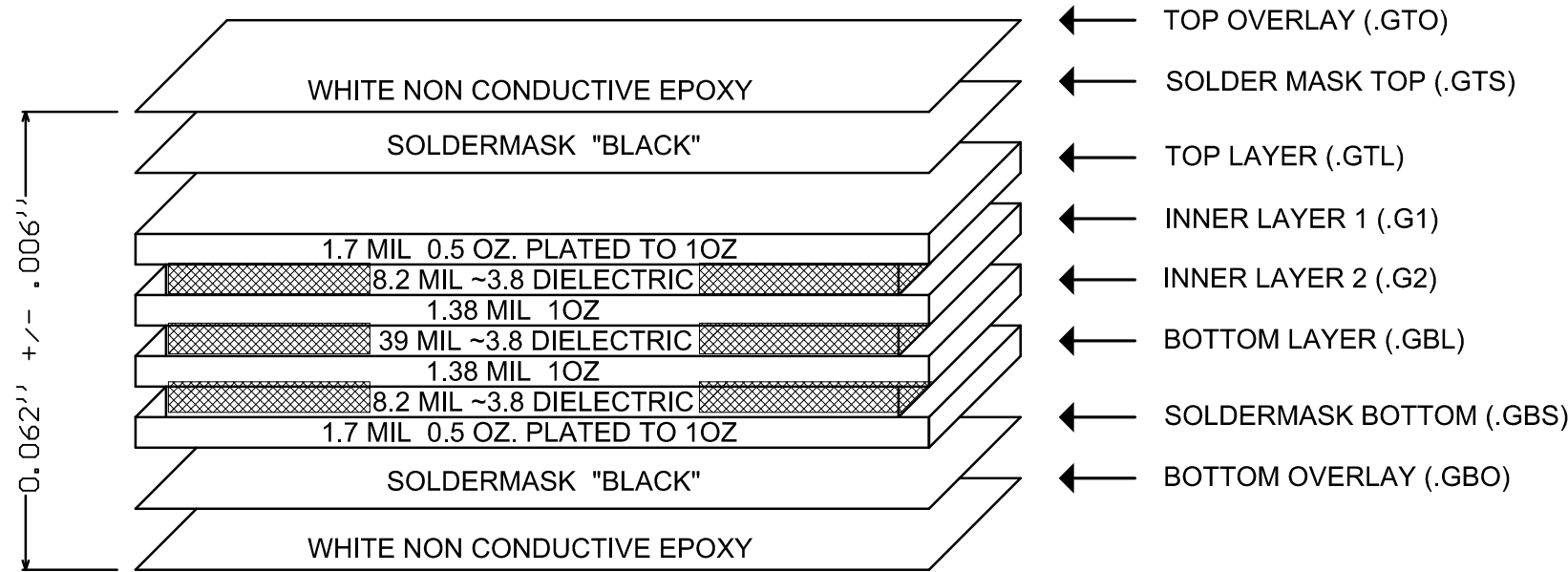


1. RoHS COMPLIANCE: YES ☒ NO ☐
ALL MATERIALS, LAMINATES, RESINS, METALIZATIONS, INKS AND SOLDERMASK TO BE COMPLIANT TO EU RoHS DIRECTIVE 2002/95/EC. LAMINATE AND RESIN MATERIALS TO HAVE A Tg >170°C TO >260°C AND WHEN CONSTRUCTED, BE ABLE TO WITHSTAND 6X THERMAL CYCLES AT 260°C. VENDOR TO ADD MARKING Pb-FREE OR USE APPROVED SYMBOL PER IPC-1066 TO PRIMARY SIDE SILKSCREEN. MARKING SHALL BE ADDED TO PRIMARY SIDE. ETCH ONLY IF SILKSCREEN IS NOT REQUIRED.
2. IPC SPECIFICATION:
MANUFACTURE BOARD IN ACCORDANCE WITH PERFORMANCE STANDARD IPC-6011/6012 CLASS 2. BOARD TO BE INSPECTED PER IPC-600-A CLASS 2 LATEST REV.
3. MATERIAL SPECIFICATIONS
GLASS FIBER EPOXY LAMINATE AND PREPREG MATERIALS PER IPC-4101 (CURRENT REVISION). ALL MATERIALS MUST MEET RoHS COMPLIANCE CRITERIA. SEE NOTE RoHS COMPLIANCE
4. PCB THICKNESS:
CARD PROFILE: FINISHED. CARD THICKNESS : 0.062" +/- .006".
5. VIA, HOLE SIZE, FINISH AND THICKNESS:
PLATED HOLE SIZES SHOWN IN LEGEND ARE FINISHED SIZES +/- 0.002", AFTER PLATING. NON-PLATED HOLE SIZES SHOWN IN LEGEND ARE +/-0.002"
6. COPPER WEIGHT (OZ) PER LAYER:
COPPER PLATING (OUTER LAYERS SHALL HAVE A MINIMUM OF 1/2 OZ. COPPER CLADDING AND SHALL BE A MINIMUM OF 1 OZ. AFTER PLATING. FINISHED HOLES SHALL HAVE AN AVERAGE COPPER THICKNESS OF 0.001" AND HAVE A MINIMUM THICKNESS OF 0.0008. WHEN USED, INNER LAYERS SHALL BE A MINIMUM OF 1 OZ
7. SURFACE FINISH:
