

# TPA2051D3 I<sup>2</sup>C™ Pull-Up Resistor Selection

Alfredo Barriga

Portable Audio Applications

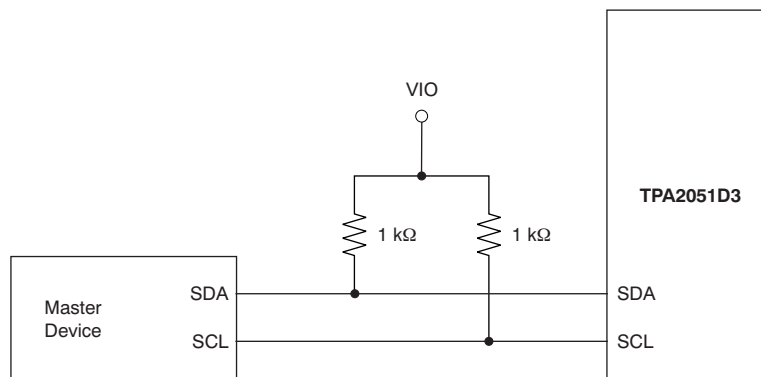
## ABSTRACT

The [TPA2051D3](#) audio subsystem from TI uses the I<sup>2</sup>C bus to communicate between integrated circuits in a system. This document explains how to choose the appropriate resistor values for the I<sup>2</sup>C interface connection to the TPA2051D3.

## 1 Overview

The TPA2051D3 uses the I<sup>2</sup>C bus to communicate between integrated circuits in a system. It operates as an I<sup>2</sup>C slave and employs two signals: SDA (data) and SCL (clock). The I<sup>2</sup>C 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 I<sup>2</sup>C bus level, which can range from 1.7 V to 3.3 V.



**Figure 1. TPA2051D3 I<sup>2</sup>C Bus Connections**

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  $VOL_{Max}$  with a 3.3-mA sink current is  $VOL_{Max} = 0.2 \bullet VIO$ .

## 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 I<sup>2</sup>C bus voltages and will prevent the VOL sink current from causing issues at the system level.

For more information on the TPA2051D3, refer to the [product data sheet](#), available for download from [www.ti.com](http://www.ti.com).

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