

Leesys - Leipzig Electronic Systems GmbH

Component requirements for manufacturing of customer-specific parts

accepted with Vendor Addendum

accepted without Vendor Addendum

SUPPLIER Stamp:	SUPPLIER Signature:
	Print-Name:
	Date:

Duplication or dissemination of this document, as well as the use or communication of its contents without express permission is forbidden. Violators are liable to payment of damages. All rights reserved in the event of a grant of patent or a GM entry.

Contents

1	Scope	3
2	Materials	3
3	Definitions and Standards	3
4	Deviations and supplements to standards – general requirements for customer-specific parts	4
4.1	Monitoring and reporting process	4
4.2	PRODUCT related changes (PCN, product change notification)	4
4.3	Date of manufacture	4
4.4	Marking	4
5	Deviations and supplements to standards – special requirements for SMT / THT components	5
5.1	Packing	5
5.1.1	Moisture sensitivity	5
5.1.2	Taping	5
5.1.3	Component polarity marking (Pin 1 - Identification)	6
5.1.4	Positioning in the tape	6
5.1.5	Vacuum pick position / Flat surface area	6
5.2	Component robustness	6
5.2.1	Component robustness in PCBA washing process	6
5.2.2	Component robustness in vapour phase process (only for repair purpose)	7
5.2.3	Component robustness in X-Ray inspection process (also valid for programmed circuits)	7
5.3	Component surface finish / solder ball configuration	7
5.3.1	Solderability SnPb (Ag) eutectic assembly	7
5.3.2	Leaded packages (e.g. QFP, TSOP, SO, PLCC, etc.)	7
5.3.3	Standard packages for capacitors, inductivities, resistors (0201 - 1608)	8
5.3.4	Components with flat soldering finish (e.g. VCO, PA, RF-Filter, LGAs, VQFN, QFN, etc.)	8
5.3.5	Components with solder balls (e.g. BGAs, μ BGAs, CSPs, wCSPs, etc.)	8
5.3.6	Electromechanical & special components (e.g. Connectors, Shielding, IrDA, buzzers etc.)	8
5.4	Additional requirements for lead free assembly	9
5.4.1	Definitions	9
5.4.2	Acceptance criteria, solderability / wetting test	9
5.4.3	Recommended lead free finishes / solder ball configuration	9
5.4.4	Critical solder ball components	9
5.4.5	Moisture sensitivity class	9
6	Reflow soldering profile	10
7	Electro-static-discharge robustness	12
8	Special requirements for THT process	12
8.1	Automatic PCB assembly (radial sequencer/ inserter)	12
8.1.1	Packing	12
8.1.2	Component taping	13
8.1.3	Taped component removal pull testing	13
8.1.4	Input tape splicing	14
8.2	Manual PCB assembly	14
8.3	Generally	14
9	Shipping documents	14
10	Legal regulations	14
11	Acknowledgement	14
11.1	Vendor addendum	14
11.2	Miscellaneous	14
11.3	History of changes	15
12	Annex 1 : Logistical requirements	16
13	Annex 2: Vendor Addendum (form)	17

1 Scope

This document describes in detail the general requirements for manufacturing of customer-specific parts.

2 Materials

This document applies to customer-specific parts.

3 Definitions and Standards

The following standards and named references, if not stated, in their respectively last and valid version are part of this standard.

IEC 60286-1,-2,-3,-4	Packaging of components for automatic handling
ANSI/EIA 481	Carrier Taping of Surface Mount Components for Automatic Handling
IEC 61340-5-1	Protection of electronic devices from electrostatic phenomena – General requirements
IPC/JEDEC J-STD-020	Moisture/Reflow Sensitivity Classification for Non-hermetic Solid State Surface Mount Devices
IPC/JEDEC J-STD-033	Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices
IEC 60068-2-58	Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)
ANSI/ESDA/JEDEC JS-001	ESDA/JEDEC Joint Standard for Electrostatic Discharge Sensitivity Testing - Human Body Model (HBM) - Component Level
ANSI/ESD STM5.2	ESD Association Standard Test Method for Electrostatic Discharge (ESD) Sensitivity Testing – Machine Model (MM) – Component Level
ANSI/ESDA/JEDEC JS-002	ESDA/JEDEC Joint Standard for Electrostatic Discharge Sensitivity Testing - Charged Device Model (CDM) - Device Level
ANSI/ESD S20.20	Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)
JEDEC JESD625	Requirements for Handling Electrostatic-Discharge-Sensitive (ESDS) Devices

4 Deviations and supplements to standards – general requirements for customer-specific parts

4.1 Monitoring and reporting process

On request the supplier shall deliver the following documents and reports to Leesys:

- Description of the qualification samples used
- Datasheets, drawings
- Qualification reports
- Re-Qualification reports
- Monitoring reports.

