ChipTest Engineering Limited
an IC Test Company

Corporate Presentation
Agenda

1. Introduction
2. Business Units
3. Customers
4. Quality
5. Team
6. Logistics
7. USP
Introduction

- Semiconductor IC Test Company founded in 2005
- Product Test Engineering & Application Support Services
- Semiconductor Hardware Products & Embedded Solutions
- Focus on servicing global Semiconductor Companies
- Headquarters & Operations in Chennai, India.
- Training Academy - AlphaOmega Institute for Semiconductors
Vision

Consistently excel in Semiconductor Test Solutions for global IC & ATE Customers

Mission

Exceed the fast emerging needs of our Customers by:

- Accelerating time-to-market thru continuous Innovation & high Quality
- Providing unparalleled Service that is Versatile & Cost-effective
Values

1. Business Ethics - defines us as a Company
2. Professionalism - defines us as Individuals
3. Citizenship - defines our Contribution to Society

Corporate Objectives

1. Profit - earnings that enable achieving our other 4 Objectives
2. Client Satisfaction
3. Competence
4. Employee Satisfaction
5. Growth
Business Units

1. Test Services
   a. Products
   b. Tester Platforms
   c. Capabilities
   d. Key Highlights

2. Hardware Products

3. Embedded Solutions

4. Allied Services

(Details on each BU follows)
1. Test Plan Derivation
2. Hardware load board and DUT board design & fabrication
3. Test program generation
4. Test program debugging & correlation
5. Product characterization
6. Test time optimization
7. Wafer Sort Verification & Testing
8. Final Device Testing using developed set-up
1. Test Services

Road Map

<table>
<thead>
<tr>
<th>Product / Year</th>
<th>Existing</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-End RF</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>High-End Mixed Signal</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>High-End Digital</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-End Mixed Signal</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Low-end Mixed Signal & Power Products Capabilities since 1996*
1. Test Services

Products

- High Speed Digital Logic & SoC Devices
- Clock Drivers, Buffers, PLL & VCO
- Power Management Devices
- Mixed Signal ASIC Products
- Integrated Passive Devices (R, RC & RCD Networks)
- Industrial Analog Devices
- Audio, Video & Telecom ICs
1. Test Services

Platforms

Existing

- Verigy 93k Pin Scale Digital Test System
- Advantest T6573 SoC Test System
- Teradyne ETS 364 Mixed Signal Test System
- Credence ASL 1K Mixed Signal Test System

Proposed

- High End Mixed Signal Test System
- RF Test System
## 1. Test Services

**Teradyne ETS 364**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max I/O channels</td>
<td>64</td>
</tr>
<tr>
<td>Max Vector Rate</td>
<td>133 MVPS</td>
</tr>
<tr>
<td>Max Vector Depth</td>
<td>8 M</td>
</tr>
<tr>
<td>Memory Capture</td>
<td>1 M</td>
</tr>
<tr>
<td>Fail Memory Depth</td>
<td>8 K</td>
</tr>
<tr>
<td>Serial Mode</td>
<td>8 M, 16 M, 32 M</td>
</tr>
<tr>
<td>Driver Level</td>
<td>-1.0 to 7.0 V; 16 Bit</td>
</tr>
<tr>
<td>Current Range</td>
<td>32 mA</td>
</tr>
<tr>
<td>Driver Slew Rate</td>
<td>2 V / nS</td>
</tr>
<tr>
<td>Min. Pulse Width</td>
<td>4 nS</td>
</tr>
<tr>
<td>Formats Supported</td>
<td>NR, RO, RZ, CS, ZS, CPS, CPE, KN, KT</td>
</tr>
<tr>
<td>Receive Bandwidth</td>
<td>&gt; 150 MHz</td>
</tr>
<tr>
<td>Time Sets</td>
<td>4 Unidirectional Per Pin</td>
</tr>
<tr>
<td>Timing Resolution</td>
<td>&lt; 100 pS</td>
</tr>
<tr>
<td>Skew</td>
<td>&lt; 250 pS</td>
</tr>
</tbody>
</table>
# 1. Test Services

