

2022 OLED Component and Material Report

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2. OLED Industry Issue Analysis

2.2 IT Line Investment Status and Prospect

Summary of IT Line Investment Forecasts by Company

Company	Line		Gen	Capacity (K/month)	Substrate	TFT	OLED Method	Possibility	Note
SDC	-	-	8.5G	-	-	-	-	-	-
LGD	E-6	Phase 3	6G ½	-	-	-	-	-	-
	E-6	Phase 4	6G ½	-	-	-	-	-	-
BOE	B12	Phase 3	6G ½	-	-	-	-	-	-
	B16	-	8.6G ½ or ¼	-	-	-	-	-	-
CSOT	T8	-	8G	-	-	-	-	-	-
Tianma	Xiamen	Phase 2	6G ½	-	-	-	-	-	-
Visionox	V3	-	6G ½	-	-	-	-	-	-
	V4	-	8.6G ½	-	-	-	-	-	-

Source: UBI Research DB

3. Development of Components and Materials for Foldable Devices and Industry Status

3.3 Foldable OLED Business and Exhibition Trends by Panel Maker

■ Samsung Display

- The ‘Galaxy Z Fold 4’ to be released by Samsung Electronics is expected to be the same as its predecessor ‘Galaxy Z Fold 3’.
- For the Cover Window, Ultra Thin Glass (UTG) with a thickness of 30 um is used as it is and protective films will be attached to the top and bottom. It was expected that the *****to reduce the thickness of the panel, but it is expected to be used as it is to *****.
- Like its predecessor, the Galaxy Z Fold 4 will also have ***** technology.
- *****is used for the lower protective film of the substrate.
- Electro-magnetic resonance (EMR) pen is expected to be applied to the Galaxy Z Fold4. Two digitizers are expected to be placed on the left and right as in the previous model.
- There was talk that *****would disappear or be replaced with a new material, but ***** is expected to be adopted as it is.

Foldable OLED for ‘Galaxy Z Fold4’

Picture	Layer	Thickness	Supplier
	Protective film	~10um	*****
	UTG	30um	*****
	Protective film	~10um	*****
	Organic layer	~10um	*****
	Anode	~10um	*****
	Cathode	~10um	*****
	Buffer layer	~10um	*****
	Substrate	~10um	*****
	Buffer layer	~10um	*****
	Cathode	~10um	*****
	Anode	~10um	*****
	Protective film	~10um	*****

Source: UBI Research DB

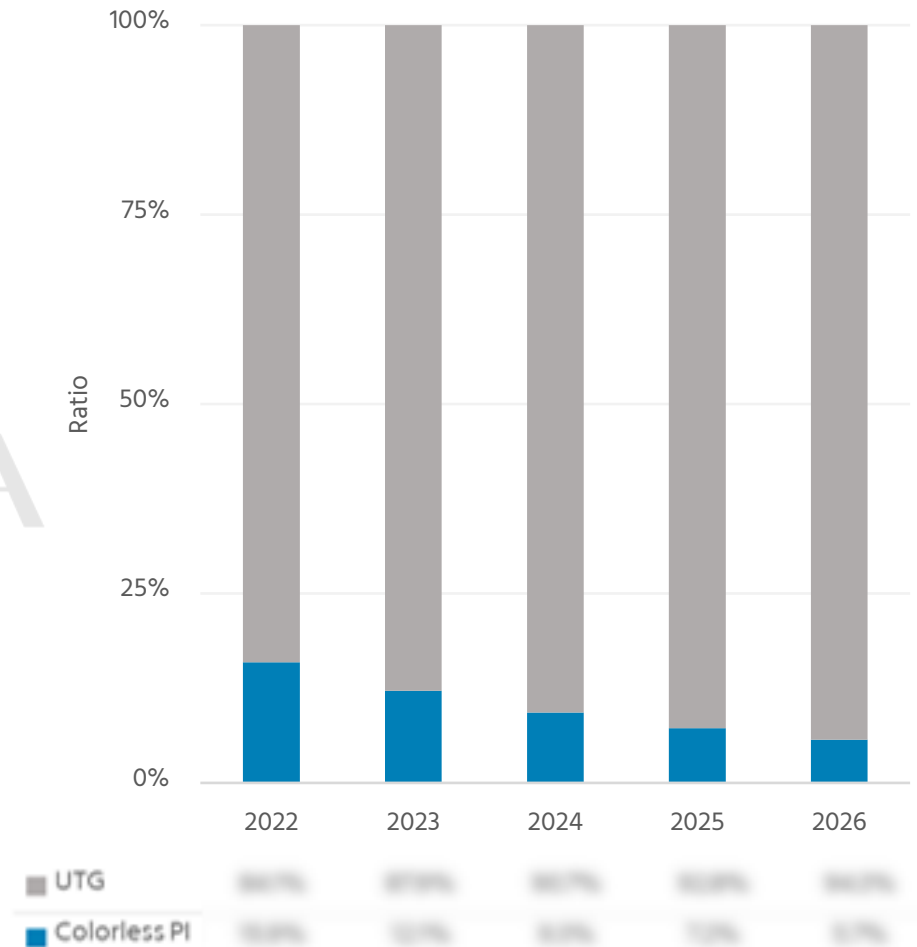
3. Development of Components and Materials for Foldable Devices and Industry Status

