JEDEC STANDARD

Descriptive Designation System for Electronic-device Packages and Footprints

JESD30L

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JEDEC SOLID STATE TECHNOLOGY ASSOCIATION

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DESCRIPTIVE DESIGNATION SYSTEM FOR ELECTRONIC-DEVICE PACKAGES

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Foreword

This standard establishes requirements for the generation of electronic-device package designators for the JEDEC Solid State Technology Association. The requirements herein are intended to ensure that such designators are presented in as uniform a manner as practicable

Example of how this standard can be used, is in defining the part in sufficient detail to enable process efficiencies during the part and product life cycles, i.e., design, purchasing, manufacturing, quality control, test, etc... This release includes additional definition and clarification of the device to provide this support to the industry. The standard is designed to be scalable insofar that it should cover as many components as possible that are available in the market. It should also be scalable to encompass the emergence of new packages in the future. It is not intended to provide standardization for a limited number of parts, or the perceived common parts in the market, since this is impracticable to measure.

Although this standard is considered to have international standardization implications, a complete comparison between the JEDEC standard and the international documents has not been made.

This revision of the standard incorporates many new table entries and text emendations compared to JESD30I. The material contained in this standard was formulated by the JEDEC JC-11 Committee on Mechanical (Package Outlines) Standardization and approved by the JEDEC Board of Directors.

This standard supports the JEP30-P100 Part Model Package Guidelines for Electronic-Device Packages – XML Requirements, and its companion JEP30-P101, Part Model Package Schema. These JEP30 standards represent a standard XML structure to enable Component Manufacturers to provide part data to their customers, utilizing these definitions herein in a digital model.

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DESCRIPTIVE DESIGNATION SYSTEM FOR ELECTRONIC-DEVICE PACKAGES

(From JEDEC Board Ballot JCB-23-26 formulated under the cognizance of the JC-11 Committee on Mechanical (Package outline) Standardization.)

1 Scope

This standard describes a systematic method for generating descriptive designators for electronic-device packages. The descriptive designator is intended to provide a useful communication tool but has no implied control for assuring package interchangeability.

2 Terms and Definitions

For the purpose of this standard, the following definitions shall apply:

2.1 Package Terms and Definitions

body direction: this attribute defines whether the part body is either vertical or horizontal, by comparing the cross-sectional area of the part in both the horizontal direction and the vertical direction. If the horizontal cross-sectional area is greater than the vertical cross-sectional area, then the body direction is horizontal.

die-size package: See chip scale package

footprint (of a package): The pattern of package terminals that is used to define the land patterns on a mating printed circuit board.

NOTE The footprint may include features necessary for mechanical mounting of the package.

package: The encapsulation of an electronic component.

See Table 1 for a list of package outline styles.

package terminal: Package terminal code is a one-character code that indicates the terminal codes of all the terminals on the package (see 3.2.4 for how this is calculated). An additional optional code can be added to explain the extended terminal type.

package terminal position: Package terminal position is a one-character code that indicates the position of all the terminals on the package (see 3.2.2 for how this is calculated). An additional optional code can be added to explain the extended terminal type.

part access direction: Various parts require additional clearance around the part, typically in one direction post assembly on the PCB. This may be a once off access to the part as the PCB is mounted into its enclosure, or it may require continuous access over the life of the product. Part access can come in any of the following directions – Topside, Underside, Front, Back, Right side, Left side

terminal: An externally available point of electrical connection. (Ref. JESD99.) The solid or stranded wire or formed conductor that extends from a package body to serve as a mechanical or electrical connector, or both. The terminal can also be a metallic post or stud mount package body that is used for making electrical connections.

2.1 Package Terms and Definitions (cont'd)

terminal group: A part can have multiple terminals of different shapes, position, and size. The term group is used to define a grouping of terminals that have a uniform layout, and which have a common set of terminal types and terminal dimensions. As an example, a layout of multiple terminals would be a set of 16 terminals organized into 2 columns of 8 where the spacing in the vertical direction is the same for all terminals and the spacing in the horizontal direction is the same for all terminals.

terminal group terminal code: A single-letter suffix that identifies the standard terminal belonging to a specific group of terminals on a package. When there is a single terminal group on a package, then the package terminal code is the same as the terminal group terminal code.

terminal group terminal position: A single-letter prefix that identifies the physical terminal positions specific to a group of terminals on a package. When there is a single terminal group on a package, then the package terminal position is the same as the terminal group terminal position.

terminal mount: The method or technology employed in mounting the terminal to the printed board land pattern. There are 5 types available – SMT, Through-hole, Non-board, Hole, or Press-fit

2.2 Footprint Terms and Definitions

all layers: All routing layers.

any mount: The object is displayed when footprint is placed either Top or Bottom

assembly: Mount side assembly layer

assembly top: Top side of the board assembly layer

assembly bottom: Bottom side of the board assembly layer

assembly opposite: Opposite side of the board assembly layer

bottom layer: Bottom side of the board; the object with this layer will be shown when the footprint is placed on the bottom of the board.

bottom mount only: The object is displayed when footprint is placed on the Bottom only

drill drawing layer: The layer in which you specify the drill hole size.

drill hole size: The shape and dimensions of the hole size before plating.

finish hole size: The shape and dimensions of the hole size after plating.

mount layer: The top routing layer for top mounted part.

mount side: The side of the printed circuit board on to which the component is assembled.

opposite layer: The bottom routing layer for a top mounted part.

opposite side: The other side of the printed circuit board on to which the component is assembled.

2.2 Footprint Terms and Definitions (cont'd)

relative layer N: Route layer relative to the Mount Layer, with 0 = Mount Layer. i.e., component manufacturers may want to specify a ground plane to be placed N layers below the package body, to ensure proper functionality of the part.

silkscreen bottom layer: Bottom side of the board silkscreen layer

silkscreen mount layer: Mount side silkscreen layer

silkscreen opposite layer: Opposite side silkscreen layer.

silkscreen top layer: Top side of the board silkscreen layer.

soldermask bottom layer: Bottom side of the board soldermask layer

soldermask mount layer: Mount side soldermask layer

soldermask opposite layer: Opposite side soldermask layer.

soldermask top layer: Top side of the board soldermask layer.

solderpaste bottom layer: Bottom side of the board solderpaste layer

solderpaste mount layer: Mount side solderpaste layer

solderpaste opposite layer: Opposite side solderpaste layer.

solderpaste top layer: Top side of the board solderpaste layer.

top Layer: Top side of the board; the object with this layer will be shown when the footprint is placed on the top of the board.

top mount only: The object is displayed when footprint is placed on the Top only

Infinite soldering: This is a process in which there is an unconstrained amount of solder available to make the solder connection between the terminal and the Thru-hole or the Surface pad connection. It consists of

1) Wave soldering,
2) Selective wave soldering,
3) Solder Pot
4) Manual soldering

Finite soldering: This process limits the amount of solder that is available to the specific Thru-hole connection or the Surface pad connection. Finite Soldering process consists of

1) SMT (for Surface Mount Devices), and Paste-in-Hole (for Through Hole Mount devices).
2) Captive Solder Charge, e.g., Laser Soldering

3 Descriptive Designation System for Electronic-device Packages

3.1 General

The standard descriptive designation system is a method for identifying the physical features of an electronic-device package. The most scalable method to achieve this is to split the definition of the package into three basic elements, namely package outline, terminal position, and terminal description. To conform as close as possible to previous JEDEC Standards, the terminal position precedes the package outline, while the terminal code follows the package outline. This designator is extended through the use of additional fields to provide additional package information such as package-body material, terminal count, and package body dimensions.

This mandatory package designator may be extended, through the use of user-selected fields, to provide additional package information such as specific package features, package differentiators, and supplemental information.

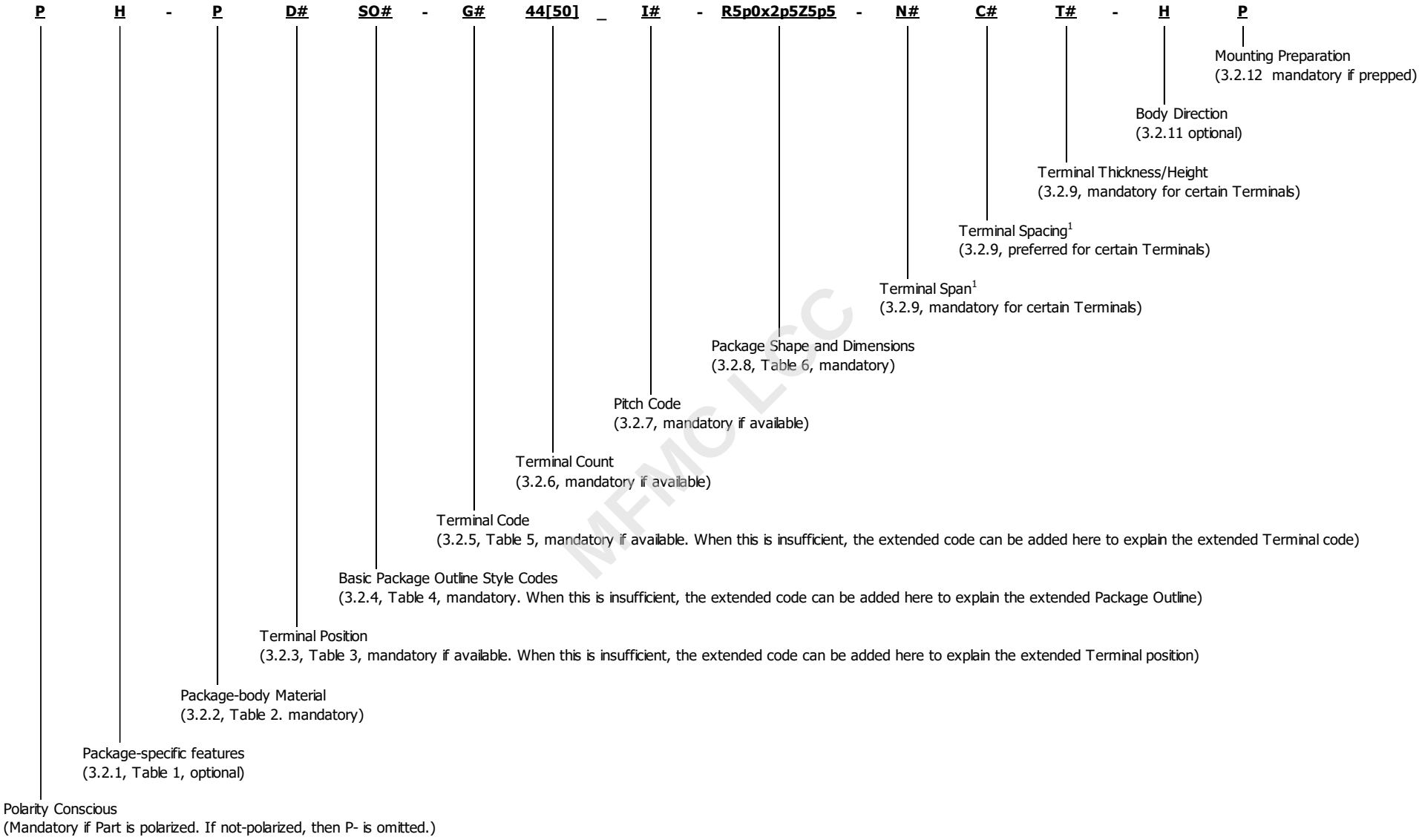
As outlined in the Foreword, this standard supports the JEP30-P100 Part Model Package Guidelines for Electronic-Device Packages – XML Requirements, and its companion JEP30-P101, Part Model Package Schema. When populating dimensional data associated with the component part, it is required to provide tolerance data so that software tools consuming this data can take cognizance of the tolerance spread to perform their function. An example of this is in Footprint creation where the tolerance spread on the terminal contact area, terminal span and spacing all contribute to the final dimension of the land pattern.

In contrast, when the component manufacturer provides a recommended design pattern, they are only required to populate the target design value to which the design tools should conform to. If compliance to these dimensions is critical to the integrity of the component part performance, then component manufacturers are encouraged to also provide the tolerance on the footprint design to which the fabrication process must adhere too in order to guarantee the performance and reliability specified by the component manufacturer. An example of this would be the hole size and spread to guarantee a gas tight connection between pressfit terminals and the final PCB product.

The second advantage to providing tolerances on the land pattern that can be gained from the provision of a tolerance on a design dimension, is that if end-user customers have already established footprint, which matches the requirement land pattern for a given part, then it avoids the need for the customer to generate a new footprint, for a small and irrelevant change.

These JEP30 standards represent a standard XML structure to enable Component Manufacturers to provide part data to their customers, utilizing these definitions herein in a digital model.

NOTE JEITA ED7303 (“Name and code for integrated circuit package”) and IEC 60191-4 (“Coding system and classification into forms of package outlines for electronic device packages”) are standards similar to JESD30.



Note 1: The group of Terminal Span, Terminal Spacing and Terminal Thickness Height is replaced by Terminal Shape and Size for certain Terminal Codes. See Section 3.2.9

Figure 1 - Descriptive Designation System for Electronic-device Packages

3.2 Field Descriptions

3.2.1 Package-specific Features

Package-specific features are described through the use of a prefix comprising codes for applicable functions. All package-specific features precede the package material code and are separated from them by a dash (-).

Table 1 shows the defined package-specific-feature codes.

Table 1 - Codes for Package-specific Features

Function	Code	Package-specific feature
Added feature	H	Integral heat spreader wholly or partially exposed
	A	Stacked package assembly
	C	Windowed package for optical devices

3.2.2 Package-body Material

A single-letter prefix is used to identify the predominant external package-body material. The package-body-material prefix is the first field of the mandatory descriptive designator and must be included.

When multiple material possibilities may coexist interchangeably, or when the package-body material is other than one of those defined in Table 2, an upper-case letter “X” should be used to signify a special or new material.

Table 2 - Prefixes for Predominant Package-body Material

Code	Material
A	Plastic Metal mix
C	Ceramic, metal-sealed, cofired
E	Ceramic Plastic mix
G	Ceramic, glass-sealed
L	Glass
M	Metal - A hybrid circuit package made solely of metal, without glass or ceramic.
P	Plastic (molding compound, glob-top, and printed circuit board-like substrates)
S	Silicon
T	Tape (usually polyimide), where tape is an integral part of the package
X	Other

3.2.3 Terminal-position Prefix

The two-letter package-outline-style code should be supplemented with a single-letter prefix that identifies the physical terminal positions or, if applicable, the device footprint, e.g., DIP, PGA, SIP, and ZIP.

If more than one type of terminal is present, then the position character is defined by the position of the electrical terminals that determine the terminal code as defined in Table 3 – Prefixes for terminal position below. If one of these terminals is a mounting stud, its position shall not govern the choice of the position character prefix in the package name. The following rules apply:

The extended definitions of positions are recommended to be incorporated in the name of the package.

If there is only one Terminal group within the Package, then the Terminal position in the Package name = the value of the Terminal position of that Terminal Group.

If there are several Terminal Groups within a Package, where each terminal group has a terminal position that cannot be represented by the same single character, such as one terminal group having a position of any of S, D, T, Q, R and the other terminal group having any of A, B, E, G, U, Z, the character that denotes the Terminal position in the package name should reflect this complexity by using the code “M” for “Mixed Position”,

The value of the Terminal position attribute is defined according to the signal/power terminals only. When there are no such terminals, the Terminal position attribute is defined according to the remaining terminals. If there are no terminals of any kind as in a housing only, then the Terminal position code is omitted.

If there are 2 or more Terminal groups, where one Terminal Group Terminal Position = Dual “Left-to-Right/Outside”, and the next Terminal Group Terminal Position = Dual “Back-to-Front/Outside”, then at the Package level, the Package Terminal Position is set to “Quad / Outside”.

1) Assuming in that same example that one Terminal Group Terminal Position was “Outside”, and the other Terminal Group Terminal Position was not “Outside”, then the Package Terminal Position is set to “Quad” at the Package level.

2) This means that the primary Package Terminal Position character can be set even if the extended definitions of the Terminal Group Terminal Positions do not align up.

Table 3 shows one-letter terminal-position prefix codes.

The value of these codes is available in the “Terminal position with additional information” table in Annex A. Position Images along with an explanation of the “Relationship concepts between the Terminal Contact Area and the Body Outline” are also available following this table in Annex A.

3.2.3 Terminal-position Prefix (cont'd)

Table 3 - Prefixes for Terminal Position

Code	Name	Position
A	Axial	Terminal wires extend from both ends in the direction of the major longitudinal axis of a cylindrical, elliptical package, or elongated box-shaped package. i.e., the Terminals emerge from two opposite ends of an elongated component, through the main axis of the package body.
B[2]	Bottom	Terminals extend to or through the seating plane.
D[2]	Dual	Terminals are on opposite sides of a square or rectangular package or located in two parallel rows on one surface.
E	End	Terminals are package endcaps.
G	Diagonal	Two Terminals located diagonally on the body. May be located on the underside or on the side of the package body.
I	Internal	Terminals which are defined internal to a connector. When a connector does not have terminals that make electrical connections to a pcb substrate, then this position classification, as in a cable-to-cable connector.
M	Mixed position	Terminal belonging to several Terminal Groups whose terminal positions that cannot be consolidated into one of the other position codes.
Q[2]	Quad	Terminals are on the four sides of a square or rectangular package or arranged in a square or rectangle pattern on one surface.
R[2]	Radial	Terminals extend from the package equidistance from the central z-axis.
S[2]	Single	Terminals are on one side or surface of a square or rectangular package
T[2]	Triple	Terminals are on three sides of a square or rectangular package.
U[2]	Upper	Terminals are on the upper surface of a package opposite to the seating plane.
Z	Zigzag	Terminals are on one surface of a square or rectangular package arranged in a staggered configuration.

NOTE Example of terminal positions images are shown in Annex A.
NOTE 1 References to package shape do not take account of notches, or other irregularities.
NOTE 2 These position definitions can have some variations that often require further definition or clarification as defined in Annex A.

3.2.4 Package Outline Style Codes

The basic package designator is a two-character package outline style code. It is preceded with a terminal-position code and a succeeding terminal code (see 3.2.3 Terminal-position Prefix above and 3.2.5 Terminal Suffix below). Table 4 shows the two-character package outline style codes.

Table 4 - Package Outline Style Codes

Package style code	Package type	Description
AT	Array Type	A rectangular or square shaped body with or without chamfered corners with perpendicular sides. The sides do not taper outwards or inwards as in a Small Outline or a Flatpack Package Outline.
CP	Clamped Package (Press-Pack)	A package for high-current devices, in the form of a cylinder with a flat, circular high-current terminal on each end that is intended to be clamped between two bus bars acting as heat sinks.
CS	Chip Scale Package	A Package that is no more than 1.2X the area of the internal die size.
CY	Cylinder or Can	A cylindrical (tubular) package whose terminals exit from one end parallel to the axis of the package.
DB	Disk Button	A package shaped like a disk or button whose terminals exit radially from the periphery of the package (like the spokes of a wheel) or axially from the center of the disk.
FM	Flange Mount	A package having a flange mounted heat sink that is an integral part of the package and that extends beyond the package body to provide mechanical mounting to a packaging interconnect structure or cold plate. NOTE The terminals may exit from, or be attached to, any surface of the package.
FP	Flatpack	A surface-mount package whose terminals project parallel to, and are designed primarily to be attached parallel to, the seating plane. The terminals exist on three or four sides of the package and can contain a surface terminal on the underside of the package. The terminals can also be metal pad surfaces or be terminals that emerge from the side of the package.
GA	Grid-Array	A package that has terminals arranged in a matrix on the bottom or upper side of the package and contained within the package outline.

Table 4 - Package Outline Style Codes (cont'd)

Package style code	Package type	Description
IP	In-Line Package	A package having a single row or parallel rows of terminals designed primarily for insertion (through-hole) mounting perpendicular to the seating plane. NOTE: The terminals may emerge from a single side or from two parallel sides with the terminals formed to produce parallel rows.
LF	Long Form	A cylindrical or tubular package having terminal endcaps or axial terminal wires.
MA[1]	Microelectronic Assembly	Unpackaged (uncased) microcircuits and/or packaged microcircuits so constructed on a packaging interconnect structure. NOTE The microelectronic assembly may also include discrete devices. These and the microelectronic devices may be mounted on either one or two sides of the packaging interconnect structure. The external terminals typically exit from one side of the assembly. Various package sizes, shapes, and external terminal shapes may be used.
PF	Press Fit	A round or elliptical package whose mechanical mounting area is inserted under pressure into the packaging interconnect structure or cold plate for purposes of thermal and/or electrical connection. NOTE 1 The package body (not the terminals) must be press fit into the interconnecting structure to be defined as a pressfit package. If the terminals are press fit into the interconnecting structure, but the package body is not, then the terminals are defined as pressfit, and the package is classified as one of the other package style codes. NOTE 2 If the package body is also an electrical connection, then the pressfit portion of the package body is also defined as the pressfit pin.
PM[1]	Post or Stud Mount	A package, intended for mounting to an interconnect structure or cold plate, that incorporates a threaded stud, threaded hole, or post for that purpose. NOTE A variety of package sizes, shapes, and external terminal shapes are possible.

Table 4 - Package Outline Style Codes (cont'd)

Package style code	Package type	Description
SO	Small Outline	A surface-mount package whose terminals project parallel to, and are designed primarily to be attached parallel to, the seating plane. The terminals exist on one or two sides of the package and can contain a surface terminal on the underside of the package. The terminals can also be metal pad surfaces or be terminals that emerge from the side of the package.
UC	Uncased Chip	Unpackaged die that has bumps, terminal frames or other terminals added for electrical attachment.
XC	Connector	A package that physically and electrically joins or separates two component/PCB/interconnect structures, transferring electrical signals or current.
XD	Discrete	An electronic device, either passive (resistor, capacitor, inductor) or simple active (transistor or diode).
XH	Hardware	An item used solely for performing auxiliary activities such as heat or light conduction, support, elevation, anchoring, grounding, etc.
XS	Switch	A device that opens and closes the flow of current in an electrical circuit. Relays with mechanical contacts are also regarded as switches.
NOTE Example of package outline styles images are shown in Annex A. NOTE 1 These package outline styles definitions can have some variations that often require further definition or clarification as defined in Annex A.		

