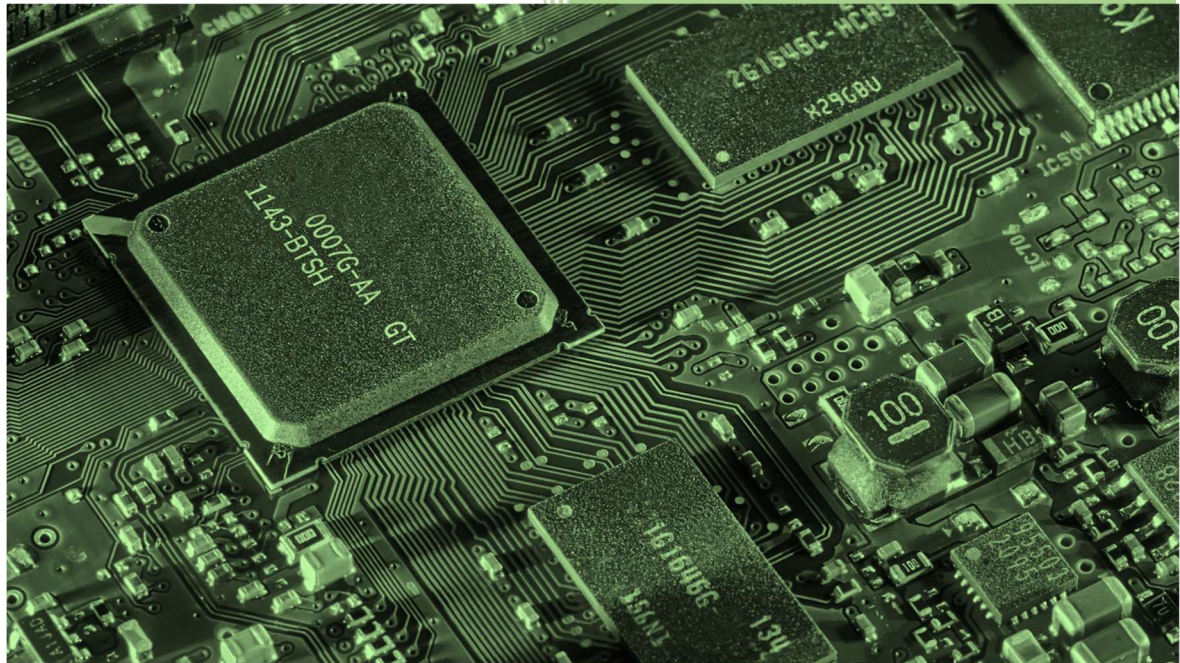




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Material Market Update: Q4-2023



Howard Phillips

Head of Supply Chain

October 2023



Axis Electronics: Material Market Update – Q4-2023

October 2023

Welcome to Axis Electronics' Material Market Update for Q4 2023. I hope you find the following information of value.

In our recent reports, we have highlighted the positive and negative impacts of the decline in the semi-conductor market through 2022 and 2023. Nearly all indicators are showing that the market has now bottomed out, and the next growth period is underway.

This growth is welcomed, and with heavy investments in new Wafer Fabs across the globe the market is in a reasonable position to respond positively.

However, despite the positive message that availability of material generally improving, we do continue to see that Analog and Logic is relatively constrained and I expect the next growth period to create some constraints in the supply of electronic components. So, dependent on the technology and lifecycle status of certain components pockets of extended lead-times will continue to disrupt supply in places.

While the stock situation is improving to support programs in 2023 and 2024, Axis Electronics' message remains unchanged. We have clear evidence that the programs supported by a material pre-buy strategy (from 2021 and 2022) have benefited tremendously. We therefore continue to encourage all customers to extend their MRP horizons out to at least the end of 2026. To enable you to meet your business needs, your qualified data is crucial to Axis in mitigating ongoing Supply Chain pricing and lead time challenges.

Axis Electronics continues to offer risk mitigation solutions for your long-term forecasts by recommending material pre-buy options against your planned forecasts. This allows us to manage your demand within our Supply Chain.

