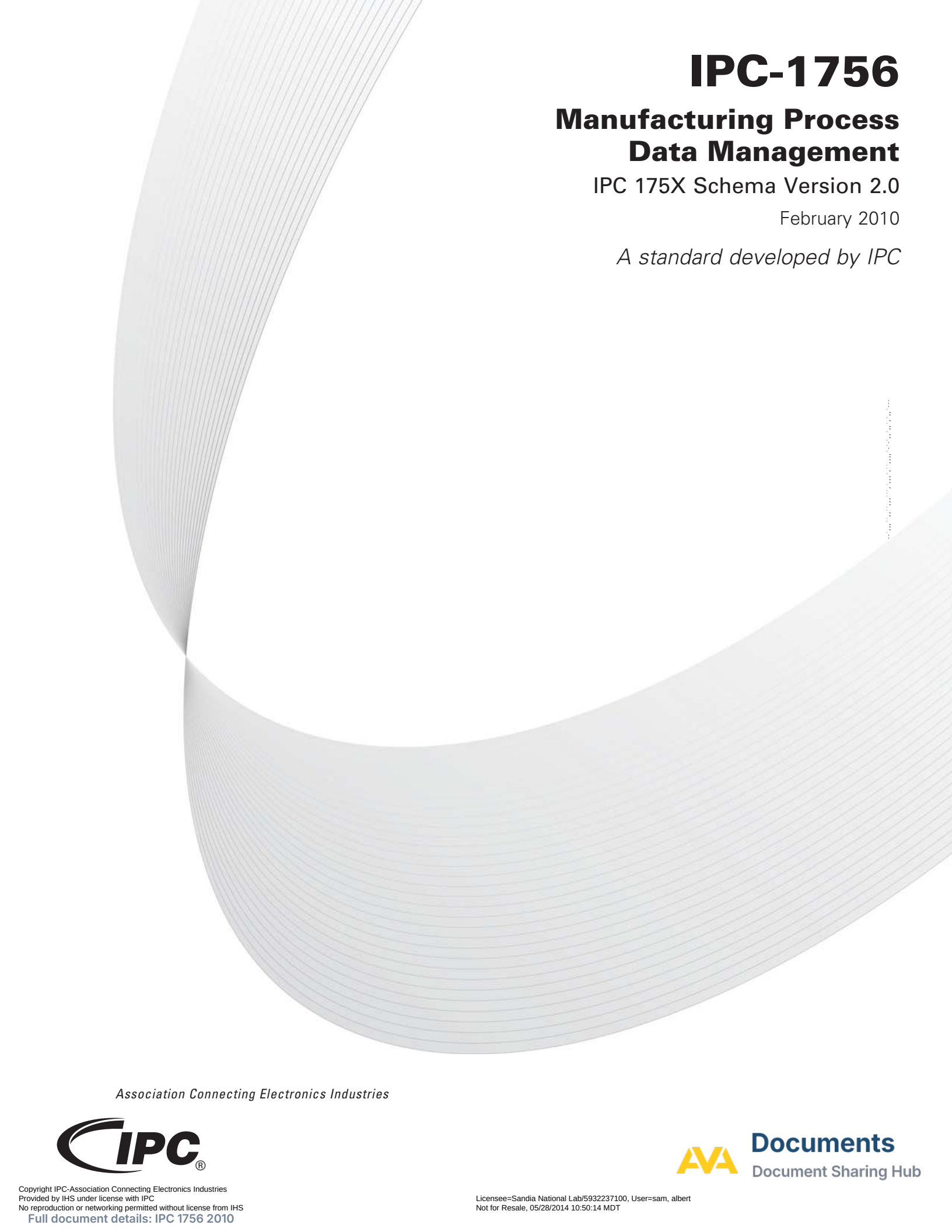




IPC-1756

Manufacturing Process Data Management

IPC 175X Schema Version 2.0

February 2010

A standard developed by IPC

Association Connecting Electronics Industries



Copyright IPC-Association Connecting Electronics Industries
Provided by IHS under license with IPC
No reproduction or networking permitted without license from IHS
Full document details: IPC 1756 2010



Licensee=Sandia National Lab/5932237100, User=sam, albert
Not for Resale, 05/28/2014 10:50:14 MDT

The Principles of Standardization

In May 1995 the IPC's Technical Activities Executive Committee (TAEC) adopted Principles of Standardization as a guiding principle of IPC's standardization efforts.

