Environmental Fact Sheet

PowPak LMK-5T-DV-B

The aim of this document is to provide relevant and reliable information on the environmental performance of the PowPak LMK-5T-DV-B. Results reported in this Environmental Fact Sheet are based on a Life Cycle Assessment (LCA) carried out by an independent company (Sphera).

Manufacturer

Lutron Electronics Co., Inc.
7200 Suter Rd, Coopersburg, PA 18036

Study conducted by

Sphera Solutions GmbH
Hauptstraße 111-113, 70771 Leinfel-den-Echterdingen, Germany

Product description

The RF dimming module with 0-10 V control is a radio frequency (RF) control that operates 0-10V controlled fluorescent ballasts or LED drivers based on input from RA2 Select, RadioRA 2, and HomeWorks systems.

- 0-10V control link automatically sources or sinks up to 60mA to third-party fixtures
- Switches line voltage up to 5A
- Configurable high- and low-end trim
- Various operating voltages available
- Utilizes Lutron Clear Connect RF technology
- RadioRA 2 or HomeWorks software required for system functionality
- Mounts to an electrical junction box through a 1/2in (21mm) knockout opening
- Reliable XCT sensing technology

System description

The product system for this study considers one device during its entire lifetime.

The functional unit was taken as one piece of PowPak dimming module operating at standard conditions defined by Lutron.

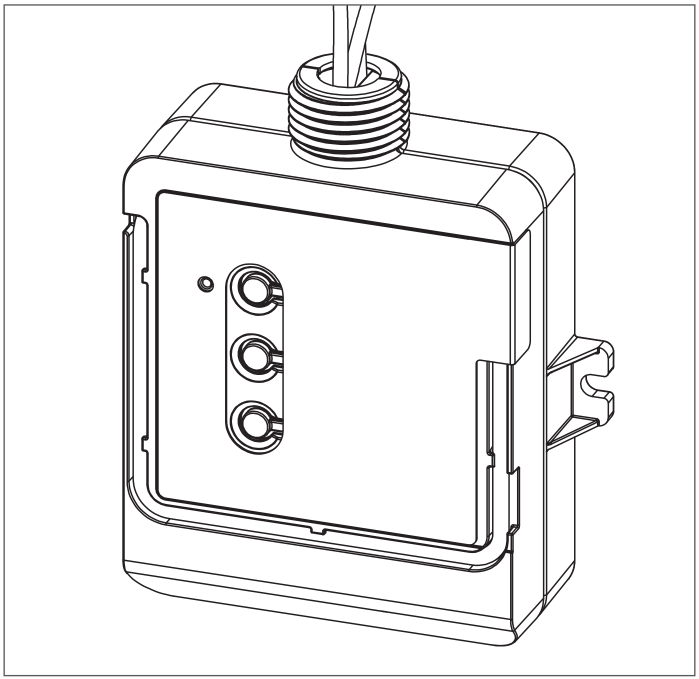
The Use Stage electricity consumption was calculated according to standard operating conditions defined by Lutron.

Product reference

LMK-5T-DV-8

PowPak 0-10V

The functional unit of this study is one piece of PowPak dimming module operating 8 hours per day and 5 days a week for a lifetime of 10 years.



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Material content

Plastics	Mass [kg]	% of Total weight	Metals	Mass [kg]	% of Total weight	Other	Mass [kg]	% of Total weight
Housing (PC-ABS)	0.062	14.27%	Steel screws & large steel nuts (Stainless steel)	0.005	1.2%	PWB (incl. Gold, relay & fuse)	0.097	22.3%
Transparent foil and black protector (PC)	0.001	0.1%	brass cover of PWB (Brass)	0.000	0.1%			
Clamps (EPS)	0.017	3.81%			0.0%			0.0%
Total plastics	0.08	18%	**Total metals and others**	0.01	1%	**Total others**	0.10	22%
						Packaging	0.253	58.2%

Table 1: Material content for PowPak LMK-5T-DV-B

Scope of the LCA

A Cradle-to-Grave LCA study was carried out according to DIN ISO 14040/44 using LCA for Experts software. The system boundary (see Figure 1) includes upstream raw material production and transportation to the manufacturing site along with soldering and assembly of the PowPak.

Distribution to customers as well as energy consumption during the Use Stage, were included in the system boundaries. This considered consumption in-use (2W) with a duration of 8 hours per day and 5 days a week and in stand-by (0.61W) for a lifetime of 10 years.

The device is landfilled at end-of-life (EoL) as part of construction waste.

Environmental impacts of the system were calculated by applying the Environmental Footprint 3.0 (EF3.0) method. The focus of this flyer is on climate change (carbon footprint) but in total thirteen midpoint impact categories have been addressed and discussed at the end.

