



Emerging Green 2015  
September 22, 2015

# Agenda

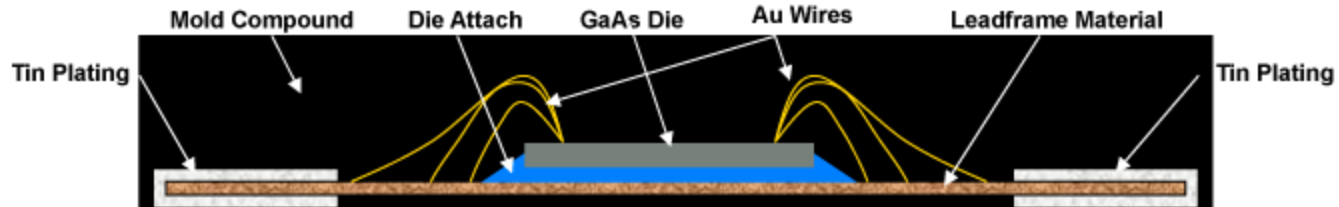
- ❖ What Do We Mean by “Full Material Disclosure”?
- ❖ Why Pursue It?
  - Why NOT?
- ❖ Requirements
- ❖ Tools & Services
- ❖ Challenges & Limitations
- ❖ What Do We Need?

# What Is “Full Material Disclosure” (FMD)?

## ❖ The Answer to the Question

- What is this thing made of, and where are the substances located?
- And when I say “what is this thing made of”, I want to know about *EVERYTHING* it’s comprised of...

### Integrated Circuit Cross Section



Images courtesy TriQuint Semiconductor

# What Does FMD Look Like?

Current Production Information							
<b>TI Part Number</b>		SN74ABT244ADW	<b>Assembly Site</b>		TI MALAYSIA A/T		
<b>Lead/Ball Finish</b>		CU NIPDAU	<b>Package Type / Pins</b>		DW   20		
<b>Planned Lead/Ball Finish</b>			<b>Package Body Size (WxLxH) mm</b>		7.52x12.82x2.35		
<b>MSL / Reflow Ratings</b>		Level-1-260C-UNLIM	<b>Total Device Mass (mg)</b>		564.823281		
Environmental Ratings Information							
<b>Part Number Type</b>		Std	<b>JIG Material Content Compliance</b>				
<b>RoHS &amp; High-Temp Compliant</b>		Y	<b>Green Compliant</b>		Y		
<b>Pb-Free (RoHS) Conversion Date</b>		01-Aug-2003 (DC 0331)	<b>Green Conversion Date</b>		01-Sep-2005 (DC 0536)		
<b>Pb-Free (RoHS) Available Supply Date</b>		15-Sep-2005	<b>Green Available Supply Date</b>		01-Mar-2007		
Component Information							
Component	Substance	CAS Number	Amount (mg)	Homogeneous Material Level		Component Level	
				Percentage %	ppm	Percentage %	ppm
<b>Bond Wire</b>							
Copper and Its Alloys	Iron	7439-89-6	0.000001	0.0005	5	0	0
Magnesium and Its Alloys	Magnesium	7439-95-4	0.000001	0.0005	5	0	0
Other Nonferrous Metals and Alloys	Beryllium	7440-41-7	0.000002	0.0011	10	0	0
Other Nonferrous Metals and Alloys	Calcium	7440-70-2	0.000006	0.0033	32	0	0
Other Nonferrous Metals and Alloys	Yttrium	7440-65-5	0.000006	0.0033	32	0	0
Precious Metals	Gold	7440-57-5	0.18348	99.9891	999891	0.0325	324
Precious Metals	Silver	7440-22-4	0.000004	0.0022	21	0	0
<b>Sub-Total</b>			<b>0.1835</b>	<b>100</b>	<b>1000000</b>	<b>0.0325</b>	<b>324</b>
<b>Die Attach Adhesive</b>							
Precious Metals	Silver	7440-22-4	0.235741	70	699999	0.0417	417
Thermoplastics	Epoxy	85954-11-6	0.101032	30	300000	0.0179	178
<b>Sub-Total</b>			<b>0.336773</b>	<b>100</b>	<b>1000000</b>	<b>0.0596</b>	<b>595</b>
<b>Lead Frame</b>							
Copper and Its Alloys	Copper	7440-50-8	145.72536	97.41	974100	25.8002	258001
Copper and Its Alloys	Iron	7439-89-6	3.5904	2.4	24000	0.6357	6356
Copper and Its Alloys	Phosphorus	7723-14-0	0.04488	0.03	300	0.0079	79
Other Nonferrous Metals and Alloys	Lead	7439-92-1	0.04488	0.03	300	0.0079	79
Other Nonferrous Metals and Alloys	Tin	7440-31-5	0.04488	0.03	300	0.0079	79
Zinc and Its Alloys	Zinc	7440-66-6	0.1496	0.1	1000	0.0265	264
<b>Sub-Total</b>			<b>149.6</b>	<b>100</b>	<b>1000000</b>	<b>26.4862</b>	<b>264858</b>
<b>Lead Frame Plating</b>							
Nickel and Its Alloys	Nickel	7440-02-0	2.561582	95.12	951200	0.4535	4535
Precious Metals	Gold	7440-57-5	0.021005	0.78	7799	0.0037	37
Precious Metals	Palladium	7440-05-3	0.110413	4.1	41000	0.0195	195
<b>Sub-Total</b>			<b>2.693</b>	<b>100</b>	<b>1000000</b>	<b>0.4768</b>	<b>4767</b>
<b>Mold Compound</b>							
Other Inorganic Materials	Fused Silica	60676-86-0, 14464-46-1	312.066543	76	759999	55.2503	552502
Other Organic Materials	Proprietary Non Halide Flame Retardant		14.371486	3.5	35000	2.5444	25444
Other Plastics and Rubber	Carbon Black	1333-86-4	1.231842	0.3	3000	0.2181	2180
Thermoplastics	Epoxy	85954-11-6	82.944002	20.2	201999	14.6849	146849
<b>Sub-Total</b>			<b>410.613873</b>	<b>100</b>	<b>1000000</b>	<b>72.6978</b>	<b>726975</b>
<b>Semiconductor Device</b>							
Ceramics / Glass	Doped Silicon	7440-21-3	1.396135	100	1000000	0.2472	2471
<b>Sub-Total</b>			<b>1.396135</b>	<b>100</b>	<b>1000000</b>	<b>0.2472</b>	<b>2471</b>
<b>Total</b>			<b>564.823281</b>			<b>100</b>	<b>1000000</b>

