

Altium[®]

ALTUMLIVE 2018:

THE SECRETS OF A SUCCESSFUL BOARD BUILD

4 BEST PRACTICES FOR
DESIGNER/MANUFACTURER COLLABORATION



Shashank Samala

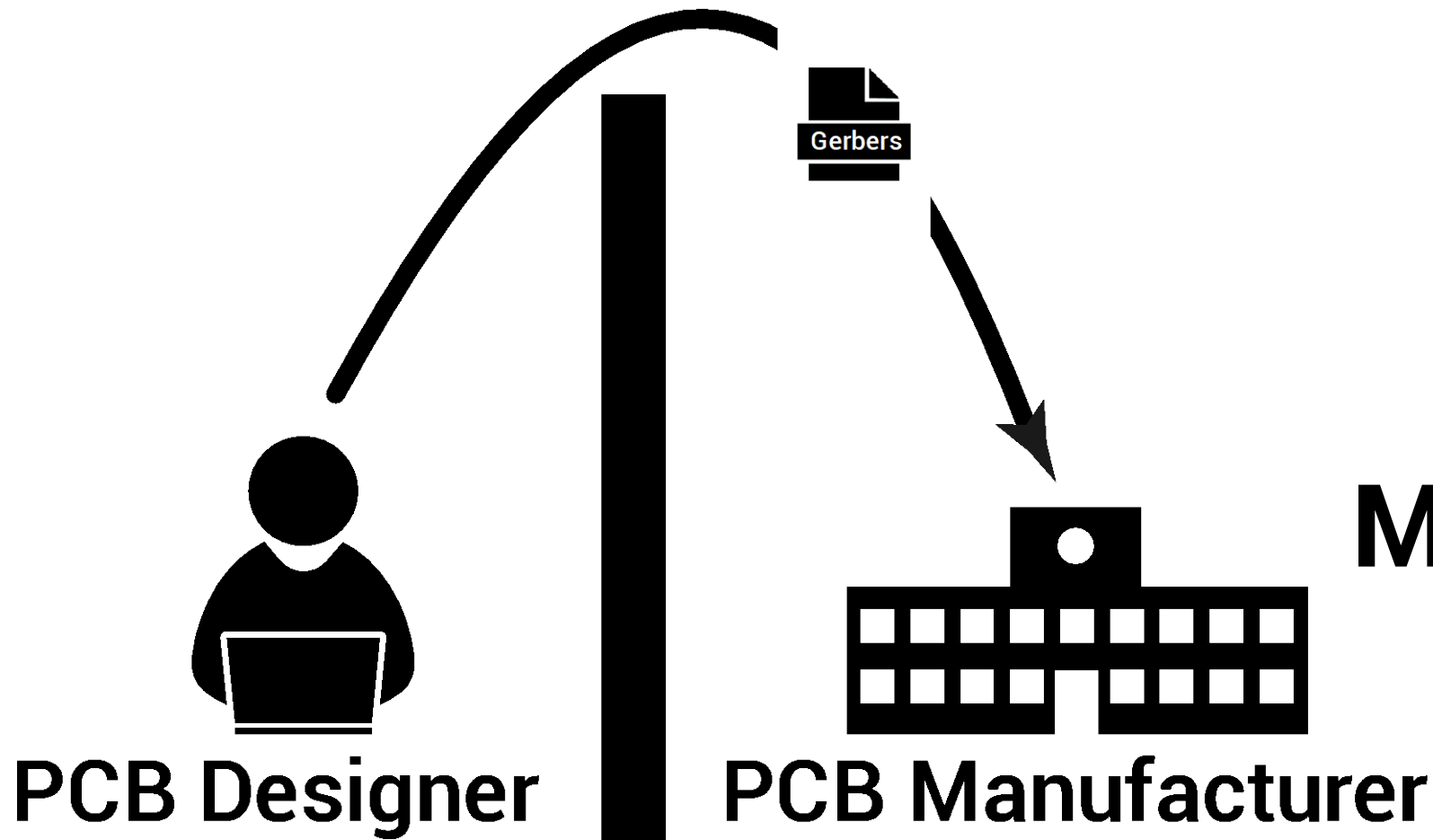
Tempo Automation,
VP of Product , Cofounder

San Diego

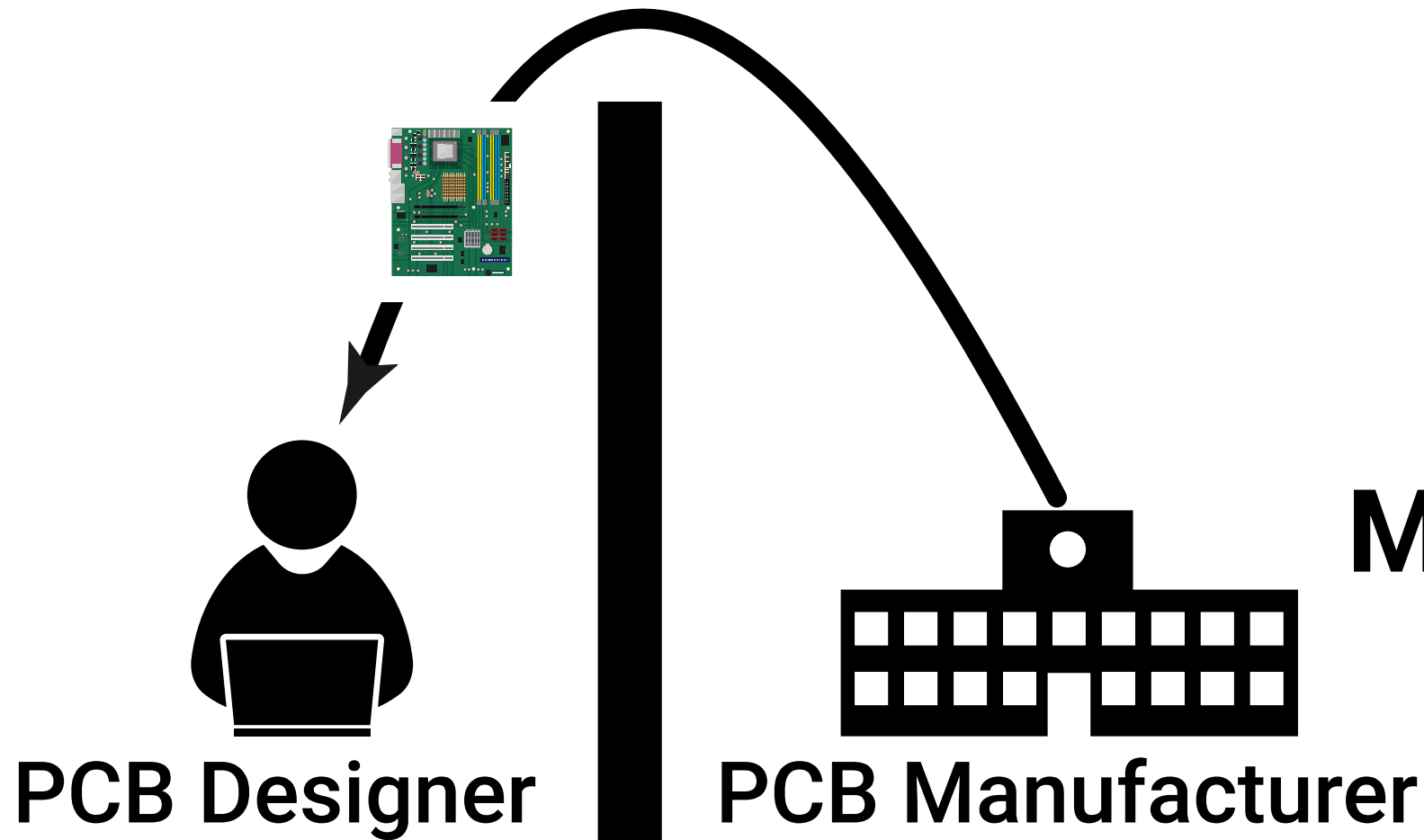
Oct 4-5 2018

Agenda

- 1 Waterfall Manufacturing
- 2 Agile Manufacturing
- 3 Best Practice 1: Design Intent Synchronization
- 4 Best Practice 2: Quote Optimization
- 5 Best Practice 3: Manufacturing Synchronization
- 6 Best Practice 4: Transfer Manufacturing Knowledge