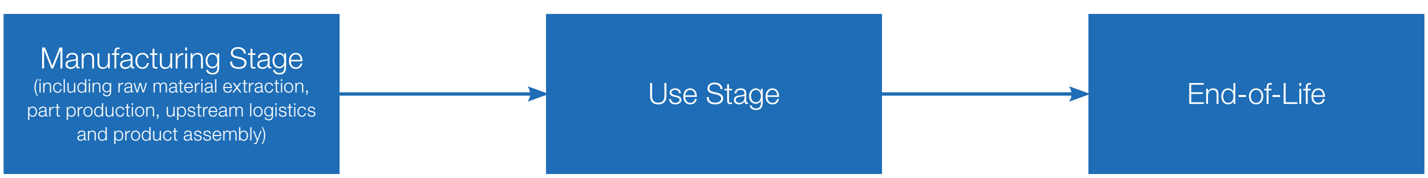

Figure 1

Two scenarios were analyzed to test sensitivity of aspects from the baseline scenario and to identify meaningful approaches to reduce the product's footprint relating to climate change:

Scenario 1: Different duration of the use modes in-use and stand-by (Figure 3)

Scenario 2: Other EoL treatments (Figure 4)

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Climate change results for the base scenario

The carbon footprint of one PowPak over a lifetime of 10 years is 45.87 kg CO_2 eq. (see Figure 2). Results show that the Use Stage is the main contributor to the overall impact of the device with 82% followed by the Manufacturing Stage with 11%. Distribution contributes 7% and EoL contributes negligibly to the carbon footprint impact.

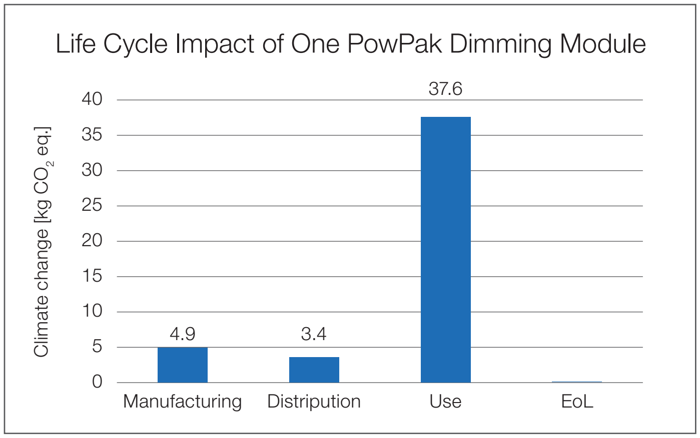

Figure 2: Climate change potential of one piece of PowPak dimming module.

Climate change results comparing different duration of the use modes

In the base scenario, the 37.6 kg CO_2 eq. from Use Stage is divided nearly equally between the in-use and stand-by modes (see Figure 3). Assuming the same lifespan of 10 years, when considering continuous operation (24 hours per day, 7 days a week) the Use Stage emissions increase by 42.3 kg CO_2 eq. to 88.2 kg CO_2 eq.

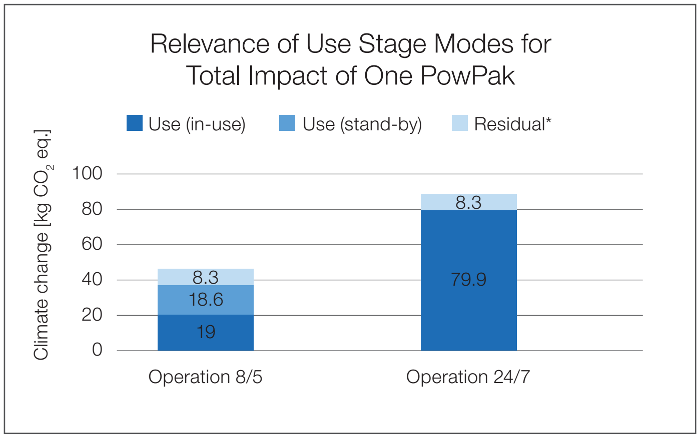

Figure 3: Climate change potential of one PowPak dimming module.
*Residual refers to the manufacturing, distribution and EoL stages.

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Climate change results comparing other EoL treatments

End-of-life treatment depends on the end user, location, and demolition processes of the building. Due to its size, it is likely that the PowPak is disposed of as a fraction of construction waste (i.e., landfill), but on other occasions, it may be recycled. This assessment considers the environmental burdens of recycling (e.g., energy consumption of shredding processes) and credits for the recovered raw materials, as long as they can replace virgin materials on the market and therefore prevent their production.

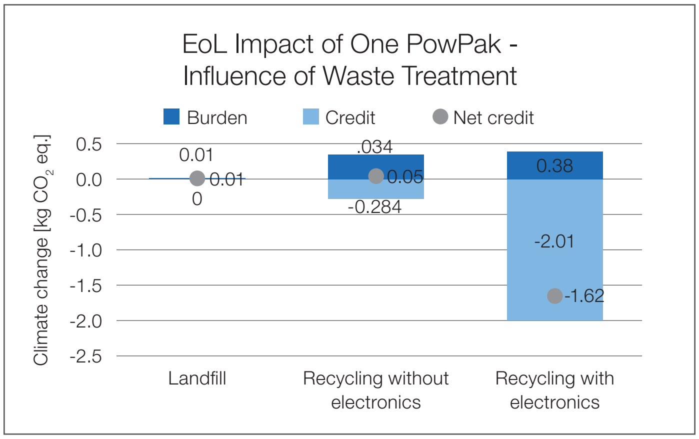

Figure 4: Climate change potential of EoL Stage of one PowPak dimming module.

