THE PCB SUPPLY CHAIN

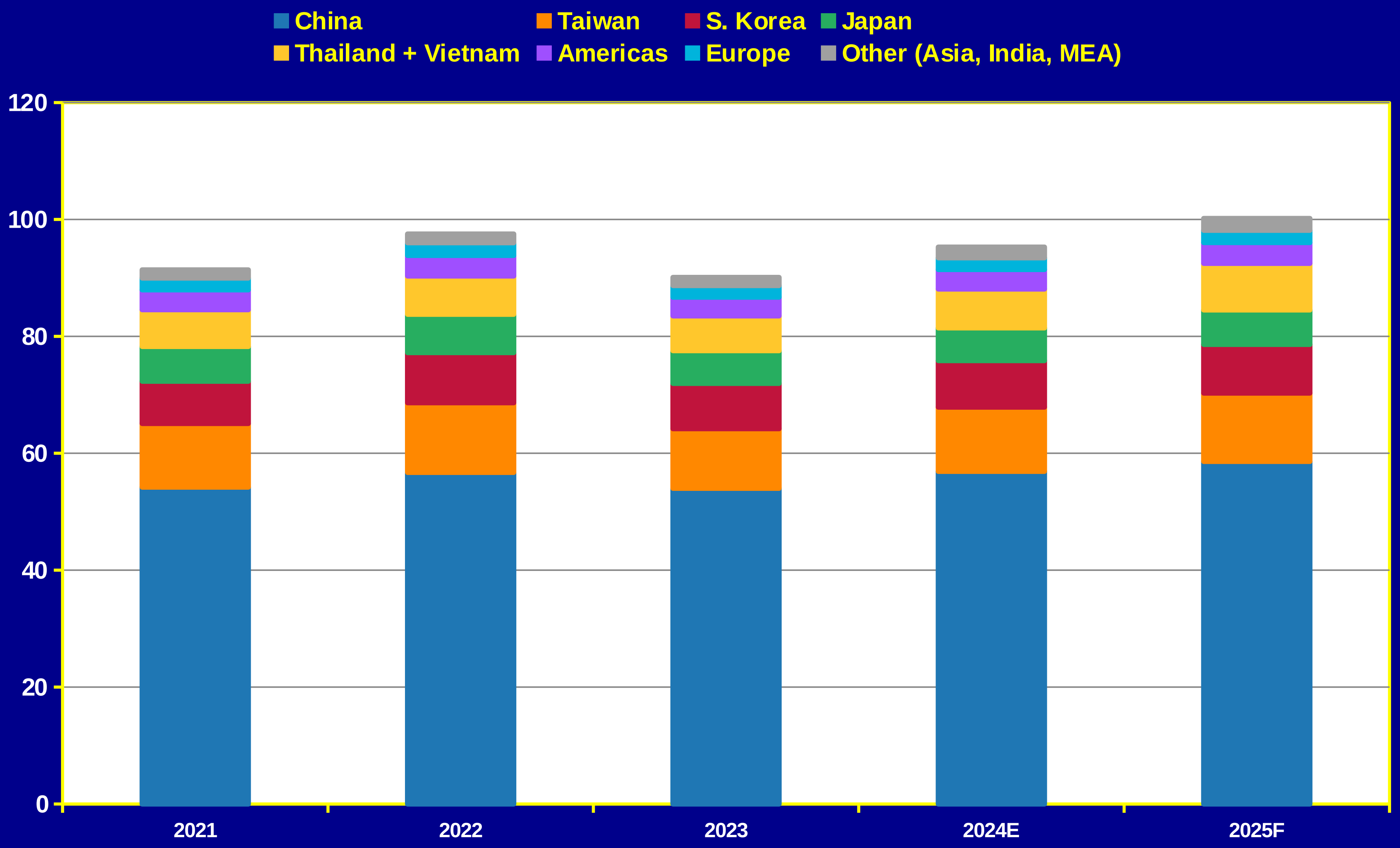
Market Conditions · Forecasting · Opportunities

39 Sectors · 389 Companies · 25+ Years of Composite Data · Through Q2 2026

PCB as Epicenter · Real Composite Data · Real Growth Rates · Real Cycle Signals

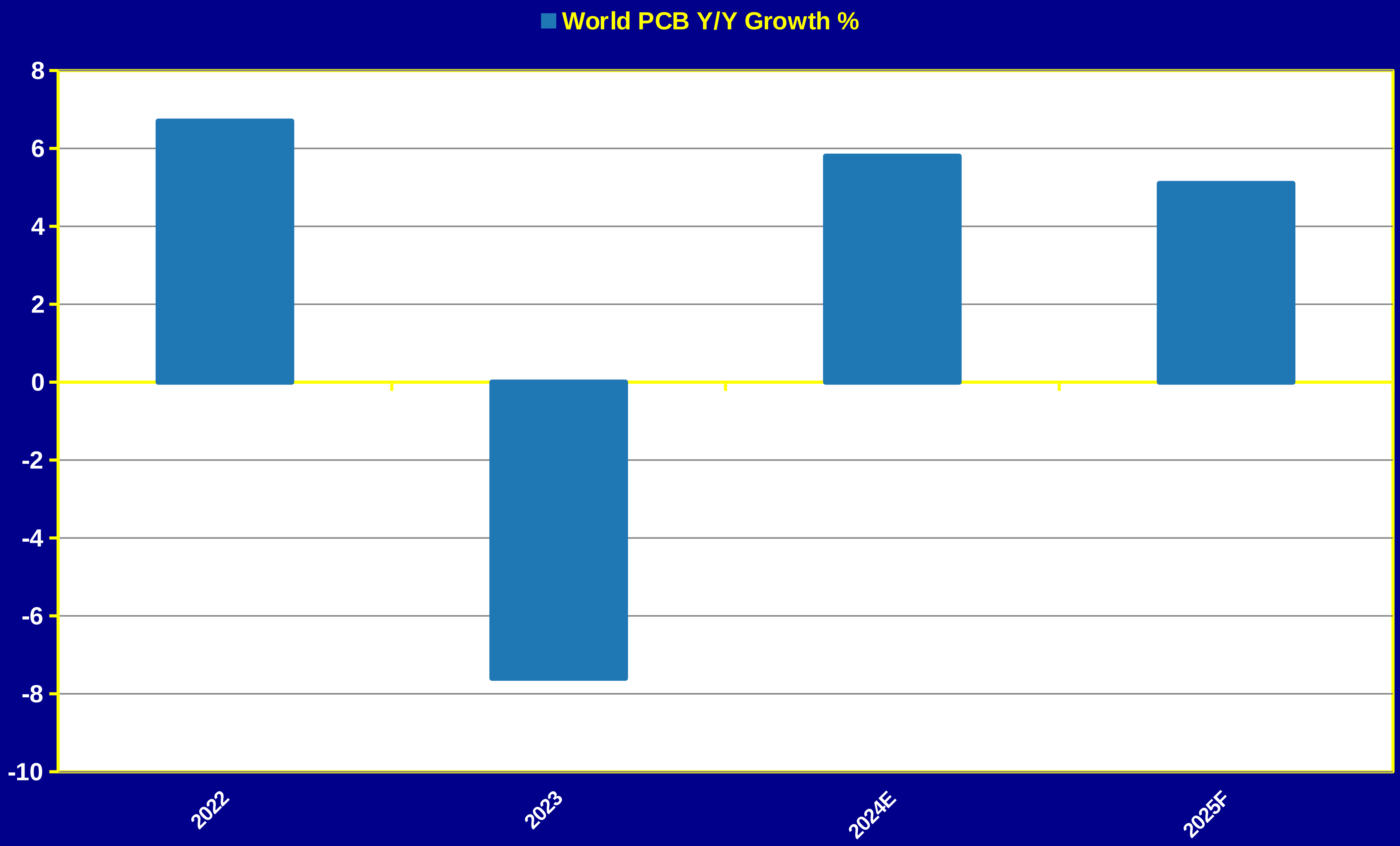
Custer Contexo Group · Customer Presentation · September 2026

World PCB Output by Location | 2021-2025F (US$B)



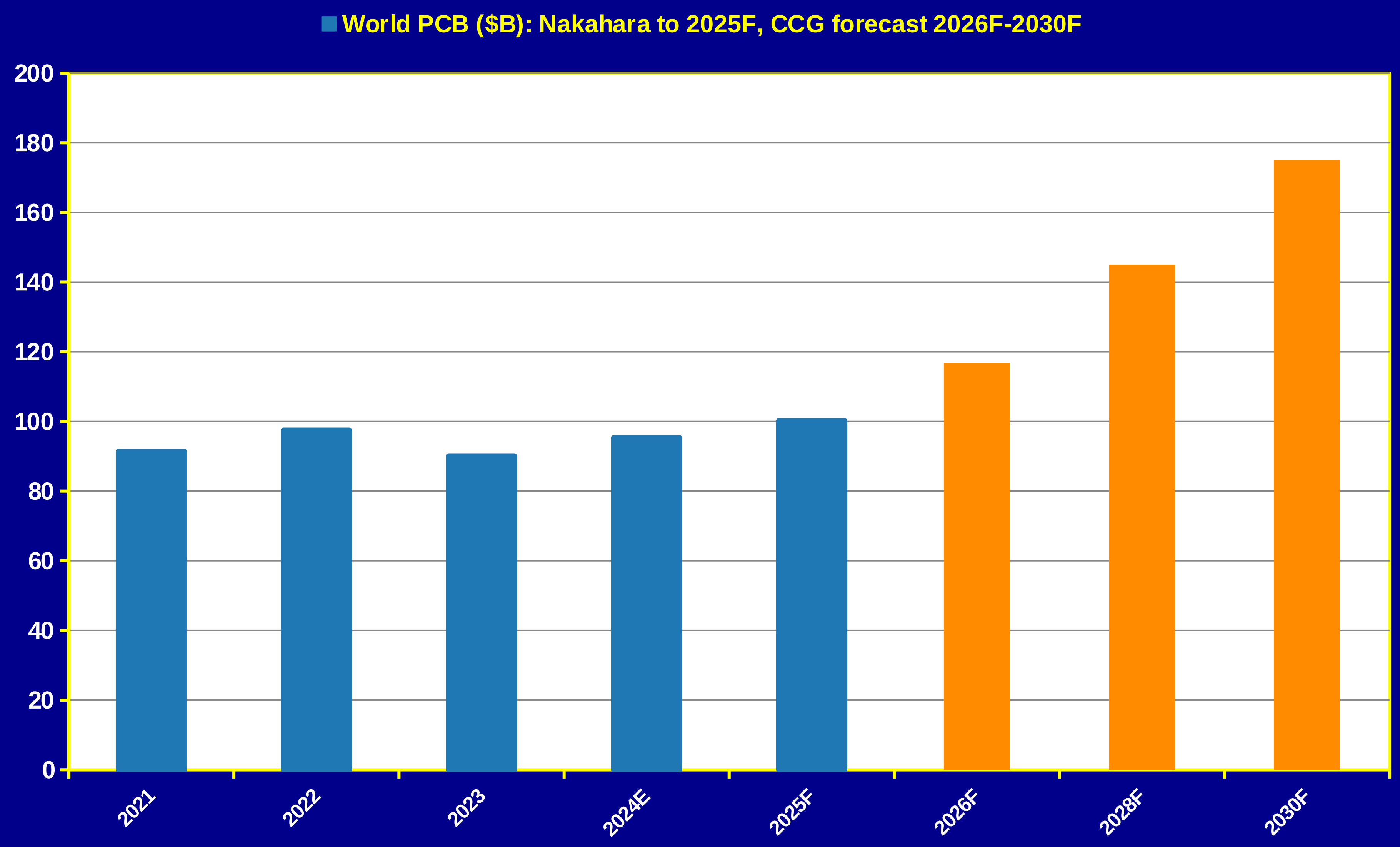
Source: Dr. H. Nakahara, N.T. Information Ltd (World PCB Output, Mar 2025; ~$8B is assembly by PCB makers). 2024E $95.3B, China $56.9B (60%). 2025F = his Mar 2025 forecast; NTI Digest (Apr 2026) estimates 2025 at ~$100B.

World PCB Output Y/Y Growth | 2022-2025F (%)



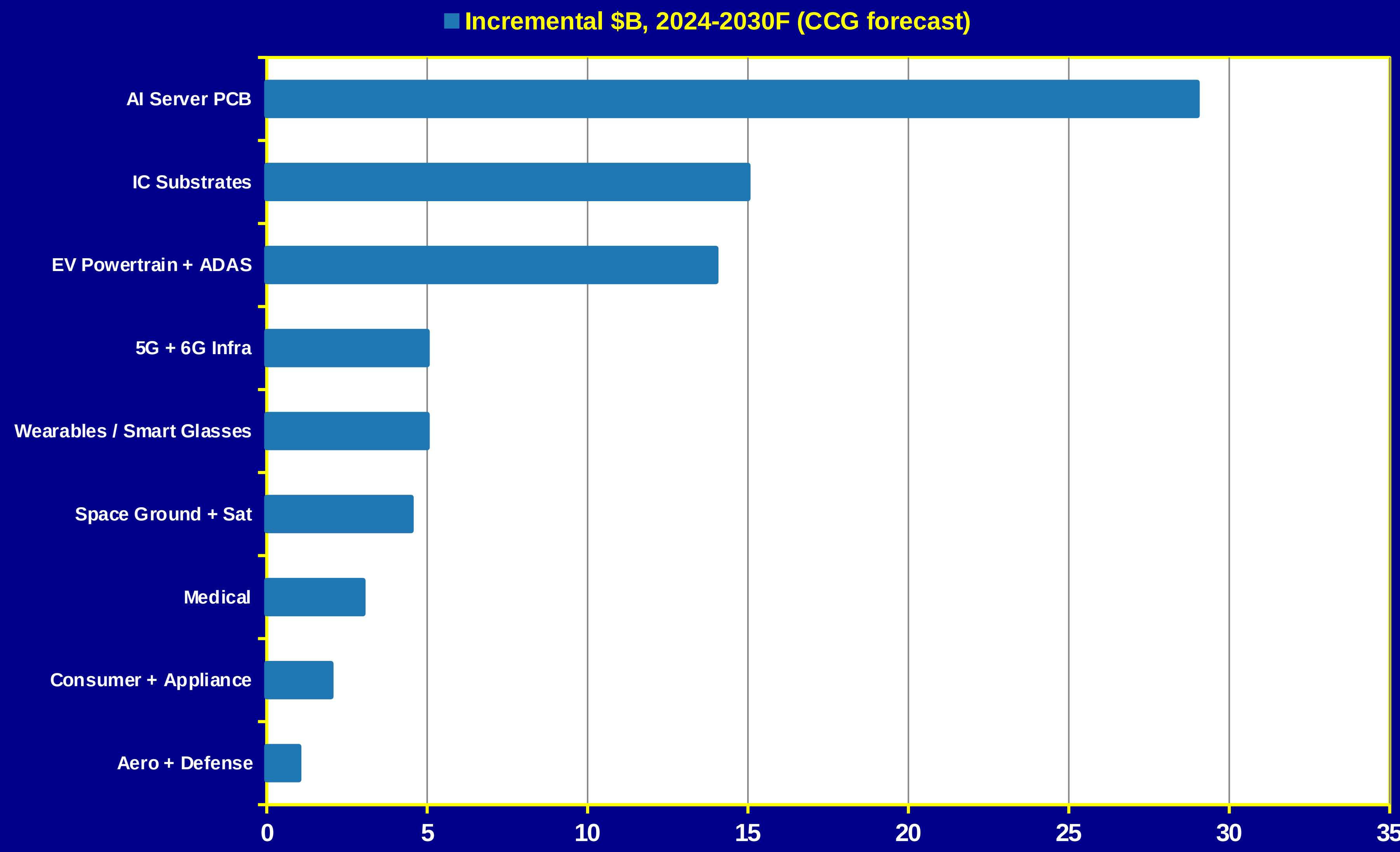
Source: Dr. H. Nakahara, N.T. Information Ltd (World PCB Output, Mar 2025). 2022 +6.7%, 2023 -7.6%, 2024E +5.8%, 2025F +5.1%. NTI Digest (Apr 2026) estimates 2025 at ~$100B.

World PCB Market Outlook | 2021-2030F (US$B, CCG Forecast)



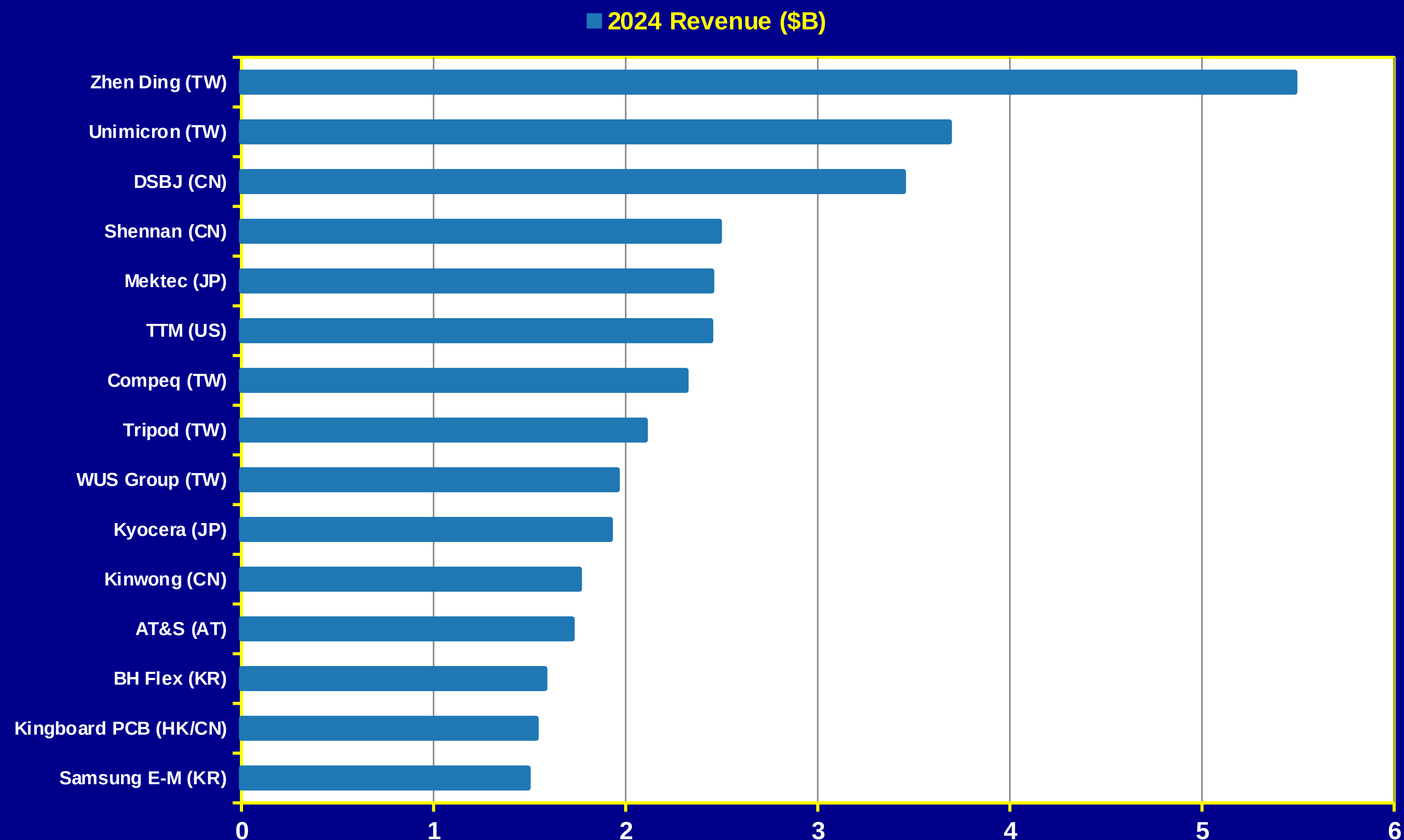
Source: 2021-2025F Dr. H. Nakahara, N.T. Information Ltd (World PCB Output, Mar 2025). 2026F-2030F (orange): CCG forecast (Prismark/CCG growth model), $116.8B (2026F), $145B (2028F), $175B (2030F), about 12%/yr from 2025F.

