SigNature DNA Marking Update

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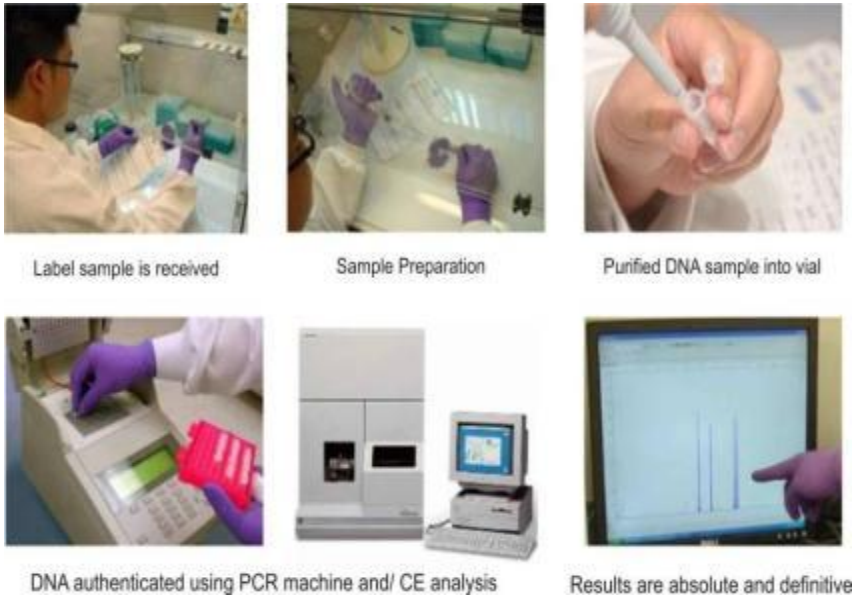
April 2013

In Field Rapid Screening
In Lab Forensic Authentication

Authenticity
Original
Manufacturers



Provenance
All Others

DLA Implementation of SigNature DNA Marking

- Applies to 5962 class items - microcircuits
- July 2012, 18-months of R&D effort completed
- August 2012, DNA mark requirement for all “emulated” microcircuits
- November 2012, DNA marking requirement for all new microcircuit solicitations
- December 2012, decision to reimburse the cost of DNA marking material
- January 2013, procurements limited to trusted sources with DNA marking

Independent Assessment of DNA Technology

Attempted to “defeat” the technology

- Transfer of marking technology onto previously unmarked items
- Perform DNA sequencing of extracted marking to uncover & replicate hidden “keys”
- Zero successes in over 400 attempts

Assess maturity of SigNature® DNA

- Literature search and data review are positive

Future Procurements of FSC 5962
Trusted Sources

- Original Equipment Manufacturers (OEM)
- Original Component Manufacturers (OCM)
- Qualified Manufacturers under QML
- Authorized Distributors
- Qualified Suppliers of QPL Products
- Qualified Suppliers List for Distributors (QSLD) with trace
- Qualified Testing Suppliers List (QTSL)
- SRI Generalized Emulation of Microcircuits (GEM)

DNA Marking Early Adopters

<u>8 Companies Under Contract:</u>

- SRI Generalized Emulation of Microcircuits (GEM)
- Qualified Suppliers List for Distributors (QSLD) with trace
- Qualified Testing Suppliers List (QTSL)