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Additional environmental impact indicators

Impact category	Manufacturing	Distribution	Use	EoL
AP - Acidification [Mole of H+ eq.]	4.80E-02	1.23E-02	1.35E-01	4.69E-05
GWP - Climate change - total [kg CO_2 eq.]	4.87E+00	3.38E+00	3.76E+01	6.62E-03
ECOtox. - Ecotoxicity, freshwater - total [CTUe]	3.37E+01	3.32E+01	2.11E+02	4.97E-02
EPf - Eutrophication, freshwater [kg P eq.]	1.41E-05	1.15E-06	7.80E-05	1.10E-08
EPm - Eutrophication, marine [kg N eq.]	4.64E-03	5.49E-03	1.96E-02	1.22E-05
EPt - Eutrophication, terrestrial [Mole of N eq.]	5.03E-02	6.02E-02	2.08E-01	1.34E-04
LU - Land use [Pt]	1.57E+01	1.06E+00	1.88E+02	1.76E-02
ODP - Ozone depletion [kg CFC-11 eq.]	1.39E-10	2.92E-16	5.43E-13	2.56E-17
PM - Particulate matter [Disease incidences]	4.59E-07	4.07E-08	1.14E-06	5.82E-10
POCP - Photochemical ozone formation, human health [kg NMVOC eq.]	1.55E-02	1.53E-02	5.76E-02	3.69E-05
ADPe - Resource use, fossils [MJ]	6.78E+01	4.57E+01	5.77E+02	8.73E-02
ADPm - Resource use, mineral and metals [kg Sb eq.]	5.31E-04	1.24E-07	7.59E-06	6.22E-10
W - Water use [m^3 world equiv.]	8.63E-01	6.11E-03	5.35E+00	7.06E-04

Table 2: Life Cycle impact of one piece of PowPak in EF3.0 categories

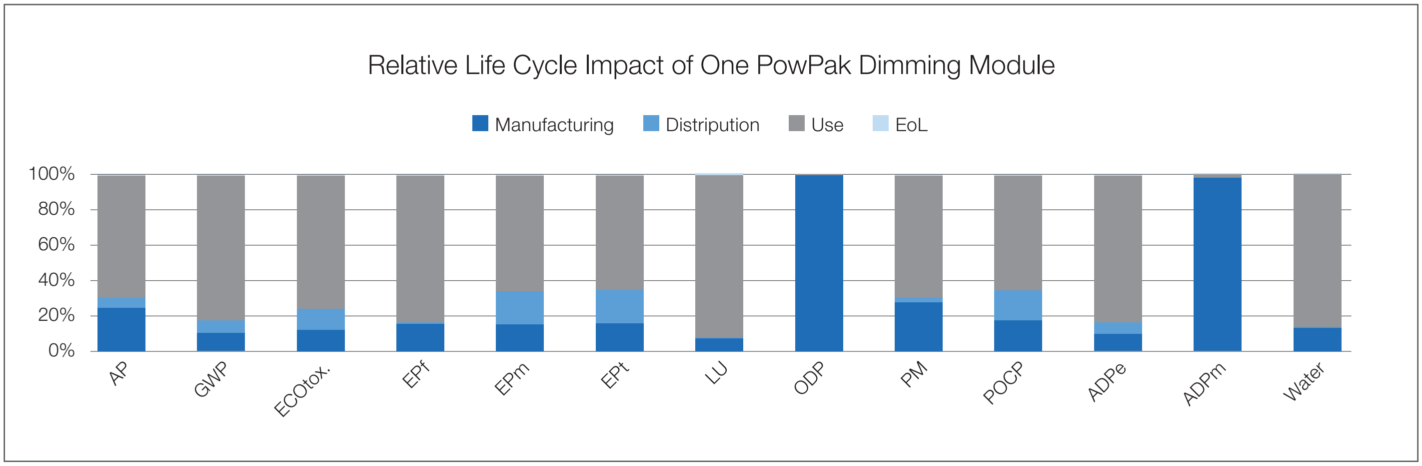

Figure 5: Relative Life Cycle impact of one PowPak in EF3.0 categories.

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Summary and conclusion

With the aim of assessing the environmental impact of the PowPak dimming module with 0-10V control, climate change potential was used as a reference indicator in this study due to its stability and global importance.

Within the Cradle-to-Grave system boundary of the device, the LCA study shows electricity consumption during the Use Stage as the main hotspot for climate change. The observation of the hotspot is seen as a trend in most other environmental categories as well.

The scenario analysis shows that when varying the proportion of the use modes (in-use and stand-by), the impact per device increases proportionally to the larger share of the in-use profile.

With recycling of electronics at EoL, the burden associated with the waste processing increases, but it can provide lower net results for this Life Cycle stage. However, due to its low contribution to the overall impact of the product, this does not affect the overall conclusion of the study in terms of the hotspots.