
Application Note

MSP 34xx Family

Recommendations for ESD-Optimized Layout

Basic Recommendations

ESD tests with different TV chassis layouts have shown that in order to avoid ESD sensitivity, the following two layout recommendations should be used in all layout designs with the MSP:

1. ESD caused reset (see Fig. 2: **(A)**)

As the reset input pin of the MSP is of high impedance, voltage spikes caused by ESD pulses can generate an MSP hardware reset with muting of all analog outputs. This can be avoided by connecting one blocking capacitor of approximately 100 nF as closely as possible between the RESETQ pin and the MSP ground (e.g. DVSS pin).

2. ESD sensitivity due to ground voltage differences (see Fig. 2: **(B)**)

ESD pulses can cause high current spikes in the ground line. This may result in large voltage differences at the MSP ground pins if they are not connected with low impedance. These large voltage differences can lead to an MSP malfunction. Therefore, all MSP ground pins (DVSS, AVSS, AHVSS, VREF1/2, and ASGX) should be connected together close to the MSP. Alternatively, they should be connected to a common MSP ground plane.

The following recommendations have also shown good results:

1. Ground connection MSP to power supply (see Fig. 2: **(C)**)

The MSP ground should have a close and low-impedance connection to the power supply ground.

2. Ground connection between TV connector and power supply (see Fig. 1: **(D)**)

As ESD pulses are normally applied by the TV-user only to the connectors for antenna, chinch, scart, and headphone, each of the corresponding connector-grounds should have a direct and separated low-impedance connection to the power supply ground. This enables possible voltage differences between the MSP and other sections to be minimized. For maintaining good audio signal-to-noise performance, the area encircled by the ground connection of the MSP, the ground connections of the connectors, and the audio signal lines to the connectors should be kept to a minimum.

3. Layout example

Figures 1 and 2 show exemplary layouts with the MSP 34xx (in 64-pin PSDIP package) and the above recommendations in detail.

4. ESD test results

Typical ESD test results with layouts designed according to the above-mentioned recommendations:

- ESD pulses up to 10 kV: maximum 1 of 10 tests shows any effect to the audio functions
- ESD pulses from 10 kV to 15 kV: No destroyed MSP was detected. If any effect to audio was detected, it could be automatically corrected by the controller software.

(tested with: ESD pulse generator (Schaffner) using the Human Body Model (1.5 kOhm, 100 pF))

