

TTI, Inc.



The Specialist in Electronic
Component Distribution

A Berkshire Hathaway Company



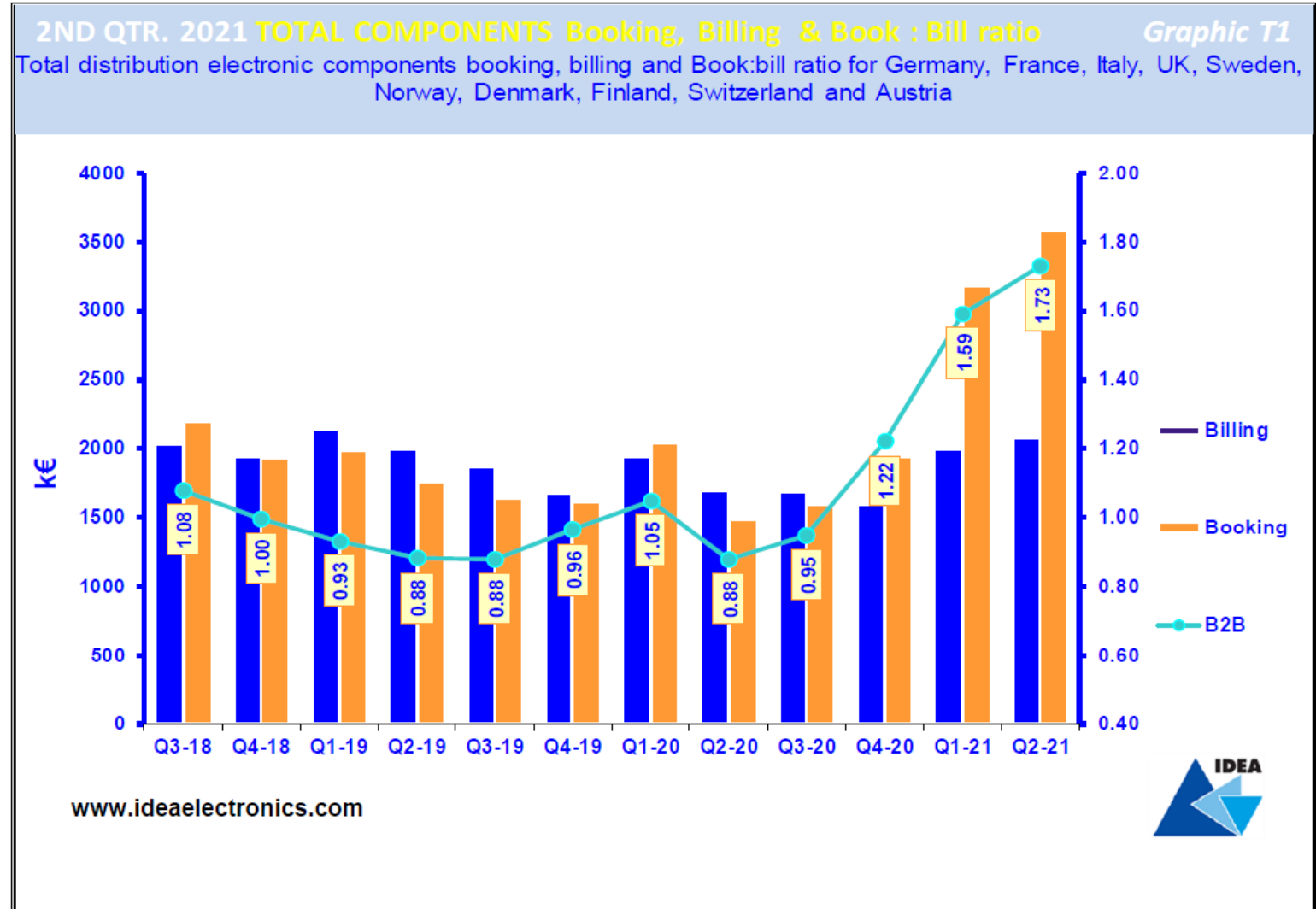
Market Conditions Overview



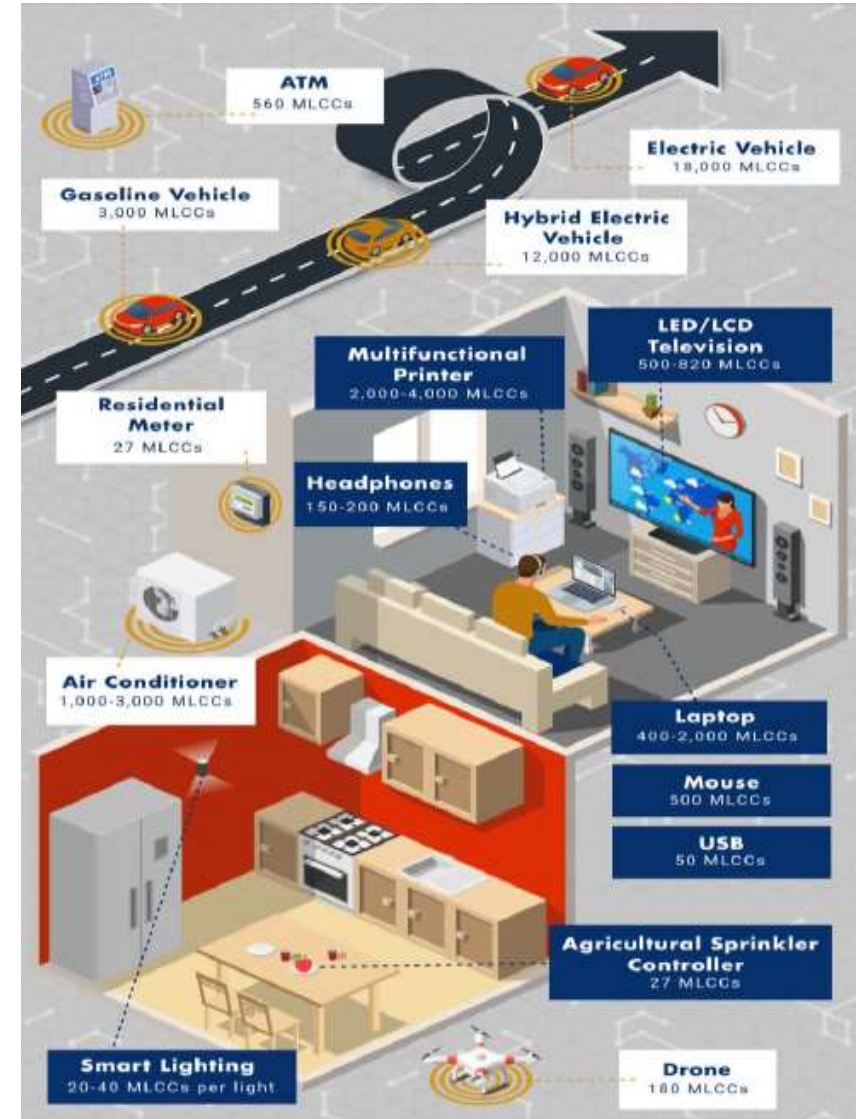
The demand for electronic components continues to increase globally in 2021. The main drivers for upside demand have been the continued investment in 5G and IOT, the emergence of WFH increasing demand for PCs, Tablets and consumer electronics, huge investment in the Medical market, plus the recovery in Automotive and Industrial segments in Asia, The Americas and Europe

Q2 saw some softening in smartphone demand in China, however the sharp increase in Automotive demands (primarily driven by major investment in electrified car production and refilling of dealer inventories through late Q1 and early Q2) have pushed Lead Times to much higher levels than seen in 2020 and the outlook though 2H 2022 suggest that we will face shortages on many passive and discrete components for an extended period

In addition to market recovery, the low component and sub assembly inventory at the end of 2020 has further driven high bookings (chart below) and demands for immediate shipments have stretched the capacity at the suppliers who have quickly reached 90% utilization, thus extending lead times further, in some cases above 50 weeks



