PI3HDMI411AD/412AD
HDMI Source Test ID 7-3 VOFF Test Setup

Introduction

HDMI Test ID 7-3 described in HDMI Compliance Test Specification is to ensure the single-ended voltage of TMDS is within AVcc±10mV when the source is in standby or off mode.

Test ID 7-3: TMDS – V_{OFF}

Reference	Requirement
[HDMI: Table 4-15] Source DC Characteristics at TP1	TMDS single-ended standby (off) output voltage, V_{OFF} must be within AVcc ±10mVolts.

Table 1: TMDS VOFF Specification

The test setup for VOFF mentioned in HDMI CTS is shown below:

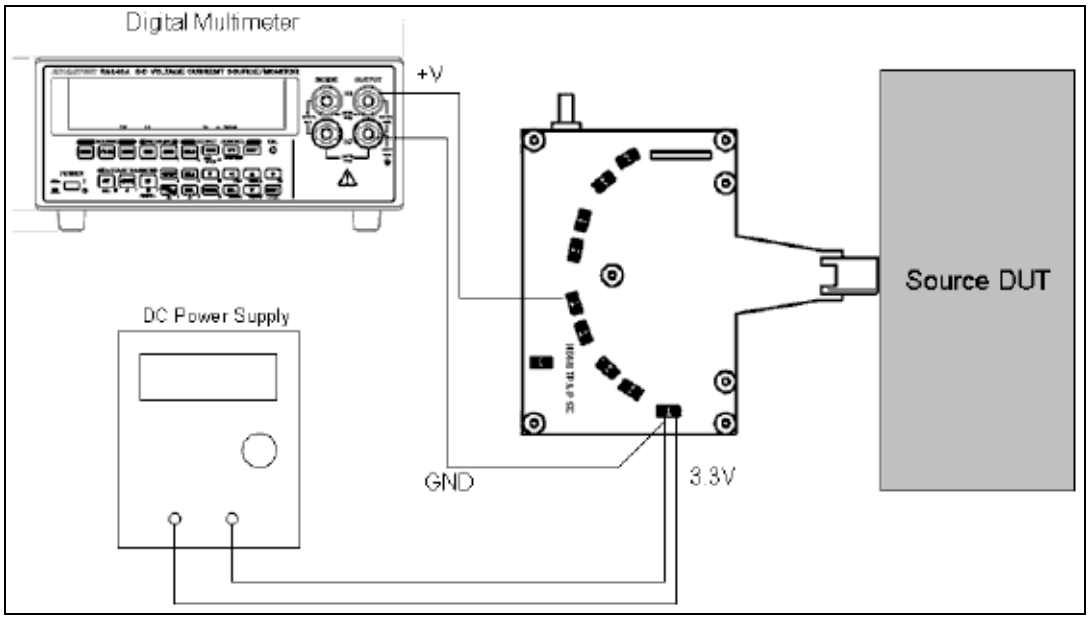


Figure 1: TMDS VOFF Test Setup

When 3.3V AVcc is applied to the test fixture while DUT is disconnected from AC mains or other power source, voltage across each 50Ω pull-up on the test fixture is measured using a multimeter.

AVcc Leakage when DUT is not powered up

Throughout the test, 50Ω resistors at test fixture are pulled up to 3.3V AVcc. The AVcc will forward bias the ESD diode in the protection architecture of Pericom PI3HDMI411AD/412AD design.

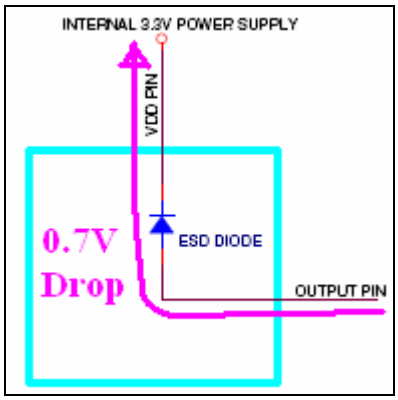


Figure 2: PI3HDMI41xAD Internal ESD Protection Architecture

As a result, a leakage path as shown in Figure 3 is created from AVcc to Internal 3.3V Power Supply of the Source, assuming that ESD diode has 0.7V drop. Figure 2 is the zoom in of ESD DIODE in Figure 3.

