

# Creation Technologies

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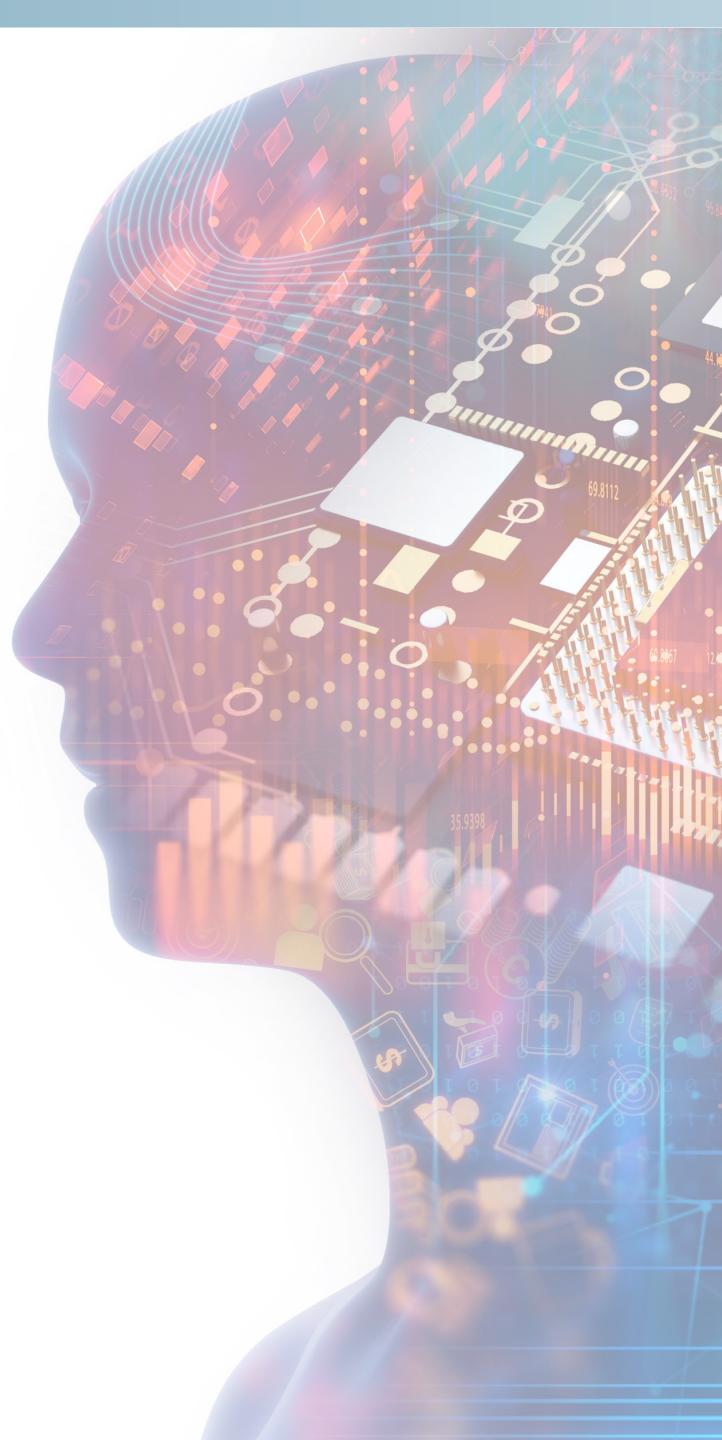
Market Conditions Q2 2021

**creation**  
TECHNOLOGIES

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# Q2-3 Market Status Update (Summary)

## IMMEDIATE NEW CONCERNs

- **Resin Capacity -**  
Impact of resin and plastics shortages on cost and delivery of mechanical & interconnect components in Q2 & Q3
- **Taiwan Drought -**  
Taiwan has started redirecting water reserves into manufacturing and homes, risk to Wafer Production Capacity

- **Renesas Fire -**  
March 19, 2021 Renesas Naka fab facility in Japan is heavily damaged in a fire

- **Double Booking Management -**  
Manufacturers are deploying policies and procedures to mitigate double booking strategies

## GLOBAL CHIP SHORTAGES REMAIN

- Not seeing relief from supply constraints and cost increases in Q2 / Q3. Programs like the Microchip PSP approach are unique. Most manufacturers are utilizing NCNR expansion and restricted terms to try and control exaggerated book to bill ratios

## ELECTROMECHANICAL SUPPLY CHAIN IMPACTED

- TCXO-Temperature Compensated Crystal Oscillators shortages and cost increases due to AKM fire
- Concerns regarding connector and cable supply disruptions and cost significant increases are likely due to resins shortages

## PCB MARKET CHANGES

- A positive Book-to-Bill Ratio (1.2 in NA) with increases in laminate, prepeg and copper materials costs and lead times are driving PCB cost and factory lead time increases up to 20+ weeks

## METAL MARKETS GOING FORWARD

- Depreciating USD and increased demand will drive copper costs up in the 2nd half of 2021
- Iridium and similar Platinum materials have seen steep increases in cost in the last 90 days impacting Semiconductors
- Ruthenium Oxide Paste has significantly increase in cost impacting Thick Film Resistor manufacturing and Passive Components

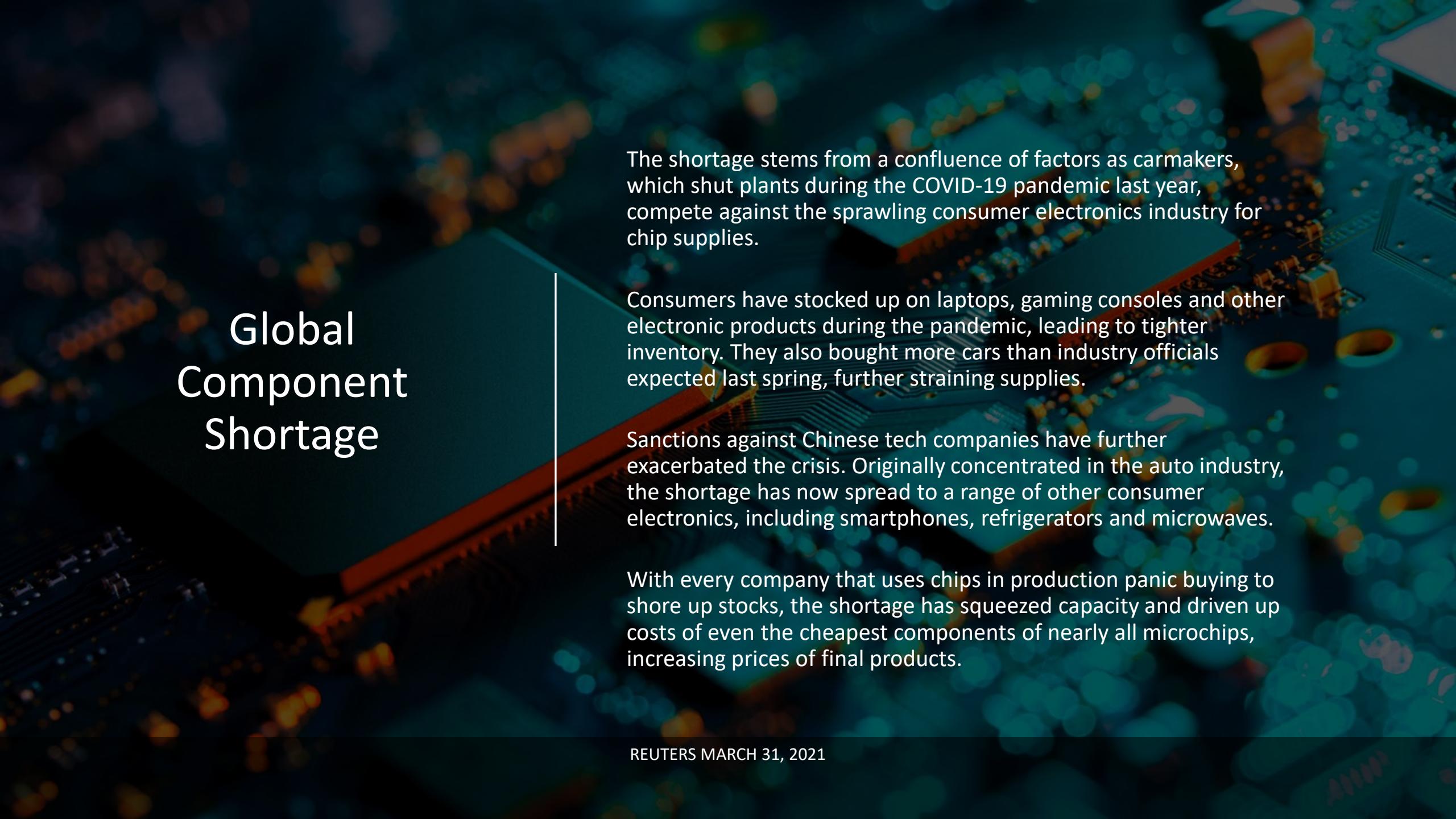


# Q2 & Q3 2021 Market Outlook

# “Everywhere You Look, the Global Supply Chain Is a Mess”

WSJ 03-18-21

“Everywhere You Look, the Global Supply Chain Is a Mess,” read a recent headline in the *Wall Street Journal*. Most supply chain practitioners would agree between the pandemic, container shortages, winter weather, factory fires, the blocking of the Suez Canal by a container ship, and other logistics woes, things are messy. These disruptions have already led to the current global shortage of semiconductors, and now the supply disruption of another critical category of materials is occurring..



# Global Component Shortage

The shortage stems from a confluence of factors as carmakers, which shut plants during the COVID-19 pandemic last year, compete against the sprawling consumer electronics industry for chip supplies.

Consumers have stocked up on laptops, gaming consoles and other electronic products during the pandemic, leading to tighter inventory. They also bought more cars than industry officials expected last spring, further straining supplies.

Sanctions against Chinese tech companies have further exacerbated the crisis. Originally concentrated in the auto industry, the shortage has now spread to a range of other consumer electronics, including smartphones, refrigerators and microwaves.

With every company that uses chips in production panic buying to shore up stocks, the shortage has squeezed capacity and driven up costs of even the cheapest components of nearly all microchips, increasing prices of final products.

# Mitigation Strategies

Speed and clarity for AML & costing support is crucial as available inventory is time sensitive

- Be aware that material availability and allocation is being tied to cost acceptance
- Define and communicate UPPV and PPV approval policies in advance and review monthly
- Review and lean out BOM/AML modifications and independent distributor policies
- Forecast horizons of 12 to 18 months drive visibility and validity at manufacturers
- Utilize Creation's Value Add Value Engineering BOM Risk Assessments
- Leverage MFR relationships through access to design activity and development
- Drive robust AML diversity along with attention to BOM accuracy
- Review over engineered sockets by limiting extended temp, industrial and automotive grade materials
- Identify and communicate MFR representatives assigned to your organization
- Identify and communicate direct manufacturer sales contacts assigned to your organization
- Identify and communicate preferred independent distributor partners
- Review and refresh and communicate counterfeit policies and procedures on a monthly basis



## Q2 & Q3 New Concerns

# Q2 & Q3 New Concerns

RESIN CAPACITY

RENESAS FIRE

ARTIFICIAL DEMAND

TAIWAN DROUGHT

## RESIN CAPACITY SUPPLY CONSTRAINTS

Like the semiconductor shortage, this one has been a long time coming. During summer 2020, Covid-19-related lockdowns caused inventory levels to fall. Then, in August, Hurricane Laura forced a number of petrochemical factories in Louisiana and Texas to shut down; overnight 10% to 15% of U.S. PE and PP production stopped.

This was followed by a slew of force majeures from big polymer producers, including LyondellBasell in Louisiana and Chevron Phillips Chemical in Texas. (By declaring force majeure, these suppliers were relieved of certain supply-delivery commitments due to circumstances outside their control.) Simultaneously, Covid-19 safety precautions slowed production at many workplaces and caused labor and trucking shortages at ports.

The final blow was the winter storm in February that struck the Gulf Coast. Texas is home to the world's largest petrochemical complex, which turns oil and gas and other byproducts into plastics. Almost 100 critical chemicals and derivatives used widely across many products and industries are processed in Texas. It will take more than six months to correct the imbalances caused by the storm. Given these problems, the grounding of a container ship in the Suez Canal on March 23 could not have come at a worse time.

Harvard Business Review March 26<sup>th</sup>, 2021

### Potential Technologies Impacted By Cost and Supply Disruptions

#### Connectors, Cables, Switches

Computer Products, EMI/RFI Shielding and Absorbing Fasteners, Hardware and Fluid Transfer, Boxes, Enclosures Epoxy Adhesives, Labels  
Optoelectronics and Displays, Relays and I/O Modules RF and Microwave, Sensors and Transducers

## RENESAS FIRE

**TOKYO, Japan, 2021** — Renesas Electronics Corporation (TSE:6723), a premier supplier of advanced semiconductor solutions, today announced the occurrence of a fire on March 19, 2021 at 2:47 am at part of the processes in the N3 Building (300mm line) of Naka Factory (located in Hitachinaka, Ibaraki Prefecture) of Renesas Semiconductor Manufacturing Co., Ltd, a wholly-owned manufacturing subsidiary of Renesas. The fire was extinguished at 8:12 am on March 19, 2021.

