# V5 10N STATIC LOAD

# Study Report

| | |
|---|---|
| Analyzed File | V5 v8 |
| Version | Autodesk Fusion 360 (2.0.3803) |
| Creation Date | 2018-03-19, 18:59:31 |
| Author | |

## ⊟ Simulation Model 1:1

### ⊟ Study 2 -(10N) Static Stress

#### ⊟ Study Properties

| | |
|---|---|
| Study Type | Static Stress |
| Last Modification Date | 2018-03-19, 18:43:52 |

#### ⊟ Settings

##### ⊟ General

| | |
|---|---|
| Contact Tolerance | 0.1 mm |
| Remove Rigid Body Modes | No |

##### ⊟ Mesh

| | |
|---|---|
| Average Element Size (% of model size) | |
| Solids | 10 |
| Scale Mesh Size Per Part | No |
| Average Element Size (absolute value) | - |
| Element Order | Parabolic |
| Create Curved Mesh Elements | No |
| Max. Turn Angle on Curves (Deg.) | 60 |
| Max. Adjacent Mesh Size Ratio | 1.5 |
| Max. Aspect Ratio | 10 |
| Minimum Element Size (% of average size) | 20 |

### ⊟ Adaptive Mesh Refinement

| | |
|---|---|
| Number of Refinement Steps | 0 |
| Results Convergence Tolerance (%) | 20 |
| Portion of Elements to Refine (%) | 10 |
| Results for Baseline Accuracy | Von Mises Stress |

## ⊟ Materials

| Component | Material | Safety Factor |
|---|---|---|
| Headset V5 v1:1 | PLA (3D Printed) | Yield Strength |
| Odroid XU4 v1:1 | SolidWorks Materials\|Silicon\|67 | Yield Strength |
| Screen V4 v1:1 | SOLIDWORKS Materials\|Silicon\|67 | Yield Strength |

### ⊟ PLA (3D Printed)

| | |
|---|---|
| Density | 3.75E-07 kg / mm^3 |
| Young's Modulus | 3400 MPa |
| Poisson's Ratio | 0.38 |
| Yield Strength | 13 MPa |
| Ultimate Tensile Strength | 15 MPa |
| Thermal Conductivity | 1.6E-04 W / (mm C) |
| Thermal Expansion Coefficient | 8.57E-05 / C |
| Specific Heat | 1500 J / (kg C) |

### ⊟ SOLIDWORKS Materials|Silicon|67

| | |
|---|---|
| Density | 2.33E-06 kg / mm^3 |
| Young's Modulus | 112400 MPa |
| Poisson's Ratio | 0.28 |
| Yield Strength | 120 MPa |
| Ultimate Tensile Strength | 0 MPa |
| Thermal Conductivity | 0.124 W / (mm C) |
| Thermal Expansion Coefficient | 0 / C |
| Specific Heat | 0 J / (kg C) |

### ⊟ SolidWorks Materials|Silicon|67

| | |
|---|---|
| Density | 2.33E-06 kg / mm^3 |

| | |
|---|---|
| Young's Modulus | 112400 MPa |
| Poisson's Ratio | 0.28 |
| Yield Strength | 120 MPa |
| Ultimate Tensile Strength | 0 MPa |
| Thermal Conductivity | 0.124 W / (mm C) |
| Thermal Expansion Coefficient | 0 / C |
| Specific Heat | 0 J / (kg C) |

## Contacts

### Bonded

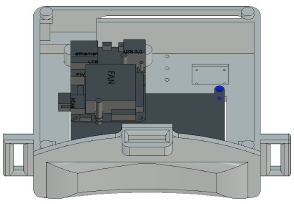
| Name |
|---|
| [S] Bonded1 [Odroid XU4 v1:1\|\|Screen V4 v1:1] |

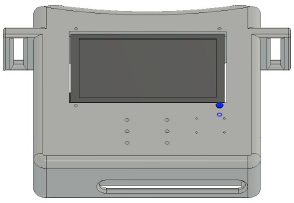
## Connectors

### Bolt Connector1

| | |
|---|---|
| Type | Bolt Connector |
| Bolt Subtype | With Nut |
| Bolt Diameter | 2.705 mm |
| Head Washer | No |
| Nut Washer | No |
| Pre-load type | Axial |
| Material | PLA (3D Printed) |
| Elastic Modulus | 3400 MPa |
| Poisson's Ratio | 0.38 |
| Thermal Expansion Coefficient | 8.57E-05 / C |

