

DNA Marking & Authentication: Anti-Counterfeiting Solution for Electronics

Parts Standardization Management Committee

November 1, 2011



Recent Vision Tech Case

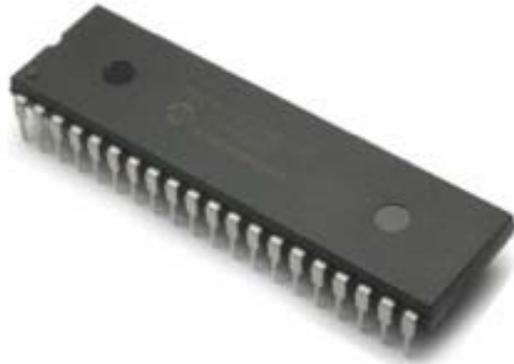
“put countless innocents at risk and compromise national security”

“ticking time bomb of incalculable damage and harm”

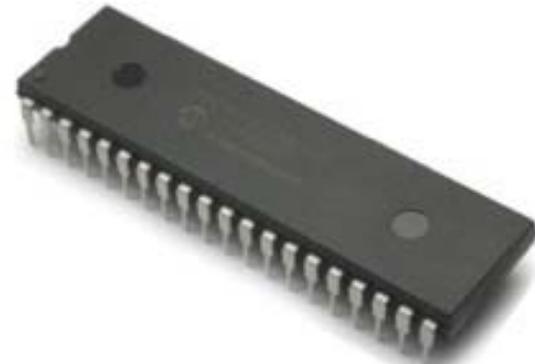
“hundreds of thousands, if not millions, of counterfeit parts are potentially still floating around in the supply chain or, worse yet, inside equipment that’s being used today.”

“It’s a national security issue, and a clear and present danger,” said Brian Toohey, SIA President

Can You Tell the Difference?



Real

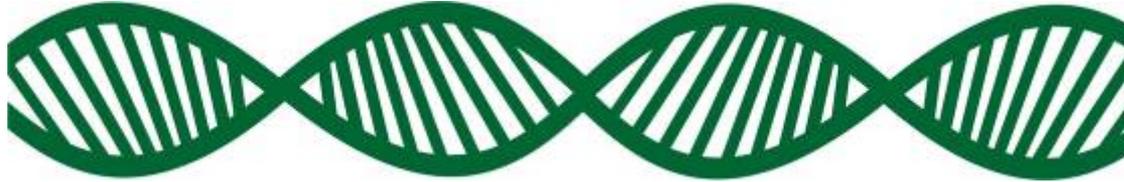


Fake

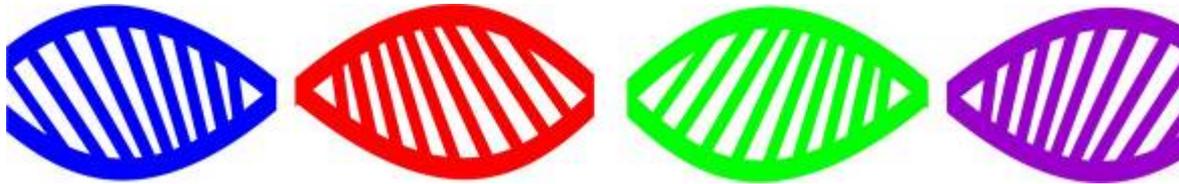
We Can!

DNA offers absolute authentication. Parts can be “**branded**” at the **molecular level** using the gold standard for forensic evidence most preferred by global courts.

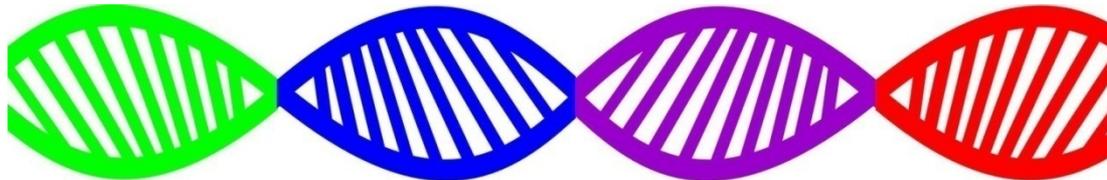
Creating a SigNature DNA Marker



Large Botanical DNA is acquired.



DNA is segmented.



Segments are shuffled, reassembled and encrypted to form a unique, secure DNA marker.

SigNature DNA is Robust & Stable

Category	Testing Contents	Result
UV energy	Equivalent up to 350 years of UV energy accumulation in Denver	Stable
X rays	4 times X-ray exposure by X-ray scanning machine at airport	Stable
γ rays	30 kGy radiation exposure by Gamma-ray sterilization machine	Stable
pH	pH 1 to 14 overnight	Stable
Thermal	> 250°C (4 hours)	Stable
Solvents	Aggressive aprotic solvents, oxidizers, radicals	Stable

Current Hosts for DNA

- Surface treatments, plastics, laminates, varnishes, clear coats, reactive adherents
- Metal surfaces, metal coatings
- Extruded, molded plastics, IMD
- Cyanoacrylates and adhesives
- Wide range of security inks
 - Flexo, offset, gravure, thermal transfer
- Laser toner and inkjet Ink
- Cash degradation ink
- Paper, labels, packaging
- Textile treatments, yarn, fabric
 - Integrated in fibers
 - Direct application onto product
 - Woven labels, insignias



Broad IP Portfolio:

38 Patents

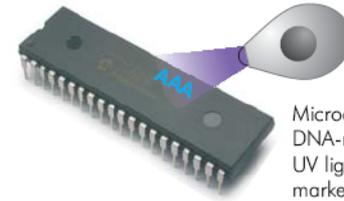
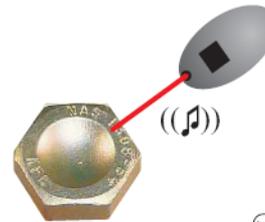
7 Trademarks



Screening & Authentication

*Rapid
Screening
in the Field*

SigNature® DNA Security Measures



Microchip screen with DNA-marked fluorescing ink UV light provides instant marker detection



Invisible 2-D barcode with DNA marker



DNA-marked Critical Documents



Label sample is received



Sample Preparation



Purified DNA sample into vial



DNA authenticated using PCR machine and/ CE analysis



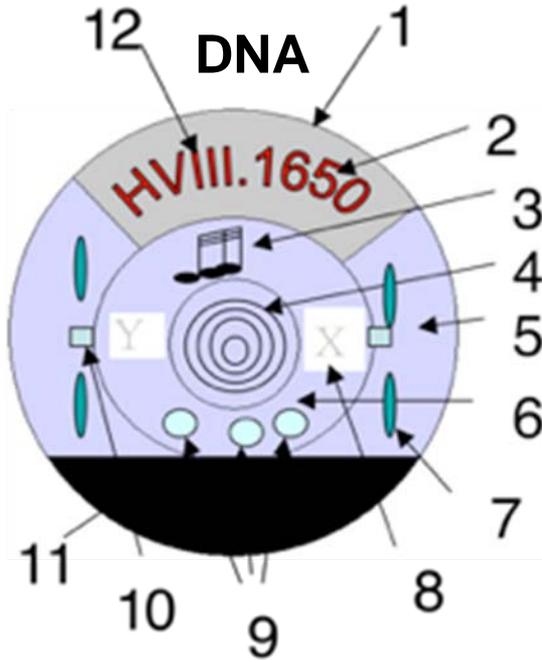
Results are absolute and definitive

*Forensic
Authentication
in the Lab*

EU Optical Disks tell our story...



DNA



1. PET Al sputtered foil release label
2. Fluorescent red ink turns orange with red laser
3. Musical note hologram: shape shift/color change
4. 10 concentric circles. Shapes shift when tilted
5. X,Y microdots visible under 30X magnification
6. Random interference lines
7. 4 microprints of 'AUDIO VIDEO'
8. Shine red laser 30° from top of X and US 'culture' projects on paper 45° below.
9. Three circles encoded with Characters 'U' 'S' 'A'
10. Microprint 'AUDIO VIDEO'
11. Machine readable encrypted codes
12. DNA embedded in #2 fluorescent ink

Within 9 months of launch, 11 of the 12 security platforms were copied by counterfeiters. SigNature DNA was the only measure that could not be duplicated. Years later, only DNA can distinguish the genuine from the counterfeit.

SigNature DNA Protects Supply Chain for “Made-in-England”



Fiber

Yarn & Textiles

Fabric

SigNature DNA
Woven Label

Finished
Garment

SigNature DNA-IR adducts **protect the entire supply chain**

DNA Markers are The Anti-Counterfeit
technology selected by the TCoE

SigNature DNA Protects 35% of the UK Cash-in-Transit Industry (>40 B\$/yr)

1. Loomis Cash Box "Attack"



Following discharge, cash is marked with SigNature® DNA.

2. Recovery of Stained Notes



Stained Evidence recovered by U.K. Police

3. Screen for SigNature® DNA



DNA marker detected with UV handheld device.

4. Sample Collection



Stained evidence sent to DNA Lab for analysis.

5. DNA Analysis



DNA is extracted and analyzed.

6. DNA Authentication



An Expert Witness Statement Report is provided to the UK Police and Loomis. Before a Case Goes to Trial, the Police submit the Report to the Crown Prosecution.

DNA-IR adducts protect the entire custody chain

- 18 months: 20+ convictions resulting in 100+ years of jail time where the **SigNature DNA taggant has been key evidence**
- 100% authentication/100% conviction rates
- Now being adopted across Sweden