<https://www.renesas.com/us/en/about/press-center>

### Potential Technologies Impacted By Cost and Supply Disruptions

**Automotive grade sensors, Automotive grade power management, Automotive grade signal management and amplification**  
Timing management, Opto-Isolators, Video Decoders, Optocouplers, Memory Products, Transmitters/Receivers – RS422 & RS485,  
Transmitters/Receivers – Wireless

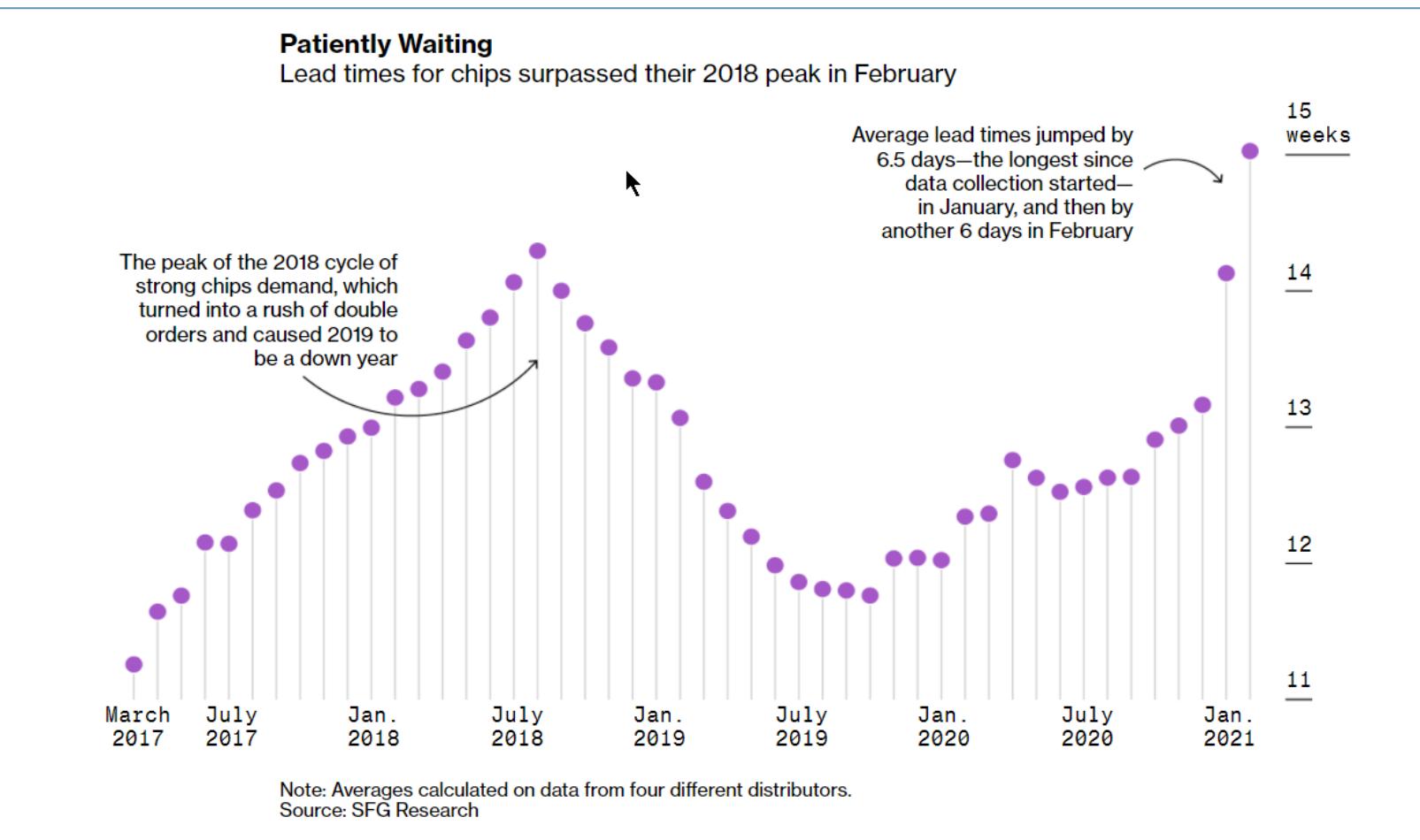
# ARTIFICIAL DEMAND

## HISTORICAL PERSPECTIVE

### Mark Liu Chairman of Taiwan Semiconductor Manufacturing Co. Ltd.

“ Liu also confirmed for the first time that there is a serious "double-booking" effect in the industry, in which clients place orders for more chips than they actually intend to use. As a result, Liu said, his company has to expend extra effort to determine which orders are truly urgent and which will wind up sitting on TMSC's shelves.”

Nikkei Asia March 30<sup>th</sup> 2021



# MANUFACTURERS MANAGING ARTIFICIAL DEMAND

## Market Reaction

“These constraints are compounded by the fact that some backlog does not accurately reflect true requirements and as a result, may ultimately be canceled or pushed out by customers. Effective as outlined below, **Maxim** will be temporarily moving to a **non-cancellable and non-reschedulable order policy.**”

“With that in mind we would like to introduce the **Microchip Preferred Supply Program (PSP)** .... The Preferred Supply Program has the following elements:

- **12 months of continuous, non-cancellable and non-reschedulable backlog**

**Similar NCNR policies :** St Micro, Xilinx, NXP, Cypress, Broadcom

## Additional Market Reactions

- Limiting supply reschedule capabilities
- Significantly reduced pricing life cycles
- Cost volatility and LOA invalidity
- Firm order requirements
- Q3 & Q4 fab capacity allocation is not transparent

# MANUFACTURERS MANAGING ARTIFICIAL DEMAND

“With this backdrop and to ensure that supply is directed at the most critical needs, the window in which ADI will not allow CRD push outs, quantity decreases, and cancelations is changing to a rolling 90 days, effective May 7, 2021.”



April 7, 2021



## FAQ for 90 Day Window

### What is changing?

The window in which ADI will not allow CRD push outs, quantity decreases, and cancelations is changing to a rolling 90 days. Orders with request dates outside of that window will not be affected and will continue to follow existing rules. ADI will not accept the changes mentioned for orders with request dates inside of the 90-day window. Any orders scheduled to ship in the next 35 days are excluded.

### Why is ADI making this change?

ADI is making this change due to the current market and supply conditions. Given the situation, ADI wants to ensure the supply is directed to the most critical needs.

### When does this change go into effect?

The change goes into effect on May 7, 2021.

### Are there any limitations to placement of new orders?

No, there are no changes to new order acceptance rules.

### Can I increase the quantity on an existing purchase order?

Yes, you may although ADI recommends placing a new order to ensure that your current order commit is not jeopardized.

### Are pull in requests allowed inside of 90 days?

Yes, all pull in requests will follow current rules.

### Are there any changes to orders with request dates outside of 90 days?

No, there are no changes to existing rules.

## EVENTS TO MONITOR

### TAIWAN DROUGHT

- The government issued its first red alert on water supply in six years Wednesday, warning that reservoirs in several parts of central Taiwan are running dangerously low. Authorities will cut the water supply to companies in two major science parks in Taichung by 15%, economics minister Wang Mei-hua said at a briefing in Taipei.
- Water will also be cut to non-industrial users across Taichung and Miaoli County two days a week, Wang said. The measures will come into effect from April 6.
- While Taiwan Semiconductor Manufacturing Co. and Micron Technology Inc. both have chip-making operations in Taichung, Wang said the restrictions would not affect their production. TSMC's headquarters further north in Hsinchu has been spared further restrictions for now.

**Bloomberg, March 24, 2021: Taiwan Cuts Water Supply for Chipmakers as Drought Threatens to Dry Up Reserves**

- Chipmakers use the world's most ubiquitous liquid to clean wafers throughout the production process, as well as keep factories and the air inside them clean. In 2019, the latest year for which data is available, TSMC's daily water consumption in Taiwan was 156,000 tons per day. At its northern production sites, the company accounted for 10.3% of that region's daily supply.

**Bloomberg, Feb 25, 2021; Making Chips Requires Lots of Water and, Gulp, Taiwan Has a Drought**

- Taiwan has two rainy seasons that arrive at different times of the year and affect different areas. The southern part of the island is the first to experience the monsoon, with heavy rains hitting between May and September. Monsoon rains then move onto the north and northeast.
- In addition to the monsoon, the country has a "plum rain" season, which typically runs between May and June. Plum rains are short and intense and come in fronts, which means it can rain for a few days or even weeks at the time, or not rain at all.

<https://www.roughguides.com/taiwan/when-to-go/>

## EVENTS TO MONITOR

### POWER OUTAGE TSMC Fab14 P7

ITSMC's Fab14 P7 in the Southern Taiwan Science Park suffered a power outage on April 14th. The cause of the power outage was an accidental severing of an underground power cable during construction work nearby.

According to TrendForce's latest investigations, the facility accounts for around 4% of TSMC's total 12-inch wafer foundry capacity and around 2% of the global 12-inch wafer foundry capacity, and TSMC is still assessing the exact figures for the wafers that have to be scrapped and the wafers that can be reworked. According to the latest available information, power was fully restored to the fab site at 7:30 p.m. on April 14th.

While the diesel uninterruptible power supply (DUPS) of the facility kicked in instantly when the power cable was cut, there was still a short period of power interruption and voltage drop. As a result, some of the equipment systems in the facility temporarily experienced operational irregularity or malfunction. Based on past experiences with this type of incident, TrendForce believes that it will take 2-7 days to recalibrate the equipment systems so that they can return to normal operation.



## The Fabless Bottleneck In The News

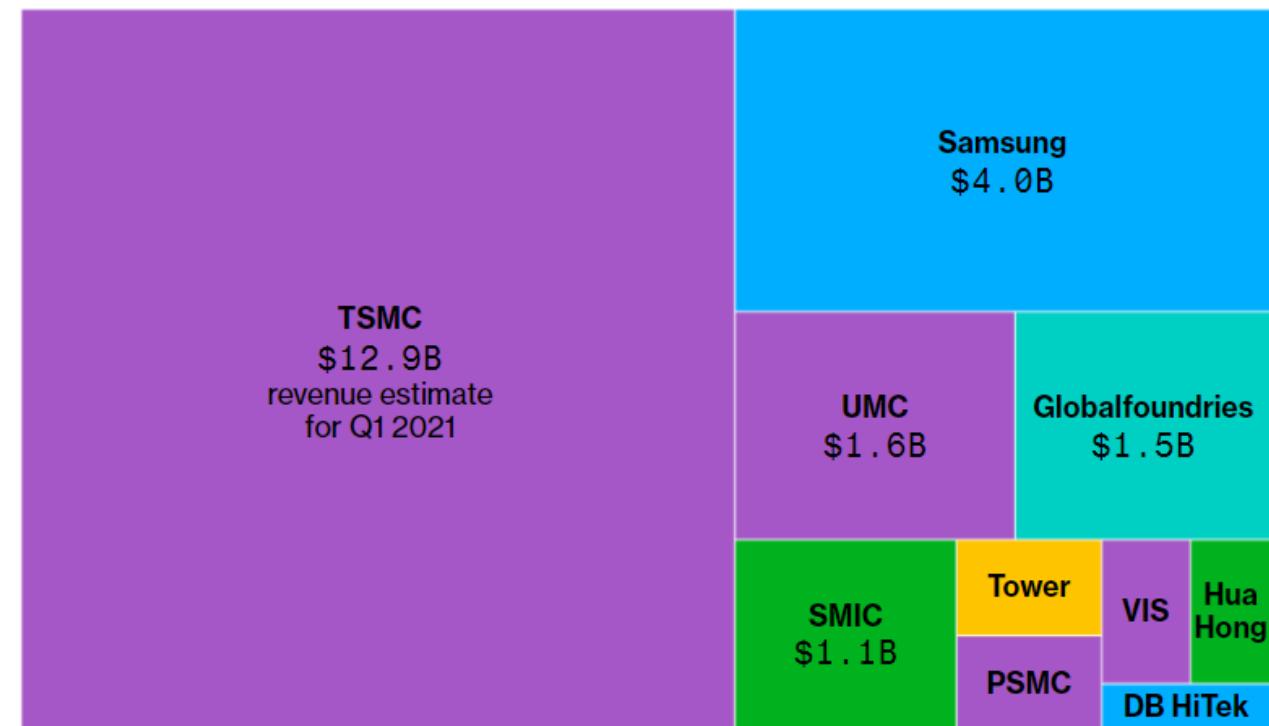
# Limited Foundry Capacity

Prior to the 1980s, the semiconductor industry was vertically integrated. Semiconductor companies owned and operated their own silicon-wafer fabrication facilities and developed their own process technology for manufacturing their chips. These companies also carried out the assembly and testing of their chips, the fabrication.

These conditions underlay the birth of the fabless business model. Engineers at new companies began designing and selling ICs without owning a fabrication plant. Simultaneously, the foundry industry was established by Dr. Morris Chang with the founding of Taiwan Semiconductor Manufacturing Corporation (TSMC). Foundries became the cornerstone of the fabless model, providing a non-competitive manufacturing partner for fabless companies.