3.2.5 Terminal Suffix

The two-letter package-outline-style code is supplemented with a single-letter suffix following a dash (-) that identifies the terminal code. Table 5 shows one-letter terminal suffix codes.

If more than one type of terminal is present, then the electrical terminals determine the terminal suffix code. If one of these terminals is a mounting stud, its classification shall not govern the choice of terminal suffix code because that is described by the package-outline-style code. The following rules apply:

1) The extended definitions of Terminals are recommended to be incorporated in the name of the package.

2) If there is only one Terminal group within the Package, then the Terminal code in the Package name = the value of the Terminal code of that Terminal Group.

If there are several Terminal Groups within a Package, the character that denotes the Terminal code in the Package name should reflect the combination of the Terminals across each of the Terminal Groups, by using the Mixed SMT, Mixed TH, or Mixed Technology if each Terminal Group has different Terminal types. When there are 2 or more Terminal Groups on the part, and the value of the Terminal code is different for each terminal group, then

1) If all the terminals are surface mount terminals, then the terminal code character in the package name is set to "E" for “Mixed SMT”; or

2) If all the terminals are through hole terminals, then the terminal code character in the package name is set to "K" for “Mixed TH”; or

3) If all the terminals are a mixture of both surface mount, through hole, or pressfit, then the terminal code character in the package name is set to " V" for “Mixed Technology”

The value of the Terminal code attribute is defined according to the signal/power terminals only. When there are no such terminals, the Terminal code attribute is defined according to the remaining terminals. If there are no terminals of any kind as in a housing only, then the Terminal code is omitted.

Similar to the rollup of the Terminal Group Terminal Position into the Package Terminal Position, if the extended codes of the Terminal Group Terminal Code are not the same for each Terminal Group, then the extended definition is ignored at the Package Terminal Code level.

3.2.5 Terminal Suffix (cont'd)

Table 5 - Suffixes for Terminal

Code	Form/shape	Description
B[1]	Ball	A spherical terminal in the shape of a ball.
C	C-bend	A compliant terminal extending from the sides of the body, bending down, and forming a flat contact area with the board under the package body. It is similar to a J-bend except that the bottom of the terminal is flat, and not rounded up under the package body.
D[1]	Lug	A type of wire terminal secured by a screw, crimp, or solder to provide electrical and/or mechanical function.
F[1]	Flat	A compliant, or noncompliant, unformed planar terminal that extends away from the package body.
G[1]	Gull-wing	An SMD terminal that extends horizontally from the package body, bent downward adjacent to the body, and then bent outward near the bottom of the body.
H	Compressed Mount Technology	The connector is sandwiched between two objects to provide connection, such as two PCB boards. Enough retention force is needed to compress the terminal at both ends to ensure the reliability of connection.
I	Post (Stud) Terminal	A metallic post or a modified through-hole terminal intended for SMD mounting.
J	J-bend	An SMD terminal form that extends horizontally from the package body near its Z axis centerline, is formed down and then rolled under the package. Terminals so formed are shaped like the letter "J.
L[1]	L-bend	An L-shaped compliant SMD terminal that extends from the bottom of the package body and bends sideways, forming an "L" shape. Additional classification is not necessary if the terminal ends are visible in the plan view of the part when mounted on the seating plane.
M[1]	Column	Terminals are perpendicular to the seating plane and consist of solid or metallized extensions
N[1]	Surface-terminal	Metallized contact area located on any surface of the device body.
O[1]	Pressfit	A terminal that forms an interference fit with the hole in which it is vertically inserted, using pressure, creating enough friction that causes the metal coating of the terminal and the hole to reflow
P[1]	Pin	A reinforced terminal that extends from the bottom of the package body and is intended for attachment as is, to a plated through-hole in the printed board or into a socket. This terminal is not meant to be formed or cut during the part assembly to the printed board.

Table 5 - Suffixes for Terminal (cont'd)

Code	Form/shape	Description
Q[1]	Quick-connect	A tab-like terminal typically extending from the upper or under side of the package body, or a terminal within a socket that plugs into another connector. If the part is mounted to the printed board, then it should be classified under the definition of the electrical terminals that connect to the printed boards, and not by these tab-like terminals. These terminals provide a plug-on, plug-off connection.
R[1]	Wraparound	A metallized contact area that wraps around the top, 1 or more sides and bottom of the package body.
S[1]	S-bend	A SMD terminal that extends away from the package body and is then rolled twice underneath the package to form a shape like the letter "S".
T[1]	Through-Hole	A tempered terminal with square/rectangular/circular or V-shaped cross section intended for attachment to a through-hole in the land structure. This terminal can be prepped to provide a different mounting method for the Part.
U	J-inverted	A SMD terminal that extends horizontally from the package body near its Z axis centerline, is formed down and then rolled away the package.
W[1]	Terminal Wire	A solid metal terminal that extends from the package body.
Y	Screw	A hole or a threaded terminal
NOTE Examples of terminal images are shown in Annex A. NOTE 1 These terminal form definitions can have some variations that often require further definition or clarification as defined in Annex A.		

3.2.6 Terminal-count Suffixes

The terminal-count suffix is a numeric field used to identify the number of terminals on the device package. If there is more than one type of terminal, the terminal-count shall include all those terminals whose function is either electrical signal or power terminals. If the terminal count is lower than the number of available terminal positions due to terminals missing or deleted, the latter may be added in parentheses, e.g., 20[26] or 168[289]. The terminal count suffix field follows the terminal code character, which is separated from the preceding portion of the descriptive designator by a dash (-).

Terminals are considered missing when the terminal numbering of the available terminals present assumes that there are no missing terminals. Hence when the 3rd terminal is missing in a row of 4 terminals, the fourth terminal number is 4.

Terminals are considered deleted when the terminal numbering of the available terminals present assumes that there was never a terminal intended for that location. Hence when the 3rd terminal is deleted in a row of 4 terminals, the last terminal in the row is terminal number 3.

3.2.6 Terminal-count Suffixes (cont'd)

Some terminals may be excluded from terminal numbering. Example of some of these terminals are non-electrical terminals, such as those terminals that provide only a mechanical function.

When there are no such signal/power terminals, the Terminal count attribute is defined according to the remaining terminals. If there are no terminals of any kind as in a housing only, then the Terminal count is omitted.

3.2.7 Package Pitch

The Package Pitch follows the Terminal Count via a separation of an underscore (_). There are characters that are used to represent the direction of the pitch on the package. The value is determined by the shortest distance between the center of any 2 terminals, irrespective if they belong to the same terminal group or not. When the smallest pitch is

- In either the x or y direction, then the character I for "Inline" is used. If the pitch is in the x direction, then the distance between the center on the terminals in the y direction (dy) = 0. If the pitch is in the y direction, then the distance between the center on the terminals in the x direction (dx) = 0. For grid pattern of terminals in which the pitch value in the row and column directions are different, then a secondary pitch value can be applied to the Inline pitch code, e.g., Ix1p20y0p75 conveys that the pitch is 1.2mm in the x axis and 0.75mm in the y axis. See NOTE 8 in Table A.3 - Suffixes for terminal with additional definition below.
- If both the dx and the dy are > 0, then the character D for "Diagonal Pitch" is used. Interstitial pitch (staggered terminals).
- If the Terminals are in a circular array, then the character R for "Pitch Radius" is used. The Pitch Radius is then followed by the Angle between the terminal's centers, e.g., R4p5A30 means that the Pitch Radius is 4.5mm and that angle between the Terminals is 30 degrees.
- If there is no pitch, on the part, due to for example a single terminal, then the character "X" is used. If there are no terminals of any kind as in a housing only, then the pitch is omitted.
- Pitch values shall be specified at their nominal values

Pitch codes as per previous revisions of this Standard are no longer used because of the emergence of too many new pitches in the industry.

3.2.8 Supplemental-information Field

An additional supplemental-information field follows Package Pitch and is separated by a dash (-). When applied, the field normally refers to nominal package dimensions. An example of such is R5p08x2p54Z1p27, meaning Package-body shape is Rectangle and its dimension = 5.08 mm x 2.54 mm and Package-body dimension in the z direction = 1.27 mm.

Table 6 - Package Shape and Size below provides a list of standard Package Shapes with their respective shape codes to help identify the shape of the package body.

Table 6 - Package Shape and Size

Package Shape	Dimension 1	Dimension 2	Dimension 3	Diameter	Radius	No. of Sides	Inner/Outer	Code	Example	Construction
Rectangle	Y	Y						R	R5p0x2p5Z5p5	R<Dim1>x<Dim2>
Rounded Rectangle	Y	Y			Y			RR	RR1p0x0p5R0p05Z5p5	RR<Dim1>x<Dim2>R<Radius>
Modified Rectangle	Y	Y						MR	MR1p0x0p5Z5p5	MR<Dim1>x<Dim2>
Circle				Y				C	C0p5Z5p5	C<Diameter>
Double-D	Y	Y						DD	DD5p0x1p25Z5p5	DD<Dim1>x<Dim2>
Regular Polygon				Y		Y	Y	RP	RP8ID8p6Z5p5, or RP8OD8p6Z5p5	RP<Number of Sides><Inner/Outer Diameter><Diameter>
Segment	Y			Y				S	S5p5D2p4Z5p5	S<Diameter>D<Dim 1>
Para-truncated Circle	Y			Y				PtC	PtC10p0x5p2Z5p5	PtC<Diameter>D<Dim 1>
Rounded Diamond	Y			Y	Y			RD	RD10p0x12p2x1p5Z5p5	RD<Diameter>D<Dim 1><Radius>
Rounded Chamfered Diamond	Y	Y		Y				RCD	RD10p0x12p2x1p0Z5p5	RD<Diameter>D<Dim 1><Dim2>
Isosceles Trapezoid	Y	Y	Y					IT	IT10p0x0p5x0p70Z5p5	IT<Dim 1>x<Dim 2>x<Dim 3>
Contour								Ctur	Ctur<checksum>Z5p5	Ctur<checksum>

Shapes with Tab have “wT” abbreviation added to the end of the shape code, as in RwT5p0x2p5.

The shape definitions are specified in the JEDEC Publication JEP30-P100, in A.1

3.2.9 Terminal Span, Spacing, Shape and Size

The Package name as shown in Figure 1 - Descriptive Designation System for Electronic-device Packages shows the example of Terminal Span, Spacing and Terminal Thickness as defined by the –N#C#T# following the Package dimensions is configurable based on Terminal type, as outlined in the following sub-clauses. Notice that some Terminal types do not require this information to be captured in the package name, since these terminal types do not add value to the Package name designation, however, they are required to be properly defined in the PartModel file as defined in the JEP30 Guideline publications.

The addition of this clause to the naming convention only applies to the signal/power terminals only. When there are no such terminals, the Terminal code attribute is defined according to the remaining terminals. When there are multiple terminal types that drive multiple values for this clause, then this clause can be excluded from the naming convention.

3.2.9.1 Terminal Span and Terminal Spacing

Terminal Span and Spacing values are critical in the calculation of the most efficient land patterns for many Terminal types. Failure to provide the complete set of this information results in the user applying worse case calculations that have a wider tolerance than what is otherwise the case.

IPC proposes a series of formulas to arrive at a new min and max terminal spacing, derived from terminal span values minus 2 times the terminal contact length minus the square root of the sum of the squares of the part and terminal tolerances. The calculation is made based off the assumption that the worst-case scenario is that the maximum terminal length will not occur at the same time on the part as the minimum terminal span. This may be statically true for a large percentage of the parts, but it does not guarantee that all parts will fall in between those new limits. These new dimensions are then used in the footprint rules calculations, resulting in land patterns that are either too big or too small, but almost certainly not properly optimized for the part.

Since it is most likely that the maximum terminal length will not occur at the minimum terminal span to calculate the minimum terminal spacing, the component manufacturer should provide the following set of dimensions in relation to the terminal contact area and position.

1) Terminal span including tolerances - The max value is critical
2) Terminal spacing including tolerances - The min value is critical
3) Terminal length including tolerances.

These dimensions are critical for the following terminal types and added to the Package name as shown in Figure 1 - Descriptive Designation System for Electronic-device Packages.

3.2.9.2 Terminal Shape and Size

Terminal Shape and Size is more applicable than Span or Spacing values for some Terminal types, because this shape and size is used in the calculation of the land patterns for these Terminal types. Table 7 - Terminal types requiring Terminal Span and Terminal Spacing versus Terminal Shapes and Size dimensions below outlines which terminal types should have their shape and size defined and which terminal types should have their span and spacing defined. For those terminals which require their shape and size to be defined, Table 8 – Terminal shape and size below provides the code structure to represent this data.

Table 7 - Terminal types requiring Terminal Span and Terminal Spacing versus Terminal Shapes and Size dimensions

Code	Name	Level 1	Span, Spacing, Shape Size
B	Ball	Bump	Terminal Shape & Size
		Collapsing	Terminal Shape & Size
		Non-Collapsing	Terminal Shape & Size
C	C-bend		Span and Spacing
D	Lug	Perforated (Pierced) Solder Terminal	Terminal Shape & Size
		Cup Solder Terminal	Terminal Shape & Size
		Hook Solder Terminal	Terminal Shape & Size
		Crimp Lug	Terminal Shape & Size
		Ring Tongue Terminal	Terminal Shape & Size
		Lug with Threaded Hole	Terminal Shape & Size
F	Flat		Span and Spacing
		Elevated	Span and Spacing
		Flat-L-Bend	Span and Spacing
		Hole	Not Required
		With-opening	Not Required
G	Gull-wing		Span and (Opt) Spacing
		Modified	Span and (Opt) Spacing
H	Compressed Mount Technology		Pad Shape and Size
I	Post (Stud)	Butt	Terminal Shape & Size
		Flatten Post Connection	Terminal Shape & Size
J	J-bend		Span Pitch
L	L-bend		Span Pitch
		Inward	Span and Spacing
		Outward	Span and Spacing
		Side Inward	Span and Spacing
		Side Outward	Span and Spacing
		LC-bend	Span and Spacing
M	Column		Terminal Shape & Size
		Ribbon Wrap	Terminal Shape & Size
		Microspring	Terminal Shape & Size
		Copper Coated Solder Column	Terminal Shape & Size
N	Surface-terminal		Terminal Shape & Size
		Castellated	Terminal Shape & Size
		Hole	Terminal Shape & Size
		With-opening	Terminal Shape & Size
		Open-Ring	Terminal Shape & Size

Table 7 - Terminal types requiring Terminal Span and Terminal Spacing versus Terminal Shapes and Size dimensions (cont'd)

Code	Name	Level 1	Span, Spacing, Shape Size
O	Pressfit		Pad Hole and Shape Size
		Compliant	Pad Hole and Shape Size
		Non-Compliant	Pad Hole and Shape Size
P	Pin		Terminal Shape & Size
		Kinked	Terminal Shape & Size
		Shoulder	Terminal Shape & Size
		Press-In Solderable	Not Required
		Swage Fastening Pin	Terminal Shape & Size
		Press-In Non-Solderable	Not Required
Q	Quick-connect		Terminal Shape & Size
R	Wraparound	Castellated	Not Required
		Ring	Not Required
		Open-Ring	Not Required
		Nibble	Not Required
		Convex-E	Not Required
		Convex-S	Not Required
S	S-bend	Inward Flat	Span and Spacing
		Inward Curved	Span and Spacing
		Outward Flat	Span and Spacing
		Outward Curved	Span and Spacing
T	Through-Hole		Terminal Shape & Size
		Kinked	Terminal Shape & Size
		Shoulder	Terminal Shape & Size
U	J-inverted		
W	Terminal Wire		Terminal Shape & Size
		Kinked (Bent)	Terminal Shape & Size
		SM-Wire	Terminal Shape & Size
		SM-Coined Wire	Terminal Shape & Size
		Wraparound – SMT Mount	Terminal Shape & Size
		Coined Wraparound – SMT Mount	Terminal Shape & Size
Y	Screw	Clearance Hole	Not Required
		Threaded Hole	Not Required
		Screw	Not Required

Table 8 - Terminal Shape and Size

Terminal Shape	Dimension 1	Dimension 2	Dimension 3	Diameter	Radius	No. of Sides	Inner/Outer	Code	Example	Construction
Rectangle	Y	Y						R	R1p0x0p5	R<Dim1>x<Dim2>
Rounded Rectangle	Y	Y			Y			RR	RR1p0x0p50R0p05	RR<Dim1>x<Dim2>R<Radius>
Modified Rectangle	Y	Y						MR	MR1p0x0p5	MR<Dim1>x<Dim2>
Circle				Y				C	C0p5	C<Diameter>
D-Shape	Y	Y						DS	DS1p0X0p2	DS<Dim1>x<Dim2>
Double-D	Y	Y						DD	DD1p0x0p2	DD<Dim1>x<Dim2>
Regular Polygon				Y		Y	Y	RP	RP8ID0p6, or RP8OD0p6	RP<Number of Sides><Inner/Outer Diameter><Diameter>
Segment	Y			Y				S	S0p5D0p4	S<Diameter>D<Dim 1>
Para-truncated Circle	Y			Y				PtC	PtC1p0x0p2	PtC<Diameter>D<Dim 1>
Isosceles Trapezoid	Y	Y	Y					IT	IT1p0x0p5x0p7	IT<Dim 1>x<Dim 2>x<Dim 3>
Contour								Ctur	Ctur<checksum>	Ctur<checksum>

The shape definitions are specified in the JEDEC Publication JEP30-P100, in A.1

3.2.10 Terminal Vertical Dimensions

Terminal vertical dimensions is sometimes used to calculate the solder fillet requirements for certain terminal shapes.

This dimension should be captured for the following terminal shapes and added to the Package name as shown in Figure 1 - Descriptive Designation System for Electronic-device Packages. The definition of the Terminal Vertical Dimensions is specified in Table 9.

Table 9 - Terminal Types Requiring Terminal Vertical Dimensions

Code	Name	Level 1	Terminal Vertical Dimensions
B	Ball	Bump	Terminal Height
		Collapsing	Terminal Height
		Non-Collapsing	Terminal Height
C	C-bend		Terminal Thickness
D	Lug	Perforated (Pierced) Solder Terminal	Not Required
		Cup Solder Terminal	Not Required
		Hook Solder Terminal	Not Required
		Crimp Lug	Not Required
		Ring Tongue Terminal	Not Required
		Lug with Threaded Hole	Not Required
F[1]	Flat		Terminal Thickness
		Elevated	Terminal Thickness
		Flat-L-Bend	Terminal Thickness
		Hole	Not Required
		With-opening	Not Required
G[1]	Gull-wing		Terminal Thickness
		Modified	Terminal Thickness
H	Compressed Mount Technology		Not Required
I	Post (Stud)	Butt	Not Required
		Flatten Post Connection	Not Required
J	J-bend		Terminal Thickness
L[1]	L-bend		Terminal Thickness
		Inward	Terminal Thickness
		Outward	Terminal Thickness
		Side Inward	Terminal Thickness
		Side Outward	Terminal Thickness
		LC-bend	Terminal Thickness
M[1]	Column		Terminal Height
		Ribbon Wrap	Terminal Height
		Microspring	Terminal Height
		Copper Coated Solder Column	Terminal Height

Table 9 - Terminal Types Requiring Terminal Vertical Dimensions (cont'd)

Code	Name	Level 1	Terminal Vertical Dimensions
N	Surface-terminal		Exposed Terminal Thickness
		Castellated	Exposed Terminal Thickness
		Hole	Exposed Terminal Thickness
		With-opening	Exposed Terminal Thickness
		Open-Ring	Exposed Terminal Thickness
O	Pressfit	Compliant	Terminal Insertion Height
			Terminal Insertion Height
			Terminal Insertion Height
			Terminal Insertion Height
			Terminal Insertion Height
		Non-Compliant	Terminal Insertion Height
P[1]	Pin		Terminal Insertion Height
		Kinked	Terminal Insertion Height
		Shoulder	Terminal Insertion Height
		Press-In Solderable	Not Required
		Swage Fastening Pin	Terminal Insertion Height
		Press-In Non-Solderable	Not Required
Q	Quick-connect		Not Required
R[1]	Wraparound	Castellated	Not Required
		Ring	Not Required
		Open-Ring	Not Required
		Nibble	Not Required
		Convex-E	Not Required
		Convex-S	Not Required
S	S-bend	Inward Flat	Terminal Thickness
		Inward Curved	Terminal Thickness
		Outward Flat	Terminal Thickness
		Outward Curved	Terminal Thickness
T[1]	Through-Hole		Terminal Insertion Height
		Kinked	Terminal Insertion Height
		Shoulder	Terminal Insertion Height
U	J-inverted		Terminal Thickness
W[1]	Terminal Wire		Terminal Insertion Height
		Kinked (Bent)	Terminal Insertion Height
		SM-Wire	Terminal Thickness
		SM-Coined Wire	Terminal Thickness
		Wraparound – SMT Mount	Terminal Thickness
		Coined Wraparound – SMT Mount	Terminal Thickness

Table 9 - Terminal Types Requiring Terminal Vertical Dimensions (cont'd)

Code	Name	Level 1	Terminal Vertical Dimensions
Y	Screw	Clearance Hole	Not Required
		Threaded Hole	Not Required
		Screw	Not Required

The Terminal Vertical definitions is specified in the JEDEC Publication JEP30-P100, in A.2, the following codes are used for each type of Terminal vertical dimension.

- Terminal Height "H"
- Terminal Thickness "T"
- Exposed Terminal Thickness "ET"
- Terminal Insertion Height "IH"

3.2.11 Body Direction

This attribute is different to the "mounting preparation attribute" since it defines whether the part body is either vertical or horizontal, by comparing the cross-sectional area of the part in both the horizontal direction and the vertical direction. If the horizontal cross-sectional area is greater than the vertical cross-sectional area, then the body direction is horizontal. The enumerated value of this attribute is therefore:

1) Horizontal (H), and
2) Vertical (V)
3) The Code H and V are optional for inclusion into the Package Name

An example of horizontal body direction is shown in

Figure 2 - Horizontal Body Direction, and an example of vertical body direction is shown in

Figure 3 - Vertical Body Direction.

