Exploring the Future: DRAM Market and Technology Outlook

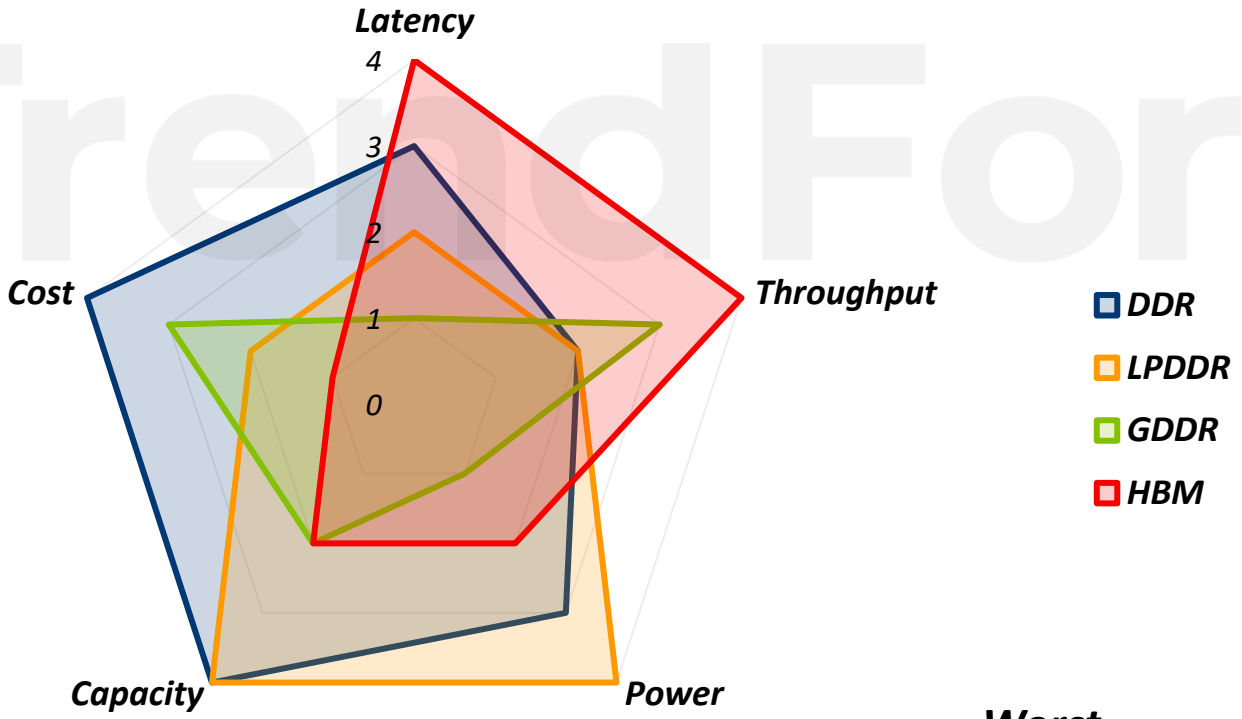
Presenter: Avril Wu/ Senior Vice President