Companies from Taiwan and South Korea dominate the foundry business

Taiwan   South Korea   U.S.   China   Israel



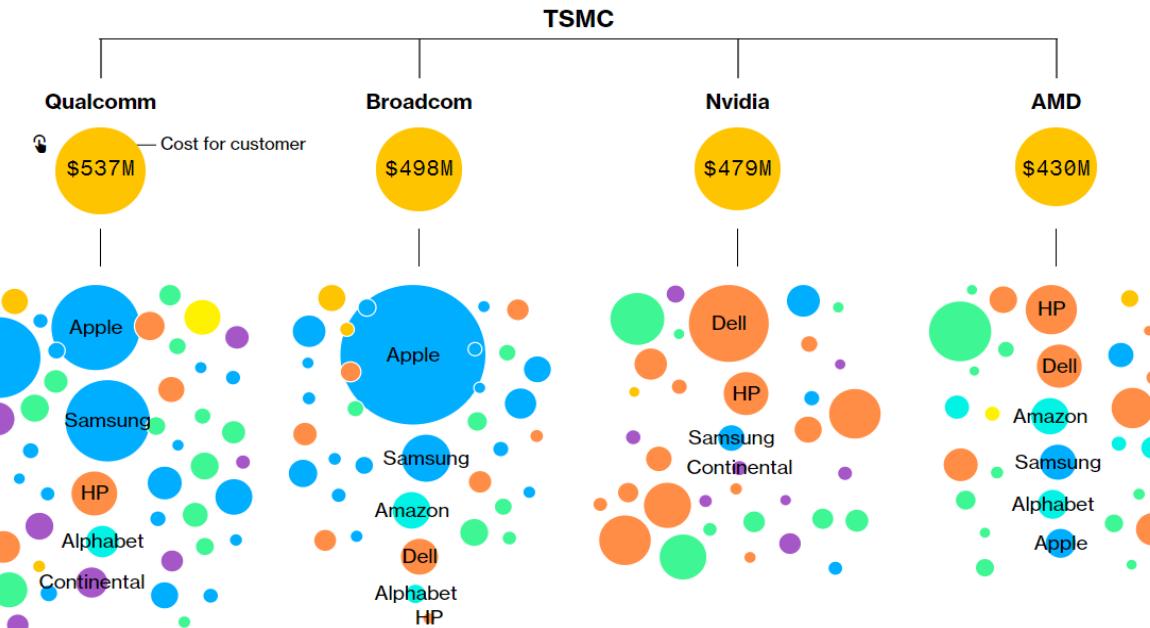
Note: Estimates as of February. Figures for Samsung include its System LSI unit; for Globalfoundries include the manufacturing unit acquired from IBM; for PSMC its foundry business only.  
Source: TrendForce

How a Chip Shortage Snarled Everything From Phones to Cars  
Bloomberg March 28<sup>th</sup>, 2021

### Supply Chain Bottleneck

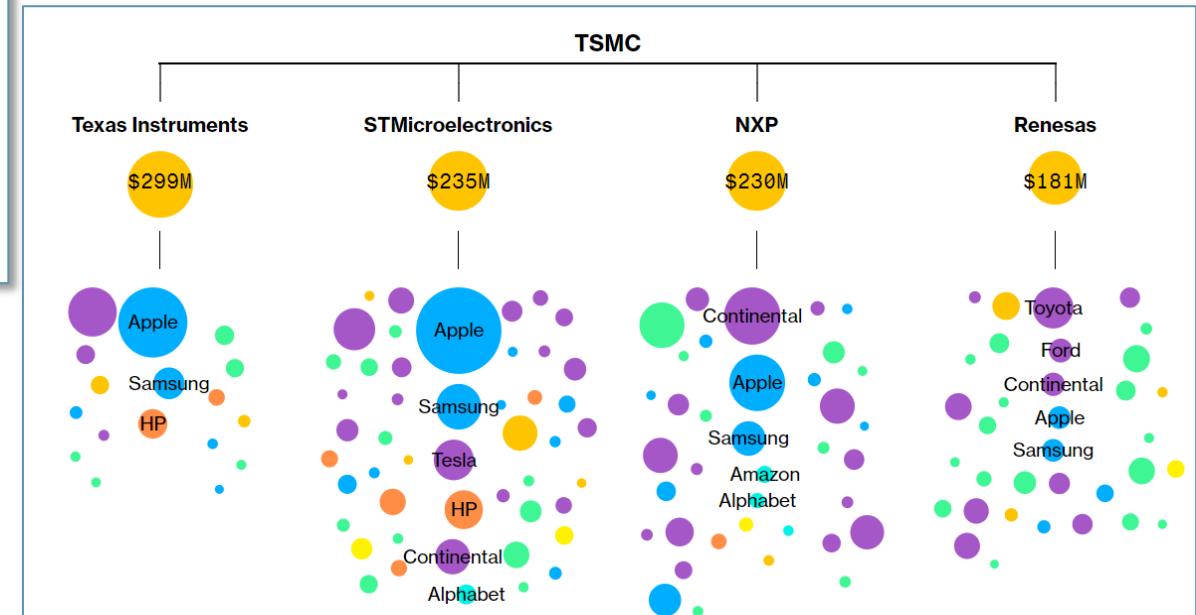
TSMC manufactures chips for **chip designers and semiconductor firms**, which in turn supply major makers of consumer electronics and cars

• Autos • Communications • Consumer electronics • Hardware • Household appliances  
• Online Services

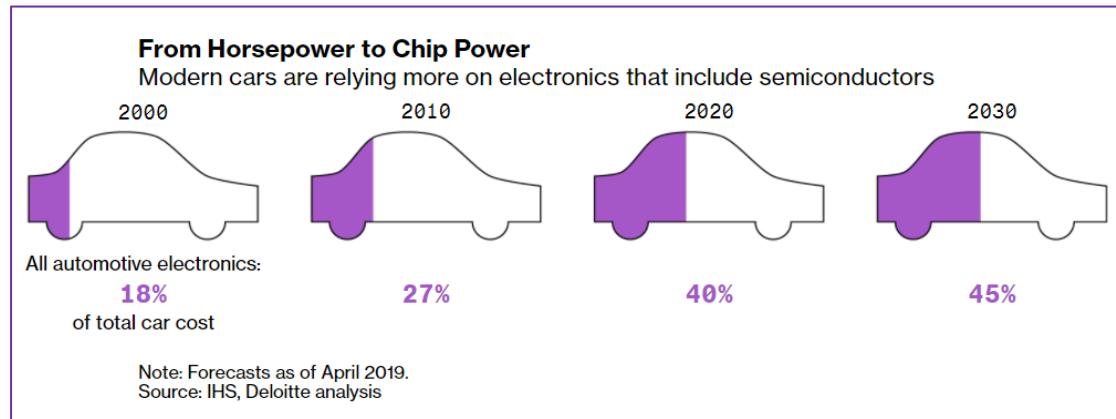
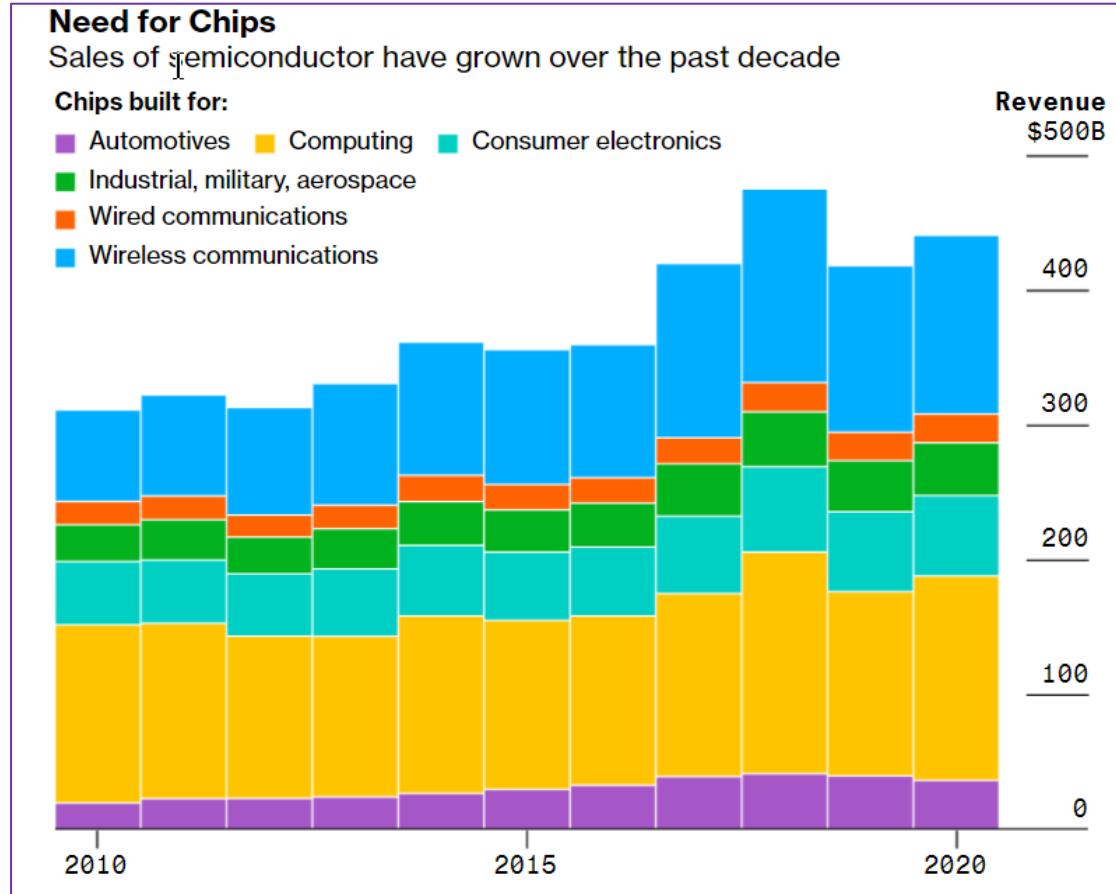


How a Chip Shortage Snarled Everything From Phones to Cars  
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# Breadth and Depth of the Bottleneck