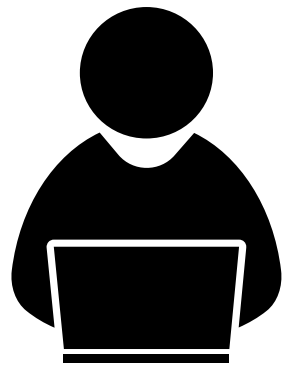


Waterfall Manufacturing

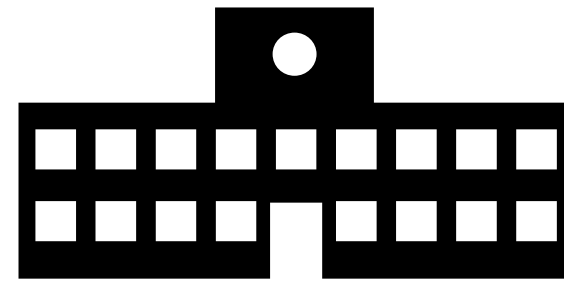


Waterfall Manufacturing

Shatter the Wall



PCB Designer

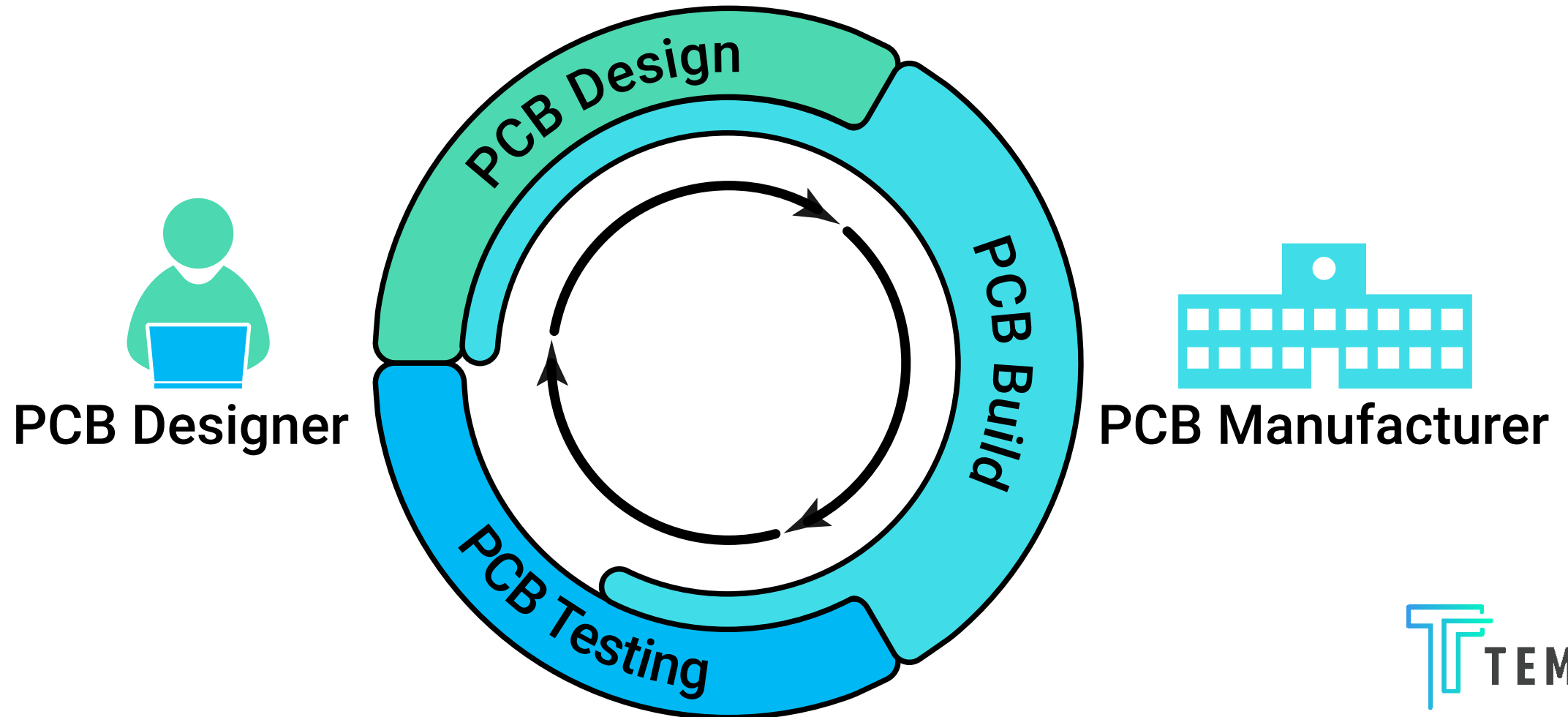