## Teradyne ETS 364 (Contd…)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Resolution</th>
<th>Range</th>
<th>Channels</th>
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<tbody>
<tr>
<td><strong>Voltage Force</strong></td>
<td>16 Bit</td>
<td>± 10, 30 V</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>± 100 V</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>18 Bit</td>
<td>± 10, 30, 100 V</td>
<td>4</td>
</tr>
<tr>
<td><strong>Current Force</strong></td>
<td>16 Bit</td>
<td>± 10, 100 uA; ± 1, 10, 100 mA</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>± 1, 2, 20, 200 uA; ± 2, 20, 200 mA; ± 1, 2, 40 A</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>18 Bit</td>
<td>± 1, 2, 10, 20, 100, 200 uA; ± 1, 2, 10, 20, 100, 200, 500 mA; ± 1, 2 A</td>
<td>4</td>
</tr>
<tr>
<td><strong>Voltage Measure</strong></td>
<td>16 Bit</td>
<td>± 10, 30 V</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>± 100 V</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>18 Bit</td>
<td>± 0.5, 1, 2, 5, 10, 20, 30, 50, 100, 200 V</td>
<td>4</td>
</tr>
<tr>
<td><strong>Current Measure</strong></td>
<td>16 Bit</td>
<td>± 1, 2, 20, 200 uA; ± 2, 20, 200 mA; ± 1, 2 A</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>± 500 mA</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>± 40 A</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>± 10, 100 uA; ± 1, 10, 100 mA; ± 1, 2 A</td>
<td>21</td>
</tr>
</tbody>
</table>
1. Test Services
ETS 364 Capabilities

- High Voltage & Current Handling: ± 100V, 40 A
- Per Pin Digital Architecture with On-Board DSP
- Time Measurement Unit with 5 pS Resolution
- High Precision Voltage Digitizer: 4 uV Resolution, 4 MHz BW
- High Speed Digitizer: 4 GSPS, 1 GHz BW
- Programmable Low Jitter Clock Source: 10 MHz to 1 GHz
- Programmable V/I Waveform Generator in each Analog Channel
- Robust math & data analysis Library
- True Parallel Multi-site Testing possible
1. Test Services
Advantest Capabilities

- Trained Engineering Manpower in 93K & T2K SoC systems
- Offline System with HpSmarTest for program development
- Vector Conversion Tools for wgl, stil & vcd patterns
- ATE with 128 Channel PS400 & MSDPS Resources
- Onsite Consultation & Engineering Assistance
- Closely Associated Partner for High End ATE Needs
- Mixed Signal & High Speed Digital Capability
- ATE with P1000, NP2500, AV8 & TIA Resources
1. Test Services – Case Studies
(more case studies available on our Website)

- Audio / Video Decoders
- Notebook DDR Power Controllers
- White LED Charge Pump Drivers
- Li/ Ion Battery Chargers
- Hearing Aid DSP Controller
- MEMS Clock & EMI Clock Synthesizers
- Digital Multiphase Controllers
- Power Interface Switch Products
- Dynamic Beam Steering Controller
- RF LDO, FET, Laser Diode Drivers and much more
1. Test Services

Key Highlights

- 400 MHz Base-band Frequency Measurement
- 12 Bit DAC – INL & DNL Measurements
- Serial I2C Bus Test for Various Registers Entry
- 10 pF Capacitance Measurement in guarded network loops
- Clock Generator Product Verification
- Scan Chains with 9000 FF and 3 Meg Vector Patterns
- Multi Site Solution & Test Time Reduction by 50%
1. Test Services

Advantest Highlights

- 12 Meg Scan Vectors Conversion & Debugging
- PCIE Interface Testing @ 2 GHz using NP 2500
- 10 Bit Video ADC Testing using AV8 Module
- 16 Bit Sigma Delta Audio ADC Testing using AV8 Module
- Both Single & Differential Ended ADC Tests
- Multiple Clocks using Multi-port Technique
- Multi Site Production & Characterization Solutions
1. Test Services
Advantest Highlights (Contd...)

