Counterfeit Electronic Component Detection & Avoidance
Asking Questions

- Ask questions during the webinar by using the Questions window
- Questions will be addressed at the end of the presentations
- Any question we do not get to will be answered individually by email
- The presentation will be sent to you after the webinar
- Please respond to the survey questions at the end of the webinar
<table>
<thead>
<tr>
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<th>Agenda</th>
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<tbody>
<tr>
<td>1.</td>
<td>SiliconExpert Introduction                                              5 minutes</td>
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<td>2.</td>
<td>Dr. Diganta Das &quot;Counterfeit Electronic Component Detection &amp; Avoidance&quot; 35 minutes</td>
</tr>
<tr>
<td>3.</td>
<td>Jeff Williams- &quot;SiliconExpert &amp; Counterfeit Risk Mitigation&quot;           15 minutes</td>
</tr>
<tr>
<td>4.</td>
<td>Questions &amp; Answers                                                    5 minutes</td>
</tr>
</tbody>
</table>
Jeff Williams
Vice President of Sales
303-932-6304
jwilliams@siliconexpert.com
• Serving Electronic OEMs, Distributors, Manufacturers & Contract Manufacturers

• Our Electronic Component Database of over 250 million components powers our:
  o Comprehensive software tools
  o Integrated solutions
  o Professional services
Reactive vs. Proactive Approaches to Obsolescence Management

250 Million+ Orderable Part Numbers

Up to 42 Parametric values/product line

Risk Analysis & Obsolescence Forecasting Algorithms developed with CALCE

Environmental Data tracked: EU & China RoHS, REACH, WEEE compliance & Material Declarations

Parametrically-derived cross-references for millions of parts
Reactive vs. Proactive Approaches to Obsolescence Management

Today’s Expert Panelist

Dr. Diganta Das
Center for Advanced Life Cycle Engineering, University of Maryland
Counterfeit Electronics

Diganta Das, PhD
Center for Advanced Life Cycle Engineering (CALCE)
University of Maryland, College Park, MD, USA
diganta@umd.edu (www.calce.umd.edu)
What We Plan to Cover in this Webinar

- What we have learned at the CALCE-SMTA counterfeit symposium
- Counterfeiting beyond electronics
- Can we know the extent of counterfeiting; do we need to?
- How ignoring the distributor assessment process is making you more vulnerable?
- Is there an uptick in the prosecution and investigation of counterfeiters?
- Standards relating to counterfeit electronics - will they reduce the counterfeiting risks?
- Can you detect counterfeit risks without comparative inspection? – Role of PCNs.
- Can part authentication tools make a difference?
CALCE Overview

• The Center for Advanced Life Cycle Engineering (CALCE) at the University of Maryland, College Park formally started as an NSF Center of Excellence in electronics systems reliability (1984).
• One of the world’s most advanced and comprehensive testing and failure analysis laboratories.
• Funded by over 150 of the world’s leading companies.
• Supported by about 100 faculty, visiting scientists, research assistants and interns.
• Received NSF innovation award in 2009 and IEEE standards education award in 2013.
What is a Counterfeit Electronic Part?

- A counterfeit electronic part is one whose identity has been deliberately misrepresented.

- Identity of an electronic part includes:
  - Manufacturer,
  - Part number,
  - Date and lot code,
  - Reliability level,
  - Inspection/Testing,
  - Documentation.


The CALCE-SMTA Symposium

• Held June 24-26 at Maryland
  • Sixteen presentations on topics ranging from law enforcement to details of material characterization
  • Two panel discussions on detection techniques and authentication tools
  • Two workshops on June 26
  • Between the technical sessions and exhibition, 125 attendees from 100+ companies from seven countries and 27 US states and territories and DC
• Symposium proceedings available to the attendees, CALCE members and subscribers at http://www.calce.umd.edu/symposiums/SCEPJune2014_presentation.html
Key Learnings from the Speakers AND Attendees

• Firming up of US government (DoD) rules and regulations
  • After periods of discussions and comments, DFAR rules are released and discussed
  • We received a first glance at the rules

• Standards development process through SAE is getting mature and covering more areas

• Special purpose detection technologies and gadgets with promising initial results and they require further evaluation, validation and reporting back to the supply chain

• Attacks on Cyber Physical systems will be of concern and these may be coupled with industrial espionage, access to export control materials and plain cyber security and data breach
Key Learnings from the Speakers AND Attendees

• Examples of more applications of material authentication-enabling technologies

• Built-in authentication methods
  • Utilize the original material and other manufacturing information

