Fiber Optics Products Division

RoHS Compliance Program Overview

May 2006

Agenda

- RoHS Overview
- Assurance of Compliance
- Product Introduction & Obsolescence Plan
- Rollout Schedule
- For More Information

RoHS Introduction & Background

Restriction of Use of Certain Hazardous Substances in Electrical & Electronic Equipment

- European Union Directive Passed on January 27th 2003 Comes Into Effect on July 1st, 2006
- Covers All Electronic Equipment Sold in & Into Europe
- Bans Six Substances
  - Lead, Mercury, Cadmium
  - Hexavalent Chromium
  - Polybrominated Biphenyls (PBB)
  - Polybrominated Diphenyl Ethers (PBDE)
- Eliminates Harmful Substances at the Source

Heavily Based on Waste Electrical & Equipment (WEEE) Directive

- WEEE Aims to Reduce Harmful Materials From Landfills by Designing Products That Can Be Re-used & Re-cycled

RoHS Compliant Requires A Change In Thinking

Lead Has Long Been Identified As a Harmful Substance in the Environment

- Lead Does Not Biodegrade or Decay
- Deposition in Soil Becomes a Long Term Source of Exposure for Causing Adverse Health Effects
- Lead Considered One of Top 17 Most Toxic Substances

Dealing With Growing Number of Waste Electronic Products Has Become Urgent

- Over 63 Million Computers Junked in 2003

Requires That Manufacturers of Electronic Equipment Design for the Environment (DFE)

- Lead-free Becomes Part of the Design Process, Not an Afterthought

What Does It Mean To Be RoHS Compliant?

Lead-free Defined by JEDEC – J – STD – 006A

- Considered Lead Free When None of Their Components or Raw Materials Contain Lead That Is Intentionally Added
- Or Must Not Contain More Than 0.1% of Incidental Lead Impurities by Weight in Homogenous Materials

