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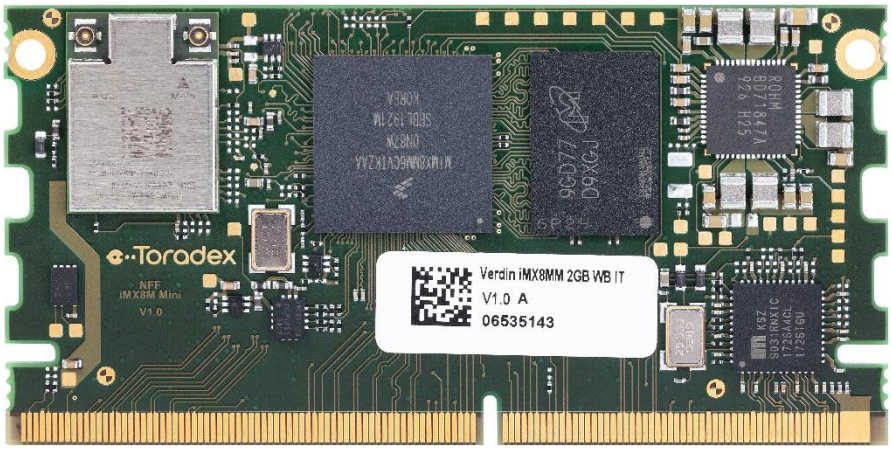
# Verdin iMX8M Mini

## Errata Document



# Document Revision History

| Date | Doc. Rev. | Notes |
|---|---|---|
| 25-Feb-2020 | Rev. 0.9 | Initial Release |
| 14-Apr-2020 | Rev. 0.91 | Minor cosmetic improvements |
| 19-Jun-2020 | Rev. 0.92 | Add fixed module version V1.1A<br>Errata #13: Added as new errata |
| 09-Sep-2020 | Rev. 0.93 | Update module names of fixed versions<br>Errata #5: Update description and workaround<br>Errata #10: Update workaround<br>Errata #13: Update customer impact, description, and workaround |
| 16-Mar-2021 | Rev. 0.94 | Add front picture<br>Errata #14: Added as new errata<br>Minor changes |
| 03-May-2021 | Rev. 0.95 | Errata #15: Added as a new errata |
| 14-May-2021 | Rev. 0.96 | Errata #16: Added as a new errata |
| 30-Jun-2021 | Rev. 1.00 | Removed errata #15 and moved it over to the errata documents of the affected Verdin carrier boards (in accordance with the 1.3 version of the Verdin Family Specification) |

# Overview

## Errata #1: HAR-2331 - Degradation of internal IO pull-up current capability for SDIO signals continuously driven in a 3.3V operating mode

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
**Verdin iMX8M Mini DualLite 1GB V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini Quad 2GB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB V1.1A**

### Customer Impact

Potential reliability issues with the SDIO interface if the interface is extensively used with 3.3V IO voltage. However, this effect has not been observed by Toradex so far.

### Description

NXP released an errata that describes the possible degradation of the internal pull-up resistors if the pads are continuously driven in 3.3V operation (see NXP errata e50080, which can be downloaded here: https://www.nxp.com/webapp/Download?colCode=IMX8MM_0N87W). The pull-up level can change over time from 20kΩ to 92kΩ.

The SDIO interface is the only interface that runs at 3.3V. The SDIO interface only runs at 3.3V if non-UHS-I speeds are in use. For the higher UHS-I transfer speeds, the interface changes to 1.8V IO voltage.

The interface relies on the internal pull-up resistors on the 1.0 version of the Verdin iMX8M Mini. On modules with version 1.1 and more recent, additional external pull-up resistors placed on the module allow disabling the pull-up resistors in the SoC.

### Workaround

If UHS-I speed modes are used (SDR12, SDR25, DDR50, SDR50, or SDR104), the interface runs in 1.8V. In this case, the 3.3V IO voltage level is only used during the enumeration process. Therefore, UHS-I graded SD cards are recommended to be used.

Adding external pull-up resistors on the carrier is not a preferred workaround and is only applicable if UHS-I is disabled. The problem is that for UHS-I cards, the IO voltage range needs to be switchable between 3.3V and 1.8V. This switchable voltage rail is only available on the module.

## Errata #2: HAR-2332 - Missing pull-up on CAN SPI MISO signals might cause signal flickering

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
**Verdin iMX8M Mini DualLite 1GB V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini Quad 2GB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB V1.1A**

### Customer Impact

Except for the potential increase in current consumption, no impact is expected.