• Counterfeit goes beyond electronics and impacts all engineered goods
  • Electrical systems
  • Building material
  • Construction equipment
  • …
Areas of Interest (and Controversy)

• Application of external tagging and “mandates” proved to be the most contentious topic

• Role of government in prevention of counterfeiting – call for release of the names of customers of people prosecuted

• Clones – do we expect a prevalence of those in future OR is that possibility limited by technical development

• Reporting … whether to report and to whom
Counterfeit Nuts and Bolts

- The US Postal services found 20,000 of its nuts and bolts to be counterfeit halfway through the construction of its headquarters.
- The building's cement walls snapped and 100 tons of concrete crashed to the ground during an earthquake.

“Safety Threat Seen: Counterfeits Now Nuts, Bolts Issue” - Gregory Crouch
Date Published: January 27th 1989
Qatar Ministry Seizes Over 15,000 Counterfeit Building Materials
Counterfeit Rolling Bearings
Counterfeit Water Pumps
Imaging Supplies Industry

Xerox raids resulted in the seizure of more than 55,000 boxes of counterfeit consumables and parts for numerous Xerox products

“Xerox Combats Counterfeit Supplies and Parts; Offers Simple Ways to Validate Authenticity” - Xerox Newsroom
Date Published: May 22nd 2013
Counterfeit Medical Devices

“U.S. Customs seized $83M worth of counterfeit medical devices, drugs in 2012” - By Mass Device Staff, January 30th 2013

Counterfeit Vehicle Airbags

“Maricopa man arrested in counterfeit airbags case” - Kyle Daly
Date Published: April 2nd 2014
http://www.inmaricopa.com/Article/2014/04/02/ice-special-agents-serve-search-warrant-at-maricopa-meadows-residence
Fake DuPont Fire Resistant Material

A group of textile manufacturers infringed on Dupont’s trademark rights by distributing Nomex branded garments that did not contain Nomex fibers.
Counterfeit DuPont Plastic Prompts Aston Martin Recall

- The accelerator pedal arm could break due to low quality
- If that occurred, a driver would be unable to maintain speed, increasing risk of a crash
- Aston Martin will now recall 17,590 cars including all left-hand drive models built since November 2007 and all right-hand drive models since May 2012
- Overall this affects 75% of all cars built in that period
The Web of Suppliers to Aston Martin

- The counterfeit was from Shenzen Kexiang Mould Tool Co. Ltd.
- The company used counterfeit DuPont plastic to make accelerator pedal arms
- The company is a third-tier subcontractor and the faulty material was in turn supplied by Synthetic Plastic Raw Material Co.
- Beyond auto parts, the same firm makes parts for the medical, electronics, home appliance and industrial application industries
Counterfeit Parts in Russian MiGs

Algeria cancelled a contract worth $1.3 billion because it found counterfeit parts in their delivery
Counterfeit Network Devices

Network Genesis, a Cisco reseller was accused of knowingly buying counterfeit or stolen products and passing them to customers.
Counterfeit “Electronics”: Batteries
Counterfeit “Electronics”: Wires
Counterfeit “Electronics”: Switch Gear

“CBI Electric – Counterfeit Products?”- Chris Yelland
http://e4electricalknysna.com/cbi-electric-counterfeit-products/
GIDEP (Government Industry Data Exchange Program) Counterfeit Electronic Part Reports
ERAi Counterfeit Part Report Trend (2013)

Reported Parts vs. Semiconductor Sales

- ERAi Total Parts Reported
- Semiconductor Sales (Bln $)

Copyright © 2013, ERAi, Inc. All Rights Reserved.
Obsolescence Incidence by Part Status

ERAI Database Obsolescence Ratios 2001-2013

- 72% Active Parts
- 16.70% Discontinued Parts
- 12.30% Undetermined

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LH0041 - An Obsolete National Semiconductor Operational Amplifier

<table>
<thead>
<tr>
<th>Obsolete Part</th>
<th>Alternate Part or Supplier</th>
<th>Source</th>
<th>Last Time Buy Date</th>
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</thead>
<tbody>
<tr>
<td>LH0041CG</td>
<td>NONE</td>
<td>NONE</td>
<td>03/10/98</td>
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<tr>
<td>LH0041CJ</td>
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<td>LH0041G</td>
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<tr>
<td>LH0041J</td>
<td>NONE</td>
<td>NONE</td>
<td>09/30/93</td>
</tr>
</tbody>
</table>
The Ubiquitous Solicitation

Dear Sir,

How are you? Hope everything is ok in your side!
We want to know would you like to get some components recently? if so, we can check for you and supply you the best price. If not recently, why not add us to your company supplier, it will help you get the service more than you think.

