# Qisda Corporation.

# Monitor
# 524PF
# LCA Project Report

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|---|---|
| LCA practitioner： | Qisda Corporation. |
| Product： | 524PF |
| Verification Requirement： | 1. ISO 14040:2006/Amd 1:2020<br>2. ISO 14044:2006/Amd 2:2020 |
| Date of Issue： | 2026/02/20 |
| Version： | 1.0 |

# Table of Contents

# 1 Basic Information

## 1.1 Company Introduction

| | |
|---|---|
| **Company Name:** | Qisda Corporation. |
| **Company Address:** | No.157, Shanying Rd., Guishan Dist., Taoyuan City, Taiwan(R.O.C.) |
| **Manufacture Site:** | Plot CN-12, Dong Van IV Industrial Park, Kim Bang District, Ha Nam Province, Vietnam. |
| **Company Profile:** | Founded in 1984 and headquartered in Taiwan, Qisda Corporation (formerly known as BenQ Corp.) is a global technology group and an all-round electronic design manufacturing services (DMS) leader. The company operates as an ODM/OEM partner, providing highly integrated software and hardware solutions across various sectors. |
| **Company website:** | https://www.qisda.com/tw |

## 1.2 Contact Information

Should you have any inquiries regarding the product system boundaries, inventory processes, or calculation results presented in this report, please do not hesitate to reach out to us using the contact information provided below.

Table 1-1 Contact Information

| | |
|---|---|
| Contact Person: | Urban RD Dehng |
| Telephone： | 886-3-3598800＃3880 |
| Email: | urban.rd.dehng@qisda.com |

## 1.3 Production Facilities and Product Specifications

### 1.3.1 Manufacturing Sites

The manufacturing facilities associated with the products under assessment are detailed below:

| Subject product | Product Description | Address |
|---|---|---|
| 524PF | monitor | Plot CN-12, Dong Van IV Industrial Park, Kim Bang District, Ha Nam Province, Vietnam. |

### 1.3.2 Product Specifications

The product specifications of the products inspected are as follows:

| Item | Product Specifications |
|---|---|
| Display | Display Size (in.): 23.8<br>Viewable Area (in.): 23.8<br>Panel Type: IPS Technology<br>Resolution: 1920 x 1080<br>Resolution Type: FHD (Full HD)<br>Static Contrast Ratio: 1,500:1 (typ)<br>Light Source: Edge LED |
| Power | On Mode : 11.6W<br>Sleep Mode : 0.24W<br>Off Mode : 0.16W<br>Voltage: AC 100-240V |
| Weight (metric) | Weight：4.9 kg (with stand); 3.4 kg (without stand)<br>Package weight：7.2 kg (with stand); 5.7 kg (without stand) |
| Dimensions (metric) (W x D x H) | Dimensions ：53.94 x 4.72 x 31.43 cm (without stand)<br>Dimensions With Stand：53.94 x 18.95 x 50.32 cm<br>Package dimensions：62.1 x 14 x 39.3 cm |
| General | Sustainable impact specifications：<br>Low halogen; Molded paper pulp cushion inside box is 100% sustainably sourced and recyclable; Outside box and corrugated cushions are 100% sustainably sourced and recyclable; 85% ITE-derived closed loop plastic; Contains ocean-bound plastic; Contains 20% recycled |

| | |
|---|---|
| | glass in the monitor panel; At least 30% recycled metal including 90% recycled aluminum in the stand [8,9,10,11,12,14]<br>Certifications and compliances：<br>BIS; BSMI; CB; CCC; CE; CECP; CEL; cTUVus; EAC; FCC; GS Mark; ICES; ISO 9241-307; KC; KCC; NOM; PSB; RCM; SEPA; TUV-S; VCCI; WEEE; ISC; California Energy Commission (CEC); WW application; UAE; TGM; Ukraine certificates; NRCS; PSE; Ukraine EE; TÜV Low Blue Light Hardware Solution certified; Works with Chromebook certified; Korea MEPS; CEL Grade 2; Australian-New Zealand DoC; EMF |

# 2 Overview of Life Cycle Assessment

## 2.1 Purpose of Life Cycle Assessment

This LCA study is conducted in strict accordance with ISO 14040 and ISO 14044 standards. The primary objective is to complete a comprehensive environmental impact assessment and obtain a formal Verification Statement from a third-party certification body.

This facilitates transparent Business-to-Consumer (B2C) communication regarding the product's environmental performance.

