How Your CAD File Affects the Success of Your New Thin Film Design

INTRODUCTION

At UltraSource, Inc., customer supplied computer-aided-design (CAD) files play a critical role in supporting the manufacture of every thin film component we build. Customer furnished CAD files are used to fabricate the photomasks that are used in manufacturing to pattern the circuit images via photolithography and etching on to the ceramic substrate. And although our customers typically know that the preparation of the photomasks are a critical part of the thin film manufacturing processes, we find that CAD files will often contain layout and/or data errors.

WHY THIS MATTERS

Today's complex thin film components increasingly require more physical layers and features. A few years ago the typical thin film component may only have required two or three layers. Now, common designs require up to six layers and sophisticated designs need up to ten layers. A modern thin film component or circuit design may include many elements such as tuning pads, RF or microwave features, optical features, resistors, capacitors, vias, selective solder pads, solder stops, polyimide dielectrics, vision recognition alignment targets, and custom labeling. If the CAD design contains data or layout errors such as gaps and misalignments in between the polygons that make up the design, detecting and repairing the errors may cause a significant delay in the fabrication of the photomask(s) and the end products. In a worst case scenario, data or layout errors in the CAD can cause an erroneous design to be fabricated.

THE SOLUTION

The key to reducing the time to market and avoiding errors is for customers designing thin film components and circuits to be diligent in generating CAD designs that follow industry standards and generally accepted good practices. This application note was written in order to help our customers understand how they can help ensure their products rapidly turn into the exact manufactured component they have designed. By keeping some simple design rules in mind, you can avoid having us contact you to resolve your design issues after you have placed your order and need your parts urgently. We derived these 10 rules from the most common issues we encounter in our daily design and CAD review processes.

**PLEASE READ CAREFULLY AND INTEGRATE THESE RULES INTO FUTURE CAD DESIGNS
IN ORDER TO AVOID PROCESSING DELAYS**

1. Preferred File Format: AutoCAD DWG or DXF. Not Preferred: Gerber or GDS files, as translation errors may occur during the conversion to AutoCAD format.
2. Files must be 2-dimensional with the units and scale clearly specified.
3. Zero width polylines should be used to create closed boundary polylines for all patterned geometries.
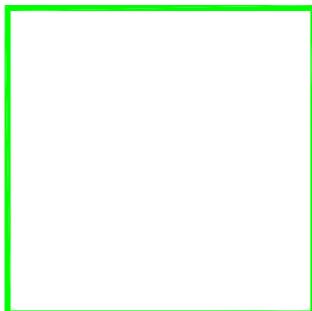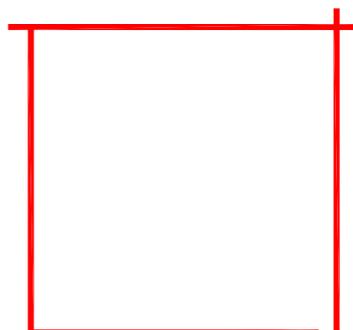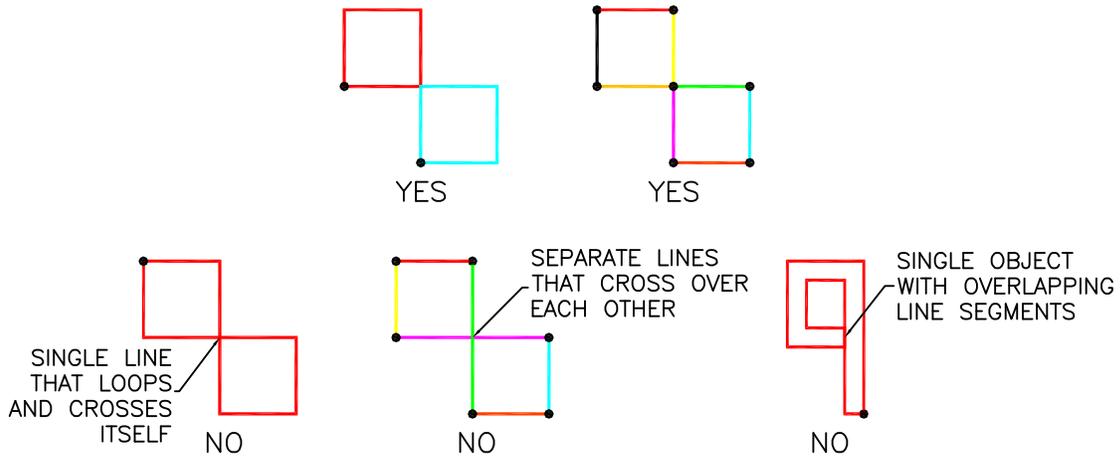