It is important:
One leading distributor and broker in electronic components in China

Many strong lines, as Microchip, Maxim, Altera, FIDI, Fairchild, NXP, ADI, ONS, ETC

Good sources and channels in supplying electronic parts, which are obsolete and hard to find, including active and passive.

For many convenient parts, we can suggest you replacements from reliable Chinese manufacturers so that to cost down.

Any question or requirements, please do not hesitate to contact me. Have a good day!

Thanks & Regards

Martin

ISO 9001:2000
No problem too big No BUSINESS too SMALL
# Attempt for a Distress Purchase

<table>
<thead>
<tr>
<th>Part Number</th>
<th>DC</th>
<th>Description</th>
<th>Supplier</th>
<th>Supplier Name</th>
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<tr>
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<td>CAN</td>
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<td>HK Golden Sun Electronics</td>
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<td>HK Two L Electronics</td>
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<tr>
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<td>CAN12</td>
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<td>Wintrus Technology (HK)</td>
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<td>LRF Components Inc</td>
<td>LRF Components Inc</td>
</tr>
</tbody>
</table>
Suppliers - Do You Know How they Look?

What types of facilities do the distributors have?

• A Google Maps check in 2010 of the addresses of 228 Independent Distributors showed 11% had a residential address.
• Site trips have found residential businesses using commercial mailboxes as a business address.

Web Site Quotes (residential business)

“With over 100 million dollars of available inventory XXXXX is the Solution to your availability crisis.”

“…offers off-the-shelf delivery on literally tens of thousands of electronic components…”

220 manufacturers on the line card

From Fred Schipp, 2010 at CALCE-SMTA Symposium
Global Nature of Electronic Part Supply Chain

Every participant in the supply chain can be a possible source of unauthorized parts and can pass them on. The responsibility is on each “customer” in the supply chain to protect themselves.
Typical Electronics Part Supply Chain

**Authorized supply chain**

**Sources**
- Part manufacturers
- Authorized aftermarket manufacturers

**Authorized distributors**

**Customers**
- Original equipment manufacturers (OEM)
- Contract manufacturers (CM) [board assembly]
  - ...

**Unauthorized supply chain**

**Sources**
- Authorized supply chain
  - Excess inventories
  - Scrapped parts
  - Product overruns
- Recyclers
  - Reclaimed parts
- Package assembly and testing companies
  - Scrapped parts
- Spurious manufacturers

**Counterfeiting**

**Brokers**

**Independent distributors**

**Gray market**

**Counterfeiting**
Proof of Authorization of Distributors

• Part manufacturer’s website
• Part manufacturer documents
• www.ECIAauthorized.com
• http://www.authorizeddirectory.com/
• SIA/Rochester - Electronics Authorized Directory
Every participant in the supply chain can be a possible source of unauthorized parts and pass it on. The responsibility is on each “customer” in the supply chain to protect themselves.
Electronics Part Distributor Assessment Factors

- **Delivery service quality**: Confidence that the orders will be taken and met accurately and timely.
- **Quality control**: Policies and operating procedures that ensure the organization’s quality awareness, quality policies, and procedures for implementation and continuous improvement.
- **Process control**: The activities established by the distributor to maintain part quality and to achieve and maintain service quality.
- **Handling, storage, and shipping controls**: Procedures defined by the distributor to help prevent part deterioration and damage during handling, storage, and shipping.
- **Corrective and preventive actions**: Corrective actions are required whenever nonconformities are identified. Preventative actions are used for continuous improvement and to resolve potential nonconformities.
- **Part traceability**: Part traceability is the ability of the part distributor to trace a part to a manufacturer's incoming lot.
- **Customer support and service**: Ability to respond to and satisfy concerns and queries from customers.
Actions that You Need to Take

• Plan ahead for part obsolescence since that is the primary cause for “distress” purchase
• Your “Distributor” is the organization that you buy parts from
• Assess that source in complete depth without regard to its size, type of business, and what you are buying
• You cannot make this assessment at the point of purchase and need to make that pre-selection ahead of time
• Determine if your distributor is authorized for the specific part that you are purchasing
A Sense of Urgency in the Law Enforcement

- Driven by new legal teeth from DoD and other departments and higher visibility

- Many offices (from DoJ, DoD, DHS, DoE) around the country are showing interest and taking action – for example, an FBI event in Wichita included a half day session on counterfeit electronics in addition to topics such as trade secret theft, ITAR, export control …

- Contact me for help in getting touch with the right people who are leading the efforts
Justice Department Prosecution of VisionTech for Counterfeit Electronic Parts

- VisionTech sold hundreds of thousands of counterfeit electronic parts to the U.S. Navy, defense contractors and others, marketing some of these products as “military-grade”.