<u>2 Third Party Markers:</u>

- SMT Corp
- Premier Semiconductor Services

DNA Marking Early Adopters

<u>29 In Negotiation:</u>

- Original Equipment Manufacturers (OEM)
- Original Component Manufacturers (OCM)
- Qualified Manufacturers under QML
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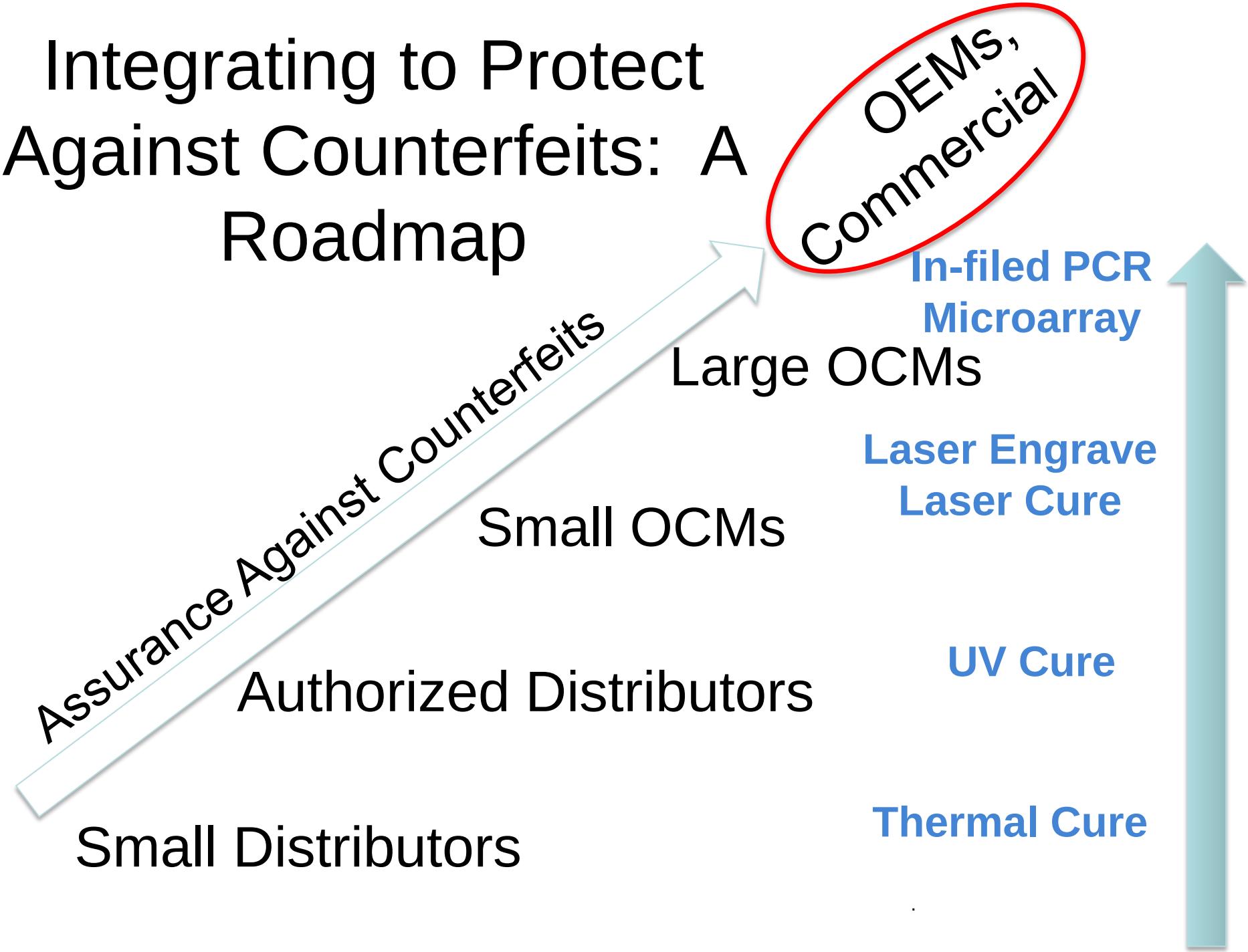
Integrating to Protect Against Counterfeits: A Roadmap



Integrating Scale, Timing and Evolving Methodologies to Service All Manufacturers and Distributors

