Draft

ECAD/MCAD-Collaboration

Work Package: 3D Master Part Concept

Version 2009-05-07

Establishing Leadership in IT-Based Engineering

Content

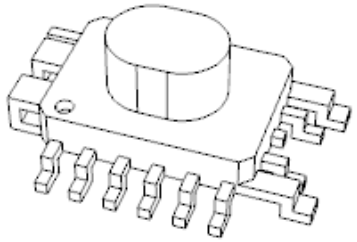
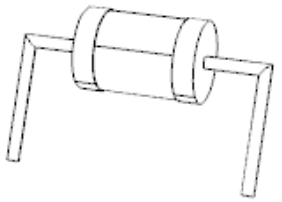
- Aim of 3D Master Part Concept
- Main characteristics Type A and B
- Description of 3D Master models Type A and B
  - Parameter Overview
  - 3D Dimensioning Concept
  - Additional Definitions (only for Type A)
  - Implementation Constraints
- General Implementation Issues

Aim of 3D Master Part Concept

- Defining parametric 3D master models
- Master models should be used as simplified placeholder
- Specification of 3D Master Parts in standard format
  à 3D-PDF, readable in free available reader, e.g. Adobe Reader
- Users/Vendors could implement the master model concept in any CAD-System
- Instantiation by XML-File, which contains the parameters to feed the 3D master models
- Instantiated models may be modified/enriched by librarian information

- Out of Scope
  – Detailed, exact geometry or technology information

Main characteristics of Master Model Types

Type / Characteristic	Type A	Type B
Diagram		
Basic Body	• Block with chamfers • Additional body on top • Hole • Cut	• Cylinder
Contact (Pin)	• Any number of pins • Pin type C, L, I or Z • Additional pin rows possible	• 2 pins type L • Optional "ring" contact without standard L-Pins

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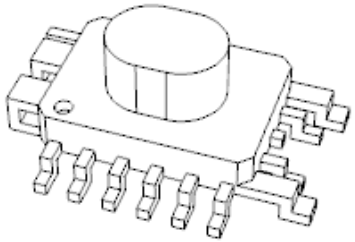
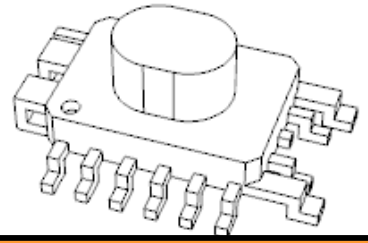
Type A



Type A
Parameters (1 of 7)



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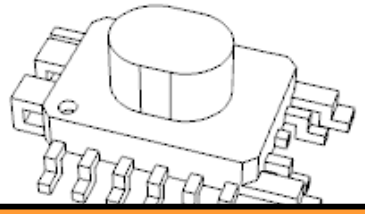
Electrical Insertion Point	X_Offset	ACS_X_Offset
Electrical Insertion Point	Y_Offset	ACS_Y_Offset
Electrical Insertion Point	Z_Offset	ACS_Z_Offset
Electrical Insertion Point	Angle	ACS_Angle
Basic Body	Width	Body_Width
Basic Body	Length	Body_Length
Basic Body	Height	Body_Height
Basic Body	Bottom_Height	Body_Bottom_Height
Basic Body	Chamfer_LB	Body_Chamfer_LB
Basic Body	Chamfer_RB	Body_ Chamfer_RB
Basic Body	Chamfer_LA	Body_ Chamfer_LA
Basic Body	Chamfer_RA	Body_ Chamfer_RA

Type A
Parameters (2 of 7)



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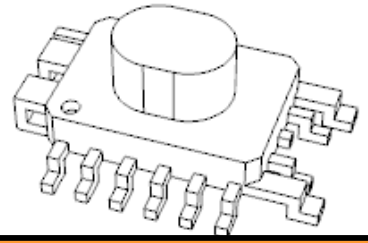
Additional Body	Add_Length	Body_Add_Length
Additional Body	Add_Width	Body_Add_Width
Additional Body	Add_Radius	Body_Add_Radius
Additional Body	Add_Bottom_Height	Body_Add_Bottom_Height
Additional Body	Add_Height	Body_Add_Height
Additional Body	Add_Offset_X	Body_Add_Offset_X_
Additional Body	Add_Offset_Y	Body_Add_Offset_Y
Basic Body	Hole_X	Body_Hole_X
Basic Body	Hole_Y	Body_Hole_Y
Basic Body	Hole_Diameter	Body_Hole_Diameter
Basic Body	Hole_Depth	Body_Hole_Depth

Type A
Parameters (3 of 7)



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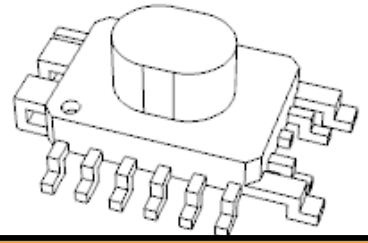
Pin	Width_R	Pin_Width_R
Pin	Width_L	Pin_Width_L
Pin	Width_B	Pin_Width_B
Pin	Width_A	Pin_Width_A
Pin	Pitch_R	Pin_Pitch_R
Pin	Pitch_L	Pin_Pitch_L
Pin	Pitch_B	Pin_Pitch_B
Pin	Pitch_A	Pin_Pitch_A
Pin	Thickness_R	Pin_Thickness_R
Pin	Thickness_L	Pin_Thickness_L
Pin	Thickness_B	Pin_Thickness_B
Pin	Thickness_A	Pin_Thickness_A
Pin	Radius	Pin_Radius

Type A
Parameters (4 of 7)



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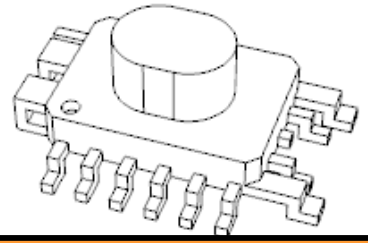
Pin	Fixation_Height_L	Pin_Fixation_Height_L
Pin	Fixation_Height_B	Pin_Fixation_Height_B
Pin	Fixation_Height_A	Pin_Fixation_Height_A
Pin	Fixation_Height_1_R	Pin_Fixation_Height_1_R
Pin	Fixation_Height_1_L	Pin_Fixation_Height_1_L
Pin	Fixation_Height_1_B	Pin_Fixation_Height_1_B
Pin	Fixation_Height_1_A	Pin_Fixation_Height_1_A
Pin	Length_R	Pin_Length_R
Pin	Length_L	Pin_Length_L
Pin	Length_B	Pin_Length_B
Pin	Length_A	Pin_Length_A

Type A
Parameters (5 of 7)



Element	Short name in 3DPDF	Full name (EDMDSchema)
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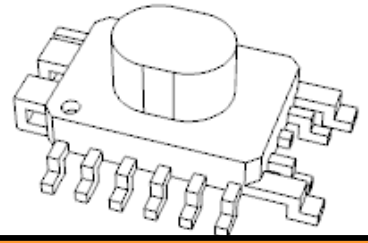
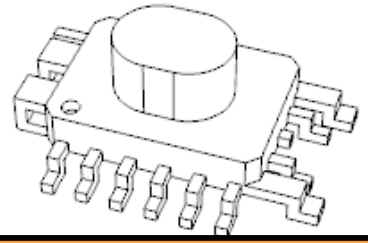
Pin	Length_1_L	Pin_Length_1_L
Pin	Length_1_B	Pin_Length_1_B
Pin	Length_1_A	Pin_Length_1_A
Pin	Index_R	Pin_Index_R
Pin	Index_L	Pin_Index_L
Pin	Index_B	Pin_Index_B
Pin	Index_A	Pin_Index_A
Pin	Increment_R	Pin_Increment_R
Pin	Increment_L	Pin_Increment_L
Pin	Increment_B	Pin_Increment_B
Pin	Increment_A	Pin_Increment_A

Type A
Parameters (6 of 7)



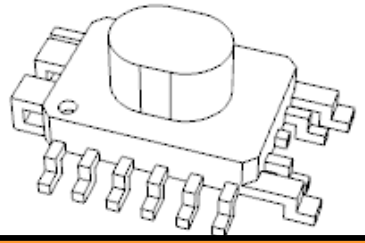
Element	Short name in 3DPDF	Full name (EDMDSchema)
Pin	Offset_R	Pin_Offset_R
Pin	Offset_L	Pin_Offset_L
Pin	Offset_B	Pin_Offset_B
Pin	Offset_A	Pin_Offset_A
Pad	Length	Pad_Length
Pad	Width	Pad_Width
Pad	Offset_R	Pad_Offset_R
Pad	Offset_L	Pad_Offset_L
Pad	Offset_A	Pad_Offset_A
Pad	Offset_B	Pad_Offset_B

Type A
Parameters (7 of 7)



Element	Short name in 3DPDF	Full name (EDMDSchema)
Opt	Cut_X1	Opt_Cut_X1
Opt	Cut_Y1	Opt_Cut_Y1
Opt	Cut_X2	Opt_Cut_X2
Opt	Cut_Y2	Opt_Cut_Y2
Opt	Cut_Z1	Opt_Cut_Z1
Opt	Cut_Z2	Opt_Cut_Z2

Type A
Non-Geometric Parameters (1/2)



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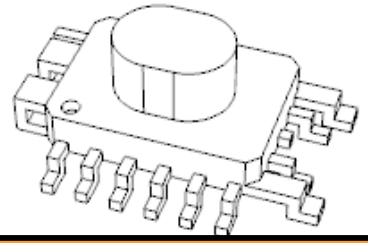
Basic Body	Color	Body_Color
Additional Body	Add_Number	Body_Add_Number
Additional Body	Color	Body_Add_Color
Pad	Name	Pad_Name
Pad	Nr_R	Pad_Nr_R
Pad	Nr_L	Pad_Nr_L
Pad	Nr_A	Pad_Nr_A
Pad	Nr_B	Pad_Nr_B
Opt	Cut_Number	Opt_Cut_Number

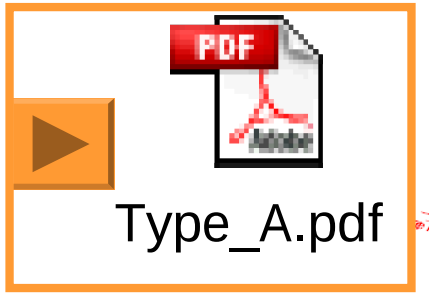
Type A
Non-Geometric Parameters (2/2)

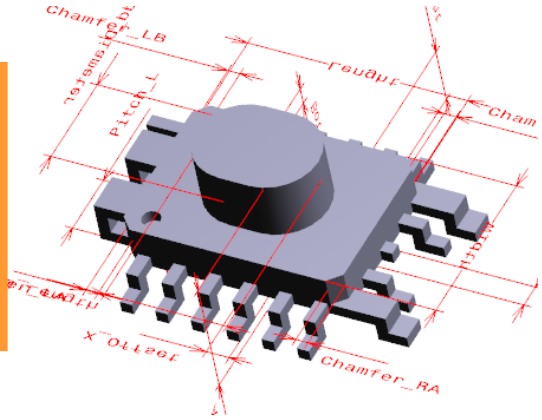


Element	Short name in 3DPDF	Full name (EDMDSchema)
Pin	Number_R	Pin_Number_R
Pin	Number_L	Pin_Number_L
Pin	Number_B	Pin_Number_B
Pin	Number_A	Pin_Number_A
Pin	Type_R	Pin_Type_R
Pin	Type_L	Pin_Type_L
Pin	Type_B	Pin_Type_B
Pin	Type_A	Pin_Type_A
Pin	Color_R	Pin_Color_R
Pin	Color_L	Pin_Color_L
Pin	Color_B	Pin_Color_B
Pin	Color_A	Pin_Color_A