TrendForce

FMS the Future of Memory and Storage

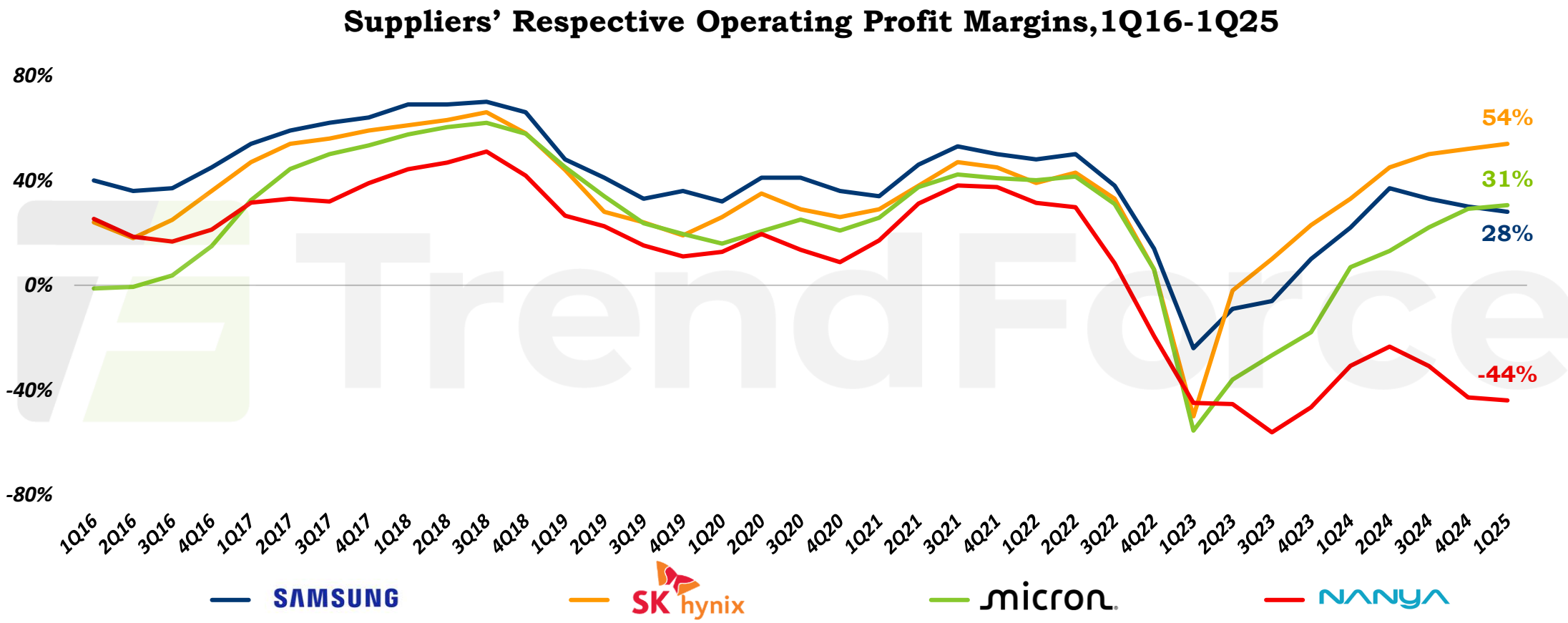
Comprehensive Evaluation of Different Memory Technologies

- ***LPDDR: The Efficiency Champion -*** *Designed for battery-powered devices, LPDDR minimizes power consumption with lower voltages and a narrow bus to enhance device battery life.*
- ***DDR: The Mainstream Workhorse -*** *Prevalent in PCs, and servers, balances performance, capacity, and cost. It improves with higher data rates and better power efficiency, offering solid performance for general use but with lower efficiency and bandwidth compared to LPDDR, GDDR, or HBM.*
- ***GDDR: The Speed Demon -*** *Used in graphics cards and gaming consoles, provide high bandwidth for rendering tasks. They feature a wide bus and high clock speeds but require active cooling due to higher power consumption and heat.*
- ***HBM: The Bandwidth King -*** *HBM, for high-performance computing and AI, offers unmatched bandwidth with stacked DRAM and an ultra-wide interface. Although power-efficient per bit transferred, its complex and costly manufacturing restricts its use to advanced AI and supercomputing.*