- This was the first federal prosecution in a case involving the trafficking of counterfeit integrated circuits.

- The investigation conducted by U.S. Immigration and Customs Enforcements (ICE), Homeland Security Investigations (HIS) and the Naval Criminal Investigative Service (NCIS) together with other agencies, revealed that the company imported counterfeit integrated circuits from China and Hong Kong.

- The Semiconductor Industry Association (SIA), and a number of companies assisted with this case, including STMicroelectronics, Inc., Texas Instruments, Inc. (TI), Analog Devices, Inc., Intel Corporation, National Semiconductor, Inc., ON Semiconductor, Freescale Semiconductor, Inc., BAE Systems Electronic Solutions, and Raytheon Company.
Semiconductor Companies Impacted by VisionTech

VisionTech Facts (Dec 2006 thru Sep 2010)

- Sold $15.8 million in imported integrated circuits involving 3,263 shipments.
- 95% of imported shipments were from one Chinese supplier identified as the primary source for the counterfeit parts sold by VisionTech.
- Approximately 1.1% of imported shipments were detected before delivery to VisionTech.
- Component manufacturer analysis of parts in VisionTech warehouse after the raid estimated at least 70% of the date codes were counterfeit.

Data was extracted from publicly available Department of Justice Criminal Case 10-245 (PLF), released September 9, 2011. Investigation was led by NCIS and ICE investigators, and prosecuted by the U.S. Attorney’s Office in the District of Columbia.
VisionTech Customers

- Listed 1,101 world-wide companies on their customer list.
- Listed 867 U.S. based companies on their customer list.
- The list is practically a Who’s Who of independent distribution.
  - 84% of IDEA members (27 out of 32) – www.idofea.org
  - 44% of ERAI members (215 out of 489) – www.erai.com
Cautionary Tale: Some Parts Involved in the VisionTech Suit

- SMJ 34020AG BM40 (TI): Military Grade graphics system processor DSP (Mil number 5962-9162303)
  - It is an NRND (not recommended for new design) part and available from TI

- JM38510/32502BRA (TI): Octal D-Type Transparent Latches
  - It is an active part and available from TI

- JM38510/11302BRA (Analog Devices): 8-Bit High Speed Multiplying DAC
  - It is a production part available from Analog

- 574ASD/883B (Analog Devices): Not available from Analog or its authorized distributors but available from Rochester Electronics, an Aftermarket supplier

- 624SD/883B (Analog Devices): Not available from Analog or its authorized distributors but available from Rochester Electronics
Prosecution for Counterfeit Part Supply to Navy

- Peter Picone and his companies, Tytronix Inc. and Epic International Electronics, sold $2.5 million worth of counterfeit semiconductors to numerous clients from February 2007 to December 2012.
- His companies imported thousands of semiconductors from companies in China and Hong Kong that refurbished old parts and put markings of OCMs such as National Semiconductor and Motorola.
- Authorities seized nearly 13,000 semiconductors bearing counterfeit markings of at least 35 companies at his home.
Examples of Counterfeit Part Supply

• In one order in 2012, Picone sent 100 counterfeit semiconductors to the submarine base in Groton knowing they were for a contract for a new submarine.

• In another order in 2009, Picone sold 33 counterfeit semiconductors for $68,000 to a defense contractor who was going to send them to the Navy for use in the secondary propulsion system of an active-duty nuclear submarine.

• Picone faces up to 46 months in prison after pleading guilty to selling counterfeit microchips to the US Naval Submarine Base destined for nuclear submarines.
SAE Standards Related to Electronics Counterfeiting

1. OEMS/Users of Electronics: AS5553
2. OEMS/Users of Materiel (other than electronics): AS6174
3. Independent Distributors/Brokers of Electronics: AS6081
4. Authorized Distributors of Electronics: AS6496
5. Test Laboratories of Electronics: AS6171
SAE Aerospace G-19
Counterfeit Electronic Parts Committee

- Chartered in 2007 to address aspects of preventing, detecting, responding to and counteracting the threat of counterfeit electronic components. Participants included:
  - Government
  - Defense/Aerospace manufacturers
  - Industry Groups
  - Testing Laboratories