- HP83K/93K, Adv T6575, D10 & Catalyst ATE Expertise
- Scan/ATPG Tools Usage, Memory Repair, Bitmap generation
- Network Processor, 3D Video Graphic Processor, Port ASICs
- 10 Gig Ethernet Switch, Queuing, Memory, PCI Bridge Products
- FPGA Device Testing – 20 Sites, 1000+ Probes
- Vector Conversion, JTAG Timing, LBIST, Loopback Test, etc
1. Test Services

Advantest Highlights (Contd…)

- Strong Scripting Skills - PERL, C & C++
- Scripts to analyze tester logs for yield enhancement
- ATPG Test Data Compression for reduced ATE Patterns
- Functional Design Verification for GSR & HFR ASICs
- Knowledge of VERA & Specman tools
- Block & Chip Level Test Cases Implementation
- DFT Structures & Implementation to reduce DPPM
2. Hardware Products

- ATE & Application Board Hardware Schematics
- Board Layout Design - Cadence & Mentor Tools
- Board Fabrication, BOM Procurement & Assembly
- Low Cost ATE Handlers Design & Development
- Low Cost Manipulators Design & Development
- Mechanical Stiffeners & Handler Docking Plates
- Handler and Tape/Reel Spare Parts Design & Development
- ATE Test Sockets Design & Development upto 5 mil pitch
2. Hardware Products
   Capabilities

- PCB Design – Cadence Allegro, Mentor Graphics, Orcad Tools
- PCB Design for High Speed Digital & Precision Analog needs
- PCB Fab – Impedance Controlled, 6 mm Thickness, Hard Gold
- PCB Fab – 0.3 mil Airgap, Buried Vias, Sequential Lamination
- Mechanical Product & Conceptual Design
- Mechanical 2D CAD Drafting / Drawings, 3D Modeling
- FEA Analysis & CAE Simulations
2. Hardware Products

Gravity PTB Handler

- Hot & Ambient Testing with Option for Cold
- Various Packages with Conversion kit in each Family
- User Friendly Touch Screen Interface
- Real Time Product & Error Monitoring Display
- Bench top & Production Test Applications
- Hard Dock & Soft Dock Mechanisms
- Proven Poke Yoke Features
- Economical & Lower Foot print
- Accelerated Return of Investment
2. Hardware Products

Universal Test Head Manipulator

- Modular Low Cost Reliable design
- Optimum Footprint Area—1410 x 1220 mm (56 x 48 inch)
- Gravity Feed & Pick/Place Handler Interface
- Overhead Wafer Sort Prober Interface
- Easy positioning with Linear movements
3. Embedded Solutions

- Embedded Hardware Design for Semiconductor Equipments
- Embedded Software Development for Control & Interface
- Semiconductor Equipment & Process Control Applications
- Bench Instrumentation & Labview Automation
- Automated Data Collection & Report Generation
- PLCC Based System Automation to PC Based System
- Auto Loading / Unloading Feature for Manual Equipment
3. Embedded Solutions
Capabilities

- Microcontroller Architecture & their Development Tools
- 8/16/32 Bit Microcontrollers – 8051, PIC, ARM
- PC Based Tools, Assembler, C, VB, VC++
- Embedded Compilers – Keil, GNU, CodeWarrior, CCS C
- Embedded Software Stacks Development & Management
- Embedded RTOS, Windows 7/XP/2000/Vista & Linux
- Communication Protocols - I2C, SPI, RS232/485, USB
- Communication Protocols - GSM, GPS, TCP/IP, ZIGBEE
4. Allied Services

- Onsite Test Engineering Support

- Associated partners for the following:
  - Prototype Samples Packaging
  - Surface Mount Package – Production Assembly
  - Lead Scan / Tape & Reel Finish Process
  - New Product / Package Qualification
  - Long Term Reliability tests - HTOL, HAST, TMCL, Autoclave, etc.
  - External & Internal Failure Analysis – X-ray & Decap
  - Other Failure Analysis like ESD, Latch-up & CSAM
## 4. Allied Services
### Reliability

