

How To Save Space And BOM Costs By Sharing Microphones Across Automotive Subsystems

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ABSTRACT

As explained in the article [“How to share eCall and Hands-Free Voice Command Recognition Microphones across automotive subsystems to save system cost and space”](#), two dedicated microphones, one for eCall and another one for hands-free voice application, are typically used in vehicles.

Texas Instruments’ automotive-grade audio codecs, TLV320AIC310x-Q1 ([TLV320AIC3109-Q1](#), [TLV320AIC3104-Q1](#), and [TLV320AIC3106-Q1](#)) have two special modes called “Passive Direct Bypass” and “Active PGA Bypass” that allow the use of one microphone for both eCall and hands-free application. A microphone can be eliminated from the system altogether, resulting in significant cost and space savings associated with the second microphone, cable routing, and microphone installation.

This application report explains the different ways one of the codecs, TLV320AIC3109-Q1, can be configured in these special modes.

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1 Configuring TLV320AIC3109-Q1 for Passive Direct Bypass or Active PGA Bypass Mode

Figure 1 shows the functional block diagram of the TLV320AIC3109-Q1 (mono codec).

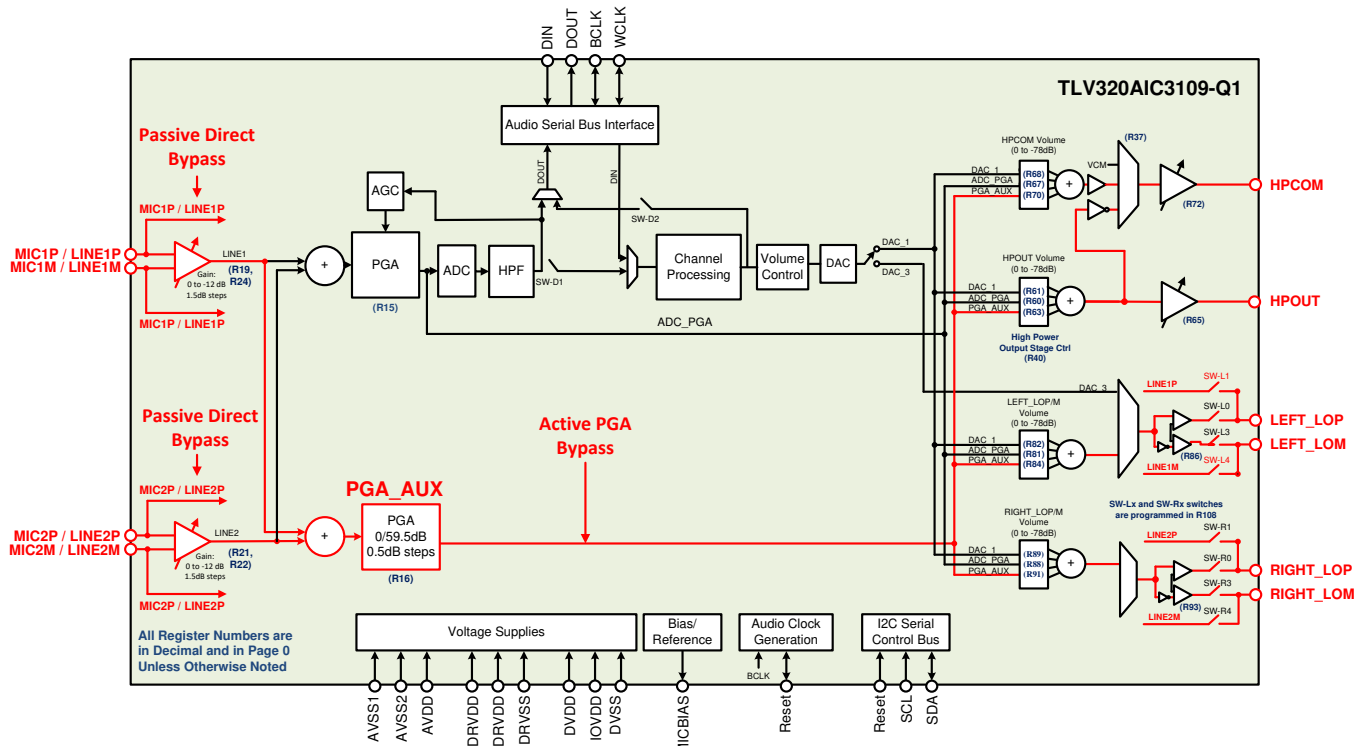


Figure 1. Configuring TLV320AIC3109-Q1 for Bypass Path Options

While MIC1P/M inputs support eCall functionality by routing the digitized ADC output to the connectivity module, either a dedicated MIC2P/M input or the same MIC1P/M input can be used to establish a direct connection from microphone to the head unit for voice recognition through two different options.

