

MakerCAM Workflow

This presentation covers setting up your project, importing your design files, and creating the three necessary toolpaths (traces, drills, and outline) to mill a PCB on the Carvera.

MakerCAM Workflow

This presentation covers setting up your project, importing your design files, and creating the three necessary toolpaths (traces, drills, and outline) to mill a PCB on the Carvera.

MakerCAM Workflow

Phase 1: Project & Stock Setup

- Open Makera CAM and select **New Project**.
- On the "Welcome to MakeraCAM" screen, choose a **3 AXIS** project.



▼ Stock

Material: PCB
Length(X): 150
Width(Y): 100
Height(Z): 1.5

+ WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]D Pocket
 - [T3]2D Drilling
 - [T3]2D Contour

Welcome to MakeraCAM



[New Project](#)

[Open Project](#)

[Recent Projects](#)

3 AXIS

4 AXIS

Phase 1: Setting the Stock

- In the **Stock Setup** panel on the left, click "**Edit**".
- Enter the dimensions of your PCB stock:
 - **Material:** PCB
 - **Length (X):** 127 mm
 - **Width (Y):** 101 mm
 - **Height (Z):** 1.7 mm
- Click **OK** to save.

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.00 mm

Width(Y): 100.00 mm

Height(Z): 1.50 mm

Edit

WCS1

- 3D Models
- 2D Layers
- Layer1
- Path

Top

Phase 1

Mouse X: 35.772 Y: 43.632 Z: 0.000

1 inch of rain Tuesday

Search

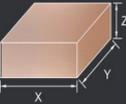
4:59 PM 10/26/2025

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)



Stock



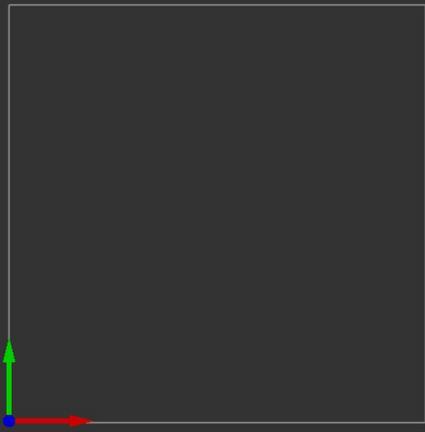
Material	PCB
Length(X)	127 mm
Width(Y)	101 mm
Height(Z)	1.7 mm

Ok Cancel



WCS1

- WCS1
 - 3D Models
 - 2D Layers
 - Layer1
 - Path



Top

Phase 1

Mouse X: 0.000 Y: 0.000 Z: 0.000

Phase 3: Import Your Design

- Go to the top menu: **File --> Import --> Import PCB (KiCad Gerber & Drill).**
- Import your three files one by one:
 - **Edge_Cuts** file (outline)
 - **F.Cu** file (traces)
 - **PTH.drl** file (holes)

MakersCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

- New Ctrl+N
- Open... Ctrl+O
- Open Recent...
- Save Ctrl+S
- Save As... Ctrl+Shift+S
- Import Image...
- Import 2D Model...
- Import 3D Model...
- Import PCB...**
- Exit

X Height(Z) 1.54 mm Edit

WCS1

- WCS1
 - 3D Models
 - 2D Layers
 - Layer1
 - Path

Top

Phase 2

Phase 2

1 inch of rain Tuesday

Search

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Open File

Documents > CNC > 1stProject

Search 1stProject

Organize New folder

Gallery

Desktop
Downloads
Documents
Pictures
Music
Videos
1stProject
Tom Makecara

Name

- Resistance1-Edge_Cuts.gbr
- Resistance1-F_Cu.gbr
- Resistance1-PTH.drl

No preview available.

File name: Resistance1-Edge_Cuts.gbr

Pcb Gerber(*.art;*.drl;*.PCB;*.W)

Open Cancel

Top

Phase 2

Phase 2

1 inch of rain
Tuesday

Search

5:01 PM
10/26/2025

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.00 mm

Width(Y): 100.00 mm

Height(Z): 1.50 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance)-Edge_Cuts.gbr
- Path

Top

Phase 2

Phase 2

Mouse X: 35.772 Y: 43.632 Z: 0.000

1 inch of rain Tuesday

Search

5:01 PM 10/26/2025

MakeraCAM-[Untitled]
File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.00 mm

Width(Y): 100.00 mm

Height(Z): 1.50 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance - Edge_Cuts.gbr
- Path

Top

Phase 2

Phase 2

Mouse X: 35.772 Y: 43.632 Z: 0.000

1 inch of rain Tuesday

Search

5:01 PM 10/26/2025

MakersCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

New Ctrl+N
Open... Ctrl+O
Open Recent...
Save Ctrl+S
Save As... Ctrl+Shift+S
Import Image...
Import 2D Model...
Import 3D Model...
Import PCB...
Exit