The Component Multiplication Effect



Labour and Freight Supply and Cost Trends



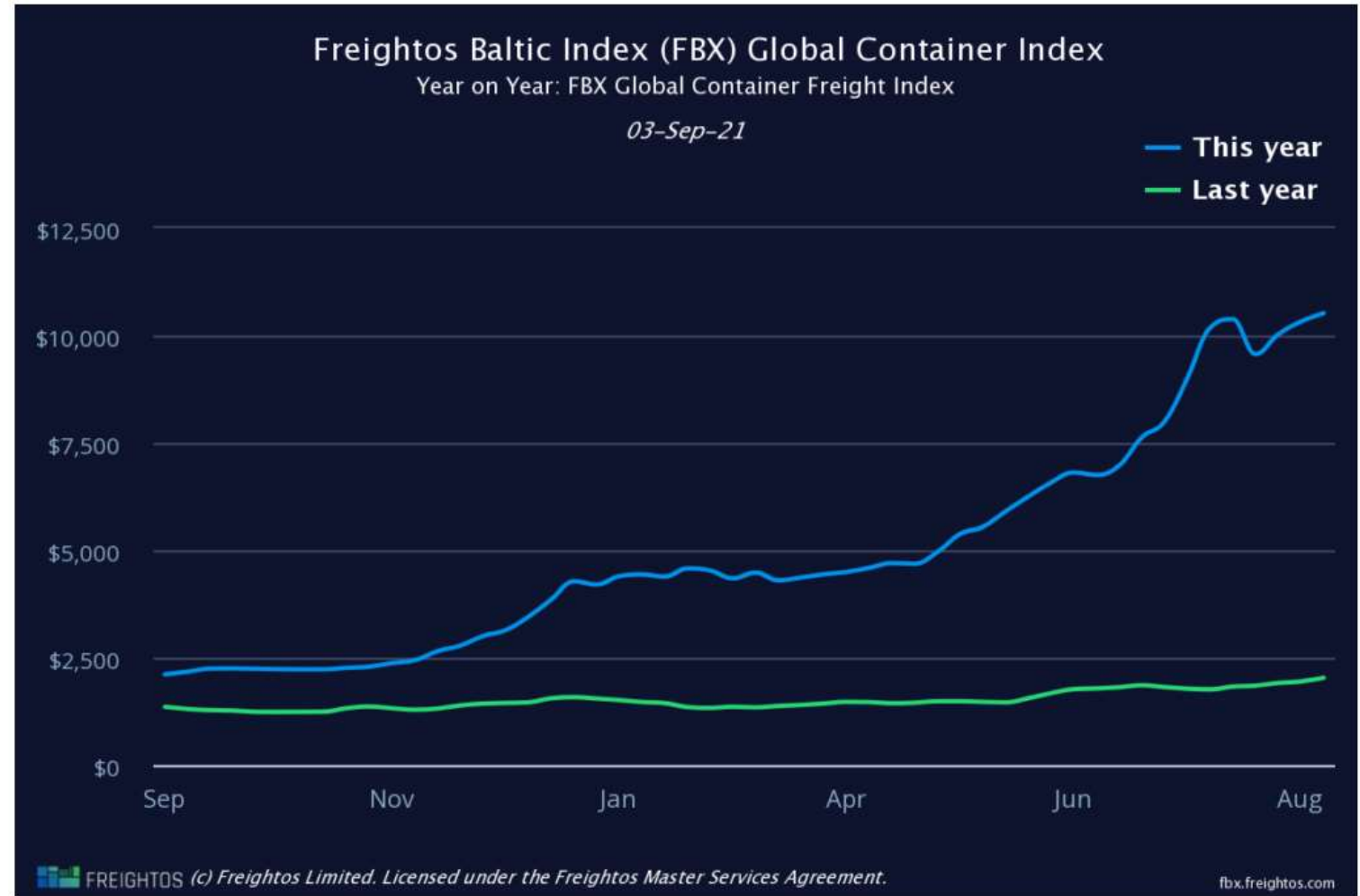
Latest advice from our Asian based suppliers is that sea freight continues to take up to 12 weeks from China with no near term improvements expected

Freight costs have continued to increase and are now stable on a very high level (see graph)

Port restrictions in China recently have further disrupted shipments and may have longer term impacts on supply as backlogs increase

Labour challenges are impacting some suppliers on a case by case basis. In Malaysia, Philippines, Indonesia and Taiwan we have seen restrictions in movement of labour also impact capacity levels at some plants. Due to the lockdown in Malaysia since June most factories have been running at maximum 60-70% capacity

Murata MLCC Production in Japan disrupted by Covid cases during August. Now reopened but some shipments delayed in the meantime



Raw Materials Supply and Cost Trends



Metals, Resins, Packaging and finished materials such as aluminium foil and polypropylene films have become scarce as supply chains struggle with high demand

In some cases material suppliers are asking for payment in advance to secure supply

Latest material price indexes updated weekly at <https://www.ttieurope.com/content/ttieurope/en/resources/marketeye.html>

- | | |
|-----------|-----------|
| Aluminum | Copper |
| Gold | Lead |
| Nickel | Oil |
| Palladium | Platinum |
| Silver | Tantalite |
| Tin | Zinc |