Source: TrendForce

Product Mix Makes Tremendous Difference on Suppliers' Profitability

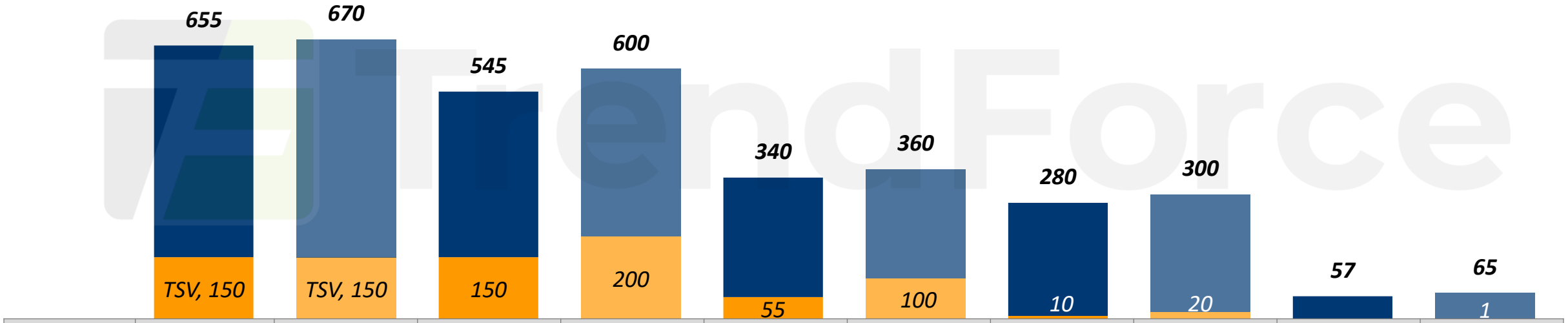


Source: TrendForce

Capacity Expansion Efforts Will Concentrate on HBM in 2026

- *Competition for HBM market share will intensify during 2025; HBM4 will be the key for 2026.*
- *The ratio of TSV over global capacity is expected to increase from around 19% at the end of 2025 to around 23% at the end of 2026.*
- *CXMT leads in DRAM capacity expansion, but its presence in the HBM market will remain small due to challenges related to R&D.*

Unit: Average k Wafers/Month



The end of	2025	2026	2025	2026	2025	2026	2025	2026	2025	2026
Wafer %	23%	22%	28%	33%	16%	28%	3%	6%	0%	2%
	SAMSUNG		SK hynix		micron		CXMT		NANYA	

Source: TrendForce

DRAM Technology Transitions to DDR5 (16Gb)

- *Major suppliers are focusing on developing DDR5 based on 1b/1beta and 1c/1gamma processes in 2025-2026. Samsung is likely to launch DDR5 products based on the 1c process from the end of 2025, though the production capacity of the 1c process will be prioritized for HBM4.*
- *CXMT launched DDR5 based on the G4 process in 1Q25, with performance close to that of the products from the three major suppliers' 1Y and 1Z processes.*
- *DDR5 with 6400 MT/s is gradually becoming the mainstream offering in 2025, and new products with 7200-8800 MT/s will be developed to meet demand beyond 2H26.*

Density	Nodes (nm)	Company	1Q25	2Q25	3Q25	4Q25	1Q26	2Q26	3Q26	4Q26
16Gb	1Y	SAMSUNG	4800-5600 MT/s				EOL			
		SK hynix	4800 MT/s				EOL			
	G4	CXMT	4800-6400 MT/s							
	1Z	micron	4800-5600 MT/s	EOL						
	1a/1alpha	SAMSUNG	★ 5600-6400 MT/s							
		SK hynix	★ 4800-6400 MT/s							
	1b/1beta	SAMSUNG	★ 5600-6400 MT/s							
		SK hynix			C/S		★ 7200 MT/s			
		micron	★ 5600-6400 MT/s							
	1c/1gamma	SK hynix		C/S	★ C/S: 7200 MT/s	C/S: 8000 MT/s			C/S: 8800 MT/s	5600-6400 MT/s
		micron		C/S	★		C/S: 8000 MT/s			5600-7200 MT/s