X 150.00 mm
Y 100.00 mm
Height(Z) 1.50 mm

Edit

WCS1
3D Models
2D Layers
Layer1
Resistance-Edge_Cuts.gbr
Path

Top

Phase 2

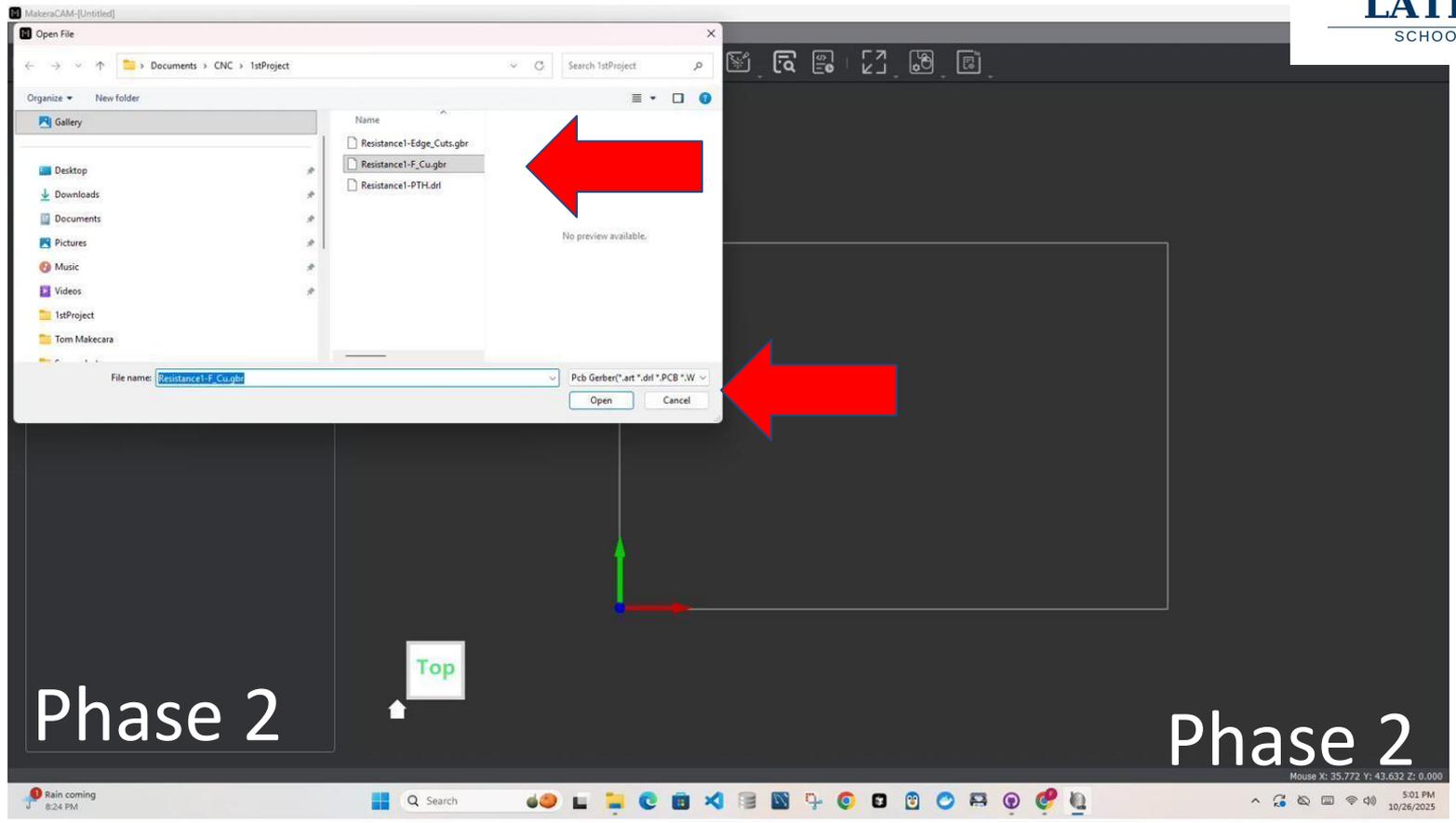
Phase 2

Mouse X: 35.772 Y: 43.632 Z: 0.000

Rain coming 8:24 PM

Search

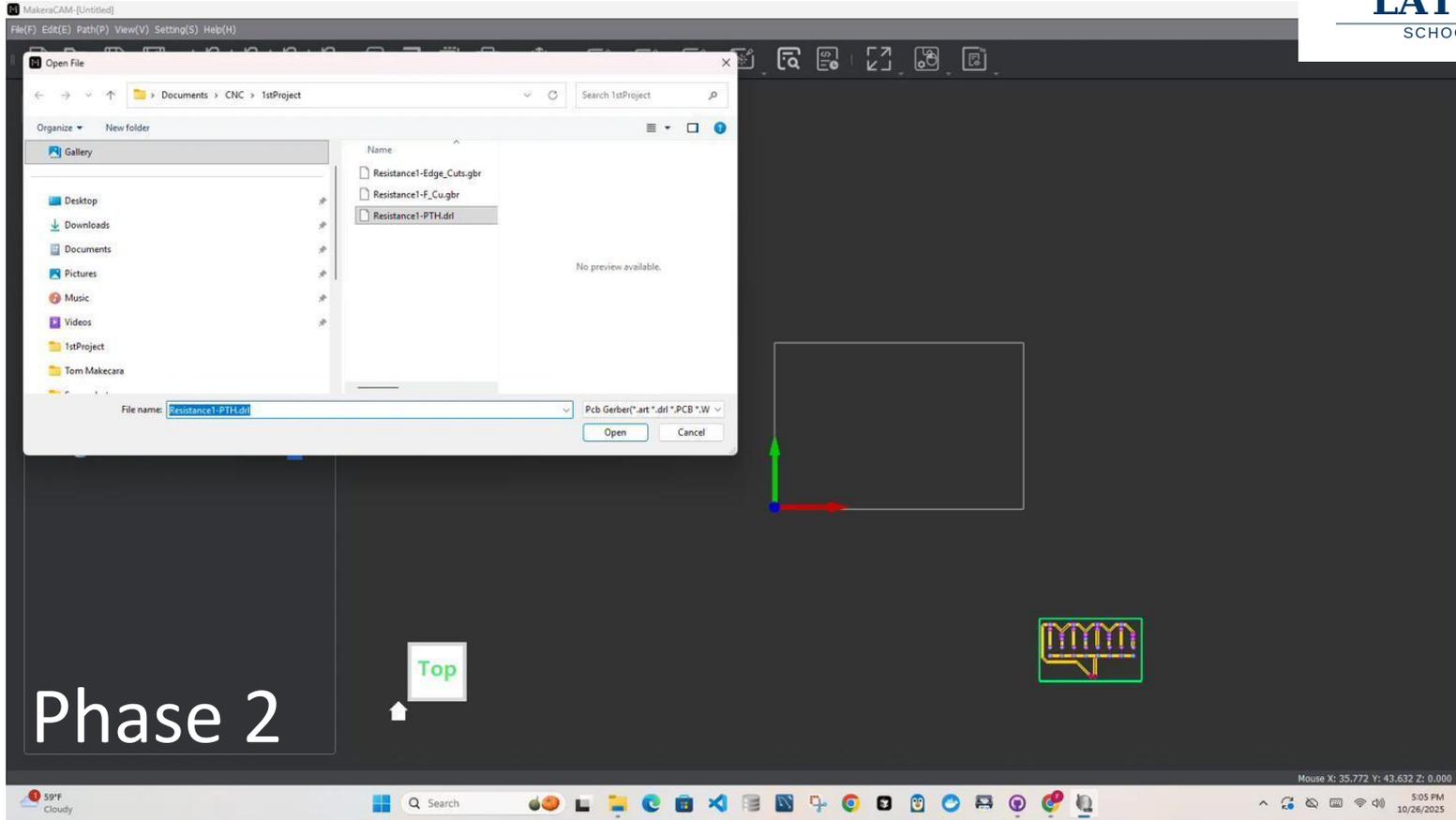
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Phase 2

Phase 2

Top



Phase 2

Top

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material: PCB

Length(X): 150.00 mm

Width(Y): 100.00 mm

Height(Z): 1.50 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.oem
 - Resistance1-F_Cu.gbr.psd
- Path

Position X: 161.040 Y: -101.634 Z: 0.000 Size Length:56.368 Width:33.038 Height:0.000 Mouse X: 35.772 Y: 43.632 Z: 0.000

5:03 PM 10/26/2025

Phase 2

Phase 2

MakersCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

- New Ctrl+N
- Open... Ctrl+O
- Open Recent...
- Save Ctrl+S
- Save As... Ctrl+Shift+S
- Import Image...
- Import 2D Model...
- Import 3D Model...
- Import PCB...**
- Exit

PCB

X 150.00 mm

Y 10.00 mm

Height(Z) 1.50 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_psd
- Path

Top

Phase 2

Phase 2

Mouse X: 35.772 Y: 43.632 Z: 0.000

Sports headline Arch Manning L...

Search

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MakersCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Open File

Documents > CNC > 1stProject

Search 1stProject

Organize New folder

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Documents

Pictures

Music

Videos

1stProject

Tom Makecara

Name

- Resistance1-Edge_Cuts.gbr
- Resistance1-F_Cu.gbr
- Resistance1-PTH.drl

No preview available

File name: Resistance1-PTH.drl

Pcb Gerber(*.art *.drl *.PCB *.W

Open Cancel

Phase 2

Top

Phase 2

59°F Cloudy

Search

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MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path

Top

Phase 2

Phase 2

Mouse X: 35.772 Y: 43.632 Z: 0.000

59°F Cloudy

Search

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Phase 3: Position Your Design

- Your design may be off-screen. Zoom out to find it.
- Drag your mouse to select the entire design (it will become dotted).
- Press the **M key** (or **Transform** → **Move**).
- In the "Move" panel:
 - Change the **Anchor** to the **lower-left corner**.
 - Set **Location X: 6.000**
 - Set **Location Y: 6.000**
- Click **Close**.

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path

Top

Phase 2

Phase 2

Mouse X: 35.772 Y: 43.632 Z: 0.000

59°F Cloudy

Search

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MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path

Transform

- Move M
- Rotate R
- Scale S
- Mirror
- Array

Top

Phase 2

Phase 2

59°F Cloudy

Search

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Mouse X: 35.772 Y: 43.632 Z: 0.000

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1PTH.drl_0.900 mm
 - Resistance1PTH.drl_1.400 mm
 - Path

Transform

- Move M
- Rotate R
- Scale S
- Mirror
- Array

Top

Position X: 159.487 Y: -103.657 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 194.766 Y: -101.020 Z: 0.000

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Phase 2

Phase 2

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path

Top

Anchor

Move

Quick Align Stock

Location

X	40.000	mm
Y	25.000	mm
Z	0.000	mm

Center to Center

Rotate

Scale

Mirror

Array

Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 65.056 Y: 32.383 Z: 0.000

Sports headline Arch Manning L...

Search

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Phase 2

Phase 2



MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path

Top

Anchor

▼ Move

Quick Align Stock

Location

- X: 40.000 mm
- Y: 25.000 mm
- Z: 0.000 mm

Center to Center

> Rotate

> Scale

> Mirror

> Array

Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 30.428 Y: 32.537 Z: 0.000

Sports headline Arch Manning L...

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Phase 2

Phase 2



MakerCAM Workflow

Phase 3: Traces and Toolpaths - Important Tip

A trace is selected when you see a dotted line !

MakersCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material: PCB

Length(X): 150.000 mm

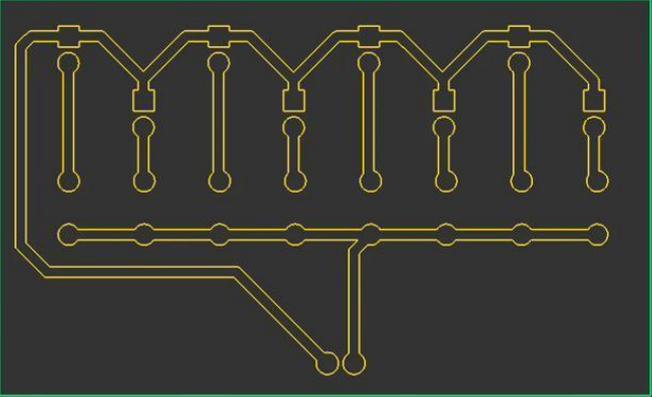
Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path



Top

Phase 2

Not selected

Phase 3

Mouse X: 23.604 Y: 43.670 Z: 0.000

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MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.dr1_0.900 mm
 - Resistance1-PTH.dr1_1.400 mm
 - Path

Selected

Phase 3

Top

Phase 3

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length: 62.026 Width: 37.642 Height: 0.000 Mouse X: 35.584 Y: 21.860 Z: 0.000

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Phase 3: Toolpath 1 (Traces) - Boundary

- This path clears the copper for your traces.
- **Critical Step:** Set the Boundary.
 - Make only the **F.Cu** and **Edge_Cuts** layers visible.
 - Hold **Shift** and click both layers to select them.
 - **Hold Shift** and click the **OUTERMOST line** of the outline to **deselect it** (it will turn solid).
 - Only the traces and the *inner* outline should remain selected (dotted).

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path

Top

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 30.823 Y: 40.906 Z: 0.000

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Phase 3

Phase 3

MakerCAM Workflow

Phase 3: Toolpath 1 (Traces) - Settings

- Select the **2D Pocket** tool from the top toolbar.
- **Cutting Depth:**
 - **Start Depth:** 0.000 mm
 - **End Depth:** 0.05 mm
- **Add Tools:**
 - **Tool 1:** Click **Add Tool** --> **0.8mm Corn** --> "Choose".
 - **Tool 2:** Click **Add Tool** --> **0.2mm 30 degree Engraving (Metal)** --> "Choose".
 - (Ensure 0.8mm bit is listed first)
- **Strategy:**
 - Set **Path Strategy** to **Parallel**.
- Click **Calculate**.

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path

2D Pocket

2D Contour

2D Drilling

2D Chamfer

2D Thread

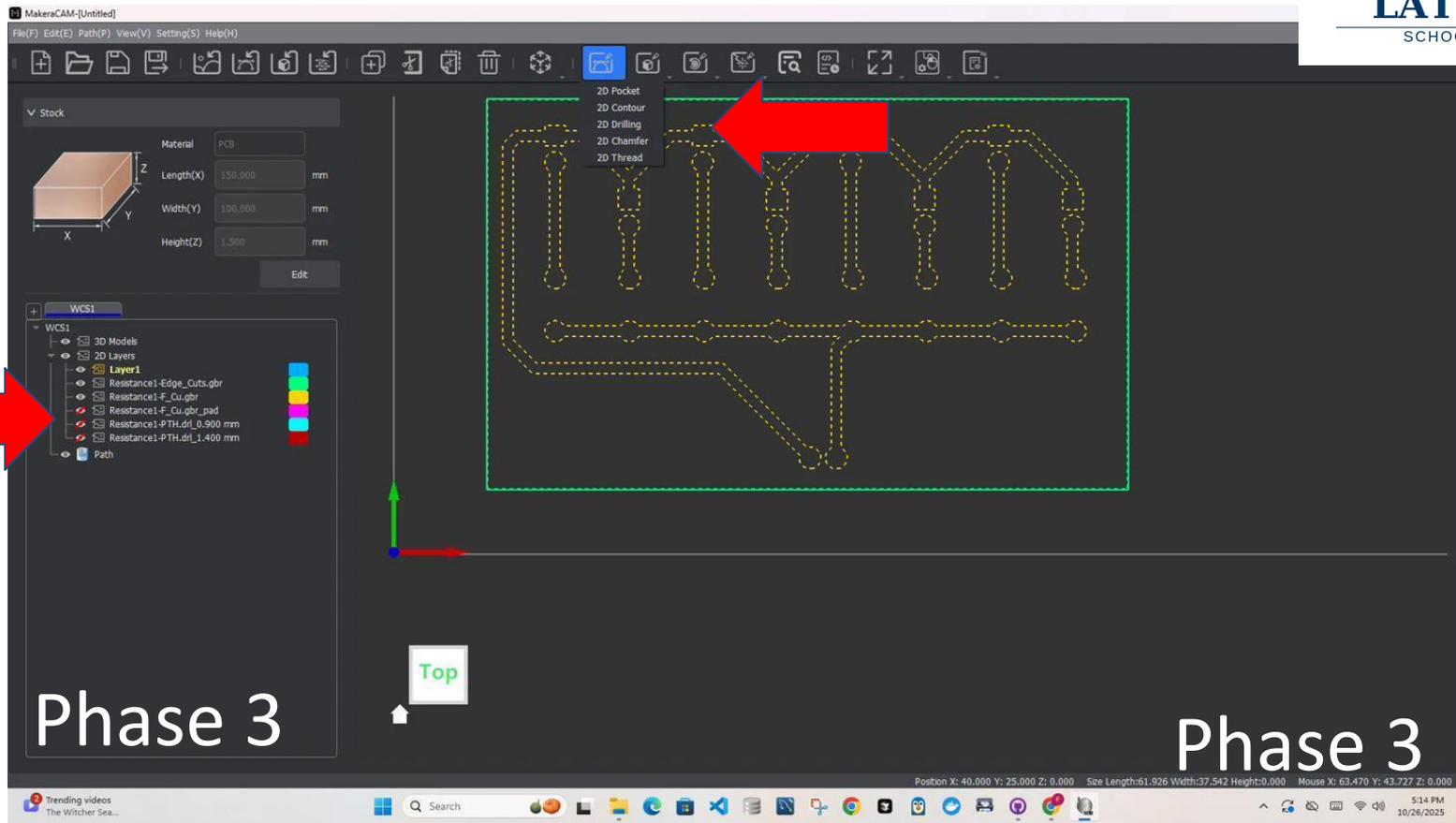
Top

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 63.470 Y: 43.727 Z: 0.000

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The Witcher Sea...

Search

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Phase 3

Phase 3

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path

2D Pocket

Path Name: 2D Pocket

Spindle Speed: 1000 rpm

Tool Number: 0

Strategy

Path Strategy

Offset Parallel

Direction: Inside Out / Front To Back

Angle: []

Offset: 0 mm

Cutting Direction

Conventional Climb

Cutting Order: Auto

Ramping Strategy

Ramping

Top

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 63.470 Y: 43.727 Z: 0.000

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Phase 3

Phase 3

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path

2D Pocket

Path Name: 2D Pocket

Cutting Depth

Start Depth: 0 mm

End Depth: 5 mm

Safe Position

Clearance Height: 15 mm

Retract Height: 15 mm

Tools

Calculate Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 63.470 Y: 43.727 Z: 0.000

59°F Cloudy

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Phase 3

Top

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path

2D Pocket

Path Name: 2D Pocket

Cutting Depth

Start Depth: 0 mm

End Depth: .05 mm

Safe Position

Clearance Height: 15 mm

Retract Height: 15 mm

Tool List

Calculate Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 63.470 Y: 43.727 Z: 0.000

59°F Cloudy

Search

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Phase 3

Top

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)



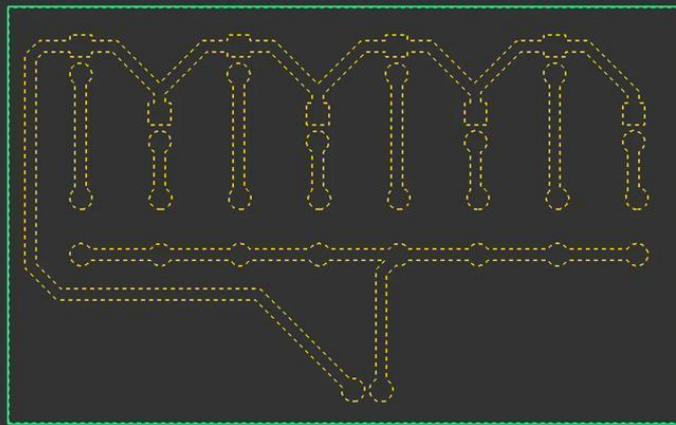
▼ Stock

Material PCB
Length(X) 150.000 mm
Width(Y) 100.000 mm
Height(Z) 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path



2D Pocket

Path Name 2D Pocket

Enable Start Position

Start Position X 0 mm
Y 0 mm

▼ Tools

Tool List

Add Tool Delete

0.2mm*30° Engraving(Metal) Help

Diameter 1 mm
Step Over 1 mm
Step Down 1 mm
Feed Rate 1 mm/min
Plunge Rate 1 mm/min
Spindle Speed 1000 rpm
Tool Number 0

