

Q: Can Femtet analyze the impact test ?

A: Yes, Femtet can do it with the transient analysis of the stress solver.

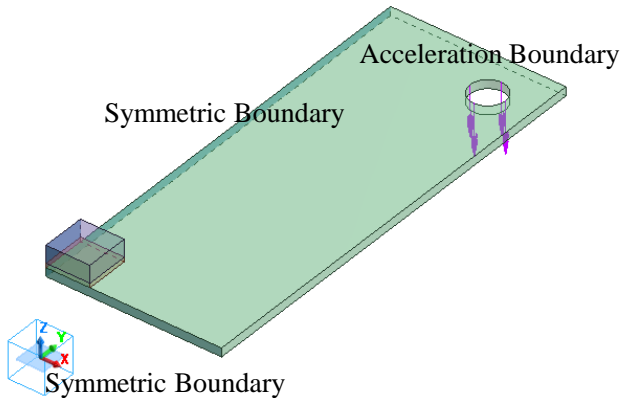
Acceleration boundary* is set for the analysis.

* It is different from [Acceleration] in [Options] in the [Analysis Condition Setting] dialog box.

Impact Test Analysis



- The impact test applies impact acceleration for a very short term.
- Femtet can use the time-dependent acceleration boundary in the stress-transient analysis to perform the analysis with impact acceleration taken into account.
- This example uses a simple model where the impact acceleration above is set.



The model is a quarter-symmetric model of a substrate with a component mounted at the center.

The symmetric face is set with a symmetric boundary condition (Fix).

Acceleration boundary is set to the inner surface of the hole located at the corner of the substrate.

See the next slides for more information.

Boundary Condition (Acceleration)

Edit Boundary Condition [e,h,w]

Mechanical

Symmetry/Conti...
Notes

Boundary Condition Type

Displacement
 Normal Displacement
 Rotational Displacement
 Acceleration

Lumped Vertex Load
 Distributed Edge Load
 Distributed Face Load
 Pressure
 Torque Load
 Joint Load

Simple Contact
 Contact Surface
 Spring Connection
 Remote Load

Acoustic Impedance
 Open Boundary
 Free

Time Dependency
 Set ON/OFF
 ON/OFF List

Uniform Displacement
 Use distribution data
 Distribution Data

UX
 UY
 UZ

Results Import

X: 0.0
Y: 0.0 m/s2
Z: -5000*9.8

Constrain the normal displacement

Edit Nonlinearity Table

[Time-Weight] Graph

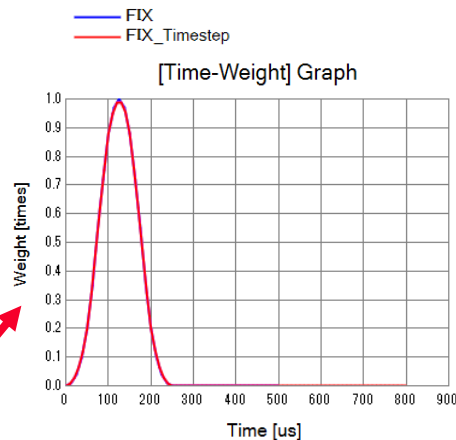
| No. | Time | Weight |
|-----|-----------|--------|
| 1 | 0.0 | 0.0 |
| 2 | 1.25E-05 | 0.01 |
| 3 | 2.5E-05 | 0.04 |
| 4 | 3.75E-05 | 0.1 |
| 5 | 5.00E-05 | 0.2 |
| 6 | 6.25E-05 | 0.35 |
| 7 | 7.5E-05 | 0.55 |
| 8 | 8.75E-05 | 0.72 |
| 9 | 1.00E-04 | 0.88 |
| 10 | 1.13E-04 | 0.97 |
| 11 | 1.25E-04 | 1.0 |
| 12 | 1.375E-04 | 0.97 |
| 13 | 1.5E-04 | 0.88 |
| 14 | 1.625E-04 | 0.72 |
| 15 | 1.75E-04 | 0.55 |
| 16 | 1.875E-04 | 0.35 |
| 17 | 2.0E-04 | 0.2 |
| 18 | 2.125E-04 | 0.1 |
| 19 | 2.25E-04 | 0.04 |
| 20 | 2.375E-04 | 0.01 |
| 21 | 2.5E-04 | 0.0 |

Unit: s times

Smooth Interpolation

Final time: enter up to 10[s]

OK Cancel Help



The time dependency weight is set such that an impact acceleration peak of 500 G for 250 us is generated.

Analysis Condition (Stress-Transient Analysis)



Analysis Condition Setting

Solver

Stress Analysis

Mesh

Resonant Analy...

Harmonic Analy...

Transient Analysis

Step/Thermal Lo...

Acceleration

Angular Velocity

Constant Tempe...

High-Level Setti...

Results Import

Notes

Analysis Type

Static Analysis

Resonant Analysis

Harmonic Analysis

Buckling Analysis

Transient Analysis

2D Approximation

Planar Strain

Plane Stress

Large Deformation

Large Displacement

Large Strain

Options

Acceleration

Angular Velocity

Constrain the freedom of shells

Calculate the mass and the moment of inertia.