The following pages provide Market Updates from our strategic suppliers and trusted sources to provide further evidence and detail. I am also delighted to welcome contributions from Raluca Maxim and Adrien Suciu who are both Commodity Managers for Cicor.

The Axis team is ready to receive your enquiries and orders, to work with you to mitigate supply chain risks.

Thank you for your attention.



Howard Phillips – Head of Supply Chain

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Electronic Components: Market Sales & Forecasts

As we move into the final quarter of 2023, all forecasts are indicating a sharper decline in worldwide semiconductor revenues. Gartner's models reducing its 2023 forecast to -12.3% (\$74 billion) on 2022 numbers.

All industries, except for automotive have seen a decline in semiconductor revenues in 2023. This decline has contributed to a moderate surplus the supply chain, which is a downgrade on the severe surplus reported by Gartner in Q2-2023. Figures 1 -3 show this in more detail.

2024 continues to see significant growth forecasted. Despite 2023 forecasts being downgraded, 2024 figures remain as strong as the previous quarter, with Gartner forecasting 20.4% growth taking the industry to \$633 billion.

Significant growth continues to be forecasted as we move through 2024-2027 and beyond with the \$1 Trillion barrier expected to be broken in 2033. Although Wafer Fabs are in construction globally and expected to come on line in the next few years, the growth forecasted presents a real risk of the next constraint period for the industry.

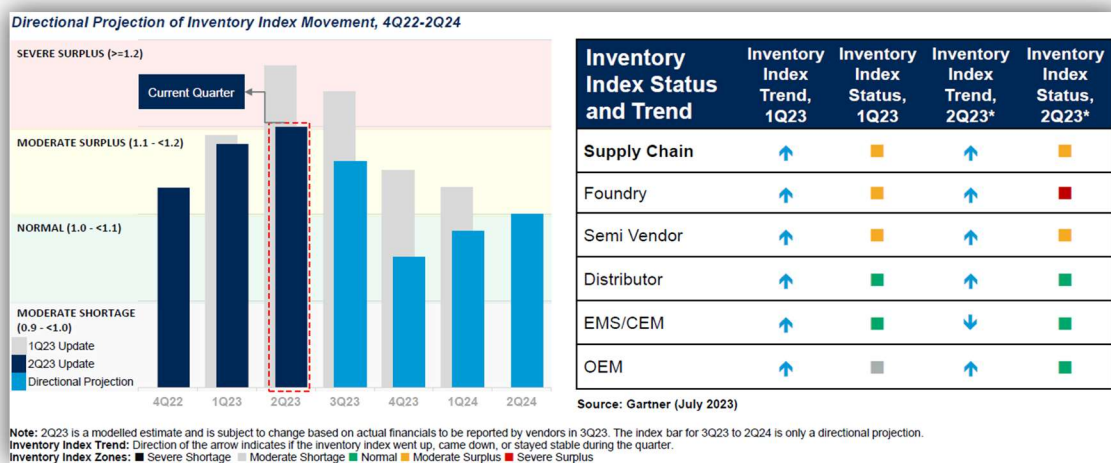


Figure 1: Directional Projection of Inventory Index Movement, 3Q23-2Q24 – Gartner

2023 Growth	2023 (USD B)	Apps	2027 (USD B)	2022-27 CAGR
-25.4%	\$103.2	Smartphone	\$133.8	-0.7%
-0.3%	\$73.5	Industrial/Mil/Aero	\$108.0	7.9%
-17.2%	\$59.5	PC & Tablet	\$70.6	-0.3%
-18.7%	\$40.5	Server	\$63.1	4.8%
-35.9%	\$20.4	SSD	\$59.4	13.2%
23.5%	\$17.7	ADAS	\$35.4	19.8%
36.0%	\$15.3	EV/HEV	\$29.3	21.2%
-15.4%	\$8.2	Wearables	\$13.9	7.3%
303.7%	\$2.1	Auto-HPC	\$13.2	86.1%
-6.5%	\$185.4	Others	\$224.8	2.6%
-12.3%	\$525.9	Total Semi	\$751.6	4.6%