Next ~$80B of PCB Growth by Opportunity | 2024-2030F (US$B, CCG Forecast)



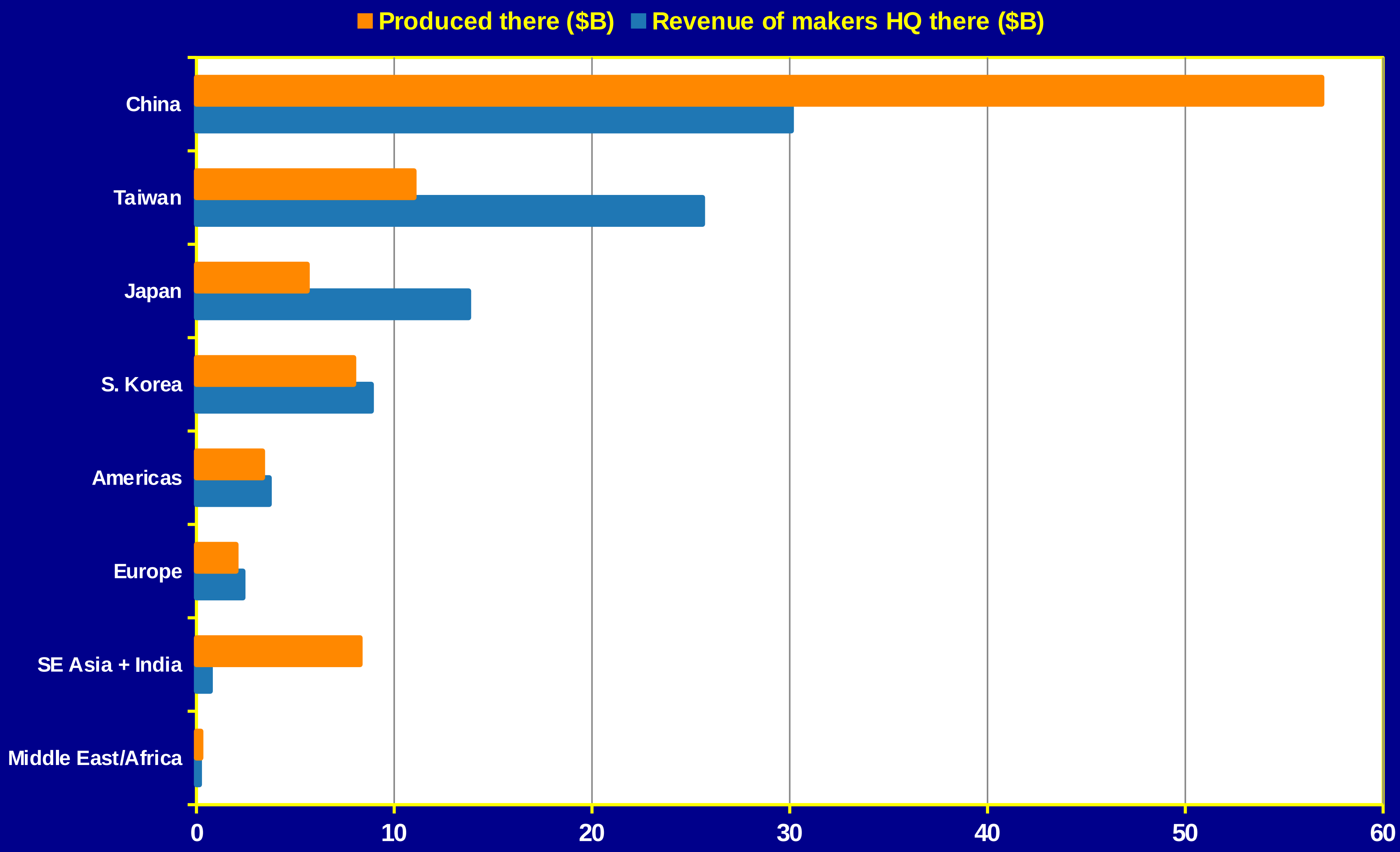
Source: Custer Contexo Group PCB growth-opportunity model. Total $78.5B, in line with the CCG 2030F forecast ($175B) less 2024 output ($95.3B, Nakahara). AI server PCB, IC substrates and EV powertrain + ADAS = $58B, 74% of the increase.

Top 15 Global PCB Makers | 2024 Revenue (US$B, Nakahara NTI-100)



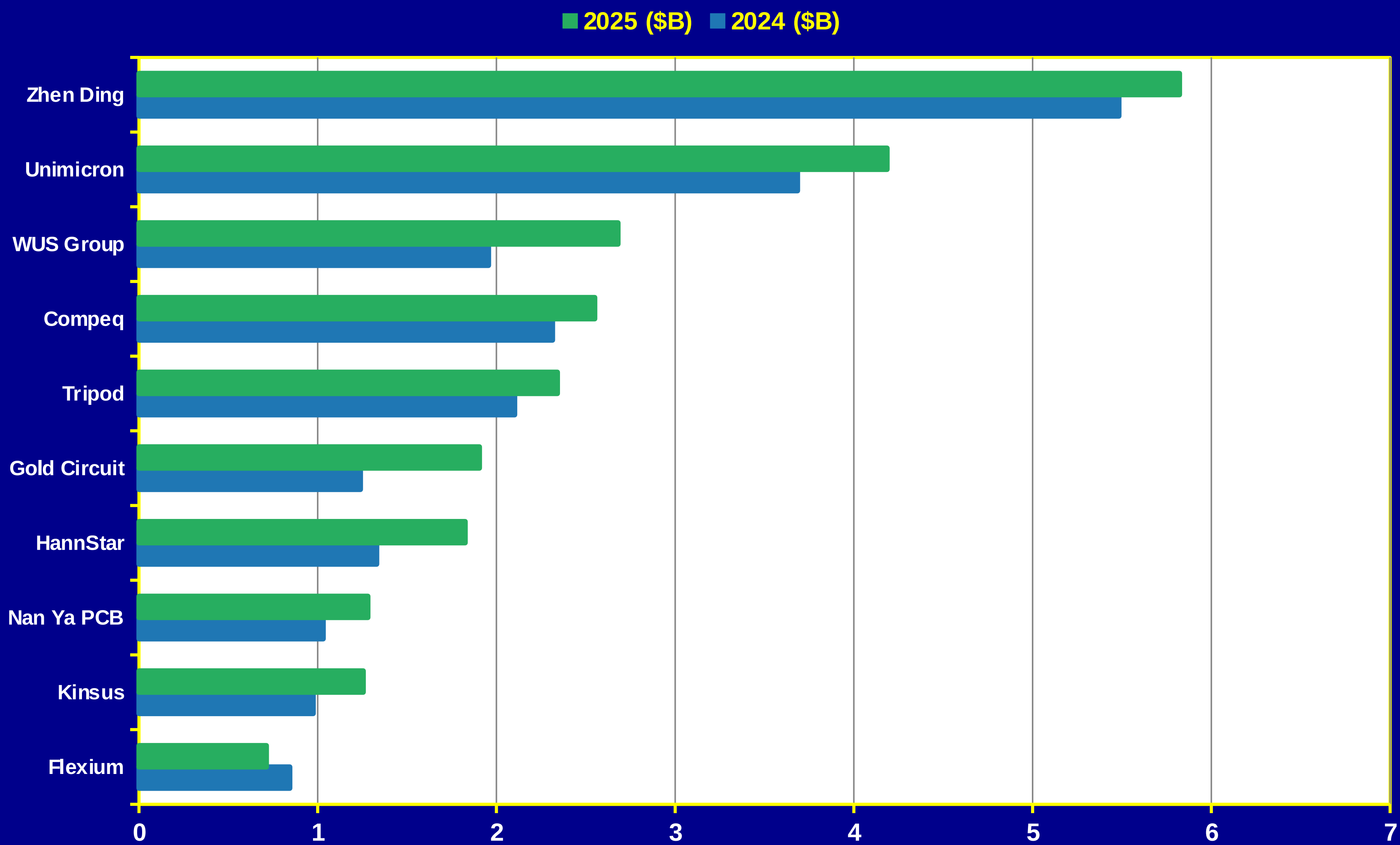
Source: Dr. H. Nakahara, NTI-100 2024 Table 2 (N.T. Information Ltd, July 2025), by maker nationality. Top 30 = $52.5B; all 159 makers >$100M = $85.1B (+9.3%). Zhen Ding includes Avary.

World PCB | Maker HQ vs Production Location 2024 (US$B)



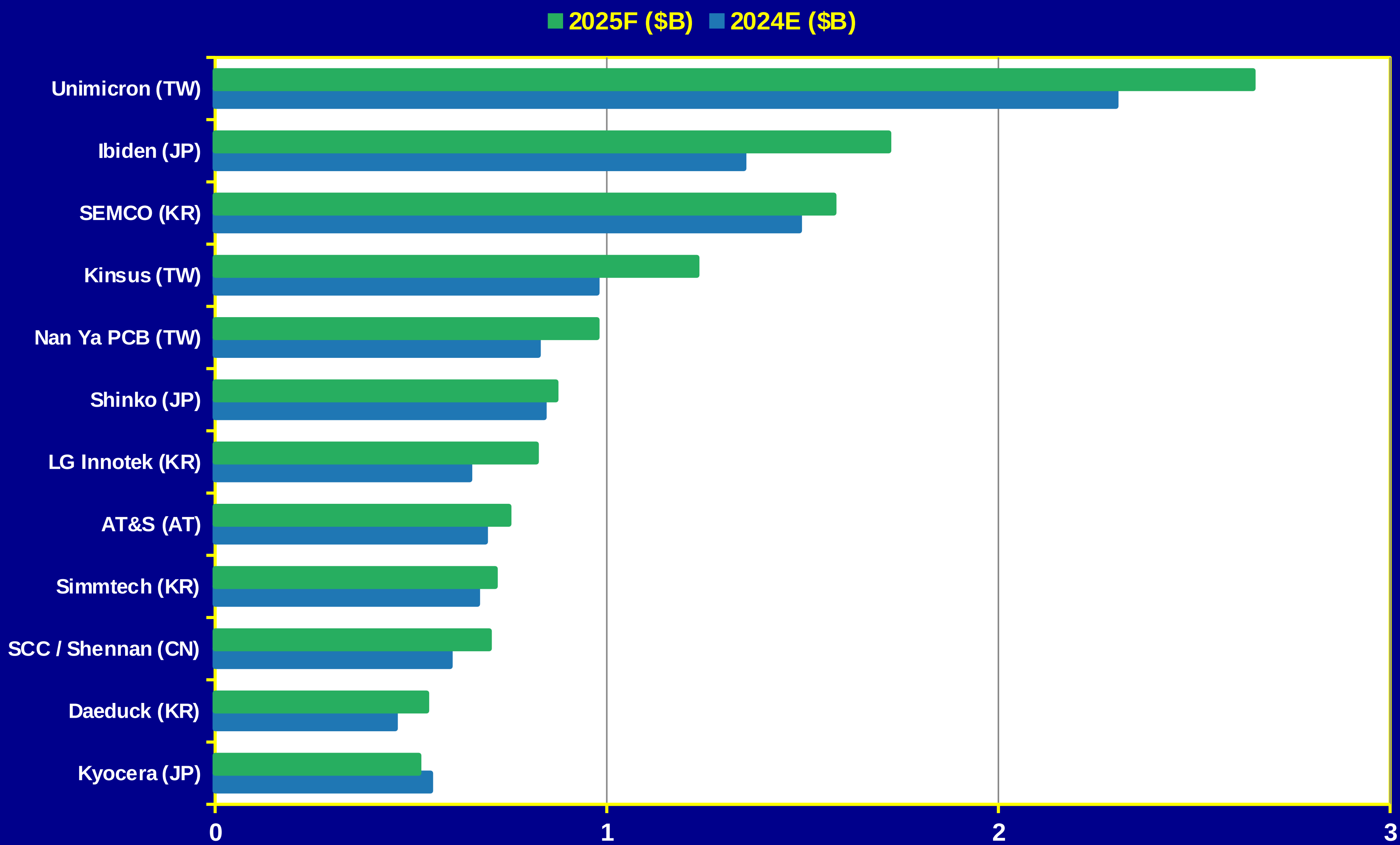
Source: Nakahara NTI-100 2024 Table 8 (159 makers >$100M, $85.1B) and NTI World PCB Output 2024E ($95.3B). Taiwan makers earn $25.6B; $11.0B of PCBs are made in Taiwan (2.3x). HQ = N. America / Middle East / SE Asia; location = N.+S. America / ME+Africa / Thailand, Vietnam, other Asia+India.

Taiwan PCB Makers | 2024 vs 2025 Revenue (US$B, Nakahara Final)



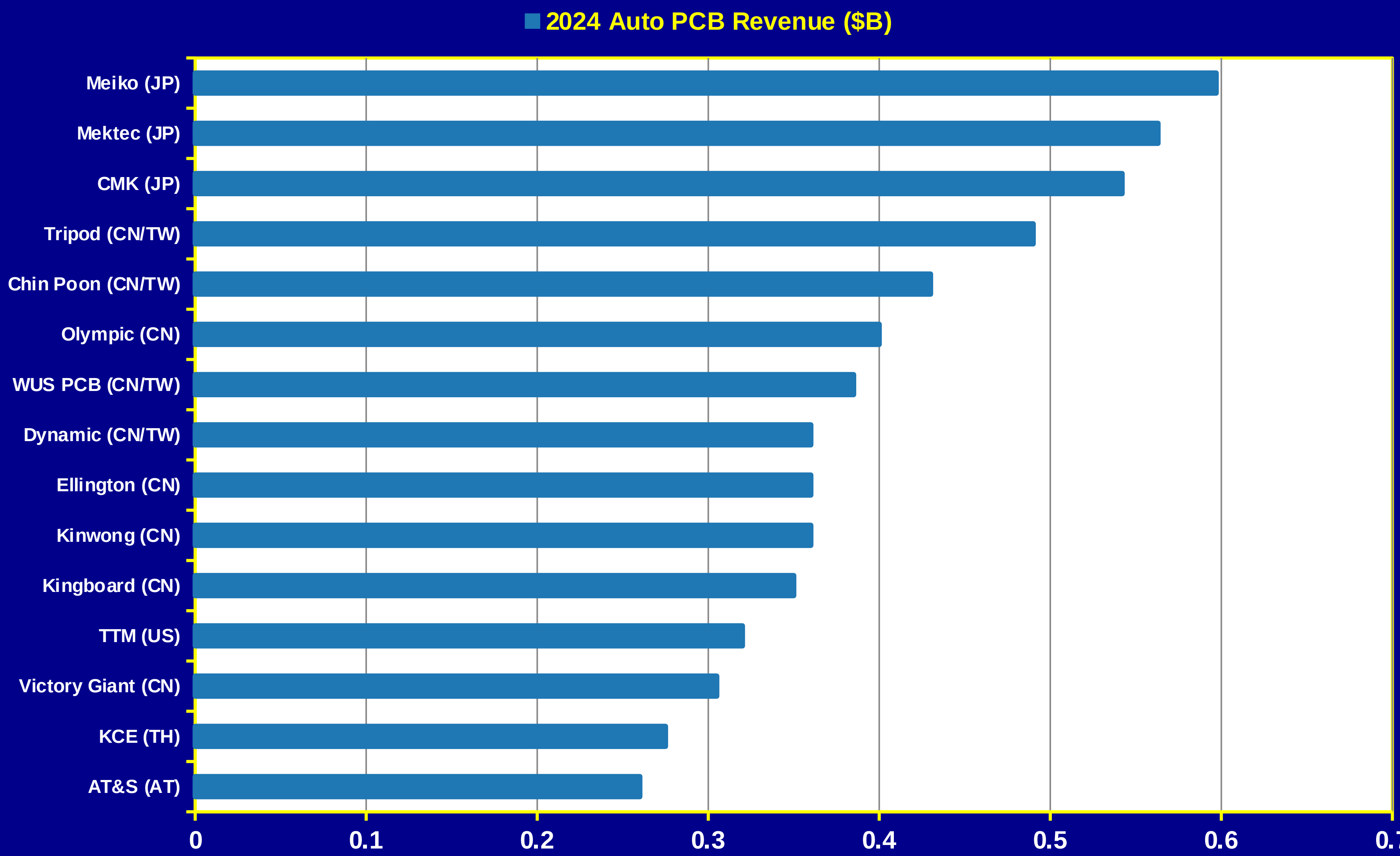
Source: Dr. H. Nakahara, Top Taiwan PCB Makers in 2025 (Final), NTI Digest Apr 2026, at NT$31.35/US$. Top 10 shown. 26 makers: $25.4B -> $29.5B, +16.1% (Table 8 puts 2024 at $25.6B). Fastest of the top 10: Gold Circuit +54%; Flexium -15%.

IC Package Substrate Makers | 2024E vs 2025F Revenue (US$B)



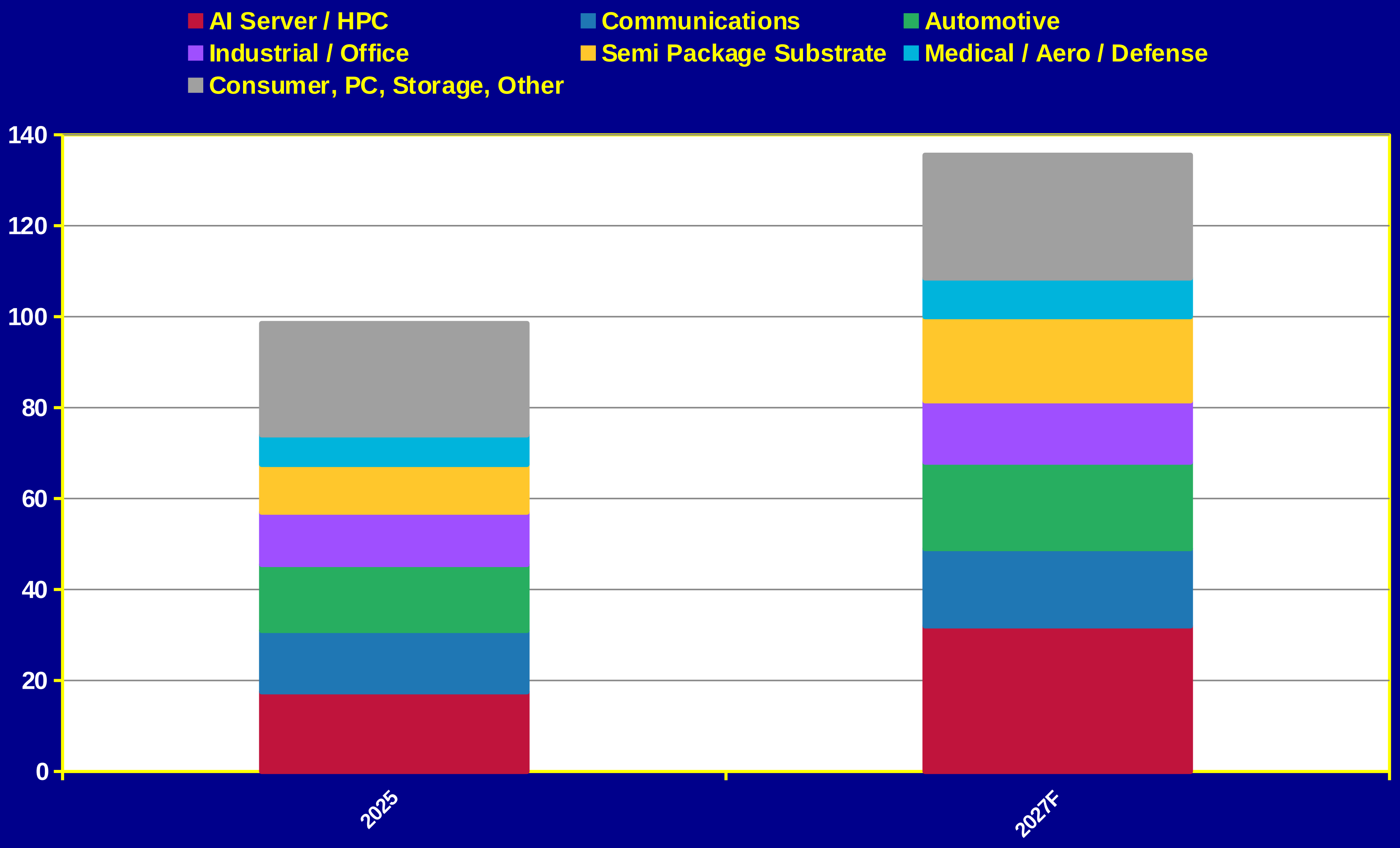
Source: Dr. H. Nakahara, Top 20 Organic IC Substrate Makers, Estimated (N.T. Information Ltd, Nov 2025; marked 'to be updated'). Top 12 shown. World organic substrate ~$14.3B (2024E) -> $16.2B (2025F), +13.9%.

Automotive PCB Makers | 2024 Auto Revenue (US$B)



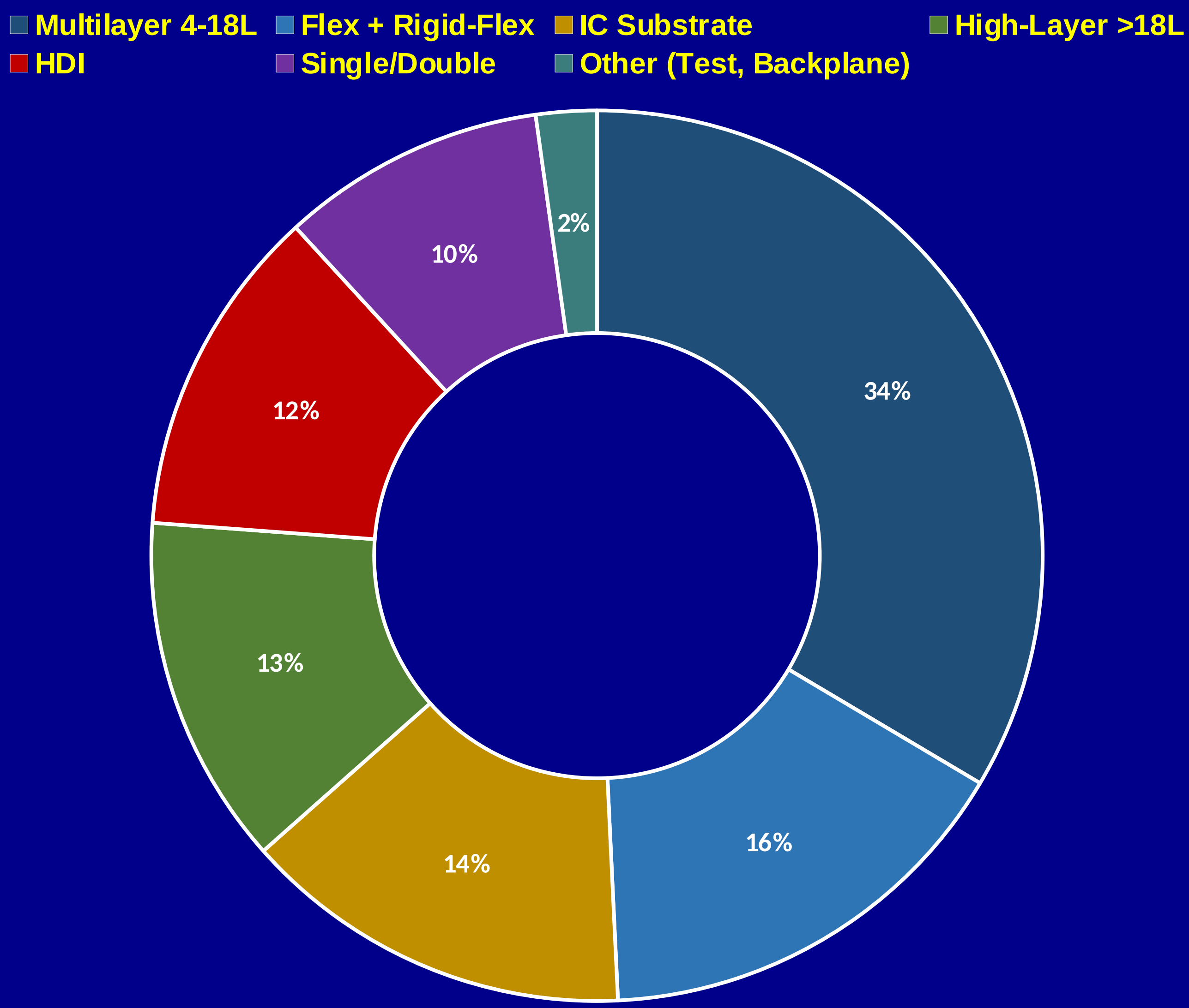
Source: Dr. H. Nakahara, Estimated Top 25 Automotive PCB Makers in 2024 (N.T. Information Ltd, Aug 2025). Top 15 shown. Top 25 = $7.9B; world automotive PCB ~$12.3B. Japanese makers hold the top 3 spots.