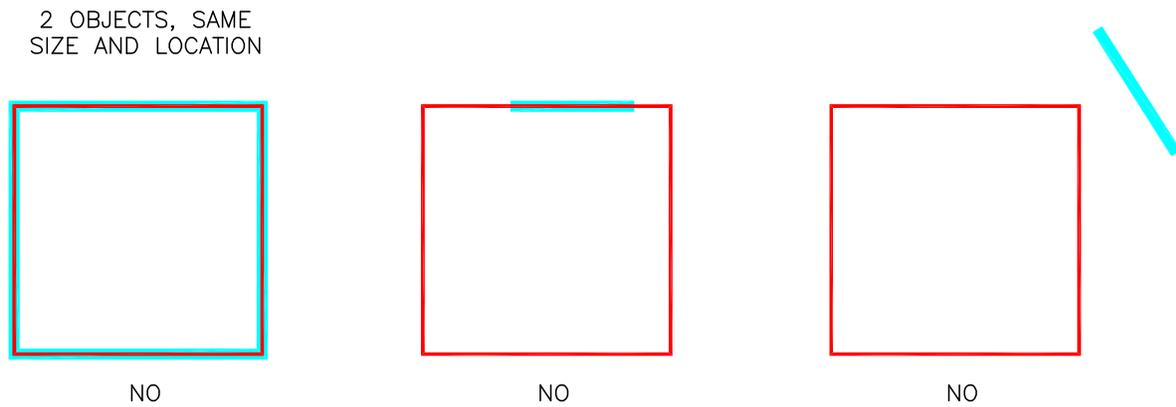YES   NO

4. Polylines must not result in self intersecting boundaries. The bold dots in the image below indicate the start and stop points for line segments.

YES   YES

SINGLE LINE
THAT LOOPS
AND CROSSES
ITSELF   NO

SEPARATE LINES
THAT CROSS OVER
EACH OTHER

NO

SINGLE OBJECT
WITH OVERLAPPING
LINE SEGMENTS

NO

5. Avoid double entities or extraneous lines.

2 OBJECTS, SAME
SIZE AND LOCATION

NO   NO   NO

6. If polylines with a width must be used, the corner type must be stated. The default method varies between the various design software packages, and AutoCAD standard is a square corner.

SQUARE   ROUND
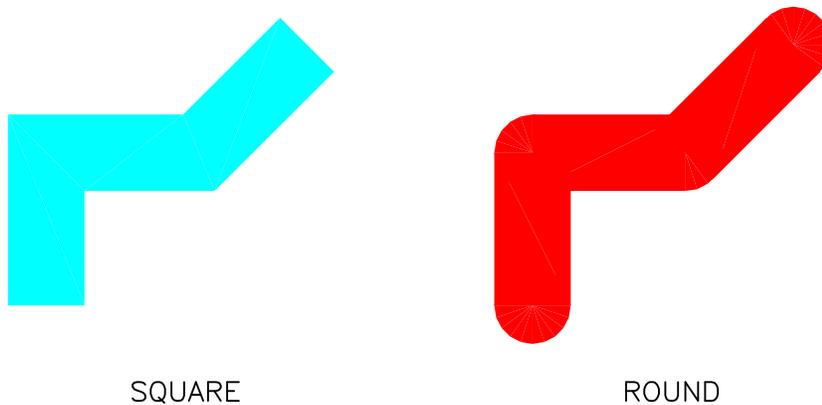
7. Each different metal or mechanical pattern should be drawn on a separate layer, preferably with descriptive layer names as shown below:

| Sample Layer Name	Description
Outline	Mechanical outline of circuit
Cond-front	Conductor layer, specifying front or back side
Notes	Non-pattern features, including notes or dimensions
Resistor	Resistor layer
Via	Metallized through hole.
AuSn	Pre-deposited solder layer

8. If the design software does not allow exporting a file with more than one layer, then each metal or mechanical pattern should be exported separately using the identical scale and origin.