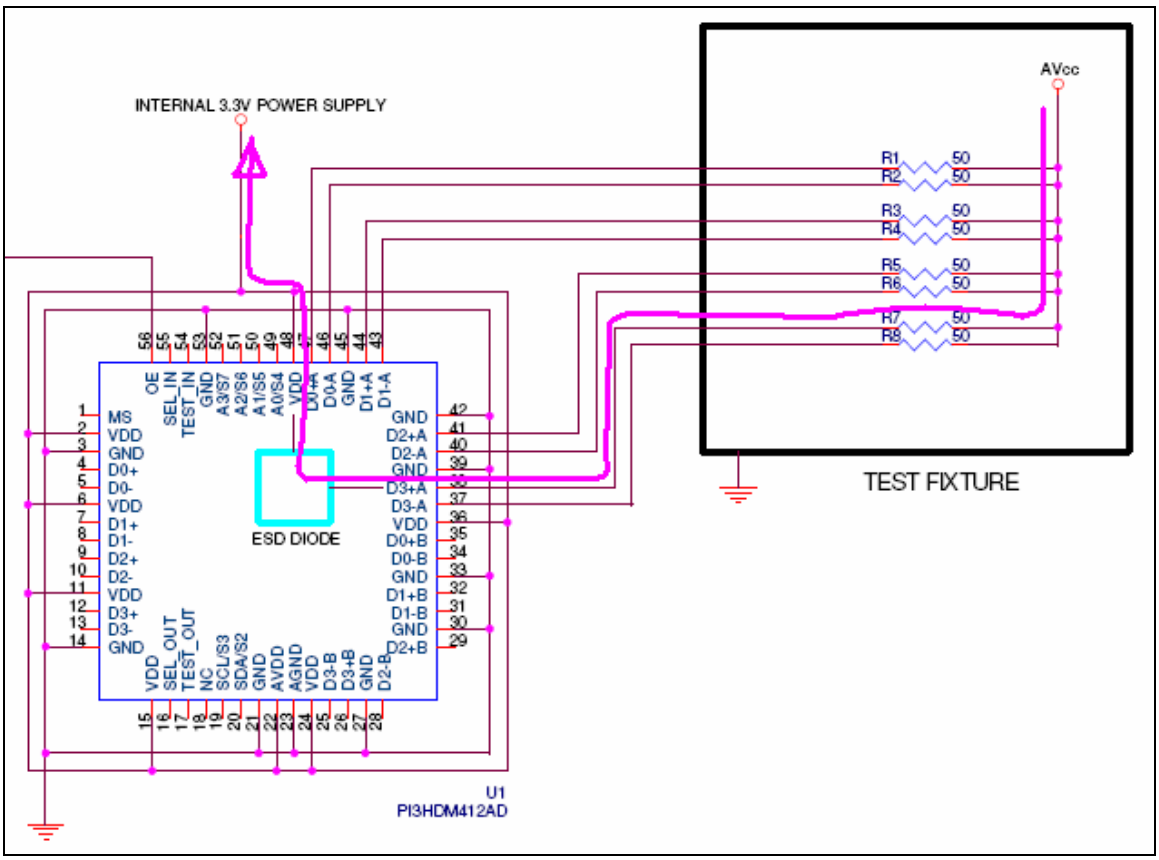


Figure 3: PI3HDMI412AD AVcc Leakage Path

Reference Design

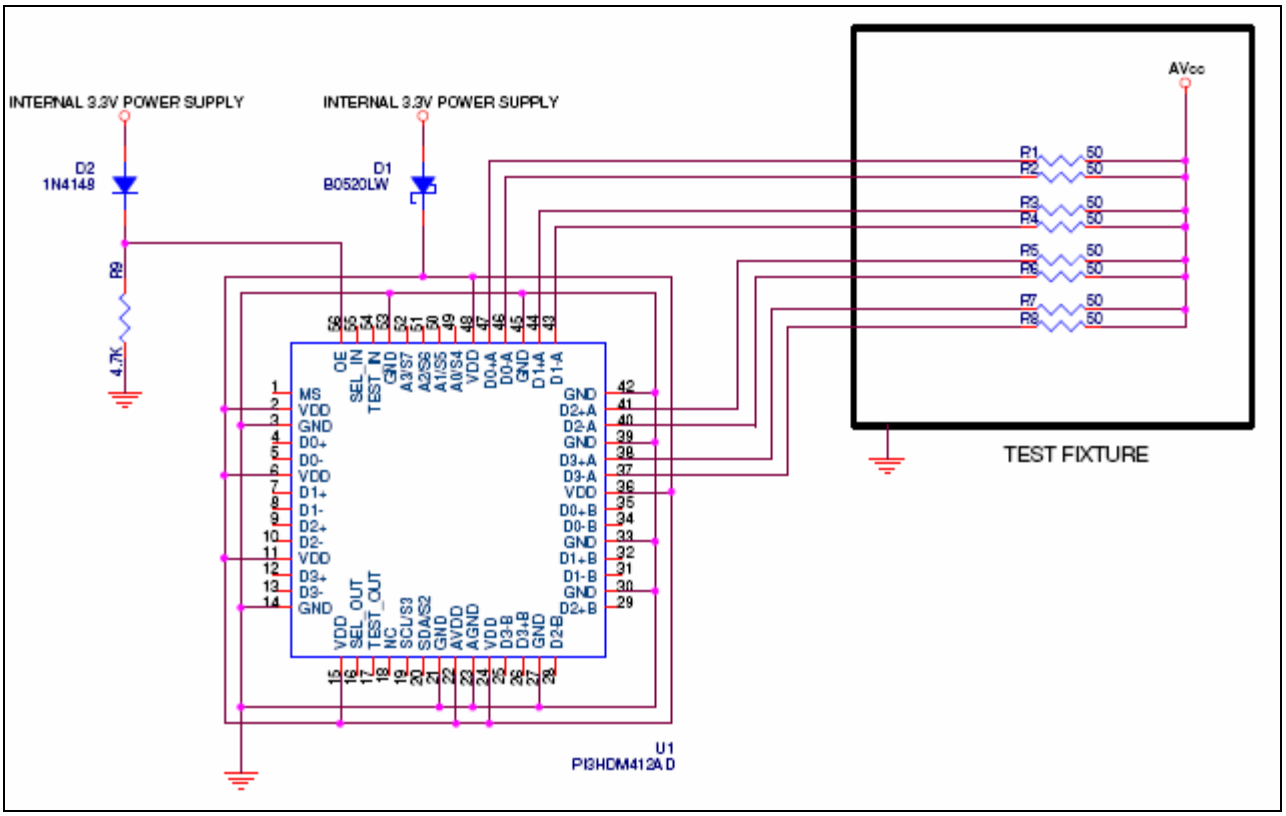


Figure 4: PI3HDMI412AD Reference Design + Test Setup

3.3VDD Pin Design Requirement

An external low voltage drop diode, D1 (B0520LW) in Figure 4 for instance, is recommended to add between Internal 3.3V Power Supply and VDD pins of PI3HDMI411AD/412AD to block the leakage path described in Figure 3. This Internal 3.3V Power Supply is also supplied to 50Ω pull-up termination at Sink. As it is required to have pull-up to 3.3V±10mV at Sink, the voltage drop of diode D1 must be small to ensure sufficient voltage can supply to Sink.