3.5 Colorless PI

Future Outlook

- UTG is leading the Cover Window market for foldable OLED. Colorless PI is being used in part, but it is unlikely that there will be much demand in the future.
- Samsung Display, which is leading the foldable OLED market, is mass-producing panels only with UTG. Samsung Electronics is also applying only UTG to foldable phones.
- Samsung Display is expected to develop foldable OLED with UTG in the future. Although colorless PI can be used for slidable OLED, Samsung Display announced in SID 2022 that it will use UTG if mass-produced.
- Although Chinese panel makers are mass producing a small amount of foldable OLED with colorless PI, the proportion in the overall market is low. Chinese panel makers are also developing foldable OLED with UTG, so the market share of colorless PI for foldable phones will be low.
- Although colorless PI may be used for foldable IT devices, the quantity and application schedule are unknown, and even if mass-produced, it will not occupy a large share in the overall foldable OLED market.

Forecast of Market Share for Cover Windows for Foldable Phones



Source: UBI Research DB

4. Main Development Status Analysis of OLED

4.2 Pol-less

■ Samsung Display

- In 2025, it is expected that the photo process will be reduced once more by introducing ***process instead of the ***for the *****.
- In this case, the photo process will be applied **in total to ***and ***

Samsung Display's Pol-less Development Prospects

Year	2021	2022	2023~2024	2025
Structure	Multi-layer	-	-	-
	Single layer	Low reflection (LDR) type	Highly reflective (HRR) type	Highly reflective (HRR) type
	Substrate	-	Reflection control (RC) type	Reflection control (RC) type
	Substrate	-	-	-
Supplier	Multi-layer (Samsung Display, LG Display, Samsung Display, Samsung Display, Samsung Display)	-	Multi-layer (Samsung Display)	-
	Single layer (Samsung Display, Samsung Display)	-	-	-
Model	Single layer	Single layer	Single layer (Highly reflective)	Single layer (Highly reflective)
Photo mask	1 mask	-	1 mask	1 mask

Source: UBI Research DB

5. Analysis and Forecast of OLED Panel Makers' Mass Production Capacity

5.1 Line Status by Panel Maker

BOE B7

- Mobile device customers for the B7 line include ***, ***, and ***, while smart watch customers include *** and ***
- Various technologies such as ***, ***, ***, and *** are being tried.
- It has an *K LTPO capacity at Ph-3 and plans to expand to **K in 2022.
- The average monthly operation rate of B7 in the first half of 2022 was analyzed to be **%.

Monthly Operation Rate of BOE B7 in the First Half of 2022

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Average
Operating Ratio							

Source: UBI Research DB

BOE B11

- In the B11 line, mobile device customers include ***, ***, ***, and ***.
- Apple's iPhone 13 panel mass production started at the end of October 2021. It is preparing for mass production of a 6.1-inch LTPS model for iPhone 14.
- It has a **K LTPO capacity and plans to expand **K in 2022.
- The average monthly operation rate of B11 in the first half of 2022 was analyzed to be **%.

