

# Ultralow capacitance, four line ESD 5V3U4U-HDMI Array Diode for Protection of High-Speed Digital Interfaces

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With this new TVS diode array Infineon combines ESD protection together with high speed signal integrity and with a straight forward - easy to implement - PCB layout.

Digital televisions, DVD / Blu-ray players, -recorders, game consoles, digital set top boxes, LCD monitors, and also mobile communication equipment will greatly benefit from this INFINEON product.

ESD 5V3U4U-HDMI enhances system's robustness as it is designed to protect effectively high speed interfaces from electrostatic discharges (ESD) generated by end-users. Applications include HDMI1.3, DisplayPort, USB 3.0, FireWire and also MicroSD interface.

ESD 5V3U4U-HDMI makes ESD protection easy and adds value to the application:

## ■ Excellent ESD clamping performance

ESD 5V3U4U-HDMI is qualified to endure ESD strikes of up to 20kV (contact and air discharge), exceeding therefore the market standard IEC61000-4-2 level 4. According to tests performed at 8kV contact discharge (IEC61000-4-2), ESD 5V3U4U-HDMI reveals a much more efficient clamping performance than other TVS market's solutions that are offered in the same package. With Infineon's TVS diode, electrostatic discharges are clamped faster to a lower and safer voltage level for the application.

## ■ Fulfilment of high speed signal quality requirements

One of the most critical tests in the HDMI certification is the TDR (time domain reflectometry) characterization of the HDMI sink e.g. for a HD-TV. Even a small amount of added capacitance on an HDMI port originates a drop in the impedance of the differential pair, which can lead to heavily attenuated signals and consequently to certification compliance issues.

In cases of using TVS diodes showing a higher capacitance, very extreme modifications on the PCB layout are necessary in order to compensate the diode capacitance and be able to meet the TDR specification window of  $100\Omega \pm 15\%$  and the more stringent value of  $\pm 10\%$  for the HDMI load.

Therefore ultralow capacitance ESD protection devices like ESD 5V3U4U-HDMI with a capacitance remaining at or below 0.4pF (line to ground) over a frequency range from 1MHz to beyond 3GHz are mandatory to keep signal's integrity at an optimum without complex compensation PCB structures.

## ■ Cleanest PCB layout for easy design

ESD 5V3U4U-HDMI is a very effective solution supporting quicker time to market and reduces purchasing complexity as each array device can be easily implemented to replace 4 discrete components. ESD 5V3U4U-HDMI can save up to 50% board space in comparison with e.g. ceramic protection devices in case size 0402 as one array device can protect four high speed data lines at the same time.

In applications like HDMI 1.3 or DisplayPort, the pin spacing of the connectors is 0.5mm, just the same as the pitch spacing of ESD 5V3U4UHDMI in TSLP-9 package. It means this array device can be placed on top of two differential microstrip line pairs, avoiding multiple stubs and bends in the PCB traces that would cause reflections and signal attenuation. For further information about this as well as other members from the ultralow capacitance TVS diode series, check [www.infineon.com/highspeedinterfaces](http://www.infineon.com/highspeedinterfaces)

Figure 1: HDMI layout suggestion with ESD 5V3U4U-HDMI in TSLP-9 package.