Standards Should:

- Show relationship to Design for Manufacturability (DFM) and Design for the Environment (DFE)
- Minimize time to market
- Contain simple (simplified) language
- Just include spec information
- Focus on end product performance
- Include a feedback system on use and problems for future improvement

Standards Should Not:

- Inhibit innovation
- Increase time-to-market
- Keep people out
- Increase cycle time
- Tell you how to make something
- Contain anything that cannot be defended with data

Notice

IPC Standards and Publications are designed to serve the public interest through eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay the proper product for his particular need. Existence of such Standards and Publications shall not in any respect preclude any member or nonmember of IPC from manufacturing or selling products not conforming to such Standards and Publication, nor shall the existence of such Standards and Publications preclude their voluntary use by those other than IPC members, whether the standard is to be used either domestically or internationally.

Recommended Standards and Publications are adopted by IPC without regard to whether their adoption may involve patents on articles, materials, or processes. By such action, IPC does not assume any liability to any patent owner, nor do they assume any obligation whatever to parties adopting the Recommended Standard or Publication. Users are also wholly responsible for protecting themselves against all claims of liabilities for patent infringement.

IPC Position Statement on Specification Revision Change

It is the position of IPC's Technical Activities Executive Committee that the use and implementation of IPC publications is voluntary and is part of a relationship entered into by customer and supplier. When an IPC publication is updated and a new revision is published, it is the opinion of the TAEC that the use of the new revision as part of an existing relationship is not automatic unless required by the contract. The TAEC recommends the use of the latest revision. Adopted October 6, 1998

Why is there a charge for this document?

Your purchase of this document contributes to the ongoing development of new and updated industry standards and publications. Standards allow manufacturers, customers, and suppliers to understand one another better. Standards allow manufacturers greater efficiencies when they can set up their processes to meet industry standards, allowing them to offer their customers lower costs.

IPC spends hundreds of thousands of dollars annually to support IPC's volunteers in the standards and publications development process. There are many rounds of drafts sent out for review and the committees spend hundreds of hours in review and development. IPC's staff attends and participates in committee activities, typesets and circulates document drafts, and follows all necessary procedures to qualify for ANSI approval.

IPC's membership dues have been kept low to allow as many companies as possible to participate. Therefore, the standards and publications revenue is necessary to complement dues revenue. The price schedule offers a 50% discount to IPC members. If your company buys IPC standards and publications, why not take advantage of this and the many other benefits of IPC membership as well? For more information on membership in IPC, please visit www.ipc.org or call 847/597-2872.

Thank you for your continued support.



IPC-1756

Manufacturing Process Data Management

Developed by the Manufacturing Process Declaration Task Group (2-18a)
of the Supplier Declaration Subcommittee (2-18) of IPC

Users of this publication are encouraged to participate in the
development of future revisions.

Contact:

IPC
3000 Lakeside Drive, Suite 309S
Bannockburn, Illinois
60015-1249
Tel 847 615.7100
Fax 847 615.7105



Foreword

While IPC-1751 defines the generic requirements for declaration process management, IPC-1756 establishes a standard reporting format for manufacturing process data between supply chain participants and supports the reporting of components, printed circuit boards, sub-assemblies, and products which will be used in further manufacturing processes utilizing reflow and wave soldering techniques. This standard defines the content and requirements for reporting manufacturing process information.

The enactment of *Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003, on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment*, drove industry use of solders that have higher processing temperatures and thus the need for the reporting of soldering capabilities.

This standard is supported by software developed at the National Institute of Standards and Technology (NIST) by employees of the US Federal Government in the course of their official duties. Pursuant to title 17 Section 105 of the United States code, the software is not subject to copyright protection and is in the public domain. The software known as “Scriba” can be used to create the information needed between User and Supplier as defined in the IPC-175X series of standards. The output of Scriba can be saved as a graphic and is based on an underlying Extensible Markup Language (XML) schema, which in turn is represented by a Unified Modeling Language (UML) model. The NIST tool and XML schema are available for free download at www.ipc.org.

End product producers and customers throughout the supply chain are requesting that suppliers provide information about the products that they produce as well as certain material declarations so that the recipient is aware of the presence and amount of certain chemicals in the items it procures. The IPC-175X standards are intended to provide for the creation of an electronic record that will serve as a standard way for reporting or collecting this type of data. The following figure is the opening screen of the NIST tool.