The core objectives of this LCA assessment are defined as follows:

- Quantifying Lifecycle Impacts: To systematically evaluate and understand the environmental impacts associated with the subject products across all defined life cycle stages.
- Hotspot Identification: To identify significant environmental "hotspots" within the life cycle, providing a data-driven basis for developing sustainability strategies and driving continuous performance improvements.
- International Stakeholder Communication: To establish a scientifically robust environmental profile that supports effective communication and transparency with global customers and stakeholders.

## 2.2 Life Cycle Assessment Requirements and Standards

- ISO 14040:2006/Amd 1:2020 Environmental management — Life cycle assessment — Principles and framework — Amendment 1
- ISO 14044:2006/Amd 2:2020 Environmental management — Life cycle assessment — Requirements and guidelines — Amendment 2

# 3 System Boundary

## 3.1 Functional Unit and Declared Unit

The functional unit for the products assessed in this study is defined as "1 unit" (1 Pcs). Similarly, the declared unit is established as "1 unit" (1 Pcs).

## 3.2 System Boundary

- The system boundary for this assessment is defined as "Cradle-to-Grave," encompassing all life cycle stages from raw material extraction to final disposal.
- The collection and verification of activity data are categorized into five distinct life cycle stages: Raw Material, Manufacturing, Distribution, Use, and Disposal.

## 3.3 Data Collection

- Methodological Compliance: Data collection was conducted in strict accordance with the guidelines specified in ISO 14044:2006, Section 4.3.2.
- Data Sources: All primary data was obtained through direct measurement, calculation, or estimation based on current manufacturing processes and verified technical documentation.
- Assessment Scope: Furthermore, the LCA model incorporates and evaluates all relevant outputs, including manufacturing waste and co-products, to ensure a comprehensive impact assessment.

### 3.4 Limitations and Assumptions

- Secondary Data Sources: Environmental impact data regarding energy consumption and pollutant emissions during the Upstream (Raw Material) stage are sourced from the Ecoinvent 3.11 database.
- Electricity Emission Factors: The electricity grid mix for operations in Vietnam is based on the Ecoinvent 3.11 dataset. This data includes an uncertainty assessment and represents the low-voltage electricity supply available within the region.
- Logistics and Transportation: In the absence of primary data from direct audits of suppliers and logistics providers, conservative transportation coefficients have been applied. These include generic datasets for road (land trucks), sea (container ships), and air freight to ensure all relevant transportation scenarios are comprehensively covered.

### 3.5 Cut-off Rules

- Exclusion Criteria: The system boundary excludes environmental impacts associated with personnel-related activities, infrastructure, and capital goods (production equipment), as these are considered outside the functional scope of the product life cycle.
- Data Modeling: All inventory data used in this report have been consolidated and modeled using the most representative life cycle inventory (LCI) datasets available to ensure the highest degree of accuracy and completeness.

### 3.6 Allocation Principles

- Manufacturing Stage: During the manufacturing phase, energy consumption and material requirements at the facility

level are allocated based on the proportion of "production man-hours" attributable to the subject product.

- Other Life Cycle Stages: For all other life cycle stages, specific primary data or actual consumption values directly associated with the product are used, requiring no further allocation.

# 4 Life Cycle Assessment and Analysis

## 4.1 Subject products and manufacturing facilities

The subject products and their respective manufacturing facilities associated with this assessment are detailed in Section 1.3 of this report.

## 4.2 Data collection period

The reference period for the collection of primary activity data in this study is as follows:

| Subject products | Data collection period |
|---|---|
| 524PF | Jan 1 , 2025 to Dec 31 , 2025 |

## 4.3 Calculation Principles

The calculation principles for this LCA assessment are as follows. The data collection also considers the requirements of the Carbon Footprint Product Category Rules (CF-PCR) for Liquid Crystal Display (LCD)：

A. Raw Material Stage

- Environmental Impact of Raw Materials = Activity Data X SimaPro Factor
- Environmental Impact of Raw Material Transport = Product Delivery Weight X Transport Distance X SimaPro Factor
- Note: Activity data for raw materials are based on the standard Bill of Materials (BOM). Inputs related to defective products and alternative components are not considered.