#### Selected Entities

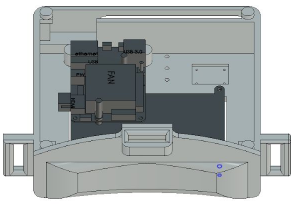


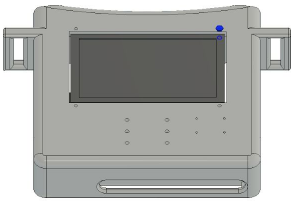


## ⊟ Bolt Connector2

| | |
|---|---|
| Type | Bolt Connector |
| Bolt Subtype | With Nut |
| Bolt Diameter | 2.705 mm |
| Head Washer | No |
| Nut Washer | No |
| Pre-load type | Axial |
| Material | PLA (3D Printed) |
| Elastic Modulus | 3400 MPa |
| Poisson's Ratio | 0.38 |
| Thermal Expansion Coefficient | 8.57E-05 / C |

### ⊟ Selected Entities

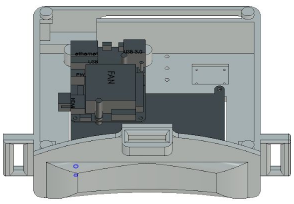


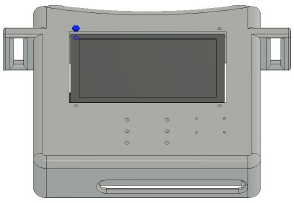


## ⊟ Bolt Connector3

| | |
|---|---|
| Type | Bolt Connector |
| Bolt Subtype | With Nut |
| Bolt Diameter | 2.705 mm |
| Head Washer | No |
| Nut Washer | No |
| Pre-load type | Axial |
| Material | PLA (3D Printed) |
| Elastic Modulus | 3400 MPa |
| Poisson's Ratio | 0.38 |
| Thermal Expansion Coefficient | 8.57E-05 / C |

### ⊟ Selected Entities

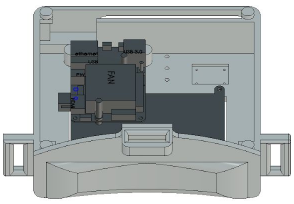


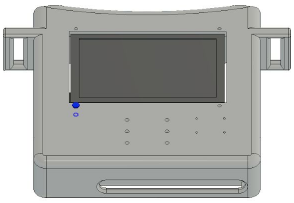


## ⊟ Bolt Connector4

| | |
|---|---|
| Type | Bolt Connector |
| Bolt Subtype | With Nut |
| Bolt Diameter | 2.705 mm |
| Head Washer | No |
| Nut Washer | No |
| Pre-load type | Axial |
| Material | PLA (3D Printed) |
| Elastic Modulus | 3400 MPa |
| Poisson's Ratio | 0.38 |
| Thermal Expansion Coefficient | 8.57E-05 / C |

### ⊟ Selected Entities

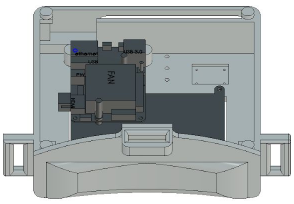


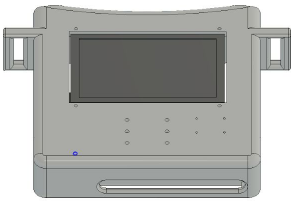


### ⊟ Bolt Connector5

| | |
|---|---|
| Type | Bolt Connector |
| Bolt Subtype | Threaded Hole |
| Bolt Diameter | 3.2 mm |
| Head Washer | No |
| Usable Thread Length | 5 mm |
| Pre-load type | Axial |
| Material | Steel |
| Elastic Modulus | 210000 MPa |
| Poisson's Ratio | 0.3 |
| Thermal Expansion Coefficient | 1.2E-05 / C |