4.2 PRODUCT related changes (PCN, product change notification)

After qualification, the supplier may not carry out any alteration to the component or the process, which affects the shape, suitability, function, processing or reliability, without previously informing Leesys.

The following are examples of major changes, which shall be reported:

- All mechanical dimensions of component, tape or other packaging
- Marking, labelling, appearance
- Package and other materials, methods of fastening and contacting, lead material and coating
- Packing
- Location of production (also assembly, etc.)
- Data sheet: function, static and dynamic parameters (including typical values) and operating, handling and processing conditions
- Thermal and mechanical parameters (e.g. suitability for processing, automatic processability, soldering and cleaning processes)
- Changes of tools or production equipment
- Quality and reliability
- Material and process flow, which affects fit, form and function

The supplier must immediately notify Leesys about any changes to the products to be delivered. The supplier shall send the notifications directly to Leesys (E-Mail: pcn@leesys.com).

A new data sheet or data book or a generally distributed publication is not to be classified as a notification.

4.3 Date of manufacture

The date code of the delivered components must not be older than 12 months at the goods receipt at Leesys.

Shelf life of the component must be higher than 12 months after delivery at Leesys Warehouse under storage conditions max. +35°C and 70% RH maximum according to IPC/JEDEC J-STD-033.

4.4 Marking

Components shall bear the following marking, as far as their size permits (minimum requirement):

- Type respectively ordering designation
- Supplier's name or logo
- Date of manufacture or date code
- Pin numbering or polarity marking, according to the specification (where applicable)
- No double markings.

Marking shall be clearly legible, correctly and uniformly orientated, smudge-proof and resistant in the approved manufacturing procedures. If there is insufficient space for all or part of the marking, or there are other important reasons for not marking the component, the marking shall in all cases appear on the packing unit.

5 Deviations and supplements to standards – special requirements for SMT / THT components

5.1 Packing

The packing materials shall be suitable for use in ESD-protected areas according to IEC 61340-5-1. The following requirements must be met:

	Surface resistance in Ω	Notice
Packing materials in proximity with device and direct contact with the device pins	$10^2 \leq R_s < 10^{11}$ *)	acc. to the test methods of IEC 61340-5-1
*) When surface resistance of $>10^9\Omega$ is used, the material shall be procured with a static decay characteristic of 10% of the initial value, max. 1000V, in less than 2s.		

Table 1: ESD packing requirements

The components shall be protected from damage by mechanical, climatic influences.

Within a packing unit the orientation and polarity shall be uniform (if applicable).

If Drypack required, see J-STD 020 and J-STD 033.

Each individual packing unit (box, reel, etc.) shall carry the following marking in clear text and in bar code or 2D-code:

- Barcode label according to Annex 1
- Special marking for selections, special tests or preconditioning
- Warning labels for ESD-sensitive components
- MSL label, if applicable
- RoHS, lead-free label.

Because of automatic insertion, the package of the components must meet international standards, e.g. IEC 60286-1, -2, -3, and 4.

5.1.1 Moisture sensitivity

According to moisture sensitivity level classification of J-STD-020 moisture level ≤ 3 is required (Pb- and Pb-free assembly).

If components are exposed to humidity beyond allowable floor times according to J-STD-020, they must be reconditioned with following processes:

- a) Convection oven, temp. $45^\circ\text{C} \pm 5^\circ\text{C}$, Rel. Humidity $< 5\%RH$, time ≤ 192 hours
- b) Convection oven, temp. $125^\circ\text{C} \pm 5^\circ\text{C}$, Rel. Humidity $< 5\%RH$, time ≤ 48 hours.

5.1.2 Taping

Components have to be delivered in tape on reel packaging according to IEC 60286-3 and ANSI/EIA 481 with:

- a) Component's reel diameter $\geq 250\text{mm} / \leq 360\text{mm}$; 13inch (330.2mm) preferred
- b) Cover: HAA (Heat Activated Adhesive Cover Tape)
PSA (Pressure Sensitive Adhesive Cover Tape)

Cover tape shall always be of antistatic material and shall not cover the reel transport holes. Components shall not stick to carrier tape or to the cover tape.