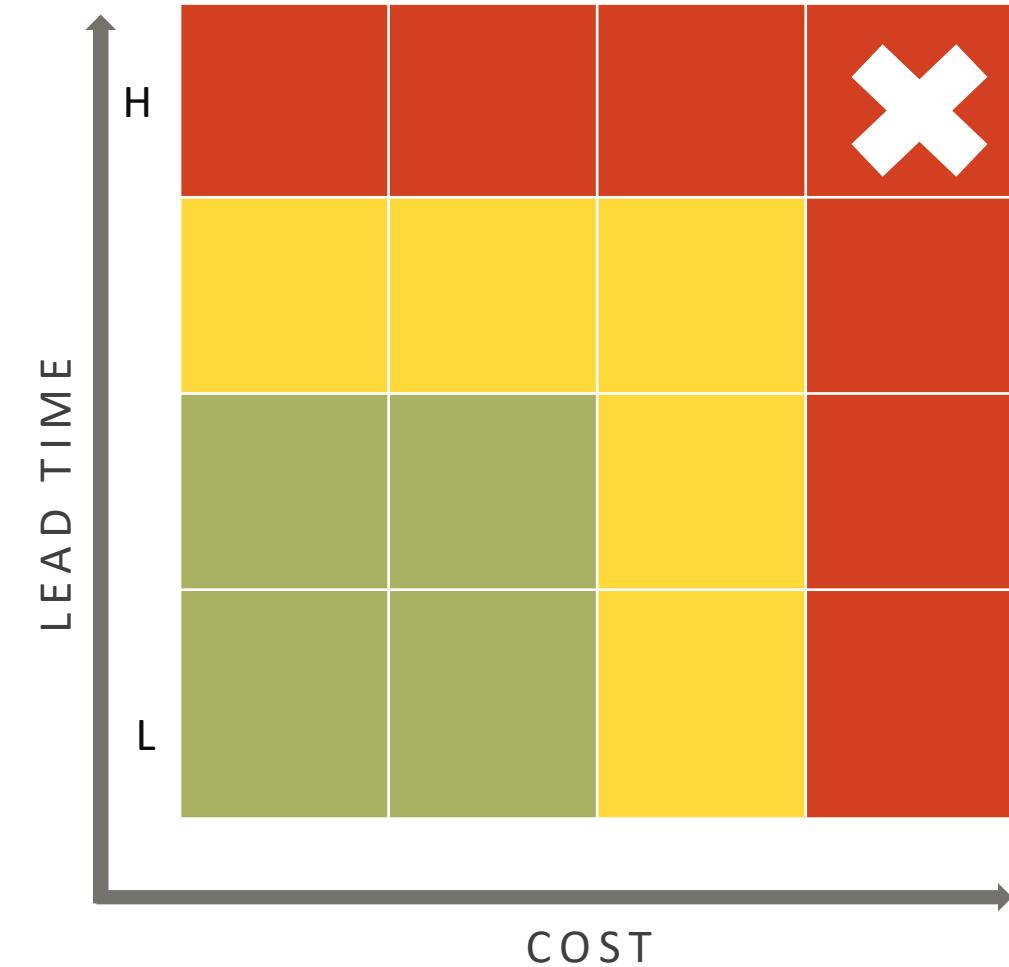
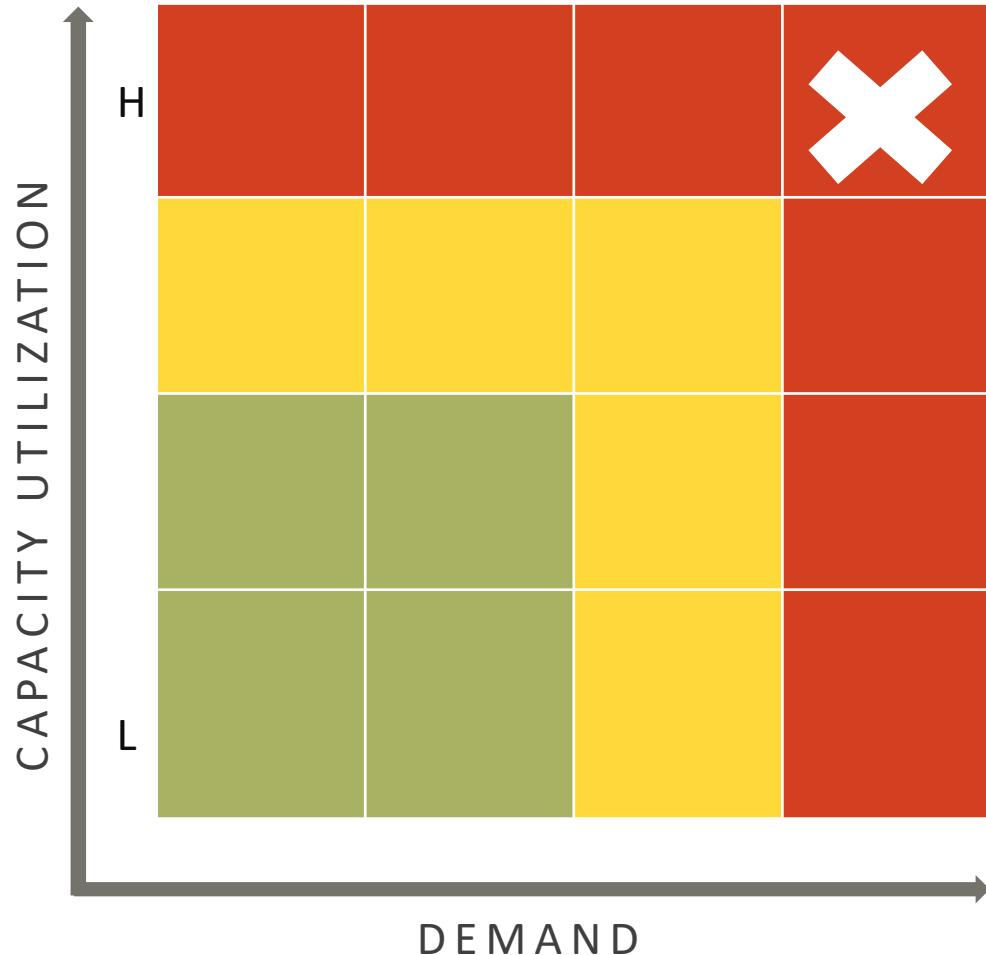
# Market Complexity Increases As The Technology Mix and End Markets Evolve





# Semiconductor Q2&Q3 Outlook

# Semiconductor Market Conditions Outlook



# Cost & Lead Times Increases Are Implemented By Manufacturers

## St Micro

The ongoing COVID-19 pandemic continues to create challenges throughout the world economy, including the semiconductor industry. At ST, among other challenges, many of our materials suppliers are struggling to meet our demand - resulting in cost increases and aggressive commercial terms to maintain our supply of these scarce materials.

Given this situation, we are obliged to inform you that we are increasing prices across all product lines effective from 1st of January 2021.

In addition, we are at the same time experiencing strong demand across all product lines. Therefore, we are allocating our production capacity based on your firm order placement and our best demand visibility to maximize the efficiency of our manufacturing operations.

## Microchip

While the Covid-19 pandemic stretches out, it also has a tremendous negative impact on our industry's business dynamics. The entire global semiconductor supply chain is struggling as it has never struggled in the past. From materials, to wafer fab, assembly, and test resources, everyone is fighting to respond to the extremely high demand for products. Many of our suppliers are taking actions that result in cost increases as well as aggressive commercial terms that we must meet to maintain our supply of the needed materials and services to support your orders. Given this unfortunate situation, in accordance with Microchip's Terms and Conditions, we regret to inform you that we are increasing prices across many of our product lines starting with shipments as of January 15, 2021.

## NXP

The effects of the COVID-19 virus continue to have an unprecedented impact on trade and commerce affecting us both as suppliers and as customers. As a result, we are facing a severe shortage of our products as well as a significant increase in the cost of material used to manufacture those products. To address the unforeseen increase in costs from our suppliers, we reluctantly must raise pricing on all products. This step is necessary to ensure we are able to obtain supply of materials and services to complete manufacturing of the products for sale to you.

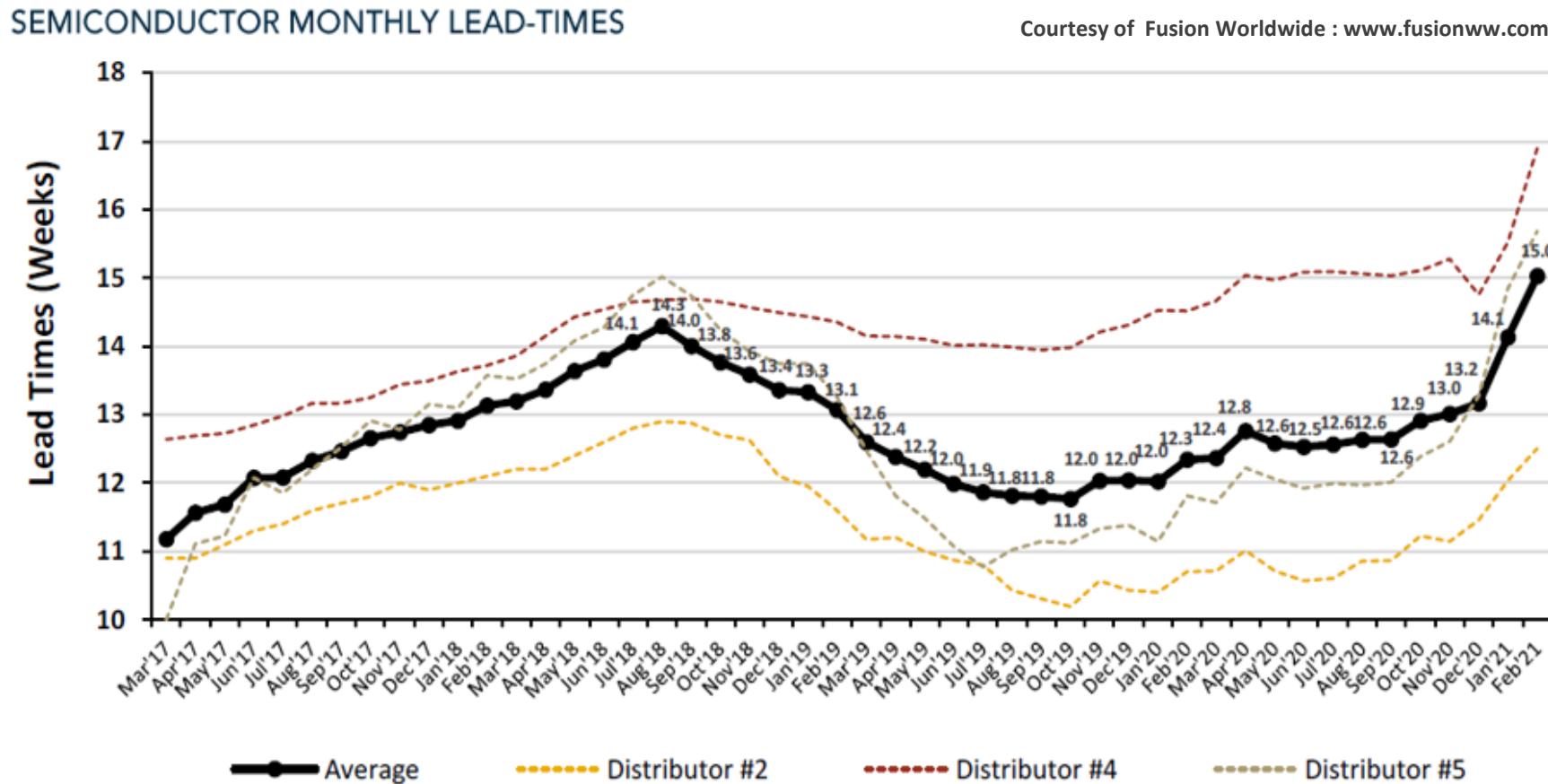
## Silicon Labs

The ongoing COVID-19 pandemic has had an immense impact on all industries including the semiconductor industry. Semiconductor material, assembly and test suppliers have been extremely challenged responding to the recent large increases in worldwide demand for semiconductor products. For Silicon Labs, this has resulted in cost increases and aggressive commercial terms to maintain supply of materials and services to meet the large increases in our customer's demand. Given this situation, we are obliged to inform you that we are increasing prices across many of our product lines.

## Following Suit

Broadcom, Amphenol, Renesas/IDT, Bosch, Cypress, Osram, Infineon, Marvell, Amphenol, Vishay, Laird, Analog Devices , Xilinx

