

# 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.

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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- $\Omega$  (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- $\Omega$  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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