TMDS181 and TMDS171 Configuration Guide

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ABSTRACT

The purpose of this document is to provide a quick start-up guide for the TMDS171 and TMDS181 devices.

Contents

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1 Device Configuration Guide

1. **Choose I2C mode or pin-strap mode via I2C_EN:**
   - When I2C_EN is high, the device is in I2C mode and the configuration is done through I2C.
   - When I2C_EN is low, the device is in pin-strap mode and the configuration is done through the device pins.

2. **Choose functional mode via DEV_FUNC_MODE:**

   In pin-strap mode, the device can automatically configure itself as a redriver at low data rates (<1.0 Gbps) or as a retimer above this data rate. Additional configuration is available using the DEV_FUNC_MODE bits ([1:0] in register 0x0Ah) when the device is in I2C mode.
   The DEV_FUNC_MODE bits select the device working function mode:
   - 00 – Redriver mode: 250 Mbps – 3.4 Gbps
   - 01 – Automatic redriver to retimer crossover at 1.0 Gbps (default)
   - 10 – Automatic retimer when HDMI2.0a based on TMDS_CLOCK_RATIO_STATUS (reserved for TMDS171)
   - 11 – Retimer mode across full range 250 Mbps to 6 Gbps

   The difference between configuration of 0x01 and 0x10 is the crossover frequency for configuration of 0x01 is 1 Gbps while the crossover frequency for configuration of 0x10 is 3.4 Gbps.
   When changing between the device configuration modes via Dev_Func_Mode, it is required to toggle the PD_EN bit or the external HPD_SNK for the change to take effect.
   When in automatic redriver to retimer mode, it is not required to toggle the PD_EN bit or the external HPD_SNK when the device changes from the redriver to retimer or vice versa.

3. **Choose transmit termination via TX_TERM_CTL:**

   In pin-strap mode, when the TX_TERM_CTL pin is configured as NC, TX_TERM_CTL automatically selects the termination impedance.
   - For data rates greater than 3.4 Gbps, TX_TERM_CTL will be set to 75- to 150-Ω differential near-end termination. (TMDS181 only)
   - For data rates between 2 Gbps and 3.4 Gbps, TX_TERM_CTL will be set to 150- to 300-Ω differential near-end termination.
   - For data rates less than 2 Gbps, TX_TERM_CTL will be set to no termination.

   When configured in I2C mode, TX_TERM_CTL bits (Register 0x0Bh, bits [4:3]) need to be set manually.
   For data rates less than 3.4 Gbps, TX_TERM_CTL will be set to no termination (value of 0x00h) or

150- to 300-Ω (value of 0x01h) differential near-end termination. For data rates greater than 3.4 Gbps, TX_TERM_CTL will be set to 75- to 150-Ω differential near-end termination (value of 0x11h, TMDS181 only).
APPLY_RXTX_CHANGES (bit 2 in register 0x0Ah) needs to be set after any changes to the TX_TERM_CTL field.

4. **Choose input receive equalization via EQ_SEL:**
   - In pin-strap mode, when the EQ_SEL pin is configured as NC, the equalization is adaptive. It is recommended to keep this pin as NC to enable adaptive equalization.
   - When EQ_SEL is connected low, the equalization is fixed at 7.5 dB. When EQ_SEL is high, the equalization is fixed at 14 dB.
   - Equalization control can also be configured in register 0x0Dh in I2C mode.
   - APPLY_RXTX_CHANGES (bit 2 in register 0x0Ah) needs to be set after any changes to this register.

5. **Choose de-emphasis settings via PRE_SEL:**
   - In pin-strap mode, when the PRE_SEL pin is configured as NC, no de-emphasis is applied. When PRE_SEL is connected low, 2 dB de-emphasis is applied.
   - De-emphasis settings can also be configured with fields [7:5] and [4:2] in register 0x0Ch in I2C mode.
   - APPLY_RXTX_CHANGES (bit 2 in register 0x0Ah) needs to be set after any changes to this register.

2   Summary

The guidelines provided in this application report serve as a starting point for configuring the TMDS181 and TMDS171 devices for your application.

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