### Description

The Verdin iMX8M Mini features up to two MCP2518 external CAN FDs from Microchip that shares the same SPI interface for connecting to the SoC via level translators.

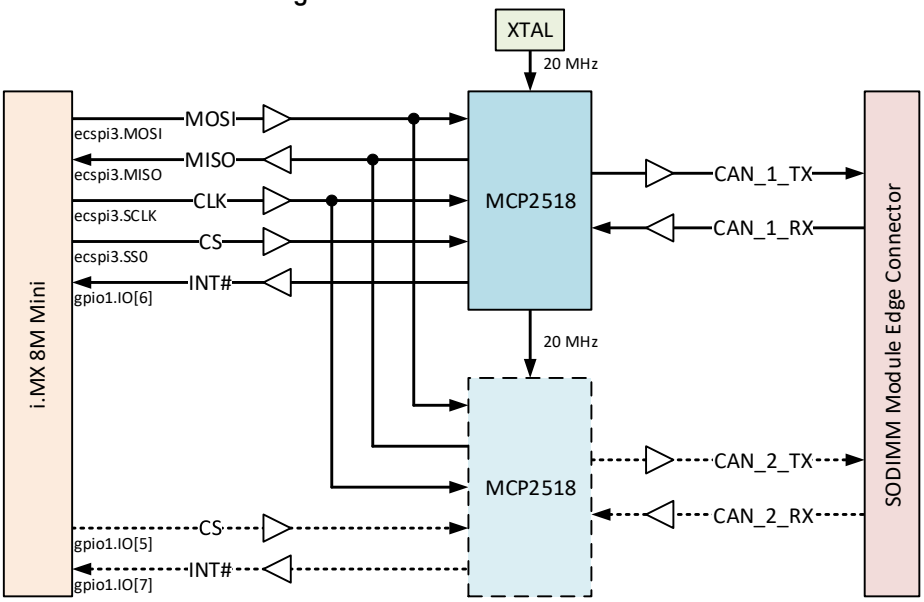



Figure 1: CAN Block Diagram

There are level shifters in the SPI signals between the SoC and the CAN controllers. If none of the CAN controllers are driving the MISO signal (both chip-select signals for the CAN controllers are deactivated), the MSIO signal can get to be floating. This means the MSIO signal is neither driven to GND or 3.3V and could cause an oscillation at the level shifter, which could cause a higher current draw than expected.

### Workaround

There is no software or hardware workaround available for V1.0 modules. A weak external pull-up is added on the modules with version 1.1 to avoid the MISO signal from floating.

## Errata #3: HAR-2333 - MCP2517FDT-H/JHA is assembled instead of MCP2518FDT- E/QBB as indicated in the product datasheet

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
**Verdin iMX8M Mini DualLite 1GB V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini Quad 2GB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB V1.1A**

### Customer Impact

The MCP2517 is basically identical to the MCP2518. The MCP2518 is the newer, improved version that introduces a low power mode, an SEQ field, a DEVID register, and a slightly modified package. The MCP2518FDT- E/QBB will be assembled in the next product version.

### Description

The part MCP2517FDT-H/JHA has been assembled instead of MCP2518FDT- E/QBB as indicated in the product datasheet.

### Workaround

Do not use the additional features of the MCP2518.

## Errata #4: HAR-3184 - KSZ9031 assembled instead of KSZ9131 Indicated in the product datasheet

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
**Verdin iMX8M Mini DualLite 1GB V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini Quad 2GB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB V1.1A**

### Customer Impact

The KSZ9131 is an updated version of the KSZ9031. The features are identical. However, the KSZ9131 resolves several errata of the KSZ9031, including issues with passing Ethernet compliance tests.

The KSZ9031 and the KSZ9131 are officially software compatible. However, there are some differences in the settings of the RGMII timing. Make sure that the BSP supports the corresponding Ethernet PHY.

The new KSZ9131 will be assembled in the next product version.

### Description

The part KSZ9031RNXIC has been assembled instead of KSZ9131RNXI that is indicated in the product datasheet.

### Workaround

Not available.

## Errata #5: HAR-3191 - Incorrect assertion of CTRL_FORCE_OFF_MOCI# in reset and power-down cycle

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
**Verdin iMX8M Mini DualLite 1GB V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini Quad 2GB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB V1.1A**

### Customer Impact

Depending on the carrier board, the power can get killed during the reset cycle, or the power-down does not switch off the rails in the expected order.