PC – Personal Computer, SSD – Solid-State Drive

Figure 2: Growth levels by industry – Q2-2023 – Gartner

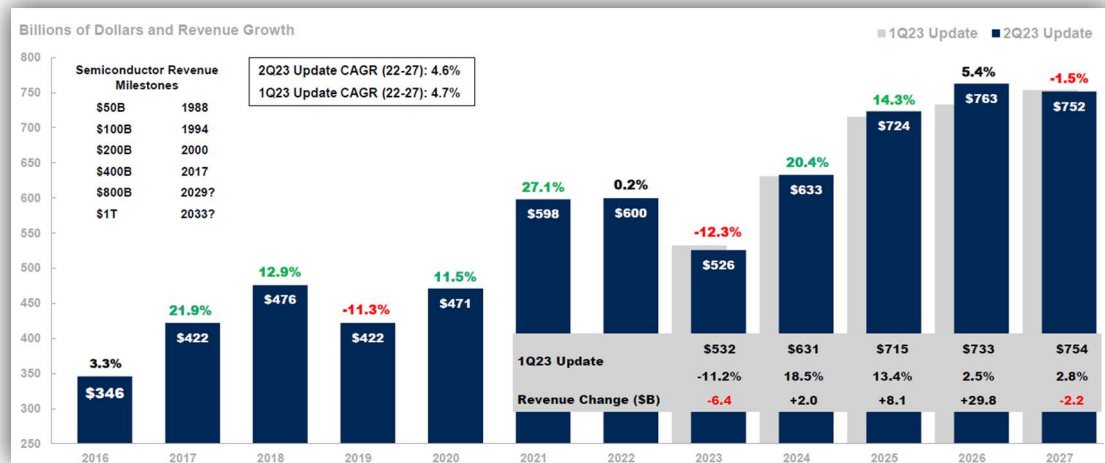


Figure 3: Source – Semiconductor Revenue Forecast, 2Q22 update - Gartner

Electronic Components: Wafer Fab Update

In our previous updates we have highlighted the record investments by Semiconductor manufacturers but also advised that these positive moves by industry should be met with caution as a CAPEX correction was anticipated with the downturn in forecasted revenues.

Latest indicators forecast that CAPEX for Fab Equipment (which drives Fab Capacity) to be at \$136.3 Billion for 2023, which is -22.5% YOY. Growth of just 1.35 (\$138 B) is expected in 2024, and then single digit % growth in 2025-2027.



Figure 4 Source – Forecasted CAPEX spending, 2Q22 update - Gartner

Capacity forecast for 2023 to 2026 is as follows, which highlights the risk that growth will struggle to meet the demands of the forecasts for 2024 and 2025. This creates a real possibility for constraints in the semi-conductor market as we move into 2024 and beyond.

Lastly, it is important to acknowledge that many of the \$ billions invested are being directed into new / smaller technologies (5 nm – 10nm). Older technology products will continue to lag as manufacturers encourage developers towards the newer technology nodes.

Electronic Components: Pricing and Lead Time Trends

Market updates from our key suppliers show that lead times are reducing as some of the new Wafer Fab capacity starts to come online. In general terms, wholesale price reductions are not expected as we move into 2024. Ongoing macroeconomic factors are contributing to a high level of volatility, and pricing could change at any moment.

The messaging from distribution remains consistent. To secure the best pricing please place orders as early as possible, and where program funding is available it is recommended to drive inventory into stock at the earliest opportunity.

Allocation still exists for some manufacturers and/or technology types, so we advise customers to provide the clearest visibility of program nature and special contractual exceptions which can be applied.