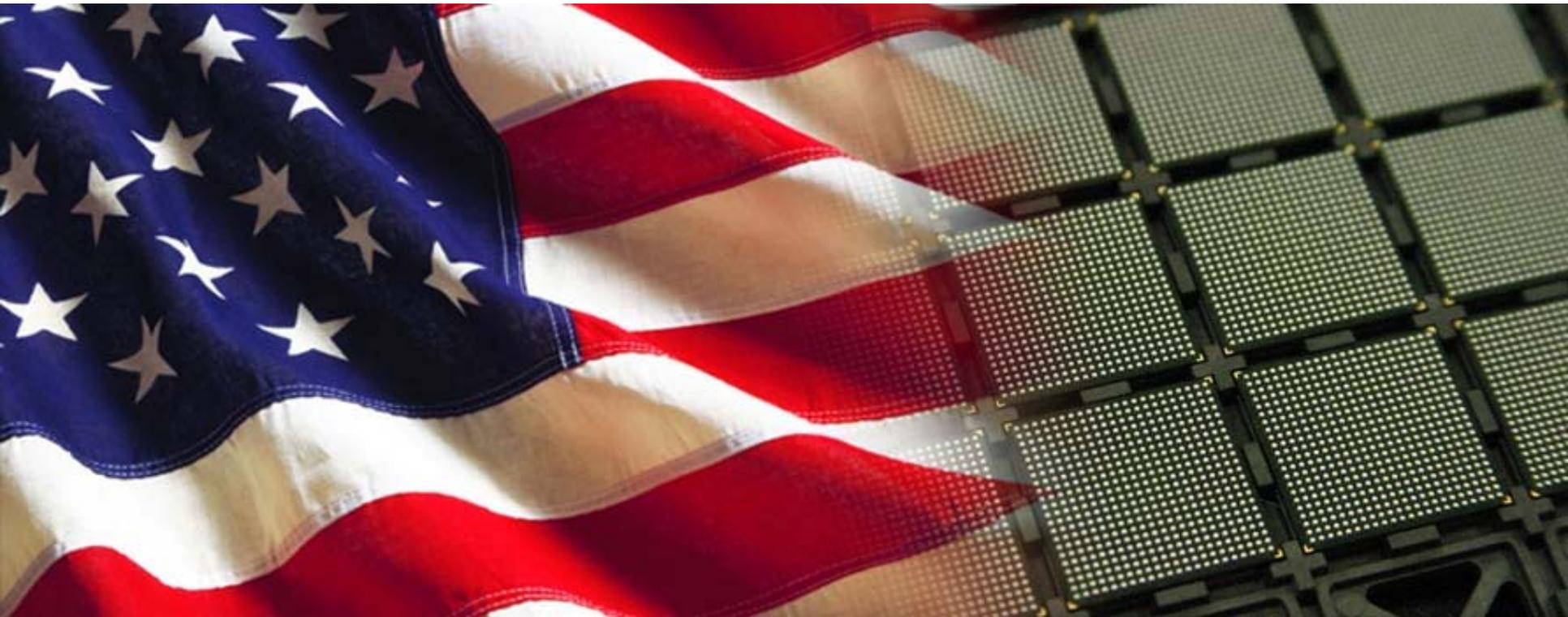
Return on Investment

- For the first quarter of 2010, relative to the first quarter of 2009, our UK CViT customers indicated that **cash attacks were down 55% and cash losses down 72%**.
- The elimination of a single CViT attack would pay for the cost of our program.
- In fact, over **100 crimes were avoided**. Both customers attribute to decrease to “Deterrence by DNA”.
- **The return on their investment in SigNature DNA has been extraordinary.**



DNA Marking Microchips for U.S. Government

Protecting electronics industry,
government throughout supply chain



Fighting Counterfeit Items is a Top DLA Priority

Stewardship Excellence is one of 3 strategic focus areas for DLA with an expected action step to

Improve detection, deterrence and disposition of non-conforming, counterfeit material

Source: 2011 Director's Guidance Report

Phase 1 Successful Results

OCM & Large Authorized Distributor

- Marked 100% of production at CA facility for over 2 months
- No change to production process
- No impact on mark permanency testing
- Marks rapidly scanned without difficulty
 - Microchips at OCM
 - Labels at Distributor
- 100% Forensic authenticity
- 100% Distinction between genuine (marked) and counterfeit (unmarked) swabbed samples



Fiscal 2012 Director's Guidance

In the area of counterfeit parts, officials are creating training to educate all DLA employees on how to identify a counterfeit part and what to do if they find one, said Stephen Rodock, a technical and quality analyst for DLA Logistics Operations. Other preventive steps will include additional sample testing from high-risk suppliers and the potential use of DNA marking by which manufacturers embed information in materials to identify them as original parts.

DNA to Assure Safety & Recapture Market

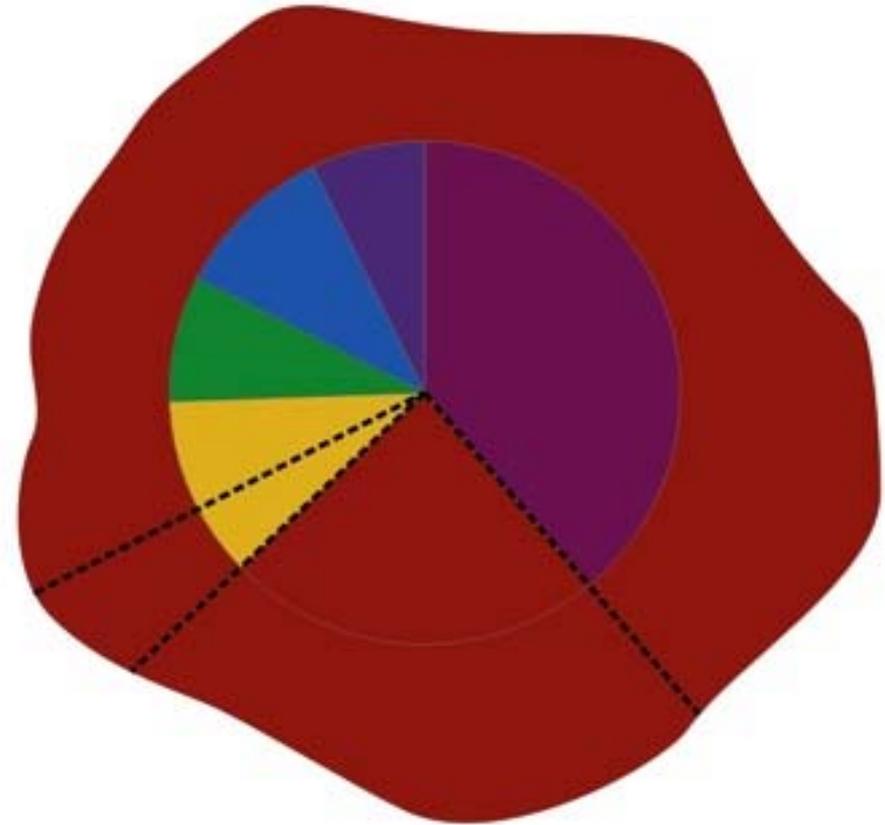
U.S. Department of Commerce conducted a four-year study between 2005 and 2008 which revealed that 39% of 387 companies encountered counterfeit electronic components, microcircuits, or circuit boards