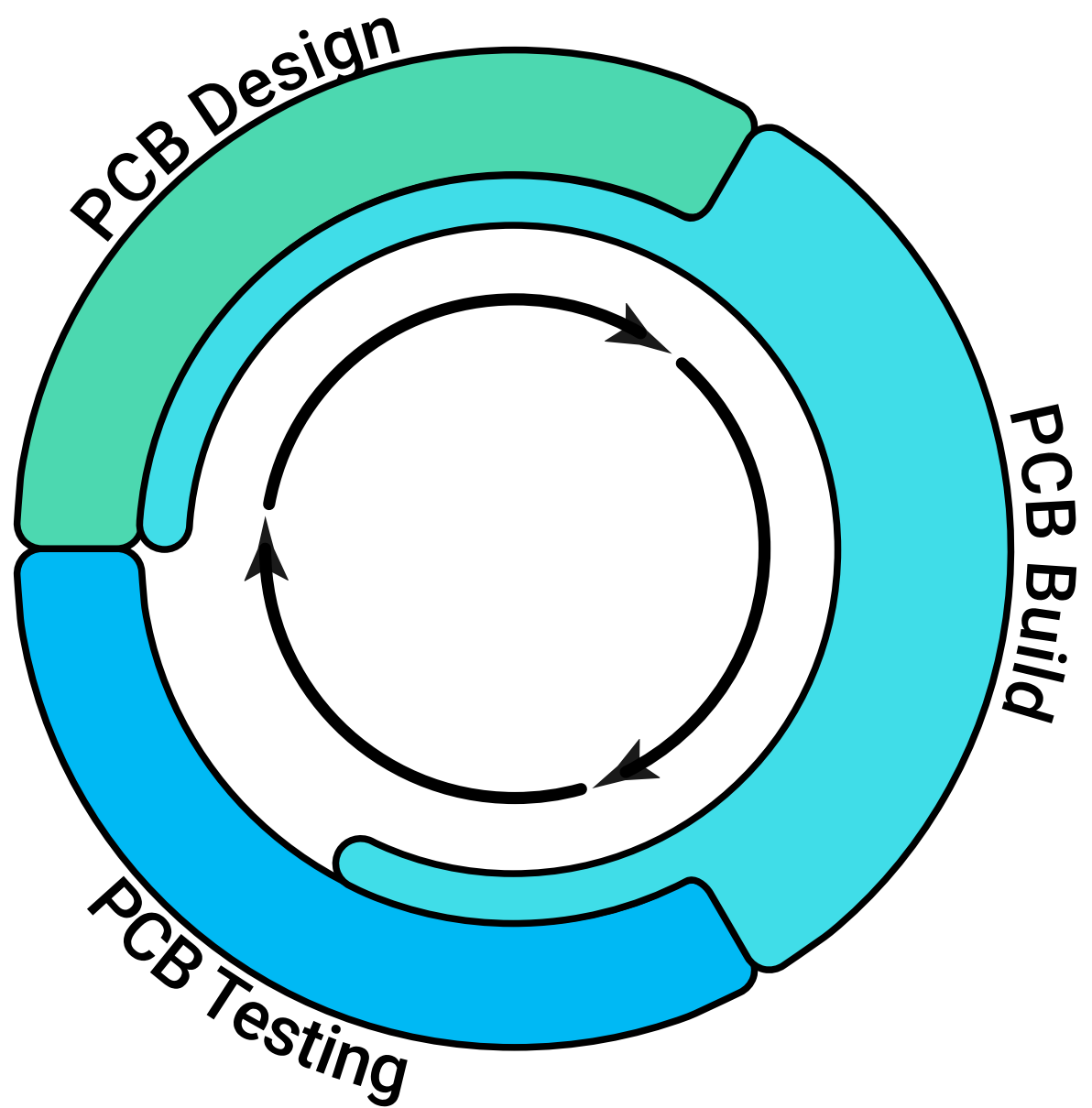
PCB Manufacturer



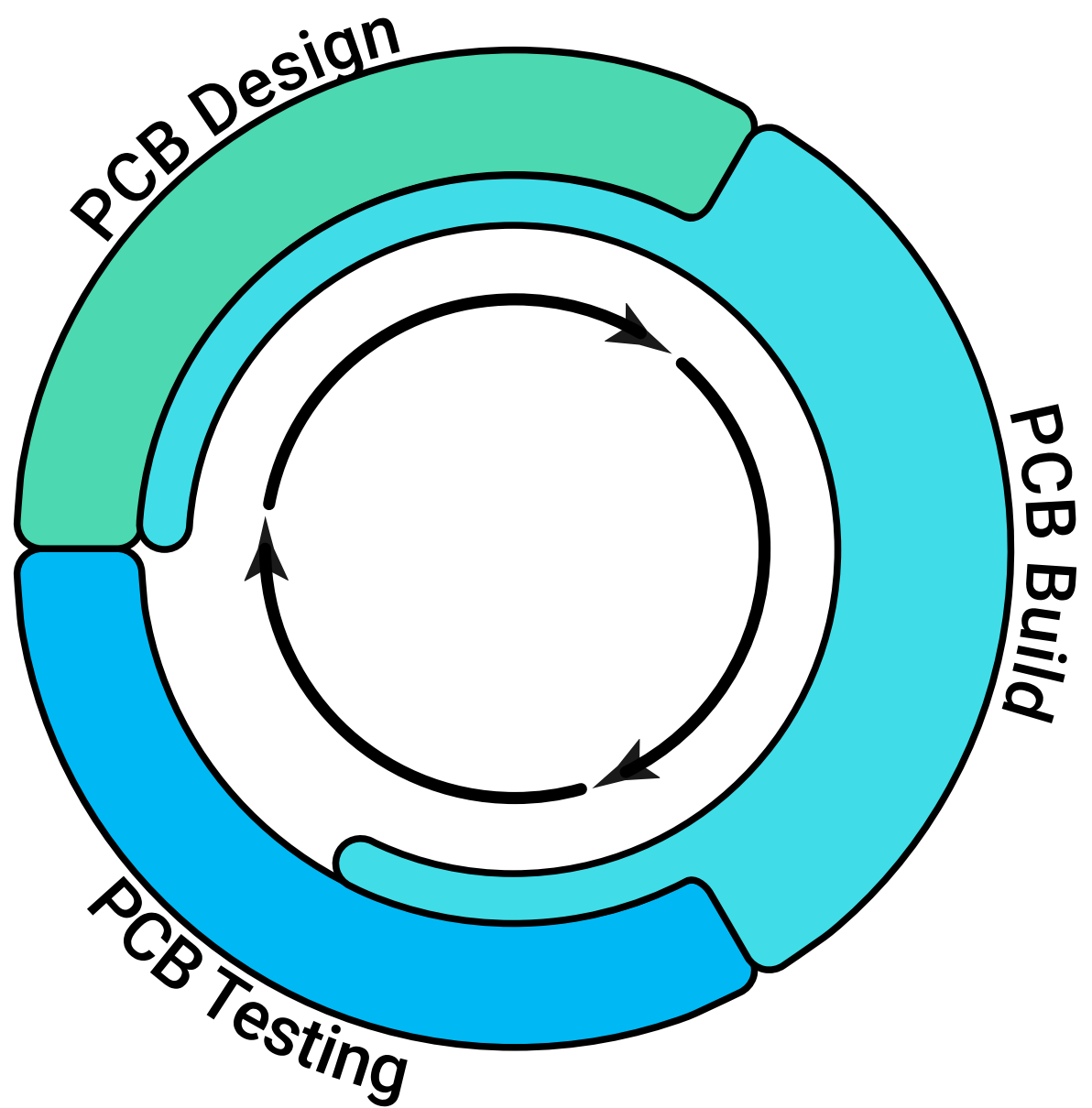
From Waterfall Manufacturing...

...to Agile Manufacturing



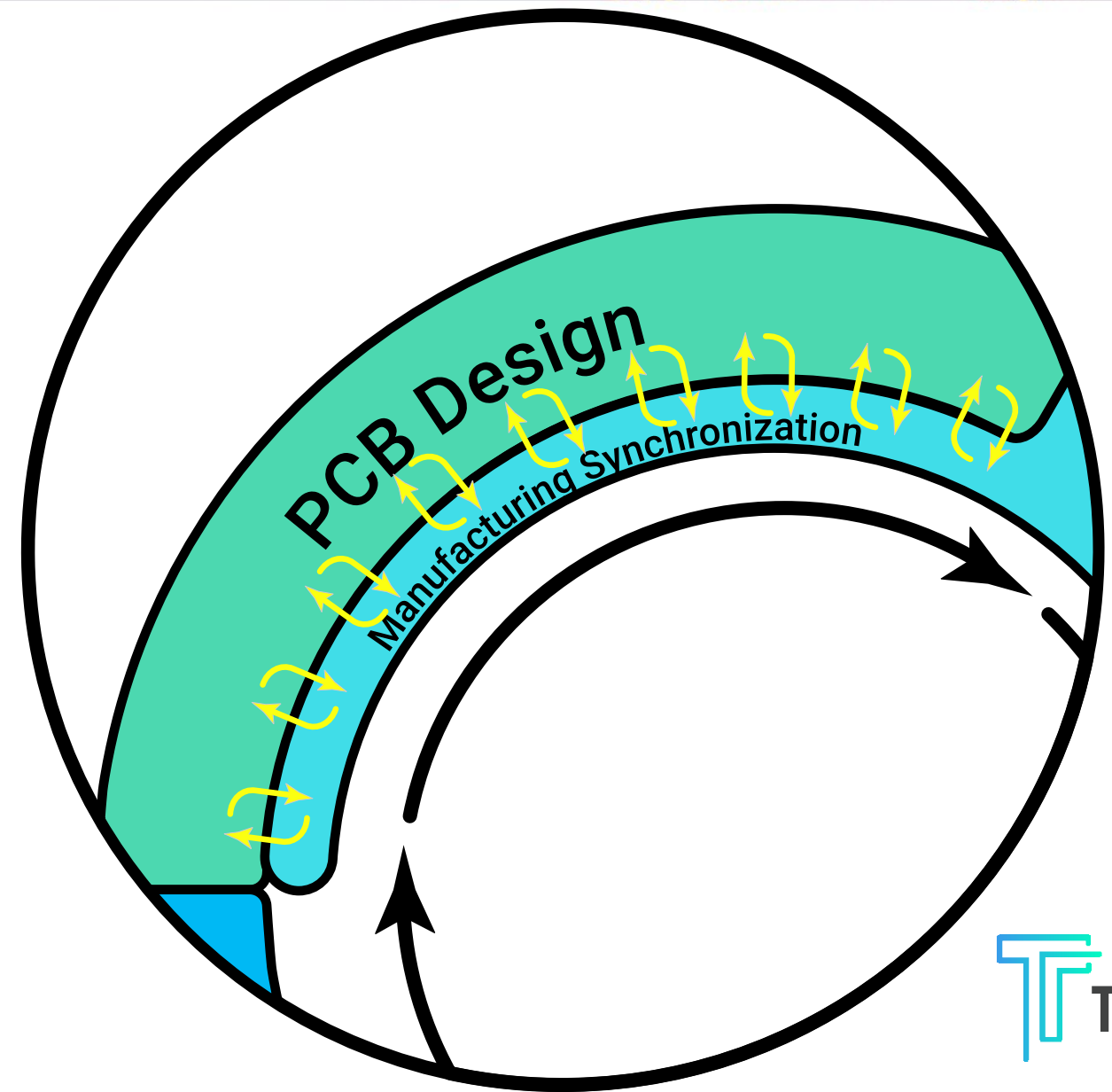


How do you achieve Agile Manufacturing?