Calculate Close

Phase 3

Top

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 63.470 Y: 43.727 Z: 0.000

MakersCAM - [Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000

Width(Y): 100.000

Height(Z): 1.500

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts_gbr
 - Resistance1-F_Cu_gbr
 - Resistance1-F_Cu_gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path

Tool Magazine

Tool Group

Name	Number	Type	Diameter(D)	Angle(A)	Tip Diameter(F)	Half
3.175*25mm Flat End	1	Flat End	3.175	0	3.175	0
0.2mm*30° Engraving	5	Engraving	3.175	0	0.2	15
0.8mm Com	3			0	0.8	0
3.175*12mm Flat End	2	Flat End	3.175	0	3.175	0
0.3mm*30° Solder Mask Removal	4	Engraving	3.175	0	0.3	15
0.1mm*90° Chamfering	6	Engraving	3.175	0	0.1	45
1*3mm Flat End(Metal)	4	Flat End	1	0	1	0
1.5*6mm Flat End(Metal)	4	Flat End	1.5	0	1.5	0
2*8mm Flat End(Metal)	4	Flat End	2	0	2	0

Tool Properties

Material	Spindle Speed	Step Over	Step Down	Feed Rate

Tool Information

Name

Number

Type

Diameter(D)

Angle

Choose

Pocket

2D Pocket

Start Position

X: 0 mm

Y: 0 mm

Add Tool

Delete

30° Engraving(Metal)

Help

Diameter: 1 mm

Step Over: 1 mm

Step Down: 1 mm

Feed Rate: 1 mm/min

Plunge Rate: 1 mm/min

1000 rpm

Calculate

Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 63.470 Y: 43.727 Z: 0.000

59° Cloudy

Search

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Phase 3

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material PCB

Length(X) 150.000

Width(Y) 100.000

Height(Z) 1.500

WCS1

- 3D Models
- 2D Layers
- Layer1
 - Resistance1-Edge_Cuts_gbr
 - Resistance1-F_Cu_gbr
 - Resistance1-F_Cu_gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path

Tool Magazine

Tool Group

- All
- Example Tools
- Flat End
 - 3.175*25mm Flat End
 - Single Flute Metal
 - Single Flute Non Metal
 - Corn Bits
- Engraving
 - Single Flute Metal
 - Single Flute Non Metal
 - Chamfering Bits
 - Solder Mask Remover
- Ball Nose
 - Ball Nose Metal
 - Ball Nose Non Metal
- Drill
- Thread

Name	Number	Type	Diameter(D)	Angle(A)	Tip Diameter(F)	Half
3.175*25mm Flat End	1	Flat End	3.175	0	3.175	0
0.2mm*30° Engraving(Metal)	2	Engraving	3.175	0	0.2	15
0.8mm Corn	3	Flat End	0.8	0	0.8	0
3.175*12mm Flat End(Metal)	4	Flat End	3.175	0	3.175	0
0.3mm*30° Solder Mask Removal	5	Engraving	3.175	0	0.3	15
0.1mm*90° Chamfering	6	Engraving	3.175	0	0.1	45
1*3mm Flat End(Metal)	4	Flat End	1	0	1	0
1.5*6mm Flat End(Metal)	4	Flat End	1.5	0	1.5	0
2*8mm Flat End(Metal)	4	Flat End	2	0	2	0

Tool Properties

Material	Spindle Speed	Step Over	Step Down	Feed Rate
1 PCB	12000	60	0.3	500
2 Carbon Fiber	12000	60	0.3	500

Tool Information

0.8mm Corn

Name 0.8mm Corn

Number 3

Type Flat End

Diameter(D) 0.8

Angle 0

Choose Close

Pocket

2D Pocket

Start Position

X 0 mm

Y 0 mm

Add Tool Delete

30° Engraving(Metal) Help

Diameter 1 mm

Step Over 1 mm

Step Down 1 mm

Feed Rate 1 mm/min

Plunge Rate 1 mm/min

Spindle Speed 1000 rpm

Tool Number 0

Calculate Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 63.470 Y: 43.727 Z: 0.000

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Phase 3

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path

Top

2D Pocket

Path Name: 2D Pocket

Enable Start Position

Start Position: X: 0 mm, Y: 0 mm

Tools

Tool List

- 0.8mm Corn

Add Tool Delete

0.8mm Corn Help

Diameter: 0.800 mm

Step Over: 0.480 mm

Step Down: 0.300 mm

Feed Rate: 500 mm/min

Plunge Rate: 300 mm/min

Spindle Speed: 12000 rpm

Tool Number: 3

Calculate Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 63.470 Y: 43.727 Z: 0.000

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Search

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Phase 3



MakersCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB
Length(X): 150.000
Width(Y): 100.000
Height(Z): 1.500

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts_gbr
 - Resistance1-F_Cu_gbr
 - Resistance1-F_Cu_gbr_pad
 - Resistance1-PTH_drl_0.900 mm
 - Resistance1-PTH_drl_1.400 mm
 - Path

Tool Magazine

Tool Group

- All
 - Example Tools
 - Flat End
 - 3.175*25mm Flat End
 - 0.2mm*30° Engraving(Metal)
 - Engraving
 - Single Flute Metal
 - Single Flute Non Metal
 - Corn Bits
 - 0.8mm Corn
 - 3.175*12mm Flat End(Metal)
 - 0.3mm*30° Solder Mask Removal
 - 0.1mm*90° Chamfering
 - Ball Nose
 - Ball Nose Metal
 - Ball Nose Non Metal
 - Drill
 - Thread

Tool Information

0.2mm*30° Engraving(Metal)

Name: 0.2mm*30° Engraving(Metal)
Number: 2
Type: Engraving
Diameter(D): 3.175
Angle: 0

2D Pocket

Start Position X: 0 mm
Start Position Y: 0 mm

0.8mm Corn

Add Tool Delete Help

Diameter: 0.800 mm
Step Over: 0.480 mm
Step Down: 0.300 mm
Feed Rate: 500 mm/min
Plunge Rate: 300 mm/min
Spindle Speed: 12000 rpm
Flute: 3

Calculate Close

Choose

Tool Properties

Material	Spindle Speed	Step Over	Step Down	Feed Rate
1 Copper	12000	50	0.1	300
2 Aluminum	12000	50	0.2	500
3 Plastic	12000	50	1	1000
4 PCB	12000	50	0.1	500
5 Softwood	12000	50	2	1000
6 Hardwood	12000	50	1	1000
7 Brass	12000	50	0.1	300

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 63.470 Y: 43.727 Z: 0.000

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Phase 3

MakersCAM - [Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material: PCB
Length(X): 150.000
Width(Y): 100.000
Height(Z): 1.500

WCS1

- 3D Models
- 2D Layers
- Layer1
 - Resistance1-Edge_Cuts_gbr
 - Resistance1-F_Cu_gbr
 - Resistance1-F_Cu_gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path

Tool Magazine

Tool Group

- All
- Example Tools
 - Flat End
 - 3.175*25mm Flat End
 - 0.2mm*30° Engraving(Metal)
 - Engraving
 - Single Flute Metal
 - Single Flute Non Metal
 - Corn Bits
 - 0.8mm Corn
 - 3.175*12mm Flat End(Metal)
 - 0.3mm*30° Solder Mask Removal
 - 0.1mm*90° Chamfering
 - Ball Nose
 - Ball Nose Metal
 - Ball Nose Non Metal
 - Drill
 - Thread

Name	Number	Type	Diameter(D)	Angle(A)	Tip Diameter(F)	Half Ar
3.175*25mm Flat End	1	Flat End	3.175	0	3.175	0
0.2mm*30° Engraving(Metal)	2	Engraving	3.175	0	0.2	15
0.8mm Corn	3	Flat End	0.8	0	0.8	0
3.175*12mm Flat End(Metal)	4	Flat End	3.175	0	3.175	0
0.3mm*30° Solder Mask Removal	5	Engraving	3.175	0	0.3	15
0.1mm*90° Chamfering	6	Engraving	3.175	0	0.1	45

Tool Properties

Material	Spindle Speed	Step Over	Step Down	Feed Rate
1 Copper	12000	50	0.1	300
2 Aluminum	12000	50	0.2	500
3 Plastic	12000	50	1	1000
4 PCB	12000	50	0.1	500
5 Softwood	12000	50	2	1000
6 Hardwood	12000	50	1	1000
7 Brass	12000	50	0.1	300