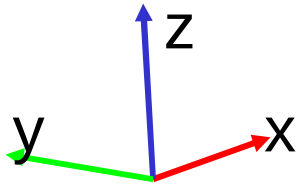
3D Dimensioning Concept

- Represented in 3D PDF

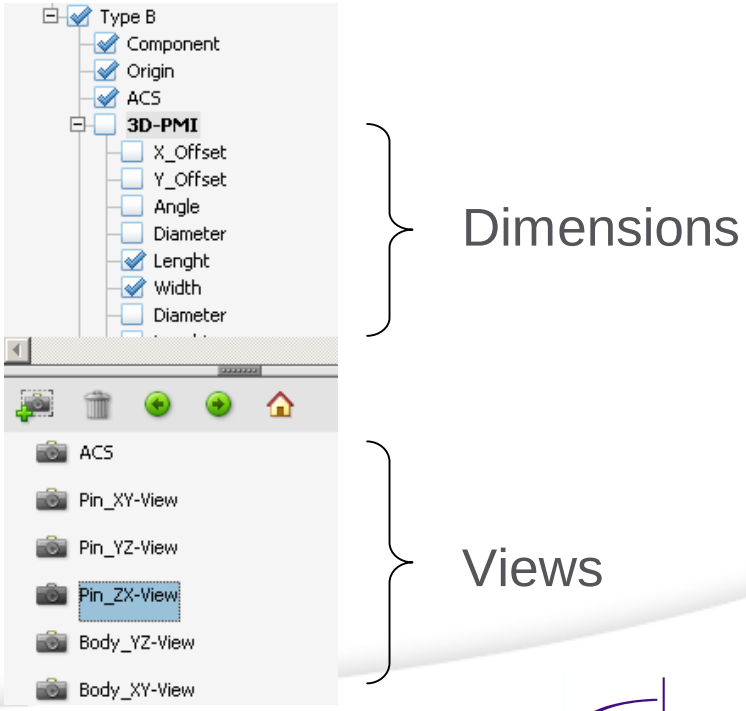




- Orientation of Coordinate System

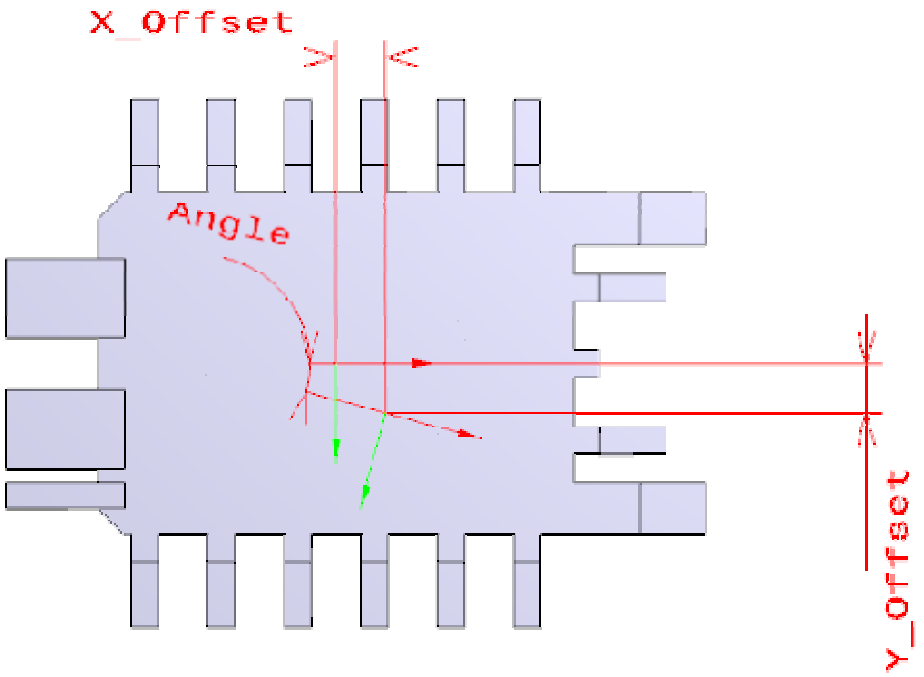


- Dimensions are on views
  - ACS_XY, ACS_ZX
  - Body_XY, Body_YZ
  - Chamfer_XY
  - Hole_XY, Hole_XZ
  - Pin_XY
  - Cut_XY, Cut_ZX

