ABSTRACT

The TPA2051D3 audio subsystem from TI uses the I²C bus to communicate between integrated circuits in a system. This document explains how to choose the appropriate resistor values for the I²C interface connection to the TPA2051D3.

1 Overview

The TPA2051D3 uses the I²C bus to communicate between integrated circuits in a system. It operates as an I²C slave and employs two signals: SDA (data) and SCL (clock). The I²C pins feature an open-drain architecture; therefore, an external pull-up resistor must be used for the SDA and SCL signals to set the logic high level for the bus.

Figure 1 shows a typical application circuit with the TPA2051D3 and the host processor. VIO corresponds to the I²C bus level, which can range from 1.7 V to 3.3 V.

![Figure 1. TPA2051D3 I²C Bus Connections](image)

The TPA2051D3 holds the SDA pin low to indicate acknowledgement at each transfer operation. VOL corresponds to the voltage level at the SDA pin during the ACK clock period. By design, the expected VOL\text{Max} with a 3.3-mA sink current is VOL\text{Max} = 0.2 \times \text{VIO}.

2 Recommendation

The recommended pull-up resistor value for proper VOL is 1 kΩ, as shown in Figure 1. Using a 1-kΩ pull-up resistor will work well for a wide range of I²C bus voltages and will prevent the VOL sink current from causing issues at the system level.


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