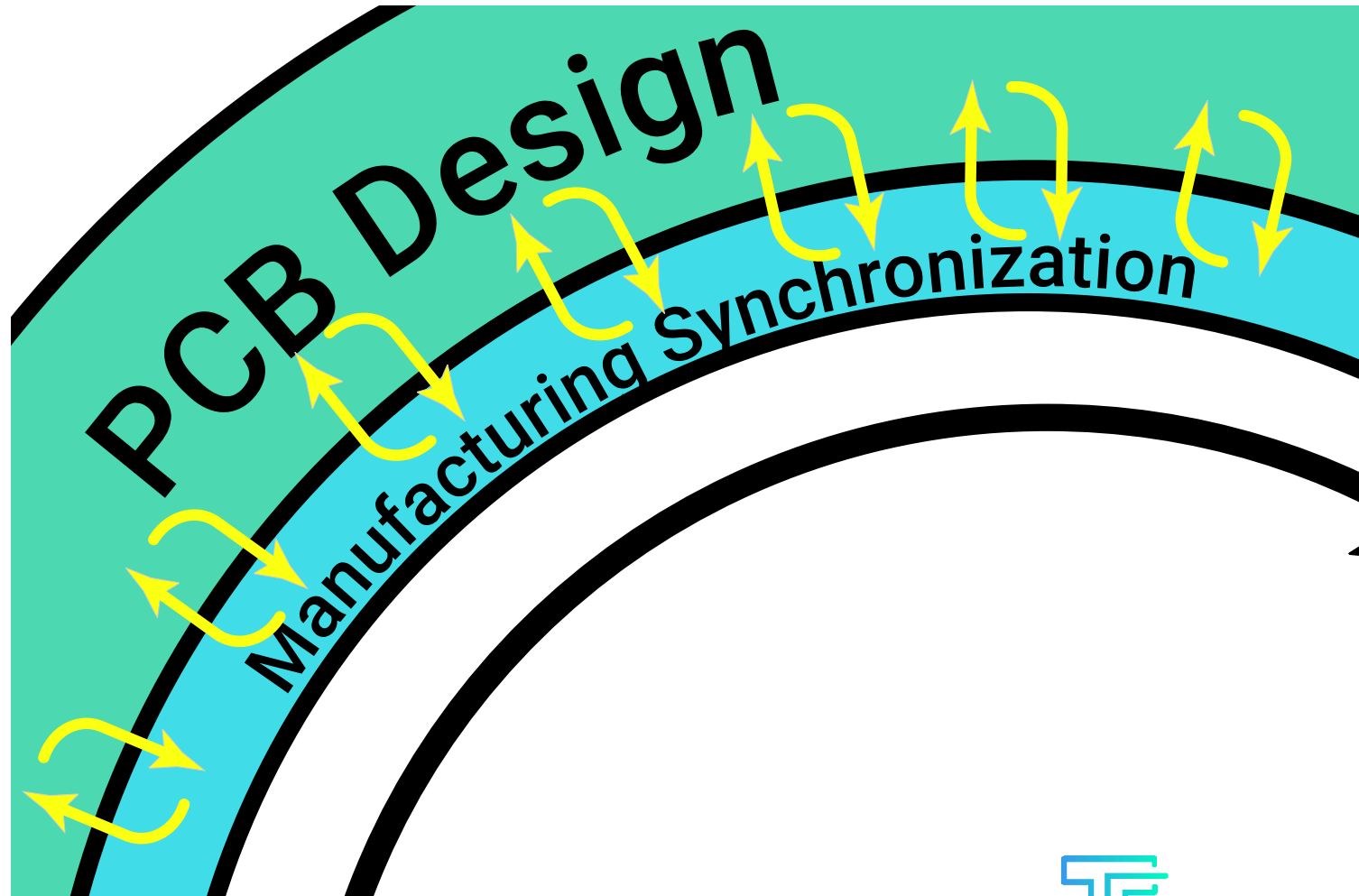


Radical Transparency!

Transparency during PCB Design



Best Practice 1: Manufacturing Synchronization



Manufacturing Synchronization Best Practices

Planning	<ul style="list-style-type: none">• Engage with CM• Confirm CM supports QC requirements• Determine special processes required• Generate target stackup
Sourcing	<ul style="list-style-type: none">• Compile for component sensitives• Check for stock availabilities
Schematic	<ul style="list-style-type: none">• Include features for testing at CM
Layout	<ul style="list-style-type: none">• Use DRC rules specific to the CM• Check thermal impacts of manufacturing

Manufacturing Synchronization with Tempo

Capabilities with Cost and Lead Time

Factory Specific DRC

Impedance Uncontrolled, Controlled Dielectric, Controlled Impedance $\pm 10\%$, Controlled Impedance $< \pm 10\%$ +

Traces

Width and Spacing COST TIME -

	COST	TIME
> .003"	\$	🕒
.003"	\$ \$	🕒 🕒

.0025" \$ \$ \$ 🕒 🕒

Clearance to board edge (minimum): 0.010"

Request Our Stack-up & DRC Files for Fast Quoting

Complete the request form to receive our stack-up and design rules files for Altium:

- ✓ 2-8 layers
- ✓ Board thickness of 0.031 or 0.062
- ✓ Outer or inner copper weights of 1-4 oz

Don't see your stack-up combination on the form? Feel free to let us know via our chatbot in the lower right of your browser or email: sales@tempoautomation.com.

Optimize Before Manufacture
 Importing our stack-ups into your Altium project will save you time & \$!