Supplier Product Declaration

Beta software Test 2
This document is a supplier declaration for a product or family of products.
See IPC Web Site for Information on IPC-1750 Series Standard <http://www.ipc.org/IPC-175x>

This software was developed at the National Institute of Standards and Technology by employees of the Federal Government in the course of their official duties. Pursuant to title 17 Section 105 of the United States Code this software is not subject to copyright protection and is in the public domain. Scriba is an experimental system under development. NIST assumes no responsibility whatsoever for its use by other parties, and makes no guarantees, expressed or implied, about its quality, reliability, or any other characteristic. We would appreciate acknowledgement if the software is used.

Sectionals *
MaterialInfo
ManufacturingInfo

Subsectionals *
A - Query/Reply
B - Material Group
C - Material Summary
D - Homogeneous Material

Form Type * Request/Reply **Version** 2.0 *** Required Field**

Requester Information

Company Name *
Request Document ID
Company Unique ID
Unique ID Authority
Request Date *
Respond By Date

Contact Name *
Contact Title
Contact Phone *
Contact Email *

My supplier ID
Destination
Destination : URL or Email Address
☐ Supplier Choice
Supplier provides Mfr Item Version & Manufacturing Site

Requester Comments

Lock Request Fields Additional Details

Supplier Information

Company Name *
Response Document ID
Company Unique ID
Unique ID Authority
Response Date *

Contact Name *
Contact Title
Contact Phone *
Contact Email *

Authorized Representative *
Representative Title
Representative Phone *
Representative Email *

Supplier Comments

Additional Details

Legal Statement

Legal Declaration *
Supplier Acceptance *

Attachment

Name	File Type	Attach	Save
		Attach	Save

Initial Screen for Requester/Supplier Product Descriptions

Acknowledgment

Any document involving a complex technology draws material from a vast number of sources. While the principal members of the Manufacturing Process Declaration Task Group (2-18a) of the Supplier Declaration Subcommittee (2-18) are shown below, it is not possible to include all of those who assisted in the evolution of this standard. To each of them, the members of the IPC extend their gratitude.

Supplier Declaration Subcommittee

Chair
Eric Simmon
National Institute of Standards
and Technology (NIST)

Manufacturing Process Declaration Task Group

Chair
Fritz R. Byle
Astronautics Corp. of America

Technical Liaisons of the IPC Board of Directors

Peter Bigelow
IMI Inc.

Sammy Yi
Aptina Imaging Corporation

Manufacturing Process Declaration Task Group

Christine Blair, STMicroelectronics, Inc.
Krista Botsford, Botsford EcoTech Partners LLC
Fritz Byle, Astronautics Corp. of America
Elizabeth Cathers, National Semiconductor Corp.
Ardy Chan, Christie Digital Systems, Inc.
Om Chopra, Thomas & Betts Corporation
John Cuthbertson, Vitesse
Marsha Decker, LSI Corporation
David Fitton, Diodes Zetex Semiconductors Ltd.
Randall Flinders, Emulex Corporation
Mark Frimann, Texas Instruments Inc.
Judith Gonzalez, Kemet Electronics Corp.
Mike Green, Lockheed Martin Space Systems

Art Griesser, National Institute of Standards and Technology (NIST)
Curtis Grosskopf, IBM Corporation
Bill Haas, Seagate Technology
Eddie Hofer, Rockwell Collins
Nico Hoshijo, Intel Corporation
JB Hollister, Cisco Systems
Scott Houthuysen, LSI Corporation
Michael Hutchings, Sun Microsystems Inc.
Kurk Kan, Murata Power Solutions, Inc.
Theodore Knudson, Brush Wellman, Inc.
Ruma Kohli, IBM Microelectronics
Ken Lyjak, IBM Corporation
Karen McConnell, Lockheed Martin EPI Center
Dr. N. Nagaraj, Papros Inc.
Gary Pike, Harman Specialty Group
Elvira Preecha, Qualcomm Inc.
Terry Richesin, Intel Corporation

Frank Rossman, Jabil Circuit, Inc.
Denis Ryskamp, Trimble Navigation, Ltd.
Tony Senese, Panasonic Electric Works
John Sharp, TriQuint Semiconductor Inc.
Aimee Siegler, Benchmark Electronics
Eric Simmon, National Institute of Standards and Technology (NIST)
Kiran Sivadas, Enventure Technologies Inc.
Rob Taylor, Lenovo
Griffin Teggegan, Freescale Semiconductor
Denise Turley, Tyco Electronics
Kevin Weston, Celestica
Jim White, Dassault Systemes
Lee Wilmot, TTM Technologies, Inc.
Linda Young, Intel Corporation



A special note of thanks goes to the following individuals for their dedication to bringing this project to fruition. We would like to highlight those individuals who made major contributions to the development of this standard.