B. Manufacturing Stage = Activity Data (allocated based on product quantity or labor hours) X SimaPro Factor

C. Distribution Stage = Activity Data (allocated based on product sales volume) X SimaPro Factor
D. Use Stage = Activity Data (allocated based on product energy consumption test reports) X SimaPro Factor
E. Disposal Stage = Activity Data (allocated based on recovery rates specified in the WEEE Directive) X SimaPro Factor

### 4.4 Requirements for Primary and Secondary Data

To ensure the reliability and representativeness of the Life Cycle Inventory (LCI), the data collection process adheres to the following hierarchical requirements:

| Category | Details / Reference Period |
|---|---|
| Temporal Scope | Jan 1 , 2025 to Dec 31 , 2025 |
| Geographical boundaries | Vietnam |
| LCA software | Simapro 10.2.0.1 (ReCiPe 2016 Midpoint (E) V1.11/ World (2010) E) |
| LCA database | Ecoinvent v3.11 database |

- Temporal and Geographical Representativeness: The temporal and geographical scope of the collected data accurately reflects the current manufacturing conditions of the subject products within Vietnam.
- Completeness: Based on the predefined system boundaries, all relevant environmental flows have been accounted for, ensuring the completeness of the inventory.
- Data Age and Reliability: Secondary datasets utilized for the

calculations are predominantly within a 10-year period. Any exceptions involving older datasets (post-2000) have been assessed to have a negligible impact on the overall results, thus maintaining high representativeness.

- Localized Modeling: As the manufacturing process occurs in Vietnam, region-specific LCI datasets are prioritized. In cases where Vietnam-specific data is unavailable, Global (GLO) or Rest-of-World (RoW) datasets from the Ecoinvent database are applied as the best available proxies.

# 5 Life Cycle Assessment Methodology

## 5.1 LCA Software

The SimaPro 10.2.0.1 software platform was utilized for this assessment. Developed by PRé Sustainability in the Netherlands, SimaPro is one of the most globally recognized tools for conducting Life Cycle Assessments. Beyond providing a robust framework for Life Cycle Inventory (LCI) data, the system enables the evaluation of diverse environmental impacts and facilitates the comparative analysis of environmental footprints across different manufacturing processes and raw material selections.

## 5.2 Impact Assessment Methodology (LCIA)

The ReCiPe 2016 Midpoint (E) V1.11 / World (2010) E analysis method in SimaPro 10.2.0.1 software was used for this LCA assessment, along with the Ecoinvent v3.11 database. Long-term environmental impacts (> 100 years) were excluded from this LCA assessment.

## 5.3 LCA Software Modeling and Data Integration

The activity data collected during the inventory phase are systematically integrated into the SimaPro 10.2.0.1 modeling environment. Each data point is recorded and categorized according to its respective life cycle stage. Furthermore, process-specific flows are allocated to the relevant life cycle modules—from raw material acquisition to final disposal—ensuring that environmental impacts are accurately attributed across the entire product system.

# 6 Product Environmental Impact Assessment Results

## 6.1Characterization of Environmental Impacts

The Life Cycle Assessment (LCA) results presented in this report represent potential environmental impacts and are intended for relative comparison. These values are not absolute measurements of actual environmental damage, nor do they predict whether safety margins or regulatory thresholds have been exceeded.

The potential environmental impact categories and their respective characterization models are summarized in Table 6-1 below. Detailed assessment results for each subject product are provided in Section 6.1, categorized by life cycle stages.

Table 6-1

Characterization Indicators for Potential Environmental Impacts

| Impact Category | unit |
|---|---|
| Global warming | kg CO2 eq |
| Stratospheric ozone depletion | kg CFC11 eq |
| Ionizing radiation | kBq Co-60 eq |
| Ozone formation, Human health | kg NOx eq |
| Fine particulate matter formation | kg PM2.5 eq |
| Ozone formation, Terrestrial ecosystems | kg NOx eq |
| Terrestrial acidification | kg SO2 eq |
| Freshwater eutrophication | kg P eq |
| Marine eutrophication | kg N eq |
| Terrestrial ecotoxicity | kg 1,4-DCB |
| Freshwater ecotoxicity | kg 1,4-DCB |
| Marine ecotoxicity | kg 1,4-DCB |

| | |
|---|---|
| Human carcinogenic toxicity | kg 1,4-DCB |
| Human non-carcinogenic toxicity | kg 1,4-DCB |
| Land use | m2a crop eq |
| Mineral resource scarcity | kg Cu eq |
| Fossil resource scarcity | kg oil eq |
| Water consumption | m3 |