World PCB by End Market | 2025 vs 2027F (US$B, CCG Est.)



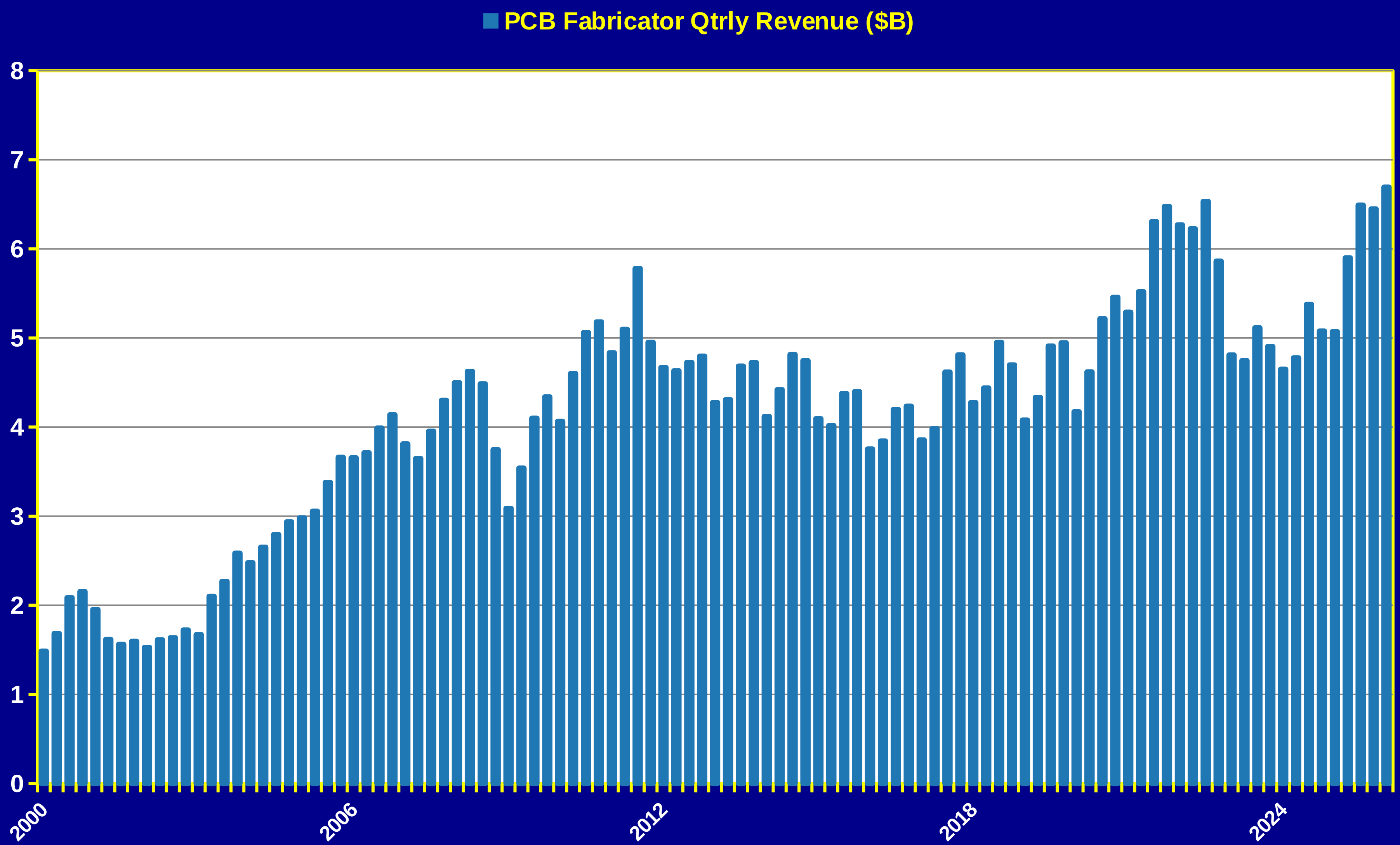
Source: Custer Contexo World PCB Market Data Warehouse (Jul 2026), CCG consensus of Nakahara, Prismark, HNPCA and others. Total $98.5B (2025) -> $135.5B (2027F, ~17%/yr). CCG estimates; Nakahara's figures differ for some segments (e.g., automotive $12.3B in 2024).

World PCB Technology Mix | 2025 Share (%, CCG Est.)



Source: Custer Contexo World PCB Market Data Warehouse (Jul 2026), CCG consensus. Total $98.5B. IC substrate + HDI + >18L high-layer = 39% of value. Substrate estimates vary by source: $14.0B here, $10.5B in the end-market view, $16.2B (Nakahara).

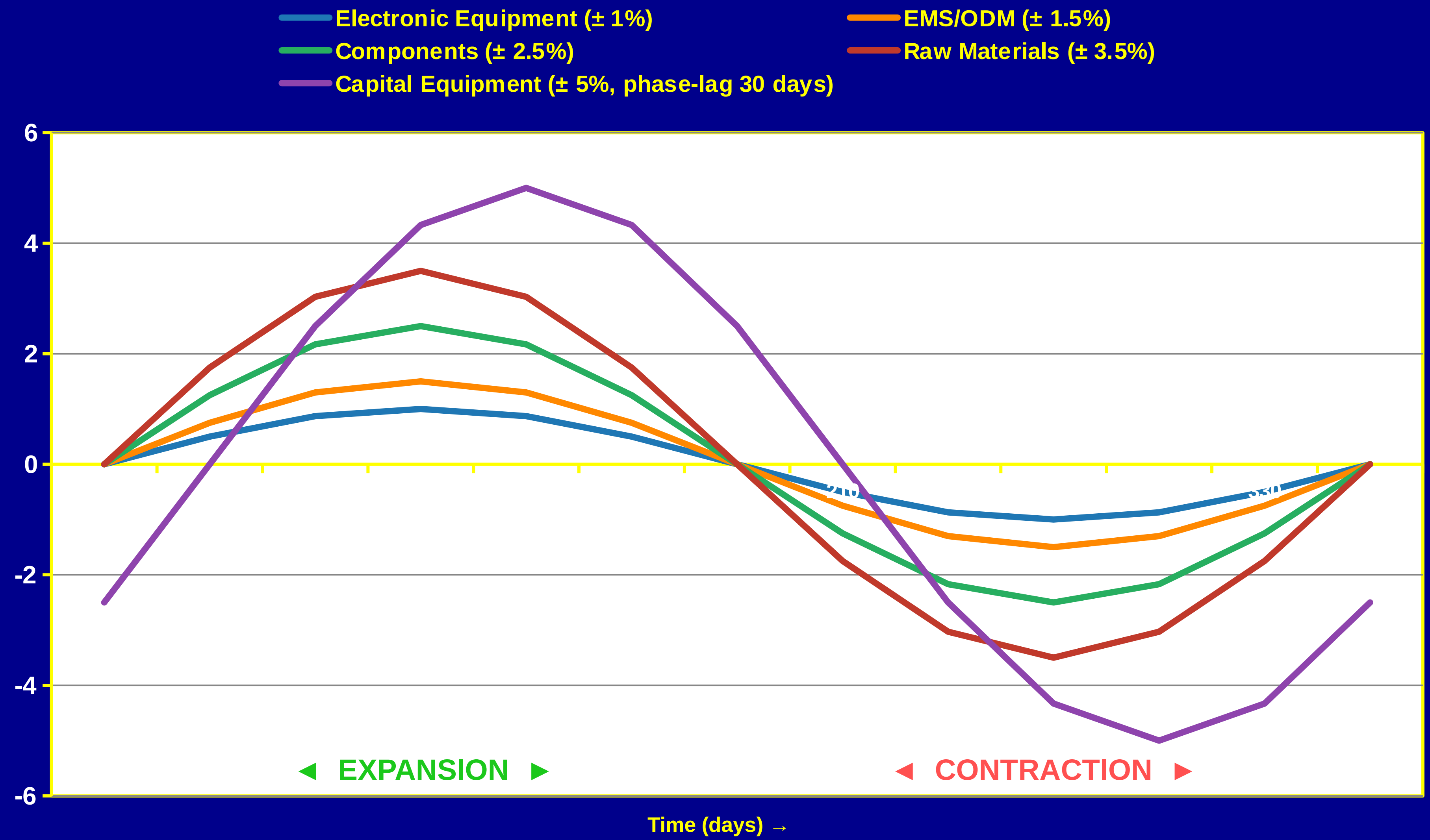
CCG PCB Fabricator Composite | Qtrly Revenue (US$B)



Source: Custer Financial Database, company filings. 35 fabricators (19 live) incl. Ibiden, Unimicron, TTM, Nan Ya PCB, Tripod, Compeq, Gold Circuit, Kinsus, AT&S. Q1'26 $6.69B, +32% Y/Y. Ibiden on fiscal label (Q1 = Apr-Jun). Includes MFS 2003-14 (corrected).

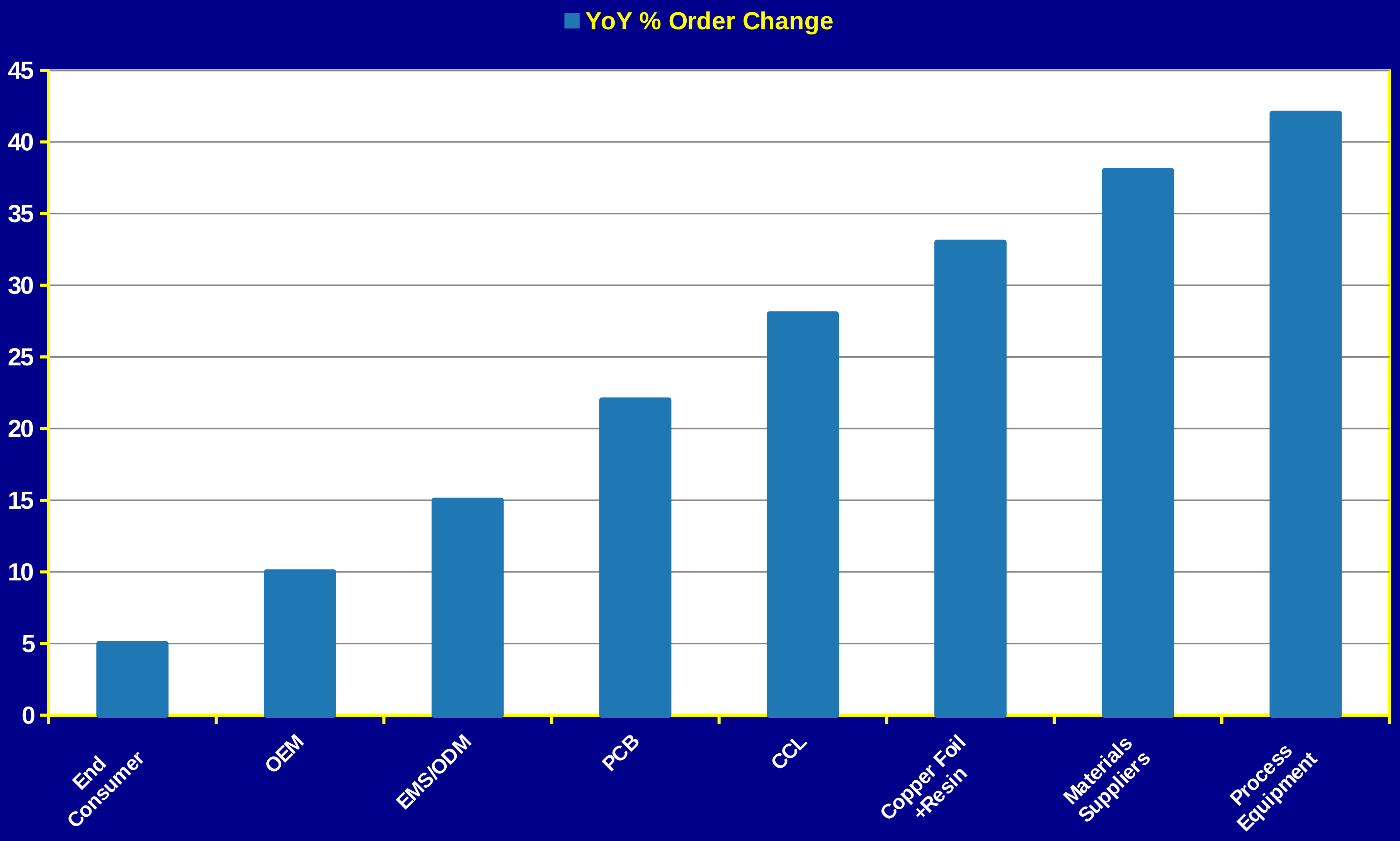
CCG Business Cycle Hypothesis

Amplitude Escalation + Phase Lag Across 5 Supply Chain Tiers



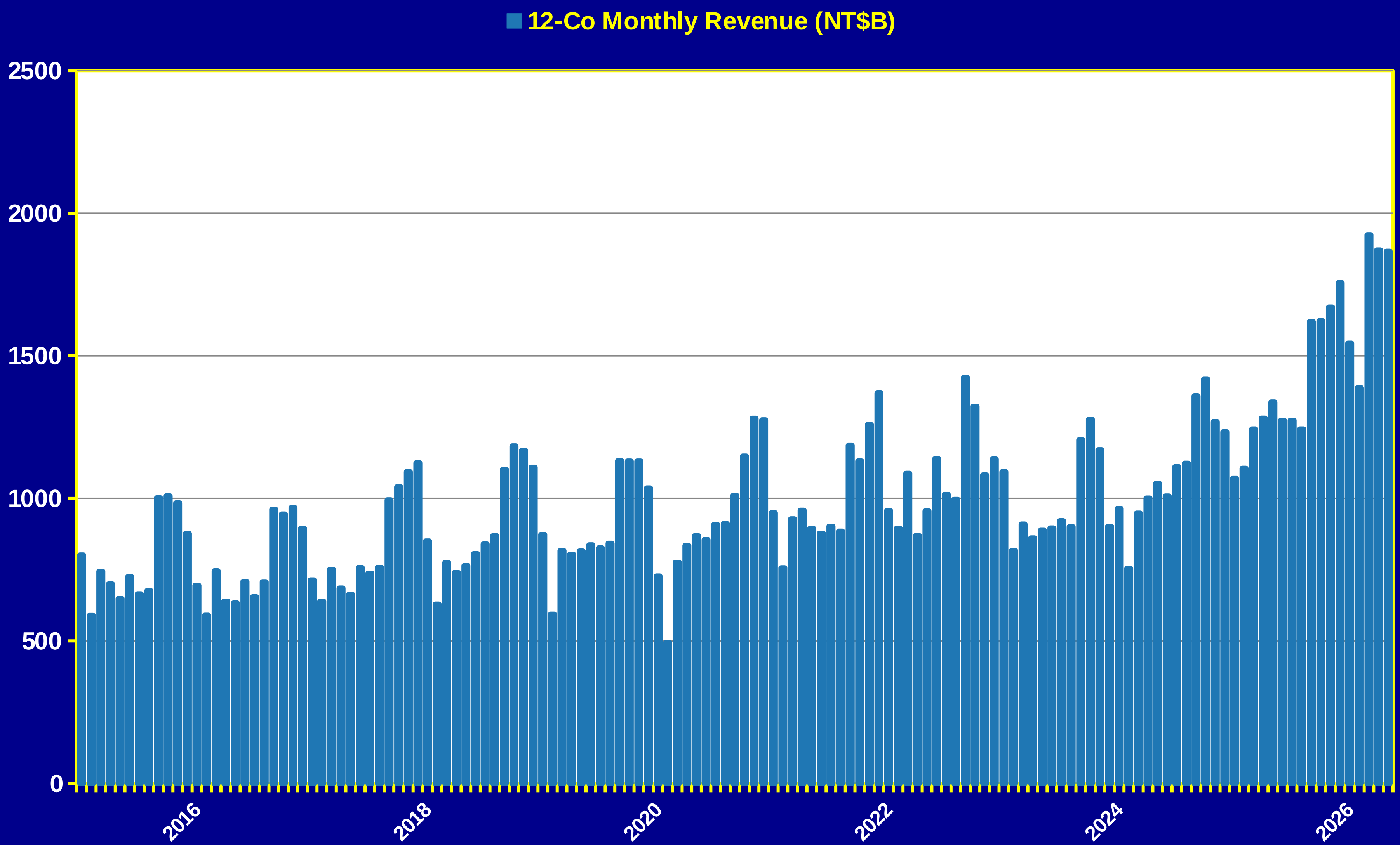
Source: CCG hypothesis chart in use 25+ years (illustrative). AMPLIFICATION 5x from EE to Capital Equipment. PHASE LAG 30 days at Capital Equipment.

The Bullwhip Cascade | 5% End Demand → 42% Equipment Order Change



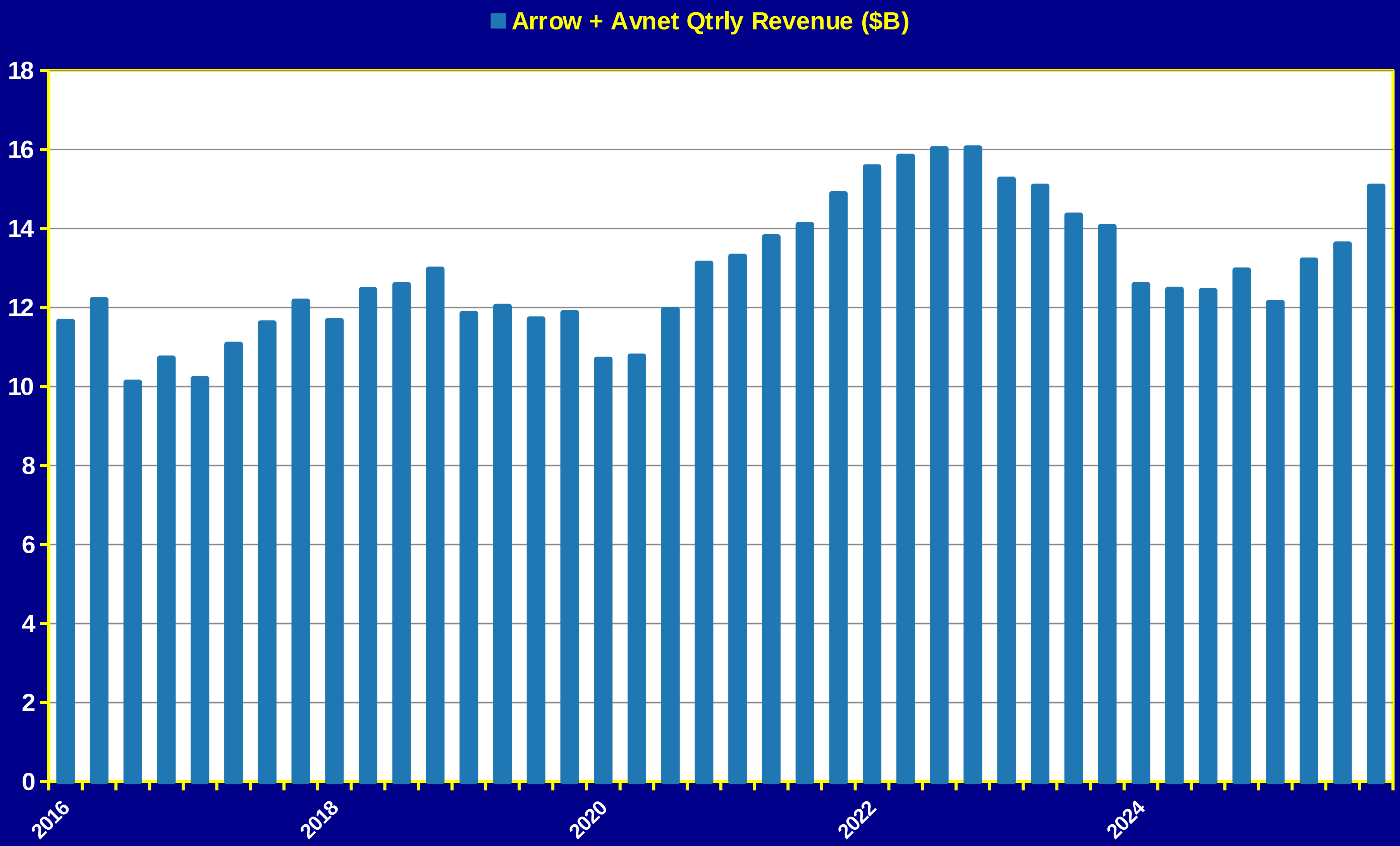
Source: CCG illustrative bullwhip framework (not measured data). Amplification through the supply chain of 8-12x from consumer to equipment.