DNA can be used to regain a Company's proportionate Market Share.

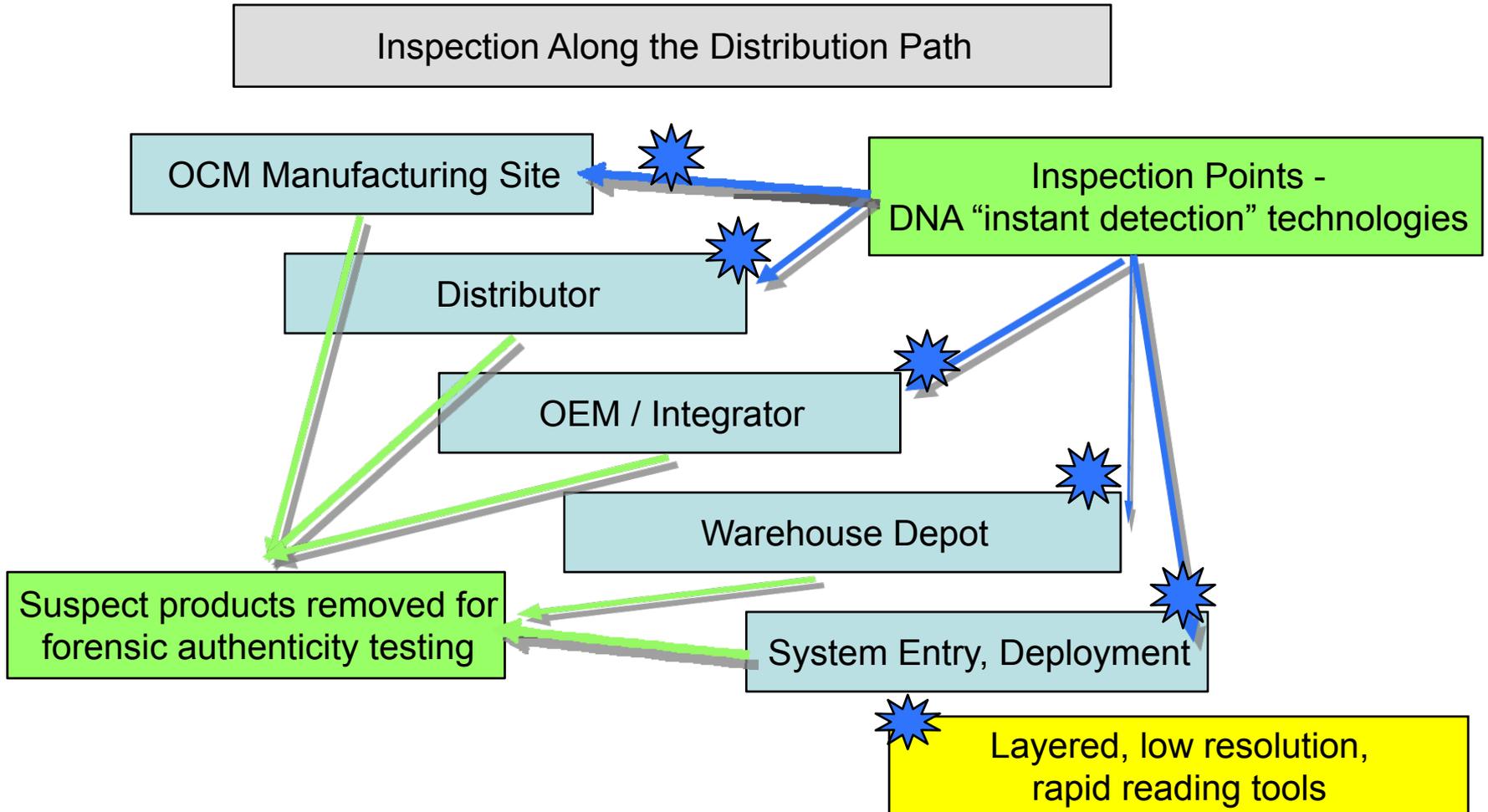
According to the National Electronics Distributors Association, counterfeiting has become a **\$100-billion** problem.

....or grow their Market Share.

....or dominate a Market.