Tool Information

Name: 0.2mm*30° Engraving(Metal)
Number: 2
Type: Engraving
Diameter(D): 3.175
Angle: 0

Pocket

2D Pocket

Start Position
X: 0 mm
Y: 0 mm

0.8mm Corn
Add Tool
Delete
Help

Diameter: 0.800 mm
Step Over: 0.480 mm
Step Down: 0.300 mm
Feed Rate: 500 mm/min
Plunge Rate: 300 mm/min
Spindle Speed: 12000 rpm
Tool Number: 3

Calculate Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 63.470 Y: 43.727 Z: 0.000

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Phase 3

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)



▼ Stock

Material: PCB
Length(X): 150.000 mm
Width(Y): 100.000 mm
Height(Z): 1.500 mm

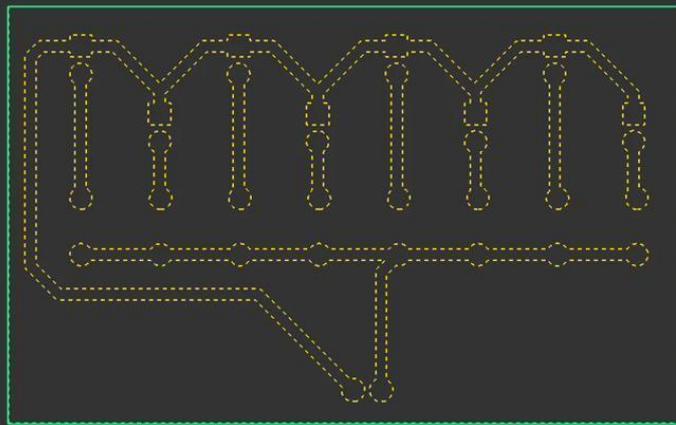
Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path

Top

Phase 3



2D Pocket

Path Name: 2D Pocket

Spindle Speed: 12000 rpm

Tool Number: 2

▼ Strategy

Path Strategy

Offset Parallel

Direction: Inside Out Front To Back

Angle: []

Offset: 0 mm

Cutting Direction

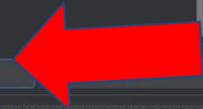
Conventional Climb

Cutting Order: Auto

▼ Ramping Strategy

Ramping

Calculate



MakerCAM Workflow

Phase 4: Toolpath 2 (Drill Holes)

- This path drills the component holes.
- **Visibility:** In the "WCS1" panel, hide everything except your **PTH.drl** (drill) layers.
- **Tool:** Select the **2D Drilling** tool from the top toolbar.
- **Selection:** Select all the visible drill holes.
- **Cutting Depth:**
 - **Drill Tip Start Depth:** 0.000 mm
 - **Drill Tip End Depth:** 1.7 mm (full board thickness)
- **Add Tool:**
 - Click **Choose Tool**.
 - Select the **0.8mm Corn** bit and click "Choose".
- Click **Calculate**.

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)



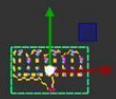
▼ Stock

Material: PCB
Length(X): 150.000 mm
Width(Y): 100.000 mm
Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1PTH.drl_0.900 mm
 - Resistance1PTH.drl_1.400 mm
 - Path



Anchor

▼ Move

Quick Align Stock

Location

X: 190.500 mm
Y: -84.836 mm
Z: 0.000 mm

Center to Center

> Rotate
> Scale
> Mirror
> Array

Close

Phase 4

Top

Position X: 190.500 Y: -84.836 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 194.766 Y: -101.020 Z: 0.000

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path
 - [T3,2]2D Pocket

2D Pocket

Path Name: 2D Pocket

Spindle Speed: 12000 rpm

Tool Number: 2

Strategy

Path Strategy

Offset Parallel

Direction: Inside Out Front To Back

Angle:

Offset: 0 mm

Cutting Direction

Conventional Climb

Cutting Order: Auto

Ramping Strategy

Ramping

Calculate Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 39.733 Y: 6.260 Z: 0.000

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Phase 4

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)



▼ Stock

Material PCB

Length(X) 150.000 mm

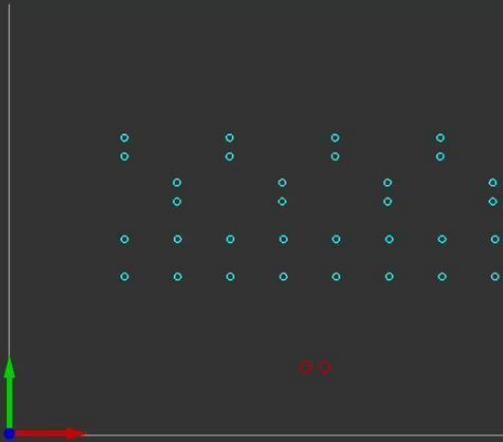
Width(Y) 100.000 mm

Height(Z) 1.500 mm

Edit

+ WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket



2D Drilling

Path Name 2D Drilling

Drill Tip Start Depth 0 mm

Drill Tip End Depth 0 mm

▼ Safe Position

Clearance Height 15 mm

Retract Height 15 mm

Enable Start Position

Start Position X 0 mm, Y 0 mm

▼ Tool

Choose Tool

rpm

Diameter 0 mm

Step Down 0 mm

Feed Rate 0 mm/min

Plunge Rate 0 mm/min

Spindle Speed 0 rpm

Calculate Close

Phase 4

Top

Mouse X: 39.733 Y: 6.260 Z: 0.000

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

2D Pocket
2D Contour
2D Drilling
2D Chamfer
2D Thread

Stock

Material PCB

Length(X) 150.000 mm

Width(Y) 100.000 mm

Height(Z) 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket

Top

Phase 4

Set depth to 1.7 m

Mouse X: 39,733 Y: 6,260 Z: 0,000

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MakersCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material PCB

Length(X) 150.000

Width(Y) 100.000

Height(Z) 1.500

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]D Pocket

Tool Magazine

Tool Group

- All
 - Example Tools
 - Flat End
 - 3.175*25mm Flat End 1 Flat End 3.175
 - Engraving
 - 0.2mm*30° Engraving(Metal) 4 Engraving 3.175
 - 0.8mm Corn 5 Engraving 3.175
 - 3.175*12mm Flat End(Metal) 3 Flat End 3.175
 - 0.3mm*30° Solder Mask Removal 5 Engraving 3.175
 - 0.1mm*90° Chamfering 6 Engraving 3.175
 - Ball Nose
 - Ball Nose Metal
 - Ball Nose Non Metal
 - Drill
 - Thread

Tool Information

Name	Number	Type	Diameter(D)	Angle(A)	Tip Diameter(F)	Half Ar
3.175*25mm Flat End	1	Flat End	3.175	0	3.175	0
0.2mm*30° Engraving(Metal)	4	Engraving	3.175	0	0.2	15
0.8mm Corn	5	Engraving	3.175	0	0.8	0
3.175*12mm Flat End(Metal)	3	Flat End	3.175	0	3.175	0
0.3mm*30° Solder Mask Removal	5	Engraving	3.175	0	0.3	15
0.1mm*90° Chamfering	6	Engraving	3.175	0	0.1	45

Tool Properties

Material	Spindle Speed	Step Over	Step Down	Feed Rate

Drilling

2D Drilling

Clearance Height 15 mm

Retract Height 15 mm

Start Position X 0 mm Y 0 mm

Choose Tool

Diameter 0 mm

Step Down 0 mm

Feed Rate 0 mm/min

Plunge Rate 0 mm/min

Spindle Speed 0 rpm

Tool Number 0

Retract

Calculate Close

Phase 4

Mouse X: 39.733 Y: 6.260 Z: 0.000

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MakersCAM - [Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material PCB

Length(X) 150.000

Width(Y) 100.000

Height(Z) 1.500

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts_gbr
 - Resistance1-F_Cu_gbr
 - Resistance1-F_Cu_gbr_pad
 - Resistance1-PTH_drl_0.900 mm
 - Resistance1-PTH_drl_1.400 mm
- Path
 - [T3,2]D Pocket

Tool Magazine

Tool Group

- All
 - Example Tools
 - Flat End
 - 3.175*25mm Flat End 1 Flat End 3.175 0 3.175 0
 - Single Flute Metal
 - Single Flute Non Metal
 - Corn Bits
 - 0.2mm*30° Engraving(Metal) 2 Engraving 3.175 0 0.2 15
 - 0.8mm Corn 3 Flat End 0.8 0 0.8 0
 - Engraving
 - 3.175*12mm Flat End(Metal) 4 Flat End 3.175 0 3.175 0
 - 0.3mm*30° Solder Mask Removal 5 Engraving 3.175 0 0.3 15
 - 0.1mm*90° Chamfering 6 Engraving 3.175 0 0.1 45
 - Ball Nose
 - Ball Nose Metal
 - Ball Nose Non Metal
 - Drill
 - Thread