Taiwan EMS / ODM Composite | Monthly Revenue (NT$B)



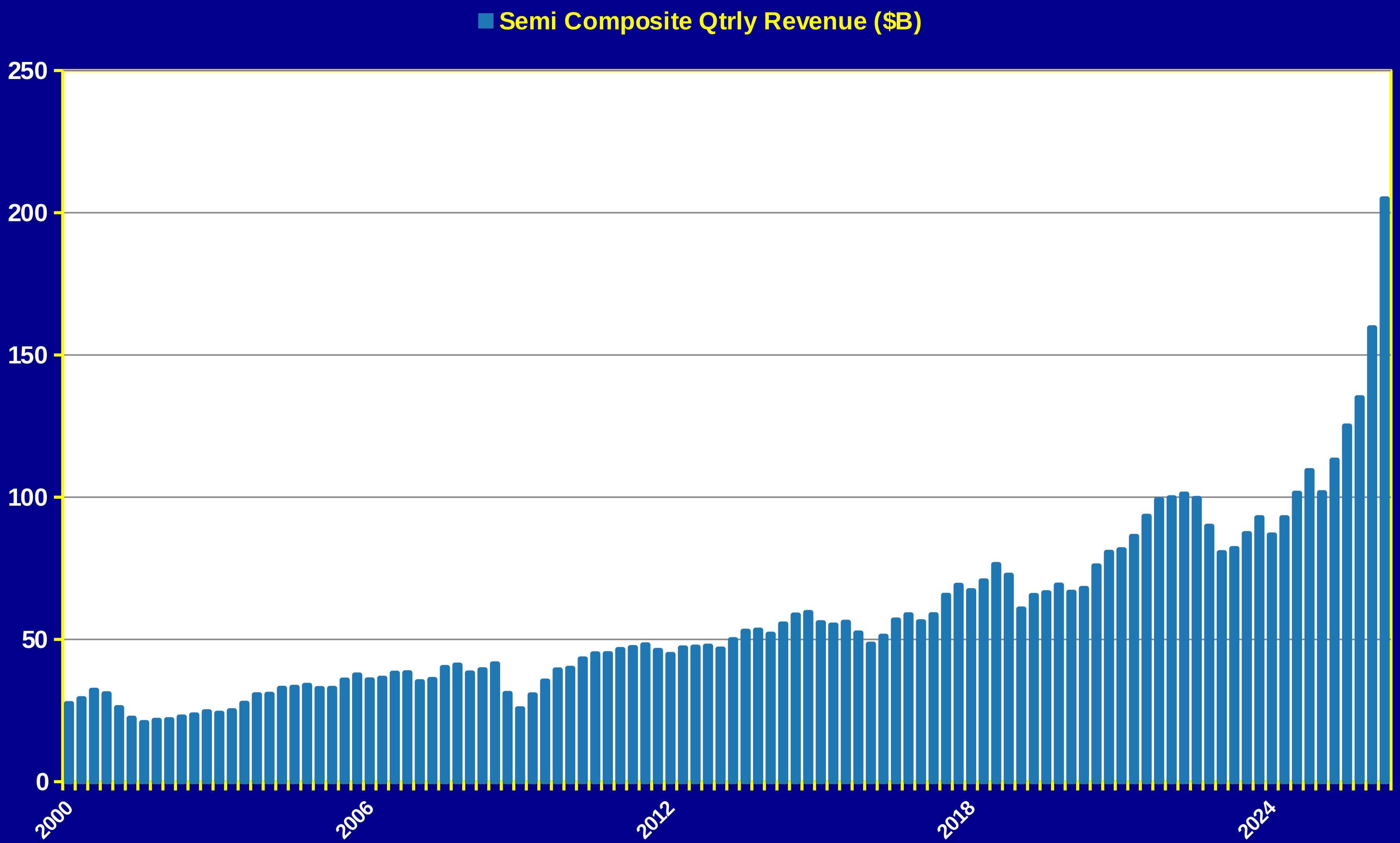
Source: TWSE monthly filings (CCG EMS Master Data). 12 cos: Foxconn, Quanta, Wistron (incl. its subsidiary Wiwynn), Pegatron, Compal, Inventec, Lite-On, USI, Gigabyte, Clevo, MSI, Asus. May'26 NT$1,867B. 3/12 +46.6%, 12/12 +30.9%.

Electronic Component Distributors (Arrow + Avnet) | Qtrly Revenue (US$B)



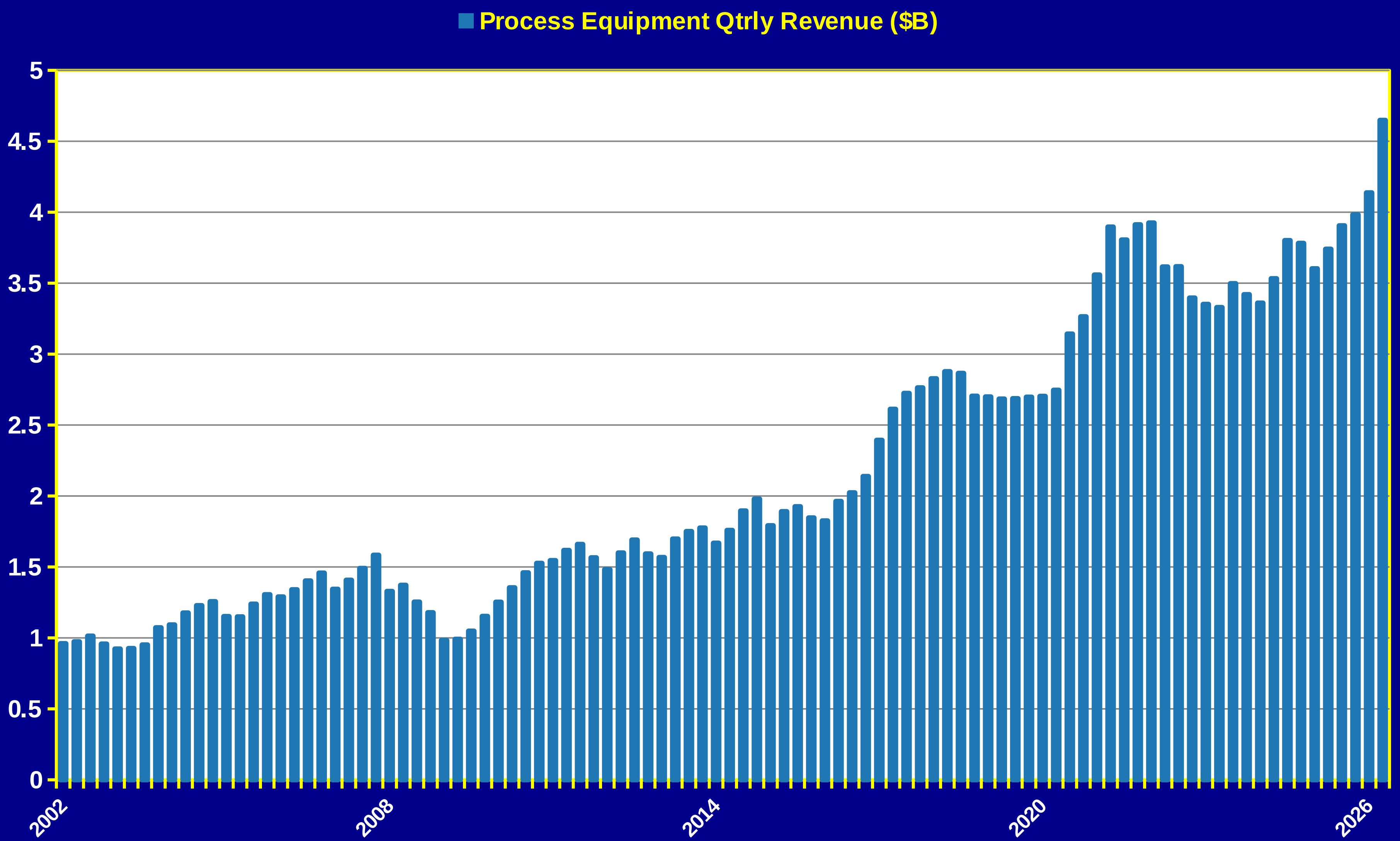
Source: Custer Dashboard Earnings Tracker (Custer Financial Database; Arrow FY23/FY24 match 10-K). Q3'16 step down = Avnet sale of Technology Solutions. Q4'25 3/12 +16.4%, 12/12 +7.1%: 3/12 above 12/12 = accelerating after a 2023-24 inventory correction.

CCG Semi Composite | Qtrly Revenue (US$B)



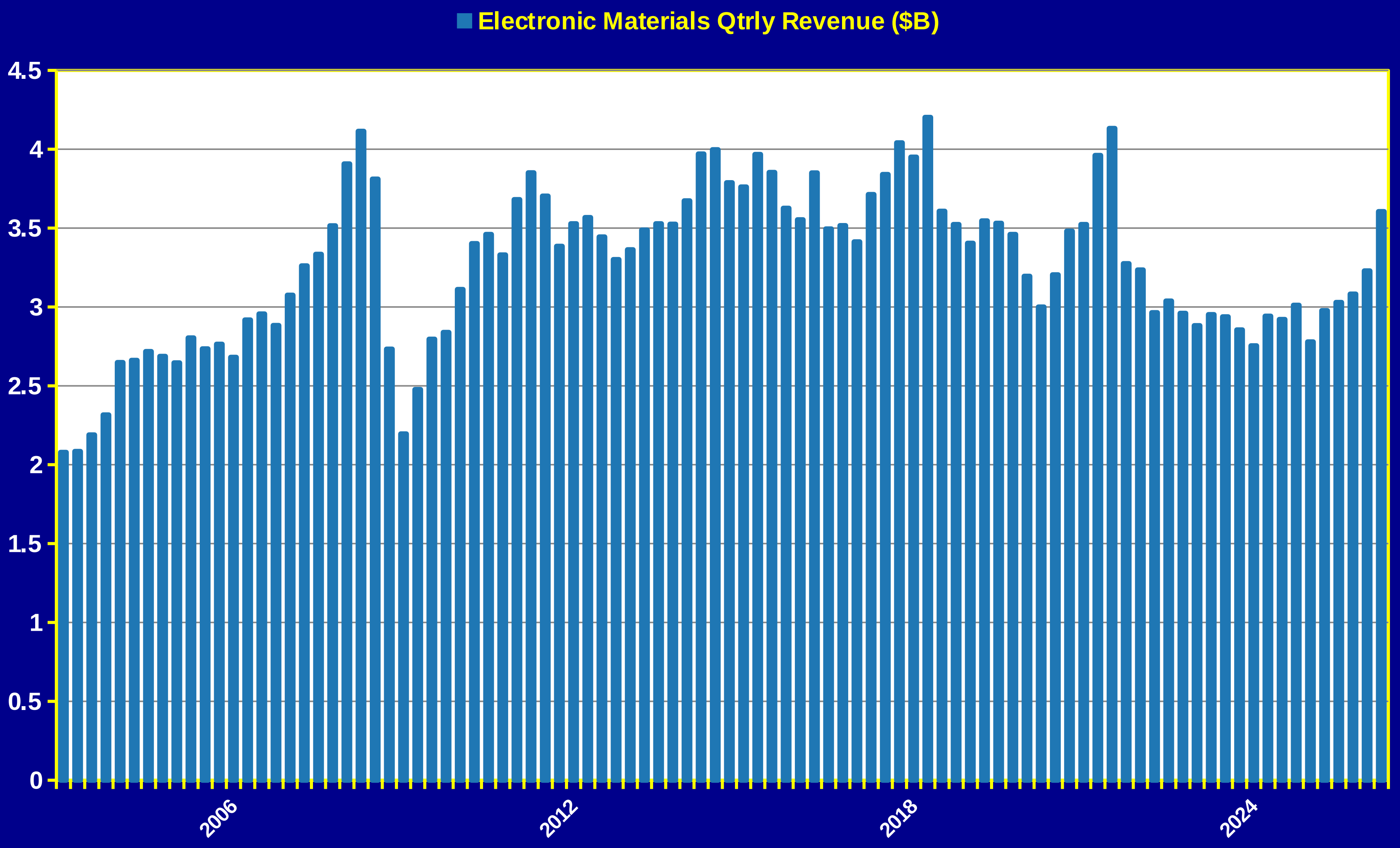
Source: Custer Financial Database, company filings; US$ at Fed H.10 qtrly-avg FX. Walt Custer's 39-company aggregate to Q1'18, then continuation panel (22 live incl. TSMC, Intel, Micron, SK Hynix, Qualcomm, TI, AMD). Q2'26 $204.9B, +81% Y/Y.

CCG Process Equipment Suppliers Composite | Qtrly Revenue (US$B)



Source: Custer Financial Database, company filings. Walt Custer's Process Equipment Related Suppliers (incl. design software and semi tools), 12 (11 live): Nordson, Cadence, Kulicke & Soffa, Ultra Clean, Cohu, FormFactor, Axcelis, Azenta, Novanta, Camtek, CSUN; Coherent carried. Walt Custer aggregate to Q3'20. Q2'26 $4.65B, +24% Y/Y.

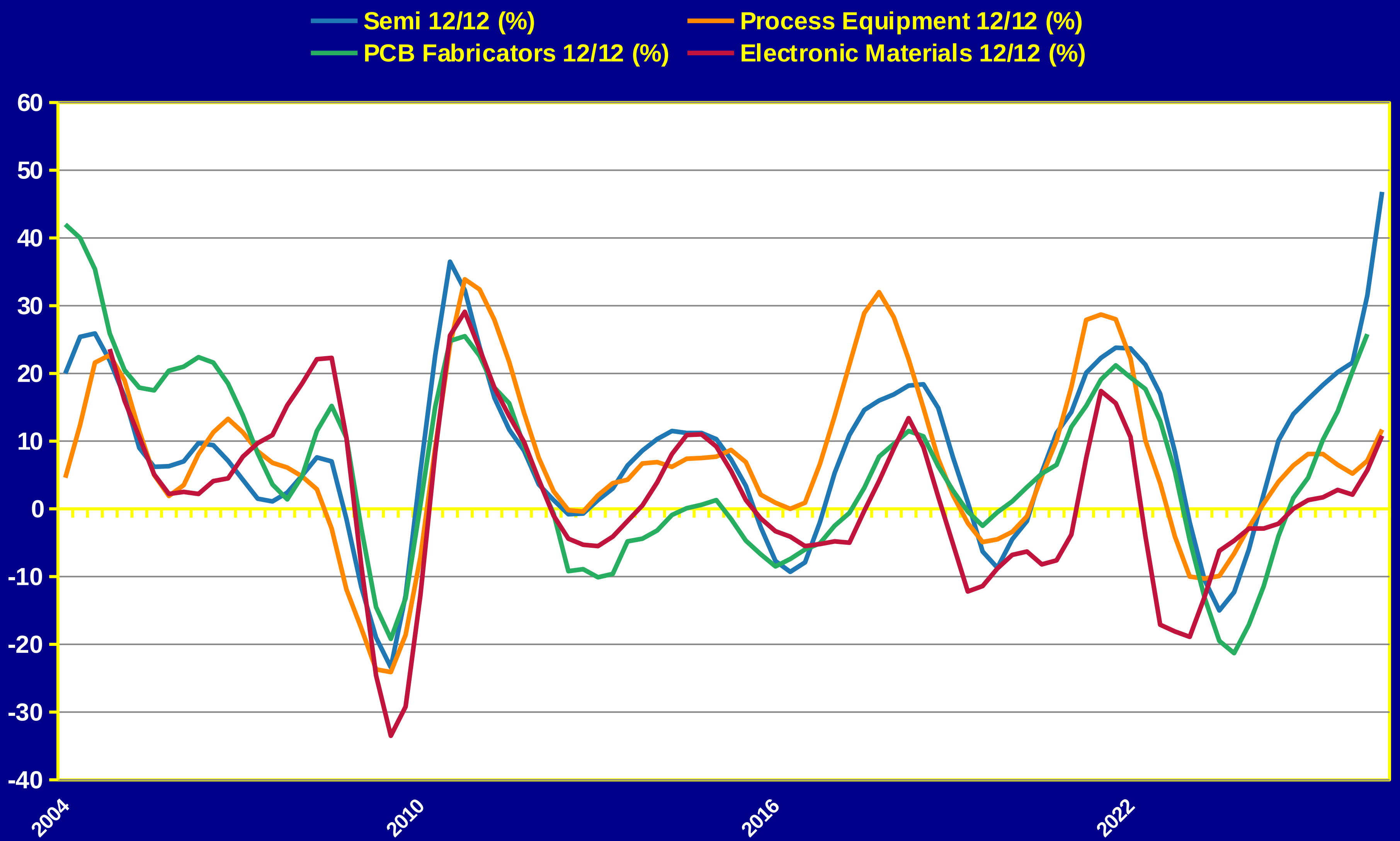
CCG Electronic Materials Composite | Qtrly Revenue (US$B)



Source: Custer Financial Database, company filings. Material suppliers excl. laminate, 14 (6 live): Element Solutions, Entegris, Eternal Chemical, Hexcel, Taiwan Glass, Tokyo Ohka. Walt Custer aggregate to Q3'20. Q2'26 $3.61B, +21% Y/Y.

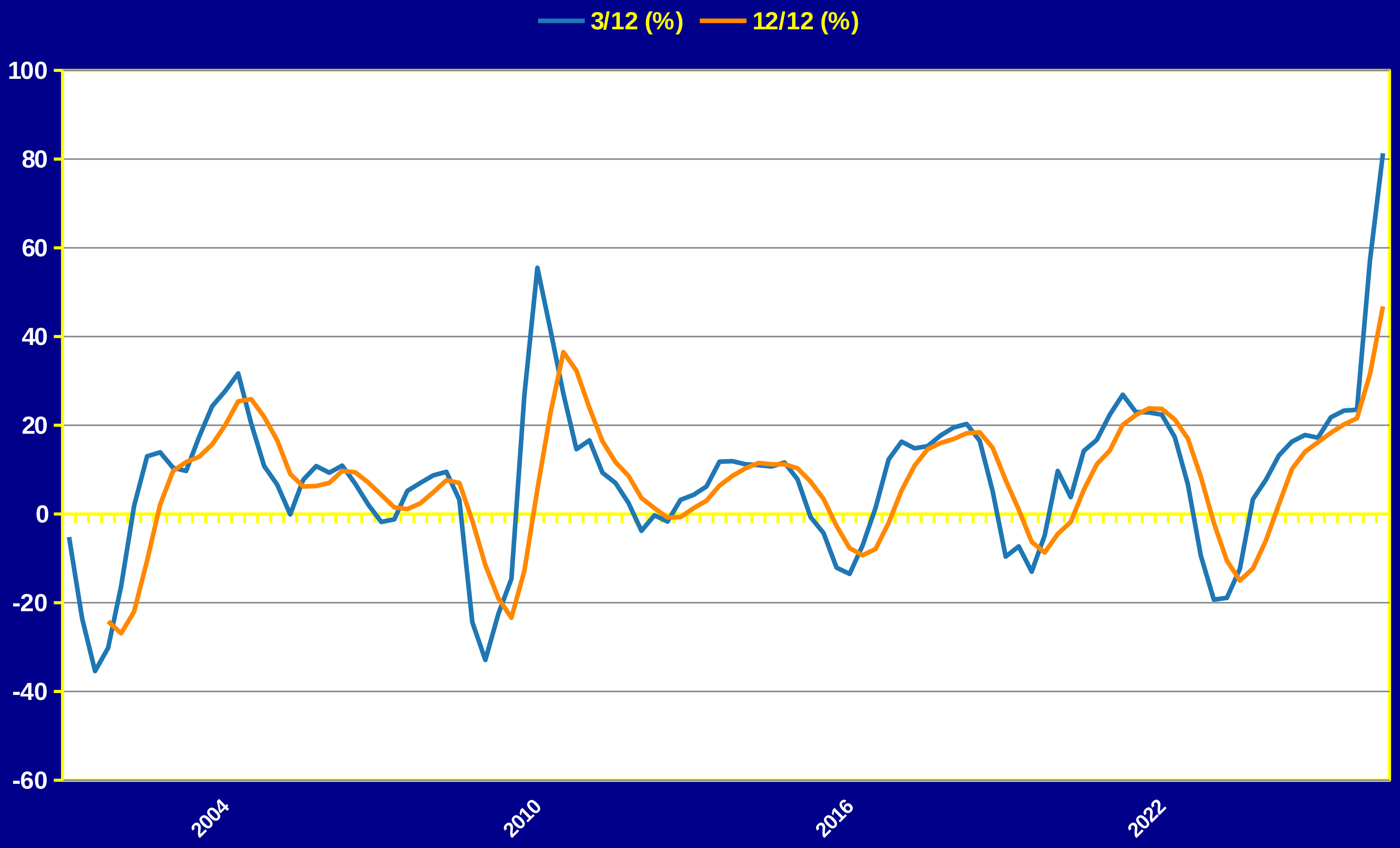
Custer Contexo Group

PCB Supply Chain Momentum | 12/12 Growth by Tier (%)



Source: CCG composites from company filings (Custer Financial Database). 12/12 = last 4 qtrs vs prior 4. Q2'26: Semi +46.8%, Process Equip +11.7%, Materials +10.8%; PCB Fabricators +25.8% (Q1'26).