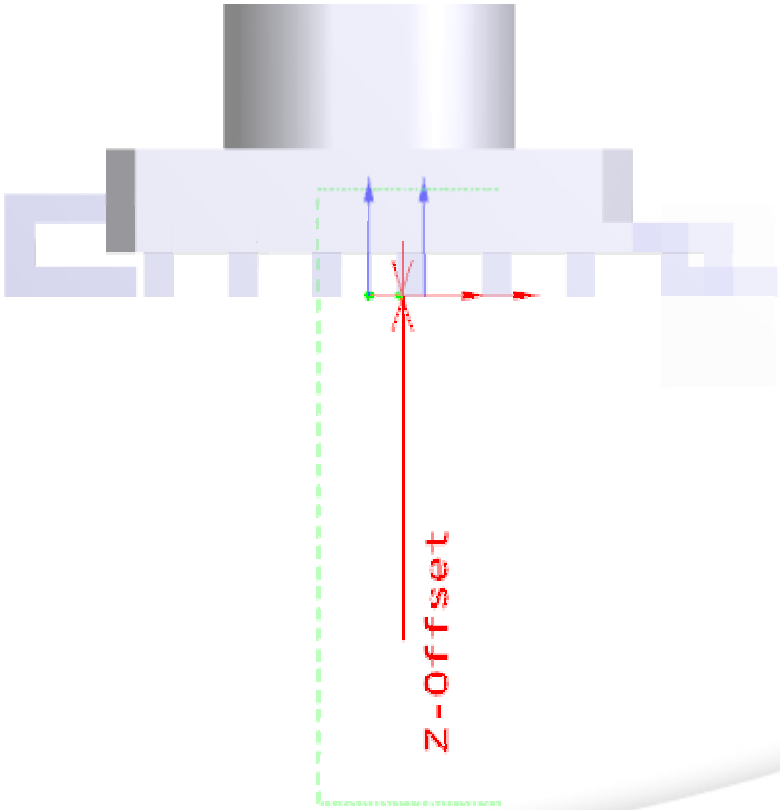


View for ACS Definition

- ACS_XY

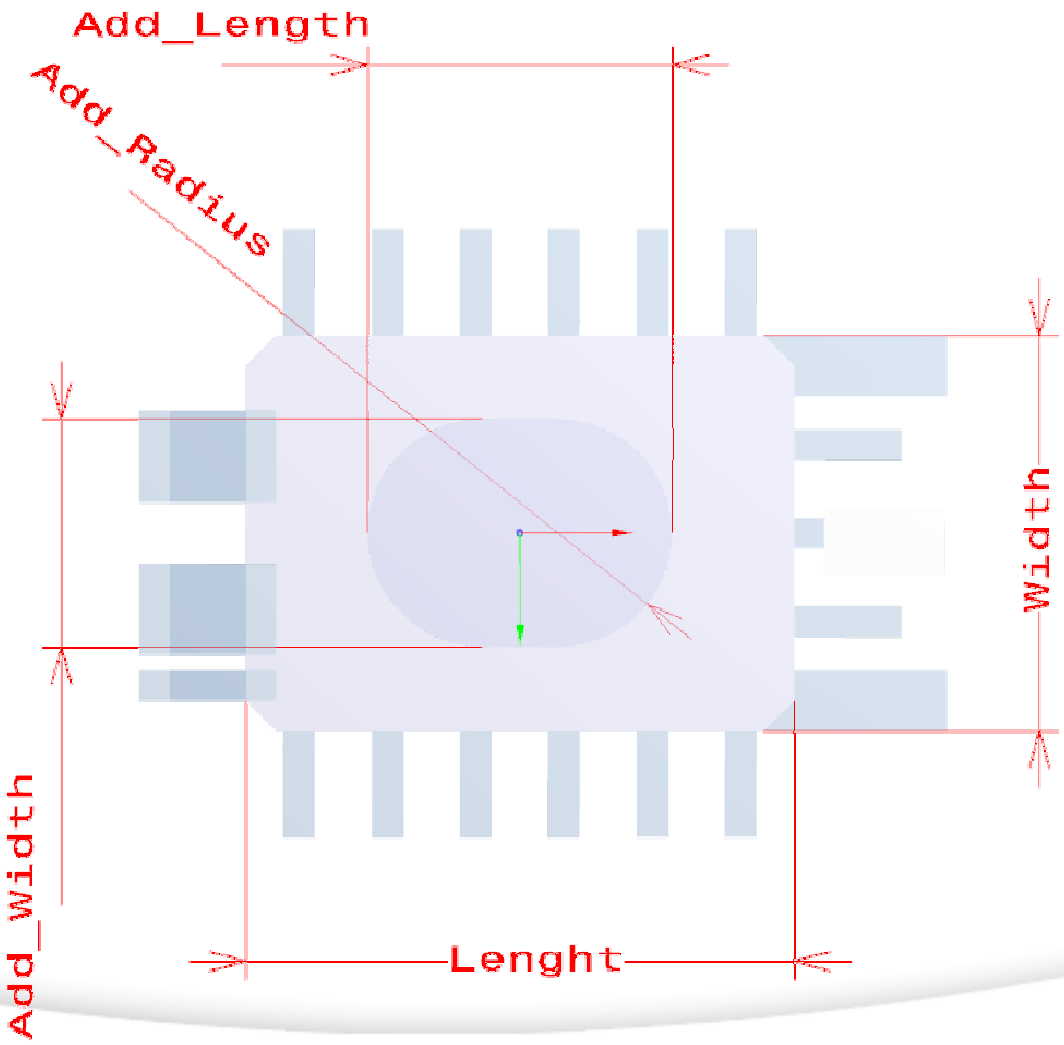


- ACS_ZX



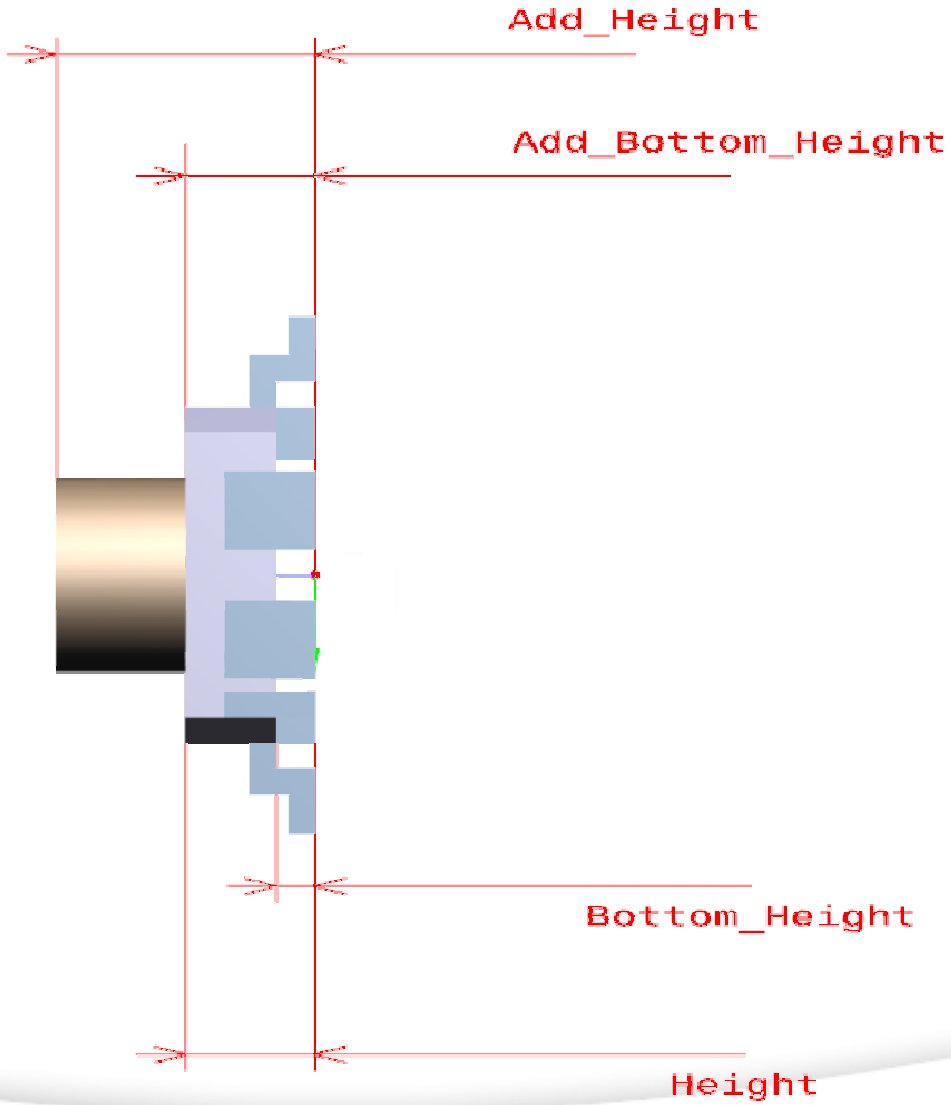
View for Basic & Additional Body Definition

