



## About Volterra...

Volterra, a fabless semiconductor company, provides innovative semiconductor solutions for low-voltage power delivery. Volterra develops its proprietary technology to fit into a broad range of applications where conservation of power consumption and reduction of overall system size and cost are critical.

Our semiconductor core technology focuses on advanced switching regulator solutions for low voltage applications having the key features of:

- High Efficiency
- Compact Size: Low Profile, Small Footprint
- High Frequency Operation
- Scalability
- Ease of Use
- Cost Effectiveness

## Volterra Mission Statement

To be the premier supplier of leading edge silicon solutions for low-voltage power delivery in the Computer and Communication markets. We will develop and maintain new customer relationships through technical leadership, superior customer service and a first class work environment.

## 1. PURPOSE

This document describes Volterra Semiconductor's quality management system and represents the top tier document.

## 2. SCOPE

Volterra Semiconductor is a "fab-less" semiconductor company which subcontracts the manufacturing and test of our products. This document applies to all Volterra Semiconductor sites, business units and activities conducted therein.

## 3. REFERENCE DOCUMENTS/FORMS

ISO 84042	Quality Vocabulary
ISO 2000	Quality Management and Quality Assurance Standards. Guidelines for selection and use.
ISO 2001:1994	Quality Systems – Model for quality assurance in design, development, installation and servicing

## 4. DEFINITIONS AND ACRONYMS

The definitions in ISO 84042 apply.

## 5. QUALITY SYSTEMS REQUIREMENTS

### 5.1 Management Responsibilities

#### 5.1.1 Quality Policy

Volterra's quality policy is:

*"To strive for consistent improvement in all of our products, processes and services, resulting in a significant value advantage to our customers."*

It is available on the Volterra Intranet and Volterra's website, and is used in new hire orientation and training.

#### 5.1.2 Organization

##### 5.1.2.1 Responsibility and Authority

The responsibility, authority and interrelation of all personnel who manage, perform and verify work affecting are defined by:

- a.) The company's functional organization chart
- b.) The appropriate operating policies, procedures, specifications, work instructions and travelers

##### 5.1.2.2 Resources

Resource requirements are identified and adequate resources are provided including trained personnel for management, work performance and verification activities.

##### 5.1.2.3 Management Representative

The Quality Systems Manager is Volterra's appointed Management Representative responsible to ensure effective implementation and maintenance of the Quality Management Systems.

### 5.1.3 Management Review

5.1.3.1 Volterra's senior management (President/CEO and direct reports), at least annually, reviews the Quality System for its continued suitability and effectiveness.

## 5.2 Quality System

### 5.2.1 General

The structure for documenting and controlling the manufacturing and business processes used by Volterra is the quality system.

### 5.2.2 Quality Systems Procedures

The quality system defined in this manual aligns to the requirements of ISO 2000:1994. The quality system is documented through this manual, policies, procedures, specifications, work instructions, drawings, etc. as appropriate to the complexity of the work, the methods used and the skills required in producing Volterra's products.

### 5.2.3 Quality Planning

Volterra's Five Phase New Product Development Process and the documents referenced in this manual, as applicable, together define the customer and company requirements of our products and the means of meeting those requirements.

## 5.3 Contract Review

### 5.3.1 General

Documented procedures exist for contracts to procure goods/materials/services and for the sale of Volterra products.

### 5.3.2 Review

5.3.2.1 Sales Contracts. The Sales and Marketing organizations are responsible for reviewing sales contracts and orders to ensure that customer requirements are identified and met.

5.3.2.2 Purchase Contracts. Operations has responsibility for establishing and administering contracts for the purchase of services and materials used in producing Volterra's products.

### 5.3.3 Amendments to Contracts

Changes to sales or purchase contracts, whether initiated by Volterra or by customers/suppliers/subcontractors are reviewed and incorporated into the applicable specifications.

### 5.3.4 Records

Records of contract reviews and amendments are maintained.

## 5.4 Design Control

### 5.4.1 General

Engineering management is responsible for establishing and maintaining procedures to control and verify the design of new devices or modifications to existing devices.

### 5.4.2 Design and Development Planning

The design manager is responsible for the planning and execution of each design project. This includes the project management of not only what is to be done, by whom and when, but insuring that adequate resources and qualified personnel are available

5.4.3 Organizational and Technical Interfaces

Organizational and technical interfaces between customers, internal design or support groups are identified during the planning and development phases as part of Volterra's Product Development Process.

5.4.4 Design Input

Design specifications/objectives are agreed upon between the appropriate parties prior to commencing the design, as part of Volterra's Product Development Process.