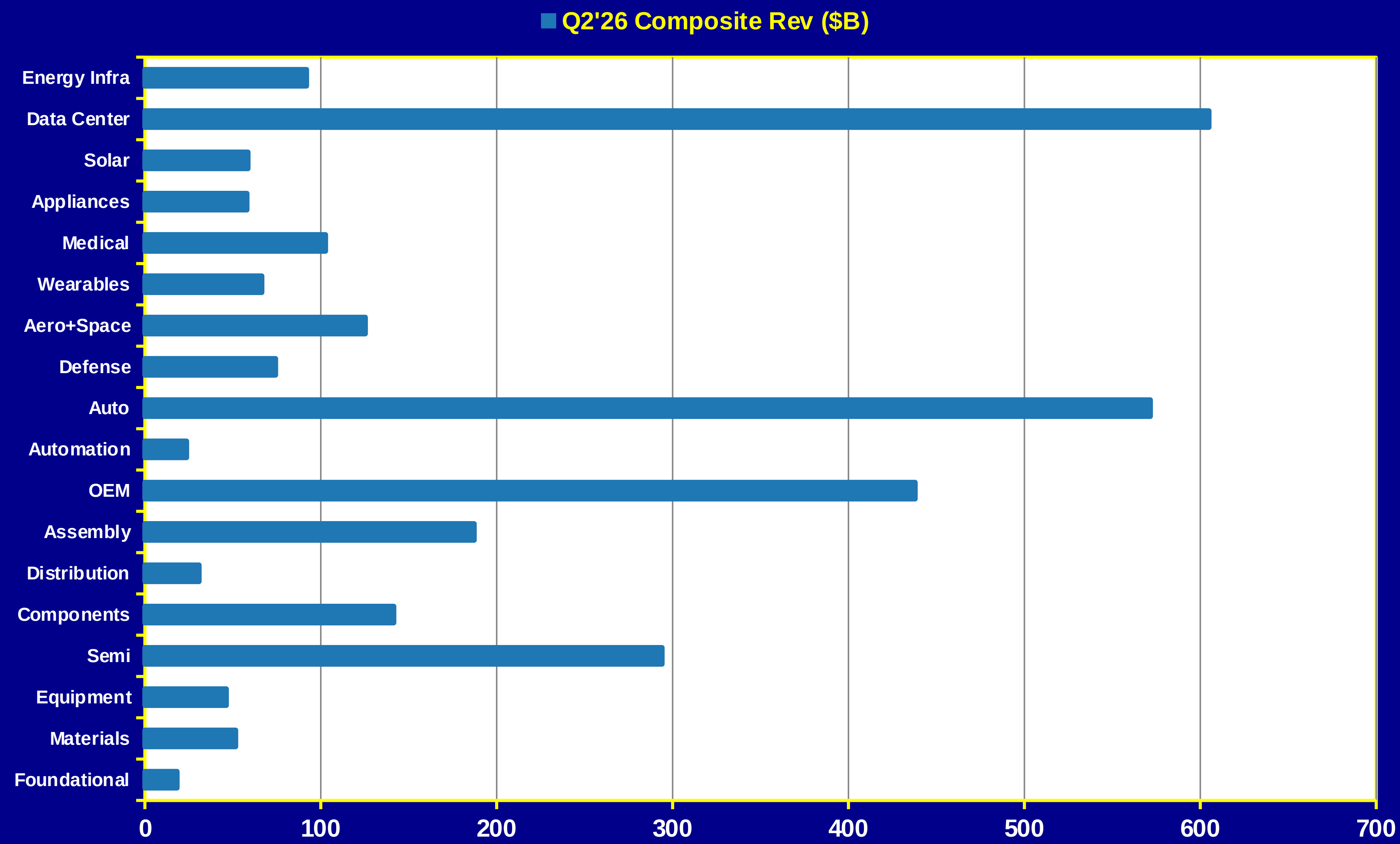
CCG Semi Composite | 3/12 vs 12/12 Growth (%)



Source: Walt Custer 3/12 + 12/12 method on the CCG Semi composite (company filings). 3/12 = latest qtr vs yr-ago qtr; 12/12 = last 4 qtrs vs prior 4. Q2'26: 3/12 +81.3%, 12/12 +46.8%. 3/12 above 12/12 = accelerating.

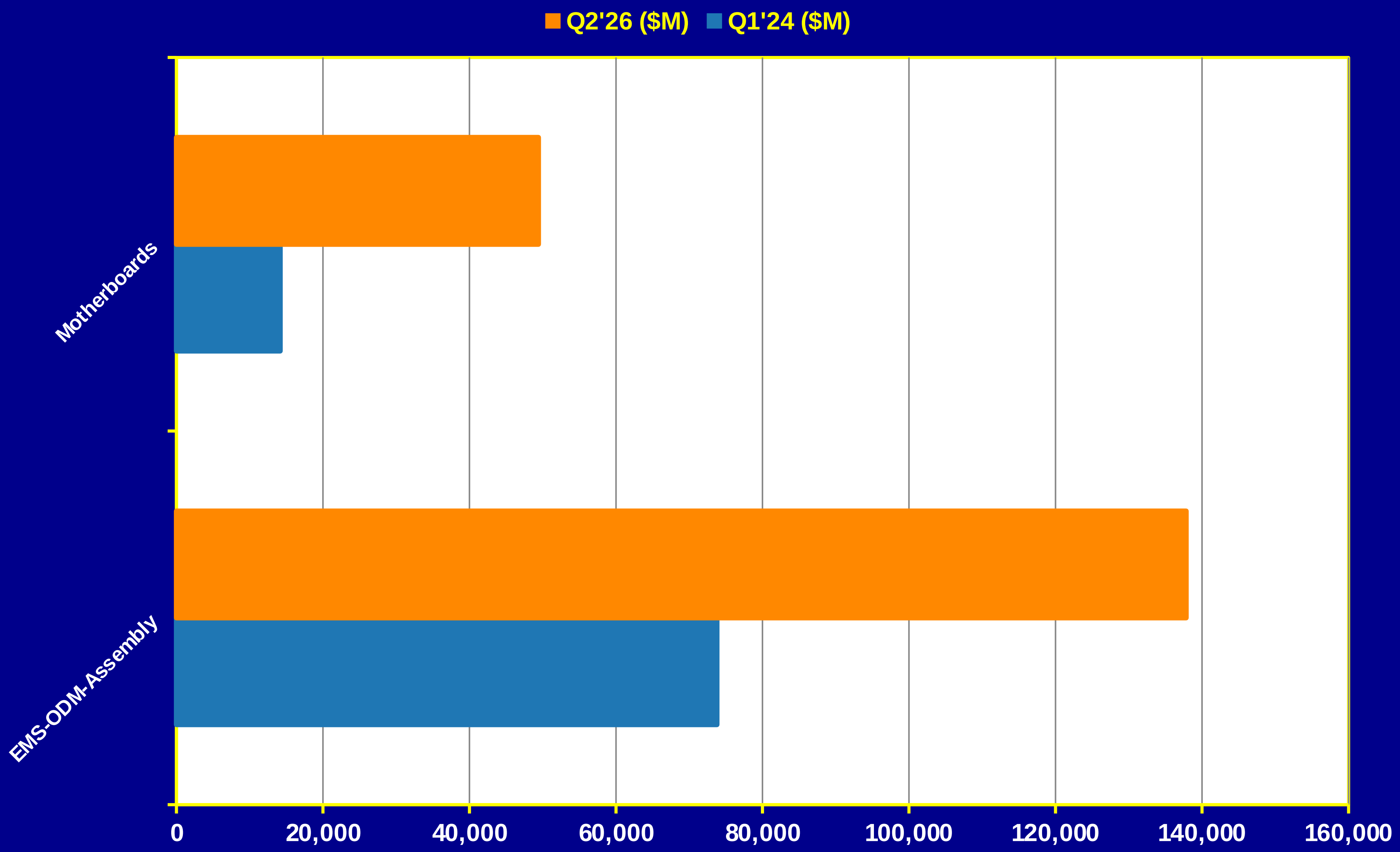
Custer Contexo Group

Q2'26 Qtrly Revenue by Supply Chain Tier | US$B (389-Company Composite)



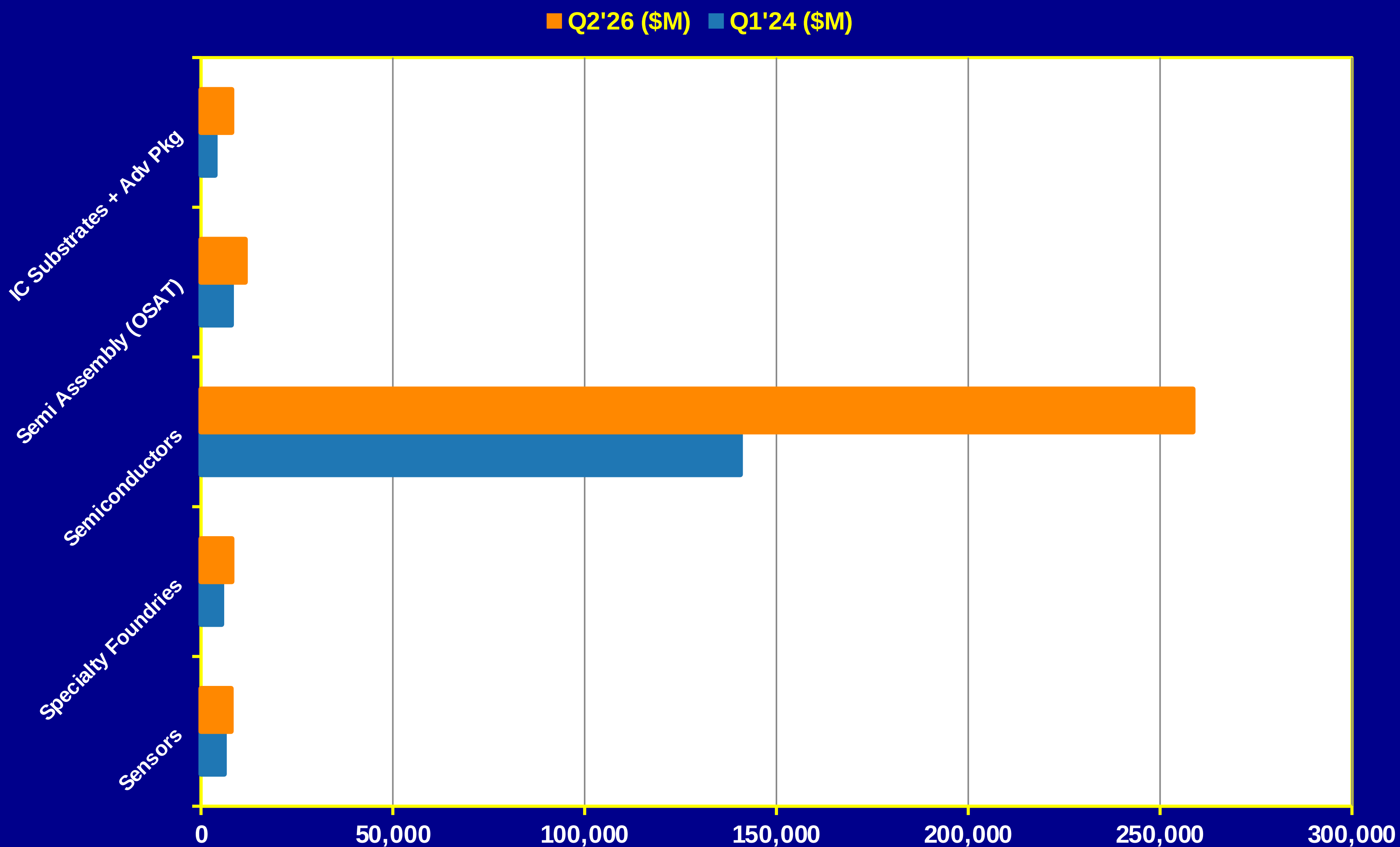
Source: CCG 39-sector, 389-company composites, Q2'26 revenue by tier (sum $2,985B). Sector rosters differ from the CCG long-run composites elsewhere in this deck.

Assembly Tier Composites | Q1'24 vs Q2'26 Revenue (US$M)



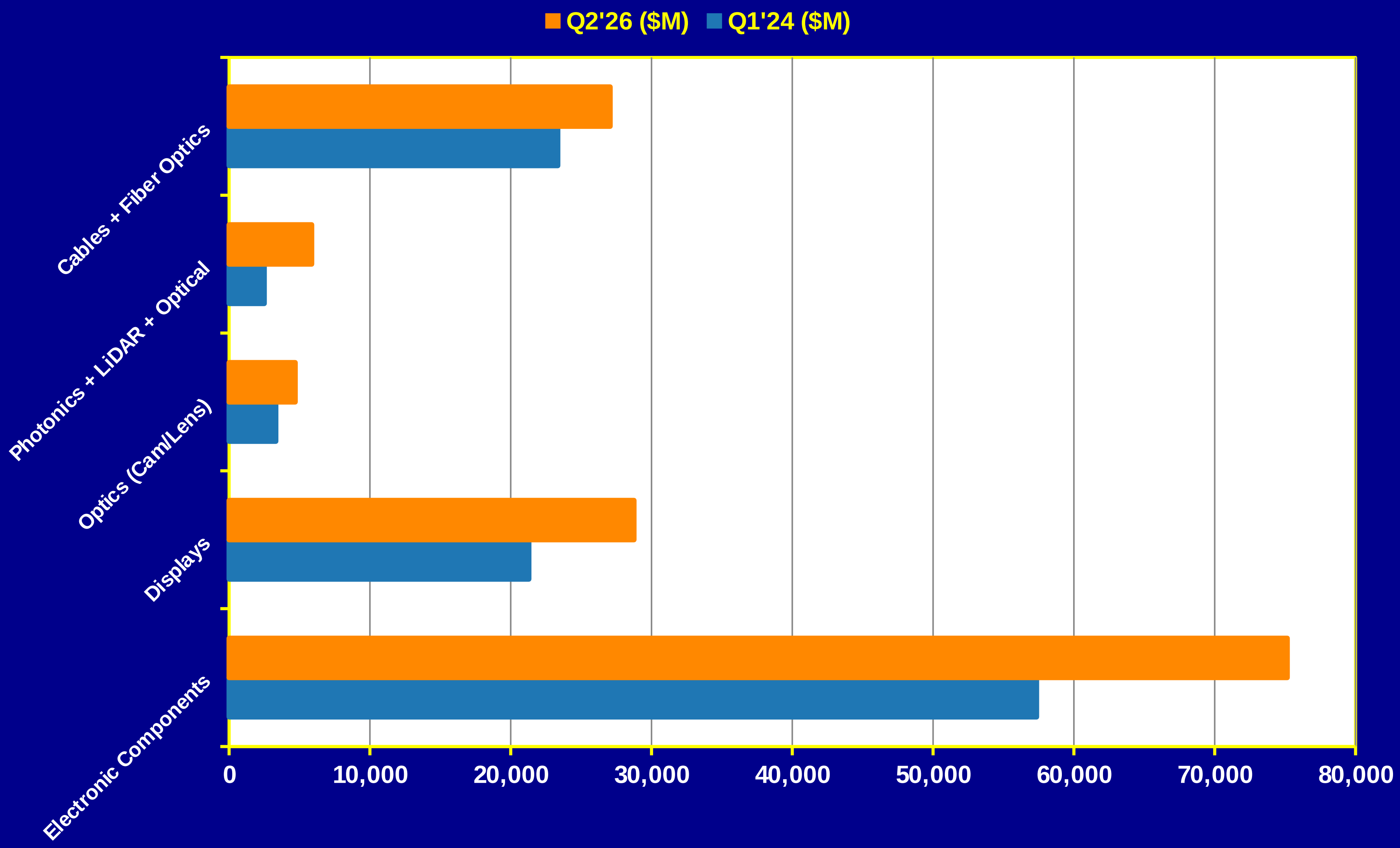
Source: CCG Assembly Tier: 16 EMS + 9 Motherboards = 25 companies. Motherboards +249% Q1'24-Q2'26 — AI server motherboard explosion.

Semi Tier Composites | Q1'24 vs Q2'26 Revenue (US$M)



Source: CCG Semi Tier composites: 8 Sensors + 9 Foundries + 19 Semis + 7 OSAT + 8 IC Substrate = 51 companies. Semi +84% Q1'24-Q2'26; IC Substrate +119%.

Components Tier Composites | Q1'24 vs Q2'26 Revenue (US$M)



Source: CCG Components Tier: 14 electronic components + 9 displays + 6 optics + 8 photonics/LiDAR + 9 cables/fiber = 46 companies. Photonics/LiDAR +135% Q1'24-Q2'26 on data center optics.

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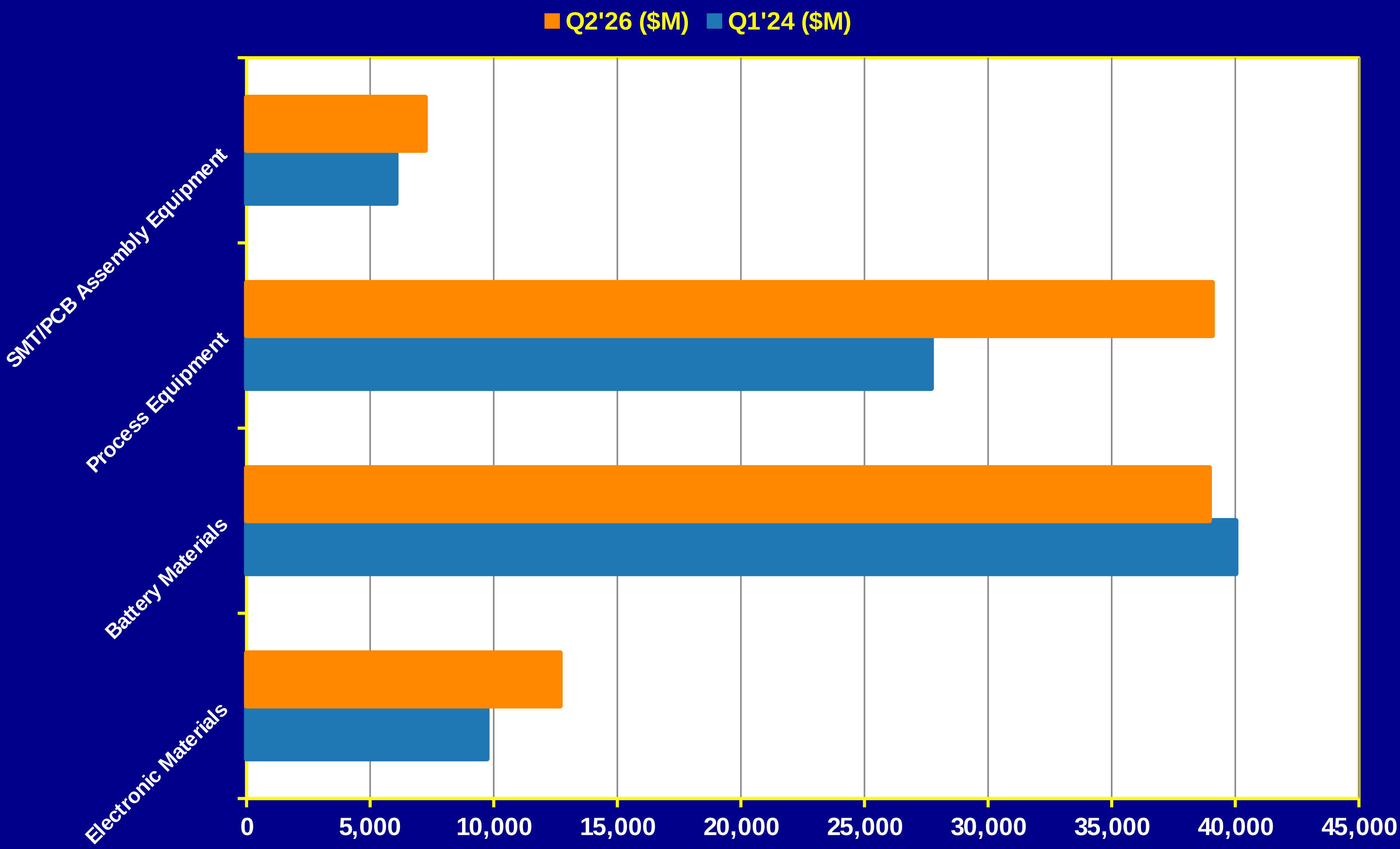
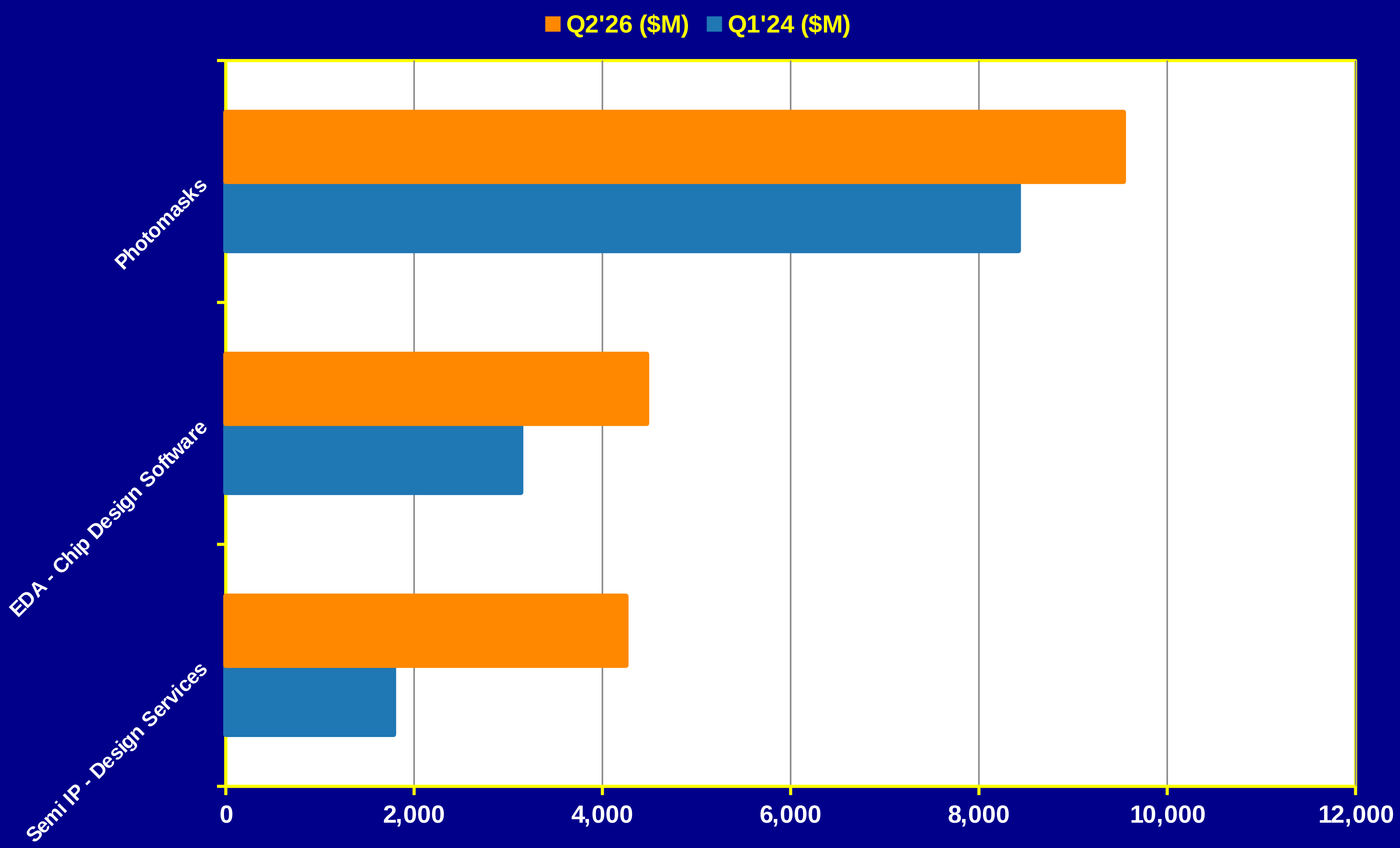
Materials + Equipment Tiers | Q1'24 vs Q2'26 Revenue (US$M)