COPPER FINISH SHALL BE ELECTROLESS NICKEL/IMMERSION GOLD (ENIG) (100-300 MICRO-INCHES) / IMMERSION GOLD FLASH (2-10 MICROINCHES)
8. LAYER STACK
LAYER COUNT: 2 ☐ 4 ☒ 6 ☐
TECHNOLOGY LINE/SPACE: 6 MIL LINE/ 6 MIL SPACE (± 20%)
SMT USED: TOP ☒ BOTTOM ☐
ELECTRICAL TEST : REQUIRED, 100% FOR SHORTS AND OPENS
LAYER STACKUP BELOW:



9. SOLDER MASK SPECIFICATION:
SOLDERMASK TOP AND BOTTOM SIDE OF CARD USING LIQUID PHOTO IMAGEABLE MASK MATERIAL. OVER BARE COPPER. PER IPC-3548D. MASK ARTWORKS PROVIDED ARE 1:1 WITH PAD SIZES. VENDOR SHALL MODIFY TO OBTAIN MINIMUM PAD TO MASK CLEARANCE. SOLDERMASK COLOR "BLACK" (Amendment: to Allow for ENIG before Solder Mask)
10. SILKSCREEN:
SILKSCREEN CARD PER ARTWORK PROVIDED USING NON-CONDUCTIVE WHITE EPOXY INK. VENDOR TO MODIFY SILKSCREEN ARTWORK (CLIP), SUCH THAT NO SILKSCREEN APPEARS ON EXPOSED METALLIC AREAS.
11. UL REQUIREMENTS
BOARDS SHALL BE PURCHASED FROM UL RECOGNIZED VENDORS ONLY AND SHALL BE MARKED IN COPPER ON SECONDARY SIDE OF CARD WITH VENDORS UL IDENTITY, FLAMMABILITY RATING (94-V0), AND DATE CODE (WWYY).
12. ARRAYS DIMENSIONS (PANELIZATION):
IF DIMENSIONS ARE NOT 100% EXPLICIT PLEASE USE GERBER BOARD OUTLINE CONTRACT MANUFACTURE ALLOWED TO PANALIZE PER MACHINE REQUIREMENTS.
13. CONTROLLED IMPEDANCE REQUIREMENTS: YES ☐ NO ☒
NET NAME:
IMPEDANCE REQUIRED:
TOLERANCE:
14. REMOVE BURRS AND SHARP EDGES
15. V-GROVE 30° SCORE-LINE TO 1/3 TICKNESS ON BOOTOM AND TOP