# 2021 Average Lead Times Have Surpassed the 2018 High Water Mark



# Technology and Manufacturer LT 04-01-2021

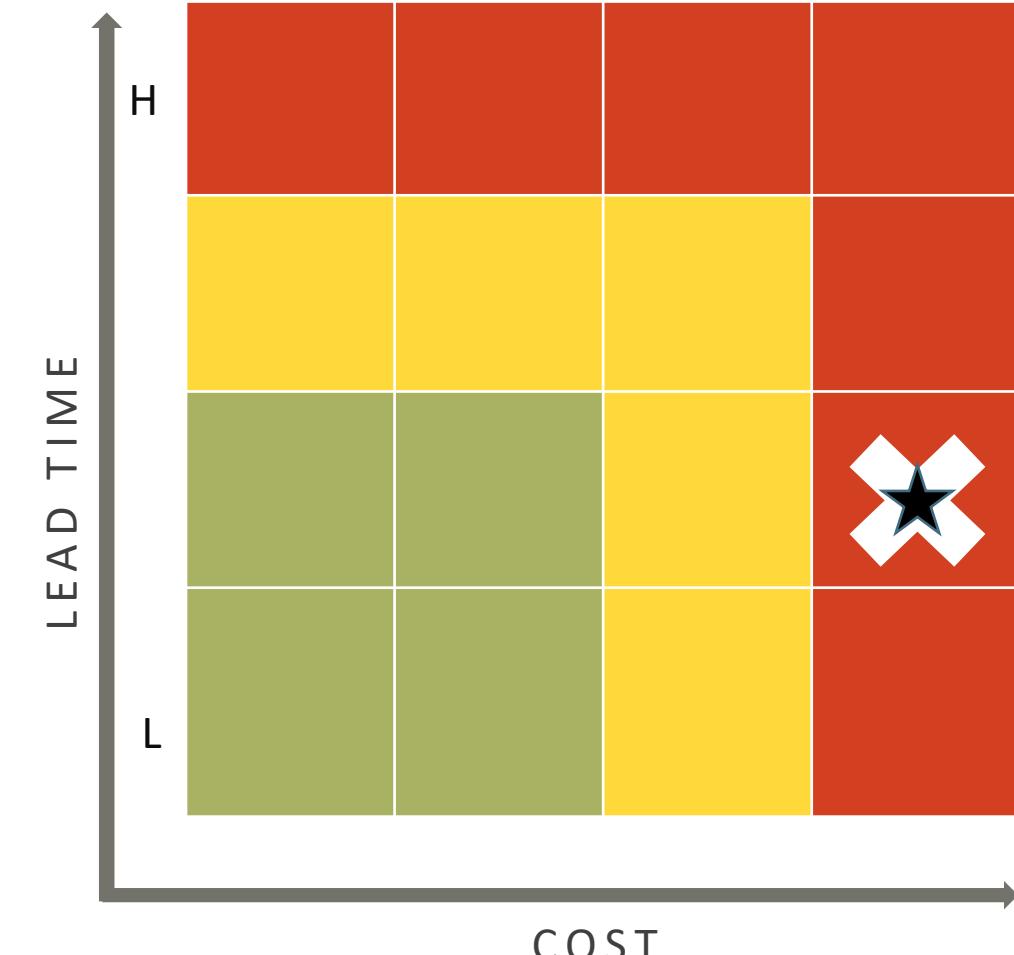
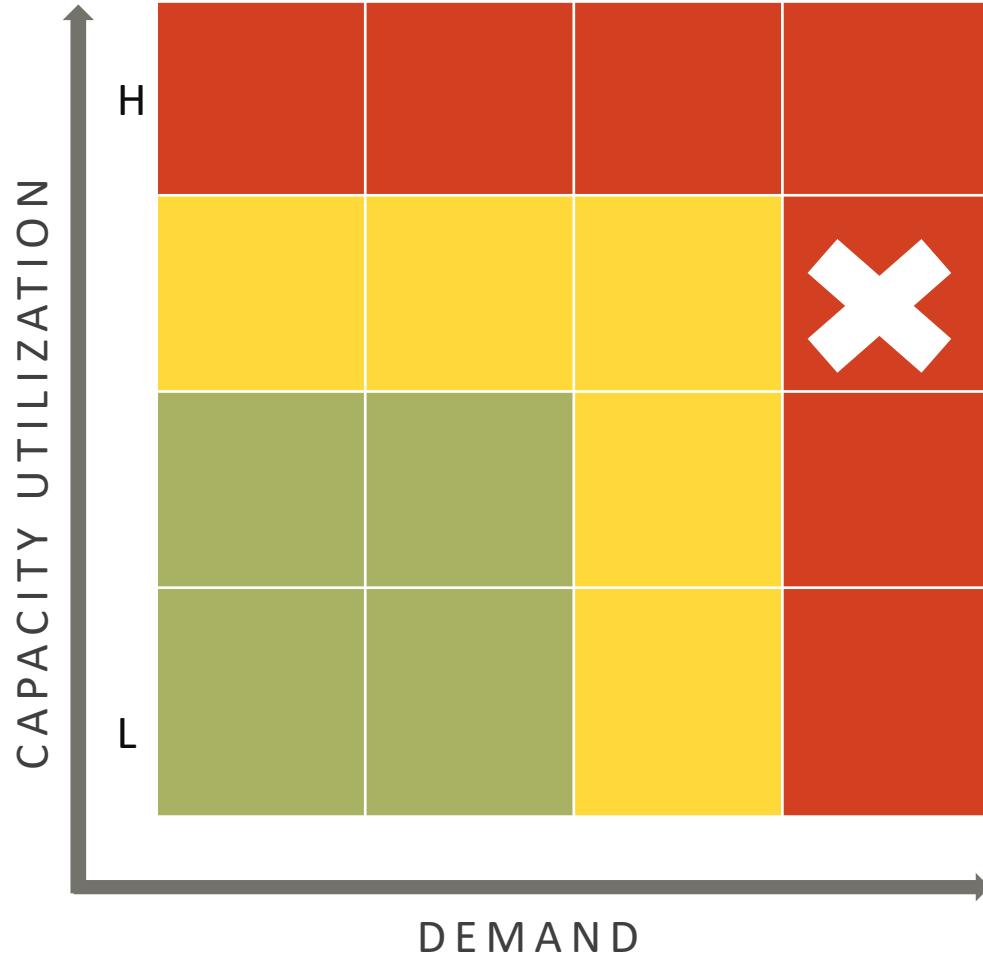
Tech	Supplier	LT	Recent LT Changes
Memory	Micron	14-15 Weeks	6-8 Weeks
Memory	Alliance Memory	14-15 Weeks	6-8 Weeks
Memory	ADATA	14-15 Weeks	6-8 Weeks
Memory	Greenliant	10-24 Weeks	2-12 Weeks
Memory	Wang Hong Electronics	<b>20-28 Weeks</b>	8-10 Weeks
Memory	Transcend	14-15 Weeks	6-8 Weeks
MCU	NXP	<b>26-52 Weeks</b>	8-12 Weeks
MCU	Renesas	<b>26-52 Weeks</b>	8-12 Weeks
MCU	STMicroelectronics	<b>26-52 Weeks</b>	8-12 Weeks
MCU	Microchip	<b>16-40 Weeks</b>	4-10 Weeks
MCU	Qualcomm	<b>26-52 Weeks</b>	8-12 Weeks
MCU	Nuvoton	<b>26-52 Weeks</b>	8-12 Weeks
Analog	Texas Instruments	20-24 Weeks	8-12 Weeks
Analog	NXP / Freescale	20-24 Weeks	8-12 Weeks
Analog	Renesas	20-24 Weeks	8-12 Weeks
Analog	Toshiba	20-24 Weeks	8-12 Weeks
Analog	ON Semiconductor	<b>16-24 Weeks</b>	4-10 Weeks
Analog	Infineon	<b>22-40 Weeks</b>	4-10 Weeks
Analog	STMicroelectronics	16-30 Weeks	2-4 Weeks

Tech	Supplier	LT	Recent LT Changes
Rf & Wireless	Broadcom	<b>24-52 Weeks</b>	8-12 Weeks
Rf & Wireless	Media Tek	20-30 Weeks	8-10 Weeks
Rf & Wireless	Realtek	20-30 Weeks	8-10 Weeks
Rf & Wireless	Microchip	<b>24-26 Weeks</b>	6-8 Weeks
Rf & Wireless	Infineon/Cypress	<b>26-30 Weeks</b>	16-18 Weeks
Rf & Wireless	U-blox	<b>26-30 Weeks</b>	16-18 Weeks
Rf & Wireless	NXP	<b>30-32 Weeks</b>	6 Weeks
Discrete	ON Semiconductor	<b>22-50 Weeks</b>	8-12 Weeks
Discrete	Infineon	<b>22-44 Weeks</b>	8-12 Weeks
Discrete	STMicroelectronics	<b>22-40 Weeks</b>	4-12 Weeks
Discrete	Anshi Semiconductor (Wingtech)	12-30 Weeks	6-14 Weeks
Discrete	Rohm	<b>20-40 Weeks</b>	8-20 Weeks
Discrete	DIODES	18-30 Weeks	8-12 Weeks
Discrete	Littlefuse	16-30 Weeks	4-8 Weeks
Passives	Vishay	<b>24-52 Weeks</b>	8-12 Weeks
Passives	Murata	20-26 Weeks	6-10 Weeks
Passives	Nichicon	16-24 Weeks	6 Weeks
Passives	Matsushita	16-30 Weeks	4-12 Weeks
Passives	Taiyo Yuden	18-20 Weeks	2 Weeks
Passives	TDK	<b>22-44 Weeks</b>	6-12 Weeks
Passives	Yageo	20-24 Weeks	2-4 Weeks



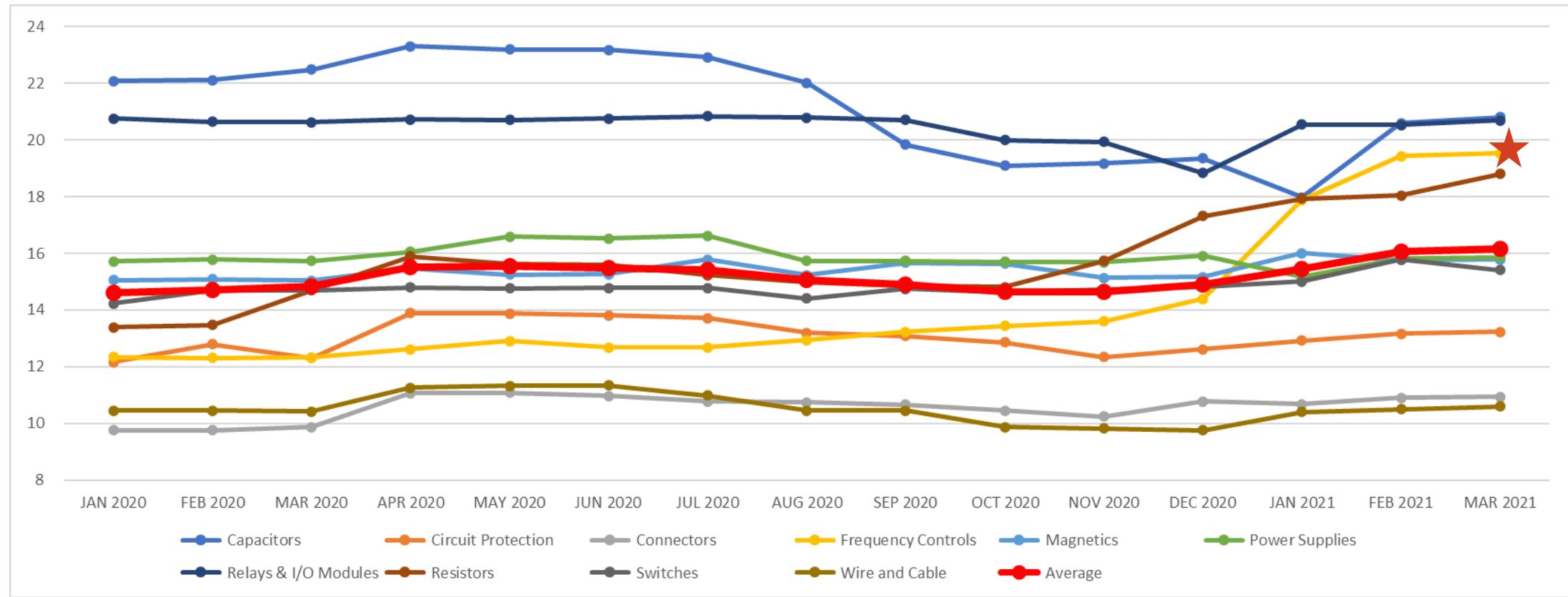
# Electromechanical Q2&Q3 Outlook

# Electromechanical Market Conditions Outlook



★ Connectors and Cable resin concerns late Q2

# PEMCO – Lead Time Trend by Key Technology



Courtesy of Arrow Electronics, March 29, 2021  
Passive, Electro-mechanical and Connector

★ AKM fire impact, October 2020  
<https://www.akm.com/jp/en/about-us/news/information/20210122-information/>

# TCXO Temperature Compensated Crystal Oscillators Are Not Recovering Well From The AKM Fire

Suntsu guidance is representative of this technology as a whole



TCXO Market Update  
March 30, 2021

Dear Valued Customer,

Over the last 12 months the electronic components industry has experienced unprecedented challenges. Covid-19, elevated demand for consumer electronics, unexpected demand in the automotive market, and tensions between the U.S. and China have all conspired to create a perfect storm. The pressure on global supply chains can be felt across every sector, but none more so than the semiconductor industry, which depends on highly specialized equipment and skilled personnel to operate at peak production.

Of relevance to Suntsu Electronics and our customers is the strain on IC fabrication that supports the production of Temperature Compensated Crystal Oscillators (TCXO's). We reported late last year that a fire at the Asahi Kasei Microsystems (AKM) factory in Japan was going to cause a shortage in the market and now 4 month later we are still seeing fallout. As ICs from AKM were our primary source for analog compensated TCXOs, we have been unable to meet even a fraction of the demand for those parts and stock from all manufacturers using the AKM IC has been consumed through the broker market.

Rumors were floating around recently that AKM was going to start coming back online with the help of Renesas Electronics and there was hope that supply would recover. Then last week, Renesas experienced a fire at their production facility and a bad situation got worse.

The elevated global demand on an already constrained semiconductor industry is driving even greater production delays, extended lead times, and elevated costs. Our supply of digitally compensated TCXO IC's is getting pinched in the process and deliveries to support our TCXO production have become erratic and unreliable as our partners suffer from unprecedented demand on top of material and labor shortages down the entire supply chain. Simply put, our ability to meet the demand from our customers has become severely compromised and our lead times for new orders are pushing out further every week as material becomes more and more constrained.

We are doing everything in our power to secure as much material and production allocation as possible, but the global situation remains fluid, and as such, so does our ability to produce parts. We will do our best to provide updated delivery schedules as expediently as possible.

Thank you for your continued support and understanding!

