

# ***Mono Configuration of the TPA005D02 Class-D Audio Power Amplifier***

## *Application Report*

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# ***Mono Configuration of the TPA005D02 Class-D Audio Power Amplifier***

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## **ABSTRACT**

Class-D Audio Power Amplifiers (APAs) are becoming an extremely popular choice for audio solutions in battery-powered applications. The increased efficiency and reduction in heat dissipation of a Class-D APA versus that of a Class-AB APA allows the battery life on an application to be extended. The TPA005D02 is monolithic stereo Class-D APA offered from Texas Instruments. This document discusses how to configure the TPA005D02 to be used in a mono configuration. The actual specifications of the TPA005D02 can be found in the published Texas Instruments data sheet (literature #SLOS227A).

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## **Design Problem**

Many battery-powered applications would like to take advantage of the increased efficiency of the TPA005D02 APA but do not need stereo output. This document will show the specific application circuit in a mono configuration. The use of this device in the mono configuration saves board space, cost, and supply current when compared with the same device used in a stereo configuration.

## **Solution**

The use of the TPA005D02 APA in the mono configuration eliminates the need for many of the surrounding components required to operate the device in the stereo configuration. The schematic for the TPA005D02 APA is in the *TPA005D02 Evaluation Module User's Guide* (literature #SLOU032A). The modifications needed to be made to the evaluation board for the mono configuration of the TPA005D02 are shown in the schematic shown in Figure 1.

The TPA005D02 APA integrated circuit consists of two separate amplifiers inside the device, one for the right channel and one for the left channel. To operate in the mono configuration, only one of the two amplifiers inside the TPA005D02 will be used. The TPA005D02 has two pins (LCOMP and RCOMP) that can be used to shut down power to the respective amplifier. Tying the respective xCOMP to GND will stop the bridge from switching and will save quiescent power of the device. In this document, the left amplifier will be shut down to allow operation of the device in the mono configuration. In order to shut down the left amplifier, LCOMP (pin 43) and input pins LINP (pin 5) and LINN (pin 4), will be tied directly to GND (see Figure 1). The operation of this device in the mono configuration eliminates ten external components when compared with use of this device in the stereo configuration. The capacitors on the inputs of the unused amplifier and on the xCOMP will be eliminated from use in the mono configuration. The two inductors and three capacitors on the output of the unused amplifier will also be eliminated.

The  $V_{DD}$  power supply pin sets for both amplifiers in the TPA005D02 must be connected even though one amplifier (left in this example) is shut down. No power will be pulled by the unused amplifier. The  $V_{DD}$  supply pin sets are connected through a guard ring internally, the device can be destroyed if only one supply pin set is connected. The unused amplifier (see Figure 1) will not pull large current transients through the power pins, therefore the  $1\ \mu\text{F}$  bypass capacitor (C13) on the LPV $_{DD}$  (pin 16) can be replaced with a  $0.1\ \mu\text{F}$  ceramic capacitor (shown). The bypass capacitors C15 ( $220\ \mu\text{F}$ ) and C11 ( $10\ \mu\text{F}$ ) on the unused channel may be removed. The output pins LOU $T_P$  (10, 11) and LOU $T_N$  (14, 15), for the unused amplifier, will be left floating.

The MUTE and FAULT features of the TPA005D02 will operate normally in this mono configuration. The two detectable fault conditions are the charge pump under-voltage lock-out condition and the thermal fault condition. More details on the functionality of these features can be found in the product's data sheet.

