltages, and convert the summed value from millivolt to Degree Celsius using the NIST ITS-90 conversion table or polynomial equation.

Date Codes that pertain to this issue:

All production devices before Data Code 1723 and with Device ID/Revision register value of 0x4011 are affected, as shown in Table 1.

Fix

Devices with Date Code of 1723 or later are not affected. These devices have a Device ID/Revision value of 0x4012.

2. Module: Intermittent I^2C Read Command Clock Stretching Failure - MCP9600 Only

During I^2C Sequential Read communication for two or more bytes, the MCP9600/L00/RL00 may intermittently fail to Clock Stretch, $t_{STRETCH}$, as described in the data sheet, for bus frequencies greater than 85 kHz (typical). When this failure occurs, the MCP9600/L00/RL00 continues to output the previously transmitted data. For example, when reading the two byte T_H temperature register, if the device fails to clock stretch for the Least Significant Byte, then the device will output the Most Significant Byte.

Work around

Since this issue is intermittent, repeat the Sequential Read instruction until the second byte read is different from the Most Significant Byte.

Date Codes that pertain to this issue:

All production devices before Data Code 1845 and with Device ID/Revision register value of 0x4012 or lower are affected, as shown in Table 1.

Fix

Devices with Date Code of 1845 or later are not affected. These devices have a Device ID/Revision value of 0x4013.

3. Module: Input Range bit (Bit 4 of the Status Register) - MCP9600 Only

When the MCP9600/L00/RL00's Bit 4 of the Status Register, Input Range bit, is set to '1', the T_H, T_C and T_Δ registers are not updated as indicated in the Rev E data sheet bit description (DS20005426**E**). This characteristic may result in what appears to be unpredictable temperature data, if the temperature register is not updated when the thermocouple temperature is near the upper or the lower temperatures limits for the specified thermocouple range. For example, if the thermocouple EMF is within the specified range, but the sum with the Cold Junction EMF exceeds the specified thermocouple range, then the Input Range bit is set to '1' and the temperature registers are not updated.

Work around

None.

Date Codes that pertain to this issue:

All production devices before Date Code 1845 and with Device ID/Revision register value of 0x4012 or lower are affected, as shown in Table 1.

Fix

Devices with Date Code 1845 or later are not affected. These devices have a Device ID/Revision value of 0x4013.

Devices with the Device ID/Revision value of 0x4013 update the temperature registers as follows, when the Bit 4 of the Status Register, Input Range bit, is set to '1':

- If the thermocouple EMF exceeds the specified range, then T_H and T_Δ Registers are not updated, but T_C Register is updated with a valid temperature data at the specified interval, or t_{CONV}.
- If the thermocouple EMF is within the specified range, but the sum with the Cold-Junction EMF exceeds the specified range, then T_H Register is not updated, but T_Δ and T_C Registers are updated with valid temperature data at the specified interval, or t_{CONV}. The value of T_Δ and T_C Registers can be used to calculate valid Hot-Junction temperature data using the NIST ITS-90 conversion look-up table or polynomial equation.

4. Module: Outputs Extra 0x00 data during Sequential Read - MCP9600 Only

When the MCP9600/L00/RL00 Registers are Sequentially Read, the device outputs 0x00 between the Least Significant Byte of the Alert 4 Register and the Most Significant Byte of the Device ID/Revision Register values.

Work around

Ignore the byte.

Date Codes that pertain to this issue:

All production devices before Date Code 1845 and with Device ID/Revision register value of 0x4012 are affected, as shown in Table 1.

Fix

Devices with Date Code 1845 or later are not affected. These devices have a Device ID/Revision value of 0x4013.

5. Module: Open Circuit Detection - MCP9601 Only

The MCP9601/L01/RL01 Open Circuit detection Alert feature may not correctly assert. And, if it asserts, then OC Alert output may not remain asserted while the Thermocouple is disconnected; OC Alert output may chatter. This characteristic is primarily due to the minor shift in characteristics of the thermocouple inputs Common-mode typical impedance.

For proper operation, the three external resistors in Figure 1-1 of the data sheet need to be changed from the recommended values in data sheet Revision F (DS20005426**F**). The following specifications will be changed from the values specified in Revision F of the data sheet V_{SiOC}, V_{SiNOR}, and R_A, R_B, and R_C from Figure 1-1.

Work around

None.

Date Codes that pertain to this issue:

All production devices before Date Code 2107 and with Device ID/Revision register value of 0x4110 are affected, as shown in Table 2.