Note: C/S=Customer Sample

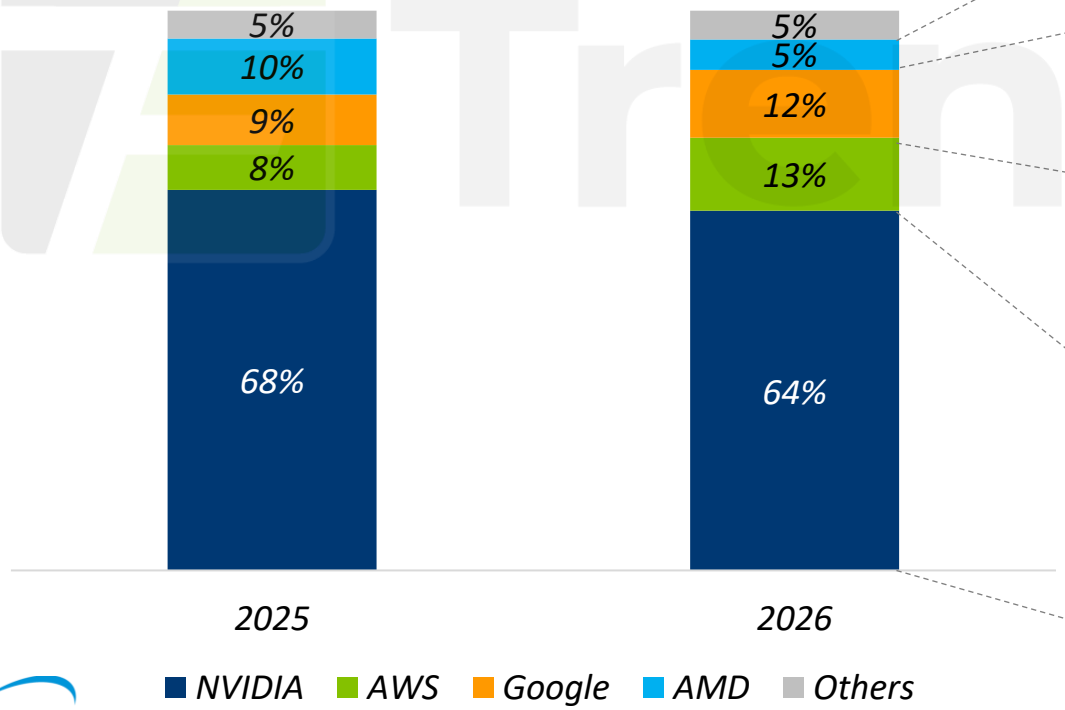
★ *means applying EUV technology*

Source: TrendForce

ASICs Will Start to Consume Bigger Proportion of HBM Output in 2026

- *CSPs' in-house ASICs will show stronger shipment momentum in 2026 due to TCO considerations and a higher demand for AI inference.*
- *Meanwhile, HBM density per ASIC chip will increase. It is worth noting that Rubin's per die consumption remains the same as Blackwell's.*
- *In 2026, NVIDIA will be the primary driver of HBM4 consumption, while other tech companies will concentrate their demand more on the HBM3e category.*

Distribution of HBM Demand Among AI Chip Makers



AI Chip Makers' Main Offerings

CSPs	AI Chip	HBM Type	2025	2026
AMD	MI325, MI350	HBM3e 12hi	V	
	MI375	HBM3e 12hi		V
Google	TPU v5 tra	HBM2e 8hi	V	
	TPU v6 tra	HBM3e 8hi	V	V
	TPU v7	HBM3e 12hi		V
aws	Trainium v2	HBM3 12hi	V	
	Trainium v2 T1	HBM3e 8hi	V	
	Trainium v2 T2	HBM3e 12hi	V	V
	Trainium v3	HBM3e 12hi		V
NVIDIA	B200, GB200	HBM3e 12hi	V	
	B300, GB300	HBM3e 12hi	V	V
	R100, VR200	HBM4 12hi		V

Source: TrendForce

Beyond Demand: How Supplier HBM/DRAM Capacity Shifts Affect Pricing

- *In 2025 - DRAM prices show resilience due to (1) partial demand pulled in, and (2) EOL for legacy products.*
- *In 2026 - HBM3e will show price weakness in 1H26. As more production capacity will be allocated to convention DRAM, the overall trend will likely shift down during 1H26.*

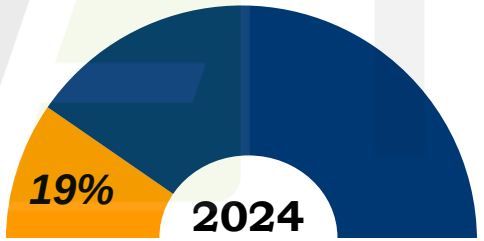
QoQ %	Year	Q1	Q2	Q3	Q4
2025	Blended DRAM ASP	**Conventional DRAM:** down 8~13% **HBM Blended:** down 0~5%	**Conventional DRAM:** up 5~10% **HBM Blended:** up 5~10%	**Conventional DRAM:** up 10~15% **HBM Blended:** up 15~20%	**Conventional DRAM:** up 0~5% **HBM Blended:** up 5~10%
	Sufficiency	0%	-2%	-3%	-1%
2026	Blended DRAM ASP	**Conventional DRAM:** down 3~8%	**Conventional DRAM:** down 0~5%	**Conventional DRAM:** mostly flat	**Conventional DRAM:** down 0~5%
	Sufficiency	4%	3%	0%	-1%

