



Does your chip  
need a designer  
label?





# With the new Algotronix DesignTag™ no one will take your work for granted...

Today the semiconductor industry is more complex than ever before. CAD Tool companies, design service companies, IP core vendors and a multitude of talented individual design and verification engineers all contribute to a successful System on Chip product. Moreover, programmable devices such as FPGAs are blurring the distinction between hardware and software.

Semiconductor product labelling, however, still relies on ink markings on the chip package just as in the earliest days of the industry. This simple approach is becoming increasingly inadequate. Marking on FPGA chip packages, for example, credits the FPGA vendor - not the creator of the design it implements. The marking on a complex SoC chips credits only the company that markets the final product - all other contributors in the value chain are invisible to the end customer, market researchers, analysts and the press. Unfortunately, invisible contributors have difficulty in obtaining fair value for their work - or fair valuations for their businesses.

The simple approach of adding text to the chip package is also insufficient for the companies at the top of the value chain. It is trivial to mislabel a product to increase its value or to pass off inferior 'clones', test failures or devices reclaimed from scrapped equipment as high value 'brand name' merchandise. Detecting this kind of fraud requires depackaging the device and microscopic analysis of

the chip within - a time consuming and expensive procedure which is rarely used.

From a diagnosis and maintenance perspective relying on chip package markings for product and product version identification is also problematic. Markings can be faded or there may simply not be enough space on a small package to convey the required information. FPGA chips where designs are updated in the field provide an insoluble challenge when determining product version from package markings.

The solution to these problems is a machine-readable e-tag implanted within the active circuitry on the chip. A web-based database indexed by the tag code allows users to provide a rich set of information about the tagged product. Algotronix' standard Red Tag product is a low cost solution intended primarily for product identification and version control. Black Tag is a 'hardened' version of the DesignTag intended for covert use and detection of intellectual property misuse. Multiple Black tags can be associated with a single chip. Finally, with the Algotronix DesignTag, IC product labelling steps into the internet age.



## Where will your IP go today?



# It's your design...



## Take Credit

Everyone deserves to be acknowledged for their work. But in the chip industry only the company at the top of the value chain gets their name on the package lid. CAD Tool vendors, design services companies and individual engineers who make a vital contribution to the product go unacknowledged. Sometimes, even the IC supplier goes without credit as powerful customers insist on marking key chips with their own logo. FPGA chip packages are marked by the FPGA vendors - not the creators of the circuit they implement.

Now, the Algotronix DesignTag links a machine-readable identifier on each individual chip to a web-based database. Finally, designers can tie a rich set of information directly to the product: datasheets, marketing literature or even movie-like credits acknowledging the contributors to the chip.



## Take Action

Up until now misuse of IP blocks and CAD tool licences has been an almost undetectable crime. Only by removing the chip package and time consuming microscopic analysis could suspicious vendors determine whether their Intellectual Property was contained in a particular chip. With encrypted FPGA bitstreams or antifuse FPGAs or where the IP has been compiled by synthesis and place and route tools even microscopic analysis may be insufficient.

Algotronix Black Tags can be added to IP cores or inserted into designs by CAD tools. They provide a strong deterrent to IP misuse, whether intentional or unintentional. Use of tools or IP Cores supplied under evaluation or educational licences to create commercial products or use of IP supplied under a single project licence in multiple projects can be detected by scanning the final product. With Black Tag the terms of IP and software licence agreements become enforceable.



## Take Care

Fraudulently marked 'fake' or 'ghost' chips have been reported in the supply chain. Changing the package markings to increase the speed grade or make a 'Commercial' temperature range chip into an 'Industrial' or 'Military' device will increase its value - and in most cases the substitution will never be detected. Even more subtle changes - like marking 'no name' clone products as coming from well known brands, recycling 'ghost' chips from scrapped equipment as new devices or selling test failures as good devices

are also occurring and in most cases will go undetected because of the difficulty and expense of matching the package markings to the chip within.

The Algotronix DesignTag allows the end user to 'look through' the package and directly identify the chip within.



## Take Control

Diagnosing problems in electronic equipment usually involves determining part and version information for integrated circuits assembled onto circuit boards. This simple step is complicated by the fact that package markings can be faded, obscured or insufficient to identify the component.

The Algotronix DesignTag can provide a unique machine readable identifier for a particular chip component and design version. Linking this identifier to a web based database allows rich information on the component to be delivered automatically to service engineers.

DesignTag also allows IP core vendors to independently determine which version of their product has been used in a particular chip in the event of customer complaints.

# About the Algotronix DesignTag

The Algotronix DesignTag is a very small, low power active circuit element which can be added to electronic designs. The DesignTag is a digital circuit which can be used in FPGA designs. Multiple tags can be present in a single chip. An external scanner can detect the presence and serial number of the tag and use this information to access an external web-based database to provide a rich set of information about the tagged chip. Security mechanisms allow DesignTag users to control who can detect their tag or to restrict elements of the information stored in the web database.

# Keeping an eye on your IP



Algotronix is a well established security and consulting company based in Edinburgh in the United Kingdom. It was founded in 1998 as a spin-out from Xilinx a leading vendors of FPGA chips. Algotronix' customers include multinational defence companies, government agencies and financial institutions. Algotronix AES encryption cores are securing communication systems used by many NATO countries and in commercial applications ranging from casino gaming machines to network test equipment. Algotronix has strong ties to the leading FPGA research group at Imperial College in London and to the System on Chip design expertise of the Institute for System Level Integration (ISLI) in Scotland.

The DesignTag product brings together Algotronix' experience in implementing cryptography with its research into Digital Rights Management systems in a novel combination which is the subject of multiple patent applications.

## The Design Tag

The Algotronix DesignTag intentionally creates a 'side channel' between the tag circuit implanted within the chip and an off-chip detector. This side channel is engineered to transmit a small amount of data - the tag code - covertly, reliably and reasonably quickly to the detector without requiring electrical contact. Thus DesignTag can be detected without any knowledge of the function or documentation of the pinout of the chip being scanned. A sensor is simply placed in contact with the top of the package. It is also possible, in principle, to operate without direct contact to the chip.

The DesignTag system consists of four components: the small tag circuit fragment attached to the user design, a sensor for collecting data from the tagged chip, software running on a laptop computer and a web based database of tag codes and design information.

The Algotronix Design Tag Product Options

Product	Tags per chip	Covert Use	Generally Available	Application
Red Tag	One	No	Yes	Design identification / version control
Black Tag	Many	Yes	Limited Access	IP tracking
Private Label	Customised high security tagging for large organisations			

## Tag

The tag is a small digital circuit. It requires no special analog components and can be implemented on an FPGA. The tag requires very little area and is low power. To further reduce power the tag can optionally be configured to switch off a few minutes after the chip is powered on - in this case tag scanning must take place immediately after power on.

## Scanner

The sensor is a low-cost, off the shelf component. Data can be collected using a high precision digital multimeter with data logging capability or, more conveniently, using a data logging unit supplied by Algotronix which connects directly to a computer running the Algotronix software using a USB cable.

## Software

Algotronix supplies a software application

which runs under Microsoft Windows. This application, in conjunction with Algotronix' web service, can process a file of sensor data collected using a digital multimeter or process data as it is collected from the Algotronix data logging unit. When DesignTags are detected the software will provide tag codes which can be looked up in the Algotronix web database.

## Web Service

Algotronix is developing a web database which will be closely integrated with the tag scanning software to deliver additional information on the tagged products. Customers will have the option to associate datasheets or marketing materials with the tagged chips or to provide background information on the design. Naturally, customers also have the option to keep tag information private and restrict the situations in which it will be reported

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