5.4.5 Design Output

Design output requirements are documented in terms of pattern generation tapes, test programs and other databases or verification results. This is to ensure that the designs meet their input requirements, have established acceptance criteria, conform to appropriate regulatory requirements and that characteristics crucial to the safe and proper functioning of the product are identified.

5.4.6 Design Review

Design reviews are held throughout the Product Development Process with all functions involved participating.

5.4.7 Design Verification

Design verification is performed at various stages of the Product Development Process to ensure design output is consistent with design input requirements. A peer review system has been established as a means of checking that all aspects of a design have received sufficient consideration. Whenever possible, previously proven elements, functional blocks or cells are re-used to maximize the potential of new designs to meet required performance.

5.4.8 Design Validation

Designs are validated in Volterra's applications labs, by third parties (as may be appropriate/required) and/or customers. Such validations are proof of ability of the product to function in its intended application and environment. Evidence of customer's validation may be a purchase order.

5.4.9 Design Changes

The identification, documentation, review and approval of changes to the design, materials or manufacturing processes is carried out in accordance to a formal documented procedure, consistent with customer and industry requirements.

5.5 Document and Data Control

5.5.1 General

Volterra maintains documented procedures for the control of documents and data related to the design and manufacture of our semiconductor products.

5.5.2 Document and Data Control Approval and Issue

Documents and data are reviewed and approved for adequacy by the appropriate functions prior to issue. Material, design and process documents define work

within Volterra. Document Control has the responsibility to ensure that the latest revisions of all documents are available.

#### 5.5.3 Document and Data Changes

Changes to documents and data are reviewed and approved by the same functions that performed the original review and approval and any added stakeholders.

### 5.6 Purchasing

#### 5.6.1 General

Volterra has documented procedures that ensure that purchased materials/goods/services meet specified requirements.

#### 5.6.2 Evaluation of Sub-Contractors

Materials/goods/services used in the production of Volterra products are obtained only from qualified sources having known manufacturing and quality control capabilities. Volterra maintains a listing of approved sources of supply of materials/goods/services and has in place a process for their selection, qualification and ongoing monitoring of performance.

#### 5.6.3 Purchasing Data

Purchased materials/goods/services are defined in controlled specifications and/or contracts.

#### 5.6.4 Verification of Purchased Product

Where Volterra verifies and accepts materials/goods/services, semi-finished or finished product at other than Volterra premises, documented measures have been established for verification/acceptance. These include provisions for customer verification at Volterra's subcontracted manufacturing sites.

### 5.7 Customer Supplied Product – NA

### 5.8 Product Identification and Traceability

All products are traceable by batch during all stages of manufacturing, test and delivery. This is accomplished by means of Volterra and Volterra's subcontractors' systems and controls for logs, travelers, WIP reports etc.

### 5.9 Process Control

Volterra is a "fab-less" semiconductor company. All manufacturing processes – wafer fabrication, assembly and test – are subcontracted. As such, all immediate control of manufacturing processes resides with the subcontractors. Volterra's degree of process control is effected through our:

- a.) initial evaluation and selection process of subcontractors and their processes, including their manufacturing and quality systems
- b.) contractually defined requirements, including quality attributes
- c.) quality expectations as conveyed to subcontractors either in contracts, purchase orders, referenced specifications or other communications
- d.) ongoing monitoring of subcontractors' in line and end of line process and product monitors
- e.) other metrics as appropriate

5.10 Inspection and Testing

Product specific inspection, test procedures and programs are supplied to our subcontractors as applicable to the product and subcontracted service. All other inspection and test procedures, unless specifically stated and required by Volterra, default to the subcontractor's standard procedure.

This includes receiving, in-process and final inspections and testing. Additionally, the records of such inspections and tests at subcontractors are maintained and made accessible to Volterra.

5.11 Control of Inspection, Measuring and Test Equipment

Volterra has a documented system for control of inspection, test and measuring equipment as applicable to the equipment utilized in our development and engineering facilities. Volterra expects our subcontractors have the same level of controls on equipment in their manufacturing and test facilities. This expectation is one of the facets addressed in the selection of subcontractors.

5.12 Inspection and Test Status

Inspection and test status of product at all stages of manufacture is identified at our subcontractor facilities by their internal systems. Their establishment and ability to maintain such systems is one of the criteria used in the selection of subcontractors.

5.13 Control of Non-Conforming Material

Volterra's subcontractors have established and maintain procedures for the control of product which does not conform to specified requirements. These include provisions for identification, documentation, evaluation, segregation, notification and disposition of any product found to be non-conforming. The output of the subcontractors' non-conforming materials control processes are conveyed to Volterra's Operation group, which is the final arbitrator in the disposition of non-conforming material.