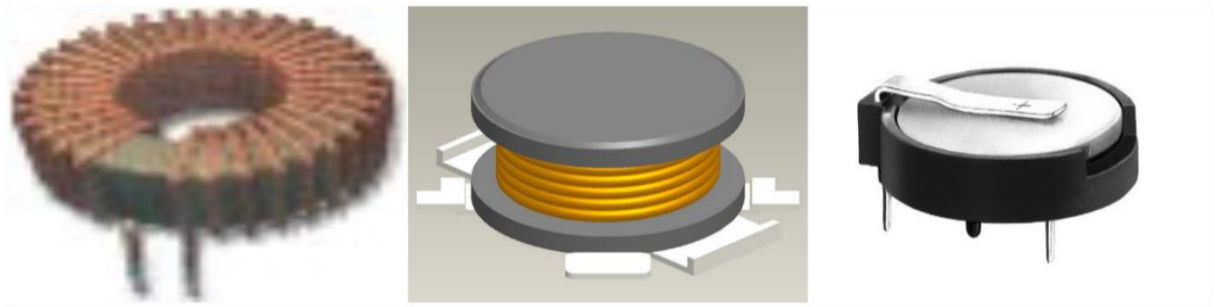


Figure 2 - Horizontal Body Direction

3.2.11 Body Direction (cont'd)

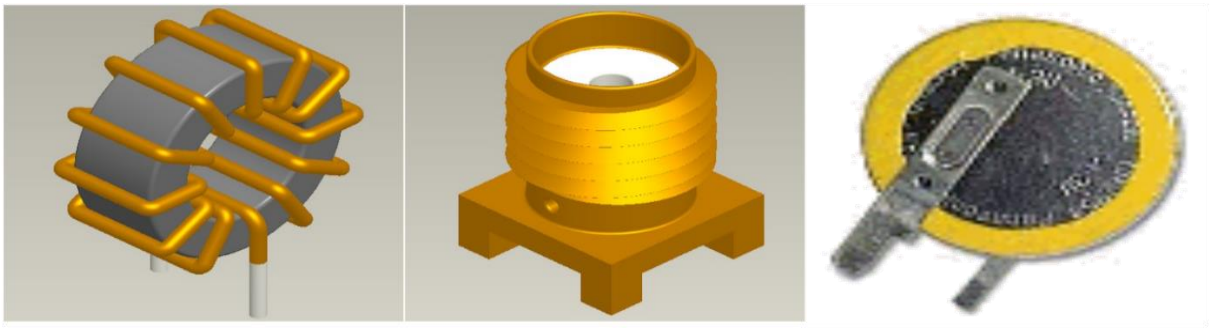


Figure 3 - Vertical Body Direction

3.2.12 Mounting Preparation

Most parts are mounted onto the printed board, without the need to preform (prep) the part. This is defined as "Straight" mounting, since the part is placed on the printed board in the way intended by the component manufacturer. When the part is pre-formed before assembly, and the body direction, or standoff is changed to enable an alternative assembly mounting, then this is called "Prepped before Mounting". The enumerated value of this attribute is therefore:

1) Straight Mounted (S), and
   a. The Code S is optional for inclusion into the Package Name
2) Prepped before Mounting (P)
   a. The Code P is mandatory for inclusion into the Package Name if the Part is prepped by the component manufacturer.

A sample of horizontal and vertical body directions is shown in Figure 4 - Packages that are Straight Mounted as received from Supplier, and Figure 5 - Prepped Packages prior to Assembly below

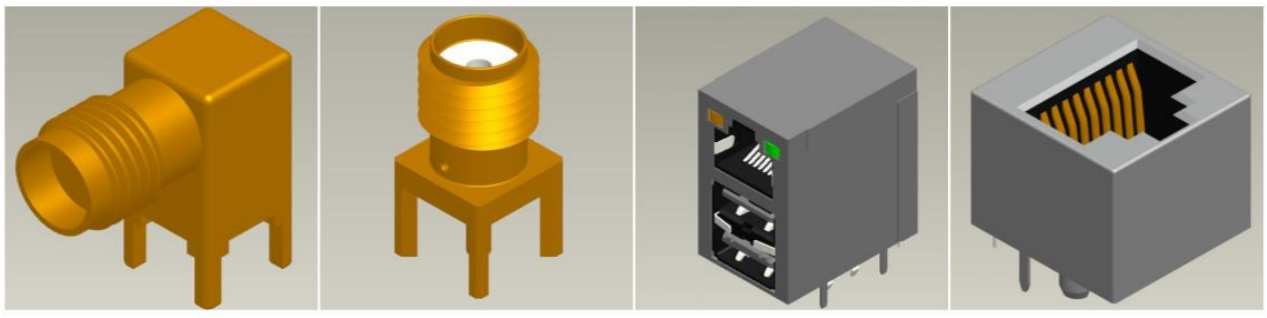


Figure 4 - Packages that are Straight Mounted as received from Supplier

3.2.12 Mounting preparation (cont'd)

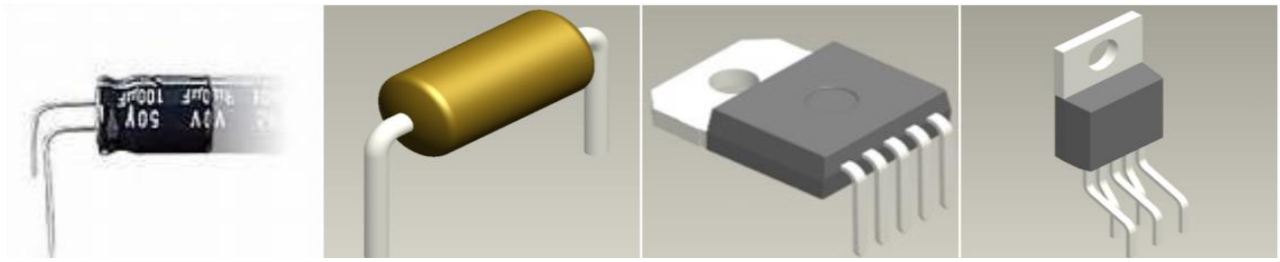


Figure 5 - Prepped Packages prior to Assembly

4 Other Part Detail

The following Part detail does not impact the naming convention of the Part, but its' definition is required by consumers of the Part.

4.1 Part Access Direction

Various Part types require additional clearance around the Part, typically in one direction post assembly on the printed board. This may be a once off access to the Part as the printed board is mounted into a Box Assembly, or it may require continuous access over the life of the Product. Either way, appropriate clearances need to be taken into consideration during Footprint generation, Component Placement and subsequent DFM analysis to validate compliance to manufacturing rules. The location of the views shown in Figure 6 are independent upon the rotation of the device in the center of this image and are set for the device at the time of part definition within the library. These views are shown in orthographic perspective for readability purposes only but represent a 45-degree rotation in a counterclockwise direction. The assignments of the directions are given with the Terminals facing downwards towards the interconnecting structure (i.e., live bug).

1. Topside
   Underside
   Front
   Back
   Left
   Right
   Not-Required

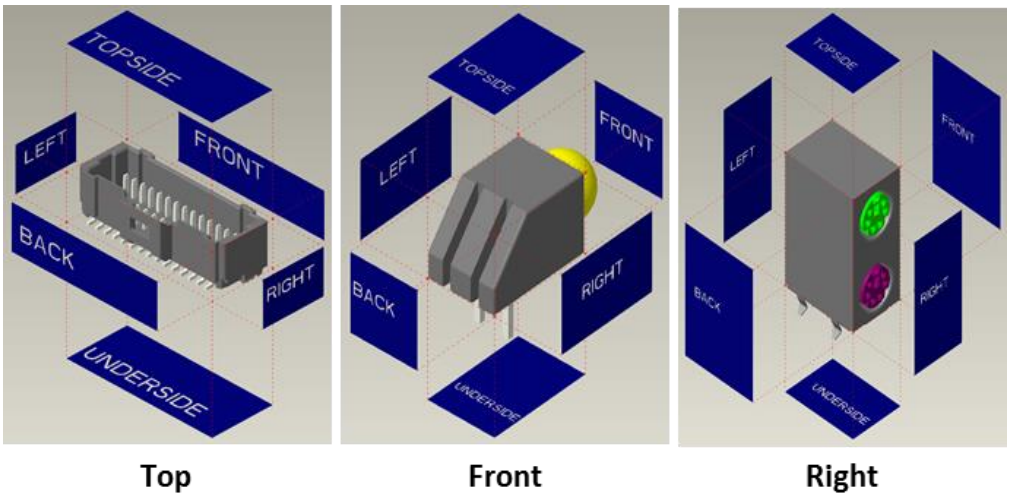


Figure 6 - Package View Representative

4.1 Part Access Direction (cont'd)

Subsequently, after library generation, a part may be tagged as requiring part access on both the right side and left side, i.e., for specific probing purposes. When the part is rotated, say by a further 90 degrees counterclockwise, the side now facing the "left", will be facing the "back", and the side that was originally facing the "right" will be now facing the "front".

4.2 Part Entry UOM and Dimensional Definition

This is the UOM on the Part Datasheet that will be used to enter the details of the part dimensions.

1) mm (Millimetres)

The controlling dimensional UOM shall be metric.

All dimensional values used within all naming conventions, either for the package designation or the footprint designation or other shape designations, are specified in mm and specified to the desired number of decimal places necessary to specify the accuracy required. For ease of readability, the decimal point is replaced by a lowercase "p". This applies to pitch, package dimensions in all directions, terminal contact area, terminal span, and terminal spacing.

An example of such is R5p08x2p54, means that the shape is rectangle, and its dimension are 5.08 mm x 2.54 mm.

For users who wish to accommodate ranges, then any or all specific dimensions can be substituted with a dimensional range. An example of such is R5p0-5p50x2p50-2p60, meaning that the shape dimension must be within these limits 5.00<=Dimension 1<=5.50 mm, and the other dimension must be 2.50<=Dimension 2<=2.60 mm. This enables the same footprint to be shared across several parts.

All angles are measured with respect to 3 o'clock or the horizontal line and is measured in a counterclockwise direction so 12 o'clock is considered 90 degrees, 9 o'clock is considered 180 degrees and 6 o'clock is considered 270 degrees.

5 Recommended Land Patterns

Some Component Manufacturers provide a recommended land pattern as opposed to providing the dimensional details of the terminals on the package. This standard recommends that component manufacturers also provide the terminal contact dimensional details, even if they also provide the recommended land pattern details. The provision of both sets of data can enable customers to perform reliability testing and other activities during the product creation process.

This clause extends this standard to describe a systematic method for generating descriptive designators for footprints upon which the electronic-device packages are attached to.

The Footprint naming convention follows the concepts outlined in this standard for electronic-device packages, but it has some modifications and some additional detail appended to it, to properly identify the footprint for its intended use.

This clause provides the opportunity to encourage the industry to unify towards a single defining structure for footprints by adhering to a comprehensive, robust definition based on geometric data of the package, coupled with additional detail for the manufacturing process and design density. Figure 7 below provides an overview of the naming convention for Footprints.

5 Recommended Land Patterns (cont'd)

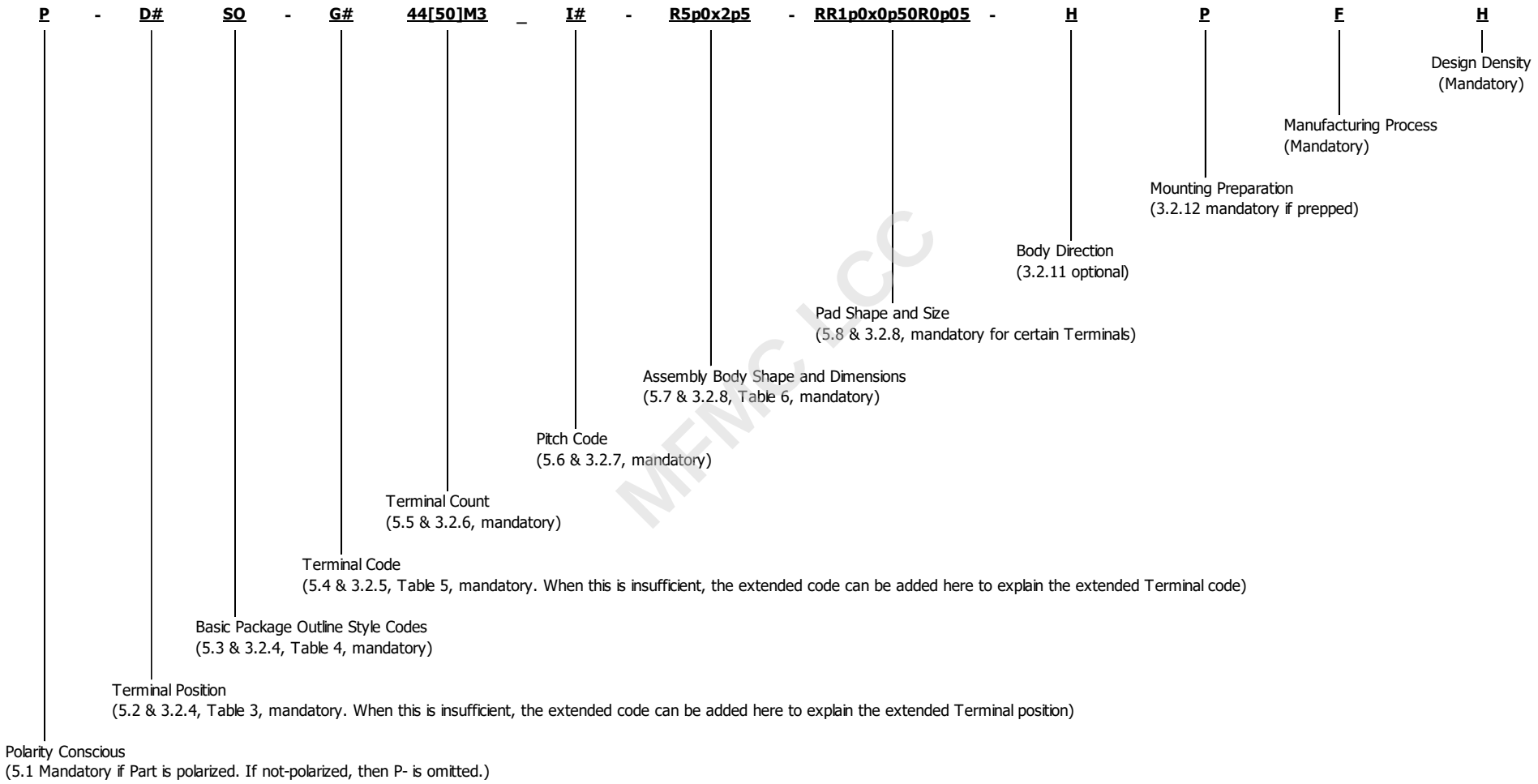


Figure 7 - Descriptive Designation System for Footprints

5.1 Polarity Conscious

This field is mandatory if the Part is polarized and is denoted by the character “P” that precedes the Package Terminal Position and is separated by a dash.

If the User implements a different land pattern for example a diode versus a capacitor by implementing a different polarity symbol into the land pattern, then the user can substitute the first character with their own character that will provide the relevant identification of the respective land pattern for their use. However, for a physical package whose dimensions are exactly the same, this will drive a unique footprint for each user choice, compared to the use of a common polarity indicator for all polarity conscious parts, that can simply be represented by “P”. It is therefore recommended that to minimize footprint duplications, that the polarity indicator used in the footprint is a simple dot, and that the naming convention is represented by “P”.

5.2 Terminal Position

This terminal position character is defined by the enumerated set of values as defined in 3.2.3

Terminal-position Prefix and its corresponding tables.

When the single character is insufficient, a 2nd optional character can be added to explain the extended position. A list of extended positions for each primary position is shown in Table A.1 – Terminal position with additional definition below.

5.3 Package Outline Style Codes

This package outline style code is defined by the enumerated set of values as defined in 3.2.4 Package Outline Style Codes and its corresponding tables.

It is not recommended to include the extended package code as defined in Table A.2.1 - Illustrations of Extended Package Outline Styles as many of the extended package variations can share the same footprint.

5.4 Terminal Code

The terminal code is defined by the enumerated set of values as defined in 3.2.5 Terminal Suffix and its corresponding tables.

When the single character is insufficient, a 2nd optional character can be added to explain the extended terminal code. A list of extended codes for each primary terminal is shown in Table A.3 - Suffixes for terminal with additional definition below. However, as with package outline, caution should be used to prevent the duplication of footprints solely based on adding in this 2nd character. The general rule of thumb should be that if the land pattern is changed because of the additional definition of the terminal, then its inclusion into the footprint name is required.

Example 1. A Non-collapsing Ball requires a larger pad than the ball diameter, compared to a Collapsing Ball requires a reduced pad below the nominal ball diameter. In this case, inserting the extended terminal code is required.

Example 2. A Gull-wing and a Gull-wing with a modification may not drive a difference in the land pattern dimension. Consequently, there is no advantage for the inclusion of the extended terminal code into the footprint designation when there is no impact to the land pattern dimension.

Table A.3 Note 7 - Suffixes for terminal with additional definition specifies which extended terminal codes are excluded from the footprint designation.

5.5 Terminal Count

The terminal-count suffix is a numeric field used to identify the number of terminals on the device package, in accordance with the definition of the term “Terminal”, along with how the number is computed as per 3.2.6 Terminal-count Suffixes.

When additional pads or holes are added for mounting or alignment purposes, then the total count of these terminals is added at the end following the letter “M”.

Example: A DDR4 connector has 288 terminals in a pattern of 300 terminals in which 12 terminals are deleted. This connector typically comes with 3 mechanical type terminals. In this case they terminal count would be 288[300]M3.

5.6 Pitch Code

The pitch code follows the same logic as that defined in 3.2.7 Package Pitch.

5.7 Assembly Outline Shape and Dimensions

The assembly body shape and dimension dimensions follow “pitch code” and is separated by dash (-), as defined in 3.2.8 Supplemental-information Field. A list of package shapes codes and their associated dimensions is shown in Table 6 - Package Shape and Size. The assembly body shape and dimensions should be a one-to-one representation of the max package body outlines for the part that is intended for this footprint.

Where a footprint is designed to support multiple parts from different manufacturers, then the assembly body shape and dimensions becomes the maximum envelope of the overlay of all the package bodies that can be mounted to that footprint.

NOTE The height of the assembly body shape is not included as many different parts from various manufacturers with different Z height dimensions can be mounted onto a given footprint. Consequently, whereas a Package designation will contain the Z height dimension, a Footprint designation will exclude it.

5.8 Pad & Hole Shape and Size

The mount side pad shape and size are more applicable for the footprint naming convention compared to the package naming convention which may specify span and spacing for some terminal types. Table 10 - Pad and Hole Shape and Size below provides the code structure to represent the pad shape and size used in the footprint. This code only applies to the signal/power terminals only. When there are no such terminals, the pad shape and size code is defined according to the remaining pads. When there are multiple different pad sizes, then the code associated with the smallest pad area is used in the naming convention.

Pads and Holes in general follow the same shape definition that are assigned to the Package or Terminal shape as defined above with the following exceptions

Modifier Rectangle Pad shapes employing one or more modifications to the corners are outlined in Table 11 - Pad and Hole Shape Modifiers. For chamfered corners, when the modification is even on both sides, then there is only one dimension after the code. Where the modification is different, then the corner modified dimension in the direction of Dim 1 of the primary shape precedes the corner modified dimension in the direction of Dim 2 and is separated by the lowercase x.

1) Irregular polygons names are determined by defining the coordinates of the polygon in an anti-clockwise direction starting with the most-lower left coordinate as outlined in JEP30-P100 and then taking the checksum of that.

Table 10 - Pad and Hole Shape and Size

Pad Shape	Dimension 1	Dimension 2	Dimension 3	Diameter	Radius	No. of Sides	Inner/Outer	Code	Example	Construction
Rectangle	Y	Y						R	R1p0x0p5	R<Dim1>x<Dim2>
Rounded Rectangle	Y	Y			Y			RR	RR1p0x0p50R0p05	RR<Dim1>x<Dim2>R<Radius>
Half Rounded Rectangle	Y	Y			Y			RR	HlfRR1p0x0p50R0p05	HlfRR<Dim1>x<Dim2)>R<Radius>
Modified Rectangle[2]	Y	Y						MR	MR1p0x0p5<modifier>	MR<Dim1>x<Dim2><modifier>
Circle				Y				C	C0p5	C<Diameter>
D-Shape	Y	Y						DS	DS1p0X0p2	DS<Dim1>x<Dim2>
Rounded Rectangle D-Shape[1]	Y	Y			Y				HlfRRwDS1p0x0p50R0p05	HlfRR<Dim1>x<Dim2>R<Radius>
Double-D	Y	Y						DD	DD1p0x0p2	DD<Dim1>x<Dim2>
Contour								Ctur	Ctur<checksum>	Ctur<checksum>

NOTE Half Rounded Rectangle is like the D-Shape with the exception that the radius of the corners is less that the radius of the curvature in the D-shape, and is typically 25% of the smallest dimension of the pad
NOTE 1 Rounded Rectangle D-Shape has a radius on one end of the pad = 50% of the pad width, whereas on the other end it has rounded corners of typically 25% of the pad width. This is typically used for D-Shape terminals which have wettable flanks.
NOTE 2 Modified Rectangle will have an additional modifier code at the end of the main shape. See Table 11 - Pad and Hole Shape Modifiers.

The shape definitions are specified in the JEDEC Publication JEP30-P100, in A.1

Table 11 - Pad and Hole Shape Modifiers

Corner Modification Location	Code	Chamfered Corner Code (Modification is the same on both sides)	Chamfered Corner Code (Modification is different on both sides)	Rounded Convex Corner
Southwest and Southeast	Back = B	CBC0p8	CBC0p8x0p6	CBR0p8
Northwest and Southwest	Left = L	CLC0p8	CLC0p8x0p6	CLR0p8
Northwest and Northeast	Front = F	CFC0p8	CFC0p8x0p6	CFR0p8
Northeast and Southeast	Right = R	CRC0p8	CRC0p8x0p6	CRR0p8
Southwest Corner	SW	CSWC0p8	CSWC0p8x0p6	CSWR0p8
Southeast Corner	SE	CSEC0p8	CSEC0p8x0p6	CSER0p8
Northwest Corner	NW	CNWC0p8	CNWC0p8x0p6	CNWR0p8
Northeast Corner	NE	CNEC0p8	CNEC0p8x0p6	CNER0p8
Northwest, Southwest and Southeast	Not Northeast = NNE	CNNEC0p8	CNNEC0p8x0p6	CNNER0p8
Southwest, Southeast and Northeast	Not Northwest = NNW	CNNWC0p8	CNNWC0p8x0p6	CNNWR0p8
Southeast, Northeast and Northwest	Not Southwest = NSW	CNSWC0p8	CNSWC0p8x0p6	CNSWR0p8
Northeast, Northwest and Southwest	Not Southeast = NSE	CNSEC0p8	CNSEC0p8x0p6	CNSER0p8

NOTE The dimensions values of 0p8 and 0p6 are just for illustration purpose only and should be replaced by the actual dimensions of the corner modification.

