

DC-Coupling in Stratix V Devices

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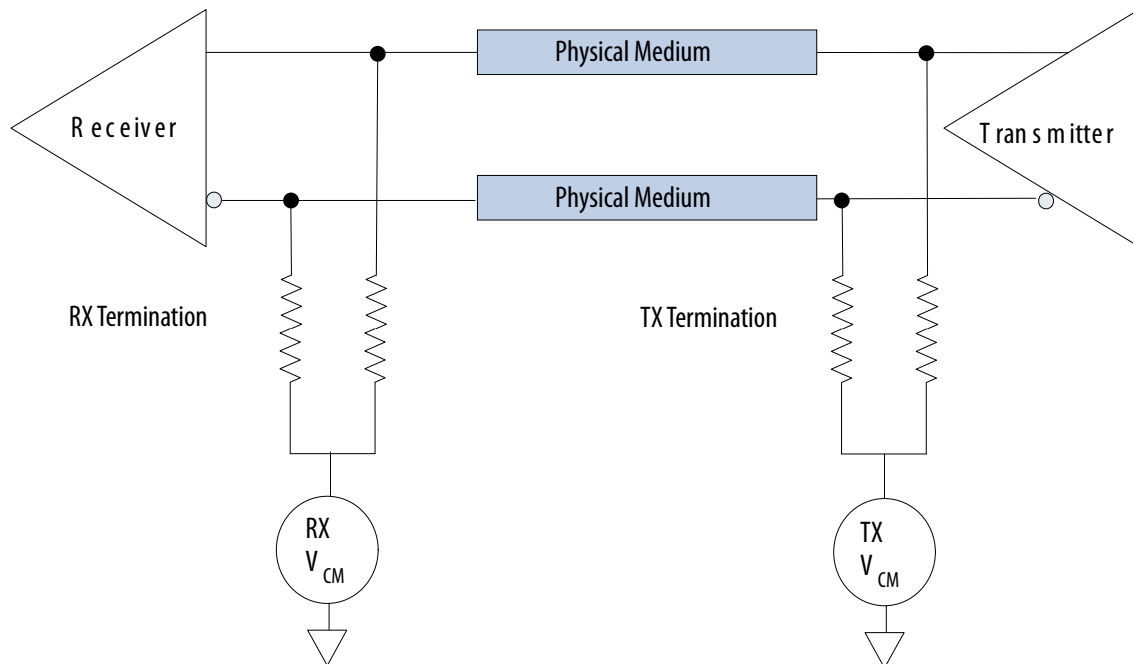


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AC-coupling consists of using a series capacitor with the transceiver link to filter out the DC component from a signal. DC-coupling allows both AC and DC signals to pass through a connection and does not require an additional series capacitor. Stratix® V GX and GS devices support DC-coupling on transmitter and receiver pins. Stratix V GT devices do not support DC-coupling on the ATT channels (28-Gbps channels). DC-coupling is supported on the GX channels of the Stratix V GT device.

One of the restrictions for DC-coupling Altera devices with non-Altera devices is that the transmitter and the receiver common mode voltages should match. When the transmitter and receiver common mode voltages are different, the two conflicting common mode voltages settle down to an intermediate common mode voltage level.

Figure 1: DC-Coupled Link



Related Information

[Stratix V Device Datasheet](#)

For information about DC-coupling to other Altera families, and non-Altera devices, refer to the GX or GS transmitter and receiver common-mode voltage requirements listed in the datasheet.

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Stratix V DC-Coupling Scenarios

Several common DC-coupling scenarios are mentioned in the sections below. If you need more information about DC-coupling guidelines for your application, contact Altera mySupport.

Related Information

[Altera mySupport](#)

Connecting a Stratix V PCML Transceiver to Another Stratix V PCML Transceiver

For Stratix V GX or GS devices, you can DC-couple a Stratix V pseudo current mode logic (PCML) transceiver to another Stratix V PCML transceiver over the entire data rate range from 600 Mbps to 14.1 Gbps. DC-coupling is not supported in the Stratix V GT devices.

Connecting a Stratix V PCML Transmitter to Another Stratix V LVDS Receiver

The voltage levels are different for a pseudo current mode logic (PCML) transmitter and a low voltage differential signaling (LVDS) receiver.