- April 2009 - SAE International released aerospace standard AS5553, Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition

- August 2009 – United States DoD adopted AS5553

From: Bruce Mahone, SAE International
AS6171: Test Methods Standard | Counterfeit Electronic Parts

- **Purpose**
  - Standardize practices to detect suspect counterfeit electronic parts and to ensure consistency of test techniques and requirements across the supply-chain

- **Target Audience**
  - Independent Testing Facilities Distributors (in-house testing capability)

- **Uses**
  - Definition of Test Methods for counterfeit detection
  - Accreditation
  - Intended to be used for accreditation of Independent Test Laboratories or Distributors (ILAC, through ACLASS, A2LA, etc.)

- **Status**
  - More than half of the sections balloted and approved and rest are either in ballot or getting ready for ballot
Test Methods in SAE 6171

- External visual inspection
- Radiological inspection
- X-ray fluorescence
- Remarketing and resurfacing
- De-lid/ Decapsulation or destructive physical analysis
- Electrical tests
- Acoustic microscopy
- Optical/SEM inspection
- Raman/FTIR/Design Recovery/Other Thermo-mechanical testing and miscellaneous testing

Risk Criteria and sampling plans
Personnel Certification requirements
SAE AS6174 - Counterfeit Materiel

- Developed by SAE G-21 to address the concerns with mechanical equipment and materiel
- Recommended for use by all contracting organizations that procure materiel, whether such materiel
  - Procured directly or,
  - Integrated into assemblies or equipment
- Generic set of requirements
  - Intended to be flowed down to all organizations that procure materiel
- Requires that organization develop a Materiel Authenticity Assurance Plan, shall document processes for
  - Materiel availability planning (life cycle management, obsolescence plans)
  - Purchasing guidelines (supplier whetting, audits)
  - Contract clauses
  - Product tests
  - Plans for risk mitigation, disposition, and reporting
What’s The Difficulty with Inspection after Purchase?

- Purchasing and then inspecting to detect counterfeit parts is sometimes necessary but the process may not be sustainable.
  - Need for part to compare against.
  - Time and costs may outweigh benefits.
  - Part damage during inspection and added handling.
Change Control and Notification for Electronic Parts

- **Change control** is the procedure used by part manufacturers to propose, qualify, approve, and implement changes made to parts.

- **Change notification** is the procedure used by the part manufacturers to notify their customers of changes made to the parts.

- These notifications are underutilized tools in counterfeit avoidance.

Change Notification Standard

The change notification procedures generally used by solid-state manufacturers are outlined in EIA/JEDEC Standard 46-D.

• Any change that affects the form, fit, function, or reliability of a part is considered major, and requires customer notification. Any change that does not affect these factors is considered minor, and does not require notification unless special contractual agreements exist.

• Customers are notified of changes via documents called Product or Process Change Notifications (PCNs).

• Customers should be notified of changes at least 90 days before the proposed first ship date of the product.

## Examples of Major Changes

<table>
<thead>
<tr>
<th>Type of Change</th>
<th>Changes to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wafer Fab</td>
<td>Manufacturing site, process flow, materials, wafer diameter, mask…</td>
</tr>
<tr>
<td>Package Assembly</td>
<td>Assembly site, materials, marking, package style…</td>
</tr>
<tr>
<td>Test</td>
<td>Test elimination, electrical specification, change in AC/DC specification, burn-in change</td>
</tr>
<tr>
<td>Mechanical Specification</td>
<td>Case outline, package tolerances, Packing/Shipping/Labeling, carrier dimensions</td>
</tr>
</tbody>
</table>
Minimum Content of PCNs

- PCN tracking number
- Product identification (e.g., supplier part numbers)
- Customer part number(s) (optional)
- Detailed description of change(s)
- Reason for change(s)
- Method to detect changed product (if applicable)
- Projected (positive or negative) impact on quality or reliability, and any applicable qualification data
- Contact information for supplier representative
Minimum Content of PCNs

- Proposed First Ship Date for change
- Supplier Qualification plan schedule or results (if applicable)
- Date for the qualification samples availability (if required)
- Date for the qualification data availability (if required)
- Last date of manufacture of the unchanged product (if applicable)
- Statement, that device material declaration will be updated due to material change (if applicable)
Material Characterization Based Identification of Counterfeit Components

• The molding compound is often modified for reasons such as RoHS compliance, material property requirement, or material price.

• For each modification of the mold compound, the manufacturer typically issues a process change notice (PCN).