- c) Carrier tape material: punched paper, embossed plastic

5.1.3 Component polarity marking (Pin 1 - Identification)

Polarized components have to be signed at Pin 1 on top side of the component (e.g. by dot or square, etc.); the marking must be perceptible by visual control.

5.1.4 Positioning in the tape

The Pin 1 - marking has to point to reel transport hole.

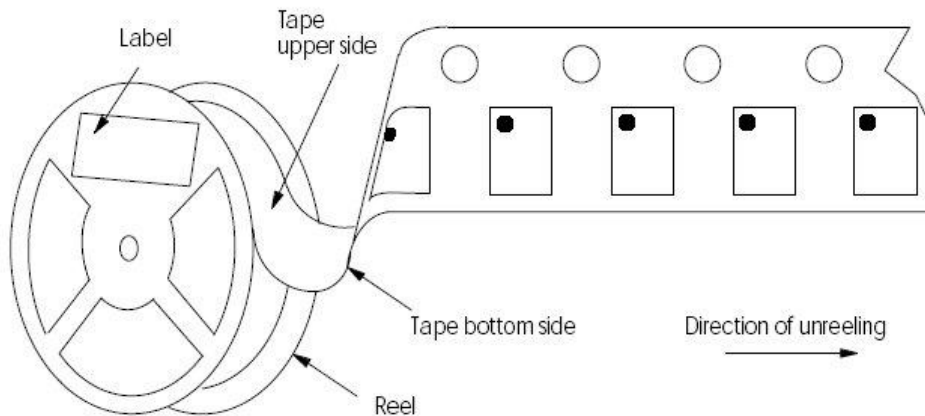


Figure 1: Component position in tape (IEC 60286-3)

5.1.5 Vacuum pick position / Flat surface area

Adequate flat surface areas on top of the component for pick and place vacuum nozzle must be given (typically 20% of component surface); the area should be placed in the middle of component gravity centre. In addition to IEC 60286-3 and EIA-481 requirements, for non-symmetrical /special components the parameter P2 has to be defined as the distance measured from the centre of sprocket hole to centre of vacuum pick point on component; for such components "pocket offset" is required so that components vacuum pick point is located at midpoint between two sprocket holes (see Figure 4).

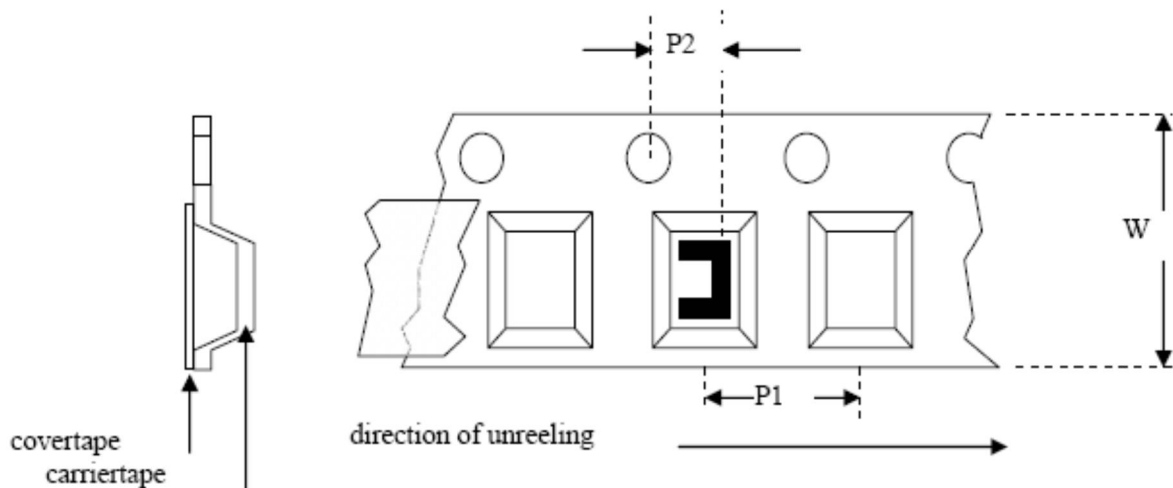


Figure 2: Pocket set up for non-symmetrical / special components

5.2 Component robustness

5.2.1 Component robustness in PCBA washing process

1-side assembled PCBs, which are failure processed on mounting side 2 (e.g. misprint), will be recovered by washing process (alkaline, H₂O based cleaning agent, typical cleaning temperature of 45°C to 50°C). Supplier shall notify Leesys, if incompatibilities with this process could affect electrical performance, mechanical performance or reliability of the component.

