Thunderbolt Display
Environmental Report

Model MC914
Date introduced July 20, 2011

Environmental Status Report

Thunderbolt Display is designed with the following features to reduce environmental impact:

- Arsenic-free display glass
- Mercury-free LED-backlit display
- Brominated flame retardant–free
- Energy Efficient Ethernet enabled[1]
- PVC-free[2]

Meets ENERGY STAR® Version 6.0 requirements for displays
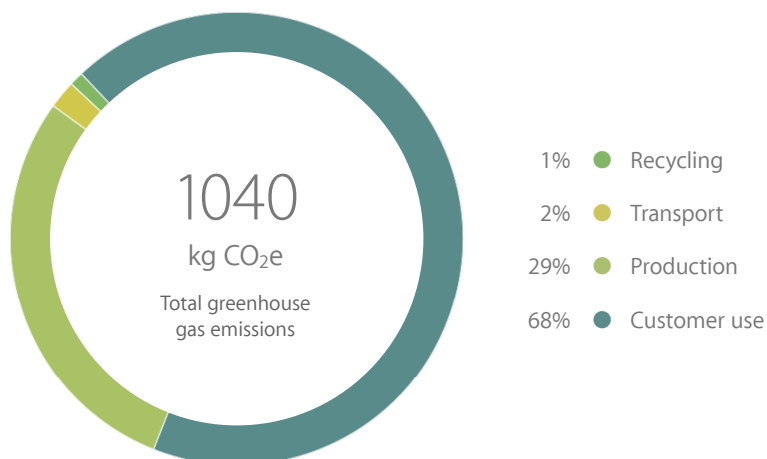
Achieves a Gold rating from EPEAT[3]

Apple and the Environment

Apple believes that improving the environmental performance of our business starts with our products. The careful environmental management of our products throughout their life cycles includes controlling the quantity and types of materials used in their manufacture, improving their energy efficiency, and designing them for better recyclability. The information below details the environmental performance of the Thunderbolt Display as it relates to climate change, energy efficiency, material efficiency, and restricted substances.

Climate Change

Greenhouse gas emissions have an impact on the planet's balance of land, ocean, and air temperatures. Most of Apple's corporate greenhouse gas emissions come from the production, transport, use, and recycling of its products. Apple seeks to minimize greenhouse gas emissions by setting stringent design-related goals for material and energy efficiency. The chart below provides the estimated greenhouse gas emissions for the Thunderbolt Display over its life cycle.

Greenhouse Gas Emissions for Thunderbolt Display

1040
kg CO_2e

Total greenhouse gas emissions

1%	Recycling
2%	Transport
29%	Production
68%	Customer use

Energy Efficiency

Because one of the largest portions of product-related greenhouse gas emissions results from actual use, energy efficiency is a key part of each product's design. Apple products use power-efficient components and software that can intelligently power them down during periods of inactivity. The result is that the Thunderbolt Display is energy efficient right out of the box.

The Thunderbolt Display outperforms the stringent requirements of the ENERGY STAR Program Requirements for Displays Version 6.0. The following table details the power consumed in different use modes.
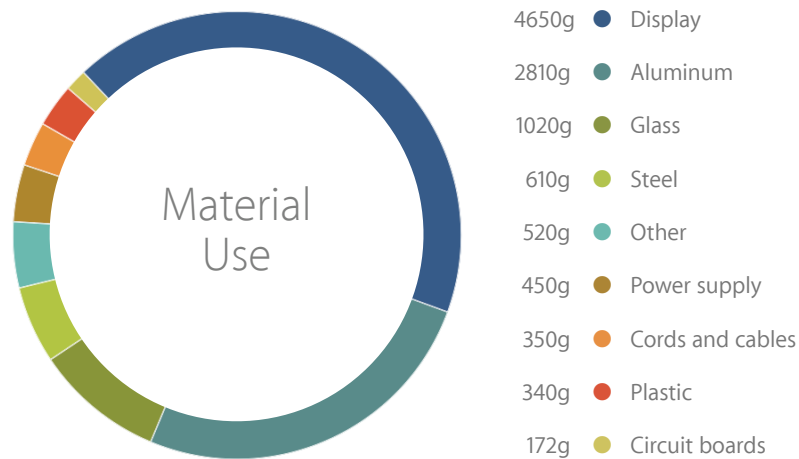
Power Consumption for Thunderbolt Display

Mode	100V	115V	230V
Off	0.40W	0.43W	0.45W
Sleep	1.04W	1.03W	1.04W
On	105W	104W	102W
Power supply efficiency	89.0%	89.0%	89.0%

Material Efficiency

Apple's ultracompact product and packaging designs lead the industry in material efficiency. Reducing the material footprint of a product helps maximize shipping efficiency. It also helps reduce energy consumed during production, and material waste generated at the end of the product's life. The chart below details the materials used in the Thunderbolt Display.