5.9 Body Direction

Certain Package-outline styles can, usually disk buttons or cylinders, can have their body in either a horizontal or vertical direction. This can impact the shape of the placement outline, hence its inclusion into the land pattern naming convention. The definition of body direction is specified in 3.2.11 Body Direction.

5.10 Mounting Preparation

Some parts can be mounted directly to the assembly in the form as intended by the component manufacturer, while other parts may require preparation prior to assembly. This preparation can impact the land pattern; hence this is specified in the land pattern naming convention as per 3.2.12 Mounting Preparation.

5.11 Manufacturing Process

There are several manufacturing processes that impact the design of footprint, namely

- Infinite Solder (I),
- Finite Solder (F),
- Pressfit (P).

Infinite soldering is a process in which there is an unconstrained amount of solder available to make the solder connection between the terminal and a Thru-hole connection. Infinite Soldering process consists of

- Wave soldering,
- Selective wave soldering,
- Solder Pot
- Manual soldering

Finite soldering, however, limits the amount of solder that is available to the specific connection. All SMD type components utilize finite soldering process, however Thru-hole solderable connections can employ either finite or infinite soldering process, which need to be taken into consideration when designing the land pattern. Finite Soldering process consists of

- SMT (for Surface Mount Devices), and Paste-in-Hole (for Through Hole Mount devices).
- Captive Solder Charge, e.g., Laser Soldering.

The principle for a press-fit connection is that a contact terminal is pressed into a printed circuit board (PCB). There are two types of press-fit pins: the solid pin having a solid press-in zone and the compliant pin having an elastic press-in zone. Compliant pins feature an elastic behavior and thus will deform during insertion (significantly reducing stress on the PCB holes compared to solid press-fit pin). Press-fit connections sustain a permanent contact normal force when inserted to enable a reliable electrical and mechanical connection over the lifetime of the connection. Additionally, high contact normal forces between compliant pin and plated through hole (commonly) generate cold welded interconnections autonomously after the pin insertion; especially, if tin plating is used for at least one or both contact partners (pin/hole). Due to these cold-welding processes intermetallic connections are generated leading to excellently low contact resistance values, while significantly supporting the mechanical stability of the connection.

5.12 Design Density

Footprint geometry can vary depending upon the product environment in which the component will be used. IPC specifies three land pattern geometry variations that applies to most components although there are some components that are either too small or have too fine geometries that restricts the use of that component to high density products, while other components are large enough that prohibit from use in that density class.

Table 12 - Design Density Class Codes

JEDEC Design Density Class	IPC Density Level	Land Size
Low Density (L)	Density Level A	Maximum (Most) Land Protrusion (M)
Nominal Density (N)	Density Level B	Median (Nominal) Land Protrusion (L)
High Density (H)	Density Level C	Minimum (Least) Land Protrusion (L)

When component manufacturer specify that a recommended land pattern is required for the successful performance of that component, then the preferred assignment is the nominal density of (N), unless the part dimensions push the part into either the high or low density applications.

5.13 Serial Number

If the User still finds that 2 different Package's result in the same footprint name, based on all the parameters that are considered here, then the user should add a serial code at the end of the footprint name.

6 Footprint Layers

Footprints have several layers which may be required to be defined by the component manufacturer to guarantee the reliable performance of the component part. However, when footprints are required to be specified by the component manufacturer, typically its definition is restricted to just the land patterns. This changes when the part has special requirements, as in thermal requirements or special routing or grounding requirements. This clause provides some guidance to specify this requirement in a standardized way while also supporting the provision of the digital data via the JEP30-P101 PartModel Package XML file.

NOTE A component manufacturer should only specify the minimum requirements to be enforced within a footprint that is required to ensure the proper performance of the part.

A footprint can consist of the following

1. Assembly Outline,
2. Conductive Area,
3. Placement Outline,
4. Keep-out and Keep-in Layers,
    a. List of layers to which the restrictions apply
    b. List of restrictions that apply in any combination such as
        i. Trace or plane
        ii. Via,
        iii. Testpoint
        iv. Component (may come with height criteria)
5. Paste Mask Layers
6. Mount side Soldermask Layers
7. Mount Side Pad Layer
8. Hole
    a. Definition of plating versus non-plating
    b. Hole type as in Thru-hole, Micro-via, or Mounting Hole
    c. From Layer-to-Layer
9. Internal Pad Layer
    a. List of layers in which the Internal Pad differs from other layers
10. Opposite Side Pad Layer
11. Opposite Side Soldermask Layer
12. Plane Clearance (Anti-pad)
    a. List of layers to which the restrictions apply
13. Thermal including spoke width, inner and outer diameters.

6.1 Assembly Outline Layer

This is a representation of the package body and usually contains a marker for the center of the package body. If defined, the outline should be a closed polyline. The origin of the assembly outline layer should align with the package body.

6.2 Conductive Area

Some parts have a connecting pattern on the package-body that electrically and physically connects several other terminals on the device as shown in Figure 8 - Irregular Shaped Terminals below. For some parts, a 2 x 4 terminal patters would be sufficient in which solder mask would cover the area between the top and bottom rows and only the terminal would be exposed for soldering as shown by the green pads in the left diagram.

However, for other parts, the interconnecting conductive area as shown by the blue pattern in the right image is required to be soldered to the PCB, because of thermal conduction requirements. These special requirements are typically identified by the component manufacturer and defined in the part datasheet.

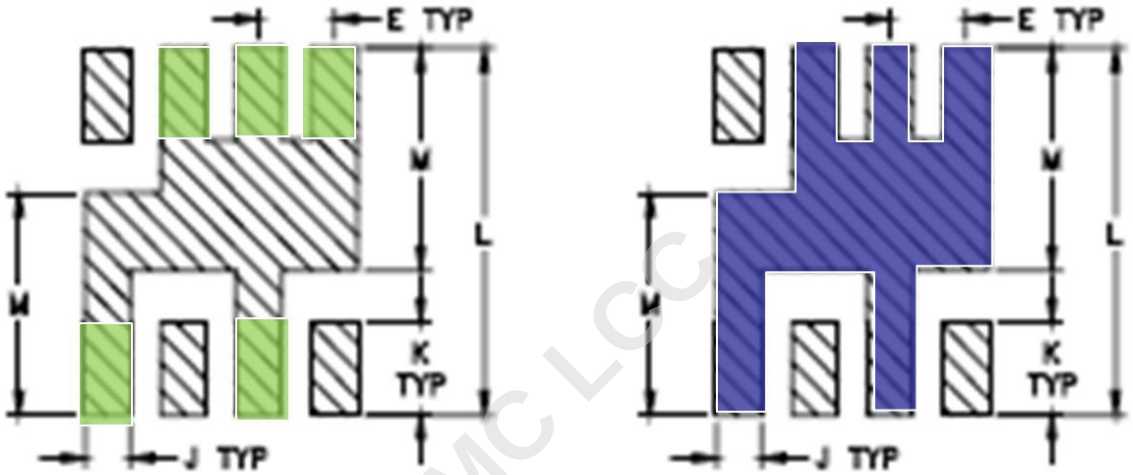


Figure 8 - Irregular Shaped Terminals

6.3 Placement Outline

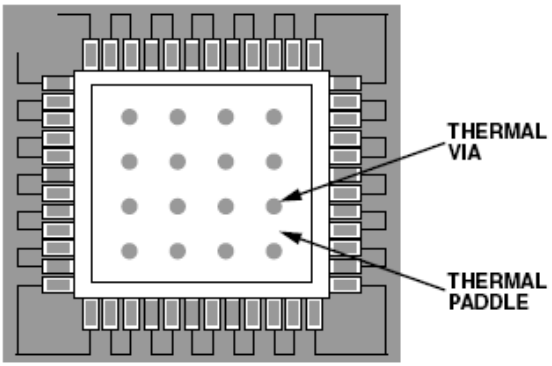
This is a representation of the maximum extent of the package body, or the package body plus its terminals. The choice of the outline representation is typically defined by the ECAD layout tool. This can be calculated from the provision of the package body dimensions plus the terminal dimensions. If defined, the outline should be a closed polyline.

6.4 Keep-in Layers,

Some Parts have specific design requirements such as grounding requirements which must be placed within a restrictive area under the package to ensure successful operation. This can be achieved by specifying the number of via's that have to be kept within a specific keep-in area.

Equally so, the area under a Thermal pad could have a keep-out area for TH type vias as this could cause soldering related problems.

1) List of layers to which the restrictions apply
2) List of restrictions that apply in any combination such as
   a. Trace or plane,
   b. Via, or
   c. Testpoint
   d. Component (may come with height criteria)



Source: Analog Devices

Figure 9 - QFN with Grounding Via's

Other Part requirements could have a land and via pattern that is specified outside the package body outline, as shown in Figure 10 - Part with Trace and Via Requirements

The difference between Figure 9 and Figure 10 is that in Figure 9 the component manufacturer allows for the placement of vias within a given area, whereas in Figure 10, the locations of the vias are locked to specific coordinates.

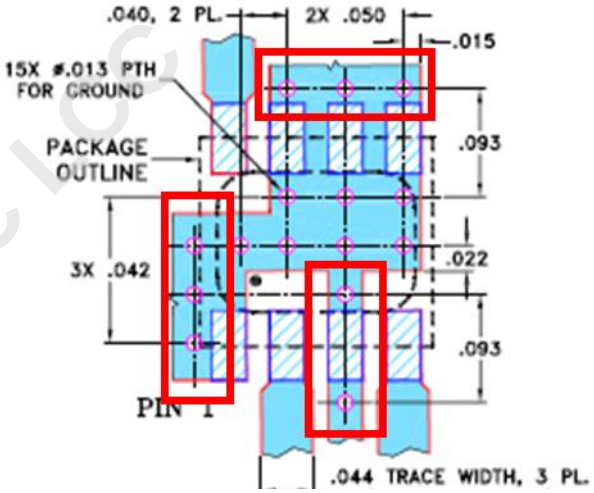
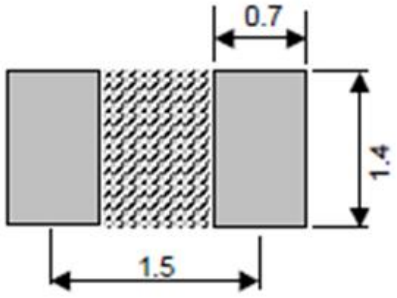


Figure 10 - Part with Trace and Via Requirements

6.5 Keep-out Layers

Component Manufacturers may want to specify that the area underneath the package body between the terminals is free from any traces or vias or both.



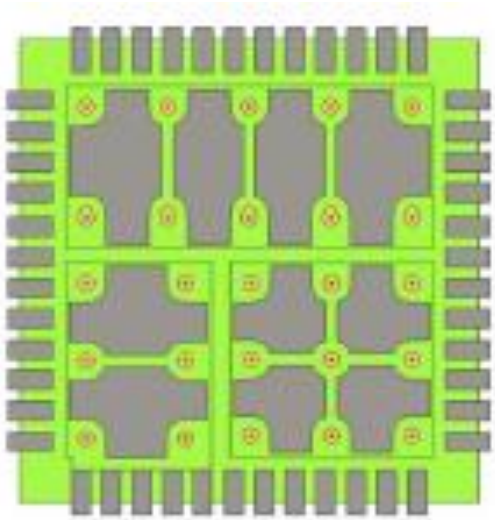
*Do not design any patterns on shaded area.

Figure 11 - Keep-out Areas

6.6 Paste Mask Layers

Normally, the definition of the paste mask opening is defined by the PCB Assembly operations, yet in certain circumstances, a component manufacture might want to specify it especially for Thermal Pads or for non-normal manufacturing process.

An example would be the windowpane approach to a complex via pattern in a Thermal Pad as shown in Figure 12 - Complex Paste Mask Shapes.



Source: IPC-7093

Figure 12 - Complex Paste Mask Shapes

6.7 Soldermask Layers

Soldermask apertures are openings in the soldermask around pads or on pads to enable the paste to be deposited within these opening, which makes the attachment to the part. For SMD type packages, the soldermask opening is defined on the mount side, but for Thru-hole components, soldermask opening is required for both the top side and the bottom side.

6.8 Pad Layer

This represents the copper land areas onto which the terminal is soldered to. For SMD parts, this is specified on the mount side, but for Thru-hole components, the pad must be defined for both the Top and Bottom layers on double sided PCB's. If the Internal pad is different to the mount side pad, then that should also be specified.

6.9 Hole

Hole in the PCB can now be constructed by several methods and are not limited to drill operations. Consequently, several shape patterns can now be supported including shapes with sharp corners. As a result, both the shape and its dimensions are required.

- Definition of plating versus non-plating
- Hole type as in Thru-hole, Micro-via, or Mounting Hole
- From Layer
- To Layer

6.10 Internal Pad Layer

Internal layer pads are normally only specified for Thru-hole parts, in which the pad surrounding the hole on the Internal layers is different to the pad on the mount side layer. When different, it is required to list the layers in which the Internal Pad differs from other layers, where the layer number is the sequential count below the mount side layer.

6.11 Opposite Side Pad Layer

For most Thru-hole terminals the pads defined on the mount side versus the opposite side is the same, expect perhaps for terminal one, which may have a square pad instead of a circular pad solely to show the orientation of the part.

6.12 Plane Clearance (Anti-pad)

Thru-hole terminals penetrate the board and as a result penetrate power and ground layers. The Anti-pad is a ring around an internal pad that defines the clearance between the annular ring surrounding the hole to the nearest trace of copper.

Since the component manufacturer is typically unaware of the Product under design by the designer, then this is usually specified by the Product designer as opposed to by the component manufacturer.

6.13 Thermal Relief

Thermal relief is only required for holes that are subject to soldering in large conductor areas such as power planes, or conductive areas intended for thermal relief. To reduce the soldering dwell time, relief is required by providing thermal resistance during the soldering process. This is achieved by providing thermal spokes that connect the annular ring to the pad. The total thermal tie cross-sectional area across all planes for a given terminal/net must be sufficient to meet the current capacity requirements.

6.14 Padstack

Padstack are defined by the accumulation of Pads names and have different structures for SMD versus TH parts. Padstacks are a subset of the Cell and are an accumulation of the naming of various layers that makes up the padstack. The Padstack name can be defined as a string that shows the concatenation of various elements that makes up the padstack name. While the shape and size are defined in 5.8 Pad & Hole Shape and Size above, some additional prefixes are required for the padstack, so that it is possible to distinguish what the shape belongs to.

- Hole has the letter H before the shape name
- Non-plated through hole has HN before the shape name
- SolderMask has the letter M before the shape name
- PasteMask has the letter P before the shape name
- Inner Layer = Z
- Opposite Side = X.

6.14.1 SMD Padstack

SMD Padstacks name can be made up from the name of shapes defined on multiple layers. An extended list would include the following

- Top Pad Name
- Top Pad Void Name (V)
- Top Soldermask opening Name (M)
- Top Pastemask Name,
- Bottom Pad Name (X)
- Bottom Pad Void Name (VX)
- Bottom Soldermask opening name (MX)
- Bottom pastemask Name (PX)

6.14.1 SMD Padstack (cont'd)

Typically, when a SMD component is placed on either the top side or the bottom side, it would have the same pad, soldermask and pastemask definitions on both sides. The SMD Padstack name length can be reduced by applying the following rules and will typically result in

<Pad shape>_V<Void shape>_M<Soldermask shape>_P<paste mask shape>

The rule of applying the codes are as follows and in the following sequence

- The padstack name starts off with the top side pad shape code,
- If there is no void within the smd pad, then the void code (_V<shape code>) is eliminated.
- If the soldermask is defined as 1-to-1 with the pad, then the soldermask code (_M<shape code>) is eliminated. This occurs in designs in which the designer relies on the PCB manufacturer to enlarge all soldermask opening based on their fabrication capabilities, however if the customer is sourcing from different multiple PCB manufacturers, then leaving the choice to the manufacturer can result in different soldermask openings for the same design which ultimately can create yield issues for the PCB Assembler.

  However, typically most footprints are NSMD (Non-SolderMask Defined) pads, then the soldermask opening is larger than the pad and therefore this is included in the padstack name. For SMD (SolderMask Defined) pads, the soldermask overlaps onto the pad and so the soldermask opening is smaller than the pad. SMD defined pads should include the soldermask shape code into the padstack names.
- If the Pastemask aperture is defined as 1-to-1 with the pad, then the pastemask code (_P<shape code>) is eliminated. Similar to the soldermask, this occurs in designs in which the designer relies on the Stencil manufacturer to define all pastemask opening based on stencil thickness and type of solder paste used. However, following IPC standards a 10% reduction on pad size is typically used to define the paste aperture, subject to max size. In addition, as shown above in 6.6 Paste Mask Layers and 6.7 Soldermask Layers, some components have very complex patterns.
- If the bottom pad is the same as the top pad, then the bottom pad can be omitted from the padstack name. This is the most common situation as the same manufacturing assembly process can be employed on both sides of the PCB. However, when a SMD part is pushed from the top side to the bottom side and falls into a different manufacturing zone such as an infinite soldering process like wave-soldering, and assuming the part is compatible with that manufacturing process, then typically the pad shapes are different. If different, then the shape code is pre-appended with the letter X.
- If there is no void in the bottom pad, then this clause can be omitted.
- If the bottom pad is modified, then it will typically drive a different soldermask shape code, since that is calculated based on the pad shape dimensions. If the same as the top side, then this too is omitted.

6.14.1 SMD Padstack (cont'd)

- The application of a bottom Pastemask name has another criterion for determining its insertion into the SMD padstack name, that being the soldering process being employed to attach the part to the footprint. If the placing of the component in an area that will utilize a finite soldering process, the pad size will be the same as the top side and thus the Pastemask will also typically align with the top Pastemask shape. In this scenario, then the Pastemask code is omitted. However, if the soldering process is an Infinite soldering process, then there is no requirement for a Pastemask layer to be added to the padstack, even if the bottom pad is different than the top pad. Such an occurrence would be to apply a SMT process to a SMD part on the topside, but utilize a wave soldering process for that same part if placed on the bottom-side.

The result of this rule logic can result in a SMD Padstack name that is as short as a single shape name (Top Pad Name defined as <Pad shape>_) to as complicated as including all shape codes such as

<Pad shape>_V<Void shape>_M<Soldermask shape>_P<paste mask shape>_X<Pad shape>_VX<Void shape>_MX<Soldermask shape>_PX<paste mask shape>

If a component manufacturer deems it necessary to define various elements of the footprint, it is advisable to only define what is absolutely necessary (such as a Pad shape) and leave all other layers to be defined by the PCB designer. This may not always be possible as high wattage parts are compressed into ever shrinking packages.

6.14.2 Through-hole Padstack

Through-hole Padstacks follows the same principles as SMD Padstacks but they have some unique additional requirements. The insertion side of the TH part is deemed as the Mount side, whereas the side of the PCB in which the terminal exit from the hole is denoted as the Opposite Side. Through-hole components require a hole in the PCB into which the terminals are inserted.

For Infinite soldering process, the TH padstack is defined as

Mount side <Pad shape>_H<Hole shape>_Z<Internal Pad Shape>_X<Opposite side Pad Shape>_M<Mount side Soldermask>_MX<Opposite side Soldermask>.

For Finite soldering, such as "Paste-in-Hole" soldering process, the TH padstack is defined as

Mount side <Pad shape>_H<Hole shape>_Z<Internal Pad>_X<Opposite side Pad Shape>_M<Mount side Soldermask shape>_MX<Opposite side Soldermask Shape> _P<Paste mask shape>

The additional rule for the Through-hole padstack naming convention that applies to the insertion of a specific shape is as follows

- If the internal layer has the same annular ring as specified on the mount side, then it is omitted from the TH Padstack naming convention.
- Opposite side pad shape is usually the same as the mounts side pad, but in some applications that utilizes the infinite soldering process, it can be larger than the mount side pad to strengthen the mechanical bond to the PCB.

6.14.2 Through-hole Padstack (cont'd)

- Paste mask layer is included only for finite soldering process. In contrast to the paste mask aperture for a SMD pad, the paste mask aperture for "Paste-in-Hole" soldering process requires that there is sufficient solder deposited to fill the hole. As a result, many times the paste mask aperture has elongated shapes even for pads that are circular. The dimensions for the paste mask aperture are also usually slightly larger than the pad. Paste mask shape is placed on the mount side where the component is inserted into the PCB. Care should be taken to ensure that after the paste is deposited on the pad, that the insertion process does not remove the paste as the terminal is inserted into the hole. Consequently, sufficient solder paste needs to remain on the pad around the hole, necessary to fill the hole and create a fillet.

7 New descriptive codes

If a new package is proposed that does not conform to one of the designated field character codes, the JEDEC JC-11 Committee on Mechanical Standardization may develop a new code for that package characteristic.