5.2.2 Component robustness in vapour phase process (only for repair purpose)

Supplier or manufacturer shall provide a notification, if there are incompatibilities with this process, which may affect electrical/ mechanical performance or reliability of the component.

5.2.3 Component robustness in X-Ray inspection process (also valid for programmed circuits)

All components have to tolerate two times X-Ray-Inspection without affecting electrical / mechanical performance or reliability.

- Typical production case: - 20sec inspection; < 0.25 Gy
- Worst case with object always in centre: - 20sec inspection; < 0.50 Gy.

5.3 Component surface finish / solder ball configuration

5.3.1 Solderability SnPb (Ag) eutectic assembly

The acceptance criterion for solderability test is a wettability of $\geq 95\%$ (according to IEC 60068-2-58) under the following conditions:

- solder type (metal configuration): Sn60Pb40 or Sn62Pb36Ag2
- solder temperature: $215 \pm 3^\circ\text{C}$

Recommended plating:

Base Material	Barrier layer	Finish
Ceramic	Ni: 2 - 4 μm	electroplated Sn, SnPb: > 5 μm
Fe, Fe-alloys	without	electroplated SnPb, SnPb hot-dipped: > 10 μm
	Cu: 3 - 5 μm	electroplated SnPb, SnPb hot-dipped: > 5 μm
	Ni: 2 - 4 μm	electroplated Sn, SnPb, SnPb hot-dipped: > 5 μm
Cu, CuAg, CuSn, CuNiSn	without	electroplated SnPb, SnPb hot-dipped: > 5 μm
	Ni: 2 - 4 μm	electroplated Sn, SnPb, SnPb hot-dipped: > 5 μm
CuZn, CuNiZn, CuBe	Cu: 3 -5 μm	electroplated SnPb, SnPb hot-dipped: > 5 μm
	Ni: 2 - 4 μm	electroplated Sn, SnPb, SnPb hot-dipped: > 5 μm
CuNiZn	without	electroplated SnPb, SnPb hot-dipped: > 5 μm
	Ni: 2 - 4 μm	electroplated Sn, SnPb, SnPb hot-dipped: >5 μm

Table 2: Plating recommendations

5.3.2 Leaded packages (e.g. QFP, TSOP, SO, PLCC, etc.)

Coplanarity $\leq 100\mu\text{m}$ (must be fulfilled before and after thermal stress. Max. temperature according to the reflow soldering profile); verification of process capability $c_{mk} \leq 1,67$ and $c_{pk} \leq 1,33$ required.

Stand-off $\geq 50\mu\text{m}$ (for SOT / SOD $\geq 0\mu\text{m}$);

Pitch $\geq 0.4\text{mm}$.

It is allowed:

- finishes: Sn, SnPb, SnCu, NiPd, SnBi (Bi $\leq 4\%$)
- lead frame material: Cu

It is **not** allowed:

- finishes: Ag, AgPd, Cu + Cu-alloys
- lead frame material: FeNi (Alloy 42) is not desired

5.3.3 Standard packages for capacitors, inductivities, resistors (0201 - 1608)

End face metallizing for outer solder joint shaping is required; Metallization width $\geq 0.2\text{mm}$ (components metallization width of 0.2mm can be tolerated only for 0201).

It is allowed:

Finishes: Sn, SnPb, SnCu, Ni/Au (Au $0.1 - 0.3\mu\text{m}$), SnBi (Bi $\leq 4\%$)

It is **not** allowed:

finishes: Ag, AgPd, Cu + Cu-alloys

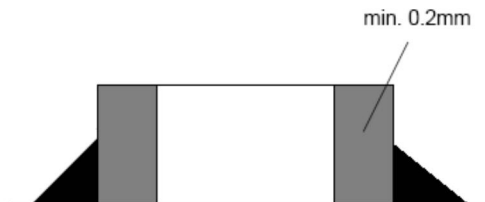


Figure 3: End face metallization

5.3.4 Components with flat soldering finish (e.g. VCO, PA, RF-Filter, LGAs, VQFN, QFN, etc.)

Coplanarity $\leq 100\mu\text{m}$ (must be fulfilled before and after thermal stress. Max temperature according to the reflow soldering profile); verification of process capability $c_{mk} \leq 1,67$ and $c_{pk} \leq 1,33$ required.