- Body_XY



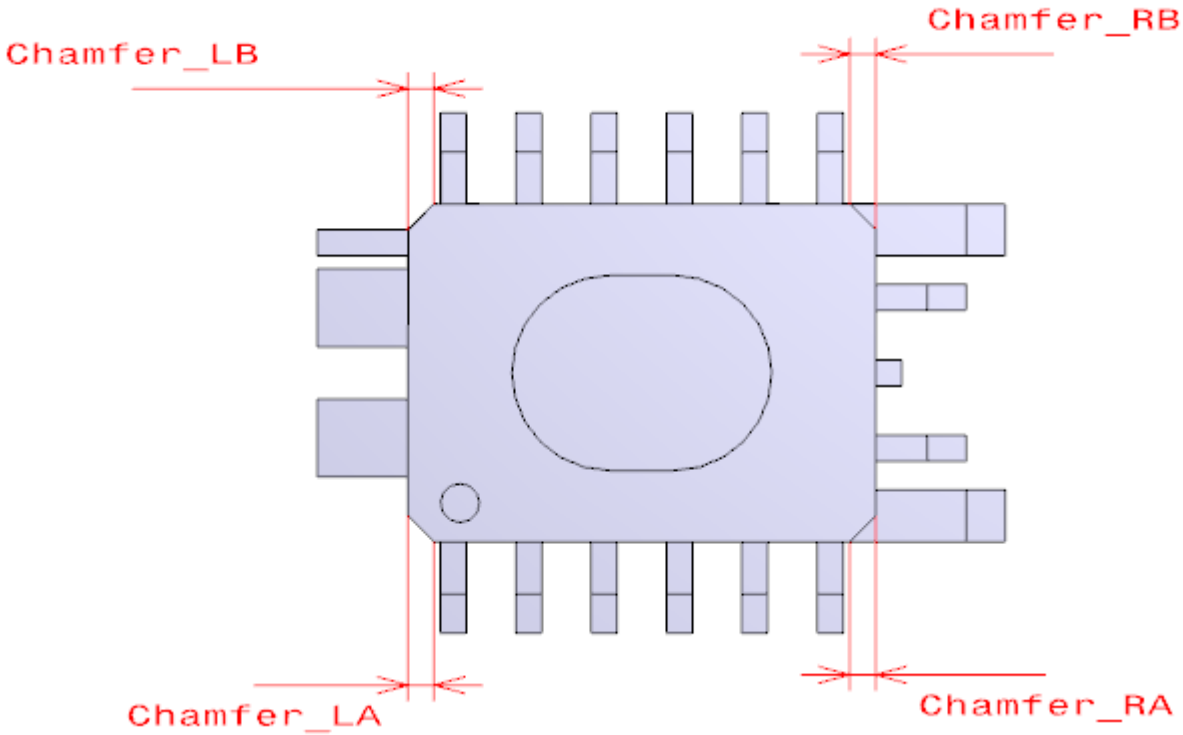
View for Basic Body Definition

- Body_YZ



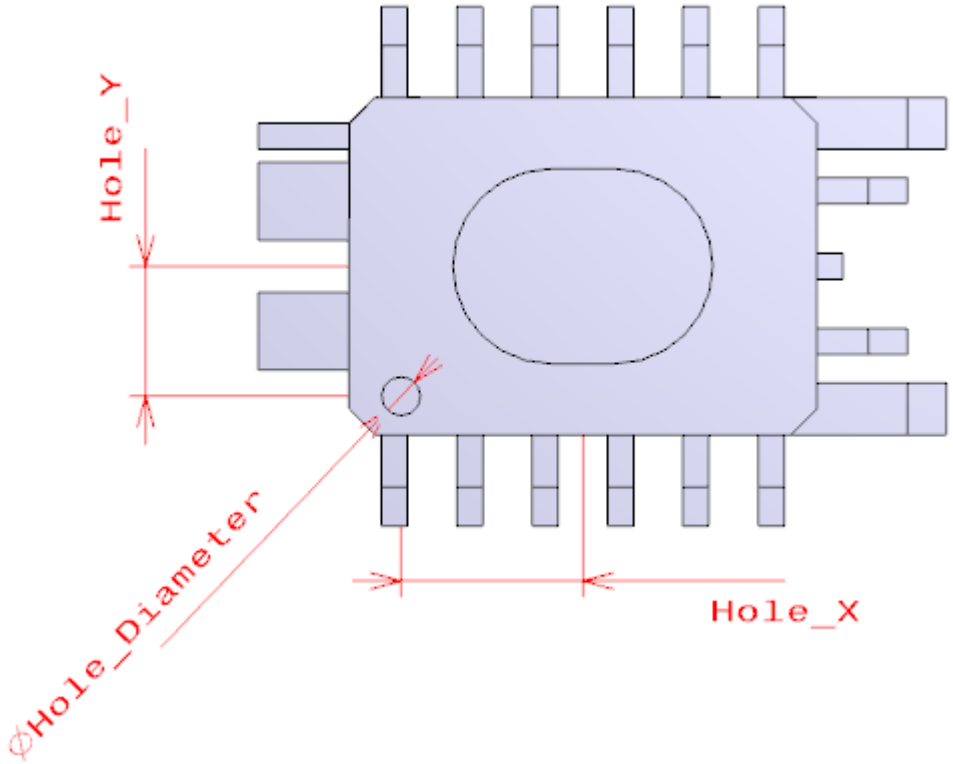
View for Chamfer Definition

- Chamfer_XY



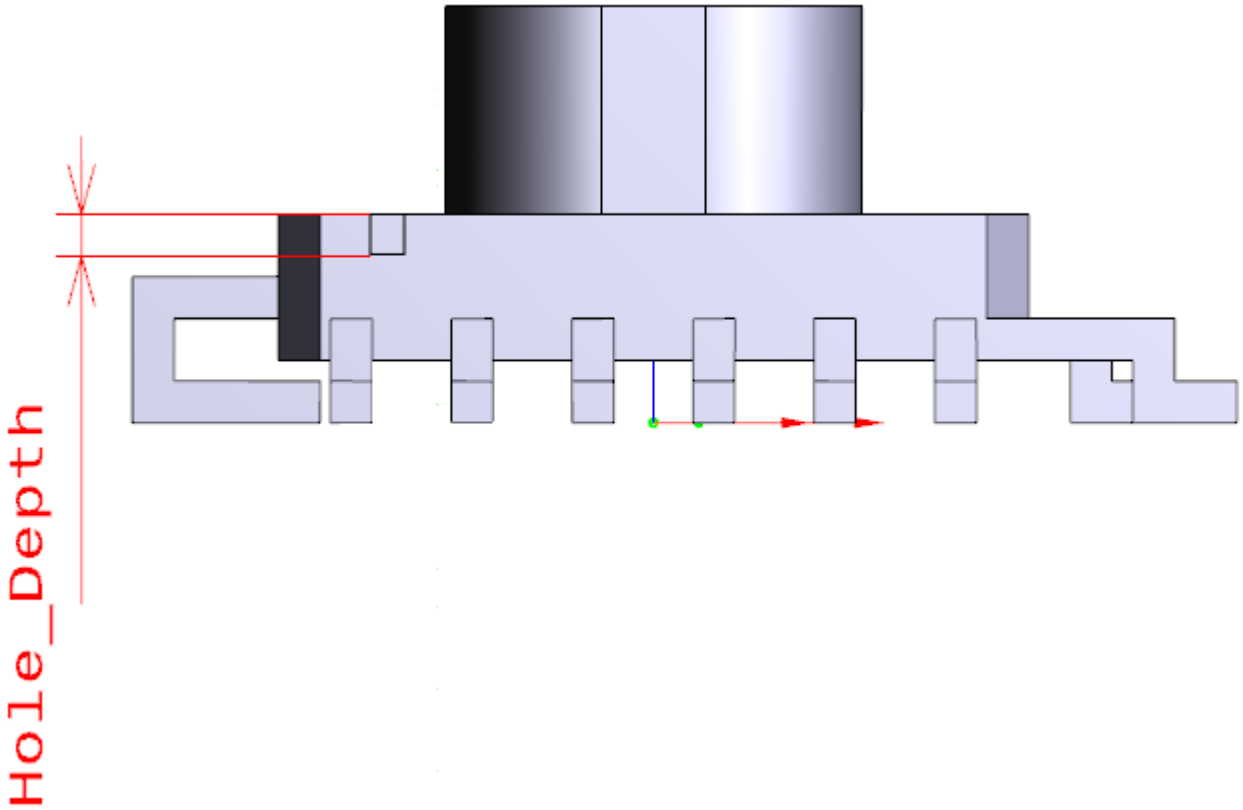
View for Hole Definition

- Hole_XY



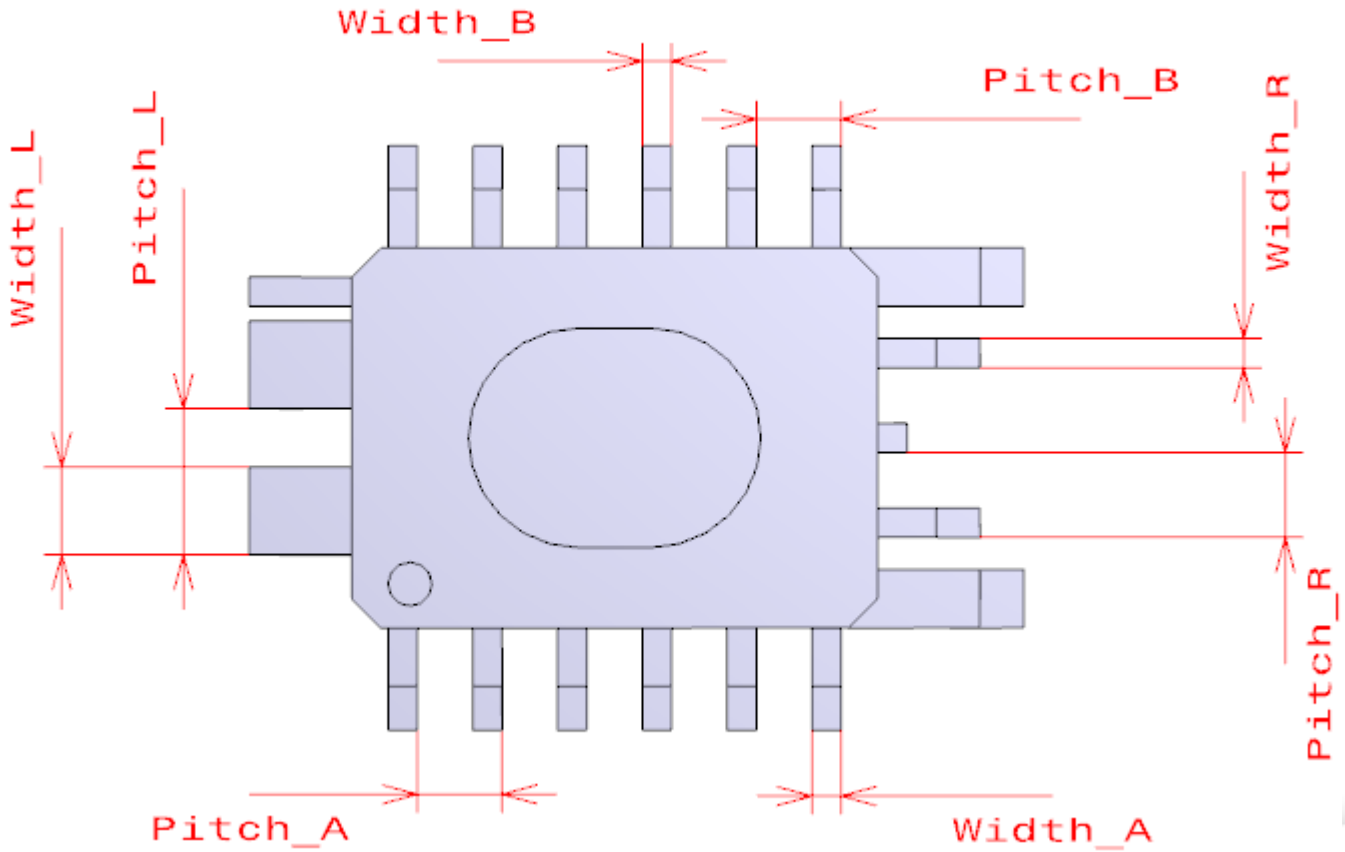
View for Hole Definition

- Hole_XZ



View for Pin Definition

- Pin_XY



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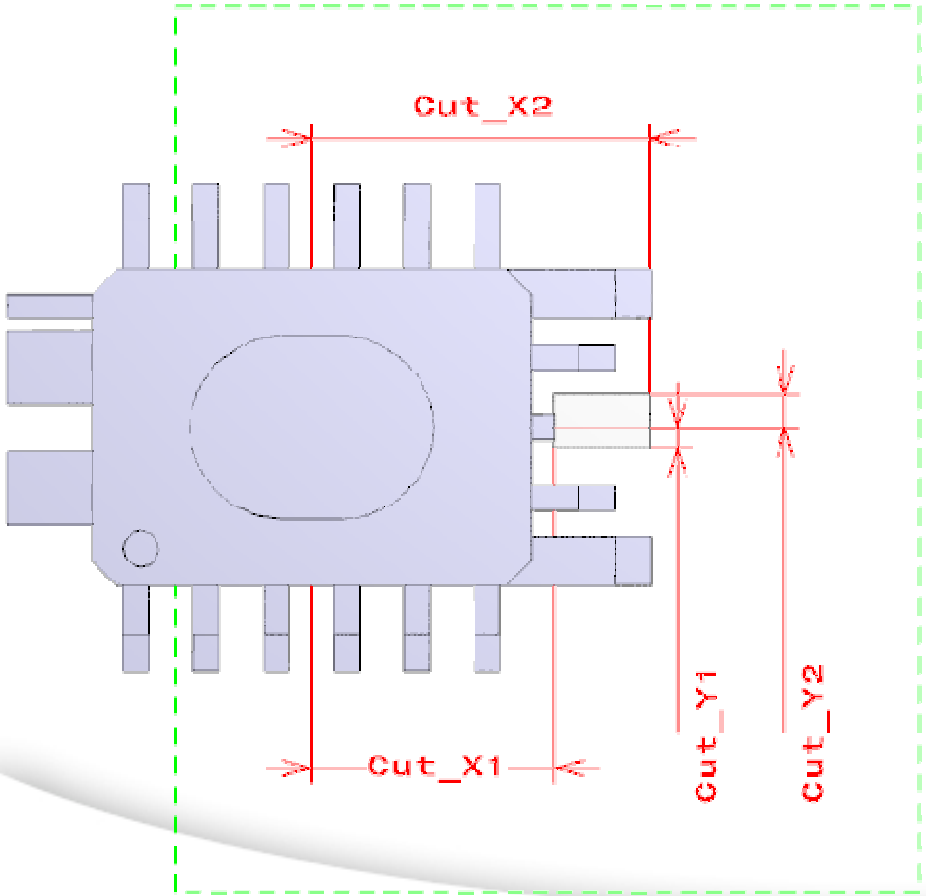
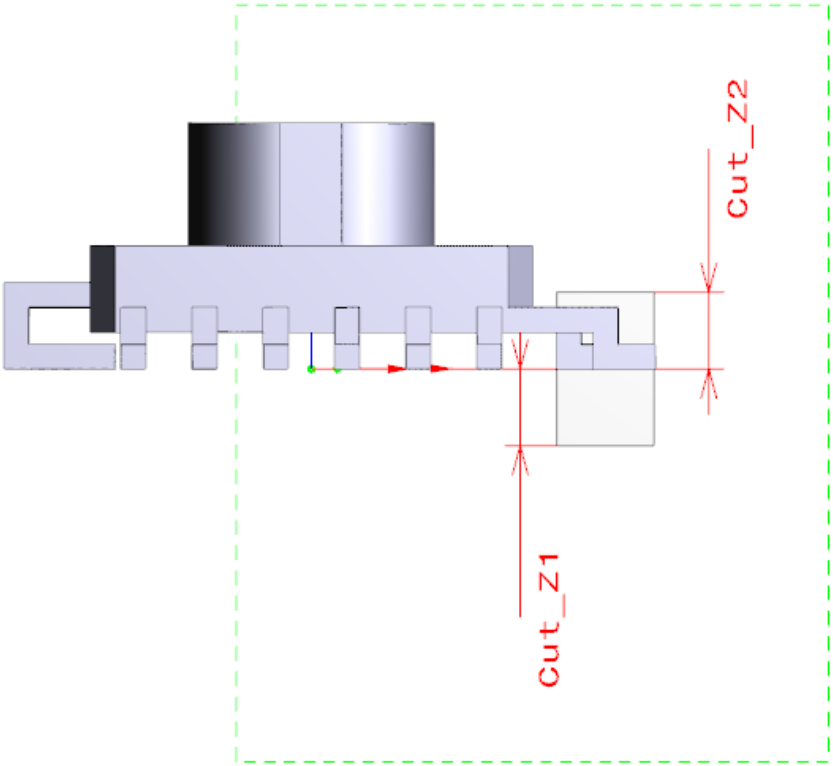
View for Cut Definition