Annex A (normative) Additional information on package, terminal position, and terminal

Table A.1 - Terminal position with additional definition

Code	Name	Level 1	Level 2	Level 3	Ext Code
B[2]	Bottom				
		Circular Array			C
		Diagonal			G
			Southwest-to-Northeast		SWtNE
			Northwest-to-Southeast		NWtSE
		Matrix			M
			Full Matrix[1]		F
			Column Matrix[1]		L
			Perimeter Matrix[1]		P
			Perimeter with Inner Array Matrix[1]		A
			Perimeter Matrix with Thermal Pad[1]		T
			Random Matrix		R
D	Dual				
		Left-to-Right[3]			LtR
			Outside		LtR1
			Edge-Out		LtR2
			Overlap		LtR3
			Edge-In		LtR4
			Inside		LtR5
			Span		LtRSp
				Overlap	LtRSp3
				Edge-In	LtRSp4
				Inside	LtRSp5
		Back-to-Front[3]			BtF
			Outside		BtF1
			Edge-Out		BtF2
			Overlap		BtF3
			Edge-In		BtF4
			Inside		BtF5
			Span		BtFSp
				Overlap	BtFSp3
				Edge-In	BtFSp4
				Inside	BtFSp5
		Bottom-to-Upper			BtU
			Outside		BtU1
			Edge-Out		BtU2
			Overlap		BtU3
			Edge-In		BtU4

Table A.1 - Terminal position with additional definition (cont'd)

Code	Name	Level 1	Level 2	Level 3	Ext Code
D (cont.)	Dual (cont.)	Bottom-to-Upper (cont'd)	Span		BtUSp
				Outside	BtUSp1
				Edge-Out	BtUSp2
				Overlap	BtUSp3
				Edge-In	BtUSp4
		Corners[5] (cont.)			C
			Left		CL
				Outside	CL1
				Edge-Out	CL2
				Overlap	CL3
				Edge-In	CL4
			Back		CB
				Outside	CB1
				Edge-Out	CB2
				Overlap	CB3
				Edge-In[4]	CB4
			Right		CR
				Outside	CR1
				Edge-Out	CR2
				Overlap	CR3
				Edge-In[4]	CR4
			Front		CF
				Outside	CF1
				Edge-Out	CF2
				Overlap	CF3
				Edge-In[4]	CF4
			Left-to-Right Top		CLtRT
				Outside	CLtRT1
				Edge-Out	CLtRT2
				Overlap	CLtRT3
			Left-to-Right Bottom		CLtRB
				Outside	CLtRB1
				Edge-Out	CLtRB2
				Overlap	CLtRB3
			Back-to-Front Left		CBtFL
				Outside	CBtFL1
				Edge-Out	CBtFL2
				Overlap	CBtFL3
			Back-to-Front Right		CBtFR
				Outside	CBtFR1
				Edge-Out	CBtFR2
				Overlap	CBtFR3

Table A.1 - Terminal position with additional definition (cont'd)

Code	Name	Level 1	Level 2	Level 3	Ext Code
G	Diagonal				
		Southwest-to-Northeast[4]			CSWtNE
			Overlap		CSWtNE3
			Edge-In		CSWtNE4
			Inside		CSWtNE5
		Northwest-to-Southeast[4]			CNWtSE
			Overlap		CNWtSE3
			Edge-In		CNWtSE4
			Inside		CNWtSE5
		Back-left-to-Front-right[5]			CBLtFR
			Outside		CBLtFR1
			Edge-Out		CBLtFR2
			Overlap		CBLtFR3
		Front-left-to-Back-right[5]			CFLtBR
			Outside		CFLtBR1
			Edge-Out		CFLtBR2
			Overlap		CFLtBR3
		Left-bottom-to-Right-top[5]			CLBtRT
			Outside		CLBtRT1
			Edge-Out		CLBtRT2
			Overlap		CLBtRT3
		Left-top-to-Right-bottom[5]			CLTtRB
			Outside		CLTtRB1
			Edge-Out		CLTtRB2
			Overlap		CLTtRB3

Table A.1 - Terminal position with additional definition (cont'd)

Code	Name	Level 1	Level 2	Level 3	Ext Code
Q[2]	Quad				
		Outside			1
		Edge-Out			2
		Overlap			3
		Edge-In			4
		Inside			5
		Span			Sp
			Overlap		Sp3
			Edge-In		Sp4
			Inside		Sp5
		Corners			C
			Overlap[4]		C3
			Edge-In[4]		C4
			Inside[4]		C5
			Left-to-Right[5]		CLtR
				Outside	CLtR1
				Edge-Out	CLtR2
				Overlap	CLtR3
			Back-to-Front[5]		CBtF
				Outside	CBtF1
				Edge-Out	CBtF2
				Overlap	CBtF3
R[2]	Radial				
		Outside			1
		Edge-Out			2
		Overlap			3
		Edge-In			4
		Inside			5
		Corners[6]			C
			Outside		C1
			Edge-Out		C2
			Overlap		C3
			Edge-In		C4

Table A.1 - Terminal position with additional definition (cont'd)

Code	Name	Level 1	Level 2	Level 3	Ext Code
S[2]	Single				
		Left			L
			Outside		L1
			Edge-Out		L2
			Overlap		L3
			Edge-In		L4
			Inside		L5
		Back			B
			Outside		B1
			Edge-Out		B2
			Overlap		B3
			Edge-In		B4
			Inside		B5
		Right			R
			Outside		R1
			Edge-Out		R2
			Overlap		R3
			Edge-In		R4
			Inside		R5
		Front			F
			Outside		F1
			Edge-Out		F2
			Overlap		F3
			Edge-In		F4
			Inside		F5
		Corner			C
			Southwest[4]		CSW
				Overlap	CSW3
				Edge-In	CSW4
				Inside	CSW5
			Southeast[4]		CSE
				Overlap	CSE3
				Edge-In	CSE4
				Inside	CSE5

Table A.1 - Terminal position with additional definition (cont'd)

Code	Name	Level 1	Level 2	Level 3	Ext Code
S[2] (cont.)	Single (cont.)	Corner (cont.)	Northeast[4]		CNE
				Overlap	CNE3
				Edge-In	CNE4
				Inside	CNE5
			Northwest[4]		CNW
				Overlap	CNW3
				Edge-In	CNW4
				Inside	CNW5
			Back-left[5]		CBL
				Outside	CBL1
				Edge-Out	CBL2
				Overlap	CBL3
			Back-right[5]		CBR
				Outside	CBR1
				Edge-Out	CBR2
				Overlap	CBR3
			Front-right[5]		CFR
				Outside	CFR1
				Edge-Out	CFR2
				Overlap	CFR3
			Front-left[5]		CFL
				Outside	CFL1
				Edge-Out	CFL2
				Overlap	CFL3
			Left-bottom[5]		CLB
				Outside	CLB1
				Edge-Out	CLB2
				Overlap	CLB3
			Right-bottom[5]		CRB
				Outside	CRB1
				Edge-Out	CRB2
				Overlap	CRB3
			Right-top[5]		CRT
				Outside	CRT1
				Edge-Out	CRT2
				Overlap	CRT3
			Left-top[5]		CLT
				Outside	CLT1
				Edge-Out	CLT2
				Overlap	CLT3

Table A.1 - Terminal position with additional definition (cont'd)

Code	Name	Level 1	Level 2	Level 3	Ext Code
T[2]	Triple				
		Not Left			NL
			Outside		NL1
			Edge-Out		NL2
			Overlap		NL3
			Edge-In		NL4
			Inside		NL5
			Span		NLSp
				Overlap	NLSp3
				Edge-In	NLSp4
				Inside	NLSp5
		Not Back			NB
			Outside		NB1
			Edge-Out		NB2
			Overlap		NB3
			Edge-In		NB4
			Inside		NB5
			Span		NBSp
			Span (cont.)	Overlap	NBSp3
				Edge-In	NBSp4
				Inside	NBSp5
		Not Right			NR
			Outside		NR1
			Edge-Out		NR2
			Overlap		NR3
			Edge-In		NR4
			Inside		NR5
			Span		NRSp
				Overlap	NRSp3
				Edge-In	NRSp4
				Inside	NRSp5
		Not Front			NF
			Outside		NF1
			Edge-Out		NF2
			Overlap		NF3
			Edge-In		NF4
			Inside		NF5
			Span		NFSp
				Overlap	NFSp3

Table A.1 Terminal position with additional definition (cont'd)

Code	Name	Level 1	Level 2	Level 3	Ext Code
T[2] (cont.)	Triple (cont.)	Not Front			NF
			Outside		NF1
			Edge-Out		NF2
			Overlap		NF3
			Edge-In		NF4
			Inside		NF5
			Span		NFSp
				Overlap	NFSp3
				Edge-In	NFSp4
				Inside	NFSp5
		Corner			C
			Not-Southwest[4]		NCSW
				Overlap	NCSW3
				Edge-In	NCSW4
				Inside	NCSW5
			Not-Southeast[4]		NCSE
				Overlap	NCSE3
				Edge-In	NCSE4
				Inside	NCSE5
			Not-Northeast[4]		NCNE
				Overlap	NCNE3
				Edge-In	NCNE4
				Inside	NCNE5
			Not-Northwest[4]		NCNW
				Overlap	NCNW3
				Edge-In	NCNW4
				Inside	NCNW5
			Not-Back-left[5]		NCBL
				Outside	NCBL1
				Edge-Out	NCBL2
				Overlap	NCBL3
			Not-Back-right[5]		NCBR
				Outside	NCBR1
				Edge-Out	NCBR2
				Overlap	NCBR3
			Not-Front-right[5]		NCFR
				Outside	NCFR1
				Edge-Out	NCFR2
				Overlap	NCFR3

Table A.1 - Terminal position with additional definition (cont'd)

Code	Name	Level 1	Level 2	Level 3	Ext Code
T[2] (cont.)	Triple (cont.)	Corner (cont.)	Not-Front-left[5]		NCFL
				Outside	NCFL1
				Edge-Out	NCFL2
				Overlap	NCFL3
			Not-Left-bottom[5]		NCLB
				Outside	NCLB1
				Edge-Out	NCLB2
				Overlap	NCLB3
			Not-Right-bottom[5]		NCRB
				Outside	NCLB1
				Edge-Out	NCRB2
				Overlap	NCRB3
			Not-Right-top[5]		NCRT
				Outside	NCRT1
				Edge-Out	NCRT2
				Overlap	NCRT3
			Not-Left-top[5]		NCLT
				Outside	NCLT1
				Edge-Out	NCLT2
				Overlap	NCLT3
U[2]	Upper				
		Circular Array			C
		Diagonal			G
			Southwest-to-Northeast		SWtNE
			Northwest-to-Southeast		NWtSE
		Matrix			M
			Full Matrix[1]		F
			Column Matrix[1]		L
			Perimeter Matrix[1]		P
			Perimeter with Inner Array Matrix[1]		A
			Perimeter Matrix with Thermal Pad[1]		T
			Random Matrix		R

NOTE 1 These matrices can also have optional "Staggered" or have their "Corner pattern missing" definitions.

NOTE 2 The additional definition on these Positions is optional since these positions are valid without having to define any additional detail.

NOTE 3 This Dual position can be Staggered.

NOTE 4 Both sides of the Terminal contact area must be equal distance to or from the Package body outline

NOTE 5 Outer side of Terminal contact area must be in line with Package body outline

NOTE 6 The 4 Terminal contact area in Radial Corners must be equal distance from each other, otherwise use Quad Corners.

A.1 Relationship concepts between the Terminal Contact Area and the Body Outline.

There are 5 different classifications of the relationship of Terminal Contact Area (TCA) with the package body outline, defined as follows. The relationship is defined at the “Most Material Condition” MMC. It is also defined for each row or column of terminals, so if within a single terminal group, the left side is “Outside” but the right side is “Edge Out”, then they must be defined separately in different “Terminal Groups”: 1) Outside, 2) Edge Out, 3) Overlap, 4) Edge In, and 5) Inside.

A.1.1 Outside

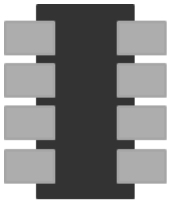
The TCA is outside the body outline, as in a Gull-wing terminal. There is a gap between the inner side of the TCA and the edge of the package body outline under the condition where the spacing of the terminals is at its minimum, while the package body dimensions are at its maximum.

A.1.2 Edge-Out

The TCA starts at the edge of the package body outline and project outwards away from the center of the package body. If the package body size is increased to its maximum tolerances, the terminal shape still only starts from the edge of the package body and not underneath the package body.

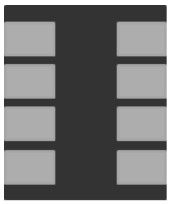
A.1.3 Overlap

The TCA starts inside the edge of the package body outline and project outwards away from the center of the body to terminate somewhere outside the package body outline. If the package body size is increased to its maximum tolerances, the terminal shape still terminates outside the edge of the package body and not at either the edge of the package body or underneath the package body.



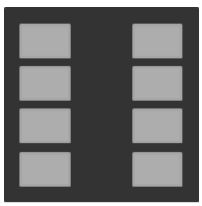
A.1.4 Edge-In

The TCA starts at the edge of the package body outline and project inwards towards the center of the package body. If the package body outline is increased to its maximum tolerances, the terminal shape still starts from the edge of the package body and not inside the package body outline. While the TCA may be inside the package body outline at nominal dimensions but touch the edge of the package body outline at its maximum tolerance, then its classification is defined as “Edge-In” since this represents the MMC of the part.



A.1.5 Inside

The TCA starts inside the edge of the package body outline and project inwards towards the center of the body. If the TCA is increased to its maximum tolerances, the terminal shape must still not touch the edge of the package body outline. If the terminal is not classified as “Pullback” then use the “Bottom” position, otherwise use “Single”, “Dual”, “Triple”, “Quad”, “Diagonal” or “Radial” positions, depending on the configuration of the terminals.



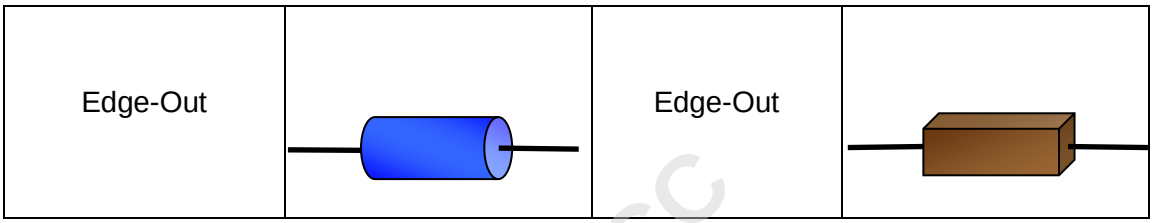
A.2 Position Images

The following is a set of images whose purpose is to provide better clarity for the definitions in Table A.2.

When using the positions “Southwest”, “Southeast”, “Northeast”, and/or “Northwest”, both sides of the Terminal Contact Area must be equal distance from the package body outline.

With respect to the orientation of the part, the position of the terminal(s) in each terminal group should be classified as follows:

A.2.1 Axial Position

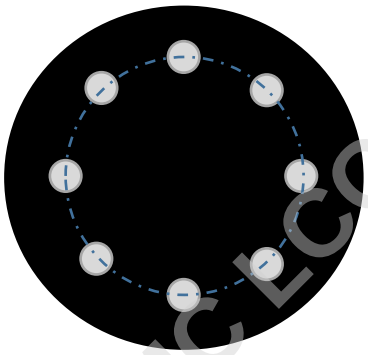
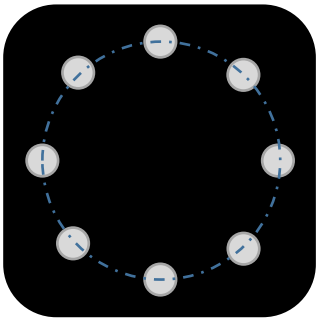


A.2.2 Bottom and Upper Positions

Terminal contact areas may be located on the bottom or upper-side of the package with or without additional definition. In all cases, the TCA must be contained wholly within the package body outline. However, there are some instances where TCA's that are inside the package body outline can still be classified under other position categories.

The following terminals must be classified under the "Bottom" or "Upper" position classification

- Periphery rows or columns of terminals that are more than 1 deep, or
- Terminals must not be classified as "Pullback" irrespective of the distance from the package body outline

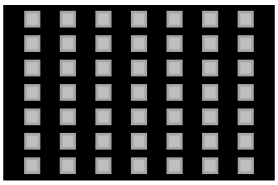
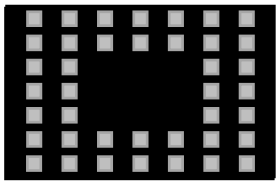
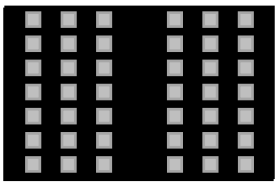
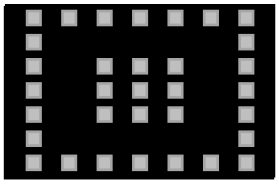
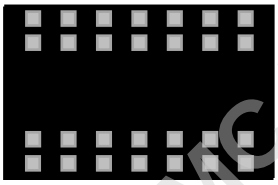
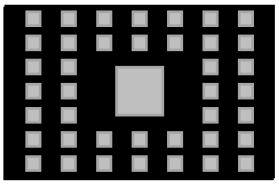
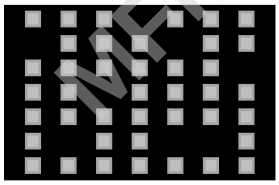
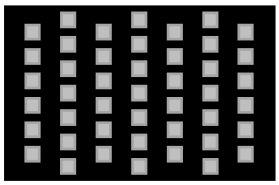
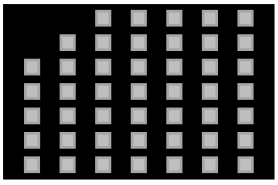
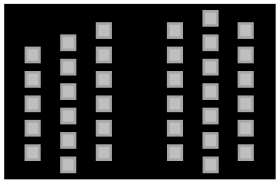
Circular Array		

"Bottom (or Upper)/Diagonal/Southwest-to-Northeast' or "Bottom (or Upper)/Diagonal/Northwest-to-Southeast/Inside" positions are very similar to "Diagonal/Southwest-to-Northeast/Inside" or "Diagonal/Northwest-to-Southeast/Inside" respectively, except that the terminals are not defined as "Pullback".

Bottom / Diagonal / Southwest-to-Northeast		Bottom / Diagonal / Northwest-to-Southeast	

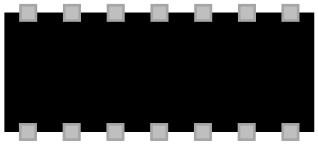
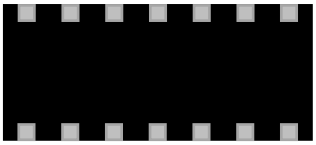
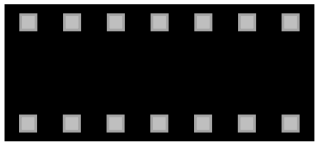
A.2.2 Bottom and Upper Positions (cont'd)

There are several different kinds of Matrix patterns, but they all fall in under the Bottom or Upper position. All these patterns can have the option of corner pattern missing and or have their matrix pattern staggered. Note in the example below that the Full Matrix has a quantity of 3 corner patterns missing compared to the staggered Column Matrix which has 2 corner patterns missing.

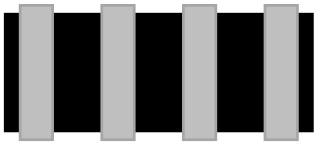
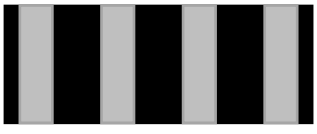
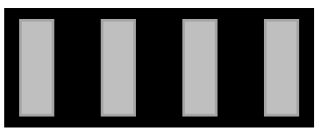
Full Matrix		Perimeter Matrix	
Column Matrix		Perimeter with Inner Array Matrix	
Column Matrix		Perimeter Matrix with Thermal Pad	
Random Matrix		Full Matrix Staggered	
Full Matrix with Corner Pattern Missing		Column Matrix with Corner Pattern Missing and Staggered	

A.2.3 Dual Position

When a terminal group has two or more terminals on opposite sides of the package body centre line, then the extended position is to be defined as follows.

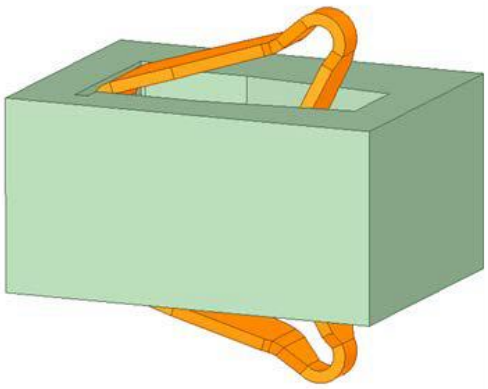
Left-to-Right / Outside		Back-to-Front / Outside	
Left-to-Right / Edge-Out		Back-to-Front / Edge-Out	
Left-to-Right / Overlap		Back-to-Front / Overlap	
Left-to-Right / Edge-In		Back-to-Front / Edge-In	
Left-to-Right / Inside		Back-to-Front / Inside	

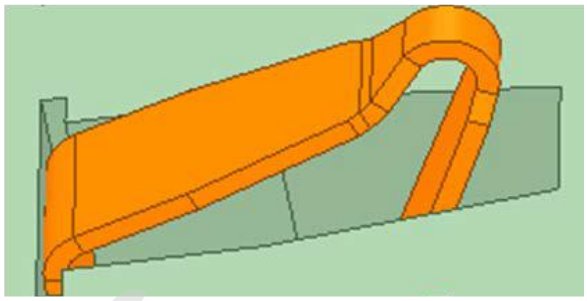
When the terminal contact area extends to, or beyond the package body outline on opposite sides, such as from “Left-to-Right” or “Back-to-Front”, then the extended position is defined as “Span”.

Left-to-Right / Span / Overlap		Back-to-Front / Span / Overlap	
Left-to-Right / Span / Edge-In		Back-to-Front / Span / Edge-In	
Left-to-Right / Span / Inside		Back-to-Front / Span / Inside	

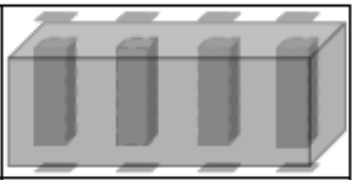
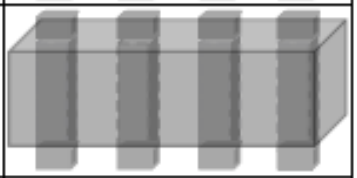
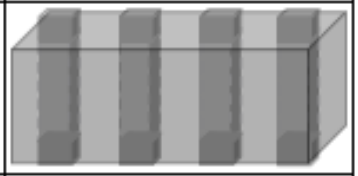
A.2.3 Dual Position (cont'd)

The "Compressed Mount Technology" terminal has a Dual position of Bottom-to-Upper, because the terminal is connected within the connector package body in the z-direction, even though the terminal contact area is in the xy plane. The position of the terminal contact area moves from the initial contact thru to the compressed position, as the connector terminal is squeezed between its mating contacts. Therefore the recommended terminal contact area necessary for the design is greater than the terminal contact area on the actual terminal. For this reason, component manufacturers should provide a "Recommended Pad" design for this type of terminal.