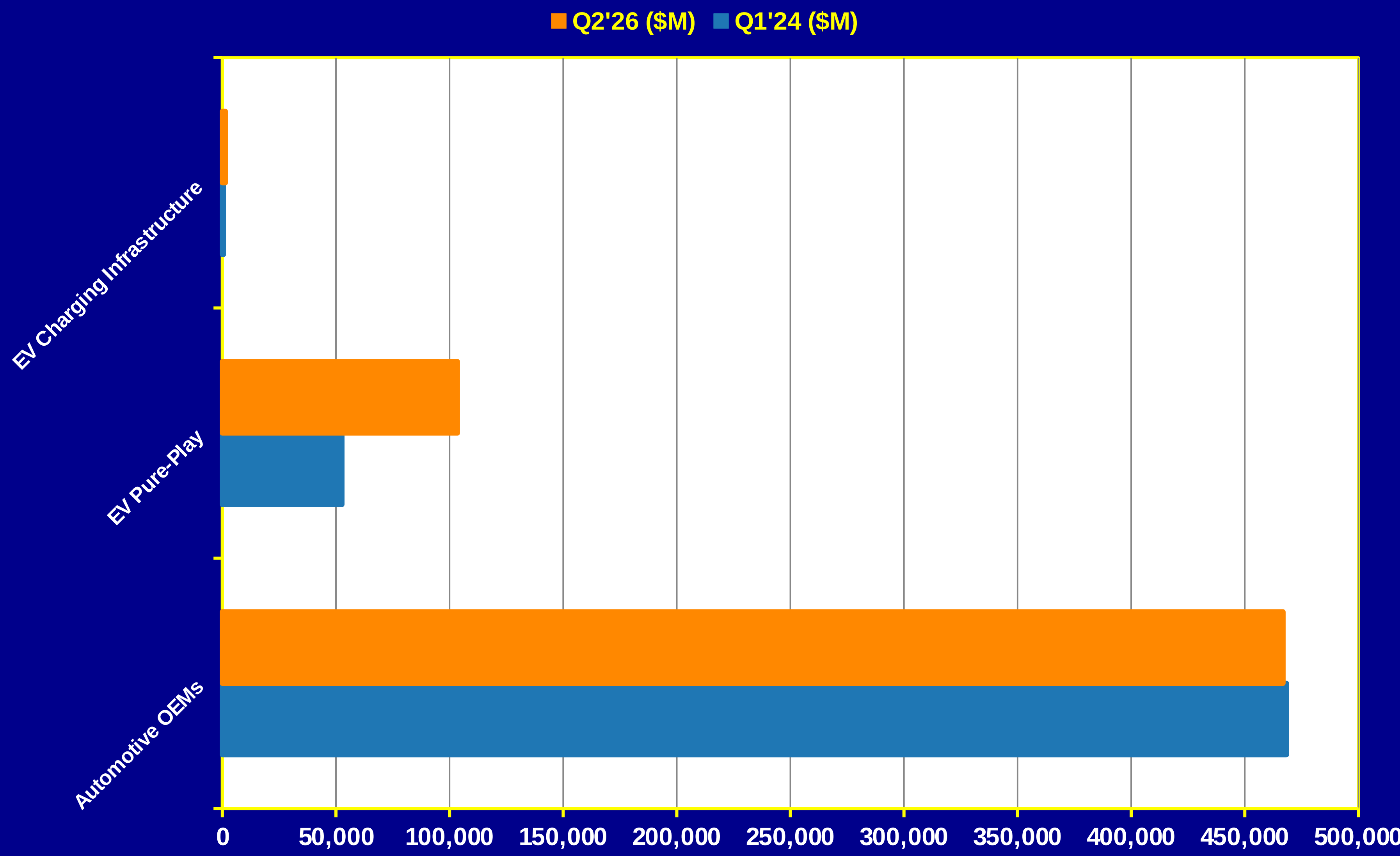
Source: CCG Materials + Equipment tiers: 10 Elec Mat + 10 Battery Mat + 16 Process Equip + 8 SMT/PCB Assembly = 44 companies.

Foundational Tier Composites | Q1'24 vs Q2'26 Revenue (US$M)



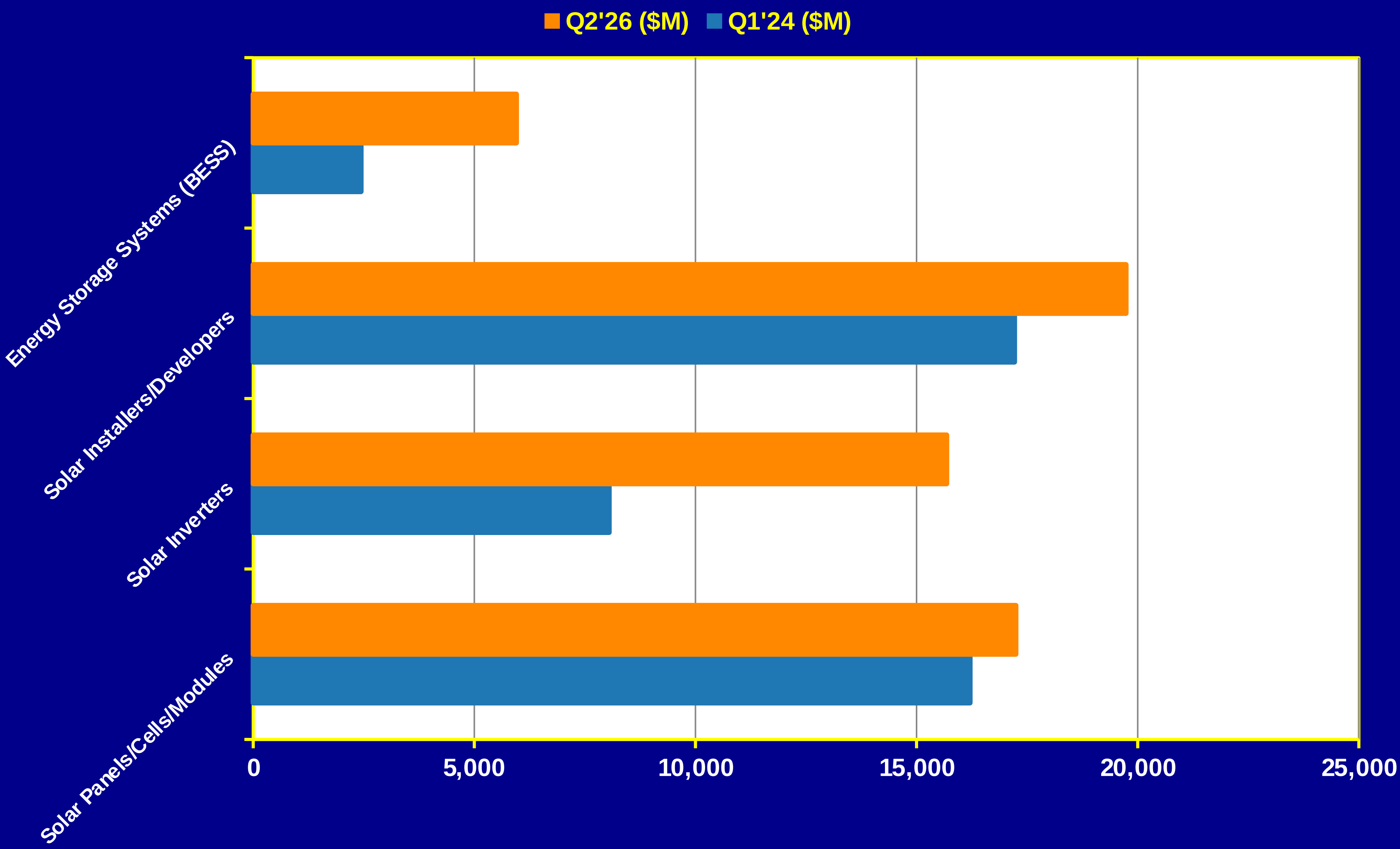
Source: CCG Foundational Tier: 9 Semi IP + 5 EDA + 4 Photomasks = 18 companies. Semi IP +139% Q1'24-Q2'26 (ARM, Alchip, GUC). LEADING INDICATOR 12-18 mo ahead of silicon.

Automotive Tier Composite | Q1'24 vs Q2'26 Revenue (US$M)



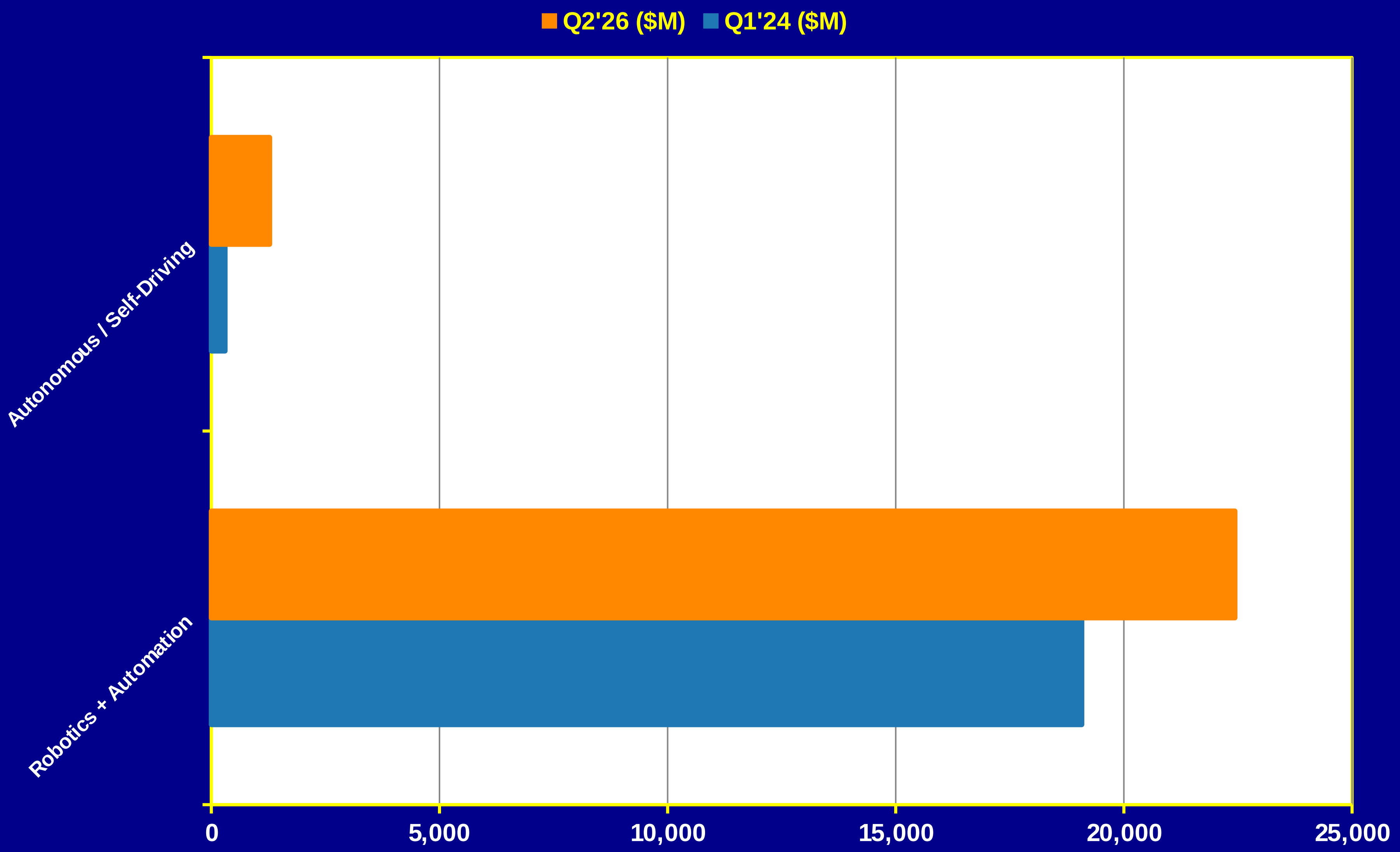
Source: CCG Auto Tier composite: 11 traditional OEMs + 8 EV pure-play + 6 EV charging = 25 companies.

Solar+Storage Tier Composite | Q1'24 vs Q2'26 Revenue (US$M)



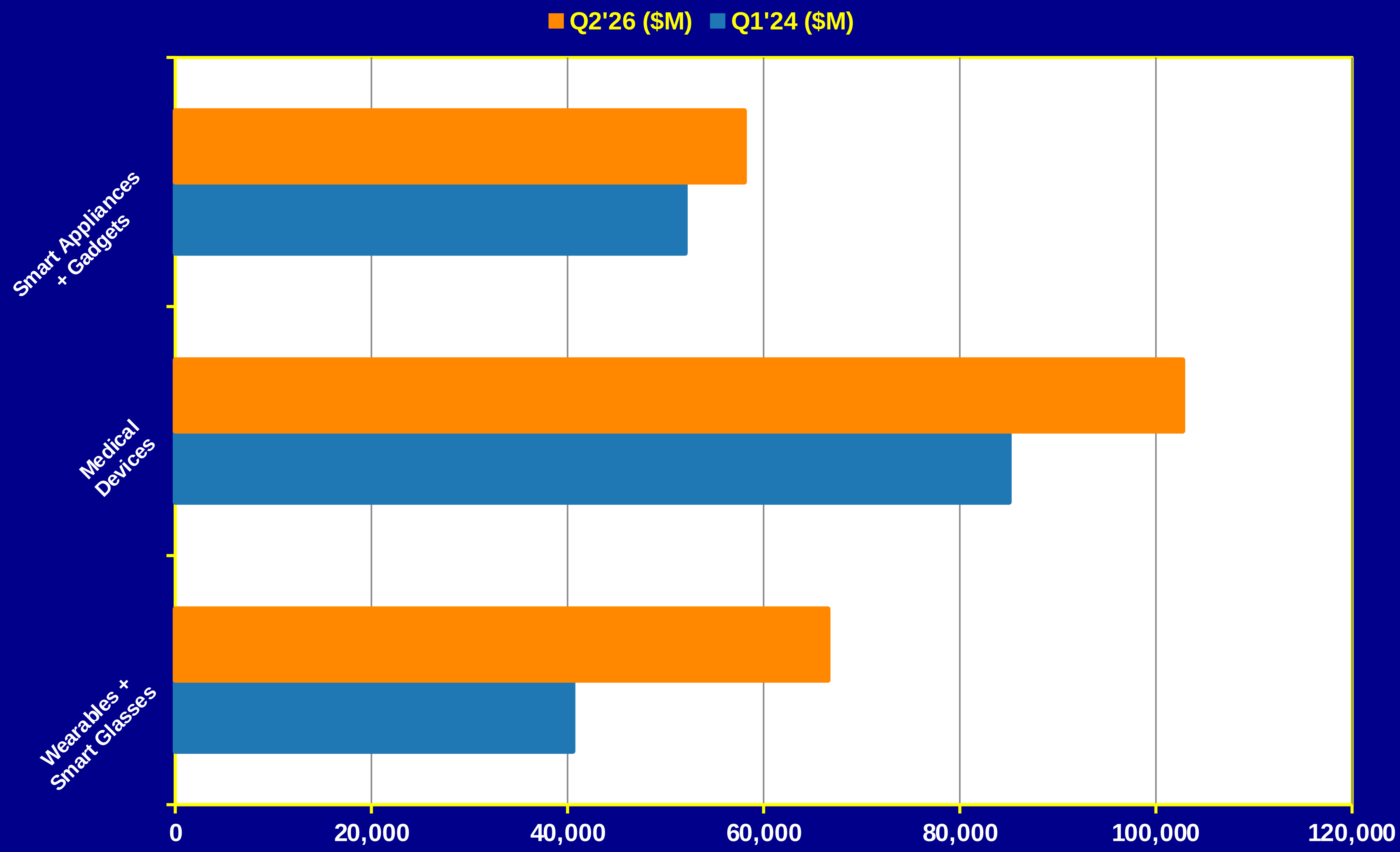
Source: CCG Solar composite: 8 panels + 8 inverters + 7 installers + 3 BESS = 26 companies. BESS +144% Q1'24-Q2'26.

Automation Tier Composites | Q1'24 vs Q2'26 Revenue (US$M)



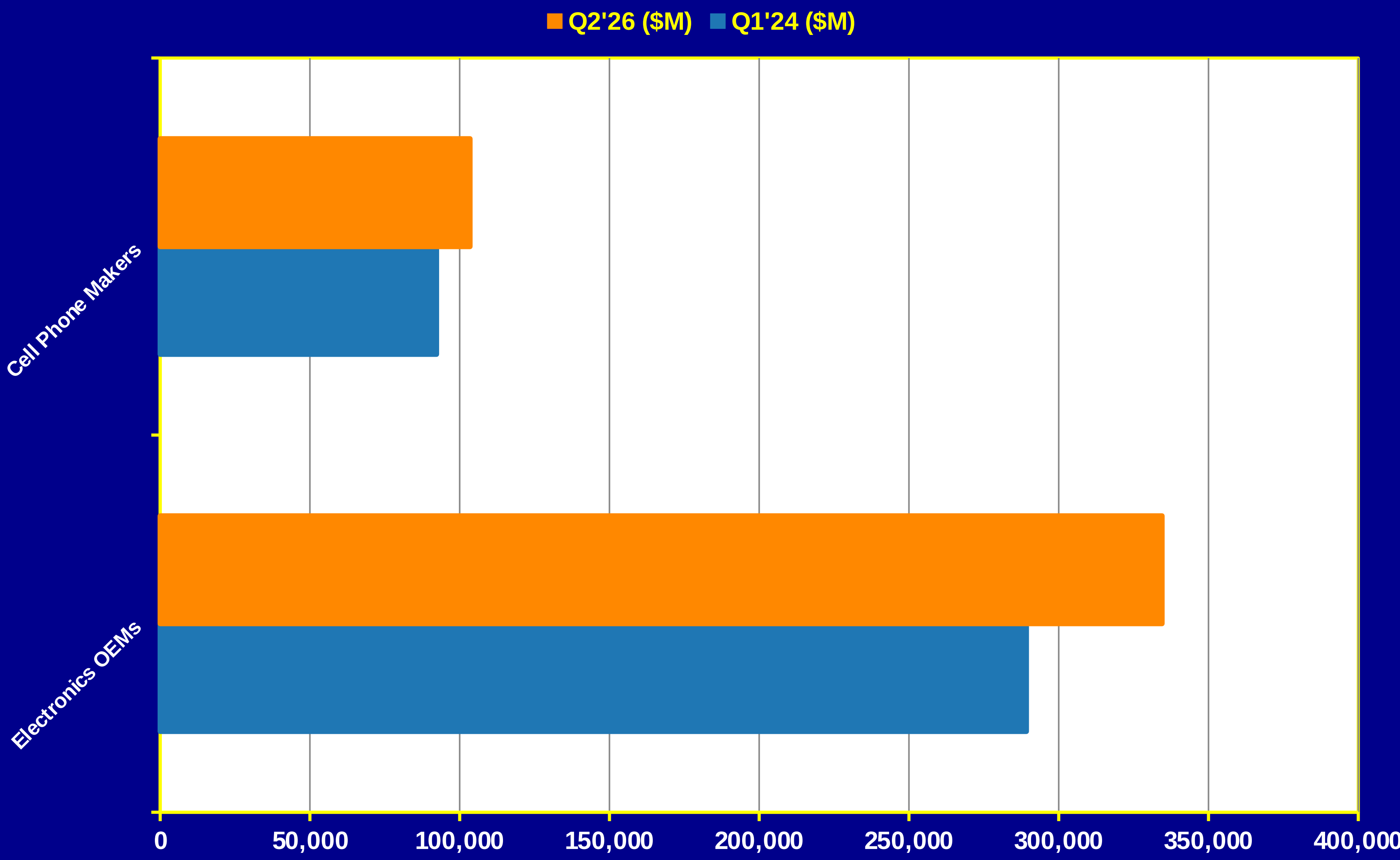
Source: CCG Automation Tier: 10 Robotics + 5 Autonomous = 15 companies. Autonomous +326% Q1'24-Q2'26 (from tiny base).