1 Year Aluminum Price

1.30 USD/lb



1 Year Crude Oil Price

74.49 USD/bbl



Capacitor Lead Time – Paumanok Report

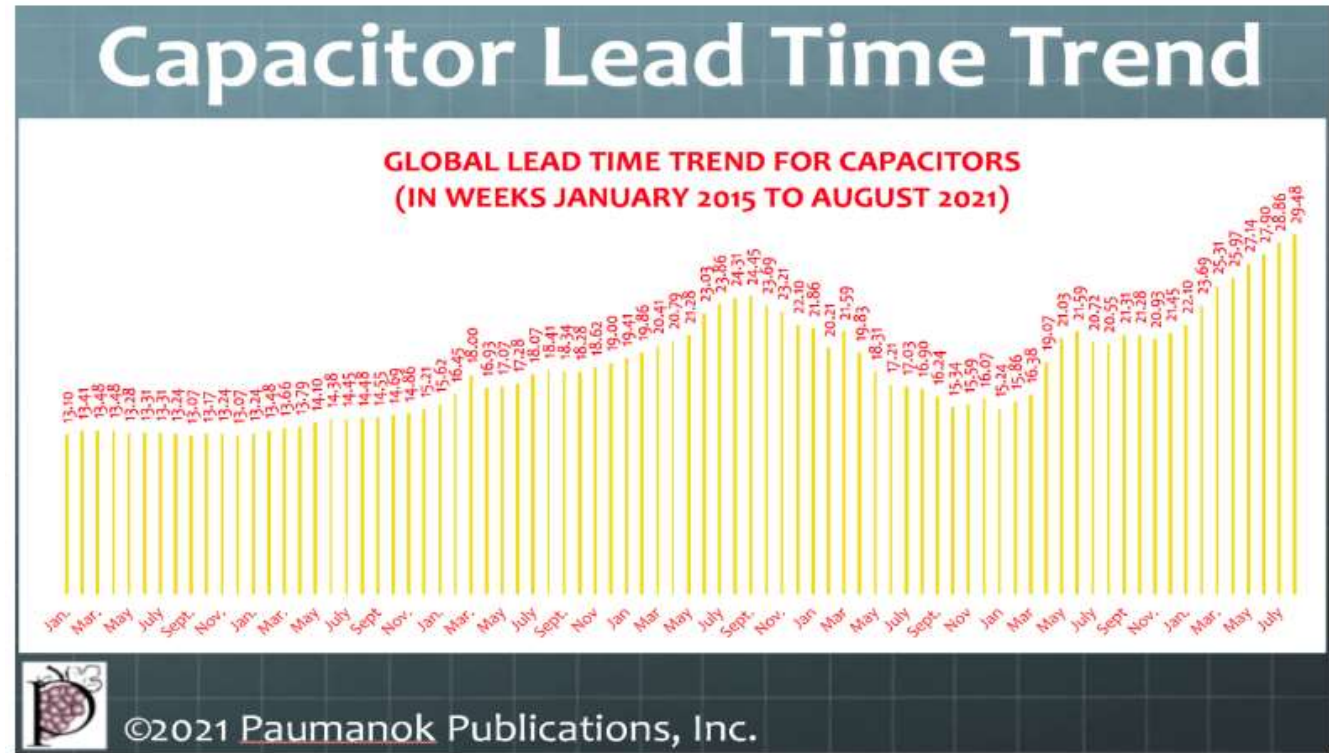


MLCC Lead Times – Lead times for MLCCs showed increasing lead times again in August compared to July 2021, with lead times for the 0603 and 1206 EIA increasing and remaining unchanged for the larger other chip case sizes. High-cap BME MLCC demand also increased in August on a month-to-month basis. Primary sources are forecasting a 15 percent increase in MLCC sales for the September 2021 quarter (on a quarter-to-quarter basis, which is substantial).

Aluminum Capacitor Lead Times + PPI Analysis – Lead times for aluminum electrolytic capacitors rose alarmingly in August 2021 following equally large spikes in demand and lead times in July 2021. Lead times for SMD V-chips, radial leaded, snap-mount and large-can capacitors all increased, with lead times for V-chips and radial leaded parts at 40 weeks. This new record high can be traced back to the “short-term” supply chain disruptions in Malaysia, which saw the idling of the Nichicon plant and the Panasonic plant in that country and, in turn, had an impact on lead times globally. This is a short-term event and lead times are expected to subside with the relaxation of work stoppage in Malaysia due to COVID-19. However, primary sources in China report shortages of etched anode and cathode foils.

Tantalum Capacitor Lead Times – Tantalum capacitor lead times continued to be among our primary concerns in August 2021, as lead times continued to extend for multiple product lines and the price of tantalum approached \$100 per pound. This is due to the pandemic’s impact on the supply chain from Central Africa, where the majority of ore is sourced globally due to Dodd-Frank legislation and “closed loop” supply chains for conflict minerals that favored the Democratic Republic of Congo.

In August 2021, the lead times for both the conductive polymer type and the manganese type tantalum capacitors increased again, with all case sizes and styles now at 40-week lead times



Plastic Capacitor Lead Times – Lead times for plastic film capacitors increased again in August 2021 and remain elevated. Lead times for all types of plastic film capacitors jumped because of pandemic-related supply chain issues with certain plastic film materials (i.e. polypropylene shipped from India). Upward shifts in demand and lead times have been noted for polypropylene-based interference suppression type capacitors, as well as radial-leaded PET type and PP type capacitors which all are in sharp demand for applications in battery electric vehicle propulsion (charger, inverter and converter circuits).

Resistor Lead Time – Paumanok Report



In August of 2021, resistor market lead times increased by 5.8 percent on a month-to-month basis. As we have stated in previous reports, the supply chain for resistors remains impacted by massive price increases in raw materials such as ruthenium and the availability of alumina substrates and cores...