<table>
<thead>
<tr>
<th>SI #</th>
<th>Reliability Test Name</th>
<th>Jedec Ref#</th>
<th>Test Conditions</th>
<th>Test duration</th>
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<tbody>
<tr>
<td>1</td>
<td>Initial CSAM inspection</td>
<td>J-STD-020C</td>
<td>-</td>
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<tr>
<td></td>
<td>Pre-conditioning test</td>
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<tr>
<td></td>
<td>Temperature Cycling</td>
<td>JESD 22 A113-E</td>
<td>-40°C to +60°C</td>
<td>5 Cycles</td>
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<td></td>
<td>Stabilization Bake</td>
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<td>125°C</td>
<td>24 Hrs</td>
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<td></td>
<td>Moisture Soak</td>
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<td>85°C / 85% Rh</td>
<td>168 Hrs</td>
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<tr>
<td></td>
<td>Solder Reflow</td>
<td></td>
<td>260°C</td>
<td>3 Cycles</td>
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<tr>
<td></td>
<td>Final CSAM inspection</td>
<td>J-STD-020C</td>
<td>-</td>
<td>-</td>
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<tr>
<td>2</td>
<td>High Temperature Storage test</td>
<td>JESD 22 A103-C</td>
<td>150°C</td>
<td>1000 Hours</td>
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<tr>
<td>3</td>
<td>High Temperature Operating Life Test</td>
<td>JESD 22 A108-C</td>
<td>125°C, Max Vdd</td>
<td>1000 Hours</td>
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<tr>
<td>4</td>
<td>HAST Test</td>
<td>JESD 22 A110-C</td>
<td>130°C, 85% RH</td>
<td>96 Hours</td>
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<td>5</td>
<td>Pressure Pot Test</td>
<td>JESD 22 A102-C</td>
<td>121°C, 100% Rh</td>
<td>168 Hours</td>
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<td>6</td>
<td>Temperature Cycling test</td>
<td>JESD 22 A104-C</td>
<td>-60°C to +150°C</td>
<td>1000 Cycles</td>
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<td>7</td>
<td>ESD Test</td>
<td>JESD 22 A114-D</td>
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<td>8</td>
<td>Latch Up Test</td>
<td>JESD 22 78A</td>
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</table>
## 4. Allied Services
### FA Facilities

<table>
<thead>
<tr>
<th>SI #</th>
<th>Test Description</th>
<th>Manufacturer</th>
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<tbody>
<tr>
<td>1</td>
<td>Optical Inspection at 1000X</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>X-ray Inspection for internal assembly abnormalities</td>
<td>Phoenix, Germany</td>
</tr>
<tr>
<td>3</td>
<td>Scanning Acoustic Microscopic Inspection (Through Scan, C-scan, B-scan &amp; A-scan)</td>
<td>Sonix, USA</td>
</tr>
<tr>
<td>4</td>
<td>Chemical Decapping</td>
<td>Nisene, USA</td>
</tr>
<tr>
<td>5</td>
<td>Cross Sectional analysis</td>
<td>Buehler, USA</td>
</tr>
<tr>
<td>6</td>
<td>Die Shear Test</td>
<td>HMP, USA</td>
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<tr>
<td>7</td>
<td>Ball Shear Test</td>
<td>Royce, USA</td>
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<tr>
<td>8</td>
<td>Wire Pull Test</td>
<td>HMP, USA</td>
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<tr>
<td>Sl #</td>
<td>Equipment</td>
<td>Manufacturer</td>
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<td>------</td>
<td>--------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>1</td>
<td>Burn-in</td>
<td>Blue-M, USA</td>
</tr>
<tr>
<td>2</td>
<td>Temperature &amp; Humidity</td>
<td>Blue-M, USA</td>
</tr>
<tr>
<td>3</td>
<td>Temperature Cycler</td>
<td>Blue-M, USA</td>
</tr>
<tr>
<td>4</td>
<td>HAST</td>
<td>Hirayama, Japan</td>
</tr>
<tr>
<td>5</td>
<td>Dry Heat (Class 100) Oven</td>
<td>Labline, USA</td>
</tr>
<tr>
<td>6</td>
<td>Autoclave</td>
<td>Hirayama, Japan</td>
</tr>
<tr>
<td>7</td>
<td>Steam Ager</td>
<td>Mountain Gate, Singapore</td>
</tr>
<tr>
<td>8</td>
<td>Solder Pot</td>
<td>HMP, USA</td>
</tr>
<tr>
<td>9</td>
<td>Lead Integrity Tester</td>
<td>HMP, USA</td>
</tr>
<tr>
<td>10</td>
<td>Reflow Oven</td>
<td>Heller, USA</td>
</tr>
</tbody>
</table>
“To consistently excel in Semiconductor Test Software and Hardware Solutions and exceed the fast emerging needs of our Customers through continuous innovation, high quality, accelerated, versatile & cost–effective services”
Quality Controlled Process flow approach
Archival of Process records and Quality data
Closely monitored Corrective Action Systems
Well defined Process Flow documents & Check-lists
Setting & Monitoring of Key Performance Indices
Project Scheduling & Milestone Tracking
Systems for Continuous Process Improvement
Customer specific Qualification Process
ISO 17025 Certification by 2015
Customers