SC Business Category	Small Distributors 1	Large, Authorized Distributors 2	Small OCMs 3	Large OCMs 4
Scale of daily production	Small batches: 100s or less 1,000s	1,000s 10,000s	10,000s 100,000s	Millions
Type of Epoxy Ink All Milspec All thoroughly tested to Jedec standards	Clear	Clear	White, black or colored	NONE
Type of Cure	Thermal	Thermal/UV	UV	Covalent Coordinated Complex with Existing Package
Type of Print	Hand Small scale Pad Printing	Small Scale PP Large Scale PP	Large Scale PP	Laser Engraving
Source of Service	3rd Party (preferred) In house	3rd Party In house	In house	In house
DNA Carrier	Clear Epoxy Ink	Clear Epoxy Ink	Pigmented Ink	None
Method of DNA Implantation	Ink	Ink	Ink	Plasma Deposition, Laser-Activated Deposition
Type of SigNature DNA Mark	Provenance	Provenance	Authenticity	Authenticity

SigNature® DNA

Entity Contracts with Applied DNA

DLA has developed an approach (CLIN) to subsidize certain SigNature DNA marking costs (e.g., mark creation, DNA-infused ink, etc.) for successful FSC 5962 awardees

In-House DNA Marking

3rd Party DNA Marking House

In-House DNA Marking

Assessment

- Vendor Assessment for QMS
- Risk Assessment Necessary for DNA Marking (Marking, Curing, Storing and Control)

Equipment

- Oven with Fume Hood
- Secure Storage Area

On-Site Training

- DNA Marking Training Manual (SOPs)
- DNA Marking Demo
- Personnel Qualification Process

DNA compliant

OCM
Full Trace
Testing Protocol

Getting Started

- Risk Assessment
- Equipment Evaluation
- On-site Training
- Personnel Qualification
- DIBBS
- Live Component Marking
- Ongoing Program