### ⊟ Selected Entities

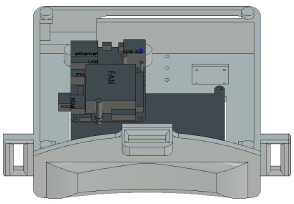


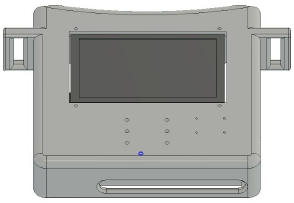


## ⊟ Bolt Connector6

| | |
|---|---|
| Type | Bolt Connector |
| Bolt Subtype | Threaded Hole |
| Bolt Diameter | 3.2 mm |
| Head Washer | No |
| Usable Thread Length | 5 mm |
| Pre-load type | Axial |
| Material | Steel |
| Elastic Modulus | 210000 MPa |
| Poisson's Ratio | 0.3 |
| Thermal Expansion Coefficient | 1.2E-05 / C |

### ⊟ Selected Entities





## Mesh

| Type | Nodes | Elements |
|---|---|---|
| Solids | 55771 | 30876 |

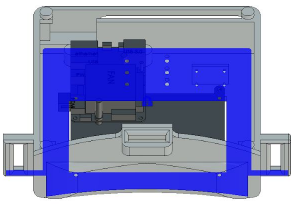
## Load Case1

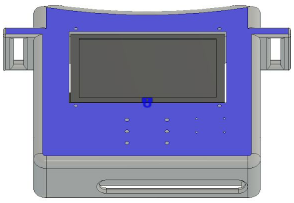
### Constraints

#### Fixed1

| | |
|---|---|
| Type | Fixed |
| Ux | Yes |
| Uy | Yes |
| Uz | Yes |

##### Selected Entities



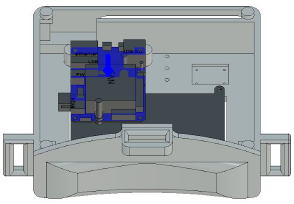


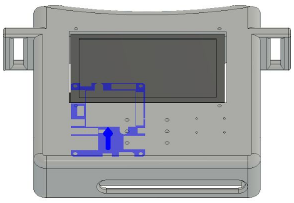
## Loads

### Force1

| | |
|---|---|
| Type | Force |
| Magnitude | 10 N |
| X Value | 0 N |
| Y Value | -10 N |
| Z Value | -1.472E-29 N |
| Force Per Entity | No |

#### Selected Entities





## Results

### Result Summary

| Name | Minimum | Maximum |
|---|---|---|
| Safety Factor | | |
| Per Body | 3.557 | 15 |
| Stress | | |
| Von Mises | 0 MPa | 33.74 MPa |
| 1st Principal | -8.505 MPa | 38.9 MPa |
| 3rd Principal | -32.45 MPa | 6.457 MPa |
| Normal XX | -31.73 MPa | 36.6 MPa |
| Normal YY | -27.34 MPa | 18.19 MPa |
| Normal ZZ | -8.901 MPa | 8.671 MPa |
| Shear XY | -7.553 MPa | 8.13 MPa |
| Shear YZ | -2.846 MPa | 2.399 MPa |

| | | |
|---|---|---|
| Shear ZX | -4.579 MPa | 4.341 MPa |
| Displacement | | |
| Total | 0 mm | 0.2135 mm |
| X | -6.697E-04 mm | 0.07142 mm |
| Y | -0.2076 mm | 5.889E-04 mm |
| Z | -0.01896 mm | 7.541E-04 mm |
| Reaction Force | | |
| Total | 0 N | 1.136 N |
| X | -0.3298 N | 0.2184 N |
| Y | -0.1516 N | 1.135 N |
| Z | -0.2962 N | 0.1995 N |
| Strain | | |
| Equivalent | 0 | 3.271E-04 |
| 1st Principal | -3.499E-08 | 3.788E-04 |
| 3rd Principal | -2.982E-04 | 5.553E-07 |
| Normal XX | -2.679E-04 | 2.918E-04 |
| Normal YY | -1.893E-04 | 1.509E-04 |
| Normal ZZ | -7.356E-05 | 5.101E-05 |
| Shear XY | -1.72E-04 | 1.852E-04 |
| Shear YZ | -6.481E-05 | 5.464E-05 |
| Shear ZX | -1.043E-04 | 9.887E-05 |
| Contact Pressure | | |
| Total | 0 MPa | 13.87 MPa |
| X | -4.57 MPa | 5.466 MPa |
| Y | -5.986 MPa | 12.72 MPa |
| Z | -0.7645 MPa | 0.9387 MPa |