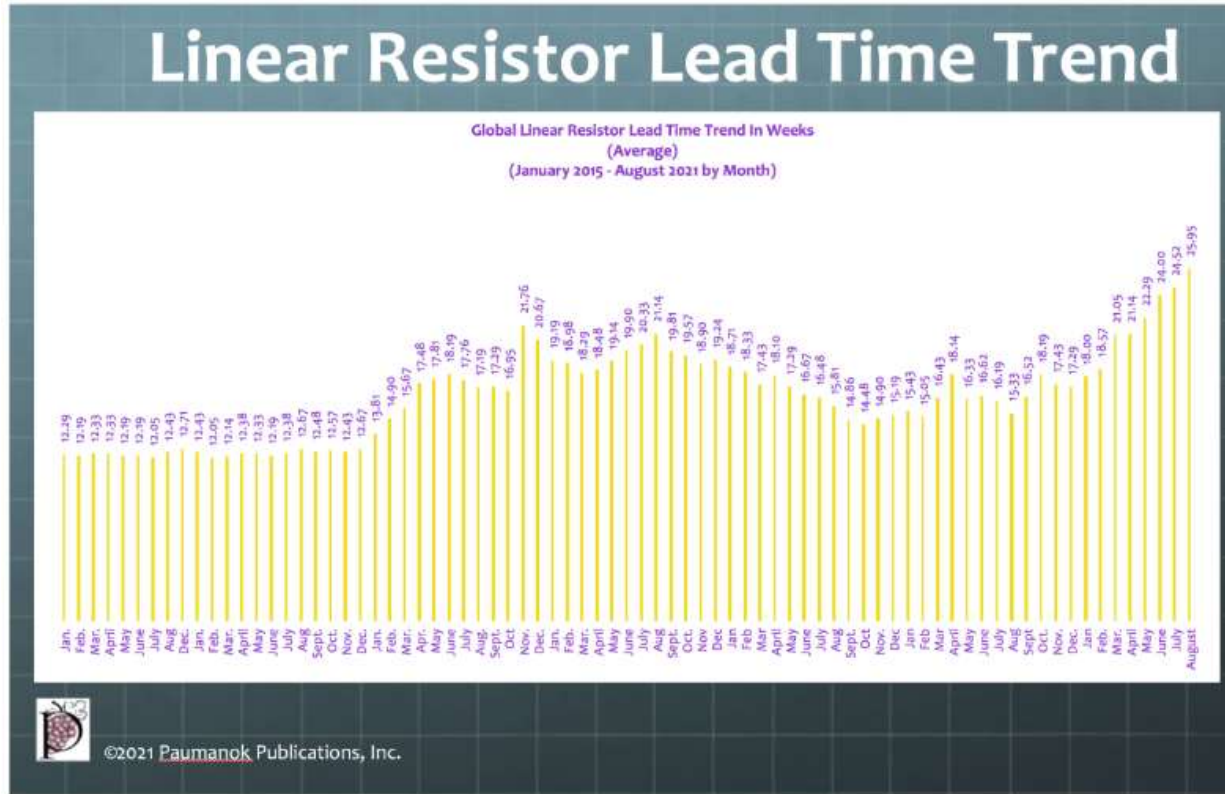
Thick Film Chip Resistors registered a solid 30-week lead time for all chips in August 2021 as supply chain issues with ruthenium continued to plague the industry, along with “short-term” shutdowns of factories in Malaysia and the Philippines.

The price of ruthenium, the active ingredient in thick film resistor paste, increased in price sharply to \$850 per Troy ounce in May and was at \$725 an ounce in August 2021. The price is now 20 times what it has traditionally been (\$44/oz) and remains a serious problem for manufacturers of thick film chip resistors, networks and arrays.

Thin Film Resistors continued to show a tightening across the board in August 2021, and in the prior months of July, June, May and April 2021, in response to tightening thick film chip markets. Thin film products, based on nickel and chrome materials, are the alternative to ruthenium thick film chips and the volatile price of ruthenium thick film materials. However, we note that thin film chips now have lead times at almost 40 weeks for 0603 and 0805 chips consumed in the computer and auto markets.

Resistor Networks demonstrated a spike in lead times in August, following lead time increases in July, June and May 2021. This spike is led by arrays, which jumped up in lead times in June substantially; following SIP network, which jumped up in lead times in the prior month, we expect that other ruthenium-bearing network products will also show increases in lead times as a result of the massive increase in ruthenium price.

Axial and Radial Leaded Resistors demand increased again raised alarm bells and concerns over idled factories in Asia due to the pandemic. Lead times for tin oxide and power wirewound joined those of carbon film at unusually long levels in August – the direct result of restricted factories in the Philippines and Malaysia



Discrete inductor demand increased sharply again in August 2021, rising 13.75 percent – a huge jump, following spikes in both July and June

Factories in Malaysia and the Philippines have been impacted by the pandemic and have idled production, resulting in supply chain disruptions and changing lead times