Fix

Devices with Date Code 2107 or later are not affected. These devices have a Device ID/Revision value of 0x4111.

6. Module: Unimplemented byte on Device Configuration Register

The MCP960X/L0X/RL0X Configuration Register is 8 bits wide followed by an unimplemented byte which outputs 0x00 during sequential Read command. This byte is shown in Table 5-1 “Summary of Registers and Bit Assignment” of Revision G of the data sheet.

Work around

Ignore the byte.

Date Codes that pertain to this issue:

All production devices.

Fix

None.

7. Module: Receive Protocol or Repeat Read Command

On some devices of the MCP960X/L0X/RL0X, the Repeat Read command or the receive protocol may not function properly. During Repeat Read command, the device is expected to retain the previously set register pointer and continue to output data from the selected register. However, on some devices, the device may continue to output data from the following register, just as a Sequential Read command.

Work around

Always set the register pointer prior to each Read Command as shown on Figure 4-3 of the data sheet.

Date Codes that pertain to this issue:

- MCP9600/L00/RL00: All production devices before Date Code 2121 and with Device ID/Revision register value of 0x4113 are affected, as shown on Table 1.

- MCP9601/L01/RL01: All production devices before Date Code 2107 and with Device ID/Revision register value of 0x4110 are affected, as shown on Table 2.

Data Sheet Clarifications

The following typographic corrections and clarifications are to be noted for the latest version of the device data sheet:

1. The MCP9600/L00/RL00 Input Range Bit of the Status Register (Bit 4) will be clarified (from current description, Revision E Data Sheet DS20005426**E**) on the next data sheet revision, as described in Module 3.
2. The MCP9601/L01/RL01 Open Circuit detection threshold V_{SiOC} and V_{SiNOR} will be clarified (from current description, Revision F Data Sheet DS20005426**F**) on the next data sheet revision, as described in Module 5.

TABLE 1: SILICON ISSUE SUMMARY MCP9600/L00/RL00

Module	Feature	Issue Summary	Affected Device ID/Revision (1)				Fixed Date Code
			0x4011	0x4012	0x4013	0x4014	
1	T_{H_ACY}	This parameter may not meet data specification starting from Rev C data sheet DS20005426C (MCP9600 only)	X	—	—	—	1723
2	$t_{STRETCH}$	This parameter may not meet data specification (MCP9600/L00/RL00)	X	X	—	—	1845
3	Input Range	Device Characteristics changed from the data sheet description (MCP9600/L00/RL00)	X	X	—	—	1845
4	Extra Byte	Correction to the Device Characteristics (MCP9600/L00/RL00)	X	X	—	—	1845
6	I^2C Read	Unimplemented byte on Device Configuration Register (MCP9600/L00/RL00) Affected	X	X	X	X	—
7	Receive Protocol	The Repeat Read command or the Receive Protocol may not function properly (MCP9600/L00/RL00) Affected.	X	X	X	—	2121

Note 1: The Device ID/Revision Register is found in the user register pointer 0x20.

TABLE 2: SILICON ISSUE SUMMARY MCP9601/L01/RL01

Module	Feature	Issue Summary	Affected Device ID/Revision (1)		Fixed Date Code
			0x4110	0x4111	
5	Open Circuit Detection	Open Circuit detection mechanism may not correctly assert (MCP9601/L01/RL01)	X	—	2107
6	I^2C Read	Unimplemented byte on Device Configuration Register (MCP9601/L01/RL01) Affected	X	X	—
7	Receive Protocol	The Repeat Read command or the Receive Protocol may not function properly (MCP9601/L01/RL01).	X	—	2107

Note 1: The Device ID/Revision Register is found in the user register pointer 0x20.

APPENDIX A: DOCUMENT REVISION HISTORY

Rev. E Document (10/2021)

Updated Module 7. date code for the MCP9600/L00/RL00.

Rev. D Document (04/2021)

- Added Errata Module 5.
- Added Errata Module 6.
- Added Errata Module 7.
- Updated Table 1 and Table 2.
- Updated minor typographic corrections throughout the document.

Rev. C Document (5/2019)

- Added Errata Modules 2, 3 and 4.

Rev. B Document (9/2017)

- Added Fix regarding the devices with Date Code of 1723.
- Added Note 1 to Table 1.

Rev. A Document (5/2017)

- Initial release of this document.

NOTES:

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods being used in attempts to breach the code protection features of the Microchip devices. We believe that these methods require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Attempts to breach these code protection features, most likely, cannot be accomplished without violating Microchip's intellectual property rights.
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