### Description

On the version 1.0 Verdin iMX8M Mini modules, the CTRL_FORCE_OFF_MOCI# is a simple GPIO with an on-module pull-up resistor. This has two impacts:

During a reset cycle, the CTRL_FORCE_OFF_MOCI# goes low. This means that during a reset cycle, the CTRL_FORCE_OFF_MOCI# is asserted and will kill the power of the system. This happens independent of whether the reset cycle was initiated by software, a watchdog, or by pressing the reset button (CTRL_RESET_MICO# is pulled low)

During the power-down sequence, the CTRL_FORCE_OFF_MOCI# gets asserted just after the CTRL_RESET_MOCI# goes low. The CTRL_FORCE_OFF_MOCI# should go low after the module power rails are removed, and the CTRL_PWR_EN_MOCI is disabled. This means the power rails get killed in a very early stage, leading to an uncontrolled power-down of the rails. So far, no damages have been seen by this non-graceful power-down.

Verdin iMX8M Mini modules with version 1.1A and more recent use a different circuit for generating the CTRL_FORCE_OFF_MOCI# signal. On these modules, the CTRL_FORCE_OFF_MOCI# remains high during a reset cycle, and the power-down sequence described in the Verdin Development Guide is followed.

### Workaround

To perform a reset cycle without killing the power, the carrier board needs to ignore the CTRL_FORCE_OFF_MOCI# signal. This can be done on the Verdin Development Board by removing the jumper between pin A23 and B23 of X6. For other carrier boards, check the corresponding schematic and errata documents of these carrier boards.

Ignoring the CTRL_FORCE_OFF_MOCI# signal on the carrier board disables the kill-feature of the carrier board rails. This means the main power rail is not removed during power-down. This requires manually turning off the main power by (long) pressing the power button on the carrier board.

## Errata #6: HAR-3192 - Keeping CTRL_RESET_MICO# down does not keep the module in reset

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
**Verdin iMX8M Mini DualLite 1GB V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini Quad 2GB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB V1.1A**

### Customer Impact

It is not possible to delay the power-up cycle or prolong a reset cycle by keeping the CTRL_RESET_MICO# input signal down.

### Description

Holding the CTRL_RESET_MICO# down does keep the module in the reset state. The falling edge of the CTRL_RESET_MICO# triggers the reset cycle, which reboots the module independent of whether the CTRL_RESET_MICO# signal is kept low. Similarly, keeping the CTRL_RESET_MICO# low while powering up the module does not stop the module from booting entirely.

The behavior will be changed in version 1.1 of the module. The holding down of the CTRL_RESET_MICO# signal will prolong the reset cycle. A falling edge on the CTRL_RESET_MICO# input will initiate the reset cycle while the module will wait for the rising edge for releasing the reset of the on-module reset and the external CTRL_RESET_MOCI#.

### Workaround

Not available.

## Errata #7: HAR-2728 - JTAG Boundary Scan is not accessible

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
**Verdin iMX8M Mini DualLite 1GB V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini Quad 2GB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB V1.1A**

### Customer Impact

It is not possible to use the Boundary Scan mode.

### Description

It is not possible to access the JTAG Boundary Scan mode. The JTAG strapping on the module is not correct. An incorrect JTAG ID is read back.

### Workaround

Not available.

## Errata #8: HAR-2326 - No dedicated reset for eMMC

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
**Verdin iMX8M Mini DualLite 1GB V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini Quad 2GB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB V1.1A**

### Customer Impact

No impact is expected. Until now, no boot issues have been reported that could have been resolved by the dedicated eMMC reset.

### Description

The dedicated reset input of the boot eMMC on the module is not connected to the SoC. Therefore, the eMMC can only be reset by a power-on reset. Even though NXP also does not connect the eMMC reset to the SoC in their reference design, there is a 30-second watchdog enabled in the boot ROM of the i.MX 8M Mini. If something goes wrong during the system boot, the eMMC reset would allow for the reset of the eMMC in order to retry the system boot.

The dedicated reset signal of the SoC eMMC interface (SD1_RESET_B) will be connected to the reset input of the eMMC device in revision 1.1 of the module.

### Workaround

If the eMMC needs to be reset, a complete system reset needs to be performed, which includes a power cycle that triggers the power-on-reset of the eMMC.

