Application Report
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Achieve Ultra-Low Idle Current With TPA3128D2, TPA3156D2, or TPA3126

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ABSTRACT

The TPA3128D2, TPA3156D2, and TPA3126 Class D Audio Power Amplifiers have ultra-low power loss and help to extend the battery life of Bluetooth® and wireless speakers and other battery-powered audio systems. The high efficiency of the TPA3128D2, TPA3156D2, and TPA3126 devices allows them to output 2 × 30 W without external heat sink on a dual layer PCB. This application note describes the new features in the TPA3128D2, TPA3156D2, and TPA3126 devices and the benefits in application. This application note also shows some test results to prove the performance improvement by the new features.

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Trademarks

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1 General Overview

To extend the battery life and lower power consumption in consumer electronics, for example, TV, BT speaker, wireless speaker, mini speaker, USB speaker, or musical instrument, the TPA3128D2, TPA3156D2, and TPA3126 provide some new features to improve the performance of power consumption compared to the traditional audio amplifiers. This document details these new features in the TPA3128D2, TPA3156D2, and TPA3126.

- Section 2 describes the new feature Novel Hybrid mode.
- Section 3 analyzes the benefits from separated AVCC.
- Section 4 introduces individual channel shut down mode.

2 Novel Hybrid Mode

TPA3128D2 supports Novel Hybrid mode to save power consumption in idle state and light-load state. This way, battery life can be extended by this feature. The idle state power consumption is evaluated in both BD mode and Hybrid mode. The performance is compared in quiescent case and dynamic case.

2.1 Quiescent Performance Improvement

Set TPA3128D2 in idle state, and measure the current in PVCC. Measure the PVCC current in both BD mode and Hybrid mode. PVCC idle current in Hybrid mode is less than BD mode, and the difference enlarges as PVCC increases.

The following figure shows the comparison of PVCC idle current from BD mode to Hybrid mode. (Fsw = 400 kHz, with snubber)

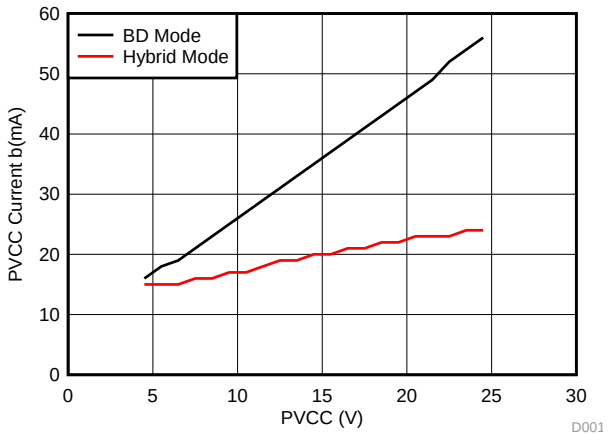

Figure 1. PVCC Idle Current vs. Voltage With Snubber

The following figure shows the comparison of PVCC idle current from BD mode to Hybrid mode. (Fsw = 400 kHz, without snubber)

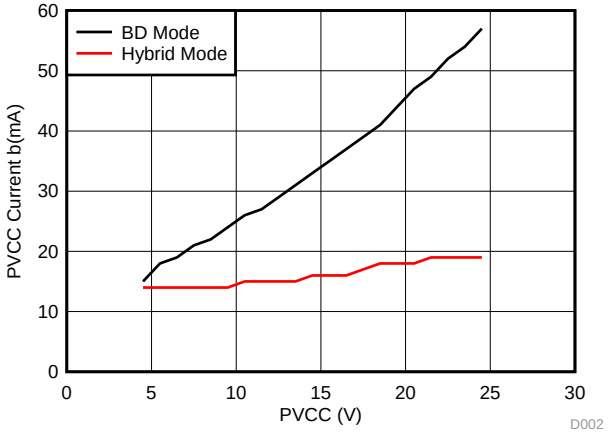

Figure 2. PVCC Idle Current vs. Voltage Without Snubber

2.2 Dynamic Performance Improvement

When playing music normally, the dynamic overall power consumption is also improved obviously in Hybrid mode. The PVCC current drops obviously in the red circles in the following figure.

