Universal Intelligent Input Data

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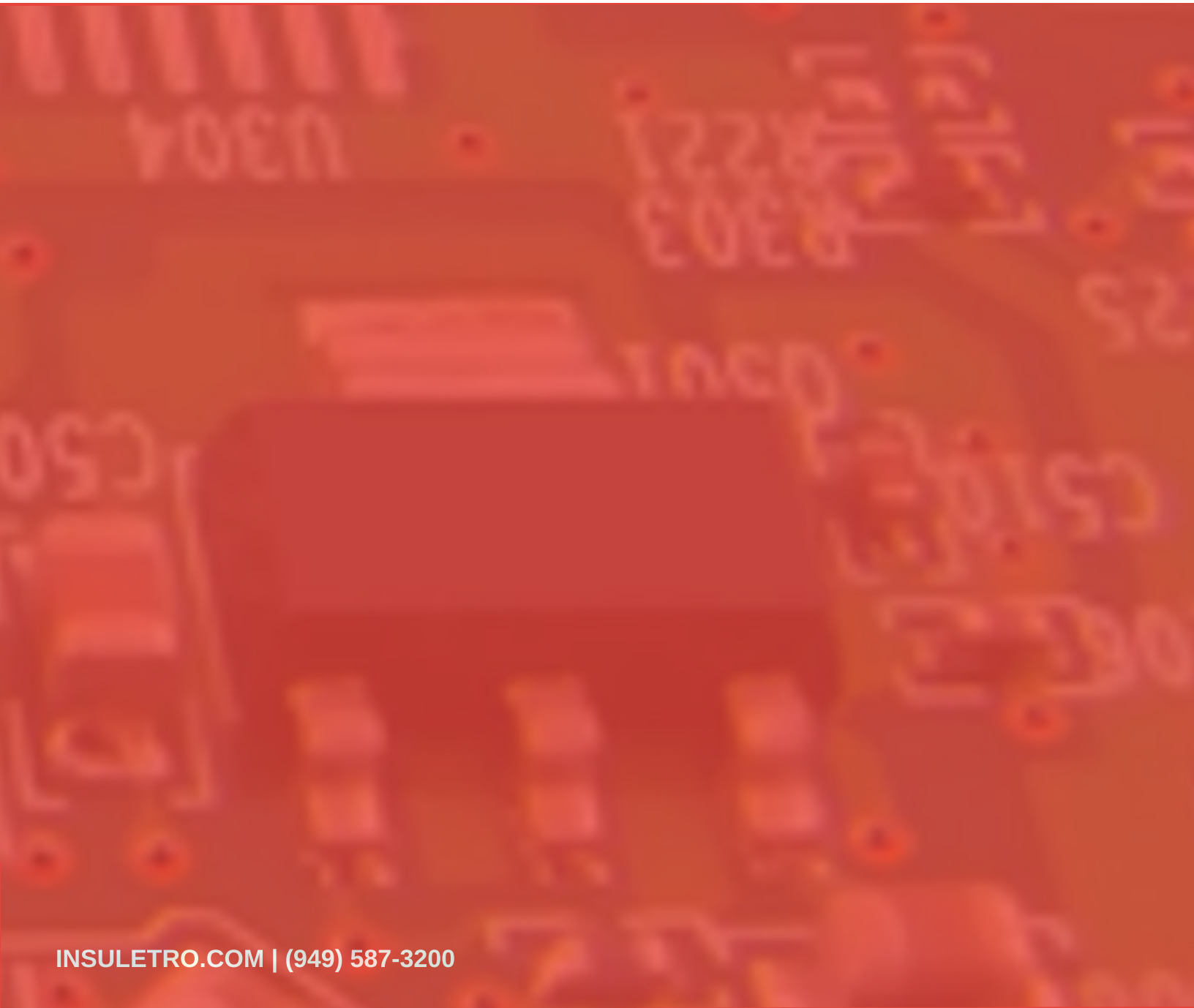


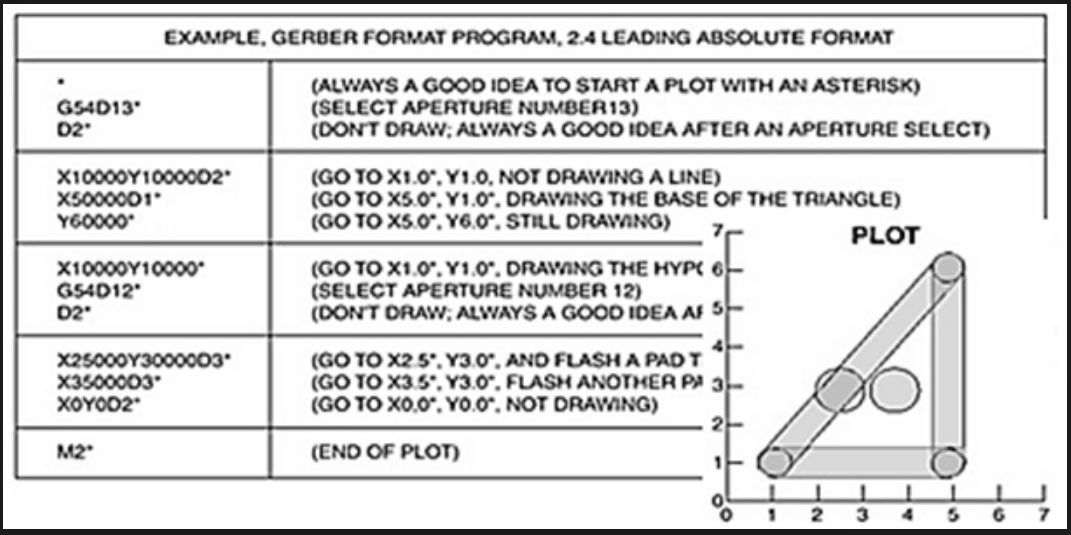
TABLES OF CONTENTS

BASICS

MOST OF US HAVE HEARD OF, "INTELLIGENT OUTPUT DATA."