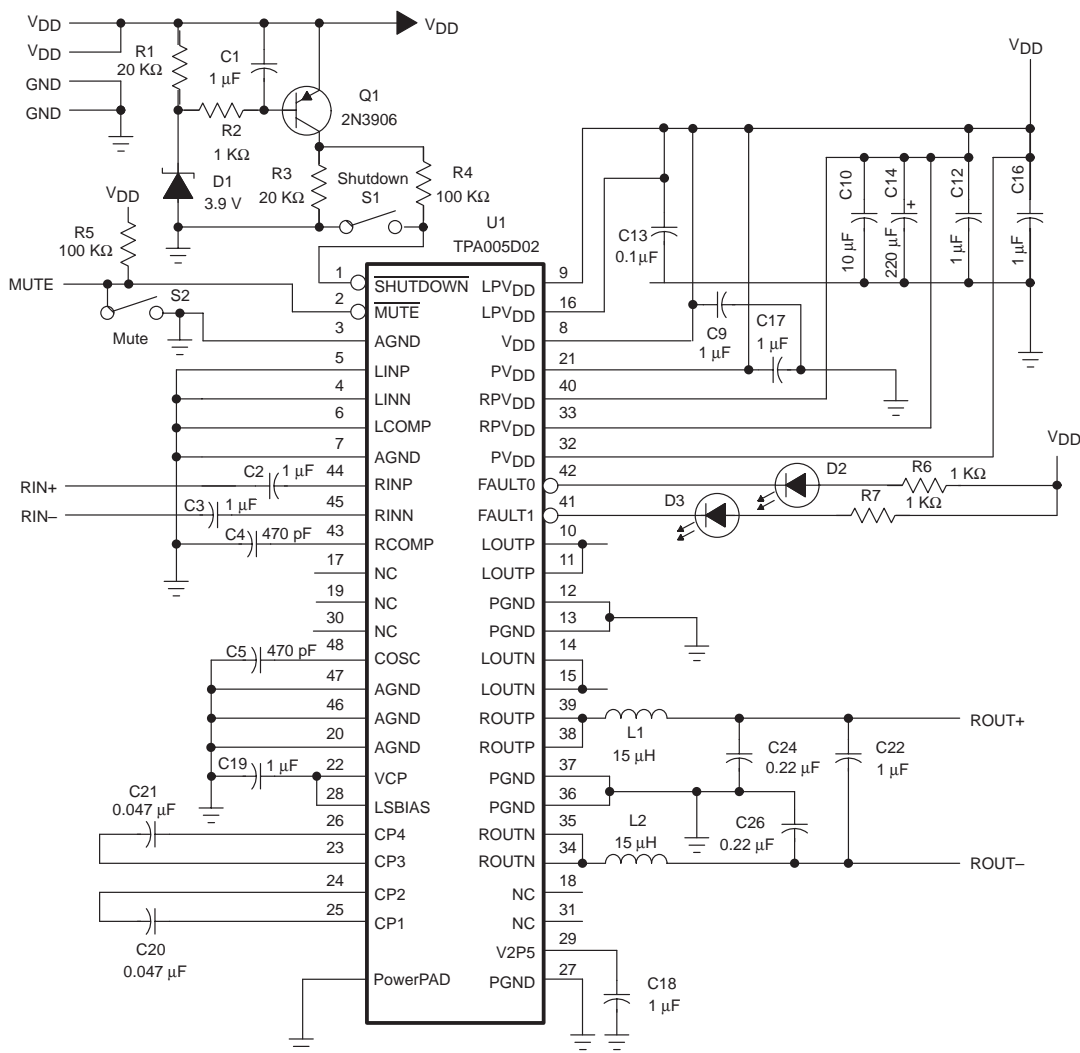


Figure 1. TPA005D02 Class-D EVM Schematic Diagram for Mono Configuration

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## Conclusion

The Class-D APA is an effective, highly efficient, audio solution for many battery-powered applications. A comparison of class D amplifier versus linear amplifier supply current is included in the TPA005D02 datasheet. The results at normal listening levels show the linear amplifier to have three times the current draw of the class D device. This comparison is important in showing the selection of the type of audio amplifier used in a battery-powered system can extend battery life by three times, if a class-D amplifier is used. Offering flexibility in the way to configure the TPA005D02 allows both mono and stereo configurations the advantage of this increased efficiency in battery-powered systems. This allows use of this device in many different applications that could benefit from Texas Instruments, Class-D technology.