ALL FEATURES ON ONE LAYER   NO

Outline   Cond—front   Resistor (0.5X scale)   NO
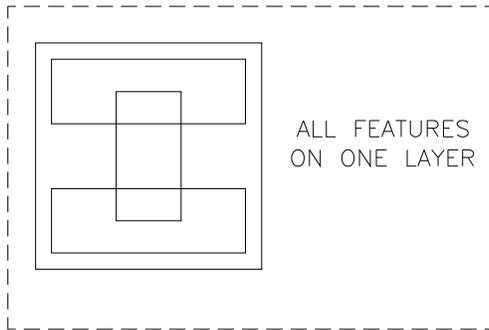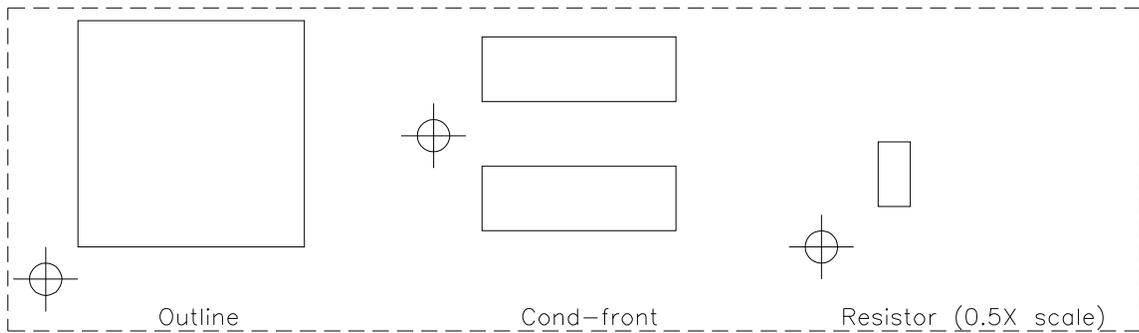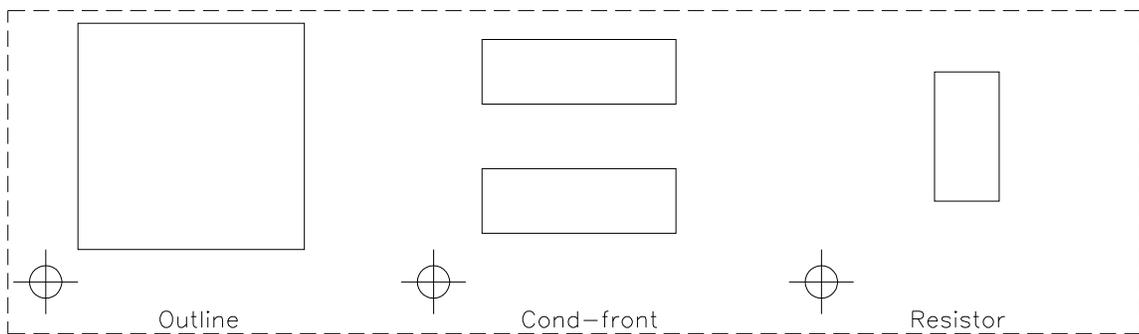
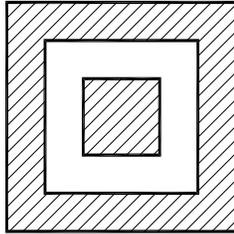Outline   Cond—front   Resistor   YES

9. Patterned text should be drawn using zero width polylines. If typed text must be used, limit the font type to either RomanS or TXT.

10. Voids within patterned features must be clearly identified. Acceptable methods include the use of segmentation or layer names to identify voided objects.
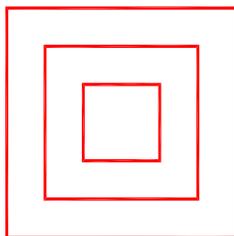
DESIRED METAL PATTERN

CONDUCTOR RING DRAWN
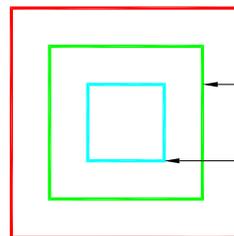AS 2 "C" OBJECTS
(SEGMENTATION)
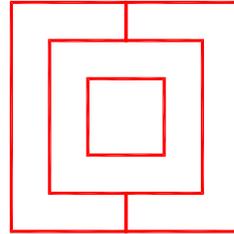
YES

ALL FEATURES DRAWN
ON ONE LAYER

NO

EMBEDDED VOIDS
IDENTIFIED BY
SEPARATE LAYERS
(AKA PAINT/SCRATCH)

COND—PAD1

COND—VOID1

COND—PAD2

YES