- Cut_XY



- Cut_ZX

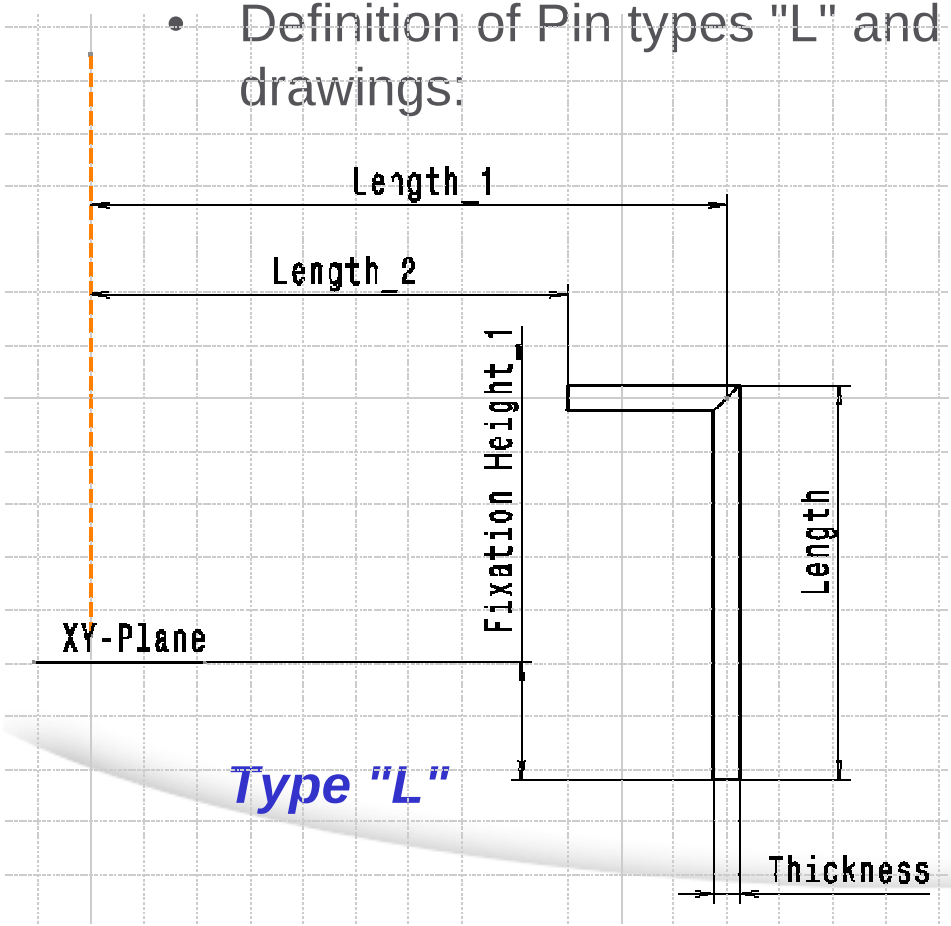


Additional Definitions

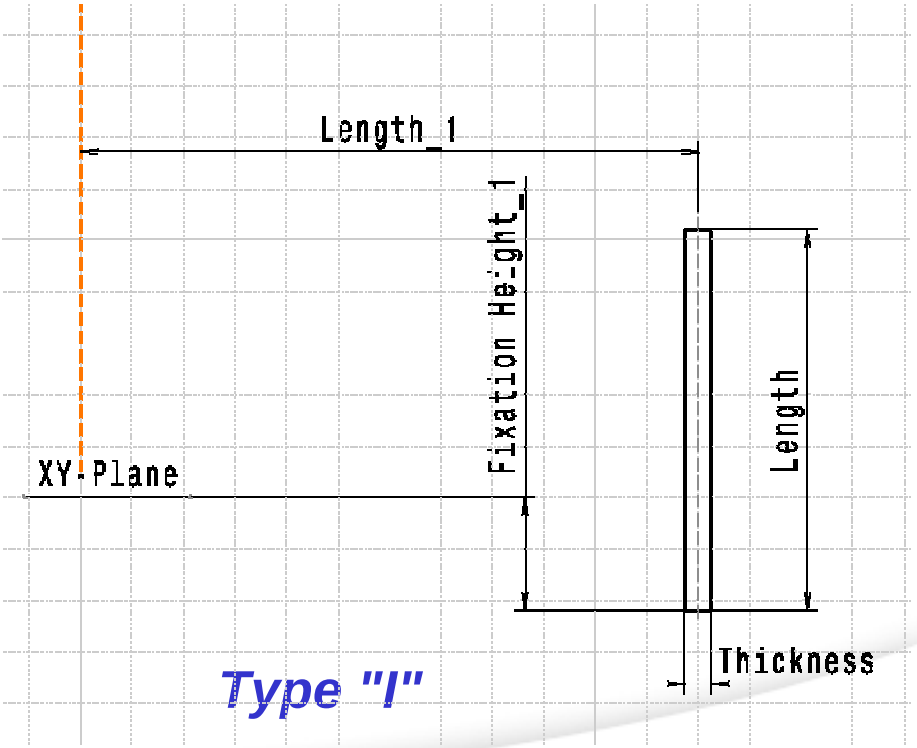
- For purposes of clarity not all definitions are described in the 3D PDF
- Following definitions are described by separate illustrations:
  - Pin Types 'L", "I", "Z" and "C"
  - Offset of Additional Body
  - Definition of numbering of Pins
  - Additional Pin rows
  - Offset for pin rows
  - Definition of Solder Pads

Pin Types L and I

- Position of Pins is represented in the 3D PDF Master Model description (cp. previous slides)
- Definition of Pin types "L" and "I" is described by the following drawings:



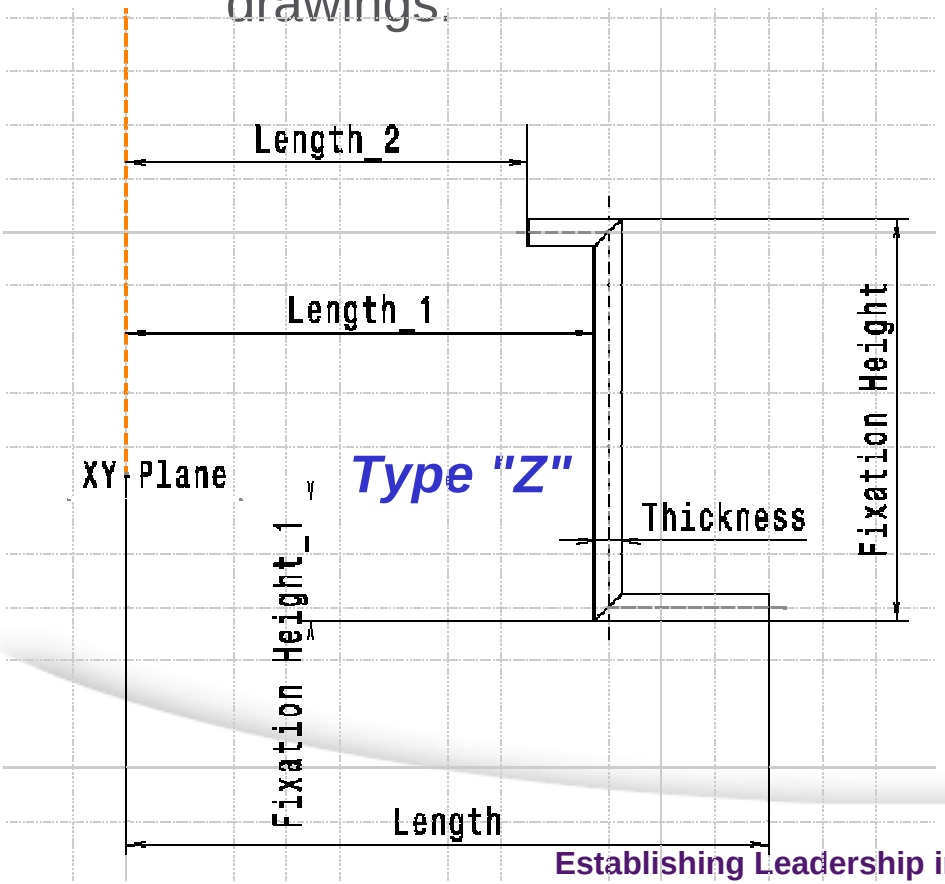
Type "L"

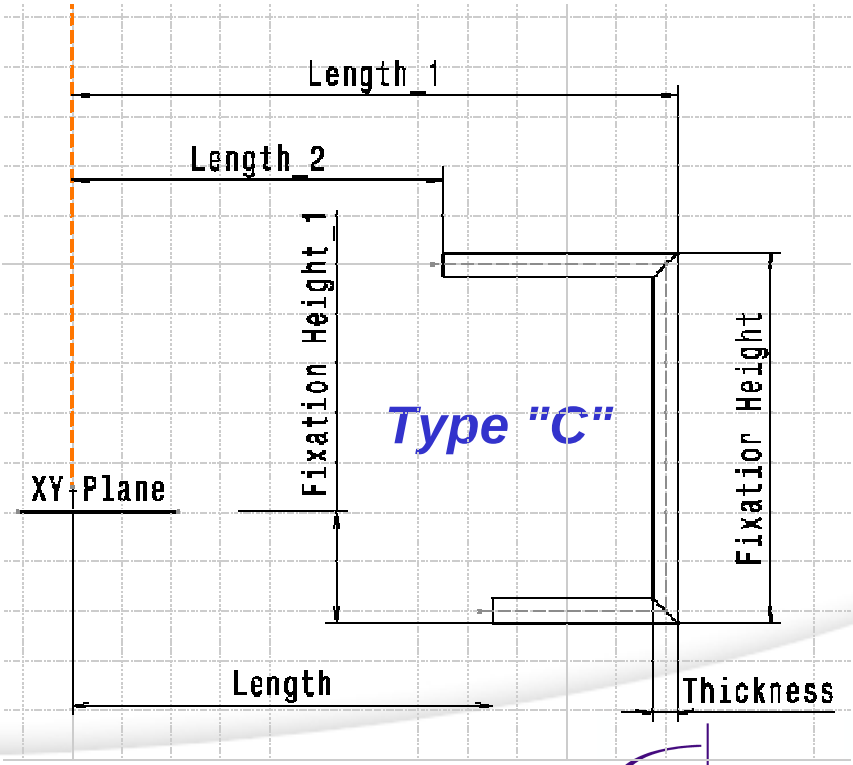


Type "I"

Pin Types Z and C

- Position of Pins is represented in the 3D PDF Master Model description (cp. previous slides)
- Definition of Pin types "Z" and "C" is described by the following drawings:





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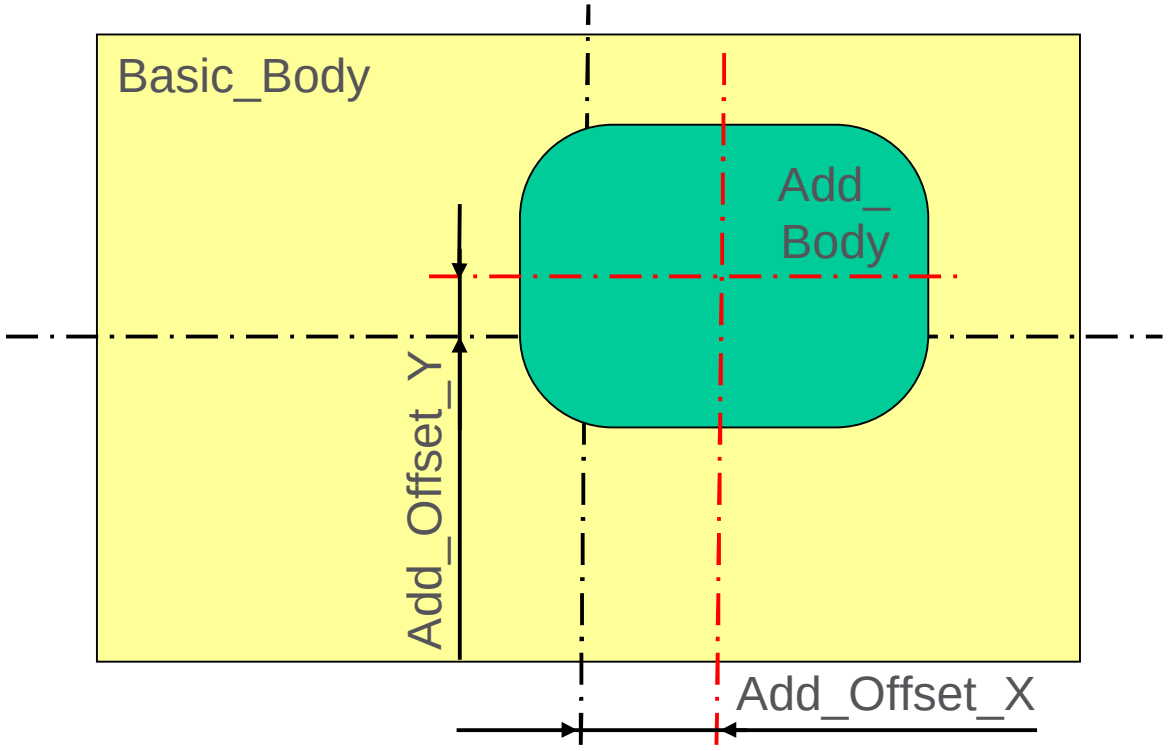
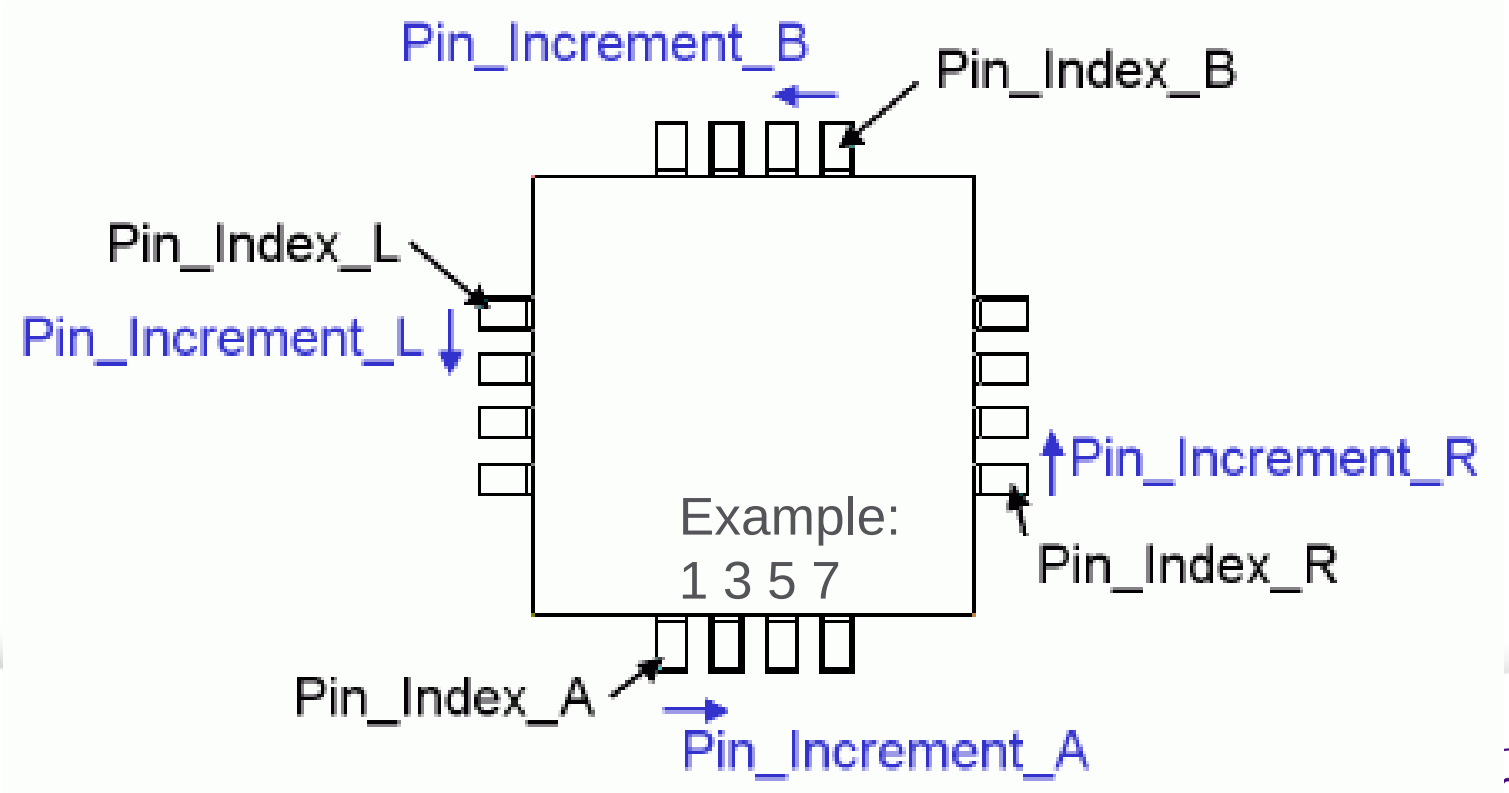
Offset of Additional Body



Definition of numbering of Pins

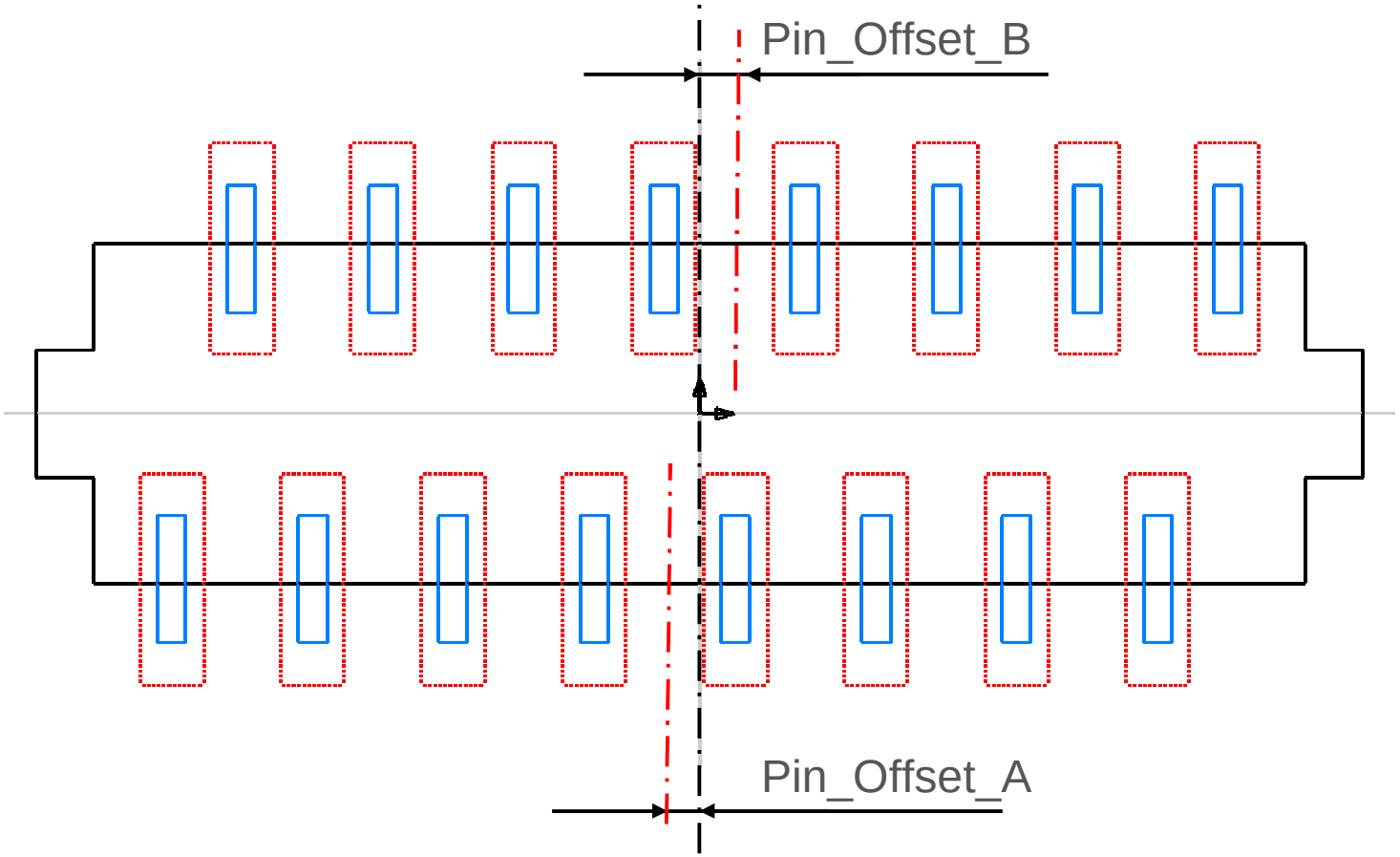
- Each Pin row has an index for numbering, and a counting increment
- Example: Pin_Index_A = 1 and Pin_Increment_A = 2, then the pins in row A have the numbers 1, 3, 5, and 7



Additional Pin rows

- 0 to n pin rows possible for each side, definition by
  - Type
  - Pitch
  - Offset
  - Width
  - Number

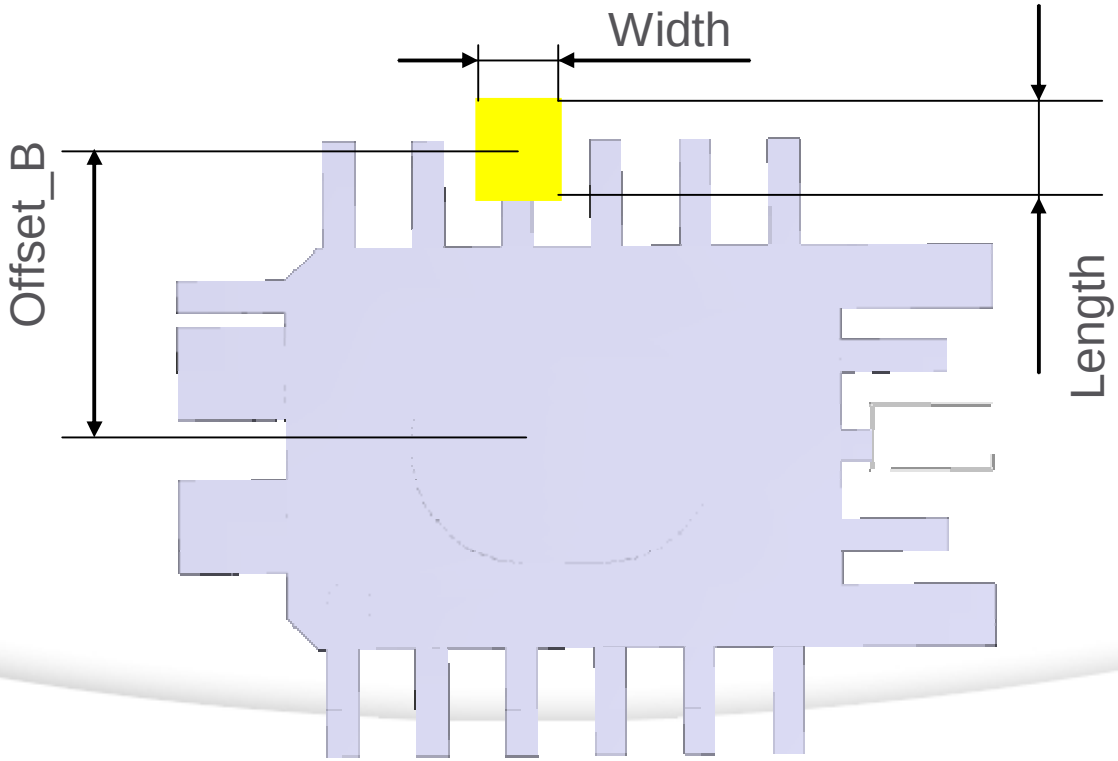
Offset for pin rows



- Positive values for offset in positive x-/y-axis; negative values for offsets in negative x-/y-axis (e.g. Pin_Offset_A in above figure)
- Equivalent definition for Pin_Offset_L and Pin_Offset_R

Solder Pad Definition

- Multiple Pad types allowed [0..n]
  - Defined by Length, Width, Offset and Name
  - Pad is always centered to longitudinal direction
- Each Pinrow refers to one Pad type