Monthly Operation Rate of BOE B11 in the First Half of 2022

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Average
Operating Ratio							

Source: UBI Research DB

6. OLED Shipment Forecast

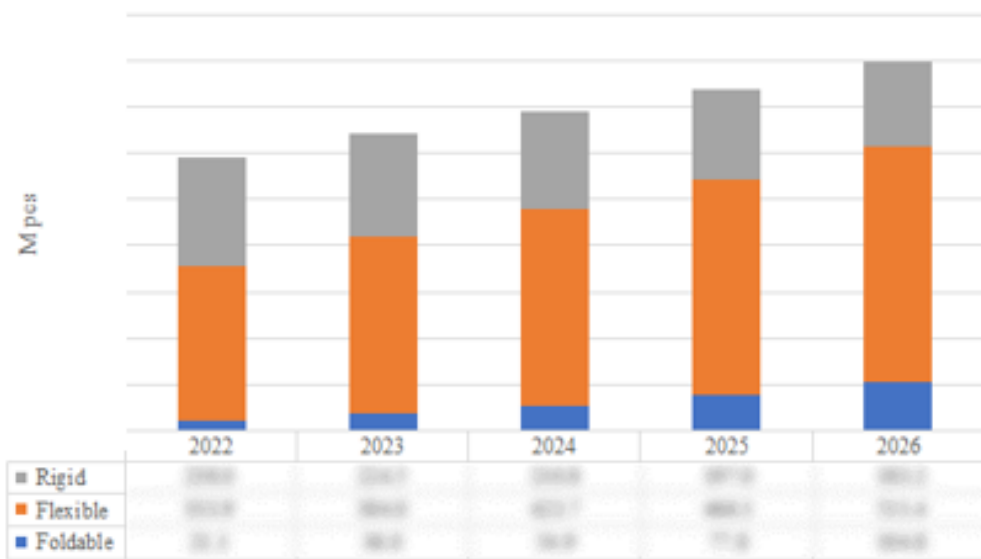
6.3 OLED Shipments for Smartphones

By Substrate

- All smartphone OLED shipments were classified into rigid, flexible, and foldable substrates.
- The shipment of flexible OLED in 2022 is expected to be *** million units and it is expected to ship *** million units in 2026 at an average annual growth rate of 11%. The expected shipment volume of foldable OLED in 2022 is *** million units and it is expected to form a market of *** million units in 2026 with an average annual growth rate of 49%. Rigid OLED shipments continue to decline and are expected to ship *** million units in 2022 and *** million units in 2026.

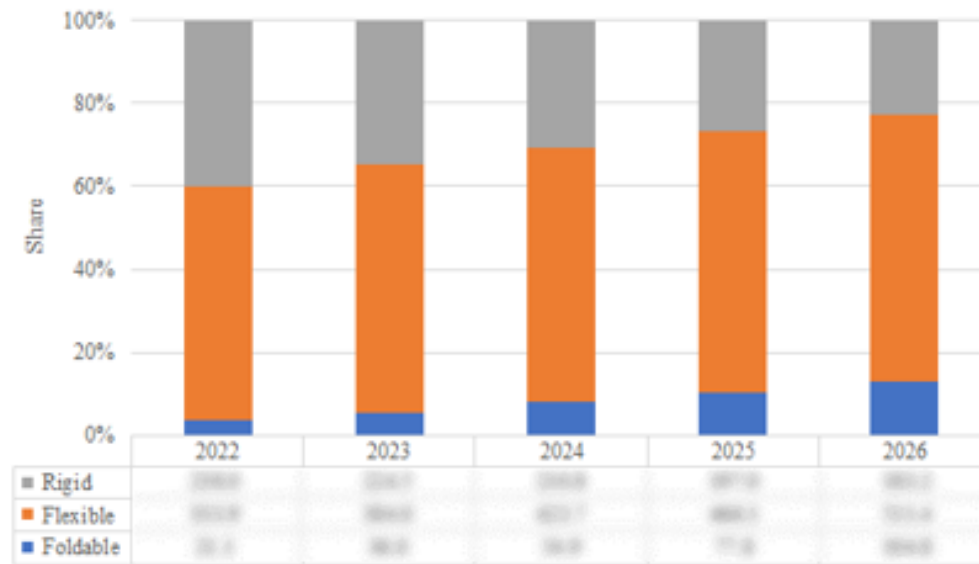


Shipment forecast by substrate for mobile device



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Shipment ratio forecast by substrate for mobile device



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