



戶外數位看板新時代：

速食餐飲（QSR）戶外菜單板的挑戰與解決方案

Outdoor Digital Signage for QSR : Challenges and How We Overcome Them

Litemax 高亮、低功耗與全天候智慧顯示技術白皮書

A Litemax Whitepaper on High Brightness, Low Power, and All-Weather Display Technologies

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摘要 / Abstract

在速食餐飲 (Quick Service Restaurant, QSR) 產業中，戶外數位菜單板成為品牌形象與營運效率的重要接觸點。然而，戶外環境的挑戰——高溫曝曬、風雨濕氣、強烈日光與能源效率需求——使顯示設備必須兼具高亮、省能與穩定可靠。

本白皮書將探討 QSR 戶外數位看板的主要挑戰，並分享晶達光電 (Litemax) 如何透過高亮顯示、寬溫設計、防黑化技術與 ECOgreenpixel 節能架構，協助全球品牌在各地氣候條件下維持清晰亮度與營運穩定，實現智慧顯示的永續價值。

In the Quick Service Restaurant (QSR) industry, outdoor digital menu boards have become a key interface for branding and operational efficiency.

However, environmental challenges—such as sunlight readability, extreme temperatures, humidity, and power efficiency—demand displays that deliver both brightness and reliability.

This whitepaper explores the challenges of outdoor QSR displays and how Litemax overcomes them through high-brightness technology, wide-temperature tolerance, anti-blackening design, and the ECOgreenpixel energy-saving architecture.

It illustrates how Litemax empowers global QSR brands to achieve clarity, durability, and sustainability in every environment.

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1. 市場背景與產業趨勢 / Market Background & Trends

全球速食餐飲業者正加速數位化轉型，戶外數位看板不僅取代傳統燈箱，更成為智慧點餐系統的重要介面。根據市場研究，全球 QSR 數位看板市場年成長率超過 7%，帶動戶外高亮、低功耗顯示器需求急速上升。

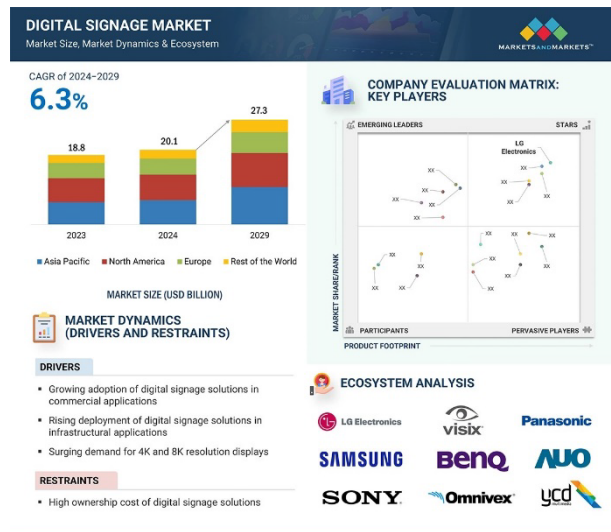
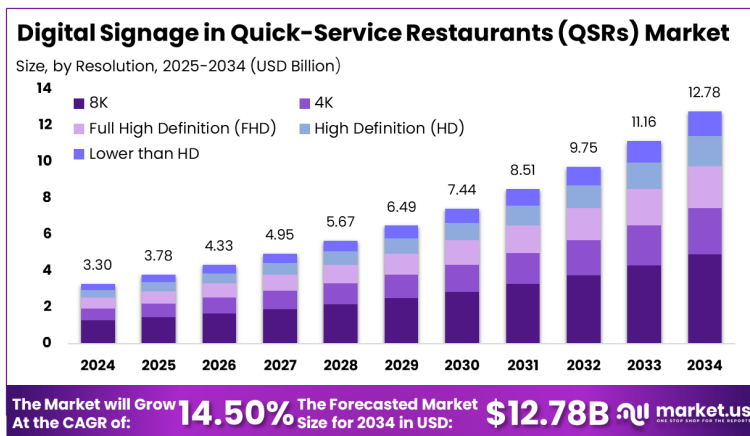
關鍵驅動因素包括：

- 智慧餐飲體驗 (AI 點餐、自動化更新)
- ESG 永續與節能需求
- 多場域整合 (Drive-Thru、店外宣傳、即時菜單切換)