- Integrated Device Manufacturers
- Fabless Product Design Companies
- Start-up, ATE & Subcontracting Companies
- Equipment Manufacturing Companies
Customers (Contd…)

- Global Semiconductor Customer Base
- Markets Served – America, Asia Pacific & India
- Markets Explored – Europe, Japan
- Applications – Mobile, Computing & Consumer
- Customer Specific Dedicated Teams – Offshore & Onsite
- Inbuilt Long Term Partnership Model
Professional Team

- Well Experienced Leadership
- Talented Test Engineers
- Qualified & Skilled Technicians
- Proficiency in Communicating in English
- Low Direct Labor Cost
- Ready availability of Engineering Resources for expansion
For most people, the idea of Social Service is donating money to a social organization - perhaps an old-age home or an orphanage or similar. This however is the easy part. The difficult part is volunteering one's time to improve society.

**When can we make a contribution to society**

- **During Phase 1**, of our lifetime, perhaps up to the age of 35, we are so focused on building our careers, starting our families & establishing a name for ourselves.

- **During Phase 2**, perhaps from age of 35 thru 65, we are the most active in our work, working as a team, being able to significantly contribute to Economic Development.

- **During Phase 3**, perhaps from age 65 onwards, we are most able to contribute our time on an increased basis to social causes.
S-E-C at ChipTest is all about how we can contribute socially during Phase 2 itself while also handling Economic Development.

Towards this, there are 3 areas that each of us can assist by making these a part of our day to day approach:

1. Following discipline in any and everything we do
2. Providing a helping hand to people around us in any way we possibly can
3. Showing the right path forward to people around us

S-E-C in ChipTest is primarily done by One-to-One Mentoring as each person encourages & motivates the other, towards a more purposeful & effective lifestyle.
Organization Structure

CEO (Sankara)

- Sales & Marketing (Sankara)
- Test Services (Balakumar)
- Quality (Anwar)
- Finance / HR (Sekar)
- Support Services (Rajendran)
- Hardware Products & Embedded Solutions (Magesh)
AlphaOmega Institute for Semiconductors

- Unique one for Semiconductor Training in India
- 6 months PG Diploma Course in IC Assembly & Test
- Incumbents are the Engineering graduates
- Practical Online Training with State of the Art Equipments
- Dissertation in Tester Software & Hardware in ATE
- Trained Professionals readily available for expansion
Logistics

- Green Channel Status for Imports & Exports
- Zero Duty
- No Open Inspection
- Clearance within 6 Working Hrs
- Drop ship Facility to end Customers
- Proximity to Sea & Air Ports with efficient Cargo Handling
Logistics (Contd…)

- Easy Equipment Consignment In & Out of our Facility
- Daily Flights to US, Europe & Asia Pacific Destinations
ChipTest - USP

- Turnkey Test Engineering & Production Support
- Cost-effective Test Solutions – Offshore & Onsite
- Talented Hardware & Programming Skills
- Excellent round-the-clock Customer Service
- Proven track record with Focus on long term Values
- Cutting Edge Hardware Engineering & Embedded Solutions
- Continuous and Standardized Training Methodologies
- Closely Associated partner for Packaging Support
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Please visit our Website for

- Resource, Capability Details
- Projects Case Study Details
- ChipTest’s News and Events
- Indian Electronic Hardware Industry News
- Global Semiconductor Industry News
Annexure
About Chennai, Tamilnadu

- Tamilnadu # 1 for Technical Education in India
- World Class Engineering Universities: IIT & MIT
- Abundant Low Cost Skilled Manpower
- Global Connectivity with modernized Airport and Seaport
- Investor Friendly Government Support for Hi-Tech Industries
- Quality High Speed Internet Connectivity
- Excellence in Software, IT Skills & Services
- Strong Manufacturing & Engineering Industry Base
About Tamilnadu - Continued

252 Engineering Colleges
Annual turn-out 79,800 Graduates

230 Polytechnics
Annual turn-out 63K Technicians

626 Industrial Training Institutes
Annual turn-out 113K Operators