Third Party DNA Marking House

Assessment

- RICQ, Quote, Agreement

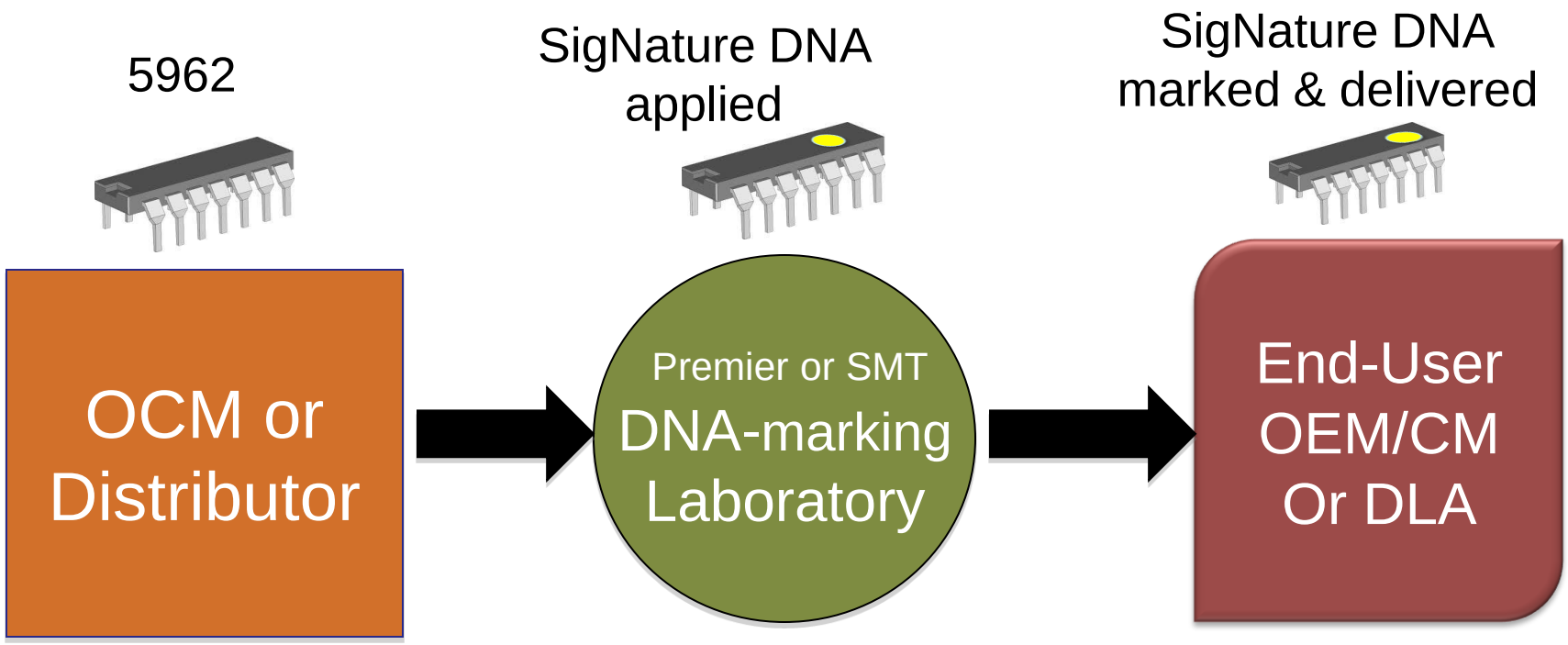
Partner

- Align with SMT Corp
- SMT/APDN Quote 3rd Party Price

DNA compliant

Full Trace
Testing Protocol

Third-Party DNA-Marking



DNA Marking Lab

DNA Marking Lab

Secure DNA-Specific Work Area

DNA Marking Third Party Quote

a) Minimum set up fee per marking shipment of $495.00 (includes First Line Item Documentation Fee - LIDF)

b) Each additional line item (part number) will incur a $125.00 LIDF

c) Below pricing is applied to each individual line item quantity; pricing is not cumulative for multiple line items.

Price Breaks per line item/part number:

1 - 250 components = $0.60/component

251 - 500 @ .50

501 – 1,000 @ .40

1,001 – 5,000 @ .25

5,001 and over @ .20

appliedDNAsciences

Certificate of DNA Analysis

Product Name (Description): M4465 Clear UV Ink with DNA and Rapid Reporters (on printed cured microchips samples and uncured ink)

Client:

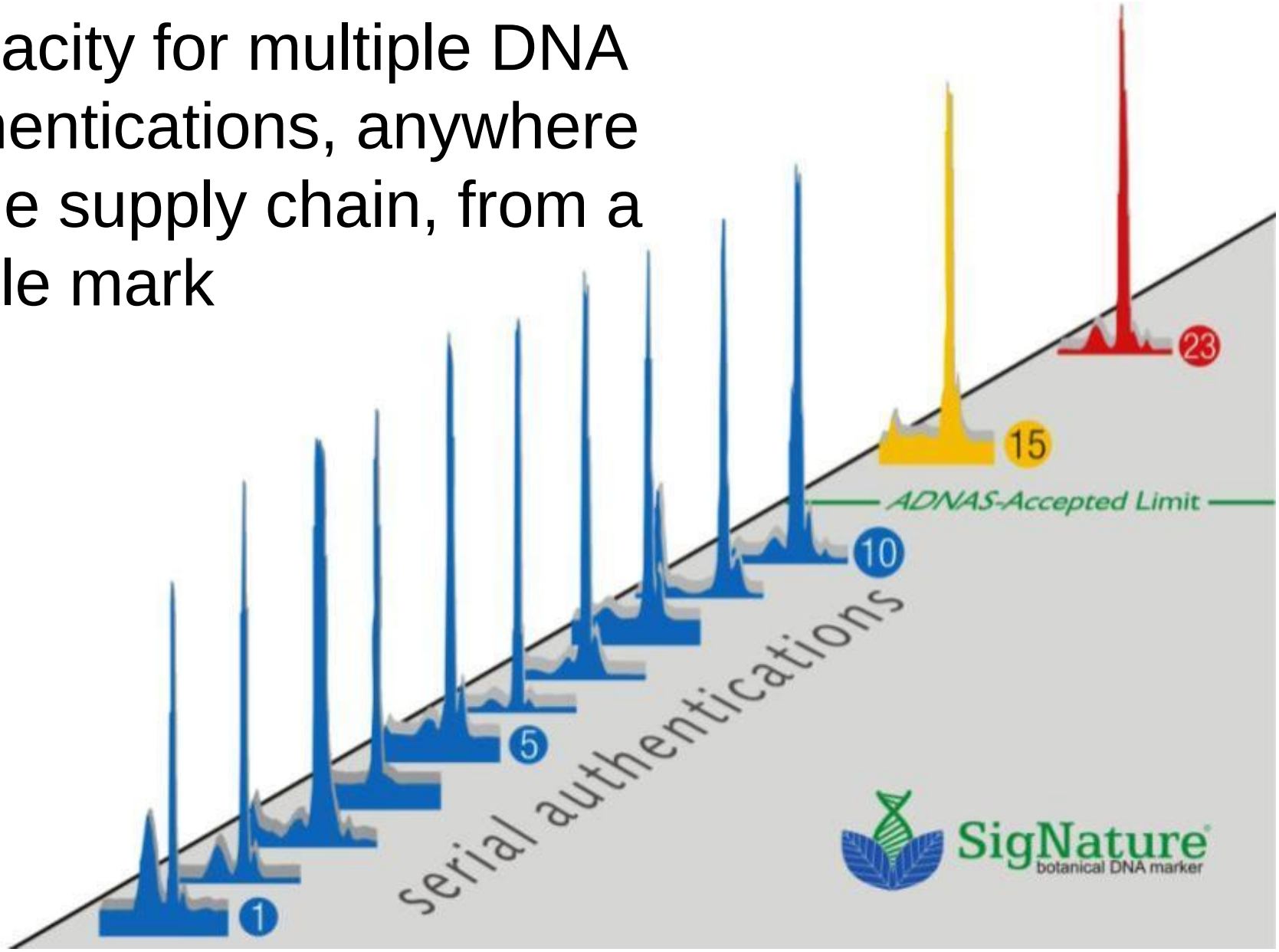
Part Number:

Lot number(s) of vial codes produced:

Manufactured on: 23 Aug 2012

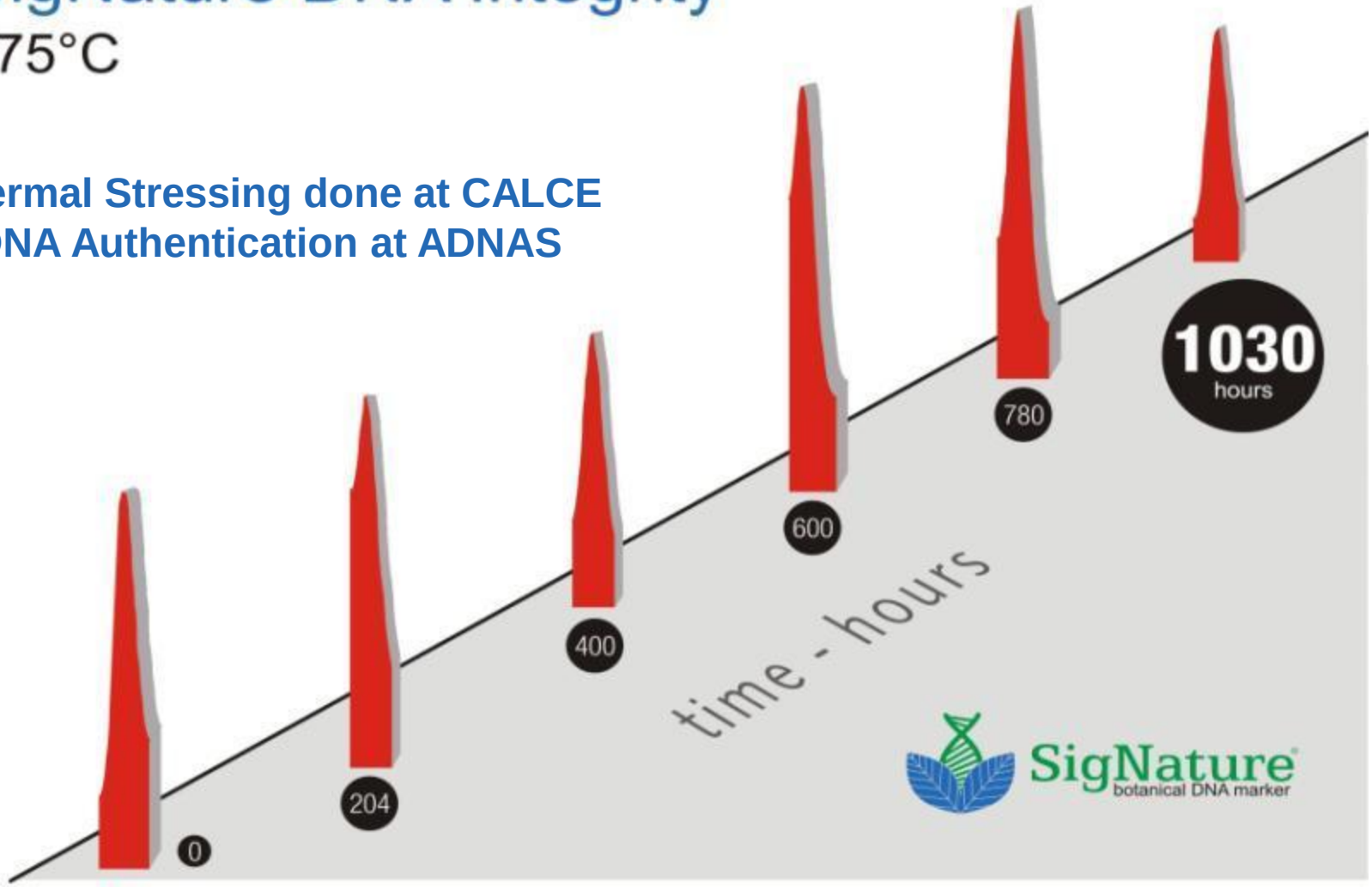
Material Tested	Sample ID	SigNature® DNA Tests	Lab NB Ref	Result
Microchip sample #1	*C120829-001*	*UV/IR Rapid Reporter*	*Authentication Binder #1 – JR591*	*Pass*
		Authentication DNA	*Authentication Binder #1 – JR591*	*Pass*
Microchip sample #2	*C120829-002*	*UV/IR Rapid Reporter*	*Authentication Binder #1 – JR591*	*Pass*
		Authentication DNA	*Authentication Binder #1 – JR591*	*Pass*
Microchip sample #3	*C120829-003a*	*UV/IR Rapid Reporter*	*Authentication Binder #1 – JR591*	*Pass*
		Authentication DNA	*Authentication Binder #1 – JR591*	*Pass*
Microchip sample #4	*C120829-003b*	*UV/IR Rapid Reporter*	*Authentication Binder #1 – JR591*	*Pass*
		Authentication DNA	*Authentication Binder #1 – JR591*	*Pass*
Microchip sample #5	*C120829-004*	*UV/IR Rapid Reporter*	*Authentication Binder #1 – JR591*	*Pass*
		Authentication DNA	*Authentication Binder #1 – JR591*	*Pass*

Capacity for multiple DNA authentications, anywhere in the supply chain, from a single mark