Material Use for Thunderbolt Display

4650g	Display
2810g	Aluminum
1020g	Glass
610g	Steel
520g	Other
450g	Power supply
350g	Cords and cables
340g	Plastic
172g	Circuit boards

Packaging

The packaging design for the Thunderbolt Display uses corrugated cardboard made from a minimum of 35 percent post-consumer recycled content. The following table details the materials used in its packaging.

Packaging Breakdown for Thunderbolt Display

Material	Retail box	Retail and shipping box
Paper (corrugate, paperboard)	2360g	3890g
Expanded polystyrene	660g	660g
Polypropylene (film, fabric)	65g	65g
Other plastics	16g	16g

Restricted Substances

Apple has long taken a leadership role in restricting harmful substances from its products and packaging. As part of this strategy, all Apple products comply with the strict European Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment, also known as the RoHS Directive. Examples of materials restricted by RoHS include lead, mercury, cadmium, hexavalent chromium, and the brominated flame retardants (BFRs) PBB and PBDE. The Thunderbolt Display goes even further than the requirements of the RoHS Directive by incorporating the following more aggressive restrictions:

- Arsenic-free display glass
- Mercury-free LED-backlit display
- BFR-free
- PVC-free internal cables
- PVC-free AC power cord available in all regions except India and South Korea

Recycling

Through ultra-efficient design and the use of highly recyclable materials, Apple has minimized material waste at the product's end of life. In addition, Apple offers and participates in various product take-back and recycling programs in 95 percent of the regions where Apple products are sold. All products are processed in the country or region in which they are collected. For more information on how to take advantage of these programs, visit www.apple.com/recycling.

Definitions

Electronic Product Environmental Assessment Tool (EPEAT): A program that ranks computers and displays based on environmental attributes in accordance with IEEE 1680.1-2009. For more information, visit www.epeat.net.

Greenhouse gas emissions: Estimated emissions are calculated in accordance with guidelines and requirements as specified by ISO 14040 and ISO 14044. Calculation includes emissions from the following life-cycle phases contributing to Global Warming Potential (GWP 100 years) in CO_2 equivalency factors (CO_2e):

- **Production:** Includes the extraction, production, and transportation of raw materials, as well as the manufacture, transport, and assembly of all parts and product packaging.

- **Transport:** Includes air and sea transportation of the finished product and its associated packaging from the manufacturing site to continental distribution hubs. Transport of products from distribution hubs to the end customer is not included.

- **Use:** User power consumption assumes a four-year period. Consumption patterns are modeled according to European Commission and U.S. Environmental Protection Agency computer eco-design studies. Geographic differences in the power grid mix have been accounted for at a continental level.

- **Recycling:** Includes transportation from collection hubs to recycling centers and the energy used in mechanical separation and shredding of parts.

Energy efficiency terms: The energy values in this report are based in part on the ENERGY STAR Program Requirements for Displays Version 6.0. For more information, visit www.energystar.gov.

- **Off:** Lowest power mode of the display when it is shut down. Also referred to as Standby.

- **Sleep:** Low power state that is entered after the display receives instructions from a computer or via functions. This mode is characterized by a blank screen.

- **On at full brightness:** The display is connected to a power source and a host computer and produces an image at its maximum brightness.

- **Power supply efficiency:** Average of the power supply's measured efficiency when tested at 100 percent, 50 percent, and 20 percent of the power supply's rated output current.

Restricted substances: Apple defines a material as BFR-free and PVC-free if it contains less than 900 parts per million (ppm) of bromine and of chlorine.

1. Energy Efficient Ethernet requires a compliant switch to enter low-power mode.

2. PVC-free worldwide except in India and South Korea, where PVC-free AC power cords are not available.

3. The Thunderbolt Display achieved a Gold rating from EPEAT in the United States and Canada.