• The key for the detection method is that every part has a different date code and the PCNs are delineated by date code. One is able to identify the mold compound by using part number and date code (as long as the location of assembly is also known).
Material Characterization Based Identification of Counterfeit Components

- Use of the material information and tracking the changes over time provides a definitive method to
  - Time stamp a part
  - Assign a position to the part in a chronological sequence vis-à-vis previous and subsequent versions of the part
Sample EMC Timeline by Part Number
Example – Altera FPGA - EPF6016AFC100-1

- **ASAT Hong Kong**
  - **2000**
  - **introduction**
  - **ASE Malaysia**

- **Shin Etsu**
  - **Nitto HC-100**
  - **2002**

- **Shin Etsu**
  - **Nitto Denko HC-100-XJ**
  - **2005**

- **Nitto**
  - **Sumitomo G 770**
  - **2006**

- **ASE Malaysia and ASE Taiwan**

- **Sumitomo G 770**
  - **Hitachi CEL...**
  - **2008**

- **Amkor Korea and Amkor Philippines**

- **Sumitomo G 770**
  - **Nitto GE-100LFC S**
  - **2008**
Why is a Database Needed?

• We have shown that identification of electronic mold compound and comparison of that with publicly available information on the expected mold compound of the parts can help detect counterfeit.

• However, when a part is being considered for purchase or after a purchase is made, there is not enough time to research the material history of an electronic part.

• Component engineers, test engineers and purchasing professionals need to make fast determination of counterfeit risk and need a reliable decision support system.
Information Needed for Effective Detection

- **EMCs**
  - General information: Manufacturer, Name ...
  - Thermo-physical Properties: Coefficients for thermal expansion, glass transition temperature, Thermal Conductivity ...
  - Material Information: Epoxy, Filler, Hardener ...

- **PCNs**
  - Part manufacturer
  - PCN number
  - Date code of effect
  - Part number(s)
  - ...

- **Parts:** Part number, Part name, Manufacturer ....
Database Use - Illustration

1. Receive Part Sample or Obtain Part Information
2. Identify Part Number and Date Code
3. Query Database
4. Is the date code valid?
   - Y: Find additional information
     - Site of manufacture
     - …
     - Do the information check out?
       - Y: Find epoxy molding compound
       - N: Is the date of Introduction/Discontinuation of EMC valid with part date code?

   - N: High Counterfeit Risk
     - Y: Find epoxy molding compound
     - N: Thermo-physical properties
     - Test methods
Main Tables of the Database

Part Table
- Manufacturer
- Name
- Date of Introduction
- Date of Discontinuation

PCN Table
- PCN Number
- Date Code
- Part (s)
- OLD/NEW EMC

Mold Compound Table
- General Information
- Thermo-physical properties
- Process and Material Information

Test Methods
- Standard
- Equipment
- Sample information
Advanced Search: EMCs by PCN and Date Code

Part Table
- Manufacturer
- Name
- Date of Introduction
- Date of Discontinuation

PCN Table
- PCN Number
- Date Code
- Part(s)

Mold Compound Table
- General Information
- Thermo-physical Properties
- Process and Material Information

Insert Part name and Date code

Search for
- Part
- EMC
- Multi
- Single
- Range

Find all older, current and newer EMCs for the part with regard to the date code
Future Steps with the Database

• Validation of the database
• Population of the database
• Secure use of the database within a company with compartmentalized data
• All suggestions welcome on any of these topics
### PCNs from One OCM: 1996-2012

<table>
<thead>
<tr>
<th>Change Description</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range change</td>
<td>1</td>
</tr>
<tr>
<td>Lead finish</td>
<td>3</td>
</tr>
<tr>
<td>MSL change</td>
<td>6</td>
</tr>
<tr>
<td>Design change</td>
<td>11</td>
</tr>
<tr>
<td>Package material change</td>
<td>14</td>
</tr>
<tr>
<td>Change in marking or date code</td>
<td>15</td>
</tr>
<tr>
<td>Mold compound</td>
<td>21</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>21</td>
</tr>
<tr>
<td>Die revision or addition</td>
<td>27</td>
</tr>
<tr>
<td>Addition or change of Fab facility</td>
<td>33</td>
</tr>
<tr>
<td>Addition or change of assembly/test facility</td>
<td>36</td>
</tr>
</tbody>
</table>
Making Multi-Factor Combinations

- Mold Compound
  - EMC 1
  - EMC 2
  - EMC 3
  - EMC 4

- Substrate Material
  - SM 1
  - SM 2
  - SM 3

- Lead Finish
  - LF 1
  - LF 2

- Marking Font
  - MF 1
  - MF 2

Year (and Week)
Authentication

The act of establishing or confirming an item as authentic. Verify that the claims made about the product are true.