Constant Te...

Initial Stress (Results Import)

Analysis Condition Setting

Solver

Stress Analysis

Mesh

Resonant Analy...

Harmonic Analy...

Transient Analysis

Step/Thermal Lo...

Acceleration

Angular Velocity

Constant Tempe...

High-Level Setti...

Results Import

Notes

Transient Analysis

Timestep

Manual

Automatic

Restart

Continue from the last session

| No. | Calcula... | Output... | Timestep |
|------|------------|-----------|----------|
| 1 | 80 | 1 | 10 |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| Unit | | | |

Insert Rows

Delete Rows

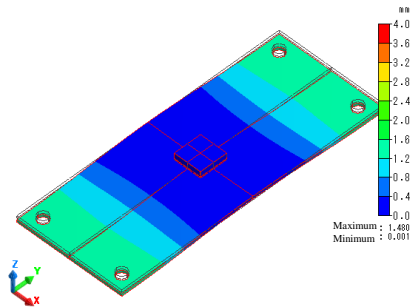
Import

Table

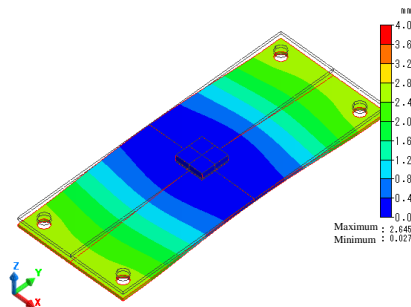
Timestep and calculation steps are set to 10us and 80, respectively.
The total time is as follows.

$$80 \times 10 \text{ us} = 800 \text{ us}$$

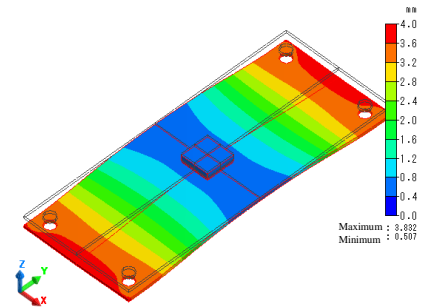
Results (Displacement + Z Displacement Contour)



40us



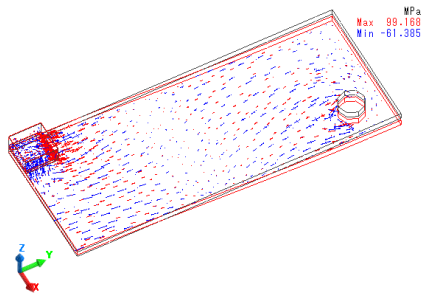
60us



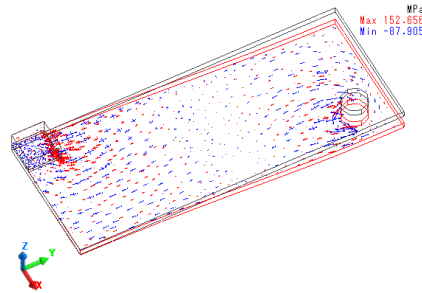
80us

The impact acceleration applied to the holes at the four corners causes deformation in the surrounding portions of the substrate. However, due to the low rigidity of the substrate, the part mounted in the center remains at its original position with less substrate deformation.

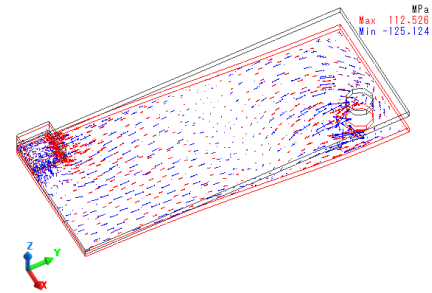
Result (Displacement + Principal Stress)



40us



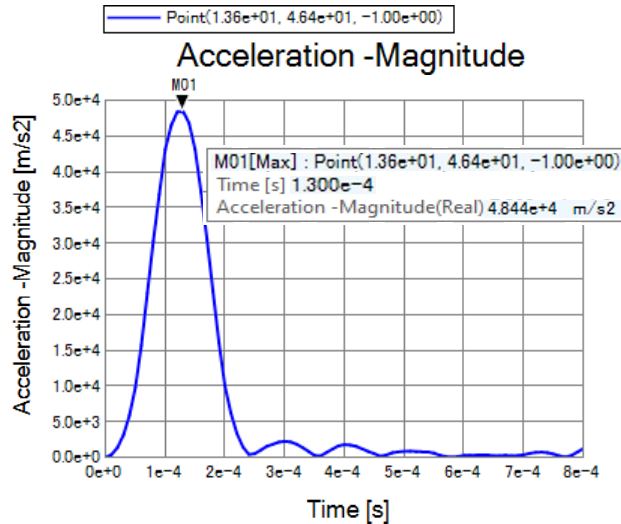
60us



80us

Large tensile stress is generated around the centrally mounted part in the longitudinal direction.

Acceleration at Acceleration Boundary



The graph indicates the peak acceleration is about 500 G.