### 6.1.1 LCIA Results for 524PF

| Impact Category | unit | total | 524PF-1(Raw Material) | 524PF-2(Manufacture) | 524PF-3(Transport) | 524PF-4(Use) | 524PF-5(End-of-Life) |
|---|---|---|---|---|---|---|---|
| Global warming | kg CO2 eq | 1.81E+02 | 1.03E+02 | 3.67E-01 | 7.98E+00 | 6.97E+01 | 1.08E-01 |
| Stratospheric ozone depletion | kg CFC11 eq | 1.21E-04 | 8.19E-05 | 1.64E-07 | 6.28E-06 | 3.28E-05 | 1.98E-08 |
| Ionizing radiation | kBq Co-60 eq | 2.37E+07 | 2.37E+07 | 2.90E-03 | 5.65E-02 | 2.73E+01 | -1.50E-02 |
| Ozone formation, Human health | kg NOx eq | 5.82E-01 | 3.02E-01 | 1.20E-03 | 1.63E-01 | 1.16E-01 | 1.62E-04 |
| Fine particulate matter formation | kg PM2.5 eq | 4.12E-01 | 2.51E-01 | 9.08E-04 | 4.99E-02 | 1.10E-01 | 2.21E-05 |
| Ozone formation, Terrestrial ecosystems | kg NOx eq | 6.04E-01 | 3.18E-01 | 1.22E-03 | 1.65E-01 | 1.19E-01 | 1.65E-04 |
| Terrestrial acidification | kg SO2 eq | 9.46E-01 | 5.87E-01 | 2.58E-03 | 1.55E-01 | 2.01E-01 | 6.17E-05 |
| Freshwater eutrophication | kg P eq | 1.98E-01 | 1.13E-01 | 2.99E-04 | 4.21E-04 | 8.42E-02 | 6.15E-06 |
| Marine eutrophication | kg N eq | 4.97E-02 | 4.39E-02 | 1.29E-05 | 5.00E-05 | 5.62E-03 | 1.19E-04 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Terrestrial ecotoxicity | kg 1,4-DCB | 8.20E+02 | 6.88E+02 | 8.27E-01 | 2.70E+01 | 1.05E+02 | 1.26E-02 |
| Freshwater ecotoxicity | kg 1,4-DCB | 3.98E+01 | 3.33E+01 | 3.49E-02 | 1.09E-01 | 6.40E+00 | 2.24E-05 |
| Marine ecotoxicity | kg 1,4-DCB | 1.90E+05 | 1.58E+05 | 1.34E+02 | 5.52E+02 | 3.14E+04 | 2.74E-01 |
| Human carcinogenic toxicity | kg 1,4-DCB | 3.67E+03 | 3.00E+03 | 4.63E+00 | 9.11E+01 | 5.70E+02 | 3.49E-04 |
| Human non-carcinogenic toxicity | kg 1,4-DCB | 1.59E+05 | 1.31E+05 | 1.13E+02 | 4.06E+02 | 2.68E+04 | 3.13E-01 |
| Land use | m2a crop eq | 8.33E+00 | 6.99E+00 | 7.07E-03 | 8.48E-02 | 1.25E+00 | 3.01E-04 |
| Mineral resource scarcity | kg Cu eq | 2.22E+00 | 2.04E+00 | 8.98E-04 | 1.65E-02 | 1.61E-01 | 3.72E-04 |
| Fossil resource scarcity | kg oil eq | 4.90E+01 | 2.75E+01 | 9.51E-02 | 2.45E+00 | 1.89E+01 | 3.92E-03 |
| Water consumption | m3 | 1.33E+00 | 8.52E-01 | 1.13E-03 | 7.66E-03 | 4.62E-01 | 7.03E-03 |

### 6.1.2 Discussion and Strategic Implications

The LCA results underscore the significant environmental footprint associated with the Raw Material (Upstream) and Use (Downstream) stages of the subject product. The insights derived from this assessment provide critical guidance for product designers and manufacturers:

- Design for Environment (DfE): Strategic tools can be implemented to help designers evaluate the sensitivity of various design decisions. Key focus areas include sustainable material selection, optimized packaging configurations, and energy-efficient architectures that reduce impact during both manufacturing and product operation.
- Customer Engagement: This study presents an opportunity to develop educational initiatives for end-users, emphasizing the importance of maximizing equipment productivity and optimizing power management settings to reduce lifetime energy consumption.
- Supply Chain and Process Optimization: Given the impact of the Manufacturing (Core) stage, stakeholders should prioritize the transition to renewable energy and the minimization of process waste. Furthermore, improving production yields through advanced process engineering can effectively reduce upstream raw material requirements and the associated environmental burdens of logistics and transportation.