First Name*

Last Name*

Email*

Company Name*

Layers*

Select -

Weight Outer*

Select -

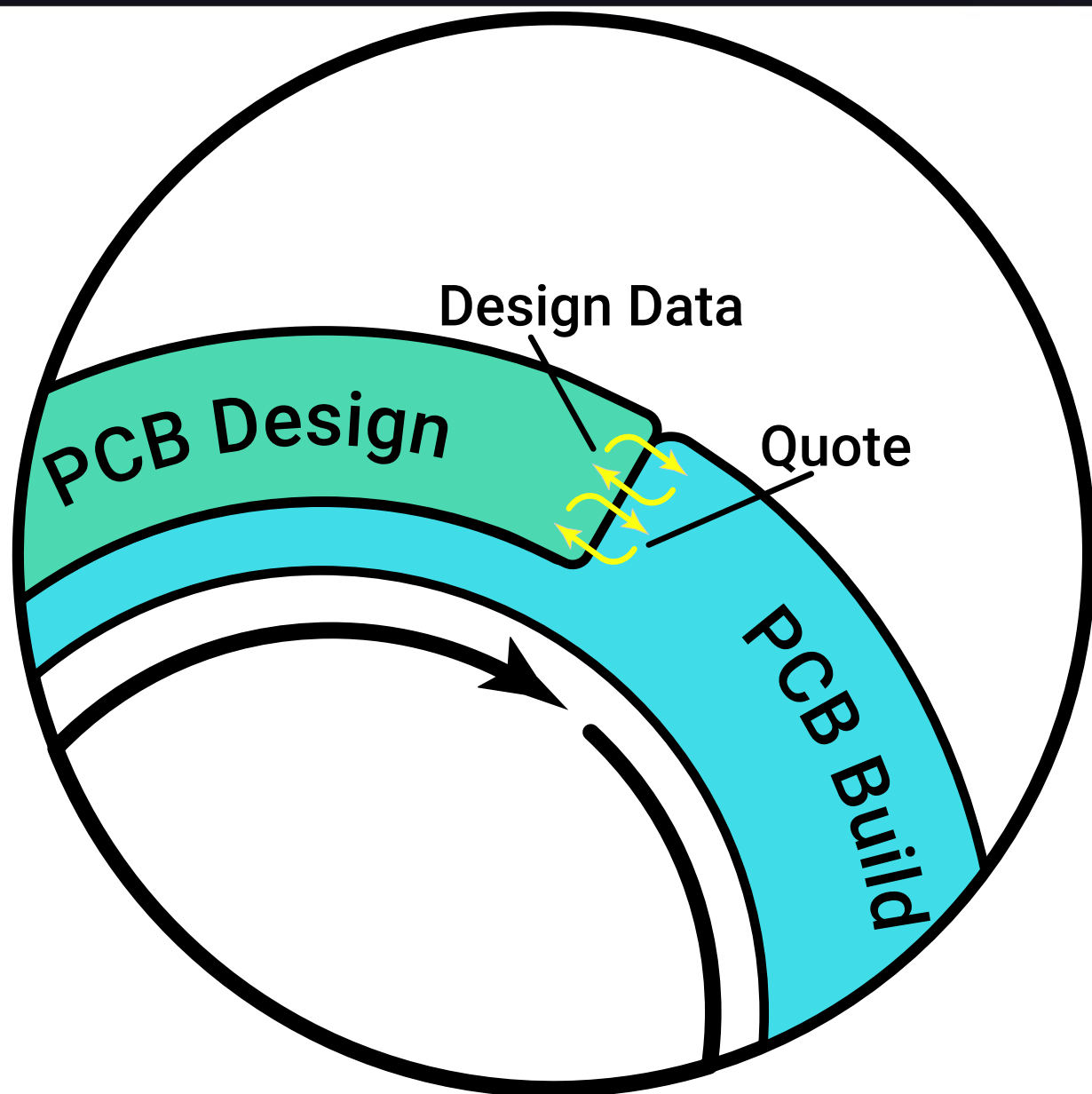
Weight Inner 2*

Select -

🕒 🕒

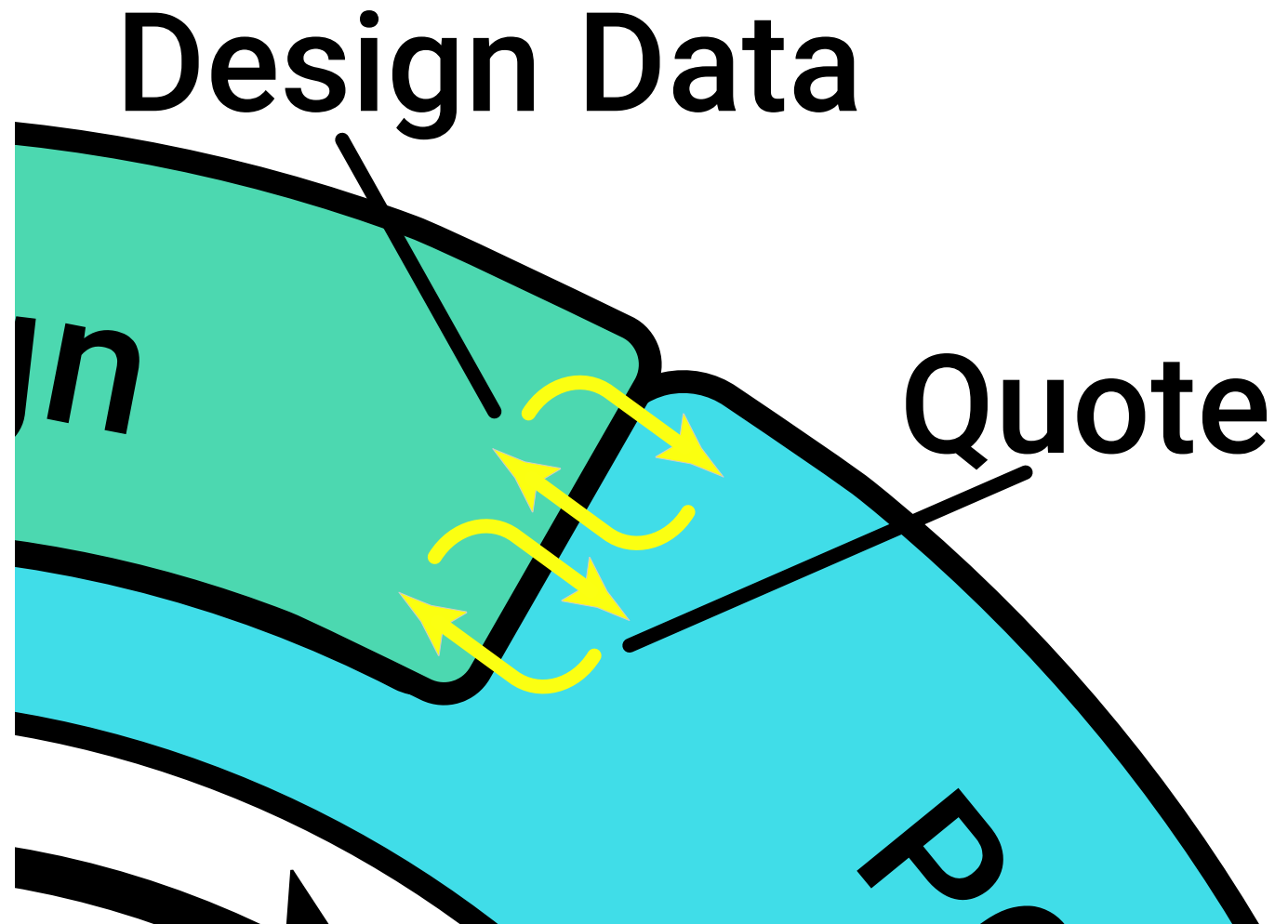
Layers*

Thickness*



Transparency during transfer to PCB Build

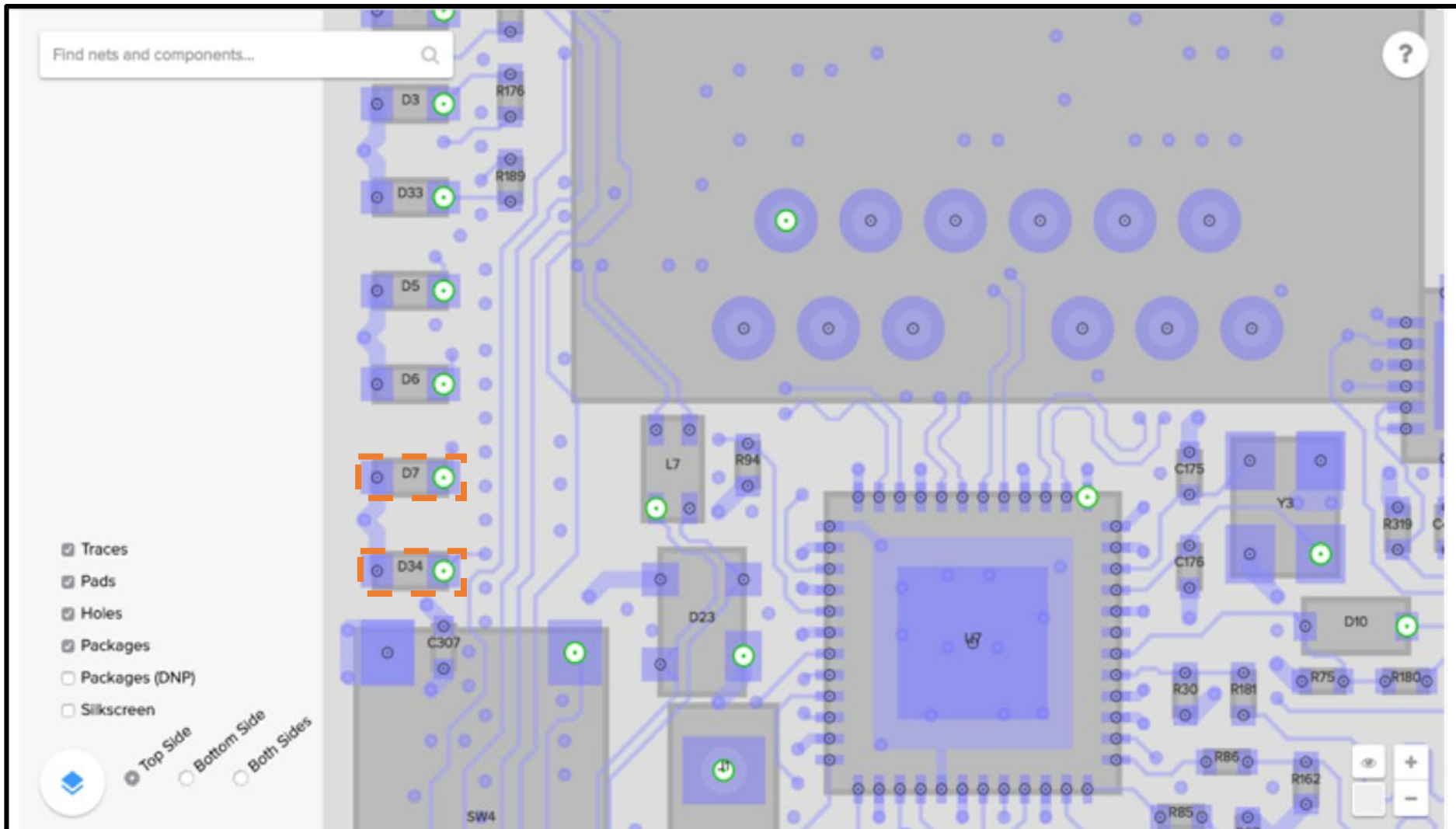
Best Practice 2: Design Intent Synchronization



Design Intent Synchronization Best Practices

CAD	<ul style="list-style-type: none">• Gerbers are incomplete, use native CAD or IPC-2581
BOM	<ul style="list-style-type: none">• Use CM supplied template• Simulate procurement• Check for CAD – BOM mismatch
Stackup	<ul style="list-style-type: none">• Iterate implementation with manufacturer
Notes	<ul style="list-style-type: none">• Confirm receipt and understanding

CAD Validation with Tempo



BOM Validation with Tempo

TEMPO
3246 – Prototype Project 1
Trevor ▾

Steps

- ✓ CAD ACCEPTED
estop_V2 (1).PcbDoc
REUPLOAD CAD
- ✓ PROJECT BASICS
- ⚠ 9 BOM SOURCING ERRORS
Bill of Materials-estop (1).xls.xlsx
REUPLOAD BOM EDIT
- BOARD VISUALIZER
- BOARD PREFERENCES
- GET A QUOTE
- ⚡ Chat with Support
Having trouble?
Feel free to chat with support for immediate help.