Manufacturer	Product	Lead Time (Wks)	Trend Direction	Commentary
Coilcraft	Shielded Power Inductors RF inductor, ceramic core	6 - 16 weeks	↓	Lead time reduced
Diodes Inc	Power MOSFET	12 - 42 weeks	↓	Lead Times reducing
Intel	NAND	40-52 weeks	↔	Increased Lead Time
	CPUs	40-52 weeks	↔	Increased Lead Time
	Ethernet Controller	104 weeks	↔	Allocation
Microchip	All	36 - 52 weeks	↓	Increased lead-times, but reducing
Micron Technology	DRAM Module	25 weeks +	↔	Long term support through 2025.
	DRAM	8 + weeks	↓	Please forecast your demand, lead time going up
	NOR Flash	16 weeks +	↔	Prices flat to down depending on the density. Forecast is key to receive allocation
	e-MMC	25 weeks	↓	4,8 and 16GB keep on converting. Please ensure that relevant info is provided. Price stable but lead time increasing a little
	SSD	25 weeks +	↑	Flat prices. Bring all opportunities with relevant information
Nexperia	Power Mosfet	26-40 weeks	↓	Lead times carry on stabilizing except for SO8, supply situation still a bit more complicated.
Onsemi	Power Mosfet	16-40 weeks	↓	Lead times stable even if still long.
Renesas	All Products	26 weeks +	↔	Price increase across the whole portfolio (IDT, Intersil, Dialog included) in January 2023
STMicroelectronics	All Products	up to 45 wks	↓	Shorter lead times (SMA, SMB, SMC)
	Power Mosfet	26-40 weeks	↓	Supply remains tight so lighter lead times improvement
	Eeprom (SPI & ASM)	40 weeks	↔	Allocation on all packages. Situation hasn't evolved

Figure 4: Source - AVNET Trendliner Q3 / 2023

Electronic Components: Passive update

Provided by Raluca Maxim – Passive Commodity Manager, Cicor

Sources: TTI Market Update Q3 2023 & Smith Market Intelligence Report, September 2023

MLCC Ceramic Capacitors

MLCC lead times have started to fall to normal levels. Ultra-small parts such as the 0201, 0402 and 0603 (EIA case sizes) consumed in handsets have shown the biggest drop.

Tantalum Capacitors

Tantalum capacitor lead times started to drop from mid-2022 through to now as much of the pressure that was on the supply chain to support the global increase in demand for computing devices began to drop off. However, increases in demand from the Defence and Aerospace sector have kept longer LTs for Mil and COTs and Wet technologies.

Aluminium Capacitors

Smaller SMD V-Chip and radial leaded aluminium electrolytic capacitors have started to reduce in LT related to the supply chain for notebook and desktop computers. However larger power caps still on longer LTs due to use in the infrastructure channels for power transmission and distribution. Hybrid Capacitors used mainly in automotive markets remain on long LT.

Plastic Film Capacitors

Lead times for plastic film capacitors stabilized on a month-to-month basis but remain elevated, because of its key use in renewable energy systems, PHEV and EV propulsion.

Thick Film Chip Resistors

Thick film chip resistor lead times have declined steadily between mid-2022 and now due to reduction in consumer product usage in China. High Power parts remain tighter due to increased demand in EV, infrastructure, and Defence/Aerospace.

Thin Film Resistors

Auto grade, larger case sizes and tight tolerance items remain very restricted due to the strength of demand in EV and Industrial applications. Manufacturers are investing in more capacity for these longer lead time parts and reducing expansion in the consumer items. Mil and Aerospace demand also impacting availability of Hi Rel items.

Inductors

Inductor lead times and demand remain stable. Investments in power choke capacity by a number of manufacturers has kept pace with the market growth. Some supply issues still related to bigger transformers for power applications.

Timing Devices

Manufacturers of Crystals and Oscillators have now been able to resource materials and fix supply chains to enable much better availability. Lead Times normalising

RFQ Trend in Open Market

The number of requests for passive components was slightly higher in August than in previous months, but only by a small percentage. Deliveries for automotive MLCCs, chip resistors, and connectors are still the main problems, while commercial-grade and consumer-focused materials are once again growing in excess. Murata, Yageo, TDK, Panasonic, Kemet, and KOA Speer are seeing the most automotive capacitor and chip-resistor problems, while TE Connectivity and Molex are having the most interconnect-component shortages right now.