When the terminal contact area extends to, or beyond the package body outline on opposite sides, such as from "Left-to-Right" or "Back-to-Front", then the extended position is defined as "Span".

Bottom-to-Upper / Outside (Side View)		Bottom-to-Upper / Span / Outside (Side View)	
Bottom-to-Upper / Edge-Out (Side View)		Bottom-to-Upper / Span / Edge-Out (Side View)	
Bottom-to-Upper / Overlap (Side View)		Bottom-to-Upper / Span / Overlap (Side View)	
Bottom-to-Upper / Edge-In (Side View)		Bottom-to-Upper / Span / Edge-In (Side View)	

A.2.3 Dual Position (cont'd)

When a terminal group has two terminals in more than one corner, then if two corners are not diagonal to each other, the extended position is to be defined as follows.

Corners / Left / Outside		Corners / Right / Outside	
Corners / Back / Outside		Corners / Front / Outside	
Corners / Left / Edge-Out		Corners / Right / Edge-Out	
Corners / Back / Edge-Out		Corners / Front / Edge-Out	
Corners / Left / Overlap		Corners / Right / Overlap	
Corners / Back / Overlap		Corners / Front / Overlap	
Corners / Left / Edge-In		Corners / Right / Edge-In	

A.2.3 Dual Position (cont'd)

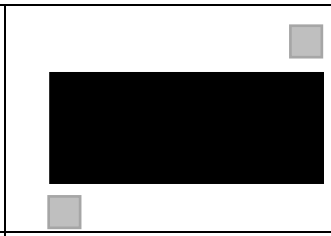
Corners / Back / Edge-In		Corners / Front / Edge-In	
Corners / Left-to-Right Top / Outside		Corners / Back-to-Front Right / Outside	
Corners / Left-to-Right Bottom / Outside		Corners / Back-to-Front Left / Outside	
Corners / Left-to-Right Top / Edge-Out		Corners / Back-to-Front Right / Edge-Out	
Corners / Left-to-Right Bottom / Edge-Out		Corners / Back-to-Front Left / Edge-Out	
Corners / Left-to-Right Top / Overlap		Corners / Back-to-Front Right / Overlap	
Corners / Left-to-Right Bottom / Overlap		Corners / Back-to-Front Left / Overlap	

A.2.4 Diagonal Position

If two corners are diagonal to each other, the extended position is to be defined as follows

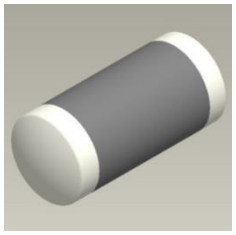
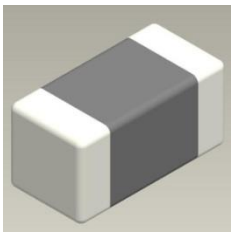
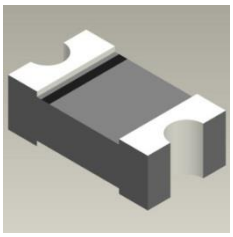
Southwest-to-Northeast / Overlap		Northwest-to-Southeast / Overlap	
Southwest-to-Northeast / Edge-In		Northwest-to-Southeast / Edge-In	
Southwest-to-Northeast / Inside		Northwest-to-Southeast / Inside	
Left-top-to-Right-bottom / Outside		Left-bottom-to-Right-top / Outside	
Left-top-to-Right-bottom / Edge-Out		Left-bottom-to-Right-top / Edge-Out	
Left-top-to-Right-bottom / Overlap		Left-bottom-to-Right-top / Overlap	

A.2.4 Diagonal Position (cont'd)

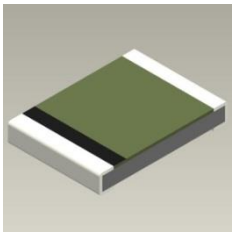
Back-left-to-Front-right / Outside		Front-left-to-Back-right / Outside	
Back-left-to-Front-right / Edge-Out		Front-left-to-Back-right / Edge-Out	
Back-left-to-Front-right / Overlap		Front-left-to-Back-right / Overlap	

A.2.5 End Positions

Terminals act as a cover, forming an end cap which envelops the entire end of the component, whether it is a cylindrical shape or a rectangular prism. A Part whose package body is like a Rectangular Prism and whose terminals cover all 5 sides – i.e., the top, bottom, end and the 2 sides, is considered to have an End position.

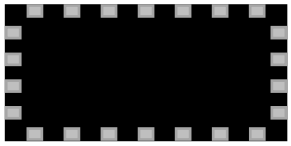
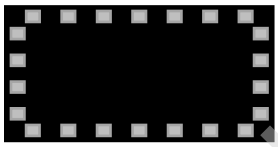
End			

When the lead does not wrap around on all sides at the end of the component, then the position is considered Single or Dual as shown in this example below.

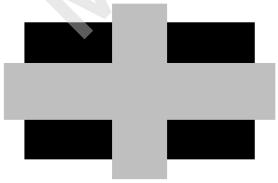
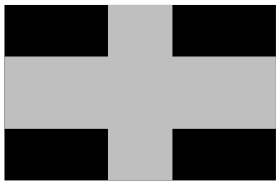
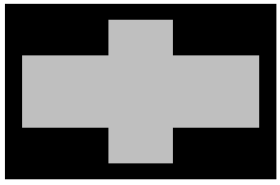


A.2.6 Quad Positions

When a terminal group has terminals on all four sides the extended position is to be defined as follows:

Outside		Edge-Out	
Overlap		Edge-In	
Inside		Corners / Overlap	

When the terminal contact area extends to, or beyond the package body outline on opposite sides, such as from “Left-to-Right” or “Back-to-Front”, then the extended position is defined as “Span”.

Span / Overlap		Span / Edge-In	
Span / Inside			

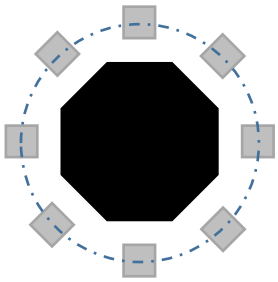
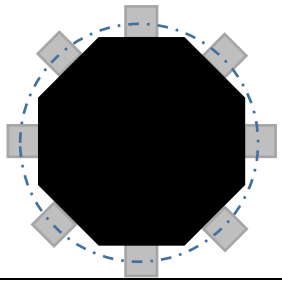
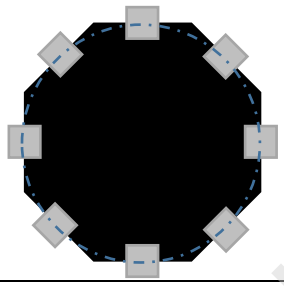
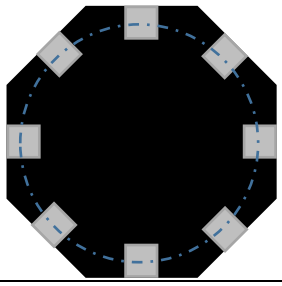
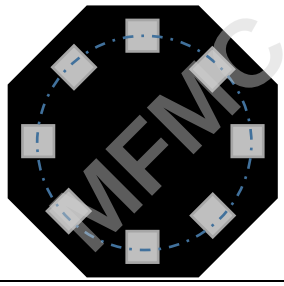
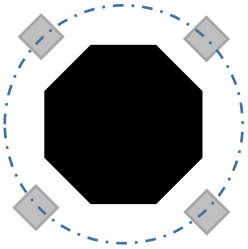
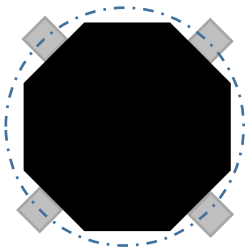
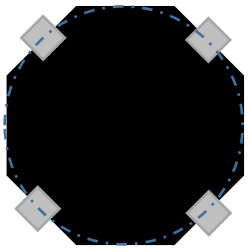
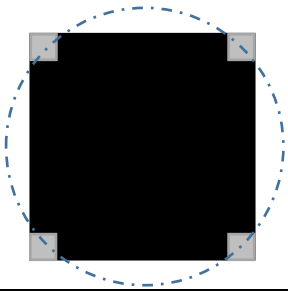
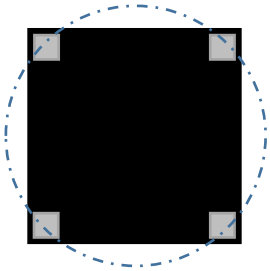
A.2.6 Quad Position (cont'd)

When a terminal group has terminals in each of the four corners, then the extended position is to be defined as follows:

Corners / Edge-In		Corners / Inside	
Corners / Left-to-Right / Outside		Corners / Left-to-Right / Edge-Out	
Corners / Left-to-Right / Overlap		Corners / Back-to-Front / Outside	
Corners / Back-to-Front / Edge-Out		Corners / Back-to-Front / Overlap	

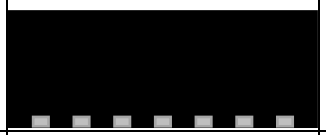
A.2.7 Radial Positions

When a terminal group has terminals the same distance from a central z-axis, and their locations can be specified by a radius, angle between the terminals, and angle to fill, then the extended position is to be defined as follows:

Outside		Edge-Out	
Overlap		Edge-In	
Inside		Corners / Outside	
Corners / Edge-Out		Corners / Overlap	
Corners / Edge-In		Corners / Inside	

A.2.8 Single Position

When a terminal group has terminals in a single row or column, then the extended position is to be defined as follows:

Left / Outside		Right / Outside	
Left / Edge-Out		Right / Edge-Out	
Left / Overlap		Right / Overlap	
Left / Edge-In		Right / Edge-In	
Left / Inside		Right / Inside	
Back / Outside		Front / Outside	
Back / Edge-Out		Front / Edge-Out	
Back / Overlap		Front / Overlap	
Back / Edge-In		Front / Edge-In	
Back / Inside		Front / Inside	

A.2.8 Single Position (cont'd)

When the terminal group has a single terminal in one corner, then if

1) The outer edges of the TCA are equal distance outside the package body outline on two sides, while the inner point is inside the package body outline, then it is classified as "Overlap".
2) The outer edges of the TCA are in line with the package body outline on two sides, then it is classified as "Edge-In",
3) The outer edge of the TCA is equal distance inside the package body outline on two sides, then it is classified as "Inside".

Corner / Southwest / Overlap		Corner / Northeast / Overlap	
Corner / Southeast / Overlap		Corner / Northwest / Overlap	
Corner / Southwest / Edge-In		Corner / Northeast / Edge-In	
Corner / Southeast / Edge-In		Northwest / Edge-In	
Corner / Southwest / Inside		Corner / Northeast / Inside	
Corner / Southeast / Inside		Corner / Northwest / Inside	

A.2.8 Single Position (cont'd)

When the terminal group has a single terminal residing Outside, Edge-Out or Overlapping the package body outline on only one side, while the other side is in line with the package body outline, the extended position is to be defined as

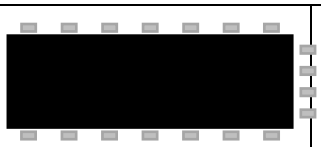
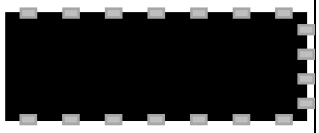
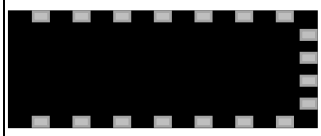
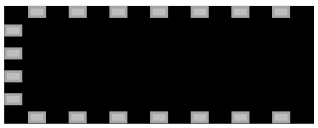
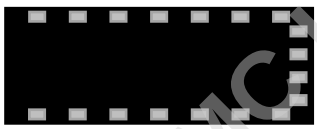
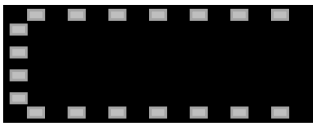
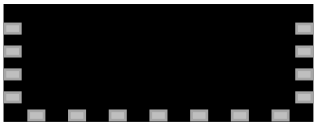
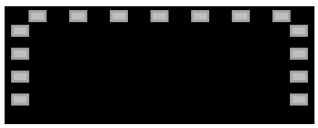
Corner / Back-left / Outside		Corner / Left-bottom / Outside	
Corner / Back-right / Outside		Corner / Right-bottom / Outside	
Corner / Front-right / Outside		Corner / Right-top / Outside	
Corner / Front-left / Outside		Corner / Left-top / Outside	
Corner / Back-left / Edge-Out		Corner / Left-bottom / Edge-Out	
Corner / Back-right / Edge-Out		Corner / Right-bottom / Edge-Out	
Corner / Front-right / Edge-Out		Corner / Right-top / Edge-Out	

A.2.8 Single Position (cont'd)

Corner / Front-left / Edge-Out		Corner / Left-top / Edge-Out	
Corner / Back-left / Overlap		Corner / Left-bottom / Overlap	
Corner / Back-right / Overlap		Corner / Right-bottom / Overlap	
Corner / Front-right / Overlap		Corner / Right-top / Overlap	
Corner / Front-left / Overlap		Corner / Left-top / Overlap	

A.2.9 Triple Position

When a terminal group has leads in three rows / columns, the extended position is to be defined as follows

Not-Left / Outside		Not-Right / Outside	
Not-Left / Edge-Out		Not-Right / Edge-Out	
Not-Left / Overlap		Not-Right / Overlap	
Not-Left / Edge-In		Not-Right / Edge-In	
Not-Left / Inside		Not-Right / Inside	
Not-Back / Outside		Not-Front / Outside	
Not-Back / Edge-Out		Not-Front / Edge-Out	
Not-Back / Overlap		Not-Front / Overlap	
Not-Back / Edge-In		Not-Front / Edge-In	
Not-Back / Inside		Not-Front / Inside	

A.2.9 Triple Position (cont'd)

When the terminal contact area extends to, or beyond the package body outline on three sides, then the extended position is defined as "Span".

Not-Left / Span / Overlap		Not-Right / Span / Overlap	
Not-Left / Span / Edge-In		Not- Right / Span / Edge-In	
Not-Left / Span / Inside		Not- Right / Span / Inside	
Not-Back / Span / Overlap		Not-Front / Span / Overlap	
Not- Back / Span / Edge-In		Not- Front / Span / Edge-In	
Not- Back / Span / Inside		Not- Front / Span / Inside	

A.2.9 Triple Position (cont'd)

When a terminal contact has three terminals in three corners the extended position is to be defined.

Corner / Not-Southwest / Overlap		Corner / Not-Northeast / Overlap	
Corner / Not-Southeast / Overlap		Corner / Not-Northwest / Overlap	
Corner / Not-Southwest / Edge-In		Corner / Not-Northeast / Edge-In	
Corner / Not-Southeast / Edge-In		Corner / Not-Northwest / Edge-In	
Corner / Not-Southwest / Inside		Corner / Not-Northeast / Inside	
Corner / Not-Southeast / Inside		Corner / Not-Northwest / Inside	

A.2.9 Triple Position (cont'd)

Corner / Not-Back-left / Outside		Corner / Not-Front-right / Outside	
Corner / Not-Back-right / Outside		Corner / Not-Front-left / Outside	
Corner / Not-Back-left / Edge-Out		Corner / Not-Front-right / Edge-Out	
Corner / Not-Back-right / Edge-Out		Corner / Not-Front-left / Edge-Out	
Corner / Not-Back-left / Overlap		Corner / Not-Front-right / Overlap	
Corner / Not-Back-right / Overlap		Corner / Not-Front-left / Overlap	

A.2.9 Triple Position (cont'd)

Corner / Not-Left-bottom / Outside		Corner / Not-Right-top / Outside	
Corner / Not-Right-bottom / Outside		Corner / Not-Left-top / Outside	
Corner / Not-Left-bottom / Edge-Out		Corner / Not-Right-top / Edge-Out	
Corner / Not-Right-bottom / Edge-Out		Corner / Not-Left-top / Edge-Out	
Corner / Not-Left-bottom / Overlap		Corner / Not-Right-top / Overlap	
Corner / Not-Right-bottom / Overlap		Corner / Not-Left-top / Overlap	

Table A.2 - Illustrations of Package Outline Styles

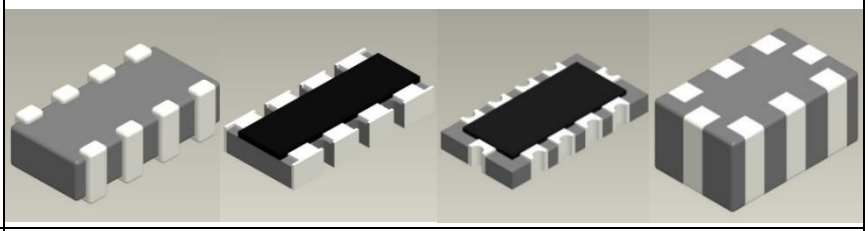
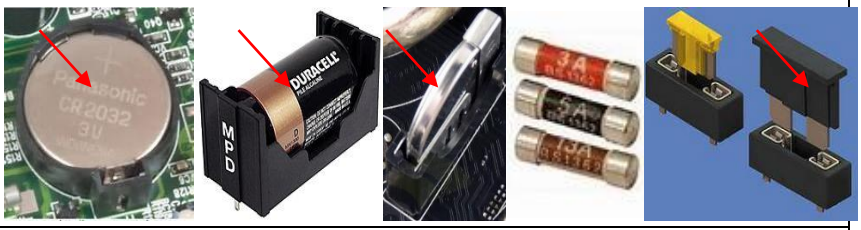
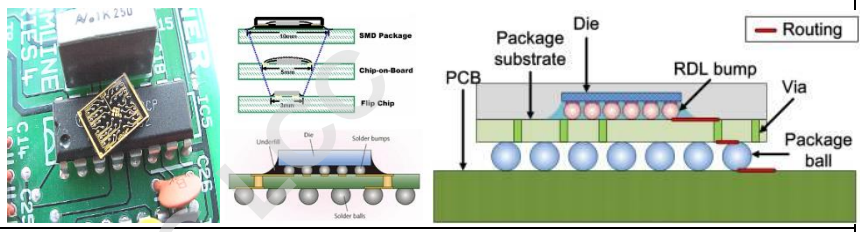
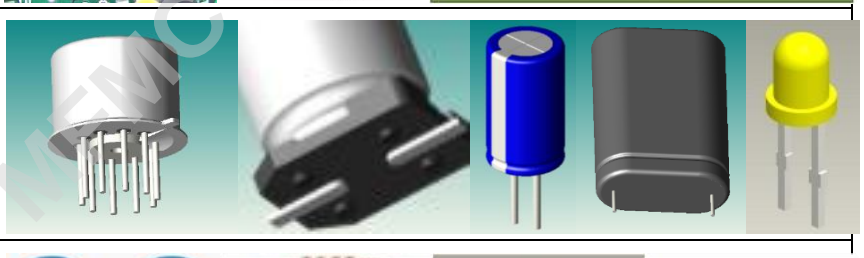
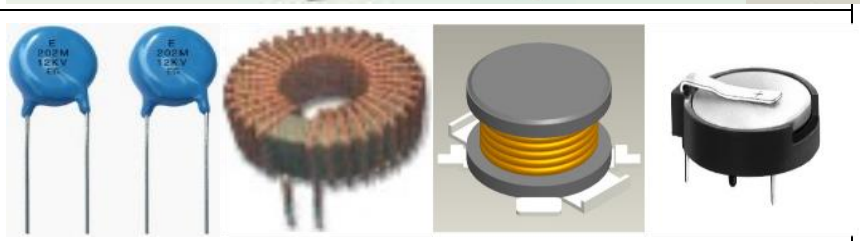
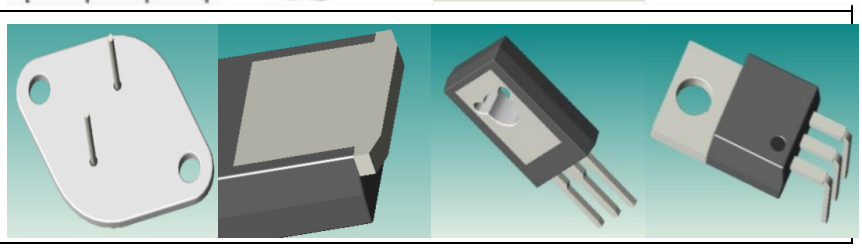
Package style code	Package type	Example Images
AT	Array Type	
CP	Clamped Package (Press-Pack)	
CS	Chip Scale Package	
CY	Cylinder or Can	
DB	Disk Button	
FM	Flange Mount	

Table A.2 - Illustrations of Package Outline Styles (cont'd)