Stand-off $\geq 0\mu\text{m}$.

End face metallizing (castellation) for outer solder joint shaping is desired.

It is allowed:

finishes: Sn, SnPb, SnCu, Ni/Au (Au $0.1 - 0.3\mu\text{m}$), NiPd, SnBi (Bi $\leq 4\%$).

It is **not** allowed:

finishes: Ag, AgPd, Cu + Cu-Alloys.

5.3.5 Components with solder balls (e.g. BGAs, μ BGAs, CSPs, wCSPs, etc.)

Solder ball composition:

- Sn 63 ± 1 / Pb 37 ± 1 is allowed
- Sn 62 ± 1 / Pb 36 ± 1 / Ag 2 ± 0.5 is allowed
- High melting or hard balls are not allowed.

Coplanarity: maximum $100\mu\text{m}$; verification of process capability $c_{mk} \leq 1,67$ and $c_{pk} \leq 1,33$ required.

Ball diameter $\geq 250\mu\text{m}$; Tolerance for ball diameter: maximum $75\mu\text{m}$.

Interface area of component substrate to solder ball: minimum of $230\mu\text{m}$.

Ability for X-Ray-Inspection must be given. All components have to tolerate two times X-Ray-Inspection without affecting electrical performance, mechanical performance or reliability.

Pitch $\geq 0.5\text{mm}$.

For lead free solder ball components please refer to chapter 4.8.

5.3.6 Electromechanical & special components (e.g. Connectors, Shielding, IrDA, buzzers etc.)

Coplanarity $\leq 100\mu\text{m}$ (must be fulfilled before and after thermal stress. Max temperature according to the reflow soldering profile); verification of process capability $c_{mk} \leq 1,67$ and $c_{pk} \leq 1,33$ required.

Stand-off $\geq 0\mu\text{m}$

It is allowed:

finishes: Sn, SnPb, NiPd, Ni/Au (Au $0.1 - 0.3\mu\text{m}$).

It is not allowed:

finishes: Ag, AgPd, Cu + Cu-Alloys

Exception: Prem Can / Fish Can shielding's (CuNi18Zn20 without plating).

5.4 Additional requirements for lead free assembly

5.4.1 Definitions

Lead free process compatible component is defined by Leesys as a component which is compatible with lead free soldering conditions, with solder paste of SnAg(3.0 - 4.0)Cu(0.5 - 0.9) as metal composition.

Advanced requirement regarding RASH (Resistance against soldering heat, compare reflow profile is specified in section 5).

Lead free and lead containing process compatible component is defined by Leesys as a component which is compatible with lead free soldering conditions and SnPb(Ag) Eutectic soldering conditions (specified in section 5).

Lead free component is defined by Leesys as a component, whose content of lead does not exceed 0.1 weight-percent. The Definition based on the EU directive RoHS (Restriction of the use of certain Hazardous substances in electrical and electronic equipment). Lead free components have to be classified as lead free process compatible component or lead free and lead containing process compatible component.

5.4.2 Acceptance criteria, solderability / wetting test

The acceptance criterion for solderability test is a wettability of $\geq 95\%$ (according to IEC 60068-2-58) under the following conditions:

- solder type (metal configuration): SnAg(3.0 - 4.0)Cu(0.5 - 0.9)
- solder temperature $245 \pm 3^\circ\text{C}$.

5.4.3 Recommended lead free finishes / solder ball configuration

- Ag/Cu/Ni/Sn
- Ag/Cu/Sn
- Sn
- Ag
- Au
- SnAg
- SnCu
- Ni/Pd
- Ni/Pd/Au (Au 0.1 – 0.3 μm)
- SnBi (Bi $\leq 4\%$)
- SnAg(3.0 - 4.0)Cu(0.5 - 0.9) for components with solder balls (e.g. BGAs, μ BGAs, CSPs, w/CSPs, etc.)

5.4.4 Critical solder ball components

Based on Leesys experience there is risk that lead free solder ball components perform not at same reliability level as lead containing devices, for example under drop load (JEDEC Drop test).

In particular Leesys focuses on solder ball components with ball pitch $\leq 0.65\text{mm}$ and component size $\geq 8.0 \times 8.0\text{mm}$.

For these devices judged as critical Leesys strongly recommends:

- Cu/OSP-Substrate Technology to minimize risk driven by IMC-formation
- "Alternative" Solder ball alloy composition with reduced Ag-Content (Ag $< 2\%$) and additional alloy constitution(s) to minimize risk driven by AgSn formation in solder joint.