Component Description	Current Status	Most Problematic Manufacturers
Transistors	Supply is stable.	Infineon and onsemi products affected by the February Weiwu fire in Wuxi, China
MOSFETs /IGBTs	Supply is constrained—especially for automotive and industrial products.	Infineon, onsemi, and Vishay
Rectifiers	Supply is stable.	
Thyristors	Supply is stable.	
RF ICs	Supply is stable.	
Ceramic Capacitors	Constraints can be found in automotive and industrial products, while others are stable.	KYOCERA AVX, KEMET, Panasonic, and Murata
Tantalum Capacitors	Supply is stable.	
Resistors	Constraints can be found in automotive and industrial products, while others are stable.	KOA Speer, Yageo, and Murata
Inductors	Supply is stable.	
Quartz Crystals/Resonators	Supply is stable.	
Transformers	Supply is stable.	
Filters	Supply is stable.	
Varistors	Supply is stable.	
Thermistors	Supply is stable.	
Timing ICs/Clock Buffers/Clock Generators	Supply is stable.	
Connectors	Supply is stable.	
Relays	Supply is stable.	
Switches	Supply is stable.	
Opto Couplers	Supply is stable.	
LEDs	Supply is stable.	

Figures 5: Manufacturer Lead Times: September Market Intelligence Report 2023: N.F. Smiths Associates LP

Global Material Supply and Logistic Trends

Raw material price index for passive components stable through Q2 2023 for all keystone metals (nickel, copper, titanium and palladium)



Figures 6 – 7: Nickel and Palladium: 5 Year Price – Source: www.mining.com

Printed Circuit Board Update

Provided by Howard Phillips and Adrien Suciu, PCB Commodity Manager, Cicor

Graphic PLC update

PCB materials:

Looking quite stable at present with lead times being quite consistent, standard FR4 materials can now be a stock item in a lot of cases, if not it's normally available in 10/15 working days. Chemistry is no longer on allocation which is a much better situation and although Dupont Flex AP material is still on 35 w/days, alternative materials such as Thinflex, etc (if not on the shelf) are available in 20 w/days. We are not seeing any (hoped-for) price reductions due to inflation and the increase in fuel prices, which is still affecting the whole of Europe.

Plant loadings:

Still very busy with loadings being high for the next two to three months, lead-times remain normal as we have increased capacity and are still delivering on time, most UK competitors in the same market sector are also very busy. Q1 2024 has the potential to continue to be very busy also, this is due to some very large defense projects coming to fruition at the same time, which could lead to increased lead times in Q1 and Q2 next year although only by a week or two, so getting orders placed on the supply chain as early as possible would make sense.

Market Trends:

From a European perspective, the general market place is still very positive, except for the automotive industry which has seen a downward trend from 2022 to 2023 affecting several European PCB volume suppliers. Our European PCB competitors who are in the same market sector are very busy with lead-times nearly double the UK offering, in the main this is due to the space sector as a French PCB plant specialising in European space work had a fire and has since closed, so the work has been shared amongst the remaining suppliers. Also, the tap for commercial Aerospace requirements has been turned back on since the COVID shutdowns, and things are ramping up quite quickly in this sector.

Xmas Shut down:

As normal this is our main closure period and an opportunity for annual maintenance/new equipment installations. This year we will be closed from the 22nd of December to the 2nd of January. Lead times might extend by a day or two at this time due to the time taken to close and reopen the plant.

On-shoring:

Whilst there is a lot of talk about moving away from Asia and On-shoring, we have seen little up-take as commercially there is still a large difference in unit prices between Asia and Europe/USA.

Metals Update

Copper ended the quarter roughly the same as where it started, but it must be noted that pricing has been trending downwards since 1st week of September and is currently at its lowest point since mid-2022.

Tin in general has remained stable for the last quarter.

After the drop noted in our last update, the pricing of Aluminium and Steel have both remained stable.

Availability of raw materials is not considered a risk this time.