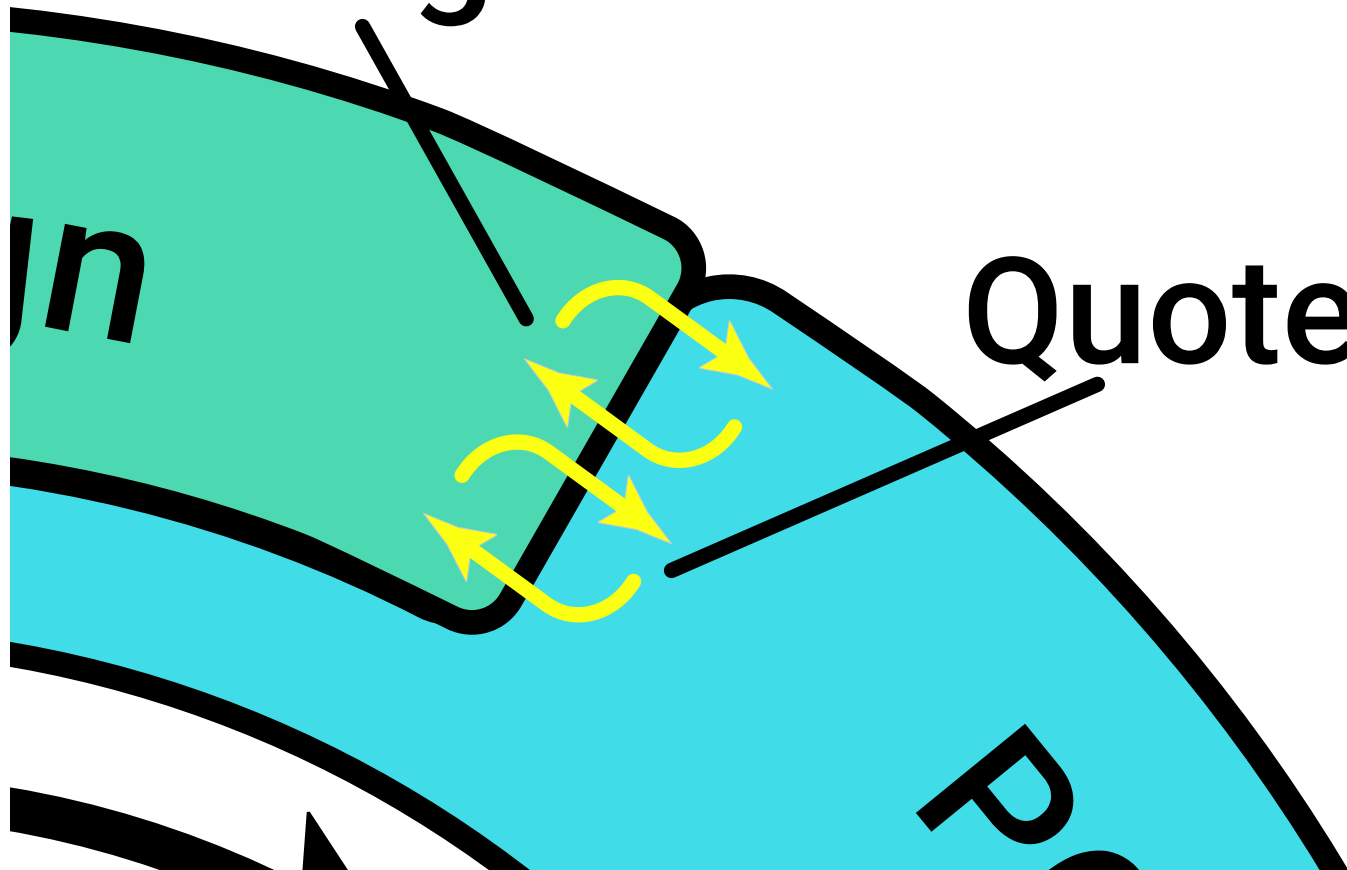
VERIFY YOUR BOM

We found 21 parts in your BOM. There are 9 BOM Lines that need to be corrected.

↓ Export BOM (.csv)
+ New BOM Line
ACCEPT BOM AND PROCEED

#	DESIGNATOR	DESCRIPTION	MANUF.	MPN	QTY	SOURCING	EDIT	
0	<input type="text" value="C1"/>	<input type="text" value="1u"/>	TDK	<input style="border: 1px solid red;" type="text" value="CGA3E1X7R1E105K080AC"/>	<input type="text" value="1"/>	<div style="display: flex; align-items: center;"> <div style="border: 1px solid #ccc; padding: 2px;">Sourced by Tempo</div> <div style="margin-left: 5px;">▾</div> </div> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 5px; width: 100%;"> <ul style="list-style-type: none"> Sourced by Tempo <li style="background-color: #e2e8f0;">I will provide Do not assemble Use other distributors </div>	UPDATE	
<small style="color: red;">ERROR: MPN is out of stock at Digikey and Mouser. Edit the MPN above, replace it with another MPN, or use the Sourcing dropdown menu above to fix.</small>								
				DELETE	Select to consign this part.			
6	<input type="text" value="D1, D3"/>	<input type="text"/>		<input style="border: 1px solid red;" type="text" value="ES2D"/>	<input type="text" value="2"/>	<div style="display: flex; align-items: center;"> <div style="border: 1px solid #ccc; padding: 2px;">Sourced by Tempo</div> <div style="margin-left: 5px;">▾</div> </div>	UPDATE	
<small style="color: red;">ERROR: Could not find this exact MPN at Digikey or Mouser. Edit the MPN above, replace it with another MPN, or use the Sourcing dropdown menu above to fix.</small>								
				Q PART SEARCH RESULTS (12 FOUND)	DELETE			
7	<input type="text" value="D2, D4"/>	<input type="text"/>		<input style="border: 1px solid red;" type="text" value="P6SMB10AT3G"/>	<input type="text" value="2"/>	<div style="display: flex; align-items: center;"> <div style="border: 1px solid #ccc; padding: 2px;">Sourced by Tempo</div> <div style="margin-left: 5px;">▾</div> </div>	UPDATE	
<small style="color: red;">ERROR: Could not find this exact MPN at Digikey or Mouser. Edit the MPN above, replace it with another MPN, or use the Sourcing dropdown menu above to fix.</small>								
				Q PART SEARCH RESULTS (1 FOUND)	DELETE			

Design Data



**Best Practice 3:
Quote Optimization**

Price Optimization Best Practices

Components	<ul style="list-style-type: none">• Use Approved Parts List (AVL) to allow crosses• Request component level price breakdown
Fab	<ul style="list-style-type: none">• Ask pricing implications for board parameters• Maximize boards per panel
Assembly	<ul style="list-style-type: none">• TH placements 5x > SMT• Leadless 8x > SMT