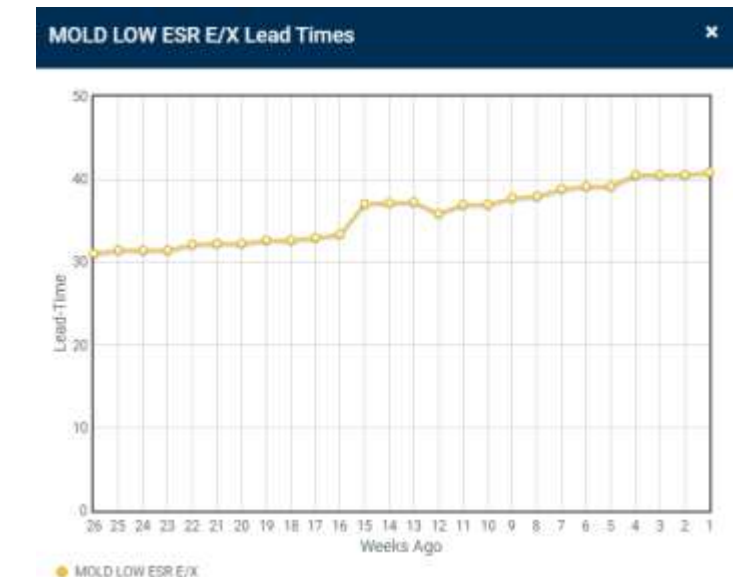
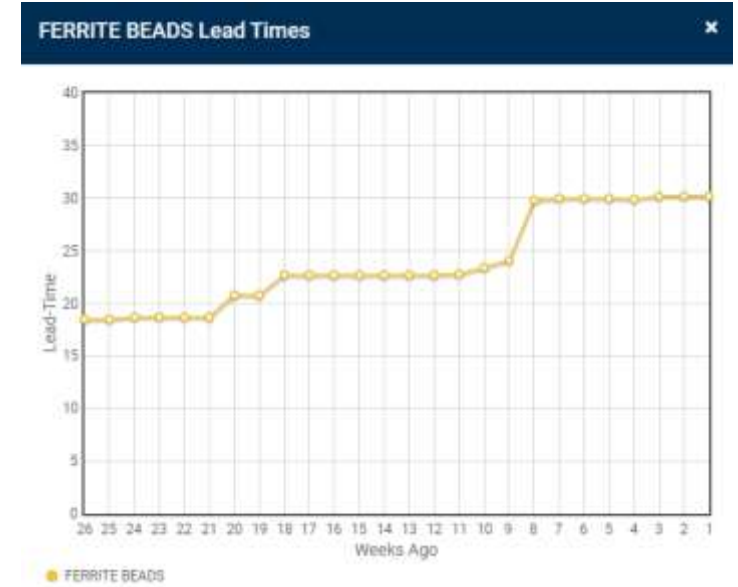
The increase in demand is seen for all types of discrete inductors across the board, and is very unusual, having never occurred before in the lifetime of the index



Passive & Discrete Supplier Trends



Commodity	Supply Trend
MLCC	Extended delays in Murata acknowledging new orders as factory planning becomes overloaded. TDK and AVX on long LT driven by Auto demand. Yageo have production capacity but LT increased due to transport issues in China. Kemet unable to accept orders on certain items. Hi Cap the most critical
Resistor	Vishay and KOA on allocation for R Chip and quantities restricted until at least Q1 2022. TTE, Ohmite, Vishay, Panasonic and KOA on extended LT for power, low ohmic current sense and thin film and surge resistors. Bourns stable at the moment
Tantalum Cap	MnO2 and Polymer stable at around 30 weeks on average but larger sizes increasing above 35 weeks. Backlog exceeding short term capacity with all three suppliers (AVX/Kemet/Vishay). Some E/X case parts now increasing beyond 40 weeks LT
Aluminium Cap	SMD parts on allocation from Panasonic and Nichicon. Malaysia Covid restrictions have been impacting capacity. Radials on long lead time above 26 weeks. Lelon also experiencing power restrictions in China (reducing working hours)
Film Cap	Kemet, TDK, Panasonic, Vishay and Wima all increasing LT due to material supply challenges. Some DC Link items above 60 weeks due to high demand in power electronics.
Inductors	1210 Inductor from TDK on allocation. Eaton and Panasonic increasing due to material/logistics. Murata and TDK Ferrite Beads now on limited supply (above 30 weeks). Vishay stable/small increased LT but some additional capacity available for Industrial grade parts
Circuit Protection	Eaton, TDK, Bourns and Littelfuse increasing lead time case by case due to transit times but average LTs still relatively stable compared to other products. Leaded Varistors extending the most at the moment
Timing Devices	32khz Crystals on allocation from Abracon & Kyocera. Larger packages on longer LTs due to ceramic packaging shortages. AKM Fire caused shortage of oscillator ICs. New capacity not available until Q1/Q2 2022. Recommendation is to approve smaller cases for new design 1008, 1210, 1612, 2016. 3225 is critical
Discretes	Littelfuse, Vishay and TTE above 40 weeks LT across Diodes, Opto and Mosfets. SMD LEDs more stable but still increasing due to transit times. Force Majeure Resin issue at Optek impacting some packaged LEDs