## Errata #9: HAR-2726 - Undefined state of CTLR_PWR_EN_MOCI during reset cycle

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
**Verdin iMX8M Mini DualLite 1GB V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini Quad 2GB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB V1.1A**

### Customer Impact

Depending on the carrier board circuit, the carrier board's power rails are not disabled during the reset cycle. This means these rails are maybe not cycled during the reset state. If a peripheral device uses a power-on-reset rather than the system reset, the device may not get reset.

### Description

During a reset cycle, the CTRL_PWR_EN_MOCI signal can go to an undefined state. For some time, the signal can be neither high nor low. The signal may go to around 1V. It is intended that the PWR_EN_MOCI# goes low during the rest cycle.

### Workaround

If a defined state of the CTRL_PWR_EN_MOCI is required during the reset cycle, use a comparator circuit.

## Errata #10: HAR-3366 - Undefined state of CTLR_PWR_EN_MOCI in power-off-state

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
**Verdin iMX8M Mini DualLite 1GB V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini Quad 2GB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB V1.1A**

### Customer Impact

The peripheral power rails on the carrier boards maybe do not get disabled in power-off-state as expected.

### Description

Due to back feeding, the CTRL_PWR_EN_MOCI can have a residual voltage. This means the voltage remaining at CTRL_PWR_EN_MOCI can be too high (>0.3V), which can be interpreted as a high state by some input circuits. Depending on the carrier board, the peripheral voltage rails may not be switched off in the module's power-off-state.

### Workaround

Try to reduce the back-feeding to the module. Make sure the input-low threshold for the circuits that are using the CTRL_PWR_EN_MOCI signals is high enough for detecting the low-level even with back-feeding. Maybe use a comparator for cleaning up the signal levels.

## Errata #11: HAR-3240 - Power rails of Wi-Fi module cannot be turned off

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**

### Customer Impact

It is not possible to save power by only temporarily enabling the Wi-Fi and Bluetooth module.

### Description

It is not possible to turn off the Wi-Fi and Bluetooth module's power rails after they have been turned on. The Wi-Fi and Bluetooth module's power rails are intended to be controlled by the gpio3.IO[25] to save power if the wireless connections are not in use. At the power-up of the module, the rails for the wireless module are turned off. If they are not turned on, the rails remain turned off. Only after they have been turned on it is not possible to turn them off again without rebooting the whole system.

### Workaround

After booting the module, turn on the power rails for the Wi-Fi and Bluetooth module only if the radio is required. Keep the rails turned on or reboot the system if the rails need to be turned off again.

## Errata #12: HAR-2727 - After power-down, the module cannot be turned on by using CTRL_PWR_BTN_MICO#

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
**Verdin iMX8M Mini DualLite 1GB V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini Quad 2GB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB V1.1A**

### Customer Impact

If a power control scheme is used that keeps the main module rail permanently on, the module cannot be turned on after shutting down. For booting the module after a shutdown, the main rail always needs to be power cycled.

### Description

After powering down the module, the module cannot be turned on using the CTRL_PWR_BTN_MICO# signal. The issue appears if the module was shut down in software (using the “poweroff” command) or by emergency shut down by holding the CTRL_PWR_BTN_MICO# low for more than 5s. If the main supply power of the module is uninterrupted, the module cannot be turned on again. The only way to turn on the module is to power cycle the main supply power rail of the module.

### Workaround

Power cycle the main supply of the module. One option is to kill the main power rails using the CTRL_FORCE_OFF_MOCI# signal (see Errata #5: ).

## Errata #13: HAR-5754 - The CTRL_FORCE_OFF_MOCI# signal type is push-pull instead of open-drain

Affected Version: **Verdin iMX8M Mini Quad 2GB WB IT V1.0B**
**Verdin iMX8M Mini DualLite 1GB V1.0B**
Fixed in: **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**
**Verdin iMX8M Mini Quad 2GB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**
**Verdin iMX8M Mini DualLite 1GB V1.1A**

### Customer Impact

Depending on the carrier board, the CTRL_FORCE_OFF_MOCI# is pulled up to 3.3V or 5V, which violates the absolute maximum voltage of the push-pull type signal on version V1.0 of the module.

### Description

The signal type of the CTRL_FORCE_OFF_MOCI# has been changed from a 1.8V push-pull to a 5V tolerant open-drain. The reason is to simplify the carrier board design and omit a level shifter on the carrier board.