Tool Information

Drilling

2D Drilling

Clearance Height 15 mm

Retract Height 15 mm

Start Position X 0 mm

Position Y 0 mm

Choose Tool

Diameter 0 mm

Step Down 0 mm

Feed Rate 0 mm/min

Plunge Rate 0 mm/min

Spindle Speed 0 rpm

Retract

Calculate Close

Mouse X: 39.733 Y: 6.260 Z: 0.000

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Phase 4

Name	Number	Type	Diameter(D)	Angle(A)	Tip Diameter(F)	Half Ar
3.175*25mm Flat End	1	Flat End	3.175	0	3.175	0
0.2mm*30° Engraving(Metal)	2	Engraving	3.175	0	0.2	15
0.8mm Corn	3	Flat End	0.8	0	0.8	0
3.175*12mm Flat End(Metal)	4	Flat End	3.175	0	3.175	0
0.3mm*30° Solder Mask Removal	5	Engraving	3.175	0	0.3	15
0.1mm*90° Chamfering	6	Engraving	3.175	0	0.1	45

Material	Spindle Speed	Step Over	Step Down	Feed Rate
PCB	12000	60	0.3	500
Carbon Fiber	12000	60	0.3	500

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material PCB

Length(X) 150.000 mm

Width(Y) 100.000 mm

Height(Z) 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path
 - [T3,2]D Pocket

Top

2D Drilling

Path Name 2D Drilling

Start Position X 0 mm Y 0 mm

▼ Tool

Choose Tool

0.8mm Corn 1 rpm

Diameter 0.800 mm

Step Down 0.300 mm

Feed Rate 500 mm/min

Plunge Rate 300 mm/min

Spindle Speed 12000 rpm

Tool Number 3

▼ Retract

None

Fixed Z Height

Relative Retract

Calculate

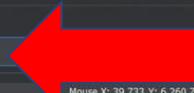
Mouse X: 39.733 Y: 6.260 Z: 0.000

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Search

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Phase 4



MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material PCB

Length(X) 150.000 mm

Width(Y) 100.000 mm

Height(Z) 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path
 - [T3,2]D Pocket

Top

2D Drilling

Path Name 2D Drilling

Start Position X 0 mm Y 0 mm

Choose Tool

0.8mm Corn 1 rpm

Diameter 0.800 mm

Step Down 0.300 mm

Feed Rate 500 mm/min

Plunge Rate 300 mm/min

Spindle Speed 12000 rpm

Tool Number 3

Retract

None

Fixed Z Height

Relative Retract

Calculate

Position X: 40.744 Y: 24.621 Z: 0.000 Size Length:51.228 Width:32.138 h

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Search

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Phase 4



MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material PCB

Length(X) 150.000 mm

Width(Y) 100.000 mm

Height(Z) 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
 - Path
 - [T3,2]D Pocket
 - [T3]2D Drilling

Top

2D Drilling

Path Name 2D Drilling

Start Position X 0 mm Y 0 mm

▼ Tool

Choose Tool

0.8mm Corn 1 rpm

Diameter 0.800 mm

Step Down 0.300 mm

Feed Rate 500 mm/min

Plunge Rate 300 mm/min

Spindle Speed 12000 rpm

Tool Number 3

▼ Retract

None

Fixed Z Height

Relative Retract

Calculate Close

Position X: 40.744 Y: 24.621 Z: 0.000 Size Length:51.228 Width:32.138 Height:0.000 Mouse X: 39.733 Y: 6.260 Z: 0.000

59°F Cloudy

Search

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Phase 4

MakerCAM Workflow

Phase 5: Toolpath 3 (Board Outline)

- This path cuts the board out from the stock.
- **Visibility:** In "WCS1", hide everything except the **Edge.Cuts** layer.
- **Tool:** Select the **2D Contour** tool from the top toolbar.
- **Selection:** Select the outline. Click the **OUTSIDE** line to deselect it (it turns solid). The **INSIDE** line must remain dotted.
- **Cutting Depth:**
 - **Start Depth:** 0.000 mm
 - **End Depth:** 1.7 mm
- **Add Tool:**
 - Click **Choose Tool** → **0.8mm Corn** → "Choose".

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket
 - [T3]2D Drilling

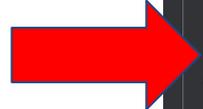
Position X: 40.744 Y: 24.621 Z: 0.000 Size Length:51.228 Width:32.138 Height:0.000 Mouse X: 39.733 Y: 6.260 Z: 0.000

59°F Cloudy

Search

5:21 PM 10/26/2025

Phase 5



MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)



▼ Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

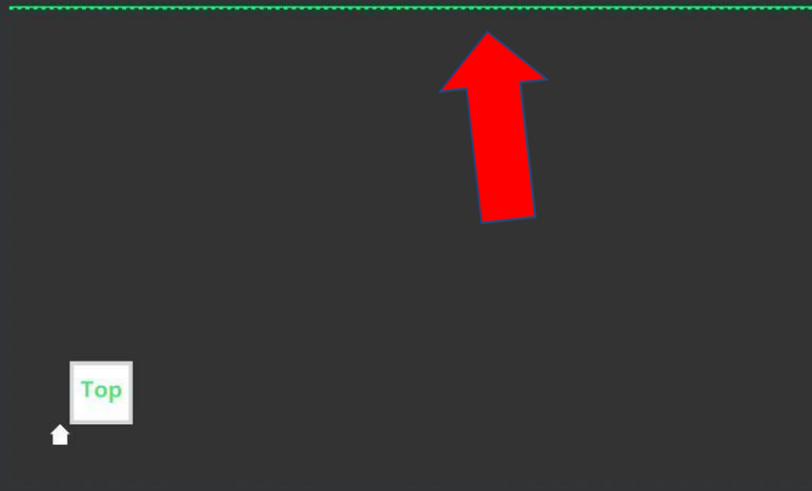
Edit

+ WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket
 - [T3]2D Drilling

Top

Phase 5



2D Contour

Path Name: 2D Contour

Step Down: 0.300 mm

Feed Rate: 500 mm/min

Plunge Rate: 300 mm/min

Spindle Speed: 12000 rpm

Tool Number: 3

▼ Strategy

Position: Inside Outside On Vector

Offset: 0.000 mm

Cutting Direction: Conventional Climb

Cutting Order: Auto

▼ Ramping

Calculate Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 60.364 Y: 43.751 Z: 0.000

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

2D Pocket
2D Contour
2D Drilling
2D Chamfer
2D Thread

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edges_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket
 - [T3]2D Drilling

Top

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 53.857 Y: 43.897 Z: 0.000

59°F Rain

Search

5:22 PM 10/26/2025

Phase 5

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material PCB

Length(X) 150.000

Width(Y) 100.000

Height(Z) 1.500

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]D Pocket
 - [T3]2D Drilling

Tool Magazine

Tool Group

Name	Number	Type	Diameter(D)	Angle(A)	Tip Diameter(F)	Half Ar
3.175*25mm Flat End	1	Flat End	3.175	0	3.175	0
0.2mm*30° Engraving	2	Engraving	3.175	0	0.2	15
0.8mm Corn	3	Corn	3.175	0	0.8	0
3.175*12mm Flat End	4	Flat End	3.175	0	3.175	0
0.3mm*30° Solder Mask removal	5	Engraving	3.175	0	0.3	15
0.1mm*90° Chamfering	6	Engraving	3.175	0	0.1	45

Tool Information

Name

Number

Type

Diameter(D)

Angle

Tool Properties

Material	Spindle Speed	Step Over	Step Down	Feed Rate

Contour

2D Contour

Retract Height 15 mm

Start Position

Choose Tool

Diameter 0.800 mm

Step Down 1 mm

Feed Rate 1 mm/min

Plunge Rate 1 mm/min

Spindle Speed 1 rpm

Tool Number 1

Offset 0.000 mm

Calculate Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 53.857 Y: 43.897 Z: 0.000

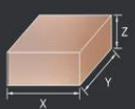
5:22 PM 10/26/2025

Phase 5

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock



Material PCB

Length(X) 150.000

Width(Y) 100.000

Height(Z) 1.500

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edges_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]D Pocket
 - [T3]2D Drilling