5.4.5 Moisture sensitivity class

According to moisture sensitive level classification of J-STD-020 moisture level ≤ 3 is required (Pb-free assembly, small body packages, peak Temp. 260°C).

6 Reflow soldering profile

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat/Soak Temperature Min (T_{smin}) Temperature Max (T_{smax}) Time (t_s) from (T_{smin} to T_{smax})	100°C 150°C 60-120 seconds	150°C 200°C 60-120 seconds
Ramp-up rate (T_L to T_p)	3°C/ second max.	3°C/ second max.
Liquids temperature (T_L) Time (T_L) maintained above T_L	183°C 60-150 seconds	217°C 60-150 seconds
Peak package body temperature (T_p)	For users T_p must not exceed the Classification temp in table 4 For suppliers T_p must equal or exceed the Classification temp in table 4	For users T_p must not exceed the Classification temp in table 5 For suppliers T_p must equal or exceed the Classification temp in table 5
Time (t_p)* within 5°C of the specified classification temperature (T_c), see figure 6	20* seconds	30* seconds
Ramp-down rate (T_p to T_L)	6°C/second max.	6°C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
*Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum.		

Table 3: Classification profile

Package thickness	Volume: < 350 mm ³	Volume: ≥ 350 mm ³
< 2,5 mm	235 °C	220 °C
≥ 2,5 mm	220 °C	220 °C

Table 4: SnPb eutectic process - classification temperatures (T_c)

Package thickness	Volume: < 350 mm ³	Volume: 350 – 2000 mm ³	Volume: > 2000 mm ³
< 1,6 mm	260 °C	260 °C	260 °C
1,6 mm - 2,5 mm	260 °C	250 °C	245 °C
> 2,5 mm	250 °C	245 °C	245 °C

Table 5: Pb-free process - classification temperatures (T_c)

Note: All temperatures refer to the centre of the package, measured on the package body surface that is facing up during assembly reflow.

