Good USB Routing Practices

A quick summary of Good Usb Practices

Trace length Matching

- Intel suggests that USB traces be matched to 150 mils within each other in length.
- Trace spacing is debated.
    - Intel suggests 20 mils spacing between the USB traces.
    - Texas Instruments suggests a minimum of 30 mils.
    - Other sources suggest 5x the trace widths as trace spacing.
- To forcefully match trace lengths, bend traces in a "zigzag" pattern at the mismatched end.
    - Diagram from Texas Instruments PDF

2.3 High-Speed Signal Trace Length Matching

Match the etch lengths of the relevant differential pair traces of each interface. The etch length of the differential pair groups do not need to match (that is, the length of the transmit pair does not need to match the length of the receive pair). When matching the intrapair length of the high-speed signals, add serpentine routing to match the lengths as close to the mismatched ends as possible. See Figure 5 for more details.
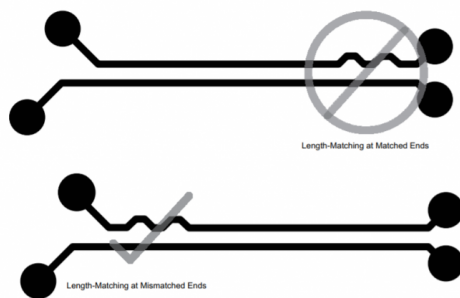
Length-Matching at Matched Ends

Length-Matching at Mismatched Ends

Figure 5. Length Matching

Signal Integrity

- Run USB lines in parallel at all times.
- Avoid jumping voids in ground planes.
- Lines may have to be routed non-parallel near connectors and controllers. If so, make sure the non-parallel area is within 0.25 inches of the connector and controller.
- Don't bend USB signal lines at right angles.
- Try keeping the traces at least 100 mil from the edges of ground planes.
- Don't run the USB signals in parallel to other pulsating traces such as the keyboard matrix or LED backlighting. If this is required, keep the traces at least 50 mils away.
- When the traces must go through parts (I.E. the 22-ohm resistors), keep the layout symmetric
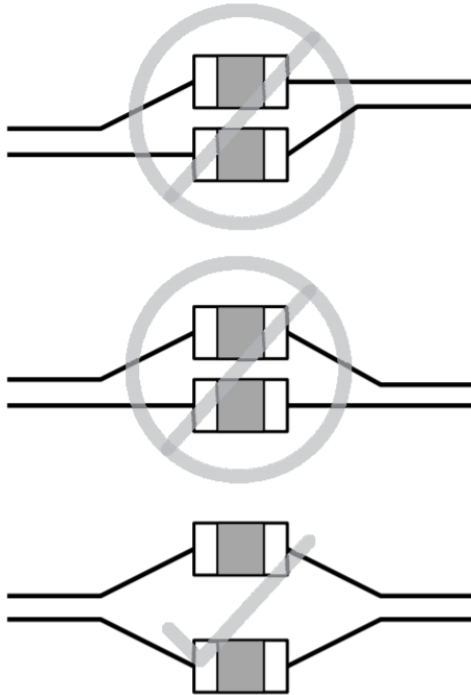
○ Diagram from Texas Instruments PDF

Figure 19. AC-Coupling Placement

Sources

http://www.usb.org/developers/docs/hs_usb_pdg_r1_0.pdf

http://www.ti.com/lit/an/spraar7g/spraar7g.pdf

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