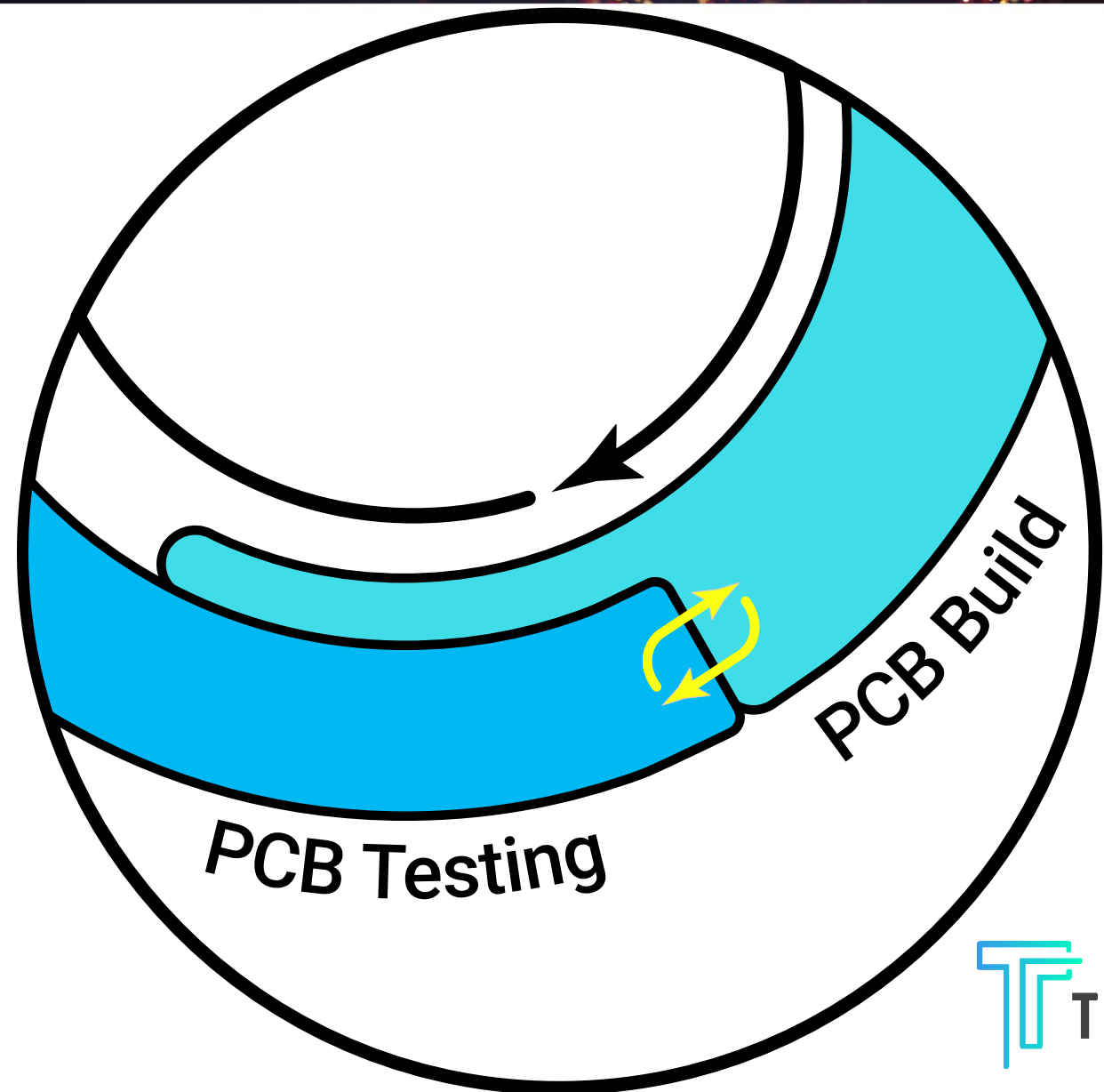
Lead Time Optimization Best Practices

Components	<ul style="list-style-type: none">• Use Approved Parts List (AVL)• Secure low stock component early
Fab	<ul style="list-style-type: none">• Minimize materials that not stocked• Choose via type to minimize lamination cycles
Assembly	<ul style="list-style-type: none">• Minimize number of through hole parts• Minimize special operations (press fit etc.)

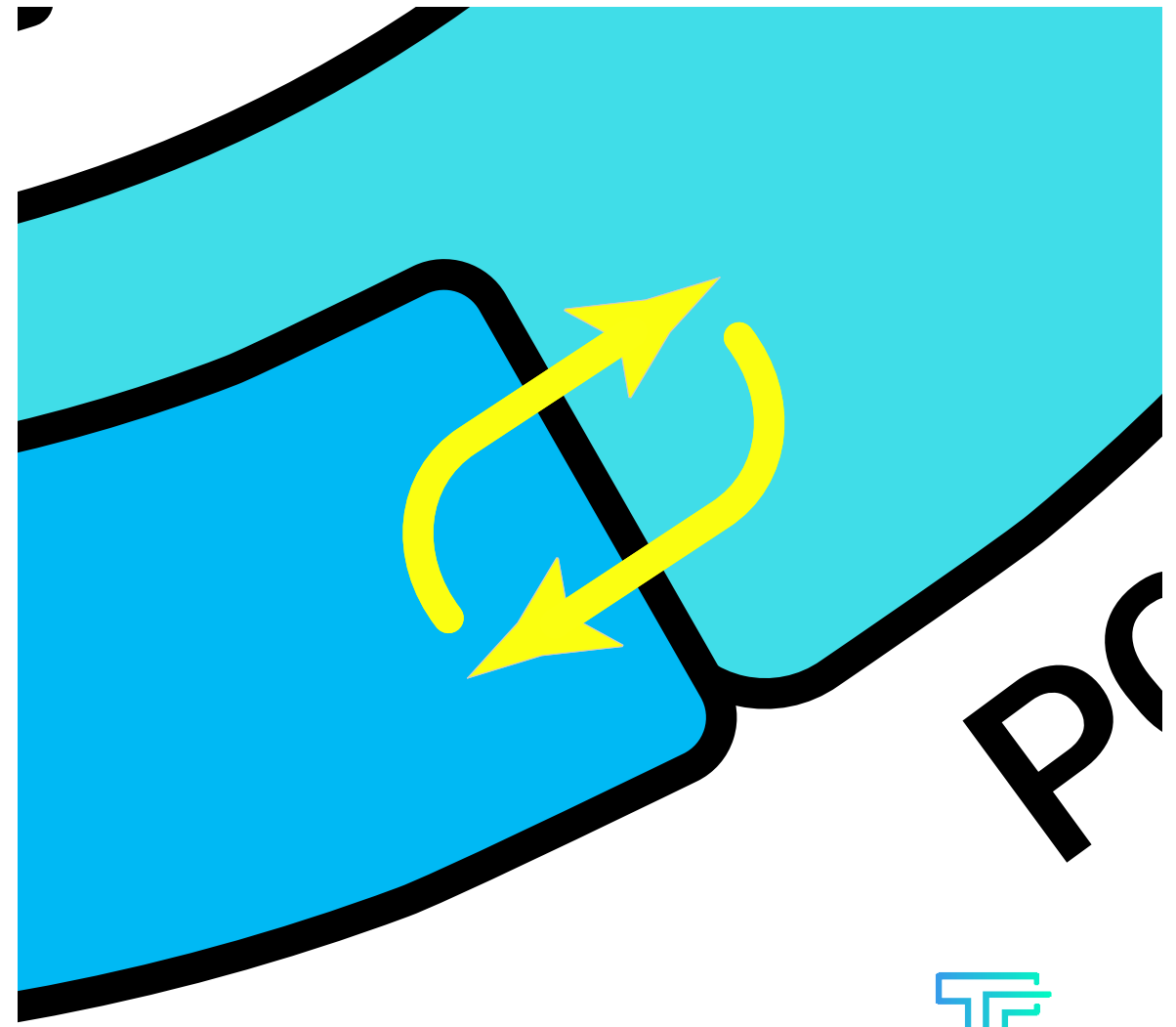
Quote Optimization with Tempo

20 boards in 3 business days			Estimated delivery ⓘ Tuesday, Mar. 13 2018
Fabrication	1 day	\$863.46	✓ Order 20 boards now ⓘ View DFM feedback hide details
Fabrication Base Cost			
• 3.94in x 2.36in			
• 2 Layers			
• Quantity: 20	1 day	\$737.46	
Surface Finish: HASL Lead-free	—	\$27.00	
Solder Mask Color: Red	—	\$99.00	
Assembly	1 day	\$1,923.67	
Assembly Base Cost			
• Placement Count: 32			
• Placement Sides: single sided	1 day	\$1,743.67	
Through Hole Placement Count: 2	—	\$180.00	
Components ⓘ	—	\$814.84	
21 BOM Lines:			
• Tempo Sourced Parts: 19			
• Third Party Sourced Parts: 0			
• Consigned Parts: 2			
• Do Not Assemble Parts: 0 (no charge)			
Shipping & Packaging ⓘ	same day	\$99.70	
Buffer ⓘ	1 day	—	
Total	3 days	\$3,701.67	
Price / unit		20 x \$185.08	
Sales Tax ⓘ		\$333.15	
Total (incl. tax)		\$4,034.82	

Transparency during transfer from PCB Build



Best Practice 4: Learn from each Build



Knowledge Transfer Best Practices

Files

- As built production files
- Design recommendations

Programs

- Reflow profile
- Machine programs

Diagnostics

- Production log
- QA records

Knowledge Transfer with Tempo

Traveler Traceability

Side 1 (top) SMT (3/9)