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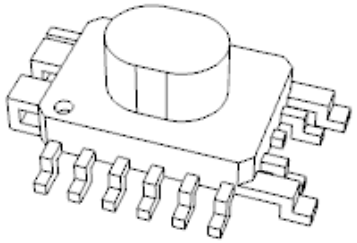
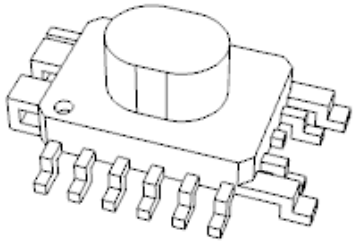
Implementation Constraints (1 of 2)

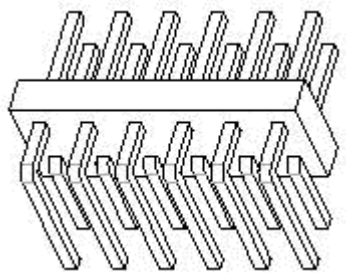


- Default Orientation
  - The longer side of the basic body extends along the x-axis
- Body
  - Origin in the middle of the Body
- Hole
  - If Diameter = 0 or "" then no Hole
- Optional Chamfers of Basic Body
  - 45° Chamfers
  - If value = "0" or "" then no Chamfer
- Optional Additional Body
  - All 4 radiuses are identical
  - Multiple Additional Bodies allowed [0..n]
- Cut (Optional through Body or Contacts)
  - Multiple Cuts allowed [0..n]

Implementation Constraints (2 of 2)



- Pin
  - "Pin 1" is the pin along the positive x- and y-axis (first max. x-direction, then max. y-direction)
  - Pin definition for each side is independent (different Pins on sides right, left, ahead and behind possible)
  - Positioning of pins: evenly distributed on each row [number of Pins and pitch]
  - Definition of 'Pin_Length' and 'Pin_Length_1' depends on the 'Section Type'
  - Identical Pin_Radius for each edge of the pin
    - If both the Pin_Width and the Pin_Thickness are twice the Pin_Radius, the pins are round.
  - Pin_Length_2 could be negative, then the Pins will go through the Basic Body (cp. picture)



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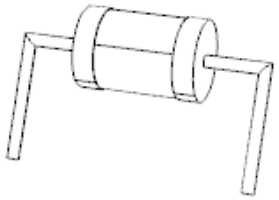
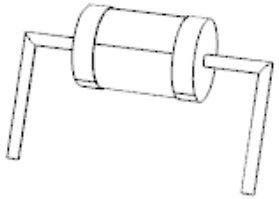
Type B



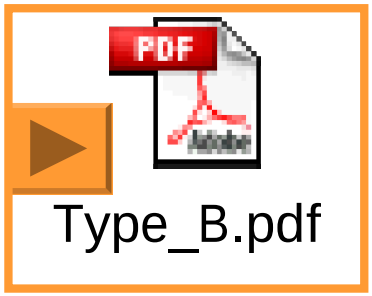
Type B
Parameters

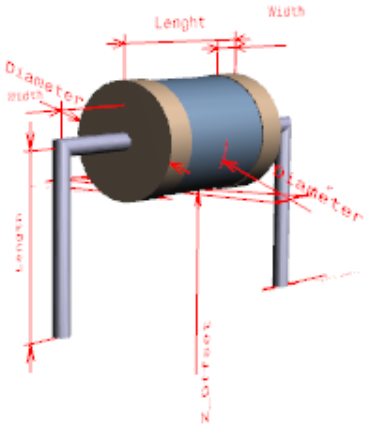


Element	Short name in 3DPDF	Full name (EDMDSchema)
Electrical Insertion Point	X_Offset	ACS_X_Offset
Electrical Insertion Point	Y_Offset	ACS_Y_Offset
Electrical Insertion Point	Z_Offset	ACS_Z_Offset
Electrical Insertion Point	Angle	ACS_Angle
Basic Body	Diameter	Body_Diameter
Basic Body	Length	Body_Length
Pin	Diameter	Pin_Diameter
Pin	Length	Pin_Length
Pin	Width	Pin_Width
Pin_opt	Diameter	Pin_opt_Diameter
Pin_opt	Offset	Pin_opt_Offset
Pin_opt	Width	Pin_opt_Width

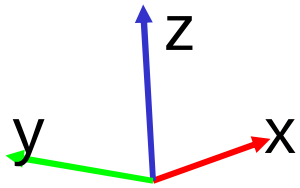
3D Dimensioning Concept

- Represented in 3D PDF

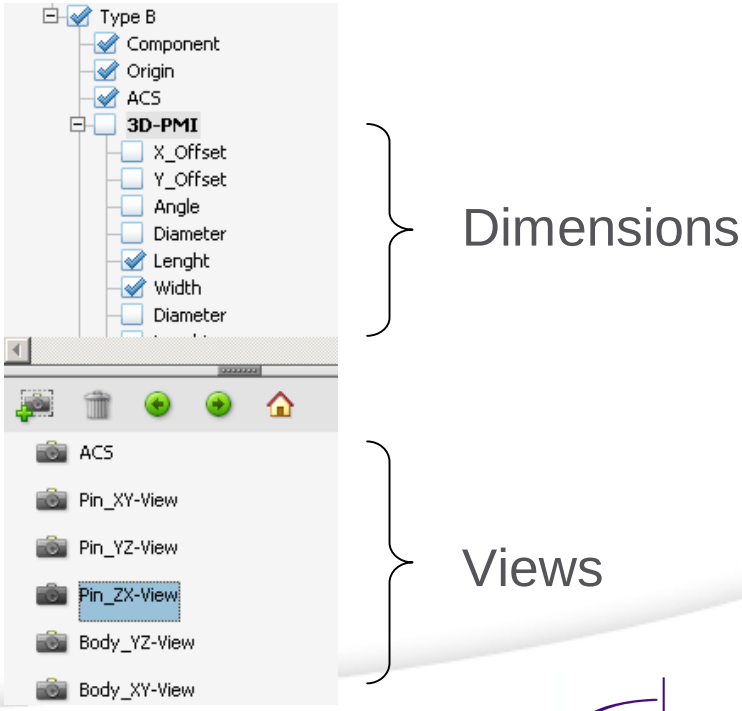




- Orientation of Coordinate System

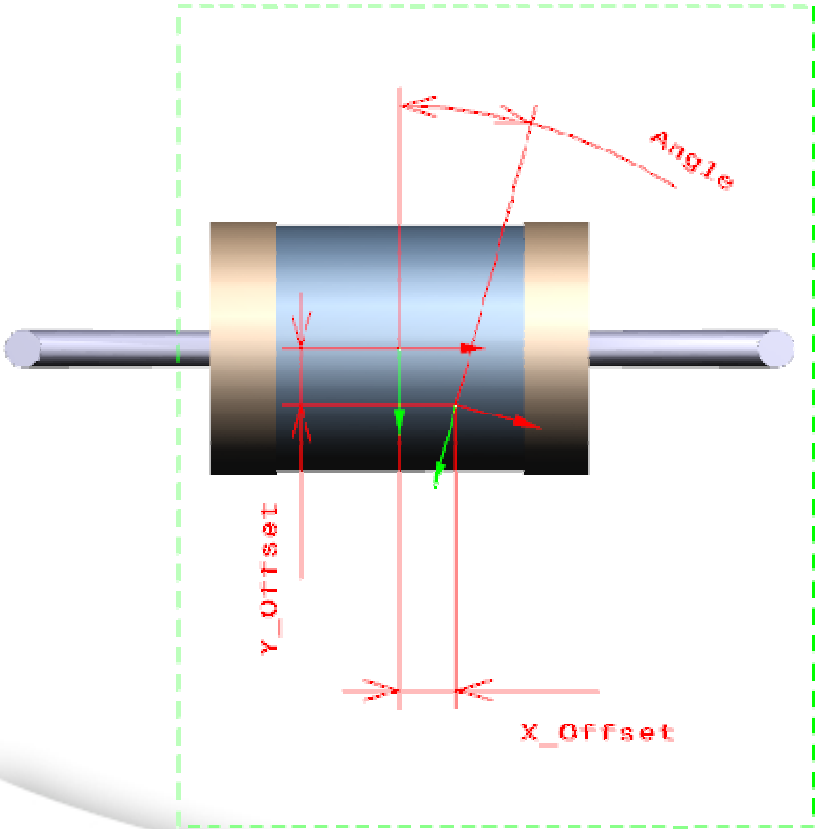


- Dimensions are on views
  - ACS_XY, ACS_ZX
  - Body_XY, Body_YZ, Body_ZX
  - Pin_XY, Pin_YZ, Pin_ZX