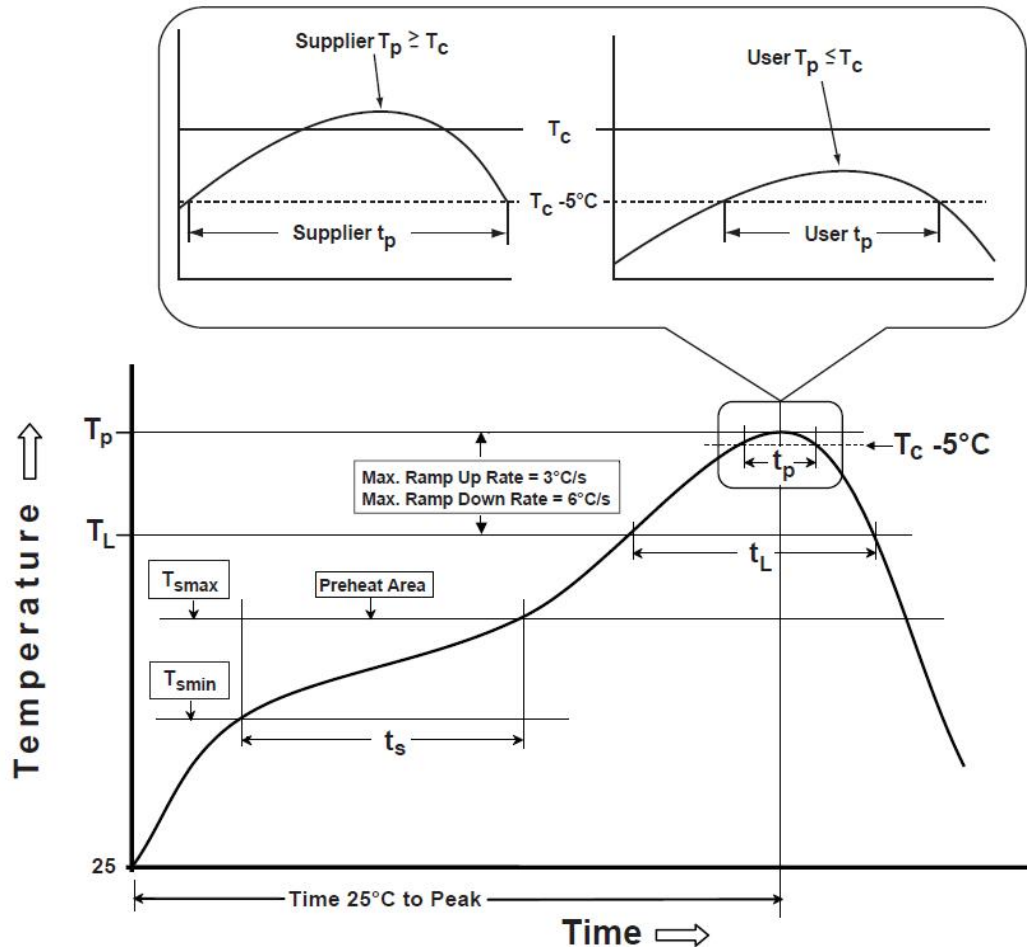


Figure 4: Classification profile (not to scale, according to IPC/JEDEC J-STD-020)

Note: All components have to resist this profile three times with total cool down time of at least 5 minutes without affecting electrical performance, mechanical performance or reliability. Supplier or manufacturer shall provide a notification to Leesys, if there are incompatibilities to this requirement. Components mounted either on top of PCB or hanging below.

7 Electro-static-discharge robustness

Components have to resist ESD-voltages that occur in a production process environment that is working according ANSI/ESD S20.20 or JEDEC JESD625.

The components shall withstand voltages defined in the following standards:

ANSI/ESDA/JEDEC JS-001	ESDA/JEDEC Joint Standard for Electrostatic Discharge Sensitivity Testing - Human Body Model (HBM) - Component Level
ANSI/ESD STM5.2	ESD Association Standard Test Method for Electrostatic Discharge (ESD) Sensitivity Testing – Machine Model (MM) – Component Level
ANSI/ESDA/JEDEC JS-002	ESDA/JEDEC Joint Standard for Electrostatic Discharge Sensitivity Testing - Charged Device Model (CDM) - Device Level

(named standards in their respectively last and valid version)

Testing Method	Class (minimum)	Voltage (for pass)
Human Body Model	1B	500 to < 1000
Charge Device Model	C1	250 to < 500
Machine Model	M3	200 to < 400

Table 6: electro-static-discharge robustness

8 Special requirements for THT process

8.1 Automatic PCB assembly (radial sequencer/ inserter)

8.1.1 Packing

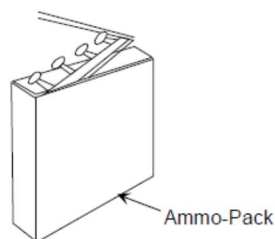


Figure 5: Ammo-Pack

8.1.2 Component taping

Dimensions are in millimeters;
inch equivalents are bracketed.

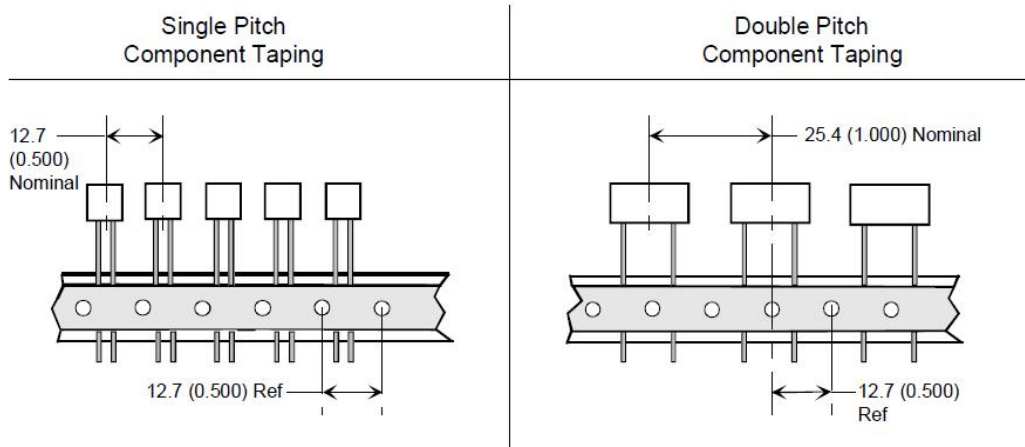


Figure 6: Component spacing for 12.7 mm pitch tape

8.1.3 Taped component removal pull testing

The tape components shall unfold (ammo-pack) with a force not to exceed 5 N. Pull tests shall be applied as illustrated.

