



Audio Amplification Proposal for the ENERGY STAR Version 2.0 Audio/Video Product Specification

September 10, 2009

Following the August 10, 2009 distribution of the Draft 2 Version 2.0 Audio/Video (AV) Product Specification, manufacturers provided EPA with additional data on amplifier products that form the basis for this proposal. This proposal contains definitions, energy efficiency requirements for products that offer audio amplification, and idle power requirements relevant to the audio amplification product function.

EPA intends to fold these definitions and requirements into the next draft of the Version 2.0 AV specification following a discussion with stakeholders on September 17, 2009.

Definitions:

The definitions for audio amplifiers and product classifications have been updated for the purpose of identifying specific product types that will be subject to the unique requirements under this proposal. The definition of “AV Product” has been modified to capture the majority of products on the market, but specifically excludes Commercial/Prosumer Audio Amplifiers and Dedicated Audio DSP Devices since they are subject to different requirements. Also, the idle state definition has been modified to allow commercial amplifiers a short time frame to achieve the proposed idle levels.

Audio Amplifier Size Classifications:

- 1) Large Amplifier: Where $P_{IN} > 100 \text{ W}$ (P_{IN} = Input Power @ 1/8 MUP 1kHz Sine Wave)
- 2) Medium Amplifier: Where $20 \text{ W} \leq P_{IN} < 100 \text{ W}$ (P_{IN} = Input Power @ 1/8 MUP 1kHz Sine Wave)
- 3) Small Amplifier: Where $P_{IN} < 20 \text{ W}$ (P_{IN} = Input Power @ 1/8 MUP 1kHz Sine Wave)

Product Classifications:

- 1) AV Product: For purposes of this specification, all products that do not meet the definition of a Commercial/Prosumer Audio Amplifier or Dedicated Audio DSP Device shall be classified as AV Products and subject to the requirements specified in this document.
- 2) Commercial/Prosumer Audio Amplifier: A device may be classified as a “Commercial/Prosumer Audio Amplifier” if it meets all of the following criteria:
 - i) Provides audio amplification as its primary function.
 - ii) Provides support for RS232 or similar protocol for hard-wired remote control.
 - iii) Does not provide integrated speakers or one or more separate speakers intended for use as a single product.
 - iv) Does not provide surround sound audio processing.



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Idle State: A state within On mode in which a product is not performing a primary function and no content is actively being delivered to the end-user. This state shall occur within 5 minutes of the loss of signal (LOS) on all active AV inputs.

Energy Efficiency Criteria

Mandatory Auto-Power Down

EPA identified an opportunity to promote an energy efficiency strategy for large audio amplifiers used in commercial and high-end residential (prosumer) environments. Based on conversations with stakeholders, EPA understands that these products can be designed to automatically shut off switching amplifier circuitry to greatly reduce power consumption in the idle state when there is no active signal on the amplifier input. By allowing a small amount of power consumption to keep signal processors on line during the idle state, these amplifiers can maintain near-instantaneous response time upon receipt of an active input signal. EPA is also proposing an extended 2-hour timeframe for Commercial/Prosumer Audio Amplifiers to Auto Power Down (APD) to discourage users from disabling this function.

AV Products: To qualify for ENERGY STAR, AV Products must offer APD functionality that is enabled by default. APD must occur no more than 30 minutes from (1) when the product ceases performance of all primary functions, and (2) the last user input (e.g. control signal, volume adjustment) is received. For devices that process audio or video signals from external sources, the presence of a signal on any active AV input shall constitute performance of a primary function, and APD must occur no more than 30 minutes from loss of signal (LOS) on all active AV inputs.

Commercial/Prosumer Audio Amplifiers: To qualify for ENERGY STAR, Commercial / Prosumer Audio Amplifiers must offer APD functionality that is enabled by default. APD must occur no more than 2 hours from (1) when the product ceases performance of all primary functions, and (2) the last user input (e.g. control signal, volume adjustment) is received. For devices that process audio or video signals from external sources, the presence of a signal on any active AV input shall constitute performance of a primary function, and APD must occur no more than 2 hours from loss of signal (LOS) on all active AV inputs.

On Mode Efficiency Requirements

EPA is proposing a 55% minimum efficiency requirement for all audio amplifiers (medium and large size) with greater than 20W input power given a 1/8 MUP sine wave input signal. Small amplifiers will not be subject to On Mode efficiency requirements, since the greatest energy savings for these products will be achieved through the APD requirement. For medium-sized amplifiers (between 20W and 100W input power), the overhead of power electronics and other circuitry is accounted for in the efficiency equation by scaling down the input power by 20%. Large amplifiers (greater than 100W input power) do not receive this additional overhead allowance. All power values listed in Table 1 are calculated using amplifier input power (P_{IN}) given a 1kHz sine wave input signal at 1/8 of Maximum Undistorted Power (1/8 MUP). The data



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set that provides the basis for the 55% efficiency requirement is plotted on page 5 of this document.

Table 1: On Mode Audio Amplifier Efficiency Requirements

<i>Product Function</i>	<i>On Mode Amplifier Efficiency</i>
Audio Amplification Small Amplifiers ($P_{IN} < 20 \text{ W}$)	N/A
Audio Amplification Medium Amplifiers ($20 \text{ W} \leq P_{IN} < 100 \text{ W}$)	Efficiency > 55% Where: $Efficiency = P_{OUT} / (0.80 * P_{IN})$ $P_{IN} = \text{Input Power @ } 1/8 \text{ MUP } 1\text{kHz Sine Wave}$ $P_{OUT} = \text{Output Power @ } 1/8 \text{ MUP } 1\text{kHz Sine Wave}$
Audio Amplification Large Amplifiers ($P_{IN} \geq 100 \text{ W}$)	Efficiency > 55% Where: $Efficiency = P_{OUT} / P_{IN}$ $P_{IN} = \text{Input Power @ } 1/8 \text{ MUP } 1\text{kHz Sine Wave}$ $P_{OUT} = \text{Output Power @ } 1/8 \text{ MUP } 1\text{kHz Sine Wave}$

Idle State Power Consumption Requirements

EPA is proposing an idle state power consumption requirement for Commercial/Prosumer Audio Amplifiers to encourage manufacturers to design products to turn off audio power amplifier circuitry when it is not in use. Based on test data received to date and best professional judgment, EPA believes that the overhead required to operate a product with amplifiers turned off is approximately 10% of the power required to operate with a 1/8 MUP sine wave input signal. To qualify for ENERGY STAR, EPA is proposing that Commercial/Prosumer Audio Amplifiers not exceed the calculated Low Power Idle State power consumption limits specified in Table 2.



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Table 2: Idle State Power Consumption Limits

<i>Product Function</i>	<i>Idle State Power Consumption Limit (W)</i>
Audio Amplification (Commercial/Prosumer Audio Amplifiers)	$P = (0.10 * P_{IN})$ or 10 W, whichever is greater <i>Where:</i> $P_{IN} = \text{Input Power @ } 1/8 \text{ MUP } 1\text{kHz Sine Wave}$



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Amplifier Efficiency

(20% Overhead Benefit for Medium Size Amps)