Newer Verdin carrier boards make use of this change and add a pull-up to the +V5_STB or +V3.3 rail. On Verdin modules with PCB version 1.0, the CTRL_FORCE_OFF_MOCI# is a regular 1.8V GPIO. This means the maximum voltage of the GPIO is violated. The GPIO has ESD protection diodes in the SoC. The value of the pull-up resistor depends on the carrier board. On the latest Toradex Verdin carrier boards, the pull-up resistor is 100kΩ. The resulting current in the ESD protection diode is not expecting to damage the SoC pin. However, it is recommended to avoid these module/carrier board combinations or modify the carrier board.

### Workaround

On Verdin Development Boards, it is possible to remove the jumper for the CTRL_FORCE_OFF_MOCI# signal (pin A23 an B23 of X6). On the Dahlia carrier board, remove resistor R247. However, both workarounds disable the “kill-feature”. Therefore, after a shutdown, the supplies are not turned off. This prevents the system from being turned on by using the power button. Pressing the power button only for 5s shuts down the module rails and the peripheral rails on the carrier board, but not the main voltage going to the module, which ends up being in the same situation in which the system cannot be turned on by using the power button. For turning on the system, either power cycle the whole board or turn off the main module rail on the carrier board by pressing the power button for >7s.

## Errata #14: HAR-7203 - Wrong Termination of PCIe Reference Clock

| | |
|---|---|
| Affected Version: | **Verdin iMX8M Mini Quad 2GB WB IT V1.1A**<br>**Verdin iMX8M Mini Quad 2GB IT V1.1A**<br>**Verdin iMX8M Mini DualLite 1GB WB IT V1.1A**<br>**Verdin iMX8M Mini DualLite 1GB V1.1A** |
| Fixed in: | **Verdin iMX8M Mini Quad 2GB WB IT V1.1B**<br>**Verdin iMX8M Mini Quad 2GB IT V1.1B**<br>**Verdin iMX8M Mini DualLite 1GB WB IT V1.1B**<br>**Verdin iMX8M Mini DualLite 1GB V1.1B** |

### Customer Impact

The voltage level of the PCIe reference clock output (PCIE_1_CLK_N and PCIE_1_CLK_P) is too low and not PCIe compliant. For some PCIe peripheral devices, the voltage swing is too small for those devices to operate properly.

### Description

The PCIe reference clock available at the module edge connector pins 226 and 228 is generated by the i.MX 8M Mini SoC. The clock signals are unintentionally terminated twice. There are 49.9Ω termination resistors on the module, and the SoC pins have internal terminations as well. This double termination adds too much load on the reference clock, leading to a wrong output level.

The V1.0B versions of the Verdin iMX8M Mini modules are not affected by this issue since those feature an external PCIe clock source that requires the external termination resistors.

### Workaround

Remove the two 49.9Ω termination resistors R28 and R29 on the Verdin iMX8M Mini module. The resistors are located on the top side of the module.

