PCN# 20170801000

Continuous Improvement on:

MitySOM-5CSx
All 5CSE and 5CSX Modules

Date: August 1, 2017

To: Purchasing Agents & Design Engineers

Dear Customer,

This is an initial announcement of a change to a product that is currently offered by Critical Link. The details of this change are on the following pages.

For questions regarding this notice, contact the Hardware Manager Bill Halpin (bill.halpin@criticallink.com).

Sincerely,

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PCN Number: 20170801000

PCN Date: August 1, 2017

Title: Continuous Improvement

Contact: Bill Halpin

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Ship Date: 08/01/2017

Overview
Changes to MitySOM-5CSx are identified in the following sections.

1 Increase Bypass Caps on USB PHY's Internal LDOs

1.1 Description of Change
The original USB PHY design on the MitySOM-5CSx modules has bypass caps for the TUSB1211 USB PHY's power rails that are smaller than recommended. This change increases the value to the recommended range.

1.2 Reason for Change
Recently there were MitySOM-5CSx modules that were screened out during production tests because they could not pass the USB interface tests. Investigation of the modules that showed the failure lead to the understanding that limited bypass cap margin results in minor reset anomalies near 0°C and below. This low temperature issue was a soft error that was reported as a USB reset when accessing a flash drive. The tests reliably completed at room temperatures and down to 0°C and below, but sometimes took a little longer due to the resets. Other stress tests were performed across the temperature range using RNDIS for a network connection through USB. The RNDIS tests did not show error reports in this low temperature range.

The design was reviewed and the USB bypass caps were identified as an improvement. A larger value was selected for these caps, as recommended in the TUSB1211 datasheet. This change corrected the soft reset errors on the USB port.

1.3 Anticipated Impact on Form, Fit, Function (positive / negative)
Form and Fit are not impacted by this change.

The 5CSx SOMs with revisions of "Dash 5" and lower could experience some performance impact at temperatures near 0°C and below. With the capacitor change, those units will experience improved performance near 0°C and below, and in all cases, the USB port is expected to continue to function. All production units pass the USB tests before entering the distribution chain. With module versions that included the original cap values, the worst case condition was near temperatures of 0°C and below and resulted in USB reset messages reported in Linux.

1.4 Anticipated Impact on Quality or Reliability (positive / negative)
There is no impact to quality with this change. For reliability, the module is expected to have the same reliable performance and there is no change to the life expectancy of the product. When considering reliability as a

performance measure, the USB port maintains more reliable data rates at low temperatures with the added bulk capacitance for those modules that exhibited the USB reset message under Linux. On all modules, the USB drive is expected to continue functioning even if it reports USB reset messages in Linux.

2 Remove 102k Pull-Up Resistor From USB1_PS_ON [USB1_PSW] on the MitySOM

2.1 Description of Change

The USB On-The-Go interface includes a power switch control line for designs that want the OTG power switching to the USB port. This is the USB1_PS_ON [USB1_PSW] connection to the MitySOM. The MitySOM includes a weak pull-up of 102k for modules up to "Dash 5" versions. In module versions above "Dash 5", this resistor will not be populated.

2.2 Reason for Change

Volume production of the MitySOM-5CSx modules showed some lot-dependent fallout for the USB interface when running stress tests over temperature. The reference design for the USB1_PSW [USB1_PS_ON], provided in the Dev Board, has a pull-down resistor (R411) that is too strong. The failures on the USB interface were traced to the baseboard's 2.2k pull-down resistor in a high temperature operating environment for affected modules. According to the PHY datasheet, 100k is the recommended typical resistor value. Unfortunately, the inclusion of a pull-up on the MitySOM's USB1_PSW [USB1_PS_ON] net prevents using the typical value pull-down resistor.

To allow future baseboard designs to use the typical resistor value for USB1_PSW [USB1_PS_ON], the 102k resistor will be removed from the module. For existing designs, the USB interface problems are avoided if the baseboard uses a weaker pull-down resistor ranging from 10k to 20k value.

The USB1_PSW control can be configured for various modes of operation. By default, the USB PHY has this output set to open-source, and needing a pull-down resistor. The reference firmware provided in the Dev Board and Critical Link git code repositories leaves the output set as open-source. With these defaults, it does not make sense to keep the pull-up resistor populated on the MitySOM because it sets up a voltage divider with the required pull-down resistor on the baseboard.

2.3 Anticipated Impact on Form, Fit, Function (positive / negative)

There is no impact to Form or Fit. The Function is not expected to behave differently with two minor exceptions:

a) If a baseboard design includes the heavy 2.2k pull-down resistor on the USB1_PS_ON [USB1_PSW] net, this design, with any MitySOM-5CSx version, could experience USB problems at high temperatures. Without the 102k pull-up on the MitySOM, this failure mode will be experienced over a wider range of temperatures for those affected SOMs. Please correct this situation for old and new MitySOMs by increasing the pull-down resistor value to 10k or 20k. If all MitySOM revisions will be above "Dash 5", the pull-down can be set to the typical recommended 60k to 100k value.

b) If a design exists where the effort was taken to write a driver [for the TUSB1211 PHY] to change the USB1_PSW output mode to open-drain, the SOM's pull-up will not be available on new modules. To avoid this case, the pull-up resistor can be added to the baseboard or the output could be configured in the PSW_CMOS mode to drive the output in either direction.

2.4 Anticipated Impact on Quality or Reliability (positive / negative)

The MitySOM-5CSx module products will continue to focus on highest quality designs. By removing the SOM's 102k resistor from the USB1_PS_ON [USB1_PSW] net, the quality of total system design can be slightly improved. In this case, the improvement is allowing use of the typical pull-down resistor value [60k to 100k] for new baseboard designs.

The quality is maintained for existing designs as long as the pull-down resistor on the baseboard is in the 10k to 20k range. The high temperature failure mode associated with the 2.2k resistor is not present when a 10k is used instead.

3 Products Affected

Details regarding the full revision history can be located in the MitySOM-5CSx Revision History section on the Critical Link support site.
https://support.criticallink.com/redmine/projects/mityarm-5cs/wiki

Table 1: Products Affected

Model Number	Starting PCA	Replacement PCA
5CSE-L2-3Y8-RC	80-000705RC-5	80-000705RC-8
5CSE-S2-3Y8-RI	80-000729RI-5	80-000729RI-8
5CSE-H4-3YA-RC	80-000713RC-5	80-000713RC-8
5CSE-H4-3YA-RI	80-000713RI-5	80-000713RI-8
5CSX-H5-4YA-RC	80-000714RC-5	80-000714RC-8
5CSX-H5-4YA-RI	80-000714RI-5	80-000714RI-8
5CSX-H6-42A-RC	80-000642RC-5	80-000642RC-8
5CSX-H6-42A-RI	80-000642RI-5	80-000642RI-8
5CSX-H6-4YA-RC	80-000772RC-5	80-000772RC-8
5CSX-H6-4YA-RI	80-000772RI-5	80-000772RI-8
5CSX-H6-53B-RC	80-000646RC-5	80-000646RC-8

See MitySOM-5CSx Datasheet and Carrier Board Design Guide for migration options across the MitySOM-5CSx family.

4 Document Revision History

Date	Version	Change Description
01-Aug-2017	1.0	Initial Version