Great ideas often originate with unknown sources, then someone claims the innovation. However, I've read somewhere that there is nothing new under the sun. All that to say, I've been talking this idea around for several years and I'm sure the smartest person in the room actually created it and that's not me. I just wanted to go on record as someone pushing the idea forward…

With the factory of the future someday to become a reality, we all strive to take steps in automation. One of these steps has been the creation and utilization of intelligent data, such as ODB++ or IPC-2581. To review a brief history of PCB tooling data formats, we originally used tape-ups and created photo artwork from these. I know because I'd come home at night with red and blue tape on my elbow sleeves. With the advent of EDA CAD tools, we transitioned in the 1960-70s to the creation of Gerber data RS-274D then RS-274X (with embedded apertures). We still use this data to this day as the most predominate tooling data supplied. By the way, it is as dumb as a door handle. If you wish to add some intelligence to your gerber data, please supply an IPC-356 netlist! Gerber is nothing other than vector data with instructions to flash or draw at a given set of coordinates.



EXAMPLE, GERBER FORMAT PROGRAM, 2.4 LEADING ABSOLUTE FORMAT	
* G54D13* D2*	(ALWAYS A GOOD IDEA TO START A PLOT WITH AN ASTERISK) (SELECT APERTURE NUMBER13) (DON'T DRAW; ALWAYS A GOOD IDEA AFTER AN APERTURE SELECT)
X10000Y10000D2* X50000D1* Y60000*	(GO TO X1.0", Y1.0, NOT DRAWING A LINE) (GO TO X5.0", Y1.0", DRAWING THE BASE OF THE TRIANGLE) (GO TO X5.0", Y6.0", STILL DRAWING)
X10000Y10000* G54D12* D2*	(GO TO X1.0", Y1.0", DRAWING THE HYP((SELECT APERTURE NUMBER 12) (DON'T DRAW; ALWAYS A GOOD IDEA AI
X25000Y30000D3* X35000D3* X0Y0D2*	(GO TO X2.5", Y3.0", AND FLASH A PAD T (GO TO X3.5", Y3.0", FLASH ANOTHER PA (GO TO X0.0", Y0.0", NOT DRAWING)
M2*	(END OF PLOT)

Gerber File, 274X Vector Data with Embedded Aperture Information

KEY STRATIGIES

IPC PRODUCIBILTY LEVELS

The evolution continued with an attempt to create an intelligent data format with the following data formats: IPC-D-350, EDIF, GenCAM, ODB++, and IPC-2581. The intelligent nature of these data formats has continued to evolve, and it has many value points and a few warnings, such as do not pass on your company's Intellectual Property (IP) with your manufacturing data.

With this brief descriptive and historical overview, I want to transition into the focus of this article and that is consideration for a "Universal Intelligent Input Data Format." Most fabricators and assembly manufacturers have developed a "Capabilities Matrix," showing the capabilities of their services to obtain an optimal yield. This capability matrix will convey different parameters that designers could utilize on their designs to improve reliability and yield when building at that shop.

These typically fall into certain producibility levels as IPC has detailed.
IPC Producibility Levels: (Per IPC-2221 1.6.3)

- **Level A: General Design Producibility – Preferred**
- **Level B: Moderate Design Producibility – Standard**
- **Level C: Least Design Producibility – Reduced**

SOLUTIONS

A producibility level is not to be interpreted as a design requirement, but rather as a method of communicating the degree of difficulty some design features have compared to the manufacturing (fabrication/assembly) capabilities. Each feature size can factor into materials used and processes utilized as these also must include tolerance allowances. These are to be used as a guide to make a robust product.

What so often occurs is the investigation to see how my gerber data looks after the layout is complete and the project is late. At this point, any corrective action seldom occurs and a low producibility level is accepted. The use of one level for a specific feature does not mean other features all fall into the same level. Producibility level does not occur for the layout as a whole, rather what happens is each feature size is examined as a standalone entity such as the via or trace parameters. You could have a highly producible trace width, but a low producible via/drill/plating.

As you comprehend this Catch-22 problem with its complex set of parameters, we need to look to a solution. The solution could be for each fabricator to be able to create a Universal Intelligent Input Data Format that can be loaded into any CAD tool. This would aid in the rules and constraints definition that each design must comply to. This should be used to set minimum parameters, optimal, and robust design features as allowed by the optimal manufacturing producibility levels. This should always be met with the observation of the capabilities of the supply chain that will build your product in production quantities. As stated in past Puma articles all boards will be built in proto-type quantities at a high-tech proto-type shop and some may transition into another production shop that may have another set of producibility levels. Thus, always design for production metrics not prototype shop capabilities.

THE FINAL WORD

In conclusion, my hope is we keep talking about this idea and that it gains traction, acceptance and demand is created with the hope of becoming an industry standard. I just wanted to go on record as someone pushing the idea forward…

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Contact any of our Technical Account Managers or call any of our branch offices to schedule your Complimentary Virtual Training Session.