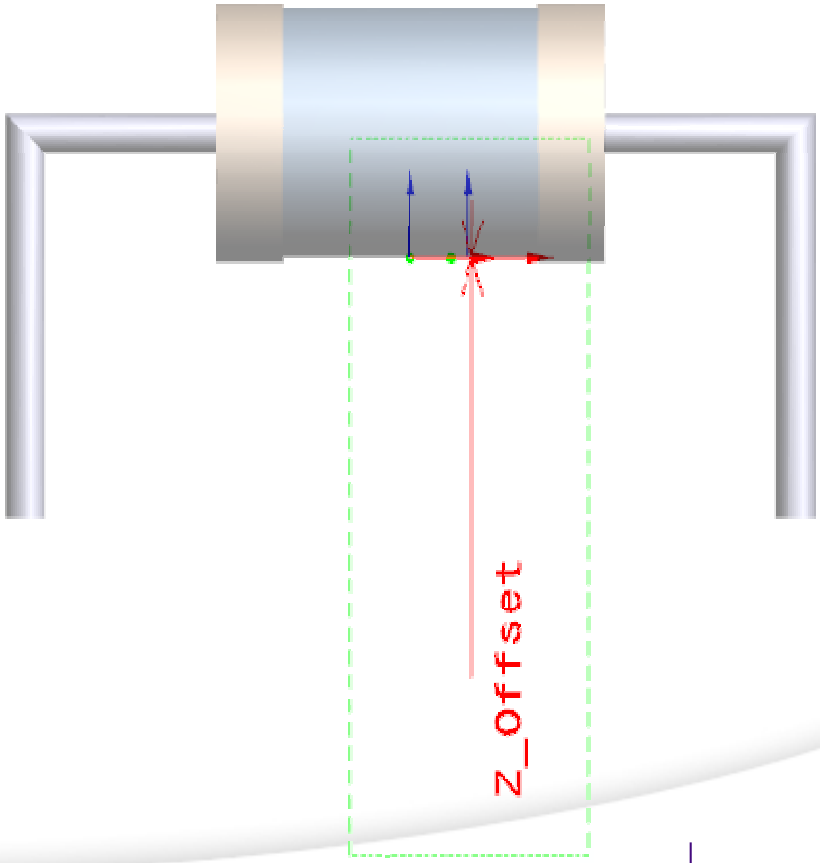


View for ACS Definition

- ACS_XY View

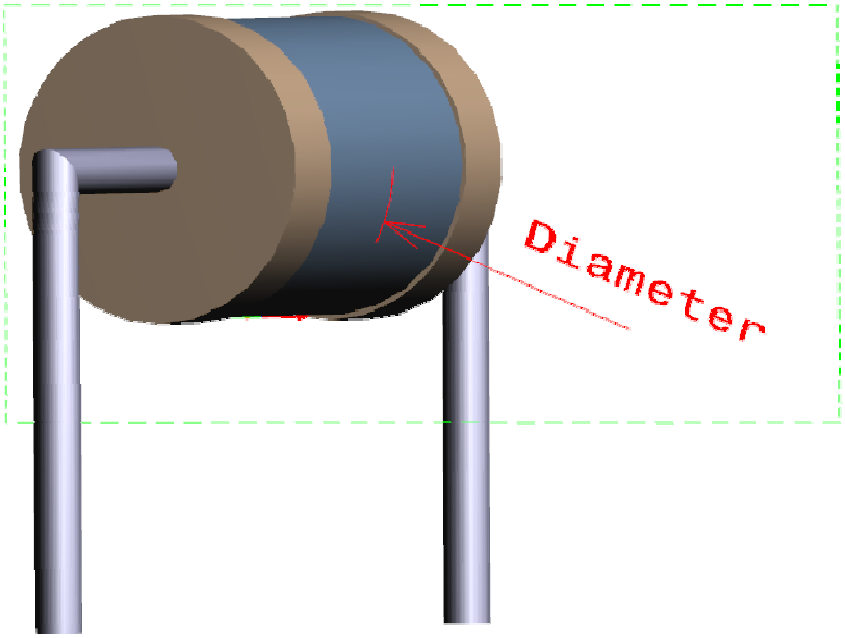


- ACS_ZX View

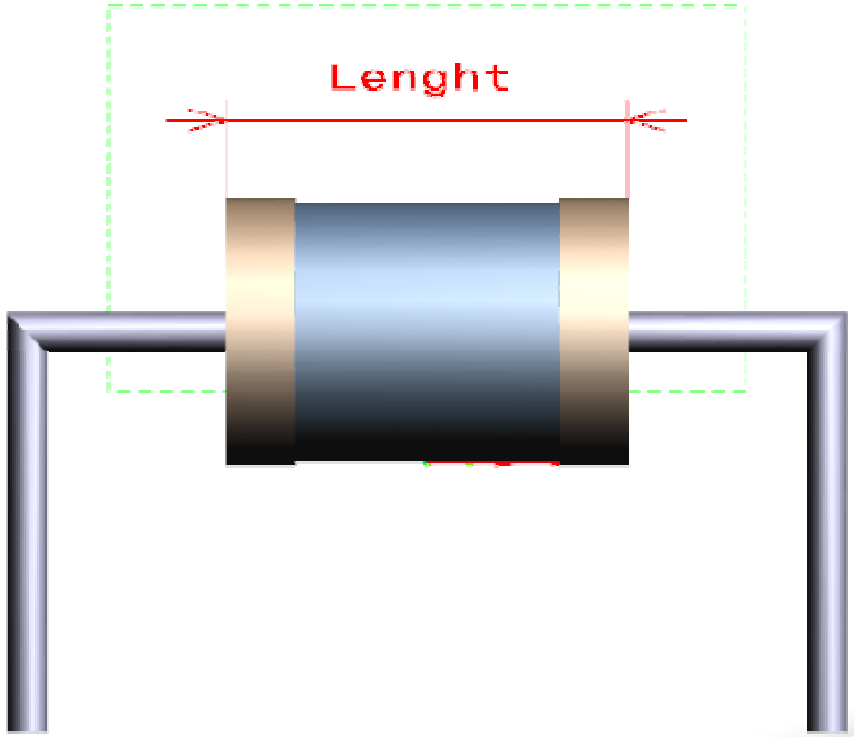


Views for Basic Body Definition

- Body_YZ View



- Body_ZX View



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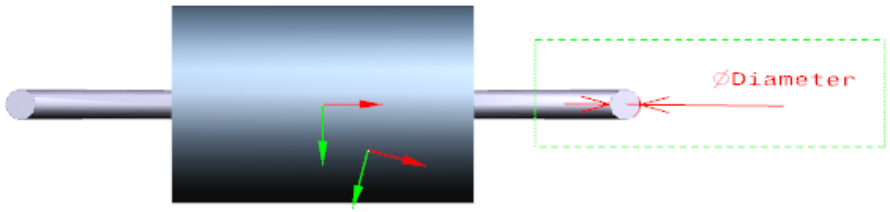
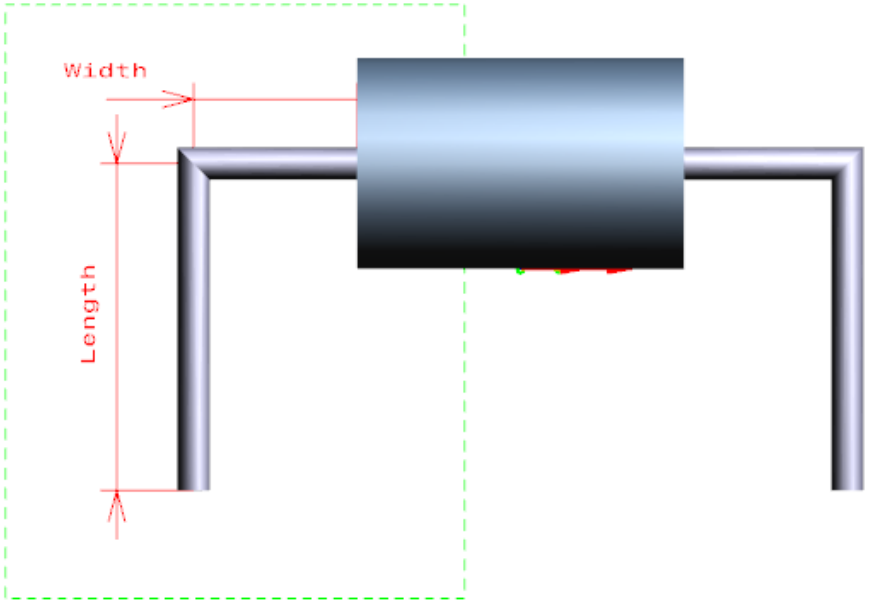
Views for Pin Definition

- Pin_XY View

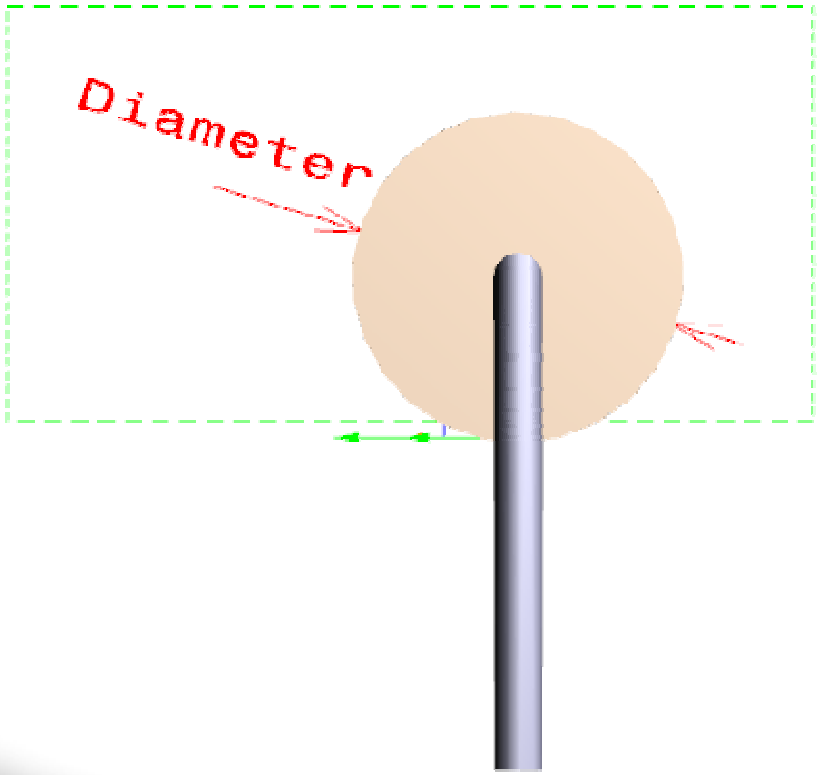


- Pin_ZX View

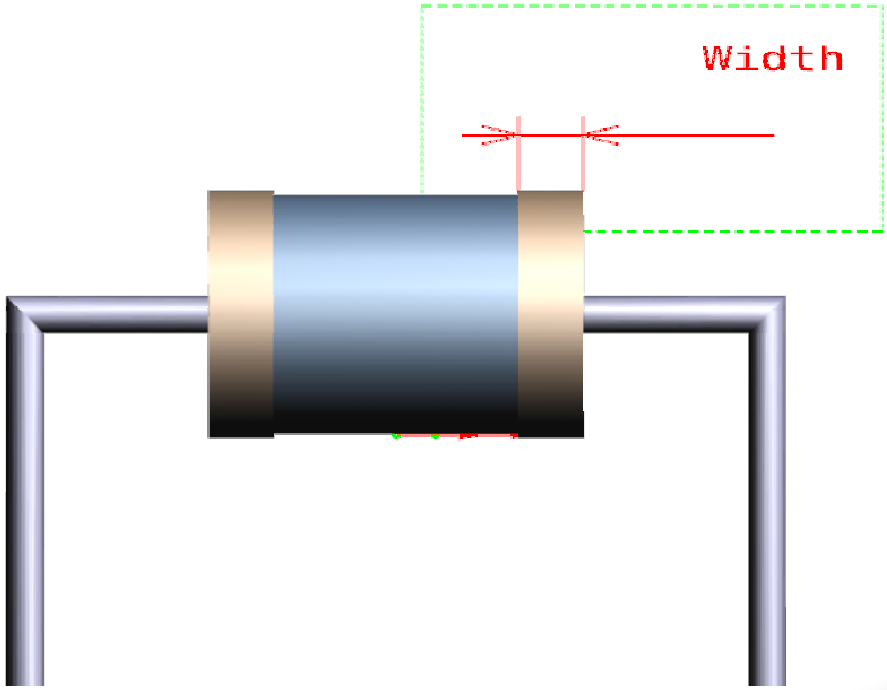


Views for optional Pin Variant

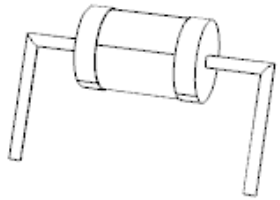
- Pin_opt_YZ View



- Pin_opt_ZX View



Type B
Implementation Constraints



- "Pin 1" is the pin along the positive x-axis
- Model is mirror-symmetrical
  - Cylinder is in the middle of the pins
  - Both pins are identical
- Special type with "ring" as contact without standard L-Pins
  - Inner Diameter of ring equals Body Diameter
  - Standard L-Pins values:
    - Pin_Diameter = 0
    - Pin_Length = 0
    - Pin_Width = 0

- Special type with upright body out of scope

Draft

General Implementation Issues

Applicable for Type A and Type B Master Models

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General Implementation Issues

- Tolerances
  - Tolerances must be applied to all geometric Parameters
    - Nominal Value
    - algebraic sign + Tolerance for Maximum Material Model
    - algebraic sign + Tolerance for Minimum Material Model
- Color
  - Each feature (Basic Body, Add. Body, Pinrow) has an attribute for the color
    - 9-digit rgb-code (e.g. 255255255 for white)
- Electrical Insertion Point
  - ACS Electrical Insertion Point represents the placement constraint. The origin coordinate system is just for defining the ACS.