5.14 Corrective and Preventative Action

When problems occur, appropriate corrective actions are taken according to defined procedures. Corrective actions include:

- Documenting the problem
- Where product is involved, preventing any additional defective product from being produced, and preventing any defective product from being shipped to a customer
- Investigating the cause of the problem and recording the results of the investigation
- Defining, documenting, and implementing appropriate corrective actions
- Verifying that the corrective action is effective in eliminating the problem and preventing its recurrence
- Promptly inform management of any issues that they are unable to resolve

Additionally, data and information from all sources of product and process problems are periodically analyzed to identify areas where action may be needed to prevent potential problems from occurring. Appropriate actions are taken to initiate preventive actions and to ensure they are effective within Volterra and our

subcontractors. Corrective and preventive actions are included in the management review process.

5.15 Handling, Storage, Packaging and Delivery

Procedures for the handling, storage, packaging and delivery have been documented and implemented at Volterra and our subcontractors to prevent damage or deterioration of products during manufacture, transit and delivery to customers.

5.16 Control of Quality Records

Procedures have been documented for the identification, collection, storage, maintenance and disposition of quality records.

5.17 Internal Quality Audits

Periodic internal quality system assessments are conducted and used to ensure compliance to stated requirements, the effective operation of the quality system, and the identification of opportunities for continuous improvement. Assessments are scheduled according to system performance and are performed by qualified personnel independent of the area being assessed. Results of assessments are documented and corrective actions are verified to ensure they are effective.

5.18 Training

Employees are hired based on their qualifications to perform specific job functions. Management is responsible for providing training in the basic skills needed to perform the job, for identifying opportunities to expand or enhance employees' skills and to provide necessary additional training. The effectiveness of training is periodically assessed and records of training are maintained.

5.19 Servicing - NA

5.20 Statistical Techniques

Subcontractor implementation and use of statistical techniques in manufacturing processes are considered during supplier selection and later, monitored by Volterra's Operations group. Data are reviewed and utilized in managing production, correcting problems and in assessing process changes.

Statistical methods are applied in establishing data sheet limits, production test limits and guardbands. They are also used as appropriate to the situation in yield analysis, distributional analysis and reliability stress screening.

6. **RESPONSIBILITIES**

**Quality Assurance** - Maintaining, interpreting and revising this document is the responsibility of Quality Assurance.

**ATTACHMENT 1**  
Cross Reference to Related Specifications

<u>ISO2001 Ref.</u>	<u>Topic</u>	<u>Volterra Ref.</u>	<u>Where Found/Related Documents</u>
<b>4.1</b>	<b>Management Responsibility</b>		
4.1.1	Quality Policy	5.1.1	SOP QR-2000 Quality Manual
4.1.2.1	Responsibility	5.1.2	SOP QR-2000 Quality Manual
4.1.2.2	Resources	5.1.2.2	SOP QR-2000 Quality Manual
4.1.2.3	Management Representative	5.1.2.3	Quality Systems Mgr is Management rep and reports to VP of Operations
4.1.3	Management Review	5.1.3	SOP QR-2001 Management Review of Quality System
<b>4.2</b>	<b>Quality System</b>		
4.2.1	General	5.2.1	SOP QR-2000 Quality Manual
4.2.2	Quality Sys.	5.2.2	SOP QR-2000 Quality Manual
4.2.3	Quality Planning	5.2.3	SOP QR-2000 Quality Manual SOP QR-0070 through -0074, -0289(New Prod Dev)
<b>4.3</b>	<b>Contract Review</b>		
4.3.1	General	5.3.1	SOP QR-2002 Contract Review
4.3.2	Review	5.3.2	SOP QR-2002 Contract Review
4.3.3	Amendment	5.3.3	SOP QR-2002 Contract Review
4.3.4	Records	5.3.4	SOP QR-2002 Contract Review
<b>4.4</b>	<b>Design Control</b>		
4.4.1	General	5.4.1	- SOP OP-0070 Product Introduction Process Requirements
4.4.2	Planning	5.4.2	- SOP OP-0071 Prod Def Phase req'mnts
4.4.3	Org & Interfaces	5.4.3	SOP OP-0072 Prod Dev Phase req'mnts
4.4.4	Design Input	5.4.4	SOP OP-0073 Prod Char-Verif Phase Req'mnts
4.4.5	Design Output	5.4.5	> SOP OP-0074 Qual & Test Transfer Req'mnts
4.4.6	Design Review	5.4.6	/ SOP QR-0289 Product Ramp Phase Requirements
4.4.7	Verification	5.4.7	"
4.4.8	Validation	5.4.8	"
4.4.9	Design Changes	5.4.9	- SOP QR-0021 Change Management Process WI QR-0328 PCN System
<b>4.5</b>	<b>Document and Data Control</b>		
4.5.1	General	5.5.1	SOP QR-2003 Document and Data Control System
4.5.2	Approval and Issue	5.5.2	SOP QR-2003 Document and Data Control System
4.5.3	Document Changes	5.5.3	SOP QR-2003 Document and Data Control System SOP QR-0021 Change Management Process WI QR-0328 PCN System
<b>4.6</b>	<b>Purchasing</b>		
4.6.1	General	5.6.1	SOP PR-0004, Purchasing User Guide
4.6.2	Eval of Subcon	5.6.2	SOP QR-0331 Subcon Selection/Qual/DisQual SOP QR-0332 Subcon Quality Assessment SOP QR-0330 Qualified Suppliers List
4.6.3	Data	5.6.3	SOP QR-0305 Supplier Business Review
4.6.4	Verification	5.6.4	SOP OP-0134 Test Correlation, Verification and Guardband Creation
<b>4.7</b>	<b>Control of Customer Supplied Product - NA</b>		
<b>4.8</b>	<b>Product Identification and Traceability</b>		
4.8	Traceability	5.8	SOP OP-2004 Product Identification & Traceability SOP AP-0024, Product Marking
<b>4.9</b>	<b>Process Control</b>		
4.9	Process Control	5.9	SOP QR-0070 through -0074( New Prod Dev) SOP QR-2000, Quality Manual SOP QR-0021 Change Management Process WI QR-0328 PCN System
<b>4.10</b>	<b>Inspection and Testing</b>		
4.10.1	General	5.10	SOP QR-2000 Quality Manual
4.10.2	Receiving	5.10	SOP QR-2000 Quality Manual
4.10.3	In-Process	5.10	SOP QR-2000 Quality Manual