- Paste first article (side 1, top)
bianca completed Mon 3:15 pm, 01/08/18
- QA - Paste first article (side 1, top)
somalen completed Mon 4:33 pm, 01/08/18
- PnP first article (side 1, top)
peter completed Mon 9:09 pm, 01/08/18
- QA - PnP first article (side 1, top)
garvin62
- Reflow first article (side 1, top)
- QA - Reflow first article (side 1, top)
- Paste and inspect all boards (side 1, top)
- PnP all boards (side 1, top)
jessica
- Inspection of all boards pre-reflow (side 1, top)

AOI ↑

Through-hole ↑

Final QA ↑

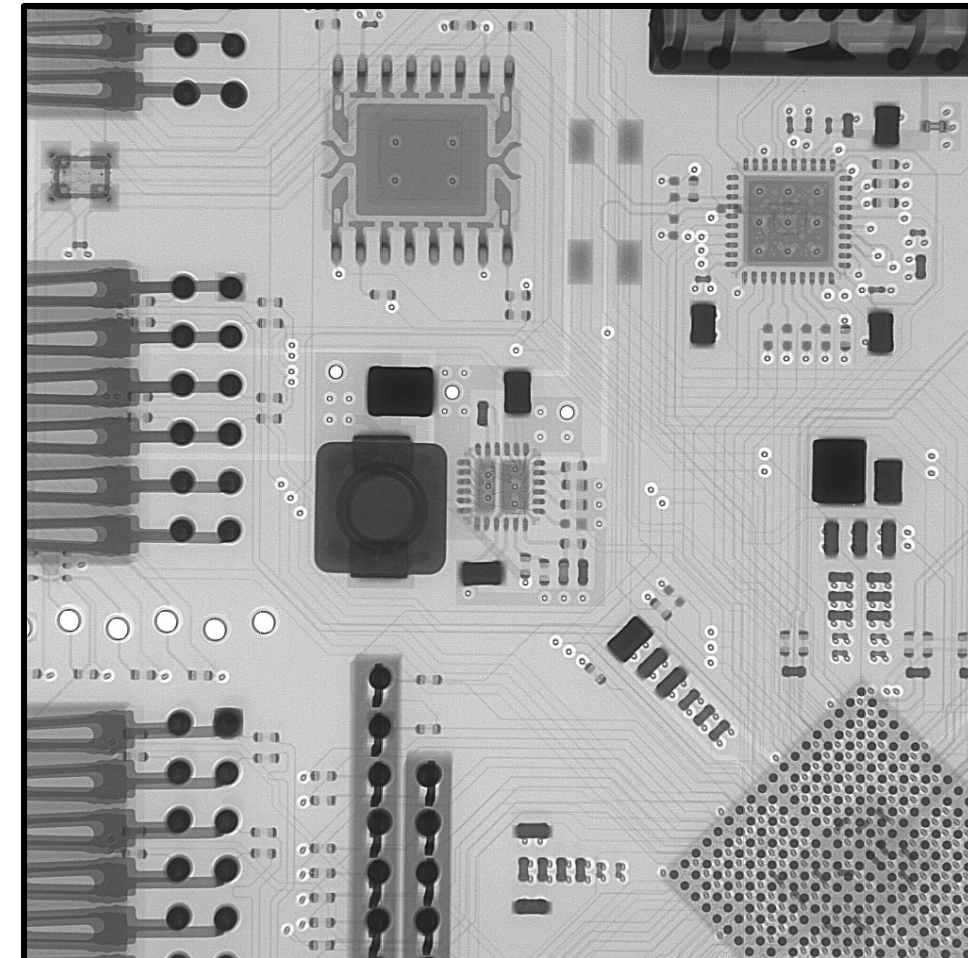
Shipment ↑

Production Log

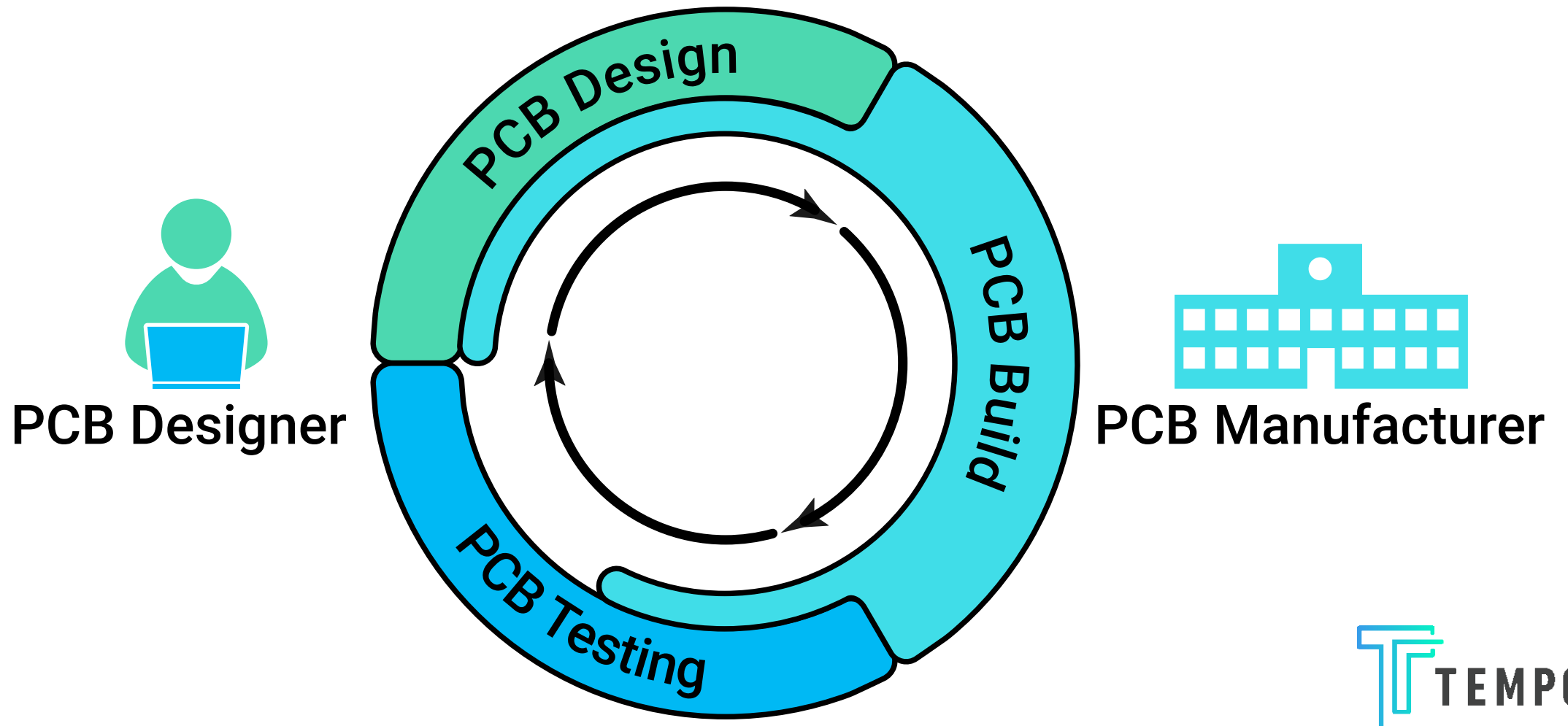
QA defects

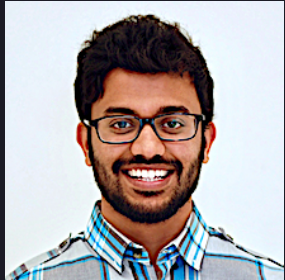
- Component - Orientation/polarity** ✖
QA - PnP first article (side 1)
3602-001
J302
- Component - Orientation/polarity** ✖
QA - PnP first article (side 1)
3602-001
U8
- Component - Orientation/polarity** ✖
QA - PnP first article (side 1)
3602-001
U53
- Component - Orientation/polarity** ✖
QA - PnP first article (side 1)
3602-001
U56
- Component - Orientation/polarity** ✖
QA - PnP first article (side 1)
3602-001
R247
- Component - Orientation/polarity** ✖
QA - PnP first article (side 1)
3602-001
D12, D13, D14

AOI and X-Ray Image



Agile PCBA Manufacturing

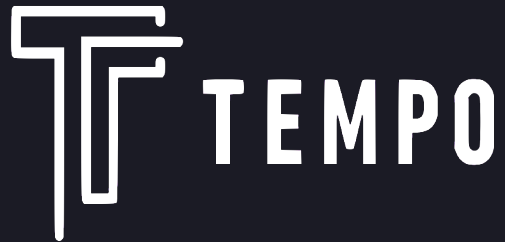




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VP of Product, Cofounder

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THANK
YOU!