Tool Magazine

Tool Group

- All
- Example Tools
 - Flat End
 - 3.175*25mm Flat End 1 Flat End 3.175 0 3.175 0
 - Single Flute Metal
 - Single Flute Non Metal
 - Corn Bits
 - Engraving
 - 0.2mm*30° Engraving(Metal) 2 Engraving 3.175 0 0.2 15
 - Single Flute Metal
 - Single Flute Non Metal
 - Chamfering Bits
 - 3.175*12mm Flat End(Metal) 4 Flat End 3.175 0 3.175 0
 - Solder Mask Remover
 - 0.3mm*30° Solder Mask Removal 5 Engraving 3.175 0 0.3 15
 - Ball Nose
 - 0.1mm*90° Chamfering 6 Engraving 3.175 0 0.1 45
 - Ball Nose Metal
 - Ball Nose Non Metal
 - Drill
 - Thread

Name	Number	Type	Diameter(D)	Angle(A)	Tip Diameter(F)	Half Ar
3.175*25mm Flat End	1	Flat End	3.175	0	3.175	0
0.2mm*30° Engraving(Metal)	2	Engraving	3.175	0	0.2	15
0.8mm Corn	3	Flat End	0.8	0	0.8	0
3.175*12mm Flat End(Metal)	4	Flat End	3.175	0	3.175	0
0.3mm*30° Solder Mask Removal	5	Engraving	3.175	0	0.3	15
0.1mm*90° Chamfering	6	Engraving	3.175	0	0.1	45

Tool Properties

Material	Spindle Speed	Step Over	Step Down	Feed Rate
1 PCB	12000	60	0.3	500
2 Carbon Fiber	12000	60	0.3	500

Tool Information



Name 0.8mm Corn

Number 3

Type Flat End

Diameter(D) 0.8

Angle 0

Choose Close

Contour

2D Contour

Retract Height 15 mm

Start Position

Choose Tool

Diameter 0.800 mm

Step Down 0.300 mm

Feed Rate 500 mm/min

Plunge Rate 300 mm/min

Spindle Speed 12000 rpm

Tool Number 3

Offset 0.000 mm

Calculate Close

Phase 5

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 60.364 Y: 43.751 Z: 0.000

Temps to drop Tomorrow

Search

5:23 PM 10/26/2025

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material PCB

Length(X) 150.000 mm

Width(Y) 100.000 mm

Height(Z) 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]D Pocket
 - [T3]2D Drilling

Top

2D Contour

Path Name 2D Contour

Position

Inside Outside ←

Offset 0.000 mm

Cutting Direction

Conventional Climb

Cutting Order Outside In

▼ Ramping

Ramping

▼ Tabs

No Tab Custom

Tab Shape Triangle

Tab Width 10 mm

Tab Thickness 1 mm

Add Clear tab

Calculate Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:61.926 Width:37.542 Height:0.000 Mouse X: 60.364 Y: 43.751 Z: 0.000

Tempo to drop Tomorrow

Search

5:24 PM 10/26/2025

Phase 5

Phase 5: Toolpath 3 - Strategy & Tabs

- **Strategy:** Scroll down and select **Outside**.
- **Tabs:**
 - Scroll down to **Tabs**.
 - Select **Custom** and click **Add**.
 - Click on 3-4 edges of your board outline to add tabs.
- Click **Calculate**.



MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material PCB

Length(X) 150.000 mm

Width(Y) 100.000 mm

Height(Z) 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edges_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket
 - [T3]2D Drilling

2D Contour

Path Name 2D Contour

▼ Strategy

Position

Inside Outside On Vector

Offset 0.000 mm

Cutting Direction

Conventional Climb

Cutting Order Auto

▼ Ramping

Ramping

▼ Tabs

No Tab Custom

Tab Shape Triangle

Tab Width 10 mm

Tab Thickness 1 mm

Calculate Close

Top

Phase 5

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 9.206 Y: 26.267 Z: 0.000

1 inch of rain Tuesday

Search

5:26 PM 10/26/2025

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)



▼ Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

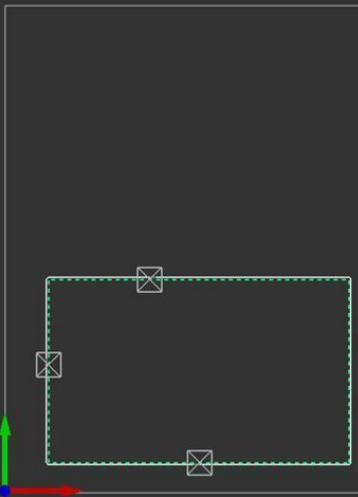
Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket
 - [T3]2D Drilling
 - [T3]2D Contour

Top

Phase 5



2D Contour

Path Name: 2D Contour

▼ Strategy

Position: Inside Outside On Vector

Offset: 0.000 mm

Cutting Direction: Conventional Climb

Cutting Order: Auto

▼ Ramping

Ramping

▼ Tabs

No Tab Custom

Tab Shape: Triangle

Tab Width: 10 mm

Tab Thickness: 1 mm

Add Clear tab Calculate Close

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 9.206 Y: 26.267 Z: 0.000

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-P.TH.dr1_0.900 mm
 - Resistance1-P.TH.dr1_1.400 mm
- Path
 - [T3,2]D Pocket
 - [T3]2D Drilling
 - [T3]2D Contour

Top

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 9.206 Y: 26.267 Z: 0.000

1 inch of rain Tuesday

Search

5:27 PM 10/26/2025

Phase 5

MakerCAM Workflow

Phase 6: Simulate and Export

Preview:

- Click the **Preview Toolpaths** icon.
- Check the boxes for all three toolpaths (Pocket, Drilling, Contour).
- Click **Preview** and watch the simulation.

Export:

- Close the preview and click the **Export** icon.
- Select all three toolpaths in the new window.
- Click the **Export** button.
- Save your **.nc** g-code file.

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Settings(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket
 - [T3]2D Drilling
 - [T3]2D Contour

Phase 6

Top

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 15.132 Y: 29.067 Z: 0.000

Sports headline Arch Manning L...

Search

5:28 PM 10/26/2025

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Settings(S) Help(H)



▼ Stock

Material: PCB

Length(X): 150.000 mm

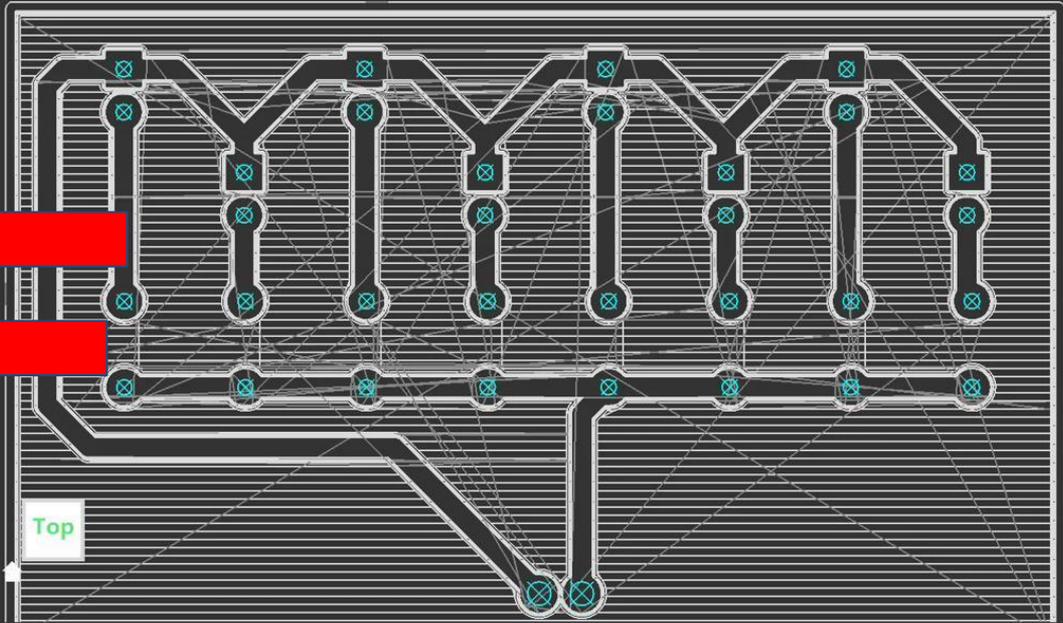
Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket
 - [T3]2D Drilling
 - [T3]2D Contour