T-1/3

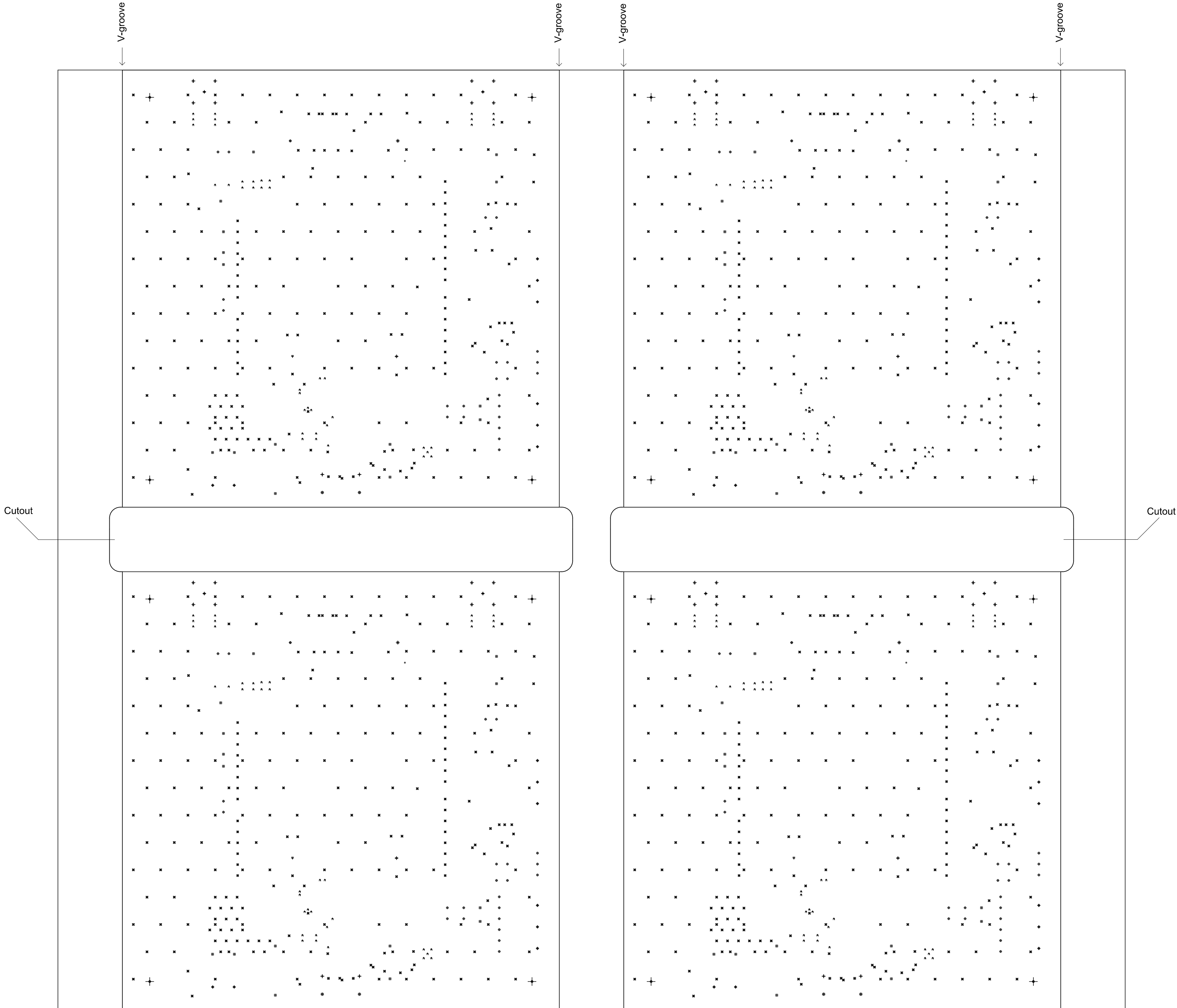
T-2/3

| Symbol | Count | Hole Size | Hole Length | Routed Path Length | Plated | Hole Type |
|------------|-------|---------------------|--------------------|--------------------|--------|-----------|
| ▽ | 4 | 41.34mil (1.050mm) | - | - | NPTH | Round |
| ○ | 4 | 44.50mil (1.118mm) | - | - | NPTH | Round |
| ⊙ | 4 | 61.62mil (1.550mm) | - | - | NPTH | Round |
| ⊗ | 4 | 64.00mil (1.626mm) | - | - | NPTH | Round |
| ■ | 8 | 35.69mil (0.905mm) | - | - | NPTH | Round |
| ⊗ | 8 | 55.12mil (1.400mm) | 23.62mil (0.600mm) | 31.50mil (0.800mm) | PTH | Skt |
| ⊗ | 8 | 69.96mil (1.750mm) | - | - | PTH | Round |
| ⊙ | 8 | 86.39mil (2.190mm) | 23.62mil (0.600mm) | 43.21mil (1.100mm) | PTH | Skt |
| ○ | 16 | 100.00mil (2.510mm) | - | - | NPTH | Round |
| ⊙ | 32 | 91.16mil (1.300mm) | - | - | PTH | Round |
| ⊗ | 32 | 62.96mil (1.600mm) | - | - | PTH | Round |
| □ | 60 | 40.00mil (1.016mm) | - | - | PTH | Round |
| ○ | 92 | 46.16mil (1.030mm) | - | - | PTH | Round |
| ⊗ | 128 | 39.37mil (1.000mm) | - | - | PTH | Round |
| ⊗ | 164 | 10.00mil (0.254mm) | - | - | PTH | Round |
| ⊗ | 602 | 10.00mil (0.254mm) | - | - | PTH | Round |
| 1004 Total | | | | | | |

Skt definitions: Routed Path Length = Calculated from top start (cavity position to top end cavity position)
Hole Length = Routed Path Length + Tool Size - Slot length as defined in the PCB layout

| Layer | Name | Material | Thickness | Constant | Board Layer Stack | Board Layer Stack | Board Layer Stack |