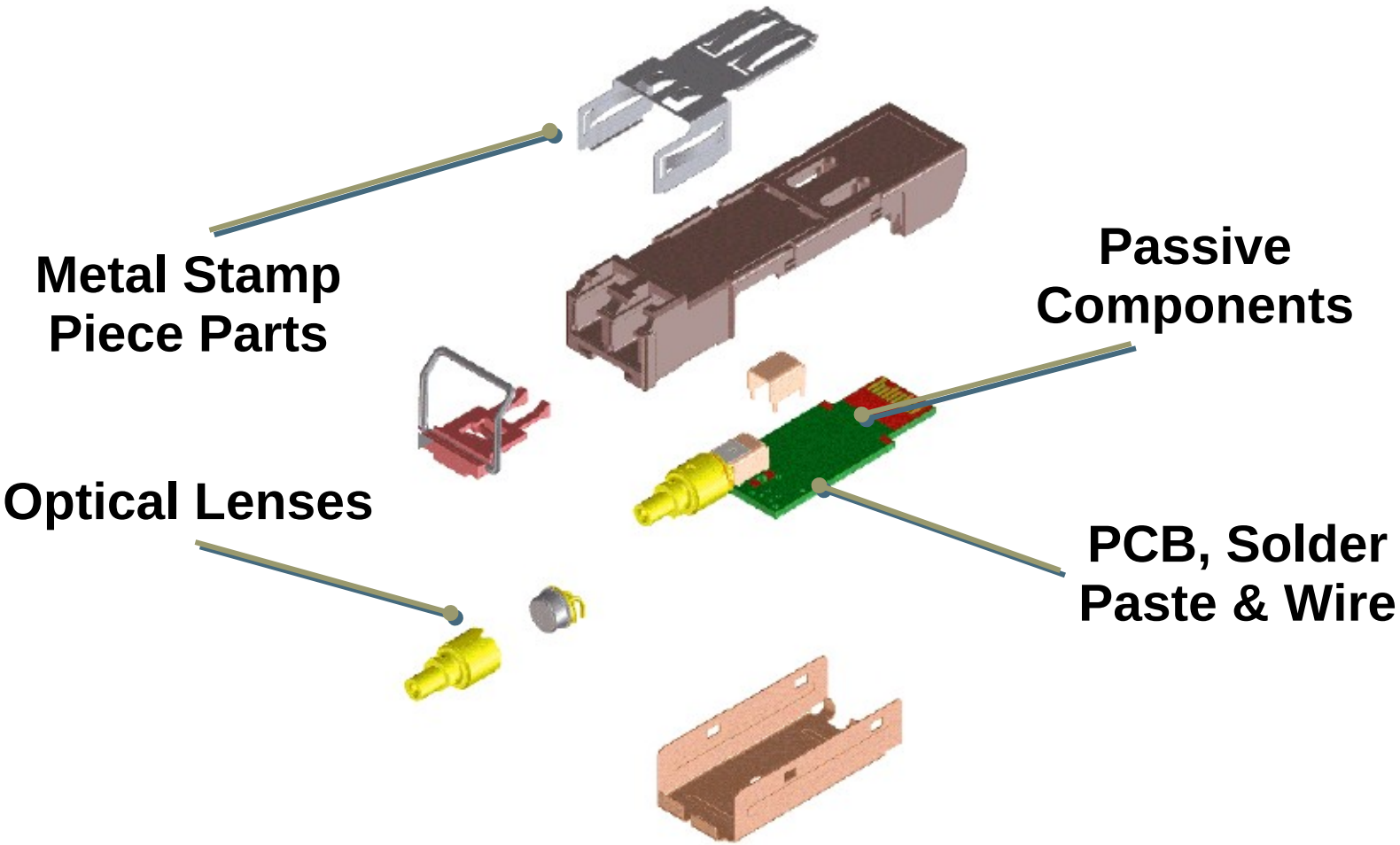
Optical Transceivers & RoHS: Lead-free

RoHS

Mercury **Cadmium** **Lead** **Hexavalent Chromium** **PBB** **PBDE**

For Optical Transceivers…
RoHS Compliant = Lead-free

Lead In Optical Transceivers



RoHS Directive Exemptions

RoHS Exemptions Are Currently Applied to

- Lead in Solders for Network Infrastructure Equipment
- Lead in High Melting Temperature Type Solders - 85% Lead
- Lead in Solders for Servers, Storage and Storage Array Systems (Exemption Granted Until 2010)
- Flip Chip Technology
- Lead in Glass of Electronic Component (Optical Glass)

RoHS Compliant Strategy

Avago will be the first fiber optics company to roll out RoHS compliant products

- Matured FE/GigE high runners May 2005 AVAILABLE NOW
- Industrial and Legacy high runners Feb 2006

Price

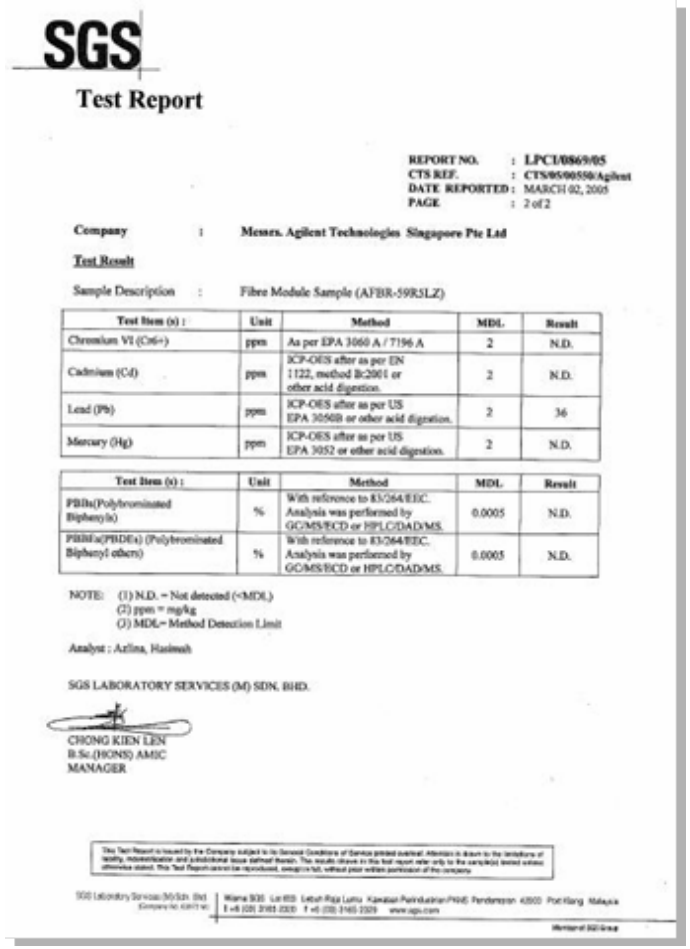
- BEST PRICES will be on the RoHS Devices

Avago's Advantages

- Wide range of RoHS compliance products by Feb 06
- Significantly ahead of the 1st Jul 06 statutory RoHS requirement
- No issues with regards to backward compatibility
- Opportunity for design wins due to Customer change to ROHS platform

Assurance Of Compliance

- Avago Technologies Will Conduct Full Chemical Composition Analysis at External Lab
  - Each Piece Part Will Be Dissected to Determine Lead Content
- Report of Certification of RoHS Compliance Will Be Made Available to Customers



SGS

Test Report

REPORT NO. : LPCI/0869/05
CTS REF. : CTS/0500550/Agilent
DATE REPORTED : MARCH 02, 2005
PAGE : 2 of 2

Company : Messrs. Agilent Technologies Singapore Pte Ltd

Test Result

Sample Description : Fibre Module Sample (AFBR-59R5LZ)

Test Item (s) :	Unit	Method	MDL	Result
Chromium VI (Cr6+)	ppm	As per EPA 3060 A / 7196 A	2	N.D.
Cadmium (Cd)	ppm	ICP-OES after as per EN 1122, method B:2001 or other acid digestion.	2	N.D.
Lead (Pb)	ppm	ICP-OES after as per US EPA 3050B or other acid digestion.	2	36
Mercury (Hg)	ppm	ICP-OES after as per US EPA 3052 or other acid digestion.	2	N.D.