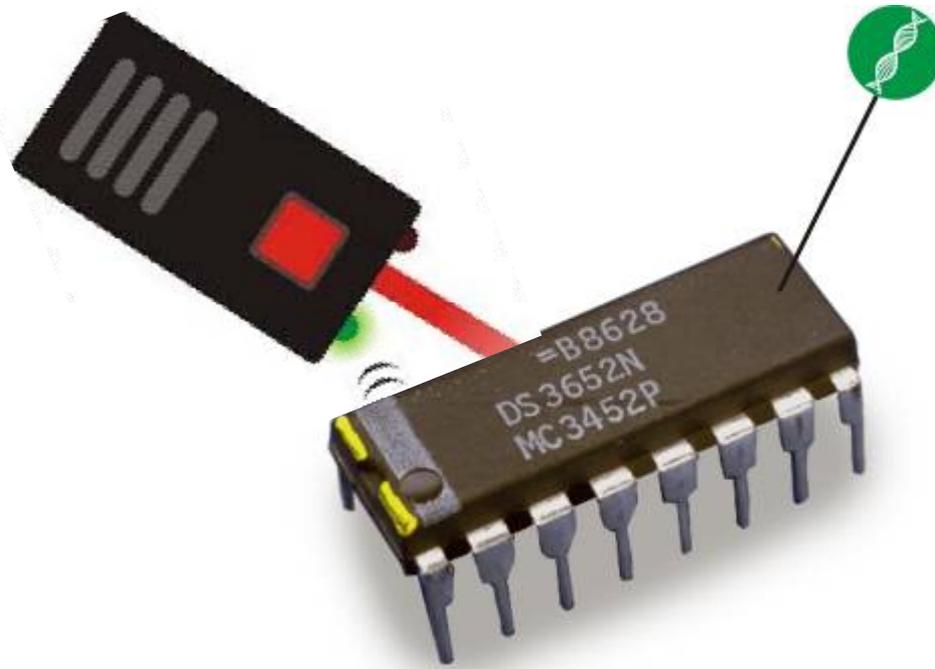


Authenticity Along the Supply Chain



Seamless in the Supply Chain

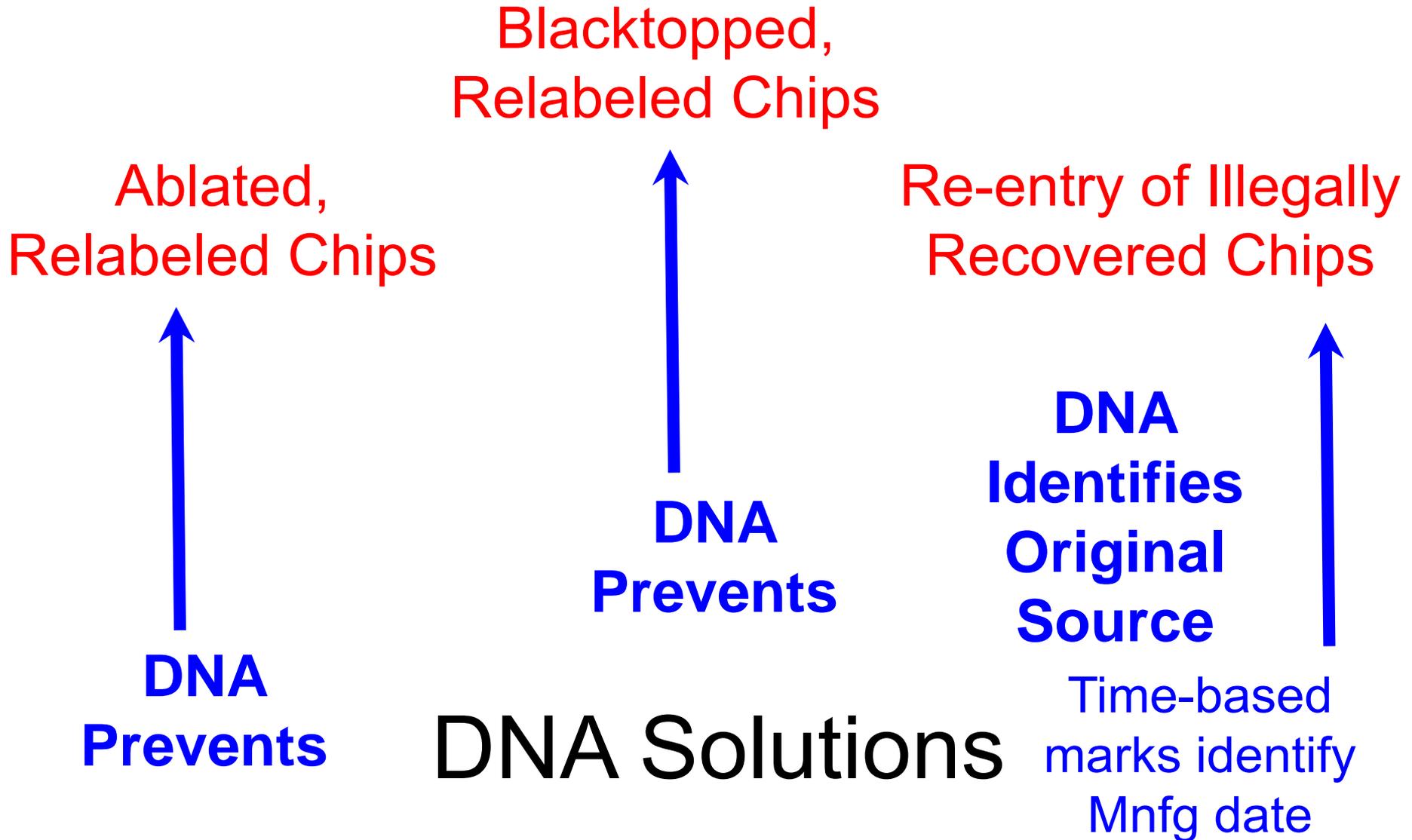
DNA adducts can protect the entire logistical chain