- Passive Direct Bypass:** A passive direct analog bypass path from microphone inputs to line outputs. There are two possible options:
 - MIC1P/M to LEFT_LOP/M
 - w 30 6C 03 // route MIC1P/M input to LEFT_LOP/M
 - w 30 5E 00 // power-down LEFT_LOP/M output buffer
 - MIC2P/M to RIGHT_LOP/M
 - w 30 6C 30 // route MIC2P/M input to RIGHT_LOP/M
 - w 30 5D 00 // power-down RIGHT_LOP/M output buffer
- Active PGA Bypass:** An active PGA analog bypass path with a gain stage from microphone inputs to either line outputs, or single-ended (SE) or differential (DIFF) headphone (HP) outputs. There are four different options:
 - MIC1P/M or MIC2P/M to LEFT_LOP/M
 - /*Route either MIC1P/M or MIC2P/M to PGA_AUX*/
 - w 30 18 00 // route differential MIC1P/M input to PGA_AUX, or
 - w 30 16 00 // route differential MIC2P/M input to PGA_AUX
 - /*Route PGA_AUX to LEFT_LOP/M*/
 - w 30 10 00 //unmute, 0-dB gain for PGA_AUX or
 - w 30 54 80 //route PGA_AUX to LEFT_LOP/M
 - w 30 56 0d //unmute, apply 0-dB gain, and power-up LEFT_LOP/M

- MIC1P/M or MIC2P/M to RIGHT_LOP/ M
 - /*Route either MIC1P/M or MIC1P/M to PGA_AUX*/*
 - w 30 18 00 // route differential MIC1P/input to PGA_AUX, or
 - w 30 16 00 // route differential MIC2P/M input to PGA_AUX
 - /*Route PGA_AUX to RIGHT_LOP/M*/*
 - w 30 10 00 //unmute, 0-dB gain for PGA_AUX or
 - w 30 5b 80 //route PGA_AUX to RIGHT_LOP/M
 - w 30 5d 03 //unmute, apply 0-dB gain, and power-up RIGHT_LOP/M
- MIC1P/M or MIC2P/M to differential HPOUT
 - /*Route either MIC1P/M or MIC1P/M to PGA_AUX*/*
 - w 30 18 00 // route differential MIC1P/input to PGA_AUX, or
 - w 30 16 00 // route differential MIC2P/M input to PGA_AUX
 - /*Route PGA_AUX to RIGHT_LOP/M*/*
 - w 30 10 00 //unmute, 0-dB gain for PGA_AUX or
 - w 30 26 04 //HPCOM as diff HPOUT, short-circuit protection enabled
 - w 30 3F 80 //route PGA_AUX to HPOUT, HPOUT gain = 0-dB
 - w 30 41 0B //unmute and power-up HPOUT
- MIC1P/M or MIC2P/M to single-ended HPOUT
 - /*Route either MIC1P/M or MIC1P/M to PGA_AUX*/*
 - w 30 18 00 // route differential MIC1P/input to PGA_AUX, or
 - w 30 16 00 // route differential MIC2P/M input to PGA_AUX
 - /*Route PGA_AUX to differential HPOUT*/*
 - w 30 10 00 //unmute, 0-dB gain for PGA_AUX or
 - w 30 26 14 //HPCOM as single-ended HPOUT, short-circuit protection enabled
 - w 30 3F 80 //route PGA_AUX to HPOUT, HPOUT gain = 0-dB
 - w 30 41 0B //unmute and power-up HPOUT

Command Syntax: w [i2c address] [register] [data], where 'i2c address', 'register' and 'data' are in hexadecimal format.

A similar microphone sharing scheme can be realized with the other TLV320AIC310x-Q1 products, [TLV320AIC3104-Q1](#) and [TLV320AIC3106-Q1](#), by using appropriate device configurations.

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