Passive & Discrete Supplier Pricing Trends



Commodity	Price Trend
MLCC	Yageo, Kemet, Murata, AVX, TDK and Samsung small increases. Some large case and high palladium content parts (mainly AVX and Knowles) increasing significantly
Resistor	Increasing from Yageo, Vishay, TTE, Ohmite and VPG. KOA and Panasonic stable. Bourns increasing Trimmer prices from 1 st September
Tantalum Cap	MnO2 and Polymer increases from Kemet and AVX in 1H 2021. Second AVX increase announced Q3. Vishay stable on moulded but Wet Tant increasing
Aluminium Cap	Increasing from Kemet, Panasonic, Nichicon, TDK, Lelon, Vishay and Eaton. Alu Foil shortage driving prices up for raw materials
Film Cap	Kemet, TDK, Panasonic and Wima increasing prices. Vishay stable
Inductors	Increasing from TDK, Eaton and Panasonic. Stable from Bourns, Vishay, Murata
Circuit Protection	Eaton, TDK, Bourns and Littelfuse all increasing prices due to material costs
Timing Devices	Significant price increases from Abracon and increasing trend from Kyocera
Discretes	Littelfuse, Vishay and TTE increasing prices across all Diodes, Opto and Power Mosfets

Raw material costs and resourcing costs experienced in the last 12 months are no longer being absorbed by the manufacturers so prices are increasing

Logistic costs have increased 4/5 times for most suppliers

Under-capacity issues are driving investment in new manufacturing lines. Manufacturers will look to recover costs






Instability in many of the traditional lower cost manufacturing regions is driving investment in higher cost areas

Preference towards higher technology products and NPIs, with some manufacturers exiting standard commodity items thereby reducing competition

Obsolescence further reducing options in some product areas




MLCC Lead Time Update



CASE SIZE	0201		0402		0603		0805		1206		1210 & <	
	Comm	Auto	Comm	Auto	Comm	Auto	Comm	Auto	Comm	Auto	Comm	Auto
	22	28	22	28	22	26	22	25	26	32	28	35
	20	N/A	24	28	24	26	22	24	28	32	28	36
	22	N/A	24	28	22	28	22	22	26	30	26	28
	28	22	28	28	28	26	28	22	26	28	28	30
	22	25	25	25	25	25	25	25	25	25	25	28

Commercial Tantalum Lead Time Update



CASE SIZE	A CASE			B CASE			C CASE			D CASE			E / X CASE		
	Mn02	Polymer	Conformal	Mn02	Polymer	Conformal	Mn02	Polymer	Conformal	Mn02	Polymer	Conformal	Mn02	Polymer	Conformal
 A KYOCERA GROUP COMPANY  a YAGEO company 	26	20	45	26	20	45	26	20	45	Allocation	20	45	Allocation	20	45
	28	45	N/A	42	54	N/A	38	35	N/A	52	35	N/A	45	35	N/A
	32	24	22	40	56	22	26	30	23	26	64	22	26	25	22

Aluminum, Film and EDLC Lead Time







Category	Trend	Lead-Time
Aluminum Surface Mount	Increasing	34-51 weeks
Aluminum Polymer & Hybrid	Increasing	34-44 weeks
Aluminum Axial / Radial	Increasing	22-40 weeks
Aluminum Snap-In	Increasing	22-40 weeks
Aluminum Screw Terminal	Increasing	18-32 weeks
Aluminum Flat Pack	Stable	18-22 weeks
Film (SMD, Axial, Radial)	Increasing	20-30 weeks
Film - Power	Increasing	28-32 weeks
EDLC (SuperCap)	Increasing	17-20 weeks



Thick Film Resistor Chip Lead Time Update



CASE SIZE	0201		0402		0603		0805		1206		1210 & <	
	Lead Free	Lead Bearing	Lead Free	Lead Bearing	Lead Free	Lead Bearing	Lead Free	Lead Bearing	Lead Free	Lead Bearing	Lead Free	Lead Bearing
 KOA SPEER ELECTRONICS, INC.   	Soft Allocation	N/A	Soft Allocation	44	Soft Allocation	30	Soft Allocation	39	Soft Allocation	42	Soft Allocation	32
	24	N/A	53+	N/A	53+	N/A	53+	N/A	53+	N/A	24	N/A
	28	N/A	Soft Allocation	25	Soft Allocation	53+	Soft Allocation	47	Soft Allocation	53+	53+	53+
	25	N/A	25	N/A	25	N/A	25	N/A	25	N/A	25	N/A

Resistors Lead Time



Category	Trend	Lead-Time
Surface Mount Metal Film	Constrained	13-53+ weeks
Networks	Extended	20- 48 weeks
Current Sense	Constrained	12 -53+ weeks
Thin Film	Constrained	10-53+ weeks
Trimmers	Extended	10 -40 weeks
Through Hole Wirewound	Extended	16-40 weeks
Through Hole Metal Film	Extended	16-50 weeks



Magnetics Lead Times



Category	Trend	Lead-Time
Ferrite chips	Extended	24-30 weeks
EMI/RFI Filters	Stable	16-24 weeks
Inductor – Power	Extended	18-52 weeks *
Inductor - RF	Stable	14-22 weeks
Transformers	Extended	16-22 weeks
Timing Devices	Constrained	24-53+ weeks



*TDK 1210 Inductors on 52 weeks

Circuit Protection Lead Times



Category	Trend	Lead-Time
Fuse - Electrical	Increasing	12-20 weeks
Fuse - Resettable	Increasing	15-30 weeks
Fuse – SMT	Increasing	15-30 weeks
Thermistors	Increasing	14-30 weeks
Varistors - SMT	Slight Increase	14-20 weeks
Varistors - Thru-Hole	Increasing	16-36 weeks



Discrete Semi Lead Times



Category	Trend	Lead-Time
Diodes – Small Signal	Increasing	16 – 55 weeks
Diodes - TVSS	Increasing	18 – 55 weeks
IGBTs	Increasing	20 - 55 weeks
MOSFETs – Low Power	Extended	19 - 77 weeks
MOSFETs – High Power	Increasing	18 - 77 weeks
Standard Logic	Increasing	26 - 40 weeks
Rectifiers	Increasing	18 - 55 weeks
Thyristors	Increasing	18 - 48 weeks

VISHAY.
Littelfuse
 Expertise Applied | Answers Delivered
IXYS
 Heavy-Duty Technology
Kingbright
 WWW.KINGBRIGHTUSA.COM
TOSHIBA
 Leading Innovation >>>
BOURNS
TT Electronics
 Make Possible

Optoelectronic Lead Times



Category	Trend	Lead-Time
Displays	Increasing	16-30 weeks
LEDs Low Power (<1watt)	Stable	6-12 weeks
LEDs Mid-Power (1-2 watt)	Stable	6-12 weeks
LEDs High Power (<2 watt)	Increasing	22-30 weeks
Infrared, Sensors, Emitter & Detector	Extended *	18-65 weeks
Optocouplers	Increasing	22-30 weeks



* Vishay Infrared Photo Diodes

MIL Capacitor Lead Time



Category	Trend	Lead-Time
Hi Q Capacitors	Stable	14-18 weeks
Tantalum COTS	Extended	18-40 weeks
Stack Caps	Stable	26-35 wks
Wet Tantalum	Extending	18-20 weeks
Hermetically Sealed Tantalum	Extending	18-20 weeks
CWR	Stable	12-20 weeks
CDR (*AVX)	Stable	20-25 weeks
M390214/01-05 CKR	Extending	17-22 weeks
Dip Guard - M39014/20-23	Extended	20-26 weeks
MIL-C-20 CCR's	Stable	20 weeks
Hi-Volt Caps SMD & Through-hole (>500v)	Stable	20-24 weeks

VISHAY
AVX KEMET
A KYOCERA GROUP COMPANY a YAGEO company
CDE CORNELL DUBILIER
AMERICAN TECHNICAL CERAMICS
knowles
DLI • NOVACAP • SYFER • VOLTRONICS

MIL Resistor & Filter Lead Time



Category	Trend	Lead-Time
RWR	Reduced	20-40 weeks
RNR	Extended	53 weeks
RER	Reduced	30 weeks
RBR	Stable	28 weeks
RJR / RTR	Stable	13 weeks
RLR	Reduced	12-26 weeks
RNC	Reduced	20-35 weeks

Category	Trend	Lead-Time
M22 Rheostats	Stable	28 weeks
83401 Networks	Stable	12-20 weeks
RNC90Y	Stable	16 weeks
55342 MIL Chips	Extended	40 weeks
MIL Inductors	Stable	10-19 weeks
Feed- Through Filters	Stable	16-20 weeks



How does TTI help ?



TTI's Product team does a thorough job of observing the current market, the future market and our customer's requirements to keep the supply chain flowing.

TTI's excellent supplier relationship keeps us in the forefront with our suppliers. Knowing when they are adding capacity, expecting price increases or shortages, allows us to plan accordingly.

During these times, we are continually working to protect our existing customers:

- We work with our suppliers to secure special differentiated service through our SEA Program
- We update our lead times continually (adjusting for any logistic delay if the supplier already does not include this)
- We review our current customer's history to assure we have parts to replenish day to day buys
- We review our MRP accounts and try to get as much foresight into the demands from our customers. The further out we have visibility to, the more we will stock. *TTI does not have a problem putting inventory on the shelf.*
- **We will not allow 'new' customers to come in and take allocated inventory . If you have parts on a program then we will have stock for you.**
- We will add a PM min to the part keeping available inventory for program customers.
- We continually review our open orders with our suppliers for on time delivery
- We continually review and add NPI products to be able to offer you the latest components
- TTI STOCKS PARTS

- ✓ We have the **Largest Component Inventory in European Distribution**
- ✓ As the Largest Distributor of I, P & E Components in Europe, we have the broadest portfolio and stocking depth of products from our key suppliers
- ✓ **We are Product experts – We can offer help and advice to find the best solutions for your application**
- ✓ **Industry Leading Tools available online:**
 - ✓ [Lead Time Trends | TTI Europe](#)
 - ✓ [MarketEYE Resource Center | TTI Europe](#)