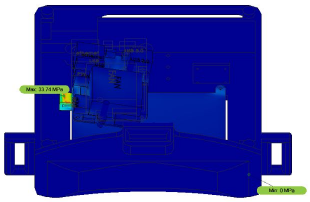
## ⊟ Reaction Forces

| **Constraint Name** | **Reaction Force** | | **Reaction Moment** | |
|---|---|---|---|---|
| | **Magnitude** | **Component (X,Y,Z)** | **Magnitude** | **Component (X,Y,Z)** |
| Fixed1 | 10.05 N | 3.685E-08 N | 367.5 N mm | 192.3 N mm |
| | | 10.05 N | | -1.424E-05 N mm |
| | | -2.194E-07 N | | -313.2 N mm |

## ⊟ Stress

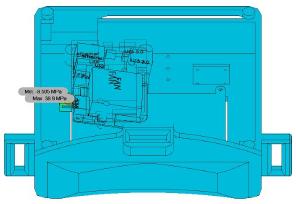
### ⊟ Von Mises

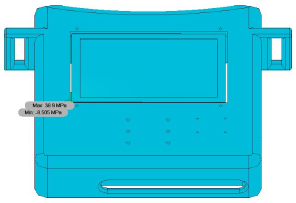
[MPa] 0 33.74



### ⊟ 1st Principal

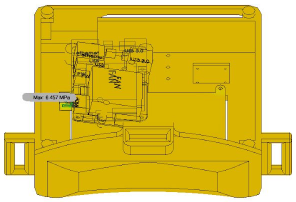
[MPa] -8.51 38.9

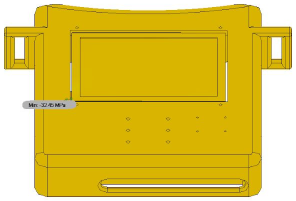




⊟ **3rd Principal**

[MPa] -32.45 6.46

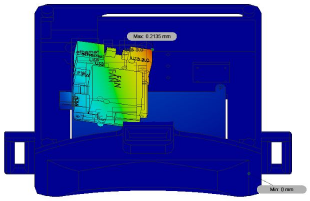




## ⊟ Displacement

### ⊟ Total

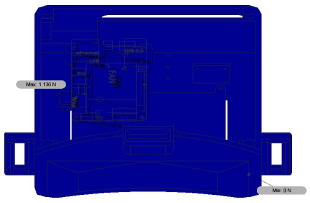
[mm] 0 0.2135

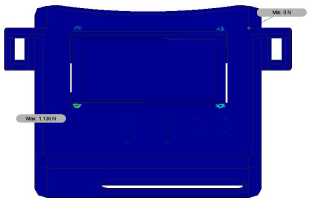


## ⊟ Reaction Force

⊟ **Total**

[N] 0  1.136

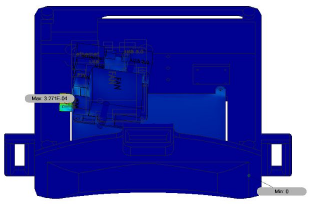




⊟ **Strain**

⊟ **Equivalent**

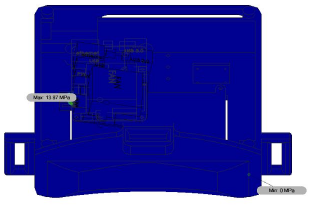
0  3.271E-04

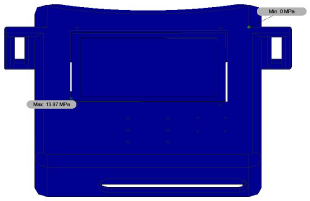


## ⊟ Contact Pressure

### ⊟ Total

[MPa] 0 13.87




Min: 0.0MPa
Max: 13.97MPa