Introduction

A shift in device parameters of DS1820B B7 die (used in DS18B20, DS1820S, and DS1822 products) has caused several recent lots to experience EEPROM data corruption failures during power up. Although occurrence is rare, this failure can happen to any device during any power up. Dallas Semiconductor recommends running the software patch detailed in this document after each power up to restore the internal trim values of the DS1820B B7.

Failure Description

EEPROM can corrupt each time the DS1820B B7 goes through a power up sequence in either normal or parasite power operation modes. This failure occurs randomly but is dependent upon fabrication lot variation and the signal noise and rise time of the VDD/DQ pin. Overall, the failure rate during each power up should be considered very small. Repeated power cycling to a device will increase its chance of failure.

Corruption can occur in any EEPROM location inside the device. This could cause the loss of user data stored in the TH and TL registers as well as corruption of internal trim registers causing inaccuracy of temperature readings. There is no set value that these registers will change to. A failure can be expected to effectively randomize the TH and TL values and can induce temperature measurement errors of up to ±60°C. Once internal temperature measurement trim values are lost they cannot be recovered however the device can be blanket trimmed to regain most of its original accuracy.

Recommended Software Patches

Dallas Semiconductor recommends using the two software patches listed here. Which one to use will depend on the application. The Blanket Trim patch is for use in systems where the internal trim values have already been lost or in systems where the internal trim values cannot be maintained outside of the device. The Recover Trim procedure reads out the trim values of the DS1820B B7 on the initial power up, verifies they are still good, and then writes them back into the device on each subsequent power up. The application must have sufficient external nonvolatile store for this procedure to work properly.

Both procedures must be run directly after the device is powered up. Afterwards the TH and TL values should be written (if they were corrupted). Then the application can proceed as normal.

Blanket Trim

After each device power-up, issue the following command sequence to store an average trim value then write TH and TL to their desired values and proceed as normal. The procedure will place an average trim value into the DS1820B B7. Temperature reading accuracy will be no worse than ±2°C afterwards.

Reset / Presence Detect
0xCC Skip ROM (or 0x55 Match ROM if required)
0x95
0x9D

Reset / Presence Detect
0xCC Skip ROM (or 0x55 Match ROM if required)
0x63
0xBB

Reset / Presence Detect
0xCC Skip ROM (or 0x55 Match ROM if required)
0x94

Reset / Presence Detect
0xCC Skip ROM (or 0x55 Match ROM if required)
0x64

Recover Trim
At the very first device power up read the internal trim values and store them in a nonvolatile memory location outside the DS1820B B7. On each additional power up rewrite the trim values back into the device. Afterwards write TH and TL to their desired values and proceed as normal.

Initial Power Up
Reset / Presence Detect
0xCC Skip ROM (or 0x55 Match ROM if required)
0x93
Read 1 byte and store as TRIM1

Reset / Presence Detect
0xCC Skip ROM (or 0x55 Match ROM if required)
0x68
Read 1 byte and store as TRIM2

There is a small possibility the trim values were corrupted on the very first power up. If TRIM1 is not equal to XXXXX101b or XXXXX011b and TRIM2 is not equal to 10111011b assume the trim values are already corrupted and use the Blanket Trim procedure above otherwise use the procedure below.

Each Additional Power Up
Reset / Presence Detect
0xCC Skip ROM (or 0x55 Match ROM if required)
0x95
Write TRIM1

Reset / Presence Detect
0xCC Skip ROM (or 0x55 Match ROM if required)
0x63
Write TRIM2

Reset / Presence Detect
0xCC Skip ROM (or 0x55 Match ROM if required)
0x94

Reset / Presence Detect
0xCC Skip ROM (or 0x55 Match ROM if required)
0x64

Summary
The DS1820B B7 die can corrupt its EEPROM during either parasite or normal power up. The failure rate is very low, however failures occur randomly at each power up and cannot be effectively screened. For this reason Dallas Semiconductor recommends using the software patch listed above to prevent loss of the internal trim values, which maintain temperature reading accuracy. If the device's trim values have already been lost a blanket trim value can be inserted to maintain an accuracy of at least ±2°C. This affects all recent lots of DS18B20, DS18S20, and DS1822 products.