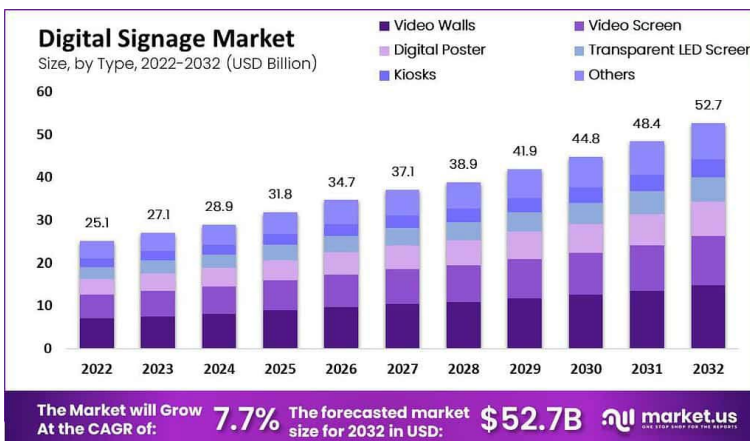
The global QSR sector is undergoing rapid digital transformation. Outdoor digital signage has evolved from static lightboxes to intelligent ordering interfaces. According to industry research, the outdoor digital signage market for QSRs is growing at over 7% CAGR, fueled by demand for high brightness, energy-efficient, and durable displays.

Key drivers include:

- Smart dining experiences (AI ordering, real-time updates)
- ESG and sustainability goals
- Multi-location adaptability (drive-thru, outdoor promotions, menu synchronization)



來源: The Business Research Company + Market.us



2. QSR 戶外菜單板的主要挑戰 / Key Challenges

挑戰項目	中文說明
陽光下可視性	戶外日照超過 100,000 lux，普通顯示器易反光或畫面不清。
高溫與黑化效應	長時間暴露於陽光造成 LCD 黑化或色偏。
濕氣與防水性	雨水滲入與結露問題影響穩定性。
能源效率	24/7 運行下的高功耗問題。
維護與壽命	戶外環境導致維修頻率高。

Challenge	Description
Sunlight Readability	Readability under direct sunlight (>100,000 lux).
High Temperature & Blackening	LCD blackening and color shift under heat exposure.
Moisture & Waterproofing	Water ingress and condensation risks.
Energy Efficiency	High power consumption in continuous operation.
Maintenance & Lifespan	Increased maintenance in harsh environments.

3. 晶達解決方案：如何克服這些挑戰 / Litemax Solutions: How We Overcome Them

晶達光電針對 QSR 戶外應用，推出專為極端環境設計的高亮防水顯示系統與節能顯示架構。

核心技術包括：

- 超高亮顯示 (2500–4000 nits) :
採用 Litemax 獨家「High Efficient LED Backlight」技術，確保在強日光下依然清晰可見。
- 寬溫與防黑化設計 (-30°C ~ 80°C) :
防黑化 Tni 面板結合特殊導熱材料，防止畫面失真。
- 全機防水防塵 (IP65) 結構 :
適用於戶外雨天或油煙環境，具抗 UV 塗層與防結露設計。
- ECOgreenpixel 節能架構 :
比傳統顯示減少 30% 以上耗電量，結合動態亮度控制 (Adaptive Dimming) 。
- 智慧遠端監控 (AI Display Management) :
可即時監控亮度、溫度與電力狀態，降低維護成本。

For outdoor QSR applications, Litemax provides display systems engineered for extreme environments.

Key technologies include:

- Ultra High Brightness (2500–4000 nits) using proprietary LED backlight technology for superior sunlight readability.
- Wide Temperature & Anti-Blackening Design (-30°C ~ 80°C) with thermal dispersion materials.
- IP65 Weatherproof Construction with anti-UV and anti-condensation protection.
- ECOgreenpixel Architecture reduces power consumption by over 30% via adaptive dimming.
- AI Display Management System for real-time monitoring of brightness, temperature, and power health.

4. 實際應用案例 / Case Study

歐美主要連鎖速食品牌於北美與中東地區導入晶達高亮戶外顯示解決方案，
用於 Drive-Thru 數位菜單板：

- 系統全天候運作，於夏季高溫達 40°C 下仍維持穩定亮度。
- 每台顯示器年節電超過 1200 度電，減碳約 600 公斤。
- AI 遠端監控平台自動調整亮度與排程維護。



Leading global QSR chains in North America and the Middle East have adopted Litemax high-brightness displays for their drive-thru menu boards:

- Reliable performance in 40°C high-temperature operation.
- Energy savings of over 1200 kWh per unit annually, reducing ~600 kg CO₂.
- AI-based monitoring ensures optimal brightness and proactive maintenance.

5. 結論與展望 / Conclusion & Outlook

隨著智慧餐飲的快速成長，戶外數位看板將持續成為品牌體驗的重要接觸點。晶達光電憑藉高亮、省能、智慧化的顯示技術，將持續協助全球 QSR 品牌在極端環境中展現穩定與永續價值，邁向綠色智慧顯示新時代。

As digital transformation accelerates in the QSR sector, outdoor digital signage will remain a critical touchpoint for brand engagement. Litemax continues to lead with high-brightness, energy-efficient, and intelligent display solutions—empowering QSR brands worldwide to achieve reliability, clarity, and sustainability in every environment.