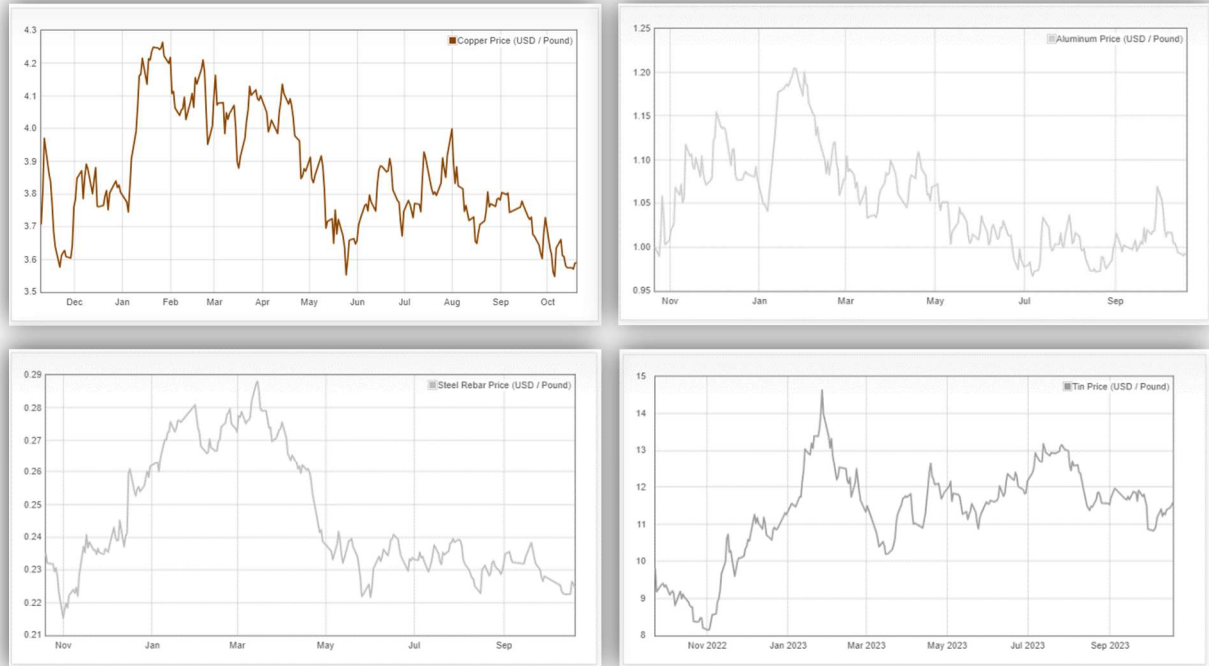


Figure 8-11: Source – www.dailymetalprice.com

Macroeconomics

With 2024 rapidly approaching we continue to see new macroeconomic factors influence supply chains and different markets across the world.

US / China Trade War

The United States and China trade war is showing no signs of easing, with President Biden imposing further restrictions on the use of Chinese companies for goods and services. New trade restrictions on AI chips will all but cut off the Chinese market from high-end GPUs and Accelerators – not just in the data centre but also in the home as well. In response, China announces further export restrictions raw materials – this time on graphite a material that is used in electric vehicle batteries.

[China imposes export curbs on graphite \(ft.com\)](https://www.ft.com/content/2023/09/27/china-graphite-export-restrictions)

Global conflicts

Major conflict around the globe continues to disrupt supply chains.

More recently, the troubles in Israel and Palestine present a risk to the supply of some electronic components.

The Ukraine and Russia conflict continues, and pressure remains on the supply of raw materials such as nickel, copper and iron.

Inflation, and Interest Rates

Inflation in the UK is slowly working its way downwards (6.7% in Sept '23) , but is still above that of its peers in Europe. The average of the European Union being 4.9% in Sept '23.

Further afield Japan and US continue to fare better with inflation rates currently sitting in the 3% and 3.7% respectively.

In general consumer confidence is returning, as supports the expected growth in the semiconductor industry for 2024 and beyond.

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