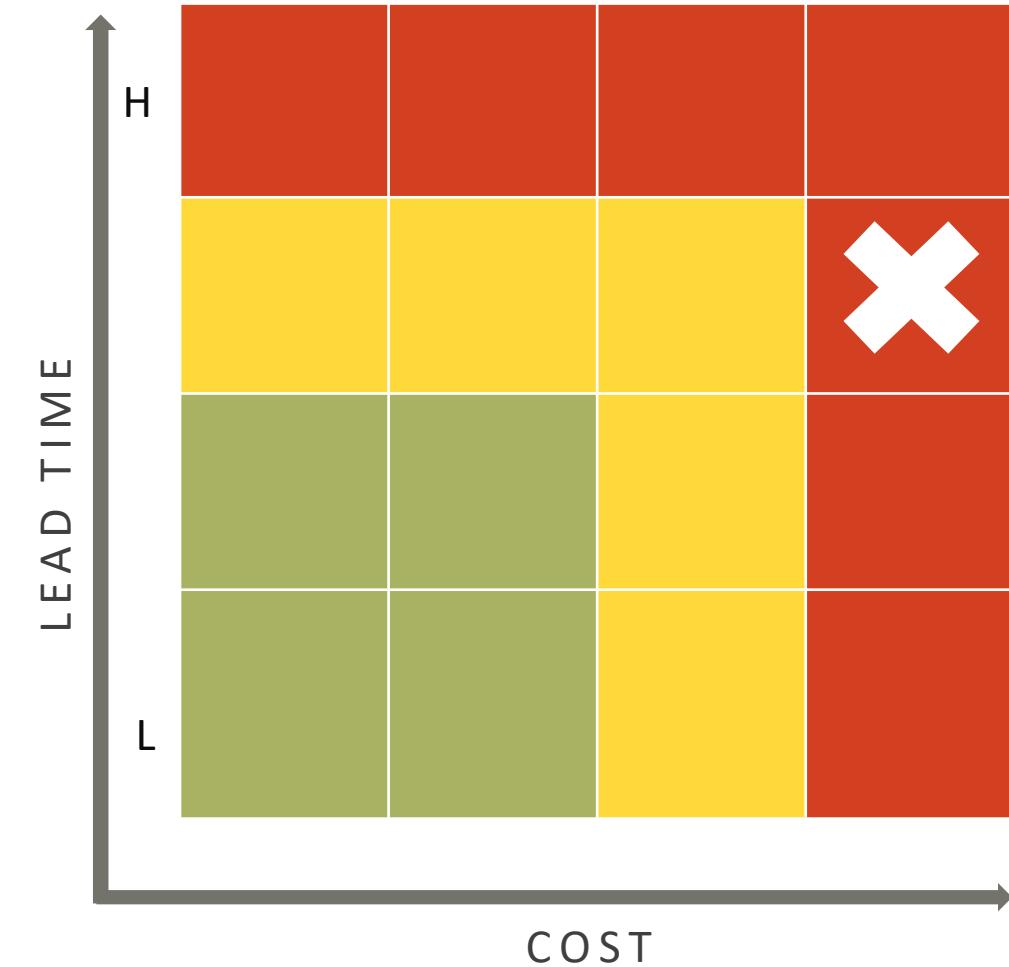
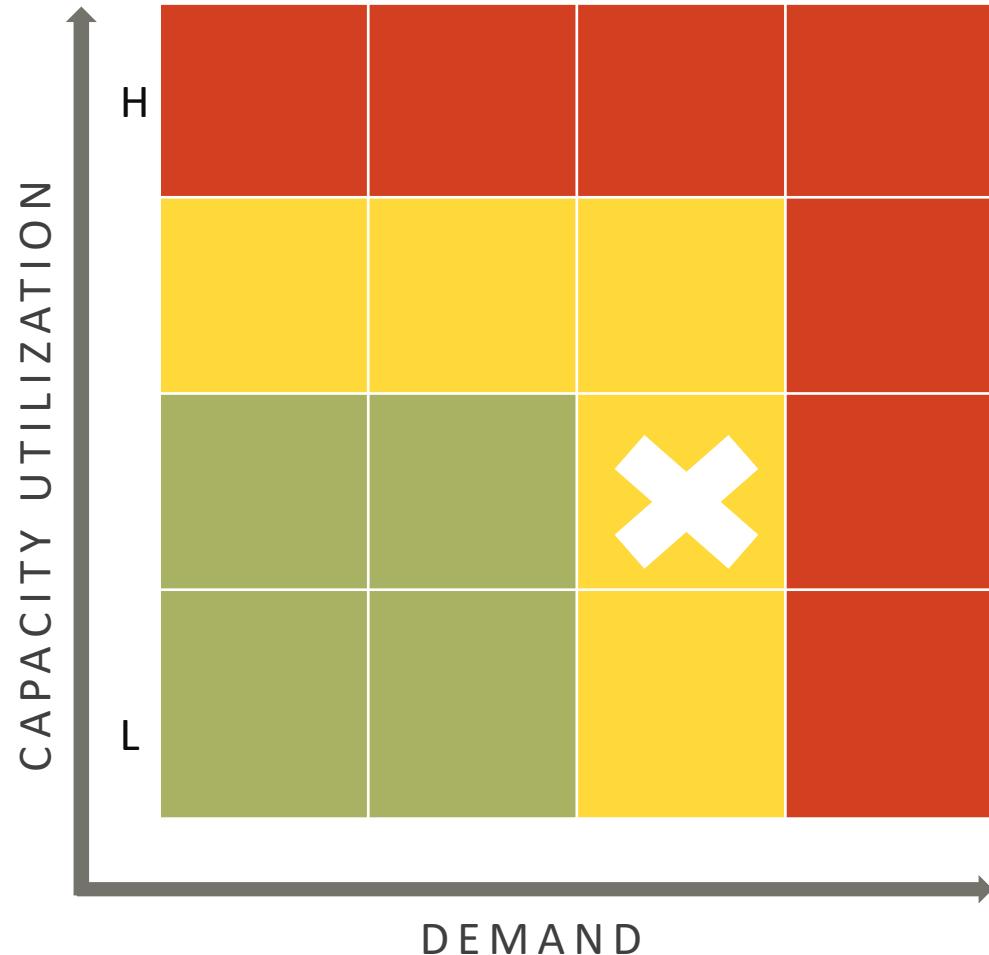
A handwritten signature in black ink, appearing to read "Ryan Benhard".

Ryan Benhard  
Director of Operations

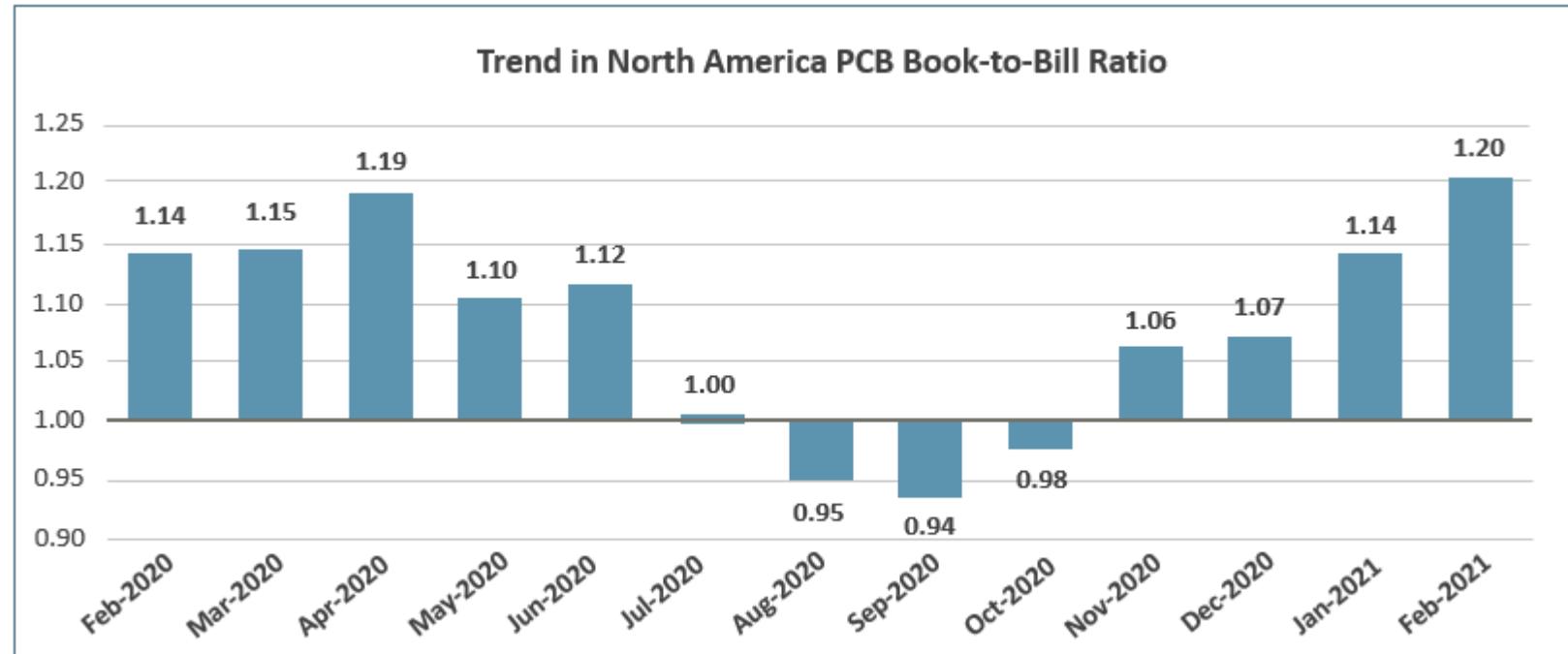


# PCB Q2&Q3 Outlook

# PCB Market Conditions Outlook



A positive Book-to-Bill Ratio with increases in laminate, prepeg and copper materials costs and lead times are driving PCB cost and factory lead time increases

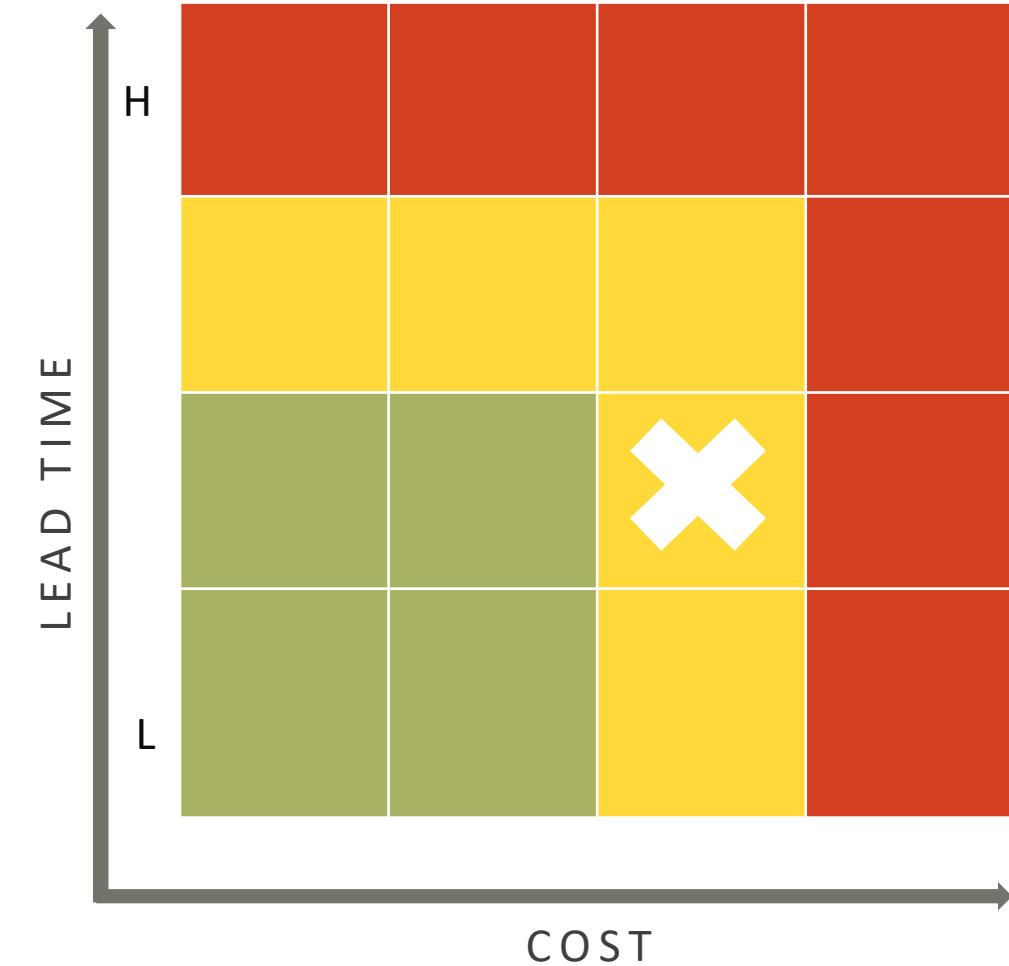


Tech	Supplier	LT	Recent LT Changes
PCB	Suntak Technology Limited	11	4 to 6 Weeks
PCB	Techwise (Macao) Circuits Limited	19	6 to 8 Weeks
PCB	TTM Technologies, Inc.	10	4 or 6 Weeks
PCB	China Circuit Technology	15	4 to 6 Weeks
PCB	Circuit-Tech	6	2 to 4 Weeks
PCB	Circuitronix, LLC	16	6 to 8 Weeks



# Metals Q2&Q3 Outlook

# Metals Market Conditions Outlook



### 1 Year Copper Price

3.98 USD/lb



USD ▾ Pounds ▾ 1 year ▾

### 1 Year Platinum Price

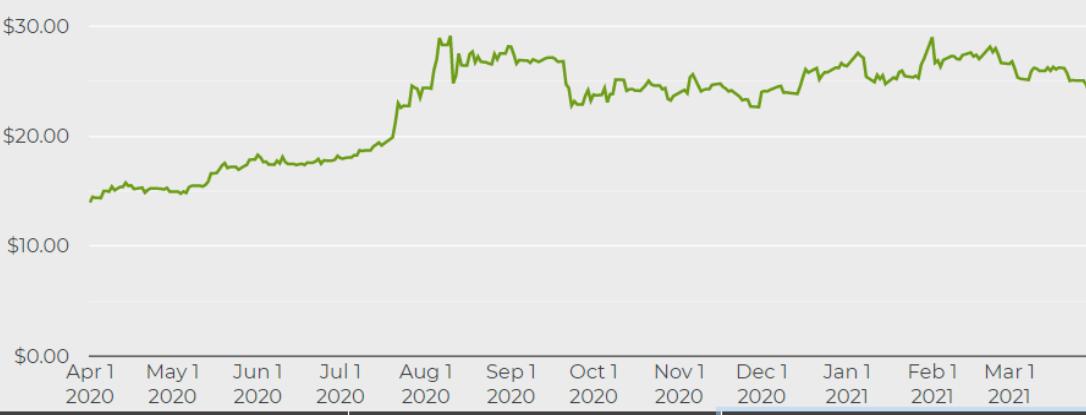
1,215.53 USD/ozt



USD ▾ Troy Ounce ▾ 1 year ▾

### 1 Year Silver Price

24.96 USD/ozt



USD ▾ Troy Ounce ▾ 1 year ▾

### 1 Year Tin Price

12.41 USD/lb



USD ▾ Pounds ▾ 1 year ▾

Tin-silver-copper (Sn-Ag-Cu, also known as SAC), is a lead-free (Pb-free) alloy commonly used for electronic solder.