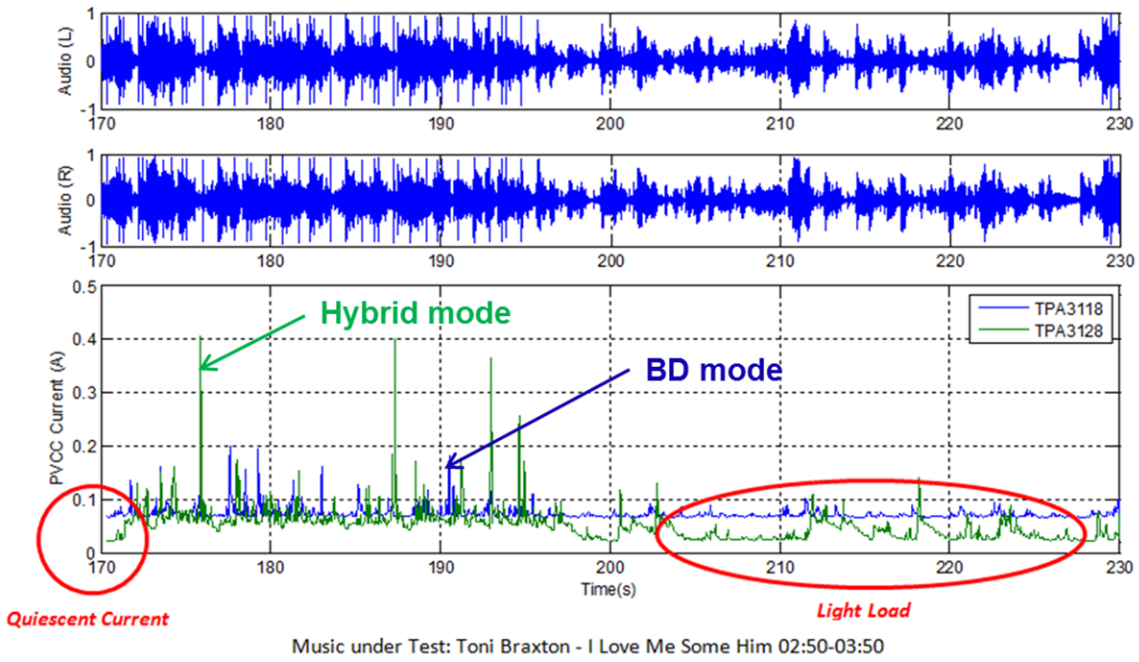

Figure 3. PVCC Current During Playing Audio

3 Separated AVCC

The internal LDO power loss is lowered by separating AVCC and PVCC, as shown in the following figures.