Unit Level Traceability (ULT) Numbers and 2-D Bar-codes on Intel CPU¹


Serialization Based

Bar codes, serialization, RFID

Overt

Holograms, tamper evident seals, logos, visual or handheld reader verification

Forensic

Chemical taggants, DNA inks, handheld readers and laboratory verification

Taggants create codes that serve as product fingerprints.
Serialization Based Authentication Service Providers

- Authentication service providers provide:
  - a method for identifying brand owners’ products through unique serialization,
  - a platform for authenticating their products,
  - and analysis and reporting.

- Requirements for registering and qualifying as an authentication service provider (ASP):
  - Use of code-based security
  - Minimum requirements of code space
  - Security of provider
Taggants Based Authentication

• Taggants is a covert tool for product authentication. Several different taggants are available.

• The taggants are used to create unique code that can serve as a unique fingerprint for a product.

• Examples of taggants include DNA based, polymer based and rare earth material based.

Rare earth mineral based  Polymer based
Roadblocks in Incorporating Authentication Tools

- **Cost justification on OCM side**
  - Incorporating authentication techniques will increase the cost of the parts and cause the ODM to lose competitiveness.

- **Hesitation to adoption by OEMs**
  - OEMs may face reduced number of qualified suppliers.
  - OEMs do not want “across-the-board” adoption.
  - Interoperability.

- **Security within the supply chain**
  - Part authentication data may be compromised by reverse engineering.
What is Needed for Success of these Tools

- Needs to be secure and covert
- Needs to be easily verifiable by end user in the field
- Needs to be quickly verifiable by the end user in the field
- Needs to be low cost
- Needs to be compatible with manufacturing process e.g., pick and place, cleaning, SMT reflow
- Needs to survive for life of the product (and possibly longer)
- Needs to be able to survive end item and product qualification testing
- Needs to be secure from reversed engineering or cloning
- Cannot compromise reliability of the host system
- Anti-tampering features for the higher assembly would an added benefit
Authentication is Much More than just Counterfeit Detection and That is the Key to Supply Chain Acceptance

- Part traceability
- Chain of custody monitoring
- Brand protection
- Avoiding product diversion
- Fraud control
- Warranty management
- Failure cause identification
- ...
Outlook and Concerns About Future

- Shorter procurement cycle of products
- New geographic sources of counterfeit parts
- Counterfeiting of other components related to electronics: e.g., battery, connectors, wires, power modules, solar panels, ... - methods of authentication of such parts by inspection will be different
- Need for material identification for compliance will be necessary due to various laws limiting various materials
- Possible reduced ability to perform inspection with various multilayered and complicated package structures
- New tools being used by semiconductor and passive part packaging companies for inspection and quality control need to be investigated since those will be needed for inspection in future
How to Make Better use of the Crisis?

• Get the organizations (yours and your supply chain partners) to think closely about electronic part selection and management and to adopt best practices (e.g., obsolescence management, supplier evaluation) to reduce reliance on post-purchase actions.

• Tools and methodologies being developed for the counterfeit detection and avoidance should be migrated to improve the overall quality system needed to avoid substandard parts since substandard parts remain a larger concern for possible product failures.

• Start differentiating your products by providing guard against counterfeiting of your products – do not make your goal to only AVOID counterfeit parts to go into it. If your product is in demand, somebody will try to counterfeit it.
Short-Course on Failure Analysis of Electronics
Tuesday, September 16 – Friday, September 19, 2014
University of Maryland, College Park, MD, USA

CALCE and Buehler are jointly offering a four-day course on failure analysis of electronics at the University of Maryland, College Park campus. Over 200 engineers from leading companies and government organizations from around the world have taken this course.

1. Failure analysis techniques
2. Failure mechanisms of electronic products
3. Physics-of-failure and root cause analysis
4. Hands-on laboratory sessions

Course fee: $2500 (20% CALCE Member Discount Applies)
Contact: Bhanu Sood: +1 (301) 405 3498, bpsood@calce.umd.edu
What does CALCE/UMD Offer?