Mining.com, April 2<sup>nd</sup>, 2021

# Copper Q2&Q3

## USD Expected to Weaken Through 2021

Chile and China Represent over 1/3 of global production

1 United States Dollar equals  
**6.57 Chinese Yuan**

Apr 3, 3:28 PM UTC · Disclaimer

1	United States Dollar
6.57	Chinese Yuan



Data provided by Morningstar for Currency and Coinbase for Cryptocurrency

1 United States Dollar equals  
**717.10 Chilean Peso**

Apr 2, 4:06 PM UTC · Disclaimer

1	United States Dollar
717.10	Chilean Peso



Data provided by Morningstar for Currency and Coinbase for Cryptocurrency

## Ruthenium Oxide Paste

"Thick film chip resistors are manufactured through the screen-printing of ruthenium oxide paste on an alumina ceramic substrate. These substrates are usually 96 percent purity alumina, which is an extremely durable ceramic that must be trimmed with a laser to form the desired rectangular chip shape and the desired ohmic value."

Resistor Markets Tighten as Ruthenium Prices Skyrocket  
EMS Now, Apr 9, 2021 | Analysis, Components, Supply Chain

"This product is ubiquitous and designed into every printed circuit board manufactured, regardless of end-market. Therefore, vendors should look at thick film chip resistors as a potential risk factor.

The risky nature of thick film chip resistors is their reliance upon ruthenium in their resistive pastes (RuO<sub>2</sub>). Ruthenium is a by-product of platinum mining in South Africa. Platinum mining has been plagued by workers' strikes, and this is in turn impacting the volume of metal above ground and, subsequently, the price, which increased to \$330 USD per troy ounce in February and \$400 per troy ounce in March 2021."

### 1 Year Ruthenium Price

400.00 USD/ozt



## IRIDIUM

Iridium is well suited to several industrial applications "because of its high melting point, hardness and resistance to corrosion," said John Plassard, an analyst with investment house Mirabaud.

Those qualities make it especially sought after for mobile phones, where demand is soaring as 5G technology is rolled out, and in hydrogen fuel cells, potentially a key component in the transition to electric vehicles.

**Hindustan times March 21,2021**

Iridium, a member of the platinum family of metals, is used in all spin electronic devices, from the read/write heads that transfer data to and from the hard disk in your computer, to emerging magnetic random-access memory, MRAM, a higher performance, energy efficient alternative to conventional RAM and DRAM. Fused with manganese into an antiferromagnetic alloy, it is stable, durable and heat resistant. But it is also extremely scarce.

"Iridium is one of the rarest elements on Earth, twice as rare as other critical raw materials such as platinum, gold and ruthenium. Accordingly, the price has risen ten-fold over the last decade and is forecast to increase by a factor of 100 as more applications emerge in the future," explains Atsufumi Hirohata, a physicist at the University of York in the UK.

[ec.europa.eu/programmes](http://ec.europa.eu/programmes), March 18, 2015





Beyond Q2&Q3

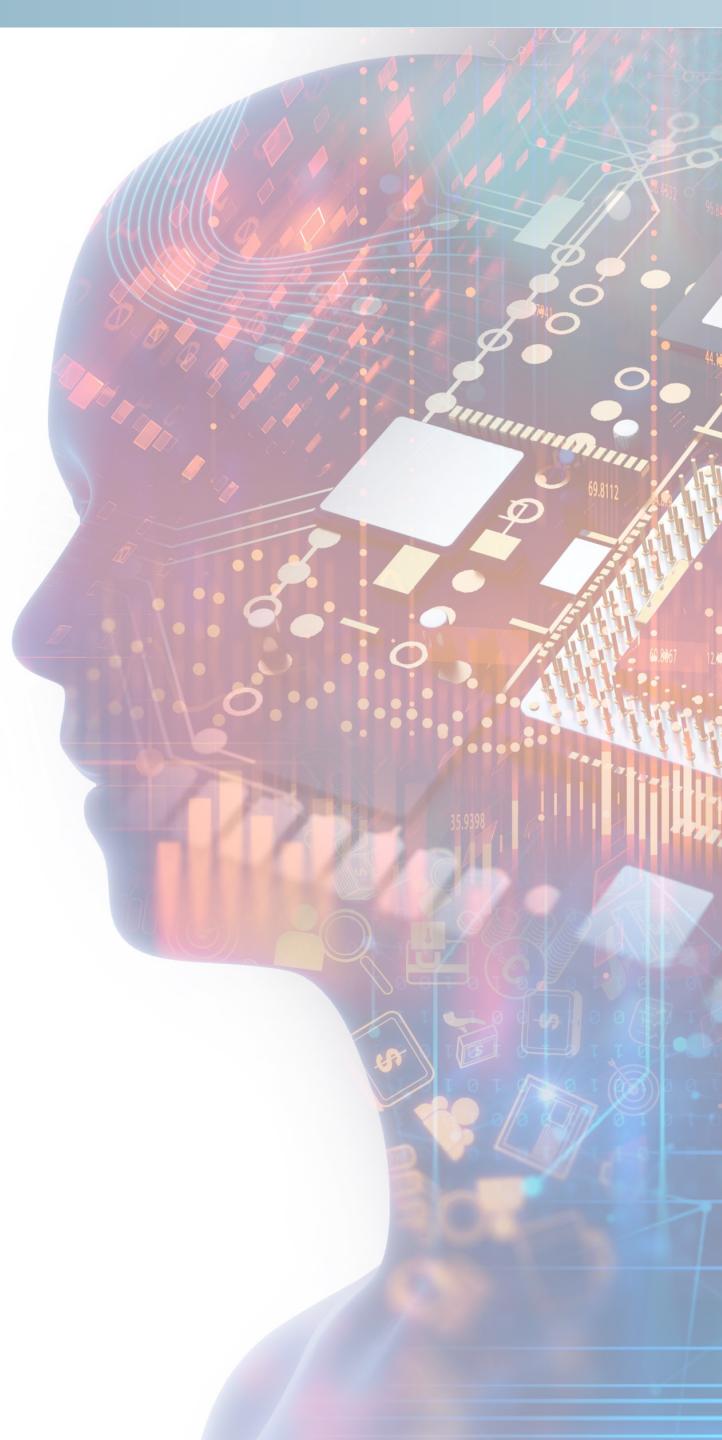
# Preliminary Market Outlook - Q4 2021 Q1 2022

**Every Storm  
Runs Out Of Rain**

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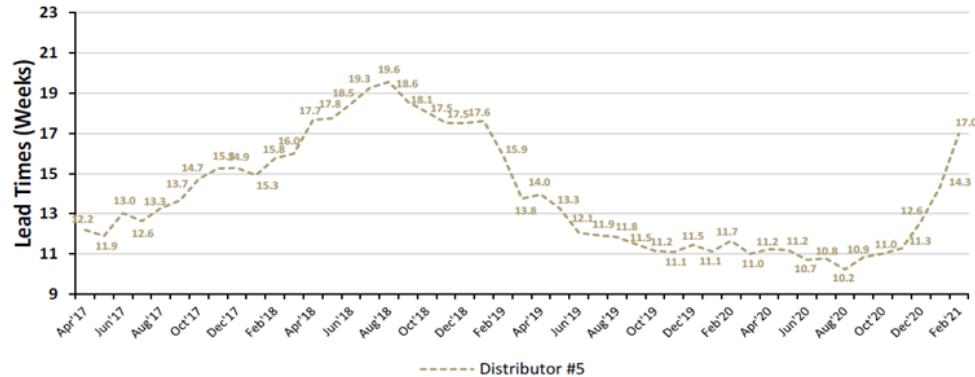
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## Additional Reference Data

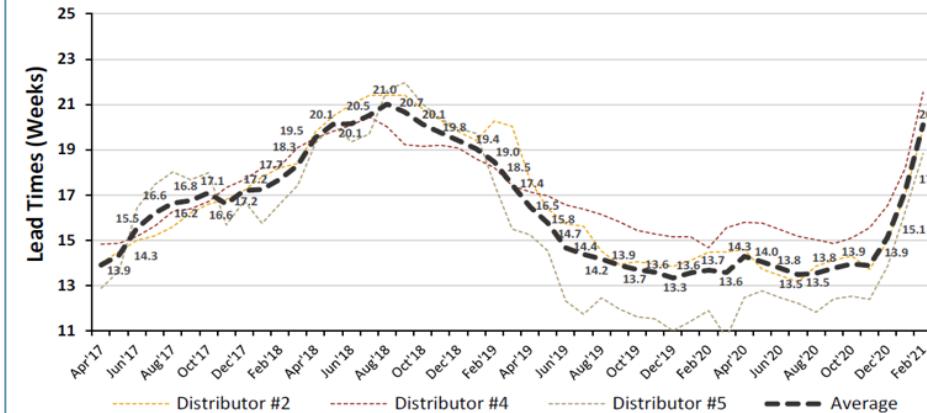
**Power management LTs up nearly three weeks in February.** LTs for power management components (DC-DC converters, power supply, MOSFETs, linear regulators) increased by nearly three weeks month-over-month in February and are now just ~2.5 weeks below prior-cycle highs achieved in August 2018. Notably, linear regulator, MOSFET, and LED drivers were key drivers in February expansion.

POWER MANAGEMENT LEAD-TIMES AT DISTRIBUTOR #5



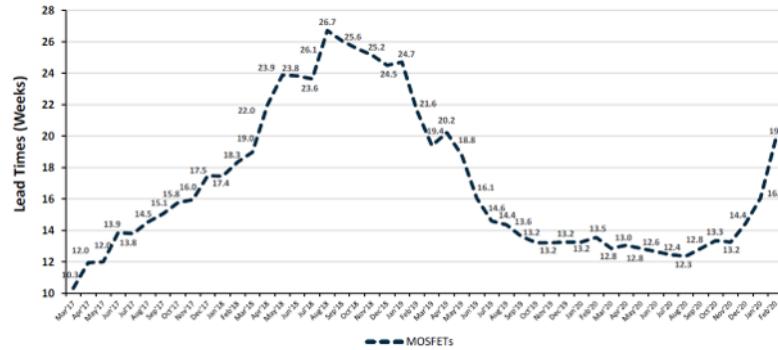
**LTs for discrete components increased nearly three weeks in February.** LTs for discrete components are now at 20.1 weeks, up nearly three weeks MoM in February, and are now less than a week below cycle highs achieved in September 2018 (21.0 weeks). Rectifier, diode, transistor, and optocouplers products drove LTs higher, while thyristor products modestly offset the expansion.

DISCRETE COMPONENT LEAD-TIMES



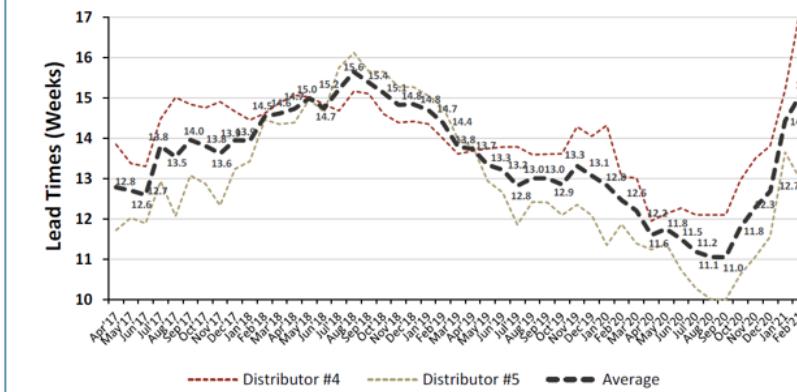
**MOSFET LTs expanded three-and-a-half weeks in February.** MOSFET LTs increased for the third straight month in February and are now at 19.7 weeks on average. LTs for MOSFETs remained relatively stable through most of 2020, but have now expanded by over six weeks in the past three months. MOSFET LT expansion is likely driven by increasing demand for 5G base stations, new CPU/GPU platforms, automotive (EVs), smartphones (wireless/rapid charging), artificial intelligence, and industrial automation.