Consumer Composites | Q1'24 vs Q2'26 Revenue (US$M)



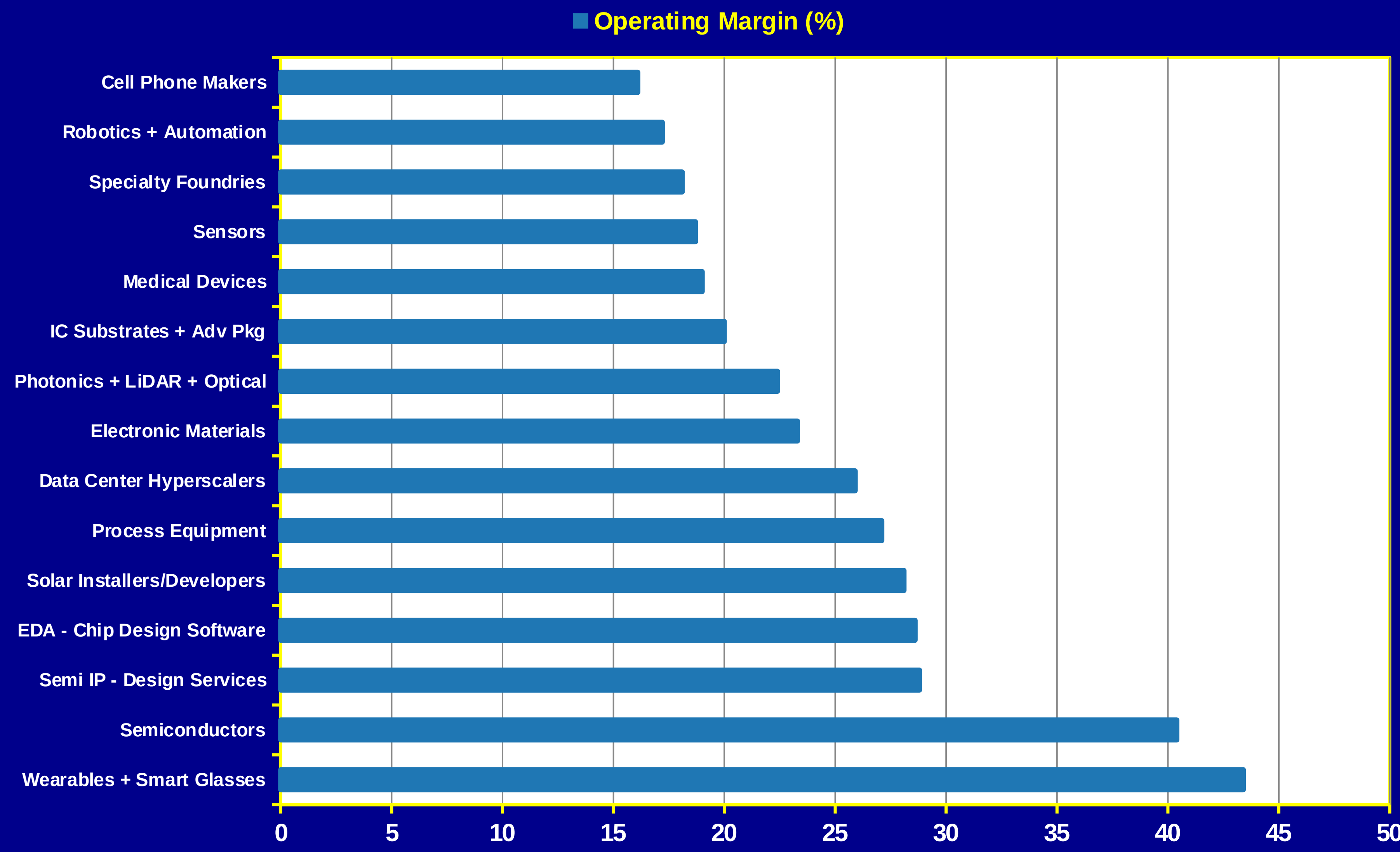
Source: CCG End Markets composites: 10 Wearables + 25 Medical + 14 Appliances = 49 companies. Wearables at 43% margin - highest of any tier.

OEM Tier Composites | Q1'24 vs Q2'26 Revenue (US$M)



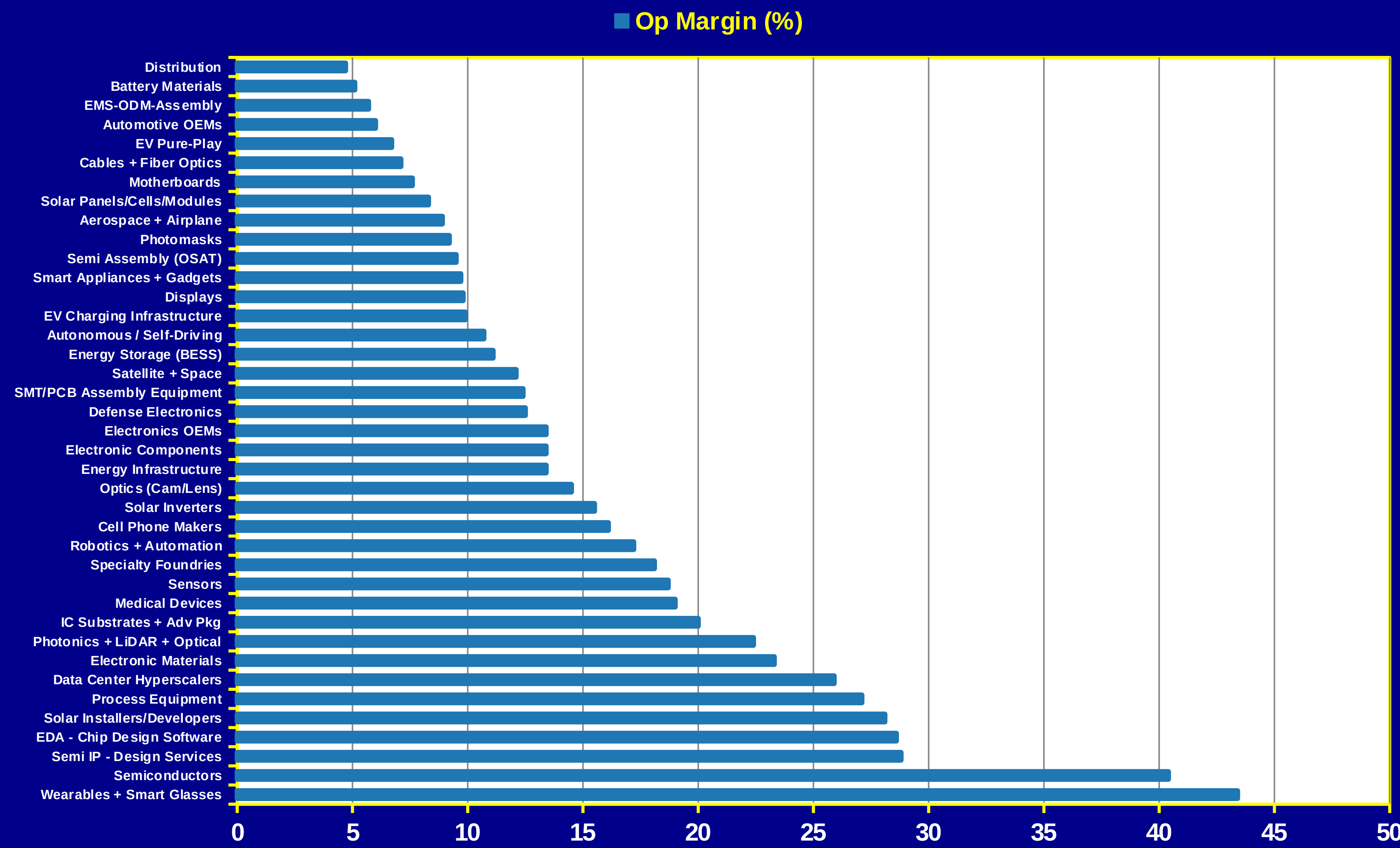
Source: CCG OEM Tier: 14 Electronics OEMs + 6 Cell Phone Makers = 20 companies. Apple, Dell, HP, Lenovo, Samsung, Xiaomi, Sony, LG, etc.

Top 15 Sectors by Composite Operating Margin | TTM (%)



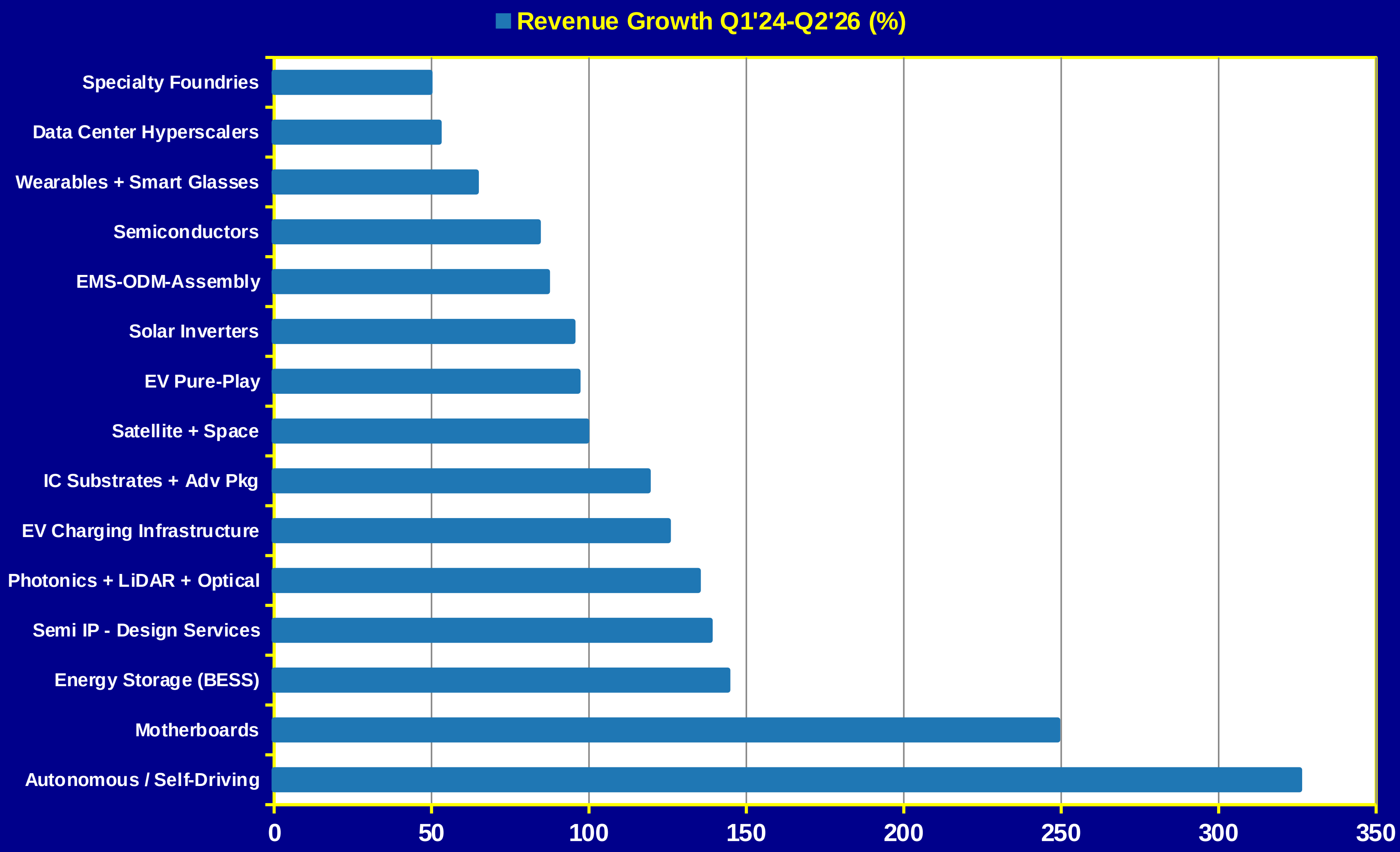
Source: CCG Sector Composites TTM operating margin. Wearables, Semis, Semi IP and EDA lead at 29-43%.

Cross-Sector Margin Distribution | 39-Sector Composite Operating Margins (%)



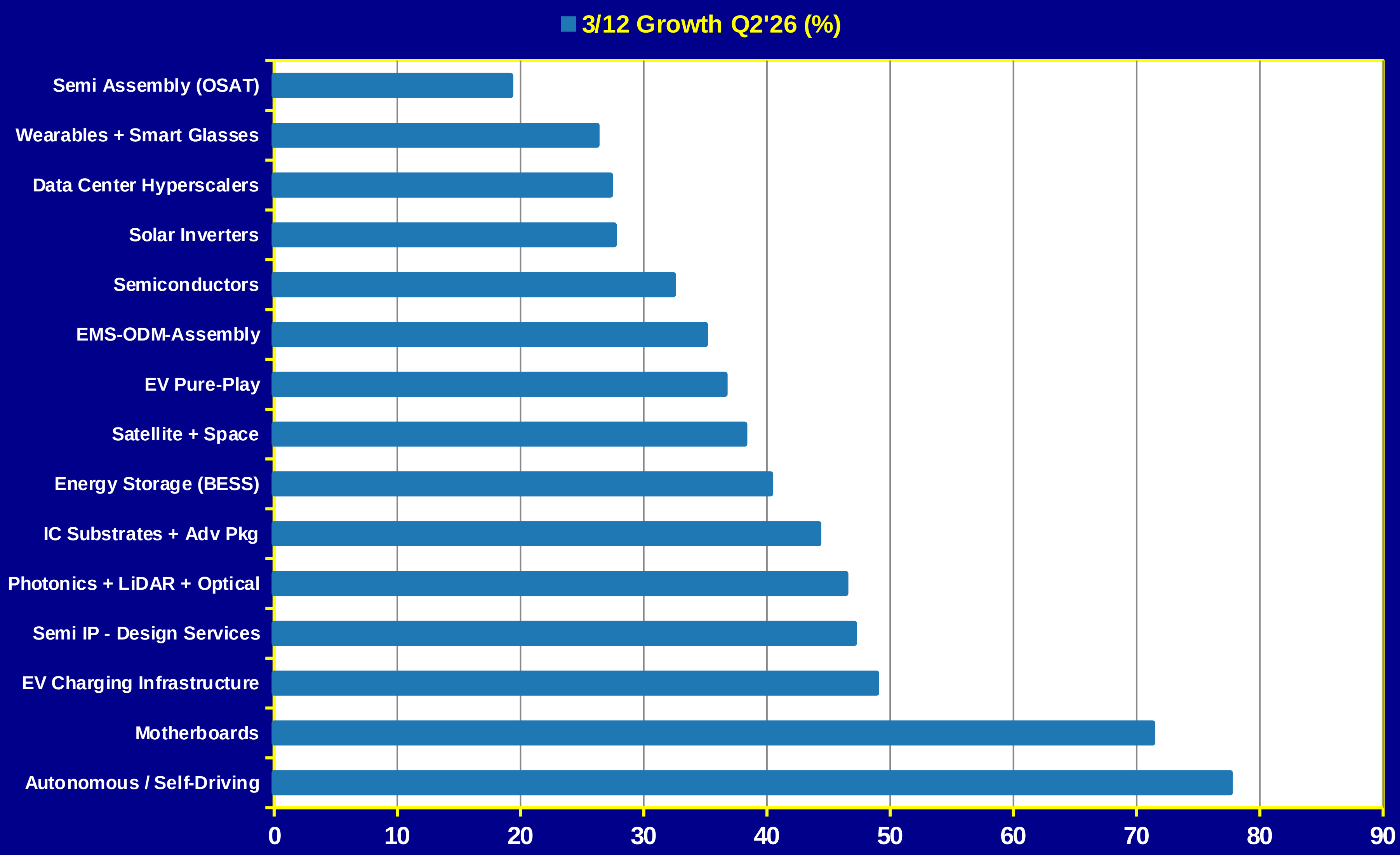
Source: CCG 39-sector composite operating margins (TTM). Range: Distribution 4.7% (thinnest) to Wearables 43.4% (fattest).

Top 15 Sectors by Revenue Growth | Q1'24 -> Q2'26, 9 Qtrs (%)



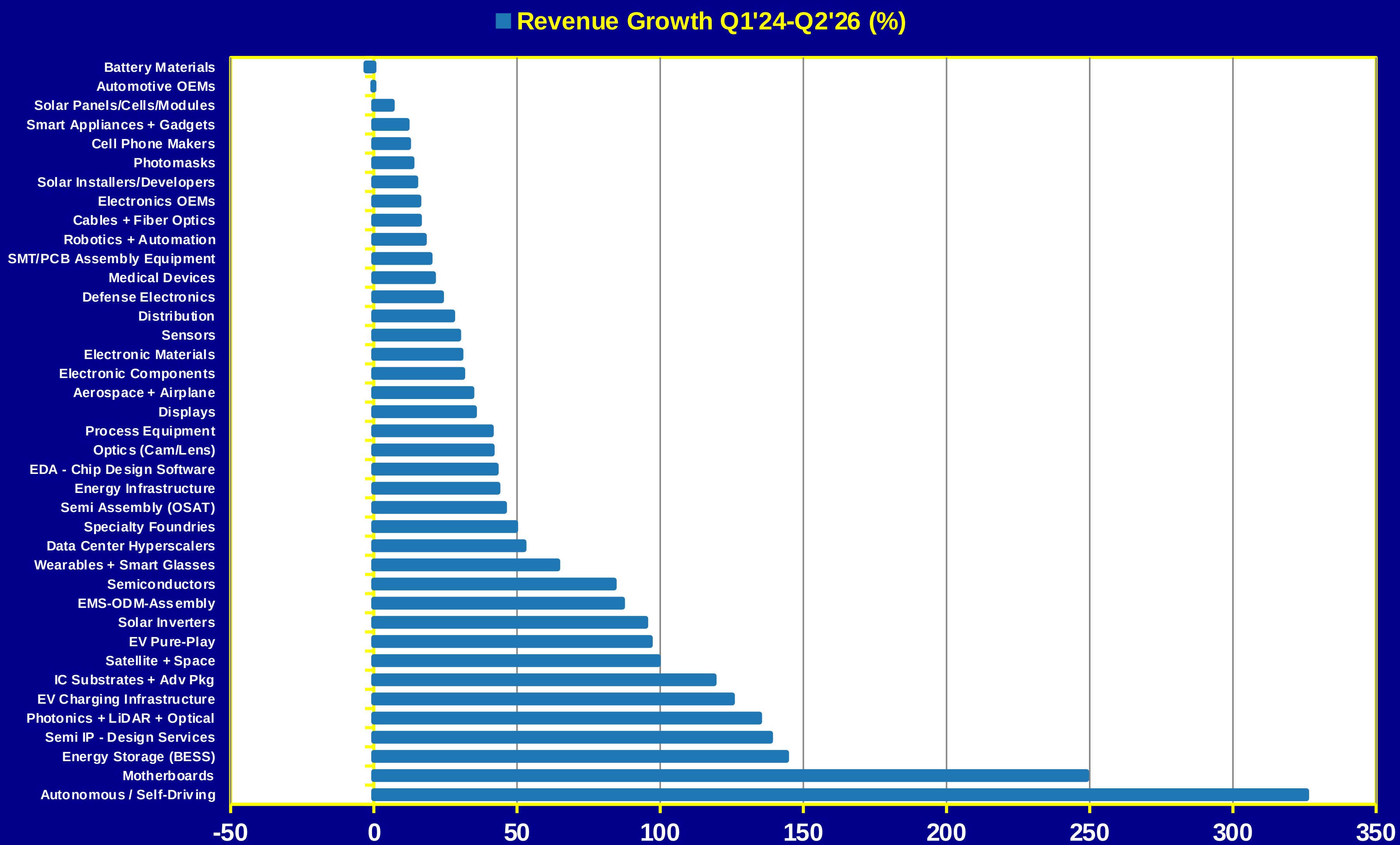
Source: CCG 39-sector composites (389 companies). Growth from Q1'24 to Q2'26 (nine quarters).

Top 15 Sectors by 3/12 Growth Rate | Q2'26 (%)



Source: Walt Custer 3/12 discipline: last 3 mo vs same 3 mo yr-ago. Detects cycle turns 3-6 mo before 12/12.

Full 39-Sector Revenue Growth Ranking | Q1'24 -> Q2'26 (%)



Source: CCG 39-sector composites, Q1'24 to Q2'26 (nine quarters). Autonomous, Motherboards, BESS lead; Battery Materials, Auto OEMs bottom.