Test Item (s) :	Unit	Method	MDL	Result
PBBs(Polybrominated Biphenyls)	%	With reference to IEC 62321:2008, Analysis was performed by GC/MS/ECD or HPLC/DAD/MS.	0.0005	N.D.
PBBEs(PBDEs) (Polybrominated Biphenyl ethers)	%	With reference to IEC 62321:2008, Analysis was performed by GC/MS/ECD or HPLC/DAD/MS.	0.0005	N.D.

NOTE: (1) N.D. = Not detected (<MDL)
(2) ppm = mg/kg
(3) MDL= Method Detection Limit

Analyst : Azlina, Hasimah

SGS LABORATORY SERVICES (M) SDN. BHD.

CHONG KIEN LEN
B.Sc.(HONS) AMSC
MANAGER

All Platforms Will Be Rigorously Tested

Qualification Tests	
High Temperature Operating Life (HTOL)	Optical Cable Insertion
Temperature Cycling	Pre Conditioning
Low Temperature Storage	Mechanical Shock Vibration
Biased Cyclic Moisture Resistance	Solderability
Biased Damp Heat	Reliability Stress Test
Extraction /Insertion	Tin Whiskering

Product Introduction Plan

- All RoHS-Compliant Products Introduced Via NPI Process
- RoHS-Compliant Support Material Will Be Made Available With Samples
  - New Datasheets
  - Qualification and Reliability Reports
  - RoHS-Compliance Certification (SGS Reports)
  - UL, CDRH, TUV Safety Certificates
  - Part Number Cross reference information on last time buy, last time ship
- Avago Recommends Paper Qual Whenever Possible
  - No Change in Performance and Reliability
  - Supporting Data Will Validate Quality and Reliability
  - No Issues with Regards to Solderability or Backward Compatibility

Product Numbering Scheme

All RoHS-Compliant Products Will Have a "Z" Suffix

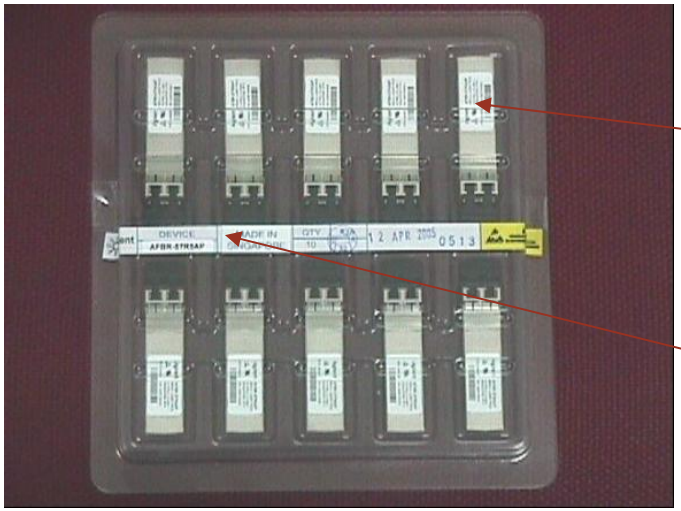
Redesigned or New Part Numbers

- Standard Part Numbers: Change "H" to "A" and add "Z" (HFBR-5903 → AFBR-5903Z)
- Custom Part Numbers: Change "Q" to "S" and add "Z" (QFCT-5686 → SFCT-5686Z)

Non-redesigned Part Numbers, strictly RoHS conversion

- Standard Part Numbers: Just add "Z" (HFCT-5911ATL → HFCT-5911ATLZ)
- Custom Part Numbers: Just add "Z" (QFBR-T261 → QFBR-T261Z)

RoHS Product Labeling and Packaging



Pb-free module product label includes the Part Number (with suffix “Z”)

Tray label includes device number of Pb-free modules (with suffix “Z”)

Outer ESD Bag “Pb-free” text

Obsolescence Of Existing Platforms

- All Existing Platforms Will Be Obsolete Per Attached Schedule
  - FOPD Will Support Both Non-RoHS & RoHS-Compliant Parts During Transition
- Any Product Obsolescence of Existing Products Will Be Published As They Occur
  - Will Adhere to Existing Obsolescence Guidelines

Actions Required

- For Phase 1 RoHS parts market released in FY05
  - Convert existing parts to RoHS parts immediately, LTB in 1st Apr06
- RoHS parts market released in FY06
  - Look out for upcoming obsolescence plan for the existing leaded fiber products
  - Use RoHS compliant parts for new design in / replacement opportunities
- Contact your local Avago Field Sales Engineer for more information or samples