- Training:
  - Supply chain management
  - Part obsolescence risk mitigation
  - Counterfeit detection
  - Intellectual property law
- Inspection and material characterization to help identify risks for specific part lots
- Development of counterfeit parts plan for specific industry segment or company
- Parts management plan including obsolescence management
- Development of unique part and material characterization techniques for specific applications
- Identification of appropriate authentication techniques for specific applications
- Yearly symposium on electronic parts supply chain
- School of Law IPR center as a consulting resource
CALCE Acknowledges its Sponsors and Customers

- Consumer and mobile products
- Telecommunications and computer systems
- Energy systems (generation/storage/distr)
- Industrial systems
- Transportation systems
- Aerospace systems
- Medical systems
- Military systems
- Equipment manufacturers
- Government Labs and Agencies

- Alcatel-Lucent
- Aero Contol Systes
- Agilent Technologies
- American Competitiveness Inst.
- Amkor
- Arbitron
- Arcelik
- ASC Capacitors
- ASE
- Astronautics
- Atlantic Inertial Systems
- AVI-Inc
- Axsys Engineering
- BAE Systems
- Benchmark Electronics
- Boeing
- Branson Ultrasonics
- Brooks Instruments
- Buehler
- Capricorn Pharma
- Cascade Engineering
- Celestical International
- Channel One International
- Cisco Systems, Inc.
- Crane Aerospace & Elec
- Curtiss-Wright Corp
- CDI
- De Brauw Blackstone Westbroek
- Dell Computer Corp.
- DMEA
- Dow Solar
- DRS EW Network Systems, Inc.
- EIT, Inc.
- Embedded Computing & Power
- EMCORE Corporation
- EMC
- EADS - France
- Emerson Advanced Design Ctr
- Emerson Appliance Controls
- Emerson Appliance Solutions
- Emerson Network Power
- Emerson Process Management
- Engent, Inc.
- Ericsson AB
- Motorola
- Mobile Digital Systems, Inc.
- NASA
- National Oilwell Varco
- NAVAIR
- NetApp
- S.C. Johnson Wax
- Sandia National Labs
- SanDisk
- Schlumberger
- Schweitzer Engineering Labs
- Selex-SAS
- Sensors for Medicine and Science
- SiliconExpert
- Silicon Power
- Space Systems Loral
- SolarEdge Technologies
- Starkey Laboratories, Inc
- Sun Microsystems
- Symbol Technologies, Inc
- SymCom
- Team Corp
- Tech Film
- Tekelec
- Teradyne
- The Bergquist Company
- The M&T Company
- The University of Michigan
- Tin Technology Inc.
- TÜBİTAK Space Technologies
- U.K. Ministry of Defence
- U.S. Air Force Research Lab
- U.S. AMSAA
- U.S. ARL
- U.S. Naval Surface Warfare Center
- U.S. Army Picatinny/UTRS
- U.S. Army RDECOM/ARDEC
- Vectron International, LLC
- Vestas Wind System AS
- Virginia Tech
- Weil, Gotshal & Manges LLP
- WesternGeco AS
- Whirlpool Corporation
- WiSpry, Inc.
- Woodward Governor
- Johns Hopkins University
- Keynote Company
- Kimball Electronics
- L-3 Communication Systems
- LaBarge, Inc.
- Lansmont Corporation
- Laird Technologies
- LG, Korea
- Liebert Power and Cooling
- Lockheed Martin Aerospace
- Lutron Electronics
- Maxion Technologies, Inc.
- Microsoft
- Rendell Sales Company
- Research in Motion
- Resin Designs LLC
- RNT, Inc.
- Roadtrack
- Rolls Royce
- Rockwell Automation
- Rockwell Collins
- Saab Avionics
- Samsung Mechtronics
- Samsung Memory
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SiliconExpert Counterfeit Risk Algorithm:

Obsolescence, market shortages & price hikes are key motivational factors for counterfeiters to target a part.
Demo Portion
How SiliconExpert helps with mitigating the effects of counterfeit:
SiliconExpert’s Part Search Tool – GIDEP Alerts
How SiliconExpert helps with mitigating the effects of counterfeits:

SiliconExpert’s Part Search Tool – Results Screen
How SiliconExpert helps with mitigating the effects of counterfeits:
SiliconExpert’s Part Search Tool – Part Markings
How SiliconExpert helps with mitigating the effects of counterfeits: SiliconExpert’s BOM Manager Tool – Authorized Inventory
How SiliconExpert helps with mitigating the effects of counterfeits:
SiliconExpert’s BOM Manager Tool – Setting GIDEP Alerts
Q&A Session

Please fill out the survey at the end of the webinar. Your feedback is greatly appreciated.

For webinar attendees:
Demos of SiliconExpert’s Part Search & BOM Manager tools

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