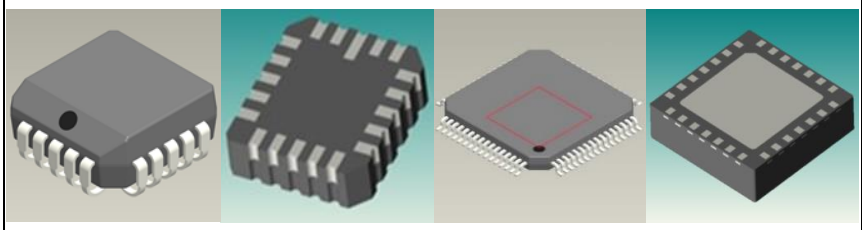
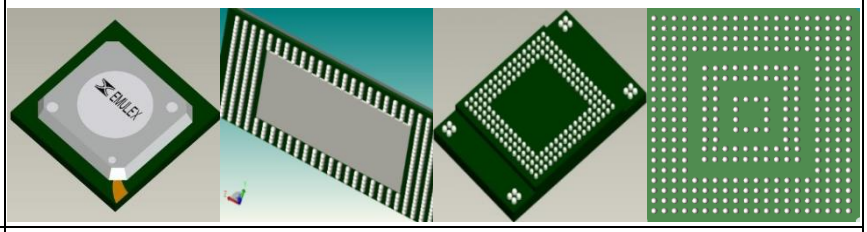
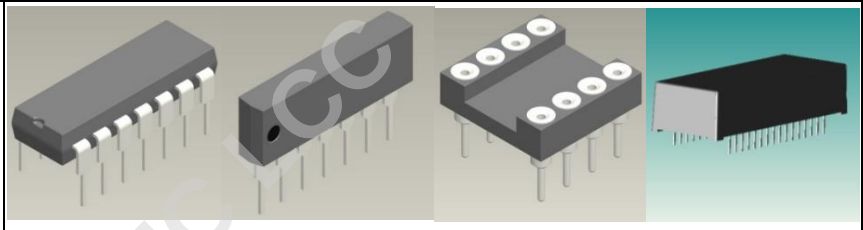
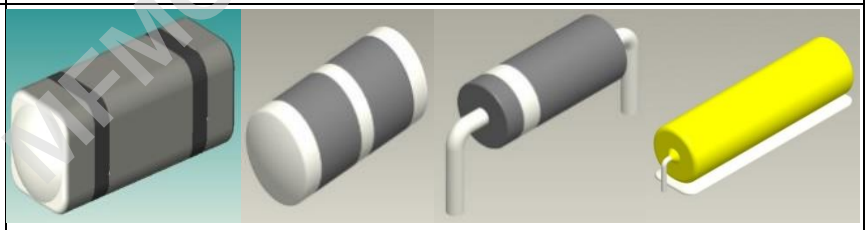
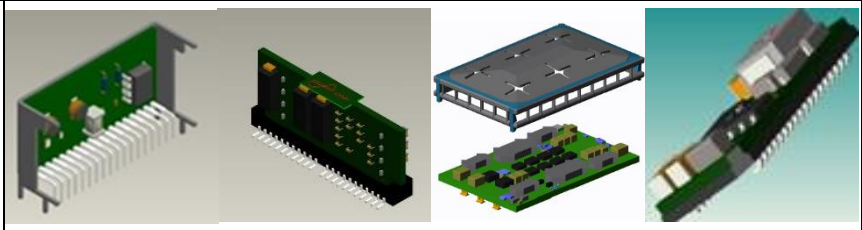
Package style code	Package type	Example Images
FP	Flatpack	
GA	Grid-Array	
IP	In-Line Package	
LF	Long Form	
MA[1]	Microelectronic Assembly	
PF	Press Fit	

Table A.2 - Illustrations of Package Outline Styles (cont'd)

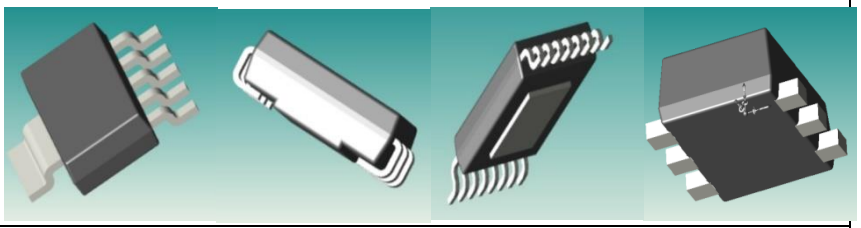
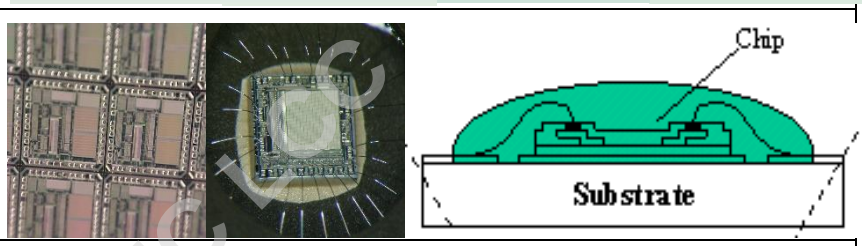
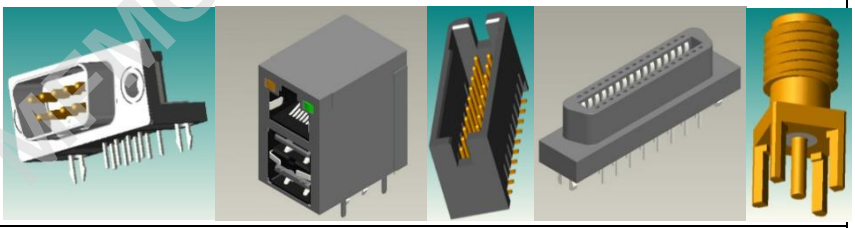
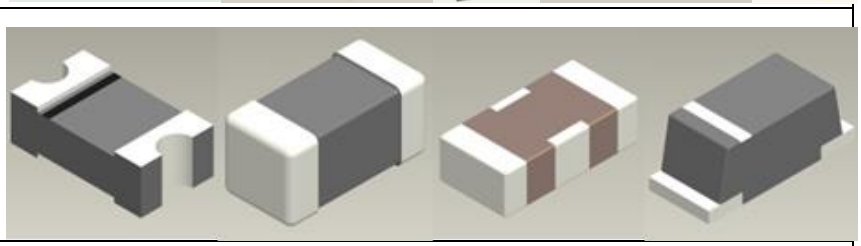
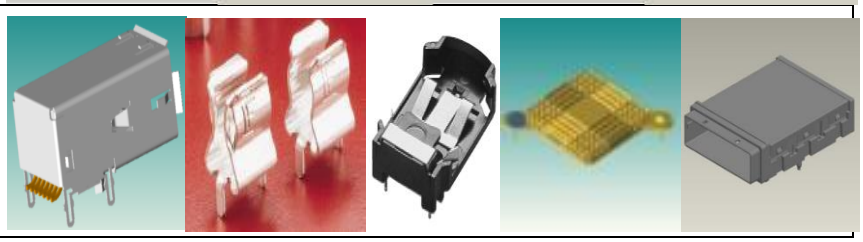
Package style code	Package type	Example Images
PM[1]	Post or Stud Mount	
SO	Small Outline	
UC	Uncased Chip	
XC[1]	Connector	
XD	Discrete	
XH	Hardware	

Table A.2 - Illustrations of Package Outline Styles (cont'd)

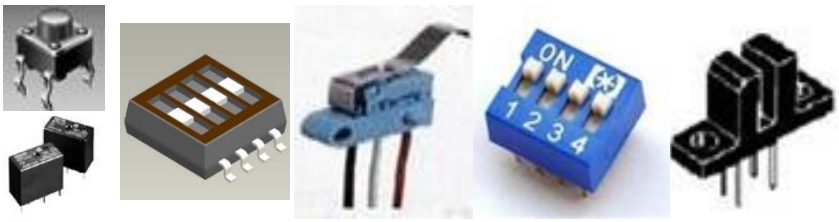
Package style code	Package type	Example Images
XS	Switch	
NOTE 1 These package outline styles definitions can have some variations that often require further definition or clarification as defined in Annex A. 2.1.		

Table A.2.1 - Illustrations of Extended Package Outline Styles

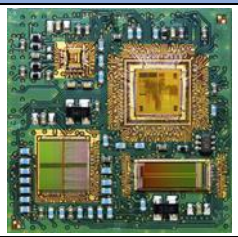
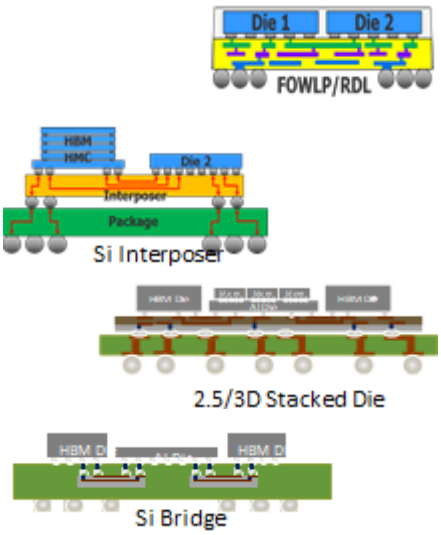
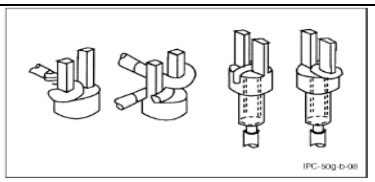
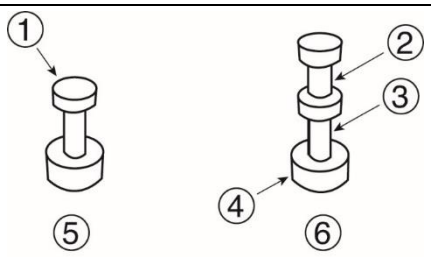
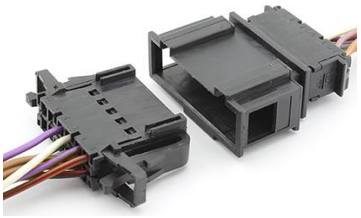
Package style code	Package type	Level 1	Description	Example Images	Ext Code
MA[1]	Microelectronic Assembly	Multichip Module (MCM)	A submodule of the microelectronics assembly that contains two or more uncased devices.		1
		Chiplet	A Chiplet is a tiny integrated circuit (IC) that contains a well-defined subset of functionality. It is designed to be combined with other chiplets on an interposer in a single package. Multiple chiplets working together in a single integrated circuit may be called a multi-chip module (MCM), hybrid IC, or 2.5D IC.		2
PM[1]	Post or Stud Mount	Bifurcated Solder Terminal	A post or stud mount terminal with a slot or slit opening through which one or more wires are placed prior to soldering.		1
		Turret Solder Terminal	A post or stud mount terminal with a groove or grooves around which one or more wires are wrapped prior to soldering.		2
XC[1]	Connector	Cable-to-Cable	A connector whose electrical connection is internal to the connector and no electrical connection is made to a PCB or mounting substrate, other than mounting support or shielding.		1
NOTE 1 These package outline styles have additional variations.					

Table A.3 - Suffixes for terminal with additional definition

Code	Name	Level 1	Level 2	Ext Code
B	Ball[8]	Bump		B
		Collapsing		C
		Non-Collapsing		N
D	Lug			
		Perforated (Pierced) Solder Terminal		P[7]
		Cup Solder Terminal		C[7]
		Hook Solder Terminal		H[7]
		Crimp Lug		M[7]
		Ring Tongue Terminal		R[7]
		Lug with Threaded Hole		T[7]
F[1]	Flat			
		Elevated		E
		Flat-L-Bend		L
		Hole		H
		With-opening		O
G[1]	Gull-wing			
		Modified[2]		S[7]
I	Post (Stud)	Butt		B[7]
		Flatten Post Connection		P[7]
L[1]	L-bend			
		Inward		I
		Outward		O
		Side Inward		A
		Side Outward		B
		LC-bend		C
M[1]	Column[8]			
		Ribbon Wrap		R[7, 8]
		Microspring		M[7, 8]
		Copper Coated Solder Column		C[7, 8]
N	Surface-terminal[4, 5, 8]			
		Castellated[3]		C[7]
		Hole[4, 5]		H
		With-opening[4, 5]		O
		Open-Ring[4, 5]		R
O[8]	Pressfit	Compliant[1]		T[7]
			Eye-of-the-Needle Pin	E[7]
			Conical Pin	C[7]
			Multi-Spring Pin	M[7]
			Action Pin	A[7]
		Non-Compliant		N[7]

Table A.3 - Suffixes for terminal with additional definition (cont'd)

Code	Name	Level 1	Level 2	Ext Code
P[1]	Pin[8]			
		Kinked		K[7]
		Shoulder[2]		S[7, 8]
		Press-In Solderable		P
		Swage Fastening Pin		F
		Press-In Non-Solderable		N
R[1]	Wraparound[6]			
		Castellated [3]		C[7]
		Ring[6]		R
		Open-Ring[6]		O[7]
		Nibble[6]		N[7]
		Convex-E[6]		E
		Convex-S		S
S	S-bend			
		Inward Flat		F
		Inward Curved		C[7]
		Outward Flat		P
		Outward Curved		O[7]
T[1]	Through-Hole[8]			
		Kinked		K[7]
		Shoulder[2]		S[7]
W[1]	Terminal Wire			
		Kinked (Bent)		K[7]
		SM-Wire		S
		SM-Coined Wire		C
		Wraparound – SMT Mount		R
		Coined Wraparound – SMT Mount		O
Y	Screw	Clearance Hole		C
		Threaded Hole		T[7]
		Screw		S[7]

Table A.3 - Suffixes for terminal with additional definition (cont'd)

NOTE 1 The additional definition on these Terminal shapes is optional since these terminal shapes are valid without having to define any additional detail.

NOTE 2 Some terminals have different Shoulder or other Modification variations. It is only necessary to classify the terminal as having a shoulder or modification, but not necessary to classify the variations of the shoulder or the modification. See Table A.4 for more details.

NOTE 3 The Castellated Surface terminal or Wraparound terminal may or may not have a wettable flank on either side of the castellated indenture. See Table A.4 for more details.

NOTE 4 The Surface-terminal may or may not have a D-Shape, however it will not exist on a Surface terminal that contains a Hole, or a "with opening" area. It is also not possible for an Open-Ring Surface terminal to have a D-Shape option. See Table A.4 for more details.

NOTE 5 The Surface terminal may or may not have a Pullback, however it will not exist on a Surface terminal that contains a Hole, or a "with opening" area. It is also not possible for an Open-Ring Surface terminal to have the Pullback option. See Table A.4 for more details.

NOTE 6 The Wraparound terminal may or may not have a D-Shape, however it will not exist on a Wraparound terminal that is a Ring, Open-Ring, Nibble, or a Convex terminal. See Table A.4 for more details.

NOTE 7 These Extended terminal codes are not required for inclusion into the footprint designation.

NOTE 8 For a grid pattern of these terminals in which nx and ny ≥ 2, if the pitch is the x direction is not the same as in the y direction, then a secondary pitch value can be applied to the Inline pitch code.

Table A.3.1 - Illustrations of terminal code

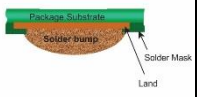
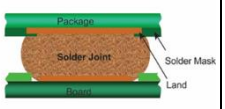
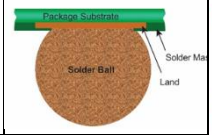
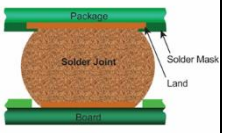
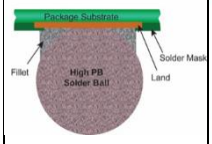
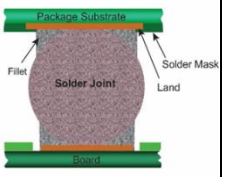
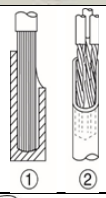
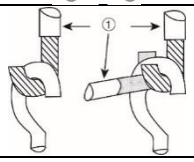
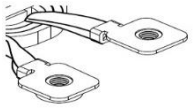
Code	Name	Level 1	Description	Image
B	Ball	Bump	A rounded protrusion of solder used to make interconnections between a package body and a printed board during controlled-collapse soldering. 	
		Collapsing	A solder ball whose metallurgical composition is designed to melt and coalesce into the solder connection during reflow soldering. 	
		Non-Collapsing	A solder ball whose metallurgical composition prevents it from melting into the solder connection during reflow soldering. 	
C	C-bend		A SMD compliant terminal extending from the sides of the body, bending down and forming a flat contact area with the board under the package body. It is similar to a J-lead except that the bottom of the J-lead is flat, and not rounded up under the package body.	
D	Lug	Perforated (Pierced) Solder Terminal	A flat-metal solder terminal with an opening through which one or more wires are placed prior to soldering.	
		Cup Solder Terminal	A cylindrical solder terminal with a hollow opening into which one or more wires are placed prior to soldering. 1. Single Wire Fill 2. Multiple Wire Fill	
		Hook Solder Terminal	A solder terminal with a curved feature around which one or more wires are wrapped prior to soldering. 1. Wire Lead	
		Crimp Lug	A wire terminal that forms a connection via crimping.	
		Ring Tongue Terminal	Round-end tongue terminal with hole to accommodate screw or stud	
		Lug with Threaded Hole	A wire terminal that forms a connection with a screw	

Table A.3.1 - Illustrations of terminal code (cont'd)

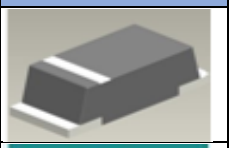
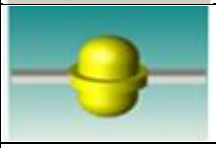
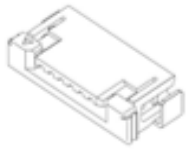
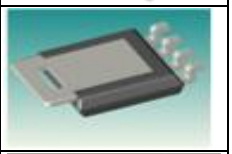
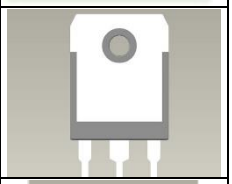
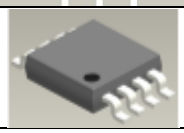
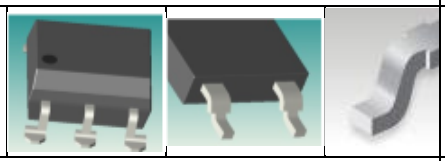
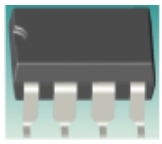
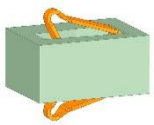
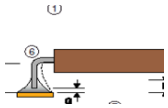
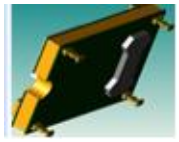
Code	Name	Level 1	Description	Image
F	Flat		A compliant, or noncompliant, unformed planar terminal that extends away from the body of the package.	
		Elevated	A terminal that exits from the package body side above the seating plane.	
		Flat-L-Bend	A formed flat terminal, that extends away from the package body, and then bends upwards at approximately 90 °outside of the package body."	
		Hole	A Flat terminal flange with a hole or slot in it.	
		With-opening	A Flat terminal flange with one or more internal openings. Normally there is a Hole (defined as a separate terminal) contained within the "opening".	
G	Gull-wing		An SMD terminal that extends horizontally from the package body, bent downward adjacent to the body and then bent outward near the bottom of the body.	
		Modified	Gull-wing terminals with different Shoulder variations	 
H	Compressed Mount Technology		A spring type terminal that protrudes from the bottom and upper sides of a connector, that makes connection to the pads on the two mating PrCB's which sandwiches the connection. The pad shape must be elongated to cover the full motion of the spring during compression.	
I	Post (Stud) Terminal	Butt	A terminal designed for through-hole applications but mounted without a hole, sometimes with modified end connections. Terminal connections are formed perpendicular to the land surface.	
		Flatten Post Connection	An SMD post like terminal that is perpendicular to the seating plane of the package body.	
J	J-bend		An SMD terminal that extends horizontally from the package body near its Z axis centerline, is formed down and then rolled under the package. Terminals so formed are shaped like the letter "J."	

Table A.3.1 - Illustrations of terminal code (cont'd)

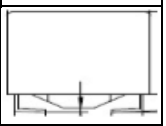
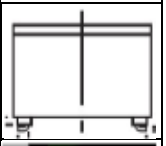
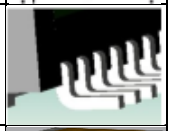
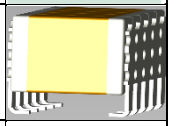
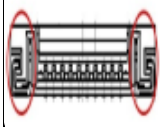
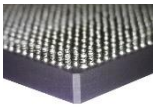
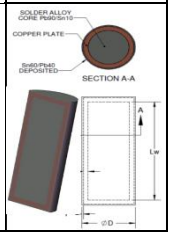
Code	Name	Level 1	Description	Image
L	L-bend		An L-shaped compliant SMD terminal that extends from the bottom of the body and bending sideways, forming an "L" shape. Additional classification is not necessary if the terminal ends are visible in the plan view of the part when mounted on the seating plane."	
		Inward	An L-bend terminal where the toe faces inwards towards the center of the package body.	
		Outward	An L-bend terminal where the toe faces outwards away from the center of the package body.	
		Side Outward	An L-bend whose vertical portion travels down the side of the package body and then outwards away from the package body.	
		Side Inward	An L-bend whose vertical portion travels down the side of the package body and then inwards towards the package body.	
		LC-Bend	An L-bend whose vertical portion exits the package body from the underside, then bends outwards towards the edge of the package body, and upwards again, (as if it was a C-bend with the exit on the opposite end).	
M	Column		Terminals are perpendicular to the seating plane of the package body, and consist of solid or metallized extensions.	
		Ribbon Wrap	Solder column with a high melting temperature alloy wound with a thin outer layer of copper ribbon spirally wrapped around the column, and then coated with solder.	
		Microspring	A beryllium copper coil coated but not filled with a solderable alloy.	 
		Copper Coated Solder Column	Solder column with a high melting temperature alloy covered by electroplated copper, and then coated with solderable finish	

Table A.3.1 - Illustrations of terminal code (cont'd)

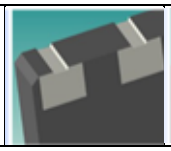
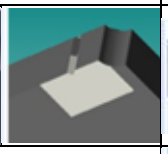
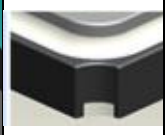
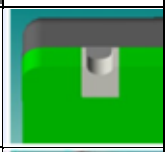
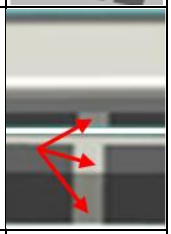
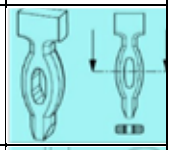
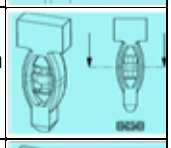
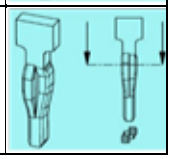
Code	Name	Level 1	Description	Image
N	Surface-terminal		Metallized contact area located on any surface of the device body.	
		Castellated	A metallized contact area recessed into the side or corner of the package body to allow solder to wet the contact area.	  
		Castellated with Wettable Flank	A castellated surface terminal with plating on either side of the indentation.	
		Hole	A surface terminal which has an opening in it where the metallized surface extends to the edge or inside of the opening	
		With-opening	A surface terminal with one or more internal openings.	
		Open-Ring	A surface terminal that is located on the bottom and 2 opposite sides of the device body.	
O	Pressfit		A pin that when inserted into a plated-through hole, creates a gas-tight joint against the barrel of the hole	
		Eye-of-the-Needle Compliant Pin	A compliant pin is one that when inserted into a plated-through hole, creates a spring force against the barrel of the hole that creates a gas-tight joint.	
		Conical Compliant Pin	A compliant coined C shaped portion that when pushed into the hole, compresses in a controlled way, creating a gas-tight joint.	
		Multi-Spring Compliant Pin	Compliant pins that have multiple spring actions to maintain a gas fit connection between the pin and the hole.	
		Action Compliant Pin	A micro version of the Eye-of-the-Needle Compliant Pin that provide significant hole reduction compared to previous pressfit pin designs and retains the assembly and operational advantages of press-fit connectors.	

