ON Semiconductor

Comments on Draft 1 Version 2.0 ENERGY STAR® Requirements for External Power Supplies (EPS)
from ON Semiconductor

Draft 1 version 2.0 of Energy Star Requirements for external power supplies requires a true power factor of 0.9 or greater when measured at 100% of rated output power for power supplies with a nameplate output power greater than or equal to 75 W (lines 139 to 150).

Although we applaud EPA's initiative to include Power Factor in this new version, we recommend these new requirements should be **harmonized** with two existing regulations:

- International Electrotechnical Commission's IEC61000-3-2 regulation on limits for harmonic current emissions. See enclosed the content of this international regulation.

IEC61000-3-2.pdf

- Code of Conduct on Energy Efficiency of External Power Supplies Version 2, dated 24 November 2004. See enclosed.

CoC EPS Version 2
24 Nov 2004.pdf

1. Harmonization with IEC61000-3-2

1.1) The IEC61000-3-2, which has been effective since January 2001 in Europe and Japan, only specifies the line-current-harmonic limits. An external power supply that meets the IEC61000-3-2 regulation is one in which the odd harmonic currents are below the specified limits. External power supplies that meet the IEC61000-3-2 typically have a power factor of 0.85 or greater when measured at 100% of rated output power. More specifically, at 100% of rated output power and 230-Vac line, two-stage external power supplies with an active-PFC front end exhibit a power factor greater than 0.9.
The opposite is however not true, i.e. it is entirely possible that an external power supply can exhibit a power factor of 0.9 and yet will fail a given odd harmonic current and therefore will not meet the IEC61000-3-2.

1.2) In order for a single-stage PFC topology to meet the proposed power factor specification at 230-Vac line, the necessary circuit modifications would result in a few-percent efficiency loss and in a substantially increased cost. For single-stage external power supplies the power factor is typically greater than 0.80.
The proposed power factor requirement would eliminate the single-stage topology that is one of the most cost-effective ways of building highly efficient external power supplies such as notebook adapters with a nameplate output power below 150 W.

1.3) In line 143 and 144, you refer to an output power of 75 W. The IEC61000-3-2 refers to an input power greater than 75 W.

Lines 135 to 137 state that the PF is measured at 100% of the rated output power. The IEC61000-3-2 is more comprehensive because it specifies that every application must be compliant as soon as the input power exceeds 75 W. For example, as currently worded, a 130 W adapter could have a PF of 0.9 at 130 W (i.e. 100% of the rated output power) and a very low PF, when delivering only 100 W.

1.4) In lines 135 to 137, the measurement conditions are missing, i.e. the input voltage at which the PF is measured.

1.5) The IEC61000-3-2 is an international regulation. In Europe, it is referenced as EN61000-3-2 and in Japan as JIC-C-61000-3-2. It is now mandatory in Australia and China has incorporated this regulation in its **China Compulsory Certificate mark**, commonly known as **CCC Mark** (http://en.wikipedia.org/wiki/China_Compulsory_Certificate). The CCC mark is a compulsory safety mark for many products sold on the Chinese market.

China standards

2. Harmonization with the Code of Conduct on Energy Efficiency of External Power Supplies Version 2, dated 24 November 2007

On page 5, the Code of conduct specification applies a derating factor of 4% to the minimum active mode efficiency for external power supplies that meet the IEC61000-3-2.

Let's assume a 90% efficiency external power supply. If one inserts a 95% efficiency PFC stage, the total efficiency drops to 0.9 x 0.95 = 85.5% which is less than the starting point (i.e. 90%) by 4.5%.

Other comments:

3. Coherence with ENERGY STAR® requirements for computers version 4.0.

In the ENERGY STAR® requirements for computers version 4.0, table 1 page 10, the whole system (Notebook/Tablet + adapter) must be compliant with the following numbers in standby mode, sleep mode and idle mode:

Notebooks and Tablets	**Standby (Off Mode):** ≤ 1.0 W **Sleep Mode:** ≤ 1.7 W **Idle State:** **Category A:** ≤ 14.0 W **Category B:** ≤ 22.0 W

We recommend the version 2.0 ENERGY STAR® Requirements for EPS should also be coherent with the ENERGY STAR® requirements for computers version 4.0.

4. Multiple output external power supplies.

We would like to draw the attention of the EPA on the growing number of multiple output power supplies. For example, applications such as game consoles (Play Station 2, Xbox) and printers use external power supplies with 2 outputs, 1 main output (usually 12 V) and an auxiliary output used in standby (usually 5V).

Right now, the current version 1.1 ENERGY STAR® specification for EPS and the proposed Draft 1 Version 2.0 only address external power supplies with a single output voltage. We recommend the EPA should extend in the future its specification to external power supplies with 2 or more output voltages.

In summary, ON Semiconductor recommends that the proposed power factor requirement, **as currently stated** in the draft 1 ENERGY STAR requirements for EPS version 2, should be changed as follows:

1. The ENERGY STAR requirements for EPS version 2 should be harmonized with the international regulation IEC61000-3-2 which specifies maximum limits on harmonic currents.
2. The ENERGY STAR EPS version 2 requirements for minimum efficiency should be harmonized with the Code of Conduct on Energy Efficiency of External Power Supplies Version 2, dated 24 November 2004.

Sincerely,

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