Calce Life Cycle Testing:
SigNature DNA Integrity
175°C

Thermal Stressing done at CALCE
DNA Authentication at ADNAS



MIL-STD-883 TM 1019.7

- Ionizing radiation (total dose) test procedure

RHA level designator	Radiation and total dose (Rads(Si))	DNA SURVIVES
	No RHA	
M	3000	
D	10^4	
P	$3x10^4$	
L	$5x10^4$	
R	10^5	YES
F	$3x10^5$	YES
G	$5x10^5$	YES
H	10^6	YES

- *conducted at Aeroflex-rad

SigNature DNA

Tested on metal, ceramic and epoxy surfaces

- Thermal Cycle*
  - MIL-STD-883 TM 1010**: 100** cycles, -65°C to +150°C
- Thermal Shock*
  - MIL-STD-883 TM 1011: -65°C to +125°C; 15 cycles
- Unbiased HAST*
  - JESD22-A118, 130°C/85% RH; 100 hours
- Cyclic Moisture Resistance*
  - MIL-STD-883 TM 1004 (+25°C - 65°C, -10°C); **100** cycles
- Resistance to Solvents
  - MIL-STD-883 TM 2015

*Conducted by Silicon Cert Laboratories without applied voltage.

SigNature DNA

Tested on metal, ceramic and epoxy surfaces

- Simulated wave solder immerse in solder*; JESD22-B102E, Sn96.5Ag3.0Cu0.5, at 245° C for 5 seconds
- Simulated solder reflow solder*; JESD22-B102E reflow at 260°C
- Ten X-ray exposures*; MIL-STD-883 TM 2012 Radiography
- Salt Atmosphere*; MIL-STD-883 TM 1009 Condition D, 35° C, 240 hours
- Resistance of Insulating Surfaces**ASTM D-257 07 Sample exceeded the measuring capability of the Megaohmeter. Surface Resistivity (Ω/square) is greater than 5.24E+15; SigNature DNA is non-conductive

*Conducted by Silicon Cert Laboratories without applied voltage.
**Conducted by Intertek

SigNature DNA

Tested on metal, ceramic and epoxy surfaces

- Outgas Testing***; ASTM E 595, Vacuum < $5x10^{-5}$ torr – 24hrs @125°C, DNA falls 30-80% below the rejection criteria
- Non nutrient for fungus****; MIL-STD-810G METHOD 508.6: Resistance to Fungus Test; all SigNature® DNA-embedded inks are NEGATIVE in 28 day test

***Conducted by Pacific Testing Laboratories

****Conducted by APDN Laboratories

MSDS

Clear Thermal DNA Embedded Ink w/ Rapid Reporters

Material Safety Data Sheet

Document Number: 105-046.01
Effective: 19-Nov-2012

Section I: Chemical Product and Company Identification

Manufacturer's Name : Applied DNA Sciences, Inc.

Business Address : 25 Health Sciences Drive
Stony Brook, New York 11790-3350
United States of America

Business Phone: 1-631-444-6370
Emergency Phone: 1-631-444-6370
Business Fax: 1-631-444-8848

Chemical Name & Synonyms: Pad Printing Ink

Trade Names & Synonyms: Component marking ink with Rapid Reporters

Chemical Family: UN1210 Printing Ink Related Material
Email: safety@adnas.com

Section II: Composition / Information on Ingredients

Chemical Name	CAS #	Weight %
Cyclohexanone	108-94-1	1 – 5
Trimethyl benzene	25551-13-7	1 – 5
Xylenes (o-, m-, p-isomers)	1330-20-7	1 – 5
Ethyl benzene	100-41-4	0.1 – 1
Pseudocumene	95-63-6	0.1 – 1
1, 3, 5-trimethylbenzene	108-67-8	0.1 – 1
Hexamethylene diisocyanate	822-06-0	0.1 – 1

Percentages may not equal 100% since only hazardous components are listed