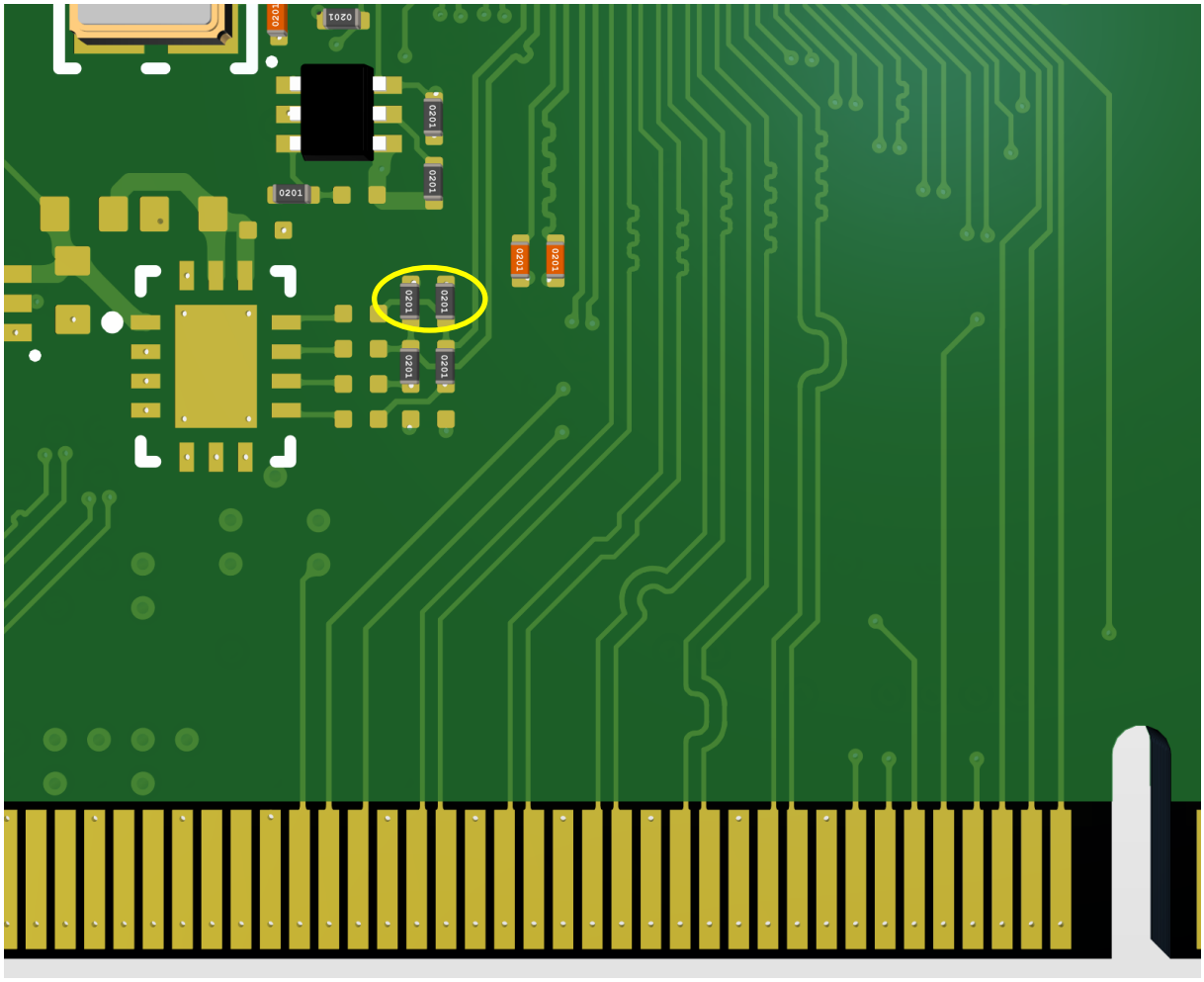



Figure 2: Location of R28 and R29 (Top Side, Top View)

## Errata #16: HAR-8214 – MIPI CSI camera optional master clock output not usable

Affected Version: **Verdin iMX8M Mini V1.0**
**Verdin iMX8M Mini V1.1**
Fixed in: **not scheduled**

### Customer Impact

The optional master clock output of the CSI_1 interface (CSI_1_MCLK) is not usable. Most of the CSI camera modules supported by Toradex feature an on-board crystal/oscillator and thus do not require this clock for functioning properly.

### Description

The Verdin pinout contains an optional master clock output for the CSI_1 interface. The SAI3_MCLK SoC pin is used for providing the optional Verdin camera interface master clock CSI_1_MCLK output. This signal is available on the module edge connector pin 91. The SoC pin can provide clock signals from the SAI3 and SAI5 audio interfaces. Therefore, a dummy audio driver with a dummy audio stream would be required for enabling the clock output. The current Toradex BSP does not support the CSI_1_MCLK option.

The i.MX 8M Mini SoC features two general-purpose clock outputs that can be used independently from the audio interfaces. Those clock signals are only available as alternate functions of other signal pins. Therefore, the clock signals are not compatible with other Verdin modules.

Table 16-1 General purpose clock outputs (alternate functions, not compatible with other Verdin modules)

| X1 Pin# | Verdin Std Function | i.MX 8M Mini Ball Name | i.MX 8M Mini Function | I/O | Standard Use Case for this Pin |
|---|---|---|---|---|---|
| 185 | USB_2_EN | GPIO1_IO14 | CCM_CLKO1 | O | This pin enables the external USB voltage supply for the USB_2 interface. |
| 187 | USB_2_OC# | GPIO1_IO15 | CCM_CLKO2 | O | USB overcurrent, this pin can signal an overcurrent condition in the USB supply of the USB_2 interface |

### Workaround

Instead of using the CSI_1_MCLK, use an external crystal or oscillator for the camera.

The i.MX 8M Mini SoC features two general-purpose clock outputs that can be used independently from the audio interfaces. Those clock signals are only available as alternate functions of other signal pins. Therefore, the clock signals are not compatible with other Verdin modules. If one of the general purposes clock outputs are used, adding an assembly option for using the CSI_1_MCLK pin is highly recommended. This ensures compatibility with existing and future versions of the Verdin iMX8M Mini and other Verdin modules.