# 7 Data Quality Management

## 7.1 Data Quality Assurance and Retention

To ensure the integrity and accuracy of the Life Cycle Inventory (LCI), the source of every data point is strictly documented. All primary activity data are cross-verified with supporting evidence—such as procurement records, utility invoices, and production logs—to establish credibility. In compliance with verification standards, all relevant datasets and supporting documentation are retained for a minimum of five years to facilitate future audits and longitudinal tracking.

## 7.2 Data Quality Assessment

The data quality for this LCA study was evaluated using a systematic approach, with a primary focus on the Global Warming Potential (GWP) results as a proxy for overall inventory reliability. The assessment criteria include temporal, geographical, and technological representativeness. The summary of the data quality analysis is presented in Table 7-1, with comprehensive coefficient reference lists and calculation details provided for each subject product.

Table 7-1 Data Quality Rating (DQR) and Assessment Results

| Data quality level | | |
|---|---|---|
| Subject Product | DQR Score | Data Quality Level |
| 524PF | 1.61 | High quality |
| DQR Judgment Criteria Explanation | ◎Data Quality Rating (DQR) | Overall data quality level |
| | DQR≤ 1.7 | High quality |
| | 1.7 < DQR ≤ 3.0 | Basic quality |
| | 3.0 < DQR ≤ 5.0 | Preliminary quality assessment |

### 7.3 Transparency Description

To enhance the credibility, reliability, and transparency of the Life Cycle Assessment (LCA) results, our company has partnered with CYTech Co., Ltd. (http://www.cytech.com.tw/), a professional environmental consultancy.

The assessment and subsequent report have been prepared in strict accordance with the following international standards and technical specifications:

- ISO 14040/14044:2006: Life cycle assessment — Principles, framework, and requirements.

# 8 LCA Critical Review and Verification

To ensure the highest level of credibility and reliability for the Life Cycle Assessment (LCA) results of the subject product, 「UL Solutions」 has been commissioned to conduct an independent third-party audit and verification.

## 8.1 Verification of Operational Compliance

### 8.1.1System Boundary

The scope of this verification involves a comprehensive assessment of the product's life cycle, aimed at obtaining a formal Declaration of Conformity from the verification body. This facilitates transparent communication with Business-to-Consumer (B2C) stakeholders regarding the product's environmental footprint.

The system boundary is defined as Cradle-to-Grave, encompassing the following five life cycle stages:

- Raw Material Acquisition
- Manufacturing
- Distribution
- Use Stage
- Disposal Stage

### 8.1.2 Compliance with Standards and Technical Specifications

The Life Cycle Assessment (LCA) and the resulting environmental declaration have been verified for compliance with the following international standards :

- ISO 14040:2006/Amd 1:2020 Environmental management — Life cycle assessment — Principles and framework — Amendment 1
- ISO 14044:2006/Amd 2:2020 Environmental management — Life cycle assessment — Requirements and guidelines — Amendment 2

### 8.1.3 Level of Assurance

The Internal verification for the subject products' LCA has been conducted to a reasonable level of assurance. This confirms that the inventory data, calculation methodologies, and environmental impact results are materially correct and provide a faithful representation of the products' life cycle performance.

## 8.2 Validity of Assessment Results

The validity of the LCA analysis results for "524PF" completed by our company shall be at most 2 years. However, if there are any changes in the life cycle of the "524PF" LCA assessment, its validity will be terminated.

## 9 References


- ISO 14040:2006/Amd 1:2020 Environmental management — Life cycle assessment — Principles and framework — Amendment 1
- ISO 14044:2006/Amd 2:2020 Environmental management — Life cycle assessment — Requirements and guidelines — Amendment 2
- Ecoinvent, 2025. Swiss Centre for Life Cycle Assessment, v3.11 (www.ecoinvent.ch)。
- PRé Consultants, 2025. Software SimaPro version 10.2.0.1(www.pre.nl)。


## 10 Attachments

Attachment 1:LCA 適用之評估資料收集總表-524PF

Attachment 2: 佳世達科技_hp 524PF_LCA 係數引用清冊