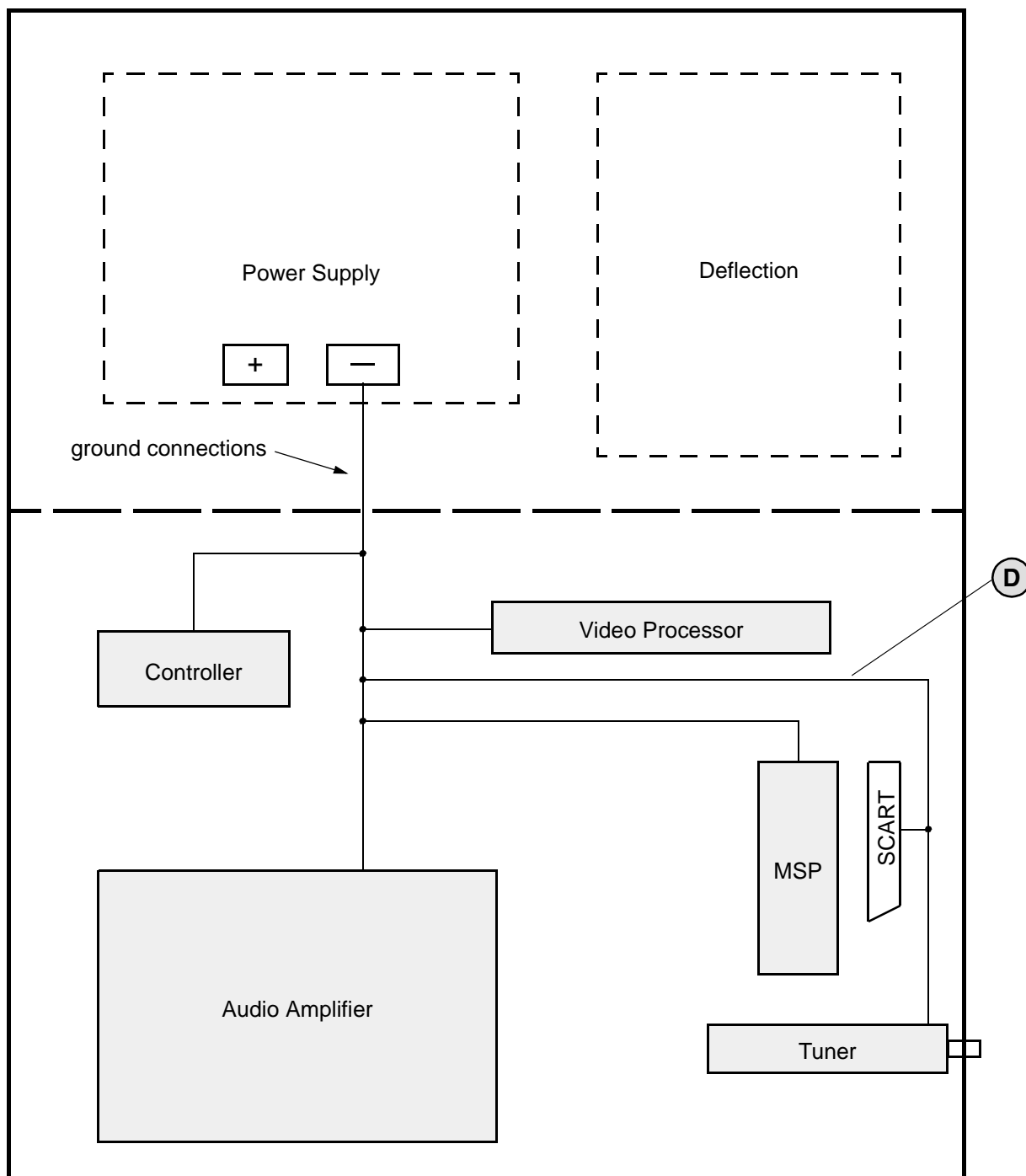


Fig. 1: Typical TV-chassis layout with recommended ground connection design

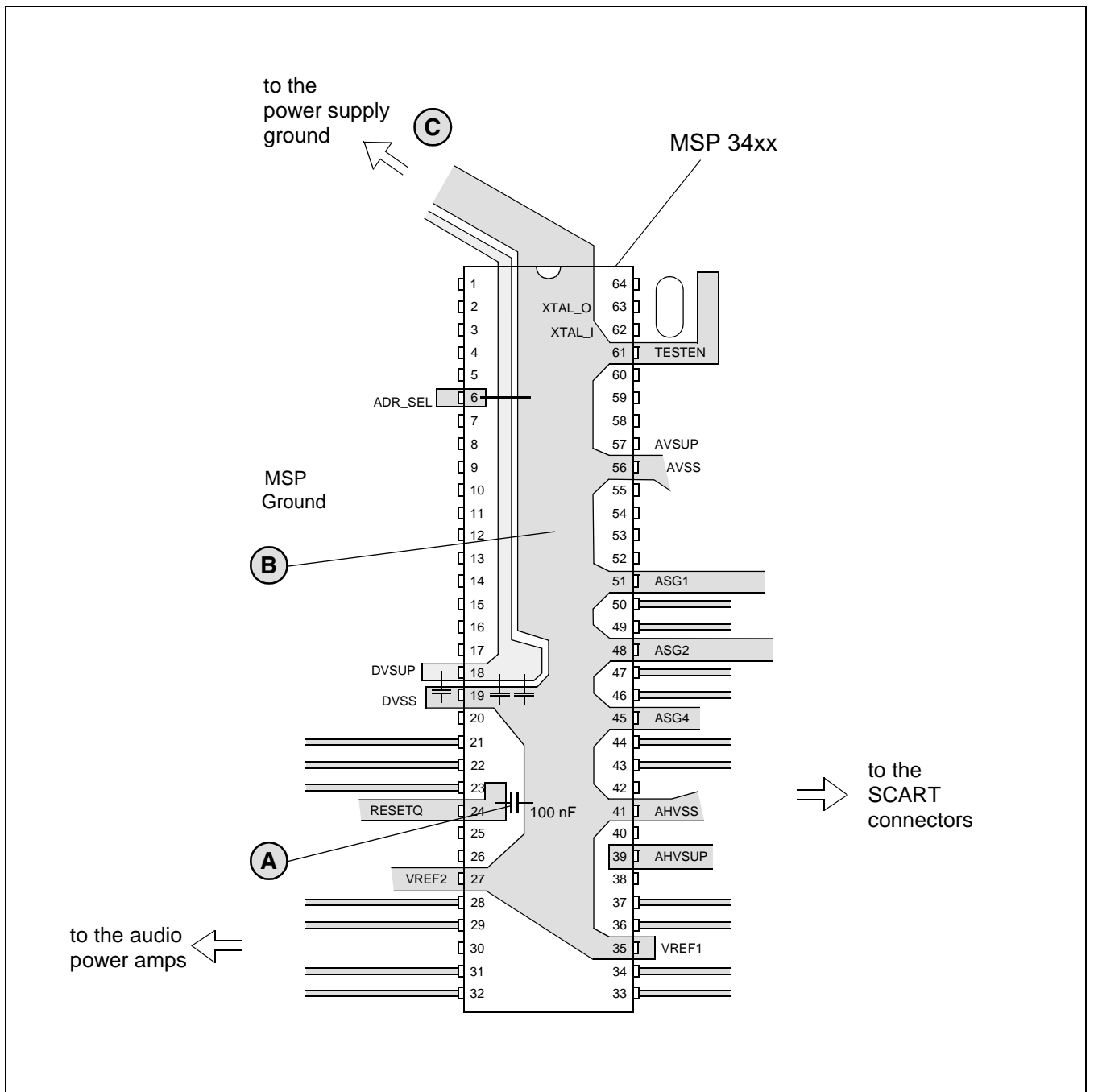


Fig. 2: Principal MSP layout for optimal ESD stability (one-layer PC-board)

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