However, since the LVDS receiver has a built-in common mode detector, you can directly connect the PCML transmitter output to the LVDS receiver input without using voltage divider circuits to match the voltage levels.

Connecting Stratix V PCML Transmitter to Another Altera PCML Receiver

Table 1: Recommended Receiver Common Mode Voltages for other Altera PCML Receivers

Receiver	Receiver Common Mode Voltage	DC-Coupling ⁽¹⁾
Stratix IV GX, GS, GT	0.82 V or 1.1 V	Supported. Set RX common mode voltage value to 0.82 V.
Stratix II GX	0.85 V or 1.2 V	Supported. Set RX common mode voltage value to 0.85 V.
Arria® V GX, GT	0.7 V	Supported.
Arria V GZ	0.6 V or 0.7 V	Supported. Set RX common mode voltage value to 0.7V.
Arria II GX, GZ	0.82 V or 1.1 V	Supported. Set RX common mode voltage value to 0.82 V.

⁽¹⁾ Stratix V transmitter common mode voltage is 0.65 V

Receiver	Receiver Common Mode Voltage	DC-Coupling ⁽¹⁾
Arria GX	0.85 V or 1.2 V	Supported. Set RX common mode voltage value to 0.85 V.
Cyclone [®] V GX, GT	0.8 V	Supported.
Cyclone IV GX	0.82 V	Supported.

Stratix V PCML Receiver to Another Altera PCML Transmitter

Table 2: Recommended Transmitter Common Mode Voltages for other Altera PCML Transmitters

Transmitter	Transmitter Common Mode Voltage	DC-Coupling ⁽²⁾
Stratix IV GX, GS, GT	0.65 V	Supported.
Stratix II GX	0.6 V or 0.7 V	Supported. Set TX common mode voltage value to 0.7 V.
Arria V GX, GT	0.7 V	Supported.
Arria V GZ	0.65 V	Supported.
Arria II GX, GZ	0.65 V	Supported.
Arria GX	0.58 V	Supported.
Cyclone V GX, GT	0.65 V	Supported.
Cyclone IV GX	0.65 V	Supported.

Related Information

[Stratix V Device Datasheet](#)

Stratix V PCML Transmitter to Non-Altera Device Receiver

DC-coupling between a Stratix V transmitter to other non-Altera receivers is supported for the entire data rate range from 611 Mbps to 14.1 Gbps. In this case, you must maintain the non-Altera receiver common mode voltage within +/- 100 mV of the Altera Stratix V transmitter.

Note: You can measure the transmitter common mode voltage at the transmitter pin using a DC multi-meter or a high impedance oscilloscope probe.

⁽¹⁾ Stratix V transmitter common mode voltage is 0.65 V

⁽²⁾ Stratix V receiver common mode voltage can be set to 0.6 V, 0.7 V, or 0.75 V depending on the V_{CCR_GXB} and bandwidth settings. Refer to *Stratix V Device Datasheet* for more details.

Non-Altera Device Transmitter to Stratix V PCML Receiver

DC-coupling between a non-Altera transmitter to a Stratix V PCML receiver is supported if all the following conditions are satisfied:

- Trace length is less than or equal to 3 inches
- Channel loss is less than 4 dB
- Data rate is less than or equal to 10.3125 Gbps
- Application does not use backplanes or optical connectors

You must maintain the non-Altera transmitter common mode voltage within +/- 100 mV of the Altera Stratix V receiver.

Note: You can measure the transmitter common mode voltage at the transmitter pin using a DC multi-meter or a high impedance oscilloscope probe.

Contact Altera mySupport, if your application requires the following conditions. In this case the minimum V_{ID} required for the Stratix V receiver will be higher than what is specified in the datasheet.

- Trace length is more than 3 Gbps
- Channel loss is more than 4 dB
- Data rate is higher than 10.3125 Gbps
- Application uses backplanes or optical connectors

Related Information

[Altera mySupport](#)

Document Revision History

Date	Version	Changes Made
August 2015	2.0	Made the following changes: <ul style="list-style-type: none"> • Changed the description in the "DC-Coupling in Stratix V Devices" section.
August 2014	1.0	Initial Release