Table A.3.1 - Illustrations of terminal code (cont'd)

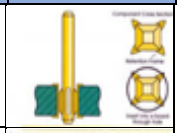
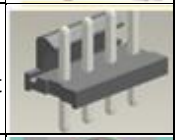
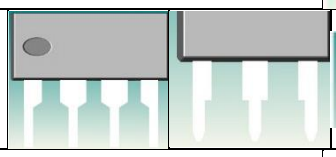
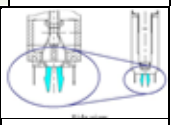
Code	Name	Level 1	Description	Image
O (cont.)	Pressfit (cont.)	Non-Compliant Pin	This is a rigid square pin that deforms the hole as opposed to the pin itself being deformed.	
P	Pin		A Pin/Peg lead extends from the bottom of the package and is intended for attachment as is, to a plated through-hole in the PCB. This lead is not meant to be formed, or cut during the part assembly to the PCB.	
		Kinked	A double-point bend used to provide extra stability to the part during the assembly process. The "kink" in the terminal is meant to snap into the plated through-hole.	
		Shoulder	Pin terminals with different Shoulder variations	 
		Press-In Solderable	A prong shaped terminal that is compressed and soldered into a hole.	
		Swage Fastening Pin	Post Mount Terminals are typically mounted to a printed board via a swage fastening pin. A cylindrical hollow pin that is makes connection to a plated through hole through cold expansion, flaring or swaging, by means of a turret press, to form a secure press fit inside the hole.	
		Press-In Non-Solderable	A mechanical non-usable terminal that is compressed into a hole. This is to provide part alignment of the other terminals to the Land Pattern, and/or for maintaining the part seated to the printed board during the soldering process."	
Q	Quick Connect		A tab-like terminal typically extending from the upper side of the package body. If the part is mounted to the printed board, then it should be classified under the definition of the terminals that connect to the printed board, and not by these Tab like terminals. These tab-like terminals provide a plug-on, plug-off connection.	

Table A.3.1 - Illustrations of terminal code (cont'd)

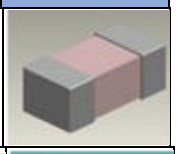
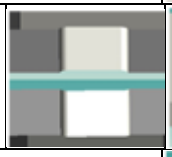
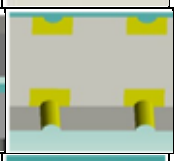
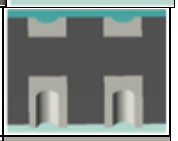
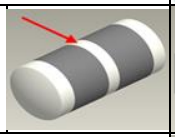
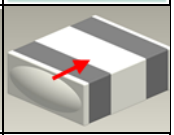
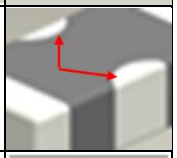
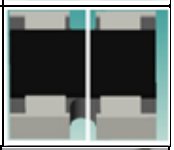
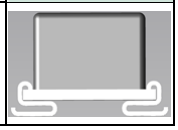
Code	Name	Level 1	Description	Image
R	Wraparound		A metallized contact area that wraps around the top, 1 or more sides and bottom of the device body.	
		Castellated	A wraparound recessed into the side or corner of the package body to allow solder to wet the contact area.	 
		Castellated with Wettable Flank	A castellated wraparound with plating on either side of the indentation.	
		Ring	A wraparound that wraps around the package body.	 
		Open-Ring	A wraparound that wraps around the device body, but is open on the top side only.	
		Nibble	A wraparound that has a wire end protruding from the end of the terminal.	
		Convex E	A wraparound with even shoulders	
		Convex S	A wraparound with uneven shoulders	
S	S-bend	Inward Flat	An "S-bend" terminal where the toe faces inwards towards the center of the package body. The end of the terminal contact area remains flat and not curved.	
		Inward Curved	An "S-bend" terminal where the toe faces inwards towards the center of the package body. This terminal curves upward at the end of the terminal contact area similar to a J-bend	
		Outward Flat	An "S-bend" terminal where the toe faces outwards away from the center of the package body. The end of the terminal contact area remains flat and not curved.	
		Outward Curved	An "S-bend" terminal where the toe faces outwards away from the center of the package body. This terminal curves upward at the end of the terminal contact area similar to a J-bend.	

Table A.3.1 - Illustrations of terminal code (cont'd)

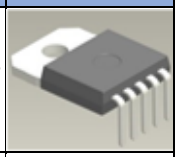
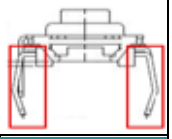
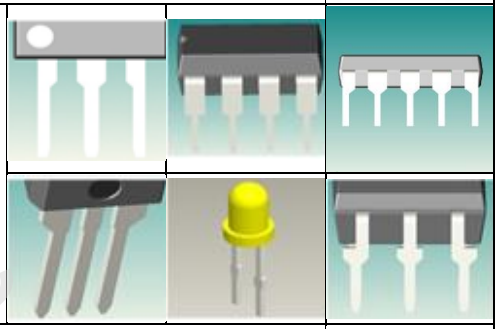
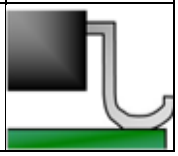
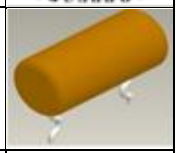
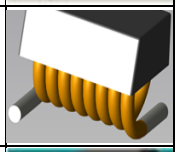
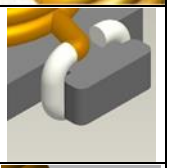
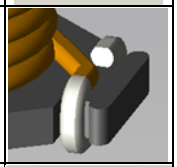
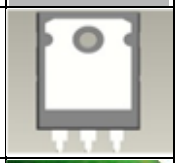
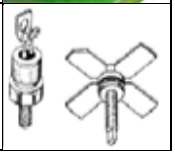
Code	Name	Level 1	Description	Image
T	Through-Hole		A tempered terminal with square/rectangular/circular or V-shaped cross section intended for attachment to a through-hole in the land structure. This lead can be prepped to provide a different mounting method for the part.	
		Kinked Lead	When forming is performed by the component manufacturer, usually this results in the lead being kinked, to provide standoff of the part from the PCB, or to lock the part to the PCB.	
		Shoulder	Through-Hole terminals with different Shoulder variations	
U	J-Inverted		A SMD terminal that extends horizontally from the package body near its Z axis centerline, is formed down and then rolled away the package. Terminals so formed are shaped like the letter "U".	

Table A.3.1 - Illustrations of terminal code (cont'd)

Code	Name	Level 1	Description	Image
W	Terminal-wire		A solid metal terminal that extends from the package body.	
		Kinked (Bent)	A two or more point bend used to provide standoff and/or stability to the part during the assembly process.	
		SM-Wire	Wire terminals whose ends are soldered horizontally to a surface mount pad. The end view of a surface mount terminal, is typically a circle.	
		Coined Wire – Surface Mount	Terminal-wire whose ends are soldered horizontally to a surface mount pad. The end view of a surface mount terminal, is typically not a circle, since the bottom of the terminal has been deformed.	
		Wraparound – Surface Mount	Terminal-wire that are part of a wire wrapped around a package body that are soldered to a surface mount pad, have a rectangular terminal contact area, because the wire contact to the printed board is horizontal. The bottom of the terminal has not been deformed.	
		Coined Wraparound – Surface Mount	Terminal-wires that are part of a wire wrapped around a package body that are soldered to a surface mount pad, have a rectangular terminal contact area, because the wire contact to the printed board is horizontal. The bottom of the terminal has not been deformed.	
Y	Screw	Clearance Hole	A hole in the device designed with a clearance for the fastener.	
		Threaded Hole	A hole in the device designed with an internal thread for the fastener.	
		Screw	A threaded terminal intended to be used as a fastener.	

Annex B (informative) Package classification

Electronic-device packages may be classified by form, basic type, or derivative type.

B.1 Major classification

Major classification (basic style) is determined by the primary method of attachment to the interconnect land structure. The following definitions apply:

point-to-point-wiring device: A device using flexible wire or cable, clamps, screws, or other means for electrical connection.

NOTE For the purposes of this standard “point-to-point-wiring device” incorporates terminal codes D, Q and Y (see Table 5). The mounting surface may or may not be an electrical connection.

surface-mount device (SMD): A device intended for mounting on a single surface of the interconnect land structure.

NOTE For the purposes of this standard “surface-mount device” incorporates terminal codes B, C, F, G, J, L, M, N, R, S, U and W where the Lead Mount is SMT (see Table 5).

through-hole (or insert-mount) device: A device intended for mounting on a land structure by inserting one or more of its terminals through holes in the structure.

NOTE For the purposes of this standard, “through-hole device” incorporates terminal codes P, T, and W where the Lead Mount is TH (see Table 5).

B.2 Intermediate classification

For purposes of intermediate classification, intermediate classification (or package-outline style) is represented by a two-letter package-outline-style code (see Table 1) and the terminal-position prefix or terminal suffix code. For example, “BGA” (bottom or ball-grid array) is a surface-mount device while “PGA” (perpendicular or pin-grid array) is a through-hole mount device.

B.3 Minor classification

Minor classification (or derivative package style) is defined as the further differentiation of the intermediate classification (basic package designator) by the addition of other designators to indicate terminal position (Table 2), package-body material (Table 3), package specific feature code(s) (Table 4), or terminal code (Table 5).

The minor classification may also be used to define the first field of the optional Package-specific features field (see 3.2.3.1).

Annex C (informative) Differences between JESD30L and its predecessors

This annex briefly describes most of the changes made to entries that appear in this standard, JESD30L, compared to recent prior revisions. If the change to a concept involves any words added or deleted (excluding deletion of accidentally repeated words), it is included. Some punctuation changes are not included.

Initial Issue: A	Date: N/A	JC11 Item Number: N/A

Change Record History

Issue: D	Date: June 2006	Item Number: 11.2-689S
Description of changes		
Major document revision		
Revised definition texts for clarity in section 2		
Deleted deprecated or obsolete definitions in section 2		
Added definitions for chip-scale, die-size, and wafer-level packages in section 2		
Added note referencing JEITA and IEC documents at Figure 1; removed “mandatory” and “optional” headings; noted the mandatory codes; adjusted paragraph references		
Combined sections 3.2 and 3.3 into new section 3.2 with title “Field descriptions”; reordered and renumbered subsections and tables		
Deleted deprecated basic package designators in Table 1; added codes DSB and WLB; revised descriptive text		
Deleted unused package-body material prefix codes in T able 2		
Reordered package-specific feature codes in table 3; added feature code C; added feature sub-codes for B, and X (new profile codes); added sub-codes for F (new terminal pitches); added explanation of recommended ordering in designator and of use of sub-codes to text in 3.2.3		
Added Table 6 with new suffix code for ball diameter and added explanatory text to 3.2.5		
Added Table A.1 replacing old text listing; deleted deprecated codes		
Updated Tables B.1, C.1, and D.1; added SON and QFN examples to Table C.1; deleted some obsolete shapes from Figure C.1		
Deleted chip-sized package paragraphs from Annex D and references in Table D.1		
Revised and corrected text throughout document		
Revised Table of Contents		

Issue: E	Date: August 2008	Item Number: 11.2-764S
Description of changes		
Page 6 - Change table from “Seated Height Profile” to “Maximum Seated Height Profile” to match up with SPP-017.		
Page 8, Table 6 – Changed the alphanumeric code for “b” to 3 digits and added the nominal ball diameter 0.20mm to align with Design Guide 4.5		
Figure C.1 - Rearrange and clean up the package pictures		
Table 1 - Add SKT designator to this table for sockets		
Para. 3.2.5 – Changed from “..an additional two-character…” to “…an additional three-character…”		

Annex C (informative) Differences between JESD30L and its predecessors (cont'd)

Issue: F	Date: April 2013	Item Number: 11.2-864S
Description of changes		
Page 8, Changed text in 3.2.5 from "FR-PBGA-127b04" to "FR-PBGA-127b45"		
Page 9, Table 6 – Revised the BGA ball diameter code scheme to reflect the ball size rather than a code with values from b01 to b10. The obsolete codes are also listed.		
Page 9, Table 6 – Added the alphanumeric code for "b55" to add the nominal ball diameter 0.55mm		
Page 16, 17; Table C.1 –Added "JEITA and [IEC] Designator/Common Name" column and the appropriate values. Added POP-FBGA package type.		

Issue: G	Date: August 2015	Item Number: 11.2-914S
Description of changes		
Foreword: Added additional purpose of this document		
Page 1 – 4: Added some new terms and definitions		
Page 5: Replaces previous naming convention with a new naming convention		
Page 6: Replace with new package outline section		
Page 7-8 Added new detail to calculate the Lead position for Parts with multiple lead positions.		
Page 9: Added new codes to the Material table, simplified the Package-specific features.		
Page 10: Added new detail to calculate the Lead form for Parts with multiple lead form.		
Page 11: Added new codes for Lead form		
Page 12: Modified method for counting the terminal count assigned in the package name. Inserted a new Pitch code table.		
Page 13: Added new section Part Access Direction		
Page 14: Added new section for Mounting Direction		
Page 15: Added new section for Body Direction		
Page 17 - 23: Added new tables for to define additional detail to the Lead Position		
Page 24 – 32: Added new tables for to define additional detail to the Lead Form		

Issue: H	Date: January 2016	Item Number: 11.2-931
Description of changes		
All Pages: All references to the word "Lead" are changed to "Terminal".		
Page 6: Moved Package Outline definitions into Table 1 and aligned with IPC.		
Page 10: Updated definitions in Table 2 to align with IPC wording		
Page 11: Updated definitions in Table 5 to align with IPC wording. Added sub category I for Post (Stud) Terminal.		
Page 15: Added clarification for Package Pitch in section 3.2.6		
Page 20 – 23: Added Illustrations of Package outline Style images in Table A.1		
Page 24: Added Extended Package Outlines Style Codes, Images and Descriptions in Table A.1.1		
Page 25 - 30: Added in Table A.2, the Ext Code for the extended Terminal Position. Also added in extra level of definition for most Terminal positions.		
Page 31 - 32: Added new section on "Relationship concepts between the Terminal Contact Area and the Package Body Outline" in section A.2.1		
Page 33 - 53: Added new images to graphically show definition of all Terminal positions.		
Page 54 - 56: Added in Table A.3, the Ext Code for the extended Terminal Shape. Also added in new category for Post (Stud) and New sub categories for several Terminal shapes..		
Page 57 - 69: Aligned the Extended Terminal definition with IPC, updated images		

Annex C (informative) Differences between JESD30L and its predecessors (cont'd)

Issue: I	Date: August 2017	Item Number: 11.2-962
Description of changes		
All Pages: All references to the word "Terminal Shape" are changed to "Terminal" or "Terminal code".		
Page 14: Added detail regards the exclusion of terminals from Terminal Numbering.		
Page 14: Updated definitions of package pitch, regarding pitch character of "X" and nominal values for pitch definition		
Page 14: Updated dimension definitions in section 3.2.7 to specify Maximum Material Conditions, and to provide finer precision of dimensional values.		
Page 15 - 18: Added replacement section for Span, Spacing for certain Terminal types to include Terminal Shape and sizes in section 3.2.8,		
Page 19 – 20: Added Enhanced "Terminal Thickness" section to include "Terminal Vertical Dimensions" in . Section 3.2.9		
Page 24: Added UOM of Microns to the Part Entry UOM in Section 4.2		
Page 67: Added an Extended Terminal Type of "Flat/With-opening".		
Page 68: Renamed the Extended terminal names for Column type terminal, and removed Pillar		

Annex C (informative) Differences between JESD30L and its predecessors (cont'd)

Issue: J	Date: July 2022	Item Number: 11-2-1002
Description of changes		
Re-located various sections to follow the same sequence as the Descriptive Designation in Figure 1		
Updated document title to include Footprints into the naming convention		
Updated Foreword to represent the now released companion document JEP30-P100 and JEP30-P101		
Page 1: Updated definition for terms "package terminal" and "package terminal position"		
Page 2-3: Added a new set of terms and definitions to support the addition of Footprints to the standard naming convention.		
Page 4: Updated "General" section to reflect the addition of the recommended land patterns.		
Page 5: Updated Figure 1 to reflect the insertion of the package and terminal shapes and sizes		
Table 2, Page 6: Added Material Code "X" to denote "Other" or mixed material type.		
Page 7: Add reference to the table containing the "Table 3 - Prefixes for terminal position". Add condition for the exclusion of the terminal position code from descriptive designator when no terminals exist.		
Table 3, P.8: Added new terminal position to reflect the internal connections of a cable-to-cable connector.		
Page 9: Add reference to in the Package Outline style code section a reference to the Terminal-position prefix and to the Terminal suffix		
Page 12: Add condition for the exclusion of the terminal position code from descriptive designator when no terminals exist. Added same condition to section 3.26 Terminal Count and section 3.2.7 Package Pitch on page 15.		
Table 5, Page 14: Update the definition for Quick-connect terminal		
Page 15: Package Pitch: Updated the inline pitch to include both the X and Y values for grid array patterns		
Table 6, Page 16: Updated construction for Rounded Rectangle, added checksum for contour shapes, and removed min and max criteria for dimension 1 and 2.		
Section 3.2.9, Page 17: Added additional criteria for the inclusion of Span, Spacing, Shape and Size		
Section 3.2.9.2, Page 17: Rewrite this section and re-located before Table 7.		
Table 7, Page 18: Updated Spacing for Gull-wing to be optional. Changed Span and Spacing to span pitch for J-bend and L-bend		
Table 8, Page 20: Updated construction for Rounded Rectangle, added checksum for contour shapes, and removed min and max criteria for dimension 1 and 2.		
Section 3.2.11, Page 23: Body Direction: Updated references to Figure 2 and Figure 3		
Section 3.2.12, Page 24: Mounting preparation: Updated references to Figure 4 and Figure 5. Updated code for Straight Mounted		
Page 26: Updated the dimension values in the naming convention to replace the decimal with the lowercase "p" so that the name can reflect the required dimensional accuracy. Also added capability to optionally include ranges for each dimension		
Page 26-33 Section 5: Added new section for Recommended Land Patterns.		
Page 34-41 Section 6: Added new section for footprint layers		
Annex A: Re-locate section "Terminal Position with additional definition" before "Illustrations of package Outlines Styles" to follow the same sequence as the Descriptive Designation in Figure 1		
Table A.1, Page 42: Insert option for Bottom Position without extended codes.		
Table A.1, Page 44: Updated incorrect extended codes for Diagonal Left-top to Right-bottom		
Table A.1, Page 46: Updated incorrect extended codes for Single Right from T to R		
Table A.1, Page 48-50: Insert option for Triple Position without extended codes. Insert option also for Triple position with Level 1 extended codes without level 2 codes.		
Table A.2 Page 73: Removed note 1 from Flange Mount Package outline		
Table A.2, Page 75: Added note 1 to connector package.		
Table A.2, Page 76: Update table reference in Note 1.		
Table A.2.1, Page 77: Added extended code to cater for Cable-to-Cable Connector		
Table A.3 Page 80: Updated Extended terminal Code for Ribbon Wrap from S to R, and for Microspring from A to M		
Table A.3, Page 81: Insert option for Wraparound and S-bend terminal types without extended codes.		
Table A3 Page 80-81: Added notes 7 & 8 to several terminal types		

Annex C (informative) Differences between JESD30L and its predecessors (cont'd)

Issue: K	Date: August 2023	Item Number: 11.2-1031S
Description of changes		
3.2.3 Terminal-position prefix and Annex A Table A1: Add same structure that is available to Bottom Terminal Position to Upper Terminal position. Updated A.1.2.2 to add the Upper position structure to the Bottom position structure. Update text for "Mixed Position"		
3.2.4 Package-outline-style codes: Update Grid-Array description		
3.2.9.2 Terminal Shape and Size Table 7: Changed Extended terminal type for Gull-wing from Shoulder to Modified. Updated references throughout document.		

Issue: L	Date: November 2023	Item Number: 11.2-1039S
Description of changes		
Table 5 Section 3.2.5: Added new terminal called Compressed Mount Technology		
Section 3.2.8 Supplemental-information Field: Updated section to remove duplication information that is already contained in section 4.2		
Table 7 Section 3.2.9.2: Updated the CMT terminal contribution to the package naming convention		
Table 9 section 3.2.10: Updated table with CMT terminal vertical dimension requirements		
Table A.1 in Annex A: Updated extended position for Dual / Bottom-to-Upper		
Annex A.1.2.3 Dual Position – Added new position for Dual / Bottom-to-Upper		
Table A.3.1: Updated Illustrations of terminal code		
Corrected numbering of sequential subheadings in Annex A, starting with A.1.1 changed to A.1.		

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Standard Improvement Form **JEDEC** **JESD30L**

The purpose of this form is to provide the Technical Committees of JEDEC with input from the industry regarding usage of the subject standard. Individuals or companies are invited to submit comments to JEDEC. All comments will be collected and dispersed to the appropriate committee(s).

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1. I recommend changes to the following:

☐ Requirement, clause number _____

☐ Test method number _____ Clause number _____

The referenced clause number has proven to be:

☐ Unclear ☐ Too Rigid ☐ In Error

☐ Other _____

2. Recommendations for correction:

_____

_____

_____

_____

3. Other suggestions for document improvement:

_____

_____

_____

_____

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