MOSFET LEAD-TIMES UP IN FEBRUARY (DISTRIBUTOR #5)



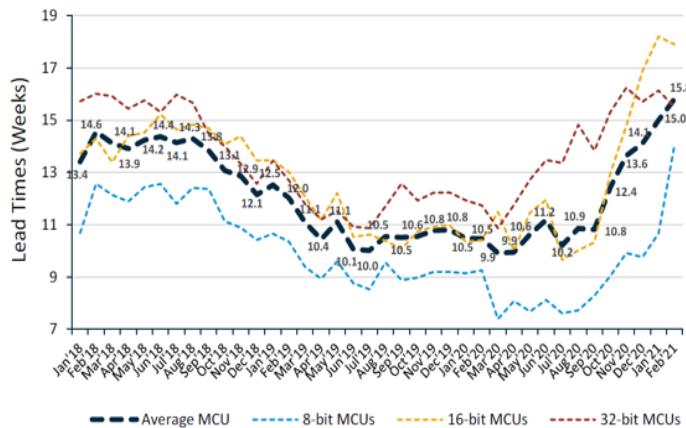
**Analog LTs expanded by four days in February.** Analog product LTs were up four days MoM, extending the expansion SFG has witnessed since September 2020. Distributor #4 saw a sharp uptick in analog LTs, while distributor #5 saw a modest decline in LTs. SFG believes TI and ON historically have had shorter LTs and have additional unused capacity, which make them beneficiaries of rising LTs at competitors.

ANALOG LEAD-TIMES EXPAND IN FEBRUARY

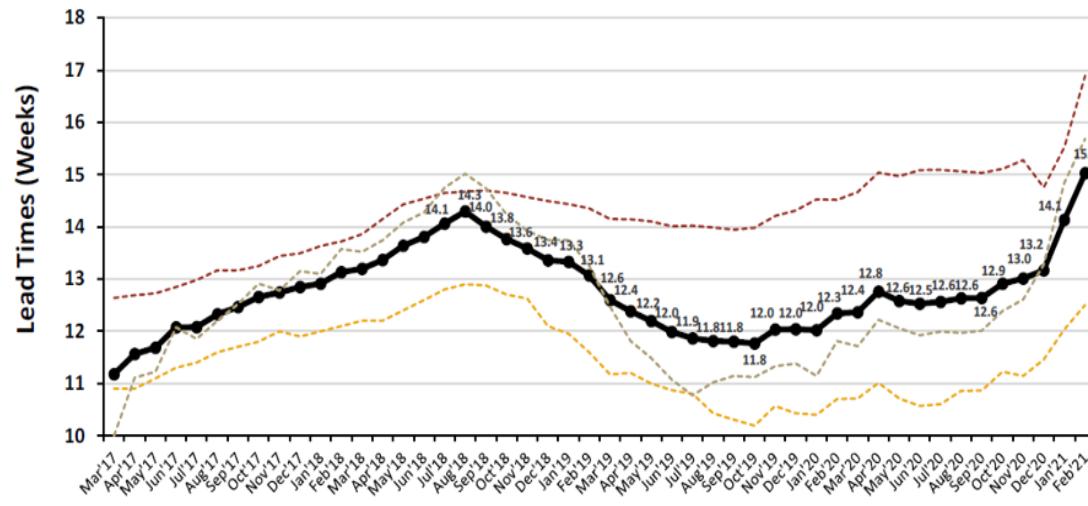


**Industry MCU LTs increased by six days in February.** SFG found that MCU LTs were up six days from January, driven by a significant increase in 8-bit microcontrollers, partially offset by modest declines in 16-bit and 32-bit microcontrollers. Notably, MCU LTs were 15.8 weeks in February and are now above the levels last reached in June 2018.

MCU LEAD-TIMES BY TYPE - DISTRIBUTOR #5



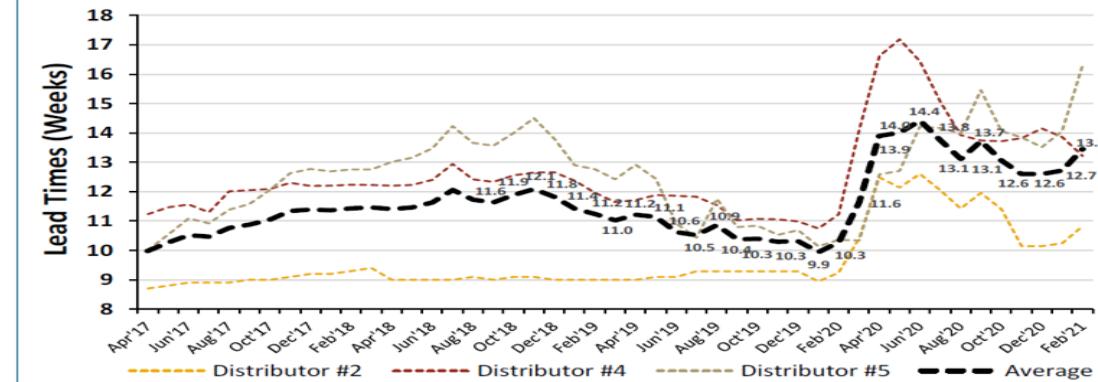
SEMICONDUCTOR MONTHLY LEAD-TIMES



Courtesy of Fusion Worldwide : [www.fusionww.com](http://www.fusionww.com)

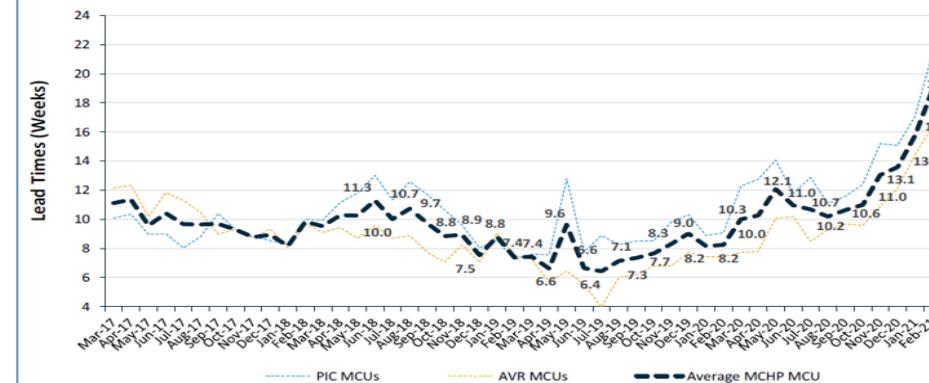
**Optoelectronics LTs up five days in February.** After increasing by nearly four-and-a-half weeks from February to June in 2020, optoelectronic product (LED displays, optocouplers, infrared, photodetectors) LTs have generally contracted. In February, LTs increased by five days MoM and are now at 13.5 weeks on average. Optoelectronic LTs historically have been some of the most stable LTs of any product, but many in this supply chain are based in Wuhan and the increased LTs in 1H20 represented a disrupted supply chain as a result of the pandemic, which has since stabilized.

OPTOELECTRONICS LEAD-TIMES



**Microchip MCU LTs increase to a new high-water mark in February.** Microchip MCU LTs were up by three weeks in February and are now 18.9 weeks on average. Both AVR and PIC LTs expanded by more than two weeks during the month. Microchip LTs fluctuated between 6.0 and 9.0 weeks from 4Q18 until 1Q20, but have since achieved new record highs, increasing the risk for double-ordering. LTs have expanded by eight weeks over the past six months, supporting recent management commentary of continued supply chain constraints.

MICROCHIP MCU LEAD-TIMES



## Memory

Supplies of graphics memory are very tight in the channel as cryptocurrency-mining activity rises and pent-up gaming-console demand lingers. Open-market pricing of GDDR5 and GDDR6 is fluctuating daily, and, overall, the market has realized a significant increase over last month. Lead times are currently stable across the major manufacturers, within the standard four to six weeks. The elevated demand is likely to continue for the next several months.

SK Hynix said recently that they expect strong demand for notebooks and gaming PCs in 2021, citing how customer inventory levels decreased following a pickup in sales during the fourth quarter. The memory manufacturer also believes that PC shipments will be much higher than expected in the first half of 2021.

Spot shortages continue to pop up in the open market for SODIMMs, most notably for 8GB and 16GB memory, and we've seen a steady 2-3% rise in pricing on a weekly basis that we expect will continue.

As far as server memory goes, open-market demand has seen an uptick for RDIMMs as inventory levels remain depressed across manufacturers. Pricing is still elevated by 20-30% above the norm, but lead times are stable at between four and six weeks across the major manufacturers.

Recent power-related events hit two of the top three memory manufacturers over the last few months, potentially impacting DRAM capacity. In early December, two separate events affected Micron's Taiwan DRAM operations. The company said the disruptions reduced their available fiscal second-quarter DRAM supply. Samsung was also forced to shut down its two factories in Austin, Texas, in February due to winter-storm-related impacts. Combined, the two facilities represent 28% of the company's overall production capacity.

## IC

Availability of microcontrollers is worsening as demand reaches peak levels. Supplies are extremely limited, causing pricing from suppliers to fluctuate daily by anywhere from 1-3%. Lead times are well over 30 weeks and trending upward. The most impacted manufacturers are Cypress Semiconductor, STMicroelectronics, Texas Instruments, NXP, and Renesas, all with lead times of 30-plus weeks.

Renesas president and CEO Hidetoshi Shibata recently warned that semiconductor supplies will likely remain tight through the first half of 2021.

"Demand in the first half of 2021 is expected to be very strong," he said in a recent statement. "The performance from April to June will be stronger than that from January to March." Shibata went on to say that it takes a long time to expand capacity and that he did not believe this year's capacity expansion would have any beneficial impact.

Demand for many Microchip products has intensified, and supplies are severely constrained. The company put out a statement in early February that its booking rate is above normal and that, as near-term availability drives up on most products that are in high demand, orders are continuing to be scheduled further and further out. Microchip said that they expect the bulk of their capacity to be booked by the end of February and that their 12-month backlog will be accepted on a first-come, first-served basis. Microchip estimates that shortages will continue for much of 2021 and possibly into 2022.

Lead times for capacitors, oscillators, resistors, and diodes are extending, and prices are elevated and change daily as a lack of product troubles the industry. Vishay, Murata, and Yageo are the most impacted manufacturers, with all experiencing shortages of certain parts. Lead times range between 16 and 20 weeks, extending upwards of 40 weeks for some products, including MLCCs. We anticipate constrained supply for the rest of the year.

Open-market demand for Xilinx parts has soared. While pricing has remained stable, lead times have nearly doubled in the last week due to the ongoing automotive chip shortage. The U.S. chipmaker recently warned that the supply constraints facing the auto industry will not be resolved quickly and that the challenges extend beyond supplies of components.

## Peripherals

Availability of NVIDIA's RTX 3000 series GPUs remains severely limited, and shortages persist, with demand far outstripping supply. Supplies are tightly controlled in the market, with very minimal manufacturer allocation. Demand for the RTX 3060, RTX 3080, and RTX 3090 series has intensified in recent weeks. Channel pricing has increased by 10-15% over last month's but fluctuates daily, and lead times are between five and seven weeks.

We do not anticipate a change in demand anytime soon. A surge in cryptocurrency mining, coupled with reduced availability of raw materials for production and factory closures during Lunar New Year, could lead to worsening conditions by the end of the first quarter.

In related news, NVIDIA announced last month that it will be supplementing the sky-high demand for the GeForce RTX 3000 series graphics cards by releasing stock of older GPUs. The legacy RTX 2060 and GTX 1050 Ti will be available to board partners so that they can release new hardware. A spokesperson for NVIDIA noted that the GPUs were "never EOLED [end-of-lifed]" and that the company was merely "meeting market demand, which remains extremely high."<sup>[6]</sup>

## CPUs

Elevated demand for Intel's mobile CPUs persists, and inventory has tightened in the channel over the last month, specifically for the Ice Lake and Comet Lake families. Lead times are currently running between one and two weeks when product is available, and pricing is in line with last month's.

The availability of AMD's EPYC and Rome families of CPUs is worsening as demand from OEMs has increased in recent weeks. Pricing is stable, but lead times are lengthening and are between four and six weeks.

## Finished Goods

There has been an uptick in open-market demand for LCD panels, and pricing is steadily rising. Panel-makers are facing supply constraints due to shortages of glass substrates and LCD-driver ICs that began in the last quarter of 2020.

AUO recently announced sequential declines in revenues and area shipments of LCD panels in January. The company expects shipments in the first quarter to drop by 7-9% sequentially due to tight supply of materials, including the aforementioned glass substrates and driver ICs, and fewer working days due to the Lunar New Year.

The company also disclosed that a recent furnace explosion at a manufacturing plant operated by the world's #2 glass-substrate vendor – AGC in the South Korean city of Gumi – is estimated to cripple its production for at least six months. Shortages of the substrate used for TFT-LCD and OLED panels will widen further in the second and third quarters as a result.<sup>[7]</sup>

Innolux Corporation's prices for large panels are expected to rise by a high-mid-single-digit percentage in the first quarter of 2021, extending an upwards trend from the previous quarter, the company said.