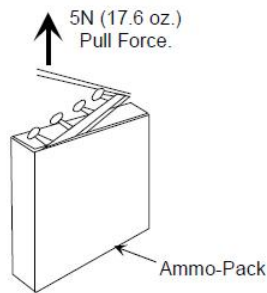


Figure 7: Pull force testing

8.1.4 Input tape splicing

Component may be spliced with an acceptable splicing tape. Splices must not interfere with tape feed holes and overall tape thickness may not exceed 1.5 mm.

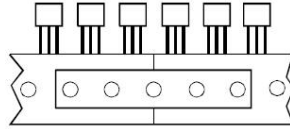


Figure 8: Tape splicing

8.2 Manual PCB assembly

- 2 Pins: ammo-packing according to chapter 7.1.4
- 3 Pins: bulk packing
- > 3 Pins: tray packing (no pin bending)
- Connectors: tray packing required (no pin bending)

8.3 Generally

- Peak temperature: 265°C for 5 sec
- Lead-free

9 Shipping documents

The shipping papers shall contain the following information:

- Address for delivering and billing
- Supplier's name
- Leesys code number, as in the order
- Supplier's type designation, in conformity with the marking on the packaging and/or components
- Leesys order number and date
- Supplier's order number and date
- Designation of origin in accordance with EU regulations (if applicable)
- Total quantity in the delivery
- Export control commodity number.

10 Legal regulations

The components have to comply with the legal requirements

For example: RoHS, Reach

11 Acknowledgement

11.1 Vendor addendum

Deviations from this document shall be agreed by Leesys and the supplier and documented in a "Vendor Addendum" (see Annex 2).

11.2 Miscellaneous

If an individual provision of this document is or becomes legally void or unfeasible, the validity and effect of any arrangements made for the performance of the invalid provision, as well as of the remaining provisions of this document, shall not be affected thereby. Leesys and supplier shall work together on an amicable basis to substitute the invalid provision. The economic result of the substitute shall be as close as legally possible to the invalid provision.

11.3 History of changes

Issue Date	Document	Editor	Notice: Short Description of Change(s):
2009-09-17	Released	Steffen Hager SECM SQM	Based on SEN Component Requirements 2009-09
2013-01	Released	Steffen Hager Leesys QS	updated
2017-08-30	Draft	Thomas Voigt Leesys QM	- Minor corrections - Para. 3 - Standards added - Para. 4.2 - Revised, E-Mail Address added - Para 5 - Standards added - Annex 1 Changed to logistical requirements - Annex 2 Vendor Addendum (form) added
2017-08-31	Released	Thomas Voigt Leesys QM	
2018-02-13	Draft	Thomas Voigt Leesys QM	- Para. 4 separated in general requirements (Para. 4) and SMT / THT specific requirements (Para. 5)
2018-02-16	Released	Thomas Voigt Leesys QM	

12 Annex 1 : Logistical requirements

Leesys stores large-volume materials using exchangeable Euro-pallets, stillage or own steel pallets. For deliveries on one of these types of pallets, a maximum pallet dimension of EURO 120 x 80 x 95 cm is permitted (L / W / H pallet included). For deliveries using other types of pallets, measures for an effortless unloading must be guaranteed by the Supplier. The total pack size, without pallet, may not exceed 120 x 80 x 80 cm (L/W/H).

- (1) A maximum pallet size of EURO 120x80x95 is permitted for deliveries.
- (2) The following box dimensions are used at Leesys:
E1: inner dimensions 56 x 36 x 8.5 cm
E4: inner dimensions 56 x 36 x 38.5 cm (only for material order picking)

If possible, Supplier packaging should be in line with these box dimensions. For this purpose, a consultation with the warehouse manager is requested.

- (3) Deliveries must contain the quantity and product type according to the order placed by Leesys, with each item to be individually packaged.
- (4) Leesys requires the use of labelling of the material in accordance to VDA 4992 - MAT Label (VDA-Recommendations 30. September 2015)

<https://www.vda.de/de/services/Publikationen/Publikation.~1321~.html>

13 Annex 2: Vendor Addendum (form)

Confidential!

Name of SUPPLIER	Major Deviations in Vendor Addendum to Leesys requirements	Page 1 of 1
Type of changes: C = completed and agreed R = replaced E = exceptions D = deleted		
Date of Vendor Addendum:		
Leesys Component Requirements for Manufacturing		Edition 2017-08
Item / Subject	Text	Type of change
SUPPLIER Stamp:	SUPPLIER Signature:	Leesys Responsible
	Print-Name: Date:	Print-Name: Department: Date: