

Introduction

Thank you for considering integrating an Embedded Artists product in your design. This document is an integration checklist that outlines important things to consider when creating your design.

The list is general and some of the things listed may not be relevant to your specific project.

If you have comments or additional suggestions what to be added to the checklist, please contact us at info@EmbeddedArtists.com

Electrical

- Verify that there are no unconnected signals in the schematic. In general, run the Design Rule Check (DRC) in the schematic capture program.
- Verify that the schematic pin numbers match the layout pads.
 - Sometimes a component can have several different packages with different pin numbering.
 - Sometimes standard packages, like SOT23 is used but with different pin numbering.
- Verify that I2C channels have the correct pull-up resistors, suitable length and not too much capacitive loading. Also verify that there are no I2C address conflicts between connected peripheral chips.
- Verify that serial/UART channels are connected correctly, i.e., that TXD is connected to RXD in each end and vice versa, RXD is connected to TXD.
- Verify that there are not multiple drivers on any signal. If a signal as multiple drivers then verify that driving is either time-multiplexed or that other precaution is taken (for example current limiting).
- Verify that reset and startup behavior is controlled
 - Correct output behavior of the system during reset and shortly after.
 - If nets have multiple drivers, verify that there are not multiple active drivers during reset.
- Verify that all I/O have proper ESD protection and suitable over-voltage/over-current protection, if needed.
- Verify that all I/O have proper EMI (Electromagnetic Interference) protection - no disturbances are radiated and the I/O is immune to disturbances that can be expected.
- Specific to LPC4088 QSB: Verify that P23 (signal P2.10 on the LPC4088) is not pulled low during/shortly after reset goes high. That will put the LPC4088 in ISP mode.

Powering

- Verify that the output noise is low enough.
 - Specific to LCP4088 QSB: The board expect less then +-50mV noise on any power supply.
- Verify that the power supply can deliver enough current in all situations (high temperature and low/high input voltage).
- Verify that the step response of the power supply is acceptable. Make sure the verification is done in the complete operating temperature range. The step response of a power supply show how it behaves on a change in load current or input voltage. Verifying the step response ensures that the output voltage is always within the tolerances, even during transient conditions.

PCB

In general, consult your PCB layout partner for details about all the checklist points in this section.

- Verify that all signals with special routing rules (for example USB signals) have been correctly specified with impedance requirements (differential or relative to ground) and other routing rules.
- Verify that signals that carry large currents have the correct track widths and copper thickness.
- Verify that the correct layout symbols have been used for all components. Many components have several different packages options. Sometimes datasheets refer to standard package names. These may not always have the same measures as the packages in the layout program library. Always double-check all components.
- Verify that the board thickness, solder mask color, silk screen color and stackup are specified. The latter is extra important when there are signals need controlled impedance routing.
- Verify that the layout is good from grounding, high speed signal, noise and disturbance perspectives. This subject is too big to just list in a few checkpoints. Check suitable application notes from silicon vendors or text books about the subject.

Physical

- Verify that there is enough space around the module to be integrated.
 - A 3D model can be used to verify that the module (and the rest of the components in the design) physically fits together.
 - Specific to the LPC4088 QSB: Do not forget that the HDK micro-B USB connector needs space for the cable.
- Verify that components placed under the module to be integrated are not too high.
 - Specific to the LPC4088 QSB: Available height depends on the height of the female headers (22 pos, 100 mil pitch). Typical height of these is 8 mm.
 - Specific to the LPC4088 QSB: Components on the bottom side are up to 3 mm high.

Thermal

- Verify that all components are specified and operate correctly in the full temperature range.
- Verify that no component has too high power dissipation
 - Can for example the components dissipate max power without overheating? This is mostly related to power supplies but can also be I/O protection circuits.

Other

- Verify that the complete design can be tested effectively during production (Design for test).
- Verify that the design is suitable for manufacturing (Design for manufacturing), for example PCB design rules, how (physically) close certain components are located, etc.
- Verify that the Bill-of-Material (BOM) is completely specified and that components are available from suitable distributors in suitable volumes.
- Verify that the selected components in the BOM have the correct RoHS status, or whatever environmental directive that needs to be adhered to.
- Verify if the final product needs CE/FCC testing/certification.

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