Fritz Byle, Astronautics Corp. of
America

Eric Simmon, National Institute
of Standards and Technology
(NIST)

William Haas, Seagate Technology
Curtis Grosskopf, IBM Corporation

Frank Rossman, Jabil Circuit, Inc.

Additionally, we would like to thank the National Institute of Standards and Technology (NIST) for their significant contributions to the development of this standard.



Table of Contents

1	SCOPE	1
1.1	Purpose	1
1.2	Classification.....	1
1.3	Manufacturing Data Fields	2
1.4	Interpretation.....	3
1.5	Presentation.....	3
2	APPLICABLE DOCUMENTS	3
3	GENERAL REQUIREMENTS	4
3.1	Data Model.....	4
3.2	Business Process.....	5
3.2.1	Request/Response (Pull).....	5
3.2.2	Distribute (Push).....	5
3.3	Terms and Definitions	6
3.4	Manufacturing Information Structure	7
4	DESCRIPTION OF THE MANUFACTURING DATA FIELDS	7
4.1	Package	8
4.1.1	Package Configuration	8
4.1.2	J-STD-020 MSL Rating.....	10
4.1.3	J-STD-020 Classification Temperature (T_C).....	10
4.1.4	J-STD-020 Time within 5°C of T_C	10
4.1.5	Component Ramp Up Rate.....	10
4.1.6	Preheat Maximum Temperature	11
4.1.7	Preheat Duration	11
4.1.8	Component Temperature Spike.....	11
4.1.9	Time Limitation Above 217°C	11
4.1.10	Component Ramp Down Rate	11
4.2	Solder	11
4.2.1	Maximum Number of Solder Processing Cycles	12
4.2.2	Wave Solder Temperature (max.).....	12
4.2.3	Total Time in Wave (max.).....	12
4.3	Terminal	13
4.3.1	Terminal Shape	13
4.3.2	Terminal Size	14
4.3.3	Number of Instances	14
4.3.4	Terminal Base Alloy.....	15
4.3.5	Terminal Plating	15
4.3.6	Bulk Solder Termination	16
4.4	J-STD-075 PSL Rating.....	17
4.4.1	PSL Additional Information	18
4.4.2	PSL Third Character Enumerations	18
4.5	Comments (Additional Manufacturing Process Information/Tin Whisker Mitigation).....	19

Appendix A Manufacturing Field Data	20
Appendix B Examples of PSL Conditions	22
Appendix C Package Plating XML Schema	23

Manufacturing Process Data Management

1 SCOPE

This standard establishes the requirements for exchanging manufacturing data between suppliers and their customers for electrical and electronic product. This standard applies to products, components, subproducts and materials that are supplied to producers of electrical and electronic components for incorporation into their products. It covers assembly materials and manufacturing data in order to facilitate and identify the process sensitivity of the products, components and subproducts. It does not apply to packing materials (e.g., cardboard, plastic tray, etc.).

The standard applies to business-to-business transactions. It is not intended to be used by the general public when making purchasing decisions.

1.1 Purpose

This standard is intended to benefit suppliers and their customers by providing consistency and efficiency to the manufacturing data declaration process. It establishes standard data exchange techniques and electronic data exchange formats that will facilitate and improve data transfer along the entire global supply chain.

1.2 Classification

This standard establishes 23 fields for declaration of manufacturing data. These fields are supported by Scriba and other tools developed between users and suppliers. The data descriptions **shall** incorporate the requirements of the IPC-1751 for generic company information. As such, the IPC-1751 becomes a **mandatory** part of this standard, and all conditions apply to the characteristics of the data structure as defined by the XML schema and the Scriba data capture tool. See Figure 1-1.

The Product tab is the link between the product(s) defined in IPC-1751 and IPC-1752. This link may establish the relationship of the manufacturing process information covered in IPC-1756 with the product object identified in IPC-1751 and any of the four use case conditions described in IPC-1752.

highlight this Product in Product Tree

Product Query/Reply Material Manufacturing Information

Product ID

Requester Product Number Requester Product Name

Mfr Product Number Mfr Product Name Effective Date

Version Mfr Site

Additional Unique IDs Additional Product IDs

Mass

Mass Neg Tolerance Pos Tolerance

Unit of Measure

Alternate Item

Alternate Mfr Product Number Alternate Mfr Product Name Alternate Effective Date

Alternate Product Comment

Figure 1-1 Scriba Image Needed to Define Manufacturing Process Information

1.3 Manufacturing Data Fields

There are 22 fields available for providing manufacturing information. The fields are organized according to the use and relate to the product package configuration, its material properties and the process sensitivity. The individual fields are:

- Package Configuration
- J-STD-020 MSL Rating
- J-STD-020 Classification Temperature (T_C)
- J-STD-020 Time Within 5°C of T_C
- Component Ramp-Up Rate
- Preheat Maximum Temperature
- Preheat Duration
- Component Temperature Spike
- Time Limitation Above 217°C
- Component Ramp Down Rate
- Maximum Number of Solder Process Cycles
- Wave Solder Temperature (max.)
- Total Time in Wave (max.)
- Terminal Shape
- Terminal Size
- Terminal Instances
- Terminal Base Alloy
- Terminal Plating
- Ball Array Material
- J-STD-075 PSL Rating
- PSL Additional Information
- Comments (Additional Manufacturing Process Information/Tin Whisker Mitigation)

Figure 1-2 shows an example of a tool image used to capture the information for the process details. This figure relates to the product object or product family described in the product tree of IPC-1752 when the sectional tabs of “Manufacturing Information” have been highlighted.

The screenshot shows a software interface for capturing manufacturing process information. It features several sections with input fields and a table.

- Manufacturing Process Information:** Contains fields for J-STD-020 MSL Rating (dropdown), Classification Temp, Max Time Within 5, Ramp Rate, Ramp Down Rate, Time Above 217, Preheat Max Temp, Preheat Duration, Preheat Min Temp, Package Designator, Component Temp Spike, and a large text area for Comments.
- Solder:** Contains fields for Nbr of Reflow Cycles, Max Total a Wave Time, and Max Wave Solder Time.
- PSL Rating:** Contains fields for Psl Rating Wave (dropdown), Wave Additional Info, Reflow Additional Info, Psl Rating Reflow (dropdown), and Reflow.
- Terminal:** A table with columns: shape, size, numberInstances, terminalBaseAlloy, gridArrayMaterial, and plating.

Figure 1-2 Manufacturing Process Information Image Example

Since the 1751 support four use cases a set of products (Product Tree) can be developed that groups all related products into a single use case to which the processes shown in Figure 2 pertain.

1.4 Interpretation

The word “**shall**,” the emphatic form of the verb, is used throughout this standard whenever a requirement is intended to express a provision that is **mandatory**. Deviation from a “**shall**” requirement may be considered if sufficient data is supplied to justify the exception. The words “should” and “may” are used to express non-mandatory provisions intended to be recommendations. “Will” is used to express a declaration of purpose related to the text description. To assist the reader, the word “**shall**” is presented in bold characters.

1.5 Presentation

All dimensions and tolerances in the IPC-175X standard series are expressed in metric units with millimeters the main form of dimensional expression. Inches may be shown in brackets as appropriate and are not always a direct conversion depending on round-off discrepancies or the required precision. Users are cautioned to employ a single dimensioning system and not intermix millimeters and inches. Temperature is only expressed in SI degrees representing Celsius measurement. The measurement of volume and mass (weight) **shall** also be in SI units. Reference information is shown in parentheses ().

2 APPLICABLE DOCUMENTS

The following documents form a part of this standard to the extent specified herein. The revision of the document in effect at the time a declaration is produced **shall** take precedence.

2.1 IPC¹

IPC-T-50 *Terms and Definitions for Interconnecting and Packaging Electronic Circuits*

IPC-1751 *Generic Requirements for Declaration Process Management*

IPC-1752 *Material Declaration Management*

IPC-7351 *Generic Requirements for Surface Mount Design and Land Pattern Standard*

2.2 Joint Industry Standards (ECA, IPC, JEDEC)

IPC/JEDEC J-STD-020 *Moisture/Reflow Sensitivity Classification for Non-hermetic Solid State Surface Mount Devices*

ECA/IPC/JEDEC J-STD-075 *Classification of Non-IC Electronic Components for Assembly Processes*

IPC/JEDEC JP002 *Current Tin Whiskers Theory and Mitigation Practices Guideline*

2.3 JEDEC²

JEDEC JESD22A111 *Evaluation Procedure for Determining Capability to Bottom Side Board Attach by Full Body Solder Immersion of Small Surface Mount Solid State Devices*

JEDEC JESD30 *Descriptive Designation System for Semiconductor-Device Packages*

2.4 IEC³

IEC 60194 *Printed board design, manufacture and assembly – Terms and definitions*

¹ www.ipc.org

² www.jedec.org

³ www.iec.ch