Source: TrendForce

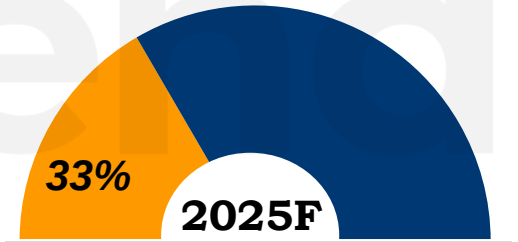
HBM Contribution to Overall DRAM Market Value Grows Rapidly

- *With or without Samsung being qualified by NVIDIA for its HBM3e or HBM4, price pressure on both products will become more apparent in 2026 as output is expected to exceed consumption from suppliers' profit perspective.*
- *However, despite HBM's higher cost per Gb, its revenue contribution is expected to keep growing.*

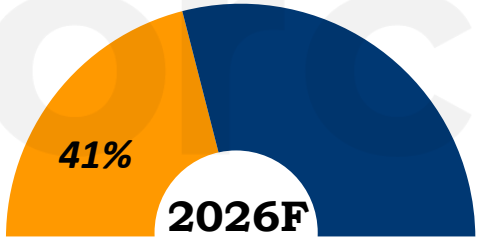
Percentages Held by HBM Products in Total DRAM Bit Output and Total DRAM Revenue, 2024-2026



HBM Out of Total DRAM	
Revenue	Output
19%	5%



HBM Out of Total DRAM	
Revenue	Output
33%	8%



HBM Out of Total DRAM	
Revenue	Output
41%	9%

Source: TrendForce

Conclusion

1. ***HBM Growth Driven by AI:*** *HBM is experiencing significant growth, primarily fueled by the demands of AI. Its share of total DRAM revenue is projected to expand from 8% in 2023 to 33% in 2025. In 2026, NVIDIA is expected to be the main consumer of the next-generation HBM4.*

2. ***Intensifying Supplier Competition:*** *The competition for HBM market share among major suppliers like Samsung, SK hynix, and Micron is set to intensify through 2025. SK hynix is forecast to allocate the largest portion of its wafer capacity to HBM by 2026. Looking ahead, gaining an edge in HBM4 technology will be crucial for market leadership in 2026.*

3. ***Shift to Advanced Technologies:*** *The industry is transitioning toward DDR5, with major suppliers focusing on developing the 1b/1beta and 1c/1gamma processes in 2025-2026. While DDR5 with speeds of 6400 MT/s will become mainstream in 2025, faster products reaching 7200-8800 MT/s are being developed for demand after the second half of 2026.*

4. ***DRAM Price Volatility Expected:*** *DRAM prices are expected to show resilience and increase in 2025. However, in the first half of 2026, prices for conventional DRAM are likely to weaken as more production capacity is allocated back to it. HBM3e may also experience price weakness in early 2026.*

Source: TrendForce

TrendForce & TRI Research Areas

- IC
- Memory
- Consumer Electronics
- Green Energy
- Display Panel
- Smartphones & Apps
- LED
- Innovative Technology
- Intelligent Living
- Industry 4.0
- Automotive Technology
- AI
- Communication, Broadband & Networking
- Gov. & Ent. Consulting Service
- Cloud Computing & IoT

Sales & Services

Semiconductor Research

DRAM, NAND Flash, Foundry

SR_MI

SR_MI@TrendForce.com

Green Energy Research

Solar PV

GER_MI

GER_MI@TrendForce.com

Optoelectronics Research

Micro LED, Mini LED, VCSEL, UV, Video Wall, Lighting

OR_MI

OR_MI@TrendForce.com

Display Research

TFT-LCD , OLED , Smartphone , Tablet , NB , Monitor/AIO , TV

DR_MI

DR_MI@TrendForce.com

ICT Application Research

Communication & Broadband, Consumer Electronics, Innovative Technological Applications, Automotive, Industry 4.0, Gov. & Ent.

TRI_MI

TRI_MI@TrendForce.com

Thank You

To find out more about TrendForce, scan the QRCode below.

Or visit the URL for further information.

TrendForce

English
www.trendforce.com

Traditional Chinese
www.trendforce.com.tw

Simplified Chinese
www.trendforce.cn