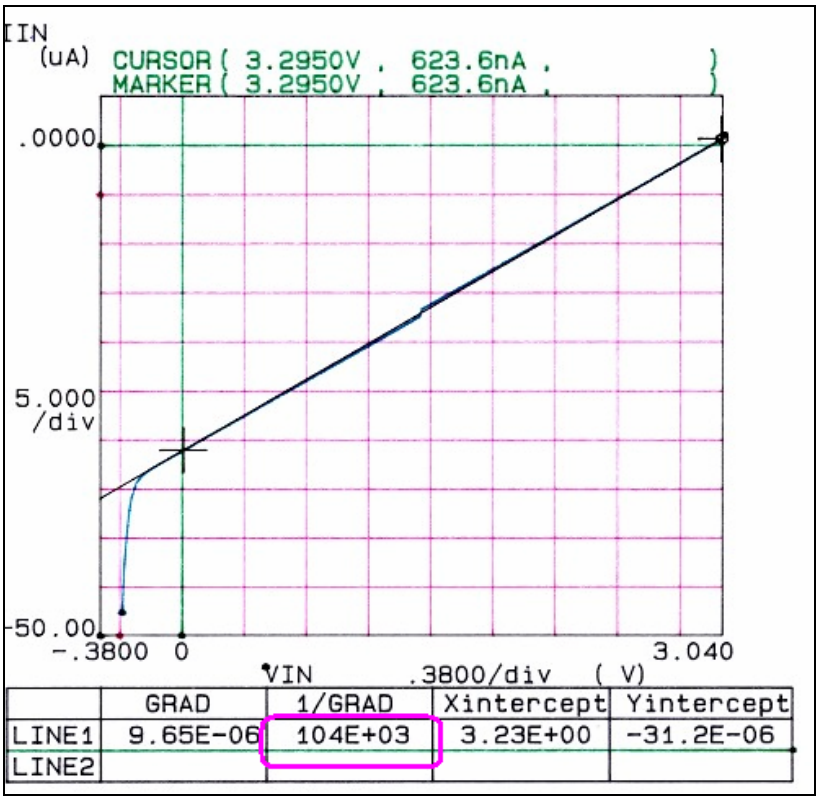
Enable Pin Design Requirement

Another external diode, D2 (1N4148), is also recommended to add between Internal 3.3V Power Supply and the enable (OE) pin of PI3HDMI411AD/412AD. This prevents the leakage from AVcc to Internal 3.3V Power Supply via ESD diode and OE pin. This external pull-up is also used to enable PI3HDMI412AD when it is in use.

During the VOFF test, PI3HDMI412AD is powered off. In parallel, the enable pin cannot be float. If OE pin is remained floating, VOFF across each 50Ω pull-up is measured as 0.8V using a multimeter. The leakage path is present as AVcc flows through the internal pull-up resistor of OE pin. To guarantee no leakage path is created, OE pin has to be pulled low using a resistor, R9 in Figure 4, externally. With OE pin shorting to ground, VOFF of PI3HDMI411AD/412AD across each 50Ω pull-up is measured as 6.5mV, which is within 10mV specification.

Pull-down Resistor Selection for OE Pin

As shown in Figure 5, the enable pin is designed to have a 100kΩ internal resistor. This 100kΩ resistor will be pulled up to (AVcc – 0.7) V when AVcc is applied.



	GRAD	1/GRAD	Xintercept	Yintercept
LINE1	9.65E-06	104E+03	3.23E+00	-31.2E-06
LINE2				

Figure 5: PI3HDMI412AD Internal Pull-up at OE pin

When performing the test, it is recommended to mount a 4.7kΩ resistor at R9 in Figure 4 to pull OE pin to a voltage lower than 0.8V, which is the maximum specification of input low voltage described in Pericom datasheet. A 4.7kΩ resistor can pull OE pin to 0.12V, which is determined by 4.7kΩ / (100kΩ + 4.7kΩ) X (AVcc – 0.7) V.