# Why Pursue it?

- ❖ Stay Ahead of Regulatory and Customer Requirements
  - Immediately know whether/how new or changed requirements impact your products
- ❖ Enables “Beyond Regulation” Capability
  - Identify substances that could present higher risks or costs (business, environmental, social, human health)
  - Gain Competitive Advantage
- ❖ Evaluate, Prioritize, Replace or Redesign to Improve Product Performance (along business, environmental, social or human health axes)

# Why Not Do It?

- ❖ High up-front cost!!
  - Hard to justify! Flies in the face of normal corporate short-term focus/rewarding “saving the day” vs. “prevention”
- ❖ Requires Planning, Systems, Tools, Management, Budget
  - But so does asking your suppliers every few months to update their Certificates of Compliance for you
  - FMD is far more data-intensive, and requires a sophisticated software database for implementation vs. a Yes/No approach
    - May also find that it requires the use of 3<sup>rd</sup> party services
- ❖ Today, more and more manufacturers are collecting FMD, but it’s (still) not easy or rote
  - Every implementation is still custom

# Requirements

- ❖ Extensive planning
- ❖ Management Support + Adequate Budget & Staffing
- ❖ Business Processes that enable and require its implementation, use and impact
  - In Product Development, Supply Base Management, Legal, Quality, etc.
  - Supplier FMD Capability and Quality must be measured/reported/acted upon
- ❖ Tools and systems that support collection, management, sophisticated analysis and reporting of material composition information for articles

# Tools & Services: How Will You Implement?

- ❖ Outside service?
  - For what part of the process?
  - Trusted Third Party Data Firewall?
    - Will your suppliers be more willing to provide FMD to a 3<sup>rd</sup> party?
- ❖ What Data Formats will you accept? Why?
  - IPC/IEC Data formats don't allow ranges to be specified
- ❖ How will you validate data?
  - What Business Rules will be necessary?
  - IPC/IEC Data formats don't include self-checks/validation
- ❖ How will you train/educate/on-board suppliers?
- ❖ What database management system(s) meet your requirements?
  - Internally or externally hosted? Is IT on-board?



# Challenges & Limitations

- ❖ Supplier Knowledge & Capability
- ❖ Internal Knowledge & Capability
  - And resources
- ❖ Supplier Resistance
  - Intellectual Property
  - “You’re not a strategic customer”
- ❖ Lack of universally accepted standards
  - Despite IPC 1752A & IEC 62474 Material Declaration Standards, all the large OEMs still have their own forms/formats/data requirements (but some will accept these standard forms)
  - A case of “Oh but our needs are different” (just like everyone else)?
  - There are no cross-industry standards
- ❖ Intestinal Fortitude = Management Backing
  - Are you really going to disqualify suppliers because they won’t provide FMD?

# What Do We Need?

- ❖ Broad Industry Agreement – up and down the supply chain – on the fundamental need for FMD
- ❖ An adequate and meaningful way to deal with intellectual property
  - This would require at least one new standard
- ❖ Standards for substance declaration that are comprehensive enough for cross-industry use: cross-industry cooperation
  - The EEE supply base is not limited just to EEE customers...
  - Many industries need the same data but think they're unique
- ❖ Broad adoption of cost-effective software and tools: reduction in manual effort/errors

# Thank You For Your Attention

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# About DCA

- ❖ Manufacturing Consulting firm
  - Focus on Discrete/Fabricated “Article” Manufacturers
  - Based in San Francisco, CA
- ❖ Focus 1: Strategies/Tactics for Compliance with Product-Targeted Environmental Regulation & Customer Requirements
  - Substance compliance, Recycling, Energy Use, Conflict Minerals, Carbon/GHG, NGOs
  - EU, China, USA, Canada, Korea, Japan, etc.
  - A&D, Industrial and Commercial, Consumer Electronics, Medical, Apparel, Agriculture, Construction, etc.
- ❖ Focus 2: Supplier/Component/Technology Selection, Management, & Integrity
  - Product development business processes that improve engineering efficiency and mitigate many supply chain problems
- ❖ See [www.DesignChainAssociates.com](http://www.DesignChainAssociates.com)

# Mike's Background

20 years in manufacturing companies, in product development and quality/reliability roles:



INTERGRAPH

intel®



COMPAQ

15 years in consultancies



- ❖ Co-Moderator: ANSI Chemicals Network
- ❖ Initial Member of California EPA DTSC Green Ribbon Science Panel: 2009-2013
- ❖ Member of American Chemical Society Green Chemistry Institute Advisory Board: 2014-current