4.10.4	Final Inspection	5.10	SOP QR-2000 Quality Manual
4.10.5	Records	5.10	SOP QR-2000 Quality Manual
<b>4.11</b>	<b>Control of Inspection, Measuring and Test Equipment</b>		
4.11.1	General	5.11	SOP QR-2005 Control of IMTE (Calibration) SOP QR-2000 Quality Manual
4.11.2	Control Procedure	5.11	SOP QR-2005 Control of IMTE (Calibration) SOP QR-2000 Quality Manual
<b>4.12</b>	<b>Inspection and Test Status</b>		
4.12	Inspection/Test Status	5.12	SOP QR-2000 Quality Manual
<b>4.13</b>	<b>Control of Non-Conforming Product</b>		
4.13.1	General	5.13	SOP QR-2000 Quality Manual
4.13.2	Review and Disposition	5.13	SOP QR-2006 Control of Non-Conforming Material SOP QR-2000 Quality Manual SOP QR-2006 Control of Non-Conforming Material SOP QR-2006 Control of Non Conforming Material
<b>4.14</b>	<b>Corrective and Preventative Actions</b>		
4.14.1	General	5.14	SOP QR-2000 Quality Manual
4.14.2	Corrective Action	5.14	SOP QR-0056 Customer Requested Analysis (CRA) SOP QR-2006 Cont. Of Non-Conf. Mat'l SOP QR-0324 8-D Process SOP QR 2007 Corrective Action
4.14.3	Preventative Action	5.14	SOP QR-2000 Quality Manual
<b>4.15</b>	<b>Handling, Storage, Packaging, Preservation and Delivery</b>		
4.15	Handling, Storage, Packaging, Preservation and Delivery	5.15	SOP QR-2000, Quality Manual SOP OP-2008 Handling, Storage, Packaging, Preservation & Delivery SOP QR-2006 Control Of Non Conforming Material
<b>4.16</b>	<b>Control of Quality Records</b>		
4.16	Quality Records	5.16	SOP QR-2009 Quality Records & Retention
<b>4.17</b>	<b>Internal Quality Audits</b>		
4.17	Int. Quality Audits	5.17	SOP QR-2010 Internal Quality Assessment
<b>4.18</b>	<b>Training</b>		
4.18	Training	5.18	SOP QR-2011 Training
<b>4.19</b>	<b>Servicing - NA</b>		
<b>4.20</b>	<b>Statistical Techniques</b>		
4.20	Statistical Techniques	5.20	SOP QR-2000, Quality Manual SOP OP-0134 Test Correlation, Verification and Guardband Creation SOP OP-0334 Wafer Sort/Final Test Low Yield Trigger Limit Procedure

# *Quality at*



**VOLTERRA**

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VOLTERRA SEMICONDUCTOR CORP.  
47467 FREMONT BLVD.  
FREMONT CA 94538  
PHONE 510 743 1200  
FAX 510 743 1600