Phase 6

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 9.206 Y: 26.267 Z: 0.000

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]D Pocket
 - [T3,2]D Drilling
 - [T3,2]D Contour

Phase 6

Top

Vectors ONLY

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 15.132 Y: 29.067 Z: 0.000

1 inch of rain Tuesday

Search

5:28 PM 10/26/2025

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Settings(S) Help(H)



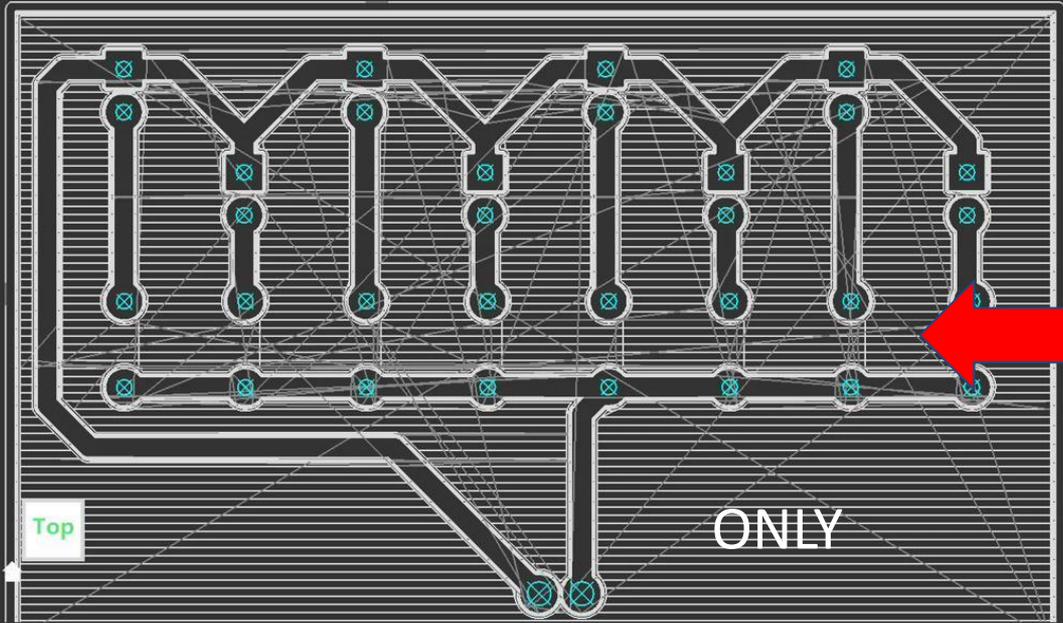
▼ Stock

Material	PCB	
Length(X)	150.000	mm
Width(Y)	100.000	mm
Height(Z)	1.500	mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-P.TH.drl_0.900 mm
 - Resistance1-P.TH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket
 - [T3]2D Drilling
 - [T3]2D Contour



Phase 6

Top

ONLY

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 15.132 Y: 29.067 Z: 0.000

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material: PCB
Length(X): 150.000 mm
Width(Y): 100.000 mm
Height(Z): 1.500 mm

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-P.TH.drl_0.900 mm
 - Resistance1-P.TH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket
 - [T3]2D Drilling
 - [T3]2D Contour

Preview ToolPaths

Tool Path List

- [T3,2]2D Pocket
- [T3]2D Drilling
- [T3]2D Contour

Preview Cancel

Top

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 15.132 Y: 29.067 Z: 0.000

Sports headline Arch Manning L...

5:29 PM 10/26/2025

Phase 6

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Preview ToolPaths

Display Setting

- Display tool path
- Display Material
- Display Tool
- Display Model

Exit Preview

Top

Phase 6

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 15.132 Y: 29.067 Z: 0.000

Sports headline Arch Manning L...

Search

5:29 PM 10/26/2025

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Preview ToolPaths

Display Setting

- Display tool path
- Display Material
- Display Tool
- Display Model

Exit Preview

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 15.132 Y: 29.067 Z: 0.000

5:29 PM 10/26/2025

Phase 6

Top

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Preview ToolPaths

Display Setting

- Display tool path
- Display Material
- Display Tool
- Display Model

Exit Preview

Top

Phase 6

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 15.132 Y: 29.067 Z: 0.000

5:29 PM 10/26/2025

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Preview ToolPaths

- Display Setting
- Display tool path
- Display Material
- Display Tool
- Display Model

Exit Preview

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 15.132 Y: 29.067 Z: 0.000

5:30 PM 10/26/2025

Phase 6

Phase 6: Simulate and Export

Export:

- Close the preview and click the **Export** icon.
- Select all three toolpaths in the new window.
- Click the **Export** button.
- Save your .nc g-code file.

MakeraCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket
 - [T3]2D Drilling
 - [T3]2D Contour

Top

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 15.132 Y: 29.067 Z: 0.000

59°F Rain

Search

5:31 PM 10/26/2025

Phase 6

MakersCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-P.TH.dr1_0.900 mm
 - Resistance1-P.TH.dr1_1.400 mm
- Path
 - [T3,2]2D Pocket
 - [T3]2D Drilling
 - [T3]2D Contour

Export ToolPaths

Tool Path List	Path Name	Tool Name	Tool Type	Tool Number
ToolPath				
[T3,2]2D Pocket				
[T3]2D Drilling				
[T3]2D Contour				

Export Cancel

Top

59°F Rain

Search

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 15.132 Y: 29.067 Z: 0.000

5:31 PM 10/26/2025

Phase 6

MakersCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

▼ Stock

Material: PCB

Length(X): 150.000 mm

Width(Y): 100.000 mm

Height(Z): 1.500 mm

Edit

WCS1

- 3D Models
- 2D Layers
 - Layer1
 - Resistance1-Edge_Cuts.gbr
 - Resistance1-F_Cu.gbr
 - Resistance1-F_Cu.gbr_pad
 - Resistance1-PTH.drl_0.900 mm
 - Resistance1-PTH.drl_1.400 mm
- Path
 - [T3,2]2D Pocket
 - [T3]2D Drilling
 - [T3]2D Contour

Top

Export ToolPaths

Tool Path List

Path Name	Tool Name	Tool Type	Tool Number
[T3,2]2D Pocket	0.8mm Com	FlatEnd	3
[T3,2]2D Pocket	0.2mm*30° Engraving(Metal)	Engraving	2
[T3]2D Drilling	0.8mm Com	FlatEnd	3
[T3]2D Contour	0.8mm Com	FlatEnd	3

Export

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 15.132 Y: 29.067 Z: 0.000

59°F Rain 5:31 PM 10/26/2025

Phase 6

MakersCAM-[Untitled]

File(F) Edit(E) Path(P) View(V) Setting(S) Help(H)

Save Paths

This PC > Windows (C:) >

Search Windows (C:)

Organize New folder

Name	Date modified	Type	Size
inetpub	4/9/2025 8:31 PM	File folder	
PerfLogs	4/1/2024 12:26 AM	File folder	
poppler	6/11/2025 2:32 PM	File folder	
Program Files	10/26/2025 3:12 PM	File folder	
Program Files (x86)	9/12/2025 4:43 PM	File folder	
Projects	4/18/2025 5:13 PM	File folder	
Users	2/3/2025 11:05 AM	File folder	
Windows	10/26/2025 2:54 PM	File folder	

File name: DubickTResistorgcode

Save as type: gcode File(*.nc)

Save Cancel

[T3]2D Pocket
[T3]2D Drilling
[T3]2D Contour

Top

Phase 6

Position X: 40.000 Y: 25.000 Z: 0.000 Size Length:62.026 Width:37.642 Height:0.000 Mouse X: 15.132 Y: 29.067 Z: 0.000

59°F Rain

Search

5:32 PM 10/26/2025

The screenshot displays the MakersCAM software interface. A 'Save Paths' dialog box is open, showing the file path 'C:\Users\Tom Dubick\Documents\CNC' and the file name 'DubickTResistorgcode'. The 'Save as type' is set to 'gcode File (*.nc)'. A red arrow points to the 'Save' button in the dialog box. The main workspace shows a 2D CAD model of a PCB with various components and traces. A green arrow points up, a red arrow points right, and a blue dot is at the origin. A 'Top' button is visible in the workspace. The bottom status bar shows the position (X: 40.000, Y: 25.000, Z: 0.000), size (Length: 62.026, Width: 37.642, Height: 0.000), mouse coordinates (X: 15.132, Y: 29.067, Z: 0.000), and system information (59°F Rain, 5:33 PM, 10/26/2025).

Phase 6

MakerCAM Workflow