|-------|----------------|---------------|-----------|----------|-------------------|-------------------|-------------------|
| | Top Overlay | | | | | | |
| | Top Solder | Solder Resist | 0.50mil | 3.5 | | | |
| 1 | Top Layer | | 1.38mil | | | | |
| | Dielectric1 | DP-022 | 8.20mil | 4.5 | | | |
| 2 | Inner Layer 1 | | 1.38mil | | | | |
| | Dielectric4 | Core-042 | 39.00mil | 4.6 | | | |
| 3 | Inner Layer 2 | | 1.38mil | | | | |
| | Dielectric7 | DP-022 | 8.20mil | 4.5 | | | |
| 4 | Bottom Layer | | 1.38mil | | | | |
| | Bottom Solder | Solder Resist | 0.50mil | 3.5 | | | |
| | Bottom Overlay | | | | | | |

Total board thickness (Board Layer Stack): 61.91mil



Drill Guide For (Bottom Layer, Top Layer)

| | | | | | |
|---|-------------|-----------------------|--|------------------|--|
| MATERIAL | | DRAWN BY/DATE | | WWW.SWARM.SPACE | |
| INTERPRET DRAWING | | Liam Gallagher13/2021 | | SpaceX | |
| PER ANSI Y32 | | CHECKED BY/DATE | | DRAWING TYPE: | |
| UNLESS OTHERWISE SPECIFIED | | MFG ENG/DATE | | Title: | |
| ALL DIMENSIONS IN INCHES. | | FNL APPROVAL/DATE | | mPCle_Breakout01 | |
| TOLERANCE | XX ± .01 | FNL APPROVAL/DATE | | SIZE | |
| ANGLE | .XXX ± .005 | FNL APPROVAL/DATE | | DWG No. | |
| FRACTION | ± 1" | FNL APPROVAL/DATE | | mPCle_Breakout01 | |
| FRACTION | ±1/64 | FNL APPROVAL/DATE | | REV | |
| CONFIDENTIAL | | PROD CTRL/FNL REL | | B | |
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