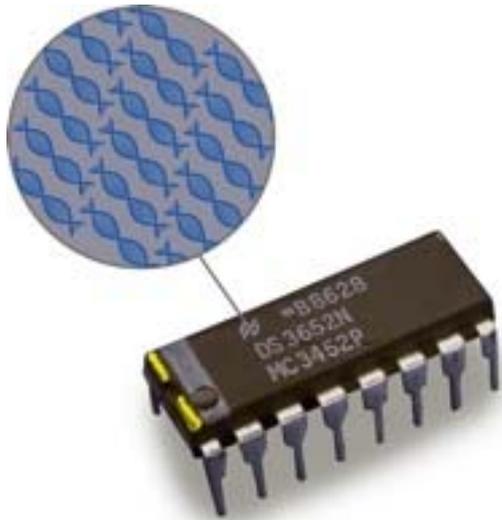
- Microchip with DNA-IR marked epoxy-acrylate ink.
- DNA in a structured, nano-particulate ensemble.

- 1) Manufacturer marks product within existing process.
- 2) Distributor scans with rapid detector.
- 3) OEM/Integrator samples randomly & sends to APDN Lab.
- 4) APDN authenticates forensically and provides audit control reports.

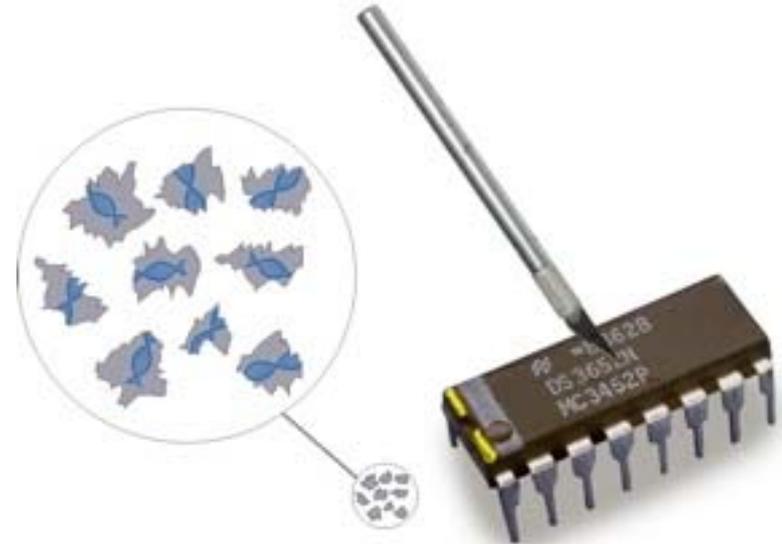
Mechanisms of Counterfeiting



Ablation Would Perturb the DNA and “Un-Mark” the Chip



The DNA is applied to a chip's surface, resulting in the formation of a structured DNA mark.



If the DNA is removed by scraping, the ordered DNA structure becomes perturbed, and the DNA unreadable.

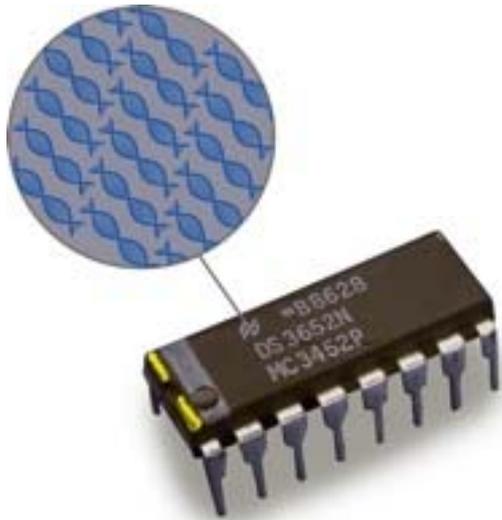
Sand-blast Erasure of Component Markings

