Claims

What is claimed is:

1. A circuit for an audio reproduction system, the circuit comprising:

a single power conversion circuit to be directly coupled to a battery and one or more audio amplifiers, wherein the power conversion circuit is further coupled to an alternating current-to-direct current (AC/DC) adapter;

a control circuit coupled to the power conversion circuit, the control circuit to:

when the AC/DC adapter is coupled between the power conversion circuit and an external alternating current (AC) mains, operate in a charge mode to control the power conversion circuit to charge the battery from the AC/DC adapter; and

when the AC/DC adapter is not coupled between the power conversion circuit and the external AC mains, operate in a discharge mode to control the power conversion circuit to generate an amplifier supply voltage from the battery to be provided to the one or more audio amplifiers.

2. The circuit of claim 1, wherein, in charge mode, the control circuit is to regulate a first current drawn by the power conversion circuit from the AC/DC adapter to charge the battery based on a second current that is drawn by the one or more amplifiers from the AC/DC adapter so that a total of the first and second currents is less than a threshold.

3. The circuit of claim 2, wherein, in charge mode, to regulate the first current and to regulate a battery voltage of the battery, the control circuit includes:

a constant current (CC) charge error amplifier to compare an output current magnitude of the power supply with a target current magnitude and output a CC output signal based on the comparison;

a constant voltage (CV) charge error amplifier to compare the battery voltage to a CV reference voltage and output a CV output signal based on the comparison; and

a charge pulse width modulation (PWM) modulator to receive a lesser of the CC output signal or the CV output signal as a charge error signal and to control modulation of the power conversion circuit based on the charge error signal.

4. The circuit of claim 1, wherein, in the discharge mode, the control circuit is to regulate a voltage level of the amplifier supply voltage based on one or more operating conditions of the audio system.

5. The circuit of claim 4, wherein, to regulate a voltage level of the amplifier supply voltage, the control circuit includes:

target circuitry to generate a target supply voltage based on the one or more operating conditions;

a discharge error amplifier to generate a discharge error signal based on the amplifier supply voltage and the target supply voltage; and

a discharge pulse width modulation (PWM) modulator to generate a discharge-mode variable PWM signal based on the discharge error signal, the discharge-mode variable PWM signal to control the power conversion circuit to generate the amplifier supply voltage.

6. The circuit of claim 4, wherein the one or more operating conditions include a system volume setting, a magnitude of an input audio signal at an input of the one or more amplifiers, a magnitude of an output audio signal at an output of the one or more amplifiers, or a time-advance envelope of an upcoming audio signal.

7. The circuit of claim 4, wherein the control circuit is to regulate the voltage level within a range of possible values that includes a voltage level less than a battery voltage of the battery and a voltage level greater than the battery voltage.

8. The circuit of any one of claims 1 to 7, wherein the power conversion circuit is a switching power control circuit having a plurality of switching transistors and a single inductor.

9. The circuit of any one of claims 1 to 7, wherein the control circuit is to control the power conversion circuit to:

operate in a buck mode during the discharge mode when a target supply voltage of the amplifier supply voltage is less than a battery voltage of the battery; and

operate in a boost mode during the charge mode when the target supply voltage is greater than the battery voltage.

10. The circuit of claim 9, wherein the control circuit is to control the power conversion circuit to operate in a charge buck mode during the charge mode.

11. An audio reproduction system comprising:

one or more audio amplifiers;

a single power conversion circuit to be directly coupled to a battery and the one or more audio amplifiers, wherein the power conversion circuit is further coupled to an alternating current-to-direct current (AC/DC) adapter;

a control circuit coupled to the power conversion circuit, the control circuit to:

during a charge mode, control the power conversion circuit to charge the battery from the AC/DC adapter; and

during a discharge mode, control the power conversion circuit to generate an amplifier supply voltage from the battery to be provided to the one or more audio amplifiers.

12. The system of claim 11, wherein, during the charge mode, the control circuit is to regulate a first current drawn from the AC/DC adapter to charge the battery based on a second current that is drawn by the one or more amplifiers from the AC/DC adapter so that a total of the first and second currents is less than a threshold.

13. The system of claim 12, wherein, to regulate the first current and to regulate a battery voltage of the battery, the control circuit includes:

a constant current (CC) charge error amplifier to compare an output current magnitude of the power supply with a target current magnitude and output a CC output signal based on the comparison;

a constant voltage (CV) charge error amplifier to compare the battery voltage to a CV reference voltage and output a CV output signal based on the comparison; and

a charge pulse width modulation (PWM) modulator to receive a lesser of the CC output signal or the CV output signal as a charge error signal and to control the power conversion circuit based on the charge error signal.

14. The system of claim 11, wherein the control circuit is to regulate a voltage level of the amplifier supply voltage based on one or more operating conditions of the audio system, wherein the control circuit is to regulate the voltage level within a range of possible values that includes a voltage level less than a battery voltage of the battery and a voltage level greater than the battery voltage.

15. The system of claim 14, wherein, to regulate the voltage level of the amplifier supply voltage, the control circuit includes:

target circuitry to generate a target supply voltage based on the one or more operating conditions;

a discharge error amplifier to generate a discharge error signal based on the amplifier supply voltage and the target supply voltage; and

a discharge pulse width modulation (PWM) modulator to generate a discharge-mode variable PWM signal based on the discharge error signal, the discharge-mode variable PWM signal to control the power conversion circuit to generate the amplifier supply voltage.

16. The system of any one of claims 11 to 15, further comprising the AC/DC adapter and the battery.

17. A control circuit for a battery-powered audio system, the control circuit comprising:

charge-mode circuitry to, during a charge mode, control a single power conversion circuit that is directly coupled to a battery of the audio system to charge the battery from an alternating current-to-direct current (AC/DC) adapter; and

discharge-mode circuitry to, during a discharge mode, control the power conversion circuit to generate an amplifier supply voltage from the battery to be provided to one or more audio amplifiers that are directly coupled to the power conversion circuit, wherein the discharge-mode circuitry is to regulate a voltage level of the amplifier supply voltage based on one or more operating conditions of the audio system, wherein the discharge-mode circuitry is to regulate the voltage level within a range of possible values that includes a voltage level less than a battery voltage of the battery and a voltage level greater than the battery voltage.

18. The control circuit of claim 17, wherein, during the charge mode, the charge-mode circuitry is to regulate a first current drawn by the power conversion circuit from the AC/DC adapter to charge the battery based on a second current that is drawn by the one or more amplifiers from the AC/DC adapter so that a total of the first and second currents is less than a threshold.

19. The control circuit of claim 18, wherein, to regulate the first current and to regulate a battery voltage of the battery, the charge-mode circuitry includes:

a constant current (CC) charge error amplifier to compare an output current magnitude of the power supply with a target current magnitude and output a CC output signal based on the comparison;

a constant voltage (CV) charge error amplifier to compare the battery voltage to a CV reference voltage and output a CV output signal based on the comparison; and

a charge pulse width modulation (PWM) modulator to receive a lesser of the CC output signal or the CV output signal as a charge error signal and to control the power conversion circuit based on the charge error signal.

20. The control circuit of any one of claims 17 to 19, wherein, to regulate the voltage level of the amplifier supply voltage, the discharge-mode circuitry includes:

target circuitry to generate a target supply voltage based on the one or more operating conditions;

a discharge error amplifier to generate a discharge error signal based on the amplifier supply voltage and the target supply voltage; and

a discharge pulse width modulation (PWM) modulator to generate a discharge-mode variable PWM signal based on the discharge error signal, the discharge-mode variable PWM signal to control the power conversion circuit to generate the amplifier supply voltage.