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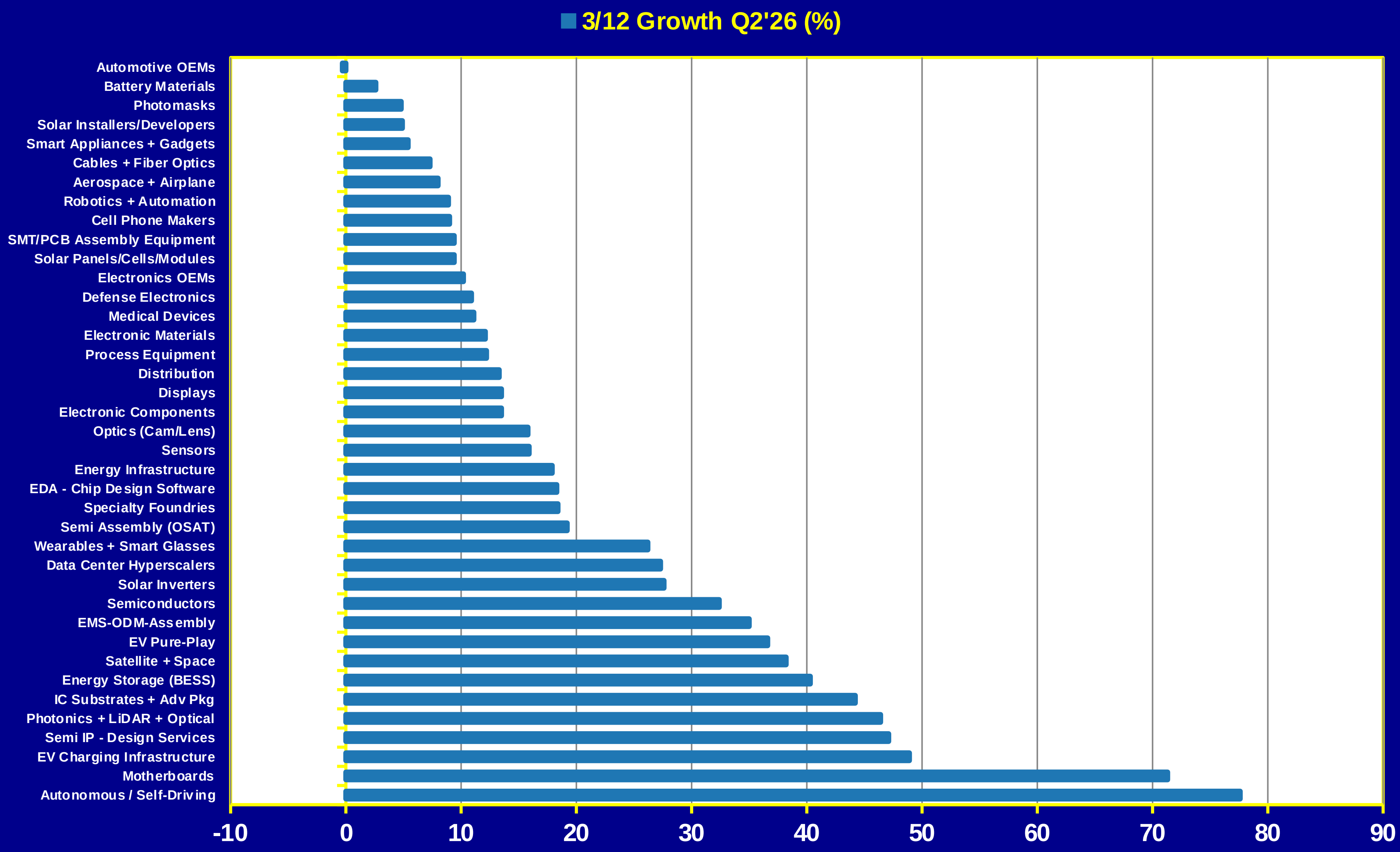
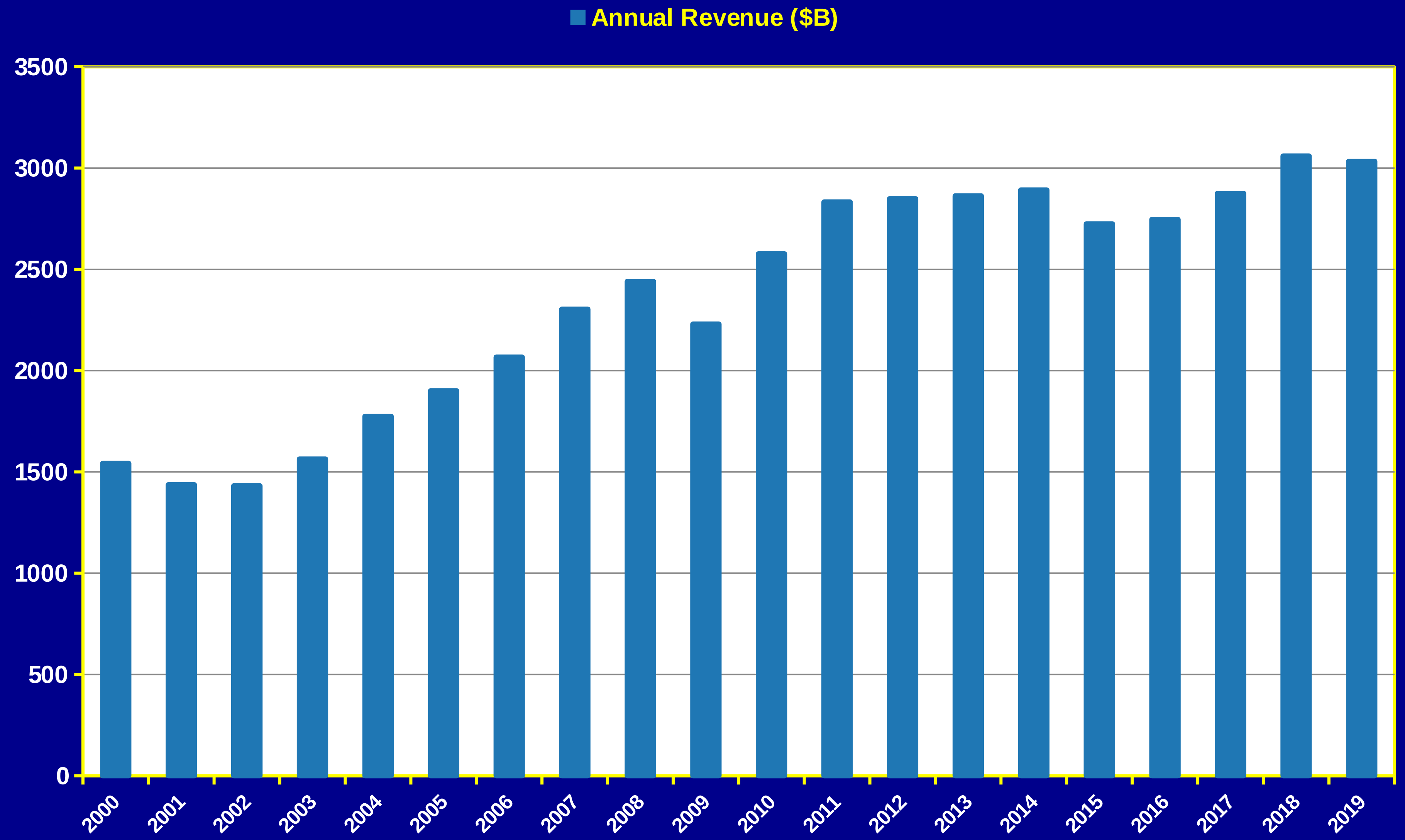
Full 39-Sector 3/12 Momentum Ranking | Q2'26 (%)



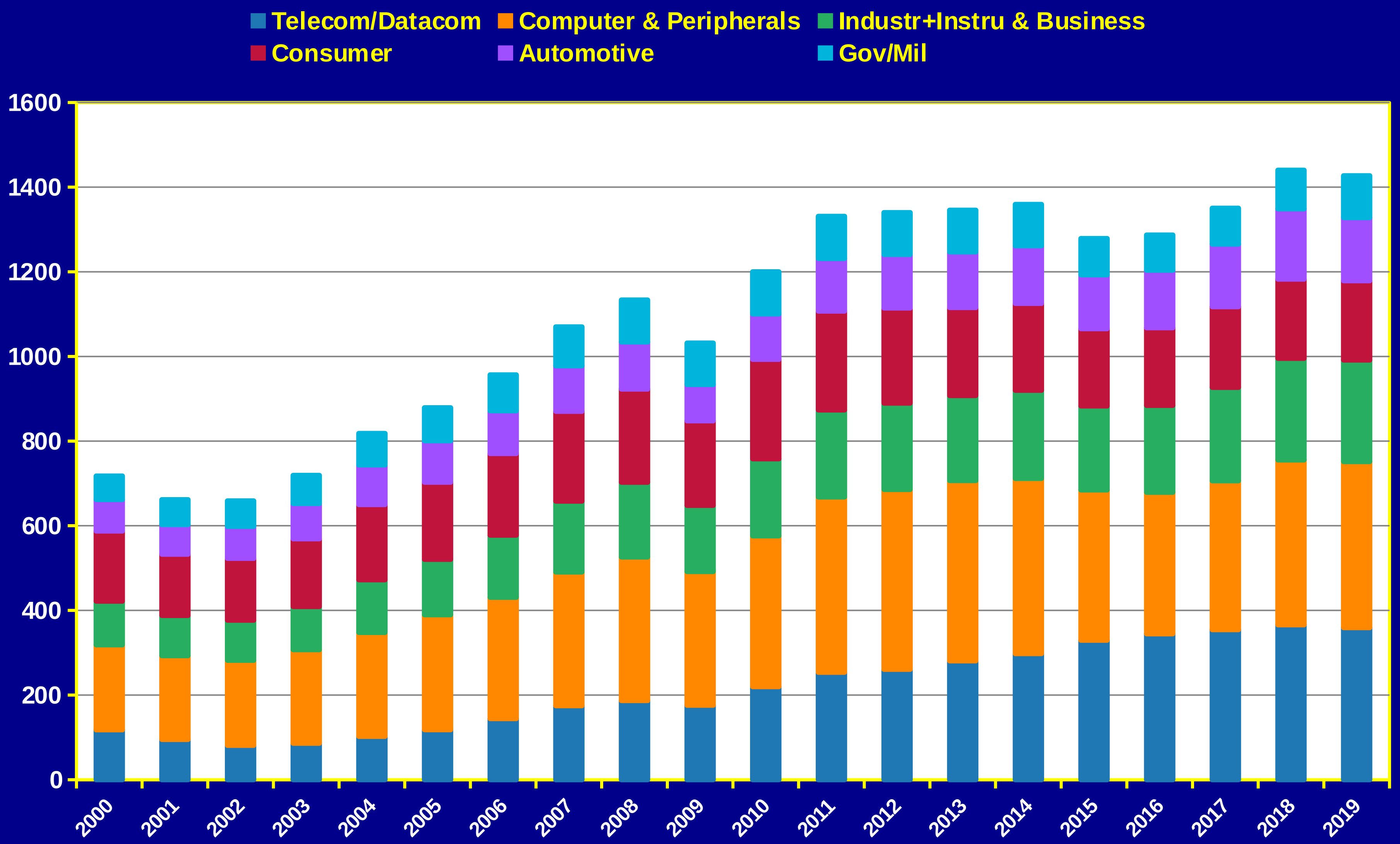
Source: CCG 39-sector 3/12 growth Q2'26. Real-time cycle-momentum indicator: >20% = expansion; 0-20% = plateau; <0 = contraction.

CCG 213-Company Composite | Annual Revenue 2000-2019 (US$B)



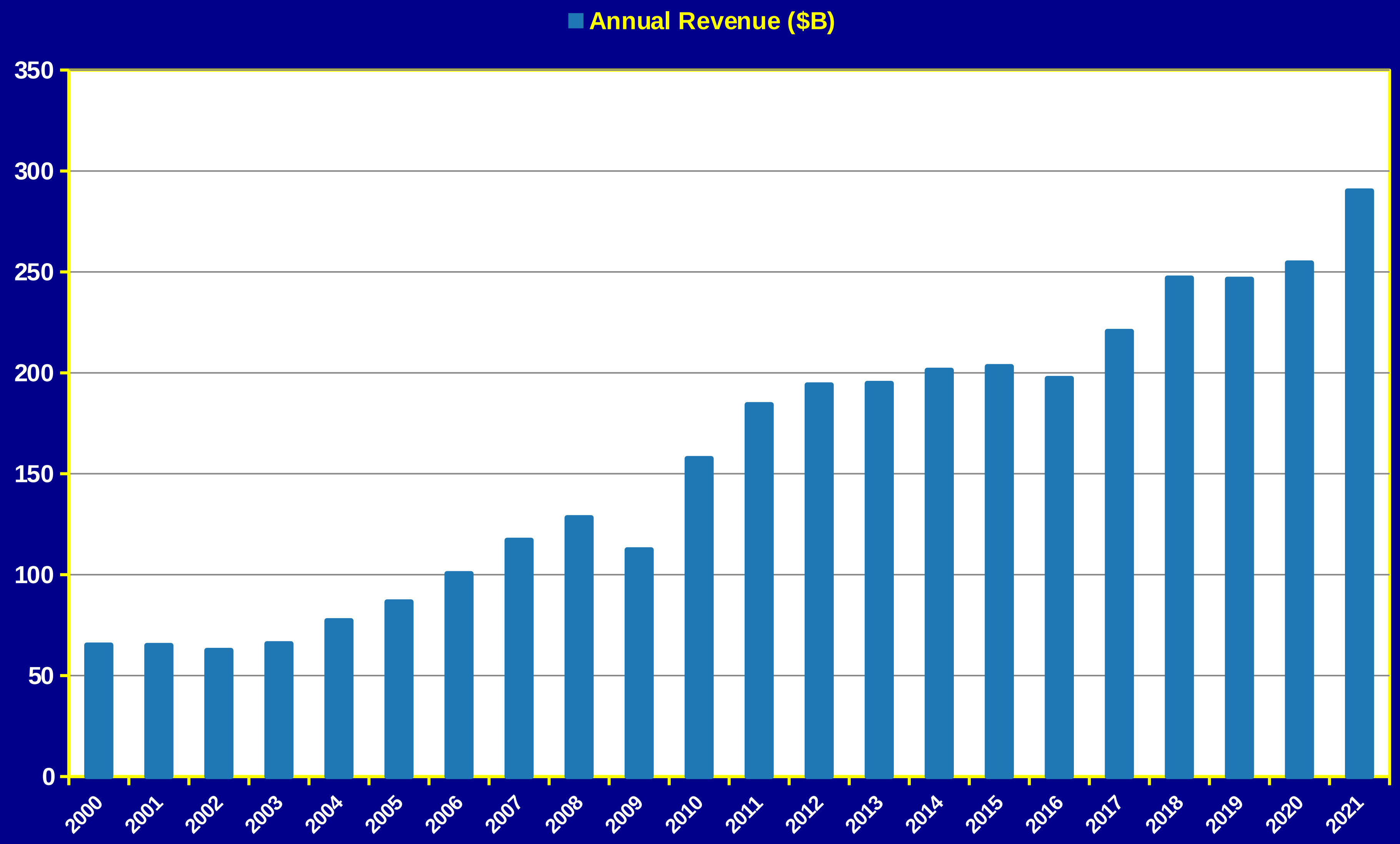
Source: Walt Custer, Custer Contexo Group (Rev-Eleq deck): Computer 13, Internet 13, Storage 17, Communication 30, SEMI 40, Medical 21, Instruments and others. Series ends Q3 2020. Down years: 2001-02, 2009, 2015, 2019.

World Electronic Equipment Production by Type | 2000-2019 (US$B)



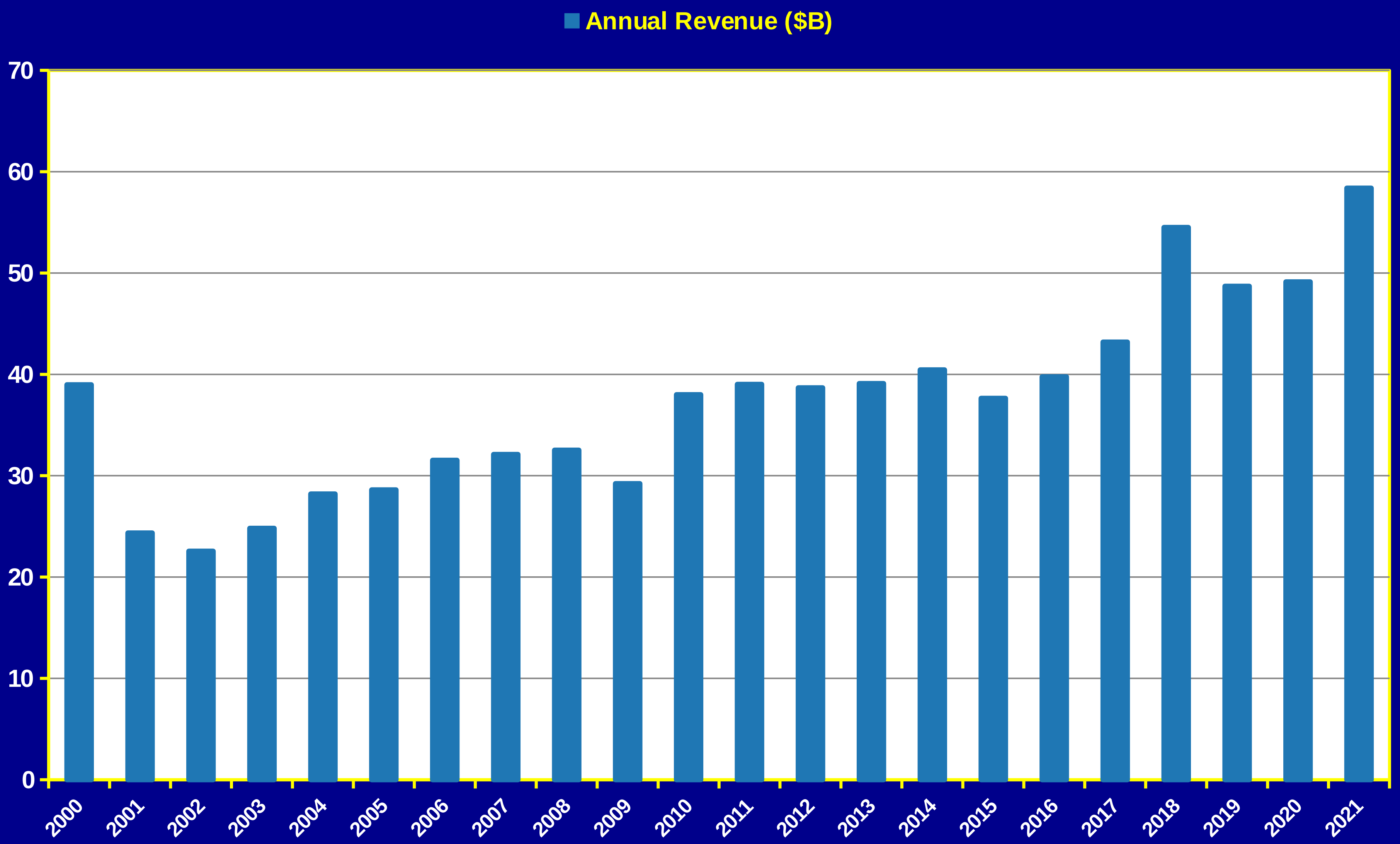
Source: Walt Custer, Custer Contexo Group (Rev-Eleq deck), annual sums of quarterly estimates at fluctuating exchange rates. Quarterly data run to Q3 2020. Down years: 2001-02, 2009, 2015, 2019.

CCG Large EMS 9-Company Composite | Annual Revenue 2000-2021 (US$B)



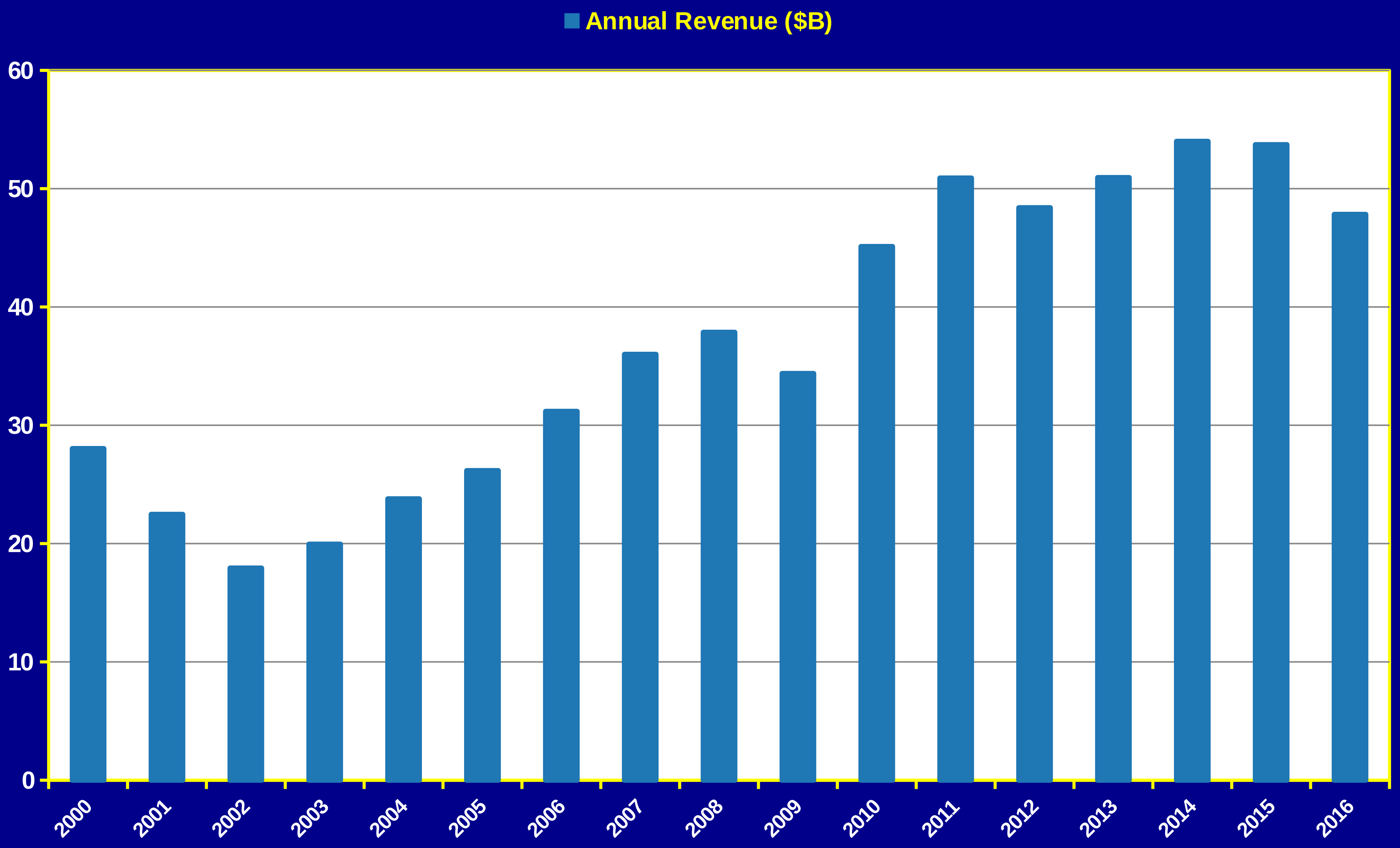
Source: Walt Custer (Rev-Oth deck): Benchmark, Celestica, Flex, Foxconn, Jabil, Plexus, Sanmina, Sypris, Venture. Series ends Q3 2022; see the Taiwan EMS/ODM slide for current data.

CCG Passives 14-Company Composite | Annual Revenue 2000-2021 (US$B)



Source: Walt Custer (Rev-Oth deck): ALPS, AVX, Bel Fuse, Diodes, Intl Rectifier, Kemet, Knowles, Littelfuse, Murata, RF Micro, Rohm, Vishay, TDK, Yageo. Series ends Q3 2022.
2001: -38% (dot-com bust).

CCG Distributors 9-Company Composite | Annual Revenue 2000-2016 (US$B)



Source: Walt Custer (Rev-Oth deck): Arrow, Avnet, EACO, Electrocomponents, Excelpoint, Nu Horizons, Richardson, WPG, WT Micro. Series ends Q3 2017; see the Arrow + Avnet slide for current data.

Executive Dashboard | Six Numbers That Matter

$95.3B
World PCB output, 2024E
Nakahara, Mar 2025

~$100B
World PCB output, 2025E
Nakahara estimate, Apr 2026

$175B
World PCB 2030F, CCG forecast
Prismark/CCG growth model

60%
China share of world output, 2024E
$56.9B of $95.3B, Nakahara

+81%
CCG Semi composite, Q2'26 Y/Y
Company filings

+32%
CCG PCB fabricator composite, Q1'26 Y/Y
Company filings

Source: Dr. H. Nakahara / N.T. Information Ltd (World PCB Output Mar 2025; NTI Digest Apr 2026); CCG PCB forecast; CCG composites from company filings (Custer Financial Database, Sep 2026).