DNA destroyed with sandblast

Photos with permission of Tom Sharpe



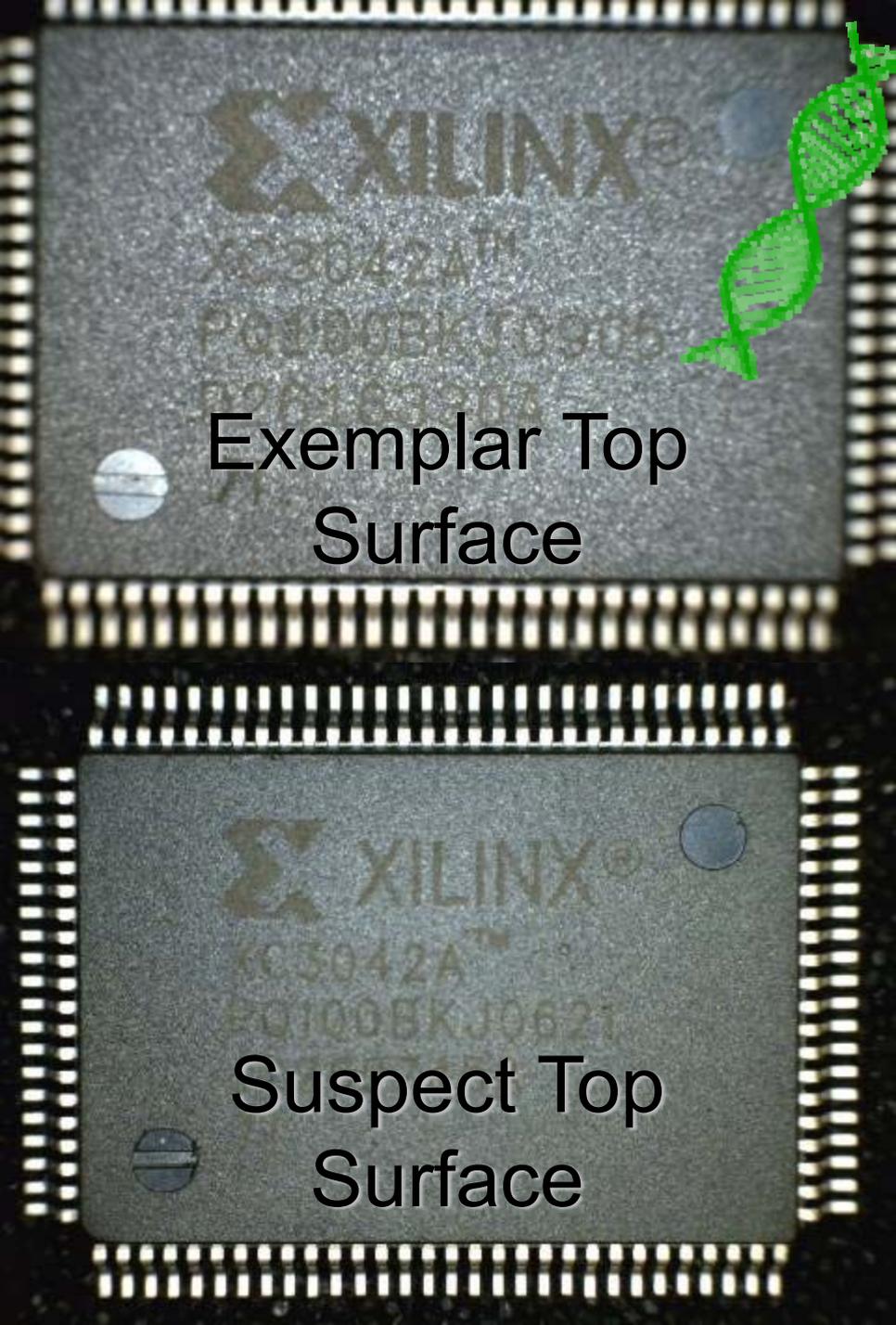
Refurbishing Would Cover the DNA and “Hide” the Mark



The DNA is applied to a chip's surface, allowing for forensic analysis and authentication.



If the DNA is covered by blacktopping, it becomes “unreachable” and no longer authentically marked.



Exemplar Top
Surface

Suspect Top
Surface

Nanoensemble
destroyed in
transfer of
blacktop

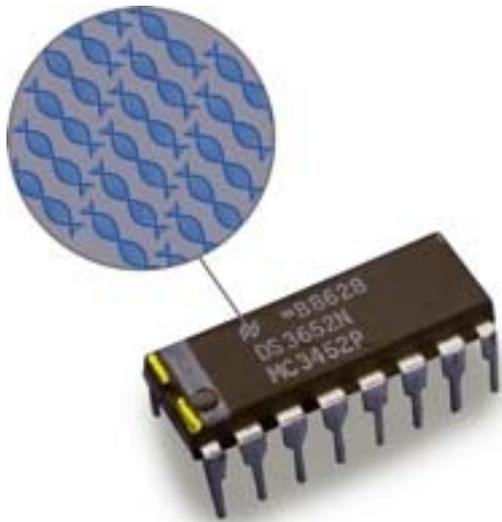
New Blacktop
Resurfacing



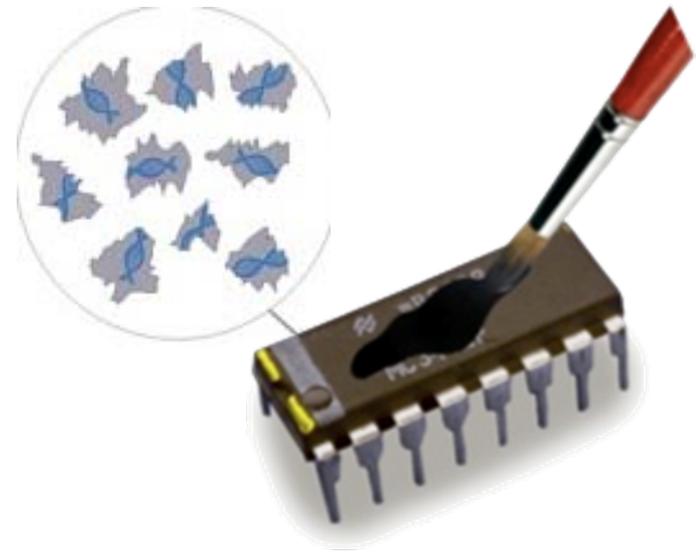
Photos with permission of Tom Sharpe



Reused DNA blacktop can not be authenticated - loss of structure during transfer eliminates detection.



The structured DNA is rendered “chaotic” by all efforts to remove it.



The chaotic DNA can not be detected nor diluted for transfer to rogue.

The Result?