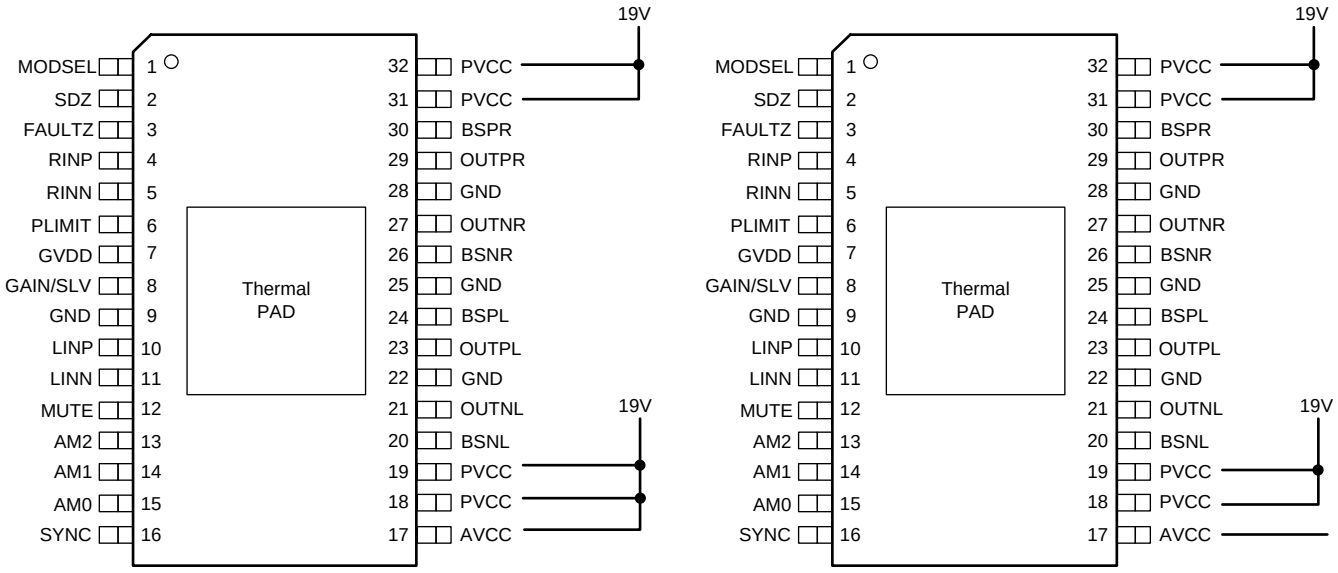

Figure 4. Separate PVCC and AVCC

The following two tables show the saved total power by separating 5V AVCC in BD mode and Hybrid mode.

Table 1. Saved Power in BD Mode

PVCC(V)	AVCC(V)	Current On PVCC (mA)	Current On AVCC (mA)	Total Power Consumption (mW)	Saved Power (mW)
6	6	12	4	96	9
	5	12	3	87	
12	12	21	4	300	16
	5	22	4	284	
18	18	32	4	648	34
	5	33	4	614	
24	24	46	4	1200	52
	5	47	4	1148	

Table 2. Saved Power in Hybrid Mode

PVCC(V)	AVCC(V)	Current On PVCC (mA)	Current On AVCC (mA)	Total Power Consumption (mW)	Saved Power (mW)
6	6	7	4	66	4
	5	7	4	62	
12	12	9	4	156	28
	5	9	4	128	
18	18	10	4	252	52
	5	10	4	200	
24	24	12	4	384	76
	5	12	4	308	

4 Shut Down Individual Channel

Connect to RIN+ and RIN– directly to GND, and TPA3128D2 will enter Individual shutdown mode. R channel is shut down this way. This feature will permit customer to add a power save mode when battery is not enough.

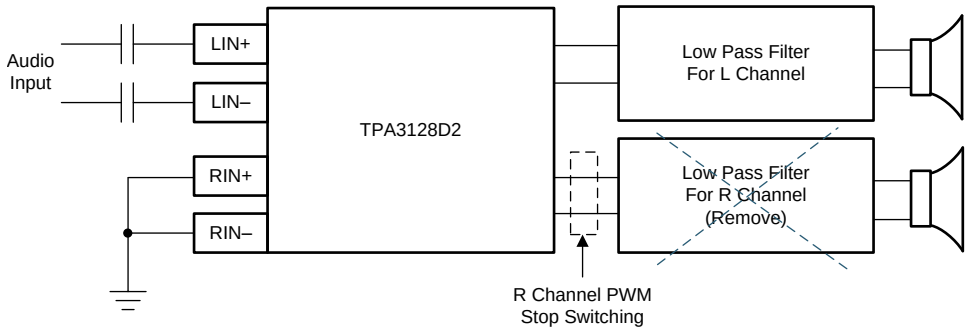

Figure 5. Connect to RIN+ and RIN- Directly to GND

The following tables show the saved PVCC current in BD mode and Hybrid mode.

Table 3. Saved Power in BD Mode

PVCC (V)	Current On PVCC (mA)		Saved PVCC Current (mA)
	Channel R On	Channel R Off	
6	17	11	6
12	26	16	10
18	37	22	15
24	51	29	22

Table 4. Saved Power in Hybrid Mode

PVCC (V)	Current On PVCC (mA)		Saved PVCC Current (mA)
	Channel R On	Channel R Off	
6	11	9	2
12	14	10	4
18	15	11	4
24	17	12	5

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (January 2017) to A Revision	Page
• Added TPA3156D2 and TPA3126 part numbers to the document title, abstract, and *General Overview*	1

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