**Every counterfeiting effort
is blocked.**



DNA Tamper-Evident Labels Transform Moisture Barrier Bags into Secure Packages



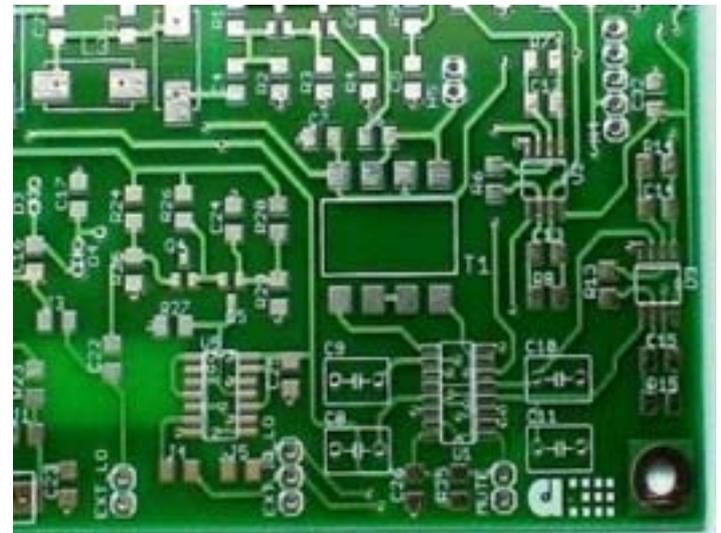
DNA Lettering Glows
Under UV Light



Tamper Evident **VOID**
Will Appear Upon Removing Label

Microchip Marking Vehicles for Printed Circuit Boards

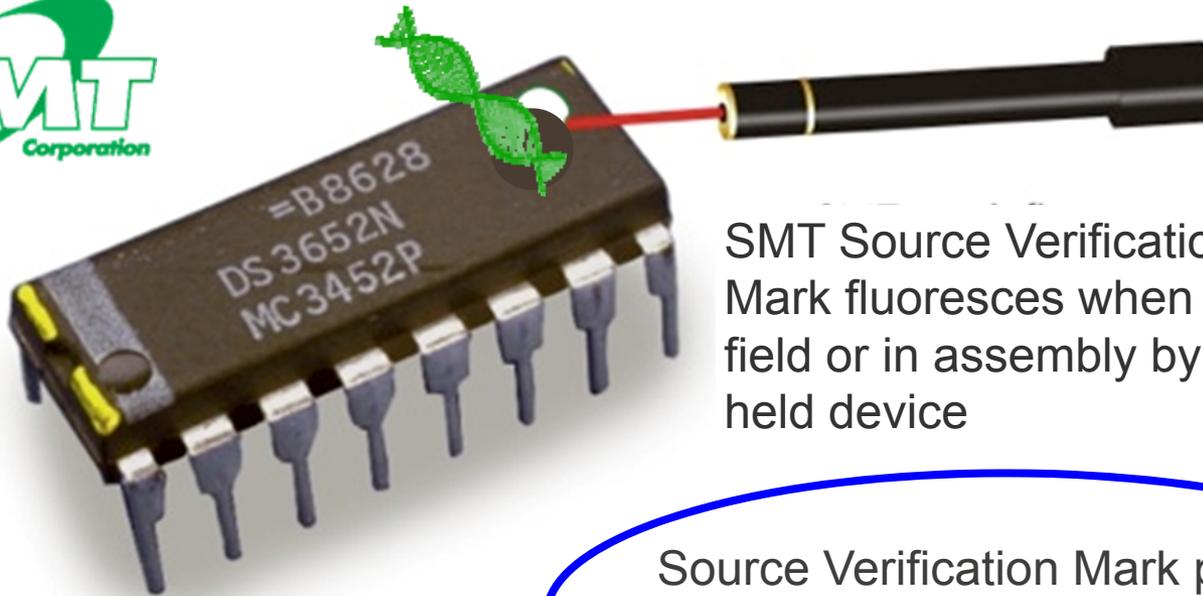
- Conformal coatings
 - Keep dust, water and conductives out
 - Keep DNA-Rapid Reporter in
- Antistatic bags
- Tertiary Carriers, Cartons or Sealed bins



Source Verification DNA for Distributors

(vs Original Authenticity DNA for OCMs)

Source Verification™ DNA for Distributors



SMT Source Verification DNA Mark fluoresces when read in the field or in assembly by a hand-held device

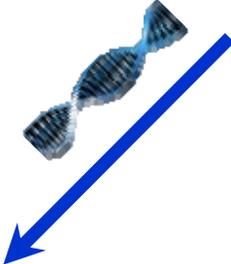
SMT Source Verification DNA Mark fluoresces when read in the field or in assembly by a hand-held device

Source Verification Mark permits trace to a “Trusted” Independent Distributor

Opportunities to Take Action

- Take a Proactive Stand for Absolute Authenticity vs. Suspect Counterfeit Parts
 - ***Prove the Positive!***
- Buy with Confidence to Build with Confidence
 - ***Engage your Supply Chain to DNA Mark Parts with Certificate of Conformance!***
- Participate in the Current Program to DNA Mark
 - ***Early Adopters Enjoy Marketing Benefits!***
- Participate in the G-19 “Marking / Tagging” Working Group being organized by Phil Zulueta
 - ***Have a Say in the Standard!***

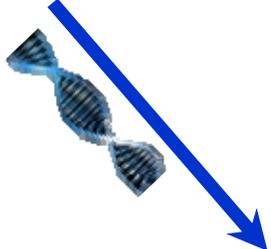
Parts “Branded” with DNA Carry their own Certificate of Conformance



Fasteners



Microchips



Spare Parts

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